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VETENSKAPS-AKADEMIENS

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P. A. NORSTEDT & SÖNER.
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OM SUMMATION AF PERIODISKA FUNKTIONER.

AF

H. GYLDÉN.

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STOCKHOLM, 1872.
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KONGL. BOKTRYCKARE.

Om ett ändligt antal värden af en funktion äro gifna, hvilka motsvara värden af funktionens argnment, som växa med en oföränderlig och ändlig qvantitet, så kallas den operation, hvarigenom summan af dessa funktionsvärden uttryckes medelst en ny funktion: summation af den gifna funktionen. Resultatet erhålles genom integration af den ändliga differenseqvationen

$$y_s - y_{s-1} = F(s)$$

der $F(t)$ är den gifna funktionen och y_s det sökta resultatet; s betecknar på samma gång ett helt tal, då enheten för t är sålunda vald, att det oföränderliga värdet, hvarmed argumentet växer, betecknas med 1.

I några få fall, d. ä. då $F(t)$ betecknar en hel rationell algebraisk funktion eller ock en exponential- eller trigonometrisk funktion af en viss beskaffenhet, kan ofvanstående differenseqvation strängt integreras. Är $F(t)$ af en annan beskaffenhet, så finner man y_s medelst en serieutveckling, som är känd under namnet Mac Laurins summationsformel. Denna formel är likväl ingalunda allmänt användbar, ty hon hör ofta till de så kallade halfkonvergenta serierna. För att kunna bedöma möjligheten att medelst denna formel erhålla ett noggrannt resultat, blef det nödvändigt att diskutera den så kallade resttermen. Men ville man använda denna term endast för ett sådant kriterium, så skulle ej mycket vinnas, och emedan så skett, är man med lösningen af problemet att summera funktioner ej synnerligen långt kommen. Underkastar man dock resttermen en sådan transformation att hon kan numeriskt beräknas, så blifver den Mac Laurinska formeln användbar vid flera tillfällen, der hon förut hade lemnat ett helt och hållet illusoriskt resultat. Denna transformation består deri, att resttermen utvecklas i en konvergent serie; men ehuru man sålunda blifver i stånd att finna ett resultat med all önskvärd noggrannhet, så händer dock att den nya serieutvecklingens konvergens är af den natur, att användningen af densamma blefve mer än nödvändigt mödosam.

Vid de undersökningar i störingstheorien, hvarmed jag sedan någon tid sysselsatt mig, visade sig det ofvannämnda problemet erhålla en särdeles vigtig användning. Jag företog mig derföre att undersöka huruvida ej den Mac Laurinska formeln skulle kunna ersättas genom någon annan mera lämplig. Det visade sig dervid, att denna formel endast är ett speciellt fall af en allmännare, samt att ur denna allmännare formel andra speciella kunna härledas, hvilka under vissa omständigheter äro att föredraga.

Vid dessa undersökningar har jag inskränkt mig till reellt periodiska funktioner och några med dem beslägtade, emedan endast sådana förekomma vid de användningar, jag åsyftar. Af denna orsak antager jag, att $F(t)$ såväl som alla dess differentialkoefficienter ständigt kunna uttryckas medelst serier af formeln

$$F(t) = M_0 + M_1 \operatorname{Cos}(\psi + \mu t) + M_2 \operatorname{Cos} 2(\psi + \mu t) + \cdots \tag{1}$$

der ψ betecknar en konstant båge och μ ett godtyckligt irrationellt tal. Tillika skola vi införa talet π såsom enhet för ändringen af t, då vi hafva

$$y_s - y_{s-1} = F(s\pi)$$

och erhålla, om vi sätta

$$y_0 = F(0),$$
$$y_s = F(0) + F(\pi) + \cdots + F(s\pi) \tag{2}$$

Vi kunna gifva åt vårt problem en annan form, hvilken blifver till nytta vid användningen. Sätta vi nämnligen

$$u = \varphi(\mu t)$$

under antagandet att u är en periodisk funktion af μt, samt

$$F(t) = f(u);$$

och beteckna vi dessutom

$$u_0 = \varphi(0)$$
$$u_1 = \varphi(\mu\pi)$$
$$\cdots\cdots$$
$$u_s = \varphi(s\mu\pi),$$

så är

$$y_s = f(u_0) + f(u_1) + \cdots + f(u_s)$$

och vår uppgift vore att uttrycka y_s såsom en funktion af u_s.

Införa vi i eqv. (2) värden för $F(0)$, $F(\pi)$, o. s. v., i enlighet med eqv. (1), eller

$$F(t) = M_0 + M_1 \operatorname{Cos}(\psi + \mu t) + M_2 \operatorname{Cos} 2(\psi + \mu t) + \cdots$$

så erhålla vi

$$\begin{aligned} y_s = (s+1) M_0 &+ M_1 \operatorname{Cos}\psi\,(1 + \operatorname{Cos}\mu\pi + \operatorname{Cos} 2\mu\pi + \cdots + \operatorname{Cos} s\mu\pi) \\ &- M_1 \operatorname{Sin}\psi\,(\operatorname{Sin}\mu\pi + \operatorname{Sin} 2\mu\pi + \cdots + \operatorname{Sin} s\mu\pi) \\ &+ M_2 \operatorname{Cos} 2\psi\,(1 + \operatorname{Cos} 2\mu\pi + \operatorname{Cos} 4\mu\pi + \cdots + \operatorname{Cos} 2s\mu\pi) \\ &- M_2 \operatorname{Sin} 2\psi\,(\operatorname{Sin} 2\mu\pi + \operatorname{Sin} 4\mu\pi + \cdots + \operatorname{Sin} 2s\mu\pi) \\ &+ \cdots\cdots \end{aligned}$$

Med stöd af de bekanta relationerna

$$\begin{cases} 1 + \operatorname{Cos} n\mu\pi + \operatorname{Cos} 2n\mu\pi + \cdots + \operatorname{Cos} sn\mu\pi = \frac{1}{2} + \frac{1}{2}\,\frac{\operatorname{Sin}(s+\frac{1}{2})n\mu\pi}{\operatorname{Sin}\frac{1}{2}n\mu\pi} \\ \operatorname{Sin} n\mu\pi + \operatorname{Sin} 2n\mu\pi + \cdots + \operatorname{Sin} sn\mu\pi = \frac{1}{2}\operatorname{Cotg}\frac{1}{2}n\mu\pi - \frac{1}{2}\,\frac{\operatorname{Cos}(s+\frac{1}{2})n\mu\pi}{\operatorname{Sin}\frac{1}{2}n\mu\pi} \end{cases} \tag{3}$$

finner man ur ofvanstående eqvation

$$\begin{aligned} y_s = (s+1)M_0 &+ \sum_1^{\infty} M_n \left(\tfrac{1}{2} + \tfrac{1}{2}\operatorname{Cotg}\tfrac{1}{2}n\mu\pi \operatorname{Sin} sn\mu\pi + \tfrac{1}{2}\operatorname{Cos} sn\mu\pi\right)\operatorname{Cos} n\psi \\ &- \sum_1^{\infty} M_n \left(\tfrac{1}{2}\operatorname{Cotg}\tfrac{1}{2}n\mu\pi - \tfrac{1}{2}\operatorname{Cotg}\tfrac{1}{2}n\mu\pi \operatorname{Cos} sn\mu\pi + \tfrac{1}{2}\operatorname{Sin} sn\mu\pi\right)\operatorname{Sin} n\psi \end{aligned} \tag{4}$$

Såvida vi nu kunna tänka oss $s\mu\pi$ uttryckt såsom en funktion af u_s och detta uttryck substitueradt i eqv. (4), så kunna vi äfven anse oss hafva en lösning till vår uppgift. Men i den händelse att utvecklingen af $F(t)$ efter multiplerna af μt endast långsamt konvergerar, blifver en dylik lösning illusorisk, eller åtminstone obrukbar för summeriska räkningar. Ty om äfven slutresultatet, ordnadt efter multiplerna af u_s såsom argument, skulle i hög grad konvergera, så skulle dock hvarje utvecklingskoefficient utgöras af en oändlig serie, hvaraf ett mycket stort antal termer blefve märkliga. Vi böra derföre söka att transformera formeln (4) på något för vårt ändamål lämpligt sätt och för sådan orsak skola vi till en början bemöda oss att framställa y_s under formen af en bestämd integral. Dessförinnan skola vi dock lägga märke till, att en del termer i uttrycket (4) omedelbart låta summera sig. Det är nämnligen

$$F(0) = M_0 + \sum_1^\infty M_n \operatorname{Cos} n\psi$$

$$F(s\pi) = M_0 + \sum_1^\infty M_n \operatorname{Cos} n\psi \operatorname{Cos} ns\mu\pi - \sum_1^\infty M_n \operatorname{Sin} n\psi \operatorname{Sin} ns\mu\pi$$

Sätta vi derföre

$$\begin{aligned} z_s &= y_s - \tfrac{1}{2}F(0) - \tfrac{1}{2}F(s\pi) \\ &= y_s - \tfrac{1}{2}f(u_0) - \tfrac{1}{2}f(u_s), \end{aligned}$$

så blifver

$$z_s = sM_0 + \tfrac{1}{2}\sum_1^\infty M_n \operatorname{Cotg} \tfrac{1}{2}n\mu\pi \operatorname{Sin} n(s\mu\pi + \psi) - \tfrac{1}{2}\sum_1^\infty M_n \operatorname{Cotg} \tfrac{1}{2}n\mu\pi \operatorname{Sin} n\psi;$$

men, emedan

$$\tfrac{1}{2}\int^{n=0} \operatorname{Cotang} \tfrac{1}{2} n\mu\pi \left\{\operatorname{Sin} n(s\mu\pi + \psi) - \operatorname{Sin} n\psi\right\} = s,$$

så kunna vi äfven ansätta denna eqvation

$$z_s = \tfrac{1}{2}\sum_0^\infty M_n \operatorname{Cotang} \tfrac{1}{2}n\mu\pi \operatorname{Sin} n(\psi + s\mu\pi) - \tfrac{1}{2}\sum_0^\infty M_n \operatorname{Cotg} \tfrac{1}{2}n\mu\pi \operatorname{Sin} n\psi$$

Om vi nu skulle lyckas att bestämma en funktion $\chi(t)$ sålunda att vilkoret

$$(5) \qquad \int_0^{s\pi} \operatorname{Cos} n(\psi + \mu t)\chi(t)dt = \operatorname{Cotg} \tfrac{1}{2}n\mu\pi \left\{\operatorname{Sin} n(\psi + s\mu\pi) - \operatorname{Sin} n\psi\right\}$$

blefve uppfyldt, så hade vi omedelbart

$$z_s = \tfrac{1}{2}\sum_0^\infty M_n \int_0^{s\pi} \operatorname{Cos} n(\psi + t)\chi(t)dt = \tfrac{1}{2}\int_0^{s\pi} \chi(t)dt \sum_0^\infty M_n \operatorname{Cos} n(\psi + \mu t)$$

d. ä.

$$(6) \qquad z_s = \tfrac{1}{2}\int_0^{s\pi} F(t)\chi(t)dt$$

Svårigheten består således nu endast deri att kunna bestämma funktionen $\chi(t)$, och denna öfvervinnes ögonblickligen, om man i stället för $\operatorname{Cotg}\tfrac{1}{2}n\mu\pi$ i eqv. (5) substituerar den bekanta utvecklingen

$$\operatorname{Cotang} \tfrac{1}{2}n\mu\pi = \frac{2}{\pi}\left\{\frac{1}{n\mu} + \frac{2n\mu}{(n\mu)^2 - 2^2} + \frac{2n\mu}{(n\mu)^2 - 4^2} + \cdots\right\}$$

Man har nämnligen, i fall m betecknar ett helt tal,

$$(7) \qquad \int\limits_0^{s\pi} \operatorname{Cos} n(\psi + \mu t) \operatorname{Cos} 2mt dt = \frac{n\mu}{(n\mu)^2 - (2m)^2} \{\operatorname{Sin} n(\psi + s\pi) - \operatorname{Sin} n\psi\}$$

hvaraf följer att vilkoret (5) blifver uppfyldt om

$$\chi(t) = \frac{2}{\pi}\{1 + 2 \operatorname{Cos} 2t + 2 \operatorname{Cos} 4t + \cdots\}$$

d. ä.

$$\chi(t) = \frac{2}{\pi} \operatorname{Lim.} \frac{\operatorname{Sin}(2k+1)t}{\operatorname{Sin} t}$$

der Lim. betecknar att det hela talet k bör anses växande i oändlighet.

Det vunna resultatet, nämnligen

$$z_s = \frac{1}{\pi} \operatorname{Lim.} \int\limits_0^{s\pi} F(t) \frac{\operatorname{Sin}(2k+1)t}{\operatorname{Sin} t} dt$$

är likväl för vårt ändamål utan någon omedelbar betydelse och innehåller ingenting annat än den bekanta Mac Laurinska summationsformeln. Betrakta vi likväl den väg, på hvilken detta resultat vunnits, så visar det sig att detsamma hufvudsakligast stöder sig på den anförda utvecklingen af $\operatorname{Cotang} \frac{1}{2}n\mu\pi$. Den svårighet, som vi ännu hafva att öfvervinna, synes derföre ligga deri att finna någon annan, mera konvergent serie-utveckling för denna funktion. Sådana kunna lyckligtvis äfven ganska lätt erhållas, ehuru de hitintills tyckas hafva undgått all uppmärksamhet.

Ur den bekanta formeln

$$\operatorname{Cotang} \tfrac{1}{2}\pi x = \frac{2}{\pi x} \frac{\left(1 - \frac{x^2}{1^2}\right)\left(1 - \frac{x^2}{3^2}\right)\left(1 - \frac{x^2}{5^2}\right)\cdots}{\left(1 - \frac{x^2}{2^2}\right)\left(1 - \frac{x^2}{4^2}\right)\left(1 - \frac{x^2}{6^2}\right)\cdots}$$

följer ögonblickligen, om i betecknar ett helt positivt tal:

$$\frac{\operatorname{Cotg} \frac{1}{2}\pi x}{\left(1 - \frac{x^2}{1^2}\right)\left(1 - \frac{x^2}{3^2}\right)\cdots\left(1 - \frac{x^2}{(2i-1)^2}\right)} = \frac{2}{\pi x} \frac{\left(1 - \frac{x^2}{(2i+1)^2}\right)\left(1 - \frac{x^2}{(2i+3)^2}\right)\cdots}{\left(1 - \frac{x^2}{2^2}\right)\left(1 - \frac{x^2}{4^2}\right)\left(1 - \frac{x^2}{6^2}\right)\cdots}$$

Sönderdelas här qvantiteten till höger om likhetstecknet i partialbråk, sålunda att

$$(8) \qquad \frac{\operatorname{Cotang} \frac{1}{2}\pi x}{\left(1 - \frac{x^2}{1^2}\right)\left(1 - \frac{x^2}{3^2}\right)\cdots\left(1 - \frac{x^2}{(2i-1)^2}\right)} = \frac{2}{\pi}\left\{\frac{X_0^{(i)}}{x} + \frac{2xX_1^{(i)}}{x^2 - 2^2} + \frac{2xX_2^{(i)}}{x^2 - 4^2} + \cdots\right\}$$

så finner man för koefficienterna $X_n^{(i)}$ följande värden

$$X_n^{(1)} = -\frac{1^2}{(2n)^2 - 1^2}$$

$$X_n^{(2)} = \frac{1^2 . 3^2}{[(2n)^2 - 1^2][(2n)^2 - 3^2]}$$

$$X_n^{(3)} = -\frac{1^2 . 3^2 . 5^2}{[(2n)^2 - 1^2][(2n)^2 - 3^2][(2n)^2 - 5^2]}$$

o. s. v.

Vi beteckna nu

$$(9) \qquad \chi_i(t) = \frac{2}{\pi}\{X_0^{(i)} + 2X_1^{(i)} \operatorname{Cos} 2t + 2X_2^{(i)} \operatorname{Cos} 4t + \cdots\}$$

$$1 - b_1^{(i)}x^2 + b_2^{(i)}x^4 - \ldots \pm b_i^{(i)}x^{2i} = \left(1 - \frac{x^2}{1^2}\right)\left(1 - \frac{x^2}{3^2}\right)\cdots\left(1 - \frac{x^2}{(2i-1)^2}\right)$$

då

$$b_1^{(1)} = 1$$

$$b_1^{(2)} = \frac{10}{9}$$

$$b_2^{(2)} = \frac{1}{9}$$

$$b_1^{(3)} = \frac{259}{225}$$

$$b_2^{(3)} = \frac{7}{45}$$

$$b_3^{(3)} = \frac{1}{225}$$

o. s. v.

Med stöd af eqvationerne (7) och (8) erhålles härmed följande relation

$$\int_0^{s\pi} \{\text{Cos}\, n(\psi + \mu t) - b_1^{(i)}(n\mu)^2 \text{Cos}\, n(\psi + \mu t) + \cdots \pm b_i^{(i)}(n\mu)^{2i} \text{Cos}\, n(\psi + \mu t)\} \chi_i(t) dt$$

$$= \text{Cotang}\, \tfrac{1}{2} n\mu\pi \, \{\text{Sin}\, n\pi(\psi + s\mu t) - \text{Sin}\, n\psi\},$$

hvarefter riktigheten af följande summationsformel omedelbart inses

$$(10) \qquad z_s = \tfrac{1}{2} \int_0^{s\pi} \left\{F(t) + b_1^{(i)} \frac{d^2 F(t)}{dt^2} + \cdots + b_i^{(i)} \frac{d^{2i} F(t)}{dt^{2i}}\right\} \chi_i(t) dt$$

§ 2.

Den utveckling af Cotang $\frac{1}{2}\pi x$, hvarpå summationsformeln (10) är grundad, skall nu bevisas på en helt annan, om ock något längre väg. Man skall derunder blifva i tillfälle att finna nya uttryck för den funktion, som i föregående § blifvit betecknad med $\chi_i(t)$, samt för andra med denna nära beslägtade. De resultat, som sålunda träda i dagen, äro tillika analoga med dem, hvilka jag framvisat i min afhandling: "Relationer emellan Siner och Cosiner för irrationella vinklar", Helsingfors 1867.

Om ϑ betecknar en vinkel, som tänkes variera emellan gränserna $-\frac{1}{2}\pi$ och $+\frac{1}{2}\pi$, så kan funktionen Cos ϑ^{2i+1}, der i betyder ett helt positivt tal, framställas medelst följande serie:

$$C_0^{(i)} - 2C_2^{(i)} \text{Cos}\, 2\vartheta - 4C_4^{(i)} \text{Cos}\, 4\vartheta - \cdots$$

då

$$C_0^{(i)} = \frac{2}{\pi} \int_0^{\frac{1}{2}\pi} \text{Cos}\, \vartheta^{2i+1} d\vartheta$$

och

$$C_{2n}^{(i)} = -\frac{4}{\pi} \frac{1}{2n} \int_0^{\frac{1}{2}\pi} \text{Cos}\, 2n\vartheta \, \text{Cos}\, \vartheta^{2i+1} d\vartheta$$

eller

$$C_0^{(i)} = \frac{2}{\pi}\,\frac{2.4.6\,..\,2i}{1.3.5\,..\,(2i+1)}$$

$$C_{2n}^{(i)} = \frac{4}{\pi}\,\frac{1}{2n}\,\mathrm{Sin}\,\frac{2n+1}{2}\,\pi\,\frac{(-1)^i\,1.2.3\,...\,2i(2i+1)}{[(2n)^2-1^2]\,[(2n)^2-3^2]\,...\,[(2n)^2-(2i+1)^2]}$$

Jemföres dessa värden med dem, hvilka vi i föregående § funno för koefficienterna $X_n^{(i)}$, så inses ögonblickligen:

(11) $$\frac{C_{2n}^{(i)}}{C_0^{(i)}} = -\,\frac{1}{n}\,\mathrm{Sin}\,\frac{2n+1}{2}\,\pi\,X_n^{(i+1)}$$

Vi hafva således:

(12) $$\frac{1}{C_0^{(i)}}\,\mathrm{Cos}\,\vartheta^{2i+1} = 1 - 2X_1^{(i+1)}\,\mathrm{Cos}\,2\vartheta + 2X_2^{(i+1)}\,\mathrm{Cos}\,4\vartheta - \ldots,$$

d. ä., med hänseende till eqv. (9)

$$\mathrm{Sin}\,\vartheta^{2i+1} = \frac{\pi}{2}\,C_0^{(i)}\chi_i(\vartheta)$$

(13) $$= \frac{2.4.6\,..\,2i}{1.3.5\,..\,2i+1}\,\chi_i(\vartheta)$$

så länge

$$0 \lesseqgtr \vartheta \lesseqgtr \pi$$

Emedan dock ofvanstående eqvation förblifver oförändrad, om ϑ ökas med någon multipel af 2π, så bibehåller hon sin giltighet för alla ϑ-värden, hvilka uppfylla vilkoret

$$2m\pi \lesseqgtr \vartheta \lesseqgtr (2m+1)\pi.$$

Deremot är

(14) $$\mathrm{Sin}\,\vartheta^{2i+1} = -\frac{2.4.6\,..\,2i}{1.3.5\,..\,2i+1}\,\chi_{i+1}(\vartheta)$$

så länge

$$(2m-1)\pi \lesseqgtr \vartheta \lesseqgtr 2m\pi$$

Om nu eqv. (12) multipliceras med $d\vartheta$ och derefter integreras, så uppstår ett resultat af formeln

(15) $$\vartheta = \sum_1^{\infty} \beta_{2n}^{(i)}\,\mathrm{Sin}\,2n\vartheta + \frac{\pi}{2}\sum_0^{i} \alpha_{2n+1}^{(i)}\,\mathrm{Sin}\,(2n+1)\vartheta$$

der

$$\beta_{2n}^{(i)} = \frac{C_{2n}^{(i)}}{C_0^{(i)}} = -\,\frac{(-1)^n}{n}\,X_n^{(i+1)} = -\,\frac{1}{n}\,\mathrm{Cos}\,n\pi X_n^{(i+1)}$$

$$\alpha_{2n+1}^{(i)} = \frac{1.3.5\,..\,2i+1}{2.4.6\,..\,2i}\,\frac{1}{2n+1}\,\frac{1}{2^{2i}}\,\frac{(2i+1)2i(2i-1)\,..\,(i+n+2)}{1.2.3\,..\,(i-n)}$$

I likhet med eqv. (12) gäller eqv. (15) endast för ϑ-värden, hvilka ej öfverskrida gränserna $-\frac{1}{2}\pi$ och $+\frac{1}{2}\pi$.

Multipliceras härpå eqv. (15) en gång med $\mathrm{Cos}\,x\vartheta\,.\,d\vartheta$, och derefter med $\mathrm{Sin}\,x\vartheta\,.\,d\vartheta$, der x betecknar en fullkomligt godtycklig storhet, så erhålles medelst integration:

$$\int \vartheta\,\mathrm{Cos}\,x\vartheta d\vartheta = C - \mathrm{Cos}\,x\vartheta \sum_1^{\infty} \frac{2n\beta_{2n}^{(i)}}{(2n)^2-x^2}\,\mathrm{Cos}\,2n\vartheta - \frac{\pi}{2}\,\mathrm{Cos}\,x\vartheta \sum_0^{i} \frac{(2n+1)\alpha_{2n+1}^{(i)}}{(2n+1)^2-x^2}\,\mathrm{Cos}\,(2n+1)\vartheta$$

$$- x\,\mathrm{Sin}\,x\vartheta \sum_1^{\infty} \frac{\beta_{2n}^{(i)}}{(2n)^2-x^2}\,\mathrm{Sin}\,2n\vartheta - \frac{\pi}{2}\,x\,\mathrm{Sin}\,x\vartheta \sum_0^{i} \frac{\alpha_{2n+1}^{(i)}}{(2n+1)^2-x^2}\,\mathrm{Sin}\,(2n+1)\,\vartheta$$

$$\int \vartheta \operatorname{Sin} x\vartheta d\vartheta = C_1 - \operatorname{Sin} x\vartheta \sum_1^\infty \frac{2n\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Cos} 2n\vartheta - \frac{\pi}{2} \operatorname{Sin} x\vartheta \sum_0^i \frac{(2n+1)\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Cos}(2n+1)\vartheta$$

$$+ x \operatorname{Cos} x\vartheta \sum_1^\infty \frac{\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Sin} 2n\vartheta + \frac{\pi}{2} x \operatorname{Cos} x\vartheta \sum_0^i \frac{\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Sin}(2n+1)\vartheta$$

der vi med C och C_1 betecknat tvenne integrationskonstanter.

Multipliceras den förra af dessa eqvationer med Cos $x\vartheta$, den sednare med Sin $x\vartheta$, adderas produkterna och fäster man dervid afseende vid denna eqvation:

$$\operatorname{Cos} x\vartheta \int \vartheta \operatorname{Cos} x\vartheta d\vartheta + \operatorname{Sin} x\vartheta \int \vartheta \operatorname{Sin} x\vartheta d\vartheta = \frac{1}{x^2},$$

så erhålles

$$(a) \qquad C \operatorname{Cos} x\vartheta + C_1 \operatorname{Sin} x\vartheta = \frac{1}{x^2} + \sum_1^\infty \frac{2n\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Cos} 2n\vartheta + \frac{\pi}{2} \sum_0^i \frac{(2n+1)\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Cos}(2n+1)\vartheta$$

och genom differentiation af denna i afseende på ϑ framgår:

$$(b) \qquad -xC \operatorname{Sin} x\vartheta + xC_1 \operatorname{Cos} x\vartheta = -\sum_1^\infty \frac{(2n)^2\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Sin} 2n\vartheta - \frac{\pi}{2} \sum_0^i \frac{(2n+1)^2\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Sin}(2n+1)\vartheta$$

Insättes $\vartheta = 0$ i eqv. (b), så finner man:

$$C_1 = 0;$$

gifver man härefter åt ϑ värdet $\frac{\pi}{2}$ och betecknar man

$$\sum_0^i \frac{\alpha_{2n+1}^{(i)}}{1 - \frac{x^2}{(2n+1)^2}} \operatorname{Sin} \frac{2n+1}{2}\pi = \frac{1}{\varkappa\left(2i+1, x\frac{\pi}{2}\right)},$$

så gifver samma eqvation:

$$C = \frac{\pi}{2} \frac{1}{x \operatorname{Sin} x\frac{\pi}{2}\, \varkappa\left(2i+1, x\frac{\pi}{2}\right)}$$

Med dessa värden för C och C_1 finner man slutligen ur eqv. (a)

$$(16)\ \operatorname{Cos} x\vartheta = x\frac{2}{\pi} \operatorname{Sin} x\frac{\pi}{2}\, \varkappa\left(2i+1, x\frac{\pi}{2}\right) \left\{ \frac{1}{x^2} + \sum_1^\infty \frac{2n\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Cos} 2n\vartheta + \frac{\pi}{2} \sum_0^i \frac{(2n+1)\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Cos}(2n+1)\vartheta \right\}$$

Likaledes finner man ur eqv. (b), eller genom att differentiera eqv. (16) i afseende på ϑ:

$$(17) \qquad \operatorname{Sin} x\vartheta = \frac{2}{\pi} \operatorname{Sin} x\frac{\pi}{2}\, \varkappa\left(2i+1, x\frac{\pi}{2}\right) \left\{ \sum_1^\infty \frac{(2n)^2\beta_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Sin} 2n\vartheta + \frac{\pi}{2} \sum_0^i \frac{(2n+1)^2\alpha_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Sin}(2n+1)\vartheta \right\}$$

De genom eqvationerne (16) och (17) uttalade theorem motsvaras i min afhandling »Relationer etc.» af eqvationerne (26) och (27), hvilka med här begagnade beteckningar hafva följande utseende:

$$(18) \quad \operatorname{Cos} x\vartheta = \operatorname{Cos} x\frac{\pi}{2}\, \varkappa\left(2i, x\frac{\pi}{2}\right) \left\{ 1 + x^2 \sum_0^\infty \frac{(2n+1)\beta_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Cos}(2n+1)\vartheta - \sum_1 \frac{2n\alpha_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Cos} 2n\vartheta \right\}$$

$$(19) \quad \operatorname{Sin} x\vartheta = x \operatorname{Cos} x\frac{\pi}{2}\, \varkappa\left(2i, x\frac{\pi}{2}\right) \left\{ \sum_0^\infty \frac{(2n+1)^2\beta_{2n+1}^{(i)}}{(2n+1)^2 - x^2} \operatorname{Sin}(2n+1)\vartheta - \sum_1^i \frac{(2n)^2\alpha_{2n}^{(i)}}{(2n)^2 - x^2} \operatorname{Sin} 2n\vartheta \right\}$$

Dessa eqvationer kunna härledas ur eqvationen

$$\vartheta = \sum_0^\infty \beta_{2n+1}^{(i)} \operatorname{Sin} (2n+1)\vartheta - \sum_1^i \alpha_{2n}^{(i)} \operatorname{Sin} 2n\,\vartheta$$

alldeles på samma sätt, som eqvationerna (16) och (17) här blifvit deducerade ur eqv. (15), ehuru i den ofvan åberopade afhandlingen en helt annan väg blifvit följd.

Jemför man uttrycken för $\beta_{2n}^{(i)}$ och $\beta_{2n+1}^{(i)}$, nämnligen

$$\beta_{2n}^{(i)} = \frac{1}{n} \operatorname{Cos} n\pi \frac{(-1)^i 1^2 . 3^2 .. (2i+1)^2}{[(2n)^2 - 1^2]\,[(2n)^2 - 3^2] \ldots [(2n)^2 - (2i+1)^2]}$$

och

$$\beta_{2n+1}^{(i)} = \frac{2}{\pi} \frac{2}{2n+1} \operatorname{Sin} \frac{2n+1}{2} \pi \frac{(-1)^i 2^2 . 4^2 . 6^2 .. (2i)^2}{[(2n)^2 - 1^2]\,[(2n)^2 - 3^2] \ldots [(2n)^2 - (2i+1)^2]} [2n - (2i+1)]$$

så finner man följande relation

$$\frac{\beta_{2n+1}^{(i)}}{\beta_{2n}^{(i)}} = \frac{2}{\pi} \frac{2n}{2n+1} [2n - (2i+1)] \frac{2^2 . 4^2 \ldots (2i)^2}{1^2 . 3^2 .. (2i+1)^2}$$

Äfvenså erhålles ur uttrycken

$$\alpha_{2n}^{(i)} = \frac{1}{n} \frac{1}{2^{2i}} \frac{2i(2i-1) .. (i+n+1)}{1.2.3 .. (i-n)} 2^{2i} \frac{i.2.3 .. i}{(i+1)(i+2) .. 2i}$$

$$\alpha_{2n+1}^{(i)} = \frac{1}{2n+1} \frac{1}{2^{2i}} \frac{(2i+1)2i \ldots (i+n+2)}{1.2.3 \ldots (i-n)} \frac{1.3.5 .. 2i+1}{2.4.6 .. 2i}$$

$$\frac{\alpha_{2n}^{(i)}}{\alpha_{2n+1}^{(i)}} = \frac{2n+1}{2n} (2n+2i+2) \frac{2^{2i}}{2i+1} \frac{1.2.3 .. i}{(i+1)(i+2) .. 2i} \frac{2.4.6 .. 2i}{1.3.5 \ldots 2i+1}$$

hvaraf, med stöd af den kända relationen

$$1 . 2 . 3 .. i . 2^{2i} = \frac{1.2.3 .. 2i}{1.3.5 .. (2i-1)} 2^i = \frac{2.4.6 .. 2i}{1.3.5 \ldots (2i-1)} (i+1)(i+2) .. 2i$$

man omedelbart erhåller det enklare uttrycket

$$\frac{\alpha_{2n}^{(i)}}{\alpha_{2n+1}^{(i)}} = \frac{2n+1}{2n} (2n+2i+2) \frac{2^2 . 4^2 .. (2i)^2}{1^2 . 3^2 . 5^2 .. (2i+1)^2}$$

Den funktion, som vi här betecknat med $\varkappa(2i, x\frac{\pi}{2})$ är slutligen definierad medelst följande eqvation

$$\varkappa\left(2i, x\frac{\pi}{2}\right) = \left(1 - \frac{x^2}{2^2}\right)\left(1 - \frac{x^2}{4^2}\right) \ldots \left(1 - \frac{x^2}{(2i)^2}\right)$$

Insätta vi $\vartheta = \frac{\pi}{2}$ i eqv. (16), så erhålles med hänseende till relationen emellan $\beta_{2n+1}^{(i)}$ och $X_n^{(i+1)}$

$$\frac{\operatorname{Cotg} x\frac{\pi}{2}}{\varkappa\left(2i+1, x\frac{\pi}{2}\right)} = \frac{2}{\pi} \left\{ \frac{1}{x} + \frac{2x X_1^{(i+1)}}{x^2 - 2^2} + \frac{2x X_2^{(i+1)}}{x^2 - 4^2} + \ldots \right\}$$

Skall denna utveckling vara identisk med den i eqv. (8), så bör

$$\varkappa\left(2i+1, x\frac{\pi}{2}\right) = \left(1 - \frac{x^2}{1^2}\right) .. \left(1 - \frac{x^2}{(2i+1)^2}\right)$$

Vi hafva emellertid å andra sidan

$$\varkappa\left(2i+1, x\frac{\pi}{2}\right) = \cfrac{1}{\cfrac{\alpha_1^{(i)}}{1 - \frac{x^2}{1^2}} - \cfrac{\alpha_3^{(i)}}{1 - \frac{x^2}{3^2}} + \cdots \pm \cfrac{\alpha_{2i+1}^{(i)}}{1 - \frac{x^2}{(2i+1)^2}}}$$

Emedan $\varkappa(2i+1, x\frac{\pi}{2})$ påtagligen måste vara en synnektisk funktion, som icke blifver oändlig för något ändligt x-värde, så erfordras för att den här ifrågavarande identiteten skall ega rum, 1:o att de båda uttrycken, vi angifvit för $\varkappa(2i+1, x\frac{\pi}{2})$, försvinna för samma x-värden, samt 2:o att desamma uttrycken ej äro olika i något konstant förhållande.

Om nu funktionen

$$\left(1-\frac{x^2}{1^2}\right)\left(1-\frac{x^2}{3^2}\right)\ldots\left(1-\frac{x^2}{(2i+1)^2}\right)$$

försvinner på samma sätt som

$$\frac{1}{\dfrac{\alpha_1^{(i)}}{1-\frac{x^2}{1^2}}-\dfrac{\alpha_3^{(i)}}{1-\frac{x^2}{3^2}}+\cdots\pm\dfrac{\alpha_{2i+1}^{(i)}}{1-\frac{x^2}{(2i+1)^2}}}$$

så blifver å andra sidan funktionerna

$$\frac{1}{\left(1-\frac{x^2}{1^2}\right)\left(1-\frac{x^2}{3^2}\right)\cdots\left(1-\frac{x^2}{(2i+1)^2}\right)}$$

och

$$\frac{\alpha_1^{(i)}}{1-\frac{x^2}{1^2}}-\frac{\alpha_3^{(i)}}{1-\frac{x^2}{3^2}}+\cdots\pm\frac{\alpha_{2i+1}^{(i)}}{1-\frac{x^2}{(2i+1)^2}}$$

på samma sätt oändligt stora och tvärtom. Men detta sednare inträffar ögonskenligen, hvaraf vi sluta *att de begge uttrycken vi anfört för* $\varkappa(2i+1, x\frac{\pi}{2})$ *äro identiska*, åtminstone så när som på en konstant faktor. Denna faktor kunna vi bestämma genom att sätta $x=0$, och det visar sig då att densamma ej kan hafva något annat värde än 1, alldenstund vi ur eqv. (15) finna att

$$1=\alpha_1^{(i)}-\alpha_3^{(i)}+\cdots\pm\alpha_{2i+1}^{(i)}$$

Såsom en konseqvens af den bevisade identiteten, erhålla vi äfven följande uttryck för koefficienterna $\alpha_1^{(i)}$, $\alpha_3^{(i)}$, o. s. v.:

$$\alpha_1^{(i)}=\frac{1}{\left(1-\frac{1}{3^2}\right)\left(1-\frac{1}{5^2}\right)\cdots\left(1-\frac{1}{(2i+1)^2}\right)}$$

$$\alpha_3^{(i)}=-\frac{1}{\left(1-\frac{3^2}{1^2}\right)\left(1-\frac{3^2}{5^2}\right)\cdots\left(1-\frac{3^2}{(2i+1)^2}\right)}$$

$$\alpha_5^{(i)}=\frac{1}{\left(1-\frac{5^2}{1^2}\right)\left(1-\frac{5^2}{3^2}\right)\left(1-\frac{5^2}{7^2}\right)\cdots\left(1-\frac{5^2}{(2i+1)^2}\right)}$$

o. s. v.

§ 3.

Den genom eqv. (10) angifna summationsformeln kan underkastas en ganska vigtig transformation, för hvilken vi nu skola redogöra.

Om vi erinra oss den för funktionen $\chi_i(t)$ angifna serieutveckling och för korthetens skull sätta

$$T_s^{(i)}=\frac{2}{\pi}\int_0^{s\pi}\left\{F(t)+b_1^{(i)}\frac{d^2F(t)}{dt^2}+\cdots+b_i^{(i)}\frac{d^{2i}F(t)}{dt^{2i}}\right\}\left\{X_1^{(i)}\operatorname{Cos}2t+X_2^{(i)}\operatorname{Cos}4t+\cdots\right\}dt$$

så blifver

$$z_s = \frac{1}{\pi}\int_0^{s\pi}\left\{F(t) + b_1^{(i)}\frac{d^2F(t)}{dt^2} + \cdots + b_i^{(i)}\frac{d^{2i}F(t)}{dt^{2i}}\right\}dt + T_s^{(i)}$$

Vår transformation berör endast termen $T_s^{(i)}$, för hvilken vi medelst delvis integration först erhåller:

$$T_s^{(i)} = \frac{2}{\pi}\Big/_0^{s\pi}\left\{F(t) + \cdots + b_i^{(i)}\frac{d^{2i}F(t)}{dt^{2i}}\right\}\left\{\frac{1}{2}X_1^{(i)}\operatorname{Sin} 2t + \frac{1}{4}X_2^{(i)}\operatorname{Sin} 4t + \cdots\right\}$$

$$-\frac{2}{\pi}\int_0^{s\pi}\left\{\frac{dF(t)}{dt} + b_1^{(i)}\frac{d^3F(t)}{dt^3} + \cdots + b_i^{(i)}\frac{d^{2i+1}F(t)}{dt^{2i+1}}\right\}\left\{\frac{1}{2}X_1^{(i)}\operatorname{Sin} 2t + \cdots\right\}dt$$

Upprepar man denna operation och erinrar sig dervid, att Sin $2t$, Sin $4t$ o. s. v. såväl för 0 som för $s\pi$ försvinna, samt att Cos $2t$, Cos $4t$, o. s. v. för dessa gränsvärden erhålla ett och samma konstanta värde, nämnligen 1, så finner man:

$$T_s^{(i)} = \frac{2}{\pi}\left\{\frac{1}{2^2}X_1^{(i)} + \frac{1}{4^2}X_2^{(i)} + \cdots\right\}\Big/_0^{s\pi}\left\{\frac{dF(t)}{dt} + b_1^{(i)}\frac{d^3F(t)}{dt^3} + \cdots + b_i^{(i)}\frac{d^{2i+1}F(t)}{dt^{2i+1}}\right\}$$

$$-\frac{2}{\pi}\int_0^{s\pi}\left\{\frac{d^2F(t)}{dt^2} + b_1^{(i)}\frac{d^4F(t)}{dt^4} + \cdots + b_i^{(i)}\frac{d^{2i+2}F(t)}{dt^{2i+2}}\right\}\left\{\frac{1}{2^2}X_1^{(i)}\operatorname{Cos} 2t + \frac{1}{4^2}X_2^{(i)}\operatorname{Cos} 4t + \cdots\right\}dt$$

Fortsätter man detta förfarande, så erhåller man, då ν betecknar ett helt positiv tal:

$$(20)\qquad T_s^{(i)} = \frac{2}{\pi}\left\{\frac{1}{2^2}X_1^{(i)} + \frac{1}{4^2}X_2^{(i)} + \cdots\right\}\Big/_0^{s\pi}\left\{\frac{dF(t)}{dt} + b_1^{(i)}\frac{d^3F(t)}{dt^3} + \cdots + b_i^{(i)}\frac{d^{2i+1}F(t)}{dt^{2i+1}}\right\}$$

$$-\frac{2}{\pi}\left\{\frac{1}{2^4}X_1^{(i)} + \frac{1}{4^4}X_2^{(i)} + \cdots\right\}\Big/_0^{s\pi}\left\{\frac{d^3F(t)}{dt^3} + b_1^{(i)}\frac{d^5F(t)}{dt^5} + \cdots + b_i^{(i)}\frac{d^{2i+3}F(t)}{dt^{2i+3}}\right\}$$

$$+ \cdots\cdots\cdots\cdots\cdots\cdots\cdots$$

$$\pm\frac{2}{\pi}\left\{\frac{i}{2^{2\nu}}X_1^{(i)} + \frac{1}{2^{2\nu}}X_2^{(i)} + \cdots\right\}\Big/_0^{s\pi}\left\{\frac{d^{2\nu-1}F(t)}{dt^{2\nu-1}} + b_1^{(i)}\frac{d^{2\nu+1}F(t)}{dt^{2\nu+1}} + \cdots + b_i^{(i)}\frac{d^{2i+2\nu-1}F(t)}{dt^{2i+2\nu-1}}\right\}$$

$$\mp\frac{2}{\pi}\int_0^{s\pi}\left\{\frac{d^{2\nu}F(t)}{dt^{2\nu}} + b_1^{(i)}\frac{d^{2\nu+2}F(t)}{dt^{2\nu+2}} + \cdots + b_i^{(i)}\frac{d^{2i+2\nu}F(t)}{dt^{2i+2\nu}}\right\}\left\{\frac{1}{2^{2\nu}}X_1^{(i)}\operatorname{Cos} 2t + \frac{1}{4^{2\nu}}X_2^{(i)}\operatorname{Cos} 4t + \cdots\right\}dt$$

§ 4.

För användandet af formeln (20) återstår oss ännu att bestämma värdet af de konstanta faktorerna i de från integraltecknet befriade termerna. Tillsvidare äro nämnligen dessa faktorer endast angifna i form af oändliga serier; men med tillhjelp af de satser, som blifvit utvecklade i § 2, är det ganska lätt att angifva slutna värden för desamma.

Vi hafva först i enlighet med eqv. (13)

$$\frac{1.3.5\ldots(2i+1)}{2.4.6\ldots 2i}\operatorname{Sin}\vartheta^{2i+1} - \frac{2}{\pi} = \frac{4}{\pi}\left\{X_1^{(i+1)}\operatorname{Cos}2\vartheta + X_2^{(i+1)}\operatorname{Cos}4\vartheta + \cdot\cdot\right\}$$

Multipliceras denna eqvation med $d\vartheta$ och integreras, så framträder, om integrationskonstanten betecknas med $c_1^{(i)}$:

$$(21)\qquad c_1^{(i)} + \frac{1.3.5\ldots(2i+1)}{2.4.6\ldots 2i}\int\operatorname{Sin}\vartheta^{2i+1}d\vartheta - \frac{2}{\pi}\vartheta = \frac{4}{\pi}\left\{\frac{1}{2}X_1^{(i+1)}\operatorname{Sin}2\vartheta + \frac{1}{4}X_2^{(i+1)}\operatorname{Sin}4\vartheta + \cdot\cdot\right\}$$

Nu är likväl, i enlighet med de beteckningar, vi begagnat vid uppställandet af eqv. (15),

$$-\frac{1.3.5\ldots(2i+1)}{2.4.6\ldots 2i}\int\operatorname{Sin}\vartheta^{2i+1}d\vartheta = \alpha_1^{(i)}\operatorname{Cos}\vartheta - \alpha_3^{(i)}\operatorname{Cos}3\vartheta + \cdots \pm \alpha_{2i+1}^{(i)}\operatorname{Cos}(2i+1)\vartheta$$

Insättes detta värde i eqv. (21), så erhåller man

$$(22)\qquad c_1^{(i)} - \frac{2}{\pi}\vartheta = \alpha_1^{(i)}\operatorname{Cos}\vartheta - \alpha_3^{(i)}\operatorname{Cos}3\vartheta + \cdots \pm \alpha_{2i+1}^{(i)}\operatorname{Cos}(2i+1)\vartheta$$
$$+ \frac{4}{\pi}\left\{\frac{1}{2}X_1^{(i+1)}\operatorname{Sin}2\vartheta + \frac{1}{4}X_2^{(i+1)}\operatorname{Sin}4\vartheta + \cdots\right\}$$

Specialiseras ϑ i denna eqvation sålunda, att för detsamma antages värdet 0, så erhålles

$$(\alpha)\qquad c_1^{(i)} = \alpha_1^{(i)} - \alpha_3^{(i)} + \cdots \pm \alpha_{2i+1}^{(i)}$$
$$= 1$$

Ur eqvationen (22) erhålles vidare medelst multiplikation med $d\vartheta$ och derpå följande integration:

$$(23)\qquad c_2^{(i)} + c_1^{(i)}\vartheta - \frac{1}{2}\left(\frac{2}{\pi}\right)\vartheta_2 = \frac{\alpha_1^{(i)}}{1}\operatorname{Sin}\vartheta - \frac{\alpha_3^{(i)}}{3}\operatorname{Sin}3\vartheta + \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{2i+1}\operatorname{Sin}(2i+1)\vartheta$$
$$- \frac{4}{\pi}\left\{\frac{1}{2^2}X_1^{(i+1)}\operatorname{Cos}2\vartheta + \frac{1}{4^2}X_2^{(i+1)}\operatorname{Cos}4\vartheta + \cdots\right\}$$

hvaraf följer

$$c_2^{(i)} = -\frac{4}{\pi}\left\{\frac{1}{2^2}X_1^{(i+1)} + \frac{1}{4^2}X_2^{(i+1)} + \cdots\right\}$$

Eqv. (23) gifver oss vidare

$$c_3^{(i)} + c_2^{(i)}\vartheta + \frac{1}{2}c_1^{(i)}\vartheta^2 - \frac{1}{2.3}\left(\frac{2}{\pi}\right)\vartheta^3 = -\frac{\alpha_1^{(i)}}{1^2}\operatorname{Cos}\vartheta + \frac{\alpha_3^{(i)}}{3^2}\operatorname{Cos}3\vartheta - \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{(2i+1)^2}\operatorname{Cos}(2i+1)\vartheta$$
$$- \frac{4}{\pi}\left\{\frac{1}{2^3}X_1^{(i+1)}\operatorname{Sin}2\vartheta + \frac{1}{4^3}X_2^{(i+1)}\operatorname{Sin}4\vartheta + \cdots\right\}$$

hvarur erhålles, om ϑ sättes lika med noll,

$$(\beta)\qquad c_3^{(i)} = -\frac{\alpha_1^{(i)}}{1^2} + \frac{\alpha_3^{(i)}}{3^2} - \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{(2i+1)^2}$$

Sättes åter $\frac{\pi}{2}$ i stället för ϑ, så försvinner högra delen af ofvanstående eqvation, och vi erhålla

$$c_2^{(i)}\frac{\pi}{2} = -c_3^{(i)} - \frac{1}{2}c_1^{(i)}\left(\frac{\pi}{2}\right)^2 + \frac{1}{2\,.\,3}\left(\frac{\pi}{2}\right)^2$$

Genom att fortsätta detta förfarande erhålles i allmänhet

$$(24)\quad \left\{\begin{aligned} & c_{2\nu}^{(i)} + c_{2\nu-1}^{(i)}\vartheta + \frac{1}{2}c_{2\nu-2}^{(i)}\vartheta^2 + \cdots + \frac{1}{1\,.\,2\,.\,3\,..\,2\nu-1}c_1^{(i)}\vartheta^{2\nu-1} - \frac{1}{1\,.\,2\,.\,3\,..\,2\nu}\left(\frac{2}{\pi}\right)\vartheta^{2\nu} \\ & = (-1)^{\nu-1}\left\{\frac{\alpha_1^{(i)}}{1^{2\nu-1}}\operatorname{Sin}\vartheta - \frac{\alpha_3^{(i)}}{3^{2\nu-1}}\operatorname{Sin}3\vartheta + \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{(2i+1)^{2\nu-1}}\operatorname{Sin}(2i+1)\vartheta\right\} \\ & + (-1)^{\nu}\frac{2}{\pi}\left\{\frac{1}{2^{2\nu}}X_1^{(i+1)}\operatorname{Cos}2\vartheta + \frac{1}{4^{2\nu}}X_1^{(i+1)}\operatorname{Cos}4\vartheta + \cdots\right\} \end{aligned}\right.$$

och

$$(25)\quad \left\{\begin{aligned} & c_{2\nu+1}^{(i)} + c_{2\nu}^{(i)}\vartheta + \frac{1}{1\,.\,2}c_{2\nu-1}^{(i)}\vartheta^2 + \cdots + \frac{1}{1\,.\,2\,.\,3\,..\,2\nu}c_1^{(i)}\vartheta^{2\nu} - \frac{1}{1\,.\,2\,.\,3\,..\,(2\nu+1)}\left(\frac{2}{\pi}\right)\vartheta^{2\nu+1} \\ & = (-1)^{\nu}\left\{\frac{\alpha_1^{(i)}}{1^{2\nu}}\operatorname{Cos}\vartheta - \frac{\alpha_3^{(i)}}{3^{2\nu}}\operatorname{Cos}3\vartheta + \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{(2i+1)^{2\nu}}\operatorname{Cos}(2i+1)\vartheta\right\} \\ & + (-1)^{\nu}\frac{4}{\pi}\left\{\frac{1}{2^{2\nu+1}}X_1^{(i+1)}\operatorname{Sin}2\vartheta + \frac{1}{4^{2\nu+1}}X_2^{(i+1)}\operatorname{Sin}4\vartheta + \cdots\right\} \end{aligned}\right.$$

Eqv. (24) gifver oss

$$(26)\quad \frac{2}{\pi}\left\{\frac{1}{2^{2\nu}}X_1^{(i+1)} + \frac{1}{4^{2\nu}}X_2^{(i+1)} + \cdots\right\} = \frac{1}{2}(-1)^{\nu}c_{2\nu}^{(i)};$$

ur eqv. (25) finna vi åter

$$(27)\quad \left\{\begin{aligned} & c_{2\nu+1}^{(i)} = (-1)^{\nu}\left\{\frac{\alpha_1^{(i)}}{1^{2\nu}} - \frac{\alpha_3^{(i)}}{3^{2\nu}} + \cdots \pm \frac{\alpha_{2i+1}^{(i)}}{(2i+1)^{2\nu}}\right\} \\ & \frac{1}{2}(-1)^{\nu}c_{2\nu}^{(i)} = -\frac{1}{\pi}(-1)^{\nu}\left\{c_{2\nu+1}^{(i)} + \frac{1}{1\,.\,2}c_{2\nu-1}^{(i)}\left(\frac{\pi}{2}\right)^2 + \frac{1}{1\,.\,2\,.\,3}c_{2\nu-2}^{(i)}\left(\frac{\pi}{2}\right)^3 + \cdots\right. \\ & \qquad \left. + \frac{1}{1\,.\,2\,.\,3\,..\,2\nu}c_1^{(i)}\left(\frac{\pi}{2}\right)^{2\nu} - \frac{1}{1\,.\,2\,.\,3\,..\,(2\nu+1)}\left(\frac{\pi}{2}\right)^{2\nu}\right\} \end{aligned}\right.$$

Medelst eqvationerne (26) och (27) äro de konstanta koefficienterna i eqv. (20) i allmänhet angifna i sluten form, men om i i sistnämnda eqvation erhåller värdet 0, så blifva de formler, vi till sist funnit, utan gällande kraft. För denna händelse är dock de ifrågavarande seriernas summa känd, ty vi hafva

$$X_1^{(0)} = X_2^{(0)} = \cdots = 1$$

och

$$\frac{1}{2^{2\nu}} + \frac{1}{4^{2\nu}} + \cdots = \frac{1}{2}B_{2\nu-1}\frac{\pi^{2\nu}}{1\,.\,2\,.\,3\,..\,2\nu}$$

der $B_{2\nu-1}$ beteckna de Bernoulliska talen, nämnligen $B_1 = \frac{1}{6}$, $B_3 = \frac{1}{30}$, $B_5 = \frac{1}{42}$, $B_7 = \frac{1}{30}$, o. s. v.

§ 5.

De resultat, hvilka i föreliggande afhandling blifvit bragta i dagen, äro betingade af möjligheten att kunna utveckla Cotangenten för hvilken vinkel som helst i en ständigt konvergerande serie. Vi hafva sett huru en sådan utveckling låter utföra sig sålunda, att konvergensen blifver tillräcklig för summeriska beräkningar. Jag skall nu, ehuru detta egentligen ej hör till föreliggande ämne, äfven anföra analoga utvecklingar för tangenten, secanten och cosecanten. Dylika utvecklingar erhållas ögonblickligen ur eqvationerne (16), (17), (18) och (19) genom att i dem införa passande speciella värden för ϑ. Vi erhålla sålunda

$$\mathrm{Tang}\, x\frac{\pi}{2} = x\varkappa\left(2i, x\frac{\pi}{2}\right)\left\{\frac{1^2\beta_1^{(i)}}{1^2-x^2} - \frac{3^2\beta_3^{(i)}}{3^2-x^2} + \frac{5^2\beta_5^{(i)}}{5^2-x^2} - \cdots\right\}$$

$$\mathrm{Cotg}\, x\frac{\pi}{2} = \frac{2}{\pi}\varkappa\left(2i+1, x\frac{\pi}{2}\right)\left\{\frac{1}{x} - \frac{2x\beta_2^{(i)}}{2^2-x^2} + \frac{4x\beta_4^{(i)}}{4^2-x^2} - \cdots\right\}$$

$$\mathrm{Sec}\, x\frac{\pi}{2} = \varkappa\left(2i, x\frac{\pi}{2}\right)\left\{1 + \frac{x^2\beta_1^{(i)}}{1^2-x^2} + \frac{3x^2\beta_3^{(i)}}{3^2-x^2} + \cdots - \frac{2x^2\alpha_2^{(i)}}{2^2-x^2} - \frac{4x^2\alpha_4^{(i)}}{4^2-x^2} - \cdots - \frac{2i^2\alpha_{2i}^{(i)}}{(2i)^2-x^2}\right\}$$

$$\mathrm{Cosec}\, x\frac{\pi}{2} = \frac{2}{\pi}\varkappa\left(2i+1, x\frac{\pi}{2}\right)\left\{\frac{1}{x} + \frac{2x\beta_2^{(i)}}{2^2-x^2} + \frac{4x\beta_4^{(i)}}{4^2-x^2} + \cdots\right.$$

$$\left. + \frac{\pi}{2}\frac{x\alpha_1^{(i)}}{1^2-x^2} + \frac{\pi}{2}\frac{3x\alpha_3^{(i)}}{3^2-x^2} + \cdots + \frac{\pi}{2}\frac{(2i+1)x\alpha_{2i+1}^{(i)}}{(2i+1)^2-x^2}\right\}$$

Jag afslutar här dessa undersökningar med att påpeka den stora formelrikedom, som låter utveckla sig på grund af de anförda relationerna. Differentieras t. ex. den andra af ofvanstående eqvationer i afseende på x, så erhålles

$$\frac{1}{\left(\mathrm{Sin}\, x\frac{\pi}{2}\right)^2} = \left(\frac{2}{\pi}\right)^2\varkappa\left(2i+1, x\frac{\pi}{2}\right)\left\{\frac{1}{x^2} + \frac{2\,.\,2\,x^2\beta_2^{(i)}}{(2^2-x^2)^2} - \frac{2\,.\,4\,x^2\beta_4^{(i)}}{(4^2-x^2)^2} + \cdots\right\}$$

$$+ \left(\frac{2}{\pi}\right)^2\varkappa\left(2i+1, x\frac{\pi}{2}\right)\left\{\frac{2\beta_2^{(i)}}{2^2-x^2} - \frac{4\beta_4^{(i)}}{4^2-x^2} + \cdots\right\}$$

$$- \left(\frac{2}{\pi}\right)^2\frac{d\varkappa\left(2i+1, x\frac{\pi}{2}\right)}{dx}\left\{\frac{1}{x} - \frac{2x\beta_2^{(i)}}{2^2-x^2} + \frac{4x\beta_4^{(i)}}{4^2-x^2} - \cdots\right\}$$

Betraktar man μ såsom föränderlig i eqvationerna (3), och differentieras dessa i afseende på denna qvantitet, så finner man

$$\mathrm{Sin}\, n\mu\pi + 2\,\mathrm{Sin}\, 2n\mu\pi + \cdots + s\,\mathrm{Sin}\, sn\mu\pi = \frac{1}{4}\frac{\mathrm{Sin}\, sn\mu\pi}{(\mathrm{Sin}\,\frac{1}{2}n\mu\pi)^2} - \frac{1}{2}s\frac{\mathrm{Cos}\,(s+\frac{1}{2})n\mu\pi}{\mathrm{Sin}\,\frac{1}{2}n\mu\pi}$$

$$1 + \mathrm{Cos}\, n\mu\pi + 2\,\mathrm{Cos}\, 2n\mu\pi + \cdots + s\,\mathrm{Cos}\, sn\mu\pi = 1 - \frac{1}{4}\frac{1}{(\mathrm{Sin}\,\frac{1}{2}n\mu\pi)^2} + \frac{1}{4}\frac{\mathrm{Cos}\, sn\mu\pi}{(\mathrm{Sin}\,\frac{1}{2}n\mu\pi)^2} + \frac{1}{2}s\frac{\mathrm{Sin}\,(s+\frac{1}{2})n\mu\pi}{\mathrm{Sin}\,\frac{1}{2}n\mu\pi}$$

Förmedelst dessa relationer härleder man summationsresultat för funktionen

$$t\{M_0 + M_1\,\mathrm{Cos}\,(\psi + \mu t) + \cdots\}$$

på samma sätt, som ofvan för den i (1) angifna serien.

KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11. N:o 2.

ENUMERATIO HEMIPTERORUM.

BIDRAG TILL EN FÖRTECKNING ÖFVER ALLA HITTILLS KÄNDA

HEMIPTERA,

JEMTE SYSTEMATISKA MEDDELANDEN

AF

C. STÅL.

3.

TILL KONGL. VET.-AKAD. INLEMNAD DEN 10 JANUARI 1872.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER.
KONGL. BOKTRYCKARE.

ENUMERATIO SCUTELLERINORUM EUROPÆ, ASIÆ, AFRICÆ ET AUSTRALIÆ.

Fam. **Pentatomidæ** STÅL.

Subf. **Scutellerina** STÅL.

CONSPECTUS DIVISIONUM.

a. Mesosterno et metasterno rugis vel carinis duabus altis instructis, carinis mesosterni antrorsum altioribus; thorace scutelloque basi conjunctim sensim convexis, illius basi inter angulos basales scutelli retrorsum producta; rostri articulo secundo articulis duobus apicalibus simul sumtis multo breviore et articulo apicali paullo longiore; ventre sulcato, maculis stridulatoriis strigosis destituto, incisuris disco sensim curvatis. — *Elvisuraria* STÅL.

aa. Mesosterno et metasterno carinis vel rugis altis duabus destitutis, interdum sulcatis.

b. Corpore superne valde, subtus levissime convexo; capite transverso, maxime nutante vel perpendiculari; thorace scutelloque basi conjunctim sensim longitrorsum convexis, illius margine basali versus angulos basales scutelli obtuse rotundato, angulis posticis plerumque obtuse rotundatis, haud distinguendis; articulo secundo rostri articulis duobus apicalibus simul sumtis multo breviore; ventre maculis stridulatoriis strigosis destituto, incisuris medium versus sensim curvatis. — *Sphærocoraria* STÅL.

bb. Corpore subtus distincte convexo, plerumque supra subtusque æque convexo vel subtus convexiore.

c. Thoracis basi retrorsum, scutelli basi antrorsum plus minus *) convexo-declivi, quod optime a latere distinguitur; thorace postice ante basin totam scutelli plerumque distincte **) truncato, angulis basalibus plerumque distinctissimis, ante vel extra angulos basales scutelli sitis; ventre maculis stridulatoriis strigosis destituto, raro maculis duabus opacis apud mares instructo, incisuris medium versus sensim curvatis; articulo secundo rostri articulis duobus apicalibus simul sumtis plerumque breviore, sæpe multo breviore. — *Scutelleraria* STÅL.

cc. Thorace scutelloque basi conjunctim sensim longitrorsum convexis, rarissime leviter convexo-declivibus, illius parte basali inter angulos basales scutelli retrorsum nonnihil producta, vel thorace postice inter angulos laterales sensim rotundato, angulis basalibus obtusissimis vel rotundatis.

d. Ventre utriusque sexus maculis duabus stridulatoriis, longitrorsum densissime subtilissimeque strigosis, oblongis vel elongatis, per segmenta saltem quartum et quintum extensis, interdum ægre distinguendis, instructo, incisuris intermediis disco rectis vel biundatis, ad latera disci subito obtuse subangulato-curvatis; orificiis distinctissimis. ***) — *Tetyraria* STÅL.

dd. Ventre maculis stridulatoriis strigosis destituto.

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*) In *Tetrarthria, Tectocori* et *Calliphoris* quibusdam obsoletissime.

**) In *Augocori* et speciebus quibusdam *Pœcilochromæ* margo basalis thoracis latera versus leviter rotundatus et in margines laterales posticos sensim transiens, anguli postici obtuse rotundati, haud distinguendi.

***) Genera plurima americana, exceptis *Augocori* et *Eurygastro,* ad hanc divissionem referenda.

e. Capite longiore quam latiore, vel æque longo ac lato; marginibus lateralibus anticis thoracis anterius haud vel levissime rotundatis; propleuris prope margines laterales haud vel leviter impressis.

f. Orificiis haud distinguendis; articulo secundo antennarum recto. — *Odontotarsaria* STÅL.

ff. Orificiis distinctis; articulo secundo antennarum subcurvo; sternis profunde sulcatis. — *Eurygastraria* STÅL.

ee. Capite transverso, subsemiorbiculari; thorace antice capite latiore, marginibus lateralibus anticis distincte rotundatis; scutello latissimo; propleuris versus margines laterales profunde impressis vel excavatis, parte extra impressionem sita paullo deflexa; corpore setoso vel piloso; orificiis haud distinguendis. — *Odontoscelaria* STÅL.

Div. **Elvisuraria** STÅL.

CONSPECTUS GENERUM.

1(2). Parte basali producta thoracis rotundata; carinis mesosterni antrorsum ante coxas anticas laminato-productis; tibiis teretibus, superne haud sulcatis. — *Coleotichus* WHITE.

2(1). Parte basali producta thoracis truncata; carinis mesosterni antice haud productis; tibiis superne leviter bisubsulcatis, ruga media instructis, utrimque marginatis. — *Solenostethium* SPIN.

COLEOTICHUS WHITE.

WHITE, Mag. N. H. (2) p. 541. (1839); Tr. E. S. Lond. 3. p. 88. (1842); DALL., List. 1. p. 3 et 5. (1851); STÅL, H. afr. 1. p. 35. (1864); MAYR, Reise Nov., Hem. p. 13. (1866).

a. *Corpore angustiore; lobis prosterni prostethioque postice distincte punctatis; segmentis ventris secundo, tertio, quarto et quinto postice pone spiracula macula parva distinctissime punctata notatis; segmento anali maris a basi sensim producto, nec medio transversim profunde depresso, apice subtruncato.*

1. **C. costatus** FABR. — *Cimex costatus* FABR., Mant. 2. p. 282. 22. (1787); GMEL., S. N. 1: 4. p. 2130. 156. (1788); FABR., E. S. 4. p. 87. 28. (1794); DON., Ins. New Holl., Hem. pl. 3. f. 5. (1805). — *Tetyra costata* FABR., S. R. p. 135. 34. (1803); GERM., Zeitschr. 1: 1. p. 74. 4. (1839). — *Coleotichus costatus* DALL., List. 1. p. 5. 1. (1851). — *Coleotichus unicolor* DALL., List. 1. p. 5. 2. (1851). — *Eurygaster costatus* VOLL., Faun. ind. néerl. 1. p. 39. 1. (1863).
Patria: Nova Hollandia. (Mus. Holm.)

aa. *Corpore latiore; lobis prosterni prostethioque postice lævibus vel illis obsoletius punctatis; segmentis ventris pone spiracula macula distinctius punctata destitutis; segmento anali marium mihi cognitorum medio transversim profunde depresso, apice medio profunde rotundato-sinuato.*

2. **C. artensis** MONTR. — *Scutellera artensis* MONTR., An. S. Linn. Lyon. (2) 5. p. 259. (1858). — *Coleotichus marginatus* SIGN., An. S. E. Fr. (4) 1. p. 59. 1. (1861). — *Coleotichus testaceus* WALK., Cat. Het. 1. p. 2. 6. (1867).
Patria: Nova Caledonia, Woodlark. (Mus. Holm.)
Capite angulisque lateralibus thoracis obtusioribus, apice obtusius rotundatis, a congeneribus mihi cognitis divergit. Anguli apicales segmentorum ventris secundi et tertii haud prominuli, anguli segmentorum quarti et quinti levissime prominuli, vix acuminati, anguli segmenti sexti acuti, minus producti quam in specie sequente. Latera ventris distincte punctata. Quoad colores variat flavescens vel ad majorem vel minorem partem fuscus vel nigricans, limbo lato et lævigato laterali antico thoracis margineque costali semper flavo-testaceis vel subcroceis. Margines laterales antici thoracis posterius distincte nonnihil rotundati.

3. **C. nigro-varius** STÅL. —? *Coleotichus nigrovarius* WALK., Cat. Het. 1. p. 2. 5. (1867).
Patria: Insulæ Fidschi. (Mus. Holm.)
Specimina quattuor, quæ propter patriam ad hanc speciem dubius refero, a specie præcedente divergunt capite triangulari, apice magis producto et minus obtuso, angulis lateralibus thoracis paullo prominulis, obtusiusculis, tantum apice imo rotundatis, ejusdem marginibus lateralibus anticis totis rectis vel subrectis, angustissime lævigatis, gulisna apicalibus segmentorum ventris quarti et quinti paullo magis prominulis, angulis se-

gmenti sexti acutioribus, nonnihil longius productis. Coloribus verisimiliter valde variat. Linea lævigata thoracis et scutelli distincta, in scutello sæpe subelevata.

4. **C. fuscus** STÅL. —? *Coleotichus fuscus* VOLL., Faun. ind. néerl. 1. p. 59. (1863).
Patria: Amboina. (Mus. Vien.); Ceram.
Specimen unicum mihi cognitum, quod maxime dubius et tantum propter patriam ad hanc speciem refero. divergit a speciebus duabus præcedentibus thorace fere usque ad margines laterales anticos distincte fusco-punctato, his marginibus posterius obsoletissime rotundatis. Caput uti in C. *nigro-vario* formatum, anguli laterales thoracis obtusiores quam in illa specie, apice subrotundati. Anguli apicales segmenti sexti abdominis uti in *C. artensi,* minus producti quam in *C. nigrovario.* Linea lævigata thoracis et scutelli distincta.

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5. **C. pallidus** VOLL. — *Coleotichus pallidus* VOLL., Faun. ind. néerl. 1. p. 4. not. (1863).
Patria: Nova Hollandia, Adélaide.

ELVISURA SPIN.

SPIN., Ess. p. 357. (1837); MAYR, Reise Nov., Hem. p. 13. (1866).

1. **E. irrorata** SPIN. — *Elvisura irrorata* SPIN., Ess. p. 359. (1837).
Patria: Senegal.

OXYPRYMNA STÅL.

Elvisura STÅL, H. afr. 1. p. 35. (1864).

1. **O. Spinolæ** SIGN. — *Elvisura Spinollæ* SIGN., An. S. E. Fr. (4) 1. p. 55. 1. pl. 2. f. 2. (1861).
Patria: India orientalis.

SOLENOSTETHIUM SPIN., A. et S.

Solenosthedium SPIN., Ess. p. 360. (1837); DALL., List. 1. p. 3. (1851). — *Cœloglossa* GERM., Zeitschr. 1: 1. p. 130. (1839); H. S., W. I. 5. p. 59. (1839); STÅL, H. afr. 1. p. 35 et 52. (1864). — *Solenostethium* A. et S., Hist. p. 26. (1843); MAYR, Reise Nov., Hem. p. 13. (1866).

a. *Segmento ventrali sexto feminarum apice in medio in angulum obtusum prominulo.*

1. **S. liligerum** THUNB. — *Cimex liligerus* THUNB., Nov. ins. sp. 2. p. 32. (1783); GMEL., S. N. 1: 4. p. 2133. 172. (1788). — *Scutellera furcifera* BURM., Handb. 2: 1. p. 395. 2. (1835). — *Cœloglossa Sehestedii* p. GERM., Zeitschr. 1: 1. p. 132. 3. (1839). — *Scutellera furcifera* p. BLANCH., Hist. des ins. 3. p. 158. 8. (1840). — *Solenosthedium liligerum* DALL., List. 1. p. 6. 2. (1851). — *Cœloglossa liligera* STÅL, H. afr. 1. p. 52. 1. (1864).

Var. a. — *Cimex furcifer* FABR., E. S. 4. p. 84. 19. (1794). — *Tetyra furcifera* FABR., S. R. p. 130. 11. (1803). — *Tetyra liligera* THUNB., H. rostr. cap. 2. p. 6. (1822). — *Cœloglossa furcifera* GERM., Zeitschr. 1: 1. p. 131. 2. (1839.) — STOLL, Pun. f. 59.

Var. b. — *Solenosthedium pallescens* STÅL, Ö. V. A. F. 1858. p. 310. 1.
Patria: Africa meridionalis. (Mus. Holm.)
Variat scutello posterius fascia vel maculis flavescentibus destituto.

2. **S. Sehestedii** FABR. — *Tetyra Schestedii* FABR., S. R. p. 130. 9. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4 p. 284. 4. (1842). — *Cimex furcifer* WOLFF, Ic. 4. p. 134. 128. f. 128. (1804). — *Scutellera furcifera* var. *Sehestedtii* BLANCH., Hist. des ins. 3. p. 158. 8. (1840). — *Solenosthedium Sehestedii* DALL., List. 1. p. 6. 2. (1851). — *Cœloglossa Sehestedii* p. GERM., Zeitschr. 1: 1. p. 132. 3. (1839). — *Cœloglossa Sehestedti* STÅL, H. afr. 1. p. 53. 2. (1864).
Patria: Calabar. (Mus. Holm.); Ashanti, Congo.

3. **S. lynceum** FABR. — *Cimex lynceus* FABR., E. S. 4. p. 87. 29. (1794); COQ., Ill. 1. p. 39. t. 10. f. 7. (1799). — *Tetyra lyncea* FABR., S. R. p. 130. 10. (1803). — *Scutellera bilunata* LEF., Mém. Soc. Lin. Par. p. 102. pl. 5. f. 5. (1827). — *Cœloglossa lyncea* GERM., Zeitschr. 1: 1. p. 131. 1. (1839); A. COSTA, An. S. E. Fr. 10. p. 307. pl 6. f. 11. (1841); H. S., W. I. 5. p. 60. f. 502. (1839); FIEB., Eur. H. p. 374. 1. (1861). — *Solenostethium lynceum* A. et S., Hist. p. 26. 1. (1843). — *Solenostedium lynceum* DALL., List. 1. p. 6. 1. (1851).
Patria: Mauritania, Tanger; Sicilia. (Mus. Holm.)

4. **S. Ledereri** FIEB. — *Cœloglossa Ledereri* FIEB., Eur. H. p. 374. 2. (1861).
Patria: Syria; Turcia.

aa. *Segmento ventrali sexto feminarum apice sensim sinuato.*

5. **S. rubro-punctatum** GUÉR. — *Scutellera rubro-punctata* GUÉR., Voy. Coq., Zool. 2: 2. p. 157. (1838). — *Solenosthedium rubropunctatum* DALL., List. 1. p. 7. 4. (1851); VOLL., Faun. ind. néerl. 1. p. 4. 1. pl. 1. f. 1. (1863).
Patria: India orientalis. (Mus. Holm.); China; Java.

6. **S. chinense** STÅL. — *Solenosthedium chinense* STÅL. Ö. V. A. F. 1854. p. 231. 1; et l. c. 1856. p. 51. 1.
Patria: China. (Mus. Holm.)

7. **S. attenuatum** WESTW. — *Pachycoris ? attenuata* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Pachycoris ? attenuatus* GERM., Zeitschr. 1: 1. p. 108. 55. (1839). — *Solenosthedium attenuatum* DALL., List. 1. p. 7. 5. (1851).
Patria: Gambia; Sierra Leona.

Div. **Sphærocoraria** STÅL.

CONSPECTUS GENERUM.

1(2). Orificiis in sulcum brevissimum, subito abbreviatum, extensis; capite brevi, apice late rotundato; tibiis superne leviter bisulcis, inter sulcos ruga obtusa instructis; segmento ventrali sexto utriusque sexus postice profunde arcuato-sinuato. — *Steganocerus* MAYR.

2(1). Orificiis in sulcum longissimum continuatis; capite longiore, apice minus obtuso.

3(4). Marginibus lateralibus anticis thoracis ad angulos laterales retuso-sinuatis; segmento sexto ventris apud mares apice truncato, apud feminas arcuato-sinuato; tibiis superne planiusculis et interdum ruga subtili instructis. — *Sphærocoris* BURM.

4(3). Marginibus lateralibus anticis thoracis ad angulos laterales haud retuso-sinuatis; segmento ventrali sexto apud mares apice rotundato-producto et segmentum genitale tegente, apud feminas arcuato-sinuato et valvulas genitales liberas relinquente; tibiis superne leviter subbisulcis, inter sulcos ruga distincta instructis. — *Hyperoncus* STÅL.

STEGANOCERUS MAYR.

MAYR, Verh. z.-b. Ges. Wien. 14. p. 903. (1864); Reise Nov., Hem. p. 19 et 20. (1866).

1. **S. multipunctatus** THUNB. — *Sphærocoris impluviatus* GERM., Zeitschr. 1: 1. p. 77. 2. (1839). — *Sphærocoris Argus* DALL., List. 1. p. 8. 5. (1851). — *Sphærocoris multipunctatus* STÅL, H. afr. 1. p. 50. 5. (1864).
Var. a. — *Cimex multipunctatus* THUNB., N. ins. sp. 2. p. 30. (1783); GMEL., S. N. 1: 4. p. 2133. 170. (1788). — *Cimex rusticus* FABR., Mant. 2. p. 282. 26. (1787); GMEL., S. N. 1: 4. p. 2131. 159. (1788); FABR., E. S. 4. p. 88. 33. (1797). — *Tetyra rustica* FABR., S. R. p. 140. 59. (1803). — *Tetyra multipunctata* THUNB., H. rostr. cap. 2. p. 6. (1822). — *Sphærocoris simplex* H. S., W. I. 3. p. 104. f. 329. (1835); GERM. in SILB., Rev. 5. p. 189. 140. (1837). — *Sphærocoris adspersus* STÅL, Ö. V. A. F. 1853. p. 210. 3. — STOLL, Pun. f. 60 et 203.
Var. b. — *Sphærocoris 4-notata* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Sphærocoris quadrinotatus* GERM. in SILB., Rev. 5. p. 189. 139. (1837); GERM., Zeitschr. 1: 1. p. 80. 6. (1839); H. S., W. I. 5. p. 8. et 49. f. 464. (1839); DALL., List. 1. p. 10. 9. (1851).
Var. c. — *Cimex Argus* FABR., Mant. 2. p. 281. 11. 1787); GMEL., S. N. 1: 4. p. 2129. 147. (1788); FABR., E. S. 4. p. 83. 15. (1794). — *Tetyra Argus* FABR., S. R. p. 133. 24. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 76. 1. (1842). — *Sphærocoris Argus* BURM., Handb. 2: 1. p. 391. 2. (1835). — *Sphærocoris impluviatus* H. S., W. I. 5. p. 49 et 52. f. 499. (1839). — STOLL, Pun. f. 50.
Var. d. — *Sphærocoris simulans* STÅL, Ö. V. A. F. 1858. p. 310. 2.
Var. e. — *Sphærocoris hamiferus* STÅL, Ö. V. A. F. 1853. p. 209. 1.
Patria: Africa meridionalis. (Mus. Holm.)

SPHÆROCORIS BURM.

Sphærocoris p. BURM., Handb. 2: 1. p. 390. (1835); STÅL, H. afr. 1. p. 35 et 46. (1864). — *Sphærocoris* MAYR, Reise Nov., Hem. p. 17. (1866).

1. **S. ocellatus** KLUG. — *Tetyra ocellata* KLUG, Symb. 5. pl. 43. f. 1—3. (1834). — *Sphærocoris annulus* H. S., W. I. 3. p. 105. f. 330. (1836); *Sphærocoris ocellatus* BURM., Handb. 2: 1. p. 391. 1. (1835);

A. et S., Hist. p. 40. 1. (1843); H. S., W. I. 5. p. 49. (1839); DALL., List. 1. p. 8. 3. (1851); STÅL, H. afr. 1. p. 46. 1. (1864). — *Pachycoris ocellatus* GERM., Zeitschr. 1: 1. p. 82. 1. (1839).

Patria: Caffraria, Abyssinia. (Mus. Holm.)

2. **S. annulus** FABR. — *Cimex annulus* FABR., S. Ent. p. 697. 5. (1775); GOEZE, E. B. 2. p. 232. 6. (1778); FABR., Sp. 2. p. 339. 6. (1781); Mant. 2. p. 281. 7. (1787); GMEL., S. N. 1: 4. p. 2128. 143. (1788); FABR., E. S. 4. p. 82. 10. (1794). — *Cimex Argus* DRURY, Ill. 3. p. 67. pl. 46. f. 9. (1782); PANZ., VOET, Col. 4. p. 111. t. 47. f. 9. (1798). — *Tetyra annulus* FABR., S. R. p. 132. 20. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 289. 9. (1842). — *Scutellera gibbosa* P. B., Ins. p. 232. Hém. pl. 5. b. f. 3. (1805). — *Pachycoris annulus* GERM, Zeitschr. 1: 1. p. 83. 2. (1839). — *Sphærocoris annulus* A. et S., Hist. p. 41. 2. (1843). — *Sphærocoris distinctus* SIGN., Rev. et Mag. Zool. 1851. p. 441. 3. — *Sphærocoris Argus* STÅL, H. afr. 1. p. 47. 2. (1864). — STOLL, Pun. f. 268.

Patria: Sierra Leona, Calabar, Gabon, (Mus. Holm.)

3. **S. pœcilus** DALL. — *Sphærocoris pœcilus* DALL., List. 1. p. 9. 6. (1851); STÅL, H. afr. 1. p. 48. 3. (1864). — *Sphærocoris niloticus* STÅL, Ö. V. A. F. 1854. p. 232. 1.

Patria: Nubia. (Mus. Holm.); Gambia.

4. **S. testudo grisea** DE GEER. — *Sphærocoris punctarius* STÅL, H. afr. 1. p. 49. 4. (1864). — *Sphærocoris Testudo grisea* STÅL, H. afr. 4. p. 252. (1866).

Var. a. — *Cimex testudo grisea* DE GEER, Mém. 7. p. 616. 14. pl. 46. f. 2—3. (1778). — *Sphærocoris punctaria* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Sphærocoris polysticta* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Sphærocoris tigrinus* GERM., Zeitschr. 1: 1. p. 77. 3. (1839); H. S., W. I. 5. p. 8. f. 465. (1839). — *Sphærocoris punctarius* DALL., List. 1. p. 9. 7. (1851). — STOLL, Pun. f. 261.

Var. b. — *Sphærocoris caffer* STÅL, Ö. V. A. F. 1853. p. 210. 2.

Var. c. — *Sphærocoris pardalinus* SCHAUM, Ber. Ak. Berl. 1853. p. 357; PETERS, Reis. Mossamb., Ins. p. 36. f. 1. (1862).

Patria: Africa meridionalis et occidentalis, (Mus. Holm.); Madagascar.

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5. **S. unicolor** DALL. — *Sphærocoris ? unicolor* DALL., List. 1. p. 7. 1. (1851). — *Sphærocoris ? flavonotatus* DALL., List. 1. p. 7. 2. (1851).

Patria: Congo.

6. **S. annularis** WESTW. — *Sphærocoris annularis* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Pachycoris annularis* GERM, Zeitschr. 1: 1. p. 83. 3. (1839).

Patria: Terra Capensis.

Ad *S. ocellatum* vel *annulum* referendus.

HYPERONCUS STÅL.

STÅL, Ö. V. A. F. 1870. p. 615.

1. **H. lateritius** WESTW. — *Sphærocoris lateritia* WESTW. in HOPE, Cat. 1. p. 13. (1837). — *Sphærocoris lateritius* DALL., List. 1. p. 10. 8. (1851).

Patria: China, Hongkong. (Mus. Holm.)

2. **H. lineaticornis** STÅL. — Late obovatus, valde convexus, testaceo-flavescens, superne distincte et sat dense nigro-punctatus, capite, lateribus thoracis ante medium maculaque irregulari majuscula basali scutelli remote et subtiliter ferrugineo punctatis; parte hemelytrorum scutello tecta nigra, impunctata; corpore subtus remote fusco-punctato; apice imo articuli primi, lineis superiore et inferiore per partem apicalem articuli secundi et articulum tertium ducta articulisque duobus ultimis antennarum, articulo apicali rostri, maculis parvis sparsis femorum marginibusque superioribus tibiarum nigris. ♀. Long. $10\frac{1}{2}$, Lat. $8\frac{1}{2}$ mill.

Patria: Archipelagus indicus. (Mus. Vien.)

Quoad convexitudinem corporis et formam capitis, differentias specificas optimas, medium tenet inter *H. lateritium* et *pulchellum*, differt ab illo corpore minus convexo, capite lateribus posterius nonnihil profundius sinuato, ante sinus minus lato et anterius minus obtuse, fere semicirculariter rotundato, marginibus lateralibus anticis thoracis ante medium rectis ventreque nonnihil minus dense punctato; ab hoc differt corpore convexiore, capite longiore, ante sinus minus angustato, apice latiore et latius rotundato, articulisque duobus apicalibus rostri longitudine subæqualibus, nec articulo tertio quarto longiore.

3. **H. punctellus** STÅL. — *Hyperoncus punctellus* STÅL, Ö. V. A. F. 1870. p. 615. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

Div. **Scutelleraria** Stål.

Conspectus generum.

1(2). Antennis difformibus, articulo secundo longissimo et articulo tertio multo longiore, præsertim apud mares curvato, articulo primo apicem capitis paullo superante, articulo tertio omnium brevissimo; tibiis posticis, præsertim apud mares, compressis et apice introrsum curvatis; margine laterali scutelli basin versus reflexo; segmento genitali maris duplicato. — *Peltophora* Burm.

2(1). Antennis conformibus vel subconformibus, articulo secundo plerumque brevi vel brevissimo, articulo primo apicem capitis rarissime attingente vel subsuperante; tibiis posticis apice rectis.

3(6). Marginibus lateralibus capitis longi vel longiusculi rectis vel obsolete sinuatis, fere totis acutis; segmento genitali marium duplicato.

4(5). Corpore anguste obovato; lateribus ventris plus minus convexis; thoracis margine basali latera versus recto, angulis posticis distinctissimis, dentatis; scutello abdominis latitudine, basi prope angulos distincte impresso, parte apicali explanata; margine exteriore corii recto; margine antico propleurorum toto obtuso, subcalloso, margine postico ad angulos haud sinuato; ventre maculis opacis duabus destituto. — *Cantao* A. et S.

5(4). Corpore ovali vel ovato; lateribus thoracis abdominisque explanatis, acutis; thoracis margine basali latera versus leviter rotundato, angulis posticis deletis, obtuse rotundatis; scutello abdomine angustiore, angulis basalibus depressis; margine exteriore corii rotundato, ante medium leviter reflexo; margine antico toto propleurorum leviter explanato, acuto, margine postico ad angulos obtuse sinuato; ventre marium maculis duabus oblongis discoidalibus, subimpressis, opacis, in segmentis tertio, quarto et quinto sitis, instructo. — *Tectocoris* Hahn.

6(3). Marginibus lateralibus capitis plerumque distinctissime sinuatis, raro obsolete sinuatis, in hoc casu obtusis; segmento genitali marium simplici.

7(8). Marginibus lateralibus abdominis explanatis, acutis; capite disco pone medium obsolete biimpresso, lateribus prope oculos oblique longitrorsum obtuse impressis, marginibus lateralibus acutis vel acutiusculis, reflexis vel subreflexis; angulis posticis thoracis plerumque deletis vel obsoletis et rotundatis; margine antico propleurorum subcalloso vel incrassato, versus prosternum leviter ampliato, margine postico ad angulos leviter vel levissime sinuato. — *Pœcilochroma* White.

8(7). Lateribus abdominis haud vel tantum ad partem explanatis, lateribus ventris saltem basin versus plus minus convexis; capite prope oculos impressione longitudinali destituto.

9(10). Antennis quadriarticulatis, articulo secundo articulo basali circiter triplo longiore; corpore sericeo; capite sat longo, præsertim anterius convexo, marginibus lateralibus ante medium subacutis; angulis posticis thoracis obtuse rotundatis; margine toto antico propleurorum obtuso, elevato, margine postico ad angulos recto; ventre sulco longo instructo, lateribus planiusculis, anterius convexiusculis, margine postico segmentorum utrimque recto; sulco orificiorum longo, recto vel levissime curvato, apice subito antrorsum producto vel rugam antrorsum emittente; rostro longo, articulo secundo compresso *). — *Tetrarthria* Dall.

10(9). Antennis quinquearticulatis; basi thoracis distincte truncato, angulis posticis distinctis; margine postico propleurorum ad angulos plerumque distincte sinuato.

11(18). Thorace ante medium impressione transversa lineari, plerumque fortius punctata, instructo; corpore subsericeo vel pilosulo; mesosterno sulcato; articulo secundo antennarum articulo primo haud vel paullo breviore. — (*Scutellera*).

12(15). Ventre tibiisque distincte sulcatis; corpore valde oblongo; margine antico propleurorum obtuso, incrassato, prope prosternum leviter ampliato.

*) Genus americanum *Augocoris* a *Tetrarthria* differt corpore saltem superne glabro, capite breviore, plano vel planiusculo, marginibus lateralibus totis reflexis, margine antico propleurorum inter oculos et coxas plus minus rotundato et plerumque nonnihil dilatato, ventris lateribus valde convexis, incisuris utrimque recurvis vel sinuato-recurvis.

13(14). Ventre ultra medium sulcato; sulco orificiorum longissimo, apicem versus sensim antrorsum curvato, parte metapleurorum ante sulcum sita lævigata, nitida. — *Scutellera* LAM.

14(13). Ventre basi sulcato; sulco orificiorum minus longo, levissime curvato. — *Brachyaulax* STÅL

15(12). Ventre tibiisque sulco destitutis, illo basi raro obsoletissime sulcato; prostethio antice intra marginem versus sternum impresso, vel ibidem subampliato, margine antico versus angulos anticos obtuso, haud incrassato.

16(17). Corpore valde oblongo; sulco toto orificiorum distincto. — *Procilia* STÅL.

17(16). Corpore obovato vel anguste obovato; sulco orificiorum extrorsum subcalloso. — *Philia* SCHJÖDTE.

18(11). Thorace ante medium impressione transversa fortius punctata plerumque destituto; corpore, saltem superne, glabro.

19(36). Articulis tribus ultimis rostri longitudine inæqualibus; marginibus lateralibus capitis nec carinatis, nec reflexis.

20(31). Margine postico propleurorum ad angulos posticos distincte sinuato; lateribus capitis distincte sinuatis.

21(28). Sulco orificiorum apice occluso vel in rugam continuato; mesosterno saltem anterius subsulcato, sulco utrinque plerumque leviter carinato. — *(Chrysocoris).*

22(25). Articulo tertio antennarum articulo secundo saltem duplo longiore; segmentis ventris, saltem ultimo vel penultimo, in angulis apicalibus vel ad angulos illos in denticulum, sæpe hemelytris tectum et tunc ægre distinguendum, prominulis; margine antico prostethii pone oculos haud calloso, obtuso.

23(24). Scutello marginem exteriorem connexivi haud tegente. — *Calliphara* GERM.

24(23). Scutello connexivum totum, excepta parte basali, tegente. — *Chrysocoris* HAHN.

25(22). Articulo tertio antennarum articulo secundo haud vel vix plus quam dimidio longiore; segmentis ventris in angulis apicalibus inermibus; tibiis superne sulco destitutis.

26(27). Articulo tertio antennarum articulo secundo longiore; prostethio pone oculos intra marginem anticum impresso, hoc margine inter oculos et sternum ampliato; margine antico angulorum basalium scutelli subreflexo; segmentis ventris prope latera antice posticeque convexiusculis vel tumescentibus. — *Lamprocoris* STÅL.

27(26). Articulis secundo et tertio antennarum longitudine subæqualibus; prostethii margine antico pone oculos obtusissimo, haud elevato, versus sternum ampliato; margine antico angulorum basalium scutelli haud reflexo; segmentis ventris latera versus haud tumescentibus, angulis segmenti sexti marium acutis, productis. — *Graptophara* STÅL.

28(21). Sulco orificiorum apice aperto, sensim ampliato; incisuris ventris utrimque leviter antrorsum curvatis. — *(Callidea).*

29(30). Capite subperpendiculariter declivi, ante oculos subito profunde sinuato-angustato, ante sinus quam inter oculos multo angustiore; thorace valde convexo-declivi; ventre scutello convexiore, lateribus valde convexis. — *Callidea* BURM.

30(29). Capite oblique nutante, ante oculos sensim obtuse sinuato, ante sinus quam inter oculos paullo angustiore; thorace ante medium modice declivi; ventre scutelloque fere æque convexis, hujus lateribus leviter convexis. — *Calliscyta* STÅL.

31(20). Margine postico propleurorum ad angulos basales haud vel obsolete sinuato, margine antico extus anguste reflexo vel elevato, introrsum dilatato, acuto; marginibus lateralibus capitis leviter vel levissime sinuatis; margine costali corii basin versus obtuso, calloso. — *(Cryptacrus).*

32(35). Capite longiore; incisuris ventris utrinque antrorsum curvatis, distinctissimis; margine antico prostethii pone oculos reflexo vel subincrassato, versus sternum dilatato, acuto.

33(34). Corpore obovato, longiore; angulis posticis thoracis in dentem acutum sat longum productis; articulo secundo rostri basin mesosterni haud attingente; scutello dorso ante medium subhorizontali; abdomine pectore longiore. — *Cryptacrus* MAYR.

34(33). Corpore ovali, breviore; angulis posticis thoracis distinctis, in dentem haud productis; articulo secundo rostri basin mesosterni attingente; scutello ante medium sensim subgibboso; abdomine pectore vix longiore. — *Anoplogonius* STÅL.

35(32). Capite breviore; corpore latiuscule ovali; incisuris ventris latera versus rectis, obsoletissimis; articulo secundo rostri basin mesosterni haud attingente; angulis posticis thoracis distinctissimis, vix productis; pectore abdomineque fere æque longis. — *Graptocoris* STÅL.

36(19). Articulis tribus ultimis rostri longitudine subæqualibus; marginibus lateralibus capitis anguste reflexis, acutis. — *Chœrocoris* DALL.

PELTOPHORA BURM.

Scutiphora GUÉR., Voy. Coq., Ins. p. 165. (1830); LAP., Ess. p. 71. (1832). — *Peltophora* BURM., Handb. 2: 1. p. 393. 29. (1835); GERM., Zeitschr. 1: 1. p. 110. (1839); A. et S., Hist. p. 35. (1843); DALL., List. 1. p. 4. (1851); STÅL, H. afr. 1. p. 33. (1864). — MAYR, Reis. Nov., Hem. p. 16. (1866).

1. **P. pedicellata** KIRBY. — *Scutellera pedicellata* KIRBY, Introd. 3. p. 517. (1826) sec. DALL.

♂♀. *Peltophora rubro-maculata* GERM., Zeitschr. 1: 1. p. 110. 1. (1839). — *Peltophora picta* A. et S., Hist. p. 35. 1. (1843); DALL., List. 1. p. 19. 1. (1851).

♂. *Scutiphora picta* GUÉR., Voy. Coq., Ins. p. 165. (1830). — *Scutiphora rubromaculata* GUÉR., Voy. Coq., Ins. pl. 11. f. 7. (1830); LAP., Ess. pl. 55. f. 3. (1832). — *Peltophora rubromaculata* BURM., Handb. 2: 1. p. 393. 1. (1835); H. S., W. I. 3. p. 101. f. 326. (1835).

♀. *Peltophora cruenta* BURM., Handb. 2: 1. p. 393. 2. (1835).

Patria: Australia borealis et orientalis. (Mus. Holm.)

CANTAO A. et S.

A. et S., Hist. p. 29. (1843); DALL., List. 1. p. 3. (1851); STÅL, H. afr. 1. p. 33. (1864); MAYR, Reis. Nov., Hem. p. 14. (1866).

a. *Thorace scutelloque distincte punctatis; segmento genitali marium mihi cognitorum apice processu medio instructo; segmento ventrali sexto feminarum apice obtuse sinuato, ad medium marginis apicalis transversim calloso; margine antico prosterni, saltem ad partem, flavescente vel testaceo.* — CANTAO A. et S.

1. **C. ocellatus** THUNB. — *Cimex ocellatus* THUNB., N. ins. sp. 3. p. 60. f. 72. (1784); GMEL., S. N. 1: 4. p. 2133. 174. (1788). — *Cimex dispar* FABR., E. S. 4. p. 81. 7. (1794); DON., Ins. China. pl. 13. f. 1. (1798) sec. DALL. — *Tetyra dispar* FABR., S. R. p. 129. 5. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 281. 2. (1842). — *Callidea dispar* BURM., Handb. 2: 1. p. 394. 5. (1835); H. S. W. I. 3. p. 99. f. 324. (1835). — *Calliphara dispar* GERM., Zeitschr. 1: 1. p. 123. 1. (1839). — *Callidea ocellata* WESTW. in DON., Ins. China. p. 47. pl. 20. f. 1. (1842). — *Scutellera dispar* BLANCH., Hist. des ins. 3. p. 158. 6. Hém. pl. 8. f. 2. (1840). — *Cantao dispar* A. et S., Hist. p. 29. 1. (1843). — *Cantao ocellatus* DALL., List. 1. p. 17. 1. (1851); VOLL., Faun. ind. néerl. 1. p. 10. 1. (1863); STÅL, H. Fabr. 1. p. 9. 1. (1868); Ö. V. A. F. 1870. p. 616. 1. — *Cantao rufipes* DALL., List. 1. p. 17. 3. (1851). — STOLL, Pun. f. 260, A. et B.

Patria: India orientalis, Assam; Malacca; China; Java; Insulæ Philippinæ. (Mus. Holm.); Timor.

Segmentum anale maris processu apicali transverso, apice emarginato, instructum.

2. **C. rudis** VOLL. — *Cantao rudis* VOLL., Faun. ind. néerl. 1. p. 60. (1863).

Patria: Insula Morotai. (Mus. Holm.); Kajoa.

A *C. ocellato* vix diversus. Marem haud vidi.

3. **C. variabilis** MONTR. — *Scutellera variabilis* MONTR., Ann. sc. ph. (2) 7: 1. p. 93. (1855).

Patria: Insula Woodlark. (Mus. Holm.)

Segmentum genitale maris processu apicali spiniformi armatum.

aa. *Thorace læviusculo; scutello obsolete punctato; segmento genitali marium mihi cognitorum processu apicali intra marginem ortu armato; segmento ventrali sexto feminarum postice truncato, medio rotundato-subproducto, ad marginem apicalem haud transversim calloso; margine antico prosterni concolore, obscure violaceo; capite magis nutante quam in divisione præcedente.* — IOSTETHUS STÅL.

4. **C. parentum** WHITE. — *Calidea parentum* WHITE, Mag. nat. hist. (2) 3. p. 542. (1839). — *Callidea (Calliphara) parentum* WHITE, Tr. E. S. Lond. 3. p. 85. (1842) — *Cantao parentum* DALL., List. 1. p. 17. 2. (1851).

Patria: Australia, Rockhampton. (Mus. Holm.)

5. **C. purpuratus** WESTW. — *Callidea purpurata* WESTW. in HOPE, Cat. 1. p. 16. (1837). — *Cantao purpuratus* VOLL., Faun. ind. néerl. 1. p. 11. 2. pl. 1. f. 5. (1863). — *Cantao bandanus* WALK., Cat. Het. 1. p. 14. 4. (1867).

Patria: Insulæ Timor et Banda. (Mus. Holm.)

Capite toto nigro vel violaceo-nigro, apicem versus paullo latiore, a præcedente mox distinguendus. Mas mihi ignotus.

TECTOCORIS HAHN.

Tectocoris HAHN, W. 1. 2. p. 33. (1834); DALL, List. 1. p. 3. (1851); STÅL, H. afr. 1. p. 33. (1864); MAYR, Reis. Nov., Hem. p. 17. (1866). — *Scutellera* A. et S., Hist. p. 27. (1843).

1. **T. lineola** FABR. — *Scutellera cyanipes* BLANCH., Hist. d. ins. 3. p. 159. 9. (1840). — *Tectocoris Banksii* DALL., List. 1. p. 16. 1. (1851). — *Tectocoris cyanipes* DALL., List. 1. p. 16. 2. (1851); VOLL., Faun. ind. néerl. 1. p. 8. 1. (1863). — *Scutellera Banksii* MONTR., Ann. sc. ph. (2) 7: 1. p. 92. (1855); An. S. Linn. Lyon. (2) 5. p. 243. (1858).

Var. a. — ♂. *Scutellera Tongæ* BOISD., Voy. Astr., Ins. 2. p. 624. 2. pl. 11. f. 3. (1832); GERM., Zeitschr. 1: 1. p. 137. 11. (1839).

♀. *Scutellera cyanipoda* BOISD., Voy. Astr., Ins. 2. p. 622. 1. pl. 11. f. 1—2. (1832); GERM., Zeitschr. 1: 1. p. 138. 12. (1839). — *Tectocoris Gambiæ* WESTW. in HOPE, Cat. 1. p. 14. (1837).

Var. b. — *Cimex lineola* FABR., Spec. 2. p. 340. 13. (1781); Mant. 2. p. 281. 15. (1787); GMEL. S. N. 1: 4. p. 2129. 151. (1788); FABR., E. S. 4. p. 84. 20. (1794). — *Tetyra lineola* FABR., S. R. p. 135. 30. (1803). — *Pachycoris lineola* GERM., Zeitschr. 1: 1. p. 89. 14. (1839).

Var. c. — *Cimex Banksii* DON., Ins. New Holl., Hem. pl. 3. f. 1. (1805). — *Scutellera Banksii* GUÉR., Voy. Coq., Ins. p. 155. (1830); H. S., W. I. 4. p. 2. f. 341—342. (1839); GERM., Zeitschr. 1: 1. p. 133. 2. ♂. (1839); A. et S., Hist. p. 28. 2. pl. 1. f. 5. (1843).

Var. d. — *Scutellera Schönherri* ESCH., Entomogr. 1. p. 99. t. 2. f. 1. (1822); BURM., Handb. 2: 1. p. 396. 4. (1835); H. S., W. I. 4. p. 1. f. 340. (1839); GERM., Zeitschr. 1: 1. p. 133. 1. (1839). — *Tectocoris diophthalmus* STÅL, Ö. V. A. F. 1870. p. 617. 1.

Var. e. — *Cimex diophthalmus* THUNB., N. ins. sp. 2. p. 30. t. 2. f. 45. (1783); GMEL., S. N. 1: 4. p. 2133. 169. (1788).

Var. f. — *Tetyra cyanipes* FABR., S. R. p. 133. 23. (1803); WOLFF, Ic. 5. p. 171. 165. f. 165. (1811). — *Tectocoris cyanipes* HAHN, W. 1. 2. p. 34. f. 132. (1834). — *Scutellera cyanipes* BURM., Handb. 2: 1. p. 396. 3. (1835); A. et S., Hist. p. 28. 1. (1843). — *Scutellera Banksii* ♀ GERM., Zeitschr. 1: 1. p. 133. 2. (1839). — STOLL, Pun. f. 58 et 167.

Patria: Cochinchina, Sumatra, Java, Timor, Australia, Polynesia. (Mus. Holm.)

Varietas *Tongæ* rostro longiore a varietatibus reliquis divergit et insulas quasdam maris pacifici, Fidschi, Viti, Tongatabu, inhabitat. Mas (=*Tongæ* BOISD.) superne obscure violaceus, nigro vel obscure testaceo vel cinnamomeo-pictus, parum variat. Femina (=*cyanipoda* BOISD.) superne vel violacea, plus minus flavescente-picta, thorace vittis tribus, antice distantibus, flavescentibus plerumque notato; vel flavescens, capite ad partem, vitta laterali obliqua intramarginali thoracis, interdum etiam maculis nonnullis scutelli cæruleis vel obscure violaceis. Hemelytra violacea, interdum flavescente-lineata et marginata.

Varietas *lineola* FABR., nigro-violacea, superne parce rufo-notata, quoad picturam medium tenet inter varietates *Tongæ* et *Banksii*.

Varietas *Banksii* DON., nigra vel nigro-violacea, superne maculis fasciisque rufo-testaceis ornata, disco thoracis rufotestaceo transverso, postice triradiato insignis. In exemplis insulam Woodlark inhabitantibus margines laterales et vitta capitis nec non margo costalis corii basin versus sæpe sunt rufo-testacei, et radii postici disci thoracis sæpe ad marginem posticum thoracis extensi. Hæc varietas in Cochinchina, Java, Timor, Australia et Woodlark capitur.

Varietas *Schönherri* ESCH., quæ insulas Philippinas inhabitat et pictura thoracis scutellique ipsa valde variat, thorace toto rufo-testaceo vel nigro-violaceo et disco maximo, quam in *Banksii* majore, rufo-testaceo, posterius plerumque quinqueradiato, hemelytrisque nigro-violaceis est insignis; in exemplis disco thoracis minore et postice triradiato notatis adest latera versus macula parva, testacea, radium exteriorem representans. Exempla superne fere tota rufo-testacea ad varietatem *cyanipedem* FABR. appropinquant, divergunt autem hemelytris violaceo-nigris. Pictura scutelli variat.

Exempla duo feminina ex Australia reportata et ad formam brevirostrem referenda, quoad picturam ad varietates femininas superne parce violaceo-notatas formæ longirostris (= *Tongæ*) maxime appropinquant.

PŒCILOCHROMA WHITE.

Pœcilochroma WHITE, Tr. E. S. Lond. 3. p. 84. (1842). — *Pœcilocoris* DALL., Tr. E. S. Lond. 5. p. 100. (1848); List. 1. p. 4. (1851); STÅL, H. afr. 2. p. 33. (1864); MAYR, Reis. Nov., Hem. p. 17. (1866).

a. *Bucculis apicem versus in dentem elevatis; thorace longitrorsum distincte convexo, marginibus lateralibus anticis distincte reflexis, angulis posticis in dentem parvum, interdum ægre perspiciendum, prominentibus; scutello anterius distincte convexo-declivi, abdomine paullo angustiore, basi subito ampliato et basi thoracis latiore; rostro paullo pone basin ventris extenso; ventre anterius obsoletissime sulcato, segmento sexto utriusque sexus apice truncato.*

1. **P. Hardwickii** Westw. — *Tectocoris Hardwickii* Westw. in Hope, Cat. 1. p. 13. (1837). — *Tectocoris affinis* Westw. in Hope, Cat. 1. p. 13. (1837). — *Pachycoris Nepalensis* H. S., W. I. 4. p. 1. f. 339. (1839). *Scutellera Hardwickii* Germ., Zeitschr. 1: 1. p. 135. 6. (1839). — *Pœcilocoris Hardwickii* Dall., Tr. E. S. Lond. 5. p. 107. 8. pl. 13. f. 8. (1848); List. 1. p. 13. 8. (1851).

Patria: India orientalis, Silhet. (Mus. Holm.) Nepalia.

aa. *Bucculis anterius inermibus; thorace longitrorsum minus convexo, marginibus lateralibus haud vel leviter reflexis, angulis posticis plerumque rotundatis, rarius subdistinctis, dente destitutis; scutello anterius leviter vel levissime convexo-declivi.*

b. *Scutello latissimo, abdominis medio haud vel paullo angustiore, basi subito distincte rotundato-ampliato, prope basin basi thoracis latiore.* — Ioglena Stål.

c. *Articulo tertio antennarum articulo secundo plus duplo longiore; rostro ad vel pone medium ventris extenso; thorace opaco, marginibus lateralibus anticis acutioribus, parte apicali violaceo-nigra vel violaceo-nigro-maculata.*

d. *Marginibus lateralibus capitis ante sinus parallelis; segmento ventrali sexto apice truncato vel subtruncato; scutello maculis subapicalibus destituto.*

2. **P. Denovani** Burm. — *Tetyra Denovani* Burm., Nov. act. Ac. Leop. 16. Suppl. 1. p. 286. 2. taf. 41. f. 1. (1834). — *Scutellera Denovani* Germ., Zeitschr. 1: 1. p. 136. 8. (1839). — *Pœcilochroma Denovani* Stål, Ö. V. A. F. 1870. p. 618. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

3. **P. lata** Dall. — *Pœcilocoris latus* Dall., Tr. E. S. Lond. 5. p. 101. 1. pl. 13. f. 4. (1848); List. 1. p. 12. 1. (1851).

Patria: China; Assam. (Mus. Holm.)

4. **P. equestris** Stål. — Rufo-testacea, capite, antennis, rostro, parte tertia antica, medio subinterrupta, thoracis, maculis magnis octo scutelli, in series duas, unam basalem, alteram pone medium, dispositis, (hemelytris?) subviolaceo-nigris; pectore toto, macula laterali parva segmentorum ventris pone spiracula pedibusque obscure violaceis, nitidis. ♂. Long. 22, Lat. 14½ mill.

Patria: Malacca. (Mus. Holm.)

P. latæ maxime affinis, differre videtur rostro nonnihil longiore, pectore pedibusque totis obscure violaceis.

dd. *Capite ante sinus laterales leviter angustato; segmento ventrali sexto, saltem apud feminam, obtuse sinuato, sinu fundo truncato; scutello maculis subapicalibus ornato.*

5. **P. ornata** Dall. — *Pœcilocoris ornatus* Dall., List. 1. p. 15. 13. (1851).

Patria: India orientalis. (Mus. Holm.)

cc. *Articulo tertio antennarum articulo secundo paullo plus quam dimidio longiore; rostro medium ventris haud attingente; thorace opaco, parte apicali lateribusque anticis nitidis, parte apicali concolore, ad marginem apicalem dense distincteque punctata, marginibus lateralibus minus acutis; segmento ventrali sexto feminæ apice medio obtuse producto, parte producta rotundato-subangulata.*

6. **P. Druræi** Lin. — *Cimex Druræi* Lin., Mant. alt. p. 534. (1771); Drury, Ill. 1. p. 94. pl. 42. f. 1 et 5, a. b. (1770); Fabr., S. Ent. p. 697. 6. (1775); Spec. 2. p. 339. 8. (1775); Mant. 2. p. 281. 9. (1787); Gmel., S. N. 1: 4. p. 2129. 145. (1788); Fabr., E. S. 4. p. 83. 13. (1794). — *Tetyra Druræi* Fabr., S. R. p. 132. 17. (1803); Burm., Nov. act. Ac. Leop. 16. Suppl. 1. p. 287. 4. (1834). — *Scutellera Druræi* Germ., Zeitschr. 1: 1. p. 135. 7. (1839). — *Pœcilocoris Druræi* Dall., Tr. E. S. Lond. 5. p. 103. 4. pl. 13. f. 6. (1848); List. 1. p. 12. 3. (1851). — *Pœcilocoris obsoletus* Dall., Tr. E. S. Lond. 5. p. 104. 5. (1848); List. 1. p. 12. 4. (1851). — Stoll, Pun. f. 267.

Patria: China, Hongkong. (Mus. Holm.); India orientalis, Silhet.

bb. *Scutello abdomine multo angustiore, basi vix ampliato, prope basin basi thoracis latitudine subæquali; articulo tertio antennarum articulo secundo circiter triplo longiore; rostro paullo pone basin ventris extenso; thorace ad marginem anticum pone verticem depresso vel obtuse impresso, marginibus lateralibus leviter reflexis; ventre anterius obsoletissime sulcato, segmento sexto, saltem apud mares, subrotundato-truncato.*

7. **P. interrupta** Westw. — *Tectocoris interrupta* Westw. in Hope, Cat. 1. p. 14. (1837). — *Scutellera interrupta* Germ., Zeitschr. 1: 1. p. 134. 4. (1839); H. S., W. I. 5. p. 73. f. 531. (1839). — *Pœcilocoris interruptus* Dall., Tr. E. S. Lond. 5. p. 102. 2. (1848); List. Hem. 1. p. 12. 2. (1851).
Patria: India orientalis. (Mus. Holm.); Nepalia.

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8. **P. purpurascens** Westw. — *Tectocoris purpurascens* Westw. in Hope, Cat. 1. p. 14. (1837). — *Scutellera purpurascens* Germ., Zeitschr. 1: 1. p. 135. 5. (1839). — *Pœcilocoris purpurascens* Dall., Tr. E. S. Lond. 5. p. 103. 3. pl. 13. f. 5. (1848); List. 1. p. 13. 6. (1851).
Patria: Nepalia.

9. **P. pulchra** Dall. — *Pœcilocoris pulcher* Dall., Tr. E. S. Lond. 5. p. 105. 6. pl. 13. f. 7. (1848); List. 1. p. 13. 5. (1851); Voll., Faun. ind. néerl. 1. p. 5. 1. pl. 1. f. 2. (1863).
Patria: Malabar; Sumatra.

10. **P. Childreni** White. — *Tectocoris (Pœcilochroma) Childreni* White, Mag. N. H. (2) 3. p. 542. (1839); Tr. E. S. Lond. 3. p. 84. pl. 7. f. 1. (1842). — *Pœcilocoris Childreni* Dall., Tr. E. S. Lond. 5. p. 106. 7. (1848); List. 1. p. 13. 7. (1851).
Patria: Nepalia.

11. **P. dives** Guér. — *Scutellera dives* Guér., Ic. Ins. pl. 55. f. 1. (1838). — *Pœcilocoris dives* Dall., Tr. E. S. Lond. 5. p. 108. 9. (1848); List. 1. p. 14. 11. (1851); Voll., Faun. ind. néerl. 1. p. 6. 2. (1863).
Patria: Java.

12. **P. longirostris** Dall. — *Pœcilocoris longirostris* Dall., Tr. E. S. Lond. 5. p. 109. 10. pl. 13. f. 9. (1848); List. 1. p. 14. 11. (1851); Voll., Faun. ind. néerl. 1. p. 6. 3. (1863).
Patria: Java.

13. **P. obesa** Dall. — *Pœcilocoris obesus* Dall., List. 1. p. 13. 9. (1851).
Patria: Assam.

14. **P. rufigenis** Dall. — *Pœcilocoris rufigenis* Dall., List. 1. p. 14. 10. (1851).
Patria: Assam.

CHŒROCORIS Dall.

Tetyra A. et S., Hist. p. 46. (1843). —*Chœrocoris* p. Dall., List. 1. p. 4 et 29. (1851). — *Chœrocoris* Stål, H. afr. 1. p. 34. (1864); Mayr, Reis. Nov., Hem. p. 16. (1866).

a. *Capite angustiore, marginibus lateralibus acutis, distincte reflexis, jugis apicem versus subconvergentibus, tylo anterius subdepresso; thorace antrorsum valde angustato, marginibus lateralibus anticis distincte reflexis; angulis apicalibus segmentorum ultimorum ventris callo distincto instructis.*

1. **C. paganus** Fabr. — *Cimex paganus* Fabr., S. Ent. p. 698. 8. (1775); Goeze, E. B. 2. p. 233. 7. (1778); Fabr., Spec. 2. p. 340. 11. (1781); Mant. 2. p. 281. 13. (1787); Gmel., S. N. 1: 4. p. 2129. 149. (1788); Fabr., E. S. 4. p. 84. 17. (1796); Donov., Ins. New Holl., Hem. pl. 3. f. 4. (1805). — *Tetyra pagana* Fabr., S. R. p. 134. 29. (1803); A. et S., Hist. p. 47. 1. (1843). — *Scutellera pagana* Guér., Voy. Coq., Ins. p. 156. pl. 11. f. 5. (1830); Boisd., Voy. Astr., Ins. 2. p. 625. 3. pl. 11. f. 4. (1832). — *Callidea pagana* Germ., Zeitschr. 1: 1. p. 122. 24. (1839). — *Chœrocoris paganus* Dall., List. 1. p. 29. 1. (1851); Voll., Faun. ind. néerl. 1. p. 36. 1. (1863).
Patria: Australia borealis; Sydney; Adelaide; Swan River. (Mus. Holm.)
Segmentum genitale maris apice rotundatum, margine apicali reflexo.

aa. *Capite latiore, marginibus lateralibus imis levissime reflexis, jugis haud convergentibus, tylo anterius haud depresso; thorace antrorsum minus angustato, marginibus imis lateralibus obsoletius reflexis; angulis apicalibus segmentorum ventris callo sæpius minus distincto instructis.*

2. **C. variegatus** Dall. — *Chœrocoris variegatus* Dall., List. 1. p. 30. 2. pl. 1. f. 3. (1851).
Patria: Australia orientalis media; Richmond River. (Mus. Holm.); Swan River.
Segmentum genitale maris apice sinuatum, haud reflexum.
Variat capitis vittis tribus limboque antico et laterali thoracis pallide flavescentibus.

TETRARTHRIA Dall.

Dall., List. 1. p. 3 et 20. (1851); Stål, H. afr. 1. p. 33. (1864); Mayr, Reis. Nov., Hem. p. 12 (1866).

1. **T. variegata** Dall. — *Tetrarthria variegata* Dall., List. 1. p. 20. 1. pl. 1. f. 1 (1851); Stål, Ö. V. A. F. 1870. p. 616. 1. — *Tetrarthria marginepunctata* Voll., Faun. ind. néerl 1. p. 13. pl. 1. f. 6, a et b. (1863). — *Tetrarthria 5-maculata* A. Dohrn, Stett. E. Z. 24. p. 347. 2. (1863).
Patria: Insulæ Philippinæ; Celebes. (Mus. Holm.); Java?

2. **T. callideoides** A. Dohrn. — *Tetrarthria callideoides* A. Dohrn, Stett. E. Z. 24. p. 348. 3. (1863). — *Tetrarthria tenebrosa* Voll., Versl. Ak. Amst. (2) 2. p. 175. 1. (1868); Tijdschr. v. Entom. 12. p. 255. 1. pl. 11. f. a. (1869).
Patria: Insulæ Buru; Ternate. (Mus. Holm.); Batchian, Amboina.
Statura robustiore, punctura distinctiore, capite thoraceque anterius densius punctatis, segmentoque genitali maris apice medio obtusissime rotundato, dente apicali destituto, a præcedente differt.

SCUTELLERA Lam.

Scutellera Lam., Syst. p. 293. (1801); Dall., List. 1. p. 4 et 18. (1851); Stål, H. afr. 1. p. 33. (1864); Mayr, Reis. Nov., Hem. p. 17. (1866). — *Calliphara* A. et S., Hist. p. 30. (1843).

1. **S. nobilis** Fabr. — *Cimex nobilis* Fabr., S. Ent. p. 697. 2. (1775); Spec. 2. p. 338. 2. (1781); Herbst, Gem. Naturg. 6. p. 255. 2. pl. 39. A. f. 1. (1784); Fabr., Mant. 2. p. 280. 2. (1787); Gmel., S. N. 1: 4. p. 2128. 3. (1788); Fabr, E. S. 4. p. 80. 3. (1794); Panz. in Voet, Col. 4. p. 111. 1. t. 47. f. 1. (1798); Wolff, Ic. 2. p. 49. 46. f. 46. (1801). — *Tetyra nobilis* Fabr., S. R. p. 129. 6. (1803). — *Scutellera nobilis* Lam., Hist. nat. 3. p. 491. 1. (1816); Burm., Handb. 2: 1. p. 395. 1. (1835); Blanch., Hist. des ins. 3. p. 158. 7. pl. 8. f. 3. (1840); Dall., List. 1. p. 18. 1. (1851); Voll., Faun. ind. néerl. 1. p. 11. 1. (1863). — *Tectocoris nobilis* Hahn, W. I. 3. p. 24. f. 247. (1835). — *Tectocoris perplexa* Westw. in Hope, Cat. 1. p. 4. (1837). — *Calliphara nobilis* Germ., Zeitschr. 1: 1. p. 124. 2. (1839); A. et S. Hist. p. 30. 1. (1843). — Stoll, Pun. f. 1, 7, 22, et 23. — Schröter, Abh. 1. p. 326. T. 1. f. 9. (1776).
Patria: India orientalis, Bengalia, Madras. (Mus. Holm.)

2. **S. fasciata** Panz. — *Cimex fasciatus* Panz. in Voet, Col. 4. p. 108. 2. t. 46. f. 2. (1798). — *Tectocoris nepalensis* Westw. in Hope., Cat. 1. p. 14. (1837). — *Calliphara nepalensis* Germ., Zeitschr. 1: 1. p. 125. 4. (1839). — *Calliphara amethystina* Germ., Zeitschr. 1: 1. p. 124. 3. (1839). — *Scutellera fasciata* Dall., List. 1. p. 19. 2. (1851). — *Callidea lanius* Stål, Ö. V. A. F. 1854. p. 231. 1. — *Scutellera lanius* Stål, Ö. V. A. F. 1856. p. 51. 1. — *Scutellera amethystina* Voll., Faun. ind. néerl. 1. p. 12. 2. (1863). — Stoll, Pun. f. 49 et 251.
Patria: China; Java. (Mus. Holm.) Nepal, Assam.
Scutellera lanius e Java varietatem majorem, robustiorem, supra subsanguineam, leviter violaceo-nitidam, maculis concoloribus, haud tamen violaceo-indutis, notatam constituit.

BRACHYAULAX Stål.

Stål, Ö. V. A. F. 1870. p. 616.

1. **B. oblonga** Westw. — *Tectocoris oblonga* Westw. in Hope, Cat. 1. p. 14. (1837). — *Calliphara oblonga* Germ., Zeitschr. 1: 1. p. 129. 15. (1839). — *Scutellera oblonga* Dall., List. 1. p. 19. 4. (1851).
Patria: Malacca. (Mus. Holm.)

2. **B. rufo-maculata** Stål. — *Brachyaulax rufo-maculata* Stål, Ö. V. A. F. 1870. p. 616. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

PROCILIA Stål.

Stål, H. afr. 1. p. 33 et 35. (1864).

1. **P. Morgani** White. — *Callidea Morgani* White, Mag. nat. hist. (2) 3. p. 542. (1839); Tr. E. S. Lond. 3. p. 86. (1842). — *Scutellera Morgani* Dall., List. 1. p. 19. 3. (1851).
Patria: Sierra Leona, Fanti.

2. **P. nigricornis** Sign. — *Calliphara nigricornis* Sign., Rev. et mag. Zool. 1851. p. 438. pl. 12. f. 1. — *Procilia nigricornis* Stål, H. afr. 1. p. 36. 1. (1864).
Patria: Gabon. (Mus. Holm.)

3. **P. scintillans** Stål. — *Procilia scintillans* Stål, H. afr. 1. p. 36. 2. (1864).
Patria: Guinea, Calabar. (Mus. Holm.)

4. **P. prætoria** Stål. — *Procilia prætoria* Stål, H. afr. 1. p. 37. 3. (1864).
Patria: Gabon.

PHILIA Schjödte.

Philia p. Schjödte in Kröyer Nat. Tidsskr. 4. p. 279. (1842). — *Philya* Stål, H. afr. 1. p. 33. (1864); Mayr, Reis. Nov., Hem. p. 17. (1866).

a. *Corpore robustiore; sulco orificiorum longiore; segmento genitali maris a basi ultra medium minus declivi, posterius minus depresso-producto, parte producta minus reflexa, a latere visa cum parte declivi angulum rotundatum obtusum vel angulum fere nullum formante.*

b. *Capite minus nutante, longiore; ventre densius et distinctius punctato; femoribus totis flavescentibus vel rufescentibus.*

c. *Limbo lato flavescente vel rufescente ventris intus in segmentis secundo, tertio, quarto et quinto usque ad spiracula sinuato.*

1. **P. senator** Fabr. — *Callidea senator* Dall., List. 1. p. 22. 1. (1851); Voll., Faun. ind. néerl. 1. p. 25. 15. (1863). — *Philia senator* Stål, H. Fabr. 1. p. 10. 1. (1868).

Var. a. — *Tetyra senator* Fabr., S. R. p. 131. 14. (1803); Schjödte in Kröyer, Nat. Tidsskr. 4. p. 284. 6. (1842). — *Callidea senator* Germ., Zeitschr. 1: 1. p. 121. 22. (1839). — *Scutellera metallica* Montr., Ann. sc. ph. (2) 7: 1. p. 94. (1855). — *Philia Senator* Stål, H. Fabr. 1. p. 9. 1. (1868). — *Callidea Crœsus* p. Voll., Tijdschr. v. Entom. 12. p. 259. 6. pl. 11. f. e. (1869). sec. ex. typ.

Var. b. — *Scutellera dux* Kirby, Tr. Linn. S. 12. p. 474. 27. (1818). — *Scutellera corallifera* Mac Leay in King's Survey. 2: App. p. 466. 176. (1827) sec. Dall. — *Scutellera basalis* Gray in Griff., An. Kingd. 15. p. 233. pl. 92. f. 1. (1832). — *Tectocoris binotata* Westw. in Hope, Cat. 1. p. 15. (1837). — *Calliphara basalis* Germ., Zeitschr. 1: 1. p. 129. 16. (1839). — *Scutellera aurantiacomaculata* Blanch. in D'Orb., Dict., Hém. pl. 4. f. 1. (1849).

Patria: Nova Guinea, Amboina, Timor, Kajoa, Woodlark, Australia borealis. (Mus. Holm).

Segmentum genitale maris apice obtuse rotundatum. Valde variat. Varietas *a* superne nunc obscure violacea tota (=*Crœsus* Voll., var.), nunc fasciis viridi-æneis ornata (=*senator* Fabr.)

2. **P. elegans** Montr. — *Callidea elegans* Montr. et Sign., An. S. E. Fr. (4) 1. p. 59. 2. (1861). — *Philia elegans* Stål, H. Fabr. 1. p. 10. 2. (1868).

Patria: Nova Caledonia. (Mus. Holm.)

Præcedenti maxime affinis et cum eadem quoad formam segmenti genitalis maris congruens, differre videtur punctura subtiliore, pictura thoracis et scutelli, antennis basin versus, femoribus tibiisque flavescentibus, his violaceo-indutis.

cc. *Limbo ventris intus integro,*

3. **P. fulgurans** Stål. — Nitida, supra subviolaceo-cuprea, subtus cum capite subcupreo-nigra; limbo laterali lævi, usque ad spiracula extenso, ventris, coxis, trochanteribus femoribusque croceis; antennis totis, rostro, tarsis tibiisque nigris, his violaceo-indutis. ♂. Long. 12, Lat. $6\frac{1}{2}$ mill.

♂. Segmento genitali apice rotundato-truncato.

Patria: Insula Mysol. (Mus. Holm.)

Hæc species, quæ forma segmenti genitalis cum præcedentibus duabus congruit, ab illis divergit limbo croceo ventris intus integro; a sequentibus differt articulo primo antennarum nigro, punctura remotiore, in capite vix ullo, ut et præsertim forma segmenti genitalis maris.

Specimen femininum e Rockhampton Australiæ, superne nigrum, densius et distinctius punctatum, ad hanc speciem forte est referendum.

4. **P. ditissima** Voll. — *Callidea ditissima* Voll., Faun. ind. néerl. 1. p. 26. 16. pl. 2. f. 5. (1863). — *Philia ditissima* Stål, H. Fabr. 1. p. 10. 3. (1868). — *Callidea Crœsus* p. Voll., Versl. Ak. Amst. (2) 2. p. 176. 6. (1868); Tijdschr. v. Entom. 12. p. 259. 5. pl. 11. f. e. (1869).

Patria: Insulæ Ceram et Gebeh. (Mus. Holm.)

Segmentum genitale maris apice obtuse sinuatum, inter sinus in dentem prominulum. Limbus flavus ventris spiracula attingit vel fere attingit.

5. **P. fastuosa** Voll. — *Callidea fastuosa* Voll., Faun. ind. néerl. 1. p. 26. 17. (1863). sec. ex. typ.

Patria: Insulæ Ternate. (Mus. Holm.)

Segmentum genitale maris apice obtuse lateque sinuatum, sinu ipso medio angulatim emarginato.

Limbus flavescens ventris angustior quam in speciebus præcedentibus.

bb. *Capite maxime nutante, breviore; ventre læviusculo vel parcius et subtilius punctato; femoribus apice plerumque distincte violaceis.*

6. **P. cuprina** Stål. — Aureo-cuprea, nitida, superne obscure purpureo vel fusco-purpureo-induta, limbo laterali thoracis et scutelli aureo-viridibus, extus cæruleis; capite viridi-æneo, vittis duabus anterius ampliatis

cupreis; antennis nigris, articulis duobus basalibus pedibusque testaceo-flavescentibus, apice imo femorum tibiisque plus minus distincte violaceo-nitidis; articulis duobus basalibus rostri flavescentibus, articulis duobus apicalibus tarsisque apicem versus nigris; hemelytris subviolaceo-nigris. ♂. ♀. Long. 11, Lat. $6\frac{1}{3}$ mill.

♂. Segmento genitali sensim angustato, posterius paullo producto, apice subsinuato-truncato.

Patria: Nova Guinea, Andai. (Mus. Holm.)

Punctura scutelli quam in plurimis congenericis multo remotiore, capite, thorace ventreque lævigatis vel punctis subtilissimis rarissimis conspersis, thorace tamen uti in congenericis prope marginem anticum et in sulco transverso distincte punctato, ventris limbo concolore nec croceo, capiteque breviore, magis nutante a præcedentibus diversa. Segmentum genitale maris fere uti in *P. senatore, elegante* et *fulgurante* formatum, sed minus declive, magis productum, longius.

7. **P. leucocyanea** MONTR. — *Scutellera Leucocyanea* MONTR., Ann. sc. ph. (2) 7: 1. p. 95. (1855). — *Philia leucocyanea* STÅL, H. Fabr. 1. p. 10. 4. (1868).

Patria: Woodlark. (Mus. Holm.)

aa. *Corpore minus robusto: sulco orificiorum brevi; segmento genitali maris a basi maxime declivi, posterius subito maxime depresso et sub angulo fere recto retrorsum producto, apice minus late truncato.* — LAMPROMICRA STÅL.

8. **P. festiva** GERM. — *Callidea festiva* GERM., Zeitschr. 1. p. 120. 19. (1839). — *Philia festiva* STÅL, Ö. V. A. F. 1870. p. 617. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

9. **P. geniculata** STÅL. — *Philia geniculata* STÅL, Ö. V. A. F. 1870. p. 617. 2.

Patria: Insulæ Philippinæ. (Mus. Holm.)

10. **P. jactator** STÅL. — *Callidea jactator* STÅL, Ö. V. A. F. 1854. p. 231. 2; l. c. 1856. p. 52. 2. — *Callidea gloriosa* VOLL., Faun. ind. néerl. 1. p. 35. 32. pl. 3. f. 5. (1863).

Patria: Java. (Mus. Holm.)

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11. **P. late-fasciata** VOLL. — *Callidea latefasciata* VOLL., Versl. Ak. Amst. (2) 2. p. 175. 3. (1868). Tijdschr. v. Ent. 12. p. 257. 4. pl. 11. f. d. (1869).

CALLIPHARA GERM.

Calliphara p. GERM., Zeitschr. 1: 1. p. 122. (1839). — *Calliphara* STÅL, H. afr. 1. p. 34. (1864). — *Lamprophara* STÅL, H. afr. 1. p. 34. (1864).

a. *Tibiis teretibus, superne sulco destitutis: thorace ad marginem anticum subelevatum impressione lineari distincta instructo; articulo primo antennarum articulo secundo plus duplo (♂) vel duplo (♀) longiore.* — LAMPROPHARA STÅL.

1. **C. bifasciata** WHITE. — *Callidea (Calliphara) bifasciata* WHITE, Tr. E. S. Lond. 3. p. 85. (1842).

Patria: Insulæ Fidschi, Samoa, Ovalau. (Mus. Holm.)

aa. *Tibiis superne saltem apicem versus sulco lato distincto instructis; thorace prope marginem anticum haud vel levissime obtuseque impresso.*

b. *Ventre latera versus punctis destituto, lævi vel aciculato: angulis apicalibus segmentorum plurimorum dente vel spina distincta, interdum sat magna, armatis; capite longiore; segmento genitali marium mihi cognitorum longo vel longiusculo, sensim rotundato-subangustato, apice obtuse rotundato et medio interdum subsinuato; articulo primo antennarum articulo secundo duplo vel plus duplo longiore.* — CALLIPHARA STÅL.

2. **C. Peronii** GUÉR. — *Scutellera regalis* var. *Peronii* GUÉR., Voy. Coq., Ins. p. 155. pl. 11. f. 4. (1830). — *Callidea regia* WESTW. in HOPE, Cat. 1. p. 16. (1837); VOLL., Faun. ind. neerl. 1. p. 16. 1. (1863). — *Calliphara regia* GERM., Zeitschr. 1: 1. p. 126. 8. (1839); H. S., W. I. 5. p. 82. (1839). — *Calliphara imperialis* H. S., W. I. 5. f. 529. (1839). — *Calliphara Peronii* STÅL, Berl. E. Z. 10. p. 151. 1. (1866).

Patria: Timor. (Mus. Holm.)

3. **C. imperialis** FABR. — *Cimex imperialis* FABR., S. Ent. p. 697. 4. (1775); GOEZE, E. B. 2. p. 232. 5. (1778); FABR., Spec. 2. p. 339. 4. (1781); Mant. 2. p. 280. 4. (1787); GMEL., S. N. 1: 4. 2128. 140. (1788); FABR., E. S. 4. p. 81. 6. (1794); DON., Ins. New Holl., Hem. pl. 3. f. 2. (1805). — *Tetyra imperialis* FABR., S. R. p. 128. 1. (1803). — *Calliphara imperialis* GERM., Zeitschr. 1: 1. p. 126. 6. (1839); H. S., W. I. 5. p. 83. (1839); STÅL, Berl. E. Z. 10. p. 152. 2. (1866). — *Calliphara regia* H. S., W. I. 5. f. 528. (1839). — *Callidea imperialis* DALL., List. 1. p. 24. 9. (1851).

Patria: Australia, Cap York. (Mus. Holm.)

4. **C. Billardierii** FABR. — *Tetyra Billardierii* FABR., S. R. p. 129. 4. (1803). — *Scutellera Billardierii* GUÉR., Voy. Coq., Ins. p. 154. pl. 11. f. 1. (1830). — *Calliphara Billardierii* GERM., Zeitschr. 1: 1. p. 125. 5. (1839); STÅL, Berl. E. Z. 10. p. 152. 3. (1866); H. Fabr. 1. p. 10. 1. (1868). — *Scutellera splendida* MONTR., An. sc. ph. (2) 7: 1. p. 94. (1855). — *Callidea Billardierii* VOLL., Faun. ind. néerl. 1. p. 16. 2. (1863). — STOLL, Pun. f. 48.

Patria: Amboina, Woodlark, Australia. (Mus. Holm.)

5. **C. dimidiata** DALL. — *Scutellera Billardierii* var. GUÉR., Voy. Coq., Ins. p. 154. pl. 11. f. 2. (1830). — *Callidea dimidiata* DALL., List. 1. p. 24. 8. (1851). — *Callidea laticincta* WALK., Cat. Het. 1. p. 35. 43. (1867).

Var. b. — *Tetrarthria fasciata* WALK., Cat. Het. 1. p. 20. 9. (1867). — *Callidea elongata* VOLL., Versl. Ak. Amst., Nat. (2) 2 p. 175. 4. (1868); Tijdschr. voor Entom. 12. p. 257. 3. pl. 11. f. 6. (1869).

Patria: Nova Guinea; Insulæ Aru. (Mus. Holm.)

Callipharæ Billardierii affinis, statura paullo minore et graciliore, scutello basin versus minus convexo, pone medium et interdum basi nigro-violaceo, segmentis ventris tribus basalibus rufis vel flavescentibus, reliquis totis nigro-violaceis, spinis marginalibus ventris nonnihil majoribus differt. Tibiæ tantum apicem versus obtuse sulcatæ.

6. **C. cruenta** STÅL. — Obscure violacea, nitida, lævis, scutello parce punctulato; antennis rostroque nigris; maculis duabus magnis thoracis, basin plerumque attingentibus, interdum saltem posterius confluentibus, nec non parte circiter tertia basali scutelli segmentisque quattuor basalibus ventris rufo-testaceis. ♂. ♀. Long. 15—17, Lat. 7—8 mill.

Patria: Australia, Cap York (Mus. Holm.)

Præcedentibus duabus valde affinis; differt a *C. Billardierii* statura paullo angustiore, scutello basin versus minus convexo, partibus duabus tertiis apicalibus violaceis spinisque marginalibus ventris paullo majoribus; a *C. dimidiata*, cui statura similis, divergit parte rufescente scutelli minus longe retrorsum extensa, segmentis quattuor basalibus ventris rufis. Articulus primus antennarum articulo secundo fere triplo longior. Segmenta ventralia tertium, quartum et quintum in angulis apicalibus dente acuto armata. Tibiæ superne tantum apicem versus late obtuseque sulcatæ. Pars basalis rufa scutelli posterius interdum ramum brevem dentiformem emittit. Segmentum quintum ventris interdum obsolete rufo-maculatum.

7. **C. Cæsar** VOLL. — *Callidea Cæsar* VOLL., Faun. ind. néerl. 1. p. 21. 9. pl. 2. f. 1. (1863). — *Calliphara Cæsar* STÅL, Berl. E. Z. 10. p. 152. 4. (1866).

Patria: Insulæ Buru. (Mus. Holm.); Morotai, Halmaheira.

Tibiæ per totam longitudinem superne sulcatæ. Segmentum genitale maris posterius valde rotundatum. Articulus primus antennarum secundo duplo longior.

8. **C. praslinia** GUÉR. — *Scutellera Praslinea* GUÉR., Voy. Coq., Ins. p. 158 et 160. pl. 11. f. 3. (1830). — *Callidea praslinea* GERM., Zeitschr. 1: 1. p. 118. 13. (1839). — *Calliphara Praslinia* STÅL, Berl. E. Z. 10. p. 152. 5. (1866).

Var. b. — *Callidea ebenina* WALK., Cat. Het. 1. p. 39. 52. (1867).

Patria: Novæ Hebrides, Aneiteum. (Mus. Holm.); Nova Irlandia.

Tibiæ superne planiusculæ vel convexiusculæ, apicem versus obtuse sulcatæ.

bb. *Ventre latera versus punctato; segmento genitali marium breviore, lateribus parallelis vel apicem versus subampliato, apice sinuato vel sinuato-truncato, angulis apicalibus rotundatis; articulo secundo antennarum longiore quam in divisione præcedente; spinis marginalibus ventris brevibus vel nullis.* — CHRYSOPHARA STÅL.

9. **C. excellens** BURM. — *Tetyra excellens* BURM., Nov. act. Acad. Leop. 16: Suppl. 1. p. 287. 5. t. 41. f. 2. (1834). — *Callidea nobilis* GERM., Zeitschr. 1: 1. p. 117. 12. (1839). — *Callidea excellens* A. et S., Hist. p. 32. 1. (1843). — *Callidea praslinia* DALL., List. 1. p. 24. 10. (1851). — *Calliphara excellens* STÅL, Berl. E. Z. 10. p. 153. 6. (1866).

Var. b. — *Callidea speciosa* WHITE in GRAY, Zool. Misc. 80. 3. (1842). sec. DALLAS.

Patria: Insulæ Philippinæ. (Mus. Holm.)

10. **C. nobilis** LIN. — *Cimex nobilis* LIN., Cent. ins. p. 17. 46. (1763); Amœn. 6. p. 400. 46. (1763); S. N. ed. 12. 1: 2. p. 716. 3. (1767); STÅL, Berl. E. Z. 10. p. 153. (1866). — *Cimex pustulatus* PANZ. in VOET, Col. 4. p. 111. 11. pl. 47. f. 11. (1798). — *Scutellera Buquetii* GUÉR., Voy. Coq., Ins. p. 159 et 162. (1830). — *Callidea nobilis* DALL., List. 1. p. 25. 11. (1851). — *Calliphara Buquetii* STÅL, Berl. E. Z. 10. p. 153. 7. (1866).

Patria: Insulæ Philippinæ, Java, Timor; China, Hongkong. (Mus. Holm.)

Magnitudine minore, capite minore et breviore, a præcedente divergit.

11. **C. regalis** FABR. — *Cimex regalis* FABR., S. Ent. p. 697. 3. (1775); GOEZE, E. B. 2. p. 232. 4. (1778); FABR., Spec. 2. p. 339. 3. (1781); Mant. 2. p. 280. 3. (1787); GMEL., S. N. 1: 4. p. 2128. 139. (1788); FABR., E. S. 4. p. 80. 5. (1794); DON., Ins. New Holl., Hem. pl. 3. f. 3. (1805). — *Tetyra regalis* FABR., S. R. p. 128. 2. (1803). — *Calliphara regalis* GERM., Zeitschr. 1: 1. p. 127. 9. (1839); STÅL, H. Fabr. 1. p. 10. 2. (1868).

Patria: Nova Hollandia.

12. **C. eximia** VOLL. — *Callidea eximia* VOLL., Faun. ind. néerl. 1. p. 20. 8. pl. 1. f. 8. (1863). — *Calliphara eximia* STÅL, Berl. E. Z. 10. p. 153. 8. (1866).

Patria: Nova Guinea, Ternate, Waigiu, Mefoor, Novæ Hebrides. (Mus. Holm.)

Capite parvo, fere uti in *C. nobili*, oculis ocellisque magnis, articulis primo et secundo antennarum longitudine subæqualibus insignis, a *C. regali* forte haud distinguenda.

Scutellum variat aureo flavescens, virescente-æneum vel obscure cæruleum.

Exempla duo masculina, superne cærulescentia, quæ ad hanc speciem refero, angulis segmentorum penultimorum ventris inermibus gaudent.

13. **C. munda** STÅL. — *Calliphara munda* STÅL, Berl. E. Z. 10. p. 153. 9. (1866).

Patria: China. (Mus. Holm.)

Antennæ exempli descripti mutilæ.

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14. **C. obscura** WESTW. — *Tectocoris obscura* WESTW. in HOPE, Cat. 1. p. 14. (1837).

Patria: Nepalia. (an potius Insulæ Philippinæ?)

CHRYSOCORIS HAHN.

Chrysocoris HAHN, W. I. 2. p. 38. (1834); STÅL, H. afr. 1. p. 34. (1864); MAYR, Reis. Nov., Hem. p. 18. (1866). — *Callidea* A. et S., Hist. p. 31. (1843). — *Eucorysses* A. et S., Hist. p. 31. (1843); STÅL, H. afr. 1. p. 34. (1864). MAYR, Reis. Nov., Hem. p. 18. (1866). — *Galostha* A. et S., Hist. p. 32. (1843). — *Cosmocoris* STÅL, H. afr. 1. p. 34. (1864); MAYR, Reis. Nov., Hem. p. 18. (1866).

Subg. **Eucorysses** A. et S.

Caput majusculum, minus nutans, lateribus minus profunde sinuatis. Thorax marginibus lateralibus anticis rectis vel subrectis. Pars basalis scutelli haud vel obsoletissime elevata. Tibiæ superne totæ sulcatæ. Segmentum sextum ventris apud feminas mihi cognitas apice medio obtuse vel obtusissime angulato-prominulum.

a. *Margine antico prostethii toto obtusiusculo, inter sulcum rostralem et angulos anticos toto subrecto, nec versus sulcum illum dilatato.*

1. **C. (Eucorysses) superbus** DALL. — *Callidea superba* DALL., List. 1. p. 23. 6. (1851).

Patria: Ceylon. (Coll. A. DOHRN.)

Rostrum, saltem apud feminam, medium segmenti tertii ventris attingit. Segmentum ventrale sextum feminæ apice medio distincte angulato-prominulum.

aa. *Margine antico prostethii versus sulcum rostralem distincte nonnihil ampliato, ibidem explanato, acutiusculo et subreflexo.*

b. *Capite maculisque pectoris ad coxas flavescentibus, illo interdum purpureo-nitido, vitta media parteque basali intraoculari nigris.*

2. **C. (Eucorysses) grandis** THUNB. — *Eucorysses grandis* STÅL, Berl. E. Z. 10. p. 154. 1. (1866).

Var. a. — *Cimex grandis* THUNB., N. ins. sp. 2. p. 31. t. 2. f. 46. (1783); GMEL., S. N. 1: 4. p. 2133. 171. (1788). — *Calliphara grandis* GERM., Zeitschr. 1: 1. p. 128. 13. (1839). — *Callidea grandis* DALL., List. 1. p. 23. 4. (1851); VOLL., Faun. ind. néerl. 1. p. 18. 4. (1863). — *Eucorysses superbus* UHLER, Pr. Ac. Phil. 1860. p. 221. — *Callidea distinguenda* UHLER, Pr. Ac. Phil. 1861. p. 286.

Var. b. — *Cimex Baro* FABR., E. S. Suppl. p. 528. 7—8. (1798). — *Tetyra Baro* FABR., S. R. p. 129. 3. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 279. 1. (1842). — *Calliphara Baro* GERM., Zeitschr. 1: 1. p. 127. 11. (1839). — *Callidea Baro* DALL., List. 1. p. 22. 3. (1851). — *Tetrarthria tetraspila* WALK., Cat. Het. 1. p. 19. 3. (1867).

Var. c. — *Eucorysses pallens* A. et S., Hist. p. 31. 1. pl. 1. f. 4. (1843). — *Callidea Baro* VOLL., Faun. ind. néerl. 1. p. 17. 3. (1863).

Patria: China. (Mus. Holm.); Silhet; Japonia.

bb. *Capite varicolore, interdum flavescente et purpureo vel violaceo-nitido, in hoc casu vitta media destituto parteque basali nigra brevi, vix ante ocellos extensa; pectore ad coxas maculis flavescentibus destituto.*

3. **C. (Eucorysses) sexmaculatus** LEACH. — *Scutellera sexmaculata* LEACH, Zool. misc. 2. p. 36. t. 14. (1815). — *Scutellera arrogans* MONTR., An. S. Linn. Lyon. (2) 5. p. 258. (1858). — *Eucorysses sexmaculatus* STÅL, Berl. E. Z. 10. p. 154. 2. (1866).

Patria: Nova Caledonia, Insula Lifu. (Mus. Holm.)

Rostrum maris apicem segmenti quarti ventris attingens vel subattingens, feminæ apicem segmenti tertii subattingens.

4. **C. (Eucorysses) Iris** GERM. — *Calliphara Iris* GERM., Zeitschr. 1: 1. p. 128. 12. (1839); H. S., W. I. 5. p. 80. f. 526. (1839) — *Callidea sexmaculata* DALL., List. 1. p. 23. 5. (1851); VOLL., Faun. ind. néerl. 1. p. 18. 5. pl. 1. f. 7. (1863).

Patria: Insula Bintam prope Singapor. (Mus. Holm.); Java.

C. sexmaculato similis, minor, corpore, præsertim capite, purpurascente-flavescente, capite lævi, rostroque breviore differt. Rostrum exempli masculini, quod examinavi, apicem segmenti ventralis tertii subattingens.

5. **C. (Eucorysses) atricapillus** GUÉR. — *Eucorysses atricapillus* STÅL, Berl. E. Z. 10. p. 154. 3. (1866).

Var. a. — *Scutellera atricapilla* GUÉR., Voy. Coq., Ins. p. 156. (1830). — *Tectocoris javana* WESTW. in HOPE, Cat. 1. p. 14. (1837). — *Calliphara javana* GERM., Zeitschr. 1: 1. p. 129. 14. (1839); H. S., W. I. 5. p. 81. f. 527. (1839). — *Callidea atricapilla* DALL., List. 1. p. 24. 7. (1851); VOLL., Faun. ind. néerl. 1. p. 19. 6. (1863).

Var. b. — *Callidea variabilis* VOLL., Faun. ind. néerl. 1. p. 22. 10. pl. 1. f. 9. (1863).

Var. c. — Supra obscure cærulea, basi vittaque capitis, thorace pone medium, fascia angusta basali, fasciis abbreviatis duabus latis, medio subinterruptis, maculaque prope apicem scutelli nigris; angulis imis lateralibus thoracis limboque postico scutelli purpurascente-rufis; ventre nigro-maculato. ♀.

Patria: *var. a.* Java; Borneo; *var. b.* Insula Bali. (Mus. Holm.); *var. c.* Java. (Mus. Vien.)

Rostrum utriusque sexus basin segmenti tertii ventris attingens vel subsuperans.

Subg. **Cosmocoris** STÅL.

Caput majusculum, minus nutans. Thorax marginibus lateralibus anticis medio plus minus distincte sinuatis, apud mares anterius impressione triangulari sat profunda instructus. Scutellum basi transversim elevatum. Tibiæ superne apicem versus planiusculæ vel sulcatæ.

a. *Scutello basi sat fortiter elevato.*

6. **C (Cosmocoris) sellatus** WHITE. — *Callidea sellata* WHITE in GRAY, Zool. misc. p. 79. 1. (1842). sec. DALL; DALL., List. 1. p. 22. 2. (1851). — *Tetrarthria mesozona* WALK., Cat. Het. 1. p. 24. 18. (1867).

Var. b. — *Callidea sellata* var. *chromatica* WHITE in GRAY, Zool. misc. p. 80. 2. (1842). — *Callidea binotata* WALK., Cat. Het. 1. p. 34. 41. (1867).

Var. c. — *Cosmocoris sellatus* var. STÅL, Ö. V. A. F. 1870. p. 618. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

Segmentum genitale maris sat productum, posterius subsemicirculariter rotundatum. Segmentum ventrale sextum feminæ apice medio levissime rotundato-prominulum.

7. **C. (Cosmocoris) quadrimaculatus** VOLL. — *Callidea quadrimaculata* VOLL., Faun. ind. néerl. 1. p. 23. 12. pl. 2. f. 2. (1863). — *Tetrarthria cleroides* WALK., Cat. Het. 1. p. 23. 15. (1867).

Var. b. — *Callidea Schlegelii* VOLL., Faun. ind. néerl. 1. p. 24. 13. pl. 2. f. 3. (1863). — *Tetrarthria rutila* WALK., Cat. Het. 1. p. 20. 8. (1867).

Patria: Insulæ Ceram, Waigiu et Kajoa. (Mus. Holm.); Halmaheira, Ternate, Lombok, Ke, Flores, Amboina.

Segmentum ventrale sextum utriusque sexus postice sensim subsinuatum. Segmentum genitale maris paullo brevius et obtusius rotundatum quam in specie præcedente.

8. **C. (Cosmocoris) excavatus** GUÉR. — *Scutellera excavata* GUÉR., Voy. Coq., Ins. p. 160. 10 et p. 163. (1830). — *Callidea gibbosa* VOLL., Faun. ind. néerl. 1. p. 30. 24. (1863).

Patria: Java. (Mus. Holm.)

Segmentum ventrale sextum maris longius quam in præcedentibus, apice latera versus obtuse sinuatum, medio inter sinus obtusissime rotundatum. Segmentum genitale maris apice truncatum, angulis posticis rotundatis. Femina ignota.

aa. *Scutello basi leviter elevato; marginibus lateralibus thoracis levissime sinuatis.*

9. **C. (Cosmocoris) coxalis** STÅL. — *Callidea coxalis* STÅL, An. S. E. Fr. (4) 4. p. 47. 1. (1864).

Patria: Singapor, Tringany. (Mus. Holm.)

Mas ignotus. Segmentum ventrale sextum feminæ postice obtuse sinuatum.

10. **C. (Cosmocoris) celebensis** VOLL. — *Callidea celebensis* VOLL., Versl. Ak. Amst. (2) 2. p. 175. 5. (1868); Tijdschr. voor Ent. 12. p. 258. 5. pl. 11. f. c. (1869).
Patria: Celebes.

Subg. Chrysocoris HAHN.

Caput parviusculum, valde nutans, lateribus plerumque fortiter sinuatis. Thorax marium impressione triangulari anteriore destitutus. Pars basalis scutelli haud vel leviter elevata. Tibiæ superne apicem versus planæ vel sulcatæ.

a. *Marginibus lateralibus anticis thoracis obtusis, obtuse sinuatis, haud reflexis; macula discoidali scutelli triangulari, subæquilatera; scutello maculis nigris duabus lateralibus notato.* — CHLOROLAMPRA STÅL.

11. **C. (Chrysocoris) Germari** ESCHSCH. — *Scutellera Germari* ESCHSCH., Entomogr. 1. p. 100. 73. t. 2. f. 2. (1822). — *Scutellera Germarii* GUÉR., Voy. Coq., Ins. p. 158. 2. (1830). — *Callidea Germari* BURM., Handb. 2: 1. p. 394. 2. (1835); H. S., W. I. 3. p. 102. f. 327. (1835); GERM., Zeitschr. 1: 1. p. 113. 4. (1839); DALL., List. 1. p. 27. 20. (1851). — *Chrysocoris Germari* STÅL, H. Fabr. 1. p. 11. 1. (1868); Ö. V. A. F. 1870. p. 618. 1.

Var. b. — *Callidea Consul* VOLL., Faun. ind. néerl. 1. p. 36. not. (1863).
Patria: Insulæ Philippinæ. (Mus. Holm.)

aa. *Marginibus lateralibus anticis thoracis plerumque rectis vel obsolete sinuatis, saltem posterius acutiusculis et leviter reflexis, rarius totis sensim rotundatis et explanatis; scutello maculis lateralibus tribus nigris typice notato.*

b. *Marginibus lateralibus anticis thoracis rectis vel subrectis.* (Sp. 12—20). — CHLOROCHRYSA STÅL.

c. *Ventre maculis vel pictura quadam flavescente destituto.*

12. **C. (Chrysocoris) hypomelænus** VOLL. — *Callidea hypomelæna* VOLL., Faun. ind. néerl. 1. p. 33. 29. pl. 3. f. 2. (1863). — *Chrysocoris hypomelænus* STÅL, H. Fabr. 1. p. 11. 2. (1868).
Patria: Borneo. (Mus. Holm.)

cc. *Ventre, saltem disco, flavescente.*

d. *Thorace posterius in medio macula unica nigra, interdum deficiente, notato; segmento ventrali sexto marium mihi cognitorum postice subtruncato vel latissime subsinuato; segmento genitali marium apice truncato vel subrotundato-truncato, angulis posticis rotundatis; macula discoidali scutelli lineari vel retrorsum sensim vel subsensim angustata.* (Sp. 13—19).

e. *Disco ventris flavescente, utrinque quadriradiato, radiis longis, partem apicalem segmentorum occupantibus.*

13. **C. (Chrysocoris) Stockerus** LIN. — *Cimex Stockerus* LIN., M. L. U. p. 167. 1. (1764); S. N. ed. 12. 1: 2. p. 715. 2. (1767). — *Callidea taprobanensis* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1: 1. p. 118. 14. (1839). — *Callidea Erichsoni* GERM., Zeitschr. 1: 1. p. 113. 5. (1839) — *Callidea Stockerus* DALL., List. 1. p. 27. 18. (1851). — *Chrysocoris Erichsoni* STÅL, H. Fabr. 1. p. 11. 4. (1868). — STOLL, Pun. f. 172, A.
Patria: Ceylon. (Mus. Holm.)
Verba LINNÆI »Scutellum — — maculis octo — — —, una transversa in ano» melius ad hanc specim quam ad *C. dilaticollem* spectant. Scutellum enim apice typice nigro-limbatum vel intra apicem nigro-fasciatum, interdum ibidem pictura nigra destitutum.

14. **C. (Chrysocoris) elatus** STÅL. — *Callidea Stockerus* GERM., Zeitschr. 1: 1. p. 114. 6. (1839), excl. syn. — *Chrysocoris elatus* STÅL, H. Fabr. 1. p. 11. 3. (1868).
Patria: India orientalis. (Mus. Holm.)
In hac specie et præcedente macula discoidalis scutelli angusta, linearis vel sublinearis.

15. **C. (Chrysocoris) patricius** FABR. — *Cimex patricius* FABR., E. S. Suppl. p. 527. 3—4. (1798). — *Tetyra patricia* FABR., S. R. p. 131. 15. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 286. 7. (1842). — *Scutellera Patricius* GUÉR, Voy. Coq., Ins. p. 159. 6. (1830). — *Callidea bengalensis* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1. 1. p. 118. 15. (1839); DALL., List., 1. p. 28. 22. (1851). — *Callidea basilica* GERM., Zeitschr. 1: 1. p. 117. 11. (1839). — *Callidea patricia* GERM., Zeitschr. 1: 1. p. 121. 21. (1839). — *Chrysocoris patricius* STÅL, H, Fabr. 1. p. 11. 2 et 5. (1868). — STOLL, Pun. f. 222, A.
Patria: Tranquebar. (Mus. Holm.)
Macula discoidalis scutelli latior quam in duabus præcedentibus, ante medium antrorsum sensim ampliata.
Segmentum genitale maris quam in plurimis congenericis medio transversim fortius impressum, vel, si vis, pone medium magis reflexum. Macula subapicalis rotundata scutelli nigra.

ee. *Ventre fere toto vel disco maximo, utrinque breviter radiato, flavescente, radiis basin et apicem segmentorum occupantibus: scutello apice typice nigro vel obscure violaceo, macula subapicali rotundata destituto.*

16. **C. (Chrysocoris) purpureus** WESTW. — *Cimex Stockerus* FABR., S. Ent. p. 696. 1. (1775); Spec. 2. p. 338. 1. (1781); Mant. 2. p. 280. 1. (1787); E. S. 4. p. 79. 1. (1794); WOLFF, Ic. 2. p. 47. 44. f. 44. (1801). — *Tetyra Stockerus* FABR., S. R. p. 131. 12. (1803). — *Scutellera Stockerus* LATR., Gen. 3. p. 113. 2. (1807). — *Callidea Stockerus* BURM., Handb. 2: 1. p. 394. 3. (1835) — WESTW. in DON., Ins. China. p. 48. pl. 21. f. 1. (1842). — *Callidea purpurea* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1: 1. p. 115. 8. (1839); DALL., List. 1. p. 26. 14. (1851); VOLL., Faun. ind. néerl. 1. p. 31. 25. (1863). — *Chrysocoris purpureus* STÅL, H. Fabr. 1. p. 10. 1. et p. 11. 6. (1868). — STOLL, Pun. f. 15, 16, A.

Patria: India orientalis. (Mus. Holm.); Bengalia, Bombay.

In exemplis nostris thorax anterius maculis tantum duabus nigris ornatus. Macula discoidalis scutelli parviuscula, oblonga.

17. **C. (Chrysocoris) auratus** GUÉR. — *Scutellera aurata* GUÉR., Voy. Coq., Ins. p. 159. 9 et p. 163. (1830). — *Callidea chrysoprasina* H. S., W. I. 3. p. 103. f. 328. (1835); GERM., Zeitschr. 1: 1. p. 116. 9. (1839); DALL., List. 1. p. 26. 15. (1851); VOLL., Faun. ind. néerl. 1. p. 29. 23. (1863). — *Callidea aurifera* WESTW. in HOPE, Cat. 1. p. 15. (1837). — *Chrysocoris chrysoprasinus* STÅL, H. Fabr. 1. p. 11. 7. (1868).

Patria: Java. (Mus. Holm.); Bali.

Macula discoidalis scutelli oblongo-obovata.

18. **C. (Chrysocoris) Stollii** WOLFF. — *Cimex Stollii* WOLFF, Ic. 2. p. 48. 45. f. 45. (1801). — *Scutellera Stockerus* GUÉR., Voy. Coq., Ins. p. 159. 5. et p. 161. (1830). — *Callidea Stollii* GERM., Zeitschr. 1: 1. p. 114. 7. (1839); DALL., List. 1. p. 26. 16. (1851). — *Chrysocoris Stollii* STÅL, H. Fabr. 1. p. 11. 8. (1868).

Patria: China; Assam. (Mus. Holm.)

Macula discoidalis scutelli latiuscula, obovata.

19. **C. (Chrysocoris) ornatus** DALL. — *Callidea ornata* DALL., List. 1. p. 27. 17. (1851).

Patria: Assam. (Mus. Holm.); China.

A *C. Stollii* forte haud distinctus, pectore maculis lineisque flavescentibus destituto, pedibus totis cæruleo-nigris insignis.

dd. *Thorace posterius in medio maculis duabus oblongis nigris ornato; segmento ventrali sexto marium postice obtuse rotundato-producto, segmento genitali marium posterius depresso-reflexo, apice obtuse sinuato: macula discoidali scutelli antice subito ampliata, macula subapicali rotundata nigra.*

20. **C. (Chrysocoris) marginellus** WESTW. — *Callidea marginella* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1: 1. p. 117. 10. (1839). — *Callidea cœlestis* STÅL, Ö. V. A. F. 1855. p. 181. 1; l. c. 1856. p. 52. 1. — *Chrysocoris marginellus* STÅL, H. Fabr. 1. p. 12. 9. (1868).

Patria: India orientalis, Tranquebar, Madras. (Mus. Holm.)

bb. *Thoracis marginibus lateralibus anticis explanatis, rotundatis; macula discoidali scutelli typice antice dilatata et fissa.* — CHRYSOCORIS HAHN = GALOSTHA A. et S.

21. **C. (Chrysocoris) dilaticollis** GUÉR. — *Scutellera dilaticollis* GUÉR., Voy. Coq., Ins. p. 160. 11. et p. 164. (1830). — *Chrysocoris Stollii* HAHN, W. I. 2. p. 39. f. 136. (1834). — *Callidea abdominalis* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1: 1. p. 112. 2. (1839). — *Galostha Stockerus* A. et S., Hist. p. 34. 2. (1843). — *Callidea dilaticollis* DALL., List. 1. p. 28. 26. (1851); VOLL., Faun. ind. néerl. 1. p. 28. 21. (1863). — *Callidea Stockerus* STÅL, Ö. V. A. F. 1855. p. 389. — *Chrysocoris Stockerus* STÅL, H. Fabr. 1. p. 12. 10. (1868).

Var. b. — *Callidea sumatrana* VOLL., Faun. ind. néerl. 1. p. 28. 20. pl. 2. f. 9. (1863). — *Chrysocoris sumatranus* STÅL, H. Fabr. 1. p. 12. 11. (1868).

Patria: Java, Sumatra, Celebes. (Mus. Holm.); China, Malacca, Timor.

22. **C. (Chrysocoris) eques** FABR. — *Callidea eques* DALL., List. 1. p. 28. 25. (1851). — *Chrysocoris Eques* STÅL, H. Fabr. 1. p. 11. 3 et 12. 12. (1868).

Var. a. — *Cimex Eques* FABR., E. S. 4. p. 79. 2. (1794). — *Tetyra Eques* FABR., S. R. p. 131. 13. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 284. 5. (1842). — *Scutellera Eques* GUÉR., Voy. Coq., Ins. p. 158. 3. (1830). — *Callidea eques* BURM., Handb. 2: 1. p. 394. 1. (1835); GERM., Zeitschr. 1: 1. p. 112. 1. (1839). — *Galostha eques* A. et S., Hist. p. 33. 1. (1843).

Var. b. — *Callidea Schwaneri* VOLL., Faun. ind. néerl. 1. p. 26. 18. pl. 2. f. 7. (1863).

Var. c. — *Callidea formosa* WESTW. in HOPE, Cat. 1. p. 15. (1837); GERM., Zeitschr. 1: 1. p. 113. 3. (1839). — *Callidea dorsalis* WHITE in GRAY, Zool. misc. 80. 4. (1842) sec. DALL.

Patria: Tranquebar, Malacca, Borneo, Banca. (Mus. Holm.); Sumatra.

23. **C. pulchellus** DALL. — *Callidea pulchella* DALL., List. 1. p. 25. 13. (1851).
Patria: Silhet.
C. marginello maxime affinis.

24. **C. bilunulatus** VOLL. — *Callidea bilunulata* VOLL., Faun. ind. néerl. 1. 33. 28. pl. 3. f. 1. (1863).
Patria: Sumatra.

25. **C. hyperythrus** VOLL., STÅL. — *Callidea hypherythra* VOLL., Faun. ind. néerl. 1. p. 34. 30. pl. 3. f. 3. (1863).
Patria: Borneo.

26. **C. Bosschei** VOLL. — *Callidea Bosschei* VOLL., Faun. ind. néerl. 1. p. 34. 31. pl. 3. f. 4. (1863).
Patria: Banca.

27. **C. modestus** VOLL. — *Callidea modesta* VOLL., Faun. ind. néerl. 1., p. 29. 22. (1863).
Patria: Sumatra.

LAMPROCORIS STÅL.

Lamprocoris STÅL, H. afr. 1. p. 34. (1864); MAYR, Reis. Nov., Hem. p. 18. (1866). — *Sophela* WALK., Cat. Het. 1. p. 17. (1867).

Subg. Lamprocoris STÅL.

1. **L. (Lamprocoris) lateralis** GUÉR. — *Scutellera lateralis* GUÉR., Voy. Coq., Ins. p. 159. 4. et p. 160. (1830). — *Callidea lateralis* DALL., List. 1. p. 28. 24. (1851); VOLL., Faun. ind. néerl. 1. p. 32. 26. pl. 2. f. 11. (1863).
Patria: Java. (Mus. Holm.); Sumatra.

2. **L. (Lamprocoris) obtusus** WESTW. — *Callidea obtusa* WESTW. in HOPE, Cat. 1. p. 16. (1837); GERM., Zeitschr. 1: 1. p. 119. 16. (1839); VOLL., Faun. ind. néerl. 1. p. 32. 27. (1863).
Patria: Java.

3. **L. (Lamprocoris) Roylii** WESTW. — *Callidea Roylii* WESTW. in HOPE, Cat. 1. p. 16. (1837); GERM., Zeitschr. 1: 1. p. 119. 17. (1839); DALL., List. 1. p. 28. 23. (1851).
Patria: Assam, Bengalia.

Subg. Sophela WALK.

4. **L. (Sophela) spiniger** DALL. — *Callidea spinigera* DALL., Tr. E. S. Lond. 5. p. 168. 1. pl. 19. f. 1. (1849).
Patria: India orientalis. (Mus. Holm.); Butan.

GRAPTOPHARA STÅL.

STÅL, H. afr. 1. p. 34. (1864); MAYR, Reis. Nov., Hem. p. 18. (1866).

1. **G. Reynaudii** GUÉR. — *Scutellera Reynaudii* GUÉR. in BÉLANG., Voy., Zool. p. 497. Ins. pl. 4. f. 3. (1834); GERM., Zeitschr. 1: 1. p. 136. 9. (1839). — *Callidea pulchra* WESTW. in HOPE, Cat. 1. p. 16. (1837). — *Calliphara pulchra* GERM., Zeitschr. 1: 1. p. 127. 10. (1839). — *Callidea Reynaudii* DALL., List. 1. p. 27. 19. (1851); VOLL., Faun. ind. néerl. 1. p. 22. 11. (1863).
Patria: Java. (Mus. Holm.); Borneo.

CRYPTACRUS MAYR.

Cryptacrus MAYR., Verh. z.-b. Ges. Wien. 14. p. 904. (1864). — *Graptocoris* p. STÅL, H. afr. 1. p. 34. et 37. (1864). — *Graptocoris* MAYR, Reis. Nov., Hem. p. 14. (1866).

1. **C. comes** FABR. — *Tetyra comes* FABR., S. R. p. 130. 8. (1803); SCHJÖDTE in KRÖYER, Nat. Tidsskr. 4. p. 282. 3. (1842). — *Scutellera comes* GERM., Zeitschr. 1: 1. p. 137. 10. (1839). — *Pœcilocoris ? comes* DALL., List. 1. p. 15. 14. (1851). — *Graptocoris Comes* STÅL, H. afr. 1. p. 38. 1. (1864). — *Cryptacrus erotyloides* WALK., Cat. Het. 1. p. 11. 4. (1867). — *Cryptacrus Comes* STÅL, H. Fabr. 1. p. 12. 1. (1868).

Var. b. — *Scutellera pinguis* GERM. in SILB., Rev. 5. p. 191. 146. (1837). — *Pachycoris rufilabris* GERM., Zeitschr. 1: 1. p. 88. 10. taf. 1. f. 2. (1839). — *Pœcilocoris ? pinguis* DALL., List. 1. p. 15. 15. (1851). — *Graptocoris pinguis* STÅL, H. afr. 1. p. 38. 2. (1864).
Patria: Guinea; Caffraria. (Mus. Holm.)

2. **C. novemmaculatus** SIGN. — *Callidea novemmaculata* SIGN., Rev. et Mag. Zool. 1851. p. 439. 2. pl. 12. f. 2. — *Graptocoris novemmaculatus* STÅL. H. afr. 1. p. 39. 3. (1864)
Patria: Guinea, Gabon. (Mus. Holm.)

ANOPLOGONIUS STÅL.

Graptocoris p. STÅL, H. afr. 1. p. 34. et 37. (1864).

1. **A. nigricollis** SIGN. — *Chærocoris nigricollis* SIGN. in THOMS., Arch. ent. 2. p. 270. 489. pl. 11. f. 1. (1858). — *Graptocoris nigricollis* STÅL, H. afr. 1. p. 40. 4. (1864). — *Cryptacrus silphoides* WALK., Cat. Het. 1. p. 12. 5. (1867).
Patria: Guinea, Calabar. (Mus. Holm.)

GRAPTOCORIS STÅL.

Graptocoris p. STÅL, H. afr. 1. p. 34 et 37. (1864).

1. **G. aulicus** GERM. — *Chærocoris aulicus* DALL., List. 1. p. 30. 3. (1851). — *Graptocoris aulicus* STÅL, H. afr. 1. p. 40. 5. (1864).

Var. a. — *Pachycoris aulicus* GERM. in SILB., Rev. 5. p. 189. 141. (1837); GERM., Zeitschr. 1: 1. p. 90. 15. (1839); H. S., W. I. 5. p. 10. f. 467. (1839).

Var. b. — *Pachycoris ornatus* GERM. in SILB., Rev. 5. p. 190. 142. (1837).

Var. c. — *Chærocoris personatus* STÅL, Ö. V. A. F. 1853. p. 210. 1.

Patria: Terra capensis; Caffraria. (Mus. Holm.)

CALLIDEA LAP.

Calidea p. LAP., Ess. p. 71. (1832). — *Callidea* p. BURM., Handb. 2: 1. p. 393. (1835). — *Libyssa* DALL., List. 1. p. 4 et 20. (1851). — *Callidea* STÅL, H. afr. 1. p. 35 et 41. (1864).

a. *Articulis primo et secundo antennarum longitudine subæqualibus.*

1. **C. signata** FABR. — *Cimex signatus* FABR., E. S. 4. p. 80. 4. (1794); WOLFF., Ic. 3. p. 91. f. 85. (1802). — *Tetyra signata* FABR., S. R. p. 129. 7. (1803). — *Scutellera signata* LATR., Gen. ins. 3. p. 112. 1. (1807); P. B., Ins. p. 232. Hém. pl. 5. b. f. 1 et 2. (1805). — *Callidea signata* BURM., Handb. 2: 1. p 394. 4. (1835); H. S., W. I. 3. p. 98. f. 323. (1836); GERM., Zeitschr. 1. p. 119. 18. (1839); STÅL, H. afr. 1. p. 42. 1. (1864). — *Libyssa signata* DALL., List. 1. p. 21. 1. (1851).
Patria: Senegal. (Mus. Holm.)
Segmentum genitale maris sensim rotundato-angustatum, apice obtuse angulato-sinuatum, angulis apicalibus subprominulis. Margo costalis ultra medium flavescens.

aa. *Articulo primo antennarum articulo secundo longiore.*

b. *Marginibus lateralibus ventris immaculatis; margine antico prostethii toto vel saltem versus medium flavescente, interdum violaceo vel ænescente-nitido.*

c. *Segmento genitali marium posterius flavescente vel croceo, apice late truncato vel rotundato, medio profunde emarginato; antennis longioribus et gracilioribus.*

2. **C. Dregii** GERM. — *Callidea Dregii* GERM., in SILB., Rev. 5. p. 191. 145. (1837); STÅL, H. afr. 1. p 42. 2. (1864). — *Callidea examinans* WHITE, Tr. E. S. Lond. 3. p. 85. (1842). — *Libyssa Dregii* DALL., List. 1. p. 22. 3. (1851). — *Libyssa Signoreti* STÅL, Ö. V. A. F. 1853. p. 210. 1. — *Callidea duodecimpunctata* SCHAUM in PETERS, Reis. Mossamb., Ins. 35. (1862).
Patria: Natalia. (Mus. Holm.)
Segmentum genitale maris apice obtuse rotundatum, medio subito profunde emarginatum.

3. **C. duodecimpunctata** FABR. — *Cimex 12-punctatus* FABR., E. S. Suppl. p. 527. 4—5. (1798). — *Cimex duodecimpunctatus* COQ, Ill. 1. p. 36. t. 9. f. 7. (1799). — *Tetyra 12-punctata* FABR., S. R. p. 132. 16. (1803). — *Callidea nana* H. S., W. I. 3. p. 100. f. 325. (1835).
Patria: Senegal. (Mus. Holm.)
Segmentum genitale maris retrorsum sensim leviter angustatum, apice late truncatum, in medio subito acute emarginatum. Regio acetabulorum, sulcus orificiorum cum rugis sulcum terminantibus et margo costalis ultra medium flavescentes. *C. Dregii* simillima, minor.

4. **C. madagascariensis** SIGN. — *Libyssa Madagascariensis* SIGN., An. S. E. Fr. (3) 8. p. 917. 67. (1861). — *Callidea madagascariensis* STÅL, H. afr. 1. p. 43. 3. (1864).
Patria: Madagascar (Mus. Holm.)

Præcedentibus duabus simillima, statura crassiore, latiore, articulo primo antennarum toto vel fere toto, femoribus apice vel apicem versus nigris præsertim differt. Segmentum genitale maris retrorsum sensim nonnihil angustatum, apice late subtruncatum, medio subito profunde emarginatum.

cc. *Segmento genitali marium obscure cœruleo, ante medium aureo-fasciato, retrorsum rotundato-angustato, apice sensim rotundato et in medio leviter emarginato; antennis brevioribus et crassioribus.*

5. **C. distinguenda** Reiche et Fairm. — *Callidea distinguenda* Reiche et Fairm., Voy. Abyss., Ent. p. 433. 1. (1848); Stål, H. afr. 1. p. 45. 5. (1864).
Patria: Abyssinia. (Mus. Holm.)

6. **C. natalensis** Stål. — *Callidea duodecimpunctata* Germ., Zeitschr. 1. p. 120. 20. (1839); Stål, H. afr. 1. p. 44. 4. (1864). excl. syn. — *Libyssa duodecimpunctata* Dall., List. 1. p. 21. 2. (1851).
Patria: Caffraria. (Mus. Holm.)
An a præcedente diversa? divergit præsertim statura paullo breviore et latiore.

bb. *Marginibus lateralibus ventris maculis parvis nigris ornatis; antennis totis nigris; margine antico prostethii haud vel tantum pone oculos flavescente; segmento genitali maris retrorsum valde angustato, apice profunde emarginato, acutiuscule bilobo.*

7. **C. Bohemani** Stål. — *Libyssa Bohemani* Stål, Ö. V. A. F. 1853. p. 210. 2. — *Callidea Bohemani* Stål, H. afr. 1. p. 45. 6. (1864).
Patria: Caffraria. (Mus. Holm.)
Variat colore cœruleo in purpurascente flavescentem vergente.

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8. **C. Westwoodii** Voll. — *Libyssa Westwoodii* Voll., Versl. Ak. Amst., Nat. (2) 2. p. 175. 2. (1868); Tijdschr. v. Ent. 12. p. 256. 2. (1869).
Patria: Zambesi.

CALLISCYTA Stål.

1. **C. Stålii** Voll. — *Callidea Stålii* Voll., Faun. ind. néerl. 1. p. 24. 14. pl. 2. f. 4. (1863).
Patria: Insula Timor; Cap York Australiæ. (Mus. Holm.)

Div. Tetyraria Stål.

Conspectus generum.

1(2). Angulis lateralibus thoracis productis, acutis; capite apice magis angustato et producto, thoraci longitudine subæquali; sulco sternali minus profundo; articulo secundo antennarum apicem capitis haud attingente; parte buccularum ante vaginam sita retrorsum haud vel levissime altitudine crescente. — *Hotea* A. et S.

2(1). Angulis lateralibus thoracis haud vel leviter prominulis, apice rotundatis; capite apice minus producto et minus angustato, thorace breviore; sulco sternali profundiore; articulo secundo antennarum apicem capitis attingente vel superante; parte buccularum ante insertionem vaginæ sitæ retrorsum altitudine sensim crescente; scutello feminarum quam marium apice obtusius rotundato, posterius semiorbiculari. — *Deroplax* Mayr.

HOTEA A. et S.

A. et S. Hist. p. 41. (1843); Dall., List. 1. p. 5 et 39. (1851); Stål, H. afr. 1. p. 35 et 53. (1864); Mayr., Reis. Nov., Hem. p. 15. (1866).

a. *Corpore ovali; marginibus lateralibus capitis ultra medium subparallelis, dein subito angulatis; ventre usque ad margines laterales convexo, angulis apicalibus segmentorum tuberculo parvo armatis.* — Phymatogonia Stål.

1. **H. (Phymatogonia) denticulata** Stål. — *Hotea denticulata* Stål, H. afr. 1. p. 56. 4. (1864).
Patria: Madagascar.

aa. *Corpore ovato; capite ante oculos sensim angustato; lateribus ventris planis vel ad margines depressis, tuberculis destitutis; bucculis anterius obtuse rotundatis.*

b. *Corpore latiore; tylo haud tumescente, a latere viso apice haud prominulo; bucculis longius ab apice subdentatis.* — Hotea A. et S.

2. **H. (Hotea) Gambiæ** Westw. — *Trigonosoma Gambiæ* Westw. in Hope, Cat. 1. p. 11. (1837). — *Trigonosoma apicale* Westw. in Hope, Cat. 1. p. 11. (1837). — *Pachycoris Gambiæ* Germ., Zeitschr. 1. p. 106. 50. (1839). — *Pachycoris apicalis* Germ., Zeitschr. 1. p. 106. 51. (1839). — *Hotea triangulum* A. et S., Hist. p. 41. 1. pl. 1. f. 7. (1843). — *Hotea Gambiæ* p. Dall., List. 1. p. 39. 2. (1851). — *Hotea Gambiæ* Stål, H. afr. 1. 54. 1. (1864).
Patria: Senegal, Gambia. (Mus. Holm.)

3. **H. (Hotea) subfasciata** Westw. — *Trigonosoma subfasciatum* Westw. in Hope, Cat. 1. p. 11. (1837). — *Pachycoris falcatus* Germ. in Silb., Rev. 5. p. 191. 144. (1837). — *Hotea Gambiæ* p. Dall., List. 1. p. 39. 2. (1851). — *Hotea vicinum* Sign., Rev. et Mag. Zool. 1851. p, 441. 4. — *Hotea subfasciata* Stål, H. afr. 1. p. 54. 2. (1864).
Patria: Caffraria, Gabon, Calabar. (Mus. Holm.)

bb. *Corpore angustiore; tylo tumescente, latiusculo, apice producto, obtuso; bucculis minus longe ab apice subdentatis.* — Tylonca Stål.

4. **H. (Tylonca) curculionoides** H. S. — *Pachycoris curculionoides* H. S., W. I. 3. p. 106. f. 331. (1835); Germ., Zeitschr. 1. p. 106. 49. (1839). — *Pachycoris punctulatus* Germ., Zeitschr. 1. p. 106. 48. (1839). — *Hotea curculionoides* Dall., List. 1. p. 39. 1. (1851); Voll., Faun. ind. néerl. 1. p. 37. 1. (1863).
Patria: Java, Sumatra, Timor. (Mus. Holm.); China; Amboina.

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5. **H. fusca** Voll. — *Hotea fusca* Voll., Faun. ind. néerl. 1. p. 38. 2. (1863).
Patria: Java.

6. **H. acuta** Stål. — *Hotea acuta* Stål, H. afr. 1. p. 55. 3. (1864).
Patria: Calabar.

DEROPLAX Mayr.

Deroplax Mayr., Verh. z.-b. Ges. Wien. 14. p. 905. (1864). — *Argocoris* Mayr., Verh. z.-b. Ges. Wien. 14. p. 905. (1864). — *Sergia* Stål, H. afr. 1. p. 35 et 56. (1864); Mayr, Reis. Nov., Hem. p. 15. (1866).

a. *Corpore superne valde convexo, subfornicato; capite thoraceque simul sumtis scutello longitudine subæqualibus; thorace longiusculo, haud duplo latiore quam longiore, scutello circiter tertia parte breviore, marginibus lateralibus anticis ante medium obtusissimis, convexis, et tuberculis nonnullis parvis instructis.* — Argocoris Mayr.

1. **D. (Argocoris) Redtenbacheri** Mayr. — *Argocoris Redtenbacheri* Mayr, Verh. z.-b. Ges. Wien. 14. p. 905. (1864). — *Sergia obesa* Stål, H. afr. 1. p. 57. (1864).
Patria: Sennaar. (Mus. Vien.); Senegal. (Coll. Signoret.)

aa. *Corpore superne minus convexo, lateribus minus declivibus; capite thoraceque simul sumtis scutello plerumque distincte brevioribus; thorace circiter duplo latiore quam longiore, scutello circiter dimidio breviore, marginibus lateralibus anticis ante medium plerumque minus obtusis, inermibus.*

b. *Articulo secundo antennarum articulo tertio longiore; lobis prosterni totis distincte punctatis; linea longitudinali lævigata scutelli et thoracis nulla vel obsoleta et ad partem obliterata.* — Deroplax Mayr.

cc. *Corpore superne, præsertim thorace, convexiore; capite magis nutante, carina marginum lateralium posterius obtusissima vel obliterata; lobis prosterni subrectangularibus; margine ventris lævigato.*

2. **D. (Deroplax) nigro-punctata** Stål. — *Sergia nigro-punctata* Stål, H. afr. 1. p. 57. 2. (1864).
Patria: Senegal. (Mus. Holm. et Vien.)
Variat obscurior, corpore subtus pedibusque nigricantibus, margine angusto ventris pallido.

cc. *Corpore superne minus convexo; capite minus nutante, marginibus lateralibus totis distincte carinatis; lobis prosterni rotundatis; ventre usque ad margines punctato.*

3. **D. (Deroplax) obscura** Dall. — *Odontotarsus obscurus* Dall., List. 1. p. 40. 3. (1851). — *Eurygaster natalensis* Stål, Ö. V. A. F. 1853. p. 211. 1. — *Sergia obscura* Stål, H. afr. 1. p. 58. 3. (1864).
Patria: Caffraria, Africa meridionalis occidentalis. (Mus. Holm.)

4. **D. (Deroplax) illota** Stål. — *Odontotarsus illotus* Stål, Ö. V. A. F. 1858. p. 311. 8. — *Sergia illota* Stål, H. afr. 1. p. 58. 4. (1864).
Patria: Territorium lacus N'Gami. (Mus. Holm.)

5. **D. (Deroplax afra** H. S. — *Psacasta afra* H. S., W. I. 5. p. 47. f. 497. (1839). — *Sergia afra* STÅL, H. afr. 1. p. 60. 7. (1864).
Patria: Guinea. (Coll. SIGNORET.)

bb. *Articulis secundo et tertio antennarum longitudine subæqualibus; lobis prosterni prope marginem læviusculis vel minus dense et minus fortiter punctatis; thorace scutelloque linea lævigata distinctissima percurrente vel subpercurrente instructis.* — SERGIA STÅL.

6. **D. (Sergia) silphoides** THUNB. — *Sergia silphoides* STÅL, H. afr. 1. p. 59. 6. (1864).

Var. a. — *Cimex silphoides* THUNB., Nov. ins. sp. 2. p. 29. (1783); GMEL., S. N. 1: 4. p. 2133. 168. (1788). — *Tetyra silphoides* THUNB., H. rostr. cap. 2. p. 6. (1822).

Var. b — *Cimex stigma* FABR., E. S. Suppl. p. 528. 10—11. (1798). — *Tetyra stigma* FABR., S. R. p. 133. 21. (1803). — *Pachycoris stigma* BURM., Handb. 2: 1. p. 392. 4. (1835); GERM., Zeitschr. 1. p. 90. 16. (1839). — *Odontotarsus silphoides* DALL., List. 1. p. 41. 4. (1851). — STOLL, Pun. f. 21.
Patria: Terra capensis. (Mus. Holm).

7. **D. (Sergia) Coquerelii** SIGN. — *Odontotarsus Coquerelii* SIGN., An. S. E. Fr. (3) 8. p. 918. 68. pl. 13. f. 1. (1861). — *Sergia Coquerelii* STÅL, H. afr. 1. p. 59. 6. (1864).
Patria: Madagascar. (Coll. SIGNORET).

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8. **D. circumducta** GERM. — *Pachycoris circumductus* GERM. in SILB., Rev. 5. p. 190. 143. (1837).
Patria: Terra capensis.

9. **D. caffra** GERM. — *Pachycoris caffer* GERM., Zeitschr. 1. p. 95. 27. (1839).
Patria: Caffraria.

Div. **Odontotarsaria** STÅL.

CONSPECTUS GENERUM.

1(6). Capite ante oculos sessiles angustato; marginibus lateralibus anticis thoracis rectis vel versus medium levissime sinuatis, angulis anticis obtusis, haud prominulis; scutello posterius angustato, margine partis apicalis anguste inflexo.

2(3). Corpore, præsertim subtus, sericeo, subtomentoso; capitis lateribus obtusissimis, immarginatis; tylo lato, tumido; scutello apice sensim angustato, truncato vel sinuato-truncato; tibiis superne convexiusculis. — *Alphocoris* GERM.

3(2). Corpore nudo; capitis lateribus marginatis; tibiis superne planiusculis vel sulcatis, marginatis.

4(5). Scutello apice sinuato-angustato et plus minus caudato-producto; capite antice levissime convexo-declivi, tylo vix tumescente. — *Odontotarsus* LAP.

5(4). Scutello apice sensim angustato, haud caudato; capite anterius sat fortiter convexo-declivi, tylo tumescente. — *Ellipsocoris* MAYR.

6(1). Capite ante oculos globosos et breviter stylatos vel substylatos subquadrato, apice lato, truncato vel rotundato-truncato; thorace apice capite latiore, marginibus lateralibus anticis anterius plerumque distincte sinuatis; scutello pone medium subsensim angustato, margine apicali haud inflexo. — *Phimodera* GERM.

ALPHOCORIS GERM.

Alphocoris GERM., Zeitschr. 1: 1. p. 58. (1839); DALL., List. 1. p. 5. (1851); STÅL, H. afr. 1. p. 35 et 60. (1864); MAYR, Reis. Nov., Hem. p. 13. (1866).

a. *Capite minus convexo, anterius minus convexo-declivi; tylo magis tumido; bucculis antice subito elevatis, ibidem interdum lobatis.*

1. **A. lobulatus** STÅL. — *Alphocoris lixoides* STÅL, H. afr. 1. p. 60. 1. (1864). excl. syn.
Patria: Senegal. (Mus. Holm.)

2. **A. lixoides** GERM. — *Alphocoris lixoides* GERM., Zeitschr. 1: 1. p. 59. 1. T. 1. f. 3. (1839); A. et S., Hist. p. 44. 1. (1843); DALL., List. 1. p. 41. 2. (1851).
Patria: Senegal. (Mus. Vien.).
Præcedenti maxime affinis, differt bucculis antice haud lobatis.

aa. *Capite magis convexo et anterius magis convexo-declivi; tylo minus tumescente; bucculis anterius sensim obtuse rotundatis, apice haud subito elevatis.*

3. **A. indutus** Stål. — *Alphocoris indutus* Stål, H. afr. 1. p. 61. 2. (1864).
Patria: Caffraria.
Scutellum apice late angulato-emarginatum, angulis apicalibus distinctis.

4. **A. crassus** Stål. — *Alphocoris crassus* Stål, H. afr. 1. p. 61. 3. (1864).
Patria: Senegal. (Coll. Signoret.)
An ab *A. larinoide* diversus? Scutellum *apice* obtuse rotundatum et medio leviter emarginatum.

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5. **A. larinoides** Germ. — *Alphocoris larinoides* Germ., Zeitschr. 1: 1. p. 60. 2. (1839).
Patria: Senegal.

6. **A. mucoreus** Klug. — *Tetyra (Alphocoris) mucorea* Klug, Symb. 5. tab. 43. f. 4 et 5. (1845).
Patria: Ambukohl.

ODONTOTARSUS Lap.

Odontotarsus Lap., Ess. p. 68. (1832). — *Bellocoris* p. Hahn, W. I. 2. p. 43. (1834). — *Odontarsus* Muls. et Rey, Pun., Sent. p. 47. (1865).

1. **O. caudatus** Burm. — *Pachycoris caudatus* Burm., Handb. 2: 1. p. 392. 6. (1835); H. S., W. I. 4. p. 28. f. 378. (1839). — *Odontotarsus productus* Spin., Ess. p. 362. 3. (1837). — *Tetyra (Pachycoris) caudata* Klug, Symb. 5. t. 43. f. 6. (1845). — *Odontarsus caudatus* Muls. et Rey, Pun., Scut. p. 58. 1. (1865).
Patria: Europa meridionalis; Africa borealis. (Mus. Holm.)

2. **O. grammicus** Lin. — *Cimex grammicus* Lin., S. N. ed. 12. 1: 2. p. 716. 7. (1767). — *Cimex purpureo-lineatus* Rossi, Faun. etr. 2. p. 228. 1291. pl. 7. f. 2. (1790). — *Tetyra grammica* Fabr., S. R. p. 137. 43. (1803). — *Odontotarsus purpureolineatus* Lap., Ess. p. 68. (1832). — *Pachycoris grammicus* Burm., Handb. 2: 1. p. 392. 5. (1835). — *Bellocoris purpureolineatus* Hahn, W. I. 2. p. 43. f. 138. (1834). — *Odontotarsus grammicus* Spin., Ess. p. 362. 2. (1837). — *Odontarsus grammicus* Muls. et Rey, Pun., Scut. p. 51. 2. (1865).
Patria: Europa meridionalis, Asia minor. (Mus. Holm.)

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3. **O. nigricornis** Garb. — *Odontotarsus nigricornis* Garb., Bul. S. E. It. 1. p. 44. (1869).
Patria: Italia prope Taurinum.

ELLIPSOCORIS Mayr.

Mayr., Verh. z.-b. Ges. Wien. 14. p. 906. (1864); Reis. Nov., Hem. p. 15. (1866).

1. **E. trilineatus** Mayr. — *Ellipsocoris trilineatus* Mayr, Verh. z.-b. Ges. Wien. 14. p. 906. (1864).
Patria: Syria, Beirut. (Mus. Vien.)

PHIMODERA Germ.

Phimodera Germ., Zeitschr. 1. p. 60. (1839); Mayr, Reis. Nov., Hem. p. 19. (1866); Muls. et Rey, Pun. Scut. p. 40. (1865).

a. *Trochanteribus, saltem posterioribus, subtus in apice tuberculo vel spina acute conica armatis; capitis marginibus lateralibus postice ad oculos subito fortiter sinuatis, dein rectis et subparallelis vel parallelis; jugis apice recte truncatis, angulis apicalibus rectis, angulo exteriore rotundato; tuberculis marginum lateralium abdominis majusculis.*

1. **P. galgulina** H. S. — *Podops galgulinus* H. S., W. I. 4. p. 29. f. 379. (1839). — *Phimodera galgulina* Germ., Zeitschr. 1: 1. p. 61. 1. (1839); A. et S., Hist. p. 56. 1. (1843); Gorski, Anal. p. 50. 17. (1852); Fieb., Wien. E. M. 7. p. 3. 2. (1863).
Patria: Borussia. (Mus. Holm.); Gallia, Hungaria, Russia.
In hac specie trochanteres posteriores spina distinctissima, conica, trochanteres antici tuberculo sunt armati.

2. **P. humeralis** Dalm. — *Var. a.* — *Phimodera galgulina* Boh., Vet. Ak. H. 1851. p. 102. (1853). excl. syn.

Var. b. — *Tetyra humeralis* Dalm., Anal. p. 94. (1823); Fall., Suppl. Cim. Sv. p. 4. 3—4. (1826); H. Suec., Cim. p. 14. 4. (1828). — *Phimodera humeralis* Germ., Zeitschr. 1: 1. p. 62. 3. (1839); Gorski, Anal.

p. 51. 18. (1852); FLOR, Rhynch. p. 83. 2. (1860); FIEB., Eur. H. p. 375. 2. (1861); FIEB., Wien. E. M. 7. p. 2. 1. (1863).

Patria: Suecia meridionalis; Germania borealis, Berolinum. (Mus. Holm.)

Præcedenti simillima, trochanteribus posterioribus tuberculo obtuso armatis mox distinguenda.

aa. *Trochanteribus subtus spina vel tuberculo apicali destitutis; capite ab oculis versus medium vel ultra medium sensim leviter angustato vel subsinuato-angustato, anterius paullo ampliato; jugis apice oblique subtruncatis, angulo apicali interiore subacuto, angulo apicali exteriore obtuso, rotundato; tylo ante juga subprominulo.*

b. *Thorace uti in divisione a formato, marginibus lateralibus anterius sat fortiter sinuatis, angulis anticis subrectis; scutello linea media lævigata vel ruga lorgitudinali destituto; tuberculis marginalibus ventris majusculis.*

3. **P. Flori** FIEB. — *Phimodera Flori* FIEB., Wien. E. M. 7. p. 82. 1. (1863).

Patria: Berolinum. (Mus. Holm.); Livonia.

Præcedentibus duabus simillima, notis supra allatis, nec non statura angustiore, angulis lateralibus thoracis ante emarginaturam obtusius prominulis et apice subrotundatis differt.

bb. *Thorace marginibus lateralibus anterius vix vel obtuse sinuatis, angulis anticis igitur obtusis; scutello linea lævigata vel ruga longitudinali, nec basin nec apicem attingente, instructo; tuberculis marginalibus abdominis minoribus.*

4. **P. lævilinea** STÅL. — Præcedentibus simillima, quoad picturam cum *P. galgulina* congruens, sed plaga longitudinali media extus fusco-marginata medio minus profunde sinuata, obtusius sinuato-angustata; differt præterea statura paullo angustiore, forma capitis, trochanteribus inermibus, thoracis marginibus lateralibus anterius obtusius sinuatis, scutello anterius rugis duabus longitudinalibus pallidis distinctissimis, et linea longitudinali media distinctissime lævigata, nec basin nec apicem attingente, instructo. ♂. Long. 6, Lat. $3\frac{1}{2}$ mill.

Patria: Dauria. (Mus. Holm.)

5. **P. lapponica** ZETT. — *Tetyra lapponica* ZETT., Faun. Lapp. 1. p. 460. 1. (1828); Ins. Lapp. p. 257. 1. (1840). — *Podops Lapponicus* GERM., Zeitschr. 1: 1. p. 67. 9. (1839).

Patria: Lapponia. (Coll. ZETTERSTEDT.)

Exemplum typicum masculinum a me examinatum, supra subferrugineum, fusco-conspersum, subtus cum pedibus fere totis nigrum, differt a specie præcedente, cum qua forma capitis congruit, thoracis marginibus lateralibus anticis anterius vix sinuatis, fere rectis, postice obtusius rotundatis, angulis lateralibus obtusius emarginatis, scutello basi latera versus rugula longitudinali lævi destituto, sed ruga longitudinali distinctissima, punctulata, anterius sensim evanescente, posterius sensim subampliata, prope apicem subito abbreviata instructo. Long. $7\frac{1}{2}$, Lat. $4\frac{1}{2}$ mill.

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6. **P. fumosa** FIEB. — *Phimodera galgulina* FIEB., Eur. H. p. 375. 1. (1861). excl. syn. — *Phimodera fumosa* FIEB., Wien. E. M. 7. p. 5. 3. (1863).

Patria: Russia orientalis, Orenburg.

7. **P. amblygonia** FIEB. — *Phimodera amblygonia* FIEB., Wien. E. M. 7. p. 8. 5. (1863).

Patria: Russia meridionalis, Sarepta.

8. **P. nodicollis** BURM. — *Podops nodicollis* BURM., Handb. 2: 1. p. 387. 3. (1835). — *Phimodera nodicollis* GERM., Zeitschr. 1: 1. p. 62. 2. T. 1. f. 7. (1839).

Patria: Sibiria, Barnaul.

Div. **Eurygastraria** STÅL.

CONSPECTUS GENERUM.

1(4). Orificiis in sulcum haud extensis; mesosterno utrinque ad sulcum rostralem ruga vel tuberculo compresso instructo.

2(3). Capitis marginibus lateralibus posterius haud vel obsoletissime sinuatis; jugis tylo vix longioribus, apice ipso convergentibus et plerumque contiguis; corpore supra subtusque sat convexo; scutello abdomini latitudine subæquali, a basi sensim rotundato-ampliato; abdomine thorace angustiore; ventre apud mares maculis duabus discoidalibus magnis impunctatis vel punctis rarissimis subtilibus conspersis instructo. — *Psacasta* GERM.

3(2). Capitis marginibus lateralibus posterius distincte sinuatis; jugis tylo multo longioribus et ante hunc contiguis; corpore supra subtusque minus convexo; scutello abdomine multo angustiore, lateribus ultra medium subparallelis; abdomine thorace paullo latiore, margine subcrispo; connexivi segmentis convexis, versus incisuras sensim depressis; ventris lateribus depressis, angulis segmentorum tumescentibus. — *Xerobia* STÅL.

4(1). Orificiis in sulcum sat longum subito abbreviatum extensis; lateribus sulci mesosterni nec carinatis nec rugosis; corpore supra subtusque leviter convexo; scutello abdomine multo angustiore; lateribus abdominis explanatis, hoc thorace latiore. — *Eurygaster* LAP.

PSACASTA GERM.

Ventocoris p. HAHN, W. 1. 2. p. 35. (1833). — *Psacasta* GERM., Zeitschr. 1. p. 68. (1839); MULS. et REY, Pun., Scut. p. 33. (1865); MAYR, Reis. Nov., Hem. p. 14. (1866). — *Tetyra* SPIN., Ess. p. 364. (1837). — *Cryptodontus* MULS. et REY, Pun. p. 36. (1865).

Subg. Psacasta GERM.

1. **P. (Psacasta) Cerinthe** FABR. — *Cimex Cerinthe* FABR., Mant. 2. p. 280. 6. (1787); E. S. 4. p. 82. 9. (1794). — *Cimex Cerinthes* GMEL., S. N. 1: 4. p. 2128. 142. (1788). — *Tetyra cerinthe* FABR., S. R. p. 140. 56. (1803); SCHJÖDTE in KRÖY., Nat. Tidsskr. 4. p. 301. 18. (1842); MULS. et REY, Pun., Scut. p. 36. (1865). — *Tetyra pagana* FABR., S. R. p. 140. 57. (1803). — *Tetyra gentilis* FABR., S. R., Ind. p. 20. (1803). — *Trigonosoma Cerinthe* GERM., Zeitschr. 1: 1. p. 57. 3. (1839). — *Trigonosoma pagana* GERM., Zeitschr. 1: 1. p. 57. 4. (1839). — *Psacasta nigra* GERM., Zeitschr. 1: 1. p. 141. 6. (1839); H. S., W. I. 5. p. 47. f. 498. (1839). — *Tetyra (pagana) gentilis* SCHJÖDTE in KRÖY., Nat. Tidsskr. 4. p. 301. 19. (1842). — *Tetyra hispana* RAMB., Faun. And. 2. p. 99. 4. (sec. MULS.) — *Psacasta Cerinthæ* FIEB., Eur. H. p. 375. 1. (1861).
Patria: Mauritania; Europa meridionalis.

2. **P. (Psacasta) exanthematica** SCOP. — *Cimex Exanthematicus* SCOP., Ent. carn. p. 121. 353. (1763). — *Cimex Pedemontanus* FABR., Spec. 2. p. 342. 19. (1781). — *Cimex Allioni* GMEL., S. N. 1: 4. p. 2132. 164. (1788). — *Tetyra pædemontana* FABR., S. R. p. 137. 42. (1803). — *Scutellera pedemontana* LATR., Hist. nat. 12. p. 181. 15. (sec. MULS.) — *Ventocoris pedemontanus* HAHN, W. I. 2. p. 37. f. 134. (1833). — *Psacasta pedemontana* GERM., Zeitschr. 1: 1. p. 69. 1. (1839); MULS. et REY, Pun., Scut. p. 33. 1. (1865). — *Psacasta Allioni* FIEB., Eur. H. p. 376. 2. (1861).
Patria: Europa meridionalis; Madeira. (Mus. Holm.)

3. **P. (Psacasta) conspersa** GERM. — *Psacasta conspersa* GERM., Zeitschr. 1: 1. p. 71. 4. (1839); DALL., List. 1. p. 44. 2. (1851); FIEB., Eur. H. p. 376. 3. (1861).
Patria: Europa meridionalis. (Mus. Holm.)

Subg. Cryptodontus MULS. et REY.

4. **P. (Cryptodontus) tuberculata** FABR. — *Cimex tuberculatus* FABR., Spec. 2. p. 343. 30. (1781). — *Tetyra tuberculata* FABR., S. R. p. 139. 52. (1803). — *Psacasta tuberculata* GERM., Zeitschr. 1: 1. p. 70. 2. (1839); FIEB., Eur. H. p. 376. 4. (1861). — *Cryptodontus tuberculatus* MULS. et REY, Pun., Scut. p. 37. 1. (1865).
Patria: Europa meridionalis. (Mus. Holm.)

5. **P. (Cryptodontus) neglecta** H. S. — *Tetyra neglecta* H. S., W. I. 4. p. 27. f. 377. (1839). — *Tetyra granulata* COSTA, Atti ist. d'inc. 7. p. 400. t. 4. f. 13. (1847) sec. FIEB; SCHAUM, Ber. Ent. 1848. p. 190. (1850). — *Psacasta neglecta* FIEB., Eur. H. p. 377. 5. (1861).
Patria: Europa media et meridionalis.

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6. **P. anthriboides** GERM. — *Tetyra cerinthe* WOLFF, Ic. 5. p. 173. f. 167. (1811). — *Psacasta anthriboides* GERM., Zeitschr. 1: 1. p. 70. 3. (1839).
Patria: Africa.

XEROBIA STÅL.

1. **X. sculpturata** STÅL. — *Eurygaster sculpturatus* STÅL, Ö. V. A. F. 1858. p. 311. 5; H. afr. 1. p. 61. 1. (1864).
Patria: Svakop Africæ meridionalis occidentalis. (Mus. Holm.)

2. **X. verruculosa** Stål. — Præcedenti simillima, differt tantum capite paullo longiore, thoracis angulis lateralibus magis productis, ultra latera hemelytrorum distinctissime prominentibus, marginibusque lateralibus anticis magis convergentibus. ♀. Long. 10, Lat. 7 mill.

Patria: Beirut. (Coll. Signoret.)

EURYGASTER Lap.

Eurygaster Subg. *Eurygaster* Lap., Ess. p. 69. (1832). — *Bellocoris* p. Hahn, W. I. 2. p. 42. (1834). — *Eurygaster* Spin., Ess. p. 365. (1837); Muls. et Rey, Pun., Scut. p. 59. (1865). — *Tetyra* Germ., Zeitschr. 1: 1. p. 72. (1839); H. S., W. I. 5. p. 48. (1839). — *Eurygaster* Subg. *Platypleurus* Muls. et Rey, Pun. Scut. p. 59. (1865).

a. *Margine costali corii pone partem tertiam basalem distinctissime sinuato; segmentis connexivi posterius impressis; ventre basi distinctissime longitrorsum sulcato, marginibus sulci carinato-elevatis; abdomine apice maxime rotundato-angustato; corpore superne verruculoso.* — Holophlygdus Stål.

1. **E. (Holophlygdus) hottentottus** Fabr. — *Cimex Hottentotta* Fabr., S. Ent. p. 699. 14. (1775); Spec. 2. p. 342. 21. (1781); Mant. 2. p. 282. 24. (1787). — *Cimex maroccanus* Fabr., E. S. Suppl. p. 529. 30—1. (1798). — *Tetyra maroccana* Fabr., S. R. p. 135. 35. (1803). — *Tetyra hottentotta* Fabr., S. R. p. 136. 37. (1803). — *Eurygaster maroccanus* Fieb., Eur. H. p. 369. 1. (1861); Muls. et Rey, Pun., Scut. p. 66. 3. (1865). — *Eurygaster hottentottus* Stål, H. Fabr. 1. p. 12. 2. (1868).

Patria: Europa meridionalis, Africa borealis. (Mus. Holm.)

»Major *C. mauro* et latior; distinguitur facillime colore toto obscure ferrugineo, minime nitido» *Cimex hottentottus* a *Fabricio* describitur.

aa. *Margine costali corii pone partem tertiam basalem haud vel obtusissime sinuato, ante sinum non nisi levissime ampliato; segmentis connexivi posterius haud impressis; ventre basi haud vel levissime longitrorsum impresso; abdomine apice minus fortiter rotundato-angustato; corpore superne verruculis destituto.*

b. *Marginibus lateralibus pronoti leviter rotundatis; scutello basi utrinque macula oblonga callosa destituto, linea lævigata media calloso-elevata.* — Eurygaster Lap., Spin.

2. **E. (Eurygaster) fuscus** Gmel. — *Tetyra hottentotta* Germ., Zeitschr. 1: 1. p. 73. 2. (1839). — *Eurygaster hottentotus* Fieb., Eur. H. p. 369. 2. (1861); Muls. et Rey, Pun., Scut. p. 63. 2. (1865). — *Eurygaster niger* Stål, H. Fabr. 1. p. 12. 3. (1868).

Var. a. — *Cimex maurus* p. Fabr., S. Ent. p. 699. 13. (1775); E. S. 4. p. 87. 30. (1794). — *Tetyra maura* p. Fabr., S. R. p. 136. 36. (1803).

Var. b. — *Cimex fuscus* Gmel., S. N. 1: 4. p. 2134. 181. (1788).

Var. c. — *Cimex cucullatus* Gmel., S. N. 1: 4. p. 2134. 182. (1788). — *Tetyra nigra* Fabr., S. R. p. 136. 39. (1803).

Patria: Europa media et meridionalis. (Mus. Holm.)

Specimina majora *Cimicis mauri* Fabr. ad hanc speciem sunt referenda.

3. **E. (Eurygaster) dilaticollis** A. Dohrn — *Eurygaster dilaticollis* A. Dohrn, Stett. E. Z. 21. p. 100. 3. (1860). — *Eurygaster brevicollis* Fieb., Eur. H. p. 370. 4. (1861).

Patria: Sarepta Russiæ meridionalis. (Mus. Holm.)

bb. *Marginibus lateralibus pronoti rectis vel subrectis; scutello basi utrinque prope angulos basales macula oblonga callosa notato, linea longitudinali lævi haud callosa.* — Platypleurus Muls.

4. **E. (Platypleurus) maurus** Lin. — *Tetyra maura* Fall., Hem. Suec., Cim. p. 12. 2. (1828). — *Eurygaster maurus* Fieb., Eur. H. p. 370. 3. (1861); Muls. et Rey, Pun., Scut. p. 59. 1. (1865); Stål, H. Fabr. 1. p. 12. 1. (1868).

Var. a. — *Cimex maurus* Lin., Faun. Suec. p. 246. 913. (1761). — *Thyreocoris austriacus* Schrank, Faun. boic. 2. p. 68. 1095. (1801). sec. Muls. — *Eurygaster cognatus* Westw. in Hope, Cat. 1. p. 11. (1837).

Var. b. — *Tetyra picta* Fabr., S. R. p. 136. 38. (1803). — *Eurygaster orientalis* Westw. in Hope, Cat. 1. p. 11. (1837).

Patria: Europa tota, Africa borealis; Syria. (Mus. Holm.); India orientalis. sec. Hope.

Div. **Odontoscelaria** Stål.

Conspectus generum.

1(2). Thorace marginibus lateralibus pone medium sinuatis vel incisis, impressione transversa inter sinus prædito; corpore longe piloso. — *Arctocoris* Germ.

2(1). Thoracis marginibus lateralibus prope angulos laterales incisis; corpore breviter setuloso; tibiis spinulosis. — *Odontoscelis* LAP.

ARCTOCORIS GERM.

Arctocoris p. GERM., Zeitschr. 1: 1. p. 46. (1839). — *Irochrotus* A. et S., Hist. p. 39. (1843); FIEB., Eur. H. p. 86 et 377. (1861); MAYR, Reis. Nov., Hem. p. 18. (1866).

1. **A. lanatus** PALL. — *Cimex lanatus* PALL., Reis. 2. p. 729. 82. (1773); FABR., Spec. 2. p. 342. 24. (1781); Mant. 2. p. 282. 28. (1787); E. S. 4. p. 88. 35. (1794). — *Tetyra lanata* FABR., S. R. p. 142. 65. (1803). — *Pachycoris lanatus* GERM., Zeitschr. 1: 1. p. 109. 57. (1839). — *Pachycoris maculiventris* GERM., Zeitschr. 1: 1. p. 109. 58. (1839). — *Arctocoris villosus* H. S., W. I. 5. p. 39. f. 489. (1839). — *Arctocoris lanatus* H. S., W. I. 5. p. 39. f. 490. (1839). — *Pachycoris hirta* COSTA, An. S. E. Fr. 10. p. 306. pl. 6. f. 10. (1841). — *Irochrotus maculiventris* A. et S., Hist. p. 39. 1. (1843); MULS., Pun., Scut. p. 30. (1865). — *Irochrotus lanatus* DALL., List. 1. p. 55. 1. (1851). — *Irochrotus hirtus* FIEB., Eur. H. p. 378. (1861). — STOLL, Pun. f. 61.
Patria: Europa meridionalis, Sicilia, Russia. (Mus Holm.); Siberia.

2. **A. incisus** STÅL. — Anguste subobovatus, punctulatus, niger, supra in ferrugineum vergens, griseopilosus et subtomentosus; thorace ante medium leviter rotundato-angustato, medio transversim distinctissime impresso, marginibus lateralibus medio profundissime incicis, angulis anticis antrorsum subprominulis. ♂. Long. 5, Lat. 3 mill.
♂. Ventre disco utrinque in segmentis quarto et quinto macula ovali opaca atra subimpressa instructo.
Patria: Bengalia. (Mus. Holm.)

I. lanato valde affinis, magnitudine minore, statura angustiore, subobovata, retrorsum angustata, thorace apice tantum angustato, marginibus lateralibus profundissime incisis, nec obtuse sinuatis, bucculisque magis elevatis differt.

ODONTOSCELIS LAP.

Odontoscelis LAP., Ess. p. 74. (1832); FIEB., Eur. H. p. 86 et 378. (1861); MAYR, Reis. Nov., Hem. p. 19. (1866). — *Ursocoris* HAHN, W. I. 2. p. 48. (1834). — *Arctocoris* p. GERM., Zeitschr. 1: 1. p. 46. (1839). — *Odonscelis* MULS., Pun., Scut. p. 17. (1865).

1. **O. fuliginosa** LIN. — *Cimex fuliginosus* LIN., Faun. Svec. p. 246. 914. (1761). — *Cimex litura* FABR., E. S. 4. p. 90. 43. (1794). — *Tetyra fuliginosa* FALL., Cim. Suec. p. 42. 2. (1807). — *Tetyra carbonaria* ZETT., Vet. Ak. H. 1819. p. 70. 19. (1819); FALL., Hem. Suec., Cim. p. 13. 3. (1828). — *Odontoscelis dorsalis* FIEB., Eur. H. p. 378. 1. (1861). — *Odontoscelis fuliginosa* FIEB., Eur. H. p. 378. 2. (1861). — *Odonscelis fuliginosa* MULS., Pun., Scut. p. 18. 1. (1865).
Patria: Europa, Africa borealis. (Mus. Holm.)

2. **O. dorsalis** FABR. — *Tetyra dorsalis* FABR., S. R. p. 139. 54. (1803). — *Arctocoris plagiatus* GERM., Zeitschr. 1: 1. p. 48. 2. (1839). — *Odonscelis dorsalis* MULS., Pun., Scut. p. 24. 2. (1865).
Patria: Europa meridionalis.

SPECIES INCERTI GENERIS.

1. **Calldea vulcanica** LE GUILLOU, Rev. zool. 1841. p. 263. 15.
Patria: Banda.

2. **Callidea dædalica** VOLL., Versl. Ak. Amst., Nat. (2) 2. p. 176. 7. (1868).
Patria ignota.

3. **Callidea puella** VOLL., Versl. Ak. Amst., Nat. (2) 2. p. 176. 8. (1868).
Patria: Cochinchina.

4. **Callidea fascialis** WHITE, Tr. E. S. Lond. 3. p. 86. (1842); DALL., List. 1. p. 28. 21. (1851).
Patria: Silhet.

5. **Scutellera holosericea** A. DOHRN, Stett. E. Z. 24. p. 347. 1. (1863).
Patria: Java.

6. **Odontotarsus lineatus** SPIN., Ess. p. 363. 6. (1837).
Patria: Africa.

7. **Arctocoris tomentosus** GERM., Zeitschr. 1: 1. p. 49. 3. (1839); H. S., W. I. 5. p. 38. f. 488. (1839).
Patria: Dongola.

8. **Eurygaster ligneus** VOLL., Faun. ind. néerl. 1. p. 39. 2. (1863).
Patria: Java, Celebes.

MACROCARENUS STÅL.

Hoc genus ab *Eurygastro* differt capite longo, acuminato, angulis lateralibus thoracis prominulis, acutiusculis, ventre subsulcato, margineque antico prostethii haud producto. (sec. DALL.)

9. **Macrocarenus acuminatus** DALL. — *Eurygaster ? acuminatus* DALL., List. 1. p. 49. 5. (1851).
Patria: Nova Hollandia.

ENUMERATIO COREIDARUM AFRICÆ, ASIÆ ET AUSTRALIÆ.

Fam. **Coreidæ** Stål.

Conspectus subfamiliarum.

a. Orificiis distinctis, rarissime [1]) obsoletis vel haud distinguendis; segmentis dorsalibus quarto et quinto dorsi abdominis basi in medio sinuatis [2]), sinu lobulo obtuso segmentorum præcedentium repleto.

b. Bucculis plerumque longioribus et pone antennarum insertionem extensis, sæpe totis vel fere totis pone antennas positis, raro totis vel fere totis ante antennas sitis, in hoc casu sunt thorax postice capite plerumque circiter duplo vel plus duplo longior, acetabula postica profunde excisa et tibiæ posticæ superne sulcatæ vel dilatatæ; segmento dorsali primo abdominis postice truncato, segmento dorsali sexto quinto haud vel raro et tunc paullo breviore; scutello basin metanoti attingente vel superante, parte intraoculari capitis plerumque latiore; acetabulis posticis plerumque profunde excisis, ad vel ante medium metastethii extensis; [3]) tibiis posticis plerumque sulcatis vel dilatatis; spiraculis a marginibus lateralibus ventris plerumque remotis; segmento ventrali sexto feminarum plerumque pone plicam fisso, raro integro et plica destituto.

c. Vena decurrente alarum glochide plerumque destituta; [4]) venis membranæ plerumque e vena transversa, extrorsum sensim ad marginem basalem appropinquata, vel e margine ipso basali membranæ emissis, raro [5]) e vena a margine basali tota et ubique fere æque longe remota emissis; marginibus sulci orificiorum apice plerumque interruptis vel ibidem humilioribus, apice plerumque singulatim productis, margine saltem antico ex apice antrorsum processum, basin metastethii plerumque attingentem, emittente; [6]) capite plerumque pone tylum impressione lineari distincta vel impressionibus obsoletioribus duabus instructo; angulis posticis segmenti dorsalis sexti abdominis marium plerumque rotundatis, obtusis vel rectis, rarissime [7]) acutiusculis et paullo retrorsum prominulis; tibiis plerumque superne sulcatis vel dilatatis. — *Coreina* Stål.

cc. Vena decurrente alarum glochide instructa; venis membranæ e vena transversa, tota a margine basali remota, emissis; marginibus sulci orificiorum callosis, plerumque et præsertim apice et apicem versus crassis, apice conjunctim arcuatis, ibidem numquam interruptis, nec humilioribus, numquam processum emittentibus; capite pone tylum haud impresso, antrorsum sensim convexo-declivi, jugis tyloque inter et ante tubercula antenni-

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[1]) In *Eutheto* et *Stachyocnemo*.
[2]) Excepto *Prionotylo*.
[3]) In *Cloresmariis* paullo minus profunde excisis, margineque exteriore ab axi corporis fortius divergente.
[4]) Excepto *Atracto*.
[5]) *Lybantaria; Aulacosternum*.
[6]) Exceptis *Craspedo, Sphictyrto;* in *Phyllomorphariis* orificia sunt ad basin metastethii valde appropinquata, processum nullum antrorsum emittentia.
[7]) In *Cloresmariis* et *Cletomorphis* quibusdam, nec non *Hydarariis;* in *Phyllomorphariis* segmentum sextum lateribus totis foliaceo-dilatatis, retrorsum productis, lobatis.

fera distinguendis; angulis posticis segmenti dorsalis sexti abdominis in utroque sexu retrorsum prominulis, sæpe dentatis vel spinosis; tibiis teretibus, sulco destitutis. — *Pseudophloeina* STÅL.

bb. Bucculis parvis, brevibus, totis ante insertionem antennarum positis, sæpe parte capitis ante antennas sita brevioribus; thorace basi capite haud vel paullo, raro fere duplo, rarissime [1]) plus duplo latiore; scutello parte intraoculari capitis plerumque angustiore, sæpe basin metanoti haud attingente; segmento abdominis dorsali primo postice plerumque rotundato, interdum sat producto, segmento dorsali sexto quinto plerumque et apud feminas fere semper, sæpius multo vel circiter dimidio breviore; acetabulis posticis plerumque minus profunde excisis et medium metasterni haud attingentibus, margine eorum exteriore igitur plerumque ab axi longitudinali corporis maxime divergente et cum margine postico metapleurorum angulum nullum vel obtusissimum formante; [2]) spiraculis ventris ad margines laterales plerumque valde appropinquatis; tibiis plerumque teretibus et sulco destitutis, numquam dilatatis, raro compressis; articulo primo tarsorum posticorum plerumque, et sæpe valde, elongato. — *Alydina* STAL.

aa. Orificiis interdum distinguendis, in hoc casu inter acetabula posteriora positis et extrorsum sulcos duos divergentes, anticum breviorem, plerumque emittentibus; segmento dorsali quarto abdominis basi et apice, vel apice saltem, in medio sinuato; tibiis teretibus, sulco supero destitutis; segmento ventrali sexto feminarum sæpius producto et genitalia tota vel fere tota tegente vel truncato, haud fisso; corii margine apicali recto vel subrecto. — *Corizina* STÅL.

Subf. **Coreina** STÅL.

CONSPECTUS DIVISIONUM.

a. Segmento ventrali sexto feminarum plerumque pone plicam distinctissime angulatam vel rarius rotundato-angulatam vel obtuse rotundatam fisso, rarissime plica medio subtruncata instructo [3]) vel integro et plica destituto; [4]) capite quadrato, tuberculis antenniferis latitudinem fere totam vel maximam capitis occupantibus, tylo inter illa tubercula rarissime [5]) elevato et iisdem altitudine æquali, plerumque a basi subito declivi, rarissime ante tubercula antennifera paullo prominulo; bucculis totis vel fere totis pone insertionem antennarum positis, ad vel pone marginem anticum oculorum extensis; rostro pone basin mesosterni haud extenso; thorace capite multo, plerumque duplo vel plus duplo longiore et latiore.

b. Femoribus anterioribus subtus in latere anteriore spina plerumque distinctissima et acuta [6]) vel spinis duabus armatis, præterea inermibus vel quam obsoletissime brevissimeque spinosis, femoribus intermediis, rarissime apud mares spinis pluribus distinctis instructis; femoribus posticis spinosis, plerumque incrassatis et apud mares crassioribus.

c. Mesosterno antice haud sulcato; segmento ventrali sexto feminarum apice plus minus distincte arcuato-sinuato, angulis fissuralibus subrectis. — *Mictaria* STÅL.

cc. Mesosterno antice plus minus distincte sulcato; segmento ventrali sexto feminarum postice angulato-sinuato, angulis fissuralibus obtusis. — *Amorbaria* STAL.

bb. Femoribus anterioribus subtus biseriatim spinosis vel apice utrimque spina distincta armatis vel inermibus.

d. Jugis distantibus, ad (infra) tubercula antennifera haud productis.

e. Coxis posticis maxime distantibus, inter se quam a lateribus pectoris longius remotis; spiraculis ventris magnis vel maximis, plerumque distincte transversis; femoribus posticis valde incrassatis. — *Petascelaria* STÅL.

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[1]) *Stenocephalaria.*
[2]) Exceptis *Stenocephalariis, Leptocorisariis* et quibusdam *Micrelytrariis.*
[3]) *Odontorhopala.*
[4]) *Aschistus, Latimbi* proprii.
[5]) *Aschistus.*
[6]) Obs: *Cneius.*

ee. Coxis posticis minus distantibus; spiraculis ventris minoribus, rotundatis vel subrotundatis; femoribus posticis raro incrassatis et spinosis.

f. Abdomine valde ampliato; incisura ventrali secunda prope margines laterales antrorsum, incisura quarta ibidem retrorsum curvata; spiraculis segmentorum intermediorum ventris a margine laterali quam a margine apicali longius remotis.

g. Antennis longioribus et gracilioribus, articulo primo secundo haud breviore, capite longiore; rostro medium mesosterni attingente vel subsuperante. — *Daladeraria* STÅL.

gg. Antennis brevioribus et crassioribus, articulo primo secundo breviore, capite haud longiore: rostro pone coxas anticas haud vel vix extenso. — *Brachytaria* STÅL.

ff. Abdomine rarissime valde ampliato [1]), plerumque angusto vel angustiusculo; incisuris ventralibus secundo et quarto utrimque rectis vel ad margines laterales obsolete curvatis; spiraculis segmentorum intermediorum ventris a margine laterali quam a margine postico segmentorum haud longius remotis; articulo primo antennarum articulo secundo plerumque breviore, his articulis raro æque longis. — *Homoeoceraria* STÅL.

dd. Jugis basin versus ad (infra) tubercula antennifera angulato-productis vel elevatis et ibidem contiguis vel subcontiguis; articulo primo antennarum articulo secundo plerumque longiore, numquam breviore. — *Latimbaria* STÅL.

aa. Segmento ventrali sexto feminarum pone plicam truncatam vel sinuatam, rarissime [2]) angulatam vel subangulatam, fisso, raro [3]) integro, in his duobus casubus est rostrum gracile atque pone basin mesosterni extensum vel caput ante tubercula antennifera plus minus prominulum.

h. Acetabulis posticis e margine postico metastethii minus profunde excisis, margine exteriore ab axi longitudinali corporis valde divergente et cum margine postico metapleurorum angulum obtusum formantibus; area odorifera transversim rugosa; processu, ex apice marginis antici elevati sulci orificiorum antrorsum emisso, marginem anticum metastethii haud attingente; femoribus posticis incrassatis, spinosis. — *Cloresmaria* STÅL.

hh. Acetabulis posticis e margine postico metastethii profundius excisis, margine exteriore ab axi longitudinali corporis haud vel paullo divergente et cum margine postico metapleurorum angulum plerumque rectum, rarius obtusiusculum formante; processu ex apice marginis antici orificiorum emisso marginem anticum metastethii attingente vel subattingente.

i. Hamo et vena decurrente alarum ex eodem loco ortis; capite ante tubercula antennifera distantia producto; bucculis brevibus, sæpe valde elevatis; rostro gracili vel gracillimo, longo vel longiusculo; venis membranæ e vena transversa basali, tota a basi membranæ remota, emissis; ventre obtuse sulcato; articulo primo antennarum secundo breviore, secundo omnium longissimo. — *Lybantaria* STÅL.

ii. Hamo et vena decurrente alarum basi distantibus [4]).

k. Capite ante tubercula antennifera producto, longo vel longiusculo, bucculis totis vel fere totis ante insertionem antennarum positis; femoribus posticis ad vel pone apicem abdominis extensis. — *Anisoscelaria* STÅL.

kk. Capite rarius longo, bucculis plerumque ad partem vel totis pone insertionem antennarum extensis, raro magnam ad partem vel fere totis ante antennas positis, in hoc

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[1]) *Diocles* STÅL.
[2]) *Dasynus*, *Aulacosternum*, *Sphictyrtus*, *Lybas*.
[3]) *Myrsilus*, *Lybantaria* quædam.
[4]) Excepto *Aulacosterno*.

casu sunt femora postica inermia et haud incrassata; femoribus posticis apicem abdominis rarissime attingentibus vel subsuperantibus; segmento genitali marium modice vel leviter convexo; segmento dorsali sexto feminarum apice truncato vel inter angulos apicales sensim obtuse sinuato; spiraculis plerumque in medio vel pone medium segmentorum ventris positis, raro ab apice quam a basi segmentorum duplo longius remotis.[1])

l. Rostro longo, articulo quarto longissimo, duobus penultimis conjunctis longiore; capite ante tubercula antennifera distantia producto; bucculis longis, per maximam partem gulæ extensis; pedibus posterioribus modice distantibus, femoribus posticis haud incrassatis; spiraculis a basi et apice segmentorum ventris fere æque longe distantibus. — *Cyllararia* Stål.

ll. Rostro longitudine variabili, articulo quarto mediocri, penultimis conjunctis breviore.

m. Femoribus subtus spinosis vel tuberculatis, posticis plerumque incrassatis; pedibus posticis valde distantibus; capite ante tubercula antennifera haud producto, his tuberculis latitudinem maximam capitis occupantibus, apice haud vel obsolete prominulis; tyli basi spatium inter tubercula antennifera occupante et his plerumque altitudine æquali; bucculis pone antennas positis; rostro raro paullo pone basin mesostethii extenso. — *Physomeraria*[2]) Stål.

mm. Femoribus posticis rarissime spinosis et incrassatis; pedibus posticis haud vel modice distantibus et a lateribus pectoris quam inter se saltem dimidio longius remotis.

n. Segmentis abdominis thoraceque haud foliaceo-lobatis.

o. Segmento dorsali sexto marium apice truncato vel rotundato, angulis posticis rotundatis vel obtusis[3]); femoribus haud nisi obsoletissime clavatis; tibiis superne plerumque distincte sulcatis.

p. Segmentis dorsalibus tertio quartoque dorsi abdominis apice medio in sinum segmentorum sequentium productis; femoribus posticis pone medium abdominis extensis.

q. Plica segmenti sexti ventralis feminarum medio obtuse vel obtusissime angulato-producta[4]); spiraculis distinctissime ante medium segmentorum positis. — *Pendulinaria* Stål.

qq. Plica segmenti ventralis sexti feminarum postice sensim sinuata, ad basin segmenti maxime appropinquata, interdum sub margine apicali segmenti quinti occulta; scutello plerumque æquilatero; spiraculis a basi et ab apice segmentorum ventris æque longe vel fere æque longe remotis.

r. Abdomine modice vel levissime ampliato, spiraculis a margine laterali quam a margine apicali segmentorum ventris minus longe remotis; antennis porrectis distantibus; lateribus pectoris maculis minutis duabus vel tribus nigris notatis. — *Gonoceraria* Stål.

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[1]) Obs: *Pachylidaria*, quæ Americam inhabitant, segmento genitali marium valde convexo, plus minus compresso, segmentoque sexto dorsali abdominis feminarum in medio fortius sinuato insignia.

[2]) Ad *Physomeraria* et *Corearia* appropinquant *Spartoceraria* americana, divergunt autem rostro crassiore, articulo primo præsertim apicem versus valde incrassato, tuberculis antenniferis distinctissime productis, pedibus posticis valde distantibus, hemelytris plerumque obsolete et parce punctatis vel læviusculis, margine laterali pectoris versus suturam inter mesostethium et metastethium sensim subemarginato, margine inflexo hemelytrorum subangulato, segmentoque genitali marium duplicato. Ad hanc divissionem *Spartocera* et affinia, nec non *Curtius* et *Molchina* pertinent.

[3]) Exceptis *Cletomorphis* quibusdam.

[4]) *Sphictyrtus*, quod genus inter *Pendulinum* et *Hypselonotum* eorumque affinia transitionem format, plica angulata gaudet. Feminæ *Pendulini carmelitæ* et *bucculenti* mihi ignotæ.

rr. Abdomine plerumque sat ampliato, spiraculis a marginibus lateralibus quam a margine apicali segmentorum ventris longius remotis vel a marginibus illis æque longe distantibus; antennis porrectis prope basin sese tangentibus vel subtangentibus. — *Corearia* STÅL.

pp. Segmentis dorsalibus abdominis apice truncatis; femoribus posticis medium abdominis haud attingentibus; segmento ventrali sexto feminarum truncato, pone plicam mediam subtruncatam fisso, segmento dorsali quinto ejusdem sexus truncato. — *Prionotylaria* STÅL.

oo. Segmento dorsali sexto utriusque sexus apice sinuato vel sinuato-truncato, angulis posticis acutis vel acutiusculis, retrorsum prominulis vel productis; articulo primo antennarum femoribusque distincte clavatis; tibiis teretibus, gracilibus, sulco supero destitutis. — *Hydararia* STÅL.

nn. Segmentis abdominis lateribusque thoracis foliaceis, lobatis, spinis longis et gracilibus ciliatis; antennis pedibusque gracilibus, partim spinis gracilibus obsitis; angulo apicali corii longissime angusteque producto. — *Phyllomorpharia* STÅL.

Div. **Mictaria** STÅL.

CONSPECTUS GENERUM.

1(2). Scutello basi transversim distinctissime elevato; articulis antennarum secundo superne, tertio supra subtusque dilatatis, quarto primo vix longiore; thorace anteriora versus transversim impresso, ante impressionem transversim leviter elevato; tibiis omnibus supra subtusque dilatatis, posticis apud mares calcari superiore subapicali destitutis; ventre marium segmentis primo et secundo medio conjunctim leviter tuberculato-elevatis, segmento secundo apice medio in segmentum tertium producto et cum hujus disco transversim elevato; articulo secundo rostri tertio longiore. — *Sulpicia* STÅL.

2(1). Scutello basi haud elevato; articulo tertio antennarum haud vel leviter dilatato.

3(4). Angulis lateralibus thoracis in processum longissimum, curvatum, antrorsum ultra caput productum, extensis; femoribus posticis, saltem apud mares, in latere interiore tuberculis instructis; tibiis posticis marium subtus pone medium ad partem tertiam apicalem dente armatis vel dentato-ampliatis, pone dentem denticulatis; ventre marium inermi. — *Derepteryx* WHITE.

4(3). Angulis lateralibus thoracis antrorsum ultra caput haud productis.

5(10). Femoribus posticis utriusque sexus, saltem in latere interiore (posteriore) tuberculis serie positis, numero variabilibus, interdum tantum tribus vel duobus, armatis, rectis, apud mares nonnihil pone medium vel apicem versus subtus spina magna armatis; ventre marium tuberculis destituto; tibiis posticis marium subtus denticulatis. — (*Helcomeria*).

6(7). Femoribus omnibus superne prope apicem lobo instructis; scutello apice tuberculato; tibiis omnibus superne fortiter dilatatis; dente inferiore tibiarum posticarum marium paullo pone medium posito, articulo primo antennarum omnium longissimo, quarto et secundo æque longis. — *Helcomeria* STÅL.

7(6). Femoribus superne lobo destitutis; apice scutelli tuberculo destituto.

8(9). Articulo primo antennarum quarto haud longiore, quarto tertio multo longiore; tibiis posticis marium ante medium in angulum vel dentem maximum sensim dilatatis; femoribus posticis marium subtus intus pone medium spina valida, latus interius tibiarum tangente, armatis. — *Prionolomia* STÅL.

9(8). Articulo primo antennarum quarto longiore, quarto tertio vix longiore vel eidem longitudine subæquali; tibiis posticis marium subtus in dentem vel angulum haud ampliatis; femoribus posticis marium subtus extus pone medium spina valida, latus exterius tibiarum posticarum tangente, armatis. — *Elasmomia* STÅL.

10(5). Femoribus posticis tuberculis superioribus et lateralibus destitutis, sæpe dense minutissimeque granulatis.

11(28). Tibiis posticis superne, plerumque etiam subtus, totis vel ad partem, interdum tantum apice dilatatis. — *(Cipia)*.

12(27). Segmento secundo ventris feminarum latera versus plerumque tuberculo instructo vel apice in medio rotundato-producto, rarissime tuberculis lateralibus destituto vel apice medio truncato, in hoc casu sunt tibiæ posticæ supra subtusque distinctissime dilatatæ; ventre marium ante medium tuberculo magno discoidali instructo vel in segmento secundo bituberculato.

13(26). Segmento secundo ventris tuberculis duobus distantibus, apud mares distinctissimis, apud feminas parvis, obtusis, obsoletis, rarissime deficientibus, instructo; tibiis omnibus interdum dilatatis.

14(17). Tibiis omnibus vel saltem anticis et posticis, præsertim apud feminas, distincte dilatatis; angulis lateralibus thoracis late dilatatis, plus minus productis; (articulo quarto antennarum tertio longiore, tertio vel secundo et tertio subcompressis vel utrinque ad partem carinatis, his primo vix vel paullo gracilioribus [1]) — *(Phyllogonia)*.

15(16). Tibiis anterioribus superne a basi ultra medium valde et suboblique rotundato-dilatatis, dein subito angustioribus et tantum levissime dilatatis, anterioribus subtus levissime, posticis ibidem magis dilatatis, his apud mares superne calcari subapicali destitutis; segmento secundo ventris marium tuberculis duobus distantibus armato, apice medio in segmentum tertium longe producto, hoc segmento disco tuberculo magno instructo; feminæ ignotæ. — *Phyllogonia* STÅL.

16(15). Tibiis anterioribus superne fere a basi plus minus dilatatis, parte dilatata ubique fere æque lata vel apicem versus sensim levissime angustata, tibiis posticis utrinque dilatatis, apud feminas apicem versus angustioribus; segmento secundo ventris feminarum apice in medio haud vel obsoletissime producto, tuberculis duobus obtusissimis distantibus instructo; ventre marium mihi cognitorum segmentis secundo et tertio posterius utrinque fortiter spinoso-tuberculatis, illo in medio posterius paullo producto et cum basi segmenti tertii elevato; tibiis posticis marium apice superne calcaratis et subtus sat longe pone medium denticulo armatis. — *Elasmopoda* STÅL.

17(14). Tibiis anterioribus haud vel obsoletissime dilatatis, raro distincte dilatatis, in hoc casu apicem versus sensim latioribus; tibiis posticis marium mihi cognitorum superne calcari subapicali armatis.

18(25). Angulis apicalibus segmenti quinti abdominis spina destitutis; oculis mediocribus; parte capitis inter et ante oculos sita subquadrata, fere æque longa ac lata, parte anteoculari oculis longiore vel longitudine æquali; tuberculis antenniferis productis, haud vel leviter distantibus.

19(24). Tibiis anterioribus haud vel obsoletissime dilatatis, apicem versus haud latioribus — *(Hoplopterna)*.

20(21). Antennis [2]) minus gracilibus, articulo primo quarto longiore, articulis duobus apicalibus longitudine subæqualibus; tibiis posticis marium [3]) subtus apicem versus dente armatis; femoribus posticis marium sensim curvatis; segmento saltem secundo ventris latera versus spina vel tuberculo, in feminis parvo et obtuso, armato, margine postico in medio retrorsum plus

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[1]) Antennæ *Elasm. falcis* et *Phyllogoniæ bilobæ* in exemplis a me examinatis plus minus mutilæ. Mas *Elasmopodæ falcis* ignotus.
[2]) Articulus ultimus antennarum in exemplis *Hoplopternæ Rothii*, *alatæ* et *cornutæ*, quæ vidi, mutilus.
[3]) Mares *Hoplopternæ Rothii*, *alatæ* et *cornutæ* haud vidi.

minus distincte producto; angulis lateralibus thoracis dilatatis productis, plus minus sursum vergentibus, marginibus lateralibus distincte dentatis. — *Hoplopterna* STÅL.

21(20). Articulo primo antennarum quarto breviore vel longitudine subæquali, quarto tertio longiore; angulis lateralibus thoracis haud vel leviter productis, marginibus subinermibus vel obsolete denticulatis.

22(23). Articulo quarto rostri articulo secundo longiore; abdomine marium [1]) segmento genitali breviusculo posterius haud vel sensim leviter angustato, segmento dorsali ultimo apice rotundato, segmentis ventris primo et secundo in medio haud conjunctim elevatis; femoribus posticis marium subrectis vel sensim curvatis; antennis gracilibus. — *Plectrocnemia* STÅL.

23(22). Articulis secundo et quarto rostri longitudine subæqualibus; segmento genitali marium pone medium angustiore; abdomine marium segmento dorsali ultimo apice sat late truncato, angulis apicalibus distinctis, segmentis ventralibus primo apice et secundo basi in medio transversim conjunctim elevatis; femoribus posticis marium prope basin curvatis. — *Pternistria* STÅL.

24(19). Tibiis anterioribus distinctissime et apicem versus sensim latius dilatatis, posticis supra subtusque valde dilatatis; articulo tertio antennarum leviter dilatato. — *Cipia* STÅL.

25(18). Angulis apicalibus segmenti quinti abdominis spina distinctissima armatis; oculis majusculis; parte capitis inter et ante oculos sita subtransversa, parte anteoculari oculis paullo breviore; tuberculis antenniferis magis distantibus, tylo paullo altioribus, apice haud productis, superne haud impressis; corpore angusto, gracili; femoribus posticis marium breviusculis, ante medium curvatis; feminæ ignotæ. — *Odontobola* STÅL.

26(13). Ventre segmento secundo tuberculis duobus distantibus destituto, apud mares ante medium tuberculo magno discoidali instructo, hoc tuberculo in feminis deficiente; tibiis anterioribus simplicibus, posticis utriusque sexus utrinque valde dilatatis, prope basin latissimis, dein sensim angustatis, apud mares superne tuberculo calcariformi distincto armatis; femoribus posticis marium basi distinctissime curvatis. — *Mygdonia* STÅL.

27(12). Ventre segmento secundo utriusque sexus apice in medio truncato, apud mares bituberculato, apud feminas inermi; tibiis anterioribus simplicibus, posticis interdum per totam longitudinem superne levissime dilatatis, apice latioribus et semper nonnihil dilatatis; articulo quarto antennarum articulo tertio longiore, articulo primo quarto longiore; thoracis angulis lateralibus dilatatis, extrorsum et paullo sursum vergentibus. — *Ochrochira* STÅL.

28(11). Tibiis posticis superne numquam dilatatis, sæpe compressis, plerumque simplicibus, raro subtus apud mares angulato-dilatatis, vel per spatium breve ab apice remotum paullo ampliatis.

29(34). Mesosterno tuberculis destituto.

30(33). Tibiis posticis marium [2]) subtus in angulum ampliatis vel dente armatis, raro dentis loco obtuse leviterque ampliatis; segmento secundo ventris feminarum [3]) segmento tertio plerumque breviore, margine postico medio haud vel obsoletissime obtusissimeque producto; articulo quarto antennarum articulo tertio plerumque multo longiore.

31(32). Thorace apice collari annuliformi obsoleto vel nullo; tibiis posticis marium in medio vel pone medium subtus dentatis vel ampliatis; ventre marium tuberculato. — *Mictis* LEACH.

32(31). Thorace apice in collare annuliforme distinctissimum coarctato; tibiis posticis marium basin versus subtus dente acuto armatis; ventre marium inermi. — *Cossutia* STÅL.

33(30). Tibiis posticis utriusque sexus inermibus, apice ipso tantum interdum in dentem prominulis; segmento ventrali secundo marium postice in medio plus minus retrorsum producto, apud feminas mihi cognitas plerumque segmento tertio longiore vel longitudine æquali et apice in medio paullo producto vel rotundato. — *Anoplocnemis* STÅL.

34(29). Mesosterno tuberculato. — *Puppeia* STÅL.

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[1]) Mas *Plectrocnemiæ histricæ* mihi ignotus.

[2]) Mares *Mict. pictoris* et *albo-vittatæ* haud vidi.

[3]) *Mictis tenebrosa* ♀ segmentis secundo tertioque in medio æque longis, illo apice medio leviter rotundato, gaudet.

SULPICIA STÅL.

STÅL, H. afr. 2. p. 2 et 10. (1865).

1. **S. distincta** SIGN. — *Petascelis distinctus* SIGN. in THOMS., Arch. 2. p. 293. 553. (1858). — *Sulpicia distincta* STÅL, H. afr. 2. p. 11. 1. (1865).

Patria: Calabar. (Coll. SIGNORET.)

Segmentum dorsale ultimum abdominis apud marem ante medium lateribus parallelis instructum, in medio subito angulum obtusum subdilatatum formans, pone medium valde angustatum, apice anguste truncatum.

DEREPTERYX WHITE.

Derepteryx WHITE, Mag. N. H. (2) 3. p. 542. (1839); Tr. E. S. Lond. 3. p. 92. (1842); DALL., List. 2. p. 377. (1852). — *Derapteryx* WESTW. in HOPE, Cat. 2. p. 8. (1842).

a. *Tibiis simplicibus.* — DEREPTERYX WHITE, WESTW.

1. **D. Hardwickii** WHITE. — *Cerbus (Derepteryx) Hardwickii* WHITE, Mag. N. H. (2) 3. p. 542. (1839); WHITE, Tr. E. S. Lond. 3. p. 93. (1842). — *Derapteryx Hardwickii* WESTW. in HOPE, Cat. 2. p. 8. (1842). — *Derepteryx Hardwickii* DALL., List. 2. p. 382. 1. (1852).

Patria: India orientalis, Silhet. (Mus. Holm.); Nepalia.

A sequente differre videtur præsertim tibiis simplicibus. Tibiæ posticæ maris compressæ, ultra medium sensim leviter curvatæ, subtus ante partem tertiam apicalem dente lato obtusangulo armatæ, pone dentem denticulatæ. Apex scutelli in tuberculum nigrum elevatus. Membrana, saltem hic illic, sericea.

aa. *Tibiis dilatatis.* — PTERYGOMIA STÅL.

2. **D. Grayii** WHITE. — *Cerbus (Derepteryx) Grayii* WHITE, Mag. N. H. (2) 3. p. 542. (1839); WHITE, Tr. E. S. Lond. 3. p. 92. pl. 7. f. 1. (1842). — *Derepteryx Grayii* DALL., List. 2. p. 382. 2. (1852).

Patria: Nepalia; Bengalia borealis.

3. **D. obscurata** STÅL. — *Derepteryx obscurata* STÅL, Tr. E. S. Lond. (3) 1. p. 602. 1. (1863).

Patria: China, Shanghai.

HELCOMERIA STÅL.

1. **H. spinosa** SIGN. — *Petascelis spinosus* SIGN., An. S. E. Fr. (2) 9. p. 123. pl. 4. f. IV. (1851).

Patria: Silhet. (Coll. SIGNORET.)

PRIONOLOMIA STÅL.

a. *Lateribus pectoris vitta sericea ornatis; femoribus posticis marium mihi cognitorum subtus prope basin tuberculo obtuso compresso instructis; tibiis posticis subcurvis, superne per totam longitudinem, licet apicem versus angustius dilatatis, subtus apud feminas ante medium latiuscule rotundato-dilatatis; tibiis anticis superne margine interiore (anteriore) paullo dilatato, vel quam margine exteriore paullo magis elevato; antennis robustioribus, articulo tertio sensim subincrassato.*

b. *Tibiis anticis subdilatatis.*

1. **P. malaya** STÅL. — *Mictis malaya* STÅL, An. S. E. Fr. (4) 5. p. 172. 1. (1865).

Patria: Malacca. (Mus. Holm.)

Processus angulorum lateralium thoracis longitudine, forma et numero dentium marginalium variat. Mas ignotus.

2. **P. expansa** STÅL. — *Derepteryx expansus* STÅL, Ö. V. A. F. 1870 p. 646. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

bb. *Tibiis anticis haud dilatatis.*

3. **P. heros** FABR. — *Lygæus heros* FABR., E. S. 4. p. 136. 9. (1794); S. R. p. 205. 9. (1803). — *Mictis heros* DALL., List. 2. p. 406. 55. (1852); STÅL, H. afr. 1. p. 44. 4. (1868). — *Mictis hystrix* COSTA, Rend. Ac. Nap. 2. p. 253. (1863).

Patria: Java. (Mus. Holm.); Silhet.

aa. *Pectore vitta laterali sericea destituto; femoribus posticis marium basi subtus tuberculo destitutis; tibiis posticis rectis, margine superiore exteriore levissime ampliato, apud feminas subtus ante medium levissime dilatatis; tibiis anticis simplicibus; antennis gracilioribus, articulo tertio haud incrassato.*

4. **P. fulvicornis** FABR. — *Cimex fulvicornis* FABR., Mant. 2. p. 288. 94. (1787). — *Lygæus fulvicornis* FABR., E. S. 4. p. 136. 7. (1794); S. R. p. 204. 6. (1803). — *Mictis fulvicornis* STÅL, H. Fabr. 1. p. 45. 5. (1868).

Patria: Assam, Silhet. (Mus. Holm.)

ELASMOMIA Stål.

1. **E. granulipes** Westw. — *Myctis granulipes* Westw. in Hope, Cat. 2. p. 11. (1842).
Patria: Iudia orientalis borealis. (Mus. Vicu. et Coll. Signoret.)

Mas: abdomine lateribus ultra medium subparallelis, ventre inermi, segmento secundo postice truncato; femoribus posticis valde incrassatis, subfusiformibus, rectis, subtus nonnihil ante medium tuberculo distinctissimo et paullo pone medium spina valida ferrugineo-flavescentibus armatis, apice dentibus duobus latiusculis præditis, extus et intus superiora versus tuberculis parvis nonnullis serie positis, intus præterea pone medium tuberculis sparsis instructis; tibiis posticis compressis, rectis, subtus subdilatatis, apicem versus vix angustatis, subtus per fere totam longitudinem minutissime denticulatis, pone medium præterea denticulis nonnullis distinctioribus armatis.

Femina: abdomine hemelytris latiore, utrinque nonnihil rotundato-ampliato; femoribus posticis modice incrassatis, subcompressis, rectis, tuberculis lateralibus minutis et rarioribus quam in mare, subtus subcarinatis, carina obsoleta, obtusa, minutissime tuberculata, pone medium tuberculis duobus paullo majoribus distantibus armata, prope apicem in dentem latum ampliata; tibiis posticis compressis, rectis, subtus subdilatatis et minute denticulato-serratis.

Depressiuscula. Articulus antennarum quartus tertio paullo longior, secundo paullo brevior. Rostri articulus secundus quarto paullo longior, tertius quarto brevior. Tibiæ posticæ utriusque sexus femoribus longitudine subæquales vel sublongiores. Abdomen dorso in exemplis a me examinatis nigricans, ferrugineo-mixtum, secundum Westwood rufum, quod forte variat. Alæ subfusco-vinaceæ. Anguli laterales thoracis sensim extrorsum producti. Abdomen feminæ quam in speciebus *Prionolomiæ* nonnihil magis ampliatum et spiracula segmentorum ventralium tertii, quarti et quinti a margine laterali quam a margine apicali segmentorum distinctissime longius remota.

PHYLLOGONIA Stål.

1. **P. biloba** Sign. — *Petascelis bilobus* Sign., An. S. E. Fr. (2) 8. p. 69. 3. pl. 4. f. 2. (1850). — *Derepteryx biloba* Stål, H. afr. 2. p. 13. 1. (1865).
Patria: Guinea lusitanica. (Coll. Signoret.)

Pars dilatata inferior tibiarum posticarum versus medium ubique fere æque lata, parte tertia basali et apicali sensim augustata.

ELASMOPODA Stål.

1. **E. falx** Drury. — *Cimex falx* Drury, Ill. 3. p. 62. pl. 45. f. 2. (1782). — *Petascelis lunatus* Sign. in Thoms., Arch. 2. p. 291. 555. (1858). — *Derepteryx Falx* Stål, H. afr. 2. p. 14. 2. (1865).
Patria: Calabar. (Coll. Signoret.)

2. **E. undata** Dall. — ♂. *Mictis undata* Dall., List. 2. p. 395. 29. (1852).
♀. *Mictis foliacipes* Stål, Ö. V. A. F. 1855. p. 28. 13. — *Derepteryx foliaceipes* Stål, H. afr. 2. p. 16. 5. (1865).
Patria: Natalia. (Mus. Holm.)

HOLOPTERNA Stål.

a. *Articulo tertio antennarum tereti.*

1. **H. valga** Lin. — *Cimex valgus* Lin., M. L. U. p. 171. 5. (1764); S. N. ed. 12. p. 720. 36. (1767); Fabr., S. Ent. p. 708. 54. (1775); De Geer, Mém. 7. p. 618. 16. pl. 46. f. 6. (1778); Fabr., Spec. 2. p. 351. 76. (1781); Mant. 2. p. 288. 91. (1787); Gmel., S. N. 1: 4. p. 2141. 36. (1788). — *Cimex hottentotta* Herbst, Gem. Naturg. 6. p. 256. 6. pl. 39. A. f. 5. (1784). — *Lygæus valgus* Fabr., E. S. 4. p. 133. 1. (1794); S. R. p. 203. 1. (1803). — *Alydus valgus* Thunb., H. rostr. cap. 3. p. 2. (1822). — *Cerbus valgus* Burm., Handb. 2: 1. p. 340. 4. (1835). — *Cerbus affinis* H. S., W. I. 6. p. 29. Taf. 190. f. F. (1842). — *Mictis valgus* Blanch., Hist. 3. p. 120. 1. pl. 4. f. 5. (1840); A. et S., Hist. p. 190. 2. (1843); Dall., List. 2. p. 393. 23. (1852). — *Mygdonia valga* Stål, H. afr. 2. p. 18. 2. (1865). — Stoll, Pun. f. 52 et 53.
Patria: Terra capensis (Mus. Holm.)

2. **H. atramentaria** Germ. — *Cerbus valgus* Hahn, W. I. 1. p. 14. f. 7. (1831); H. S., W. I. 6. p. 28. f. 586 et B. (1842). — *Cerbus atramentarius* Germ. in Silb., Rev. 5. p. 155. 76. (1837). — *Mictis atramentaria* Dall., List. 2. p. 393. 24. (1852).
Patria: Terra Capensis.

3. **H. alata** Westw. — *Myctis alata* Westw. in Hope, Cat. 2. p. 12. (1842). — *Mictis alata* Dall., List. 2. p. 393. 25. (1852). — *Derepteryx alata* Stål, H. afr. 2. p. 14. 3. (1865).
Patria: Terra capensis. (Coll. Signoret.); Sierra Leona, sec. Hope, sed vix recte.

4. **H. Rothii** Dall. — *Mictis Rothii* Dall., List. 2. p. 395. 28. (1852). — *Derepteryx Rothii* Stål, H. afr. 2. p. 15. 4. (1865).
Patria: Abyssinia. (Coll. Signoret.)

aa. *Articulis secundo et tertio antennarum supra subtusque leviter compresso-carinatis.*

5. **H. cornuta** Dall. — *Mictis cornuta* Dall., List. 2. p. 397. 27. (1852). — *Mictis sulcicornis* Sign. in Thoms., Arch. 2. p. 295. 558. pl. 11. f. 5. (1858). — *Mygdonia cornuta* Stål, H. afr. 2. p. 25. 11. (1865).
Patria: Calabar. (Mus. Holm.)

PLECTROCNEMIA Stål.

a. *Segmentis ventris secundo et tertio tuberculis duobus distantibus, apud mares magnis et subconicis, armatis, segmento secundo apice truncato; tibiis posticis marium sensim ampliatis, apice latissimis, subtus pone medium dentatis: antennis minus gracilibus; femoribus posticis marium distincte curvatis; corpore pilosulo.*

1. **P. cruciata** Dall. — *Mictis cruciata* Dall., List. 2. p. 396. 31. (1852). — *Mictis cruciatus* Sign. in Thoms., Arch. 2. pl. 9. f. 7. (1858)). — *Mygdonia cruciata* Stål, H. afr. 2. p. 19. 3. (1865). — Stoll, Pun. f. 264.
Patria: Calabar. (Mus. Holm.); Congo.

aa. *Segmento secundo ventris tuberculis duobus, apud mares distinctis, apud feminas obsoletis vel deficientibus, instructo; antennis gracilibus.*

b. *Tibiis porticis marium a basi versus medium sensim vel subsensim plus minus ampliatis, subtus fere in medio vel prope medium in angulum vel denticulum ampliatis, pone angulum sinuatis; tibiis posticis feminarum mihi cognitarum* [1]*) per fere totam longitudinem utrinque dilatatis, basi angustatis.*

c. *Tibiis posticis marium in medio et apice fere æque latis; tibiis posticis feminarum pone medium subangustatis* [2]*).*

2. **P. oblongipes** Fabr. — *Lygæus oblongipes* Fabr., S. R. p. 206. 12. (1803). — *Lygæus lævis* P. B., Ins. p. 202. Hém. pl. 12. f. 1. (1805). — *Lygæus serratus* P. B., Ins. p. 202. Hém. pl. 12. f. 2. (1805). — *Mygdonia lævis* Stål, H. afr. 2. p. 20. 4. (1865). — *Mygdonia rufidorsis* Stål, H. afr. 2. p. 21. 5. (1865). — *Mygdonia oblongipes* Stål, H. Fabr. 1. p. 43. 1. (1868).
Patria: Calabar. (Mus. Holm.)

cc. *Tibiis posticis marium apice latissimis; feminæ ignotæ.*

3. **P. granulata** Stål. — *Mygdonia granulata* Stål, H. afr. 2. p. 22. 6. (1865).
Patria: Guinea. (Coll. Signoret.)
Segmentum secundum ventrale maris apice medio obsolete productum, segmentum tertium apice latissime rotundato-productum, in medio segmento quarto circiter dimidio longius.

4. **P. spinosula** Sign. — *Mictis spinosulus* Sign. in Thoms., Arch. 2. p. 296. 560. (1858). — *Mygdonia spinulosa* Stål, H. afr. 2. p. 22. 7. (1865).
Patria: Calabar. (Coll. Signoret.)

5. **P. hottentotta** P. B. — *Lygæus Hottentottus* P. B., Ins. p. 203. Hém. pl. 12. f. 3. (1805). — *Mygdonia hottentotta* Stål, H. afr. 2. p. 23. 8. (1865).
Patria: Calabar. (Mus. Holm.)

bb. *Mares ignoti; tibiis posticis feminarum femoribus brevioribus, subtus compressis, vix dilatatis, apice in dentem prominulis, supra fere a basi ad vel paullo ultra medium dilatatis, pone medium simplicibus, parte dilatata obtuse rotundata.*

6. **P. histrica** Stål. — *Mygdonia histrica* Stål, H. afr. 2. p. 24. 9. (1865).
Patria: Grand Bassam Guineæ. (Coll. Signoret.)
Exemplum unicum femininum, antennis mutilis, vidi.

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7. **P. terminalis** Dall. — *Mictis terminalis* Dall., List. 2. p. 396. 20. (1852).
Patria: Congo.

8. **P. lividipes** Fairm. — *Mictis lividipes* Fairm. in Thoms., Arch. 2. p. 296. 561. (1858)
Patria: Gabon.

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[1]) Feminas *P. oblongipedis* tantum vidi.
[2]) Ad hanc divissionem forte referenda est *P. terminalis* Dall.

PTERNISTRIA Stål.

1. **P. macromera** Guér. — *Anisoscelis macromera* Guér., Voy. Coq., Zool. 2: 2. p. 176. (1830). — *Mictis insularis* Walk., Cat. het. 4. p. 26. 63. (1871).

Patria: Insulæ Aru. (Mus. Holm.); Nova Guinea.

Venter maris a Walker incorrecte descriptus.

2. **P. bispina** Stål. — Nigro-picea, helvo-sericea, punctata, supra callis parvis irregularibus lævibus adspersa; antennis, rostro, pedibus anterioribus tarsisque posticis piceo-flavescentibus; dorso abdominis fusco, lateribus pallido-maculatis. ♂. ♀. Long. 20—25, Lat. 7—9 mill.

♂. Segmento tertio ventris inermi, latera versus tuberculo destituto; femoribus posticis sat incrassatis, basi gracilioribus et curvatis, subtus serie longitudinali granulorum et apice spina majuscula armatis; tibiis posticis utrinque dilatatis, basi angustatis, subtus ante partem tertiam apicalem dente armatis, superne ad apicem calcaratis.

♀. Ventre inermi; femoribus posticis subrectis, minus incrassatis, subtus tuberculis minutis serie positis et prope apicem dente majusculo armatis; tibiis posticis utrinque dilatatis, basin versus angustatis, inermibus.

Patria: Rockhampton Australiæ. (Mus. Holm.)

P. macromeræ valde affinis, differt antennis brevioribus et crassioribus, tibiis posticis latioribus, ante medium minus angustatis, segmento ventrali tertio marium tuberculis destituto, tuberculisque segmenti secundo minoribus.

CIPIA Stål.

Stål, H. afr. 2. p. 2 et 11. (1858).

1. **C. dilatata** Sign. — *Petascelis dilatata* Sign., An. S. E. Fr. (2) 8. p. 68. 1. pl. 4. f. 1. (1850). — *Cipia dilatata* Stål, H. afr. 2. p. 12. 1. (1865).

Patria: Calabar. (Mus. Holm.)

2. **C. guttipes** Stål. — *Cipia guttipes* Stål, Ö. V. A. F. 1870. p. 646. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

ODONTOBOLA Stal.

1. **O. bellicosa** Fabr. — *Cimex bellicosus* Fabr., Spec. 2. p. 361. 137. (1781); Mant. 2. p. 297. 178. (1787); Gmel., S. N. 1: 4. p. 2188. 510. (1788). — *Lygæus bellicosus* Fabr., E. S. 4. p. 145. 36. (1794); S. R. p. 215. 47. (1803). — *Mygdonia bellicosa* Stål, H. afr. 2. p. 17. 1. (1865).

Patria: Calabar. (Mus. Holm.)

MYGDONIA Stål.

Stål, H. afr. 2. p. 2. et 16. (1858).

a. *Tibiis posticis marium subtus pone medium in dentem magnum ampliatis, pone dentem subito angustatis; abdomine marium segmento dorsali ultimo postice rotundato; thorace hemelytrisque tuberculis vel callis conspersis.*

1. **M. tuberculosa** Sign. — *Mictis tuberculosus* Sign., Rev. et Mag. Zool. 1851. p. 448. 15. pl. 15. f. 6. — *Mygdonia tuberculosa* Stål, H. afr. 2. p. 24. 10. (1865).

Patria: Calabar, Gabon. (Mus. Holm.); Sierra Leona.

aa. *Tibiis posticis marium subtus pone medium dente destitutis, sensim angustatis; abdomine marium segmento dorsali ultimo apice truncato; thorace hemelytrisque tuberculis callisve destitutis.*

2. **M. amplicollis** Stål. — Subferrugineo-nigricans, parce helvo-subsericea, supra pectoreque punctulata; apice scutelli tarsisque ferrugineo-flavescentibus; dorso abdominis croceo; alis vinaceis, venis pone medium fuscis. ♂. ♀. Long. 35, Lat. hem. $10\frac{1}{2}$, Lat. thor. $16\frac{1}{2}$ mill.

♂. Abdomine hemelytris latitudine subæquali, ventris segmentis secundo apice et tertio basi in medio in tuberculum parvum conjunctim elevatis, segmentis tertio apice et quarto basi in tuberculum maximum, transversum, apice obtuse rotundatum, valde elevatum, margine summo compresso-carinatum, elevatis; femoribus posticis sat incrassatis, pone medium levissime gracilescentibus, basi magis gracilibus et curvatis, subtus in ipsa basi leviter tuberculatis, præterea obtuse carinatis, carina minute et obsolete, pone medium paullo distinctius denticulata, prope apicem paullo magis elevata et apice tuberculo instructa; tibiis posticis prope basin latissimis, dein sensim angustatis, subtus prope basin in dentem prominulis, pone dentem denticulatis, superne calcari subapicali parvo instructis.

♀. Abdomine hemelytris latiore, utrinque nonnihil rotundato, ventre inermi, segmento secundo apice in medio obsolete rotundato, tertio apice truncato; femoribus posticis rectis, minus incrassatis, basin versus sensim gracilescentibus, subtus carinatis, carina denticulata et prope apicem dente lato obtuso distinctiore instructa; tibiis posticis tibiis maris similibus, sed subtus non nisi obsoletissime denticulatis et basin versus dente distinctiore destitutis, calcari nullo.

Patria: Silhet. (Coll. SIGNORET).

Statura fere *Acanthocephalæ alatæ* BURM, sed magis depressa. Antennæ articulo primo thoraci longitudine subæquali, secundo tertio longiore, quarto mutilo in exemplis descriptis. Articuli secundus et quartus rostri æque longi, tertio multo longiores. Thorax marginibus lateralibus anticis sat fortiter obtusiuscule, lateralibus posticis subtilius dentatis, angulis lateralibus sensim dilatatis, extrorsum et plus minus sursum vergentibus, apice acutiusculis vel rectangularibus. Tibiæ anteriores sæpe in ferrugineum vergentes.

OCHROCHIRA STÅL.

1. **O. albiditarsis** WESTW. — *Myctis albiditarsis* WESTW. in HOPE, Cat. 2. p. 11. (1842). — *Mictis albiditarsis* DALL., List. 2. p. 406. 54. (1852).

Patria: Silhet. (Mus. Holm. et Vien.)

♂. Abdominis segmento dorsali ultimo pone medium subsemicirculariter rotundato, segmento secundo ventris truncato, posterius tuberculis duobus obtusissimis, valde distantibus, parvis armato, segmento genitali apice utrinque profundissime sinuato; femoribus posticis rectis, leviter incrassatis, subtus in medio subtuberculatis, apice dentibus duobus subserratis armatis; tibiis posticis quam apud feminam latioribus, subtus compressis, basin versus in dentem obtusum prominulis, pone dentem denticulatis, superne pone medium apicem versus sensim paullo dilatatis, apice leviter calcaratis.

♀. Femoribus posticis subtus apice in dentem magnum latum foliaceum ampliatis; tibiis gracilibus, superne pone medium sensim dilatatis.

2. **O. palliditarsis** STÅL — Fusco-ferruginea, parce helvo-subsericea, superne punctulata, thorace subruguloso; articulo quarto antennarum, basi excepta, tarsisque ferrugineo-flavescentibus; tibiis anterioribus dilute ferrugineis; membrana fusca; alis vinaceis; dorso abdominis rufo-ferrugineo, segmentis postice nigro-trimaculatis, margine postico segmenti sexti et segmentis genitalibus nigris; tibiis posticis superne totis leviter dilatatis, apice latioribus. ♀. Long. 37, Lat. hem. $11\frac{1}{2}$, Lat. thor. $16\frac{1}{2}$ mill.

♀. Abdomine hemelytris latiore, utrinque nonnihil rotundato-ampliato, segmento secundo ventris truncato, segmento sexto apice breviter fisso, fissura antice plica acutangulari, ultra medium segmenti extensa, terminata; femoribus posticis rectis, nonnihil incrassatis, sensim crassioribus, paullo compressis, subtus carina apicem versus sensim distinctiore, minutissime granulata vel denticulata, prope apicem in dentem elevata, pone dentem humiliore et apice spinosa, instructis.

Patria: India orientalis borealis. (Coll. SIGNORET.)

Statura fere præcedentis, sed major, lateribus thoracis minute irregulariterque subserratis, angulis lateralibus acutioribus et minus sursum vergentibus, tibiis posticis superne in margine exteriore totis paullo dilatatis, femoribus posticis subtus prope apicem sensim leviter dentato-dilatatis, dente minore, minus elevato et anterius in carinam sensim transiente, nec non fissura segmenti sexti ventris breviore præsertim differt. Antennæ corpore nonnihil breviores, articulo primo thoraci longitudine æquali, quarto et secundo fere æque longis, illo primo distinctissime nonnihil breviore. Articuli secundus et quartus rostri æque longi, tertio longiores. Femora apice utrinque macula parva laterali nigra. Orificia obtuse auriculata, auriculo extus subsinuato.

Quoad formam thoracis ad *Mictem pictorem* appropinquat, angulis lateralibus tamen quam in hac specie magis productis et acutioribus.

MICTIS LEACH.

Mictis LEACH, Zool. misc. 1. p. 92. (1814); A. et S., Hist. p. 189. (1843); DALL., List. 2. p. 377. (1852). — *Cerbus* HAHN, W. I. 1. pl. 1. f. 1, B—E. (1831); BURM., Handb. 2: 1. p. 339. (1835). — *Myctis* WESTW. in HOPE, Cat. 2. (1842).

a. *Articulo primo antennarum articulo quarto longiore vel sublongiore, quarto et tertio longitudine subæqualibus, paullo variabilibus; tibiis posticis marium subtus a basi versus medium sensim dilatatis, medio in dentem ampliatis pone dentem simplicibus, ad apicem supra subtusque tuberculo parvo distincto instructis.* — MICTIS LEACH.

1. **M. profana** FABR. — *Lygæus profanus* FABR., S. R. p. 211. 33 (1803). — *Mictis crucifera* LEACH, Zool. misc. 1. p. 92. pl. 40. (1814). — *Anisoscelis abdominalis* GUÉR., Voy. Coq., Zool. 2: 2. p. 176. (1838). — *Anisoscelis profanus* GUER., Icon., Ins. pl. 55. f. 9. (1838). — *Cerbus crucifer* H. S., W. I. 6. p. 60. f. 622. (1842). — *Myctis profanus* WESTW. in HOPE, Cat. 2. p. 10. (1842). — *Mictis profana* DALL., List. 2. p. 404. 51. (1852). — *Nematopus profanus* MONTR., Ann. sc. phys. (2) 7. p. 102. (1855).

Patria: Australia; Insulæ Fidsehi, Woodlark, Ceram. (Mus. Holm.)

Longitudo et color articuli quarti antennarum paullo variat.

2. **M. symbolica** DALL. — *Mictis symbolica* DALL, List. 2. p. 404. 52. (1852).
Patria: Australia.
A præcedente vix distinguenda.

3. **M. crux** DALL. — *Mictis crux* DALL., List. 2. p. 405. 53. (1852).
Patria: Insulæ Fidschi. (Mus. Holm.); Ins. Navigatorum.
A præcedentibus vix distinguenda.

4. **M. caja** STÅL. — *Mictis caja* STÅL., An. S. E. Fr. (4) 5. p. 173. 4. (1865).
Patria: Australia, Moreton Bay. (Mus. Holm.)
Pedes postici maris fere ut in *M. profana*, femoribus autem minus incrassatis et basi minus curvatis, tibiis subtus fere ante medium in dentem latum, subobtusangulum ampliatis, pone dentem apicem versus inermibus; pedes postici feminarum etiam fere ut in *M. profana*, sed tibiis ante medium subtus vix ampliatis, obsoletissime denticulatis.

aa. *Articulo quarto antennarum articulo primo plerumque distinctissime longiore, tertio quarto semper breviore* [1]).

b. *Articulo quarto antennarum articulo primo vix vel paullo longiore; tibiis posticis marium medio curvatis, subtus versus medium sensim angulato-dilatatis, apice superne tuberculo vel dente destitutis, in utroque sexu basi leviter curvatis; pectore postice supra acetabula postica macula pallida, dense albidosericea, notato* [2]).

5. **M. tenebrosa** FABR. — *Cimex tenebrosus* FABR., Mant. 2. p. 288. 93. (1787); GMEL., S. N. 1: 4. p. 2142. 228. (1788). — *Lygæus tenebrosus* FABR., E. S. 4. p. 135. 6. (1794); S. R. p. 204. 5. (1803). — *Cerbus umbilicatus* H. S., W. I. 6. p. 29. Taf. CXC. f. A. (1842); W. I. 6. p. 51. f. 611. (1842); W. I. 9. p. 247. (1853). — *Mictis tenebrosa* DALL., List. 2. p. 399. 38. (1852). — *Mictis umbilicata* DALL., List. 2. p. 400. 39. (1852). — STOLL, Pun. f. 277.
Patria: China; Assam. (Mus. Holm.); Tenasserim, Java.
Maculis duabus magnis flavis, interdum in fasciam latam confluentibus, ante medium dorsi abdominis positis insignis. Pectus postice macula dense albido-sericea notatum. Venter marium, præter tuberculum magnum ab *Herrich Schæffer* commemoratum, in segmento secundo posterius latera versus spina vel tuberculo parvo acute conico est armatus; venter feminæ inermis [3]), segmento secundo medio segmento tertio longitudine æquali, apice in medio obtusissime rotundato-subproducto.

bb. *Articulo quarto antennarum articulo primo et præsertim articulo tertio longiore, plerumque multo longiore; segmento secundo ventris feminarum segmento tertio breviore; tibiis posticis marium subtus pone medium spina armatis vel paullo ampliatis* [4]).

c. *Pectore posterius supra acetabula postica macula pallida dense albido-sericea notato, vitta laterali percurrente pallidiore destituto; tibiis posticis marium superne prope apicem in margine exteriore tuberculo vel dente obtuso distincto calcariformi destitutis, raro ibidem tuberculis parvis vel denticulis pluribus instructis, subtus pone dentem inermibus; abdomine pone segmentum quartum angustato, segmento dorsali ultimo marium postice utrinque valde rotundato-angustato, apice in medio obtuse rotundato-producto; femoribus posticis marium valde incrassatis, fere in medio vel paullo pone medium crassissimis, basin versus multo gracilioribus et ibidem curvatis, feminarum subrectis, basin versus gracilibus, dein sensim incrassatis, subtus pone medium vel longius apicem versus crista magna, angulum formante, pone angulum denticulata, instructis.* — CERBUS HAHN.

6. **M. longicornis** WESTW. — *Cerbus fulvicornis* HAHN, W. I. 1. p. 7. f. 1. (1831). — *Cerbus tenebrosus* BURM., Handb. 2: 1. p. 340. 5. (1835); H. S., W. I. 6. p. 22. f. 578. et Taf. CXC. f. C. (1842); W. I. 6. p. 62. f. 624. (1842); W. I. 9. p. 247. (1853). — *Myctis longicornis* WESTW. in HOPE, Cat. 2. p. 11. (1842). — *Mictis fulvicornis* DALL., List. 2. p. 403. 48. (1852). — *Mictis conjunctus* H. S., W. I. 9. p. 247. (1853). — STOLL, Pun. f. 188.
Patria: Java. (Mus. Holm.); Insulæ Philippinæ.
Species quoad magnitudinem corporis, crassitiem femorum posticorum, et magnitudinem tuberculorum trium ventris marium maxime varians. Tuberculum obtusum anterius ventris præsertim magnitudine variat, nunc ma-

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[1]) Articulus antennarum quartus *M. macræ, metallicæ* et *gallinæ* in exemplis nostris mutilus.
[2]) Ad hanc divissionem forte referendæ sunt *Mictis nigricornis* DALL. et *fasciata* WESTW.
[3]) Incorrecte scripsit *Herrich Schæffer:* Der Bauch wie beim Mann. (H. S., W. I. 6. p. 51.)
[4]) Mares *M. pictoris* et *albo-vittatæ* mihi sunt ignoti.

ximum et altissimum, nunc omnino deficiens. Dorsum abdominis interdum pone medium nigro-maculatum. Thorax maculis duabus subæneo-fuscis notatus.

Obs.: *Lygæus fulvicornis* FABR. ad *Prionolomiam* pertinet. *Lygæum tenebrosum* FABR., verum sub numero 5 hujus generis invenias.

7. **M. pungens** STÅL. — *Mictis pungens* STÅL, Ö. V. A. F. 1870. p. 647. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)
Tubercula ventris uti in specie præcedente variant. Articulus quartus antennarum articulo primo vix longior.

8. **M. gallina** DALL. — *Mictis gallina* DALL., List. 2. p. 403. 49. (1852).
Patria: Silhet. (Mus. Holm.)
Abdomen dorso nigrum, ante medium utrinque macula magna fulva. Venter marium tuberculo anteriore medio destitutus, segmento secundo apice truncato, tuberculis duobus conicis, longis, distantibus, postice armato.

cc. *Pectore posterius macula laterali pallida dense albido-sericea destituto, interdum vitta pallida ornato; tibiis posticis marium superne prope apicem in margine exteriore tuberculo vel dente obtuso calcariformi armatis, raro apicem versus superne denticulis pluribus armatis, denticulo subapicali tunc distinctiore; femoribus posticis feminarum* [1]) *subtus apicem versus denticulis nonnullis, imo majore, armatis, crista magna destitutis.* — ASPILOSTERNA STÅL.

d. *Segmento ventrali tertio marium tuberculis destituto; punctis dorsi haud metallicis; alis vinaceis.*

e. *Tuberculis antenniferis apice intus obtusiusculis, rotundatis; tibiis posticis marium* [2]) *subtus pone medium dente acuto armatis; femoribus posticis marium basi vel prope basin plus minus curvatis.*

f. *Abdomine, saltem apud mares, pone medium segmenti tertii usque ad medium segmenti sexti sensim paullo ampliato, hoc segmento medio utrinque obtuse rotundato-angulato, dorso posterius in angulum obtusum apice rotundatum producto; femoribus posticis maris a basi ultra medium sensim incrassatis; tibiis posticis maris femoribus longioribus, subtus pone dentem magnum et superne apicem versus denticulatis: feminæ ignotæ.*

9. **M. macra** STÅL. — *Mictis macra* STÅL, An. S. E. Fr. (4) 5. p. 173. 5. (1865).
Patria: Silhet; Ligor Malaccæ. (Mus. Holm.)

ff. *Abdomine utriusque sexus posterius angustato; tibiis posticis femoribus longitudine subæqualibus vel brevioribus, apud mares supra subtusque denticulis parvis destitutis; angulis lateralibus thoracis productis, rectis vel acutis; tibiis posticis feminarum sensim leviter incrassatis, subtus obsoletissime subcarinatis, carina apicem versus elevatiore, ibidem dente distinctissimo et pone hunc denticulis nonnullis armatis.*

g. *Femoribus posticis marium basi distinctissime curvatis, ibidem gracilioribus, pone curvaturam ubique fere æque crassis, basi ipsa subtus una cum apice trochanterum in tuberculum obtusum subelevatis, feminarum basi levissime curvatis; hemelytris punctulatis.*

10. **M. serina** DALL. — *Mictis serina* DALL., List. 2. p. 403. 47. (1852).
Patria: China, Hongkong. (Mus. Holm. et Vien.)

gg. *Femoribus posticis marium basi nonnihil curvatis, a basi ultra medium sensim incrassatis, basi ipsa subtus haud tuberculato-elevatis, feminarum rectis; hemelytris parce punctatis vel maculis parvis lævigatis conspersis.*

11. **M. pictor** FABR. — *Lygæus pictor* FABR., E. S. 4. p. 138. 14. (1794); S. R. p. 207. 17. (1803). *Mictis Pictor* STÅL, H. Fabr. 1. p. 44. 3. (1868).
Patria: India orientalis borealis. (Coll. SIGNORET).
Mas mihi ignotus. Species magna, latiuscula. Pedes postici feminæ uti in *M. albo-vittata*, tibiis tamen robustioribus, magis compressis, a latere visis latioribus.

12. **M. albo-vittata** STÅL. — *Mictis albo-vittata* STÅL, An. S. E. Fr. (4) 5. p. 172. 2. (1865).
Patria: Malacca. (Mus. Holm.)
Mas ignotus.

13. **M. acutangula** STÅL. — *Mictis acutangula* STÅL, An. S. E. Fr. (4) 5. p. 173. 3. (1865).
Patria: Borneo, Saravak. (Mus. Holm.); Malacca. (Coll. SIGNORET.)

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[1]) Feminæ *M. macræ* et *metallicæ* mihi incognitæ sunt.
[2]) Mares *M. pictoris* et *albovittatæ* haud vidi.

ee. *Tuberculis antenniferis apice intus acutis, productis; femoribus posticis marium ante medium levissime curvatis, feminarum rectis et prope apicem dente distinctiore armatis; tibiis posticis marium pone medium per spatium breve sensim leviter dilatatis, parte dilatata apicem versus latiore, denticulata.*

14. **M. discolor** DALL. — *Mictis discolor* DALL., List. 2. p. 402. 46. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

dd. *Segmentis ventris secundo et tertio tuberculis duobus conicis armatis; punctis dorsi corporis viridi-chalybeis; angulis lateralibus thoracis vix prominulis, obtusis, apice imo subdentatis; alis nigricantibus.* — CALLICHLAMYDIA STÅL.

15. **M. metallica** SIGN. — *Mictis metallica* SIGN., Rev. et Mag. Zool. 1851. p. 447. 14; THOMS., Arch. 2. p. pl. 9. f. 6. (1858). — *Cossutia metallica* STÅL, H. afr. 2. p. 46. 1. (1865)
Patria: Gabon. (Mus. Holm.)

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16. **M. nigricornis** DALL. — *Mictis nigricornis* DALL., List. 2. p. 400. 40. (1852).
Patria: Silhet.

17. **M. fasciata** WESTW. — *Myctis fasciata* WESTW. in HOPE, Cat. 2. p. 11. (1842). — *Mictis fasciata* DALL., List. 2. p. 404. 50. (1852).
Patria: China.
Hæc et præcedens a *M. tenebrosa* vix divergunt.

COSSUTIA STÅL.

STÅL, H. afr. 2. p. 2 et 46. (1865).

1. **C. flaveola** DRURY. — *Cimex flaveolus* DRURY, Ill. 3. p. 59. pl. 43. f. 3. (1782). — *Cimex sanctus* DRURY, Ill. 3. p. 63. pl. 45, f. 5. (1782). — *Paryphes Andreæ* BURM., Handb. 2: 1. p. 336. 5. (1835). — *Cerbus Boerhaviæ* H. S., W. I. 6. p. 85. f. 655. (1842). — *Myctis religiosus* WESTW. in HOPE., Cat. 2. p. 12. (1842). — *Mictis flaveola* DALL., List. 2. p. 401. 42. (1852). — *Cossutia flaveola* STÅL, H. afr. 2. p. 47. 2. (1865).
Patria: Sierra Leona. (Mus. Holm.); Calabar, Gabon.

2. **C. Stålii** SIGN. — *Mictis Stålii* SIGN., in THOMS., Arch. 2. p. 298. 565. (1858). — *Cossutia Stålii* STÅL, H. afr. 2. p. 48. 3. (1865).
Patria: Grand Bassam Guineæ. (Coll. SIGNORET.)

ANOPLOCNEMIS STÅL.

Mictis Div. 1, DALL., List. 2. p. 386. (1852). — *Mictis* STÅL, H. afr. 2. p. 27. (1865).

a. *Angulis lateralibus thoracis distinctis, rectis vel acutis, productis; macula pectoris orificia includente carnea vel albicante, distincta; femoribus posticis marium valde incrassatis, basin versus valde curvatis et gracilioribus.*

b. *Femoribus posticis basi subtus tuberculo, in maribus conico et distinctissimo, in feminis parvo, obsoleto, interdum deficiente, armatis; ventre marium haud tuberculato, segmento secundo apice medio leviter rotundato-producto.*

1. **A. luctuosa** STÅL. — *Mictis curvipes* SIGN., An. S. E. Fr. (3) 8. p. 938. 113. (1861). — *Mictis luctuosa* STÅL, H. afr. 2. p. 27. 1. (1865).
Patria: Madagascar. (Mus. Holm.)

2. **A. madagascariensis** SIGN. — *Mictis madagascariensis* SIGN., An. S. E. Fr. (3) 8. p. 938. 114. (1861); STÅL, H. afr. 2. p. 28. 2. (1865).
Patria: Madagascar. (Mus. Holm.)

3. **A. curvipes** FABR. — *Cimex curvipes* FABR., Spec. 2. p. 351. 78. (1781); Mant. 2. p. 288. 96. (1787); GMEL., S. N. 1: 4. p. 2142. 231. (1788). — *Lygæus curvipes* FABR., E. S. 4. p. 137. 11. (1794); S. R. p. 206. 14. (1803). — *Myctis apicalis* WESTW. in HOPE, Cat. 2. p. 12. (1842). — *Cerbus fuliginosus* KLUG, Preisverz. p. 11. 214. (1842); Stett. E. Z. 20. p. 86. 214. (1859). — *Coreus heteropus* LATR. in CAILLAUD, Voy. Meroé. 4. p. 287. 30. Atl. Vol. 2. pl. 58. f. 30. (sec. SCHAUM). — *Mictis curvipes* DALL., List. 2. p. 392. 20. (1852); STÅL, H. afr. 2. p. 29. 3. (1865). — *Mictis Libyssa* DALL., List. 2. p. 392. 21. (1852). — *Mictis gracilis* DALL., List. 2. p. 392. 22. (1852). — *Mictis Bohemani* STÅL, Ö. V. A. F. 1855. p. 28. 11. — *Mictis heteropus* SCHAUM in PETERS, Reis. Mossamb., Ins. p. 41. (1862).
Patria: Caffraria, Mossambik, Senegallia, Sierra Leona. (Mus. Holm.); Congo, Gambia, Abyssinia.

4. **A. tartarea** Stål. — *Mictis tartarea* Stål, H. afr. 2. p. 30. 4. (1865). — *Mictis flaviceps* Sign. in litt.
Patria: Gabon. (Coll. Signoret.)

bb. *Femoribus posticis subtus tuberculo basali destitutis; segmento secundo ventris marium apice in medio ad vel ultra medium segmenti tertii producto, parte producta cum disco segmenti tertii in tuberculum altitudine varians elevata.*

5. **A. pectoralis** Germ. — *Cerbus pectoralis* Germ., in Silb., Rev. 5. p. 154. 74. (1837). — *Myctis parallelus* Westw. in Hope, Cat. 2. p. 12. (1842). — *Myctis horrificus* Westw. in Hope, Cat. 2. p. 12. (1842). — *Mictis nigrita* Dall., List. 2. p. 391. 19. (1852). — *Mictis furva* Stål, Ö. V. A. F. 1855. p. 80. 10. — *Mictis validipes* Stål, Ö. V. A. F. 1855. p. 28. 12.
Patria: Africa meridionalis. (Mus. Holm.)

aa. *Angulis lateralibus thoracis haud prominulis, rotundatis.*

c. *Femoribus posticis marium basin versus valde curvatis, subtus pone medium in dentem validissimum ampliatis, basi in latere interiore spina conica vel tuberculo obtuso armatis; species asiaticæ.*

6. **A. phasianus** Fabr. — *Cimex Phasianus* Fabr., Spec. 2. p. 361. 136. (1781); Mant. 2. p. 297. 177. (1787); Gmel, S. N. 1: 4. p. 2188. 509. (1788). — *Lygæus phasianus* Fabr., E. S. 4. p. 144. 35. (1794); S. R. p. 214. 45. (1803). — Stoll, Pun. f. 68 et 69.
Patria: India orientalis vel Insulæ asiaticæ.

7. **A. grossipes** Fabr. — *Lygæus grossipes* Fabr., S. R. p. 205. 11. (1803). — *Lygæus tumidipes* Fabr., S. R. Index. p. 11. (1803). — *Cerbus tumidipes* H. S., W. I. 6. p. 54. f. 614. (1842).
Patria: Sumatra.

8. **A. punctum** Westw. — *Myctis punctum* Westw. in Hope, Cat. 2. p. 10. (1842). — *Mictis punctum* Dall., List. 2. p. 389. 10. (1852).
Patria: India orientalis, Cuna, Bombay, Bengalia.

9. **A. affinis** Westw. — *Myctis affinis* Westw. in Hope, Cat. 2. p. 10. (1842). — *Mictis affinis* Dall., List. 2. p. 389. 11. (1852).
Patria: Java; Corea?

10. **A. bicolor** Westw. — *Myctis bicolor* Westw. in Hope, Cat. 2. p. 10. (1842). — *Mictis bicolor* Dall., List. 2. p. 389. 12. (1852).
Patria: India orientalis, Nielgherries; China.

11. **A. protracta** H. S. — *Mictis protractus* H. S., W. I. 9. p. 247. (1853).
Patria: India orientalis.

12. **A. compressa** Dall. — *Mictis compressa* Dall., List. 2. p. 388. 7. (1852).
Patria: India orientalis borealis.

13. **A. dubia** Dall. — *Mictis dubia* Dall., List. 2. p. 389. 13. (1852).
Patria: Java.

14. **A. castanea** Dall — *Mictis castanea* Dall., List. 2. p. 389. 14. (1852).
Patria: Ceylon.

15. **A. lata** Dall. — *Mictis lata* Dall., List. 2. p. 390. 15. (1852).
Patria: Hongkong.

Obs.: Species hujus divisionis secundum descriptiones auctorum haud determinandæ. Color articuli quarti antennarum valde variat. Antennæ longitudine et crassitie quoque variare videntur.

Species mihi cognitæ, forte in duas colore alarum variabiles conjungendæ, hoc modo disponendæ:

1(6). Abdomine dorso dilute ferrugineo vel croceo; femoribus posticis marium basi subtus in latere interiore spina basali conica valida armatis, superne carina obtusa granulosa vel denticulata instructis; antennis longioribus, paullo variabilibus.
2(5). Alis totis vel ad partem fuscis.
3(4). Alis totis fuscis. (Specimina e Pulo Penang et Insulis Philippinis.)
4(3). Alis basin versus vinaccis. (Specimina ex Insulis Philippinis et Saigon).
5(2). Alis totis vinaceis. (Specimina e Java).
6(1). Abdomine dorso nigro, flavo-bimaculato; femoribus posticis marium superne haud nisi obtusissime et obsoletissime carinatis, subtus tuberculo basali obtusissimo et obsoleto instructis; antennis brevioribus; alis subdecoloribus, pone medium levissime infuscatis. (Specimina e China, Chifou).

cc. *Femoribus posticis marium rectis vel basi leviter curvatis, subtus in dentem validissimum haud ampliatis, spina valida basali destitutis: articulis secundo et tertio rostri plerumque longitudine subæqualibus; species africanæ.*

16. **A. scutellaris** Dall. — *Mictis scutellaris* Dall., List. 2. p. 390. 17. (1852); Stål, H. afr. 2. p. 32. 7. (1865).
Patria: Caffraria. (Mus. Holm.)
Articulus secundus rostri tertio paullo longior.

17. **A. scutellata** Reiche et Fairm. — *Mictis scutellata* Reiche et Fairm., Voy. Abyss., Entom. p. 447. pl. 29. f. 4. (1848). — Stål, H. afr. 2. p. 33. 8. (1865).
Patria: Abyssinia.

18. **A. castaneicornis** Stål. — *Mictis castanicornis* Stål, Ö. V. A. F. 1855. p. 27. 1; *Mictis castaneicornis* Stål, H. afr. 2. p. 33. 9. (1866).
Patria: Caffraria. (Mus. Holm.)
Articulus secundus rostri tertio paullo longior.

19. **A. tomento-virgata** Stål. — *Mictis tomento-virgata* Stål, Ö. V. A. F. 1855. p. 27. 4; H. afr. 2. p. 34. 10. (1865).
Patria: Caffraria. (Mus. Holm.)

20. **A. Mayri** Stål. — *Mictis Mayri* Stål, H. afr. 2. p. 32. 6. (1865).
Patria: Abyssinia. (Mus. Holm.)

21. **A. tristator** Fabr. — *Lygæus tristator* Fabr., S. R. p. 206. 13. (1803). — *Mictis tristator* Dall., List. 2. p. 390. 16. (1852); Stål, H. afr. 2. p. 35. 11. (1865); H. Fabr. 1. p. 43. 1. (1868).
Patria: Sierra Leona, Calabar. (Mus. Holm.)
Articulus secundus rostri tertio paullo longior.

22. **A. melancholica** Stål. — *Mictis melancholica* Stål, H. afr. 2. p. 35. 12. (1865).
Patria ignota. (Coll. Signoret.)
Articulus secundus rostri tertio paullo longior.

23. **A. grallatoria** Stål. — *Mictis grallatoria* Stål, Ö. V. A. F. 1855. p. 27. 6; H. afr. 2. p. 36. 13. (1865).
Patria: Caffraria. (Mus. Holm.)
Articulus secundus rostri tertio distincte nonnihil longior.

24. **A. griseo-sericea** Stål. — *Mictis griseo-sericea* Stål, Ö. V. A. F. 1855. p. 27. 5; H. afr. 2. p. 37. 14. (1865).
Patria: Caffraria. (Mus. Holm.)

25. **A. natalensis** Stål. — *Mictis natalensis* Stål, Ö. V. A. F. 1855. p. 28. 8; H. afr. 2. p. 37. 15. (1865).
Patria: Caffraria. (Mus. Holm.)
Articulus secundus rostri tertio nonnihil longior.

26. **A. annulicornis** Germ. — *Cerbus annulicornis* Germ. in Silb., Rev. 5. p. 156. 78. (1837). — *Mictis annulicornis* Dall., List. 2. p. 388. 8. (1852); Stål, H. afr. 2. p. 38. 16. (1865).
Patria: Terra capensis.

27. **A. annulicornis** Westw. — *Myctis annulicornis* Westw. in Hope, Cat. 2. p. 13. (1842).
Patria: Terra capensis.

28. **A. varicornis** Westw. — *Myctis varicornis* Westw. in Hope, Cat. 2. p. 12. (1842).
Patria: Sierra Leona.

29. **A. lugubrina** Stål. — *Mictis lugubrina* Stål, Ö. V. A. F. 1855. p. 28. 7; H. afr. 2. p. 39. 17. (1865).
Patria: Caffraria. (Mus. Holm.)

30. **A. amicta** Stål. — *Mictis amicta* Stål, Ö. V. A. F. 1855. p. 28. 9; H. afr. 2. p. 39. 18. (1865).
Patria: Caffraria. (Mus. Holm.)

31. **A. pagana** Dall. — *Mictis pagana* Dall., List. 2. p. 386. 3. (1852); Stål, H. afr. 2. p. 40. 19. (1865).
Patria: Terra capensis. (Mus. Holm.)

32. **A. caffra** Stål. — *Mictis caffra* Stål, Ö. V. A. F. 1855. p. 27. 2; H. afr. 2. p. 41. 20. (1865).
Patria: Caffraria. (Mus. Holm.)

33. **A. apicalis** Germ. — *Cerbus apicalis* Germ. in Silb., Rev. 5. p. 157. 79. (1837). — *Mictis apicalis* Dall., List. 2. p. 386. 2. (1852); Stål, H. afr. 2. p. 41. 21. (1865).
Patria: Terra capensis. (Mus. Holm.)

34. **A. gracilicornis** Stål. — *Mictis gracilicornis* Stål, H. afr. 2. p. 42. 22. (1865).
Patria: Calabar. (Mus. Holm.)
Femora postica feminæ subtus pone medium compresso-carinata, a latere visa subtus pone medium distincte subampliata.

35. **A. monacha** Stål. — *Mictis monacha* Stål, H. afr. 2. p. 43. 23. (1865).
Patria ignota. (Coll. Signoret).
Femora postica feminæ basin versus subcurvæ, a latere visa ultra medium sensim incrassata, subtus pone medium distinctius subcarinata, carina tamen haud subsubito compresso-elevata.

36. **A. tenuicornis** Stål. — *Mictis tenuicornis* Stål, H. afr. 2. p. 43. 24. (1865).
Patria: Guinea. (Coll. Signoret.)
Femora postica feminæ uti in *A. monacha.*

37. **A. carmelita** Stål. — *Mictis carmelita* Stål, H. afr. 2. p. 44. 25. (1865).
Patria: Caffraria. (Mus. Holm.)

38. **A. vidua** Schaum. — *Mictis vidua* Schaum, Ber. Ak. Berl. 1853. p. 357; Stål, Ö. V. A. F. 1855. p. 27. 5; Schaum in Peters, Reis. Mossamb., Ins. p. 41. Taf. 2. f. 5. (1862); Stål, H. afr. 2. p. 44. 26. (1865).
Patria: Caffraria. (Mus. Holm.); Mossambique.
Femora postica feminæ fere uti in *A. monacha,* haud vel vix curvata.

39. **A. capucina** Stål. — *Mictis capucina* Stål, H. afr. 2. p. 45. 27. (1865).
Patria: Caffraria. (Mus. Holm.)
Femora postica feminæ fere uti in *A. gracilicorni.*

40. **A. africana** Stål. — *Mictis africana* Stål, H. afr. 2. p. 45. 28. (1865).
Patria: Caffraria. (Mus. Holm.)
Femora postica feminæ fere uti in *A. vidua.*

41. **A. nigricornis** Germ. — *Cerbus nigricornis* Germ. in Silb., Rev. 5. p. 156. 77. (1837). — *Mictis nigricornis* Dall., List. 2. p. 388. 9. (1852).
Patria: Terra capensis.

42. **A. similis** Dall. — *Mictis similis* Dall., List. 2. p. 387. 4. (1852).
Patria: Africa meridionalis.

43. **A. inconspicua** Dall. — *Mictis inconspicua* Dall., List. 2. p. 387. 5. (1852).
Patria: Africa meridionalis.

44. **A. fusca** Westw. — *Myctis fuscus* Westw. in Hope, Cat. 2. p. 13. (1842).
Patria: Terra capensis.

45. **A. ventralis** Westw. — *Myctis ventralis* Westw. in Hope, Cat. 2. p. 13. (1842).
Patria: Gambia.
Obs.: *Mictis ventralis* Dall., List. 2. p. 387. 6. e terra capensi verisimiliter est alia species.

46. **A. scutellaris** Westw. — *Myctis scutellaris* Westw. in Hope, Cat. 2. p. 12. (1842).
Patria: Sierra Leona.

PUPPEIA Stål.

Stål, H. afr. 2. p. 2 et 25. (1865).

1. **P. cincta** Sign. — *Mictis cinctus* Sign., An. S. E. Fr. (2) 8. p. 71. pl. 4. f. 3. (1850). — *Puppeia cincta* Stål, H. afr. 2. p. 26. 1. (1865).
Patria: Guinea lusitanica. (Mus. Holm.)

Species **Mictariorum** incerti generis.

1. **Pachylis tribulus** Germ. in Silb., Rev. 5. p. 153. 73. (1837)
Patria: Terra capensis.

2. **Cerbus tornator** Germ. in Silb., Rev. 5. p. 154. 75. (1837).
Patria: Terra capensis.

3. **Myctis gracilis** Westw. in Hope, Cat. p. 11. (1842).
Patria: Java.

4. **Lygæus phasianus** Wolff, Ic. 2. p. 72. 69. f. 69. (1801).
Patria: India orientalis.

5. **Pachylis obscura** SPIN., Ess. p. 137. 5. (1837).
Patria: Senegal? America meridionalis?
6. **Mictis Dallasii** STÅL. — *Mictis dilatata* DALL., List. 2. p. 393. 26. (1852).
Patria: Congo.
7. **Mictis moesta** DALL., List. 2. p. 400. 41. (1852).
Patria: Congo.
8. **Mictis limbativentris** STÅL, Tr. E. S. Lond. (3) 1. p. 603. 1. (1863).
Patria: Nova Guinea.
9. **Discogaster fuliginosus** UHLER, Pr. Ac. Phil. 1860. p. 225.
Patria: Japonia.
10. **Menenotus tuberculipes** MOTSCH., Bull. Soc. Mosc. 39: 1. p. 187. (1866).
Patria: Japonia.
A *Discogastro fuliginoso* vix distinguendus. Ad *Elasmomiam* vel genus affine referendus.

Div. **Amorbaria** STÅL.

CONSPECTUS GENERUM.

1(2). Thorace, scutello venisque hemelytrorum tuberculis parvis acutis asperis; margine abdomininis denticulato; antennis brevibus, setosis; corpore remote subsericeo; mesosterno antice obsolete sulcato; pedibus posticis inter se et a lateribus corporis æque longe remotis; scutello apice longitrorsum elevato. — *Acroelytrum* MAYR.
2(1). Thorace, scutello venisque hemelytrorum tuberculis acutis destitutis; corpore glabriculo vel brevissime subquamoso-setuloso.
3(6). Spina femorum anteriorum distinctissima, acuta.
4(5). Articulo apicali antennarum et articulo tertio vel hujus apice æque crassis; segmento dorsali ultimo marium mihi cognitorum apice obtuse rotundato; femoribus posticis marium valde incrassatis; tibiis posticis marium subtus plus minus dilatatis, pone medium denticulatis; tylo a supero viso haud distinguendo vel quam tuberculis antenniferis multo minus prominulo. — *Amorbus* DALL.
5(4). Articulo apicali antennarum articulo tertio crassiore, segmento dorsali ultimo marium apice in processum latum transversum producto; tibiis posticis marium inermibus; femoribus posticis marium sensim levissime incrassatis, femoribus anterioribus haud crassioribus; tylo a supero viso et tuberculis antenniferis æque longe prominulis. — *Gelonus* STÅL.
6(3). Femoribus anterioribus subtus prope apicem obtuse subampliatis, haud spinosis, posticis anterioribus haud crassioribus, subtus prope apicem dente armatis; rostro medium mesosterni attingente; mesosterno ante medium sulcato, marginibus sulci anterius obtusis, haud ampliatis; corpore angusto, postice valde angustato-producto; segmento genitali maris acuminato. — *Cneius* STÅL.

ACROELYTRUM MAYR.

MAYR., Verh. z.-b. Ges. Wien. 15. p. 432. (1865); Reis. Nov., Hem. p. 83. (1866).

1. **A. muricatum** MAYR. — *Acroelytrum muricatum* MAYR, Verh. z.-b. Ges. Wien. 15. p. 432. (1865); Reis. Nov., Hem. p. 84. f. 16. (1866).
Patria: Australia. (Mus. Vien.)
Pedes antiei exempli examinati mutili. Segmentum ventrale sextum feminæ posterius angulariter sinuatum, profundissime fissum, fissura antice plica obtusangula terminata.

AMORBUS DALL.

DALL., List. 2. p. 377 et 408. (1852); STÅL, H. afr. 2. p. 2. (1865).

a. *Bucculis longis; rostro breviore, articulo primo pone bucculas haud extenso; coxis posticis inter se et a lateribus corporis fere æque longe distantibus; jugis infra tubercula antennifera ante tylum haud prominulis; capite superne ferrugineo vel ferrugineo-flavescente, vittis duabus nigris ornato; abdomine minus lato; segmentis genitalibus dorsalibus æque longis.*

1. **A. alternatus** Dall. — *Amorbus alternatus* Dall., List. 2. p. 408. 1. (1852).
Patria: Australia borealis; Moreton Bay; Port Denison. (Mus. Holm.)
Segmenta dorsalia abdominis posterius nigro-maculata vel nigro-fasciata. Segmentum dorsale ultimum maris apice obtuse rotundatum et utrinque subsinuatum. Tibiæ posticæ utriusque sexus ante medium subtus angulatæ, apud feminas multo angustiores quam apud mares.

2. **A. biguttatus** Stål. — Pallide ferrugineo-flavescens; supra fusco-ferrugineo-punctatus; linea abbreviata longitudinali thoracis venisque corii lævigatis, macula postica corii prope angulum interiorem flavescente; lineis duabus capitis nigris; membrana fusca, angulo basali interiore obscuriore; alis vinaceis; dorso abdominis fusco-ferrugineo, anterius pallidiore, maculis duabus disci flavescentibus, lateribus segmentorum quattuor posteriorum nigro-maculatis; femoribus posticis pone medium vel apicem versus fasciaque media tibiarum posticarum fuscis; segmentis secundo, tertio et quarto connexivi vitta communi, postice lata, antrorsum angustata, nigra, ornatis. ♀. Long. 20, Lat. hem. 7, Lat. abd. 8 mill.
♀. Abdomine leviter ampliato, segmentis genitalibus dorsalibus æque longis, anteriore apice obtusissime sinuato, posteriore apice obtuse subangulato sinuato, plus duplo latiore quam longiore; femoribus posticis leviter incrassatis, rectis, superne vix perspicue subcarinatis, subtus extus obtuse carinatis, carina granulata, apicem versus denticulata et apice dente acuto distincto armata; tibiis posticis rectis vel ante medium vix curvatis, a latere visis ubique æque latis, subtus haud dilatatis, minutissime denticulatis.
Patria: Port Denison Australiæ. (Mus. Holm.)
Statura præcedentis, cui proximus, punctis thoracis et scutelli haud vel obsoletius, in parte exteriore corii tamen distinctius, granulatis, thoracis angulis apicalibus vix prominulis, angulis lateralibus rectis, nec obtusis, macula corii, pictura dorsi abdominis, tibiis posticis feminæ rectis, subtus ante medium dente destitutis et ceteris distinctissima. Articulus quartus antennarum tertio paullo brevior. Caput et thorax anterius obsolete granulata, hujus marginibus lateralibus crenulatis. Scutellum apice læve, basi maculis duabus lævinsculis, interdum obsoletis, notatum. Pectus dilute punctatum. Venter disco et femora granulata. Articulus primus antennarum vix trigonus, secundus teres.

aa. *Bucculis minus longis; rostro longiore, articulo primo pone bucculas extenso.*

b. *Apice scutelli haud incrassato.*

c. *Pedibus ventreque distincte granulatis.*

d. *Tibiis posticis utriusque sexus subtus paullo ante medium angulato-ampliatis leviterque curvatis: femoribus posticis sexuum subconformibus, apud mares paullo crassioribus, carina inferiore prope apicem dente distincto armata.*

3. **A. atomarius** Stål. — Sordide flavescens vel ferrugineo-flavescens, supra infuscatus et nigro-punctatus, punctis granulis pallidis instructis; antennis, capite superne, dorso abdominis, femoribus anterioribus superne, posticis intus, tibiisque posticis intus a basi ultra medium nigricantibus; articulo quarto antennarum, linea laterali capitis, apice scutelli, maculis duabus vel fascia antica segmentorum connexivi, interdum etiam maculis discoidalibus dorsi abdominis flavescentibus; alis subfusco-vinaceis. ♂. ♀. Long. 19—22, Lat. hem. 6½—7 mill.
♂. Abdomine haud ampliato, segmento dorsali apicali posterius utrinque subsinuato, apice obtuse rotundato; segmento genitali posterius subsulcato, apice subsinuato; femoribus posticis graciliter subfusiformibus, subtus intus tuberculis nonnullis parvis serie positis, extus carina distincta denticulata, apice dente distinctiore armata, præditis; tibiis posticis subtus distinctius dilatatis.
♀. Abdomine levissime ampliato; segmentis genitalibus dorsalibus fere æque longis vel posteriore anteriore breviore, apice obtuse sinuatis; femoribus posticis gracilioribus, ante medium sensim gracilescentibus, præterea uti apud marem; tibiis posticis quam apud marem minus dilatatis.
Patria: Australia borealis; Port Denison; Sydney. (Mus. Holm.)
Antennarum articulus primus vix, secundus distinctius trigonus, articulus quartus tertio longitudine subæqualis vel paullo longior. Thorax angulis anticis acutis, antrorsum prominulis, marginibus lateralibus pallescentibus, angulis lateralibus obtusiusculis, subprominulis. Membrana nigro-fusca. Pectus remote granulato-punctatum. Abdomen, pedes et antennæ granulata.

dd. *Tibiis posticis utriusque sexus pone medium vel fere in medio subtus angulato-ampliatis vel apud feminas haud angulatis; femoribus posticis marium fusiformibus.*

e. *Tibiis posticis utriusque sexus subtus angulato-ampliatis; femoribus posticis marium subtus mox pone medium in angulum obtusissimum ampliatis; segmentis genitalibus dorsalibus feminarum fere æque longis, transversis.*

4. **A. robustus** Mayr. — *Amorbus robustus* Mayr, Verh. z.-b. Ges. Wien. 15. p. 432. (1865); Reis. Nov., Hem. p. 85. f. 17. (1866).
Patria: Australia borealis, Cap York. (Mus. Holm.)

ee. *Tibiis posticis feminarum rectis, subtus haud angulatis; femoribus posticis marium longius pone medium in angulum vel dentem ampliatis.*

5. **A. rubiginosus** Guér. — *Coreus rubiginosus* Guér., Voy. Coq., Ins. p. 173. (1838). — *Physomerus affinis* Westw. in Hope, Cat. 2. p. 9. (1842). — *Amorbus rubiginosus* Dall., List. 2. p. 410. 3. (1852); Mayr, Reis. Nov., Hem. p. 86. (1866).
Patria: Australia, Moreton Bay, Adelaide. (Mus. Holm.)

6. **A. obscuricornis** Westw. — *Physomerus obscuricornis* Westw. in Hope, Cat. 2. p. 9. (1842). — *Amorbus obscuricornis* Dall., List. 2. p. 410. 5. (1852); Mayr, Reis. Nov., Hem. p. 86. (1866).
Patria: Australia. (Mus. Holm.)

cc. *Ventre pedibusque granulis destitutis vel his obsoletissime granulatis; pedibus posticis minus distantibus; abdomine utriusque sexus lato; jugis infra tubercula antennifera tuberculatis, prominulis; articulis basalibus antennarum triquetris.*

7. **A. rubicundus** Stål. — *Amorbus rubicundus* Stål, Freg. Eug. resa., Ins. Hem. p. 232. 31. (1859).
Patria: Australia, Sydney. (Mus. Holm.)

bb. *Apice scutelli incrassato.*

8. **A. abdominalis** Dall. — *Amorbus abdominalis* Dall., List. 2. p. 410. 6. pl. 12. f. 8. (1852).
Patria: Adelaide. (Mus. Holm.); Kangaroo Island.

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9. **A. angustior** Westw. — *Physomerus angustior* Westw. in Hope, Cat. 2. p. 9. (1842). — *Amorbus angustior* Dall., List. 2. p. 410. 4. (1852); Mayr, Reis. Nov., Hem. p. 87. (1866).
Patria: Australia.

10. **A. subserratus** Westw. — *Physomerus subserratus* Westw. in Hope, Cat. 2. p. 9. (1842).
Patria: Melville Island.

11. **A. bispinus** Westw. — *Physomerus bispinus* Westw. in Hope, Cat. 2. p. 9. (1842).
Patria: Australia, Swan River.

12. **A. rhombifer** Westw. — *Physomerus rhombifer* Westw. in Hope, Cat. 2. p. 9. (1842). — *Amorbus rhombifer* Dall., List. 2. p. 411. 8. (1852).
Patria: Australia.

13. **A. rhombeus** Westw. — *Physomerus rhombeus* Westw. in Hope, Cat. 2. p. 10. (1842). — *Amorbus rhombeus* Dall., List. 2. p. 411. 7. (1852).
Patria: Insula Melvillei.

14. **A. hirticulus** Dall. — *Amorbus hirticulus* Dall., List. 2. p. 409. 2. (1852).
Patria: Australia orientalis.

GELONUS Stål.

Stål, H. afr. 2. p. 3. (1865).

1. **G. tasmanicus** Le Guil. — *Syromastes Tasmanicus* Le Guil., Rev. zool. 1841. p. 263. 16. — *Amorbus discolor* Dall., List. 2. p. 411. 9. (1852).
Patria: Adelaide. (Mus. Holm.); Tasmania.

CNEIUS Stål.

Stål, H. afr. 2. p. 4. (1865).

1. **C. dentipes** Stål. — *Cneius dentipes* Stål, Berl. E. Z. 10. p. 160. 1. (1866).
Patria: Australia borealis. (Mus. Holm.)

Div. **Petascelaria** Stål.

Conspectus generum.

1(2). Tibiis omnibus simplicibus, posticis versus medium introrsum leviter arcuatis, subtus denticulatis; antennis brevibus, articulis primo et secundo longitudine subæqualibus, secundo tertioque apicem versus sensim paullo incrassatis; capite pone tylum inter tubercula antennifera subelevato, lineola impressa distincta destituto, pone suturas inter tylum et tubercula illa lineola subtili curvata instructo; thorace basi rotundato, collari distinctissimo instructo; articulis secundo et quarto rostri tertio circiter duplo longioribus; spiraculis obsolete transversis. — *Carlisis* STÅL.

2(1). Tibiis saltem posticis dilatatis; antennis sæpius longioribus, articulo primo secundo longiore; articulo secundo rostri tertio quartoque breviore.

3(4). Spiraculis maximis, valde transversis; femoribus anterioribus subtus spinis vel tuberculis pluribus armatis; capite ante oculos brevius producto, pone tylum impressionibus duabus longitudinalibus instructo; tibiis posticis marium apice subtus spinoso-productis. — *Petillia* STÅL.

4(3). Spiraculis minoribus, minus transversis; femoribus anterioribus apice utrinque spina armatis; capite ante oculos longius producto, pone tylum impressione unica instructo.

5(6). Articulo antennarum tertio dilatato; scutello basi haud elevato; tibiis posticis marium apice subtus subdentatis. — *Oxypristis* SIGN.

6(5). Articulo antennarum tertio simplice; scutello basi transversim elevato; tibiis posticis sexuum conformibus, apice subtus inermibus. — *Petascelis* SIGN.

PETILLIA STÅL.

Petillia STÅL, H. afr. 2. p. 2. (1865). — *Trematocoris* MAYR, Verh. z.-b. Ges. Wien. 15. p. 431. (1865).

a. *Tibiis posticis prope basin fascia vel macula flavescente notatis, parte dimidia vel vix dimidia apicali simplice, subtus denticulata; margine postico metapleurorum simplice; femoribus anterioribus superne inermibus; parte laterali producta thoracis oblique antrorsum vergente; thorace basi ante scutellum truncato.* ♂. ♀. — TREMATOCORIS MAYR.

1. **P. tragus** FABR. — *Cimex tragus* FABR., Mant. 2. p. 288. 92. (1787); GMEL., S. N. 1: 4. p. 2142. 227. (1788). — *Lygæus tragus* FABR., E. S. 4. p. 135. 5. (1794); S. R. p. 104. 4. (1803)); WOLFF, Ic. 5. p. 194. f. 188. (1811). — *Cerbus tragus* H. S., W. I. 6. p. 73. f. 641. (1842). — *Mictis tragus* DALL., List. 2. p. 399. 36. (1852). — STOLL, Pun. f. 276.
Patria: China. (Mus. Holm.)

2. **P. lobipes** WESTW. — *Myctis lobipes* WESTW. in HOPE, Cat. 2. p. 11. (1842). — *Mictis lobipes* DALL., List. 2. p. 399. 37. (1852).
Patria: Bombay; China; Java. (Mus. Holm.)

aa. *Tibiis posticis macula flavescente subbasali destitutis, subtus per totam longitudinem, licet apicem versus sensim angustius dilatatis, pone medium dentibus pluribus magnis armatis; femoribus omnibus superne tuberculatis vel subspinosis; angulis lateralibus thoracis plus minus ampliatis, haud antrorsum vergentibus; margine postico metapleurorum ad angulos posticos compresso-reflexis, lobatis; segmento secundo ventris medio apicem versus compresso-elevato; thorace basi medio obtuse rotundato.* ♂.

3. **P. dentipes** A. et S. — *Mictis dentipes* A. et S., Hist. p. 190. 2. pl. 4. f. 10. (1843); DALL., List. 2. p. 397. 32. (1852).
Patria: Java.

4. **P. calcar** DALL. — *Mictis calcar* DALL., List. 2. p. 397. 33. (1852).
Patria: Ceylon. (Mus. Holm.)

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5. **P. grossa** DALL. — *Mictis grossa* DALL., List. 2. p. 398. 34. (1852).
Patria ignota.

6. **P. valida** DALL. — *Mictis valida* DALL., List. 2. p. 398. 35. (1852).
Patria: Ceylon.

7. **P. mormo** STÅL. — *Petillia mormo* STÅL, An. S. E. Fr. (4) 5. p. 174. 1. (1865).
Patria: Port Natal.

OXYPRISTIS SIGN.

SIGN., An. S. E. Fr. (3) 8. p. 937. (1861); STÅL, H. afr. 2. p. 2 et 8. (1865).

1. **O. Leroyi** SIGN. — *Oxypristis Leroyi* SIGN., An. S. E. Fr. (3) 8. p. 938. 112. pl. 14. f. 1. (1861); STÅL, H. afr. 2. p. 9. 1. (1865).
Patria: Madagascar. (Mus. Holm.)

PETASCELIS Sign.

Sign., An. S. E. Fr. (2) 5. p. 302. (1847); Dall., List. 2. p. 377. (1852); Stål, Stål, H. afr. 2. p. 5 et 9. (1865).

1. **P. remipes** Sign. — *Petascelis remipes* Sign., An. S. E. Fr. (2) 5. p. 302. pl. 3. f. 4. (1847); Dall., List. 2. p. 382. 1. (1852); Stål, H. afr. 2. p. 9. 1. (1865).
Patria: Natalia. (Mus. Holm.)

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2. **P. affinis** Dall. — *Petascelis affinis* Dall., List. 2. p. 382. 2. (1852).
Patria: Africa meridionalis.

3. **P. laminipes** Fairm. — *Petascelis laminipes* Fairm. in Thoms., Arch. 2. p. 292. 552. pl. 9. f. 5. (1858).
Patria: Gabon.

CARLISIS Stål.

Stål, Ö. V. A. F. 1858. p. 314; H. afr. 2. p. 3 et 48. (1865).

1. **C. Wahlbergii** Stål. — *Carlisis Wahlbergi* Stål, Ö. V. A. F. 1858. p. 314. 1; H. afr. 2. p. 49. 1. (1865).
Patria: Territorium lacus N'Gami. (Mus. Holm.)

Div. **Daladeraria** Stål.

DALADER A. et S.

A. et S., Hist. p. 187. (1843); Dall., List. 2. p. 377. (1852); Stål, H. afr. 2. p. 1. (1865).

In hoc genere hamus et vena decurrens alarum basi haud distant.

1. **D. acuticosta** A. et S. — *Dalader acuticosta* A. et S., Hist.. p. 188. 1. pl. 4. f. 7. (1843); Dall., List. 2. p. 381. 1. (1852). — Stoll, Pun. f. 183.
Patria: Assam, Silhet. (Mus. Holm.); Borneo.

2. **D. planiventris** Westw. — *Acanonicus planiventris* Westw. in Hope, Cat. 2. p. 8. (1842). — *Dalader rotundicosta* A. et S., Hist. p. 188. 2. (1843). — *Dalader planiventris* Dall., List. 2. p. 381. 2. (1852).
Patria: Silhet; Java; Insulæ Philippinæ; Sumatra. (Mus. Holm.)

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3. **D. africanus** Dall. — *Dalader africanus* Dall., List. 2. p. 381. 3. (1852).
Patria: Sierra Leona.

ODONTORHOPALA Stål.

Corpus modice depressum. Caput subquadratum, pone oculos subcallosum, tuberculis antenniferis libere prominulis, nonnihil distantibus, oblique truncatis, tylo inter illa tubercula distinguendo, usque a basi sensim curvato-declivi; impressione longitudinali brevi pone tylum; bucculis brevibus. Rostrum basin metasterni vix attingens, graciliusculum, articulo primo apicem versus sensim paullo incrassato, apice oblique truncato, secundo tertio longiore. Antennæ mediocres, articulis primo et secundo longitudine subæqualibus, illo crassiore, hujus parte plus quam tertia apicali incrassata, extus planiore, supra subtusque dentato-serrata, intus tuberculata; articulo tertio quarto breviore, illo reliquis graciliore. Thorax ultra medium sat convexo-declivis, apice subtruncatus, lateribus posterius alato-productis, basi ante scutellum truncata, angulis posticis obtusis, rotundatis, marginibus lateralibus anticis ante medium ruga obsoleta obtusa terminatis. Scutellum æquilaterum, basi transversim rugoso-elevatum. Corium apice, versus angulum apicalem subangustatum, leviter sinuatum, margine apicali sutura clavi nonnihil longiore. Membrana venis subundulatis, subfurcatis. Mesosternum apice subimpressum. Mesopleura et metapleura intus et extus fere æque longa, illa his nonnihil breviora. Abdomen feminarum a basi ad medium segmenti quarti sensim valde ampliatum, dein angustatum, hemelytris multo latius, segmentis ventris secundo et tertio apice versus angulos obtuse rotundatis, segmento quarto utrinque latera versus leviter ampliato, antice posticeque ibidem sinuato, segmento quinto apice truncato, segmento sexto apice segmentis genitalibus multo latiore, postice profunde acutangulariter emarginato, fere usque ad basin fisso, fissura antice plica transversa recta terminata; parte segmenti sexti ultra segmenta genitalia lateraliter prominula sinuato-truncata, angulis apicalibus subrectis; segmentis genitalibus dorsalibus transversis, apice obtuse sinuatis, antico retrorsum haud angustato. Femora subtus spinis obtusiusculis remotis duplice serie positis armata, apicem versus sensim leviter incrassata, postica apud feminas reliquis paullo crassiora, recta. Tibiæ posticæ, feminarum saltem, rectæ, graciliusculæ, superne sulcatæ, haud compressæ, longitudine femorum.

Præcedenti proximum genus, tuberculis antenniferis minus crassis, magis distantibus, structura antennarum, quarum articulus secundus, nec tertius, est apice ampliatus, thorace basi ante scutellum truncato, angulis posticis rotundatis, scutello basi transversim elevato, abdomine pone medium segmenti quarti, nec pone apicem segmenti tertii, angustato, segmento abdominis sexto apice, apud feminas saltem, latiore, segmento ventrali sexto profundius et acutius emarginato, alarum hamo et vena decurrente basi distantibus, femoribusque minus dense spinosis differt.

1. **O. callosa** Stål. — Pallide grisco-flavescens, fusco-ferrugineo-punctatus, hic illic in ferrugineum vergens; clava articuli secundi antennarum scutelloque nigris, hujus apice maculaque parva media in ruga antica flavescentibus; membrana ochracea, fusco-nebulosa; abdomine ferrugineo, dorso infra hemelytra nec non macula marginali basali segmentorum secundi, tertii et sexti sordide flavescentibus; alis vinaceis. ♀. Long. 21, Lat. hem. 6, Lat. abd. 12 mill.

♀. Pedibus posticis paullo distantibus, femoribus levissime incrassatis; segmento abdominis sexto apice segmentis genitalibus multo latiore.

Patria: Madagascar. (Mus. Vien.)

Quoad staturam ad *Dalad. acuticostam* appropinquat. Caput subtiliter, thorax, hemelytra et pectus distincte punctata; thoracis parte laterali producta foliacea, apice rotundata, oblique antrorsum prominente, leviter curvata, nonnihil latiore quam longiore, subtilius punctata, margine posterius obsolete erosula, marginibus lateralibus anticis minute acutiuscule tuberculatis; macula arcuata ante medium thoracis nigro-fusca. Scutellum impunctatum, transversim subrugosum. Corium hic illic infuscatum, venis læviusculis. Articulus primus antennarum nigro-punctulatus, supra subtusque tuberculato-subspinosus. Femora nigro-punctata. Tibiæ anteriores apice, posticæ basi fuscæ. Abdomen angulis apicalibus segmenti tertii acute prominentibus, segmento quarto extus angulato-rotundato, segmento quinto extus in medio in dentem obtusiusculum prominulo.

Div. **Brachytaria** Stål.

Conspectus generum.

1(2). Antennis teretibus, articulo tertio compresso, quarto tertio sublongiore; femoribus spinosis; margine postico metapleurorum sensim subrotundato; corpore minus depresso. — *Brachytes* Dall.

2(1). Antennarum articulis tribus basalibus triquetris, quarto tertio breviore; femoribus inermibus; margine postico metapleurorum versus medium obtuse angulato; corpore magis depresso. — *Elasmogaster* Stål.

BRACHYTES Westw.

Westw. in Hope, Cat. 2. p. 8. (1842); Dall., List. 2. p. 377. (1852).

1. **B. bicolor** Westw. — *Brachytes bicolor* Westw. in Hope, Cat. 2. p. 8. (1852); Dall., List. 2. p. 379. 1. (1852).

Patria: India orientalis. (Mus. Holm.); Bombay; Bengalia.

Mas mibi ignotus.

ELASMOGASTER Stål.

Stål, Ö. V. A. F. 1853. p. 259; H. afr. 2. p. 4 et 62. (1865).

1. **E. africanus** Dall. — *Brachytes africanus* Dall., List. 2. p. 379. 2. (1852). — *Elasmogaster brunnescens* Stål, Ö. V. A. F. 1855. p. 27. 1. — *Elasmogaster africanus* Stål, H. afr. 2. p. 62. 1. (1865).

Patria: Caffraria. (Mus. Holm.)

Div. **Homoeoceraria** Stål.

Conspectus generum. [1])

1(2). Tylo inter tubercula antennifera usque a basi sensim vel subsubito declivi; segmento ventrali sexto feminarum pone plicam angulatam fisso, postice emarginato, medio quam latera versus

[1]) Cave, ne cum generibus hujus divisionis, quæ mundum antiquum inhabitant, genera quædam americana, ex. gr. *Sarium, Lupanthum*, confundas.

breviore; segmentis genitalibus feminæ dorso triplo latioribus quam longioribus; hemelytris apicem abdominis attingentibus vel subattingentibus. — *Homoeocerus* BURM.

2(1). Tylo inter tubercula antennifera haud declivi, spatium inter illa replente et ante eadem paullo producto; segmento ventrali sexto feminarum postice truncato, in medio leviter emarginato, haud fisso, plica destituto, ubique fere æque longo; segmentis genitalibus feminæ dorso circiter duplo latioribus quam longioribus, proportionaliter angustioribus et longioribus quam in genere præcedente; hemelytris apicem abdominis haud attingentibus. — *Aschistus* STÅL.

HOMOEOCERUS BURM.

Homoeocerus BURM., Handb. 2: 1. p. 316. (1835); DALL., List. 2. p. 438. (1852); STÅL, H. afr. 2. p. 5. (1865). — *Ceratopachys* WESTW. in HOPE, Cat. 2. p. 22. (1842); DALL., List. 2. p. 486. (1852); STÅL, H. afr. 2. p. 5 et 68. (1865). — *Prismatocerus* A. et S., Hist. p. 185. (1843); STÅL, H. afr. 2. p. 5 et 63. (1865). — *Philonus* DALL., List. 2. p. 438 et 448. (1852). — *Ornytus* p. DALL., List. 2. p. 438 et 447. (1852); STÅL, H. afr. 2. p. 5 et 69. (1865). — *Tliponius* STÅL, Ö. V. A. F. 1859. p. 464; H. afr. 2. p. 5. (1865). — *Anacanthus* UHLER, Pr. Ac. Phil. 1860. p. 227. — *Anacanthocoris* UHLER, Pr. Ac. Phil. 1861. p. 287. — *Diocles* STÅL, H. afr. 2. p. 5 et 68. (1865). — *Tagus* STÅL, H. afr. 2. p. 5 et 67. (1865).

a. *Thorace anterius nonnihil depresso, angulis lateralibus in processum latum, apice angulatum, productis; antennis validis, articulis basalibus duobus triquetris, tertio compresso, quarto tertio breviore; articulis omnibus rostri longitudine subæqualibus; hemelytris maculis lævigatis irregulariter conspersis; pedibus posticis valde distantibus.* — PRISMATOCERUS A. et S.

1. **H. magnicornis** BURM. — *Homoeocerus magnicornis* BURM., Handb. 2: 1. p. 316. 2. (1835). — *Prismatocerus auritulus* A. et S., Hist. p. 185. 1. pl. 4. f. 3. (1843); STÅL, H. afr. 2. p. 63. 1. (1865). — *Ceratopachys magnicornis* DALL., List. 2. p. 503. 8. (1852).
Patria: Terra capensis. (Mus. Holm).
Segmentum genitale maris apice sat profunde bisinuatum.

2. **H. auriculatus** STÅL. — *Prismatocerus auriculatus* STÅL, H. afr. 2. p. 64. 2. (1865).
Patria: Caffraria. (Mus. Holm.)

aa. *Thoracis angulis lateralibus haud vel levissime prominulis vel sensim acuminato-productis; pedibus posticis minus distantibus.*

b. *Metanoto nigro; angulis lateralibus thoracis rotundatis; membrana nigro-fusca.* — (Sp. 3—5).

c. *Articulo antennarum primo capite circiter dimidio longiore, tertio apicem versus utrinque leviter compresso, quarto tertio breviore; dorso abdominis marginibus lateralibus, segmento sexto segmentisque genitalibus feminæ nigris; articulis tribus basalibus vel omnibus rostri longitudine subæqualibus.* — PHILONUS DALL.

3. **H. plagiatus** GERM. — *Homoeocerus plagiatus* GERM. in SILB., Rev. 5. p. 147. 63. (1837). — *Philonus nigrovittatus* STÅL, Ö. V. A. F. 1855. p. 29. 1. — *Ceratopochys plagiatus* DALL., List. 2. p. 502. 6. (1852). — *Prismatocerus plagiatus* STÅL, H. afr. 2. p. 66. 5. (1865).
Patria: Terra capensis, Caffraria. (Mus. Holm.)

4. **H. insubidus** GERM. — *Homoeocerus insubidus* GERM. in SILB., Rev. 5. p. 147. 62. (1837). — *Philonus fuscus* DALL., List. 2. p. 448. 2. pl. 12. f. 6. (1852). — *Philonus insubidus* DALL., List. 2. p. 449. 3. (1852). — *Philonus natalensis* STÅL, Ö. V. A. F. 1855. p. 29. 2. — *Prismatocerus insubidus* STÅL, H. afr. 2. p. 66. 6. (1865).
Patria: Terra capensis, Caffraria. (Mus. Holm.)
Typus generis *Philoni* DALL.

cc. *Antennis brevibus, teretibus, articulo primo capite paullo longiore, quarto tertio longitudine subæquali vel paullo longiore; articulo secundo rostri tertio longiore; macula segmenti sexti dorsalis maris, segmentis dorsalibus genitalibus feminæ fere totis nigris.*

5. **H. annulatus** THUNB. — *Alydus annulatus* THUNB., H. rostr. cap. 3. p. 4. (1822). — *Homoeocerus nigripes* BURM., Handb. 2: 1. p. 316. 3. (1835); A. et S., Hist. p. 203. 1. (1843). — *Gonocerus marginellus* WESTW. in HOPE, Cat. 2. p. 25. (1842). — *Philonus nigripes* DALL., List. 2. p. 448. 1. (1852). — *Ornytus annulatus* STÅL, H. afr. 2. p. 70. 2. (1865).
Patria: Terra capensis. (Mus. Holm.)

bb. *Metanoto flavescente vel rufescente; angulis lateralibus thoracis plerumque distinctis.*

d. *Oculis brevissime stylatis, magnis; articulo primo antennarum capite vix longiore, articulis duobus ultimis fere æque longis; articulis rostri fere æque longis.* — CERATOPACHYS WESTW.

6. **H. nigricornis** GERM. — *Homoeocerus nigricornis* GERM. in SILB., Rev. 5. p. 148. 65. (1837). — *Ceratopachys capensis* WESTW. in HOPE, Cat. 2. p. 22. (1842). — *Ceratopachys nigricornis* DALL., List. 2. p. 503. 7. (1852); STÅL, H. afr. 2. p. 69. 1. (1865). — *Tliponius rugifer* STÅL, Ö. V. A. F. 1859. p. 465. 9.
Patria: Terra capensis, Caffraria. (Mus. Holm.)

dd. *Oculis sessilibus; articulo primo antennarum capite distincte et plerumque multo longiore.*

e. *Plica segmenti sexti ventralis feminarum postice rotundato, prope apicem segmenti posita, angulis fissuralibus denticulo acuto retrorsum prominulo armatis; antennis teretibus, sat longis, articulo quarto tertio longitudine subæquali vel paullo longiore; articulo secundo rostri tertio paullo longiore; dorso abdominis postice nigro; membrana fusca.*

7. **H. pallens** FABR. — *Cimex pallens* FABR., Spec. 2. p. 363. 149. (1781); Mant. 2. p. 299. 195. (1787); GMEL., S. N. 1: 4. 2171. 384. (1788). — *Lygæus pallens* FABR., E. S. 4. p. 152. 58. (1794); S. R. p. 221. 76. (1803). — *Coreus alternans* WESTW. in HOPE, Cat. 2. p. 24. (1842). — *Ornytus alternans* DALL., List. 2. p. 447. 1. (1852); STÅL, H. afr. 2. p. 70. 1. (1865).
Patria: Sierra Leona, Calabar. (Mus. Holm.)

ee. *Plica segmenti sexti ventris feminarum mihi cognitarum angulata, plerumque ab apice segmenti remota, angulis fissuralibus inermibus, obtusis; articulo secundo rostri tertio plerumque breviore; membrana rarissime distinctius infuscata; dorso abdominis apice raro fusco vel nigricante.*

f. *Articulis tribus basalibus rostri longitudine subæqualibus; antennis crassiusculis, articulo tertio quarto breviore, articulis duobus basalibus plus minus distincte triquetris; marginibus thoracis lateralibus concoloribus; lateribus pectoris maculis punctiformibus nigris destitutis.*

8. **H. bicolor** GERM. — *Homoeocerus bicolor* GERM. in SILB., Rev. 5. p. 148. 64. (1837). — *Ceratopachys ruficornis* DALL., List. 2. p. 500. 1. (1852). — *Prismatocerus bicolor* STÅL, H. afr. 2. p. 65. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

9. **H. discolor** STÅL. — *Prismatocerus discolor* STÅL, H. afr. 2. p. 65. 4. (1865).
Patria: Caffraria. (Mus. Holm.)

ff. *Articulis secundo et tertio rostri longitudine plerumque distinctissime inæqualibus.*

g. *Abdomine utrinque sat rotundato-ampliato; articulis duobus apicalibus rostri æque longis, singulatim secundo longioribus; margine apicali corii fere toto rotundato, ad angulum apicalem vix productum leviter sinuato; membrana vitrea.* — DIOCLES STÅL.

10. **H. dilutus** STÅL. — *Diocles dilutus* STÅL, H. afr. 2. p. 68. 1. (1865).
Patria: Caffraria. (Mus. Holm.)
Femina ignota.

gg. *Abdomine haud vel leviter ampliato; margine apicali corii non nisi prope apicem clavi leviter rotundato, versus angulum apicalem plus minus productum sensim sinuato; articulo secundo rostri tertio plerumque breviore.*

h. *Articulo tertio rostri quarto longiore; lateribus pectoris maculis parvis duabus vel tribus nigris interdum ægre distinguendis notatis.* — TAGUS STÅL.

11. **H. productus** STÅL. — *Tagus productus* STÅL, H. afr. 2. p. 67. 1. (1865).
Patria: Sennaar. (Mus. Holm.); Senegal.
Articulus antennarum tertius quarto circiter duplo et dimidio longior.

12. **H. virescens** DALL. — *Ceratopachys virescens* DALL., List. 2. p. 500. 2. (1852).
Patria: Natalia. (Mus. Holm.)
Exemplum unicum femininum, articulo ultimo antennarum segmentisque ultimis ventris mutilis, examinavi.

13. **H. inornatus** STÅL. — Pallide olivaceo-flavescens; puncto medio mesopleurorum et metapleurorum nigro, sæpe obsoleto; membrana sordide hyalina, angulo basali obscuriore; alis obsoletissime infuscatis. ♂. ♀. Long. 13—16, Lat. 4—$4\frac{1}{2}$ mill.

♂. Abdomine haud ampliato; segmento dorsali ultimo postice rotundato, utrinque subsinuato, segmento genitali integro, apice in medio obtutissime rotundato-producto.

♀. Abdomine vix ampliato; segmento ventrali sexto postice obtuse lateque angulato-sinuato.
Patria: Pondichery. (Mus. Holm.); China. (Coll. SIGNORET.)

Colore pallido antennisque sat validis, distinctissime triquetris, insignis. Thorax, scutellum, hemelytra, plerumque etiam pectus sat dense et distincte punctata. Caput et venter obsolete punctulata. Antennæ corpore paullo breviores, articulo primo reliquis crassiore, capite circiter duplo longiore, triquetro; articulo secundo primo distincte nonnihil longiore, triquetro; articulo tertio primo longitudine subæquali, triquetro, compresso, basin versus sensim angustato, apicem versus tertio vix vel paullo latiore; articulo quarto brevi, quarto plus dimidio breviore. Caput pone oculos obsolete callosum. Rostrum articulo tertio quarto dimidio longiore. Thorax angulis lateralibus acutiusculis, nonnihil productis, leviter sursum vergentibus. Margo apicalis corii sæpe pallescens, in albidum vergens. Antennæ basin versus interdum incarnatæ.

14. **H. biplagiatus** Stål. — Subolivaceo-flavescens; fascia latissima subbasali thoracis hemelytrisque obscure subferrugineis, corio medio macula magna transversa sordide flavo-albida notato; antennis infuscatis, articulis secundo tertioque apicem versus nigris, hoc dilatato, basin versus lutescente; vitta angusta laterali capitis, granulis marginum lateralium thoracis, macula punctiformi mesopleurorum et metapleurorum, nigris; dorso abdominis dilute subsanguineo; connexivi segmentis fasciis tribus infuscatis ornatis. ♀. Long. 21, Lat. 6¾ mill.

♀. Abdomine vix ampliato; segmento ventrali sexto late obtuseque angulato-sinuato.

Patria: Bombay. (Mus. Holm.)

Rostrum exempli descripti mutilum; propter magnam affinitatem cum sequente in hac divisione locatus. Totus, licet in capite et ventre subtilius, punctatus. Antennæ minus graciles, sat longæ; articulo primo thorace nonnihil breviore, distincte triquetro; secundo primo longiore et graciliore, triquetro; tertio a basi apicem versus supra subtusque sensim dilatato, apicem versus articulo secundo duplo latiore, apice sinuato, articulo primo nonnihil breviore; articulo quarto mutilo in exemplo descripto. Ocelli ad oculos valde appropinquati, dilute subsanguinei. Thorax brevissime pilosulus, antrorsum valde declivis, angulis lateralibus rectis, apice subacuminatis, distincte nonnihil prominulis. Scutellum prope apicem infuscatum. Hemelytra remotissime subsericea, maculis lævigatis et denudatis irregulariter conspersa, margine imo costali olivaceo-flavescente. Spiracula paullo ante medium segmentorum ventris posita. Segmenta dorsalia abdominis exempli descripti magnam ad partem mutila. Membrana infuscata, basi obscurior.

15. **H. sigillatus** Stål. — Olivaceo-flavescens; articulis secundo et tertio antennarum apicem versus infuscatis; vitta punctaria laterali capitis, granulis marginum lateralium thoracis, maculis sat magnis lateralibus dorsi crocei abdominis nigris; fascia lata subbasali thoracis hemelytrisque subferrugineis, corio medio ad angulum interiorem macula magna flavo-albida subrotundata ornato, margine costali anguste pallido; membrana infuscata, angulo basali obscuriore; alis sordide hyalinis. ♀. Long. 18, Lat. 6 mill.

♀. Abdomine vix ampliato; segmento ventrali sexto apice late obtuseque angulato-sinuato.

Patria: India orientalis borealis. (Coll. Signoret).

Præcedenti quoad staturam, puncturam et picturam maxime affinis, differt antennis gracilioribus, articulis basalibus obsoletius triquetris, articulo tertio multo minus et tantum apicem versus dilatato, angulis lateralibus thoracis apice minus acutis, quod tamen certe variat, macula corii haud transversa, pictura dorsi abdominis, connexivo fasciis destituto. Articulus quartus antennarum mutilus in exemplo descripto. Rostri articulus tertius quarto dimidio longior. Ocelli dilute subsanguinei, ad oculos valde appropinquati.

hh. *Articulis tertio et quarto rostri æque longis vel tertio quarto breviore; metasterno basi sinuato, angulis posticis acutis, productis.*

i. *Antennarum articulo quarto tertio semper distincte breviore, articulis primo et tertio æque longis vel primo tertio breviore, primo thorace plerumque breviore; corpore minus angustato; abdomine subampliato, lateribus leviter reflexis; lateribus pectoris maculis punctiformibus tribus vel duabus nigris plerumque notatis; angulo basali vel margine basali membranæ haud obscurato.* — (Sp. 16—21).

k. *Marginibus lateralibus anticis thoracis concoloribus, haud pallescentibus; corio macula parva discoidali fusca destituto; mesosterno saltem anterius leviter obtuseque sulcato; spiraculis ventris annulo fusco vel nigro cinctis; apice imo clavi fusco vel nigro; articulis secundo et tertio antennarum simplicibus.*

l. *Thorace scutelloque linea percurrente lævigata notatis; margine postico segmenti ventralis sexti feminarum prope fissurum haud angulato-ampliato.*

16. **H. marginiventris** A. Dohrn. — *Homoeocerus marginiventris* A. Dohrn, Stett. E. Z. 21. p. 402. 40. (1860).

Patria: Ceylon. (Coll. A. Dohrn.)

♀. Caput pone impressionem anteriorem granulis nigris in series duas longitudinales positis instructum, inter series, uti videtur, subsulcatum. Articulus quartus rostri tertio distincte nonnihil longior. Antennarum articuli primus et tertius æque longi, secundus et tertius nigricantes, quod certe variat, primus triqueter, quartus tertio tertia parte brevior. Thorax marginibus lateralibus concoloribus, angulis lateralibus rectis, nonnihil prominulis, posterius subsinuatis. Hemelytra macula parva fusca discoidali destituta. Mesosternum totum leviter obtuseque sulcatum. Spiracula nigro-cincta. Margo abdominis maculis parvis nigris, tribus in plurimis segmentis positis, ornatus. Latera pectoris maculis tribus parvis nigris ornata.

17. **H. lævilineus** STÅL. — Præcedenti valde affinis, differt statura paullo angustiore, antennarum articulis secundo et tertio paullo crassioribus, tertio primo sublongiore, hoc proportionaliter breviore, quarto tertio fere dimidio breviore, angulis lateralibus thoracis apice rotundatis, vix vel minus prominulis, pectore maculis punctiformibus nigris nullis vel obsoletissimis, margine abdominis immaculato. ♀. Long. 11, Lat. 3 mill.

♂. Abdominis segmento dorsali sexto minus obtuse rotundato, angulis posticis obtusis; segmento genitali integro, postice rotundato, apice in medio vix sinuato.

Patria: Ceylon. (Mus. Vien.)

Specimen valde mutilatum, mesosterno acu percusso, examinavi. Femina ignota.

ll. *Thorace linea lævigata nulla vel tantum anterius distinguenda instructo; margine postico segmenti ventralis sexti feminæ prope fissuram utrinque in angulum obtusum ampliato.*

18. **H. singalensis** STÅL. — *Tliponius cingalensis* STÅL, Ö. V. A. F. 1859. p. 465. 6.

Patria: China borealis; Amoy. (Mus. Holm.); Ceylon.

Anguli laterales thoracis rotundati, haud prominuli. Articulus secundus antennarum apice nigrescit.

kk. *Marginibus lateralibus anticis thoracis pallidioribus; corio macula parva discoidali fusca vel nigra, plerumque distincta, notato; spiraculis ventris haud nigro-cinctis, pallidis; margine postico segmenti ventralis sexti feminarum utrinque prope fissuram in angulum rectum vel subacutum ampliato.*

m. *Articulis secundo et tertio antennarum simplicibus, tertio apice supra subtusque non nisi obsoletissime subcompresso; mesosterno obsolete obtusissimeque subsulcato: pectore maculis punctiformibus nigris notato.*

19. **H. unipunctatus** THUNB. — *Cimex unipunctatus* THUNB., N. ins. sp. 2. p. 38. t. 2. f. 52. (1783). — *Tliponius unipunctatus* STÅL, Berl. E. Z. 10. p. 160. 7. (1866).

Patria: Japonia; China, Hongkong. (Mus. Holm.)

Connexivum nigro-punctulatum. Pictura dorsi abdominis variat.

20. **H. marginellus** H. S. — *Gonocerus marginellus* H. S., W. I. 6. p. 7. f. 562. (1842). — *Homoeocerus unipunctatus* DALL., List. 2. p. 447. 11. (1852). — *Tliponius marginellus* STÅL, Berl. E. Z. 10. p. 160. (1866).

Patria: Java? (Mus. Holm.); Cochinchina. (Coll. SIGNORET.)

Connexivum pallidum, punctis nigris destitutum.

mm. *Articulis antennarum secundo tertioque apice nigris et ibidem supra subtusque distincte nonnihil compresso-ampliatis; mesosterno haud sulcato; pectore maculis punctiformibus nigris destituto.*

21. **H. puncticornis** BURM. — *Coreus puncticornis* BURM., N. act. Ac. Leop. 16: Suppl. p. 295. 20. (1834). — *Homoeocerus puncticornis* BURM., Handb. 2: 1. p. 316. 1. (1835); DALL., List. 2. p. 446. 10. (1852).

Patria: Insulæ Philippinæ. (Mus. Holm.)

Antennarum articulus primus variat apice niger vel concolor, articulus quartus tertio paullo brevior, tertius primo longitudine æqualis vel fere longior.

ii. *Antennarum*[1] *articulo quarto tertio rarissime paullo breviore, plerumque longiore vel longitudine æquali; articulo primo tertio semper distincte longiore, thorace raro paullo breviore; corpore angusto; abdomine haud vel levissime ampliato, lateribus valde reflexis; pectore raro maculis nigris notato; margine basali vel angulo basali membranæ plerumque obscurato vel fusco; angulo apicali corii longe producto; articulo secundo rostri tertio plerumque breviore.* — ANACANTHUS UHLER = ANACANTHOCORIS UHLER.

n. *Lateribus pectoris maculis parvis duabus vel tribus nigris notato; antennis gracilibus; feminæ ignotæ.*

22. **H. limbatipennis** STÅL. — *Tliponius limbatipennis* STÅL, Ö. V. A. F. 1859. p. 464. 3.

Patria: Sumatra. (Mus. Holm.); Celebes.

Articulus primus antennarum teres, thorace nonnihil longior, articuli reliqui —? Articulus tertius rostri secundo nonnihil longior, tertio brevior. Segmentum genitale maris apice integrum, subsinuato-truncatum.

23. **H. fasciolatus** STÅL. — Olivaceo-flavescens, supra obscurior; hemelytris sordide ferrugineis, margine costali olivaceo-flavescente, fascia media, nonnihil pone apicem clavi posita, extus abbreviata, albicante; margine basali thoracis ante scutellum pallido, lævigato; membrana infuscata, angulo basali venaque intima nigris; alis

[1]) Antennæ exemplorum mihi cognitorum *H. limbatipennis, javanici, fasciolati, albiventris* et *lineaticollis* plus minus mutilæ.

leviter infuscatis; dorso abdominis dilute croceo, apicem versus in sanguineum vergente, segmento sexto utrinque ad connexivum nigro-marginato; mesopleuris et metapleuris macula parva nigra notatis; antennis sordide ferrugineis. ♂. Long. 13, Lat. $3\frac{3}{4}$ mill.

♂. Segmento dorsali ultimo apice rotundato; segmento genitali posterius subdepresso, apice biinciso.
Patria: India orientalis borealis. (Coll. SIGNORET.)

H. maculæ DALL., affinis videtur, sed angulis lateralibus thoracis acutiusculis, nonnihil productis et subreflexis, corio fascia albicante ornato, divergit. Distincte punctulata, ventre læviusculo, punctis capitis et thoracis fuscis. Oculi sat magni. Rostrum articulo secundo tertio paullo breviore, tertio quarto distincte nonnihil breviore. Antennæ gracillimæ, articulo primo tertiusculo, thorace paullo breviore, secundo et tertio simplicibus, secundo primo longiore, tertio primo breviore, quarto —? Thorax marginibus lateralibus anticis anguste infuscatis, in medio obsoletissime subserratis. Scutellum apice pallidum et læve. Hemelytra in clavo distinctius, in corio subtilius punctata, maculis parvis lævigatis irregulariter remoteque conspersa.

nn. *Lateribus pectoris immaculatis.*

o. *Segmento ventrali sexto feminarum apice late obtuseque angulato-emarginato: articulo secundo rostri tertio breviore.* — (Sp. 24—35).

p. *Membrana ad apicem anguli apicalis exterioris corii macula marginali fuscescente obsoleta notato.*

24. **H. albiventris** DALL. — *Homoeocerus albiventris* DALL., List. 2. p. 444. 4. (1852).
Patria: Birma. (Mus. Holm.)
Dorsum abdominis exempli nostri dilute subcroceum, lateribus subsanguineo-maculatis. Antennæ gracillimæ, articulo primo thorace nonnihil longiore, quarto —? Rostri articulus tertius secundo longior, quarto brevior.

pp. *Membrana pone apicem clavi macula fuscescente destituto.*

q. *Thorace inter angulos laterales fascia nigricante notato, pone fasciam plerumque in subsanguineum vergente; hemelytris normaliter incarnatis, postice in areolis corii macula pallida, in exemplis pallidis ægre vel haud distinguenda, notatis; antennarum articulo quarto tertio longitudine subæquali vel paullo breviore, primo thoraci longitudine æquali.*

25. **H. fascifer** STÅL. — *Tliponius fascifer* STÅL, Ö. V. A. F. 1859. p. 465. 7. — *Homoeocerus fascifer* STÅL, Ö. V. A. F. 1870. p. 649. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)
Segmentum genitale maris integrum, apice in medio late obtuseque rotundato-angulato-producto.

26. **H. fasciatus** STÅL. — *Homoeocerus fasciatus* STÅL, Ö. V. A. F. 1870. p. 649. 3.
Patria: Insulæ Philippinæ. (Mus. Holm.)
Mas ignotus.

qq. *Thorace fascia posteriore nigricante destituto.*

r. *Antennis minus gracilibus; segmento genitali marium mihi cognitorum apice biinciso vel biemarginato, vel saltem in medio obtuse angulato-producto; plica segmenti ventralis sexti feminarum, uti in plurimis congenericis, ab apice segmenti sat longe remota; corio macula rotundata pallida una vel nulla notato.*

s. *Punctis thoracis hemelytrorumque maxima parte fuscis vel subferrugineis.*

27. **H. bipustulatus** STÅL. — *Homoeocerus bipustulatus* STÅL, Ö. V. A. F. 1870. p. 650. 4.
Patria: Insulæ Philippinæ. (Mus. Holm.)

28. **H. punctum** DALL. — *Homoeocerus punctum* DALL., List. 2. p. 446. 7. (1852).
Patria: Pulo Loz. (Mus. Holm.); Corea?
Exemplum, quod dubius ad hanc speciem refero, ab *H. bipustulato* differt articulis secundo et tertio antennarum apice minus ampliatis, dorso abdominis apice fusco, apice tarsorum nigricante. Articulus quartus antennarum tertio distinctissime nonnihil longior. Mas ignotus.

29. **H. albiguttulus** STÅL. — Præcedentibus duobus maxime affinis, differt tantum tylo paullo ante tubercula antennifera prominulo, antennis, uti videtur, nonnihil longioribus, articulis secundo et tertio apice a latere visis obsoletissime subampliatis, thorace linea longitudinali subpercurrente lævi sat distincta et præsertim forma segmenti genitalis maris. ♂. Long. $16\frac{1}{2}$, Lat. 4 mill.

♂. Segmento dorsali ultimo postice rotundato; segmento genitali integro, apice in medio levissime obtusissimeque subangulato-producto.
Patria: Cochinchina. (Coll. SIGNORET.)
Articulus primus antennarum thoraci longitudine subæqualis, quartus —? Margo basalis thoracis anguste lævigatus.

30. **H. urbanus** Stål. — Præcedentibus iterum maxime affinis, differt antennis brevioribus, articulo primo thorace paullo breviore, apice haud nigro, articulis secundo et tertio apice obsoletissime subampliatis, jugis tyloque a supero visis æque longe prominulis. ♀. Long. $17\frac{1}{2}$, Lat. $4\frac{1}{2}$ mill.
Patria: Ternate. (Mus. Holm.)

31. **H. immaculipennis** Stål. — Præcedentibus maxime affinis, mox differt corio macula pallida læviuscula vel obsoletius punctata destituto; antennarum articulis tribus basalibus apice nigris, primo thorace paullo breviore, secundo et tertio apice obsolete subampliatis, marginibus thoracis paullo distinctius, licet semper obsolete, subserrulatis. ♀. Long. 17, Lat. 4 mill.
Patria: Cochinchina. (Mus. Holm.)
In pectore ad coxas adest in exemplo descripto vitta albicans, per ventrem obsolete continuata, uti in congenericis pluribus affinibus certe sæpe deficiens. Tubercula antennifera et tylus a supero visa æque longe prominula. Articulus quartus antennarum —?

ss. *Punctis thoracis hemelytrorumque concoloribus; macula corii nulla vel in areola apicali interiore posita.*

32. **H. immaculatus** Stål. — *Homoeocerus immaculatus* Stål, Ö. V. A. F. 1870. p. 650. 5.
Patria: Insulæ Philippinæ. Mus. Holm.)

33. **H. graminis** Fabr. — *Lygæus graminis* Fabr., S. R. p. 216. 55. (1803). — *Homoeocerus graminis* Stål, H. Fabr. 1. p. 59. 2. (1868).
Patria: India orientalis.

34. **H. concoloratus** Uhler. — *Anacanthus concoloratus* Uhler. Pr. Ac. Phil. 1860. p. 225.
Patria: China, Amoy. (Mus. Holm.)
A præcedente vix distinguendus. In exemplo uno adest macula corii obsoletissima pallescente.

rr. *Antennis gracillimis; segmento genitali marium apice in medio biinciso, marginibus incisurarum tamen contiguis, incisuris sulcos simulantibus, spatio inter incisuras processu subreflexo, obtuso et sulcato repleto; plica segmenti sexti ventralis feminarum longe versus apicem segmenti extensa; margine apicali segmentorum anteriorum ventris latera versus subcalloso.*

35. **H. javanicus** Dall. — *Gonocerus ? abbreviatus* H. S., W. I. 6. p. 81. f. 652. (1842). — *Homoeocerus javanicus* Dall., List. 2. p. 444. 2. (1852).
Patria: Java. (Mus. Holm.)

oo. *Margine postico segmenti ventralis sexti feminarum utrinque prope fissuram in angulum ampliato.*

t. *Thorace linea lævigata longitudinali percurrente instructo; mesosterno anterius obsolete subsulcato.*

36. **H. lineaticollis** Stål. — Subolivaceo-flavescens, supra fusco-punctatus, macula corii ad angulum interiorem pallida; membrana leviter infuscata, angulo basali venaque intima nigricantibus. ♀. Long. 14, Lat. 4 mill.
Patria: Borneo. (Mus. Holm.)
Situ maculæ pallidæ corii cum *H. albiventri* congruens. Antennæ exempli descripti fere totæ mutilæ, articulo primo sat gracili, thorace paullo longiore. Rostrum articulo secundo tertio breviore, articulis tertio et quarto longitudine subæqualibus. Thorax parte apicali limboque laterali punctis decoloribus instructis, margine basali lineaque longitudinali percurrente lævigatis, hac in disco distinctiore et subcallosa, angulis lateralibus obtusis, haud prominulis, marginibus lateralibus ante medium obtuse obsoletissimeque crenulatis. Scutellum postice pallidum. Hemelytra venis lævigatis, margine costali pallido, læviusculo vel dilute punctato. Pectus distincte, latera ventris obsolete punctata. Dorsum abdominis dilute croceum, lateribus subsanguineis, lateribus segmenti sexti intra marginem, nec non macula laterali segmentorum genitalium nigricantibus. Mesosternum anterius subsulcatum. Alæ levissime infuscatæ.

tt. *Thorace linea longitudinali lævigata destituto; angulo apicali corii longissime producto, apicem versus valde angustato; antennis longissimis, gracillimis.*

37. **H. tenuicornis** Stål. — Pallide olivaceo-virescens, dilute punctatus; antennis ferrugineo-olivaceis, gracillimis, articulo quarto ultra medium albicante; margine scutellari clavi nec non nebula postica corii fuscis, hac nebula macula pallida in areola postica exteriore posita notata, antrorsum prope marginem costalem ramum angustum emittente; membrana sordide hyalina, margine basali venaque intima fuscis. ♀. Long. 21, Lat. 5 mill.
Patria: Singapur. (Mus. Holm.)
Statura structuraque antennarum ad *H. angulatum* appropinquat, angulis thoracis tamen haud productis. Thorax subtiliter, scutellum, hemelytra et pectus distinctius punctata. Antennæ articulo primo thorace longiore, quarto tertio fere longiore. Rostrum articulo secundo tertio longiore, quarto tertio multo longiore. Thorax angulis lateralibus obtusis, vix prominulis, marginibus lateralibus vix perspicue subcrenulatis. Hemelytra obsolete subincarnata. Dorsum abdominis pone medium lateribus sanguineis. Articulus primus tarsorum posticorum arti-

culis duobus ultimis fere dimidio longior. Corpus subtus vitta laterali subeburnea, per caput, pectus et ventrem ducta, in pectore distinctissima, interdum certe deficiente vel obsoletissima, notatum. Alæ levissime infuscatæ.

38. **H. angulatus** Westw. — *Homoeocerus angulatus* Westw. in Hope, Cat. 2. p. 22. (1842); Dall., List. 2. p. 444. 1. (1852).
Patria: Malacca. (Mus. Holm.); Malabar.

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39. **H. abbreviatus** Fabr. — *Lygæus abbreviatus* Fabr., E. S. 4. p. 150. 51. (1794); S. R. p. 219. 67. (1803). — *Homoeocerus abbreviatus* Stål, H. Fabr. 1. p. 59. 1. (1868).
Patria: India orientalis.

40. **H. biguttatus** Westw. — *Homoeocerus 2-guttatus* Westw. in Hope, Cat. 2. p. 22. (1852). — *Homoeocerus biguttatus* Dall., List. 2. p. 444. 3. (1852).
Patria: India orientalis.

41. **H. serrifer** Westw. — *Coreus serrifer* Westw. in Hope, Cat. 2. p. 24. (1842).
Patria: Java.

42. **H. macula** Dall. — *Homoeocerus macula* Dall., List. 2. p. 445. 5. (1852).
Patria: India orientalis.

43. **H. gutta** Dall. — *Homoeocerus gutta* Dall., List. 2. p. 445. 6. (1852).
Patria ignota.
Pictura membranæ ad *H. albidiventrem* appropinquat.

44. **H. chinensis** Dall. — *Homoeocerus chinensis* Dall., List. 2. p. 447. 12. (1852).
Patria: Hongkong.

45. **H. prominulus** Dall. — *Ceratopachys prominulus* Dall., List. 2. p. 501. 3. (1852)
Patria: Bombay.

46. **H. cordiger** Stål. — *Tliponius cordiger* Stål, Ö. V. A. F. 1859. p. 465. 8.
Patria: Tranquebar.
Ab *H. prominulo* forte haud distinguendus. Quoad picturam et puncturam hemelytrorum ad *H. biplagiatum* et *sigillatum* appropinquat. Ocelli ad oculos valde appropinquati. Articuli tertius et quartus rostri æque longi. Articulus primus antennarum subtriqueter. Hemelytra punctulata et remote subsericea, maculis lævigatis et denudatis parvis irregulariter conspersa.

47. **H. vicinus** Dall. — *Homoeocerus vicinus* Dall., List. 2. p. 501. 4. (1852).
Patria: Bengalia borealis.

48. **H. plebejus** Stål. — *Tliponius plebejus* Stål, Ö. V. A. F. 1859. p. 464. 5.
Patria: Java.
Antennæ corpore breviores, minus graciles, articulo primo distincte incrassato, subtriquetro, thorace breviore, articulo quarto tertio breviore. Articulus quartus rostri tertio paullo longior, articulus secundus tertio brevior. Spiracula ventris nigro-cincta. Anguli laterales thoracis rotundati. Prope *H. singalensem* locandus.

49. **H. variabilis** Dall. — *Ceratopachys variabilis* Dall., List. 2. p. 502. 5. (1852). — *Tliponius insignicornis* Stål, Ö. V. A. F. 1859. p. 465. 10.
Patria: India orientalis borealis.
Antennæ crassæ, articulis tribus basalibus triquetris, tertio compresso, dilatato. Rostrum articulis tertio et quarto æque longis, articulo secundo tertio breviore. Corpus granulatum.

50. **H. punctipennis** Uhler. — *Gonocerus punctipennis* Uhler, Pr. Ac. Phil. 1860. p. 226.
Patria: Japonia, Simoda.

51. **H. prasinus** Germ. — *Syromastes prasinus* Germ. in Silb., Rev. 5. p. 146. 61. (1837).
Patria: Terra capensis.

ORNYTUS Dall.

Ornytus p. Dall., List. 2. p. 438 et 447. (1852).

1. **O. elongatus** Dall. — *Ornytus elongatus* Dall., List. 2. p. 447. 2. pl. 13. f. 5. (1852).
Patria ignota.

ASCHISTUS Stål.

1. **A. brevicornis** Dall. — *Ornytus ? brevicornis* Dall., List. 2. p. 448. 3. (1852).
Patria: India orientalis. (Coll. Signoret.); Bengalia borealis.

Elongatus, angustus. Antennæ articulo primo incrassato, distincte triquetro, capite circiter dimidio longiore, thorace multo breviore, articulo secundo primo multo longiore, tertio primo longitudine subæquali vel fere longiore, quarto —? Thorax linea subpercurrente lævigata instructus, marginibus lateralibus subtiliter crenulatis, anteriora versus anguste reflexis. Metanotum et dorsum abdominis usque ad segmentum sextum nigrum, abdomen flavo-bimaculatum. Rostrum basin mesosterni attingens, articulis secundo et quarto fere æque longis, tertio longioribus.

Div. **Latimbaria** Stål.

LATIMBUS Stål.

Stål, Ö. V. A. F. 1859. p. 446; H. afr. 2. p. 5 et 71. (1865).

a. *Tuberculis antenniferis apice extus antrorsum acute productis; scutello subæquilatero; corpore magis depresso; antennis concoloribus; segmento ventrali sexto feminarum plica instructo, pone plicam fisso.* — Ptyctus Stål.

1. **L. (Ptyctus) punctatus** Dall. — *Philonus ? punctatus* Dall., List. 2. p. 449. 4. (1852). — *Latimbus punctatus* Stål, H. afr. 2. p. 71. 1. (1865).
Patria: Caffraria.. (Mus. Holm.)
Segmentum ventrale sextum feminæ plica obsoleta angulata instructum.

2. **L. (Ptyctus) concolor** Germ. — *Syromaster concolor* Germ. in Silb., Rev. 5. p. 146. 59. (1837). — *Homoeocerus concolor* Dall., List. 2. p. 446. 9. (1852). — *Paryphes hilaris* Stål, Ö. V. A. F. 1855. p. 29. 1. — *Latimbus concolor* Stål, H. afr. 2. p. 72. 2. (1865).
Patria: Caffraria. (Mus. Holm.)
Segmentum ventrali sextum feminæ plica lata subtruncata instructum.

aa. *Angulo apicali exteriore tuberculorum antenniferorum subrecto: antennis saltem ad partem nigris, longis, gracilibus; corpore minus depresso.* — Latimbus Stål.

b. *Femoribus, anterioribus saltem, subtus prope apicem spinulis duabus minutissimis obsoletis armatis; dorso abdominis subconcolore; ventre latera versus nigro-maculato; segmento ventrali sexto feminarum plica destituto, apice in medio sinuato, ante sinum obtuse impresso; mares ignoti.*

3. **L. (Latimbus) punctiventris** Sign. — *Homoeocerus punctiventris* Sign. in Thoms., Arch. 2. p. 299. 571. (1858). — *Latimbus punctiventris* Stål, H. afr. 2. p. 72. 3. (1865).
Patria: Calabar. (Mus. Holm.)
In exemplo nostro unico articuli antennarum primus et secundus ferruginei, ille extus niger, reliqui mutili.

4. **L. (Latimbus) nigrispinus** Stål. — Pallide subferrugineo-flavescens, superne lateribusque distincte, in capite subtilius subferrugineo-punctatus; antennis, vitta capitis laterali, marginibus lateralibus anticis angulisque lateralibus thoracis, vitta angusta laterali pectoris, vittis duabus angustis lateralibus et inter has maculis ventralibus nigris. ♀. Long. 16, Lat. $4\frac{1}{2}$ mill.
Patria ignota. (Coll. Signoret.)
L. punctiventri valde affinis, magnitudine majore angulisque lateralibus thoracis in spinam leviter recurvam productis mox distinguendus. Antennæ articulo primo capiti et thoraci simul sumtis longitudine æquali, secundo longiore, tertio secundo breviore, quarto —? Connexivum maculis marginalibus nigris, angulos segmentorum occupantibus, notatum. Alæ vinaceæ. Femora postica inermia. Vittæ ventris interdum ad incisuras interruptæ. Maculæ ventris inter vittas positæ tres in singulo segmento, duæ basales, una media.

bb. *Femoribus multispinosis; abdomine dorso nigro; ventre maculis nigris destituto, late obscureque subferrugineo-vittato; femina ignota.*

5. **L. (Latimbus) armipes** Stål. — *Latimbus armipes* Stål, Ö. V. A. F. 1859. p. 466. 1; H. afr. 2. p. 73. 4. (1865).
Patria: Calabar. (Mus. Holm.)

Div. **Cloresmaria** Stål.

Conspectus generum.

1(4). Tuberculis antenniferis magis distantibus, apice haud vel levissime libere prominulis; impressione capitis pone tylum subtili vel nulla; tylo a basi sensim oblique declivi, basi tuberculis antenniferis haud vel vix humiliore; femoribus anterioribus subtus multispinulosis.

2(3). Rostro ad vel paullo pone basin mesosterni extenso, articulo primo longissimo; capite apice minus producto; prosterno apice haud impresso; segmento genitali marium magno vel majusculo; segmento ventrali sexto feminarum postice angulariter emarginato, profundissime fisso, fissura plica transversa recta basali antice terminata; coxis posticis inermibus; articulis tribus basalibus antennarum fere æque longis. — *Notobitus* STÅL.

3(2). Rostro breviore, medium mesosterni haud vel vix superante, articulo primo omnium brevissimo, capite breviore; prosterno apice obtuse sulcato; segmento genitali marium mediocri; coxis posticis, saltem apud mares, extus spina armatis; antennarum articulo primo secundo breviore, secundo tertio longiore. — *Cloresmus* STÅL.

4(1). Tuberculis antenniferis minus distantibus, apice libere productis; impressione pone tylum distinctissima; tylo inter tubercula antennifera haud elevato, a basi subito valde declivi, infra tubercula perpendiculari; femoribus anticis inermibus, intermediis prope apicem spinula armatis; coxis posticis inermibus; rostro ad vel fere ad medium mesosterni extenso, articulo primo elongato, pone bucculas longe extenso; mesosterno ante medium sulcato; segmento genitali marium mediocri; segmento ventrali sexto feminarum haud fisso, apice obtuse sinuato. — *Priocnemicoris* COSTA.

NOTOBITUS STÅL.

STÅL, Ö. V. A. F. 1859. p. 451; H. afr. 2. p. 3. (1865).

1. **N. meleagris** FABR. — *Cimex Meleagris* FABR., Mant. 2. p. 297. 179. (1787); GMEL., S. N. 1: 4. p. 2188. 511. (1788). — *Lygæus meleagris* FABR., E. S. 4. p. 145. 37. (1794); WOLFF, Ic. 1. p. 23. f. 23. (1800); FABR., S. R. p. 215. 48. (1803). — *Nematopus meleagris* BURM., Handb. 2: 1. p. 337. 1. (1835); H. S., W. I. 6. p. 79. f. 650. (1842); WESTW. in HOPE, Cat. 2. p. 13. (1842); A. et S., Hist. p. 200. 3. (1843); DALL., List. 2. p. 422. 1. (1852). — STOLL, Pun. f. 213 et 278.
Patria: China. (Mus. Holm.)
Dorsum abdominis colore variat.

2. **N. longipes** DALL. — *Nematopus longipes* DALL., List. 2. p. 423. 2. (1852).
Patria: China.

3. **N. affinis** DALL. — *Nematopus affinis* DALL., List. 2. p. 423. 3. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

4. **N. malayus** STÅL. — *Nematopus malayus* STÅL, Ö. V. A. F. 1854. p. 234. 1.
Patria: Pulo Penang. (Mus. Holm.)
Præcedentibus duabus maxime affinis, forte haud distincta. Tibiæ posticæ maris basin versus curvatæ, parte curvata subtus subinermi. Segmentum genitale maris apice in medio obtuse productum, ad hanc partem productam utrinque denticulo armatum. Partes pectoris postice et anguli laterales thoracis anguste pallido-marginati.

5. **N. pallicornis** DALL. — *Nematopus pallicornis* DALL., List. 2. p. 424. 4. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

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6. **N. dorsalis** WESTW. — *Nematopus dorsalis* WESTW. in HOPE, Cat. 2. p. 13. (1842).
Patria: Bengalia.

7. **N. sexguttatus** WESTW. — *Nematopus 6-guttatus* WESTW. in HOPE, Cat. 2. p. 13. (1842).
Patria: China?

8. **N. marginalis** WESTW. — *Nematopus marginalis* WESTW. in HOPE, Cat. 2. p. 14. (1842).
Patria: India orientalis.

9. **N. serripes** DALL. — *Nematopus serripes* DALL., Tr. E. S. Lond. (2). 1. p. 4. 1. pl. 2. f. 2. (1850).
Patria: Boutan.

CLORESMUS STÅL.

STÅL, Ö. V. A. F. 1859. p. 451; H. afr. 2. p. 3. (1865).

1. **C. Signoreti** STÅL. — *Cloresmus Signoreti* STÅL, Ö. V. A. F. 1859. p. 452. 1.
Patria Java.

2. **C. nepalensis** WESTW. — *Nematopus nepalensis* WESTW. in HOPE, Cat. 2. p. 14. (1842); DALL., List. 2. p. 424. 5. (1852). — *Nematopus brevicornis* H. S., W. I. 9. p. 261. f. 995. (1851).
Patria: India orientalis (Mus. Holm.)

3. **C. similis** DALL. — *Nematopus similis* DALL., List. 2. p. 425. 6. (1852).
Patria: Amoy. (Mus. Holm.)

4. **C. javanicus** WESTW. — *Nematopus javanicus* WESTW. in HOPE, Cat. 2. p. 14. (1842); DALL., List. 2. p. 425. 7. (1852).
Patria: Java.

PRIOCNEMICORIS COSTA.

Priocnemicoris A. COSTA, Rend. Ac. Nap. 2. p. 253. (1863). — *Myrsilus* STÅL, H. afr. 2. p. 3. (1865).

1. **P. flaviceps** GUÉR. — *Nematopus flaviceps* GUÉR., Voy. Coq., Ins. p. 177. Atl. pl. 12. f. 10. (1830). *Priocnemicoris refulgens* A. COSTA, Rend. Ac. Nap. 2. p. 254. (1863).
Patria: Insulæ Mysol et Aru. (Mus. Holm.); Nova Guinea.

2. **P. albithorax** BOISD. — *Næmatopus albithorax* BOISD. Voy. Astr., Ent. 2. p. 635. pl. 11. f 13. (1835).
Patria: Nova Guinea. (Mus. Holm.)
A præcedente vix distinctus.

Div. **Lybantaria** STÅL.

CONSPECTUS GENERUM.

1(12). Capite leviter nutante, subporrecto, minus lato, plerumque multo longiore quam inter oculos latiore; jugis et tylo sat productis.

1(11). Bucculis ante medium vel antice in angulum rectum vel acutum ampliatis; hemelytris completis; ocellis distinctis.

3(4). Thoracis marginibus lateralibus anticis apicem versus dente armatis; scutello ante medium in tubercula duo convexa obtusa elevato, pone medium ruga longitudinali instructo; angulis apicalibus segmentorum omnium abdominis leviter prominulis, apice rotundatis; articulo quarto antennarum —? segmento genitali marium apice nonnihil producto et in medio profunde sinuato; femina ignota. — *Lobogonius* STÅL.

4(3). Thoracis marginibus lateralibus apicem versus inermibus, apice ad collare interdum in dentem productis; scutello plano; angulis apicalibus segmentorum haud rotundatis, haud vel obsoletissime prominulis.

5(8). Segmento sexto ventrali feminarum integro, haud fisso, plica destituto; articulis quarto et tertio antennarum longitudine subæqualibus, vel quarto tertio paullo longiore; articulo primo rostri pone oculos vix vel levissime producto.

6(7). Corpore subovali, brevi, crasso; tylo prope apicem dente armato; abdomine apicem versus leviter decurvo, segmentis postice in medio quam latera versus brevioribus; antennis corpori longitudine subæqualibus; segmento genitali maris convexo, haud producto, apice in medio subelevato et subsulcato, utrinque subretuso. — *Brachylybas* STÅL.

7(6). Corpore oblongo, tylo inermi; abdomine haud decurvo, segmentis antepenultimis ventris latera versus haud vel paullo longioribus; antennis corpore brevioribus; maribus ignotis. — *Sciophyrus* STÅL.

8(5). Segmento ventrali sexto feminarum pone plicam obtusangulam fisso; articulo quarto antennarum tertio breviore.

9(10). Capite longo, multo longiore quam inter oculos latiore; articulo primo rostri pone oculos distincte extenso; segmento genitali marium mihi cognitorum transversim leviter convexo, sensim declivi, postice producto et angustato, apice emarginato; antennis gracilibus, longiusculis; venis membranæ furcatis, haud vel raro hic illic anastomosantibus. — *Lybas* DALL.

10(9). Capite subquadrato; articulo primo rostri pone oculos haud vel vix extenso; antennis minus gracilibus et minus longis; (hemelytris apicem abdominis haud attingentibus); membrana tota irregulariter reticulata; segmento genitali marium postice obtuse rotundato-producto. apice in medio subtruncato. — *Pachycephalus* UHLER.

11(2). Bucculis ante medium rotundatis, nec angulatis, nec dente armatis; hemelytris abbreviatis, pone apicem clavi oblique truncatis; membrana brevissima, truncata: ocellis nullis; scutello planiusculo; articulo quarto antennarum tertio breviore; articulo primo rostri pone oculos vix extenso; segmento genitali maris convexo, apice subtruncato, ad angulos posticos impresso; femina ignota. — *Lygæopharus* Stål.

12(1). Capite lato, distincte nutante, fere æque longo ac lato, inter oculos et antennas antrorsum angustato, parte intraoculari pone antennas sita subtransversa; jugis et tylo minus productis, hoc spina armato; bucculis angulum acutum formantibus; tibiis distincte sulcatis; segmento ventrali sexto feminarum integro, plica destituto.

13(14). Articulis quarto et tertio antennarum longitudine subæqualibus; capite longitrorsum levissime convexo, tuberculis antenniferis apice extus obtusis; thorace ruga transversa destituto; femoribus subtus spinosis; segmento ventrali sexto feminarum posterius in medio haud producto; segmento genitali maris convexo, apice obtuse rotundato. — *Agathyrna* Stål.

14(13). Articulo quarto antennarum tertio breviore; capite longitrorsum valde convexo, tuberculis antenniferis apice extus antrorsum prominulis; thorace pone medium ruga transversa instructo; femoribus inermibus; segmento ventrali sexto feminarum apice in medio obtuse rotundato-producto, medio et lateribus æque longo; mas ignotus. — *Acanthotyla* Stål.

LOBOGONIUS Stål.

Stål, Ö. V. A. F. 1870. p. 653.

1. **L. egregius** Stål. — *Lybas egregius* Stål, An. S. E. Fr. (4) 5. p. 184. 2. (1865).
Patria: Insula Mysol. (Mus Holm.)

♂. Segmentum dorsale sextum lateribus apicem versus subsinuatis, angulis posticis rectis, margine postico magnam ad partem obtuse rotundato. Segmentum genitale valde declive, apice nonnihil productum, obtuse rotundatum et in medio profunde sinuatum.

Femina ignota. Articulus quartus antennarum mutilus in exemplo descripto. Tibiæ obsolete subsulcatæ.

BRACHYLYBAS Stål.

Stål, Ö. V. A. F. 1870. p. 653.

1. **B. variegatus** Le Guil. — *Gonocerus variegatus* Le Guil., Rev. zool. 1841. p. 262. 14.
Patria: Insulæ Fidschi, Ovalau, Vavao. (Mus. Holm.)

SCIOPHYRUS Stål.

1. **S. inermis** Stål. — *Lybas inermis* Stål, An. S. E. Fr. (4) 5. p. 184. 1 (1865).
Patria: Insula Mysol. (Mus. Holm.)

LYBAS Stål.

Dall., List. 2. p. 450 et 463. (1852); Stål, H. afr. 2. p. 6. (1865); Ö. V. A. F. 1870. p. 653.

a. *Thoracis marginibus lateralibus anticis obtusis, antice ad collare obtusissime rotundatis, pone medium leviter sinuatis, ruga obtusa levissime elevata instructis, hac ruga apice ad collare nec rotundato-producta, nec in dentem vel angulum prominula.*

1. **L. pallidicornis** Stål. — *Lybas pallidicornis* Stål, Ö. V. A. F. 1870. p. 654. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

2. **L. obscuricornis** Stål. — *Lybas obscuricornis* Stål, Ö. V. A. F. 1870. p. 654. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)

aa. *Thoracis marginibus lateralibus anticis subrectis vel in medio vel ante medium leviter sinuatis, ruga plerumque distinctissima instructis, hac ruga apice ad collare magis elevata et rotundato-prominula vel ibidem angulum formante vel in dentem producta.*

b. *Tylo apice vel prope apicem haud tuberculato.*

c. *Rostro medium segmenti tertii ventralis haud vel paullo superante.*

3. **L. punctipes** Stål. — *Lybas punctipes* Stål, Ö. V. A. F. 1870. p. 655. 3.
Patria: Insulæ Philippinæ. (Mus. Holm.)

4. **L. obscuripes** Stål. — *Lybas obscuripes* Stål, Ö. V. A. F. 1870. p. 655. 4.
Patria: Insulæ Philippinæ. (Mus. Holm.)

5. **L. maculipes** Stål. — *Lybas maculipes* Stål, Ö. V. A. F. 1870. p. 656. 5.
Patria: Insulæ Philippinæ. (Mus. Holm.)

cc. *Rostro pone segmentum ventrale tertium plus minus longe extenso.*

d. *Parte apicali prominula rugæ marginalis thoracis apice rotundata; marginibus lateralibus anticis thoracis sinuatis; femoribus fusco-annulatis vel maculatis.*

6. **L. pictipes** Stål. — *Lybas pictipes* Stål, Ö. V. A. F. 1870. p. 656. 6.
Patria: Insulæ Philippinæ. (Mus. Holm.)

7. **L. dentifer** Stål. — *Lybas dentifer* Stål, Ö. V. A. F. 1870. p. 656. 7.
Patria: Insulæ Philippinæ. (Mus. Holm.)

dd. *Marginibus lateralibus anticis thoracis rectis, sat longe ante medium sinu parvo obsoletissimo instructis, ruga antice in dentem acutiusculum, extrorsum nonnihil vergentem, producta; femoribus fuscis, basi pallidis.*

8. **L. annulipes** Dall. — *Lybas annulipes* Dall., List. 2. p. 464. 2. (1852).
Patria: Cambodja. (Mus. Holm.); Malabar.

bb. *Tylo apice a latere viso paullo producto; femoribus crassiusculis.*

9. **L. fascipes** Walk. — *Lybas fascipes* Walk., Cat. Het. 4. p. 152. 10. (1871).
Patria: Nova Guinea. (Mus. Holm.)
In exemplo nostro rostrum apicem segmenti ventralis quarti attingit. Ruga marginum lateralium thoracis apice angulum obtusum format. Tibiæ superne distincte sulcatæ.

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10. **L. varipes** Westw. — *Gonocerus varipes* Westw. in Hope, Cat. 2. p. 25. (1842).
Patria: Java.

11. **L. obscurus** Dall. — *Lybas obscurus* Dall., List. 2. p. 463. 1. pl. 14. f. 2. (1852).
Patria: Java; Corea.

LYGÆOPHARUS Stål.

Stål, Ö. V. A. F. 1870. p. 653.

1. **L. maurus** Stål. — *Lygæopharus maurus* Stål, Ö. V A. F. 1870. p. 653. not.
Patria: Insulæ Moluccanæ. (Mus. Holm. et Coll. Haglund.)

PACHYCEPHALUS Uhler.

Pachycephalus Uhler, Pr. Ac. Phil. 1860. p. 225. — *Hygia* Uhler, Pr. Ac. Phil. 1861. p. 287.

1. **P. opacus** Uhler. — *Pachycephalus opacus* Uhler, Pr. Ac. Phil. 1860. p. 226.
Patria: Japonia. (Mus. Holm.); Takanosima.

AGATHYRNA Stål.

Stål, Stett. E. Z. 22. p. 144. (1861).

1. **A. præcellens** Stål. — *Agathyrna præcellens* Stål, Stett. E. Z. 22. p. 145. 1. (1861).
Patria: Insulæ Moluccanæ, Aru. (Mus. Holm. et Coll. Haglund.)
Variat tota nigra vel subferrugineo-nigra.

ACANTHOTYLA Stål.

1. **A. fasciata** Walk. — *Cletus fasciatus* Walk. Cat. Het. 4. p. 196. 44. (1871).
Patria: Nova Guinea. (Mus. Holm.)
Antennæ corpore paullo breviores. Rostrum in exemplo rostro apicem segmenti secundi ventris paullo superat.

Div. **Anisoscelaria** Stål.

LEPTOGLOSSUS Guér.

Stål, Enum. 1. p. 160. (1870).

1. **L. membranaceus** Fabr. — *Cimex membranaceus* Fabr., Spec. 2. p. 351. 79. (1781); Mant. 2. p. 289. 98. (1787); Gmel., S. N. 1: 4. p. 2142. 233. (1788). — *Lygæus membranaceus* Fabr., E. S. 4. p. 139.

16. (1794); WOLFF, Ic. 1. p. 22. 22. f. 22. (1800); FABR., S. R. p. 209. 23. (1803). — *Coreus (Anisoscelis) membranaceus* BURM., Nov. act. Acad. Leop. 16. Suppl. p. 295. 21. (1834). — *Anisoscelis membranacea* BURM., Handb. 2: 1. p. 332. 3. (1835); DALL., List. 2. p. 454. 9. (1852). — *Anisoscelis membranaceus* WESTW. in HOPE., Cat. 2. p. 16. (1842). — *Cimex Momordicæ* FORST., Descr. an. p. 16. 10. (1844). — *Anisoscelis orientalis* DALL., List. 2. p. 454. 8. (1852). — *Anisoscelis flavopunctatus* SIGN. in MAILLARD, Not. sur l'ile de la Réun., Ins. p. 27. pl. 21. f. 4. — *Theognis membranaceus* STÅL, H. afr. 2. p. 86. 1. (1865). — STOLL, Pun. f. 73.

Patria: Tranquebar, Ceylon, Insulæ Philippinæ, Australia borealis, Caffraria. (Mus. Holm.); Java, Senegal, Ins. Reunion.

2. **L. bidentatus** MONTR. — *Anisoscelis bidentatus* MONTR., Ann. Scienc. phys. (2) 7. p. 101. (1855).

Patria: Woodlark; Australia borealis. (Mus. Holm.)

Quoad latitudinem tibiarum posticarum medium tenet inter *L. membranaceum* et *australem*.

3. **L. australis** FABR. — *Cimex australis* FABR., S. Ent. p. 708. 58. (1775); Spec. 2. p. 352. 84. (1781); Mant. 2. p. 289. 103. (1787); GMEL., S. N. 1: 4. p. 2143. 237. (1788). — *Lygæus australis* FABR., E. S. 4. p. 140. 21. (1794); S. R. p. 211. 31. (1803). — *Theognis australis* MAYR, Reis. Nov., Hem p. 104. (1866). *Leptoglossus australis* STÅL, H. Fabr. 1. p. 51. 2. (1868).

Patria: Insulæ Taiti, Fidschi. (Mus. Holm.)

Div. **Cyllararia** STÅL.

CYLLARUS STÅL.

STÅL, H. afr. 2. p. 6 et 86. (1865).

1. **C. longirostris** STÅL. — *Gonocerus longirostrum* SIGN. in THOMS., Arch. 2. p. 302. 576. (1858). — *Cyllarus longirostris* STÅL, H. afr. 2. p. 87. 1. (1865).

Patria: Grand Bassam Guineæ. (Coll. SIGNORET.)

Div. **Physomeraria** STÅL.

CONSPECTUS GENERUM.

1(6). Sutura clavi margineque apicali corii longitudine subæqualibus; articulo quarto antennarum tertio longiore vel longitudine subæquali; tibiis superne haud tuberculatis, anticis haud compressis.

2(5). Margine posteriore thoracis rotundato; margine apicali corii versus angulum apicalem exteriorem distincte sinuato; thorace apice paullo depresso; capite pone tylum impressione brevi longitudinali distincta instructo; rostro basin mesosterni paullo superante; mesosterno anterius sulcato; segmento ultimo genitali dorsali feminarum apice profunde sinuato, angusto; segmento ventrali sexto feminarum plica transversa recta, angulo fissurali deleto, obtuse rotundato; venis membranæ anastomosantibus.

3(4). Articulis secundo et tertio antennarum compressis, illo apicem versus levissime, hoc distinctius sensim ampliatis; sulco mesosterni marginibus leviter elevatis. — *Phelaus* STÅL.

4(3). Articulis secundo et tertio antennarum subcompressis, apicem versus haud ampliatis, quarto tertio vix longiore; sulco mesosterni utrinque carina altissima laminiformi terminato. — *Rhyticoris* A. COSTA.

5(2). Margine postico thoracis ante scutellum truncato; articulo quarto antennarum tertio plerumque longitudine subæquali; capite pone tylum impressionibus duabus parallelis instructo; mesosterno antice levissime impresso; margine apicali corii recto vel extus obsoletissime sinuato; venis membranæ haud anastomosantibus; segmento genitali maris apice processu sat longo obtuso instructo; segmentis genitalibus dorsalibus feminarum transversis, obtusissime sinuatis; corpore valde oblongo; segmento ventrali sexto feminarum plica subbasali recta, angulo fissurali obtuse rotundato-subangulato; scutello longiore quam latiore. — *Physomerus* BURM.

6(1). Sutura clavi margine apicali corii plerumque longiore, hoc truncato; articulo quarto antennarum tertio breviore; oculis parvis; abdomine feminarum apice sat angustato, segmentis genitalibus dorsalibus, præsertim ultimo, profunde sinuatis, hoc bilobo; tibiis superne tuberculatis, anticis compressis; capite pone tylum impressionibus duabus linearibus instructo; segmento ventrali sexto feminarum plica basali transversa, angulo fissurali obtuso interdum subrotundato; metapleuris postice rotundatis.

7(10). Tibiis posticis subtus dilatatis; sutura clavi margine apicali corii longiore; femoribus posticis incrassatis, apice superne tuberculo vel dente armatis, basi superne tuberculatis vel antrorsum tumescentibus.

8(9). Hemelytris basin versus parallelis, dein leviter rotundato-ampliatis; mesosterno haud sulcato; metapleuris postice minus rotundatis. — *Acanthocoris* A. et S.

9(8). Hemelytris margine costali sensim levissime rotundato; mesosterno sulcato. — *Petalocnemis* Stål.

10(7). Tibiis posticis simplicibus; sutura clavi et margine apicali corii æque longis; femoribus posticis, saltem apud feminas, haud incrassatis, superne tuberculo apicali destitutis; tibiis posticis simplicibus; mesosterno obtuse sulcato. — *Choerommatus* A. et S.

PHELAUS Stål.

Phelaus p. Stål, H. afr. 2. p. 3 et 49. (1865).

1. **P. dilaticornis** Sign. — *Physomerus dilaticornis* Sign., An. S. E. Fr. (3) 8. p. 939. 115. (1861). — *Phelaus dilaticornis* Stål, H. afr. 2. p. 50. 1. (1865).
Patria: Madagascar. (Coll. Signoret).

RHYTICORIS A. Costa.

A. Costa, Rend. Ac. Nap. 2. p. 253. (1863). — *Phelaus* p. Stål, H. afr. 2. p. 3 et 49. (1865).

1. **R. spinipes** P. B. — *Lygæus spinipes* P. B., Ins. p. 203. Hém. pl. 12. f. 5. (1805). — *Physomerus spinipes* Dall., List. 2. p. 412. 2. (1852). — *Bardistus ? reticollis* A. Costa, Rend. Ac. Nap. 2. p. 252. (1863). — *Phelaus spinipes* Stål, H. afr. 2. p. 51. 2. (1865).
Patria: Calabar Guineæ. (Mus. Holm.)

2. **R. terminalis** Burm. — *Physomerus terminalis* Burm., Handb. 2: 1. p. 341. 2. (1835); Dall., List. 2. p. 412. 1. (1852). — *Cerbus crassiclunis* Germ. in Silb., Rev. 5. p. 157. 8. (1837). — *Phelaus terminalis* Stål, H. afr. 2. p. 52. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

PHYSOMERUS Burm.

Physomerus p. Burm., Handb. 2: 1. p. 341. (1835). — *Physomerus* A. et S., Hist. p. 196. (1842); Stål, H. afr. 2. p. 3. (1865).

1. **P. grossipes** Fabr. — *Lygæus grossipes* Fabr., E. S. 4. p. 135. 4. (1794); S. R. p. 203. 3. (1803). — *Physomerus grossipes* Burm., Handb. 2: 1. p. 341. 1. (1835). — A. et S., Hist. p. 196. 1. (1842); Dall., List. 2. p. 413. 5. (1852); Stål, H. Fabr. 1. p. 45. 2. (1865).
Patria: Java. (Mus. Holm.); Tranquebar.

2. **P. calcar** Fabr. — *Lygæus calcar* Fabr., S. R. p. 214. 46. (1803). — *Physomerus calcar* H. S., W. I. 6. p. 60. f. 621. (1842); Dall., List. 2. p. 413. 4. (1852); Stål, H. Fabr. 1. p. 45. 1. (1865).
Patria: Java. (Mus. Holm.)

3. **P. oedymerus** Burm. — *Coreus (Cerbus) oedymerus* Burm., Nov. Act. Ac. Leop. 16. Suppl. p. 296. 23. (1834). — *Physomerus oedymerus* Dall., List. 2. p. 413. 6. (1852).
Patria: Insulæ Philippinæ, Gilolo, Morotai. (Mus. Holm.)
Hæ tres species verisimiliter in unam, coloribus, longitudine antennarum, crassitie et forma pedem posticorum maris valde variabilem, conjungendæ.

4. **P. parvulus** Dall. — *Physomerus parvulus* Dall., List. 2. p. 413. 7. (1852).
Patria ignota.

ACANTHOCORIS A et S.

A. et S., Hist. p. 213. (1842); Dall., List. 2. p. 487. (1852); Stål, H. afr. 2. p. 3 et 53. (1865).

a. *Segmentis connexivi margine minutissime denticulatis, in medio et in angulo apicali dente distinctiore destitutis.*

b. *Scutello haud carinato; maribus segmento dorsali sexto apice truncato vel rotundato-truncato, segmento genitali apice subito in processum fere æque longum ac latum, apice rotundatum, producto; feminarum* [1]) *segmento abdominis sexto lateribus rectis, angulis apicalibus obtusis, vix productis, segmento genitali dorsali penultimo postice obtuse sinuato, angulis posticis obtusis.*

1. **A. lugens** Stål. — *Physomerus lugens* Stål, Ö. V. A. F. 1855. p. 28. 1. — *Acanthocoris lugens* Stål, H. afr. 2. p. 53. 1. (1865).
Patria: Caffraria.

2. **A. granulosus** Sign. — *Acanthocoris granulosus* Sign., in Thoms., Arch. 2. p. 304. 580. (1858).
Patria: Gabon. (Coll. Signoret.)

bb. *Scutello distincte carinato; feminarum segmento abdominali sexto lateribus subrectis vel levissime sinuatis, angulis posticis rectis vel subacutis, prominulis, segmento genitali dorsali penultimo apice obtuse sinuato, angulis posticis subrectis; mares ignoti.*

3. **A. tibialis** Sign. — *Acanthocoris tibialis* Sign., An. S. E. Fr. (3) 8. p. 947. 132. (1861); Stål, H. afr. 2. p. 54. 3. (1865).
Patria: Madagascar. (Coll. Signoret.); Caffraria. (Mus. Holm.)

4. **A. spinosus** Sign. — *Acanthocoris spinosus* Sign. in Thoms., Arch. 2. p. 304. 579. (1858); Stål, H. afr. 2. p. 55. 4. (1865).
Patria: Calabar (Coll. Signoret.)

aa. *Connexivi segmentis minute denticulatis, in angulo apicali, plerumque etiam in medio, dente distinctiore armatis; segmento genitali marium* [2]) *mihi cognitorum posterius sensim angustato, processu destituto.*

c. *Segmentis connexivi in medio margine dente distinctiore destitutis; angulis posticis segmenti abdominis sexti et segmenti genitalis penultimi feminarum obtusis; segmento dorsali sexto marium apice obtuse rotundato.*

5. **A. scaber** Lin. — *Cimex scaber* Lin., Cent. ins. rar. p. 17. 43. (1763); Amoen. 6. p. 400. 43. (1763); S. N. ed. XII. 1: 2. p. 719. 30. (1767); Gmel., S. N. 1: 4. p. 2138. 30. (1788). — *Alydus scaber* Thunb., H. rostr. cap. 3. p. 2. (1822). — *Acanthocoris acutus* Dall., List. 2. p. 516. 2. (1852). — *Acanthocoris scaber* p. Stål, Berl. E. Z. 10. p. 158. 1. (1866).
Patria: Java. (China. sec. Dall.)

6. **A. clavipes** Fabr. — *Cimex clavipes* Fabr., Mant. 2. p. 288. 97. (1787). — *Cimex magnipes* Gmel., S. N. 1: 4. p. 2142. 232. (1788). — *Lygæus clavipes* Fabr., E. S. 4. p. 137. 12. (1796); S. R. p. 206. 15. (1803). — *Acanthocoris clavipes* Stål, H. Fabr. 1. p. 46. 2. (1868).
Patria: China. (Mus. Holm.)

7. **A. scabrator** Fabr. — *Coreus scabrator* Fabr., S. R. p. 195. 19. (1803). — *Crinocerus scabrator* Burm., Handb. 2: 1. p. 319. 4. (1835). — *Crinocerus scabripes* H. S., W. I. 6. p. 18. f. 574. (1842). — *Acanthocoris scabrator* A. et S., Hist. p. 214. 1. (1843); Dall., List. 2. p. 515. 1. (1852); Stål, H. Fabr. 1. p. 45. 1. (1868).
Patria: Java, Insulæ Philippinæ, Ceylon. (Mus. Holm.); Insula Bourbon. (Coll. Signoret); Sumatra.

8. **A. sordidus** Thunb. — *Cimex sordidus* Thunb., N. ins. sp. 2. p. 44. (1783). — *Acanthocoris scaber* p. Stål, Berl. E. Z. 10. p. 158. 1. (1866).
Patria: Japonia. (Mus. Holm.)

cc. *Segmentis connexivi in medio margine dente distinctiore armatis; feminis angulis apicalibus segmenti dorsalis sexti et segmenti genitalis penultimi acutis, productis, segmento genitali ultimo profundius sinuato quam in divisionibus præcedentibus; segmento dorsali sexto marium mihi cognitorum apice late truncato, angulis apicalibus rectis vel subacutis.*

9. **A. fasciculatus** Fabr. — *Cimex fasciculatus* Fabr., Spec. 2. p. 350. 72. (1781); Mant. 2. p. 287. 85. (1787); Gmel., S. N. 1: 4. p. 2137. 196. (1788). — *Coreus fasciculatus* Fabr., E. S. 4. p. 130. 14. (1794); S. R. p. 197. 27. (1803). — *Coreus fasciculator* Fabr., S. R., Ind. p. 8. (1803). — *Crinocerus grylloides* Burm., Handb. 2: 1. p. 319. 5. (1835). — *Crinocerus aper* Germ. in Silb., Rev. 5. p. 149. 66. (1837). — *Crinocerus porcus* Germ. in Silb., Rev. 5. p. 150. 67. (1837). — *Acanthocoris fasciculatus* Dall., List. 2. p. 516. 3. (1852); Stål, H. afr. 2. p. 57. 7. (1865). — Stoll, Pun. f. 114.
Patria: Terra capensis. (Mus. Holm.); Abyssinia. (Coll. Signoret.); Senegal.

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[1]) Femina *A. granulosi* mihi ignota.
[2]) Mares *A. granosi* et *obscuricornis* haud vidi.

10. **A. obscuricornis** Dall. — *Acanthocoris obscuricornis* Dall., List. 2. p. 516. 4. (1852); Stål, H. afr. 2. p. 56. 6. (1865), — *Acanthocoris rotundatus* Sign., in Thoms., Arch. 2. p. 303. 578. (1858).
Patria: Sierra Leona, Calabar. (Mus. Holm.)

11. **A. granosus** Stål. — *Physomerus granosus* Stål, Ö. V. A. F. 1855. p. 29. 2. — *Acanthocoris granosus* Stål, H. afr. 2. p. 55. 5. (1865).
Patria: Caffraria. (Mus. Holm.)

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12. **A. spurcus** Germ. — *Crinocerus spurcus* Germ. in Silb., Rev. 5. p. 150. 68. (1837).
Patria: Terra capensis.

13. **A. scrofa** Germ. — *Crinocerus scrofa* Germ. in Silb., Rev. 5. p. 151. 69. (1837).
Patria: Terra capensis.

PETALOCNEMIS Stål.

Stål, Ö. V. A. F. 1853. p. 259; H. afr. 2. p. 3 et 58. (1865).

1. **P. spinulosa** Stål. — *Acanthocoris spinulosus* Stål, Ö. V. A. F. 1858. p. 316. 22. — *Petalocnemis spinulosa* Stål, H. afr. 2. p. 58. 1. (1865).
Patria: Africa meridionalis ad fluvium Svakop. (Mus. Holm.)

2. **P. denticulata** Stål. — *Acanthocoris denticulata* Stål, Ö. V. A. F. 1855. p. 32. 1. — *Petalocnemis denticulata* Stål, H. afr. 2. p. 59. 2. (1865).
Patria: Caffraria. (Mus. Holm.)

3. **P. sabulosa** Stål. — *Petalocnemis sabulosa* Stål, H. afr. 2. p. 60. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

4. **P. pachycera** Stål. — *Petalocnemis pachycerus* Stål, Ö. V. A. F. 1855. p. 29. 1. — *Petalocnemis pachycera* Stål, H. afr. 2. p. 60. 4. (1865).
Patria: Caffraria. (Mus. Holm.)

5. **P. muricata** Thunb. — *Cimex muricatus* Thunb., N. ins. sp. 2. p. 30. t. 2. f. 51. (1783); Gmel., S. N. 1: 4. p. 2145. 260. (1788). — *Alydus muricatus* Thunb., H. rostr. cap. 3. p. 2. (1822). — *Petalocnemis muricata* Stål, H. afr. 4. p. 254. (1866).
Patria: Terra capensis.

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6. **P. aspera** Dall. — *Acanthocoris asper* Dall., List. 2. p. 516. 5. (1852).
Patria: Africa meridionalis.

7. **P. apicalis** Dall. — *Acanthocoris apicalis* Dall., List. 2. p. 517. 6. (1852).
Patria: Africa meridionalis.

8. **P. thoracica** Dall. — *Acanthocoris thoracicus* Dall., List. 2. p. 517. 7. (1852).
Patria: Africa meridionalis.

9. **P. obscura** Dall. — *Acanthocoris obscurus* Dall., List. 2. p. 518. 8. (1852).
Patria: Bengalia; Bombay.

CHOEROMMATUS A. et S.

Choerommatus A. et S., Hist. p. 204. (1843); Stål, H. afr. 2. p. 4 et 60. (1865). — *Neurodederrhis* Stål, Ö. V. A. F. 1853. p. 260.

1. **C. farinosus** A. et S. — *Choerommatus farinosus* A. et S., Hist. p. 204. 1. pl. 4. f. 4. (1843); Dall., List. 2. p. 518. 1. (1852); Stål, H. afr. 2. p. 61. 1. (1865).
Patria: Senegal. (Mus. Holm.)

2. **C. argillaceus** Stål. — *Choerommatus argillaceus* Stål, H. afr. 2. p. 61. 2. (1865).
Patria: Madagascar. (Mus. Holm.)

3. **C. indutus** Stål. — *Choerommatus indutus* Stål, H. afr. 2. p. 62. 3. (1865).
Patria: Caffraria. (Mus. Holm.)
Typus generis *Neurodederrhis*.

4. **C. niger** Voll. — *Choerommatus niger* Voll., Rech. faun. Madag. 5: 1. p. 14. 13. pl. 1. f. 8. (1869).
Patria: Insula Mayotte.

Div. **Pendulinaria** Stål.

Conspectus generum.

1(2). Bucculis longissimis, paullo pone oculos extensis, totam vel fere totam longitudinem capitis occupantibus, pone medium sensim angustatis; tuberculis antenniferis apice extus antrorsum compresso-prominulis, subtus infra insertionem antennarum obsoletissime sinuatis; sternis sulco sat profundo percurrente continuo, per segmentum ventrale primum continuato, in segmentis reliquis obsoletissimo vel vix ullo, instructis; hamo alarum et vena decurrente ex eodem loco ortis vel maxime appropinquatis; vena transversa basali membranæ tota a margine basali remota; segmento genitali dorsali ultimo feminarum triangulari, apice angustissimo et integro; margine apicali corii recto, angulo apicali haud angustato; spiraculis a basi et ab apice segmentorum ventris fere æque longe remotis; antennis porrectis basin versus contiguis, articulo primo capite haud longiore. — *Aulacosternum* Dall.

2(1). Bucculis minus longis, totis vel fere totis ante oculos positis, numquam plus quam dimidium longitudinis capitis occupantibus; antennis porrectis distantibus, articulo primo capite longiore; tuberculis antenniferis apice extus haud compresso-prominulis, subtus sensim sinuatis; hamo et vena decurrente alarum basi distantibus; segmento genitali dorsali ultimo feminarum apice truncato vel sinuato; margine apicali corii versus angulum apicalem productum sinuato; spiraculis ante medium segmentorum ventris positis.

3(4). Scutello longiore quam latiore, acuto. — *Pendulinus* Thunb.

4(3). Scutello æquilatero, apice anguste rotundato-truncato. — *Amblypelta* Stål.

AULACOSTERNUM Dall.

Dall., List. 2. p. 486 et 503. (1852).

1. **A. nigro-rubrum** Dall. — *Aulacosternum nigro-rubrum* Dall., List. 2. p. 504. 1. pl. 14. f. 6. (1852).
Patria: Australia borealis; Rockhampton. (Mus. Holm.)

2. **A. punctipes** Stål. — Pallide sordide flavescens, supra fortiter fusco-punctatum, subtus minus fortiter dilute et hic illic fusco-punctatum, pedibus concoloribus, dense nigro-punctulatis; dorso abdominis rufo-ferrugineo, parte apicali nigra, flavescente-marginata; parte basali segmentorum connexivi, maculis parvis marginalibus ventris, membrana antennisque nigris, harum articulis secundo et tertio versus medium, quarto apicem versus ferrugineis; vittis duabus capitis pallescentibus; thorace anterius vitta nigricante. ♀. Long. 11, Lat. $3\frac{1}{2}$ mill.
Patria: Rockhampton Australiæ. (Mus. Holm.)
A. nigro-rubro statura puncturaque simillimum, differt pictura, magnitudine minore, thorace breviore, angulis lateralibus thoracis obtusioribus, hamo venaque decurrentibus ex eodem loco ortis. Alæ infuscatæ.

PENDULINUS Thunb.

Pendulinus p. Thunb., H. rostr. cap. 4. p. 5. (1822). — *Dasynus* Burm., Nov. act. Ac. Leop. 16: Suppl. p. 297. (1834). — *Galæsus* Dall., List. 2. p. 438 et 440. (1852); Stål, H. afr. 2. p. 6 et 83. (1865). — *Theraptus* Stål, Ö. V. A. F. 1859. p. 462; H. afr. 2. p. 6 et 83. (1865). — *Odontoparia* Mayr, Verh. z.-b. Ges. Wien. 15. p. 433. (1865); Reis. Nov., Hem. p. 79. (1866).

a. *Angulis lateralibus thoracis rotundatis vel obtusissimis, haud prominulis, marginibus lateralibus anticis anguste leviterque reflexis, postice ad angulos laterales leviter rotundatis; membrana nigra, angulo basali interiore corio concolore; alis fuscis, anterius decoloribus; pectore ventreque nigro-fasciatis; fasciis ventris basin segmentorum occupantibus; capite ante antennas producto; articulo primo rostri pone oculos extenso; mesosterno haud sulcato.* — Galæsus Dall.

1. **P. (Galæsus) hasticornis** Thunb. — *Cimex hasticornis* Thunb., N. ins. sp. 3. p. 53. tab. 3. f. 64. (1784); Gmel., S. N. 1: 4. p. 2163. 369. (1788). — *Pendulinus hasticornis* Thunb., H. rostr. cap. 4. p. 5. (1822); Ins. hem. tria gen. p. 3. 2. (1825). — *Cimex bicolor* Gray in Griff., An. kingd. 15. pl. 92. f. 4. (1832). — *Galæsus hasticornis* Dall., List. 2. p. 441. 1. pl. 13. f. 2. (1852); Stål, H. afr. 2. p. 84. (1865).
Patria: Terra capensis, Caffraria. (Mus. Holm.)

2. **P. (Galæsus) rufifemoratus** Dall. — *Galæsus rufifemoratus* Dall., List. 2. p. 441. 2. (1852).
Patria: Gambia.

3. **P. (Galæsus) melanocnemis** Stål. — *Homoeocerus melanocnemis* Stål, Ö. V. A. F. 1858. p. 439. 1. — *Galæsus melanocnemis* Stål, H. afr. 2. p. 85. 2. (1865).
Patria: Mossambique. (Mus. Holm.)

aa. *Angulis lateralibus thoracis distinctis vel spinosis, paullo prominulis, marginibus lateralibus anticis postice ad angulos illos rectis; alis unicoloribus; mesosterno plerumque sulcato.*

b. *Capite ante tubercula antennifera a latere viso levissime producto; basi segmentorum ventris sæpius nigra.* — Theraptus Stål.

4. **P. (Theraptus) carmelita** Burm. — *Chariesterus carmelita* Burm., Handb. 2: 1. p. 317. 1. (1835). *Lagaria ? africana* Dall., List. 2. p. 443. 2. (1865). — *Homoeocerus apicatus* Fairm. in Thoms., Arch. 2. p. 299. 517. (1858). — *Theraptus Carmelita* Stål, H. afr. 2. p. 83. 1. (1865).
Patria: Calabar. (Mus. Holm.); Sierra Leona, Gabon, Congo.

bb. *Capite ante tubercula antennifera distincte producto; ventre fasciis nigris destituto vel segmentis basi apiceque vel apice nigris.*

c. *Bucculis antice angulum subrectum, inerme, formantibus; articulo quarto antennarum secundo longiore.* — Dasynus Burm.

d. *Articulo tertio antennarum apice supra subtusque carinato vel laminato-ampliato.*

5. **P. (Dasynus) coccocinctus** Burm. — *Coreus (Dasynus) coccocinctus* Burm., Nov. act. Ac. Leop. 16. Suppl. p. 297. 24. (1834). — *Paryphes ? coccocinctus* Dall., List. 2. p. 440. 4. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

6. **P. (Dasynus) laminatus** Stål. — Niger, superne pectoreque distincte denseque punctatus; capite anterius et subtus, margine imo omni fasciaque apicali thoracis, margine imo costali et parte exteriore marginis apicalis corii, margine imo postico partium pectoris, macula antica propleurorum, limbo laterali metapleurorum, mesosterno, exceptis vittis duabus, nec non fascia lata subbasali segmentorum ventris cinnabarinis; segmentis dorsi abdominis et connexivi basin versus fusco-subcinnabarinis. ♂. Long. $14\frac{1}{2}$, Lat. 4 mill.
♂. Segmento genitali apice obtuse rotundato et in medio subemarginato, nigro, lateribus angustis maculaque antica cinnabarinis.
Patria: Batavia Javæ. (Mus. Vien.)
P. coccocincto valde affinis, pictura, angulis thoracis lateralibus paullo obtusioribus et minus prominulis, et præsertim articulo tertio antennarum apicem versus utrinque distincte laminato-dilatato, nec tantum acute carinato, parte dilatata circiter duplo longiore quam latiore, differt. Articulus quartus antennarum mutilus in exemplo descripto. Pictura forte variabilis.

dd. *Articulo tertio antennarum apice tereti, nec carinato nec dilatato.*

7. **P. (Dasynus) pallidus** Stål. — *Dasynus pallidus* Stål, Ö. V. A. F. 1870. p. 651. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)

8. **P. (Dasynus) nigro-punctatus** Stål. — *Dasynus nigro-punctatus* Stål, Ö. V. A. F. 1870. p. 651. 3.
Patria: Insulæ Philippinæ. (Mus. Holm.)

cc. *Bucculis antice angulum acutum formantibus vel dente acuto armatis; capite subtus latera versus distincte punctato; articulis secundo et tertio antennarum longitudine subæqualibus.* — Odontoparia Mayr.

e. *Corpore angusto; antennis longioribus, articulo primo omnium longissimo, capiti thoracique simul sumtis longitudine subæquali; bucculis altioribus.*

9. **P. (Odontoparia) bucculentus** Stål. — *Dasynus bucculentus* Stål, Ö. V. A. F. 1870. p. 652. 4.
Patria: Insulæ Philippinæ. (Mus. Holm.)

ee. *Corpore minus angusto; antennis minus longis, articulis primo et tertio longitudine subæqualibus, secundo brevioribus, primo thorace breviore; bucculis minus altis.*

10. **P. (Odontoparia) nicobarensis** Mayr. — *Odontoparia nicobarensis* Mayr, Verh. z.-b. Ges. Wien. 15. p. 433. (1865); Reis. Nov., Hem. p. 98. f. 22. (1866).
Patria: Sambeloug Insularum Nicobarensium (Mus. Vien.)

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11. **P. linea** Dall. — *Paryphes linea* Dall., List. 2. p. 440. 5. (1852).
Patria: Sierra Leona.

AMBLYPELTA Stål.

1. **A. bilineata** Stål. — Pallidissime subolivaceo-flavescens, nitida, thorace, scutello, hemelytris pectoreque distincte punctatis, thorace postice hemelytrisque obscurioribus, in ferrugineum vergentibus, subviolaceo-fusco-

punctatis; lineis duabus longitudinalibus capitis, lineis duabus articuli primi nec non articulo quarto antennarum nigris, hoc prope basin pallido-annulato; dorso abdominis sanguineo-flavescente, segmento sexto sanguineo et utrinque nigro-lineato; apice scutelli nigro. ♂. Long. 10, Lat. 3½ mill.

♂. Segmento dorsali sexto apice inter angulos posticos distinctos rotundato; segmento genitali apice profunde bisinuato, sinubus stylo longo curvato occupatis.

Patria: Nova Caledonia. (Coll. SIGNORET.)

Statura fere *Pendulini nicobarensis*, sed thorace breviore, capite magis producto. Caput parce punctulatum. Antennæ articulis primo et tertio æque longis, thorace nonnihil brevioribus, secundo primo circiter dimidio longiore, quarto ad partem mutilo in exemplo descripto. Rostrum basin metasterni subsuperans, articulo primo pone oculos vix extenso, secundo quartoque fere æque longis, tertio longioribus. Thorax sat fortiter et remote, postice nonnihil subtilius et densius punctatus. Venter ad partem tibiæque exempli descripti mutilæ. Latera abdominis parallela. Anguli laterales thoracis extrorsum acute prominuli. Membrana et alæ sordide hyalinæ.

2. **A. nitida** STÅL. — Pallide subolivaceo-flavescens, nitida, distincte dilute punctata, thorace postice fusco-punctato; apice scutelli nigro; articulo quarto antennarum fusco, prope basin pallido; membrana decolore; alis sordide hyalinis, abdomine dorso dilute croceo, lateribus subsanguineis. ♂. Long. 12, Lat. 3⅔ mill.

♂. Segmento dorsali sexto postice rotundato; segmento genitali posterius rotundato, medio subsinuato-truncato.

Patria: Rockhampton Australiæ. (Mus. Holm.)

Præcedenti maxime affinis, differt thorace nonnihil densius punctato, articulo primo antennarum tertio distincte nonnihil longiore, præsertim autem forma segmenti genitalis maris; pictura minus valet, certe varians. Venter pone medium in disco pilosus. Articulus quartus antennarum tertio circiter dimidio longior.

Div. **Gonoceraria** STÅL.

CONSPECTUS GENERUM.

1(4). Capite ante tubercula antennifera distincte producto; scutello saltem apice nigro.

2(3). Antennis crassioribus, articulo quarto fusiformi et tertio multo breviore; segmento genitali dorsali ultimo feminarum mihi cognitarum apice profunde acutangulariter emarginato; segmento genitali marium pone medium sinuato-angustato, apice sinuato-truncato, angulis posticis distinctis; angulis posticis segmenti dorsalis sexti feminarum subrectis; genus faunæ europææ. — *Gonocerus* LATR.

3(2). Antennis minus crassis, articulo quarto tertio haud breviore; segmento genitali dorsali ultimo feminarum apice obtuse vel obtusiuscule arcuato-sinuato; angulis posticis segmenti dorsalis sexti abdominis feminarum obtusiusculis. — *Plinachtus* STÅL.

4(1). Scutello apice haud nigro; capite raro ante tubercula antennifera distinctius producto, parte apicali a latere visa apice sensim declivi, haud rotundata; angulis posticis segmenti dorsalis sexti abdominis feminarum rectis vel acutiusculis; margine costali corii et margine abdominis minutissime crenulato vel serrulato.

5(6). Angulis segmentorum abdominis haud acute prominulis. — *Cletus* STÅL.

6(5). Angulis segmentorum quorundam abdominis acute productis. — *Cletomorpha* MAYR.

PLINACHTUS STÅL.

STÅL, Ö. V. A. F. 1859. p. 470; H. afr. 2. p. 6 et 81. (1865).

a. *Pedibus posterioribus, præsertim posticis, sat distantibus, his a lateribus corporis quam inter se circiter dimidio longius remotis; ventre aciculato, remotissime subtiliterque punctato.* — NESIOTES STÅL.

1. **P. bellus** STÅL. — *Galæsus bellus* STÅL, An. S. E. Fr. (4) 5. p. 184. 1. (1865).

Patria: Insulæ Fidschi. (Mus. Holm.)

Anguli laterales thoracis anterius denticulo obtusissimo obsoleto instructi.

aa. *Pedibus posticis a lateribus corporis quam inter se saltem duplo longius remotis; ventre distincte punctato.*

2. **P. scutellaris** STÅL. — Nigricans, superne hic illic subferrugineo-pallescens, subtus cum maculis duabus anterioribus thoracis, scutelli disco maximo subcordato, margine costali ante medium, rostro dorsoque abdominis stramineus; apice dorsi abdominis, segmentis connexivi pone medium, macula magna laterali partium pectoris, mesosterno, maculis marginalibus maculisque in series duas positis lateralibus ventris nec non vittis duabus in-

ferioribus capitis nigris; membrana alisque sordide hyalinis, illius angulo basali, his pone medium fuscis. ♀. Long. 15, Lat. 5 mill.

Patria: Sennaar. (Mus. Vien).

P. aciculari affinis videtur. Punctura dorsi nigra. Antennæ articulo primo secundo breviore, triquetro, secundo apicem versus supra subtusque levissime carinato-ampliato, reliquis articulis —? Anguli laterales thoracis in spinam acutissimam reflexam producti. Discus stramineus scutelli parce nigro punctatus. Rostrum basin mesosterni subsuperans, articulis secundo et quarto fere æque longis, tertio longioribus. Macula magna nigra lateralis mesostethii et metastethii macula straminea ipsa notata. Coloribus picturaque verisimiliter varians.

3. **P. pungens** Thunb. — *Cimex pungens* Thunb., N. ins. sp. 2. p. 36. (1783). — *Alydus pungens* Thunb., H. rostr. cap. 3. p. 2. (1822). — *Gonocerus pungens* Stål, Ö. V. A. F. 1856. p. 195. 3. — *Plinachtus pungens* Stål, H. afr. 2. p. 81. 1. (1865).

Patria: Terra capensis. (Mus. Holm).

4. **P. pugionatus** Stål. — *Plinachtus pugionatus* Stål, Ö. V. A. F. 1859. p. 470. 2.

Patria: Caffraria.

5. **P. spinosus** Stål. — *Plinachtus spinosus* Stål, Ö. V. A. F. 1859. p. 470. 3.

Patria: Terra capensis.

6. **P. dubius** H. S. — *Gonocerus dubius* H. S., W. I. 6. p. 9. f. 565. (1842). — *Plinachtus dubius* Stål, H. afr. 2. p. 82. 2. (1865).

Patria: Terra capensis. (Mus. Holm.)

♂. Segmentum genitale apice late obtuseque sinuatum, prope angulos apicales processu spiniformi, valde extrorsum vergente, marginem posticum subtangente, armato.

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7. **P. acicularis** Fabr. — *Alydus acicularis* Fabr., S. R. p. 251. 14. (1803). — *Leptoscelis ventralis* Dall., List. 2. p. 458. 10. (1852). — *Plinachtus acicularis* Stål, H. Fabr. 1. p. 62. 1. (1868).

Patria: Ceylon; Tranquebar.

8. **P. rufiventris** Dall. — *Anisoscelis rufiventris* Dall., Tr. E. S. Lond. (2) 1. p. 5. 2. (1850).

Patria: Butan.

9. **P. peltastes** Stål. — *Plinachtus Peltastes* Stål, Stett. E. Z. 22. p. 144. 1. (1861).

Patria: Ceylon.

10. **P. basalis** Westw. — *Coreus basalis* Westw. in Hope, Cat. 2. p. 24. (1842).

Patria: Cuna Indiæ orientalis.

11. **P. luridus** Dall. — *Gonocerus luridus* Dall., List. 2. p. 493. 1. (1852).

Patria: Africa meridionalis.

CLETUS Stål.

Stål, Freg. Eug. resa, Ins. p. 236. (1859); H. afr. 2. p. 6 et 75. (1865); Mayr, Reis. Nov., Hem. p. 118. (1866).

a. *Rostro basin metasterni attingente vel superante; articulo quarto antennarum omnium brevissimo; capite ante tubercula antennifera distincte nonnihil producto; mesosterno metasternoque distincte sulcatis.*

b. *Antennis crassis vel crassiusculis, brevioribus, articulo primo parti capitis pone antennas sitæ longitudine subæquali; thorace anteriora versus granulato, ante medium transversim leviter impresso, ante impressionem distincte multo minus declivi, angulis lateralibus plus minus distincte sinuatis, ante sinum plus minus prominulis, marginibus lateralibus anticis postice versus angulos laterales rotundatis: margine costali corii haud vel obsoletissime pallescente.*

c. *Rostro basin metasterni attingente; sulco sternorum sat profundo.*

1. **C. scurra** Germ. — *Syromaster scurra* Germ. in Silb., Rev. 5. p. 146. 60. (1837). — *Gonocerus ? crassicornis* Dall., List. 2. p. 498. 14. (1852). — *Cletus Scurra* Stål, H. afr. 2. p. 80. 10. (1865).

Patria: Terra capensis. (Coll. Signoret.)

cc. *Rostro apicem segmenti secundi ventris subattingente vel subsuperante; sulco sternorum minus profundo.*

2. **C. leprosus** Burm. — *Gonocerus leprosus* Burm., Handb. 2: 1. p. 311. 3. (1835). — *Gonocerus spissicornis* Stål, Ö. V. A. F. 1856. p. 195. 4. — *Cletus leprosus* Stål, H. afr. 2. p. 80. 11. (1865).

Patria: Terra capensis. (Mus. Holm.)

3. **C. ferruginosus** Stål. — Præcedenti colore, statura puncturaque maxime affinis, differt antennarum articulo primo, uti videtur, crassiore, articulis secundo tertioque gracilioribus, secundo tertio distincte nonnihil longiore, basin versus obsoletissime incrassato, articulo secundo rostri proportionaliter breviore, quarto secundo vix breviore. ♀. Long. 10, Lat. 3 mill.

Patria: Terra capensis. (Mus. Holm.)

Articulus quartus antennarum mutilus in exemplo descripto.

bb. *Antennis gracilioribus, longioribus, articulo primo capitis parte pone antennas sita distincte longiore, capiti a latere viso longitudine æquali; rostro apicem segmenti secundi ventris attingente: thorace antice vix minus declivi.*

4. **C. notatus** Thunb. — *Cimex notatus* Thunb., N. ins. sp. 2. p. 37. (1783); Gmel., S. N. 1: 4. p. 2145. 258. (1788). — *Alydus notatus* Thunb., H. rostr. cap. 3. p. 1. (1822).

Patria: Terra capensis. (Mus. Upsal.)

Speciebus quibusdam divisionis aa, ex. gr. *C. rustico, ochraceo* haud dissimilis, capite rostroque longioribus mox distinguendus. Articulus secundus antennarum primo circiter tertia parte longior, primus tertio subbrevior, quartus tertio tertia parte brevior. Rostrum articulo quarto tertio vix longiore, secundo quarto distincte longiore. Corium macula pallida posteriore destitutum, margine costali ultra medium distincte angusteque pallescente. Segmentum genitale maris apice rotundatum, medio vix sinuatum, margine apicali, medio excepto, anguste subdepresso.

aa. *Rostro basin metasterni haud attingente, articulo quarto tertio nonnihil longiore et secundo nonnihil breviore.*

d. *Tuberculis antenniferis apice extus plerumque inermibus, raro obsolete subdentatis; articulo quarto antennarum tertio breviore.*

e. *Margine costali corii a basi ad vel ultra medium distinctissime pallescente vel albicante, corio postice macula pallida lævigata plerumque notato: tuberculis antenniferis inermibus; mesosterno sulcato.*

f. *Antennarum articulo primo parte capitis pone antennas sita haud vel vix longiore, articulis secundo et tertio longitudine subæqualibus; angulis lateralibus thoracis apice haud vel leviter acuminatis, apice subrecurvis, margine eorum antico a supero viso leviter rotundato.*

g. *Macula pallida corii in areola interiore posita.*

5. **C. capitulatus** H. S. — *Gonocerus capitulatus* H. S., W. I. 6. p. 8. f. 565. (1842). — *Coreus parvulus* Westw. in Hope, Cat. 2. p. 23. (1842). — *Homoeocerus minimus* A. et S., Hist.. p. 204. 2. (1843). — *Cletus capitulatus* Mayr, Reis. Nov., Hem. p. 119. (1866).

Patria: Java. (Mus. Holm.); Manila.

6. **C. Amyoti** Montr. — *Gonocerus Amyoti* Montr., An. S. E. Fr. (4) 1. p. 66. 26. (1861).

Patria: Lifu. (Coll. Signoret).

C. capitulato maxime affinis, differt angulis lateralibus thoracis fuscis, apice acutioribus, postice levissime sinuatis, ibidem denticulatis.

gg. *Macula pallida corii in areola apicali exteriore posita, areola interiore rarius macula obsoleta notata.*

7. **C. pusillus** Dall. — *Gonocerus pusillus* Dall., List. 2. p. 497. 13. (1852). — *Cletus pusillus* Stål, H. afr. 2. p. 75. 1. (1865).

Patria: Territorium lacus N'Gami. (Mus. Holm.)

8. **C. clavatus** Sign. – *Gonocerus clavatus* Sign., An. S. E. Fr. (3) 8. p. 943. 126. (1861). — *Cletus clavatus* Stål, H. afr. 2. p. 76. 2. (1865)

Patria: Madagascar. (Mus. Holm.)

9. **C. binotulatus** Stål. — *Gonocerus binotulatus* Stål, Ö. V. A. F. 1858. p. 316. 21. — *Cletus binotulatus* Stål, H. afr. 2. p. 76. 3. (1865).

Patria: Territorium lacus N'Gami. (Mus. Holm.)

ff. *Antennarum articulo primo parte capitis pone antennas sita longiore, articulo secundo tertio plerumque distincte longiore; angulis lateralibus thoracis acutis, extrorsum vel leviter antrorsum vergentibus, margine eorum antico recto vel subsinuato, margine postico denticulato; corii macula pallida in areola apicali interiore posita, raro nulla.*

10. **C. bis-bipunctatus** Stål. — *Gonocerus bis-bipunctatus* Stål, Ö. V. A. F. 1858. p. 316. 20. — *Cletus bis-bipunctatus* Stål, H. afr. 2. p. 77. 4. (1865).

Patria: Caffraria. (Mus. Holm.)

Antennæ mutilæ in exemplo unico.

11. **C. trigonus** Thunb. — *Cimex trigonus* Thunb., N. ins. sp. 2. p. 37. (1783); Gmel., S. N. 1: 4. p. 2145. 259. (1788). — *Cimex pugnator* Fabr., Mant. 2. p. 287. 84. (1787); Gmel., S. N. 1: 4. p. 2137. 195. (1788). — *Coreus pugnator* Fabr., E. S. 4. p. 130. 30. (1794); S. R. p. 197. 26. (1803). — *Gonocerus acutus* Dall., List. 2. p. 495. 7. (1852). — *Cletus trigonus* Stål, Freg. Eug. resa, Hem. p. 237. 44. (1859); Mayr, Reis. Nov., Hem. p. 119. (1866). — *Cletus bistillatus* A. Dohrn, Stett. E. Z. 21. p. 403. 46. (1860). — *Cletus pugnator* Stål, H. Fabr. 1. p. 60. 1. (1868).

Patria: Insulæ Philippinæ, Ceylon, Bengalia. (Mus. Holm. et Upsal.)

Variat dorsum abdominis totum vel fere totum vel anterius, præsertim lateribus, nigrum.

12. **C. rusticus** Stål. — *Cletus rusticus* Stål, Freg. Eug. resa., Ins. p. 237. 43. (1859).

Patria: China. (Mus. Holm.)

Corium macula postica pallida destitutum.

ee. *Margine costali corii haud vel obsoletissime pallescente; corio rarissime macula postica pallida notato.*

13. **C. ochraceus** H. S. — *Gonocerus ochraceus* H. S., W. I. 6. p. 7. f. 563. (1842); Dall., List. 2. p. 496. 9. (1852). — *Coreus immaculatus* Westw. in Hope, Cat. 2. p. 23. (1842). — *Cletus ochraceus* Stål, H. afr. 2. p. 77. 5. (1865); Mayr, Reis. Nov., Hem. p. 119. (1866).

Patria: Terra capensis (Mus. Holm.)

Mesosternum haud vel obsolete, apice distinctius sulcatum. Tubercula antennifera inermia.

14. **C. caffer** Stål. — *Gonocerus caffer* Stål, Ö. V. A. F. 1855. p. 31. 2. — *Cletus caffer* Stål, H. afr. 2. p. 78. 6. (1865).

Patria: Caffraria. (Mus. Holm.); Madagascar

Tubercula antennifera hujus et sequentis speciei apice extus obsoletissime subdentata. Mesosternum —?

15. **C. varius** Dall. — *Gonocerus varius* Dall., List. 2. p. 496. 11. (1852). — *Cletus varius* Stål, H. afr. 2. p. 78. 7. (1865).

Patria: Caffraria. (Mus. Holm.)

dd. *Tuberculis antenniferis apice extus spinula armatis; articulo quarto antennarum tertio nonnihil longiore, articulo primo basi superne tuberculato; marginibus lateralibus anticis thoracis tuberculis parvis pallidis instructis; mesosterno haud sulcato; angulo basali interiore membranæ obscure fusca.*

16. **C. bipunctatus** H. S. — *Gonocerus bipunctatus* H. S., W. I. 6. p. 9. f. 566. (1842). — *Gonocerus pugnator* Dall., List. 2. p. 495. 5. (1852).

Patria: Java, Batavia. (Mus. Holm.)

Variat corio apice prope angulum interiorem macula pallida obsoleta ornato vel destituto.

17. **C. saucius** Stål. — Præcedenti simillimus et maxime affinis, differt spinula tuberculorum antenniferorum minore, minutissima, thorace linea longitudinali lævi distinctiore instructo, maculis duabus parvis nigris destituto, angulis lateralibus nonnihil minus productis. ♂. Long. 10, Lat. hem. $3\frac{1}{2}$ mill.

Patria: Australia borealis. (Mus. Holm.)

Segmentum genitale maris posterius nonnihil angustatum, paullo productum, apice obtuse rotundatum. Corium macula postica pallida minus distincta, interdum verisimiliter deficiente. Angulus apicalis corii, apex tibiarum et tarsi subsanguinei.

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18. **C. calumniator** Fabr. — *Coreus calumniator* Fabr., E. S. 4. p. 131. 16. (1794); S. R. p. 198. 29. (1803). — *Cletus Calumniator* Stål, H. Fabr. 1. p. 60. 2. (1868).

Patria: India orientalis.

19. **C. bipunctatus** Westw. — *Coreus bipunctatus* Westw. in Hope, Cat. 2. p. 23. (1842). — *Cletus bipunctatus* Mayr, Reis. Nov., Hem. p. 119. (1866).

Patria: India orientalis.

20. **C. rubidiventris** Westw. — *Coreus rubidiventris* Westw. in Hope, Cat. 2. p. 23. (1842). — *Cletus rubidiventris* Mayr, Reis. Nov., Hem. p. 118. (1866).

Patria: India orientalis.

21. **C. punctulatus** Westw. — *Coreus punctulatus* Westw. in Hope, Cat. 2. p. 23. (1842). — Mayr, Reis. Nov., Hem. p. 119. (1866).

Patria: India orientalis.

22. **C. capensis** Westw. — *Coreus capensis* Westw. in Hope, Cat. 2. p. 23. (1842).

Patria: Terra Capensis.

23. **C. obsoletus** H. S. — *Gonocerus obsoletus* H. S., W. I. 6. p. 10. f. 567. (1842). — *Cletus obsoletus* Mayr, Reis. Nov., Hem. p. 119. (1866).

Patria: America borealis, sec. Herrich Schæffer.

24. **C. affinis** H. S. — *Gonocerus affinis* H. S., W. I. 6. p. 10. (1842).
Patria ignota.

25. **C. punctiger** DALL. — *Gonocerus punctiger* DALL., List. 2. p. 494. 3. (1852).
Patria: China.

26. **C. fascialis** DALL. — *Gonocerus fascialis* DALL., List. 2. p. 496. 12. (1852).
Patria: Africa meridionalis.

27. **C. crenicollis** SCHAUM. — *Gonocerus crenicollis* SCHAUM, Ber. Ak. Berl. 1853. p. 358; PETERS, Reis. Mossamb., Ins. p. 43. t. 2. f. 7. (1862).
Patria: Mossambique.

28. **C ? collaris** GUÉR. — *Gonocerus collaris* GUÉR., Voy. Coq., Ins. p. 173. pl. 12. f. 4. (1830).
Patria: Nova Guinea.

29. **C. elongatus** A. DOHRN. — *Cletus elongatus* DOHRN, Stett. E. Z. 21. p. 403. 47. (1860).
Patria: Ceylon.

CLETOMORPHA MAYR.

Cletus, subg. *Cletomorpha* MAYR, Reis. Nov., Hem. p. 118. (1866).

a. *Angulis posticis segmenti dorsalis sexti subrectis; abdomine minus lato, angulis apicalibus segmentorum quarti et quinti leviter prominulis.*

b. *Marginibus lateralibus lineaque subtili media scutelli lævigatis, pallidis.*

1. **C. lituripennis** STÅL. — *Gonocerus lituripennis* STÅL, Ö. V. A. F. 1855. p. 30. 1. — *Gonocerus lineatus* SIGN., An. S. E. Fr. (3) 8. p. 942. 123. (1861). — *Cletus lituripennis* STÅL, H. afr. 2. p. 79. 9. (1865).
Patria: Caffraria. (Mus. Holm.); Madagascar.
Anguli apicales segmentorum quarti et quinti abdominis levissime acute prominuli. In exemplo nostro unico tuberculum antenniferum rectum apice spinula armatum, sinistrum inerme. Articulus primus antennarum basin versus haud gracilescens. Mas ignotus.

bb. *Marginibus scutelli haud lævigatis.*

2. **C. lancigera** FABR. — *Coreus lanciger* FABR., E. S. 4. p. 128. 7. (1794); S. R. p. 195. 17. (1803). — *Gonocerus lanciger* DALL., List. 2. p. 496. 8. (1852). — *Cletus lanciger* STÅL, H. afr. 2. p. 79. 8. (1865); MAYR, Reis. Nov., Hem. p. 119. (1866); H. Fabr. 1. p. 60. 1. (1868).
Patria: Calabar Guineæ. (Mus. Holm.)
Articulus primus antennarum ante medium gracilior. Segmentum dorsale ultimum maris truncatum. Segmentum genitale maris apice biincisum, postice utrinque impressum.

aa. *Angulis posticis segmenti dorsalis sexti abdominis feminarum acutis, retrorsum æque longe ac segmentis genitalibus productis; abdomine latiore, angulis posticis segmentorum quarti et quinti magis et acutius productis; articulo basali antennarum basin versus gracilescente.* — CLETOMORPHA MAYR.

3. **C. bellula** STÅL. — *Cletus bellulus* STÅL, Freg. Eug. resa, Hem. p. 237. 45. (1859); MAYR, Reis. Nov., Hem. p. 118. (1866).
Patria: Java. (Mus. Holm.); Insulæ Philippinæ.
♂. Segmentum dorsale ultimum apice obtuse sinuatum. Segmentum genitale apice rotundatum et medio leviter emarginatum, prope apicem processu depresso instructum.
Anguli segmenti secundi abdominis vix, segmenti tertii levissime, segmentorum quarti et quinti distincte prominuli.

4. **C. denticulata** STÅL. — *Cletomorpha denticulata* STÅL, Ö. V. A. F. 1870. p. 652. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

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5. **C. hastata** FABR. — *Cimex hastatus* FABR., Mant. 2. p. 287. 88. (1787); GMEL., S. N. 1: 4. p. 2137. 199. (1788). — *Coreus hastatus* FABR., E. S. 4. p. 132. 21. (1794); S. R. p. 199. 37. (1803). — *Cletomorpha hastata* STÅL, H. Fabr. 1. p. 61. 1. (1868).
Patria: Tranquebar.

6. **C. elevator** FABR. — *Coreus elevator* FABR., S. R. p. 194. 11. (1803). — *Cletomorpha elevator* STÅL, H. Fabr. 1. p. 61. 2. (1868).
Patria: Guinea.

7. **C. alternata** DALL. — *Gonocerus alternatus* DALL., List. 2. p. 495. 6. (1852).
Patria: Java.

Div. **Hydararia** Stål.

Conspectus generum.

1(2). Abdomine utrinque nonnihil rotundato-ampliato, posterius angustato; spiraculis pone medium segmentorum ventris positis, a margine laterali remotis; capite ante antennas minus producto; antennis corpori longitudine subæqualibus; angulis lateralibus thoracis acutis, productis; margine apicali corii versus angulum apicalem distinctissime sinuato, ante sinum rotundato; feminæ ignotæ. [1]) — *Hydara* Dall.

2(1). Abdominis lateribus rectis, subparallelis; spiraculis a basi et apice segmentorum ventris æque longe remotis, ad margines laterales valde appropinquatis; capite ante antennas magis producto; antennis corpore angusto paullo brevioribus; angulis lateralibus thoracis rotundatis, haud prominulis; margine apicali corii subrecto; feminæ ignotæ. — *Corduba* Stål.

HYDARA Dall.

Dall., List. 2. p. 485 et 492. (1852); Stål, H. afr. 2. p. 5 et 73. (1865).

1. **H. tenuicornis** Westw. — *Coreus tenuicornis* Westw. in Hope, Cat. 2. p. 24. (1842). — *Hydara tenuicornis* Dall., List. 2. p. 493. pl. 14. f. 5. (1852); Stål, H. afr. 2. p. 73. 1. (1865). — *Hydara gracilicornis* Stål, Ö. V. A. F. 1855. p. 30. 1; Sign., An. S. E. Fr. (3) 8. p. 942. 122. (1861).
Patria: Caffraria. (Mus. Holm.); Madagascar, Sierra Leona.

CORDUBA Stål.

Stål, Stett. E. Z. 23. p. 305. (1862); H. afr. 2. p. 5 et 74. (1865).

1. **C. macra** Stål. — *Corduba macra* Stål, Stett. E. Z. 23. p. 35. (1862); H. afr. 2. p. 74. 1. (1865).
Patria: Sierra Leona. (Mus. Holm.)

Div. **Phyllomorpharia** Stål.

1(6). Lobis segmenti sexti abdominis sensim angustatis.

2(5). Margine postico thoracis medio ante scutellum sinuato, ad sinum lobato; marginibus sulci orificiorum apice interruptis, margine postico tuberculato lobato.

3(4). Rostri articulo secundo tertio breviore, pone coxas anticas haud vel vix producto, primo pone oculos vix producto; lobo segmenti abdominis quarti extrorsum haud angustato. — *Phyllomorpha* Lap.

4(3). Rostri articulis secundo et tertio longitudine subæqualibus, illo coxas intermedias attingente, primo pone oculos distincte extenso; lobis omnibus abdominis apicem versus sensim angustatis. — *Phyllophya* Stål.

5(2). Margine postico thoracis medio ante scutellum haud vel obsoletissime sinuato, haud bilobo; rostri articulo primo pone oculos extenso, articulo secundo tertio paullo longiore et coxas intermedias attingente; margine apicali sulci orificiorum humiliore, depresso. — *Pephricus* A. et S.

6(1). Lobis segmenti sexti abdominis retrorsum ampliatis, apice latissimis, truncatis; thorace basi ante scutellum truncato, haud lobato; rostri articulo primo pone oculos vix extenso, articulis secundo tertioque æque longis; margine orificiorum sat elevato, calloso, apice certe elevato, tamen ibidem paullo humiliore. — *Craspedum* A. et S.

PHYLLOPHYA Stål.

1. **P. persica** Westw. — *Phyllomorpha persica* Westw., Arc. 1. p. 8. pl. 2. f. 4. (1845).
Patria ignota. (Mus. Holm.); Persia, Teheran.

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[1]) Genus americanum *Madura* spiraculis ad margines laterales segmentorum ventris maxime appropinquatis ab *Hydara* divergit. Mares *Maduræ* mihi ignoti.

PEPHRICUS A. et S.

A. et S., Hist. p. 235. (1842).

1. **P. paradoxus** SPARRM. — *Cimex paradoxus* SPARRM., Vet. Ak. H. 38. p. 386. pl. 6. f. A. B. C. (1777); GMEL., S. N. 1: 4. p. 2126. 132. (1788). — *Acanthia paradoxa* FABR., Spec. 2. p. 510. (1781); Mant. 2. p. 279. 16. (1787); FABR., E. S. 4. p. 73. 24. (1794). — *Coreus paradoxus* FABR., S. R. p. 194. 14. (1803). — *Phyllomorphus paradoxus* BURM., Handb. 2: 1. p. 310. 2. (1835). — *Phyllomorpha paradoxa* GUER., Dict. pitt. pl. 673. f. 5; Rev. Zool. 1839. p. 232. 3; WESTW., Arc. 1. p. 7. 1. pl. 2. f. 1. (1845); DALL., List. 2. p. 492. 2. (1852); STÅL, H. afr. 2. p. 105. 3. (1865). — *Pephricus paradoxus* A. et S., Hist. p. 235. 1. (1842). — STOLL, Pun. f. 101.

Patria: Terra capensis. (Mus. Holm.)

2. **P. capicola** WESTW. — *Phyllomorpha capicola* WESTW., Arc. 1. p. 8. 2. pl. 2. f. 2. (1845); DALL., List. 2. p. 492. 3. (1852); STÅL, H. afr. 2. p. 105. 4. (1865).

Patria: Terra capensis. (Mus. Holm.)

CRASPEDUM A. et S.

A. et S., Hist. p. 234. (1842).

1. **C. phyllomorphum** LATR. — *Syromastes phyllomorphus* LATR. in CUV., Règn. an. 3. p. 438. 3. pl. 19. f. 3. (1829). — *Phyllomorpha Latreillei* GUÉR., Dict. pitt. pl. 673. f. 6; Rev. Zool. 1839. p. 233; WESTW., Arc. 1. p. 8. 3. pl. 2. f. 3. (1845); DALL., List. 2. p. 492. 4. (1852); STÅL, H. afr. 2. p. 104. 1. (1865). — *Craspedum phyllomorpha* A. et S., Hist. p. 234. 1. (1842).

Patria: Caffraria; Eikhams Africæ meridionalis occidentalis. (Mus. Holm.); Senegal.

2. **C. madagascariense** COQ. — *Phyllomorpha madagascariensis* COQ., An. S. E. Fr. (2) 6. p. 185. pl. 7. f. 6. (1848); STÅL, H. afr. 2. p. 104. 2. (1865).

Patria: Madagascar.

SPECIES **Phyllomorphariorum** INCERTI GENERIS.

1. **Phyllomorpha pellicula** WESTW., Arc. 1. Add. (1845).

Patria: Africa tropica.

2. **Phyllomorpha Livingstonii** WESTW., Tr. E. S. Lond., (2) 4. Proc. p. 71. (1857).

Patria: Africa meridionalis interior.

Subf. **Pseudophloeina** STÅL.

CONSPECTUS GENERUM.

1(6). Scutello elevato, convexo; femoribus posticis basi in latere interiore tuberculo destitutis; corpore compresso; segmento genitali marium mihi cognitorum apice integro, haud biemarginato; margine postico prostethii prope angulos posticos distincte sinuato; articulis secundo et tertio antennarum æque longis vel illo hoc longiore; angulis posticis thoracis dente sæpe ægre distinguendo armatis. — Div. *Clavigrallaria* STÅL.

2(5). Articulis secundo et quarto rostri æque longis vel hoc illo longiore, articulo primo paullo pone oculos extenso.

3(4). Tuberculis antenniferis inermibus, apice extus compresso-prominulis; spatio inter oculos et apicem tuberculorum antenniferorum a latere viso oculis longiore vel longitudine æquali. — *Acanthomia* STÅL.

4(3). Tuberculis antenniferis spina armatis, apice extus haud compressis; spatio inter oculos et apicem tuberculorum antenniferorum a latere viso oculis breviore. — *Oncaspidia* STÅL.

5(2). Articulo quarto rostri secundo breviore, articulo primo pone oculos haud extenso; tuberculis antenniferis inermibus, apice obsolete compressis et subdentato-prominulis; tibiis posticis femoribus quarta vel fere tertia parte brevioribus. — *Clavigralla* SPIN.

6(1). Scutello plano vel planiusculo; femoribus posticis basi in latere interiore inferiore tuberculo parvo, interdum obtusissimo et ægre perspiciendo, instructis; maribus mihi cognitis segmento genitali apice utrinque distincte sinuato, sinubus stylo ovali repletis; tibiis posticis femoribus vix vel paullo brevioribus; articulo secundo antennarum tertio breviore.

7(10). Margine abdominis, excepta spina angulorum apicalium segmentorum, inermi.

8(9). Articulo primo antennarum capite breviore, parte fere dimidia basali gracili, parte dimidia apicali clavata, spinulosa, articulo secundo primo longiore, tertio paullo breviore, his duobus gracilibus, quarto —?; capite spinoso, tuberculis antenniferis apice extus dentato-prominulis; scutello apice calloso et paullo elevato; articulo quarto rostri secundo vix breviore; margine posteriore thoracis inter angulos laterales sensim obtuse rotundato, inermi; mesosterno et metasterno distincte sulcatis. — *Mevania* Stål.

9(8). Articulo primo antennarum capiti longitudine subæquali, parte dimidia basali haud graciliore, articulo secundo primo paullo breviore, tertio primo longitudine æquali vel paullo longiore, his duobus minus gracilibus, quarto secundo vix longiore; capite inermi, tuberculis antenniferis apice extus dentato-prominulis; scutello apice haud calloso; articulo quarto rostri secundo multo breviore; margine posteriore thoracis obtusissime subrotundato-truncato, ad angulos basales scutelli spina gracili armato; mesosterno obtuse sulcato. — *Myla* Stål.

10(7). Margine segmentorum abdominis spinis apice setigeris duabus vel tribus minoribus et in angulis apicalibus spina majore armato; capite majusculo, thorace nonnihil longiore, nonnihil exserto, subporrecto, ante oculos versus tubercula antennifera leviter ampliato; tuberculis antenniferis apice spina incurva armatis; rostro coxas posticas vel basin metasterni attingente, articulo primo marginem posticum oculorum vix attingente, quarto secundo breviore; antennis corpore nonnihil brevioribus, sat longe ab oculis insertis, articulo primo capite breviore, basi graciliore, aspero, secundo primo longitudine subæquali, tertio secundo longiore, quarto fusiformi; thorace basi subtruncato et inermi; femoribus basi gracilioribus, posticis incrassatis, subtus multispinosis; mesosterno et metasterno distincte sulcatis. — *Hoplolomia* Stål.

ACANTHOMIA Stål.

a. *Capite versus tubercula antennifera haud ampliato; thorace posterius ferrugineo vel subcinnamomeo, carina obtusa posteriore instructo, parte declivi dense griseo-flavescente-subtomentosa, ante medium utrinque tuberculo obtuso vel obtusiusculo armato; antennis et parte basali femorum flavescente-albidis, illarum articulis tribus basalibus apice plerumque fuscis; tibiis posticis femoribus distinctius brevioribus, basi plus minus distincte curvatis.*

1. **A. tomentosicollis** Stål. — *Clavigralla tomenticollis* Stål, Ö. V. A. F. 1855. p. 31. 3. — *Clavigralla tomentosicollis* Stål, H. afr. 2. p. 107. 2. (1865).
Patria: Caffraria. (Mus. Holm.)
Mas ignotus. Rostrum basin metasterni attingens, articulo primo paullo pone oculos extenso.

2. **A. curvipes** Stål. — Præcedenti maxime affinis, differt rostro breviore, pone apicem metasterni vix extenso, parte postica ferruginea thoracis antice in angulos acutos duos producta, nec antice in medio obtusissime sinuata et ad sinum obtuse rotundata, corii limbo apicali fusco, pallido-consperso, venulis duabus membranæ inter basin et venam transversam anticam positis nigris, tibiis posticis, saltem apud mares, brevioribus et basin versus distinctius curvatis, tuberculis marginalibus thoracis concoloribus, nec fuscis. ♂. Long. 7½, Lat. 2½ mill.
Patria: Bissao. (Coll. Signoret).

3. **A. brevirostris** Stål. — *A. tomentosicolli* iterum maxime affinis, statura picturaque simillima, differt capite, antennis rostroque brevioribus, capite apice magis declivi, rostro basin mesosterni vix superante, articulo primo pone oculos haud extenso, dentibus angulorum apicalium segmentorum abdominis paullo minoribus. ♀. Long. 11, Lat. 3½ mill.
Patria: Chartum. (Coll. Mayr.)

aa. *Capite ante oculos versus tubercula antennifera antrorsum ampliato; thorace ferrugineo vel nigricante, parte declivi breviter albicante-pilosula et remotius subtomentosa, marginibus lateralibus medio spina acuta armatis; tibiis posticis femoribus vix vel paullo brevioribus, basi vix vel leviter curvatis.*

b. *Antennis ferrugineis vel ferrugineo-flavescentibus; tibiis pallidis, basi apiceque sæpe ferrugineis, membrana grisea vel albicante, fusco-venosa.*

c. *Scutello inermi.*

4. **A. natalensis** STÅL. — *Clavigralla natalensis* STÅL, Ö. V. A. F. 1855. p. 31. 2; H. afr. 2. p. 107. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

5. **A. horrida** GERM. — *Syromaster horridus* GERM. in SILB., Rev. 5. p. 145. 58. (1837). — *Clavigralla elongata* SIGN., An. S. E. Fr. (3) 8. p. 944. 130. (1861). — *Clavigralla flavipennis* SIGN., An. S. E. Fr. (3) 8. p. 945. 131. (1861). — *Clavigralla horrida* STÅL, H. afr. 2. p. 108. 4. (1865).
Patria: Caffraria; Insula Mauritii. (Mus. Holm.); Zanzibar; Madagascar.

cc. *Scutello disco utrinque spinoso.*

6. **A. muricata** STÅL. — *Alydus acantharis* THUNB., H. rostr. cap. 3. p. 1. (1822). — *Clavigralla muricata* STÅL, Ö. V. A. F. 1855. p. 31. 1. — *Clavigralla acantharis* STÅL, H. afr. 2. p. 108. 5. (1865).
Patria: Terra capensis; Caffraria. (Mus. Holm.)

bb. *Antennis tibiisque nigricantibus, pallido-annulatis; membrana fusca, pallido-conspersa.*

7. **A. hystrix** DALL. — *Clavigralla Hystrix* DALL., List. 2. p. 512. 4. (1852); STÅL, H. afr. 2. p. 109. 6. (1865).
Patria: Calabar. (Mus. Holm.)

8. **A. hystricodes** STÅL. — *Clavigralla Hystricodes* STÅL, H. afr. 2. p. 109. 7. (1865).
Patria: Sierra Leona. (Mus. Holm.)

ONCASPIDIA STÅL.

1. **O. pilosicollis** STÅL. — *Clavigralla pilosicollis* STÅL, Ö. V. A. F. 1855. p. 31. 4; H. afr. 2. p. 106. 1. (1865). — *Clavigralla similis* SIGN., An. S. E. Fr. (3) 8. p. 944. 129. (1861).
Patria: Caffraria. (Mus. Holm.); Zanzibar.

CLAVIGRALLA SPIN.

SPIN., Ess. p. 200. (1837); DALL., List. 2. p. 487. (1852).

1. **C. horrens** A. DOHRN. — *Clavigralla horrens* A. DOHRN, Stett. E. Z. 21. p. 403. 48. (1860).
Patria: Ceylon; Java; Insulæ Philippinæ; Nova Guinea. (Mus. Holm.)

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2. **C. gibbosa** SPIN. — *Clavigralla gibbosa* SPIN., Ess. p. 202. 1. (1837); DALL., List. 2. p 511. 1. (1852).
Patria: Bombay.

3. **C. acantharis** FABR. — *Lygæus acantharis* FABR., S. R. p. 206. 16. (1803). — *Clavigralla acantharis* STÅL, H. Fabr. 1. p. 67. 1. (1868).
Patria: China.

4. **C. scutellaris** WESTW. — *Coreus scutellaris* WESTW. in HOPE, Cat. 2. p. 24. (1842).
Patria: India orientalis, Gogo.

5. **C. tuberculata** DALL. — *Clavigralla tuberculata* DALL., List. 2. p. 513. 5. (1852).
Patria: China, Hongkong.

MEVANIA STÅL.

STÅL, H. afr. 2. p. 8 et 110. (1865).

1. **M. spiniceps** SIGN. — *Clavigralla spiniceps* SIGN., An. S. E. Fr. (3) 8. p. 944. 128. (1861). — *Mevania spiniceps* STÅL, H. afr. 2. p. 110. 1. (1865).
Patria: Madagascar. (Coll. SIGNORET.)
Mas ignotus.

MYLA STÅL.

STÅL, H. afr. 2. p. 8 et 111. (1865).

1. **M. nigrispina** STÅL. — *Myla nigrispina* STÅL, H. afr. 2. p. 111. 1. (1865).
Patria: Guinea. (Coll. SIGNORET.)
Mas ignotus.

2. **M. concolor** A. Dohrn. — *Clavigralla concolor* A. Dohrn, Stett. E. Z. 21. p. 403. 49. (1860).
Patria: Ceylon. (Coll. A. Dohrn.)
Præcedenti simillima, minor, antennis longioribus et paullo gracilioribus, articulo primo basi nonnihil graciliore, capite paullo longius producto, tuberculis antenniferis apice extus in dentem distinctiorem prominulis, divergit. ♂.

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3. **M. hoploxys** Dall. — *Clavigralla ? hoploxys* Dall., List. 2. p. 515. 9. (1852).
Patria: Gambia.
M. nigrispina ad hanc speciem forte est referenda.

HOPLOLOMIA Stål.

1. **H. scabricula** Stål. — Lurida, tota remote setosa; membrana grisea, venis lineolis fuscis hic illic notatis; spina angulorum apicalium segmentorum apicalium segmentorum fusca; connexivi segmentis quattuor anticis ferrugineis, duobus posticis apice fuscis vel ferrugineis; femoribus confluenter ferrugineo-variegatis, basi impictis; tibiis basi apiceque infuscatis. ♀. Long. $6\frac{1}{2}$, Lat. hem. 2 mill.
Patria: India orientalis. (Mus. Holm.)

Caput tuberculis acutiusculis setigeris pluribus, in series tres dispositis, armatum. Articulus primus antennarum asper. Thorax antrorsum sensim declivis, antice subdepressus, granulato-punctatus, tuberculis acutis fuscis pluribus, in series duas remote dispositis, instructus, marginibus lateralibus tuberculis nonnullis acutis fuscis setigeris armatis, angulis lateralibus paullo prominulis et spina gracili extrorsum vergente pallida armatis. Scutellum asperum. Clavus seriatim granulatum. Venæ corii granulatæ, granulis setigeris. Abdomen hemelytris multo latius, utrinque rotundatum. Corpus subtus totum punctatum. Femora granulata, postica subtus pone medium denticulis pluribus et spinis duabus distinctis armata.

Species **Pseudophloeinorum** incerti generis.

1. **Merocoris spinicollis** Spin., Ess. p. 216. 3. (1837).
Patria: Bombay.
2. **Clavigralla annulipes** Sign., An. S. E. Fr. (3) 8. 943. 127. (1861).
Patria: Madagascar.

Subf. Alydina Stål.

Conspectus dvisionum.

a. Thorace capite duplo vel plus duplo latiore, basi truncato; capite exserto, augusto, oblongo, porrecto, jugis porrectis, productis, tylo longioribus, collo cylindrico, parte intraoculari capitis latiore; antennis ab oculis remotis; ocellis ad basin colli positis, appropinquatis; corio margine apicali recto, truncato, sutura clavi paullo breviore; mesopleuris extrorsum levissime angustatis; angulis posticis metapleurorum acutis, sensim productis; segmento ventrali quinto feminarum postice obtusangulariter emarginato, segmento sexto usque ad basin fisso, angulis fissuralibus subrectis, subproductis; alarum venus subtensa et decurrente basi contiguis vel valde appropinquatis. — *Stenocephalaria* Stål.

aa. Thorace postice capite haud latiore vel numquam plus quam circiter dimidio latiore; margine apicali corii in exemplis macropteris sutura clavi haud breviore, plerumque multo longiore; segmento ventrali quinto feminarum truncato; mesopleuris plerumque extrorsum valde angustatis et extus metapleuris circiter dimidio brevioribus.

b. Articulo secundo rostri articulis duobus apicalibus simul sumtis plerumque distincte longiore, quarto tertio circiter duplo, plerumque plus duplo longiore; angulis posticis metastethii plerumque acutis et productis; segmento ventrali sexto feminarum integro vel minus profunde fisso, plica distincta destituto. — *Micrelytraria* Stål.

bb. Articulo secundo rostri articulis duobus apicalibus simul sumtis haud longiore, quarto tertio numquam duplo longiore.

c. Thorace postice capite saltem dimidio latiore; capite angustiusculo, thorace distincte breviore; ocellis appropinquatis; articulo primo rostri pone oculos extenso; angulis posticis metastethii acutis, productis; dorso abdominis segmento primo postice truncato, segmentis tertio et quarto postice sensim obtuse rotundatis; hamo alarum et vena decurrente basi haud vel parum distantibus; pedibus gracilibus, femoribus posticis inermibus. — *Leptocorisaria* STÅL.

cc. Thorace postice capite vix vel paullo latiore; capite magno, thorace haud vel paullo breviore; articulo primo rostri pone oculos haud vel vix extenso; angulis posticis metastethii plerumque subrectis; dorso abdominis segmento primo postice plerumque rotundato et plus minus producto, segmentis tertio et quarto apice medio productis; hamo et vena decurrente alarum distantibus; femoribus posticis plerumque spinosis; sulco orificiorum longe a margine antico metastethii abbreviato. — *Alydaria* STÅL.

Div. **Stenocephalaria** STÅL.

STENOCEPHALUS LATR.

Sténocéphale LATR., Fam. nat. p. 421. (1825).

Stenocephalus LAP., Ess. p. 31. (1832); DALL., List. 2. p. 481. (1852). — *Dicranomerus* HAHN, W. I. 1. p. 22. (1831) sine descr.

Subg. Dichromerus STÅL.

Rostrum basin metasterni subattingens, articulo quarto tertio breviore.

1. **S. (Dichromerus) caffer** DALL. — *Stenocephalus caffer* DALL., List. 2. p. 482. 2. (1852).
Patria: Territorium lacus N'Gami. (Mus. Holm.)

2. **S. (Dichromerus) punctipes** STÅL. — Pallide griseo-flavescens, superne pectoreque subremote fusco-ferrugineo-punctatus; antennis pedibusque fusco-conspersis, illarum articulo secundo basi impicto; parte apicali femorum posticorum, basi apiceque tibiarum, apice articuli primi articulisque duobus ultimis tarsorum nigricantibus; angulis lateralibus thoracis mucrone parvo lævigato, ferrugineo-flavescente, prominulo armatis; membrana grisea, inter venas fusco-sublineata; abdomine ferrugineo, margine fusco-maculato, macula angulorum basalium segmentorum albicante. ♂. Long. 9, Lat. 2 mill.
Patria: Madagascar. (Mus. Holm.)
Statura præcedentis, sed minor. Articuli duo ultimi antennarum exempli descripti mutili. Juga apice divaricata. Caput linea longitudinali pallida notatum. Rostrum sordide albicans, apicem versus fuscum. Thorax postice fusco-maculatus, marginibus lateralibus prope apicem tuberculo parvo acutiusculo pallido armatis. Vena intracostalis corii fere tota distincta, elevata, pallido fuscoque varia. Coxæ nigro-fuscæ, posteriores apice sæpe pallidæ.

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3. **S. lautipes** STÅL. — *Stenocephalus lautipes* STÅL, Ö. V. A. F. 1859. p. 468. 1.
Patria: Senegal.

4. **S. testaceus** STÅL. — *Stenocephalus testaceus* STÅL, Ö. V. A. F. 1859. p. 468. 2; H. afr. 2. p. 88. 1. (1865).
Patria: Terra capensis.

5. **S. punctarius** STÅL. — *Stenocephalus punctarius* STÅL, H. afr. 2. p. 89. 2. (1865).
Patria: Insula Réunion.

PSOTILNUS STÅL.

STÅL, Ö. V. A. F. 1859. p. 468.

1. **P. mucronifer** STÅL. — *Psotilnus mucronifer* STÅL, Ö. V. A. F. 1859. p. 468. 1.
Patria: Terra capensis.

Div. **Leptocorisaria** STÅL.

CONSPECTUS GENERUM.

1(4). Capite longo, jugis porrectis, ante tylum productis et hoc longioribus; thorace longiore, longitrorsum haud convexo, levissime declivi; collari minus distincto, punctato.

2(3). Articulo primo antennarum incrassato, subcompresso, a latere viso pone medium latiore, basi gracilescente; segmento ventrali sexto feminarum pone plicam distinctissimam angulatam fisso; segmento dorsali sexto marium apice rotundato-producto. — *Mutusca* STÅL.

3(2). Articulo primo antennarum gracili, tereti, parte apicali sensim levissime incrassata; segmento ventrali sexto feminarum integro vel breviter fisso, plica nulla vel obsoleta (an fortuito in mortuis dessiccatis?); segmento dorsali sexto marium truncato. — *Leptocorisa* LATR.

4(1). Capite minus longo, ante antennas sensim convexo-declivi, jugis tylo brevioribus; thorace convexiore, breviore, magis declivi, collari distinctissimo, saltem superne lævigato.

5(8). Femoribus inermibus.

6(7). Angulis lateralibus thoracis spina armatis; segmento ventrali sexto feminarum postice obtusangulariter emarginato, plica angulata, apicem segmenti attingente vel subattingente instructo, pone plicam fisso. — *Noliphus* STÅL.

7(6). Angulis lateralibus thoracis inermibus; segmento ventrali sexto feminarum plica destituto, apice obtusissime sinuato, breviter obsoleteque fisso; genus americanum. — *Lyrnessus* STÅL.

8(5). Femoribus anticis subtus prope apicem in latere anteriore spina distinctissima armatis; segmento ventrali ultimo feminarum subsinuato-truncato, posterius obsolete fisso, fissuræ marginibus subcompressis. — *Cosmoleptus* STÅL.

MUTUSCA STÅL.

STÅL, H. afr. 2. p. 6. (1865).

1. **M. brevicornis** DALL. — *Leptocorisa brevicornis* DALL., List. 2. p. 483. 2. (1852).
Patria: Australia borealis. (Mus. Holm.); Swan River.

2. **M. prolixa** STÅL. — *Leptocorisa prolixa* STÅL, Freg. Eug. resa, Ins. Hem. p. 235. 39. (1859).
Patria: China. (Mus. Holm.)
Dorsum abdominis rubescens, ad connexivum utrinque linea fusca, interdum per segmenta genitalia feminæ obsolete continuata. Mas segmento dorsali sexto apice rotundato-producto, segmento genitali integro, apice rotundato.

LEPTOCORISA LATR.

Gerris p. FABR., E. S. 4. p. 187. (1794). — *Leptocorise* LATR., Fam. nat. p. 421. (1825). — *Leptocorisa* LATR. in CUV., Règn. An. 5. p. 197. (1829); LAP., Ess. p. 25. (1832). — *Myodochus* BURM., Handb. 2: 1. p. 325. (1835). — *Stenocoris* BURM., Handb. 2: 2. p. 1010. (1838). — *Rhabdocoris* KOL., Mel. 2. p. 67. (1845). — *Gerris* STÅL, H. afr. 2. p. 87. (1865).

a. *Segmento genitali marium transverso, apice lato et bisinuato, vel, si vis, apice late sinuato-truncato et in medio lobulo obtuso instructo; segmento ventrali sexto feminarum apice truncato, medio haud vel obsoletissime prominulo; spiraculis a margine ventris remotis.* — RHABDOCORIS KOL.

1. **L. (Rhabdocoris) acuta** THUNB. — *Cimex acutus* THUNB., N. ins. sp. 2. p. 34. (1783). — *Cimex angustatus* FABR., Mant. 2. p. 308. 300. (1787). — *Cimex angustus* GMEL., S. N. 1: 4. p. 2193. 531. (1788). *Gerris oratorius* FABR., E. S. 4. p. 191. 13. (1794); S. R. p. 261. 3. (1803). — *Gerris angustatus* FABR., E. S. 4. p. 191. 14. (1794); S. R. p. 262. 8. (1803); STÅL, H. Fabr. 1. p. 66. 2. (1868). — *Myodochus trinotatus* H. S., W. I. 8. p. 95. f. 863. (1848). — *Leptocorisa maculiventris* DALL., List. 2. p. 484. 6. (1852).
Patria: China; Insulæ Philippinæ; Java; Australia. (Mus. Holm.)

2. **L. (Rhabdocoris) varicornis** FABR. — *Gerris varicornis* FABR., S. R. p. 260. 2. (1833); WOLFF, Ic. 5. p. 202. 196. f. 196. (1811); STÅL, H. Fabr. 2. p. 67. 3. (1868). — *Lepticorisa flavida* GUÉR., Voy. Coq., Ins. p. 178. pl. 12. f. 12. (1830). — *Coreus (Stenocephalus) varicornis* BURM., Nov. act. Ac. Leop. 16: Suppl. p. 298. 25. (1834). — *Myodochus varicornis* BURM., Handb. 2: 1. p. 325. 1. (1835). — *Leptocorisa chinensis* DALL., List. 2. p. 483. 1. (1852). — *Leptocorisa varicornis* DALL., List. 2. p. 484. 3. (1852).
Patria: China; Malacca; Ceylon; Insulæ Philippinæ; Insulæ Fona. (Mus. Holm.)

3. **L. (Rhabdocoris) costalis** H. S. — *Myodochus costalis* H. S., W. I. 8. p. 96. f. 864. (1848).
Patria: Insulæ Philippinæ. (Mus. Holm.); Java.

aa. *Segmento genitali marium haud transverso, fere æque longo ac lato, apice obtusangulariter producto, integro; segmento ventrali sexto feminarum apice in medio obtuse rotundato-producto; spiraculis ad margines ventris subappropinquatis.* — ÉRBULA STÅL.

4. **L. (Erbula) apicalis** Westw. — *Leptocorisa apicalis* Westw. in Hope, Cat. 2. p. 18. (1842). — *Leptocoris annulicornis* Sign., An. S. E. Fr. (3) 8. p. 941. 120. (1861). — *Gerris apicalis* Stål, H. afr. 2. p. 88. 1. (1865).
Patria: Sierra Leona; Insula Mauritii. (Mus. Holm.); Madagascar.

aaa. *Segmento genitali marium haud transverso, retrorsum angustato, apice obtusissime sinuato, angulis posticis ad sinum rotundatis; segmento ventrali sexto feminarum apice medio obtuse producto, haud fisso; segmentis genitalibus dorsalibus brevioribus; spiraculis ad margines ventris valde appropinquatis; femoribus apice rufescentibus; species americanæ.* — Stenocoris Burm. = Myodochus Burm. (*L. tipuloides* De Geer).

aaaa. *Segmento genitali marium haud transverso, retrorsum angustato, apice profunde sinuato, angulis posticis acute prominulis; segmento ventrali sexto feminarum postice subtruncato et breviter fisso; segmentis genitalibus dorsalibus feminæ longioribus; spiraculis ad margines ventris valde appropinquatis; femoribus apice haud rufescentibus; species americanæ.* — Leptocorisa Latr., Lap. (*L. filiformis* F. et *nigricornis* Stål.)

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5. **L. bengalensis** Westw. — *Leptocorisa bengalensis* Westw. in Hope, Cat. 2. p. 18. (1842).
Patria: Bengalia.
Ad *L. acutam* verisimiliter referenda.

6. **L. bipunctata** Costa. — *Leptocorisa bipunctata* Costa, Read. Ac. Nap. 2: 10. p. 260. (1863).
Patria ignota.

7. **L. Burmeisteri** Montr. — *Leptocorisa Burmeisteri* Montr., An. S. Lin. Lyon. (2) 11. p. 227. (1865).
Patria: Kanala.

NOLIPHUS Stål.

Stål, Ö. V. A. F. 1858. p. 440; H. afr. 2. p. 6. (1865).

a. *Parte fusca vel nigra apicali femorum posticorum annulo pallido ornata; clavo pone medium corioque intus luridis.*

1. **N. erythrocephalus** Stål. — *Noliphus erythrocephalus* Stål, Ö. V. A. F. 1858. p. 440. 1.
Patria: Insulæ Philippinæ; Cap York Australiæ. (Mus. Holm.); Sumatra.

aa. *Parte fusca apicali femorum posticorum annulo pallido destituta.*

2. **N. insularis** Stål. — *Noliphus insularis* Stål, An. S. E. Fr. (4) 5. p. 185. 2. (1865).
Patria: Insulæ Fidschi. (Mus. Holm.)
Punctura præcedentis.

3. **N. discopterus** Stål. — Testaceus; thorace, scutello, hemelytris pectoreque distincte punctatis; apice articulorum trium basalium vel non articulo quarto antennarum, rostro, thorace posterius, basi clavi, corio extus, limbo laterali propleurorum, maculis marginalibus abdominis, macula magna media segmentorum quarti et quinti ventris, femoribus apicem versus nec non apice tibiarum tarsorumque nigricantibus; membrana leviter infuscata; ocellis intus nigro-marginatis; annulo subbasali articuli primi antennarum albicante. ♀. Long. 10, Lat. 2 mill.
Patria: Insula Samoa. (Mus Holm.)
Statura præcedentium, sed minor, punctura thoracis remotiore picturaque divergens.

4. **N. papuensis** Stål. — *Noliphus papuensis* Stål, An. S. E. Fr. (4) 5. p. 185. 1. (1865).
Patria: Nova Guinea. (Mus. Holm.)
Thorax hemelytraque quam in præcedentibus remotius punctata, thorax paullo convexior et magis nitidus.

COSMOLEPTUS Stål.

1. **C. limbaticollis** Stål. — *Lyrnessus limbaticollis* Stål, An. S. E. Fr. (4) 5. p. 185. 1. (1865).
Patria: Nova Guinea, Aru, Mysol. (Mus. Holm.)

Div. **Micrelytraria** Stål.

Conspectus generum.

1(8). Scutello nec spinoso, nec apice recurvo; thorace inermi; corpore plus minus depresso; thorace horizontali vel levissime declivi; antennis longe ab oculis insertis; articulo primo antennarum crasso vel crassiusculo.

2(7). Jugis anterius contiguis; abdomine basi haud coarctato; mesosterno et metasterno distincte sulcatis; corpore plus minus depresso; capite porrecto, pone oculos haud coarctato, plus minus exserto, collo parte intraoculari latiore; genera americana.

3(6). Articulo primo antennarnm ante medium gracilescente, articulo quarto tertio multo longiore; thorace antrorsum angustato.

4(5). Jugis longissimis, longe ante tylum productis, a latere visis apice fissis; articulo primo antennarum secundo longitudine subæquali, capite paullo breviore; segmento ventrali sexto feminarum pone plicam subapicalem fisso; corpore valde elongato. — *Protenor* STÅL.

5(4). Jugis tyloque æque longis, illis apice integris; articulo primo antennarum articulo secundo capiteque multo brevioribus; segmento ventrali sexto feminarum integro, apice subimpresso; corpore minus elongato. — *Darmistus* STÅL.

6(3). Articulo primo antennarum crasso, basi gracilescente, articulo secundo breviore, articulo quarto tertio vix longiore et crassiore; corpore lineari, valde elongato, thorace antrorsum haud angustato; jugis tyloque æque longis; pedibus brevibus; segmento ventrali sexto feminarum integro. — *Bactrodosoma* STÅL.

7(2). Jugis distantibus, tylo brevioribus; sternis obsolete sulcatis; capite pone oculos leviter angustato, exserto; articulo primo antennarum articulo secundo capiteque multo breviore, parte basali gracilescente; femoribus omnibus subincrassatis; segmento ventrali sexto feminarum apice fisso vel inciso. — *Micrelytra* LAP.

8(1). Scutello spina armato vel apice recurvo; metasterno haud vel obsolete sulcato; capite pone oculos plus minus distincte angustato et exserto, plerumque nutante; antennis gracilibus.

9(14). Scutello disco vel ante apicem spina erecta armato.

10(11). Jugis longissimis, acutissimis, longe ante tylum productis, ante tylum contiguis, apice hiscentibus; antennis longe ante oculos insertis, articulo primo capite longiore; scutello spina discoidali armato; thorace inermi, basi subbisinuato; corpore gracili, valde elongato; capite leviter exserto; abdomine lineari. — *Stachyolobus* STÅL.

11(10). Jugis tylo brevioribus, distantibus; antennis ab oculis minus remotis, articulo primo capite haud longiore; thoracis angulis lateralibus spina armatis; scutello prope apicem spina armato; capite valde exserto, oblongo.

12(13). Articulo primo rostri distincte pone oculos extenso, capiti longitudine subæquali vel longiore; angulis posticis metastethii subrectis; angulo apicali corii angustissimo, longe ultra medium membranæ extenso; venis membranæ e margine basali emissis; articulo primo antennarum secundo haud breviore; segmento ventrali sexto feminarum fisso. — *Marcius* STÅL.

13(12). Articulo primo rostri capite breviore, pone oculos haud extenso; angulis posticis metastethii acutis, productis; angulo apicali corii minus angustato et tantum paullo pone medium membranæ extenso; venis membranæ e vena transversa a basi remota emissis; articulo primo antennarum secundo breviore. — *Dulichius* STÅL.

14(9). Scutello apice ipso in spinam interdum erectam producto vel apice recurvo; jugis tylo brevioribus; angulis lateralibus thoracis spina armatis; segmento ventrali sexto feminarum fisso; genera americana.

15(16). Articulo primo rostri capite breviore, pone oculos haud extenso; capite postice valde angustato, basi parte intraoculari multo angustiore; abdomine anterius valde coarctato. — *Trachelium* H. S.

16(15). Articulo primo rostri capiti longitudine subæquali vel fere longiore, pone oculos extenso; capite pone oculos minus angustato, basi parte intraoculari haud vel paullo angustiore; abdomine anterius haud vel obsolete coarctato. — *Cydamus* STÅL.

STACHYOLOBUS Stål.

Stål, Ö. V. A. F. 1870. p. 658.

1. **S. macilentus** Stål. — *Stachyolobus macilentus* Stål, Ö. V. A. F. 1870. p. 659. 1. t. 7. f. 4.
Patria: Insulæ Philippinæ. (Mus. Holm.)

MARCIUS Stål.

Stål, H. afr. 1. p. 7. (1865).

a. *Thorace anterius inermi; articulo primo rostri capiti longiore, articulo secundo apicalibus duobus simul sumtis longiore; abdomine anterius distinctissime coarctato.* ♀.

1. **M. generosus** Stål. — *Marcius generosus* Stål, An. S. E. Fr. (4) 5. p. 186. 1. (1865).
Patria: Nova Guinea. (Mus. Holm.)

aa. *Thorace anterius bispinoso; rostri articulo primo capite longitudine subæquali, articulo secundo apicalibus duobus haud vel vix longiore; abdomine anterius haud vel vix coarctato.* ♂. ♀.

2. **M. quinquespinus** Stål. — *Marcius quinquespinus* Stål, Ö. V. A. F. 1870 p. 657. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

DULICHIUS Stål.

Stål, H. afr. 2. p. 7 et 89. (1865).

1. **D. trispinosus** Stål. — *Dulichius trispinosus* Stål, H. afr. 2. p. 90. 1. (1865).
Patria: Caffraria. (Mus. Holm.)

Div. **Alydaria** Stål.

Conspectus generum.

1(26). Tibiis posticis spinis pluribus destitutis, interdum apice subtus dente armatis.

2(25). Ocellis ab oculis remotis, inter se et ab oculis æque longe vel quam ab oculis vix duplo longius remotis; articulo secundo rostri quarto plerumque distincte longiore.

3(4). Femoribus posticis inermibus, pone medium gracilescentibus, apicem abdominis superantibus; tibiis posticis gracilibus, femoribus longioribus, rectis, teretibus; tarsis posticis articulo primo apicalibus duobus simul sumtis fere triplo longioribus; jugis extus acutiuscule marginatis; articulo primo rostri sat incrassato; articulo tertio antennarum secundo multo longiore; segmento tertio ventris postice valde rotundato, quarto duplo longiore; orificiis haud distinguendis; segmento ventrali sexto feminarum fisso, fissura valvante. — *Euthetus* Dall.

4(3). Femoribus posticis subtus spinosis, a basi sensim plus minus incrassatis; orificiis plerumque distinctissimis.

5(12). Tibiis posticis rectis, teretibus, apice subtus inermibus vel in dentem obsoletum raro prominulis; sulco orificiorum plerumque recto, raro apice paullo curvato, extrorsum et interdum paullo antrorsum ducto, longiusculo; femoribus posticis basi intus tuberculo nullo vel obsoletissimo instructis; thorace basi medio ante scutellum truncato vel subsinuato; articulo secundo antennarum tertio haud vel paullo longiore; pedibus posticis haud vel paullo distantibus.

6(9). Articulo primo antennarum secundo breviore; segmento ventrali sexto feminarum integro.

7(8). Orificiis obsoletissimis, ante acetabula postica distinguendis, extrorsum haud productis; articulo primo antennarum apicem capitis haud attingente, articulo quarto præcedentibus duobus simul sumtis breviore; femoribus posticis crassis, apicem abdominis distincte superantibus; articulo primo tarsorum posticorum apicalibus duobus plus duplo, fere triplo longiore; corpore breviusculo. — *Tollius* Stål.

8(7). Orificiis distinctis, sulcum extrorsum vergentem, productum, marginatum simulantibus; articulo primo antennarum apicem capitis attingente, quarto præcedentibus duobus simul sumtis haud vel vix breviore; femoribus posticis minus crassis, apicem abdominis haud vel vix superantibus; articulo primo tarsorum posticorum apicalibus duobus circiter duplo longiore. *Alydus* FABR.

9(6). Articulo primo antennarum secundo haud breviore.

10(11). Femoribus posticis basi intus tuberculo destitutis; tibiis posticis apice inermibus; segmento ventrali sexto feminarum posterius fisso; sulco orificiorum longiusculo, distinctissimo; articulo quarto antennarum præcedentibus duobus longitudine subæquali vel longiore, primo apicem capitis superante. — *Megalotomus* FIEB.

a. Margine sulci orificiorum apice processum, rugæ vel carinæ brevis instar, antrorsum emittente. — *Megalotomus* FIEB.

aa. Margine sulci orificiorum apice processum nullum emittente. — *Hyphus* MULS.

11(10). Femoribus posticis basi intus tuberculo obtuso obsoleto instructis; tibiis posticis apice subtus denticulo obsoletissimo armatis; femina ignota. — *Burtinus* STÅL.

12(5). Tibiis posticis plus minus curvatis et compressis, apice subtus in dentem distinctissimum prominulis.

13(22). Pedibus posticis paullo distantibus vel subcontiguis.

14(17). Sulco orificiorum brevi, antrorsum et levissime extrorsum ducto, levissime extrorsum curvato, fortiter calloso-marginato; pedibus posterioribus nonnihil distantibus; femoribus posticis basi intus tuberculo destitutis; thorace basi ante scutellum truncato vel subsinuato; segmento ventrali sexto feminarum mihi cognitarum apice obtusangulariter sinuato, usque ad basin fisso; scutello basin metanoti haud attingente.

15(16). Rostro basin mesosterni attingente vel subattingente, articulo secundo quarto multo longiore; margine orificiorum apice minus alte elevatis; segmento genitali marium apice sinuato. — *Mirperus* STÅL.

16(15). Rostro basin mesosterni superante, articulis secundo et quarto æque longis; orificiis apice fortiter tuberculato-elevatis; segmento genitali marium apice processum acutum emittente; feminæ ignotæ. — *Tupalus* STÅL.

17(14). Sulco orificiorum longo, leviter calloso-marginato, extrorsum et antrorsum curvato-producto; femoribus posticis basi intus tuberculo distincto instructis.

18(19). Capite latissimo, basi thoracis latiore, ante oculos stylatos versus tubercula antennifera valde angustato; articulo primo antennarum secundo breviore, quarto præcedentibus duobus simul sumtis breviore; thorace basi ante scutellum truncato; scutello apicem metanoti attingente; segmento ventrali sexto feminarum pone plicam truncatam basalem fisso. — *Camptopus* A. et S.

19(18). Capite basi thoracis haud latiore; oculis haud vel brevissime stylatis; articulo quarto antennarum præcedentibus duobus longiore; scutello basin metanoti haud attingente; articulo secundo rostri quarto haud vel paullo longiore; segmento ventrali sexto feminarum fisso, fissura plus minus valvante.

20(21). Margine basali thoracis ante scutellum bisinuato; segmento dorsali sexto abdominis marium apice rotundato vel subrotundato-truncato; tibiis leviter compressis, subtus versus medium inermibus vel integris. — *Riptortus* STÅL.

21(20). Margine basali thoracis ante scutellum truncato vel subsinuato, angulis posticis dentato-productis; segmento dorsali sexto marium truncato vel sinuato-truncato, angulis posticis spinosis; tibiis marium quam feminarum magis compressis et curvatis. — *Hyalymenus* A. et S.

22(13). Pedibus posticis inter se et a marginibus pectoris fere æque longe distantibus; antennis breviusculis; ocellis inter se quam ab oculis paullo magis remotis; scutello apicem metatoti haud attingente; sulco orificiorum longiusculo, distincto.

23(24). Corpore subcompresso; articulo primo antennarum secundo breviore, apicem capitis haud superante, quarto præcedentibus duobus simul sumtis longitudine subæquali; rostri articulo primo pone marginem anticum oculorum paullo extenso, secundo quarto longiore; femoribus posticis apicem abdominis superantibus; tibiis posticis leviter compressis. — *Tenosius* STÅL.

24(23). Corpore depresso; articulo primo antennarum secundo longiore, apicem capitis superante, quarto præcedentibus duobus breviore; rostri articulo primo ad marginem anticum oculorum extenso, secundo quartoque æque longis; femoribus posticis apicem abdominis haud attingentibus, brevibus; tibiis vix compressis. — *Apidaurus* STÅL.

25(2). Ocellis maxime distantibus, ad oculos positis; corpore depresso; antennis breviusculis, articulo primo apicem capitis superante; thorace transverso; scutello apicem matanoti attingente; rostri articulo primo marginem anticum oculorum æquante, secundo quartoque æque longis; sulco orificiorum distincto, longiusculo; pedibus brevibus, posterioribus modice distantibus; femoribus posticis abdomine multo brevioribus, apud mares sat incrassatis; tibiis posticis apice dente armatis; segmento genitali marium apice processu, longitudine variabili, instructo. — *Daclera* SIGN.

26(1). Tibiis posticis rectis, spinis pluribus subtus armatis; pedibus posterioribus distantibus; femoribus posticis apicem abdominis attingentibus vel plerumque superantibus.

27(34). Rostri articulo secundo quarto breviore vel longitudine æquali; thorace antrorsum leviter vel levissime angustato, vix vel leviter declivi; scutello apicem metanoti haud attingente; angulo apicali corii longe angustato-producto; articulo quarto antennarum levissime incrassato; orificiis distinctis, sulco brevi, longitudinali; corpore plus minus depresso; segmento genitali marium subtruncato, sinuato; segmento ventrali sexto feminarum pone plicam truncatam fisso.

28(29). Ocellis ad oculos maxime appropinquatis; corpore magis depresso; articulo primo tarsorum posticorum duobus apicalibus simul sumtis vix longiore; tibiis posticis subtus biseriatim spinosis; femoribus marium intus apicem versus spina valida armatis. — *Nemausus* STÅL.

29(28). Ocellis ab oculis nonnihil remotis; corpore minus depresso.

30(33). Tibiis posticis duplice serie spinosis.

31(32). Thorace transverso; capitis margine nonnihil ante oculos subsinuato, haud dentato; articulo primo antennarum secundo longiore. — *Trichocnemus* STÅL.

32(31). Thorace haud transverso; capite margine paullo ante oculos dente rectangulo armatis; articulo primo antennarum secundo breviore; femoribus marium crassis, apicem versus intus spina valida. — *Nariscus* STÅL.

33(30). Tibiis posticis subtus serie unica spinarum; tylo apice plus minus prominulo; articulo primo antennarum secundo haud breviore; femoribus marium posticis leviter incrassatis, apicem versus intus spina destitutis. — *Hypselopus* BURM.

34(27). Rostri articulo secundo quarto multo longiore; thorace antrorsum modice declivi, antrorsum angustato, basi quam apice circiter duplo latiore; scutello apicem metanoti subattingente; angulo apicali corii haud angustato-producto; articulo quarto antennarum crasso, fusiformi; orificiis obsoletissimis, haud calloso-marginatis, brevibus; corpore vix depresso; segmento genitali marium apice rotundato integro. — *Stachyocnemus* STÅL.

EUTHETUS DALL.

DALL., List. 2. p. 467 et 479. (1852); STÅL, H. afr. 2. p. 7 et 90. (1865).

1. **E. pulchellus** DALL. — *Euthetus pulchellus* DALL., List. 2. p. 479. 1. pl. 14. f. 3. (1852).
Patria: India orientalis borealis.

2. **E. leucostictus** STÅL. — *Euthetus leucostictus* STÅL, Ö. V. A. F. 1855. p. 30. 1; H. afr. 2. p. 91. 1. (1865).
Patria: Caffraria. (Mus. Holm.)

3. **E. leucopoecilus** STÅL. — *Euthetus leucopoecilus* STÅL, Ö. V. A. F. 1855. p. 30. 2; H. afr. 2. p. 91. 2. (1865).
Patria: Caffraria. (Mus. Holm.)

4. **E. sordidus** STÅL. — *Euthetus sordidus* STÅL, Ö. V. A. F. 1855. p. 30. 3; H. afr. 2. p. 91. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

MEGALOTOMUS Fieb.

Megalotomus Fieb., Eur. H. p. 58 et 226. (1861). — *Huphus* Muls., Pun., Cor. p. 158. (1870).

1. **M. (Huphus) costalis** Stål. — Subæneo-niger, distincte punctatus, remote griseo-sericeus et pilosus; limbo lato costali corii dilute ferrugineo-flavescente; capitis macula minutissima obsoleta inter ocellos maculisque colli quattuor, duabus superioribus, una utrinque laterali, nec non tibiis, basi apiceque exceptis, subferrugineis; vitta hic illic dilatata basali ventris, nec non macula oblonga angulos basales segmentorum quattuor posteriorum abdominis occupantibus flavescentibus. ♂. Long. 14, Lat. $2\frac{2}{3}$ mill.

♂. Segmento genitali apice truncato, in medio haud producto.

Patria: Japonia. (Mus. Holm.)

M. limbato Burm. simillimus et maxime affinis, differt magnitudine majore, articulo primo antennarum tertio distincte longiore, limbo pallido corii latiore, ut et forma segmenti genitalis maris, quod apice est truncatum, nec in medio obtuse productum.

MIRPERUS Stål.

Mirperus Stål, Ö. V. A. F. 1859. p. 460. — *Tupalus* p. Stål, H. afr. 2. p. 7 et 95. (1865).

a. *Tuberculis antenniferis apice extus in denticulum acutum prominulis; articulo primo antennarum secundo distincte longiore; angulis lateralibus thoracis in dentem acutum distinctissime productis; dorso abdominis prope basin macula transversa, pone medium macula longitudinali stramineis notato; vitta laterali pallida pectoris ad coxas maxime appropinquata; spinis femorum posticorum basi plerumque straminis; articulo primo tarsorum posticorum crassiore, compresso, apicalibus duobus ad unum circiter dimidio longiore.* — Mirperus Stål.

1. **M. (Mirperus) jaculus** Thunb. — *Cimex Jaculus* Thunb., N. ins. sp. 2. p. 34. t. 2. f. 50. (1783); Gmel., S. N. 1: 4. p. 2145. 253. (1788). — *Alydus Jaculus* Dall., List. 2. p. 470. 4. (1852). — *Alydus crassifemur* Stål, Ö. V. A. F. 1855. p. 30. 1. — *Alydus Madagascariensis* Sign., An. S. E. Fr. (3) 8. p. 938. 114. (1861). — *Tupalus Jaculus* Stål, H. afr. 2. p. 96. 3. (1865). — Stoll, Pun. f. 292.

Patria: Caffraria. (Mus. Holm.); Madagascar.

Articulus primus antennarum distincte depressus, superne planus.

2. **M. (Mirperus) torridus** Westw. — *Alydus torridus* Westw. in Hope, Cat. 2. p. 20. (1842); Dall., List. 2. p. 470. 3. (1852). — *Alydus albidens* Westw. in Hope, Cat. 2. p. 20. (1842); Dall., List. 2. p. 470. 2. (1852). — *Tupalus albidens* Stål, H. afr. 2. p. 97. 4. (1865).

Patria: Sierra Leona. (Mus. Holm.)

A præcedente differt articulo primo antennarum graciliore, vix depresso. Antennæ et spinæ femorum colore variant. Femora postica interdum tota nigra.

aa. *Tuberculis antenniferis apice extus subrectangulis; articulo primo antennarum secundo haud vel paullo longiore; angulis lateralibus thoracis rectis vel acutiusculis, vix vel levissime prominulis; dorso abdominis basi immaculato, pone medium in parte producta apicali segmentorum tertii et quarti interdum macula obsoletissima parva pallescente; vitta laterali pallida pectoris a coxis remota; spinis femorum posticorum nigris; articulo primo tarsorum posticorum graciliore, apicalibus duobus simul sumtis duplo longiore.* — Melanacanthus Stål.

3. **M. (Melanacanthus) ferrugineus** Stål. — *Tupalus ferrugineus* Stål, Ö. V. A. F. 1870. p. 657. 1

Patria: Insulæ Philippinæ; Java. (Mus. Holm.)

4. **M. (Melanacanthus) scutellaris** Dall. — *Alydus scutellaris* Dall., List. 2. p. 474. 16. (1852).

Patria: Australia, Sydney. (Mus. Holm.); Swan River.

TUPALUS Stål.

Tupalus Stål, Ö. V. A. F. 1859. p. 60. — *Tupalus* p. Stål, H. afr. 2. p. 7 et 95. (1852).

1. **T. arcuatus** Fabr. — *Lygæus arcuatus* Fabr., E. S. Suppl. p. 538. 21—2. (1798). — *Alydus arcuatus* Fabr., S. R. p. 248. 1. (1803). — *Tupalus arcuatus* Stål, H. afr. 2. p. 95. 1. (1865); H. Fabr. 1. p. 65. 1. (1868).

Patria: India orientalis. sec. Fabr.; Madagascar; Bourbon. (Coll. Signoret.)

2. **T. fasciatus** Dall. — *Alydus fasciatus* Dall., List. 2. p. 471. 5. (1852). — *Tupalus fasciatus* Stål, H. afr. 2. p. 96. 2. (1865).

Patria: Africa. sec. Dallas. (Coll. Signoret).

CAMPTOPUS A. et S.

A. et S., Hist. p. 224. (1843).

1. **C. undulatus** WESTW. — *Alydus undulatus* WESTW. in HOPE, Cat. 2. p. 20. (1842).
Patria: Terra capensis.
A *C. laterali* europæo vix distinguendus. Patriam verisimiliter incorrecte indicavit WESTWOOD.

RIPTORTUS STÅL.

STÅL, Ö. V. A. F. 1859. p. 460; H. afr. 2. p. 7 et 93. (1865).

a. *Corpore nigro, nitido; membrana violaceo-nigricante; apice scutelli concolore, subtiliter carinato; thoracis angulis lateralibus obtusiusculis distinctis, apice vix dentatis, haud productis, margine basali medio in dentem acutiusculum distinctissimum majusculum producto.* — MELANOLAMPRUS STÅL.

1. **R. (Melanolamprus) Stålii** SIGN. — *Alydus Stålii* SIGN. in THOMS., Arch. 2. p. 301. 573. (1858). — *Riptortus Stålii* STÅL, H. afr. 2. p. 94. 4. (1865).
Patria: Calabar. (Coll. SIGNORET.)

aa. *Corpore ferrugineo vel ferrugineo-flavescente, raro nigricante, opaco; membrana plus minus obscure infuscata; thoracis angulis lateralibus in dentem acutum distincte prominulis, margine basali medio dente obtusissimo instructo vel ibidem obtusissime, interdum vix perspicue rotundato-prominulo; apice scutelli pallido, subcalloso.*

b. *Lateribus capitis pectorisque vitta, plus minus interrupta, vel maculis pallidis, plerumque distincte lævigatis, instructis, fascia illa raro distinctius nigricante-marginata; segmento dorsali sexto abdominis marium mihi cognitorum apice obtusissime angulato vel rotundato-subangulato.* — Sp. 2—10.

c. *Lateribus pectoris maculis pallidis, interdum obsoletissimis, notato; thorace pallescente, posterius obscuriore, disco granulis distinctis acutiusculis nigris remote consperso.*

2. **R. pedestris** FABR. — *Cimex pedestris* FABR., S. Ent. p. 727. 156. (1775); Spec. 2. p. 375. 224. (1781); Mant. 2. p. 307. 292. (1787). — *Cimex pedes* GMEL., S. N. 1: 4. p. 2191. 524. (1788). — *Gerris pedestris* FABR., E. S. 4. p. 190. 11. (1794). — *Lygæus pedestris* FABR., E. S. Suppl. p. 539. 29—30. (1798). — *Alydus pedestris* FABR., S. R. p. 252. 17. (1803). — *Riptortus pedestris* STÅL, H. Fabr. 1. p. 64. 1. (1868).
Patria: India orientalis; Cochinchina. (Mus. Holm.)

3. **R. fuscus** FABR. — *Lygæus fuscus* FABR., E. S. Suppl. p. 539. 30—1. (1798). — *Alydus fuscus* FABR., S. R. p. 249. 6. (1803). — *Alydus ventralis* WESTW. in HOPE, Cat. 2. p. 20. (1842). — *Alydus major* A. DOHRN, Stett. E. Z. 21. p. 402. 44. (1860). — *Riptortus fuscus* STÅL, H. Fabr. 1. p. 64. 2. (1868).
Patria: Bengalia. (Mus. Holm.)
A præcedente vix divergit.

4. **R. clavatus** THUNB. — *Cimex clavatus* THUNB., N. ins. sp. 2. p. 34. t. 2. f. 4. (1783); GMEL., S. N. 1: 4. p. 2145. 252. (1788). — *Camptopus annulatus* UHLER, Pr. Ac. Phil. 1860. p. 225.
Patria: Japonia. (Mus. Holm. et Upsal.)
Præcedenti maxime affinis, differt thoracis disco et marginibus nec non pectore paullo densius nigro-muriculatis, pectoris lateribus maculis pallidis nullis vel obsoletissimis, haud lævigatis. In exemplo typico metanotum totum et segmentum dorsale abdominis primum totum nigra, dorsum abdominis prætera ante medium fascia subarcuata fusco-subferruginea notatum. Connexivum nigrum, pallido-maculatum. Pictura dorsi abdominis et apicis articulorum antennarum variat. Dens angulorum lateralium thoracis concolor.

cc. *Lateribus pectoris vitta, plus minus late interrupta, pallida, lævigata, ornatis; disco thoracis lateribusque pectoris granulis acutiusculis nigris distinctis destitutis, raro obsoletissime minutissimeque granulatis, granulis concoloribus.*

d. *Abdominis dorso, saltem apice, nigro; rostro ad vel pone medium metasterni extenso.*

5. **R. annulicornis** BOISD. — *Alydus annulicornis* GUÉR., Voy. Coq., Ins. p. 177. pl. 12. f. 11. (1830); DALL., List. 2. p. 475. 17. (1852). — *Alidus annulicornis* BOISD., Voy. Astr., Ins. 2. p. 636. pl. 11. f. 14. (1835); MONTR., An. sc. ph. Lyon. (2) 7: 1. p. 103. (1855).
Patria: Insulæ Philippinæ; Nova Guinea; Insula Fidschi. (Mus. Holm.)
Vitta lateralis pectoris valde variat latitudine, plus minusve late interrupta.

6. **R. Eugeniæ** STÅL. — *Alydus Eugeniæ* STÅL, Freg. Eug. resa, Ins. Hem. p. 234. 36. (1859).
Patria: Insulæ Philippinæ. (Mus. Holm.)
A præcedente forte haud distinguendus.

dd. *Dorso abdominis nec nigro, nec nigro-picto; connexivo nigro-picto.*

e. *Lateribus metanoti late nigris; corpore obscurius ferrugineo vel flavo-ferrugineo.*

7. **R. robustus** Dall. — *Alydus robustus* Dall., List. 2. p. 473. 13. (1852).
Patria: Australia, Moreton Bay, Cap York. (Mus. Holm.)
Patriam incorrecte indicavit Dallas. Rostrum paullo pone basin metasterni extensum, coxas intermedias haud vel vix superans.

8. **R. flavo-lineatus** Stål. — *Alydus flavolinea* Sign. in Thoms, Arch. 2. p. 301. 574. (1858). — *Riptortus flavo-lineatus* Stål, H. afr. 2. p. 93. 1. (1865).
Patria: Gabon. (Coll. Signoret.)
R. robusto simillimus et maxime affinis, differt rostro longiore, coxas posticas attingente.

ee. *Corpore dilutius flavo-ferrugineo: spina angulorum lateralium thoracis nigra; metanoti lateribus anguste nigro-limbatis.*

9. **R. dentipes** Fabr. — *Cimex dentipes* Fabr., Mant. 2. p. 290. 112. (1787); Gmel., S. N. 1: 4. p. 2144. 246. (1788). — *Lygæus dentipes* Fabr., E. S. 4. p. 143. 31. (1794); Wolff, Ic. 3. p. 104. 98. t. 10. f. 98. (1802). — *Alydus dentipes* Fabr., S. R. p. 249. 7. (1803); Dall., List. 2. p. 472. 8. (1852). — *Alydus Fabricii* Sign., An. S. E. Fr. (3) 8. p. 940. 118. (1861). — *Riptortus Fabricii* Stål, H. afr. 2. p. 93. 2. (1865). — *Riptortus dentipes* Stål, H. Fabr. 1. p. 65. 4. (1868).
Patria: Sierra Leona. (Mus. Holm.); Madagascar. (Coll. Signoret.)
Spina angulorum lateralium thoracis gracilis. Rostrum medium metasterni attingens. Metasternum nigrum, disco sæpe flavescens vel flavescente-bivittatum.

10. **R. flavo-vittatus** Stål. — *Alydus flavo-vittatus* Stål, Ö. V. A. F. 1855. p. 30. 2. — *Riptortus flavo-vittatus* Stål, H. afr. 2. p. 94. 3. (1865).
Patria: Caffraria. (Mus. Holm.)
Præcedenti simillimus, spina angulorum lateralium thoracis nonnihil latiore rostroque paullo breviore, vix pone coxas intermedias extenso, divergens.

bb. *Lateribus capitis et pectoris vitta lineari, flavescente, lævigata, nullibi interrupta, utrinque distinctissime nigro-marginata; segmento dorsali sexto marium apice magis sensim et obtusius rotundato vel subrotundato-truncato; metanoto croceo toto, margine angusto laterali rarius nigricante; dente angulorum lateralium thoracis parviuscula.*

11. **R. linearis** Fabr. — *Cimex linearis* Fabr., S. Ent. p. 710. 62. (1775); Spec. 2. p. 353. 89. (1781); Mant. 2. p. 290. 113. (1787); Gmel., S. N. 1: 4. p. 2144. 247. (1778). — *Lygæus linearis* Fabr., E. S. 4. p. 144. 32. (1794). — *Alydus linearis* Fabr., S. R. p. 250. 10. (1803); Dall., List. 2. p. 472. 9. (1852). — *Alydus dentipes* H. S., W. I. 8. p. 99. f. 867. (1848). — *Riptortus linearis* Stål, H. Fabr. 1. p. 64. 3. (1868).
Patria: China; Insulæ Philippinæ; Ceram. (Mus. Holm.); Java, Bombay.

12. **R. atricornis** Stål. — Præcedenti maxime affinis et forte haud distinctus, articulis antennarum tribus basalibus totis nigris, quarto fusco-testaceo differt. ♂. Long. 13, Lat. 2½ mill.
Patria: Australia borealis; Java. (Mus. Holm.)

13. **R. pilosus** Thunb. — *Cimex pilosus* Thunb., N. ins. sp. 2. p. 35. (1783); Gmel., S. N. 1: 4. p. 2145. 254. (1788); Dall., List. 2. p. 473. 11. (1852). — *Lygæus pilosus* Wolff, Ic. 3. p. 105. 99. f. 99. (1802). excl. syn. Stollii. — *Alydus clavatus* A. Dohrn, Stett. E. Z. 21. p. 402. 43. (1860).
Patria: Insulæ Philippinæ. (Mus. Holm.)
Secundum exemplum typicum Thunbergii hæc species ad duas præcedentes maxime appropinquat, differt tantum antennis corpori concoloribus, articulis tribus basalibus antennarum apice imo infuscatis, vitta laterali capitis pectorisque paullo angustiore, in apice metastethii subcoarctata, limbo laterali superiore capitis inter oculos et antennas haud nigro. Specifice forte haud distincta.

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14. **R. serripes** Fabr. — *Cimex serripes* Fabr., S. Ent. p. 709. 61. (1775); Spec. 2. p. 353. 88. (1781); Mant. 2. p. 290. 111. (1787); Gmel., S. N. 1: 4. p. 2144. 245. (1788). — *Lygæus serripes* Fabr., E. S. 4. p. 143. 30. (1794). — *Alydus serripes* Fabr., S. R. p. 249. 5. (1803).
Patria: Nova Hollandia.

15. **R. tenuicornis** Dall. — *Alydus tenuicornis* Dall., List. 2. p. 471. 6. (1852).
Patria: Sierra Leona.

16. **R. acantharis** Dall. — *Alydus acantharis* Dall, List. 2. p. 472. 7. (1852).
Patria Sierra Leona.

17. **R. longipes** Dall. — *Alydus longipes* Dall., List. 2. p. 473. 12. (1852).
Patria ignota; in America certe haud occurrit.

18. **R. obscuricornis** Dall. — *Alydus obscuricornis* Dall., List. 2. p. 475. 19. (1852).
Patria: Port Essington.

19. **R. curvidens** Montr. — *Alydus curvidens* Montr., An. S. Lin. Lyon. (2) 5. p. 254. (1858).
Patria: Nova Caledonia.

HAMEDIUS Stål.

Stål, Ö. V. A. F. 1859. p. 461.

1. **H. incarnatus** Er. — *Hypselopus incarnatus* Er., Arch. 8: 1. p. 272. 263. (1842).
Patria: Tasmania.

TENOSIUS Stål.

Stål, Ö. V. A. F. 1859. p. 460.

1. **T. proletarius** Schaum. — *Alydus proletarius* Schaum, Ber. Ak. Berl. 1853. p. 358; Peters, Reis. n. Moss., Ins. p. 42. T. 2. f. 6. (1862).
Patria: Mossambique.

2. **T. capicola** Stål. — Præcedenti maxime affinis, differt antennis paullo brevioribus, articulo primo apicem capitis haud attingente. ♂. Long. 8, Lat. 2 mill.
Patria: Terra capensis. (Mus. Holm.)

DACLERA Sign.

Sign. in Maillard, Not. Réun., Ins. p. 27.

1. **D. punctata** Sign. — *Daclera punctata* Sign. in Mail., Not. Réun., Ins. p. 27. pl. 20. f. 7.
Patria: Insula Réunion. (Mus. Holm.)

2. **D. rufescens** Stål. — Dilute rufescente-ferruginea, remotissime subsericea, thorace, scutello, hemelytris et pectore distincte et sat dense punctatis; maculis marginalibus abdominis, trochanteribus et basi femorum sordide flavescente-albidis. ♂. Long. 11, Lat. 3 mill.

♂. Segmento dorsali sexto abdominis quinto paullo longiore, apice obtusissime rotundato; segmento genitali apice processu depresso, longiore quam latiore, sensim angustato, apice anguste rotundato, instructo.

Patria: Rockhampton Australiæ. (Mus. Holm.)

D. punctatæ simillima, nonnihil densius punctata, magis rufesceus, maculis lateralibus subimpressis ventris concoloribus, præsertim autem forma segmenti genitalis maris, cujus anguli postici sunt rectiusculi, nec in dentem acutum producti, processus apicalis longior, nec angulum subrectangulum simulans. Articuli tres basales antennarum longitudine subæquales, quartus tertio dimidio longior.

NEMAUSUS Stål.

Stål, H. afr. 2. p. 8 et 101. (1865).

1. **N. sordidatus** Stål. — *Hypselopus sordidatus* Stål, Ö. V. A. F. 1858. p. 315. 18. — *Nemausus sordidatus* Stål, H. afr. 2. p. 102. 1. (1865).
Patria: Territorium fluvii Svakop. (Mus. Holm.)

2. **N. inornatus** Stål. — *Hypselopus inornatus* Stål, Ö. V A. F. 1858. p. 315. 19. — *Nemausus inornatus* Stål, H. afr. 2. p. 102. 2. (1865).
Patria: Territorium fluvii Svakop. (Mus. Holm.)

TRICHOCNEMUS Stål.

1. **T. maculatus** Thunb. — *Alydus maculatus* Thunb., H. rostr. cap. 3. p. 3. (1822). — *Hypselopus linearis* Stål, Ö. V. A. F. 1855. p. 29. 2. — *Nemausus maculatus* Stål, H. afr. 2. p. 103. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

NARISCUS Stål.

Stål, H. afr. 2. p. 8 et 100. (1865).

1. **N. spinosus** Burm. — *Hypselopus spinosus* Burm., Handb. 2: 1. p. 329. 2. (1835).
Patria: Dongola, Ambukohl.

2. **N. cinctiventris** Germ. — *Hypselopus cinctiventris* Germ. in Silb., Rev. 5. p. 152. 71. (1837). — *Hypselopus validipes* Stål, Ö. V. A. F. 1858. p. 315. 17. — *Hypselopus spinosus* Sign., in Thoms., Arch. 2. p. 300. 572. (1858). — *Nariscus cinctiventris* Stål, H. afr. 2. p. 101. 1. (1865).
Patria: Terra capensis; Territorium fluvii Svakop. (Mus. Holm.); Gabon Guineæ.

HYPSELOPUS Burm.

Hypselopus p. Burm., Handb. 2: 1. p. 328. (1835). — *Meloza* A. et S., Hist. p. 221. (1843). — *Hypselopus* Stål, H. afr. 2. p. 7 et 98. (1865).

a. *Capite thoraceque æque longis, tylo apice minus producto; tibiis posticis superne haud sulcatis; apice scutelli calloso-tuberculato.* — Hypselopus Burm.

1. **H. (Hypselopus) gigas** Burm. — *Hypselopus gigas* Burm., Handb. 2: 1. p. 329. 1. (1835); Stål, H. afr. 2. p. 99. 3. (1865). — *Hypselopus pallidiventris* Stål, Ö. V. A. F. 1858. p. 315. 16.
Patria: Territorium lacus N'Gami. (Mus. Holm.)
Pedes postici, saltem apud mares, longi, femoribus dimidiis pone apicem abdominis extensis. Articulus primus antennarum plus quam dimidia longitudine apicem capitis superans. Tibiæ posticæ femoribus paullo breviores.

2. **H. (Hypselopus) annulicornis** Stål. — *Hypselopus annulicornis* Stål, Ö. V. A. F. 1855. p. 29. 1; H. afr. 2. p. 100. 4. (1865).
Patria: Caffraria.
Præcedenti robustior, antennis pedibusque posticis brevioribus, articulo primo circiter dimidio apicem capitis superante, femoribus posticis apicem abdominis circiter quarta parte longitudinis superantibus, articulo primo tarsorum posticorum breviore.

aa. *Capite thorace sublongiore, tylo apice longius producto; tibiis posticis parte dimidia vel plus quam dimidia apicali superne plana vel obtuse sulcata.* — Meloza A. et S.

3. **H. (Meloza) villosipes** A. et S. — *Meloza villosipes* A. et S., Hist. p. 221. 1. (1843). — *Hypselopus villosipes* Stål, H. afr. 2. p. 99. 2. (1865).
Patria: Insula Mauritii. (Coll. Signoret).
♀. Pars paullo plus quam tertia apicalis articuli primi antennarum apicem capitis superans. Femora postica nonnihil pone apicem abdominis extensa. Tibiæ posticæ femoribus circiter quarta parte breviores. Tarsi postici —?

4. **H. (Meloza) prolixus** Stål. — *Hypselopus prolixus* Stål, Freg. Eug. resa, Ins. Hem. p. 233. 35. (1859); H. afr. 2. p. 98. 1. (1865).
Patria: Terra capensis. (Mus. Holm.); Insula Bourbon.
♀. Articulo primo antennarum longiore, saltem dimidia sua longitudine apicem capitis superante, pedibus posticis longioribus, dimidio apicali apicem abdominis superantibus, tibiis posticis femoribus paullo brevioribus a præcedente insignis. Tarsi postici —?

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5. **H. tripunctatus** Dall. — *Hypselopus tripunctatus* Dall., List. 2. p. 469. 3. (1852).
Patria: Africa meridionalis.

Species **Alydinorum** incerti generis vel divisionis.

1. **Alydus gracilipes** Westw. in Hope, Cat. 2. p. 20. (1842).
Patria: Africa occidentalis.
An ad *Euthetum* referendus?

2. **Alydus erythromelas** Montr., An. sc. phys. Lyon. (2) 7: 1. p. 103. (1855).
Patria: Woodlark.
Ad *Noliphum* forte referendus.

3. **Hypselopus maculiventris** Germ. in Silb., Rev. 5. p. 151. 70. (1837).
Patria: Terra capensis.

ACESTRA Dall.

Dall., List. 2. p. 488. (1852).

1. **A. sinica** Dall. — *Acestra sinica* Dall., List. 2. p. 488. 1. pl. 14. f. 4. a—c. (1852).
Patria: China.

Subf. Corizina Stål.

Conspectus divisionum.

a. Femoribus posticis incrassatis, subtus spinosis; angulis anticis thoracis antrorsum in dentem acutum prominulis. — *Harmostaria* Stål. (*Harmostes* Burm. et *Aufeius* Stål.)

aa. Femoribus posticis inermibus; angulis anticis thoracis obtusis vel inermibus.

b. Thoracis marginibus lateralibus anterius haud vel obtuse sinuatis, linea transversa impressa dorsali hunc sinum haud attingente; prostethio anterius impressione transversa margines laterales attingente destituto; areola apicali interiore corii quadrangulari.

c. Articulo primo antennarum brevi, crasso, apicem capitis haud vel paullo superante, basi subito vel subsubito coarctato vel gracilescente, articulo quarto tertio longiore; angulo apicali exteriore tuberculorum antenniferorum plus minus prominulo, plerumque acuto; capite paullo nutante; metapleuris postice plus minus oblique truncatis, extrorsum ampliatis. — *Corizaria* Stål.

cc. Articulo primo antennarum longiore, interdum sat longo, ultra apicem capitis longe extenso, parte apicem capitis haud superante basin versus sensim gracilescente, articulo quarto tertio breviore; capite porrecto; tuberculis antenniferis apice extus haud prominulis, ibidem obtusis; metapleuris postice extra coxas truncatis, extrorsum ubique æque longis vel extrorsum angustatis, angulo apicali exteriore obtuso. — *Myrmaria* Stål.

bb. Marginibus lateralibus thoracis anterius distincte angulato-emarginatis vel incisis, pronoto prostethioque anterius impressione distincta, incisuram marginalem attingente, instructis; areola apicali interiore corii triangulari; segmento ventrali sexto feminarum pone segmentum dorsalem sextum truncatum plus minus rotundato-producto. — *Serinetharia* Stål.

Div. Corizaria Stål.

Conspectus generum.

1(4). Orificiis distinctis, extrorsum sulcos duos emittentibus, sulco anteriore brevi, ad coxas intermedias valde appropinquata, interdum minus distincto, sulco posteriore distincto, longissimo, versus marginem lateralem pectoris extenso, metapleuris pone hunc sulcum lævigatis vel subtilius punctatis.

2(3). Ocellis inter se quam ab oculis circiter duplo longius distantibus; metapleuris postice valde oblique truncatis, versus angulum posticum exteriorem sensim distinctissime productis; capite antice minus producto, tuberculis antenniferis distinctius prominulis; thorace anterius ad marginem anticum angustissime lævigatum ruga transversa callosa lævi distinctissima instructo; sutura acetabulorum intermediorum in sulcum distinctissimum extrorsum continuata; segmento dorsali et ventrali sexto feminarum apice truncato, segmento dorsali sexto marium apice sensim rotundato vel rotundato-subtruncato; segmento dorsali sexto nigro, limbo laterali flavescente vel flavo-maculato, plerumque etiam macula vel vittula postica, flavescentibus. — *Liorhyssus* Stål.

3(2). Ocellis ad oculos maxime appropinquatis; metapleuris postice subrecte truncatis, angulis posticis subrectis, apice rotundatis; capite anterius magis producto, longiusculo; tuberculis antenniferis levissime prominulis; thorace anterius punctato, ruga transversa lævigata destituto; sutura acetabulorum intermediorum in sulcum nullum nisi obsoletissimum extrorsum continuata; rostro basin metasterni attingente; segmento dorsali sexto feminarum apice angustiuscule truncato, segmento ventrali sexto ejusdem sexus apice obtuse rotundato; segmento dorsali sexto marium apice breviter producto, truncato; segmento dorsali sexto flavescente, vitta media percurrente nigra.[1]) — *Peliochrous* Stål.

[1]) Obs.: In *Maccevetho*, *Niesthrea*, *Rhopalo* et *Aeschyntelo*, quasi in *Peliochroo*, segmentum dorsale sextum est typice flavescens, vitta media, apicem typice attingente, sæpe etiam vitta laterali nigris ornatum; parte longitudinali media vel vitta media nigra apice numquam macula vel lineola flavescente notata. In *Niesthrea* segmentum dorsale sextum pictura nigra est sæpe destitutum.

4(1). Orificiis obsoletissimis vel haud distinguendis; metapleuris totis distincte punctatis, sulco transverso nullo vel obsoleto, postice subrecte truncatis, angulis posticis rotundatis, haud productis; angulo apicali tuberculorum antenniferorum acuto; articulis secundo et tertio antennarum gracilibus; segmento dorsali sexto typice flavescente et vittis nigris tribus vel saltem una media ornato, apice in utroque sexu rotundato. — *Stictopleurus* STÅL.

LIORHYSSUS STÅL.

Corizus Subg. *Liorhyssus* STÅL, Enum. 1. p. 222. (1870). — *Colobatus* MULS., Pun., Coréid. p. 105 et 137. (1870). — *Liorhyssus* STÅL, Ö. V. A. F. 29: 6. p 55. (1872).

1. **L. hyalinus** FABR. — *Corizus dilatipennis* SIGN., An. S. E. Fr. (3) 7. p. 89. 18. (1859). — *Corizus variegatus* SIGN., An. S. E. Fr. (3) 7. p. 89. 20. (1859). — *Corizus truncatus* STÅL, H. afr. 2. p. 117. 3. (1865). — *Corizus (Liorhyssus) hyalinus* STÅL, Enum. 1. p. 222. 1. (1870).
Patria: Terra capensis, Nubia. (Mus. Holm.); Insulæ Mauritii, Australia.

2. **L. natalensis** STÅL. — *Corizus natalensis* STÅL, Ö. V. A. F. 1855. p. 31. 2; SIGN., An. S. E. Fr. (3) 7. p. 87. 16. (1859); STÅL, H. afr. 2. p. 118. 4. (1865). — *Corizus puncticornis* STÅL, Ö. V. A. F. 1855. p. 32. 3.
Patria: Caffraria; Aegyptus. (Mus. Holm.)

3. **L. flavo-maculatus** SIGN. — *Corizus flavo-maculatus* SIGN., An. S. E. Fr. (3) 7. p. 89. 19. (1859); STÅL, H. afr. 2. p. 119. 5. (1865).
Patria: Terra capensis. (Mus. Holm.)

4. **L. rubicundus** SIGN. — *Corizus rubicundus* SIGN., An. S. E. Fr. (3) 7. p. 86. 15. (1859).
Patria: Ceylon. (Mus. Holm.)

PELIOCHROUS STÅL.

1. **P. nigro-maculatus** STÅL. — *Corizus nigromaculatus* STÅL, Ö. V. A. F. 1855. p. 32. 4; SIGN., An. S. E. Fr. (3) 7. p. 100. 42. (1859); STÅL, H. afr. 2. p. 116. 2. (1865).
Patria: Caffraria. (Mus. Holm.)

STICTOPLEURUS STÅL.

STÅL, Ö. V. A. F. 29: 6. p. 55. (1872).

1. **S. scutellaris** DALL. — *Rhopalus scutellaris* DALL., List. 2. p. 526. 4. (1852). — *Corizus pilosicollis* STÅL, Ö. V. A. F. 1855. p. 31. 1; SIGN., An. S. E. Fr. (3) 7. p. 76. 1. (1859). — *Corizus Stålii* SIGN., An. S. E. Fr. (3) 7. p. 78. 3. (1859). — *Corizus Coquerelii* SIGN., An. S. E. Fr. (3) 7. p. 78. 4. (1859). — *Corizus scutellaris* STÅL, H. afr. 2. p. 115. 1. (1865).
Patria: Terra capensis; Caffraria. (Mus. Holm.); Madagascar.
Segmentum dorsale sextum abdominis apice minus productum quam in *S. abutilone;* segmentum ventrale sextum feminarum compresso.

SPECIES **Corizariorum** INCERTI GENERIS.

1. **Rhopalus bengalensis** DALL., List. 2. p. 528. 12. (1852).
Patria: Bengalia borealis.
2. **Rhopalus chinensis** DALL., List. 2. p. 529. 13. (1852).
Patria: China.
3. **Corizus javanensis** SIGN., An. S. E. Fr. (3) 7. p. 90. 21. (1859).
Patria Java.
4. **Corysus semicruciatus** MOTSCH., Bull. Soc. Mosc. 36: 3. p. 77. (1863).
Patria: Ceylon.
5. **Coryzus brevicollis** MOTSCH., Bull. Soc. Mosc. 36: 3. p. 77. (1863).
Patria: Ceylon.
6. **Corizus capensis** GERM in SILB., Rev. 5. p. 144. 56. (1837); SIGN., An. S. E. Fr. (3) 7. p. 91. 25. (1859).
Patria: Terra capensis.

Div. **Serinetharia** STÅL.

CONSPECTUS GENERUM.

1(2). Bucculis capite brevioribus; segmento ventrali sexto feminarum mihi cognitarum postice ultra segmenta genitalia producto, rotundato. — *Serinetha* SPIN.

2(1). Bucculis basin capitis attingentibus; segmento ventrali sexto feminarum mihi cognitarum apice truncato. — *Jadera* STÅL.

SERINETHA SPIN.

Leptocoris HAHN, W. I. 1. p. 200. (1831). — *Serinetha* SPIN., Ess. p. 247. (1837). — *Pyrrhotes* p. WESTW. in HOPE, Cat. 2. p. 6. (1842). — *Lygæomorphus* BLANCH., Hist. ins. 3. p. 116. (1840). — *Tynotoma* A. et S., Hist. p. 220. (1843).

a. *Jugis apicem versus tylo haud altioribus, apice haud prominulis.*

b. *Capite ante oculos ruga obliqua, alte tuberculato-elevata, antrorsum et extrorsum prominula, instructo; bucculis proportionaliter longioribus; lateribus thoracis latiuscule reflexis.*

1. **S. corniculata** STÅL. — *Serinetha corniculata* STÅL, Berl. E. Z. 10. p. 381. 1. (1866).
Patria: India orientalis. (Mus. Holm).

bb. *Capite pone tubercula antennifera ruga obliqua plus minus distincta, numquam tamen in tuberculum extrorsum prominula; bucculis brevioribus; thorace planiusculo vel convexiusculo, marginibus lateralibus interdum angustissime reflexis.*

c. *Hemelytris rufis vel nigricantibus, margine apicali corii concolore.*

d. *Thorace anterius pone collare fortiter impresso, collari toroso, elevato.* — SERINETHA SPIN. = LEPTOCORIS HAHN.

2. **S. abdominalis** FABR. — *Lygæus augur* p. FABR., E. S. 4. p. 161. 88. var. (1794). — *Lygæus abdominalis* FABR., S. R. p. 226. 111. (1803). — *Leptocoris rufus* HAHN, W. I. 1. p. 201. f. 102. (1831). — *Leptocoris abdominalis* BURM., Handb. 2: 1. p. 305. 1. (1835). — *Lygæomorphus abdominalis* BLANCH., Hist. 3. p. 116. 1. (1840). — *Pyrrhotes abdominalis* WESTW. in HOPE, Cat. 2. p. 26. (1842). — *Serinetha abdominalis* DALL., List. 2. p. 460. 2. (1852); STÅL, H. Fabr. 1. p. 68. 3. (1868).
Patria: Java; Insulæ Philippinæ; Assam; Tranquebar. (Mus. Holm.)
Variat margine costali infuscato.

dd. *Thorace anterius pone collare leviter vel levissime impresso, collari depresso, rarius elevato, impressione latiore, fundo plana.*

e. *Thorace obsolete carinato; hemelytris nigris, area costali rufa.*

3. **S. rufo-marginata** FABR. — *Lygæus rufomarginatus* FABR., E. S. 4. p. 152. 56. (1794); S. R. p. 220. 73. (1803). excl. syn. STOLLII. — *Serinetha rufomarginata* DALL., List. 2. p. 460. 3. (1852); STÅL, H. afr. 1. p. 68. 2. (1868).
Patria: Insulæ Philippinæ. (Mus. Holm.)

ee. *Thorace distinctius carinato.*

f. *Segmento genitali marium apice truncato vel subsinuato-truncato, angulis posticis haud productis.* — LYGÆOMORPHUS BLANCH.

4. **S. augur** FABR. — *Cimex augur* FABR., Spec. 2. p. 366. 167. (1781); Mant. 2. p. 301. 220. (1787). — *Cimex augur* p. GMEL., S. N. 1: 4. p. 2174. 412. (1788). — *Lygæus augur* p. FABR., E. S. 4. p. 161. 88. (1794); S. R. p. 226. 112. (1803). — *Lygæus chalcocephalus* FABR., S. R. p. 226. 110. (1803). sp. fictit. — *Leptocoris augur* BURM., Handb. 2: 1. p. 305. 2. (1835). — *Serinetha augur* DALL., List. 2. p. 460. 1. (1852); STÅL, H. Fabr. 1. p. 68. 4. (1868).
Patria: Bengalia. (Mus. Holm.)
Thorax quam in affinibus antrorsum minus angustatus, minus transversus, marginibus lateralibus postice subrectis.

5. **S. hæmatica** GERM. — *Leptocoris hæmatica* GERM. in SILB., Rev. 5. p. 144. 54. (1837). — *Lygæomorphus Augur* BLANCH., Hist. 3. p. 116. 2. (1840). — *Serinetha hæmatica* DALL., List. 2. p. 462. 11. (1852); STÅL, H. afr. 2. p. 113. 4. (1865). — *Serinetha lateralis* SIGN., An. S. E. Fr. (3) 8. p. 939. 117. (1861).
Patria: Sierra Leona, Caffraria. (Mus. Holm.); Senegal, Calabar, Madagascar, Insula Mauritii.

6. **S. griseiventris** WESTW. — *Pyrrhotes griseiventris* WESTW. in HOPE, Cat. 2. p. 26. (1842). — *Serinetha griseiventris* DALL., List. 2. p. 462. 12. (1852); STÅL, H. afr. 2. p. 114. 5. (1865).
Patria: Sierra Leona. (Mus. Holm.)

ff. *Segmento genitali marium postice sinuato, angulis posticis productis.*

7. **S. tagalica** BURM. — *Lygæus (Leptocoris) tagalicus* BURM., N. act. Ac. Leop. 16: Suppl. p. 299. 27. (1834). — *Serinetha tagalica* DALL., List. 2. p. 460. 4. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

In hac specie margines laterales thoracis sunt distinctissime reflexi et collare distincte elevatum, torosum.

8. **S. fimbriata** Dall. — *Serinetha fimbriata* Dall., List. 2. p. 462. 10. (1852).
Patria: Australia. (Mus. Holm).

cc. *Hemelytris nigricantibus, margine apicali corii sordide flavescente; thorace subtiliter punctato, distincte carinato, collari depresso, læviusculo.* — Tynotoma A. et S.

9. **S. hexophthalma** Thunb. — *Cimex hexophthalmus* Thunb., N. ins. sp. 3. p. 54. (1784); Gmel., S. N. 1: 4. p. 2179. 435. (1788). — *Lygæus hexophthalmus* Thunb., H. rostr. cap. 4. p. 5. (1822). — *Corizus fulcratus* Germ. in Silb., Rev. 5. p. 144. 57. (1837). — *Serinetha fulcrata* Dall., List. 2. p. 462. 14. (1852). *Serinetha hexophthalma* Stål, H. afr. 2. p. 112. 2. (1865).
Patria: Terra capensis. (Mus. Holm.)

10. **S. amicta** Germ. — *Leptocoris amicta* Germ. in Silb., Rev. 5. p. 144. 55. (1837). — *Tynotoma vittata* A. et S., Hist. p. 220. 1. (1843). — *Serinetha amicta* Dall., List. 2. p. 462. 13. (1852); Stål, H. afr. 2. p. 113. 3. (1865). — *Serinetha moesta* Stål, Ö. V. A. F. 1855. p. 29. 1.
Patria: Caffraria. (Mus. Holm.); Gambia.

aa. *Jugis apicem versus tylo paullo altioribus, apice paullo prominulis.*

11. **S. fraterna** Westw. — *Pyrrhotes fraterna* Westw. in Hope, Cat. 2. p. 26. (1842). — *Serinetha fraterna* Dall., List. 2. p. 462. 9. (1852); Stål, H. afr. 2. p. 112. 1. (1865).
Patria: Senegal. (Mus. Holm.); Sierra Leona.

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12. **S. vicina** Dall. — *Serinetha vicina* Dall., List. 2. p. 460. 5. (1852).
Patria: Insulæ Philippinæ. (Mus. Holm.)

13. **S. taprobanensis** Dall. — *Serinetha taprobanensis* Dall., List. 2. p. 461. 6. (1852).
Patria: Ceylon.

14. **S. longirostris** Dall. — *Serinetha longirostris* Dall., List. 2. p. 461. 7. (1852).
Patria: Java.

15. **S. lurida** Dall. — *Serinetha lurida* Dall., List. 2. p. 461. 8. (1852).
Patria ignota.

16. **S. Dallasi** A. Dohrn. — *Serinetha Dallasi* A. Dohrn, Stett. E. Z. 21. p. 402. 42. (1860).
Patria: Ceylon.

Species incertæ subfamiliæ.

1. **Anisoscelis cæruleipennis** Guér., Voy. Coq., Ins. p. 177. (1830).
Patria: Insulæ Moluccanæ, Buru.

2. **Macoevethus lativentris** Motsch., Bull. Soc. Mosc. 39: 1. p. 188. (1866).
Patria: Japonia.

ENUMERATIO CIMICIDARUM EXTRAEUROPÆARUM.

Fam. **Cimicidæ** Stål.

Subf. **Anthocorina** Reut.

LYCTOCORIS Hahn.

Lyctocoris p. Hahn, W. I. 3. p. 19. (1835). — *Lyctocoris* Fieb., Wien. E. M. 4. p. 264. (1860); Reut., Ö. V. A. F. 1871. p. 409.

1. **L. Fitchii** Reut. — *Lyctocoris Fitchii* Reut., Ö. V. A. F. 1871. p. 557.
Patria: America borealis, NewYork.

DOLICHOMERUS Reut.

Ö. V. A. F. 1871. p. 557.

1. **D. elongatus** Reut. — *Dolichomerus elongatus* Reut., Ö. V. A. F. 1871. p. 558. t. 7. f. 1.
Patria: Carolina meridionalis. (Mus. Holm.)

2. **D. Stålii** Reut. — *Dolichomerus Stålii* Reut., Ö. V. A. F. 1871. p. 558.
Patria: Carolina meridionalis. (Mus. Holm.)

CALLIODIS Reut.

Ö. V. A. F. 1871. p. 558.

1. **C. picturata** Reut. — *Calliodis picturata* Reut., Ö. V. A. F. 1871. p. 559. t. 7. f. 2.
Patria: Brasilia.

SOLENONOTUS Reut.

Reut., Ö. V. A. F. 1871. p. 559.

1. **S. sulcifer** Stål. — *Anthocoris ? sulcifer* Stål, Rio H. 1. p. 43. 4. (1860). — *Solenonotus sulcifer* Reut., Ö. V. A. F. 1871. p. 560. t. 7. f. 3.
Patria: Brasilia, Rio Janeiro. (Mus. Holm.)

PIEZOSTETHUS Fieb.

Fieb., Wien. E. M. 4. p. 265. (1860); Reut., Ö. V. A. F. 1871. p. 410.

1. **P. sordidus** Reut. — *Piezostethus sordidus* Reut., Ö. V. A. F. 1871. p. 560.
Patria: Texas. (Mus. Holm.); Brasilia.

2. **P. binotatus** Reut. — *Piezostethus binotatus* Reut., Ö. V. A. F. 1871. p. 560.
Patria: Carolina meridionalis. (Mus. Holm.)

SCOLOPOSCELIS Fieb.

Fieb., Wien. E. M. 7. p. 61. (1863); Reut., Ö. V. A. F. 1871. p. 413.

1. **S. flavicornis** Reut. — *Scoloposcelis flavicornis* Reut., Ö. V. A. F. 1871. p. 461.
Patria: Texas. (Mus. Holm.)

PORONOTUS Reut.

Reut., Ö. V. A. F. 1871. p. 561.

1. **P. discifer** Stål. — *Xylocoris discifer* Stål, Rio H. 1. p. 44. 1. (1860). — *Poronotus discifer* Reut., Ö. V. A. F. 1871. p. 562. t. 7. f. 4.
Patria: Brasilia, Rio Janeiro. (Mus. Holm.)

2. **P. constrictus** Stål. — *Xylocoris constrictus* Stål, Rio H. 1. p. 44. 3. (1860). — *Poronotus constrictus* Reut., Ö. V. A. F. 1871. p. 562.
Patria: Rio Janeiro. (Mus. Holm.)

LASIOCHILUS Reut.

Reut., Ö. V. A. F. 1871. p. 562.

1. **L. pallidulus** Reut. — *Lasiochilus pallidulus* Reut., Ö. V. A. F. 1871. p. 562. t. 7. f. 5.
Patria: Carolina meridionalis. (Mus. Holm.)

DILASIA Reut.

Reut., Ö. V. A. F. 1871. p. 563.

1. **D. fuscula** Reut. — *Dilasia fuscula* Reut., Ö. V. A. F. 1871. p. 563. t. 7. f. 6.
Patria: Texas; Carolina meridionalis. (Mus. Holm.)

DASYPTERUS Reut.

Reut., Ö. V. A. F. 1871. p. 564.

1. **D. limbatellus** Stål. — *Xylocoris limbatellus* Stål, Rio H. 1. p. 44. 2. (1860). — *Dasypterus limbatellus* Reut., Ö. V. A. F. 1871. p. 564. t. 7. f. 7.
Patria: Rio Janeiro. (Mus. Holm.)

2. **D. assimilis** Reut. — *Dasypterus assimilis* Reut., Ö. V. A. F. 1871. p. 564.
Patria: Texas; Carolina meridionalis. (Mus. Holm.)

TRIPHLEPS Fieb.

Fieb., Wien. E. M. 4. p. 266. (1860); Reut., Ö. V. A. F. 1871. p. 414.

1. **T. lepidus** Stål. — *Anthocoris lepidus* Stål, Rio H. 1. p. 43. 3. (1860). — *Triphleps lepidus* Reut., Ö. V. A. F. 1871. p. 564.
Patria: Rio Janeiro; Buenos Ayres. (Mus. Holm.)

2. **T. rugicollis** Reut. — *Triphleps rugicollis* Reut., Ö. V. A. F. 1871. p. 565.
Patria: Texas. (Mus. Holm.)

3. **T. latulus** Reut. — *Triphleps latulus* Reut., Ö. V. A. F. 1871. p. 565.
Patria: New Jersey, Carolina meridionalis. (Mus. Holm.)

4. **T. insidiosus** Say. — *Reduvius insidiosus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 357. 5. (1859). — *Anthocoris pseudo-chinche* Fitch, First and sec. rep. p. 295. (1856).
Patria: New York.

ZOPHEROCORIS Reut.

Reut., Ö. V. A. F. 1871. p. 565.

1. **Z. armatus** Stål. — *Anthocoris armatus* Stål, Rio H. 1. p. 43. 2. (1860). — *Zopherocoris armatus* Reut., Ö. V. A. F. 1871. p. 566. t. 7. f. 8.
Patria: Rio Janeiro.

MACROTRACHELIA Reut.

Reut., Ö. V. A. F. 1871. p. 566.

1. **M. nigro-nitens** Stål. — *Anthocoris nigro-nitens* Stål, Rio H. 1. p. 43. 1. (1860). — *Macrotrachelia nigro-nitens* Reut., Ö. V. A. F. 1871. p. 566. t. 7. f. 9.
Patria: Rio Janeiro. (Mus. Holm.)

PACHYTARSUS FIEB.

FIEB., Wien. E. M. 4. p. 262. (1860); Eur. H. p. 37. (1861).

1. **P. crassicornis** FIEB. — *Pachytarsus crassicornis* FIEB., Wien. E. M. 4. p. 269. 3. t. 6. E. (1860).
Patria: India orientalis.

ODONTOBRACHYS FIEB.

FIEB., Wien. E. M. 4. p. 264. (1860); Eur. H. p. 38. (1861).

1. **O. nigra** FIEB. — *Odontobrachys nigra* FIEB., Wien. E. M. 4. p. 270. 6. t. 6. L. (1860).
Patria: India.

BLAPTOSTETHUS FIEB.

FIEB., Wien. E. M. 4. p. 265. (1860).

1. **B. piceus** FIEB. — *Blaptostethus piceus* FIEB., Wien. E. M. 4. p. 270. 7. t. 6. f. N. (1860).
Patria: Celebes.

CYRTOSTERNUM FIEB.

FIEB., Wien. E. M. 4. p. 265. (1860); Eur. H. p. 39. (1861).

1. **C. flavicorne** FIEB. — *Cyrtosternum flavicorne* FIEB., Wien. E. M. 4. p. 270. 8. t. 6. O. (1860).
Patria: India.

CARDIASTETHUS FIEB.

FIEB., Wien. E. M. 4. p. 266. (1860); Eur. H. p. 39 et 141. (1861).

1. **C. luridellus** FIEB. — *Cardiastethus luridellus* FIEB., Wien. E. M. 4. p. 271. 14. (1860).
Patria: Pensylvania.

Subf. **Ceratocombina** REUT.

SCHIZOPTERA FIEB.

FIEB., Wien. E. M. 4. p. 269. (1860).

1. **S. cicadina** FIEB. — *Schizoptera cicadina* FIEB., Wien. E. M. 4. p. 272. 16. t. 6. W. (1860).
Patria: Venezuela.

Subf. **Cimicina** STÅL.

CONSPECTUS GENERUM.

1(2). Capite parte media thoracis longiore, paullo exserto; articulis ultimis antennarum gracillimis; thorace apice fortius sinuato, angulis anticis magis productis; rudimento transverso hemelytrorum introrsum sensim distinctissime angustato, intus quam extus breviore; pedibus gracilioribus, femoribus leviter incrassatis, subtus apicem versus vel pone medium planiusculis, vix sulcatis; tibiis rectis; tibiis anterioribus tarsis circiter duplo vel paullo plus duplo longioribus, tibiis posticis tarsis circiter triplo longioribus et femoribus ejusdem paris longioribus; corpore brevissime piloso, marginibus lateralibus thoracis hemelytrorumque longius setosis. — *Cimex* LIN.

2(1). Thorace apice obtusius sinuato, angulis anticis minus productis; pedibus crassioribus; corpore densius et longius piloso; capite haud vel vix exserto.

3(4). Capite parte media thoracis paullo breviore; articulis ultimis antennarum —? rudimento hehelytrorum transverso, introrsum haud angustato; femoribus superne fortiter incrassatis, subtus pone medium longitrorsum distincte excavatis; tibiis crassis, leviter curvatis, posticis femoribus longitudine subæqualibus; tarsis crassiusculis, anterioribus tibiis circiter dimidio brevioribus, posticis tertia parte tibiarum vix longioribus; unguiculis validis, haud longis, basi latioribus. — *Cacodmus* STÅL.

4(3). Capite parte media thoracis vix longiore; articulis ultimis antennarum minus gracilibus, filiformibus; rudimento hemelytrorum intus angustato; femoribus minus incrassatis, subtus apicem versus obtuse sulcatis; tibiis rectis, posticis femoribus nonnihil longioribus; tarsis longiusculis, graciliusculis, crassioribus tamen quam in genere præcedente. — *Oeciacus* STÅL. (Typ: *Acanthia hirundinis* JEN.)

CIMEX LIN., LATR.

Cimex p. LIN., S. N. ed. X. 1. p. 441. (1758). — *Acanthia* p. FABR., S. Ent. p. 693. (1775). — *Acanthia* FABR., S. R. p. 112. (1803); FALL., Cim. Suec. p. 27. (1807); BURM., Handb. 2: 1. p. 250 et 252. (1835); FIEB., Eur. H. p. 37 et 135. (1861). — *Cimex* LATR., Gen. 3. p. 136. (1807); R. an. 5. p. 201. (1829); LAP., Ess. p. 51. (1832); H. S., Nom. 1. p. 37. (1835); SPIN., Ess. p. 170. (1837).

a. *Lateribus thoracis late explanatis et subreflexis; rudimento hemelytrorum apice truncato vel subrotundato-truncato.*

1. **C. lectularius** LIN. — *Cimex lectularius* LIN., S. N. ed. X. 1. p. 441. 1. (1758). — *Acanthia lectularia* FIEB., Eur. H. p. 135. 1. (1861).
Patria: Rio Janeiro; Valparaiso. (Mus. Holm.)

aa. *Lateribus thoracis non nisi angustissime depresso-marginatis; rudimento hemelytrorum apice sensim distincte rotundato.*

2. **C. hemipterus** FABR. — *Acanthia hemiptera* FABR., S. R. p. 113. 2. (1803); STÅL, H. Fabr. 1. p. 91. 1. (1868).
Patria: America meridionalis.

3. **C. rotundatus** SIGN. — *Acanthia rotundata* SIGN., An. S. E. Fr. (2) 10. p. 540. 2. pl. 16. f. 2. (1852); STÅL, H. afr. 3. p. 25. (1865).
Patria: Insula Bourbon.

4. **C. foedus** STÅL. — *Acanthia foeda* STÅL, Ö. V. A. F. 1854. p. 237. 1.
Patria: Remedios Columbiæ. (Mus. Holm.)
C. lectulario similis, angustior, processu apicali capitis angustiore, antrorsum haud ampliato, ubique æque lato, thorace angustiore, paullo convexiore, marginibus lateralibus angustissime subdepressis, corpore (an denudato in exemplo nostro unico?) superne glabro, marginibus lateralibus thoracis hemelytrorumque parcius et brevius ciliatis, differt.

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5. **C. valdivianus** PHIL. — *Acanthia valdiviana* PHIL., Stett. E. Z. 26. p. 64. (1865).
Patria: Chile, Valdivia, sub cortice arborum.

6. **C. macrocephalus** FIEB. — *Acanthia macrocephala* FIEB., Eur. H. p. 135. not. (1861).
Patria: India orientalis.

CACODMUS STÅL.

1. **C. villosus** STÅL. — *Acanthia villosa* STÅL, Ö. V. A. F. 1855. p. 38. 1; H. afr. 3. p. 24. 1. (1865).
Patria: Caffraria. (Mus. Holm.)

SPECIES CIMICIDARUM INCERTI GENERIS.

1. **Reduvius musculus** SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 357. 6. (1859).
Patria: America borealis, North-west Territory.

2. **Anthocoris borealis** DALL., List. 2. p. 588. 3. (1852).
Patria: America borealis ad Hudsons Bay.

3. **Anthocoris obsoletus** BL. in GAY, Hist. Chile, Zool. 7. p. 140. 1. (1852). — *Xylocoris obsoletus* SIGN, An. S. E. Fr. (4) 3. p. 566. 77. (1864).
Patria: Chile.

4. **Anthocoris elegans** BL. in GAY, Hist. Chile, Zool. 7. p. 140. 2. l. 2. f. 5. (1852); SIGN., An. S. E. Fr. (4) 3. p. 566. 78. (1864).
Patria: Chile.

5. **Anthocoris parvulus** BL. in GAY, Hist. Chile, Zool. 7. p. 141. 3. (1852); SIGN., An. S. E. Fr. (4) 3. p. 566. 79. (2864).
Patria: Chile.

6. **Anthocoris funebris** Motsch., Bull. S. nat. Mosc. 36: 3. p. 88. (1863).
Patria: Ceylon.

7. **Anthocoris parallelus** Motsch., Bull. S. Nat. Mosc. 36: 3. p. 89. (1863).
Patria: Ceylon.

8. **Anthocoris tantillus** Motsch., Bull. S. Nat. Mosc. 36: 3. p. 89. (1863).
Patria: Ceylon.

9. **Xylocoris americanus** Dall., List. 2. p. 589. 2. (1862).
Patria: America borealis.

10. **Xylocoris conicus** Bl. in Gay, Hist. Chile, Zool. 7. p. 137. 1. l. 2. f. 4. (1852); Sign., An. S. E. Fr. (4) 3. p. 566. 74. (1864).
Patria: Chile.

11. **Xylocoris brevicollis** Bl. in Gay, Hist. Chile, Zool. 7. p. 138. 2. (1852); Sign., An. S. E. Fr. (4) 3. p. 566. 75. (1864).
Patria: Chile.

12. **Xylocoris testaceus** Bl. in Gay, Hist. Chile, Zool. 7. p. 138. 3. (1852); Sign., An. S. E. Fr. (4) 3. p. 566. 76. (1864).
Patria: Chile.

13. **Xylocoris humeralis** Sign., An. S. E. Fr. (3) 8. p. 952. 150. (1861); Stål, H. afr. 3. p. 24. 1. (1865).
Patria: Madagascar.

ENUMERATIO NABIDARUM EXTRAEUROPÆARUM.

Fam. **Nabidæ** Fieb.

Conspectus subfamiliarum.

a. Thorace antice impressione transversa nulla vel ad marginem apicalem sat appropinquata instructo, collari nullo vel angusto prædito; acetabulis anticis ad marginem anticum prostethii valde appropinquatis; clavo a basi ad apicem scutelli haud vel obsoletissime retrorsum ampliato, parte pone apicem scutelli sita brevi, commissura scutello breviore; corio embolio instructo; capite usque ad oculos immerso; rostro minus gracili, interdum crasso; clavo corioque coriaceis, opacis.

b. Rostro brevi, crasso, articulo tertio basin capitis haud attingente, articulo secundo tertio breviore; ocellis nullis; articulo primo antennarum brevi; pronoto transverso, utrinque anguste marginato, intra marginem anticum anguste callosum subtiliter impresso, postice prope basin transversim impresso, inter impressiones transversas anticam et posticam impressione longitudinali instructo, margine basali ante scutellum latissime sinuato, sinu fundo truncato; scutello magno; metasterno longitrorsum distincte carinato, ruga longitudinali vel carina a metapleuris separato; metapleuris transversim rugosis, granulatis, postice oblique truncatis, angulo postico interiore acuto; coxis anticis brevissimis; orificiis haud distinguendis; trochanteribus anticis subtus tumidis vel tuberculato-elevatis, spinulosis; femoribus anticis valde incrassatis, superne tumidis, apicem versus gracilioribus, subtus spinulis obtusatis armatis; tibiis anticis leviter curvatis, fossa spongiosa apicali minuta instructis; coxis intermediis et posticis brevibus, illis has haud attingentibus, posticis paullo pone acetabula extendendis; segmento ventrali sexto feminarum apice obtuse producto et rotundato-subangulato. — *Pachynomina* Stål.

bb. Rostro longiore, variabili, articulo tertio pone basin capitis extenso; ocellis distinctis, in macropteris majoribus; pronoto raro subtransverso, medio vel pone medium plus minus distincte constricto vel transversim impresso, basi in medio haud vel leviter angustiusculeque sinuato, lateribus haud vel obsolete marginatis; scutello mediocri; metasterno metapleurisque confusis, his rugosis vel subpunctato-rugosis, angulo apicali interiore apice rotundato; orificiis distinctis, sulcum oblique extrorsum et retrorsum currentem emittentibus; coxis modice longis, omnibus pone acetabula extensis, intermediis posticas attingentibus, anticis subtus haud tumidis, inermibus; femoribus anticis modice incrassatis; tibiis anticis fossa spongiosa distincta instructis; segmento ventrali sexto feminarum mihi cognitarum postice sinuato. — *Nabina* Stål.

aa. Thorace antice in collare annuliforme, latiusculum, haud callosum, impressione plus minus distincta vel strictura a parte reliqua thoracis separatum, producto, raro transverso, antrorsum subsensim angustato; acetabulis anticis a margine antico prostethii remotis; clavo macropterorum a basi apicem scutelli versus sensim plus minus distincte ampliato, commissura scutello longiore; clavo corioque plerumque submembranaceis et subpellucidis, interdum subcoriaceis et opacis; rostro longo vel longiusculo, gracili; ocellis distinctis; capite plerumque nonnihil exserto; scutello mediocri; metasterno metapleurisque confusis, horum angulo apicali interiore obtuse rotundato; orificiis distinctis, sulcum emittentibus; pedibus longis vel longiusculis, gracilibus, femoribus anticis plerumque incrassatis; segmento ventrali sexto postice sinuato. — *Coriscina* Stål.

Subf. **Pachynomina** Stål.

PACHYNOMUS Klug.

Reduvius subg. *Pachynomus* Klug, Symb. 2. (1830). — *Pachynomus* Lap., Ess. p. 81. (1832); Burm., Handb. 2: 1. p. 222 et 240. (1835).

a. *Rostri articulis tribus basalibus valde incrassatis, articulo secundo tertio dimidio breviore; angulo interiore corii subrecto; membrana magna; metapleuris longioribus quam latioribus.* — Pachynomus Klug.

1. **P. picipes** Klug. — *Reduvius picipes* Klug, Symb. 2. t. 19. f. 9. (1830). — *Pachynomus picipes* Burm., Handb. 2: 1. p. 241. 2. (1835).
Patria: Dongala ad Chandeck; Aegyptus.

2. **P. brunneus** Lap. — *Pachynomus brunneus* Lap., Ess. p. 81. (1832); Burm., Handb. 2: 1. p. 240. 1. (1835); Stål, H. afr. 3. p. 39. 1. (1865). — *Pachynomus picipes* A. et S., Hist. p. 327. (1843),
Patria: Senegal. (Mus. Holm.)

aa. *Rostri articulis tribus basalibus minus crassis, articulo secundo tertio vix breviore; angulo interiore corii obtuso; membrana mediocri; metapleuris fere æque longis ac latis.* — Punctius Stål.

3. **P. alutaceus** Stål. — *Pachynomus alutaceus* Stål, Ö. V. A. F. 1858. p. 442. 1.
Patria: Tranquebar. (Mus. Holm.)

4. **P. biguttatus** Stål. — *Pachynomus biguttatus* Stål, An. S. E. Fr. (4) 3. p. 58. 1. (1863).
Patria: India orientalis.

Subf. **Nabina** Stål.

Conspectus generum.

1(8). Segmentis ventris basi haud impressis, ibidem carinulis longitudinalibus destitutis; oculis posterius plus minus distincte sinuatis; antennis inter articulos primum et secundum articulo brevi, cum tertio connato, instructis; corpore nitido.

2(3). Articulo secundo rostri articulo tertio breviore, basin capitis haud attingente; thorace prope marginem anticum haud impresso, collari destituto; corpore setoso; abdomine punctato vel punctato-subruguloso. — *Nabis* Latr.

3(2). Rostro longiore, articulo secundo articulo tertio longiore, pone oculos et basin capitis extenso; thorace prope marginem apicalem transversim subtiliter impresso vel subtiliter subconstricto, collari instructo; scutello impressionibus duabus discoidalibus parvis anterius instructo; corpore setis raris instructo; ventre haud punctato, nitido, substrigoso.

4(5). Articulo antennarum cum basi articuli secundi connato longiore, articulo primo circiter dimidio breviore; femoribus anticis subtus haud dentato-ampliatis. — *Pagasa* Stål.

5(4). Articulo antennarum cum basi articuli secundi connato parvo, articulo primo multo breviore.

6(7). Femoribus anterioribus subtus in medio vel prope medium dente armatis vel in angulum ampliatis, pone dentem spinulosis; tibiis intermediis rectis; pronoto pone medium constricto. — *Allœorhynchus* Fieb.

7(6). Femoribus anterioribus subtus multispinulosis, in dentem vel angulum haud ampliatis; tibiis anticis fossa spongiosa parva instructis, intermediis fossa destitutis, distincte curvatis; pronoto medio constricto. — *Psilistus* Stål.

8(1). Segmentis ventris basi impressis, parte impressa carinulis longitudinalibus compluribus instructa; segmento ventrali marium sexto posterius et utrinque depresso, postice producto, segmentum genitale in disco ferente; antennis inter articulos primum et secundum articulo nullo vel minimo et obsoletissimo instructo, articulo secundo crassiusculo; rostro medium mesosterni attingente, articulo secundo articulis tertio et quarto simul sumtis vix vel paullo breviore, pone caput extenso; scutello basi obsolete biimpresso; membrana venas nonnullas posterius evanescentes a basi emittente; oculis postice haud sinuatis; corpore opaco, piloso; thorace prope marginem anticum obsolete obtuseque impresso, collari obsoleto instructo. — *Phorticus* Stål.

NABIS Latr.

Nabis p. Latr., Gen. 3. p. 127. (1807). — *Prostemma* Lap., Ess. p. 12. (1832); Stein, Berl. E. Z. 1. p. 86. (1857). — *Postemma* Duf., An. S. E. Fr. 3. p. 349. (1834). — *Metastemma* A. et S., Hist. p. 327. (1843); Fieb., Eur. H. p. 43 et 157. (1861).

a. *Femoribus anticis subtus in medio tuberculo parvo instructo, ante tuberculum inermibus; segmento genitali marium magno.* — Nabis Latr.

aa. *Femoribus anticis subtus tuberculo medio destitutis, per fere totam longitudinem spinosis; segmento genitali marium minore.* — Poecilta Stål.

b. *Femoribus posterioribus pone medium piceis, anticis totis rufescentibus.* — (*P. sanguinea* Rossi, Fieb.)

bb. *Femoribus anticis a basi ultra medium nec non annulo femorum posteriorum fere medio piceis vel nigris.*

1. **N. (Poecilta) perpulchra** Stål. — *Metastemma perpulchra* Stål, Ö. V. A. F. 1855. p. 38. 1. — *Metastemma perpulchrum* Stål, H. afr. 3. p. 40. 1. (1865). — *Prostemma perpulchrum* Stein, Berl. E. Z. 1. p. 96. 11. (1857).
Patria: Caffraria. (Mus. Holm.)

2. **N. (Poecilta) carduelis** A. Dohrn. — *Prostemma carduelis* A. Dohrn, Stett. E. Z. 19. p. 229. t. 1. f. 8. (1858).
Patria: Ceylon. (Mus. Holm.)
P. perpulchræ simillima, ventre toto nigro vel disco obsolete subpiceo mox differt. Hemelytra uti in *P. perpulchra* picta, clavo rufo vel flavo-testaceo, apice infuscato vel nigricante, corii parte circiter tertia basali testacea, margine lineaque nigris.

3. **N. (Poecilta) fasciata** Stål. — Nigra, nitida, setosa; pronoto posterius, scutello, clavo, parte tertia basali corii clavo breviore, propleuris postice, mesostethio et metastethio testaceis; pedibus flavo-testaceis, coxis anticis, femoribus anticis ultra medium, annulo medio femorum posteriorum, apice tibiarum omnium et basi tibiarum anticarum piceis vel nigro-piceis; corii fascia fere media, percurrente, etiam per angulum basalem interiorem membranæ extensa, anguloque apicali, nec non membranæ margine basali pone angulum exteriorem corii apiceque sordide subalbidis. ♂. Long. 6, Lat. 2 mill.
Patria: Insulæ Philippinæ. (Mus. Holm.)
Præcedentibus duabus simillima, ab ambabus differt parte basali testacea corii lineis nigris destituta, macula transversa albicante media in fasciam percurrentem extensa, angulo basali interiore membranæ albicante, mesostethio et metastethio testaceis, nec piceis nec nigris, coxisque posterioribus flavo-testaceis.

PAGASA Stål.

Stål, Rio H. 2. p. 60. (1862).

a. *Capite flavescente; articulo secundo rostri pone oculos extenso.*

1. **P. pallidiceps** Stål. — *Prostemma pallidiceps* Stål, Rio H. 1. p. 69. 1. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Fusco-picea, pronoto æneseente; capite, antennis, rostro, macula obtriangulari apicali pronoti scutelloque flavescentibus; capite subtus et lateribus fusco; clavo, corii limbo ad clavum, fascia obsoleta maculari media maculaque parva prope medium marginis apicalis pallidis; pedibus dilute piceis.

2. **P. ænescens** Stål. — Præcedenti maxime affinis, sed minor, vertice basi nigricante, scutello hemelytrisque fusco-testaceis, his immaculatis, femoribus posterioribus basin versus pallidioribus, et uti videtur, antennis rostroque paullo brevioribus, illarum articulo secundo paullo crassiore differt. ♂. Long. 7, Lat. 2 mill.
Patria: Minas Geraës. (Mus. Holm.)

aa. *Capite nigro.*

3. **P. pallipes** Stål. — Nigra, nitida, obsolete ænescens, scutello, parte coriacea hemelytrorum intus membranaque opacis, haud ænescentibus; antennis fusco vel flavo-testaceis; rostro pedibusque totis flavo-testaceis, illo ad vel paullo pone apicem coxarum anticarum extenso, articulo secundo pone caput extenso; margine imo apicali pronoti obsoletissime pallescente. ♂. Long. $7\frac{1}{2}$, Lat. $2\frac{1}{2}$ mill.
Patria: Texas. (Mus. Holm).
Corisco subcoleoptrato primo intuito simillima.

4. **P. nitida** Stål. — Præcedenti simillima, hemelytris totis nitidis, rostro breviore, articulo secundo pone basin capitis vix extenso, femoribus anticis paullo latioribus, margine apicali pronoti haud pallescente, magnitudineque minore differt. ♀. Long. 7, Lat. 2 mill.
Patria: Wisconsin. (Mus. Holm.)

ALLOEORHYNCHUS Fieb.

Fieb., Eur. H. p. 43 et 159. (1861).

a. *Dente vel angulo inferiore femorum anticorum fere medio.*

1. **A. puerilis** Stål. — *Metastemma puerilis* Stål, Ö. V. A. F. 1855. p. 39. 2; H. afr. 3. p. 41. 1. (1865). — *Prostemma puerile* Stein, Berl. E. Z. 1. p. 96. 12. (1857).
Patria: Caffraria. (Mus. Holm.)

2. **A. vinulus** Stål. — *Alloeorhynchus vinulus* Stål, An. S. E. Fr. (4) 4 p. 59. 1. (1864). — *Alloeorhynchus pulchellus* Stål, Ö. V. A. F. 1870. p. 675. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.); Java.

aa. *Dente inferiore distincte ante medium femorum anticorum posito.*

3. **A. vittativentris** Stål. — Nigro-picea, obsoletissime æneseens, nitida, parce setosa; antennis fusco-testaceis, basin versus pallescentibus; rostro, pedibus, ventre maculisque marginalibus superioribus abdominis pallide sordide flavescentibus; rostro basin versus, tibiis apice vel apicem versus infuscatis; vitta laterali ventris margineque postico segmentorum ventralium inter vittam et marginem nigricantibus. ♀. Long. 5, Lat. $1\frac{1}{2}$ mill.
Patria: Nova Granada, Bogota. (Mus. Holm.)
Statura *A. flavipedis.* Femora antica subtus dente acutiusculo armata, femora intermedia subtus paullo pone medium denticulo armata, pone dentem spinulosa. Articulus secundus rostri pone oculos extensus.

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4. **A. trimacula** Stein. — *Prostemma trimacula* Stein, Berl. E. Z. 4. p. 76. (1860).
Patria: Mexico, Oaxaca.

5. **A. Moritzii** Stein. — *Prostemma Moritzii* Stein, Berl. E. Z. 4. p. 77. (1860).
Patria: Insula St. Jean.

PSILISTUS Stål.

1. **P. corallinus** Stål. — Corallinus, nitidus, parce setosus; scutello, clavo corioque intus infuscatis; membrana nigro-fusca; statura Alloeorhynchorum. ♀. Long. 11, Lat. 3 mill.
Patria: Borneo. (Coll. Signoret.)

PHORTICUS Stål.

Stål, Rio H. 1. p. 69. (1860).

a. *Femoribus anticis fortius incrassatis, subtus fere in medio dente armatis, pone dentem obsoletissime denticulatis; lobo postico pronoti linea longitudinali pallida notato; tibiis anticis apicem versus subcurvis et sensim sat incrassatis, subtus ad fossam spongiosam dente acuto distinctissimo armatis.*

1. **P. viduus** Stål. — *Phorticus viduus* Stål, Rio H. 1. p. 69. 1. (1860).
Patria: Brasilia, Rio Janeiro. (Mus. Holm.)

2. **P. collaris** Stål. — Nigricans vel fusco-testaceus, opacus, impunctatus, pilosus; parte apicali postice obtusangula nec non linea longitudinali lobi postici pronoti, margine acetabulorum, abdomine pedibusque pallide testaceo-flavescentibus. ♂. ♀. Long. $3\frac{1}{2}$, Lat. $1\frac{1}{3}$ mill.
Form. macr. — Hemelytris completis, apicem abdominis subsuperantibus, fuscis vel nigricantibus; basi antennarum, clavo a basi ultra medium, parte circiter tertia basali corii maculaque discoidali sæpe obsoleta confluentibus testaceo-flavescentibus; limbo libero membranæ obsolete, margine basali pone angulum apicalem corii plerumque distincte pallescentibus.
Form. brach. — Hemelytris abbreviatis, scutello vix duplo longioribus, postice oblique truncatis, testaceo-flavescentibus, apice fuscis, membrana nulla.
Patria: Texas. (Mus. Holm.)

aa. *Femoribus anticis leviter incrassatis, subtus dente destitutis; tibiis anticis rectis, sensim modice incrassatis, ad fossam spongiosam denticulo obsoleto instructis; lobo postico pronoti linea pallida destituto.*

3. **P. obscuriceps** Stål. — *Phorticus obscuriceps* Stål, Rio H. 1. p. 69. 2. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
P. collari simillimus.

Species nabinorum incerti generis.

1. **Prostemma 7-guttatum** Stein, Berl. E. Z. 1. p. 89. 3. (1857).
Patria: Africa meridionalis.

2. **Prostemma fuscum** Stein, Berl. E. Z. 1. p. 90. 4. (1857).
Patria: Pennsylvania.

3. **Prostemma ruficolle** Stein, Berl. E. Z. 1. p 94. 8. (1857).
Patria: Terra capensis.

Subf. **Coriscina** Stål.

Conspectus generum.

1(10). Rostro quadriarticulato, articulo primo brevi, subtransverso vel æque longo ac lato; pronoto haud transverso, lateribus haud vel obtuse obsoleteque marginatis, margine basali ante scutellum recto; hemelytris parallelis vel subparallelis, haud dilatatis, margine costali recto vel subrecto; membrana areis duabus vel tribus longis, venas complures emittentibus instructa, vel longitudinaliter venosa.

2(3). Acetabulis anticis ante medium prostethii excisis, pone stricturam thoracis haud extensis, postice occlusis; coxis anticis longissimis, ad apicem mesostethii extendendis; femoribus anticis sensim leviter recurvis, incrassatis, subtus spinulis minutissimis armatis; tibiis anticis femoribus nonnihil brevioribus, leviter curvatis, subtus apicem versus obsolete crenulatis; pedibus posterioribus gracilibus, femoribus basin versus haud incrassatis; tarsis mediocribus, articulo secundo reliquis longiore; unguiculis incurvis, brevibus, latiusculis; articulo secundo rostri tertio longiore; articulo primo antennarum capite nonnihil longiore, articulo secundo nonnihil breviore; membrana areis longis angustis duabus et venis longitudinalibus compluribus instructa; ocellis distantibus; pronoto basi ante scutellum latissime sinuato, sinu fundo truncato; corpore elongato, gracili. — *Gorpis* Stål.

3(2). Acetabulis et eorum parietibus exterioribus usque ad basin prostethii extensis; coxis anticis minus longis, interdum sat brevibus; femoribus anticis rectis; pronoto basi ante scutellum truncato.

4(5). Ocellis maxime appropinquatis, subcontiguis: articulis primo et secundo antennarum longitudine subæqualibus, illo capite longiore; articulo secundo rostri tertio longiore; membrana venis nonnullis longitudinalibus obsoletissimis instructa; pedibus gracillimis; coxis anticis nonnihil pone acetabula extensis; femoribus omnibus, præsertim anticis, basin versus sensim nonnihil incrassatis, anterioribus subtus utrinque spinis nonnullis longis, gracillimis, setiformibus divaricatis armatis; tibiis anticis subtus serie duplici, intermediis serie unica spinarum setiformium nonnullarum armatis; tarsis mediocribus, articulis duobus apicalibus fere æque longis; unguiculis gracilibus, mèdiocribus; abdomine angusto; corpore gracili. — *Arbela* Stål.

5(4). Femoribus tibiisque spinis longis setiformibus destitutis.

6(7). Ocellis valde appropinquatis; oculis sat fortiter granulatis; articulo primo antennarum secundo breviore et capite fere duplo longiore, parte vix dimidia apicali paullo incrassata; rostro pone prostethium haud extenso, articulo secundo tertio multo longiore; lobo antico pronoti carina longitudinali subtili anterius abbreviata instructo; membrana venis nonnullis longitudinalibus instructa, areis nullis; coxis anticis brevibus, vix longioribus quam crassioribus, pone prostethium haud extendendis; femoribus anticis nonnihil incrassatis, subtus spinulis remotis armatis; tibiis anticis subtus biseriatim minutissime spinulosis; tarsis brevibus; unguiculis brevibus, validiusculis. — *Metatropiphorus* Reut.

7(6). Ocellis distantibus; oculis subtiliter vel subtilissime areolatis; articulo primo antennarum capite haud vel paullo longiore; articulo secundo rostri tertio haud vel paullo longiore; lobo antico pronoti haud carinato; membrana areis duabus vel tribus venas complures emittentibus instructa; coxis anticis longioribus quam crassioribus, pone prostethium extensis; femoribus anterioribus, præsertim anticis, plerumque distincte incrassatis et apicem versus sensim gracilescentibus, subtus dense pilosis; tibiis anticis subtus utrinque spinulosis; tarsis mediocribus; unguiculis gracilibus, longiusculis.

8(9). Capite pone oculos subito coarctato, ad vel fere ad oculos immergendo; (vitta superiore exteriore femorum anticorum, parte apicali femorum posticorum vittisque percurrentibus tribus pronoti nigris). — *Stålia* REUT. (*Nabis major* COSTA et *boops* SCHJ.)

9(8). Capite collo brevi iustructo, distincte nonnihil exserto; (femoribus anticis vitta superiore exteriore nigra destitutis, parte apicali vel subapicali femorum posticorum raro nigricante vel fusca). — *Coriscus* SCHRANK.

10(1). Rostro triarticulato, articulo primo brevi, fere duplo longiore quam crassiore, secundo longissimo, fere pone mesosternum extenso, tertio brevi; capite pone oculos subito coarctato, usque ad oculos immerso; antennis pone medium partis anteocularis capitis insertis, remote setosis, articulo primo brevi, secundo illo fere triplo longiore, his minus gracilibus, articulis reliquis gracillimis; ocellis valde distantibus, ad basin capitis prope oculos valde prominulos positis, majusculis; thorace leviter transverso, basi ante scutellum obtuse sinuato, apice in collare angustum subito coarctato, ante medium transversim leviter impresso, marginibus lateralibus subacutis, anguste leviterque reflexis; scutello subæquilatero; hemelytris rotundato-dilatatis, parte costali subreflexa, angulo apicali corii acute producto; membrana areis tribus brevibus, postice venas oblique longitudinales emittentibus; femoribus æque crassis, inermibus; tibiis anticis subtus inermibus, remote obsoletissime obtuseque subserratis; tarsis mediocribus; unguiculis gracilibus. — *Scotomedes* STÅL.

GORPIS STÅL.

STÅL, Ö. V. A. F. 1859. p. 377; H. afr. 3. p. 38. (1865).

1. **G. cribraticollis** STÅL. — *Gorpis cribraticollis* STÅL, Ö. V. A. F. 1859. p. 377.
Patria: Ceylon.

ARBELA STÅL.

STÅL, H. afr. 3. p. 38 et 42. (1865).

a. *Lobo postico pronoti distinctissime densiusculeque punctato, linea longitudinali media per scutellum continuata pallidiore.*

1. **A. nitidula** STÅL. — *Nabis nitidula* STÅL, Freg. Eug. resa, Ins. Hem. p. 261. 114. (1859). — *Arbela nitidula* STÅL, Ö. V. A. F. 1870. p. 674. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)
In exemplis rite coloratis caput, thorax, scutellum, hemelytra et pectus nigra sunt, linea media lobi postici pronoti et scutelli, marginibusque lateralibus illius lobi et corii pallidis.

2. **A. elegantula** STÅL. — *Arbela elegantula* STÅL, H. afr. 3. p. 42. 1. (1865).
Patria: Insula Bourbon. (Mus. Holm.)
Variat forte interdum obscurior et uti species præcedens colorata.

aa. *Lobo postico pronoti lævi vel obsolete et parce punctulato scutelloque linea media pallida destitutis.*

3. **A. costalis** STÅL. — Nigra, nitida, lobo postico pronoti punctis raris et obsoletis prædito; antennis basin versus, marginibus lateralibus lobi postici pronoti et corii, apice imo scutelli, acetabulis anticis, abdomine, rostro pedibusque pallide testaceo-flavescentibus; ventre antice posticeque nigro. ♂. ♀. Long. 5—6, Lat. 1—$1\frac{1}{3}$ mill.
Patria: Insulæ Fidschi, Ovalau. (Mus. Holm.)
A. nitidulæ simillima, lobo postico pronoti remotissime et obsolete punctulato mox distinguenda.

4. **A. polita** STÅL. — *Arbela polita* STÅL, Ö. V. A. F. 1870. p. 675. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)

ACANTHOBRACHYS FIEB.

FIEB., Eur. H. p. 43. (1861).

Speciem hujus generis, quantum novi, haud descripsit FIEBER.

METATROPIPHORUS REUT.

REUT., Ö. V. A. F. 29: 6. p. 93. (1872.)

1. **M. Belfragii** REUT. — *Metatropiphorus Belfragii* REUT., Ö. V. A. F. 29: 6. p. 94. 1. 1872.
Patria: Texas. (Mus. Holm.)

CORISCUS SCHRANK.

Coriscus p. SCHRANK, Faun. boic. 2: 1. p. 46. (1801). — *Nabis* p. LATR. Gen. 3. p. 127. (1807). — *Aptus* HAHN, W. 1. 1. f. 24. A—C. (1831). — *Nabis* SPIN., Ess. p. 105. (1837); FIEB., Eur. H. p. 43 et 159. (1861). — *Reduviolus* KIRBY in RICH., Faun. bor. am. 4. p. 279. (1837). — *Nabicula* KIRBY in RICH., Faun. bor. am. 4. p. 281. (1837).

a. *Scutello toto vel fere toto nigro vel vitta nigra notato; articulo primo antennarum gracili.* — Sp. 1—22.

b. *Corpore nigro, nitido, antennis, rostro, pedibus limboque abdominis pallidis; capite distincte exserto, pone oculos distinctissime retrorsum sensim angustato.* — NABICULA KIRBY.

1. **C. subcoleoptratus** KIRBY. — *Nabicula subcoleoptrata* KIRBY in RICH., Faun. bor. am. 4. p. 282. 1. (1837). — *Nabis subcoleoptratus* REUT, Ö. V. A. F. 29: 6. p. 81. 1. (1872).
Patria: Wisconsin, Illinois. (Mus. Holm.)

bb. *Corpore toto vel ad partem pallido vel fusco, opaco vel opaculo; capite pone oculos haud vel obsolete retrorsum angustato.*

c. *Femoribus posticis apice fuscis vel prope apicem fusco-annulatis; annulis vel saltem annulo subbasali apiceque tibiarum fuscis.* — Sp. 2—8.

d. *Femoribus fusco-conspersis vel maculatis vel saltem prope annulum subapicalem annulo fusco notatis; connexivo plerumque impressione nulla vel obsoleta discreto.*

e. *Connexivo fusco, macula angulos anticos segmentorum occupante, interdum longe retrorsum extensa, pallida; femoribus inermibus.* — APTUS HAHN.

ee. *Connexivo pallescente vel pallido, macula raro deficiente angulos anticos vel basin segmentorum occupante nigra vel fusca, supra subtusque distinguenda; femoribus anterioribus subtus spinulis plerumque sat distinctis armatis.*

2. **C. crassipes** REUT. — *Nabis crassipes* REUT., Ö. V. A. F. 29: 6. p. 83. 5. (1872).
Patria: Mexico. (Mus. Holm.)

3. **C. sericans** REUT. — *Nabis sericans* REUT., Ö. V. A. F. 29: 6. p. 83. 6. (1872).
Patria: Texas. (Mus. Holm.)

4. **C. roripes** STÅL. — *Nabis roripes* STÅL, Rio H. 1. p. 70. 2. (1860); REUT., Ö. V. A. F. 29: 6. p. 84. 7. (1872).
Patria: Rio Janeiro. (Mus. Holm.)

5. **C. sordidus** REUT. — *Nabis sordidus* REUT., Ö. V. A. F. 29: 6. p. 85. 8. (1872).
Patria: Mexico, Vera Cruz. (Mus. Holm.)

6. **C. pallescens** REUT. — *Nabis pallescens* REUT., Ö. V. A. F. 29: 6. p. 85. 9. (1872).
Patria: Wisconsin, Pennsylvania, New Jersey. (Mus. Holm.)

dd. *Femoribus apice fuscis vel annulo fusco notatis, prœterea impictis, inermibus, gracilibus, longis, anticis leviter, intermediis vix incrassatis; pedibus sat longe pilosis; articulo primo antennarum capiti longitudine œquali vel fere longiore; connexivo impressione distincte discreto; lobo postico pronoti punctato.*

7. **C. villosipes** STÅL. — *Nabis villosipes* STÅL, Rio H. 1. p. 69. 1. (1860); REUT., Ö. V. A. F. 29: 6. p. 86. 10. (1872).
Patria: Brasilia, Rio Janeiro. (Mus. Holm).

8. **C. annulatus** REUT. — *Nabis annulatus* REUT., Ö. V. A. F. 29: 6. p. 86. 11. (1872).
Patria: America borealis, Illinois. (Mus. Holm.)

cc. *Femoribus inermibus, nec apice fuscis, nec prope apicem fusco-annulatis, interdum remote minuteque fusco vel nigro-conspersis; tibiis plerumque impictis.*

f. *Articulo basali antennarum capite plerumque distincte breviore, raro capitis fere longitudine; ocellis ad basin capitis appropinquatis; hemelytris semper membrana instructis, corio etiam in brachypteris apice valde oblique truncato, margine apicali sutura clavi numquam breviore, angulo apicali acuto; mesosterno typice nigro vel nigro-bivittato, raro in exemplis pallidis vel nuper exclusis pallido toto; dorso abdominis nigro vel fusco, raro testaceo, in hoc casu vitta fusca pallido-bilineata destituto.* — Sp. 9—19.

g. *Dorso abdominis fusco, nigro vel raro testaceo, vitta media pallida, medio fusco-lineata, destituto; in forma brachyptera hujus divisionis hemelytra sunt sat explicata et apicem abdominis interdum subsuperantia.*

h. *Membrana abbreviata, apice tamen rotundato-producta, apicem abdominis raro paullo superante, venis nonnullis longitudinalibus, areas haud formantibus, instructa, vena interiore venulas haud emittente; alis nullis vel abbreviatis; forma macroptera ignota.* — REDUVIOLUS KIRBY. *(C. rugosus* LIN., *ericetorum* SCHOLTZ et *minor* REUT.*)*

9. **C. inscriptus** KIRBY. — *Reduviolus inscriptus* KIRBY in RICH., Faun. bor. am. 4. p. 280. 1. pl. 6. f. 7. (1837).
Patria: America borealis.

10. **C. punctipennis** REUT. — *Nabis punctipennis* REUT., Ö. V. A. F. 29: 6. p. 92. 29. (1872).
Patria: Chile. (Mus. Holm.)

11. **C. rufusculus** REUT. — *Nabis rufusculus* REUT., Ö. V. A. F. 29: 6. p. 92. 28. (1872).
Patria: NewYork, Illinois, Wisconsin. (Mus. Holm.)
Variat mesosterno vittis duabus nigris notato vel destituto.

12. **C. Faminei** STÅL. — *Nabis Faminei* STÅL, Freg. Eug. resa, Ins. Hem. p. 260. 112. (1859); REUT., Ö. V. A. F. 29: 6. p. 92. 30. (1872).
Patria: Patagonia. (Mus. Holm.)

hh. *Species numquam distincte brachypteræ, membrana semper magna vel majuscula et apicem abdominis saltem paullo superante, in forma brachyptera areis postice occlusis destituta, vena interiore semper venas complures obliquas versus marginem interiorem emittente; alis formæ brachypteræ abbreviatis.* — CORISCUS SCHRANK.

13. **C. ferus** LIN. — *Cimex ferus* LIN., Faun. Suec. p. 256. 962. (1761). — *Nabis ferus* FIEB., Eur. H. p. 161. 9. (1861); REUT., Ö. V. A. F. 29: 6. p. 72. 5. (1872).
Patria: America borealis, New Jersey, Wisconsin, California. (Mus. Holm.); Europa.

14. **C. Kalmii** REUT. — *Nabis Kalmii* REUT., Ö. V. A. F. 29: 6. p. 91. 24. (1872).
Patria: Wisconsin. (Mus. Holm.)

15. **C. parvulus** REUT. — *Nabis parvulus* REUT., Ö. V. A. F. 29: 6. p. 90. 23. (1872).
Patria: Valparaiso. (Mus. Holm.)

16. **C. Kinbergii** REUT. — *Nabis Kinbergii* REUT., Ö. V. A. F. 29: 6. p. 90. 21. (1872).
Patria: America meridionalis, Buenos Ayres; Australia, Sydney.

17. **C. capsiformis** GERM. — *Nabis capsiformis* GERM. in SILB., Rev. 5. p. 132. 28. (1837); REUT., Ö. V. A. F. 29: 6. p. 88. 18. (1872). — *Nabis caffra* STÅL, Ö. V. A. F. 1855. p. 39. 1; H. afr. 3. p. 41. 1. (1865).
Patria: Africa, Caffraria, Territorium lacus N'Gami, Abyssinia; America borealis, Carolina. (Mus. Holm.)
Variat mesosterno nigro vel nigro-bivittato vel toto pallido.

18. **C. roseipennis** REUT. — *Nabis roseipennis* REUT., Ö. V. A. F. 29: 6. p. 89. 19. (1872).
Patria: Wisconsin. (Mus. Holm.)

19. **C. punctipes** REUT. — *Nabis punctipes* REUT., Ö. V. A. F. 29: 6. p. 89. 20. (1872).
Patria: Wisconsin, New Jersey. (Mus. Holm.)

gg. *Dorso abdominis nigro, vitta media pallida, fusco-unilineata, notato; hemelytris dimorphis, sæpe abbreviatis et medium abdominis haud vel vix attingentibus, membrana tamen semper instructa, margine apicali corii longitrorsum obliquo, angulo apicali corii acuto; lobo antico pronoti distincte nigro-trivittato; mesosterno nigro.* (*C. flavo-marginatus* SCHOLTZ.).

ff. *Articulo basali antennarum capite longitudine æquali; hemelytris interdum valde abbreviatis et scutello vix plus quam duplo longioribus, rotundato-truncatis, membrana destitutis, angulo apicali exteriore subrecto, apice rotundato; lobo postico pronoti punctulato; lateribus latis scutelli, mesosterno dorsoque abdominis pallidis.*

i. *Dorso abdominis segmentoque genitali fusco-lineatis; ocellis a basi capitis remotis, parvis, saltem in brachypteris; corpore gracili; parte postoculari capitis interdum retrorsum nonnihil ampliata.* (*C. lineatus* DAHLB. et *limbatus* DAHLB.)

20. **C. propinquus** REUT. — *Nabis propinquus* REUT., Ö. V. A. F. 29: 6. p. 87. 13. (1872).
Patria: Wisconsin. (Mus. Holm.)

21. **C. vicarius** REUT. — *Nabis vicarius* REUT., Ö. V. A. F. 29: 6. p. 87. 15. (1872).
Patria: Illinois. (Mus. Holm.)

ii. *Dorso abdominis segmentoque genitali maris lineis fuscis destitutis; ocellis, saltem in macropteris, a basi capitis minus remotis, majusculis.*

22. **C. tagalicus** Stål. — *Nabis tagalica* Stål, Freg. Eug. resa, Ins. Hem. p. 261. 133. (1859). — *Nabis tagalicus* Reut., Ö. V. A. F. 29: 6. p. 88. 17. (1872).
Patria: Insulæ Philippinæ. (Mus. Holm.)

aa. *Scutello pallido, vitta nigra destituto; articulo primo antennarum minus gracili, versus medium sensim distincte nonnihil incrassato; tylo sat elevato.* — Aspilaspis Stål. *(C. viridulus* Spin.)

23. **C. indicus** Stål. — *C. viridulo* simillimus et maxime affinis, differt statura majore et graciliore, capite a latere viso nonnihil graciliore, pronoto lobo postico angustiore, corio macula marginali fusca destituto, sed ante medium ad clavum nebula parva infuscata, vittulas duas, quarum exterior brevissima, simulante notata, venis membranæ concoloribus. ♀. Long. 8, Lat. $1\frac{2}{3}$ mill.
Patria: India orientalis borealis. (Mus. Holm.)

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24. **C. angustus** Spin. — *Nabis angustus* Spin., Ess. p. 107. 3. (1837).
Patria: Bombay.

25. **C. geniculatus** Er. — *Nabis geniculata* Er., Arch. 8: 1. p. 282. 271. (1842).
Patria: Tasmania.

26. **C. nigriventris** Stål. — *Nabis nigriventris* Stål, Stett. E. Z. 23. p. 458. 331. (1862).
Patria: Mexico.

27. **C. canadensis** Prov. — *Nabis canadensis* Prov., Canad. Nat. (1869).
Patria: Canada.

28. **C. argentinus** Mey. — *Nabis argentinus* Meyer, Mitth. Schw. E. Ges. 3. p. 177.
Patria: Buenos Ayres.

29. **C. elongatus** Mey. — *Nabis elongatus* Meyer, Mitth. Schw. E. Ges. 3. p. 178.
Patria: Buenos Ayres.

30. **C. punctipennis** Bl. — *Nabis punctipennis* Bl. in Gay, Hist. de Chile., Zool. 7. p. 161. 1. Hem. l. 2. f. 7. (1852); Sign., An. S. E. Fr. (4) 3. p. 577. 115. (1864).
Patria: Chile.

SCOTOMEDES Stål.

1. **S. ater** Stål. — Ellipticus, niger, opacus, lobo antico pronoti nitido; rostro, abdomine pedibusque dilute piceis; pronoto pone impressionem, clavo, vitta exteriore antrorsum angustata et anterius abbreviata corii, pectoreque remote punctatis; macula parva marginali corii apicem versus posita flavo-ferruginea; membrana alisque fuscis, his basin versus pallidis; articulo primo antennarum apicem capitis æquante; hemelytris apicem abdominis sat longe superantibus. ♀. Long. $11\frac{1}{2}$, Lat. thor. $3\frac{1}{3}$, Lat. hem. $4\frac{2}{3}$ mill.
Patria: Sumatra. (Mus. Leyden.)

ENUMERATIO TINGITIDARUM EXTRAEUROPÆARUM.

Fam. **Tingitidæ** Stål.

Conspectus subfamiliarum.

a. Capite transverso, inter antennas distantes paullo producto, jugis apice libere productis, cornicula duo simulantibus; bucculis modice elevatis nec antice nec postice productis, antice haud convergentibus; tuberculis antenniferis extus in dentem productis; oculis parvulis; ocellis, saltem in macropteris, distinctis; antennis distantibus, processu brevi capitis separatis, articulo primo crasso, secundo crassiore, apicem versus gracilescente, basi subito maxime coarctato et stylo brevi gracillimo suffulto; pronoto transverso, processu postico angulato destituto, basi obtusissime rotundato, scutellum haud tegente, apice truncato; scutello parvo, distincto; clavo distincto; sutura clavi distincta; corio venis longitudinalibus tribus et areis quattuor longitudinalibus instructa, area una costali (=laterali Fieb.) postice pone areas reliquas ad vel fere ad apicem hemelytri producta [1], areis duabus discoidalibus, areaque clavali ad clavum sita; membrana in exemplis macropteris membranacea, late valvante, basi coriacea, in brachypteris tota coriacea, vix vel leviter valvante; mesosterno metasternoque bicarinatis; orificiis haud distinguendis; pedibus brevibus, validiusculis, tibiis anterioribus femoribus vel femoribus cum trochanteribus longitudine æqualibus, uti in reliquis familiæ, licet quam in his minus evidenter, quasi infra apicem femorum insertis. — *Piesmina* Stål.

aa. Jugis apice haud productis; bucculis totis maxime elevatis, saltem postice dilatato-productis, antice plerumque convergentibus et sese tangentibus, sulcum rostralem antice plerumque occlusum formantibus; pronoto postice plerumque angulum formante; scutello plerumque processu angulato postico pronoti tecto; clavo plerumque dificiente vel cum corio connato; membrana semper tota coriacea vel reticulata; costa [2]) plerumque membranaceo-dilatata. — *Tingitina* Stål.

Subf. **Piesmina** Stål.

PIESMA St. F. et S.

Tingis subg. *Piesma* St. F. et S., Enc. 10. p. 653. (1825). — *Zosmenus* Lap., Ess. p. 49. (1832); Fieb., Eur. H. p. 35 et 116. (1861). — *Piesma* Spin., Ess. p. 231. (1837); A. et S., Hist. p. 301. (1843). — *Zosmerus* Dougl. et Scott, Brit. H. p. 237. (1865).

a. *Pronoto bicarinato, ante medium latissimo, utrinque obtuse rotundato, parte laterali sat dilatata, antice in angulum subacutum, apice imo rotundatum, antrorsum nonnihil prominula.*

1. **P. diluta** Stål. — *Zosmenus dilutus* Stål, Ö. V. A. F. 1855. p. 37. 1; H. afr. 3. p. 26. 1. (1865). Patria: Caffraria. (Mus. Holm.)

aa. *Pronoto antrorsum angustato, carinis duabus longioribus distinctis et una anteriore obsoletissima instructo, marginibus lateralibus subsinuatis, antice subito rotundatis.*

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[1]) Area costalis *Tingitidarum* versus costam plus minus declivis.

[2]) Costa est vena illa, quæ in latere inferiore hemelytri in costam vel carinam, sæpe acutam vel foliaceam, est elevata, marginem exteriorem mesosterni et metasterni, in *Tingitibus* quoque marginem abdominis tangit, et a margine exteriore (costali) sæpe est valde remota. Obs.: Genus *Cantacader*.

2. **P. cinerea** Say. — *Tingis cinerea* Say, New. Harm. Ind., Dec. 1831; Compl. writ. 1. p. 349. 2. (1859).
Patria: Illinois. (Mus. Holm.)
Variat pallida, immaculata.

Subf. Tingitina Stål.

Conspectus divisionum.

a. Capite ante locum insertionis antennarum longe producto, triangulari, superne spinoso; bucculis altis, anterius longe productis, ibidem sensim convergentibus, postice levissime productis et marginem anticum prosterni tangentibus; antennis distantibus, gracilibus; tuberculis antenniferis extus in dentem prominulis; pronoto antice obtuse sinuato, postice obtuse rotundato vel obtuse angulato, scutellum interdum, clavum semper liberum relinquente; clavo suturaque clavi distinctis; hemelytris dilatatis, pedibus gracilibus, anticis ab apice prostethii longe remotis; articulo secundo antennarum apicem capitis haud attingente vel saltem haud superante; segmento ultimo ventris marium apice sinuato, angulis posticis productis. — *Cantacaderaria* Stål.

aa. Capite ante antennas haud vel levissime prominulo; bucculis antrorsum haud vel leviter prominulis, postice fortiter retrorsum productis et coxas anticas plerumque attingentibus vel subattingentibus; pronoto postice angulum formante; articulo primo antennarum apicem capitis æquante vel superante; segmento ventrali ultimo marium truncato vel obtusissime sinuato.

b. Pedibus brevibus, validis, femoribus præsertim anticis vel anterioribus a basi subito superne incrassatis, dein apice vel apicem versus gracilescentibus; pronoto apice obtuse sinuato, vesicula destituto; areis corii nullis vel obsoletis; costa haud vel leviter dilatata. — *Serenthiaria* Stål.

bb. Pedibus nunc longis nunc breviusculis, femoribus prope basin haud subito incrassatis, a basi ubique æque crassis vel basi levissime et sensim gracilescentibus; pronoto typice vesicula antica instructo; areis corii distinctis, costa plerumque dilatata. — *Tingitaria* Stål.

Div. Cantacaderaria Stål.

CANTACADER A. et S.

Cantacader A. et S., Hist. p. 246. (1843); Fieb., Eur. H. p. 35 et 117. (1861). — *Taphrostethus* Fieb. Ent. Mon. p. 29 et 40. (1844).

In hoc genere, nisi fallor, non costa, sed radius inferne est carinato-elevatus et marginem exteriorem pectoris et abdominis tangens; area costalis igitur extra latera abdominis sita. Costa ad marginem exteriorem hemelytrorum valde appropinquata.

a. *Pedibus longioribus, gracillimis, femoribus anticis apicem buccularum attingentibus vel superantibus; oculis majoribus; margine costali ante medium levissime rotundato, pone medium recto; angulis posticis segmenti sexti abdominis ad apicem segmenti genitalis maris extensis.*

1. **C. tenuipes** Stål. — *Cantacader tenuipes* Stål, H. afr. 3. p. 26. 1. (1865).
Patria: Sierra Leona. (Mus. Holm.)

Antennæ longissimæ. Spinæ capitis longæ, anticæ apicem buccularum attingentes. Bucculæ antice acutæ, sensim acuminatæ. Pronotum apice capite cum oculis latius, lateribus dilatatis, reticulatis, seriebus areolarum pone medium duabus, ante medium tribus instructis. Area costalis ante medium fere triseriatim reticulata.

2. **C. Afzelii** Stål. — Præcedenti simillimus, differt pedibus (antennisque?) nonnihil brevioribus, femoribus anticis apicem capitis subsuperantibus, spinis capitis paullo brevioribus, bucculis antice minus longe productis et obtusiuscule rotundatis, pronoto apice capite cum oculis paullo angustiore, marginibus lateralibus carina anterius subfoliacea et reticulata terminatis, nec non area costali angustiore, ante medium uniseriatim reticulata. ♂. Long. 5, Lat. $1\frac{3}{4}$ mill.
Patria: Sierra Leona. (Mus. Holm).

aa. *Pedibus paullo brevioribus, femoribus anticis apicem buccularum vix attingentibus; oculis minoribus; margine costali corii sensim curvato; angulis posticis segmenti sexti abdominis minus productis.*

3. **C. subovatus** Motsch. — *Monanthia subovata* Motsch., Bull. S. Nat. Mosc. 36: 3. p. 91. (1863).
Patria: Ceylon. (Mus. Holm.)

Hæc species a *C. quinquecostato* forte haud differt. In exemplo nostro typico bucculæ sunt antice rotundatæ, apicem spinarum anticarum capitis nonnihil superantes.

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4. **C. quinquecostatus** Fieb. — *Taphrostethus quinquecostatus* Fieb., Ent. Mon. p. 41. t. 3. f. 18—22. (1844).
Patria: India orientalis.

TELEIA Fieb.

Fieb., Ent. Mon. p. 29 et 55. (1844).

1. **T. coronata** Fieb. — *Teleia coronata* Fieb., Ent. Mon. p. 56. 1. T. 4. f. 26—32. (1844).
Patria: India orientalis.

PHATNOMA Fieb.

Fieb., Ent. Mon. p. 30 et 57. (1844).

1. **P. laciniata** Fieb. — *Phatnoma laciniata* Fieb., Ent. Mon. p. 57. 1. T. 4. f. 33—38. (1844).
Patria: Indin orientalis.

Div. **Serenthiaria** Stål.

Conspectus generum.

1(4). Pronoto carina unica, interdum obsoletissima, instructo.

2(3). Orificiis distinctis, marginibus elevatis; margine costali hemelytrorum acuto, anguste depresso, costa paullo ampliata; corpore depresso; femoribus tibiis longitudine subæqualibus. — *Serenthia* Spin.

3(2). Orificiis haud distinguendis; margine costali corii obtusissimo, costa haud ampliata, nec elevata; corpore hemelytrisque fortiter convexis; tibiis femoribus brevioribus, crassis. — *Ceratinoderma* Stål.

4(1). Pronoto carinis tribus instructo; corpore leviter convexo; costa distincta, subelevata, nec depressa, nec dilatata; orificiis —? — *Solenostoma* Sign.

SERENTHIA Spin.

Piesma Lap., Ess. p. 00. (1832). — *Serenthia* Spin., Ess. p. 168. (1837); A. et S., Hist. p. 300. (1843). — *Agramma* Westw., Mod. class., Syn. gen. p. 120. (1840); Fieb., Ent. Mon. p. 29 et 36. (1844).

1. **S. gibba** Fieb. — *Agramma gibba* Fieb., Ent. Mon. p. 38. 3. T. 3. f. 7—11. (1844).
Patria: India orientalis.

CERATINODERMA Stål.

1. **C. fornicata** Stål. — Oblonga, nigricans, opaca, subtus cum pedibus cinerascente-induta; capite pronotoque subtilius, hemelytris pectoreque distinctissime punctatis; pronoto linea longitudinali lævigata, vix elevata, anterius evanescente, instructo; hemelytris fornicatis, commissura recta, subvalvante; carinis mesosterni sat elevatis; bucculis altis. ♀. Long. $2\frac{3}{4}$, Lat. hem. 1 mill.
Patria: Caffraria. (Mus. Holm.)
Antennæ mutilæ in exemplo unico descripto.

SOLENOSTOMA Sign.

Solenostoma Sign., An. S. E. Fr. (4) 3. p. 575. (1864). — *Coleopterodes* Phil., Stett. E. Z. 25. p. 306. (1864).

1. **S. liliputiana** Sign. — *Solenostoma liliputiana* Sign., An. S. E. Fr. (4) 3. p. 575. 108. pl. 13. f. 27. (1864). — *Coleopterodes fuscescens* Phil., Stett. E. Z. 25. p. 306. (1864).
Patria: Chile. (Mus. Holm.)
In exemplis nostris hemelytra vena obsoleta longitudinali obtusissime elevata sunt prædita.

Div. **Tingitaria** Stål.

Conspectus generum [1]).

1(10). Sulco rostrali capitis a bucculis formato plerumque apice aperto, bucculis antice haud productis, ibidem distantibus; loco insertionis rostri inter bucculas ab antico visas distinguendo; orificiis haud distinguendis, sulcum nullum marginatum emittentibus; pronoto apice capite cum oculis latiore, parte laterali foliacea apice subito fortiter ampliata, lateraliter ultra oculos prominula, tota lineari vel retrorsum sensim angustata, explanata, horizontali vel levissime reflexa.

2(5). Lateribus foliaceis pronoti antice fortiter antrorsum productis; hemelytris vitreis, areolis magnis instructis, areis discoidali et costali conjunctim fortiter elevatis, tumidis vel tectiformibus, fere æque latis, area costali areolis paucioribus magnis, uniseriatis instructa.

3(4). Capite spinis longis, gracilibus armato; pronoti lateribus foliaceis areis paucis magnis uniseriatis instructis, carinis altis, foliaceis, lateralibus altissimis, conchatis, media antice posticeque plus minus vesiculari; hemelytris abdomine circiter duplo longioribus, areola una areæ costalis, in medio hemelytri et pone partem maxime tumidam sita, duplicata, membrana costæ areis magnis uniseriata; antennis pedibusque longiusculis, gracilibus. — *Galeatus* Curt. (*Tingis spinifrons* Fall., *affinis* H. S., *maculata* H. S.

4(3). Capite spinis brevibus, crassiusculis armato; pronoti lateribus foliaceis saltem biseriatim areolatis, carinis tribus percurrentibus foliaceis, media altiore, antice vesiculari; hemelytris abdomine haud duplo longioribus, areola nulla areæ costalis duplicata; membrana costæ biseriata; antennis pedibusque minus longis et minus gracilibus. — *Derephysia* Spin.

5(2). Lateribus foliaceis pronoti antice haud vel levissime antrorsum prominulis, saltem biseriatim areolatis; hemelytris areolis parvis numerosis reticulatis; areis discoidali et costali hemelytrorum conjunctim haud elevatis, illa concaviuscula, subhorizontali vel horizontali, hac extrorsum plus minus declivi, areolis biseriatis numerosis vel seriebus pluribus areolarum minus regulariter dispositis instructa; processu postico pronoti in brachypteris brevi; carinis pronoti distincte foliaceis et areolatis.

6(7). Antennis crassis, tuberculatis, setosis; areolis hemelytrorum majoribus, area discoidali intus leviter rotundata; pronoto antice vesiculato. — *Dictyonota* Curt.

7(6). Antennis gracilibus, haud tuberculatis, nec setosis; species dimorphæ, plerumque brachypteræ.

8(9). Area discoidali hemelytrorum haud curvata, vena costata aream illam intus terminante curvata vel, in brachypteris, recta; pronoto antice vesiculari, apice bisinuato. — *Acalypta* Westw.

9(8). Areis omnibus hemelytrorum linearibus, curvatis, venis margineque costali parallelis; pronoto antice haud vel leviter transversim vesiculari, apice sinuato. — *Campylosteira* Fieb.

10(1). Sulco rostrali apice occluso; bucculis antice plerumque plus minus prominulis, ibidem subito convergentibus et contiguis; loco insertionis rostri ab antico haud distinguendo; orificiis vel sulco ab orificiis ducto plerumque distinctis, marginibusque elevatis et interdum explanatis præditis, raro obsoletis vel haud distinguendis, in hac casu est pronotum apice capite haud latius, margineque laterali foliaceo vel maxime reflexo vel anterius angustato instructum.

11(62). Orificiis plerumque distinctis et distincte marginatis, raro obsoletis vel haud distinguendis, in hoc casu sunt margines laterales foliacei pronoti explanati vel erecti, numquam fortiter reflexi et superficiem pronoti tangentes, nec bullati.

12(19). Areis costali et discoidali hemelytrorum conjunctim fortiter elevatis, tectiformibus vel, saltem ad partem, tumidis; hemelytris areolis plerumque magnis reticulatis, apicem abdominis longissime superantibus, area discoidali dimidium tantum vel ne dimidium quidem longitudinis hemelytri occupante, area costali lata, area discoidali haud vel paullo angustiore, extrorsum

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[1]) Propter nexum systematicum genera quoque europæa mihi cognita in conspectu disposui.

maxime vel perpendiculariter declivi; lateribus pronoti late foliaceis, antrorsum productis; membrana costæ latissima; costa medio vel pone medium fortiter curvata; antennis pedibusque gracilibus, illarum articulo primo elongato.

13(16). Pronoto antice vesicula magna, antrorsum ultra caput producta, instructo, carinis lateralibus fortiter abbreviatis, carina media foliacea, valde elevata; areis discoidali et costali ante medium hemelytri valde elevatis.

14(15). Hemelytris basi angustis, dein subito fortiter ampliatis, margine exteriore basi profunde reflexo-sinuato; area discoidali postice aperta, vel, uti videtur, fere usque ad apicem hemelytri extensa; parte areæ costalis aream discoidalem tangente triseriatim, medio quadriseriatem areolata, seriebus duabus exterioribus minute areolatis, ægre distinguendis; parte laterali foliacea pronoti lata, postice retrorsum nonnihil prominula; antennis setosis; marginibus pronoti et hemelytrorum spinis gracilibus ciliatis. — *Corythucha* STÅL.

15(14). Hemelytris a basi sensim rotundato-ampliatis, margine exteriore basi nec sinuato, nec reflexo; marginibus pronoti et hemelytrorum exterioribus spinulis minutissimis, ægre perspicundis, ciliatis. — *Stephanitis* STÅL.

16(13). Pronoto antice vesicula parva vel mediocri instructo, carinis lateralibus percurrentibus.

17(18). Pronoto vesicula majuscula, supra caput prominula instructo, carinis foliaceis, areolis magnis uniseriatis reticulatis, parte laterali foliacea antrorsum nonnihil, haud tamen ultra caput producta, processu postico brevi, obtuso; area discoidali hemelytrorum posterius concaviusculo, area costali biseriata [1]), areolis seriei exterioris minoribus. — *Leptobyrsa* STÅL.

18(17). Pronoto vesicula parva, leviter angulato-producta instructo, carina media carinis lateralibus altiore; area discoidali levissime convexa, levissime obliqua, area costali biseriata; unguiculis basi subtus appendiculatis. — *Lepturga* STÅL.

19(12). Areis discoidali et costali hemelytrorum raro conjunctim elevatis, in hoc casu sunt latera pronoti numquam late foliacea, nec pars foliacea antice producta.

20(43). Area costali hemelytrorum saltem partim seriebus areolarum tribus vel pluribus, interdum confusis, instructa, raro regulariter biseriata, in hoc casu sunt hemelytra amplissima et sulcus sternalis pone mesosternum carina transversa interruptus.

21(22). Sulco sternali inter mesosternum et metasternum carina transversa sat alta, curvata vel angulata, interrupto, pone carinam ampliato; antennis pedibusque gracilibus, longis, illarum articulo primo elongato; marginibus lateralibus foliaceis pronoti explanatis; hemelytris amplis, fortiter dilatatis, abdomen longe superantibus, costa sat fortiter sinuosa, area costali pone aream discoidalem excurva et retrorsum sensim nonnihil ampliata; spinis capitis sat longis. — *Gargaphia* STÅL.

22(21). Sulco sternali carina transversa haud interrupta.

23(26). Processu postico pronoti apice obtuso; area discoidali hemelytris plus dimidio breviore; spinis posticis capitis longis.

24(25). Pronoto carina unica percurrente instructo, apice transversim leviter vesiculari, marginibus lateralibus angustiuscule dilatatis, uniseriatis, spinis ciliatis, processu postico apice subsinuato-truncato; hemelytris amplis, sat fortiter dilatatis, abdomine circiter duplo longioribus, basi sinuatis, areolis majusculis reticulatis, areis discoidali et parte adjacente areæ costalis areolis parvis instructis; antennis pedibusque longiusculis, gracilibus, illarum articulo primo secundo distincte nonnihil longiore; bucculis ubique fere æque altis, antice paullo prominulis. — *Acanthocheila* STÅL.

25(24). Pronoto carinis tribus instructo, apice levissime vesiculari, marginibus lateralibus obtusis, carina obtusissima terminatis, processu postico apice rotundato et subdecurvo; hemelytris mediocribus, paullo dilatatis, abdomine tamen multo longioribus, areolis areæ discoidalis et

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[1]) Obs.: Area costalis biseriata = pars areæ costalis aream discoidalem adjacens biseriatim areolata; pars areæ costalis enim pone aream discoidalem extensa semper typice uniseriata.

costalis minutis, præterea areolis majoribus instructis; antennis pedibusque mediocribus, gracilibus, illarum articulo primo secundo vix longiore; bucculis antrorsum humilioribus, apice haud prominulis. — *Amblystira* STÅL.

26(23). Processu postico pronoti apice acuto vel subacuto vel saltem angulato.

27(28). Vesicula antica pronoti magna, maxime elevata, subglobosa, prominula, a superficie pronoti strictura discreta; marginibus lateralibus pronoti plus minus dilatatis; hemelytris leviter dilatatis, apicem abdominis modice superantibus, areis discoidali posteriora versus et area costali conjunctim elevatis, tumidis, illa hemelytris circiter dimidio breviore, posterius latiore; antennis sat longis vel longiusculis, gracilibus, articulo primo secundo circiter duplo longiore; pedibus graciliusculis, mediocribus. — *Sphærocysta* STÅL.

28(27). Vesicula antica pronoti nec globosa, nec strictura a pronoti superficie discreta, interdum haud elevata.

29(36). Marginibus lateralibus pronoti dilatatis, explanatis vel levissime reflexis; hemelytris amplis vel longis; antennis gracilibus, plerumque longis; articulo primo antennarum secundo longiore, plerumque sat elongato.

30(35). Pronoto vesicula antica fortiter elevata instructa.

31(34). Vesicula pronoti dorso sensim curvata.

32(33). Vesicula pronoti longa, antrorsum longe extensa, ultra apicem capitis producta, antrorsum angustata, antice subdecurva; antennis gracilibus, basi haud contiguis, articulo primo longiore quam crassiore, quarto tertio paullo crassiore; hemelytris mediocribus, apicem abdominis sat longe superantibus, membrana costæ leviter vel modice ampliata, ubique fere æque lata, areis discoidali et costali æque latis, illa extus quam intus haud magis rotundata, hac minus regulariter biseriata, medio triseriata, pone aream discoidalem vix excurva, apice incurva; carinis sternalibus minus altis; lateribus pronoti modice dilatatis. — *Corythaica* STÅL.

33(32). Vesicula pronoti brevi vel breviuscula, antrorsum leviter prominula, antice haud decurva; antennis gracillimis, longis, basi haud contiguis, articulo primo elongato et secundo saltem triplo longiore; pronoti lateribus modice dilatatis, haud sinuatis; hemelytris longis, apicem abdominis longe superantibus, area discoidali per dimidium vel ne dimidium quidem hemelytri extensa, intus subsensim rotundata, area costali seriebus tribus vel pluribus areolarum instructa, pone aream costalem plus minus excurva et retrorsum subampliata; membrana costæ latitudine variabili; pedibus gracilibus. — *Leptostyla* STÅL.

34(31). Vesicula pronoti dorso angulato, antrorsum leviter prominula, medio altissimina; lateribus pronoti maxime dilatatis, parte dilatata margine dentata vel spinosa; hemelytris amplis vel amplissimis, apicem abdominis superantibus, area costali latiuscula, seriebus pluribus confusis instructa, membrana costæ lata vel latissima; antennis pedibusque gracilibus, illis basi haud contiguis, articulo primo secundo longiore. — *Phyllontochila* FIEB.

35(30). Pronoto antice vesicula nulla vel levissime elevata instructo; antennis incrassatis, articulo quarto basi subito curvato; hemelytris mediocribus, apicem abdominis leviter superantibus. — *Eurycera* LAP.

36(29). Marginibus lateralibus pronoti dilatatis vel carinatis, maxime reflexis, erectis vel suberectis; hemelytris haud vel leviter dilatatis, apicem abdominis leviter superantibus; antennis corpore brevioribus, plerumque crassis vel crassiusculis; corpore cum hemelytris ovali vel oblongo, raro subelongato; area discoidali plerumque ultra medium hemelytri extensa, intus plus minus distincte obtusangula, nec sensim rotundata; articulo primo antennarum brevi.

37(40). Costa distincte dilatata, membrana costæ serie saltem una areolarum instructa; pronoto tricarinato, carinis parallelis.

38(39). Antennis graciliusculis, articulo tertio graciliore; margine lato vel latiusculo foliaceo pronoti maxime reflexo et superficiem pronoti tangente, obtuse rotundato. — *Physatochila* FIEB.

39(38). Antennis crassis, articulo tertio quarto haud graciliore; margine laterali pronoti levissime dilatato, plerumque cariniformi, erecto vel suberecto, raro maxime reflexo et superficiem pronoti tangente. — *Catoplatus* SPIN.

40(37). Costa obtusa, haud dilatata, membrana destituta.

41(42). Pronoto carina una percurrente instructo, marginibus lateralibus obtusis, haud dilatatis, carina subtili obtusaque terminatis; antennis pedibusque breviusculis, illis basi contiguis, crassis, articulo tertio haud graciliore. — *Leptoypha* STÅL.

42(41). Pronoto tricarinato, carinis parallelis, marginibus lateralibus maxime dilatatis et reflexis, usque ad carinam mediam pronoti extensis, parte plus quam dimidia postica valde convexa, tumida; antennis pedibusque sat longis, graciliusculis, illis basi contiguis, articulo tertio longo, gracili. — *Oncophysa* STÅL.

43(20). Area costali hemelytrorum seriebus regularibus duabus vel unica instructa.

44(59). Area costali biseriata.

45(52). Marginibus lateralibus pronoti totis maxime reflexis vel primum explanatis, dein fortiter reflexis, parte reflexa partem explanatam tangente.

46(47). Antennis pedibusque gracilibus, illis basi haud contiguis, articulo primo elongato, tertio gracillimo; pronoto tricarinato, carinis haud foliaceis, percurrentibus, vesicula antica parva; hemelytris longissimis, interdum sat amplis, area discoidali per dimidium vel paullo plus quam dimidium hemelytri extensa, intus sensim rotundata, membrana costæ latissima; spinis capitis longis, gracilibus. — *Leptodictya* STÅL.

47(46). Antennis pedibusque minus gracilibus, illis basi contiguis, articulo primo plerumque secundo haud vel vix longiore, fere æque crasso ac longo; parte laterali dilatata pronoti lata vel latissima, convexa vel tumida, ad vel fere ad carinam mediam extensa, carinis lateralibus non nisi pone medium pronoti vel posterius distinguendis.

48(49). Parte laterali reflexa supra angulos laterales pronoti elevata et extrorsum producta, posterius excavata, retrorsum longe producta; femoribus apice superne supra insertionem tibiarum spinoso-productis; vesicula pronoti antrorsum in angulum prominula. — *Elasmognathus* FIEB.

49(48). Parte laterali reflexa ultra angulos laterales pronoti haud vel leviter extrorsum prominula, pone angulos eosdem haud vel levissime extensa, posterius non nisi levissime obtusissimeque impressa; femoribus apice haud spinosis; vesicula pronoti antrorsum haud vel obtusissime prominula.

50(51). Bucculis a latere visis antice ultra apicem tyli prominulis et angulum subacutum formantibus; carinis pronoti in processu postico parallelis; corpore cum hemelytris oblongo vel subelongato; sulco sternali in metasterno fortiter ampliato. — *Cysteochila* STÅL.

51(50). Bucculis a latere visis antice haud productis, angulum subrectum, subrotundatum formantibus; carinis pronoti lateralibus in processu postico retrorsum divergentibus; corpore cum hemelytris subovali, margine costali sat rotundato; sulco sternali profundo, in metasterno haud ampliato. — *Oncochila* STÅL. (*Mon. scapularis* FIEB.)

52(45). Marginibus lateralibus pronoti plus minus dilatatis, interdum tantum sublaminato-carinatis, explanatis vel suberectis.

53(54). Antennis pedibusque longis, gracillimis, illis longissimis, articulo primo longissimo, capiti et dimidio pronoto longitudine subæquali, secundo brevissimo; pronoto tricarinato, marginibus lateralibus acute carinatis; hemelytris parallelis, angustis, abdomine multo longioribus, area discoidali vix dimidium hemelytri occupante, extus recto, intus rotundato-angulato; rostro pone coxas anticas vix extenso. — *Tigava* STÅL.

54(53). Antennis pedibusque minus longis et minus gracilibus, interdum brevibus et crassis, articulo primo brevi vel breviusculo, secundo haud vel paullo, raro fere duplo longiore.

55(56). Pronoto fortiter dilatato, alato, vesicula antica maxima, longa, antrorsum longe producta et ultra apicem capitis extensa, sensim curvata, carinis foliaceis; antennis pedibusque gracilibus, illarum articulo primo secundo fere duplo longiore; hemelytris amplis, latis, abdomine multo longioribus, parte tertia basali sensim angustata, area discoidali extus quam intus fortius rotundata, paullo ultra medium hemelytri extensa, area costali angusta, pone aream discoidalem excurva, membrana costæ lata; carinis sternalibus altis, foliaceis; areolis marginalibus buccularum magnis. — *Leptocysta* STÅL.

56(55). Vesicula antica pronoti magnitudine variabili, sæpe nulla, interdum alte elevata, antrorsum tamen leviter, numquam ultra caput producta, nec elongata.

57(58). Antennis pedibusque gracilibus, mediocribus vel longiusculis, illarum articulo primo secundo duplo longiore; pronoto nigro, albo-tricarinato, marginibus lateralibus albis; hemelytris angustiusculis, apicem abdominis sat longe superantibus, area discoidali circiter dimidium longitudinis hemelytri occupante. — *Leptopharsa* STÅL.

58(57). Antennis pedibusque plerumque minus gracilibus, articulo primo secundo haud vel paullo longiore. — *Tingis* FABR.

59(44). Area costali hemelytrorum uniseriata; antennis crassis vel crassiusculis, articulo primo secundo haud vel paullo longiore, tertio quarto haud graciliore, apice suboblique truncato.

60(61). Corpore elongato; hemelytris angustis, abdomine paullo longioribus, membrana costæ lineari, angustissima, uniseriata; pronoti marginibus lateralibus carinatis, reflexis, erectis. — *Teleonemia* COSTA.

61(60). Corpore oblongo; hemelytris amplissimis, latissimis, extus rotundatis, membrana costæ amplissima, latissima; marginibus lateralibus pronoti foliaceis, dilatatis. — *Eurypharsa* STÅL.

62(11). Orificiis haud distinguendis; marginibus lateralibus pronoti totis vel saltem anterius dilatatis, maxime reflexis et superficiem pronoti tangentibus, vel fortiter dilatatis, erectis, bullatis; membrana costæ uniseriata. — *Monanthia* St. F. et S.

ACALYPTA WESTW.

Acalypta WESTW., Mod. classif. 2, Syn. gen. p. 121. (1840). — *Orthosteira* FIEB., Ent. Mon. p. 29 et 46. (1844). — *Orthostira* FIEB., Eur. H. p. 36 et 130. (1861); THOMS., Opusc. 4. p. 399. (1871).

1. **A. Thomsonii** STÅL. — Grisea, subtus cum pedibus antennisque ferruginea, harum articulis basali et apicali nec non capite nigris; bucculis pallidis, apice contiguis. ♂. ♀. Long. $2\frac{1}{2}$—3, Lat. hem. $1\frac{1}{2}$—$1\frac{3}{4}$ mill.

Forma brachypt. — Processu postico pronoti subacutangulo, angulo apice rotundato; hemelytris apicem abdominis paullo superantibus, area discoidali quadriseriata, lateribus subparallelis instructa, postice angustata, costis ambabus aream terminantibus postice arcuato-convergentibus; area costali area discoidali multo latiore, quinqueseriata.

Patria: Carolina meridionalis. (Mus. Holm.)

Ad divisionem B, a (THOMS., Opusc.) optime referenda. A reliquis mihi cognitis congenericis bucculis apice contiguis divergens. Antennæ articulo tertio ubique æque crasso, nec basi crassiore, articulo quarto circiter duplo longiore. Pronotum tricarinatum, carinis posterius divergentibus, media altiore, tota distinctissima, percurrente, vesicula antica antice acutiuscule prominula, carina media haud altiore; parte laterali foliacea biseriata, ante medium triseriata, haud rotundata, antice angulum subrectum formante. Membrana costæ biseriata, postice subtriseriata, prope basin per spatium breve vix plus quam uniseriata. Rete marginum lateralium pronoti hemelytrorumque crassum.

CORYTHUCHA STÅL.

a. *Vesicula partem anteriorem pronoti occupante, postice obtusa et rotundata.*

b. *Carina foliacea media pronoti alta, anterius altissima, hinc antrorsum versus vesiculam leviter vel levissime, retrorsum sensim magis altitudine decrescente; reti pronoti hemelytrorumque saltem partim spinulis vel setulis spiniformibus instructo.*

1. **C. fuscigera** STÅL. — *Tingis fuscigera* STÅL, Stett. E. Z. 23. p. 323. 258. (1862).

Patria: Mexico. (Mus. Holm.)

Vesicula pronoti ante medium fortiter compressa, posterius et dorso areolis magnis reticulata, lateribus partis anterioris compressæ areolis minutissimis, quam in speciebus reliquis mihi cognitis proportionaliter multo minoribus, instructis hæc species a congericis mox distinguitur.

2. **C. fusco-maculata** STÅL. — *Tingis fusco-maculata* STÅL, Rio H. 1. p. 63. 1. (1860).
Patria: Rio Janeiro Brasiliæ; Nova Granada, Bogota. (Mus. Holm.)
Præcedenti simillima, mox differt lateribus partis anterioris compressæ vesiculæ pronoti areolis majoribus instructis. Bucculæ variant pallescentes vel, plerumque in exemplis bogotanis, nigris.

3. **C. ciliata** SAY. — *Tingis ciliata* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 348. 1. (1859).
Patria: New Jersey, Illinois. (Mus. Holm.)

4. **C. arcuata** SAY. — *Tingis arcuata* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 350. 5. (1859).
Patria: Texas, Illinois. (Mus. Holm.)

5. **C. hyalina** H. S. — *Tingis hyalina* H S., W. I. 5. p. 84. f. 532. (1839); FIEB., Ent. Mon. p. 103. 3. T. 9. f. 1—4. (1844).
Patria: America borealis.

6. **C. Gossypii** FABR. — *Acanthia Gossypii* FABR., E. S. 4. p. 78. 45. (1794). — *Tingis Gossypii* FABR., S. R. p. 126. 10. (1803). — *Galeatus Gossypii* STÅL, H. Fabr. 1. p. 93. 1. (1868).
Patria: Insulæ Americæ meridionalis.
Specimen Musei Holmiensis e Cuba, quod ad hanc speciem refero, a *T. ciliata*, cui similis, differt vesicula pronoti minus alta et carina foliacea media haud vel vix altiore, hemelytris, uti mihi videtur, posterius et in membrana costæ areolis paucioribus et paullo majoribus instructis.

7. **C. decens** STÅL. — *Tingis decens* STÅL, Stett. E. Z. 23. p. 324. 259. (1862).
Patria: Mexico, Tabasco.

bb. *Carina foliacea media pronoti minus alta, vesicula multo humiliore, anterius quam medio paullo altiore; carinis vel reti pronoti hemelytrorumque inermibus.*

8. **C. juglandis** FITCH. — *Tingis Juglandis* FITCH, Third rep. p. 148. (1859).
Patria: New Jersey, Illinois. (Mus. Holm.)

aa. *Vesicula pronoti longa, per magnam partem pronoti extensa, posterius sensim acuminata.* — MACROCORYTHA STÅL.

9. **C. rhomboptera** FIEB. — *Tingis rhomboptera* FIEB., Ent. Mon. p. 103. 2. T. 8. f. 37, 38. (1844).
Patria: Insulæ Philippinæ.

STEPHANITIS STÅL.

a. *Antennis brevissime pilosis; pronoti lateribus foliaceis antice vix vel levissime antrorsum productis, vesicula latiore, antrorsum minus producta, apicem capitis haud vel levissime superante; costa medio leviter sinuosa, membrana costæ ad sinum costæ circiter dimidium latitudinis hemelytri occupante; corpore subtus nigro.* (*Tingis pyri* GEOFFR. et *Oberti* [1]) KOL.)

aa. *Antennis longe pilosis; pronoti lateribus foliaceis antice distincte antrorsum productis, fere ante caput extensis, vesicula minus lata, longa, sat longe ante caput extensa; costa medio fortiter sinuosa, membrana costæ medio ad sinum costæ fere duas tertias partes latitudinis hemelytri occupante; areolis laterum pronoti et hemelytrorum majusculis, plurimis magnitudine subæqualibus.*

1. **S. mitrata** STÅL. — *Tingis mitrata* STÅL, Rio H. 1. p. 64. 4. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Statura fere *S. Pyri*, hemelytris tamen extus propius basin paullo magis et magis sensim rotundatis. Carina foliacea media et vesicula pronoti æque altæ, carinæ laterales leviter elevatæ. Antennæ longiores quam in *S. Pyri*, articulo primo secundo plus triplo, fere quadruplo longiore. Sulcus sternalis retrorsum ampliatus, sat alte marginatus.

LEPTOBYRSA STÅL.

1. **L. Steinii** STÅL. — *Tingis Steini* STÅL, Rio H. 1. p. 64. 5. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Quoad formam et reticulationem hemelytrorum ad *Stephanitidem mitratam* appropinquat, hemelytra autem prope basin extus fortius rotundata. Rete pronoti et hemelytrorum pilosum, discus etiam pronoti pilosus. Vesicula mediocris, subcompressa, capitis apicem æquans. Carinæ pronoti foliaceæ, æque altæ, lineares, uniseriatæ. Membrana costæ ante medium triseriata. Spinæ capitis longissimæ, setiformis.

Obs.: Species e Bogota, cujus exemplum unicum valde mutilum adest in Museo Holmiensi, ad hoc genus referenda videtur, differt pronoto fortius dilatato, carinis altissimis, membrana costæ angustiore, antice posticeque biseriata corporeque ferrugineo.

[1]) Obs.: *Steph. Oberti* bucculis antice humilibus et distantibus gaudet.

LEPTURGA Stål.

1. **L. nigritarsis** Stål. — Flavescente-albicans; abdomine ferrugineo; disco metasterni latissimo, disco ventris, articulo quarto antennarum apicem versus tarsisque nigris. ♀. Long. corp. $3\frac{1}{2}$, cum. hem. 5, Lat. hem. $3\frac{3}{4}$ mill.

Patria: Cap York Australiæ. (Mus. Holm.)

Statura fere *Stephanitidis Pyri*, sed pronoto fortius dilatato, hemelytris extus basin versus minus sensim rotundatis, potius obtuse rotundato-subangulatis. Caput spinis longis armatum, infra antennas ad bucculas macula parva nigra notatum. Antennæ mediocres, rigide setosæ, articulo primo secundo fere triplo longiore. Rete pronoti et hemelytrorum, illius carinæ nec non carinæ sternales spinulis gracilibus ciliatæ. Pronotum lateribus foliaceis maxime dilatatis, posterius angustatis, antice fortiter productis, ultra caput extensis, præsertim antice rotundatis, multiseriatim irregulariter reticulatis; carinis discoidalibus foliaceis, lateralibus humilibus, retrorsum nonnihil divergentibus, media illis altiore et biseriata; vesicula parva, compressa, paullo producta. Hemelytra hyalina, venis nonnullis transversis membranæ costæ maculaque parva media exteriore areæ discoidalis fuscis; costa medio sat fortiter sinuosa; membrana costæ plus quam dimidium latitudinis hemelytri occupante; area costali pone medium sensim nonnihil ampliata, hic quoque biseriata.

GARGAPHIA Stål.

Monanthia Subg. *Gargaphia* Stål, Stett. E. Z. 23. p. 324. (1862).

a. *Area costali hemelytrorum fere tota seriebus tribus vel pluribus areolarum instructa, basi subbiseriata; regione partis areæ costalis, quæ pone sinum costæ extensa est, fuscedine plus minus diffuse tincta, venisque hujus partis hemelytri fuscis; areis costali et discoidali fere æque latis; pronoto discoque hemelytrorum nudis? antennis parce, breviter obsoleteque pilosis.*

b. *Membrana costæ saltem anterius biseriata, anteriora versus areæ costali latitudine subæquali.*

1. **G. flexuosa** Stål — *Monanthia flexuosa* Stål, Rio H. 1. p. 61. 3. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

Membrana marginalis pronoti biseriata, posterius triseriata, extus rotundata, pone medium paullo ampliata. Vesicula compressa, sat elevata, antice acuta, producta. Hemelytra fusca, membrana costæ a basi longe ultra medium nec non parte marginali interiore pone medium decoloribus, hyalinis, dilute fusco-reticulatis.

2. **G. lunulata** Mayr. — *Monanthia lunulata* Mayr, Verh. z.-b. Ges. Wien. 15. p. 441. (1865); Reis. Nov., Hem. p. 163. f. 46. (1866).

Patria: Rio Janeiro. (Mus. Holm.)

Præcedenti maxime affinis, pallidior, areis costali et discoidali hemelytrorum pallidis, hac fusco-binotata, vitta fusca obliqua pone illas areas minus obscura, areolis membranæ costæ areolis ad marginem interiorem et apicem hemelytri sitis paucioribus et majoribus, membrana marginali pronoti retrorsum angustata, posterius quoque biseriata, pronoto igitur paullo angustiore, differt.

bb. *Membrana costæ latiore quam in divisione* b, *prope basin areis costali et discoidali simul sumtis latitudine subæquali, triseriata, regione sinus costalis seriebus confusis quattuor vel quinque instructa.*

c. *Membrana laterali pronoti ubique fere æque lata.*

3. **G. munda** Stål. — *Monanthia munda* Stål, Rio H. 1. p. 60. 1. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

Hemelytra tota, excepta regione sinus costalis in membrana costæ, fusco vel nigro-reticulata, venis transversis nonnullis dimidii antici membranæ costæ validioribus et nigrioribus.

4. **G. simulans** Stål. — *Monanthia simulans* Stål, Rio H. 1. p. 61. 4. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

Præcedenti valde affinis, minor, membrana marginali pronoti paullo latiore, minus regulariter triseriata, paullo magis rotundata, hemelytris maxima parte pallido-reticulatis, area discoidali medio, costali extus infuscatis, colore antennarum pedumque mox distinguenda.

cc. *Membrana laterali pronoti pone medium distinctissime ampliata.*

5. **G. obliqua** Stål. — Nigra; antennis, capite, pronoto posterius et carinis, carinis sternalibus pedibusque pallide ferrugineo-flavescentibus; membrana marginali pronoti hemelytrisque subdecoloribus, vitreis, pallido-fuscoque reticulatis, horum vitta nebulosa obliqua posteriore fusca. ♂. Long. cum hem. $3\frac{1}{2}$ mill.

Patria: Rio Janeiro. (Mus. Holm.)

Præcedentibus duabus valde affinis, mox differt membrana costæ anterius paullo latiore formaque pronoti, cujus membrana lateralis est latior, pone medium rotundato-ampliata, anterius triseriata, posterius irregulariter quadriseriata, ante medium pallido-reticulata, pone medium fusco-reticulata. Articulus primus antennarum fuscescens. Hemelytra pallido-reticulata, vena areas discoidalem et costalem separante pone medium fusco-notata, venis duabus vel tribus membranæ costæ extrorsum infuscatis. Carinæ laterales pronoti ante medium levissime extrorsum arcuatæ.

aa. *Area costali hemelytrorum area discoidali angustiore, sæpe dimidio angustiore, regulariter biseriata, seriebus raro in medio et posterius subconfusis et subtriplicibus; parte posteriore areæ costalis pone sinum costalem extensa numquam fusco-vittata vel fuscedine tincta, interdum venis nigris terminata; membrana marginali pronoti pone medium ampliata, ante medium triseriata vel subtriseriata, posterius irregulariter quadriseriata; membrana costæ proportionaliter lata vel latiuscula, anterius saltem triseriata, prope basin areis costali et discoidali simul sumtis haud vel vix angustiore; antennis longius et densius pilosis; pronoto piloso (an semper?)*

d. *Reti membranæ costæ ante medium nigro vel fusco-fasciato, fascia plerumque latiuscula; venis partem apicalem areæ costalis terminante pallidis vel leviter infuscatis.*

6. **G. formosa** Stål. — *Monanthia formosa* Stål, Rio H. 1. p. 61. 2. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

7. **G. patricia** Stål. — *Monanthia (Phyllontochila) patricia* Stål, Stett. E. Z. 23. p. 324. 260. (1862).
Patria: Mexico. (Mus. Holm.)

8. **G. fasciata** Stål. — Nigra, antennis, articulo quarto excepto, bucculis, spinis capitis, vesicula, carinis apiceque processus pronoti, carinis sternalibus, orificiis pedibusque pallide sordide flavescentibus, membrana pronoti hemelytrisque subdecoloribus, pallidissime subflavescente-reticulatis, fascia reticulari percurrente ante medium hemelytrorum nigricante. ♂. Long. cum. hem. 4⅓ mill.
Patria: Illinois. (Mus. Holm.)

G. patriciæ simillima et valde affinis, differt membrana laterali pronoti subangustiore, unicolore, nec posterius fusco-fasciata, area discoidali posterius vel pone medium infuscata, nec tota infuscata et medio pallido-maculata.

dd. *Reti membranæ costæ fascia nigra destituto, sed ante medium venis transversis saltem duabus nigris instructo; venis partem posticam areæ costalis terminantibus nigris.*

9. **G. trichoptera** Stål. — Nigricans, totus distincte albicante-pilosa; antennis, excepto articulo quarto, pedibusque pallide flavescente-albidis; capite, carinis, vesicula parteque postica pronoti, nec non reti membranæ marginalis pronoti hemelytrorumque albicantibus; venis tribus vel quattuor transversis ante medium membranæ costæ nec non venis partem posteriorem areæ costalis terminante nigris. ♂. ♀. Long. cum. hem. 4⅓—5½ mill.
Forma macropt. — Area discoidali majore, longiore, per dimidium hemelytri extensa, medio fere latissima, utrinque acuminata, alis explicatis.

Forma brachypt. — Area discoidali breviore, vix plus quam tertiam partem longitudinis hemelytri occupante, postice latissima, apice obtuse rotundata; alis nullis; hemelytris fere æque amplis ac in forma macroptera.
Patria: Bogota Novæ Granadæ. (Mus. Holm.)
A præcedentibus tribus divergit membrana costæ paullo latiore, anterius magis rotundata et ibidem distinctius quadriseriata, seriebus retrorsum sensim numero crescentibus. Species pilosa, insignis.

10. **G. nigrinervis** Stål. — Præcedenti simillima, minor, capite obscuriore, membrana laterali pronoti pone medium distincte angulata, subrectangula, membrana costæ paullo angustiore et venis tantum duabus nigris prædita, hemelytris corporeque subtus nudis mox distinguenda. ♂. Long. cum. hem. 3½ mill.
Patria: Bogota. (Mus. Holm.)

Exemplum unicum brachypterum, alis destitutum, hemelytrorum area discoidali uti in specie præcedente formata, examinavi. Antennæ basi fuscescunt.

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11. **G. tricolor** Mayr. — *Monanthia (Gargaphia) tricolor* Mayr, Verh. z.-b. Ges. Wien. 15. p. 442. (1865).
Patria: Venezuela.

LEPTOSTYLA Stål.

a. *Articulo primo antennarum secundo vix vel paullo plus quam duplo longiore, bucculis breviore; hemelytris angustioribus, membrana costæ anterius levissime rotundata, angusta, ante medium area costali haud latiore, potius fere angustiore, anterius confuse subuniseriata, versus sinum costalem biseriata; area discoidali fere per dimidium hemelytri extensa.*

1. **L. oblonga** Say. — *Tingis oblonga* Say, Journ. Ac. Philad. 4. p. 325. (1825); Compl. writ. 2. p. 248. (1859).
Patria: New Jersey. (Mus. Holm.)

aa. *Articulo primo antennarum secundo circiter triplo longiore, bucculis longitudine subæquali vel fere longiore; hemelytris minus angustis, membrana costæ anterius distinctius rotundata, prope basin areis costali et discoidali simul sumtis latitudine subæquali, anterius biseriata vel triseriata, ad sinum costalem parti reliquæ hemelytri latitudine subæquali vel paullo latiore, ibidem triseriata vel quadriseriata; area discoidali dimidio hemelytro breviore.*

b. *Membrana costæ anterius biseriata, versus medium triseriata.*

2. **L. vittipennis** Stål. — Nigra; capite subferrugineo; pedibus pallidissime sordide flavescentibus; carinis pronoti albicantibus, vesicula fusca; hemelytris fuscis, nigro-reticulatis; membrana costæ, excepta parte ipsa apicali, nec non membrana marginali pronoti decoloribus, albicante-reticulatis. ♂. Long. cum hem. 3 mill.
Patria: Rio Janeiro. (Mus. Holm.)
Statura oblonga præcedentis, sed hemelytris paullo latioribus. Spinæ capitis longæ. Antennæ exempli unici examinati desunt. Pronotum carinis tribus retrorsum subconvergentibus instructum, vesicula modice elevata, paullo producta; membrana marginali biseriata, ubique æque lata, margine exteriore fere toto recto. Area costalis confuse subtriseriata.

bb. *Membrana costæ anterius triseriata, versus medium quadriseriata vel subquinqueseriata.*

3. **L. furcata** Stål. — Nigra vel ferruginea; spinis longis capitis, antennis pedibusque pallide sordide flavescentibus; carinis pronoti sordide albicantibus, retrorsum subconvergentibus; membrana marginali pronoti hemelytrisque subdecoloribus, griseo-reticulatis, horum vitta communi, areas discoidalem et costalem nec non partem interiorem adjacentem hemelytrorum occupante, pone medium furcata et versus marginem costalem ducta, fusca; parte apicali hemelytrorum plus minusve infuscata, fusco-reticulata, apice fusco-limbata. ♂. ♀. Long. cum hem. $3\frac{3}{4}$ mill.

Var. immatura. — Ferruginea; areis discoidali et costali hemelytrorum pallidis, nec fuscis.
Patria: Rio Janeiro. (Mus. Holm.)
L. vittipenni similis, paullo major, membrana marginali pronoti extus paullo rotundata, parte apicali hemelytrorum minus obscure fusca, interdum vix infuscata, fuscedine, quæ discum anteriorem fuscum retrorsum continuat, vittæ obliquæ instar fortius excurva, et paullo pone medium membranæ costæ extensa, ultra partem posteriorem areæ costalis producta; vitta communi hemelytrorum igitur posterius furcata, nec sensim usque ad apicem hemelytri extensa, ultra aream costalem per membranam costæ lateraliter extensa, nec uti in *L. vittipenni* tantum in apice ipso hemelytri in membranam costæ leviter dilatata.

4. **L. hyaloptera** Stål. — Præcedenti maxime affinis, forte varietas ejusdem, differt tantum hemelytris pone areas costalem et discoidalem impictis, nec fusco-vittatis, area discoidali nonnihil latiore, areis discoidali et costali, vel discoidali saltem, fusco-reticulatis, nec fuscis. ♂. ♀. Long. cum hem. 3—4 mill.
Patria: Rio Janeiro. (Mus. Holm.)

LEPTOPHARSA Stål.

Hoc genus ad præcedens maxime appropinquat et area costali regulariter biseriata vesiculaque pronoti breviore, humiliore vel nulla tantum differt.

1. **L. elegantula** Stål. — Oblonga, nigra; articulis secundo tertioque antennarum, nec non pedibus pallide flavescentibus; spinis sat longis capitis, vesicula, carinis membranaque marginali pronoti albicantibus, hac hyalina; pronoto postice grisescente; hemelytris hyalinis, decoloribus, intus levissime obscuratis, membrana costæ albicante-reticulata, areis discoidali et costali pallide subferrugineo-reticulatis, area suturali fusco-reticulata. ♂. Long. cum hem. 3 mill.
Patria: Bogota Novæ Granada. (Mus. Holm.)
Statura fere *Leptostylæ vittipennis*. Antennarum articulus primus secundo duplo longior. Pronotum vesicula transversa, triangulari, antice subtruncata, haud vel vix prominula, membrana marginali retrorsum vix angustata, antice posticeque paullo rotundata, biseriata, areolis seriei exterioris paullo majoribus. Hemelytra tertia parte apicali abdomen superantia, membrana costæ basi paullo rotundata, ante medium areis costali et discoidali simul sumtis latitudine subæquali, ibidem biseriata, ad sinum costalem paullo latiore, hoc sinu obtusissimo; area discoidali vix dimidium hemelytri longitudinis occupante, area costali nonnihil latiore, utrinque acuminata.

2. **L. marginella** Stål. — *Monanthia marginella* Stål, Rio H. 1. p. 62. 8. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Pronotum vesicula elevata destitutum, marginibus lateralibus membrana angusta, cariniformi, uniseriata, instructis. Hemelytra basi haud rotundata, fusea, pronoto vix latiora, area discoidali per dimidium hemelytri ex-

tensa, intus obtusangula, extus vix rotundata, area costali fere duplo latiore; membrana costæ angusta, tota sat regulariter biseriata, pallida, areæ costali latitudine subæquali.

LEPTODICTYA Stål.

Ad dua præcedentia valde appropinquat hoc genus, ab ambobus differt structura membranæ lateralis pronoti.

a. *Reti hemelytrorum densissimo, areolis minutis vel minutissimis; membrana costæ multiseriata, seriebus confusis.*

b. *Membrana marginali pronoti tota et usque a margine ipso pronoti maxime reflexa et pronoti superficiem tangente, transversim convexiuscula, obtuse subrotundata.*

1. **L. ochropa** Stål. — *Monanthia ochropa* Stål, Rio H. 1. p. 62. 10. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Membrana costæ ultra medium sensim ampliata, antice distincte rotundata, anterius areis costali et discoidali conjunctis longitudine æquali, dense irregulariterque reticulata, dimidio exteriore pallido-reticulato, exteriore nigro vel fusco-reticulato. Pars interior hemelytrorum fusco-reticulata. Area discoidalis elliptica, utrinque acuminata.

bb. *Membrana marginali pronoti primum extrorsum ultra latera pronoti extensa, dein subito maxime recurva, partem suam explanatam et partem angustam lateralem superficiei pronoti tangente, parte reflexa depressa, plana vel planiuscula, intus truncata.*

c. *Vesicula pronoti elevata, ovali, antice angulatim producta; margine laterali pronoti subrotundato; limbo exteriore membranæ costæ haud fusco.*

2. **L. approximata** Stål. — *Monanthia approximata* Stål, Rio H. 1. p. 63. 13. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Quoad staturam picturamque hemelytrorum præcedenti haud dissimilis. Hemelytra pallido-reticulata, parte posteriore nec non fasciis angustis quattuor membranæ costæ fusco-reticulatis.

cc. *Vesicula pronoti parva, transversa, antice obtusissime angulata et levissime prominula; limbo exteriore membranæ costæ infuscato; margine laterali pronoti subrecto.*

3. **L. fusco-cincta** Stål. — *Monanthia fusco-cincta* Stål, Rio H. 1. p. 62. 11. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Statura præcedentium duarum, sed hemelytris basi nonnihil magis rotundatis, membrana costæ anterius latiore.

4. **L. Dohrnii** Stål. — *Monanthia Dohrnii* Stål, Rio H. 1. p. 62. 12. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Præcedenti simillima, sed angustior, colore antennarum, hemelytris angustioribus, membrana costæ nonnihil angustiore, minus distincte fusco-limbata, mox distinguenda.

aa. *Reti hemelytrorum minus denso, areolis majoribus, paucioribus composito; membrana costæ fere tota triseriata.*

5. **L. lepida** Stål. — *Monanthia lepida* Stål, Rio H. 1. p. 63. 14. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Vesicula pronoti parva, transversa, antice obtuse angulata et levissime prominula. Membrana marginalis pronoti primum explanata, dein subito maxime reflexa, depressa, extus recta. Membrana costæ anteriora versus areis costali et discoidali conjunctis latitudine subæqualis, basi distincte rotundata.

ACANTHOCHILA Stål.

Monanthia Subg. *Acanthocheila* Stål, Rio H. 1. p. 61. (1860).

1. **A. armigera** Stål. — *Monanthia armigera* Stål, Rio H. 1. p. 61. 5. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

2. **A. spinuligera** Stål. — *Monanthia spinuligera* Stål, Rio H. 1. p. 61. 6. (1860).
Patria: Rio Janeiro. (Mus Holm.)
A præcedente vix distincta, verisimiliter ejus varietas pallidior.

LEPTOCYSTA Stål.

1. **L. sexnebulosa** Stål. — *Tingis sex-nebulosa* Stål, Rio H. 1. p. 64. 2. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

CORYTHAICA Stål.

1. **C. monacha** Stål. — *Tingis Monacha* Stål, Rio H. 1. p. 64. 3. (1860). — *Tingis cyathicollis* Costa, Ann. Mus. zool. 2. p. 146. t. 2. f. 4. (1864).
Patria: Rio Janeiro. (Mus. Holm.)

SPHÆROCYSTA Stål.

1. **S. inflata** Stål. — *Tingis ? inflata* Stål, Rio H. 1. p. 64. 6. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Pronotum lateribus sat fortiter dilatatis, pone medium rotundatis, anterius fortiter sensim angustatis, pone medium biseriatis, serie marginali areolis majoribus instructa; vesicula antica areolis æqualibus instructa.

2. **S. globifera** Stål. — *Tingis ? globifera* Stål, Rio H. 1. p. 65. 7. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Præcedenti similis, differt membrana marginali pronoti tota angusta, obsolete uniseriata, vesicula pone medium utrinque areolis duabus reliquis multo majoribus, rotundatis, alia pone alteram posita, posteriore in parte vesiculæ inferiore posita et minus facile distinguenda.

PHYLLONTOCHILA Fieb.

Monanthia subg. *Phyllontocheila* p. Fieb., Ent. Mon. p. 59. (1844).

a. *Pronoto maxime dilatato; hemelytris pone medium haud angustatis, sinu costali sat profundo, membrana costæ ad sinum illum plus quam dimidium latitudinis hemelytri occupante.*

1. **P. erosa** Fieb. — *Monanthia erosa* Fieb., Ent. Mon. p. 71. 14. t. 6. f. 5—9, (1844).
Patria: Insulæ Philippinæ; Pulo Penang. (Mus. Holm.)

2. **P. Wahlbergii** Stål. — *Phyllontocheila Wahlbergi* Stål, Ö. V. A. F. 1855. p. 37. 1. — *Monanthia (Phyllontochila) Wahlbergi* Stål, H. afr. 3. p. 27. 1. (1865).
Patria: Caffraria. (Mus. Holm.)

3. **P. alaticollis** Stål. — *Phyllontocheila alaticollis* Stål, Ö. V. A. F. 1855. p. 37. 2. — *Monanthia (Phyllontochila) alaticollis* Stål, H. afr. 3. p. 27. 2. (1865).
Patria: Caffraria. (Mus. Holm.)

aa. *Pronoto valde dilatato; hemelytris pone medium sensim subangustatis; sinu costali obtusissimo, membrana costæ ad sinum illum vix dimidium latitudinis hemelytri occupante.*

4. **P. dentata** Fieb. — *Monanthia dentata* Fieb., Ent. Mon. p. 71. 13. t. 6. f. 2—4. (1844).
Patria: India orientalis. (Mus. Holm).

CATOPLATUS Spin.

Catoplatus Spin., Ess. p. 167. (1837).

a. *Margine laterali ampliato pronoti leviter reflexo vel erecto, a superficie laterum pronoti distante; antennis, capite pedibusque totis vel fere totis pallidis.* — Catoplatus Spin.

1. **C. australicus** Stål. — Oblongus, dilute cervinus, articulo quarto antennarum nigro; marginibus pronoti lateralibus cariniformibus, sat reflexis, haud tamen erectis, obsolete uniseriatis, antice paullo latioribus et subbiseriatis; hemelytris medium versus levissime ampliatis, membrana costæ angusta, lineari, uniseriata, area discoidali pone medium latissima, intus distincte obtusangula, margine exteriore fere toto recto; alis fuscis. ♀. Long. 5. Lat. 2 mill.
Patria: Australia, Port Denison, Cap York. (Mus. Holm.)
C. Fabricii Stål (=*Monanthiæ costatæ* Fieb. nec. Fabr.) in multis simillimus, differt antennis crassioribus, articulo tertio quarto vix duplo longiore, capite apice tuberculo parvo instructo, spinis e basi emissis longioribus, margine superiore tuberculorum antenniferorum subelevato, marginibus lateralibus pronoti minus reflexis, hemelytris angustioribus, pronoto vix latioribus, area discoidali aliter formata, sulco mesosterni antrorsum sensim ampliato. Statura corporis fere *Eurycercæ clavicornis*, nonnihil longior tamen.

aa. *Margine laterali pronoti maxime reflexo et superficiem laterum pronoti tangente vel subtangente; antennis, capite, pedibus totis vel maxima parte nigris.* — Coscinopoea Stål. (*Mon. Eryngii* Latr. et *albida* H. S.

EURYCERA Lap.

Eurycera Lap., Ess. p. 49. (1832). — *Laccometopus* Fieb., Ent. Mon. p. 30 et 119. (1844).

1. **E. costata** Fabr. — *Acanthia costata* Fabr., E. S. 4. p. 77. 39. (1794). — *Tingis costata* Fabr., S. R. p. 125. 4. (1803). — *Laccometopus costatus* Stål, H. Fabr. 1. p. 92. 1. (1868).
Patria ignota; Europa borealis sec. Fabr.

2. **E. Kollari** Fieb. — *Laccometopus Kollari* Fieb., Ent. Mon. p. 98. 2. T. 8. f. 17—22. (1844).
Patria: Insula Mauritii.

AMBLYSTIRA Stål.

1. **A. pallipes** Stål. — *Monanthia pallipes* Stål, Rio H. 1. p. 62. 7. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

PHYSATOCHILA Fieb.

1. **P. plexa** Say. — *Tingis plexus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. 349. 4. (1859).
Patria: Illinois. (Mus Holm.)
Ad *Monanthiam quadrimaculatam* Wolff, Fieb., quæ etiam ad hoc genus est referenda, appropinquat.

LEPTOYPHA Stål.

1. **L. mutica** Say. — *Tingis mutica* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 349. 3. (1859).
Patria: Texas. (Mus. Holm.)

ONCOPHYSA Stål.

1. **O. vesiculata** Stål. — *Monanthia (Physatocheila) vesiculata* Stål, Freg. Eug. resa, Ins. Hem. p. 259. 108. (1859).
Patria: Australia. (Mus. Holm.)

ELASMOGNATHUS Fieb.

Fieb., Ent. Mon. p. 30 et 90. (1844).

1. **E. Helferi** Fieb. — *Elasmognathus Helferi* Fieb., Ent. Mon. p. 91. 1. T. 7. f. 33—41. (1844).
Patria: India orientalis.

2. **E. Fieberi** Stål. — *Elasmognathus Fieberi* Stål, Ö. V. A. F. 1855. p. 38. 1. — *Monanthia (Elasmognathus) Fieberi* Stål, H. afr. 3. p. 29. 7. (1865).
Patria: Caffraria. (Mus. Holm.)

CYSTEOCHILA Stål.

a. *Parte laterali reflexa et inflata pronoti ultra latera baseos hemelytrorum nonnihil prominula, sat fortiter elevata, posterius subimpressa, carinam mediam haud attingente.*

1. **C. tingoides** Motsch. — *Monanthia ? tingoides* Motsch., Bull. S. Nat. Mosc. 36: 3. p. 92. (1863).
Patria: Ceylon. (Mus. Holm.)
Hæc species quodammodo ad *Elasmognathum* appropinquat.

aa. *Parte laterali reflexa pronoti minus gibba, ultra latera hemelytrorum haud prominula, postice haud impressa.*

2. **C. sordida** Stål. — *Monanthia (Physatocheila) sordida* Stål, Freg. Eug. resa, Ins. Hem. p. 259. 109. (1859). — *Monanthia (Physatochila) sordida* Stål, H. afr. 3. p. 29. 6. (1865).
Patria: Terra capensis. (Mus. Holm.)
Membrana costalis nulla, costa carinæ instar prominula. Area costalis distincte biseriata. Membrana lateralis reflexa pronoti carinam mediam haud attingens, ultra carinas laterales levissime extensa.

3. **C. caffra** Stål. — Præcedenti simillima, nonnihil major, differt membrana laterali reflexa pronoti latiore, carinam mediam attingente, membrana costæ distinctissima, uniseriata, areolis inæqualibus, reti fusco. ♀. Long. $3\frac{3}{4}$, Lat. hem. $1\frac{1}{2}$ mill.
Patria: Caffraria. (Mus. Holm.)
Antennæ exempli unici mutilæ.

TIGAVA Stål.

Stål, Rio H. 1. p. 63. (1860).

1. **T. præcellens** Stål. — *Tigava præcellens* Stål, Rio H. 1. p. 63. 1. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

TINGIS Fabr.

Tingis p. Fabr., S. R. p. 124. (1803). — *Monanthia* p. Fieb., Ent. Mon. p. 30 et 58. (1844); Eur. H. p. 36 et 119. (1861).

a. *Hemelytris pone medium vel posterius conjunctim sensim angustatis, apice semicirculariter rotundatis vel subacuminatis.*

b. *Membrana costæ basi seriebus saltem duabus instructa; articulo tertio antennarum apice haud incrassato.*

c. *Margine laterali pronoti et hemelytrorum dentibus vel spinis destitutis.* — Tingis Fabr.

1. **T. (Tingis) nitidula** Stål. — Oblonga, lurida, nitidula, nuda; capite, spinis, tuberculis antenniferis bucculisque exceptis, articulis duobus basalibus et quarto antennarum, sternis, exceptis carinis, macula pleurorum nec non ventre tarsisque nigris; articulo tertio antennarum pedibusque dilute ferrugineis. ♂. ♀. Long. cum. hem. 4, Lat. 2 mill.
Patria: Australia occidentalis. (Mus. Holm.)
Statura fere *T. Cardui*, sed hemelytris longioribus, apicem abdominis longius superantibus, antennarum articulo tertio multo longiore, sat gracili, pronoti vesicula fortius elevata, antice distincte nonnihil prominula, carinis multo altioribus et areolis majusculis uniseriatis reticulatis, reti membranæ marginalis pronoti et hemelytrorum, præsertim membranæ costæ, areolis majoribus instructo, area discoidali minus longe pone medium hemelytri extensa, extus vix rotundata, membrana costæ biseriata, membrana marginali pronoti subtriseriata, pedibus longioribus, reti hemelytrorum et pronoti impicto, spinis capitis longioribus, una discoidali, duabus subapicalibus distantibus differt. Pronotum antice utrinque ad vesiculam nigro-maculatum.

cc. *Margine laterali pronoti et hemelytrorum dentibus vel spinis distinctissimis setigeris ciliatis.* — Lasiacantha Stål.

2. **T. (Lasiacantha) odontostoma** Stål. — Pallide subferruginea, articulis secundo et apicali antennarum, macula magna ante medium maculaque apicali membranæ costæ nigricantibus. ♂. Long. $3\frac{1}{2}$, Lat. $1\frac{1}{2}$ mill.
Patria: Sierra Leona. (Mus. Holm.)
Antennæ breviusculæ, setis inæqualibus obsitæ, articulo tertio graciliusculo, quarto plus duplo longiore. Caput spinis quinque sat longis armatum; bucculis antice denticulo marginali armatis. Membrana marginalis et carinæ pronoti, hemelytra, præsertim area costalis, tibiæ tarsique pallescentes. Margines laterales et carinæ pronoti, margines laterales et costæ hemelytrorum, nec non pedes spinosi. Pronotum carinis distinctissimis, versus medium sensim altioribus; vesicula antica modice elevata, compressa, antrorsum nonnihil prominula; membrana laterali posterius triseriata, antrorsum biseriata, ante medium fortiter reflexa, erecta, pone medium minus reflexa, ibidem fortius rotundata, pronoti lateribus igitur ante medium sinuatis. Hemelytra apicem abdominis modice superantia, area discoidali nonnihil pone medium hemelytri extensa, membrana costæ quadriseriata, antice subtriseriata, ante medium per spatium breve late subrecurva. Orificia haud distinguenda.

3. **T. (Lasiacantha) Hedenborgii** Stål. — Cervina, longius spinosa, membrana costæ maculis una minore fere media et alia apicali fuscis notata; antennis longiusculis; bucculis inermibus. ♀. Long. $3\frac{1}{2}$, Lat. 2 mill.
Patria: Insula Cyprus. (Mus. Holm.)
Præcedenti affinis, antennis pedibusque longioribus, membrana laterali pronoti leviter et ubique æque reflexa, spinis capitis, pronoti hemelytrorumque longioribus, tamen minus numerosis, carina media pronoti anterius pone vesiculam leviter elevatam in vesiculam altissimam compressam, antrorsum leviter nutantem, elevata, membrana costæ biseriata, maculis fuscis areolis minoribus et numerosioribus instructis. Antennæ pedesque setosi, illarum articulo tertio quarto fere quadruplo longiore. Membrana marginalis pronoti posterius fortiter ampliata, rotundata et quadriseriata, ante medium sensim fortiter angustata, antice tantum biseriata.

bb. *Membrana costæ tota vel antice uniseriata; pedibus longiusculis; articulo tertio antennarum leviter curvato, apice sensim incrassato, clavato vel subclavato; membrana costæ uniseriata.* — Melanorhopala Stål.

4. **T. (Melanorhopala) clavata** Stål. — Lurida; antennis corporis longitudine, articulo tertio apice articuloque quarto nigris, illo apice distinctissime incrassato, clavato; marginibus lateralibus pronoti anguste dilatatis, valde reflexis, erectis, uniseriatis. ♀. Long. cum. hem. $5\frac{1}{3}$, Lat. 2 mill.

Forma brachypt. — Alis nullis; hemelytris pone medium sensim fortius angustatis, singulatim subacuminatis, parte quinta apicali abdomen superantibus, area discoidali dimidium hemelytri longius superante, sat longe ante medium latissima.

Patria: NewYork, Wisconsin. (Mus. Holm.)

Quoad staturam ad *Catoplatum Fabricii* quodammodo appropinquat, sed multo longior et angustior. Caput spinis quinque longis, porrectis. Pronotum marginibus lateralibus rectis; carinis tribus posterius subdivergentibus, acutis, uniseriatis; vesicula transversa, vix vel haud elevata, antice truncata. Clava articuli tertii antennarum articulo quarto distinctissime crassior. Tarsi nigri.

5. **T. (Melanorhopala) lurida** Stål. — Præcedenti maxime affinis, differt articulo tertio antennarum apice sensim levissime incrassato, parte incrassata articulo quarto crassitie æquali. ♂. Long. $5\frac{1}{2}$, Lat. 2 mill.

Forma macropt. — Alis completis, fuscis; hemelytris pone medium minus angustatis, singulatim posterius levissime angustatis, apice rotundatis, parte fere tertia apicali abdomen superante, area discoidali paullo pone medium hemelytri extensa, paullo ante medium latissima.

Patria: Illinois. (Mus. Holm.)

6. **T. (Melanorhopala) uniformis** Stål. — Præcedentibus duabus simillima et maxime affinis, ab ambabus differt antennis articulo tertio brevioribus, margineque foliaceo angusto pronoti maxime reflexo et superficiem pronoti tangente, a *T. clavata* præterea clavo antennarum minus incrassato, paullo crassiore tamen, uti videtur, quam in *T. lurida*. ♀. Long. $5\frac{1}{2}$, Lat. 2 mill.

Patria: Illinois. (Mus. Holm.)

Formam macropteram, hemelytris alisque uti in *T. lurida* instructam, tantum vidi.

aa. *Hemelytris posterius haud angustatis, apice obtusius rotundatis vel truncatis; antennis nigris, crassiusculis, articulis tertio et quarto æque crassis, illo apice oblique truncato; spinis quinque capitis longiusculis.* — Americia Stål.

7. **T. (Americia) albilatera** Stål. — *Laccometopus albilaterus* Stål, Rio H. 1. p. 65. 1. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

Species hujus divisionis ad *Teleonemiam* valde appropinquant. Margo dilatatus pronoti angustus, uniseriatus, suberectus. Hemelytra tertia parte apicali abdomen superantia, apice truncata, angulis apicalibus rotundatis, area discoidali sublanceolata, intus magis rotundata, pone medium hemelytri nonnihil extensa; sinu costali obtuso, distincto; area costali posterius sensim paullo ampliata; membrana costæ lata, sensim nonnihil ampliata, area costali duplo latiore, anterius irregulariter triseriata, in sinu costali quinqueseriata; margine imo apicali hemelytri decolore.

8. **T. (Americia) limbata** Stål. — Nigro-fusca; spinis capitis, bucculis, thorace, pectore hemelytrisque subferrugineo-fuscescentibus, his opacis, membrana costæ angustiuscula, decolore, fusco-reticulata, apice maculaque fere media fuscis. ♂. ♀. Long. $4\frac{1}{3}$, Lat. 2 mill.

Patria: Bogota Novæ Granada; Rio Janeiro. (Mus. Holm.)

Præcedenti maxime affinis, ab illa tantum differt forma angustiore hemelytrorum. Hemelytra quarta parte apicali abdomen superantia, apice obtusiuscule rotundata, ibidem haud pallido-marginata; membrana costæ biseriata, anterius uniseriata, ante medium areæ costali latitudine æquali, ad sinum costalem tertiam partem latitudinis hemelytri occupante. Pedes sordide ferruginei; tarsis nigris.

TELEONEMIA A. Costa.

Teleonemia A. Costa, Ann. mus. zool. 2. p. 144. (1864). — *Amaurosterphus* Stål, H. Fabr. 1. p. 92. (1868).

a. *Vesicula pronoti majuscula, subglobosa, subcompressa, alta; rostro longo, nonnihil pone metasternum extenso.* — Amaurosterphus Stål.

1. **T. (Amaurosterphus) morio** Stål. — *Tropidocheila morio* Stål. Ö. V. A. F. 1855. p. 187. — *Laccometopus Morio* Stål, Rio H. 1. p. 65. 2. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

Membrana costæ distincta, uniseriata.

aa. *Vesicula pronoti haud elevata, antice obtusissime angulata; rostro pone mesosternum haud extenso.* — Teleonemia A. Costa.

b. *Pronoto nigro, carinis concoloribus.*

2. **T. (Teleonemia) aterrima** Stål. — Nigra tota; membrana costæ per totam longitudinem distinctissima, uniseriata; carinis mesosterni parallelis. ♂. Long. $5\frac{1}{2}$, Lat. $1\frac{3}{4}$ mill.

Patria: Nova Granada, Bogota. (Mus. Holm.)

T. morioni simillima, rostro antennisque brevioribus, pronoto vesicula elevata destituto differt.

b. *Carinis totis vel summis pronoti pallidis.*

c. *Antennis crassis, cylindricis, longis, corpori longitudine subæqualibus.*

3. **T. (Teleonemia) validicornis** STÅL. — Valde elongata, cinerascens; antennis nigricantibus; areolis disci et partis apicalis hemelytrorum fuscis, membrana costæ angusta, uniseriata, anterius angustissima, cariniformi et vix seriata, hyalina, medio et apice fusca; carinis sternalibus parallelis. ♂. Long. 5, Lat. $1\frac{1}{2}$ mill.
Patria: Bogota. (Mus. Holm.)
A reliquis congenericis divisionis b differt statura longiore, antennis longioribus et crassioribus et notis supra allatis. Areolæ quædam prope apicem et in margine apicali hemelytrorum subdecolores.

cc. *Antennis minus crassis, corpore multo brevioribus.*

d. *Carinis mesosterni retrorsum convergentibus, postice subcontiguis; carinis metasterni fortius distantibus.*

4. **T. (Teleonemia) luctuosa** STÅL. — *Laccometopus luctuosus* STÅL, Rio H. 1. p. 65. 3. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Sat elongata et angusta. Hemelytra postice subampliata, membrana costæ angustissima, maxima parte cariniformi, vix areolata, pone aream discoidalem paullo latiore et uniseriata, nigricante, pone medium maculis tribus pallidis notata.

dd. *Carinis mesosterni parallelis vel retrorsum divergentibus, cum carinis metasterni subcontiguis, his tamen plerumque paullo magis distantibus.*

e. *Hemelytris apice subampliatis, margine costali subrecto, areolis nullis partis apicalis decoloribus vel subdecoloribus.*

5. **T. (Teleonemia) prolixa** STÅL. — *Laccometopus prolixus* STÅL, Rio H. 1. p. 65. 4. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Statura præcedentis, sequentibus longior et angustior, costa fere recta, cariniformi, pone medium submembranacea et areolata, pallida, apice fusca.

ee. *Hemelytris postice haud vel vix ampliatis, margine costali ante sinum leviter curvato; areolis quibusdam anteapicalibus hemelytrorum pallidioribus vel subdecoloribus, subhyalinis.*

6. **T. (Teleonemia) Sacchari** FABR. — *Acanthia Sacchari* FABR., E. S. 4. p. 77. 40. (1794). — *Tingis Sacchari* FABR., S. R. p. 126. 5. (1803). — *Monanthia Sachari* FIEB., Ent. Mon. p. 76. 19. T. 6. f. 22—25. (1844). — *Monanthia (Tropidocheila) Sacchari* STÅL, H. Fabr. 1. p. 92. 2. (1868).
Patria: Cuba; Insula S:ti Bartholomæi. (Mus. Holm.)
Costa vix dilatata, subcariniformis, serie obsoletissima areolarum angustarum, venulis fuscis separatarum, instructa.
Figura FIEBERI, si verum ad hanc speciem est referenda, membranam nimis latam præbet.

7. **T. (Teleonemia) scrupulosa** STÅL. — Præcedenti maxime affinis et simillima, differt membrana costa distinctissima, tota distinctissime uniseriata, margine haud incrassata, areolis haud vel paullo longioribus quam latioribus. ♂. ♀. Long. 4, Lat. $1\frac{1}{3}$ mill.
Patria: Rio Janeiro; Bogota. (Mus. Holm).
Figura FIEBERI melius forte ad hanc speciem refertur.

8. **T. (Teleonemia) Belfragii** STÅL. — Præcedenti simillima, differe videtur tantum hemelytris posterius sensim subangustatis, membrana costæ venis transversis fortioribus, nigris, paucioribus, areolisque longioribus instructa. ♀. Long. $3\frac{1}{2}$, Lat. $1\frac{1}{3}$ mill.
Patria: Texas. (Mus. Holm.)

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9. **T. (Teleonemia) elevata** FABR. — *Aradus elevatus* FABR., S. R. p. 120. 14. (1830). — *Tingis (Tropidocheila) elevata* STÅL. H. Fabr. 1. p. 91. 1. (1868).
Patria: America meridionalis.

10. **T. (Teleonemia) Sidæ** FABR. — *Acanthia Sidæ* FABR., E. S. 4. p. 77. 41. (1794). — *Tingis Sidæ* FABR., S. R. p. 92. 3. (1803); FIEB, Ent. Mon. p. 108. (1844). — *Tingis (Tropidocheila) Sidæ* STÅL, H. Fabr. 1. p. 92. 3. (1868).
Patria: Insulæ Americæ meridionalis.

11. **T. (Teleonemia) funerea** A. COSTA. — *Teleonemia funerea* A. COSTA, Ann. mus. zool. 2. p. 145. 2. f. 5. (1864).
Patria ignota.

EURYPHARSA Stål.

1. **E. nobilis** Guér. — *Tingis nobilis* Guér., Icon., Ins. p. 349. (1838).
Patria: Nova Granada, Bogota; Brasilia borealis. (Mus. Holm.)

MONANTHIA St. F. et S.

Tingis subg. *Monanthia* p St. F. et S., Enc. Méth. 10. p. 653. (1825). — *Monanthia* subg. *Physatocheila* p. Fieb., Ent. Mon. p. 80. (1844).

a. *Membrana marginali pronoti fortissime reflexa et superficiem pronoti tangente, simpliciter reticulata.*

b. *Pronoto carina unica instructo, marginibus lateralibus carinatis, tantum prope apicem leviter dilatatis et reflexis; area discoidali hemelytrorum medio carina transversa subobliqua instructa, area costali seriebus pluribus instructa; carinis sternalibus modice elevatis.* — (*M. unicostata* Muls.)

bb. *Pronoto carinis tribus, lateralibus anterius plus minus abbreviatis, instructo; marginibus lateralibus totis dilatatis, reflexis et seriatis; area discoidali carina transversa media destituta.*

c. *Area costali seriebus areolarum tribus vel pluribus, plus minus confusis vel regularibus, instructa; carinis sternalibus altis.* — Monanthia St. F. et S.

d. *Membrana marginali pronoti latitudine variabili, medio latissima vel ubique fere æque lata; species europææ.*

dd. *Membrana marginali pronoti angusta, retrorsum sensim angustata, tota seriata.*

1. **M. (Monanthia) monotropidia** Stål. — *Monanthia monotropidia* Stål, Rio H. 1. p. 63. 15. (1860).
Patria: Rio Janeiro; Bogota. (Mus. Holm.)
Pronotum posterius utrinque carina obtusa obsoleta instructo. Hemelytra opaca, densissime minuteque areolata, areolis partis apicalis, membranæ costæ et marginis interioris pone medium majoribus, vitreis. Spinæ capitis sat longæ, discoidalis brevis.

cc. *Carinis sternalibus minus elevatis; hemelytris, præsertim posterius, areolis majoribus reticulatis, area costali biseriata, in sinu costali triseriata; area discoidali per dimidium hemelytri extensa, sensim ampliata, prope apicem latissima.* — Compseuta Stål.

e. *Membrana marginali pronoti angusta, retrorsum sensim augustata, uniseriata.*

2. **M. (Compseuta) ornatella** Stål. — *Tropidocheila ornatella* Stål, Ö. V. A. F. 1855. p. 37. 1. — *Monanthia (Physatochila) ornatella* Stål, H. afr. 3. p. 28. 3. (1865).
Patria: Caffraria. (Mus. Holm.)

ee. *Membrana marginali pronoti latissima, obtuse rotundata, carinam mediam attingente, irregulariter multireticulata.*

3. **M. (Compseuta) natalensis** Stål. — *Physatocheila natalensis* Stål, Ö. V. A. F. 1855. p. 38. 1. — *Monanthia (Physatochila) natalensis* Stål, H. afr. 3. p. 28. 4. (1865).
Patria: Caffraria. (Mus. Holm.)
Margo imus buccularum et membrana anteocularis capitis albicantes.

4. **M. (Compseuta) femoralis** Stål. — Nigra; antennis, trochanteribus, apice femorum tibiisque dilute ferrugineis; margine membranæ anteocularis spinisque capitis, margine postico buccularum intus, collari, membrana marginali carinisque thoracis, nec non hemelytris sordide albicantibus, his pellucidis, remote nigro-reticulatis. ♀. Long. $2\frac{1}{2}$, Lat. $1\frac{1}{3}$ mill.
Patria: Caffraria. (Mus. Holm.)
M. natalensi affinis, pictura pedum hemelytrisque nigro-reticulatis totis mox differt. Articuli duo apicales antennarum mutili in exemplo descripto. Spinæ capitis longiusculæ. Pronotum postice albicans et nigro-reticulatum, membrana marginali lata, convexa, rotundata, carinis altiusculis, nigro-reticulatis, uniseriatis, lateralibus paullo divergentibus.

aa. *Membrana marginali pronoti maxima, bullata, erecta, a pronoto distante, extus maxime convexa, reti duplice instructa, areis retis majoris et crassioris ipsis subtilius reticulatis; carinis sternalibus altis.* — Cochlochila Stål.

5. **M. (Cochlochila) bullita** Stål. — Nigra; antennis pedibusque dilute flavescente-ferrugineis; bucculis, membrana anteoculari capitis, carinis membranaque marginali pronoti, hemelytris, metapleuris postice, nec non carinis foliaceis sternalibus luridis. ♀. Long. 3, Lat. $1\frac{1}{2}$ mill.
Caput usque a basi fortiter declive, inerme. Pronotum carinis sat altis, foliaceis, lateralibus in disco antrorsum divergentibus, curvatis et setosis, anterius abbreviatis; membrana marginali latissima, erecta, bullata, reti

majore fusco. Hemelytra fusco-reticulata, areis costali et discoidali medio et postice conjunctim tumidis, illa triseriata, in sinu costali quadriseriata, hac retrorsum ampliata, posterius latissima.

DICONOCORIS Mayr.

Mayr, Verh. z.-b. Ges. Wien. 15. p. 442. (1865).

1. **D. javanus** Mayr. — *Diconocoris javanus* Mayr, Verh. z.-b. Ges. Wien. 15. p. 442. (1865).
Patria: Java.

Species incerti generis.

1. **Tingis dilatata** Guér., Mag. zool. 1831.
Patria: Senegal.

2. **Monanthia tabida** H. S., W. I. 5. p. 86. f. 535. (1839); Fieb., Ent. Mon. p. 70. 12. T. 6. f. 1. (1844).
Patria: Mexico.
Quoad staturam ad *Leptostylam, Leptopharsam* et *Leptodictyam* appropinquat.

3. **Monanthia gibba** Fieb., Ent. Mon. p. 83. 26. T. 7. f. 7—12. (1844).
Patria: India orientalis.

4. **Monanthia fasciata** Fieb., Ent. Mon. p. 84. 27. T. 7. f. 13—16. (1844).
Patria: India orientalis.

5. **Piesma tingidoides** Spin. in Gay, Hist. Chile, Zool. 7. p. 200. 1. (1852).
Patria: Chile.

6. **Cantacader ? Germainii** Sign., An. S. E. Fr. (4) 3. p. 586. 3. (1864).
Patria: Chile.

7. **Tingis circumdata** Blanch. in d'Orb., Voy. Amér. 6: 2. p. 219. 763. pl. 29. f. 9. (1843).
Patria: Chiquitos.

8. **Tingis triangularis** Blanch. in d'Orb., Voy. Amér. 6: 2. p. 219. 764. pl. 29. f. 10. (1843).
Patria: Chiquitos.

9. **Monanthia nigriceps** Sign., An. S. E. Fr. (3) 8. p. 955. 158. (1861). — *Monanthia (Physatochila) nigriceps* Stål, H. afr. 3. p. 29. 5. (1865).
Patria: Madagascar.

10. **Monanthia flavipes** Sign., An. S. E. Fr. (3) 8. p. 956. 159. (1861).
Patria: Madagascar.

11. **Physatocheila irregularis** Montr. et Sign., An. S. E. Fr. (4) 1. p. 68. 33. (1861).
Patria: Lifu.

12. **Tingis australis** Montr., An. S. Lin. Lyon. (2) 11. p. 235. (1864).
Patria: Kanala.

13. **Monanthia atra** Motsch., Bull. S. Nat. Mosc. 36: 3. p. 91. (1863).
Patria: Ceylon.

14. **Tingis unicolor** Sign., An. S. E. Fr. (3) 8. p. 955. 160. (1861).
Patria: Madagascar.

ENUMERATIO ARADIDARUM EXTRAEUROPÆARUM.

Fam. **Aradidæ** Fieb.

Conspectus subfamiliarum.

a. Sternis segmentisque ventralibus sulco subtili, in prosterno distinctiore, instructis; rostro plerumque basin prosterni attingente vel nonnihil superante; capitis processu apicali tumescente, apice obtuso, integro, parte postoculari antice ad oculos parte anteoculari haud latiore; oculis fortiter ultra partem postocularem capitis prominulis; antennarum articulo primo brevi, crasso, basi subito in stylum brevissimum oblique coarctato; bucculis brevissimis, distantibus, locum insertionis rostri haud occultantibus; incisuris ventralibus plurimis medio angulatis; spiraculis a margine laterali ventris longe remotis, prope basin segmentorum positis; trochanteribus breviusculis, cum femoribus connatis et ab his haud vel ægre discernendis: segmento genitali maris postice dilatato, fisso; orificiis haud distinguendis. — *Aradina* Stål.

aa. Sternis ventreque sulco destitutis, prosterno raro obsolete subsulcato, lato; rostro basin capitis rarissime superante; capitis parte postoculari parte anteoculari latiore, partem posticam oculorum suffulciente, sæpe ultra oculos extrorsum spinoso-producta; oculis ultra partem postocularem capitis haud vel levissime prominulis; spiraculis a margine basali segmentorum ventralium remotis et plerumque fere æque longe a basi ac ab apice segmentorum positis; articulo basali antennarum basi sensim vel minus subito angustato vel gracilescente, apicem processus apicalis capitis plerumque attingente vel superante; segmento genitali maris duplicato. segmento postico integro, postice haud dilatato; trochanteribus distinctis.

b. Tylo genisque ante locum insertionis rostri productis; segmento genitali maris primo brevissimo, interdum retracto, parte laterali in processum brevem vel brevissimum, raro foliaceum, retrorsum semper producto, segmento secundo tumido, producto. — *Brachyrhynchina* Stål.

bb. Rostro in apice capitis inserto, capite dimidio breviore; capite processu apicali destituto; segmento genitali marium primo postice rotundato, secundo toto recurvo et partem apicalem superiorem abdominis occupante. — *Isodermina* Stål.

Subf. **Aradina** Stål.

ARADUS Fabr.

Aradus p. Fabr., S. R. p. 116. (1803); Fieb., Eur. H. p. 34 et 110. (1861). — *Piestosoma* Lap., Ess. p. 53. (1832).

a. *Rostro basin prosterni subattingente vel superante.*

b. *Carinis intermediis pronoti usque ad apicem extensis: hemelytris sexuum conformibus.*

c. *Parte laterali dilatata pronoti antice in lobum brevem prominula; segmento ventrali quinto feminæ disco ante sinum carina transversa, obtusangulariter fracta, utrinque in marginem apicalem segmenti sensim transiente, instructo; pronoto pone medium distincte elevato; marginibus lateralibus scutelli altissimis.* — Piestosoma Lap.

cc. *Parte laterali dilatata pronoti antice haud vel obsoletissime prominula; segmento ventrali quinto feminarum carina transversa discoidali destituto; pronoto pone medium haud elevato; marginibus scutelli minus alte elevatis.*

d. *Antennarum articulis secundo et tertio longitudine æqualibus vel subæqualibus.*

1. **A. (Aradus) æqualis** SAY. — *Aradus æqualis* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 352. 6. (1859).
Patria: New Jersey, Texas. (Mus. Holm.); Indiana.

dd. *Articulo secundo antennarum tertio longiore.*

e. *Marginibus lateralibus pronoti ante medium haud sinuatis.*

f. *Parte circiter tertia vel plus quam tertia anteriore marginis lateralis hemelytrorum sensim distincte rotundato-ampliata; pronoto postice ante basin hemelytrorum plerumque distincte obtuse lobato.*

g. *Capite subtransverso; lateribus scutelli ante medium parallelis.*

2. **A. (Aradus) robustus** UHLER. — *Aradus robustus* UHLER, Proc. Bost. S. N. H. 1871.
Patria: New Jersey. (Mus. Holm.)

gg. *Capite longiore quam latiore.*

3. **A. (Aradus) fusco-annulatus** STÅL. — *Aradus fusco-maculatus* STÅL, Freg. Eug. resa, Ins. Hem. p. 260. 110. (1859).
Patria: California. (Mus. Holm.)
Præcedenti subsimilis, antennis nonnihil minus incrassatis, capite longiore, scutello a basi sensim angustato mox distinguendus.

4. **A. (Aradus) similis** SAY. — *Aradus similis* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 351. 3. (1859).
Patria: Carolina meridionalis. (Mus. Holm.)

5. **A. (Aradus) acutus** SAY. — *Aradus acutus* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 351. 2. (1859). — *Aradus americanus* H. S., W. I. 8. p. 115. f. 889. (1848).
Patria: Carolina, Texas. (Mus. Holm.)

ff. *Margine laterali hemelytrorum anterius haud rotundato; pronoto postice ante hemelytra truncato, non nisi obsoletissime producto, apice capite cum oculis latitudine subæquali, carinis intermediis parallelis; species A. lugubri simillimæ.*

h. *Antennis non nisi obsoletissime compressis.*

6. **A. (Aradus) flavicornis** DALM. — *Aradus flavicornis* DALM., Anal. p. 88. 98. (1823); STÅL, H. afr. 3. p. 37. 1. (1865). — *Aradus leucotomus* A. COSTA, Ann. mus. zool. 2. p. 143. t. 2. f. 2. (1864).
Patria: Sierra Leona, Caffraria. (Mus. Holm.)
Antennis crassioribus a sequentibus divergit. Rostrum basin prosterni attingens. Variat antennis totis flavescentibus.

7. **A. (Aradus) Fallenii** STÅL. — *Aradus Falléni* STÅL, Rio H. 1. p. 68. 1. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
A. lugubri similis, differt magnitudine minore, antennis pallescentibus, articulo primo toto, secundo basi nigris, articulo secundo apicalibus duobus simul sumtis distinctissime breviore, marginibus lateralibus pronoti apice haud sinuatis, scutello pone medium angustiore, area media corii venis duabus vel unica transversis instructa, rostro basin prosterni attingente segmentoque genitali maris prope apicem impressione rotundata instructo, membrana maculis fuscis destituta differt.

8. **A. (Aradus) pallidicornis** STÅL. — Præcedenti maxime affinis et simillimus, differt tantum antennarum articulo quarto tertio subbreviore rostroque distincte nonnihil pone prosternum extenso. ♀. Long. 5, Lat. $1\frac{3}{4}$ mill.
Patria: Cuba. (Mus. Holm.)

9. **A. (Aradus) gracilicornis** STÅL. — Præcedentibus duobus simillimus, differt antennis gracilioribus, obscurioribus, fuscis, rostro longiore, articulo ultimo toto pone prosternum extenso, pronoti marginibus lateralibus apice denticulo acuto armatis, pone medium obtuse rotundato-subangulatis, scutello pone medium minus angustato, hemelytris pallescentibus, basi corii areaque costali pone medium fuscis. ♀. Long. 5, Lat. $1\frac{3}{4}$ mill.
Patria: Cuba. (Mus. Holm.)

hh. *Antennis distinctissime compressis.*

10. **A. (Aradus) compressicornis** STÅL. — Præcedentibus tribus maxime affinis et simillimus, antennis nigris, latiusculis, præsertim articulis secundo et tertio fortiter compressis, his æque latis, secundo basi et apice levissime angustato, apicalibus duobus simul sumtis paullo breviore, marginibus lateralibus pronoti ante medium

haud vel vix sinuatis, pone medium obtuse rotundatis, apice inermibus, scutello sensim angustato, hemelytris fuscis, reticulatis, membrana fusco-tessellata, rostroque pone prosternum producto distinctus. ♀. Long. 5, Lat. $1\frac{3}{4}$ mill.

Patria: Nova Granada, Bogota. (Mus. Holm.)

ee. *Marginibus lateralibus pronoti ante medium distinctissime sinuatis, ante sinum rotundatis et dentibus pluribus distinctissimis armatis.*

11. **A. (Aradus) australis** Er. — *Aradus australis* Er., Arch. 8: 1. p. 281. 269. (1842).
Patria: Australia borealis. (Mus. Holm.); Tasmania.

bb. *Carinis pronoti depressis intermediis obsoletissimis, partim oblitteratis; antennis brevibus, crassiusculis; hemelytris sexuum difformibus, in mari retrorsum fortiter angustatis, in femina interdum abbreviatis.*

12. **A. (Aradus) cinnamomeus** Panz. — *Aradus cinnamomeus* Fieb., Eur. H. p. 111. 3. (1861).
Patria: Texas. (Mus. Holm.)
Specimen unicum texanum a speciminibus europæis distinguere nequeo.

aa. *Rostro brevi, basin capitis haud vel vix attingente.* — Quilnus Stål.

13. **A. (Quilnus) niger** Stål. — Niger, subtiliter granulosus; capitis lateribus ante oculos parallelis. ♂. ♀. Long. 5—6, Lat. 2 mill.
Patria: Carolina meridionalis. (Mus. Holm.)

Quoad habitum ad *A. lugubrem* quodammodo appropinquat, abdomine autem latiore antennisque crassioribus discedens. Caput vix longius quam cum oculis latius, ante oculos versus apicem tuberculorum antenniferorum antrorsum haud vel obsoletissime ampliatum, tuberculis illis apice in dentem brevem, medium articuli primi antennarum attingentem, productis; parte laterali basi ad oculos inermi. Antennæ crassæ, articulis secundo et tertio æque longis et æque crassis, basin versus haud vel vix gracilescentibus, articulo quarto tertio distincte breviore et paullo graciliore. Pronotum antrorsum sensim angustatum, basi quam apice fere duplo latius, apice capiti cum oculis latitudine æquale, marginibus lateralibus rectis, postice leviter rotundatis, dense minutissimeque denticulatis, basi ante scutellum obtusissime sinuatum, rugis longitudinalibus obtusis, obsoletis quattuor, mediis posterius, lateralibus anterius evanescentibus. Scutellum subsensim angustatum, posterius concaviusculum, marginibus lateralibus levissime reflexis, antice obtusioribus. Hemelytra sexuum conformia, margine laterali anterius vix rotundato et vix dilatato, minutissime densissimeque denticulato. Segmentum genitale maris a latere visum pone medium subito declive, lobis apicalibus divaricatis, apice emarginatis. Valvulæ genitales laterales feminæ postice obliquæ et marginatæ.

14. **A. (Quilnus) parvicollis** Stål. — Fusco-cinnamomeus, asperus; capite ante oculos antrorsum ampliato. ♂. Long. 7, Lat. thor. 2, Lat. abd. 3 mill.
Patria: Insula Cyprus. (Mus. Holm.)

Species statura singulari, pronoto angusto et ceteris a reliquis mihi cognitis discedens. Caput paullo longius quam latius, pronoto medio nonnihil longius, ante oculos versus apicem tuberculorum antenniferorum sensim distincte ampliatum, his tuberculis apice acuminatis et vix ultra medium articuli primi antennarum extensis. Antennæ minus crassæ, articulis fere æque crassis, cylindricis, secundo tertio subbreviore, tertio quarto vix duplo longiore. Pronotum parviusculum, apice capiti cum oculis latitudine æquale, basi quam apice circiter dimidio latius, antrorsum sensim angustatus, basi ante scutellum distinctissime arcuato-sinuatum, medio rugis duabus obtusis, anterius distinctis, retrorsum evanescentibus, ante medium utrinque versus margines laterales longitrorsum rugoso-elevatum. Scutellum angustum, pone medium sensim angustatum, marginibus lateralibus elevatis. Hemelytra angusta, apud feminam mihi ignotam forte latiora, fere uti apud marem *A. cinnamomei* formata, margine costali anterius obtuse rotundato. Abdomen angulis apicalibus segmentorum, præsertim segmenti quinti, paullo prominulis; segmento genitali fisso, lobis apice oblique sinuato-truncatis. Pedes longiusculi.

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15. **A. quadrilineatus** Say. — *Aradus quadrilineatus* Say, Journ. Ac. Phil. 4. p. 326. (1825); Compl. writ. 2. p. 249. (1859).
Patria: Missouri.

16. **A. crenatus** Say. — *Aradus crenatus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 350. 1. (1859).
Patria: Missouri.

17. **A. rectus** Say. — *Aradus rectus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 352. 4. (1859).
Patria: Missouri, Florida.

18. **A. tuberculifer** Kirby. — *Aradus tuberculifer* Kirby in Rich., Faun. bor. am. 4. p. 278. 1. pl. 6. f. 5. (1837).
Patria: America borealis.

19. **A. affinis** Kirby. — *Aradus affinis* Kirby in Rich., Faun. bor. am. 4. p. 279. 2. (1837).
Patria: America borealis.

Subf. Brachyrhynchina Stål.

Conspectus divisionum.

1(2). Scutello maximo, longe ultra medium abdominis extenso, hemelytra tegente, carina obtusa longitudinali instructo; antennis brevibus, articulis duobus basalibus brevissimis, simul sumtis processu apicali capitis brevioribus; marginibus sulci rostralis totis distantibus; loco insertionis rostri distinguendo; hemelytris membranaceis, margine costali tantum ultra medium incrassato; spiraculis ventris — ? — *Calisiaria* Stål.

2(1). Scutello medioeri, triangulari vel postice rotundato; hemelytris liberis, parte coriacea distincta; processu capitis apicali apice integro et inermi vel emarginato et plus minus distincte bilobo; antennis mediocribus vel longiusculis, articulo primo processu apicali capitis haud vel paullo breviore, secundo semper ultra processum extenso; marginibus sulci rostralis antice plerumque subcontiguis vel contiguis et locum insertionis rostri in hoc casu occultantibus. — *Brachyrhyncharia* Stål.

Div. **Calisiaria** Stål.

CALISIUS Stål.

Stål, Rio H. 1. p. 67. (1860).

1. **C. pallipes** Stål. — *Calisius pallipes* Stål, Rio H. 1. p. 68. 1. (1860).
Patria: Rio Janeiro. (Mus. Holm.)
Statura *Aradosyrtis Ghiliani*, a qua differre videtur capite apice denticulis pluribus armato, pronoti lateribus ante medium sinuatis, ante sinum lobulo instructis, marginibus abdominis distincte denticulatis.

ARADOSYRTIS A. Costa.

A. Costa, Ann. mus. zool. 2. p. 132. (1864).

1. **A. Ghiliani** A. Costa. — *Aradosyrtis Ghiliani* A. Costa, Ann. mus. zool. 2. p. 133. t. 1. f. 6. (1864).
Patria ignota.

ARADACANTHIA A. Costa.

A. Costa, Ann. mus. zool. 2. p. 142. (1864).

1. **A. multicalcarata** A. Costa. — *Aradacanthia multicalcarata* A. Costa, Ann. mus. zool. 2. p. 142. t. 2. f. 3. (1864).
Patria ignota.

Div. **Brachyrhyncharia** Stål.

Conspectus generum.

1(30). Scutello triangulari, haud vel vix transverso; articulo quarto antennarum tertio haud vel raro paullo longiore, plerumque breviore; marginibus sulci rostralis plerumque parallelis, rectis.

2(29). Ventre convexiusculo, prope margines laterales et ad basin segmentorum tertii, quarti et quinti ruga subtili vel carina destituto, segmento quinto feminarum apice ante valvulas genitales unisinuato, margine apicali in medio haud angulato.

3(8). Pronoto basi truncato, marginibus lateralibus medio vel prope medium biemarginatis vel bisinuatis, vel ibidem lobulo parvo vel dente armatis; corpore pallido, subferrugineo-griseo, vel dilute ferrugineo, lævigato, haud granulato, sæpe materie quadam crustæ griseæ instar delibuto; sulco rostrali lanceolato.

4(5) Thorace antrorsum ampliato, lateribus foliaceis, valde dilatatis, paullo pone medium biemarginatis, emarginatura posteriore obsoletiore; antennis gracilibus, longiusculis, articulo primo longo, omnium longissimo, utrinque setis sat dense obsito, articulis secundo et tertio æque longis, tertio brevioribus; parte coriacea hemelytrorum magnitudine normali; membranæ venis anastomosantibus; femoribus supra subtusque setosis; margine abdominis dilatato, foliaceo, lobato. — *Alyattes* STÅL.

5(4). Thorace haud vel levissime dilatato, postice latiore, marginibus lateralibus in medio dente vel denticulo instructis; articulo basali antennarum minus longo, secundo tamen longiore, nudo; parte coriacea hemelytrorum a membrana haud vel ægerrime discernenda, hujus venis nullis vel obsoletissimis; femoribus nudis, haud compressis; abdominis margine nec dilatato, nec lobato, angulis segmentorum interdum leviter prominulis.

6(7). Articulo primo fere dimidio antennarum processum apicalem capitis superante; thorace apice in collum distinctissimum producto, marginibus lateralibus anterius in lobum truncatum ad collum antrorsum productis. — *Carventus* STÅL.

7(6). Articulo primo antennarum apicem processus capitis subattingente; thorace apice in collum haud producto, marginibus lateralibus anterius angulum obtusiusculum subito formantibus, haud lobatis. — *Proxius* STÅL.

8(3). Thorace plerumque basi ante scutellum sinuato vel ante angulos basales scutelli lobato vel sublobato; marginibus lateralibus rectis vel medio vel prope medium unisinuatis, nec bisinuatis, nec denticulo nec lobulo armatis; sulco rostrali plerumque lineari; corpore nigro vel ferrugineo, raro ferrugineo-flavescente, opaco, granulato, rugoso vel punctato.

9(12). Femoribus posticis, saltem apud mares, subtus pone medium vel apicem versus spina distinctissima armatis; oculis ultra partem postocularem capitis prominulis, hac parte inermi; scutello ruga longitudinali instructo; venis membranæ distinctis, anastomosantibus; feminæ ignotæ.

10(11). Antennarum articulo primo longo, omnium longissimo, maxima parte ante processum apicalem breviusculum capitis extenso; ruga scutelli ultra medium fortiter elevata. — *Crimia* A. et S.

11(10). Antennarum articulo primo tertio paullo breviore, ante processum apicalem longum capitis haud vel paullo extenso; ruga scutelli anterius haud vel paullo elevatiore. — *Artabanus* STÅL.

12(9). Femoribus posticis interdum subtus spinulosis vel spinuloso-granulatis, spina reliquis majore et distinctiore tamen destitutis.

13(14). Spiraculis segmentorum ventris a marginibus lateralibus proportionaliter minus longe remotis, spiraculis segmenti quinti ad margines illos maxime appropinquatis; articulo primo antennarum tertio longitudine subæquali vel paullo longiore, dimidio saltem apicali ultra apicem processus apicalis capitis extenso; capitis parte postoculari pone oculos tumida, inermi, lateraliter ultra oculos haud prominula, processu apicali apice plus minus distincte bilobo. — *Hesus* STÅL.

14(13). Spiraculis segmentorum ventris a marginibus lateralibus longius remotis, spiraculis segmenti quinti a marginibus illis distantibus.

15(18). Maxima parte articuli primi antennarum ante processum brevissimum capitis extensa.

16(17). Articulo primo antennarum fortiter incrassato, longe ultra processum apicalem brevissimum capitis extenso, articulo tertio haud breviore, articulis reliquis graciliusculis, nudis, articulo secundo quarto haud breviore; capite brevi, parte postoculari subsensim retrorsum angustata, inermi, ultra oculos lateraliter haud prominula; margine laterali abdominis versus apicem segmentorum plus minus producto, pedibus crassiusculis; venis membranæ distinctis. — *Artagerus* STÅL.

17(16). Articulo primo antennarum minus incrassato, articulo tertio breviore, articulis tribus ultimis crassiusculis, omnibus pilosis, articulo secundo quarto breviore; parte postoculari subito angustata, lateraliter ad oculos subprominula; pedibus minus crassis; venis membranæ nullis; margine abdominis integro. — *Aphleboderrhis* STÅL.

18(15). Articulo primo antennarum processum apicalem capitis haud superante vel haud plus quam dimidio apicali articuli illius ante processum extenso; processu capitis longo vel longiusculo; venis membranæ plerumque distinctissimis.

19(20). Margine thoracis et abdominis spinis validis armato; capite pone oculos sensim angustato et spina extrorsum et retrorsum vergente armato, processu apicali sat longo et in spinas duas longas abeunte; thorace basi truncato; scutello ruga longitudinali media instructo; membrana reticulata. — *Barcinus* STÅL.

20(19). Marginibus thoracis et abdominis inermibus vel denticulatis, interdum lobatis.

21(22). Lateribus thoracis ante medium in processum depressum longum antrorsum productis; capite pone oculos sublobato, processu apicali apice fisso, lateribus distinctissime denticulato; margine abdominis denticulis obtusiusculis armatis; antennarum articulo primo dimidio ante processum capitis extenso, articulo tertio paullo longiore. — *Dysodius* ST. F. et S.

22(21). Lateribus thoracis anterius non nisi leviter et obtuse lobatis; processu apicali capitis lateribus inermibus vel obsolete denticulatis.

23(28). Venis membranæ distinctis; thorace basi truncato vel plerumque ante scutellum sinuato.

24(25). Thorace basi sinuato, lobo antico disco bituberculato, lobo postico tuberculis destituto; processu capitis longo, apice emarginato; antennis gracilibus, articulo primo nonnihil incrassato, processu capitis longiore, articulo tertio primo longitudine subæquali, secundo quartoque longiore. — *Cinyphus* STÅL.

25(24). Lobo antico thoracis tuberculis duobus discoidalibus distinctioribus destituto.

26(27). Thorace basi subtruncato, vix sinuato, lobo antico rugis duabus longitudinalibus crassis, retrorsum nonnihil divergentibus, in lobum posticum extensis et hujus medium attingentibus; articulo primo antennarum processum capitis longitudine superante, reliquis articulis longiore, articulis secundo et tertio æque longis. — *Illibius* STÅL.

27(26). Lobo antico thoracis rugis duabus longitudinalibus minus elevatis vel obsoletissimis et obtusissimis instructo, his rugis in lobum posticum haud continuatis; articulo primo antennarum minus longo. — *Brachyrhynchus* LAP.

28(23). Venis membranæ haud distinguendis; thorace basi subrotundato-truncato. — *Pictinus* STÅL.

29(2). Ventre plerumque fortiter depresso et plano vel planiusculo, prope margines basales segmentorum tertii, quarti et quinti ruga subtili vel carina instructo, plerumque etiam prope margines laterales carina longitudinali vel serie granularum prædito, segmento quinto feminarum apice ante valvulas genitales subbisinuato, margine apicali in medio ante fissuram genitalem leviter angulato-prominulo. — *Neuroctenus* FIEB.

30(1). Scutello posterius lato, obtuse rotundato, transverso; articulo quarto antennarum tertio multo longiore; sulco rostrali lanceolato. — *Aneurus* CURT.

ALYATTES STÅL.

STÅL, H. afr. 3. p. 30. (1865).

1. **A. eximius** HAGL. — *Alyattes eximius* HAGL., Stett. E. Z. 29 p. 163. 1. (1868).
Patria: Brasilia borealis. (Mus. Holm).
Femora autica fortiter compressa.

2. **A. lanceolatus** FABR. — *Aradus lanceolatus* FABR., S. R. p. 118. 5. (1803). — *Alyattes lanceolatus* STÅL, H. Fabr. 1. p. 94. 1. (1868).
Patria: America meridionalis.

CARVENTUS STÅL.

STÅL, H. afr. 3. p. 32. (1865).

1. **C. denticollis** STÅL. — Ferrugineo-grisescens, lævis, nitidulus, materie quadam grisea delibutus; thorace, pectore maculaque membranæ pone apicem corii ferrugineis. ♀. Long. 5, lat. thor $1\frac{3}{4}$ mill.
Patria: Insula Mysol. (Mus. Holm.)

Caput pone oculos dente depresso, extrorsum prominente, armatum, tuberculis antenniferis extus parallelis, acutis, processu apicali mediocri, apice lobis duobus angustis, longiusculis, subcontiguis instructo. Antennæ graciles, articulo primo nonnihil incrassato, parte vix dimidia apicali ante processum capitis extensa; articulo secundo primo circiter tertia parte breviore, tertio secundo fere duplo longiore, quarto secundo nonnihil longiore. Thorax ante medium depressus, margine basali ante scutellum truncato, ad angulos basales scutelli in denticulum obtusiusculum prominulo; marginibus lateralibus fere in medio dente distinctissimo armatis, ante et pone dentem sinuatis, pone sinum posteriorem subampliatis et deinde prope basin subsinuatis, anterius in lobum latum, apice truncatum prominulis; thorax ante medium quam pone medium nonnihil angustior, lateribus ante medium parallelis. Scutellum —? Abdomen thorace nonnihil latius, ultra medium sensim nonnihil ampliatum, dein paullo angustatum, angulis apicalibus segmentorum leviter prominulis.

PROXIUS Stål.

1. **P. incrustatus** Stål. — Dilute ferrugineus, partim materie quadam grisea crustæ instar delibutus. ♀. Long. $4\frac{1}{2}$, Lat. $1\frac{1}{2}$ mill.

Patria: Rio Janeiro. (Mus. Holm.)

Statura *Carventi denticollis*. Caput pone oculos dente majusculo prominulo incrustato armatum, pone medium rugis duabus griseis, postice conjunctis, sulcum rostralem lateris inferioris simulantibus, instructum, tuberculis antenniferis griseis, oblique productis; processu apicali mediocri, apice emarginato, lobis lateralibus griseis. Antennæ articulo primo processum capitis æquante, secundo primo vix dimidio breviore, reliquis articulis —? Thorax lateribus subparallelis, posterius subampliatis, instructus, prope basin ruga transversa et ante medium maculis duabus magnis griseis, incrustatis, præditus, his maculis disco impressis et ferrugineis, extus prope margines laterales sulcatis; marginibus lateralibus medio denticulo armatis et posterius ad rugam transversam obtuse dentato-prominulis, anterius subito angulum obtusiusculum formantibus, quamobrem thorax antice utrinque oblique truncatus. Scutellum ad margines laterales griseo-incrustatus. Membrana grisea. Caput subtus, latera pectoris et abdominis griseo-incrustata.

CRIMIA A. et S.

A. et S., Hist. p. 305. (1843); Stål, H. afr. 3. p. 31. (1865).

1. **C. tuberculata** A. et S. — *Crimia tuberculata* A. et S., Hist. p. 305. 1. (1843). — *Dysodius truncatus* H. S., W. I. 8. p. 123. f. 891. (1848).

Patria: Java. (Mus. Holm.)

ARTABANUS Stål.

Stål, H. afr. 3. p. 31. (1865); Ö. V. A. F. 1870. p. 672.

1. **A. geniculatus** Stål. — *Artabanus geniculatus* Stål, Ö. V. A. F. 1870. p. 673. 1.

Patria: Insulæ Philippinæ. (Mus. Holm.)

2. **A. sinuatus** Stål. — Ferrugineo-nigricans; rostro, membrana, abdomine tarsisque ferrugineo-flavescentibus; membrana fusco-venosa. ♂. Long. 12, Lat. Thor. 4 mill.

Patria: Nova Guinea. (Mus. Holm).

A. geniculato multo major, tuberculis antenniferis acutioribus et longius productis, thorace ante medium utrinque fortius lobato, abdomine ante medium subampliato et ceteris distinctissimus. Caput pone oculos sinuato-angustatum; tuberculis antenniferis acutis, oblique productis; processu apicali apice inciso; vertice longitrorsum birugoso. Antennæ articulo primo apicem processus capitis attingente, secundo quarto vix longiore, primo brevioribus; tertio primo nonnihil longiore. Thorax basi truncatus, ante scutellum vix sinuatus, marginibus lateralibus medio sat profunde sinuatis, ante sinum lobo sat magno, ipso inciso et fere bilobo, instructis, prope collare lobulo minuto præditis; thorax ante et pone sinum lateralem fere æque latus, lobo antico longitrorsum quadri-rugoso; lobo postico hic illic subsetoso. Scutellum ruga longitudinali distincta antice latiore, subtomentosa, instructum. Abdomen maris anterius et apice fuscum, ante medium thorace paullo latius, basi et posterius fere æque latum, inter basin et medium utrinque subrotundato-ampliatum, segmento quinto retrorsum sensim leviter ampliato, apice rectangulariter lobato-prominulo, angulis segmenti sexti productis.

HESUS Stål.

Stål, Stett. E. Z. 23. p. 437. (1862); H. afr. 3. p. 31. (1865).

1. **H. acuminatus** Fabr. — *Aradus acuminatus* Fabr., S. R. p. 117. 3. (1803). — *Hesus acuminatus* Stål, H. Fabr. 1. p. 95. 1. (1868).

Patria: America meridionalis.

2. **H. flaviventris** Burm. — *Dysodius flaviventris* Burm., Handb. 2: 1. p. 255. 2. (1835); H. S., W. 1. 9. p. 140. f. 957. (1853).

Patria: Brasilia, Rio Janeiro; Nova Granada, Bogota (Mus. Holm.)

Lobus anticus thoracis inter rugas duas distantes obliquas rugis duabus parallelis, valde appropinquatis, sulcum terminantibus, instructus.

3. **H. cordatus** Fabr. — *Aradus cordatus* Fabr., S. R. p. 117. 4. (1803). — *Hesus cordatus* Stål, H. Fabr. 1. p. 95. 2. (1868).

Patria: Surinam. (Mus. Holm.)

Thorax inter rugas discoidales obliquas distantes rugis parallelis duabus destitutus.

4. **H. annuliger** Stål. — *Hesus annuliger* Stål, Stett. E. Z. 23. p. 438. (1862).

Patria: Mexico. (Mus. Holm.)

Ab *H. cordato* vix differt.

5. **H. subarmatus** Stål. — *H. cordato* maxime affinis, differt lobo antico thoracis in medio marginum lateralium tuberculo parvo armatis angulisque anticis ad collare in tuberculum prominulis. ♀. Long. 10, Lat. thor. $3\frac{1}{2}$ mill.

Patria: Surinam. (Mus. Holm.)

ARTAGERUS Stål.

Stål, Rio H. 1. p. 67. (1860); H. afr. 3. p. 31. (1865).

a. *Antennarum articulo primo tertio haud vel paullo longiore, secundo primo dimidio vel vix dimidio breviore.*

1. **A. crispatus** Stål. — *Artagerus crispatus* Stål, Rio H. 1. p. 67. 1. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

2. **A. histricus** Stål. — *Artagerus histricus* Stål, Stett. E. Z. 23. p. 438. 266. (1862).

Patria: Mexico. (Mus. Holm.)

aa. *Antennarum articulo primo tertio fere duplo longiore, secundo plus triplo vel fere quadruplo longiore.*

3. **A. setosus** Stål. — Niger, articulo ultimo antennarum tarsisque dilute ferrugineis; membrana fusca, venis pallescentibus. ♀. Long. $8\frac{1}{2}$, Lat. thor., 3 Lat. med. abd. 4 mill.

Patria: Bogota Columbiæ. (Mus. Holm.)

A præcedentibus præsertim differt longitudine articuli primi antennarum formaque abdominis. Articulus primus antennarum dense setosus. Latera et vitta media capitis, rugæ lobi antici, latera et discus lobi postici thoracis, ruga scutelli, venæ hemelytrorum, latera pectoris et abdominis nec non pedes subtomentoso-setosi. Thorax uti in *A. crispato* formatus, lobo antico antrorsum angustato, antice utrinque leviter obtuseque producto. Abdomen feminæ thorace latius, a basi ad medium sensim leviter ampliatum, dein subangustatum, angulis apicalibus segmentorum quattuor anteriorum distincte rotundato-prominulis, segmento quinto posterius utrinque in lobum triangularem producto, pone lobos subito fortiter angustato, abdomine pone lobos illos subtruncato, angulis segmenti sexti tantum leviter lobato-prominulis.

APHLEBODERRHIS Stål.

Stål, Rio H. 1. p. 67. (1860).

1. **A. pilosa** Stål. — *Aphleboderrhis pilosa* Stål, Rio H. 1. p. 67. 1. (1860).

Patria: Rio Janeiro. (Mus. Holm.)

BARCINUS Stål.

1. **B. horridus** Stål. — Niger, magna parte abdominis annulisque pedum ferrugineo-flavescentibus. ♂. Long. 11, Lat. thor. $3\frac{1}{2}$, Lat. abd. 5 mill.

Patria: Malacca. (Coll. Signoret.)

Statura fere *Cinyphi emarginati*. Sat fortiter depressus, lævigatus, capite, thorace scutelloque partim breviter ochraceo-subtomentosis. Caput pone oculos sensim angustatum et spina nonnihil ab oculis remota, extrorsum et nonnihil retrorsum vergente, gracili, armatum; tuberculis antenniferis divergentibus, acute et sat longe productis; processu apicali longo, apice lobis duobus longis, gracilibus, spiniformibus terminato. Antennæ articulo primo processu capitis duplo longiore, secundo primo vix dimidio breviore, tertio primo longitudine æquali, quarto secundo subbreviore, secundo et tertio ante medium ferrugineis. Thorax lobo antico lobo postico angustiore, illo utrinque sat fortiter rotundato et spinis duabus magnis flavo-ferrugineis marginalibus armato; lobo postico spinis duabus validis marginalibus, anteriore majore, prædito. Ruga media scutelli distincta. Abdomen maris utrinque rotundatum, thorace latius, ferrugineo-flavescens, ano lateribusque ante medium nigris, his flavescente-maculatis, margine laterali segmentorum quattuor anteriorum spinis duabus magnis armato, segmentis quinto et sexto utrinque in lobum magnum acute triangularem productis; lobis segmenti genitalis primi sat longis, depressis, acuminatis. Femora prope apicem annulo obsoleto ferrugineo notata. Tibiæ annulo apiceque flavescente-ferrugineis.

DYSODIUS St. F. et S.

St. F. et S., Enc. méth. 10. p. 654. (1825); A. et S., Hist. p. 304. (1843); Stål, H. afr. 3. p. 31. (1865).

1. **D. lunatus** Fabr. — *Acanthia lunata* Fabr., E. S. 4. p. 72. 20. (1794). — *Aradus lunatus* Fabr., S. R. p. 117. 2. (1803); Wolff, Ic. 5. p. 168. 162. f. 162. (1811); Guér., Icon., Ins. pl. 56. f. 15. (1838). — *Dysodius lunatus* Burm., Handb. 2: 1. p. 255. 1. (1835); A. et S., Hist. p. 304. 1. (1843); H. S., W. I. 8. p. 119. f. 884. (1848); Stål, H. Fabr. 1. p. 95. 1. (1868). — Stoll, Pun. f. 84.
Patria: Nova Granada; Surinam. (Mus. Holm.)

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2. **D. crenulatus** Stål. — *Dysodius crenulatus* Stål, Stett. E. Z. 23. p. 437. 263. (1862).
Patria: Mexico; Bogota Columbiæ.

CINYPHUS Stål.

Stål, H. afr. 3. p. 31. (1865).

1. **C. emarginatus** Stål. — *Dysodius emarginatus* Stål, Stett. E. Z. 23. p. 437. 264. (1862).
Patria: Mexico, Vera Cruz. (Mus. Holm.)

ILLIBIUS Stål.

1. **I. laticeps** Stål. — Niger, superne in capite, thorace abdomineque reticulatim brevissime ochraceo-subtomentosus; apice articuli ultimi antennarum tarsisque ferrugineis. ♂. Long. 11, Lat. thor. 4, Lat. abd. $5\frac{3}{4}$ mill.
Patria: Bogota Novæ Granadæ. (Mus. Holm.)
Statura fere *Crimiæ tuberculatæ*, sed capite abdomineque latioribus. Lævis, thorace et lateribus pectoris obsoletissime granulatis. Caput sat latum, pone oculos inerme, subito in collum coarctatum; tuberculis antenniferis sat validis, antrorsum productis; processu apicali sensim gracilescente, apice integro. Antennæ minus graciles, articulo primo dimidio apicem processus capitis superante, secundo et tertio longitudine æqualibus, primo tertia parte brevioribus, quarto tertio nonnihil breviore. Thorax lobo antico lobo postico angustiore, illo convexo, fortiter rotundato-angustato, rugis longitudinalibus quattuor instructo, rugis mediis fortioribus, magis elevatis, retrorsum divergentibus, marginibus lateralibus paullo pone medium tuberculo distincto dentiformi armatis; lobo postico marginibus subparallelis, antice subito angustato, anterius pone rugas intermedias lobi antici tuberculis duobus obtusis, continuationem illarum rugarum efficientibus, prædito. Ruga scutelli distincta, antice magis elevata. Abdomen maris retrorsum ultra medium sensim ampliatum, pone medium utrinque leviter rotundatum, posterius nonnihil angustatum, pone segmentum quintum subtruncatum, angulis apicalibus segmentorum obtuse leviterque prominulis.

BRACHYRHYNCHUS Lap.

Brachyrhynchus subg. *Brachyrhynchus* Lap., Ess. p. 54. (1832). — *Brachyrhynchus* A. et S., Hist. p. 304. (1843); Stål, H. afr. 3. p. 32. (1865). — *Arictus* Stål, H. afr. 3. p. 31. (1865).

a. *Articulis secundo et tertio antennarum longitudine æqualibus vel subæqualibus.*

b. *Antennis crassiusculis; thorace basi ante scutellum fortius sinuato; species asiaticæ et africanæ.* — Brachyrhynchus Lap.

1. **B. granosus** Stål. — *Brachyrhynchus orientalis* Burm., Handb. 2: 1. p. 254. 1. (1835). — *Dysodius orientalis* H. S., W. I. 8. p. 123. f. 890. (1848).
Patria: Java. (Mus. Holm.)
Figura Schæfferi est nimis lata.

2. **B. membranaceus** Fabr. — *Aradus membranaceus* Fabr., S. R. p. 118. 6. (1803). — *Brachyrhynchus membranaceus* Stål, H. Fabr. 1. p. 96. 2. (1868).
Patria: India orientalis.

3. **B. orientalis** Lap. — *Brachyrhynchus orientalis* Lap., Ess. p. 54. (1832); A. et S., Hist. p. 305. 1. (1843). — *Dysodius membranaceus* H. S., W. I. 8. p. 122. f. 887. (1848). — *Crimia nigra* A. Dohrn, Stett. E. Z. 21. p. 406. 71. (1860)

Patria: Java, Ceylon, Insulæ Philippinæ. (Mus. Holm.)

4. **B. albipennis** Fabr. — *Aradus albipennis* Fabr., S. R. p. 118. 8. (1803). — *Brachyrhynchus membranaceus* Burm., Handb. 2: 1. p. 254. 3. (1835). — *Brachyrhynchus albipennis* Stål, H. Fabr. 1. p. 96. 1. (1868).

Patria: Pulo Penanz. (Mus. Holm.); Sumatra.

5. **B. nasutus** Stål. — *Brachyrhynchus nasutus* Stål, Ö. V. A. F. 1870. p. 673. 2.

Patria: Insulæ Philippinæ. (Mus. Holm.)

6. **B. sulcicornis** Sign. — *Mezira sulcicornis* Sign., An. S. E. Fr. (3) 8. p. 956. 161. (1861). — *Brachyrhynchus sulcicornis* Stål, H. afr. 3. p. 33. 1. (1865).

Patria: Madagascar.

7. **B. rugosus** Sign. — *Crimia rugosa* Sign. in Thoms., Arch. 2. p. 309. 590. (1858). — *Brachyrhynchus rugosus* Stål, H. afr. 3. p. 33. 2. (1865).

Patria: Calabar Guineæ.

8. **B. Germari** Stål. — *Brachyrhynchus lobatus* Germ. in Silb., Rev. 5. p. 133. 31. (1837); Stål, H. afr. 3. p. 33. 3. (1865).

Patria: Terra capensis; Natalia. (Mus. Holm.)

9. **B. furcatus** Germ. — *Brachyrhynchus furcatus* Germ. in Silb., Rev. 5. p. 133. 32. (1837); Stål, H. afr. 3. p. 34. 4. (1865).

Patria: Terra capensis. (Mus. Holm.)

10. **B. monedula** Stål. — *Mezira rugosa* Sign., An. S. E. Fr. (3) 8. p. 957. 162. (1861). — *Brachyrhynchus Monedula* Stål, H. afr. 3. p. 34. 5. (1865).

Patria: Madagascar.

bb. *Antennis graciliusculis; species americanæ.*

11. **B. punctiventris** Stål. — Niger, supra cum pectore pedibusque distinctissime granulatus; ventre punctato; thorace basi truncato; apice articuli ultimi antennarum, macula membranæ pone apicem corii, angulis apicalibus segmentorum abdominis, rostro tarsisque flavo-ferrugineis. ♀. Long. 12, Lat. thor. $4\frac{1}{2}$, Lat. abd. 6 mill.

Patria: Nova Granada, Bogota. (Mus. Holm.)

Statura fere *B. granosi*, sed brevior, capiteque angustiore et longiore. Caput pone oculos sensim angustatum et spinula extrorsum vergente, ultra oculos haud extensa, armatum; tuberculis antenniferis antrorsum prominulis, haud divergentibus, acutis; processu apicali longiusculo, apice inciso, lateribus parallelis. Antennæ articulo primo apicem processus capitis vix attingente, secundo paullo breviore; secundo tertio vix breviore; quarto longitudine primi. Thorax ante medium transversim impressus, lobo antico postico angustiore, utrinque fortiter rotundato-angustato, obtusissime quadrituberculato; lobo postico lateribus parallelis, antice rotundato-angustato; marginibus lateralibus thoracis ante medium distincte angulato-emarginatis. Scutellum ruga media obsoleta instructum, ad margines laterales, præsertim anterius, rugoso-elevatum. Abdomen thorace latius, utrinque leviter rotundatum, segmento quinto retrorsum leviter, sexto fortiter angustato; angulis segmentorum vix prominulis; ventre distinctissime et densissime subrugoso-punctato, margine apicali segmentorum in disco lævigato, in medio latiore.

12. **B. abdominalis** Stål. — Niger, sat distincte granulatus, abdomine ferrugineo, parce obsoleteque granulato, fusco-variegato; thorace basi sinuato. ♂. Long. 9, Lat. thor. 3, Lat abd. $4\frac{1}{2}$ mill.

Patria: Cuba. (Mus. Holm).

Præcedenti valde affinis, differt corpore minus distincte granulato, ventre impunctato, capite pone oculos rotundato-angustato, tuberculis antenniferis sensim leviter divergentibus, processu apicali capitis a basi ad medium sensim angustato, anterius angustiore et apice distinctius emarginato, articulo primo antennarum apicem processus capitis attingente, thorace nonnihil angustiore, tuberculis quattuor vix ullis instructo, basi in medio granulis duobus distantibus flavo-ferrugineis notato, lateribusque fortius rotundato-sublobatis, scutello ad margines laterales haud rugoso, sed basi in angulis tuberculo parvo flavo-ferrugineo instructo, nec non colore abdominis.

aa. *Articulo tertio antennarum secundo distinctissime longiore; thorace basi truncato vel obsolete sinuato.* — Arictus Stål.

13. **B. thoracoceras** Montr. — *Aradus thoracoceras* Montr., An. sc. phys. Lyon. (2) 7: 1. p. 107. (1855).

Patria: Insulæ Fidschi; Nova Guinea; Australia borealis et occidentalis. (Mus. Holm.)

14. **B. tagalicus** Stål. — *Arietus tagalicus* Stål, Ö. V. A. F. 1870. p. 672. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

15. **B. morio** Germ. — *Brachyrhynchus morio* Germ. in Silb., Rev. 5. p. 134. 33. (1837). — *Mezira morio* Stål, H. afr. 3. p. 35. 1. (1865).
Patria: Terra capensis. (Mus. Holm.)

16. **B. granuliger** Stål. — *Brachyrhynchus granuliger* Stål, Rio H. 1. p. 66. 4. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

17. **B. lobatus** Say. — *Aradus lobatus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 354. 9. (1859).
Patria: Texas. (Mus. Holm.)

18. **B. flavicans** Stål. — *Brachyrhynchus flavicans* Stål, Rio H. 1. p. 66. 3. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

19. **B. americanus** Spin. — *Brachyrhynchus americanus* Spin. in Gay, Hist. Chile, Zool. 7. p. 202. Hem. 1. 2. f. 11. (1852). — *Brachyrhynchus chilensis* Stål, Ö. V. A. F. 1854. p. 237. 1.
Patria: Chile. (Mus. Holm.)

20. **B. granulatus** Say. — *Aradus granulatus* Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 353. 7. (1859). — *Dysodius parvulus* H. S., W. I. 9. p. 139. f. 956. (1853).
Patria: Carolina. (Mus. Holm.); Florida; Baltimore.

PICTINUS Stål.

1. **P. cinctipes** Stål. — Nigricans; marginibus lateralibus thoracis ante medium, maculis parvis marginalibus abdominis annuloque lato prope basin tibiarum sordide flavescentibus; trochanteribus ferrugineis. ♂. Long. $5\frac{1}{2}$, Lat. thor. $2\frac{1}{2}$, Lat. abd. $2\frac{3}{4}$ mill.
Patria: Nova Granada, Bogota. (Mus. Holm.)

Species singularis. Caput subtransversum, fere uti in *Illibio laticipite* formatum, pone oculos spina extrorsum prominula armatum, tuberculis antenniferis parallelis, antrorsum productis, processu apicali basi subito angustato, dein sensim subgracilescente, apice integro. Antennæ graciliusculæ, articulo primo processu capitis circiter dimidio longiore, articulis secundo et tertio longitudine subæqualibus, primo paullo brevioribus, quarto primo vix breviore. Thorax granulatus, ante medium depressus, antrorsum angustatus, marginibus lateralibus depressis, nonnihil reflexis, ante medium sinuatis, pone sinum rotundato-ampliatis, anterius in lobum brevem subsemiorbicularem prominulis. Scutellum ruga longitudinali, distinctissima, granulata instructum. Venæ hemelytrorum granulatæ. Membrana nitida, fusco-grisescens, pone angulum apicalem corii macula pallescente. Pectus obsolete granulatum, posterius læviusculum. Abdomen thorace vix latius, lateribus subparallelis, segmento quinto sexto latiore, illo apice subito rotundato-angustato, hoc retrorsum ultra medium sensim angustato, dein subito angulum subrectum formante; ventre dense subruguloso-punctato, macula media segmentorum lævigata.

NEUROCTENUS Fieb.

Neuroctenus Fieb., Eur. H. p. 34. (1861). — *Mezira* p. Stål, H. afr. 3. p. 31 et 35. (1865).

a. *Articulo primo antennarum processum capitis haud superante.*

1. **N. caffer** Stål. — *Brachyrhynchus caffer* Stål, Ö. V. A. F. 1855. p. 38. 1. — *Mezira caffra* Stål, H. afr. 3. p. 35. 2. (1865).
Patria: Terra capensis. (Mus. Holm.)

Abdomen prope margines laterales carina destitutum; ventre utrinque granulato, granulis prope margines laterales in seriem distinctiorem ordinatis, segmentis basi serie granulorum potius quam carina instructis.

2. **N. bilobus** Sign. — *Aneurus bilobus* Sign., An. S. E. Fr. 3. (8) p. 958. 165. (1861). — *Mezira biloba* Stål, H. afr. 3. p. 36. 3. (1865).
Patria: Madagascar. (Mus. Holm.)

3. **N. tenuicornis** Sign. — *Aneurus tenuicornis* Sign., An. S. E. Fr. (3) 8. p. 958. 164. (1860). — *Mezira tenuicornis* Stål, H. afr. 3. p. 36. 4. (1865).
Patria: Madagascar. (Mus. Holm.)

4. **N. Hochstetteri** Mayr. — *Neuroctenus Hochstetteri* Mayr, Verh. z.-b. Ges. Wien. 16. p. 365. (1866) Reise Nov., Hem. p. 166. f. 47. (1866).
Patria: Nova Selandia.

5. **N. serrulatus** Stål. — *Neuroctenus serrulatus* Stål, Ö. V. A. F. 1870. p. 674. 1.
Patria: Insulæ Philippinæ. (Mus. Holm.)

6.′ **N. Mayri** Stål. — *Neuroctenus Mayri* Stål, Ö. V. A. F. 1870. p. 674. 2.
Patria: Insulæ Philippinæ. (Mus. Holm.)
Obs.: Species plures hujus divisionis ex Australia, India orientali et America boreali adsunt in Museo Holmiensi.

aa. *Articulo primo antennarum apicem processus capitis superante.*

7. **N. terginus** Stål. — *Brachyrhynchus terginus* Stål, Rio H. 1. p. 66. 1. (1860).
Patria: Rio Janeiro; Bogota. (Mus. Holm.)

8. **N. litigiosus** Stål. — *Mezira litigiosa* Stål, Stett. E. Z. 23. p. 439. 268. (1862).
Patria: Mexico. (Mus. Holm.)

9. **N. bimaculatus** Stål. — *Brachyrhynchus bimaculatus* Stål, Rio H. 1. p. 66. 2. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

10. **N. brasiliensis** Mayr. — *Neuroctenus brasilienses* Mayr, Verh. z.-b. Ges. Wien. 16. p. 365. (1866); Reise Nov., Hem. p. 167. f. 48. (1866).
Patria: Brasilia.

MELANOSTERPHUS Stål.

Stål, H. Fabr. 1. p. 97. (1868).

1. **M. spinosus** Fabr. — *Aradus spinosus* Fabr., S. R. p. 119. 13. (1803). — *Melanosterphus spinosus* Stål, H. Fabr. 1. p. 97. 1. (1868).
Patria: America meridionalis.

ANEURUS Curt.

Curt., Brit. Ent. — Fieb., Eur. H. p. 35 et 116 (1861).

1. **A. australicus** Stål. — *A. lævi* maxime affinis, abdomine angustiore, forma capitis, antennis gracilioribus longitudineque articulorum antennarum tantum differre videtur. ♂. Long. 5, Lat. thor. $1\frac{2}{3}$, Lat. abd. 2 mill.
Patria: Australia borealis. (Mus. Holm.)
Caput quam in *A. lævi*, uti videtur, minus, tuberculis antenniferis apice extus haud acuminatis, processu apicali paullo breviore et basin versus latiore, haud longiore quam basi latiore. Antennæ articulo primo brevi, secundo primo distincte nonnihil longiore, tertio secundo circiter dimidio longiore, quarto articulis duobus basalibus simul sumtis paullo longiore. Abdomen ferrugineum, fusco-limbatum.

2. **A. politus** Say. — *Aneurus politus* Say, New Harm. Ind., Dec. 1831; Compl. writ. 1. p. 354. (1859); Uhler, Proc. Bost. Soc. 1871.
Patria: Florida, Cuba.

3. **A. inconstans** Uhler. — *Aneurus inconstans* Uhler, Proc. Bost. Soc. 1871.
Patria: America borealis.

4. **A. simplex** Uhler. — *Aneurus simplex* Uhler, Proc. Bost. Soc. 1871.
Patria: America borealis.

PHLOEOBIA Montr.

Montr., An. S. Lin. Lyon. (2) 11. p. 236. (1865).

1. **P. Sayi** Montr. — *Phloebia Sayi* Montr., An. S. Lin. Lyon. (2) 11. p. 236. (1865).
Patria: Kanala.

Species brachyrhynchinorum incerti generis.

1. **Aneurus subdipterus** Burm., Handb. 2: 1. p. 254. 2. (1835).
Patria: Brasilia, Cassapava.

2. **Brachyrhynchus punctulatus** Burm., Handb. 2: 1. p. 254. 1. (1835).
Patria: Cassapava.

3. **Aradus lugubris** Boisd., Voy. Astr., Ins. 2. p. 642. pl. 11. f. 24. (1835).
Patria: Vanikoro.

4. **Aradus melænus** Germ. in Silb., Rev. 5. p. 135. 35. (1837).
Patria: Terra capensis.

5. **Aradus ornatus** Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 352. 5. (1859).
Patria: Indiana.

6. **Aradus emarginatus** Say, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 354. 8. (1859).
Patria: Mexico.

7. **Mezira crassicornis** Sign., An. S. E. Fr. (3) 8. p. 957. 163. (1861).
Patria: Madagascar.

8. **Mezira lifuana** Montr. et Sign., An. S. E. Fr. (4) 1. p. 69. 34. (1861).
Patria: Lifu.

9. **Mezira minima** Montr. et Sign., An. S. E. Fr. (4) 1. p. 69. 35. (1861).
Patria: Art.

10. **Mezira moesta** Stål, Stett. E. Z. 23. p. 438. 267. (1862).
Patria: Mexico.

11 **Mezira ovata** Stål, Stett. E. Z. 23. p. 439. 269. (1862).
Patria: Mexico.

12. **Aradus dichroa** Montr., An. S. Lin. Lyon. (2) 5. p. 256. (1858).
Patria: Nova Caledonia.

13. **Brachyrhynchus angustellus** Bl. in Gay, Hist. Chile, Zool. 7. p. 205. 2. (1852).
Patria: Chile.
Ad *Aradum* forte referendus.

ECPIESTOCORIS Bl.

Blanch. in Gay, Hist. Chile, Zool. 7. p. 222. (1852).

14. **E. castaneus** Bl. in Gay, Hist. Chile, Zool. 7. p. 223. 1. t. 2. f. 13. (1852).
Patria: Chile.

Subf. Isodermina Stål.

ISODERMUS Er.

Isodermus Er., Arch. 8: 1. p. 281. (1842). — *Anchomichon* Spin. in Gay, Hist. Chile, Zool. 7. p. 214. (1852).

1. **I. planus** Er. — *Isodermus planus* Er., Arch. 8: 1. p. 282. 270. T. 5. f. 9. (1842).
Patria: Tasmania. (Mus. Holm.)

2. **I. Gayi** Spin. — *Anchomichon Gayi* Spin. in Gay, Hist. Chile, Zool. 7. p. 216. 1. l. 1. f. 14. (1852).
Patria: Chile.

3. **I. patagonicus** Stål. — *Mezira ? patagonica* Stål, Freg. Eug. resa, Ins. p. 260. 111. (1859).
Patria: Patagonia. (Mus. Holm.)
A præcedente forte haud diversus.

ENUMERATIO ACANTHIIDARUM EXTRAEUROPÆARUM.

Fam. **Acanthiidæ** STÅL.

ACANTHIA FABR., LATR.

Acanthia p. FABR., S. Ent. p. 693. (1775). — *Acanthia* LATR., Préc. p. 85. (1797); Gen. 3. p. 142. (1807); LAP., Ess. p. 52. (1832); SPIN., Ess. p. 76. (1837). — *Salda* p. FABR., S. R. p. 113. (1803); FALL., Mon. Cim. p. 28. (1807). — *Salda* FALL., H Svec., Cim. p. 71. (1829); BURM., Handb. 2: 1. p. 215. (1835); A. et S., Hist. p. 404. (1843); FIEB., Eur. H. p. 40 et 144. (1861). — *Sciodopterus* A. et S., Hist. p. 404. (1843).

a. *Membrana areolis elongatis quinque, omnibus apicem areæ magnæ attingentibus, instructa* [1]*; corpore superne pubescente, præsertim in hemelytris dense distinctissimeque punctulato, magna parte flavescente; scutello nigro, macula parva marginali ante medium parteque circiter dimidia apicali, vel saltem hujus limbo, flavescentibus.*

1. **A. Signoretii** GUÉR. — *Salda Signoretii* GUÉR., in SAGRA, Hist. Cuba, Ins. p. 401. pl. 13. f. 10. (1857).
Patria: Cuba. (Mus. Holm.)

Articulo secundo antennarum longissimo articuloque quarto tertio breviore insignis.

Obs.: Species hujus divisionis e Texas, forte a SAY descripta, adest in Museo Holmiensi, in quo præterea asservantur species *Acanthiæ* plures ab illo auctore certe descriptæ, haud tamen certe determinandæ.

aa. *Membrana areolis quattuor normaliter instructa, raro areola quinta, inter areolas duas exteriores posita, posterius abbreviata, retrorsum angustata, prædita.*

b. *Prostethio toto vel fere toto pallido, saltem limbo laterali et limbo toto acetabulorum vel acetabulis totis nec non margine antico pallidis, illis latissimis; hemelytris dense et plerumque distincte punctatis; thorace antrorsum leviter vel minus fortiter angustato, antice lato et ibidem capite haud vel vix angustiore; bucculis pallidis vel pallido-marginatis.*

c. *Membrana sæpe (plerumque?) inter areolas duas exteriores areola quinta breviore, retrorsum angustata, illis breviore, instructa; segmento ventrali sexto feminarum truncato.*

2. **A. pilosa** FALL. — *Salda pilosa* THOMS., Opusc. 4. p. 404. 6. (1871).
Var. b. — Hemelytris pone medium macula costali nigra destitutis.
Salda sericans STÅL, Stett. E. Z. 19. p. 191. 79. (1858).
Patria: Kamtschatka. (Mus. Holm.)

cc. *Membrana areolis quattuor normalibus instructa; segmento ventrali sexto feminarum normali, posterius producto et rotundato. — (A. lateralis* FALL.)

bb. *Prostethio toto vel magna parte nigro, marginibus antico, plerumque etiam laterali, concoloribus, acetabulis raro et tunc tantum anterius et ante suturam pallidis vel pallido-limbatis; thorace plerumque antrorsum fortius angustato et antice capite angustiore.*

d. *Hemelytrorum area costali pallido-marginata vel pallido-maculata; segmento ventrali sexto feminarum mihi cognitarum postice late distincteque pallido-limbato vel bimaculato.*

e. *Marginibus lateralibus pronoti pallidis.*

3. **A. ventralis** STÅL. — *Salda ventralis* STÅL, Rio H. 1. p. 81. 1. (1860).
Patria: Rio Janeiro. (Mus. Holm.)

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[1]) In *A. pilosa* et *boreali* adsunt interdum areolæ quinque, areola quarta tamen posterius abbreviata et venam, areas adjacentes separantem, posterius emittens.

4. **A. coxalis** STÅL. — Nigra, nitida, brevissime griseo-pubescens; labro, tylo maculisque duabus parvis anterioribus capitis, marginibus angustis lateralibus thoracis a basi ultra medium, margine antico acetabulorum anticorum pedibusque pallide flavescentibus; hemelytris sordide albicantibus, fusco-venosis; clavo, margine interiore, basi lineolisque duabus longitudinalibus exterioribus corii nigris, macula subapicali corii pallida; coxis apiceque imo tibiarum nigris; margine apicali segmentorum ventris parteque apicali segmenti sexti feminæ albicantibus. ♀. Long. $4\frac{1}{2}$, Lat. thor. 2, Lat. hem. $2\frac{1}{2}$ mill.

Patria: Cuba. (Mus. Holm.)

Colore hemelytrorum coxisque nigris a præcedente mox distinguenda.

ee. *Marginibus lateralibus thoracis concoloribus.*

5. **A. saltatoria** LIN. — *Salda saltatoria* THOMS., Opusc. 4. p. 407. 14. (1871).

Patria: NewYork; Illinois. (Mus. Holm.)

6. **A. pallipes** FABR. — *Salda pallipes* THOMS., Opusc. 4. p. 407. 15. (1871).

Patria: Sitka Americæ borealis. (Mus. Holm.)

Obs.: Species plures boreali-americanæ hujus divisionis, verisimiliter a SAY descriptæ, asservantur in Museo Holmiensi.

7. **A. oblonga** STÅL. — *Salda oblonga* STÅL, Stett. E. Z. 19. p. 191. 80. (1858).

Patria: Sibiria, Irkutsk. (Mus. Holm.)

Hæc species ad *A. hirsutulam* FLOR appropinquat, differt præsertim margine costali corii longius ultra medium et posterius fortius reflexo segmentoque ventrali sexto feminæ postice distincte pallescente.

dd. *Hemelytrorum area costali nigra, immaculata; segmento ventrali sexto feminarum mihi cognitarum nigro toto vel margine apicali angustissime obsoleteque pallescente.*

8. **A. luctuosa** STÅL. — *Salda luctuosa* STÅL, Freg. Eug. resa, Ins. Hem. p. 263. 123. (1859).

Patria: California. (Mus. Holm.)

Hæc a reliquis hujus divisionis statura et longitudine æreolæ interioris membranæ divergit et ad *A. pallipedem* appropinquat, corpore toto nigro hemelytrisque immaculatis mox distinguenda. Femina ignota.

Obs.: Species ex America boreali (Wisconsin, New Jersey), *A. morioni* ZETT. maxime affinis, adest in Museo Holmiensi.

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9. **A. ligata** SAY. — *Acanthia ligata* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 359. 1. (1859).

Patria: Indiana.

10. **A. hirta** SAY. — *Acanthia hirta* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 359. 2. (1859).

Patria: Indiana.

11. **A. lugubris** SAY. — *Acanthia lugubris* SAY, New Harm. Ind. Dec. 1831; Compl. writ. 1. p. 360. 3. (1859).

Patria: Missouri.

12. **A. humilis** SAY. — *Acanthia humulis* SAY, New Harm. Ind. Dec. 1831. — *Acanthia humulis (humilis)* Compl. writ. 1. p. 360. 4. (1859).

Patria: Florida.

13. **A. confluens** SAY. — *Acanthia confluenta* SAY, New Harm. Ind. Dec. 1831. — *Acanthia confluenta (confluens)* SAY, Compl. writ. 1. p. 361. 5. (1859).

Patria: America borealis.

14. **A. interstitialis** SAY. — *Acanthia interstitialis* SAY, Journ. Ac. Phil. 4. p. 324. (1825); Compl. writ. 2. p. 248. (1859).

Patria: Missouri.

15. **A. chilensis** BLANCH. — *Acanthia chilensis* BL. in GAY, Hist. Chile, Zool. 7. p. 225. 1. Hem. l. 2. f. 15. (1852).

Patria: Chile.

16. **A. stellata** CURT. — *Acanthia stellata* CURT. in Ross, Sec. Voy., App. p. LXXV. (1835).

Patria: America arctica.

17. **A. ornata** STÅL. — *Salda ornata* STÅL, Stett. E. Z. 23. p. 458. 332. (1862).

Patria: Mexico.

INDEX PARTIS TERTIÆ.

MIKROMETRISK BESTÄMNING

AF 104 STJERNOR INOM TELESKOPISKA STJERNGRUPPEN

20 VULPECULÆ

AF

Dr HERMAN SCHULTZ.

MED KARTA.

TILL KONGL. VET.-AKAD. INLEMNAD DEN 13 MARS 1872.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

§ 1.

Bland stellära astronomiens problemer förtjenar frågan om de så kallade stjerngruppernas natur och dynamiska förhållanden så mycket heldre en särskild uppmärksamhet, som densamma i viss mening till och med kan anses bilda sjelfva hufvudproblemet angående verldsbyggnadens beskaffenhet. De ifrågavarande föremålen, som i så stor mängd påträffas på himmelen, men af hvilka blott ett ringa fåtal kan ses med obeväpnadt öga, har W. Herschel enligt förtätningsgraden indelat i trenne klasser. Af dessa äro hans »*globular clusters*», som vanligen innehålla en oändlighet af stjernor tätt hopade kring ett bestämdt och oftast nebulöst centrum, redan intressanta genom denna egendomliga form, som synes gifva ett ojäfaktigt bevis för ett intimt fysiskt samband stjernorna emellan. Stjerngrupperna af de två andra klasserna innehålla deremot betydligt färre och apparent från hvarandra mera aflägsnade stjernor, och vid dem förefinnes ej heller såsom i första fallet ett omedelbart i ögonen fallande fysiskt centrum. Vid dessa stjerngrupper saknas således i sjelfva verket det ögonskenliga beviset för ett närmare fysiskt samband mellan stjernorna, som vid *globular clusters* följde af föremålens yttre gestalt; men det ofantligt stora antalet af förhandenvarande öppna stjerngrupper erbjuder deremot i senare fallet ett sannolikhetsbevis för, att äfven dessa stjerngrupperingar icke blott bero på optiskt-perspektiviska förhållanden. Den kolossalaste af alla dessa detacherade stellära verldar är slutligen den så kallade vintergatan (via lactea), angående hvilkens verkliga form och förhållande till stjerngrupperna i inskränkt mening äfven W. Herschel, såsom man vet, först uppkastat geniala ehuru naturligtvis ofullständigt bevisade hypoteser.

Dessa stjernverldars inre och yttre förhållanden synas i allmänhet vara af en så mångfaldig och förvecklad natur, att, så vida man f. n. förstår, uppgiften aldrig kan blifva att söka en uttömmande solution på hithörande problemer. Men då frågan är att inom vidare gränsor än hittills förskaffa oss kunskap om verldsbyggnadens olika facer, så är dock å andra sidan gifvet, att vinnandet af en sådan kunskap till en stor del måste betingas af en mera eller mindre fullständig solution af stjerngrupps-problemet. Att för öfrigt på vetenskapens n. v. ståndpunkt vilja på förhand uppgöra en detaljerad plan för utforskningen af de stellära verldarne, vore visserligen ett vanskligt företag; men, sedan uppmätningen af dubbelstjernorna redan ledt till så vackra resultat, så synes det icke osannolikt, att en än mera omfattande inblick i verldsbyggnadens natur borde kunna vinnas genom en analog uppmätning af *globular clusters* och en undersökning af dessas relativa ortsförändringar i förhållande till hvarandra och till den öfriga stjernverlden.

Tillfälliga omständigheter hafva emellertid hittills förhindrat mig att egna en särskild uppmärksamhet åt dessa intressanta föremål och föranledt mig att i stället sysselsätta mig med de öppna stjerngrupperna. Jag anser mig ej heller dermed hafva egnat min tid åt ett mindre vigtigt arbete, då äfven studiet af dessa föremål måste anses ega ett stort och omfattande intresse, ehuru detsamma hittills blifvit så föga uppmärksammadt. Historiken öfver stjerngruppernas bestämning daterar sig, såsom bekant, ifrån BESSELS berömda studier öfver Plejad-gruppen, och inom detta forskningsgebit föreligga för öfrigt blott några få enstaka arbeten ifrån den senaste tiden.

Stjerngruppen i Vulpecula är i förhållande till sin ringa areal ganska stjernrik och i jemförelse med de öfriga små teleskopiska stjerngrupperna äfven relativt rik på klarare stjernor, ehuru de flesta dock äro mycket ljussvaga. Den är identisk med H. VIII. 20 och saknar, såsom föremålen af denna Herschelska klass i allmänhet, egentlig central förtätning, så att dess apparenta form icke gifver någon anledning att antaga ett närmare fysiskt samband de konstituerande stjernorna emellan. Föremålets yttre naturliga begränsning är äfven högeligen obestämd och den här angifna utsträckningen, af ungefärligen $1^m,5$ i rektascension och 15′ i deklination, således till följd deraf tämligen godtyckligt antagen.

Stjerngruppens klaraste stjerna är *20 Vulpeculæ* af 6:e storleken, och en blick på den bifogade kartan visar, att densamma intager ett nära centralt läge i förhållande till de öfriga stjernorna. Utom denna innehåller stjerngruppen ännu 10 stycken andra i »*Bonner-Beobachtungen*» anförda stjernor af ungefärligen 9:de storleken. Inom den antagna gränsen äro för öfrigt alla märkbarare stjernor här upptagna samt inom gruppens mera centrala del äfven de flesta af de svagare, hvilka under någorlunda gynnsamma atmosferiska förhållanden, och med användning af ungefärligen 300 gångers förstoring, kunnat bestämmas medelst Upsala-refraktorn utan att i märkbarare grad nedtrycka exaktitudsgränsen. Enligt den använda tubens dimensioner och till följd af glasens godhet var det att vänta, att dessa gränsstjernor skulle vara af ungefärligen 13:e storleken i BESSELS storleks-skala, hvilket direkta fotometriska estimeringar äfven bestyrkt.

Alla af mig utförda positions-bestämningar hvila på differential-observationer med hårmikrometer och bestå af rektascensions-differenser, erhållna genom passager observerade med öga och öra, och deklinations-differenser uppmätta med mikrometerskrufven. Mina observationer referera i de flesta fall de andra stjernorna direkte på centralstjernan 20 Vulpeculæ, ehuru jag dock i många fall ansett lämpligt eller funnit mig nödgad att förmedla jemförelsen med denna medelst någon af de andra klarare stjernorna. Direkta jemförelser mellan några af de klarare stjernorna sinsemellan förekomma äfven, men systematiskt anlagda multipel-observationer hafva enligt observationsplanen icke blifvit utförda. Det hade visserligen i många fall varit beqvämast att få bestämma de relativa positionerna genom positions-vinkel och afstånd, men som fugaluret ej gör vederbörlig tjenst, så har detta ej låtit sig göra; och, äfven i saknad af en registrer-apparat för tidsobservationerna, har jag således uteslutande varit hänvisad till ett i allmänhet besvärligt och ganska tidsödande observationssystem. Undantagsvis hafva några positions-vinklar blifvit uppmätta, för att kontrollera passage-observationerna på sådana stjernpar, som ligga nära på samma deklinations-cirkel. Stjernornas absoluta koordinater hvila på äldre och nyare rektascensions- och deklinations-bestämningar för 20 Vulp.

Observationerna på stjerngruppen började utan någon bestämdare på förhand uppgjord plan på hösten 1866, och de företogos ursprungligen tillsammans med analoga observationer på andra föremål af samma slag, för att bilda ett behöfligt arbets-komplement till mina ett par år tidigare påbörjade observationer på töckenstjernor, hvilka i allmänhet erfordra månfri himmel och i öfrigt bästa disponibla luft. I sammanhang med hvad ofvan blifvit anfördt, vill jag här påpeka den omständigheten, att atmosferiska förhållanden, som ej äro lämpliga för nebulos-observationer, lika litet lämpa sig för observationer på *globular clusters*. För att således med allvar egna mig åt dessa föremål, skulle jag bland annat nödgats att till stor del uppgifva min äldre plan att observera töckenstjernor.

Under de första åren observerades stjerngruppen i Vulp. blott sporadiskt och vanligen icke under de gynnsammaste förhållanden; först under de två sista åren har arbetet bedrifvits planmässigt, och för dess afslutande mera sammanhängande observations-serier blifvit utförda. Till följd af sitt läge och stjernornas svaghet har stjerngruppen blott kunnat observeras med fördel under höstmånaderna på vestra himmelen. De få här förekommande vårobservationerna på östra himmelen äro i de flesta fall utförda mot för ljus himmelsgrund.

Den bifogade grafiska framställningen af stjerngruppen enligt mina observationer är med stor omsorg benäget utförd af professoren WACKERBARTH.

§ 2.

Den vid observationerna använda tuben är en 13 fots refraktor ifrån STEINHEILS optiska institut i München, hvilken varit uppstäld i Upsala observatorii kupol sedan år 1860. Tuben har 9 Pariser-tums fri objektiv-öppning, och dess glas äro af utmärkt beskaffenhet. En fullständig redogörelse för instrumentets detaljer har här icke något intresse; men, då en allmän öfversigt öfver instrumentets stånd under de år, som observationerna fortgått, här ej bör saknas, så är det behöfligt att åtminstone meddela några antydningar angående instrumentets konstruktion. Såsom observationsur användes alltid en stjerntidskronometer af KESSELS (1329), som slår halfsekunder, och hvars gång i alla händelser är tillräckligt jemn för här afsedda ändamål.

Tuben är monterad på ett starkt gjutjerns-stativ, på hvilket det lutande plan, som uppbär timaxelns lager, är fastskrufvadt; och den parallaktiska monteringen är således af den vanliga Tyska formen, som fordrar omläggning för observation på östra och vestra himmelen. *Stativet*, som har visat en god stabilitet, *är att justera i azimut och polhöjd*. Denna metod att orientera instrumentet är mycket beqväm och säker.

Deklinations-axeln har cylindriska tappar och är fullkomligt innesluten i den gjutjernskanon, som är fastskrufvad på timaxelns öfre ända. Deklinationsaxeln löper vid ena ändan i en noga anslutande metallring, som fasthålles i sin ställning af trenne tryckskrufvar, och vid den andra emot de af glashårdt stål förfärdigade och sferiskt afsvarfvade ändarne af trenne skrufvar med svag stigning, som genomgå kanonen och träffa axeln på trenne punkter 120° från hvarandra. *Dessa skrufvar* äro försedda med starka motmuttrar och *tjena äfven till att justera vinkeln mellan deklinationsaxeln och timaxeln.* Det är gifvet, att denna inrättning i sin enkelket skall medföra åtskilliga svårigheter. För det första har oljan svårt att stadna på axelns anslagscirkel, och för det andra måste afputsning och oljning af axeln, då denna ej demonteras, verkställas genom sjelfva skrufhålen, men hvarvid man alltid riskerar att förändra vinkeln mellan båda axlarna. Utförandet af denna operation utan att perturbera instrumentet möjliggöres naturligtvis genom att på en gång blott uttaga en af skrufvarna.

På sjelfva deklinationscirkelns ekrar är vidare en liten *kollimator* af $1\frac{1}{2}$ tums öppning fästad parallelt med refraktorn. Denna kollimator är såsom ett nivelleringsinstrument vridbar kring sin optiska axel och inrättad till nivellering. Dess optiska axel kan justeras så, att den noga sammanfaller med axeln till den cylindriska nivelleringsytan, mot hvilken tuben roterar. Justeras derefter kollimatorns optiska axel, vid inriktning på ett tillräckligt aflägset föremål, till noggrann parallelism med refraktorns, och kollimatorn nivelleras, så är refraktorns optiska axel med detsamma äfven nivellerad, d. v. s. noga inriktad i horisontalplanet. Steinheil använder denna kollimator till bestämning af *deklinationscirkelns indexfel, instrumentets polhöjd* och *refraktorns kollimation.* Han föreslår äfven att använda densamma till bestämning af *refraktorns böjning:* är nämligen kollimatorn justerad till parallelism med refraktorn i vertikalt läge, så att man sålunda ser en och samma zenitalstjerna samtidigt i centra af båda tubernas hårkors, så gifva afvikelserna vid inställning på stjernor vid andra höjder omedelbart böjningen, då kollimatorns böjning kan antagas vara omärklig.

För att föröka tubens styfhet, och således förminska dess böjning, är den egentliga tuben till ungefärligen $\frac{2}{3}$ af sin längd omgifven af ett *bärrör,* som sedan medelst starka byglar på vanligt sätt fasthålles i metallvaggan på ändan af deklinationsaxeln. *För kollimation i optiska axeln korrigeras genom lateral förskjufning af tuben i bärröret.* Detta sätt att bortjustera kollimationen är i det hela ganska beqvämt och säkert, såsom inrättningen med bärröret äfven för öfrigt visat sig väl motsvara sitt ändamål.

Cirklarna hafva vackra graderingar, som afläsas medelst nonier på respektive 1ˢ och 10″ när.

Refraktorns efter finjustering återstående fel har jag bestämt på följande sätt. Sätt

φ' = timaxelns polhöjd,

$90° + 15i$ = vinkeln mellan den åt norr förlängda timaxeln och deklinationsaxelns cirkelända,

Θ = korrektionen för timcirkelns indexfel,

Δ = korrektionen för deklinationscirkelns indexfel.

Antag vidare, att deklinationsaxeln och kollimatorn vid samma tillfälle blifvit nivellerade i refraktorns båda lägen med objektivet under polen, och sätt

$I'\delta$ eller $I''\delta$ = de återstående vinklar, med hvilka deklinationsaxelns cirkelända ligger öfver horisontalplanet,

I'_c eller I''_c = de återstående vinklar, med hvilka kollimatorns objektivända ligger öfver horisontalplanet,

T_1 eller T_2 = afläsningarna på timcirkeln,

D_1 eller D_2 = afläsningarna på deklinationscirkeln,

hvarest indices referera sig till refraktorns olika lägen. I öfverensstämmelse med vanligt antagande är refraktorn här i läget I eller II, allteftersom deklinationscirkeln ligger östligt eller vestligt, emedan tuben är inriktad under polen.

Man får då tillräckligt noga

$$\Theta = 18^h - \tfrac{1}{2}(T_2 + T_1) - \tfrac{1}{15} \cdot \frac{I''_\delta - I'_\delta}{2} \cdot \operatorname{Sec} \varphi',$$

$$i = \{6^h - \tfrac{1}{2}(T_2 - T_1)\} \,.\, \operatorname{Cot} \varphi' - \tfrac{1}{15} \frac{I''_\delta + I'_\delta}{2} \cdot \operatorname{Cosec} \varphi',$$

$$\varphi' = \tfrac{1}{2}(D_2 - D_1) + \tfrac{1}{2}(I''_c + I'_c),$$

$$\Delta = 90° - \tfrac{1}{2}(D_2 + D_1) - \tfrac{1}{2}(I''_c - I'_c).$$

Vid dessa bestämningar har kollimatorn alltid medelst ett terrestert föremål och således i horisontelt läge justerats till parallelism med refraktorn. För att eliminera böjningens möjliga inverkan på bestämningen af φ' enligt föregående formler, har densamma alltid utgjort medium af tvänne sjelfständiga bestämningar, vid hvilka kollimatorn successive blifvit justerad till parallelism med refraktorn i positionen I och II.

I sammanhang härmed har äfven refraktorns böjning bestämts medelst kollimatorn. Är kollimatorn t. ex. justerad till parallelism med refraktorn i horisontelt läge i positionen I, så blir afvikelsen mellan båda tubernas optiska axlar för horisontelt läge i positionen II = dubbla maximi-böjningen.

Slutligen återstår följande att tillägga med afseende på räkningen enligt föregående formler. En skaldel på deklinationsaxelns och kollimatorns nivåer är respektive 4",7 och 4",0. Vidare är att anmärka, att nivån icke omedelbart gifver deklinationsaxelns lutning, emedan den matematiska rotationsaxeln icke exakt koinciderar med nivelleringstapparnas axel. Kallas nivelleringsaxelns lutning eller deklinationsaxelns apparenta lutning enligt nivån för N, så hafva mina undersökningar visat, att det lutningstal, som skall användas i formlerna, tillräckligt noga blir

$$I_\delta = 20'',5 .\ \operatorname{Sin}(D - 24°) + N,$$

hvarest D = den motsvarande afläsningen på deklinationscirkeln.

Azimuten för instrumentets meridian och optiska axelns kollimation har jag bestämt genom passager af en polstjerna nära meridianen i refraktorns båda lägen. Afläsningen af deklinationscirkeln vid samma tillfällen gaf mig då äfven en kontroll-bestämning på φ' och Δ, och öfverensstämmelsen mellan bestämningarna enligt de båda metoderna var i allmänhet fullt tillfredsställande.

Sätt

a = instrumentpolens azimut i tid,

$90° - 15c$ = vinkeln mellan refraktorns optiska axels objektivända och deklinationsaxelns cirkelända,

t_1 och t_2 = de apparenta celesta timvinklarna vid observationen,
så fås tillräckligt approximativt för stjernan öfver polen

$$(12^h - a)\frac{\text{Sin}\,(\varphi - \delta)}{\text{Cos}\,\delta} = \tfrac{1}{2}(T_2 + T_1) - 6^h - \tfrac{1}{2}(t_2 + t_1),$$

$$c = \{\tfrac{1}{2}(T_2 - T_1) - \tfrac{1}{2}(t_2 - t_1) - 6^h\}\,.\,\text{Cos}\,\delta - i\,.\,\text{Sin}\,\delta,$$

då

φ = kupolens polhöjd,

δ = stjernans apparenta deklination, och afläsningarna (T_1 och T_2) på timcirkeln antagas korrigerade för indexfel, refraktion och tubens böjning.

Dessutom fås för stjernan öfver polen den approximativa formeln

$$\varphi' = \varphi + (90° - \delta) - \tfrac{1}{2}(D_2 - D_1) + 57''.\,\text{Tang}\,(D_1 - \varphi) + \beta\,.\,\text{Sin}\,(D_1 - \varphi),$$

då

β = den vinkel, med hvilken objektivändans böjning öfverträffar okulärändans, och böjningen helt enkelt antages variera proportionelt mot sinus för zenitafståndet.

Deklinationscirkelns indexfel fås enligt

$$\Delta = 90° - \tfrac{1}{2}(D_1 + D_2).$$

Innan jag anförer de numeriska angifvelserna öfver refraktorns stånd, bör jag anmärka, att instrumentet demonterades fullständigt under loppet af sommaren 1866, för att rengöras, och att samma operation till följd af tillfälliga omständigheter åter måste upprepas redan under sommaren 1870. Vid båda tillfällena uttogos äfven objektiv-linserna ur sin fattning och afputsades. Sedan instrumentet åter blifvit uppställdt, centrerades objektivet såväl i förhållande till okuläret med vanlig centreringsapparat som med afseende på begge linsernas ställning till hvarandra, då detta objektiv är så monteradt, att det i allmänhet erfordrar denna dubbla justering. Då det till följd af stativets ovanliga höjd skulle vara ytterligt besvärligt att centrera tuben med objektivet åt zenit, så har jag alltid funnit mig nödgad att utföra denna operation med tuben i horisontelt läge, ehuru detta äfven är ganska obeqvämt. Genom att sålunda undersöka tubens centrering i motsatta horisontela lägen har jag emellertid kunnat förvissa mig om, att dess böjning icke har någon märkbar inverkan på centreringen. Att de relativa böjningstalen äfven äro ganska små, finner man af felförteckningen i det följande.

Till följd af tillfälliga omständigheter sönderfaller, såsom man ser, refraktorns återstående felserier under den här ifrågavarande tiden i fyra särskilda perioder, ehuru monteringen är så säker, att dessa fel på tubens kollimation när knappt skulle hafva lidit några märkbara förändringar under loppet af de ifrågavarande fem åren, ifall instrumentets stånd icke varit utsatt för några afsigtliga modifikationer under samma tid. I de här följande tabellerna äro felen uttryckta i bågminuter och $s = \varphi - \varphi'$ samt $\Delta a = 60\,(180° - 15a)$. Såsom man ser, hafva instrumentets fel hela tiden varit så små, att de äro utan någon egentlig betydelse för reduktionen af observationerna. Öfverensstämmelsen mellan talen inom samma period är äfven ganska god, och de små återstående afvikelserna skulle sannolikt till större delen hafva eliminerats, ifall hvarje bestämning baserats på ett större antal enskilda observationsmoment; men jag har med afsigt icke velat offra mera tid på dessa undersökningar, än som för ändamålet kunde anses nödvändigt. Att variationerna i tubens kollimation synas hafva varit något märkbarare, kan vid en större refraktor som denna ej öfverraska, och de förklaras dessutom vanligen genom tillfälliga förhållanden.

Tab. I.

Observationstid.	s	$\varDelta a$	i	c	β
1866 Augusti	+ 0',23	− 2',65	+ 0',09	+ 0',18	
—— December	+ 0',33	− 2',32	+ 0',11	+ 0',05	
1867 Juli	+ 0'.30	− 2',33	+ 0'.14	+ 0'.56	
Medium	+ 0',29	− 2',43	+ 0',11	+ 0',26	+ 0',3

Refraktorn justerades med afseende på $\varDelta a$, i (i sammanhang med deklinationsaxelns oljning) och c.

Tab. II.

Observationstid.	s	$\varDelta a$	i	c	β
1867 Juli	+ 0',33	+ 0',48	+ 0',22	+ 0',35	
—— Oktober	+ 0',25	+ 0',66	+ 0',17	+ 0',34	
1868 April—Maj	+ 0',25	+ 0',41	+ 0'.18	− 0',14	+ 0',30
—— Juni	+ 0',28	+ 0',38	+ 0'.18	+ 0'.24	
Medium	+ 0',28	+ 0',48	+ 0',19	+ 0',20	+ 0',30

En ny mikrometer apterades till refraktorn, och i sammanhang dermed modifierades alla refraktorns fel.

Tab. III.

Observationstid.	s	$\varDelta a$	i	c	β
1868 Juli	− 0',11	+ 0',16	− 0',09	+ 0',09	+ 0',57
—— Aug., Sept.	− 0',05	+ 0',33	− 0',26	+ 0',15	+ 0',33
—— Oktober	− 0',35	+ 0',49	− 0',15	− 0',07	+ 0',32
1869 Februari	− 0',25	+ 0',22	− 0',14	− 0',43	+ 0',28
—— Juni	− 0',10	+ 0',24	− 0',03	− 0',29	+ 0',28
Efter afputsning och oljning af deklinationsaxeln erhölls vidare					
1869 Juni, Juli	− 0',15	+ 0',11	+ 0',10	− 0',37	+ 0',38
—— Augusti	− 0',13	+ 0',24	− 0',06	− 0',25	+ 0',47
—— December	——	——	− 0',21	——	——
1870 Mars	− 0',18	+ 0',23	− 0',23	− 1',11	——
—— Maj, Juni	+ 0',05	+ 0',10	+ 0',01	− 0',81	+ 0',42
Medium	− 0'.14	+ 0',24	− 0,11	− 0',34	+ 0',38

Refraktorn derefter fullständigt demonterad. Efter ny uppställning och justering, då äfven en af de starka ringar, som fasthålla tuben i bärröret, blifvit hårdare åtdragen, emedan böjnings-talen på sista tiden visat sig något för stora, erhölls följande fel-serie

Tab. IV.

Observationstid.		s	Δa	i	c	β
1870	Augusti	$+0',03$	$+0',20$	$-0',10$	$-0',23$	$+0',22$
——	September	$+0',18$	$+0',16$	$+0',11$	$-0',30$	$+0',20$
1871	Mars	$+0',22$	$+0',05$	$-0',06$	$-0',84$	——
——	April	$+0',22$	——	$+0',08$	——	$+0',10$
——	Maj	$+0',22$	$+0',41$	$-0',02$	$-0',60$	——
——	Juni	$+0',23$	$+0',14$	$-0',05$	$-0',43$	$+0',35$
——	Juli	$+0',23$	$+0',09$	$-0',14$	$-0',01$	——
——	Augusti	$+0',18$	$+0',27$	$-0',13$	$+0',46$	$+0',18$
——	September	——	——	$-0',16$	——	——
——	Oktober	$+0',03$	$-0',04$	$-0',05$	$+0',72$	$+0',18$
——	November	$+0',37$	$+0',38$	$-0',01$	$+0',48$	——
——	December	$+0',15$	$+0',31$	$+0',18$	$+0',11$	$+0',10$
Media	(hösten 1870)	$+0',10$	$+0',18$	$0',00$	$-0',27$	$+0',21$
	1871	$+0',22$	$+0',20$	$-0',04$	$\begin{cases} -0',47\,^{1)} \\ +0',44\,^{2)} \end{cases}$	$+0',18$

1) Januari—Juli.
2) Augusti—December

Mikrometerhåret sprang af obekant orsak tvänne gånger under år 1871 — i Januari och September, så att mikrometern vid dessa tillfällen varit partielt demonterad.

§ 3.

Såsom variationerna i refraktorns stånd öfver hufvud varit mycket små, så har äfven *instrument-parallelen* egt en stor konstanthet. Under de första åren af instrumentets användning visade sig dock delvis svårförklarliga irregulariteter i de qvantiteter, som bestämma instrumentets stånd, till följd hvaraf jag ansåg det för rådligast att alltid direkte referera observationerna till den apparenta celesta parallelen, vid hvarje observation bestämd genom *stjern-passager utefter det stillastående parallel-håret.* De sålunda erhållna parallel-talen egde emellertid i allmänhet en god öfverensstämmelse sinsemellan, och hvilket således syntes bevisa, att de skenbara variationerna i instrumentets stånd icke hade någon inverkan på dem. Detta förklarades slutligen äfven derigenom, att de ifrågavarande irregulariteterna hufvudsakligen befunnos bero på vissa torsioner i instrumentets graderade cirklar. Efter några enklare förändringar i konstruktionen och iakttagande af vederbörliga försigtighetsmått vid bestämning af instrumentets stånd har öfverensstämmelsen mellan bestämningarna, såsom jag redan uppvisat i § 2, blifvit fullkomligt tillfredsställande. Ehuru således något tvifvel med afseende på parallel-bestämningarnas komparabilitet numera ej återstår, så har jag dock fortfarande bestämt parallelen genom stjern-passager utefter det stillstående parallel-håret.

För att evaluera *sannolika felet i en parallel-bestämning* och erhålla de qvantiteter, medelst hvilka den *sannolika parallelen* kan beräknas, har jag gått till väga på följande sätt.

Sätt *korrektionen för positions-cirkelns indexfel*, då tuben är instäld i timvinkeln t och deklinationen δ, alltefter som tuben är i positionen I eller II,

$$= I \pm A_0 \,.\, p \pm A_1 \,.\, \lambda,$$

hvarest I är indexfelets konstanta term, p och λ konstanter beroende på nollpunktens möjliga förflyttning genom tyngdens inverkan, A_0 och A_1 koefficienter beroende på tubens ställning, nämligen

$$A_0 = \operatorname{Sin} n \,.\, \operatorname{Cos}(N + \delta),$$
$$A_1 = \operatorname{Cos} n,$$

hvarest

$$\operatorname{Cos} n = [9\,.\,70082] \,.\, \operatorname{Sin} t,$$
$$\operatorname{Sin} n \,.\, \operatorname{Sin} N = [9\,.\,70082] \,.\, \operatorname{Cos} t,$$
$$\operatorname{Sin} n \,.\, \operatorname{Cos} N = [9\,.\,93691].$$

Sätt vidare

$$A_2 = s \,.\, \frac{\operatorname{Sin}(\theta + t)}{\operatorname{Cos}\theta} \,.\, \operatorname{Sec}\delta + \beta \,.\, \operatorname{Cos}\varphi \,.\, \operatorname{Tang}\delta \,.\, \operatorname{Sin} t,$$
$$A_3 = c \,.\, \operatorname{tang}\delta + i \,.\, \operatorname{Sec}\delta,$$
$$A_4 = [9\,.\,974] \,.\, \frac{\operatorname{Cos} N \,.\, \operatorname{Cot} n}{\operatorname{Sin}^2(N + \delta) \,.\, \operatorname{Cos}\delta},$$

hvarest

$$s = \varphi - \varphi',$$
$$\operatorname{tang}\theta = \frac{180^\circ - a}{s} \cdot \operatorname{Cos}\varphi.$$

Man har då, för en godtycklig parallel-bestämning, följande relation mellan afläsningen på positions-cirkeln och ofvan anförda qvantiteter, alltefter som refraktorn är i positionen I eller II

$$I \pm A_0 \,.\, p \pm A_1 \,.\, \lambda = \left.\begin{matrix}360^\circ\\180^\circ\end{matrix}\right\} - \text{afläsningen} + A_2 \pm A_3 + A_4,$$

hvarest alla qvantiteterna — utom I, p, λ — kunna beräknas eller äro omedelbart gifna enligt det föregående. Koefficienterna A_0 och A_1 samt refraktions-termen A_4 erhållas direkte ur tabeller för observations-orten med timvinkeln och deklinationen såsom argument.

Hvarje parallel-bestämning gifver således, för evaluerandet af de 3 återstående obekanta, en eqvation af formen

$$I \pm A_0 \,.\, p \pm A_1 \,.\, \lambda + M = \varepsilon,$$

alltefter som refraktorn är i positionen I eller II; och ur alla parallel-bestämningarna inom samma observations-period, under hvilken nollpunkten icke blifvit förändrad, fås således en serie af konditions-eqvationer af denna form, hvilka gifva de *sannolika värdena på I, p* och λ under samma tid.

De under här ifrågavarande tid erhållna *konditions-eqvationerna för parallel-bestämningen* följa nedan kronologiskt ordnade och sammanstälda efter de särskilda observations-perioderna.

I. *Konditions-Eqvationer hösten 1866.*

1866 Sept. 15	$I + 0,74\,.\,p + 0,21\,.\,\lambda + 6',4 = \varepsilon$	1866 Okt. 15	$I + 0,74\,.\,p + 0,00\,.\,\lambda + 6',1 = \varepsilon$
—— 27	$I + 0,79\,.\,p + 0,50\,.\,\lambda + 3,7 = \varepsilon$	—— 16	$I + 0,74\,.\,p - 0,03\,.\,\lambda + 9,6 = \varepsilon$
—— 28	$I + 0,77\,.\,p + 0,51\,.\,\lambda + 8,4 = \varepsilon$	—— 17	$I + 0,71\,.\,p + 0,43\,.\,\lambda + 9,9 = \varepsilon$
—— 29	$I + 0,56\,.\,p + 0,12\,.\,\lambda + 9,3 = \varepsilon$	—— 19	$I + 0,60\,.\,p + 0,32\,.\,\lambda + 12,0 = \varepsilon$
—— 30	$I + 0,60\,.\,p + 0,25\,.\,\lambda + 8,2 = \varepsilon$	—— 20	$I + 0,58\,.\,p + 0,19\,.\,\lambda + 11,0 = \varepsilon$
Okt. 2	$I - 0,71\,.\,p + 0,19\,.\,\lambda + 11,9 = \varepsilon$	—— 22	$I + 0,58\,.\,p + 0,15\,.\,\lambda + 10,2 = \varepsilon$
—— 3	$I - 0,64\,.\,p + 0,00\,.\,\lambda + 9,5 = \varepsilon$	—— 25	$I + 0,56\,.\,p + 0,12\,.\,\lambda + 13,8 = \varepsilon$
—— 4	$I + 0,78\,.\,p + 0,20\,.\,\lambda + 7,4 = \varepsilon$	Nov. 16	$I + 0,63\,.\,p + 0,29\,.\,\lambda + 7,2 = \varepsilon$
—— 11	$I + 0,52\,.\,p + 0,19\,.\,\lambda + 8,6 = \varepsilon$	—— 17	$I + 0,57\,.\,p + 0,20\,.\,\lambda + 11,5 = \varepsilon$

Alla dessa eqvationer tilläggas vigten 1.

II. *Konditions-Eqvationer 1867 Aug. — 1868 Juni.*

		Vigt.			Vigt.
1867 Aug. 13	$I + 0,56\,.\,p + 0,02\,.\,\lambda + 11',4 = \varepsilon$	1	1868 Febr. 16	$I - 0,68\,.\,p + 0,25\,.\,\lambda + 20',7 = \varepsilon$	1
—— —	$I + 0,62\,.\,p + 0,35\,.\,\lambda + 14,6 = \varepsilon$	»	—— 18	$I - 0,80\,.\,p + 0,18\,.\,\lambda + 14,8 = \varepsilon$	5
—— 25	$I - 0,48\,.\,p + 0,43\,.\,\lambda + 12,5 = \varepsilon$	»	—— —	$I - 0,67\,.\,p + 0,23\,.\,\lambda + 15,6 = \varepsilon$	1
—— 26	$I - 0,80\,.\,p + 0,11\,.\,\lambda + 12,3 = \varepsilon$	»	—— 24	$I - 0,47\,.\,p + 0,09\,.\,\lambda + 16,3 = \varepsilon$	»
—— 28	$I - 0,52\,.\,p + 0,25\,.\,\lambda + 12,6 = \varepsilon$	»	—— 25	$I - 0,59\,.\,p + 0,36\,.\,\lambda + 17,1 = \varepsilon$	3
—— 30	$I - 0,73\,.\,p + 0,36\,.\,\lambda + 11,2 = \varepsilon$	»	—— 27	$I - 0,62\,.\,p + 0,46\,.\,\lambda + 16,7 = \varepsilon$	1
Sept. 4	$I - 0,77\,.\,p + 0,26\,.\,\lambda + 12,8 = \varepsilon$	»	—— 28	$I - 0,51\,.\,p + 0,16\,.\,\lambda + 16,4 = \varepsilon$	»
—— 5	$I - 0,60\,.\,p + 0,03\,.\,\lambda + 15,1 = \varepsilon$	»	Mars 3	$I + 0,89\,.\,p + 0,37\,.\,\lambda + 13,7 = \varepsilon$	»
—— 12	$I + 0,56\,.\,p + 0,03\,.\,\lambda + 16,4 = \varepsilon$	»	—— —	$I + 0,95\,.\,p + 0,08\,.\,\lambda + 11,8 = \varepsilon$	»
—— —	$I + 0,69\,.\,p + 0,45\,.\,\lambda + 15,9 = \varepsilon$	»	—— 4	$I + 0,65\,.\,p + 0,49\,.\,\lambda + 12,2 = \varepsilon$	»
—— 26	$I - 0,78\,.\,p + 0,26\,.\,\lambda + 12,9 = \varepsilon$	»	—— 28	$I - 0,50\,.\,p + 0,00\,.\,\lambda + 16,1 = \varepsilon$	»
Okt. 21	$I - 0,56\,.\,p + 0,43\,.\,\lambda + 18,4 = \varepsilon$	»	—— 29	$I - 0,53\,.\,p + 0,14\,.\,\lambda + 16,4 = \varepsilon$	»
—— 22	$I - 0,58\,.\,p + 0,41\,.\,\lambda + 16,4 = \varepsilon$	»	April 8	$I - 0,73\,.\,p - 0,12\,.\,\lambda + 11,7 = \varepsilon$	»
—— 25	$I - 0,62\,.\,p + 0,46\,.\,\lambda + 16,7 = \varepsilon$	»	—— 14	$I + 0,58\,.\,p + 0,41\,.\,\lambda + 11,3 = \varepsilon$	»
Nov. 2	$I + 0,47\,.\,p + 0,13\,.\,\lambda + 12,1 = \varepsilon$	»	—— 27	$I + 0,73\,.\,p + 0,18\,.\,\lambda + 12,1 = \varepsilon$	»
—— 8	$I + 0,57\,.\,p + 0,16\,.\,\lambda + 14,1 = \varepsilon$	»	Maj 9	$I + 0,73\,.\,p + 0,13\,.\,\lambda + 12,2 = \varepsilon$	»
—— 11	$I + 0,56\,.\,p + 0,06\,.\,\lambda + 11,3 = \varepsilon$	»	—— 12	$I - 0,79\,.\,p + 0,50\,.\,\lambda + 12,5 = \varepsilon$	»
—— 13	$I + 0,56\,.\,p + 0,09\,.\,\lambda + 9,2 = \varepsilon$	»	—— —	$I - 0,73\,.\,p + 0,49\,.\,\lambda + 15,6 = \varepsilon$	»
—— —	$I + 0,60\,.\,p + 0,13\,.\,\lambda + 10,8 = \varepsilon$	»	—— —	$I - 0,66\,.\,p + 0,43\,.\,\lambda + 16,5 = \varepsilon$	»
—— —	$I - 0,77\,.\,p + 0,14\,.\,\lambda + 11,4 = \varepsilon$	»	—— 13	$I - 0,77\,.\,p + 0,50\,.\,\lambda + 14,9 = \varepsilon$	»
—— 29	$I + 0,63\,.\,p + 0,11\,.\,\lambda + 10,2 = \varepsilon$	»	—— —	$I - 0,63\,.\,p + 0,38\,.\,\lambda + 16,2 = \varepsilon$	»
Dec. 7	$I + 0,57\,.\,p + 0,20\,.\,\lambda + 7,0 = \varepsilon$	»	—— 22	$I - 0,70\,.\,p + 0,43\,.\,\lambda + 17,3 = \varepsilon$	2
—— 8	$I + 0,59\,.\,p + 0,29\,.\,\lambda + 11,8 = \varepsilon$	»	Juni 2	$I - 0,70\,.\,p + 0,47\,.\,\lambda + 14,1 = \varepsilon$	1
1868 Jan. 16	$I - 0,49\,.\,p + 0,30\,.\,\lambda + 19,8 = \varepsilon$	»	—— —	$I - 0,62\,.\,p + 0,37\,.\,\lambda + 13,1 = \varepsilon$	»
—— —	$I - 0,46\,.\,p + 0,27\,.\,\lambda + 18,8 = \varepsilon$	»	—— 10	$I - 0,77\,.\,p + 0,12\,.\,\lambda + 13,2 = \varepsilon$	15
Febr. 9	$I + 0,52\,.\,p + 0,50\,.\,\lambda + 13,6 = \varepsilon$	»	—— —	$I + 0,73\,.\,p + 0,04\,.\,\lambda + 11,6 = \varepsilon$	5

III. Konditions-Eqvationer 1868 Juli — 1870 Juni.

1868 Juli 24	$I + 0,75 . p + 0,25 . \lambda + 13',1 = \varepsilon$
—— 26	$I - 0,57 . p + 0,19 . \lambda + 15,8 = \varepsilon$
—— —	$I - 0,56 . p + 0,03 . \lambda + 15,6 = \varepsilon$
—— 27	$I - 0,57 . p + 0,18 . \lambda + 13,8 = \varepsilon$
—— —	$I - 0,56 . p - 0,07 . \lambda + 16,5 = \varepsilon$
Aug. 4	$I + 0,56 . p + 0,07 . \lambda + 12,6 = \varepsilon$
—— 11	$I + 0,68 . p + 0,43 . \lambda + 11,7 = \varepsilon$
—— 13	$I + 0,62 . p + 0,30 . \lambda + 12,2 = \varepsilon$
—— 17	$I + 0,56 . p + 0,00 . \lambda + 12,7 = \varepsilon$
—— 30	$I + 0,56 . p + 0,03 . \lambda + 15,1 = \varepsilon$
—— —	$I + 0,59 . p + 0,26 . \lambda + 12,8 = \varepsilon$
Sept. 3	$I + 0,56 . p + 0,06 . \lambda + 12,0 = \varepsilon$
—— —	$I + 0,66 . p + 0,43 . \lambda + 14,2 = \varepsilon$
—— 4	$I + 0,56 . p + 0,08 . \lambda + 18,1 = \varepsilon$
—— —	$I + 0,66 . p + 0,43 . \lambda + 12,2 = \varepsilon$
—— 6	$I + 0,56 . p + 0,04 . \lambda + 13,6 = \varepsilon$
—— —	$I + 0,62 . p + 0,35 . \lambda + 15,1 = \varepsilon$
—— —	$I + 0,66 . p + 0,43 . \lambda + 16,7 = \varepsilon$
—— 7	$I + 0,56 . p + 0,04 . \lambda + 11,6 = \varepsilon$
—— 9	$I - 0,56 . p + 0,18 . \lambda + 16,8 = \varepsilon$
—— 20	$I - 0,70 . p + 0,41 . \lambda + 14,7 = \varepsilon$
—— —	$I - 0,62 . p - 0,06 . \lambda + 12,6 = \varepsilon$
—— 22	$I - 0,54 . p + 0,30 . \lambda + 13,0 = \varepsilon$
Okt. 1	$I + 0,58 . p + 0,20 . \lambda + 18,4 = \varepsilon$
—— —	$I + 0,65 . p + 0,40 . \lambda + 14,9 = \varepsilon$
—— 2	$I + 0,56 . p + 0,08 . \lambda + 12,6 = \varepsilon$
—— 17	$I - 0,69 . p + 0,14 . \lambda + 12,9 = \varepsilon$
—— 26	$I + 0,56 . p + 0,12 . \lambda + 15,5 = \varepsilon$
Nov. 2	$I + 0,56 . p + 0,12 . \lambda + 18,5 = \varepsilon$
—— 4	$I + 0,63 . p + 0,38 . \lambda + 17,0 = \varepsilon$
—— 5	$I + 0,82 . p + 0,43 . \lambda + 16,1 = \varepsilon$
—— 11	$I + 0,62 . p + 0,04 . \lambda + 11,6 = \varepsilon$
Dec. 9	$I + 0,85 . p - 0,12 . \lambda + 12,8 = \varepsilon$
1869 Jan. 7	$I + 0,70 . p + 0,00 . \lambda + 11,6 = \varepsilon$
—— 10	$I + 0,74 . p + 0,50 . \lambda + 15,6 = \varepsilon$
—— 18	$I - 0,54 . p + 0,40 . \lambda + 20,2 = \varepsilon$
—— 21	$I + 0,31 . p + 0,36 . \lambda + 19,9 = \varepsilon$
—— —	$I + 0,45 . p + 0,47 . \lambda + 18,7 = \varepsilon$
—— 27	$I + 0,35 . p + 0,40 . \lambda + 21,8 = \varepsilon$
Febr. 2	$I - 0,47 . p - 0,02 . \lambda + 20,5 = \varepsilon$
—— 4	$I - 0,85 . p + 0,14 . \lambda + 21,4 = \varepsilon$
—— 21	$I + 0,83 . p + 0,42 . \lambda + 22,3 = \varepsilon$
Mars 1	$I - 0,60 . p - 0,04 . \lambda + 16,5 = \varepsilon$
—— 6	$I - 0,46 . p + 0,21 . \lambda + 19,8 = \varepsilon$
—— 14	$I - 0,53 . p + 0,43 . \lambda + 22,3 = \varepsilon$
—— 28	$I - 0,32 . p + 0,50 . \lambda + 17,7 = \varepsilon$
—— 30	$I - 0,57 . p + 0,03 . \lambda + 18,6 = \varepsilon$
—— 31	$I - 0,61 . p + 0,32 . \lambda + 18,1 = \varepsilon$
1869 Apr. 12	$I + 0,85 . p + 0,39 . \lambda + 18',3 = \varepsilon$
—— 21	$I + 0,79 . p + 0,41 . \lambda + 21,1 = \varepsilon$
—— 22	$I + 0,75 . p - 0,14 . \lambda + 20,8 = \varepsilon$
Juni 19	$I + 0,67 . p + 0,25 . \lambda + 19,7 = \varepsilon$
—— —	$I - 0,79 . p + 0,25 . \lambda + 21,8 = \varepsilon$
Juli 13	$I - 0,58 . p + 0,25 . \lambda + 21,0 = \varepsilon$
—— —	$I - 0,56 . p - 0,01 . \lambda + 21,1 = \varepsilon$
—— 15	$I - 0,59 . p + 0,27 . \lambda + 18,5 = \varepsilon$
—— —	$I - 0,56 . p - 0,02 . \lambda + 20,6 = \varepsilon$
—— 22	$I - 0,56 . p - 0,06 . \lambda + 18,5 = \varepsilon$
Aug. 3	$I - 0,62 . p + 0,37 . \lambda + 21,3 = \varepsilon$
—— 13	$I + 0,58 . p + 0,24 . \lambda + 17,3 = \varepsilon$
—— 15	$I + 0,56 . p - 0,06 . \lambda + 16,7 = \varepsilon$
—— 25	$I + 0,62 . p + 0,35 . \lambda + 15,1 = \varepsilon$
—— 27	$I + 0,59 . p + 0,25 . \lambda + 18,3 = \varepsilon$
—— 30	$I + 0,77 . p + 0,19 . \lambda + 20,2 = \varepsilon$
—— 31	$I + 0,78 . p + 0,23 . \lambda + 14,0 = \varepsilon$
Sept. 4	$I + 0,49 . p + 0,43 . \lambda + 15,1 = \varepsilon$
—— 10	$I + 0,79 . p + 0,12 . \lambda + 17,3 = \varepsilon$
—— 17	$I + 0,56 . p + 0,08 . \lambda + 14,6 = \varepsilon$
—— 30	$I + 0,68 . p + 0,33 . \lambda + 15,0 = \varepsilon$
Okt. 3	$I + 0,77 . p + 0,46 . \lambda + 16,7 = \varepsilon$
—— 25	$I + 0,57 . p - 0,18 . \lambda + 18,4 = \varepsilon$
Nov. 6	$I + 0,85 . p - 0,08 . \lambda + 12,7 = \varepsilon$
—— 11	$I + 0,58 . p + 0,21 . \lambda + 20,4 = \varepsilon$
—— 28	$I - 0,49 . p + 0,23 . \lambda + 17,3 = \varepsilon$
Dec. 12	$I + 0,60 . p + 0,32 . \lambda + 18,7 = \varepsilon$
—— 17	$I + 0,73 . p + 0,49 . \lambda + 16,4 = \varepsilon$
—— 27	$I - 0,48 . p + 0,19 . \lambda + 16,2 = \varepsilon$
1870 Jan. 19	$I + 0,66 . p + 0,36 . \lambda + 14,5 = \varepsilon$
Febr. 17	$I + 0,58 . p + 0,41 . \lambda + 15,4 = \varepsilon$
—— 23	$I + 0,69 . p + 0,50 . \lambda + 16,7 = \varepsilon$
Mars 5	$I - 0,52 . p + 0,38 . \lambda + 24,6 = \varepsilon$
—— 7	$I - 0,64 . p + 0,07 . \lambda + 20,2 = \varepsilon$
—— 11	$I - 0,75 . p + 0,25 . \lambda + 21,7 = \varepsilon$
—— 28	$I + 0,66 . p + 0,15 . \lambda + 18,9 = \varepsilon$
—— 29	$I + 0,77 . p + 0,49 . \lambda + 22,5 = \varepsilon$
—— 30	$I + 0,77 . p + 0,42 . \lambda + 17,8 = \varepsilon$
Apr. 1	$I + 0,77 . p + 0,41 . \lambda + 21,7 = \varepsilon$
—— 18	$I + 0,81 . p + 0,31 . \lambda + 24,1 = \varepsilon$
—— —	$I + 0,43 . p + 0,26 . \lambda + 20,9 = \varepsilon$
—— 19	$I + 0,65 . p + 0,42 . \lambda + 21,3 = \varepsilon$
—— 21	$I + 0,70 . p - 0,07 . \lambda + 21,2 = \varepsilon$
—— 27	$I + 0,84 . p + 0,12 . \lambda + 18,7 = \varepsilon$
—— 30	$I + 0,61 . p + 0,40 . \lambda + 18,5 = \varepsilon$
Maj 9	$I - 0,72 . p + 0,42 . \lambda + 23,3 = \varepsilon$
—— —	$I - 0,70 . p + 0,38 . \lambda + 23,0 = \varepsilon$
—— —	$I - 0,69 . p + 0,46 . \lambda + 19,5 = \varepsilon$

III. Konditions-Eqvationer 1868 Juli — 1870 Juni. Forts.

1870 Maj 29	$I - 0{,}70 \,.\, p + 0{,}47 \,.\, \lambda + 22',7 = \varepsilon$	1870 Juni 2	$I - 0{,}69 \,.\, p + 0{,}46 \,.\, \lambda + 25',5 = \varepsilon$
—— —	$I - 0{,}70 \,.\, p + 0{,}47 \,.\, \lambda + 19{,}7 = \varepsilon$	—— 8	$I - 0{,}33 \,.\, p + 0{,}34 \,.\, \lambda + 17{,}8 = \varepsilon$
—— —	$I - 0{,}62 \,.\, p + 0{,}35 \,.\, \lambda + 20{,}7 = \varepsilon$	—— —	$I - 0{,}32 \,.\, p + 0.33 \,.\, \lambda + 21{,}8 = \varepsilon$

Alla eqvationerna inom denna period hafva vigten 1.

IV. Konditions-Eqvationer. Hösten 1870.

		Vigt.			Vigt.
1870 Juli 30	$I + 0{,}62 \,.\, p + 0{,}28 \,.\, \lambda + 18',0 = \varepsilon$	1	1870 Sept. 29	$I + 0{,}67 \,.\, p + 0{,}43 \,.\, \lambda + 22',3 = \varepsilon$	1
Aug. 6	$I + 0{,}71 \,.\, p + 0{,}46 \,.\, \lambda + 18{,}0 = \varepsilon$	»	—— —	$I + 0{,}68 \,.\, p + 0{,}44 \,.\, \lambda + 19{,}2 = \varepsilon$	»
—— 8	$I + 0{,}58 \,.\, p + 0{,}43 \,.\, \lambda + 18{,}6 = \varepsilon$	»	Okt. 3	$I + 0{,}57 \,.\, p + 0{,}04 \,.\, \lambda + 18{,}2 = \varepsilon$	»
—— 29	$I + 0{,}56 \,.\, p + 0{,}03 \,.\, \lambda + 17{,}5 = \varepsilon$	»	—— 4	$I + 0{,}71 \,.\, p + 0{,}48 \,.\, \lambda + 16{,}8 = \varepsilon$	»
Sept. 1	$I + 0{,}56 \,.\, p + 0{,}12 \,.\, \lambda + 22{,}3 = \varepsilon$	»	—— 6	$I + 0{,}56 \,.\, p + 0{,}11 \,.\, \lambda + 20{,}4 = \varepsilon$	»
—— 4	$I + 0{,}56 \,.\, p + 0{,}06 \,.\, \lambda + 20{,}4 = \varepsilon$	»	—— 12	$I + 0{,}62 \,.\, p + 0{,}36 \,.\, \lambda + 19{,}7 = \varepsilon$	»
—— 11	$I + 0{,}89 \,.\, p + 0{,}11 \,.\, \lambda + 17{,}3 = \varepsilon$	»	Nov. 2	$I + 0{,}56 \,.\, p + 0{,}07 \,.\, \lambda + 21{,}4 = \varepsilon$	»
—— 12	$I + 0{,}56 \,.\, p + 0{,}07 \,.\, \lambda + 19{,}4 = \varepsilon$	»	—— —	$I + 0{,}64 \,.\, p + 0{,}38 \,.\, \lambda + 19{,}6 = \varepsilon$	»
—— 16	$I + 0{,}56 \,.\, p + 0{,}13 \,.\, \lambda + 20{,}3 = \varepsilon$	»	—— 13	$I + 0{,}56 \,.\, p + 0{,}08 \,.\, \lambda + 15{,}4 = \varepsilon$	»
—— —	$I + 0{,}75 \,.\, p + 0{,}50 \,.\, \lambda + 20{,}0 = \varepsilon$	»	—— 26	$I \quad 0{,}76 \,.\, p + 0{,}38 \,.\, \lambda + 23{,}6 = \varepsilon$	6
—— 17	$I + 0{,}75 \,.\, p + 0{,}50 \,.\, \lambda + 19{,}0 = \varepsilon$	»	—— 27	$I - 0{,}73 \,.\, p + 0{,}46 \,.\, \lambda + 20{,}3 = \varepsilon$	3
—— 23	$I + 0{,}57 \,.\, p + 0{,}15 \,.\, \lambda + 20{,}3 = \varepsilon$	»	—— —	$I + 0{,}58 \,.\, p + 0{,}24 \,.\, \lambda + 18{,}6 = \varepsilon$	1
—— —	$I + 0{,}68 \,.\, p + 0{,}45 \,.\, \lambda + 18{,}1 = \varepsilon$	»	Dec. 1	$I + 0{,}68 \,.\, p + 0{,}44 \,.\, \lambda + 19{,}2 = \varepsilon$	»
—— 25	$I + 0{,}70 \,.\, p + 0{,}46 \,.\, \lambda + 21{,}0 = \varepsilon$	»	—— 4	$I + 0{,}72 \,.\, p + 0{,}49 \,.\, \lambda + 17{,}6 = \varepsilon$	»
—— 26	$I + 0.54 \,.\, p + 0{,}03 \,.\, \lambda + 17{,}5 = \varepsilon$	»	—— 10	$I + 0{,}62 \,.\, p + 0{,}35 \,.\, \lambda + 18.9 = \varepsilon$	»

V. Konditions-Eqvationer 1871.

		Vigt.			Vigt.
1871 Jan. 24	$I + 0{,}43 \,.\, p + 0{,}17 \,.\, \lambda + 4',4 = \varepsilon$	1	1871 Juni 13	$I + 0.76 \,.\, p + 0{,}37 \,.\, \lambda + 1',9 = \varepsilon$	3
Mars 4	$I + 0{,}77 \,.\, p + 0{,}43 \,.\, \lambda + 4{,}9 = \varepsilon$	2	—— —	$I - 0{,}66 \,.\, p + 0{,}22 \,.\, \lambda + 7.9 = \varepsilon$	3
—— 5	$I + 0{,}71 \,.\, p + 0{,}47 \,.\, \lambda + 4{,}1 = \varepsilon$	2	Juli 25	$I + 0{,}67 \,.\, p + 0{,}32 \,.\, \lambda + 5{,}3 = \varepsilon$	3
—— 7	$I + 0{,}65 \,.\, p + 0{,}49 \,.\, \lambda + 4{,}9 = \varepsilon$	1	—— —	$I - 0{,}38 \,.\, p + 0{,}38 \,.\, \lambda + 6{,}8 = \varepsilon$	3
—— 17	$I - 0{,}75 \,.\, p + 0{,}00 \,.\, \lambda + 7{,}8 = \varepsilon$	»	Aug. 8	$I + 0{,}58 \,.\, p + 0{,}22 \,.\, \lambda + 3{,}3 = \varepsilon$	2
—— 24	$I - 0{,}76 \,.\, p + 0{,}00 \,.\, \lambda + 6{,}8 = \varepsilon$	»	—— 9	$I + 0{,}57 \,.\, p + 0{,}12 \,.\, \lambda + 2{,}0 = \varepsilon$	2
—— 26	$I - 0{,}48 \,.\, p + 0{,}25 \,.\, \lambda + 7.0 = \varepsilon$	»	—— —	$I - 0{,}78 \,.\, p + 0{,}44 \,.\, \lambda + 6{,}7 = \varepsilon$	6
Apr. 8	$I + 0{,}77 \,.\, p + 0{,}25 \,.\, \lambda + 4{,}8 = \varepsilon$	»	—— 13	$I + 0.56 \,.\, p - 0{,}02 \,.\, \lambda + 2.7 = \varepsilon$	1
—— 13	$I + 0{,}81 \,.\, p + 0{,}42 \,.\, \lambda + 4{,}3 = \varepsilon$	»	—— —	$I + 0{,}60 \,.\, p + 0{,}30 \,.\, \lambda + 3{,}6 = \varepsilon$	»
—— 18	$I + 0{,}59 \,.\, p + 0{,}42 \,.\, \lambda + 6{,}7 = \varepsilon$	»	—— —	$I - 0{,}84 \,.\, p + 0{,}44 \,.\, \lambda + 7{,}7 = \varepsilon$	3
—— 22	$I + 0{,}80 \,.\, p + 0{,}22 \,.\, \lambda + 3{,}8 = \varepsilon$	»	—— 15	$I + 0{,}56 \,.\, p - 0{,}05 \,.\, \lambda + 0{,}8 = \varepsilon$	2
—— 23	$I + 0{,}70 \,.\, p - 0{,}13 \,.\, \lambda + 5.6 = \varepsilon$	»	—— —	$I + 0{,}62 \,.\, p + 0{,}35 \,.\, \lambda + 2{,}4 = \varepsilon$	1
—— 26	$I + 0{,}81 \,.\, p - 0{,}16 \,.\, \lambda + 4{,}0 = \varepsilon$	»	—— 20	$I + 0{,}65 \,.\, p + 0{,}41 \,.\, \lambda + 0{,}6 = \varepsilon$	»
—— 27	$I + 0{,}81 \,.\, p + 0{,}21 \,.\, \lambda + 1.8 = \varepsilon$	»	—— 22	$I + 0{,}56 \,.\, p + 0{,}02 \,.\, \lambda + 0{,}2 = \varepsilon$	»
—— 28	$I + 0{,}79 \,.\, p + 0{,}30 \,.\, \lambda + 2{,}5 = \varepsilon$	»	—— 23	$I + 0{,}56 \,.\, p - 0{,}05 \,.\, \lambda + 5{,}3 = \varepsilon$	»
Maj 8	$I - 0{,}72 \,.\, p + 0{,}49 \,.\, \lambda + 5{,}8 = \varepsilon$	2	—— 24	$I + 0{,}56 \,.\, p + 0{,}02 \,.\, \lambda + 3{,}2 = \varepsilon$	»
—— 21	$I - 0{,}68 \,.\, p + 0{,}45 \,.\, \lambda + 6{,}2 = \varepsilon$	2	—— —	$I + 0{,}68 \,.\, p + 0{,}44 \,.\, \lambda - 0{,}2 = \varepsilon$	»
—— 23	$I - 0{,}60 \,.\, p + 0{,}32 \,.\, \lambda + 6{,}9 = \varepsilon$	1	—— 27	$I + 0{,}56 \,.\, p + 0{,}03 \,.\, \lambda + 0{,}2 = \varepsilon$	»
—— 24	$I - 0{,}75 \,.\, p + 0{,}50 \,.\, \lambda + 11{,}4 = \varepsilon$	»	—— —	$I + 0{,}65 \,.\, p + 0{,}41 \,.\, \lambda + 3{,}1 = \varepsilon$	»

V. Konditions-Eqvationer 1871. Forts.

		Vigt.			Vigt.
1871 Aug. 28	$I+0,57\,.\,p+0,12\,.\,\lambda+4',0=\varepsilon$	2	1871 Okt. 5	$I+0,56\,.\,p+0,05\,.\,\lambda-0',9=\varepsilon$	1
— —	$I-0,32\,.\,p+0,29\,.\,\lambda+4,2=\varepsilon$	3	— 14	$I+0,57\,.\,p+0,16\,.\,\lambda+0,4=\varepsilon$	»
— —	$I-0,66\,.\,p+0,22\,.\,\lambda+4,5=\varepsilon$	3	Nov. 1	$I+0,57\,.\,p+0,13\,.\,\lambda+2,5=\varepsilon$	»
— 31	$I+0,69\,.\,p+0,46\,.\,\lambda-0,8=\varepsilon$	1	— 3	$I+0\ 56\,.\,p-0,01\,.\,\lambda+3,7=\varepsilon$	»
Sept. 1	$I+0,73\,.\,p+0,49\,.\,\lambda-0,9=\varepsilon$	»	— 5	$I+0,56\,.\,p+0,06\,.\,\lambda+0,6=\varepsilon$	»
— 3	$I-0,73\,.\,p+0,33\,.\,\lambda+6,4=\varepsilon$	6	— 6	$I+0,56\,.\,p+0,10\,.\,\lambda-1,5=\varepsilon$	»
— 6	$I+0,57\,.\,p+0,14\,.\,\lambda+2,9=\varepsilon$	1	— 9	$I+0,56\,,\,p+0,10\,.\,\lambda+1,5=\varepsilon$	»
— —	$I+0,70\,.\,p+0,17\,.\,\lambda-1,6=\varepsilon$	»	— 10	$I+0,57\,.\,p+0,16\,.\,\lambda-0,6=\varepsilon$	»
— 8	$I+0,57\,.\,p+0,14\,.\,\lambda+1,9=\varepsilon$	»	— —	$I-0,58\,.\,p+0,16\,.\,\lambda+5,4=\varepsilon$	2
— 17	$I+0,60\,.\,p+0,32\,.\,\lambda-0,5=\varepsilon$	»	— 13	$I+0,56\,.\,p+0,03\,.\,\lambda+3,7=\varepsilon$	1
— 24	$I+0,57\,.\,p+0,16\,.\,\lambda+3,9=\varepsilon$	»	— —	$I-0,75\,.\,p+0,38\,.\,\lambda+6,5=\varepsilon$	5
— —	$I+0,70\,.\,p+0,47\,.\,\lambda-1,6=\varepsilon$	»	— 19	$I+0,74\,.\,p+0,45\,.\,\lambda-3,1=\varepsilon$	1
— 27	$I+0,58\,.\,p+0,21\,.\,\lambda-0,2=\varepsilon$	»	— —	$I-0,72\,.\,p+0.28\,.\,\lambda+4,1=\varepsilon$	3
— —	$I+0,69\,.\,p+0,46\,.\,\lambda+1,6=\varepsilon$	»	— 20	$I+0,75\,.\,p+0,45\,.\,\lambda+0,8=\varepsilon$	1
— 30	$I+0,57\,.\,p+0,17\,.\,\lambda-2,1=\varepsilon$	»	— —	$I-0,45\,.\,p+0,19\,.\,\lambda+4,8=\varepsilon$	3
Okt. 1	$I+0,57\,.\,p+0,12\,.\,\lambda+3,0=\varepsilon$	»	— 30	$I+0,56\,.\,p+0,40\,.\,\lambda+0,3=\varepsilon$	1
— —	$I+0,69\,.\,p+0,45\,.\,\lambda-2,3=\varepsilon$	»	Dec. 9	$I+0,65\,.\,p+0,41\,.\,\lambda-1,9=\varepsilon$	»
— 2	$I+0,56\,.\,p+0,00\,.\,\lambda-0,8=\varepsilon$	»	— 13	$I-0,78\,.\,p+0,20\,.\,\lambda+3,0=\varepsilon$	5
— —	$I+0,68\,.\,p+0,44\,.\,\lambda-2,2=\varepsilon$	»	— 17	$I+0,62\,.\,p+0,35\,.\,\lambda-0,1=\varepsilon$	1
— 3	$I+0,56\,.\,p+0,05\,.\,\lambda-0.9=\varepsilon$	»	— —	$I-0,64\,.\,p+0,31\,.\,\lambda+6,8=\varepsilon$	5

Parallel-bestämningarna äro alltid omsorgsfullt utförda med användning af tillräcklig tid och stjernor af passande ljusstyrka, och de böra således i allmänhet vara ganska säkra, oaktadt åtskilliga fall förekomma, då luftförhållandena gjorde det omöjligt att erhålla en fullt skarp bestämning. Men ehuru några under sådana förhållanden utförda bestämningar märkbart kunna föröka sannolika felet i en bestämning, har jag dock ej ansett mig berättigad att här företaga en godtycklig utgalring. Strängt taget är för öfrigt bestämningen af sannolika parallelen, enligt föregående eqvationer, ej att anse för fullkomligt generel, då de flesta eqvationerna hvila på observationer på södra himmelen, hvarest observationerna på stjern-gruppen och mina flesta nebulos-observationer blifvit utförda. Några få parallel-bestämningar på andra punkter af himmelen hafva emellertid ej visat någon märkbar afvikelse, hvilket ej heller var att befara, då tyngdens inverkan på denna refraktors parallel är ganska liten.

Såsom redan i det föregående blifvit angifvit, utbyttes 1868 på sommaren den äldre mikrometern emot en ny. Båda mikrometrarnas positions-cirklar gifva afläsningarna på 1' när, och deras excentricitets-fel äro högst obetydliga. Dessa hafva emellertid blifvit eliminerade ur alla här och i det följande förekommande angifvelser. Det bör dessutom anmärkas, att parallel-bestämningarna alltid blifvit utförda genom bisektion af den använda stjernan, och att dervid vanligen båda hären varit sammanskrufvade till ett. Vid dessa bestämningar har jag i de flesta fall användt 210 gångers förstoring, med ett fält af 12',6, och blott undantagsvis den något svagare förstoringen 160, hvars fält är 13',6.

Vid en inspektion af föregående eqvationer visar det sig ej osannolikt, att I under loppet af de särskilda observations-perioderna lidit små variationer, som äro funktioner af tiden, hvarföre man, vid solution af eqvationerna strängt taget, antingen borde uppdela dessa i grupper omfattande kortare tidsintervaller eller ock i dem införa en ny term beroende af tiden. Men då de ifrågavarande variationerna äro små och i allmänhet osäkra, så att de svårligen kunna skiljas från de tillfälliga felen, så har jag ansett, att dylika modifikationer af räkningen blott skulle komma att föröka räknearbetet utan någon slags motsvarande reel vinst. Jag har således, vid solution af eqvationerna enligt minsta qvadrat-metoden, ej tvekat att behandla alla eqvationerna inom samma period i en enda kalkyl enligt föregående schema. Det kunde slutligen synas oberättigadt att kombinera alla eqvationerna för år 1871 med hvarandra, då mikrometern varit demonterad i September; men denna anmärkning har dock blott skenbar vigt, då ingen märkbar afvikelse förefinnes mellan parallel-talen före och efter ifrågavarande demontering. Den här angifna kombinationen af eqvationerna rättfärdigas äfven slutligen, såsom det skall visa sig, fullkomligt af det värde på sannolika felet i en bestämning, som kalkylen gifver.

En första solution af eqvationerna med de 3 obekanta I, p och λ gifver en ytterligt svag bestämning på λ. Då λ-termen således illa satisfierar samtliga eqvationerna, så har jag vid en ny solution satt $\lambda = 0$, eller, som är detsamma, helt enkelt antagit den här verksamma komposanten af tyngdkraften verka vinkelrätt mot den med eqnator parallela diametern i positions-cirkeln. Denna enklare hypotes synes äfven vara antagen af de fleste observatörer, och bland andra har Bessel utgått från densamma vid härledning af formlerna för Königsberger-Heliometern. En ny solution af eqvationerna för $\lambda = 0$ gifver värden på I och p, som högst obetydligt differera från de i förra fallet erhållna, och förökningen af sannolika felet i vigts-enheten — en enkel parallel-bestämning — är att anse för omärklig.

De sålunda slutligen erhållna resultaten äro:

Tid.	Minimi-Eqvationer.	Sannolika värden.	Sannol. felen i 1 best.
Hösten 1866	$\begin{cases} 18{,}00 \,.\, I + 9{,}12 \,.\, p + 164{,}70 = 0 \\ 9{,}12 \,.\, I + 7{,}90 \,.\, p + 76{,}90 = 0 \end{cases}$	$\left.\begin{array}{l} I = -10',2 \pm 0',58 \\ p = +\ 2',0 \pm 0',88 \end{array}\right\}$	1',6
1867—1868	$\begin{cases} 76{,}99 \,.\, I - 20{,}86 \,.\, p + 1071{,}22 = 0 \\ -20{,}86 \,.\, I + 36{,}09 \,.\, p - 342{,}31 = 0 \end{cases}$	$\left.\begin{array}{l} I = -13',5 \pm 0',19 \\ p = +\ 1',7 \pm 0',27 \end{array}\right\}$	1',8
1868—1870	$\begin{cases} 102{,}00 \,.\, I + 17{,}96 \,.\, p + 1793{,}60 = 0 \\ 17{,}96 \,.\, I + 41{,}35 \,.\, p + 243{,}06 = 0 \end{cases}$	$\left.\begin{array}{l} I = -17',9 \pm 0\ ,23 \\ p = +\ 1',9 \pm 0',35 \end{array}\right\}$	2',2
Hösten 1870	$\begin{cases} 37{,}01 \,.\, I + 11{,}01 \,.\, p + 737{,}70 = 0 \\ 11{,}01 \,,\, I + 16{,}48 \,.\, p + 186{,}26 = 0 \end{cases}$	$\left.\begin{array}{l} I = -20',7 \pm 0',19 \\ p = +\ 2',5 \pm 0',28 \end{array}\right\}$	1',2
1871	$\begin{cases} 127{,}00 \,.\, I + 4{,}07 \,.\, p + 483{,}72 = 0 \\ 4{,}07 \,.\, I + 55{,}50 \,.\, p - 155{,}24 = 0 \end{cases}$	$\left.\begin{array}{l} I = -\ 3',9 \pm 0',12 \\ p = +\ 3',1 \pm 0',19 \end{array}\right\}$	1',8

Sannolika felet i en parallel-bestämning uttryckt i positions-vinkel är således per medium $= 1',72$; och, då det effektiva fältet vid dessa bestämningar med all säkerhet ej kan antagas större än 11′, så följer häraf, att *det sannolika felet i stjernans bisektion vid hvardera ändan af håret* utgjort

$$0'',23,$$

som angifver ett fullt tillfredsställande resultat, då de använda hårens diameter var $= 0'',5$, och man betänker, att många ogynsamma förhållanden dervid inverkat. (Jemf. Struves Mens. Micr. pag. XXVII.)

Ur uppmätningen af deklinations-differenserna mellan de klarare stjernorna i stjerngruppen, hvarvid 320 gångers förstoring blifvit använd, finner man sannolika felet i bisektionen af en sådan stjerna $= 0'',25$, då detta fel naturligtvis blifvit bestämdt så, att de olika förhållandena på de särskilda observations-aftnarna äfven här fått inverka.

Medelst talen i föregående tab. har man således att beräkna de sannolika *inställnings-talen P_0 för sanna parallelen* enligt formeln

$$P_0 = \left.\begin{matrix}360°\\180°\end{matrix}\right\} + [A_2 - I] \pm [A_3 - p \,.\, A_0],$$

allteftersom refraktorn är i positionen I eller II. Enligt denna formel har jag för de särskilda perioderna beräknat följande tabeller för sannolika parallelen, ungefärligen omfattande de vid observationerna på stjerngruppen förekommande timvinklarna. Jag har dervid för alla perioderna per medium antagit p konstant $= + 2',4$.

Tabell öfver sanna Parallelen.

t.	I.	II.	III.	IV.	V. Jan.—Juli.	V. Aug.—Dec.
Refrakt. I.						
-2^h	0° 6′,6	0° 12′,7	0° 16′,4	0° 19′,3	0° 2′,3	0° 2′,8
-1^h	6,4	12,9	16,5	19,4	2,4	2,9
0^h	6,5	13,1	16,5	19,4	2,5	3,0
$+1^h$	6,7	13,1	16,5	19,5	2,6	3,0
$+2^h$	7,0	13,1	16,4	19,4	2,6	3,0
$+3^h$	7,4	13,0	16,3	19,3	2,5	3,0
$+4^h$	7,9	12,9	16,1	19,2	2,4	2,8
$+5^h$	8,4	12,6	16,0	19,0	2,2	2,7
$+6^h$	9,0	12,4	15,8	18,9	2,1	2,5
Refrakt. II.						
$+2^h$	0° 9′,2	0° 15′,3	0° 19′,7	0° 22′,5	0° 5′,9	0° 5,4
$+1^h$	8,8	15,2	19,7	22,5	5,8	5,3
0^h	8,6	15,1	19,7	22,4	5,7	5,3
-1^h	8,6	15,0	19,7	22,4	5,6	5,2
-2^h	8,8	14,9	19,8	22,4	5,6	5,2
-3^h	9,3	14,8	19,8	22,4	5,6	5,2
-4^h	9,9	14,7	19,9	22,4	5,6	5,2
-5^h	10,6	14,7	20,0	22,5	5,7	5,2
-6^h	11,4	14,6	20,0	22,6	5,7	5,3

Då de vid observationerna på stjerngruppen använda parallelerna i hvarje fall föga afvika från dem, som föregående tabeller gifva, och de förekommande differential-koordinaterna äro små, så är den öfver instrument-parallelen utförda räkningen utan någon egentlig betydelse för observationernas reduktion. De erhållna tabellerna äro emellertid ej utan sitt intresse, då de vid första ögonkastet visa, att, till följd af refraktorns noggranna justering och det obetydliga beloppet af den på tyngden beroende parallel-koefficienten, parallelens variationer med timvinkeln äro nästan omärkliga. Då slutligen de i det föregående angifna talen dessutom hafva ådagalaggt, att variationen i nollpunktens läge med årstiderna äfven är högst obetydlig; så är härmed instrument-parallelens säkerhet fullt bevisad och hufvudändamålet med denna undersökning således vunnet.

§ 4.

Den mikrometer, med hvilken det ojemförligt större antalet af mätningarna på stjerngruppen blifvit utfördt, kom icke till användning förr än under loppet af sommaren 1868, ehuru ett tidigare utbyte af mikrometer varit önskvärdt, då den äldre i flere hänseenden bevisat sig vara ett mindre godt instrument. Under de första åren af dess användning visade sig denna mikrometer visserligen i allmänhet rätt tillfredsställande, ehuru såväl sliden som skrufven dock alltid erfordrade en för fin mikrometrisk rörelse alltför styf justering, som dessutom lät befara, att mikrometern till följd af skadlig nötning snart kunde blifva mindre användbar. Oafsedt vissa småningom alltmera framträdande ofullkomligheter i utförandet, bestå de principiela felen i denna mikrometer för öfrigt hufvudsakligen i saknaden af nollpunkts-skruf, finjusterings-apparat för mikrometer-hårens relativa ställning och okulär-slid; hvartill dessutom kommer nödvändigheten att använda en ensidig och obeqväm hårbelysning. Då här tvänne mikrometrar förekomma, så skall jag i det följande beteckna den äldre med I och den nya med II.

Mikrometern I användes ursprungligen till planetariska observationer men från år 1864 hufvudsakligen till observationer af töckenstjernor; den har i båda fallen gifvit rätt tillfredsställande resultat, ehuru densamma, särdeles under de senare åren, visserligen icke varit lämplig att användas till egentliga stellära observationer. De första mätningarna inom här ifrågavarande stjerngrupp utfördes emellertid med densamma, men jag har dock enligt förhållandet mellan de sannolika felen så mycket mindre funnit mig berättigad att, vid beräkningen af media, tilldela dessa observationer mindre vigt än de följande, då dessa genom sin större mängd redan få en betydlig öfvervigt öfver de äldre.

Vid konstruktionen af mikrometern II sökte jag naturligtvis att undvika de bekanta ofullkomligheterna vid den äldre mikrometern. Således försågs den nya mikrometern med såväl kollimations- som nollpunkts-skruf och okulär-slid, så att inställningarna alltid kunna utföras vid centralt eller symetriskt läge i fältet. Mikrometern erhöll äfven en beqväm inrättning för frambringande af skarp parallelism emellan håren och för bortskaffande af hår-parallax. Mikrometern II är vidare, för belysning af håren i mörkt fält, försedd med tvänne från mikrometer-skrufven betydligt aflägsnade lampor, hvilka alltid båda på en gång komma till användning och likformigt belysa håren från begge sidor. En ofullkomlighet vid denna refraktor är, att den saknar fältbelysning, och att anbringandet af sådan skulle möta åtskilliga svårigheter.

Hår-lamporna vid mikrometern II, hvilka ständigt åtfölja positions-rörelsen och dervid äfven fungera såsom motvigter, hafva dubbel rörelse och intaga således alltid af sig sjelfva sin vederbörliga ställning. Denna konstruktion medgifver blott användning af hår vinkelräta mot mikrometer-skrufvens axel. Slid-rörelsen med håren och skrufvarna är nämligen innesluten i en liten stark rektangulär låda, från hvilken de armar, genom hvilka lampljuset inkastas, utspringa under en vinkel af ungefärligen 30° emot fokal-planet. Lampljuset passerar först genom konvexa linser, hvarefter detsamma reflekteras till håren af planspeglar, som äro vridbara och derigenom äfven blifva beqväma moderatörer af belysningen. Den nämnda mikrometer-lådan fasthålles vidare på positions-apparatens corpus af slider från 2:ne sidor, mellan hvilka den således kan förskjufvas och medelst en kollimations-skruf vederbörligen justeras i förhållande till positions-cirkelns centrum. Positions-rörelsen sker kring en stark metall-hals och är således mycket säker. Mikrometer-sliderna äro med största omsorg inslipade, och såväl de som mikrometer-skrufven hafva en särdeles mjuk gång. Skrufven stöder sin sferiskt afsvarfvade ända emot en i mikrometer-lådan fix agat-platta, och den har således sjelf blott en rotatorisk rörelse kring sin axel, under det att skrufmuttern, som innehålles i det rörliga hårets slid, tillsammans med denna och håret får den progressiva rörelsen. Det är således äfven en mycket lätt operation att uttaga mikrometer-skrufven för tillfällig afputsning, då mikrometern derigenom på intet vis desajusteras. Skrufmutterns gängor tryckas emot skrufvens af en måttligt spänd ur-fjäder, som verkar i skruf-axelns riktning. Bågvalören på en gänga i mikrometer-skrufven II är ungefärligen 13″, då den äldre mikrometer-skrufvens gänga var ungefärligen 17″; de använda spindelväfs-hårens diameter var, såsom jag redan nämnt, i båda mikrometrarna ungefärligen $= 0'',5 = 0,003$ linier.

Innan denna mikrometer kom till användning och äfven sedan, har jag offrat mycken tid på undersökning af densamma. Det är emellertid ej min afsigt att här närmare gå in på dithörande detaljer, då, för det närvarande ändamålet, ett kort angifvande af några af de vunna resultaten är allt som behöfves.

En af de första undersökningarna af mikrometern II angick slid-rörelsen eller hade till uppgift att afgöra, *huruvida håren vid koincidens på olika punkter af skalan bibehöllo sin parallelism och samma afstånd i optiska axelns riktning.* För afgörande af den senare frågan användes en för ändamålet inrättad mikroskop-apparat med skruf, i hvilken 0,02 af en gänga är = mikrometer-hårets diameter. Mätningar den 10 Dec. 1867 på 3:ne punkter af skalan gåfvo följande särdeles tillfredsställande resultat, hvarest talen äro media af 10 enkla mätningar.

Skaldel.	Hår-afstånd i optiska axelns riktning.		
	Uttryckt i delar af hårdiametern.	Uttryckt i bågsekunder.	Uttryckt i linier.
0^r.........	6,6	3'',30	0^l,020
35^r.........	6,9	3 ,45	0,021
70^r.........	6,7	3 ,35	0,020

Således är hårens ifrågavarande afstånd för alla punkter af skalan att anse för konstant = 6,7 hår-diameter eller = 0,02 Par. lin. (Jemf. STRUVE'S Mens. Micr. pag. VI).

Frågan om hårens parallelism och dennas oföränderlighet utefter skalans hela längd afgjordes, såsom vanligt, genom att med svagare förstoring taga koincidenser vid hårens båda ändpunkter. Sådana undersökningar hafva med tillfredsställande resultat utförts vid flera tillfällen. Exempelvis anförer jag följande undersökning från den 22 Jan. 1872, vid hvilken 210 gångers förstoring användes, och de angifna koincidenstalen äro media af 10 enkla.

Koincidenser.		Venster — Höger.
Högra ändan.	Venstra ändan.	
9^r,976	9^r,992	0^r,016 = 0'',20
34 ,989	34 ,995	0 ,006 = 0 ,08
59 ,985	59 ,990	0 ,005 = 0 ,06

I medium fås således häraf differensen mellan koincidenserna vid hårens motsatta ändar = 0'',11, som blott är $\frac{1}{5}$ hår-diameter, och som äfven ungefärligen motsvarar den största variationen i hårens parallelism ifrån den 10:e till den 60:e skaldelen. Då det använda fältet var 756'', så är, enligt föregående koincidenser, den lilla vinkeln mellan håren f. n. per medium ungefärligen = $\frac{1}{2}$ bågminut.

Vid mikrometern II förefinnes vidare ingen rimlig orsak att befara *variationer i hår-koincidenserna för skrufvens olika lägen;* sådana variationer hafva ej heller någonsin visat sig. Exempelvis anföres följande sammanställning af koincidenser, tagna, för olika lägen af skrufven, den 22 Jan. 1872 med användning af blott 320 gångers förstoring. Hvarje af de angifna talen äro media af 10 enkla koincidenser.

Skrufven nedåt.................... 35^r,0012,
— uppåt.................... 35 ,0004,
— till höger............ 35 ,0020,
— till venster......... 35 ,0018,

hvarest afvikelserna tydligen äro fullkomligt betydelselösa. Koincidenserna i mikrometern I hafva deremot, särdeles de sista åren före 1868, i allmänhet haft något afvikande valörer, allteftersom skrufven legat öfver eller under mikrometer-centrum, så att afseende måst göras härpå vid beräkningen af deklinations-differenserna.

De återstående undersökningarna af mikrometrarna voro slutligen de, som angingo *anomalierna i sjelfva skrufvarnas form.* En preliminär undersökning för flere år sedan af mikrometern I i detta hänseende gaf, såsom jag vid ett föregående tillfälle angifvit, särdeles tillfredsställande resultat. Detsamma kan, till en viss grad, sägas om analoga undersökningar under de sista åren, ehuru små tillfälliga anomalier då gjorde resultaten osäkrare; så att en utjemning af mätningarna med denna skruf ur alla synpunkter blir fullkomligt betydelselös.

De ifrågavarande undersökningarna utfördes vid mikrometern II med tvänne olika för ändamålet konstruerade apparater: den första, som användes under loppet af år 1868, innan mikrometern apterats till refraktorn, baserar sig på uppmätning af artificiela dubbelstjernor; den andra är en mikroskop-apparat, som beqvämt kan användas, då mikrometern är monterad på refraktorn. Med den sistnämnda apparaten utfördes mätningar under sommaren 1870, hvilka gåfvo en tillfredsställande kontroll på de äldre mätningarna. I båda fallen användes så stark förstoring, som förhållandena medgåfvo med afseende på tillräcklig ljusstyrka och hårens definition.

Af dessa undersökningar hafva de, som angå utjemningen för gängornas olika höjd, och hvilka kostat jemförelsevis litet arbete, verkligen gifvit märkbara utjemningstal, som ej kunna negligeras. Den utan jemförelse besvärligaste delen af undersökningarna med afseende på irregulariteten inom gängorna, hvilken omständigheterna föranledde mig att utsträcka till ungefärligen $\frac{5}{6}$ af skrufvens 70 gängor, har åter blott ledt till det negativa resultatet, att en utjemning för densamma är alldeles betydelselös. De erhållna talen äro nämligen så små, att utjemningen högst skulle afse få tiotusendelar af 1 linea, och man inser således, att de tillfälliga variationerna i utjemningstalen under dessa förhållanden lätt kunna blifva af samma ordning som talen sjelfva.

För att kortligen karakterisera skrufven, låter jag här hufvudresultaten af mätningarna följa, hvarvid för det afsedda ändamålet dock är tillräckligt att blott utsätta trenne decimaler. Den första serien, som år 1868 utfördes med dubbelstjern-apparaten, utgör en uppmätning af ett afstånd ungefärligen $= \frac{1}{4}$ gänga med 39 gängor ifrån den 4:e till och med den 66:e skaldelen och från 10 särskilda begynnelsepunkter inom hvarje använd gänga. De två sista mätnings-serierna, som utfördes på sommaren 1870 med mikroskop-apparaten, utgöra en uppmätning af ett afstånd ungefärligen $= \frac{1}{4}$ gänga med hvar 10:e gänga från den 10:e t. o. m. den 60:e skaldelen. Mellan de 2 första mätnings-serierna hade ingen förändring blifvit företagen med mikrometern; men derefter söndertogs den i detalj för afputsning och för att erfara, huru alla partier visade sig efter 2 års användning. Det enda, som då var att anmärka, var tillvaron af en ytterligt fin cirkulär bräcka i den lilla agat-plattan, mot hvilken skrufven löper; och omständigheterna bevisa, att denna sannolikt antingen ursprungligen förefunnits eller tillkommit under sommaren 1868, så att den således inverkat på såväl den första som den andra undersöknings-serien. Sedan en ny starkare och särdeles finkornig sten blifvit insatt, utfördes den tredje mätnings-serien, i hvilken, såsom man ser, variationerna i talen äro ännu mindre än i de två första serierna

Ser. I. Uppmätning af ett afstånd = ¼ gänga. År 1868.

Begynnelsepunkt.	5^r	10^r	15^r	20^r	25^r	30^r	35^r	40^r	45^r	50^r	55^r	60^r	65^r
0	0^r,242	0^r,245	0^r,247	0^r,248	0^r,248	0^r,246	0^r,245	0^r,244	0^r,243	0^r,243	0^r,242	0^r,242	0^r,242
1	245	248	250	250	250	249	248	248	247	247	247	246	247
2	251	252	252	252	250	250	250	251	251	251	251	251	251
3	258	256	253	252	251	250	251	251	252	252	253	254	254
4	260	256	252	252	251	251	251	252	252	252	254	254	254
5	258	254	252	251	252	253	253	253	253	254	254	254	254
6	251	250	250	251	252	254	254	254	254	254	254	254	255
7	247	247	249	249	250	251	251	251	251	251	251	251	250
8	243	245	247	247	248	248	248	247	248	248	247	246	246
9	241	243	246	246	246	246	245	244	244	244	243	243	243

Talen, för hvarje af de i denna tab. angifna gängorna, utgöra media af mätningar med 3:ne närliggande gängor, och de basera sig öfver hufvud på en stor mängd enskilda mätningar. Att så mycken tid blifvit offrad på detta arbete förklaras deraf, att min ursprungliga afsigt var att härleda definitiva utjemningstal, tills erfarenheten lärde mig inse betydelselösheten af sådana utjemningar, då afvikelserna äro så små som i n. v. fall. Man ser, att de periodiska variationerna ungefärligen bibehålla samma karakter utefter skrufvens hela längd, och att de först mot början af skrufven (för inställn. $\overline{\lessdot}\, 5^r$) erhålla något märkbarare valörer.

Härledes exempelvis vanlig utjemningsformel för 5:e skaldelen, och korrektionen på en afläsning uttryckt i skaldelar betecknas med k, så fås

$$k = -0^r{,}00138 \,.\, \mathrm{Cos}\, u + 0^r{,}00654 \,.\, \mathrm{Sin}\, u -$$
$$- 0^r{,}00001 \,.\, \mathrm{Cos}\, 2u - 0^r{,}00065 \,.\, \mathrm{Sin}\, 2u \,,$$

som gifver k:s maximi-valör $= 0^r{,}007 = 0''{,}09$, hvilken äfven utgör k:s absoluta maximum ifrån den 5:e t. o. m. den 65:e skaldelen. För den 65:e skaldelen är nämligen k:s maximum ungefärligen $= 0^r{,}005 = 0''{,}06$, och för de mellersta gängorna stiger det blott till $0^r{,}003 = 0''04$. I det föregående är redan angifvet, att sannolika felet i en inställning med 320 gångers förstoring på en af stjerngruppens klarare stjernor är $= 0''{,}3$, och äfven skrufvens största periodiska fel äro således små i förhållande till detta. Jag har följaktligen så mycket mindre tvekat att helt och hållet negligera korrektionerna för dessa små fel, som de hufvudsakligen blott äro märkbara för skrufvens yttersta gängor, hvilka i alla händelser äro osäkrare, och korrektionernas värde dessutom måste anses förminskadt genom det lilla felet i löp-stenen under de två första åren. De små konstanta fel, hvilka således till följd häraf, teoretiskt taget, skulle komma att återstå i de slutliga media, sakna all praktisk betydelse; och efter insättning af den nya löpstenen förfaller till följd af resultaten i den här följande tab. III all fråga om en utjemning.

Talen i de två följande tabellerna hvila på jemförelsevis få mätningar, så att de tillfälliga felen ej kunna anses fullständigt eliminerade; men de äro i alla händelser tillräckligt noggranna för det afsedda ändamålet.

Ser. II. Uppmätn. af ett afstånd = ⅘ gänga. År 1870.

Begynnelsepunkt.	10^r	20^r	30^r	40^r	50^r	60^r
0	0^r,764	0^r,762	0^r,759	0^r,755	0^r,754	0^r,755
1	768	762	760	759	760	759
2	763	758	760	760	760	760
3	759	756	757	756	758	759
4	753	755	756	752	756	759
5	752	754	755	751	753	757
6	751	755	756	754	751	750
7	754	755	756	753	750	746
8	757	758	753	750	750	747
9	760	759	753	751	750	751

Efter insättning af den nya löp-stenen utfördes följande mätningar.

Ser. III. Uppmätn. af ett afstånd = ⅘ gänga. År 1870.

Begynnelsepunkt.	10^r	20^r	30^r	40^r	50^r	60^r
0	0^r,758	0^r,755	0^r,751	0^r,750	0^r,750	0^r,752
1	758	754	751	751	751	752
2	755	750	750	749	750	750
3	751	748	748	747	749	748
4	749	749	748	744	746	748
5	748	750	748	747	744	743
6	749	752	749	749	748	745
7	750	752	750	750	749	748
8	751	752	750	750	749	748
9	755	754	750	750	749	750

För bestämning af gängornas olika höjd utfördes under sommaren 1868 med dubbelstjern-apparaten 2:ne mätnings-serier från den 10:e till den 60:e skaldelen, hvarvid ett afstånd af blott ungefär 2 gängors höjd uppmättes, emedan apparaten icke med säkerhet kunde användas för större afstånd. Under sommaren 1870 utfördes tvänne analoga mätnings-serier med mikroskop-apparaten — en före och en efter insättningen af den nya löp-stenen. Denna förändring visade ingen märkbar inverkan på dessa mätningar, då öfverensstämmelsen mellan alla fyra serierna kan anses för fullständig. De två sista serierna utgjorde en uppmätning af ett afstånd ungefär = 5 gängor, motsvarande det största afstånd, som med säkerhet kunde uppmätas med den använda apparaten. Vid alla dessa mätningar varierades mikrometerns nollpunkt enligt bekanta reglor, så att skrufgängornas små periodiska ojemnheter äro fullständigt eliminerade. De af dessa 4 serier erhållna resultaten kombinerades med åtskilliga uppmätningar af celesta deklinations-differenser, som motsvarade större afstånd på skalan, och hvilka erhållits genom dubbla mätningar symetriskt anordnade på båda sidor om skalans midtelpunkt. Jag har sålunda funnit följande, för praktiskt ändamål tillräckligt noggranna, utjemningstal för gängornas olika höjd i mikr. II.

Skaldelar.	Utjemningstal uttryckta i skaldelar.
35ʳ	— 0ʳ,042
30ʳ och 40ʳ	— 0,038
25ʳ och 45ʳ	— 0,031
20ʳ och 50ʳ	— 0,022
15ʳ och 55ʳ	— 0,012
10ʳ och 60ʳ	0,000
5ʳ och 65ʳ	+ 0,012

Användas dessa tal till utjemning af de i de 4 fundamentala serierna för denna undersökning uppmätta afstånden, så erhålles det sannolika felet i ett sålunda utjemnadt afstånd $= \pm\, 0^r{,}0008$.

Skrufgängornas bågvalörer hafva blott blifvit bestämda genom polaris-passager, då jag alltid iakttagit att vid hvarje tillfälle observera dubbla passage-serier, vid hvilka respektive det rörliga håret varit symetriskt ställdt på båda sidor om det fixa. Om m_0 betecknar differensen mellan de aflästa skal-delarna, Δm skal-afståndets utjemnings-tal för gängornas olika höjd, f det apparenta båg-afståndet mellan håren, samt r en skrufgängas bågvalör; så fås tillräckligt noga

$$r = f/m_0 + k/m_0 - f/m_0 \,.\, \Delta m/m_0,$$

hvarest k/m_0 är korrektionen för refraktion.

Följande tab. angifver resultaten af hithörande polaris-observationer med mikr. II, hvarest medium af 5 passager antages såsom vigtsenhet, luftens godhet såsom vanligt betecknas med en af siffrorna 1, 2, 3, 4 eller kombinationer af dem, och bästa luft utmärkes med 1. De här angifna utjemningstalen öfverensstämma ej fullkomligt med talen i föregående tab., men de små afvikelserna äro dock utan någon praktisk betydelse.

Bestämning af bågvalören för 1 gänga uti Mikr. II medelst Polaris-passager.

Dag.	m_0	$f/m_0 + k/m_0$	$f/m_0 \,.\, \Delta m/m_0$	r''	Temp. C.	Luft.	Vigt.
1868 Juli 24	34ʳ,963 — 16ʳ,959	12″,876	— 0″,016	12″,89	+ 17°,5	2.3	1,2
	52,959 — 34,963	12,897	+ 0,016	12,88			1,2
Juli 25	34,963 — 16,960	12,912	— 0,016	12,93	+ 19,8	3	0,8
	52,960 — 34,963	12,923	+ 0,016	12,91			0,8
Juli 27	34,963 — 16,965	12,855	— 0,016	12,87	+ 23,9	2	1.2
	52,965 — 34,963	12,871	+ 0,016	12,86			1,2
Aug. 4	34,963 — 16,965	12,867	— 0,016	12,88	+ 24,0	1.2	1,2
	52,965 — 34,963	12,882	+ 0,016	12,87			1,2
Aug. 14	34,963 — 16,962	12,863	— 0,016	12,88	+ 26,9	2	1,2
	52,962 — 34,963	12,919	+ 0,016	12,90			1,2

Dag.	m_0	$f/m_0 + k/m_0$	$f/m_0 \cdot \Delta m/m_0$	r''	Temp. C.	Luft.	Vigt.
1868 Sept. 8	34r,963 — 16r,967	12″,829	— 0″,016	12″,85	+ 24°,6	1.2	1,0
	52,967 — 34,963	12,866	+ 0,016	12,85			0,2
1869 Febr. 22	34,975 — 16,976	12,852	— 0,016	12,87	— 5,0	2	1,2
	52,977 — 34,975	12,896	+ 0,016	12,88			1,2
Juni 19	34,975 — 16,976	12,880	— 0,016	12,90	+ 16,7	2	1,0
	52,976 — 34,975	12,887	+ 0,016	12,87			1,0
Juni 29	34,975 — 16,977	12,840	— 0,016	12,86	+ 17,0	2	1,0
	52,977 — 34,975	12,880	+ 0,016	12,86			1,0
Juli 17	34,976 — 16,978	12,871	— 0,016	12,89	+ 18,8	2	1,2
	52,978 — 34,976	12,902	+ 0,016	12,89			1,2
Juli 18	34,976 — 16,478	12,856	— 0,016	12,87	+ 19,9	2	1,2
	53,478 — 34,976	12,904	+ 0,016	12,89			1,2
Sept. 10	34,976 — 16,475	12,865	— 0,016	12,88	+ 22,2	2.3	1,2
	53,475 — 34,976	12,875	+ 0,016	12,86			1,2
Sept. 28	34,976 — 16,479	12,852	— 0,016	12,87	+ 11,1	2	1,2
	53,479 — 34,976	12,887	+ 0,016	12,87			1,2
1870 April 19	34,981 — 15,480	12,866	— 0,017	12,88	+ 15,5	1.2	1,2
	54,480 — 34,981	12,912	+ 0,017	12, 90			1,2
April 20	34,981 — 15,480	12,879	— 0,017	12,89	+ 18,2	2	1,2
	54,480 — 34,981	12,926	+ 0,017	12,91			1,2
April 21	34,981 — 15,480	12,903	— 0,017	12,92	+ 19,6	2	1,2
	54,480 — 34,981	12,929	+ 0,017	12,91			1,2
Juni 6	35,004 — 15,000	12,867	— 0,017	12,88	+ 22,6	1.2	1,0
	55,000 — 35,004	12,909	+ 0,017	12,89			1,0
Juni 7	35,004 — 15,000	12,842	— 0,017	12,86	+ 18,9	2.3	1,2
	55,000 — 35,004	12,906	+ 0,017	12,90			1,0
Juni 8	35,004 — 15,000	12,854	— 0,017	12,87	+ 20,7	2	1,0
	55,000 — 35,004	12,892	+ 0,017	12,88			1,0
Aug. 8	35,000 — 15,000	12,859	— 0,017	12,88	+ 20,7	2.3	1,4
	55,000 — 35,000	12,897	+ 0,017	12,88			1,4
Aug. 9	35,000 — 15,000	12,851	— 0,017	12,87	+ 22,0	2	1,4
	55,000 — 35,000	12,891	+ 0,017	12,87			1,4
Aug. 10	35,000 — 15,500	12,836	— 0,017	12,85	+ 23,1	2	1,0
	54,500 — 35,000	12,884	+ 0,017	12,87			1,0
Aug. 11	35,000 — 15,500	12,844	— 0,017	12,86	+ 21,7	2	1,4
	54,500 — 35,000	12,886	+ 0,017	12,87			1,4
Sept. 29	35,000 — 15,000	12,869	— 0,017	12,89	+ 13,0	1,2	1,2
	55,000 — 35,000	12,899	+ 0,017	12,88			0,8
Sept. 30	35,000 — 15,000	12,842	— 0,017	12,86	+ 13,2	2.3	1,0
	55,000 — 35,000	12,884	+ 0,017	12,87			1,0
Okt. 12	35,000 — 15,000	12,872	— 0,017	12,89	+ 4,2	1	1,0
	55,000 — 35,000	12,895	+ 0,017	12,88			1,0
Okt. 13	35,000 — 15,500	12,849	— 0,017	12,87	+ 3,2	3	1,4
	54,500 — 35,000	12,897	+ 0,017	12,88			1,2
Okt. 15	35,000 — 15,500	12,857	— 0,017	12,87	+ 1,8	1!	1,0
	54,500 — 35,000	12,885	+ 0,017	12,87			0,8

Den nya agaten insattes under loppet af Juli 1870. Det största utjemningstalet, för de periodiska variationerna inom gängorna, på en enkel skal-afläsning utgör under åren 1868 och 1869 blott $0^r,003$; och den analoga korrektionen på mediet r'' ur samma års observationer skulle blott stiga till det lilla sekundtalet

$$0'',0002.$$

Från sommaren 1870 äro åter enligt det föregående skrufvens periodiska variationer att anse för fullkomligt omärkliga; och negligerandet af denna utjemning är således, äfven vid ifrågavarande fundamentala bestämning, härmed fullständigt motiveradt.

Föregående tab. gifver i med.

$$r\,(Mikr.\ II) = \mathbf{12'',887} \pm 0'',0016\,.\ \text{Vigt} = 62,6.$$
$$\text{Temp.} = +\,17^\circ,0\ \text{C.}$$

För *mikr. I* har analogt erhållits ur polaris-passager

enligt äldre bestämn............ $r = 17'',222$. Vigt $= 13,4$,

» nyare » .... $r = 17\ ,232$. Vigt $= 44,2$.

Häraf fås i medium

$$r\,(Mikr.\ I) = \mathbf{17'',230} \pm 0'',0030\,.\ \text{Vigt} = 57,6.$$
$$\text{Temp.} = +\,15^\circ,4\ \text{C.}$$

Bestämningen för mikr. II omfattar ungefär 30 gångor.

De mot dessa bestämningar svarande höga temperatur-talen förklaras deraf, att jag, för att hushålla med de klara nattstunderna, nästan utan undantag utfört dessa observationer om dagen och vanligen på klara sommar-eftermiddagar.

De omjusteringar af hårkorsets ställning i tubröret, hvilka, till följd af möjligen märkbara variationer i objektivets fokalafstånd med temperaturen och variationer i tubrörets längd för olika temperatur- och fuktighets-förhållanden, under årets lopp visat sig nödvändiga, hafva alltid varit högst obetydliga. På förhållandet mellan objektivets fokal-afstånd och gäng-höjden i mikrometer-skrufven för växlande temperaturer har det ej ännu lyckats mig att erhålla någon säker bestämning; men allt synes häntyda på, att detta förhållande är mycket nära konstant.

§ 5.

Innan sjelfva observationerna anföras, återstår nu blott att nämna några ord om deras reduktion och härledningen af reduktionstalen, hvilka i de flesta fall varit mycket små. För att förebygga räknefel, har jag så mycket som möjligt gifvit dessa räkningar en tabellarisk form, och, så ofta det någorlunda beqvämt låtit sig göra, upprättat hjelptabeller, hvilka jag dock ej anser nödvändigt att här anföra.

Refraktions-korrektionerna, på rektascensions- och deklinations-differenserna $\varDelta\alpha^s$ och $\varDelta\delta''$, äro helt enkelt beräknade enligt

$$d(\varDelta\alpha^s) = M\,.\,\text{Cot}\,n\,.\,d(\varDelta\delta''),$$

$$d(\varDelta\delta'') = [6.440]\,.\,\frac{\varDelta\delta''}{\text{Sin}^2(N+26^\circ)},$$

hvarest

$$M = [8.916]\,.\,\text{Cos}\,(N+52^\circ).$$

Dessa korrektions-tal tagas direkte ur för ändamålet upprättade tabeller med timvinkeln och deklinations-differensen såsom argument.

Reduktions-talen till medellocus för observations-årets början fås af formlerna

$$d(\varDelta\alpha^s) = [0.047] \cdot a \cdot \varDelta\alpha^s + [8.918] \cdot b \cdot \varDelta\delta'',$$
$$d(\varDelta\delta'') = -b \cdot \varDelta\alpha'' + c \cdot \varDelta\delta'',$$

hvarest de välbekanta qvantiteterna a, b, c, för denna stjerngrupp tillräckligt noga blifva

$$a = -\{[4.329]\, g \cdot \text{Cos}\,(301^\circ{,}6 + G) + [4.686] \cdot h \cdot \text{Cos}\,(301^\circ{,}6 + H)\},$$
$$b = -\{[4.686]\, g \cdot \text{Sin}\,(301^\circ{,}6 + G) + [4.329]\; h \cdot \text{Sin}\,(301^\circ{,}6 + H)\},$$
$$c = -\{[4.639]\, h \cdot \text{Cos}\,(301^\circ{,}6 + H) - [4.329] \cdot i \cdot \text{Sin}\,\delta\},$$

och för beräknandet af hvilka qvantiteter jag upprättat hjelptabeller, som med argumenten p'' och A° gifva

$$p'' \cdot \begin{Bmatrix}\text{Cos}\\ \text{Sin}\end{Bmatrix} (A^\circ) \cdot \text{Sin}\, 1''$$

uttryckta i enheter af 5:e decimalen.

Jag har vidare reducerat dessa såsom mina öfriga stellära observationer på epoken 1865,0, och till den ändan beräknat årliga precessionen enligt formlerna

$$\textit{årliga precess. i } \varDelta\alpha^s = [5.397] \cdot \varDelta\alpha^s + [4.836_n] \cdot \varDelta\delta''$$

och

$$\textit{årliga precess. i } \varDelta\delta'' = [5.918] \cdot \varDelta\alpha''.$$

De enda här ifrågakommande instrumentela korrektionerna äro slutligen reduktionen för gängornas olika höjd vid mikr. II och för parallelen, af hvilka den förra, som egentligen är den enda märkbara, erhålles enligt tabellen i det föregående, och num. valören af det lilla reduktions-talet för parallelen i $\varDelta\alpha^s$ kan beräknas enligt

$$d(\varDelta\alpha^s) = (0{,}001 \cdot \varDelta\delta) \cdot \varDelta P,$$

då äfven $\varDelta\delta$ och $\varDelta P$ äro num. val. uttryckta i bågminuter, och

$$\varDelta P = P_0 - P,$$

hvarest $P =$ det använda parallel-talet, och $P_0 =$ det sannolika parallel-talet, som erhålles ur de i det föregående anförda tabellerna. De motsvarande reduktions-talen i $\varDelta\delta''$ äro, såsom små qvantiteter af 2:a ordningen i afseende på $\varDelta P$, här fullkomligt försvinnande.

För att i tabellen öfver sjelfva observationerna undvika en onödig iterering af vissa tal, angifver jag dessa i sammanhang i följande tabell, hvilken i första kolumnen innehåller en förteckning öfver observations-aftnarna, och hvars följande kolumner således i ordning angifva: *refraktorns position I eller II*, *hårkoincidenserna*, *den använda parallelen P*, *temperaturen enligt den hundragradiga termometern vid midten af observationstiden i kupolen och i den yttre luften* samt slutligen *korta notiser öfver de atmosferiska förhållandena*, hvarest siffrorna hafva den vanliga ofvan angifna betydelsen.

Observationsdag.	Refraktor.	Hår-Koincidens.	Parallelen.	Temperatur Inre.	Temperatur Yttre.	Atmosferiska förhållanden.	
1866 Sept. 27	I	29r,047(6)	0° 6	+ 14°,5	+ 10°,3	2	Starkt månsken.
Sept. 28	I	29,055(5)*	180 7	+ 13,7	+ 10,8	2	Starkt månsken.
Sept. 29	I	29,055(5)* 37,243(5)*	180 9	+ 13,7	+ 11,3	2	Starkt månsken.
Sept. 30	I	29,047(6) 37,238(2)	0 6	+ 11,3	+ 8,8	2.3	Månsken.
Okt. 19	I	29,062(4)*	180 12	+ 1,6	— 0,8	2.3	Starkt månsken.
Okt. 20	I	29,055(2)	0 11	+ 4,3	+ 2,9	3	Starkt månsken.
Okt. 22	I	29,055(2) 37,243(1)	0 13	+ 5,7	+ 3,7	2.3	Starkt månsken.
Nov. 16	I	38,376(1) 30,175(7)	0 10	— 7,0	— 9,9	2.3	Starkt månsken.
Nov. 17	I	30,176(1)*	180 11	— 5,2	— 7,0	2	Starkt månsken.
1867 Juli 21	II	28,008(2)	180 14	+ 13,5	+ 9,1	2.3	Skymning.
Juli 31	II. I	28,008(2) 36,212(1)*	0 18	+ 8,8	+ 5,8	2	
Aug. 12	I	27,253(1)	0 7	+ 12,4	+ 9,3	1.2	Månsken.
Aug. 13	I	27,228(4)*	180 12	+ 14,3	+ 9,7	1.2	Månsken.
Sept. 12	I	27,223(9) 35,421(8)	0 17	+ 10,6	+ 8,1	2	Starkt månsken.
Nov. 11	I	27,237(3)* 35,448(3)*	180 12	0,0	— 2,5	1.2	Starkt månsken.
Nov. 13	I	27,237(3)* 27,225(3) 35,448(3)*	180 10	+ 3,7	+ 1,7	2.3	Starkt månsken och skymning.
1868 Maj 12	II	27,365(11)	180 8	+ 9,3	+ 8,2	1.2	
Maj 13	II	27,365(11) 35,562(3)	180 11	+ 11,5	+ 10,7	1.2	
Maj 22	II	27,365(11) 35,562(3)	180 13	+ 8,6	+ 4,7	1.2	
Juli 26	II	34,966(4)	0 11	+ 15,5	+ 11,9	2.3	
Juli 27	II	34,964(12)	0 12	+ 15,9	+ 12,5	1.2	
Aug. 13	I	34,963(3)	0 13	+ 17,5	+ 12,8	1.2	Stadiga och vackra bilder.
Aug. 30	I	34,960(4)	0 13	+ 12,5	+ 7,0	1.2	Starkt månsken.
Sept. 3	I	34,961(3)	0 13	+ 8,5	+ 4,2	1.2	Starkt månsken.
Sept. 4	I	34,963(4)	0 13	+ 9,8	+ 5,6	1	Månsken och norrsken.
Sept. 6	I	34,960(5)	0 13	+ 14,8	+ 12,3	1.2	Rätt stadiga bilder. Starkt månsken.
Okt. 1	I	34,969(4)	0 13	+ 4,7	+ 1,6	2	Oroliga bilder. Starkt månsken.
Okt. 2	I	34,969(4)	0 13	+ 3,1	0,0	2.3	Dåliga o. oroliga bilder. Starkt månsken.
Okt. 26	I	34,970(3)	0 13	+ 2,2	+ 0,9	2	Oroliga bilder. Månsken.
Nov. 4	I	34,972(2)	0 13	+ 3,0	+ 1,9	1.2	Ytterl. oroliga bilder. Blåst. Månsken.
1869 Aug. 25	I	34,974(3)	0 21	+ 15,8	+ 14,0	2	Mycket oroliga bilder. Starkt månsken.
Sept. 17	I	34,975(5)	0 18	+ 9,8	+ 8,3	2.3	Diffusa och ytterl. oroliga bilder. Starkt månsken.
Okt. 25	I	34,974(5)	0 19	0,0	— 2,5	1	Vackra och stadiga bilder. Månsken och norrsken.
1870 Aug. 21	I		0 21	+ 9,6	+ 5,4	1.2	Oroliga bilder.

Observationsdag.	Refraktor.	Hår-Koincidens.	Parallelen	Temperatur Inre.	Temperatur Yttre.	Atmosferiska förhållanden.	
1870 Aug. 29	I	$34^{r},997$(4)	$0^{\circ}19'$	$+12^{\circ},0$	$+9^{\circ},3$	2	
Aug. 31	I	34,999(6)	0 19	+ 12,0	+ 8,5	1.2	Norrsken och blåst.
Sept. 1	I	34,999(6)	0 21	+ 9,5	+ 7,8	2.3	Diffusa och ytterl. oroliga bilder. Blåst.
Sept. 4	I		0 21	+ 12,6	+ 11,3	2	Månsken. Norrsken. Blåst. Ytterligt orol. bilder.
Sept. 11	I	35,000(4)	0 19	+ 8,9	+ 6,0	2	Orol. och diffusa bilder. Starkt månsken.
Sept. 12	I		0 20	+ 8,2	+ 4,8	2.3	Ytterl. diffusa och orol. bilder. Månsken. Blåst.
Sept. 16	I	34,996(4)	0 21	+ 5,5	+ 0,2	1	Lugna o. vackra bilder. Starkt månsken.
Sept. 17	I	35,001(6)	0 21	+ 5,6	+ 1,3	1	Vackra bilder. Månsken.
Sept. 18	I		0 21	+ 8,6	+ 5,9	2.3	Månsken. Dunstig luft.
Sept. 22	I	35,002(6)	0 21	+ 9,7	+ 6,7	1!	Särdeles vackra bilder. Snart mulet.
Sept. 23	I	35,001(4)	0 21	+ 11,4	+ 8,5	1	
Sept. 24	I		0 21	+ 12,3	+ 10,1	2.3	Diffusa, matta o. orol. bilder. Norrsken.
Sept. 25	I	34,998(4)	0 21	+ 10,6	+ 7,5	1.2	Oroliga men vackra bilder. Norrsken.
Sept. 26	I	34,998(6)	0 19	+ 11,0	+ 4,9	2.3	Mycket variabel luft. Starkt norrsken.
Sept. 27	I		0 19	+ 9,4	+ 5,3	3	
Sept. 29	I	35,002(6)	0 19	+ 9,2	+ 6,6	1.2	Blåst. Oroliga bilder.
Okt. 2	I	35,001(4)	0 21	+ 10,3	+ 8,5	3	
Okt. 3	I	35,003(4)	0 20	+ 8,0	+ 2,0	2	Rätt stadiga och vackra bilder. Månsken. Norrsken.
Okt. 4	I	35,000(6)	0 20	+ 6,8	+ 1,9	2	Rätt vackra och stadiga bilder. Snart töcken.
Okt. 6	I	35,003(4)	0 21	+ 2,2	+ 1,4	2	Rätt vackra och stadiga bilder. Månsken. Snart mulet.
Okt. 12	I	35,000(6)	0 21	+ 2,1	— 3,0	1	Något oroliga bilder. Starkt månsken.
Okt. 15	I	35,003(6)	0 21	0,0	— 2,8	2	Bilderna något diffusa och oroliga. Blåst.
Nov. 2	I	35,003(4)	0 21	+ 1,7	— 2,3	1	Starkt månsken.
Nov. 4	I		0 21	+ 3,0	+ 1,6	2	Starkt månsken. Blåst.
Nov. 5	I	34,998(4)	0 21	+ 1,5	— 1,1	1.2	Starkt månsken. Snart mulnande.
Nov. 13	I	34,999(4)	0 21	+ 2,3	+ 0,5	3	
Nov. 27	I	35,000(4)	0 21	+ 2,2	+ 1,1	3	
Dec. 1	I	35,001(4)	0 21	— 6,8	— 11,7	3	
Dec. 4	I	34,999(4)	0 21	0,0	— 3,3	2	Rätt vackra ehuru något oroliga o. matta bilder.
Dec. 5	I	35,000(4)	0 21	— 3,8	— 6,8	1.2	Utmärkt vackra men något oroliga bilder. Töcken.
Dec. 10	I	35,001(4)	0 21	— 12,8	— 15,5	3	
1871 Maj 8	II	34,986(4)	0 5	+ 3,0	— 2,3	1.2	Bilderna något diffusa och oroliga. Nattskymning.
Maj 21	II	34,987(4)	0 5	+ 5,9	+ 1,9	2	Bilderna vackra men mycket oroliga. Stark nattskymning.
Maj 23	II	34,987(4)	0 5	+ 11,3	+ 9,0	1.2	Stark nattskymning.
Maj 24	II	34,988(4)	0 5	+ 12,6	+ 9,9	3	Stark nattskymning.
Aug. 8	I	34,992(4)	0 6	+ 16,8	+ 14,0	2	Blåst. Månsken.
Aug. 9	I	34,996(12)	0 6	+ 19,0	+ 16,8	2.3	Ytterligt oroliga och diffusa bilder.
Aug. 13	I	34,993(4)	0 6	+ 19,9	+ 18,2	2.3	Bilderna matta o. ytterligt oroliga. Blåst.
Aug. 15	I	34,996(4)	0 6	+ 14,7	+ 11,7	2.3	Mycket oroliga bilder.

Observationsdag.	Re-frak-tor.	Hår-Koincidens.	Parallelen.	Temperatur Inre.	Temperatur Yttre.	Atmosferiska förhållanden.	
1871 Aug. 20	I	$34^{r},995(4)$	$0^{\circ}\,6'$	$+14^{\circ},4$	$+11^{\circ},8$	2	Blåst. Oroliga bilder.
Aug. 22	I	34,993(4)	0 6	+11,9	+10,1	1.2	Blåst. Oroliga bilder.
Aug. 23	I	34,994(4)	0 6	+13,6	+10,6	3	Luft mycket ojemn. Snart moln.
Aug. 24	I	34,994(4)	0 6	+13,3	+10,7	1.2	Ytterligt starkt norrsken.
Aug. 27	I	34,993(4)	0 6	+11,8	+ 8,0	2	Starkt månsken.
Aug. 28	I		0 6	+13,3	+ 9,4	3	
Aug. 29	I		0 6	+14,1	+10,0	3	
Aug. 31	I	34,995(4)	0 6	+14,5	+11,3	1.2	Starkt månsken.
Sept. 1	I	34,994(4)	0 6	+15,8	+11,4	2	Starkt månsken.
Sept. 4	I	34,995(4)	0 6	+15,1	+11,3	2	Starkt månsken; snart mulet.
Sept. 6	I		0 6	+12,7	+ 6,9	1.2	Bilder vackra och stadiga men matta.
Sept. 8	I		0 6	+12,2	+ 7,4	1.2	Norrsken och månsken.
Sept. 17	I	34,993(4)	0 6	+ 6,7	+ 1,8	2	Ytterligt oroliga ehuru icke dåliga bilder.
Sept. 24	I	34,995(4)	0 6	+ 1,8	− 2,3	2	
Sept. 27	I	34,993(4)	0 6	+ 5,0	+ 2,3	2.3	Matta men vackra bilder.
Okt. 1	I	34,994(4)	0 6	+ 1,6	− 2,2	2	Oroliga bilder. Norrsken. Starkt månsken.
Okt. 2	I	34,989(4)	0 6	+ 0,6	− 3,7	2	Starkt månsken.
Okt. 3	I			+ 1,1	− 4,4	1.2	Starkt månsken.
Okt. 5	I			+ 4,9	+ 1,3	2	Månsken.
Okt. 14	I	34,995(5)	0 6	+ 5,6	+ 2,6	1	Utmärkt vackra och stadida bilder — något matta. Norrsken.
Nov. 1	I	34,992(4)	0 4	+ 0,5	− 3,6	3	
Nov. 3	I	34,995(4)	0 5	+ 1,3	− 1,6	1.2	Oroliga bilder. Aftonskymning.
Nov. 5	I	34,990(4)	0 2	− 2,2	− 5,3	2	Blåst. Bilder mycket oroliga.
Nov. 9	I	34,991(4)	0 3	+ 2,3	+ 1,7	2.3	Blåst. Norrsken.
Nov. 10	I	34,992(4)	0 1	+ 1,5	+ 0,7	2	Blåst. Mycket oroliga bilder. Norrsken.
Nov. 13	I	34,992(4)	0 6	− 4,1	− 6,5	2	Något diffusa och mycket oroliga bilder.
Dec. 4	I		0 1	−13,0	−18,9	3	
Dec. 9	I		0 1	−10,3	−14,8	2	

Vid användning af koincidenser för bestämning af deklinations-differenser är det onekligen teoretiskt riktigast att systematiskt variera koincidens-punkten, för att dymedelst eliminera skrufgängornas periodiska fel. Men som dessa fel vid båda här använda mikrometrar i alla händelser äro små och vid mikr. I alldeles omärkliga i förhållande till apparatens osäkerhet, och den ifrågavarande metoden, genom nödvändigheten att skarpt bestämma de successiva nollpunkterna, medförer en betydlig tidsförlust som sällan motsvarar vinsten; så har jag ej ansett lämpligt att använda densamma i denna observations-serie. I stället för att sålunda variera nollpunkten, har jag afsigtligt lemnat densamma oförändrad; och då koincidens-talen vanligen under långa perioder, på små tillfälliga afvikelser när, varit konstanta, så har jag, sålänge inga bestämda periodiska variationer börjat visa sig, ansett säkrast att vid reduktionerna använda media af koincidenserna för motsvarande tider. Detta gäller i synnerhet med afseende på mikr. II, då mikr. I deremot så ofta måste desajusteras för afhjelpande af tillfälliga fel, och man vid den måste skilja på koincidenserna efter skrufvens olika lägen, samt det dessutom var nödvändigt att, för uppmätande af större afstånd än halfva fältet, i denna hafva flere parallelhår på mikrometer-sliden, hvilka således gåfvo olika koincidens-tal.

De i sista tabellen före den 26 Juli 1868 angifna koincidenserna, som således gälla för mikr. I och i de flesta fall utgöra media af koincidenserna från flere observations-aftnar, äro de vid reduktionerna omedelbart använda talen. De bifogade siffrorna angifva antalet aftnar, från hvilka koincidenserna äro tagna. De koincidens-tal, som erhållits då skrufven legat öfver mikrometer-centrum, äro utmärkta med en asterisk; de tal för samma afton, som märkbart differera från hvarandra, referera sig till olika hår. Man ser för öfrigt att nollpunkten ofta blifvit förändrad. Ur godtyckligt valda observationer med mikrom. I erhålles af 121 afvikelser, mellan koincidens-media och de enskilda aftnarnas koincidenser, sannolika felet i en aftons koincidens $= 0^r,0032$; och alldenstund de i tabellen angifva koincidens-media per medium basera sig på 4,2 koincidenser från särskilda aftnar, så blir således *sannolika felet i ett af tabellens koincidens-tal per medium*

$$= 0^r,0015 .$$

Tabellens koincidens-tal för mikr. II från den 26 Juli 1868, hvilka äro erhållna på de angifna aftnarna vid observation af stjerngruppen, äro deremot icke de vid reduktionen omedelbart använda talen. De bifogade siffrorna angifva här motsvarande antal enkla koincidenser.

Vid reduktionerna af alla observationerna med mikr. II hafva respektive följande koincidens-media blifvit använda mellan de angifna tiderna, hvarvid de bifogade siffrorna utmärka antalet observations-aftnar, från hvilka de ingående koincidenserna äro tagna.

1868 Juli 24	—	Sept. 22			$34^r,963$	(20).
1868 Okt. 1	—	Dec. 9			34 ,970	(10).
1869 Jan. 7	—	Juni 29			34 ,975	(21).
1869 Juli 13	—	Okt. 25			34 ,976	(19).
1869 Nov. 1	—	1870 Maj 9			34 ,981	(26).
1870 Aug. 7	—	Dec. 10			35 ,000	(36).
1871 Jan. 24	—	Maj 27			34 ,992	(25).
1871 Juli 30	—	Dec. 9			34 ,993	(30).

Dessa koincidens-media, hvilka således icke basera sig blott på de i föregående tabell angifna 67 talen utan i det hela på koincidenser från 187 aftnar under samma tid, äro tagna utan afseende på den i allmänhet obetydliga olikheten i vigterna för de särskilda aftnarnas koincidenser. Hela antalet enkla koincidenser, på hvilka de 187 aftnarnas media grunda sig, utgör 850 stycken; så att i hvarje aftons koincidens således per medium ingå 4,5 enkla koincidenser.

Jemföras föregående 8 media respektive med de 187 koincidenserna, så fås *sannolika felet i en aftons koincidens*

$$= 0^r,0017.$$

Sannolika felet i ett af föregående medeltal, motsvarande per medium 23,4 koincidenser från olika aftnar, blir således

$$= 0^r,00036,$$

och *sannolika felet i en enkel koincidens*

$$= 0^r,0036.$$

Med afseende på här ofvan anförda koincidens-media bemärkes vidare att dessa tal kontinuerligt tillväxa från den 24 Juli 1868 till den 9 Maj 1870, ehuru nollpunkten under denna tid icke blifvit förändrad. Detta fenomen har framkallats af det ofvan angifna lilla felet i den först använda löp-stenen och beror således derpå, att skrufven under dessa 2 år småningom åstadkommit en svag fördjupning i stenen, som enligt dessa siffror skulle motsvara ungefärligen 0,02 skaldelar eller radien i mikrometerhåret. Efter insättning af den nya löp-stenen har detta fenomen icke vidare visat sig. I början af Januari och under September 1871 måste, såsom redan blifvit anmärkt, nya hår insättas i mikrometern, till följd hvaraf dock blott vid första tillfället en märkbar förändring af nollpunkten inträffade.

I 5:e och 6:e kolumnerna af förteckningen öfver observations-dagarna finner man de liktidiga temperaturerna i kupolen och i den yttre luften vid midten af observationstiden. Talen i den föregående kolumnen angifva således *mikrometerskrufvens temperatur* under observationen; de i den följande kolumnen, hvilka benäget blifvit mig meddelade af Adjunkten Rubenson, äro deremot bifogade, för att antyda till hvilken grad kupolen varit utvädrad under observationerna. Då storleken af differenserna mellan dessa båda temperatur-tal för de särskilda aftnarna emellertid icke står i något bestämdt förhållande till luftens apparenta beskaffenhet under observationerna, så kunna de mot förväntan icke gifva någon tillfredsställande förklaring på uppkomsten af de oroliga bilderna, hvilka så sällan medgifvit användning af starkare förstoring.

Hela antalet af de enkla observations-momenten på stjerngruppen utgör i runda tal 4200 passager och 1700 deklinations-mätningar under 101 observations-aftnar fördelade på 103 stjernor utom central-stjernan. Vid observationerna med mikr. II har jag nästan utan undantag användt 320 gångers förstoring, och vid bestämmandet af hårkoincidenserna för denna mikrometer har nämnde förstoring alltid blifvit använd. Med mikr. I har jag deremot i de flesta fall blott användt 210 gångers förstoring. Närmare angifvelser härom vid hvarje observation kan icke hafva något intresse.

I den här följande tabellariska redogörelsen för sjelfva observationerna innehåller

1:sta kolumnen: observations-tiden.

2:a kolumnen: media af de omedelbart observerade rektascensions-differenserna uttryckta i stjerntids-sekunder, hvarest den bifogade siffran angifver antalet enkla passager.

3:e kolumnen: dessa differential-koordinaters reduktionstal, hvilka utgöra summan af refraktionen, reduktionen till årets början, precessionen till 1865,0 och korrektionen för parallelen. Dessa tal äro uttryckta i $^1/_{1000}$ af en tids-sekund såsom enhet. Parallel-korrektionen, som vanligen blott belöper sig på få tusendelar af en tids-sekund, uppgår emellertid i några få fall till högst $0^s,04$.

4:e kolumnen: media af de omedelbart aflästa mikrometer-talen i skaldelar, hvilka, subtraherade från motsvarande koincidens-tal eller omvändt, gifva de observerade deklinations-differenserna. De bifogade siffrorna angifva antalet enkla mätningar.

5:e kolumnen: de observerade deklinations-differensernas reduktionstal uttryckta i $^1/_{100}$ af en bågsekund såsom enhet. Dessa innehålla äfven korrektionen för gängornas olika höjd.

6:e och 7:e kol.: de till 1865,0 reducerade differential-koordinaterna respektive uttryckta i tids- och båg-sekunder. *Evaluerandet af deklinations-differenserna är härvid utfördt utan afseende på de möjliga variationerna i skrufgängornas bågvalörer med temperaturen.*

8:e kolumnen: medel-timvinkeln under observationen af den ifrågavarande stjernan uttryckt i timmar.

9:e kolumnen: parallel-afvikelsen $P_0 - P$ uftryckt i hela bågminuter.

De mikrometertal enligt mikr. I, som erhållits då skrufven legat öfver mikrometer-centrum, äro liksom motsvarande koincidenser i det föregående utmärkta med en asterisk. På ett dylikt sätt äro äfven några få rektascensions-differenser utmärkta, hvilka blifvit beräknade ur uppmätta positionsvinklar.

Observations-tabellerna sönderfalla i 9 afdelningar, af hvilka *den första* innehåller jemförelserna med central-stjernan, som efter rektascensionen utgör gruppens 61:a stjerna; i *de följande 7 afdelningarna* äro deremot några andra af gruppens klarare stjernor utvalda till komparations-stjernor för bestämning af några af gruppens svagare stjernor. Den *9:e afdelningen* innehåller slutligen några få jemförelser mellan några af de klarare stjernorna sinsemellan.

Med afseende på tecknen utgöra differential-koordinaterna i de åtta första afdelningarna alltid *differenserna mellan den ifrågavarande stjernan och komparations-stjernan.* Stjernornas s. k. storlek är alltid angifven bredvid ordningsnummern, som bestämmes af stjernans rektascension.

Afdelningen I. Stjernan N:o 61 Komparations-stjerna.

N:o 1. 11^m,7.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 19	$-45^s,760(5)$	$+8$	$30'',158(3)^*$	$+9$	$-45^s,75$	$+19'',0$	$3^h,7$	$-4'$
1867 Aug. 13	$-45,667(6)$	$+5$	$28,280(4)^*$	$+11$	$-45,66$	$+18,2$	$1,3$	$+1$
1868 Okt. 2	$-45,671(7)$	$+10$	$33,609(4)$	$+19$	$-45,66$	$+17,7$	$1,5$	$+3$
1870 Dec. 1	$-45,757(7)$	$+11$	$33,651(2)$	$+34$	$-45,75$	$+17,7$	$3,0$	-2

N:o 2. 11^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 19	— 41^s,940(5)	+ 1	24^r,756(2)*	+ 4	— 41^s,94	— 74″,2	3^h,5	— 5′
1867 Aug. 13	— 41 ,817(6)	+ 4	22 ,826(3)*	+ 7	— 41 ,81	— 75 ,8	1 ,1	+ 1
1868 Maj 22	— 41 ,920(5)	+ 1	31 ,723(3)	+ 9	— 41 ,92	— 75 ,0	20 ,0	+ 2
Okt. 2	— 41 ,871(7)	+ 11	40 ,867(4)	+ 11	— 41 ,86	— 75 ,9	1 ,2	+ 4
1870 Dec. 1	— 42 ,000(7)	+ 4	40 ,839(3)	+ 24	— 42 ,00	— 75 ,0	2 ,5	— 2
Dec. 4	— 41 ,957(7)	+ 4	40 ,893(3)	+ 25	— 41 ,95	— 75 ,7	2 ,3	— 2
1871 Nov. 1	— 41 ,770(10)	+ 6	40 ,834(2)	+ 27	— 41 ,76	— 75 ,0	3 ,8	— 1
Nov. 5	— 41 ,700(8)	+ 8	40 ,845(2)	+ 29	— 41 ,69	— 75 ,1	1 ,4	+ 1

N:o 3. 10^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 27	— 41^s,840(6)	+ 5	19^r,709(3)	+ 14	— 41^s,84	+ 161″,0	3^h,1	+ 1′
Sept. 28	— 41 ,740(5)	+ 9	38 ,375(3)*	+ 14	— 41 ,73	+ 160 ,7	3 ,2	0
Sept. 29	— 41 ,740(5)	+ 15	——	——	— 41 ,73	——	3 ,2	— 2
1867 Juli 31	— 41 ,620(5)	+ 12	18 ,691(3)	+ 16	— 41 ,61	+ 160 ,7	0 ,4	— 2
Aug. 12	— 41 ,767(6)	— 11	17 ,940(4)	+ 16	— 41 ,78	+ 160 ,6	1 ,1	+ 6
1868 Maj 13	— 41 ,650(6)	— 17	18 ,068(3)	+ 34	— 41 ,67	+ 160 ,5	18 ,3	+ 5
Juli 27	— 41 ,614(7)	— 17	22 ,564(4)	+ 5	— 41 ,63	+ 159 ,8	23 ,0	+ 8
Aug. 13	— 41 ,700(7)	0	22 ,577(4)	+ 6	— 41 ,70	+ 159 ,7	1 ,7	+ 3
1870 Okt. 4	— 41 ,638(8)	+ 24	22 ,557(3)	+ 19	— 41 ,61	+ 160 ,5	2 ,9	— 1
Okt. 6	— 41 ,814(7)	+ 27	22 ,607(3)	+ 18	— 41 ,79	+ 159 ,9	2 ,6	— 2
1871 Nov. 1	— 41 ,625(8)	+ 22	22 ,566(2)	+ 28	— 41 ,60	+ 160 ,4	4 ,0	— 1
Nov. 5	— 41 ,550(8)	+ 15	22 ,539(2)	+ 25	— 41 ,54	+ 160 ,7	1 ,6	+ 1

N:o 5. 12^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 22	— 40^s,280(5)	+ 20	23^r,376(3)	+ 12	— 40^s,26	+ 98″,0	1^h,7	— 6′
1868 Sept. 3	— 40 ,171(7)	+ 3	42 ,490(4)	+ 24	— 40 ,17	+ 97 ,2	2 ,3	+ 3
1870 Sept. 18	— 40 ,571(7)	+ 19	27 ,476(3)	+ 25	— 40 ,55	+ 97 ,2	3 ,8	— 2
Sept. 22	— 40 ,200(7)	+ 17	——	——	— 40 ,18	——	1 ,6	— 2

N:o 6. 12^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 22	— 38^s,360(5)	+ 13	24^r,231(4)	+ 10	— 38^s,35	+ 83″,2	2^h,1	— 6′
1868 Sept. 3	— 38 ,529(7)	+ 5	41 ,364(4)	+ 22	— 38 ,52	+ 82 ,7	2 ,6	+ 3
1870 Sept. 18	——	——	28 ,633(3)	+ 24	——	+ 82 ,3	3 ,1	— 2
Sept. 22	— 38 ,571(7)	+ 14	——	——	— 38 ,56	——	1 ,7	— 2

N:o 7. 8^m,9.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	— 37^s,660(5)	— 5	15^r,838(3)*	— 12	— 37^s,67	— 227″,9	4^h,9	— 1′
Sept. 30	— 37 ,580(5)	+ 10	42 ,229(3)	— 6	— 37 ,57	— 227 ,2	3 ,8	+ 2
1867 Juli 21	— 37 ,414(7)	+ 4	41 ,204(4)	— 2	— 37 ,41	— 227 ,4	22 ,7	+ 1
Juli 31	— 37 ,580(5)	— 11	23 ,023(3)*	— 1	— 37 ,59	— 227 ,3	23 ,0	— 3

N:o 7. 8^m,9. (Forts.)

Observationstid.	Observ. Δα^s.	Red. i 1/1000^s.	Mikrometer-Afläsning.	Red. i 1/100''.	Medel-koordin. 1865,0. Δα^s.	Δδ''.	Medel-Tim-vinkel.	$P_0 - P$.
1867 Nov. 11	— 37^s,517(6)	+ 15	22^r,192(5)*	+ 4	— 37^s,50	— 228'',4	1^h,8	+ 3'
1868 Maj 12	— 37 ,517(6)	+ 34	40 ,545(3)	— 13	— 37 ,48	— 227 ,2	18 ,6	+ 8
Sept. 4	— 37 ,671(7)	+ 12	17 ,297(4)	+ 29	— 37 ,66	— 227 ,4	3 ,7	+ 3
Sept. 6	— 37 ,614(7)	+ 1	52 ,579(4)	— 23	— 37 ,61	— 227 ,3	2 ,5	0
Okt. 1	— 37 ,614(7)	+ 14	52 ,615(4)	— 22	— 37 ,60	— 227 ,6	2 ,9	+ 3
1870 Aug. 21	— 37 ,486(7)	— 9	{ 52 ,657(6) 17 ,329(6) }	+ 14	— 37 ,50	— 227 ,5	1 ,9	— 2
Sept. 16	— 37 ,686(7)	— 12	52 ,640(5)	— 21	— 37 ,70	— 227 ,5	4 ,9	— 2
Sept. 25	— 37 ,586(7)	— 8	52 ,655(4)	— 13	— 37 ,59	— 227 ,7	2 ,9	— 2
Okt. 2	— 37 ,611(9)	— 8	{ 17 ,270(5) 52 ,688(5) }	+ 14	— 37 ,62	— 228 ,1	3 ,0	— 2
Okt. 3	— 37 ,600(9)	— 4	{ 52 ,654(5) 17 ,321(5) }	+ 15	— 37 ,60	— 227 ,5	2 ,6	— 1
1871 Maj 8	— 37 ,720(10)	+ 4	52 ,642(3)	— 21	— 37 ,72	— 227 ,7	19 ,0	+ 1
Nov. 13	— 37 ,600(8)	— 12	52 ,648(2)	— 3	— 37 ,61	— 227 ,6	0 ,8	— 3

N:o 8. 11^m,0.

Observationstid.	Observ. Δα^s.	Red. i 1/1000^s.	Mikrometer-Afläsning.	Red. i 1/100''.	Δα^s.	Δδ''.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 20	— 36^s,867(6)	— 8	41^r,172(3)	— 1	— 36^s,88	— 208'',8	2^h,3	— 4'
1868 Okt. 2	— 36 ,986(7)	+ 14	51 ,244(4)	— 17	— 36 ,97	— 209 ,9	3 ,0	+ 3
1869 Aug. 25	— 37 ,017(7)	— 19	51 ,221(3)	— 14	— 37 ,04	— 209 ,5	2 ,1	— 5
1870 Sept. 17	— 37 ,057(7)	— 8	51 ,231(3)	— 9	— 37 ,07	— 209 ,3	3 ,0	— 2
Dec. 1	— 37 ,006(7)	— 8	51 ,255(3)	— 5	— 37 ,01	— 209 ,5	2 ,5	— 2
Dec. 4	— 36 ,943(7)	— 8	51 ,248(3)	— 4	— 36 ,95	— 209 ,4	2 ,1	— 2

N:o 9. 12^m,4.

Observationstid.	Observ. Δα^s.	Red. i 1/1000^s.	Mikrometer-Afläsning.	Red. i 1/100''.	Δα^s.	Δδ''.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 17	— 35^s,571(7)	+ 4	38^r,412(3)	+ 19	— 35^s,57	— 43'',8	2^h,8	— 2'
Sept. 18	——	——	38 ,480(2)	+ 19	——	— 44 ,7	3 ,6	— 2
Sept. 22	— 35 ,514(7)	+ 4	——	——	— 35 ,51	——	2 ,3	— 2
1871 Nov. 10	— 35 ,575(8)	+ 9	38 ,368(2)	+ 26	— 35 ,57	— 43 ,2	1 ,7	+ 2

N:o 10. 12^m,8.

Observationstid.	Observ. Δα^s.	Red. i 1/1000^s.	Mikrometer-Afläsning.	Red. i 1/100''.	Δα^s.	Δδ''.	Medel-Tim-vinkel.	$P_0 - P$.
1869 Sept. 17	— 35^s,383(6)	— 1	44^r,575(2)	+ 4	— 35^s,38	— 123'',7	2^h,2	— 2'
1870 Sept. 11	— 35 ,300(7)	+ 2	44 ,693(3)	+ 3	— 35 ,30	— 124 ,9	4 ,3	0
1871 Nov. 10	— 35 ,520(10)	+ 7	44 ,508(2)	+ 17	— 35 ,51	— 122 ,5	1 ,6	+ 2

N:o 11. 11^m,4.

Observationstid.	Observ. Δα^s.	Red. i 1/1000^s.	Mikrometer-Afläsning.	Red. i 1/100''.	Δα^s.	Δδ''.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 22	— 33^s,680(5)	+ 19	23^r,499(4)	+ 10	— 33^s,66	+ 95'',8	2^h,2	— 6'
1868 Sept. 3	— 34 ,014(7)	+ 2	42 ,342(4)	+ 21	— 34 ,01	+ 95 ,3	2 ,8	+ 3
1870 Sept. 18	——	——	27 ,598(3)	+ 21	——	+ 95 ,6	3 ,3	— 2
Sept. 22	— 33 ,914(7)	+ 15	——	——	— 33 ,90	——	1 ,9	— 2
1871 Aug. 23	— 33 ,950(8)	+ 17	27 ,620(2)	+ 23	— 33 ,93	+ 95 ,3	1 ,8	— 3

N:o 12. 12^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_r - P_c$.
1869 Aug. 25	— 33^s,550(6)	— 8	45^r,812(2)	0	— 33^s,56	— 139″,6	2^h,7	— 5′
Sept. 17	— 33 ,640(5)	— 1	45 ,822(2)	0	— 33 ,64	— 139 ,8	2 ,4	— 2
1871 Sept. 17	— 33 ,938(8)	— 4	45 ,835(2)	+ 8	— 33 ,94	— 139 ,6	3 ,3	— 3
Sept. 24	— 33 ,863(8)	— 4	45 ,808(2)	+ 9	— 33 ,87	— 139 ,3	3 ,1	— 3

N:o 13. 9^m,2.

1866 Sept. 29	— 33^s,600(5)	— 2	18^r,970(3)*	— 7	— 33^s,60	— 173″,8	4^h,7	— 1′
Sept. 30	— 33 ,660(5)	+ 8	39 ,098(3)	— 4	— 33 ,65	— 173 ,2	3 ,7	+ 2
1867 Juli 21	— 33 ,567(6)	+ 4	38 ,073(4)	+ 2	— 33 ,56	— 173 ,4	22 ,7	+ 1
Juli 31	— 33 ,560(5)	— 8	26 ,142(4)*	0	— 33 ,57	— 173 ,5	23 ,2	— 3
Nov. 11	— 33 ,633(6)	+ 6	35 ,448(5)*	+ 5	— 33 ,63	— 174 ,5	2 ,3	+ 1
Nov. 13	——	——	25 ,357(4)*	+ 3	——	— 173 ,8	3 ,5	+ 3
1868 Maj 12	— 33 ,683(6)	+ 24	37 ,425(3)	— 6	— 33 ,66	— 173 ,4	18 ,8	+ 8
Juli 26	— 33 ,514(7)	+ 26	48 ,472(5)	— 13	— 33 ,49	— 174 ,2	23 ,6	+ 9
Sept. 4	— 33 ,786(7)	+ 10	21 ,431(4)	+ 20	— 33 ,78	— 174 ,2	3 ,9	+ 3
Sept. 6	— 33 ,829(7)	+ 2	48 ,443(4)	— 12	— 33 ,83	— 173 ,8	2 ,5	0
Okt. 1	——	——	48 ,486(4)	— 12	——	— 174 ,3	3 ,4	+ 3
Okt. 2	— 33 ,571(7)	+ 11	——	——	— 33 ,56	——	2 ,0	+ 3
1870 Sept. 25	— 33 ,514(7)	— 6	48 ,496(4)	— 4	— 33 ,52	— 174 ,0	3 ,7	— 2
Okt. 3	— 33 ,500(7)	— 2	——	——	— 33 ,50	——	3 ,3	— 1
1871 Aug. 9	— 33 ,575(8)	— 10	48 ,478(3)	0	— 33 ,59	— 173 ,8	0 ,5	— 3
Sept. 17	— 33 ,563(8)	— 9	48 ,467(2)	0	— 33 ,57	— 173 ,6	3 ,2	— 3
Sept. 24	— 33 ,588(8)	— 9	48 ,483(2)	+ 1	— 33 ,60	— 173 ,8	2 ,9	— 3

N:o 16. 10^m,0.

1866 Sept. 27	— 29^s,980(5)	+ 4	22^r,749(3)	+ 10	— 29^s,98	+ 108″,6	3^h,2	+ 1′
Sept. 28	— 29 ,980(5)	+ 5	35 ,330(3)*	+ 11	— 29 ,98	+ 108 ,2	4 ,3	+ 1
1867 Aug. 12	— 30 ,017(6)	— 7	21 ,044(4)	+ 11	— 30 ,02	+ 107 ,1	1 ,7	+ 6
1868 Maj 12	— 30 ,017(6)	— 16	21 ,099(3)	+ 20	— 30 ,03	+ 108 ,2	18 ,9	+ 8
Maj 13	— 30 ,083(6)	— 10	21 ,095(3)	+ 19	— 30 ,09	+ 108 ,2	19 ,1	+ 5
Juli 27	— 29 ,929(7)	— 11	26 ,654(4)	+ 7	— 29 ,94	+ 107 ,2	23 ,7	+ 8
Aug. 13	— 30 ,100(7)	0	26 ,635(4)	+ 8	— 30 ,10	+ 107 ,4	1 ,9	+ 3
1870 Okt. 15	— 30 ,043(7)	+ 15	26 ,660(3)	+ 17	— 30 ,03	+ 107 ,7	2 ,0	— 2
Nov. 2	— 30 ,114(7)	+ 15	26 ,679(3)	+ 17	— 30 ,10	+ 107 ,4	1 ,4	— 2
1871 Okt. 2	— 29 ,963(8)	+ 19	26 ,625(2)	+ 21	— 29 ,94	+ 108 ,1	3 ,5	— 3

N:o 17. 8^m,8.

1866 Sept. 29	— 29^s,040(5)	— 9	18^r,100(3)*	— 18	— 29^s,05	— 330″,0	4^h,6	— 1
Sept. 30	— 29 ,040(5)	+ 12	18 ,119(3)	— 11	— 29 ,03	— 329 ,5	3 ,5	+ 2
1867 Juli 31	— 29 ,033(6)	— 19	17 ,067(3)*	— 7	— 29 ,05	— 329 ,9	23 ,4	— 3
Nov. 11	— 29 ,050(6)	+ 5	16 ,303(5)*	— 4	— 29 ,04	— 329 ,9	2 ,7	+ 1
1868 Juli 26	— 29 ,171(7)	+ 51	60 ,563(5)	— 53	— 29 ,12	— 330 ,4	23 ,8	+ 9

N:o 17. 8^m,8. (Forts.)

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	$P_0 - P$.
1868 Sept. 4	— 29^s,114(7)	+ 14	9^r,323(4)	+ 41	— 29^s,10	— 330'',0	3^h,8	+ 3
Sept. 6	— 29 ,071(7)	+ 15	60 ,541(4)	— 53	— 29 ,06	— 330 ,2	2 ,8	+ 3
Okt. 2	— 29 ,057(7)	+ 15	60 ,571(4)	— 52	— 29 ,04	— 330 ,4	3 ,0	+ 3
1870 Aug. 21	— 28 ,943(7)	— 18	60 ,578(6)	— 45	— 28 ,96	— 330 ,1	1 ,4	— 2
Aug. 29	— 29 ,000(7)	— 6	60 ,569(6)	— 44	— 29 ,01	— 330 ,0	1 ,7	0
Okt. 2	— 29 ,044(9)	— 18	9 ,328(5) 60 ,609(5)	+ 5	— 29 ,06	— 330 ,4	2 ,7	— 2
Okt 3	— 29 ,089(9)	— 11	60 ,586(5) 9 ,354(5)	+ 6	— 29 ,10	— 330 ,1	2 ,3	— 1
Dec. 5	— 29 ,057(7)	— 19	60 ,589(6) 9 ,334(6)	+ 9	— 29 ,08	— 330 ,2	1 ,8	— 2
Dec. 10	— 29 ,014(7)	— 20	60 ,595(5) 9 ,342(6)	+ 8	— 29 ,03	— 330 ,2	2 ,3	— 2
1871 Okt. 2	— 28 ,988(8)	— 26	60 ,563(2)	— 41	— 29 ,01	— 329 ,9	3 ,2	— 3
Nov. 3	— 28 ,988(8)	— 19	60 ,563(2)	— 36	— 29 ,01	— 329 ,9	0 ,2	— 2

N:o 18. 9^m,9.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	$P_0 - P$.
1866 Sept. 27	— 28^s,820(5)	+ 1	14^r,265(4)	+ 17	— 28^s,82	+ 254 ,9	3^h,7	+ 2'
Sept. 28	— 28 ,940(5)	+ 6	43 ,853(3)*	+ 22	— 28 ,93	+ 255 ,2	4 ,6	+ 1
1867 Juli 31	— 28 ,940(5)	+ 14	13 ,254(3)	+ 17	— 28 ,93	+ 254 ,4	0 ,9	— 2
Aug. 12	— 28 ,917(6)	— 17	12 ,538(4)	+ 17	— 28 ,93	+ 253 ,7	2 ,2	+ 6
1868 Maj 13	— 29 ,000(6)	— 14	12 ,591(3)	+ 29	— 29 ,01	+ 254 ,9	19 ,5	+ 4
Juli 27	— 28 ,971(7)	— 12	15 ,219(4)	— 13	— 28 ,98	+ 254 ,3	0 ,0	+ 5
Aug. 13	— 28 ,971(7)	— 3	15 ,208(4)	— 11	— 28 ,97	+ 254 ,5	2 ,5	+ 3
1870 Okt. 15	— 29 ,100(7)	+ 25	15 ,273(2)	— 4	— 29 ,08	+ 254 ,2	2 ,3	— 2
Nov. 2	— 29 ,057(7)	+ 25	15 ,260(3)	— 4	— 29 ,03	+ 254 ,4	1 ,8	— 2
1871 Okt. 2	— 28 ,913(8)	+ 33	15 ,222(2)	+ 1	— 28 ,88	+ 254 ,8	3 ,4	— 3
Nov. 3	— 28 ,938(8)	+ 27	15 ,242(2)	+ 1	— 28 ,91	+ 254 ,5	0 ,3	— 2

N:o 19. 11^m,7.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	$P_0 - P$.
1866 Okt. 19	— 28^s,860(5)	+ 5	29^r,564(3)*	+ 6	— 28^s,86	+ 8'',7	3^h,9	— 4'
1870 Dec. 1	— 28 ,771(7)	+ 8	34 ,429(2)	+ 19	— 28 ,76	+ 7 ,6	2 ,9	— 2
1871 Sept. 6	— 28 ,988(8)	+ 7	34 ,399(2)	+ 22	— 28 ,98	+ 7 ,9	2 ,5	— 3
Sept. 27	— 28 ,722(9)	+ 8	34 ,377(3)	+ 23	— 28 ,71	+ 8 ,2	2 ,8	— 3
Okt. 14	— 28 ,856(9)	+ 8	34 ,321(2)	+ 23	— 28 ,85	+ 8 ,9	1 ,9	— 3

N:o 20. 10^m,7.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	$P_0 - P$.
1866 Sept. 27	— 28^s,740(5)	+ 1	18^r,665(4)	+ 13	— 28^s,74	+ 179'',0	3^h,4	+ 1
Sept. 28	— 28 ,660(5)	+ 5	39 ,410(3)*	+ 16	— 28 ,66	+ 178 ,6	4 ,4	+ 1
1867 Aug. 12	— 28 ,767(6)	— 12	16 ,953(4)	+ 14	— 28 ,78	+ 177 ,6	2 ,0	+ 6
1868 Maj 13	— 28 ,567(6)	— 15	17 ,030(3)	+ 24	— 28 ,58	+ 178 ,3	19 ,3	+ 5
Aug. 13	— 28 ,743(7)	— 2	21 ,198(4)	— 2	— 28 ,75	+ 177 ,4	2 ,3	+ 3

N:o 20. 10^m,7. (Forts.)

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{100}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Okt. 15	— 28^s,771(7)	+ 20	21^r,254(2)	+ 6	— 28^s,75	+ 177'',2	2^h,1	— 2'
Nov. 2	— 28 ,700(7)	+ 20	21 ,229(3)	+ 7	— 28 ,68	+ 177 ,5	1 ,6	— 2
1871 Sept. 6	— 28 ,800(8)	+ 23	21 ,159(2)	+ 12	— 28 ,78	+ 178 ,4	2 ,7	— 3
Sept. 27	— 28 ,600(8)	+ 24	21 ,184(2)	+ 12	— 28 ,58	+ 178 ,1	2 ,6	— 3
Okt. 14	— 28 ,689(9)	+ 24	21 ,205(2)	+ 12	— 28 ,67	+ 177 ,8	1 ,8	— 3

N:o 21. 12^m,0.

1869 Aug. 25	— 27^s,975(4)	— 10	46^r,381(2)	— 5	— 27^s,99	— 147'',0	2^h,8	— 5'
Sept. 17	— 28 ,080(5)	— 3	46 ,481(2)	— 4	— 28 ,08	— 148 ,3	2 ,5	— 2

N:o 22. 11^m,9.

1866 Okt. 19	— 27^s,640(5)	+ 9	31^r,599(3)*	+ 8	— 27^s,63	+ 43'',8	4^h,0	— 4'
1870 Dec. 4	— 27 ,571(7)	+ 10	31 ,647(3)	+ 20	— 27 ,56	+ 43 ,4	2 ,2	— 2

N:o 23. 12^m,3.

1868 Okt. 26	— 27^s,043(7)	+ 5	29^r,007(3)	+ 12	— 27^s,04	+ 77'',0	1^h,9	+ 3'
1870 Sept. 12	— 27 ,114(7)	+ 9	29 ,099(3)	+ 17	— 27 ,11	+ 76 ,2	1 ,3	0

N:o 25. 11^m,8.

1868 Nov. 4	— 24^s,500(7)	+ 1	19^r,495(3)	— 3	— 24^s,50	+ 199'',4	1^h,6	+ 3'
1870 Sept. 1	— 24 ,600(7)	+ 18	19 ,599(2)	0	— 24 ,58	+ 198 ,5	1 ,7	+ 2

N:o 28. 12^m,0.

1870 Sept. 17	— 22^s,986(7)	+ 25	16^r,222(2)	0	— 22^s,96	+ 242'',0	4^h,6	— 2'
Sept. 18	— 22 ,750(6)	+ 22	16 ,224(2)	— 6	— 22 ,73	+ 241 ,9	3 ,1	— 2
Sept. 22	— 22 ,971(7)	+ 22	16 ,247(3)	— 6	— 22 ,95	+ 241 ,6	2 ,9	— 2

N:o 29. 11^m,7.

1868 Okt. 26	— 22^s,629(7)	+ 1	27^r,230(3)	+ 7	— 22^s,63	+ 99'',8	2^h,2	+ 3'
1870 Sept. 1	— 22 ,571(7)	+ 12	27 ,297(3)	+ 11	— 22 ,56	+ 99 ,4	1 ,9	— 2

N:o 30. 11^m,6.

1868 Nov. 4	— 20^s,957(7)	— 1	16^r,132(3)	— 13	— 20^s,96	+ 242'',6	2^h,3	+ 3'
1870 Sept. 1	— 21 ,143(7)	+ 21	16 ,224(2)	— 9	— 21 ,12	+ 241 ,9	2 ,1	— 2
1871 Sept. 6	— 21 ,370(10)	+ 27	16 ,213(3)	— 6	— 21 ,34	+ 242 ,0	2 ,0	— 3

N:o 31. 11^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 22	— 20^s,700(5)	+ 31	14^r,358(3)	+ 13	— 20^s,67	+ 253'',4	2^h,3	— 6'
1868 Sept. 3	— 20 ,943(7)	— 2	54 ,501(4)	+ 53	— 20 ,95	+ 252 ,3	3 ,1	+ 3
1870 Sept. 1	— 21 ,056(9)	+ 21	15 ,427(2)	— 10	— 21 ,04	+ 252 ,1	2 ,3	— 2
1871 Sept. 6	— 20 ,980(10)	+ 28	15 ,408(2)	— 8	— 20, 95	+ 252 ,3	2 ,2	— 3

N:o 32. 12^m,4.

1870 Sept. 17	— 20^s,371(7)	+ 21	18^r,970(2)	+ 4	— 20^s,35	+ 206'',6	4^h,7	— 2'
Sept. 18	— 20 ,029(7)	+ 18	18 ,812(2)	— 1	— 20 ,01	+ 208 ,6	3 ,2	— 2
Sept. 22	— 20 ,286(7)	+ 19	18 ,923(2)	— 1	— 20 ,27	+ 207 ,2	3 ,1	— 2

N:o 33. 11^m,5.

1866 Okt. 19	— 19^s,883(6)	+ 3	27^r,705(3)*	+ 2	— 19^s,88	— 23'',4	4^h,2	— 4'
1870 Dec. 1	— 19 ,943(7)	+ 3	36 ,820(3)	+ 14	— 19 ,94	— 23 ,3	2 ,7	— 2

N:o 34. 10^m,5.

1866 Sept. 27	— 19^s,540(5)	0	13^r,865(4)	+ 17	— 19^s,54	+ 261'',8	3^h,9	+ 2'
Sept. 28	— 19 ,360(5)	+ 5	44 ,253(3)*	+ 21	— 19 ,36	+ 262 ,1	4 ,7	+ 1
1867 Sept. 12	— 19 ,429(7)	+ 23	20 ,244(4)	+ 15	— 19 ,41	+ 261 ,7	1 ,9	— 4
1868 Maj 13	— 19 ,467(6)	— 14	12 ,191(3)	+ 26	— 19 ,48	+ 261 ,7	19 ,6	+ 4
1870 Sept. 1	— 19 ,571(7)	+ 21	14 ,760(3)	— 11	— 19 ,55	+ 260 ,7	2 ,4	— 2
Okt. 15	— 19 ,386(7)	+ 23	14 ,760(2)	— 11	— 19 ,36	+ 260 ,7	2 ,4	— 2
Nov. 2	— 19 ,543(7)	+ 23	14 ,746(3)	— 11	— 19 ,52	+ 260 ,9	2 ,0	— 2
1871 Okt. 2	— 19 ,500(8)	+ 30	14 ,710(2)	— 6	— 19 ,47	+ 261 ,3	3 ,6	— 3

N:o 35. 12^m,4.

1870 Sept. 17	— 18^s,471(7)	+ 25	15^r,710(2)	0	— 18^s,45	+ 248'',6	4^h,9	— 2'
Sept. 18	— 18 ,475(8)	+ 22	15 ,890(2)	— 7	— 18 ,45	+ 246 ,2	3 ,4	— 2
Sept. 22	— 18 ,543(7)	+ 22	15 ,760(2)	— 8	— 18 ,52	+ 247 ,9	3 ,2	— 2

N:o 37. 12^m,4.

1870 Sept. 17	— 16^s,886(7)	+ 26	14^r,705(2)	— 1	— 16^s,86	+ 261'',5	5^h,1	— 2'
Sept. 18	— 17 ,029(7)	+ 22	14 ,619(2)	— 10	— 17 ,01	+ 262 ,6	3 ,6	— 2
Sept. 22	— 16 ,871(7)	+ 22	——	——	— 16 ,85	——	3 ,0	— 2

N:o 38. 9^m,6.

1866 Okt. 22	— 16^s,360(5)	+ 44	14^r,840(3)	+ 18	— 16^s,32	+ 386'',2	2^h,5	— 6'
1867 Sept. 12	— 16 ,843(7)	+ 88	12 ,998(3)	+ 20	— 16 ,31	+ 386 ,6	2 ,3	— 4
1868 Maj 13	— 16 ,133(6)	— 14	13 ,160(3)	+ 32	— 16 ,15	+ 386 ,3	19 ,9	+ 3
Maj 22	— 16 ,320(5)	— 9	13 ,156(3)	+ 33	— 16 ,38	+ 386 ,4	19 ,7	+ 2

N:o 38. 9^{m},6. (Forts.)

Observationstid.	Observ. $\varDelta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\varDelta\alpha^s$.	Medel-koordin. 1865,0. $\varDelta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1868 Sept. 4	— 16^s,329(7)	— 4	64^r,826(4)	+ 91	— 16^s,33	+ 385'',8	3^h,9	+ 3
Sept. 6	— 16,414(7)	+ 11	4,996(4)	— 43	— 16,40	+ 385,8	1,9	0
1870 Okt. 4	— 16,391(11)	+ 18	5,064(4)	— 40	— 16,37	+ 385,4	1,4	0
Okt. 6	— 16,443(7)	+ 33	5,073(4)	— 33	— 16,41	+ 385,3	3,9	— 2
Nov. 2	— 16,400(7)	+ 32	5,047(4)	— 38	— 16,37	+ 385,6	2,2	— 2
Dec. 4	— 16,343(7)	+ 33	5,031(3)	— 33	— 16,31	+ 385,9	3,6	— 2
1871 Aug. 9	— 16,425(8)	+ 37	5,045(3)	— 37	— 16,39	+ 385,7	1,0	— 3
Aug. 31	— 16,488(8)	+ 41	5,038(3)	— 30	— 16,45	+ 385,7	4,0	— 3
Sept. 6	— 16,525(8)	+ 42	5,071(3)	— 29	— 16,48	+ 385,3	4,1	— 3
Sept. 24	— 16,513(8)	+ 41	5,047(2)	— 30	— 16,47	+ 385,6	4,0	— 3

N:o 39. 11^{m},4.

1868 Nov. 4	— 15^s,900(7)	— 3	17^r,597(3)	— 12	— 15^s,90	+ 223'',8	2^h,0	+ 3'
1870 Aug. 31	— 15,786(7)	+ 12	17,661(2)	— 7	— 15,77	+ 223,4	3,2	0

N:o 40. 11^{m},4.

1868 Nov. 4	— 15^s,043(7)	— 1	20^r,745(3)	— 6	— 15^s,04	+ 183'',3	1^h,8	+ 3'
1870 Aug. 31	— 15,043(7)	+ 10	20,756(2)	0	— 15,03	+ 183,6	3,4	0
1871 Sept. 27	— 15,188(8)	+ 21	20,731(3)	0	— 15,17	+ 183,8	2,4	— 3

N:o 41. 11^{m},4.

1868 Okt. 26	— 14^s,914(7)	+ 2	29^r,838(3)	+ 6	— 14^s,91	+ 66'',2	2^h,4	+ 3'
1870 Sept. 1	— 15,014(7)	+ 7	29,896(2)	+ 9	— 15,01	+ 65,9	3,7	— 2
1871 Sept. 27	— 15,025(8)	+ 10	29,877(2)	+ 11	— 15,02	+ 66,0	2,3	— 3

N:o 43. 11^{m},1.

1866 Okt. 19	— 13^s,357(7)	+ 2	27^r,223(2)*	+ 1	— 13^s,36	— 31'',7	4^h,4	— 4'
Okt. 20	— 13,440(5)	+ 2	30,911(3)	+ 1	— 13,44	— 32,0	2,3	— 4
1870 Dec. 1	— 13,414(7)	+ 2	37,488(3)	+ 9	— 13,41	— 32,0	2,8	— 2

N:o 44. 11^{m},7.

1868 Nov. 4	— 12^s,900(7)	— 3	17^r,401(3)	— 13	— 12^s,90	+ 226'',3	2^h,1	+ 3'
1870 Aug. 31	— 12,986(7)	+ 12	17,402(2)	— 8	— 12,97	+ 226,7	3,5	0

N:o 45. 11^{m},7.

1870 Sept. 1	— 11^s,589(7)	+ 22	11^r,768(3)	— 24	— 11^s,57	+ 299'',2	1^h,5	— 2'
Sept. 11	— 11,843(7)	+ 17	11,857(3)	— 14	— 11,83	+ 298,1	4,6	0
Sept. 12	— 11,671(7)	+ 13	11,858(3)	— 24	— 11,66	+ 298,0	1,1	0

N:o 46. $12^m,6$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1868 Okt. 26	$-11^s,214(7)$	+ 3	$34^r,275(3)$	+ 5	$-11^s,21$	$+ 9'',0$	$2^h,6$	+ 3'
1870 Sept. 1	− 11 ,286(7)	+ 3	34 ,186(3)	+ 7	− 11 ,28	+ 10 ,6	4 ,0	− 2

N:o 48. $11^m,6$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Nov. 16	$-8^s,900(3)^*$	+ 2	$28^r,909(3)$	+ 3	$(-8^s,90$	$+ 21'',8$	$3^h,3$	——
Nov. 17	− 9 ,021(4)*	+ 2	31 ,415(3)*	+ 3	$-9,02)$	+ 21 ,4	2 ,8	——
1868 Okt. 26	− 9 ,729(7)	+ 3	33 ,308(3)	+ 4	− 9 ,73	+ 21 ,5	2 ,6	+ 3'
1870 Sept. 1	− 9 ,514(7)	+ 3	33 ,326(2)	+ 6	− 9 ,51	+ 21 ,6	4 ,2	− 2

N:o 49. $9^m,0$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	$-8^s,460(5)$	− 10	$23^r,561(3)^*$	− 9	$-8^s,47$	$-235'',8$	$3^h,0$	− 2'
Sept. 30	− 8 ,520(5)	+ 2	23 ,534(4)	− 10	− 8 ,52	− 236 ,2	3 ,2	+ 1
1867 Nov. 11	− 8 ,400(6)	+ 1	21 ,740(5)*	− 7	− 8 ,40	− 236 ,3	2 ,5	+ 1
1868 Maj 12	− 8 ,333(6)	+ 32	41 ,062(3)	− 19	− 8 ,30	− 236 ,2	19 ,0	+ 8
Juli 26	− 8 ,443(7)	+ 33	53 ,267(5)	− 35	− 8 ,41	− 236 ,2	23 ,8	+ 9
Sept. 4	− 8 ,400(7)	+ 7	16 ,622(4)	+ 18	− 8 ,39	− 236 ,2	3 ,8	+ 3
Sept. 6	− 8 ,571(7)	+ 7	53 ,238(4)	− 37	− 8 ,56	− 235 ,9	3 ,6	+ 3
Okt. 2	− 8 ,443(7)	+ 8	53 ,262(4)	− 35	− 8 ,44	− 236 ,1	3 ,0	+ 3
1869 Aug. 25	− 8 ,200(6)	− 26	53 ,235(3)	− 35	− 8 ,23	− 235 ,7	2 ,7	− 5
1870 Sept. 25	− 8 ,471(7)	− 16	53 ,312(4)	− 35	− 8 ,49	− 236 ,3	3 ,6	− 2
Okt. 3	− 8 ,414(7)	− 12	53 ,274(4)	− 35	− 8 ,43	− 235 ,9	3 ,6	− 1
1871 Aug. 24	− 8 ,420(10)	− 20	53 ,284(2)	− 32	− 8 ,44	− 236 ,0	1 ,1	− 3
Aug. 27	− 8 ,410(10)	− 20	53 ,257(2)	− 31	− 8 ,43	− 235 ,7	1 ,1	− 3
Aug. 28	− 8 ,370(10)	− 20	——	——	− 8 ,39	——	1 ,2	− 3
Okt. 3	− 8 ,335(5)*	− 8	——	——	− 8 ,34	——	3 ,0	—
Dec. 9	− 8 ,335(4)*	− 8	——	——	− 8 ,34	——	1 ,6	—

N:o 50. $10^m,5$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 27	$-8^s,260(5)$	− 3	$16^r,175(3)$	+ 13	$-8^s,26$	$+ 221'',9$	$4^h,1$	+ 2'
Sept. 28	− 8 ,360(5)	+ 3	41 ,951(3)*	+ 18	− 8 ,36	+ 222 ,4	4 ,9	+ 1
1867 Sept. 12	− 8 ,400(8)	+ 21	22 ,561(3)	+ 11	− 8 ,38	+ 221 ,7	2 ,3	− 4
1868 Maj 13	− 8 ,117(6)	− 14	14 ,475(3)	+ 18	− 8 ,13	+ 222 ,3	19 ,8	+ 4
Nov. 4	− 8 ,143(7)	− 4	17 ,821(3)	− 14	− 8 ,15	+ 220 ,9	2 ,5	+ 3
1870 Okt. 15	− 8 ,586(7)	+ 19	17 ,854(2)	− 12	− 8 ,57	+ 220 ,8	2 ,6	− 2
Nov. 2	− 8 ,386(7)	+ 19	17 ,839(3)	− 12	− 8 ,37	+ 221 ,0	2 ,2	− 2
1871 Aug. 23	− 8 ,475(8)	+ 23	17 ,798(2)	− 12	− 8 ,45	+ 221 ,5	1 ,6	− 3
Aug. 24	− 8 ,390(10)	+ 23	17 ,788(2)	− 13	− 8 ,37	+ 221 ,6	0 ,9	− 3
Aug. 27	− 8 ,440(10)	+ 23	17 ,816(2)	− 13	− 8 ,42	+ 221 ,2	1 ,2	− 3
Aug. 28	− 8 ,360(10)	+ 23	——	——	− 8 ,34	——	1 ,1	− 3
Okt. 3	− 8 ,313(5)*	+ 11	——	——	− 8 ,30	——	3 ,3	—
Dec. 9	− 8 ,506(4)*	+ 11	——	——	− 8 ,50	——	2 ,1	—

N:o 51. 9^{m},0.

Observationstid.	Observ. $\Delta\alpha^{s}$.	Red. i $^{1}/_{1000}{}^{s}$.	Mikrometer-Afläsning.	Red. i $^{1}/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^{s}$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	— 7^{s},820(5)	— 18	14^{r},643(3)*	— 16	— 7^{s},84	— 389'',6	3^{h},1	— 2'
Sept. 30	— 8,020(5)	+ 3	14,636(3)	— 17	— 8,02	— 389,6	3,3	+ 1
1867 Nov. 11	— 7,883(3)	0	12,817(5)*	— 13	— 7,88	— 390,1	2,5	+ 1
1868 Sept. 4	— 7,800(7)	+ 9	4,715(4)	+ 47	— 7,79	— 389,3	3,6	+ 3
Sept. 6	— 7,714(7)	— 8	65,131(4)	— 80	— 7,72	— 389,6	3,3	0
1870 Sept. 16	— 7,714(7)	— 29	65,151(3)	— 86	— 7,74	— 389,4	4,6	— 2
Sept. 25	— 7,814(7)	— 26	65,175(4)	— 77	— 7,84	— 389,6	3,3	— 2
1871 Maj 8	— 7,810(10)	+ 1	65,178(3)	—101	— 7,81	— 390,0	18,6	+ 1
Maj 21	— 7,710(10)	— 2	65,114(3)	— 92	— 7,71	— 389,1	19,1	+ 1
Maj 23	— 7,760(10)	— 3	65,149(3)	— 92	— 7,76	— 389,6	19,2	+ 1
Aug. 8	— 7,820(10)	— 36	65,164(3)	— 75	— 7,86	— 389,6	1,6	— 3
Aug. 9	— 7,773(8)	— 35	65,177(4)	— 74	— 7,81	— 389,7	0,3	— 3
Nov. 13	— 7,775(8)	— 37	65,123(2)	— 70	— 7,81	— 389,0	0,9	— 3

N:o 53. 11^{m},4.

1866 Nov. 16	— 4^{s},263(4)*	+ 1	28^{r},254(3)	+ 2	— 4^{s},26	+ 33'',1	3^{h},1	—
Nov. 17	— 4,187(4)*	+ 1	32,129(3)*	+ 2	— 4,19	+ 33,7	2,7	—
1868 Okt. 26	— 4,486(7)	— 1	32,439(3)	+ 2	— 4,49	+ 32,6	2,8	+ 3'
1870 Sept. 1	— 4,214(7)	+ 4	32,444(2)	+ 4	— 4,21	+ 33,0	4,3	— 2

N:o 63. 9^{m},6.

1866 Sept. 27	+ 1^{s},451(4)*	+ 5	{ 20^{r},378(4) 37,733(4) }	+ 13	+ 1^{s},46	+ 149'',7	5^{h},4	—
Sept. 28	+ 1,422(3)*	+ 3	{ 37,724(3)* 20,380(3)* }	+ 10	+ 1,43	+ 149,5	4,5	—
1867 Juli 21	+ 1,412(5)*	+ 2	19,308(4)	+ 6	+ 1,41	+ 150,0	23,6	—
Sept. 12	+ 1,415(6)*	+ 2	18,562(4)	+ 6	+ 1,42	+ 149,3	2,1	—
1868 Sept. 4	+ 1,481(5)*	+ 3	23,435(4)	— 8	+ 1,48	+ 148,5	1,2	—
Sept. 6	+ 1,471(7)	+ 3	46,511(4)	+ 19	+ 1,47	+ 149,0	1,6	0'
1871 Nov. 13	+ 1,370(5)*	+ 6	46,545(3)	+ 17	+ 1,38	+ 149,0	1,7	—
Dec. 4	+ 1,484(5)*	+ 6	23,370(3)	— 7	+ 1,49	+ 149,7	3,7	—
Dec. 9	+ 1,435(6)*	+ 6	23,378(2)	— 9	+ 1,44	+ 149,6	2,5	—

N:o 66. 10^{m},0.

1866 Sept. 27	+ 4^{s},456(3)*	+ 5	21^{r},188(4)	+ 15	+ 4^{s},46	+ 135'',6	5^{h},7	—
Sept. 28	+ 4,498(3)*	+ 3	21,211(3)*	+ 9	+ 4,50	+ 135,2	4,7	—
1867 Sept. 12	+ 4,474(6)*	+ 2	19,389(3)	+ 5	+ 4,48	+ 135,0	3,0	—
1868 Sept. 4	+ 4,537(5)*	+ 2	24,550(4)	— 5	+ 4,54	+ 134,1	1,4	—
Sept. 6	+ 4,371(7)	+ 2	45,351(4)	+ 14	+ 4,37	+ 134,0	2,7	0'
1870 Okt. 4	+ 4,322(9)	+ 7	45,473(3)	+ 14	+ 4,33	+ 135,1	3,8	— 1
Okt. 6	+ 4,400(7)	+ 8	45,450(3)	+ 11	+ 4,41	+ 134,8	1,8	— 2

N:o 66. 10^m,0. (Forts.)

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1871 Aug. 24	+ 4^s,390(10)	+ 11	45^r,429(2)	+ 13	+ 4^s,40	+ 134'',6	3^h,7	— 3'
Aug. 31	+ 4 ,488(8)	+ 11	45 ,422(2)	+ 12	+ 4 ,50	+ 134 ,5	1 ,6	— 3
Sept. 6	+ 4 ,390(10)	+ 11	45 ,445(3)	+ 12	+ 4 ,40	+ 134 ,8	2 ,8	— 3

N:o 69. 11^m,5.

1866 Nov. 16	+ 7^s,660(5)	+ 8	21^r,536(3)	+ 5	+ 7^s,67	+ 148'',9	3^h,4	— 3'
Nov. 17	+ 7 ,580(5)	+ 9	31 ,612(3)*	+ 4	+ 7 ,59	+ 147 ,6	2 ,7	— 4

N:o 70. 12^m,1.

1866 Nov. 16	+ 7^s,820(5)	+ 7	22^r,563(4)	+ 4	+ 7^s,83	+ 131'',2	3^h,2	— 3'
Nov. 17	+ 7 ,840(5)	+ 9	22 ,626(5)*	+ 3	+ 7 ,85	+ 130 ,1	2 ,6	— 4

N:o 73. 9^m,8.

1866 Sept. 29	+ 10^s,640(5)	— 10	39^r,582(3)*	— 9	+ 10^s,63	— 181'',5	2^h,7	— 2'
Sept. 30	+ 10 ,600(5)	— 1	18 ,529(3)	— 9	+ 10 ,60	— 181 ,3	3 ,0	+ 1
1867 Aug. 13	+ 10 ,717(6)	— 1	37 ,803(3)*	— 10	+ 10 ,72	— 182 ,3	1 ,8	+ 1
1868 Maj 22	+ 10 ,520(5)	+ 3	16 ,881(3)	— 16	+ 10 ,52	— 180 ,8	19 ,9	+ 2
Aug. 30	+ 10 ,857(7)	+ 4	49 ,019(4)	— 30	+ 10 ,86	— 181 ,4	1 ,6	+ 3
1869 Okt. 25	+ 10 ,957(7)	— 17	20 ,933(4)	+ 6	+ 10 ,94	— 180 ,9	2 ,7	— 3
1870 Aug. 29	+ 10 ,757(7)	— 8	20 ,904(4)	+ 6	+ 10 ,75	— 181 ,6	1 ,4	0
Sept. 11	+ 10, 629(7)	— 10	20 ,956(3)	+ 6	+ 10 ,62	— 181 ,0	3 ,7	0
Sept. 12	+ 10 ,714(7)	— 12	20 ,935(2)	+ 6	+ 10 ,70	— 181 ,2	1 ,6	— 1
Sept. 16	+ 10 ,671(7)	— 15	20 ,905(2)	+ 4	+ 10 ,66	— 181 ,6	3 ,3	— 2
1871 Aug. 27	+ 10 ,630(10)	— 20	20 ,925(2)	+ 3	+ 10 ,61	— 181 ,3	3 ,2	— 3
Nov. 13	+ 10 ,600(8)	— 20	20 ,901(3)	+ 4	+ 10 ,58	— 181 ,6	1 ,1	— 3

N:o 74. 11^m,2.

1870 Sept. 16	+ 11^s,514(7)	— 27	8^r,292(3)	+ 33	+ 11^s,49	— 343'',9	2^h,3	— 2'
Sept. 17	+ 11 ,443(7)	— 28	8 ,273(3)	+ 33	+ 11 ,42	— 344 ,1	2 ,4	— 2
1871 Aug. 24	+ 11 ,290(10)	— 35	8 ,238(2)	+ 32	+ 11 ,26	— 344 ,5	1 ,3	— 3
Aug. 27	+ 11 ,130(10)	— 35	8 ,263(3)	+ 32	+ 11 ,10	— 344 ,2	1 ,4	— 3
Aug. 31	+ 11 ,300(10)	— 35	8 ,278(2)	+ 32	+ 11 ,27	— 344 ,0	1 ,5	— 3

N:o 75. 11^m,0.

1871 Aug. 24	+ 11^s,420(10)	+ 24	56^r,707(2)	+ 42	+ 11^s,44	+ 280'',3	1^h,4	— 3'
Aug. 27	+ 11 ,420(10)	+ 24	56 ,761(2)	+ 42	+ 11 ,44	+ 280 ,9	1 ,6	— 3

N:o 77. 12^m,4.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 16	+ 13^s,029(7)	— 25	10^r,013(3)	+ 28	+ 13^s,00	— 321'',7	2^h,6	— 2'
Sept. 17	+ 13,200(7)	— 25	10,066(2)	+ 28	+ 13,18	— 321,0	2,6	— 2
1871 Okt. 1	+ 12,888(8)	— 33	10,030(2)	+ 26	+ 12,86	— 321,4	2,6	— 3

N:o 82. 13^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 17^s,429(7)	— 13	15^r,939(2)	+ 11	+ 17^s,42	— 245'',5	1^h,6	0'
Sept. 27	+ 17,200(7)	— 13	15,978(2)	+ 10	+ 17,19	— 245,0	2,9	0

N:o 83. 9^m,4.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	+ 19^s,740(5)	— 3	34^r,739 — 34^r,927(4)	— 3	+ 19^s,74	— 3'',3	2^h,0	— 2'
Sept. 30	+ 19,660(5)	— 3	27,473 — 27,638(3)	— 3	+ 19,66	— 2,9	2,3	+ 1
1867 Aug. 13	+ 19,760(5)	— 2	28,538 — 28,677(4)	— 5	+ 19,76	— 2,4	1,5	+ 1
1868 Maj 22	+ 19,920(5)	0	40,086 — 40,251(4)	— 7	+ 19,92	— 2,9	19,9	+ 2
Aug. 30	+ 19,786(7)	— 3	49,268 — 49,462(4)	— 7	+ 19,78	— 2,6	1,8	+ 3
1870 Okt. 12	+ 19,686(7)	— 5	30,740 — 30,971(3)	— 13	+ 19,68	— 3,1	1,6	— 2
1871 Maj 8	+ 19,760(10)	— 1	51,967 — 52,151(3)	— 15	+ 19,76	— 2,5	19,3	+ 1
Maj 21	+ 19,780(10)	— 1	39,323 — 39,501(3)	— 15	+ 19,78	— 2,4	20,0	+ 1
Maj 23	+ 19,680(10)	— 1	31,017 — 31,239(3)	— 15	+ 19,68	— 3,0	20,1	+ 1
Aug. 13	+ 19,763(8)	— 4	31,558 — 31,829(4)	— 15	+ 19,76	— 3,6	0,3	— 2
Okt. 14	+ 19,638(8)	— 5	28,585 — 28,794(3)	— 16	+ 19,63	— 2,9	2,3	— 3

N:o 87. 10^m,5.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	+ 23^s,720(5)	— 6	33^r,504(3)*	— 7	+ 23^s,71	— 76'',7	2^h,2	— 2'
Sept. 30	+ 23,900(5)	— 4	24,605(3)	— 7	+ 23,90	— 76,6	2,4	+ 1
1867 Aug. 13	+ 23,700(5)	— 3	31,681(4)*	— 9	+ 23,70	— 76,8	1,7	+ 1
1868 Aug. 30	+ 23,643(7)	— 2	40,862(4)	— 15	+ 23,64	— 76,2	2,0	+ 3
1870 Okt. 12	+ 23,800(7)	— 11	29,108(3)	— 16	+ 23,79	— 76,1	1,8	— 2
Dec. 4	+ 23,657(7)	— 11	29,111(2)	— 18	+ 23,65	— 76,1	2,6	— 2
Dec. 5	+ 23,743(7)	— 11	29,110(2)	— 18	+ 23,73	— 76,1	3,0	— 2
1871 Nov. 13	+ 23,788(8)	— 13	29,044(2)	— 20	+ 23,78	— 76,9	1,5	— 3

N:o 88. 12^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 12	+ 24^s,700(7)	— 13	24^r,285(3)	— 12	+ 24^s,69	— 138'',2	2^h,0	— 1'
Sept. 16	+ 24,929(7)	— 15	24,233(2)	— 12	+ 24,91	— 138,9	2,1	— 2

N:o 91. 13^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 30^s,171(7)	— 17	14^r,489(2)	+ 4	+ 30^s,15	— 264'',3	2^h,1	0'
Sept. 29	+ 30,443(7)	— 17	14,475(2)	+ 3	+ 30,43	— 264,5	2,8	0
1871 Nov. 9	+ 30,425(8)	— 21	14,542(2)	— 1	+ 30,40	— 263,6	2,0	0

N:o 92. 12^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 31^s,429(7)	— 17	13^r,125(2)	+ 9	+ 31^s,41	— 281'',6	1^h,9	0'
Sept. 29	+ 31 ,150(8)	— 18	13 ,250(2)	+ 7	+ 31 ,13	— 280 ,2	2 ,7	0
1871 Nov. 9	+ 31 ,470(10)	— 22	13 ,133(2)	+ 3	+ 31 ,45	— 281 ,7	1 ,8	0

N:o 93. 12^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 23	+ 35^s,157(7)	— 16	26^r,447(2)	— 19	+ 35^s,14	— 110'',4	2^h,9	— 2'
Sept. 24	+ 35 ,100(7)	— 16	26 ,406(3)	— 19	+ 35 ,08	— 110 ,9	3 ,0	— 2

N:o 94. 11^m,9.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 12	+ 35^s,043(7)	— 10	30^r,930(2)	— 20	+ 35^s,03	— 52'',7	1^h,8	— 1'
Sept. 16	+ 35 ,214(7)	— 11	30 ,949(2)	— 21	+ 35 ,20	— 52 ,4	2 ,0	— 2

N:o 95. 9^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	+ 35^s,320(5)	— 8	33^r,678(3)*	— 9	+ 35^s,31	— 79'',7	2^h,3	— 2'
Sept. 30	+ 35 ,140(5)	— 5	24 ,412(3)	— 9	+ 35 ,14	— 80 ,0	2 ,5	+ 1
1867 Juli 31	+ 35 ,200(5)	— 6	23 ,366(3)	— 11	+ 35 ,19	— 80 ,1	1 ,1	— 2
Aug. 13	+ 35 ,200(5)	— 4	31 ,864(3)*	— 11	+ 35 ,20	— 80 ,0	2 ,0	+ 1
1868 Maj 12	+ 35 ,150(6)	+ 7	22 ,775(3)	— 20	+ 35 ,16	— 79 ,3	18 ,9	+ 7
Maj 22	+ 35 ,200(5)	+ 1	22 ,776(4)	— 17	+ 35 ,20	— 79 ,2	20 ,2	+ 2
Aug. 30	+ 35 ,271(7)	— 4	41 ,128(4)	— 20	+ 35 ,27	— 79 ,7	2 ,2	+ 3
1870 Sept. 11	+ 35 ,114(7)	— 10	28 ,843(4)	— 21	+ 35 ,10	— 79 ,6	2 ,0	0
Sept. 23	+ 35 ,271(7)	— 13	28 ,841(3)	— 22	+ 35 ,26	— 79 ,6	3 ,3	— 2
Okt. 12	+ 35 ,222(9)	— 13	28 ,840(3)	— 22	+ 35 ,21	— 79 ,6	1 ,4	— 2
Nov. 4	+ 35 ,263(8)	— 14	28 ,824(3)	— 24	+ 35 ,25	— 79 ,8	2 ,8	— 2
Dec. 5	+ 35 ,229(7)	— 13	28 ,864(3)	— 26	+ 35 ,22	— 79 ,3	3 ,3	— 2
1871 Maj 8	+ 35 ,190(10)	— 3	28 ,846(3)	— 28	+ 35 ,19	— 79 ,5	19 ,4	+ 1
Nov. 13	+ 35 ,175(8)	— 16	28 ,818(2)	— 28	+ 35 ,16	— 79 ,9	1 ,2	— 3

N:o 96. 10^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Sept. 29	+ 35^s,700(5)	— 11	35^r,428(3)*	— 10	+ 35^s,69	— 109'',9	2^h,5	— 2'
Sept. 30	+ 35 ,940(5)	— 5	22 ,756(3)	— 10	+ 35 ,94	— 108 ,5	2 ,7	+ 1
1867 Aug. 13	+ 35 ,740(5)	— 3	33 ,622(3)*	— 13	+ 35 ,74	— 110 ,3	2 ,2	+ 1
1868 Aug. 30	+ 35 ,900(4)	— 2	43 ,363(4)	— 24	+ 35 ,90	— 108 ,5	2 ,4	+ 3
Sept. 3	+ 35 ,914(7)	0	43 ,345(4)	— 24	+ 35 ,91	— 108 ,3	1 ,1	+ 4
1870 Sept. 23	+ 35 ,957(7)	— 16	26 ,607(3)	— 20	+ 35 ,94	— 108 ,4	3 ,1	— 2
Okt. 12	+ 35 ,729(7)	— 17	26 ,613(3)	— 20	+ 35 ,71	— 108 ,3	2 ,0	— 2
Dec. 4	+ 35, 843(7)	— 18	26 ,665(2)	— 26	+ 35 ,83	— 109 ,0	4 ,6	— 2
Dec. 5	+ 35 ,743(7)	— 17	26 ,630(2)	— 24	+ 35 ,73	— 108 ,1	3 ,2	— 2
1871 Nov. 13	+ 35 ,750(8)	— 20	26 ,555(2)	— 26	+ 35 ,73	— 109 ,0	1 ,4	— 3

N:o 97. 13^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 37^s,786(7)	— 16	19^r,922(2)	— 11	+ 37^s,77	— 194'',4	2^h,9	0
Sept. 29	+ 37 ,943(7)	— 17	19 ,908(2)	— 12	+ 37 ,93	— 194 ,6	3 ,3	0

N:o 98. 9^m,4.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1866 Okt. 22	+ 38^s,933(6)	+ 21	43^r,074(3)	+ 2	+ 38^s,95	+ 241'',6	2^h,7	— 6'
1868 Maj 22	+ 39 ,000(5)	— 1	41 ,365(4)	+ 5	+ 39 ,00	+ 241 ,3	19 ,6	+ 2
Sept. 3	+ 39 ,071(7)	— 17	16 ,219(4)	— 36	+ 39 ,05	+ 241 ,2	1 ,2	+ 4
1870 Aug. 29	+ 39 ,043(7)	+ 1	——	——	+ 39 ,04	——	2 ,0	0
Aug. 31	——	——	53 ,718(4)	+ 17	——	+ 241 ,4	1 ,8	0
Sept. 4	+ 39 ,114(7)	+ 5	53 ,732(3)	+ 16	+ 39 ,12	+ 241 ,6	1 ,4	— 1
Okt. 4	+ 38 ,713(8)	+ 5	53 ,731(4)	+ 18	+ 38 ,72	+ 241 ,6	3 ,6	— 1
Okt. 6	+ 38 ,950(8)	+ 8	53 ,688(3)	+ 15	+ 38 ,96	+ 241 ,0	1 ,7	— 2
Okt. 12	+ 38 ,971(7)	+ 8	53 ,671(3)	+ 15	+ 38 ,98	+ 240 ,8	2 ,3	— 2
Dec. 4	+ 38 ,971(7)	+ 11	53 ,701(3)	+ 16	+ 38 ,98	+ 241 ,2	3 ,9	— 2
1871 Aug. 9	+ 38 ,925(8)	+ 15	53 ,686(3)	+ 13	+ 38 ,94	+ 241 ,0	1 ,2	— 3
Sept. 1	+ 38 ,988(8)	+ 16	53 ,667(2)	+ 17	+ 39 ,00	+ 240 ,8	4 ,2	— 3
Sept. 6	+ 38 ,988(8)	+ 15	53 ,687(2)	+ 16	+ 39 ,00	+ 241 ,1	3 ,9	— 3

N:o 99. 11^m,9.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 23	+ 41^s,871(7)	— 11	32^r,738(2)	— 27	+ 41^s,86	— 29'',4	2^h,7	— 2'
Sept. 24	+ 41 ,929(7)	— 11	32 ,735(2)	— 27	+ 41 ,92	— 29 ,5	2 ,8	— 2

N:o 100. 13^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 23	+ 42^s,014(7)	— 19	23^r,859(2)	— 21	+ 42^s,00	— 143'',8	2^h,4	— 2'
Sept. 24	+ 42 ,000(7)	— 19	23 ,824(2)	— 21	+ 41 ,98	— 144 ,2	1 ,9	— 2

N:o 101. 11^m,8.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 23	+ 42^s,057(7)	— 15	29^r,104(2)	— 25	+ 42^s,04	— 76'',2	2^h,5	— 2'
Sept. 24	+ 41 ,957(7)	— 15	29 ,101(2)	— 25	+ 41 ,94	— 76 ,3	2 ,1	— 2

N:o 102. 13^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 44^s,057(7)	— 19	16^r,589(2)	— 8	+ 44^s,04	— 237'',3	2^h,5	0'
Sept. 29	+ 44 ,257(7)	— 20	16 ,502(2)	— 9	+ 44 ,24	— 238 ,5	3 ,1	0

N:o 103. 11^m,6.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	$P_0 - P$.
1870 Sept. 26	+ 46^s,029(7)	— 22	10^r,317(2)	+ 7	+ 46^s,01	— 318'',0	2^h,3	0'
Sept. 27	+ 45 ,986(7)	— 23	10 ,351(2)	+ 6	+ 45 ,96	— 317 ,6	3 ,1	0

N:o 104. 10^m,6.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Sept. 23	+ 47^s,929(7)	— 15	30^r,079(3)	— 29	+ 47^s,91	— 63'',7	2^h,1	— 2'
Sept. 24	+ 47 ,929(7)	— 15	30 ,095(2)	— 29	+ 47 ,91	— 63 ,5	1 ,7	— 2
1871 Okt. 2	+ 47 ,900(8)	— 18	30 ,077(3)	— 48	+ 47 ,88	— 63 ,8	1 ,8	— 3
Okt. 14	+ 47 ,888(8)	— 18	30 ,076(2)	— 37	+ 47 ,87	— 63 ,7	2 ,8	— 3
Nov. 10	+ 47 ,950(8)	— 13	30 ,144(2)	— 39	+ 47 ,93	— 62 ,9	1 ,9	+ 2

Afdeln. II. Stjernan N:o 17 Komparations-stjerna.

N:o 15. 11^m,5.

1870 Sept. 29	— 2^s,167(9)	— 2	39^r,273(3)	— 3	— 2^s,17	— 55'',1	3^h,5	0'
Okt. 2	— 2 ,170(10)	— 4	39 ,287(3)	— 4	— 2 ,17	— 55 ,3	3 ,9	— 2

N:o 42. 12^m,2.

1869 Sept. 17	+ 14^s,960(5)	— 2	37^r,208(2)	— 5	+ 14^s,96	+ 28'',7	2^h,4	— 2'
1870 Aug. 29	+ 14 ,729(7)	— 2	37 ,154(3)	— 7	+ 14 ,73	+ 27 ,7	1 ,3	+ 1
1871 Aug. 24	+ 14 ,863(8)	— 2	36 ,160(2)	— 9	+ 14 ,86	+ 27 ,8	1 ,6	— 3

N:o 54. 11^m,2.

1869 Aug. 25	+ 25^s,150(6)	+ 4	35^r,829(2)	— 11	+ 25^s,15	+ 10'',9	2^h,4	— 5'
Sept. 17	+ 25 ,080(5)	+ 5	35 ,857(3)	— 12	+ 25 ,09	+ 11 ,2	1 ,7	— 2

N:o 59. 10^m,0.

1868 Sept. 6	+ 27^s,629(7)	— 6	——	——	+ 27^s,62	——	4^h,0	+ 3'
Okt. 2	+ 27 ,643(7)	— 7	——	——	+ 27 ,64	——	2 ,6	+ 3
1869 Aug. 25	+ 27 ,850(6)	+ 1	37^r,780(3)	— 10	+ 27 ,85	+ 36'',0	2 ,6	— 5
Sept. 17	+ 27 ,950(6)	— 2	37 ,872(3)	— 11	+ 27 ,95	+ 37 ,2	3 ,2	— 2
1870 Aug. 29	+ 27 ,625(8)	— 4	37 ,801(3)	— 14	+ 27 ,62	+ 36 ,0	1 ,5	0
Okt. 2	+ 27 ,686(7)	— 3	37 ,824(4)	— 15	+ 27 ,68	+ 36 ,2	3 ,4	— 2
Dec. 5	+ 27 ,571(7)	— 2	37 ,844(2)	— 18	+ 27 ,57	+ 36 ,5	2 ,7	— 2
1871 Aug. 24	+ 27 ,650(8)	— 1	37 ,806(2)	— 18	+ 27 ,65	+ 36 ,1	1 ,7	— 3
Aug. 29	+ 27 ,663(8)	— 1	——	——	+ 27 ,66	——	0 ,4	— 3
Aug. 31	+ 27 ,650(8)	0	37 ,824(2)	— 18	+ 27 ,65	+ 36 ,8	1 ,0	— 3

Afdeln. III. Stjernan N:o 38 Komparations-stjerna.

N:o 4. 11^m,0.

1870 Nov. 5	— 24^s,824(7)	+ 9	31^r,101(2)	+ 17	— 24^s,82	+ 50'',4	1^h,0	— 1'
Nov. 13	— 24 ,929(7)	+ 8	31 ,126(2)	+ 17	— 24 ,92	+ 50 ,1	1 ,2	0

N:o 14. 12^m,2.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Nov. 5	— 16^s,514(7)	+ 5	34^r,240(2)	+ 12	— 16^s,51	+ 9'',9	1^h,2	— 1'
Nov. 13	— 16 ,614(7)	+ 5	34 ,250(2)	+ 12	— 16 ,61	+ 9 ,8	1 ,4	— 1
			N:o 24. 12^m,3.					
1870 Nov. 5	— 10^s,186(7)	+ 2	35^r,701(2)	+ 7	— 10^s,18	— 9'',0	1^h,9	— 2'
Nov. 13	— 10 ,343(7)	+ 2	35 ,695(2)	+ 7	— 10 ,34	— 8 ,9	1 ,6	— 1
			N:o 25. 11^m,8.					
1871 Aug. 20	— 8^s,200(10)	— 15	49^r,326(2)	— 21	— 8^s,22	— 184'',9	2^h,0	— 3'
Aug. 22	— 8 ,420(10)	— 15	49 ,371(2)	— 21	— 8 ,44	— 185 ,5	0 ,8	— 3
			N:o 26. 12^m,1.					
1870 Nov. 5	— 8^s,214(7)	+ 3	34^r,501(2)	+ 6	— 8^s,21	+ 6'',5	2^h,0	— 2'
Nov. 13	— 8 ,029(7)	+ 3	34 ,451(3)	+ 6	— 8 ,03	+ 7 ,1	1 ,8	— 1
1871 Aug. 20	— 8 ,090(10)	+ 3	34 ,447(2)	+ 6	— 8 ,09	+ 7 ,1	2 ,0	— 3
Aug. 22	— 8 ,160(10)	+ 2	34 ,439(2)	+ 6	— 8 ,16	+ 7 ,2	1 ,0	— 3
			N:o 27. 10^m,7.					
1870 Nov. 5	— 6^s,700(7)	+ 7	28^r,953(2)	+ 3	— 6^s,69	+ 78'',0	1^h,4	— 2'
Nov. 13	— 6 ,786(7)	+ 6	28 ,925(3)	+ 4	— 6 ,78	+ 78 ,3	2 ,1	— 1
1871 Aug. 20	— 6 ,760(10)	+ 8	28 ,923(2)	+ 4	— 6 ,75	+ 78 ,3	2 ,3	— 3
Aug. 22	— 6 ,830(10)	+ 8	28 ,978(2)	+ 4	— 6 ,82	+ 77 ,6	1 ,3	— 3
			N:o 28. 12^m,0.					
1871 Aug. 20	— 6^s,550(10)	— 11	46^r,134(3)	— 13	— 6^s,56	— 143'',7	2^h,3	— 3'
Aug. 22	— 6 ,610(10)	— 10	46 ,104(2)	— 13	— 6 ,62	— 143 ,3	1 ,0	— 3
			N:o 36. 12^m,3.					
1870 Dec. 4	— 1^s,790(10)	+ 1	34^r,413(2)	+ 2	— 1^s,79	+ 7'',6	3^h,7	— 2'
1871 Sept. 4	— 1 ,840(10)	+ 1	34 ,389(2)	+ 2	— 1 ,84	+ 7 ,8	1 ,6	— 3
			N:o 47. 10^m,3.					
1870 Dec. 4	+ 6^s,029(7)	+ 8	42^r,880(2)	+ 8	+ 6^s,04	+ 101'',6	4^h,5	— 2'
1871 Aug. 15	+ 6 ,125(8)	+ 9	42 ,835(3)	+ 5	+ 6 ,13	+ 101 ,1	1 ,2	— 3
Aug. 20	+ 5 ,990(10)	+ 9	42 ,832(3)	+ 6	+ 6 ,00	+ 101 ,1	3 ,1	— 3
Aug. 22	+ 5 ,990(10)	+ 9	42 ,864(2)	+ 5	+ 6 ,00	+ 101 ,5	1 ,4	— 3

Afdeln. IV. Stjernan N:o 63 Komparations-stjerna.

N:o 35. $12^m,4$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1871 Sept. 4	—20^s,200(10)	+ 15	27^r,347(2)	+ 13	—20^s,19	+ 98'',7	2^h,1	—3'
Sept. 8	—20 ,238(8)	+ 15	27 ,383(2)	+ 13	—20 ,22	+ 98 ,2	1 ,8	—3

N:o 36. $12^m,3$.

1871 Sept. 4	—19^s,370(10)	+ 27	16^r,019(2)	— 7	—19^s,34	+ 244'',5	2^h,3	—3'
Sept. 8	—19 ,550(8)	+ 27	16 ,021(2)	— 7	—19 ,52	+ 244 ,4	2 ,1	—3

Afdeln. V. Stjernan N:o 73 Komparations-stjerna.

N:o 52. $12^m,3$.

1870 Sept. 16	—15^s,786(7)	— 2	37^r,428(3)	+ 8	—15^s,79	— 31'',2	2^h,9	—2'
Sept. 17	—15 ,643(7)	— 2	37 ,502(2)	+ 8	—15 ,65	— 32 ,2	2 ,2	—2

N:o 54. $11^m,2$.

1871 Aug. 27	—14^s,875(8)	— 9	45^r,672(2)	— 6	—14^s,88	—137'',7	1^h,7	—3'
Aug. 29	—14 ,838(8)	— 9	——	——	—14 ,85	——	0 ,6	—3
Aug. 31	—14 ,722(9)	— 9	45 ,659(2)	— 6	—14 ,73	—137 ,5	2 ,5	—3

N:o 55. $12^m,3$.

1870 Sept. 16	—14^s,629(7)	+ 11	27^r,490(2)	+ 7	—14^s,62	+ 96'',9	2^h,8	—2'
Sept. 17	—14 ,371(7)	+ 11	27 ,531(2)	+ 7	—14 ,36	+ 96 ,3	1 ,9	—2
1871 Aug. 27	—14 ,588(8)	+ 13	27 ,590(2)	+ 9	—14 ,58	+ 95 ,5	1 ,8	—3
Aug. 29	—14 ,538(8)	+ 13	——	——	—14 ,53	——	0 ,9	—3
Aug. 31	—14 ,538(8)	+ 13	27 ,517(2)	+ 9	—14 ,53	+ 96 ,4	2 ,3	—3

N:o 56. $12^m,2$.

1870 Sept. 11	—14^s,386(7)	+ 10	21^r,878(3)	+ 2	—14^s,38	+ 169'',1	4^h,1	0'
Sept. 12	—14 ,214(7)	+ 12	21 ,750(3)	— 2	—14 ,20	+ 170 ,7	1 ,5	—1
1871 Aug. 27	—14 ,363(8)	+ 19	21 ,766(2)	+ 1	—14 ,34	+ 170 ,5	2 ,0	—3
Aug. 29	—14 ,360(5)	+ 19	——	——	—14 ,34	——	1 ,2	—3

N:o 57. $12^m,4$.

1869 Sept. 17	—13^s,380(5)	+ 4	32^r,807(2)	+ 8	—13^s,38	+ 28'',0	4^h,8	—2'
Okt. 25	—13 ,317(6)	+ 4	32 ,730(3)	+ 8	—13 ,31	+ 29 ,0	2 ,4	—3

N:o 60. 12^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1870 Aug. 21	— 11^s,129(7)	+ 11	——	——	— 11^s,12	——	2^h,3	— 2'
Aug. 29	— 11 ,271(7)	+ 5	25^r,060(3)	+ 3	— 11 ,27	+ 128'',1	1 ,0	+ 1
Sept. 11	— 11 ,086(7)	+ 8	25 ,178(3)	+ 5	— 11 ,08	+ 126 ,6	3 ,9	0
1871 Aug. 24	— 11 ,175(8)	+ 14	25 ,033(3)	+ 5	— 11 ,16	+ 128 ,4	3 ,0	— 3

N:o 62. 12^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1869 Sept. 17	— 9^s,960(5)	— 3	40^r,908(2)	— 1	— 9^s,96	— 76'',5	3^h,9	— 2'
Okt. 25	— 9 ,980(5)	— 3	40 ,819(4)	+ 1	— 9 ,98	— 75 ,3	2 ,1	— 3

N:o 67. 11^m,7.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1869 Sept. 17	— 5^s,020(5)	+ 5	32^r,179(3)	+ 4	— 5^s,02	+ 36'',1	4^h,1	— 2'
Okt. 25	— 5 ,340(5)	+ 5	32 ,108(3)	+ 4	— 5 ,34	+ 37 ,0	2 ,6	— 3
1871 Aug. 24	— 4 ,856(9)	+ 6	32 ,161(2)	+ 4	— 4 ,85	+ 36 ,5	2 ,6	— 3
Aug. 27	— 4 ,988(8)	+ 6	32 ,128(2)	+ 5	— 4 ,98	+ 37 ,0	3 ,0	— 3

N:o 68. 12^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1869 Sept. 17	— 4^s,820(5)	— 4	40^r,452(2)	— 4	— 4^s,82	— 70'',6	4^h,0	— 2'
Okt. 25	— 4 ,420(5)	— 4	40 ,363(3)	— 2	— 4 ,42	— 69 ,4	2 ,2	— 3
1871 Aug. 24	— 4 ,475(8)	— 5	40 ,449(2)	0	— 4 ,48	— 70 ,3	2 ,8	— 3
Aug. 27	— 4 ,575(8)	— 5	40 ,416(2)	— 3	— 4 ,58	— 69 ,9	3 ,1	— 3

N:o 80. 12^m,7.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1870 Sept. 16	+ 6^s,100(7)	+ 3	40^r,354(2)	+ 1	+ 6^s,10	+ 69'',0	3^h,1	— 2'
Sept. 17	+ 6 ,171(7)	+ 3	40 ,316(2)	+ 1	+ 6 ,17	+ 68 ,5	2 ,2	— 2

Afdeln. VI. Stjernan N:o 95 Komparations-stjerna.

N:o 58. 11^m,3.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1871 Aug. 31	— 36^s,613(8)	+ 41	7^r,858(2)	— 14	— 36^s,57	+ 349'',6	1^h,4	— 3'
Sept. 1	— 36 ,689(9)	+ 42	7 ,912(3)	— 12	— 36 ,65	+ 348 ,9	2 ,9	— 3
Sept. 4	— 36 ,700(10)	+ 41	7 ,918(2)	— 13	— 36 ,66	+ 348 ,8	2 ,5	— 3

N:o 59. 10^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
1870 Okt. 2	— 36^s,657(7)	— 9	51^r,672(4)	— 11	— 36^s,67	— 215'',0	3^h,7	— 2'
Dec. 5	— 36 ,643(7)	— 10	51 ,614(2)	— 6	— 36 ,65	— 214 ,2	2 ,9	— 2
1871 Aug. 31	— 36 ,363(8)	— 13	51 ,598(2)	— 5	— 36 ,38	— 214 ,0	1 ,2	— 3
Sept. 1	— 36 ,556(9)	— 14	51 ,617(2)	— 8	— 36 ,57	— 214 ,3	3 ,6	— 3
Sept. 4	— 36 ,500(10)	— 14	51 ,608(2)	— 6	— 36 ,51	— 214 ,2	2 ,7	— 3

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Timvinkel.	P_0—P.
			N:o 64. 12^m,2.					
1870 Sept. 4	— 32^s,914(7)	+ 16	24^r,528(2)	+ 15	— 32^s,90	+ 135$''$,1	3^h,7	— 2$'$
Sept. 11	— 32 ,857(7)	+ 12	24 ,539(3)	+ 14	— 32 ,85	+ 135 ,0	1 ,7	0
			N:o 65. 12^m,2.					
1870 Sept. 4	— 31^s,200(7)	+ 17	24^r,147(2)	+ 15	— 31^s,18	+ 140$''$,0	4^h,0	— 2$'$
Sept. 11	— 31 ,071(7)	+ 12	24 ,171(3)	+ 13	— 31 ,06	+ 139 ,7	2 ,0	0
			N:o 76. 11^m,6.					
1870 Sept. 4	— 22^s,957(7)	+ 15	24^r,101(2)	+ 11	— 22^s,94	+ 140$''$,6	4^h,1	— 2$'$
Sept. 11	— 22 ,929(7)	+ 10	24 ,068(4)	+ 8	— 22 ,92	+ 141 ,0	2 ,2	0
			N:o 80. 12^m,7.					
1871 Okt. 1	— 18^s,625(8)	0	37^r,473(2)	+ 12	— 18^s,63	— 31$''$,8	2^h,3	— 3$'$
Nov. 5	— 18 ,522(9)	+ 4	37 ,556(2)	+ 13	— 18 ,52	— 32 ,9	2 ,1	+ 1
			N:o 81. 12^m,5.					
1870 Nov. 4	— 18^s,043(7)	+ 27	9^r,935(2)	— 25	— 18^s,02	+ 322$''$,8	2^h,0	— 2$'$
Nov. 27	— 18 ,000(7)	+ 28	9 ,878(2)	— 23	— 17 ,97	+ 323 ,5	2 ,8	— 2
1871 Okt. 1	— 18 ,175(8)	+ 34	9 ,791(3)	— 22	— 18 ,14	+ 324 ,6	2 ,5	— 3
Nov. 5	— 18 ,163(8)	+ 16	9 ,780(2)	— 21	— 18 ,15	+ 324 ,7	2 ,3	+ 1
			N:o 82. 13^m,2.					
1871 Okt. 1	— 18^s,200(9)	— 12	47^r,717(3)	+ 2	— 18^s,21	— 164$''$,0	2^h,1	— 3$'$
Nov. 5	— 17 ,830(10)	0	47 ,602(2)	+ 3	— 17 ,83	— 162 ,5	1 ,8	+ 1
			N:o 85. 12^m,8.					
1870 Nov. 4	— 12^s,029(7)	+ 25	10^r,824(3)	— 33	— 12^s,00	+ 311$''$,2	2^h,2	— 2$'$
Nov. 27	— 12 ,000(7)	+ 26	10 ,804(2)	— 24	— 11 ,97	+ 311 ,6	3 ,0	— 2
			N:o 88. 12^m,3.					
1871 Sept. 24	— 10^s,275(8)	— 3	39^r,484(2)	+ 3	— 10^s,28	— 57$''$,9	2^h,5	— 3$'$
Okt. 1	— 10 ,511(9)	— 3	39 ,514(2)	+ 3	— 10 ,51	— 58 ,2	1 ,9	— 3
			N:o 89. 12^m,7.					
1870 Nov. 4	— 9^s,957(7)	+ 26	10^r,036(3)	— 30	— 9^s,93	+ 321$''$,4	2^h,5	— 2$'$
Nov. 27	— 9 ,929(7)	+ 27	10 ,064(2)	— 27	— 9 ,90	+ 321 ,1	3 ,4	— 2
1871 Sept. 24	— 9 ,925(8)	+ 33	10 ,002(2)	— 28	— 9 ,89	+ 321 ,8	2 ,7	— 3

N:o 90. $11^m,7$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Nov. 4	— $8^s,514(7)$	+ 25	$9^r,854(2)$	— 30	— $8^s,49$	+ $323'',8$	$2^h,6$	— 2'
Nov. 27	— 8 ,413(8)	+ 27	9 ,878(2)	— 28	— 8 ,39	+ 323 ,5	3 ,5	— 2

N:o 104. $10^m,6$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Okt. 2	+ $12^s,825(8)$	— 2	$36^r,227(2)$	— 9	+ $12^s,82$	+ $15'',8$	$1^h,7$	— 3'
Nov. 9	+ 12 ,738(8)	— 2	36 ,257(2)	— 9	+ 12 ,74	+ 16 ,2	2 ,9	0

Afdeln. VII. Stjernan N:o 98 Komparations-stjerna.

N:o 58. $11^m,3$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Aug. 31	— $40^s,414(7)$	+ 9	$32^r,841(3)$	+ 25	— $40^s,41$	+ $28'',1$	$3^h,4$	0'
Sept. 4	— 40 ,357(7)	+ 10	32 ,914(2)	+ 25	— 40 ,35	+ 27 ,1	1 ,9	— 2

N:o 69. $11^m,5$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Aug. 22	— $31^s,550(8)$	— 3	$42^r,227(3)$	+ 13	— $31^s,55$	— $93'',1$	$2^h,5$	— 3'
Aug. 23	— 31 ,450(10)	— 3	42 ,184(2)	+ 14	— 31 ,45	— 92 ,5	1 ,3	— 3

N:o 70. $12^m,1$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Aug. 22	— $31^s,075(8)$	— 4	$43^r,462(2)$	+ 11	— $31^s,08$	— $109'',0$	$2^h,3$	— 3'
Aug. 23	— 31 ,190(10)	— 4	43 ,441(2)	+ 12	— 31 ,19	— 108 ,4	1 ,1	— 3

N:o 71. $12^m,2$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Sept. 26	— $30^s,829(7)$	+ 9	$32^r,814(2)$	+ 20	— $30^s,82$	+ $28'',4$	$4^h,6$	0'
Sept. 27	— 30 ,957(7)	+ 8	32 ,890(2)	+ 20	— 30 ,95	+ 27 ,4	2 ,1	0
1871 Aug. 23	— 30 ,938(10)	+ 8	32 ,874(2)	+ 23	— 30 ,93	+ 27 ,5	0 ,9	— 3

N:o 72. $12^m,2$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Sept. 26	— $29^s,700(7)$	+ 16	$23^r,326(2)$	+ 19	— $29^s,68$	+ $150'',6$	$5^h,2$	0'
Sept. 27	— 29 ,729(7)	+ 13	23 ,325(2)	+ 12	— 29 ,72	+ 150 ,6	2 ,3	0

N:o 75. $11^m,0$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Aug. 29	— $27^s,386(7)$	+ 7	——	——	— $27^s,38$	——	$3^h,4$	0'
Aug. 31	——	——	$31^r,958(3)$	+ 17	——	+ $39'',4$	2 ,2	0
Sept. 4	— 27 ,350(8)	+ 9	31 ,924(2)	+ 17	— 27 ,34	+ 39 ,8	1 ,7	— 2

N:o 78. $12^m,3$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1870 Sept. 26	— $25^s,157(7)$	+ 12	$25^r,922(2)$	+ 17	— $25^s,15$	+ $117'',2$	$5^h,0$	0'
Sept. 27	— 25 ,071(7)	+ 10	25 ,908(2)	+ 13	— 25 ,06	+ 117 ,3	2 ,4	0

N:o 79. $11^m,2$.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0.		Medel-Tim-vinkel.	P_0-P.
					$\Delta\alpha^s$.	$\Delta\delta''$.		
1870 Aug. 29	$-24^s,650(7)$	+ 7	——	——	$-24^s,64$	——	$3^h,2$	0'
Aug. 31	——	——	$39^r,563(3)$	+ 11	——	$-58'',7$	2 ,0	0
Sept. 4	$-24,957(7)$	+ 5	39 ,525(2)	+ 11	$-24,95$	$-58,2$	1 ,6	— 2
1871 Aug. 31	$-24,825(8)$	+ 5	39 ,478(2)	+ 14	$-24,82$	$-57,7$	2 ,6	— 3
Sept. 1	$-24,813(8)$	+ 4	39 ,545(2)	+ 13	$-24,81$	$-58,5$	3 ,7	— 3

N:o 84. $12^m,0$.

1870 Sept. 26	$-18^s,057(7)$	+ 8	$28^r,924(2)$	+ 13	$-18^s,05$	$+78'',4$	$4^h,8$	0'
Sept. 27	$-18,000(7)$	+ 7	28 ,952(2)	+ 11	$-17,99$	$+78,1$	2 ,7	0

N:o 85. $12^m,8$.

1871 Sept. 8	$-16^s,163(8)$	+ 3	$35^r,738(2)$	+ 12	$-16^s,16$	$-9'',5$	$2^h,2$	— 3'
Sept. 17	$-16,000(8)$	+ 3	35 ,693(2)	+ 12	$-16,00$	$-8,9$	3 ,5	— 3

N:o 86. $11^m,5$.

1870 Nov. 5	$-15^s,429(7)$	+ 8	$23^r,482(2)$	+ 3	$-15^s,42$	$+148'',5$	$0^h,9$	+ 1'
Nov. 27	$-15,314(7)$	+ 7	23 ,493(3)	+ 16	$-15,30$	$+148,5$	3 ,8	— 2
1871 Sept. 8	$-15,563(8)$	+ 16	23 ,410(2)	+ 5	$-15,55$	$+149,3$	2 ,4	— 3
Sept. 17	$-15,675(8)$	+ 17	23 ,464(2)	+ 7	$-15,66$	$+148,6$	3 ,7	— 3

N:o 87. $10^m,5$.

1871 Sept. 8	$-15^s,250(8)$	— 26	$59^r,607(2)$	— 51	$-15^s,28$	$-317'',7$	$2^h,6$	— 3'
Sept. 17	$-15,275(8)$	— 27	59 ,575(2)	— 55	$-15,30$	$-317,3$	3 ,8	— 3

Afdeln. VIII. Stjernan N:o 104 Komparations-stjerna.

N:o 93. $12^m,2$.

1871 Okt. 2	$-13^s,050(8)$	— 2	$38^r,516(2)$	+ 6	$-13^s,05$	$-45'',3$	$1^h,4$	— 3'
Nov. 9	$-12,988(8)$	+ 1	38 ,613(2)	+ 6	$-12,99$	$-46,6$	2 ,6	0

N:o 94. $11^m,9$.

1871 Okt. 2	$-12^s,850(8)$	+ 4	$34^r,052(2)$	+ 10	$-12^s,85$	$+12'',2$	$1^h,5$	— 3'
Nov. 9	$-12,863(8)$	+ 4	34 ,110(2)	+ 11	$-12,86$	$+11,5$	2 ,8	0

N:o 99. $11^m,9$.

1871 Okt. 2	$-5^s,988(8)$	+ 6	$32^r,269(2)$	+ 4	$-5^s,98$	$+35'',1$	$1^h,2$	— 3'
Nov. 9	$-6,125(8)$	+ 3	32 ,342(2)	+ 4	$-6,12$	$+34,2$	2 ,5	0

N:o 100. 13^m,0.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1871 Okt. 2	— 6^s,175(8)	— 1	41^r,172(3)	— 1	— 6^s,18	— 79'',6	0^h,9	— 3'
Nov. 9	— 6,038(8)	+ 2	41,212(3)	— 1	— 6,04	— 80,2	2,1	0

N:o 101. 11^m,8.

1871 Okt. 2	— 5^s,975(8)	+ 1	35^r,924(2)	+ 4	— 5^s,97	— 12'',0	1^h,1	— 3'
Nov. 9	— 5,963(8)	+ 1	35,995(2)	+ 4	— 5,96	— 12,9	2,3	0

Afdeln. IX. Ljusstarka Stjernor.

N:o 3—N:o 38.

1870 Okt. 4	— 25^s,360(10)	— 6	52^r,478(4)	— 19	— 25^s,37	— 225'',4	1^h,7	— 1'
Okt. 6	— 25,500(7)	— 12	52,488(3)	— 22	— 25,51	— 225,6	3,7	— 2
1871 Aug. 13	— 25,433(9)	— 16	52,439(3)	— 17	— 25,45	— 225,0	0,9	— 3

N:o 3—N:o 63.

1870 Okt. 4	— 43^s,114(7)	+ 11	34^r,183(4)	+ 28	— 43^s,10	+ 10'',8	3^h,2	— 1'
Okt. 6	— 43,229(7)	+ 11	34,200(3)	+ 28	— 43,22	+ 10,6	2,4	— 2
1871 Aug. 13	— 43,038(8)	+ 9	34,140(3)	+ 32	— 43,03	+ 11,3	1,8	— 3

N:o 3—N:o 66.

1871 Aug. 13	— 46^s,163(8)	+ 10	32^r,939(3)	+ 33	— 46^s,15	+ 26'',8	2^h,0	— 3'
Aug. 15	— 46,125(8)	+ 10	33,006(3)	+ 32	— 46,12	+ 25,9	0,7	— 3

N:o 3—N:o 98.

1871 Aug. 15	— 80^s,775(8)	+ 9	41^r,282(3)	+ 55	— 80^s,77	— 80'',5	0^h,5	— 3'
Okt. 1	— 80,675(8)	+ 13	41,298(3)	+ 55	— 80,66	— 80,7	3,8	— 3

N:o 7—N:o 51.

1870 Sept. 16	— 29^s,871(7)	+ 21	22^r,426(3)	+ 17	— 29^s,85	+ 162'',2	4^h,9	— 2'
Sept. 25	— 29,829(7)	+ 19	22,422(4)	+ 11	— 29,81	+ 162,2	3,1	— 2
1871 Maj 8	— 29,890(10)	+ 2	22,424(3)	+ 23	— 29,89	+ 162,2	18,8	+ 1

N:o 7—N:o 83.

1871 Maj 23	— 57^s,370(10)	0	52^r,426(3)	— 1	— 57^s,37	— 224'',7	20^h,1	+ 1'
Maj 24	— 57,340(10)	+ 3	52,389(3)	— 6	— 57,34	— 224,3	19,2	+ 1

N:o 7—N:o 95.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Maj 21	$-72^s,820$(10)	+ 2	$46^r,458$(3)	+ 28	$-72^s,82$	$-147'',5$	$19^h,9$	+ 1'
Maj 23	$-72,770$(10)	+ 2	46,474(3)	+ 29	$-72,77$	$-147,7$	20,2	+ 1

N:o 13—N:o 63.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Maj 24	$-35^s,060$(10)	− 2	$60^r,043$(3)	− 47	$-35^s,06$	$-323'',3$	$19^h,7$	+ 1'
Aug. 8	$-35,000$(10)	− 22	60,017(3)	− 36	$-35,02$	$-322,8$	2,0	− 3

N:o 13—N:o 83.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Maj 24	$-53^s,560$(10)	+ 1	$48^r,293$(3)	+ 9	$-53^s,56$	$-171'',3$	$19^h,5$	+ 1'
Aug. 9	$-53,225$(8)	− 7	48,235(3)	+ 16	$-53,23$	$-170,5$	0,8	− 3
Aug. 13	$-53,325$(8)	− 3	21,798(3)	+ 18	$-53,33$	$-169,9$	0,6	− 2
Sept. 6	$-53,375$(8)	− 5	48,314(2)	+ 15	$-53,38$	$-171,5$	3,6	− 3

N:o 38—N:o 63.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Aug. 31	$-17^s,863$(8)	+ 27	$16^r,688$(2)	− 5	$-17^s,84$	$+235'',9$	$3^h,6$	− 3'
Sept. 24	$-17,950$(8)	+ 28	16,631(2)	− 5	$-17,92$	$+236,6$	3,7	− 3

N:o 38—N:o 66.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Aug. 31	$-20^s,775$(8)	+ 28	$15^r,488$(2)	− 4	$-20^s,75$	$+251'',4$	$3^h,7$	− 3'
Sept. 24	$-21,038$(8)	+ 30	15,461(2)	− 3	$-21,01$	$+251,7$	3,9	− 3
Sept. 27	$-20,800$(8)	+ 30	15,528(2)	− 3	$-20,77$	$+250,8$	4,1	− 3

N:o 38—N:o 98.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Aug. 31	$-55^s,575$(8)	+ 25	$23^r,805$(2)	+ 37	$-55^s,55$	$+144'',6$	$3^h,8$	− 3'
Sept. 27	$-55,288$(8)	+ 27	23,827(2)	+ 39	$-55,26$	$+144,3$	4,2	− 3
Okt. 1	$-55,313$(8)	+ 27	23,833(2)	+ 39	$-55,29$	$+144,2$	4,0	− 3

N:o 51—N:o 83.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Maj 21	$-27^s,600$(10)	− 3	$64^r,969$(3)	− 74	$-27^s,60$	$-387'',1$	$19^h,6$	+ 1'
Maj 23	$-27,580$(10)	− 2	64,930(3)	− 73	$-27,58$	$-386,5$	19,6	+ 1

N:o 51—N:o 95.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	$\Delta\alpha^s$.	$\Delta\delta''$.	Medel-Tim-vinkel.	P_0-P.
1871 Maj 8	$-42^s,850$(10)	− 2	$59^r,052$(3)	− 38	$-42^s,85$	$-310'',4$	$19^h,8$	+ 1'
Maj 21	$-42,920$(10)	0	58,961(3)	− 41	$-42,92$	$-309,3$	19,3	+ 1
Maj 23	$-42,870$(10)	0	58,973(3)	− 39	$-42,87$	$-309,4$	19,5	+ 1

N:o 63—N:o 66.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Okt. 4	— 3^s,113(8)	+ 2	33^r,868(3)	+ 3	— 3^s,11	+ 14'',6	3^h,9	— 1'
Okt. 6	— 3 ,057(7)	+ 1	33 ,872(3)	+ 2	— 3 ,06	+ 14 ,6	2 ,0	— 2
1871 Sept. 1	— 3 ,020(10)	+ 2	33 ,871(2)	+ 3	— 3 ,02	+ 14 ,5	3 ,9	— 3
Sept. 27	— 3 ,088(8)	+ 2	33 ,882(3)	+ 3	— 3 ,09	+ 14 ,4	2 ,9	— 3

N:o 63—N:o 83.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1871 Maj 24	— 18^s.470(10)	+ 3	23^r,203(3)	+ 9	— 18^s,47	+ 152'',0	19^h,9	+ 1'
Aug. 8	— 18 ,420(10)	+ 19	23 ,232(3)	+ 5	— 18 ,40	+ 151 ,6	1 ,8	— 3

N:o 63—N:o 98.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Aug. 29	— 37^s,586(7)	+ 4	——	——	— 37^s,58	——	2^h,8	0'
Aug. 31	——	——	42^r,158(3)	+ 14	——	— 92'',1	2 ,3	0
Sept. 4	— 37 ,714(7)	0	42 ,163(3)	+ 15	— 37 ,71	— 92 ,2	2 ,2	— 2
Okt. 4	— 37 ,686(7)	+ 4	42 ,175(3)	+ 15	— 37 ,68	— 92 ,3	3 ,4	— 1
Okt. 6	— 37 ,629(7)	+ 3	42 ,171(3)	+ 16	— 37 ,63	— 92 ,3	2 ,1	— 2
1871 Sept. 1	— 37 ,538(8)	+ 1	42 .174(2)	+ 18	— 37 ,54	— 92 ,4	4 ,0	— 3
Sept. 27	— 37 .600(8)	+ 2	42 ,141(2)	+ 20	— 37 ,60	— 91 ,9	3 ,0	— 3

N:o 66—N:o 98.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Aug. 29	— 34^s,514(7)	+ 3	——	——	— 34^s,51	——	3^h,0	0'
Aug. 31	——	——	43^r,263(3)	+ 10	——	— 106'',4	2 ,5	0
Sept. 4	— 34 ,529(7)	— 1	43 ,311(3)	+ 11	— 34 ,53	— 107 ,0	2 ,4	— 2
1871 Aug. 15	— 34 ,363(8)	— 4	43 ,298(3)	+ 15	— 34 ,37	— 106 ,9	1 ,0	— 3
Aug. 24	— 34 ,475(8)	— 4	43 ,254(2)	+ 13	— 34 ,48	— 106 ,3	3 ,9	— 3
Sept. 6	— 34 ,600(8)	— 4	43 ,271(2)	+ 14	— 34 ,60	— 106 ,5	3 ,8	— 3

N:o 83—N:o 95.

Observationstid.	Observ. $\Delta\alpha^s$.	Red. i $^1/_{1000}{}^s$.	Mikrometer-Afläsning.	Red. i $^1/_{100}{}''$.	Medel-koordin. 1865,0. $\Delta\alpha^s$.	Medel-koordin. 1865,0. $\Delta\delta''$.	Medel-Tim-vinkel.	P_0—P.
1870 Sept. 11	— 15^s,429(7)	+ 6	29^r,067(4)	+ 11	— 15^s,42	+ 76'',6	2^h,4	0'
Okt. 12	— 15 ,529(7)	+ 9	29 ,035(3)	+ 11	— 15 ,42	+ 77 ,0	2 ,1	— 2
1871 Maj 8	— 15 ,520(10)	+ 2	29 ,016(3)	+ 15	— 15 ,52	+ 77 ,2	19 ,6	+ 1

Anmärkningar.

1. Inga bestämda antydningar förefinnas till egen rörelse inom stjerngruppen under observationstiden.
2. Den starka afvikelsen i $\Delta\alpha$ vid stjernan N:o 48 förklaras enklast genom att antaga, att positionsvinklarne 1866 blifvit orätt aflästa på $^1/_2$ °. Egendomligt är det emellertid, att samma fel skulle hafva blifvit begånget 2:ne aftnar efter hvarandra. Dessa båda observationer äro uteslutna ur mediet.
3. Stjernan N:o 98 har ett matt sken och visar sig redan för ungefärligen 200 gångers förstoring svagt förlängd nära i deklinations-cirkeln, ehuru densamma vid en flyktig blick ej är att skilja från en enkel illa definierad fixstjerna. Oaktadt många försök (dock aldrig i bästa luft) har det ej lyckats mig att erhålla en tillfredsställande uppfattning af detta egendomliga föremål, som synes vara en dubbelstjerna (hvars sydliga komponent sjelf är dubbel) omgifven af en mycket liten nebulositet. Då afståndet mellan hufvudkomponenterna ej kan vara mycket mindre än 1'', så kan den stora svårigheten, att se dem stadigt, blott förklaras genom tillvaron af nebulositet. Positionsvinkeln uppmättes den 19 Dec. 1871 med 500 gångers förstoring = 162°. (?)

§ 6.

Stjernornas relativa ljusstyrka eller deras så kallade storlek är angifven i enlighet med den Besselska eller Argelanderska skalan. Bestämningen af dessa storlekar är utan fotometriska apparater blott utförd genom estimering vid direkt jemförelse af stjernorna. Jag har dervid utgått ifrån den hypotesen, att $\frac{1}{3}$ klarhetsgrad motsvarar en tillräckligt stor ljusdifferens, för att *vid första ögonkastet* säkert kunna uppfattas af mitt öga; och jag har i allmänhet icke gerna med hvarandra jemfört stjernor, som jag ansett differera i ljusstyrka på mera än 0,3 à 0,4 klarhetsgrad. Vid dessa observationer har jag alltid användt så svagt okulär, som stjernans klarhetsgrad medgifvit.

För att med möjligaste säkerhet kunna utföra dessa estimeringar, har jag således indelat stjernorna i grupper med afseende på ljusstyrka och läge till hvarandra. Öfvergången från den ena gruppen till den andra har vidare förmedlats genom lämpligt utvalda stjernor, och dessa jemförelser mellan de serskilda grupperna har jag för öfrigt mångfaldigat i en stor mängd kombinationer, för att så mycket som möjligt förvissa mig om, att bestämningarna på olika punkter af stjerngruppen äro nära likformiga. Ehuru dessa observationer till följd af stjernornas svaghet och den nästan alltid dunstiga och oroliga luften förefallit mig ganska svåra, så hoppas jag dock, på grund af alla iakttagna försigtighetsmått, att de erhållna resultaten nära skola återgifva de naturliga förhållandena, och att i alla händelser inga större inadvertenser kunna förekomma.

De flesta af dessa bestämningar äro utförda under de 2 sista höstarna, och de äro vanligen erhållna på mellanstunder mellan de andra observationerna på några af de ofvan angifna observations-aftnarna; men dessutom hafva några aftnar, hvilka icke äro upptagna i det föregående, uteslutande blifvit använda till dessa bestämningar. Jag anser det för öfrigt utan intresse att här anföra några detaljer af dessa observationer och angifver således i följande tab. blott *resultaten för hvarje afton.* Hvarje resultat antages här tillräckligt noga hafva lika stor vigt, ehuru densamma, vid fullkomligt skarp räkning, visserligen skulle komma att utfalla något olika.

Stjernan N:o 51, som jag *antagit* vara af storleken $9^{m},0$, har bildat utgångspunkten för dessa fotometriska bestämningar; och, genom att från densamma steg för steg avansera genom klarhets-differenser af ofvan angifna belopp, har jag funnit de svagaste stjernorna vara af 13 à 14 storleken. De bestämningar, hvilka jag sålunda erhållit, äro dock på grunder, som straxt nedan skola angifvas, icke för alla stjernorna identiska med de definitivt antagna storlekarna. Det är visserligen otvifvelaktigt, att i bästa luft och med användning af lämpligt okulär till och med stjernor af 14^{m} skulle kunna ses med denna refraktor; men det är dock högst osannolikt, att jag, under de faktiska förhållandena, med detta instrument skulle ha kunnat utföra positionsbestämningar för stjernor af så ringa ljusstyrka, då luftförhållandena äfven i gynnsammaste fall icke voro så utmärkta, att starkare förstoring än 320 gånger kunnat användas med någon egentlig fördel. Med afseende på de instrumentela resurserna och luftens beskaffenhet kan jag således ej antaga, att de ljussvagaste stjernorna, som blifvit observerade, äro märkbart svagare än 13^{m}. Det blir således äfven högst sannolikt, att jag estimerat ljusdifferenserna vid de svagare stjernorna relativt större än vid de klarare. Detta antagande synes äfven vara fullt berättigadt, då man betänker, att svaga dunster i luften, som icke märkbart fördunkla de klarare stjernorna, dock redan kunna vara tillräckliga, för att försvåra uppfattningen af mycket svaga stjernor, och således låta dessa synas proportionsvis svagare än de äro. Jag har följaktligen antagit den sannolika hypotesen, att stjernorna till och med 11^m blifvit riktigt estimerade, men att jag vid de svagare begått estimerings-fel proportionela mot stjernornas aftagande ljusstyrka, hvilkas summa för de svagaste stigit till $\frac{1}{2}$ klarhetsgrad. De omedelbart observerade stjern-storlekarna från 11^m hafva således blifvit korrigerade enligt följande schema:

	Korrektion.
13^m,0 — 13^m,5	— 0^m,5 ,
12 ,5 — 13 ,0	— 0 ,4 ,
12 ,0 — 12 ,5	— 0 ,3 ,
11 ,5 — 12 ,0	— 0 ,2 ,
11 ,0 — 11 ,5	— 0 ,1.

Resultat af de Fotometriska Bestämningarna.

Stjerna.	Estimerade Stjernstorlekar.	Med.	Corrig.	Stjerna.	Estimerade Stjernstorlekar.	Med.	Corrig.
N:o 51	9,0	9^m,0	——	N:o 43	11,0. 11,1. 11,2. 11,2. 11,2..................	11^m,1	——
17	8,8. 8,8. 8,9. 8,8. 8,8. 8,8	8 ,8	——	75	11,1. 11,1. 11,1. 11,1. 11,1. 11,1	11 ,1	——
7	9,0. 8,9. 8,9. 8,9. 8,9. 9,0	8 ,9	——	54	11,3. 11,4. 11,3. 11,3. 11,4..................	11 ,3	11^m,2
49	9,0. 8,9. 9,3. 9,1. 8,8. 8,8. 8,9	9 ,0	——	74	11,1. 11,1. 11,1. 11,5. 11,3. 11,5	11 ,3	11 ,2
13	9,2. 9,2. 9,2. 9,2. 9,3	9 ,2	——	79	11,1. 11,3. 11,3. 11,3. 11,3. 11,3	11 ,3	11 ,2
95	9,2. 9,3. 9,2. 9,2. 9,2. 9,3	9 ,2	——	31	11,4. 11,4. 11,4. 11,6. 11,4	11 ,4	11 ,3
83	9,3. 9,4. 9,4. 9,2. 9,4. 9,4	9 ,4	——	58	11,3. 11,4. 11,4. 11,4. 11,5. 11,5. 11,6. 11,4	11 ,4	11 ,3
98	9,3. 9,5. 9,2. 9,4. 9,4	9 ,4	——	11	11,5. 11,5. 11,7. 11,8. 11,7..................	11 ,6	11 ,4
38	9,5. 9,5. 9,5. 9,6. 9,5. 9,6. 9,6. 9,6	9 ,6	——	39	11,8. 11,6. 11,6. 11,4. 11,7..................	11 ,6	11 ,4
63	9,6. 9,6. 9,5. 9,7. 9,6. 9,6. 9,6. 9,8	9 ,6	——	40	11,8. 11,6. 11,6. 11,4. 11,7..................	11 ,6	11 ,4
73	9,7. 9,6. 9,7. 9,7. 9,7. 9,9. 9,7. 10,0......	9 ,8	——	41	11,5. 11,4. 11,7. 11,6. 11,8..................	11 ,6	11 ,4
18	9,7. 10,0. 9,7. 9,9. 9,9. 9,9. 10,0. 9,9	9 ,9	——	53	11,6. 11,7. 11,6. 11,6. 11,7..................	11 ,6	11 ,4
3	9,7. 10,0. 9,9. 10,2. 10,1. 10,1. 10,2. 10,0	10, 0	——	15	11,7. 11,6. 11,6. 11,7	11 ,7	11 ,5
16	9,7. 10,0. 10,0. 9,9. 10,1. 10,1	10 ,0	——	33	11,7. 11,4. 11,7. 11,8. 12,0. 11,7	11 ,7	11 ,5
59	9,8. 10,0. 10,1. 10,1. 10,1. 10,1. 10,0	10 ,0	——	69	11,6. 11,6. 11,6. 11,8. 11,8. 11,7. 11,7...	11 ,7	11 ,5
66	9,8. 9,9. 9,9. 10,0. 9,9. 10,1. 10,0. 10,1. 10,0	10 ,0	——	86	11,6. 11,8. 11,6. 11,8. 11,8..................	11 ,7	11 ,5
96	10,0. 10,1. 10,3. 10,1. 10,4. 10,3. 10,3...	10 ,2	——	30	11,9. 11,6. 11,9. 11,8	11 ,8	11 ,6
47	10,1. 10,3. 10,3. 10,3. 10,4. 10,2	10 ,3	——	48	11,7. 11,9. 11,6. 11,8	11 ,8	11 ,6
34	10,3. 10,4. 10,4. 10,5. 10,6. 10,6	10 ,5	——	103	11,8. 11,8. 11,9..............................	11 ,8	11 ,6
50	10,5. 10,5. 10,5. 10,6	10 ,5	——	76	11,7. 11,8. 11,8. 12,0. 11,8. 11,7. 11,7...	11 ,8	11 ,6
87	10,4. 10,5. 10,5	10 ,5	——	19	11,7. 11,6. 12,0. 12,0. 12,0. 12,0. 12,0...	11 ,9	11 ,7
104	10,6. 10,7. 10,5. 10,5. 10,7	10 ,6	——	67	11,7. 12,0. 11,9. 12,0	11 ,9	11 ,7
20	10,6. 10,7. 10,8. 10,7. 10,7. 10,7	10 ,7	——	1	12,0. 12,0. 11,7. 11,8. 12,0. 12,2	12 ,0	11 ,7
27	10,5. 10,5. 10,8. 10,9. 10,7. 10,8	10 ,7	——	29	11,9. 11,6. 12,0. 12,1. 12,1. 12,1	12 ,0	11 ,7
2	10,9. 11,0. 11,0. 11,0. 11,0	11 ,0	——	44	12,1. 11,9. 12,0. 11,8. 12,1..................	12 ,0	11 ,7
4	11,0. 11,0. 10,7. 11,0. 11,1	11 ,0	——	45	12,1. 11,9. 11,9. 11,8. 12,1. 12,2	12 ,0	11 ,7
8	10,9. 11,1. 11,0. 11,0. 11,0	11 ,0	——	90	11,9. 12,0. 12,0. 12,0. 12,0..................	12 ,0	11 ,7

Resultat af de Fotometriska Bestämningarna. Forts.

Stjerna.	Estimerade Stjernstorlekar.	Med.	Corrig.	Stjerna.	Estimerade Stjernstorlekar.	Med.	Corrig.
N:o 25	12,0. 12,1. 12,1. 12,1. 12,0	12^m,1	11^m,8	N:o 52	12,6. 12,9. 12,7	12^m,7	12^m,3
101	12,1. 12,0. 12,1. 12,0	12 ,1	11 ,8	55	12,7. 12,7. 12,7. 12,6	12 ,7	12 ,3
22	12,0. 12,0. 12,2. 12,2. 12,2. 12,3. 12,2. 12,1	12 ,2	11 ,9	60	12,7. 12,7. 12,7. 12,6	12 ,7	12 ,3
94	12,2. 12,1. 12,3. 12,3	12 ,2	11 ,9	62	12,6. 12,7. 12,7. 12,9	12 ,7	12 ,3
99	12,2. 12,1. 12,3. 12,3	12 ,2	11 ,9	68	12,6. 12,7. 12,7. 12,9	12 ,7	12 ,3
5	12,0. 12,0. 12,4. 12,4. 12,5. 12,4. 12,4	12 ,3	12 ,0	78	12,7. 12,7. 12,7. 12,7	12 ,7	12 ,3
6	12,0. 12,0. 12,4. 12,4. 12,5. 12,4. 12,4	12 ,3	12 ,0	88	12,6. 12,5. 12,6. 12,9	12 ,7	12 ,3
21	12,2. 12,4. 12,5. 12,3. 12,3. 12,2	12 ,3	12 ,0	9	13,0. 12,7. 12,7	12 ,8	12 ,4
28	12,1. 12,1. 12,4. 12,5. 12,4	12 ,3	12 ,0	32	12,6. 12,9. 13,0	12 ,8	12 ,4
84	12,3. 12,3. 12,3	12 ,3	12 ,0	35	12,6. 12,9. 13,0	12 ,8	12 ,4
26	12,4. 12,4. 12,3	12 ,4	12 ,1	37	12,6. 12,9. 13,0	12 ,8	12 ,4
70	12,0. 12,3. 12,7. 12,1. 12,6. 12,6. 12,7	12 ,4	12 ,1	57	12,6. 13,0	12 ,8	12 ,4
14	12,5. 12,4. 12,5	12 ,5	12 ,2	77	12,6. 13,0. 12,9	12 ,8	12 ,4
93	12,4. 12,5	12 ,5	12 ,2	81	13,1. 13,0. 12,8. 12,8. 12,9	12 ,9	12 ,5
42	12,6. 12,5. 12,7	12 ,6	12 ,2	46	13,0. 13,1	13 ,1	12 ,6
56	12,7. 12,7. 12,4. 12,8. 12,6	12 ,6	12 ,2	80	13,2. 13,1	13 ,2	12 ,7
64	12,7. 12,7. 12,0. 12,8. 12,7	12 ,6	12 ,2	89	13,4. 13,0	13 ,2	12 ,7
65	12,7. 12,7. 12,0. 12,8. 12,7	12 ,6	12 ,2	10	13,3. 13,2. 13,3	13 ,3	12 ,8
71	12,3. 12,5. 12,7. 12,7	12 ,6	12 ,2	85	13,1. 13,3. 13,5	13 ,3	12 ,8
72	12,3. 12,5. 12,7. 12,7	12 ,6	12 ,2	97	13,4. 13,5. 13,6	13 ,5	13 ,0
92	12,6. 12,5	12 ,6	12 ,2	100	13,4. 13,5. 13,6	13 ,5	13 ,0
12	12,6. 12,7. 12,7	12 ,7	12 ,3	102	13,4. 13,5. 13,6	13 ,5	13 ,0
23	12,7. 12,7. 12,7	12 ,7	12 ,3	82	13,6. 13,6. 13,8	13 ,7	13 ,2
24	12,9. 12,7. 12,3. 12,7	12 ,7	12 ,3	91	13,6. 13,6. 13,8	13 ,7	13 ,2
36	12,9. 12,7. 12,3. 12,7	12 ,7	12 ,3				

§ 7.

Vid evaluerandet af de slutliga media ur alla observationerna har jag negligerat de i allmänhet små vigts-olikheterna för de särskilda aftnarna; jag har således, med antagande af en enkel observation till vigtsenhet, gifvit hvarje aftons medium för en viss stjerna vigten $\frac{m}{n}$, då n betecknar observations-aftnarnas antal för denna stjerna, och m hela antalet af motsvarande enkla observationer. Medelfelet r_0 i ett enkelt observationsmoment bestämmes således enligt formeln

$$r_0 = \sqrt{\frac{\frac{m}{n} \Sigma \varepsilon^2}{n-1}},$$

om ε betecknar de omedelbara afvikelserna mellan det absoluta mediet och de särskilda aftnarnas media. För att emellertid erhålla en säkrare och generelare bestämning på detta medelfel, har jag sammanställt ifrågavarande afvikelser vid alla stjernorna i en enda räkning och således evaluerat r_0 enligt den lätt begripliga formeln

$$r_0 = \sqrt{\frac{\Sigma\left(\frac{m}{n} \cdot \Sigma \varepsilon^2\right)}{\Sigma n - \mu}},$$

hvarest μ = antalet af de använda stjernorna. Då dessa medelfel borde utfalla märkbart olika för stjernor af olika klarhetsgrader, så indelade jag enligt förhållandena stjernorna efter ljusstyrkan i trenne grupper, såsom synes i följande tabell, hvilken angifver de motsvarande sannolika felen.

Tab. A.

Sannolika felet i 1 Observat.-Moment.

Stjernstorlekar.	i $\Delta\alpha^s$ (i parall.)	Antal aftonmedia.	i $\Delta\delta''$.	Antal aftonmedia.
9^m—10^m	$0^s,1466$	215	$0'',454$	212
10 —11	0,1583	133	0 ,564	118
11 —13	0,2056	239	0 ,580	245

De på denna väg erhållna valörerna på sannolika felen i ett observations-moment bero tydligen blott så till vida på de tillfälliga felen under en afton, som dessa icke blifvit fullständigt eliminerade ur aftonens medium; men de hafva deremot sin hufvudsakliga grund i de olika omständigheter, som karakterisera de särskilda aftnarna, och hvilka åter äro funktioner af personela, instrumentela och atmosferiska förhållanden.

Analogt med de s. k. *personliga eqvationer*, som ega rum mellan olika observatörers uppfattning, ligger det fullkomligt i sakens natur, att, vid så subtila iakttagelser som de astronomiska, äfven mer eller mindre märkbara *personliga variationer* i uppfattningen, beroende på olika disposition, måste förekomma hos en och samma observatör. Det inträffar således t. ex. ovilkorligen, att man till följd af viss disposition vid ett tillfälle observerar stjernans appuls vid passagen tidigare eller senare än vid ett annat, att man kan hafva en tillfällig tendens att göra inställningarna med mikrometer-skrufven för starka eller för svaga, o. s. v. Man förlägger sålunda tillfälligt sjelfva observationens tyngdpunkt, och man kan följaktligen vid två särskilda tillfällen på grund häraf få märkbart olika resultat, ehuru den inre öfverensstämmelsen i hvardera observationen är ganska utmärkt. För öfrigt är det otvifvelaktigt, att dessa personliga variationer i och för sig hos skickliga observatörer alltid ligga inom mycket trånga gränsor. Men, om åter betydligt olika atmosferiska förhållanden — med i mångfaldiga grader olika definierade, lugna eller oroliga, klara eller matta bilder — kombinera sig med olika disposition hos observatören, så uppstår i sjelfva verket en sådan mångfald af växlande orsaker och verkningar, att relativt märkbara afvikelser mellan observations-resultaten knapt kunna öfverraska. Jag ser i dessa omständigheter den enda möjliga förklaringen på det, i synnerhet vid passage-observationer med öga och öra, ofta anmärkta förhållandet, att afvikelserna mellan särskilda bestämningar vanligen äro större, än man kunde vänta sig till följd af den inre harmonien mellan de enskilda momenten i en bestämning. Det är dock gifvet, att dessa afvikelser mellan särskilda resultat i många fall äfven kunna märkbart förökas genom periodiska instrumentela fel, som ligga utom observatörens kontroll.

De instrumentela orsaker af denna natur, hvilka här möjligen bidragit att öka de ifrågavarande sannolika felen, kunna svårligen vara andra än: tillfälliga irregulariteter i skrufvens rörelse eller i urets gång, någon olikhet i hårbelysningen, olika justering af okuläret och små tillfälliga fel i objektivets fokal-justering, hvilken vid orolig luft aldrig med full säkerhet kan kontrolleras. Jag anser det dock för alldeles oantagligt, att en ojemnhet i urets gång skulle hafva kunnat införa några märkbara fel i de här förekommande små rektascensions-differenserna; men alla de andra instrumentela felorsakerna hafva utan tvifvel mera eller mindre förefunnits, och hvilka således i förening med variabla atmosferiska förhållanden och olika disposition hos observatören måste hafva framkallat de i tabellen anförda afvikelserna.

Enligt tab. A är sannolika felet i en observerad rektascensions-differens per medium för alla stjernorna $= 0^s,170$, hvaraf således *sannolika felet i eqvator i en observerad appuls* erhålles

$$= 0^s,11.$$

Då man härvid betänker, att det motsvarande sannolika felet vid passage-instrumentet äfven för klarare stjernor föga understiger $0^s,1$, och att dessutom de flesta här förekommande stjernorna äro mycket ljussvaga; så är den erhållna siffran att anse för fullkomligt normal.

Med särskildt afseende på deklinations-differenserna var det icke osannolikt, att irreguliära variationer i den äldre mikrometer-skrufven, utan att ega någon öfvervigt vid bestämningen af de slutliga media, dock kunnat märkbart föröka sannolika felet i ett observations-moment. För att förvissa mig härom, har jag exempelvis för stjernorna af 9—10 storleken äfven beräknat det ifrågavarande sannolika felet uteslutande ur observationerna med mikr. II, och sålunda funnit detsamma något mindre än i tabellen, nämligen

$$= 0'',36,$$

som gifver *sannolika felet i en enkel inställning med ett hår*

$$= 0'',25.$$

Jag bör slutligen erinra derom, att användningen af konstant bågvalör på skrufgångan omöjligen kunnat bidraga att skenbart föröka ifrågavarande fel, då det i observationerna icke förefinnes något bestämdt utprägladt beroende af temperaturen. Här är äfven att omnämna, att jag i min mikrometer icke haft hårkors utan blott hår i en led; så att således särskilda inställningar på positions-cirkeln måst göras för de båda slagen af observationer. För att ej förlora för mycket tid, har jag dock alltid vid samma inställning bestämt koordinaterna af samma slag för flera stjernor å rad. Det synes emellertid med afseende härpå ej vara omöjligt, att fel ibland kunnat begås vid dessa jemförelsevis ofta återkommande inställningar; men jag anser mig dock vara säker på, att smärre fel af denna art på t. ex. ett eller annat tiotal minuter ej förekommit, ehuru misstag på 10° ett par gånger inträffat vid mina observationer på töckenstjernor. Men det är naturligtvis blott de små felen, som här kunna medföra någon fara. Tillfälliga mindre fel i afläsningen af mikrometer-skalan äro här ej heller sannolika.

För att åtminstone erhålla en antydning på den total-effekt, som framkallats af dessa, i detalj vanligen oåtkomliga, förhållanden, på hvilken felen i tab. A hufvudsakligen bero, är det af intresse att jemföra dessa tal med de analoga, som erhållas direkte ur differenserna mellan hvarje aftons medium och de motsvarande enkla observations-momenten. De på denna väg erhållna talen, som ju blott bero på de rent tillfälliga felen under en afton, äro sammanställda i följande tabell.

Tab. B.

Sannolika felet i 1 Observations-Moment.

Stjernstorlekar.	i $\Delta\alpha^s$ (i parall.)	Antal observat.-moment.	i $\Delta\delta''$.	Antal observat.-moment.
9^m—10^m	$0^s,0635$	1020	$0'',212$	628
10 —11	0 ,0650	611	0 ,223	240
11 —13	0 ,0818	1654	0 ,366	562

För beräkningen af sannolika felen i media af alla aftnarnas observationer har jag användt de i tab. A för olika klarhets-grader angifna sannolika felen i ett observations-moment. Enligt det sätt, på hvilket de absoluta media här beräknats, blir deras vigt $= m$, då ett observations-moment tages till vigtsenhet; och *medelfelet i absoluta mediet* erhålles således

$$= \frac{r_0}{\sqrt{m}}.$$

Dessa media med deras sannolika fel och vigter sammanställas i följande tabeller. *Första* tab. innehåller de stjernor, hvilka blott jemförts med central-stjernan; *andra* tab. upptager de klarare stjernor, hvilka jemförts med central-stjernan och med hvarandra, samt *tredje* tab. slutligen de ljussvagare stjernor, som jemförts med central-stjernan och med andra af de klarare stjernorna.

Tab. I.

Stjernor endast jemförda med Central-stjernan N:o 61.

Stjerna.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
N:o 1	$-45^s,705$	25	$0^s,041$	$+\ 18'',15$	13	$0'',16$
2	$-41,866$	55	0 ,028	$-\ 75,21$	22	0 ,12
5	$-40,290$	26	0 ,040	$+\ 97,47$	10	0 ,18
6	$-38,477$	19	0 ,047	$+\ 82,73$	11	0 ,18
8	$-36,987$	41	0 ,032	$-209,40$	19	0 ,13
9	$-35,550$	22	0 ,044	$-\ 43,90$	7	0 ,22
10	$-35,397$	23	0 ,043	$-123,70$	7	0 ,22
11	$-33,875$	27	0 ,040	$+\ 95,50$	13	0 ,16
16	$-30,021$	64	0 ,018	$+107,78$	32	0 ,08
17	$-29,047$	112	0 ,014	$-330,07$	90	0 ,05
18	$-28,952$	71	0 ,017	$+254,53$	34	0 ,08
19	$-28,832$	38	0 ,038	$+\ 8,26$	12	0 ,17

Tab. I. Forts.

Stjernor endast jemförda med Central-stjernan N:o 61.

Stjerna.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
N:o 20	— 28ˢ,697	68	0ˢ,019	+ 177″,99	29	0″,10
21	— 28,035	9	0,069	— 147,65	4	0,29
22	— 27,595	12	0,059	+ 43,60	6	0,24
23	— 27,075	14	0,055	+ 76,60	6	0,24
29	— 22,595	14	0,055	+ 99,60	6	0,24
30	— 21,140	24	0,042	+ 242,17	8	0,21
31	— 20,903	31	0,037	+ 252,53	11	0,18
32	— 20,210	21	0,045	+ 207,47	6	0,24
33	— 19,910	13	0,057	— 23,35	6	0,24
34	— 19,461	52	0,022	+ 261,36	24	0,12
37	— 16,907	21	0,045	+ 262,05	4	0,29
39	— 15,835	14	0,055	+ 223,60	5	0,26
40	— 15,080	22	0,044	+ 183,57	8	0,21
41	— 14,980	22	0,044	+ 66,03	7	0,22
43	— 13,403	19	0,047	— 31,90	8	0,21
44	— 12,935	14	0,055	+ 226,50	5	0,26
45	— 11,687	21	0,045	+ 298,43	9	0,19
46	— 11,245	14	0,055	+ 9,80	6	0,24
48	— 9,620	21	0,045	+ 21,58	11	0,18
49	— 8,411	109	0,014	— 236,04	47	0,07
50	— 8,354	92	0,017	+ 221,53	26	0,11
53	— 4,288	22	0,044	+ 33,10	11	0,18
73	+ 10,683	81	0,016	— 181,38	36	0,08
74	+ 11,308	44	0,031	— 344,14	13	0,16
77	+ 13,613	22	0,044	— 321,37	7	0,22
91	+ 30,327	22	0,044	— 264,13	6	0,24
92	+ 31,330	25	0,041	— 281,23	6	0,24
96	+ 35,812	62	0,020	— 108,83	29	0,10
97	+ 37,850	14	0,055	— 194,50	4	0,29
102	+ 44,140	14	0,055	— 237,90	4	0,29
103	+ 45,985	14	0,055	— 317,80	4	0,29

Positionsmätning har gifvit följande rektascensions-differenser mellan några stjernor, som ligga nära på samma deklinations-cirklar:

$$(9) - (10) = -0^s{,}07,$$
$$(19) - (20) = -0{,}11,$$
$$(40) - (41) = -0{,}08,$$
$$(49) - (50) = -0{,}14,$$

hvilka siffror dock ej vidare komma till användning vid den definitiva bestämningen af de relativa positionerna.

Tab. II.

Ljusstarka Stjernor jemförda med N:o 61 och hvarandra.

Stjern-par.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
3—38	—25^s,443	26	0^s,029	—225'',33	10	0'',14
3—61	—41,686	78	0,017	+ 160,41	34	0,08
3—63	—43,117	22	0,031	+ 10,90	10	0,14
3—66	—46,135	16	0,037	+ 26,35	6	0,19
3—98	—80,715	16	0,037	— 80,60	6	0,19
7—51	—29,850	24	0,030	+ 162,20	10	0,14
7—61	—37,589	112	0,014	—227,58	79	0,05
7—83	—57,355	20	0,033	—224,50	6	0,19
7—95	—72,795	20	0,033	—147,60	6	0,19
13—61	—33,607	99	0,015	—173,82	54	0,06
13—63	—35,040	20	0,033	—323,05	6	0,19
13—83	—53,375	34	0,025	—170,80	11	0,14
38—61	—16,364	101	0,015	+ 385,83	46	0,07
38—63	—17,880	16	0,037	+ 236,25	4	0,23
38—66	—20,843	24	0,030	+ 251,30	6	0,19
38—98	—55,367	24	0,030	+ 144,37	6	0,19
51—61	— 7,815	97	0,015	—389,55	44	0,07
51—83	—27,590	20	0,033	—386,80	6	0,19
51—95	—42,880	30	0,027	—309,70	9	0,15
63—61	+ 1,442	46	0,022	+ 149,37	38	0,07
63—66	— 3,070	33	0,026	+ 14,42	11	0,14
63—83	—18,435	20	0,033	+ 151,80	6	0,19
63—98	—37,623	44	0,022	— 92,20	16	0,11
66—61	+ 4,439	68	0,018	+ 134,77	31	0,08
66—98	—34,498	38	0,024	—106,62	13	0,13
83—61	+ 19,741	80	0,016	— 2,87	38	0,07
83—95	—15,487	24	0,030	+ 76,93	10	0,14
95—61	+ 35,204	94	0,015	— 79,66	44	0,07
98—61	+ 38,978	86	0,016	+ 241,22	37	0,08

Tab. III.

Ljussvagare Stjernor jemförda med Stjernan 61 och andra Stjernor.

Stjern-par.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
4—38	—24^s,870	14	0^s,055	+ 50'',25	4	0'',29
12—13	— 0,294*	11	0,062	——	—	——
12—61	—33,752	27	0,040	—139,58	8	0,21
14—38	—16,560	14	0,055	+ 9,85	4	0,29
15—17	— 2,170	19	0,047	— 55,20	6	0,24
24—38	—10,260	14	0,055	— 8,95	4	0,29

Tab. III. Forts.

Ljussvagare Stjernor jemförda med Stjernan 61 och andra Stjernor.

Stjern-par.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
25—38	— 8^s,330	20	0^s,046	— 185″,20	4	0″,29
25—61	— 24,540	14	0,055	+ 198,95	5	0,26
26—38	— 8,123	34	0,035	+ 6,98	9	0,19
27—38	— 6,760	34	0,027	+ 78,05	9	0,28
28—38	— 6,590	20	0,046	— 143,50	5	0,26
28—61	— 22,880	20	0,046	+ 241,83	7	0,22
35—61	— 18,473	22	0,044	+ 247,57	6	0,24
35—63	— 20,205	18	0,048	+ 98,45	4	0,29
36—38	— 1,815	20	0,046	+ 7,70	4	0,29
36—63	— 19,430	18	0,048	+ 244,45	4	0,29
42—17	+ 14,850	20	0,046	+ 28,07	7	0,22
47—38	+ 6,043	35	0,027	+ 101,33	10	0,18
52—73	— 15,720	14	0,055	— 31,70	5	0,26
54—17	+ 25,120	11	0,062	+ 11,05	5	0,26
54—73	— 14,820	25	0,041	— 137,60	4	0,29
55—73	— 14,524	38	0,033	+ 96,28	8	0,21
56—73	— 14,315	27	0,040	+ 170,10	8	0,21
57—73	— 13,345	11	0,062	+ 28,50	5	0,26
58—61	— 1,455 *	15	0,053	——	—	——
58—95	— 36,627	27	0,040	+ 349,10	7	0,22
58—98	— 40,380	14	0,055	+ 27,60	5	0,26
59—17	+ 27,689	72	0,017	+ 36,33	19	0,10
59—61	— 1,439 *	10	0,046	——	—	——
59—95	— 36,556	41	0,023	— 214,34	12	0,13
60—73	— 11,158	29	0,038	+ 127,70	9	0,19
62—73	— 9,970	10	0,065	— 75,90	6	0,24
64—95	— 32,875	14	0,055	+ 135,05	5	0,26
65—95	— 31,120	14	0,055	+ 139,85	5	0,26
67—73	— 5,048	27	0,040	+ 36,65	10	0,18
68—73	— 4,575	26	0,040	— 70,05	9	0,19
69—61	+ 7,630	10	0,065	+ 148,25	6	0,24
69—98	— 31,500	18	0,048	— 92,80	5	0,26
70—61	+ 7,840	10	0,065	+ 130,65	9	0,19
70—98	— 31,135	18	0,048	— 108,70	4	0,29
71—98	— 30,900	24	0,042	+ 27,77	6	0,24
72—98	— 29,700	14	0,055	+ 150,60	4	0,29
75—61	+ 11,440	20	0,046	+ 280,60	4	0,29
75—98	— 27,360	15	0,053	+ 39,60	5	0,26
76—95	— 22,936	14	0,055	+ 140,80	6	0,24
78—98	— 25,105	14	0,055	+ 117,25	4	0,29
79—98	— 24,805	30	0,038	— 58,28	9	0,19
80—73	+ 6,135	14	0,055	+ 68,75	4	0,29

Tab. III. Forts.

Ljussvagare Stjernor jemförda med Stjernan 61 och andra Stjernor.

Stjern-par.	$\Delta\alpha^s$.	Vigt.	Sannolika fel.	$\Delta\delta''$.	Vigt.	Sannolika fel.
80—95	— 18^s,575	17	0^s,050	— 32″,35	4	0″,29
81—95	— 18 ,070	30	0 ,038	+ 323 ,90	9	0 ,19
82—61	+ 17 ,305	14	0 ,055	— 245 ,25	4	0 ,29
82—95	— 18 ,020	19	0 ,047	— 163 ,25	5	0 ,26
84—98	— 18 ,020	14	0 ,055	+ 78 ,25	4	0 ,29
85—95	— 11 ,985	14	0 ,055	+ 311 ,40	5	0 ,26
85—98	— 16 ,080	16	0 ,051	— 9 ,20	4	0 ,29
86—98	— 15 ,483	30	0 ,038	+ 148 ,73	9	0 ,19
87—61	+ 23 ,738	51	0 ,022	— 76 ,44	23	0 ,12
87—98	— 15 ,290	16	0 ,039	— 317 ,50	4	0 ,28
88—61	+ 24 ,800	14	0 ,055	— 138 ,55	5	0 ,26
88—95	— 10 ,395	17	0 ,050	— 58 ,05	4	0 ,29
89—95	— 9 ,907	22	0 ,044	+ 321 ,43	7	0 ,22
90—95	— 8 ,440	15	0 ,053	+ 323 ,65	4	0 ,29
93—61	+ 35 ,110	14	0 ,055	— 110 ,65	5	0 ,26
93—95	— 0 ,125*	8	0 ,073	——	—	——
93—104	— 13 ,020	16	0 ,051	— 45 ,95	4	0 ,29
94—61	+ 35 ,115	14	0 ,055	— 52 ,55	4	0 ,29
94—95	— 0 ,282*	10	0 ,065	——	—	——
94—104	— 12 ,855	16	0 ,051	+ 11 ,85	4	0 ,29
99—61	+ 41 ,890	14	0 ,055	— 29 ,45	4	0 ,29
99—104	— 6 ,050	16	0 ,051	+ 34 ,65	4	0 ,29
100—61	+ 41 ,990	14	0 ,055	— 144 ,00	4	0 ,29
100—104	— 6 ,110	16	0 ,051	— 76 ,90	6	0 ,24
101—61	+ 41 ,990	14	0 ,055	— 76 ,25	4	0 ,29
101—104	— 5 ,965	16	0 ,051	— 12 ,45	4	0 ,29
104—61	+ 47 ,900	38	0 ,026	— 63 ,52	12	0 ,16
104—95	+ 12 ,780	16	0 ,039	+ 16 ,00	4	0 ,28

Positions-mätning har gifvit följande rektascensions-differenser mellan tvänne stjernpar i denna tab., hvilkas stjernor respektive ligga nära på samma deklinations-cirklar

$$(99) - (101) = -0^s{,}20,$$
$$(100) - (101) = -0{,}15.$$

För att evaluera de definitiva differential-koordinaterna, i förhållande till stjernan 61, för de klarare stjernorna i tab. II, sätter jag för rektascensions-differenserna

$$(3) - (61) = -41^s{,}69 + x_1$$
$$(38) - (61) = -16{,}36 + x_2$$
$$(63) - (61) = +1{,}44 + x_3$$
$$(66) - (61) = +4{,}44 + x_4$$
$$(98) - (61) = +38{,}98 + x_5$$

$$(7) - (61) = -37^s{,}59 + y_1$$
$$(51) - (61) = -7{,}82 + y_2$$
$$(83) - (61) = +19{,}74 + y_3$$
$$(95) - (61) = +35{,}20 + y_4$$

$$(13) - (61) = -33^s{,}61 + z_1$$
$$(63) - (61) = +1{,}44 + z_2$$
$$(83) - (61) = +19{,}74 + z_3$$

och analogt för deklinations-differenserna

$(3)-(61)=+160'',4+\xi_1$	$(7)-(61)=-227'',6+\eta_1$	$(13)-(61)=-173'',8+\zeta_1$
$(38)-(61)=+385,8+\xi_2$	$(51)-(61)=-389,6+\eta_2$	$(63)-(61)=+149,4+\zeta_2$
$(63)-(61)=+149,4+\xi_3$	$(83)-(61)=-\ \ 2,9+\eta_3$	$(83)-(61)=-\ \ 2,9+\zeta_3$
$(66)-(61)=+134,8+\xi_4$	$(95)-(61)=-\ 79,7+\eta_4$	
$(98)-(61)=+241,2+\xi_5$		

För bestämning af de ingående obekanta erhållas således följande 6 grupper af eqvationer med deras vigter:

	Vigt.
$x_1-x_2+0^s,113=\varepsilon$	26
$x_1 \quad -0,004=\varepsilon$	78
$x_1-x_3-0,013=\varepsilon$	22
$x_1-x_4+0,005=\varepsilon$	16
$x_1-x_5+0,045=\varepsilon$	16
$x_2 \quad +0,004=\varepsilon$	101
$x_2-x_3+0,080=\varepsilon$	16
$x_2-x_4+0,043=\varepsilon$	24
$x_2-x_5+0,027=\varepsilon$	24
$x_3 \quad -0,002=\varepsilon$	46
$x_3-x_4+0,070=\varepsilon$	33
$x_3-x_5+0,083=\varepsilon$	44
$x_4 \quad +0,001=\varepsilon$	68
$x_4-x_5-0,042=\varepsilon$	38
$x_5 \quad +0,002=\varepsilon$	86

	Vigt.
$y_1-y_2+0^s,080=\varepsilon$	24
$y_1 \quad -0,001=\varepsilon$	112
$y_1-y_3+0,025=\varepsilon$	20
$y_1-y_4+0,005=\varepsilon$	20
$y_2 \quad -0,005=\varepsilon$	97
$y_2-y_3+0,030=\varepsilon$	20
$y_2-y_4-0,140=\varepsilon$	30
$y_3 \quad -0,001=\varepsilon$	80
$y_3-y_4+0,027=\varepsilon$	24
$y_4 \quad -0,004=\varepsilon$	94
$z_1 \quad -0,003=\varepsilon$	99
$z_1-z_2-0,010=\varepsilon$	20
$z_1-z_3+0,025=\varepsilon$	34
$z_2 \quad -0,002=\varepsilon$	46
$z_2-z_3+0,135=\varepsilon$	20
$z_3 \quad -0,001=\varepsilon$	80

	Vigt.
$\xi_1-\xi_2-0'',07=\varepsilon$	10
$\xi_1 \quad -0,01=\varepsilon$	34
$\xi_1-\xi_3+0,10=\varepsilon$	10
$\xi_1-\xi_4+0,25=\varepsilon$	6
$\xi_1-\xi_5-0,20=\varepsilon$	6
$\xi_2 \quad -0,03=\varepsilon$	46
$\xi_2-\xi_3+0,15=\varepsilon$	4
$\xi_2-\xi_4-0,30=\varepsilon$	6
$\xi_2-\xi_5+0,23=\varepsilon$	6
$\xi_3 \quad +0,03=\varepsilon$	38
$\xi_3-\xi_4+0,18=\varepsilon$	11
$\xi_3-\xi_5+0,40=\varepsilon$	16
$\xi_4 \quad +0,03=\varepsilon$	31
$\xi_4-\xi_5+0,22=\varepsilon$	13
$\xi_5 \quad -0,02=\varepsilon$	37

	Vigt.
$\eta_1-\eta_2-0'',20=\varepsilon$	10
$\eta_1 \quad -0,02=\varepsilon$	79
$\eta_1-\eta_3-0,20=\varepsilon$	6
$\eta_1-\eta_4-0,30=\varepsilon$	6
$\eta_2 \quad -0,05=\varepsilon$	44
$\eta_2-\eta_3+0,10=\varepsilon$	6
$\eta_2-\eta_4-0,20=\varepsilon$	9
$\eta_3 \quad -0,03=\varepsilon$	38
$\eta_3-\eta_4-0,13=\varepsilon$	10
$\eta_4 \quad -0,04=\varepsilon$	44
$\zeta_1 \quad +0,02=\varepsilon$	54
$\zeta_1-\zeta_2-0,15=\varepsilon$	6
$\zeta_1-\zeta_3-0,10=\varepsilon$	11
$\zeta_2 \quad +0,03=\varepsilon$	38
$\zeta_2-\zeta_3+0,50=\varepsilon$	6
$\zeta_3 \quad -0,03=\varepsilon$	38

Behandlas dessa eqvationer enligt minsta qvadratmetoden, så erhållas följande definitiva differential-koordinater för stjernorna i tab. II i förhållande till stjernan 61.

Tab. IV.

Stjernpar.	$\Delta\alpha^s$.	Sannolika fel.	$\Delta\delta''$.	Sannolika fel.
3—61	— 41^s,711	0^s,0152	+ 160'',39	0'',052
7—61	— 37,600	0,0164	— 227,53	0,036
13—61	— 33,610	0,0171	— 173,79	0,052
38—61	— 16,363	0,0150	+ 385,81	0,049
51—61	— 7,788	0,0168	— 389,56	0,044
63—61	+ 1,415	0,0179	+ 149,32	0,038
66—61	+ 4,464	0,0148	+ 134,78	0,052
83—61	+ 19,754	0,0129	— 2,86	0,037
95—61	+ 35,187	0,0170	— 79,70	0,045
98—61	+ 38,994	0,0138	+ 241,31	0,049

På grund af tabb. I och IV erhållas nu vidare differential-koordinaterna i förhållande till stjernan 61 för alla stjernorna i tab. III.

Tab. V.

Stjernorna i tab. III reducerade på 20 Vulp.

Stjerna.	$\Delta\alpha$.	Sannolika fel.	$\Delta\delta$.	Sannolika fel.	Stjerna.	$\Delta\alpha$.	Sannolika fel.	$\Delta\delta$.	Sannolika fel.
4	— 41^s,23	0^s,057	+ 436'',1	0'',29	55	— 3^s,84	0^s,037	— 85'',1	0'',22
12	— 33,90	0,064	——	——	56	— 3,63	0,043	— 11,3	0,22
12	— 33,75	0,040	— 139,6	0,21	57	— 2,66	0,064	— 152,9	0,27
14	— 32,92	0,057	+ 395,7	0,29	58	— 1,46	0,053	——	——
15	— 31,22	0,049	— 385,3	0,24	58	— 1,44	0,043	+ 269,4	0,22
24	— 26,62	0,057	+ 376,9	0,29	58	— 1,39	0,057	+ 268,9	0,26
25	— 24,69	0,048	+ 200,6	0,29	59	— 1,36	0,022	— 293,7	0,11
25	— 24,54	0,055	+ 199,0	0,26	59	— 1,44	0,046	——	——
26	— 24,49	0,038	+ 392,8	0,20	59	— 1,37	0,029	— 294,0	0,14
27	— 23,12	0,031	+ 463,9	0,28	60	— 0,48	0,041	— 53,7	0,20
28	— 22,95	0,049	+ 242,3	0,26	62	+ 0,71	0,067	— 257,3	0,25
28	— 22,88	0,046	+ 241,8	0,22	64	+ 2,31	0,058	+ 55,4	0,26
35	— 18,47	0,044	+ 247,6	0,24	65	+ 4,07	0,058	+ 60,2	0,26
35	— 18,79	0,052	+ 247,8	0,30	67	+ 5,64	0,043	— 144,7	0,20
36	— 18,18	0,049	+ 393,5	0,29	68	+ 6,11	0,043	— 251,4	0,20
36	— 18,01	0,052	+ 393,8	0,30	69	+ 7,63	0,065	+ 148,3	0,24
42	— 14,20	0,048	— 302,0	0,22	69	+ 7,49	0,050	+ 148,5	0,26
47	— 10,32	0,031	+ 487,1	0,19	70	+ 7,84	0,065	+ 130,7	0,19
52	— 5,04	0,057	— 213,1	0,27	70	+ 7,86	0,050	+ 132,6	0,29
54	— 3,93	0,064	— 319,0	0,26	71	+ 8,09	0,044	+ 269,1	0,25
54	— 4,14	0,044	— 319,0	0,30	72	+ 9,29	0,057	+ 391,9	0,29

Tab. V. Forts.

Stjernorna i tab. III reducerade på 20 Vulp.

Stjerna.	$\Delta\alpha$.	Sannolika fel.	$\Delta\delta$.	Sannolika fel.	Stjerna.	$\Delta\alpha$.	Sannolika fel.	$\Delta\delta$.	Sannolika fel.
75	$+11^{s},44$	$0^{s},046$	$+280'',6$	$0'',29$	88	$+24^{s},79$	$0^{s},053$	$-137'',8$	$0'',29$
75	+ 11,63	0,055	+ 280,9	0,26	89	+ 25,28	0,047	+ 241,7	0,22
76	+ 12,25	0,058	+ 61,1	0,24	90	+ 26,75	0,056	+ 244,0	0,29
78	+ 13,89	0,057	+ 358,6	0,29	93	+ 35,11	0,055	— 110,7	0,26
79	+ 14,19	0,041	+ 183,0	0,20	93	+ 35,06	0,075	——	——
80	+ 16,82	0,057	— 112,6	0,30	93	+ 34,90	0,056	— 109,5	0,32
80	+ 16,61	0,053	— 112,1	0,29	94	+ 35,12	0,055	— 52,6	0,29
81	+ 17,12	0,042	+ 244,2	0,20	94	+ 34,91	0,067	——	——
82	+ 17,31	0,055	— 245,3	0,29	94	+ 35,06	0,056	— 51,7	0,32
82	+ 17,17	0,050	— 243,0	0,26	99	+ 41,89	0,055	— 29,5	0,29
84	+ 20,97	0,057	+ 319,6	0,29	99	+ 41,87	0,056	— 28,9	0,32
85	+ 23,20	0,058	+ 231,7	0,26	100	+ 41,99	0,055	— 144,0	0,29
85	+ 22,91	0,053	+ 232,1	0,29	100	+ 41,81	0,056	— 143,4	0,28
86	+ 23,51	0,041	+ 390,0	0,20	101	+ 41,99	0,055	— 76,3	0,29
87	+ 23,74	0,022	— 76,4	0,12	101	+ 41,95	0,056	— 76,0	0,32
87	+ 23,70	0,041	— 76,2	0,28	104	+ 47,90	0,026	— 63,5	0,16
88	+ 24,80	0,055	— 138,6	0,26	104	+ 47,97	0,043	— 63,7	0,28

Tages slutligen media mellan de särskilda bestämningarna i tab. V med vederbörligt afseende på de af sannolika felen följande vigterna, och de resulterande positionerna sammanställas med positionerna för de öfriga stjernorna från tabb. I och IV; så erhålles följande definitiva förteckning öfver stjernornas sökta differential-koordinater.

Tab. VI.

Definitiva Differential-Koordinater i förhållande till 20 Vulpeculæ.

Stjerna.	Storlek.	$\Delta\alpha$ 1865,0.	$\Delta\delta$ 1865,0.	Stjerna.	Storlek.	$\Delta\alpha$ 1865,0.	$\Delta\delta$ 1865,0.
1	11,7	$-45^{s},71$	$+18'',2$	14	12,2	$-32^{s},92$	$+395'',7$
2	11,0	— 41,87	— 75,2	15	11,5	— 31,22	— 385,3
3	10,0	— 41,71	+ 160,4	16	10,0	— 30,02	+ 107,8
4	11,0	— 41,23	+ 436,1	17	8,8	— 29,05	— 330,1
5	12,0	— 40,29	+ 97,5	18	9,9	— 28,95	+ 254,5
6	12,0	— 38,48	+ 82,7	19	11,7	— 28,83	+ 8,3
7	8,9	— 37,60	— 227,5	20	10,7	— 28,70	+ 178,0
8	11,0	— 36,99	— 209,4	21	12,0	— 28,04	— 147,7
9	12,4	— 35,55	— 43,9	22	11,9	— 27,60	+ 43,6
10	12,8	— 35,40	— 123,7	23	12,3	— 27,08	+ 76,6
11	11,4	— 33,88	+ 95,5	24	12,3	— 26,62	+ 376,9
12	12,3	— 33,79	— 139,6	25	11,8	— 24,63	+ 199,7
13	9,2	— 33,61	— 173,8	26	12,1	— 24,49	+ 392,8

Tab. VI. Forts.

Definitiva Differential-Koordinater i förhållande till 20 Vulpeculæ.

Stjerna.	Storlek.	$\Delta\alpha$ 1865,0.	$\Delta\delta$ 1865,0.	Stjerna.	Storlek.	$\Delta\alpha$ 1865,0.	$\Delta\delta$ 1865,0.
27	10,7	— 23^s,12	+ 463″,9	66	10,0	+ 4^s,46	+ 134″,8
28	12,0	— 22,92	+ 242,0	67	11,7	+ 5,64	— 144,7
29	11,7	— 22,60	+ 99,6	68	12,3	+ 6,11	— 251,4
30	11,6	— 21,14	+ 242,2	69	11,5	+ 7,54	+ 148,3
31	11,3	— 20,90	+ 252,5	70	12,1	+ 7,85	+ 131,3
32	12,4	— 20,21	+ 207,5	71	12,2	+ 8,09	+ 269,1
33	11,5	— 19,91	— 23,4	72	12,2	+ 9,29	+ 391,9
34	10,5	— 19,46	+ 261,4	73	9,8	+ 10,68	— 181,4
35	12,4	— 18,61	+ 247,7	74	11,2	+ 11,31	— 344,1
36	12,3	— 18,10	+ 393,7	75	11,1	+ 11,51	+ 280,8
37	12,4	— 16,91	+ 262,1	76	11,6	+ 12,25	+ 61,1
38	9,6	— 16,36	+ 385,8	77	12,4	+ 13,01	— 321,4
39	11,4	— 15,84	+ 223,6	78	12,3	+ 13,89	+ 358,6
40	11,4	— 15,08	+ 183,6	79	11,2	+ 14,19	+ 183,0
41	11,4	— 14,98	+ 66,0	80	12,7	+ 16,70	— 112,4
42	12,2	— 14,20	— 302,0	81	12,5	+ 17,12	+ 244,2
43	11,1	— 13,40	— 31,9	82	13,2	+ 17,23	— 244,0
44	11,7	— 12,94	+ 226,5	83	9,4	+ 19,75	— 2,9
45	11,7	— 11,69	+ 298,4	84	12,0	+ 20,97	+ 319,6
46	12,6	— 11,25	+ 9,8	85	12,8	+ 23,03	+ 231,9
47	10,3	— 10,32	+ 487,1	86	11,5	+ 23,51	+ 390,0
48	11,6	— 9,62	+ 21,6	87	10,5	+ 23,73	— 76,4
49	9,0	— 8,41	— 236,0	88	12,3	+ 24,80	— 138,2
50	10,5	— 8,35	+ 221,5	89	12,7	+ 25,28	+ 241,7
51	9,0	— 7,79	— 389,6	90	11,7	+ 26,75	+ 244,0
52	12,3	— 5,04	— 213,1	91	13,2	+ 30,33	— 264,1
53	11,4	— 4,29	+ 33,1	92	12,2	+ 31,33	— 281,2
54	11,2	— 4,06	— 319,0	93	12,2	+ 35,01	— 110,2
55	12,3	— 3,84	— 85,1	94	11,9	+ 35,05	— 52,2
56	12,2	— 3,63	— 11,3	95	9,2	+ 35,19	— 79,7
57	12,4	— 2,66	— 152,9	96	10,2	+ 35,81	— 108,8
58	11,3	— 1,44	+ 269,2	97	13,0	+ 37,86	— 194,5
59	10,0	— 1,37	— 293,8	98	9,4	+ 38,99	+ 241,3
60	12,3	— 0,48	— 53,7	99	11,9	+ 41,88	— 29,2
61	6	0	0	100	13,0	+ 41,90	— 143,7
62	12,3	+ 0,71	— 257,3	101	11,8	+ 41,97	— 76,2
63	9,6	+ 1,42	+ 149,3	102	13,0	+ 44,14	— 237,9
64	12,2	+ 2,31	+ 55,4	103	11,6	+ 45,99	— 317,8
65	12,2	+ 4,07	+ 60,2	104	10,6	+ 47,92	— 63,5

Media af sannolika felen efter stjern-storlekarna i föregående positioner gifva följande felförteckning:

Stjern-storlek.	Sannolika fel i $\Delta\alpha^s$ (parall.)	Sannolika fel i $\Delta\alpha''$ (eqvator).	Sannolika fel i $\Delta\delta''$.
9^m—10^m	$0^s,016$	$0'',22$	$0'',06$
10 —11	0,020	0,27	0,12
11 —12	0,044	0,59	0,21
12 —13	0,047	0,63	0,23

Med afseende på eliminationen af de tillfälliga felen har deklinations-bestämningen således icke obetydligt större vigt än rektascensions-bestämningen; och det är icke antagligt, att konstanta fel i deklinations-bestämningen märkbart modifiera dessa bestämningarnas relativa vigter.

Det är emellertid obestridligt, att små konstanta fel kunna vara att befara till följd af ofullständig utjemning af skal-afläsningarna och fel i skrufgängans bågvalör, ehuru dessa i alla händelser måste vara ytterligt små. Vidare kan användningen af samma bågvalör på gängan för alla temperaturer synas vara så mycket mindre berättigad, som denna erhållits vid en betydligt högre medeltemperatur än deklinations-differenserna. Då differenserna emellan de ifrågavarande medeltemperaturerna dock sällan öfverstigit 10°, och den negligerade temperatur-koefficienten måste vara mycket liten, så skulle summan af dessa konstanta fel i media blott i några få fall möjligtvis kunna öfverstiga det ofvan angifna sannolika felet i deklinations-differenserna för de ljusstarkaste stjernorna. Dessa möjligen återstående fel förblifva således alltid betydelselösa för de stjernor, som äro svagare än 10 storleken, men kunna, sedan temperatur-koefficienten hunnit bestämmas med vederbörlig skärpa, möjligtvis motivera en revision af deklinations-differenserna för de klaraste stjernorna. Då emellertid osäkerheten i mikrom. I måste vara af vida större betydelse än dessa små fel, så borde framför allt, vid en ny reduktion af observationerna på de klarare stjernorna, bestämningarna med densamma sannolikt helt och hållet uteslutas. Jag har för formen skull ansett mig böra påpeka dessa förhållanden, ehuru jag är öfvertygad, att genom en ny reduktion litet eller intet skulle vara att vinna.

Fyra af de här förekommande stjernorna äro på begäran observerade med Bonner-Heliometern under hösten 1869. De meddelade Bonner-positionerna, som hvila på 4 observationer, angifvas i följande tab. reducerade till $\Delta\alpha$ och $\Delta\delta$.

Observationer med Bonner-Heliometern År 1869.

Stjernpar.	$\Delta\alpha$ 1865,0.	Upsala —Bonn.	$\Delta\delta$ 1865,0.	Upsala —Bonn.
7—61	$-37^s,52$	$-0^s,08$	$-227'',7$	$+0'',2$
17—61	$-29,00$	$-0,05$	$-329,8$	$-0,3$
49—61	$-8,32$	$-0,09$	$-235,8$	$-0,2$
51—61	$-7,78$	$-0,01$	$-389,5$	$-0,1$

§ 8.

Sedan alla stjernorna nu blifvit reducerade på centralstjernan N:o 61, återstår, för evaluerandet af deras rektascensioner och deklinationer, i hufvudsak blott att angifva denna stjernas position. Till detta ändamål har jag visserligen inga längre observations-serier till min disposition, men i alla händelser föreligga tillräckligt många observationer, för att kunna gifva en ganska god om ock ej ytterligt skarp position. En fördel dervid är dessutom den, att de disponibla observationerna blifvit utförda på flera olika observatorier, och att observations-epokerna differera betydligt från hvarandra. Så förefinnas från de äldre observations-epokerna positions-bestämningar af Flamsteed, Bradley, d'Agelet, Piazzi och Lalande; vidare är stjernan observerad af Bessel och, ungefärligen under midten af detta sekel, af Robinson och Rümker samt i *Pulkova* och *Bonn*, och något senare i *Oxford*. Slutligen hafva nybestämningar på begäran benäget blifvit mig meddelade af Geheimerådet Argelander ifrån Bonn och af Professor Gyldén ifrån Stockholm. Stjernan skall äfven förekomma hos Taylor, ehuru jag i saknad af hans observationer ej kunnat begagna mig af den af honom erhållna positionen.

Katalog-Positionerna för Stjernan N:o 61 (20 Vulpeculæ).

Katalogens eller Observationens Epok.	Med. α.	Med. δ.	Katalog eller Observations-ort.
1690,0	$19^h 58^m 58^s,00$(3)	$+25° 34' 50''$ (3)	Flamsteed Brit. Cat.
1755,0	20 1 44,64(5)	+ 25 45 43,9(3)	Bessels Bradley.
1800,0	20 3 37,80(2)	+ 25 53 22,7(3)	Gould-d'Agelet.
1800,0	20 3 37,41($\frac{1}{3}$)	+ 25 53 26,2(1)	Hist. Coel. Lal. (1)
1800,0	20 3 37,42(5)	+ 25 53 27,5(5)	Piazzis äldre Cat.
1825,0	20 4 40,53(1)	+ 25 57 41,0(1)	Weisse 20^h219
1836,0	20 5 8,26(1)	+ 25 59 36,0(1)	Rümker 8106.
1840,0	20 5 18,20(6)	+ 26 0 19,4(5)	Robinson 4312.
1846,0	20 5 33,30(4)	+ 26 1 19,3(4)	Pulkava (2)
1855,0	20 5 56,00(1)	+ 26 2 54,0(1)	B. B. VI. 26°.3828.
1867,0	20 6 26,14(1)	——	Oxford, Observat.
1869,0	20 6 31,24(3)	+ 26 5 20,4(3)	Bonner-Merid.
1871,0	20 6 36,18(2)	+ 26 5 42,7(2)	Stockholms Merid.

(1) Reduktion enligt Asten.

(2) Denna position på begäran mig benäget meddelad af D:r Nyrén.

Af de nyare bestämningarna äro de ifrån Bonn mig blott meddelade i media. De enskilda observations-resultaten från Pulkova och Stockholm, reducerade till observations-årens början, voro följande:

Pulkova. Observations-tid.	Med. α 1846,0.	Med. δ 1846,0.
1846 Juli 16	$20^h 5^m 33^s,14$	$+26° 1' 20'',0$
Juli 31	33,48	20,3
Aug. 12	33,35	19,4
Sept. 13	33,24	17,3
Stockholm. Observations-tid.	Med. α 1871,0.	Med. δ 1871,0.
1871 Sept. 4	$20^h 6^m 36^s,22$	$+26° 5' 42'',1$
Sept. 6	36,15	43,2

För reduktion af de ofvan angifna positionerna till den gemensamma epoken 1865,0 har jag enligt Bessel antagit

årliga precessionen för 1755,0

$+2^s,5121\ ;\ +10'',164$

och *sek. var.*

$+0^s,0013\ ;\ +0'',311.$

För att vidare fasthålla vid en lofvärd princip inom den moderna astronomien, böra alla positionerna äfven reduceras på någon viss antagen normal-katalog, ehuru en dylik reduktion, af lätt begripligt skäl, i nuvarande fall för öfrigt torde hafva föga praktiskt intresse. Oafsedt de ifrågavarande reduktions-talens litenhet och den oundvikliga osäkerheten, såväl i dessa som i flera af de här anförda positionerna, måste nämligen valet af en normal-katalog ännu alltid blifva tämligen godtyckligt. Och, komma mina positioner en gång framdeles till användning i någon stellär undersökning, så är gifvet, att kalkulatorn då måste reducera dem på det af honom använda systemet. Utan att således här inlåta mig på den för mitt ämne likgiltiga frågan om rangordningen mellan de olika systemer, som för närvarande användas, har jag helt godtyckligt bestämt mig för det Wolferska och utfört reduktionerna enligt Argelanders föreskrifter i "Untersuch. über die Eigenbew. von 250 Sternen".

Pulkova-positionen och den *andra Bonner-positionen* referera sig, såvida jag förstår, omedelbart till Wolfers. Den *Piazziska positionen*, såsom hvilande på 5 observationer, är i och för sig af stort värde, men hvilket dock här betydligt förminskas af den omständigheten, att jag i saknad af Piazzis nyare katalog måst använda den äldre. Reduktionen till Wolfers, såsom egentligen gällande för den nyare katalogen, blir således äfven tämligen godtycklig och osäker. *Lalande's position* är deremot af underordnadt värde, då den blott hvilar på en observation och rektascensionen blott på passagen öfver ett hår. Då reduktionen från "Hist. Coel." till 1800 blifvit utförd enligt Asten, som ej anbringar Bessels korrektion på Piazzi, så har jag äfven ansett mig böra antaga samma reduktionstal till Wolfers för Lalande som för Piazzi. *Flamsteeds position*, blott upptagen för fullständighetens skull, kommer här icke vidare till någon användning. Öfverensstämmelsen mellan FLAMSTEED och BRADLEY är händelsevis fullständig i deklination; men FLAMSTEEDS rektascension är deremot öfver 3^s större än BRADLEYS. *Gyldéns position* refererar sig till Naut. Almanac, och jag har följaktligen härledt reduktions-talen till WOLFERS genom en direkt jemförelse af Berliner-Jahrbuch och Naut. Alm. för det ifrågavarande året.

De tal, som här användas för reduktion till Wolfers, blifva således de i följande tab. angifna

Reduktion till Wolfers.

Observatör.	i Rektascension.	i Deklination.
Bradley	$-0^s,02$	$0'',0$
D'Agelet	$+0,02$	$-0,1$
Lalande	$+0,20$	$-0,6$
Piazzi	$+0,20$	$-0,6$
Bessel	$+0,04$	$+0,9$
Rümker	$+0,04$	$0,0$
Robinson	$+0,05$	$0,0$
Argelander 1854	$+0,05$	$0,0$
Main 1867	$+0.06$	—
Naut. Alm. 1871	$+0,04$	$+0,8$

Med användning af dessa reduktions-tal och den ofvan angifna precessionen erhållas slutligen de i följande tab. angifna medel-positionerna för 1865,0.

Observatör.	Med. α 1865,0.	Medel-observat.-år.	Observatör.	Med. δ 1865,0.	Medel-observat.-år.	Relativa Vigter.	
Bradley	$20^h\,6^m\,21^s,03$	1755	Bradley	$+26°\,4'\,40'',7$	1755	1	1
D'Agelet	21,17	1784,14	D'Agelet	38,9	1784,35	$^1/_2$	$^1/_2$
Lalande	20,96	1793,64	Lalande	41,9	1793,64	$^1/_3$	$^1/_2$
Piazzi	20,97	1793,64	Piazzi	43,2	1793,64	$^1/_2$	$^1/_2$
Bessel	21,10	1825,64	Bessel	39,7	1825,64	$^3/_4$	$^3/_4$
Robinson	21,08	1831,20	Pulkova	38,4	1846,61	1	1
Pulkova	21,06	1346,61	Rümker	39,4	1847,7	1	$^3/_4$
Rümker	21,19	1847,7	Robinson	41,1	1851,45	$^3/_4$	1
Argelander	21,18	1853,84	Argelander	39,4	1853,84	$^3/_4$	$^3/_4$
Main	21,17	1867,61	Argelander	38,3	1869,7	$^3/_4$	1
Argelander	21,19	1869,7	Gyldén	40,4	1871,68	1	1
Gyldén	21,14	1871,68				1	

Valet af de i sista kolumnen angifna relativa vigt-talen, som skola användas vid beräkningen af media, har jag i nuvarande fall naturligtvis blott kunnat betrakta såsom en smakfråga. Den ringa vigt, som här tilldelats Piazzis position, är enligt det föregående fullt motiverad; och jag har för öfrigt, af lätt begripligt skäl, ej ansett mig böra gifva positionerna af 1:sta och 2:dra rangen alltför olika vigt.

Spekulationer öfver den ifrågavarande stjernans egna rörelse erbjuda för närvarande föga intresse, då den, såsom man ser, i alla händelser är så liten, att den svårligen på kortare tid än ett par sekel med säkerhet kan skiljas ifrån de återstående små positions-felen. Vid beräkningen[1] af media har jag emellertid, med antagande af den använda precessionen såsom riktig, enligt minsta qvadratmetoden samtidigt evaluerat medel-positionen 1865,0 och egna rörelsen. Observations-dagarna för Bonner-observationerna 1869 såsom för Rümkers position äro mig obekanta; men de hypotetiskt antagna siffrorna kunna ej mycket afvika från de sanna, och en närmare kännedom om dem är här dessutom alldeles obehöflig. För Bradley har jag antagit observationstiden = katalog-epoken. Den ifrågavarande räkningen gifver

Medelpositionen för 20 Vulpeculæ 1865,0

$$20^h\ 6^m\ 21^s{,}15 \pm 0^s{,}015,$$
$$+ 26^\circ\ 4'\ 39''{,}5 \pm 0''{,}59;$$

och *Egna Rörelsen under ett Sekel*

$$+ 0^s{,}13 \pm 0^s{,}030,$$
$$- 1''{,}5 \pm 1''{,}17.$$

Med användning af föregående position för 20 Vulp. erhållas, enligt tab. VI föregående §, de i följande förteckning angifna rektascensionerna och deklinationerna för stjerngruppens öfriga observerade stjernor.

Katalog öfver Stjerngruppen 20 Vulpeculæ.

Stjerna.	Storlek.	α 1865,0.	Precess.	Sekulär Var.	δ 1865,0.	Precess.	Sekulär Var.
1	11,7	$20^h\ 5^m\ 35^s{,}44$	$+ 2^s{,}5123$		$+ 26^\circ\ 4'\ 57''{,}7$	$+ 10''{,}447$	$+ 0''{,}308$
2	11,0	39,28	5130		26 3 24,3	452	308
3	10,0	39,44	5114		26 7 19,9	452	308
4	11,0	39,92	5096		26 11 55,6	453	307
5	12,0	40,86	5119		26 6 17,0	454	308
6	12,0	42,67	5120		26 6 2,2	456	308
7	8,9	43,55	5116		26 0 52,0	457	308
8	11,0	44,16	5141		26 1 10,1	458	308
9	12,4	45,60	5130		26 3 55,6	460	308
10	12,8	45,75	5135		26 2 35,8	460	308
11	11,4	47,27	5121		26 6 15,0	462	308
12	12,3	47,36	5137	$+ 0^s{,}0014$	26 2 19,9	462	308
13	9,2	47,54	5139		26 1 45,7	462	308
14	12,2	48,23	5100		26 11 15,2	463	307
15	11,5	49,93	5154		25 58 14,2	465	308
16	10,0	51,13	5121		26 6 27,3	467	308
17	8,8	52,10	5151		25 59 9,4	468	308
18	9,9	52,20	5111		26 8 54,0	468	307
19	11,7	52,32	5128		26 4 47,8	468	308
20	10,7	52,45	5116		26 7 37,5	468	307
21	12,0	53,11	5139		26 2 11,8	469	308
22	11,9	53,55	5126		26 5 23,1	470	308

Katalog öfver Stjerngruppen 20 Vulpeculæ. Forts.

Stjerna.	Storlek.	α 1865,0.	Precess.	Sekulär Var.	δ 1865,0.	Precess.	Sekulär Var.
23	12,3	20h 5m 54s,07	+ 2s,5124		+ 26° 5′ 56″,1	+ 10″,470	+ 0″,307
24	12,3	54,52	5103		26 10 56,4	471	307
25	11,8	56,53	5116		26 7 59,2	473	307
26	12,1	56,66	5103		26 11 12,3	474	307
27	10,7	58,03	5098		26 12 23,4	475	307
28	12,0	58,23	5113		26 8 41,5	476	307
29	11,7	58,55	5123		26 6 19,1	476	307
30	11,6	6m 0,01	5114		26 8 41,7	478	307
31	11,3	0,25	5113		26 8 52,0	478	307
32	12,4	0,94	5116		26 8 7,0	479	307
33	11,5	1,24	5132		26 4 16,1	479	307
34	10,5	1,69	5113		26 9 0,9	480	307
35	12,4	2,54	5114		26 8 47,2	481	307
36	12,3	3,05	5104		26 11 13,2	482	307
37	12,4	4,24	5114		26 9 1,6	483	307
38	9,6	4,79	5105		26 11 5,3	484	307
39	11,4	5,31	5116		26 8 23,1	484	307
40	11,4	6,07	5119		26 7 43,1	485	307
41	11,4	6,17	5127		26 5 45,5	485	307
42	12,2	6,95	5153		25 59 37,5	486	308
43	11,1	7,75	5135		26 4 7,6	487	307
44	11,7	8,21	5117		26 8 26,0	488	307
45	11,7	9,46	5112	+ 0s,0014	26 9 37,9	490	307
46	12,6	9,90	5132		26 4 49,3	490	307
47	10,3	10,83	5100		26 12 46,6	491	307
48	11,6	11,53	5132		26 5 1,1	492	307
49	9,0	12,74	5150		26 0 43,5	494	308
50	10,5	12,80	5118		26 8 21,0	494	307
51	9,0	13,36	5157		25 58 9,9	494	308
52	12,3	16,11	5149		26 1 6,4	498	308
53	11,4	16,86	5132		26 5 12,6	499	307
54	11,2	17,09	5156		25 59 20,5	499	308
55	12,3	17,31	5141		26 3 14,4	499	307
56	12,2	17,52	5136		26 4 28,2	500	307
57	12,4	18,49	5146		26 2 6,6	501	307
58	11,3	19,71	5117		26 9 8,7	502	307
59	10,0	19,78	5155		25 59 45,7	502	308
60	12,3	20,67	5139		26 3 45,8	503	307
61	6	21,15	5136		26 4 39,5	504	307
62	12,3	21,86	5153		26 0 22,2	505	307
63	9,6	22,57	5126		26 7 8,8	506	307
64	12,2	23,46	5132		26 5 34,9	507	307
65	12,2	25,22	5133		26 5 39,7	509	307
66	10,0	25,61	5128		26 6 54,3	510	307
67	11,7	26,79	5147		26 2 14,8	511	307

Katalog öfver Stjerngruppen 20 Vulpeculæ. Forts.

Stjerna.	Storlek.	α 1865,0.	Precess.	Sekulär Var.	δ 1865,0.	Precess.	Sekulär Var.
68	12,3	$20^h\ 6^m\ 27^s,26$	$+\ 2^s,5154$	$+\ 0^s,0014$	$+\ 26^\circ\ 0'\ 28'',1$	$+\ 10'',512$	$+\ 0'',307$
69	11,5	28 ,69	5127		26 7 7 ,8	513	307
70	12,1	29 ,00	5129		26 6 50 ,8	514	307
71	12,2	29 ,24	5119		26 9 8 ,6	514	307
72	12,2	30 ,44	5111		26 11 11 ,4	516	307
73	9,8	31 ,83	5151		26 1 38 ,1	517	307
74	11,2	32 ,46	5162		25 58 55 ,4	518	307
75	11,1	32 ,66	5119		26 9 20 ,3	518	307
76	11,6	33 ,40	5135		26 5 40 ,6	519	307
77	12,4	34 ,16	5161		25 59 18 ,1	520	307
78	12,3	35 ,04	5115		26 10 38 ,1	521	307
79	11,2	35 ,34	5127		26 7 42 ,5	522	307
80	12,7	37 ,85	5148		26 2 47 ,1	525	307
81	12,5	38 ,27	5123		26 8 43 ,7	525	307
82	13,2	38 ,38	5157		26 0 35 ,5	526	307
83	9,4	40 ,90	5141		26 4 36 ,6	529	307
84	12,0	42 ,12	5119		26 9 59 ,1	530	307
85	12,8	44 ,18	5126		26 8 31 ,4	533	307
86	11,5	44 ,66	5115		26 11 9 ,5	533	307
87	10,5	44 ,88	5147		26 3 23 ,1	534	307
88	12,3	45 ,95	5151		26 2 21 ,2	535	307
89	12,7	46 ,43	5125		26 8 41 ,2	535	307
90	11,7	47 ,90	5126		26 8 43 ,5	537	307
91	13,2	51 ,48	5161		26 0 15 ,4	542	307
92	12,2	52 ,48	5163		25 59 58 ,3	543	307
93	12,2	56 ,16	5152		26 2 49 ,3	548	307
94	11,9	56 ,20	5148		26 3 47 ,3	548	307
95	9,2	56 ,34	5150		26 3 19 ,8	548	307
96	10,2	56 ,96	5152		26 2 50 ,7	549	307
97	13,0	59 ,01	5158		26 1 25 ,0	549	307
98	9,4	$7^m\ 0,14$	5129		26 8 40 ,8	552	306
99	11,9	3 ,03	5148		26 4 10 ,3	556	307
100	13,0	3 ,05	5156		26 2 15 ,8	556	307
101	11,8	3 ,12	5151		26 3 23 ,3	556	307
102	13,0	5 ,29	5163		26 0 41 ,6	556	307
103	11,6	7 ,14	5169		25 59 21 ,7	561	307
104	10,6	9 ,07	5152		26 3 36 ,0	564	307

Tillägg.

Under loppet af sommaren 1873, sedan tryckningen af denna afhandling redan betydligt fortskridit, erhöll jag från observatoriet i Washington nedan bifogade serie af positions-bestämningar på central-stjernan 20 Vulp., hvilken jag anser det vara af intresse att här meddela. Den i det föregående antagna positionen för ifrågavarande stjerna erhåller dels derigenom en utmärkt kontroll, och den fullständiga öfverensstämmelsen mellan densamma och mediet af Washingtoner-bestämningarna bevisar dessutom, att de af mig antagna koordinaterna ega en ganska stor noggrannhet.

Utdrag ur brefvet från Washington:

"U. S. Naval Observatory, Washington.

— — — — — — — — — — — — — — — — — — —

In accordance with your request, made two years ago, it affords me great pleasure to send you the following observations of 20 Vulpeculæ, made with our Transit-Circle.

Date.	Observer.	Mean R. A. 1871,0.	Mean N. P. D. 1871,0.
1871 Aug. 15	Frisby.	$20^h\ 6^m\ 36^s,17$	$63°\ 54'\ 17'',8$
18	Eastman.	36 ,08	18 ,6
Sep. 21	F.	36 ,19	18 ,5
22	Stone.	36 ,25	17 ,7
23	Harkness.	36 ,15	17 ,7
Oct. 13	Ha.	36 ,14	17 ,4
17	F.	36 ,13	19 ,4
18	Ha.	36 ,19	18 ,2
19	F.	36 ,31	18 ,0
20	Ha.	36 ,16	17 ,7
21	F.	36 ,16	19 ,3
	Mean	$20^h\ 6^m\ 36^s,18$	$63°\ 54'\ 18'',2$
	Div, Flex., etc.		— 2
	Adopted position	$20^h\ 6^m\ 36^s,18$	$63°\ 54'\ 18'',0$

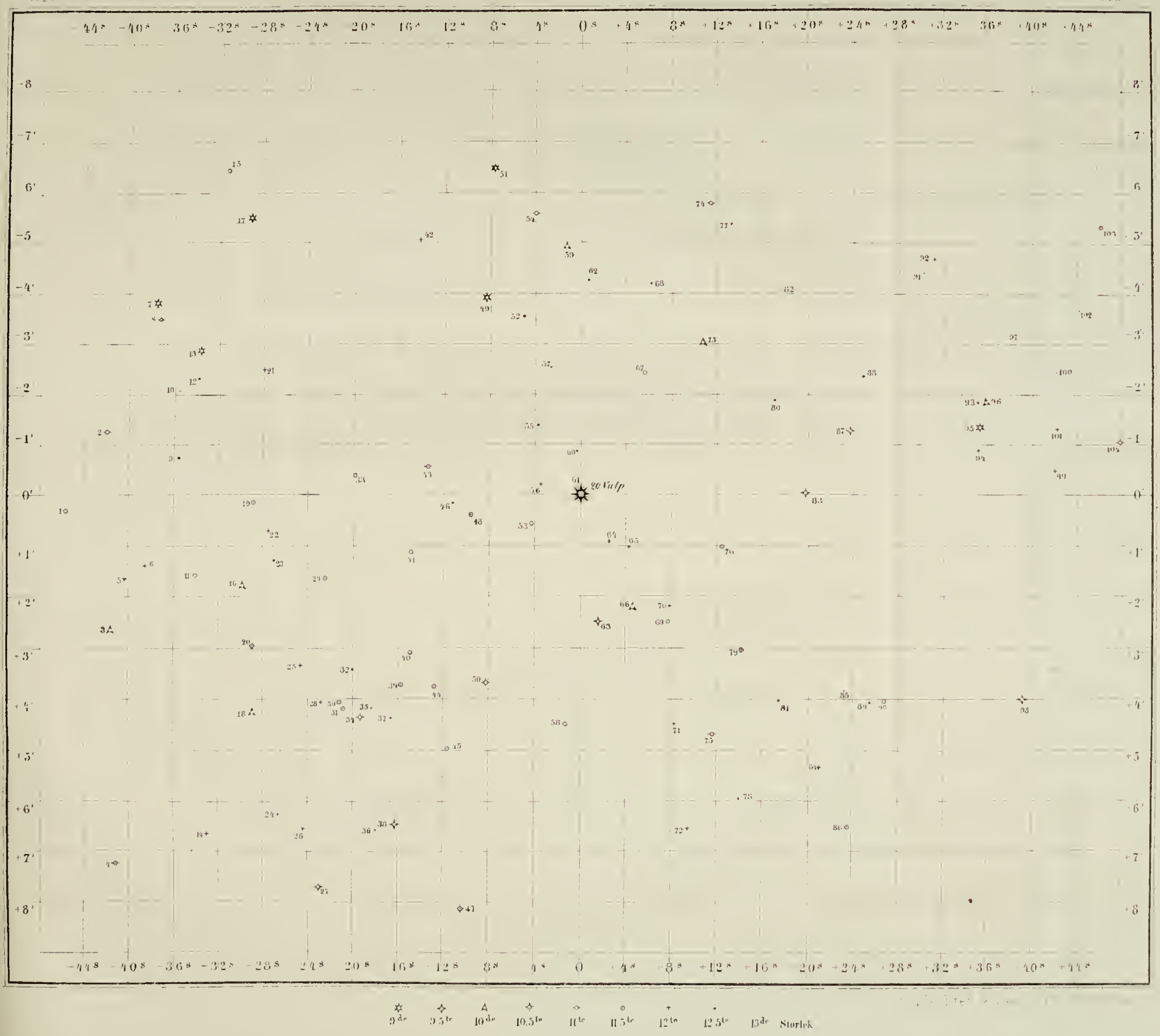
— — — — — — — — — — — — — — — — — — —

B. F. Sands
Rear Admiral, U. S. N.,
Superintendent."

TELESKOPISK STJERNGRUPP I VULPECULA.

i reverserande Tub.

H. Schultz



KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11 N:o 4

FLORIDAN BRYOZOA,

COLLECTED BY

COUNT L. F. DE POURTALES,

DESCRIBED

BY

F. A. SMITT.

PART II.

WITH 13 PLATES.

COMMUNICATED TO THE ROYAL ACADEMY OF SCIENCES, 1872 JUNE 12.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

Nearest to the *Cellulariæ*, though in the family of the *Cellarieæ (Salicornariadæ)*, Busk has placed the genus *Nellia*, justly remarking the cellularian conformation of its zoœcia. And indeed it seems me most properly to be conjoined, systematically, with that type. But the reasons for my opinion best will be understood here in comparing it with some other forms, showing the relations between the Cellularian, Flustridan and Membraniporidan types.

Nellia oculata [1]) (Pl. 1, figs. 53 and 54).

In its geographical distribution, it exhibits a very great interest as being one of the species common for the Australian and Caribbean seas. I need only to refer to a comparison between my figures and those given by Busk, which readily will show the specifical identity.

As to the constitution of this species, the "two raised hollow, perforated, papilli-"form processes below the aperture" (Busk) in reality are true avicularia, one pair at each side of the zoœcion; but very often they are defective, especially the lowest one in each pair, in wanting the operculum (mandible), thus presenting the opening closed only by a membrane; and their minute size (the breadth of their aperture being about 0,02 mm.) often makes it very difficult to discover the articulation of the mandible. The radical tubes spring out from the middle of the front side, just below the aperturral area of the zoœcia, thus presenting the most remarkable difference from the *Cellulariæ* and more properly answering to the budding of new zoœcia or branches on the *Eucratea* as well as of the radical tubes on the *Cellariæ* and *Escharella palmata* [2]).

Pourtales has taken some small colonies of this species at very different depths, once from 13, another time from 138 fathoms.

To the genus *Farcimia*, what name otherwise would have no right to be retained in the science, Count Pourtales has referred the new species described by him under the name of

Farcimia cereus [3]) (Pl. 1, figs. 55 and 56),

which, we think, must be regarded as a distinct generical type, claiming its own name. Thus, after Pourtales, we may take up the generical denomination *Farcimia*, first given by Fleming, but hitherto superfluous as being only a synonyme of the name *Cellaria*. Such a new genus, *Farcimia*, must be characterized, then, by its *Membraniporidan* zoœcia associated to form a *Cellarian* stem and calcified beneath the original

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1) Busk, *Cat. Polyz. Brit. Mus.*, p. 18, pl. LXIV, fig. 6; pl. LXV (bis) fig. 4.
2) Öfvers. Vet. Akad. Förh. 1867, Bih. p. 80.
3) Bull. Mus. Comp. Zool., Harv. Coll., Cambr., N:o 6, p. 110.

ectocyst, nearest in the same way as do the *Cupularia* and several forms of the Escharine type [1]).

It is through this mode of calcification, that the *Farcimia cereus* acquires such a different appearance after the condition of the specimens. When unworn (fig. 55), it shows the yellow, shining surface smooth, with the markings only of the regular elliptical areæ of the zoœcia in four alternating rows, the distal end of the one area intruding a little between the proximal ends of its two nearest heigher neighbours, with a rounded avicularium at each side. The avicularia then show nearly the same form and position as in *Nellia oculata*, with the difference only that they are single here in each place and stand a little lower. The most important difference between the two genera in this state is to be seen in the opercular apparatus at the distal end of the apertural area of the zoœcia. In the worn condition (fig. 56), however, the *Farcimia cereus* presents a totally different appearance. Then the avicularia no more can be seen, the apertural areas of the zoœcia, to the greatest part of their extent, are closed by a concave calcareous lamina, and the interstices between the areæ are cancellated by calcareous ridges, very much resembling what is to be seen on the *Myriozoa* The form of the open space, left by the calcareous lamina in the apertural area, is very constant, the distal end of it answering to the form of the operculum. As to the size of the zoœcia, I have measured the length of one area to be very nearly = 0,5 mm.

According to Pourtales, this species is rather abundant in 270 fathoms off Havana; I have only seen a few broken specimens from that locality.

Of the genus *Cellaria*, the Floridan fauna contains a variety of the same type as the oldknown *Cellaria fistulosa.* This variety very well deserves its own name, as it has already received it by Busk,

Cellaria tenuirostris [2]) (Pl. I, figs. 57—59);

though it will be seen, that it is so closely connected with the typical form from the old continent, that we must suppose them to have the same origin. The most important difference, as already was remarked by Busk, is to be expressed by the form of the avicularia (figg. 57 and 58), what organs, on the *Cellaria tenuirostris*, replace a zoœcion, retaining the typical form of this, but the opercular apparatus is transformed to a pointed, prominent rostrum, with a narrow, produced, pointed mandible. Another difference consists in the mode of connexion between the branches of the stem, accomplished by a knot of intricated radical tubes (fig. 57), what connexion I never have seen on the typical *Cellaria fistulosa.* The oœcia (ovicells, fig. 59) of the *C. tenuirostris* develop themselves in the same manner as on *C. fistulosa,* though they are not so much immersed; and very often they present a feeble longitudinal ridge over their front-side. Their opening is in the beginning round and broad, but after their full

[1]) The true signification of this mode of calcification, I can not study on died and dried specimens. Further down, in a yet more complicated form, we shall see it upon a Microporidan species.

[2]) *Salicornaria tenuirostris,* Busk, *Brit. Mus. Cat. Polyz.*, p. 17, tab. LXIII, fig. 4.

development, it attains the same form as the aperture of the zoœcion, though it is much smaller, and I never saw the denticles of the zoœcial aperture in it. The zoœcia have the well-known *cellarian* form; they undergo the same changes with age and present the same variations in consequence with the more robust or slender form of the stem, as those differences that are already known concerning the *C. fistulosa:* yet they are smaller — I have measured the crescent-shaped apertures about 0,08 mm. broad — generally more elongated and hyaline with slighter and more scattered granulations; but the lateral rib on each side of the area is very conspicuous.

Now, if we try to discuss the relations, that exist between this form and the *C. fistulosa,* we need only to point to the justly median form, that is described by Busk under the name of *Cellaria Johnsoni*[1]). Thus, in *C. fistulosa,* the avicularia develop themselves in the same manner and position as do the oœcia; these two organs there constituting a secondary budding; when they are present together, above the same zoœcion, the avicularium keeps the higher position. In the *C. Johnsoni,* the avicularium (Busk, l. c., vol. VIII, pl. XXVIII, fig. 5) retains the same form as that of *C. fistulosa,* but seems to appertain to the primary budding, thus replacing a zoœcion, in the same manner as that of *C. tenuirostris.* These differences, concerning the form and position of the avicularia, have their full analogy in many of the bryozoan genera, and very often they appear within the limits of the variability of a species [2]). It is a general rule, that where we do not find any real difference in the form of the zoœcia, there the other differences, also, lose the greatest part of their value as specifical characters. Now, the *C. tenuirostris* really differs from *C. fistulosa* in the size of the zoœcia as well as in their granulation; but these differences are slight and can not be judged as of high value; and it seems me rather preferable to regard them as varieties from the same origin. Of course it is a matter of agreement, how to express the different degrees of affinity; in accordance with many other bryozoan series, I should like to conjoin the above-named three forms into the limits of one species; and, indeed, it will be very difficult, if not impossible, with certainty to distinguish small fragments of these forms, in their highest degree of calcification, if they want their avicularia.

The *Cellaria tenuirostris* is brought up from 52 fathoms, off Carysfort reef, and from 68 fath, W. off Tortugas. As it was first described by Busk from Bass-strait, it is now to be registered among the interesting forms, which are common for the Australian and Caribbean seas.

After this account of the three genera of Floridan bryozoa, which, according to the hitherto prevalent opinions of the systematical arrangement of this group, should be arranged together in the family *Cellarieœ* (*Salicornariadœ*), it is very easy to show the true relations between them. The great differences, in the form as well as in the developmental changes of the zoœcia, in these genera, throw them long away from each other. The only reason for bringing them together in one family, would be the arti-

[1]) Quart. Journ. Micr. Sc., vol. VI, p. 125, Zooph. pl. XIX, fig. 2; vol. VII, p. 65, Zooph. pl. XXII, figs. 4, 5; vol. VIII, Zooph. pl. XXVIII, figs. 4, 5.

[2]) See: *Kritisk Förteckning öfver Skandinaviens Hafs-Bryozoer,* Öfvers. Vet. Akad. Förh. 1867, p. 397 and 410; Bih., p. 60 etc.

culated structure of the stem. Now, what this character really denotes, in my former papers at many instances I have shown on the Scandinavian bryozoa, and in the following we shall see that same to be the case with several Floridan forms: the manner of building the stem, with all the changes depending thereon, can only give characters of a secondary value, while the form of the individuals alone, with their developmental changes, will show the natural affinities. Thus the *Nellia*, as far as it yet is known, comes nearest to the Cellularian type, and in a natural system must be regarded as a Cellularian genus, modified, through its mode of growing, like the *Cellariæ*. The *Farcimia*, as that genus here is established, through its well defined apertural area, which it closes, proximally, in the nearest agreement with some Membraniporidan forms, for the same reason must be regarded as belonging to the *Membraniporidan* series. The true *Cellariæ*, from which we must separate the *Cellaria articulata* (as being a *Microporidan* form), through the younger form of their zoœcia, place themselves in the neighbourhood of the *Flustræ*. In the Flustrine type, however, the lower forms come very near each other, though the highest differentiations of the type very much diverge. Thus, when the connecting links are missing, we can scarcely judge of the affinities and, probably, we must wait long, before we can trace the evolution of all that digressions of the type, thus finding natural grounds for establishing families and genera etc. Now, as I have shown in my former papers, the Escharine and Celleporine types have developed themselves from various stages of Flustrine constitution, and the progress of that development very often has left its traces in the present evolution of the colonies, what is expressed in the variations of the form of the zoœcia from the beginning of the colony to its last stages. Therefore, for the natural arrangement, after this principle, of the Escharine and Celleporine groups, it will be necessary to know the development at least of the leading forms. As an instance, how far these developmental relations are to search for, I will show the development of a *Vincularia*, that I do not venture to identify with any formerly known species, wherefore I propose to give it the name

Vincularia abyssicola (Pl. I, figs. 60 and 61).

Pourtales has brought up two fragments of this species, the one fixed on a *Retepora* from 450 fathoms off Cojima, Cuba, the other on a *Nullipora* from 68 fathoms at Florida. The one of these colonies, in its outer appearance, after the hitherto prevalent opinions, would be a *Membraniporidan* form (fig. 60), encrusting the *Retepora*. The zoœcia are purely flustrine, linguiform (pyriform) covered by a yellow ectocyst, into whose distal part the halfelliptical operculum is moving itself. From each of the proximal corners of that aperture, a furrow is going back proximally. The avicularia retain the form and position of the zoœcia, as buddings of the same order, with the only difference, that the operculum is transformed to a mandible of triangular form with the tip produced, acute, and with the sides bordered to an elliptical form by a membrane. Taking away the yellow, primary ectocyst, below this we find nearly whole the front side, of the zoœcia as well as of the avicularia, covered by a white, shining, granular calcification, thus making an escharine form out of the formerly flustrine species. The other colony, brought up by POURTALES, is raised at two points into stems of the *Vincularian* form (fig. 61), otherwise retaining the same constitution of the zoœcia and avicularia. These stems, if taken alone, by the authors, without doubt, would have been brought in adifferent systematical series, from that into which they would place the encrusting stage.

The zoœcia, as deprived of their primary ectocyst[1]), have their front in the middle raised a little between the two above-named furrows. The apertural area has a trapezoidal form, with rounded distal end, broader in its proximal part, with rounded corners and the proximal margin concave. As to its dimensions I have measured one area 0,29 mm. long and 0,22 mm. in its greatest breadth: thus the length is to the breadth, about as 4 to 3. If these areas had been a little more elongated, one could expect to have reason for uniting this species with *Vincularia elegans*, D'ORB.[2]), from the Falkland-islands, because the linguiform zoœcia, if deprived of their primary ectocyst, have their borders raised, the front side sloping inwards against the above-named furrows, thus the description, given by D'ORBIGNY, would suit it very well; but his figures present the areas of a form, that seems to come nearer to the *Vinc. ornata*, BUSK, only wanting the denticles of that form, which, perhaps, have escaped the attention of D'ORBIGNY.

Now my Plate I, as it is composed of very different forms, I hope it will show, that neither the agreement, nor the diversity in the manner of building their colonies, will give any warrant as to the natural affinities of the higher bryozoa. If that be granted, I will have fewer opponents against my exposition of the following families; yet nobody deeper than myself can feel the insufficiency of our present knowledge as to the limits of the natural series.

MEMBRANIPORIDÆ.

Membranipora lineata[3]) (Pl. II, fig. 62).

Of this species POURTALES has taken a very typical, though for the most part died and unclean colony, growing on a piece of coral from 42 fathoms at Florida. The only remarkable difference from the oldknown european form would be the size of the oœcia, about 0,21 mm. broad, while the zoœcia in that respect resemble the european form. Thus it would hold an intermediate position between *Membr. craticula* and the true *M. lineata;* but, as I have shown (Öfvers. Vet. Akad. Förh. 1867, pag. 391), these two forms are to be regarded as variations of age and development of the same species.

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[1]) The drawer has shown one in the middle of the shadowed part of the raised stem (fig. 61); the other zooecia there were either covered by their primary ectocyst or in an oblique position. Yet that clear zooecion, in a flexure of the stem, has got a more than usually abbreviated form.

[2]) *Voy. d. l'Amér. mer.*, Tom. V, part 4, Zooph., Div. 1, Bryoz., pag. 21, tab. IX, figs. 25—28.

[3]) Of the synonyms see: Öfvers. Vet. Akad. Förh. 1867, pag. 364.

In comparing it with the *Membranipora spinosa*, D'Orb. [1]), from Peru and Bolivia, one will scarcely find any difference, for that number of spines (18—20), cited by him, even the Floridan form presents on some of its older zoœcia, and, in particular in its overgrown parts, it totally resembles the D'Orbignyan figure.

The avicularia (fig. 62) are scattered in the interstices between the areæ, where the limits between the zoœcia are very obscure.

When we remember the developmental changes of this species, it will be easy to understand its relation to the

Membranipora irregularis [2]) (Pl. II, fig. 63),

of what form Pourtales has taken two small colonies, from 60 fathoms at Florida, the one growing on a Nullipora, the other on a shell of a died Pecten.

It is of a very simple construction, wanting all other secondary buddings than the oœcia, which in their form [3]) show its near affinity to the preceding. The wanting of the spines would do nothing as to the specifical distinction, and it would be the same with the more firmly calcificated nature of the walls of its zoœcia; but this calcification, in the most calcified zoœcia, below the covering membrane of the areæ, produces an inner "expansion all round the circumference, but wider inferiorly". This last character brings it nearer to the *unicornis*-variation of this type, where it must be regarded, I think, as one of those reductions of the secondary buddings, which are very common in the Membraniporidan series [4]).

The borders of the areæ sometimes are roughly granulated, although nothing near so much, as what shows the figure given by Busk [5]).

The small specimens, I have had for examination, do not allow me to say much about the variability of the *M. irregularis;* but once, I think, it will be demonstrated, with more certainty, to be only a developmental stage of the *Membranipora unicornis.* That same judgment, without any hesitation, we must give of the interesting form,

Membranipora sigillata [6]) (Pl. II, figs. 64—68)

which, for the first time, was described by Pourtales, as brought up from 270 fathoms off Havana. Yet that specimen was only a small fragment; but since then he has found the species again, in a more complete colony (fig. 66), living at the depth of 262 fathoms, at Florida.

It is growing in the manner of *Retepora* (auctt.), and this so perfectly alike, that it would be impossible to separate it from that genus, were it not for the totally different zoœcial constitution. In connexion with the Reteporidan manner of growth,

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[1]) *Voy.*, ibid., pag. 16, tab. VIII, figs. 1—4.

[2]) D'Orb., l. c. pag. 17, tab. VIII, figs. 5 and 6.

[3]) I measured the breadth of one oœcion to about 0,24 mm.

[4]) Öfvers. Vet. Akad. Förh. 1867, pp. 419 and 473.

[5]) Quart. Journ. Micr. Sc., N. Ser., vol. VII, Zooph., pl. XXXIII, fig. 3.
Obs. D'Orbigny says: "cellulis . . . margine lævigato cinctis".

[6]) *Cellepora sigillata*, Pourt., Bull. Mus. Comp. Zoöl. Cambr., N:o 6, pag. 110.

beyond the colonial organs possessed by the typical *Membranipora unicornis*, it developes avicularia, whose nearest correspondence we find on the true *Reteporæ;* although sometimes, even in the European seas, on the common Membraniporidan growth [1]) the same colonial organs can be developed without any remarkable alteration of the other parts.

The two specimens of *Membr. sigillata*, which were sent me for examination, give a very complete knowledge of the variability of the species. What I take to be the most typical form, is that most resembling the common *Membr. unicornis*. The zoœcia are placed in alternating rows, two or sometimes three in the breadth of a branch. They show the common form of the *Membr. unicornis*, with two pairs of spines [2]), where the oœcia are wanting, and with one pair only in front of an oœcion. The inner lamina, in the areas, is well developed, as it was in the preceding form of this group. Where the ooecia are developed, with the characteristical transverse rib, they are crowned by the common avicularia, which thus seem to be sessile upon them; but in wanting of the oœcia, these avicularia are raised, as on the *Membr. minax*. On the sides of the branches, as well as on their back, other avicularia are developed of a greater size and more sessile, navicular like those of *Membr. discreta*. The tip of their beak is curved and the margin of their opening (area) denticulated. At the back of the branches (fig. 65), the limits of the zoœcia are very apparent. The calcification in their wall on this side presents a rounded or elongated thinness in their middle, the best reminiscence, I think, from the encrusting state of the species, in what condition the whole wall of the back side of the zoœcia is less calcified. The scattered avicularia on the back of the stem have the same form as those on its sides, but usually they have the distal end (the tip) more raised, thus taking a more oblique position.

The root of the stem is all too little developed for giving any good idea of the encrusting state, but in the British Museum I have seen a specimen, taken from 37 fthms. at Lat. 41° 30′ n., Long. 141° east, that, I think, must be referred to the same species, though it does not show any raised portion.

The original specimen (figs. 67 and 68), described by Pourtales, at first sight, perhaps, would be separated as a distinct variety from the preceding one; for in all its parts it presents a more elongated form, thus, for instance, showing the median avicularia (fig. 67) more raised and pedunculated, what is rendered more conspicuous by its wanting of the oœcia. But, in accordance with many other bryozoa, these differences very easily will be accounted for as depending on a more advanced colonial evolution.

Now, if the Reteporidan growth does not give us any reason for making a new genus, consequently the same must be said about the *Cupularian* growth. Thus, as its zoœcial form brings it very near to the preceding ones, I name

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[1]) On the *Membranipora discreta*, see Öfvers. Vet. Akad. Förh. 1867, pag. 396 etc.

[2]) Very often the one of the inner spines is wanting, as it usually occurs even on the *Cellularina*.

Membranipora canariensis (Pl. II, figs. 69—71)

that species first described by Busk [1]) as belonging to the genus *Cupularia*.

The zoœcia, when they retain their membranous covering (fig. 69), show their true membraniporidan constitution. The vibracularia, also, which of course are nothing else than modifications of the same colonial organs as the avicularia, have their close correspondence on the preceding forms, answering to the avicularia of the *Membr. unicornis*. Here they are turned obliquely backwards, in radiating as well as in lateral direction [2]) of the colonial growth, so that their tip is directed proximally, and the margin of their opening (area), at the articulation of the bristle (vibraculum), on the one side is raised in "a prominent tooth" above the level of its other side.

When deprived of their primary ectocyst (fig. 70), the zoœcia exhibit the inner lamina in their area of the same form as that of the preceding species, and particularly of the *Farcimia cereus*.

On the back (fig. 71) the rounded thinnesses in the calcification, which are excavations or sometimes perforations (in the dried state) in the wall of the zoœcia, probably correspond with the above-named marks on the back of the preceding species.

The *Membranipora canariensis*, after Pourtales' collections, seems to be very common at Florida, from 10 to 44 fathoms depth. Through the kindness of Mr. Busk, who first described it from Madeira, I have been able to compare it with specimens from the coast of Marocco. Thus it is very widely spread in the western hemisphere, and a closer comparison with the *Cupularia stellata*, Busk, probably, I think, will show it to have a yet wider distribution.

Thus, in the natural series of *Membranipora lineato-unicornis*, with all surety, in the Floridan sea we find three different modes of growth, viz: *Membraniporidan*, *Reteporidan* and *Cupularian* (auctt.). To these, I think, the *Cellarian (Farcimia cereus)* must be added, although that form, through its peculiar calcification between the areæ, has gone far away, as it seems, in the deviation from the common origin.

At the side of this series, as I formerly [3]) have shown, the *Lepralia nitida*, auctt., for the sake of its morphological relations is to be placed, although it offers the greatest systematical interest in being one of the connecting links between the flustrine and escharine types. And, indeed, its zoœcial as well as colonial structure, particularly if combined with that of *Lepralia sceletos*, Busk [4]), must be regarded as Membraniporidan, Yet, as it now can be demonstrated to represent the creeping state in a series, capable of a still higher development, that series, suitably, ought to have its own generical denomination, and I propose to name it *Membraniporella*. To that genus, then, should be referred a very pretty species.

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[1]) Quart. Journ. Micr. Sc., vol. VII, pag. 66, Pl. XXIII, figs. 6—9; *Crag Polyzoa*, pag. 87, Pl. XIII, fig. 2.

[2]) Compare Öfvers. Vet. Akad. Förh. 1867, pp. 391 and 405 etc., on the variations of the direction of these avicularia.

[3]) *Krit. Fört. Skand. H. Bryoz.*, Öfvers. Vet. Akad. Förh. 1867, pags. 366 and 401.

[4]) Quart. Journ. Micr. Sc., vol. VI, pag. 262, Zooph., pl. XX, fig. 3.

Membraniporella Agassizii [1]) (Pl. V, figs. 103—106),

taken by POURTALES from a depth of 450 fathoms, off Cojima, Cuba. These specimens are fragments of white-shining, dichotomously divided, cylindrical stems (fig. 106) of a slender *Eschara*-growth (auctt.). As they are all broken at both ends, they do not show the mode of fixing of the colonies; but from the tips of the branches down to their lower parts, very completely, they present the changes of the species with age. The young zoœcia (fig. 103) precisely agree with *Membraniporella nitida*, except that the ribs are narrower and usually more numerous (12—8 pairs). The avicularia, which in that species either wanted or were irregularly scattered in the interstices between the zoœcia, here, with the same form [2]), take a greater development and a constant place, pointing distally, one at each side of the mouth of the zoœcia. The oœcia are rounded, with a transverse rib, discontinuous in the middle, forming the margin of their aperture. Their wall is ornamented by two or three pairs of transverse ribs, converging towards a longitudinal area on their front, thus repeating the construction of the lateral wall (outside the area) of the zoœcia [3]). On the older parts of the stem, the interstices between the areæ of the zoœcia cover themselves with rounded warts [4]) (figs. 104 and 105), crowned by a circular area, which is circumscribed by a rib, from which transverse ribs descend, in the same manner as just described on the oœcia. As these warts are augmenting in number, they take a more irregular shape, heaping themselves densely together, not only over the lateral parts of the zoœcia (fig. 104), but also covering the proximal part of their areæ (fig. 105), and so going on until the whole front side of the zoœcia is overgrown. At the same time, this new covering of the stem takes the avicularia with it, leaving them irregularly dispersed on its glossy, warty surface.

As to the size of this species, I have measured the mouth (operculum) of a zoœcion with a breadth of about 0,16 mm.

Although I place this species here, among the *Membraniporidæ*, we shall have to consider it again, when we are discussing the affinities of the *Eschariporidæ*.

Very near to the *lineata*-series, within the Membraniporidan family, another one also is to be arranged [5]), with the *Membranipora Flemingii*, BUSK, as the best known type. As the principal character for the group, thus formed, I may cite the words of BUSK, in his description of one of the species [6]): "Aperture sub-trifoliate, or somewhat

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[1]) Compare the *Escharipora filiformis*, D'ORB., *Pal. Franc.*, *Terr. Crét.*, vol. V, pag. 232, tab. 700, figs. 13—15.
[2]) Compare *Krit. Fört.*, l. c., tab. XX, fig. 50.
[3]) The drawer has omitted these markings on the zoœcia (fig. 103) but for a figure of them, I can refer to a comparison with *Krit. Fört.*, l. c., pl. XX, fig. 22, where the same markings are shown on the sides of a *Tata*-zoœcion.
[4]) Compare *Hippothoa (Lepralia) Brogniartii*, BUSK, *Cat. Brit. Mus.*, *Polyz.*, p. 65, pl. LXXXI, fig. 1. This species I refer to the genus *Hippothoa*, although its characteristic, as yet known, rather will place it into the *Escharidan* family. Still, in that family, we do'nt know any relatives to it; and the median sinus, otherwise the most constant *character* of the *Myriozoids*, which here wants, in the *Hippothoa hyalina*, also, is wanting in those zoœcia, which produce an oœcion at their tip.
[5]) *Krit. Fört.* etc., Öfvers. Vet. Akad. Förh. 1867, pag. 367, 403 etc.
[6]) Quart. Journ. Micr. Sc., vol. VI, pag. 262.

contracted on the sides below the middle." In my former papers [1]), I have shown the developmental changes, how they are going out from the common origin of all the Membraniporidans. Thus, in their lower stages, the species of this group scarcely will be to distinguish from the preceding; but as the development goes on, through the above-named character, they acquire sush a peculiarity, as well can deserve its own generical name. For that purpose the name *Mollia*, first proposed by LAMOUROUX [2]), here may be used, because it, by him, included the first of our Floridan species, that belongs to this group. But then, in the following, I must change the name of the escharine genus, which I once [3]) constituted with that name, while it included those forms, which would best agree with the character given by LAMOUROUX.

Of the above-named group, among the POURTALES' collections, we find two very different species.

Mollia patellaria [4]) (Pl. II, fig. 72).

It is one of the smaller bryozoa. The very regular, elliptical zoœcia, in their *Mollia-* (*Diachoris-*) growth, have a length of about 0,36 mm. From their sharp margin, the finely granular, yellowish hyaline front side very steeply slopes down inwards to a furrow, parallel with the circumference; inside of this it is gently swollen. The subtrifoliate area has the proximal margin concave; its length as well as its greatest breadth I have measured to about 0,1 mm. The smoothly rounded oœcion developes itself, in the usual manner, at the distal end of a zoœcion, very little raised above the level of the front side of this. Sometimes, in the rows of the zoœcia, we find small features of the zoœcial form, which perhaps may be avicularia, although, in their dried state, I have seen no true avicularian structure in them.

This species, in very neat colonies growing on a *Nullipora*, is taken by POURTALES, at Florida, from a depth of 36 fathoms. In accordance with BUSK, I have identified it with the mediterranean form; although the descriptions by MOLL and HELLER do not give any surety as to the form of the zoœcial area.

Mollia antiqua [5]) (Pl. II, fig. 73).

To the description and excellent figures of the Madeiran specimen, given by BUSK, I will only mention the difference, which perhaps will strike any one, in comparing my figure with them. This difference, consisting in the more pointed distal end of the zoœcia, only depends on the more highly calcificated constitution of the figured

[1]) *Krit. Fört.*, l. c., pag. 388, 405 etc.

[2]) *Pol. Cor. Flex.*, pag. 115.

Since then a new genus, *Diachoris*, with almost the same characters, has been constituted by BUSK (*Voy. Rattlesn.*, pag. 382; *Brit. Mus. Cat.*, *Polyz.*, pag. 53); but as the types of that genus seem to be *Bugularidan* species, it must be used within the limits of that family.

[3]) *Bidr.* etc., Öfvers. Vet. Akad. Förh. 1867, Bih., pag. 14.

[4]) *Eschara patellaria*, MOLL, *Eschara*, p. 68, tab. IV, fig. 20.

Diachoris simplex, HELLER, *Bryoz. Adr. Meeres*, Verh. d. k. k. zool.-bot. Gesellsch. Wien, Bd. XVII (1867) p. 94 (p. 18 sep.), tab. I, fig. 4.

[5]) *Membranipora antiqua*, BUSK, *Zoophyt.*, Quart. Journ. Micr. Sc., vol. VI, pag. 262, pl. XX, figs. 1 and 2.

part of the Floridan colony, for the most of the zoœcia, particularly the younger ones, completely agree with BUSKS figures.

The species is taken by POURTALES on died shells and on Nullipora from the depths of 29 and 44 fathoms.

The *Mollian* series, probably, can be followed to a great richness of species of various forms of growth. Thus, for instance, we will probably find its congeners in the neighbourhood of *Semieschara ringens* etc. by D'ORBIGNY; and, as a *Cupularian* growth, perhaps the *Selenaria maculata*, BUSK, may be joined with it. Even among the true escharine bryozoa there are many, such as *Lepralia spathulifera*, who mind of the form of its area; but there is much to be done, before with certainty we can say anything about that question. As the middle of the proximal margin of the zoœcial area, as well as its lateral tooth, of *Mollia antiqua*, very usually raise themselves, we may think they would meet each other, and thus the comparison of its structure farther may be followed for the explanation of the structure and affinities of such forms as *Mollia holostoma* [1]), *M. oceani* [2]) and *Steginoporella elegans* (M. Edw.), what species will be discussed further down.

Such a raising of the distal part of the front side of the zoœcia also gives the character to a group, whose most simple species, by GRAY [3]), was the type for the family

MICROPORIDÆ.

The aperture, closed by its operculum, in this family coincides with the distal part of the margin of the zoœcion, and proximally, at the articulation of the operculum, it is limited by a transverse rib, formed by the raising, in that line, of the front side. Thus, in the full development of the type, the primary area, in the same manner as on the Escharines, disappears; and as this was the most pregnant character of the section *Escharina*, here, also, we perceive the close proximity of that group, although yet the plain front side and the raised primary margins of the zoœcia mind us of the *Flustrine* nature.

Micropora coriacea [4]) (Pl. III, fig. 74).

This species, as it of late years by JOHNSTON, GRAY and BUSK [5]) is determined, without doubt in the European seas [6]) is identical with the Floridan one. POURTALES has takeñ it in very different depths, from 36 to 135 fathoms, growing on died shells, Nullipora and stones.

[1]) *Membranipora holostoma*, BUSK, *Crag. Polyz.*, p. 36, tab. III, fig. 11.

[2]) ibid., p. 35. tab. III, fig. 8.

[3]) *Brit. Mus. Cat.*, part I, *Rad.*, pages 115 and 147.

[4]) An *Escharina peruviana*, D'ORB., *Voy. d. l'Amer. mér.*, *Polyp.*, p. 16, tab. VII, fig. 9—12?

[5]) JOHNST. (*Flustra*) *Brit. Zooph.*, ed. 2, p. 348, tab. LVI, fig. 8.
GRAY (*Micropora*) *Brit. Mus. Cat.*, part I, *Rad.*, p. 115.
BUSK (*Membranipora*) *Brit. Mus. Cat.*, *Polyz.*, p. 57, tab. LXXIII, figs. 4, 5.
Obs. The *Flustra* (*Discopora*) *coriacea* of ESPER (*Pflanzenth.*, *Flustra*, tab. VII) seems better to agree with *Membranipora bifoveolata*, HELLER (*Bryoz. Adr. Meeres*, Verh. k. k. zool, bot. Ges. Wien 1867, pag. 95), if that form really should be distinct from *M. coriacea*.

[6]) *Lepralia complanata*, NORMAN, Ann. Mag. Nat. Hist., ser. 3, vol. XIII, pag. 84 (p. 4 sep.), tab. X, fig. 4.

The most of that colonies are less calcificated, than what seem the figures by BUSK to show; yet the tuberosities "on each side of the base of the mouth" are very apparent. Inside and behind each of these tuberosities, at least in the higher degrees of calcification, the wall of the front side presents that depression, very often like a hole, which would bring this species at the side of the last preceding, were it not for the totally different aperture of the zoœcion. The avicularia are developed at the distal end of the zoœcia, in the same manner and of the same rounded form as the oœcia, although usually very much smaller than these; their triangular, pointed mandible, when closed, is directed obliquely upwards-backwards. The oœcia, when young, are wholly smooth; in their full development, though I never saw them in any higher degree of calcification, they get a projection in their front, formed at the meeting-point of three radiating ridges.

As to the size of this species, in one colony I measured the length of the articulation of the operculum, in the semicircular aperture of a zoœcion, to about 0,12 mm.; in another colony that measure was about 0,14 mm.

In distinguishing the species, which I propose to be retained within the generical denomination *Cupularia*, though that in a sense modified after the Microporidan character of the zoœcia, we must take care of their very different appearances after age and conservation. The calcification goes on below the primary ectocyst; and, with this preserved, the zoœcia, therefore, have a very different appearance from the conditions, in which this ectocyst is lost.

Cupularia umbellata [1]) (Pl. III, figs. 75—80).

In its young and well-preserved condition (fig. 75), when covered by its yellow, granular primary ectocyst, it looks very like the *Cupularia vulnerata* [2]); but sometimes, when a little more thickly calcificated (fig. 77), it shows the row of greater pores, on the internal, secondary ectocyst, along the margin of the front side of the zoœcia, shining through the primary ectocyst, where the *Cup. vulnerata* has its lunate openings. Beside these pores, when treated with caustic kali, or, through other agent, deprived of its primary ectocyst, in the younger states, it presents the front side of the white-shining internal, secondary ectocyst finely perforated by small, round pores; but the raised margins of the zoœcia are finely granulated. When older or more highly calcificated, if deprived of its primary ectocyst, the front side of the zoœcia (fig. 79) more

[1]) *Lunulites umbellata,* DEFR., Dict. d. sc. nat., vol. 27, p. 361; BLAINV., ibid., Atlas, Zooph., tab. 47, fig. 1; D'ORB. (*Discoporella*) *Pal. Franc., Terr. Crét.,* vol. V, p. 473, tab. 717, figg. 1—5; MANZONI (*Cupularia*) *Bryoz. Plioc. Ital.,* Sitzb. d. k. Akad. d. Wiss. Wien, Bd. LIX, Abth. 1 (Jan. 1869), p. 10, tab. II, figg. 16, 16[1].

(?) *Discoporella Berardana,* D'ORB., *Pal. Franc.,* l. c., p. 474.

Cupularia Lowei, GRAY, BUSK, *Cat. Brit. Mus., Polyz.,* p. 99, tab. 116.

To these synonyms I should have laid even *Discoporella denticulata,* GABB et HORN (*Cupularia,* CONR.), if, by these authors, I had found any remark of the Microporidan form of the mouth.

[2]) *Membranipora vulnerata,* BUSK, Quart. Journ. Micr. Sc., vol. VIII, p. 124, Zooph., pl. XXV, fig. 3.

and more takes the appearance of *Discoporella denticulata*, GABB et HORN [1]). The smaller pores then disappear, or, instead of them, only a few greater ones are to be seen, irregularly distributed; and, on some zoœcia of the same colony, the whole calcification of the front side only appears as narrow ribs between the greater pores, connecting a central plate with the margins of the zoœcia. If that central plate be thrown away, the margins of the area appear dentated, through the rests of the named ribs. In that state we recognize the figures of *Cupularia denticulata* given by BUSK [2]).

Through the last remarks, we may easily understand the relation of this form to the *Cupularia doma* [3]) (Pl. III, figs. 81—84), which is much more highly calcificated, immediately from the beginning of the colonial growth, whereby this acquires its more conical form (figs. 83 and 84). At the same time, the zoœcia grow higher, in raising their sidewalls, whereby their secondary front-side appears to be more deeply immersed. The warts, also, on the back side of the colony, grow higher, sometimes giving this side that appearance of being aculeate, as remarked by D'ORBIGNY. Now, all these characteristics are more and more approximated by the variations of the preceding form; and I can-not but regard the *Cup. doma* as the most highly calcified variety of the *Cup. umbellata*.

POURTALES has taken two colonies of *Cup. doma* from the depth of 29 fathoms, at Florida. In the same cast he took three colonies of *Cup. umbellata*, what form he found, also, at the depth of 7 fathoms, off Cape Fear-River. Through the kindness of Mr. BUSK, I have been enabled to compare these with his *Cupularia Johnsoni*, which was taken, by the *Porcupine*-expedition, from a depth of 45 fathoms, off Algeria.

With a structure, which reminds us, through its most important characters, of the preceding genera, here I propose to be placed, provisionally, a new generic division, which I name *Steginoporella*, thus characterised:

Zoœcia flustrina, extus microporidacea, intus calcificatione secundaria constructionem *Steginoporarum* (D'ORB.) imitantur.

Steginoporella elegans [4]) (Pl. IV, figs. 96—101).

This species, in *Membraniporella* — growth as well as in *Siphonella* (fig. 101) — and in *Eschara* (fig. 100) — growth, was taken by POURTALES at the depths of 15—37 fathoms.

In its outer appearance (fig. 96), with the ectocyst preserved, it already is described and excellently figured by BUSK; but the inner structure of its zoœcia seems yet to be noticed only by M. EDWARDS, inasmuch as it is described by him in a worn condition.

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[1]) *Monogr. Sec. Tert. Foss. Polyz. N. Amer.*, Journ. Acad. Nat. Sc. Philad., N. Ser., vol. V, Art. III, p. 142, pl. 20, fig. 25.

[2]) *Crag Polyzoa*, p. 85, pl. XIII, fig. 1.

[3]) *Discoflustrella doma*, D'ORB., Pal. Franc., l. c., pag. 561.
Cupularia Johnsoni, BUSK, Quart. Journ. Micr. Sc., vol. VII, p. 67, Zooph. pl. XXIII, figs. 1—5.

[4]) *Eschara elegans*, M. EDW., Ann. d. Sc. nat., ser. 2, vol. VI, p. 337, tab. 12, fig. 13; D'ORB. (*Escharellina*) *Pal. Franc., Terr. Crèt.*, vol. V, p. 448.
Obs. Nomine generis *Escharellina* usus essem, si cum nomine *Escharinella* non tam facile confundi posset.
Membranipora magnilabris, BUSK, *Cat. Brit. Mus., Polyz.*, p. 62, tab. LXV, fig. 4.

The lateral walls of the zoœcia are highly raised, and the membrano-calcareous ectocyst, with the great operculum in the primary aperture, lies stretched, as in a frame, fixed at their margin. This ectocyst covers a room, whose floor is the correspondence to the *lamina*, we have seen on the preceding species, although it has a much more complicated extension and configuration; because, through this lamina, the whole zoœcion is divided into two chambers, the one above the other, of which the lower, particularly, is the dwelling-room of the bryozoan individuum and, through a modification of the distal part of the lamina, gets its own aperture. The proximal part of the lamina is a plain, horizontal plate, very prettily perforated by white-edged pores. As in the preceding species, at the articulation of the great operculum in the outer ectocyst, the lamina is raised to a broad, transverse denticle, sometimes, with its lateral corners, uniting with the margin of the zoœcion; but, from the base of this denticle, it slopes downwards, almost vertically, to the floor of the zoœcion, and the middle part of this sloping is opened to form a round mouth of the lower chamber, with raised border, which finally is prolonged, a little cylindrical [1]). Thus, at each side of this internal mouth, the distal part of the original zoœcion, also, is secluded from the lower chamber, but, at each side of the above-named, transverse denticle, it communicates with the upper chamber.

As to the purpose, pursued by this dividing of the original zoœcion, from dead and dried specimens, of course, we can not draw any sure conclusions. In my former papers [2]), I have supposed the upper chamber of the *Steginoporidan* zoœcia to be connected, in any mode, with the reproduction. Now, another circumstance, on the *Steg. elegans*, seems to bring that supposition nearer to the truth. This is the great variation of the size of the zoœcia and, particularly, of their distal part. Very near each other, opercula can be measured with their greatest breadth differing the one from the other in variations from 0,4 mm. to 0,86 mm., although they retain the same half-elliptical form. As the ordinary oœcia are wanting, they, very probably, seem to be replaced by that enlargement; although an examination of the living state is quite necessary for giving a true judgment. This is the more the case, as, without such an examination, we can scarcely decide, in what relation this form stands to the

Steginoporella Rozierii [3]) (Pl. IV, fig. 102).

At the first sight, this form is very easily distinguished from the preceding by its smaller size. The greatest breadth of the aperture of the zoœcia I have measured to about 0,2 mm.

The only little specimen I got for examination, is dead and dried, and the outer ectocyst is totally gone away; but otherwise, in the form of its zoœcia, with their raised granular margin, as well as in the conformation of the lower chamber, with its

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[1]) The drawer, for the sake of distinctness, has represented this cylindre much more prolonged and its margin more horizontal, than the reality.

[2]) *Krit. Fört.*, Öfvers. Vet. Akad. Förh., 1867, Bih., p. 48.

[3]) *Flustra Rozierii*, Aud., Sav., *Descr. de l'Egypte, Polyp.*, tab. 8, fig. 9; D'Orb. (*Reptescharellina*) *Pal. Franc. Terr. Crèt.*, vol. V, p. 453; Busk (*Membranipora*) *Cat. Brit. Mus.*, Polyz., p. 59, tab. LXV. fig. 6.

plain front-side prickled by pores. in almost all essential points it agrees with the preceding form. But, for its specifical distinctness, the distal part of its lower chamber is more contracted, and the aperture of the thus formed neck dilates at the sides, so as to meet again the lateral walls of the zoœcion. The broad denticle, at the articulation of the operculum, in the preceding species, does not seem here to be developed, at least in that degree. Thus the proximal margin of the outer aperture, finally, seems to have been supported by the concave margin of the inner aperture.

The oœcia, which, on this species, are very commonly developed, were already figured by SAVIGNY and are further described by BUSK.

Now, of the Microporidan series, the Floridan fauna has shown us not less than four different manners of growth, viz. the *Membraniporan-*, *Cupularian-*, *Hemescharan-* (*Siphonella)* and *Escharan*-growths. To these, in the systematical arrangement, without doubt, the *Vincularian* growth is to be laid. For, if we compare the *Vincularia neozelanica*, BUSK [1]) with the *Steginoporella elegans,* we will find them so closely agree with each other, that they scarcely can be separated in two different genera. As to the *Cellarian* growth, from the arctic fauna, we know [2]), the *Cellaria articulata* is to be placed in this family. Then, as it can not enter any of the above proposed genera, it must have its own generical name, for what purpose, I think, the otherwise superfluous *Glauconome* [3]) (MÜNSTER) will be the most fit one.

In the *Paléontologie Francaise* (l. c. p. 504) D'ORBIGNY at first, in his sections *A* and *B* of the *Cellulinés empatés*, distinguished the *escharine* and *flustrine* types. There (pag. 505) he also constituted a genus, *Biflustra*, which, afterwards, in the *Crag Polyzoa*, was accepted by BUSK, and now, through the excellent researches of that author, is rendered the best-known generical type in a natural series, which I propose to be regarded as a distinct family with the name of

BIFLUSTRIDÆ.

The most striking characteristic for this family, even in its lower forms, will be the relatively great size of the zoœcia [4]). For the higher degrees of development, as their characteristic, we can cite the following from BUSK [5]): The polyzoarium is composed of very regular quadrangular cells, with granular margins, and widely open in front.

Otherwise, in this as in all natural series, we may expect to find the different degrees of development different enough for making it difficult, if not impossible, to give a constant characteristic; but the quadrangular shape of the zoœcia, as well as their strong, usually high and hardly calcificated and granular margins, in most cases will make the Biflustridan type recognizable.

[1]) Quart. Journ. Micr. Sc., n. ser., vol. I, p. 155, *Zoophytol.*, tab. XXXIV, fig. 5, 5 *a*.
[2]) Cfr. *Krit. Fört.*, Öfvers. Vet. Akad. Förh., 1867, p. 451.
[3]) GOLDFUSS: *Petrefacta Germaniæ*, part I, p. 100.
[4]) *Krit. Fört.*, l. c., pag. 413.
[5]) *Crag Polyzoa*, pag. 71.

For the genus *Biflustra*, of course, the outer form of the colony must go out of the definition, thus embracing both the encrusting and raised forms, of the above-named zoœcial constitution.

Biflustra Lacroixii[1]) (Pl. IV, figs. 85—88).

This species, although with much hesitation, I place in the genus *Biflustra*, because, in its most advanced states of development, it seems more and more to approach to the following ones.

In what I consider to be its first, lowest state of development (fig. 88), it is a thin, glossy, yellow-white shining crust, with the limits between the zoœcia scarcely perceptible, with the elliptical areæ, distant from each-other, very well-marked through their thickened, granular border. In the zoœcia, covered by their thin, translucent ectocyst, within the areæ, the bundle of tentacles and the *musculi retractores operculi* clearly present themselves through their black colour.

This was the very uniform constitution of one little colony, growing on a *Steginoporella* at 35 fathoms. Another colony, of greater development (figs. 85 and 86), taken at 60 fathoms, showed the zoœcia with their areæ more densely approximated to each-other, varying from the elliptical (fig. 86) to the more and more regular, quadrangular shape (fig. 85). At the corners of the zoœcia sometimes a triangular (through its calcification a little raised) space is left, but never with that stout tubercle represented in the cited figure of SAVIGNY. The oœcia have the same $\frac{1}{2}$-spherical shape, represented by that author, except that, curiously, they seem, by his drawer, to have been placed preposterously.

The colour of this specimen has lost its clearness; yet, through the dusky grey ectocyst, the black tentacles and retractor-muscles of the operculum still are visible.

As to the size of this species, once I measured the breadth of one operculum to abouth 0,16 mm.; the breadth of another was about 0,18 mm.

Small and few as are these colonies, they do not give any idea of a higher differentiation; but the above-named changes of the zoœcial form seemingly point out the direction of the development, as going towards the typical constitution of a *Biflustra*.

Besides the above-named specimens, POURTALES has taken another colony, growing on the inside of a dead shell, at a depth of 13 fathoms.

Biflustra denticulata[2]) (Pl. IV, figs. 89—91).

The synonyms, cited below, will show that I leave the question yet undecided, as to the identity of this form with the old-known species, which is so commonly

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[1]) *Flustra Lacroixii*, AUD., SAV., *Descr. de l'Egypte*, Zool., Polypes, pl. 10, fig. 9; BUSK, p. p. (*Membranipora*) *Cat. Brit. Mus., Polyz.*, p. 60, pl. LXIX.
? *Flustra puelcha*, D'ORB., *Voy. d. l'Amér. mer., Polyp*, p. 18, pl. VIII, figs. 15, 16; ID. (*Biflustra*) *Pal. Franc., Terr. Crét.*, vol. V, p. 244; (*Reptoflustra*), l. c., p. 328.

[2]) ? *Flustra tuberculata*, BOSC, *Vers*, vol. III, p. 118; BUSK (*Membranipora*) Quart. Journ. Micr. Sc., vol. VI, p. 126, *Zooph.*, tab. XVIII, fig. 4; ID., *Crag Polyzoa*, p. 30, tab. II, fig. 1.

growing on the *Sargassum fluitans.* Yet the differences, for the most part, reduce themselves to the size of the zoœcia and to the different degrees of calcification.

The Floridan specimens, growing on dead shells and corals, in their younger zoœcia remind us of *Bifl. Lacroixii,* as they are covered by a transparent, glossy ectocyst and have their margins in the same manner granulated. But very soon the area is encroached, proximally and laterally, by that internal calcareous lamina of marine-bluish hue, prickled with white pores and irregularly prolonged, internally, into denticles (fig. 91), which have given this *Biflustra* its name. The secondary area, thus constituted, varies much in its shape, according to the development of the lamina and to the outer form of the zoœcion, which is depending on the more or less regular growth of the colony. Very commonly, at the one of the proximal corners, the area is more encroached upon than at the other; but more and more, in the older zoœcia, it approaches to the rounded rectangular form, occupying about half the length of the primary area, which form is to be considered as typical for the species. At the same time the calcification is going on: the pores in the named lamina are to be filled, and this becomes granular by warts, the dénticles on the margin of the secondary area for a good part dissappear, and, at the proximal corners of the zoœcia, the rounded tubercles are developed, just of that form described, in the *Crag Polyzoa,* by Busk. Yet, these tubercles in no wise are constant, as seen form the figures 89 and 90, which are taken from different parts of the same colony.

In comparing this form, then, with the true *Biflustra tuberculata,* we find all the same parts, in the same manner, but in different degrees, developed. For on the *B. tuberculata,* also, I have seen the above-named lamina, with its pores, though not so much developed, intruding on the proximal part of the primary area; and the denticles, also, are to be seen, but shorter and closer together. The tubercles, as already remarked by Busk, on the *B. tuberculata* are more developed, higher, very often crooked, and, in accordance with their greater size, proportionately to the breadth of the proximal end of the zoœcion, of course they must be more nearly approximated, especially at the doubling of the zoœcial rows. The walls of the zoœcia, also, on the *B. tuberculata,* proportionately to the size of the individuals, are higher, and, like the tubercles, they are white, instead of being greyish or, in the microscope, of a bluish hue. As to the respective size of the two forms, among all variations, for the following measures I have chosen two zoœcia, seemingly of the most common and regular shape:

	B. denticulata.	*B. tuberculata.*
Length of the zoœcion	0,58 mm.	0,44 mm.
Breadth » » » (in the middle)	0,28 »	0,26 »
» » » operculum	0,1 »	0,11 »

? *Flustra membranacea,* Esper, *Pflanzenth., Flustra,* tab. V (excl. descript.); Wood (*Membranipora*) Ann. Mag. Nat. Hist., vol. XIII, p. 20 (sec. Busk).

? *Flustra tehuelcha, Fl. inca, Fl. Isabelleana (?), Fl. peregrina,* D'Orb., *Voy. d. l'Amér. mér., Polyp.,* pp. 17 et 18, tab. VIII, figg. 10—24, tab. X, figg. 1—3; Id. (*Reptoflustra*) *Pal. Franc., Terr. Crét.,* vol. V, pp. 328 et 329.

? *Membranipora telacea,* Busk, *Cat. Brit. Mus., Polyz.,* tab. LVIII. fig. 6.

Membranipora denticulata, Busk, Quart. Journ. Micr. Sc., vol. IV, p. 176; *Zooph.,* tab. VII, figg. 1 et 2

These measurements, of course, only can have a relative value, but, commonly, as they show, the zoœcia of *B. tuberculata*, are smaller and, relatively, broader.

In their outer appearance, the two forms very easily can be distinguished, but regard being had to the developmental changes, the question yet stands open, if not the above-named differences will be accounted for by the different localities and manners of growing.

The specimens taken by POURTALES were brought up from 10 fathoms.

Biflustra Savartii[1]) (Pl. IV, figs. 92—95).

The inconstancy of the tubercles of the preceding species may justify the determination of this species, at first given by BUSK. Our Floridan form, no doubt, is identical with the *Membranipora Savartii* from the Crag Formation, described by that anthor, and, like this, it entirely wants the tubercles, which are shown in the SAVIGNY'an figure cited below.

The very uniform granulation on the front side (the above-named *lamina*), which slopes down, from the margins, inwards to the secondary area, commonly arranges itself in transverse rows, though not very regular, and here and there in the elliptical, secondary area, it projects into denticles, very like those of *Bifl. tuberculata,* although they never seem to be so closely set together.

That great "serrate denticle within the lower margin" on *Bifl. delicatula,* described by BUSK, I never saw on *Bifl. Savartii,* except that a few times, in that place, a broad projection was to be seen, which I hold to be the oœcion of the nearest older zoœcion in the same row, placed in the same manner as, for instance, on *Flustra truncata*, where the oœcia, totally immersed, intrude into the proximal end of the nearest younger zoœcion.

Another difference from the *Bifl. delicatula* would be the appearance of the back side of the colony; for there, on the *B. Savartii,* we see the zoœcia (fig. 94) almost quite plain, forming very regular rectangles, instead of sharp ridges, as figured by BUSK. But this difference, perhaps, will be accounted for, in connexion with a higher calcification, by the more or less intimate connexion of the two opposite layers of the colony.

As to their size, the zoœcia vary as much as in the preceding species; among the variations I measured one zoœcion, which seemed to be of the most common and regular shape, 0,4 mm. in length, 0,3 mm. in its greatest breadth.

The specimens, which were sent me for examination, all dead, were taken by POURTALES at a depth of 29 fathoms. They are all raised in that form, which, by

[1]) ? *Flustra Savartii,* AUD., SAV., *Descript. de l'Egypte, Polyp.*, tab. X, fig. 10; D'ORB. (*Membranipora*) Pal. Franc., Terr. Crét., vol. V, p. 542. (*Membranipora corrugata,* BLNVLLE, Dict. Sc. Nat., vol. LX, p. 412)
? *Flustrellaria tubulosa,* D'ORB., *Pal. Franc.,* l. c. p. 532, tab. 727, figg. 9, 10.
? *Membranipora Ligeriensis,* D'ORB., l. c., p. 550, tab. 607, figg. 5, 6.
Membranipora Lacroixii, BUSK, *Cat. Brit. Mus., Polyz.,* tab. 104, fig. 1.
Membranipora Savartii, BUSK, *Crag Polyzoa,* p. 31, tab. II, fig. 6.
? *Biflustra delicatula,* BUSK, ibid., p. 72, tab. I, figg. 1. 2, 4; tab. II, fig. 7.

Hagenow (*Bryoz. Maastr. Kreideb.*, pag. 83), was named *Siphonella.* Their colour is white, but, very prettily, the raised margins of the zoœcia are bright yellowish-green, probably a rest of the primary ectocyst.

To the Biflustridan family the most typical species of the old genus *Vincularia* are to be brought. I need only to refer to a comparison between *Biflustra denticulata* and *Vincularia ornata,* Busk [1]). Once, perhaps, they will turn out to be the same species; or, at least, they hold the same near relation to each other, as that above remarked about *Steginoporella elegans* and *Vincularia neozelanica.*

In the above described *Membraniporella Agassizii,* we have seen one of the most evident connecting links between the Flustrine and Escharine types. Now, through the development of various species, in the beginning of their colonies, the last named type has shown its starting-point to be the same as that of the preceding type, viz. the zoœcial form [2]) at first, under the name of *Tata,* described by Van Beneden. And, in its own typical constitution, after full development, the escharine zoœcion will be to reduce to the same component parts, as what we have seen in the preceding. Then, if we compare the form, which I have described [3]) as *Escharipora nitido-punctata,* with the *Membraniporella nitida,* in the same time calling to mind the internal calcification of the *Microporidæ,* the front side of the first named species will correspond with an internal calcification in a zoœcion of the same type as the latter [4]). Thereby one will understand, also, the constitution of the *Steginoporidæ,* as described by D'Orbigny [5]). Then, the species of that family must be conjoined with the

ESCHARIPORIDÆ.

From this family, once, in trying to follow D'Orbigny, I had separated the *Porinidæ,* characterized by their lunate or circular median pore, as well as by their semicircular aperture, which latter character, however, they had in common with the *Eschariporidæ.* Afterwards, in seeing species, which, for other reasons, would not be separated from the *Escharipore,* though they were provided with that characteristical pore, I rejoined these families. Now, the Floridan collection contains some forms, which make that distinction yet more unteanable.

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[1]) *Brit. Mus. Cat., Polyz.,* p. 96, tab. LXV, fig. 2; Quart. Journ. Micr. Sc., n. ser., vol. I, p. 155, *Zoophytol.,* tab. XXXIV, fig. 4.

[2]) Cfr. Busk, Quart. Journ. Micr. Sc., vol. VIII, *Zoophyt.,* tab. XXIV, fig. 1 (*Porina Malusii*); Smitt, Pl. VI, fig. 126 (see below; *Porina ciliata*); *Krit. Fört.,* Öfvers. Vet. Akad. Förh., 1867, Bih., pl. XXVI, fig. 98 (*Lepralia spathulifera*), figg. 109—111 (*Porella lævis*); pl. XXVII, fig. 167 (*Discopora ventricosa*); Öfvers. 1871, pl. XXI, fig. 27 (*Discopora emucronata*), fig. 29 (*Disc. stenostoma*), fig. 31 (*Disc. ventricosa*).

[3]) Öfvers. Vet. Akad. Förh., 1867, Bih., p. 49.

[4]) Formerly I compared that front side, directly, with the spines of the *Membraniporæ,* what now, I think, must be corrected.

[5]) *Pal. Franc., Terr. Crét.,* vol. V, p. 497.

Cribrilina radiata [1]) (Pl. V, figs. 107, 108).

In addition to the excellent description, given by Moll, I will only point to the pair of movable bristles (fig. 107), placed proximally at the side of the aperture. Their nearest correspondence, I think, we find, on *Membraniporella sceletos* [2]), in that "ascending spine at each lower angle of the aperture", as described by Busk. As to their use, they seem to represent sensorial vibracula. Very often they are laid down along the side of the zoœcion [3]). In the harder calcifications (fig. 108) they are wanting. The latter state, also, shows an other aberrance, when the triangular or semicircular space of the front side, just proximally of the aperture, raises itself into a blunt denticle (mucro). Similar denticles are raising themselves on various points of the front side of the zoœcion, as thicknesses of the wall, especially in the mesial line and on the ribs, in their end, at the margin of the front side. The rib on the oœcion, also, in the harder calcification raises itself in the same manner, just above the middle of the aperture. As to their size, the zoœcia vary very much. In the same colony I have measured the striated and prickled front-side (the primary area) of two zoœcia, from its proximal end to the proximal margin of the aperture, differing in length from 0,19 mm. to 0,38 mm. The breadth of the aperture of the more out-grown zoœcia varies from 0,07 mm. to 0,08 mm.

Pourtales has taken two specimens of this species, the one from 176 fathoms, in a slight degree of calcification, growing on a dead Terebratula, the other, of a harder calcification, growing on a piece of Oculina from 60 fathoms.

Cribrilina innominata [4]) (Pl. V, figs. 109, 110).

The only difference from the preceding form, which may be used as a specifical character, is the presence, on *Cribrilina innominata,* of a lunate pore in the triangular or semicircular space, proximally of the zoœcial aperture. This is the reason, why I do not identify this form with the *Eschara radiata* of Moll, notwithstanding the weighty authority of Busk on the other side, because that pore, probably, would not have escaped the observation of Moll. Otherwise, in their whole structure as well as in their changes with the degree of calcification, these two *Cribrilinæ* are totally agreeing.

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[1]) *Eschara radiata,* Moll, *Esch.,* p. 63, tab. IV, fig. 17.

As to the generic name *Cribrilina,* I find it necessary to restitute this name, created by Gray, 13 years before the *Escharipora* was proposed by D'Orbigny. In the following we will see, that the last name, also, is to be used in this family.

[2]) *Lepralia sceletos,* Busk, Quart. Journ. Micr. Sc., vol. VI, p. 262, *Zooph.,* tab. XX, fig. 3.

[3]) These bristles seem to declare that *pore special,* as described by D'Orbigny, in the following species, which are to be placed very near to the present species and its congeners:

Semiescharipora fragilis, Pal. Franc., Terr. Crèt., vol. V, p. 480, pl. 717, figs. 8—11;
» *brevis,* » » » » » » p. 485, pl. 718, figs. 21—24;
» *ovalis,* » » » » » » p. 488, pl. 719, figs. 13—16.

[4]) *Lepralia innominata,* Couch, *Corn. Fn.,* part. III, p. 114, tab. XXII, fig. 4; Johnst., *Brit. Zooph,,* ed. 2, p. 319, tab. LV, fig. 12; Gray, *Cat. Brit. Mus.,* part. I, Rad., p. 121; Busk, *Cat. Brit. Mus., Polyz.,* p. 79, tab. LXXXVI, figg. 2, 3; Id., *Crag Polyzoa,* p. 40, tab IV, fig. 2.

? *Reptescharella pygmea,* D'Orb., Pal. Franc. Terr. Crét., vol. V, p. 468, tab. 716, figg. 7, 8.

Lepralia radiata, Busk, Quart. Journ. Micr. Sc., vol. VI, pp, 128 et 263, *Zoophytol.,* tab. XX, figg. 4 et 5

Nevertheless, the Floridan specimens of *Cribrilina innominata*, brought up by POURTALES, have all their zoœcia of a smaller size. — I have measured the breadth of the aperture to about 0,06 mm. —; but this difference, when we have seen all the variations, in this respect, of the preceding form, here can be of no specifical value. Yet, as long as we do not know the true physiological significance of the named pore, leaving it for further inquiry, we can make no better than to retain it as a character for systematical distinction.

POURTALES has taken the *Cribrilina innominata*, growing on Nulliporæ and on a piece of a dead shell, in various depths from 29 to 60 fathoms.

Cribrilina figularis [1]) (Pl. V, figs. 111, 112).

In the preceding species, when we have seen such differences as that between figs. 109 and 110, taken from different parts of the same colony, we may well be prepared to find the *Cribrilina figularis* varying in the same degree. POURTALES brought up two colonies of this species, the one (fig. 111) growing on a piece of shell, at 29 fathoms, the other (fig. 112) on a piece of coral, at 42 fathoms. In the first, the species has its typical appearance, as described by JOHNSTON and BUSK, except that the mouth of its zoœcia is provided with a pair of marginal spines, which, sometimes, are bifurcate. Now, the presence or absence of marginal spines at the aperture scarcely can make any specifical difference, because it is a developmental law for the Escharines, particularly of this group [2]), in their higher development to lose them. But, with our present knowledge, as they seem to be constant in the Floridan form, in connexion with the greater pores and more marked ribs of the zoœcia, they will be accounted for enough, by giving this form a separate name, *Cribrilina floridana*, as a local variety. Unfortunately, on this colony no oœcia are developed, and then we are unable to say, if the mouth of the so-called fertile zoœcia, also, is provided with marginal spines [3]). As to the size of the zoœcia, I have measured the breadth of the mouth to about 0,15 mm., which seemed to be the most common size.

The other colony, taken by POURTALES, is more highly calcified, whereby the pores are rendered smaller and the ribs, proportionately, more leveled. Thus, this colony is more advanced towards the appearance of *Cribrilina annulata*. That same we have seen to be the case with the two preceding species (figs. 108 and 110). In considering the systematical significance of the interesting variety of *Cribrilina punctata* from Gibraltar [4]), BUSK, also, regarded this as the most perfect state of that species.

[1]) *Lepralia figularis*, JOHNST., *Brit. Zooph.*, ed. 2, p. 314, tab. LVI, fig 2; GRAY, *Cat. Brit. Mus.*, part. I, Rad., p. 119; BUSK, *Cat. Brit. Mus., Polyz.*, p. 80, tab. LXXIII, figg. 1—3; SMITT, (*Escharipora*) *Krit. Fört. Skand. Hafsbryoz.*, Öfvers. Vet. Akad. Förh. 1867, Bih., p. 4.

[2]) *Krit. Fört.*, Öfvers. Vet. Akad. Förh., 1867, Bih., pgs. 52 and 54.

[3]) As to the form of the oœcia, which, in this group, seem to be very useful for the specifical distinction, the figures given by BUSK, seem to indicate a very low degree of calcification, because on a specimen in the British Museum I have seen the oœcia of this species to be almost of the same form as those of *Cribrilina punctata* figured by BUSK, in his *Crag Polyzoa* (Pl. 14, fig. 1), except that they were more rounded and showed a rib, also, from the mucro, descending proximally to the middle of the apertural margin.

[4]) *Lepralia punctata*, Quart. Journ. Micr. Sc., vol. IV, p. 310, *Zoophytol.*, Pl. XI, figs. 4, 5.

In the northern seas, we know a state of the true *Cribrilina annulata* [1]), in which it very nearly agrees with the constitution of the *Cribrilina punctata.* Thus, all these species, in their developmental and calcificational changes, follow the same way, from a more flustrine (with more plain frontside and greater pores of the zoœcia) to their most typical escharine state (with more convex frontside and smaller pores of this side), and very often they will be confounded with each other. So far as they yet are known, with their nearest allies, they will thus be arranged:

1. Oœcia imperforata:
   A: Avicularia, ubi adsunt, inter zoœcia disperguntur; Vibrissæ (vibracularia?), ubi adsunt [2]), ad marginem aperturæ, lateri zoœciorum affixæ sunt:
      α: Porus medianus deest:
         Cribrilina radiata,
      β: Area pone aperturam zoœcii poro mediano lunato perforatur:
         Cribrilina innominata.
   B: Avicularia, ubi adsunt, ad marginem aperturæ posita lateri zoœciorum affixa sunt:
      a: Avicularia, ubi adsunt, apice proximaliter vergunt:
         α: Porus medianus deest; margo proximalis aperturæ zoœcii primarius horizontalis manet:
            αα: Margo aperturæ zoœcii setosa:
               Cribrilina floridana,
            ββ: Margo aperturæ zoœcii setis caret:
               Cribrilina figularis.
         β: Porus medianus aliquando adest; margo proximalis aperturæ zoœcii in mucronis formam porrigitur:
            Cribrilina nitido-punctata.
      b: Avicularia, ubi adsunt, apice distaliter vergunt:
         Cribrilina punctata.
2. Oœcia poris perforata:
   α: Zoœcia inarmata:
      Cribrilina annulata,
   β: Zoœcia aviculariis munita:
      Cribrilina puncturata.

Escharipora (?) mucronata n. sp. (Pl. V, figs. 113—115).

Char.: Zoœcia ovalia, ad margines cancellata, aperturam semiellipticam vel longiorem, postremo quadrangularem præbent, angulis rotundatis; frontem mediam præbent poris vulgo tribus reniformibus, in annulum positis, interne denticulatis perforatam, mucrone ad aperturam erecto præditam. Avicularia

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[1]) Öfvers. Vet. Akad. Förh., 1867, Bih., p. 54, pl. XXIV, fig. 10.

[2]) When these bristles can be demonstrated always to be missing in the European forms, then the Floridan varieties will take their own names.

elongata, apice distaliter versa, inter zoœcia disponuntur, oœcia, quæ granulis rugosa sunt, apice proximaliter versa coronant vel etiam inter hæc eandem directionem servant. Latitudo aperturæ zoœcii circ. 0,17 mm.

Hab.: Fragmentum coloniæ, Hemescharæ modo nascentis, cepit POURTALES in prof. 36 org.

In placing, provisionally, this species in the Eschariporidan family, we must confess it to be done against our own views on this point, because, as I ever have insisted upon, in arranging the Escharine group into its separate families, the form of the mouth will be the most important character and, in dubious cases, as to the affinity, will be the surest guide. Now, in this respect, the present species, without doubt, comes nearest to the true *Escharæ,* or their nearest allies, the *Discoporæ,* as defined in my former papers.

But as it wants the median avicularium, which, in the first-named family, is so commonly developed, as well as the internal denticle of the mouth, which, in the same manner, is a common appearance in the *Discoporæ,* with our present knowledge, its best systematical place, at least provisionally, will be in the beginning of the escharine series, until we, possibly, will be enabled to show, that the Eschariporidan constitution of the front side of the zoœcia is a prototypical state, also, for the other Escharine families.

The form of the ovate zoœcia, in their young state only, in the margin of the colony, will be well appreciated. Their plainly convex, rugose front-side in the middle is perforated by three, sometimes two or four, lunate pores, arranged concentrically. Their horizontal, horseshoe-shaped mouth has the proximal margin straight or a little concave. At the middle of this margin, between the mouth and the above-named pores, the front side, usually, develops a blunt eminence (*mucro*). The elongated, raised avicularia are developed in the furrows between the zoœcia, taking their place usually in a line with the above-named eminence, with their tip directed towards the perifery of the colony or obliquely outwards from the zoœcial row. The half-spherical oœcia have their wall rugose, in the same manner as the zoœcia. When the oœcia are developed, the avicularia in their direction turn round.

As the calcification goes on, at first it fills up the furrows between the zoœcia, marking their limits through irregular rows of secondary pores. At last, the whole front side of the zoœcia is covered by this layer, with the exception of a great hole in their middle, into which the above-named lunate pores open themselves, now, usually, of a more irregular form. Of this species POURTALES took a little fragment of an irregular *Hemeschara*-growth, W. off Tortugas.

As further examples of that group, which, I think, most properly will be named *Escharipora,* I may cite the *Eschara lichenoides* [1]) and *Eschara distoma* [2]), described by BUSK. Very near to the first-named species is to be placed the

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[1]) *Cat. Brit. Mus., Polyz.,* p. 90, pl. CVI, figs. 1—3.
This species, as already remarked by KIRCHENPAUER (*Mus. Godeffroy,* Cat. IV, pag. XXVIII) has nothing to do with the *Esch. lichenoides,* as described by MILNE-EDWARDS.

[2]) *Lepralia distoma,* Quart. Journ. Micr. Sc., vol. VI, p. 127, *Zooph.,* tab. XVIII, fig. 1; *Eschara distoma,* ibid., vol. VII, p. 66, *Zooph.,* tab. XXII, figg. 10—12.

Escharipora stellata, n. sp. (Pl. VI, figs. 130—133),

Char.: Zoœcia ovalia, planata, frontem calcificatione reticulatam, poris stellatis pertusam præbent; aperturam primariam præbent semicircularem, secundariam vero elevatam, transverse oblongam. Avicularia acuta, longirostria, vulgo tria, aperturam zoœcii muniunt, quorum duo, intus vergentia, ad angulos illius aperturæ proximales posita sunt, tertium vero avicularium, quod interdum deest, proximaliter versum, ad medium marginem distalem aperturæ in apice zoœcii locum tenet.

Hab.: Hanc speciem POURTALES cepit sat frequentem, Sertularias, Coralia, testas obducentem e prof. 42— 183 org.

In its young state, and particularly in the less deep regions of the sea, where it seems usually not to be so much calcified as in the deep-water, almost the whole front side of the zoœcia is perforated by round, stellate pores, between which the wall, in its advancing calcification, raises itself in a reticulated manner, whereby the pores appear deeply immersed. The calcification, in going forth, raises the apertures of the zoœcia, giving them a narrower, transversely oblong shape, instead of their primarily semicircular form, with a breadth of about 0,1 mm. At the same time, it raises the tip of the avicularia, which all converge towards the zoœcial aperture. In the harder calcification, and, as usual, in the deep-water, the stellate pores are fewer, confined to the median part of the front side of the zoœcia, and, consequently, the ridges between them are broader. At last, the pores lose their stellate appearance, and the summit of the ridges then becomes slightly furrowed; these furrows, in their connection, giving a new reticulation to the surface of the zoœcia. On the examined specimens, I never saw any oœcion, were it not the more or less developed tumidness, distally of the zoœcial aperture, where the third avicularium, as usual, is placed.

This species seems to be one of the more common ones among the Floridan bryozoa. POURTALES has taken it from six different localities, at a depth varying from 42 to 183 fathoms.

Porellina ciliata [1]) (Pl. VI, figs. 126—129).

Of this species POURTALES has taken some very well developed colonies living at various depths of from 7 to 60 fathoms, encrusting shells, corals etc.

In its ordinary appearance, it perfectly agrees with the European and Arctic form, and, particularly, through she shape of the zoœcial aperture, with the Mediterranean variety [2]). The greatest breadth of that aperture here I have measured to about 0,11 mm.

One of the colonies (fig. 126) shows the manner of development from the flustrine type, the first (central) zoœcion retaining the *Tata*-form with the primary area of

[1]) *Syn.* vide *Porina ciliata, Krit. Fört.*, Öfvers. Vet. Akad. Förh., 1867. Bih., p. 6.
Adde *Reptoporellina subvulgaris*, D'ORB., *Pal. Franc., Terr. Crét.*, vol. V, p. 477.

[2]) *Krit. Fört.*, l. c., p. 62.

that type and with the marginal spines in the number of 11, uniformly distributed on the whole margin.

At the development of the oœcia, particularly in the higher degrees of calcification, once[1]) I have shown, how the margin of the oœcial aperture, in growing forth over the front side of the zoœcion, covers the zoœcial aperture as well as a semicircular space, proximally of this, enclosing the lunate median pore. Now, on the Floridan specimens we find that same process going on still further, in producing (fig. 129) a transverse bridge over the thus formed secondary aperture. In the southern Atlantic, at the Falkland-Islands, the *Porellina diademata* (*Flustra diademata*, Lmrx., in Quoy, Gaim., *Voy. de l'Uranie, Zool.*, p. 609, pl. 89, figs. 3—6 = *Lepralia personata*, Busk, *Cat. Brit. Mus. Polyz.*, p. 74, pl. 90, figs. 2—4) represents another variety in the manner of developing this secondary aperture.

As to the generic name *Porellina*, it has been necessary to replace that name instead of *Porina*, as I formerly used it, for that group of this family, which retains the median pore in its lunate form, because the most typical species of *Porina*, by D'Orbigny, have this pore rounded, as we will find to be the case more constantly in the following species.

As one example of a raised stem of the genus *Porellina* I may cite the *Porellina* (*Eschara*) *flabellaris*, (Busk)[2]).

Porina serrulata, n. sp. (Pl. V, figs. 116—125).

Char.: Zoœcia ovalia, elongata, frontem primariam præbent sparse porosam, aperturam primariam semiellipticam (cujus latit. = 0,09—0,1 mm. circ.); porum medianum pone aperturam præbent rotundum; avicularia minima in media longitudine præbent lateralia, transverse posita, mandibulo rotundato clausa. Oœcia rotunda, postremo calcificatione coloniæ obducta, frontem præbent aperte rimatam, rima costis transversis, in linea media connatis, clausa. Avicularia majora spathulata inter zoœcia disponuntur (præsertim in margine bryozoarii erecti, ramosi, ramis planatis) magnitudinem fere zoœciorum tenent.

Hab.: Pourtales hanc speciem Sertulariæ affixam e prof. 35—42 orgyarum ad Floridam cepit.

It is one of the most interesting *Porinæ*, because, in the front side of its oœcia (fig. 122), it most strikingly remembers us of the construction of the front side of the zoœcia of the *Membraniporellæ*. This, also, when the oœcia are developed, will be its best recollecting character, but otherwise, in wanting the oœcia, the great, spathulate avicularia, in connexion with the Porinidan structure of the zoœcia, will suffice for recognizing it. Of the named avicularia, those who are placed in the margin of the stem (fig. 123) often increase to a size almost equalling that of the zoœcia. Then, with their spathulate area, as they are placed upwards, a little obliquely outwards, in

[1]) *Krit. Fört.*, l. c., p. 60, Anm., pl. XXIV, figs. 13 and 14.
[2]) *Cat. Brit. Mus., Polyz.*, p. 91, pl. CVII, figs. 7—10.

a row, the one above the other, they give the margin of the branches that serrulate appearance, whence I have taken the specifical name of this species.

In the construction of the zoœcia, as they appear when young (figs. 116 and 121), all the Porinidan characters are plainly expressed. With the exception of the characteristical median pore, all the primary pores of the ectocyst soon are closed, the calcification, in going forth, thus giving the zoœcial wall a reticulated appearance which again is rendered porous by the thickening of the walls of the meshes [1]). Then the furrows between the zoœcia are filled up, and, at the same time, the calcification gives a very different, usually transversely-ovate, secondary form (fig. 124, *c—e*) to the primarily semielliptical aperture of the zoœcia, until these, also, at last are closed. The median pore in the same manner is vanishing, but the small, lateral avicularia, like the greater, spathulate ones, are uplifted by the layer of calcification, and, though they change their place and direction, they, usually, will be observed even on the lower parts of the stem, where the other colonial organs are overgrown. This calcification does not always produce any uniform layer, but particularly round the aperture of the zoœcia and below the avicularia it grows thicker, and the eminences thus formed, in running irregularly together, at last, on the lower parts of the stem, produces the appearance, as shown by the fig. 118.

Porina subsulcata n. sp.? (Pl. VI, figs. 136—140).

Char.: Porina erecta, ramosa, ramis planatis (latit. = 1,5 mm. circ.) structuram individuorum præbet *Porinæ (Escharæ) sulcatæ* (M. Edw.).

Descr.: Zoœcia primaria elongata, ovato-cylindrica, frontem præbent convexam, aperturam semiellipticam (lat. = 0,09 mm. circ.), porum medianum rotundum, margines præbent poris perforatos. Supra frontem primariam linea calcificationis elevatur granulosa, in parte zoœcii proximali simplex, mediana, in media fronte bifurcata latus utrumque aperturæ petit, quomodo area pone aperturam formatur triangularis, quæ porum medianum et avicularium acutum ad marginem proximalem aperturæ positum, distaliter versum, amplectitur. Implentur deinde, calcificatione progrediente, spatia interlinearia supra limites zoœciorum, poris marginalibus evanescentibus, relicto solum sulco limitari. Depressa tunc area zoœcii secundaria aperturam præbet profunde positam, reniformem, pro aviculario supra illam projecto. Calcificatione jam longius progressa formantur avicularia nova, structuram anteriorum æmulantia, proximaliter versa, supra partem proximalem zoœciorum. Obducuntur deinde areæ zoœciorum, evanescunt avicularia ad aperturam, clauduntur aperturæ porique mediani.

Ad margines ramorum coloniæ avicularia formantur majora, acuta, quæ mandibulo triangulari clauduntur.

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[1]) In the living state, these pores are closed by a shining membrane, and then, when dried, the stem has a glossy surface; in the dead state, when dried, the pores are open, and the surface of the stem is more dully white.

Hab.: POURTALES hanc speciem sat frequentem cepit in prof. 10—48 orgyarum viventem. Mortuam e prof. 471 org. eam sustulit.

In constituting this a new species, I have made it almost only because of the colonial form, and, consequently, I regard it rather a local variety; but in the Floridan sea, where it seems to be very common, at least in the numerous specimens I got for examination, it never presents that broad, foliaceous growth of *Porina (?) sulcata*, as described by MILNE—EDWARDS [1]) nor that of *Porina (?) decussata*, as described by BUSK [2]). But in comparing it with these descriptions of the Australian species, in the structure of the individuals, it is very easy to see, how nearly it agrees with them. The gravest objection against its specifical unity with this form would be the circumstance, that neither MILNE—EDWARDS nor BUSK has remarked anything of the median pore; but, as the value of that character, by those authors, was not so fully appreciated, as it is now, we are, perhaps, allowed to suppose, that it has been overlooked by them; and, in the older zoœcia, the named pore very often is evanishing. Now, it is necessary very carefully here to distinguish the different forms, because, in the neighbourhood of this species, we have to place the interesting *Adeonæ* and, then, to decide, from what simpler form that curious growth is nearest to be derived.

The great changes of the zoœcia, produced by their calcification, make it very difficult, in broken or worn fragments, to recognize this species. The most common appearance is that of the rhomboidal zoœcia, limited by a marginal furrow, with a depressed, ovate area on their front side, which encloses the apparently reniform aperture, that is encroached upon, proximally, by the raised tip of the median avicularium. The Porinidan character of such a constitution, particularly as the median pore often is missing, only will be understood in comparing it with the youngest zoœcia in more complete colonies. There, the elongated, almost cylindrical zoœcia present their primary aperture of a semicircular shape, placed in a level with the plainly convex front-side, which is perforated by the rounded median pore. The marginal furrows are soon filled up by a calcification reticulated by pores. The distal part, with the mouth of the zoœcia, then, is raised, at the same time as the median avicularium is developed between the mouth and the median pore. Now the front side, in its further calcification, has produced one granulated ridge, running around the mouth, embracing the median pore and avicularium, from both sides converging to the middle of the front, whence it runs straight to the proximal end of the zoœcion. In its thickening, then, this ridge becomes the rounded wall around the above-named depressed area. Proximally of this area, a new avicularium is developed, with its tip pointing downwards the stem (proximally) but otherwise retaining the same shape as the above-named one. Then, in the overgrown and worn condition, particularly in the lower parts of the stem, the species gets a totally different and very perplexing appearance, as if it were composed of pyriform or, sometimes, rectangular zoœcia, limited by a furrow, with an ovate aperture (the rest of the area) and, below this, a rounded hole, which

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[1]) *Eschara sulcata*, Ann. d. Sc. nat., ser. 2, vol. VI, p. 47, tab. V, fig. 2.

[2]) *Eschara decussata*, *Cat. Brit. Mus.*, *Polyz.*, p. 91, tab. CVII, figs. 4—6.
Of course that species is different from *Esch. decussata*, M. EDW.

is the rest of the proximal avicularium. Usually between these, then, a transverse furrow is to be seen over the middle of those zoœcia.

As in the preceding species, avicularia of a greater size but of the typical form here, also, sometimes are developed in the margin of the branches. In the Australian form they seem to correspond with those figured by MILNE—EDWARDS [1]), as placed between the zoœcia.

In this species, already, we see the Porinidan type, in its zoœcial conformation, very much approaching that type, which, after D'ORBIGNY, I have proposed to be named *Escharella*. I need only to refer to a comparison between this and the zoœcial conformation of the *Escharella palmata*. The same likeness with the *Escharellæ*, in their hardest calcification, we find in the

Porina violacea [2])

of what species POURTALES sent me one fragment of a colony, growing on a Nullipora, taken from the depth of 35 fathoms, W. off Tortugas.

Its colour is that peculiar black purplish-blue tint, which is so well known from European specimens. The zoœcia, in their hard calcification, are very much thickened, warty on their glossy surface. From the deeply immersed median pore in the middle of the front-side, the avicularium, with its pointed tip, points directly distally up towards the middle of the proximal margin of the zoœcial aperture, whose breadth I have measured to about $0{,}09$ mm.

With reference to the fine distinction, at first pointed out by BUSK, between the *Porina violacea* and the

Porina plagiopora [3]) (Pl. VI, figs. 134 and 135),

which both forms lived together in the Crag-period, we have here to register the last-named form, also, among the living *Porinæ*, in very well developed colonies, encrusting shells and Nulliporæ, taken by POURTALES at a depth of 60 fathoms, West off Tortugas.

Its colour is almost the same as that of the preceding form, but a little lighter, purplish-blue.

Besides the oblique direction of the avicularium and its greater size, already pointed out by BUSK, it differs from the *P. violacea*, particularly, through the size, also of the zoœcial aperture, whose breadth I, here, have measured to about $0{,}14$ mm.

Otherwise, these two *Porinæ* so closely agree with each other, that I think we have reason to regard the *P. plagiopora* as a variety of greater development of the same specifical type as the *P. violacea*. For, with a greater development of the avicularium (what very often is to be observed within the limits of the bryozoan species) this probably, for finding place enough, would turn itself obliquely.

[1]) l. c., pl. V, fig. 2 at *d*.
[2]) *Lepralia violacea*, JOHNST., *Brit. Zooph.*, ed. 2, p. 325, tab. LVII, fig. 9; GRAY (*Escharella*) *Brit. Mus. Cat.*, part. I (Rad.), p. 125; BUSK (*Lepralia*) *Cat. Brit. Mus., Polyz.*, p. 69, tab. LXXXVII, figg. 1 et 2; ID., *Crag Polyzoa*, p. 43. tab. IV, fig. 3.
[3]) *Lepralia plagiopora*, BUSK, *Crag Polyzoa*, p. 44, tab. IV, fig. 5.

In the neighbourhood of the *P. violacea*, also, is to be placed the true *Porina lichenoides* [1]), that once I saw in the Paris-museum, in the Jardin des Plantes, although it was in an all too bad condition for making out, with certainty, its specifical distinction, in relation to its nearest allies. Yet, its most important character seems to be the more lateral position of the avicularium.

In comparing the structure of the preceding *Porinæ* with the *Anarthropora monodon,* besides the more cylindrical raising of the aperture, quoted as the distinctive character of the genus *Anarthropora,* one will find the chief difference to be the relation between the median pore and avicularium. For, in the *Anarthropora monodon,* the avicularium, in its development, covers that pore. The distal avicularium, developed in that species, evidently corresponds to the similarly placed organ in the *Escharipora stellata.* Thus, the *Anarthroporidan* structure very naturally is connected with the other *Eschariporidan* types, and, indeed, it is a matter of opinion, how long we ought to go, in our generical dismembering of a natural family. Formerly, as the family then was known, I thought it very natural to distinguish the tubular raising of the zoœcial aperture as the character of a separate genus to be placed at the side of the articulated *Onchopora,* for, by them, to remember, in this family, of the common tendency of development of the escharines towards the celleporine construction. But the name of *Anarthropora,* as I expressively remarked, was created only for replacing that of *Quadricellaria,* constituted by Sars, but, before him, used by D'Orbigny for the name of another bryozoan genus. Now Mr. Norman [2]) has made another use of *Anarthropora;* and, as I hope soon to receive that "entire rearrangement of the Membraniporidæ" [3]), which he has promised shortly to carry out, it will be the most prudent in the mean time to follow his opinion.

Anarthropora minuscula [4]) (Pl. VI, fig. 141).

In the arctic sea at first I distinguished this form as an unarmed variety of *Anarthropora monodon.* From that form, however, it differed, as I then remarked, by its smaller size, its constantly lower degree of calcification and its more uniformly cylindrical secondary raising of the aperture. All these differences very plausibly seemed to be deduced from a supposed lower degree of development; and, for the sake of the intermediate forms, I could not give any other constant characteristic than the presence or absence of the avicularium. Now, this characteristic, also, loses its value, because on *Myriozoum,* from a depth of 42 fathoms, W. off Tortugas, Pourtales has taken one little colony of *Anarthropora minuscula* provided with avicularium of the typical form and position. Yet, the specimen is all too little for deciding, if, in its further development, it should have assumed the typical appearance of the true *Anarthropora monodon.* The whole colony, just in the beginning of its growth, contains only five zoœcia.

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[1]) *Eschara lichenoides,* Lam, *Anim. s. Vert.,* vol. II, ed. 1, p. 176; ed. 2, p. 268.
[2]) Brit. Assoc., 1868, Rep., p. 309.
[3]) To that family, *Anarthropora,* after Norman, should be referred.
[4]) *Krit. Fört.,* Öfvers. Vet. Akad. Förh., 1867, Bih., pp. 7 et 65, tab. XXIV, figg. 20—22.
Lepralia tubulosa (?) Norm., Brit. Assoc. 1868, Rep., p. 308.

The primary aperture of the one I measured to be of about 0,09 mm. in the breadth, what is only two thirds of the usual size in the northern specimens of *Anarthropora minuscula*. For its further investigation it may retain its separate name.

Tessaradoma boreale[1]) (Pl. VI, figs. 143—145).

If we accept the NORMANNIAN genus *Anarthropora* for expressing the celleporine tendency of the Porinidan type, such as this is represented by *Porina violacea*, we must, of consequence, do the same with his genus *Tessaradoma*, which is nothing else than the same change of the named type, such as we have seen it in the *Porina serrulata*. Still, as these two *Porinæ* scarcely will be separated in different genera — for, in consequence of such an opinion, we should soon, I fear, have as many genera, as we have species — then, the systematical value of *Tessaradoma*, as well as of *Anarthropora*, is very problematical. Furthermore, with our present knowledge of the bryozoa, for the definition of that genus, it will scarcely suffice to cite the characteristic, given by SARS and translated in English by ALDER.

The *Tessaradoma boreale*, after POURTALES' collections, seems to be one of the most common Floridan Bryozoa. At twenty different localities, in well developed colonies, he has taken it living at the depths of from 82 to 450 fathoms. In the same manner it is not uncommon in the deep-water on the European side of the Atlantic, from Spitzbergen to the West off Portugal and at the Azores[2]).

With the richness of the specimens it has been possible to follow its development from the creeping state, which, without doubt, would have been referred, by the authors, to a different family. The one of these colonies (fig. 143), then, would have been a *Lepralia;* the other (fig. 144), in its beginning, should have been named *Alysidota,* but it grows into the constitution of a *Lepralia,* and thence it raises itself to the wellknown *Tessaradoma boreale.* May this be a new warning against the constitution of families and genera only after the form of the colonial growth!

At the side of the *Porinæ* I have placed the

MYRIOZOIDÆ[3]),

which, in their most typical constitution of the zoœcia, in a very pregnant manner remind us of the *Porinæ*, as the median pore of these is represented, in the *Myriozoids*, by the median sinus of the proximal margin of the aperture. But all the variations, as well as the developmental changes of the typical *Myriozoidæ*, have caused us to conjoin very different forms into the limits of this family. For the more complete discussion of these relations I must refer the reader to my papers on the scandinavian

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[1]) *Synon.* vide *Krit. Fört.*, Öfvers. Vet. Akad. Förh., 1867, Bih., p. 8.
Adde: *Tessaradoma gracile*, NORM., Brit. Assoc. 1868, Rep., p. 309.

[2]) Attending to this great geographical distribution, it would be of interest to compare it with the Cretacean fossil, *Porina filiformis*, D'ORB. (Pal. Franc., Terr. Crét., vol. V, pag. 438, pl. 714, figs. 11—13), because, with the exception of the compressed form of the branches of that species, we can scarcely see, with certainty, any specifical distinction, as the small avicularia very easily can have escaped the observation.

[3]) Öfversigt Vet. Akad. Förh. 1867, Bih., p. 8.

bryozoa. In accordance with the systematical results there obtained, as based upon the developmental changes of the form of the aperture of the zoœcia, here at first I will account for a very interesting species, which scarcely is to be brought, with certainty, under any formerly constituted genus. I will name it

Mamillopora.

Char. gen.: Zoœcia escharina formam flustrinam eo imitantur, quod magnam aperturam, totam fere frontem occupantem, retinent; coloniam *Cupulariæ* formæ exstruunt. Apertura zoœciorum formam præbet ellipticam, parte proximali a lateribus constrictam, margine proximali sinuatam.

Species, quam solam novimus, nominetur

Mamillopora cupula (Pl. VII, figs. 146 and 147, *a—c*).

Char. spec.: Apertura zoœciorum (cujus longitudo vulgo circiter = 0,18 mm.) margine incrassato circumvallatur, tuberculis rotundatis setarum loco irregulari ordine distributis interdum munito. Vibracularia (?), quæ formam zoœciorum fere imitantur, irregulari ordine inter zoœcia supra frontem coloniæ distribuuntur et supra dorsum (latus inferius) coloniæ sparguntur. Oœcia tumida poris dense perforantur, frontem sæpissime præbent linea longitudinali impressam.

Hab.: Hanc speciem sat frequentem cepit POURTALES ad Floridam e prof. 30—68 orgyarum.

As we do not know more than a single species, it is very difficult to define the limits of the genus, which, perhaps, will show many more modifications. In the generical character, however, I have quoted the form also of the colonial growth, because, with the almost flustrine form of the zoœcial aperture, what seems me very probable at least, may be connected also the Cupularian growth, which more commonly is to be found within the Flustrine series. And, in truth, I regard the *Mamillopora* as one of the most flustrine states of the Myriozoidan family. With a more typically escharine development of this family, I scarcely wait to find it in such an almost flustrine colonial form. That the *Mamillopora* is to be placed here, I think, is proved by the evidently sinuated proximal margin of the zoœcial aperture, which character, however, in the worn or overgrown specimens, very easily is evanished; and the great aperture I do not name *area*, what denomination we used for the flustrine forms, because, notwithstanding its great size, for the most part, in the manner of the Escharines, it is occupied by the operculum.

Among the formerly constituted genera, the *Conescharellina*, by D'ORBIGNY [1]), perhaps would receive the above described species; but his description as well as the figures of the zoœcial form make it all too doubtful for here, with any certainty, to adopt that genus. With more surety our Floridan species seems to be allied to the

[1]) *Pal. Franc.*, l. c., p. 446, tab. 714, figg. 14—16.

species of *Lunulites*, described by Busk [1]), from the Philippine Islands, at least to the *Lunulites cancellata;* bus as he has had only worn specimens, it is impossible to say anything of their true apertural form. The other species of *Lunulites*, cited by him, belong to the Flustrine group.

The *Mamillopora cupula* is taken by Pourtales at seven different localities in the Floridan sea, in very good and complete specimens, varying, as to the shape of the colony, in accordance with our figures 147, *a—c*. Yet all the vibracularia (?) want their operculum (vibraculum), so that it is impossible to say, whether they are, in reality, vibracularia or avicularia. In some of the specimens, they hold a tolerably regular position in linear rows between the zoœcial rows, just as remarked by Busk (l. c.) in the character of *Lunulites;* but in other colonies they are very irregular in their development. Their aperture is elliptical, with the same constriction at the articulation of the vibraculum (?), as that in the aperture of the zoœcia at the articulation of the operculum. At the back side of the colony they are still more irregularly spread but hold the same size and form. The cancellation at this side of the colony, where it is developed, lies only as a thin layer of bladders (abortive vibracularia?) on the back of the zoœcia.

As to the form of the zoœcia, they agree pretty well with the description of *Lunulites cancellata* given by Busk, which description seems to have been founded on highly calcified, dead and worn, young specimens; but for the circular apertures, together with the greater development of the cancellation on the back side of the colony, on the Philippine form, I dare not to conjoin these two forms into one species. In the *Mamillopora cupula*, the elliptical zoœcial apertures [2]) are constricted at the articulation of the operculum, whereby, as the proximal margin is broadly sinuated, a rounded sinus is formed, also, on each side, between the named constriction and sinuation. Thus, the apertures have a very characteristical shape; but it is not easy to discern, because, when the operculum and the covering corneous membrane of the proximal part of the aperture are retained, these make its margin obscure, and in the worn specimens the named character, also, very easily is evanished. As the apertures occupy nearly whole the front of the zoœcia, with their incrassated margin they are placed very near each other in the radiating rows. In the margin, sometimes I have seen rounded holes, looking as they were marks after decayed spines; but more usually the incrassation of the margin goes on irregularly, in forming rounded tubercles, without any marks of true spines.

The oœcia are more or less swollen. When found on the margin of the colony, they are almost spherical. Their front side is densely prickled by pores and usually, by a longitudinal impression, divided into two tumidnesses. It is very common to find them attached to zoœcia with a greater aperture than the ordinary ones [3]).

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[1]) *Cat. Polyz. Brit. Mus.*, p. 101.

[2]) I have measured the length of the aperture of the ordinary zoœcia (without oœcia) varying between 0,16 and 0,19 mm.

[3]) Whether these oœcia, as to their physiological function, are to distinguish from those, which are attached to zoœcia of ordinary construction, in died and dried specimens, of course, it is impossible to decide

The form of the zoœcial aperture, as I often have demonstrated, in most cases will be our surest guide in searching for the natural affinities of the Escharines. Thus, provisionally, for arranging together the nearest allied species, by marking out, systematically, the most pregnant differences, although, as in the following will be seen, no true generical divisions, in the ordinary sense, here will be accepted, at the side of the preceding genus I place another one, which, in the same manner, seems to be new. It may be named

Gemellipora.

Char. gen.: Apertura zoœciorum vestigii pedis equini formam refert, ad angulos proximales pro articulatione operculi constringitur, marginem proximalem sinuatum præbet.

The name of the genus is chosen in reference to the colonial form of one of the Floridan species, which may be named

Gemellipora eburnea (Pl. VII, figs. 152—156; Pl. IX, figs. 177, *a* and 178).

Char. spec.: Zoœcia eburnea, clavata, rare porosa, aperturam (cujus latitudo in parte coloniæ serpente circiter = 0,05 mm.) fere rotundam, margine proximali latissime sinuatam præbent, coloniam primo serpentem (Hippothoiformem, auctt.) deinde erectam (Gemellariiformem, ramis tamen monostichis in rectam lineam divergentibus) articulatam exstruunt.

Hab.: POURTALES hujus speciei exempla haud rara e prof. 120—170 orgyarum sustulit.

This species, in its erected state (fig. 153), through its ivory colour and delicate stem, for the naked eye very much resembles the *Crisiæ.* But a more close examination will show the zoœcia arranged more like the *Gemellariæ,* two and two, back to the back, in two rows a little spirally contorted around the imaginary axis of the stem and branches. This contortion, however, here is connected with an alternately opposite direction of the zoœcia of the same row, and the front of all the zoœcia is turned either to the right or to the left side of the stem, from the plane of the ramification. Further, the stem and the branches of *Gemellipora eburnea* are articulated, the latter at least at their base, which constantly is attached to the first (oldest) pair of the zoœcia in the internodes of the stem. The creeping part of the colony (fig. 152), from which this stem is raised, has the appearance of a dwarfish *Hippothoa divaricata;* but the specifical form of the zoœcial aperture easily will distinguish it therefrom. In the harder degrees of calcification, and when more outgrown, this creeping state acquires a totally other aspect, by prolonging the proximal part of its zoœcia into a narrow, tubiform pedicle (Pl. IX, figs. 177, *a* and 178). This form I met with on a stone from 120 fathoms, and at first, as the most of the zoœcia, in connexion with the harder calcification, had got the margin of their aperture secondarily raised, and, worn as they were, presented it irregularly sinuated in its proximal end, I thought it to be of another genus, until at last the one of the zoœcia showed the primary aperture unaltered and of the justly typical form of this species. This aperture, in the *Gemellipora eburnea,* is truly escharine; otherwise it has its corresponding parts in the above described *Mamillopora cupula,* what will best be understood, if we imagine the proximal part of that aperture to be reduced almost to the extent of the sinus of the proximal margin, whereby the lateral sinuses are to be less marked between this and the constriction for the articulation of the operculum. Thus, the aperture of *Gemellipora* (fig. 156), through that reduction of the proximal part, will assume a more circular shape. The pores in the wall of the zoœcia are very scarce; otherwise they resemble the same punctuation in the *Crisiæ.*

As to the elongated form of the creeping state, it is worthy of notice, how it shows the greatest similarity to the cretacean *Hippothoa elegans,* as described by D'Orbigny [1]), which, moreover, in the colonial form reproduces the erected state of *Gemellipora eburnea,* if this be thought to be reduced into a uniserial constitution. But for the identification of the species, the cretacean fossil, I think, must be examined again.

Gemellipora eburnea seems to be a deep-sea form. Pourtales has taken it from the depths of 120—170 fathoms, growing on *Cellepora margaritacea,* on pieces of dead shells and on stones.

With almost the same form of the zoœcial aperture, this species, among the Floridan Bryozoa, has its nearest relation to the

Gemellipora lata (Pl. VII, fig. 157),

what species also seems me to be new for the science.

Char. spec.: Zoœcia lata, frontem præbent modice ventricosam, poris sat magnis pertusam, aperturam (cujus latit. circ. = 0,13 mm.) rotundate quadrangularem, margine proximali latissime sinuatam, margine laterali aliquantulum incrassato circum-scriptam, aream triangularem, depressam, lateribus aliquanto incrassatis limitatam, proximaliter pone aperturam positam præbent. Avicularia rotunda, verrucarum forma, quorum apertura rotunda latitudinem fere 0,1 mm. præbet, inordinatius supra confinia zoœciorum distributa sunt.

Hab.: Pourtales hanc speciem, una cum *Vincularia abyssicola* et forma serpente speciei sequentis, *Nulliporam* obducentem e prof. 68 orgyarum sustulit.

Of this species, I have only seen one small colony, growing on a *Nullipora,* that was brought up by Pourtales from a depth of 68 fathoms. It has a yellowish colour, with the zoœcial apertures, through their covering membrane and operculum, of a darker greenish-yellow tint. As to their size, the zoœcia are rather of the greater ones of the more regular Escharines; the breadth of their apertures, at their middle, I have measured to be about 0,13 mm. A comparison between the figures 157 and 152 which are delineated at the same enlargement, will show the difference, in this respect, from the preceding species.

The form of the zoœcial apertures I have named circularly quadrangular, because the constriction at the articulation of their operculum is less marked, so that their

[1]) *Pal. Franc., Terr. Crét.,* vol. V, p. 384, pl. 711, figs. 1—4

sides are a little more parallel; otherwise, the typical form evidently is the same as that of the apertures of the preceding species. Still, their margin here is a little more, though feebly, raised into a free rim, which is continued, from the two proximal corners of the apertures, in two proximally converging lists, thus limiting a triangular depression, which calcifies more lately than the other part of the front side of the zoœcia. The pores on this front side are, relatively, very obvious, even at a low degree of enlargement. In the usual manner, they are arranged quincuncially, though this order, with any irregularity in the growth of the zoœcia, very easily will be dissolved.

Irregularly distributed over the limitary furrows between the zoœcia, some rounded, wart-like avicularia are to be seen, whose plain tip is occupied by the round aperture, with a semicircular mandible (operculum), whose breadth is about 0,09 mm.

As we know the relation between the creeping and the erected states of the Bryozoa, especially that of the *Tessaradoma boreale,* there can be no doubt, I think, of these two species of *Gemellipora* belonging to one and the same genus. Still, this, in the following, will be shown so nearly to approach to some species of the genus *Escharella,* that it is only for the convenience of holding together the nearest allied species and for pointing out the different stages of the serial development of the escharine type, that we here have established a new genus. A little more difficult it seems to be to decide, whether to that same genus will be referred the species, also, that I name .

Gemellipora glabra (Pl. XI, figs. 207—210) [1].

Char. spec.: Apertura zoœciorum partem distalem, quœ operculo clauditur, fere rotundam (margine tres saltem partes periphericas circuli occupante), partem vero proximalem trilobam præbet, quia sinus proximalis medianus, speciebus præcedentibus comparatus, valde angustus videtur et sinus laterales latitudine fere æquat vel illis parum major est.

1. Forma *striatula:*

Char.: Colonia crustacea zoœciis elongate rhomboidalibus, modice ventricosis vel fronte fere planis, poris punctatis, transverse rugosis, longitudinaliter delicatissime undulato-striatis exstruitur. Ad partem distalem zoœciorum vel oœcia depressa, rotunda, poris calcificationis punctata, poro speciali (apertura elliptica avicularii proximaliter vergente) ad apicem perforata exsistunt, vel alia organa coloniæ secundi ordinis (avicularia) minoris magnitudinis, ambitus rectangularis, quæ eodem modo poris calcificationis poroque speciali (apertura) perforantur, hunc locum tenent.

2. Forma *glabra* (typica):

Char.: Colonia in stirpis teretis, contiguæ formam erecta, e qua rami multifarie sparsi in rectam lineam divergunt, zoœciis primo porosis, vivis membrana calcarea nitida obductis, calcificatione valida tectis exstruitur. Pars distalis præsertim juniorum zoœcio-

[1]) (?) *Flustra Gayi*, Aud., Savigny, *Descr. de l'Egypte*, Polypes, pl. X, fig. 2.

rum libera erigitur, quare horum apertura supra frontem stirpis elevata margine libero, setis sæpissime quinque munito circumscribitur. Avicularia sat magna, ad medium frontem zoœciorum posita, irregulari ordine distributa, rostro supra frontem stirpis eriguntur, quare aperturam ellipticam oblique ad planum frontis illius positam præbent. Oœcia rotunda calcificatione e lateribus surgente obducuntur.

Hab.: Formæ *striatulæ* coloniam, Nulliporam incrustantem, e prof. 68 orgyarum, formam *glabram* e prof. 36—42 org. haud raram cepit POURTALES.

As to the form of the zoœcial apertures, here we, evidently, find the same generic character as in the two preceding species; but the constriction at the articulation of the operculum is considerably greater, whereby the distal (opercular) part of the aperture becomes more alike to a section of a circle than to that of an ellipse, and the proximal part, especially the median sinus, grows narrower. This alteration of the type, however, in connexion with the inarticulated stem, in the erected state, would induce us to make it a new genus, if we knew any more species, which were to be placed in a closer relation to the *G. glabra;* but now, with the perplexing richness of genera, proposed for the Bryozoa, it seems to be more convenient to conjoin it with its nearest known allies, although the horseshoe-shaped form of the zoœcial aperture, through the narrowness of the proximal part, by a good deal is gone away.

Under the same specifical name I have conjoined two evidently distinct forms. This is not the first time, and the real meaning, I hope, easily will be understood. When some forms, either trough their developmental changes or through the union in them of the most characteristic features, are connected with each other in the same manner, as, in other species, we find the different parts of the same colony to be, then I give a binomial name to that group of forms, because, besides the intimate relation, it is a matter of convenience to use a collective name, as in many instances it will be difficult, perhaps impossible, to decide, to what form any worn or incomplete colony will be referred. This, however, with our present knowledge, is not the case with the two *Gemelliporæ* in question: through the above given characteristics they are very easy to distinguish; but the form of the zoœcial apertures, as far as I can see, is totally the same, and then, as we have seen in many instances among the Chilostomata to be the case, with a greater richness of specimens, we are forced to wait for a crowding of changes, which will trouble the characteristics.

Of the typical form, POURTALES, West off Tortugas, has taken some well developed stems, though broken from their origin. They are all of a very uniform thickness and yellowish hue; the stem and branches are about one millimeter thick. The branches turn in all directions, but are all more or less vertical against the stem. In the tip of the branches, the young growing zoœcia for the greatest part of their length are free, utricular. Their wall is perforated by rather large pores. By the proceeding calcification, the pores are closed, and the zoœcia are covered by a continuous layer, obliterating their limits, and in which at last their apertures are pierced in the common plane of the surface of the stem. For a good time, however, the distal part of the zoœcion with its aperture is raised above this level. The margin of the zoœcial aperture, in its distal half, usually bears five spines (*setæ*). The greatest breadth of the aperture, on these stems, I have measured to be about 0,09 mm. Whith the development of the oœcion, we do not find the apertural spines, and the oœcion, from its circumference, is covered by a layer of calcification, leaving a rounded space of its front more uncovered. The rounded avicularia, directed downwards, hold their place in the middle of the front of the zoœcia, but, irregular as is their development, very often they are missing. From the surface of the stem they are raised with that point looking downwards (proximally), which, in the acute avicularia, answers to the tip of the rostrum. Thus, their aperture, in its oblique position against the surface of the stem, looks upwards a little. As to the size of this aperture, in its varieties, very often, in its breadth, it nearly approaches that of the zoœcial apertures.

Very unlike this, the *Gemellipora striatula* is going on in its calcification of the wall of the colonial organs. This form, in the single colony I have had for examination, remains very thin and rather closely perforated by its quicuncial primary pores. The interstices between these pores, in an undulating manner, almost as we see it on the *Horneræ* [1]), are very delicately striated. The zoœcia, furthermore, are a little more coarsely marked by transverse furrows, and on the front of the oœcia, from each side of the aperture, usually we find a longitudinal depression. All the colonial organs are depressed, very little convex on their front side. The aperture of the zoœcia differs from that of the preceding form, essentially, in its size: its breadth I have measured to be about 0,06 mm. At the distal end of the oœcia, an avicularium is developed, with an elliptical aperture, the rounded mandible closing its proximal part. In want of the oœcia, at the distal end of the zoœcia we find an avicularium with a similar aperture.

In reference to the relations, which we know to exist between other bryozoa, more nearly related to each other, if we try to inquire into the manner, in which the last two *Gemelliporæ* are connected, in accordance with the laws, that are followed, generally, in their increase, by the Chilostomata, the form of the colony as well as the size and flatness of the colonial organs and their less degree of calcification show the *Gemellipora striatula* to be of a lower stage of cheilostomatous development than the *G. glabra*. This again, through the form of its zoœcia, especially that of the younger, utricular, ones, clearly shows the tendency of the Myriozoidan type, also, towards the Celleporine configuration as the general end-point for the Escharine development. But in the same time, these zoœcia retain their apertural spines, which, generally, with a higher degree of chilostomatous development, for a more or less part, are cast away. Thus, in this respect, the *Gemellipora glabra* stands nearer the flustrine origin of the escharine development. For a more accurate determination of their true relation to each other, a complete series of developmental changes of *G. glabra*, from the first zoœcia at the origin of its colonies, as well as a greater richness of specimens of the *G. striatula* will be needed. With our present knowledge, the last-named form, most probably, seems to be a degenerated variety of the same type as the *G. glabra*.

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[1]) Öfvers. Vet. Akad. Förh., 1866, Tafl. VII, fig. 13.

As I can find no better place for it, with the genus *Gemellipora* I conjoin a species, whose outer appearance most strikingly reminds of the creeping state of *Gemellipora eburnea.*

Gemellipora limbata (Pl. XI, figs. 212—214).

Char.: Zoœcia repentia ovalia proximaliter in tubum producuntur, aperturam rotundam (cujus diam. = 0,09 mm.) secundarie in tubæ formam erigunt. Oœcia sphærica, libera, crista transversa media, horizontali ornantur, lateri distali tubæ secundariæ zoœcii apponuntur.

Hab.: Coloniam hujus speciei, per Celleporam serpentem, e prof. 471 orgyarum sustulit POURTALES.

The trumpet-shaped raising of the rounded secondary aperture and the narrow, elongated, tubiform proximal part of the zoœcia, when unworn, ovate for the rest, very easily distinguish this species; but as the only specimen I have seen is dead, without presenting any sign of the true primary aperture, it is hardly possible to say anything about its true affinities.

The following genus, nearest in accordance with D'ORBIGNY, I formerly characterized and named *Mollia* [1]); but for the reasons given above, that name will be used, more conveniently, for another group of a totally different constitution. Here, then, we must seek for its substitution by another name, and, indeed, an old one, *Hippothoa* [2]), seems very well to be used in this sense. At its first constitution, by LAMOUROUX, it included only one species, *Hippothoa divaricata*, which I have shown [3]) to be a variety of the same type as *Hippothoa* (formerly *Mollia*) *hyalina.*

In its generic character, of course, we must cast away the form of the colonial growth, founding it upon the form of the zoœcial aperture. From this genus, in my former papers, I have separated, as a distinct genus, what I then named *Myriozoum*, founded, essentially, upon a modification of the form of the median sinus; but now, as in the southern species I find this characteristic more nearly combined with the typical form of the Hippothoan aperture, it seems to be the best to restore the name of *Myriozoum* only to those species, which, in the form of the zoœcial aperture, agree with the southern, oldknown *Myriozoum truncatum*, using the name of *Leieschara* for those species, which in the shape of the zoœcial aperture agree with the *Hippothoa*, while the great development of their cancellation places them in the nearest relation to the *Myriozoum*. The genus *Hippothoa*, then, will be characterised:

Zoœcia incancellata aperturam semiellipticam vel semicircularem margine proximali recto medio sinuatam præbent. Avicularia mediana desunt [4]).

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[1]) Öfvers. Vet. Akad. Förh., 1867, Bih., pag. 14.
[2]) LMRX. 1821, *Expos. Méth.*, pag. 82.
[3]) Öfvers. Vet. Akad. Förh., 1867, Bih., pag. 112.
[4]) This is almost the same character as that for my subdivision marked *C* among the *Myriozoidæ* (l. c. p. 14).

But in all our classifications of a truly natural group, where the different species will be arranged into more or less complete series, we must be prepared for seeing the limits between the divisions fading away, especially, when the developmental changes are known. Thus, the

Hippothoa Hyndmanni [1])

with almost the same right would be placed in the preceding genus, what will be evident, in considering the Floridan variety, in wellgrown specimens, taken by POURTALES, west off Tortugas, growing on a dead shell and on a *Nullipora*, from the depths of 42 and 68 fathoms. On account of some differences from the British form, with the following characterisation, I give it a new name,

Hippothoa porosa (Pl. VII, fig. 158).

Char.: Apertura zoœciorum, margine secundario elevato circumvallata, marginem proximalem primarium primo concavum, quamvis e sinu mediano ad sinum utrumque lateralem convexe arcuatur, postremo rectum præbet. Zoœcia plana poris dense positis perforantur, vibraculario magno laterali muniuntur, cujus apertura ad partem distalem zoœcii locum tenet.

Hab.: E profundo 40—70 orgyarum colonias quasdam hujus formæ Nulliporam et testam mortuam insidentes ad Floridam cepit POURTALES.

As the most important differences, for its distinction from the true *Hippothoa Hyndmanni,* as far as I know that form, the flatter shape of the zoœcia as well as their punctation, all over their front, by pores, and the more distal place of the vibracular opening are to be regarded, although even these differences are very common as variations for the species of the Myriozoidan as well as of the Eschariporidan series [2]). The figures by JOHNSTON and BUSK, furthermore, mark the pores along the margins of the zoœcia much greater, than what we see on the Floridan form, but even there, in the younger zoœcia, these great pores are to be observed, although, usually, at last they seem to be closed by the proceeding calcification. Very often I have found one of these pores for a longer time remaining open, closed only by a membranous covering.

The margin of the vibracular aperture, on its outer side, is raised in its middle, almost alike what we have seen on the *Cupulariæ*, whereby the vibraculum, which, when entire, has the length of 3 or 4 zoœcia, in its bend over the zoœcium, is moved more obliquely over this.

A very interesting observation on the developmental changes of the zoœcial aperture here may be made. At first, the proximal part of that aperture has the same constriction at the articulation of the operculum, as in the preceding genus, a correspon-

[1]) *Lepralia Hyndmanni*, JOHNST., *Brit. Zooph.*, ed. 2, p. 306, tab. LIV fig. 6; GRAY (*Herentia*) *List Brit. Anim.*, part. 1, *Rad.*, p. 122; BUSK (*Lepralia*) *Cat. Polyz. Brit. Mus.*, part. 2, p. 74, tab. LXXXVII, figg. 5—8; NORMAN, Brit. Assoc. 1868, Rep., p. 307.

[2]) Cfr. Öfvers. Vet. Akad. Förh., 1867, Bih., pag. 102 etc., on *Hippothoa vulgaris*.

ding concavity of the proximal margin and the same three sinuses. These then are of almost the same size, but by little and little, as the concavity of the proximal margin, by the proceeding calcification, is filled up, the median sinus grows deeper, until the Hippothoan form of the aperture is finished, although the lateral sinuses, reminding of the Gemelliporidan state, never seem to be obliterated.

The greatest breadth of the zoœcial aperture I have measured to be about 0,14 mm.

For the most typical Hippothoan form of the zoœcial aperture, we may cite the

Hippothoa spongites [1]) (Pl. VIII, figs. 161—163).

This, as an American species, in all probability, was already known by PALLAS, although that author, even as the most of the ancient writers on this subject, in determining it after the form of the colonial growth seems to have conjoined it with the other escharines, which grow in the more or less complicated Hemescharan (auctt.) manner. The only one, before BUSK, who evidently gives the true character, is MOLL. At the side of the typical form, a great group of varieties is to be placed, which very easily may be defined as distinct species, in the same manner as one might do it with the varieties of *Porellina ciliata.* Such a variety, characterized by the transformation of the avicularia into vibracularia, under the name of *Eschara vulgaris, var. α,* was already described by MOLL, and, in a harder degree of calcification, closing the primary pores in the front of the zoœcia, under the name of *Lepralia vulgaris,* from Madeiran specimens it was described by BUSK (Quart. Journ. Micr. Sc., vol. VI, p. 127, *Zooph.,* tab. XVIII, fig. 3) and, from Adriatic specimens, under the name of *Lepralia Stossici,* it seems also to have been described by HELLER (l. c.). In my papers on the Scandinavian and Arctic Bryozoa, proceeding from that form as the starting-point for the comparison, under the collective name of *Mollia vulgaris,* I have discussed the relations existing between the variations of this type, as occurring in the northern seas.

In the southern regions, the Hemescharan growth, which was thought to be the medicinal *Adarce* of the ancients, seems to attain its greatest development and to be the most usual colonial form of the *Hippothoa spongites.* Such it was taken by POURTALES, in fragments of a contorted, tubular construction, from the depth of 35 fathoms. Together with these, as well as higher up in the sea, from the depth of 13 fathoms, he took also its Lepralian (auctt.) growth.

The rectangular zoœcia, with their almost plain front-side pierced by pores and limited by a raised ridge, the semicircular zoœcial aperture, with a breadth of about 0,1 mm. and with its median sinus proximally a little dilated, the acute, lateral avicularia, with a breadth at the articulation of the mandible of about half the breadth of

[1]) *Eschara spongites,* PALL., *El. Zooph.,* p. 45; ESPER *(Cellepora) Pflanzenth.,* vol. 1, p. 242, Tab. Cellep. III; MOLL *(Eschara) Esch.* p. 34, tab. 1, figg. 3, A et 3, B; — (de veteribus synonymis, quoad certa esse possunt, vide hos scriptores!) —; LMRX. p. p. *(Cellepora) Expos. Méth.,* p. 2, tab. 41, fig. 3; LAMK. p. p., *Anim. s. Vert.,* ed. 1, vol. 2, p. 176; ed. 2, vol. 2, p. 258; BLNVLLE, p. p. *(Eschara) Actinol.,* p. 429 (Dict., tomi LX p. 394).
Lepralia spinifera, p. p. BUSK, *Cat. Polyz. Brit. Mus.,* tab. XCI, figg. 1 et 2.
Lepralia serialis, HELLER, Verh. k. k. zool. bot. Gesellsch., Wien 1867, Bd. XVII, p. 104.
Lepralia spongites, HELLER, ibid.

the zoœcial aperture and commonly placed one at each side of this, obliquely directed distally and outwards: these are the characters, which distinguish the most typical state of *Hippothoa spongites* from the other forms of this group. But from this state, even in the POURTALES-collections, it shows the usual variations of almost all its characters. The more outgrown colonies, and, particularly, the new layers of zoœcia, which are growing over the older ones, get their front side more convex. The harder calcifications may get the pores in this front side closed, what variation will occur in the same colony with the open pores. Proximally of the aperture, the zoœcia, in the middle of their front side, very often get a raised, more or less acute tubercle (mucro). By the thickening of the front wall, the aperture, secondarily may be sunken in a circular depression. The size of the zoœcial aperture varies to 0,11 or 0,12 mm. Still more the avicularia may vary both to their place, number and size. It is not uncommon to find a single avicularium on the zoœcia, of a varying size, at the one side of the aperture, but more usual, especially in the feebler calcifications, retaining their most typical size, they may occur as many as four on the front side, proximally of the aperture, of each zoœcion. Occasionally, in the harder calcifications, we find great, spathulate avicularia, sometimes bent in a crescentic manner, irregularly dispersed over the colony.

The rounded, swollen oœcia, in the same manner, are placed free and irregularly distributed over the zoœcia. They lack the pores in the wall; very often they are crowded by avicularia of a varying number and size. As to their own varying size, their breadth very commonly equals that of two zoœcial rows.

Through the above-named variations of the constitution of the front wall of the zoœcia, the *Hippothoa spongites* very nearly approaches the *Hippothoa ansata* (= Hipp. alba [Hincks] [1]), and, through the secondary sinking of the aperture of the zoœcia, it shows its near relationship to the *Hippothoa Woodiana* [2]). This last peculiarity, in connexion with the not uncommon variation of the length of the zoœcial aperture, places at its side, also, one Floridan form, which scarcely, specifically, will be distinguished from the *Hippothoa Dutertrei* [3]); but, as it presents one peculiarity in the form of the vibraculum, it may well have its own name,

Hippothoa pes anseris (Pl. VII, figs. 159 and 160).

Char.: Zoœcia rhombico-ovalia frontem imperforatam, convexam, aperturam (cujus latitudo = 0,08 mm.) semielliptieam vel potius elongato-semicircularem, margine incrassato setis septem munito circumvallatam, margine proximali sinuato delicatissime dentatam præbent. Vibracularium ad latus utrumque aperturæ zoœcii vibraculum præbet fissum, cujus radii tres in pedis avis palmati formam membrana colligantur. Oœcia parva sunt, tumide rotunda.

Hab.: Nulliporæ affixam hanc formam e prof. 42 org. cepit POURTALES.

[1]) See BUSK, Quart. Journ. Micr. Sc.. vol. VIII, Zoophytol., tab. XXX, figs. 2 and 2, *a*. The text I have never seen.

[2]) *Lepralia Woodiana*, BUSK, *Crag Polyzoa*, p. 42, tab. VII, figs. 1 and 3.

[3]) *Flustra Dutertrei*, AUD., SAV. *Descr. de l'Egypte, Polypes*, tab. IX fig. 2; D'ORB. (*Repteschareliina*) *Pal. Franc. Terr. Crét.*, vol. V, p. 453.

With these characters, as will be seen in comparing it with the figures given by SAVIGNY, the *Hippothoa pes anseris* presents no other discrepance from the *Hippothoa Dutertrei*, than the forked vibraculum, provided with an interradial membrane, thus resembling, in miniature, one foot of a goose. In comparing the *Hippothoa Dutertrei* with the description and figures of the *Hipp. vulgaris* given by BUSK (Quart. Journ. Micr. Sc., l. c.), the most essential difference seems to consist in the more distal place of the vibracularia of the first-named form, what difference, as in other forms we know the variability in this respect, scarcely will be enough for the specifical distinction, although these forms, when typically developed, readily will be distinguished. The fine denticulation of the proximal margin of the zoœcial aperture of the *Hippothoa pes anseris*, which, very possibly, has escaped the observation of SAVIGNY, has no other significance, I think, than that of a variety of calcification. At the proximal corners of the zoœcial aperture, a lateral sinus sometimes is to be found, just alike what we have seen on the *Hippothoa porosa*.

The *Hippothoa pes anseris* was taken by POURTALES in two small colonies, growing on a *Nullipora*, West off Tortugas.

Not very far from the *Hippothoa spongites*, though, by its perpetually more open median sinus of the zoœcial aperture, well distinguished from it, the

Hippothoa Isabelleana [1]) (Pl. VIII, figs. 166—168)

is to be placed.

Of this species POURTALES has sent me two varieties, whose differences, however, with all reason will be accounted for by their different degrees of colonial development.

The first variety (fig. 168) was growing in one single layer of whitish and yellowish hue on *Oculina* and *Nullipora*, at the depth of 42 fathoms. It is in a pretty hard degree of calcification; thus the pores on the convex front-side of the zoœcia, and still more on the rounded, inflate oœcia, sometimes scarcely are discernible. The zoœcial aperture, with a breadth of about 0,14 mm., secondarily raised into a moderately high rim, is of a semielliptical or semicircular form, with a semicircular sinus in the middle of the straight proximal margin. The avicularia are wanting.

The other variety was found growing in the depth of 17 fathoms, in a considerably greater and more compound colony, composed of several concentric layers, of a purplish blue tint, around an axis of foreign matter, probably a branch of a coral (fig. 167 and *a*). Here (fig. 166) the acute, lateral avicularia, at the side of the zoœcial aperture, are very constant, and the pores on the front side are great and conspicuous, usually deeply sunken in the secondary thickening of the wall. The zoœcial aperture, with a breadth of about 0,15 mm., in its developmental changes, presents the median sinus in the proximal margin varying from a broad concavity to a shorter, semicircular, form. Internally, at last, it is encroached upon, proximally, by a broad, transverse plate.

[1]) *Escharina Isabelleana*, D'ORB., *Voy. d. l'Amér. mér.*, Tom. V, Part. 4, Zooph., Divis. 1, Bryoz., p. 12, tab. IV, fig. 13—16; ID. *(Reptoporina) Pal. Franc., Terr. Crét.*, vol. V, p. 442.

This species, by the just-named plate and the open, semicircular median sinus of the zoœcial aperture, with the genus *Hippothoa*, among the Floridan Bryozoa, combines a series of forms of Celleporine constitution, in the same manner, as, in the northern regions, the *Hippothoa hyalina* combines with it that group, which I have conjoined under the collective name of *Cellepora ramulosa*. But before following that continuation of the Myriozoidan type, it is more convenient here to account for a species, which, through the character of its zoœcial aperture, as it comes very near to the *Hippothoa Isabelleana*, among the Floridan Bryozoa, in another way shows the mode of connexion between the preceding species and that group, for which, as a subgeneric division, in my former papers, I proposed to use the name *Herentia*.

Hippothoa mucronata (Pl. VIII, fig. 169).

Char.: Zoœcia ovalia, porosa, poris ad lineas marginales præsertim distinctis, parietem frontis in mucronis formam densant, cujus latera compressa margini secundario aperturæ continuantur, aperturam (cujus latitudo = 0,11 mm.) præbent semiellipticam, tuberculis (reliquiis setarum) 6—9 coronatam, secundarie valde demersam, margine proximali recto medio late sinuatam. Oœcia rotunda frontem in tuberculi obtusi formam erigunt.

Hab.: Colonias duas coloris rubri fragmento testæ mortuæ insidentes e prof. 29 orgyarum cepit Pourtales.

The blood-red colour and the, relatively, hard calcification as well as the general form of the zoœcia, with their well developed mucro on the proximal part of the secondary raising of the aperture, at the first sight give this species the appearance of one of the forms, which I have brought together [1]) under the collective name of *Discopora coccinea* [2]); but the median sinus of the proximal margin of the primary zoœcial aperture, the principal characteristic of the Myriozoidan type, places it at the side of the preceding species. Still, this character, through the great breadth of that sinus, is very much modified, as the straightness of the proximal margin, usually, is reduced to its most lateral parts, although, in some zoœcia, the sinus is to be found much smaller, than what shows the figure.

The above-named raising of the front-side of the zoœcia, as well as the obtusely mucronate form of the oœcia, would induce the supposition, that this species might be the same as the *Flustra margaritifera*, by Quoy and Gaimard [3]), from the Falkland-islands; but with the ambiguity of the description and figures, given by those authors, it will be the best to follow Busk in using that synonyme for another species [4]), of antarctic origin, which seems to belong to the Discoporidan type.

In my former papers, as, among the northern Bryozoa, I saw the old-known *Hippothoa (Lepralia) linearis*, in the general form of the zoœcia as well as in their

[1]) Öfvers. Vet. Akad. Förh. 1867, Bih., pp. 26 and 164.
[2]) Compare also the *Discopora (Lepralia) multispinata*, Busk, Quart. Journ. Micr. Sc., n. ser., vol. 1, p. 78. Zooph., pl. XXXII. fig. 5
[3]) *Voy. de l'Uranie*, Zool., p. 606, tab. 92, figs. 7 and 8.
[4]) *Lepralia margaritifera*, Brit. Mus. Cat. Polyz., p. 72, tab. CI, figs. 5 and 6.

primary aperture, most alike the *Escharella auriculata*, under the subgeneric name of *Herentia*, I placed it at the side of that species, though expressly remarking [1]) its significance of a connecting link between the Escharellidan and Hippothoan types; but now, through the southern forms, in seeing it still more nearly combined with the last-named type, in its divergence towards the Celleporine constitution, most conveniently it will be placed at the side of the preceding species.

The typical *Hippothoa linearis* I have not found among the POURTALES collections, but the variety of the same type, which, after BUSK, I have identified with the tertiary *Eschara biaperta* by MICHELIN, seems to be very common in the Floridan sea.

Hippothoa biaperta [2]) (Pl. VIII, figs. 173—176).

It was found by POURTALES growing on shells and corals, particularly small ones of the Gorgonian tribe, in an encrusting state or raised in small but, relatively, broad expansions of Escharan (auctt.) construction [3]), in a varying depth of from 9 to 60 fathoms.

With the greater richness of specimens, in different degrees of development, it presents also a greater fullness of developmental changes, than what we knew before. Sometimes, the young zoœcia (fig. 175) are distinctively perforated, all over the front, by pores, which never seem entirely to want, though, sometimes (fig. 173), they are obscured, or rather less distinctively marked, in the lowest degrees of calcification. Usually, they are greatest at the margins of the zoœcia, where, in the older zoœcia, they are only persistent. The younger zoœcia, when unworn, in the feebler calcifications at least, have their aperture, with a breadth of about 0,08—0,09 mm., crowded by 6 or 7 bristles; and sometimes, in 1 or 2 pairs, on the older and thickened zoœcia also, these bristles will be found, even at the development of the oœcia. The form of the avicularia, in the same manner as we have observed on northern specimens, is varying, round or acute, the one or the other form, sometimes, in different colonies, being more exclusively predominant; sometimes these two forms occur profusely together. The oœcia, which, on the northern specimens, we did not know, have a rounded form. From their base they are covered by a thicker, annular layer, which, on their front, leaves a semicircular space of feebler thickening. This space, in the same manner as the front of the zoœcia, is more or less distinctively perforated by pores; in the former case it is striated, in a radiating manner, by furrows converging from the pores towards the middle of the apertural margin.

The supernumerary avicularia, most commonly of the acute form, of this *Hippothoa*, of course, are to be accounted for in the same manner as those of the typical *Hippothoa linearis* and of the *Hippothoa spongites*. The occurrence, number and size of these defensive organs seem to belong upon special cases of need, afforded by outer circumstances; but it is a general rule, that the more the Escharines approach to the

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1) Öfvers. Vet. Akad. Förh. 1867, p. 479.
2) Synonyma vide in Öfvers. Vet. Akad. Förh. 1867, Bih., p. 14.
3) Not unlike the fig. 193 (see below).

Celleporine constitution, what especially will occur in the young layers of zoœcia overgrowing the older ones of the colony, in connexion with the more irregular arrangement, the more the avicularia also become independent in their development. In this respect, among the Floridan Bryozoa, the *Hippothoa biaperta* is one of the best examples of variability.

Through almost the same degree of affinity combined with the *Hippothoa biaperta* and with the *Hipp. Isabelleana,* in the Floridan sea, a species, which seems me to be new, presents the manner of divergence of this type towards the colonial conformation, which formerly constituted the genus *Hippothoa.*

Hippothoa divergens (Pl. IX, figs. 177 and 179).

Char.: Zoœcia rhombica vel ovalia frontem convexam, vulgo imperforatam, valde calcaream præbent. Apertura zoœcii rotunda proximaliter aperte sinuatur, aviculariis parvis, rotundis, ad latera positis munitur. Avicularium majus, acutum, extus vergens, ad partem lateralem frontis zoœcii erigitur.

1. Forma *typica:* Zoœcia rhombica, quorum apertura latitudine 0,11—0,12 mm. fere æquat, coloniam crustiformem contiguam exstruunt. — Fig. 179.

2. Forma *laxa:* Zoœcia ovalia, quorum apertura latitudine 0,09 mm. fere æquat, coloniam laxam, *Molliæ* vel *Hippothoæ (auctt.)* formæ, exstruunt. — Fig. 177.

Hab.: Formam typicam testæ mortuæ insidentem e prof. 135 orgyarum, formam laxam lapillo insidentem e prof. 120 orgyarum sustulit Pourtales.

Through the zoœcial aperture most alike the *Hippothoa Isabelleana,* and with the same lateral avicularium as that species, except that it is placed more laterally and that its mandible, here, in its outer half is narrowed, almost linear, it combines, therewith, the *oral* avicularia of *Hippothoa biaperta,* with what species it shares, also, the harder degree of calcification, usually with an imperforate front side, though, sometimes, the pores may be observed at the margins of the zoœcia. With the hard calcification, in the thickening of the shining, bluish-white zoœcial wall, the primary aperture becomes deeply sunken, and the oral avicularia, sometimes, enclosed in the secondary aperture, thus formed.

In the genus *Hippothoa* I place the Floridan form of another species, which seems me yet to be undescribed, although that form, as will be seen by its definition, wants the most essential character of this genus.

Hippothoa fenestrata (Pl. VI, fig. 142).

Char.: Zoœcia ovata, modice ventricosa, fronte porosa, aperturam primariam (cujus latitudo circ. = 0,12 mm.) quadrato-rotundatam (in forma e mari pacifico *Hippothoæ* modo sinuatam eam vidi) secundarie in tubum erectum producunt, qui proximaliter fenestra rotunda apertus aviculariis ad latera acutis munitur.

Hab.: Colonia parva, a POURTALESIO ad Floridam e prof. 17 orgyarum capta, tubum Serpulæ investit. In *Mus. Brit.* colonia e mari pacifico *Escharæ* (auctt.) modo erecta servatur.

For the rounded-quadrangular form of the primary zoœcial aperture, this species, as it occurs in the POURTALES-collections, more systematically would be referred to the following genus *Escharella*, because the Hippothoan sinus of the proximal margin of the aperture, in no wise here is indicated. The only alteration, that presents the primary aperture in the secondary growth, is the more rounded form, and the proximal margin retains its uniform concavity. In the British Museum, however, I have seen a raised stem, probably from the Pacific, which in all the other points of the zoœcial constitution agreed with our Floridan form, though possessing the true Hippothoan primary aperture. This makes me cautious for separating the Floridan form from the genus *Hippothoa*, and I venture to regard it as a prototypical state of the same species as that from the Pacific. Further-more, it is only a little colony, in an encrusting state, I have had for the examination of the Floridan form, what, if it could be followed longer, not improbably would present more developmental changes.

The secondary raising of the zoœcial aperture readily will be accounted for, if we remind us the above described transverse ridge (fig. 129) over the secondary aperture of the *Porellina ciliata*, dividing that aperture into two parts, of which the proximal one will answer to the fenestra of the *Hippothoa fenestrata*. Otherwise, the tubiform production has its nearest correspondence in the *Anarthroporidan* characteristic, and, in the form of the zoœcia and their punctation by pores, also, it very nearly accords with the *Anarthropora minuscula*, though the size is much greater.

The acute avicularia, pointing upwards, at the side of the secondary aperture of the zoœcia, vary in their number, one at the one side, or two, placed symmetrically, one at each side of it.

What I here have told of the prototypical significance of the one form for another, in almost the same manner refers to the genus *Myriozoum*, in its relation to the *Leieschara* (SARS, mihi). If we compare the colonial form as well as the form of the zoœcia and their cancellation, all over the front, by secondary pores, of the *Myriozoum truncatum* with the corresponding characters, for instance, of the *Leieschara subgracilis*, we will find the closest resemblance in all that points, except the thickness of the stem. But two more essential characters throw them away from each other: — the first-named species has the zoœcial aperture almost circular, and it wants the avicularia. In the young and well-preserved zoœcia, however, of the *Myriozoum truncatum*, just proximally of the articulation of the operculum, we find the aperture a little constricted, feebly indicating what we have seen on the *Mamillopora* [1]) and the *Gemellipora*. Now, the Floridan fauna has presented us a species with that character more developed, in the same time as it possesses the lateral avicularia very much agreeing with those of the *Leieschara subgracilis*. This Floridan species provisionally may be named

[1]) It is worthy of notice, also, that the oœcia of the *Myriozoum truncatum*, which seem yet to be undescribed, in their form resemble those of the *Mamillopora cupula*.

Myriozoum ovum (Pl. VII, figs. 148—151).

Char.: Colonia, quæ ovi formam refert, axi perforata, longitudine circiter 2 mm., pars sine dubio fuit stirpis moniliformis, articulatæ, e zoœciis ex axi in lineas decem radiantibus construitur. Zoœcia cancellata, fronte quadrata, aperturam (cujus latitudo = 0,12—0,13 mm.) rotundam præbent, ad articulationem operculi constrictam (quare margo proximalis hujus aperturæ concavus semicirculum minorem refert), aviculariis rotundis (ellipticis) ad lineas limitares in angulis distalibus positis muniuntur.

Hab.: Colonias mortuas, disjunctas, e proff. 114 et 233 orgyarum cepit POURTALES. An hæc species sub nomine *Ovulitis* [1]), stratuum Tertiarium fossilis, antehac sit descripta, nondum decerni potest.

As to the scientific history of this species, if it should be known before, we can only refer to the descriptions of the fossil *Ovulites*, without, with any certainty, after these descriptions to determine the species, because the zoœcial constitution of the fossil yet seems be unknown. The colonial form, although here it seems to be very characteristic, all too easily can deceive us, and therefore, until a new examination of the fossil can be done, I have proposed a new name for it. The specimens, sent by POURTALES, were taken off Tennessee reef and Pacific reef, at the above-named depths. They are all dead, but, I believe, not in a fossil state, as the apertures and pores are all open, with their margins very sharply defined.

The colonial growth of this species, as to the arrangement of the zoœcia in linear rows radiating from the longitudinal axis, evidently agrees with that of the raised *Leieschara* and the *Myriozoum truncatum*. Furthermore, it gives us a hint, how the constrictions on the stem, so common in the *Leieschara coarctata* [2]), are to be accounted for. These constrictions, if we imagine them to be fullfilled, until they reached the axis of the stem, would have produced the same moniliform constitution of the stem, as what seems to have been the manner of growing of the *Myriozoum ovum*. How the ovuliform internodes of this species may have been connected, not yet having been found in the living state, we may imagine after the analogy of the *Escharella palmata* [3]) and *Caberea* [4]). Still, the *Myriozoum ovum* presents that peculiarity, that the internodes are longitudinally perforated, what would induce the supposition, that it has been growing on a foreign, cylindrical, supporting matter; but the regularity of the internodes opposes that supposition, and, in the raised *Leieschara*, as well as in the *Myriozoum truncatum*, though their axis is not hollowed, it is occupied by a spongy substance of porous cells, between the bases of the zoœcia, thus, in this respect, also, presenting an analogy to the *Myriozoum ovum*.

The form of the zoœcial aperture, easiest to be compared with two unequal half-circles, the one inversely attached to the other, reappears in the aperture of the avicularia, whose mouth, also, is constricted at the articulation of the mandible. These

[1]) *Ovulites*, LAM., *Anim. s. Vert.*, ed. 1, vol. 2 p. 194; ed. 2, vol. 2 p. 298, ubi ceteri scriptores leguntur. HAGENOW, *Sclerop. und Thallopoden* in GEINITZ, *Grundr. d. Versteinerungskunde*, p. 634 (p. 50 sep.).
[2]) Compare Öfvers. Vet Akad. Förh. 1867, p. 485.
[3]) Öfvers Vet. Akad. Förh. 1867, Bih., pp 79 and 80.
[4]) Öfvers. 1867, p. 327.

avicularia, amidst the greatly developed cancellation by secondary pores over the front-side of the zoœcia, just as in the *Leieschara crustacea*, sometimes easily will be overseen.

Through the *Hippothoa pes anseris* and its nearest allies, we have seen the connexion between the Hippothoan and Leiescharan types. Now, the firstnamed of these, especially through the *Hippothoa biaperta*, besides the divergence towards the, formerly so named, Hippothoan constitution, presents so close a relation to the typical *Celleporæ*, that it will be most convenient, in dissolving my former group of the *Celleporina*, as a distinct sub-order of the *Cheilostomata*, characterized by the so named Celleporine constitution of the zoœcia, here to include the true *Celleporæ* in the Myriozoidan family. That genus *Cellepora*, then, in the following manner will be characterized:

Zoœcia (magis minusve utriculata) aperturam primariam rotundam, proximaliter aperte sinuatam, secundariam aperturam (formæ magis variæ) aviculario laterali obliquo munitam vulgo præbent.

With this character, around the old-known *Cellepora ramulosa* [1]), a very natural group will be collected, although it very often will be difficult to recognize the true shape of the primary zoœcial aperture. In most cases, for that purpose, the growing edge of a colony must be examined; and, when this can not be done, the systematical arrangement, of course, may trust to characters of less value or, in accordance with the synthetic method, we may attend to likenesses of serial significance [2]). Furthermore, we must remind, that the Celleporine constitution is the end-point of development of all the Escharine types, where they meet another, usually, after having lost the most of their regular characters. For the practice, then, in many cases, where the true affinities can not be determined with certainty, it would be the best to retain a distinct sub-order for that constitution; still, I think, it will once be possible, with the dubious species also, to trace them back again to any truly escharine origin.

At the first, three species may be accounted for, which I nowhere, with any certainty, can find to be described before.

Cellepora verruculata (Pl. VIII, figs. 170—172).

Char.: Zoœcia decumbentia ad margines perforantur, aviculariis duobus acutis muniuntur, quorum unum in apertura secundaria includitur, alterum supra partem proximalem frontis locum tenet. Oœcia imperforata calcificatione progrediente maximam ad partem obteguntur. Apertura secundaria zoœcii tuberculis vulgo quatuor (4—6) coronatur, quorum unum cuspis est avicularii oralis, altera vero tubera sunt marginis. Apertura primaria latitudine 0,13 mm.; secundaria vero 0,16 mm. fere æquat.

[1]) This without doubt was the same species as the *Cellepora pumicosa*, by LINNÉ; but for the reasons given in Öfvers. Vet. Akad. Förh. 1867, Bih., p. 32, that name more conveniently, in accordance with BUSK, will be used in another sense.

[2]) Of the species, which formerly constituted my genus *Cellepora*, the group, which I named *Cellepora scabra* must be transferred to the Discoporidan series. The genus *Celleporaria* most closely is connected with *Cellepora*.

Hab.: In profundo 42 orgyarum coloniam hujus speciei cepit POURTALES.

For the outer appearance of this species, as seen by a lower degree of magnifying, in its older parts, we can refer to the fig. 9 of the plate 78 of the *Iconographie Zoophytologique* by MICHELIN, representing his *Eschara labiosa*, with the only remark, that the tuberosities would be smaller and more separated from each other. In their younger state, of which I give the figures, the zoœcia, of an escharine constitution, are more obviously decumbent, presenting the Myriozoidan form of the primary aperture, whose breadth is about 0,13 mm. As the calcification proceeds, the oral avicularium is involved therein, with its aperture pointing obliquely upwards. The furrows between the zoœcia in the same time are filled up, with their pores remaining in the rather irregular cancellation on the otherwise plain surface of the colony. Mean-while, also, the lateral avicularia are formed on the proximal part of the front-side of the zoœcia, almost in the same position as the supernumerary ones in the *Hippothoa biaperta.* Where the oœcia are developed, they are very soon involved in the layer of calcification, marked only as low, transverse swellings distally of the secondary zoœcial apertures. Here and there on the thus formed secondary surface of the colony, small tuberosities are to be observed; but most constantly they are formed on the margin of the secondary zoœcial aperture, generally four, one at each side of its more or less quadrangular circumference, but very often their number increases to six. Of these, the one belongs to the tip of the oral avicularium, the other are merely unevennesses of the layer of calcification. Through their pure white colour, they show off against the shining vitreous (bluish white) surface of the colony. The breadth of the secondary zoœcial aperture is about 0,16 mm.

As it will be seen, this species, through the form of the primary zoœcial aperture, as well as through the manner of calcification, comes very near to the *Hippothoa biaperta.* I have only seen one specimen of it, taken by POURTALES W. of Tortugas, but this a very complete one, giving a good idea of its developmental changes.

Cellepora coronata (Pl. IX, fig. 186).

Char.: Zoœcia erecta crustam coloniæ superficie fere planam exstruunt poris punguntur, margine secundario aperturæ tuberculis vulgo sex coronantur, aviculario laterali rotundo in fronte coloniæ muniuntur. Oœcion unum solum vidi, poris punctatum, maximam ad partem stratu calcificationis obductum. Apertura secundaria zoœcii latitudine 0,24 mm., altitudo zoœciorum 1 mm. fere æquat.

Hab.: Coloniam hujus speciei in prof. 26 orgyarum Oculinam investientem cepit POURTALES.

With the Myriozoidan character of thé zoœcial aperture, although not easily perceptible, this species combines the manner of producing, on the margin of the aperture, secondary tubercles, as was to be seen in the preceding species, with which it shares, also, at a lower degree of magnifying, the outer appearance of the plain surface óf the colony. Its rounded lateral avicularium, although, relatively, much smaller, and its punctation by pores, although these more uniformly distributed, also are paralleled in that species. But, as far as I can see on the only specimen I have had for examination, it wants the oral avicularium, and its zoœcia are all vertically raised from the basal plane of the colony. Furthermore, it is very easily distinguished by its great size, as the zoœcia, in one layer constituting the thickness of the colony, are about one millimeter high, with an aperture of about ¼ mm. in breadth.

In this last respect, however, it is far exceeded by the

Cellepora gigas (Pl. IX, figs. 181 and 183—185).

Char.: Zoœcia erecta, utriculata, magis libera, crustam coloniæ hispidam exstruunt, poris vulgo minutis perforantur, marginem secundarium aperturæ tubiformem erigunt, aviculario laterali rotundo muniuntur. Oœcia rotunda, imperforata, magnam ad partem supra stratum calcificationis eriguntur. Apertura secundaria zoœcii latitudine 0,36—0,4 mm. fere æquat, altitudo zoœciorum usque ad 2,5 mm. augetur.

Hab.: Colonias tres hujus speciei in prof. 125 orgyarum cepit Pourtales.

The bottle-shaped zoœcia, which form is accomplished, particularly, by their producing of the tubiform secondary mouth, together with their size, usually of about 2 millim. of length (height), and their Myriozoidan (sinuated) aperture, at once will distinguish this species. The form of the colony, also, seems to be characteristical for it, growing in rounded heads, depressed in the middle. These heads are formed by several layers of zoœcia, the young ones, of a shining opaline white colour, overgrowing the older ones, which have lost their glossy lustre, in the same time making the pores in their wall more obvious. This apparently greater development of the pores in the first zoœcial layers of the colony induces me hither to refer a colony of some zoœcia in a single layer, which have the pores (fig. 185) distributed all over their front side, almost in the same manner as the preceding species. As in that species, so also in the *Cellepora gigas*, I have never seen any oral avicularium.

This, on the contrary, is very constant in the group, for which I used the collective name of *Cellepora ramulosa*, of what group it is very easy to distinguish several forms, or species, as they have been named, characterized, principally, by the form of the colony; and, indeed, in different localities, these may prove themselves to be constant enough. Still, with this principle, at last one would come to the same conclusion with Hincks: »the bewilderment increases with the number of specimens examined». Thus, we must cast away all other characters than those drawn from any differences in the form of the colonial organs. In this manner we may admit two seemingly well distinguished series of forms, the one with perforated, the other with imperforated oœcia. All the Floridan forms, which here will be accounted for, belong to the first-named series.

Cellepora tuberosa [1]) (Pl. IX, fig. 180).

This, as it occurs among the Pourtales-collections, seems to be very common in the Floridan sea, with a colonial form of rounded, usually compressed knobs, or as incrustations, of a milk- or yellow-white colour, growing on shells and corals at a va-

[1]) Synonyma vide in Öfvers. Vet. Akad. Förh. 1867, Bih., p. 31.

rying depth of from 15 to about 300 fathoms. Its most peculiar property, in the Floridan sea, distinguishing it from the well-known European variety, is the less degree or raising or entirely wanting of the avicularian rostrum (tubercle) at the zoœcial mouth.

The zoœcia are in a hard degree of calcification, in this respect almost resembling the *Cellepora gigas*. Their front side, uniformly thickened, wants pores; and the oral avicularium, with a rounded or blunt triangular mandible, is totally inclosed in the secondary zoœcial aperture, whose varying breadth I have measured to be about 0,14 or 0,15 mm. When the rounded, perforated oœcion is developed, the margin of the secondary zoœcial aperture is growing up from each side on its front. The great spathulate avicularia, which are dispersed among the zoœcia, morphologically belong to the same order as these, with almost the same construction and size; their aperture, in its varying length, can be measured up to 0,3 mm. On their front side, sometimes, I have seen a small lateral avicularium, in the same position as on the zoœcia of the two preceding species.

Cellepora avicularis [1]) (Pl. IX, figs. 193—198).

Of this form POURTALES has taken well-grown colonies, although of small size, growing on *Serialaria* and on pieces of any undeterminible Zoophyte, at a varying depth of from 9 to 111 fathoms.

With almost all the characters of the preceding form, it differs therefrom, principally, by the smaller size of the colonial organs, their less degree of calcification, proceeding also in a little differing manner, and by the different colonial form. The breadth of a primary zoœcial aperture I have measured to about 0,09 mm.; the breadth of a secondary one to about 0,13 mm. In the tips of the branches the zoœcia, of a shining hyaline colour, are cylindrical and well-marked from each other. Lower down on the stem, a common layer of calcification fills up the furrows between the zoœcia, and, from the base of the oœcia, it grows up over the front of these. This layer of calcification attains a still greater development on the elongated and slender form of this group,

Cellepora margaritacea (Pl. IX, figs. 187—192),

which is described by POURTALES [2]) and seems to be one of the most common Bryozoa of the Floridan Sea, as, in a great richness of specimens, it was taken by him, at 22 different localities, in a varying depth of from 15 to 270 fathoms.

In the zoœcial construction, as well as in the form of the other colonial organs, it most nearly approaches the above-described *Cellepora tuberosa*. This at once will be obvious in comparing its ovate rhomboidal zoœcia, in the tips of the branches, with the cylindrical ones of the corresponding age of the *Cellepora avicularis*. Furthermore, the avicularian rostrum, at the side of the zoœcial aperture, just as usual in the Flo-

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[1]) Synonyma vide in Öfvers. Vet. Akad. Förh. 1867, Bih., p. 32.

[2]) *Vincularia margaritacea*, POURT., Bull. Mus. Comp. Zool. Cambridge, N:o 6, p. 110.

ridan *Cellepora tuberosa*, does not raise itself, secondarily, the whole avicularium being enclosed in the secondary zoœcial aperture; and the oœcia, in the same likeness, remain more freely raised above the common secondary layer of calcification of the stem. The great spathulate avicularia are common to all the three forms; but on the *Cellepora margaritacea* alone we have seen bristles (marginal spines), four to the number, on the primary margin of the zoœcial aperture. As to the size of the zoœcia, I have measured the breadth of their primary aperture of *Cellepora margaritacea*, to be about 0,1 mm.

For the systematical arrangement, in comparing the three last-named *Celleporæ*, any difference of truly specifical value scarcely will be to find. They are, evidently, three different varieties of size, of growing and of calcification, of the same type. The smooth surface of the *Cellepora margaritacea* is produced by the continuous secondary layer of calcification concealing the limits between the zoœcia, which was to be seen, also, on the *Cellepora avicularis*, although, in connexion with the difference in the form of the stems, in a little differing manner of extension. The degree of raising the avicularian rostrum at the zoœcial aperture, in this group, is all too variable for giving any available character. Still the three varieties seem to be very constant and may very well deserve their own names.

From the group, which here we have named *Hippothoa*, under the name of *Escharella* once [1]) I have separated another group of Myriozoidan forms, characterized, principally, in the constitution of the zoœcia, with their front side, typically, more or less plain and pierced by primary pores. The Myriozoidan character in the proceeding calcification appeared, in the round or rounded-quadrangular primary aperture, by producing a lateral denticle, on each side, at the articulation for the operculum and by then filling up the proximal part of the aperture almost in the same manner as *Hippothoa*, but retaining the median sinus more open, semicircular. In the proceeding development, in connexion with the calcification, in the middle of the proximal margin of the aperture, very often they produced a median denticle, and proximally of the aperture very commonly they would develope a median avicularium, more or less intimately connected with or enclosed in the secondary raising of the aperture. These characters, it must be confessed, as a natural consequence of the variability of the species in question, are very vague; and, indeed, the whole group is to be regarded as a connecting link between the types of *Hippothoa* and *Eschara*.

As the first example of a prototypical form of this group, as well as of the difficulty of distinguishing it from the preceding genera, we may cite the

Escharella sanguinea [2]) (Pl. VIII, figs. 164 and 165).

This species, in well-developed colonies, of a whitish hue, in free expansions as

[1]) Öfvers. Vet. Akad. Förh. 1867, Bih., pp. 8 and 70.

[2]) (?) *Escharina torquata*, D'Orb., *Voy. d. l'Amér. mér.*, vol. V, part. 4, p. 11, tab. IV, figg. 1—4.
(?) *Cellepora subtorquata*, Id., *Pal. Franc.*, *Terr. Crét.*, vol. V, p. 399.
Hemeschara sanguinea, Norm., Quart. Journ. Micr. Sc., n. ser., vol. VIII, p. 222, tab. VII, figg. 9—11.

well as in tubiform convolutions, at a depth of 60 fathoms, POURTALES has taken SW. of Tortugas.

In the ordinary form of the zoœcial aperture, such as it already is well described by NORMAN, it has its nearest correspondence in the typical constitution of *Gemellipora*. In the young zoœcia (fig. 165) we find the proximal margin of the aperture concave or broadly sinuated, with a sinus at each side of it, proximally of the denticle at the articulation of the operculum [1]). In the older zoœcia, the median sinus is narrower and the lateral sinuses, commonly, are more marked, with a more pointed denticle at the opercular articulation. This form of the zoœcial aperture, indeed, would not give us reason enough for placing it in the genus *Escharella;* but the greatly developed primary pores on the front side of the zoœcia give it an appearance, very alike to the forms, which I have described under the collective name of *Escharella porifera*, and, among the ordinary zoœcia, whose aperture has a breadth of about 0,15 mm., we find some greater ones, irregularly distributed (fig. 164, above, on the left in the figure), whose proximal margin of the aperture, between the lateral sinuses, is projecting in the form of a broad denticle. This more usually, judging from the figures given by NORMAN, in the ordinary zoœcia, also, seems to be the case in the European form of this species.

The avicularia, of an acute form, in the same manner as in *Hippothoa spongites* and *Escharella linearis*, are very varying in their place, number and size. Sometimes they are raised into high tubercles, sometimes they are low, horizontal and of small size, and, then, amidst the great zoœcial pores, they are very easily overseen. Their most normal place seems to be that of one at each side of the zoœcial aperture.

The oœcia are already described by NORMAN.

The overgrowing layers (the new layers of zoœcia, growing over the older ones) present the usual propensity of the zoœcia to more and more becoming Celleporine; thus we may find them almost vertically raised in an utriculate manner, with the aperture at the tip and with the sides verrucose by the uneven calcification over the interstices between the primary pores.

How nearly this species is related to the

Escharella pertusa [2])

will appear, already, from the supposition, enounced by NORMAN, that BUSK'S figures, pl. LXXVIII, figs. 1 and 2, were drawn from the *E. sanguinea*. The specifical charac-

[1]) As this denticle very often is less obvious than the proximal ones, it is good reason for identifying this species with the *Escharina (Cellepora) torquata* (subtorquata) D'ORB.

[2]) *Cellepora pertusa*, ESPER, *Forts. d. Pflanzenth.*, part. 1 p. 149. *Cellep.* tab. X; LMRX., *Pol. Cor. Flex.*, p. 89; M. EDW. *(Escharina)* in LAM. *Anim. s. Vert.*, ed. 2, vol. 2 p. 232; JOHNST. *(Lepralia) Brit. Zooph.*, ed. 2 p. 311, tab. LIV fig. 10; GRAY, *List Brit. Anim. Brit. Mus.*, part. 1 p. 119; D'ORB. *(Cellepora) Pal. Franc., Terr. Crét.*, vol. V. p. 401; BUSK *(Lepralia) Brit. Mus. Cat. Polyz.*, p. 80, tab. LXXVIII, tab. LXXIX figg. 1 et 2; NORMAN, Quart. Journ. Micr. Sc., n. ser., vol. VIII p. 222 (p. 11 sep.). *Cellepora perlacea*, D. CHIAJE, *Mem. su gli anim. s. vert.*, vol. 3 p. 37, tab. XXXIV figg. 4 et 6; M. EDW. *(Escharina)* l. c, p. 234; D. CH. *(Cellepora) Descr. Notom. Anim. s. Vert.*, vol. V p. 148, tab. 158 figg. 1—6; THOMPS. Ann. Mag. Nat. Hist., vol. X p. 20; D'ORB., l. c., p. 400.

ter, indeed, of *E. pertusa*, as quoted by the first-named author, is of no constant value, because in a colony, which was taken by POURTALES at the same locality with the preceding species, some of the zoœcia are plain, other ventricose, presenting all the characters of *E. pertusa.* But here it is of the greatest interest, on some of the zoœcia, at the articulation of the operculum in the zoœcial aperture, to find a little lateral denticle, corresponding, evidently, to the above-described on the *E. sanguinea*, although considerably smaller. When this is formed, as the proximal margin may be sharpened, internally, by a concave rim, in this species we meet again the Gemelliporidan character of the zoœcial aperture, although not fully typical. Furthermore, its constitution, in other points, bears a very close resemblance to the above-described *Gemellipora lata.* The pores in the zoœcial wall are greater and more numerous, and instead of the depression proximally of the zoœcial aperture, here we find tubercles; these are the most pregnant differences in the zoœcial construction, of no great value, certainly, as being only variations of the calcification. The avicularia of the *Gemellipora lata*, also, have their correspondence in the *E. pertusa*, as well as in the greater ones of *E. sanguinea;* for, although here, generally, they seem to be wanting, on the older part of the colony, in the same position as that described above on *Gemellipora lata*, I find two decumbent avicularia, of a lengthened shape, about two thirds the length of the zoœcia. Their sides are swollen. The opercular apparatus is worn away, but the groove for the mandible indicates an acute form of it.

Thus, the *Escharella pertusa* seems to hold an intermediate position between the *Gemellipora lata* and *E. sanguinea,* closely related to them both. What we mean by placing these forms in two different subgenera, may be understood from our remarks before. Wherever, in this very natural group, we have sought for any generical distinctiveness, in one or another way we have seen it to be faded away.

At the side of the *Escharella pertusa*, and, indeed, very difficult characteristically to distinguish from it, is to be placed, also, the

Escharella Audouinii [1]) (Pl. XI, fig. 211).

The most applicable character, for the distinction from the preceding species. will be the size of the zoœcia, the inner breadth of their apertures here amounting to about 0,23 mm., in the same time as the thickening of the border of this aperture is more advanced, so that the outer breadth of the raised secondary aperture amounts to about 0,33 mm. The worthiest character, on the contrary, from systematical point of view, is the difference in shape of this aperture, which here is contracted in the middle, at the articulation of the operculum. The variations in the convexity of the zoœcial front-wall are almost the same as in the preceding species, although here, usu-

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[1]) (?) *Flustra torquata*, LMRX. in QUOY et GAIM. *Voy. de l'Uranie*, Zool., p. 610, tab. 89 figg. 7 et 8; M. EDW. *(Escharina)* in LAM., *Anim. s. Vert.*, ed. 2, vol. 2 p. 234; D'ORB. *(Cellepora) Pal. Franc.*, *Terr. Crét.*, vol, V p. 403.

Cellepora Mangnevillana, AUD. in SAV. *Descr. d. l'Egypte, Polypes*, tab. 8 fig. 6; D'ORB. *(Cellepora Audouinii) Pal. Franc.* l. c. p. 401.

(?) *Cellepora ovoidea* ID., ibid., fig. 1; D'ORB. *(Cellepora subovoidea) Pal. Franc.*, l. c. p. 402.

ally, it is yet more ventricose. As the distal end of the zoœcion, primarily, is sunken to a level with the limitar furrows, in the secondary aperture, as it raises itself to a horizontal level with the middle of the front wall, this raising, of course, must be greatest in the distal part of this aperture. Thus it reminds us of the *Escharella (Lepralia) cucullata*, as described by BUSK [1]), from what species, however, it is distinguished by the front wall being porous instead of granular. So, also, LAMOUROUX described his *Flustra torquata;* and, indeed, the only synonyme, which seems to be sure enough, is the figure by SAVIGNY, named, by AUDOUIN, *Cellepora Mangnevillana.*

The oœcia are high and swollen, although a little flattened, usually, in the circumference of their mouth. On the specimen examined, I do not see any avicularia.

This specimen, a very well outgrown colony, growing on a Nullipore, was taken by POURTALES, W. of Tortugas, at the depth of 37 fathoms.

The contraction in the middle of the zoœcial aperture, with this species combines the

Escharella depressa [2]) (Pl. X, figs. 203—206).

The first description of this species, with which we are able, with certainty, to identify the two Floridan forms, is that given by BUSK, notwithstanding some slight differences in the manner of calcification, which seem to make a distinct variety of the Mediterranean form. In the Floridan sea, it occurs in two well-distinguished forms, which, as they seem to be constant enough, may well deserve their own names.

E. rostrigera (figs. 203—205).

Char.: Zoœcia rectangularia vel ovato-rhombica, convexa vel fere plana, porosa vel, calcificatione progrediente, fronte imperforata, ad marginem solum porosa, parietem vulgo ad marginem distalem magis spissant; aperturam rotundate-rectangularem in mediis lateribus constringunt, (vel majorem, latiorem, etiam transverse ellipticam, margine proximali concavam, in angulis lateralibus dentatam præbent); aviculariis acutis, ad latera aperturæ vel inter illam et marginem distalem transverse positis, cuspide convergentibus, vel vibraculario uno in hoc loco muniuntur.

Hab.: In proff 35 et 43 orgyarum hanc formam Coralia et Bryozoa investientem haud frequentem cepit POURTALES.

This form, in its varying degrees of calcification, is the most aberrant from the Mediterranean form, as known by the description by BUSK. The most peculiar feature is the occurrence of greater zoœcia among the ordinary ones, in connexion, then, with a great difference in the form as well as in the size of their aperture. This peculiarity we have remarked, also, on the above-named *Escharella sanguinea*, without being

[1]) *Cat. Brit. Mus. Polyz.*, p. 81.
[2]) (?) *Flustra Marcelii*, AUD. in SAVIGNY, *Descr. de l'Egypte*, Polypes, tab. IX fig. 4.
Lepralia depressa, BUSK, *Cat. Brit. Mus., Polyz.*, p. 75, tab. XCI figg. 3 et 4.

able, as here also, in dead and dried specimens, to know anything about its physiological significance. The ordinary zoœcia have an oblong, rounded quadrangular aperture, with a breadth of about 0,1 mm.,[1]) contracted in the middle, but very often this breadth can be measured to about 0,18 mm., and, sometimes, this also can be nearly doubled, the form of the aperture, then, being more and more elliptical, transversely, with pointed lateral ends. The proximal margin of this aperture is broadly concave, with a little break at its ends, which gives the Myriozoidan character to this species. The front wall of the younger zoœcia, usually, is a little convex and densely perforated by primary pores. As the calcification proceeds, the surface of the whole colony is levelled, the grooves between the zoœcia being filled out, and their marginal pores then, of course, are deeper and greater. These pores also, usually, are persisting, the other being closed, and the front wall of the zoœcia, at last, in the harder degrees of calcification, being verrucose, in this respect very much resembling the *Escharella Jacotini.* Distally of the aperture, where the decumbent, acute avicularia are placed, converging with their tips, the calcification, usually, in a higher degree thickenes the wall, this, without doubt, corresponding to the »penthouselike projection» at that place, as described by Busk. The oœcia, as far as I can see, in this form are totally wanting. The avicularia vary both to their size and number, in the typical state one at each side of the zoœcial aperture; but very often the one is wanting, the other then, usually, being prolonged. This prolongation, especially, will affect the mandible, thus actually producing a vibraculum, whose development, otherwise, would be the most distinctive character of the following form; still, as far as can be seen on the specimens examined, in this case the vibracularium here is single on each zoœcion.

E. setigera (fig. 206).

Char.: Zoœcia ovalia, convexa, imperforata, peripheriam totam marginis spissant aperturæ elongatæ, fere ellipticæ, in medio constrictæ, vibraculariis ad latera aperturæ positis muniuntur. Oœcia primo minute porosa stratu calcificationis imperforato e basi accrescente obteguntur.

Hab.: Coloniam hujus formæ fragmentum testæ mortuæ investientem e prof. 60 orgyarum sustulit Pourtales.

The two lateral vibracularia, with their vibracula of almost the same length as the zoœcia, and the uniform calcification of the convex, imperforated zoœcial front-wall, with the thickened margin of the aperture, whose breadth may be measured to about 0,08 mm., readily will distinguish this form, which, furthermore, is provided with oœcia. From this last circumstance one might infer, perhaps, it should hold any sexual relation to the preceding form; but with our present knowledge of the Bryozoan life, we have no right, at least, to such a supposition. The only specimen I have seen, however, is very small and gives no further information on its developmental changes. It was taken, like the preceding form, in the neighbourhood of Tortugas.

[1]) On the zoœcia of a very young colony (fig. 203), I have measured this breadth to about 0,08 mm.

The above described formation of a median denticle of the zoœcial aperture which more constantly will be found in the following species, with the genus *Escharella* conjoins a new Floridan species.

Escharella bisinuata (Pl. XII, fig. 229).

Char.: Zoœcia rectangularia, fronte fere plana, porosa, linea calcarea elevata disjuncta, aperturam rotundate-quadrangularem (cujus latitudo = 0,26 mm.) calcificatione leviter torquatam, margine proximali recto bisinuatam præbent, aviculario laterali sat magno (cujus latit. = 0,11 mm.) naviculari (elongato, decumbente) muniuntur, in pariete posteriori foramine rotundo aperiuntur. Oœcia rotunda poris minutissimis perforantur.

Hab.: Hanc speciem, *Hemescharæ* (auctt.) formam, e proff. 9 et 19 orgyarum cepit Pourtales.

Through the size of its zoœcia, amounting to about 1 mm., and through their plain, rectangular form, this species, among the Floridan Escharines, already for the naked eye easily is recognized. The colonies, of a whitish calcareous hue, are growing in the Hemescharan manner. At the back side, the zoœcia present a rounded hole, with a strengthened, well defined margin. The zoœcial apertures, rounded in their distal part, are a little constricted at the articulation of the operculum, whereby the proximal corners, otherwise rectangular, are rounded into the form of sinuses. The proximal margin of these apertures, when complete, is straight, with two rounded sinuses, separated by a median denticle. Around the zoœcial aperture, a marginal space, usually thickened, of a little harder calcification, is marked out from the other front side of the zoœcion, on which the pores, of a more or less regular, quincuncial arrangement, are very conspicuous. The avicularia, of a navicular shape, are placed laterally, one on each zoœcion, usually with the distal half of their aperture in breadth with the zoœcial aperture, though in this respect, as commonly, they can be varying. The line of articulation of their mandible, usually, is strengthened by a calcareous transverse rib. The oœcia are uniformly rounded, finely prickled by minute pores, which, in the harder calcifications, scarcely are perceptible.

After the Pourtales-collections to judge, this species seems not to be of a very frequent occurrence in the Floridan sea, though he has sent it in well-developed specimens, the one growing as a crust on a Nullipora, the other in fragments of a raised Hemescharan growth.

Escharella Jacotini [1]) (Pl. X, figs. 199 and 200).

Of this well-known species, Pourtales has taken some colonies, in varying states of development, from 13—44 fathoms, growing on Nullipora, Steginoporella and Porina. The one of these colonies (fig. 199) is a very young one, with the zoœcia of the almost typical constitution, although it still wants the avicularia. Another colony, however (fig. 200), of greater size, has grown out into the constitution of that variety,

[1]) Synonyma vide in Öfvers. Vet. Akad. Förh., 1867, Bih., p. 11.

which, by D'ORBIGNY, was described under the name of *Semieschara lamellosa.* Furthermore, its avicularia have attained a peculiar development, varying from being linear, acute, or sometimes with a triangular mandible, as usual in this species, to becoming spathulate, of a greater size, sometimes, in length, equalling the zoœcia. As to their place and direction, in the same degree they may vary, as shown by the figure. For the variability of the zoœcial construction, in my former papers [1]), I have given a fuller account, where it will be seen, that, from this point, we can scarcely admit of any distinction of specifical value; but for the peculiarity of the development of the avicularia, the Floridan form, as a distinct variety, I propose to be named *Escharella spathulata.* As to its size, in the more outgrown colony, the breadth of the secondary zoœcial aperture can be measured to between 0,12 and 0,13 mm. In the British Museum I have seen one specimen of it from Torres Strait; hence it proves to have a rather great geographical range.

Escharella Landsborovii [2]) (Pl. X, figs 201 and 202).

This species, in all its varieties of calcification, has given me much trouble. In the northern regions, when preparing my former papers on the Bryozoa, I found the feebler degrees of calcification so constantly different from the state of development, which at first was described as *Escharella* (*Lepralia*) *Landsborovii,* and, in their primary shape, so much alike the *Escharella porifera,* that in the same group I united them with this last-named species, under the two names of *Escharella minuscula* and *E. majuscula,* as marking other differences of slighter value. Now, in the Floridan collections, on a mass of calcareous deposit, from 13 fathoms, I find a colony of *Escharella minuscula,* with the avicularian rostrum well developed, which, in its older parts, where it is more calcified, in all things agrees with the typical *E. Landsborovii,* excepting only its size (the breadth of the primary zoœcial aperture being about 0,1 mm.) and the just named rostrum, whose development can be of no importance for the specifical distinction, as it can be found, also, in the otherwise typical constitution of this species. The oœcia, of which I only can see one in a complete condition, still lack the peculiar markings common for this form (as well as for *E. majuscula*) with the typical *E. Landsborovii* [3]); but this difference, in northern specimens, could be remarked between the oœcia of the same colony [4]). *E. minuscula* and *E. majuscula,* then, as varieties of the same type as *E. Landsborovii,* are to be removed from *E. porifera,* which, after this emendation, is yet more naturally connected with *E. palmata* [5]).

Of the typical *Escharella Landsborovii,* POURTALES has taken two colonies, from the same locality, at the depth of 176 fathoms. The one of these (fig. 201), growing

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[1]) l. c. pag, 87 etc.

[2]) Synonyma vide in Öfvers. Vet. Akad. Förh., 1867, Bih., pp. 9 et 13! Adde:
Lepralia bella, BUSK, Quart. Journ. Micr. Sc., vol. VIII, Zoophyt., tab. XXVII figg. 2 et 3 (figuras solum vidi); HINCKS, Ann. Mag. Nat. Hist., ser. 3, vol. IX, p. 205; NORMAN, Brit. Assoc. 1868, Rep., p. 306.

[3]) Compare Öfvers. Vet. Akad. Förh. 1867, Bih., pp. 74 and 93!

[4]) l. c. pag. 75.

[5]) In the south Atlantic, at the Falkland-Islands, the *Escharella porifera* evidently is represented by the *Escharella galeata* (*Lepralia galeata,* BUSK, *Cat. Polyz. Brit. Mus.,* p. 66, pl. XCIV, figs. 1, 2); and indeed,

on a dead *Rhynchonella*, for the most part is overgrown by a crustacean Nullipore, only a few zoœcia remaining free, and these all wanting the oral avicularium. The other colony (fig. 202) is young and clear, of a prettily shining, pale azure bluish hue. Here, the small, roundish oral avicularia are constantly developed above the median denticle of the zoœcial aperture, enclosed into its secondary margin; and with their dorsal (here distal) side, usually, they are projecting into the secondary zoœcial mouth, like an upper, secondary denticle. As to their size, both these colonies have the breadth of their zoœcial aperture of about 0,19 mm.

ESCHARIDÆ.

In my former papers [1]) I proposed the establishing of this family, as founded, principally, on the horseshoe-shape of the zoœcial aperture; and still I think, in this manner a very natural group will be collected around the old-known *Lepralia pallasiana* and *Eschara cervicornis*. But in two ways, the preceding family has more and more approached to the typical constitution of this group., viz. through the *Escharella depressa* to the *Lepralian* and through the *Escharella Landsborovii* to the *Escharan* type. Furthermore, in the following, I will give reason for uniting into one family these types with the *Discopores*, then, of course, changing the characteristic of this family, as formerly given.

Around the *Lepralia (Cellepora) edax*, as formerly known from the Tertiary Crag and the Recent British sea, a series of forms, very intimately connected with each other, will be grouped together.

Lepralia inornata [2]) (Pl. XI, figs. 215 and 216).

This species, evidently, bears the strongest resemblance to the above-described *Gemellipora striatula* and possesses the same colonial organs, in the same position, as in that species, with which it agrees, also, in the size, the breadth of the zoœcial aperture, according to the different age and development of the colony, varying between 0,05 and 0,07 mm. The avicularia, with their small, round aperture, here also, have the appearance and position of abortive zoœcia, placed, normally, at the distal end of these, but in the development of a new zoœcial row taking the first place at its origin, in the position as shown by the fig. 216. The oœcia, also, with the avicularium close at their distal end, agree with those of the *Gemellipora striatula*. Lastly, the transverse striation *(undulations*, Gabb et Horn) is common for both these species. The manner of calcification, however, is not the same, for, besides the missing, in the *Lepralia inornata*, of the longitudinal striation, its zoœcial wall grows thicker, and, in

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were it not for the pointed mandible of the avicularium, as shown in the figures given by Busk, these two forms ought to be united into one species.

1) Öfvers. Vet. Akad. Förh., 1867, p. 481, and. Bih., p. 122.

2) *Cellepora inornata*, Gabb et Horn, *Foss. Polyz. Sec. and Tert. Form. North. Amer.*, Journ. Acad. Nat. Sc Philad., n. ser., vol. V p. 127, tab. 19 fig. 10.

the younger zoœcia, especially around the pores, has a milky appearance. Still, the colour of a more outgrown colony is yellow, as also in *Gemellipora striatula.*

The most characteristical difference between these species, which has caused us to place them in different families, depends on the shape of the zoœcial aperture, which here, in the *Lepralia inornata,* is keyhole-shaped by the contraction at the articulation of the operculum, usually at the third part of its length. Thus, indeed, in the comparison with the preceding family, it most nearly approaches to the form of the *Escharella depressa* or to the above described structure of the *Myriozoum ovum,* as being constituted by a combination of two circles of unequal size; but this resemblance, readiest to be accounted for as a consequence of its low position in the serial development of the escharine type, is far exceeded by its agreement with the *Lepralia cleidostoma,* so as nearly to be impossible to distinguish from it.

From the POURTALES-collections to judge, the *Lepralia inornata,* at first described as a fossil from the Eocene formation, seems not to be common in the Floridan sea, as I only have seen two colonies, growing on dead shells, the one from 26, the other from 60 fathoms.

Lepralia cleidostoma (Pl. XI, figs. 217—219).

Char.: Zoœcia rhombica, primo ventricosa, calcificatione progrediente deinde confluentia, aperturam (cujus latit. = 0,1—0,13 mm.) præbent claviformem, ad tertiam partem longitudinis coarctatam (juvenem setis marginalibus 2 l. 3 interdum fimbriatam); aviculariis lateralibus acutis, extus vergentibus muniuntur. Oœcia globosa striis radiantibus ornantur.

Hab.: Lepraliæ (auctt.) et *Celleporæ* (auctt.) formam, Coraliis et testis insidentem, e proff. 30—120 orgyarum hanc speciem sustulit POURTALES.

With the same shape of the zoœcial aperture, as in the preceding species, differing only in size, the *Lepralia cleidostoma,* through its zoœcial form and strong calcification, combines the general structure of the arctic *Lepralia hippopus* [1]). Its distinctive characters, in comparison with that species, would be the narrowness of the proximal part of the zoœcial aperture, the wanting of the pores in the zoœcial wall, the acute form of the avicularia and the striation of the oœcia. But all these characters, from systematical point of view, if justly reviewed, will loss the greatest part of their weight. The proximal rounding of the zoœcial aperture, here, as being partly filled up, can get the proximal margin less concave, more approaching to the corresponding structure in the *Lepr. hippopus;* and, in that species, we have remarked [2]) a secondary change approaching the form of the *Lepr. cleidostoma.* As to the pores in the zoœcial wall, their wanting, as in many other instances, can be accounted for by the very common variability of the calcification. That same variability, in one and the same colony, in other species, has been found to be the case with the form of the avicula-

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[1]) Öfvers. Vet. Akad. Förh. 1867, Bih., pgs. 20 and 127.
[2]) l. c., p. 128.

ria. Lastly, it is a very interesting circumstance, connected with the difference in the structure of the oœcia, for that same peculiarity, as they are striated in the *Lepr. cleidostoma*, once, by BUSK, in the structure of the zoœcia, was cited as characteristical for the *Lepralia adpressa* [1]), which character, however, at late was cast away. But, besides the development of the avicularia, this structure of the zoœcial wall was the only appliable character for the distinction between the *Lepr. hippopus* and *Lepr. adpressa;* and then, for the appreciation of the systematical weight of the differences, it is of great interest to find a character, fading away in the zoœcia, to return, in the structure of the oœcia, in a closely related species. For the commonness of their origin, that circumstance will leave a very good argument.

In the same time, this striation of the oœcia, together with the form of the zoœcial aperture, with this group connects, also, the Adriatic *Lepralia Kirchenpaueri* [2]).

The *Lepralia cleidostoma* was taken by POURTALES in only a few specimens. In one of these, the zoœcia, of an almost Celleporine constitution, are raised to form a low tuberosity. The colour of the colony is shining white, either pure or with a bluish tinge. The surface of the zoœcia is almost quite smooth or roughened by irregular warts and impressions.

Lepralia edax [3]) (Pl. XI, figs. 220—225).

1. Forma typica:

Hab.: Coloniæ in stirpis subcompressæ formam erectæ fragmentum minimum e prof. 49 orgyarum sustulit POURTALES.

2. Forma *calcarea* (figg. 220—223).

Char.: Zoœcia colore calcarea aperturam claviformem, parte proximali breviorem, margine proximali aperte concavam vel fere rectam, frontem vulgo ad marginem solum porosam præbent, linea marginali elevata limitantur, aviculario marginali rotundo muniuntur. Oœcia depresse-rotunda aream frontalem calcificatione debiliori notatam præbent, foramine transverse-elliptico in apice hujus areæ aperiuntur. Avicularia, zoœciorum magnitudinis et formæ, inter zoœcia sparsa aperturam lageniformem, parte distali (rostrali) lineariter extenuatam, ad articulationem mandibulæ trabecula calcarea trajectam præbent.

Hab.: Colonias duas (figg. 221 et 223) erectas, pumicosas, quarum una (fig. 221) tubum vermis *(Serpulæ)* edit, e proff. 49 et 79 orgyarum cepit POURTALES.

3. Forma *janthina* (figg. 224 et 225):

Char.: Zoœcia colore violacea aperturam formæ præcedentis similem, frontem porosam præbent, linea marginali elevata limitantur, aviculario laterali acuto muniuntur.

[1]) *Brit. Mus. Catal. Polyz.*, p. 82, pl. CII, figs. 3, 4; Quart. Journ. Micr. Sc. vol. IV, p. 178, *Zoophyt.*, pl. VIII, fig. 6; HINCKS, *Cat. Zooph. S. Dev. S. Cornw.*, Ann. Mag. Nat. Hist., ser. 3, vol. IX, p. 205.

[2]) HELLER, Verh. k. k. Zool. Bot. Ges Wien, Bd. XVII (1867) p. 105.

[3]) *Cellepora edax*, BUSK, *Monogr. Crag Polyz.*, p. 59, tab. IX fig. 6, tab. XXII fig. 3; ID., Quart. Journ. Micr. Sc., n. ser., vol. I p. 154, *Zoophytol.*, tab. XXXIV figg. 3 et 3a; HINCKS, Ann. Mag. Nat. Hist., ser. 3, vol. IX p. 304.

Hab.: Coloniam crustaceam Coralio insidentem e prof. 13 orgyarum sustulit POURTALES.

The typical form of the *Lepralia edax*, as in the *Crag Polyzoa*, it was first described by BUSK, will be distinguished from the two other forms, here to be described, by its manner of raising the front wall of the zoœcia into a median umbo, just proximally of the zoœcial aperture. Furthermore, it seems to want the avicularia as well as the oœcia, what character, however, in systematical respect, can be of no use. In the Quart. Journ. Micr. Sc., cited below in the preceding page, in describing the Devonshire specimen, BUSK presents another variety of the European form, with the zoœcial wall punctured, rough (roughly verrucose in the figure) and with the form of the zoœcial aperture, (in the one of the figured zoœcia) more approaching to the preceding *Lepralia cleidostoma*. With this zoœcial constitution, off Elbow reef a little fragment was taken by POURTALES. It is about 4 mm. high, 2 mm. broad, a little compressed, pointed, of pumicose consistence. Besides the zoœcial apertures of the typical form, here, also, I find some of them almost entirely agreeing with the last-named species. Thus, the breadth of the distal part of one zoœcial aperture can be measured to be about 0,06 mm., while the same measurement of its proximal part gives not more than 0,036 mm. As a third European variety of this species I regard the *Lepralia lata*[1]), which, in comparison with the other forms, in the plainness of its zoœcia, arranged in only a single layer, retains the escharine constitution unaltered. That same peculiarity, although not in the same degree, among the Floridan forms, distinguishes the *Lepralia janthina*, which in its size, also, almost agrees with the *Lepralia lata*, its zoœcial aperture having a breadth of about 0,11 mm., and, in the growing edge of the colony (fig. 224) it differs from that form, principally, by the more ovate shape of the zoœcia, with a more convex front-side, in the middle of which they are provided with a lateral avicularium, with a triangular mandible, pointing distally, towards the zoœcial aperture. The margin of this aperture is sharply defined, a little raised, and, usually of a little whitish tint, in contrast with the black-bluish colour of the zoœcial wall. In the middle of the roundish colony, the zoœcia, in the celleporine manner, are raised (fig. 225) and heaped together, irregularly. The avicularium, then, as very common among the Celleporines, will be raised into a freely ascending process.

This change into the celleporine constitution, the *Lepralia calcarea* almost entirely has undergone. It was found, by POURTALES, growing in raised stems of a pumicose consistence. Once (fig. 221) a *Serpula*, I think, had fixed itself upon such a colony, where, at last, is was enveloped by the overgrowing Bryozoon, and its calcareous shell, in the well-known manner, was eaten away. Thus, the inner surface of the Serpulan tube, longitudinally striated and densely prickled by warts and impressions, now »is formed by the backs of the bryozoan cells disposed in parallel rows,» »much as they are on the concave surface of some Lunulites».

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[1]) BUSK, Quart. Journ. Micr. Sc., vol. IV p. 309, *Zoophytol.* tab. X, figg. 1 et 2; MANZONI, *Bryoz. Plioc. Ital.* Sitzb. k. Akad. Wiss. Wien, vol. LIX (1869), p. 4 (sep.), tab. 1 fig. 6.

In consequence of the celleporine nature, the outer shape of the zoœcia is very irregular. Sometimes their front side wants the pores, but most commonly it is striated by converging furrows, leading upwards from the only remaining marginal pores. The breadth of their aperture varies between 0,07 and 0,08 mm. The oœcia present a very characteristical feature in the constitution of their front wall. This, in the middle, is thinner, in an elongate space between the aperture and a transversely elliptical hole in the tip of the oœcion, reminding of this structure in many of the Retepores. Furthermore the oœcion has its own aperture, separated, by a calcareous plate, from the lower aperture of the zoœcion. The small avicularia, nearest in correspondence to the lateral ones in the preceding *Lepralia janthina*, here are placed in the furrows between the zoœcia. As both the colonies examined are dead, no avicularian mandible is retained, but, after the form of their aperture to judge, this must have been semicircular. The greater avicularia, in their size and position corresponding to the zoœcia and irregularly dispersed among these, have an inversely spathulate or a flash-shaped form of their aperture, with its linear produced tip pointing obliquely upwards. At the articulation for the mandible, the aperture, with a breadth of about 0,1 mm., is crossed over by a calcareous bridge, roughly dentated on its mandibular side.

As to the systematical weight of the differences of the two last-named Floridan forms from the typical *Lepralia edax*, these, if regarded in connexion with the differences between the other Lepralian forms, rather will be accounted for as indicating local varieties. If compared with the *Lepralia cleidostoma* and *Lepr. inornata*, through the intermediate forms of *Lepr. adpressa*, *Lepr. Kirchenpaueri* and *Lepr. hippopus*, they are connected with these in a very natural series, where they are to be regarded as the highest known differentiations.

Far enough from this series, although, for the form of its zoœcial aperture, most likely to be placed in the genus *Lepralia*, the Floridan fauna presents a seemingly new species,

Lepralia turrita (Pl. XI, figs. 226—228).

Char.: Zoœcia erecta (quorum altitudo circ. = 0,75 mm.) dense conferta coloniam planam favosam exstruunt, aperturam ellipticam (cujus latitudo circ. = 0,15 mm.) ad articulationem operculi aliquanto constrictam, 4 (vel interdum 5) spinis teretibus, inarticulatis coronatam præbent. Oœcia rotunda, interdum bimucronata, media parte frontis supra aperturam poris perforantur. Avicularia spathulata inter zoœcia sparsim exsistunt; minora, rotunda parieti zoœciorum affixa sunt.

Hab.: Hanc speciem fragmentis Coralliorum et Nulliporis affixam e proff. 26—44 orgyarum haud frequentem cepit Pourtales.

The great size of the zoœcial aperture of this species, particu'arly if compared with the size of the front side of the zoœcia, as presented in the upper surface of the colony, together with the stout marginal spines, gives it the appearance rather of a

Membranipore in a high degree of calcification. A closer examination, however, particularly of the young zoœcia, clearly shows their truly escharine constitution, although they are modified in the celleporine manner, in being raised vertically, thus, in the upper surface of the colony, presenting only their distal part, with the horizontal aperture crowned by its raised margin, which is as it were broken up into 4 or 5 pointed tubercles. These, as the representatives of marginal spines, for their form and position, most readily will be compared with the proximal pair of the spines in the *Lepralia spathulifera* [1]).

The freely raised oœcia, as they are placed among the above-named spines, in the thickening of their wall, seem to coalesce with these, whereby sometimes they appear to be irregularly mucronate. Their frontside, above the aperture, is perforated by pores. Besides the great spathulate avicularia, with their decumbent aperture, which are irregularly dispersed among the zoœcia, smaller ones, of a rounded shape, are to be found on the vertical sides of the zoœcia.

The occurrence of this species, in the Floridan sea, seems not to be frequent, as only a few specimens were taken by POURTALES. In its worn condition, it is very difficult to recognize.

Of the genus *Eschara*, in the POURTALES-collections we find two wellgrown specimens of the *Lepralian* state [2]) of the well-known

Eschara cervicornis (Pl. XII, figs. 230 and 231).

It was growing on a Coral from 116 and on a fragment of a *Cidaris*-shell from 183 fathoms. The colonies are white, shining, the zoœcia of a uniform thickness, with the pores in a single row along their own margin as well as along the basal margin of the avicularium (fig. 230). The breadth of the zoœcial aperture may be measured to about 0,19 mm. Sometimes, in the distal part of its margin, two bristles are to be seen.

In my former papers I have shown, how many intermediate forms connect this species with the *Eschara (Lepralia) verrucosa;* and, as above remarked, the *Escharella Landsborovii* in another way connects it with the Myriozoidan type. Through its raising of the median avicularium, sometimes into the form of a highly developed rostrum, as well as through the form of its primary zoœcial aperture, the genus *Eschara*, however, still nearer approaches to the Discoporidan type. And, indeed, its most essential character, for the distinction from the Discoporidan family, as formerly constituted [3]), was the difference in the shape of the secondary zoœcial aperture, which then doubtlessly was too highly estimated. Now, as from the developmental changes of the

[1]) Öfvers. Vet. Akad. Förh. 1867, Bih., p. 125.
[2]) Öfvers. Vet. Akad. Förh. 1867, Bih., pp. 23 and 150.
[3]) Öfvers. Vet. Akad. Förh 1867, Bih., p. 22 at *C*.

colonies, in considering the differences between the individuals of different colonial age, we have seen all the escharine types to be starting out from a common, membraniporidan origin, it is a natural consequence, these types in many ways will run together again; but, for holding together, systematically, the nearest allies, we arrange them into systematical families, whose significance most easily will be understood, by comparing their representatives of corresponding typical development. These representatives we may cite:

Porellina ciliata for the family Eschariporidae,
Hippothoa spinifera .... Myriozoidae,
Discopora emucronata[1]... .... Escharidae,

as the last-named family now will be appreciated.

By this arrangement, I think, all the known escharines (and celleporines) will find a natural place in the system, if compared with any one of these representatives or with some of their relatives. As easily will be seen, in their typical, primary constitution, the named three families are characterised: the first by its median pore, the second by its median sinus, the third by its wanting of both.

To this restriction of the number of the families of this group, I have been led, particularly, by the constitution of one of the Floridan *Reteporæ*, as that genus formerly was acknowledged. This species is nothing else than the wellknown *Retepora cellulosa*, but as it occurs here in a variety of high systematical interest and of very characteristical constitution, it may well deserve its own name,

Retepora marsupiata[2]) (Pl. XIII, figs. 245—254).

Char.: Zoœcia ovata, postremo magis minusve cylindracea stirpem retiformem exstruunt, aperturam primariam (cujus latitudo circ. = 0,08 mm.) semicircularem, fere horizontalem (in plano frontis zoœcii positam) præbent, secundariam vero aperturam primo elevatam, tubiformem, proximaliter sinuatam (ubi igitur, tubo accrescente, extus bisulcata fit), calcificatione progrediente deinde immersam; aviculario orali, laterali, obliquo muniuntur, rotundo vel acuto, in apertura secundaria immerso vel in rostri obliqui formam erecto. Oœcia rotunda rima frontali aperiuntur.

Hab.: Variis in profunditatibus (16—262 orgyarum) maris Floridani hanc formam viventem cepit Pourtales. In mari ad insulam *Teneriffa* secundum Busk vivit.

In their primary state, the zoœcia are hyaline, without pores, elongated ovate, with their front-side slightly convex and marked from the lateral sides by a longitudinal crest. Inside this crest, sometimes a few depressions are to be seen, indicating, perhaps, some formation of secondary pores, although these never seem to attain any

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[1]) Öfvers. Vet. Akad Förh. 1871, p. 1129.

[2]) ? *Phidolopora labiata*, Gabb et Horn, *Monogr. Polyz. Sec. Tert. Form. N. Amer.*, Journ. Acad. Nat. Se. Philadelphia, vol. V p. 138, tab. XIX fig. 21
Retepora marsupiata, Busk, mscrpt.

further development. The zoœcial aperture, then, is horizontal (the zoœcion supposed to hold that position), semielliptical, with well defined, a little raised rim, and with the proximal margin slightly concave. Its breadth, then, can be measured to be about 0,08 mm.; its length to about 0,06 mm. Above this, the irregularly tubular secondary aperture raises itself, directed obliquely distally, in growing upwards taking with it, at its sides, the continuation of the above-named crest. The distal part of this tube very often fails, the secondary raising, then, ending abruptly, laterally, at the crest. The proximal part is bent, in its middle, in a sinus, thus, in its growing upwards, producing, internally, a rounded furrow, corresponding externally to a rounded median ridge. In connexion with this bending, the lateral avicularium is developed at the one of the longitudinal impressions, or furrows, which externally limit the above-named ridge. In the European *Retepora cellulosa*, this avicularium, when not replaced by a great acute one, is very small [1]), and in producing upwards (towards the zoœcial aperture) the margins of its aperture, attains that slit-like appearance, at first pointed out by Busk; here, in the *Ret. marsupiata*, it gains a greater development, although, sometimes, it may fail, another time, in the same colony, one may find it rounded and immersed in the secondary zoœcial aperture, as well as with an acute mandible, highly pointing outwards obliquely. Beside these avicularia, small rounded ones, with elliptical aperture, are irregularly distributed on the front side of the stem. The oœcia are rounded, a little elongated, with a longitudinal (vertical) slit in front. While all these organs are developing themselves, the zoœcial wall, by the advancing calcification, loses its hyaline condition, grows thicker, and the surface of the stem is rendered more or less even, by filling up the limitar furrows between the zoœcia. The secondary zoœcial aperture, then, is rounded, with a proximal slit (the secondary median sinus) of an oblique position, as it is thrown to the one side, by the development of the avicularium at the other. The retiform stem varies in the shape of its branches; sometimes, and this seems to be the case in the deeper regions of the sea, they are narrow, rounded, sometimes, f. i. in the colonies taken at the depth of 16 fathoms, they are broader, flattened.

This species, if we compare it with the formerly so named *Eschara (Escharoides) rosacea* [2]), evidently belongs to the same genus. The primary shape of the zoœcia, the primary as well as the secondary zoœcial aperture, the oral avicularium as well as the small, rounded ones, scattered on the secondary surface of the stem, are almost all the same.

The differences refer to the limitar crest of the zoœcia, the slit on the oœcia and the development of the great, acute avicularia, in the *Retepora marsupiata.* The difference in the form of the colonial growth can not be of any generical value.

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[1]) The correspondence between the small, slitlike and the great, acute avicularia, in the typical *Ret. cellulosa*, is not yet fully demonstrated; but, as they hold the same position as in the *Ret. marsupiata*, that correspondence is at least highly probable.

[2]) Compare f. i. our figure 254 with the figs. 156 and 157 in the Pl. XXVI in Öfvers. Vet. Akad. Förh. 1867!

Retepora reticulata [1]) (Pl. XIII, figs. 242—244).

Char.: *Reteporæ Beanianæ* varietas aviculariis majoribus elongate-spathulatis munita, apertura secundaria zoœciorum vulgo magis aperta.

Hab.: In profunditate 270 orgyarum maris extra Havannam hanc varietatem cepit POURTALES.

The only specimen which was sent me for examination, is the type-specimen for the *Cellepora reticulata*, POURT.; and this proves to be a slightly marked variety of the common *Retepora Beaniana*. The great avicularium — for, in the whole colony, I can not see more than one of that kind — with its decumbent, almost linear, transversely placed aperture, is rather a transformation of the zoœcion beneath, whose aperture at least is covered by the apertural part of the avicularium. This feature, indeed, has never been observed in the typical *Retepora Beaniana*, and, in addition to the generally more rounded and open secondary zoœcial aperture, if proved, by further investigation, to be of a constant occurence, will make a distinct form, perhaps, of the Floridan variety, although in all other essential points it seems to agree with the typical form.

The difference between the *Retepora Beaniana* and *Ret. cellulosa* is quite analogous with that between the *Eschara (Porella) lævis* and the *Retepora rosacea*. Hence, as the first-named species, through the variations in the developmeot of its oral avicularia [2]), can not be separated from the second but for the presence of a truly median oral avicularium, either the *Retepora Beaniana*, for that character, must be thrown into the same genus with the *Eschara (Porella) lævis*, or all the named species must be united into one and the same genus. It is a matter of agreement, how far to proceed in the establishing of generic divisions; but, as the *Retepora Beaniana*, through the form of its first zoœcia, as it occurs, sometimes [3]), in a *Lepralian* (auctt.) stage, evidently has proved to be of the formerly so named *Discoporidan* type, we are obliged to reunite the three families *Escharidæ*, *Discoporidæ* and *Reteporidæ*, which were formerly acknowledged.

Discopora advena (Pl. XII, fig. 232).

Char.: Zoœcia rotundate-rhombica vel fere rectangularia, ventricosa frontem imperforatam, aperturam semiellipticam vel semicircularem præbent cujus latitudo circ. = 0,16 mm.) setis marginalibus 6 vel 7 munitam, margine proximali recto bisinuatam, aviculario acuto, obliquo, aperturæ proximaliter apposito muniuntur.

Hab.: In mari ad Floridam e proff. 79 et 116 orgyarum hanc speciem Coralia obducentem cepit POURTALES, quam in Museo Brittico e mari Chinensi apportatam vidi.

With a true Escharidan shape of the zoœcia, in a very pure condition, this species combines that peculiar form of the proximal margin of the zoœcial aperture, which

[1]) *Cellepora reticulata*, POURT., Bull. Mus. Comp. Zoöl. Cambr. N:o 6. p. 110.
[2]) See Öfvers. Vet. Akad. Förh. 1867, p. 487!
[3]) Öfvers. Vet. Akad. Förh. 1867, Bih., p. 200.

above we have described on the *Escharella bisinuata*. This last character, allowing for the agreement of this species, in other points, with the Discopores, rather will be accounted for as an anomaly from the generic type than to give reason for establishing it a new genus. It is the reason, also, why I dare not to identify this species with the *Reptoporina eustomata*, by GABB et HORN [1]), although in the worn zoœcia it is lost, and very often, through the projecting avicularium, it is concealed.

After the POURTALES-collections to judge, the *Discopora advena*, in the Floridan sea, seems rather to be uncommon, as it was taken, by him, in two colonies only which both want the oœcia. In the British Museum I have seen it from the Chinese Sea, 20 miles north of Mino-Sima.

Discopora albirostris (Pl. XII, figs. 233—239).

Char.: Zoœcia rhombica vel ovoidea frontem præbent convexam, aperturam semiellipticam, margine proximali concavam, margine distali et laterali setis marginalibus 8—2 coronatam vel lævem; aviculario ad aperturam obliquo in rostri formam erecto muniuntur. Avicularia lateralia vel acuta, extus vergentia, in media longitudine frontis zoœciorum exsistunt vel majora, spathulata vel acuta, magnitudine interdum zoœciorum, inordinatius inter zoœcia sparsa sunt.

1. Forma *pusilla* (fig. 233).

Char.: Zoœcia minima coloniam crustaceam vel in capituli cylindrici coloris eburnei formam erectam exstruunt, frontem præbent nitidam vel impressionibus, si levis sit calcificationis, punctatam vel verrucis minimis, si durioris sit calcificationis, granulatam, aperturam præbent setosam (setis usque ad 8 coronatam) latitudine 0,06—0,09 mm., avicularlis acutis muniuntur, quæ tamen interdum deficiunt. Oœcia elevata, valde aperta, in colonia erecta exsistunt.

Hab.: Colonias quasdam parvas coloniæ mortuæ valde erosæ formæ sequentis insidentes in prof. 9 orgyarum cepit POURTALES; coloniam erectam testæ mortuæ insidentem in profunditate 60 orgyarum invenit.

2. Forma typica [2]) (figg. 234—239).

Char.: Zoœcia frontem præbent imperforatam vel ad margines porosam, aperturam bispinosam vel lævem præbent, latitudine 0,14—0,28 mm.; aviculario rostrali mandibulo obtuso clauso, subtus in latere rostri calcarei, teretis, sæpissime acuti posito muniuntur. Avicularia majora spathulata (vel longius producta mandibulo acuto clausa) inter zoœcia distributa sunt.

Hab.: In prof. 25—35 orgyarum sat frequentem hanc formam crustaceam (Lepraliam, auctt.) vel *Hemescharæ* (auctt.) modo expansam cepit POURTALES. E mari prope Sydney (Australiæ) apportatam in Museo Brittico eam vidi.

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[1]) Journ. Acad. Nat. Sc. Philad., vol. V, p. 144, tab. XX, fig. 26.

[2]) ? *Cellepora cucullina* MICH., *Icbnogr. Zoophytol.* p. 324, tab. 77 fig. 13.
? *Cellepora ceratomorpha*, REUSS, *Foss. Polyp. Wien. Tert. Beck*, p. 80, tab. IX fig. 25.
? *Cellepora bispinata*, BUSK, *Cat. Mar. Polyz. Brit. Mus.*, p. 87, tab. CXX figg. 1 et 2.
? *Cellepora mamillata*, ID, ibid., tab. CXX figg. 3—5.

The close relation existing between the two above-named forms, in spite of their great difference in size and outer appearance, incontestably is proved by the very same form of their zoœcial apertures.

The *Discopora pusilla* is to be reckoned among the smallest escharines. It is of a shining yellow-whitish hue; the colonies in patches of only a few millimetres or raised into a calcareous-white cylindrical stem, about 3 mm. high. The convex front wall of the zoœcia, in a radiating manner, usually prickled by small depressions, remnants of the primary pores, or at last, in the highest degrees of calcification, granulated by warts, sometimes, on its side bears an acute, lateral avicularium, whose horizontal aperture points outwards. This, however, seems to be of a very rare occurrence, when on the contrary the oral avicularium is constant, in the same position as in the preceding species, but more projecting over the zoœcial aperture, in that as well as in other respects, in the nearest resemblance to the northern *Discopora contigua*, with which this form, indeed, is closely allied, although once [1]), by a mistake, in not giving the form of the zoœcial aperture its worthy attention, I placed that northern *Discopora* at the side of the true *Celleporæ*.

The typical *Discopora albirostris*, in a fresh condition, is readily recognizable by its grayish-brown colour, with blackish-brown opercles in the zoœcial and avicularian apertures, against which the calcareous white, projecting rostra show off. The zoœcia in the growing edge of the colony are elongated ovate, in most respects presenting the greatest resemblance to the Tasmanian *Cellepora (Discopora?) bispinata*, as figured by Busk, although I dare not to identify them with that Tasmanian species, as, in this state, the Floridan form seems to be of much greater size and has a much more developed rostrum, with an avicularian aperture, which, certainly, would not, by Busk, have been described as »a very minute».

In the middle of the colony, the celleporine growth has raised the zoœcia, heaping them irregularly over each other, and, then, this form in all points corresponds with the Patagonian *Cellepora (Discopora) mamillata*, as described by Busk, particularly as the surface of the colony here, also, sometimes is »studded with mamillary projections»; but the figures, given by that author, present a more acute mandible of the rostral avicularium, and, in the description, he says that organ to be placed on the internal face of the rostrum, whereas, in the Floridan form, the aperture of this avicularium is placed laterally. What he tells of »a conical spine in the opposite side of the mouth», here also will be found; but this is nothing else than the rostrum of an overgrown zoœcion in the layer beneath. Thus, at present, we can not identify the *Discopora albirostris* with the description of any living species, and, perhaps, the two cited synonyma once will be joined to the Tertiary *Cellepora (Discopora) ceratomorpha*, Reuss, or to the *Cellepora (Discopora) cucullina*, Michelin, but for that purpose, I think, a new examination of the named fossils will be necessary.

In finishing its secondary zoœcial aperture, the *Discopora albirostris*, sometimes, at the side of the avicularian rostrum, produces the margin of the aperture in a lower

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[1]) Öfvers. Vet. Akad. Förh. 1867, Bih., pgs. 31 and 189.

denticle, thus between this and the named rostrum producing, in a manner, a secondary sinus, reminding of the corresponding feature in the *Retepora cellulosa* and *Ret. rosacea;* still, at other times, this denticle totally wants, and the latero-distal part of the margin of the aperture raises itself uniformly. As a rather curious variety we may cite the colonies, in which the oral avicularium, of a very constant form, with an elongate, rounded rectangular aperture, of the form as shown in the fig. 236 (highest in the figure), of about the same breadth as the zoœcial aperture, raises itself on some of the zoœcia only, while the other zoœcia want the avicularium, in being provided only with an acute rostrum (mucro). This, in the *Discopora albirostris*, not uncommonly seems to be the case. In the *Discopora pusilla*, in the above-named cylindrical stem, the same deficiency of the rostral avicularium is to be observed. That specimen, furthermore, presents the oœcia, which elsewhere have been wanting in the Floridan *Discoporæ* examined. These oœcia are elevated, in the middle above their aperture sometimes pointed, with a rather wide mouth. Between them and the zoœcial rostrum, one pair of denticles usually is developed, which perhaps answers to marginal bristles, thickly calcified, although on other zoœcia, deprived of oœcia, between these denticles, three bristles of the ordinary, slender form are placed on the distal part of the apertural margin, thus supporting the supposition, the denticles rather will answer to the above-named secondary raising of the lateral margin of the aperture.

Discopora pertusa (Pl. IX, fig. 182, Pl. XII, figs. 240 and 241).

Char.: Zoœcia ovata, ventricosa, erecta, tota fronte poris pertusa (vel interdum strato secundario calcificationis imperforato, nitido obducta) aperturam præbent semiellipticam (cujus latitudo circ. =0,31 mm.), margine proximali concavam, ad articulationem operculi interdum coarctatam, parte latero-distali secundaria libere erectam; aviculario ad aperturam proximali muniuntur obliquo, mandibulo obtuso clauso, quod in apertura secundaria immergitur.

Hab.: In proff. 35—60 orgyarum hujus speciei colonias tuberiformes Coraliis insidentes haud frequentes cepit Pourtalès.

The most appliable character for this species, particularly in its worn condition, as its size and outer appearance will confound it with the *Cellepora gigas*, is the presence, in the secondary zoœcial aperture, of a more or less rounded oral avicularium, in an oblique position, together with the uniform, secondary raising of the latero-distal part of the aperture. Its true affinity, on the other hand, evidently is proved by the form of its primary zoœcial aperture, which places it at the side of the last preceding species. From this, however, it differs by the constriction at the articulation for the operculum, although that character, sometimes, scarcely is perceptible. In that case, the low position of the oral avicularium will distinguish it, together with the uniformly porous zoœcial wall, although this last character, sometimes, is concealed, by its covering itself, secondarily, by a shining, continuous layer of chalk. From such a colony the fig. 182 was taken. Still, in taking away that layer, the pores become apparent.

The systematical and faunistic results of the present paper in the following table will be comprehended, the one column giving the bathymetrical distribution of the resp. species at Florida, as shown by the POURTALES-collections, another column stating their geographical and geological range, as yet known, together with some systematical remarks, giving the nearest allied forms as hinting at some more or less close connection in geographical or geological respect.

	Depth at Florida, in fathoms.	Other localities, as yet known, and annotations.
Fam. **Crisieæ**		
Gen. **Crisia**		
C. denticulata	7—60 f.	Cosmopolitan; tertiary fossil in the coralline crag.
Fam. **Diastoporidæ**		
Gen. **Diastopora**		
D. repens	306 f.	Spitzbergen, Falkland-Islands; fossil in the cretaceous and crag-period.
Fam. **Tubuliporidæ**		
Gen. **Tubulipora**		
Subg. *Idmonea*		
I. atlantica	60—270 f.	Spitzbergen — Azores, Mediterranean, Australia.
I. serpens	15 f.	Finnmarckia, Madeira etc.
I. Hochstetteriana	270 f.	Tertiary fossil in Australia.
I. Milneana	19—60 f.	Falkland-Islands, Mediterranean; tertiary fossil in California and Australia.
Fam. **Horneridæ**		
Gen. **Filisparsa**		
F. Pourtalesii	60 f.	Azores (tertiary fossil in Australia?).
Gen. **Hornera**		
H. galeata	183 f.	
Fam. **Pustuliporidæ**		
Gen. **Entalophora**		
E. proboscideoides	68 f.	Azores (300—600 f.); tertiary fossil in California.
E. deflexa	16 f.	Britain, Mediterranean; tertiary fossil in the coralline crag.
Fam. **Lichenoporidæ**		
Gen. **Discoporella**		
D. clypeiformis	130 f.	Falkland-Islands; *Discoporella crassiuscula*, its nearest allied, corresponding it in the North-Atlantic.

	Depth at Florida, in fathoms.	Other localities, as yet known, and annotations.
Fam. **Cellularieæ**		
Gen. **Cellularia**		
C. pusilla	68 f.	
C. cornigera	270 f.	
C. cervicornis	7—17 f.	Australia.
Gen. **Caberea**		
C. retiformis	68—270 f.	Patagonia?. Scarcely to separate from the *Cab. arachnoides* in the Australian sea.
Gen. **Nellia**		
N. oculata	13—138 f.	Australia.
Fam. **Bicellarieæ**		
Gen. **Halophila**		
H. Johnstoniæ	$16^1/_2$ f.	Australia.
Gen. **Bugula**		
B. flabellata	$16^1/_2$ f.	Britain etc.
Fam. **Cellarieæ**		
Gen. **Cellaria**		
C. tenuirostris	52—68 f.	Nearest allied are the *Cell. malvinensis*, corresponding it at the Falkland-Islands, and the *Cell. Johnsoni* at Madeira.
Fam. **Membraniporidæ**		
Gen. **Membranipora**		
M. lineata	42 f.	Spitzbergen, North-Atlantic, Peru, Bolivia.
M. irregularis	60 f.	Falkland-Islands. *Membr. galeata*, as the typical form of this group at the Falkland-Islands, corresponds to the *Membr. unicornis* in the North-Atlantic.
M. sigillata	262—270 f.	
M. canariensis	10—44 f.	Mediterranean, Madeira; tertiary fossil in the coralline crag.
Gen. **Membraniporella**		
M. Agassizii	450 f.	Its nearest allied, *Escharipora filiformis*, one fossil in the cretaceous period.
Gen. **Farcimia**		
F. cereus	270 f.	
Gen. **Mollia**		
M. patellaria	36 f.	Mediterranean.
M. antiqua	29—44 f.	Madeira.
Fam. **Microporidæ**		
Gen. **Micropora**		
M. coriacea	36—135 f.	Britain, Mediterranean (?), Peru (?).
Gen. **Cupularia**		
C. umbellata	7—29 f.	Madeira; fossil in the cretaceous and the crag-formations.
Gen. **Steginoporella**		
St. elegans	15—37 f.	Abrolhos Islet (south-tropical Atlantic at America), Algoa-bay; tertiary fossil in France.
St. Rozierii	?	Rio-Janeiro, Red-Sea.
Fam. **Biflustridæ**		
Gen. **Biflustra**		
B. Lacroixii	13—60 f.	Patagonia, Mediterranean (?).

	Depth at Florida, in fathoms.	Other localities, as yet known, and annotations.
B. denticulata	10 f.	Sargasso (?), Brazilia (?), Patagonia (?), Peru (?), Mazatlan, Puget-sound.
B. Savartii	29 f.	Red-Sea, Britain (? accord. to BUSK); fossil from the cretaceous (?) period and the red crag.
Gen. **Vincularia**		
V. abyssicola	68—450 f.	*Vincul. maorica* a near allied tertiary fossil from Australia.
Fam. **Eschariporidæ**		
Gen. **Cribrilina**		
Cr. radiata	60—176 f.	Mediterranean.
Cr. innominata	29—60 f.	Britain, Madeira; fossil from the coralline crag.
Cr. floridana	29—42 f.	*Cribr. figularis* the corresponding variety at Britain.
Gen. **Escharipora**		
E. mucronata	36 f.	
E. stellata	42—183 f.	*Escharipora lichenoides*, the nearest allied, from Australia.
Gen. **Porellina**		
P. ciliata	7—60 f.	Spitzbergen Mediterranean. *P. diademata* the corresponding variety at the Falkland-Islands, *P. bicristata* at Cape-Horn.
Gen. **Porina**		
P. serrulata	35—42 f.	
P. subsulcata	10—48 f.	One dead specimen from 471 fathoms. Doubtfully to separate from the *P.* (?) *sulcata*, the corresponding variety in the Australian sea.
P. violacea	35 f.	Britain, Gibraltar-bay; tertiary fossil from the coralline crag.
P. plagiopora	60 f.	Tertiary fossil of the crag.
Gen. **Anarthropora**		
A. minuscula	42 f.	Spitzbergen — Britain.
A. borealis	82—450 f.	Spitzbergen — Portugal, Azores. Perhaps a fossil of the cretaceous period.
Fam. **Myriozoidæ**		
Gen. **Myriozoum**		
M. ovum	114—233 f.	Its nearest allies seem to belong to the tertiary formation.
Gen. **Escharella**		
Subg. *Mamillopora*		
M. cupula	30—68 f.	
Subg. *Gemellipora*		
G. eburnea	120—170 f.	In the cretaceous period, the *Hippothoa elegans*, D'ORB., presented an interesting similarity to this species.
G. limbata	471 f.	
G. lata	68 f.	
G. striatula	68 f.	Red-Sea (?).
G. glabra	36—42 f.	
Subg. *Escharella*		
E. pertusa	60 f.	Britain, Australia (?).
E. sanguinea	60 f.	Britain.
E. Audouinii	37 f.	Red-Sea.
E. rostrigera	35—43 f.	*E. depressa* the corresponding variety in the Mediterranean.
E. setigera	60 f.	
E. bisinuata	9—19 f.	

	Depth at Florida, in fathoms.	Other localities, as yet known, and annotations.
E. Jacotini	13—44 f.	Spitzbergen — Cape-Horn. Red-Sea. The Floridan variety, *Escharella spathulata,* corresponds to the *Escharella lamellosa* in the North-Atlantic.
E. Landsborovii	176 f.	Spitzbergen — Britain.
Gen. **Hippothoa**		
H. Hyndmanni	40—70 f.	The Floridan variety, *Hippothoa porosa,* through the pores in the zoœcial wall, a little different from the British form.
H. spongites	13—35 f.	Mediterranean
H. Dutertrei	42 f.	The Floridan variety, *Hippothoa pes anseris,* through the form of the vibraculum, a little different from the Red-Sea-form of this species.
H. Isabelleana	17—42 f.	Rio-Janeiro. To unite, perhaps, with the *Hippothoa secundaria* of the North Atlantic.
H. mucronata	29 f.	
H. biaperta	9—60 f.	Spitzbergen; tertiary fossil.
H. divergens	120—135 f.	
H. (?) fenestrata	17 f.	Pacific.
Gen. **Cellepora**		
C. verruculata	42 f.	
C. coronata	26 f.	
C. gigas	125 f.	
C. tuberosa	15—300 f.	Finnmarckia, France, New-Foundland.
C. avicularis	9—111 f.	Spitzbergen — Britain, Mediterranean.
C. margaritacea	15—270 f.	
Fam. **Escharidæ**		
Gen. **Lepralia**		
L. inornata	26—60 f.	Tertiary fossil from North-America.
L. cleidostoma	30—120 f.	Scarcely to separate from the *Lepralia hippopus,* the corresponding variety at Spitzbergen.
L. edax	49 f.	Britain; tertiary fossil from the coralline crag.
L. calcarea	49—79 f.	Scarcely to separate from the preceding.
L. janthina	13 f.	Scarcely to separate from the two preceding forms.
L. turrita	26—44 f.	
Gen. **Eschara**		
E. cervicornis	116—183 f.	The same Lepralian (auctt.) stage of this species is common enough at Spitzbergen.
Gen. **Retepora**		
R. marsupiata	16—262 f.	Teneriffa (Busk). Scarcely to separate from the *Retepora cellulosa,* the corresponding variety in the North- and European Atlantic and in the Mediterranean.
R. reticulata	270 f.	Scarcely to separate from the *Retepora Beaniana,* the corresponding variety in the North and European Atlantic and in the Mediterranean.
Gen. **Discopora**		
D. advena	79—116 f.	
D. pusilla	9—60 f.	*Discopora contigua* the corresponding variety in the Arctic region.
D. albirostris	25—35 f.	Doubtfully to separate from the Patagonian *Discopora mamillata* and the tertiary fossils *Discopora ceratomorpha* as well as *Discopora* (? *Cellepora*) *cucullina* (Mich.).
D. pertusa	35—60 f.	

As will be seen from this table, the deeper regions, generally, contain either very old species or those with a very great geographical distribution, principally, with arctic or antarctic connection. Some of the species of the higher regions, common for the Oceans at the both sides of the American continent, without going beyond the tropics, evidently seem to point to a former connection, of a relatively late time, of these two Oceans through any Panaman passage; while other high-sea-species, common for the Carribbean and Australian seas, as well as the Mediterranean or Red-Sea, without going down to the deep regions, seem to point to any littoral connexion along the æquatorial or temperate latitudes. These considerations, however, for being further carried forth, still require a much better knowledge of the Bryozoa of the different geographical regions, than what the science possesses at present.

EXPLANATION OF THE FIGURES.

Plate I:

Fig. 53; *Nellia oculata,* one internode with the adjoining parts of the articulated stem.
» 54; One zooecion of the same, more highly magnified.
» 55; *Farcimia cereus;* part of an internode, with the bases of its adjoining lateral internodes. This stem was covered by its membranous ectocyst.
» 56; Part of an internode of the same species, as deprived of its membranous ectocyst; showing the secondary, internal calcification.
» 57; *Cellaria tenuirostris,* an internode with the adjoining parts of the articulated stem.
» 58; One avicularium and one zooecion of the same stem, more highly magnified.
» 59; Part of the tip of a younger internode, at the development of the ooecia.
» 60; *Vincularia abyssicola;* part of a colony in its Membraniporidan state.
» 61; The same species, as raising itself, from the Membraniporidan state, to the Vincularian growth.

Plate II:

» 62; *Membranipora lineata.*
» 63; *Membranipora irregularis.*
» 64; *Membranipora sigillata;* part of the reticulated stem, provided with ooecia.
» 65; Part of the back side of the same stem.
» 66; The same stem; nat. size.
» 67; Part of the stem of a more elongated form of the same species, without ooecia.
» 68; Part of the back side of the same stem.
» 69; *Membranipora canariensis;* part of a colony, covered by its membranous ectocyst.
» 70; Part of a colony of the same species, as deprived of its ectocyst.
» 71; Part of the back side of the last-named colony.
» 72; *Mollia patellaria.*

Plate III:

» 73; *Mollia antiqua.*
» 74; *Micropora coriacea.*
» 75; *Cupularia umbellata;* part of the margin of a colony, in a lower degree of calcification, as conserved in spirit, covered by its ectocyst.
» 76; Part of the back side of the same colony. At the sides of the figure, the warts are omitted.
» 77; Part of a colony of the same species, in a higher degree of calcification, as conserved in dried state.
» 78; Part of the back side of the same colony.
» 79; Part of a colony of the same species, as deprived of its ectocyst, showing the internal calcification of the zooecia.
» 80; Part of the back of the same colony.
» 81; *Cupularia doma;* part of the front side.
» 82; Part of the back side of a colony of the same species.
» 83; One small colony of the same species, nat. size.
» 84; Diagram of another colony of the same species, about two times the nat. size.

Plate IV:

Fig. 85; *Biflustra Lacroixii;* part of a colony, with elongated zooecia.
» 86; Another part of the same colony, with the areæ of the zooecia more rounded.
» 87; Part of another colony of the same species, in a lower degree of calcification, with less marked granulation, on the margin of the areas.
» 88; Part of another colony of the same species, in a low degree of calcification, with rounded areæ of the zooecia.
» 89; *Biflustra denticulata;* part of a colony, without tubercles and with scarcely marked denticulations in the areas.
» 90; Another part of the same colony, provided with tubercles at the angles of the zooecia.
» 91; Part of another colony, provided with tubercles at some of the zooecia, deprived of them at the other, and showing the denticles in the areæ more developed.
» 92; *Biflustra Savartii,* some of the younger zooecia, of a more elongated form, in the higher part of a stem.
» 93; Some of the older zooecia, of a more quadrate form, in the lower part of the same stem.
» 94; Part of the back (internal) side of a tubiform stem of the same species.
» 95; The same species, nat. size.
» 96; *Steginoporella elegans;* part of a colony, covered by its membranous ectocyst.
» 97; Part of another colony, deprived of its primary ectocyst.
» 98; One separate zooecion of the same colony.
» 99; The lateral wall of some zooecia, as separated from their neighbours.
» 100; An expanded, foliaceous stem of the same species.
» 101; One colony, in the *Siphonella*-growth, of the same species.
» 102; *Steginoporella Rozierii.*

Plate V:

» 103; *Membraniporella Agassizii,* some of the younger zooecia, from the tip of a colony.
» 104; An older zooecion with ooecion, from the lower part of a stem, where the interstitial warts cover the lateral parts of the front side of the zooecia.
» 105; From a yet older part of the same stem, where the warts are growing over the zooecial areas.
» 106; Part of a stem of this species, nat. size.
» 107; *Cribrilina radiata,* some zooecia from the margin of a colony, in a lower degree of calcification.
» 108; The same species, the one zooecion with an ooecion fixed at it, in a higher degree of calcification.
» 109; *Cribrilina innominata,* some zooecia from the margin of a colony.
» 110; Another part of the same colony, nearer to its centrum, in a higher degree of calcification.
» 111; *Cribrilina figularis,* in a lower degree of calcification.
» 112; The same species, in a higher degree of calcification.
» 113; *Escharipora* (?) *mucronata.*
» 114; Another part of the same colony.
» 115; A third part of the same colony, with ooecia and with returned avicularia.
» 116; *Porina serrulata,* some of the younger zooecia, from the tip of a stem.
» 117; From a lower part of the same stem.
» 118; A yet older part of the same stem.
» 119; Different forms of the zooecial aperture, from the same stem.
» 120; The same stem, growing on a Sertularia, nat. size.
» 121; Young zooecia from the tip of another stem.
» 122; Part of the same stem, as the preceding figure, with overgrown zooecia and ooecia.
» 123; From the margin of the same stem, with the great avicularia.
» 124; Different forms of the zooecial aperture, on the same stem.
» 125; The same stem as that of figs. 121—124, nat size.

Plate VI:

» 126; *Porellina ciliata,* the centrum of a colony, with its first, *Tati*-form zooecion.
» 127; Another part of the same colony.
» 128; Young zooecia, at the margin of another colony.
» 129; An older part of the same colony, as that of the preceding figure, with ooecia and with the overbridged secondary aperture.

Fig. 130; *Escharipora stellata.*
» 131; The same species. The shadowed zooecion shows the primary aperture almost unaltered.
» 132; Some zooecia of another colony, showing different forms of the aperture.
» 133; One separate zooecion, from the same colony as the figure 130.
» 134; *Porina plagiopora*, younger zooecia, in a lower degree of calcification.
» 135; The same species. From the margin of another colony, in a higher degree of calcification.
» 136; *Porina subsulcata,* from the growing tip of a stem.
» 137; Part of the margin of the same stem, with its great avicularia.
» 138; Some older zooecia, from another stem.
» 139; From the same stem as the preceding figure, lower down. One of the zooecia is closed. Over the proximal part of the zooecia, new avicularia are developed.
» 140; From a yet older part of the same stem.
» 141; *Anarthropora minuscula,* a young colony, in the beginning of its growth.
» 142; *Hippothoa* (?) *fenestrata,* the young zooecion, highest in the figure, showing its primary aperture.
» 143; *Tessaradoma boreale,* a colony of the *Lepralian* (auctt.) state, in the beginning of its growth.
» 144; One colony of the *Alysidotan* (auctt.) state, doubling its zooecial row (*Lepralian* state) and, thence, raised into the growth of *Tessaradoma.*
» 145; Part of a more highgrown stem.

Plate VII:

» 146; *Mamillopora cupula,* part of a colony with ooecia.
» 147, a—c; Three different colonies of the same species, in their natural size and shape
» 148; *Myriozoum ovum,* an entire internodium, disjointed, of the probably articulated stem.
» 149; The lower half of another internodium, showing the longitudinal, central canal, as well as the shape and direction of the zooecia.
» 150; The cancellated, quadrangular front side of one zooecion, with the adjoining aperture of the nearest older zooecion of the same row, as well as the apertures of the avicularia in the outer limits between the zooecia.
» 151; The outlines of some zooecia of the same species.
» 152; *Gemellipora eburnea,* part of the creeping stem. In the midst of the figure, the base of the oldest zooecion of the raised stem is seen projecting from the front side of the creeping zooecion.
» 153; Part of a raised stem.
» 154; Part of a branch as projecting from the prostrated median stem. More highly magnified.
» 155; Part of the same branch, as seen from the front-side of the zooecia; still more highly magnified.
» 156; The outline of a zooecial aperture of this species.
» 157; *Gemellipora lata.*
» 158; *Hippothoa porosa,* the Floridan variety of the *Hippothoa Hyndmanni.*
» 159; *Hippothoa pes anseris,* the Floridan representative of the *Hippothoa Dutertrei.*
» 160; The outline of a zooecial aperture of this form.

Plate VIII:

» 161; *Hippothoa spongites;* part of a colony in a low degree of calcification, with greatly developed avicularia, with an ooecion, crowned by three avicularia, covering the aperture of one zooecion as well as the greatest part of the front-side of the nearest younger zooecion of the same row.
» 162; Part of a variety of this species in a higher degree of calcification with smaller avicularia, with the outline of one ooecion in the top of the figure and with a great, spathulate avicularium in the middle of the figure.
» 163; Another part of the same colony.
» 164; *Escharella sanguinea.* At the left, in the top of the figure, one of the great zooecia is shown, as described in the text. The figure, moreover, shows the ordinary zooecia and the ooecia as well as the avicularia, the latter varying both to their place and size.
» 165; The outline of one of the ordinary zooecial apertures, more highly magnified.
» 166; *Hippothoa Isabelleana:* group of zooecia of the youngest layer of the colony.
» 167; This colony in its natural size. *a :* its intersection in the lower end.
» 168; Part of a variety of this species, in a higher degree of calcification, growing in a single zooecial layer, doubtfully to separate from the *Hippothoa secundaria* of the northern regions.
» 169; *Hippothoa mucronata;* group of zooecia together with two ooecia.
» 170; *Cellepora verruculata;* group of zooecia with ooecia, avicularia and secondary warts, from the older part of the colony.

Fig. 171; A group of younger zoœcia, in the growing edge of the same colony.
» 172, *a* and *b;* The outlines of two different zoœcial apertures of this species, in their primary form.
» 173; *Hippothoa biaperta;* group of young zoœcia, with the avicularia varying in their shape as well as in their size.
» 174; Part of another colony, in a higher degree of calcification, provided with oœcia.
» 175; Some young zoœcia of a third colony, with more numerous pores in the zoœcial wall.
» 176; An older part of the same colony as the preceding figure.

Plate IX:

» 177; *Hippothoa divergens,* part of a colony of the forma *laxa.*
At the letter *a* is shown a zoœcion, as it is overgrown by the former, of the same colony as the
» 178; *Gemellipora eburnea.* In its more outgrown state, together with the harder calcification, this colony has acquired a prolonged form of the proximal part of its zoœcia, which, moreover, are very much worn.
» 179; *Hippothoa divergens,* in its typical form. The plain inner, transverse calcification within the proximal part of the zoœcial aperture nearest will be compared with the same structure in the *Hippothoa Isabelleana,* as shown by the fig. 166.
» 180; *Cellepora tuberosa,* one group of zoœcia, together with spathulate avicularia and with oœcia, which are perforated by pores.
» 181; *Cellepora gigas,* one colony in its natural size.
» 182; *Discopora pertusa,* two zoœcia from an overgrown colony, as they had covered themselves, secondarily, by a continuous layer of chalk over their front side.
» 183; *Cellepora gigas,* one zoœcion, together with the aperture of another, at the same degree of magnifying as usual for the enlarged figures of these plates.
» 184; The outlines of the distal part of a zoœcion, together with its oœcion.
» 185; One zoœcion from a colony of the porous variety of the *Cellepora gigas.*
» 186; *Cellepora coronata,* one group of zoœcia, as seen from their upper surface, as they are raised vertically from the supporting matter, on which the colony was growing. One of the zoœcia is closed.
» 187; *Cellepora margaritacea,* part of a young branch, with the zoœcia still ventricose and evidently marked from each other by limitar furrows. One of the zoœcia shows the four marginal bristles of its aperture.
» 188; Part of an older branch, with the zoœcia for the most part confluent, as being covered by the common secondary layer of the calcification. The figure, moreover, presents the oœcia and one spathulate avicularium.
» 189; A still older part of a branch.
» 190—192; The outlines of three different colonies of this species, in their natural size.
» 193; *Cellepora avicularis,* one of its most common colonial forms, as it occurs at Florida, in its natural size.
» 194; Group of zoœcia, almost all provided with oœcia, from the younger part of a colony.
» 195; Some zoœcia and oœcia, from an older part of a colony, more thickly covered by the secondary layer of calcification.
» 196; Part of the lateral edge of a colony.
» 197, *a*—*c*; The outlines of three zoœcial apertures, *b* and *c* in their typical, primary shape.
» 198; The distal part of a zoœcion, with oral avicularium and oœcion, together with a free, spathulate avicularium of this species, to be compared with the corresponding features of the preceding species (see the fig. 188!).

Plate X:

» 199; *Escharella Jacotini.* the central part of a very young colony, in the more typical constitution of this species.
» 200; Part of a more outgrown colony, with the curious development of spathulate avicularia, for reminding of which I have named this variety *Escharella spathulata.*
» 201; *Escharella Landsborovii,* some zoœcia from a colony which seemed altogether to want the oral avicularium.
» 202; Group of zoœcia of another colony, with the oral avicularium very constantly developed.
» 203; *Escharella depressa* in the Floridan variety, which I have named *Escharella rostrigera;* some young zoœcia with persistent pores in their front wall and with the well developed avicularia, in their prolonged form, varying to their number, one or two on each zoœcion.

Fig. 204; The same variety, with more depressed zooecia, whose front side is covered by a warty ectocyst. In the midst of the figure, the shadowed zooecion presents that extraordinary shape of the aperture, as described in the text.
» 205; The same variety, with a still greater development of that curious, extraordinary zooecion, as shown in the midst of the figure.
» 206; The other variety of this species, *Escharella setigera,* in a high degree of calcification, with the avicularia transformed to vibracularia.

Plate XI:

» 207; *Gemellipora striatula;* group of zooecia with avicularia and ooecia. In the same degree of enlargement as the fig. 209.
» 208; *Gemellipora glabra,* the top of a branch, at two thirds of the degree of enlargement of the preceding figure. Above two of the zooecial apertures, the uncovered front side of the ooecion is shown.
» 209; An older part of the same stem, with two avicularia and one ooecion.
» 210; The same stem, in its natural size.
» 211; *Escharella Audouinii;* group of zooecia, two of which are provided with ooecion.
» 212; *Gemellipora limbata,* creeping over a dead and worn, indeterminible Cellepore.
» 213; A single zooecion, provided with ooecion, as seen from its front side.
» 214; The outlines of that same zooecion and ooecion, as seen laterally.
» 215; *Lepralia inornata;* group of zooecia.
» 216; Another part of the same colony, with avicularia.
» 217; *Lepralia cleidostoma;* group of younger zooecia, with ooecia and avicularia. The one zooecion, at the left in the figure, presents two marginal bristles at its aperture.
» 218; An older part of another colony, of the same warty appearance of the zooecial wall, with the limits between the zooecia evanished.
» 219; Part of another colony, of a smooth surface of the zooecial wall.
» 220; *Lepralia edax,* in the forma *calcarea;* group of zooecia with one boat-shaped avicularium.
» 221; The whole colony, in its natural size, as having overgrown and eaten away a Serpulan tube.
» 222; Group of zooecia, with avicularia (both lateral, of the ordinary size, in the limitar furrows, and boat-shaped ones) and ooecia; from another colony.
» 223; That same colony, in its natural size.
» 224; The same species, in the forma *janthina;* group of young zooecia, of a more regular constitution, at the growing edge of the colony.
» 225; Another part of the same colony, with the zooecia of the formerly so named celleporine constitution.
» 226; *Lepralia turrita;* group of young zooecia, as seen a little laterally, with one spathulate avicularium.
» 227; A lateral view of two zooecia of the same colony, with their raised spines, and with small avicularia in their wall.
» 228; The outlines of three older zooecia of the same colony, with one spathulate avicularium, as seen vertically from the front surface of the colony.

Plate XII:

» 229; *Escharella bisinuata;* part of three zooecial rows, with two ooecia and four boat-shaped avicularia.
» 230; *Eschara cervicornis;* part of its creeping state (*Lepralia,* auctt.).
» 231; Another part of the same colony, the one zooecion, in the middle of the figure, being provided with ooecion, another, in the top at the right side of the figure, presenting two marginal bristles at its aperture.
» 232; *Discopora advena;* group of zooecia, just prepared for being overgrown by a new zooecial layer.
» 233; *Discopora albirostris,* in its forma *pusilla.* As the most of the zooecial apertures, in their proximal part, are obscured by the prominent avicularium, the figures *a* and *b* give the primary zooecial aperture as viewed free.
» 234; The typical *Discopora albirostris,* growing in the Hemescharan (auctt.) manner, at the back side of the colony presenting spinous projections as well as, in the front surface of the colony, producing mamilliform unevennesses. Nat. size.
» 235; Group of young zooecia from the growing edge of this colony.
» 236; Group of older, celleporine (auctt.) zooecia from the inner part of the same colony.
» 237; Group of zooecia of that same celleporine constitution, of another colony, with the free, spathulate avicularia sometimes produced, as shown at the right side of the figure.

Fig. 238; Group of young zoœcia from the growing edge of another colony, showing the form of the primary zoœcial aperture. The enlargement of this figure is only two thirds of the common enlargement of the figures of these plates.
» 239; The distal part of the two young zoœcia, highest up at the left in the preceding figure, at the common enlargement.
» 240; *Discopora pertusa;* group of zoœcia, at two thirds of the common enlargement.
» 241; Two zoœcia of the same colony, at the common enlargement.

Plate XIII:

» 242; *Retepora Beaniana,* in the Floridan variety *Retepora reticulata;* the outlines of a part of a broken colony, in its natural size.
» 243; Part of the front side of this colony, with two oœcia and one elongated, transversely placed, free avicularium.
» 244; Part of the back side of the same colony.
» 245; *Retepora cellulosa,* in the variety named *Retepora marsupiata;* the outlines of a part of a broken colony of the slender form, in its natural size.
» 246; Part of the front side of this colony, the most of the zoœcia provided with oœcia.
» 247; Part of the back side of the same colony, at two thirds of the enlargement of the preceding figure.
» 248; The top of a branch of the broader colonial form. Front side.
» 249; Group of young zoœcia of the more slender colonial form.
» 250; An older part of a colony of that same form.
» 251; The distal part of the front side of one zoœcion, together with the avicularium placed thereupon.
» 252; Group of young zoœcia from the broader colonial form.
» 253; An older part of a colony of the same form, without oœcia.
» 254; Part of a colony of the same form, provided with oœcia.

Errata

in the Part I:

Page	11,	line	5	fr.	above,	instead	of	zooecia	read:	ooecia
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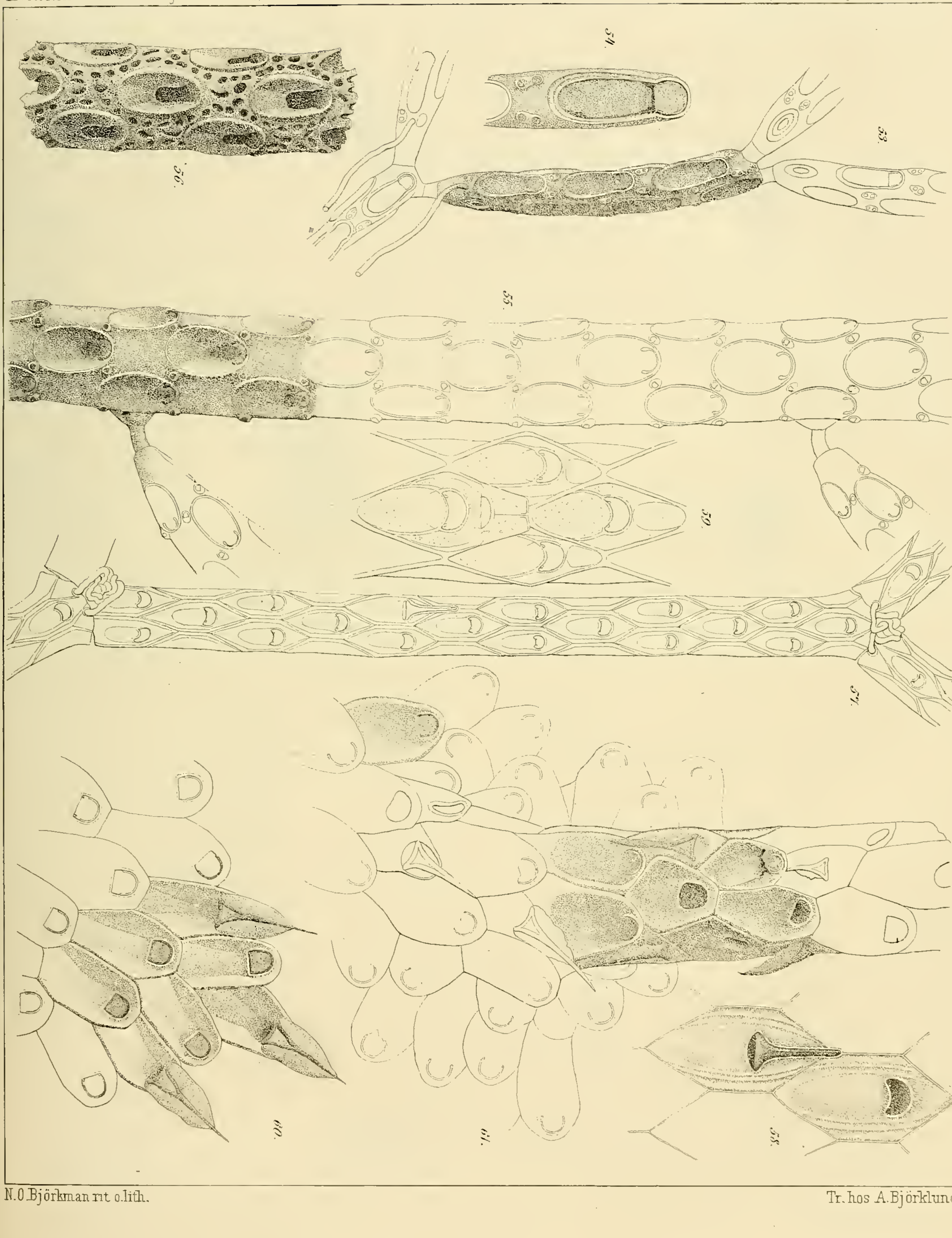
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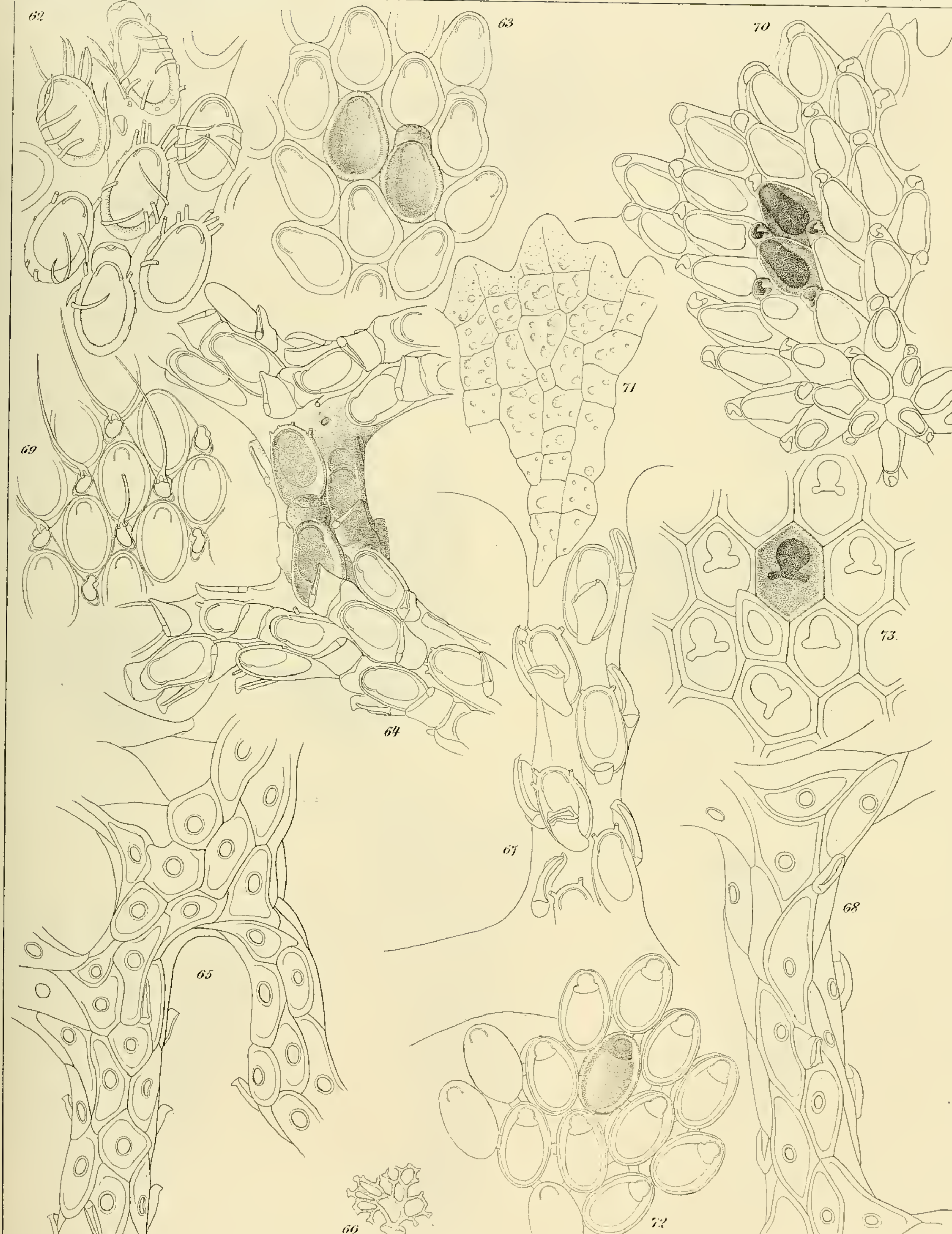

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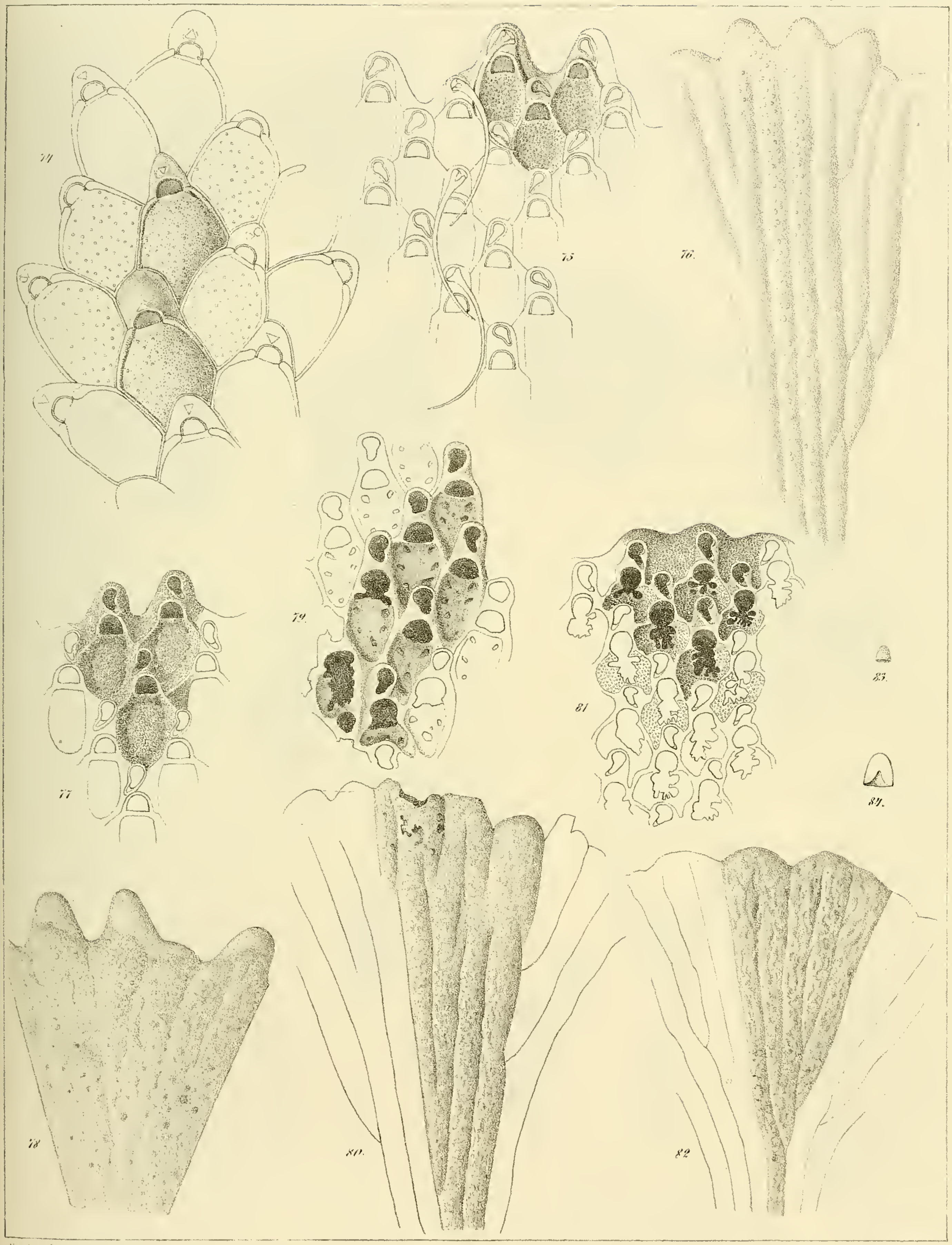

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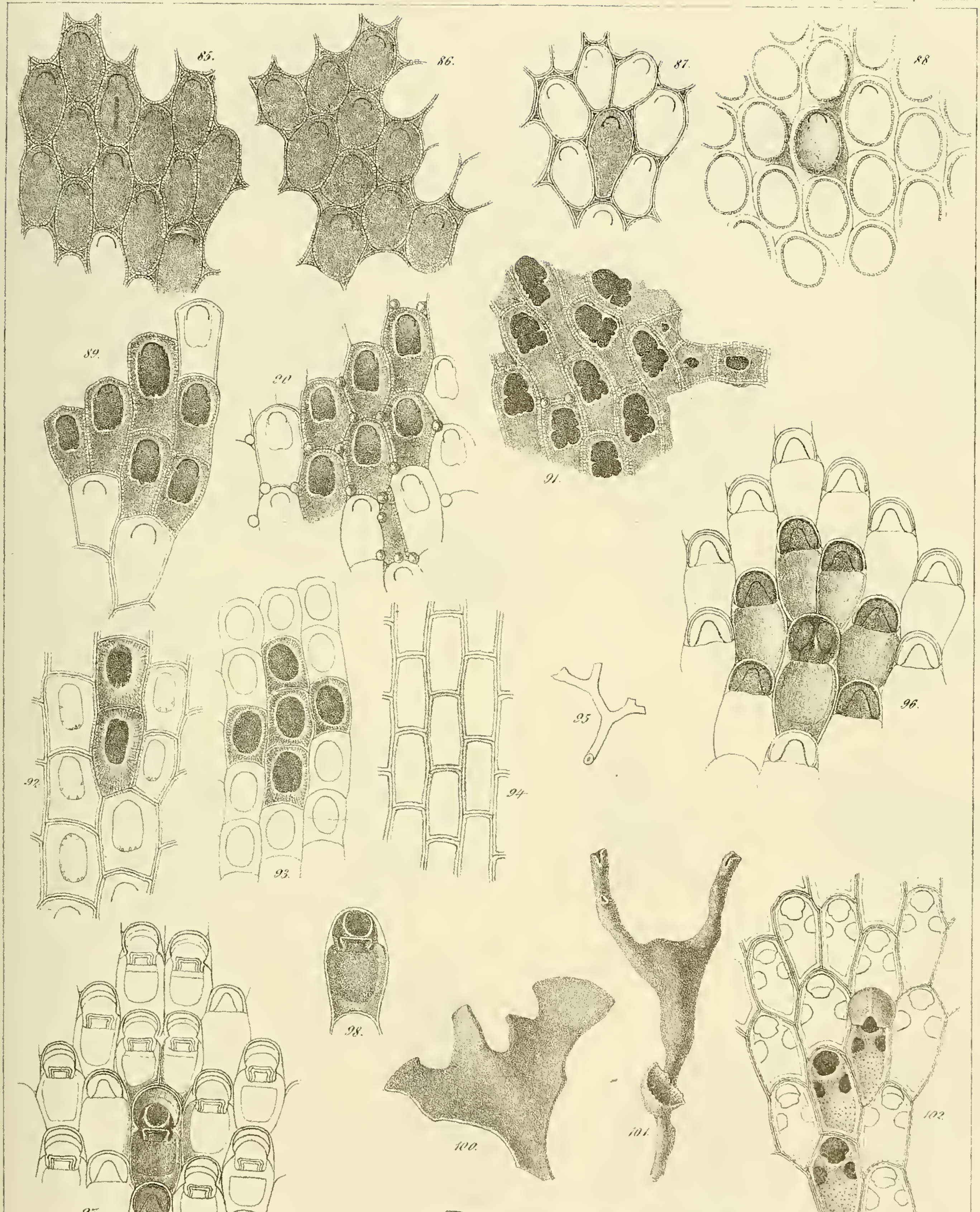

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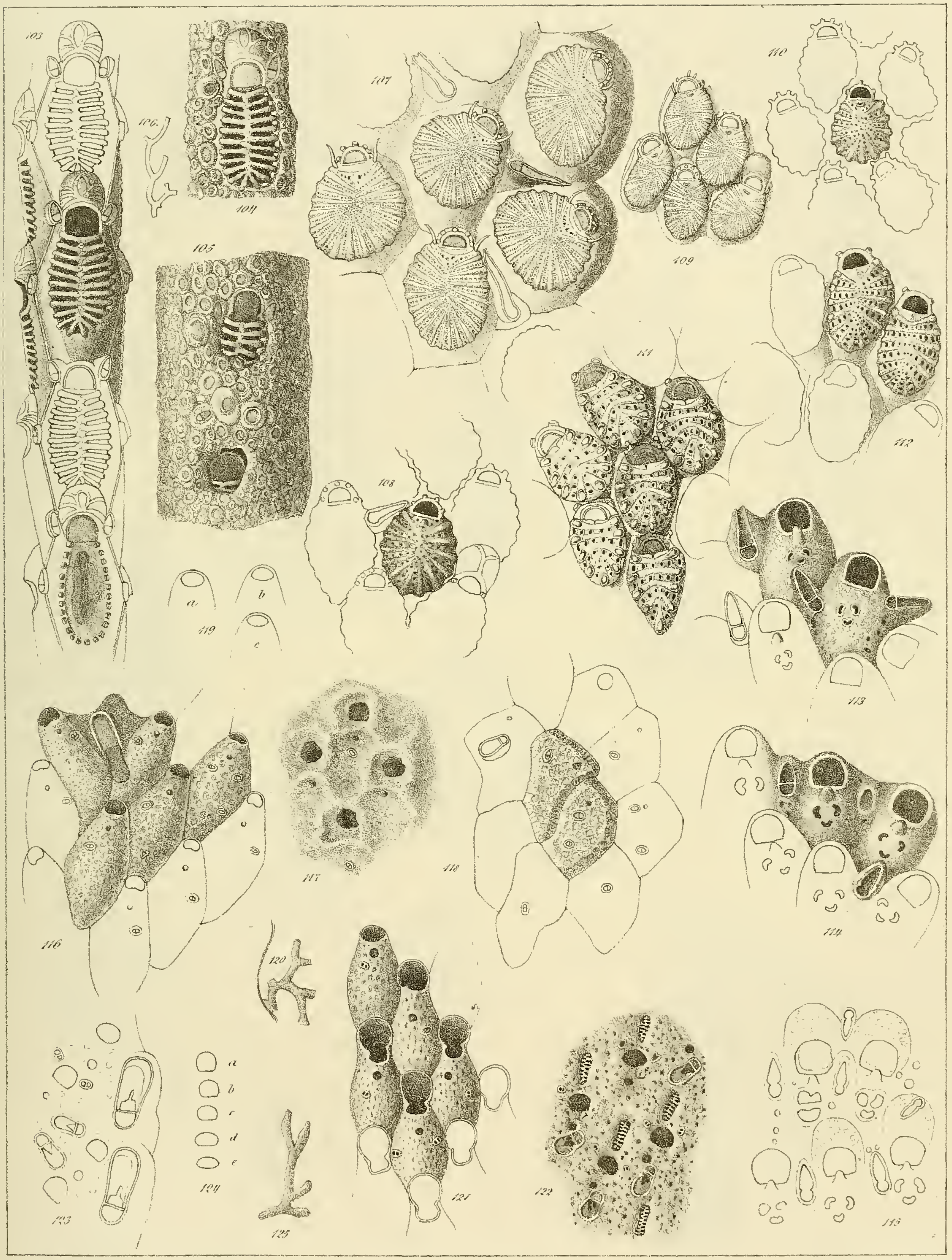
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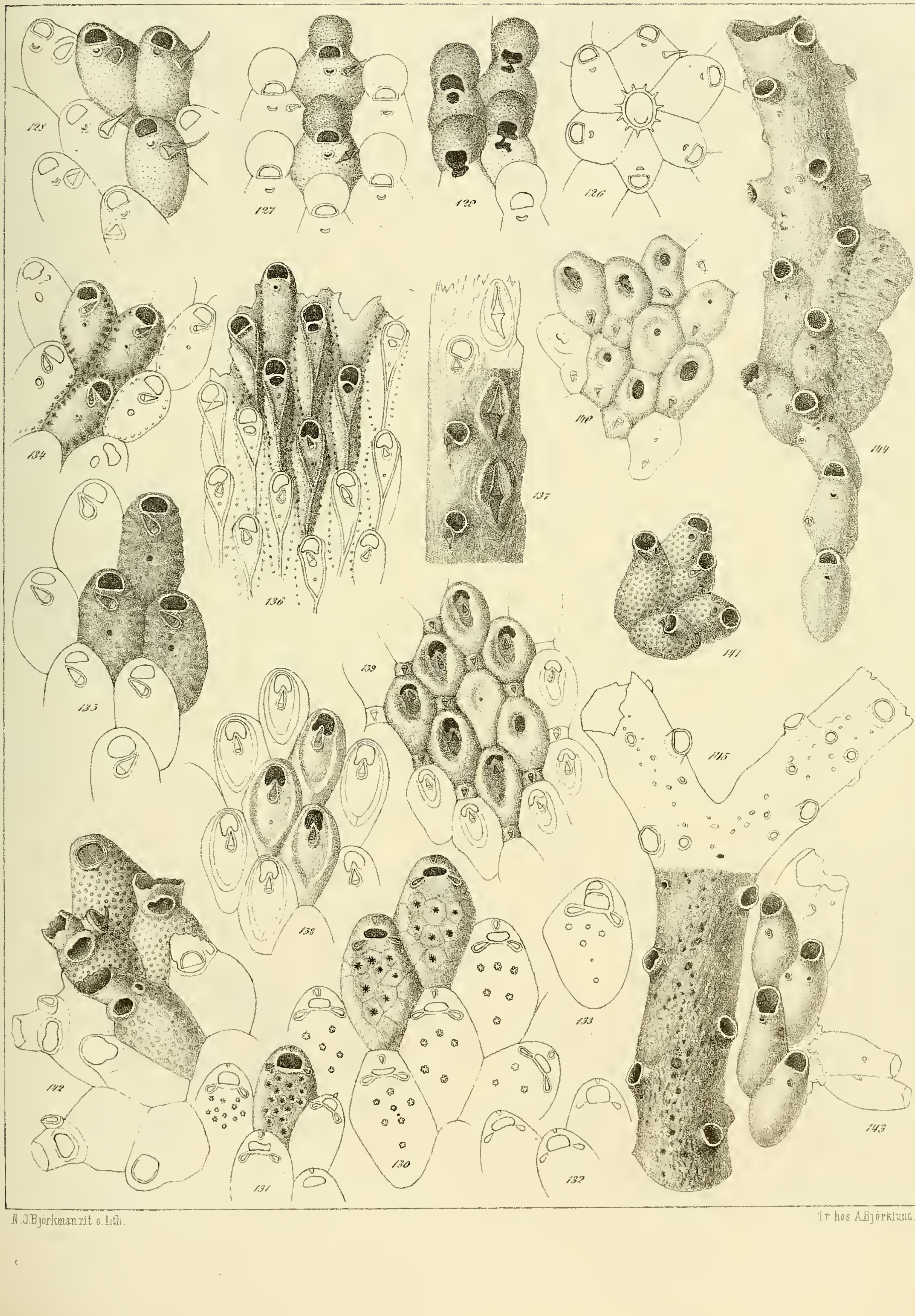

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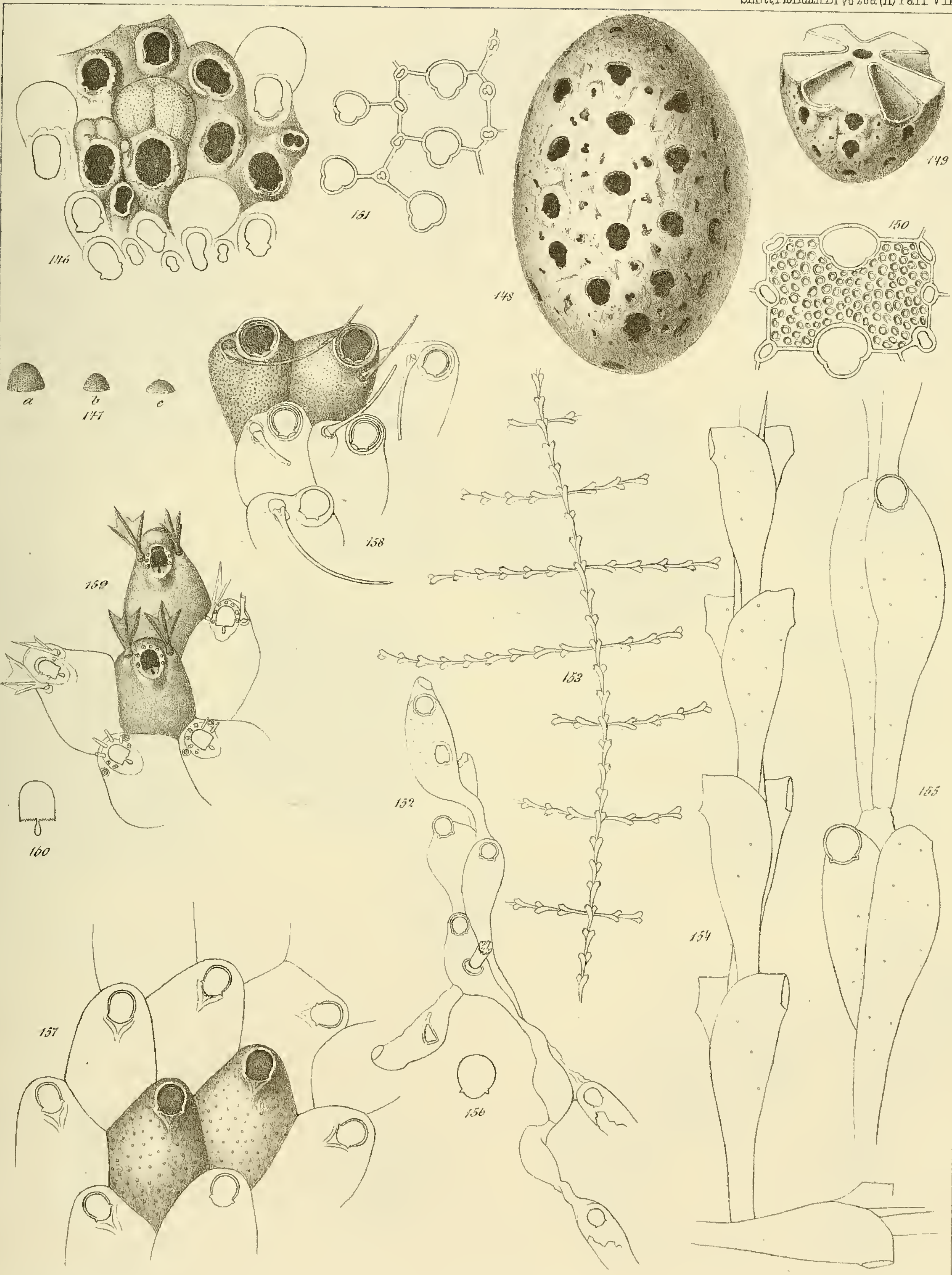

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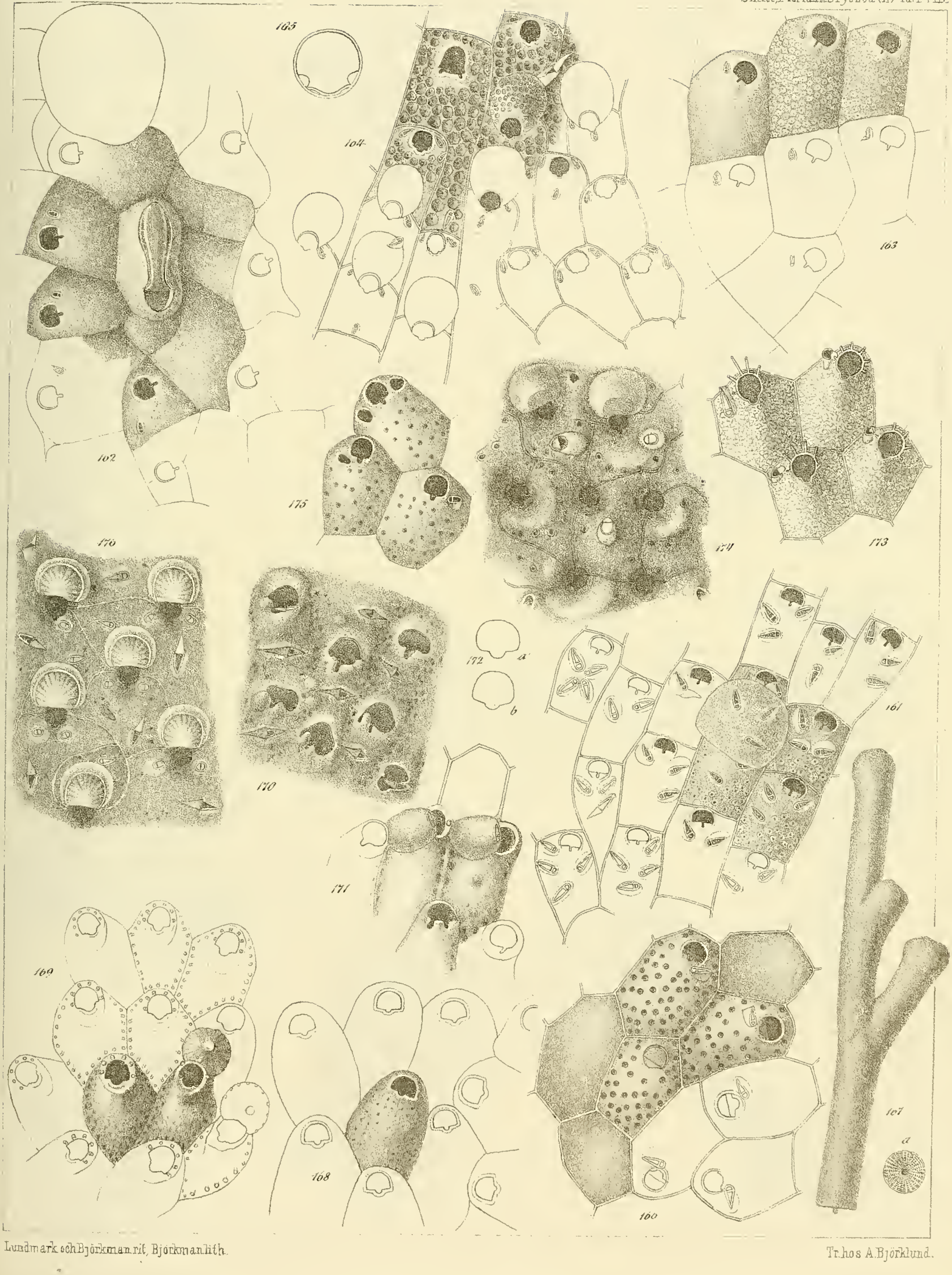

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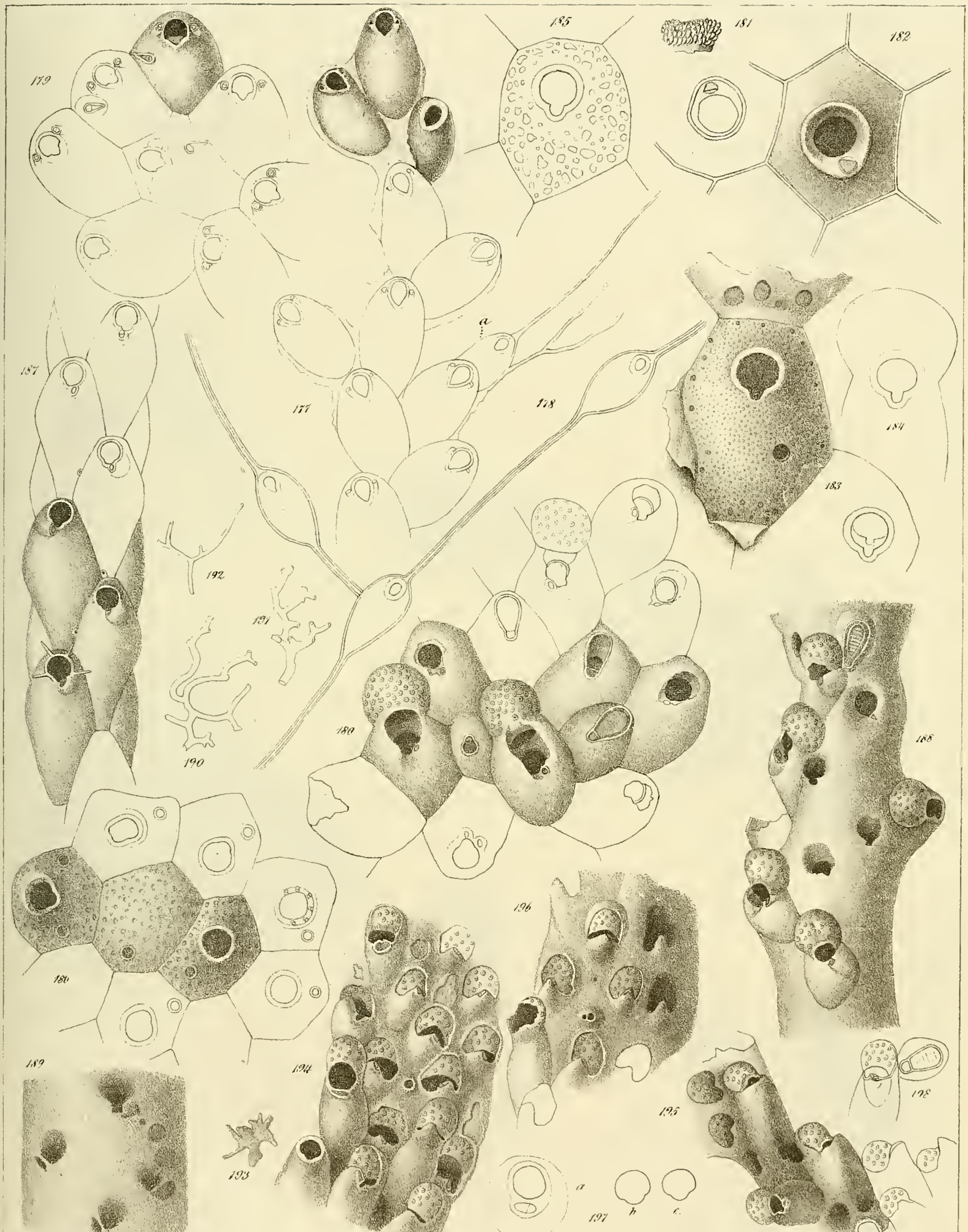
Tr. hos A. Björklund.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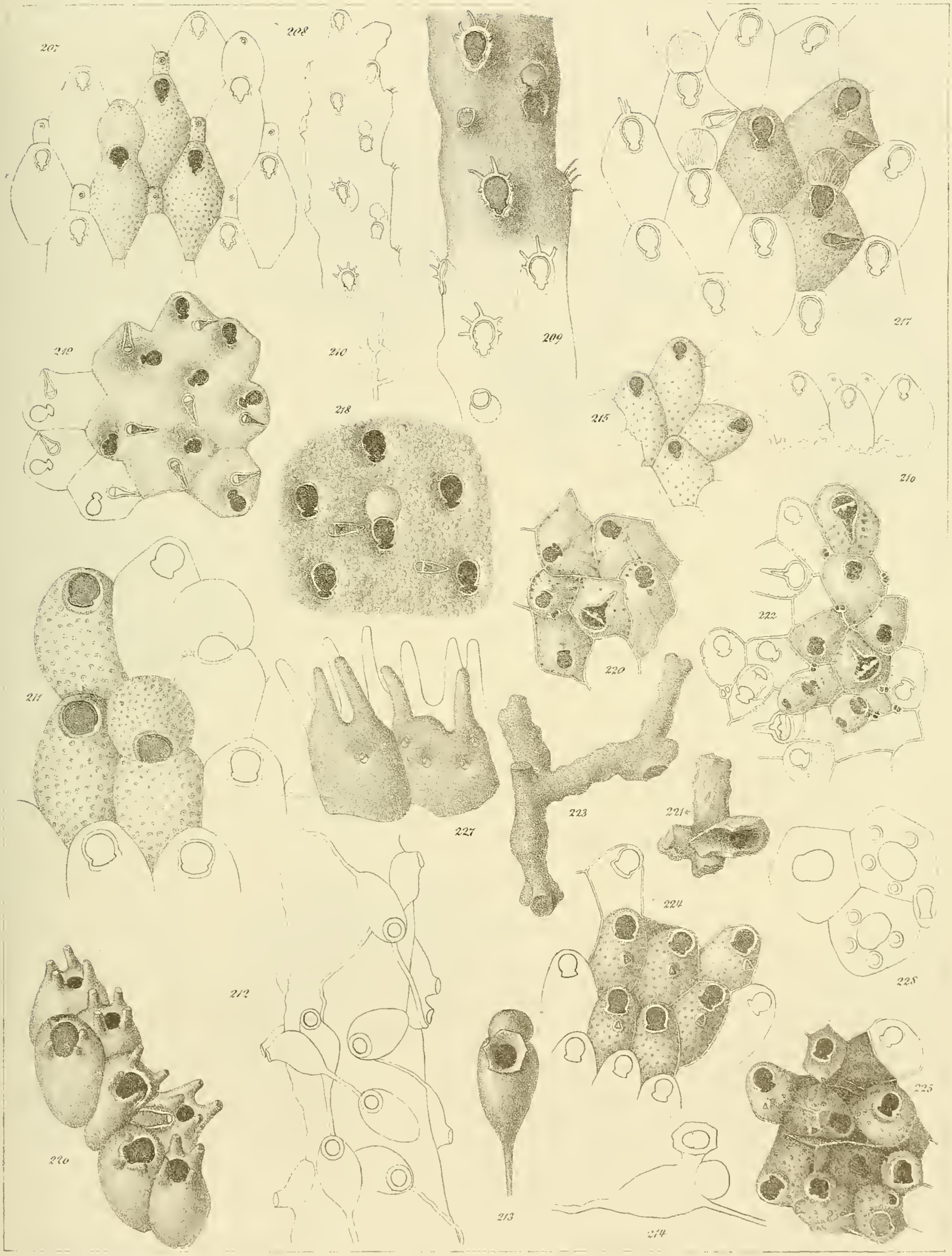
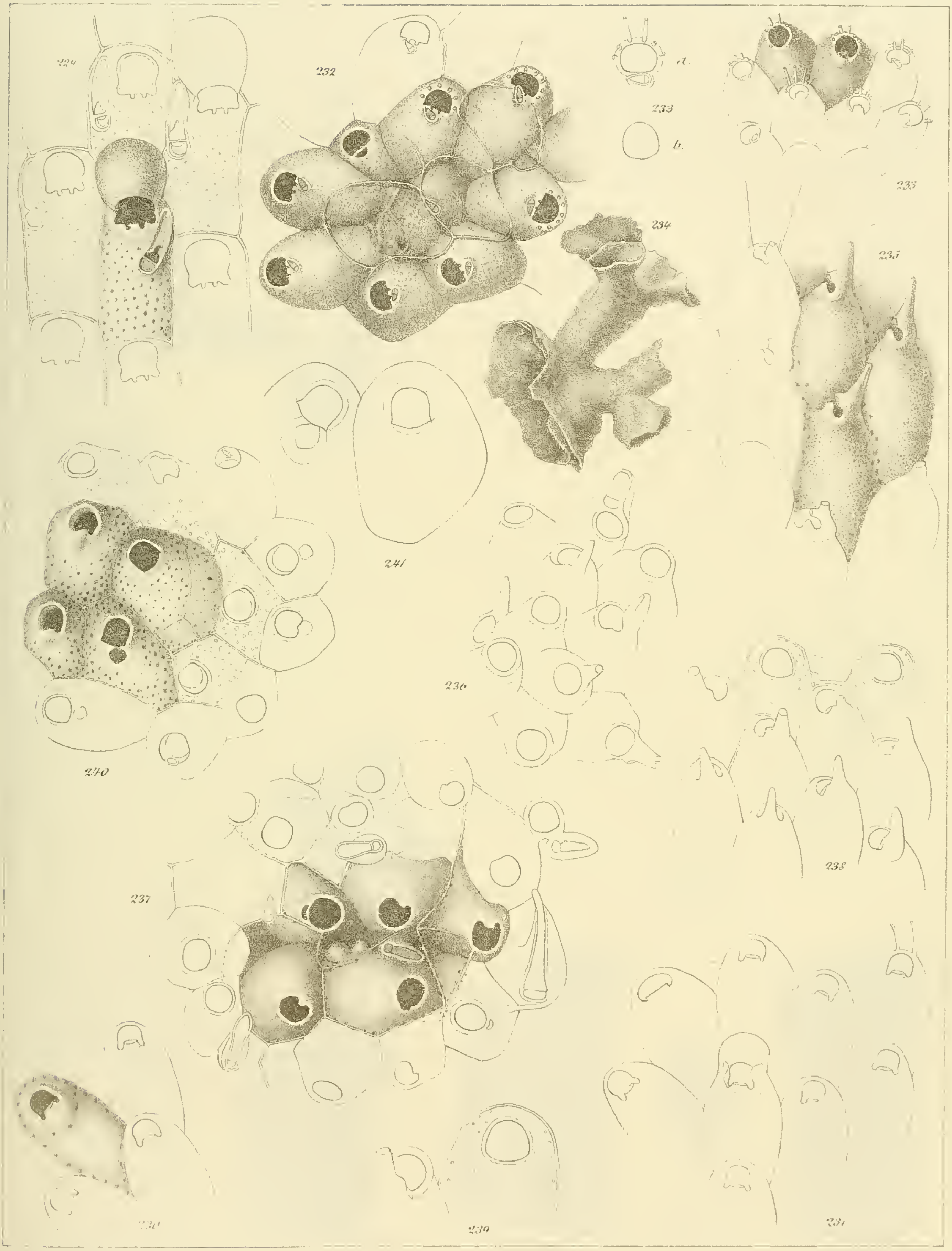
Björkman och Lundmark rit, Björkman lith.
Tr. hos A. Björkhind





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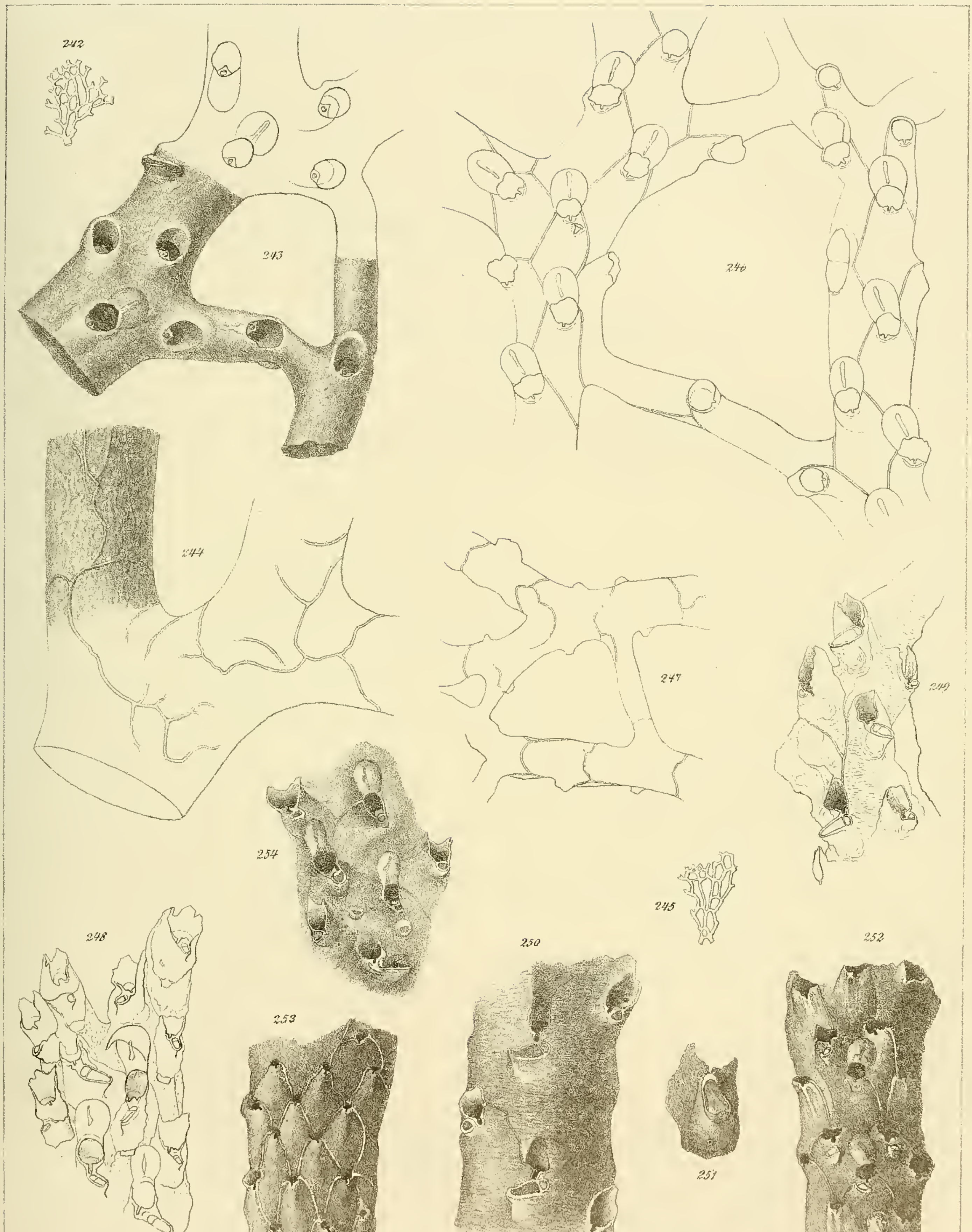

Petterson och Björkman rit. Björkman lith.

Tr. hos A. Björklund.

KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11. N:o 5.

BESKRIVELSE AF SYV NYE

CUMACEER

FRA VESTINDIEN OG DET SYD-ATLANTISKE OCEAN.

AF

G. O. SARS.

MED SEX TAVLER.

TILL KONGL. VET. AKAD. INLEMNAD DEN 14 JUNI 1871.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

Opdagelsen af de nedenfor beskrevne Cumaceer, de förste Repræsentanter af denne anomale Krebsdyrgruppe fra Tropernes og den sydlige Hemisphæres Have, skyldes de to svenske Zoologer Professor KINBERG og Dr. A. GOES. Den sidste, ved sine fortræffelige carcinologiske Arbeider bekjendte Forsker har under sit Ophold som praktiserende Læge paa den svenske Koloni i Vestindien, St. Barthelemy, anstillet meget omfattende Undersögelser af disse Tropehaves rigt udviklede Dyreliv og har navnlig havt sin Opmærksomhed henvendt paa de större Dybder (indtil 300 F.), som ialfald dengang var et fuldstændig nyt og uudforsket Feldt. Blandt de mange sjeldne og interessante Ting, som af denne Forsker ved Hjælp af Bundskraben ere ophentede fra disse fjerne Haves Dyb, ere ogsaa fire af de her beskrevne Cumaceer. De tre övrige ere under Fregatten Eugenia's Verdensomseiling tagne af den af Annelidernes Naturhistorie höit fortjente svenske Zoolog, Professor KINBERG, alle i det sydatlantiske Ocean udenfor Brasiliens Kyster mellem 23° og 35° S.B. De ved disse Forskeres utrættelige Undersögelser tilveiebragte righoldige og i videnskabelig Henseende særdeles interessante Samlinger opbevares nu paa det Zool. Rigsmuseum i Stokholm og ere allerede for en Del gjorte til Gjenstand for detaillerede Undersögelser af forskjellige Videnskabsmand. Professor LOVÉN har vist mig den Ære og Tillid at overlade Bearbeidelsen af de nedenfor omtalte Cumaceer til mig samt foreslaa min Afhandling til Optagelse i det nu under Arbeide værende Bind af Kongl. Vetenskaps Akademiens Handlingar.

Alle syv Arter have, som det var at vente, vist sig at være nye og frembyde en særlig Interesse saavel ved deres fjerne Findesteder som ved den umiskjendelige Overensstemmelse, de desuagtet vise med vore nordiske Former. Kun to af dem ere nemlig saa afvigende, at jeg for dem har maattet opstille nye Slægter, medens de övrige fem danne vel udprægede Arter af de fire nordiske Slægter: *Diastylis, Leptostylis, Leucon* og *Campylaspis*. De ere fordetmeste alle fra större Dybder, hvilket navnlig er Tilfældet med 3 af de vestindiske Former, der ere ophentede fra det betydelige Dyb af 200—300 F. For den 4:de vestindiske Cumace, den af alle mest afvigende Form, er dog ikke Dybden opgivet. Flere Grunde synes mig nu ogsaa at tale for, at denne, nedenfor under Benævnelsen *Stephanomma Goësii* opförte Form, ikke er taget sammen med de övrige, men paa betydelig grundere Vand. Især synes det i Modsætning til de övrige særdeles stærkt udviklede Synsapparat hos denne Cumace med Bestemthed at tyde hen herpaa, ligesom ogsaa den Omstændighed, at dens nærmeste Samslægtninger, Arterne af Slægten *Cuma* (sens. strict.) ere de af alle Cumaceer, der leve paa det ringeste Dyb. Ogsaa vil dette stemme overens med, hvad Erfaring tilstrækkelig har lært at det fortrinsvis er paa grundere Vand, at Faunaen udvikler sig forskjelligartet under de forskjellige Himmelströg, mindre derimod paa de store Dybder, hvor en overalt mere ensformig Fauna synes at raade. Hvad de syd-atlantiske Cumaceer angaar, saa har jeg vistnok ogsaa her for en af dem været nödsaget til at opstille en ny Slægt, *Leptocuma;* men denne viser dog i flere Henseender en betydelig större Affinitet med nordiske Slægter end den nys nævnte.

I. DIASTYLIS ANTILLENSIS, G. O. SARS, n. sp.

(Tavl. I. Fig. 1—3.)

Descriptio. Femina. Corporis forma quam solito gracilior et minus robusta. Corpus anticum a latere visum elongato-ovatum supine leviter modo arcuatum, supra visum parum dilatatum, latitudine maxima dimidia longitudine multo minore, posticum angustissimum.

Scutum dorsale mediocre segmentis liberis corporis antici junctis multo longius, sed duplam illorum longitudinem minime assequens, a latere visum subovatum, postice rotundato-truncatum antice attenuatum, altitudine maxima dimidia longitudine parum majore in medio sita, margine superiore et inferiore æqualiter arcuatis illo tamen minus quam hoc, rostro brevi sextam circiter partem scuti longitudinis occupante, horizontali, a latere viso obtuse conico; supra visum latitudine maxima altitudine parum majore pone medium sita, lateribus æqualiter arcuatis et antice versus apicem rostri sensim convergentibus. Superficies scuti in parte antica dentibus minutis antice vergentibus imprimis versus faciem dorsalem crebris obsita et plica subtiliter crenulata, sinuata, subsigmoidea, oblique transversa utrinque pone laciniam mediam a medio dorsi usque ad marginem inferiorem infra insertionem antennarum porrecta ornata, lacinia media antice rotundato-truncata, in medio obsolete carinata et ad latera postice ante plicam transversam paulo excavata.

Lobus ocularis quam solito magis elongatus, oblongo-conicus et antice tuberculi instar prominens.

Segmenta libera corporis antici omnia distincta, lævissima et supine æqualiter convexa, anteriora 2 brevia margine antico paulo elevato, sequentia 2 majora et epimeris magnis instructa, ultimum sat magnum postice profundius emarginato epimeris obtuse acuminatis.

Corpus posticum sat elongatum appendicibus caudalibus exceptis longitudinem antici circiter æquans, segmentis angustis, subcylindricis, constrictionibus parum profundis disjunctis, penultimo sat elongato, ultimo brevi, subdepresso, ad apicem dilatato et fere ad lineam rectam truncato.

Antennæ superiores angustæ, pedunculi articulo ultimo extra apicem rostri porrecto tenuissimo et elongato, flagellis structura solita.

Pedes 1:mi paris valde elongati, longitudinem corporis antici longe superantes, articulis ultimis duobus longissimis et tenuissimis, fere filiformibus, longitudine circiter æquali et longe extra apicem rostri porrectis; 2:di paris illis dimidia parte breviores et longitudinem scuti dorsalis circiter æquantes, sat angusti, articulo basali brevi et curvato, antepenultimo angusto et lineari ultimis 2 junctis longitudine circiter æquali, ultimo subulato setis nonnullis apicalibus longis instructo. Pedes 3:tii et 4:ti paris sat elongati et dense setiferi, setis ex parte ciliatis, articulo 3:tio quam solito magis elongato et sequentibus junctis longiore; ultimi pais illis tertia circiter parte breviores et articulo basali multo breviore insignes.

Appendix caudalis media brevis duplam segmenti ultimi longitudinem vix assequens et trunco appendicum lateralium multo brevior, ad basin sat lata, dein vero subito coarctata, parte terminali lineari et utrinque præter aculeos 2 terminales dentibus 5 armata.

Appendices laterales sat elongatæ segmentis ultimis 2 junctis nonnihil longiores, trunco ad apicem paulo dilatato et intus aculeis circiter 9 ex parte valde elongatis armato, stylis terminalibus elongatis et angustis, interiore paulo longiore et trunci longitudinem circiter æquante, triarticulato, articulo 1:mo ceteris 2 junctis longitudine æquali, ultimo penultimo longiore et valde angusto aculeo longo et seta breviore terminato; aculei marginis interioris hujus styli circiter 12 (6 valde elongatis articuli 1:mi, 2 secundi et 3:tii). Stylus exterior ut vulgo biarticulatus, articulo ultimo anguste lineari et setis sat multis marginato.

Longitudo circiter 6½ mm.

Habitat ad Anguillam Indiæ occidentalis in profunditate 200—300 orgyarum, fundo argillaceo.

Af denne lille meget distinkte Art foreligger to Exemplarer, tagne af Goes ved Anguilla paa 200—300 Favner Dyb, hvid Lerbund. De ere begge Hunner, paa hvilke endnu ikke Brystposen har dannet sig, og det störste Exemplar omtrent 6½ Mm. langt fra Spidsen af Rostrum til Enden af de ydre Halevedhang. Den hörer altsaa til de mindste Arter af Slægten.

Beskrivelse. Kropsformen er usædvanlig spæd og langstrakt, dog med tydelig Begrændsning mellem For- og Bagkrop. Forkroppen er (Fig. 1) af meget smal oval Form, med den övre Contour kun ganske svagt böiet, i Midten endog næsten lige og horizontal. Ovenfra seet (Fig. 2) er den kun lidet opblæst og ikke synderligt bredere end höi, baktil kun svagt afsmalnende og skarpt afsat fra den særdeles tynde og spinkle Bagkrop.

Rygskjoldet er temmelig stort, betydeligt længere end de frie Forkropssegmenter tilsammen, uden dog at opnaa disses dobbelte Længde. Seet fra Siden (Fig. 1) er det af nogenlunde oval Form, bagtil temmelig lige afskaaret fortil jevnt afsmalnende, med den störste Höide, der er kun lidet större end den halve Længde, omtrent paa Midten. Den övre Rand er jevnt men svagt bueformigt böiet med den störste Convexitet paa Midten; fortil böier den sig noget brattere ned mod den stærkt fremspringende Öielob. Den bagre Rand er næsten lige og vertical samt overgaar nedad med en stærk Böining i de nedre Kanter, der i sin hele Længde ere stærkt og jevnt bueformigt böiede og fortil overgaa i Rostrum uden at danne den mindste Antydning til nogen Vinkel under samme; i den allerforreste Del bemærkes en særdeles fin Crenulering, forövrigt ere disse Kanter fuldkommen glatte. Rostrum er temmelig kort, neppe indtagende mere end $\frac{1}{6}$ af Rygskjoldets Længde, horizontalt og seet fra Siden af konisk Form. Ovenfraa seet (Fig. 2) viser Rygskjoldet sig til Siderne jevnt convext med den störste Brede, der kun er ubetydeligt större end Höiden noget bag Midten; fortil convergere Sidekanterne med en ganske jevn Böining imod Spidsen af Rostrum. — Rygskjoldets Overflade er i den forreste Del, især oventil, temmelig tæt besat med smaa fortilrettede Torner, og viser desuden paa hver Side en meget tydelig fint crenuleret Fold eller Crista, der löber paaskraat over Rygskjoldet omtrent fra Midten af den dorsale Flade og indtil de nedre Kanter umiddelbart nedenfor Antennernes Insertion; i sin övre Del böie disse Folde sig med en stærk næsten halvcirkelformig Böining fortil og beröre hinanden næsten i Midten. Den mediane Lob af Rygskjoldet viser i Midten en utydelig Længdekjöl og er til hver Side af denne bagtil og umiddelbart foran de omtalte transversale Folde temmelig stærkt indtrykt eller excaveret. Den fortil udskydende *Öielob* er af en ganske usædvanlig Form, idet den ikke som sædvanligt er halvcirkelformig, men af langstrakt oval eller konisk Form og i sin forreste Del stærkt fremspringende, saa at den, naar Dyret sees fra Siden (Fig. 1) tager sig ud som et pukkelformigt Fremspring ved Roden af Rostrum. Denne stærke Udvikling af Öieloben synes at tyde paa, at Dyret har været forsynet med et vel udviklet Synsorgan. Paa de undersögte Spiritusexemplarer var dog intet Spor af Pigment eller lindseagtige Legemer at opdage.

De 5 frie Forkropssegmenter ere alle tydeligt udviklede og ganske glatte uden Spor af Haar eller Torner. De 2 forreste af dem ere som sædvanligt de korteste og næsten baandformige, men begge forsynede med tydelige skjöndt smale Epimerer; deres forreste Rand er tilskjærpet og noget fremspringende, men ikke crenuleret. 3:die Segment er i sit övre Parti kun lidet længre end det foregaaende; derimod er det forsynet med ganske usædvanligt stærkt udviklede pladeformige Epimerer, der fortil danne en bueformigt over det foregaaende Segment fremskydende Udvidning. 4:de Segment er det længste af alle og af normal Form. Sidste Segment endelig er forholdsvis temmelig stort, betydeligt (omtrent dobbelt) bredere end 1:ste Bagkropssegment, og har den bagre Rand stærkt udrandet og Epimererne bagtil gaaende ud i en stump Spids.

Bagkroppen, der, naar Halevedhængene fraregnes, omtrent er af Forkroppens Længde, er usædvanlig tynd, og dens Segmenter næsten fuldstændig cylindriske, uden at vise det eiendommelige knudeformige Udseende som hos Slægtens fleste övrige Arter. Næstsidste Segment er som sædvanligt det længste. Sidste Segment er derimod meget kort og seet ovenfra (Fig. 3) i Enden stærkt udvidet samt næsten lige afskaaret.

Integumenterne ere meget tynde og gjennemsigtige, saa at endog adskillige af de indre Organer f. Ex Tarmkanalen skinner igjennem, og af en tydeligt udpræget skjælformig Structur.

De övre Antenner ere af tynd og langstrakt Form og række med hele det sidste særdeles smale og forlængede Led af Pedunkelen udenfor Spidsen af Rostrum. Svöberne vise den for Slægten normale Bygning.

1:ste Fodpar er af en ganske usædvanlig smal og langstrakt Form, saa at det lige udstrakt endog er betydeligt længere end hele Forkroppen, og rækker med Enden af 4:de Led temmelig langt udenfor Spidsen af Rostrum. Basalledet og de 3 derpaa fölgende Led ere af sædvanlig Form. Derimod udmærke de 2 ydre Led sig ved en ganske overordentlig Længde og næsten börsteagtig Tyndhed. De ere omtrent af ens Længde eller det yderste lidt længere end det andet og begge kun meget sparsomt börstebesatte.

2:det Fodpar er vistnok neppe Halvparten saa langt som 1:ste, men dog endnu næsten af Rygskjoldets Længde og særdeles tyndt. Basalledet er betydeligt kortere end de 3 fölgende Led tilsammen og stærkt krummet samt i sin nedre eller indre Kant forsynet med stærke Fjærbörster. 4:de Led er som sædvanligt meget smalt og stærkt forlænget, omtrent saa langt som de 2 yderste Led tilsammen. Sidste Led er sylformigt og besat med en Del tynde Börster, hvoraf en fra Spidsen udgaaende er særdeles lang.

De 3 bageste Fodpar, de egentlige Gangfödder, ere temmelig stærkt udviklede og forsynede med talrige tildels cilierede Börster. De 2 förste Par ere omtrent af samme Længde og betydeligt længere end sidste Par. Alle disse Fodpar ere udmærkede ved den usædvanligt stærkt forlængede Form af 3:die Led, der er betydeligt længere end de fölgende Led tilsammen.

Det midterste Halevedhæng (Fig. 3) er forholdsvis kort, neppe dobbelt saa langt som sidste Segment og betydeligt kortere end de ydre Halevedhængs Stamme. Ved Basis er det temmelig bredt, men afsmalnes hurtigt til Midten af sin Længde, hvorfra det bibeholder sin Brede uforandret indtil Spidsen. Denne ydre Del, der saaledes viser en lineær Form, er i hver Kant forsynet med 5 Torner og har ved Spidsen de 2 sædvanlige Endetorner, der ere noget större end hine.

De ydre Halevedhæng (ibid.) ere temmelig stærkt forlængede og ikke saa ubetydeligt længere end de 2 sidste Segmenter tilsammen. Stammen, der i Enden er noget udvidet, har i den indre Kant omtrent 9 tildels usædvanlig lange og tynde, næsten börsteformige Torner. Grenene ere lange og tynde, den indre længst og omtrent af Stammens Længde samt bestaaende af 3 tydelige Led, hvoraf det 1:ste er störst og omtrent saa langt som de 2 övrige tilsammen. Sidste Led er særdeles smalt og betydeligt længere end 2:det Led samt bærer i Spidsen en lang Torn og en kortere Börste. I den indre Kant er denne Gren bevæbnet med 12 Torner, hvoraf især de 6 til 1:ste Led fæstede ere særdeles lange og tynde. Den ydre Gren, der er lidt kortere end den indre, er som sædvanlig 2leddet med det 1:ste Led ganske kort. Sidste Led er af smal lineær Form og i begge Kanter samt Spidsen forsynet med en Del Börster, hvoraf dog de i den ydre Kant ere meget korte og snarere lig Torner.

Hunnerne af nærværende Art vise vistnok alle de for Slægten Diastylis eiendommelige Characterer, men have dog i sin ydre Habitus noget eget ved sig, der adskiller dem fra vore nordiske Arter, der alle ere af en betydelig kraftigere og plumpere Bygning. De have derimod ved sin spinkle Kropsform en ikke ubetydelig Lighed med de fuldt udviklede Hanner af disse, saa at de forsynede med Hannens Attributer vilde kunne gjælde som fuldkommen normale Diastylishanner.

2. DIASTYLIS FIMBRIATA, G. O. SARS, nov. spec.

(Tavl. II. Fig. 4—9.)

Descriptio. Mas adultus. Corporis forma gracilis et elongata, cephalothorace longitudinem corporis postici telsone incluso circiter æquante supine parum arcuato, corpore postico quam solito debiliore.

Scutum dorsale magnum, segmentis liberis cephalothoracis junctis fere duplo longius sat, depressum, plus duplo longius quam altius, utrinque faciei ventrali propius crista longitudinali fortiter pectinato-dentata in parte imprimis postica distincta ornatum, a latere visum subellipticum, margine superiore leviter arcuato et rostro incumbente, inferioribus in parte postica fere rectis et horizontalibus dein æqualiter curvatis et ad rostrum ascendentibus angulo latero-anteriore nullo, rostro magno quartam fere partem longitudinis scuti occupante, horizontali, apice leviter infra curvato; supra visum elongato-ovatum latitudine maxima altitudine majore pone medium sita marginibus lateralibus antice æqualiter curvatis et ad apicem rostri convergentibus. Superficies scuti æqualiter convexa aculeis numerosis minimis ubique armata.

Oculus omnino deesse videtur.

Segmenta libera corporis antici omnia distincta sed humilia et angusta, epimeris in 2:do, 3:tio et 4:to rotundatis et ad latera porrectis marginibus aculeis longis fimbriatis, ultimo ad marginem anticum subtiliter crenulato postice utrinque in mucronem elongatum producto. Superficies dorsalis segmenti 3:tii et 4:ti præterea seriebus duabus longitudinalibus aculeorum brevium postice vergentium ornata.

Segmenta corporis postici parva et angusta, angulo laterali distincto, supine ex parte aculeata, aculeis series duas longitudinales formantibus, 4 priora faciei ventrali propius utrinque crista laterali dentata instructa.

Antennarum superiorum pedunculus robustus apicem rostri longe (dimidia fere parte) superans, articulo ultimo tumefacto, subgloboso, appendicibus olfactoriis numerosis longis ornato; flagellum alterum 4articulatum articulis ultimis 2 pedunculi junctis longitudine fere æquale, alterum dimidiam illius longitudinem vix æquans biarticulatum.

Antennæ inferiores longitudinem corporis excedentes, flagello tenuissimo articulis elongatis.

Pedes 1:mi paris parvi et debiles cephalothorace breviores, articulo basali ceteris junctis longitudine circiter æquali, antepenultimo ad apicem rostri minime porrecto, penultimo et ultimo longitudine fere æquali et antepenultimo brevioribus.

Pedes 2:di paris illis 1:mi paris tertia circiter parte breviores structura solita.

Pedes 3:tii et 4:ti paris subæquales, articulo basali valde dilatato et ceteris junctis longitudine æquali dente minuto terminato.

Pedes ultimi paris illis multo breviores, articulo basali angustissimo.

Palpi natatorii pedibus parium 4 anteriorum et maxillipedibus 3:tii paris inhærentes magni parte basali ovata et complanata.

Pleopodum 2 paria bene evoluta. Pone illa margini postico segmentorum 2 sequentium subtus affixæ utrinque setæ 2 magnæ et ciliatæ.

Telson valde elongatum et angustum segmenta ultima 2 juncta longitudine æquans medio geniculatum vel supine angulum obtusum formans, parte basali subcylindrica, terminali sensim attenuata aculeis utrinque 7 sat longis et paulo curvatis præter apicales 2 armata.

Appendices caudæ laterales segmenta ultima 3 juncta longitudine superante svalde angustæ, trunco telsone paulo breviore intus aculeis circiter 12 armato, stylis terminalibus trunco multo brevioribus, inæqualibus, interno breviore, biarticulato articulis ongitudine subæqualibus, intus aculeis ciliatis 15 (8 articuli 1:mi et 7 ultimi) aculeoque forti terminali armato, externo sublineari setis apicalibus 3 inæqualibus et 6 brevibus marginis exterioris ornato.

Femina corpore magis abbreviato a mare differt. Scutum dorsale tamen in specimine unica scrutata contusum et forma ejusdem idcirco non definita. — Corporis postici segmenta non dentata.

Antennarum superiorum pedunculus angustus et elongatus, articulo ultimo tenuissimo lineari et antecedente paulo longiore; flagellum alterum 3articulatum, alterum biarticulatum.

Telson quam in mare multo brevius et robustius aculeis lateralibus utrinque modo 3 magnis et distincte postice curvatis.

Appendicum lateralium truncus telsone paulo longior intus aculeis modo 4 in parte ultima armatus, stylus internus 5 modo aculeis marginis interioris (2 articuli 1:mi et 3 ultimi) ornatus, aculeo terminali longo et recto.

Longitudo maris adulti vix 6 mm.

Habitat in oceano Atlantico meridionali longit. 41°47′ occident. latit. 23°41′ meridion., a clarissimo KINBERG detecta.

Af nærværende Art foreligge to Exemplarer, som begge ere samlede af Prof. KINBERG under Fregatten Eugenias Jordomseiling i det Syd-Atlantiske Ocean i Nærheden af Cap Frio. Det ene af disse Exemplarer er en fuldt udviklet Han, det andet en Hun, men som var meget mutileret, idet Rygskjoldet og tildels ogsaa den övrige Forkrop var knust, og saaledes den ydre Kropsform hos denne ikke bestembar. Jeg holder mig derfor ved Beskrivelsen væsentlig til den fuldstændig helt conserverede Han.

Beskrivelse af Hannen. Kropsformen er (se Pl. II, fig. 4 og 5) som hos alle Hanner af Slægten Diastylis smal og langstrakt. Forkroppen, der er omtrent af Bagkroppens Længde iberegnet det midterste Halevedhæng, er temmelig nedtrykt med den övre Contour kun lidet böiet; Bagkroppen af usædvanlig svag Bygning.

Rygskjoldet indtager det meste af Forkroppen og er næsten dobbelt saa langt som de frie Forkropssegmenter tilsammen. Seet fra Siden (Fig. 4) er det af meget langstrakt næsten elliptisk Form og mere end dobbelt saa langt som höit, med den övre Contour kun ganske svagt böiet og fortil noget stærkere nedadheldende mod Rostrum, de nedre Kanter bagtil næsten lige og horizontale, men derpaa foran Midten dannende en stærk Krumning og jevnt opstigende mod Rostrum uden at danne noget bemærkeligt vinkelformigt Fremspreng under samme. Som sædvanligt ere disse Kanter i sin forreste Del eller fra det Sted, hvor de have sin störste Böining fint tandede. Rostrum er temmelig stort, næsten indtagende ¼ af Rygskjoldets Længde og horizontalt, dog med Spidsen tydeligt nedadböiet. Seet ovenfra (se Fig 5) er Rygskjoldet af aflang ægdannet Form med sin störste Brede, der er betydelig större end Höiden bag Midten og med Sidecontourerne jevnt krummede og uden skarp Grændse convergerende mod Spidsen af Rostrum. Rygskjoldets Overflade er overalt jevnt hvælvet og tæt besat med meget smaa fortilrettede Torner. Paa hver Side nærmere den ventrale Flade findes en især i sit bagre Parti tydeligt markeret Længdekjöl, besat med en Rad af usædvanlig lange noget fortilkrummede og regelmæssigt kamformigt ordnede Torner, der især naar Dyret seet ovenfra (Fig. 5) ere meget iöinefaldende, dannende en temmelig bred ydre Bræm om Siderne af Rygskjoldet. Disse Torner ere længst bagtil og aftage successivt i Længde fortil, indtil de gaa over til det samme Udseende som de overalt paa Rygskjoldet siddende Smaatorner; længere fortil paa Siderne af Rostrum blive de igjen noget större, men synes her at vise en mere uregelmæssig Anordning.

Öiet synes ganske at mangle. Ialfald er Öieloben ganske flad, og intetsomhelst Spor af Corneæ eller underliggende Pigment var at opdage.

De 5 frie Forkropssegmenter ere alle tydelige i sin hele Omkreds, men meget lave og smale. Det 1:ste er som sædvanlig det korteste, og dets Epimerer indböiede og delvis bedækkede af Rygskjoldets Sidedele (se Fig. 4). Derimod ere Epimererne paa de 3 folgende Segmenter stærkt udstaaende til Siderne (se Fig. 5) og langs den ydre afrundede Rand besatte med en Rad af lignende lange kamformigt ordnede Torner som dem paa Rygskjoldets laterale Kjöle; desuden vise de 2 bageste af dem oventil 2 Længderader af korte bagudrettede Torner. Sidste Segment, der er betydelig smalere end de övrige, gaar paa hver Side ud i en dolkformig tilspidset bagudrettet Fortsats, til hvis nedre Side er fæstet 3 lange cilierede Börster, og er ligeledes oventil forsynet med nogle korte Torner samt har sin forreste Rand fint crenuleret.

Bagkropssegmenterne ere forholdsvis smaa og svage og tiltage lidt i Længde til det næstsidste, som er det længste. De 4 forreste have paa hver Side af Bugfladen (se Fig. 4) en udstaaende bagtil i en spids Tand udlöbende Kant, under hvilken de nedre Antenners Svöbe lægger sig, naar de som sædvanlig under Dyrets Bevægelser ere tæt tiltrykte til Kroppen. Paa 2:det—4:de Segment er denne Kant i Störsteparten af sin Længde fint tandet. De 5 forreste Segmenter have desforuden paa den dorsale Side 2 Længderader af smaa bagudrettede Torner ligesom paa 3:die og 4:de Forkropssegment (se Fig. 5). Sidste Segment (se Fig. 7) mangler ganske Torner og er af den sædvanlige nedtrykte, bagtil udvidede 6-kantede Form.

De övre Antenners Pedunkel (se Fig. 6) er af forholdsvis meget kraftig Bygning og rager omtrent med Halvparten af sin Længde udenfor Spidsen af Rostrum. Af dens 3 Led sees kun de 2 ydre fuldstændigt, medens det 1:ste delvis er skjult under Rostrum. Det sidste Led er stærkt opsvulmet, næsten kugledannet og kortere end det foregaaende samt nær Enden forsynet med et stort Antal baandformige i en Tværrad ordnede Lugtepapiller, der danne et tæt vifteformigt Knippe, der delvis dækker Svöberne. Af disse sidste er den ene næsten saa lang som de 2 ydre Led af Pedunkelen tilsammen, 4leddet og ender med 2 lange Lugtepapiller. Den anden Svöbe er neppe mere end halvt saa lang og 2leddet.

De nedre Antenner ere særdeles lange og overrage ikke saa ubetydeligt selv de ydre Halevedhæng. Deres Bygning er den for Diastylishannerne sædvanlige med særdeles tynd af langstrakte Led sammensat Svöbe.

1:ste Fodpar (se Fig. 4) er forholdsvis lidet udviklet, lige udstrakt kortere end Forkroppen, med Basalledet af samme Længde som alle de övrige tilsammen. 4:de Led række ikke til Spidsen af Rostrum og er længere end næstsidste; sidste Led særdeles smalt, linieformigt og omtrent af foregaaendes Længde samt i Enden besat med en Del tynde og böiede Börster.

2:det Fodpar er omtrent $\frac{1}{3}$ kortere end 1:ste og af fuldkommen normal Bygning, med Basalledet omtrent saa langt som de 3 fölgende tilsammen og 4:de Led langstrakt og smalt, længere end de 2 yderste tilsammen.

De 2 fölgende Fodpar ere omtrent af ens Störrelse og Udseende. Begge have som Fölge af Svömmepalpernes Tilstedeværelse Basalledet stærkt udvidet ved Basis og afsmalnende mod Enden, der er væbnet med en kort Torn, samt omtrent lige langt som alle de övrige Led tilsammen.

Sidste Fodpar er betydelig kortere og har Basalledet særdeles smalt, cylindriskt eller noget indknebet paa Midten. De ydre Led saavel paa dette som de 2 foregaaende Fodpar ere forresten af det sædvanlige Udseende og indbyrdes Længdeforhold.

De til de 4 förste Fodpar og sidste Par Maxillipeder fæstede Svömmepalper ere stærkt udviklede med bredt oval og pladeformigt sammentrykt Basaldel og mangeleddet Svöbe.

De 2 Par Bagkropslemmer (pleopoda) synes at være af fuldkommen normal Bygning, med 2 tydeligt adskilte korte Aarer forsynede med lange Svömmebörster. Til den bagre Rand af de 2 fölgende Segmenter er desuden som sædvanlig paa hver Side af Bugfladen fæstet 2 stærke cilierede Börster.

Det midterste Halevedhæng (se Fig. 7) er meget smalt og langstrakt, fuldkommen lige langt som de 2 sidste Bagkropssegmenter tilsammen, og er som sædvanlig hos Diastylishannerne paa Midten knæformigt böiet (se Fig. 4), idet det basale næsten cylindriske Afsnit gaar i Flugt med Bagkroppen, medens den stærkt afsmalnende Endedel pludselig böier sig skraat nedad dannende oventil med Basaldelen et stumptvinklet Hjörne; i sin yderste Halvpart er denne Del (se Fig. 7) bevæbnet med 7 usædvanlig lange og tynde noget böiede Torner, foruden de sædvanlige 2 noget kortere terminale Torner.

De ydre Halevedhæng (ibid.) ere noget længere end de 3 sidste Bagkropssegmenter tilsammen og ligeledes af meget spinkel Form. Basaldelen eller Stammen er noget kortere end det midterste Halevedhæng og i sin indre Kant forsynet med 12 korte Torner. Aarerne ere af ulige Længde og betydelig kortere end Stammen. Den indre er den korteste, af smal dolkdannet Form, bestaaende af 2 omtrent lige lange Led. Det 1:ste af disse Led er temmelig tykt ved Basis, men jevnt afsmalnende mod Enden og i den indre Kant bevæbnet med 8 tynde cilierede Torner; sidste Led er meget smalt, indad bevæbnet med 7 lignende Torner og i Enden med en betydelig stærkere lige bagudrettet ucilieret Torn. Den ydre Gren, der ikke saa ubetydeligt overrager den indre, bestaar som sædvanlig af et kort Basalled og et langt og smalt lineært Endeled, der i Enden har 3 ulige lange tynde Börster og i den ydre Kant 6 betydelig kortere d:o.

Hvad *Hunnen* angaar, da kan jeg om dennes almindelige Habitus og navnlig Rygskjoldets Form intet bestemt sige, da det eneste undersögte Exemplar, som anfört, var betydeligt mutileret. Kropsformen synes dog at have været betydelig kortere og mere undersætsig end hos Hannen og Rygskjoldet har rimeligvis ganske manglet de tandede Længdekjöle, der udmærke Hannen.

De övre Antenners Pedunkel (se Fig. 8) har den for Hunnerne sædvanlige tynde og spinkle Form. Sidste Led er her særdeles smalt, lineært og noget længere end det foregaaende. Den ene Svöbe er af samme Længde som Pedunkelens sidste Led og 3-leddet, den anden som hos Hannen meget kort og 2-leddet.

Halevedhængene (Fig. 9) ere af temmelig forskjelligt Udseende, skjönt man let i deres Bygning gjenkjender Arten.

Det midterste Halevedhæng er kortere end de ydre Halevedhængs Stamme og af temmelig plump Form med kun 3 særdeles lange og bagudkrummede Torner paa hver Side foruden de 2 kortere terminale Torner.

De ydre Halevedhængs Stamme har i sin indre Kant kun 4 Torner nær Enden. Grenene vise omtrent det samme indbyrdes Forhold som hos Hannen, men den indre har kun 5 korte ucilierede Torner i den indre Kant (2 paa 1:ste og 3 paa sidste Led).

Som det af ovenstaaende Beskrivelse vil sees, er nærværende Cumace, trods dens Findested paa den sydlige Hemisphære, en fuldkommen normal Art af den nordiske Slægt Diastylis. Af vore norske Arter synes Hannen at vise mest Lighed med Diastylis serrata G. O. Sars; men denne Art viser flere Afvigelser fra det for Slægten Diastylis normale Forhold, navnlig i Bagkropslemmernes og Halevedhængenes Bygning, som derimod hos nærværende Art er fuldkommen normal. Ingen anden bekjendt Diastylisart har den eiendommelige kamformigt tandede Længdekjöl langs Siderne af Rygskjoldet, der i Forbindelse med de paa lignende Maade tandede Epimerer af 2:det—4:de Forkropssegment giver Forkroppen hos nærværende Art ovenfra slet Udseendet af at være omgiven af en regelmæssigt fryndset Bræm. Skjöndt Hunnen efter al Rimelighed mangler denne Tandbevæbning, har jeg dog troet at kunne benævne Arten herefter.

3. LEUCON ANOMALUS, G. O. Sars, n. sp.

(Tavl. III. (Fig. 10—13.)

Descriptio. Femina junior. Corporis forma gracillima et elongata, cephalothorace postice valde attenuato et corpori postico continuo.

Scutum dorsale sat magnum segmenta libera corporis antici juncta longitudine circiter æquans, a latere visum subovatum parte antica sensim attenuata, altitudine maxima dimidia longitudine parum majore, margine superiore sat arcuato et antice rostro incumbente, inferioribus in medio obsolete angulatis parum vero arcuatis inque parte dimidia antica subtiliter crenulatis et processu acuminato antice vergente sinu distincto a rostro disjuncto terminatis, rostro brevi vix sextam partem scuti longitudinis occupante, horizontali, forma obtuse conica; supra visum sat angustum, latitudine maxima altitudine minore et dimidiam longitudinem æquante ad marginem posticum sita, antice sensim attenuatum. Crista adest mediana longitudinalis in parte antica scuti sat elevata dentibusque 4 quam solito majoribus et antice vergentibus armata.

Lobus ocularis forma omnino insolita processum valde elongatum, anguste linguæformem, usque ad apicem rostri porrectum dentibusque 2 minutis terminatum formans.

Segmenta libera corporis antici omnia distincta, anteriora duo sat alta et arcte conjuncta, posteriora vero subito multo angustiora et corpori postico vix latiora constrictionibusque profundis disjuncta.

Corpus posticum appendicibus caudalibus exceptis antico nonnihil longius, segmentis sat magnis et subcylindricis, ultimo postice in medio obtuse producto et utrinque supra insertionem appendicum lateralium subtiliter dentato.

Antennæ superiores sat elongatæ apicem rostri longe (articulo ultimo pedunculi) superantes flagello singulo brevi papillis 2 olfactoriis longissimis terminato instructæ.

Pedes 1:mi paris in specimine unico scrutato manci; 2:di paris longitudinem scuti dorsalis rostro excepto æquantes, sat fortes, apicem versus sensim attenuati, articulo ultimo longo et angusto, fere styliformi. Pedes posteriores illis multo debiliores et sensim longitudine decrescentes, articulo 4:to quam solito magis elongato, pari anteriore ut vulgo palpigero.

Appendices caudales sat elongatæ et angustæ duplam fere articuli ultimi longitudinem assequentes, trunco paulo complanato, margine interno leviter convexo et aculeis 5 fortissimis dentibus 3 multo minoribus interpositis armato, stylis terminalibus trunco paulo brevioribus, interiore biarticulato, articulo 1:mo latiore et intus aculeis 10, quorum 2 ceteris multo majores, armato, ultimo illo paulo longiore sed subito multo angustiore intus aculeis

9 apicem versus sensim longioribus et seta longa terminali instructo, stylo exteriore interiore paulo longiore et ut illo biarticulato, articulo 1:mo brevi, ultimo angusto, sublineari, extus aculeis 8 brevibus, intus et ad apicem setis circiter 11 longis et ciliatis ornato.

Longitudo vix 8 mm.

Habitat ad St. Martin Indiæ occidentalis in profunditate 200—300 orgyarum fundo argillaceo.

Af nærværende i enkelte Henseender meget eiendommelige Art foreligger kun et enkelt Exemplar, en omtrent 8 Mm. lang ung Hun, som af GOES blev taget ved St. Martin paa 200—300 Favnet Dyb.

Beskrivelse. Kropsformen er særdeles smal og langstrakt og det i höiere Grad end hos nogen anden mig bekjendt Cumace. Forkroppen er temmelig sammentrykt fra Siderne og indknibes seet fra Siden temmelig pludselig bagtil, saa at den her neppe er bredere end Bagkroppen, med hvilken den gaar i lige Flugt uden nogen skarpt markeret Grændse mellem begge disse Kropsafsnit.

Rygskjoldet er temmelig stort, omtrent af samme Længde som alle de övrige frie Forkropssegmenter tilsammen. Seet fra Siden (Fig. 10) er det af ægdannet Form og afsmalnes i sit forreste Parti jevnt fra begge Sider mod Rostrum, der saaledes udgaar omtrent i Legemets Axe. Den övre Rand er jevnt bueformigt böiet og helder i sin forreste Del temmelig brat ned mod Roden af Rostrum. Den bagre Rand er næsten lige og gaar nedad med en stærk Runding over i de nedre Kanter. Disse ere kun lidet böiede, men vise dog paa Midten en utydelig Vinkel, hvorfra de fortil ganske svagt hæve sig skraat opad og ende med en skarp fortilrettet Fortsats, der ved en tydelig og temmelig dyb Bugt er skilt fra Rostrum. Hele det forreste Parti af de nedre Kanter er fint saugtakket. Rostrum er forholdsvis kort, neppe indtagende mere end $\frac{1}{6}$ af Rygskjoldets Længde, horizontalt og af stump konisk Form. Seet fra Siden viser det sig i Enden ligesom tvedelt eller gaaende ud i 2 korte Spidser. Ovenfra seet (Fig. 11 og 12) viser det sig imidlertid, at dette hidrörer fra den höist mærkværdige og eiendommelige Udvikling af den saakaldte *Öielob*, der fra den klokkeformige mediane eller frontale Lob af Rygskjoldet skyder sig frem i Form af en lang og smal tungeformig Fortsats langs den övre Side af Rostrum lige indtil dettes Spids og paa den noget fortykkede Ende er forsynet med 2 korte jevnsides stillede Torner. Rostrum selv viser sig i denne Stilling regelmæssigt stumpt koniskt og til Siderne jevnt overgaaende i Rygskjoldet. Langs den dorsale Side er Rygskjoldet som hos de övrige Arter af Slægten forsynet med en i sin forreste Del temmelige höi median Crista, der er forsynet med 4 usædvanligt stærke fortilrettede Tænder, hvoraf den bageste omtrent er beliggende i Midten af Rygskjoldets Længde.

De 5 frie Forkropssegmenter ere alle tydeligt udviklede. Det 1:ste er som sædvanligt det korteste og næsten baandformigt; derimod er 2:det Segment temmelig stort og forsynet med vel udviklede Epimerer. De 3 fölgende Segmenter indknibes derimod pludseligt særdeles stærkt, og de 2 bageste ere neppe bredere eller höiere end Bagkroppen samt meget skarpt afsatte fra hinanden.

Bagkroppen er, selv naar Halevedhængene fraregnes, ikke saa ubetydeligt længere end Forkroppen og dens Segmenter vel udviklede, af cylindrisk Form og jevnt tiltagende i Længde indtil næstsidste, som er det störste af dem alle. Sidste Segment er ovenfra seet (Fig. 11 og 12) af tydelig pentagonal Form, idet den bagre Rand mellem Roden af de ydre Halevedhæng danner et temmelig stort stumpt coniskt Fremspring som Antydning til et midterste Halevedhæng. Over Roden af Halevedhængene bemærkes i Kanterne af dette Segment omtrent 6 fine tæt sammentrængte Torner.

De övre Antenner (se Fig. 12) ere af meget spæd Bygning, men temmelig lange og rage med hele det ydre smalt lineære Led af Pedunkelen udenfor Spidsen af Rostrum. Af Svöberne er alene en (den övre) udviklet, der er temmelig kort, betydeligt kortere end Pedunkelens sidste Led og ender med 2 særdeles stærkt forlængede baandformige Lugtepapiller.

Det sidste Par Maxillipeder, der vise sig umiddelbart nedenfor Rygskjoldet, ere fuldkommen af samme Bygning som hos Slægtens övrige Arter og række med næstsidste Led omtrent til Enden af den under Rostrum fremspringende tilspidsede laterale Fortsats.

Af *1:ste Fodpar* var hos det undersögte Exemplar hele det ydre Parti borte. Basalledet er af sædvanlig Form og rækker noget foran den vinkelformige Böining, som de nedre Kanter af Rygskjoldet danne paa Midten.

2:det Fodpar er temmelig kraftigt bygget og omtrent af Rygskjoldets Længde, naar Rostrum fraregnes. Det bestaar som sædvanligt hos de herhen hörende Arter kun af 5 Led, der jevnt afsmalnes mod Enden. Sidste Led er særdeles smalt, næsten sylformigt, længere end de 2 foregaaende Led tilsammen og besat med en Del korte Börster.

De 3 bageste Fodpar ere af forholdsvis spæd Bygning og jevnt aftagende i Længde bagtil, samt udmærkede ved 4:de Leds usædvanlige Længde. Forövrigt vise de den for Slægten normale Bygning, og det förste af disse Par er som hos de övrige Arter forsynet med tydeligt udviklede Svömmepalper.

Halevedhængene (Fig. 13) ere noget mindre kraftigt byggede end sædvanlig tog ikke fuldt dobbelt saa lange som sidste Segment. Ogsaa er deres Form temmelig afvigende fra samme hos de övrige bekjendte Arter. Stammen er noget fladtrykt, idet den indre Rand er noget udvidet, dannende en skarp noget bueformigt böiet Kant, hvortil er fæstet 5 usædvanligt stærke Torner, foruden 3 betydeligt mindre, hvoraf de 2 have sin Plads mellem den 3:die sidste og næstsidste, den 3:die mellem denne og sidste. Grenene ere temmelig spæde og noget kortere end Stammen. Den indre, som er den korteste, bestaar af 2 meget skarpt fra hinanden afsatte Led, hvoraf det 1:ste er jevnt bredt og i den indre Kant bevæbnet med 10 Torner; af disse ere de 2, nemlig den yderste og den midterste usædvanlig lange og tynde, mere end 3 Gange saa lange som de övrige. Sidste Led, der er lidt længere end det 1:ste, er meget smalt, stærkt indknebet ved Basis og lidt udviket i Enden samt i den indre Kant bevæbnet med 9 mod Enden jevnt i Længde tiltagende Torner og med en lang terminal Börste. Den ydre Gren, som er kun ubetydeligt længere end den indre, bestaar ligeledes af 2 Led, hvoraf det 1:ste er meget kort, det sidste af smal lineær Form og i den ydre Kant bevæbnet med 8 korte Torner, i den indre og ved Spidsen med omtrent 11 lange cilierede Börster.

Ved Rygskjoldets Form og især den höist mærkværdige Udvikling af den saakaldte Öielob adskiller nærværende Art sig meget skarpt fra alle de övrige bekjendte Arter.

Da den imidlertid i andre Henseender vise de for nærværende Slægt eiendommelige Characterer, har jeg ikke troet alene herpaa at kunne grunde en egen Slægt, men henförer den forelöbigt til Slægten Leucon som dennes unegtelig mest anomale Repræsentant.

4. CAMPYLASPIS PULCHELLA, G. O. Sars, n. sp.

(Tavl. 1. Fig. 14—16.)

Descriptio. Femina. Corporis forma ut in speciebus ceteris sat abbreviata, cephalothorace valde dilatato et fere globoso, corpore postico tenuissimo.

Scutum dorsale permagnum segmentis liberis corporis antici junctis fere quadruplo longius, a latere visum rotundato-trigonum, altitudine maxima dimidia longitudine multo majore, margine superiore arcum æquum et valde prominentem formante, posteriore obliquo et inferioribus in medio sat arcuatis continuo, rostro brevi nonam modo partem scuti longitudinis occupante, horizontali et a latere viso acutissime producto, sinu subrostrali obsoleto; supra visum breviter ellipticum ad latera æqualiter convexum, latitudine maxima altitudine majore in medio sita, parte antica parum exserta. Superficies scuti ubique æqualiter arcuata, glaberrima, nitidissima, pilis omnino destituta.

Lobus ocularis sat magnus, oblongus, et a latere visus basi rostri supine tuberculi instar obductus.

Segmenta libera corporis antici brevissima, 1:mo in parte modo dorsali distincto, 2:do supine in cristam transversalem elevato, posterioribus 3 subito valde attenuatis, ultimo segmento 1:mo corporis postici parum latiore et vix altiore.

Corpus posticum appendicibus caudalibus exceptis antico brevius, tenue et debile, segmentis subcylindricis et constrictionibus parum profundis disjunctis, ultimo postice fere truncato vel leviter modo in medio producto.

Antennæ superiores sat elongata, longe extra apicem rostri porrectæ, articulis pedunculi subæqualibus.

Pedes 1:mi paris ut vulgo brevissimi et maxillipedibus 3:tii paris vix longiores; 2:di paris illis longitudine circiter æquales, articulo ultimo styliformi et aculeo longo terminato. Pedes posteriores tenuissimi et sparse pilosi postice sensim breviores, articulo 3:tio sat elongato.

Appendices caudales quam solito magis elongatæ, segmentis 4 ultimis junctis longitudine fere æquales trunco longo et angusto intus vix dilitato sed dense serrulato, stylis terminalibus brevibus et fere subæqualibus ne dimidiam quidam trunci longitudinem assequentibus, interiore ut vulgo uniarticulato aculeis 6 postice sensim longioribus, terminali longitudinem totius styli fere æquante, armato; exteriore illo paulo longiore et biarticulato, articulo 1:mo brevi. ultimo anguste sublineari setis 3 apicalibus quarum una longissima et 2 brevioribus marginis exterioris instructo.

Longitudo ab apice rostri ad extremitatem appendicum caudalium vix 4 mm.

Habitat ad Anguilla Indiæ occidentalis in profunditate 200—300 orgyarum.

Af denne lille vakre Cumace foreligger som af foregaaende kun et enkelt Exemplar, der blev taget af Goes ved Anguilla i Vestindien paa 200—300 Favnes Dyb. Exemplaret, der skjöndt neppe 4 Mm langt synes at være en fuldvoxen Hun, lader sig med fuldkommen Sikkerhed henföre til den nordiske Slægt *Campylaspis* G. O. Sars, der saaledes ogsaa viser sig repræsenteret i de tropiske Have.

Beskrivelse. Kropsformen er som hos de övrige Arter af Slægten meget kort og undersætsig, og Forkroppen særdeles stærkt, næsten kugleformigt opsvulmet og saaledes stærkt afstikkende mod den usædvanlig spinkle og svagt byggede Bagkrop.

Rygskjoldet er særdeles stort, omtrent 4 Gange saa langt som alle de frie Forkropssegmenter tilsammen, og seet fra Siden (Fig. 14) af uregelmæssig oval eller rettere tilrundet trekantet Form, med den störste Höide betydeligt större end den halve Længde. Den övre Rand er i sin hele Længde meget stærkt og jevnt bueformigt böiet og sænker sig fortil temmelig brat ned mod Rostrum. Den bagre Rand er skraat afskaaret og overgaar temmelig jevnt i de nedre Kanter, der paa Midten ere stærkt böiede og med en jevn Krumning herfra vende sig skraat opad mod Spidsen af Rostrum, uden at danne nogen tydelig Bugt eller Udstaaenhed under samme. Rostrum er som sædvanligt meget kort med den övre Rand fuldkommen lige og horizontal og ender seet fra Siden i en fint uddragen skarp Spids. Ved Basis af det viser sig oventil den temmelig stærkt fremspringende aflange *Öielob* i Form af en skarpt markeret Afsats. Seet ovenfra (Fig. 15) viser Rygskjoldet en meget regelmæssig bredt elliptisk Form med Sidecontourerne i sin hele Længde jevnt bueformigt böiede og den störste Brede, der er noget större end Höiden omtrent paa Midten. Rygskjoldets Overflade er overalt jevnt hvælvet uden Spor af Folder eller Processer, glat og glindsende med kun höist utydeligt udpræget celleformig Sculptur.

De frie Forkropssegmenter ere meget korte og ligesom trængte tæt sammen ved Rygskjoldets enorme Udvikling, saa at deres övre Rand hælder fra Rygskjoldets bagre Ende brat og næsten vertikalt ned mod Bagkroppen. Af det forreste Segment er alene det dorsale Parti tydeligt udviklet. 2:det Segment er derimod tydeligt i sin hele Længde og er oventil hævet i en temmelig stærkt fremspringende transversal Crista eller Fold; Epimererne ere tydelige, skjöndt for en Del endnu bedækkede af Rygskjoldets Sidedele, og ere ligesom paa de 3 fölgende Segmenter tilrundede og noget bagudrettede. De 3 sidste Segmenter aftage meget hurtigt saavel i Höide som Brede bagtil, og sidste Segment er neppe större end 1:ste Bagkropssegment.

Bagkroppen er af usædvanlig tynd og spinkel Form og naar Halevedhængene fraregnes betydeligt kortere end Forkroppen. Dens Segmenter ere mindre skarpt afsatte fra hinanden end hos de övrige Arter og af næsten fuldstændig cylindrisk Form. Næstsidste er som sædvanligt det længste. Sidste Segment er ikke synderligt mere end halvt saa langt og bagtil næsten lige afstumpet, kun dannende en meget svagt fremspringende Vinkel mellem Roden af de ydre Halevedhæng som en Antydning til det midterste Halevedhæng.

De övre Antenner ere vel udviklede og af tynd og langstrakt Form. Pedunkelen rækker lige fortilstrakt langt udenfor Spidsen af Rostrum og har alle 3 Led omtrent af ens Længde. Af Svöberne er som hos de övrige Arter kun den ene (övre) tydeligt udviklet.

1:ste Fodpar er som sædvanligt hos de herhen hörende Arter kun lidet udviklet, neppe længere end sidste Par Maxillipeder og vise sig umiddelbart nedenfor de nedre Kanter af Rygskjoldet, fölgende disses Böining indtil omtrent den forreste Trediedel af deres Længde.

2:det Fodpar er næsten af samme Længde som 1:ste og har det yderste Led som sædvanligt stærkt forlænget og smalt samt endende med en lang cilieret Torn.

De 3 bageste Fodpar ere særdeles tynde og spinkle og kun sparsomt börstebesatte. De aftage jevnt i Længde bagtil og have det 3:die Led stærkt forlanget samt endende med en stærkt krummet Börste.

Halevedhængene (Fig. 16) ere af en ganske usædvanlig langstrakt og smal Form og endog af samme Længde som de 4 sidste Bagkropssegmenter tilsammen. Dette skyldes især Stammen, der er overordentlig stærkt forlænget, betydeligt længere end hos nogen anden bekjendt Art af Slægten, og af smalt cylindrisk Form med den indre Rand ikke som sædvanligt udvidet, men i sin hele Længde fint saugtakket. Grenene ere neppe halvt saa lange som Stammen og vise den for Slægten normale Bygning. De ere omtrent af ens Længde, eller den ydre ganske ubetydeligt længere end den indre. Denne sidste bestaar af kun et enkelt Led, der indad er bevæbnet med 6 bagtil i Længde tiltagende Torner, hvoraf især den fra Enden udgaaende er særdeles lang og næsten af hele Grenens Længde. Den ydre Gren er 2-leddet og noget tyndere end den indre. 1:ste Led er ganske kort, det sidste smalt lineært og endende med 3 Börster, hvoraf den midterste er særdeles lang; i den ydre Kant bemærkes desuden 2 betydeligt kortere Börster.

Farven har rimeligvis været den for de herhen hörende Arter sædvanlige smukke röde; men denne Farve forandres hos de fleste Arter ved Spiritusens Indvikning, saa at den enten ganske forsvinder eller kun delvis holder sig paa enkelte Punkter. Det undersögte Exemplar havde paa Rygskjoldet nogle uregelmæssige mörkere Shatteringer eller Pletter, der synes at være Reminicenser af den oprindelige Farve.

Som man af ovenstaaende Beskrivelse vil have seet, danner nærværende Art en vel udpræget Repræsentant af Slægten Campylaspis, og skiller sig fra de övrige bekjendte Arter hovedsageligt kun ved Rygskjoldets Form og glatte ligesom polerede Udseende, ved den usædvanligt svagt byggede spinkle Bagkrop og især ved Halevedhængenes usædvanlig stærkt forlængede og tynde Form.

5. STEPHANOMMA[1]) GOËSII, G. O. Sars, nov. gen. et sp.

Tavl. IV. Fig. 17—23.

Charact. generis. Corpus elongatum, cephalothorace postice sensim attenuato et corpori postico continuo. Scutum dorsale antice nullum rostrum formans, lacinia media in fronte libere prominente, lateralibus omnino obsoletis, quare nulla adest in parte antica scuti ut in ceteris Cumaceis sutura postice bifurcata. Orificium adest semicirculare in medio extremitatis anticæ sub fronte laminis 2 triangularibus ad apparatum branchialem pertinentibus præclusum. Oculus permagnus magnam partem frontis occupans, ex ocellis compositus pluribus coronæ instar dispositis. Segmenta 5 distincta ad corpus anticum pertinentia pone scutum dorsale apparent, epimeris ex parte sat magnis et prominentibus instructa. Corpus posticum subcylindricum, segmentis constrictionibus parum profundis sejunctis. Integumenta durissima structura subtiliter areolata. Antennæ superiores flagello unico instructæ. Maxillipedes 3:tii paris palpis natatoriis destituti (?) faciei ventrali arcte appressi, 6articulati, articulo 3:tio extus valde dilatato. Pedes solummodo 1:mi paris (in femina) palpigeri, ceteri simplices et parvi. Appendix caudalis media deest, laterales stylis lanceolatis, altero uni-altero biarticulato instructæ. — Mas ignotus.

Descriptio. Femina adulta. Corporis forma sat elongata eidem Lampropis non dissimilis. Corpus anticum a latere visum antice quam postice minus attenuatum, supine inæqualiter arcuatum, margine superiore antice fere recto postice vero subito deflexo; supra visum elongato-ovatum, latitudine maxima dimidia longitudine minore et antice et postice sensim coarctatum.

Scutum dorsale supine medio carinatum sat magnum segmentis liberis corporis antici junctis nonnihil longius, a latere visum irregulariter subovatum, altitudine maxima dimidia longitudine majore, margine superiore subrecto et horizontali vel leviter modo declivi ante medium processum magnum dentiformem antice vergentem præbente, inferioribus ante medium valde arcuatis, parte postica obliqua et simul cum margine posteriore arcum æquum formante, antica leviter ascendente et processu obtuse acuminato antice vergente (angulo latero-inferiore), de quo carina exit brevis lateralis, terminata, rostro omnino nullo, parte frontali libere prominente, forma obtuse conico-rotundata, ab angulis latero-inferioribus incisura brevi disjuncta et illos nonnihil superante; supra visum antice sensim coarctatum latitudine maxima altitudine paulo majore pone medium sita. Superficies scuti impressionibus numerosis rotundatis iniqua pilis vero nullis, ante medium utrinque faciei dorsali propius paulo excavata et tuberculo irregulari instructa.

Organum visus magnam partem frontis occupans ex ocellis compositum circularibus 10 coronnæ instar circa unum medianum dispotisis.

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[1]) στέφανος: corona et ὄμμα: oculus.

Segmenta 5 libera corporis antici omnia distincta, 1:mo brevissimo epimeris indistinctis, 2:do duplo longiore medio distincte carinato epimeris magnis et fere horizontaliter porrectis segmentum anticum ex parte obtegentibus; 2 sequentibus subito multo humilioribus medio obsolete carinatis epimeris subtriangularibus et postice vergentibus instructis, ultimo segmento 1:mo corporis postice arcte conjuncto et illo et forma et magnitudine simili, medio ut antecedentibus indistincte carinato in utroque latere vero distincte 3carinato.

Marsupium ventrale sub parte postica scuti dorsalis et segmentis liberis 3 anterioribus valde prominens.

Corpus posticum appendicibus caudalibus exceptis antico nonnihil longius, subcylindricum, leviter deflexum, segmentis vix emarginatis et sat arcte conjunctis, omnibus utrinque distincte 3carinatis carina præterea dorsali ut in corpore antico visibili, penultimo ceteris majore et supra viso postice sensim attenuato, ultimo sat angusto postice vix dilatato et obtuse conico-producto.

Integumenta durissima structura subtilissime areolata, areolis rotundato-angulatis.

Antennæ superiores parvæ et debiles ab extremitate antica scuti dorsalis supra angulos latero-inferiores prominentes, pedunculo 3articulato et flagello unico brevi papillis olfactoriis 2 terminato instructæ.

Maxillipedes 3:tii paris sub parte antica scuti dorsalis faciem ventralem arcte appressi, sat robusti, palpis natatoriis destituti (?), 6articulati, articulo basali sequentibus 2 junctis vix longiore, complanato, margine exteriore in parte postica sat prominente et arcuato, 2:do subcylindrico et sat magno, 3:tio extus dilatationem permagnam laminarem, falciformem, antice curvatam formante, ultimo parvo et angusto.

Pedes 1:mi paris longitudine mediocri, parte terminali angusta et fere nuda, articulo basali vero sat magno et lato antice sensim attenuato articulis 3 sequentibus junctis longiore, antepenultimo ad angulum latero-inferiorem porrecto, penultimo illo paulo longiore et infra vergente, ultimo brevi et angusto setis nonnullis brevibus apicalibus instructo, palpo natatorio quam solito minus evoluto et fere rudimentari; 2:di paris illis fere dimidia parte breviores, simplices, tenues, antice curvati, laminæ inserti sat magnæ subtriangulari epimeris segmenti 2:di arcte conjunctæ, 5articulati, articulo ultimo sat elongato et antecedentibus 3 junctis longitudine circiter æquali, anguste conico et aculeo longo terminato. Pedes posteriores tenues et sparse pilosi, structura solita, et posteriora versus sensim breviores.

Appendix caudalis media deest.

Appendices laterales sat elongatæ segmentis ultimis 2 junctis paulo longiores, trunco anguste cylindrico et omnino inermi, stylis terminalibus subæqualibus et trunco brevioribus, interiore lanceolato margine interno subtiliter serrulato et in medio aculeis 5 brevibus armato apice vero integro; exteriore illo angustiore, indistincte biarticulato, articulo 1:mo brevissimo, ultimo subulato ad apicem oblique truncato et aculeis 3 medio longiore armato.

Longitudo ab extremitate frontis ad apicem appendicum caudalium vix 11 mm.

Habitat ad St. Martin Indiæ occidentalis, profunditate non indicata.

1 Exemplar af denne höist eiendommelige Cumace fandtes blandt de af Goes i Vestindien indsamlede Crustaceer uden Angivelse af Dybden.

Beskrivelse. Det foreliggende Exemplar er en fuldvoxen Hun af næsten 11 Mm:s Længde med stærkt udviklet Brystpose eller Marsupium. Kropsformen er temmelig langstrakt, omtrent som hos Arterne af Slægten *Lamprops*, med hvem nærværende Cumace i sin ydre Habitus har adskilligt tilfælles. Forkroppen, der som hos disse bagtil jevnt og uden skarp Grændse overgaar i Bagkroppen, viser seet fra Siden (Fig. 17), naar Brystposen regnes med, en aflang oval Form, med den övre Rand noget uregelmæssigt böiet, idet den noget bag Midten paa et Stykke sænker sig mere pludseligt nedad, medens den fortil næsten er lige. Ovenfra seet (Fig. 18) viser Forkroppen en mere regelmæssig oval Form med den störste Brede, der er noget mindre end den halve Længde omtrent paa Midten, hvorfra den saavel fortil som bagtil jevnt afsmalnes.

Rygskjoldet er temmelig stort og betydeligt længere end de frie Forkropssegmenter tilsammen. Oventil er det forsynet med en Længdekjöl, der især bagtil er meget tydelig og foran Midten skyder sig ud i en stor triangulær eller tandformig fortilrettet Fortsats (se Fig. 17). Det forreste Parti af Rygskjoldet foran denne Fortsats viser en stumpt konisk Form uden Spor af noget Rostrum. Heller ikke bemärkes her den sædvanlige Sutur, der hos de övrige Cumaceer begrændse den mediane Lob af Rygskjoldet til Siderne og foran samme adskiller i Form af en smal median Fissur de 2 Rostrum dannende Sidelober. Sagen er nemlig den, at disse for Cumaceerne saa characteristiske Sidelober her ganske og aldeles mangle, hvorfor den mediane Lob eller Pandedelen her træder frit frem, dannende det ovenfor nævnte forreste koniske Parti af Rygskjoldet. Heller ikke nogen særskilt *Öielob* findes; men de enkelte Ocelli eller lindseformige Corneæ bemærkes fordelte omkring paa den stumpt tilrundede Ende af selve Pandedelen (se Fig. 17, 19), hvor de indtage et ganske usædvanligt stort Rum og ereordnede krandsformigt omkring en median Cornea, saaledes at denne omgives af 10 andre. Umiddelbart nedenfor denne koniskt fremspringende Pandedel bemærkes i Midten fortil en stor halvcirkelformig Aabning (se Fig. 20), der förer direkte ind i den af Rygskjoldet omsluttede som Gjellehule tjenende Cavitet. Den er dækket af 2 smaa bevægelige triangulære Plader, der höre til Gjelleapparatet og tjene til under dettes rythmiske Svingninger vexelvis at aabne og lukke den nævnte Aabning. — Seet fra Siden (Fig. 17) viser Rygskjoldet en uregelmæssig oval Form, med den störste Höide betydelig större end den halve Længde. Den övre Rand er næsten lige og horizontal eller kun ganske svagt nedadheldende og viser ved Enden af den forreste Trediedel af Rygskjoldets Længde den ovenfor omtalte tandformige Fortsats, der ligesom danner en stærk Afsats, hvorfra den övre Rand videre og ligeledes med et temmelig lige og horizontalt Forlöb fortsætter sig til den stumpt tilrundede forreste Ende af Pandedelen. De nedre Kanter ere stærkt indböiede og i sin bagre Del noget skjævt nedadheldende samt dannende sammen med den bagre Rand en temmelig jevn Bue; længere fortil böie de sig med en stærk Krumning fortil og skraat opad og ende med et stumpt tilspidset fortilrettet Fremspring, der rager noget frem til hver Side af Rygskjoldet (se Fig. 17, 18 og 19) og fortsætter sig bagtil i Form af en kort tilrundet Kjöl eller Crista. Ved dette fremspringende nedre Hjörne, der maaske er at betragte som homolog med de laterale Lober hos andre Cumaceer, viser Rygskjoldet sig seet fra Siden fortil forsynet med et kort Indsnit, hvorfra Pandedelen stiger steilt i Veiret. Ovenfra seet (Fig. 18) er Rygskjoldet til Siderne jevnt bueformigt böiet, med den störste Brede, der er noget större end Höigen, beliggende betydeligt bagenfor Midten; fortil afsmalnes det hurtigt og jevnt mod den stumpt koniske Pandedel. — Rygskjoldets Overflade er meget ujevn, idet den overalt er forsynet med smaa aflange eller rundagtige Gruber, begrændsede af tildels temmelig stærkt fremspringende med hinanden anastomoserende ophöiede Folde (se Fig. 17). Noget foran Midten og nærmere den dorsale Side er Rygskjoldet til hver Side af det dorsale tandformige Fremspring noget excaveret og her bemærkes paa hver Side en temmelig stor uregelmæssig knudeformig Fremstaaenhed begrændset af en Del dybe Gruber.

Af *frie Forkropssegmenter* findes bag Rygskjoldet som hos de fleste Cumaceer 5, hvoraf det 1:ste er meget kort, baandformigt og med utydeligt udviklede Epimerer. 2:det Segment er betydeligt stærkere udviklet og omtrent dobbelt saa langt som 1:ste samt oventil forsynet med en tydelig og temmelig stærkt fremspringende Længdekjöl; dets Epimerer ere temmelig store og af en meget eiendommelig Form, idet de danne en næsten horizontalt til Siderne udstaaende Plade, der fortil skyder sig tversover det nedre Parti af 1:ste Segment og med sin stumpt tilrundede forreste Ende endog rager noget frem over Rygskjoldets bageste Rand. De 2 fölgende Segmenter ere pludselig betydelig lavere og forsynede med pladeformige bagudrettede og til Siderne stærkt udstaaende Epimerer af triangulær Form. Sidste Segment er meget smalt og saavel i Form som Störrelse meget ligt 1:ste Bagkropssegment, med hvilket der er temmelig fast forbunden. Langs Midten af den dorsale Side har det ligesom de foregaaende Segmenter en utydelig Længdekjöl og viser desuden til hver Side 3 betydeligt skarpere markerede laterale Længdekjöler, som vi ogsaa ville finde paa Bagkropssegmenterne. Bagtil er dette Segment næsten lige afskaaret og uden tydeligt udviklede Epimerer.

Bagkroppen er temmelig kraftigt bygget og, selv naar Halevedhængene fraregnes, betydeligt længere end Forkroppen samt af cylindrisk Form. Dens Segmenter ere temmelig fast forbundne med hinanden og kun lidet udrandede bagtil, hvorfor denne Kropsdels Bevægelighed vistnok er temmelig indskrænket. De ere alle med Undantagelse af sidste forsynede paa hver Side med 3 meget skarpt markerede Længdekjöle og vise desuden i Midten af den dorsale Side en enkelt lignende skjöndt mindre fremspringende Kjöl. Bagkroppen faar herved et ganske eiendommeligt regelmæssigt stribet Udseende. Næstsidste Segment er som sædvanligt det længste og er ovenfra seet (Fig. 23) bagtil noget afsmalnende; dets bagre Rand gaar til hver Side ud i et tydeligt vinkelformigt Hjörne, medens dette paa de foregaaende Segmenter er utydeligt og stumpt tilrundet. Sidste Segment er betydeligt smalere end de övrige og overalt næsten af ens Brede; dets bagre Rand danner oventil paa Midten imellem Roden af de ydre Halevedhæng en bred triangulær Udvidning som Antydning til det midterste Halevedhæng.

Integumenterne ere usædvanlig haarde og som det synes stærkt kalkholdige, hvorved det hele Legeme faar en egen Stivhed. Ved stærk Forstörrelse vise de sig overalt særdeles fint facetterede med rundagtige eller uregelmæssigt kantede, noget ophöiede Facetter, adskilte ved fine Furer (se Fig. 21 og 22).

De övre Antenner (se Fig. 19 og 20) ere særdeles smaa og træde frem fra Rygskjoldet umiddelbart ovenfor det nederste forreste Hjörne og nedenfor den halvcirkelformige ind i Kropscaviteten förende Aabning. Pedunkelen bestaar som sædvanlig af 3 Led, der alle omtrent ere af ens Længde. Af Svöberne er kun den ene (den övre) udviklet, der er temmelig kort, neppe saa lang som Pedunkelens sidste Led og i Enden forsynet med de 2 sædvanlige baandformige Lugtepapiller.

3:die Par Maxillipeder, som ere de eneste Munddele, der udvendigt kunne undersöges, ere (se Fig. 20) af en meget kraftig Bygning og tæt trykkede op mod den forreste Del af Ventralsiden, dækkende fuldstændigt de övrige Munddele nedad. De ere omtrent af Rygskjoldets halve Længde og bestaa af 6 tydeligt adskilte Led, hvoraf det 1:ste er störst, men dog forholdsvis betydeligt kortere end sædvanligt hos de övrige Cumaceer, idet det neppe er længere end de 2 fölgende Led tilsammen. Af Form er det pladedannet og ved Basis temmelig bredt med den ydre Rand her tilskjærpet og bueformigt fremspringende. 2:det Led, der hos de övrige Cumaceer pleier at være særdeles kort, er her vel udviklet og af cylindrisk Form. 3:die Led, der omtrent er af samme Længde, er i höi Grad udmærket derved, at det udad forlænger sig i en særdeles stor og bred pladeformig Udvidning, der er leformigt fortilkrummet og ender i en skarp Spids. De 3 sidste Led aftage gradvis hurtigt baade i Længde og Tykkelse, og sidste Led er særdeles lidet og smalt samt i Enden forsynet med nogle korte Börster. Af Svömmepalper har det ikke været mig muligt udvendigt at opdage nogetsomhelst Spor, hvorved dog er at mærke, at jeg paa det eneste undersögte Exemplar ikke har kunnet foretage nogen Dissection til den sikre Afgjörelse heraf. I ethvert Fald maa de, hvis de virkelig skulde være tilstede, være af en i höi Grad rudimentær Bygning.

1:ste Fodpar er af temmelig spinkel Form og fæstet usædvanligt langt ned paa Siderne under Rygskjoldet. Det er som sædvanligt 6-leddet og næsten ganske nögent uden Börster eller Torner. Basalledet, der er betydeligt længere end de 3 fölgende Led tilsammen, er ved Basis temmelig bredt, men afsmalnes jevnt mod Enden. 2:det og 3:die Led ere som sædvanligt meget korte; 4:de Led omtrent saa langt som disse tilsammen, men betydeligt tyndere, og rækkende med sin Ende til Spidsen af Rygskjoldets nederste forreste Hjörne; 5:te Led betydeligt længere end 4:de og med dette dannende en stærk knæformig Böining; sidste Led endelig særdeles smalt og omtrent af 4:de Leds Længde samt i Spidsen forsynet med nogle korte Börster. Ved Basis er dette Fodpar forsynet med en Svömmepalpe, der imidlertid er af en ganske usædvanlig ringe Udvikling, saa at den rimeligvis slet ikke kan fungere som noget virkeligt Svömmeredskab.

2:det Fodpar er neppe mere end halvt saa langt som 1:ste og ligesom de fölgende simpelt uden Spor af Svömmepalpe. Det er af en meget tynd og spinkel Form og jevnt fortilkrummet samt tager sit Udspring ikke direkte fra 2:det Segments Epimerer, men fra et særskilt med disse fast forbundet trekantet pladeformigt Stykke, hvoraf der imidlertid ogsaa findes Spor hos andre Cumaceer. Det bestaar af kun 5 Led, hvoraf det 1:ste er længst. Sidste Led er smalt, næsten sylformigt og omtrent saa langt som de 3 foregaaende tilsammen samt i Enden bevæbnet med en lang Torn.

De fölgende 3 Par ere af sædvanlig Bygning, temmelig spinkle og kun yderst sparsomt börstebesatte. De aftage jevnt i Længde bagtil, saa at sidste Par neppe er mere end halvt saa langt som 3:die, der omtrent er af samme Længde som 2:det Par.

Halevedhængene (Fig. 23) ere tynde og langstrakte, ikke saa ubetydeligt længere end de 2 sidste Bagkropssegmenter tilsammen. Stammen er cylindrisk og fuldkommen glat uden Spor af Torner eller Börster. Grenene ere indbyrdes omtrent af samme Længde og betydeligt kortere end Stammen. Den indre Gren er uleddet og af regelmæssig lancetdannet Form, med den indre Rand fint saugtakket og desuden i Midten af sin Længde bevæbnet med 5 korte Torner. Enden er simpelt tilspidset uden Spor af Torner eller Börster. Den ydre Gren, der er noget tyndere end den indre, er utydeligt 2-leddet, med 1:ste Led meget kort, sidste Led næsten sylformigt, dog med Enden noget skraat afskaaret og bevæbnet med 3 Torner, hvoraf de 2 laterale ere særdeles smaa, den midterste derimod temmelig lang.

Af de övrige bekjendte Cumaceslægter synes nærværende Form nærmest at slutte sig til den typiske Slægt *Cuma* M. Edw., med hvem den stemmer overens ved Mangelen af det midterste Halevedhæng og af Svömmepalper (hos Hunnen) paa 2:det Fodpar ligesom ogsaa ved sine meget haarde kalkholdige Integumenter. Den adskiller sig imidlertid væsentligt fra denne Slægt derved, at der bag Rygskjoldet fölge 5 tydeligt adskilte Forkropssegmenter, medens hos Cuma de 2 förste af disse ere sammensmeltede til et enkelt bredt og stort Segment, saa at der ialt her kun forefindes 4 frie Forkropssegmenter. Saavel fra Slægten Cuma som fra alle övrige Cumaceer — maaske med

Undtagelse af den endnu kun meget ufuldstændigt kjendte eiendommelige af Sp. Bate [1]) beskrevne Cumaceform, *Nannastacus binoculoides* — adskiller den sig endelig meget bestemt ved det meget forskjellige Forhold af Rygskjoldets forreste Del, idet de hos alle disse mere eller mindre tydeligt udviklede Sidelober, der danne det saakaldte Rostrum, her ganske mangle, saa at den mediane Lob her træder frit frem og danner den forreste Ende af Rygskjoldet. Ogsaa er Forholdet af Synsorganet her meget eiendommeligt, idet her ikke som hos de övrige Cumaceer findes nogen særskilt Öielob, hvorimod de enkelte Ocelli eller lindseformige Corneæ ere fordelte krandsformigt omkring Enden af selve Pandedelen. Man kan derfor i Grunden her ikke tale om et enkelt Öie, men om en hel Samling af Enkeltöine, hos nærværende Art ikke mindre end 11 i Tallet. Denne stærke Udvikling af Synsorganet i Forbindelse med det Factum, at alle Arter af den egentlige Slægt Cuma, hvortil vor Form nærmest synes at slutte sig, holde til paa forholdsvis grundt Vand, synes i Virkeligheden, som ovenfor bemærket, at tyde hen paa, at nærværende Form, for hvem Dybdeangivelse mangler, ikke som de övrige er taget paa de af Goes fortrinsvis undersöte store Dybder (200—300 Favne), men paa forholdsvis betydeligt ringere Dyb.

6. LEPTOSTYLIS MANCA, G. O. Sars, nov. spec.

(Tavl. V. Fig. 24—28.)

Descriptio. Femina. — Forma elongata sed sat robusta, corpore antico supine medio arcuato, postico illo longiore et sat forti.

Scutum dorsale duplam segmentorum corporis antici liberorum longitudinem minime assequens, a latere visum subtriangulare, altitudine maxima dimidia longitudine majore, margine superiore postice gibbo antice declivi, inferioribus medio sat curvatis parte antica subtiliter dentata et ad rostrum ascendente, angulo infra rostrum indistincto, obtuso, rostro quartam circiter partem scuti longitudinis occupante, horizontali et sat depresso; supra visum subpentagonale, latitudine maxima altitudine majore in medio fere sita, postice parum, antice vero subito valde coarctatum. In parte antica scuti adest utrinque faciei dorsali propius crista subtiliter dentata, oblique longitudinalis, paulo flexuosa, a rostro ad partem maxime arcuatam ascendens, spatium dorsale paulo impressum circumdans; lacinia media tamen æqualiter arcuata et ut rostrum supine aculeis sparsis armata. Superficies scuti præterea lævis.

Oculus deest.

Segmenta libera corporis antici omnia distincta, duobus prioribus brevioribus et epimeris parvis vixque lateraliter prominentibus, 2 sequentibus epimeris majoribus oblique postice et ad latera porrectis ornatis, ultimo minimo postice emarginato, processibus lateralibus (epimeris) muticis.

Segmenta corporis postici sat robusta, lævia, subcylindrica, superne et inferne sat emarginata.

Antennarum superiorum pedunculus brevis rostrum parum superans, articulo ultimo antecedente paulo longiore; flagello structura solita.

Pedes 1:mi paris sat magni cephalothorace longiores, articulo basali tertiam pedis longitudinis partem parum superante, ultimis 3 longitudine subæqualibus, antepenultimo apicem rostri longe superante, ultimo angustissimo.

Pedes 2:di paris vix dimidiam illorum longitudinem assequentes, articulo basali brevi tertiam pedis longitudinis partem parum superante, antepenultimo angusto ultimis 2 junctis longitudine æquali.

Pedes 3:tii et 4:ti paris sat robusti illis 2:di paris parum breviores structura solita.

Pedes ultimi paris omnino desunt.

Palpi natatorii pedibus parium 2 anteriorum et maxillipedibus 3:tii paris inhærentes bene evoluti flagello 4articulato. Appendix præterea adest pedum 3:tii et 4:ti paris basalis, parva, uniarticulata, conica, setis 3 apicalibus instructa (palpus rudimentarius).

[1]) Annals & Magazine of Natural History f. 1865.

Telson longitudinem segmenti ultimi circiter æquans, breviter lageniforme, medio dilatatum, apicem versus subito valde coarctatum aculeis apicalibus 2 longis et uno solummodo pari aculeorum lateralium prope apicem armatum.

Appendices caudæ laterales segmenta ultima 2 juncta longitudine circiter æquantes, sat angustæ, trunco telsone multo longiore intus aculeis modo 3 armato, stylis terminalibus trunco multo brevioribus, interiore 3-articulato, articulis longitudine fere æqualibus et utroque aculeo singulo marginis interioris, ultimo prætcrea seta longa apicali instructo; exteriore illo paulo longiore, biarticulato, articulo ultimo longiore setis apicalibus 3 inæqualibus ornato.

Longitudo appendicibus caudalibus inclusis 7½ mm.

Habitat in Oceano Atlantico meridionali extra ostium fluminis Plata in prof. 52 orgyarum, a clariss. KINBERG detecta.

Af nærværende Cumaceform har jeg kun havt Anledning til at undersöge et enkelt Exemplar, men dette i fuldkommen vel conserveret Tilstand. Exemplaret er en Hun med endnu ikke udviklet Marsupium og blev under Fregatten Eugenias Verdensomseiling taget af Prof. KINBERG omtrent paa samme Lokalitet, hvor den i det fölgende omtalte Leptocuma Kinbergii blev fundet.

Beskrivelse. Kropsformen er (se Fig. 24 og 25) i Sammenligning med de övrige Arter af Slægten Leptostylis temmelig kraftig, dog betydelig mere langstrakt end f. Ex. hos L. ampullacea LILLJEBORG. Forkroppen er noget kortere end Bagkroppen og temmelig opblæst, skjöndt den i denne Henseende overgaaes af de fleste övrige Arter af Slægten, hvor den især hos de ægbærende Hunner næsten er kugleformig. Bagkroppen er derimod usædvanlig kraftigt bygget.

Rygskjoldet er betydelig længere end de frie Forkropssegmenter tilsammen, men dog paa langt nær ikke dobbelt saa langt. Seet fra Siden (Fig. 24) er det næsten af trekantet Form, med den övre Rand bagtil stærkt, næsten pukkelformigt fremspringende, fortil med en jevn Böining nedadheldende mod Rostrum. De nedre Kanter danne som sædvanlig paa Midten en stærk Böining, og deres forreste opstigende Halvpart er fint tandet og danner kun en svag Antydning til Vinkel under Rostrum. Dette sidste er temmelig langt, indtagende omtrent ¼ af Rygskjoldets Længde, horizontalt, lige og stærkt nedtrykt, hvorfor det seet fra Siden viser en smalt konisk Form. Ovenfra seet (Fig. 25) viser Rygskjoldet sig temmelig opsvulmet og næsten af pentagonal Form, med den störste Brede, der er större end Höiden, omtrent paa Midten. Derfra afsmalnes det kun ubetydeligt bagtil, medens Sidekanterne fortil pludselig med et noget uregelmæssigt bugtet Forlöb convergere mod Spidsen af Rostrum. Rygskjoldet har i sin forreste Del paa hver Side nærmere den dorsale Side en noget bugtet Længdekjöl, der strækker sig fra Rostrum skraat bagtil og opad mod det mest hvælvede Parti. Denne skraat löbende Længdekjöl, der dog ikke er skarpt markeret, er i Störsteparten af sin Længde tandet, men Tænderne ere ikke overalt regelmæssigt ordnede og af og til afbrudte, ligesom deres Störrelse heller ikke overalt er lige. Störst ere de paa hver Side ved Basis af Rostrum, hvor de antage en næsten tendannet noget fortilkrummet Form (Fig. 29). Det af disse 2 Kjöle omskrevne forreste Parti af Rygskjoldet er til Siderne noget indtrykt, hvorimod den mediane Lob eller regio gastrica igjen hæver sig med en jevn Convexitet; saavel paa denne sidste Del som paa Rostrum findes nogle uregelmæssige Grupper af smaa fortilrettede Torner. Rygskjoldets Overflade er forövrigt ganske glat og jevnt hvælvet.

Öiet synes ligesom hos de övrige Arter af Slægten ganske at mangle. Der er vel (se Fig. 25) en Öielob tilstede, men denne er ganske flad og uden Spor af Corneæ eller underliggende Pigment.

De frie Forkropssegmenter ere alle i sin hele Omkreds tydeligt udviklede. De 2 forreste ere ganske korte med smaa neppe til Siderne udstaaende Epimerer. Derimod ere Epimererne paa de 2 fölgende Segmenter större og skraat bagud og udad rettede. Sidste Segment er meget lidet og omfattes næsten ganske af det foregaaendes Epimerer. Det er bagtil som sædvanlig jevnt udrandet og gaar paa hver Side ud i et stumpt bagudrettet Hjörne.

Bagkropssegmenterne, der i Regelen hos de herhen hörende Arter ere meget smale, ere her af temmelig kraftig Bygning, næsten cylindriske og baade oventil og nedentil stærkt udrandede, hvorfor de laterale Hjörner danne skarpe, omtrent rette Vinkler. Det næstsidste er som sædvanlig det længste, skjöndt ikke meget længere end det foregaaende og efterfölgende.

De övre Antenners Pedunkler ere forholdsvis lidet udviklede og række kun med omtrent Halvparten af sidste Led udenfor Spidsen af Rostrum. Af deres Led er det 2:det det korteste. Svöberne ere af normal Bygning.

1:ste Fodpar er (se Fig. 24) baade langt og kraftigt bygget, betydelig længere end Forkroppen og rækkende med Spidsen af 4:de Led langt udenfor Spidsen af Rostrum. Basalledet er kun lidet længere end de 3 fölgende Led tilsammen, temmelig stærkt krummet og langs sin nedre Kant besat med cilierede Börster. De 3 ydre Led ere alle omtrent af ens Længde, men aftage successivt i Tykkelse, saa at sidste Led bliver af en særdeles tynd lineær Form.

2:det Fodpar er neppe halvt saa langt som 1:ste, forresten af den sædvanlige Bygning, med Basalledet omtrent indtagende $\frac{1}{3}$ af Fodens Længde og 4:de Led smalt og langstrakt, omtrent af samme Længde som de 2 yderste tilsammen. Det korte 2:det Led har nedad en temmelig lang lige Torn.

Svömmepalperne paa disse Födder og paa sidste Par Kjævefödder ere normalt udviklede med Svöben kun bestaaende af 4 Led ligesom hos de övrige Arter af Slægten.

De 2 fölgende Fodpar ere af fuldkommen ens Bygning og næsten lige store; dog det forreste lidt længere. De have begge Basalledet af cylindrisk Form og nær Roden udvendigt forsynet med et lidet smalt koniskt noget fortilkrummet og i Enden med en lang og et Par kortere Börster forsynet Vedhæng (Fig. 27). Dette Vedhæng, der ogsaa findes her hos de övrige Arter af Slægten Leptostylis, forestiller den rudimentære Palpe. De ydre Led paa disse Fodpar vise det sædvanlige Udseende og indbyrdes Længdeforhold. Fra Enden af det lille 5:te Led udgaar 1 og fra 4:de Led 3 af de eiendommelige böiede og i sin ydre Del tæt tværstribede Börster.

Sidste Fodpar mangler helt og holdent, og der findes ikke det ringeste Spor af nogen Insertion af et saadant paa det meget lidet udviklede sidste Segment, hvorfor man heller ikke kan antage, at det blot ved en Hændelse er bortrevet paa det undersögte Exemplar. Ogsaa er, som man vil se (Fig. 24), 3:die og 4:de Fodpars Stilling og stærkt bagudböiede Retning en saadan, at de meget let har maattet kunne erstatte dette Fodpars Mangel.

Det midterste Halevedhæng (se Fig. 28) er som hos de övrige Arter af Slægten meget kort, neppe længere end sidste Segment, udpræget flaskeformigt, noget opsvulmet paa Midten og stærkt indknebet i Enden, der er bevæbnet med 2 temmelig lange bagudrettede Torner og desuden paa hver Side med kun en enkelt meget liden Sidetorn nær Spidsen.

De ydre Halevedhæng (ibid.) ere noget længere end de 2 sidste Segmenter tilsammen og som sædvanlig af en meget spinkel Form. Stammen er betydelig længere end det midterste Halevedhæng og indad i sit bageste Parti bevæbnet med kun 3 korte Torner. Grenene ere kortere end Stammen og indbyrdes næsten af ens Længde, dog den ydre ganske lidt længere end den indre. Denne sidste bestaar af 3 næsten lige lange Led, hvoraf ethvert ved Enden i den indre Kant har en enkelt liden Sidetorn; fra Spidsen af sidste Led udgaar desuden en lang tornformig Börste, omtrent af samme Længde som de 2 sidste Led tilsammen. Den ydre Gren bestaar som sædvanlig af 2 Led, hvoraf det yderste er længst, af linear Form og ender med 3 tynde ulige lange Börster.

Nærværende Cumace stemmer, som man ser, i alle Henseender, og navnlig ved Halevedhængenes Bygning og Tilstedeværelsen af rudimentære Palper paa 3:die og 4:de Fodpar, fuldkommen overens med Arterne af Slægten Leptostylis mihi, hvortil den derfor maa henföres, uagtet den ved en mærkelig Character, nemlig Mangelen af sidste Fodpar skiller sig fra alle övrige bekjendte Cumaceer. Vi finde imidlertid den samme Mangel constant hos alle Cumaceunger i den förste Tid efterat de have forladt Marsupium, men kun som en ganske forelöbig Mangel, idet sidste Fodpar allerede meget tidligt begynder at spire frem. At betragte det her beskrevne Exemplar som en saadan uudviklet Unge, forbyder imidlertid mange Omstændigheder, baade Störrelsen og Bygningen af de forskjellige Kropsvedhæng, hvilket alt tyder paa, at det har opnaaet sin fulde Störrelse. Vi have altsaa her et Exempel paa, at en embryonal Character ogsaa har holdt sig uforandret i den fuldtudviklede Tilstand.

7. LEPTOCUMA KINBERGII, G. O. Sars, nov. gen. et sp.

(Tavl. VI. Fig. 29—33.)

Descriptio. Femina. Corporis forma gracilis et elongata eidem generis Cumæ vel potius Lampropis non dissimilis. Corpus anticum valde compressum postico vix latius et multo brevius, a latere visum supine æqualiter arcuatum, altitudine maxima latitudine multo minore in medio sita, antice parum postice sensim humilius.

Scutum dorsale parvum segmentis liberis pedigeris junctis multo brevius, a latere visum subovatum, margine superiore fere recto et horizontali, inferioribus æqualiter arcuatis et antice ascendentibus nullisque dentibus armatis, antice obtusum, rostro nullo distincto, sed infra medium utrinque incisum, angulo latero-inferiore in lobum obtuse rotundatum producto. Lacinia scuti media (regio gastrica) sat magna, lobo oculari late depresso et parum prominente.

Segmenta libera pedigera 5 pone scutum dorsale apparent, anticum tamen brevissimum et modo in parte dorsali distinctum, cetera vero bene evoluta et ut scutum dorsale æqualiter arcuata læviaque epimeris sat magnis se inviecm tegentibus instructa.

Corpus posticum bene evolutum, segmentis cylindricis constrictionibus parum profundis disjunctis, 2 ultimis angustioribus, penultimo omnium longissimo, ultimo illo tertia circiter parte breviore et postice vix dilatato.

Integumenta lævia tenuissima et pellucida nullam structuram distinctam ostendentia, neque pilosa.

Oculus indistinctus, nullis corneis vel lentibus instructus.

Antennæ superiores brevissimæ, pedunculo 3articulato, articulis apicem versus sensim minoribus, flagellis duobus, altero 3articulato articulum 2:dum pedunculi longitudine æquante, altero minimo uniarticulato.

Pedum paria 3 anteriora palpis natatoriis bene evolutis instructa.

Pedes 1:mi paris haud multo elongati, articulo basali ceteris junctis longitudine circiter æquali, margine inferiore setis plumosis et spinulis nonnullis tenuibus ornato, antepenultimo ad angulum scuti latero-inferiorem porrecto quam solito breviore, subovato, penultimo duobus antecedentibus longitudine circiter æquali lineari adque apicem infra fasciculo setarum longarum instructo, ultimo tenuissimo vix dimidiam penultimi longitudinem assequente setis nonnullis tenuibus terminato.

Pedes 2:di paris illis parum breviores, angustissimi, 6articulati, articulo 3:tio et 4:to linearibus longitudine circiter eadem et junctis articulum basalem longitudine æquantibus, penultimo illis fere dimidia parte breviore apice utrinque setifero, ultimo minimo subconico.

Pedes posteriores postice sensim longitudine decrescentes, structura simili, articulo 3:tio et 4:to subæqualibus, ultimis duobus minimis et setis rigidis ab apice articuli 4:ti prodeuntibus maxima ex parte occultis; par eorum anticum ut pedes anteriores palpo natatorio instructum, par 4:tum palpi loco appendice modo minima uniarticulata apice setifero ornatum.

Appendix caudalis media (telson) omnino deest.

Appendices caudæ laterales sat robustæ duplam segmenti ultimi longitudem assequentes, trunco cylindrico intus spinis inæqualibus 10 armato, stylis terminalibus trunci longitudinem æquantes, complanatis, biarticulatis, interiore quam exteriore paululo modo longiore, articulo 1:mo majore intus dense aculeato, aculeis 16 inæqualibus, 5 anterioribus intervallo a ceteris apicem versus sensim majoribus disjunctis, ultimo subovato intus et ad apicem spinis 15 apicalibus longissimis, ceteris basin versus sensim minoribus armato; styli exterioris articulo 1:mo brevissimo ultimo vero elongato, margine externo et apice aculeis singularibus 18 ad apicem dilatatis et obtusis apicalibus longioribus armato, margine interno dense setifero, setis ciliatis.

Longitudo corporis, appendicibus caudalibus inclusis, 14 Mm.

Habitat in oceano atlantico meridionali extra ostium fluminis Plata Americæ meridionalis in profunditate 50 orgyarum, fundo lapidoso-arenoso, a clarissimo KINBERG detecta.

Denne i mange Henseender interessante Cumace tilhörer den sydlige Hemisphære og blev under Fregatten Eugenias Reise omkring Jorden taget i et enkelt Exemplar (en ung Hun) Syd for Plata-flodens Munding paa 50 Favnes Dyb, Grusbund. Den er af en særegen Interesse derved, at den i sig synes at combinere flere af de Characterer, hvorved vore nordiske Slægter skilles fra hinanden. Den kan derfor heller ikke henföres til nogen af dem, men maa danne Typen for en egen Slægt, som jeg har benævnt *Leptocuma* efter dens ydre Lighed med en Cuma i Forbindelse med dens spinkle Kropsform og tynde Integumenter. Arten har jeg tilladt mig at benævne efter dens Opdager, den af Annelidernes Naturhistorie höit fortjente Svenske Zoolog, Professor KINBERG.

Beskrivelse. Længden af det undersögte Exemplar er iberegnet Halevedhængene 14 Mm. Den hörer saaledes til de störste Cumaceer. I sin almindelige Kropsform (se Fig. 29) ligner den Arterne af Slægten Cuma eller endnu mere af Slægten Lamprops. Ligesom hos disse Slægter er Legemet langstrakt og smalt uden synderlig skarp Begrændsning mellem For- og Bagkrop.

Forkroppen, der er betydelig kortere end Bagkroppen, omtrent lig dennes 5 förste Segmenter tilsammen, er i höi Grad udmærket ved sin overordentlig stærkt sammentrykte Form, saa at den seet ovenfra (Fig. 30) ikke engang synes mærkeligt bredere end Bagkroppen, og det hele Dyr i denne Stilling faar en meget smal lineær Form. Seet fra Siden (Fig. 29) er Forkroppen oventil temmelig stærkt og jevnt bueformigt böiet og betydeligt ($\frac{1}{2}$ Gang) höiere end bred. Bagtil aftager den jevnt i Höide, hvorimod den fortil i Störsteparten af sin Længde bibeholder sin Höide uforandret.

Rygskjoldet er forholdsvis lidet, paa langt nær ikke saa langt som de frie Forkropssegmenter tilsammen. Seet fra Siden (Fig. 29) er det af oval Form med den övre Contour næsten lige og horizontal, den nedre stærkt bueformigt böiet og fortil opstigende. Dets forreste noget afsmalnende Ende er stump, uden noget tydeligt Rostrum, men noget nedenfor Midten paa hver Side forsynet med et lidet vinkelformigt Indsnit, nedenfor hvilket der skyder sig frem en stumpt tilrundet tungeformig Fortsats eller Lob, der forestiller Rygskjoldets forreste-nederste Hjörne (se Fig. 31). Seet ovenfra (Fig. 30) er Rygskjoldet neppe mere end halvt saa bredt som langt, fortil noget afsmalnende og i Enden stumpt afskuttet. Dets mediane Lob er temmelig stor, indtagende næsten hele Rygskjoldets Brede fortil (se Fig. 30) og strækkende sig tilbage intil Midten af Rygskjoldets Længde; fortil er den smalt tilrundet og ender med en halvcirkelformig Öielob, der imidlertid ikke er mærkeligt fremspringende og paa hvilken der heller ikke var Spor af Corneæ eller Lindser at se. Öiet synes derfor at mangle eller ialfald at være rudimentært. Rygskjoldets Sidelober ere (se Fig. 31) i Enden stumpt tilrundede og möde hinanden tæt foran Öieloben uden at danne noget somhelst rostrumlignende Fremspring. Rygskjoldets Overflade er overalt glat uden Haar eller Torner, ligesom ogsaa dets Sidekanter mangle enhver Bevæbning.

Bag Rygskjoldet fölge 5 frie Forkropssegmenter. Det förste af disse er meget kort og kun synligt i dets överste eller dorsale Parti, medens det nedad paa Siderne fuldstændig skjules af det fölgende Segment, hvis Epimerer selv skyde sig lidt udover Rygskjoldets bagre Del (se Fig. 29). De 4 fölgende Segmenter ere derimod alle vel udviklede i sin hele Omkreds og omtrent indbyrdes af samme Længde, men aftage successivt i Höide bagtil. Ligesom Rygskjoldet ere de glatte og jevnt hvælvede, samt forsynede med store pladeformige Epimerer, der gjensidig for en Del dække hinanden, hvorved deres nedre Del tilsammen danner en næsten continuerlig vertical Bræm, der dækker Basis af Födderne (se Fig. 29). Störst er Epimererne paa 3:die Segment, hvor de dække en Del af baade det foregaaende og efterfölgende Segment, altsaa vise et lignende Forhold som 2:det Segment paa Macrurernes Bagkrop. Paa alle Epimerer er det forreste Hjörne skarpt, næsten retvinklet, det bageste afrundet.

Bagkroppen er temmelig kraftigt udviklet med Segmenterne regelmæssigt cylindriske og ikke adskilte ved synderlig skarpt markerede Indknibninger. Deres dorsale og ventrale bagre Rand stöder paa Siderne sammen i en stump Vinkel, og ovenfor denne Vinkel er fæstet en Rad af korte og tætte indböiede Haar, som ogsaa finder her paa sidste Forkropssegment. Af Segmenterne er som sædvanligt det næstsidste længst og noget smalere end de foregaaende; dette er endnu mere Tilfældet med sidste Segment, der omtrent er af samme Længde som 4:de Segment og ligesom de övrige simpelt cylindriskt uden at være mækeligt udvidet i Enden.

Integumenterne ere særdeles tynde og gjennemsigtige uden nogen tydeligt udpræget Structur; kun paa enkelte Steder af Rygskjoldet var det muligt at adskille spage Spor af en lignende skjællet Structur som hos Slægten Lamprops.

De övre Antenner ere (se Fig. 31) meget smaa, neppe $\frac{1}{3}$ saa lange som Rygskjoldet og tage sit Udspring temmelig langt nede, strax ovenfor den tungeformige Fortsats hvori paa hver Side Rygskjoldets nederste-forreste Hjörne gaar ud. Pedunkelen er som sædvanlig 3leddet. Af dens 1:ste Led viser sig, naar Dyret seer fra Siden, en Del tittende frem fra Bunden af det korte forreste Indsnit tilligemed en fra dette Led udgaaende fortilkrummet cilieret Börste. De 2 fölgende Led, hvoraf det yderste er mindst, rette sig skraat opad langs den stumpt tilrundede Ende af Rygskjoldets Sidelober. Af Svöberne er den ene 3leddet og omtrent saa lang Pedunkelens 2:det Led samt ender med 2 korte baandformige Lugtepapiller. Den anden Svöbe er særdeles liden og kun bestaaende af 1 i Enden med nogle korte Börster forsynet Led.

De nedre Antenner og Munddelene kunde ikke paa det eneste foreliggende Exemplar nöiere undersöges. Kun den yderste Del af 3:dje Par Kjævefödder viser sig, naar Dyret sees fraa Siden, ragende frem ned under Rygskjoldet. Det synes at være af fuldkommen normal Bygning.

Af Födderne er ligesom hos Slægterne Leucon og Eudorella de 3 förste Par forsynede med vel udviklede Svömmepalper; det 4:de Par desuden med et lidet uleddet Apendix (Fig. 32) eller rudimentær Palpe ligesom hos Slægten Lamprops.

1:ste Fodpar (se Fig. 29) er forholdsvis ikke synderlig stærkt udviklet, lige udstrakt omtrent saa langt som Rygskjoldet og de 2 förste Segmenter tilsammen. Dets 1:ste Led eller Basalleddet er omtrent af samme Længde som alle de övrige Led tilsammen, afsmalnende mod Enden og i den nedre Rand besat med korte Fjærbörster og enkelte tynde Torner, hvoraf en noget stækere har sin Plads ved Enden af Leddet. De 2 fölgende Led ere som hos alle övrige Cumaceer korte og vise den sædvanlige skjæve Ledforbindelse. 4:de Led er ganske usædvanlig kort, neppe længere end det foregaaende og af oval Form samt rækker netop til Enden af det nedre-forreste afrundede Hjörne eller Lob af Rygskjoldet. Næstsidste Led er næsten dobbelt saa langt og af smal lineær Form samt i Enden nedad besat med et Knippe af lange tynde Börster. Sidste Led er neppe halvt saa langt og særdeles smalt, i Enden forsynet med nogle tynde Börster. Svömmepalpen, der er af den sædvanlige Bygning, er omtrent af Basalleddets halve Længde.

2:det Fodpar er noget kortere end 1:ste og af en meget spinkel Form samt sparsomt börstebesat. Det bestaar af 6 tydelige Led, hvoraf Basalleddet er störst, 2:det Led ganske kort, de 2 fölgende af lineær Form, indbyrdes omtrent af samme Længde og tilsammen saa lange som Basalleddet; 5:te Led betydelig kortere og i Enden i hver Kant forsynet med nogle tynde Börster, sidste Led meget lidet, af konisk Form og endende med nogle kortere Börster.

Af de tre bageste Fodpar er som anfört det forreste forsynet med Svömmepalper af samme Udseende som paa de 2 foregaaende Par, det næstsidste kun med et yderst lidet uleddet, i Enden börstebesat Vedhæng (Fig. 32), lignende det hos Slægten Lamprops baade til dette og det foregaaende Par fæstede Appendix; medens sidste Fodpar er fuldstændig enkelt. Alle disse 3 Fodpars Bygning er forövrigt meget overensstemmende, alene med den Forskjel, at de successivt aftage i Længde bagtil, hvilket især skyldes Basalleddets ulige Udvikling. Paa det forreste Par er nemlig dette næsten af samme Længde som alle de övrige tilsammen, paa næstsidste neppe mere end halvt saa langt, og paa sidste Par endnu kortere. 2:det Led er paa alle ganske kort, medens de 2 fölgende Led ere mere forlængede og indbyrdes omtrent af ens Længde. De 2 sidste Led ere meget smaa og som oftest skjulte af de lange og stærke fra Enden af 4:de Led udgaaende tværstribede Börster, hvis Tal er temmelig betydeligt (5—6).

Alle disse bageste Fodpar ere forövrigt temmelig rigeligt börstebesatte med tildels cilierede Börster. —

Hvad Halevedhængene angaar, saa have vi blot at adskille de laterale Vedhæng, da det midterste Vedhæng ganske mangler ligesom hos Slægterne Cuma, Leucon o. fl. Disse laterale Vedhæng ere (se Fig. 33) af temmelig kraftig Bygning og omtrent dobbelt saa lange som sidste Segment. Stammen er af cylindrisk Form, temmelig tyk og langs den indre Rand bevæbnet med 10 uligestore Torner. Grenene eller Aarerne ere næsten af ens Störrelse og af Stammens Længde, temmelig brede, pladeformige og begge bestaaende af 2 Led. Paa den indre ubetydeligt længere Gren er 1:ste Led det störste og langs sin indre Rand bevæbnet med ialt 16 Torner; af disse ere de 5 forreste ved et Mellemrum adskilte fra de övrige samt fæstede til en særegen Udvidning af Randen, og af disse er den yderste betydelig stærkere end de övrige; de derpaa fölgende 11 ere i Begyndelsen meget smaa, men tiltage jevnt i Længd bagtil, saa at den yderste omtrent er lige stor som hin 5:te Torn. Sidste Led er af oval Form, betydelig kortere end 1:ste og indad samt ved Spidsen bevæbnet med en Rad af 15 forfra bagtil i Længde tiltagende Torner, hvoraf især de 4 yderste ere særdeles lange. Paa den ydre Gren er omvendt 1:ste Led ganske kort, medens sidste Led er mere end dobbelt saa langt, samt noget afsmalnende mod Enden; det er i den indre Kant forsynet med talrige korte cilierede Börster, i den ydre Kant og ved Spidsen derimod med 18 grove Torner af en ganske usædvanlig Form, idet de istedetfor at gaa ud i en skarp Spids ere i Enden udvidede og stumpt tilrundede. De fra Enden af Leddet udgaaende Torner ere ogsaa her betydelig længere med de övrige, som hurtigt aftage i Længde fortil.

Nærværende Forms Stilling i Forhold til de övrige bekjendte Slægter synes at være noget tvivlsom, da den paa samme Tid synes at vise Affinitet til flere meget forskjellige Slægtstyper, der ved en Gruppering af Slægterne synes at maatte henföres til forskjellige Familier. Jeg skulde dog vore tilböielig til at stille den nærmest ved den typiske Slægt Cuma, fra hvilken den dog afviger derved, at de 2 förste frie Forkropssegmenter ere adskilte (ikke sammenvoxne), samt ved en Character, hvorpaa man ialmindelighed har lagt stor Vægt, nemlig Forholdet af Svömmepalperne. I denne Henseende viser vor Cumace Lighed med Slægterne Leucon og Eudorella, som ere de eneste bekjendte Slægter, hos hvem der findes (hos Hunnen) fuldstændigt udviklede Svömmepalper ogsaa paa 3:dje Fodpar. Fra disse Slægter adskiller den sig dog ved de 2 förste Fodpars Bygning og ved en helt anden Form af Rygskjoldet, i hvilken sidste Hensende den mere stemmer overens med Slægten Lamprops. Med denne Slægt stemmer den ogsaa overens ved Tilstedeværelsen af rudimentære Palper, der dog her kun er indskrænket til næstsidste Fodpar, medens de hos Lamprops ogsaa findes paa det foregaaende. I sin ydre Kropsform lignes den ogsaa temmelig Arterne af denne Slægt, men skiller sig væsentlig fra dem, foruden ved Forholdet af Svömmepalperne, ved Antennernes Bygning, Mangelen af tydeligt udviklet Öie og af det midterste Halevedhæng samt ved Sidevedhængenes forskjellige Udseende. Slægtens rette Plads vil först med Sikkerhed kunne afgjöres ved en Undersögelse af Munddelenes, navnlig Mandiblernes Bygning og ved Forholdet af Bagkropslemmerne hos Hannen.

EXPLICATIO TABULARUM.

Tab. I.

Diastylis Antillensis, G. O. Sars.

Fig. 1. Femina a latere dextro exhibita.
— 2. Eadem supra visa.
— 3. Segmentum ultimum cum appendice media (telsone) et laterali dextra supra visum.

Campylaspis pulchella, G. O. Sars.

Fig. 4. Femina adulta a latere sinistro exhibita.
— 5. Eadem supra visa.
— 6. Segmentum ultimum cum appendice caudali dextra supra visum.

Tab. II.

Diastylis fimbriata, G. O. Sars.

Fig. 7. Mas adultus a latere dextro exhibitus.
— 8. Idem supra visus.
— 9. Rostrum ejusdem cum antenna una superiore, supra visum.
— 10. Segmentum ultimum cum telsone et appendice laterali dextra, supra visum.
— 11. Rostrum feminæ cum antenna una superiore supra visum.
— 12. Segmentum ejusdem ultimum cum telsone et appendice laterali dextra, supra visum.

Tab. III.

Leucon anomalus, G. O. Sars.

Fig. 13. Femina junior a latere sinistro exhibita.
— 14. Eadem supra visa.
— 15. Pars autica scuti dorsalis cum antenna superiore dextra supra visa, formam singularem lobi ocularis ostendens.
— 16. Segmentum ultimum cum appendice caudali dextra supra visum.

Tab. IV.

Stephanomma Goësii, G. O. Sars.

Fig. 17. Femina adulta ovifera a latere sinistro exhibita.
— 18. Eadem supra visa.
— 19. Pars frontalis cum antenna superiore sinistra supra et aliquanto a latere anteriore visa, dispositionem ocellorum ostendens.
— 20. Pars antica cephalothoracis a facie ventrali exhibita, extremitatem anticam marsupii, bases pedum 1:mi paris, maxillipedes 3:tii paris, antennas superiores et orificium semicirculare supra easdem ostendens.
— 21. Pars integumenti scuti dorsalis, impressiones rotundatas ostendens.
— 22. Particula ejusdem fortiter aucta, structuram areolatam ostendens.
— 23. Segmentum ultimum cum appendice caudali dextra supra visum.

Tab. V.

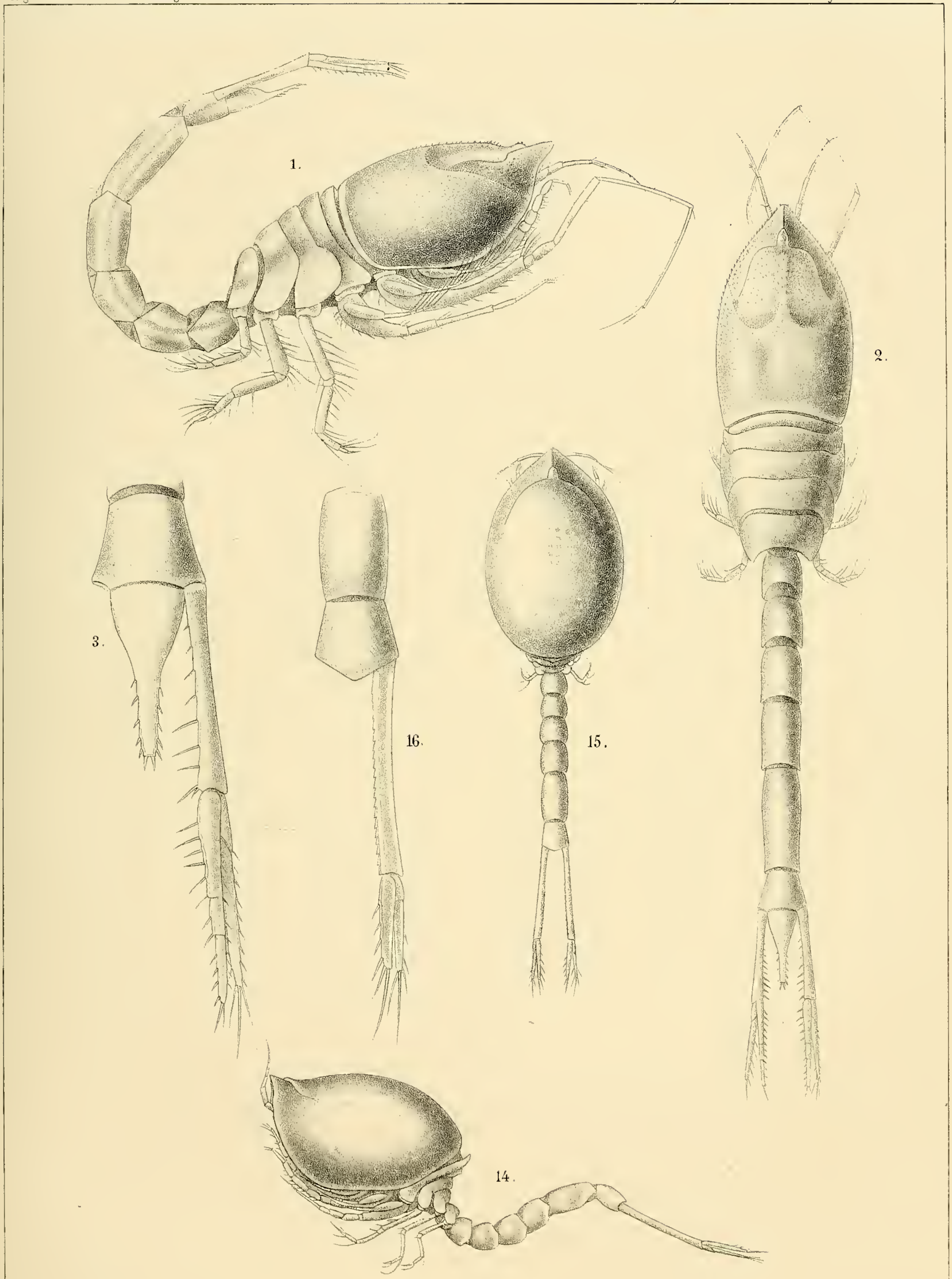
Leptostylis manca, G. O. Sars.

Fig. 24. Femina a latere dextro exhibita.
— 25. Eadem supra visa.
— 26. Aculei nonnulli cristæ laterali ad basin rostri affixi, fortius aucti.
— 27. Appendix una basalis (palpus rudimentaris) pedum 3:tii paris.
— 28. Segmentum ultimum cum telsone et appendice laterali dextra, supra visum.

Tab. VI.

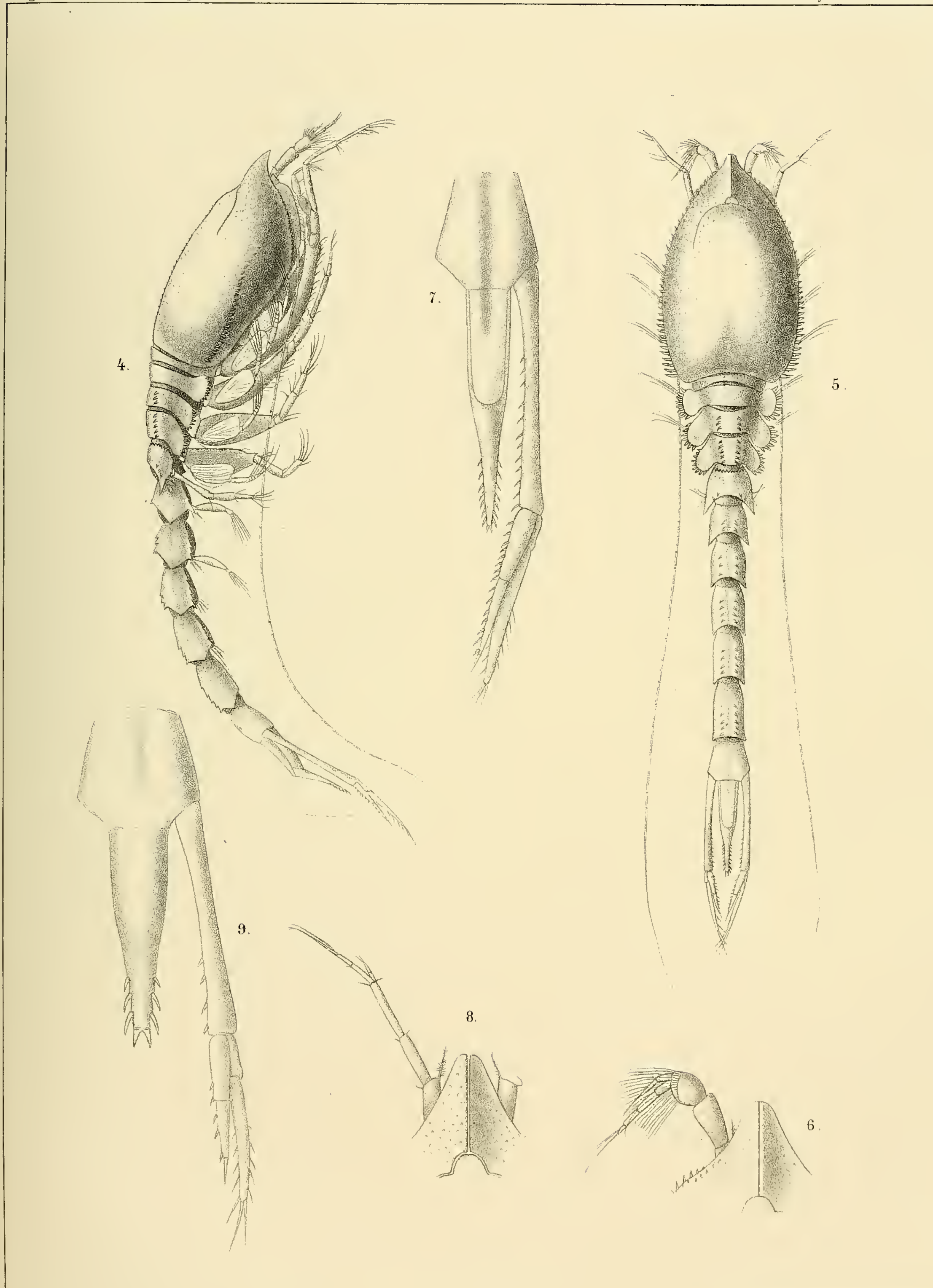
Leptocuma Kinbergii, G. O. Sars.

Fig. 29. Femina a latere dextro exhibita, 12:ies circiter aucta.
— 30. Eadem supra visa.
— 31. Pars anterior scuti dorsalis cum antenna una superiore a latere dextro exhibita.
— 32. Palpus rudimentaris pedibus 4:ti paris ad basin affixus a latere exteriore visus.
— 33. Segmentum ultimum cum appendice caudali sinistra, supra visum.



G. O. Sars del. Lith. o. tr. h. Schlachter & Seedorff, Stockh.

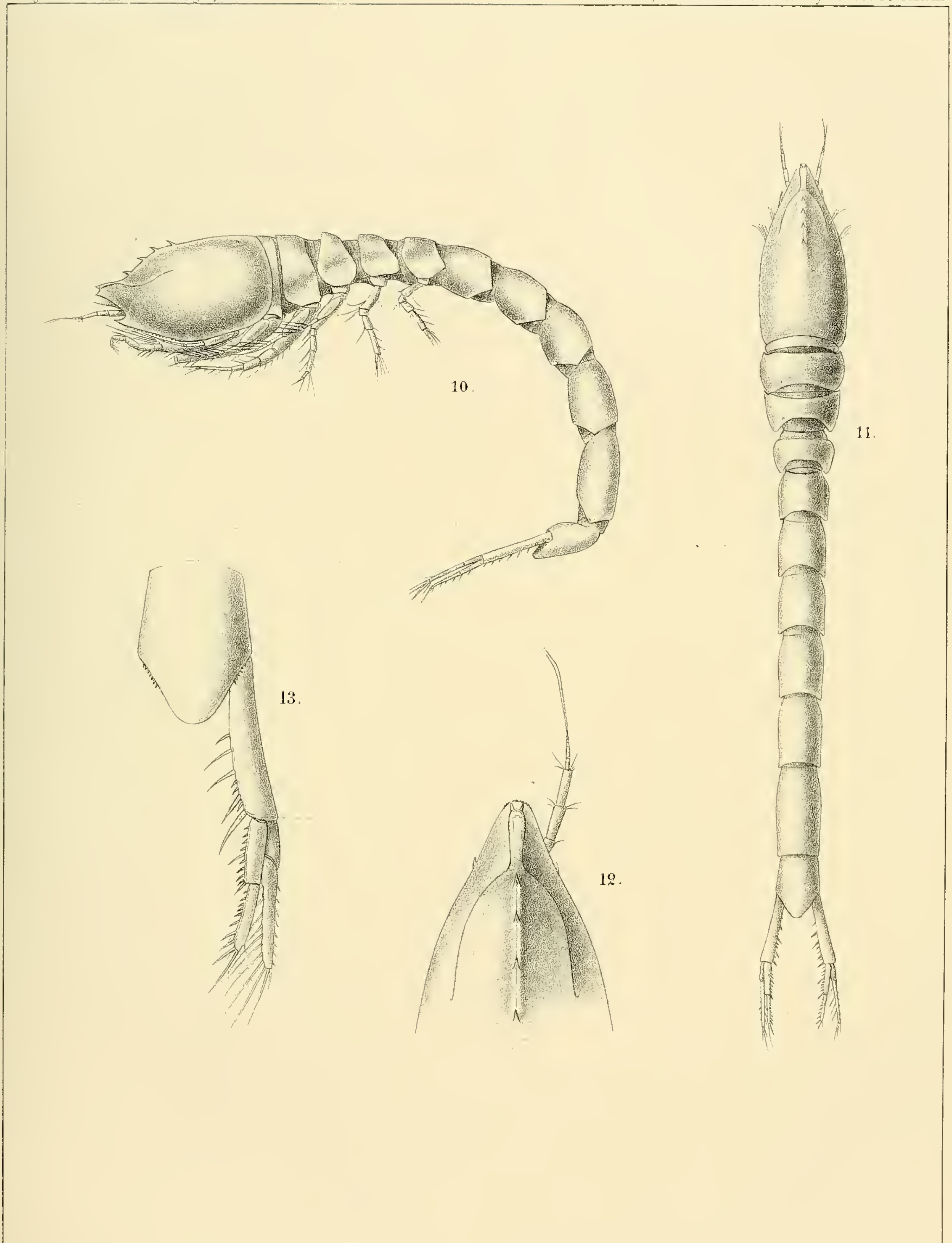
Fig. 1-3. Diastylis antillensis. Fig. 14-16. Campylaspis pulchella.



G. O. Sars del.

Lith. o. tr. h. Schlachter & Seedorff, Stockh.

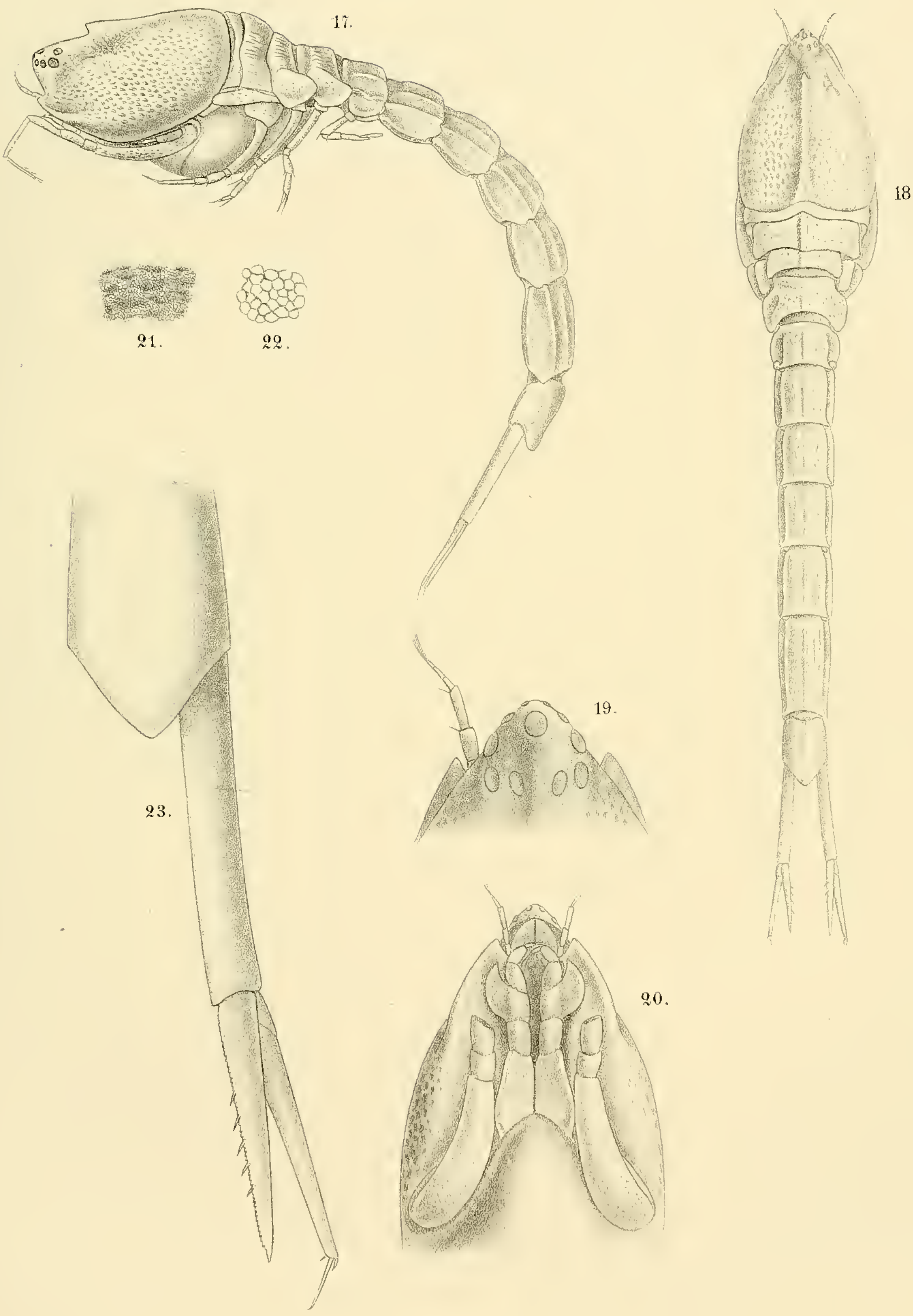
Diastylis fimbriata.



G. O. Sars del

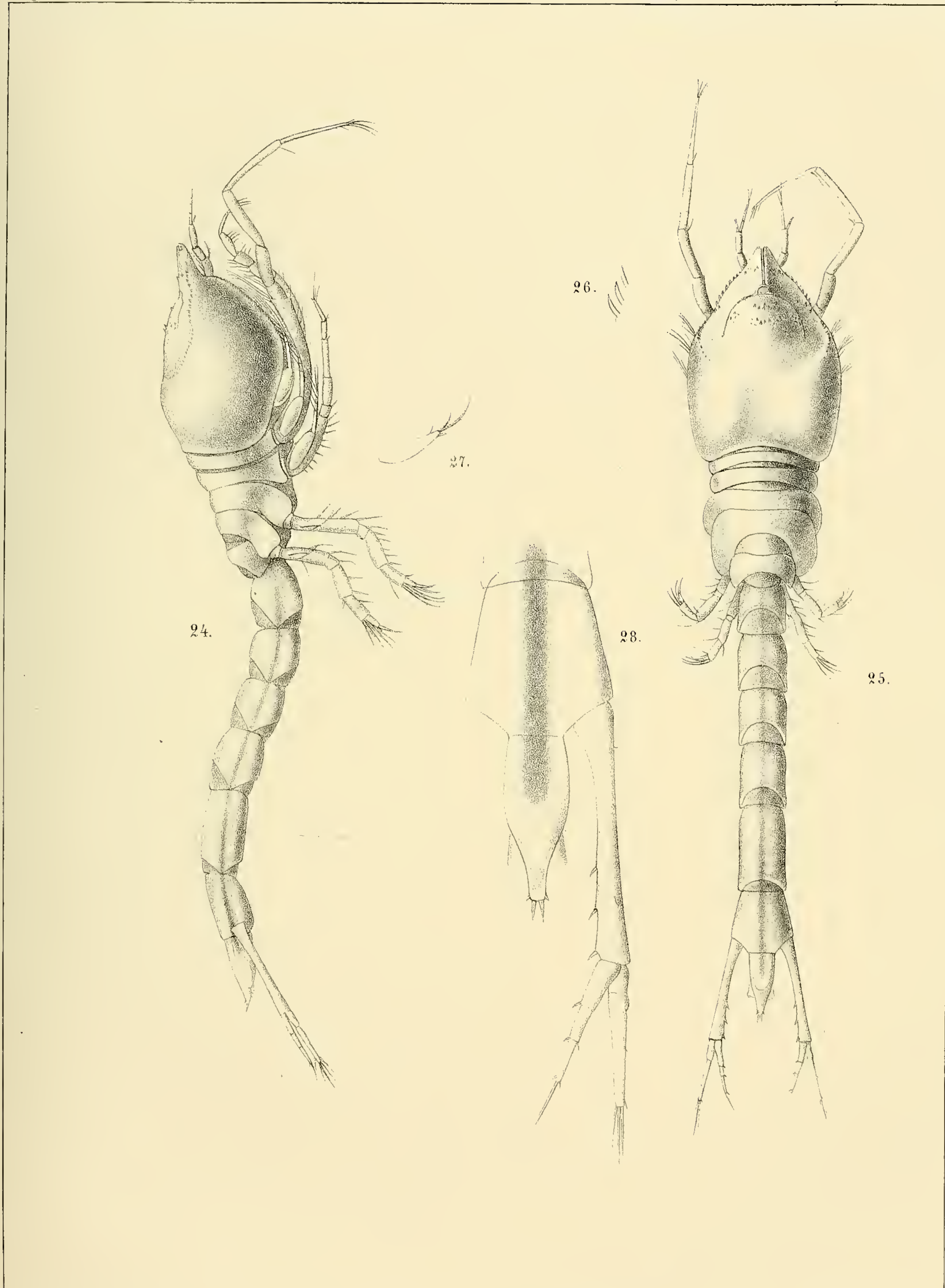
Lith. o. tr. h. Schlachter & Seedorff, Stockh.

Leucon anomalus.



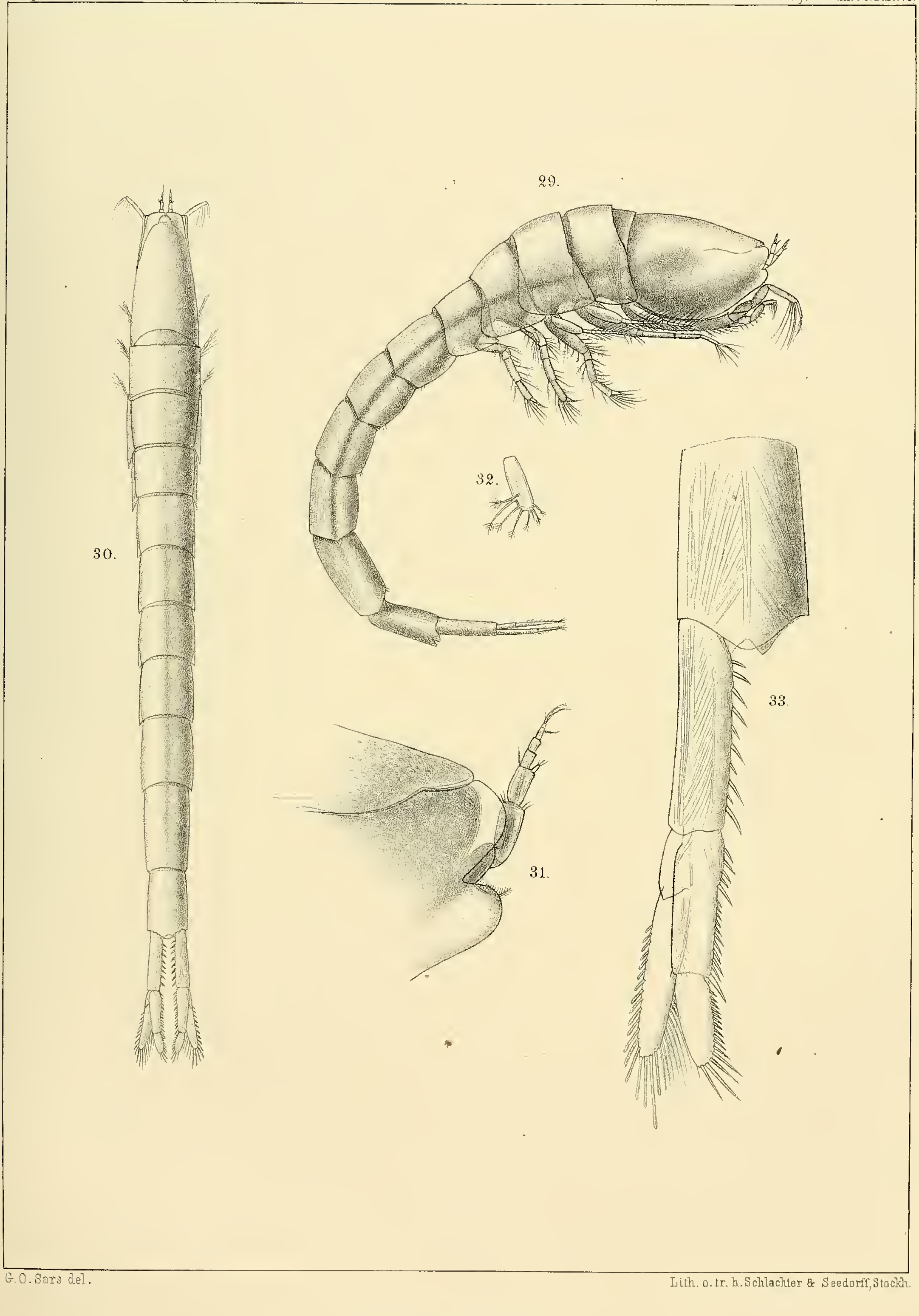
G. O. Sars del. Lith. o tr. h. Schlachter & Seedorff, Stockh.

Stephanomma Goësi.



G. O. Sars del. Lith. o. tr. h. Schlachter & Seedorff, Stockh.

Leptostylis manca.



G. O. Sars del.

Lith. o. tr. h. Schlachter & Seedorff, Stockh.

Leptocuma Kinbergii.

KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11. N:o 6.

OM

CUMACEER

FRA DE STORE DYBDER I NORDISHAFVET

AF

G. O. SARS.

MED FIRE TAVLER.

TILL KONGL. VET. AKAD. INLEMNAD DEN 14 JUNI 1871.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

Blandt det rige zoologiske Materiale, som under de af den Svenske Regjering udrustede videnskabelige Expeditioner til Undersögelsen af de polare Landes Naturforholde Tid efter anden er indsamlet findes ogsaa en Del *Cumaceer*, der frembyde den höieste Interesse ved de enorme Dybder, hvorfra de ere ophentede. Der er her Tale om Dybder, der ikke blot ligge langt under den tidligere af Forbes som Demarkationslinie for alt dyriskt Liv betegnede Dybdegrændse, men som endog overgaa de enorme Dybder, hvortil de i den allernyeste Tid af den Engelske Regjering foranstaltede Undersögelser af det atlantiske Ocean have naaet. De stige nemlig ned til ikke mindre end 2,600 Favne, eller 15,600 Fod, altsaa betydeligt længere under Havets Overflade end selv Europas höieste Fjeld Montblanc er hævet over samme. Selv paa dette enorme Dyb, hvor en evig Nat hersker og hvor Vandets Temperatur kun lidet hæver sig over Frysepunktet, har det nu vist sig, at der foruden de overalt udbredte Protozoer ogsaa leve forholdsvis höit organiserede Dyr, idet foruden andre Dyreformer en til Slægten *Diastylis* hörende kraftigt udviklet Art ved Hjælp af den saataldte Bulldog-Machine toges paa dette Dyb under den fjerde Spetsbergs-Expedition 1868. Men findes der Dyreformer af en saa höi Organisation som Cumaceerne her, er man ogsaa berettiget til at antage, at man endnu er langt fra Dybdegrændsen for det dyriske Liv, og at selv de störste Dybder i Oceanet ikke udelukkende, som man tidligere har været tilböielig til at tro, beboes af de lavtstaaende Protozoer, men ogsaa tildels af betydeligt höiere organiserede Dyreformer. Det er disse höist interessante fra 540—2,600 Favnes Dyb ophentede Cumaceer, som jeg i det fölgende nærmere skal omtale, og hvis Bearbeidelse Prof. S. Lovén har vist mig den Ære at betro til mig. Af de foreliggende sex Arter har jeg alene kunnet identificere de tre med tidligere beskrevne Former. De tre övrige anser jeg derimod for nye. De tilhöre fire af vore vel bekjendte nordiske Slægter: *Diastylis*, *Leucon*, *Eudorella* og *Campylaspis*.

1. Diastylis polaris G. O. Sars n. sp.

(Tavl. I. Fig. 1—3).

Descriptio. Femina. Corporis forma sat elongata sed robusta, integumentis durissimis. Corpus anticum vel cephalothorax supine valde arcuatum, antice sensim postice magis subito declive, supra visum anguste ovatum plus duplo longius qvam latius.

Scutum dorsale magnum segmentis liberis cephalothoracis junctis multo longius, a latere visum sat altum, altitudine maxima dimidiam longitudinem superante, margine superiore parum arcuato fere recto et leviter declivo, posteriore oblique truncato, inferioribus in medio valde arcuatis et antice ascendentibus, rostro brevi quintam scuti longitudinis partem parum superante, horizontali forma a latere visa anguste conica; supra visum in parte maxima longitudinis latitudine fere eadem, marginibus lateralibus subrectis et subparallelis, parte modo antica tertia subito coarctata. Superficies scuti ubique dentibus minimis antice vergentibus pilisque brevibus obsita in lateribus plica brevi una vel 3 indistinctissimis notata, marginibus inferioribus in parte dimidia antica ut vulgo subtiliter serrulatis.

Oculus nullus, lobus vero ocularis distinctus sed minimus et vix prominens.

Segmenta libera corporis antici supine æqualiter convexa et arcte conjuncta, margine antico 2 priorum aliquantum elevato et subtiliter serrulato, ultimo parvo margine antico crenulato et epimeris muticis.

Corpus posticum sat robustum et appendicibus caudalibus exceptis antico nonnihil longius, segmentis constrictionibus profundis sejunctis.

Antennæ superiores sat magnæ, pedunculo apicem rostri longe (articulo circiter ultimo) superante.

Pedes 1mi paris longitudinem corporis antici fere æquantes, articulis ultimis tribus longitudine subæqualibus, antepenultimo extra apicem rostri porrecto; 2di paris dimidia fere parte illis breviores, articulo antepenultimo ultimis duobus junctis longitudine circiter æquali. Pedes posteriores sat robusti et structura solita.

Appendix caudalis media sat elongata duplam segmenti ultimi asseqvens longitudinem et truncum etiam appendicum leteralium paulo superans, anguste conica, parte dimidia postica utrinque aculeis 10—11 præter aculeos 2 terminales armata, orificio anali in parte antica tertia sito.

Appendices laterales segmentis ultimis 3 junctis longitudine circiter æqvales, trunco longitudinem appendicis mediæ æqvante et intus aculeis circiter 16 armato, stylis terminalibus inæqvalibus, interiore breviore et dimidiam trunci longitudinem vix æqvante, distincte 3articulato, articulo 1mo ceteris 2 junctis longitudine circiter æqvali, intus dentibus circiter 12 (6 articuli 1mi, 3 secundi et tertii) et aculeo terminali longiore armato, stylo exteriore illo qvinta circiter parte longiore setis 2 vel 3 longis apicalibus et nonnullis brevioribus marginalibus ornato.

Longitudo ab apice rostri ad extremitatem appendicum caudæ lateralium circiter 12 mm.

Habitat in oceano arctico latit. 80° longit. orient. 4°33′ in profunditate 950 orgyarum.

Det undersögte Exemplar, der under den 4de Spetsbergsexpedition 1868 toges i Havet nordvest for Spetsbergen paa det betydelige Dyb af 950 Favne, er en fuldt udviklet Hun, paa hvilken der er tydelige Tegn til den sig dannende Brystpose eller Marsupium. Længden er fra Spidsen af Rostrum til Enden af de ydre Halevedhæng omtrent 12 Mm. Den hörer altsaa til de större Arter af Slægten.

Beskrivelse. Legemet er af temmelig langstrakt Form, men dog meget kraftigt bygget med særdeles haarde og faste Integumenter. Navnlig er Bagkroppen usædvanligt stærkt udviklet og overgaar, selv naar Halevedhængene fraregnes, Forkroppen ikke saa ubetydeligt i Længde. Forkroppen er seet fra Siden (Fig. 1) temmelig höi, oventil stærkt hvælvet, med den störste Convexitet over det 1ste frie Segment; derfra skraaner Ryglinien fortil ganske jevnt nedad mod Rostrum, bagtil mere brat mod Bagkroppen. Ovenfra seet (Fig. 2) er Forkroppen af smal oval Form og kun lidet opblæst, idet Breden omtrent er lig Höiden og betydeligt mindre end den halve Længde.

Rygskjoldet er temmelig stort, næsten dobbelt saa langt som de frie Forkropssegmenter tilsammen, og seet fra Siden (Fig. 1) af den sædvanlige uregelmæssige trekantede Form. Den övre Rand er næsten fuldkommen lige og jevnt nedadheldende mod Rostrum, den bagre Rand ligeledes temmelig lige og noget skjævt afskaaret i Retningen bagfra fortil. De nedre Kanter vise paa Midten den sædvanlige stærke Böining og ere bag denne Böining svagt indbugtede, derpaa igjen noget fremstaaende, inden de med en jevn Böining overgaa i den bagre Rand; i sin forreste Halvpart, der er stærkt opstigende, vise de den sædvanlige fine saugdannede Bevæbning og overgaa i Rostrum uden at danne nogen tydelig Vinkel under samme. Rostrum er temmelig kort, neppe indtagende mere end $\frac{1}{5}$ af Rygskjoldets Längde, horizontalt og seet fra Siden af smalt tilspidset eller konisk Form. Ovenfra seet (Fig. 2) er Rygskjoldet i Störsteparten af sin Længde næsten af ens Brede, med Sidekonturerne næsten lige og parallele; först i sin forreste Trediedel afsmalnes det pludseligt, idet Sidekanterne med en stærk Böining convergere mod Spidsen af Rostrum. Rygskjoldets Overflade er temmelig jevnt hvælvet; dog er der paa hver Side en meget svag Antydning til nogle (3) skjævt tvergaaende Folde, hvoraf en omtrent i Midten af Rygskjoldets Længde er tydeligst, men dog kun bemærkelig i en meget liden Udstrækning. Forövrigt findes overalt paa Rygskjoldet talrige meget smaa fortilrettede Torner, der især mod Rygsiden ere tæt sammen stillede og her blandede med fine Haar.

Öiet synes ganske at mangle, og Öieloben er særdeles liden og ikke fremspringende, saa at den kun er synlig naar Dyret sees ovenfra.

De bag Rygskjoldet optrædende *5 frie Forkropssegmenter* ere alle vel udviklede og oventil jevnt hvælvede, dog med tydelige Indsnöringer mellem hvert Segment. De 3 förste af disse Segmenter ere omtrent af ens Længde og betydeligt kortere end det 4de, der som sædvanligt er det længste. Den forreste Rand af de 2 förste Segmenter er noget fremstaaende og tilskjærpet samt i sin hele Længde fint tandet; ogsaa paa sidste Segment bemærkes en lignende Crennlering af den forreste Rand, ikke derimod paa 3die og 4de Segment. Epimererne ere af sædvanlig Form, idet de paa de 2 forreste Segmenter vende fortil, paa de 3 bageste bagtil; paa sidste Segment ere de ligesom paa de foregaaende stumpt tilrundede.

Bagkroppen er som ovenfor anfört meget kraftigt udviklet, og dens Segmenter skarpt afsatte fra hinanden, saavel oventil som nedentil stærkt udrandede og til Siderne dannende skarpe noget fremspringende Hjörner. Det næstsidste er som sædvanligt det længste; det sidste noget mere end halvt saa langt og ovenfra seet (Fig. 2 og 3) af tydelig 6kantet Form. Bagkroppen er ligesom Forkroppens frie Segmenter uden Torner, men besat med korte Haar.

De övre Antenner ere temmelig store, forresten af sædvanlig Form og række med hele sidste Led af Pedunkelen og en Del af 2det Led udenfor Spidsen af Rostrum.

1ste Fodpar er udstrakt næsten af Forkroppens Længde, altsaa temmelig langt, og rækker med Enden af 4de Led noget frem foran Spidsen af Rostrum. Basalleddet er temmelig stort, af samme Længde som de 4 fölgende Led tilsammen og i sin nedre Kant besat med stærke Torner foruden de sædvanlige Fjærbörster. De 3 yderste Led ere omtrent indbyrdes af samme Længde, men gradvis smalere mod Enden.

2det Fodpar er noget mere end halvt saa langt som 1ste. 4de Led er af den sædvanlige smale og langstrakte Form og omtrent saa langt som de 2 ydre Led tilsammen. Sidste Led er sylformigt og besat med en Del lange divergerende Börster.

De 3 bageste Fodpar ere af sædvanlig Form og temmelig kraftigt byggede. De aftage i Længde bagtil, saaledes imidlertid, at Forskjellen mellem de 2 forreste Par er mindre end mellem det sidste og næstsidste.

Det midterste Halevedhæng (Fig. 3) er meget stærkt udviklet, omtrent dobbelt saa langt som sidste Segment, og rækker med Spidsen selv noget udenfor Enden af Sidevedhængenes Stamme. Det er af smalt dolkdannet Form, saaledes, at dog den forreste Trediedel eller Basaldelen er mere jevnt bred, medens Endedelen hurtigt og temmelig jevnt afsmalnes lige til Spidsen. I den bageste Halvpart er det paa hver Side bevæbnet med 10—11 smaa Torne. De 2 fra Spidsen udgaaende Endetorner ere saavel i Störrelse som Form fuldkommen lig de övrige. Analaabningen er beliggende ved Enden af den forreste Trediedel af Vedhængets Længde.

De ydre Halevedhæng (ibid.) ere omtrent af samme Længde som de 3 sidste Bagkropssegmenter tilsammen og af den for Slægten sædvanlige spinkle Form. Stammen, der omtrent er af det midterste Halevedhængs Længde, er i den indre Kant bevæbnet med omtrent 16 korte Torner. Grenene ere af ulige Længde. Den indre er den korteste og ikke fuldt af Stammens halve Længde, jevnt afsmalnende mod Enden, samt bestaaende af 3 tydelige Led, hvoraf det 1ste er störst og omtrent af samme Længde som de 2 övrige tilsammen. I den indre Kant er denne Gren bevæbnet med 12 Torner, hvoraf 6 tilhöre 1ste Led, 3 hvert af de 2 övrige; sidste Led bærer desuden i Enden en noget större bagudrettet Torn, der er tydeligt afsat fra Leddet og noget kortere end dette. Den ydre Gren er omtrent $\frac{1}{3}$ længere end den indre og ved Spidsen forsynet med 3 længere Börster, i hver Kant med nogle betydeligt kortere Börster.

Af de bekjendte Arter synes nærværende Form at staa nærmest ved *Diastylis Edwardsii* (KRÖYER), men er dog en fra denne bestemt forskjellig Art, noget, jeg har kunnet direkte overbevise mig om ved en Sammenligning med Exemplarer af denne sidste Art, tagne af mig ved Lofoten. Af de hos den KRÖYERSKE Art saa særdeles iöinefaldende 4 skjævt tvergaaende, bueformigt böiede og fint crenulerede Folde eller Kjöle, der findes paa hver Side af Rygskjoldet, er hos nærværende Form neppe noget Spor at bemærke, og kun ved heldig Belysning opdager man ligesom en Slags Antydning til nogle uregelmæssige Indbugtninger paa Siderne som en Begyndelse til en lignende Folddannelse. Den adskiller sig desuden fra denne Art ved en langt mindre opsvulmet Form af Forkroppen, ved de talrige overalt paa Rygskjoldet adspredte smaa Torner, samt ved en noget forskjellig Form af Rygskjoldet og af Halevedhængene. Ogsaa er Öieloben hos D. Edwardsii meget stærkere udviklet og tydeligt knudeformigt fremstaaende.

2. Diastylis stygia G. O. Sars n. sp.

(Tavl. II. Fig. 4—7).

Descript. Femina. Corporis forma sat abbreviata, cephalothorace tumidiusculo et supine valde arcuato, corpore postico qvam solito debiliore.

Scutum dorsale magnum segmentis liberis corporis antici junctis duplo circiter longius, a latere visum sat altum, altitudine maxima dimidia longitudine multo majore, margine superiore æqvaliter convexo, posteriore indistincte sinuato, inferioribus in medio valde arcuatis parte antica subtiliter serrulata et infra rostrum angulum obsoletum obtuse rotundatum formante, rostro brevi sextam circiter partem scuti longitudinis occupante, horizontali vel indistincte supra curvato forma a latere viso anguste conica; supra visum sat tumidum, latitudine maxima altitudine multo majore in medio circiter sita, lateribus æqvaliter arcuatis et rostro continuis. Superficies scuti ubiqve æqvaliter convexa plicis nullis, sed aculeis numerosis brevibus antice vergentibus imprimis versus faciem dorsalem crebris in parte antica paulo longioribus et etiam in rostro distinctis armata.

Oculus nullus; lobus vero ocularis distinctus sed minimus et vix prominens.

Segmenta libera corporis antici omnia bene evoluta sulcis profundis disjuncta, margine antico 3 priorum acuto et subtiliter crenulato, ultimo postice in medio aculeo unico brevi armato epimeris breviter acuminatis. Spina adest sat magna et antice vergens in medio fasciei ventralis segmentorum 3 priorum.

Corpus posticum sat angustum et appendicibus caudalibus exceptis antico brevius, segmentis constrictionibus profundis sejunctis et aculeis brevibus postice vergentibus obsitis.

Antennæ superiores forma solita, pedunculo apicem rostri articulo circiter ultimo superante.

Pedes 1mi paris cephalothorace multo breviores, articulo basali inferne fortiter aculeato, 4to apicem rostri minime asseqvente et penultimo longitudine circiter æqvali, ultimo illis paulo breviore et valde angusto; 2di paris dimidiam 1mi paris longitudinem parum superantes, articulo basali intus ad apicem aculeis tribus, 2do et 3tio duobus armato, 4to angustissimo et ultimis 2 junctis fere æqvali, ultimo brevi et penultimo parum longiore. Pedes posteriores mediocres et forma solita.

Appendix caudalis media sat magna duplam segmenti ultimi longitudinem circiter æqvans trunco appendicum lateralium tamen brevior, parte antica tertia sat crassa, extremitate vero tenuissima et styliformi aculeis utrinqve circiter 9 brevibus præter 2 terminales armata.

Appendicum lateralium truncus segmenta ultima 2 juncta longitudine fere æqvans intus aculeis circiter 11 armatus, styli terminales tenues et inæqvales, interiore breviore et dimidiam circiter trunci longitudinem æqvante, distincte 3-articulato, articulo 1mo ceteris 2 junctis breviore et apicem versus subito coarctato, ultimo angustissimo et sine fine in aculeum longum terminalem excurrente; aculei marginis interioris hujus styli 8 (4 articuli 1mi, 2 secundi et tertii). Stylus exterior interiore qvinta circiter parte longior seta unica longa apicali et duabus tribusve brevioribus lateralibus apici approximatis instructus.

Longitudo circiter 10 Mm.

Habitat in mari arctico latit. 78°, longit. occident. 2°27′, in profunditate portentosa 2,600 orgyarum.

Af nærværende Art foreligger ligesom af D. polaris kun et enkelt Exemplar, der under den i 1868 anstillede Spetsberg-Expedition blev taget paa det enorme Dyb af 2,600 Favne, det största Dyb, hvortil man naaede ned, og som overhovedet er hidtil bleven undersögt. Exemplaret er en Hun, paa hvem endnu ikke er at bemærke noget Tegn til Brystposens Dannelse.

Beskrivelse. Kropsformen er idethele temmelig kort og undersætsig, skjöndt Bagkroppen er forholdsvis betydeligt svagere bygget end hos foregaaende Art. Forkroppen er temmelig stærkt opblæst og seet fra Siden oventil jevnt og stærkt bueformigt böiet, ovenfra seet af ægdannet Form, med den största Brede, der er beliggende foran Midten, omtrent lig den halve Længde.

Rygskjoldet er meget stort, næsten dobbelt saa langt som de frie Forkropssegmenter tilsammen og betydeligt höiere end den halve Længde. Seet fra Siden (Fig. 4) har det den övre Rand temmelig jevnt bueformigt böiet og i sit forreste Parti noget stærkere nedadheldende mod Rostrum; den bagre Rand er svagt bugtet; de nedre Kanter vise paa Midten den sædvanlige stærke Böining og ere bag denne Böining umærkeligt indbugtede, fortil jevnt opstigende mod Rostrum, hvori de overgaa med en stærk Krumning, der ligesom danner en Antydning til Vinkel under samme. Rostrum er forholdsvis kort, neppe indtagende mere end $\frac{1}{6}$ af Rygskjoldets Længde, næsten horizontalt eller i Enden yderst svagt opadkrummet. Ovenfra seet (Fig. 5) viser Rygskjoldet sig temmelig stærkt opsvulmet, med den största Brede betydelig större end Höiden. Til Siderne er det jevnt convext, saaledes at Sidekonturerne fortil ganske jevnt og umærkeligt overgar i Rostrum — Rygskjoldets Overflade er overalt jevnt hvælvet, uden Spor af nogen Folddannelse eller Fortsatser. Derimod er den overalt selv paa Rostrum tæt besat med smaa fortilrettede Torner, der især mod Rygsiden blive særdeles talrige og i det forreste Parti ved Roden af Rostrum ogsaa blive noget længere end bagtil. De nedre Kanter af Rygskjoldet vise i den forreste Del den sædvanlige fine Crenulering, der endog fortsætter sig et Stykke langs Rostrums Sidekanter.

Öiet mangler, som det var at vente, ganske, og Öieloben er særdeles liden og flad, samt ligesom det övrige Rygskjold besat med nogle fremadrettede Torner.

De frie Forkropssegmenter ere alle tydeligt udviklede og ved temmelig brede og dybe Tverfurer adskilte fra hinanden. Paa de 3 forreste er den forreste Rand skarp og noget hævet samt fint crenuleret, hvilket derimod ikke er Tilfældet paa de 2 bageste Segmenter. Sidste Segment har i Midten af den bagre Rand en enkelt kort opadrettet Torn, og dets Epimerer ere korte og ende i en stump Spids. Paa den ventrale Side bemærkes (se Fig. 6) i Midten af hvert af de tre forreste Segmenter en temmelig stærkt fremspringende tornformig fortilrettet Fortsats. Disse Fortsatser, som jeg icke har bemærket hos de övrige bekjendte Arter, vise sig ogsaa tildels, naar Dyret sees fra Siden (Fig. 4), ragende frem mellem Basis af Födderne.

Bagkroppen er forholdsvis betydeligt mindre udviklet end hos foregaaende Art, idet den baade er spinklere og kortere, saa at den naar Halevedhængene fraregnes ikke engang opnaar Forkroppens Længde. Alle dens Segmenter ere ligesom Rygskjoldet besat med smaa Torner, der imidlertid her ere mere spredte og alle bagtilrettede.

De övre Antenner ere af sædvanlig Form og række med det ydre Led af Pedunkelen udenfor Spidsen af Rostrum.

1ste Fodpar er forholdsvis betydeligt mindre end hos foregaaende Art og af svag Bygning. Det er lige udstrakt betydeligt kortere end Forkroppen og rækker paa langt nær ikke med sit 4de Led til Spidsen af Rostrum. Basalleddet er ligesom hos foregaaende Art nedad bevæbnet med stærke fortilrettede Torner, der, naar Dyret sees nedenfra (Fig. 6) vise sig ordnede i en enkelt noget skraa Længderad. Af de ydre Led er 4de og 5te omtrent lige lange; derimod er sidste Led betydeligt kortere end disse.

2det Fodpar (se Fig. 6), der er noget mere end halvt saa langt som det 1ste, har Basalleddet temmelig bredt og stærkt krummet samt i den indre Kant mod Enden bevæbnet med 3 stærke Torner; ogsaa de 2 fölgende Led vise paa samme Sted et Par lignende Torner. 4de Led er særdeles tyndt, lineært, og ikke fuldt saa langt som de 2 ydre Led tilsammen. Sidste Led er kun lidet længere end næstsidste, af den sædvanlige tynde syldannede Form og ved Enden forsynet med en Del temmelig lange Börster.

De 3 bageste Fodpar ere af den for Slægten normale Bygning og have 3die og 4de Led omtrent indbyrdes af samme Længde.

Det midterste Halevedhæng (Fig. 7) er omtrent dobbelt saa langt som sidste Segment; derimod betydeligt kortere end Sidevedhængenes Stamme. I sin forreste Trediepart er det temmelig tykt og af ens Brede, men indknibes derpaa pludseligt meget stærkt, saa at Endedelen bliver særdeles tynd og næsten sylformig. I sin bageste Halvpart er det paa hver Side bevæbnet med omtrent 9 tynde Torner foruden de noget större Endetorner.

De ydre Haledvedhæng (ibid) ere noget længere end de 3 sidste Segmenter tilsammen. Stammen, der omtrent er $\frac{1}{4}$ længere end det midterste Halevedhæng, er lidt udvidet i Enden og i den indre Kant bevæbnet med omtrent 11 Torner. Grenene ere meget tynde og af ulige Længde. Ogsaa her er den indre Gren den korteste og omtrent af Stammens halve Længde. Den bestaar ligesom hos foregaaende Art af 3 tydelige Led, hvoraf det 1ste er störst, men kortere end de 2 övrige tilsammen og stærkt afsmalnende mod Enden. Det særdeles smale sidste Led gaar uden tydelig Begrændsning ut i en lang lige bagudrettet Endetorn af mere end hele Leddets Længde; naar denne medregnes, bliver denne Gren omtrent af samme Længde som den ydre. De til den indre Rand fæstede Torners Tal er paa det undersögte Exemplar 8, 4 par 1ste Led og 2 paa hvert af de 2 övrige. Den ydre Gren er af smal, næsten syldannet Form og ender med en enkelt lang Börste. Af Sidebörster findes kun 2 eller 3 meget smaa nær Enden. Alle Halevedhæng vise en egen uregelmæssig celledannet Struktur.

Som man af ovenstaaende Beskrivelse vil have seet, frembyder nærværende Cumacee, uagtet dens mærkværdige Forekomst, intetsomhelst udmærkende i sin Bygning. Den er en fuldkommen normal Art af Slægten Diastylis og synes af de bekjendte Arter nærmest at slutte sig til *D. tumida* (Lilljeborg), fra hvem den blandt andet skiller sig ved en kortere Kropsform, ved den rigelige Tornbevæbning paa Rygskjoldet og Bagkroppen og ved den fuldstændige Mangel af Öie.

3. Diastylis rathkei (Kröyer).

(Tavl. III. Fig. 8—9).

Cuma Rathkii, Kröyer, Nat. Tidskrift Bd. 3, pag. 513, tab. 5 og 6, fig. 17—30, og Bd. 2 (ny Række) pg. 144, tab. 1, fig. 4 og 6.
» » Idem, Gaimards Reise, Pl.
» » Lilljeborg, Öfvers. af Vet. Akad. Förh. 1852, pg. 6.
Diastylis Rathkii, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea og dens nordiske Arter pg. 35.

Et ganske ungt Exemplar af denne ellers paa forholdsvis grundt Vand forekommende vel bekjendte Art toges under den 4de Spetsbergs-Expedition 1868 paa det betydelige Dyb af 540 Favne under 81° Brede og 1° östlig Længde.

Exemplaret er kun lidt over 6 Mm langt og viste ved förste Öiekast en noget mere sammentrykt Form af Rygskjoldet end sædvanligt hos denne Art, ligesom ogsaa Rostrum fremböd et noget afvigende Udseende. Den nöiere Undersögelse viste imidlertid, at dette alene havde sin Grund i en tilfældig Kvæstelse af Rygskjoldet. En Sammenligning med ligestore Exemplarer af D. Rathkii, tagne af mig ved Lofoten, viste forövrigt den fuldstændigste Overensstemmelse, saa at Exemplarets Henförelse til denne Art ikke kan være underkastet nogen Tvivl, uagtet dets mærkelige Forekomst paa et saa betydeligt Dyb.

I sin almindelige Habitus ligner nu Exemplaret, som af Afbildningen (Fig. 8) vel sees, meget det fuldvoxne Dyr. Forkroppen har allerede den for Arten characteristiske langstrakte Form og Rygskjoldet sin normale Tornbevæbning paa den midterste Lob (regio gastrica). Sidste Forkropssegment viser ligeledes de for Arten meget characteristiske smale og skarpt tilspidsede bagudrettede Fortsatser og har sin forreste Rand tydeligt crenuleret. Ligeledes vise de til Forkroppen hörende forskjellige Vedhæng i det væsentlige samme Form som hos det fuldt udviklede Dyr. Forskjellen indskrænker sig væsentlig kun til Bagkroppen, der er forholdsvis betydeligt mindre udviklet og langt kortere end Forkroppen, medens den hos fuldvoxne Exemplarer omtrent er af dennes Længde uden at regne Halevedhængene. Dog viser ogsaa denne Del et for Arten meget characteristisk Kjendemærke i de eiendommelige paa Ventralsiden til den bagre Rand af de 4 forreste Segmenter fæstede cilierede Börster. Mest afvigende er Halevedhængenes Form, der ogsaa hos de övrige Arter er underkastet betydelige Modifikationer efter Alderen. Det midlerste Halevedhæng (Fig. 9) er neppe dobbelt saa langt som sidste Segment, medens det hos fuldvoxne Exemplarer næsten er af samme Længde som de 2 sidste Segmenter tilsammen, og af de talrige Sidetorner er her alene 3 udviklede paa hver Side (hos endnu yngre Individer er alene de 2 Endetorner tilstede). De ydre Halevedhæng ere ligeledes forholdsvis betydeligt kortere end hos de voxne og den indre Gren forsynet med et langt ringere Antal Torner i den indre Kant, nemligen kun 7, medens disser Tal hos fuldvoxne Individer er mere end dobbelt saa stort. Forholdet mellem begge Grene er forövrigt omtrent som hos de voxne, ikke derimod mellem Grenene og Stammen, idet denne sidste er forholdsvis mindre udviklet.

4. Leucon pallidus G. O. Sars.

(Tavl. III. Fig. 10).

Leucon pallidus, G. O. Sars, l. c. pg. 57.

Den forreste Del af Kroppen (Rygskjoldet og 1ste frie Forkropssegment) af et til denne Art hörende Exemplar, en fuldvoxen Hun, erholdtes paa den under Torell's Ledelse i Aaret 1861 foretagne Spetsbergs-Expedition fra det enorme Dyb af 1400 Favne under 76° 5′ Brede og 13° 5′ östlig Længde. De ovennævnte Dele af Exemplaret ere fuldkommen vel conserverede, saa at jeg herefter med Sikkerhed har kunnet bestemme Arten. Det var mig mindre uventet at træffe denne Art iblandt de Spetsbergske Dybvandscumaceer, da jeg ved vore Kyster netop har fundet den almindeligst paa de större Dybder, ligetil 450 Favne, det störste af mig hidtil undersögte Dyb. At den imidlertid endog skulde gaa ned til over det tredobbelte Dyb, bliver dog i höi Grad mærkeligt og synes at vise at de egentlige Dybvandsdyr have en særdeles vid bathymetrisk Udbredning.

Nærværende Art, der först af mig blev opstillet i 1864 efter Exemplarer tagne ved Dröbak paa 50—60 Favnes Dyb, synes at forekomme langs vor hele Kyst. Jeg har saaledes senere truffet den saavel i Hardangerfjorden som ved Lofoten, paa begge Steder fortrinsvis paa de störste Dyb.

Fra de övrige Arter af Slægten kjendes den let (se Fig. 10) ved Rygskjoldets Form, den stærkt udviklede dorsale Crista og det store næsten horizontale, i Enden stumpt tilspidsede og kun med 3 smaa Tænder bevæbnede Rostrum. Den hörer til de mindre Arter af Slægten, da Længden af fuldvoxne ægbærende Exemplarer kun lidet overgaar 4 Mm.

5. Eudorella gracilis G. O. Sars n. sp.

(Tavl. III. Fig. 11—13).

Descript. Femina adulta. Corporis forma valde elongata et gracilis, cephalothorace supine leviter convexo postice sensim attenuato et corpori postico continuo.

Scutum dorsale parvum segmenta libera 4 anteriora juncta longitudine circiter æqvans, a latere visum subqvadrangulare, antice fere verticaliter truncatum, fronte (parte ante laciniam mediam) parum prominente et æqvaliter rotundato pilis nonnullis brevibus obsito, marginibus anticis lævibus, angulo inferiore propius tamen sinu brevi et lato dentibus utrinqve 4 marginato instructis, angulo inferiore obtuso dente majore armato, inferioribus postice obliqvis antice horizontalibus dentibusqve minutis circiter 10 crenulatis.

Segmenta libera corporis antici bene evoluta forma solita pilis brevibus et sparsis obsita.

Corpus posticum gracillimum, appendicibus caudalibus exceptis antico multo longius pilis sat longis et supine et inferne obsitum, segmento ultimo postice sat producto.

Antennæ superiores sat validæ, ut vulgo geniculatæ, articulo 1mo pedunculi obsoleto, 2do ultimo fere duplo majore, flagellis bene evolutis, altero 3-articulato altero uniarticulato, setis ex parte ciliatis ornatæ.

Pedes 1mi paris in specimine scrutato manci; 2di paris sat magni scuto dorsali longiores, articulo antepenultimo angusto et antecedente nonnihil longiore, ultimo complanato, subovato, setis rigidis ubiqve radiantibus marginato. Pedes posteriores structura solita.

Appendices caudales sat magnæ segmentis 2 ultimis junctis longitudine circiter æqvales, trunco cylindrico intus aculeis 7 tenuibus et fere setiformibus instructo, stylis terminalibus inæqvalibus, interiore majore et trunci longitudinem circiter æqvante, biarticulato, articulo ultimo tertiam 1mi asseqvente longitudinis partem aculeo forti et seta longa terminato; aculei marginis interioris hujus styli 11 (8 articuli 1mi et 3 ultimi). Stylus exterior 7tima circiter parte interiore brevior, articulo 1mo obliqvissime truncato, ultimo lineari setisqve sat longis et ciliatis marginato.

Longitudo feminæ oviferæ circiter $6\frac{1}{2}$ Mm.

Habitat in mari arctico juxta Spetsbergiam in profunditate 540 orgyarum.

Det undersögte Exemplar, der blev taget under den fjerde Spetsbergs-Expedition 1868 paa det betydelige Dyb af 540 Favne, er en Hun med stærkt udviklet Brystpose, hvoraf Ungerne netop synes at være udkomne.

Beskr. Kropsformen er usædvanlig smal og langstrakt og det hele Dyr endnu saa gjennemsigtigt, at Musklerne overalt vise sig temmelig tydeligt og selv enkelte af de indre Organer, f. Ex. Tarmkanalen skinne igjennem de tynde Integumenter. Forkroppen er seet fra Siden (Fig. 11) af den for Slægten characteristiske kölledannede Form, idet den fortil er tvert afstumpet og her höiest, medens den bagtil jevnt afsmalnes og overgaar uden nogen skarp Begrændsning i den spinkle Bagkrop. Den hos nærværende Exemplar stærkt fremspringende Brystpose gjör dog, at det forreste Parti af Forkroppen (Rygskjoldet og de 3 förste frie Segmenter) sammen med denne faar en temmelig regelmæssig oval Form. Ryglinien er svagt bueformigt böiet med den största Convexitet over 1ste frie Segment og skraaner næsten umærkeligt ned fortil mod den tilrundede Pandedel, noget stærkere bagtil.

Rygskjoldet er forholdsvis lidet, omtrent af samme Længde som de 4 förste Forkropssegmenter tilsammen og viser seet fra Siden (Fig. 11) den sædvanlige uregelmæssigt firkantede Form. Den övre Rand er næsten lige og svagt nedadheldende mod den noget fremspringende jevnt tilrundede Pandedel, der dannes af de foran den mediane Lob sammenstödende laterale Lober. Den forreste Rand er (se Fig. 12) næsten perpendiculær og fuldkommen glat indtil i Nærheden af det nedre Hjörne, hvor den danner en temmelig bred og grund Bugt til hver Side bevæbnet med 4 Tænder, der ere böiede i modsat Retning paa hver Side. Det nedre Hjörne er ikke fremspringende, men danner en stump Vinkel og er bevæbnet med en noget större fortilrettet Tand; bag denne fölger paa det forreste horizontale Parti af de nedre Kanter 10 meget smaa ligeledes fortilrettede Tænder. Den bageste Halvpart af de nedre Kanter böie sig derpaa pludseligt skjævt opad og overgaa med en jevn Böining i den bagre Rand. Rygskjoldet er næsten ganske glat uden tydelige Haar, alene med Undtagelse af den tilrundede Pandedel, der er besat med et Knippe af Börster, der imidlertid ikke udmærke sig ved nogen synderlig Længde.

Af *de 5 frie Forkropssegmenter* er som sædvanligt del 1ste kortest, de 2 fölgende störst og omtrent af ens Længde samt forsynede med brede Epimerer. Sidste Segment er hverken i Störrelse eller Form synderligt forskjelligt fra 1ste Bagkropssegment, med hvilket det ogsaa er temmelig fast forbunden.

Bagkroppen er særdeles smal og langstrakt samt overgaar, selv om Halevedhængene fraregnes, Forkroppen meget betydeligt i Længde. Dens Segmenter tiltage noget i Brede indtil 3die, hvorfra de igjen noget afsmalnes. Næstsidste er som sædvanligt det længste og omtrent saa langt som de 2 forreste tilsammen. Sidste Segment danner bagtil en temmelig stærkt fremspringende stumpt konisk Udvidning som Antydning til et midterste Halevedhæng. Saavel oventil som nedentil er Bagkropssegmenterne forsynede med en Del temmelig lange Haar, og ogsaa paa Ventralsiden af de 2 bageste Forkropssegmenter bemærkes en lignende Haarbesætning.

Integumenterne ere særdeles tynde og vise den ogsaa for de övrige Arter characteristiske skjældannede Structur.

De övre Antenner ere temmelig store og vise den for Slægten eiendommelige knæformige Böining, idet den ydre Del er slaaet opad langs den basale Del, der er lige nedadrettet langs de forreste Kanter af Rygskjoldet. Som hos de fleste övrige Arter er Pedunkelens 1ste Led utydeligt udviklet, medens 2det Led er særdeles stort og næsten rækker til det nedre Hjörne af Rygskjoldet. Sidste Led, der ved Basis er stærkt indknebet og med foregaaende Led danner den ovenomtalte knæformige Böining, er neppe synderligt mere end halvt saa stort som dette og i Enden lige afskaaret. Svöberne ere begge vel udviklede; den nedre som sædvanligt uleddet og omtrent saa lang som den övres 1ste Led. Saavel paa Pedunkelen som den övre Svöbes 1ste Led findes en Del lange fint cilierede Börster.

Af *1ste Fodpar* var paa det undersögte Exemplar hele det ydre Parti borte, saa at alene Basalleddet var i Behold. Dette er af sædvanlig Form og viser i den nedre Rand en Rad af stærke Fjærbörster.

2det Fodpar er temmelig stort, længere end Rygskjoldet, og har 3die Led temmelig stærkt forlænget, betydeligt længere end det foregaaende. Sidste Led er af oval eller bredt lancetdannet Form og rundtom forsynet med stærke i alle Retninger divergerende Börster.

De 3 bageste Fodpar vise den for Slægten normale Bygning, og det 1ste af dem er som sædvanligt forsynet med vel udviklede Svömmepalper.

Halevedhængene (Fig. 13) ere temmelig stærkt udviklede, omtrent saa lange som de 2 sidste Segmenter tilsammen. Stammen er cylindrisk og i den indre Kant forsynet med 7 særdeles tynde næsten börsteformige Torner. Grenene ere ulige lange. Den indre er som sædvanligt den længste og omtrent af Stammens Længde, 2leddet, med det yderste Led meget kort, kun $\frac{1}{3}$ saa langt som 1ste og i Enden forsynet med en stærk Torn og en lang Börste. Den indre Kant af denne Gren er bevæbnet med 11 Torner, hvoraf de 8 tilhöre 1ste Led og ere betydeligt længere og tyndere end de 3 til sidste Led fæstede, samt tydeligt cilierede. I den ydre Kant af samme Gren er desuden fæstet 4 tynde Börster, 3 til 1ste og 1 nær Enden af sidste Led. Den ydre Gren er omtrent $\frac{1}{4}$ kortere end den indre. Dens 1ste Led er særdeles skjævt afskaaret i Retningen indenfra udad, saa at det mere tager sig ud som et Slags Skjæl, der bedækker Roden af det ydre Led udad. Dette sidste er af lineær Form og i den indre Kant samt ved Spidsen forsynet med en Del lange tildels cilierede Börster.

Af de övrige bekjendte Arter synes den nærmest at slutte sig til *E. hirsuta* G. O. Sars, til hvilken jeg i Begyndelsen var tilböielig til at henföre den. Den nöiere Undersögelse har imidlertid vist flere Afvigelser. Især er den til Adskillelsen af de herhen hörende Arter saa ypperligt anvendelige Character, nemlig Forholdet af Rygskjoldets forreste Kanter (Fig. 12) temmelig forskjelligt hos begge Arter [1]). Den ligner i denne Henseende noget mere *E. truncatula* Sp. Barte, fra hvem den dog bestemt adskiller sig foruden ved sin betydeligt slankere Kroppsform ved 2det Fodpars forskjellige Bygning.

6. Campylaspis rubicunda (Lilljeborg).

(Tavl. IV. Fig. 14—16).

Cuma rubicunda Lilljeborg, Öfvers. af Vet. Akad. Förhandl. f. 1855, pg. 121.
Campylaspis rubicunda G. O. Sars, l. c. pg. 77.

Et særdeles kraftigt udviklet Exemplar af nærværende eiendommelige Cumace erholdtes paa den i Aaret 1861 foretagne Spetsbergs-Expedition fra det enorme Dyb af 1050 Favne, under 75° 45' Brede. Den nöiagtige Sammenligning, jeg har anstillet med Exemplarer tagne af mig ved vore Kyster, har vist, at dette Exemplar virkelig, uagtet sin Forekomst paa et saa betydeligt Dyb, hörer till Lilljeborgs *Cuma rubicunda*, noget man mindst skulde have ventet, da denne Art netop af alle er den, der ved vore Kyster gaar höiest op.

Det tagne Exemplar, der er omtrent 5 Mm langt, er en endnu ikke fuldt udviklet Han, som dog netop synes at have villet undergaa sin sidste Hudskiftning for at blive fuldt udviklet. Rygskjoldet er nemlig (se Fig. 14) allerede betydeligt fladere og mindre hvælvet end hos Hunnerne og de yngere Hanner, og de nedre Antenner have allerede strækt sig lige ud og træde frem bag Rygskjoldet fölgende de forreste frie Forkropssegmenters nedre Rand indtil det 4de Segment. Ogsaa ere Svömmepalperne paa 3die og 4de Fodpar allerede temmelig stærkt udviklede. Ovenfraa seet (Fig. 15) viser Forkroppen den for Arten characteristiske regelmæssige ovale eller ægdannede Form, men er noget mindre opblæst end hos Hunnerne. Halevedhængene (Fig. 16) ere som de fleste övrige Kropsvedhæng af noget kraftigere Bygning end sædvanligt hos den paa grundere Vand levende Form, men forresten nöiagtigt overensstemmende i alle sine Detailler.

Fra de övrige Arter kjendes denne Art let ved sit jevnt hvælvede fuldkommen glatte Rygskjold og ved den intensive röde Farve, der selv paa Spiritusexemplarer icke tabes, men blot overgaar til en noget mörkere rödviolet Farvenuance.

Den synes at forekomme langs vor hele Kyst, men aldrig i nogen synderlig Mængde. Foruden i Christianiafjorden har jeg saaledes senere träffet den i Hardangerfjorden og ved Lofoten. Paa sidstnævnte Sted toges den paa omtrent 200 Favnes Dyb, hvorimod den paa de övrige af mig undersögte Lokaliteter helst synes at leve paa betydeligt grundere Vand, 12—20 Favne.

Slægten *Campylaspis* blev af mig 1864 opstillet for nærværende af Lilljeborg först opdagede Cumaceform, hvis anatomiske Bygning jeg fandt særdeles afvigende fra de övrige mig bekjendte Cumaceer. Denne Slægt har nu vist sig at være næst efter Sl. Diastylis den mest artsrige i denne Krebsdyrgruppe, da jeg foruden nærværende typiske Art endnu har adskilt 6 norske Arter, nemlig: *C. costata, undata, verrucosa, horrida sulcata* og *affinis.* Hertil kommer endnu en vestindisk Art, *C. pulchella* G. O. Sars, som senere skal omtales, saa at altsaa Slægten for nærværende Tid tæller ikke mindre end 8 forskjellige Arter. Alle disse Arter staa

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[1]) Se Afbildningen af disse Kanter hos E. hirsuta i min Afhandling over Josephines Cumaceer.

hinanden, hvad de anatomiske Detailler angaar, meget nær, men ere dog let kjendelige ved enkelte ydre Characterer, navnlig ved Rygskjoldets Form og Skulptur, tildels ogsaa ved Halevedhængenes Bygning.

Af de for Slægten eiendommelige Characterer har jeg paa ovenanförte Sted givet en udförlig latinsk Diagnose og skal blot her i Korthed udhæve de vigtigste af disse.

Characteristisk er da, foruden den usædvanlig korte og undersætsige Kropsform, *Rygskjoldets* enorme Udvikling ligesom paa Bekostning af de bag dette fölgende *5 frie Segmenter*, hvoraf de forreste ere særdeles korte, næsten baandformige og ofte hævede i Form af transversale Cristæ. *De övre Antenner* have den ene (nedre) Svöbe rudimentær, kun dannende en liden börstebesat Knude; *de nedre Antenner* ere hos Hunnerne særdeles smaa, uleddede og ganske uden Börster, medens de hos de fuldt udviklede Hanner ere særdeles stærkt udviklede og selv noget længere end hele Legemet. *Labrum* er betydeligt stærkere udviklet end hos de övrige Cumaceer og mere lig samme hos Decapoderne, idet den er hjelmformig og gaar fortil ud i en konisk tandet Fortsats. *Mandiblerne* ere ogsaa meget ulige samme hos de övrige Cumaceer, idet den hos disse altid stærkt udviklede Molarproces her kun har Formen af en tynd tornformig Fortsats. *1ste Par Maxiller* ere af særdeles kraftig og undersætsig Bygning, med den ene Gren (Hovedgrenen) bevæbnet med stærke tildels grovt tandede Torner; og Svöben særdeles lang og forsynet med en enkelt eller 2 Börster. *2det Par Maxiller* ere derimod meget smaa og rudimentære, kun forestillende en enkelt liden membranös Plade besat med et meget ringe Antal Börster. *1ste Par Maxillipeder*, der ved Basis har det sædvanlige Gjelleapparat, bestaa kun af 3 Led, idet 2det, 3die och 4de Led ere smeltede sammen til et enkelt pladeformigt ovalt Led, til hvis Ende det overordentlig lille knudeformige sidste Led erfæstet. *2det Par Maxillipeder* ere af en ganske mærkelig Udvikling, idet de ydre Led blive paa en meget eiendommelig Maade opsvulmede for at kunne fungere som et Slags Griberedskab. *3die Par Maxillipeder* ere ogsaa af temmelig kraftig Bygning, men dog af et mere normalt Udseende og ligesom de 2 förste Fodpar hos Hunnen forsynet med Svömmepalper, hvilke hos Hannerne ere tilstede paa alle Födder med Undtagelse af det bageste Par. Af *Föddcrne* er det 1ste Par forholdsvis meget lidet udviklet og som oftest saavel i Form som Störrelse nöie overensstemmende med det sidste Par Maxillipeder; derimod er 2det Par temmelig stort og udmærket ved den eiendommelige stærkt forlængede Form af sidste Led. De fölgende 3 Par Födder ere hos Hunnerne meget spinkle og jevnt aftagende i Længde bagtil. Hos Hannerne have de 2 forreste af dem Basalleddet stærkt opsvulmet for at kunne optage de stærke Svömmepalperne bevægende Muskler. *Bagkroppen*, der er usædvanlig kort og undersætsig, mangler saavel hos Han som Hun ethvert Spor af ventrale Vedhæng. Af *Halevedhængene* ere alene de ydre tilstede. Disse have Grenerne meget korte og den indre kun bestaaende af et enkelt Led, den ydre smalere og 2leddet. — *Hannerne* ere ofte meget ulige Hunnerne ved sin betydelig slankere Kropsform og langt mindre opblæste Forkrop, ligesom de i Regelen ogsaa ere betydeligt större. Dette gjælder imidlertid kun de fuldt udviklede Hanner, hvorimod de endnu ikke udviklede Hanner, hvad Kropsformen angaar, temmelig nöie stemme overens med Hunnerne.

EXPLICATIO FIGURARUM.

Tab. I.

Diastylis polaris n. sp.

Fig. 1. Femina a latere sinistro exhibita.
» 2. Eadem supra visa.
» 3. Segmentum ultimum cum appendice media et laterali dextra supra visum.

Tab. II.

Diastylis stygia n. sp.

» 4. Femina a latere sinistro exhibita.
» 5. Eadem supra visa.
» 6. Corpus anticum ejusdem cum segmento 1:mo corporis postici a facie ventrali exhibitum.
» 7. Segmenta 2 ultima cum appendice caudali media et laterali dextra supra visa.

Tab. III.

Diastylis Rathkii Kröyer.

» 8. Specimen juvenile a latere sinistro visum.
» 9. Segmentum ejusdem ultimum cum appendice media et laterali dextra supra visum.

Leucon pallidus G. O. Sars.

» 10. Scutum dorsale feminæ adultæ cum segmento 1:mo libero a latere sinistro exhibitum.

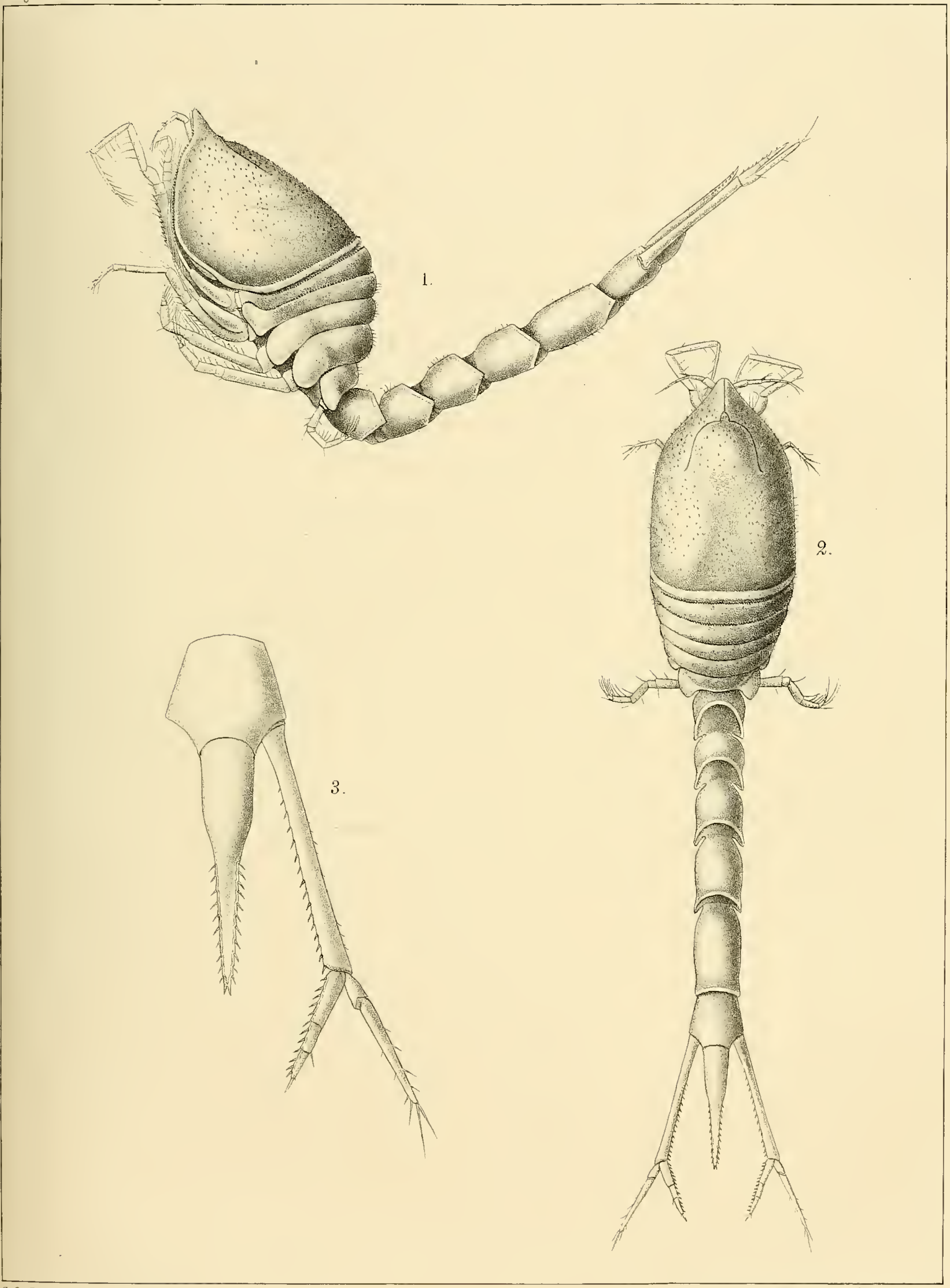
Eudorella gracilis n. sp.

» 11. Femina adulta marsupio instructa a latere sinistro exhibita.
» 12. Pars antica scuti dorsalis a latere sinistro exhibita, formam et armaturam marginis antici ostendens.
» 13. Segmentum ultimum cum appendice laterali dextra supra visum.

Tab. IV.

Campylaspis rubicunda (Lilljeborg).

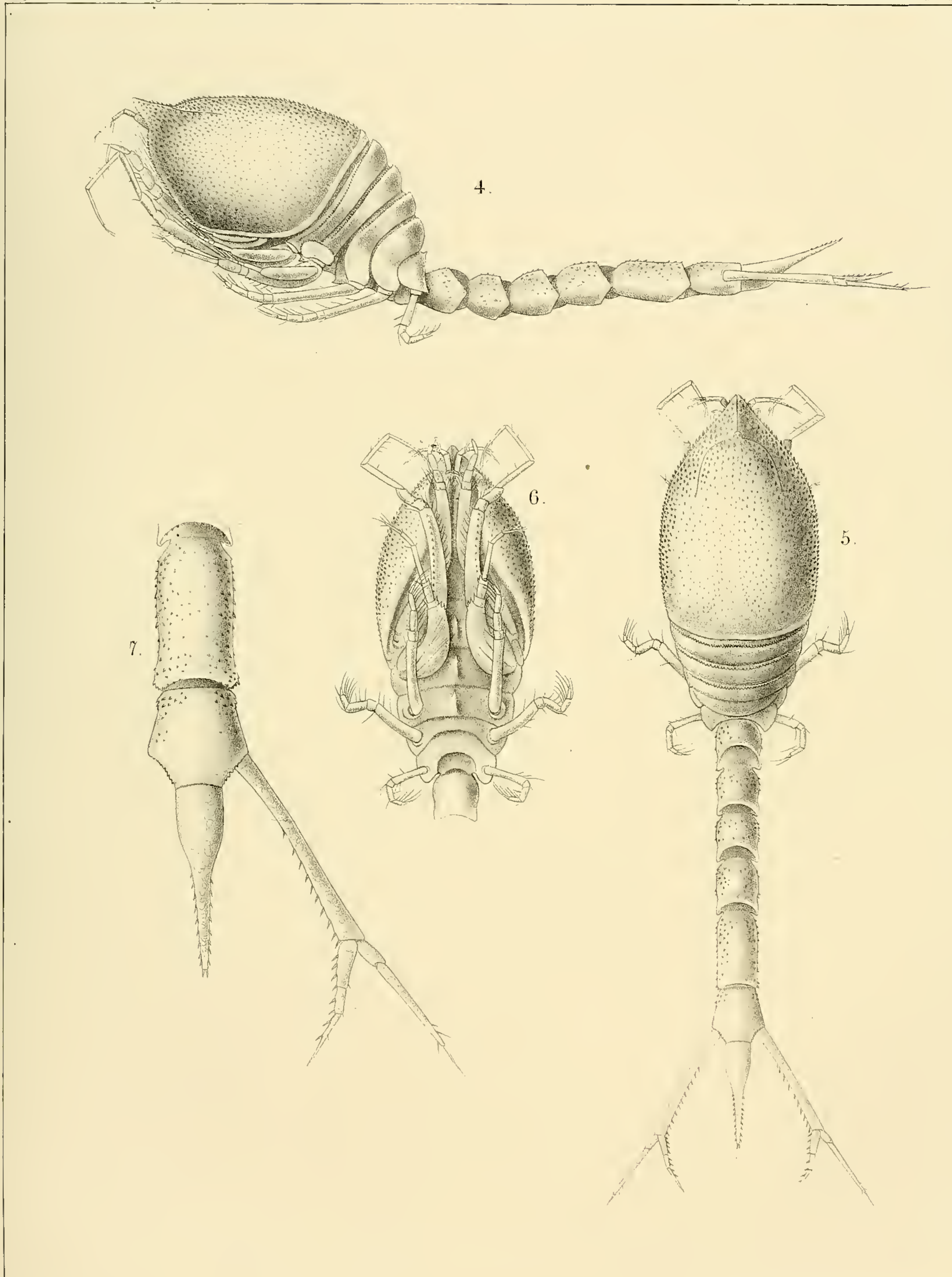
» 14. Mas junior a latere sinistro exhibitus.
» 15. Idem supra visus.
» 16. Segmentum ultimum cum appendicibus caudalibus supra visum.



G. O. Sars del.

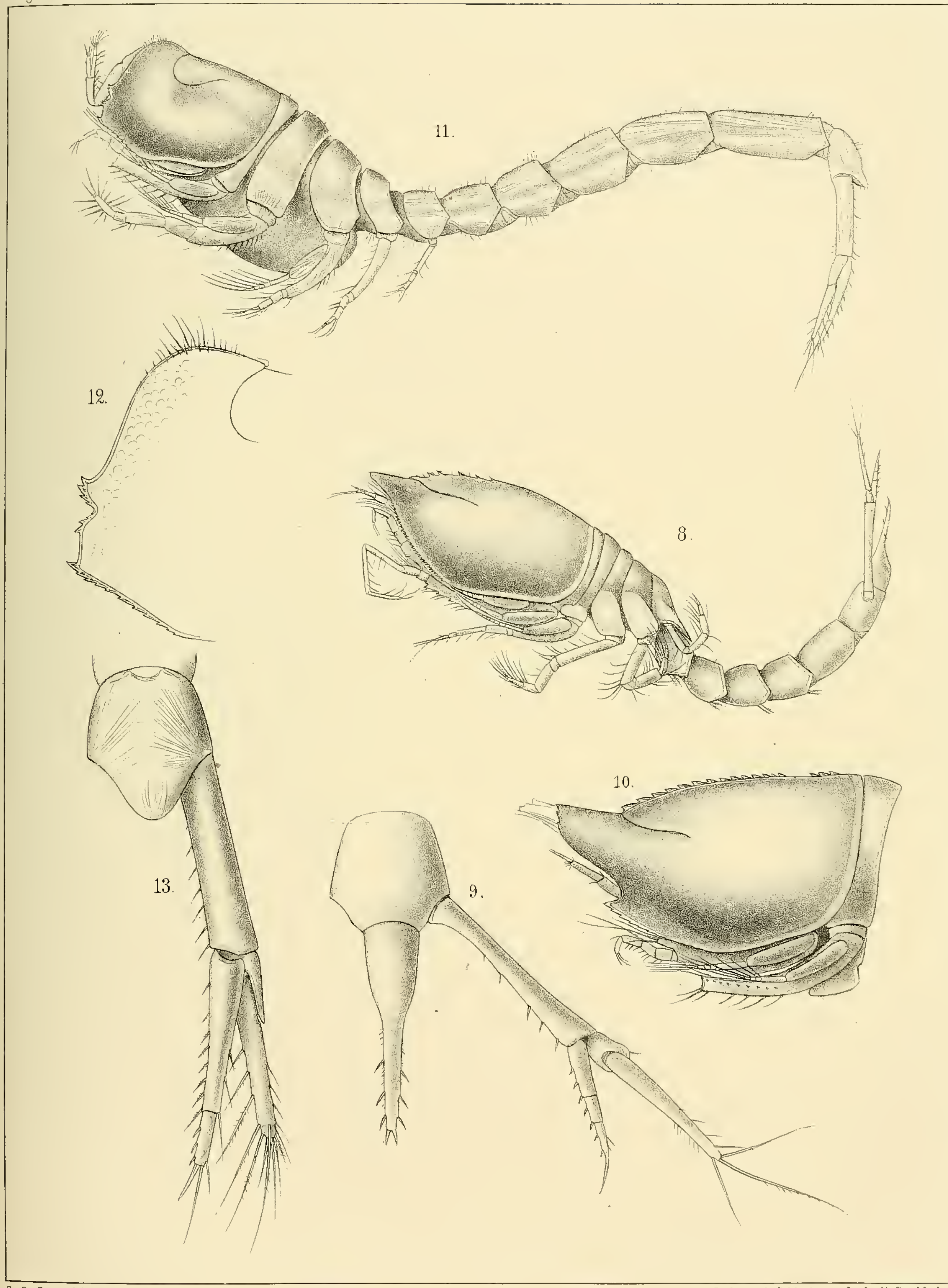
Lith. o. tr. h. Schlachter & Seedorff, Stockholm.

Diastylis polaris n. sp.



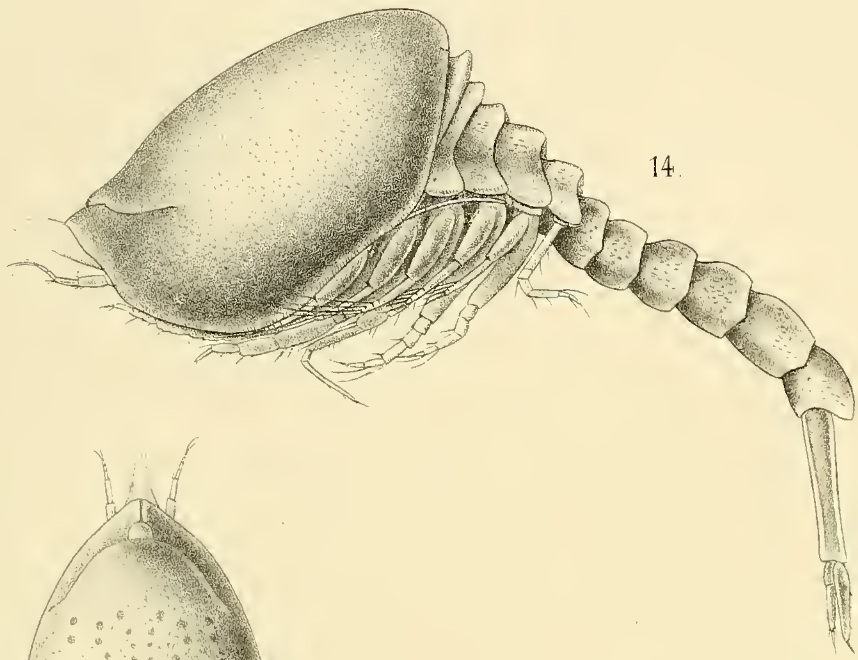
G. O. Sars del. Lith. o. tr. h. Schlachter & Seedorff, Stockholm.

Diastylis stygia.

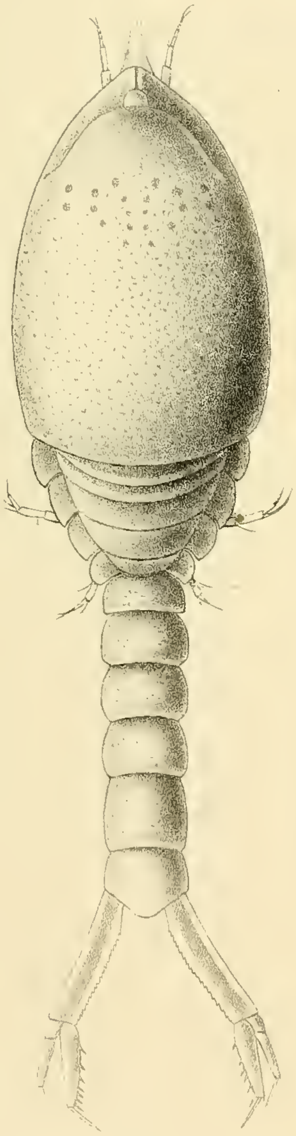


G. O. Sars del. Lith. o. tr. h. Schlachter & Seedorff, Stockholm

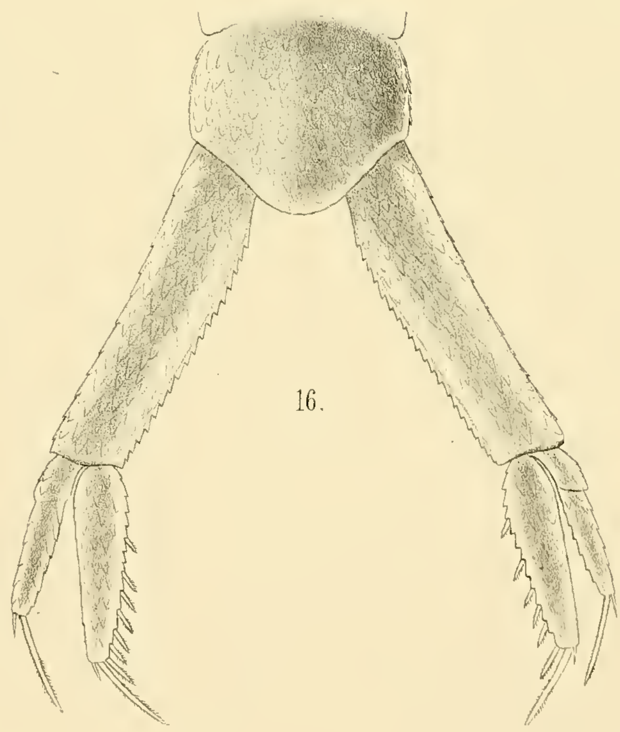
Fig. 8-9. Diastylis Rathkii, Kr. (juv)
Fig. 10. Leucon pallidus, G. O. Sars.
Fig. 11-13. Eudorella gracilis, n. sp.



14.



15.



16.

G. O. Sars del.

Lith. o. tr. h. Schlachter & Seedorff, Stockholm

Campylaspis rubicunda (Lilljeborg.)
(mas jun.)

KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11. N:o 7.

ÉTUDES

SUR LES

ÉCHINOÏDÉES.

PAR

S. LOVÉN.

MÉMOIRE PRÉSENTÉ A L'ACADÉMIE ROYALE DES SCIENCES DE SUÈDE LE 12 JUIN 1872

AVEC CINQUANTE-TROIS PLANCHES.

See separate [illegible]

STOCKHOLM, 1874.
P. A. NORSTEDT & SÖNER,
KONGL. BOKTRYCKARE.

Lorsqu'on s'occupe de la classification des Échinodermes et qu'on cherche pour leurs divisions des caractères naturels et précis, on est frappé des difficultés qu'on éprouve à comparer d'un groupe à l'autre les mêmes éléments de leur organisation si compliquée et si variée, et l'on s'étonne de trouver des points essentiels qui, aujourd'hui encore et après tant de travaux, ont besoin d'être éclaircis et de nouveau considérés. C'est dans l'espoir de pouvoir combler quelques-unes de ces lacunes qu'ont été entreprises les recherches consignées dans ce mémoire[1]). Si, parmi les faits auxquels elles ont conduit, il y en a qui rendent moins difficiles à saisir certaines distinctions nécessaires à la parfaite connaissance des différents types de cette classe, qui mérite à tant d'égards d'être l'objet d'études persévérantes, la science en est en premier lieu redevable à la subvention libérale, accordée, sur la demande de l'Académie des Sciences, par le Gouvernement et par la Diète pour l'exécution des planches, sans lesquelles il aurait été impossible de faire connaître avec clarté des détails de structure pour la plupart minutieux et assez difficiles à bien décrire.

I.

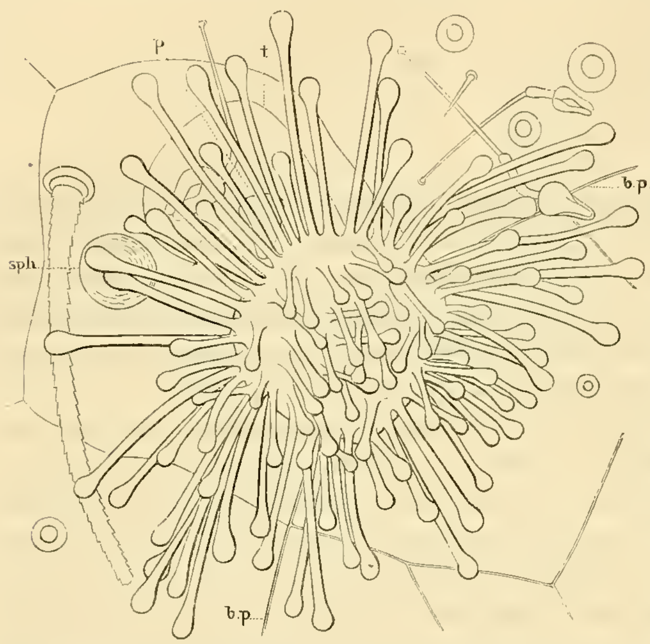
DES SPHÉRIDES.

L'examen attentif des différents organes groupés autour du péristome d'un oursin ou d'un spatangue de nos mers, fait découvrir, au milieu des tentacules, des radioles et des pédicellaires, un nombre, variable selon l'espèce, de globules sphéroïdaux, ellipsoïdaux ou quelque peu irréguliers, pourvus d'un pédicule très-court s'articulant sur un petit mamelon du test, et disposés avec une certaine régularité sur la partie péristomienne des ambulacres[2]). Une fois observés, on les retrouve chez toutes

[1]) Les principaux résultats donnés ici, ont été communiqués à l'Académie des Sciences le 12 mai 1869 et le 14 juin 1871, et publiés en extrait dans l'Öfversigt af K. Vetenskaps-Akademiens Förhandlingar, 1871, N:o 8, p. 1065, imprimé en août et septembre 1872, traduit dans l'Archiv für Naturgeschichte, Jahrg. XXXIX, I, p. 16, et dans les Annals and Magazine of Natural History, fourth series, X, p. 285, 376, 427. Voir aussi les Comptes-rendus de l'Académie des Sciences, LXXV, p. 803. Le temps nécessaire à l'exécution des planches a permis d'ajouter quelques observations sur des genres et des espèces accessibles seulement après la date de la présentation de ce mémoire.

[2]) Pl. I, fig. 2—22; pl. II, fig. 23—27; pl. III, IV, V, VII, VIII, IX, X.

les espèces vivantes de la classe, celles du genre Cidaris exceptées, chez lesquelles ils semblent manquer entièrement. On peut les appeler sphérides, d'après leur forme la plus commune. Ils sont transparents, luisants, durs et solides, et revêtus d'un tissu à cellules pigmentées, d'un épithélium et d'une cuticule à cils vibratiles [1]).



Plaque II, *b*, 1 de l'Amphidetus flavescens (O. F. Müller) à peine adulte, avec son tentacule à pinceau, ses radioles et ses pédicellaires. *b.p.* signifie le bord du péristome; *t*, le tube du tentacule; *p*, le pore tentaculaire; *sph.*, le sphéride.

Les sphérides consistent, dans leur parties dures, de deux éléments calcaires distincts, d'un tissu réticulaire qui constitue presque à lui seul le pédicule et qui pénètre souvent plus ou moins dans l'intérieur du globule, et d'une substance externe compacte et vitreuse, dont celuici est formé essentiellement et presque en entier [2]). Le tissu réticulaire, très-serré dans le pédicule, s'étend plus ou moins autour de la base du globule [3]), et, quand il se continue, ce qui est le plus souvent le cas, dans l'intérieur du globule et dans la direction de l'axe de celuici, il y constitue une sorte de charpente plus ou moins régulière [4]). La substance prédominante du globule, au contraire, est disposée par couches concentriques superposées, très-nombreuses et excessivement minces [5]), lesquelles se prolongent extérieurement sur le collier du pédicule en trainées espacées laissant entre elles des creux en forme de voûtes. Il y a des globules dont l'intérieur ne présente rien que ces couches [6]), toute trace du tissu réticulaire ayant disparu, tant celui-ci est influencé par la croissance de la substance vitreuse. Dans d'autres, il en reste seulement quelques fragments épars suspendus dans la masse transparente [7]), ou le tissu réticulaire est comme brisé en pièces détachées, déplacées et en partie dissoutes [8]). Quelquefois, des parties du réseau plus ou moins cohérentes se laissent encore entrevoir [9]), ou bien les restes en sont disposés d'une manière qui permet d'en reconnaître encore la forme primitive [10]). De même, dans les sphérides de l'Echinocardium cordatum (O.F.M.), fig. 4, on observe parfois des séries verticales plus ou moins régulières de pièces imitant des feuilles lancéolées pliées, et qui ne sont guère autre chose que les restes des parties angulaires des mailles du tissu réticulaire. Dans beaucoup de cas aussi, la charpente intérieure est plus ou moins intacte. Ainsi, dans les sphérides du Loxechinus albus (Mol.), fig. 13, elle se maintient jusque vers

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[1]) Pl. II, fig. 27. [2]) Pl. I, fig. 2—22; pl. II, fig. 23—26. [3]) Pl. I, fig. 6, 8, 10, 18, 19. [4]) Pl. I, fig. 2, 4, 10, 11, 13—17, 20. [5]) Fig. 5: Echinocardium cordatum (Penn.); fig. 11: Amblypneustes griseus (Blv.); fig. 17: Brissopsis lyrifera (Forb.), cassure; fig. 20, 23, 25: Spatangus purpureus O.F.M. [6]) Fig. 5: Echinocardium cordatum (Penn.). [7]) Fig. 20: Spatangus purpureus O.F.M. [8]) Fig. 14, 15: Meoma ventricosa (Lamk.). [9]) Fig. 26: Spatangus purpureus O.F.M. [10]) Fig. 10: Brissopsis lyrifera (Forb.).

le milieu du globule, ses piliers se transformant en rameaux grêles très-longs et un peu tortueux, qui s'étendent presque à la surface du globule. Dans ceux du Spatangus purpureus O.F.M., fig. 22, les derniers piliers des mailles se replient vers le dehors et vers les creux de la substance vitreuse.

A côté de ces diversités, qui dépendent, d'une manière plus ou moins évidente, des changements opérés dans le tissu réticulaire pendant l'accroissement du sphéride, il y en a d'autres qui sont propres à la substance vitreuse. Il n'est pas rare de trouver des globules percés, d'un bout à l'autre, d'un canal étroit, tantôt ouvert depuis le sommet jusque vers le pédicule [1]), tantôt fermé en partie, parfois dans sa portion supérieure, de sorte qu'il n'apparaît que dans la moitié inférieure [2]); en outre, sur la surface entière du globule, on voit des cavités plus ou moins nombreuses, lesquelles tantôt ne sont que des impressions faibles [3]), tantôt des creux coniques ou en forme d'entonnoir, qui pénètrent plus ou moins vers le centre, et dont le fond paraît parfois être sur le point de se remplir [4]). C'est vers les extrémités internes de ces cavités que semblent aboutir le plus souvent les piliers déviant de la charpente réticulaire. La substance vitreuse a aussi la faculté de former à sa surface des rainures, des pointes, des protubérances et d'autres inégalités, qui sont toujours plus développées au sommet du sphéride, et dont l'effet, comme celui des creux, est d'agrandir la surface en contact avec l'eau ambiante [5]).

C'est là un caractère que les sphérides ont en commun avec les radioles les plus développés, comme ceux des Échinides, d'être composés, dans leurs parties dures, de ces deux éléments distincts, d'une charpente intérieure, formée par le tissu réticulaire caractéristique du squelette tégumentaire de tous les Échinodermes, et d'une substance externe vitreuse stratifiée. Seulement, dans les radioles, cette dernière paraît être en quantité moindre, tandis que dans les sphérides, elle l'emporte sur le tissu réticulaire de manière à déterminer à elle seule la forme du globule. Dans les radioles, comme dans les sphérides, le tout est revêtu d'une couche à cellules pigmentées, d'un épithèle et d'une cuticule à cils vibratiles. Au point de vue histologique, on doit donc considérer ces organes comme formés essentiellement sur le même plan, comme des modifications d'un même type. Tous les deux s'articulent aussi sur des mamelons, et il existe même une forme particulière de radioles, celle dite en massue, qui est propre aux aires interradiales de certains Cidarides éteints, laquelle est rendue en petit par les sphérides. Mais sous d'autres rapports il existe entre eux de grandes différences.

Les sphérides appartiennent exclusivement aux ambulacres, et chez tous les genres qui en possèdent, ils ne font jamais défaut dans l'animal adulte sur la première ou sur les deux, trois ou quatre ou même cinq premières plaques péristomiennes, bien qu'ils varient beaucoup en nombre et qu'ils présentent des diversités considérables dans leur mode de disposition.

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[1]) Fig. 15: Meoma ventricosa (Lamk.); fig. 21, 25, 26: Spatangus purpureus O.F.M. [2]) Fig. 10: Brissopsis lyrifera (Forb.); fig. 11: Amblypneustes grisens (Blv.). [3]) Fig. 8: Maretia planulata (Lamk.); fig. 19: Echinocidaris nigra (Mol.). [4]) Fig. 3, 7: Echinocardium cordatum (Penn.); fig. 22, 24, 25: Spatangus purpureus O.F.M. [5]) Fig. 9: Maretia planulata (Lamk.); fig. 12: Loxechinus albus (Mol.); fig. 18: Echinocidaris nigra (Mol.); fig. 16: Brissus Scillæ Agass.

Chez les Spatanguides [1]), ils se trouvent le plus souvent à découvert, un, deux ou plusieurs réunis dans une petite fossette plus ou moins profonde, à la base des tentacules de l'aire buccale, en arrière de ceux-ci et vis-à-vis de la suture médiane de l'ambulacre, et en général d'autant plus éloignés des tentacules, qu'ils sont plus loin du péristome, surtout au bivium. Assez souvent, ils sont au nombre de deux sur les premières plaques, mais sur chacune de celles qui suivent il ne s'en trouve ordinairement qu'un seul. Le Brissus Scillæ AGASS. [2]), le Plagionotus pectoralis (LAMK.) [3]), le Schizaster fragilis (DUEBEN et KOREN), la Moïra atropos (LAMK.) [4]) se distinguent par une disposition particulière. Sur les trois, quatre ou cinq plaques du trivium, on voit les sphérides, par groupes de deux, de trois ou même davantage, placés dans des fossettes plus ou moins allongées, obliques ou même longitudinales, dont chacune, dans le Brissus et la Moïra, retient encore sa place près du pore tentaculaire, tandis que dans le Plagionotus elle s'en écarte de plus en plus. Dans le bivium de celui-ci, cet écartement va beaucoup plus loin, de manière que la fossette, allongée et étroite, contenant des sphérides nombreux placés comme une rangée de perles, s'est retirée presque à l'extrémité postérieure de la plaque. La Lovenia, enfin [5]), diffère de tous les autres Spatanguides en ce qu'elle n'a sur chaque plaque qu'un seul sphéride, enfermé dans une protubérance conique, dont le sommet est perforé d'une fente transversale.

Une telle mise à couvert, exceptionnelle chez les Spatanguides, est de règle chez les Cassidulides et les Clypéastrides. Le Cassidulus Caribæarum LAMK. et le C. Eugeniæ n. [6]) ont, dans l'état adulte, sur chaque plaque des cinq premières paires de chacun de leurs ambulacres un sphéride, lequel, placé à nu dans une petite fossette chez les très-jeunes individus, a été couvert peu à peu par une sorte de surcroissance de la couche superficielle du test, jusqu'à ce qu'il ne reste qu'une fente étroite pour ouverture, laquelle finit même, en quelques cas, par se fermer complétement.

Les Clypéastrides présentent deux types. L'Echinarachnius [7]), le Dendraster, le Scaphechinus, la Lobophora, la Mellita [8]), l'Encope [9]), la Rotula [10]), le Laganum [11]), et l'Echinocyamus n'ont dans chaque ambulacre qu'un sphéride unique, commun aux deux plaques péristomiennes, et caché plus ou moins complètement, même chez les individus les plus jeunes, dans une crypte formée dans l'épaisseur du test. Auprès du bord du péristome, qui est pourvu, au milieu de chaque ambulacre et au-dessus des deux pores des grands tentacules buccaux, d'une partie plus ou moins saillante, on observe en arrière de celle-ci une petite éminence légèrement bombée et plus ou moins apparente. Chez de très-jeunes individus on y voit le sphéride se dessiner par transparence [12]), et en perçant chez les adultes le test qui le recouvre, on le trouve avec son pédicule attaché du côté du péristome à la surface interne d'une cavité arrondie [13]), qui ne communique guère directement avec l'extérieur que par un canal très-étroit, et laquelle, dans l'Echina-

[1]) Pl. III, fig. 32: Brissopsis lyrifera (FORB.) très-jeune; fig. 33—36: Echinocardium flavescens (O.F.M.); fig. 39: Palæostoma mirabile (GRAY); fig. 38: Echinocardium cordatum (PENN.); fig. 40: Maretia planulata (LAMK.). [2]) Pl. IV, fig. 43. [3]) Pl. V, fig. 48, 49, 50. [4]) Fig. 42. [5]) Fig. 44, 45. [6]) Pl. VII, fig. 61—64, 66. [7]) Pl. VIII, fig. 72. [8]) Fig. 69. [9]) Fig. 68. [10]) Fig. 73. [11]) Fig. 70, 71. [12]) Fig. 69. [13]) Fig. 68, 71, 72.

rachnius parma, paraît être partagée en deux par une membrane verticale très-mince, prenant naissance aux bords des plaques joints dans la suture. Chez la Rotula, cette cavité est pourvue d'une ouverture plus large, mais en grande partie couverte de pointes saillant de son bord.[1]).

Le Clypéaster et l'Arachnoïdes diffèrent des autres genres de ce groupe en ce qu'ils ont deux sphérides dans chaque ambulacre, c'est-à-dire un dans chacune de ses deux plaques péristomiennes[2]). On ne leur voit pas de partie médiane saillante au-dessus des pores des deux grands tentacules, situés à fleur du test chez les Clypéasters, ou au commencement d'une surface faiblement inclinée vers la membrane buccale chez les Arachnoïdes. Rien ne trahit la présence des sphérides; à peine croit-on observer, dans les Clypéasters, qu'à une distance du pore tentaculaire, double à peu près de la distance de celui-ci au bord du péristome, les grands mamelons radiolaires laissent entre eux un interstice tant soit peu plus grand qu'ailleurs, mais non différent par la disposition des petits mamelons et des pores[3]). En perçant sur ce point la couche externe du test, dans chacune des deux plaques, on entre dans une petite cavité, renfermant un sphéride disposé comme chez les autres Clypéastrides. Dans le large sillon tout à fait uni, occupant chez l'Arachnoïdes le milieu de chaque ambulacre[4]), rien n'annonce la position des sphérides, mais guidé par cette observation dans les Clypéasters, on les trouve cachés de la même manière dans l'épaisseur du test.

L'Echinoneus a, auprès des pores tentaculaires, sur la première et sur la deuxième plaque, un sphéride globé, isolé, qui reste à découvert dans un léger enfoncement[5]). Sous ce rapport comme sous bien d'autres, il présente une certaine ressemblance avec les Échinides.

Chez la plupart de ceux-ci, les sphérides sont nombreux et disposés alternativement sur les deux rangées de plaques de l'ambulacre. L'Echinus Flemingi Forb., l'E. esculentus L., le Toxopneustes droebachensis (O.F.M.)[6]) le Loxechinus albus (Mol.) le Tripneustes ventricosus Ag., l'Echinometra Van Brunti Al. Ag.[7]), l'Amblypneustes griseus (Blv.) ont leurs sphérides, pour la plupart ellipsoïdaux, disposés auprès de la suture, de manière que leur axe longitudinal est dirigé en haut et presque parallèlement à la surface du test. Dans le Temnopleurus[8]), le Salmacis et la Mespilia, leur forme est sphéroïdale et ils sont placés à l'entrée des trous profonds situés dans les angles des plaques. Chez tous ces Échinides, la série des sphérides est séparée, des deux côtés, de celle des pores tentaculaires par les rangées des grands mamelons des radioles. Dans les Diadémiens, au contraire, et à juger d'après ce que l'on voit chez l'Astropyga venusta Verrill[9]), les sphérides sont placés auprès des pores tentaculaires, et la rangée des mamelons radiolaires les sépare de la suture. L'Echinocidaris, qui s'éloigne à tant de rapports[10]) des autres Échinides, en diffère aussi par ses sphérides, car dans chaque ambulacre il n'en possède qu'un seul, placé dans une niche arrondie creusée dans la suture, tout près du bord du péristome[11]).

[1]) Fig. 73. [2]) Fig. 74, 75, 76, 77, 78. [3]) Fig. 74, 75, 76. [4]) Fig. 77, 78. [5]) Pl. IX, fig. 79, 80. [6]) Pl. X, fig. 84, 85. [7]) Fig. 86, 87. [8]) Fig. 88. [9]) Fig. 89, 90. [10]) Voyez Ch. Desmoulins, sur les épines des Échinocidarites, Actes de la Soc. Linn. de Bordeaux, t. XXVII, 2:e livraison. [11]) Pl. X, fig. 91, 92.

La grandeur des sphérides n'est pas en rapport direct à celle de l'animal, ceux des petites espèces étant toujours relativement plus gros. Ainsi, des sphérides pris:

d'un	Echinus esculentus (L.)	de	140	mm.	ont	en moyenne	0,24	mm.	de	hauteur,	0,125	mm.	de	largeur;
»	Echinus Flemingi (Forb.)	»	105	»	»	»	»	0,24	»	»	»	0,18	»	»	»
»	Tripneustes ventricosus (Lamk.)	»	110	»	»	»	»	0,19	»	»	»	0,147	»	»	»
»	Loxechinus albus (Mol.)	»	87	»	»	»	»	0,32	»	»	»	0,15	»	»	»
»	Tripneustes sardicus (Leske)	»	60	»	»	»	»	0,18	»	»	»	0,16	»	»	»
»	Echinocidaris nigra (Mol.)	»	53	»	»	»	»	0,216	»	»	»	0,329	»	»	»
»	Salmacis bicolor (Ag.)	»	32	»	»	»	»	0,11	»	»	»	0,133	»	»	»
»	Temnopleurus toreumaticus (Leske)	»	15	»	»	»	»	0,1	»	»	»	0,125	»	»	»
»	Amblypneustes griseus (Blv.)	»	14	»	»	»	»	0,13	»	»	»	0,08	»	»	».

On voit que les sphérides d'un Echinus esculentus L. de grande taille et ayant un diamètre dix fois plus grand que celui d'un Amblypneustes, surpassent du double seulement ceux de ce dernier. De même, un Echinocyamus pusillus (O.F.M.) de 11 millimètres, a des sphérides de 0,09 mm. de hauteur et de 0,11 mm. de largeur, tandis que, dans un Clypeaster rosaceus (L.) douze fois plus grand, ou de 135 millimètres, ils n'ont qu'environ le double, savoir 0,17 mm. de hauteur et 0,225 mm. de largeur; de même encore, le plus grand des Spatanguides, la Meoma ventricosa (Lamk.), laquelle atteint plus de 160 millimètres de longueur, présente des sphérides de 0,26 mm. et de 0,22 mm. dans les mêmes dimensions, tandis que chez un individu de l'Echinocardium flavescens (O.F.M.), de 28 millimètres seulement, ils mesurent 0,15 mm. de hauteur, sur une largeur de 0,16 mm. En outre, ils varient légèrement dans le même individu.

Ces organes si petits, que leur mode d'apparition et de croissance ne permet pas de considérer comme des organes réduits à un état rudimentaire, dont la conformation si simple n'est nullement adaptée à la préhension, et qui sont si bien mis à l'abri des accidents, soit à la base des tentacules puissants et au milieu des radioles — la Brissopsis lyrifera a été vue abaissant au-dessus de ses sphérides les radioles les plus voisins —, soit dans des fossettes ou dans l'épaisseur même du test, ne peuvent être que des organes de sensation. C'est dans l'épithèle et dans la couche sous-jacente revêtant la substance vitreuse du sphéride, qu'on trouvera les éléments nerveux terminaux propres à la fonction spéciale qui lui devra être assignée. Chacun des cinq grands troncs nerveux qui naissent des angles du collier, et qui parcourent la face interne des ambulacres, le long de leur suture médiane [1]), fournit dans chaque plaque un ou deux nerfs, qui se dirigent chacun vers le pore tentaculaire correspondant. Conjointement avec le vaisseau aquifère du tentacule, le nerf s'y enfonce, pour reparaître sur la face externe au dehors de la couche calcaire du test. Sur ce trajet il doit fournir des filets nerveux au tentacule et au sphéride, bien qu'on ne soit pas parvenu à en démontrer l'existence. Mais, comme on peut le voir chez la Brissopsis lyrifera, et le plus distinctement sur la troisième plaque du bivium avoisinant le sternum et plus dépourvue de radioles que les autres, le nerf, en sortant du pore tentaculaire sur la face externe du test, se ramifie en un grand nombre de filets, lesquels, après avoir traversé la plaque diagonalement [2]), se distribuent aux aires interradiales en formant des entrelacements serrés et riches en cellules ganglionnaires [3]). On conçoit que, tous les rameaux

[1]) Pl. II, fig. 28, 29. [2]) Fig. 30. [3]) Fig. 31.

du tronc nerveux se divisant de cette manière, il y aura, répandu à la surface du corps, un système nerveux périphérique extrêmement développé, fournissant des nerfs aux radioles, aux pédicellaires, aux clavules des fascioles, et en général à toutes les parties externes. La figure donnée en représente une très-petite partie dessinée à un fort grossissement.

Si, après ces premières études sur des points d'organisation restés longtemps inaperçus par suite des difficultés qu'ils présentent à l'observation, on se demande quelle fonction spéciale il faut attribuer aux sphérides, on éprouve toute l'incertitude qui se présente quand il s'agit de se faire une idée claire des sensations chez des êtres tellement éloignés de nous dans l'échelle animale, et vivant dans des conditions d'existence si différentes de celles des animaux supérieurs. Guidé par des analogies histologiques et en quelques cas par des expériences presque concluantes, on est parvenu à reconnaître, dans la plupart des grands groupes d'animaux sans vertèbres, des organes destinés à la perception des sons, et les Echinodermes sont actuellement presque les seuls chez lesquels on en attend encore la découverte bien établie. Depuis longtemps, déjà, JOHANNES MÜLLER [1]) observa le premier, chez des Holothuries très-jeunes ou sur le point de sortir de l'état de nymphe, cinq paires de vésicules placées autour de leur cercle osseux, et renfermant des corpuscules tremblotants à la manière des otolithes. M. BAUR [2]), en confirmant cette découverte chez la Synapta digitata, démontra, dans l'animal adulte, la connexion des vésicules avec les cinq cordons nerveux principaux, auxquels il les trouva attachées par des pédicules très-courts. Mais, dans cet état, elles ne contenaient plus de corps solides, circonstance qui, d'après les observations récentes de M. CHARLES SEMPER [3]), en rend un peu douteuse la signification comme organes de l'ouïe. Cependant, si les sphérides des Echinoïdées, dont la position et les rapports avec le système nerveux correspondent à peu près à ceux assignés aux vésicules des Synaptes, se fussent présentés à l'observation pour la première fois dans l'état où ils se trouvent chez les Clypéasters, les Arachnoïdes, les Encopes [4]) etc., c'est-à-dire contenus dans des cavités du test, et séparés peut-être de leurs mamelons par suite du brisement de celui-ci, il n'aurait pas été étonnant qu'on les eût pris, au premier coup d'œil, pour des otolithes d'une grandeur exceptionnelle, reposant dans leurs otocystes, erreur qu'un examen un peu attentif aurait suffi à faire disparaître. L'otolithe, quand il est d'origine organique, est une concrétion amorphe ou cristallisée, se balançant sur les poils auditifs ou suspendue aux éléments terminaux du nerf sensitif; le sphéride, au contraire, composé des mêmes tissus que les radioles et le test, est attaché à celui-ci par une articulation mobile, qui lui permet de s'incliner d'un côté à l'autre et de se tourner quelque peu autour de son axe, apparemment à la volonté de l'animal. On ne peut pas non

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[1]) Ueber die Larven und die Metamorphose der Holothurien und Asterien, p. 10, pl. III, fig. 1—6, *d*. — Ueber die Larven und die Metamorphosen der Echinodermen. Vierte Abhandlung, p. 9, pl. I, fig. 8, *d*, pl. IX, fig. 1, 2, *d*. — Ueber den Bau der Echinodermen, p. 16.

[2]) Beiträge zur Naturgeschichte der Synapta digitata: Erste Abhandlung, p. 46, pl. I, fig. 5, *m*, pl. II fig. 6, *c*, pl. IV, fig. 16, *f*. Acta Academiæ Naturæ Curiosorum, XXXI.

[3]) Reisen in den Philippinen, I, Holothurien, p. 153, pl. XXXIX, fig. 1, *c'*. [4]) Pl. VIII, fig. 68, 72, 75, 76, 77.

plus comparer les sphérides aux poils auditifs eux-mêmes, ni aux différents organes interprétés ailleurs comme olfactifs.

Le sens du toucher a pour organes spéciaux les tentacules. C'est chez les Spatanguides que ces organes sont le plus développés et le plus diversifiés. La figure 1 donne l'aspect d'une Brissopsis lyrifera (FORB.) à l'état vivant, reposant au fond d'un vase de verre. Elle étend en haut un certain nombre des tentacules intra-fasciolaires de son ambulacre impair, terminés par un disque circulaire à bord régulièrement divisé en quinze lobes arrondis, dont chacun correspond à l'une des quinze lames calcaires à tissu réticulé, disposées en rayons autour de son centre. Dans les interstices de ces lames sont logés autant de corps opaques, qui ont toute l'apparence de glandes, dont la sécrétion, peut-être visqueuse, pourrait bien aider à la préhension. Les branchies des pétales pairs sont cachées par les radioles, de même que les tentacules simples et très-petits du bivium, tandis que ceux du trivium sont très-allongés. En bas, les tentacules buccaux et infra-anals sont en partie étendus. Ils sont couronnés d'un pinceau de cirrhes à baguette intérieure très-grêle, et dont l'extrémité renflée et arrondie est très-riche en cellules ganglionnaires multipolaires et armée de pointes ciliaires raides, non vibratiles. C'est avec ces organes sensibles que la Brissopsis sonde son terrain au fond de la mer, enfoncée jusqu'au sommet dans la vase, qu'elle fouille et qu'elle avale sans cesse.

La fonction du sens du tact général appartient à l'enveloppe entière du corps. Les radioles, distribués sur tout l'extérieur du corps, en sont des prolongations, qui ne servent que secondairement de moyens passifs de défense, et partiellement de supports, quoique atteignant presque, sur le sternum de certains Spatanguides, la signification d'organes de locomotion. Ils paraissent destinés principalement à agrandir l'étendue des tissus tégumentaires, de toute part traversés par des nerfs et en contact avec l'eau ambiante. Aussi les voit-on chez presque tous, sauf pour ce qui concerne les gros radioles des Cidarides, se maintenir exempts de corps étrangers, de parasites et de commensaux, à l'exception de quelques espèces tolérées.

Les sphérides, tout en étant d'une conformation assez semblable à celle des radioles, ne peuvent être considérés comme des organes du tact. Leur petitesse s'y oppose aussi bien que leur position constamment plus ou moins dérobée. Placés à découvert chez les Échinides, dont les grands radioles les environnent, et chez la plupart des Spatanguides, dont l'aire péristomienne plus ou moins concave les abrite, on les voit, dans la Lovenia, à l'aire péristomienne unie, et dans les Cassidulides et les Clypéastrides, à radioles courts, à tentacules faibles, et à surface inférieure plus ou moins aplatie, ou exposée d'autre manière aux accidents, cachés sous la couche externe du test et même retirés jusqu'au fond de cavités, où rien ne peut pénétrer sauf un courant minime passant par un canal très-étroit. Disposés, comme ils le sont d'une manière constante, aux approches de la bouche et le plus souvent à la base des grands tentacules buccaux, on est donc conduit à leur supposer la fonction de faire connaître la nature des substances que l'eau ambiante tient en solution, et de servir, de cette manière, à guider l'animal dans la recherche de sa nourriture. Ils méritent bien, avec tant d'autres points de l'organisation des Échinoïdées, d'être étudiés d'une manière approfondie.

Les sphérides font leur apparition un peu plus tard que les radioles et les pédicellaires. Chez les Spatanguides très-jeunes[1]), on n'en voit d'abord qu'un seul sur la première des plaques péristomiennes de l'ambulacre, puis un autre sur la deuxième plaque etc., le tout suivant l'ordre qui préside à la disposition des plaques des ambulacres dans toute la classe des Echinoïdées, et qui peut être exprimé par une formule commune à tous. Nous allons voir maintenant quel est cet ordre.

II.

DU SQUELETTE TÉGUMENTAIRE.

A. AMBULACRES.

Détermination de l'axe antério-postérieur du test. Asymétrie des ambulacres par rapport à cet axe. Mode de croissance et mouvements propres de leurs éléments. Ordre d'apparition des sphérides.

1. Échinoïdées édentées.

Une forme générale plus ou moins ovalaire, la position excentrique de la bouche et de l'ouverture anale, celle-ci sans exception située dans l'interradium impair, sont ce qui fait déterminer, au premier coup d'œil, l'axe antério-postérieur du corps chez les Collyritides, les Ananchytides, les Spatanguides, les Cassidulides et les Échinonéides. Le madréporite ne l'indique pas chez ces animaux comme chez les Échinides et les Cidarides. Dans toute la classe, cet organe cribleux, l'un des premiers formés dans l'Échinoïdée ébauchée à peine à l'intérieur de son pluteus, et au moyen duquel le système aquifère se trouve en communication réglée avec l'eau ambiante, reste toujours appliqué à un espace plus ou moint étendu des parties constituantes de l'appareil apical, qu'il ne quitte jamais comme le font les pores génitaux. Normalement, cet appareil est composé du disque central, des cinq pièces qui l'entourent et qui ont été nommées pièces génitales, et, dans les angles rentrants de celles-ci, des cinq pièces dites ocellaires. Le disque central et les pièces "génitales" sont occupées, de différentes manières, par le madréporite, les pièces ocellaires en sont toujours exemptes. Chez les Échinides et les Cidarides, dont le disque central est transformé plus ou moins complètement en membrane circumanale, c'est, sauf quelques exceptions très-rares, la pièce "génitale" droite antérieure qui seule en est pénétrée, et cela si régulièrement, que, dans les espèces éteintes aussi bien que dans celles des mers actuelles, cette pièce devient un vrai point de repère pour l'orientation du test. Il en est tout autrement des Échinoïdées édentées. Dans ce groupe, le madréporite a sa situation normale dans le disque central, dont il modifie la forme et la position, et en dehors duquel il s'étend, avec un certain ordre, à une ou plusieurs des pièces génitales. Mais c'est plus particulièrement chez les Spatanguides que l'ap-

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[1]) Pl. III, fig. 32: Brissopsis lyrifera (FORB.); fig. 33, 34, 35: Echinocardium flavescens (O. F. M.).

pareil apical présente, dans l'arrangement de ses différentes parties, des variations très-considérables, contrastant fortement avec sa fixité dans les Échinides et les Cidarides, et dépendant de la disposition comme du plus ou moins d'extension du madréporite.

Des pièces génitales, au nombre normal de cinq, les **Spatanguides** n'en possèdent que quatre. C'est la postérieure qui fait défaut, c'est-à-dire celle qui devrait se trouver placée au sommet de l'aire interradiale postérieure impaire. Elle n'a pas été développée, non plus que la glande reproductrice correspondante, dont le conduit excréteur aurait sans cela dû prendre son issue à travers cette pièce, comme le font le plus souvent, dans les quatre pièces génitales restées intactes, ceux des autres glandes reproductrices. Or, chez tous les Spatanguides connus de l'époque actuelle, à l'exception d'un seul genre, l'interstice ainsi laissé libre entre les deux pièces génitales paires latérales, est rempli par le disque central criblé du madréporite, porté plus ou moins en arrière et étendu sur un espace souvent considérable, mais toujours contigu aux dernières plaques de l'aire interradiale impaire, et séparant entre elles tant les pièces ocellaires du bivium que les pièces génitales latérales [1]. Nulle suture n'indique une limite entre la pièce génitale droite antérieure et le disque portant le madréporite; et lorsque celui-ci s'étend davantage, c'est cette même pièce qui en est occupée la première, chez quelques espèces en moindre partie, comme chez la Brissopsis lyrifera (Forb.), ou la Meoma ventricosa (Lamk.), chez d'autres en partie plus considérable, chez d'autres encore, comme chez le Schizaster fragilis (Düb. et Kor.), si complètement que le pore génital y manque forcément, et avec celui-ci la glande reproductrice de l'aire interradiale droite antérieure. Quand l'organe cribleux s'agrandit encore davantage, c'est la pièce génitale gauche antérieure, quoique limitée du côté du disque central par une suture, qui en est envahie de manière que son pore génital et la glande reproductrice disparaissent de même, et qu'il ne reste en tout que deux pores génitaux, ceux des pièces génitales latérales, comme dans l'Abatus Philippii n., le Palæostoma mirabile (Gray) et le Palæotropus Josephinæ n. Cette disposition, moyennant laquelle le madréporite, allongé en arrière, sépare l'une de l'autre les pièces génitales latérales et les pièces ocellaires du bivium, commence à se montrer dans le Prénaster, le Macropneustes, qui ont fait leur première apparition dans les derniers étages de la formation crétacée, mais qui ont atteint leur entier développement pendant la période éocène; elle devient prédominante chez les genres caractéristiques de cette dernière période, pour la plupart encore vivants, et elle est, à une seule exception près, de règle chez ceux connus des mers actuelles. Les types génériques, au contraire, qui appartenaient particulièrement à la formation crétacée ou jurassique, et qui y arrivaient à leur plus haut degré de développement, comme les genres Collyrites, Ananchytes, Holaster, Hemipneustes, Cardiaster, Toxaster, Epiaster, Micraster, Hemiaster, offrent toujours et sans exception une autre disposition des pièces apicales et du madréporite, en ce que celui-ci n'atteint jamais l'interradium postérieur, en étant séparé par les pièces ocellaires du bivium, lesquelles, contiguës des deux côtés, se tou-

[1]) Pl. XI, fig. 99: Abatus Philippii n.; Pl. XII, fig. 100, 101: Brissopsis lyrifera (Forbes); fig. 102: Schizaster fragilis (Düben et Koren); fig. 103, 104: Palæostoma mirabile (Gray); fig. 105: Palæotropus Josephinæ n.; fig. 106: Meoma ventricosa (Lamk.).

chent entre elles, ce que font aussi, chez la plupart, les pièces génitales latérales et même les pièces ocellaires latérales [1]). Parmi les Spatanguides des mers actuelles jusqu'ici connus, un seul présente ce caractère antique. C'est une espèce du genre Hemiaster Desor, jusqu'ici considéré comme éteint pendant la période miocène, et qui paraît avoir eu son maximum de développement dans la période crétacée, mais qui fut retrouvé vivant par MM. Smitt et Ljungman, naturalistes de l'expédition de la corvette suédoise la Joséphine en 1869 [2]). C'est le

***Hemiaster expergitus* n.**

Test court et arrondi, de 14 millimètres de longueur, 13 mm. de largeur et 10 mm. de hauteur à la partie postérieure. Périproctium placé très-haut. Fasciole unique péripétale assez large, formant un tour ovalaire. Pétales courts et larges; ceux du bivium de moitié plus courts que ceux du trivium. Ambulacres très-fortement rétrécis en passant sous la fasciole. Test fragile et très-mince. — Individu jeune, dont les quatre pores génitaux sont à peine indiqués à la face intérieure des pièces que perceront plus tard les conduits des glandes reproductrices, et dont les pores madréporitiques sont encore peu nombreux, mais dont le péristome a pris son contour réniforme, à lèvre déjà proéminente.

Dragué dans l'Atlantique, à 38° 7′ de lat. nord, 9° 18′ de long. ouest, et à une profondeur de 970 mètres; fond vaseux.

Par ces caractères, quoique nullement par l'habitus général, on croirait peut-être tout aussi bien avoir sous les yeux une espèce du genre Abatus Troschel. Mais ce qui en éloigne complètement ce Spatanguide et détermine sa place dans le genre Hemiaster, c'est la conformation de son appareil apical [3]). Le disque central avec le madréporite et la pièce génitale antérieure droite, fondus ensemble en une seule pièce, comme toujours plus grande que les autres, sont portés en avant et séparés de l'aire interradiale impaire tant par les pièces ocellaires du bivium que par les pièces génitales latérales.

Il y a donc, dans la structure de l'appareil apical des Spatanguides, deux types, l'un ancien, dont cet Hemiaster paraît être le seul exemple connu vivant, l'autre récent, qui commence à se faire valoir pendant la période tertiaire et qui domine aujourd'hui. Dans tous les deux, cependant, quelles que soient la forme, la grandeur et la position du disque central, la pièce génitale droite antérieure n'en est jamais séparée par une suture comme le sont les autres pièces génitales. Il en est de même chez toutes les formes dites irrégulières, les Clypéastrides exceptés; et c'est par suite de cette combinaison constante, que la pièce génitale droite antérieure indique, médiatement, l'axe antério-postérieur du test.

Si l'on place un Spatanguide, d'une espèce quelconque, très-jeune ou adulte, la bouche en haut et l'aire interradiale impaire en arrière, et que, faisant le tour du péristome, on compte les dix plaques péristomiennes des ambulacres en commençant par la gauche du bivium, de gauche à droite, (c'est-à-dire du côté droit de l'animal au côté gauche); si, en même temps, dans chacun des ambulacres I, II, III, IV, V, l'on désigne par *a* la plaque rencontrée d'abord, par *b* la deuxième, etc., on trouvera que

[1]) Pl. XI, fig. 95: Micraster cor anguinum Lamk.; fig. 96: Holaster suborbicularis Defr.; fig. 97: Ananchytes sulcata Goldf.; fig. 98: Collyrites elliptica (Lamk.).

[2]) Pl. XIII, fig. 114—120; pl. XI, fig. 93, 94; pl. V, fig. 46, 47. [3]) Pl. XI, fig. 93, 94.

les plaques I *a*, II *a*, III *b*, IV *a*, V *b*, sont plus grandes et pourvues de deux pores, c'est-à-dire de deux tentacules, tandis que les I *b*, II *b*, III *a*, IV *b*, V *a*, sont plus petites et munies d'un seul pore, d'un seul tentacule. De même, quand on examine, chez la Brissopsis lyrifera (FORBES), la distribution des nerfs et des vaisseaux aquifères [1]), on voit que les plaques péristomiennes bipores I *a*, II *a*, III *b*, IV *a*, V *b*, reçoivent dans chacun de leurs pores une branche du grand tronc nerveux et un vaisseau aquifère. En admettant, comme on en a bien le droit, que primitivement chaque plaque ambulacraire n'ait qu'un seul tentacule et qu'un seul pore, les plaques de la première série, I *a*, II *a*, III *b*, IV *a*, V *b*, bien qu'aucune suture ne puisse être distinguée, sont, par conséquent, composées, binaires, tandis que celles de la deuxième, I *b*, II *b*, III *a*, IV *b*, V *a*, sont simples, primaires, comme le sont toutes les autres plaques de l'ambulacre. En examinant la série des figures données [2]), on se sent persuadé que cette disposition asymétrique des plaques péristomiennes des ambulacres se maintient partout avec une parfaite régularité [3]).

Tandis que, chez les Échinoïdées à dents, le péristome, étroitement combiné comme il l'est avec leur appareil de mastication, retient, dans tous les âges, sa forme primitive subcirculaire ou subdécagone, il en est tout autrement chez les Échinoïdées édentées. Dans les groupes des Spatanguides et des Cassidulides, il est facile de constater par l'observation directe qu'il change considérablement de forme pendant la croissance, et des recherches ultérieures feront probablement voir qu'il en est de même chez les Échinonéides. Un Spatanguide très-jeune [4]), d'une longueur de quelques millimètres seulement, notablement plus arrondi que l'adulte de la même espèce, et ayant la bouche un peu plus rapprochée du centre, a le péristome pentagone et d'une si grande régularité, qu'il est permis de supposer qu'à un âge encore plus jeune, il aura été parfaitement équilatère. Ses côtés, uniformément enfoncés, se trouvent tous dans le même plan. A cette forme du péristome correspondent aussi, quant à leur grandeur relative, les parties qui y sont occupées par les ambulacres et les aires interradiales. Les premiers n'y entrent que pour une partie peu considérable en embrassant les angles du pentagone, tandis que les dernières, bien plus larges et presque toutes de la même largeur, forment la plus grande partie de ses côtés. La bouche se trouve encore presque au centre de la membrane buccale. Mais des changements considérables s'introduisent bientôt [5]). Les plaques ambulacraires s'élargissent, surtout celles du trivium,

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[1]) Pl. II, fig. 28.

[2]) Pl. III, fig. 32: Brissopsis lyrifera (FORB.) trés jeune; fig. 33, 34, 35: Echinocardium flavescens O. F. M., très-jeune, moins jeune, à peine adulte; fig. 39: Palæostoma mirabile (GRAY); pl. IV, fig. 41: Faorina chinensis GRAY; fig. 42: Moira atropos (LAMK.); fig. 43: Brissus Scillæ AGASS.; pl. V, fig. 46, 47: Hemiaster expergitus n. très-jeune et à peine adulte; fig. 48: Plagionotus pectoralis (LAMK.); fig. 51: Ananchytes sulcata GOLDF.; fig. 54: Holaster suborbicularis DEFR.; pl. VI, fig. 55: Collyrites elliptica (LAMK.); fig. 58, 59 C. acuta: DES.; fig. 60: C. dorsalis AGASS., et la suite des planches XXIII—XLIII.

[3]) C'est grâce à la grande libéralité de M. G. COTTEAU, le savant paléontologiste des Échinoïdées, que les planches annexées à cet ouvrage présentent des détails importants sur les Collyritides, les Ananchytides, les Échinoconides. Qu'il me soit permis de lui exprimer ici ma reconnaissance sincère et bien légitime pour cette assistance bienveillante, sans laquelle mes recherches seraient restées incomplètes sous plus d'un rapport.

[4]) Pl. III, fig. 32: Brissopsis lyrifera (FORB.); fig. 33: Echinocardium flavescens (O. F. M.); Pl. V, fig. 46, Hemiaster expergitus n.

[5]) Fig. 34, 35: Echinocardium flavescens (O. F. M.).

tandis que, comme c'est surtout le cas chez la paire postérieure, les plaques appartenant aux aires interradiales paires n'augmentent pas en largeur dans la même proportion, et que le labrum, c'est-à-dire la plaque péristomienne de l'aire interradiale impaire, s'étend en largeur, en avançant son bord libre en saillie, et se voûte. En même temps, la bouche, successivement allongée, se retire peu à peu, de manière que la plus grande partie de la membrane buccale, couverte de pièces calcaires, se trouve placée devant, et que finalement la première est cachée par la lèvre proéminente. L'individu ayant atteint l'âge adulte, les plaques ambulacraires péristomiennes du trivium sont devenues plus larges que celles des aires interradiales, et, dans quelques cas, cet accroissement des ambulacres aux dépens des dernières est tel, que, dans la Faorina chinensis GRAY[1]), la Moira atropos (LAMK.)[2]) et le Micraster cor anguinum AGASSIZ[3]), les aires interradiales de la paire 1 et 4 sont totalement exclues du péristome, et que dans la Breynia Australasiæ GRAY[4]), il en est de même de toutes les quatre aires interradiales, les 1 et 4, 2 et 3. Ce sont surtout les ambulacres pairs du trivium, les II et IV, dont les plaques péristomiennes, plus longues que larges et presque cunéiformes chez les plus jeunes, se retrouvent chez les adultes presque aussi larges que longues et tellement déprimées, que, tandis que dans de petits individus de la Brissopsis lyrifera (FORB.)[5]) de 4,6 mm. de longueur, le bord antérieur des plaques interradiales péristomiennes 1 et 4 correspond à peu près aux deux premières plaques des ambulacres II et IV, il en occupe trois chez les adultes[6]). Un mouvement se produit donc ici chez les éléments des ambulacres pairs, dans la direction du péristome. Il n'est guère moins considérable dans l'ambulacre impair. Dans le bivium il en est autrement. Là, les deux plaques du péristome sont comprimées, mais les plaques suivantes conservent encore dans les adultes leur forme allongée. Un fait tout spécial s'y rattache.

La plupart des genres vivants des Spatanguides sont des Prymnodesmiens[7]), c'est-à-dire qu'ils sont pourvus d'une fasciole infra-anale formant au-dessous du périproctium un anneau ovalaire, au dedans duquel, comme l'a observé le premier JOHANNES MÜLLER chez la Brissopsis lyrifera (FORB.), se présentent de longs tentacules à cirrhes, dont les pores se trouvent aussi renfermés dans son enceinte. Le fait est que, chez tous les genres munis de fasciole infra-anale[8]), dans les deux rangées internes du bivium, la sixième plaque et les suivantes: deux chez le Palæotropus[9]), le Spatangus[10]) et la Meoma[11]), qui n'a qu'une fasciole imparfaite; trois chez la Maretia[12]), l'Echinocardium[13]), la Lovenia[14]), la Brissopsis[15]) et l'Eupatagus; quatre chez le Micraster, le Brissus[16]), la Kleinia[17]), le Plagionotus[18]) et le Xanthobrissus, et jusqu'à six dans la Breynia[19]), ont une forme différente des autres, étant étendues vers la ligne médiane du test, et formant ensemble un coin allongé. Dans la septième plaque et les suivantes, le pore tentaculaire est aussi transposé de façon à se trouver au dedans de la fasciole. Il est encore de règle, parmi tous ces genres, que les six premières plaques des rangées intérieures du bivium correspondent aux bords extérieurs

[1]) Pl. IV, fig. 41. [2]) Fig. 42. [3]) Pl. XXXIII, fig. 201. [4]) Pl. XLI, fig. 228. [5]) Pl. XXXVII, fig. 218. [6]) Fig. 213. [7]) Prymnodesmii, de *Πρύμνα*, Poupe, et *Δέσμιος*, Lié. [8]) Pl. XXXII, fig. 200 — Pl. XLIII. [9]) Pl. XXXII, fig. 200. [10]) Pl. XXXVI, fig. 208. [11]) Pl. XXXV, fig. 205. [12]) Pl. XLII, fig. 229. [13]) Pl. XXXVIII, fig. 219. [14]) Pl. XLIII, fig. 232. [15]) Pl. XXXVII, fig. 213, 218. [16]) Pl. XXXIV, fig. 202. [17]) Pl. XXXIX, fig. 224. [18]) Pl. XL, fig. 227. [19]) Pl. XLI, fig. 228.

du labrum, du sternum et de l'épisternum, c'est-à-dire aux trois parties ventrales de l'interradium impair, et que la paire de plaques composant l'épisternum forme, des deux côtés, avec la plus voisine des plaques abdominales, un angle, l'angle épisternal, qui embrasse ce coin de plaques allongées, et qui est plus ou moins profond, plus ou moins ouvert chez les différents genres. Une Brissopsis lyrifera (FORB.) de 4,6 mm. de longueur[1]) offre sous ces rapports les mêmes proportions que les individus adultes[2]). Dans tous les deux, la cinquième plaque ambulacraire est celle qui correspond à l'angle peu marqué entre le sternum et l'épisternum, et la sixième jusqu'à la neuvième inclusivement, sont embrassées par l'angle épisternal; d'où il suit évidemment que, dans cette partie du bivium, il n'y a pas eu, pendant la croissance, de transposition de ces plaques dans la direction du péristome; on voit plutôt ici que les plaques ambulacraires, à l'exception de celles du péristome, s'allongent un peu avec l'âge.

Chez les genres dépourvus de fasciole infra-anale, les Prymnadètes[3]), comme l'Hemiaster[4]), la Faorina[5]), la Desoria[6]), l'Abatus[7]), l'Agassizia[8]), le Schizaster[9]), les plaques correspondantes à l'angle épisternal, — à peine perceptible et variant parfois avec le côté, — ne sont que faiblement ou presque point allongées dans la direction de la ligne médiane du test; elles ont à peu près la même forme que les précédentes, et le nombre des plaques du bivium qui occupent la même longueur que les trois parties ventrales de l'interradium impair, prises ensemble, se trouve variable. Chez le Schizaster fragilis (D.et K.) elles sont au nombre de sept, chez la Faorina chinensis GRAY de six, chez l'Abatus Philippii n. de sept et demie du côté gauche, six et demie du côté droit, chez la Desoria australis GRAY de huit et demie, chez l'Agassizia scrobiculata VAL. de six et demie. Cette irrégularité est plus considérable encore chez le Palæostoma mirabile (GRAY)[10]), du moins chez les jeunes individus. Dans tout ce groupe de Spatanguides Prymnadètes, la disposition des plaques est beaucoup moins rigoureuse et moins symétrique que chez les Prymnodesmiens. Ceux-ci dominent parmi les Spatanguides des mers actuelles, et il paraît qu'il n'en existait qu'un seul genre, celui des Micrasters[11]), parmi les Spatanguides de la période crétacée, dont les autres genres étaient ou dépourvus de fascioles, des Adètes, ou des Prymnadètes, n'en ayant que de péripétales ou de composées, et présentant en même temps un ordre de plaques moins régulier. Cette irrégularité se manifeste non-seulement dans les ambulacres, mais encore et tout autant dans les aires interradiales, comme cela ressortira de l'examen que nous aurons à consacrer à cette partie du squelette.

La plupart des Spatanguides des mers actuelles offrent cette particularité d'avoir leurs quatre ambulacres pairs presque conformes, et développés, dans leurs parties supérieures, en pétales, formés, pour la réception des tentacules branchiaux, des plaques nouvelles successivement ajoutées à l'ambulacre, fortement déprimées et élargies. Leur ambulacre impair, au contraire, semblable aux autres dans sa partie péristomienne, en diffère dans le reste de son extension, étant toujours plus étroit et ayant ses plaques frontales et dorsales, lesquelles ne manquent de pores dans aucune

[1]) Pl. XXXVII, fig. 218. [2]) Pl. XXXVII, fig. 213. [3]) Prymnadeti, de Πρύμνα, Poupe, et Ἄδετος, Non lié. [4]) Pl. XXVI, fig. 185. [5]) Pl. XXVII, fig. 186. [6]) Pl. XXVIII, fig. 187. [7]) Pl. XXIX, fig. 188. [8]) Pl. XXX, fig. 191. [9]) Pl. XXXI, fig. 194. [10]) Pl. XXXII, fig. 197. [11]) Pl. XXXIII, fig. 201.

espèce, peu déprimées, si ce n'est dans l'Échinocardium[1]), où l'on y voit une alternance de demi-plaques et de plaques entières qui ne se rencontre pas ailleurs. Cette diversité si marquée entre les ambulacres pairs et l'ambulacre impair est même considérée, avec raison, comme un caractère essentiel des Spatanguides. Il y a cependant au moins deux genres qui y font exception. L'un d'eux est l'Homolampas fragilis AL. AGASS.[2]), draguée à la profondeur de 650 mètres entre l'île de Cuba et la Floride, l'autre[3]) est encore une des découvertes faites par MM. SMITT et LJUNGMAN pendant l'expédition de la Joséphine en 1869. La ressemblance qu'au premier aspect ce Spatanguide offre d'en haut avec certaines formes de l'Ananchytes ovata LAMK., lui a fait donner le nom de Palæotropus[4]); l'espèce sera appelée.

Palæotropus Josephinæ n.

Test à contour ovoïde, uniformément bombé en dessus, médiocrement convexe en dessous, un peu aplati en arrière. Tous les cinq ambulacres à fleur de test, sans le moindre enfoncement, conformes dans leurs parties supérieures, entièrement apétales, les cinq ou six dernières plaques petites, presque aussi longues que larges, formant une seule rangée simple et étroite à pores alternants; les ambulacres du trivium II, III et IV parfaitement correspondants, lancéolés, médiocrement larges, l'ambulacre III un peu plus étroit que les autres; les plaques internes 6, 7, 8 du bivium très-allongées, les 7 et 8 à pores transposés, toutes les trois reçues dans un angle épisternal assez profond. Fasciole unique infra-anale subcirculaire. Aires interradiales paires 1 et 4, 2 et 3, assez conformes; labre court, sternum de grandeur médiocre, épisternum subtriangulaire. Périprocte postérieur ovalaire, compris entre les cinq premières plaques abdominales. Appareil apical presque pentagone, le disque central et les pièces génitales non distinctes; le madréporite indiqué par une petite fissure et quelques petits pores près de la place de la pièce génitale droite antérieure; deux apertures génitales tubiformes, correspondant aux aires interradiales 1 et 4; pièces ocellaires distinctes, ovalaires.

Longueur de l'individu jeune décrit: 11,7 mm.; largeur: 9,1 mm.

Habite la mer des Açores à la hauteur de Villa Franca, à une profondeur de 500 mètres.

Le labre et l'appareil sternal parfaitement développés, la fasciole embrassant de son enceinte des pores ambulacraires transposés, font de ce genre un vrai Spatanguide apétale des mers actuelles, auquel la conformité générale de ses ambulacres à fleur de test, prête cet air ancien que l'on rencontre, à ce qu'il paraît, chez plus d'un des Échinodermes ou des Mollusques habitant les grandes profondeurs de l'Océan.

La disposition asymétrique des plaques péristomiennes des ambulacres se retrouve exactement la même chez les **Cassidulides.** Un très-jeune Cassidulus caribæarum (LAMK.)[5]), comparé à un Cassidulus pacificus AL. AGASS. adulte[6]), fait voir que les premières plaques de la série I*a*, II*a*, III*b*, IV*a*, V*b* sont partout plus grandes et munies de deux pores tentaculaires, dont l'un est placé près de l'angle externe de la plaque, tandis que celles de la série I*b*, II*b*, III*a*, IV*b*, V*a* sont plus petites et ne possèdent qu'un seul pore. Chez eux aussi, le péristome subit avec l'âge des changements de forme considérables. Le Cassidulus caribæarum LAMK., encore très-jeune, présente un péristome pentagonal à angles arrondis, dont le bord est occupé par les ambulacres en plus grande partie que par les aires interradiales, à l'exception du

[1]) Pl. XII, fig. 107. [2]) Revision of the Echini, I, p. 137, II, p. 347, t. XVII, fig. 13—21, = Lissonotus fragilis AL. AGASS., Bull. M. C. Z. N:o 9, I, p. 273. [3]) Pl. XIII, fig. 108—113; Pl. XII, fig. 105; Pl. XXXII, fig. 200. [4]) Παλαιότροπος, de l'ancien type. [5]) Pl. VII, fig. 61. [6]) Fig. 67.

labre. C'est exactement l'inverse chez les adultes, car, pendant la croissance, les plaques péristomiennes interradiaires, surtout les 2 et 3, se gonflent en donnant au péristome les côtés arqués vers le dedans qui caractérisent ce groupe, et entre lesquels, dans les angles du péristome, sont enfermées les premières plaques cunéiformes et comprimées des ambulacres. Mais l'ouverture buccale, peu à peu allongée transversalement, reste au milieu de sa membrane unie. Cette transformation du péristome est combinée avec des compressions et des déplacements des plaques primaires, et avec ces changements considérables entre elles, qui ont pour résultat la disposition que M. Desor a désignée du nom de phyllode. Il reste encore à en trouver la loi par l'examen des phases de son progrès dans des individus d'âge différent.

La même règle se remarque, si l'on place un **Échinonéus** dans la position déjà désignée pour les Spatanguides, et si l'on compte de la même manière[1]). Les plaques péristomiennes de la série I*a*, II*a*, III*b*, IV*a*, V*b* sont plus grandes et binaires, ayant deux pores, c'est-à-dire qu'elles consistent en deux plaques primaires de bonne heure confondues en une seule, tandis que celles de la série I*b*, II*b*, III*a*, IV*b*, V*a*, simples et plus petites, n'en possèdent qu'un seul. Des deux pores des I*a*...V*b*, le premier est marginal et rendu incomplet, ayant de plus son canal supérieur souvent rempli. C'est là un caractère que l'on rencontre très-généralement chez les Échinides, avec lequels les Échinonéides ont sous d'autres rapports aussi une certaine ressemblance. Ainsi, tous leurs pores sont des pores géminés, et surmontés, depuis le péristome jusqu'à l'apex, de tentacules cylindriques munis d'un disque terminal faisant service de ventouse, pourvu intérieurement d'une lame circulaire à tissu calcaire réticulé. Les cinq ambulacres sont tous semblables et ont leurs éléments disposés d'une manière conforme. Les plaques qui les composent, toutes primaires, à l'exception de la première binaire de la série I*a*...V*b*, unipores et distinctes, sont de deux sortes. Les unes, que nous appellerons entières, s'étendent depuis le bord contigu à l'aire interradiale jusqu'au milieu de l'ambulacre, où elles se rencontrent des deux côtés pour former, en alternant, la suture médiane en zig-zag. Les autres, que l'on peut désigner comme des demi-plaques, sont plus ou moins cunéiformes, et aboutissent en pointe plus ou moins aiguë avant d'atteindre la suture médiane. Or, chez l'Échinonéus, ces deux sortes de plaques sont disposées de façon à former des triades alternantes, dont chacune se compose essentiellement d'une demi-plaque comprise entre deux plaques entières, desquelles l'adorale, plus grande que l'aborale, s'élargit considérablement vers la suture. Mais cet ordre, maintenu dans la plus grande partie de l'ambulacre, ne l'est pas tout à fait près du péristome et vers son extrémité opposée. Dans la série I*a*...V*b*, la plaque péristomienne binaire $1 + 2$ est suivie d'une plaque à part, simple et entière, et ce n'est qu'après celle-ci que commence la longue rangée des triades, parmi lesquelles, dans les I*a* et V*b* du bivium, les deux premières diffèrent des suivantes en ce que leurs trois plaques sont entières, la médiane atteignant la suture. Dans la

[1]) Pl. IX, fig. 80: Echinoneus cyclostomus Lamk., vu de l'extérieur. Fig. 81: partie péristomienne, V, d'un autre individu, où l'on a cru entrevoir une suture transversale partageant en deux la plaque *b*. Fig. 82: la même, le péristome vu de l'intérieur. Fig. 83: Echinoneus semilunaris (Gm.), vu de l'intérieur.

série I*b* . . . V*a*, au contraire, la plaque 1, simple, est immédiatement suivie par la première triade, laquelle, cependant, dans tous les ambulacres, a cela de particulier que sa plaque médiane, seulement quelque peu plus petite que les deux autres, est restée entière et n'a pas été réduite en demi-plaque. Viennent ensuite, dans les deux rangées, les triades régulières. Dans chacune de celles-ci, l'adorale et l'aborale, embrassant la demi-plaque médiane, se touchent l'une l'autre par une grande partie de leurs bords, et l'adorale, la plus grande des deux, ne l'emporte toutefois que légèrement à cet égard. Mais, vers le milieu de l'ambulacre, cette relation de grandeur va changer. La plaque aborale devient de plus en plus déprimée et raccourcie, elle diminue en largeur, son extrémité intérieure se retire de la suture médiane, et bientôt elle est tellement réduite qu'elle ne dépasse que faiblement la petite demi-plaque médiane. C'est là une disposition des éléments ambulacraires qui annonce, quoique de loin, un rapprochement vers les Échinoïdées à dents, chez lesquelles elle est très-développée. D'un autre côté, des différences assez considérables se font sentir dans le péristome, tordu dans la direction des aires interradiales 2 et 4, dans la forme du test, allongé dans le sens de l'axe antério-postérieur, dans la membrane buccale dépourvue de plaques libres à pores tentaculaires, et dans d'autres points encore d'une importance primaire.

Telle est l'asymétrie constante du péristome ambulacraire chez les Échinoïdées édentées. C'est dans le trivium qu'elle se manifeste. Des six plaques qui le composent, le côté droit en a deux simples et une binaire, et le côté gauche deux binaires et une simple. Le bivium reste symétrique des deux côtés de l'aire interradiale impaire.

2. Échinoidées à dents.

L'existence d'un appareil masticatoire puissant et très-compliqué, pourvu de cinq pièces d'appui, dites auricules, dont les bases élargies sont fixées par soudure à la face interne des plaques péristomiennes et sub-péristomiennes du test, soit ambulacrales soit interradiales; la position toujours centrale de la bouche; la forme invariablement subcirculaire ou subdécagone du péristome, restant la même dans tous les âges et pourvue d'entailles régulières pour la réception des branchies; le développement égal de tous les ambulacres; la disposition des mamelons du test en séries plus ou moins distinctes: — tels sont les caractères essentiels des Échinides, caractères qui, retrouvés chez les **Échinoconides**,[1]), les rapprochent des premiers dans la grande division des Échinoïdées à dents. D'un autre côté, le caractère tiré de la place occupée par l'ouverture anale, si variable dans toute la classe, pratiquée comme elle l'est en effet sur tous les points de l'aire interradiale impaire, 5, depuis les approches du péristome jusqu'à l'appareil apical, dont elle force, pour ainsi dire, en beaucoup de cas, l'enceinte pour s'établir dans cet appareil, ne peut servir, à l'exclusion de tant d'autres, comme base d'une première division. Par suite, le groupement des Échinoïdées en irrégulières et en régulières, en exocycliques et en endocycliques, ne doit pas être considéré indiquer leurs vrais rapports de conformation, utile comme il l'est certainement d'un autre côté, quand il s'agit de saisir certains traits accessoires de ressemblance.

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[1]) Pl. XIV, fig. 124—129.

Ainsi, l'analyse des ambulacres d'un Holectypus [1]) et d'une Discoïdea [2]), montre combien ces genres ont encore de rapports avec l'Échinonéus. Dans la série I*a* . . . V*b*, la plaque péristomienne, laquelle est simple, est suivie d'une plaque à part, entière, après laquelle commencent les triades, et, dans la première de celles-ci, dans le bivium et dans l'un ou l'autre des ambulacres du trivium, la plaque médiane est encore entière et non une demi-plaque. Dans la série I*b* . . . V*a*, la plaque péristomienne est suivie immédiatement de la première triade, laquelle diffère partout de la même manière. Dans le genre Échinoconus [3]), le même fait a lieu, avec cette exception que la péristomienne des I*a* . . . V*b* est bipore et binaire comme dans l'Échinonéus; de plus, tandis que dans celui-ci, comme chez l'Holectypus et la Discoidea, les pores restent plus ou moins près des bords externes de leurs plaques, de manière à former une rangée simple, chez l'Échinoconus ils sont disposés en arcs, dont chacun appartient à une triade. C'est là un caractère qui se trouve très-développé chez les Échinides. Il est très-évident dans la partie inférieure des ambulacres de l'Echinoconus conicus Breyn, dont l'état de conservation ne permet que rarement de tracer les plaques. On y compte les pores, de bas en haut: dans la série I*a* . . . V*b*, par 1, 2, 3, 3, 3, etc., et dans la série I*b* . . . V*a*, par 0, 2, 2, 3, 3, etc.

Or, c'est chez les **Échinides** que ces déplacements des pores sont portés au plus haut degré, et c'est chez eux qu'il en faut étudier les causes et le progrès.

Les Echinides et les Cidarides ont l'ouverture anale placée verticalement vis-à-vis de la bouche dans l'espace compris entre les bases des plaques génitales et ocellaires, et la couronne, qui n'en est nullement atteinte, se développe d'une manière uniforme dans ses ambulacres et ses aires interradiales. La forme rayonnée et apparemment régulière est troublée dès l'origine par l'appareil aquifère, dont la partie cribleuse, le madréporite, perce une des plaques dites génitales. Guidé par l'analogie des Spatanguides crétacés, on est convenu de considérer ici aussi cette plaque, contenant le madréporite, comme la droite antérieure, et, par conséquent, de regarder comme l'axe antério-postérieur idéal du corps, celui qui passe par l'ambulacre impair ainsi indiqué. C'est là sans doute la seule orientation vraie d'un Échinide ou d'un Cidaride. Elle trouve sa constatation dans le fait que c'est uniquement par une telle détermination du côté droit et du côté gauche, que la même formule, qui existe pour les plaques ambulacraires du péristome chez les Echinoïdées édentées, reparaît identique chez toutes les Echinoïdées munies de dents. Pour s'en convaincre il faut étudier des individus très-jeunes, chez lesquels on peut encore distinguer les plaques primaires.

Si l'on place un jeune Toxopneustes drœbachensis, de 3 à 6 millimètres de diamètre, la bouche en haut et l'ambulacre impair ainsi défini en avant, et si l'on examine les plaques péristomiennes dans l'ordre observé lors de l'examen des Echinoïdées édentées, on reconnaîtra, [4]) non-seulement que toutes les plaques péristomiennes sont des plaques composées, — on pourrait peut-être les appeler plaques majeures, — mais encore que les I*a*, II*a*, III*b*, IV*a*, V*b*, sont toutes ternaires, c'est-à-dire que

[1]) Fig. 124. [2]) Fig. 125. [3]) Fig. 126—129. [4]) Pl. XVII, fig. 140.

chacune d'elles consiste en trois plaques primaires qu'on peut encore distinguer, tandis que les I*b*, II*b*, III*a*, IV*b*, V*a* sont binaires, formées de deux plaques primaires. Donc ici, encore, les plaques péristomiennes de la série I*a*... V*b*, sont plus grandes que celles de la série I*b*... V*a*, et portent aussi des pores en nombre correspondant. Dans les deux séries, la première plaque primaire a deux pores, un pore géminé complet et un second, qui n'est qu'une échancrure dans le bord même; et l'on pourra bien supposer que cette plaque primaire provient d'une union de deux plaques, séparées à une époque de beaucoup antérieure; celle qui a été formée la première ayant eu, comme toutes les autres, un pore parfaitement géminé, lequel, rapproché du bord pendant la croissance, aura été réduit, son canal supérieur ayant été fermé et le canal inférieur retranché, ce qui l'aura changé en une simple échancrure plus ou moins profonde.[1])

Les plaques ambulacraires primaires des Échinides sont aussi soit des plaques entières, c'est-à-dire qu'elles occupent toute la distance entre l'aire interradiale et la suture médiane de l'ambulacre, soit des demi-plaques, c'est-à-dire qu'elles s'étendent de l'aire interradiale jusqu'au milieu des plaques entières, où elles aboutissent en pointe plus ou moins aiguë. Les plaques composées (majeures) du péristome formant la série I*a*... V*b*, consistent le plus souvent, dans les individus bien jeunes, en une première plaque primaire entière, en une demi-plaque primaire médiane et en une troisième plaque primaire entière[2]); quelquefois, pourtant, toutes les trois sont entières. Dans la série I*b*... V*a*, les deux plaques primaires sont toujours entières.

Le même ordre qui règne dans l'ambulacre du côté du péristome, s'y reproduit encore à son extrémité supérieure. La couronne d'un jeune Toxopneustes drœbachensis, fig. 140, d'un diamètre de 4 millimètres et d'un stoma de 2,4 millimètres, fait voir les relations présentées dans le tableau ci-joint, qui désigne pour chaque plaque composée le nombre de ses plaques primaires, dont les demi-plaques sont placées entre parenthèses.

		Plaque composée						
		1.	*2.*	*3.*	*4.*	*5.*	*6.*	*7.*
de la série I*a*..V*b*:	I*a*	1.(2.)3.	1.(2.)3.	1.(2.3.)4.	1.(2.3.4.)5.	1.(2.3.4.)5.	1.2.	
	II*a*	»	»	»	1.(2.3.)4.	»	1.2.3.4.	
	III*b*	»	»	»	1.(2.3.)4.	»	1.2.3.4.	
	IV*a*	»	»	1.(2.)3.	1.(2.3.)4.	»	1.2.3.4.	
	V*b*	»	»	1.(2.3.)4.	1.(2.3.4.)5.	»	1.2;	
de la série I*b*..V*a*:	I*b*	1.2.	1.(2.)3.	1.(2.)3.	1.(2.3.)4.	1.(2.3.4.)5.	1.(2.3.4.)5.	0.
	II*b*	»	»	»	»	»	»	1.
	III*a*	»	»	»	»	»	»	1.2.
	IV*b*	»	»	»	»	»	»	1.
	V*a*	»	»	»	»	»	»	1.

On observe que le nombre des plaques primaires de chaque plaque composée augmente du péristome à l'apex. Dans les rangées de la série I*a*... V*b*, cette pro-

[1]) Pl. XVII, fig. 140—147. [2]) Fig. 140, 141, 142.

gression n'est pas tout à fait régulière, présentant quelques inégalités dans les plaques composées *3* et *4*, ce qui pourrait être un cas individuel; mais les rangées du bivium, I*a* et V*b*, correspondent parfaitement, même à l'égard de leur dernière plaque, dans laquelle le trivium forme aussi un groupe de plaques uniformément développées. Dans la série I*b* . . . V*a*, au contraire, l'augmentation est toujours la même. Chez quelques individus, la plaque majeure composée *3*, a 1.(2.3.)4, et la plaque *4*, 1.(2.3.4.)5.; voir la fig. 141.

Dans chaque rangée ambulacraire, la plaque péristomienne composée *1* est la première formée; chaque plaque plus éloignée est d'autant plus récente, et la plus récente de toutes est celle qui se trouve contiguë à la pièce ocellaire. La plus récente n'a pas le même numéro dans les rangées des deux séries; (fig. 140). Dans celles de la série I*a* . . . V*b*, elle est la sixième, dans celles de la série I*b* . . . V*a*, la septième, à l'exception peut-être individuelle I*b*, de manière que cette série, dont la plaque composée péristomienne a une plaque primaire de moins que celle de la série I*a* . . . V*b*, en offre à son extrémité croissante une ou plusieurs de plus, la plaque composée *6* étant non-seulement achevée, mais encore la plaque composée *7* ébauchée.

Chaque plaque composée se forme de la manière suivante (voir les figures 140—142, 145, 146): Près du bord aboral d'une plaque composée achevée se dépose la première plaque primaire de la nouvelle plaque, près d'elle la deuxième, etc. Toutes les plaques primaires, les demi-plaques même, sont primitivement des plaques entières, c'est-à-dire qu'elles s'étendent de l'aire interradiale jusqu'à la suture médiane de l'ambulacre. Plus tard, pendant que l'assemblage entier de plaques primaires qui constitue la plaque composée, va en s'élargissant, et même avant qu'il soit complété par la dernière plaque primaire, les plaques intermédiaires s'arrêtent dans leur croissance, et, tout en gardant leurs positions sur le bord de l'ambulacre du côté de l'aire interradiale, elles se rétrécissent à leurs extrémités, qui s'éloignent de la suture médiane. Elles deviennent par là cunéiformes. De ces plaques intermédiaires, la plus petite est toujours celle qui a été formée la première; celles qui sont formées plus tard, restent successivement plus grandes, d'où suit que tout le groupe des plaques primaires intermédiaires prend la forme d'une figure triangulaire, dont la pointe, au milieu de la plaque composée, ne consiste qu'en l'extrémité proéminente de la dernière. Il résulte clairement de tout cela, que ces plaques intermédiaires ne sont nullement d'une origine plus récente que les autres, ni secondaires ni intercalées, mais qu'elles sont formées successivement à la suite de la première plaque entière et avant la dernière. Mais celles-ci augmentent dans une proportion plus grande, de sorte qu'elles se touchent bientôt à l'endroit où finissent les plaques intermédiaires, et qu'elles occupent tant la plus grande partie de la superficie de la plaque composée, que son bord entier près de la suture médiane.

Les plaques composées les plus récemment formées, sont visiblement plus longues que larges dans la direction de l'apex vers le péristome. Mais au fur et à mesure que chaque plaque composée grandit tout en s'éloignant de l'apex, elle s'élargit de plus en plus en proportion de sa longueur. La plus grande périphérie de la couronne est toujours placée de manière que la moitié du nombre des plaques, et un peu plus, appartient à sa partie adorale, c'est-à-dire qu'elle se trouve entre elle et le péristome, tandis que la distance de la périphérie au péristome est toujours moins grande qu'à l'appareil apical. Il en résulte que, dans le cours de la croissance, il s'opère une compression de haut en bas, devenant plus forte à mesure que les plaques sont plus âgées, et tendant, conjointement avec le mouvement qui a simultanément lieu dans les éléments de chaque plaque composée séparément, à modifier d'une manière régulière la forme des plaques et à changer aussi la disposition de leurs pores. Dans les individus les plus jeunes qui ont été examinés, tous les pores tentaculaires (à l'exception du tout premier, marginal et réduit à une simple échancrure) sont placés près de la suture vers l'aire interradiale, et ceux qui appartiennent à une seule et même plaque composée, forment entre eux un arc à légère flexion convexe vers l'extérieur (v. fig. 141). Ceux-ci sont les arcs de pores primordiaux. Or, les pores tentaculaires commencent bientôt à changer de place pour former d'autres arcs, des arcs secondaires, qui doivent rester les mêmes pendant toute la vie de l'animal, et qui sont si caractéristiques, qu'on en a même tiré les caractères des genres.[1]) Ce qui détermine le résultat de cette transposition, c'est que les pores des plaques primaires entières ont, même en raison de l'étendue de la plaque, un plus grand mouvement que ceux des demi-plaques. Chaque pore appartenant à une plaque primaire entière s'éloigne peu à peu du bord et s'approche du centre. Dans chaque plaque composée, ce déplacement est le plus considérable sur la première plaque primaire, l'adorale, où il se combine en même temps avec une attraction d'en bas; le même déplacement, quoique un peu moins sensible, a lieu sur la dernière plaque primaire, l'aborale. Pour les demi-plaques intermédiaires, le mouvement du pore n'existe pas ou n'est presque pas visible dans la première; mais, dans les suivantes, il augmente et devient de plus en plus évident. Donc, si une plaque se trouve composée, comme l'est p. ex. la plaque *4*, fig. 142 et 145, d'une plaque primaire adorale entière, 1, de trois plaques intermédiaires, 2, 3, 4, et d'une cinquième plaque entière aborale, 5, le premier pore va se transporter presque vers le milieu du bord inférieur de la plaque, le deuxième garde sa position primitive, le troisième s'est légèrement écarté du bord extérieur, le quatrième un peu plus, et le cinquième encore davantage. Mais, de tous ces mouvements divers, il résulte que le premier pore n'appartient plus à l'arc primitif des pores. Il s'en est séparé pour s'ajouter à un nouvel arc qu'il achève, arc secondaire dont les autres termes sont les pores de la plaque composée précédente, à l'exception du premier. Les arcs de 3, 4, 5, 6 ou 7 pores, qui caractérisent le genre Toxopneustes, et dans lesquels le nombre des pores dépend de celui des plaques intermédiaires, se comptent, par conséquent, toujours depuis le deuxième pore d'une plaque composée jusqu'au premier pore y compris, dans celle qui suit.

Par suite de ces transpositions, tout ordre semble avoir disparu du péristome, même dans les individus de petite taille. Pourtant le désordre n'est qu'apparent. Un examen soigneux fait voir que tout s'est réglé d'après la même loi.

Les plaques péristomiennes de la série I*a*, II*a*, III*b*, IV*a*, V*b*, offrent les transformations que voici[2]): Le pore géminé rudimentaire, 1, dépasse peu à peu le

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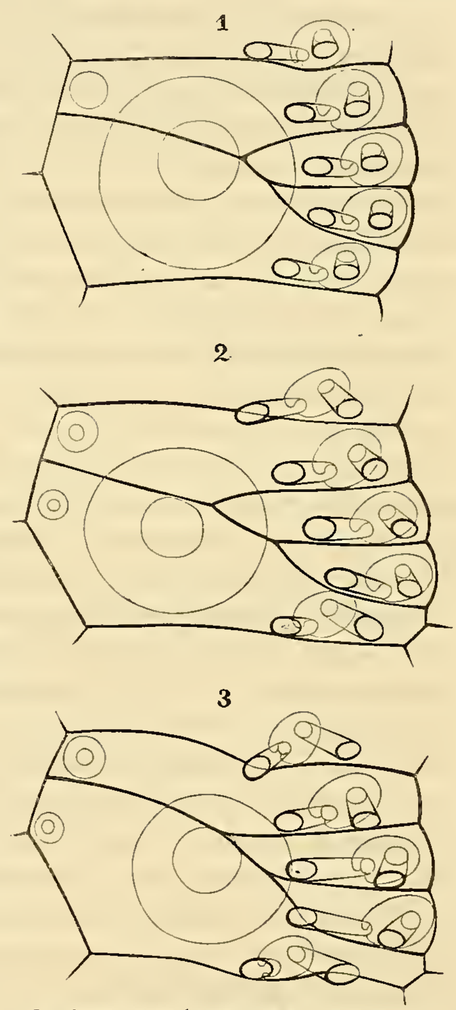
[1]) Pl. XVII, fig. 142—147. [2]) III*b* dans les figures 141—147, qui représentent l'ambulacre III dans six phases diverses de la croissance.

milieu de la première plaque, et ne reste que comme une échancrure sur son bord même. Car, pendant que la couronne grandit à son pôle apical, une légère partie de sa substance solide disparaît sur le bord du péristome, où sa couche calcaire s'absorbe lentement et si bien, que chaque pore qui y parvient se corrode pour ainsi dire, et perd plus ou moins de son enceinte ovalaire. Le pore parfaitement géminé, 2, de la première plaque primaire (*1,1*), laquelle est une plaque entière, s'avance, lui aussi, de la suture vers le milieu et se rapproche en même temps du bord, pour y perdre peu à peu une partie considérable de sa circonférence et même de son canal inférieur, le canal supérieur ayant déjà été rempli et bouché. Ces deux pores, 1 et 2, continuent de former une paire à eux. La deuxième plaque primaire (*1,2*) est une demi-plaque; son pore, 3, ne s'éloigne donc que bien peu de sa place primitive, il commence le premier arc secondaire, mais, par suite de la diminution et de la compression de la première plaque primaire, il approche du bord et y perd aussi à son tour une partie de son enceinte. La troisième et dernière plaque primaire de la première plaque composée (*1,3*), est encore une plaque entière, et son pore, 4, est également transporté vers le centre et plus avant même que celui qui le précède. Le pore 5, appartenant à la première plaque primaire de la deuxième plaque composée (*2,1*), est comme tel encore le plus mobile; il s'éloigne beaucoup de la suture et achève le premier arc secondaire composé des trois pores 3, 4 et 5. Le pore 6, placé sur la demi-plaque intermédiaire *2,2*, garde sa place comme le premier du deuxième arc, de trois pores aussi, dont le deuxième, 7, de la plaque primaire *2,3*, rentre assez considérablement, quoique pas autant que le troisième, le pore 8, appartenant à la plaque primaire *3,1*. Par le pore 9, de la plaque primaire *3,2*, commence encore un troisième arc secondaire de quatre pores, qui se meuvent d'après la même norme que les précédents, savoir 8: plaque *3,2*, 10: plaque *3,3*, 11: plaque *3,4* et 12: plaque *4,1*. Pendant que tous ces changements se sont opérés, les plaques composées *1*, *2* et *3* ont subi une compression toujours plus grande. Dans le petit individu, fig. 141, elles constituent les deux tiers de toute la hauteur de la couronne, et la plus grande périphérie coïncide à peu près avec la suture entre les plaques *2* et *3*; dans un autre un peu plus grand, fig. 142, elles sont toutes placées sous la ligne de la plus grande périphérie, occupant moins de la moitié de la hauteur de la couronne, et leur largeur dépassant quelque peu leur hauteur. La première plaque composée *1*, ou la plaque péristomienne, est surtout comprimée fortement; ses pores cessent de croître, leur canal supérieur diminue ou se ferme, le pore 2 perd sur le bord du péristome encore plus de son enceinte et le pore 3 va peu à peu le suivre; le mamelon radiolaire disparaît entièrement ou à peu près; et, dans l'individu fig. 145, la suture entre les plaques composées *1* et *2* a disparu, et ces dernières se sont confondues en une seule plaque composée binaire du deuxième ordre: $1+2$, formée de six plaques primaires, lesquelles ne peuvent plus être distinguées. Le grand mamelon radiolaire qu'elle porte est celui qui appartenait primitivement à la plaque composée *2*. Dans l'individu fig. 146, cette plaque composée binaire $1+2$ a été encore plus déprimée; il ne reste du pore *2* que la moitié et presque autant du pore 3. Dans la plaque composée *3*, les sutures des plaques primaires s'oblitèrent maintenant de plus en plus, et dans l'individu fig. 147, celle-ci se trouve de même tout à fait confondue avec

1 + 2 en une seule plaque ternaire du troisième ordre, *1 + 2 + 3*, composée de onze plaques primaires, par suite munie de 11 pores, placés de façon à se compter: 1, 2; 3, 4, 5; 6, 7, 8; 9, 10, 11, puis, pour terminer cet arc, 12 sur la plaque composée suivante, *4*, c'est-à-dire disposés par groupes de 2, de 3, de 3, de 4, etc. La forme de cette grande plaque composée est maintenant devenue telle, que la largeur est à la hauteur à peu près comme 1 : 0,7. Dans l'individu le plus jeune, fig. 141, où les trois plaques *1*, *2*, *3* se trouvaient séparées, la largeur était à leur longueur réunie comme 1 : 2,25.

Dans les premières plaques coronales qui appartiennent à la série I*b* . . . V*a*, il se produit des transpositions analogues,[1]) seulement avec des différences provenant de ce que la plaque composée *1* ne consiste qu'en deux plaques primaires. Ici, encore, à ce qu'il paraît, les plaques *1*, *2* et *3* se confondent plus tôt même que dans la série I*a* . . . V*b*. La plaque composée ternaire du troisième ordre: *1 + 2 + 3*, fig. 147, naissant à la suite de cette union, possède donc dix pores, disposés de manière à se compter: 1, 2; 3, 4; 5, 6, 7; 8, 9, 10, puis, pour terminer l'arc, 11, sur la plaque composée suivante *4*; c'est-à-dire qu'ils sont disposés par groupes de 2, de 2, de 3, de 4, etc. Dans la plaque péristomienne ternaire de la série I*a* . . . V*b*, les pores se comptaient par groupes ou arcs de 2, de 3, de 3, de 4, etc. C'est donc par le deuxième chiffre qu'on distingue les plaques péristomiennes des deux séries; il est 3 dans la série I*a* . . . V*b*, mais 2 dans la série I*b* . . . V*a*. Le quatrième arc, ici muni de quatre pores, n'en a que trois chez quelques individus du Toxopneustes drœbachensis, c'est-à-dire que la plaque composée *3* ne possède qu'une seule plaque primaire médiane. Il y a donc là quelque variabilité.



La plaque composée III*b* *5* de trois individus, d'âges différents, du Toxopneustes droebachensis O.F.M., vue de l'intérieur et par transparence, 1 étant celle d'un très-jeune individu, 3 celle d'un adulte. Grossissements différents.

Chez les Échinides et les Cidarides, les pores tentaculaires sont toujours des pores géminés. En dedans d'une enceinte ovalaire à bord plus ou moins élevé, s'ouvrent deux canaux droits, par lesquels les vaisseaux aquifères entrent dans le tentacule. Leurs embouchures à l'intérieur du test sont bien plus distantes l'une de l'autre que les embouchures extérieures. Ces canaux traversent donc l'épaisseur du test dans une direction oblique. Si l'on compare la position des embouchures extérieures avec celle des intérieures sur la même plaque à des époques différentes d'âge et de développement, on trouvera que les embouchures intérieures ne changent pas de place autant que les

[1]) Voir III *a* dans les figures 141—147.

extérieures, de sorte que les canaux, qui prennent dans les jeunes le chemin le plus court de l'intérieur à l'extérieur, se portent pendant la croissance peu à peu obliquement vers le centre, à mesure que les embouchures extérieures se transposent. Le mouvement qui a lieu dans la substance même de la plaque, n'est donc pas le même partout, et plus il est rapproché de la surface extérieure, plus il se dirige vers la suture médiane de l'ambulacre.

Ainsi croissent les ambulacres du Toxopneustes drœbachensis, durant les changements progressifs des plaques et des pores; et, chez les individus mêmes les plus développés, on reconnaît, à leur forme et à leur groupement dans le péristome, le caractère différent des deux séries. Les chiffres par lesquels la disposition des pores est désignée chez cette espèce, les 2, 3, 3, 4 etc., de la série I*a* ... V*b*, et les 2, 2, 3, 4 etc., de la série I*b* ... V*a*, se retrouvent non-seulement dans les espèces voisines, le Toxopneustes brevispinosus (Risso) et le T. lividus (Lamk.), mais encore dans le Loxechinus albus (Mol.), l'Echinus esculentus L., le Lytechinus variegatus (Lamk.), le Tripneustes ventricosus (Lamk.), la Boletia heteropora Desor, l'Amblypneustes ovum (Lamk.)[1], le Temnopleurus toreumaticus (Leske)[2], l'Echinothrix turcarum Peters[3]), l'Echinocidaris punctulata (Lamk.)[4]), en un mot chez tous les Échinides. Les Echinometra n'y font pas exception. Les mêmes chiffres se reproduisent avec une évidence frappante dans la disposition des pores autour du péristome de l'Echinometra lucunter (L.) des Indes occidentales[5]). Le madréporite est placé, comme chez tous les autres, dans la pièce génitale droite antérieure, et l'axe antério-postérieur du corps ne coïncide point, comme l'a cru Johannes Müller, avec le diamètre le plus long du test, mais il est oblique, comme l'a supposé L. Agassiz, le diamètre longitudinal passant par l'ambulacre I et par l'aire interradiale correspondante 3, et c'est dans son plan vertical que se trouve la courbe de la flexion du test. L'Hétérocentrus et le Colobocentrus[6]), au contraire, sont symétriques, le diamètre court du test constituant en même temps chez eux l'axe antério-postérieur, dans la direction duquel le péristome aussi se trouve allongé, l'anse postérieure en étant la plus profonde, comme cela s'observe aussi chez beaucoup d'autres types. C'est là la position que Johannes Müller donnait à ces Échinides. Mais la place que vient occuper en conséquence le madréporite, fut regardée par lui comme une déviation exceptionnelle à ce qu'il considérait à tort comme étant sa place normale chez la totalité des Échinides et des Cidarides, savoir vis à vis de l'aire interradiale gauche postérieure. Il n'en est rien. A l'exception des Clypéastrides, l'intime rapport du madréporite avec la pièce génitale droite antérieure est constant chez toutes les Échinoïdées. Si, par hasard, la position de cette pièce n'est pas connue, comme dans les cas fréquents où l'appareil apical a été perdu, on la trouve, dans les Échinides, par la formule de la disposition des pores des plaques péristomiennes, formule qui donne en même temps l'axe antério-postérieur du corps, avec son bivium et son trivium.

Les Saléniens, qui, par tant de raisons, mériteraient d'être examinés par rapport à l'asymétrie des ambulacres ainsi formulée, dominante, comme on le verra, chez toutes les Échinoïdées, se sont dérobés jusqu'ici à toute étude approfondie, leurs

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[1]) Pl. XVIII, fig. 153. [2]) Fig. 154. [3]) Fig. 155. [4]) Fig. 156. [5]) Fig. 157. [6]) Fig. 158.

espèces n'existant qu'à l'état fossile, dans les formations jurassiques et crétacées. Heureusement, grâce aux recherches éclairées et infatigables sur la faune marine des Petites Antilles, auxquelles s'est adonné Mr le Dr A. Goës pendant sa résidence, en qualité de médecin, dans l'île de St.-Barthélemy, et qui ont enrichi nos collections d'une foule d'objets précieux, il a été possible de donner des figures exactes[1]) du test d'une espèce vivante, [2]) la

Salenia goësiana n.

Test médiocrement renflé en dessus, presque plane en dessous. Stoma assez grand, à entailles distinctes, mais peu profondes. Ambulacres assez larges, rétrécis en haut, de 11 à 12 paires de plaques; pores en série simple, à enceinte ovalaire à bord élevé; mamelons primaires grands, imperforés, non crénelés. Aires interradiales larges, de cinq paires de plaques assez grandes; mamelons primaires assez grands, imperforés, crénelés. Appareil apical très-grand, occupant la plus grande partie de la face supérieure; disque central pentagone; pièces génitales très-grandes, hexagones avec un septième angle peu prononcé, correspondant aux angles rentrants des dernières plaques interradiales; la pièce génitale 2, un peu plus grande que les autres, portant le madréporite; ouverture anale formée, de parties presque égales, aux dépens du disque central et des pièces génitales 1 et 5, ovalaire, à bord élevé; pièces ocellaires pentagones, éloignées du disque central, à pore oculaire placé près de leur bord externe. Toutes les parties de l'appareil apical hérissées d'un grand nombre de proéminences assez longues, sessiles, cylindriques, à sommet arrondi et légèrement renflé, réticulé, ponctué et comme framboisé, très-serrées sur le bord du périproctium, qui en est garni. Diamètre du test 3,5 millimètres. — Individu jeune, sans pores génitaux, et dont le madréporite n'est marqué qu'en dedans. Couleur blanchâtre, celle des proéminances, verdâtre.

Draguée par le Dr Goës près des Virgin Islands dans les Petites Antilles, à 360 mètres de profondeur.

Les pores formant, chez les Saléniens, deux rangées simples dans chaque ambulacre, ce qui indique que toutes les plaques sont restées entières, il n'y a pas d'arcs secondaires d'une disposition différente dans les deux séries. Cependant, en étudiant avec soin le péristome, on voit[3]) que, dans les ambulacres I*a*, II*a*, III*b*, IV*a*, V*b*. le premier pore est plus éloigné du bord que celui des plaques I*b*, II*b*, III*a*, IV*b*, V*a*, et que, par conséquent, la loi est maintenue.

Tous les Échinides ont dans leur membrane buccale dix plaques libres, dont chacune est pourvue d'un pore tentaculaire. On pourrait se demander si ces plaques n'ont pas été dégagées de très-bonne heure de la couronne, avant le développement des auricules. Des observations soigneusement faites dans des circonstances favorables, donneront, sans nul doute, une réponse à cette question. Un petit Toxopneustes drœbachensis, dont le diamètre n'est que de deux millimètres, [4]) a déjà les cinq paires de grandes plaques dans la membrane buccale, chaque paire placée devant son ambulacre. De ces dix plaques, celles de la série I*a* . . . V*b*, sont plus grandes, mais dépourvues de pores tentaculaires; les cinq autres, de la série I*b* . . . V*a*, sont au contraire plus petites, mais munies, chacune, d'un pore et d'un tentacule. Ainsi, cette série précède, ici comme toujours, l'autre dans le développement des parties, en même temps qu'elle lui cède en grandeur. A une époque bien antérieure,[5]) lorsque le jeune Oursin,

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[1]) Pl. XIX, fig. 159—165. [2]) Dans le Bulletin of the Museum of comparative Zoology at Harvard College, Cambridge, Mass., n:o 9, 1869, p. 254, et dans son bel ouvrage: Revision of the Echini, p. 155 et 261, pl. III, fig. 8—14, Mr Alexandre Agassiz a décrit la Salenia varispina, draguée par le comte de Pourtalès dans les grandes profondeurs entre l'île de Cuba et la Floride, laquelle paraît avoir certains rapports avec notre espèce, dont elle diffère cependant par son "système abactinal" hérissé de radioles embryonnaires (studded with embryonic spines), au lieu de proéminences sessiles.

[3]) Pl. XIX, fig. 160, 162, 165. [4]) Pl. XVII, fig. 148. [5]) Fig. 149.

ayant un diamètre de 0,6 millimètres seulement, ne fait plus voir aucun reste de son pluteus, mais, de l'autre côté, ne laisse encore apercevoir aucun indice d'ouverture buccale ni d'anus, il se meut, comme nous l'apprenons par les observations de JOHANNES MÜLLER, à l'aide de cinq grands tentacules primordiaux, munis d'une ventouse terminale soutenue par un disque calcaire réticulé,[1]) lesquels, en gardant une distance égale entre eux, sortent de petites dépressions non loin du bord de la face buccale du corps lenticulaire, c'est-à-dire de la face qui avait été tournée vers l'intérieur du pluteus. Au dedans de ces grands tentacules, sont placées, dans un cercle, cinq paires de lamelles de tissu calcaire réticulé, d'une forme à peu près ovalaire, et avec leur diamètre long dirigé vers le centre. Chaque lamelle a, près de son extrémité extérieure, un espace ouvert ovalaire, pointu vers le dehors et à bords unis,[2]) surmonté par l'un des dix tentacules mineurs.[3]) Ces cinq paires de lamelles ne peuvent guère être que les rudiments des premières plaques primaires des ambulacres, d'autant que, plus près de la périphérie, entre deux paires, se trouvent intercalées cinq autres lamelles plus petites, presque triangulaires, qui seraient alors à considérer comme le premier commencement des aires interradiales. Chacun des cinq grands tentacules primordiaux a sa base posée sur une ligne qui sépare chaque paire des cinq tentacules mineurs, au point où passera plus tard la suture médiane de l'ambulacre. Ces cinq tentacules isolés peuvent-ils avoir quelque chose de commun avec les tentacules de la membrane orale, lesquels, comme nous l'avons vu, sont aussi d'abord isolés? KROHN les a vus s'absorber et disparaître avant que l'aperture buccale ne fût ouverte, et les dix tentacules pairs devenir en échange les instruments du mouvement.[4])

L'exposé donné ici, fait voir que, pendant la croissance de l'Échinide, dans chacun de ses ambulacres la double rangée de plaques est portée, comme par un courant très-lent, depuis leur point de naissance, près des plaques ocellaires, jusque vers le péristome. Là, les auricules, — parties qui appartiennent, non au test comme prolongements accessoires, mais essentiellement à l'appareil masticatoire, dont ils constituent les supports, — fixés par leurs bases très-fortes à la face interne des plaques ambulacraires elles-mêmes, en arrêtent le progrès. C'est grâce à cette résistance, laquelle, chez les Échinides et les Échinoconides, fait du péristome la limite fixe de la couronne vers la membrane buccale, que, durant leur croissance et par suite de la pression simultanée des plaques, se produit cet encombrement qui amène les transformations, les déplacements des parties, et les soudures finalement complètes des plaques péristomiennes, toutes choses tendantes à rendre apparemment confuse la disposition de leurs pores.

Il en est autrement des **Cidarides.** Dans ce groupe,[5]) toutes les plaques de l'ambulacre sont entières et primaires, et le restent toujours; de plus, dans chaque rangée, elles sont séparées entre elles par des sutures qui ne s'oblitèrent nulle part par une fusion quelconque. Elles continuent donc, durant toute la vie de l'Oursin, à être telles que sont les plaques

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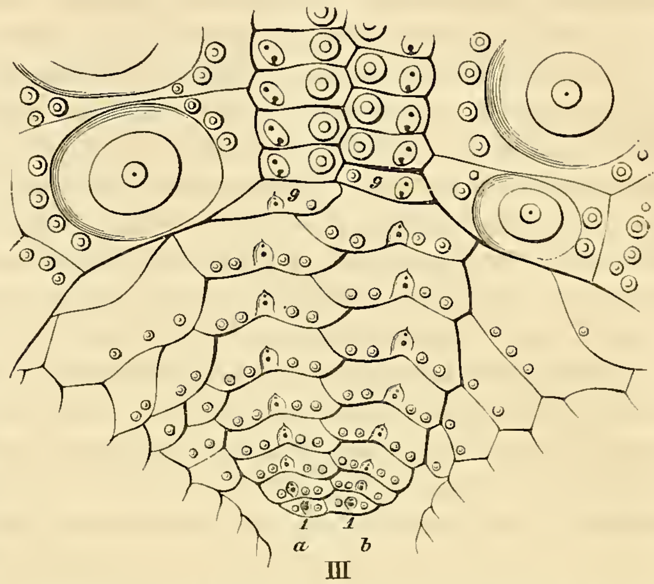
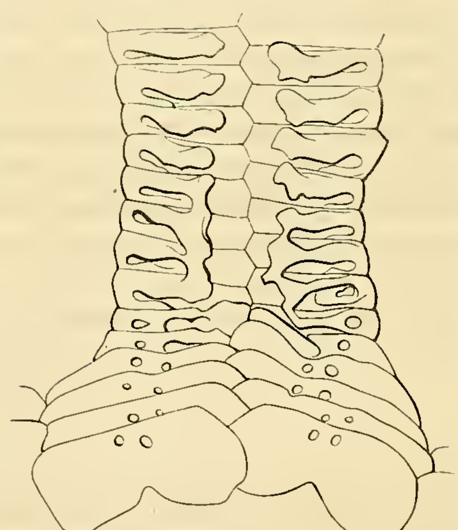
[1]) Fig. 150. [2]) Fig. 151. [3]) Fig. 152. [4]) Archiv für Anatomie und Physiologie, 1851, p. 351.
[5]) Pl. XX, fig. 166—169.

ambulacraires d'un très-jeune Échinide, la péristomienne des I*a* ... V*b* exceptée, et qu'elles le sont toutes chez les Holectypus et les Discoïdea, cependant sans former jamais des groupes composés comme les triades, les pentades, etc., de ceux-là. Elles constituent une double rangée étroite,[1]) presque partout de la même largeur, laquelle, à mesure que des plaques nouvelles sont ajoutées près de la pièce ocellaire, se porte lentement, entre les bords des aires interradiales, — à l'instar d'un fleuve entre ses deux rives, — vers la limite de la couronne. Là, les auricules n'offrent pas de résistance. Fixées par leurs bases exclusivement aux plaques interradiaires des deux côtés de l'ambulacre,[2]) elles lui laissent un passage tellement ouvert, qu'aucun obstacle ne produit un encombrement quelconque, et, par conséquent, ni dépression ni élargissement de ses plaques. Au contraire, chaque fois qu'une plaque primaire atteint, à son tour, le bord de la couronne, la suture qui l'a unie jusqu'ici à la plaque suivante, ne tarde pas à s'ouvrir,[3]) et la plaque, bientôt devenue libre, se sépare de celle-ci pour passer, comme par une embouchure, dans la membrane buccale. Simultanément il s'opère un changement dans sa conformation.[4]) La proéminence en forme d'arceau, qui s'élève sur sa face interne, et qui est d'autant plus grande qu'elle se rapproche davantage du péristome, s'absorbe lorsque la plaque se détache, et disparaît bien vite. La plaque diminue par son bord inférieur, et son mamelon radiolaire se rapetisse, mais elle augmente fortement en largeur, surtout du côté de l'aire interradiale, de même qu'en profondeur, et elle se transforme ainsi en une écaille mince, dont le bord inférieur se place au-dessus de celle qui la précède. Les pores viennent se placer dans un enfoncement qui s'approfondit peu à peu, leurs ouvertures prenant une extension transversale et changeant leur position mutuelle.



Ambulacre III de la Cidaris hystrix LAMK. 1,1, les plaques les plus âgées dont celle de la rangée *b*, appartenant à la série I*a* ... V*b*, est plus grande que l'autre. 9,9, les neuvièmes plaques des deux rangées, dont celle de la rangée *b* est sur le point de se dégager, la suture commençant à s'ouvrir sa moitié, la 9:ème de la rangée *a*, étant déjà libre et transformée en écaille.



Partie péristomienne d'un ambulacre de la Cidaris papillata LESKE, vue de l'intérieur. Les proéminences, très-développées près du bord, jusqu'à former une espèce de galerie percée à jour, qui doit contribuer à contenir les plaques ambulacrales, décroissent subitement sur les plaques en voie de se dégager.

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[1]) Fig. 166. [2]) Fig. 168. [3]) Fig. 167. [4]) Fig. 166—168, 169, a—h.

Telle est l'origine des "écailles imbriquées" de la membrane buccale des Cidaris, lesquelles ne sont réellement que des plaques ambulacraires métamorphosées [1]). Il est évident que, dans leurs rangées, les paires qui se trouvent le plus près de la bouche sont les plus âgées. Les autres se sont détachées de la couronne, chacune à son tour, en s'ajoutant ainsi au nombre des écailles imbriquées déjà formées.

C'est dans ce caractère différent des ambulacres, que réside la profonde divergence existant entre les Cidarides, d'un côté et les Échinides, et effectivement tout le reste des Échinoïdées, de l'autre. Par cela même que, chez les Cidarides, le mouvement propre de l'ambulacre a pour résultat de le résoudre, auprès du péristome, dans ses éléments, les plaques primaires, et de transformer celles-ci en écailles dégagées, mobiles et imbriquées, il est tout à fait contraire au mouvement homologue, lequel, chez les Échinides, finit par la fusion intime des plaques primaires en plaques composées se confondant dans le péristome en un cercle solide, la limite fixe de la couronne. Mais, malgré cette diversité dans le travail morphologique, on y observe la validité de la même loi qui règne chez toutes les Échinoïdées. Un examen soigneux fait voir d'abord que, parmi les écailles les plus âgées entourant immédiatement la bouche, celles qui appartiennent à la série I*a*, II*a*, III*b*, IV*a*, V*b*, sont un peu plus grandes que celles de la série I*b*, II*b*, III*a*, IV*b*, V*a*; ensuite, si l'on observe de près la suite des écailles en allant depuis la bouche jusqu'à la couronne, que les premières couvrent partout celles-ci de leurs bords latéraux internes; et, quand on aura atteint la couronne, on reconnaîtra que cette disposition imbriquée provient de ce que les plaques de la série I*a* . . . V*b* arrivent plus tard au bord, et ne commencent à se détacher que lorsque les plaques correspondantes de la série I*b* . . . V*a* seront entièrement dégagées, et qu'elles se seront déjà rangées dans la suite mobile et flottante de la membrane buccale. Cette différence se laisse suivre tout le long de l'ambulacre. De chaque paire de plaques, celle qui appartient à la série I*a* . . . V*b*, succède toujours à celle de la série I*b* . . . V*a*, et de la paire tout récemment formée auprès de la pièce ocellaire, la plaque de la première série est toujours moins développée que celle de la dernière, ou même elle n'est pas encore commencée. Ainsi, chez une Cidaris hystrix LAMK., d'un diamètre de vingt-huit millimètres, le nombre des plaques, comptées depuis la bouche jusqu'aux pieces ocellaires, est:

dans	I*a* : 54,0,	mais	dans	I*b* : 55,0;
»	II*a* : 54,6,	»	»	II*b* : 55,5;
»	III*b* : 54,0,	»	»	III*a* : 54,5;
»	IV*a* : 56,0,	»	»	IV*b* : 56,5;
»	V*b* : 56,0,	»	»	V*a* : 56,5,

ce qui donne, pour chacune des rangées de la série I*b* . . . V*a*, sur celles de la série I*a* . . . V*b* un excédant d'une plaque entière ou à demi formée.

[1]) JOHANNES MÜLLER a été le premier à énoncer la nature ambulacrale des "plaques buccales" des Cidarides. Voir: Ueber den Bau der Echinodermen, sép., p. 25, t. II, f. 7. Comme il le fait remarquer, M. CHARLES DESMOULINS l'avait déjà aperçue. Voir ses Études sur les Échinides, p. 168.

Les Cidarides ne sont pas, cependant, les seules Échinoïdées ayant ce caractère de la continuation des rangées ambulacraires au delà de la limite de la couronne. Deux genres le partagent avec elles, l'Échinothuria de S. P. WOODWARD [1]), fossile de la formation crétacée, et l'Asthénosoma de GRUBE [2]), habitant les grandes profondeurs des mers actuelles, genres qui, sous d'autres rapports, diffèrent beaucoup des Cidarides, tandis qu'ils présentent des analogies évidentes avec les Diademas. D'après le peu de renseignements publiés jusqu'ici sur ces animaux, il paraît que dans l'Asthénosoma les auricules ne seraient pas fixés à l'immobilité à la face interne du test, mais joints par articulation à la crête traversant les plaques interradiales, ce qui permettrait aux plaques ambulacraires de passer graduellement dans la membrane buccale. Imbriquées et mobiles, comme le sont ici ces plaques, depuis leur origine près de l'appareil apical, il paraît — à en juger d'après les figures — que celles d'entre elles qui arrivent dans la membrane buccale, s'y élargissent très considérablement du côté externe, de manière à la couvrir en entier de leurs écailles seules, à l'exclusion des plaques interradiaires. Quand on compare aux descriptions et aux figures de l'Asthénosoma GRUBE, celles données de l'Échinothuria floris WOODWARD, on ne peut plus douter qu'il n'y ait là deux membres d'un groupe fort remarquable, dont l'existence, qui s'étend depuis la période de la craie jusqu'à nos jours, ne nous est connue que par quelques débris isolés, et par un petit nombre d'échantillons tirés des grandes profondeurs de l'océan. Chez tous les deux on retrouve, mais en partie portés à un plus haut degré, des caractères connus, quoique beaucoup moins prononcés, chez les Diademas: le test déprimé, mince et fragile, les radioles tubuleux, les plaques interradiales arquées et imbriquées, la soudure des auricules à la face intérieure du test, moins intime et plus visible que dans la plupart des Échinides. Mais ce qui paraît distinguer fortement ces deux genres des Diademas, c'est la constitution toute particulière de leurs ambulacres, dont les plaques, légèrement arquées et imbriquées adoralement, semblent être disposées par triades, composées d'une plaque entière très-grande et de deux demi-plaques fort réduites, dont les pores sont portés jusqu'au bord adoral de la plaque. C'est là une disposition à laquelle les autres Échinides ne présentent rien de bien analogue, et qui, pour être bien comprise, exige une analyse soigneuse des parties. Ce ne serait donc qu'avec beaucoup de réserve que l'on oserait voir quelque ressemblance d'une de ces triades avec une premiere plaque du péristome du Toxopneustes, à deux pores, dont l'un marginal et réduit en simple échancrure, et la plaque libre correspondante de la membrane buccale, les deux plaques prises ensemble.

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[1]) The Geologist, a popular illustrated monthly Magazine of Geology. Edited by S. J. MACKIE. VI, p. 327, pl. XVIII; London 1863. — THOMAS WRIGHT, Monograph of the British Echinidæ from the chalk formations, I, p. 125, pl. XXIX B; figures originales d'après des exemplaires du British Museum.

[2]) Fünfundvierzigster Jahres-Bericht der Schlesischen Gesellschaft für vaterländische Kultur, 1867, April 3, p. 42. — ALEXANDER AGASSIZ, Revision of the Echini, p. 93: p. 272, t. II, c, fig. 1—5 a; p. 422. Illustrated catalogue etc., VIII: Zoological results of the Hassler Expedition, I, p. 3, t. II fig. 1, 2, photogr. — *Syn.* Calveria WYVILLE THOMSON, the Depths of the sea, p. 157. Dans le Preliminary Report of the scientific exploration of the deep sea in H. M. surveyiug vessel Porcupine, Proceedings of the Royal Society, Nov. 1869, p. 450, la découverte est annoncée d'un Oursin, qui ne peut être autre chose que l'Asthénosoma. Quelques pages avant, p. 445, le nom de Calveria hystrix etait déjà appliqué à une étoile de mer, laquelle plus tard est devenue le Korethraster hispidus WYV. THOMS., Depths of the Sea, p. 119.

Un corps fortement déprimé et aplati, le rapprochement mutuel de ses deux surfaces, la supérieure et l'inférieure, en partie jointes intérieurement par des cloisons et des piliers; le diamètre antério-postérieur, plus long ou plus court que le diamètre transversal, toujours indiqué par la position du périprocte dans l'aire interradiale impaire, et souvent par un bivium parfaitement distinct; l'extension sur les aires interradiales mêmes des pores tentaculaires très-nombreux; l'existence de pétales plus ou moins développés pour la réception des tentacules branchiaux; le madréporite[1]) occupant l'intérieur du disque central et souvent de toutes les pièces génitales, confluentes avec celui-ci, sans sutures perceptibles; les pores génitaux non toujours placés dans les pièces génitales, mais reçus quelquefois dans les aires interradiales[2]); les sphérides disposés au fond de cavités dans l'épaisseur de l'ambulacre: — ce sont là des caractères qui distinguent les **Clypéastrides** des autres Échinoïdées à dents, avec lesquelles, d'un autre côté, elles se lient intimement par l'existence d'un appareil masticatoire, et, comme suite, par la forme du péristome, constante pendant la croissance, et par sa position au centre de la face inférieure.

La loi d'asymétrie régnant dans le système ambulacraire de toutes les Echinoïdées, se manifeste ici d'une manière particulière. Ce n'est pas que les plaques péristomiennes de la série I*a* . . . V*b* soient bipores; il n'y a même pas de différence notable entre le grand pore buccal unique de cette série et celui de l'autre; mais ces plaques mêmes[3]) sont plus grandes que celles de la série I*b* . . . V*a*, et cette relation de grandeur entre les deux plaques péristomiennes de l'ambulacre, se répète souvent encore d'une manière plus ou moins évidente dans ses deuxièmes et même ses troisièmes plaques. Dans le genre Arachnoïdes, seulement, la disposition normale des éléments du péristome devient un peu vague, en offrant des formes indécises, et cela par suite de transformations successives propres à ce genre.

Parvenus à leur grandeur définitive, les Clypéastrides présentent dans plusieurs de leurs genres tous les cinq ambulacres uniformes, tandis que, dans d'autres, le bivium se fait en quelque sorte valoir, soit de bonne heure, soit peu à peu, par suite des mouvements et des changements de forme et de grandeur que subissent les plaques, plus considérables ici pendant la croissance que chez les autres Échinoïdées. Déjà L. Agassiz et Johannes Müller[4]) ont observé que, dans les Clypéastrides, la couronne "se simplifie" au péristome, que les plaques y augmentent plutôt en largeur qu'en longueur, comme l'avait déjà fait remarquer Philippi quant à l'Échinus, et que cela s'applique surtout aux plaques ambulacraires "qui y sont contiguës l'une à l'autre".

Réguliers, ayant tous les cinq ambulacres uniformes, et, abstraction faite du périprocte, généralement aussi toutes les aires interradiales, sont, dans leur état développé, l'Echinocyamus pusillus (O. F. M.) et le Laganum depressum Al. Agassiz, lesquels ont l'un et l'autre toutes les cinq aires interradiales cohérentes, formant une suite continue de plaques. Il en est de même de l'Encope Valenciennesi Agass. et de l'Encope Stokesi

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[1]) Pl. XVI, fig. 135—139. [2]) Fig. 137. [3]) Pl. XLIV, fig. 235: Echinocyamus pusillus (O. F. M.); Pl. XLV, fig. 236: Laganum depressum Ag.; Pl. XLVI, fig. 237: Encope Valenciennesi Ag.; fig. 238: Rotula dentata Lamk.; Pl. XLVII, fig. 239: Clypeaster rosaceus (L.).; Pl. XLVIII, fig. 240, et Pl. XLIX, fig. 241—243: Mellita hexapora Gm.; Pl. L, fig. 244—246: Echinarachnius parma Lamk.

[4]) Über den Bau der Echinodermen, p. 25.

Agass., du Clypeaster rosaceus (L.) et du Clypeaster prostratus Rav., ayant, dans tous les ambulacres, du bivium comme du trivium, la plaque 2 dans le premier de ces deux genres, et les plaques 2 et 3 dans le dernier, tellement élargies, que, par leurs bords externes, tous les ambulacres se touchent de manière à former une enceinte compacte séparant la plaque interradiale 2 et celles qui la suivent, de la plaque 1, celle du péristome, lequel ici, comme chez tous ces genres, se présente complet, c'est-à-dire composé de dix plaques ambulacraires et de cinq plaques interradiales.

Irrégulières, avec un bivium qui se distingue du trivium, sont la Mellita hexapora (Gm.) [1] et la Rotula dentata (Lamk.) [2]. Chez toutes les deux, la plaque 2 dans I*a* et V*b*, ne s'élargit pas de son bord interne, et, par conséquent, ne vient pas interrompre l'interradium impair, dont la suite de plaques reste intacte et cohérente. Chez la Mellita, les plaques 2 et 3 du trivium et des rangées I*b* et V*a* du bivium; chez la Rotula, les plaques 2 du trivium et les mêmes dans I*b* et V*a* du bivium, sont tellement élargies[3]), que l'enceinte formée par leur ensemble n'est ouverte qu'auprès de l'interradium impair et que, par suite, les séries de plaques des quatre aires interradiales se trouvent rompues, de sorte que, dans chacune d'elles, la plaque péristomienne 1 est séparée des suivantes. L'irrégularité se présente d'une manière opposée dans l'Echinarachnius parma (Lamk.) [4]) et la Lobophora, ches lesquels les plaques 2 de I*a* et V*b* sont plus élargies que celles du trivium et de I*b* et V*a*, de manière que l'interradium impair se trouve rompu dans une plus grande proportion que les aires interradiales paires. Tous ces genres ont encore le péristome complet, c'est-à-dire composé de dix plaques ambulacraires et de cinq plaques interradiales. A cet égard, comme à d'autres, le genre Arachnoïdes présente une déviation remarquable de l'état normal, en ce que, dans l'A. placenta L. adulte [5]), les plaques 1, 2 et 3 de tous les ambulacres sont si fortement élargies, que, dans toutes les cinq aires interradiales, la plaque 1 a disparu du péristome. Celui-ci ne se compose, par conséquent, que des dix premières plaques ambulacraires, formant, avec les deux ou trois suivantes, une large enceinte subpentagonale fermée, éloignant beaucoup les aires interradiales. Mais ici, encore, le bivium se fait valoir, bien qu'assez faiblement. Entre les plaques 2 de I*a* et V*b*, un petit espace est laissé ouvert pour deux plaques très-petites et très-comprimées de l'interradium impair. Ainsi, tandis que, chez les autres Échinoïdées à dents, et, parmi les Édentées, chez les Échinonéides, les Cassidulides, les Collyritides et les Ananchytides, le test, ou du moins sa région péristomienne se trouve partagée, d'une manière régulière et constante, entre les ambulacres et les aires interradiales; que, chez les Spatanguides, les premiers ne prédominent que rarement, de manière à exclure les derniers du péristome, comme nous l'avons décrit ci-dessus, et comme cela a été indiqué depuis longtemps par M. Charles Desmoulins, le contraire a lieu chez les Clypéastrides, la prédominance des ambulacres étant la règle, de sorte que, chez la plupart, les aires interradiales en sont interrompues. Il importe de savoir si ces particularités appartiennent déjà au plus jeune âge, ou si elles naissent pendant la croissance.

[1]) Pl. XLVIII, fig. 240. [2]) Pl. XLVI, fig. 238. [3]) Dans les deux exemplaires examinés de la Rotula, cet élargissement fait défaut dans la plaque 2 de IV*a*, de sorte que l'aire interradiale 3 n'est qu'à demi interrompue. [4]) Pl. L, fig. 244. [5]) Pl. LI, fig. 247.

Du genre Arachnoïdes AGASS., deux expèces ont été décrites:

1. ***Arachnoides placenta*** L.

Pl. VIII, fig. 77, 78. Pl. LI, fig. 247—250.

Test arrondi, subpentagonal, légèrement échancré en arrière, aplati, à sommet un peu élevé. Appareil apical placé sensiblement en arrière du centre. Périprocte submarginal, subcirculaire ou longitudinalement ovalaire. Relation de la largeur des aires interradiales, prise au bord du test, à celle des ambulacres, en moyenne comme 33 : 100. Péristome subcirculaire formé de dix plaques ambulacraires seulement, à l'exclusion des cinq plaques interradiales; lames médianes bilobées des ambulacres étroites et peu saillantes. Les plaques ambulacraires 2 et 3, ou 2, 3 et 4 contiguës, formant ensemble une enceinte compacte qui relègue vers le bord les séries de plaques interradiales, desquelles, dans l'aire impaire seule, deux petites plaques sont restées enclavées entre les plaques 2 des I*a* et V*b*. L'équateur passant par les plaques 4 ou 5 des ambulacres, et par les plaques 2 ou 3 des aires interradiales. Aires porifères lobulées des ambulacres plus ou moins conformes à leurs plaques, dont elles occupent la majeure partie. Un sillon lisse le long de la suture médiane du bivium et des plaques préanales de l'aire interradiale impaire. Dimensions: long. 66 mm., larg. 65 mm.; long. 55 mm., larg. 56,5 mm.; long. 45 mm., larg. 45 mm.

Habite les mers australes, depuis le golfe du Bengale jusqu'au sud-est de la Nouvelle-Hollande.

C'est l'espèce anciennement connue, figurée plusieurs fois par les muséographes du dernier siècle, longtemps avant l'exploration de la Nouvelle-Zélande par COOK. Elle a été confondue avec la suivante:

2. ***Arachnoides Zelandiæ*** GRAY.

Pl. LII, fig. 251—255.

Test suborbiculaire, sensiblement moins long que large, faiblement tronqué en arrière, aplati postérieurement avec la région des pétales un peu déprimée, légèrement convexe antérieurement. Appareil apical placé sensiblement en avant du centre. Périprocte ovalaire transversalement, moins rapproché du bord. Relation de la largeur des aires interradiales, prise au bord, à celle des ambulacres, en moyenne comme 72 : 100. Contour ondulé grâce aux ambulacres plus saillants que les aires interradiales, et aux sutures marquées par des sinuosités légères. Péristome subpentagonal, composé de cinq plaques interradiales et des cinq ambulacres, à lames médianes bilobées larges et saillantes. Les plaques 2 des cinq ambulacres contiguës de manière à séparer les plaques 2 des aires interradiales des plaques péristomiennes. L'équateur passant par les plaques 4 ou 5 des ambulacres, les plaques 4 des aires interradiales paires, et les plaques 3 de l'impaire. Aires porifères des ambulacres occupant, à la face inférieure, à peine la moitié des plaques 2 et 3, et un peu plus des plaques 4. Pas de sillon au bivium. Sommets des aires interradiales pourvus de trois ou quatre paires de mamelons beaucoup plus grands que les autres. Dimensions: long. 80 mm., larg. 84 mm.; long. 72 mm., larg. 79 mm.; long. 14,6 mm., largeur 16 mm.

Habite les mers de la Nouvelle-Zélande (Musée colonial de Wellington). Découverte par le Docteur DIEFFENBACH, cette espèce fut décrite par M. J.-E. GRAY il y a plus de trente ans. [1])

La description donnée ci-dessus de l'Arachnoïdes placenta (L.) est celle d'un individu adulte, de 66 mm. de longueur.[2]) Si l'on y compare un individu plus petit,[3]) de 45 mm. seulement, on observe une différence très-marquée dans la constitution du péristome, en ce que les cinq plaques des aires interradiales y alternent, dans la règle, avec les cinq ambulacres. Un troisième individu,[4]) ayant 55 mm. de longueur, présente l'état intermédiaire, c'est-à-dire un péristome constitué des cinq ambulacres et de quatre plaques interradiales, la cinquième, celle de l'aire 2, y manquant, ayant été, à ce qu'il paraît, absorbée et partagée entre les plaques ambulacraires II*b* et III*a*. C'est

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[1]) ERNEST DIEFFENBACH, Travels in New-Zealand, London 1843, II, p. 264. — GRAY, Catalogue of recent Echinidæ p. 14. — HUTTON, Catalogue of the Echinodermata of New-Zealand, Wellington, 1872, p. 12.
[2]) Fig. 247. Pl. VIII, fig. 77, 78. [3]) Fig. 248, 249. [4]) Fig. 250.

sans doute par suite d'annexions semblables que toutes les cinq plaques interradiales viennent à disparaître finalement du péristome, et c'est aussi apparemment par suite des augmentations successives qui en résultent, qu'en même temps les relations de grandeur réciproques, si évidentes ailleurs, sont troublées, chez cette espèce, dans les plaques ambulacraires 1, pour revenir, cependant, à la formule normale, dans les plaques 2. D'un autre côté, il ne faut pas oublier que, dans l'autre espèce, l'Arachnoïdes Zelandiæ,[1]) qui n'offre pas cette particularité de la disparition apparente des plaques péristomiennes interradiales, mais chez laquelle, au contraire, ces mêmes plaques semblent s'agrandir avec l'âge, l'ordre des plaques ambulacraires est néanmoins un peu vague aussi, et n'obéit que faiblement à la loi générale. C'est là une déviation qui mérite d'être étudiée soigneusement sur une suite nombreuse d'individus de différents âges.

La Mellita hexapora (Gm.), quand elle n'a que six mm. et demi de longueur[2]), présente une grande distance entre les rangées I*a* et V*b*, de sorte que l'aire interradiale comprise entre elles est plus large que dans les individus plus âgés; mais les plaques 2 de I*b* et V*a* du bivium et de tout le trivium se trouvent déjà tellement élargies, qu'elles forment une enceinte compacte, ouverte en arrière seulement, et séparant les plaques interradiales suivantes des péristomiennes 1. Toutefois, ce n'est qu'à une grandeur plus considérable de l'animal, que la plaque 3 se trouve aussi élargie de manière à entrer dans cette enceinte,[3]) et cet accroissement fait supposer qu'à une grandeur au-dessous de six mm., la Mellita doit avoir tous ses ambulacres séparés. Tel est en effet le cas de l'Echinarachnius parma (Lamk.). Un jeune individu de cette espèce, de six mm. et demi de longueur,[4]) a tous les cinq ambulacres uniformes, et leurs plaques 2 ne sont pas encore assez larges pour influer sur la forme des interradiales, lesquelles sont toutes intactes et cohérentes. Mais, chez un individu de 34 mm.[5]), les plaques 2 de I*a* et V*b* du bivium ont tellement augmenté qu'elles se touchent et viennent couper l'interradium impair; pourtant, ce n'est encore que dans les aires interradiales 1 et 4, que l'une des plaques 2 est presque isolée de la plaque 1.

Il ressort de ces observations, que les changements qui ont lieu dans les éléments des ambulacres pendant l'accroissement de l'individu, sont beaucoup plus considérables chez certaines Clypéastrides que chez les autres Echinoïdées, et l'on est amené à en conclure, que, chez les Clypéastrides, la forme régulière, à cinq ambulacres semblables et à cinq aires interradiales uniformes, est la forme primordiale, conservée pendant toute la vie par l'Echinocyamus et le Laganum, forme de laquelle s'écartent, à mesure que l'individu avance en âge, les genres Encope, Clypéaster, Mellita et Rotula, Echinarachnius, Lobophora et Arachnoïdes; les cinq derniers en développant en même temps un bivium, qui se distingue du trivium par ses formes. La pression vers le péristome pendant la croissance, et pendant la naissance successive de nouvelles plaques, et leur forte augmentation dans les pétales destinés aux branchies, est pour beaucoup dans ces métamorphoses. Aussi l'équateur du test ne reste-t-il pas le même pendant toute la vie de l'animal. On observe, en comparant de nombreux individus de l'Echina-

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[1]) Pl. LII, fig. 251—255. [2]) Pl. XLIX, fig. 241. [3]) Fig. 242, individu de 8,3 mm. de longueur; fig. 243, de 35 mm., et Pl. XLVIII, fig. 240, adulte. [4]) Pl. L, fig. 245. [5]) Fig. 246.

rachnius parma de différents âges, que de la plaque par laquelle passe la périphérie, une partie toujours plus grande s'avance insensiblement vers la surface inférieure, jusqu'à ce que la plaque suivante s'y fasse voir, et que le périproctium, dorsal chez les très-jeunes, devienne enfin plus qu'à demi ventral. En même temps, le stoma du test, comme dans les Échinides, diminue en proportion de l'animal entier. Chez une Mellita hexapora (GM.) de six mm. de largeur, le diamètre du stoma est d'environ 0,13 de celui du test; à 8 mm. de 0,1; à 35 mm. de 0,04, et à 80 mm. de 0,034.

L'ordre exprimé par la formule des deux séries des plaques péristomiennes ambulacrales, se fait encore valoir à l'apparition successive des sphérides.

Chez les Spatanguides, dont la Bissopsis lyrifera (FORB.),[1]) peut servir d'exemple, le premier sphéride vient se montrer sur la plaque péristomienne unipore de chaque ambulacre, c'est-à-dire sur les plaques I*b*, II*b*, III*a*, IV*b*, V*a*, tout près de la suture, et d'ordinaire il est penché vers la plaque bipore. Dans le très-jeune Echinocardium flavescens (O.F.M.)[2]), dont le péristome est encore pentagonal et dont la bouche est bien peu éloignée du centre de la membrane buccale, on voit, sur chacune des plaques péristomiennes bipores, c'est-à-dire sur celles de la série I*a*, II*a*, III*b*, IV*a*, V*b*, se développer le second sphéride, dont la petitesse indique la formation toute récente. La série I*a* . . . V*b* est donc ici encore précédée par la série I*b* . . . V*a*. Quand la bouche est reculée de manière à presque toucher la lèvre[3]), chaque ambulacre fait voir un troisième sphéride placé sur la plaque 2 de la série I*b* . . . V*a*, et lorsque l'aperture orale commence à être couverte par la lèvre saillante[4]), le quatrième sphéride apparaît, d'abord, à ce qu'il semble, aux ambulacres pairs du trivium, sur la plaque 2 de la série I*a* . . . V*b*.

Un Cassidulide tout jeune, un C. caribæarum LAMK., de quatre mm. de longueur[5]), a déjà deux sphérides, dont la grandeur différente annonce que celui de la plaque péristomienne unipore doit avoir été le premier formé. A sept mm. de longueur[6]), il en a quatre, tous visibles, dans de profondes cavités. Quand l'animal est parvenu à une longueur de douze mm.[7]), les sphérides sont au nombre de six, mais alors la surcroissance caractérisant ce groupe s'est également produite. Une couche de substance calcaire, d'un tissu d'abord réticulaire et irrégulier, présentant presque l'aspect d'une écume,[8]) s'étend à la surface du test; on l'observe le mieux dans la région sternale de l'interradium impair, où elle part du centre de chaque plaque et en franchit les limites, en formant des crêtes minces, tortueuses, irrégulières et donnant insensiblement naissance à cette surface finalement unie aux petites cavités éparses, qui est propre aux individus adultes. Le premier effet de cette surcroissance[9]) est de relever les bords des cavités où se trouvent les sphérides, puis d'y former des parties saillantes, qui peu à peu couvrent les derniers; et comme le premier sphéride de chaque paire se montre dans la série I*b* . . . V*a*, c'est encore celui-ci, qui à son tour est couvert le premier, puis celui de la série I*a* . . . V*b*, de façon qu'ils subissent ce recouvrement suivant l'ordre même de leur apparition.

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[1]) Pl. III, fig. 32. [2]) Fig. 33. [3]) Fig. 34. [4]) Fig. 35. [5]) Pl. VII, fig. 62. [6]) Fig. 61. [7]) Fig. 63. [8]) Fig. 65. [9]) Fig. 62, 63, 64, 66.

Le Toxopneustes drœbachensis (O.F.M.) peut servir à faire voir comment naissent les sphérides dans les Échinides[1]). Un petit individu de cette espèce, de deux mm. de diamètre[2]), ne présente dans chacun de ses ambulacres qu'un seul sphéride, 1, placé sur la première plaque primaire de la plaque composée binaire de la série I*b*, II*b*, III*a*, IV*b*, V*a*, tout près du bord du péristome et de la suture médiane. Un autre individu, de trois mm.,[3]) en possède deux, dont le second en date, 2, appartient à la première plaque primaire de la plaque composée ternaire de la série I*a*, II*a*, III*b*, IV*a*, V*b*. A une grandeur de l'animal de six mm.[4]), les sphérides sont au nombre de quatre, dont 1 est encore plus voisin du bord de la plaque primaire 1, et 2 reste comme auparavant; deux autres sont survenus: 3 sur la deuxième plaque primaire de la plaque composée binaire de la série I*b* . . . V*a*, et 4 sur la troisième plaque primaire de la plaque composée ternaire de la série I*a* . . . V*b*, 3, laquelle est entière, mais non sur 2, qui est une demi-plaque médiane. A un état de croissance un peu plus avancé, le même animal[5]) a également quatre sphérides, quoique ce ne soient pas les 1, 2, 3, 4, mais les 2, 3, 4, 5. C'est que la plaque composée binaire de la série I*b* . . . V*a*, dont les deux plaques primaires sont confondues, a été fortement comprimée, et que son sphéride 1, le premier en date, qui était placé auprès du bord de sa plaque primaire 1, a disparu. Le sphéride 2 y est encore, mais il s'est rapproché du bord par suite de la pression continue; 3 reste comme auparavant sur la plaque composée binaire de la série I*b* . . . V*a*, et 4 sur la plaque composée ternaire de la série I*a* . . . V*b*; et enfin un sphéride nouveau, 5, s'est développé sur la plaque primaire 1 de la plaque composée *2* de la série I*b* . . . V*a*. Ces sphérides 2, 3, 4, 5, se retrouvent encore après que les plaques composées *1* et *2* des deux séries se sont unies en plaques composées secondaires, et que l'animal a atteint la grandeur de onze millimètres.[6]) Mais, chez un individu un peu plus grand, d'un diamètre de quinze millimètres[7]) et portant cinq sphérides, ceux-ci ne sont pas les 2, 3, 4, 5, 6, mais les 3, 4, 5, 6, 7, car le sphéride 2, qui s'est de plus en plus approché du bord, a disparu, un autre sphéride, 6, est venu s'y ajouter, probablement sur la plaque primaire 1 de *2* dans la série I*a* . . . V*b*, et un encore, 7, probablement sur la plaque primaire 1 de la plaque composée *2* de la série I*b* . . . V*a*. Enfin, à une grandeur de cinquante-deux millimètres[8]), lorsque les plaques péristomiennes de l'ambulacre sont des plaques composées du troisième ordre, formées de *1*, *2* et *3* réunies, leurs six sphérides présentent les nombres ordinaux 3, 4, 5, 6, 7, 8, dont le dernier, à ce qu'il paraît, appartient à la plaque primaire 1 de la plaque composée *3*. Ainsi, la résorption qui se produit sur le bord du péristome, a amené la disparition de deux sphérides et d'un radiole avec son mamelon.

Si, dans le péristome du Toxopneustes drœbachensis (O.F.M.)[9]), ou de tout autre Échinide, on joint par des lignes droites les cinq plaques I*a*, II*a*, III*b*, IV*a*, V*b*, et les cinq autres I*b*, II*b*, III*a*, IV*b*, V*a*, deux pentagones égaux et semblables sont inscrits dans le cercle, ayant chacun trois angles contigus égaux. Ces deux pentagones sont disposés de manière que le côté I*a* V*b* correspond à l'aire interradiale impaire; que c'est

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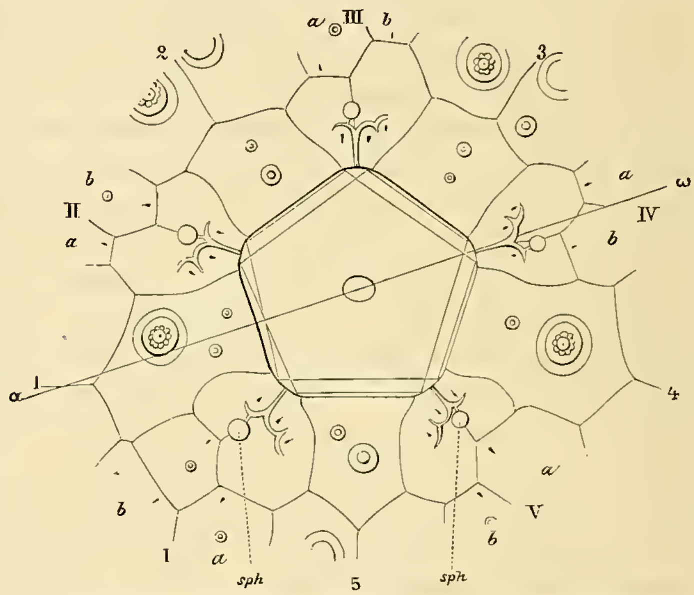
[1]) Pl. XVII. [2]) Fig. 148, 1, au péristome. [3]) Fig. 140, 141. [4]) Fig. 142. [5]) Fig. 143, 144. [6]) Fig. 145. [7]) Fig. 146. [8]) Fig. 147. [9]) Fig. 140.

à l'aire interradiale du madréporite que correspond le côté homologue IIb IIIa; que les quatre côtés qui embrassent dans les deux pentagones des angles égaux mais non homologues, sont parallèles deux à deux, mais que les côtés communs aux deux angles homologues, et de grandeur inégale, se coupent; en dernier lieu, que, simultanément, les deux pentagones, avec leurs lignes externes, forment ensemble une figure symétrique, non en raison du diamètre du stoma, coïncidant avec l'axe antério-postérieur de l'animal, mais seulement par rapport à un diamètre $\alpha\omega$, passant par le point d'intersection de ces derniers côtés; d'où il résulte que toutes les lignes qui joignent les angles homologues des deux pentagones, savoir IVa avec IVb, IIIb avec Va, Vb avec IIIa, Ia avec IIb, Ib avec IIa, sont parallèles entre elles, et rectangles relativement au même diamètre, et que, par conséquent, si l'un des pentagones est tourné autour de ce diamètre comme autour d'un axe, il coïncide avec l'autre.

On a, de la même manière, dans le péristome pentagonal à coins arrondis d'un jeune Spatanguide, deux pentagones semblables, et il est évident que la même chose a lieu dans le péristome primordial pentagonal des Cassidulides.



L'aire buccale d'une jeune Brissopsis lyrifera (FORB.). *Sph.* désigne les sphérides.

Le diamètre $\alpha\omega$, s'il est allongé, passe par l'ambulacre IV et l'aire interradiale 1, tandis que l'axe antério-postérieur du corps passe par l'ambulacre III et l'aire interradiale 5. Trop faiblement exprimé chez les Échinides de forme circulaire, pour qu'il ne se perde pas dans la multitude d'organes extérieurs puissants, distribués invariablement en rayons autour de la bouche centrale, ce dernier axe devient plus ou moins apparent chez les formes intermédiaires, pour ressortir, chez les plus parfaites, les Spatanguides, d'une manière évidente dans leur conformation bilatérale et leur tendance manifeste vers le développement indépendant d'une partie du corps portée en avant dans les mouvements de l'animal, dans certaines modifications profondes du péristome et du périprocte, dans la structure, la distribution et la direction des tentacules et des radioles. Mais, chez toutes les espèces, quelle que soit la forme générale, si parfaitement que répondent l'un à l'autre les deux ambulacres du bivium I et V et les deux ambulacres II et IV du trivium, dans les contours par lesquels ils se dessinent à la surface du test, dans leurs courbures, dans leurs parties rétrécies ou élargies, dans les formes de leurs pétales; enfin, toute constante qu'est partout la diversité de l'ambulacre impair antérieur, on voit se maintenir, dans les éléments constituants des ambulacres, l'asymétrie dont cet autre axe, $\alpha\omega$, est, pour ainsi dire, l'indice. Évidente au plus haut degré à la limite de la couronne du côté de la bouche, elle se fait sentir sur toute l'extension de l'ambulacre, dans le mode de son accroissement, comme dans le mouvement propre des rangées de ses plaques et dans les changements de place, de forme, de grandeur et de rapports réciproques de celles-ci, dans les dispositions des pores tentaculaires comme dans l'apparition, le développement et la chute des sphérides, et elle ne fera pas defaut, il est permis de le présumer, dans les rapports des radioles et des pédicellaires. Sans se trahir par aucune influence sur la conformation générale et typique du corps, cette asymétrie des ambulacres, étrangère comme elle l'est à la fois au plan radiaire et au plan bilatéral, les défait, en réalité, tous les deux, d'une manière pour ainsi dire occulte, et l'on est conduit à se demander s'il n'y a pas là un trait d'organisation, essentiellement propre à l'état intra-larval de l'Oursin, mais transféré à la forme définitive que reçoit celui-ci en se développant dans son pluteus, et s'il ne serait pas possible que le diamètre $a\omega$ désignàt la position hétérologue qu'avait, par rapport à celui-ci, l'Echinoïdée naissant dans son intérieur. S'il en est ainsi, le diamètre $a\omega$ serait son axe primordial, d'où l'Échinoïdée aurait passé plus tard à un autre, qui serait devenu l'axe antério-postérieur de l'animal adulte.

Par cette organisation indépendante et particulière qui vient d'être décrite, les ambulacres se distinguent profondément des autres parties du corps de l'Échinoïdée. Ils ne sont pas à considérer comme des régions de l'enveloppe générale, comme des aires du test, ayant la même valeur morphologique que les aires interradiales. Au contraire, dans leur ensemble ils constituent un système à eux, le système ambulacral. Appuyant, de leurs parties les premières formées et les plus développées, sur le péristome ou sur les bords mêmes de la bouche, pour s'étendre de là jusqu'aux pièces ocellaires, c'est à l'instar de bras fixés à l'immobilité et enchâssés dans le test, qu'ils fonctionnent, dans la grande majorité des genres, comme seuls porteurs des principaux organes du toucher et de la locomotion. Leur structure se trouve essentiellement identique chez les Échinoïdées des mers actuelles et chez celles des temps tertiaires et secondaires, et l'on se demande si elle l'était encore chez les plus anciennes connues, celles des temps paléozoïques dont les auteurs ont décrit, de temps à autre, un certain nombre d'espèces. Ce sont les

PERISCHOECHINIDÆ M'Coy.

Annals and Magazine of Natural History, Sec. Ser. III, 1849, p. 251. Contributions to British Palæontology, Cambrigde, 1854, p. 112. *Syn.* Tessellati Desor, Synopsis des Échinides, 1858, p. 152.

Caractérisées par la présence, dans les aires interradiales, à la plus grande périphérie, de plus de deux rangées verticales de plaques, dont les médianes sont hexagonales tandis que les adambulacrales, lesquelles seules continuent jusqu'au péristome et à l'appareil apical, sont pentagonales, c'est-à-dire découpées du bord externe pour faire place aux ambulacres.

A. LEPIDOCENTRIDÆ. Plaques interradiales imbriquées aboralement (et latéralement); les adambulacrales plus grandes que les autres et pourvues de mamelons plus grands ou plus nombreux. Formes encore très-peu connues, paraissant avoir quelques rapports avec les Cystidées.

Lepidocentrus Johannes Müller.

Ueber neue Echinodermen des Eifeler Kalkes. Abhandl. d. K. Akad. d. Wiss. Berlin 1856, p. 258. Ludwig Schultze, Monographie der Echinodermen des Eifler Kalkes. Denkschriften der K. Akad. Wiss. Wien, XXVI, p. 133.

Fragments trouvés dans le calcaire dévonien de l'Eifel, montrant une partie du test et des empreintes de l'appareil masticatoire. Aires interradiales à cinq ou à neuf rangées de plaques imbriquées aboralement et latéralement, des deux côtés de la rangée médiane impaire et ambiguë. Les plaques latérales plutôt quadrangulaires qu'hexagonales, les externes, plus grandes que les autres, arrondies du bord adambulacral, débordantes. L'ambulacre très-étroit, »construit comme celui de l'Archæocidaris Wortheni HALL», mais dans lequel, à ce qu'il paraît, on n'a pas réussi à trouver les pores. Radioles subulés très-petits, articulés sur des mamelons très-épars, dont deux ou trois sur les plaques interradiales adambulacrales, un ou deux sur les autres.

L. rhenanus (Palæocidaris) BEYRICH, Zeitschr. deutsch. geolog. Gesellschaft, IX, 4, Nov. 1856. JOH. MÜLLER, l. c. p. 264, pl. IV fig. 4—6. — Cinq rangées de plaques dans les aires interradiales.

L. eifelianus JOH. MÜLLER, l. c. p. 258, pl. III, fig. 1—8. — On n'en connaît que des plaques isolées.

L. Mülleri LUDW. SCHULTZE, l. c. p. 124, pl. XIII fig. 1. — Neuf rangées de plaques dans les aires interradiales.

Pholidocidaris MEEK ET WORTHEN.

Proc. Acad. nat. Sc. Philad., XXI, p. 78. Geol. Surv. Illinois, V, 512, pl. XV, fig. 9.

Fragments plus ou moins déformés, qui ne permettent pas de bien reconstruire la forme générale, mais qui font supposer des individus de 90 à 100 mm. de diamètre. Ambulacres assez larges, de six séries de plaques imbriquées adoralement, petites, inégales, de forme variable, ovalaires ou rhomboïdales à angles arrondis, pourvues d'un mamelon de grandeur médiocre, et ayant leurs pores géminés placés, parfois avec deux autres petits creux additionnels, dans une large dépression. Aires interradiales de cinq rangées, ou davantage, de plaques imbriquées aboralement et latéralement, granuleuses, minces, arrondies, convexes, inégales, les adambulacrales trois ou quatre fois plus grandes que les autres, de forme elliptique, plus longues que larges, débordantes. Appareil apical inconnu; une pièce détachée qui paraît y appartenir, pourvue de six ou sept pores, disposés parallèlement au bord externe, et d'un petit mamelon central. A la face ventrale (?) du corps, les plaques interradiales sont pourvues d'un mamelon primaire central, lequel, à la face opposée, ne se retrouve que sur les grandes plaques adambulacrales; il est perforé et entouré de deux anneaux lisses. Les radioles qui y appartiennent, de 25 mm. de longueur, subulés, finement striés longitudinalement; d'autres radioles, ayant le tiers ou le quart de la longueur de ceux-ci, paraissent être ceux des ambulacres; et d'autres encore, plus petits et très-nombreux, viennent des mamelons tertiaires. Appareil masticatoire inconnu. — On remarque dans la fig. 9,3 un amas de plaquettes écailleuses fort petites de forme variable.

Ph. irregularis M. et W. — Terrain carbonifère inférieur de l'Illinois, Amérique du Nord.

Perischodomus M'COY.

Annals and Magazine of Natural History, 2:d series, III, p. 253. Contributions to British Palæontology, p. 114.

Forme »sphéroïdale, subpentagonale». Ambulacres étroits, à plaques entières, entre lesquelles se trouvent en petit nombre des plaques cunéiformes atteignant de leur pointes la suture latérale. Aires interradiales larges, composées de cinq rangées de plaques inégales, (imbriquées?), dont les adambulacrales plus grandes que les autres. Pièces »génitales» portant six pores placés en chevron près de leurs bords internes. Mamelons très-petits, granulaires, serrés; les plaques interradiales latérales seules portant chacune près de son bord adambulacraire un mamelon primaire perforé, non crénelé, entouré d'un double anneau. Radioles primaires cylindriques, lisses.

P. biserialis M'COY l. c. — Dans la série de 15 ou 16 plaques ambulacraires, on en voit une cunéiforme, la pointe dirigée vers le dehors. — Calcaire carbonifère de Wexford, Angleterre. Comp. HARTE, Dublin quart. Journ. Science, V, p. 265, pl. IX.

B. PALÆECHINIDÆ M'COY. Toutes les plaques interradiales couvertes de granules, sans mamelons primaires.

Palæechinus SCOULER.

Journal of the Geological Society of Dublin, II, p. 99, sans description, Déc. 1839.

On a réuni sous cette appellation générique des oursins fossiles paléozoïques ayant les ambulacres étroits et convexes, et les aires interradiales très-larges, composées de 4 à 7 rangées de plaques couvertes de mamelons petits, serrés, égaux. L'appareil apical a été observé dans deux espèces. Le péristome et l'appareil masticatoire sont encore inconnus. — Les espèces décrites appartiennent à la formation carbonifère, à l'exception d'une seule, le P. Philippsiæ FORBES, originaire du silurien supérieur.

*Espèces ayant toutes les plaques des ambulacres entières.

P. sphæricus SCOULER, M'COY, GRIFFITH, Synopsis of the characters of the carboniferous limestone fossils of Ireland. Dublin 1844, p. 172, pl. XXIV, f. 5. Aires interradiales à six rangées de plaques. — DE KONINCK: Bull. Acad. Bruxelles, XXVIII, 1869, p. 544, pl. fig. 1. Appareil apical composé seulement de cinq pièces "génitales" contiguës, dont quatre sont pourvues de trois pores placés parallèlement aux deux bords externes, et la cinquième d'un seul pore situé près du bord interne. Pièces ocellaires nulles.

P. ellipticus SCOULER, M'COY, GRIFFITH, l. c. f. 3. Test ellipsoïdal. Aires interradiales à cinq rangées de plaques. — BAILY: Dublin Quarterly Journal of Science, V, p. 263, pl. VIII, f. 2. Péristome réfléchi, à ouverture petite; mamelons perforés. Plaques interradiales à crêtes rayonnées.

P. quadriserialis J. WRIGHT: Dubl. Qu. Journ. V, p. 260, pl. VIII, fig. 1. Quatre rangées de plaques interradiales; d'ailleurs très-peu différent de l'espèce précédente.

P. elegans M'COY, GRIFFITH, l. c. f. 2. Aires interradiales à cinq rangées de plaques granuleuses. — BAILY, l. c. p. 261, pl. VII, d'après des exemplaires de la collection GRIFFITH. L'appareil apical présentant un espace central sub-pentagonal (la membrane anale), couvert de plaquettes disposées par séries concentriques. Cinq pièces "génitales" dont chacune est percée de trois pores placés parallèlement aux deux côtés externes de la pièce, et dont l'une est plus grande que les autres, comme si elle contenait le madréporite. Cinq pièces ocellaires alternant avec les pièces "génitales", situées en face des ambulacres, et portant chacune deux pores placés près du bord externe, échancré au milieu. Radioles (des ambulacres) fort petits, 2,5 mm. de longueur, subulés, striés longitudinalement. Mamelons des plaques interradiales perforés, entourés d'un cercle de dix petits "mamelons secondaires".

**Espèces à plaques ambulacraires de deux formes diverses alternantes, ayant la même hauteur à la suture médiane, l'une entière, l'autre réduite en demi-plaque cunéiforme, ayant sa pointe dirigée en dehors.

P. gigas M'COY, GRIFFITH l. c. p. 172, pl. XXIV, fig. 4. Test déprimé, aires interradiales à six rangées de plaques, à mamelons disposés régulièrement en quinconce. La fig. 4 c, donnant deux pores géminés à chaque plaque ambulacraire, est sans doute erronée.

P. burlingtonensis MEEK et WORTHEN, Proceedings Acad. nat. sc. Philadelphia, XII, 1860, p. 396. Geological Survey of Illinois, II, 230, fig. sur bois 23, et pl. XVI, fig. 3. Fragment présentant quatre ou cinq rangées de plaques interradiales à la plus grande périphérie, mais deux seulement vers les extrémités. Les plaques ambulacraires cunéiformes, atteignant de leurs extrémités pointues l'aire interradiale, mais ayant leurs pores sensiblement retirés vers le milieu.

P gracilis MEEK et WORTHEN, Proc. Acad. nat. sc. Philad., XXI, p. 82. Geol. Surv. Illinois, V, p. 473, pl. X, fig. 2. Sept rangées de plaques interradiaires. Ambulacres plus larges que dans l'espèce précédente, d'ailleurs semblables.

P. Phillipsiæ E. FORBES, Memoirs of the geological survey of Great Britain, II, I, p. 384, pl. XXIX. Fragment. Ambulacres à demi-plaques contiguës à la suture médiane, la pointe dirigée en dehors, à moitié plus petites que les plaques entières, de manière que leurs pores sont retirés jusque près de la suture médiane. La fig. 1 *a*, donnant une disposition des plaques ambulacraires différente des deux côtés de la suture médiane, ne peut être correcte.

P.? Königi M'COY, GRIFFITH l. c. p. 171, pl. XXIV, f. 1. On n'en connaît que quelques plaques interradiales à mamelons inégaux, irrégulièrement disposés.

Melonites NORWOOD ET OWEN.

Sillimans Journal, 2de série, II, 1846, p. 225 avec fig. sur bois. — ENGELMANN, Sillim. Journ., 2de série, III, 1847, p. 124. — FERD. RÖMER, Lethæa geognostica. éd. 3, p. 288; Wiegmanns Archiv für Naturgeschichte, I, 1855, p. 312, pl. XII. — MEEK et WORTHEN, Geol. Surv. Illinois, II, p. 227, fig. 21 et p. 248 fig. 27. — Melechinus QUENSTEDT, Petrefaktenkunde Deutschlands, Erste Abtheil., III, 381, pl. 75 fig. 44—50.

Test de forme ellipsoïdale, sillonné longitudinalement, ayant les aires interradiales larges et très-convexes, et les ambulacres concaves des deux côtés d'une arête médiane. Plaques ambulacraires réduites et petites, disposées, dans chacune des deux rangées de l'ambulacre, en quatre ou cinq séries transversales (imbriquées adoralement et dès la suture vers le bord interradial?); celles formant la suture médiane plus grandes que les autres: les pores placés près du bord externe. Aires interradiales composées de 7 (à 8?) rangées de plaques à la plus grande périphérie, plus haut de six, au sommet de quatre (M. et W.) ou de deux (RÖMER) Les plaques médianes hexagonales, les latérales retranchées pour les ambulacres. Le péristome, à en juger d'après le dessin donné par MEEK et WORTHEN, ne paraît pas avoir été compact et défini comme celui des Échinides, mais plutôt indéterminé comme celui des Cidarides. Appareil masticatoire à cinq dents, marquées d'une suture médiane. Appareil apical composé de cinq pièces "génitales" et de cinq pièces ocellaires alternant avec celles-ci. Les pièces "génitales", dont aucune n'est plus grande que les autres, percées de pores en nombre variable de deux à trois, de trois à quatre, de quatre à cinq dans le même individu, groupés avec une certaine régularité parallèlement au bord externe de la pièce. Les pièces ocellaires presque quadrilatères, à deux pores selon RÖMER, imperforées ou unipores selon MEEK et WORTHEN. — Mamelons petits, serrés, imperforés.

M. multipora NORWOOD et OWEN l. c. — Calcaire carbonifère de St.-Louis, Amérique du Nord.

M. dispar (Palæchinus) G. FISCHER v. WALDHEIM, Bulletin de la Société Imp. des Naturalistes de Moscou, XXI, 1848, p. 243, pl. III, fig. 4. Fragment montrant quatre rangées de plaques interradiales et trois séries de plaques ambulacraires dans chaque rangée. — Calcaire de montagne du Gouv. de Moscou, Russie.

Oligoporus MEEK et WORTHEN.

Proc. Acad. nat. Sc. Philad., XII, 1860, p. 474. Geol. Surv. Illinois, II, p. 247.

Forme générale, appareil apical, mamelons et radioles du genre précédent, dont il diffère par les ambulacres ayant dans chacune de leurs deux rangées deux séries de plaques, parmi lesquelles on distingue des demi-plaques (irrégulièrement disposées?).

De la formation carbonifère inférieure de l'Amérique du Nord.

O. Danæ (Melonites) MEEK et WORTHEN, Proc. Ac. nat. sc. Philad. XII, 1860, p. 397. Geol. Surv. Illinois II, p. 249, pl. XVII, f. 8. Grande espèce ayant neuf rangées de plaques interradiales à la plus grande périphérie.

O. nobilis MEEK et WORTHEN, Proc. Ac. n. Sc. Philad. XX, 1868, p. 358. Geol. Surv. Illinois, V, p. 476, pl. XI, fig. 3. — Cinq rangées de plaques interradiales au milieu. Parmi les pièces "génitales", trois ont cinq pores et deux en ont quatre.

O. Coreyi MEEK et WORTHEN, Proc. Ac. nat. sc. Philad., XXII, p. 34. Espèce profondément sillonnée, à région apicale déprimée. Aires interradiales très-convexes, à six rangées de plaques.

Lepidesthes MEEK et WORTHEN.

Geol. Survey of Illinois, III, p. 522; V, pl. XVI, fig. 2.

Forme ellipsoïdale (?). Ambulacres très-larges, composés d'environ dix séries de plaques petites, alternantes, imbriquées adoralement. Aires interradiales étroites, à moitié aussi larges seulement que les ambulacres, de six ou sept rangées de plaque imbriquées aboralement et latéralement. Mamelons très-petits, égaux, comme dans les Palæechinus. Appareil masticatoire reconnu.

L. Coreyi MEEK et WORTHEN l. c. — Formation carbonifère inférieure de l'Amérique du Nord.

Protoechinus AUSTIN.

Geologist, III, 1860, p. 446.

Ambulacres apparemment à trois séries de plaques imbriquées.

P. anceps AUSTIN. Fragment très-imparfait. — Calcaire carbonifère de Wexford, Angleterre.

C. ARCHÆOCIDARIDÆ M'COY. Toutes les plaques interradiales pourvues d'un gros mamelon primaire.

Eocidaris DESOR.

Synopsis des Échinides fossiles, 1858, p. 155.

Plaques hexagonales, pourvues d'un gros mamelon perforé, à base lisse, sans anneau. Radioles. On n'en connaît que des fragments isolés.

E. Keyserlingi GEINITZ, Verstein. d. Zechstein-Gebirges, 1848, I, p. 16, pl. VII, fig. 1, 2. Dyas, I, p. 108, pl. XX, fig. 5—9. DESOR, l. c. pl. XXI, fig. 15, 16. — Permien.

E. Verneuiliana KING, Mon. Perm. Foss. p. 53, pl. 6, fig. 22, 23, 24. DESOR, l. c. pl. XXI, fig. 13 14. — Permien.

E. scrobiculata G. et F. SANDBERGER, Verst. Rhein. Schichtensystems p. 382, pl. XXXV, fig. 3. DESOR, l. c. fig. 17.

E. lævispina SANDBERGER l. c. fig. 2. Comp. Archæocidaris Nerei (»v. MÜNSTER»), JOH. MÜLLER, Neue Echinoderm. Eifel, l. c., p. 262, pl. III fig. 10, 11. — Espèce différente des autres par ses mamelons secondaires plus grands et par ses radioles creux.

E. drydenensis VANUXEM, Report third geol. District, p. 184. HALL, Twentieth Report on the State Cabinet, p. 298. Ambulacres comme dans les Cidaris. — Chemung, dévonien supérieur de l'Amérique du Nord.

Archæocidaris M'COY.

GRIFFITH. Synopsis p. 173 (1844). — Ann. and Mag. Nat. Hist., 2d series, III, p. 251. — M'COY, Contributions, p. 113. *Syn.* Echinocrinus L. AGASSIZ, Monog. d'Échinodermes, 2de livraison, p. 15, et Nomenclator zoologicus; mentionné comme nouveau genre de Crinoïdées, comprenant les Cidaris Urei de FLEMG., C. Nerei, C. Protei et C. priscus du COMTE DE MÜNSTER. — Palæocidaris. DESOR, Catalogue raisonné, p. 36.

Groupe indiqué par M'COY pour recevoir des plaques isolées pourvues d'un gros mamelon primaire perforé et entouré d'un anneau circulaire, élevé, et, au dehors de celui-ci, d'un espace lisse a bord crénelé. On en a décrit les espeèes suivantes:

Espèces du calcaire carbonifère de l'Europe.

A. Urei (Cidaris) FLMG, Brit. Animals, p. 478. M'COY, GRIFFITH l. c. p. 174, pl. XXVII fig. 1. Cidaris benburbensis PORTLOCK, Report p. 352, pl. XVI, fig. 10.

A. Münsteriana DE KONINCK, Descript. An. fossiles Carb. Belge, pl. E, fig. 2. M'COY l. c. fig. 2. D'après DE KONINCK, Bullet., Brux. 2de série, XXVIII, p. 546, ces débris devraient être rapportés au Lepidocentrus eifelianus JOH. MÜLLER; d'après DESOR, au genre Eocidaris.

A. triserialis M'COY l. c. pl. XVI, fig. 1.

A. glabrispina PHILLIPS, Geol. Yorkshire II, p. 208.

A. vetusta PHILLIPS, l. c. p. 208.

A. Nerei v. MÜNSTER, Beitr., I, p. 62, pl. III, fig. 6. DE KONINCK, l. c. p. 34, p. E. fig. 1. ? JOH. MÜLLER l. c. p. 262, pl. III, fig. 10, 11, comp. Eocidaris lævispina SANDBERGER.

A. prisca v. MÜNSTER, l. c. p. 63.

A. Konincki DESOR, Synopsis, p. 155, pl. XXI, fig. 7—10.

A. rossica v. BUCH, Karstens Archiv, XVI, 1842, p. 523. G. FISCHER v. WALDHEIM, Oryctographie Gouv. Moscou, p. 149, pl. 28, fig. 3—8. VERNEUIL, Géol. Russ. d'Europe, II, p. 16, 396, pl. I fig. 2. DESOR, Synopsis, p. 156, pl. XXI, fig. 3—6. Comp. LUDW. SCHULTZE, l. c., p. 126, pl. XIII, fig. 4. — TRAUTSCHOLD, Bull. Moscou, XLI, 467, pl. IX, 1868: Plusieurs séries de plaques interradiales imbriquées, ayant la partie de leur bord qui pénètre au-dessous de la plaque adjacente, un peu prolongée, amincie et lisse. Mamelon conique et perforé, entouré, sur une certaine distance, d'un anneau circulaire, s'élevant à la hauteur du mamelon même, et d'une scrobicule large et lisse, à bord crénelé. Radioles longs de deux pouces, à renflement annulaire crénelé, à tige renflée, hérissée de pointes coniques disposées en spirales. Appareil masticatoire très-complet, semblable à celui des Cidarides. — Calcaire carbonifère supérieur de la Russie.

Espèces du calcaire carbonifère inférieur du l'Amérique du Nord.

A. Agassizi HALL, Geol. Iowa, p. 698, pl. XXVI, fig. 1. D'après MEEK et WORTHEN, les plaques interradiales de cette espèce et des deux suivantes seraient imbriquées. Proc. Ac. nat. sc. Philad. XXI, 81.

A. shumardana HALL, l. c. f. 3. DANA, Man. Geol., p. 312, fig. 534.

A. Wortheni HALL, l. c. fig. 4. DANA l. c. fig. 532. Ambulacres comme dans le genre Cidaris.

A. Keokuk HALL, l. c. fig. 2.

A. Norwoodi HALL, l. c. fig. 5.

A. mucronata MEEK et WORTHEN, Proc. Ac. n. sc. Phil., XII, 1860, p. 395. Geol. Surv. Illinois, II, p. 295. pl. 23, fig. 3.

A. aculeatus SHUMARD, Trans. Acad. St.-Louis, I, 224, 1858.

A. biangulata SHUMARD, l. c. p. 224.

A. megastylis SHUMARD, l. c. p. 225

A. gracilis NEWBERRY, Report Colorado River of West, III, p. 117, pl. I, fig. 4.

A. ornata NEWBERRY, l. c. III, p. 116, pl. I, fig. 2, 3.

A. longispina NEWBERRY, l. c. fig. 1.

A.? Tenesseæ TROOST, Proc. American Association, Cambridge Meeting, 1850, p. 59.

Lepidocidaris MEEK et WORTHEN.

Proc. Ac. n. sc. Philad., XXI, p. 79. — Geol. Survey Illinois, V, p. 478, pl. IX. fig. 15.

Fragment indiquant pour le test entier un diamètre probable de onze à douze centimètres. Forme générale apparemment sphéroidale déprimée. Ambulacres étroits, légèrement convexes, à plaques faiblement imbriquées adoralement, les entières alternant, en apparence irrégulièrement, avec des demi-plaques cunéiformes, celles-ci pour la plupart ayant la pointe dirigée vers la suture médiane. Aires interradiales très-larges, à huit (neuf?) rangées, ou davantage, de plaques, hexagonales au milieu, les externes pentagonales, retranchées par les ambulacres, toutes imbriquées aboralement et latéralement, mais de façon que l'adambulacrale est recouverte par la rangée prochaine, laquelle déborde la troisième etc., jusqu'à la médiane, dont les deux bords sont recouverts par les rangées voisines. Chacune des plaques interradiales pourvue d'un gros mamelon central, dont le sommet est formé en une petite proéminence perforée (pour la réception du radiole), et dont la base est entourée d'un dépression circulaire lisse, bordée de mamelons granulaires. Radioles primaires, 25 mm. de longueur ou moins, cylindriques, grêles, très-finement striés, à extrémité articulaire perforée et renflée presque jusqu'à former un anneau distinct. — Appareil masticatoire à dents marquées d'un large sillon longitudinal.

L. squamosus (Eocidaris) MEEK et WORTHEN l. c. — Calcaire carbonifère inférieur de Burlington, Amérique du Nord.

Lepidechinus HALL.

Twentieth annual Report of the Regents of the University of New-York etc., Albany, 1868, p. 295. — MEEK et WORTHEN. Geol. Surv. Illinois, II, 294.

Ambulacres étroits, à deux rangées de plaques entières, imbriquées adoralement. Aires interradiales très-larges, de neuf à onze rangées de plaques hexagonales, imbriquées aboralement et latéralement des deux côtés de la rangée médiane impaire et ambiguë, les plaques adambulacraires étant plus petites que les autres. Péristome petit. Appareil apical pentagonal, de plusieurs pièces ornementées. Au-dedans de l'un de ses angles, à l'endroit occupé par le madréporite chez les Échinoidées récentes, on voit des traces de six (?) plaques "disposées en cercle, exactement comme dans la pyramide ovarienne de l'Agelacrinites." A la face dorsale du test, les mamelons primaires des plaques interradiales adambulacraires sont petits, ceux de la rangée voisine plus grands, alternants, ceux de la rangée médiane les plus forts; à la face ventrale, il n'en existe que sur les plaques adambulacraires, comme chez le Périschodomus. Dents inconnues.

L. rarispinus HALL, l. c. pl. IX, fig. 10. Grès dévonien supérieur de Chemung, Amérique du Nord.

L. imbricatus HALL, ib. — A peine différent de l'espèce précédente. Calcaire de Burlington, terrain carbonifère inférieur de l'Amérique du Nord.

Xenocidaris LUDW. SCHULTZE.

Monographie der Echinodermen des Eifler Kalkes, Denkschriften d. Akad. d. Wiss. Wien, XXVI.

Radioles, trouvés isolés, en massue, à sommet tronqué, hérissé de pointes et de tubercules, à base concave, perforée au centre.

X. clavigera L. SCHULTZE l. c., p. 126, pl. XIII f. 3, b.

X. cylindrica L. SCHULTZE l. c., fig. 3, c.

Comp. Palæocidaris rhenanus QUENSTEDT, l. c. III, 377, pl. 75, fig. 30—37.

Chez les Échinoïdées paléozoïques, rien n'annonce une affinité quelconque avec les Échinoïdées édentées, dont l'apparition ne se fera que plus tard, à la période secondaire, ni avec les Clypéastrides, des temps tertiaires et modernes. Nulle part on ne leur trouve la forme allongée des premières ou la forme aplatie des secondes C'est plutôt aux Échinides et aux Cidarides qu'elles se lient par leur test globuleux à ouverture anale opposée au péristome, et par l'existence, constatée chez plusieurs d'entre elles, d'un appareil masticatoire, assez semblable à celui des Cidarides. Les Archéocidarides présentent même, dans les formes de leurs mamelons, des analogies évidentes avec ces derniers, et dans l'un de leur genres, le Lépidocidaris, on remarque, aux ambulacres, une alternance de plaques entières et de demi-plaques assez semblable à celle que l'on voit chez les Échinides. Mais il serait vain de s'attendre, à l'égard des Lépidocentrides et des Paléchinides, beaucoup plus éloignés des types connus, à trouver dans les descriptions et dans les figures, faites toujours d'après des fragments assez incomplets, des données sur leurs ambulacres propres à les faire comparer à ceux des autres Échinoïdées. Ainsi, il est impossible de savoir si l'asymétrie régnante partout ailleurs, existait déjà chez ces anciens Oursins, d'autant plus que l'on rencontre chez certains d'entre eux une conformation de ces parties apparemment toute particulière. Ce n'est pas seulement que chez le Pholidocidaris irregularis M. et W., le Melonites multiporus Norw. et Owen, le Lepidesthes Coreyi M. et W., le Lepidocidaris squamosus M. et W., les plaques ambulacraires, très-petites, soient disposées en séries transversales et imbriquées adoralement comme dans l'Asthénostoma Grube et l'Échinothuria Woodward, ou même encore latéralement, ce qui a lieu chez le Melonites, et que les ambulacres soient tellement élargis chez le Lépidesthes, qu'ils surpassent même du double les aires interradiales. On remarque encore que, tandis que chez les Échinides et les Cidarides les plaques réduites, cunéiformes et demi-plaques, restent intactes à la partie qui les termine du côté de l'aire interradiale, de sorte qu'à la suture elles alternent en parties égales avec les plaques entières, et que, par conséquent, leurs extrémités pointues se trouvent dirigées vers la suture médiane, laquelle est formée exclusivement des plaques entières, une disposition contraire paraît avoir eu lieu chez certains Paléchinides. Ainsi, d'après les figures données par Meek et Worthen, de leurs Palæechinus burlingtonensis et P. gracilis, toutes les plaques, entières et réduites, ont la même hauteur à la suture médiane, tandis que, des deux côtés de celle-ci, elles finissent en pointe vers la suture latérale, laquelle, par conséquent, est formée par les plaques entières seules. A en juger d'après l'esquisse donnée par Edward Forbes, le même fait se constate d'une manière encore plus évidente dans le Palæechinus Phillipsiæ, les demi-plaques étant de moitié moins larges que les plaques entières, de sorte que leurs pores se trouvent retirés jusque près de la suture médiane, structure qui se fait remarquer aussi dans le Protoéchinus anceps Austin. La même disposition a été observée dans l'Oligoporus Danæ Meek et Worthen, seulement les demi-plaques semblent être en nombre beaucoup moindre que les plaques entières. Enfin, quand, comme chez le Melonites multipora Norw. et Ow., les plaques ambulacraires sont imbriquées à la fois adoralement et transversalement, c'est depuis la suture médiane vers la suture latérale qu'elles se recouvrent. C'est là une conformation qui donne lieu de supposer à ces Échinoïdées des plus anciens temps géologiques, un mode de croissance de leur ambulacres tout spécial et méritant bien d'être soigneusement étudié.

B. AIRES INTERRADIALES.

Système périsomatique. Forme normale de ses plaques. Son asymétrie par rapport à l'axe antério-postérieur dans les Échinides et les Échinonéides. Son mode d'accroissement chez les Clypéastrides. Hétéronomie de l'aire latérale 1 chez les Ananchytides et les Spatanguides. Sa disposition symétrique chez les Cassidulides, les Collyritides, les Ananchytides et les Spatanguides. Différenciation progressive de l'aire impaire des Échinoïdées édentées. Traces d'une structure écailleuse chez les Spatanguides.

Les cinq régions du squelette tégumentaire que l'on désigne par les noms d'aires interradiales, d'interradiums ou d'aires interambulacrales, sont les cinq parties de l'enveloppe générale ou test, restées libres entre les espaces occupés par les ambulacres. Par leurs fonctions, le mode de croissance et les mouvements de leurs éléments constituants, elles diffèrent fondamentalement de ceux-ci. Elles constituent à elles seules un système particulier, le système périsomatique.

1. Échinoïdées à dents.

D'après l'état actuel de nos connaissances, il paraissait naguère certain que toutes les Échinoidées qui ont vécu depuis le commencement de la période secondaire jusqu'à nous, n'auraient eu, dans chaque aire interradiale, que deux rangées de plaques. Une espèce nouvellement découverte est venue invalider, d'une manière peu attendue, cette règle considérée générale. C'est le Tetracidaris Reynesi Cotteau, fossile du terrain crétacé du Département des Basses-Alpes [1]). Vrai Cidaride sous tous les autres rapports, et se plaçant naturellement à côté du Diplocidaris Desor, ce genre remarquable reproduit, au milieu d'une faune purement mésozoïque, le caractère essentiel des Échinoïdées paléozoïques, en présentant, dans chacune de ses aires interradiales, quatre rangées de plaques qui se réduisent brusquement à deux au sommet. Les plaques de la double rangée médiane sont hexagonales, celles des rangées adambulacraires pentagonales, étant retranchées à leurs bords externes de façon à s'adapter à la réception des ambulacres, dont les formes, dans ce contact, déterminent, ici comme partout, celles des plaques interradiales. Or, l'examen des données acquises sur ces mêmes parties chez les Échinoïdées paléozoïques tend à démontrer que, chez elles aussi, toutes les fois que les plaques interradiales ne sont pas transformées en écailles imbriquées, celles de leurs rangées médianes retiennent toujours la forme hexagonale inaltérée, tandis que par suite d'une modification amenée par l'enchâssure des ambulacres, les plaques adambulacraires s'approchent plus ou moins de la forme pentagonale. C'est le cas chez les genres Paléchinus, Mélonites, Oligoporus, Éocidaris, Archéocidaris, Lépidocidaris, Lépidéchinus. On est donc conduit à en conclure que c'est la forme hexagonale, mais non la forme pentagonale, qui doit être envisagée comme la forme normale des plaques interradiales.

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[1]) Revue et Magasin de Zoologie, publié par Guérin, 1872, p. 163, pl. XXII, fig. 7. Bulletin de la Société géologique de France, Sér. 3, I, p. 258, pl. III.

Chez les **Échinides**, les aires interradiales, qui sont toutes conformes, entrent dans la composition du péristome avec deux plaques, dont une grande et l'autre petite, dans le sens de la longueur de l'aire, mais dont les rapports ne sont généralement accessibles à l'observation que chez de très-jeunes individus. Le Toxopneustes drœbachensis (O. F. M.), quand il n'a qu'environ quatre mm.[1]) de diamètre, fait voir cette disposition, par suite de laquelle il se trouve que la plus petite plaque péristomienne, et la plus grande des deux dernières formées auprès de la pièce génitale, appartiennent aux rangées 1*a*, 2*a*, 3*b*, 4*a*, 5*a*, mais la plus grande plaque péristomienne, et la plus petite auprès de la pièce génitale, aux rangées 1*b*, 2*b*, 3*a*, 4*b*, 5*b*. C'est encore l'ordre que l'on retrouve chez la Salenia[2]), et qui paraît dominer dans tout le groupe des Échinides. C'est toujours l'interradium 3, l'antérieur du côté gauche de l'animal, dans lequel la position des plaques est changée. On reconnaît facilement qu'une pareille disposition est symétrique des deux côtés d'un diamètre passant par l'ambulacre I et l'interradium 3, le même qui constitue l'axe longitudinal de l'Échinometra, et dans le plan vertical duquel se trouve dans ce genre la courbe de la flexion du test. C'est aussi dans cette même ligne qu'est placée l'ouverture anale quand celle-ci est excentrique, et que se trouve le diamètre le plus long du périprocte, devenu elliptique chez l'animal adulte.

Des recherches ultérieures devront décider de quelle manière sont disposées les plaques interradiales des **Cidarides**. Il paraît qu'à la face intérieure des plaques qui constituent la limite temporaire de leur couronne, il se fait une espèce d'écaillement, par suite duquel sont produites les plaquettes interradiales de la membrane buccale.[3]) A l'égard des **Échinoconides**, le nombre restreint des exemplaires accessibles à l'observation, et leur état de conservation, ont laissé trop de doutes pour qu'il soit permis de tracer ici avec certitude la disposition des éléments de leur aires interradiales.[4])

Les **Clypéastrides**[5]) diffèrent des autres Echinoïdées en ce que leurs aires interradiales sont percées de pores tentaculaires. Elles les ont aussi toutes les cinq semblables entre elles, leurs formes et les dimensions relatives de leurs éléments présentant une correspondance parfaite. Ainsi, chez l'Échinocyamus[6]) et le Laganum[7]), toutes les aires interradiales sont terminées auprès de l'appareil apical en une seule plaque grande et triangulaire imperforée, tandis que dans les genres Clypéaster, Encope, Mellita, Échinarachnius, Arachnoïdes[8]), les plaques plus jeunes deviennent partout de plus en plus petites, et les supérieures, toujours disposées par paires, embrassent souvent encore les pores génitaux, lesquels ne trouvent plus de place dans l'appareil apical.[9]) Comme on vient de le voir, les interradiums subissent une pression telle par l'élargissement graduel des ambulacres, que leurs rangées en sont très-souvent coupées en deux. A cet égard, comme à d'autres, les deux frontaux, 2 et 3, sont généralement symétriques entre eux, comme le sont aussi les deux latéraux, 1 et 4, et l'impair ne présente que de légères modifications. C'est de même par rapport à l'augmentation successive du nombre de leurs

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[1]) Pl. XVII, fig. 140. [2]) Pl. XIX, fig. 165. [3]) Pl. XX, fig. 166, 167, 168. [4]) Pl. XIV, fig. 124, 125, 126. Pl. XV, fig. 132, 133, 134. [5]) Pl. XLIV—LII. [6]) Pl. XLIV. [7]) Pl. XLV. [8]) Pl. XLVI—LII. [9]) Pl. XLVI, fig. 237: Encope Valenciennesi AG. Pl. XLVII, fig. 239: Clypeaster rosaceus (L.). Pl. XLVIII, fig. 240: Mellita hexapora (GM)

plaques. La très-jeune Mellita hexapora[1]), de 6,5 mm. de longueur, fait voir, dans toutes les aires interradiales, neuf à dix plaques, l'adulte, de 85 mm., treize ou peut-être douze, car il est presque impossible de s'assurer si la plaque par où passe la périphérie, est divisée en deux par une suture, ou non. De même, chez le très-jeune Echinarachnius parma[2]), de six mm. et demi de longueur, on compte dans les aires interradiales paires onze paires de plaques, et neuf dans l'impaire, et, chez l'adulte, dans les premières quinze à seize, dans la dernière quatorze. Les modifications de forme peu considérables que présente toujours l'aire interradiale impaire, sont déterminées par la position, à son intérieur, de la partie rectale du canal alimentaire. C'est à cette disposition qu'il faut attribuer la circonstance que, dans la majorité des genres, cet interradium résiste à un plus haut degré que les autres à la pression exercée par les plaques des séries ambulacraires I*a* et V*b*. Le périprocte, pratiqué par érosion aux bords contigus de deux ou de quatre de ses plaques, ou même en partie aux bords des plaques ambulacraires *2* de I*a* et V*b*, lorsque celles-ci viennent couper l'aire en deux, comme dans l'Encope Valenciennesi Ag.[3]), reste à peu près en place par rapport aux plaques environnantes, bien que sa forme et sa grandeur relative se modifient pendant la croissance. Chez la très-jeune Mellita hexapora Gm.[4]), il est comparativement beaucoup plus grand que chez l'adulte, et d'un contour arrondi. Il est alors entouré antérieurement d'une partie très-mince de la plaque *2*, qui disparaît peu à peu, de sorte que finalement c'est la plaque *1* qui constitue la limite adorale de son aperture devenue ovalaire. Dans cette espèce, comme dans le genre Encope[5]), l'aire interradiale impaire se distingue encore des autres d'une manière très-remarquable par la présence d'un hiatus ou lunule. Cette solution de continuité se produit de très-bonne heure chez la Mellita, tous les autres hiatus qui se trouvent dans les ambulacres ne venant que plus tard. Celui de l'interradium impair est presque circulaire dans l'individu très-jeune, ovalaire chez l'adulte, et il change de position pendant la croissance, de manière que chez le premier il est bordé par les plaques ventrales *2* et *3* et par les plaques dorsales *5* et *6* ou *7*, tandis que chez l'individu adulte il est entouré, à la face ventrale, des mêmes plaques *2* et *3*, mais à la face dorsale des plaques *6*, *7* et *8*, vu que les plaques dorsales s'approchent insensiblement du bord et y deviennent même en partie ventrales.

2. Échinoïdées édentées.

Les aires interradiales de **l'Échinonéus**[6]) offrent une grande ressemblance avec celles des Échinides quant aux formes des plaques et à leurs proportions mutuelles, de façon même que l'impaire 5, abstraction faite du périproctium, est d'une conformation complètement identique à celle des aires interradiales paires. Elles présentent cependant, à l'égard des plaques péristomiennes, une disparité remarquable, qui mériterait bien d'être examinée de plus près chez de jeunes individus, ainsi que bien d'autres particularités d'organisation de cette Échinoïdée, son péristome oblique, ses branchies etc. C'est que les interradiums 1, 3 et 5 entrent dans le péristome chacune avec une seule plaque,

[1]) Pl. XLIX, fig. 241. Pl. XLVIII. fig. 240. [2]) Pl. L, fig. 245, 244. [3]) Pl. XLVI, fig. 237. [4]) Pl. XLIX, fig. 241, 242, 243. Pl. XLVIII, fig. 240. [5]) Pl. XLVI, fig. 237. [6]) Pl. IX, fig. 79—83.

les interradiums 2 et 4 avec deux. En réduisant par la pensée le péristome oblique en un cercle, on voit cette disposition encore symétrique par rapport au diamètre traversant l'ambulacre I et l'interradium 3, le même qui ressort de la disposition de ces mêmes parties chez les Échinides. Dans l'Échinonéus il est coupé transversalement par le plus grand diamètre du péristome allongé dans la direction des aires interradiales 2 et 4, et ayant son anse la plus profonde vis à vis de l'ambulacre I, et non de l'interradium impair. Mais l'axe longitudinal du corps et la courbe de sa flexion coïncident ici avec l'axe antério-postérieur passant par l'ambulacre III et l'aire interradiale 5.

Toutes les autres Échinoïdées édentées, à test sensiblement allongé dans le sens de l'axe antério-postérieur, avec la face dorsale plus ou moins convexe, la ventrale aplatie, et ayant un certain nombre des premières plaques ambulacraires de la région buccale pourvues de grands pores géminés et de tentacules longs et puissants, ne présentent qu'une seule plaque péristomienne dans chacune de leurs cinq aires interradiales. Par un premier partage on écarte des autres les **Cassidulides** [1]), caractérisés par leurs phyllodes, et par l'alternance, à la région buccale, de plaques ambulacraires entières et de demi-plaques rappelant à peu près celles des Échinides, des Échinoconides et des Échinonéides. Lorsqu'on y compare les **Collyritides** [2]), on croit d'abord avoir sous les yeux un type assez éloigné, tant on est porté à accorder d'importance au caractère singulier qui, chez ces derniers, dérive du développement extraordinaire de la partie du périsome interposée entre le bivium et le trivium, et dont les plaques, au lieu de devenir de plus en plus petites vers le sommet, y maintiennent presque toute leur largeur, de manière à séparer en deux parties l'appareil apical et à reléguer en arrière le bivium avec les deux pièces ocellaires. Mais, si l'on regarde de plus près leurs squelettes étalés, on ne tardera pas à reconnaître que cette modification considérable du système dorso-central n'a pas été suivie de changements correspondants dans le reste du corps, et qu'il existe entre ces deux groupes, les Cassidulides et les Collyritides, dans la totalité de leur conformation, une certaine ressemblance et une affinité plus intime que celle qui les unit aux autres Échinoïdées édentées. Les formes simples et peu accidentées de leurs ambulacres ainsi que de leurs aires interradiales, les pétales à contours à peine accusés, le peu de variation de forme et de grandeur dans les éléments des aires interradiales, dont l'impaire, sauf pour le périprocte, ne présente que de légères modifications, toutes ces circonstances paraissent rappeler encore, à un certain degré, la simplicité des Échinonéides, originaires, comme eux, des premiers temps de la période secondaire, et elles contrastent, d'un autre côté, avec la grande variabilité de ces mêmes parties chez les Spatanguides, qui n'ont existé, en tant que nous le sachions, que depuis la période crétacée, mais qui dominent parmi les Échinoïdées édentées du monde actuel.

Car, lorsque par les **Ananchytides** on s'approche des Spatanguides, on voit s'introduire dans le périsome une modification constante, d'autant plus remarquable qu'elle

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[1]) Pl. VII, fig. 61—67; pl. XXII, fig. 179. [2]) Pl. XXIII, fig. 180.

touche à un trait de structure partout ailleurs exempt de variabilité. C'est dans l'une des aires interradiales, dans celle du côté droit, 1, que s'opère cette modification par suite de laquelle la conformité bilatérale du périsome est troublée par une disposition particulière de quelques-uns de ses éléments, différente d'un côté à l'autre. C'est l'hétéronomie des aires latérales caractéristique de ces deux groupes. Dans l'aire interradiale 1 de l'Ananchytes sulcata Goldf. [1]), on voit, à la suite de la petite et unique plaque péristomienne *1*, une seule plaque, *2+2*, représentant les deux plaques *2* des rangées *a* et *b* de l'aire interradiale gauche, 4, laquelle doit donc être considérée comme étant composée des plaques 1 *a 2* et 1 *b 2* fondues ensemble. En examinant les mêmes parties de l'Holaster scanensis Cotteau [2]), on leur trouve la même conformation, la plaque péristomienne de l'aire interradiale 1 étant suivie d'une plaque unique appartenant à la fois aux deux rangées *a* et *b*, et composée par conséquent des deux plaques 1 *a 2* et 1 *b 2* réunies. Dans l'Ananchytes, on remarque en outre, dans l'aire interradiale correspondante, 4, la plaque *a 2* séparée de la péristomienne *1* par l'interposition de la plaque *b 2*. C'est une anomalie qui ne manque pas d'analogie parmi les Spatanguides prymnadètes.

Le groupe dont ces deux genres peuvent être regardés comme typiques, fait son apparition dans la formation crétacée pour s'éteindre dans les couches éocènes, où M. Laube [3]) a encore trouvé son Oolaster, genre identique peut-être avec l'Ananchytes. Chez les **Spatanguides,** qui ont continué jusque dans le monde actuel, cette diversité partielle de l'aire interradiale latérale droite devient de plus en plus évidente et se régularise graduellement. Il a été remarqué déjà qu'à part les Adètes, qui manquent de fascioles, on reconnaît parmi les Spatanguides deux autres groupes bien caractérisés, les uns dépourvus de fasciole infra-anale, les Prymnadètes, les autres pourvus de cette fasciole, les Prymnodesmiens. Quoique réunis, en apparence, par un caractère négatif seulement, les genres prymnadètes ne laissent pas que d'être liés ensemble par d'autres rapports positifs d'une valeur évidente. Moins riches en espèces que les Prymnodesmiens dans les mers actuelles, au moins dans les régions accessibles jusqu'ici, mais plus nombreux qu'eux dans les terrains crétacés, et peut-être aussi dans les grandes profondeurs océaniques de notre monde; ayant très-souvent le madréporite séparé de l'aire interradiale impaire par suite du rapprochement réciproque des plaques génitales et ocellaires, ou tout au moins de ces dernières, et présentant une certaine irrégularité dans l'arrangement des plaques du bivium par rapport à l'interradium impair, ces Spatanguides, tout en montrant une tendance évidente vers une disposition constante des plaques *2* des interradiums latéraux 1 et 4, n'offrent encore cette tendance que d'une manière vague et inconstante. Le siége même de l'hétéronomie est variable.

C'est le Palæostoma mirabile (Gray) [4]), forme exceptionnelle sous plusieurs rapports, qui présente la déviation la plus singulière. Tandis que, chez les autres Spatanguides vivants, dans tous les interradiums la plaque péristomienne *1* est suivie d'une paire

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[1]) Pl. V, fig. 51. Pl. XXIV, fig. 181. [2]) Pl. XXV, fig. 182—184. La fig. 54, pl. V, n'est pas exacte dans ces détails par suite de fractures dans l'original. [3]) Neues Jahrbuch für Mineralogie etc., 1869, p. 451, pl. VI. [4]) Pl. XXXII, fig. 197—199.

de plaques, la *2* de la rangée *a*, et la *2* de la rangée *b*, ce genre a ceci d'extraordinaire, que la deuxième plaque est simple et unique, c'est-à-dire que les deux sont confondues en une seule, et cela dans les interradiums frontaux non moins que dans les interradiums latéraux. Par conséquent, ce qui constitue ici l'hétéronomie de l'interradium 1, c'est que la plaque ainsi devenue binaire, *a2+b2*, comprend en outre la plaque *b 3*, la correspondante *a 3* de l'interradium 4 étant restée libre. C'est là le seul exemple jusqu'ici observé de la plaque *b 3* confondue avec la *b 2*.

Cette fusion des plaques 1 *a 2* et 1 *b 2* se répète chez la Faorina chinensis Gray [1]) et la Desoria australis Gray [2]), mais uniquement dans l'interradium 1, ces mêmes plaques étant séparées dans tous les autres. C'est là la disposition qui se montra déjà chez les Ananchytides. Dans la Desoria, la plaque 4 *b 2* est, de plus, mise hors de contact avec la péristomienne par l'interposition de la 4 *a 2*, d'une manière analogue, *mutatis mutandis*, à ce qui a lieu chez l'Ananchytes. C'est donc selon le type de ce groupe éteint que s'effectue dans ces deux genres prymnadètes vivants l'hétéronomie du côté droit. Dans cinq autres genres des mers actuelles, l'Hémiaster [3]), l'Abatus [4]), l'Agassizia [5]), le Schizaster [6]), la Moïra, elle rentre dans la règle commune, selon laquelle ce sont les plaques 1 *a 2* et 1 *a 3* qui se fondent ensemble pour en former une seule. C'est là l'hétéronomie normale. Dans le groupe des Adètes [7]) on la voit développée chez l'Échinospatagus.

Les Spatanguides prymnodesmiens [8]), dont le genre Micraster est, d'après nos connaissances actuelles, le seul qui ait vécu déjà dans la période crétacée, sont les Spatanguides modernes par excellence, puisqu'ils se développent de plus en plus depuis le commencement de la période tertiaire jusqu'à nous. Chez tous aussi l'hétéronomie de l'interradium 1 est déterminée par la fusion des plaques 1 *a 2* et 1 *a 3* en une seule, laquelle presque toujours, et invariablement dans les genres récents, affectionne la forme des 4 *b 1* et 4 *b 2* prises ensemble. Si cette plaque, devenue ainsi binaire, ne présente pas néanmoins, dans beaucoup de cas, une grandeur qui paraît supporter l'idée d'une pareille fusion, quelques-unes des autres plaques de la même rangée viennent combler ce défaut jusqu'à un certain point, en se donnant une grandeur tant soit peu plus considérable. Dans quelques cas c'est la plaque *1*, ce que l'on voit dans l'Hémiaster [9]) et dans le Micraster [10]), mais le plus souvent ce sont une ou plusieurs des plaques suivantes, la *4* [11]), ou les *4* et *5* [12]), les *4*, *5* et *6* [13]), ou même une plaque plus distante, la *8* [14]), par lesquelles ce remplissage est fourni.

Telle est la disparité de conformation que présente dans les Ananchytides et les Spatanguides l'aire interradiale 1, la latérale droite, relativement à l'aire correspondante du côté gauche. Rencontrée sans exception dans la grande pluralité des genres, elle doit se retrouver chez tous. Il est évident que ce n'est pas l'aire interradiale 4 qui a une plaque de plus, mais bien l'aire interradiale 1 qui en a une de moins, défaut apparent, résultant de la fusion de deux plaques normalement distinctes. Quelque acte vital,

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[1]) Pl. XXVII, fig. 186. [2]) Pl. XXVIII, fig. 187. [3]) Pl. XXVI, fig. 185. [4]) Pl. XXIX, fig. 188. [5]) Pl. XXX, fig. 191. [6]) Pl. XXXI, fig. 194. [7]) Voir la gravure sur bois, p. 58. [8]) Pl. XXXII, fig. 200, Pl. XXXIII—XLIII. [9]) Pl. XXVI, fig. 185. [10]) Pl. XXXIII, fig. 201. [11]) Pl. XL: Plagionotus; Pl. XXXIV: Brissus. [12]) Pl. XXIX; Abatus; Pl. XXX: Agassizia. [13]) Pl. XXVI: Hemiaster; Pl. XXXVII: Brissopsis; Pl. XLI: Breynia. [14]) Pl. XXXVI: Spatangus; Pl. XXXIX: Echinocardium.

dont on ne saurait à présent que deviner la nature, a fait, de très-bonne heure, dévier de son cours régulier la formation des plaques du périsome dans un espace circonscrit peu éloigné de l'endroit où se trouvera plus tard le stoma, sur la forme duquel il n'a cependant exercé aucune influence. C'est dans la direction de cette même aire interradiale 1 que se trouve le diamètre $\alpha\omega$ par rapport auquel les ambulacres sont disposés d'une certaine manière symétrique. Lorsque, un jour, par suite d'études suivies et approfondies sur le développement des Échinoïdées, on sera arrivé à constater si ce diamètre indique la position hétérologue qu'a eue l'Oursin, encore enfermé dans l'intérieur de sa larve, relativement à celle-ci, alors aussi on reconnaîtra peut-être si cette conformation disparate de certaines plaques du périsome du côté droit n'a pas quelque relation avec l'acte vital par lequel, avant de terminer son état larval, l'Oursin reçoit dans l'intérieur de son corps une partie des viscères de son plutéus.

Des différents systèmes qui composent le squelette de l'Échinoïdée, le périsome est celui qui en détermine essentiellement la forme générale. Il a été remarqué, à l'égard des Échinides, qu'autant qu'il est permis d'en juger d'après ce qui a lieu chez le Toxopneustes et la Salenia, leurs aires interradiales sont disposées de manière à être symétriques des deux côtés d'un diamètre passant par l'ambulacre I et l'aire interradiale 3; et, en effet, si les plaques péristomiennes correspondantes sont jointes par des lignes droites, on a deux pentagones conformes et semblables inscrits dans le stoma, formant ensemble une figure symétrique par rapport au diamètre en question, comme la figure formée par les deux pentagones des ambulacres l'est relativement au diamètre $\alpha\omega$. Partagées, en même temps, d'une manière égale et uniforme, entre les intervalles des ambulacres, les cinq aires se combinent pour former un ensemble circulaire selon ce même diamètre; mais, de tous les genres des Échinides, il n'en est qu'un seul, celui de l'Échinometra, dont ce diamètre soit à la fois devenu l'axe longitudinal. Si de même, dans le péristome tordu de l'Échinonéus [1]), on joint entre elles par des lignes droites, d'abord les trois plaques uniques et les deux plus petites des plaques paires, puis les trois plaques uniques et les deux plus grandes de ces dernières, on a deux pentagones ayant en commun la base 1—5, et les angles opposés à celle-ci coïncidant en l'aire 3, placés, par suite, symétriquement par rapport au même diamètre passant par l'ambulacre I et l'interradium 3. Mais ici les aires interradiales, bien que disposées selon ce diamètre par rapport à l'alternance de leurs éléments, déterminent, par une légère inégalité, l'allongement du test, non pas dans la direction de I et 3, mais de III et 5, c'est-à-dire dans celle de l'axe antério-postérieur, indiqué par l'emplacement de la bouche et de l'ouverture anale. Il en est tout autrement des Clypéastrides, et, à l'exception des Échinonéides, de toutes les Échinoïdées édentées. Partout, chez celles-ci, chacune des aires interradiales entre dans le péristome avec une plaque unique, et, abstraction faite de l'hétéronomie des Ananchytides et des Spatanguides, leurs éléments sont disposés de façon à symétriser ensemble des deux côtés de l'axe antério-postérieur, lequel devient encore l'axe longitudinal du corps. C'est

[1]) Pl. IX, fig. 80, 82, 83.

là la symétrie bilatérale qui vient s'établir dans la conformation générale des Échinoïdées édentées, par suite de cette coïncidence constante de l'axe des aires interradiales, de l'axe antério-postérieur, et de l'axe longitudinal du corps, en une seule ligne médiane. Evidente dans toute la série de leurs genres, cette symétrie se combine, chez les types anciens, avec une certaine uniformité des éléments constituants, rappelant les Échinoïdées dites régulières, tandis que chez d'autres, et particulièrement chez les types modernes, elle se trouve établie au moyen d'éléments souvent très-disparates. C'est que le travail morphologique du système interradial, dont résulte cette symétrie, en opérant sur le nombre, la forme et la grandeur relative des plaques, ne se fait pas d'une manière uniforme dans toutes les parties à la fois. Au contraire, on peut observer qu'il agit avec plus de force dans les parties postérieures dont l'accroissement est aussi plus fort, et qu'il se fait sentir le plus à la face ventrale du corps dont il modifie plus profondément qu'ailleurs les éléments. Ainsi, la conformité des aires frontales, 2 et 3, des deux côtés de l'ambulacre impair, se trouve partout parfaitement établie, leurs rangées intérieures 2 *b* et 3 *a*, et les extérieures, 2 *a* et 3 *b*, symétrisant ensemble, mais par des formes ménagées et simples; les aires latérales 1 et 4, lesquelles, en séparant le bivium du trivium, forment les flancs du corps, ont une tendance marquée à correspondre de plus en plus par leurs rangées 1 *a* et 4 *b*, 1 *b* et 4 *a*, mais en développant des formes plus ou moins accidentées et disparates; et l'aire 5, l'impaire, embrassée par le bivium et constituant avec l'ambulacre III la partie médiane du corps, en obéissant à la loi commune, se différencie d'une manière de plus en plus prononcée.

Si donc l'on examine d'abord, dans les groupes divers, la conformation des aires interradiales paires, on trouve que chez les types les plus anciens, comme les Collyritides [1]) et les Ananchytides [2]), les plaques sont d'une ressemblance très-marquée, de manière que celles de la région buccale ne surpassent généralement pas les autres, et n'en diffèrent pas même très-notablement par leurs formes. Dans le Cassidulus [3]), genre récent d'un groupe qui de la période jurassique a survécu jusqu'à nous, une symétrie parfaite se trouve jointe à une remarquable uniformité des plaques, mais les ventrales sont d'une grandeur qui contraste sensiblement avec la forme raccourcie de celles des flancs, et des dorsales à peine plus allongées. La même observation se présente quand on poursuit, chez les Spatanguides, la série des transformations qu'éprouvent ces mêmes parties. Parmi les Prymnadètes, l'Hémiaster [4]), genre par préférence crétacé, se fait remarquer par un certaine conformité de ses plaques grandes et peu nombreuses, dont celles de la région buccale sont même plus petites que celles des flancs. Il en est de même chez le Paléostoma [5]). Dans la Faorina [6]), dont le test est globuleux comme celui de ces deux genres, les plaques formant les flancs sont encore assez grandes et en petit nombre, la plaque *2* reste sensiblement plus petite que la *3* dans les aires 1 et 4; elle l'excède légèrement dans les rangées 2 *b* et 3 *a* des frontales, et ce n'est que dans les rangées 2 *a* et 3 *b* qu'elle la surpasse d'une manière appréciable; de plus, cette même plaque *2*, dans les rangées 1 *a* et 4 *b* de la Faorina comme dans celles de l'Hémiaster expergitus n. et de l'H. Fourneli Desh., est d'une forme très-

[1]) Pl. XXIII, fig. 180. [2]) Pl. XXIV, fig. 181, Pl. XXV, fig. 182—184. [3]) Pl. XXII, fig. 179. [4]) Pl. XXVI, fig. 185. [5]) Pl. XXXII, fig. 197. [6]) Pl. XXVII, fig. 186.

irrégulière approchant du rectangle, retrouvée aussi chez l'Échinospatagus. Et, lorsque de ces genres vivants, qui tiennent plus ou moins à des formes éteintes, on passe aux genres Desoria [1]), Agassizia [2]), Schizaster [3]), Abatus [4]), on ne peut que leur reconnaître une certaine tendance vers une conformation des plaques ventrales particulière, différente de celle des plaques suivantes; mais cette tendance est encore peu marquée, et ce n'est que dans le genre Abatus qu'elle arrive à une disposition de ces parties semblable à celle qui doit être considérée comme normale chez les types récents. C'est chez les Prymnodesmiens que l'on voit cette conformation portée à son plus haut degré de développement, par l'étendue souvent très-considérable de la plaque *2*, surtout dans les aires 1 et 4, et par sa forme triangulaire plus ou moins parfaite. Mais ici, comme dans le groupe des Prymnadètes, cette conformation particulière ne se montre pas chez les types anciens. Elle ne se trouve pas chez le Micraster [5]), de la période crétacée; au contraire, on ne peut remarquer chez celui-ci qu'une disposition des éléments de ces parties semblable à celle décrite plus haut chez l'Échinospatagus, l'Hémiaster, le Paléostoma et la Faorina, et rappelant même celle observée chez les Ananchytides. C'est la même petitesse, la même forme subrectangulaire à bord adoral large de la plaque *2* de 1 *a* et 4 *b*, c'est à peu près l'uniformité des plaques des flancs et du dos, caractéristique des derniers. On reconnaît presque les mêmes traits dans le Paléotropus [6]), qui tient aux types anciens par sa forme générale ovoïde et ses ambulacres apétales à fleur de test, et parmi les genres vivants on croit voir une disposition analogue mais exagérée chez le Brissus [7]), dont la plaque *2* des 1 *a* et 4 *b* se trouve largement tronquée à son bord adoral, et éloignée de la péristomienne, comme cela a lieu dans la Desoria. Mais, lorsque de la Méoma [8]), laquelle par sa fasciole infra-anale incomplète n'est qu'à demi prymnodesmienne, on passe à la série des genres bien caractérisés de ce groupe, aux Brissopsis [9]), Spatangus [10]), Kleinia [11]), Echinocardium [12]), Plagionotus [13]), Eupatagus, Breynia [14]), Maretia [15]), Lovenia [16]), on voit cette symétrie bilatérale des aires interradiales paires se constituer avec une régularité de plus en plus grande. Les plaques *2* des quatre aires s'approchent de la forme triangulaire, presque parfaite dans les rangées 1 *a* et 4 *b*, 2 *b* et 3 *a*, mais restant tronquée adoralement dans les rangées 1 *b* et 4 *a*, 2 *a* et 3 *b*. Ce sont les *2* des 1 *a* et 4 *b* qui, en présentant le plus parfaitement une figure triangulaire, touchent à la péristomienne *1* par un angle pointu ou très-légèrement tronqué, en prenant en même temps un développement de grandeur souvent considérable, témoins les genres Plagionotus, Breynia, Maretia, Lovenia, Eupatagus, Spatangus, et contrastant fortement avec celle des plaques des flancs devenues très-raccourcies en raison de la longueur, de manière à presque déguiser l'hétéronomie de la rangée 1 *a*. Dans la plupart des genres, l'étendue des plaques *2* va en augmentant de 2 *b* à 1 *a*, et de 3 *a* à 4 *b*, et ce n'est que chez la Brissopsis et la Kleinia que celle des 1 *a* et 4 *b* est moins grande que celle des 1 *b* et 4 *a*, et qu'à l'instar de ce qui se voit chez l'Échinocardium, celle de 2 *a* et 3 *b* surpasse un peu celle de 1 *b* et 4 *a*.

[1]) Pl. XXVIII, fig. 187. [2]) Pl. XXX, fig. 191. [3]) Pl. XXXI, fig. 194. [4]) Pl. XXIX, fig. 188. [5]) Pl. XXXIII, fig. 201. [6]) Pl. XXXII, fig. 200. [7]) Pl. XXXIV, fig. 202. [8]) Pl. XXXV, fig. 205. [9]) Pl. XXXVII, fig. 213. [10]) Pl. XXXVI, fig. 208. [11]) Pl. XXXVIII, fig. 219. [12]) Pl. XXXIX, fig. 222. [13]) Pl. XL, fig. 227. [14]) Pl. XLI, fig. 228. [15]) Pl. XLII, fig. 229. [16]) Pl. XLIII, fig. 232.

En examinant ainsi, dans les divers genres, cette symétrie bilatérale des éléments constituants des aires interradiales paires, on reconnait encore d'autres relations de conformité, moins apparentes mais réelles, qui existent entre les deux aires du même côté du corps, c'est-à-dire entre la 1 et la 2, et entre la 3 et la 4, des deux côtés des ambulacres pairs du trivium, le II et le IV [1]). Ici, ce sont les deux rangées externes et les deux internes qui tendent à symétriser ensemble, la 1 *a* avec la 2 *b*, la 1 *b* avec la 2 *a*, du côté droit, la 3 *a* avec la 4 *b*, la 3 *b* avec la 4 *a*, du côté gauche. En prenant, comme le type le plus régulièrement développé des Spatanguides, le genre Kleinia, on y voit cette symétrie spéciale unilatérale réalisée d'une manière très-manifeste. Les péristomiennes triangulaires 1, *1* et 2, *1*, ainsi que 3, *1*, et 4, *1* sont symétriques, étant allongées en pointes dans des sens opposés, la 1, *1* et la 4 *1* en arrière, vers les 1 *a 2* et 4 *b 2*, la 2, *1* et la 3, *1* vers le devant, c'est-à-dire vers la 2 *b 2* et la 3 *a 2*; la 1*b 2* et la 2 *a 2*, de même que la 4 *a 2* et la 3 *b 2*, sont largement tronquées adoralement, et chacune d'elles occupe de son bord adoral toute la base aborale de la péristomienne; la 1 *a 2+3* et la 2 *b 2* de même que la 4 *b 2* et la 3 *a 2* sont triangulaires, et ne touchent qu'avec leurs angles adoraux pointus aux angles postérieurs de leurs péristomiennes. Mais cette symétrie, si nettement établie dans ce genre, quand on la poursuit dans la série des Prymnodesmiens, en remontant aux genres à plaques ventrales très-élargies, ou en descendant vers le groupe des Prymnadètes, s'affaiblit par degrés jusqu'à se perdre complètement, et même jusqu'à être remplacée par une conformation contraire. La Lovenia [2]) et la Brissopsis [3]) la présentent presque inaltérée, les péristomiennes de 1 et de 2, de 3 et de 4 ayant encore des positions et des formes symétriques, mais on observe que dans les 2 *b 2* et 3 *a 2* une troncature de l'angle adoral s'est déjà introduite. Le bord de soudure ainsi formé entre ces plaques et leurs péristomiennes se prolonge de plus en plus dans les genres Eupatagus, Breynia [4]), Maretia [5]), Echinocardium [6]), jusqu'à devenir dans le Plagionotus tout aussi long que le bord joignant la 2 *a 2* à la 2 *a 1* et la 3 *b 2* à la 3 *b 1*, et même plus long, comme dans le Spatangus [7]), la Méoma [8]), le Paléotropus [9]), le Brissus [10]), le Micraster [11]). Ce dernier, qui, bien que pourvu d'une fasciole infra-anale, participe au caractère ancien de l'appareil apical fermé des Prymnadètes de la craie, présente aussi très-distinctement un trait de conformation à peine indiqué chez quelques Prymnodesmiens, mais très-manifeste chez les Prymnadètes, celui d'avoir le bord de soudure entre la 4 *b 2* et 4 *b 1* du côté gauche sensiblement plus étendu que celui qui réunit la 1 *a 2+3* à la 1 *a 1* du côté droit. C'est que chez les Prymnodesmiens vivants on peut observer que la troncature de l'extrémité adorale des plaques *2* de 2 *b* et de 3 *a*, est, dans quelques cas, comme chez la Breynia et le Spatangus, accompagnée d'une troncature correspondante, mais bien plus légère, des plaques *2* de 1 *a* et 4 *b*, laquelle est aussi un peu plus considérable du côté gauche que du côté droit. Or, si par le Schizaster [12]), qui tient encore à cet égard aux Prymnodesmiens, on passe aux genres

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[1]) Pl. XXXVIII, fig. 219. [2]) Pl. XLIII, fig. 232. [3]) Pl. XXXVII, fig. 213. [4]) Pl. XLI, fig. 228. [5]) Pl. XLII, fig. 229. [6]) Pl. XXXIX, fig. 222. [7]) Pl. XXXVI, fig. 208. [8]) Pl. XXXV, fig. 205. [9]) Pl. XXXII, fig. 200. [10]) Pl. XXXIV, fig. 202. [11]) Pl. XXXIII, fig. 201. [12]) Pl. XXXI, fig. 194.

Abatus [1]), Agassizia [2]), Faorina [3]), Palæostoma [4]), Hemiaster [5]), ce caractère se montre de plus en plus développé, et partout le bord de soudure entre ces deux plaques est plus long du côté gauche que du côté droit. En cela, comme en d'autres points, ce sont les deux types crétacés des deux groupes, le Micraster et l'Hémiaster, qui se ressemblent le plus.

L'aire interradiale impaire, à peine différente des autres chez l'Échinonéus [6]), se modifie insensiblement dans les genres anciens, pour se différencier dans les modernes plus fortement encore que les aires paires. Dans les Collyrites [7]), sa plaque péristomienne est très-petite, plus petite même que celles des aires 1 et 4, et prolongée obliquement dans sa partie postérieure, et les plaques ventrales *3* et *4* sont à peine plus grandes que le reste. Les Ananchytes [8]) offrent une péristomienne impaire presque rectangulaire, plus grande que celles des aires paires, et les plaques ventrales sont presque égales aux autres. Dans l'Holaster [9]), la péristomienne de l'impaire diffère beaucoup des autres par sa forme régulièrement transversale, les surpassant en largeur, et les deux paires de plaques *2* et *3* sont les plus grandes du périsome. Enfin, dans le Cassidulus [10]), l'aire impaire présente une péristomienne conforme aux autres, égalant en grandeur celles des aires 2 et 3, et surpassant, comme dans la règle, celles des 1 et 4, et ses plaques *2*, *3*, et *4* forment avec celles des aires paires une région circumorale ovalaire de plaques considérablement agrandies. Dans ces trois groupes on remarque, aux plaques en général, une tendance plus ou moins distincte vers la forme hexagonale. Partout aussi les plaques ventrales de l'aire impaire présentent ceci de particulier, que la plaque gauche, celle de la rangée *a*, est placée plus en arrière que la droite, celle de la rangée *b*, ce qui se reproduit de moins en moins depuis la *2* jusqu'au périprocte, et même au-delà. Dans le Collyrites [11]) et le Cassidulus [12]) la *a 2* reste encore en contact avec la péristomienne, mais dans l'Ananchytes [13]) et l'Holaster [14]), la *b 2* seule touche à la *1*, en refoulant en arrière la *a 2*, ce qui est très-marqué chez l'Holaster et le Cardiaster, et d'où résulte finalement la disposition remarquable de ces parties que l'on connaît chez l'Hémipneustes radiatus (Gm). C'est que le bord aboral de la *b 2* se trouve coupé obliquement pour faire place à la *2 a*, dont le bord adoral, également retranché obliquement, forme un coin triangulaire avec son bord aboral. Cette figure se répète dans un certain nombre des paires suivantes, et lorsque, comme dans l'Hémipneustes, les plaques ainsi devenues cunéiformes sont tellement prolongées transversalement qu'elles atteignent de leurs pointes le bord de l'ambulacre opposé, elles deviennent complètement alternantes, de façon que leurs sutures représentent une ligne tirée en zigzag d'un côté à l'autre. Cette disposition particulière des éléments constituants, dans laquelle on ne peut que reconnaître une tendance spéciale vers la formation d'un plastron distinct, se trouve en effet limitée à la portion sternale, étant suivie posté-

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[1]) Pl. XXIX, fig. 188. [2]) Pl. XXX, fig. 191. [3]) Pl. XXVII, fig. 186. [4]) Pl. XXXII, fig. 197. [5]) Pl. XXVI, fig. 185. [6]) Pl. IX, fig. 83. [7]) Pl. VI, fig. 55—60; pl. XXIII, fig. 180. [8]) Pl. V, fig. 51; pl. XXIV, fig. 181. [9]) Pl. V, fig. 54; pl. XXV, fig. 182. [10]) Pl. VII, fig. 67; pl. XXII, fig. 179. [11]) Pl. VI, fig. 55, 59; pl. XXIII, fig. 180. [12]) Pl. VII, fig. 61, 67; pl. XXII, fig. 179. [13]) Pl. V, fig. 51; pl. XXIV, fig. 181. [14]) Pl. V, fig. 54; pl. XXV, fig. 182—184.

rieurement de la longue série double des plaques abdominales sub-hexagonales, dont celles du côté gauche sont partout légèrement refoulées en arrière. Mais ce mode de conformation n'a pas été de longue durée. Porté à son plus haut degré de développement dans un groupe de quelques genres éteints depuis longtemps, celui des Ananchytides dont il constitue l'un des caractères les plus saillants, il ne se trouve que très-faiblement représenté dans le monde actuel par les Cassidulides, dont la région sternale, d'ailleurs très-distincte du reste du corps, ne diffère que très-peu par la disposition, le nombre et la forme de ses éléments, des parties correspondantes des aires paires.

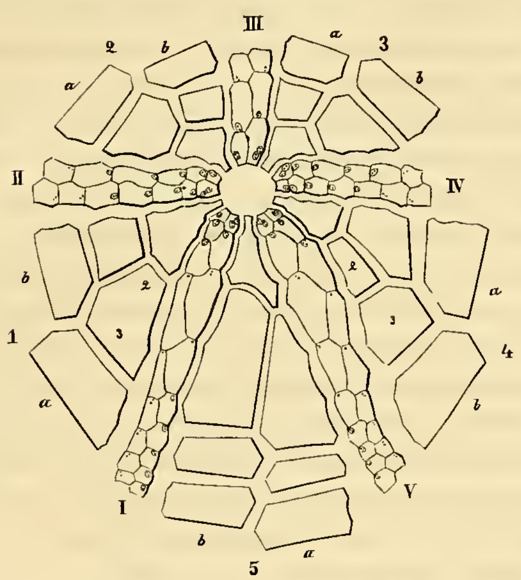
Or, l'époque de la craie avait déjà apporté, dans le groupe des **Spatanguides**, d'autres modifications de l'aire interradiale impaire, jusque là insolites parmi les Échinoïdées, modifications d'autant plus importantes qu'elles devaient amener finalement la division de cette aire en parties essentiellement dissemblables et jusqu'à un certain point remplissant même des fonctions diverses. La plaque péristomienne, transformée en lèvre, s'est adaptée plus directement au service de la nutrition; — au lieu d'un plastron composé, comme le reste du périsome, d'un certain nombre de plaques unies par des sutures, un vrai sternum s'est constitué en forme de bouclier, servant de fond solide et portant des radioles faits comme des rames et pouvant servir à la locomotion; — enfin, l'épisternum est venu se former, appuyant la partie postérieure du corps, et précédant la double rangée des plaques abdominales et dorsales. C'est là le mode de conformation qui a prévalu et qui a été perfectionné de plus en plus dans le cours des temps géologiques. Il est bien loin cependant que cette structure se trouve développée chez les anciens genres de la période crétacée, ou, en général, chez les Adètes et les Prymnadètes. Au contraire, de même que chez ceux-ci la conformation actuellement typique des aires paires ne se trouve qu'imparfaitement indiquée, ainsi, leur aire impaire ne présente non plus encore que les deux parties, la lèvre et le sternum, suivis immédiatement des deux rangées presque continues des plaques abdominales et dorsales.

La plaque péristomienne, *1*, destinée à fonctionner comme une lèvre immobile, un labrum en forme de cuillère, moyennant lequel l'animal, fouillant la couche superficielle du fond, reçoit dans sa bouche la vase riche en substances organisées qui lui sert de nourriture, est encore très-peu adaptée à cet usage chez l'Echinospatagus [1]) et l'Hétéraster, chez l'Hémiaster [2]) et le Micraster [3]), et elle n'y répond guère qu'à mesure qu'elle prend cette forme arquée, convexe, à bord adoral saillant et prolongé en lobes latéraux, qu'on lui connait chez l'Abatus [4]), le Schizaster [5]), la Méoma [6]) et le reste des genres vivants. Sa longueur varie aussi considérablement. Elle est fort courte dans le Brissus [7]), n'ayant que 0,045 de la longueur du sternum, et ne mesurant par ses bord latéraux qu'une petite portion des plaques *1* des rangées ambulacraires I *a* et V *b*. Dans l'Agassizia [8]), l'Échinocardium [9]), le Schizaster [10]), la Desoria [11]), le Plagionotus [12]), elle est un peu plus longue, égalant au plus les premières plaques ambula-

[1]) Voir la gravure sur bois p. 58. [2]) Pl. V, fig. 47; pl. XXVI, fig. 185. [3]) Pl. XXXIII, fig. 201. [4]) Pl. XXIX, fig. 188. [5]) Pl. XXXI, fig. 194. [6]) Pl. XXXV, fig. 205. [7]) Pl. XXXIV, fig. 202. [8]) Pl. XXX, fig 191. [9]) Pl. XXXIX, fig. 222. [10]) Pl. XXXI, fig. 194. [11]) Pl. XXVIII, fig. 187. [12]) Pl. XL, fig. 227.

craires adjacentes, et constituant 0,1 de la longueur du sternum. Dans les genres Meoma [1]), Spatangus [2]), Brissopsis [3]), Kleinia [4]), Palæotropus [5]), elle atteint 0,2 de la longueur du sternum, dans l'Abatus 0,25, en égalant, tout au plus, les péristomiennes ambulacraires voisines; dans l'Hémiaster [6]) et la Faorina [7]) elle comporte environ 0,4 du sternum, en mesurant de $1\frac{1}{2}$ à $2\frac{1}{2}$ des plaques ambulacraires adjacentes. Dans la Breynia [8]), l'Eupatagus, le Micraster [9]), le Paléostoma [10]), elle atteint environ 0,5 de la longueur du sternum, en répondant même à $2\frac{1}{3}$ ou $2\frac{1}{2}$ des plaques ambulacraires voisines, et, enfin, dans la Maretia [11]) et la Lovenia [12]) elle égale en longueur le sternum, et par ses bords, les trois premières plaques des ambulacres du bivium.

Dans l'Échinospatagus, genre adète, intermédiaire, sous certains rapports, entre les Spatanguides jurassiques et crétacés d'un côté et ceux des temps tertiaires et récents de l'autre, l'hétéronomie normale de l'aire 1 *a* se trouve combinée avec une conformation de l'aire impaire rappelant les Collyrites. La lèvre, bien que proportionnellement plus grande que celle de ces derniers [13]), en présente cependant la portion péristomienne très-étroite et l'aborale prolongée obliquement et presque en pointe vers le côté gauche de l'animal, de façon à offrir à la plaque *b 2* un contact assez étendu, mais, à la plaque *a 2*, un contact très-réduit, et à écarter par conséquent en grande partie la dernière. C'est là la même obliquité qui se manifeste dans les plaques *2* et suivantes des Ananchytides. Mais ici, chez l'Échinospatagus, la péristomienne est suivie d'un vrai sternum, constitué des deux plaques *2*, les plus grandes, comme dans la règle, du périsome entier, mais de formes différentes, celle de *b* étant presque rectangulaire, l'autre triangulaire. La *a 2* est, de plus, refoulée en arrière, comme le sont aussi les plaques suivantes de la même rangée relativement à celles de la rangée *b*. C'est bien loin encore de la conformation régulière et symétrique de ces mêmes parties que l'on voit chez les Spatanguides modernes.



Echinospatagus ricordeanus COTTEAU. Région ventrale.

Il en est à peu près de même des Prymnadètes, dont le sternum présente encore très-souvent cette conformation vague, qui se fait remarquer dans presque toutes les parties de leur squelette. Ses dimensions relatives varient beaucoup. Il est de peu d'extension chez le Paléostoma [14]), son angle postérieur répondant, du côté droit, à peu près au bord aboral de la plaque 3 de I *a*, mais, du côté gauche, à l'angle interne de la plaque 4 de V *b*. Dans le jeune individu de l'Hémiaster expergitus [15]), il excède légèrement la plaque

[1]) Pl. XXXV, fig. 205. [2]) Pl. XXXVI, fig. 208. [3]) Pl. XXXVII, fig. 213. [4]) Pl. XXXVIII, fig. 219. [5]) Pl. XXXII, fig. 200. [6]) Pl. XXVI, fig. 185. [7]) Pl. XXVII, fig. 186. [8]) Pl. XLI, fig. 228. [9]) Pl. XXXIII, fig. 201. [10]) Pl. XXXII, fig. 197. [11]) Pl. XLII, fig. 229. [12]) Pl. XLIII, fig. 232. [13]) Pl. VI, fig. 55—60. [14]) Pl. XXXII, fig. 197. [15]) Pl. XXVI, fig. 185.

4 de I *a*, et égale les cinq premières plaques de V *b*, tandis que dans l'Hémiaster Fourneli DESH., il atteint le milieu de la 6 de I *a*, et de la 7 de V *b*. De l'autre côté, il devient très-grand dans la Desoria [1]) et dans l'Abatus [2]), dépassant dans la première le milieu de la plaque 7 de I *a*, et atteignant le milieu de la 8 de V *b*, et dans le dernier, des deux côtés, le milieu de la septième plaque ambulacraire. Dans le Schizaster [3]), ce sont les trois quarts de la plaque 5 de I *a*, et les deux tiers de la 6 de V *b* qui correspondent à ses bords postérieurs. Ce n'est que dans les genres Faorina [4]) et Agassizia [5]) que les plaques ambulacraires 5 répondent, des deux côtés, par leurs angles médians, à la suture joignant le sternum et la plaque suivante. Dans tous ces genres, on aperçoit aussi, à la plaque gauche du sternum, une tendance à déborder en arrière la plaque droite, et dans le Paléostoma, le Schizaster, l'Agassizia, on observe même à cette dernière, comme on vient de le remarquer à la plaque correspondante de l'Échinospatagus, un élargissement de son bord adoral tendant à diminuer le contact de la plaque gauche avec la lèvre, mais qui ne parvient pas cependant à l'en séparer, comme cela a lieu chez l'Ananchytes et l'Holaster.

Avec l'apparition de la fasciole infra-anale, on voit s'introduire chez les Prymnodesmiens, dans la structure des parties qu'elle couvre ou qu'elle entoure, des modifications importantes dont la régularité contraste d'une manière frappante avec la disposition vague et indécise propre aux Prymnadètes. Des plaques ambulacraires, un certain nombre, des rangées I *a* et V *b*, à compter de la sixième, se prolongent en un coin reçu dans l'angle épisternal, et la paire *3* de l'aire impaire se produit en un épisternum que l'on voit se développer de plus en plus dans la série des genres depuis le Brissus jusqu'à la Lovenia [6]), et qui atteint son maximum dans la Kleinia, l'Échinocardium, le Plagionotus, la Breynia, l'Eupatagus, le Paléotropus. Ce n'est pas à dire pourtant que cette structure se trouve aussi nettement établie dans le type le plus ancien des Prymnadesmiens, le Micraster [7]) de la craie. Chez celui-ci, tandis que les plaques ambulacraires se sont formées en coin, un peu irrégulier cependant, les autres parties ne s'adaptent que tardivement au nouvel ordre. L'angle épisternal est à peine indiqué, et la fasciole, dont l'arceau inférieur est vu traverser, dans tous les autres genres, les deux plaques symétriques de l'épisternum, se dessine ici du côté gauche sur l'extrémité aborale du sternum même, et du côté droit sur une petite plaque qui paraît s'en être détachée. C'est là la première tentative vers la formation d'un épisternum, et il semble évident qu'en présence de la fasciole une nouvelle disposition des parties se prépare, laquelle, à l'aide de nuances qu'il reste encore à découvrir, conduira à cette régularité parfaitement balancée qu'on admire dans les squelettes des Kleinia, des Échinocardium, des Plagionotus, des Maretia, des Lovenia et des Paléotropus. C'est par suite de ce travail morphologique que la partie médiane de la face ventrale acquiert finalement cette conformation essentiellement indépendante au moyen de laquelle, et de celle de l'ambulacre impair, le corps du Spatanguide est partagé en deux parties latérales symétriques. A la même fois la forme des plaques de ces parties, et effectivement celle des parties correspondantes de toutes les aires, s'éloigne beaucoup de la forme typique

[1]) Pl. XXVIII, fig. 187. [2]) Pl. XXIX, fig. 188. [3]) Pl. XXXI, fig. 194. [4]) Pl. XXVII, fig. 186. [5]) Pl. XXX, fig. 191. [6]) Pl. XXXIV, fig. 202, — pl. XLIII, fig. 232. [7]) Pl. XXXIII, fig. 201.

hexagonale encore reconnaissable chez les anciens genres de la craie, en même temps que l'élargissement des plaques ventrales des aires paires, aux dépens de celles de l'impaire, est porté à un haut degré, au point même d'amener l'idée de l'existence, dans quelque espèce encore inconnue, d'un sternum en forme de carène linéaire et étroite au milieu d'un grand plastron ventral, d'un fond de cale, pour ainsi dire, formé par les ambulacres du bivium et les aires interradiales paires agrandies.

La double rangée abdominale et dorsale de l'aire impaire ne présente, dans les Cassidulides, les Collyritides et les Ananchytides, qu'une simple continuation de sa portion sternale, avec cette différence, seulement, que les plaques y reviennent à la forme sub-hexagonale commune aux parties correspondantes des aires paires. Il en est presque de même chez les Spatanguides prymnadètes, où on leur voit cependant une certaine tendance à dévier vers une forme arquée, et il n'en est pas autrement chez le Micraster, malgré sa fasciole infra-anale. Mais, dans les genres prymnodesmiens vivants, les parties se différencient davantage. On distingue chez plusieurs d'entre eux, comme dans les genres Spatangus, Brissopsis, Kleinia, Echinocardium, Lovenia, une paire de plaques préanales, et, dans presque tous, les plaques échancrées du périprocte se distinguent des autres par leur forme allongée et courbée en haut. Enfin, la portion dorsale de l'aire impaire est celle qui offre le moins de variations dans la série des genres. Chez les Prymnodesmiens les plus développés, elle présente encore cette position un peu reculée de la rangée *a* dans l'alternance des plaques, qui a disparu presque entièrement du sternum et de l'épisternum.

Il importe de savoir quels sont les changements que subissent les aires interradiales pendant le développement de l'individu. Si l'on compare une jeune Brissopsis lyrifera (Forb.) [1]) de 4,6 mm. de longueur, avec un individu adulte [2]), on voit que chez la première les interradiums pairs ont déjà adopté leur forme future; seulement les plaques les premières formées, les péristomiennes, et plus particulièrement celle de l'aire 3, sont comparativement plus larges, et les plaques *2* proportionnellement un peu plus longues que chez l'adulte. Dans les interradiums frontaux, on compte chez le jeune dix et onze plaques, et chez l'adulte treize, deux petites plaques étant venues s'y ajouter à l'extrémité, et dans les interradiums latéraux, chez tous les deux, dix plaques. Le changement est plus considérable par rapport à l'aire impaire. Dans des individus encore plus jeunes, le labrum ne diffère que très-peu des autres péristomiennes [3]), ou présente même une forme simplement rectangulaire rappelant sa conformation chez les adultes des Ananchytides et des Spatanguides adètes ou prymnadètes de la craie. Dans l'individu représenté fig. 218, il a déjà pris, comme aussi le sternum, la forme qu'il aura chez l'adulte. L'épisternum est bien court chez le jeune, le bord postérieur en est très-rétréci, et la plaque préanale est encore trois fois plus longue que large, tandis que chez l'individu adulte la longueur et la largeur en sont presque égales. Chez celui-ci, les plaques *5* à *8* sont anales, chez le jeune les plaques *5* à *9*, le nombre entier des plaques étant de quatorze chez le jeune et de quinze chez l'adulte. On observe donc ici que les aires interradiales des Spatanguides grandissent principalement par la croissance

[1]) Pl. XXXVII, fig. 218. [2]) Ib. fig. 213. [3]) Pl. III, fig. 32; comp. l'Échinocardium, fig. 33, et l'Hémiaster, pl. V, fig. 46.

des plaques mêmes, et bien peu par l'addition de nouvelles plaques auprès des pièces apicales. Chaque plaque est pourvue d'un nucleus qui s'annonce quelquefois en forme d'umbo, et qui est entouré, à sa surface intérieure, de lignes courbes de croissance.

Une particularité qui se rencontre assez fréquemment chez les Échinoïdées paléozoïques, est la tendance de leurs plaques interradiales à prendre la forme d'écailles plus ou moins parfaitement imbriquées dans le sens aboral, et servant sans doute à donner au périsome une flexibilité comparable à celle de l'enveloppe totale chez certaines Holothuries, ou du périsome ventral de la plupart des Crinoïdées. Cette disposition, partagée au reste par les ambulacres, est même tellement répandue parmi les genres paléozoïques, comme l'attestent bien les noms des Lépidocentrus, des Pholidocidaris, des Lépidesthes, des Lépidocidaris, des Lépidéchinus, que l'on aurait toute raison de la considérer comme une disposition primordiale des éléments du test des Échinoïdées. Elle se retrouve dans l'Echinothuria de la période crétacée et dans l'Asthénosoma des mers actuelles, et même elle ne s'est pas totalement perdue chez certains autres genres récents, dont le test entièrement rigide n'en ferait guère soupçonner l'existence. Si, après avoir fait bouillir dans une lessive de soude le test d'un Spatangus, d'une Brissopsis ou d'un Échinocardium, on le sépare avec précaution, il est facile d'observer que plusieurs de ses plaques interradiales sont pourvues, à leur bord adoral, d'une lame semilunaire très-mince, qui pénètre au dedans du bord aboral de la plaque précédente, laquelle possède à l'intérieur une faible entaille correspondante. Ainsi, ces plaques, quoique parfaitement soudées ensemble, sont en effet légèrement imbriquées aboralement. Le Spatangus [1]) a une lame ainsi formée à la troisième plaque des interradiums frontaux, et à la troisième, la quatrième et la cinquième plaque des latéraux; la Brissopsis [2]) à la troisième et la quatrième plaque des interradiums frontaux, et à la troisième, la quatrième et la cinquième de la rangée antérieure des latéraux; l'Échinocardium [3]) à la troisième et la quatrième plaque des interradiums frontaux, et des mêmes plaques de la rangée antérieure des latéraux. Sans doute, si l'on était à même de pouvoir sacrifier un certain nombre d'individus, on trouverait la même conformation chez bien des Spatanguides ou des autres Échinoïdées édentées ou même chez des Échinoïdées à dents. Toutefois, ce n'est que la forme qui a été conservée, dans un état réduit, la fonction, celle de donner au test un certain degré de flexibilité, ayant cessé d'être, ou plutôt ayant été changée, dans un sens contraire, en un moyen d'en augmenter la solidité.

C. FASCIOLES.

Bandes à clavules vibratiles, posées au-dessus de la couche à mamelons radiolaires, constituant peut-être les bords d'une membrane couvrant en partie la face dorsale du test, et laissant libres certaines régions occupées par les organes externes les plus puissants.

La fasciole n'existe que chez les Ananchytides et les Spatanguides, et ne manque pas entièrement dans aucun des genres vivants de ces derniers. Elle constitue un

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[1]) Pl. XXXVI, fig. 208, 209, 210. [2]) Pl. XXXVII, fig. 213, 214, 215. [3]) Pl. XXXIX, fig. 222, 223, 224.

trait de structure indépendant des autres parties du squelette, et n'appartient ni aux ambulacres ni aux aires interradiales; au contraire, on peut dire qu'elle les domine en quelque sorte. Elle est limitée à la face dorsale, latérale et postérieure du test. On n'en aperçoit rien à la surface intérieure des plaques, et elle n'occupe pas non plus d'intervalles entre elles. Parfaitement superficielle, et formant à elle seule un stratum superposé à celui des radioles, elle traverse les ambulacres comme les aires interradiales, au milieu des radioles, des pédicellaires et des pores tentaculaires, qu'elle efface tous, le plus souvent complètement, en déposant à leur place sa bande unie incrustée de petits tubercules, et en en désignant très-rarement les traces. Ainsi l'on voit quelquefois, par exemple chez l'Agassizia [1]), comment la fasciole, entière et intacte, recouvre comme une gaze des mamelons parfaitement reconnaissables et correspondant, quant à leur forme et leur disposition, aux autres mamelons situés immédiatement au dehors de son bord, lequel même en tapisse partiellement l'un ou l'autre; soit que la fasciole, ayant fait tomber les radioles, se soit glissée dessus, ou que, malgré son influence ailleurs décisive, la couche profonde ait continué, dans cet endroit, à se former en mamelons. Ou bien, comme cela a été observé chez le Plagionotus pectoralis et le Brissus Scillæ [2]), lorsque la fasciole a reçu des fentes, on voit percer des mamelons avec leurs radioles ou des pores tentaculaires complètement développés, la couche profonde y ayant repris le travail vital arrêté au-dessous de la fasciole intacte.

Il est facile de se convaincre, dans la Brissopsis lyrifera (Forb.) [3]), que la fasciole péripétale traverse la même plaque interradiale chez l'adulte que chez le jeune, c'est-à-dire les plaques *4* et *5* des aires frontales, les *6* et *7* des latérales, et la dixième de l'aire impaire. Elle se tient, chez l'un et l'autre, sur la même plaque ambulacraire du bivium, la 14 et la 15, et dans les ambulacres pairs du trivium sur la 9 ou la 10. Mais dans l'ambulacre III, l'impair, elle change de place en s'avançant des plaques 4 et 5 aux plaques 5 et 6. Ainsi encore la fasciole infra-anale traverse, chez le jeune comme chez l'adulte, de son arceau inférieur les plaques épisternales, *3*, de l'interradium impair, et, de son arceau supérieur, ses plaques *4* et *5*, de même que les plaques prolongées 6, 7, 8, 9, des rangées internes du bivium. Par conséquent, l'extension successive de l'anneau fasciolaire est presque proportionnée au mouvement d'accroissement des plaques, à cela près qu'elle change un peu de place sur la plaque même dans les limites de laquelle elle reste. C'est par ces mouvements qu'il faut expliquer les crevasses transversales, ou peut-être les plis, qu'elle présente assez souvent, et des deux côtés desquels ses rangées de petits tubercules changent de direction [4]).

Revêtant de cette manière la couche à mamelons et douée envers elle d'un mouvement propre quoique très-restreint, la fasciole paraît déterminer jusqu'à un certain point la forme des plaques, et plus particulièrement celle des ambulacres. On s'en aperçoit dès que l'on compare entre eux les divers groupes génériques par rapport à la fasciole péripétale. Dans les genres adètes des Spatanguides, ceux dépourvus de toute fasciole, comme l'Échinospatagus D'Orb., l'Enallaster D'Orb., l'Isaster D'Orb., l'É-

[1]) Pl. XIII, fig. 121. [2]) Pl. XIII, fig. 122, 123. [3]) Pl. XXXVII, fig. 218. [4]) Pl. XII, fig. 107.

piaster D'ORB., l'Hémipatagus DES., et dans les genres prymnodesmiens qui manquent de fasciole péripétale, le Spatangus [1]), le Micraster [2]), la Maretia [3]), le Paléotropus [4]), l'Échinocardium [5]), la Lovenia [6]), les pétales pairs sont plus au moins ouverts, à la manière des Cassidulides, des Collyritides et des Ananchytides, c'est-à-dire que le passage des plaques des flancs à tentacules simples digitiformes aux plaques dorsales à tentacules branchiaux, se fait d'une manière insensible, et comme d'un seul trait, ou, s'il y a un léger rétrécissement, que du moins les plaques se suivent d'une manière égale et continue. Au contraire, lorsqu'il y a une fasciole péripétale, ce passage se trouve marqué d'un rétrécissement plus ou moins considérable ou même par une dilatation plus ou moins grande des plaques infra-pétales. Dans quelques-uns, ce rétrécissement n'est pas très-fort, et les plaques, toutes entières, se succèdent sans interruption quelconque, comme chez l'Hémiaster Fourneli, la Faorina [7]), la Desoria [8]), l'Abatus [9]), le Schizaster [10]). Dans d'autres, la fasciole péripétale semble augmenter la résistance, offerte par la paire de plaques qu'elle traverse, à la pression lente et continue des plaques pétalaires causée par l'addition successive de plaques nouvelles auprès de la pièce ocellaire; par suite de cette addition un certain nombre des plus anciennes réduites en demi-plaques, à la manière des plaques péristomiennes des Échinides, sont refoulées, en forme de coin, vers la ligne suturale des plaques à fascioles, lesquelles, en y cédant, changent de forme ou s'écartent même en partie l'une de l'autre, pendant que la fasciole se retire en se repliant en anse plus ou moins profonde. C'est ce qu'on appelle pétales fermés, et ce qu'on voit dans tous les ambulacres pairs de la Méoma [11]), de la Breynia [12]), du Plagionotus [13]) du Brissus [14]), de la Brissopsis [15]), ou dans le bivium seulement, comme dans l'Eupatagus, l'Agassizia [16]), la Kleinia [17]). Mais partout l'ambulacre III est exempt de toute influence de la fasciole péripétale, laquelle s'amincit même quelquefois en passant par dessus. L'Hémiaster expergitus [18]) seul y fait exception, mais il est à noter que l'exemplaire observé n'est pas adulte. Lorsqu'il y a une fasciole interne, traversant les pétales pairs, comme dans la Breynia [19]), l'Échinocardium [20]), la Lovenia [21]), la série des pores tentaculaires voisins se trouble, et plusieurs d'entre eux tendent à s'effacer. L'Échinocardium seul présente, dans l'ambulacre III traversé d'une forte fasciole interne, une alternance de plaques entières et de plaques réduites. — Enfin, quant à la fasciole infra-anale, il a été démontré déjà comment son existence est accompagnée d'une conformation toute particulière des plaques ambulacraires du bivium, non moins que des plaques interradiales mêmes qu'elle traverse.

Selon les régions du test qu'elles entourent, les fascioles enferment des groupes de tentacules différents de formes et de fonctions, et n'en franchissent point les limites. Ainsi, la péripétale embrasse, dans la Brissopsis lyrifera (FORB.) [22]), les tentacules puissants, à disque terminal circulaire, de l'ambulacre impair, et les tentacules

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[1]) Pl. XXXVI, fig. 208. [2]) Pl. XXXIII, fig. 201. [3]) Pl. XLII, fig. 229. [4]) Pl. XXXII, fig. 200. [5]) Pl. XXXIX, fig. 222. [6]) Pl. XLIII, fig. 232. [7]) Pl. XXVII, fig. 186. [8]) Pl. XXVIII, fig. 187. [9]) Pl. XXIX, fig. 188. [10]) Pl. XXXI, fig. 194. [11]) Pl. XXXV, fig. 205. [12]) Pl. XLI, fig. 228. [13]) Pl. XL, fig. 227. [14]) Pl. XXXIV, fig. 202. [15]) Pl. XXXVII, fig. 213. [16]) Pl. XXX, fig. 191. [17]) Pl. XXXVIII, fig. 219. [18]) Pl. XXVI, fig. 185. [19]) Pl. XLI, fig. 228. [20]) Pl. XXXIX, fig. 222. [21]) Pl. XLIII, fig. 232. [22]) Pl. I, fig. 1.

branchiaux des ambulacres pairs; l'infra-anale constitue la limite entre les grands tentacules couronnés de cirres, appartenant aux plaques prolongées des rangées internes du bivium, et les simples tentacules digitiformes qui partent des plaques ambulacraires des flancs. Quand on considère la position toute superficielle des fascioles et la manière dont elles passent par-dessus les mamelons radiolaires; comment les organes externes les plus puissants ne se produisent qu'en dedans des enceintes formées par elles; comment, chez certains genres, le Plagionotus, l'Eupatagus, la Breynia, et d'une manière moins marquée chez tous, les mamelons du test, petits et peu développés d'un côté de la limite indiquée par la fasciole, apparaissent de l'autre tout d'un coup grands et fortement prononcés; quand on réfléchit au contraste que présente le test des Spatanguides ainsi divisé en régions disparates avec l'uniformité de celui des Clypéastrides, des Cassidulides et des Échinonéides, qui n'ont point de fascioles, on est amené à se demander s'il n'existe pas là une membrane, commençant peut-être à la plus grande périphérie du test, couvrant les côtés de la face dorsale en lame excessivement mince, mais dont la présence suffit cependant à modérer jusqu'à un certain point, dans plus d'un genre, le plein développement des mamelons et de leurs appartenances, et laissant, en dehors de son bord, qui est la fasciole, deux espaces du test entièrement libres et ouverts pour le développement de certains organes extérieurs importants, l'un autour du sommet, l'autre infra-anal. Mais c'est peu dire: la fasciole reste une énigme inexpliquée. Est elle, comme le dit JOHANNES MÜLLER [1]), une ligne de bordure ("Saumlinie"), comparable au bord vibratile des larves par cela même qu'elle se forme en lacs fermés, et qu'elle présente un mouvement vibratile très-vif? Ses clavules, serrées et d'une hauteur uniforme comme les brins d'un velours, à tiges couvertes de cils vibratiles, à têtes arrondies et molles mais non vibratiles, comme l'a déjà observé JOHANNES MÜLLER, sont sensibles au dernier point, et si l'on en touche quelques-unes, plusieurs autres se mettent aussitôt avec elles dans un mouvement commun et ondulant. Quant à la question importante de savoir si la fasciole a été transmise au Spatangue par sa larve avec la membrane dont elle paraît constituer le bord, il conviendra de rappeler que la fasciole infra-anale et la fasciole latérale s'excluent mutuellement. En voyant la fasciole infra-anale de la Méoma [2]), complète seulement dans son arceau inférieur, celles du Plagionotus [3]) et de l'Échinocardium [4]) envoyant en haut des branches courtes, et celle de la Kleinia [5]), laquelle parvient à se joindre à la péripétale au moyen de deux branches longeant le bivium, on pourrait même soupçonner que les trois fascioles, l'infra-anale, la latérale et la marginale, ne doivent être considérées que comme des formes différentes, des replis, d'une seule et même fasciole.

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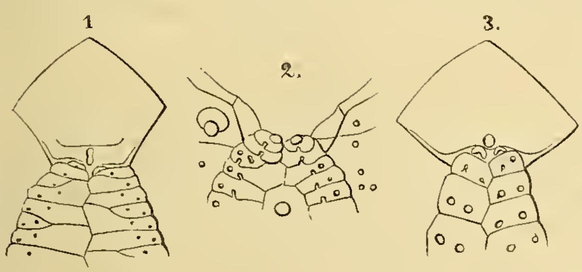
[1]) Ueber den allgemeinen Plan in der Entwickelung der Echinodermen. Abhandl. Berlin. Akad., 1852, p. 33. — Ueber den Bau der Echinodermen. Abhandl. Berlin. Akad., 1853, p. 27. [2]) Pl. XXXV, fig. 205. [3]) Pl. XL, fig. 227. [4]) Pl. XXXIX, fig. 222. [5]) Pl. XXXVIII, fig. 219.

D. APPAREIL APICAL.

Système dorso-central. Ses trois parties constituantes: les pièces ocellaires, les pièces génitales, et le disque central. Homologies de l'appareil apical avec le calice des Crinoïdées. Ses formes diverses dans les différents groupes des Echinoïdées; anomalie des Collyrites. Calice des Astériadées.

Chez toutes les Échinoïdées connues des mers actuelles, et en réalité, dans la grande majorité des genres tant vivants qu'éteints, les ambulacres, et, par conséquent, les aires interradiales convergent, à la surface dorsale, auprès d'un assemblage, plus ou moins régulièrement disposé, de pièces essentiellement différentes de tous les autres éléments du test. On a appelé cet assemblage l'appareil apical, le sommet, le *vertex*. C'est le système dorso-central. Il se compose de trois parties constituantes qui lui appartiennent d'une manière spéciale: les pièces dites ocellaires, toujours au nombre de cinq; celles dites génitales dont le nombre normal de cinq est souvent réduit à quatre, et le disque central.

Les pièces dites ocellaires correspondent aux ambulacres, et ne s'en écartent jamais, pas même dans l'appareil disjoint des Collyritides. Il ne faudrait pas considérer cependant cette adhérence intime comme l'indice d'une relation entre la pièce ocellaire et l'ambulacre, comparable à celle d'une matrice à son produit. La pièce ocellaire ne sert aux plaques ambulacraires en voie de formation que comme une sorte d'abri, les cachant sous son bord adoral, avant qu'elles sortent en dehors. Mais cette proximité immédiate au sommet de l'ambulacre permet à la pièce ocellaire, devenue le siège d'organes de sensation, de recevoir, par le trajet le plus court, le grand nerf ambulacral qui doit pénétrer dans le pore dont elle est toujours percée. Car, malgré l'ignorance où nous sommes encore à l'égard de la vraie nature de ces organes, on est convenu de considérer ce pore comme un pore oculaire, et cela, à ce qu'il semble, uniquement en raison de l'homologie morphologique pressentie entre les pièces ocellaires des Oursins et les pièces semblables placées à l'extrémité des bras des Étoiles de mer, dans lesquelles sont logés les organes dont la fonction comme organes de la vue ne peut être mise en doute après les recherches d'Ehrenberg,[1]) de Hæckel[2]) et de Greeff.[3]) Selon ce dernier, les Astériadées possèdent, à l'extrémité de chacun de leur bras, deux organes de sens distincts. Le grand tronc nerveux s'y divise en deux rameaux. L'un d'eux, le supérieur, se rend à un cirrhe tentaculaire impair, plus fort que les tentacules ambulacraires, et d'une

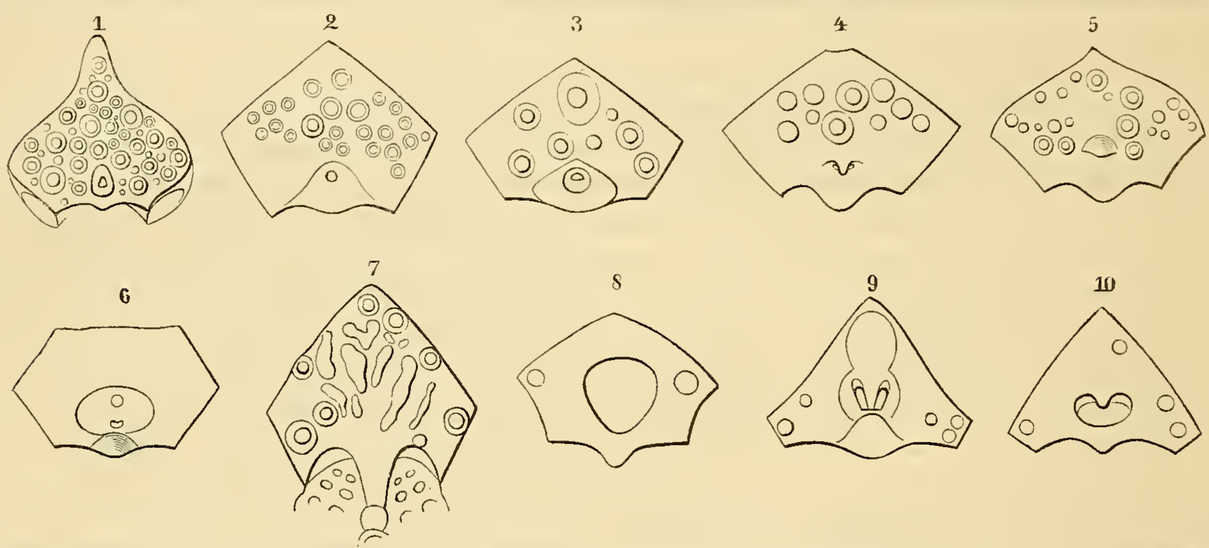


1. Pièce ocellaire, avec le sommet de l'ambulacre correspondant, de l'Échinus esculentus L., vue de l'intérieur. 2. Sommet d'ambulacre, du même, vu de l'extérieur, la pièce ocellaire ayant été enlevée. 3. Pièce ocellaire avec le sommet de l'ambulacre, de la Cidaris papillata Leske, vue de l'intérieur.

[1]) Abhandl. Akad. Berlin, 1835, p. 181. [2]) Zeitschrift für wissenschaftliche Zoologie, X, p. 183, pl. XI. [3]) Sitzungsberichte der Gesellschaft zur Beförderung der gesammten Naturwissenschaften in Marburg, 1871. N:o 8, p. 1; 1872, N:o 6, p. 100.

coloration différente, rétractile, couvert en partie de cils vibratiles, et à sommet arrondi, sans ventouse. L'autre rameau, l'inférieur, fournit des éléments nerveux à un oeil composé, chevauchant sur la base du cirrhe, muni d'une cornée, et contenant un nombre de cristallins coniques plongés dans une masse pigmentaire d'un rouge intense, les sommets dirigés vers l'intérieur et les bases convexes en dehors. Certaines Échinoïdées présentent une conformation des parties dures de la pièce ocellaire, qui permet de supposer, chez elles aussi, une structure à peu près semblable.

Dans quelques cas extrêmement rares, des Échinoïdées fossiles de la période paléozoïque, des genres Palæechinus M'Coy et Melonites Norw. et Owen, ont été trouvées dans un état de conservation qui a permis d'en étudier l'appareil apical. M. Ferd. Römer [1]), profitant d'une occasion pareille, a été le premier à signaler l'existence, chez le Melonites multiporus, de deux pores à chacune des pièces ocellaires, observation qui a été confirmée par M. Baily pour le Palæechinus elegans. [2]) On se demande donc si une



Pièces ocellaires: 1. Cidaris papillata Leske. 2. Echinus esculentus L. 3. Amblypneustes ovum Lamk. 4. Temnopleurus toreumaticus Leske. 5. Salmacis bicolor Agass. 6. Diadema setosum Gray. 7. Echinocidaris pustulosa Leske. 8. Encope Valenciennesi Agass. 9. Brissus columbaris Lamk. 10. Echinocardium cordatum Penn.

telle disposition, qui semble indiquer un oeil double à chaque pièce, a été propre aux types les plus anciens seulement, ou s'il en existe dans des genres des mers actuelles. Chez les Cidarides, les plus anciens de tous les types vivants, on en cherche en vain, leur pore ocellaire est simple. Il en est de même chez les Échinus et les genres voisins, chez l'Amblypneustes, et peut-être encore chez la Salmacis, dont le pore est surmonté d'une éminence en forme de paupière. Dans d'autres genres on reconnaît cependant une division de l'ouverture externe, devenue transversale, en deux parties séparées par une cloison mitoyenne, faiblement indiquée dans le pore très-petit de la Diadema, plus prononcée chez le Temnopleurus. Mais c'est dans le genre remarquable des Échinocidaris que l'on rencontre une disposition plus compliquée et en quelque

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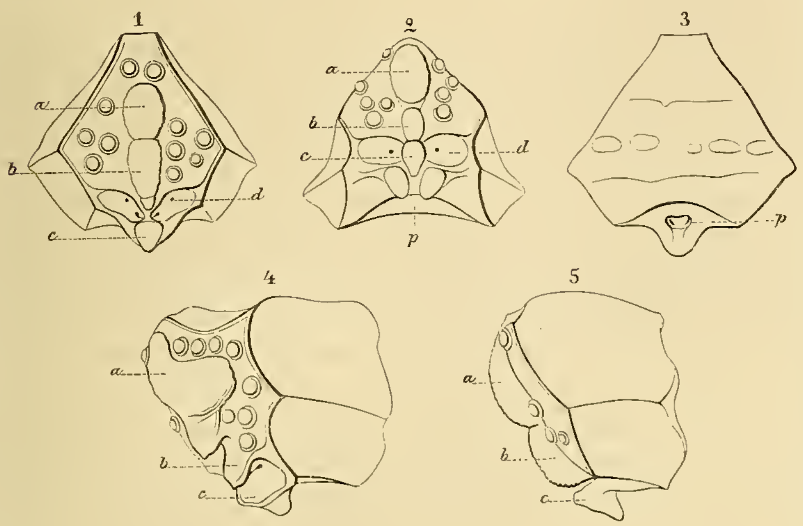
[1]) Wiegmanns Archiv für Naturgeschichte, 1855, I, p. 312, Pl. XII, fig. 4 et 6, 6 c. [2]) Dublin quarterly Journal of Science, V, p. 261, Pl. VII. Voir la gravure sur bois p. 80, fig. 2.

sorte comparable à celle des mêmes parties chez les types paléozoïques. La pièce ocellaire, très-épaisse, est d'une forme pentagonale, et le milieu de son bord adoral est prolongé en une cloison plus ou moins saillante selon l'espèce, partageant en deux canaux le conduit du pore, et séparant entre elles deux fossettes transversalement ovalaires, assez profondes, les orbites, comprises entre le bord de la couche pigmentée[1]) et le prolongement adoral de la pièce. Si ces fossettes sont vraiment, comme il le semble, des orbites renfermant les parties molles d'un oeil double, elles doivent représenter les deux pores oculaires des Mélonites et des Palæéchinus. Dans les Spatanguides, il paraît être de règle que le pore, simple à l'intérieur, est partagé à l'extérieur en deux par une éminence de son bord supérieur, analogue à la cloison des Échinocidaris, éminence qui pourrait bien servir de support à la base d'un cirrhe tentaculaire, embrassée par un oeil géminé. Dans les Clypéastrides[2]), les pores oculaires sont disposés de diverses façons; ils sont simples et relativement très-grands chez l'Encope Valenciennesi.



Pièces ocellaires de l'Echinocidaris nigra (MOL.) 1. Vue d'en haut. La face extérieure, à mamelons radiolaires, est d'une couleur bleu-noirâtre, celle de la couche pigmentée, laquelle s'élève au milieu en trois bosses, *a*, *b*, *c*, de forme variable. Entre *b* et *c* se trouve la cloison étroite partageant le pore *p* en deux, et séparant les deux orbites, *d*, au fond de chacune desquelles se fait remarquer un petit pore donnant passage à quelque nerf? 2. Une autre pièce du même individu, vue de la face adorale. Le prolongement médian en pointe a été retranché verticalement pour faire voir la manière dont le conduit du pore *p* est partagé en deux par la cloison. 3. La pièce 1, vue de sa face interne, montrant le prolongement de son bord adoral, retranché dans la figure précédente. 4. Autre pièce ocellaire du même individu, vue en demi-face. 5. La même, vue de profil.

La forme typique des pièces ocellaires est celle d'un pentagone[3]). Leurs deux bords aboraux sont compris entre deux pièces génitales, les deux latéraux entre les

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[1]) L'appareil apical des Échinocidaris se distingue du reste de la surface dorsale par sa couleur foncée. Dans l'É. nigra (MOL.), ses différentes pièces présentent des rugosités extrêmement fines, produites par l'accumulation de petites éminences d'un bleu noirâtre, pointillées, luisantes, arrondies, ovalaires ou allongées en crêtes, et alors en quelque sorte parallèles. Ces éminences, qui, dans d'autres espèces de ce genre, s'élèvent comme de petits îlots isolés, et qui, au reste, ne sont nullement limitées au système dorso-central, se retrouvent assez généralement répandues chez les Échinoïdées, prenant des formes très-diverses, comme celle de petits cônes à stries rayonnantes chez l'Echinonéus (Pl. IX, fig. 79) et l'Échinocyamus (Pl. XVI, fig. 139), de protubérances framboisées chez la Salénia (Pl. XIX, fig. 159, 161, 163; p. 27), etc. M. COTTEAU en a observé chez les Codiopsis (v. Paléontologie française, Terrain crétacé, VII, p. 774; pl. 1190, fig. 16). Elles paraissent appartenir à la couche pigmentaire du test, superposée à la couche fondamentale réticulée et blanchâtre, plus compacte que celle-ci, à texture moins friable, à cassure luisante, et recouverte de la couche à mamelons radiolaires. On voit les mamelons, par leur mouvement lent et continuel, traverser les sutures mêmes des plaques c étendre leurs bases au-dessus d'elles. — L'histologie des Échinodermes est encore entièrement à faire.

[2]) Pl. XVI. [3]) Pl. XXI, fig. 170, 171, c.

aires interradiales, tandis que l'adoral, restant contigu à l'ambulacre, présente au milieu, entre deux échancrures plus ou moins prononcées, une partie saillante déterminée par la présence des organes de sens, et correspondant à la suture médiane de l'ambulacre. Mais cette forme pentagonale typique est loin d'être constante. Elle change sans cesse dans le même individu par suite de l'accroissement des différentes parties et de l'adaptation réciproque de l'appareil apical, des ambulacres et des aires interradiales; l'emplacement même des pièces ocellaires, normalement à l'angle de deux pièces génitales, se trouve tellement modifié dans quelques genres, qu'on les voit alterner avec ces dernières au bord interne du périprocte. Leur grandeur relativement aux autres parties de l'appareil est aussi très-différente dans les différents groupes. En général, elles sont plus grandes, ainsi que d'une forme plus régulière et plus librement développée, dans les groupes d'ancienne origine, comme les Cidarides,[1]) les Saléniens[2]), les Échinoconides[3]), moins grandes, plus subordonnées, dans ceux d'une apparition moins éloignée, comme celui des Spatanguides[4]), très-petites même dans ceux d'une époque plus récente, comme les Clypéastrides[5]). Mais partout l'organe de la vision y a trouvé sa place, et nulle part les pièces ocellaires ne sont atteintes par le madréporite.

Les pièces dites génitales, normalement au nombre de cinq, plus grandes que les pièces ocellaires, sont typiquement hexagones[6]). Leurs bords aboraux constituent les cinq côtés de l'espace central pentagone; les deux bords contigus touchent aux pièces génitales; les deux suivants forment, avec les côtés homologues des pièces adjacentes, les angles dans lesquels sont comprises les pièces ocellaires; enfin, les sixièmes, les bords adoraux, sont contigus aux aires interradiales. Mais cette forme et cette disposition normales de ces pièces ne se voient inaltérées que chez des individus encore très-jeunes des Échinides, et, à l'âge adulte, jusqu'à un certain degré, chez des Cidarides[7]). Non-seulement, en commun avec tous les autres éléments constituants du squelette, par suite de la pression que ceux-ci exercent simultanément les uns sur les autres, et par la résorption plus ou moins considérable de différentes parties, les pièces génitales éprouvent des changements de forme continuels, mais encore leur bord adoral est en particulier sujet à une altération par laquelle sa figure est souvent rendue très-irrégulière. De très-bonne heure, la partie médiane de ce bord, correspondant à la suture de l'aire interradiale, commence à faire saillie[8]), et se prolonge bientôt, en beaucoup de cas, en un coin aigu pénétrant entre les plaques de celle-ci. Cette transformation considérable des pièces génitales est due aux exigences des organes de la reproduction, qui, dans presque toutes les espèces, les percent des pores par lesquels on voit les mâles répandre leur sperme et les femelles leurs oeufs, et qui acquièrent parfois des dimensions tellement considérables relativement aux pièces mêmes, qu'enfin celles-ci ne paraissent destinées qu'à les contenir[9]). Ce serait cependant à tort que l'on se croirait fondé par là à les considérer comme de simples appendices externes des organes

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[1]) Pl. XX, fig. 166. [2]) Pl. XIX, fig. 165. [3]) Pl. XV, fig. 132—134. [4]) Pl. XI, XII, fig. 93—107. [5]) Pl. XVI, fig. 135—139. [6]) Pl. XXI, fig. 170, 171; b. [7]) Pl. XX, fig. 166. Voir la gravure sur bois, p. 80, fig. 3. [8]) Pl. XXI, fig. 172—176. [9]) Pl. XII, fig. 100, 101, 106.

de la génération. Loin de là, l'existence dans ces pièces des orifices des conduits reproducteurs ne peut être regardée que comme secondaire, et, pour ainsi dire, adventice. Non seulement chez les individus non encore propres à la propagation [1]), les pièces dites génitales, complètement formées, entrent comme parties intégrantes dans la composition du système dorso-central, et ce n'est que plus tard, lorsque les glandes reproductrices ont atteint leur maturité, que les conduits de ces glandes les percent du dedans, mais encore il n'est pas très-rare de voir ces conduits, lorsque la petitesse de l'appareil apical, occupé en entier par le madréporite, ne leur permet pas de s'y ouvrir, se diriger à part, hors de lui, vers quelque point des aires interradiales, et y gagner l'eau ambiante par des pores pratiqués dans la suture médiane. Ainsi, il est bien connu que parmi les Clypéastrides, chez le Laganum Peroni, le L. Putnami, l'Encope Valenciennesi [2]), les Mellita, et d'autres, les pores génitaux sont situés hors de l'appareil apical, entre son bord et les deux dernières plaques interradiales, et que chez le Clypéaster rosaceus L. [3]) ils sont disposés en entier dans les sutures interradiales, et séparés de l'appareil par les deux ou trois dernières paires de plaques. De plus, M. Cotteau a observé que, chez un Échinide même, le Goniopygus [4]), les pores génitaux sont placés en dehors de l'appareil, dans les interradiums. Tout cela défend de considérer les pièces dites génitales comme des appendices des organes reproducteurs; en effet, elles n'y appartiennent pas plus que n'appartiennent aux organes alimentaires les plaques interradiales perforées par l'ouverture anale. Au contraire, elles sont à envisager comme des parties du squelette parfaitement indépendantes.

L'espace compris entre les bases des cinq pièces génitales est rempli par le disque central. Mais, tandis que les pièces ocellaires et génitales, bien qu'en beaucoup de cas altérées de forme, de grandeur relative ou de nombre, se retrouvent cependant dans toute la série des espèces, et dans tous les âges de l'individu, l'existence du disque central est très-souvent si passagère, et les cas de sa conservation pendant la vie entière de l'individu, sous une forme reconnaissable, tellement exceptionnels, que, malgré son importance morphologique comme partie intégrante du système dorso-central, il se soustrait très-facilement à l'observation.

Dans l'appareil apical d'un Échinide très-jeune [5]), dont le diamètre excède à peine un millimètre, et qui ne présente pas encore de traces de pores madréporiques, génitaux ou ocellaires, l'espace central se trouve occupé par une lame impaire: c'est le disque central. Il est retranché très-faiblement en face des pièces génitales 1 et 5, par suite d'une résorption commençante, laquelle a aussi ôté à celles-ci une partie de leurs bords aboraux; mais cette légère modification ne sert qu'à lui indiquer, comme naguère existante, une forme primitive exactement adaptée à l'espace compris entre les bases intactes des pièces génitales qui l'entourent. Dans un très-jeune individu d'une autre espèce, le Toxopneustes droebachensis, de 2,4 mm. [6]) on observe ce même disque, mais ici

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[1]) Pl. XXI, fig. 170—173. Pl. XI, fig. 93, 94. [2]) Voir la gravure sur bois, p. 80, fig. 15. [3]) Pl. XVI, fig. 136. [4]) Bull. Soc. Géol., 2:de série, XVI, p. 162. Échinides fossiles du Dép. de la Sarthe, p. 152, Pl. 26, fig. 2; p. 154, Pl. 27, fig. 25. Échinides fossiles du Dép. de l'Yonne, II, p. 50, Pl. 52, fig. 14. Paléontologie française, terrain cretacé, VII, p. 717, Pl. 1175—1185. [5]) Pl. XXI, fig. 170. [6]) Fig. 171.

la résorption, quoique toute récente, est un peu plus avancée à l'endroit où, comme on le verra, l'ouverture anale viendra se faire place plus tard. L'existence de ce disque chez des Échinides très-jeunes a déjà été signalée par M. ALEXANDRE AGASSIZ dans ses premières observations sur les Échinoïdées retirées par M. DE POURTALÈS des grandes profondeurs de la mer entre la Floride et l'île de Cuba [1]). »A une époque bien jeune», dit-il, «à laquelle pourtant l'ouverture buccale avec ses mâchoires se trouve déjà développée, le système anal des Échinoïdées n'est fermé que par une seule plaque subanale, laquelle apparaît avant les plaques génitales et ocellaires, et reste longtemps plus proéminente que les autres plaques survenues pour couvrir le système anal élargi.» Il résulte cependant des observations consignées ici, que le disque central se trouve développé avant que le canal intestinal ne possède une ouverture efférente; la disposition des parties est en outre telle, que cette ouverture ne pourra gagner l'extérieur qu'après l'écartement du disque, de sorte même que le premier acte préparatoire de son apparition au dehors ne consiste qu'en la résorption de la substance même de celui-ci. Par conséquent, le disque central, loin d'être un simple appendice protecteur de l'ouverture anale, ne doit être considéré que comme une pièce à elle et indépendante, une partie intégrante du système dorso-central ayant sa propre valeur morphologique. La Salénia en offre la preuve concluante, comme le fait remarquer aussi M. ALEX. AGASSIZ [2]). Chez elle, le disque central, loin d'avoir une existence passagère comme chez les Échinides, est permanent, se retrouvant pendant toute la vie de l'individu, continu et solide, croissant avec les autres parties du squelette, et remplissant l'espace central de sa lame parfaitement pentagone [3]). Lors du percement de l'ouverture anale, il devient partiellement échancré, par résorption, sur son bord latéral et postérieur, comme le deviennent aussi, et à un plus haut degré, les bords des pièces génitales adjacentes, et le périprocte se pratique, presque circulaire, sur la suture des pièces génitales 1 et 5 [4]). Mais le disque central conserve toujours parfaitement reconnaissable sa forme primitive pentagonale, et il est évident que ce n'est pas là une plaque suranale ou supplémentaire survenue dans la Salénia et les genres voisins, mais une pièce normale du squelette, se maintenant pendant toute la vie de l'animal.

Or, après ces considérations, si l'on écarte l'idée préconçue qui, des cinq pièces de l'anneau externe de l'appareil apical, a fait autant d'appartenances des organes de la sensation, et, des cinq ou quatre pièces formant son anneau intérieur, autant d'appendices aux organes reproducteurs; si l'on rend au disque central sa vraie signification morphologique, en oubliant la courte durée de son existence chez les Échinides, et en laissant de côté, comme non avenu, le périprocte des Saléniens, on ne saura échapper à l'impression qu'en restituant ainsi à l'appareil apical des Échinoïdées, exempté des

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[1]) Embryology of the Echinoderms, Memoirs of the American Academy, IX, 1864, p. 12, fig. 28. Contributions to the Fauna of the Golfstream etc., p. 281, 284, 285. Revision of the Echini, p. 280, pl. IX, fig. 3, 6, 7, pl. X, fig. 2: Toxopneustes drœbachensis; p. 286, pl. VIII, fig. 3, 10: Temnechinus; p. 300, pl. VII, fig. 9: Lytechinus; p. 683. [2]) Revision of the Echini, p. 259, 280. [3]) Pl. XIX, fig. 159—165 Pl. XXI, fig. 177. [4]) Voir la Note sur la famille des Salénidées, dans le Bull. Soc. Géol., 2:e série, XVIII, p. 614, et autres écrits de M. COTTEAU, qui le premier a exactement orienté les Échinides en général et les Saléniens en particulier.

fonctions accessoires imposées par les besoins du travail physiologique, sa valeur purement morphologique, on a reproduit les traits principaux d'une construction considérée jusque-là comme non existante dans le type échinoïde, mais fondamentale et caractéristique dans celui des Crinoïdées. De l'appareil apical des Échinoïdées on a fait un calice, homologue à celui de ces dernières, et parmi elles, en premier lieu, à celui du genre Marsupites de MANTELL[1]), Crinoïdée sans tige, fossile de la craie. Chez celui-ci, une grande pièce exactement pentagone occupe l'espace central du pôle dorsal; c'est là évidemment l'homologue du disque central. A ses cinq côtés correspondent cinq pièces hexagones, homologues aux pièces génitales des Échinides; ce sont les parabasilaires de premier ordre de la terminologie de JOHANNES MÜLLER. A l'angle de celles-ci s'intercalent ici les parabasilaires de second ordre, qui manquent dans la plupart des Crinoïdées, et qui n'ont rien d'analogue dans l'appareil des Échinoïdées. Elles sont suivies des premières radiales, homologues aux pièces ocellaires des Échinoïdées.

Toutes les pièces du calice du Marsupites sont ornées de stries très-distinctes, traversant à angle droit les sutures, et disposées de manière à former ensemble des losanges ayant deux angles opposés placés au centres de deux pièces contiguës, et dont, par conséquent, chacun est coupé en deux par la suture. Cette espèce de structure n'appartient pas exclusivement au Marsupites et aux autres Crinoïdées qui la possèdent sous des formes variées. Si l'on examine avec soin le disque central et les autres pièces de l'appareil apical des jeunes Échinides ou de la Salénia, on ne tardera pas à y constater la même structure. Elle se fait observer à la lumière directe, mais elle devient très-évidente dans une préparation convenablement faite et vue par transparence. On trouve ainsi que le disque central pentagone consiste en cinq sections triangulaires, ayant pour base l'un de ses cinq côtés, et convergeant à son centre. Le tissu réticulaire de chaque triangle est disposé en baguettes droites et parallèles, rectangulaires à la base, et laissant entre elles des intervalles très-étroits. Dans les sutures, celles venant d'une pièce se continuent directement avec celles de l'autre, et les groupes de baguettes des différents triangles, en se joignant au centre de la pièce, s'y croisent mutuellement en formant un amas apparemment confus de mailles serrées. Il en est de même dans les pièces ocellaires et dans les pièces génitales, ces dernières, en tant qu'hexagones, contenant chacune six triangles. Dans le très-petit Échinide, de 1,3 mm. seulement[2]), le disque central n'en contient que quatre, parce qu'il n'est entouré que de quatre pièces génitales au lieu de cinq, disposition tout-à-fait exceptionnelle, donnant à supposer que c'est au genre Échinocidaris qu'il faut le rapporter, le disque de ce genre étant, chez l'adulte, fendu en quatre lames triangulaires, déterminées peut-être par cette disposition des baguettes. Il est à remarquer cependant que cette structure striée, bien qu'elle s'y fasse remarquer plus directement, n'est nullement limitée à l'appareil apical. Elle existe dans toutes les plaques du test des différents groupes des Échinoïdées[3]), et elle est connue depuis longtemps chez les Cystidées. Il paraît cependant

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[1]) Pl. XXI, fig. 178. [2]) Fig. 170. [3]) Dans les Clypéastrides à test très-plat, comme les Échinarachnius, les Mellita, cette structure se laisse exposer sans peine par le polissage, comme le montre la fig. 2 de la

qu'elle se trouve très-développée dans le système dorso-central, et c'est à elle que se ramènent les diverses sortes de sculpture, d'impressions et de stries suturales, de rugosités et de côtes joignant les centres des pièces du calice, que l'on remarque chez les Crinoïdées. Aussi trouve-t-on à peine chez les Saléniens de sculpture qui ne se reproduise chez celles-ci sous quelque forme correspondante, dépendant, à ce qu'il paraît, du plus ou moins de développement des différentes baguettes, dont les médianes, par exemple, donnent lieu à des crêtes joignant les centres des pièces, comme dans la Salénia trigonata Ag. et le Goniophorus lunulatus Ag d'un côté, et le Poteriocrinus geometricus Goldf. de l'autre.

Ayant ainsi suivi les homologies du système dorso-central depuis l'Échinide dans son premier âge jusqu'à la Salénia adulte, et de celle-ci au Marsupites, on se trouve en face de la série nombreuse et variée des Crinoïdées à tige. Et, parmi celles-ci, ce n'est pas aux types mésozoïques et plus récents que l'on se voit conduit, mais plutôt vers les types paléozoïques, vers les formes à calice développé d'une manière égale dans toutes ses parties constituantes: la base, *basis*, dans la terminologie de d'Orbigny, Johannes Müller, de Koninck, L. Schultze, l'article dorso-central dans celle de de Blainville, le pelvis de Miller, homologue au disque central des Échinoïdées et du Marsupites, pentagone, tantôt entière, tantôt fendue, dans le sens de ses rayons, en pièces secondaires de nombre variable, nommées *basalia*; les pièces dites parabasilaires, *parabasalia*, de Johannes Müller, les sous-radiales de de Koninck, les basilaires de Whyville Thomson et de Carpenter, les costales de Miller, normalement au nombre de cinq, homologues aux pièces dites génitales chez les Échinoïdées, hexagones, contiguës par leur bord adoral au périsome interradial; et les premières radiales, *radialia*, de Johannes Müller, au nombre de cinq, homologues aux pièces dites ocellaires des Échinoïdées, pentagones, insérées dans l'angle des précédentes, contiguës aux ambulacres.

Dans l'une et l'autre de ces grandes classes d'Échinodermes, le système dorso-central, se présentant sous des aspects divers, est donc identique dans ses traits principaux de conformation. Chez toutes les deux il occupe le pôle opposé à la bouche. Mais la Crinoïdée est un animal typiquement fixé par sa tige, la bouche en haut entourée des bras libres, amassant les substances organisées suspendues dans l'eau ambiante, à l'aide de l'action ciliaire de ses gouttières ambulacraires, ouvertes en entier ou seulement sur les pinnules. L'Échinoïdée est un animal libre, à bras fixés, tournant sa bouche vers le sol sur lequel il doit chercher sa nourriture. De là, ce qui est la base du squelette dans l'un, en est le sommet dans l'autre. Mais, parmi les noms les plus usités par les auteurs pour les diverses parties du système dorso-central dans les deux classes, il en est qui ont été suggérés précisément par ces relations diamétralement opposées ou par des fonctions entièrement disparates. Cependant, une bonne nomenclature exige pour des parties morphologiquement homologues des noms communs et également applicables, tandis que d'un autre côté elle défend de multiplier outre mesure les appellations déjà trop nombreuses. C'est pourquoi, dans ce qui reste de ces études, le nom de calice, *calyx*, sera employé à désigner, dans les deux classes, le système dorso-central en entier; le nom de disque central, *discus centralis*, remplacera celui de base chez les Cri-

planche XII, a, du grande ouvrage de M. Alex. Agassiz. Dans de jeunes exemplaires convenablement préparés, on peut très-bien l'étudier au microscope, par transparence.

noïdées; l'ancienne appellation de pièces costales, *costalia,* proposée par MILLER, sera rendue aux pièces dites génitales dans les Échinoïdées, parabasilaires ou basilaires dans les Crinoïdées; et celle de pièces radiales, *radialia,* aux pièces désignées de ce nom chez ces dernières, et de celui de pièces ocellaires chez les Échinoïdées. [1])

Dans les Crinoïdées, les bras sont mobiles, érigés au-dessus du périsome ventral. Deux systèmes se combinent dans leur construction, l'ambulacral et le dorso-central. Les gouttières ambulacraires, continuation des lèvres de la bouche, traversent le périsome ventral dans le sens des pièces radiales du calice. Du côté de celui-ci, les rangées des pièces radiales et brachiales multipliées, la première radiale servant d'article basilaire, se dressent à leur rencontre; réunis de là, ces deux éléments constituants du bras, la gouttière ambulacraire et son support fourni par le calice, accolés l'un à l'autre, sommet à sommet, s'élèvent ensemble librement, indivis ou ramifiés. Dans les Echinoïdées, les bras sont immobiles, enchâssés dans le périsome. Le système ambulacral seul les constitue. Les ambulacres, partant de la bouche et traversant le périsome, s'étendent jusqu'au devant des radiales, qu'ils touchent de leurs sommets, en développant auprès d'elles leurs plaques nouvelles. Mais, chez les Échinoïdées, les premières radiales sont devenues porteurs des organes de la vue. Répondant uniquement à cette fonction, au lieu d'offrir au développement libre des ambulacres des supports multipliés, elles restent simples et fixées, et, dans cet état, en arrêtent l'extension. Elles deviennent même autant de points d'appui du mouvement propre des éléments ambulacraires sans cesse augmentés, mouvement qui, par suite de la résistance qu'il éprouve ainsi du côté du calice, est changé dans le sens contraire, celui du péristome. Mais, chez la plupart des Échinoïdées, le péristome, de son côté, en est la limite fixe. C'est donc dans les régions intermédiaires des flancs, que le mouvement d'accroissement, contenu ainsi aux deux pôles du test, trouve la liberté d'expansion qu'exige le développement de celui-ci, et c'est des relations diverses résultant de cette combinaison, qu'en dépend la forme générale. Mais, par suite de la réaction de ce mouvement même, le calice éprouve de tous côtés une pression qui tend à le réduire en grandeur, relativement au reste de la surface du test. L'effet de cette pression, proportionnel à la force exercée par les ambulacres et les aires interradiales croissantes, se fait remarquer chez tous les vrais Échinides et chez les Échinoconides; il est plus considérable dans les Spatanguides et autres formes, chez lesquelles les organes de la respiration viennent demander une part de plus en plus grande des ambulacres, et il est porté à un haut degré dans les Clypéastrides, par suite du grand développement de leurs ambulacres et de leurs aires interradiales, renforcées par des piliers et des cloisons massives internes. Dans les Cidaris, au contraire, dont les auricules interradiales laissent aux éléments ambulacraires un passage ouvert vers la membrane buccale, le calice se présente partout avec une grandeur relativement plus considérable et avec un développement libre de ses parties. Par conséquent, lorsque chez les Saléniens: la Salenia, le Peltastes, on le voit se répandre

[1]) Les planches XI, XII, XV, XVI, XIX, XX, XXI, et la gravure sur bois de la page 80, représentent les principales modifications du calice, depuis le Poteriocrinus geometricus GOLDF., Cyathocrinide du Dévonien, jusqu'aux Clypéastrides de notre époque.

encore plus largement sur la face dorsale du test, dont il occupe dans quelques cas les cinq sixièmes du diamètre, en étendant ses pièces costales allongées, de grandeur égale, on se demande quelles peuvent être les circonstances qui contribuent si puissamment à favoriser chez eux le développement du calice, et si, à l'instar de ce qui se passe chez les Cidaris, quelque disposition particulière des auricules y entre d'une manière essentielle.

Ainsi, on le voit, le calice de ces types d'Echinoïdées d'origine ancienne ressemble à celui de certaines Crinoïdées d'une période encore plus éloignée, non moins à l'égard de sa grandeur en comparaison de celle du test en entier, qu'à l'égard des formes et des proportions de ses différentes parties, rapports qui, très-souvent au premier coup d'oeil même, invitent à les comparer. Il n'en pas est de même d'autres types des deux classes, chez lesquels le calice se modifie de diverses manières, et plus particulièrement des types plus récents. Ainsi, dans un certain nombre de Crinoïdées, les radiales sont en contact immédiat avec le disque central, sans intervention de pièces costales, modification dont l'explication se trouvera peut-être dans cet acte du développement de l'Antédon grâce auquel les pièces costales, complètement formées dans le très-jeune individu, disparaissent avant peu de l'extérieur, en s'enfonçant dans l'intérieur du calice, réduites et transformées par suite d'un remaniement endogène.[1]) Les altérations qu'éprouve le calice des Échinoïdées, dans le cours de la vie de l'individu comme dans la succession des genres à travers les périodes géologiques, ne sont moins grandes, quoique d'un ordre différent, et dans cette classe, comme partout, ce sont les formes anciennes, et la phase du jeune âge des formes récentes qui mettent en évidence les grands traits communs et typiques, et qui décèlent ainsi les affinités et les analogies que l'évolution géologique et le développement individuel viennent déguiser.

Tandis que le calice des Crinoïdées, d'une valeur essentiellement morphologique, détermine d'une manière réelle la forme extérieure du corps dont il constitue le fondement, celui des Échinoïdées, entré de très-bonne heure au service du travail physiologique, devient de plus en plus subordonné par rapport à sa signification morphologique, à mesure que ses différentes parties sont utilisées pour les besoins de l'économie et adaptées à des fonctions diverses. Le madréporite, comme nous l'apprend l'étude du jeune âge du Toxopneustes droebachensis[2]), est le premier à s'introduire dans la pièce costale 2, dont il augmente le volume en la pénétrant de ses canaux ramifiés; puis les pièces radiales se percent des pores ocellaires et se préparent à la réception des organes de la vue, et les pièces costales s'allongent adoralement pour se laisser perforer du dedans par les conduits efférents des glandes reproductrices. Mais, de toutes les parties du calice, le disque central est le plus profondément modifié, et cela du côté des organes de la nutrition.

Dans la plupart des vrais Échinides, lorsque la place de l'ouverture anale commence à se préparer, cela ne se fait pas au centre même du disque, mais excentriquement et en dehors. Si le très-jeune Échinide, de 1,2 mm. seulement[3]), à l'espace

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[1]) Voir Wyville Thomson, On the embryogeny of Antedon rosaceus Lamck., Trans. Roy. Soc., 1865, p. 513, pl. XXIII—XXVII. Carpenter, Researches on the structure, physiology and development of Antedon rosaceus, Ib., 1866, p. 671, pl. XXXI—XLIII. Lovén, Phanogenia typica, Öfversigt af Kongl. Vetenskaps-Akademiens Förhandlingar, 1866, p. 223. [2]) Pl. XXI, fig. 171—176. [3]) Fig. 170.

central quadrilatère, appartient réellement au genre Echinocidaris, dont l'ouverture anale est centrale dans l'adulte, la division du disque en quatre lames triangulaires est précédée d'un acte par suite duquel celui-ci se détache des pièces environnantes. On voit une petite déhiscence se produire entre son bord droit latéro-postérieur et la pièce costale 1, avec une légère déviation dans la direction de la radiale I. Par suite de la résorption commençante, le bord correspondant de la costale 1 devient légèrement échancré. En transférant l'observation au très-jeune Toxopneustes, de 2,4 mm.[1]), on trouve que la déhiscence a gagné de largeur, la résorption du disque a avancé, la pièce costale 5 en est atteinte, le bord du périprocte en voie de formation s'approche de la radiale I, et, dans la membrane mince et transparente qui remplace les parties absorbées, deux petites plaquettes de tissu calcaire réticulé se sont déposées. Puis, pendant que la forme pentagonale primitive de l'espace central se perd insensiblement, par suite de l'érosion graduelle des bases des pièces costales, pour devenir finalement ovalaire selon le diamètre passant par l'ambulacre I et l'aire interradiale 3, et que le nombre des plaquettes continue à augmenter dans l'intervalle graduellement élargi, le disque, tant soit peu relevé à son bord libre, bien qu'il reste toujours contigu, par le bord opposé, à la costale 3, se réduit de plus en plus en proportion, mais se laisse cependant encore reconnaître à sa position et à sa grandeur relative. Dans des individus dépassant 5 mm.[2]), l'ouverture anale fait son apparition au milieu des plaquettes les plus petites un peu saillantes au-dessus de la membrane, excentriquement vis-à-vis de la radiale I, pour y rester définitivement, et enfin[3]), par suite du développement d'un nombre toujours multiplié de centres secondaires de formation, la membrane anale se trouve comme incrustée de plaquettes munies de mamelons et de radioles, parmis lesquelles le disque central ne se laisse plus distinguer. Il est permis de supposer que c'est là la manière dont le disque central est remplacé par la membrane anale chez la plupart de Échinides. Dans les Diademas, cette membrane et presque entièrement nue, et s'élève au centre en un tube anal conique très-long. Dans les Échinocidaris, il paraît que l'ouverture anale se pratique au moyen d'un soulèvement central, par suite duquel le disque, détaché tout autour, se fend en quatre lames triangulaires.[4])

Le calice du Toxopneustes de 2,4 mm. de diamètre[5]), présente les cinq pièces costales placées chacune vis-à-vis de l'une des aires interradiales, et formant un cercle fermé, les cinq pièces radiales se trouvant intercalées dans leurs angles rentrants, avec la même régularité. Tel est encore l'état du calice des individus adultes dans les genres Echinus, Sphærechinus, Psammechinus et dans la plupart des Saléniens. Mais, chez le Toxopneustes et beaucoup d'autres, cette disposition primitive et normale se modifie bientôt. Les pièces radiales du bivium, I et V, se portent graduellement vers l'intérieur du cercle, aux deux côtés de la costale 5, entre celle-ci et les costales 1 et 4[6]). La radiale I est celle des deux qui en atteint la première la périphérie intérieure, suivie par la radiale V. C'est le cas des genres Loxechinus, Lytechinus, Heliocidaris, Tripneustes, Boletia, Salmacis, Acrocladia, Echinometra, Echinocidaris; dans

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[1]) Fig. 171. [2]) Fig. 173, 174, 175. [3]) Fig. 176. [4]) Voir la gravure sur bois, p. 80, fig. 6 et 5. [5]) Pl. XXI, fig. 171. [6]) Fig. 172—176.

l'Amblypneustes et la Mespilia, elles s'en approchent d'assez près. Quant aux pièces radiales du trivium, la pièce IV s'avance vers la périphérie interne, qu'elle touche dans plusieurs genres, la II s'en approche aussi, quoique à une plus grande distance, mais la III, qui correspond à l'ambulacre impair, en reste toujours éloignée. Chez les Diademas[1]) adultes, toutes les radiales parviennent à toucher la membrane anale, même les II et III, qui se trouvent cependant quelquefois arriérées. Ce déplacement des pièces radiales, pendant l'accroissement de l'individu, dépend sans doute de ce que le périprocte, par suite de la tension qu'il subit, et de la résorption des bases des pièces costales, s'élargit plus vite et plus fortement que n'augmente la largeur de ces mêmes pièces, et de ce que les pièces radiales, sur lesquelles réagit le mouvement de croissance des ambulacres, sont poussées dans leurs interstices. La costale 2, contenant le madréporite, et de ce fait élargie et plus résistante, arrête les pièces II et III.

Tel est le mode de conformation du calice dans les genres d'Échinides chez lesquels le diamètre passant par l'ambulacre I et l'aire interradiale 3 se fait valoir dans la disposition des éléments des aires interradiales, et, chez les Échinomètres, dans la forme allongée du test. L'emplacement excentrique de l'ouverture anale sur ce diamètre est de règle parmi les Échinides du monde actuel, d'origine mésozoïque ou plus récente. Mais, longtemps avant l'apparition géologique de ces genres, certains Périschoéchinides offrirent une disposition différente de ces parties, la même que présentent encore les Cidarides. On doit à Baily la connaissance d'un échantillon du Palæechinus elegans, de la formation carbonifère de l'Irlande[2]), montrant une partie considérable de l'espace central du calice couvert de plaquettes arrangées de façon à indiquer la position de l'ouverture anale au milieu même[3]). C'est la place qu'occupe aussi cette ouverture dans le calice des Cidarides, contemporains autrefois, par des genres représentatifs, les Éocidaris, les Archéocidaris, de ces antiques formes, comme actuellement des plus récentes de nos mers. Au lieu de devenir ovalaire, le périprocte reste chez eux pentagone, les bases des costales intactes le limitant de leur cinq lignes droites, et les radiales se maintiennent à des distances à peu près égales de son bord, en avançant quelquefois des coins allongés séparant les costales[4]). Au milieu des plaquettes, disposées d'une manière concentrique, se trouve l'ouverture anale, au centre même du calice, emplacement qui, dans les Crinoïdées, est celui de l'ouverture centrale par laquelle la cavité interne du calice communique avec le canal de la tige[5]).

Or, cette position endocyclique de l'axe du tube alimentaire, parfaitement verticale ou déviant légèrement dans le sens du diamètre passant par l'ambulacre I et l'aire interradiale 3, ne satisfait pas la tendance du travail d'évolution de la classe des Échinoïdées, se manifestant dans la succession de ses types différents à travers les temps géologiques. Cette tendance exige que les trois axes du squelette, l'axe antério-postérieur, celui des aires interradiales, et l'axe longitudinal, se combinent en un seul, des deux côtés duquel les parties constituantes du squelette soient disposées d'une manière symétrique, et que, tandis que la bouche se porte en avant, surmontée de l'ambulacre

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[1]) V. la gravure s. bois, p. 80; fig. 6. [2]) Dublin quart. Journal of Science, V, No. XIX, p. 261, pl. VII. [3]) Gravure s. bois, p. 80, fig. 2. [4]) Gr. s. bois, p. 66, fig. 1. [5]) Gr. s. bois, p. 80, fig. 1.

frontal muni de tentacules appropriés aux fonctions du toucher et de la préhension, et que les quatre ambulacres pairs s'agrandissent pour donner de la place aux branchies de plus en plus développées, l'axe des organes de la nutrition se rapproche de la direction horizontale, dans le plan de la longueur du test graduellement devenu elliptique. C'est donc vers l'aire interradiale impaire que se doit diriger l'ouverture anale. Aussi, lorsque, après un de ces intervalles dans l'histoire de la nature, touchant lesquels nous sommes encore dans une profonde ignorance, la faune marine de notre partie du monde se décèle de nouveau, dans les couches secondaires, avec une variété toujours plus grande de formes d'Échinoïdées, dont les ascendances ne se trahissent pas par des traces quelconques, on y voit apparaître, à côte de l'ancien type à axe intestinal vertical, un autre, inaperçu de nous jusque là, le type exocyclique, à périprocte installé plus ou moins complètement dans l'interradium postérieur. Ce n'est pas là, en effet, un mode de conformation nouveau, c'est plutôt un retour vers un mode très-ancien. Un tube anal placé dans l'aire interradiale impaire embrassée par le bivium ambulacral, sur la ligne médiane indiquant la bilatéralité du corps, a, depuis le temps paléozoïque, servi, normalement, aux fonctions de la nutrition chez les Crinoïdées et les Cystidées. Or, en vue du grand développement qu'ont atteint ces deux classes dans l'antiquité zoologique, et des traits de ressemblance avec le calice des Crinoïdées que présente celui des Cidarides et d'autres Échinides d'ancienne origine, il paraît naturel de s'attendre à trouver, parmi ces derniers encore, quelque indication de l'existence d'un périprocte interradial. Il n'y en a pas chez les Périschoéchinides, à en juger d'après les fragments connus, ni non plus chez les Cidarides; chez tous les deux, l'axe du système nutritif se trouve parfaitement vertical. Mais, grâce aux travaux admirables de COTTEAU, de DESOR, de DE LORIOL, de WRIGHT, et d'autres savants qui ont jeté tant de lumière sur les origines des Échinoïdées mésozoïques, nous connaissons actuellement certaines formes, chez lesquelles on croit entrevoir une disposition moins régulière[1]). C'est en particulier le genre Hétérodiadema COTTEAU[2]), qui, malgré la perte du calice dans tous les exemplaires connus, ne laisse guère de doutes sur l'emplacement postérieur du périprocte, hors du disque central, dans une costale 5 très-allongée. insérée entre les dernières paires de plaques de l'aire impaire. Les genres Pseudodiadema, Cyphosoma, Echinocyphus[4]), présentent d'autres exemples de ce mode de conformation. Ce sont là des Diadémiens de la période crétacée. Le groupe remarquable des Saléniens, dont le calice rappelle à tant d'égards celui des Crinoïdées, et dont l'existence peut être suivie depuis le lias jusqu'à la période actuelle, est représenté, dans les couches mésozoïques inférieures, par le seul genre Acrosalenia, qui s'éteint dans les assises inférieures de la craie, et dans ce genre, lié par plusieurs caractères aux Hémicidaris et aux Pseudodiadema, le périprocte, elliptique longitudinalement, est reçu en grande partie dans la costale 5, contenue entre les rangées des dernières plaques interradiales, réduite parfois en une bande étroite bordant

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[1]) Comparez DESOR, L'Évolution des Échinides dans la série géologique, Neuchâtel, 1872, pag. 25, note. [2]) H. libycum AGASS., dans COTTEAU, Echinides nouveaux, p. 17 et 75, pl. III, fig. 6. Pal. Franç., T. Crét., VII, p. 522, pl. 1124. [3]) Comparez, entre autres, le Pseudodiadema Bourgueti DESOR, Pal. Franç., Terr. Crét. pl. 1097, fig. 5; le Cyphosoma magnificum, AGASS., WRIGHT, Cret. Echinodermata, p. 137, pl. XXV, fig. 1, b; l'Echinocyphus difficilis AGASS., ib. p. 116, pl. XXII. fig. 4.

sa partie postérieure, et même dépourvue de pore génital, par suite de la suspension de fonction de la glande reproductive située dans l'espace interradial impair[1]). Plus tard, dans la Pseudosalenia[2]), du terrain jurassique moyen et supérieur, de même que dans le Peltastes et le Goniophorus, de la craie, les costales sont toutes d'égale grandeur, le périprocte, transversalement elliptique mais toujours situé sur le diamètre antério-postérieur, se trouve avancé vers le centre du calice, et le pore génital est là dans la costale 5. Enfin, dans la Salenia[3]), qui commence à se montrer dans les étages inférieurs de la craie, pour s'y développer de plus en plus, et survivre, à travers le temps tertiaire, jusqu'à nous, le périprocte est situé excentriquement sur le diamètre passant par l'ambulacre I et l'aire interradiale 3, conformément à ce qui a lieu chez les Échinides propres d'origine moins ancienne, et chez la plupart de leurs genres dans la faune actuelle. Ainsi, quand on voit le périprocte, à peine admis, dans certaines formes mésozoïques, à l'intérieur du calice, s'y établir graduellement, dans le cours des temps géologiques, selon la loi qui se fait valoir chez la pluralité des formes actuelles, on est conduit à se demander si ce n'est pas là, chez les premières, la dernière trace d'un mode de conformation antique arriéré, qui disparaît par degrés, en rentrant dans la règle commune de la faune moderne[4]). On remarque en même temps que, dans le genre Acrosalenia[5]), le calice est en quelque sorte dérangé, les pièces costales, inégales de grandeur, étant séparées par les radiales contiguës au disque central, et que celui-ci est comme brisé en pièces irrégulières, dites supplémentaires, mais aussi, dans les autres genres, depuis la Pseudosalenia jusqu'à la Salenia, qu'à mesure que l'emplacement du périprocte devient normal, le disque et les costales s'arrangent conformément au type du groupe.

Mais, si c'est avec quelque degré de vraisemblance que nous entrevoyons, dans les dispositions diverses du calice des Saléniens, des vestiges d'un passage successif du type exocyclique au type endocyclique; s'il est vrai que les dérivés de ce dernier, à l'axe du tube digestif comme retenu dans sa position verticale, au pôle ventral par l'appareil dentaire fixé au milieu d'un péristome à contours permanents, et au pôle dorsal par l'enceinte solide du calice, sont des formes en général éminemment constantes: les Cidarides, qui ont porté jusqu'à nous le cachet de leur antique origine, les Diadémiens, les Échinides propres, tous d'une remarquable stabilité de caractères, il n'en est pas de même des dérivés de l'autre type, celui des exocycliques, à périprocte situé dans l'aire interradiale impaire, et à l'axe du système nutritif penchant vers le sens horizontal. Chez ceux-ci, la transposition de l'ouverture anale, du système dorso-central au système interradial, a été, pour ainsi dire, le signal d'un travail morphologique multiplié, qui a valu aux faunes des périodes secondaires et tertiaires, jusqu'à la nôtre, un nombre de formes variées et fortement caractérisées, et grâce auquel la classe des Échinoïdées a

[1]) Comparez: Acrosalenia hemicidaroides WRIGHT, Echinodermata of Oolitic Formations, p. 234, pl. XV, fig. 1; A. decorata HAIME, ib. p. 249, pl. XVII, fig. 1; A. spinosa AGASS., ib. p. 238, pl. XVII, fig. 3; A. pseudodecorata COTTEAU, Échinides nouveaux, p. 85, pl. XII, fig. 6, reproduite dans la fig. 8 de la gravure sur bois, p. 80. [2]) Comp. Ps. tuberculosa COTTEAU, ib., p. 22, pl. IV, fig. 8, copiée dans la grav. s. bois, p. 80, fig. 7. [3]) Pl. XIX, fig. 159—165; pl. XXI, fig. 177. [4]) Comparez: COTTEAU, Note sur la famille des Salénides, Bull. Soc. Géol., 2de série, XVIII, 1861, p. 614. [5]) V. la grav. s. bois, p. 80, fig. 8.

atteint, chez le type des Spatanguides des mers actuelles, une organisation analogue, dans certains traits fondamentaux, à celle des embranchements supérieurs des invertébrés. Le tube digestif, dès qu'il ne s'ouvre pas verticalement dans le calice, est comme saisi d'une mobilité extraordinaire, par suite de laquelle le périprocte se trouve pratiqué, dans les genres divers, sur tous les points de la ligne médiane de l'interradium impair, depuis le bord du calice jusqu'aux approches du péristome. Cette mobilité apporte des changements considérables dans la forme générale du corps, comme dans ses parties différentes, et en particulier dans le système dorso-central.

Dans les Échinoconides, qui, par leur bouche armée et fixée au centre de la face ventrale, par leur ambitus circulaire ou sub-pentagonal, et par leur système dorso-central à peu près décagonal, comme à tant d'autres égards, sont des Échinides exocycliques, l'ouverture anale, loin de se diriger vers le centre du calice, s'en éloigne de plus en plus à mesure que l'époque de l'apparition du genre se rapproche des temps modernes. C'est le contraire de ce qui paraît avoir eu lieu chez les Saléniens. En voyant, dans le Pygaster, le plus ancien de tous[1]), le grand périprocte longitudinal dorsal et sub-central, on croirait qu'il venait de passer au travers de l'enceinte du calice, et on s'attend à le voir, dans quelque espèce encore à découvrir, en briser la dernière résistance. Etendu en arrière et compris en entier dans l'aire impaire profondément échancrée, il se trouve en contact immédiat avec le calice dérangé dans ses éléments constituants, et dont la costale 5 ne se retrouve plus[2]). Dans le Pileus, genre de l'étage corallien, à périprocte supérieur sub-marginal, et dans les espèces jurassiques de l'Holectypus[3]), à périprocte éloigné du calice, marginal ou ventral, la pièce costale 5 est là, mais dépourvue de pore génital; elle redevient perforée, et l'ordre normal est rétabli dans le calice des espèces crétacées de ce dernier genre, à périprocte ventral et encore plus distant. Il en est de même des Discoidea[4]), du terrain crétacé, à périprocte ventral; la costale 5 est là, imperforée chez les espèces des assises inférieures, perforée dans celles des couches turoniennes[5]), la réapparition du pore génital annonçant la reprise du travail reproducteur de la glande correspondante, depuis que son emplacement normal, occupé auparavant par le rectum, lui a été restitué par suite de la retraite de l'ouverture anale. Enfin, dans l'Échinoconus[6]), à périprocte postérieur, sub-ventral, et dans l'Anorthopygus, chez lequel il est postérieur et dorsal, tous les deux de terrains crétacées, la costale 5 a disparu. On voit donc que, dans ce groupe d'Échinoïdées maxillées, l'ouverture anale vient, par suite de sa tendance rétrograde, se placer finalement à la face ventrale, à la manière du tube anal des Cystidées et des Crinoïdées, et que le déplacement du périprocte entraîne la suppression permanente ou

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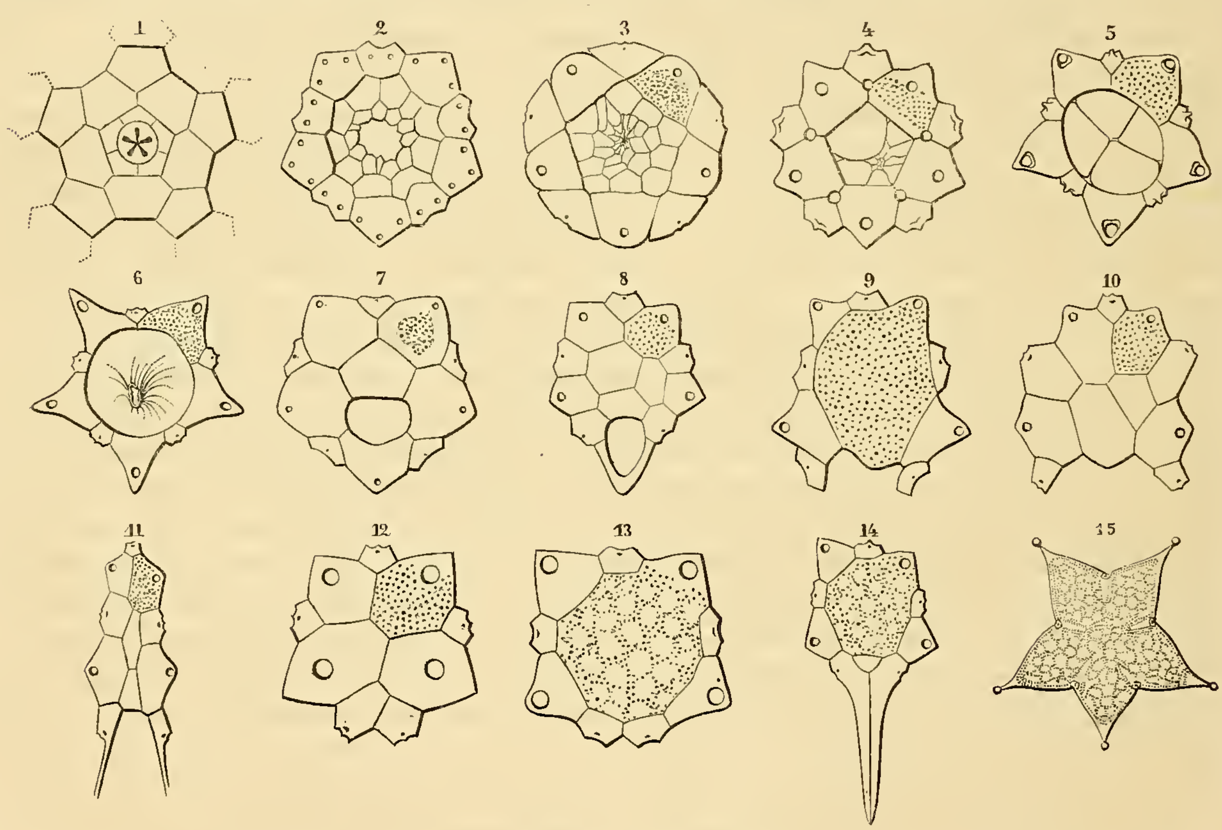
[1]) Le genre Pygaster, contemporain des Saléniens dans les mers jurassiques et crétacées de l'Europe, l'est encore aujourd'hui dans la mer des Antilles. La même localité, près des Virgin Islands, à 380 mètres de profondeur, qui procurait à M. le Dr. Goës la Salenia goësiana décrite ci-dessus, lui offrit une autre découverte importante, celle d'une espèce vivante de ce genre, conservée dans le Musée de l'État sous le nom de Pygaster relictus n. L'exemplaire unique trouvé est un peu mutilé, mais il ne peut y avoir de doutes sur le genre. Quoique adulte, selon l'apparence, il ne mesure que 3 mm. La plupart des formes crétacées retrouvées vivantes à de grandes profondeurs sont comparativement petites. [2]) V. la grav. s. bois, p. 80, fig. 9. [3]) Pl. XV, fig. 132. [4]) Fig. 133. [5]) Cotteau, Pal. franç., Terr. jur., IX, p. 404, pl. 102—111; Terr. crét., VII, p. 43, pl. 1014—1018: Holectypus; Ib., p. 13, 39, pl. 1007—1012: Discoidea. [6]) Pl. XV, 134.

transitoire du pore génital de la costale 5, et même la perte totale de cette pièce. On observe aussi, dans le genre Echinoconus, que la forme générale du corps, de circulaire qu'elle est dans la grande majorité des espèces, devient parfois elliptique chez des espèces de la craie.

Le degré de cet éloignement rétrograde du périprocte se fait sentir dans l'état des différentes parties qui composent le système dorso-central; le disque central et l'emplacement du madréporite en sont le plus fortement influencés.

Il n'existe point de pièce madréporique spéciale. L'ensemble des canaux ramifiés formant le filtre au moyen duquel est reçue l'eau destinée à la circulation aquifère, et auquel correspond à l'intérieur un appareil ampoulaire, s'installe, chez le jeune Oursin, dans le disque central ou dans une ou plusieurs des pièces costales, et s'y retrouve toujours, dans toutes les espèces. Römer observait dans le calice du Melonites multiporus trois pores à chacune des cinq pièces costales, tandis que Meek et Worthen en trouvaient le nombre variable, de quatre ou de cinq, dans les différentes costales d'un



Transformations du calice.

1. Poteriocrinus geometricus Goldf., d'après L. Schultze. 2. Palæechinus elegans M'Coy, d'après Baily. 3. Cidaris papillata, Leske. 4. Temnopleurus toreumaticus Leske. 5. Echinocidaris nigra Mol. 6. Diadema setosum Gray. 7. Pseudosalenia tuberculosa Cotteau, d'après Cotteau. 8. Acrosalenia pseudodecorata Cotteau, d'après le même. 9. Pygaster dilatatus Agass., d'après le même. 10. Galeropygus Marcoui Desor, d'après le même. 11. Hyboclypeus Theobaldi de Loriol, d'après le même. 12. Pyrina icaunensis de Loriol, d'après le même. 13. Pygurus depressus Agass, d'après le même. 14 Clypeus Osterwaldi Desor, d'après le même. 15. Encope Valenciennesi Agass.

individu. Pour le calice du Palæechinus elegans[1]), BAILY indique trois pores à chaque costale, nombre constaté par DE KONINCK. Tous les observateurs ont pris ces pores pour des pores génitaux. On est conduit, cependant, à regarder plutôt comme madréporiques les pores des costales du calice de ces Périschoéchinides, si l'on considère que les pores du madréporite, sauf une seule exception, sont toujours en nombre considérable, mais variable, et qu'ils ne manquent jamais au calice, tandis que les pores génitaux, partout simples, n'y sont pas toujours présents, et si l'on se rappelle les cas connus où les pores du madréporite sont répandus sur toutes les cinq costales, comme chez la Discoidea conica DESOR[2]) et la D. infera DESOR[3]), ou sur trois de ces pièces, les 1, 2 et 3, comme dans la Micropedina Cotteaui COCQ[4]). Quoiqu'il en soit, dans tous les autres genres dont le disque, remanié ou intact, est le siége de l'ouverture anale, le madréporite est logé dans la pièce costale 2, la droite antérieure. Il en est autrement quand l'axe du tube digestif n'est pas vertical. Alors l'espace central intérieur n'étant pas occupé par le rectum, l'appareil madréporique s'y étend, autant que le permet l'état du calice, pour pénétrer de ses pores nombreux le disque central, son siége normal, et les répandre même au delà, mais toujours en partant de la costale 2, et en effaçant la suture qui sépare celle-ci du disque, au point même que ces deux parties se confondent complètement. C'est le cas des Échinoconides, dont le disque central est d'une grandeur considérable et d'une forme pentagonale plus ou moins distincte dans les genres Anorthopygus, Pileus, Pygaster[5]), Holectypus[6]), Echinoconus[7]), tandis que chez les Discoidea[8]) il est moins grand, trop petit même dans certaines espèces pour contenir le madréporite, de sorte que des quatre costales, lesquelles en sont exemptées ailleurs, chacune en a reçu sa part.

Mais ce caractère de mutabilité qui s'imprime à toutes les parties du test avec le déplacement du périprocte, se manifeste d'une manière encore plus prononcée chez les Édentées, renforcé comme il l'est chez elles par la tendance vers le devant, propre au péristome sans appareil dentaire et en voie de transformation depuis le premier âge de l'individu. De l'autre côté, la tendance rétrograde du périprocte est évidente. Parmi les Échinonéides, le genre Galéropygus[9]), du Jura inférieur, a le périprocte contigu au calice, comme aussi le genre Hyboclypeus[10]), des couches inférieures et moyennes, tandis que dans les Galéroclypeus, Desorella et Pachyclypeus, des couches moins anciennes, il en est séparé par une distance plus grande. Dans la Pyrina Guerangeri COTTEAU, du bathonien, il est très-rapproché du calice, dans la P. icaunensis COTTEAU, du corallien, il occupe le milieu de la face supérieure de l'aire impaire, et dans les espèces nombreuses de la Craie il est presque toujours refoulé à la face postérieure. On sait qu'il est ventral chez l'Échinonéus de nos mers. Parmi les Cassidulides, les espèces du genre Clypeus à périprocte peu éloigné du calice prédominent dans les couches inférieures du Jura, tandis que celles qui l'ont postérieur appartiennent aux couches supérieures, et il paraît en être de même des Echinobrissus. On s'aperçoit aussi, en suivant

[1]) Voir la gravure sur bois, p. 80, fig. 2. [2]) Pl. XV, fig. 133. [3]) Paléontol. française, Terr. crét., VII. pl. 1013, fig. 6. [4]) Ib. pl. 1197, fig. 9. [5]) Voir la grav. s. bois, p. 80, fig. 9. [6]) Pl. XV, fig. 132. [7]) Fig. 134. [8]) Fig. 133. [9]) Voir la grav. s. bois, p. 80, fig. 10. [10]) Ib., fig. 11.

chez certains genres nombreux en espèces et d'une longue durée géologique, l'apparition successive de celles-ci dans les différentes couches, qu'en général chez les genres qui commencent avec des formes arrondies ou circulaires, le diamètre longitudinal du test l'emporte insensiblement sur le diamètre transversal, de sorte que la plupart des espèces du Jura supérieur ou de la Craie sont un peu plus allongées que les espèces des mêmes genres caractéristiques des terrains plus anciens. C'est ce qui paraît être le cas des Galéropygus et des Hyboclypeus parmi les Échinonéides, des Clypeus et des Échinobrissus parmi les Cassidulides; c'est aussi le cas des Spatanguides prymnodesmiens des mers actuelles comparativement aux prymnadètes de la période crétacée. Le Pygurus oppose, il est vrai, à cette règle apparemment générale, sa forme large et subrostrée, à périprocte postérieur infra-marginal, rigoureusement maintenue depuis la première apparition du genre dans les couches inférieures du Jura, jusqu'à la fin de son existence dans la période crétacée; mais il serait possible que les couches liasiques et infra-liasiques recélassent encore des types génériques précurseurs qui viendront invalider un jour cette exception.

Le calice des Édentées présente dans la disposition, la forme et la grandeur relative de ses éléments constituants des diversités considérables. La costale 5, d'une existence incertaine chez les Échinoconides, y est définitivement supprimée. Le disque central l'est aussi dans beaucoup de cas, et quand il s'y trouve, il est souvent modifié de forme, comprimé, plus ou moins déplacé, ou partagé en deux ou plusieurs pièces irrégulières. Cette division du disque ne se montre que pendant la période jurassique. Dans l'Échinonéide Galeropygus Marcoui[1]), dont le périprocte semble avoir retranché la partie postérieure du calice, le disque, assez large, est partagé en deux, et le madréporite est limité à la costale 2; il en est de même dans le calice fortement comprimé de l'Hyboclypeus Theobaldi[2]), et dans celui de la Pyrina Guerangeri[3]), du bathonien, où le disque est même entièrement supprimé. Chez le dernier de ces genres, qui a continué à vivre jusque dans la période crétacée, le disque paraît se montrer de nouveau dans les espèces du Jura supérieur et de la Craie, entier, confondu avec la costale 2, et pénétré des pores du madréporite[4]). Chez les Cassidulides, le disque n'est jamais totalement supprimé; il est très-grand et occupé en entier par le madréporite dans le calice régulier du Pygurus[5]), à périprocte refoulé en arrière. Dans le Clypeus[6]), une petite portion paraît s'en être détachée postérieurement, la plus grande partie étant cédée au madréporite; dans les espèces à périprocte sub-central, les radiales I et V sont allongées, pour remplir l'espace laissé par sa retraite. La division multifide du disque ne se montre guère que dans le genre Echinobrissus, chez ses espèces jurassiques, et par préférence dans celles des couches inférieures, à périprocte peu éloigné du calice, tandis que le disque est entier dans celles de la Craie, où celui-ci est plus reculé. Règle générale, toutes les fois que le disque se trouve divisé, le madréporite est limité à la costale 2, tandis que, quand le disque est entier, le madréporite s'y établit; et, lorsque le périprocte se trouve dans les approches du calice, celui présente un état de dérangement dont il revient à mesure que le périprocte s'en éloigne dans son mouvement

[1]) Voir la grav. s. bois, p. 80, fig. 10. [2]) Ib., fig. 11. [3]) Paléontologie française, Terrain jurass., IX, p. 395, pl. 99, fig. 11. [4]) Voir la grav. s. bois, p. 80, fig. 12. [5]) Ib. fig. 13. [6]) Ib., fig. 14.

rétrograde normal, et que le test se développe dans le sens de sa longueur, ou, ce qui revient au même, à mesure que le genre se maintient plus longtemps dans le cours des âges géologiques.

Chez les Collyritides on ne retrouve guère que des traces du disque central. Il a disparu complètement dans les Ananchytides[1]), et chez l'un et l'autre de ces groupes le madréporite est logé dans la costale 2. Il n'en est pas autrement dans le calice moins comprimé, plus ou moins arrondi, de la grande majorité des Spatanguides essentiellement crétacés[2]), presque tous prymnadètes, et dans celui du genre Micraster[3]), seul prymnodesmien de ce terrain. Mais, vers la fin de la période crétacée vient s'introduire une disposition différente, qui paraît commencer par les genres Prenaster et Macropneustes, pour devenir prédominante dans la période tertiaire et dans le temps actuel, chez les Prymnadètes aussi bien que chez les Prymnodesmiens. Le disque central reparaît[4]), il sépare complètement l'une de l'autre les costales 1 et 4 et les radiales I et V; en outre, dans beaucoup de formes récentes[5]), pendant que les quatre costales tendent à se grouper antérieurement d'une manière plus ou moins régulière et bilatérale, il se porte en arrière, hors de l'enceinte du calice, sur la ligne médiane du dos, entre les deux rangées des dernières plaques de l'interradium impair. Le madréporite le remplit de ses pores, partant, comme toujours, de la costale 2, en effaçant la suture qui devrait séparer celle-ci du disque. Dans quelques espèces il se répand même dans la costale 3, dont il supprime le pore génital[6]).

Enfin, lorsque, avec la période tertiaire, un type nouveau, le dernier venu, s'introduit dens la classe des Échinoïdées, celui des Clypéastrides, contemporains litoraux ou sub-litoraux d'une faune crétacée des grandes profondeurs océaniques d'alors, plus vigoureuse que celle d'un aspect dépérissant qui y persiste encore de nos jours, le calice semble toucher à la fin de son rôle morphologique. Réduit d'étendue, simultanément avec l'agrandissement des ambulacres et des aires interradiales, il ne ressort que faiblement au milieu de la face dorsale, son plus grand diamètre n'égalant en moyenne que 0,07 de celui du test, proportion fort insignifiante quand on se rappelle que chez les Saléniens il en atteint 0,82. Le madréporite l'occupe: dans les uns presque en entier et de pores nombreux, comme chez les genres Clypeaster[7]), Encope[8]), Mellita, Rotula[9]), ou en partie comme dans certains Laganums[10]); chez d'autres il en creuse la surface de rainures linéaires tortueuses et ramifiées, au fond desquelles s'ouvrent les pores, comme dans les Laganum Bonanni et depressum[11]); chez d'autres encore, comme chez l'Echinocyamus[11]), il ne s'ouvre extérieurement que par un seul pore très-grand. Mais, dans tous les genres, il en efface toutes les sutures costales et même dans plusieurs cas celles des pièces radiales, toujours subordonnées. Le disque, avec les costales égales de grandeur, formant un ensemble pénétré à l'intérieur de ses canaux ramifiés et rayonnants, ne présente pas ce rapport spécialement intime entre la costale 2 et le disque central, si remarquable dans le reste des exocycliques. Les pièces constituantes du calice sont modifiées de manière à lui donner une forme générale étoilée pentagone, la costale 5 s'y trouvant

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[1]) Pl. XI, fig. 96, 97. [2]) Fig. 93, 94. [3]) Fig. 95. [4]) Fig. 99. [5]) Pl. XII, fig. 100, 101, 106. [6]) Voir ci-dessus, p. 12. [7]) Pl. XVI, fig. 136. [8]) Voir la grav. s. bois, p. 80, fig. 15. [9]) Pl. XVI, fig. 135. [10]) Fig. 138. [11]) Fig. 137. [12]) Fig. 139.

toujours présente, à ce qu'il paraît, quoique souvent dépourvue de pore génital. Mais, par suite d'une disposition particulière des parties, difficile à comprendre, les angles du calice n'ont pas la même direction dans tous les genres. Dans la Rotula[1]), les pièces radiales sont situées aux angles saillants, qui par conséquent correspondent aux ambulacres, tandis que les costales, dont la 5 est dépourvue de pore génital, constituent les angles rentrants. Dans la plupart des autres genres, au contraire, les pièces radiales se trouvent dans les angles rentrants du calice, confondues avec le reste de ce dernier, ou distinctes, quoique réduites presque à de simples bordures des pores oculaires; quant aux costales, elles s'étendent vers les aires interradiales, pour aboutir, chez le Laganum[2]) et l'Echinocyamus[3]), à la plaque unique du sommet de celles-ci, ou pour s'insérer entre les dernières plaques de leur double rangée, comme dans l'Échinarachnius[4]), l'Encope[5]), le Clypéaster[6]), la Mellita, et y laisser, dans ces trois derniers genres, les pores des conduits génitaux, apparemment expulsés par le madréporite, le premier occupant du calice.

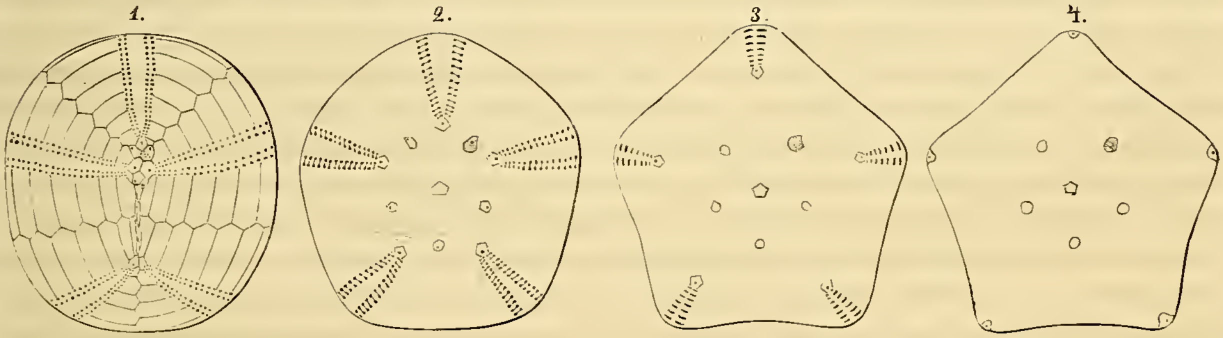
Ainsi se transforme, dans le cours des temps géologiques, le système dorso-central des Échinoïdées. Pendant que le système ambulacral, celui de leurs membres immobiles, se différencie, se complique de plus en plus, et l'emporte par cela sur les autres; pendant que le système périsomatique se dispose à le recevoir, et s'étend en déterminant la forme générale du test, le système dorso-central s'altère et se resserre. En général, toutes les fois qu'un nouveau type vient s'ajouter aux anciens, on voit s'effacer l'un ou l'autre des traits primitifs que le calice possède en commun avec celui des Crinoïdées, sa forme pentagone rayonnée se défigure, et ses parties constituantes se rapetissent par rapport aux dimensions du test, ou disparaissent même en partie. N'ayant pas un rôle essentiellement morphologique à remplir, il se modifie de diverses manières, et se défait, en s'appropriant aux différents besoins des organes des sens, de la génération, de la circulation et de la nutrition; mais il demeure à sa place, même chez les types les plus récents, témoin de cette constance des lois de l'organisation, grâce à laquelle on reconnaît ses traits fondamentaux sous toutes les apparences. Chez les Cidarides, dont l'existence remonte à l'époque reculée où vivait l'Agassizocrinus, à disque central presque sans trace de la tige disparue; chez les Saléniens, contemporains du Marsupites, on retrouve encore, dans toute son évidence, la conformation typique du calice des Crinoïdées; plus tard, et de plus en plus, à mesure que l'époque de l'apparition d'un genre est postérieure, le calice des endocycliques diminue d'étendue; mais, abstraction faite du disque central remanié, il révèle toujours, par la forme, le nombre, la disposition concentrique des éléments constituants, ses homologies légitimes. Chez les Maxillées exocycliques encore, le calice, fortement influencé par le déplacement du périprocte, se rétablit et se reconstruit plus ou moins, et dans le type des Clypéastrides mêmes, le plus récent de tous, le calice, réduit au dernier point, et aux éléments confondus mais complets, retient encore quelques traits de sa forme rayonnnée primitive. Mais, lorsque, au milieu d'une faune entièrement nouvelle, on voit le type des Édentées émerger d'un passé où notre vue se perd, le calice, du premier abord d'une grandeur subordonnée, et rendu anomal par suite de la disparition

[1]) Pl. XVI, fig. 135. [2]) Fig. 137, 138. Pl. XLV, fig. 236. [3]) Pl. XLIV, fig. 235. [4]) Pl. L, fig. 244. [5]) Pl. XLVI, fig. 237; grav. s. bois, p. 80, fig. 15. [6]) Pl. XVI, fig. 136.

définitive de la costale 5, celle de la ligne médiane, se conforme à l'ambitus plus ou moins allongé du test, et se dispose d'une manière bilatérale, les pièces costales et les radiales tendant à se ranger par paires, des deux côtés du milieu occupé, ou non, par le disque central.

Mais, quelles que soient ces formes diverses imprimées au calice des Échinoïdées par le travail morphologique et par le jeu mutuel des organes, il y existe cela de normal, que ses différentes parties tiennent ensemble en formant un tout compact. C'est là, à la vérité, un trait de formation tellement propre à la classe entière, que l'on s'étonne de voir les Collyritides [1]) y faire exception. Chez ceux-ci, les deux pièces radiales du bivium, les I et V, sont refoulées en arrière et séparées du reste du calice, des quatre costales et des trois radiales du trivium, lesquelles forment un groupe à elles, le disque central étant presque invariablement supprimé. C'est l'allongement du calice observable chez certains Échinonéides et encore plus distinctement chez les Ananchytides, poussé à l'excès, jusqu'au démembrement. Quelle que soit la disposition des organes internes qui exige cette modification insolite du squelette, il est évident que le système périsomatique y est pour beaucoup. Les aires interradiales 1 et 4, au lieu d'aller en se rétrécissant vers le sommet, maintiennent à peu près leur plus grande largeur jusqu'à la ligne médiane du dos, en remplissant ainsi l'intervalle laissé entre les deux portions séparées du calice, et s'y soudent l'une à l'autre au moyen de leurs plaques les dernières formées. C'est une combinaison parfaitement étrangère au type échinoïde, et dont on est amené à chercher ailleurs l'analogue. Or, si par la pensée l'on fait se produire cet état élargi des plaques non pas dans les aires 1 et 4 seules, mais uniformément et simultanément dans toutes les cinq aires du périsome, de manière à écarter également les cinq radiales jointes aux cinq ambulacres, et à isoler les cinq costales, en en restituant l'impaire, ainsi que le disque central au milieu; et si l'on fait en même temps saillir légèrement les ambulacres, on aura le semblant d'une Étoile de mer. C'est là un mode de développement purement imaginaire par rapport au Collyrites; il est réel chez les Astériadées.

1. 2. 3. 4.



Transformation imaginaire d'un Collyrites.

[1]) Pl. XI, fig. 28. Pl. XXIII, fig. 180.

Dans un Asterias glacialis L. très-jeune[1]), de 1,3 mm. de diamètre, venant de terminer son développement larval, à bouche ouverte, mais sans indice d'ouverture anale, le squelette se compose presque exclusivement de deux systèmes, l'ambulacral et le dorso-central. Des cinq ambulacres, chacun ne compte encore que trois paires d'éléments en forme d'osselets transversaux, analogues aux plaques ambulacraires des Échinoïdées, réunis au milieu par une suture denticulée, et comprimés des deux côtés de manière à laisser, avec ceux de la paire prochaine, deux interstices évasés, qui sont les pores tentaculaires. Les cinq premières paires d'osselets forment ensemble le péristome pentagone. Les troisièmes, à peine achevées elles-mêmes, ont déjà commencé à développer les quatrièmes. La disposition des osselets est partout identique et symétrique par rapport à un diamètre passant par la ligne médiane d'un ambulacre quelconque et par le centre du péristome. Le système dorso-central, le calice, qui constitue ici à lui seul toute la face dorsale, est parfaitement identique à celui d'un Échinide très-jeune. Au milieu, le disque central pentagone (a); autour de lui, les cinq pièces costales (b, 1—5), rappelant par leur forme celles de certains Saléniens; et, à l'angle des costales, les cinq pièces radiales (c, I—V), se voûtant au-dessus des ambulacres, et ayant le bord de leur sommet échancré pour la réception des yeux et des organes spéciaux du toucher. Le tout est enduit d'une enveloppe transparente et très-mince[2]).

Régulière comme l'est cette phase de développement, laquelle présente déjà dans son ensemble la forme future de l'Astériadée adulte, elle n'est cependant que transitoire, et de très-peu de durée. Deux circonstances l'indiquent. Le disque central n'est plus exactement pentagone; sur son bord droit, vis-à-vis de la costale 1, une perte de substance, fort légère mais appréciable, se fait remarquer, analogue à celle qui a été observée chez le très-jeune Échinide[3]). Les pièces radiales ne touchent pas parfaitement les pièces costales, et dans la membrane qui remplit l'espace très-étroit qui les en sépare, il s'est déjà formé une lame (p), encore excessivement petite, de tissu calcaire réticulé: premier rudiment à peine ébauché du système périsomatique ou interradial, destiné à constituer bientôt la plus grande partie du corps. On s'en persuade dès qu'à ce petit individu de 1,3 mm. on en compare un autre de la même espèce, mais plus grand, de 2 millimètres[4]), à sept paires d'osselets ambulacraires librement développés, sans encombrement quelconque, à bras allongés simultanément et uniformément, et de façon que les radiales sont restées à leurs places définitives au-dessus des sommets des ambulacres croissants. A la face dorsale de chaque bras, on voit, à la place de la fente étroite dans l'individu de 1,3 mm., une distance considérable séparant entre elles les pièces costales et radiales, et, au lieu de la petite lame de tissu calcaire réticulé, on remarque, dans la membrane remplissant cette distance, trois séries de plaquettes calcaires allongées, armées de radioles rudimentaires, l'une médiane, à trois plaquettes, et deux latérales dont chacune en a deux. En même temps, le disque central se trouve sensiblement retardé dans son accroissement, de façon à ne plus remplir l'espace pentagonal, et l'échancrure de son bord droit postérieur est tant soit peu

[1]) Pl. LIII, fig. 256, 257. [2]) Cette enveloppe a été omise dans les figures suivantes. [3]) Voir ci-dessus, p. 69. Pl. XXI, fig. 170, 171. [4]) Fig. 258, 259.

plus marquée. En transférant ensuite l'observation à un troisième individu, de la double grandeur du second seulement, de 4,5 mm.[1]), on voit l'énorme développement qu'a pris le système périsomatique. Ici les bras sont considérablement allongés, et les trois séries longitudinales de plaquettes, dont la médiane en compte six ou sept, en se joignant par des prolongements ou des séries transversales, commencent à former le réseau compliqué propre à l'adulte. Dans chaque bras, deux paires de tentacules respiratoires (t. r.) ont fait leur apparition. Les costales, qui, dans les individus plus jeunes encore, se couvraient de leurs lames transversales, sont au point de se séparer. Elles conservent encore presque parfaitement leur forme primitive[2]); à l'intérieur, on y remarque une crête longitudinale finissant en pointe saillante et arrondie. Mais dans l'une d'elles[3]) on reconnaît l'analogue de la costale 2 des Échinoïdées; elle est un peu plus large que les autres, et le madréporite vient de s'y ouvrir, sous la forme d'une petite fissure arquée, à laquelle correspond, à la face intérieure, un simple pore, au fond d'un enfoncement sinueux. Le disque central, devenu proportionnellement plus petit encore, et d'une figure irrégulière considérablement résorbée du côté droit postérieur, se trouve isolé au milieu de l'espace agrandi, encore circonscrit par les bases des costales, mais au point de se remplir d'un résau périsomatique de plaquettes allongées. L'ouverture anale n'y est pas encore; elle n'existe que chez des individus ayant atteint six à huit millimètres au moins. Le démembrement du calice va se continuant toujours, comme il est facile de s'en convaincre par l'observation d'individus de différentes grandeurs. On a vu que les radiales étaient les premières à s'en séparer, emportées aux bouts des bras rapidement allongés; maintenant les costales s'écartent de plus en plus les unes des autres, et au milieu de l'espace dont elles indiquent cependant toujours la forme pentagone, reste le disque central, fortement retranché à son bord droit postérieur. C'est que le système périsomatique, de plus en plus répandu, en développant le réseau de ses mailles de plaquettes au milieu des éléments constituants du calice, naguère si nettement joints, les force à se séparer. On voit cinq mailles principales les écarter par l'allongement de leurs plaquettes, tendues entre le disque et les cinq costales, comme entre celles-ci mêmes. Dans l'une de ces mailles, légèrement dilatée, l'ouverture anale se pratique, du dedans, entourée extérieurement de tubercules granulaires; dans l'Astériadée, orientée à la manière des Oursins, c'est sur le diamètre passant par l'ambulacre I et l'aire interradiale 3 qu'elle se place définitivement. Dans ce genre, l'Astracanthion de Johannes Müller et Troschel, les pièces costales, quoique éloignées les unes des autres et ayant pris une forme plus large, se reconnaissent facilement, même chez de très-grands individus. Dans d'autres genres elles paraissent se dérober dans la multitude de plaquettes diversiformes du système périsomatique; mais on les retrouve presque invariablement, en prenant pour point de repère la pièce logeant le madréporite, avec laquelle elles forment un pentagone régulier, qui se laisse distinguer des autres figures pentagonales selon lesquelles sont disposées les plaques du périsome. C'est ainsi qu'on les découvre chez le Scytaster variolatus Retzius, à leurs places, vis-à-vis des angles interradiaux, mais du reste assez semblables aux autres plaques dorsales.

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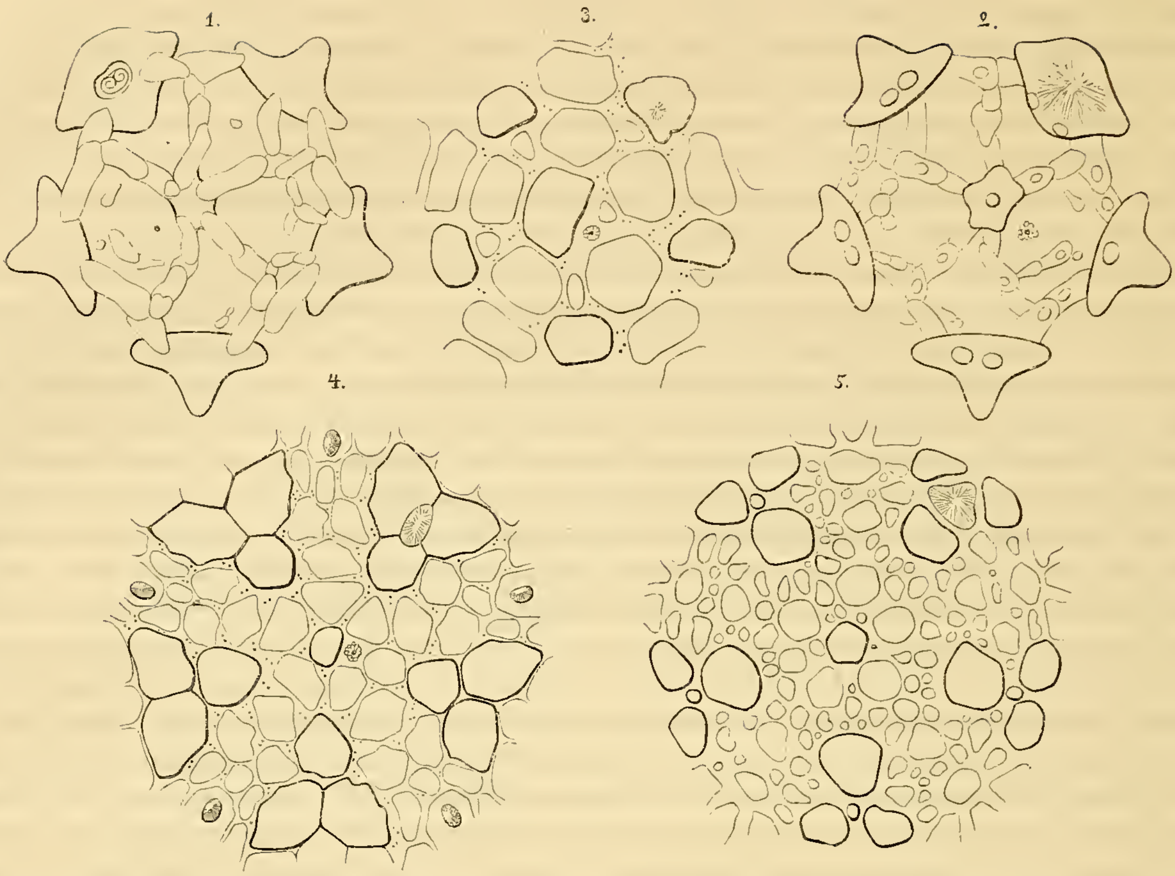
[1]) Fig. 260. [2]) Fig. 263, 264. [3]) Fig. 260, b, 2; fig. 261, 262.



Région dorso-centrale: 1, de l'Asterias glacialis L., vue de l'intérieur; 2, du même, vue de l'extérieur; 3, du Scytaster variolatus Retz.; 4, du Stellaster eqvestris Retz.; 5, de l'Astrogonium ornatum M. et T. Les contours forts marquent le disque et les costales.

Presque au milieu de leur pentagone, on voit le disque central, très-grand, mais fortement retranché à son bord droit postérieur, afin de fournir l'espace necessaire à l'ouverture anale. Il n'en est pas autrement chez le Stellaster equestris Retzius, et l'Astrogonium ornatum M. et T. La résorption du disque central est la même, mais les cinq pièces costales ont l'apparence d'être fendues: dans le premier, en trois parties, de façon que le madréporite s'en trouve comme enchâssé; dans le second, en quatre parties, dont l'une, au centre du groupe, est occupée par le madréporite. Dans ces espèces, comme chez tant d'autres, il est facile de se convaincre que les plaques du périsome, en déplaçant et en démembrant les éléments du calice, se sont disposées par pentagones très-réguliers, constitués de plaques isolées ou groupées. En tenant compte de cette circonstance, l'on constate que dans l'espace un peu dilaté où est placée l'ouverture anale, se trouve souvent une plaquette surnuméraire isolée, insérée vis-à-vis de la pièce costale 1; or c'est précisement la place qu'occupe, chez le très-jeune Échinide[1]), la première plaquette formée dans la déhiscence ouverte entre cette même costale et le bord du disque central, par suite de la résorption, dans cette même direction, des bords de ces deux pièces,

[1]) Pl. XXI, fig. 170, 171.

résorption qui bientôt se dirige vers le bord de la radiale I, vis-à-vis de laquelle vient se placer finalement l'ouverture anale. La formation de cette ouverture s'opère donc par un procédé parfaitement identique chez les Astériadées du type représenté par les genres cités, et chez les Échinides du type dont le genre Toxopneustes peut servir d'exemple. Dans l'Étoile de mer, c'est du périsome que fait partie la membrane dans laquelle se produit cette solution de continuité, ce qui permet de supposer que chez l'Oursin aussi c'est le périsome qui fournit la membrane anale, incrustée de plaquettes secondaires, par laquelle est remplacé le disque central. C'est là, en effet, dans l'une et dans l'autre des deux classes, le même type endocyclique, avec ceci de plus, que, dans toutes les deux, l'axe vertical des organes de la nutrition présente, au pôle dorsal, une légère déviation dans le sens d'un même diamètre.

Il ne saurait donc y avoir de doute sur l'homologie du disque central dans ces deux classes; il n'en est pas moins certain que les costales et les radiales de l'une et de l'autre sont typiquement les mêmes. Chacune de ces trois parties constituantes du système dorso-central se modifie aussi, dans l'une et dans l'autre, de la même manière, et sous les mêmes influences. Il est vrai que les conduits efférents des organes de la génération, chez les Échinoïdées en possession, toutefois incertaine, des costales, en sont relégués définitivement chez les Astériadées, et rejetés dans le périsome interradial. Mais, dans l'Étoile de mer comme dans l'Oursin, tandis que le disque central, complètement formé de très-bonne heure, se réduit, en cédant au développement des organes de la nutrition, c'est la même pièce costale qui s'approprie aux besoins de la circulation aquifère, et, dans tous les deux, les radiales, devenues ommatophores, sont restées simples, au-dessus des sommets des ambulacres. C'est un accord complet, évident dans le premier âge de l'Astériadée, déguisé mais parfaitement reconnaissable chez l'adulte. Il existe, entre le système dorso-central des Astériadées et celui des Échinoïdées, considéré dans sa totalité et dans ses rapports aux autres systèmes du test, comme dans ses parties constituantes, une similitude de structure et une conformité de modifications qui achèvent de faire concevoir tant l'unité de son plan morphologique primitif, que la nature identique du jeu des organes qui y apportent les altérations caractéristiques des unes et des autres.

De même, si l'on compare, de part et d'autre, le système ambulacral, on reconnait qu'il possède en commun certains grands traits de conformation: la double rangée des osselets transversaux qui donnent passage aux vaisseaux tentaculaires, enchâssée, à découvert, dans le périsome, et croissant, indépendamment de celui-ci, par l'addition, au sommet, d'osselets nouveaux, abrités sous la radiale. Le périsome, enfin, tout en prenant chez les Astériadées un développement beaucoup plus grand, contribue d'une manière analogue, chez toutes les deux, à déterminer la forme générale.

Des cinq grands types d'Échinodermes qui semblent avoir coëxisté dans les mers de la période la plus reculée dont parle la géologie, comme ils le font dans celles d'aujourd'hui, c'est donc à celui des Astériadées que se relie plus intimement qu'à aucun autre le type des Echinoïdées. On dirait que l'anomalie transitoire des Collyritides l'annonce. Mais, de tous les Échinodermes, les Échinoïdées se distinguent par des caractères importants. Leur squelette tégumentaire est un test globuleux, normalement rigide. Trois systèmes le constituent. Le système dorso-central, le calice, est typiquement compact pendant toute la vie de l'individu. Le système ambulacral, celui des cinq bras immobiles, s'étend du pôle buccal au pôle dorsal, suivant la courbure du test, jusqu'à toucher les radiales du calice; ses plaques, à pores normalement géminés, sont disposés d'une manière asymétrique, en rapport déterminé et constant à l'axe antério-postérieur, le tout se divisant en un trivium et un bivium. Le système périsomatique, le test, qui reçoit les ambulacres dans son épaisseur, présente, dans le monde actuel, normalement, deux rangées de plaques typiquement hexagones dans chacune de ses aires interradiales; chez les formes paléozoïques il y en avait plusieurs. La bouche, ouverte de très-bonne heure, est toujours inférieure, à la face ventrale; l'ouverture anale, qui se produit par une résorption locale de la substance calcaire du test déjà formé, se trouve placée, dans les divers genres, sur tous les points depuis le centre du calice jusqu'aux approches de la bouche, suivant la ligne médiane de l'aire interradiale impaire. Il y a des Echinoïdées à bouche armée de dents, et d'autres à bouche inerme. Chez les premiers, type d'origine paléozoïque, l'ambitus est normalement circulaire; le péristome, auquel se trouvent fixés intérieurement les supports de l'appareil dentaire, retient sa forme primitive circulaire ou décagone, en restant, pendant toute la vie de l'individu, au centre de la face ventrale, le test se divisant, normalement, en parties égales entre les ambulacres du trivium et ceux du bivium, comme entre les aires interradiales. Le calice, périproctal ou non, a ses costales au nombre normal de cinq, et conserve, même dans les genres récents, des traces de la disposition concentrique de ses parties constituantes. Les ambulacres sont tous conformes. Ce sont: les Cidarides, Echinoïdées par excellence, les plus anciens des types vivants, à l'axe digestif exactement vertical, à test flexible dans sa région buccale, par suite de l'imbrication des plaques, — il l'était en entier chez certains Périschoéchinides paléozoïques, et il l'est encore dans l'Asthenosoma, — à radioles développés en supports mobiles puissants; les Échinides, à limite fixe de la couronne, apparaissant au temps mésozoïque: les Saléniens, dont le calice, d'une grande étendue et d'un aspect crinoïdien, a un disque central intact, pentagone, perforé ou non par le périprocte; les Diadémiens, à disque remplacé normalement par un périprocte longitudinalement elliptique, couvert d'une membrane nue à tube anal central; les Échininiens ou Échinides propres, à disque remanié en membrane incrustée de plaquettes, remplissant le periprocte oblong, avec l'anus excentrique, dans le sens de la radiale I; les Échinoconides, qui sont exocycliques, le périprocte se trouvant placé, dans les divers genres, sur l'un quelconque des points du trajet entre la costale 5 et les approches de la bouche; enfin, les Clypéastrides, le plus récent de tous les types, à parties constituantes du calice plus ou moins confondues, à ambulacres pétaloïdes gagnant sur le périsome, à corps aplati et tendant vers la forme bilatérale, à radioles très-petits, ordinairement en masse, rayonnants. — Chez les Échinoïdées édentées, lesquelles apparaissent avec l'époque secondaire, l'ambitus est typiquement elliptique; le péristome, primitivement pentagone, se transforme pendant l'accroissement de l'individu, et, libre d'appareil dentaire, se porte vers la partie antérieure de la face ventrale, laquelle est formée principalement par l'aire interradiale impaire et les ambulacres du bivium. L'ouverture anale est reçue dans l'aire impaire, sur la ligne médiane. Le calice, toujours d'une grandeur subordonnée, et dont le disque central est d'une apparition incertaine et variable, ne possède que quatre costales se disposant par paires. Le système ambulacral tend à devenir bilatéral. Ce sont: les Échinonéides, presque éteints, à péristome subcentral, tordu, à ambulacres apétales, et à aires interradiales presque conformes, à l'axe du périsome divergeant de l'axe antério-postérieur, à périprocte d'emplacement variable, même ventral; puis les types à péristome antérieur, à l'axe du périsome coïncidant avec les deux axes, l'antério-postérieur et celui de la longueur: les Cassidulides, peu nombreux dans le monde vivant, à ambulacres presque conformes, sub-pétaloïdes, à périprocte dorsal ou postérieur, à aires interradiales semblables ayant les plaques ventrales plus grandes, à péristome transversal à bords interradiaux proéminents; les Collyritides, éteints depuis longtemps, à calice démembré, aux ambulacres conformes, à péristome subcirculaire, à périprocte postérieur dorsal; les Ananchytides, également éteints, à calice compact mais comprimé, au péristome arrondi, aux ambulacres subpétaloïdes, l'impair commençant à se différencier des autres, à l'aire interradiale 1 hétéronome, et à l'aire impaire tendant vers la formation d'un sternum; enfin, les Spatanguides, qui atteignent leur plus haut degré de développement dans la période actuelle, à corps allongé, au péristome transversal labié, surmonté de l'ambulacre impair devenu frontal, à l'aire interradiale 1 hétéronome, l'impaire se formant en un sternum très-développé, à périprocte postérieur; à radioles en forme de soies dirigées en arrière. C'est l'organisation des Echinoïdées modifiée dans le sens des types invertébrés supérieurs.

Tels sont les traits principaux de conformation extérieure, sur lesquels repose la classe des Échinoïdées. Les résumer ici brièvement, et renvoyer, pour quelques observations de détails, aux études abordées dans ces pages, c'est assez faire sentir combien il y reste encore de faits inconnus à découvrir, et de connus à examiner de nouveau.

OM ELEKTRICITETEN SOM KOSMISK KRAFT.

AF

K. A. HOLMGREN.

III.

MED EN TAFLA.

TILL KONGL. VET. AKAD. INLEMNAD DEN 12 OKTOBER 1872.

STOCKHOLM, 1873.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

III.

A). En anmärkning om den THOMSONSKE elektrometern.
B). Om fri elektricitet inomhus.
C). Om elektricitetsutveckling vid vätskors upplösning i droppar.

Fortsatta studier af elektricitetens kosmiska företeelser hafva visat mig, att det omfattande och invecklade ämnet helt visst kommer att påkalla ett och annat arbete, som till sjelfva hufvudfrågan blott står i ett fjärmare förhållande. Äfven för uppsatser af sådant innehåll har jag trott mig kunna bibehålla den från början antagna öfverskriften.

En sådan är den föreliggande. Han omfattar — som ofvan angifves — egentligen tre till sitt ämne skilda uppsatser, men hvilka jag önskat sammanfatta till en enda, helst som de två förstnämnde någon gång i den siste åberopas.

A. En anmärkning om den Thomsonske elektrometern.

1. Vid mina undersökningar har jag alltid begagnat den i många hänseenden prisvärde THOMSONSKE elektrometern [1]). Instrumentet är dock ingalunda fritt från olägenheter. Det måste begagnas med ytterlig vaksamhet, enär det mycket kan missleda. Dessutom är det behäftadt med ett särskilt, synnerligen missledande fel, som är oskiljaktigt från det väsentligen egendomliga hos dess hittills varande inrättning. Jag har ingenstädes [2]) sett detta förhållande anmärkt. Tvärtom förklarar författaren till en nyligen offentliggjord, betydligare, afhandling sig ur stånd att tolka en företeelse, som helt naturligt väckt hans uppmärksamhet och som beror af ifrågavarande fel. Hans uppfattning af företeelsen är att mängden elektricitet hos ene polen af en galvanisk stapel, om den andre afledes till jorden, vacklar utan ordning, så att olika utslag kunna erhållas för de två polerne [3]).

I THOMSONSKE elektrometern står — som bekant — visarnålen ständigt i ledande förbindelse med det inre af en svagt laddad Leydnerflaska. Visarens nollpunkt är midtöfver en smal springa, som två halfcirkelformiga, lika stora, metallskifvor lemna emellan sig. Af dessa skifvor, som äro isoleradt fästade i gemensamt plan, sättes vanligen endera — *kondensatorn* — i förbindelse med jorden; den andra — *kollektorn* — deremot upptager medelst en utom elektrometerhuset utskjutande del den elektricitet,

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[1]) I sina väsentliga delar närmast öfverensstämmande med beskrifningen på »l'électromètre à cercle divisé et à miroir» i Ann. de Ch. et de Ph. (4) VII, s. 149.

[2]) Såframt ej Hr THOMSONS föreskrift om elektrometervisarens höjd öfver skifvorna syftar härpå. Jfr. A. st., s. 151.

[3]) Jfr. Pogg. Ann. CXLIV, s. 161. Det uppgifves att liknande olikheter — såsom ock DELLMANN i Pogg. Ann. LXXXVI, s. 536 anför — kunna visa sig äfven på den DELLMANSKA elektrometern. Men, liksom dessa helt visst äro mera oregelbundna, hafva de ock en helt annan anledning, och sannolikt bero de af alla de omständigheter, som i nästföljande uppsats B. skola afhandlas.

som skall pröfvas. Denne del benämner jag med Hr THOMSON *elektrod*, men innefattar deri äfven alla de bihang — såsom långa metalltrådar, slutande med en låga, o. s. v. —, hvarmed han för olika ändamål kan förses.

2. Den rörelse, som visaren i en sådan inrättning erhåller af en åt kollektorn meddelad elektricitetsmängd, bestämmes visserligen af de hos flaskan och skifvorna befintliga elektricitetsmängdernas potential på hvarandra; och borde derför utslagen sannt angifva de sednares belopp. Men dervid får man ej förbise vissa synnerligen vigtiga omständigheter. Såsom sådana anmärkas följande:

a). Visarens rörelse förutsätter en elektrisk differens mellan de båda skifvornas laddningar. Men deraf följer att elektrometern, utom i ett enskilt fall, måste gifva olika utslag för lika stora, men till tecknet motsatta elektricitetsmängder.

Antag, för att bevisa detta, att i visarens elektriske tyngdpunkt befinnes elektricitetsmängden μ, i ena skifvans M och i den andras m, och lemna deras tecken obestämda.

Den elektriska kraft, som uppstår genom inverkan af skifvornas och visarens agenser på hvarandra, kan betecknas med

$$e\,.\,\frac{M\mu}{R_2}+e\,.\,\frac{m\mu}{r_2}$$

— hvari betydelsen af e, R och r i sig sjelf är tydlig —; och visaren gör dervid ett utslag, hvars numeriska värde må betecknas med u. Låter man derpå M och m växla tecken, så förvandlas attraktion till repulsion och tvärtom; och visaren gör åt motsatt håll ett utslag, hvars numeriska värde är u_1. Den motsvarande kraften är

$$e\,.\,\frac{M\mu}{R_1^{\,2}}+e\,.\,\frac{m\mu}{r_1^{\,2}}.$$

Nu förutsätter $u=u_1$ att en lika stor torsionskraft i visarens upphängningstråd skall i båda fallen öfvervinnas; och detta fordrar

$$e\,.\,\frac{M\mu}{R^2}+e\,.\,\frac{m\mu}{r^2}=-\left(e\,.\,\frac{M\mu}{R^1_{\,2}}+e\,.\,\frac{m\mu}{r_1^{\,2}}\right).$$

Men å andra sidan motsvaras $u=u_1$ af $R_1=r$ och $r_1=R$. Det slutliga vilkoret för $u=u_1$ är således — efter nödiga reduktioner —

$$(R^2+r^2)\,(M+m)=0$$

d. ä. $M=-m$. I alla andra fall blir $u \gtrless u_1$.

I det fall att — som vanligen sker — ena skifvan afledes till jorden och den elektricitetsmängd (M), som skall bestämmas, meddelas åt den andra, isolerade, måste således alltid $u \gtrless u_1$. Derjemte inses att $u>u_1$ förutsätter att M och μ äro af motsatta tecken och tvärtom; ty i förra fallet — vid attraktion — blir R mindre än i sednare.

b). De verksamma agensernas potential på hvarandra varierar ock med den mot elektroden anlagde kroppens elektriska tecken äfven derför, att den elektriska anordningen hos Leydnerflaskan, kollektorn och nyssnämnde kropp deraf beror. Antag att elektrometervisarens laddning är V och att en kropp, hvars laddning är K, anlägges mot elektroden. Äro V och K af motsatta tecken, måste, till följd af deras ömsesidiga attraktion, V ökas genom att elektricitet drages upp till visaren från Leydnerflaskans öfriga delar och af K en större andel öfvergå till kollektorsskifvan än om V

icke funnes. Alldeles det motsatta måste inträffa, om V och K äro af samma tecken. I förra fallet måste följaktligen de ofvan med M och μ betecknade storheterna blifva större än i det sednare; hvarjemte R genom elektriske tyngdpunkternes förflyttning tvärtom bör blifva mindre vid attraktion än vid repulsion.

c). Så länge som Leydnerflaskan är elektrisk, måste ock elektrometerskifvorna vara det. Men isolatorer äro, liksom ledare, mottaglige för elektrisk induktion. På grund häraf blir öfre delen af kollektorns isolatorer i den THOMSONSKE elektrometern genom den ständigt elektriske visarens inflytande — medelbart genom skifvorna — alltid elektrisk, och detta med motsatt tecken mot visarens. När derför en elektricitetsmängd meddelas kollektorn, införes hon i sjelfva verket mellan två motsatt elektriske kroppar: visaren och kollektorns isolator. Attraheras denna mängd af elektriciteten hos isolatorn, så minskas derigenom hennes repellerande verkan på nålens, och tvärtom.

Dessa tre, nu afhandlade, felanledningar verka således i samma riktning; och det så, att af två lika stora, men till tecknet motsatta, elektricitetsmängder, som uppmätas, ger den med Leydnerflaskans laddning liknämnda ett mindre utslag än den andra [1]. Det är en svår uppgift att till och med under enkla förutsättningar härleda ett matematiskt uttryck, som återgifver inflytandet af de särskilta felanledningarna. Men rimligtvis bör felet växa med förhållandet mellan utslagens storlek och visarens höjd öfver skifvorna, äfvensom med bredden af springan mellan de sistnämnda. Derjemte är tydligt, att till och med för elektricitetsmängder af samma tecken men olika storlek utslagens nummervärden ej utan korrektion kunna vara fullt jemförliga uttryck.

d). Ännu ett fjerde fel bör jag här anmärka. Om man toge bort de två elektrometerskifvorna, skulle ändock ett utslag uppstå, när man laddar Leydnerflaskan; ty det är omöjligt att så inrätta visaren med sina bihang, att han icke riktas af repulsionen från flaskans öfrige delar. Denna verkan framkommer så ögonskenligt, då man ändrar Leydnerflaskans laddning, att man deraf ungefärligen kan bedöma ändringens storlek: visarens nollpunkt förflyttar sig nemligen, och detta inträffar äfven om båda skifvorna afledas. Efteråt drar han sig dag för dag småningom tillbaka, i samma mån som flaskan efter hand tappar sin laddning.

Då den riktning, i hvilken sistnämnda felanledning sträfvar att föra visaren, är oberoende af det elektricitetsslag, hvarmed flaskan är laddad, och af hvilkendera skifva, som nyttjas till kollektor eller kondensator, bestämmer anordningen häraf, huruvida detta fel ökar eller minskar de öfriga. Dess storlek deremot beror naturligtvis, utom af laddningens storlek, af huru Leydnerflaskans delar äro beskaffade och huru de hopsättas.

Man ser af det anförda, huru olika elektrometern kan angifva lika stora elektricitetsmängder. Det beror dock på, huru pass dessa felanledningar inverka på mätningen. Att detta icke är obetydligt, kommer att nogsamt visa sig i det följande.

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[1]) I ofvan citerade undersökning var enligt de på sidd. 29, 30 och 162 meddelade försöksserierna elektrometerns Leydnerflaska helt visst laddad med positiv elektricitet.

3. Endera polen af en 100-parig galvanisk stapel af zink — koppar och destilleradt vatten [1]) med synnerligen väl isolerade par afleddes till arbetsrummets mur. Den andre berördes med en isolerad konduktor, som derpå anlades mot elektrometerelektroden. Af motsvarande utslagen betecknas den negative polens med N, den positives med P; medelstorleken af båda, $\frac{P-N}{2}$, betecknas med k, deras skilnad, $P+N$, med Δ; slutligen sättes $\frac{\Delta}{k}=\alpha$.

A). Elektrometerns laddflaska för flera dagar sedan laddad med 100-parige stapelns *positive* pol.

1:o). En konduktor (a) pröfvades, laddad med stapelns

negative pol $(-p)$	positive pol $(+p)$
$N = -39{,}5$	$P = +21{,}5$
$-37{,}0$	$+23{,}0$
$-38{,}0$	$P_1 = +22{,}25$
$N_1 = -38{,}17$	

Således: $\Delta_1 = -15{,}92$; $K_1 = 30{,}21$; $\alpha_1 = -0{,}53$

2:o). En annan konduktor (b):

$-p$	$+p$
$N'_1 = -34{,}0$	$P'_1 = +20{,}0$

Således: $\Delta'_1 = -14{,}0$; $K'_1 = 27{,}0$; $\alpha'_1 = -0{,}52$

B). Leydnerflaskan laddades med *negative* polen.

1:o). Konduktorn b.

$-p$	$+p$
$N' = -28{,}0$	$P' = +27{,}5$
$-28{,}0$	$+27{,}5$
$N'_2 = -28{,}0$	$P'_2 = +27{,}5$

$\Delta'_2 = -0{,}5$; $K'_2 = 27{,}8$; $\alpha'_2 = -0{,}02$

2:o). Konduktorn a:

$-p$	$+p$
$N = -35{,}0$	$P = +50{,}5$
$-34{,}0$	$+52{,}0$
$N_2 = -34{,}5$	$P_2 = +51{,}25$

$\Delta_2 = +16{,}8$; $K_2 = 42{,}9$; $\alpha_2 = +0{,}39$

3:o). Konduktorn b ånyo:

$-p$	$+p$
$N' = -22{,}5$	$P' = +29{,}0$
$-22{,}5$	$+28{,}0$
$N'_3 = -22{,}5$	$P'_3 = +28{,}75$

$\Delta'_3 = +6{,}3$; $K'_3 = 25{,}7$; $\alpha'_3 = +0{,}25$

[1]) Sex par af en DANIELLS stapel, sammansatt af hoplödda koppar-zinktrådar samt med mellankärlet af trä, gåfvo som medeltal af flera bestämningar utslaget $6D = 18{,}91$ på samma gång, som en 12-parig zink-koppar-vattenstapel gaf $12 \,.\, V = 19{,}88$. Deraf $V = \frac{1}{2}D$.

C). Anordningen af elektrometern ändrades så att den skifva, som förut tjenat som kollektor, nu gjordes till kondensator och tvärtom.

1:o). Konduktorn *b*:

$$\begin{array}{rl} & -p \\ N' = & -21{,}0 \\ & -20{,}5 \\ \hline N'_4 = & -20{,}75 \end{array} \qquad \begin{array}{rl} & +p \\ P' = & +24{,}5 \\ & +24{,}5 \\ \hline P'_4 = & +24{,}5 \end{array}$$

$$\Delta'_4 = +3{,}7;\; K'_4 = 22{,}7;\; \alpha'_4 = +0{,}16$$

2:o). Konduktorn *a*:

$$\begin{array}{rl} & -p \\ N = & -27{,}0 \\ & -26{,}0 \\ \hline N_3 = & -26{,}5 \end{array} \qquad \begin{array}{rl} & +p \\ P = & +39{,}0 \\ & +40{,}0 \\ \hline P_3 = & +39{,}5 \end{array}$$

$$\Delta_3 = +13{,}0;\; K_3 = 33{,}0;\; \alpha_3 = +0{,}39.$$

D). En annan dag, efter att elektrometerns Leydnerflaska blifvit laddad med stapelns positive pol och skifvornas betydelse var återställd till den ursprungliga — den i serierna A och B — inriktades visaren afsigtligen på en med ungefär 30° oriktig nollpunkt,

1:o) åt kondensatorsskifvans sida. Utslagens medier för konduktorn *a* blefvo:

$$N_4 = -49{,}75 \qquad P_4 = +32{,}25$$
$$\Delta_4 = -13{,}5;\; K_4 = 41{,}0;\; \alpha_4 = -0{,}33$$

2:o) åt kollektorns sida:

$$N_5 = -52{,}75 \qquad P_5 = +38{,}0$$
$$\Delta_5 = -14{,}75;\; K_5 = 45{,}38;\; \alpha_5 = -0{,}33$$

3:o). Visaren inriktades på sanne nollpunkten:

$$N_6 = -70{,}0 \qquad P_6 = +52{,}5$$
$$\Delta_6 = -17{,}5;\; K_6 = 61{,}25;\; \alpha_6 = -0{,}29.$$

Härmed torde vara bekräftadt att elektrometern har fel, hvilkas verkningar låta förklara sig på det föreslagna sättet: elektricitet af motsatt slag mot Leynerflaskans ger större utslag än den med hennes liknämnda (serierna A—D), utan att detta förutsätter någon felaktig inställning af instrumentets delar (serierna B—D).

Att öfverensstämmelsen mellan försöken skulle i allt vara fullständig, kan naturligtvis ej begäras. Men en afvikelse med afseende på den framstälde synpunkten, nemligen försöket B) 1:o), förtjenar dock att anmärkas. Detta försök gjordes omedelbart efter att Leydnerflaskan blifvit omladdad med elektricitet af motsatt slag mot hennes förutvarande. Att Δ vid det försöket bibehöll sitt negativa tecken anser jag — enligt momentet c) under N:o 2 — härleda sig derifrån att N'_2 blef för stort, till följd af att Leydnerflaskans nya laddning ej ännu hunnit omkasta elektriska tecknet hos skifvornas isolatorer. Denna tolkning öfverensstämmer ock med att N'_2 till sin storlek verkligen intager en undantagsställning.

4. Enär de felanledningar, som afhandlas i a), b) och c) under N:o 2, verka i samma riktning, kunde ifrågasättas, om icke skilnaden Δ möjligen härledde sig ensamt

eller hufvudsakligen från isolatorernes elektriska verkan på de olika elektricitetsslag, som meddelades kollektorn. Ty att en sådan verkan fanns, derom kunde ej vara något tvifvel, i betraktande af kända förhållanden i liknande fall[1]). I närvarande fall borde afståndsverkan af såväl kollektorns som visarens agenser göra isolatorerne elektriska. Likväl kunde endast den del af isolatorernes elektricitet, som hos dem inducerades af visaren, hafva någon andel i Δ, emedan den öfriges återverkan på de agenser, af hvilka han sjelf framkallades, måste vara oberoende af dessas tecken. Men, hvad nu angår visarens elektricitet, borde hennes direkta inflytande på den mera närbelägne kollektorns vara af större betydelse för Δ än det indirekta genom de mera aflägsne isolatorerne. Följaktligen kunde Δ hvarken helt och hållet eller hufvudsakligen härledas från isolatorernes elektriska inverkan.

Riktigheten af denne tankegång och tillvaron af den felanledning, som i stycket N:o 2 mom. b) härledes från visarens elektricitet, bekräftades på följande sätt.

Antag Leydnerflaskans laddning vara positiv. Om en konduktor med negativa laddningen $-M$ anlägges mot kollektorns, bör denne deraf upptaga en större eller mindre del $(-s.M)$ och derjemte — enligt mom. b) under N:o 2 — en mindre bråkdel $(-t.M)$, hvars storlek beror af Leydnerflaskans elektriska styrka; således inalles $-M'=-(s+t)M$. På konduktorn komme således att qvarstanna $-r=-(M-M')$ $=-[1-(s+t)]M$. På samma sätt skulle, om konduktorns laddning varit $+M$, hans qvarstod blifvit $+r'=+[1-(s-t')]M$. Att enligt stycket N:o 2 mom. b) visarens direkta elektriska inverkan på lika stora, men till tecknet motsatta elektricitetsmängder, som meddelas åt kollektorn, har sin andel i Δ, skulle således fordra $r'>r$. Genomföres samme tankegång med afseende på isolatorernes elektriska inflytande, så erhålles tvärtom $r'<r$. Häri var medlet för en experimentel pröfning funnet.

Elektrometerns Leydnerflaska var laddad med positiv elektricitet. Elektricitet öfverfördes, liksom i föregående serier, med en konduktor (a i N:o 3) från den galvaniske stapelns poler och till elektrometerns kollektor, under det kondensatorn var afledd. Konduktorn ställdes derpå afsides, fullt isolerad. Sedan elektrometervisaren stannat med utslagen N och P, isolerades äfven kondensatorn, och mot honom anlades nu konduktorn utan att hafva erhållit någon ny laddning. Med denna sista afdelning af försöket afsågs att utan särskilt instrument kunna uppmäta resterna (r, r'). Om de, nemligen, öfverfördes från konduktorn till den isolerade kondensatorn, så borde de minska hufvudladdningarnas utslag med ungefär så många skaldelar (n och p), som de ensamme skulle gifva; låt vara till $N-n$ och $P-p$. Gåfve nu försöken $p>n$, så vore enligt det föregående $r'>r$; och följaktligen visarens elektriska tillstånd en felkälla, och dertill en af större betydelse än isolatorernes elektricitet.

Försöken utföllo sålunda:

1:o)	$P=+51{,}0$	$P-p=+41{,}0$
	$+50{,}0$	$+39{,}0$
	$P=+50{,}5$	$P-p=+40{,}0$

[1]) Jfr. t. ex. KOHLRAUSCH, Pogg. Ann. LXXII, s. 353. — Att undersöka isolatorernes elektriska tillstånd medgaf ej instrumentets sammansättning.

Häraf $p = + 10{,}5$

2:o) $N = -75{,}5$ $\qquad N - n = -71{,}5$

$\underline{\quad -75{,}5} \qquad \underline{\quad -69{,}0}$

$N = -75{,}5 \qquad N - n = -70{,}25$

Häraf $-n = 5{,}25$ eller jemnt hälften af p.

5. Slutligen sammanfattas i nedanstående tabell några försök med hänsyn till de hufvudsakliga växlingar, som vid elektrometerns användande kunna ifrågakomma.

Med en och samme konduktor (a i N:o 3) öfverfördes i alla försöken den elektricitetsmängd, hvars utslag skulle bestämmas, till kollektorn från polerne af ett visst antal par af 100-parige stapeln. Detta antal angifves under A.

P, N, Δ, K och α hafva, med undantag af tecknen, samma betydelse som i det föregående. P och N äro medier af två eller tre försök, hvilkas inbördes öfverensstämmelse var sådan som den mellan de redan anförda.

I alla försöken var elektrometerns Leydnerflaska laddad med positiv elektricitet. I försöket N:o 1 utgjordes laddningen af hvad som återstod, efter att flaskan för flere dagar sedan hade blifvit laddad med 100-parige stapeln. Till försöket N:o 2 laddades hon ånyo med samme stapel; i försöken N:o 3, 4, 5 och 6 med en liten elektrofor en god stund före N:o 3. I försöket N:o 6 var visaren lyftad högre öfver skifvorna än i de öfriga.

Under E upptages Leydnerflaskans skenbara laddning, sådan som hon visar sig, om hon beräknas ur $K = c \,.\, AE$. Dervid har jag enligt försöket N:o 2 satt $c = \frac{34{,}5}{(100)^2}$. Uppenbart var i sjelfva verket laddningen approximativt en och densamma i de fyra sista försöken.

Tab. I.

N:o	A	N	P	Δ	K	α	E
1	100	28,8	18,5	10,3	23,7	0,43	69
2	100	40,3	28,6	11,7	34,5	0,34	100
3	25	21,0	19,5	1,5	20,3	0,07	236
4	50	47,5	42,5	5,0	45,0	0,11	260
5	100	112,0	86,5	25,5	99,3	0,26	288
6	100	67,8	54,8	13,0	61,3	0,21	177

Man ser af tabellen bland annat att icke allenast Δ växer mycket hastigt (i qvadratiskt förhållande) med A, utan att detta äfven är fallet med α; men att α tillika ökas med aftagande laddning (E) af Leydnerflaskan. Detta sistnämnda kan under vissa omständigheter gå ända till ytterlighet.

Jag bör emellertid anmärka att felet mycket förstorats i alla dessa försök genom att göra afståndet mellan elektrometervisaren och skifvorna litet samt Leydnerflaskans laddning svag. Detta skedde dels med afsigt, dels betingades det af önskan att med 100-parige stapeln kunna meddela Leydnerflaskan olika starka laddningar af känd storlek.

Genom motsatt förfarande kan felet betydligt nedsättas [1]; men detta medför nödvändigheten af en starkare laddning hos Leydnerflaskan och deraf följande olägenheter, i synnerhet om man, som jag, önskar undvika den bräcklige glastråden för visarens upphängning och i stället begagna en isolerad metalltråd. Hr THOMSON [2]) förordar en hel tums afstånd mellan visaren och skifvorna.

B. Om fri elektricitet inomhus.

6. Utom den felanledning, som vid elektrometriska bestämningar kan finnas hos mätningsinstrumentet och öfrige apparater, ges det en annan, som är föga känd, men som icke desto mindre inblandar sitt inflytande i alla på vanligt sätt anstälda försök öfver statisk elektricitet. Vid noggrannare bestämningar är denna felanledning både besvärlig och förvillande; och kan mången gång framkalla vida större fenomener än dem man vill undersöka. Det kan derför till och med hända, att man midt under en serie af mätningar erhåller ett alldeles afvikande utslag af motsatt tecken mot det, som man hade skäl att vänta. Synnerligen uppträda dessa olidliga oregelbundenheter, då en apparat står fri — utan något ledande skydd för sina väsentlige delar — och framför allt, när han medelst en längre tråd är förbunden med någon annan konduktor. Jag har alltid vid mina föregående arbeten så mycket som möjligt undvikit hvarje sådan tillställning, emedan det bland annat är ett verkligt konststycke att från försök till försök bringa elektrometern till en stadig nollpunkt, om från honom utgår en längre ledning. Att beröra tråden hjelper ej, ty man kan efter omständigheterna få mycket olika nollpunkt, till och med om tråden alltid beröres på ett och samma ställe.

På en annan yttring af samma elektricitetskälla har Hr THOMSON på ett ställe [3]) fästat uppmärksamheten, utan att mig veterligen denna upptäckt vidare föranledt någon ytterligare undersökning öfver fenomenets natur. Han angifver att luften inomhus gemenligen är negativt, väggar, golf och tak positivt elektriska: endast två eller tre gånger under 30 observationsdagar har förhållandet varit det omvända. Vidare har han i afseende på fenomenets styrka funnit densamma flera gånger motsvara den af ett DANIELLS par och att hon håller sig temligen konstant. Slutligen innebära hans iakttagelser att mellan elektriciteten inom och utom hus ej finnes något sammanhang.

Detta är — så vidt jag förstått — hufvudsakliga innehållet af hans korta uppsats. Hr THOMSON omtalar [4]) dessa fenomener med uttrycket »In-door atmosferic electricity». Efter honom betecknar jag samma fenomener med *Elektriciteten inomhus* eller *Inomhus-elektriciteten.*

7. Orsaken till alla dessa företeelser är helt enkelt den friktionselektricitet, som utvecklas hos våra kläder vid alla våra rörelser.

[1]) Detta kommer tydligare än i försöket N:o 6 att visas i uppsatsen C). I en sednare uppsats skall jag redogöra för en elektrometerinrättning, som eger den THOMSONSKES goda egenskaper utan att hafva dess olägenheter.

[2]) Ann. d. Chim. et d. Phys. (4) VII, s. 151. Jfr. stycket N:o 1 not. 2 här ofvan.

[3]) Proc. Phil. Soc. of Manch. II, s. 204.

[4]) De fenomener, som Hr THOMSON omnämnt, äro i allmänhet så svaga, att jag först vid början af innevarande år kunde säga mig med visshet hafva varseblifvit dem.

För att bevisa detta behöfver man blott stiga upp på en isolerpall och derifrån beröra elektrometerns elektrod, som för detta ändamål helst bör vara långt utdragen. Består han t. ex. af en lång metalltråd, hvars frie ände man lagt i beredskap t. ex. på observationstubens bord, så är det tillräckligt att stiga upp på isolerpallen och sedan lyfta metalltråden med handen, för att framkalla ett positivt utslag, som efter omständigheterna kan uppgå till värdet af utslaget för 12 zink-koppar-vattenpar och derutöfver. Ett stort utslag vinnes genom att gå ett par slag öfver golfvet eller med armarne göra ett par svängningar, innan man stiger upp på pallen. Slutar elektroden med en låga eller en vattenstråle, så erhållas, då man närmar sig dem, samma fenomener, utan att man behöfver isolera sig från golfvet: ett positivt utslag uppstår, men försvinner ögonblickligen, då man aflägsnar sig.

Att det verkligen är klädernas elektricitet och icke menniskokroppens, som förorsakar dessa fenomener, synes deraf att, om man förbinder elektrometern med isolerpallen och på honom lägger t. ex. sin rock, ett positivt utslag uppstår, som blir större, om man förut gnidit rocken med handen. Hänger man rocken på t. ex. en stol eller — för att undvika friktion mot annan kropp — på en våt krok och berör honom med en långt utdragen elektrod, så erhålles ock ett positivt utslag, som dock snart sjunker mot noll. Deremot erhålles intet märkbart utslag, om man naken gnider sin kropp och derpå bestiger pallen; ej heller synes skodonens gnidning mot golfvet bidraga till fenomenet. Alla försök på detta sätt kunna kortligen sammanfattas deruti, att ylletyg är ett halfledande ämne, som blir positivt elektriskt genom gnidning mot menniskohuden, liksom ock mot flera andra ämnen.

Då man rör sig, blifva således kläderna positivt elektriska och den motsvarande negativa går bort efter kroppen och vidare.

8. Men hvilken verkan utöfvar detta på den omgifvande luften och de föremål, mot hvilka hon inomhus ligger an?

Härom kan ett lika enkelt försök lemna upplysning. Står man sjelf på isolerpallen och der bredvid en med elektrometern förbunden låga, förblir elektrometervisaren nästan orörlig, huru man än med handen gnider sina kläder, med vilkor att man ej betydligare förändrar sin ställning till lågan eller elektroden i hans helhet. Men slår man till kläderna med handen, en käpp eller dylikt, eller skakar man dem nära intill lampan, så springer elektrometervisaren ut med ett stort utslag åt negativa hållet. Detta utslag ökas, om man stiger ned från pallen; och det sjunker mycket långsamt mot noll. Likaså efterföljer ett sådant negativt utslag — fastän mindre — det positiva, som uppstår, om man går på golfvet och närmar sig lågan, samt stannar der en stund. Det ökas dervid betydligt, om man först piskar, klappar eller skakar kläderna så, som då man vill befria dem från dam, och sedan aflägsnar dem från lågan.

På dessa och liknande sätt har jag t. ex. med en rock kunnat framkalla först ett positivt utslag och sedan, genom att blott och bart aflägsna rocken, förvandla detta till ett negativt, för hvilket skalans 120 delar varit otillräckliga, vid tillfällen då 12 par af zink-koppar-vattenstapeln gifvit 20 eller 30 skaldelars utslag [1]).

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[1]) För att ej med afseende på förklaringen af de sista företeelserna, gifva intrycket af föregående beskrifnin-

9. Det är ej svårt att finna närmaste orsaken till denna varaktiga negativa elektricitet, som liksom skakas ut ur ett nyss piskadt, borstadt eller gnidet ylleplagg.

När dammet ryker af ett plagg, som piskas eller skakas, bör väl anledningen dertill så förstås, att den i luggen eller mellan trådarne inneslutna, elastiska, luften utpressas och medför dammet. Om nu tygets lugg och trådar äro starkt positivt elektriska, så bör, enligt hvad man känner om fasta isolatorer i slika fall, äfven nyssnämnda, jemförelsevis orörliga, luft genom induktion (»influens») blifva negativt elektrisk. Detta bör ock, fastän i aftagande grad, blifva fallet med den luft, som omger tyget, hvaremot den aflägsnare blir positivt elektrisk och repelleras mot rummets väggar, golf och tak. Men att denna repellerade positiva skall vara svår att upptäcka är klart af erfarenheten om fasta isolatorers förhållande under liknande omständigheter. Genom piskningen eller skakningen drifves den starkare negativt elektriska luften ut i rummet, hvarest verkan af plaggets positiva elektricitet är svagare, och kommer der i omedelbar beröring med elektrometer-elektroden.

Alla de många försök, som jag öfver detta ämne anstält, hafva helt otvunget låtit förklara sig ur denne synpunkt, som på luften i jemförlige delar tillämpar vår kännedom om fasta isolatorer. Till hvad jag redan anfört gör jag derför blott ett par tillägg, som måhända kunna lända till upplysning.

10. Fattar man en duk af linne (eller bomull?) med ena handen och gnider honom med den andra, så visa sig gerna straxt negativa utslag, som ansenligt förstoras och blifva rätt betydliga, om man skakar linnet och sedan aflägsnar det. Detta fenomen härrör således från luftens elektricitet. Också finner man genom att piska eller gnida linnet, hållet isoleradt, att det verkligen dervid sjelft blir positivt. Bäst lyckas försöket genom att utföra nämnda behandling af linnet på större afstånd från elektrometer-elektroden och derjemte skaka det, innan det närmas intill honom. Allt detta bevisar, att linnet är en temligen god ledare, men att det är i stånd att rymma mycken luft.

Med ett par silkesdukar, som jag pröfvat, är förhållandet nästan i allt motsatt. Deras egen elektricitet blir genom gnidning med handen och ännu mera genom ylle starkt negativ; men luftens positiva är svår att få fram.

Metaller och fasta isolatorer elektrisera luften med sin egen elektricitet, så att, huru man än fläktar med dem, anger ej elektrometern deras motsatta. Anmärkningsvärdt är att ett kattskinn, som jag pröfvadt, förhåller sig på samma sätt.

Af dessa tillägg visar sig att olika kroppar förhålla sig ganska olika till detta fenomen, men att just de ämnen, som vanligen begagnas till kläder, företrädesvis hafva egenskapen att elektrisera luften, som under deras inflytande blir negativ. Denna olikhet torde få anses bero af förhållandet mellan två egenskaper hos hvarje kropp: förhållandet mellan hans elektriska ledningsförmåga i vanlig mening och hans egenskap att från ytan aflemna elektricitet till anslutande kroppar, eller — för att så säga — förhållandet mellan hans inre och yttre elektriska ledningsförmåga. Hos ylle och linne är den inre ledningsförmågan öfvervägande; hos isolatorer, silke och kattskinnets ragg,

gar en falsk riktning, bör jag genast nämna, att jag ej funnit sjelfva dammet hafva någon inverkan på fenomenet, ehuru jag egnat uppmärksamhet åt denne punkt.

den yttre. Hos metaller är den yttre stor. Detta antyder att den sednare egenskapen skulle vara gemensam för glänsande ämnen, den förra för matta. Hvad kattskinnet angår, synes denna egenskap verkligen tillhöra det, ty eljest skulle det vara svårt att fatta, huru de allbekanta gnistorna från en katt, som man stryker, skulle kunna tillkomma. De måste nemligen vara en urladdning till handen — kanske ock till luften — af elektricitet, som vid strykningen stannar hos håren.

11. Innan jag tillsvidare lemnar detta ämne, torde jag böra bemöta ett par invändningar, som möjligen kunna göras mot sjelfva hufvudsaken.

Att de sekundära företeelser, som jag antagit härleda sig från att luften elektriseras, icke äro en efterverkan af elektricitet hos elektrometern och hans elektrod — ehuruväl äfven en sådan finnes — bevisas deraf att deras elektriska tecken och teckenombyten bero af vilkor, som ej med isolatorernes tillstånd ega något sammanhang. Dessutom visa följande försök mycket ögonskenligt, att det är sjelfva luften, som är elektrisk. Håller man en elektrisk kropp på större afstånd från en lång elektrod, som slutar med låga, och der fläktar med honom, eller fläktar man der med en skärm, sedan kroppen blifvit bortlagd, inträffar understundom, att elektrometervisaren stötvis gör ett allt större och större utslag, som ej kan borttagas genom att öfverfara elektrodens isolatorer med lågan af en spritlampa. Likaså kan man vid början af en försöksserie — innan luften i hela rummet blifvit elektrisk — genom att med en skärm fläkta kring elektrodens låga bortskaffa de sekundära fenomenerna, ehuru detta icke lyckas genom att behandla elektrodens isolator med låga.

Men man skulle kunna föreställa sig tillkomsten af dessa fenomener på det sättet, att luften i rummet af någon okänd anledning egde negativ elektricitet och att denna droges till elektroden, när en positivt elektrisk kropp närmades honom. Men om så vore, skulle aldrig det sekundära fenomenet blifva positivt. Likväl har jag kunnat vända om hela fenomenet med en och samma kropp. I den afsigten isolerades på lämpligt sätt en filttoffel. Han förhöll sig vid gnidning som ylle: primära fenomenet blef ett positivt utslag, det sekundära ett mycket starkt negativt. Men sedan jag meddelat honom negativ elektricitet — från en elektrisk apparat — blef det sekundära fenomenet ett mycket starkt positivt utslag; och dessa sina nya egenskaper bibehöll han mycket envist.

12. Dessa fenomener äro ganska lätta att framställa, om man som ledning fasthåller den synpunkt, ur hvilken de här ofvan blifvit tolkade. Likväl får man ej länge hålla på med försöken. Synnerligast om de omväxlas så, att luften skiftevis blir starkt positivt och negativt elektrisk, inträder snart en sådan förvirring, att man ej kan beherrska en enda företeelse. Till och med sedan man upphört med alla försök, fortsätter elektrometern och liksom återupprepar dem på egen hand.

13. De ofvan — i stycket N:o 6 — inledningsvis beskrifna företeelserna torde nu ej behöfva någon särskilt förklaring. Deremot tillåter jag mig afsluta denna uppsats med ett par anmärkningar om ifrågavarande elektricitetskällas möjliga inverkan på några exempelvis valda resultater af bekantgjorda undersökningar.

Det torde här ofvan vara nogsamt visadt att om elektroden utgöres af en lång metalltråd, som slutar med t. ex. en låga, måste observatorns närvaro ytterst störande inverka på försöken; ty när han närmar sig, gör elektrometern ett stort positivt utslag och, när han aflägsnar sig, ett större eller mindre, mera varaktigt negativt. Emellertid har Hr THOMSON — så vidt man kan finna — på detta sätt begagnat sin elektrometer vid alla de elektroskopiska försök, hvilkas resultater [1]) blifvit offentliggjorda. Liknande anordning är vidtagen i Kew vid den sjelfregistrerande apparat, som är ämnad att kontinuerligt anteckna den kosmiska elektricitetens företeelser. Jag känner ej om eller huru man skyddat honom för ifrågavarande inflytelser, som der böra vara synnerligen stora och derjemte omöjliga att skilja från det sökta fenomenet; hvadan »dagliga maxima» skulle kunna uppkomma genom att elektrometerrummet regelbundet besöktes på samma tider.

Icke mindre äro berörda förhållanden en källa till fel vid sådana observationer öfver kosmiska elektriciteten, hvilka tillkomma genom att bära elektrometern från en fri plats och till observationsrummet, såsom t. ex. i München och Bruxelles. Det beror dervid på mångfaldiga och oberäkneliga omständigheter, huruvida den som handhafver instrumentet bidrager till att öka eller minska den elektricitet, som det upptager vid beröringen, och den, som det förlorar under tiden mellan beröringen och afläsningen.

Troligen är klädernas elektricitet ett bland skälen till de stridiga uppgifter, som man eger om t. ex. kroppars friktions-elektriska egenskaper. Man gnider t. ex. en ruggig halfledare och närmar honom till elektroskopet. Hvilketdera tecknet bör han då visa? Tydligen kan man genom ett sådant förfarande få fram både plus och minus, oberoende af det tecken, som kroppens ämne gifver. Möjligen kan ock härifrån komma att kroppar, rifna på olika sätt, gifva olika tecken. Ty gnidningen kan t. ex. hos band dels trycka till, dels rifva upp luggen; och klädernas elektricitet, som under gnidningen uppdrifves, kan olika inverka på den ene och den andre af de kroppar, som gnidas mot hvarandra, o. s. v.

Hvad, slutligen, angår dem af mina egna försök, som blifvit anstälda, innan jag kände beskaffenheten af ifrågavarande elektricitetskälla, vågar jag tro dem vara temligen fria från deraf härflytande fel. Redan tidigt märkte jag vigten af att fästa afseende vid valet af den plats, jag sjelf intog under försöken, om jag ock misstog mig om förnämsta skälet till att härvid fordrades några försigtighetsmått [2]).

C). Om elektricitetsutveckling vid vätskors upplösning i droppar.

14. Utan annan afsigt än att lätta både framställningen och uppfattningen af följande redogörelse tillåter jag mig att antydningsvis och i största korthet angifva det åskådningssätt, som ligger till grund för denna undersökning.

När en vätska uttränger genom ett kärls öppning, inträda i och med detsamma förändringar i hennes molekularkrafter, i det att hennes yta — och dermed ock hen-

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[1]) Några bland dem äro ganska egendomliga (Jfr. t. ex. Phil. Mag. (4) XX, s. 360. Det är med mycken tvekan jag tillåter mig att fästa uppmärksamheten på de elektriska klädernas möjliga medverkan till dessa resultater, i det jag anmärker, att de ensamt dermed kunna förklaras, men att det dessutom finnes en omständighet vid elektrometerns begagnande, som dertill skulle vara tillräcklig.

[2]) Jfr. K. Vet. Akad. Handl. Band. 8, N:o 10, sid. 28.

nes »sega hud» med sin ytspänstighet (»tension superficielle») eller sammandragningskraft (»force contractile») — blifver en helt annan än hvad hon förut var. Denna sega hud bildar liksom en säck [1]), i hvilken den öfriga, uttrangande, vätskan uppsamlas, till dess hon blir för tung eller hennes lefvande kraft för stor, så att den elastiske säcken brister i en eller flere delar. Den hastighet, hvarmed vätskans t. ex. öfversta lager efter sådana förlopp anländer till ett nedra kärl, blifver ensamt för den sega hudens skull en helt annan än den, som det skulle ega, om vätskan såsom ett sammanhängande helt anlände dit på en gång. Och skilnaden mellan de motsvarande lefvande krafterna i ena och andra fallet borde under någon ny form af lefvande kraft kunna återfinnas; om såsom värme eller elektricitet eller bådadera kunde endast med försök afgöras. Af skäl, som stå i sammanhang med min föreställning om den telluriska elektricitetens ursprung, önskade jag företrädesvis lära känna, om i närvarande fall en elektricitetsutveckling egde rum eller icke.

15. De erfarenheter, som kunde gifva någon sannolikhet för ett positivt resultat af den sålunda tillämnade undersökningen, syntes vara följande.

Enligt åtskilliga äldre försök utvecklas elektricitet icke blott vid fasta kroppars afnötning genom gnidning utan ock vid deras sönderdelning genom åtskilliga andra mekaniska medel [2]), såsom filning, skrapning, afbrytning, o. s. v. Vidare har den omtvistade frågan om elektricitetsutveckling vid afdunstning ånyo blifvit upptagen, i det att Hr PALMIERI [3]) anser sig hafva funnit vattenångorna dervid blifva positivt elektriska. Många äro ock de undersökningar, som förmenats bevisa att elektricitetsutveckling uppstår vid kroppars förbränning. Dessutom har Hr SUNDELL [4]) anställt försök öfver »Disjunktionsströmmar mellan vattenpoler» för att vidga den från försök med poler af fasta kroppar vunna erfarenheten. Äfven kunde härvid sambandet mellan elektricitet och materiella delars åtskiljande vid elektrolysen komma i åtanke. Till dessa försöksresultater sluta sig för öfrigt vissa förhållanden i den fria naturen, nemligen den starka negativa elektriciteten hos det kringyrande stoftet från vattenfall [5]), samt den telluriska elektricitetens anomalier, hvilkas förekomst häntyder på något deras samband med nederbörden [6]).

Liksom ofta i naturvetenskaperna vissa liknelser till ett lagbundet sammanhang föregått de egentliga upptäckterna, skulle onekligen de här åberopade erfarenheterna i sin sammanfattning kunna tyckas antyda att molekularattraktionen, under hvilka omständigheter och genom hvilka medel hon än blir ledig, delvis förvandlas till elektricitet. Ett sådant sammanhang skulle vara utomordentligt upplysande i afseende på elektricitetens natur [7]). Men för min del dristar jag ej anse dess tillvaro som en veten-

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[1]) Jfr. DUPRÉ, m. fl.

[2]) Jfr. RIESS, Die Lehre v. d. Reib. II, s. 400.

[3]) Nuovo Cimento, XIII, s. 235.

[4]) Öfv. af Vet. Akad. Förh. 1870, s. 521.

[5]) Jfr. isynnerhet SCHÜBLER, Schweigg. Journal, IX, s. 357; LXIX, s. 273.

[6]) Hr PALMIERI — Ann. del Oss. Met. Vesuv. II, s. 32 och Nuovo Cim. XVI, s. 7 — påstår att de stora fenomenerna endast förekomma vid ymnig nederbörd.

[7]) Det vore, nemligen, liktydigt med att vid kroppars sönderdelning skulle under alla omständigheter de egendomliga förlopp, hvilka yttra sig som elektriska fenomener, förefinnas. Ty att lika naturföreteelser förut-

skaplig sanning; ty vid närmare granskning torde flera bland de ofvan sammanförda resultater, hvarpå en sådan slutsats skulle grundas, fast heldre befinnas sjelfva vara i behof af stöd.

Vid att utan ytterligare pröfning anse elektricitetsutveckling åtfölja kroppars sönderdelning genom andra mekaniska medel än gnidning torde kunna uppstå betänkligheter, i betraktande af att just friktionen med mycken lätthet inblandar sig i sådana försök [1]). Ett exempel härpå utgör historien om elektricitetsutveckling vid afdunstning.

Hvad sönderdelningen genom värmet och kemiska kraften angår, har Hr HANKEL [2]) gifvit goda skäl för att ämnets förflygtigande genom förbränningsprocessen för de elektriska fenomenerna dervid har en blott underordnad betydelse.

Återstår således blott disjunktionen genom elektricitet. Men svårligen torde deri ligga ett bevis för att icke hela det yttre arbete, som t. ex. vid vätskors droppning förvandlas till inre, skulle kunna blifva värme; — lika så litet som t. ex. tillvaron af den nya elektromotoriska kraften i galvaniska ljusbågen af någon lär kunna anses hafva varit bevisad redan genom den allbekanta elektricitets-utvecklingen vid fasta kroppars friktion.

De ofvan anförda erfarenheterna från den fria naturen syntes ostridigt stå min tillämnade undersökning närmast. Om likväl de elektriska fenomenerna verkligen uppstode i och med vattendropparne, borde, med afseende på det sannolika sättet för nederbördens bildning, den elektromotoriska kraften snarare tillskrifvas de egendomliga förloppen vid sjelfva droppbildningen än någon vattnets mekaniska sönderdelning. Men ganska väl kunde vattendropparnes andel i dessa fenomener helt enkelt bestå uti att de fortföra en redan befintlig fri elektricitet. Härom, hoppades jag, skulle någon upplysning möjligen vinnas genom den undersökning, för hvilken jag nu går att redogöra.

§ 1. *Försöksmetoden.*

16. Det är allmänt bekant att lågor och utströmmande vätskestrålar eller fallande droppar äro synnerligen verksamma att från kroppar aflägsna fri elektricitet. Med afseende härå borde någon särskilt anordning träffas, som hindrade de båda elektricitetsslagen — i händelse af elektricitetsutveckling vid droppningen — att följas åt med dropparne. Detta borde kunna ske genom att forma droppkärlet så, att droppbildningen komme att försiggå djupt inne i en ihålighet hos detsamma: den qvarblifvande vätskans elektricitetsslag borde då breda sig öfver droppkärlets utsida, det motsatta följa med droppen. I öfverensstämmelse härmed utgjordes mina apparater af

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sätta lika förlopp, torde vara lika visst som att det behöfves olika maskiner för att förvandla t. ex. det arbetsförråd, som ligger i ett vattenfall, till olika slag af mekaniskt arbete.

[1]) Några enstaka försök, som jag anstält öfver elektricitetsutveckling vid fasta kroppars *afslitning* hafva gifvit negativt resultat, när all yttre friktion varit förebygd; stänger af ebonit eller lack hafva ej hvar för sig gifvit någon elektricitet, men väl ebonitstänger, då de vid afslitningsstället varit öfverdragna med lack. Lackflisor sprungo och vid afslitningen loss från eboniten. — Det är ej heller så uppenbart hvad som, när en homogen stång af ända igenom lika form afslites på midten, hos de båda hälfterna skulle åstadkomma en elektrisk polaritet. Sedan flera år tillbaka har jag varit betänkt på att åtminstone vid friktionen studera förhållandet mellan värme- och elektricitets-utvecklingen, hvilket förhållande synes från ämnen till ämnen genomgå alla möjliga storhetsgrader.

[2]) Abh. d. Leipz. Ges. VII, s. 1.

två elektriskt isolerade kärl; det *öfra*, bestående af *droppkärlet* och en med detta förenad, på ett eller annat sätt inrättad, hylsa eller *tuta*, som omslöt droppstället; samt det *nedra* kärlet, som på afstånd från det öfra mottog dropparne.

17. Tutan uppfylde sin bestämmelse, om elektricitet, som meddelades öfra kärlet, ej bortfördes af en ur droppkärlet strömmande vätska.

Jag förbigår en mängd försök, som alla ådagalade metodens användbarhet och tillika visade att ett elektriskt fenomen af någon anledning utvecklades vid droppvätskans öfvergång från öfra till nedra kärlet. Endast ett bland dem meddelas som exempel på samtliga försökens gång.

Droppkärlet utgjordes af en glastratt med ett i pipen medelst en kork inträngdt och till en fin spets utdraget glasrör, hvars längd togs större än hvad som kunde ifrågakomma vid de tillämnade försöken öfver hufvudfrågan. Tutan bestod af ett lampglas, som medelst en korkskifva trängdes omkring trattens pip. Hela detta öfra kärl doppades, för ledningens skull, före försöket i vatten.

Med tutan gaf nedra kärlet, med hvilket elektrometern var förenad, för 100 kub. centim. vatten, såväl då öfra kärlet stod i förbindelse med hvilkendera som helst af en 12-parig vattenstapels poler, som ock då stapeln var frånskild, utslaget $L = -84$. Men *utan* tuta sprang skalan inom få ögonblick ur tuben; hvaremot utslaget blef noll vid försök utan både tuta och stapel.

Härmed alldeles öfverensstämmande resultater gåfvo längre fram — i stycket N:o 45 — beskrifna försök, i hvilka tutans skyddande egenskap underkastades en ännu strängare pröfning.

18. Det är tydligt af tutans verkningssätt att hon är utan betydelse, derest ingen elektriskt ledande förening finnes mellan henne och droppröret. Likaledes är lätt att förstå hvad som bör inträffa, om denna ledande förbindelse innehåller någon elektromotorisk kraft. Af dennas dubbla verkan, att kontinuerligt skilja de två elektricitetsslagen och till en viss gräns hindra dem att återförenas, följer att det öfra kärlet med sin tuta genom den elektromotoriska kraften skulle komma att liksom delas i två isolerade konduktorer, laddade med hvar sitt elektricitetsslag; tutan hörde till den ene af desse konduktorer, vätskan till den andre. Då vätskan alltid kommer att nederst sluta i en spets, som omslutes af den andre konduktorn, bildas häraf ett slags kondensator, hvarigenom vätskans elektricitet kommer att neddragas till spetsen och medfölja honom, då han afslites och faller såsom droppe. Hr THOMSON har med kärl af denna sammansättning på ett öfverraskande sätt mångfaldigat verkan af små elektriska krafter [1]).

Följande försök med elektromotoriska krafter, som afsigtligen infördes i förbindelsen mellan tutan och droppkärlet gjordes derför blott för att pröfva, dels i hvilken mon möjliga felkällor af det slaget kunde inverka på mina försök, dels om verkan af den kraft, som jag sökte och redan i de föregående försöken trott mig hafva funnit, kunde upptäckas bland fenomener af kända elektriska krafter.

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[1]) Förr än jag kom att tänka derpå, blef min apparat till sin sammansättning nära lik den, som Hr THOMSON af annan anledning och för annat ändamål inrättat och beskrifvit i Proc. of Roy. Soc. of Lond., XVI, s. 67.

Planen för dessa försök var följande. Till tutor borde begagnas vatten d. v. s. vått glas eller papper. Om dessa förbundos med droppkärlets vatten endast och allenast medelst en af två metaller hoplödd tråd, och om metallernes elektromotoriska krafter vid kontakt med hvarandra och med vatten betecknas i ordning med A/B, A/V och B/V, samt den eftersökta elektromotoriska kraften med x, kan resultanten af dessa krafter betecknas med

$$x + V/A + A/B + B/V.$$

Denna summa borde hafva sitt uttryck i det motsvarande elektrometerutslaget. Beteckna detta, sådant som det nedra kärlets laddning skulle gifva det, med

$$L = x + V/A + A/B + B/V = x + K.$$

Om derefter samma delar af apparaten förbundos med samme tråd, men upp- och nedvänd, borde deraf uppkomma ett utslag

$$L' = x + V/B + B/A + A/V \text{ d. ä.}$$

$$L' = x - B/V - A/B - V/A = x - (V/A + A/B + B/V) \text{ eller}$$

$$L' = x - K.$$

Häraf skulle slutligen följa:

$$x = \frac{L + L'}{2}, \text{ och } K = \frac{L - L'}{2}.$$

Om detta x skulle kunna hafva samma ursprung som de i stycket N:o 17 omnämnda fenomenerna, borde det vara negativt. Och emedan x är oberoende af K, borde samma värde erhållas, hvilka metaller, som än begagnades till föreningstråd, äfvensom om denne icke innehölle någon elektromotorisk kontakt. Slutligen borde $x : K$ vid upprepade försök med samme föreningstråd af två metaller visa sig konstant, om ock K genom oväsentliga olikheter i apparaten utfölle olika.

19. Till försöken häröfver begagnades 60 kub. cent. destilleradt vatten. Tutan, som bestod af ett afskuret lampglas, var blott 10 cm. hög. Hon och droppkärlet — en glastratt, hvars pip drogs ut till en fin spets [1] — voro hvar för sig alldeles isoleradt uppsatta, men förenades i försöken derigenom att förbindningstråden, lämpligt böjd och med ett mellanlag af vått filtrerpapper, lades öfver hvarderas kant. I samtliga försöken stod nedra kärlet i förening med elektrometern, hvars utslag, liksom i det föregående, betecknas med L. Siffrorna framför observationerna angifva de särskilta försökens ordningsföljd.

Droppkärlet och tutan förenades med

A) en *våt pappersremsa:*

1.	$L_1 = -29$
2.	-33
3.	-30
10.	-29
Med.	$x_0 = -30{,}2$

[1] Jag hade redan genom de föregående försöken öfvertygat mig om, att det fenomen, hvars elektrometerutslag här betecknats med x, blef vida större, när vattnet strömmade med en fin stråle, som upplöste sig i en mängd små droppar, än vid enkel droppning. Derför valdes det förra utströmningssättet i dessa och alla efterföljande försök, såframt ej annorlunda kommer att angifvas.

B) en hoplödd *zink-koppartråd*, anbragt så att zinken hvilade på droppkärlet, kopparen på tutan:

4. En tråd *(a)* .... $L_2 = +57$
12. En annan tråd *(b)* .... $+55$

$L_2 = +56,0$

Samme trådar, men upp- och nedvände, så att kopparen hvilade på droppkärlet, zinken på tutan:

5. Tråden *a:* .... $L'_2 = -133$
11. Tråden *b:* .... -131

$L'_2 = -132,0$

Häraf följer: $K_2 = 94,0$; $x_2 = -38,0$, $x_2 - x_0 = -7,8$; $\frac{x_2}{K_2} = 0,40$.

C) En hoplödd *silfver-platinatråd*, med silfret på droppkärlet, platinan på tutan.

6. En tråd *(c):* .... $L_3 = -20$
9. Densamme: .... -20

$L_3 = -20$

7. Samme tråd, upp- och nedvänd: ...... $L'_3 = -35$
8. Samma försök upprepadt: .... -40

$L'_3 = -37,5$

Häraf: $K'_3 = 8,8$; $x'_3 = -28,8$, $x'_3 - x_0 = +1,4$; $\frac{x'_3}{K'_3} = 3,27$.

13. En annan tråd *(d)* i första läget: $L_3 = -27$
14. Densamme, upp- och nedvänd: $L'_3 = -37$

Häraf $K''_3 = 5,0$; $x''_3 = -32,0$, $x''_3 - x_0 = -1,8$; $\frac{x''_3}{K''_3} = 6,40$.

Tages medeltalet af dessa resultater erhållas

$$K_3 = 6,9;\ x_3 = -30,4,\ x_3 - x_0 = -0,2;\ \frac{x_3}{K_3} = 4,40.$$

D). Efter dessa försök sattes den 12-parige vattenstapelns poler i förbindelse med droppkärlet, hvilket en våt pappersremsa förenade med tutan. Vid förbindelsen med negative polen erhölls $L_n = -46$ och med den positive $L_p = -19$. Den förra förbindelsen ökade således x, den sednare minskade det. Följaktligen gick en del af droppkärlets laddning öfver till det nedra; vare sig att tutan var för kort eller för tillfället blott ofullkomligt våt. Emellertid borde lika mycket negativ som positiv elektricitet till följd af tutans ofullkomlighet följa med dropparne till nedra kärlet. Kalla då denna mängd m. Då är $L_n = x - m$ och $L_p = x + m$. Således borde

$$x_4 = \frac{L_n + L_p}{2} = -32,5$$

vara lika med ofvan funna värden på x. Nu är $x_4 - x_0 = -2,5$.

Försöken upprepades efter ett par dagar, då äfven ett försök med föreningstråd af koppar — silfver tillades, i den förmodan att dess K skulle komma x närmare än de öfriga. Då det likväl visat sig vara förknippadt med svårighet att ständigt hålla droppkärl och tuta fullkomligt våta, hvarpå dock försökens utgång berodde, fann jag mig föranlåten att inom hvarje försöksafdelning göra ett försök för direkt bestämning af x_0.

Föreningen mellan droppkärlet och tutan

a) *utan* afsigtligen införd elektromotorisk kraft;

1.	Föreningen med koppartråd:	$L_1 = -30,0$
2.	» våt bomullstråd:	$-28,5$
3.	» zinktråd:	$-29,0$
		$x_0 = -29,2$

b) med *zink-koppartråden* b och

4.	zinken på tutan:	$L'_2 = -143,5$
7.	samma försök:	$-140,0$
		$L'_2 = -141,8$
5.	Kopparen på tutan:	$L_2 = +62,5$
6.	samma försök:	$+61,5$
		$L_2 = +62,0$

$K_2 = 101,9$; $x_2 = -39,9$, $x_2 - x_0 = -10,7$; $\frac{x_2}{K_2} = 0,39$.

c) med *silfver-platinatråden* d och

18.	Silfret på tutan:	$L'_3 = -23,0$
19.	Samma försök:	$-26,0$
23.	Samma försök:	$-25,5$
		$L'_3 = -24,8$
20.	Platinan på tutan:	$L_3 = -17,0$
21.	Samma försök:	$-14,0$
		$L_3 = -15,5$
22.	Föreningen med våt bomullstråd:	$x_0 = -19,0$

$K_3 = 4,7$; $x_3 = -20,2$, $x_3 - x_0 = -1,2$; $\frac{x_3}{K_3} = 4,29$.

e) med *koppar-platinatråd*

8.	Kopparen på tutan:	$L'_5 = -40$
10.	Samma försök:	-42
		$L'_5 = -41$
9.	Platinan på tutan:	$L_5 = -5$
11.	Samma försök:	-6
		$L_5 = -5,5$
12.	Föreningen med våt bomullstråd:	$x'_0 = -22,0$

$K'_5 = 17,8$; $x'_5 = -23,3$, $x'_5 - x'_0 = -1,3$; $\frac{x'_5}{K'_5} = 1,30$.

Samma försök upprepadt efter en förändring i trådens anläggning:

13. Kopparen på tutan: .... $L'_5 = -34$
14. Samma försök: .... -33

$L'_5 = -33{,}5$

15. Platinan på tutan: .... $L_5 = -15$
16. Samma försök: .... -10

$L_5 = -12{,}5$

17. Föreningen med våt bomullstråd: $x''_0 = -20{,}0$.

$$K''_5 = 10{,}5;\ x''_5 = -23{,}0,\ x''_5 - x''_0 = -3{,}0;\ \frac{x''_5}{K''_5} = 2{,}09.$$

Medeltalen af de två seriernas resultater blifva:

$$K_5 = 14{,}2;\ x_5 = -23{,}2,\ x_5 - x_0 = -2{,}2;\ \frac{x_5}{K_5} = 1{,}63.$$

20. Det är sannt att dessa försök, strängt räknadt, ej slogo väl ut, för så vidt med dem skulle bevisas att en konstant kraft låg till grund för utslaget x. Så t. ex. blifver ej förhållandet mellan x_0 och K_2 detsamma, antingen det beräknas ur A) och B) eller ur a) och b). Vidare är $x:K$ för samme silfver-platinatråd (d) den ene dagen nästan 50 procent större än den andre. Ehuruväl det ej skulle behöfvas stort fel i experimenterna eller hos den THOMSONSKE elektrometern för att åstadkomma dessa oegentligheter, så kunna de dock vara verkliga afvikelser och x det oaktadt vara konstant, såsom försöken i det hela angifva. Ty det är ingalunda nödvändigt att hvilken förändring som helst i omständigheterna vid försöken skall medföra samma verkan på fenomenerna af båda de krafter, som här äro i fråga. Och i sjelfva verket bevisar afdelningen e) att det motsatta kan ega rum. Blott en förändring i anläggningen af föreningstråden förändrar der för ett och samma trådpar K med 50 procent, hvaremot x icke träffades af den ändringen. Detta synes mig tvärtom som bisak bevisa, att om denne metod skulle — som Hr THOMSON med rätta förordar[1]) — begagnas för bestämningar af elektromotoriska krafter, behöfver han först noggrannt studeras och utbildas. Att en olägenhet gör sig gällande vid metaller, som angripas af vatten, skall längre fram blifva tydligt.

Hvad slutligen beträffar det förhållandet att i alla försöken, utom ett under afdelningen C), det beräknade x genomgående är större än det direkt observerade (x_0), så var det just bemödandet att kunna förklara detta, som ledde till upptäckten af det THOMSONSKA elektrometerfelet. Det är ju uppenbart af det sätt hvarpå x beräknas, att det elektrometerfelet skall ingå i x och x_0; och att det skall växa med växande utslag är ofvan visadt. I sjelfva verket är $x-x_0$ långt mindre än de med särskilt afseende på elektrometerfelet anstälda försöken — jfr. Tab. I — skulle medgifva. Men elektrometervisaren befann sig i nu afhandlade försök högre öfver skifvorna, och Leydnerflaskan var starkare laddad med en elektrofor. Att i alla händelser icke hela de med x betecknade storheterna blott och bart kunna vara halfva elektrometerfelet, synes bland annat af serierna under C) och e).

[1]) Synnerligen tjenlig synes han mig vara för att elektrometriskt bestämma metallers elektromotoriska kraft i beröring med gaser och vätskors med hvarandra.

21. Emellertid hade jag dels genom hittills omnämnda försök, dels ock genom en ganska betydlig mängd andra, som här ej upptagas, blifvit öfvertygad om, att elektriska företeelser verkligen instälde sig, då vattnet genom enkel droppning eller en stråle, som upplöste sig i droppar, föll från öfra till nedra kärlet i mina försöksapparater. I det följande skall redogöras för de undersökningar, som afsågo att utröna, huruvida orsaken till dessa företeelser kunde vara någon bland hittills kända elektricitetskällor, eller om en elektromotorisk kraft verkligen uppstår i och genom förloppen vid vätskors upplösning i droppar.

22. Af mina erfarenheter om elektriciteten inomhus med hvad dertill hörer, fann jag mig naturligtvis föranlåten att innesluta hela försöksapparaten inom en ihålig konduktor [1]). Dennes inrättning, som här beskrifves, betingades af behofvet att i honom kunna insätta olika apparater och att beqvämt till elektrometern kunna öfverföra åtminstone en del af den elektricitet, som upphemtades i det nedra, isolerade, kärlet; hvarjemte luften i hela den omslutande konduktorn borde kunna ombytas, ifall så påkallades.

Apparaten sammansattes af fyra cylindriska hufvuddelar *A*, *B*, *C* och *D* (Fig. 1, samt 4, 3 och 2), gjorde af zink. *A* och *C* äro i sina öfre ändar dubbla och öppna cylindrar; deras nedre ändar äro ock öppna, men enkla. *B* är enkel och nedåt öppen. *A* förenas med *C* och *C* med *D* medelst fjädrande haspar *a*, *a'* och *b*, *b'*, så att, när apparaten är hopsatt, hvarje öfra afdelnings nedre del kommer att stå på bottnen af den undras öfre, nemligen mellan hans dubbla sidor *c*, *c'*; *d*, *d'*; *e*, *e'*. Hälles spärrvätska i dessa mellanrum, så är arbetsrummets luft utestängd. — *E* är en tratt af försilfrad messing [2]) och uppbäres af två ebonitstolpar *(G)*, upp- och nedtill öfverdragne med ett tjockt lager af gummi-lacca. *C* består af två afdelningar eller våningar. Vid *F*, der trattens pip går igenom, från öfra till nedra våningen, är ett större hål utskuret ur zinken, och detta är täppt med en ebonitskifva, hvars ytterkanter äro fastsatta med gummi-lacca. Likaså är trattens pip, som genomgår midten af denna skifva, med henne fastsmält medelst gummilacca. Denna isolering skyddas af en fastlödd metallcylinder *(f)* från vätska, som möjligen kan komma på — för att så säga — golfvet i *C:s* öfra våning. Midt i bottnen af *D* står en, med gummilacca öfverdragen, ebonitstolpe, som upptill är skodd med en försilfrad messingshylsa. Denna hylsa passar in i en annan sådan, som är fastlödd på undersidan af bottnen till en försilfrad messingsbägare, *H* (Fig. 5). En rak, upptill med ögla försedd, silfvertråd *(I)*, som är längre än nedre trattens pip, ger en pålitlig ledande förbindelse mellan bägaren och tratten. Hela zinkhusets höjd är 1,12 meter, och deraf upptagas tre fjerdedelar af *A*, hvarsd iameter är 18 Cm.

Droppkärlet fastsattes i denne apparat på olika sätt. Flera lock af något olika inrättning funnos att tillgå för detta ändamål: ett, som ofta begagnats, föreställes i fig. 4. Stycket *K* är af ebonit, öfverdragen med gummilacca. På det horizontala styckets ändar sitta silfverkrokar, på hvilka t. ex. en i ett linnefodral hvilande glastratt lätte-

[1]) Liknande försigtighetsmått har jag alltid iakttagit beträffande elektrometern.
[2]) I de flesta försöken.

ligen kan upphängas medelst i fodralet fästade band eller snören. Vätskan ifyldes genom en glastratt, som i de flesta fall var fastsatt vid locket och egde en kran af glas.

Apparatdelen *L* afser att skydda försöken mot inflytandet af klädernas elektricitet under droppvätskans ihällning. Han består af en i båda ändar öppen cylinder (af zink eller papp), som antingen står på locket *B* eller följer det ned till bottnen af *A:s* dubbelcylinder. Genom ett hål på sidan af *L* kan glaskranen, förlängd med ett hålet fyllande träskaft *(N)*, insättas och uttagas.

Ett försök utfördes sålunda: glaskranen jemte närmaste stycke af träskaftet doppades i en del af droppvätskeförrådet, samt isattes och slöts. Vätskan ihäldes i lockets tratt, och ett zinklock *(M)*, som omfattade *L*, pålades. Efter att apparaten stått en stund i detta skick, fattades kranens träskaft och vreds om, så att kranen öppnades. När vätskan runnit igenom droppkärlet — hvilket hördes på ljudet af några enstaka, större, droppars slag mot nedra kärlet — fattades *D* med ena handen och dess upphängningsfjädrar afhaspades med den andra, *D* uttogs och bägaren *H* anlades mot elektrometer-elektroden. Medan elektrometerns visare intog sitt jemnvigtsläge, häldes bägarens vätska i ett graderadt glasmått; *D* insattes på sin plats, hvarvid *H* på lämpligt sätt genom öppne cylindern *P* hölls afledd till golfvet, tilldess ett nytt försök skulle göras, då ledningen borttogs och *P* slöts.

§ 2.

Det elektriska fenomenet vid vätskans strömmande härrör ej af elektriciteten inomhus.

23. Genom nu beskrifna inrättning borde försöken vara skyddade mot inflytandet af alla i observationsrummet befintliga krafter. Då det likväl ej kunde undgås, att vid hvarje afläsning taga bort delen *D*, och då dervid, liksom vid droppvätskans ihällning, något af den yttre luften möjligen kunde intränga i apparatens inre, bjöd försigtigheten — som straxt skall visas — att pröfva, huruvida skyddet var fullt pålitligt.

Hr Thomson[1]) har angifvit att elektriciteten föres af luften genom så trånga öppningar som t. ex. en tumsbred springa mellan en dörr, som står på glänt. Med några försök har jag ökat denna erfarenhet.

I dem begagnades den i fig. 1 aftecknade apparaten, likväl med ett par ändringar: *A* utbyttes mot en cylinder af jerntrådsduk, hvars maskors öppning ej uppgick till fullt en qvadratmillimeter; ingen tuta påsattes droppkärlet, som var en tratt af försilfrad messing och försedd med ett tillspetsadt något längre (90 m.m.) glasrör.

A). När 100 kcm. destilleradt vatten gått genom droppkärlet, gaf det nedras bägare vid upprepade försök i medeltal $L_1 = + 29{,}0$. Dessa utslag berodde, åtminstone till största delen, på kontaktselektromotoriska kraften mellan silfret och vattnet i öfra kärlet; ty med en våt tratt af glas och samma dropprör erhöllos blott utslagen + 2 och + 3, hvilka kunna förklaras med inomhus-elektriciteten.

B). Derefter ställdes en med positiv elektricitet starkt laddad, större, Leydnerflaska något på sidan om apparatens nedre del. Då vattnet började rinna, berördes Leydnerflaskan med en liten, isolerad, spritlåga, hvilken derigenom för en stund blef

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[1]) Proc. Phil. Soc. of Manch. II, s. 204.

liksom nära släckt. När hon åter flammade upp, flyttades hon afsides. Häraf $L_5 = -\infty$ d. v. s. skalan med sina 120 delar gick långt ur tuben åt negativa hållet.

C). En timme derefter gjordes ett försök lika med dem i A): $L_6 = +21$.

D). Derefter ett lika med B): $L_7 = -\infty$.

E). Omedelbart derpå ett som de i A): $L_8 = -3$.

F). Leydnerflaskan, starkt laddad, stäldes på samma plats som i B) och D), men urladdades ej. Efter hvarandra upprepade försök gåfvo: $L_9 = -2{,}0$; $L_{10} = +6{,}0$.

G). Leydnerflaskan lemnades orubbad på sin plats, medan L_{10} aflästes; derpå urladdades hon som i B) och D). Häraf $L_{11} = -\infty$.

Jemförelsen mellan försöken B), D) och G) å ena sidan, samt E) och F) å andra visar, att den positivt elektriska luften från Leydnerflaskan hade inträngt i apparaten och åstadkommit de stora utslagen, samt att luftens aftagande elektriska tillstånd ger sin verkan tillkänna i försöken E) och F); sannolikt äfven i C). Af dessa försöksserier synes således, att elektrisk luft inträuger genom åtminstone så trånga öppningar, som en qv. millim. utan att fullkomligt urladdas af öppningarnas ledande begränsningar. Man får deraf en föreställning om luften, i elektriskt hänseende, som vore hon ett *stoft af ett synnerligen väl isolerande ämne* [1]).

Om de stora, med ∞ betecknade, utslagen skola framkomma, måste Leydnerflaskan ställas så, att hennes laddning ej på för nära håll afledes till apparaten eller andra föremål utan att väsentligen elektrisera luften. Detta ådagalägger ytterligare att det är luftens elektricitet, som förorsakar de stora utslagen.

För mina studier af de kosmiska företeelserna har jag i dessa försök funnit ett medel att skilja verkningarna af atmosferiska elektriciteten från dem af den terrestra. Derom framdeles. För närvarande undersökning manades jag af dem till vaksamhet med afseende på elektriciteten inomhus.

24. Mot denna är det slutna zinkhuset ett fullgiltigt skydd: följande försök bevisa det. De äro utförda med ungefär [2]) samma apparat som den i fig. 1 aftecknade. Till droppvätska nyttjades — liksom i alla följande försök, om ej annorlunda angifves — 100 k.cm. destilleradt vatten.

A). Ett par försök gjordes först i det rum, i hvilket elektrometern stod. De gåfvo: $L_1 = -33$; $L_2 = -34$.

B) Hela apparaten inflyttades i ett annat rum och uppfästades på en ebonitstång så nära intill en stor elektricitetsmaskin att långa gnistor öfverhoppade till apparaten under det vattnet rann. Apparaten återfördes derefter in i elektrometerrummet. $L_3 = -32{,}5$.

C). Apparaten återbars. Nära honom afleddes elektricitetsmaskinen med en stark spritlåga. Maskinen gick före och under vattnets itömmande, äfvensom medan det strömmade till nedra kärlet. Apparaten infördes derefter i elektrometerrummet. $L_4 = -31{,}5$.

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[1]) Terquem, Carls Repert. B. VIII, s. 59, beskrifver metoder att med elektroskoper i metallburar synliggöra elektriska agensers egenskap att ej verka inåt i en ihålig konduktor. Jag har sedan flera år begagnat samma metod. Af det ofvan meddelade synes dock att vissa försigtighetsmått dervid måste iakttagas.

[2]) Delen L fanns ej.

D) såsom A): $L_5 = -33,5$.

E) = C). Men delen D aftogs och påsattes, medan maskinen gick. När vattnet utrunnit, aftogs D och bars in till elektrometern. Således allt som i de vanliga försöken, men i starkt positivt elektrisk luft. $L_6 = -34,0$.

F). En god stund efter dessa försök undersöktes luften på den plats, der apparaten stått, med en isolerad metallsfer. Hon var starkt elektrisk, men med mycket oregelbundna växlingar från försök till försök.

Så som dessa försök utföllo, synes mig ej vara möjligt att den, under vanliga omständigheter jemförelsevis omärkliga, elektriciteten inomhus skulle kunna åstadkomma några elektriska fenomener inom zinkhuset.

25. Men enär det vore tänkbart att den elektriska luft, som vid apparatens sammansättning — och hufvudsakligen vid öfra kärlets inställning — kommer in i zinkhuset, möjligen skulle kunna verka störande, anstäldes med samme apparat som i nästföregående försök en pröfning häraf på följande vis.

Omkring röret O slogs en kautschukslang, som ledde till ett par förenade WOULFF-SKA flaskor; och det hela inrättades så, att en stor dubbelaspirator — af inemot zinkhusets rymlighet —, som genom en slang förbands med röret P, tvang luft att först gå genom vatten i ena flaskan, sedan genom svafvelsyra i den andra, och slutligen genom zinkhuset och ut i aspiratorn. För yttersta säkerhets skull leddes en metalltråd från det inre af flaskan med vattnet och till arbetsrummets vägg.

Det torde vara öfverflödigt att om utgången af dessa försök angifva mera än att han påtagligen blef densamme, antingen apparaten var fyld med rummets luft eller med sådan, som medelst ända till fem aspiratortömningar inpumpats genom WOULFF-SKA flaskorna.

26. Ett par försök under föregående pröfning föranledde en undersökning af klädnads-elektricitetens inflytande vid vätskans ihällning. För detta ändamål nyttjades till droppkärl ett 68 cm. långt glasrör, som räckte flere decimeter ofvan locket, och för att erhålla den direkta verkan af det inflytande, som skulle pröfvas, användes ingen tuta. I öfre änden af röret sattes en glastratt för ifyllningen.

Med denne apparat framkallades utslag, som växlade från + 25 till + 140 skaldelar; beroende deras storlek af min olika ställning, under det vätskan ihäldes.

Det var till förebyggande af denna felanledning, som apparaten tillökades med hufven L, hvilken ock visade sig tillfyllestgörande.

§ 3.

Det elektriska fenomenet vid vätskans strömmande har ej sitt upphof i nedra kärlet.

27. Att till nedra kärl använda glas, messing, zink eller försilfrad messing medför ingen annan förändring hos utslaget än den qvantitativa, som kan tillskrifvas kärlens tillfälliga storlek och form, samt sättet för den uppsamlade elektricitetens öfverflyttning till elektrometern. Helt naturligt måste utslaget till sin storlek blifva olika, t. ex. om nedra kärlet är en god eller dålig ledare.

En noggrann pröfning af frågan anstäldes genom att utsätta försöken för en åt nedra kärlet meddelad elektricitetsmängd. Apparaten var densamma som i föregående stycke N:o 24.

A). Utslaget af den elektricitet, som samlades i nedra kärlet, utan att det erhållit någon särskilt laddning, bestämdes af tio försök. Det största gaf $L = -16{,}0$, det minsta $L = -13{,}5$ och medeltalet af alla var $L = -14{,}9$.

B). Nedra kärlets laddning med den 100-parige vattenstapelns poler, pröfvad på vanligt sätt, gaf som medeltal af observationer vid hela observationstidens början och slut för

negative polen: $N = -48{,}5$
positive polen: $P = +29{,}5$.

C). Bland försöken under A) inskjötos några, i hvilka det nedra kärlet laddades med endera polen af stapeln, innan vattnet från det öfra påsläptes. Häraf som medeltal vid laddning med

negative polen: $R = -75$
positive polen: $S = +20$.

Man ser häraf att icke ens en nedanför tutan befintlig elektrisk kraft utöfvar någon märkbar *omedelbar* verkan på den sammanhängande strålen, och att icke ens under sådana omständigheter elektricitet genom strålen bortledes från det ena kärlet till det andra vid de försök, som i denne uppsats afhandlas. Ty i båda fallen skulle försöken uppenbarligen hafva gifvit ett negativt utslag $R < N + L$ och antingen ett positivt $S < P + L$ eller ock ett negativt S. Att tvärtom resultatet blef negativa utslaget $R > N + L$ och ett positivt $S > P + L$ kan endast förklaras derigenom att den åt nedra kärlet meddelade elektriciteten inverkar inducerande, icke omedelbart på sammanhängande strålen, utan på sjelfva tutan, så att på det förhandenvarande afståndet t. ex. det negativa N attraherar en positiv elektricitetsmängd, låt vara $n \, . \, N$, hvilken i sin ordning drager ned en negativ, låt vara $n' . \, n \, N$, i den sammanhängande strålens spets.

Enligt denna uppfattning skulle man kunna skrifva

$$R = L + N + n'n\,N \text{ eller}$$
$$R = L + (1 + a)\,N \quad\ldots\ldots\ldots\ldots (1)$$

hvarvid a är ett positivt bråk; och på samma sätt

$$S = L + P + p'p\,P \text{ eller}$$
$$S = L + (1 + b)\,P \quad\ldots\ldots\ldots\ldots (2)$$

hvarvid b likaledes är ett positivt bråk.

Strängt taget bör a vara större än b, emedan strålens egen elektricitet (L) är negativ, hvadan elektriske tyngdpunkterne för strålen och $n\,N$ närma sig hvarandra, men för $p\,P$ och strålen aflägsna sig från hvarandra. I sjelfva verket gifva ock försöken härofvan $a = 0{,}24$ och $b = 0{,}18$. Om man likväl ej fäster afseende vid dessa olikheter, borde man, för att kontrollera den här föreslagna uppfattningen af tutans verkningssätt, kunna på förhand beräkna t. ex. det S, som ett försök skulle gifva: nemligen genom att ur (1) uttaga värdet på a, och insätta det i (2).

Enligt denne plan återupprepades — dagen derpå — nyss beskrifna försök i nedanstående ordning.

A) $N_1 = -50,5$
$N_2 = -50,0$
$N_5 = -48,0$
$N = -49,5$

$P_3 = +29,0$
$P_4 = +29,0$
$P = +29,0$

B) $L_6 = -13,5$
$L_7 = -12,5$
$L_8 = -13,0$
$L_{10} = -13,0$
$L = -13,0$

C) $R_9 = -71,5$

Häraf beräknas $a' = 0,18$ och $S = +21,22$. Det derefter anstälda försöket

D) gaf $S = +21,0$.

Att ej a och a' samt b och b' sinsemellan äro lika stora förutsätter ej större förändringar än att öfra kärlet ena dagen varit mera fullständigt blött än den andre.

Är nu sjelfva uppfattningssättet riktigt, så kunna de med L betecknade utslagen omöjligen uppkomma genom någon elektricitetsutveckling i nedra kärlet. Ty om utslagen $L = -14$ eller $L = -13$ skulle hafva sitt upphof uti någon der befintlig kraft, borde bägaren (H), när som helst och utan att vätskan strömmat, gifva ett utslag (y), som enligt föregående försök skulle kunna bestämmas af t. ex. $-13 = y + a'y = (1 + 0,18)y$. Häraf skulle således följa $y = -11,0$.

Men en kraft, som direkt gåfve ända till 11 skaldelars utslag vid så svag laddning af elektrometerns Leydnerflaska som i dessa försök, skulle vara alltför stor för att kunna undgå den ringaste uppmärksamhet. Tvärtom har jag genom att anlägga bägaren, dels tom dels fyld med vatten, öfvertygat mig om att det ofvan — i stycket N:o 22 — beskrifna sättet att före hvarje försök urladda nedra kärlet varit fullkomligt ändamålsenligt.

28. I sammanhang härmed vill jag gifva en beskrifning på, huru den elektricitet, som utvecklas under ett enkelt försök med rinnande vatten och utan anbringande af någon känd kraft, visar sig verka på en utanför befintlig kropp. Detta kan göras åskådligt genom att föra en liten, med elektrometern medelst en böjlig metalltråd förbunden, spritlåga utmed strålen. I närheten af nedra kärlet ger elektrometern ett större negativt utslag, som aftar i samma mon som lågan föres högre uppåt; och detta fortsätter ända till en punkt mellan de båda kärlen, i hvilken utslaget blir noll, hvarefter det småningom växer åt positiva hållet, ända tilldess att lågan kommer upp till tutan. De två kärlen med sitt mellanrum bilda således liksom en utsträckt kropp med polärt fördelade agenser, och försöket erbjuder i sin helhet samma företeelser, som då man för ett elektroskop utefter en konduktor med polärt fördelad elektricitet eller en kompassnål utefter en magnetstång.

Jag tillägger att vid alla de olika sätt [1]), hvarpå jag sökt utröna elektriska för-

[1]) Ett godt sätt är att med en häfvare eller ett å droppkärlets sida utmynnande längre rör, samtidigt med strömmen innanför tutan, åvägabringa en äfven utanför henne och upphemta dennes andel af vätskan i ett isoleradt kärl.

delningen mellan de två kärlen, har denna med den noggrannhet, som försöken medgifvit, visat sig ske med lika stora elektricitetsmängder af motsatt slag.

§ 4.

Elektriska fenomenerna vid vattnets strömmande äro ej tillfälliga yttringar af olika krafter.

29. I N:o 17 har jag visat att jemförelsevis rätt betydliga elektricitetsmängder, som meddelas öfra kärlet, äro utan märkbart inflytande på de företeelser, om hvilka här alltjemt är fråga. Vid den anordning, som åt öfra kärlet meddelad elektricitet antager, synes således agensets kraftresultant med afseende på spetsen af strålens sammanhängande del vara, åtminstone tillnärmelsevis, lika med noll. Deraf kan man sluta att, om denna anordning på något sätt kunde förändras, det elektriska agenset i allmänhet skulle med afseende på samma spets hafva en verksam resultant, och att elektricitet följaktligen borde följa med dropparne till nedra kärlet. En sådan olikhet mot den anordning, som meddelad elektricitet antager, eger rum, om en utanför öfra kärlet befintlig kraft från ett håll verkar fördelande på dess naturliga elektricitet. Exempel på verkan af sådana krafter lemna de nyss (i N:o 27) beskrifna försöken med nedra kärlet afsigtligen elektriseradt.

Om sådana tillfälliga krafter utanför öfra kärlet skulle vara orsaken till det ifrågavarande hufvudfenomenet, borde de vara att söka, antingen hos de apparatdelar, hvarmed kärlet uppfästes eller ock utanför desse; och i sednare fallet antingen hos sjelfva zinkhuset eller ock utom eller inom det.

30. Att zinkhuset fullständigt utestänger alla utanför detsamma befintliga krafters inverkan på fenomenet och ej heller insläpper elektrisk luft är i N:o 24 och 25 tillräckligt ådagalagdt.

Hos zinkhuset befintliga krafter, som skulle kunna gifva upphof åt hufvudfenomenet, borde påtagligen vara af kontaktselektromotoriskt ursprung. Sådana finnas ock helt visst. Att de likväl ej äro orsaken till fenomenet synes bäst deraf, att detta utan skydd väsentligen utvecklar sig lika som i hus af zink eller jern. Dessutom borde under ifrågavarande förutsättning fenomenet blifva större i försök utan än med tuta; men detta är alldeles tvärtom.

31. Af utanför öfra kärlet verkande krafter, som skulle kunna utgöra fenomenets orsak, synas inga andra återstå än sådana, som kunna uppstå genom oafsigtlig gnidning af de för öfra kärlets uppfästning nödige delarne. Vanligen har jag isolerat öfra kärlet — för att hufvudfenomenet skulle få utveckla sig under möjligast enkla omständigheter —. Men blott en lätt gnidning af någon isolator skulle kunna gifva anledning till en ganska varaktig elektricitetskälla.

Emot rimligheten af att taga sådana och liknande felanledningar som förklaringsgrund för det regelbundna, negativt elektriska, hufvudfenomenet strider dock all den erfarenhet som kan hemtas från samtliga mina försök. Ty om fenomenet berodde af krafter af ifrågavarande slag, skulle det blifva större, när droppkärlet vore utan tuta, och förändras med apparatens omändring. Men intetdera är fallet. Tvärtom blir fenomenet — som nämndt — obetydligt och oftast omärkligt vid försök utan tuta; hvaremot det bibehåller sig, antingen öfra kärlet orubbligen fästes, upphänges eller löst lägges i en bärare, och vare sig att uppfästningsmedlen genom gnidning mot den del af öfra kärlet, med hvilka de äro i beröring, skulle blifva positivt eller negativt elektriska. Dessutom är det inalles likgiltigt af hvilka ämnen öfra kärlet med sina tillbehör är sammansatt, blott att ingen verksam elektromotorisk kontakt finnes i föreningen mellan tutan och droppkärlet. Tutor af våt metall, vått papper, vått glas, liksom ock droppkärl af glas eller porslin, gifva i hufvudsak samma fenomener, d. v. s. öfra kärlet blir, då tuta begagnas, vid rinnande vatten positivt elektriskt och det nedra negativt.

32. Om på olika tider — om ock med väsentligen samme apparater — upprepade försök gåfve identiska fenomener, så kunde dessa antagligen icke vara tillfälliga yttringar af nämnda krafter.

Försöken i nedanstående tabell äro med ett par undantag gjorda dag för dag: serien *A* i januari med en apparat, serien *B* i mars med en annan. Ur mina anteckningar öfver försök, som blifvit anstälda i olika syften och derför med smärre olikheter i apparaterne, har jag uttagit dem, i hvilka under nämnda tider vatten nyttjades till droppvätska, och af samtliga dessas resultater för hvar dag bildat aritmetiska mediet. Detta betecknas i tabellen med *L*. Under *E* upptagas medeltalen af elektrometerns utslag för en sexparig vattenstapel i *A* och för en tolfparig i *B*. De beräknade värdena på *L* äro genom enkel proportionering bestämda för det fall att stapeln alltid hade gifvit 20 skaldelars utslag.

Tab. II.

	A		*B*		
N:o	*E*	*L*	*E*	*L*	
				Obs.	Ber.
1	10,75	25.0	23,50	40,35	34,34
2	11.50	23,1	23,00	40,78	35.46
3	10,75	25,9	21,25	36,89	34,72
4	10,95	27,4	20,50	33,10	32,29
5	10,25	24,0	19,59	31,75	32,42
6	10,75	25,3	18,00	29,75	33,06
7	10,25	23,7	16,00	25.25	31.56

Inflytandet af tillfälliga omständigheter är visserligen lätt att igenkänna, isynnerhet i serien *A*. Såsom sådana nämner jag endast fuktighetens olika inverkan på *E* och *L*. Men i *B* tyckes, oaktadt den vidtagna reduktionen, i det hela ännu qvarstå ett aftagande hos *L*. Och då detta äfven är fallet med *E*, skulle anledningen kunna misstänkas hafva varit densamma i båda serierna. Laddningen af elektrometerns Leydnerflaska förnyades ej under de dagar, till hvilka försöken hänföra sig; hvadan värdena på *E* angifva, huru flaskans laddning med tiden minskades, således huru hos en viss isolator bunden elektricitet småningom aftog. Tillämpas detta på *L*, skulle tabellen vara en vederläggning af det, som han är ämnad att bevisa. Det rätta förhållandet är dock ett helt annat. Huru mycket den omständigheten inverkat, att till försöken

N:o 1 — N:o 3 i B ej användes fullt samma sorts vatten som till de öfriga, kan jag ej bedöma; sednare skall dock visa sig hvad minsta olikhet hos droppvätskan kan åstadkomma. Men det inses lätt att — denna omständighet förutan — observationerna L, beräknade på ofvan angifna sätt, böra synas aftaga med E, ifall hufvudfenomenet härleder sig från en konstant kraft. Ty om det i uppsatsen A) afhandlade elektrometerfelet vid bestämningarna af L betecknas med Δ och vid dem af E med δ, och om de motsvarande felfria värdena på L och E vore L_0 och E_0, så äro de beräknade L egentligen bestämda af $L = 20 \,.\, (L_0 + \Delta) : (E_0 + \delta) = 20 \,.\, \frac{L_0}{E_0} + 20 \,.\, \left(\frac{\Delta}{\delta} - \frac{L_0}{E_0}\right) : \left(\frac{E_0}{\delta} + 1\right)$, hvarvid $L_0 : E_0$ borde vara konstant och andre termen uttrycka elektrometerfelets inflytande pa det beräknade L. Nu var elektrometerns Leydnerflaska alltid laddad med positiv elektricitet, och E, som kan anses vara ett mått på denna laddning, är medelstorleken af utslagen för den — som konstant antagne — stapelns båda poler, hvarjemte de observerade L äro betydligt större än E. Häraf följer, enligt Tab. I, att både δ och $\Delta : \delta$ måste aftaga på samme gång som E; således ock det beräknade värdet L, när Leydnerflaskan småningom förlorar sin laddning. Att detta aftagande hos observationerna i B har sin grund i beräkningssättet styrkes dessutom deraf, att det icke återfinnes i serien A, för hvilken ingen sådan beräkning skett, eftersom E i henne är temligen konstant.

§ 5.

Elektricitetsutvecklingen vid vätskans strömmande är ej ett fenomen af elektromotoriska kontakter i öfra kärlet.

33. Under hela den tid, jag varit sysselsatt med detta arbete, har det visat sig, att ju mera sorgfälligt jag kunnat aflägsna alla hittills kända elektricitetskällor från försöken, desto mera regelbundet hafva resultaterna utfallit. Den största omsorgen dervid påkalla onekligen, af flera lätt insedda skäl, de kontaktselektromotoriska krafterna. Jag anför här ett försök, som jag dock tror vara fritt från inflytelsen af alla hittills bekanta elektricitetskällor. Det kan således beteckna en sammanfattning af allt det föregående.

Apparaten var den i fig. 1 aftecknade. Glastutan, ett lampglas (längd 23 cm., diam. nedtill 5 cm.), fastsmältes med gummilacca vid sin bärare, och likaså dropptratten vid tutan. För att underhålla en god förbindelse mellan tutan och droppröret inträngdes en fin, väl urpiskad och urblött, tvättsvamp omkring droppröret, så att han tillika slöt tätt an mot tutans inre. Innan detta öfra kärl insattes och hårdt fastskrufvades vid zinkhuset, nedsänktes alla dess delar, utom bäraren, i samma destillerade vatten, hvaraf en del sedan togs till droppvätska. Hela öfra kärlet utgjordes således af isolatorer, som helt och hållet öfverkläddes af vatten; och vattnet omslöts öfverallt af luft.

Ett tio gånger upprepadt försök gaf:

$$L_1 = L_2 = L_7 = -\ 40{,}0;\ L_3 = L_4 = L_{10} = -\ 41{,}5;\ L_5 = L_9 = -\ 42{,}0;\ L_6 = -\,41{,}67;$$
$$L_8 = -\ 40{,}5.$$

Med L_6 och L_7 är förhållandet följande. I båda hade kranen (N) varit illa inskjuten: nedra kärlets vatten, hvilket här, liksom i alla mina försök, hvarje gång tömdes i ett graderadt glasmått, hade i L_6 varit 90 kcm. och i L_7 blott 70. Det öfriga återfanns i en skål (g) af gummilacca, som för detta ändamål var fastsmält omkring öfversta trattens pip, och vid L_7 äfven på apparatens lock. Utslagen voro: $L_6 = -37{,}5$ och $L_7 = -28{,}0$. De ofvan antecknade äro beräknade ur $L_6 = -37{,}5 \cdot 100 : 90$ och $L_7 = -28 \cdot 100 : 70$.

Slutligen gjordes ett försök, sedan vattnet stått påfyldt i lockets tratt sex timmar. Detta gaf $L_{11} = -42{,}0$.

Aritmetiska mediet af samtliga dessa observationer är $L' = 41{,}15$ och motsvarande medelstorleken af utslagen för 12-parige stapeln $s' = 24{,}91$.

Efter trettiofem dagars förlopp iordningstäldes apparaten ånyo och försöken återupprepades på alldeles samma sätt och med samma vatten, som för detta ändamål blifvit bevaradt. Under mellantiden hade åtskilliga andra försök blifvit gjorda och elektrometern kommit i olag, så att han måste söndertagas och iståndsättas.

I nedanstående uppteckning af försöksresultaterna beteckna n och p utslagen för den 12-parige stapelns negative och positive pol.

$-L = 38{,}0$	$-n = 26{,}5$	$p = 24{,}5$
$38{,}0$	$27{,}0$	$23{,}5$
$45{,}0$	$26{,}5$	$24{,}0$
$45{,}5$	$27{,}0$	$24{,}0$
$42{,}5$	$25{,}5$	$p = 24{,}0$
$43{,}0$	$n = -26{,}5$	
$43{,}0$		
$L'' = -42{,}14$		

Således blef medelstorleken af hufvudfenomenets utslag $L'' = -42{,}14$ och af stapelpolernes $s'' = 25{,}25$.

Om man, oaktadt den opåräknade likheten mellan utslagen för 12-parige stapeln vid de två försökstillfällena, ur L', s' och s'' beräknar L'' under förutsättning att L' och L'' härleda sig från en och samma konstanta kraft och att stapeln ej undergått någon förändring från det ena försökstillfället till det andra, så erhålles $L'' = -41{,}57$ och således $L'' - L' = 0{,}42$ eller knapt en half skaldel, hvarförutom alla den förra seriens utslag falla inom den sednares gränser.

Då jag antager att denna stora öfverensstämmelse förutsätter en kraft, som, oaktadt hon ej kan härleda sig från elektromotoriska kontakter, måste hafva varit konstant, förbiser jag ej afvikelserna mellan sista seriens observationer sinsemellan och att öfverensstämmelsens fullkomlighet således kan hafva något tillfälligt. Men det är lätt bevisadt att dessa afvikelser, åtminstone kunna, helt och hållet bero af instrumentalfel. Såsom sådana misstänker jag dels den omständigheten, att elektrometern vid de sednare försöken första gången begagnades efter en genomgående reparation, dels ock den mer än vanligt dåliga väderlekens inverkan på samtlige isolatorerne. Ifrågavarande afvikelser återfinnas, nemligen, till samma belopp i några försök, som omedelbart efter de nyss beskrifna anstäldes på det sättet, att försöksapparatens nedra kärl laddades med den 100-parige stapelns poler, hvarefter bägarens andel i denna laddning pröfvades med elektrometern. De utföllo för t. ex. den positive polen sålunda: 82,0; 92,0; 76,5; 76,0. Nu är (92—76) : 76 = 0,21 lika stort som (45,5 — 38,0 : 38 = 0,20, hvilket härledes ur serien — *L*. Hufvudfenomenet var således åtminstone lika konstant som den 100-parige stapelns.

34. Att det elektriska fenomenet i dessa försök ej härleder sig från någon elektromotorisk kraft, som förmenas uppstå mellan isolatorer eller mellan isolatorer och ledare, torde det närmast följande bevisa [1]).

Om glas, fullständigt omslutet af vatten, eller vatten af luft skulle kunna gifva kontaktelektriska fenomener, så borde detta äfven vara fallet med metaller under samma omständigheter. Utbyttes fördenskull glastutan i en apparat mot en tuta af metall, så borde ej det elektriska fenomen, som är egendomligt för metallens och vattnets kontakt med hvarandra, förändras, om man öfverdroge hela metalltutan med ett vattenlager. Men om försöken dervid skulle tvärtom falla så ut, att vattenöfverdraget undertryckte sistnämnda fenomen och att i dess ställe uppträdde detsamma som när tutan vore af glas med vattenöfverdrag, så vore fenomenet uppenbarligen oberoende af kontakten mellan vattnet och det ämne, som det omsluter.

Enligt denne tankegång anordnades följande två försöksserier. I dem nyttjades apparaten fig. 1 med locket fig. 4; till droppkärl en glastratt, som efter vanligheten nedsänkts i vatten, samt till tutor tre lika formade och lika stora (18 cm höga, 5,5 cm vida) af glas, messing och zink, som hvar efter annan med en kork fastträngdes omkring dropptrattens pip. Dessutom drogs från dropptrattens inre en våt bomullsveke ned till öfre delen af tutan.

A). Först gjordes försök med de två förstnämnda tutorna. De utföllo sålunda:

1:o. Glastutan våt:

$$L_1 = -31{,}5;\quad L_2 = -32{,}0.$$

2:o). Messingstutan torr:

$$L_3 = -3{,}0;\quad L_4 = -6{,}0;\quad L_5 = -7{,}0;\quad L_6 = -8{,}0;\quad L_7 = -9{,}0;\quad L_8 = -10{,}5.$$

3:o). Messingstutan inuti fodrad med vått filtrerpapper:

$$L_9 = -29{,}5;\quad L_{10} = -35{,}0;\quad L_{11} = -38{,}0;\quad L_{12} = -37{,}0.$$

4:o). Messingstutan, sedan papperet borttagits och hela tutan doppats i destilleradt vatten:

$$L_{13} = -31{,}0;\quad L_{14} = -31{,}5.$$

B). Dagen derpå utfördes följande serier:

1:o). Apparaten hade lemnats orörd efter sista försöket under föregående dagen. Således messingstutan torr, men oxiderad:

$$l_1 = -21{,}5;\quad l_2 = -22{,}0.$$

2:o). Zinktutan torr:

$$l_3 = +27{,}0;\quad l_4 = +9{,}5;\quad l_5 = +6{,}5.$$

3:o). Zinktutan fordrad med vått filtrerpapper:

$$l_6 = -25{,}5;\quad l_7 = -26{,}0;\quad l_8 = -25{,}5;\quad l_9 = -24{,}5.$$

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[1]) Deremot anser jag ej osannolikt att mina fortsatta undersökningar kunna leda till ett sammanhang mellan här ifrågavarande fenomen och diafragma-strömmarne, hvilka sednare i sådant fall komma att få en helt annan förklaring än den hittills gifna.

4:o). Glastutan, fodrad med filtrerpapper och doppad i vatten:

$$l_{10} = -30{,}0;\ l_{11} = -29{,}5.$$

5:o). Zinktutan fullständigt doppad och utan papper:

$$l_{12} = -21{,}0;\ l_{13} = l_{14} = l_{15} = -20{,}0.$$

Förloppen i dessa försök äro mycket ögonskenliga. I serien A) visar L_3 skilnaden mellan det utslag, som tillhör sjelfva hufvudfenomenet (L_1 och L_2) och det, som skulle uppkomma ensamt af kontakten mellan vatten och messing. Detta sednare aftager småningom (L_4 till L_8), allteftersom messingstutan fuktas af stänket från strålen, och, sedan tutan blifvit fullständigt doppad i vatten, uppgå utslagen (L_{13}, L_{14}) till beloppet af glastutans, d. v. s. hufvudfenomenets. Att L_{10}, L_{11} och L_{12} till och med öfverstiga L_1 och L_2 anser jag på ett eller annat vis stå i sammanhang med messingens oxidering af vattnet [1]). Denna uppfattning finner ett stöd deri att messingstutan andra dagen, sedan hon åter hunnit blifva torr, gaf ända till sju gånger så stort utslag (l_1) som innan hon första gången — dagen förut — varit våt (L_3).

I afdelningen B) återkommo alla dessa företeelser ännu mera påfallande, men med olikheter, som torde böra förklaras dermed att vatten blir mera elektropositivt i beröring med zink än med messing [2]); hvarjemte zinkens oxydering synes hafva motsatt verkan mot messingens, eftersom det ej lyckades mig att med återupprepade försök (l_{12}—l_{15}) erhålla ett enda utslag, som gick upp till värdet af l_{10}.

§ 6.

Om olika droppvätskors inflytande på fenomenet.

35. I det föregående har jag steg för steg sökt aflägsna inflytandet af den ena efter den andra af hittills kända elektricitetskällor, som skulle kunna förmodas gifva upphof åt sjelfva hufvudfenomenet på ett sådant sätt, att vätskan dervid blott skulle hafva den underordnade betydelsen att fortskaffa redan skilda elektricitetsmängder. Hufvudfenomenet har bibehållit sin hufvudbestämning alltför tydlig och oföränderlig, för att det ej skulle i vätskans rörelse hafva en för alla försöken gemensam orsak.

Men enligt ofvan (N:o 14) antydda uppfattning af fenomenets tillkomst borde olika vätskor gifva olika fenomener och ytspänstigheten dervid vara af stort inflytande. Med valet af vätskor inrättadt härefter har jag anstält några försök. Huru få de hittills varit, hafva de dock redan gifvit det märkliga resultatet att det både finnes vätskor, hvilkas droppar äro mera negativt elektriska än vattnets och sådana med positivt elektriska droppar; hvarjemte den sednare klassen synes utgöras af vätskor med ringa ytspänstighet, såsom sprit, fotogen och svafveleter [3]), den åter med negativt elektriska droppar af sådana, hvilkas ytspänstighet är stor [4]), såsom t. ex. regnvatten, sy-

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[1]) Jfr. W. THOMSON, Proc. of Roy. Soc. of Lond. XVI, s. 71.

[2]) PÉCLET, Ann. de Chim. et de Phys. (3) II, s. 239.

[3]) De starkaste positiva utslag, som jag hittills funnit vid dessa slags försök, frambragtes med en egendomlig anordning af två droppvätskor på en gång.

[4]) Terpentinen, som visat sig hafva negativt elektriska droppar, gör härifrån ett undantag.

radt vatten, lösningar af natronsalter och i högre grad, lösningar af kopparvitriol, socker och zinkchlorid.

Sprit, sådan som han förekommer i handeln, vacklar egentligen mellan båda dessa klasser, i det man både kan träffa den som är negativ (d. v. s. har negativt elektriska droppar) och den som ger intet utslag; men vanligen är han svagt positiv [1]).

De närmare undersökningarna häröfver har jag börjat med vattnet; och anser jag mig af flera skäl derom böra meddela följande stycken.

36. Jag har brukat hemta destilleradt vatten från två olika ställen och sjelf destillerat med glaskärl. Sistnämnda sorten har alltid visat sig negativ. Af de öfriga har den ena (a) under detta år antingen varit positiv eller svagt negativ, den andra (b) merändels temligen starkt negativ, någongång svagt negativ, men sällan har någon hemtning varit positiv. Dessa olikheter hafva varit så påfallande att jag funnit mig nödsakad att föra noga anteckningar öfver hvilka hemtningar från hvardera stället jag begagnat i de särskilta försöken.

A). Nästföljande serier, med två vattensorter a, och b, skiftevis, utfördes — för annat ändamål — på det sättet att vätskestrålen utgick från nedre änden af en blank messingslamell, som var anbragt i en mycket vid messingstuta och i förbindelse med henne. Således bör verkan af kontakten mellan vatten och messing göra sig gällande i dessa försök. I hvarje serie användes till de upprepade försöken samma, en gång för alla uppmätta vattenprof; endast då och då tillsattes litet nytt för att ersätta det obetydliga, som efterhand gick förloradt:

1:o) med b_1:

$L_1 = L_2 = L_5 = -6{,}0$; $L_3 = -6{,}5$; $L_4 = -7{,}0$. Således: L konstant.

2:o) med a_1:

$L_6 = +1{,}0$; $L_7 = +5{,}0$; $L_8 = +7{,}5$; $L_9 = +9{,}5$; $L_{10} = +10{,}0$.

3:o) med b_1:

$L_{11} = +8{,}0$; $L_{12} = +5{,}5$; $L_{13} = +3{,}5$; $L_{14} = +2{,}0$; $L_{15} = 0$; $L_{16} = -1{,}0$; $L_{17} = -2{,}0$; $L_{18} = -3{,}0$; $L_{19} = -4{,}5$.

4:o) med a_1:

$L_{20} = +0{,}5$; $L_{21} = +5{,}0$; $L_{22} = +8{,}0$.

B). Skiftevisa försök med två andra hemtningar a_2 och b_2 och apparaten fig. 1 alldeles oförändrad.

1:o) med b_2:

$l_1 = -35{,}0$; $l_2 = -35{,}0$.

2:o) med a_2:

$l_3 = -12{,}5$; $l_4 = -10{,}5$; $l_5 = -4{,}5$; $l_6 = -2{,}5$; $l_7 = -3{,}0$; $l_8 = -7_{10}$; $l_9 = -9{,}0$; $l_{10} = -11{,}5$; $l_{11} = -11{,}0$; $L_{12} = l_{13} = -9{,}5$; $l_{14} = -14{,}0$.

3:o) med b_2:

$l_{15} = -33{,}5$; $l_{16} = -37{,}5$; $l_{17} = -36{,}5$; $l_{18} = -37{,}5$.

C). Med 70 kcm af a_2 och b_2 och med apparaten fig. 1 utan tuta anstäldes försök förnyade gånger under loppet af flera dagar. a_2 gaf konstant $L = +9$; b_2 dere-

[1]) Jfr. härmed QUINCKE, Pogg. Ann. CXIII, sidd. 513, 598 och 557.

mot $L = 0$ med en liten dragning åt positiva hållet, när försöket efterföljde ett med sorten a_2.

På liknande sätt hafva flera andra försök utfallit; och synas mig dessa resultater vara ganska upplysande.

Först och främst skulle ensamt de innebära ett tillräckligt bevis för att det alltjemt här ifrågavarande hufvudfenomenet icke kan vara en följd af blott och bart tillfälliga experimenteringsfel.

Vidare blifver det genom jemförelse mellan försöken B) och C) klart att sjelfva hufvudfenomenet bestämmes af mera än ett moment, och att bland dem finnes ett, som af tutan väsentligen förstärkes, och ett — det positiva — som af henne är mer eller mindre oberoende. På detta sätt synes mig det förhållandet böra tydas att a_2, som utan tuta ger positivt utslag, med tuta ger negativt; och att b_2, som ger intet eller svagt utslag utan tuta, med henne ger stort negativt. Men då följer ock af tutans verkningssätt, att elektromotoriska kraften för båda fenomenerna ej kan hafva samma säte.

Anmärkningsvärd är slutligen den efterverkan af ene vattensorten på efterföljande försök med den andre, hvilken så tydligt uppenbarar sig i A). Hon visar sig ock i B), hvarest dock i 2:o) med femte försöket återigen börjar en stigning, som sedan fortsätter igenom alla de sju följande. Det sistnämnda bevisar att den positiva egenskapen, som till en början ökas genom upprepade försök, med många sådana går förlorad, hvilket — enligt försöken i N:o 33 m. fl. — ej är fallet med den negativa.

37. Allt detta är lätt att förklara, om man blott förutsätter att vattensorterne b äro rena, men att sorterne a, om ock i ytterst ringa grad, innehålla t. ex. litet fett, som kan härleda sig från destillationsapparatens tätningar. Detta flyter vid ihällningen till stor del upp och täcker droppvätskans öfra yta med en tunn hinna, som när vätskan rinner undan, häftar vid och bekläder öfra kärlets insida. Vid förnyade försök drar sig fettämnet alltmer och mer ned till dropprörets mynning. Den negativa elektriciteten bör då i samma mon synas aftaga eller den positiva tilltaga, ty sednare skall visas, att vattnet, som i sådant fall kommer att löpa med friktion mot fettet, dervid blir positivt.

Låter man ett försök med rent vatten (b) följa på ett med orent (a), så sköljer vattenströmmen småningom bort fettämnet och dropparnes negativa elektricitet växer i samma mon. Följa försöken i motsatt ordning, så afsätter sig först med försök efter försök det orenande ämnet, tills det nått sitt maximum, hvarefter en större del än den, som kommer till, sköljes bort och afsätter sig på nedra kärlet och måttet, i hvilket bägaren hvarje gång tömmes. På detta sätt förklaras helt naturligt, icke blott den påfallande efterverkan, utan äfven serien B) 2) i sin helhet, liksom ock att sorterne a kunna gifva utslag, när apparaten är utan tuta.

Om någon olikhet mellan de två här omnämnda vattensorterne finnes i afseende på dropparnes vigt eller volym, vätskornas utströmningshastighet, elektriska ledningsmotstånd eller afdunstningshastighet, så har hon dock hittills undgått mitt sökande.

Ej heller lära några kemiska olikheter stå att upptäcka: båda sorterne hafva varit mycket använde vid kemiska arbeten [1]).

38. Om i vattensorterne *a* verkligen fanns något orenande och olösligt ämne — såsom fett — borde det negativa utslaget blifva större genom vattnets filtrering; hvarjemte verkan af både den positiva och negativa egenskapen hastigare borde växa vid upprepade försök med nya prof af samma vattenförråd än med samma prof, samt den positiva synas ökas, äfven utan föregående försök med sorten *b*.

Till försöken häröfver nyttjades apparaten fig. 1. Elektrometervisaren var upplyftad högre än vanligt och åt Leydnerflaskan var en stark laddning meddelad med en liten elektrofor, så att 12-parige stapeln gaf utslagen

$$n_1 = -85{,}0 \qquad p_2 = +74{,}5$$
$$n_{11} = -82{,}0 \qquad p_{10} = +75{,}0$$

A). Vatten af sorten *a* gaf, vid upprepade försök med samma prof,

$$L_3 = -45{,}0;\ L_4 = -40{,}0;$$

och med nytt vatten af samma förråd;

$$L_5 = -22{,}5;$$

samt med delvis ny påfyllning af samma förråd:

$$L_6 = -14{,}0.$$

B). Af samma förråd filtrerades en del genom fyradubbelt filtrerpapper:

$$L_7 = -86{,}0;$$

nytt prof af samme filtrerade del:

$$L_8 = -106{,}0;\ L_9 = -113{,}0.$$

Utom att samtliga försöken återgifva sjelfva det ofvan — i stycket N:o 37 — angifna åskådningssättet, ses af A) särskilt, att blott filtrerade vätskor äro användbara för åtskilliga undersökningar öfver hufvudfenomenet.

39. Att det orenande ämnet hos vattensorterne *a* varit något fett- eller oljaktigt ämne är väl sannolikt, men icke nödvändigt. Sot och dam hafva — som man vet — en liknande verkan i afseende på att minska vattens vidhäftning vid glas. Sjelfva regnvattnet, som, uppsamladt i en stad, väl aldrig kan vara fullt fritt från dessa orenande ämnen, borde derför förete elektriska fenomener af en viss likhet med dem af vattensorterne *a*.

Vid slutet af en lång regnperiod upphemtade jag under ett par slagregn en större mängd regnvatten i ett stort porslinskärl, som utstäldes på taket af härvarande bibliotekshus' torn. En del af detta vatten filtrerades. Detta skiftades i två delar, hvaraf den ene hölls i kokning i ett glaskärl under en halftimme; men var fullt afsvalnadt, innan det begagnades.

[1]) Oaktadt den utomordentliga ringhet, i hvilken det orenande ämnet således skulle förevara, kan det dock hafva den här förutsatta verkan: under en hel vecka kan — enligt FARADAY, Pogg. Ann. LX, s. 338 — försök öfver elektricitetsutveckling vid ångors utströmning rubbas af litet fett, som t. ex. gömmer sig i en skrufgänga hos apparaten. Ett annat exempel är följande från mina försök: en hemtning af vattensorten *a* gaf temligen stark positiv elektricitet, äfven då apparaten var försedd med tuta; men denna egenskap kunde aflägsnas med kokning. Det upplystes att man med destillationsapparaten någon gång förut hade renat begagnad svafveleter.

Försöksapparaten var den i fig. 1 afteeknade och droppvattnets mått, som vanligt, 100 kcm. Elektrometerutslagen för 12-parige stapeln voro

före försökens början:....... $n = -89,0$; $p = +82,0$

efter deras slut:............. $n = -87,75$; $p = +80,5$

A). Filtreradt, ej kokt, regnvatten (c_1):

$L_1 = -130,0$; $L_2 = -131,5$; $L_3 = -127,5$; $L_4 = -131,0$; $L_5 = -128,0$

Med. $L = -129,6$.

B). Filtreradt, kokt, regnvatten (c_2):

$L_6 = -104,5$; $L_7 = -100,0$

två nya prof (c'_2, c''_2) af samma förråd (c_2)

$L_8 = -96,0$; $L_9 = -96,0$.

C). Nytt prof (c'_1) af det ej kokta (c_1):

$L_{10} = -107,5$; $L_{11} = -111,5$;

åter två nya prof (c''_1, c'''_1) af samma förråd (c_1):

$L_{12} = -113,5$; $L_{13} = -114,5$.

D). Det kokta (c'_2 och c''_2 blandade):

$L_{14} = -110,5$;

och nytt prof (c'''_2) af det kokta förrådet (c_2)

$L_{15} = -104,5$

E). Det i D) begagnade, kokta, förrådet filtreradt:

$L_{16} = -123,0$; $L_{17} = -121,0$; $L_{18} = -123,0$. Med. $L = -122,3$.

F). Slutligen regnvatten i dess ursprungligen upphemtade skick (c):

$L_{19} = -75,0$.

Regnvattnet företedde således samma egenheter som det genom destillering beredda. Att kokningen af det förut filtrerade nedsänkte utslaget, torde böra anses härröra deraf att sot under kokningen med gaslåga möjligen inträngt i kokkärlet, änskönt det hade en lång och smal hals; och en liten afsats af detta i dropprörets fina mynning kunde hafva vållat att utslagen i E) blefvo mindre än de i A). Eljest skulle man visserligen kunna misstänka, att under kokningen bildadt vattenglas gifvit anledning till utslagets minskning; men detta stämmer ej rätt väl ihop med att — enligt serien E) — en ny filtrering efter kokningen ånyo höjer utslaget. Och åtskilliga andra försök motsäga bestämdt att kokningen nedsätter den negativa egenskapen hos rent och filtreradt vatten.

Af samtliga dessa försök framgår således det för närvarande undersökning vigtiga resultatet, att ju mera vattnet kan befrias från uppslammade ämnen, desto starkare negativt elektriske blifva dess droppar och desto mera närmar sig fenomenet till att blifva konstant. *Detta fenomen tillhör således vattnet sjelft.*

§ 7.

Elektricitetsutvecklingen är vid vätskor, som väta droppröret, ej ett friktionsfenomen.

40. Den enda uppgift [1]), som finnes om elektricitetsutveckling genom sammanhängande och vidhäftande vätskors gnidning mot fast kropp, förefaller alltför opålitlig vid sidan af allt som talar deremot.

Hvar och en vet huru omöjligt det är att genom den aldra kraftigaste gnidning med ett fuktigt riftyg framkalla ett enda spår af elektricitet hos ämnen, som med samma riftyg torrt — till och med vid lindrig gnidning — kunna gifva starka gnistor.

Faradays egendomliga sätt att låta skilda droppar gnida mot särskilta ämnen gifva ända igenom helt olika resultater mot mina försök. Så blef t. ex. rent vatten starkt positivt vid rifning mot glas, men en obetydlig tillsats af ett ledande ämne, såsom t. ex. en liten kristall af svafvelsyradt natron, förstörde verkan, »alldeles så som om vi försöka att elektrisera lack eller svafvel med flanell, som är fuktig i stället för torr» [2]). En liten tillsats af terpentin vände om vattnets fenomen.

För öfrigt bevisa mina försök sjelfva att deras hufvudfenomen ej kan hafva tillkommit genom en vätande droppvätskas yttre friktion; så t. ex. försöken B) och C) i N:o 36, hvilka ådagalägga att tillsättandet af apparatens tuta — hvarigenom intet i friktionen ändras — vid en vattensort bringar ett stort negativt fenomen i dagen, men hos en annan vattensort undertrycker ett positivt och i stället låter ett negativt framträda. Apparaterne innehålla ej heller i sig sjelfva något egendomligt, som skulle kunna hindra de två elektricitets-slagen att återförenas, om man föreställer sig dem såsom af någon orsak fördelade mellan öfra kärlet och en deraf innesluten vätande droppvätska.

Deremot vore det icke oförenligt med min uppfattning af hufvudfenomenets natur, att en svagare elektricitetsutveckling uppstode genom den retardering, som dropparnes fall lider af friktionen mot luften. Jag har dock icke kunnat upptäcka någon företeelse deraf. Hufvudfenomenets storlek aftar ej, utan tilltager tvärtom, med de två apparatkärlens närmande intill hvarandra; och detta på grund af ofvan (i N:o 27) angifna skäl. I sådant fall vore ock den afgörande vigten af t. ex. en liten våt bomullstråd mellan tutan och droppvätskan svår att förstå.

41. Bland mina aldra första försök voro de öfver inflytandet af olika dropprör. Af lätt begripliga skäl blef synpunkten dervid i första hand, om vätskan häftade vid röret eller ej.

Ett glasrör afskars i flera, lika långa stycken — längd 33, inre diam. 4 och den yttre 6 millim. — och några af dem öfversmältes med vax på olika ställen. Med en kran ofvanför droppröret kunde droppvätskans fall jemkas så att det skedde än med enkla droppar, som föllo en och en från närheten af sjelfva rörets mynning, än med ström som i de förut beskrifna försöken.

A). Ett rörstycke utan vax, äfvensom ett blott på utsidan vaxadt, så att hela insidan och båda genomskärningarna bibehöllos rena, gjorde öfra kärlet positivt och

[1]) Riess, die Lehre v. d. Reib. § 942, uppgifver — under reservation — efter Encyclopædia Metropolitana att svafveleter, alkohol och harzer i flytande form skulle genom friktion göra matt glas positivt elektriskt.
[2]) Pogg. Ann. LX, s. 328.

det nedra negativt elektriskt vid båda droppbildningssätten. Jag betecknar ett sådant fenomen som negativt.

B). På ett rörstycke vaxades blott nedre änden, men både ut- och invändigt, liksom ock sjelfva nedra genomskärningen. Vid enkel droppning blef fenomenet positivt, d. v. s. öfra kärlet negativt och det nedra positivt elektriskt; men vid ström negativt.

C). Röret B, d. v. s. det i försöken under B) begagnade, vändes upp- och ned, så att vattnet inträdde genom den vaxade änden och utträdde genom en fullkomligt ren. Fenomenet negativt, alldeles som i A).

D). En vaxpropp smältes i och kring ett styckes nedre ände. Med en varm metalltråd gjordes deri en fin öppning, som sedan ytterligare hopsmältes, så att hon blef något trängre och slät. Vid båda droppningssätten blef fenomenet positivt, mycket starkt vid det med ström.

E). På röret D aflossades vaxet så, att glaset blott i sjelfva genomskärningen blef derifrån fritt, men rörets nedre ände föröfrigt både in- och utvändigt förblef starkt vaxad. Vattnet häftade vid genomskärningen och fenomenet blef negativt, alldeles som i A).

F). Ett stycke vaxades helt och hållet både ut- och invändigt samt i genomskärningarna. Vid första försöket, med enkel droppning, blef fenomenet starkt positivt; vid det följande utvecklades ingen elektricitet; och, sedan röret blifvit uppvärmdt och svalnat, blef fenomenet som i B), men svagt.

För nästföljande tre försök utvaldes ett långt glasrör (inre diam. 2,5, yttre diam. 4,5 millim.) En fullt ren glasyta i genomskärningen erhölls genom att först anbringa vaxet för hvarje försök och derefter afskära den för alla gemensamma rörlängden (42 millim):

G). Ett blott utanpå,

H). ett blott innti, och

I). ett både in- och utvändigt vaxadt stycke gåfvo alla tre ett negativt fenomen, alldeles som i A).

K). Med samma anordning och utgång som i A) — F) anstäldes försök med stycken af ett messingsrör.

L). Ett glasrör (längd 38 millim.) tillagades som i D), så att det fick en glansk vaxöppning af ungefär en millimeters diameter. Fenomenet blef mycket starkt positivt, så att till och med skalan gick ur tuben vid stark ström. Derefter rispades åtskilliga strimmor i vaxet omkring utströmningsöppningen. Efter denna behandling fastnade vattnet vid röränden liksom vid ett ämne, som det väter. Nu blef fenomenet negativt: öfra kärlet gaf vid enkel droppning utslaget $H = +10{,}0$ och vid ström $H = +18{,}5$.

M). Försöket upprepades med ett på samma sätt tillredt messingsrör. Följande anmärkningsvärda resultater erhöllos vid enkel droppning:

1:o). vaxytan glansk, och apparaten

utan tuta: .... $H = -\ 7{,}5$

med tuta: .... $H = -12{,}0$

2:o). vaxytan rispad med glas;

utan tuta: .... intet utslag

med tuta: .... $H = +13{,}5$.

3:o). vaxytan med påsmält vax gjord glansk och öppningen dervid blifven trängre;

utan tuta: .... $H = -30{,}0$

med tuta: .... $H = -85{,}0$

N). På samma sätt kunde med gummilacca åstadkommas röröppningar, vid hvilka vattnet i början icke häftade; och erhölls då det positiva fenomenet, hvilket dock kastade om, så snart vattnet vid upprepade försök började väta. Samma omkastning egde likaledes rum vid vaxade rör, men vanligen först efter något flera försök.

O). Med rör af trä, lack, ebonit, fjäderpenna, häftplåster med flera ämnen har jag blott erhållit det negativa fenomenet, emedan — som jag vågar säga — det icke lyckats mig att få något bland dem sådant att icke vattnet häftat fast.

P). Slutligen meddelas följande försök, som direkt bevisar, att *elektricitet utvecklas vid friktion mellan vatten och ämnen, som det icke väter.* I ett väl isoleradt kärl hälles destilleradt vatten. Detta omröres häftigt med ett på lämpligt skaft — af hvilket ämne som helst — fästadt vaxstycke, hvilket derefter hastigt bortryckes ur vattnet. Är den neddoppade delen af vaxet glansk, blir vattnet mycket starkt positivt — skalans 120 delar gingo ur tuben —; är vaxytan ruggig [1]), uppstår intet utslag. Samma fenomener, fastän svagare, erhållas med gummilacca; men de äro svårare att framkalla, emedan vattnet snart väter gummilaccan.

42. Redan försöken i föregående § 6 bevisade att hufvudfenomenet bestämmes af mera än ett moment, och det syntes sannolikt att det positiva momentet härledde sig från vätskans friktion vid dropprörets mynning mot ett ämne, som hon icke vätte. Detta vinner genom de nu beskrifna försöken en fullständig bekräftelse. Särskilt bevisas det deraf att också här det positiva fenomenet tydligt framträder, äfven då apparaten ej är försedd med tuta: försöken i M) och P) göra detta mycket påtagligt. Deremot har det icke lyckats mig att utan anbringande af tuta få fram ett otvätydigt negativt fenomen.

Den undantagsställning, som försöken B) F) och K) synas intaga bland dem med vaxad rörmynning, är helt naturlig. I dem voro rören vida och strömmen, som gaf negativt fenomen, till utseendet alldeles lik de icke vaxade rörens, hvaremot strålen vid så trånga vaxöppningar, att de gåfvo positiva fenomener, för stroboskopet visade sig antingen sakna sammanhängande del eller ock vara knottrig ända upp till rörmynningen.

43. Huru friktionselektricitet i dessa försök kan uppkomma och bestå, är lätt insedt.

Båda ämnena, vax och gummilacca, som gåfvo positiva fenomener, äro isolatorer, vid hvilka vatten endast med svårighet häftar. De motsatta elektricitetsslagen böra derför här befinna sig under lika ogynnsamma vilkor för återförening som skifvans och

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[1]) En ruggig yta beredes bäst genom att värma ett vaxstycke och långsamt stryka det med ett annat kallt; en glansk genom smältning.

lockets hos en elektrofor, eller som qvicksilfrets [1]) och de kroppars, hvilka göra det elektriskt genom gnidning. Ty enligt försöken uppstår det positiva fenomenet först utanför den trånga rörmynningen, således der droppen eller strålens dropplika delar periodiskt svälla ut och dervid böra lätt gnida mot det derstädes anbragta svårvätta ämnet. Nu är dessutom lättaste vägen derifrån för vätskans elektricitet uppåt genom henne; men för rörgenomskärningens är deremot fortplantningsriktningen utåt. Den sednare andelen måste således uppsamlas på det torra isolerande ämne, genom hvars gnidning han uppkommit, och derifrån verka inducerande på den just i dessa försök nära belägna punkt af vätskan, der dropparne afskiljas och falla till nedra kärlet. Det svårvätta ämnets oliknämnda elektricitet drages dervid till droppstället, den liknämnda repelleras upp genom vätskan till droppkärlets öfre delar och till tutan, om sådan finnes. Försöket P) här ofvan visar att rörets vaxände borde blifva negativt elektrisk; hvadan ock öfra kärlet kunde blifva negativt, äfven om en annan kraft verkade i motsatt riktning men svagare. Vore friktionsverkan tvärtom svagare än denna andra kraft, så borde — liksom i försöken med vattensorterne *a* och *c* — ett negativt fenomen uppstå, som vore mindre än det med rent vatten.

Deremot kunna icke de positiva fenomenerna vid svafveleter m. fl. förklaras på samma sätt; ty dessa vätskor [2]) häfta fast vid glas, d. v. s. det ämne, som begagnades till dropprör; och någon elektricitetsutveckling genom yttre friktion kunde derför icke komma till stånd [3]).

§ 8.

Stället för elektriska fenomenets uppkomst hos vätande vätskor.

44. Genom det föregående är bevisadt, att ena momentet af hufvudfenomenet hvarken har sin grund i elektriska krafter, som möjligen kunna finnas utanför droppvätskan, ej heller uppkommer genom kontakt eller friktion mellan henne och de ämnen, hvaraf hon omslutes, men att fenomenet detta oaktadt mycket växlar med droppvätskans egenskaper. Häraf följer att fenomenet utvecklas inom vätskan sjelf; och dermed är i sjelfva verket droppstället tillräckligt utpekadt som den elektromotoriska kraftens säte. Detta skall genom hvad som nu följer fullständigare bekräftas.

Om den elektriske härden befunne sig i droppbildningsstället, borde på grund af tutans verkningssätt den sammanhängande delen af strålen vara utan elektricitet, men den i droppar upplöste elektrisk. Det befanns tydligen vara så, när vatten upphemtades med ett litet glaskärl, som med ett långt vidhäftadt skaft af gummilacca och trä infördes i tutan till olika ställen af strålen. Men detta prof var ej fullt pålitligt för klädnadselektricitetens skull.

Genom att ställa frågan något annorlunda vanns ett säkrare medel.

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[1]) Jfr. Riess, die Lehre v. d. Reib., §§ 921 och 922.

[2]) Enligt Helmholtz och Pietrowski, Wien. Ber. XL, s. 658, äro svafveleter och alkohol — åtminstone vid beröring med metaller — just utmärkta för denna egenskap.

[3]) Ehuruväl jag trott mig finna en gemensam förklaringsgrund för alla positiva fenomenerna, anser jag mig ej ännu böra yttra mig derom, alldenstund mina undersökningar deröfver ännu äro mycket ofullständiga.

Om det kunde ådagaläggas, att, i apparaten med tuta, droppbildningsstället skiftar vätskan i två sådana delar, att den ene förflyttar åt honom meddelad elektricitet till nedra kärlet, den andre deremot till det öfras utsida, så vore genom de föregående försöken bevisadt att en elektromotorisk verksamhet eger rum i sjelfva droppbildningsstället. Ty i alla försöken har hufvudfenomenets kännetecken varit att båda kärlen på en gång erhållit hvar sitt elektricitetsslag.

Härefter inrättades ett par försök. I dem nyttjades till öfra kärl en från de förut beskrifna något afvikande anordning. Af en rottingring och ett linnestycke hopsyddes ett slags fodral åt den glastratt, som skulle tjena till droppkärl och hvars pip derför — som vanligt — var utdragen i en spets. Från rottingen utgingo fina hampsnören, hvarmed detta droppkärl upphängdes på ebonitarmarne i zinkhusets lock fig. 4. Som tuta användes en i båda ändar öppen pappcylinder, hvilken med långa öglor af hampsnören upphängdes på ett par i linnefodralet fastsydda benknappar. Hela det nu beskrifna öfra kärlet neddoppades i droppvätska kort före hvarje försöksserie. Från närheten af trattens pip och uppigenom ett hål på zinkhusets lock leddes en koppartråd, som dervid omsorgsfullt isolerades från alla andra apparatdelar.

45. Nedre änden af koppartråden veks och afpassades genom föregående pröfning så, att vattenstrålen, när han kom ut ett litet stycke ur droppröret, följde tråden och på sådant sätt fick en ny sammanhängande del nedanför honom. I hufvudförsöken leddes koppartrådens öfre ände antingen till den 100-parige vattenstapelns positive $(+p)$ eller negative $(-p)$ pol eller ock lemnades han isolerad (i).

$+p$	$-p$	i
$L_1 = -11,5$	$L_2 = -12,0$	$L_3 = -13,0$
$L_5 = -12,0$	$L_4 = -14,0$	$L_6 = -13,0$

Jag anser observationerna riktigt uttrycka lagen för fenomenet. En liten verkan af stapeln bör nemligen synas; ty sedan droppvätskan upphört att strömma och med detsamma det ledande sambandet mellan öfra kärlet och stapelns poltråd är afbrutet, uttömmer sig alltid den lilla återstod af droppvätska, som rymmes i trattpipens tillspetsade del, genom några få, men väl från hvarandra skilda, droppar. Dessa stodo ej i samband med öfra kärlet, när de under fallet träffade poltråden, och medförde derför något af hans elektricitet till det nedra. Med denna förklaring torde försöken kunna påstås bevisa, att *ingen elektricitet öfvergår från den sammanhängande strålen till dropparne*, när apparaten är försedd med tuta. Nedra kärlets negativa elektricitet, hvars utslag $L_1 - L_6$ angifva, och hennes motsvarande positiva hos öfra kärlet måste således förutsätta en elektromotorisk kraft i sjelfva droppbildningsstället.

46. Slutligen gjordes några försöksserier, för hvilka en liten skifva af tvättsvamp stadigt fästades vid koppartrådens nedre ände. Meningen dermed var att kunna inskjuta stapelpolen på olika ställen i trådens väg utan att derigenom åstadkomma något synnerligt stänk. Så länge svampen dervid skulle komma att genom sammanhängande strålen stå i ledande förbindelse med tutan, borde såväl utan som med förening med endera polen, hvilken som helst, ett litet negativt utslag uppkomma: nemligen genom de enkla droppar, som, långsamt bildade af den fine strålens i svampen uppsamlade

vatten, lössletos och föllo från denne. Härjemte kunde verkan af de ofvan nämnde siste dropparne blifva synlig.

Den sammanhängande, trådsmale, strålen var i dessa och nästföregående försök vid pass 4 cm. lång. Efter att stapelns poler varit förenade med nedra kärlet, gaf dettas bägare utslagen + 74,5 och — 98,0.

Svampens plats:

A) i strålen 1 cm. från mynningen; således i sammanhängande strålen:

i	$-p$	$+p$
$L_1 = -2,5$	$L_2 = -3,5$	$L_3 = -1,5$

B) i strålen vid gränsen mellan den sammanhängande och upplöste delen, d. ä. i droppbildningsstället:

i	$-p$	$+p$
$L_4 = -3,0$	$L_5 = -11,0$	$L_6 = +2,0$

C) i strålen nedanför 7 eller 8 för stroboskopet tydligt skilda droppar:

i	$-p$	$+p$
$L_7 = -5,0$	$L_8 = -\infty$	$L_9 = +\infty$

D) bredvid strålen, ungefär $\frac{1}{2}$ cm. på sidan om droppbildningsstället:

i	$-p$	$+p$
$L_{10} = -29,0$	$L_{11} = +\infty$	$L_{12} = -\infty$

E) in i strålen ånyo och i sjelfva droppbildningsstället, så att ofvan svampen blott några små knottror syntes på den sammanhängande strålen:

i	$-p$	$+p$
$L_{13} = -4,5$	$L_{14} = -4,5$	$L_{15} = 0.$

Dessa försök med en elektrisk kraft, som genom induktion på $\frac{1}{2}$ centimeters afstånd från sammanhängande strålen åstadkom en efter dessa förhållanden utomordentligt stark laddning, besvarade således på ett afgörande sätt den fråga, för hvars skull de anstäldes, i det att de beteckna droppbildningsstället som en isolerande gräns, från hvilken två vägar för elektriciteten utlöpa: den ene till öfra, den andre till nedra kärlet.

Med en närmare undersökning af hufvudfenomenet och dess fysikaliska förklaring är jag redan sysselsatt; endast ådagaläggandet af dess tillvaro var afsigten med den närvarande, hvars utgång torde böra angifvas sålunda:

då en vätska upplöses i droppar, uppstår en elektromotorisk kraft i sjelfva droppbildningsstället.

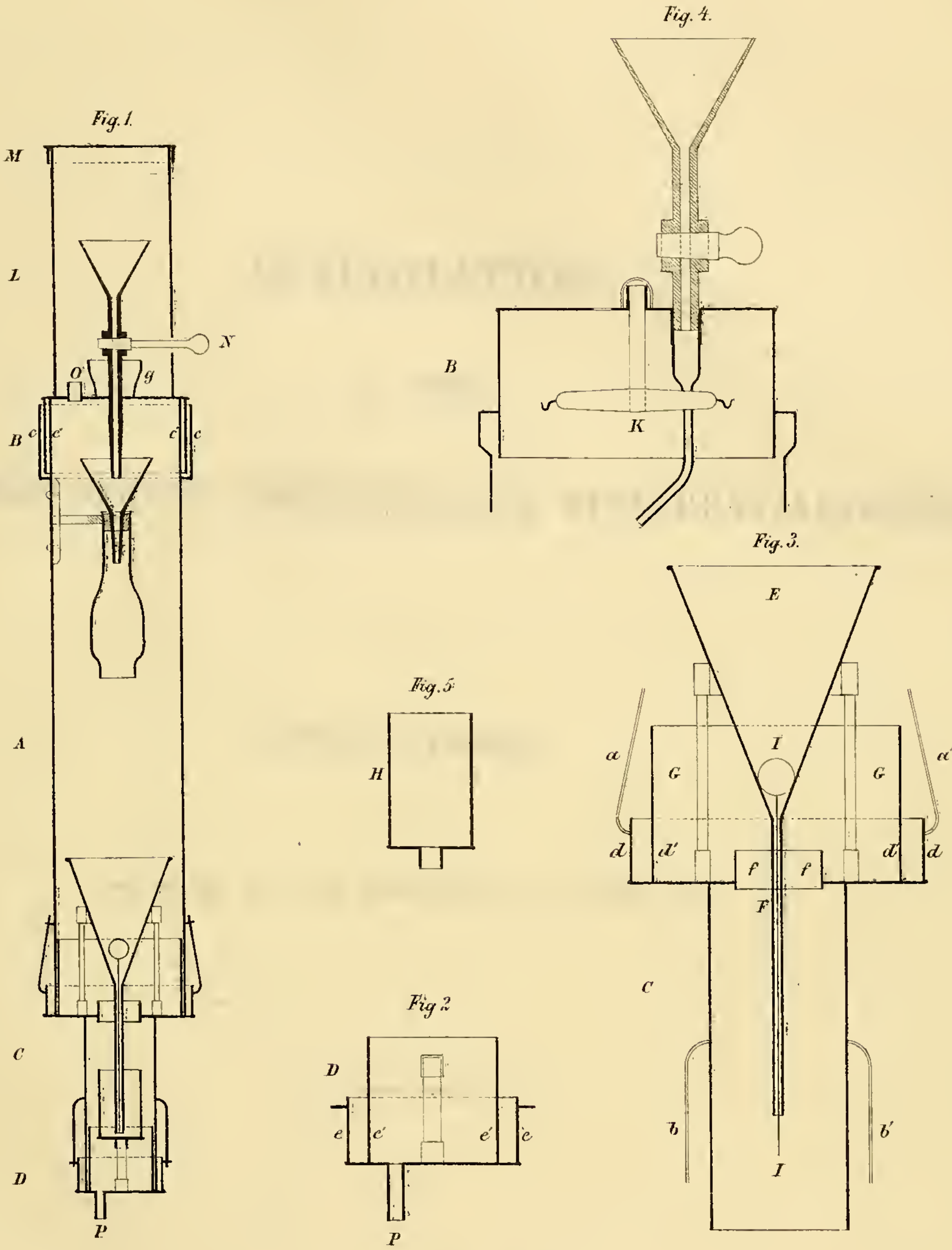

Fig. 1. 1/10 naturlig storlek
Figg. 2, 3, 4, 5 1/5 nat. storl.

KONGL. SVENSKA VETENSKAPS-AKADEMIENS HANDLINGAR. Bandet 11 N:o 9

INTEGRATION

AF VISSA

I STÖRINGSTHEORIN FÖREKOMMANDE DIFFERENTIALFORMLER

AF

HUGO GYLDÉN.

TILL KONGL. VET. AKAD. INLEMNAD DEN 12 OKTOBER 1872.

STOCKHOLM, 1874.
P. A. NORSTEDT & SÖNER
KONGL. BOKTRYCKARE.

Dels för att inleda framställningen af de undersökningar, hvilka utgöra föremålet för denna afhandling, dels för att antyda ändamålet med desamma, skall jag förutskicka några allmänna betraktelser öfver den ståndpunkt, på hvilken det s. k. problemet för tre kroppar för närvarande befinner sig. Ur en rent mathematisk synpunkt betraktadt, skulle detta problem bestå i integration af nio samtidigt gällande differentialeqvationer af andra ordningen, hvilka innehålla de trenne kropparnas koordinater samt tiden såsom oberoende variabel. Efter verkställd integration skulle man erhålla 18 eqvationer emellan de nio koordinaterna, deras första differentialer i afseende å tiden, 18 integrationskonstanter och vissa bekanta funktioner af tiden. I enlighet med kända mekaniska principer reduceras problemet dock ögonblickligen till integrationen af ett system af 12:te ordningen, d. v. s. till ett system af 6 eqvationer, hvardera af andra ordningen. Likväl är det för närvarande omöjligt att annat än tillnärmelsevis verkställa den fullständiga integrationen af detta system.

Ifrågavarande problem är af största betydelse för astronomin, enär beräkningen af himlakropparnas rörelser är beroende af dess lösning; då derföre den i mathematiskt hänseende fullständiga lösningen ej kunde ernås, så var det nödvändigt att för astronomins behof söka utveckla de tillnärmelsemethoder, som erbjödo sig på grund af förhandenvarande fysiska förhållanden. Inom vårt solsystem är nämnligen solens massa i så hög grad öfvervägande de öfriga kropparnas, att man i de flesta fall och i en första approximation kan anse de sednares banor vara sådana, som om endast solens attraherande kraft inverkade på dessas rörelser. Genom ett sådant betraktelsesätt reduceras antalet af de differentialeqvationer, som föreligga integration, till tvenne, hvardera af andra ordningen, för hvarje kring solen kretsande kropp, och man härleder utan svårighet de fyra integraleqvationerna.

Den rörelse, som man erhåller i denna första tillnärmelse motsvarar dock desto mindre den verkliga, ju större de öfriga i solsystemet förekommande massorna äro, och ju närmare dessa i den ömsesidiga rörelsen kunna komma den kropp, hvars bana man vill undersöka. Man är derföre nödsakad att medelst räkning söka att bestämma rörelsen än noggrannare i det man skrider till ytterligare tillnärmelser. Vägen härtill är utstakad, så snart man engång vid den första tillnärmelsen förfarit såsom ofvan blifvit antydt. Substituerar man nämnligen i de ursprungliga differentialeqvationerna de i den första tillnärmelsen bestämda s. k. elliptiska koordinatvärdena, men dock endast i de termer, som innehålla den tredje kroppens massa såsom faktor, så äro alla dessa termer att betraktas såsom bekanta funktioner af tiden, och den andra approximationen erhålles genom att göra de konstanter, som infördes i den första tillnärmelsen, beroende af tiden, och detta på sådant sätt, att de framlagda differentialeqvationerna blifva tillfyllestgjorda, naturligtvis så när som på termer af andra ordningen i afseende på den tredje kroppens massa. På denna väg kan man fortskrida och i många fall härleda den verkliga rörelsen med hvilken grad af noggrannhet, som åstundas. Integrationen af differentialeqvationerna reducerar sig sålunda till en följd af qvadraturer, d. ä. till sådana integrationer, der endast bekanta och bestämda funktioner af den oberoende variabla tiden förekomma under integraltecknen. Så ofta denna serie af operationer är konvergent, så kan man äfven från analytisk synpunkt anse problemet vara löst, enär just det väsentliga i lösningen ligger i den omnämnda reduktionen till qvadraturer.

För astronomin är dock denna lösning ännu ej motsvarande behofvet; ty här är det nödvändigt att numeriskt beräkna qvadraturerna, hvilket understundom är förenadt med högst betydande svårigheter. Man finner derföre att astronomernas bemödanden på detta fält hufvudsakligen varit riktade på att finna de methoder, hvarigenom ifrågavarande qvadraturer möjligast lätt kunna underkastas en numerisk utveckling, d. v. s. bringas under en form, der endast bekanta funktioner af tiden förekomma och alla integraltecken äro bortskaffade. Tiden eller någon bekant funktion deraf tänkes dervid fortfarande såsom oberoende föränderlig, och antages förblifva obestämd eller föränderlig i alla uttryck. De methoder, som man härvid funnit sig föranlåten att fullfölja, hafva varit och äro hvarandra i viss mon ganska olika; deras individualitet är i främsta rummet beroende af de i den första tillnärmelsen införda integrationskonstanternas numeriska värden, och af det ömsesidiga afståndets minimum, i hvilket de båda kring solen kretsande kropparna kunna komma till hvarandra.

I ett fritt system af trenne kroppar, hvilket är så beskaffadt att den ofvanbeskrifna följden af tillnärmelser är konvergent, äro banorna i den första approximationen bekantligen ellipser. Koordinaterna för hvar och en af de båda kring den tredje rörliga kropparna kunna dervid rationelt uttryckas medelst trigonometriska funktioner af en enda vinkel, hvilken står i en ganska enkel relation till tiden. Bestämmes denna vinkel, hvilken för den ena kroppen må betecknas med ε, ur följande eqvation

$$c + nt = \varepsilon - e \operatorname{Sin} \varepsilon \tag{1}$$

der c, n och e äro konstanter samt t betecknar tiden, så hafva koordinaterna i den elliptiska rörelsen följande allmänna form

$$A + B \operatorname{Cos} \varepsilon + C \operatorname{Sin} \varepsilon$$

hvarvid A, B och C äro konstanter.

Bestämmes vidare i analogi med det föregående för den andra kroppen en vinkel ε' ur den mot den föregående analoga eqvationen

$$c' + n't = \varepsilon' - e \operatorname{Sin} \varepsilon', \tag{2}$$

så blifva koordinaterna för denna kropp angifna medelst uttryck af samma form som ofvan, eller

$$A' + B' \operatorname{Cos} \varepsilon' + C' \operatorname{Sin} \varepsilon'$$

För beräkningen af de följande approximationerna erfordras framförallt uppställningen af uttrycket för de båda rörliga kropparnas inbördes afstånd. Detta afstånd beteckna vi med (Δ), och finna lätt på grund af vissa bekanta relationer emellan konstanterna A, B, C, o. s. v. följande uttryck

$$\begin{aligned}(\Delta)^2 = & M_0 + M_1 \operatorname{Cos} \varepsilon + M_2 \operatorname{Cos} 2\,\varepsilon + N_1 \operatorname{Sin} \varepsilon \\ & + \{M'_0 + M'_1 \operatorname{Cos} \varepsilon + N'_1 \operatorname{Sin} \varepsilon\} \operatorname{Cos} \varepsilon' \\ & + \{P'_0 + P'_1 \operatorname{Cos} \varepsilon + Q'_1 \operatorname{Sin} \varepsilon\} \operatorname{Sin} \varepsilon' \\ & + M''_0 \operatorname{Cos} 2\,\varepsilon',\end{aligned}$$

hvarvid alla koefficienter tänkas konstanta. Den andra tillnärmelsen beror nu på beräkningen af uttryck af följande form

$$Q = \int \frac{m'}{\Delta^{\frac{n}{2}}} \{a_i \operatorname{Cos} i\,\varepsilon + b_i \operatorname{Sin} i\,\varepsilon\} d\,\varepsilon \tag{3}$$

der i såsom index betecknar något helt tal, äfven noll; m' den andra rörliga kroppens massa, a_i och b_i konstanter samt n ett af de hela talen 1 eller 3.

Man inser ögonblickligen att dessa qvadraturer ej kunna utvecklas i en sluten form; ej heller kunna de angifvas medelst ett ändligt antal bekanta transcendenter. Orsaken härtill ligger hufvudsakligen deri, att relationen emellan ε och ε', eller rättare emellan de trigonometriska funktionerna af dessa vinklar ej är rationell.

Genom att eliminera tiden t ur de båda eqvationerna (1) och (2) finner man

$$\varepsilon' = c' - \frac{n'}{n} c + \frac{n'}{n} \varepsilon - e \frac{n'}{n} \operatorname{Sin} \varepsilon + e' \operatorname{Sin} \varepsilon' \tag{4}$$

Behandlingen af denna eqvation skulle leda till ganska betydande svårigheter om icke konstanten e' hade ett ringa numeriskt värde. Inom vårt solsystem är detta dock händelsen. De kroppar inom detta system, som i märklig grad kunna ändra de i första tillnärmelsen beräknade koordinaterna, röra sig nämnligen i banor, som endast obetydligt afvika från cirklar; excentriciteten e' är således för dessa banor liten. En följd af denna omständighet blifver nu, att den s. k. excentriska anomalin ε' samt trigonometriska funktioner af densamma kunna utvecklas i serier, hvilka fortgå efter multipler af ε och $\mu\,\varepsilon$, och hvilka konvergera temligen raskt. Uttrycket för $(\Delta)^2$ kan således utan svårighet angifvas såsom en funktion af ε och $\mu\,\varepsilon$ $\left(\mu = \frac{n'}{n}\right)$; men enär μ är ett irrationelt tal, blifver detta uttryck dock icke nog enkelt, att de till behandling föreliggande qvadraturerna omedelbart skulle kunna utföras; man har derföre sett sig föranlåten att förenkla uttrycken af formen (3) genom serieutveckling af nämnaren, hvarvid man dock ej alltid valt ε och $\mu\varepsilon$ till argument. Det visade sig nämnligen fördelaktigt att — så ofta excentriciteten e äfven hade ett ringa numeriskt värde — utbyta dessa argument mot de s. k. medelanomalierna eller mot nt och $n't$. — På dylika serieutvecklingar äro theorierna för de större planeterna baserade. För de små planeterna emellan Mars och Jupiter kunde ett sådant förfarande dock ej mer användas med fördel, emedan excentriciteten e här vanligen var större; man har derföre enligt HANSENS föredöme bibehållit ε och $\mu\,\varepsilon$ såsom argument, hvarigenom vissa, mindre konvergenta serieutvecklingar undvekos.

Om likväl excentriciteten e antager sådana numeriska värden, som man finner hos de periodiska kometerna, och de båda kring solen kretsande himlakropparna ej ständigt bibehålla ett betydligt ömsesidigt afstånd från hvarandra, så blifva äfven serieutvecklingarna efter ε och $\mu\varepsilon$ såsom argument otjenliga i anseende till deras ringa konvergens. Det berodde nu på att genom införandet af andra föränderliga såsom argument vinna mera konvergenta serier och dymedelst möjliggöra utförandet af de förelagda qvadraturerna. Otvifvelaktigt hafva åtskilliga försök blifvit gjorda i och för att påfinna någon utväg, på hvilken den äskade serieutvecklingen med tillbörlig konvergens skulle kunna utföras: åtminstone saknar man i den mathematiska litteraturen ej alla spår af steg i denna riktning; men till något praktiskt resultat har ej något af dessa bemödanden ledt, sålänge man vinnlade sig om att medelst införandet af en enda ny föränderlig vinna det åsyftade ändamålet.

Annorlunda gestaltar sig deremot saken om man i stället för ε och $\mu\varepsilon$ inför nya variabla, hvilkas giltighet inskränkes inom vissa gränser af ε. Om man med andra ord indelar banan i ett antal delar, så kan man inom hvarje sådan del utveckla de förelagda qvadraturerna efter tvenne vinklar, dervid konvergensen åtminstone efter det ena argumentet kan forceras i önsklig grad. Häri består den af HANSEN införda partitionsmethoden, och i öfverensstämmelse härmed benämner han äfven det i *st* för ε införda nya argumentet en partiell anomali.

För framställningen af de i det följande meddelade undersökningarne är det alldeles icke nödvändigt att fästa afseende vid de många olika sätt, på hvilka partiella anomalier kunna införas; deremot torde det dock vara nödigt, på det att denna framställning må vinna behörig klarhet, att medelst ett exempel visa huruledes de ifrågavarande qvadraturerna omgestaltas genom införandet af en sådan anomali. Ett sådant exempel kan meddelas i största korthet.

Tänka vi oss t. ex. med $F(\omega)$ en så beskaffad funktion uttryckt, som aldrig öfverskrider gränserna $+1$ och -1, och med l en enheten understigande konstant, så kan substitutionen

$$\text{Sin}\,\tfrac{1}{2}\varepsilon = lF(\omega) \tag{5}$$

endast gälla sålänge ε ej öfverskrider gränserna ε_0 och $-\varepsilon_0$, hvilka bestämmas ur eqvationen

$$\text{Sin}\,\tfrac{1}{2}\varepsilon_0 = l$$

Genom att införa variabeln ω i st. för ε har man således uteslutit den del af banan, som ligger utom ε_0 och $-\varepsilon_0$. Men tillika har man nedtryckt alla föränderliga termer i uttrycken af formen (3) till ett mindre numeriskt belopp, enär alla sådana blifva multiplicerade med k eller med potenser af denna konstant, hvilken antogs mindre än enheten. De föränderlige termerna komma med andra ord att variera emellan trängre gränser.

Ur eqvationen (5) följer omedelbart

$$\text{Cos}\,\tfrac{1}{2}\varepsilon = \pm\sqrt{1 - l^2F(\omega)^2}$$

och härmed vinnes vidare

$$\text{Sin}\,\varepsilon = 2lF(\omega)\sqrt{1 - l^2F(\omega)^2}$$

$$\text{Cos}\ \varepsilon = 1 - 2l^2F(\omega)^2$$

Man ser häraf att Sin ε varierar emellan gränserna $+2l\sqrt{1-l^2}$ och $-2l\sqrt{1-l^2}$, samt Cos ε emellan 1 och $1-2l^2$, hvilka gränser i allmänhet ligga närmare hvarandra än $+1$ och -1.

Man finner slutligen

$$d\varepsilon = 2l \frac{\frac{dF(\omega)}{d\omega}}{\sqrt{1-l^2F(\omega)^2}} d\omega$$

eller

$$\varepsilon = 2m\pi + 2arc\ \text{Sin}\ lF(\omega)$$

der m betecknar ett helt tal, och termen $2m\pi$ blifvit införd på grund af funktionens *arc Sin.* mångtydighet.

Utvecklas detta uttryck efter potenserna af l, så befinnes

(6) $$\varepsilon = 2m\pi + 2lF(\omega) + \tfrac{1}{3}l^3F(\omega)^3 + \ldots.$$

Äfven tiden t kan uttryckas medelst den nya föränderliga ω. Insättes nämnligen ofvananförda värden för ε och Sin ε i eqv. (1), så befinnes omedelbart

$$\begin{aligned} c + nt &= 2m\pi + 2lF(\omega) + \tfrac{1}{3}l^3F(\omega)^3 + \ldots \\ &\quad - 2elF(\omega)\sqrt{1-l^2F(\omega)^2} \\ &= 2m\pi + 2l(1-e)F(\omega) + (\tfrac{1}{3}+e)l^3F(\omega)^3 + \ldots. \end{aligned}$$

hvilken relation äfven kan angifvas medelst differentialuttrycket

$$ndt = 2l \frac{\frac{dF(\omega)}{d\omega}}{\sqrt{1-l^2F(\omega)^2}} \{1 - e + 2el^2F(\omega)^2\}.\, d\omega$$

Under förutsättning att $F(\omega)$ är en rent periodisk funktion af ω, eller att densamma endast innehåller sinus- och cosinusfunktioner, inses att äfven sinus- och cosinusfunktionerna af ε samt af dess multipler endast innehålla dylika funktioner af ω, samt att samma förhållande äfven äger rum i afseende å nt eller $\frac{ndt}{d\omega}$. Deremot innehålla sinus- och cosinusfunktionerna af $\mu\varepsilon$ samt af denna vinkels multipler äfven periodiska funktioner af $2\mu m\pi$ förutom funktionerna af ω. Man inser nu lätt, att vinkeln $2\mu m\pi$ ändrar sitt värde hvarje gång ε ökats med 2π eller 360°, men att samma vinkel föröfrigt bibehåller ett konstant värde. Genom införandet af den partiella anomalin ω blifver således uttrycket (3) en funktion dels af den kontinuerligt föränderliga ω, dels af den språngvis föränderliga $2\mu m\pi$.

Det numeriska värdet af konstanten l är beroende af den större eller mindre del af banan, som genom partitionen blifvit afskiljd; man kan således göra denne konstant huru liten som helst. Då nu alla termer, som innehålla trigonometriska funktioner af ω, äro multiplicerade antingen med l eller med potenser af densamma, så kan utvecklingen af uttrycket (3) efter argumentet ω göras konvergent i den grad, som önskas. Man kan vidare välja funktionen $F(\omega)$ sålunda, att Sin ε blifver uttryckt genom en serie, der endast sinusfunktioner för udda multipler af ω förekommer samt att Cos ε uttryckes medelst en serie, der endast cosinusfunktioner för jemna multipler af ω äro tillstädes; uttrycket för $d\varepsilon$ kommer dervid att antaga en motsatt form. Den tänkta utvecklingen af uttrycket (3) antager då följande form

$$Q = \int \{f_0(m) + f_1(m) \operatorname{Cos} \omega + f_2(m) \operatorname{Sin} 2\omega + \ldots\} d\omega \tag{7}$$

der funktionerna $f_0(m)$, $f_1(m)$, o. s. v. ej innehålla ω, men äro beroende af den diskontinuerligt föränderliga vinkeln $2\mu m\pi$. I följd af denna omständighet måste integrationsintervallen sönderdelas i alla de punkter, der diskontinuitet inträffar. Huruledes denna sönderdelning sker framgår lätt på grund af den införda partiella anomalins betydelse. Antaga vi t. ex. i det vi med s beteckna ett helt tal, att integrations-intervallen sträcker sig från $\varepsilon = \omega = 0$ till $\varepsilon = 2s\pi + (\varepsilon)$, der (ε) betecknar en båge, hvars längd faller emellan gränserna $-\varepsilon_0$ och $+\varepsilon_0$, så sönderfaller Q vid införandet af ω i följande termer

$$Q = \int_0^{\varepsilon_0} \frac{dQ}{d\varepsilon} d\varepsilon + \int_{2\pi - \varepsilon_0}^{2\pi + \varepsilon_0} \frac{dQ}{d\varepsilon} d\varepsilon + \ldots + \int_{2s\pi - \varepsilon_0}^{2s\pi + (\varepsilon)} \frac{dQ}{d\varepsilon} d\varepsilon$$

Ur relationen emellan ε och ω framgår emellertid, att den föränderliga ω under hvarje omlopp varierar på alldeles samma sätt, samt att densamma följaktligen är oberoende af omloppens antal. Deremot är det hela talet m beroende af detta antal omlopp och tillika endast af dem. På denna grund kan ε utbytas mot ω enligt samma formler i alla termer af ofvanstående uttryck för Q; man har dervid endast att iakttaga det talet m erhåller sådana värden, som motsvara omloppets ordningsnummer. Man erhåller derföre, om med ω_1 och ω_2 betecknas de gränsvärden, som motsvara $-\varepsilon_0$ och $+\varepsilon_0$, samt med (ω) det (ε) motsvarande värdet af ω:

$$\begin{aligned} Q = & f_0(0)\omega_2 + \{f_0(1) + f_0(2) + f_0(3) + \ldots + f_0(s-1)\}(\omega_2 - \omega_1) + f_0(s)((\omega) - \omega_1) \\ & + f_1(0) \operatorname{Sin} \omega_2 + \{f_1(1) + f_1(2) + f_1(3) + \ldots + f_1(s\text{-}1)\}(\operatorname{Sin} \omega_2 - \operatorname{Sin} \omega_1) + f_1(s) (\operatorname{Sin} (\omega) - \operatorname{Sin} \omega_1) \\ & - \tfrac{1}{2} f_2(0) \operatorname{Cos} 2\omega_2 - \tfrac{1}{2}\{f_2(1) + f_2(2) + f_2(3) + \ldots + f_2(s\text{-}1)\}(\operatorname{Cos} 2\omega_2 - \operatorname{Cos} 2\omega_1) \\ & - \tfrac{1}{2} f_2(s)(\operatorname{Cos} 2(\omega) - \operatorname{Cos} 2\,\omega_1) \\ & + \ldots \end{aligned}$$

Vanligen är härvid $\omega_2 = +\frac{\pi}{2}$; $\omega_1 = -\frac{\pi}{2}$, så att Q erhåller följande något enklare form

$$\begin{aligned} Q = & \pi\{\tfrac{1}{2} f_0(0) + f_0(1) + \ldots + f_0(s\text{-}1) + \tfrac{1}{2} f_0(s)\} + f_0(s)(\omega) \\ & + 2\{\tfrac{1}{2} f_1(0) + f_1(1) + \ldots + f_1(s\text{-}1) + \tfrac{1}{2} f_1(s)\} + f_1(s) \operatorname{Sin} (\omega) \\ & - \ldots \end{aligned}$$

Såsom man omedelbart inser, är detta uttryck beroende af det antal omlopp, kroppen tillryggalagt emellan de, de båda integrationsgränserna motsvarande tidpunkterna. Emedan det likväl är fördelaktigt, om ock ej alldeles nödvändigt att lemna den sednare integrationsgränsen obestämd, så framställer sig här en uppgift, hvars lösning är förenad med betydande svårigheter. Denna uppgift består i att uttrycka summan

$$\tfrac{1}{2} f_i(0) + f_i(1) + \ldots + \tfrac{1}{2} f_i(s)$$

såsom en funktion af s, hvilken dervid anses såsom en oberoende variabel.

Svårigheten i denna uppgift består hufvudsakligen deri, att funktionerna $f_i(m)$ äro af en serdeles sammansatt byggnad. Såsom innehållande endast Sinus- och Cosinus-funktioner af vinkeln $2\mu m\pi$, samt dess multipler, kunna desamma visserligen alltid utvecklas i periodiska serier efter detta argument, och efter en sådan utveckling blifver lösningen af ofvanstående uppgift äfven lätt utförbar. Tänker man sig nämnligen följande utveckling

$$\begin{aligned} f(m) = A_0 &+ A_1 \operatorname{Cos} 2\mu m\pi + A_2 \operatorname{Cos} 4\mu m\pi + \ldots \\ &+ B_1 \operatorname{Sin} 2\mu m\pi + B_2 \operatorname{Sin} 4\mu m\pi + \ldots \end{aligned}$$

så erhåller man omedelbart på grund af bekanta formler

$$\begin{aligned} \tfrac{1}{2}f(0) + f(1) + \ldots + \tfrac{1}{2}f(s) = sA_0 &+ \tfrac{1}{2}A_1 \operatorname{Cotg} \mu\pi \operatorname{Sin} 2\mu s\pi + \tfrac{1}{2}A_2 \operatorname{Cotg} 2\mu\pi \operatorname{Sin} 4\mu s\pi + \ldots \\ &- \tfrac{1}{2}B_1 \operatorname{Cotg} \mu\pi \operatorname{Cos} 2\mu s\pi - \tfrac{1}{2}B_2 \operatorname{Cotg} 2\mu\pi \operatorname{Cos} 4\mu s\pi - \ldots \\ &+ \tfrac{1}{2}B_1 \operatorname{Cotg} \mu\pi \qquad\qquad + \tfrac{1}{2}B_2 \operatorname{Cotg} 2\mu\pi \qquad\qquad + \ldots \end{aligned}$$

Det är dock endast i enklare fall, som denna utvecklingsmethod kan blifva praktiskt brukbar, enär den ringa konvergensen hos koefficienterna A_0, A_1, o. s. v. vanligen i de fall, der partiella anomalier måste införas, skulle föranleda högst mödosamma räkningar, och på samma gång föranleda att resultatet blefve mindre säkert i numeriskt hänseende. — Frågan är derföre nu den, huruvida andra mera konvergenta utvecklingar af funktionerna $f(m)$ låta etablera sig, hvilka på samma gång äro af den beskaffenhet, att det ofvan antydda summationsproblemet blifver praktiskt lösbart.

Hvad det förra vilkoret vidkommer, eller att finna mera konvergenta utvecklingar af $f(m)$ än de efter multiplerna af $\mu m\pi$, så förefinnes härtill redan en tillfredsställande lösning. Det har nämnligen, icke allenast på grund af theoretiska betraktelser, utan äfven i numeriska räkningar visat sig serdeles fördelaktigt att såsom argument för funktionerna $f(m)$ välja en elliptisk integral, hvilken står i en ganska enkel relation till vinkeln $2\mu m\pi$. Betecknar man med k en konstant modyl, samt med H en konstant vinkel, så är denna relation följande

$$u_m = \int_0^{H + \mu m\pi} \frac{d\varphi}{\sqrt{1 - k^2 \operatorname{Sin} \varphi^2}}$$

Härefter blifver det nya argumentet, såsom man lätt inser, $2\frac{\pi}{2K} u_m$, hvilket vi för korthetens skull beteckna med χ_m och der vi med K betecknat den fullständiga elliptiska integralen eller

$$\int_0^{\frac{1}{2}\pi} \frac{d\varphi}{\sqrt{1 - k^2 \operatorname{Sin} \varphi^2}}$$

Efter införandet af argumentet χ_m antaga funktionerna $f(m)$ denna form

$$(8) \qquad \begin{aligned} f(m) = a_0 &+ a_1 \operatorname{Cos} \chi_m + a_2 \operatorname{Cos} 2\chi_m + \ldots \\ &+ b_1 \operatorname{Sin} \chi_m + b_2 \operatorname{Sin} 2\chi_m + \ldots, \end{aligned}$$

hvilken till en början leder till följande summationsresultat

$$\begin{aligned} &\tfrac{1}{2}f(0) + f(1) + f(2) + \ldots + \tfrac{1}{2}f(s) \\ &= sa_0 + a_1[\tfrac{1}{2}\operatorname{Cos}\chi_0 + \operatorname{Cos}\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Cos}\chi_s] + \ldots \\ &\quad + b_1[\tfrac{1}{2}\operatorname{Sin}\chi_0 + \operatorname{Sin}\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Sin}\chi_s] + \ldots \end{aligned}$$

Härledningen af koefficienterna i uttrycket (8) är visserligen ej utan svårigheter, men dessa äro dock af den art att desamma ganska väl kunna öfvervinnas. För öfrigt ligga dessa svårigheter hufvudsakligen i längden af de numeriska räkningarna, hvilka på inga vilkor kunna nedsättas under en viss gräns, hvaremot utvecklingens analytiska beskaffenhet kan göras temligen enkel. Äfven utvecklingen af summorna

$$\begin{aligned} &\tfrac{1}{2}\operatorname{Cos}\chi_0 + \operatorname{Cos}\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Cos}\chi_s \\ &\tfrac{1}{2}\operatorname{Cos}2\chi_0 + \operatorname{Cos}2\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Cos}2\chi_s \end{aligned}$$

o. s. v.

kan erhållas genom några högst enkla analytiska operationer; men den lösning af frågan, som sålunda erhålles, är af ganska ringa betydelse i praktiskt hänseende, enär densamma beror på serieutvecklingar, hvilka i anseende till deras ringa konvergens äro obrukbara för numeriska beräkningar.

Emellertid är den analytiska utvecklingen af ifrågavarande summor af största betydelse för beräkningen af rörelsen i de fall, der partiella anomalier måste användas, hvarföre jag ansett uppsökandet af sådana utvecklingsmethoder vara särdeles vigtigt, hvilka tillika leda till i praktiskt hänseende brukbara räkneföreskrifter. Framställningen af de methoder, jag dervid funnit, utgör föremålet för denna afhandling. — Men ehuru den i främsta rummet sig erbjudande methoden ej är praktiskt brukbar, så kan densamma dock icke förbigås, dels emedan man genom denna omedelbart kommer till insigt om resultatets form, dels emedan densamma kan läggas till grund för härledningen af mera praktiska methoder. I afhandlingen »Om Summation af periodiska funktioner» (Kongl. Vetenskaps Akademiens Handlingar för 1872) hafva problem af den beskaffenhet, som här föreligga, blifvit hänförda till vanliga integrationsuppgifter. Den ändliga följden af funktioner har med andra ord blifvit transformerad till en oändlig, men konsergent serie, der termerna utgöras af qvadraturer, hvilkas öfre gränser äro beroende af antalet termer i den ändliga summan. Men i stället för att bringa problemet till denna form kan man omedelbart använda vissa i den nämnda afhandlingen förekommande serieutvecklingar och erhåller dymedelst värden för de bestämda integral, hvilka uttrycka utvecklingskoefficienterna i de omtalade qvadraturerna, om dessa utvecklas efter argumentet χ_s. Den följande framställningen begynner på denna väg, hvilken leder till en viss kathegori af uttryck för de ifrågavarande utvecklingskoefficienterna; den sednare hälften af föreliggande afhandling behandlar deremot de transformationer, som kunna tillämpas på de omtalade allmänna qvadraturerna.

§ 1.

Såväl vid härledningen af formen (8), som vid utvecklingen af denna forms summation äro vissa serieutvecklingar från de elliptiska funktionernas theori erforderliga.

At dessa utvecklingar har jag egnat et särskildt arbete [1]), och behöfver här således endast rekapitulera resultaten såvidt de här äro erforderliga. Dessa resultat bestå förnämligast i uppställningen af följande utvecklingar

$$(\mathrm{I})\begin{cases}\operatorname{Cos} n\, am \frac{2K}{\pi}x = \Gamma_0^{(n)} + 2\Gamma_1^{(n)} \operatorname{Cos} x + 2\Gamma_2^{(n)} \operatorname{Cos} 2x + \ldots \\ \operatorname{Sin} n\, am \frac{2K}{\pi}x = 2\Sigma_1^{(n)} \operatorname{Sin} x + 2\Sigma_2^{(n)} \operatorname{Sin} 2x + \ldots\end{cases}$$

samt de motsatta

$$(\mathrm{II})\begin{cases}\operatorname{Cos} i\, x = \gamma_0^{(i)} + 2\gamma_1^{(i)} \operatorname{Cos} am \frac{2K}{\pi} x + 2\gamma_2^{(i)} \operatorname{Cos} 2am \frac{2K}{\pi} x + \ldots \\ \operatorname{Sin} i\, x = 2\sigma_1^{(i)} \operatorname{Sin} am \frac{2K}{\pi} x + 2\sigma_2^{(i)} \operatorname{Sin} 2am \frac{2K}{\pi} x + \ldots\end{cases}$$

hvarvid koefficienternas egenskaper, samt reglerna för deras numeriska beräkning blifvit utförligt afhandlade. En likaså vigtig, som enkel relation, hvilken äger rum emellan koefficienterne i utvecklingarne (I) och (II) är följande

$$(9)\qquad\begin{cases}\gamma_n^{(i)} = \frac{i}{n}\Sigma_i^{(n)} \\ \sigma_n^{(i)} = \frac{i}{n}\Gamma_i^{(n)}\end{cases}$$

Tillika bör här anmärkas att alla dessa koefficienter försvinna när differensen $n - i$ icke är ett jemnt tal. För det speciella värdet $n = o$ lemna de sist anförda eqvationerna ingen redogörelse; i detta fall har man

$$\gamma_0^{(2i)} = \frac{2q^i}{1+q^{2i}},$$

der q betecknar den från utvecklingen af de elliptiska funktionerna kända qvantiteten.

Förutom relationerna (9) bör här ännu anföras följande:

$$(10)\qquad\begin{cases}\dfrac{\Sigma_{2i}^{(2n)}}{\Gamma_{2i}^{(2n)}} = \dfrac{1-q^{2i}}{1+q^{2i}} \\[2ex] \dfrac{\Sigma_{(2i+1)}^{(2n+1)}}{\Gamma_{2i+1}^{(2n+1)}} = \dfrac{1+q^{2i+1}}{1-q^{2i+1}}\end{cases}$$

Då vi nu gå att tillämpa dessa utvecklingar på föreliggande summationsproblem, skola vi, för att i någon mon genast förenkla framställningen, införa följande beteckningar

$$(11)\qquad\begin{cases}\Psi^{(i)} = \tfrac{1}{2}\operatorname{Cos} i\chi_0 + \operatorname{Cos} i\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Cos} i\chi_s \\ \Phi^{(i)} = \tfrac{1}{2}\operatorname{Sin} i\chi_0 + \operatorname{Sin} i\chi_1 + \ldots + \tfrac{1}{2}\operatorname{Sin} i\chi_s,\end{cases}$$

samt förutsätta, att resultatet kommer att antaga följande form

$$(12)\qquad\begin{cases}\Psi^{(i)} = \Psi_0^{(i)} + 2\Psi_1^{(i)}\operatorname{Cos}\chi_s + 2\Psi_2^{(i)}\operatorname{Cos} 2\chi_s + \ldots \\ \Phi^{(i)} = \Phi_0^{(i)} + 2\Phi_1^{(i)}\operatorname{Sin}\chi_s + 2\Phi_2^{(i)}\operatorname{Sin} 2\chi_s + \ldots\end{cases}$$

der koefficienterna endast äro beroende af konstanterna k och μ.

[1]) Studien auf den Gebiete des Störungstheori I. Entwicklung einiger Verbindungen elliptischer Functionen St. Petersburg 1871.

Likheterna (II) gifva oss, om χ_m insättes i st. för x,

$$\mathrm{Cos}\, i\chi_m = \mathrm{Cos}\, 2i \frac{\pi}{2K} u_m = \gamma_0^{(2i)} + 2\gamma_2^{(2i)} \mathrm{Cos}\, 2\, am u_m + 2\gamma_4^{(2i)} \mathrm{Cos}\, 4\, am\, u_m + \ldots$$

$$\mathrm{Sin}\, i\chi_m = \mathrm{Sin}\, 2i \frac{\pi}{2K} u_m = 2\sigma_2^{(2i)} \mathrm{Sin}\, 2\, am\, u_m + 2\sigma_4^{(2i)} \mathrm{Sin}\, 4\, am\, u_m + \ldots,$$

eller, emedan

$$am u_m = H + m\mu\pi,$$

$$\mathrm{Cos}\, i\chi_m = \gamma_0^{(2i)} + 2\gamma_2^{(2i)} \mathrm{Cos}\, 2(H + m\mu\pi) + 2\gamma_4^{(2i)} \mathrm{Cos}\, 4(H + m\mu\pi) + \ldots$$

$$\mathrm{Sin}\, i\chi_m = 2\sigma_2^{(2i)} \mathrm{Sin}\, 2(H + m\mu\pi) + 2\sigma_4^{(2i)} \mathrm{Sin}\, 4(H + m\mu\pi) + \ldots$$

Insättas dessa uttryck i eqvationerna (11), så erhållas

$$\begin{aligned}\Psi^{(i)} = s\gamma_0^{(2i)} &+ 2\gamma_2^{(2i)}\{\tfrac{1}{2}\mathrm{Cos}\, 2H + \mathrm{Cos}\, 2(H+\mu\pi) + \mathrm{Cos}\, 2(H+2\mu\pi) + \ldots + \tfrac{1}{2}\mathrm{Cos}\, 2(H+s\mu\pi)\}\\ &+ 2\gamma_4^{(2i)}\{\tfrac{1}{2}\mathrm{Cos}\, 4H + \mathrm{Cos}\, 4(H+\mu\pi) + \mathrm{Cos}\, 4(H+2\mu\pi) + \ldots + \tfrac{1}{2}\mathrm{Cos}\, 4(H+s\mu\pi)\}\\ &+ \ldots\end{aligned}$$

$$\begin{aligned}\Phi^{(i)} = &\; 2\sigma_2^{(2i)}\{\tfrac{1}{2}\mathrm{Sin}\, 2H + \mathrm{Sin}\, 2(H+\mu\pi) + \mathrm{Sin}\, 2(H+2\mu\pi) + \ldots + \tfrac{1}{2}\mathrm{Sin}\, 2(H+s\mu\pi)\}\\ &+ 2\sigma_4^{(2i)}\{\tfrac{1}{2}\mathrm{Sin}\, 4H + \mathrm{Sin}\, 4(H+\mu\pi) + \mathrm{Sin}\, 4(H+2\mu\pi) + \ldots + \tfrac{1}{2}\mathrm{Sin}\, 4(H+s\mu\pi)\}\\ &+ \ldots\end{aligned}$$

Uttrycken inom parentheserna låta här omedelbart summera sig, hvartill de nödiga formlerna finnas anförda i min afhandling »Om summation af periodiska serier» Stockholm, 1872. Man erhåller härefter

$$\begin{aligned}\Psi^{(i)} = s\gamma_0^{(2i)} &+ \gamma_2^{(2i)} \mathrm{Cotg}\; \mu\pi\, \mathrm{Sin}\, 2(H+s\mu\pi) - \gamma_2^{(2i)} \mathrm{Cotg}\; \mu\pi\, \mathrm{Sin}\, 2H\\ &+ \gamma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Sin}\, 4(H+s\mu\pi) - \gamma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Sin}\, 4H\\ &+ \ldots \qquad\qquad\qquad\qquad - \ldots\end{aligned}$$

$$\begin{aligned}\Phi^{(i)} = &- \sigma_2^{(2i)} \mathrm{Cotg}\; \mu\pi\, \mathrm{Cos}\, 2(H+s\mu\pi) + \sigma_2^{(2i)} \mathrm{Cotg}\; \mu\pi\, \mathrm{Cos}\, 2H\\ &- \sigma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Cos}\, 4(H+s\mu\pi) + \sigma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Cos}\, 4H\\ &- \ldots \qquad\qquad\qquad\qquad + \ldots\end{aligned}$$

eller

$$\begin{aligned}\Psi^{(i)} = s\gamma_0^{(2i)} &+ \gamma_2^{(2i)} \mathrm{Cotg}\, \mu\pi\, \mathrm{Sin}\, 2amu_s + \gamma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Sin}\, 4amu_s + \ldots\\ &- \gamma_2^{(2i)} \mathrm{Cotg}\, \mu\pi\, \mathrm{Sin}\, 2amu_0 - \gamma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Sin}\, 4amu_0 - \ldots\end{aligned}$$

$$\begin{aligned}\Phi^{(i)} = &- \sigma_2^{(2i)} \mathrm{Cotg}\, \pi\mu\, \mathrm{Cos}\, 2amu_s - \sigma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Cos}\, 4amu_s - \ldots\\ &+ \sigma_2^{(2i)} \mathrm{Cotg}\, \mu\pi\, \mathrm{Cos}\, 2amu_0 + \sigma_4^{(2i)} \mathrm{Cotg}\, 2\mu\pi\, \mathrm{Cos}\, 4amu_0 + \ldots\end{aligned}$$

Insättas här uttrycken för $\mathrm{Sin}\, 2amu_s$, $\mathrm{Sin}\, 4amu_s$, o. s. v. i enlighet med eqvationerna (I), så erhålles omedelbart resultat af formen (12); man finner härvid

$$\Psi_0^{(i)} = s\gamma_0^{(2i)} - \sum_1^{\infty} \gamma_{(2n)}^{(2i)} \mathrm{Cotg}\, n\mu\pi\, \mathrm{Sin}\, 2nH$$

$$\Psi_1^{(i)} = \sum_1^{\infty} \gamma_{(2n)}^{(2i)} \Sigma_2^{(2n)} \mathrm{Cotg}\, n\mu\pi$$

$$\Psi_2^{(i)} = \sum_1^{\infty} \gamma_{(2n)}^{(2i)} \Sigma_4^{(2n)} \mathrm{Cotg}\, 2n\mu\pi$$

o. s. v.

$$\Phi_0^{(i)} = \sum_1^\infty \sigma_{(2n)}^{(2i)} \operatorname{Cotg} n\mu\pi \operatorname{Cos} 2nH - \sum_1^\infty \sigma_{(2n)}^{(2i)} \Gamma_0^{(2n)} \operatorname{Cotg} n\mu\pi$$

$$\Phi_1^{(i)} = -\sum_1^\infty \sigma_{(2n)}^{(2i)} \Gamma_2^{(2n)} \operatorname{Cotg} n\mu\pi$$

$$\Phi_2^{(i)} = -\sum_1^\infty \sigma_{(2n)}^{(2i)} \Gamma_4^{(2n)} \operatorname{Cotg} 2n\mu\pi$$

o. s. v.

Om man slutligen utbyter γ- och σ-koefficienterna mot deras värden i enlighet med eqvationerna (9), så framgå följande former, der den nedre index blifvit betecknad med i',

$$(13)\quad \begin{cases} \Psi_{i'}^{(i)} = i\{\frac{1}{1}\Sigma_{2i}^{(2)} \Sigma_{2i'}^{(2)} \operatorname{Cotg} \mu\pi + \frac{1}{2}\Sigma_{2i}^{(4)} \Sigma_{2i'}^{(4)} \operatorname{Cotg} 2\mu\pi + \frac{1}{3}\Sigma_{2i}^{(6)} \Sigma_{2i'}^{(6)} \operatorname{Cotg} 3\mu\pi + \ldots\} \\ \Phi_{i'}^{(i)} = -i\{\frac{1}{1}\Gamma_{2i}^{(2)} \Gamma_{2i'}^{(2)} \operatorname{Cotg} \mu\pi + \frac{1}{2}\Gamma_{2i}^{(4)} \Gamma_{2i'}^{(4)} \operatorname{Cotg} 2\mu\pi + \frac{1}{3}\Gamma_{2i}^{(6)} \Gamma_{2i'}^{(6)} \operatorname{Cotg} 3\mu\pi + \ldots\} \end{cases}$$

Att i uttrycken för $\Psi_0^{(i)}$ och $\Phi_0^{(i)}$ vidtaga en analog ändring medför ej någon fördel.

Emellan koefficienterna $\Psi_{i'}^{(i)}$ och $\Phi_{i'}^{(i)}$ förefinnes en serdeles enkel relation, hvilken omedelbart inses af eqvationerne (10). Denna relation är

$$\Psi_{i'}^{(i)} = -\frac{1-q^{2i}}{1+q^{2i}} \cdot \frac{1-q^{2i'}}{1+q^{2i'}} \Phi_{i'}^{(i)}$$

På grund af denna relation är det ej nödvändigt att utveckla särskilda beräkningsmethoder för $\Psi_{i'}^{(i)}$ och $\Phi_{i'}^{(i)}$, utan det är tillräckligt att söka sådana för en af dessa funktioner, t. ex. för den sednare.

§ 2.

I den ofvan citerade afhandlingen »Studien auf dem Gebiete etc.» hafva funktionerna $\Gamma_{2i}^{(2n)}$ blifvit framställda under formen af bestämda integral. Den formel, som dervid ernåddes, är följande

$$\Gamma_{2i}^{(2n)} = \frac{1}{2}(-k_1)^n \frac{1+q^{2i}}{q^i} \frac{1}{K_1} \int_0^{K_1} \operatorname{Sin} am u_1^{2n} \operatorname{Cos} 2i\left(\frac{\pi}{2K_1}\right) u_1\, du_1$$

hvarvid

$$k_1 = \frac{1-\sqrt{1-k^2}}{1+\sqrt{1-k^2}}$$

och

$$K_1 = \int_0^{\frac{1}{2}\pi} \frac{d\varphi}{\sqrt{1-k_1^2 \operatorname{Sin} \varphi^2}}$$

Med stöd af detta uttryck finna vi ur den sednare af eqvationerna (13), och i det vi beteckna

$$D = -\frac{i}{1} \frac{1+q^{2i}}{q^i} \frac{1+q^{2i'}}{q^{i'}} \frac{1}{K_1^2},$$

$$(14)\quad \Phi_{i'}^{(i)} = D\int_0^{K_1} du_1 \int_0^{K_1} dv_1 \operatorname{Cos} 2i\left(\frac{\pi}{2K_1}\right)u_1 \operatorname{Cos} 2i'\left(\frac{\pi}{2K_1}\right)v_1 \left\{\begin{aligned} &\frac{k_1^2}{1} \operatorname{Sin} am u_1^2 \operatorname{Sin} am v_1^2 \operatorname{Cotg} \mu\pi \\ &+ \frac{k_1^4}{2} \operatorname{Sin} am u_1^4 \operatorname{Sin} am v_1^4 \operatorname{Cotg} 2\mu\pi \\ &+ \ldots \end{aligned}\right\}$$

en formel, hvilken kan läggas till grund för vigtiga transformationer af $\Phi_{i'}^{(i)}$.

En annan utgångspunkt för dylika transformationer vinnes med stöd af den relation, som äger rum emellan de till olika modyler hörande Γ-koefficienterna. Beteckna vi med $\Gamma_{2i}^{(2n)}(k_1)$ och med $\Gamma_{2i}^{(2n)}(k)$ de till modylerna k_1 och k hörande utvecklingskoefficienterna af Cos $2namu$ och Cos $2namu_1$, samt med $A_i^{(n)}$ utvecklingskoefficienterna af Cos φ^{2n}, så gäller följande relation (Studien & pag. 120).

$$2\Gamma_{2i}^{(2n)}(k) = \left(\frac{k_1}{4q}\right)^i (1+q^{2i}) k_1^{n-i} \{4^i A_n^{(n)} \Gamma_{2i}^{(2n)}(k_1) - 4^i A_{n-1}^{(n)} \Gamma_{2i}^{2n-2}(k_1) + \ldots\} \tag{15}$$

eller, efter en enkel omställning

$$2\Gamma_{2i}^{(2n)}(k) = (-1)^{n-i} \frac{1+q^{2i}}{(4q)^i} k_1^n \left\{ \begin{aligned} &4^i A_i^{(n)} \Gamma_{2i}^{(2i)}(k_1) - 4^i A_{i-1}^{(n)} \Gamma_{2i}^{(2i-2)}(k_1) + \ldots \\ &\qquad - 4^i A_{i+1}^{(n)} \Gamma_{2i}^{(2i+2)}(k_1) + \ldots \end{aligned} \right\} \tag{16}$$

Härvid äro koefficienterna i utvecklingen

$$\text{Cos}\,\varphi^{2n} = A_0^{(n)} + A_1^{(n)} \text{Cos}\,2\varphi + A_2^{(n)} \text{Cos}\,4\varphi + \ldots + A_n^{(n)} \text{Cos}\,2n\varphi$$

på följande sätt sammansatta

$$A_n^{(n)} = \frac{1}{2^{2n-1}}$$

$$A_{n-1}^{(n)} = \frac{1}{2^{2n-1}} \frac{2n}{1}$$

$$A_{n-2}^{(n)} = \frac{1}{2^{2n-1}} \frac{2n(2n-1)}{1\,.\,2}$$

$$\ldots\,.$$

$$A_i^{(n)} = \frac{1}{2^{2n-1}} \frac{2n(2n-1)\,.\,.\,(n+i+1)}{1\,.\,2\,.\,.\,(n-i)}$$

eller

$$4^n A_n^{(n)} = 2$$

$$4^n A_n^{(n+1)} = 2\,\frac{2n+2}{1}\,\frac{1}{4}$$

$$4^n A_n^{(n+2)} = 2\,\frac{(2n+4)(2n+3)}{1\,.\,2}\,\frac{1}{4^2}$$

$$4^n A_n^{(n+3)} = 2\,\frac{(2n+6)(2n+5)(2n+4)}{1\,.\,2\,.\,3}\,\frac{1}{4^3}$$

$$\ldots\,.\,.$$

$$4^n A_n^{(n+\nu)} = 2\,\frac{(2n+2\nu)(2n+2\nu-1)\,.\,.\,.\,(2n+\nu+1)}{1\,.\,2\,.\,.\,.\,\nu}\,\frac{1}{4^\nu}$$

Tänker man sig nu ett uttryck för $\Gamma_{2i'}^{(2n)}(k)$ bildadt i analogi med eqv. (16), så erhåller man efter multiplikation af de båda eqvationerna:

$$\Gamma_{2i}^{(2n)}(k)\,\Gamma_{2i'}^{(2n)}(k) = (-1)^{(i+i')} \frac{(1+q^{2i})(1+q^{2i'})}{(4q)^{i+i'}} k_1^{\,2n}\,.\,4^{i+i'-1}$$

$$\times \left\{ \begin{aligned} &A_i^{(n)} A_{i'}^{(n)} \Gamma_{2i}^{(2i)}(k_1)\, \Gamma_{2i'}^{(2i')}(k_1) \\ &- A_i^{(n)} A_{i'-1}^{(n)} \Gamma_{2i}^{(2i)}(k_1)\, \Gamma_{2i'}^{2i'-2}(k_1) - A_i^{(n)} A_{i'+1}^{(n)} \Gamma_{2i}^{(2i)}(k_1)\, \Gamma_{2i'}^{(2i'+2)}(k_1) - A_{i-1}^{(n)} A_{i'}^{(n)} \Gamma_{2i}^{(2i-2)}(k_1)\, \Gamma_{2i'}^{(2i')}(k_1) \\ &\qquad - A_{i+1}^{(n)} A_{i'}^{(n)} \Gamma_{2i}^{(2i+2)}(k_1)\, \Gamma_{2i}^{(2i)}(k_1) \\ &+ A_{i-1}^{(n)} A_{i'-1}^{(n)} \Gamma_{2i}^{(2i-2)}(k_1)\, \Gamma_{2i'}^{(2i'-2)}(k_1) + A_{i-1}^{(n)} A_{i'+1}^{(n)} \Gamma_{2i}^{(2i-2}(k_1)\, \Gamma_{2i'}^{(2i'+2)}(k_1) + A_{i+1}^{(n)} A_{i'-1}^{(n)} \Gamma_{2i}^{(2i+2)}(k_1)\, \Gamma_{2i'}^{(2i'-2)}(k_1) \\ &\qquad - A_{i+1}^{(n)} A_{i'+1}^{(n)} \Gamma_{2i}^{(2i+2)}(k_1)\, \Gamma_{2i'}^{(2i'+2)}(k_1) \\ &+ A_i^{(n)} A_{i'-2}^{(n)} \Gamma_{2i}^{(2i)}(k_1)\, \Gamma_{2i'}^{(2i'-4)}(k_1)\ \ldots \\ &- \ldots\,. \end{aligned} \right\}$$

Detta uttryck bör härpå substitueras i den sednare af eqvationerne (13); för att på samma gång erhålla resultatet öfverskådligare, införa vi en ny funktionsbeteckning enligt följande formel såsom definition:

$$(17)\qquad G(r, r') = A_r^{(1)} A_{r'}^{(1)} \frac{k_1^2}{1} \text{ Cotg } \mu\pi + A_r^{(2)} A_{r'}^{(2)} \frac{k_1^4}{2} \text{ Cotg } 2\mu\pi + \ldots$$

Härmed erhålles

$$(18)\qquad \Phi_{i'}^{(i)} = D_1 4^{i+i'-1} \left\{ \begin{array}{l} G(i, i')\Gamma_{2i}^{(2i)}(k_1)\Gamma_{2i'}^{(2i')}(k_1) \\ - G(i, i'-1)\Gamma_{2i}^{(2i)}(k_1)\Gamma_{2i'}^{(2i'-2)}(k_1) - G(i, i'+1)\Gamma_{2i}^{(2i)}(k_1)\Gamma_{2i'}^{(2i'+2)}(k_1) - \ldots \\ + \ldots \end{array} \right\}$$

der

$$D_1 = (-1)^{i+i'} \frac{(1+q^{2i})(1+q^{2i'})}{(4q)^{i+i'}}$$

Uttrycket (18) är visserligen af en mycket mera komplicerad beskaffenhet än den sednare af formlerna (13), men detta oaktadt dock vida lämpligare för numeriska räkningar. Det sistnämnda uttrycket konvergerar nämnligen efter potenserna af $k^2{}_1$, hvaremot de särskilda raderna i formeln (18), hvilka alltid innehålla ett ändligt antal termer, äro multiplicerade med potenser af den numeriskt vida mindre modylen

$$k_2 = \frac{1 - \sqrt{1 - k_1^2}}{1 + \sqrt{1 - k_1^2}}\ ^{1)}$$

Svårigheten vid användningen af formeln (18) skulle nu förnämnligast bero på att finna en utveckling för funktionen $G(r, r')$, som vore mera egnad för numeriska räkningar, än formeln (17). Denna är derföre visst icke obrukbar. De enskilda termerna i densamma äro mycket enkla och äro omedelbart särdeles lätta att beräkna, men deras antal är temligen stort. I utvecklingen af funktionen $G(10, 5)$ är t. ex. 20:de termen multiplicerad med faktorn 4^{14} ännu betydlig. Den ifrågavarande produkten är nämnligen

$$4^{14} A_{10}^{(20)} A_5^{(20)} \frac{k_1^{40}}{20} \text{ Cotg } 20\mu\pi = \frac{40.39\ldots31}{1.2.10} \cdot \frac{40.39\ldots26}{1.2..15}\ \frac{1}{4^{25}}\ \frac{k_1^{40}}{20} \text{ Cotg } 20\mu\pi,$$

eller efter numerisk reduktion

$$0.2240 \text{ Cotg } 20\mu\pi;$$

härefter begynna termerna visserligen att förminskas, såsom man ser deraf att

$$4^{14} A_{10}^{(30)} A_5^{(30)} \frac{k_1^{60}}{30} = \frac{60.59..41}{4.8..80} \cdot \frac{60.59..36}{4.8..100} \cdot \frac{k_1^{60}}{30} = 0.0105;$$

men i alla händelser äro mera användbara räknemethoder önskvärda. Skulle man dock någon gång se sig föranlåten att begagna den ursprungliga formeln (17), så kan man vid beräkningen af de särskilda termerna erinra sig, att

$$\frac{A_n^{(n+\nu+1)}}{A_n^{(n+\nu)}} = \frac{(2n+2\nu+2)(2n+2\nu+1)}{4(\nu+1)(2n+\nu+1)}$$

---

1) I ett exempel, som jag hade anledning att beräkna, nämnligen det, som hänför sig till den Enckeska kometens Jupitersstöringar, var

$$\begin{aligned} \text{Log } k &= 9.99736685 \\ \text{»}\quad k_1 &= 9.9042551 \\ \text{»}\quad k_2 &= 9.4018330 \end{aligned}$$

Innan vi företaga någon väsentligare transformation af formeln (17), erinras att denna på grund af eqvationen

$$A_r^{(m)} A_{r'}^{(m)} = \frac{4}{\pi^2} \int_0^\pi \int_0^\pi \operatorname{Cos} \varphi^{2m} \operatorname{Cos} \psi^{2m} \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi \, d\varphi \, d\psi,$$

der φ och ψ äro oberoende af hvarandra, kan sättas under följande form

$$(19) \quad G(r, r') = \frac{4}{\pi^2} \int_0^\pi \int_0^\pi \left\{ 1 + \frac{k^2_1}{1} \operatorname{Cos} \varphi^2 \operatorname{Cos} \psi^2 \operatorname{Cotg} \mu\pi + \frac{k^4_1}{2} \operatorname{Cos} \varphi^4 \operatorname{Cos} \psi^4 \operatorname{Cotg} 2\mu\pi + \ldots \right\}$$

$$\times \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi \, d\varphi \, d\psi$$

Man ser här omedelbart att den första icke försvinnande termen är multiplicerad med faktorn $\frac{k_1^{2r}}{r}$ om $r > r'$; På denna grund har äfven den första termen inom parenthesen i formeln (19) blifvit införd, ehuru densamma ej äger någon motsvarande i eqv. (17); efter integrationer och substitution af gränserna försvinner densamma nämnligen alltid, endast r och r' äro större än noll.

§ 3.

Möjligheten att på ett för numeriska räkningar fördelaktigt sätt transformera formeln (17) synes i första rummet bero på ersättandet af cotangentfunktionerna genom serieutvecklingar med tillräckligt stark konvergens. Sådana serieutvecklingar hafva blifvit framställda i afhandlingen »Om summation af periodiska funktioner». Den allmänna typen för dessa serier är

$$\operatorname{Cotg} n\mu\pi = \frac{2}{\pi} \varkappa(2i - 1, n\mu\pi) \left\{ \frac{X_0^{(i)}}{2n\mu} - \frac{4n\mu X_1^{(i)}}{2^2 - (2n\mu)^2} - \frac{4n\mu X_2^{(i)}}{4^2 - (2n\mu)^2} - \ldots \right\},$$

der index i betecknar ett godtyckligt valdt helt tal, samt $\varkappa(2i - 1, n\mu\pi)$ produkten

$$\left[1 - \frac{(2n\mu)^2}{1^2}\right] \left[1 - \frac{(2n\mu)^2}{3^2}\right] \ldots \left[1 - \frac{(2n\mu)^2}{(2i - 1)^2}\right]$$

och der $X^{(i)}$ äro koefficienter, hvilkas konvergens är beroende af det hela talet i. Denna serieutveckling kunde nu visserligen begagnas till transformation af formeln (15), men till en början skola vi härtill använda en annan, som ernås på följande sätt.

Den bekanta utvecklingen

$$\operatorname{Cotang} n\mu\pi = \frac{2}{\pi} \left\{ \frac{1}{2n\mu} - \frac{4n\mu}{2^2 - (2n\mu)^2} - \frac{4n\mu}{4^2 - (2n\mu)^2} - \ldots \right\},$$

hvilken utgör ett speciellt fall af ofvanstående, och ur densamma erhålles efter substitutionen $i = 0$, leder med stöd af formeln

$$-\frac{2n\mu}{(2p)^2 - (2n\mu)^2} = \frac{1}{\operatorname{Sin} 2n\mu\pi} \int_0^\pi \operatorname{Cos} 2n\mu t \operatorname{Cos} 2pt \, dt$$

till denna eqvation

$$\operatorname{Sin} 2n\mu\pi \operatorname{Cotg} n\mu\pi = \frac{2}{\pi} \frac{\operatorname{Sin} 2n\mu\pi}{2n\mu} + \frac{4}{\pi} \int_0^\pi \operatorname{Cos} 2n\mu t \left\{ \operatorname{Cos} 2t + \operatorname{Cos} 4t + \ldots \right\} dt$$

Tillämpas på den sista termen i detta uttryck regeln för delvis integration, så erhålles

$$\begin{aligned}\text{Cotg}\, n\mu\pi = \frac{2}{2n\mu\pi} &- \frac{4}{\pi}\, 2n\mu\left\{\frac{1}{2^2} + \frac{1}{4^2} + \frac{1}{6^2} + \,.\,.\right\} \\ &- \frac{4}{\pi}\,(2n\mu^3)\left\{\frac{1}{2^4} + \frac{1}{4^4} + \frac{1}{6^4} + \,.\,.\right\} \\ &- \,.\,.\,.\,. \\ &- \frac{4}{\pi}\,(2n\mu)^{2\nu-1}\left\{\frac{1}{2^{2\nu}} + \frac{1}{4^{2\nu}} + \frac{1}{6^{2\nu}} + \,.\,.\right\} \\ &+ \frac{4}{\pi}\,\frac{(2n\mu)^{2\nu}}{\text{Sin}\, 2n\mu\pi}\int_0^\pi \text{Cos}\, 2n\mu t\left\{\frac{1}{2^{2\nu}}\,\text{Cos}\, 2t + \frac{1}{4^{2\nu}}\,\text{Cos}\, 4t + \,.\,.\,.\right\} dt\end{aligned}$$

För serierna inom parentheserna skola vi införa beteckningarne S_2, S_4, o. s. v., då tillika, i enlighet med en bekant formel, följande eqvationer äro gällande

$$S_2 = \frac{1}{2}\,\frac{B_1\pi^2}{1\,.\,2}$$

$$S_4 = \frac{1}{2}\,\frac{B_3\,\pi^4}{1\,.\,2\,.\,3\,.\,4}$$

$$S_6 = \frac{1}{2}\,\frac{B_5\,\pi^6}{1\,.\,2\,.\,3\,.\,4\,.\,5\,.\,6}$$

o. s. v.

dervid vi med B_1, B_3, o. s. v., betecknat de Bernoulliska talen $\frac{1}{6}, \frac{1}{30}, \frac{1}{42}, \frac{1}{30}, \frac{5}{66}$, o. s. v. Vi anföra i sammanhang med införandet af dessa beteckningar de numeriska värdena för summorna S_2, S_4, o. s. v.

$$\begin{aligned}\text{Log.}\; S_2 &= 9.6140884 \\ \text{»}\quad S_4 &= 8.8302369 \\ \text{»}\quad S_6 &= 8.2012873 \\ \text{»}\quad S_8 &= 7.5935270 \\ \text{»}\quad S_{10} &= 6.9901316\end{aligned}$$

Uttrycket för Cotg $n\mu\pi$ antager nu följande form, om vi äfven utföra integrationen af sista termen,

$$\begin{aligned}\text{Cotg}\, n\mu\pi = \frac{2}{2n\mu\pi} - \frac{4}{\pi}\, 2n\mu\, S_2 - \frac{4}{\pi}\,(2n\mu)^3\, S_4 - \,.\,.\,. - \frac{4}{\pi}\,(2n\mu)^{2\nu-1}\, S_{2\nu} \\ - \frac{4}{\pi}\,(2n\mu)^{2\nu}\left\{\frac{1}{2^{2\nu}}\,\frac{2n\mu}{2^2-(2n\mu)^2} + \frac{1}{4^{2\nu}}\,\frac{2n\mu}{4^2-(2n\mu)^2} + \frac{1}{6^{2\nu}}\,\frac{2n\mu}{6^2-(2n\mu)^2} + \,.\,.\right\}\end{aligned}$$

Genom att tilldela det hela talet ν ett passande värde kan man bibringa den oändliga serien inom parenthesen i sista termen en tillbörlig konvergens. För öfrigt är detta uttryck ändligt.

Införes nu detta värde för Cotg $n\mu\pi$ i eqvationen (17), så framgår följande uttryck för $G(r, r')$:

$$
\begin{aligned}
G(r,r') = & \frac{2}{\pi}\frac{1}{2\mu}\left\{A_r^{(1)}A_{r'}^{(1)}\frac{k_1^2}{1^2} + A_r^{(2)}A_{r'}^{(2)}\frac{k_1^4}{2^2} + A_r^{(3)}A_{r'}^{(3)}\frac{k_1^6}{3^2} + \ldots\right\} \\
& -\frac{4}{\pi}(2\mu)S_2\left\{A_r^{(1)}A_{r'}^{(1)}k_1^2 + A_r^{(2)}A_{r'}^{(2)}k_1^4 + A_r^{(3)}A_{r'}^{(3)}k_1^6 + \ldots\right\} \\
& -\frac{4}{\pi}(2\mu)^3S_4\left\{A_r^{(1)}A_{r'}^{(1)}1^2k_1^2 + A_r^{(2)}A_{r'}^{(2)}2^2k_1^4 + A_r^{(3)}A_{r'}^{(3)}3^2k_1^6 + \ldots\right\} \\
& - \ldots\ldots \\
& -\frac{4}{\pi}(2\mu)^{2\nu-1}S_{2\nu}\left\{A_r^{(1)}A_{r'}^{(1)}1^{2\nu-2}k_1^2 + A_r^{(2)}A_{r'}^{(2)}2^{2\nu-2}k_1^4 + A_r^{(3)}A_{r'}^{(3)}3^{2\nu-2}k_1^6 + \ldots\right\} \\
& -\frac{1}{2^{2\nu}}\frac{4}{\pi}(2\mu)^{2\nu+1}\left\{A_r^{(1)}A_{r'}^{(1)}\frac{1^{2\nu}k_1^2}{2^2-(2\mu)^2} + A_r^{(2)}A_{r'}^{(2)}\frac{2^{2\nu}k_1^4}{2^2-(4\mu)^2} + A_r^{(3)}A_{r'}^{(3)}\frac{3^{2\nu}k_1^6}{2^2-(6\mu)^2} + \ldots\right\} \\
& -\frac{1}{4^{2\nu}}\frac{4}{\pi}(2\mu)^{2\nu+1}\left\{A_r^{(1)}A_{r'}^{(1)}\frac{1^{2\nu}k_1^2}{4^2-(2\mu)^2} + A_r^{(2)}A_{r'}^{(2)}\frac{2^{2\nu}k_1^4}{4^2-(4\mu)^2} + A_r^{(3)}A_{r'}^{(3)}\frac{3^{2\nu}k_1^6}{4^2-(6\mu)^2} + \ldots\right\} \\
& - \ldots\ldots
\end{aligned}
$$

Äfven här skola vi till afkortning af operationernas framställning införa nya funktionsbeteckningar. Vi sätta sålunda

$$
(20)\quad \left\{\begin{aligned}
E(\nu) &= A_r^{(1)}A_{r'}^{(1)}1^{2\nu}k_1^2 + A_r^{(2)}A_{r'}^{(2)}2^{2\nu}k_1^4 + A_r^{(3)}A_{r'}^{(3)}3^{2\nu}k_1^6 + \ldots \\
-F(\nu,p) &= A_r^{(1)}A_{r'}^{(1)}\frac{1^{2\nu}k_1^2}{(2p)^2-(2\mu)^2} + A_r^{(2)}A_{r'}^{(2)}\frac{2^{2\nu}k_1^4}{(2p)^2-(4\mu)^2} + A_r^{(3)}A_{r'}^{(3)}\frac{3^{2\nu}k_1^6}{(2p)^2-(6\mu)^2} + \ldots,
\end{aligned}\right.
$$

då $G(r,r')$ antager följande utseende

$$
\begin{aligned}
(21)\quad G(r,r') = & \frac{2}{\pi}\frac{1}{2\mu}E(-1) - \frac{4}{\pi}(2\mu)S_2E(1) - \frac{4}{\pi}(2\mu)^3S_4E(2) - \ldots - \frac{2}{\pi}(2\mu)^{2\nu-1}S_{2\nu}E(\nu-1) \\
& + \frac{1}{2^{2\nu}}\frac{4}{\pi}(2\mu)^{2\nu+1}F(\nu,1) + \frac{1}{4^{2\nu}}\frac{4}{\pi}(2\mu)^{2\nu+1}F(\nu,2) + \ldots
\end{aligned}
$$

Den sednare af eqvationerna (20) kan äfven ställas, som följer,

$$
F(\nu,p) = \frac{1}{\mu^2}\left\{A_r^{(1)}A_{r'}^{(1)}\frac{1^{2\nu}k_1^2}{2^2-\left(\frac{2p}{\mu}\right)^2} + A_r^{(2)}A_{r'}^{(2)}\frac{2^{2\nu}k_1^4}{4^2-\left(\frac{2p}{\mu}\right)^2} + A_r^{(3)}A_{r'}^{(3)}\frac{3^{2\nu}k_1^6}{6^2-\left(\frac{2p}{\mu}\right)^2} + \ldots\right\};
$$

och om nu nämnarne uttryckas medelst bestämda integral enligt formeln

$$
\frac{1}{(2m)^2-\left(\frac{2p}{\mu}\right)^2} = -\frac{\mu}{2p}\frac{(-1)^m}{\operatorname{Sin}\frac{2p}{\mu}\frac{\pi}{2}}\int_0^{\frac{\pi}{2}}\operatorname{Cos}\frac{2p}{\mu}t\;\operatorname{Cos}2mt\,dt,
$$

så blifver

$$
\begin{aligned}
(22)\quad F(\nu,p) = & \frac{1}{\mu^2}\frac{\mu}{2p}\frac{1}{\operatorname{Sin}\frac{2p}{\mu}\cdot\frac{\pi}{2}}\int_0^{\frac{\pi}{2}}\operatorname{Cos}\frac{2p}{\mu}t\{A_r^{(1)}A_{r'}^{(1)}1^{2\nu}k_1^2\operatorname{Cos}2t - A_r^{(2)}A_{r'}^{(2)}2^{2\nu}k_1^4\operatorname{Cos}4t \\
& + A_r^{(3)}A_{r'}^{(3)}3^{2\nu}k_1^6\operatorname{Cos}6t - \ldots\}\,dt
\end{aligned}
$$

Enligt regeln för delvis integration finner man

$$
\int_0^{\frac{\pi}{2}}\operatorname{Cos}\frac{2p}{\mu}t\operatorname{Cos}2mt\,dt = -(-1)^m\frac{1}{(2m)^2}\frac{2p}{\mu}\operatorname{Sin}\frac{2p}{\mu}\frac{\pi}{2} + \frac{1}{(2m)^2}\left(\frac{2p}{\mu}\right)^2\int_0^{\frac{\pi}{2}}\operatorname{Cos}\frac{2p}{\mu}t\operatorname{Cos}2mt\,dt
$$

och med stöd af denna formel öfvergår den föregående i

(23) $$F(\nu, p) = \frac{1}{(2\mu)^2} E(\nu - 1) + \frac{1}{2^2}\left(\frac{2p}{\mu}\right)^2 F(\nu - 1, p)$$

Härmedelst är således en rekursionsformel vunnen, enligt hvilken alla F-funktioner för ett gifvet p-värde kunna beräknas såsnart en enda af dem äro bekanta och sedan man beräknat E-funktionerna. Denna rekursionsformel gäller för öfrigt för alla ν-värden, både positiva och negativa. Genom att i densamma insätta $\nu - 1$ i st. för ν erhåller man

$$F(\nu - 1, p) = \frac{1}{(2\mu)^2} E(\nu - 2) + \frac{1}{2^2}\left(\frac{2p}{\mu}\right)^2 F(\nu - 2, p),$$

och insättes detta värde i eqvationen (23), så blifver denna

$$F(\nu, p) = \frac{1}{(2\mu)^2}\left[E(\nu - 1) + \frac{1}{2^2}\left(\frac{2p}{\mu}\right)^2 E(\nu - 2)\right] + \frac{1}{2^4}\left(\frac{2p}{\mu}\right)^4 F(\nu - 2, p)$$

På samma sätt erhåller man, i det med s betecknas ett helt tal,

(24) $$F(\nu,p) = \frac{1^2}{(2\mu)^2}\left\{E(\nu - 1) + \frac{1}{2^2}\left(\frac{2p}{\mu}\right)^2 E(\nu - 2) + \frac{1}{2^4}\left(\frac{2p}{\mu}\right)^4 E(\nu - 3) + \ldots + \frac{1}{2^{2s-2}}\left(\frac{2p}{\mu}\right)^{2s-2} E(\nu - s)\right\} + \frac{1}{2^{2s}}\left(\frac{2p}{\mu}\right)^{2s} F(\nu - s, p)$$

Antages nu $s > \nu$, så kan man beräkna $F(-(s - \nu), p)$ enligt den andra formeln (20), hvilken konvergerar i behörig grad, endast differensen $s - \nu$ antages tillräckligt stor.

Formeln (24) är likväl behäftad med en olägenhet, hvilken understundom kan inverka ganska störande vid utförandet af numeriska beräkningar enligt densamma. Om nämnligen talet p, äfvensom indices r och r' hafva större värden och μ dertill är liten, så består uttrycket (24) af en differens, hvilken är många gånger mindre än dess termer. Denna olägenhet undvikes i väsentlig grad genom en annan behandling af eqvationen (22). Den transformation, som härmed menas, beror på ett theorem, som blifvit bevisadt i afhandlingen »Om summation af periodiska funktioner» [eqvationen 16]. Enligt ifrågavarande theorem erhåller man följande utveckling

$$\operatorname{Cos}\frac{2p}{\mu}t = \frac{2}{\pi}\frac{2p}{\mu}\operatorname{Sin}\frac{2p}{\mu}\frac{\pi}{2}\cdot\varkappa\left(2h + 1, \frac{2p}{\mu}\frac{\pi}{2}\right)\left\{\begin{array}{l}\left(\frac{\mu}{2p}\right)^2 + \sum\limits_1^{\infty}\frac{2n\,\beta_{2n}^{(h)}}{(2n)^2 - \left(\frac{2p}{\mu}\right)^2}\operatorname{Cos} 2nt \\ \qquad + \frac{\pi}{2}\sum\limits_0^{h}\frac{(2n+1)\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2}\operatorname{Cos}(2n+1)t\end{array}\right\}$$

och insättes densamma i eqvationen (22), så finner man omedelbart

(25) $$F(\nu, p) = \frac{1}{\mu^2}\varkappa\left(2h + 1, \frac{2p}{\mu}\frac{\pi}{2}\right)\left\{A_r^{(1)}A_{r'}^{(1)}\frac{1^{2\nu+1}k_1^2\beta_2^{(h)}}{2^2 - \left(\frac{2p}{\mu}\right)^2} + A_r^{(2)}A_{r'}^{(2)}\frac{2^{2\nu+1}k_1^4\beta_4^{(h)}}{4^2 - \left(\frac{2p}{\mu}\right)^2} + \ldots\right\}$$

$$+ \frac{1}{\mu^2}\varkappa\left(2h + 1, \frac{2p}{\mu}\frac{\pi}{2}\right)\int_0^{\frac{\pi}{2}}\sum_0^{h}\frac{(2n+1)\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2}\operatorname{Cos}(2n+1)t\left\{A_r^{(1)}A_{r'}^{(1)}1^{2\nu}k_1^2\operatorname{Cos}2t - A_r^{(2)}A_{r'}^{(2)}2^{2\nu}k_1^4\operatorname{Cos}4t + \ldots\right\}dt$$

Man kan härvid välja det hela talet h nog stort att produkten

$$\varkappa\left(2h + 1, \frac{2p}{\mu}\frac{\pi}{2}\right) = \left\{1 - \frac{1}{1^2}\left(\frac{2p}{\mu}\right)^2\right\}\left\{1 - \frac{1}{3^2}\left(\frac{2p}{\mu}\right)^2\right\}\ldots\left\{1 - \frac{1}{(2h+1)^2}\left(\frac{2p}{\mu}\right)^2\right\},$$

som med växande h närmar sig gränsen $\mathrm{Cos}\,\frac{2p}{\mu}\frac{\pi}{2}$, ej erhåller något öfverdrifvet stort numeriskt värde, äfvensom att koefficienterna $\beta_{2n}^{(h)}$ begynna att starkast konvergera der koefficienterna $A_r^{(n)} A_{r'}^{(n)}$ upphöra att vara lika med noll, hvilket först inträffar då n uppnår det större af talen r och r'. I alla händelser måste $h > r$.

Koefficienterna $\beta_{2n}^{(h)}$ finnas för öfrigt ur följande formel

$$\beta_{2n}^{(h)} = \frac{(-1)^{n+h}}{n} \frac{1^2.3^2 \ldots (2h+1)^2}{[(2n)^2 - 1^2]\,[(2n)^2 - 3^2] \ldots [(2n^2 - (2h+1)^2]};$$

koefficienterna $\alpha_{2n+1}^{(i)}$ äro åter gifna medelst uttrycket

$$\alpha_{2n+1}^{(h)} = \frac{1}{2n+1} \frac{1.3.5..2h+1}{2.4.6..2h} \frac{(2h+1)2h(2h-1)\ldots(h+n+2)}{1.2.3..(h-n)} \frac{1}{2^{2h}}$$

Den sednare termen i eqvationen (25) är i sitt ofvanstående skick ej lämplig för numeriska räkningar; man erhölle nämnligen genom att utföra den betecknade integrationen för denna term följande uttryck, der den konstanta faktorn utanför integraltecknet för korthetens skull blifvit bortlemnad

$$\begin{aligned} T(\nu) = {} & A_r^{(1)} A_{r'}^{(1)} 1^{2\nu} k_1^2 \sum_0^h \frac{(2n+1)\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \frac{(2n+1)\ \mathrm{Sin}\,(2n+1)\frac{\pi}{2}}{2^2 - (2n+1)^2} \\ & + A_r^{(2)} A_{r'}^{(2)} 2^{2\nu} k_1^4 \sum_0^h \frac{(2n+1)\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \frac{(2n+1)\ \mathrm{Sin}\,(2n+1)\frac{\pi}{2}}{4^2 - (2n+1)^2} \\ & + \ldots\ldots, \end{aligned}$$

således en serie, hvars konvergens ej vore väsentligen större än den, som förefinnes hos de ursprungliga formlerna (20). Genom partiell integration af formeln

$$(26) \qquad T(\nu, s) = \int_0^{\frac{\pi}{2}} \sum_0^h \frac{(2n+1)^{2s+1}\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \mathrm{Cos}\,(2n+1)t\ \{A_r^{(1)} A_{r'}^{(1)} 1^{2\nu} k_1^2\ \mathrm{Cos}\,2t - \ldots\} dt$$

kan man dock i någon mon kringgå denna olägenhet. Använder man nämnligen formeln

$$\int_0^{\frac{\pi}{2}} \mathrm{Cos}\,(2n+1)t\ \ \mathrm{Cos}\,2mt\,dt = -(-1)^m \frac{2n+1}{(2m)^2} \mathrm{Sin}\,(2n+1)\frac{\pi}{2} + \frac{(2n+1)^2}{(2m)^2} \int_0^{\frac{\pi}{2}} \mathrm{Cos}\,(2n+1)t\ \ \mathrm{Cos}\,2mt\,dt$$

i det densamma insättes i eqvationen (26), så erhålles

$$T(\nu, s) = \sum_0^h \frac{(2n+1^{2s+2}\alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \mathrm{Sin}\,(2n+1)\frac{\pi}{2} \cdot E(\nu - 1) + \frac{1}{2^2} T(\nu - 1; s+1)$$

Denna rekursionsformel leder till följande, med eqvationen (24) analoga uttryck

$$(27) \qquad \begin{aligned} T(\nu, o) = {} & E(\nu - 1) \sum_0^h \frac{(2n+1)^2 \alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \mathrm{Sin}\,(2n+1)\frac{\pi}{2} \\ & + \frac{1}{2^2} E(\nu - 2) \sum_0^h \frac{(2n+1)^4 \alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \mathrm{Sin}\,(2n+1)\frac{\pi}{2} \\ & + \ldots \end{aligned}$$

$$+\frac{1}{2^{2s-2}}E(\nu-s)\sum_{0}^{h}\frac{(2n+1)^{2s}\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\operatorname{Sin}(2n+1)\frac{\pi}{2}+\frac{1}{2^{2s}}T(\nu-s,s)$$

Om nu $s-\nu$ har ett tillräckligt stort numeriskt värde, så blifver serien

$$T(-(s-\nu),s)=\frac{A_r^{(1)}A_{r'}^{(1)}}{1^{2(s-\nu)}}k_1^2\sum_{0}^{h}\frac{(2n+1)^{2s+1}\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\pi}\right)^2}\frac{(2n+1)\operatorname{Sin}(2n+1)\frac{\pi}{2}}{2^2-(2n+1)^2} \tag{28}$$

$$+\frac{A_r^{(2)}A_{r'}^{(2)}}{2^{2(s-\nu)}}k_1^4\sum_{0}^{h}\frac{(2n+1)^{2s+1}\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\frac{(2n+1)\operatorname{Sin}(2n+1)\frac{\pi}{2}}{4^2-(2n+1)^2}$$

$$+\ldots.$$

nog konvergent för numeriska beräkningar. Detta oaktadt är dock brukbarheten af formeln (27) inskränkt, emedan densamma angifver den sökta funktionen såsom ett aggregat af positiva och negativa termer, hvilka hvar för sig äro vida större än deras summa. För att vinna mera lämpliga beräkningsmethoder böra funktionerna $T(\nu,s)$ transformeras enligt andra grunder, hvilka äfven leda till fördelaktiga formler för funktionerna $E(\nu)$.

§ 4.

Såsom redan i § 2 blifvit nämndt kan produkten $A_r^{(n)}A_{r'}^{(n)}$ uttryckas medelst en bestämd dubbelintegral; användes detta uttryck, så finnes, i det vi för korthetens skull beteckna

$$k_1^2\operatorname{Cos}\varphi^2\operatorname{Cos}\psi^2=\eta$$

$$\Omega(\nu,t)=2\,.\,1^{2\nu}\eta\operatorname{Cos}2t+2\,.\,2^{2\nu}\eta^2\operatorname{Cos}4t+\ldots.,$$

$$E(\nu)=\frac{1}{2}\frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi\operatorname{Cos}2r\varphi\operatorname{Cos}2r'\psi\,d\varphi\,d\psi\,\Omega(\nu,0) \tag{29}$$

Denna formel gifver anledning till en särdeles vigtig transformation af $E(\nu)$.

Såsom man ögonblickligen finner är

$$\Omega(\nu,t)=-\frac{1}{2^2}\frac{d^2\Omega(\nu-1,t)}{dt^2}$$

och genom att upprepade gånger använda denna formel rekurrerar man till

$$\frac{d^{2\nu}\Omega(0,t)}{dt^{2\nu}}$$

Då $\nu=o$, så kan den motsvarande Ω-funktion omedelbart enligt en bekant formel summeras; man har nämnligen

$$\Omega(o,t)=2\eta\operatorname{Cos}2t+2\eta^2\operatorname{Cos}4t+\ldots=\frac{1-\eta^2}{1-2\eta\operatorname{Cos}2t+\eta^2}-1$$

Genom differentiation häraf finner man

$$\Omega(1,t)=\frac{2\eta(1-\eta^2)\operatorname{Cos}2t}{(1-2\eta\operatorname{Cos}2t+\eta^2)^2}-\frac{8\eta^2(1-\eta^2)\operatorname{Sin}2t^2}{(1-2\eta\operatorname{Cos}2t+\eta^2)^3}$$

Ehuru man medelst fortsatta differentiationer af dessa formler skulle kunna härleda uttryck för Ω-funktionerna, motsvarande större värden af ν, så vore ett sådant förfarande dock ej det lämpligaste. Man har nämnligen svårt att på denna väg finna lagen för de högre differentialkoefficienterna af $\Omega(0, t)$. Enklare kommer man till målet genom att sönderdela denna funktion i tvenne imaginära termer, hvilka hvar för sig lättare kunna underkastas upprepade differentiationer af deras summa under reell form.

Man inser lätt identiteten af

$$\frac{1-\eta^2}{1-2\eta \operatorname{Cos} 2t+\eta^2} = \frac{1}{1-\eta e^{\sqrt{-1}2t}} + \frac{1}{1-\eta e^{-\sqrt{-1}2t}} - 1$$

hvarmed den åsyftade sönderdelningen är verkställd. Enligt en bekant regel kan man nu bilda independenta uttryck för differentialkoefficienterna af hvar och en af dessa termer i afseende å t. För att förenkla resultatet införa vi beteckningen

$$Q_n^{(\nu)} = (-1)^{n+1}\left\{\frac{n}{1} 1^{2\nu} - \frac{n(n-1)}{1.2} 2^{2\nu} + \frac{n(n-1)(n-2)}{1.2.3} 3^{2\nu} - \ldots\right\}$$

och erhålla

$$\begin{aligned}(30)\qquad \Omega(\nu, t) = \frac{(-1)^\nu}{2^{2\nu}}\frac{d^{2\nu}\Omega(0,t)}{dt^{2\nu}} &= Q_1^{(\nu)} e^{\sqrt{-1}2t}\frac{\eta}{(1-\eta e^{\sqrt{-1}2t})^2} + Q_2^{(\nu)} e^{\sqrt{-1}4t}\frac{\eta^2}{(1-\eta e^{\sqrt{-1}2t})^3} +\\ &+ Q_3^{(\nu)} e^{\sqrt{-1}6t}\frac{\eta^3}{(1-\eta e^{\sqrt{-1}2t})^4} + \ldots + Q_{2\nu}^{(\nu)} e^{\sqrt{-1}4\nu t}\frac{\eta^{2\nu}}{(1-\eta e^{\sqrt{-1}2t})^{2\nu+1}}\\ &+ Q_1^{(\nu)} e^{-\sqrt{-1}2t}\frac{\eta}{(1-\eta e^{-\sqrt{-1}2t})^2} + Q_2^{(\nu)} e^{-\sqrt{-1}4t}\frac{\eta^2}{(1-\eta e^{-\sqrt{-1}2t})^3}\\ &+ Q_3^{(\nu)} e^{-\sqrt{-1}6t}\frac{\eta^3}{(1-\eta e^{-\sqrt{-1}2t})^4} + \ldots + Q_{2\nu}^{(\nu)} e^{-\sqrt{-1}4\nu t}\frac{\eta^{2\nu}}{(1-\eta e^{-\sqrt{-1}2t})^{2\nu+1}}\end{aligned}$$

eller

$$\begin{aligned}(31)\qquad \Omega(\nu, t) &= Q_1^{(\nu)}\frac{2\eta(1+\eta^2)\operatorname{Cos} 2t - 4\eta^2}{(1-2\eta \operatorname{Cos} 2t+\eta^2)^2} + Q_2^{(\nu)}\frac{2\eta^2(\operatorname{Cos} 4t - \eta(3+\eta^2)\operatorname{Cos} 2t + 3\eta^2)}{(1-2\eta \operatorname{Cos} 2t+\eta^2)^3}\\ &+ Q_3^{(\nu)}\frac{2\eta^3(\operatorname{Cos} 6t - 4\eta \operatorname{Cos} 4t + \eta^2(6+\eta^2)\operatorname{Cos} 2t - 4\eta^3)}{(1-2\eta \operatorname{Cos} 2t+\eta^2)^4} + \ldots\end{aligned}$$

Insättes $t = o$ i eqvationen (30), så erhålles

$$(32)\qquad \Omega(\nu, o) = Q_1^{(\nu)}\frac{2\eta}{(1-\eta)^2} + Q_2^{(\nu)}\frac{2\eta^2}{(1-\eta)^3} + Q_3^{(\nu)}\frac{2\eta^3}{(1-\eta)^4} + \ldots.$$

hvilket uttryck bör substitueras i eqvationen (29), och då leder till följande resultat, i hvilket η blifvit ersatt medelst dess värde $k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2$,

$$\begin{aligned}(33)\qquad E(\nu) &= \frac{4}{\pi^2} Q_1^{(\nu)}\int_0^\pi\!\!\int_0^\pi \frac{k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 \operatorname{Cos} 2\nu\varphi \operatorname{Cos} 2\nu'\psi\, d\varphi\, d\psi}{(1-k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2)^2}\\ &+ \frac{4}{\pi^2} Q_2^{(\nu)}\int_0^\pi\!\!\int_0^\pi \frac{k_1^4 \operatorname{Cos}\varphi^4 \operatorname{Cos}\psi^4 \operatorname{Cos} 2\nu\varphi \operatorname{Cos} 2\nu'\psi\, d\varphi\, d\psi}{(1-k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2)^3}\\ &+ \ldots\end{aligned}$$

Innan vi gå att vidare utveckla termerna i detta uttryck, skola vi anföra följande numeriska värden får Q-koefficienterna

$$Q_1^{(1)} = 1$$
$$Q_2^{(1)} = 2$$

$$\overline{Q_1^{(2)}} = 1$$
$$Q_2^{(2)} = 14$$
$$Q_3^{(2)} = 36$$
$$Q_4^{(2)} = 256$$

$$\overline{Q_1^{(3)}} = 1$$
$$Q_2^{(3)} = 62$$
$$Q_3^{(3)} = 540$$
$$Q_4^{(3)} = 1560$$
$$Q_5^{(3)} = 1160$$
$$\underline{Q_6^{(3)}} = 720$$

Då $\nu = 0$ har man dessutom

$$E(o) = \frac{4}{\pi^2}\int_0^\pi\int_0^\pi \frac{k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 \operatorname{Cos}2r\varphi \operatorname{Cos}2r'\psi \, d\varphi \, d\psi}{1 - k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2}$$

§ 5.

Vi vända oss nu till utvecklingen af funktionerna

(34) $$V(n) = \frac{4}{\pi^2}\int_0^\pi\int_0^\pi \frac{k_1^{2n} \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^{2n} \operatorname{Cos}2r\varphi \operatorname{Cos}2r'\psi \, d\varphi \, d\psi}{(1 - k_1^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2)^{n+1}}$$

och kunna dervid följa tvenne vägar. På den ena utvecklas nämnaren i en konvergent serie, hvarefter de bestämda dubbelintegralen omedelbart låta angifva sig. Det vore härvid dock ingalunda fördelaktigt att företaga en sådan utveckling efter potenserna af k_1^2 ehuru denna i analytiskt hänseende blefve den enklaste. Man skulle dessutom härigenom ej vinna annat än serieutvecklingar, som vore identiska med dem, från hvilka vi utgingo. Det är dock nu utförbart, att, sedan funktionerna $E(\nu)$ blifvit reducerade till en summa af $V(n)$-funktioner, ersätta dessa medelst andra, hvilka fortgå efter potenserna af k_2.

Substituera vi i eqvationen (32)

$$k_1^2 = \frac{4k_2}{(1+k_2)^2},$$

så erhålla vi

$$V(n) = \frac{4}{\pi^2}(1+k_2)^{2(n+1)}\int_0^\pi\int_0^\pi \frac{k_1^{2n} \operatorname{Cos}\varphi^{2n} \operatorname{Cos}\psi^{2n} \operatorname{Cos}2r\varphi \operatorname{Cos}2r'\varphi \, d\varphi \, d\psi}{(1+2k_2(1-2\operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2)+k_2^2)^{n+1}}$$

För att här underlätta utvecklingen efter potenserna af k_2, sätta vi för ett ögonblick

$$\operatorname{Cos}2T = 1 - 2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2,$$

då man erhåller

$$\{1 + 2\,k_2(1 - 2\,\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2) + k_2^2\}^{-1} = \frac{1}{1-k_2^2}\,\{1 + 2k_2\,\mathrm{Cos}\,2T + 2k_2^2\,\mathrm{Cos}\,4T + \ldots\}$$

$$\{1 + 2\,k_2(1 - 2\,\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2) + k_2^2\}^{-2} = \frac{1}{(1-k_2^2)^3}\{1 + k_2^2 + 2\,.\,2k_2\,\mathrm{Cos}\,2T + 2k_2^2(3 - k_2^2)\mathrm{Cos}\,4T + \ldots\}$$

och i allmänhet

$$\{1 + 2k_2(1 - 2\,\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2) + k_2^2\}^{-m} = \frac{1}{(1-k_2^2)^{2m-1}}\,\{L_0^{(m)} + 2k_2\,L_1^{(m)}\,\mathrm{Cos}\,2T + 2k_2^2\,L_2^{(m)}\,\mathrm{Cos}\,4T + \ldots\}$$

der

$$L_i^{(m)} = \frac{(i+1)\,(i+2)\,..\,(i+m-1)}{1\,.\,2\,.\,3\,..\,m-1}\left\{1 + \frac{m-1}{1}\,\frac{m-i-1}{i+1}\,k_2^2 + \frac{(m-1)\,(m-2)}{1\,.\,2}\,\frac{(m-i-1)(m-i-2)}{(i+1)\,(i+2)}\,k_2^4 + \ldots\right\}$$

På grund af dessa utvecklingar blifver nu

$$V(n) = k_1^{2n}\,\frac{(1+k_2)^{2(n+1)}}{(1-k_2^2)^{2n+1}}\,\{L_0^{(n+1)}\,U_0^{(n)} + 2k_2\,L_0^{(n+1)}\,U_1^{(n)} + \ldots\} \tag{35}$$

der vi betecknat

$$U_i^{(n)} = \frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi \mathrm{Cos}\,\varphi^{2n}\,\mathrm{Cos}\,\psi^{2n}\,\mathrm{Cos}\,2r\varphi\,\mathrm{Cos}\,2r'\psi\,\mathrm{Cos}\,2i\,T\,d\varphi\,d\psi$$

För $E(0)$ gälla en särskild utveckling, nämnligen

$$E(0) = k_1^2\,\frac{(1+k_2)^2}{1-k_2^2}\,\{U_0^{(1)} + 2k_2\,U_1^{(1)} + 2k_2^2\,U_2^{(1)} + \ldots\}$$

hvarest $U_i^{(1)}$ har samma betydelse, som ofvan.

För att slutligen beräkna dessa med $U_i^{(n)}$ betecknade koefficienter, hvilka endast äro funktioner af hela tal, återstår oss att angifva Cos $2iT$ såsom funktion af φ och ψ. Antages denna funktion utvecklad efter potenserna af $\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2$, så är densamma lätt funnen.

Man har nämnligen

$$\mathrm{Sin}\,T = \mathrm{Cos}\,\varphi\,\mathrm{Cos}\,\psi,$$

följaktligen är den ifrågavarande utvecklingen identisk med utvecklingen af Cos $2iT$ efter potenserna af Sin T. I följd häraf befinnes

$$\mathrm{Cos}\,2iT = 1 - \frac{(2i)^2}{2}\mathrm{Cos}\,\varphi^2\mathrm{Cos}\,\psi^2 + \frac{(2i)^2[(2i)^2-2^2]}{2\,.\,3\,.\,4}\mathrm{Cos}\,\varphi^4\,\mathrm{Cos}\,\psi^4 - \frac{(2i)^2[(2i)^2-2^2][(2i)^2-4^2]}{2\,.\,3\,.\,4\,.\,5\,.\,6}\mathrm{Cos}\,\varphi^6\mathrm{Cos}\,\psi^6 + \ldots$$

Med stöd af denna utveckling erhålles, i det A-koefficienterna bibehålla sin betydelse från § 2

$$U_i^{(n)} = A_r^{(n)}A_{r'}^{(n)} - \frac{(2i)^2}{2}\,A_r^{(n+1)}A_{r'}^{(n+1)} + \frac{(2i)^2\,[(2i)^2-2^2]}{2\,.\,3\,.\,4}\,A_r^{(n+2)}A_{r'}^{(n+2)} - \ldots$$

Såsom denna formel utvisar äro U-koefficienterna funktioner af fyra hela tal, nämnligen af n, i, r och r'; för att beteckna detta beroende skola vi, der sådant är behöfligt, skrifva

$$U_i^{(n)}(r, r')$$

Detta beteckningssätt blifver oss af nytta, emedan en ganska enkel och användbar relation eger rum emellan sådana koefficienter, hvilka höra till olika n, r och r'-värden. Denna relation finner man på följande sätt.

Af ofvanstående, i form af en dubbelintegral gifna uttryck för $U_i^{(n)}$, finner man att detsamma äfven kan ställas som följer

$$U_i\ (r, r') = \frac{4}{\pi^2} \int_0^\pi \int_0^\pi \operatorname{Cos} \varphi^{2n-2} \operatorname{Cos} \psi^{2n-2} \left(\frac{1}{2} + \frac{1}{2} \operatorname{Cos} 2\varphi\right)\left(\frac{1}{2} + \frac{1}{2} \operatorname{Cos} 2\psi\right) \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi \operatorname{Cos} 2iT d\varphi\, d\psi$$

hvaraf följande eqvation med lätthet härledes

$$U_i^{(n)}(r, r') = \frac{1}{4} U_i^{(n-1)}(r, r') + \frac{1}{8}\{U_i^{(n-1)}(r-1, r') + U_i^{(n-1)}(r+1, r') + U_i^{(n-1)}(r, r'-1) + U_i^{(n-1)}(r, r'+1)\}$$
$$+ \frac{1}{16}\{U_i^{(n-1)}(r-1, r'-1) + U_i^{(n-1)}(r-1, r'+1) + U_i^{(n-1)}(r+1, r'-1) + U_i^{(n-1)}(r+1, r'+1)\}$$

Medelst denna formel kunna alla U-koefficienter beqvämt och säkert beräknas, endast man genom direkt räkning funnit koefficienterna $U_i^{(n)}(r, r')$. Men emedan ifrågavarande koefficienter dessutom äro symmetriska funktioner af r och r', så kunna dessa indices förvexlas med hvarandra, så att

$$U_i^{(n)}(r, r') = U_i^{(n)}(r', r);$$

man har af denna anledning endast att beräkna ett inskränktare antal koefficienter än i annan händelse hade varit fallet

En annan relation emellan olika U-koefficienter vinnes på grund af identiteten

$$\operatorname{Cos} \varphi^2 \operatorname{Cos} \psi^2 = \tfrac{1}{2}(1 - \operatorname{Cos} 2T);$$

man erhåller efter substitution häraf under integraltecknet

$$U_i^{(n)}(r, r') = \tfrac{1}{2} U_i^{(n-1)}(r, r') - \tfrac{1}{4} U_{i-1}^{(n-1)}(r, r') - \tfrac{1}{4} U_{i+1}^{(n-1)}(r, r')$$

§ 6.

Den andra vägen, på hvilken $V(n)$ kan erhållas, är längre än den i föregående § följda, hvarföre vi endast skola antyda densamma; sålunda betrakta vi här förnämnligast funktionen

$$V(o) = \frac{4}{\pi^2} \int_0^\pi \int_0^\pi \frac{\operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi\, d\varphi\, d\psi}{1 - k_1^2 \operatorname{Cos} \varphi^2 \operatorname{Cos} \psi^2}$$

Enligt en bekant formel har man emellertid

$$\int_0^\pi \frac{\operatorname{Cos} 2r\varphi\, d\varphi}{1 - \lambda \operatorname{Cos} 2\varphi} = \frac{\pi}{\sqrt{1-\lambda^2}} \left\{\frac{1 - \sqrt{1-\lambda^2}}{\lambda}\right\}^r$$

enligt hvilken ett integrationstecken kan bortskaffas i uttrycket för $V(o)$. Man kan nämnligen äfven skrifva detta uttryck sålunda

$$V(o) = \frac{4}{\pi^2} \int_0^\pi \frac{\operatorname{Cos} 2r'\psi\, d\psi}{1 - \frac{1}{2} k_1^2 \operatorname{Cos} \psi^2} \int_0^\pi \frac{\operatorname{Cos} 2r\varphi\, d\varphi}{1 - \dfrac{\frac{1}{2} k_1^2 \operatorname{Cos} \psi^2}{1 - \frac{1}{2} k_1^2 \operatorname{Cos} \psi^2} \operatorname{Cos} 2\varphi};$$

enligt den angifna integralformeln blifver således, om i densamma λ utbytes mot

$$\frac{\frac{1}{2} k_1^2 \operatorname{Cos} \psi^2}{1 - \frac{1}{2} k_1^2 \operatorname{Cos} \psi^2};$$

$$V(o) = \frac{4}{\pi}\int\limits_0^{\pi} \frac{\operatorname{Cos} 2r'\psi\, d\psi}{1 - \frac{1}{2}k^2{}_1 \operatorname{Cos}\psi^2} \frac{1}{\sqrt{1 - \left(\frac{\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}{1 - \frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}\right)^2}} \left\{\frac{1 - \sqrt{1 - \left(\frac{\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}{1 - \frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}\right)^2}}{\frac{\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}{1 - \frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}}\right\}^r$$

$$= \frac{4}{\pi}\int\limits_0^{\pi} \frac{\operatorname{Cos} 2r'\psi\, d\psi}{\sqrt{1 - k_1^2 \operatorname{Cos}\psi^2}} \left\{\frac{1 - \frac{1}{2}k_1^2 \operatorname{Cos}\psi^2 - \sqrt{1 - k_1^2 \operatorname{Cos}\psi^2}}{\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}\right\}^r$$

eller om man insätter $\frac{\pi}{2} - \psi$ i st. för ψ,

$$V(o) = \frac{8}{\pi} \operatorname{Cos} r'\pi \int\limits_0^{\frac{\pi}{2}} \frac{\operatorname{Cos} 2r'\psi\, d\psi}{\sqrt{1 - k_1^2 \operatorname{Sin}\psi^2}} \left\{\frac{1 - \frac{1}{2}k_1^2 \operatorname{Sin}\psi^2 - \sqrt{1 - k_1^2 \operatorname{Sin}\psi^2}}{\frac{1}{2}k_1^2 \operatorname{Sin}\psi^2}\right\}^r$$

Multiplicerar man täljare och nämnare i den sista faktorn under integraltecknet med

$$1 + \sqrt{1 - k_1^2 \operatorname{Sin}\psi^2},$$

så erhåller man

$$V(o) = \frac{8}{\pi} \operatorname{Cos} r'\pi \int\limits_0^{\frac{\pi}{2}} \frac{\operatorname{Cos} 2r'\psi\, d\psi}{\sqrt{1 - k_1^2 \operatorname{Sin}\psi^2}} \left\{\frac{1 - \sqrt{1 - k_1^2 \operatorname{Sin}\psi^2}}{1 + \sqrt{1 - k_1^2 \operatorname{Sin}\psi^2}}\right\}^r$$

Värdet af denna integral erhålles enklast efter införandet af elliptiska funktioner i st. för variabeln ψ.

Sättes nämnligen

$$\psi = am\, \frac{2K_1}{\pi} u_1,\ mod\, k_1,$$

så blifver

$$V(o) = \frac{2K_1}{\pi} \cdot \frac{8}{\pi} \operatorname{Cos} r'\pi \int\limits_0^{\frac{\pi}{2}} \operatorname{Cos} 2r'\, am \frac{2K_1}{\pi} u_1 \left\{\frac{1 - \Delta\, am \frac{2K_1}{\pi} u_1}{1 + \Delta\, am \frac{2K}{\pi} u_1}\right\}^r$$

För att utföra integrationen utveckla vi funktionen under integraltecknet efter argumentet u_1. Dervid kommer följande formel till användning, hvilken bevisas i läran om de elliptiska funktionerna,

$$\operatorname{Log} \frac{1 - \Delta\, am \frac{2K_1}{\pi} u_1}{1 + \Delta\, am \frac{2K_1}{\pi} u_1} = \operatorname{Log} 4q^2 \operatorname{Sin} u_1^2 + 8 \left\{\frac{1}{2} \frac{q^4}{1 + q^4} \operatorname{Cos} 2u_1 + \frac{1}{4} \frac{q^8}{1 + q^8} \operatorname{Cos} 4u_1 + \ldots\right\}$$

i det q hörer till modylen k, d. v. s. bestämmes ur följande eqvationer

$$q = e^{-\pi\frac{K'}{K}}$$

$$K = \int\limits_0^{\frac{1}{2}\pi} \frac{d\psi}{\sqrt{1 - k^2 \operatorname{Sin}\psi^2}}$$

$$K' = \int_0^{\frac{1}{2}\pi} \frac{d\psi}{\sqrt{1 - k'^2 \operatorname{Sin}\psi^2}}$$

$$k^2 + k'^2 = 1$$

Man har således

$$\left\{\frac{1 - \varDelta am \frac{2K_1}{\pi} u_1}{1 + \varDelta am \frac{2K_1}{\pi} u_1}\right\}^r = (2q)^{2r} \operatorname{Sin} u_1^{2r}\, e^{8r\left\{\frac{1}{2}\frac{q^4}{1+q^4} \operatorname{Cos} 2u_1 + \frac{1}{4}\frac{q^8}{1+q^8} \operatorname{Cos} 4u_1 + \ldots\right\}}$$

Vidare har man enligt formeln (I) § 1

$$\operatorname{Cos} 2r' \, am \frac{2K_1}{\pi} u_1 = \Gamma_0^{(2r')}(k_1) + 2\Gamma_2^{(2r')}(k_1) \operatorname{Cos} 2u_1 + 2\Gamma_4^{(2r')}(k_1) \operatorname{Cos} 4u_1 + \ldots$$

Med hänseende till dessa utvecklingar erhåller man

$$V(o) = \frac{8}{\pi}\frac{2K_1}{\pi} \operatorname{Cos} r'\pi \,(2q)^{2r} \int_0^{\frac{1}{2}\pi} \{\Gamma_0^{(2r')}(k_1) + 2\Gamma_2^{(2r')}(k_1) \operatorname{Cos} 2u_1 + \ldots\} \operatorname{Sin} u_1^{2r}\, e^{8r\left\{\frac{1}{2}\frac{q^4}{1+q^4} \operatorname{Cos} 2u_1 + \ldots\right\}} du_1$$

I anseende dertill att q^4 i alla de händelser, som kunna komma i fråga har ett serdeles litet värde, kan den sista faktorn i detta uttryck utvecklas i en serie, fortlöpande efter Cosinerna för multiplerna af $2u_1$, eller ock kan denna faktor, i händelse det hela talet r ej är alltför stort, utvecklas efter potenserna af en qvantitet, hvars storleksordning är $4rq^4$. Med antagandet af det k-värde, som i § 2 blifvit angifvet, befanns

$$\operatorname{Log} q = 9.4034336,$$

Således

$$\operatorname{Log} 4q^4 = 8.2157244$$

Om således r ej är större än 10, så är produkten $4rq^4$ nog liten för ernåendet af tillräcklig beqvämlighet vid användandet af en sådan potensserie. I alla händelser förefinnes här hvarken någon svårighet vid utvecklingen af den sista faktorn, eller, sedan denna utveckling blifvit utförd, vid integrationen af de olika termerna.

Bortlemnar man alla potenser af $4rq^4$, som öfverstiga den andra, så erhåller man detta approximativa uttryck

$$V(o) = \frac{8}{\pi}\frac{2K_1}{\pi} \operatorname{Cos} r\pi \,(2q)^{2r} \int_0^{\frac{1}{2}\pi} \{\ldots 2\Gamma_{2r'-2}^{(2r')}(k_1) \operatorname{Cos}(2r'-2)\,u_1 + 2\Gamma_{2r'}^{(2r')}(k_1) \operatorname{Cos} 2r\,u_1 + \ldots\}$$
$$\left\{1 + \frac{(4rq^4)^2}{4} + \frac{4rq^4}{1+q^4} \operatorname{Cos} 2u_1 + \left(\frac{(4rq^4)^2}{4} + 2rq^8\right) \operatorname{Cos} 4u_1\right\} \operatorname{Sin} u_1^{2r} du_1$$
$$= 2\frac{2K_1}{\pi} \operatorname{Cos} r\pi \,(2q)^{2r} \left\{1 + \frac{(4rq^4)^2}{4}\right\} \{\ldots 2A_{r'-1}^{(r)}\Gamma_{2r'-2}^{(2r')}(k_1) + 2A_{r'}^{(r)}\Gamma_{2r'}^{(2r')}(k_1) + 2A_{r'+1}^{(r)}\Gamma_{2r'+2}^{(2r')}(k_1) + \ldots\}$$
$$+ 2\frac{2K_1}{\pi} \operatorname{Cos} r\pi \,(2q)^{2r} \frac{4rq^4}{1+q^4}\{\ldots [A_{r'-2}^{(r)} + A_{r'}^{(r)}]\,\Gamma_{2r'-2}^{(2r')}(k_1) + [A_{r'-1}^{(r)} + A_{r'+1}^{(r)}]\,\Gamma_{2r'}^{(2r')}(k_1) + \ldots\}$$
$$+ 2\frac{2K_1}{\pi} \operatorname{Cos} r\pi \,(2q)^{2r} \left[\frac{(4rq^4)^2}{4} + 2rq^8\right]\{\ldots [A_{r'-3}^{(r)} + A_{r'+1}^{(r)}]\,\Gamma_{2r'-2}^{(2r')}(k_1) + [A_{r'-2}^{(r)} + A_{r'+2}^{(r)}]\,\Gamma_{2r'}^{(2r')}(k_1) + \ldots\}$$

Äro dessa termer ej tillräckliga att gifva resultatet med tillbörlig noggrannhet, så förfar man enklast i det man enligt mekaniska methoder verkställer utvecklingarne före integrationen.

Det approximativa resultatet visar emellertid att funktionen $V(o)$ är af samma storleksordning som $(2q)^{2r}$ förutsatt att $r > r'$. Men eger denna olikhet icke rum, utan är tvertom $r' > r$, så är äfven $V(o)$ af en högre storleksordning; ty i detta fall är $A_{r'}^{(r)} = 0$, och äfvenså alla efterföljande $A_{r'}^{(r)}$-koefficienter. De Γ-koefficienter åter, som föregå $\Gamma_{2r}^{(2r')}(k_1)$ äro multiplicerade med potenser af k_2, hvaraf följer att äfven resultatet är multipliceradt med en potens af denna modyl.

Det återstår oss ännu att antyda, huruledes de allmännare funktionerna $V(n)$ (eqvationen (34)) kunna underkastas en liknande behandling. För att verkställa den första integrationen böra $\mathrm{Cos}\,\varphi^{2n}$ och $\mathrm{Cos}\,\psi^{2n}$ upplösas i följder af linneera cosinustermer, hvarefter $V(n)$ blifver uttryckt medelst en ändlig serie, der termerna hafva formen

$$Q(n, m) = \frac{4}{\pi^2} k_1^{2n} \int_0^\pi \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \;\; \mathrm{Cos}\, 2m'\psi \, d\varphi \, d\psi}{\{1 - k_1^2 \;\mathrm{Cos}\,\varphi^2 \;\mathrm{Cos}\,\psi^2\}^{n+1}}$$

eller

$$Q(n, m) = \frac{4}{\pi^2} k_1^{2n} \int_0^\pi \frac{\mathrm{Cos}\, 2m'\psi \, d\psi}{\{1 - \frac{1}{2} k_1^2 \;\mathrm{Cos}\,\psi^2\}^{n+1}} \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \, d\varphi}{\left\{1 - \frac{\frac{1}{2} k_1^2 \;\mathrm{Cos}\,\psi^2}{1 - \frac{1}{2} k_1^2 \;\mathrm{Cos}\,\psi^2} \;\mathrm{Cos}\, 2\varphi\right\}^{n+1}}$$

Vi sätta åter

$$\lambda = \frac{\frac{1}{2} k_1^2 \;\mathrm{Cos}\,\psi^2}{1 - \frac{1}{2} k_1^2 \;\mathrm{Cos}\,\psi^2}$$

och beteckna tills vidare

$$P(n, \lambda) = \frac{1}{\pi} \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \, d\varphi}{\{1 - \lambda \;\mathrm{Cos}\, 2\varphi\}^n}$$

der $P(n, \lambda)$ är en ännu obekant funktion, för hvilken vi dock redan känna ett speciellt värde nämnligen

$$P(1, \lambda) = \frac{1}{\sqrt{1 - \lambda^2}} \left\{\frac{1 - \sqrt{1 - \lambda^2}}{\lambda}\right\}^m$$

Genom differentiation af $P(n, \lambda)$ erhålles

$$\frac{d P(n, \lambda)}{d\lambda} = \frac{n}{\pi} \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \, d\varphi}{\{1 - \lambda \;\mathrm{Cos}\, 2\varphi\}^{n+1}} \;\mathrm{Cos}\, 2\varphi,$$

eller, emedan

$$\mathrm{Cos}\, 2\varphi = \frac{1 - (1 - \lambda \;\mathrm{Cos}\, 2\varphi)}{\lambda},$$

$$\lambda \frac{d P(n, \lambda)}{d\lambda} = -\frac{n}{\pi} \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \, d\varphi}{\{1 - \lambda \;\mathrm{Cos}\, 2\varphi\}^n} + \frac{n}{\pi} \int_0^\pi \frac{\mathrm{Cos}\, 2m\varphi \, d\varphi}{\{1 - \lambda \;\mathrm{Cos}\, 2\varphi\}^{n+1}}$$

d. v. s.

$$P(n+1,\lambda) = P(n,\lambda) + \frac{\lambda}{n}\frac{dP(n,\lambda)}{d\lambda}$$

Det ofvanstående uttrycket för $P(1,\lambda)$ gifver oss

$$\frac{dP(1,\lambda)}{d\lambda} = \frac{\lambda}{\{1-\lambda^2\}^{\frac{3}{2}}}\left\{\frac{1-\sqrt{1-\lambda^2}}{\lambda}\right\}^m + \frac{m}{\sqrt{1-\lambda^2}}\left\{\frac{1-\sqrt{1-\lambda^2}}{\lambda}\right\}^{m-1}\frac{1-\sqrt{1-\lambda^2}}{\lambda^2\sqrt{1-\lambda^2}}$$

$$= \frac{\lambda}{\{1-\lambda^2\}^{\frac{3}{2}}}\left\{\frac{1-\sqrt{1-\lambda^2}}{\lambda}\right\}^m\left\{1+\frac{m\sqrt{1-\lambda^2}}{\lambda^2}\right\}$$

hvarmed vidare erhålles

$$P(2,\lambda) = \frac{1}{\{1-\lambda^2\}^{\frac{3}{2}}}\left\{\frac{1-\sqrt{1-\lambda^2}}{\lambda}\right\}^m\left\{1+m\sqrt{1-\lambda^2}\right\}$$

Genom fortsatta differentiationer skulle man successivt finna alla erforderliga $P(n,\lambda)$-funktioner, men desamma kunna äfven erhållas efter införandet af en hjelpqvantitet α, gifven genom eqvationer

$$\frac{2\alpha}{1+\alpha^2} = \lambda\,;$$

funktionen $P(n,\lambda)$ blifver då gifven medelst en bestämd integral, hvars värde omedelbart är bekant. Härmed skola vi dock icke uppehålla oss, utan endast införa det redan funna värdet för $P(2,\lambda)$ i uttrycket för $Q(1,m)$. Detta uttryck öfvergår då i följande, der äfven λ blifvit utbytt mot $\frac{\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}{1-\frac{1}{2}k_1^2 \operatorname{Cos}\psi^2}$

$$Q(1,m) = \frac{4}{\pi}k_1^{2n}\int_0^\pi \frac{\operatorname{Cos}2m'\psi\, d\psi}{(1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2)^3\left(1-\left(\frac{\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}{1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}\right)^2\right)^{\frac{3}{2}}}\left\{\frac{1-\sqrt{1-\frac{(\frac{1}{2}k_1^2\operatorname{Cos}\psi^2)^2}{(1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2)^2}}}{\frac{\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}{1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}}\right\}^m\left\{1+m\sqrt{1-\frac{(\frac{1}{2}k_1^2\operatorname{Cos}\psi^2)^2}{(1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2)^2}}\right\}$$

$$= \frac{4}{\pi}k_1^{2n}\int_0^\pi \frac{\operatorname{Cos}2m'\psi\, d\psi}{\{1-k_1^2\operatorname{Cos}\psi^2\}^{\frac{3}{2}}}\left\{\frac{1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2-\sqrt{1-k_1^2\operatorname{Cos}\psi^2}}{\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}\right\}^m\left\{\frac{1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2+m\sqrt{1-k_1^2\operatorname{Cos}\psi^2}}{1-\frac{1}{2}k_1^2\operatorname{Cos}\psi^2}\right\}$$

Medelst införandet af elliptiska funktioner och derpå följande utveckling efter argumentet kan denna formel på liknande sätt göras tillgänglig för numerisk räkning, som det, vi använde vid funktionen $V(o)$.

§ 7.

De föregående utvecklingarne af $E(\nu)$ äro ej användbara, om det hela talet ν erhåller negativa värden, i hvilka händelser tvertom ett alldeles annat förfarande måste tillämpas. — Vi utgå åter från eqvationen (29), der vi nu hafva

$$\frac{1}{2}\Omega(-\nu) = \frac{1}{1^{2\nu}}\eta + \frac{1}{2^{2\nu}}\eta^2 + \ldots$$

Denna serie kan dock lätt summeras medelst en bestämd integral. Man har nämnligen, i det med Γ betecknas den vanliga Legenderska gammafunktionen

$$\frac{1}{s^{2\nu}} = \frac{1}{\Gamma(2\nu)}\int_0^\infty x^{2\nu-1}\, e^{-sx}\, dx$$

och med stöd häraf

$$\frac{1}{2}\,\Omega(-\nu) = \frac{1}{\Gamma(2\nu)}\int_0^\infty x^{2\nu-1}\, dx\,\{\eta e^{-x} + \eta^2 e^{-2x} + \ldots\}$$

eller

$$\frac{1}{2}\,\Omega(-\nu) = \frac{\eta}{\Gamma(2\nu)}\int_0^\infty \frac{x^{2\nu-1}\, e^{-x} dx}{1-\eta e^{-x}}$$

Insättes detta uttryck, äfvensom värdet för η i eqvationen (29), så erhålles

$$E(-\nu) = \frac{4}{\pi^2}\,\frac{1}{\Gamma(2\nu)}\int_0^\infty x^{2\nu-1}\, e^{-x}\, dx \int_0^\pi\!\!\int_0^\pi \frac{k_1{}^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi\, d\varphi\, d\psi}{1 - k_1{}^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 e^{-x}},$$

eller, om i nämnaren k_1 utbytes mot k_2,

$$E(-\nu) = \frac{4}{\pi^2}\,\frac{(1+k_2)^2}{\Gamma(2\nu)}\int_0^\infty x^{2\nu-1} e^{-x}\, dx \int_0^\pi\!\!\int_0^\pi \frac{k_1{}^2 \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi\, d\varphi\, d\psi}{1 + 2k_2(1 - 2\operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 e^{-x}) + k_2{}^2}$$

Utvecklingen af denna formel sker analogt med härledningen af formeln (33); man erhåller dervid ett resultat af följande form

(36) $$E(-\nu) = k_1^2\,\frac{(1+k_2)^2}{1-k_2{}^2}\{U_0 - 2U_1 k_2 + 2U_2 k_2^2 - \ldots\}$$

der U-koefficienterna, hvilka till åtskillnad från de föregående ej blifvit försedde med någon öfre index, äro gifna medelst detta uttryck

$$U_i = \frac{4}{\pi^2}\,\frac{1}{\Gamma(2\nu)}\int_0^\infty x^{2\nu-1}\, e^{-x}\, dx \int_0^\pi\!\!\int_0^\pi \operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi\, d\varphi\, d\psi \operatorname{Cos} 2iT$$

der

$$\operatorname{Cos} 2iT = 1 - \frac{(2i)^2}{2}\operatorname{Cos}\varphi^2 \operatorname{Cos}\psi^2 e^{-x} + \frac{(2i)^2[(2i)^2-2^2]}{2.3.4}\operatorname{Cos}\varphi^4 \operatorname{Cos}\psi^4 e^{-2x} - \ldots.$$

Sedan integrationerna blifvit utförda, erhåller man

$$U_i = \frac{A_r^{(1)} A_{r'}^{(1)}}{1^{2\nu}} - \frac{(2i)^2}{2}\,\frac{A_r^{(2)} A_{r'}^{(2)}}{2^{2\nu}} + \frac{(2i)^2[(2i)^2-2^2]}{2.3.4}\,\frac{A_r^{(3)} A_{r'}^{(3)}}{3^{2\nu}} - \ldots.$$

§ 8.

Vi återgå till eqvationen (26), och sätta deri $s=o$, hvarefter densamma kan sättas under följande form

$$T(\nu) = -\frac{1}{2}\frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi \operatorname{Cos} 2r\varphi \ \operatorname{Cos} 2r'\psi \ d\varphi \, d\psi \int_0^{\frac{\pi}{2}} \sum_0^{h} \frac{(2n+1)\,\alpha^{(h)}_{2n+1}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \ \operatorname{Cos}(2n+1)t \ \Omega(\nu, t) dt,$$

der vi bortlemnat index s samt begagnat oss af beteckningarne

$$\Omega(\nu, t) = 2 \,.\, 1^{2\nu} \eta \ \operatorname{Cos} 2t + 2 \,.\, 2^{2\nu} \ \eta^2 \ \operatorname{Cos} 4t + \ . \ .$$

$$\eta = -k_1^2 \ \operatorname{Cos}\varphi^2 \ \operatorname{Cos}\psi^2$$

Insätta vi här

$$\operatorname{Cos}(2n+1)\,t = \tfrac{1}{2}\left(e^{\sqrt{-1}(2n+1)t} + e^{-\sqrt{-1}(2n+1)t}\right)$$

samt det uttryck för $\Omega(\nu, t)$, hvilket är angifvet i eqvationen (30), så blifver

$$T(\nu) = -\frac{1}{2}\frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi \, d\varphi \, d\psi \int_0^{\frac{\pi}{2}} \sum_0^{h} \frac{(2n+1)\,\alpha^{(h)}_{2n+1}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \frac{1}{2}\left(e^{\sqrt{-1}(2n+1)t} + e^{-\sqrt{-1}(2n+1)t}\right) \left\{ \begin{matrix} Q_1^{(\nu)} \frac{\eta\, e^{\sqrt{-1}2t}}{(1-\eta e^{\sqrt{-1}2t})^2} + \ . \ . \\ + Q_1^{(\nu)} \frac{\eta e^{-\sqrt{-1}2t}}{(1-\eta e^{-\sqrt{-1}2t})^2} + \ . \ . \end{matrix} \right\} dt$$

Sättes slutligen

$$x = e^{\sqrt{-1}\,t},$$

så erhålla vi $T(\nu)$ under följande form

$$T(\nu) = \sqrt{-1}\,\frac{1}{2}\frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi \operatorname{Cos} 2r\varphi \ \operatorname{Cos} 2r'\psi \ d\varphi \ d\psi \int_1^{\sqrt{-1}} \sum_0^{h} \frac{(2n+1)\alpha^{(h)}_{2n+1}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \frac{1}{2}\left(x^{2n} + x^{-2n-2}\right) \left\{ \begin{matrix} Q_1^{(\nu)} \frac{\eta x^2}{(1-\eta x^2)^2} + Q_2^{(\nu)} \frac{\eta^2 x^4}{(1-\eta\, x^3)^3} + . \ . \\ + Q_1^{(\nu)} \frac{\eta x^{-2}}{(1-\eta x^{-2})^2} + Q_2^{(\nu)} \frac{\eta^2 x^{-4}}{(1-\eta x^{-2})^3} + . \ . \end{matrix} \right\} dt$$

Den allmänna formen för de termer, af hvilka detta uttryck är sammansatt, angifves medelst följande formel, der vi med f och g beteckna tvenne hela tal, af hvilka g äfven antager negativa värden,

$$\tau(f, g) = (-)^f \sqrt{-1}\,\frac{1}{2}\frac{4}{\pi^2}\int_0^\pi\!\!\int_0^\pi k_1^{2f} \operatorname{Cos}\varphi^{2f} \operatorname{Cos}\psi^{2f} \operatorname{Cos} 2r\varphi \operatorname{Cos} 2r'\psi \, d\varphi \, d\psi \, \frac{1}{2}\int_0^{\sqrt{-1}} \left\{ \frac{x^{2g}}{(1-\eta\, x^2)^{f+1}} + \frac{x^{-2g-2}}{(1-\eta x^{-2})^{f+1}} \right\} dx$$

Här kommer det åter i främsta rummet an på att utveckla ett uttryck af formen

$$\sigma(f, g) = (-)^f \frac{1}{2} \sqrt{-1} \int_1^{\sqrt{-1}} \left\{ \frac{x^{2g}}{(1-\eta x^2)^{f+1}} + \frac{x^{-2g-2}}{(1-\eta x^{-2})^{f+1}} \right\} dx \ ;$$

Sedan denna utveckling blifvit verkställd och $\tau(f, g)$ efter substitution af värdet för η uppställd såsom en funktion af $\operatorname{Cos}\varphi^2 \ \operatorname{Cos}\psi^2$, erhålles $\tau(f, g)$ ur formeln

$$\tau(f, g) = \frac{1}{2}\frac{4}{\pi^2} k_1^{2f} \int_0^\pi\!\!\int_0^\pi \sigma(f, g) \ \operatorname{Cos}\varphi^{2f} \ \operatorname{Cos}\psi^{2f} \ \operatorname{Cos} 2r\varphi \ \operatorname{Cos} 2r'\psi \ d\varphi \ d\psi$$

Man skulle visserligen kunna utveckla funktionen $\tau(f, g)$ efter potenserna af k_2 på samma sätt som funktionerna $E(\nu)$ och $V(\nu)$ i det föregående; men denna utveckling blefve här mindre fördelaktig, emedan x^2 varierar emellan gränserna 1 och -1, koefficienterna i denna utveckling skulle blifva vida större än de som vi förut betecknat med $U_i^{(n)}$. Deremot kunna vi införa en medelst eqvationen

$$k_1^2 = \frac{2\gamma}{1+\gamma^2}$$

bestämd storhet och utveckla $\tau(f,g)$ efter potenserna af denna.

Sedan värdet för η blifvit insatt och γ substituerad på grund af sistanförda eqvation, antager $\tau(f,g)$ följande form

$$\sigma(f,g) = (-)^f \tfrac{1}{2}\sqrt{-1}\,(1+\gamma^2)^{f+1}\int_1^{\sqrt{-1}} \left\{\frac{x^{2g}}{[1+2\gamma\,\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2 x^2+\gamma^2]^{f+1}} + \frac{x^{-2g-2}}{[1+2\gamma\,\mathrm{Cos}\,\varphi^2\,\mathrm{Cos}\,\psi^2 x^{+2}+\gamma^2]^{f+1}}\right\}dx$$

För att utveckla denna formel efter potenserna af γ sätta vi

$$\mathrm{Cos}\,T = \mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^2,\quad \mathrm{Cos}\,T_1 = \mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^{-2}$$

hvarefter erhålles

$$\sigma(f,g) = (-)^f\tfrac{1}{2}\sqrt{-1}\,\frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}}\int_1^{\sqrt{-1}}\{L_0^{(f+1)}[x^{2g}+x^{-2g-2}] - 2\gamma L_1^{(f+1)}[x^{2g}\,\mathrm{Cos}\,T + x^{-2g-2}\,\mathrm{Cos}\,T_1] + \ldots\}dx$$

der koefficienterna L_i äro bildade på samma sätt af γ, som i § 5 af k_2.

Nu är

$$\mathrm{Cos}\,iT = \tfrac{1}{2}\left\{[2\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^2]^i - \frac{i}{1}[2\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^2]^{i-2} + \frac{i(i-3)}{1.2}[2\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^2]^{i-4}\right.$$
$$\left. - \frac{i(i-4)(i-5)}{1.2.3}[2\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^2]^{i-6} + .\right\}$$

$$\mathrm{Cos}\,iT_1 = \tfrac{1}{2}\{[2\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2\,x^{-2}]^i - \ldots\}$$

samt

$$\int_1^{\sqrt{-1}}\{x^{2m}+x^{-2m-2}\}dx = 2\frac{(-1)^m}{2m+1}\sqrt{-1}\,;$$

och nu förefinnes ingen svårighet för uppställandet af $\sigma(f,g)$ såsom en funktion af $\mathrm{Cos}\,\varphi^2\;\mathrm{Cos}\,\psi^2$. Insättes detta värde i uttrycket för $\sigma(f,g)$, så antager detta formen

$$\tau(f,g) = \frac{1}{2}\,k_1^{2f}\,\frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}}\{L_0^{(f+1)}\,U_0(f,g,r,r') - 2\gamma\,L_1^{(f+1)}\,U_1(f,g,r,r') + \ldots\}$$

der U-koefficienternas betydelse framgår ur följande eqvation

$$U_i(f,g,r,r') = \frac{1}{2}\left\{2^i\,\frac{(-1)^{f+g+i}}{2(g+i)+1}\,A_r^{(f+i)}\,A_{r'}^{(f+i)} - \frac{i}{1}\,2^{i-2}\,\frac{(-1)^{f+g+i-2}}{2(g+i-2)+1}\,A_r^{(f+i-2)}\,A_{r'}^{(f+i-2)} + \ldots\right\}$$

Uttryckt såsom en summa af $\tau(f,g)$-funktioner, erhålla vi slutligen

$$(37)\qquad T(\nu) = Q_1^{(\nu)}\sum_0^h \frac{(2n+1)\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\{\tau(1,n+1)+\tau(1,-n)\}$$
$$+\,Q_2^{(\nu)}\sum_0^h \frac{(2n+1)\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\{\tau(2,n+2)+\tau(2,-(n-1))\}$$
$$+\ldots\ldots$$

§ 9.

De transformationer, genom hvilka vi i §§ 3—7 sökt att finna tjenliga räknemethoder för funktionerna $G(i,\ i')$, kunna till en del direkte användas på uttrycken (13) eller det deraf härledda uttrycket (14). Utgångspunkten för dessa transformationer bildar substitutionen af en passande serieutveckling för Cotg $n_{,}\mu\pi$. Med användande af den i § 3 anförda utvecklingen

$$\text{Cotg}\ n_{,}\mu\pi = \frac{2}{2n_{,}\mu\pi} - \frac{4}{\pi}\, 2n_{,}\mu S_2 - \frac{4}{\pi}(2n_{,}\mu)^3 S_4 - \ldots - \frac{4}{\pi}(2n_{,}\mu)^{2\nu-1} S_{2\nu}$$

$$- \frac{4}{\pi}(2n_{,}\mu)^{2\nu}\left\{\frac{1}{2^{2\nu}}\frac{2n_{,}\mu}{2^2-(2n_{,}\mu)^2} + \frac{1}{4^{2\nu}}\frac{2n_{,}\mu}{4^2-(2n_{,}\mu)^2} + \frac{1}{6^{2\nu}}\frac{2n_{,}\mu}{6^2-(2n_{,}\mu)^2} + \ldots\right\}$$

finna vi ur den sednare af eqvationerna (13):

$$\Phi^{(i)}_{i'} = -\frac{4i}{\mu\pi}\left\{\frac{1}{2^2}\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + \frac{1}{4^2}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + \frac{1}{6^2}\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

$$+ \frac{8i\mu}{\pi} S_2\left\{\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + \Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + \Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

$$+ \frac{8i\mu^3}{\pi} S_4\left\{2^2\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + 4^2\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + 6^2\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

$$+ \ldots\ldots$$

$$+ \frac{8i\mu^{2\nu-1}}{\pi} S_{2\nu}\left\{2^{2\nu-2}\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + 4^{2\nu-2}\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + 6^{2\nu-2}\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

$$+ \frac{1}{2^{2\nu}}\frac{8i\mu^{2\nu+1}}{\pi}\left\{\frac{2^{2\nu}\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'}}{2^2-(2\mu)^2} + \frac{4^{2\nu}\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'}}{2^2-(4\mu)^2} + \frac{6^{2\nu}\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'}}{2^2-(6\mu)^2} + \ldots\right\}$$

$$+ \frac{1}{4^{2\nu}}\frac{8i\mu^{2\nu+1}}{\pi}\left\{\frac{2^{2\nu}\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'}}{4^2-(2\mu)^2} + \frac{4^{2\nu}\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'}}{4^2-(4\mu)^2} + \frac{6^{2\nu}\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'}}{4^2-(6\mu)^2} + \ldots\right\}$$

$$+ \ldots\ldots$$

I analogi med beteckningssättet i § 3 skola vi äfven här sätta

$$(38)\qquad \begin{cases} E'(\nu) = 2^{2\nu}\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + 4^{2\nu}\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + 6^{2\nu}\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots \\ F'(\nu, p) = \dfrac{2^{2\nu}\,\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'}}{(2p)^2-(2\mu)^2} + \dfrac{4^{2\nu}\,\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'}}{(2p)^2-(4\mu)^2} + \dfrac{6^{2\nu}\,\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'}}{(2p)^2-(6\mu)^2} + \ldots \end{cases}$$

hvarmed erhålles

$$(39)\qquad \Phi^{(i)}_{i'} = -\frac{4i}{\mu\pi}E'(-1) + \frac{8i\mu}{\pi}S_2\,E'(0) + \frac{8i\mu^3}{\pi}S_4\,E'(1) + \ldots + \frac{8i\mu^{2\nu-1}}{\mu}S_{2\nu}\,E'(\nu-1)$$

$$+ \frac{1}{2^{2\nu}}\frac{8i\mu^{2\nu+1}}{\pi}F'(\nu, 1) + \frac{1}{4^{2\nu}}\frac{8i\mu^{2\nu+1}}{\pi}F'(\nu, 2) + \ldots$$

De anförda serierna för $E'(\nu)$ och $F'(\nu, p)$ äro lika litet som uttrycken (20) direkte användbara vid numeriska räkningar, men i likhet med dessa kunna äfven $E'(\nu)$ och $F'(\nu, p)$ underkastas väsentliga transformationer. Det kommer härvid i dagen, att man på sådan väg ernår i viss mon enklare resultat än de motsvarande vid utvecklingen af $G(i, i')$, hvarför den utveckling, vi nu följa, synes förtjena företräde.

I främsta rummet är det nödvändigt att angifva funktionen $F'(\nu, p)$ under formen af en bestämd integral; härvid följes alldeles samma väg, som ledde till eqv. (22). Man erhåller sålunda

$$(40)\quad F'(\nu,p) = -\frac{1}{\mu^2}\frac{\mu}{2p}\frac{1}{\operatorname{Sin}\frac{2p}{\mu}\frac{\pi}{2}}\int_0^{\frac{\pi}{2}} \operatorname{Cos}\frac{2p}{\mu}t\,.\,dt\,\{2^{2\nu}\,\Gamma_{2i}^{(2)}\,\Gamma_{2i'}^{(2)}\operatorname{Cos}2t - 4^{2\nu}\,\Gamma_{2i}^{(4)}\,\Gamma_{2i'}^{(4)}\operatorname{Cos}4t + \ldots\}$$

Medelst delvis integration härleder man ur detta uttryck rekursionsformeln

$$(41)\qquad F'(\nu,p) = -\frac{1}{\mu^2}E'(\nu-1) + \left(\frac{2p}{\mu}\right)^2 F'(\nu-1,p)$$

hvaraf vidare följer

$$(42)\quad F'(\nu,p) = -\frac{1}{\mu^2}\left\{E'(\nu-1) + \left(\frac{2p}{\mu}\right)^2 E'(\nu-2) + \ldots + \left(\frac{2p}{\mu}\right)^{2s-2} E'(\nu-s)\right\} + \left(\frac{2p}{\mu}\right)^{2s} F'(\nu-s,p)$$

Denna formel är i likhet med formeln (22) behäftad med den olägenhet att resultatet utgöres af ett aggregat af positiva och negativa termer, hvilkas summa är vida mindre än flere i densamma förekommande termer.

Ett med formeln (25) analogt uttryck finner man äfven för $F'(\nu,p)$, dervid samma substitution för $\operatorname{Cos}\frac{2p}{\mu}t$ kommer till användning, som i § 3. Med bibehållande af de i nämnda § begagnade beteckningarne blifver då

$$(43)\quad F'(\nu,p) = -\frac{1}{2\mu^2}\varkappa\left(2h+1,\frac{2p}{\mu}\frac{\pi}{2}\right)\left\{\frac{2^{2\nu+1}\beta_2^{(h)}\,\Gamma_{2i}^{(2)}\,\Gamma_{2i'}^{(2)}}{2^2-\left(\frac{2p}{\mu}\right)^2} - \frac{4^{2\nu+1}\beta_4^{(h)}\,\Gamma_{2i}^{(4)}\,\Gamma_{2i'}^{(4)}}{4^2-\left(\frac{2p}{\mu}\right)^2} + \frac{6^{2\nu+1}\beta_6^{(h)}\,\Gamma_{2i}^{(6)}\,\Gamma_{2i'}^{(6)}}{6^2-\left(\frac{2p}{\mu}\right)^2} - \ldots\right\}$$

$$-\frac{1}{2\mu^2}\varkappa\left(2h+1,\frac{2p}{\mu}\frac{\pi}{2}\right)T'(\nu,p)$$

der

$$(44)\quad T'(\nu,s) = \int_0^{\frac{\pi}{2}}\sum_0^h \frac{(2n+1)^{2s+1}\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\operatorname{Cos}(2n+1)t\,\{2^{2\nu}\,\Gamma_{2i}^{(2)}\,\Gamma_{2i'}^{(2)}\operatorname{Cos}2t - 4^{2\nu}\,\Gamma_{2i}^{(4)}\,\Gamma_{2i'}^{(4)}\operatorname{Cos}4t + \ldots\}$$

Genom delvis integration kan äfven denna formel omsättas i ett aggregat af termer, hvilka bestå af mera konvergenta serier; man finner i likhet med förut behandlade fall

$$(45)\qquad T'(\nu,0) = E'(\nu-1)\sum_0^h \frac{(2n+1)^2\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\operatorname{Sin}(2n+1)\frac{\pi}{2}$$

$$+\;E'(\nu-2)\sum_0^h \frac{(2n+1)^4\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\operatorname{Sin}(2n+1)\frac{\pi}{2}$$

$$\cdots\cdots$$

$$+\;E'(\nu-s)\sum_0^h \frac{(2n+1)^{2s}\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\operatorname{Sin}(2n+1)\frac{\pi}{2} + T'(\nu-s,s)$$

För den sista termen har man åter följande vid nummeriska räkningar lätt användbara uttryck

$$(46)\qquad T'(-(s-\nu),s) = \frac{\Gamma_{2i}^{(2)}\,\Gamma_{2i'}^{(2)}}{2^{2(s-\nu)}}\sum_0^h \frac{(2n+1)^{2s+1}\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\cdot\frac{(2n+1)\operatorname{Sin}(2n+1)\frac{\pi}{2}}{2^2-(2n+1)^2}$$

$$-\frac{\Gamma_{2i}^{(4)}\,\Gamma_{2i'}^{(4)}}{4^{2(s-\nu)}}\sum_0^h \frac{(2n+1)^{2s+1}\,\alpha_{2n+1}^{(h)}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\cdot\frac{(2n+1)\operatorname{Sin}(2n+1)\frac{\pi}{2}}{4^2-(2n+1)^2}$$

$$+\;\ldots\ldots$$

§ 10.

Den väg, hvilken följdes i §§ 4 och 5, skulle äfven leda till ändamålsenliga utvecklingar för funktionerna $E'(\nu)$; dessa kunna dock vida fördelaktigare finnas på helt andra grunder. Härtill är det nödigt att återgå till eqvationerne (I) och (II) i § 1. Insättes i den förra af eqvationerne II uttryck för $\operatorname{Cos} 2am\frac{2K}{\pi}x$, $\operatorname{Cos} 4am\frac{2K}{\pi}x$, o. s. v. i enlighet med den första af eqvationerna (I), så framgå omedelbart följande resultat

$$\begin{aligned}\operatorname{Cos} 2ix = {} & \gamma_0^{(2i)} + 2\gamma_2^{(2i)}\Gamma_0^{(2)} + 2\gamma_4^{(2i)}\Gamma_0^{(4)} + \ldots \\ & + 4\{\gamma_2^{(2i)}\Gamma_2^{(2)} + \gamma_4^{(2i)}\Gamma_2^{(4)} + \gamma_6^{(2i)}\Gamma_2^{(6)} + \ldots\}\operatorname{Cos} 2x \\ & + 4\{\gamma_2^{(2i)}\Gamma_4^{(2)} + \gamma_4^{(2i)}\Gamma_4^{(4)} + \gamma_6^{(2i)}\Gamma_4^{(6)} + \ldots\}\operatorname{Cos} 4x \\ & + \ldots\ldots\end{aligned}$$

På grund af denna utveckling inses omedelbart att i allmänhet, d. v. s. om $i \gtrless i'$:

$$\gamma_2^{(2i)}\Gamma_{2i'}^{(2)} + \gamma_4^{(2i)}\Gamma_{2i'}^{(4)} + \gamma_6^{(2i)}\Gamma_{2i'}^{(6)} + \ldots = 0$$

eller med stöd af eqvationerne (9) och (10)

$$\frac{1}{1}\Gamma_{2i}^{(2)}\Gamma_{2i'}^{(2)} + \frac{1}{2}\Gamma_{2i}^{(4)}\Gamma_{2i'}^{(4)} + \frac{1}{3}\Gamma_{2i}^{(6)}\Gamma_{2i'}^{(6)} + \ldots = 0$$

För den händelse då $i = i'$ har man åter

$$4\{\gamma_2^{(2i)}\Gamma_{2i}^{(2)} + \gamma_4^{(2i)}\Gamma_{2i}^{(4)} + \gamma_6^{(2i)}\Gamma_{2i}^{(6)} + \ldots\} = 1$$

Uttryckes äfven här γ-koefficienterna medelst Γ i enlighet med eqvationerne (9) och (10), så erhåller man i stället för ofvanstående eqvation följande

$$i\left\{\frac{1}{1}\Gamma_{2i}^{(2)}\Gamma_{2i}^{(2)} + \frac{1}{2}\Gamma_{2i}^{(4)}\Gamma_{2i}^{(4)} + \frac{1}{3}\Gamma_{2i}^{(6)}\Gamma_{2i}^{(6)} + \ldots\right\} = \frac{1}{4}\,\frac{1-q^{2i}}{1+q^{2i}}$$

På liknande grunder kunna äfven de serier, som i föregående § blifvit betecknade med $E'(\nu)$, summeras. För sådant ändamål differentiera vi den andra af eqvationerne (II) i afseende å $am\frac{2K}{\pi}x$, samt erinra oss dervid att i allmänhet

$$\frac{df(x)}{dx} = \frac{df(x)}{dam\frac{2K}{\pi}x}\cdot\frac{dam\frac{2K}{\pi}x}{dx};$$

men enär

$$\frac{dam\frac{2K}{\pi}x}{dx} = \frac{2K}{\pi}\Delta am\frac{2K}{\pi}x$$

och

$$\frac{1}{\Delta am\frac{2K}{\pi}x} = \frac{1}{k'}\Delta am\frac{2K}{\pi}\left(x - \frac{\pi}{2}\right),$$

så blifver

(47)
$$\frac{df(x)}{dam\frac{2K}{\pi}x} = \frac{1}{k'}\,\frac{\pi}{2K}\Delta am\frac{2K}{\pi}\left(x - \frac{\pi}{2}\right)\frac{df(x)}{dx}$$

Med stöd af denna formel finna vi nu

$$\frac{2i}{k'}\,\frac{\pi}{2K}\operatorname{Cos} 2ix\,\Delta am\frac{2K}{\pi}\left(x - \frac{\pi}{2}\right) = 2\left\{2\sigma_2^{(2i)}\operatorname{Cos} 2am\frac{2K}{\pi}x + 4\sigma_4^{(2i)}\operatorname{Cos} 4am\frac{2K}{\pi}x + 6\sigma_6^{(2i)}\operatorname{Cos} 6am\frac{2K}{\pi}x + \ldots\right\}$$

Uttryckes här $\operatorname{Cos} 2am \frac{2K}{\pi} x$, $\operatorname{Cos} 4am \frac{2K}{\pi} x$, o. s. v. medelst Cosiner för multipler af vinkeln x, så framgår följande relation

$$\begin{aligned}\frac{2i}{k'}\frac{\pi}{2K} \operatorname{Cos} 2ix\, \Delta am \frac{2K}{\pi}\left(x - \frac{\pi}{2}\right) &= 2\{2\sigma_2^{(2i)} \Gamma_0^{(2)} + 4\sigma_4^{(2i)} \Gamma_0^{(4)} + 6\sigma_6^{(2i)} \Gamma_0^{(6)} + \ldots\} \\ &+ 4\{2\sigma_2^{(2i)} \Gamma_2^{(2)} + 4\sigma_4^{(2i)} \Gamma_2^{(4)} + 6\sigma_6^{(2i)} \Gamma_2^{(6)} + \ldots\} \operatorname{Cos} 2x \\ &+ 4\{2\sigma_2^{(2i)} \Gamma_4^{(2)} + 4\sigma_4^{(2i)} \Gamma_4^{(4)} + 6\sigma_6^{(2i)} \Gamma_4^{(6)} + \ldots\} \operatorname{Cos} 4x \\ &+ \ldots\ldots\end{aligned}$$

hvilken lätt leder till ändliga uttryck för summorna till höger om likhetstecknet.

För att emellertid erhålla de resultat, hvilkas härledning åsyftas, under den enklaste form, införa vi följande beteckningar

$$(48)\begin{cases}\dfrac{d^{2\nu} \operatorname{Sin} 2ix}{\left(dam \frac{2K}{\mu} x\right)^{2\nu}} = 2\eta^{(i)}_{-2\nu,\,2} \operatorname{Sin} 2x + 2\eta^{(i)}_{-2\nu,\,4} \operatorname{Sin} 4x + 2\eta^{(i)}_{-2\nu,\,6} \operatorname{Sin} 6x + \ldots \\[2ex] \dfrac{d^{2\nu} \operatorname{Cos} 2ix}{\left(dam \frac{2K}{\pi} x\right)^{2\nu}} = \theta^{(i)}_{-2\nu,\,0} + 2\theta^{(i)}_{-2\nu,\,2} \operatorname{Cos} 2x + 2\theta^{(i)}_{-2\nu,\,4} \operatorname{Cos} 4x + 2\theta^{(i)}_{-2\nu,\,6} \operatorname{Cos} 6x + \ldots \\[2ex] \dfrac{d^{2\nu+1} \operatorname{Sin} 2ix}{\left(dam \frac{2K}{\pi} x\right)^{2\nu+1}} = \eta^{(i)}_{-(2\nu+1),\,0} + 2\eta^{(i)}_{-(2\nu+1),\,2} \operatorname{Cos} 2x + 2\eta^{(i)}_{-(2\nu+1),\,4} \operatorname{Cos} 4x + 2\eta^{(i)}_{-(2\nu+1),\,6} \operatorname{Cos} 6x + \ldots \\[2ex] \dfrac{d^{2\nu+1} \operatorname{Cos} 2ix}{\left(dam \frac{2K}{\pi} x\right)^{2\nu+1}} = 2\theta^{(i)}_{-(2\nu+1),\,2} \operatorname{Sin} 2x + 2\theta^{(i)}_{-(2\nu+1),\,4} \operatorname{Sin} 4x + 2\theta^{(i)}_{-(\nu 2+1),\,6} \operatorname{Sin} 6x + \ldots\end{cases}$$

Med stöd af detta beteckningssätt finner man följande allmänt gällande summationsformel, der σ-koefficienterna blifvit utbytta mot Γ-koefficienter på grund af den andra af eqvationerne (9).

$$\eta^{(i)}_{-1,\,2i'} = 4i\{\Gamma^{(2)}_{2i} \Gamma^{(2)}_{2i'} + \Gamma^{(4)}_{2i} \Gamma^{(4)}_{2i'} + \Gamma^{(5)}_{2i} \Gamma^{(6)}_{2i'} + \ldots\}$$

Jemföres detta resultat med den första af eqvationerne (38), så visar sig ögonblickligt att

$$E'(o) = \frac{1}{4i}\eta^{(i)}_{-1,\,2i'}$$

På ett liknande sätt finner man genom differentiation af den första af eqvationerne (II)

$$\theta^{(i)}_{-1,\,2i'} = -4i\{\Sigma^{(2)}_{2i} \Sigma^{(2)}_{2i'} + \Sigma^{(4)}_{2i} \Sigma^{(4)}_{2i'} + \Sigma^{(5)}_{2i} \Sigma^{(6)}_{2i'} + \ldots\};$$

således med stöd af eqvationerne (10)

$$\theta^{(i)}_{-1,\,2i'} = -\frac{1-q^{2i}}{1+q^{2i}} \cdot \frac{1-q^{2i'}}{1+q^{2i'}} \eta^{(i)}_{-1,\,2i'}$$

Genom upprepade differentiationer af eqvationerne (II) erhåller man vidare på den redan beträdda vägen:

$$(49)\begin{cases}\eta^{(i)}_{-2\nu,\,2i'} = (-1)^\nu 4i\{2^{2\nu-1} \Gamma^{(2)}_{2i} \Sigma^{(2)}_{2i} + 4^{2\nu-1} \Gamma^{(4)}_{2i} \Sigma^{(4)}_{2i'} + 6^{2\nu-1} \Gamma^{(6)}_{2i} \Sigma^{(6)}_{2i'} + \ldots\} \\ \eta^{(i)}_{-(2\nu+1),\,2i'} = (-1)^\nu 4i\{2^{2\nu} \Gamma^{(2)}_{2i} \Gamma^{(i)}_{2i'} + 4^{2\nu} \Gamma^{(4)}_{2i} \Gamma^{(4)}_{2i'} + 6^{2\nu} \Gamma^{(6)}_{2i} \Gamma^{(6)}_{2i'} + \ldots\} \\ \theta^{(i)}_{-2\nu,\,2i} = \dfrac{1-q^{2i}}{1+q^{2i}} \cdot \dfrac{1+q^{2i'}}{1-q^{2i'}} \eta^{(i)}_{-2\nu,\,2i'} \\ \theta^{(i)}_{-(2\nu+1),\,2i'} = -\dfrac{1-q^{2i}}{1+q^{2i}} \cdot \dfrac{1-q^{2i'}}{1+q^{2i'}} \eta^{(i)}_{-(2\nu+1),\,2i'}\end{cases}$$

af hvilka den tredje eqvationen förlorar sin betydelse då $\nu = 0$.

Vi hafva således följande, för hvarje positivt värde af ν gällande formel

$$E'(\nu) = \frac{(-1)^\nu}{4i}\,\eta^{(i)}_{-(2\nu+1),\,i'}$$

Innan vi öfvergå till framställningen af liknande uttryck för E'-funktioner med negativa ν, skola vi utföra bestämningen af koefficienterna η och θ. Ur den bekanta utvecklingen

$$\Delta am\,\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right) = \frac{\pi}{2K}\left\{1 - \frac{4q}{1+q^2}\,\mathrm{Cos}\,2x + \frac{4q^2}{1+q^4}\,\mathrm{Cos}\,4x - \frac{4q^3}{1+q^6}\,\mathrm{Cos}\,6x + \ldots\right\}$$

finner man omedelbart, genom att multiplicera denna serie med $\frac{2i}{k'}\left(\frac{\pi}{2K}\right)\mathrm{Cos}\,2ix$

$$\eta^{(i)}_{-1,\,0} = \frac{4i}{k'}\left(\frac{\pi}{2K}\right)^2 \frac{(-q)^i}{1+q^{2i}}$$

$$\eta^{(i)}_{-1,\,2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{(-q)^{i-1}}{1+q^{2i-2}} + \frac{(-q)^{i+1}}{1+q^{2i+2}}\right\}$$

$$\eta^{(i)}_{-1,\,4} = \frac{2i}{k'}\left(\frac{\pi}{4K}\right)^2 \left\{\frac{(-q)^{i-2}}{1+q^{2i-4}} + \frac{(-q)^{i+2}}{1+q^{2i+4}}\right\}$$

$$= \;.\;.\;.\;.\;.$$

$$\eta^{(i)}_{-1,\,2i-2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{-q}{1+q^2} + \frac{(-q)^{2i-1}}{1+q^{4i-2}}\right\}$$

$$\eta^{(i)}_{-1,\,2i} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{1}{2} + \frac{(-q)^{2i}}{1+q^{4i}}\right\}$$

$$\eta^{(i)}_{-1,\,2i+2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{-q}{1+q^2} + \frac{(-q)^{2i+1}}{1+q^{4i+2}}\right\}$$

o. s. v.

Och på samma sätt befinnes:

$$-\theta^{(i)}_{-1,\,2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{(-q)^{i-1}}{1+q^{2i-2}} - \frac{(-q)^{i+1}}{1+q^{2i+2}}\right\}$$

$$-\theta^{(i)}_{-1,\,4} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{(-q)^{i-2}}{1+q^{2i-4}} - \frac{(-q)^{i+2}}{1+q^{2i+4}}\right\}$$

$$= \;.\;.\;.\;.\;.$$

$$-\theta^{(i)}_{-1,\,2i-2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{-q}{1+q^2} - \frac{(-q)^{2i-1}}{1+q^{4i-2}}\right\}$$

$$-\theta^{(i)}_{-1,\,2i} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{1}{2} - \frac{(-q)^{2i}}{1+q^{4i}}\right\}$$

$$-\theta^{(i)}_{-1,\,2i+2} = \frac{2i}{k'}\left(\frac{\pi}{2K}\right)^2 \left\{\frac{-q}{1+q^2} - \frac{(-q)^{2i+1}}{1+q^{4i+2}}\right\}$$

o. s. v.

Differentieras uttrycket

$$\frac{d^{2\nu-1}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}\,x\right)^{2\nu-1}} = \eta^{(i)}_{-(2\nu-1),\,6} + 2\eta^{(i)}_{-(2\nu-1),\,2}\,\mathrm{Cos}\,2x + 2\eta^{(i)}_{-(2\nu-1),\,4}\,\mathrm{Cos}\,4x + \ldots$$

i afseende på $am\,\frac{2K}{\pi}\,x$, så erhålles med stöd af eqvationerna (47) och (48)

$$2\eta^{(i)}_{-2\nu,\,2}\,\mathrm{Sin}\,2x + 2\eta^{(i)}_{-2\nu,\,4}\,\mathrm{Sin}\,4x + 2\eta^{(i)}_{-2\nu,\,6}\,\mathrm{Sin}\,4x + \ldots$$

$$= -\left\{2\,.\,2\eta^{(i)}_{-(2\nu-1),\,2}\,\mathrm{Sin}\,2x + 2\,.\,4\eta^{(i)}_{-(2\nu-1),\,4}\,\mathrm{Sin}\,4x + 2\,.\,6\eta^{(i)}_{-(2\nu-1),\,6}\,\mathrm{Sin}\,6x + \ldots\right\}\frac{1}{k'}\,\frac{\pi}{2K}\,\Delta am\,\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right)$$

och häraf erhåller man på grund af den bekanta utvecklingen af $\Delta am\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right)$

$$\eta^{(i)}_{-2\nu,2} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{2\eta^{(i)}_{-(2\nu-1),2} - \frac{4q}{1+q^2}\,2\eta^{(i)}_{-(2\nu-1),4} + \frac{4q^2}{1+q^4}\left[3\eta^{(i)}_{-(2\nu-1),6} - \eta^{(i)}_{-(2\nu-1),2}\right]$$

$$- \frac{4q^3}{1+q^6}\left[4\eta^{(i)}_{-(2\nu-1),8} - 2\eta^{(i)}_{-(2\nu-1),4}\right] + \ldots\Big\}$$

$$\eta^{(i)}_{-2\nu,4} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{4\eta^{(i)}_{-(2\nu-1),4} - \frac{4q}{1+q^2}\left[3\eta^{(i)}_{-(2\nu-1),6} + \eta^{(i)}_{-(2\nu-1),2}\right] + \frac{4q^2}{1+q^4}\,4\eta^{(i)}_{-(2\nu-1),8}$$

$$- \frac{4q^3}{1+q^6}\left[5\eta^{(i)}_{-(2\nu-1),10} - \eta^{(i)}_{-(2\nu-1),2}\right] + \ldots\Big\}$$

$$\eta^{(i)}_{-2\nu,6} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{6\eta^{(i)}_{-(2\nu-1),6} - \frac{4q}{1+q^2}\left[4\eta^{(i)}_{-(2\nu-1),8} + 2\eta^{(i)}_{-(2\nu-1),4}\right] + \frac{4q^2}{1+q^4}\left[5\eta^{(i)}_{-(2\nu-1),10} + \eta^{(i)}_{-(2\nu-1),2}\right]$$

$$- \frac{4q^3}{1+q^6}\,6\eta^{(i)}_{-(2\nu-1),12} + \frac{4q^4}{1+q^8}\left[7\eta^{(i)}_{-(2\nu-1),14} - \eta^{(i)}_{-(2\nu-1),2}\right] - \ldots\Big\}$$

o. s. v.

På samma sätt erhåller man genom differentiation af uttrycket

$$\frac{d^{2\nu}\,\mathrm{Sin}\,2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu}} = 2\eta^{(i)}_{-2\nu,2}\,\mathrm{Sin}\,2x + 2\eta^{(i)}_{-2\nu,4}\,\mathrm{Sin}\,4x + 2\eta^{(i)}_{-2\nu,6}\,\mathrm{Sin}\,6x + \ldots;$$

i afseende på $am\frac{2K}{\pi}x$:

$$\eta^{(i)}_{-(2\nu+1),0} + 2\eta^{(i)}_{-(2\nu+1),2}\,\mathrm{Cos}\,2x + 2\eta^{(i)}_{-(2\nu+1),4}\,\mathrm{Cos}\,4x + 2\eta^{(i)}_{-(2\nu+1),6}\,\mathrm{Cos}\,6x\ldots$$

$$= \{2\,.\,2\eta^{(i)}_{-2\nu,2}\,\mathrm{Cos}\,2x + 2\,.\,4\eta^{(i)}_{-2\nu,4}\,\mathrm{Cos}\,4x + 2\,.\,6\eta^{(i)}_{-2\nu,6}\,\mathrm{Cos}\,6x + \ldots\}\,\frac{1}{k'}\,\frac{\pi}{2K}\cdot\Delta am\,\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right)$$

Denna eqvation leder till bestämningen af koefficienterna $\eta^{(i)}_{-(2\nu+1)}$, och man finner

$$\eta^{(i)}_{-(2\nu+1),0} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{\frac{4q}{1+q^2}\,2\eta^{(i)}_{-2\nu,2} - \frac{4q^2}{1+q^4}\,4\eta^{(i)}_{-2\nu,4} + \frac{4q^3}{1+q^6}\,6\eta^{(i)}_{-2\nu,6} - \ldots\right\}$$

$$\eta^{(i)}_{-(2\nu+1),2} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{2\,.\,\eta^{(i)}_{-2\nu,2} - \frac{4q}{1+q^2}\,2\eta^{(i)}_{-2\nu,4} + \frac{4q^2}{1+q^4}\left[3\eta^{(i)}_{-2\nu,6} + \eta^{(i)}_{-2\nu,2}\right] - \frac{4q^3}{1+q^6}\left[4\eta^{(i)}_{-2\nu,8} + 2\eta^{(i)}_{-2\nu,2}\right]\ldots\Big\}$$

$$\eta^{(i)}_{-(2\nu+1),4} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{4\eta^{(i)}_{-2\nu,4} - \frac{4q}{1+q^2}\left[3\eta^{(i)}_{-2\nu,6} + \eta^{(i)}_{-2\nu,2}\right] + \frac{4q^2}{1+q^4}\,4\eta^{(i)}_{-2\nu,8} - \frac{4q^3}{1+q^6}\left[5\eta^{(i)}_{-2\nu,10} + \eta^{(i)}_{-2\nu,2}\right]\ldots\Big\}$$

$$\eta^{(i)}_{-(2\nu+1),6} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\Big\{6\eta^{(i)}_{-2\nu,6} - \frac{4q}{1+q^2}\left[4\eta^{(i)}_{-2\nu,8} + 2\eta^{(i)}_{-2\nu,4}\right] + \frac{4q^2}{1+q^4}\left[5\eta^{(i)}_{-2\nu,10} + \eta^{(i)}_{-2\nu,2}\right] - \frac{4q^3}{1+q^1}\,6\eta^{(i)}_{-2\nu,12}$$

$$+ \frac{4q^4}{1+q^2}\left[7\eta^{(i)}_{-2\nu,14} + \eta^{(i)}_{-2\nu,2}\right] - \ldots\Big\}$$

o. s. v.

θ-koefficienterna erhållas ur dessa eqvationer

$$\theta^{(i)}_{-2\nu,0} + 2\theta^{(i)}_{-2\nu,2}\,\mathrm{Cos}\,2x + 2\theta^{(i)}_{-2\nu,4}\,\mathrm{Cos}\,4x + 2\theta^{(i)}_{-2\nu,6}\,\mathrm{Cos}\,6x + \ldots$$

$$= \{2\,.\,2\theta^{(i)}_{-(2\nu-1),2}\,\mathrm{Cos}\,2x + 2\,.\,4\theta^{(i)}_{-(2\nu-1),4}\,\mathrm{Cos}\,4x + 2\,.\,6\theta^{(i)}_{-(2\nu-1),6}\,\mathrm{Cos}\,6x + \ldots\}\,\frac{1}{k'}\,\frac{\pi}{2K}\Delta am\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right)$$

$$\theta^{(i)}_{-(2\nu+1),2}\,\mathrm{Sin}\,2x + 2\theta^{(i)}_{-(2\nu+1),4}\,\mathrm{Sin}\,4x + 2\theta^{(i)}_{-(2\nu+1),6}\,\mathrm{Sin}\,6x + \ldots$$

$$= -\{2\,.\,2\theta^{(i)}_{-2\nu,2}\,\mathrm{Sin}\,2x + 2\,.\,4\theta^{(i)}_{-2\nu,4}\,\mathrm{Sin}\,4x + 2\,.\,6\theta^{(i)}_{-2\nu,6}\,\mathrm{Sin}\,6x + \ldots\}\,\frac{1}{k'}\,\frac{\pi}{2K}\,\Delta am\left(x-\frac{\pi}{2}\right),$$

hvilka framgå efter differentiation af den fjerde och den andra af eqvationerna (48). Efter multiplikation med serieutvecklingen af $\Delta am\frac{2K}{\pi}\left(x-\frac{\pi}{2}\right)$ finner man, såsom förut, följande uttryck

$$\theta^{(i)}_{-2\nu,0} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{\frac{4q}{1+q^2}\,2\theta^{(i)}_{-(2\nu-1),2} - \frac{4q^2}{1+q^4}\,4\theta^{(i)}_{-(2\nu-1),4} + \frac{4q^3}{1+q^6}\,6\theta^{(i)}_{-(2\nu-1),6} - \ldots\right\}$$

$$\theta^{(i)}_{-2\nu,2} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{2\theta^{(i)}_{-(2\nu-1),2} - \frac{4q}{1+q^2}\,2\theta^{(i)}_{-(2\nu-1),4} + \frac{4q^2}{1+q^4}\left[3\theta^{(i)}_{-(2\nu-1),6} + \theta^{(i)}_{-(2\nu-1),2}\right]\right.$$
$$\left. - \frac{4q^3}{1+q^6}\left[4\theta^{(i)}_{-(2\nu-1),8} + 2\theta^{(i)}_{-(2\nu-1),4}\right] + \ldots\right\}$$

$$\theta^{(i)}_{-2\nu,4} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{4\theta^{(i)}_{-(2\nu-1),4} - \frac{4q}{1+q^2}\left[3\theta^{(i)}_{-(2\nu-1),6} + \theta^{(i)}_{-(2\nu-1),2}\right] + \frac{4q^2}{1+q^4}\,4\theta^{(i)}_{-(2\nu-1),8}\right.$$
$$\left. - \frac{4q^3}{1+q^6}\left[5\theta^{(i)}_{-2(\nu-1),10} + \theta^{(i)}_{-(2\nu-1),2}\right] + \ldots\right\}$$

$$\theta^{(i)}_{-2\nu,6} = \frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{6\theta^{(i)}_{-(2\nu-1),6} - \frac{4q}{1+q^2}\left[4\theta^{(i)}_{-(2\nu-1),8} + 2\theta^{(i)}_{-(2\nu-1),4}\right] + \frac{4q^2}{1+q^4}\left[5\theta^{(i)}_{-(2\nu-1),10} + \theta^{(i)}_{-(2\nu-1),2}\right]\right.$$
$$\left. - \frac{4q^3}{1+q^6}\,6\theta^{(i)}_{-(2\nu-1),12} + \frac{4q^4}{1+q^8}\left[7\theta^{(i)}_{-(2\nu-1),14} + \theta^{(i)}_{-(2\nu-1),2}\right] - \ldots\right\}$$

o. s. v.

$$\theta^{(i)}_{-(2\nu+1),2} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{2\theta^{(i)}_{-2\nu,2} - \frac{4q}{1+q^2}\,2\theta^{(i)}_{-2\nu,4} + \frac{4q^2}{1+q^4}\left[3\theta^{(i)}_{-2\nu,6} - \theta^{(i)}_{-2\nu,2}\right] - \frac{4q^3}{1+q^6}\left[4\theta^{(i)}_{-2\nu,8} - 2\theta^{(i)}_{-2\nu,4}\right] + \ldots\right\}$$

$$\theta^{(i)}_{-(2\nu+1),4} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^2\left\{4\theta^{(i)}_{-2\nu,2} - \frac{4q}{1+q^2}\left[3\theta^{(i)}_{-2\nu,6} + \theta^{(i)}_{-2\nu,2}\right] + \frac{4q^2}{1+q^2}\,4\theta^{(i)}_{-2\nu,8} - \frac{4q^3}{1+q^6}\left[5\theta^{(i)}_{-2\nu,10} - \theta^{(i)}_{-2\nu,2}\right] + \ldots\right\}$$

$$\theta^{(i)}_{-(2\nu+1),6} = -\frac{1}{k'}\left(\frac{\pi}{2K}\right)^1\left\{6\theta^{(i)}_{-2\nu,6} - \frac{4q}{1+q^2}\left[4\theta^{(i)}_{-2\nu,8} + 2\theta^{(i)}_{-2\nu,4}\right] + \frac{4q^2}{1+q^4}\left[5\theta^{(i)}_{-2\nu,10} + \theta^{(i)}_{-2\nu,2}\right] - \frac{4q^3}{1+q^6}\,6\theta^{(i)}_{-2\nu,12}\right.$$
$$\left. + \frac{4q^4}{1+q^8}\left[7\theta^{(i)}_{-2\nu,14} - \theta^{(i)}_{-2\nu,2}\right] - \ldots\right\}$$

o. s. v.

Medelst dessa fyra formelsystem kan man efter hand härleda de numeriska värdena för alla η- och θ-koefficienter, och räkningen blifver härvid hvarken lång eller mödosam; ty densamma består endast i s. k. mekaniska multiplikationer af periodiska serier. Men det blifver ej ens nödvändigt att medelst direkt räkning härleda alla dessa koefficienter; ty äro engång t. ex. η-koefficienterna bekanta, så kan man i händelse af behof härleda θ-koefficienterna medelst formlerna (49).

Understundom är det önskvärdt att härleda enskilda af de ifrågavarande koefficienterna utan att behöfva beräkna alla föregående; för sådant ändamål skola vi söka independenta uttryck för dessa koefficienter. Vi begynna med att differentiera eqvationen (47) eller

$$\frac{df(x)}{dam\,\frac{2K}{\pi}x} = \frac{\pi}{2K}\,\frac{1}{\Delta am\,\frac{2K}{\pi}x}\,\frac{df(x)}{dx}$$

i afseende på $am\,\frac{2K}{\pi}x$, och erhålla då

$$\frac{d^2f(x)}{\left(dam\,\frac{2K}{\pi}x\right)^2} = \frac{\pi}{2K}\,\frac{k^2\,\mathrm{Sin}\,am\,\frac{2K}{\pi}x\,\mathrm{Cos}\,am\,\frac{2K}{\pi}x}{\left(\Delta am\,\frac{2K}{\pi}x\right)^3}\cdot\frac{df(x)}{dx}$$
$$+ \frac{\pi}{2K}\,\frac{1}{\Delta am\,\frac{2K}{\pi}x}\cdot\frac{d\,\frac{df(x)}{dx}}{dam\,\frac{2K}{\pi}x}$$
$$= \left(\frac{\pi}{2K}\right)^2\left\{\frac{\frac{2K}{\pi}k^2\,\mathrm{Sin}\,am\,\frac{2K}{\pi}x\,\mathrm{Cos}\,am\,\frac{2K}{\pi}x}{\left(\Delta am\,\frac{2K}{\pi}x\right)^3}\,\frac{df(x)}{dx} + \frac{1}{\left(\Delta am\,\frac{2K}{\pi}x\right)^2}\,\frac{d^2f(x)}{dx^2}\right\}$$

Den allmänna formen för de högre differentialkoefficienterna finner man sålunda vara följande, der ι betecknar ett helt tal:

$$\frac{d^\iota f(x)}{\left(dam\,\frac{2K}{\pi}x\right)^\iota} = \left(\frac{\pi}{2K}\right)^\iota \left\{ P_1^{(\iota)}\frac{df(x)}{dx} + P_2^{(\iota)}\frac{d^2 f(x)}{dx^2} + \ldots + P_\iota^{(\iota)}\frac{d^\iota f(x)}{dx^2} \right\} \tag{50}$$

och der vi med $P_1^{(\iota)}$, $P_2^{(\iota)}$, o. s. v. betecknat rationella sammansättningar af enkla elliptiska funktioner. För bestämningen af dessa koefficienter differentiera vi ofvanstående eqvation och erhålla sålunda med hänseende till relationen (47)

$$\begin{aligned}
\frac{d^{\iota+1} f(x)}{\left(dam\,\frac{2K}{\pi}x\right)^{\iota+1}} = \left(\frac{\pi}{2K}\right)^{\iota+1} \Bigg\{ & \frac{1}{\Delta am\,\frac{2K}{\pi}x}\frac{dP_1^{(\iota)}}{dx}\frac{df(x)}{dx} + \frac{P_1^{(\iota)}}{\Delta am\,\frac{2K}{\pi}x}\frac{d^2 f(x)}{dx^2} \\
& + \frac{1}{\Delta am\,\frac{2K}{\pi}x}\frac{dP_2^{(\iota)}}{dx}\cdot\frac{d^2 f(x)}{dx^2} + \frac{P_2^{(\iota)}}{\Delta am\,\frac{2K}{\pi}x}\frac{d^3 f(x)}{dx^3} \\
& + \ldots . \\
& + \frac{1}{\Delta am\,\frac{2K}{\pi}x}\frac{dP_\iota^{(\iota)}}{dx}\cdot\frac{d^\iota f(x)}{dx^\iota} + \frac{P_\iota^{(\iota)}}{\Delta am\,\frac{2K}{\pi}x}\frac{d^{\iota+1} f(x)}{dx^{\iota+1}} \Bigg\}
\end{aligned}$$

Insättes i den föregående eqvationen $\iota + 1$ i st. för ι samt jemföras koefficienterna i den sålunda uppstående eqvationen med de i den sednast erhållna, så framgå följande relationer

$$P_1^{(\iota+1)} = \frac{1}{\Delta am\,\frac{2K}{\pi}x}\frac{dP_1^{(\iota)}}{dx}$$

$$P_2^{(\iota+1)} = \frac{1}{\Delta am\,\frac{2K}{\pi}x}\left\{P_1^{(\iota)} + \frac{dP_2^{(\iota)}}{dx}\right\}$$

$$P_3^{(\iota+1)} = \frac{1}{\Delta am\,\frac{2K}{\pi}x}\left\{P_2^{(\iota)} + \frac{dP_3^{(\iota)}}{dx}\right\}$$

$$\ldots\ldots$$

$$P_{\iota+1}^{(\iota+1)} = \frac{P_\iota^{(\iota)}}{\Delta am\,\frac{2K}{\pi}x}$$

Medelst dessa formler härleder man efterhand följande uttryck för de ifrågavarande P-funktionerna, af hvilka de första redan äro gifna i den föregående framställningen,

$$P_1^{(1)} = \frac{1}{\Delta am\,\frac{2K}{\pi}x}$$

$$P_1^{(2)} = \frac{2K}{\pi}\frac{k^2 \operatorname{Sin} am\,\frac{2K}{\pi}x\;\operatorname{Cos} am\,\frac{2K}{\pi}x}{\left(\Delta am\,\frac{2K}{\pi}x\right)^3}$$

$$P_2^{(2)} = \frac{1}{\left(\Delta am\,\frac{2K}{\pi}x\right)^2}$$

$$P_1^{(3)} = \left(\frac{2K}{\pi}\right)^2\left\{-\frac{3k'^2}{\left(\Delta am\,\frac{2K}{\pi}x\right)^5} + \frac{2(1+k'^2)}{\left(\Delta am\,\frac{2K}{\pi}x\right)^3} - \frac{1}{\Delta am\,\frac{2K}{\pi}x}\right\}$$

$$P_2^{(3)} = \left(\frac{2K}{\pi}\right) \frac{3k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x}{\left(\Delta am \frac{2K}{\pi} x\right)^4}$$

$$P_3^{(3)} = \frac{1}{\left(\Delta am \frac{2K}{\pi} x\right)^3}$$

$$P_1^{(4)} = \left(\frac{2K}{\pi}\right)^3 k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{- \frac{15k'^2}{\left(\Delta am \frac{2K}{\pi} x\right)^7} + \frac{6(1+k'^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^5} - \frac{1}{\left(\Delta am \frac{2K}{\pi} x\right)^3}\right\}$$

$$P_2^{(4)} = \left(\frac{2K}{\pi}\right)^2 \left\{- \frac{15k'^2}{\left(\Delta am \frac{2K}{\pi} x\right)^6} + \frac{11(1+k'^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^4} - \frac{7}{\left(\Delta am \frac{2K}{\pi} x\right)^2}\right\}$$

$$P_3^{(4)} = \left(\frac{2K}{\pi}\right) k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \frac{6}{\left(\Delta am \frac{2K}{\pi} x\right)^5}$$

$$P_4^{(4)} = \frac{1}{\left(\Delta am \frac{2K}{\pi} x\right)^4}$$

$$P_1^{(5)} = \left(\frac{2K}{\pi}\right)^4 \left\{\frac{105k'^4}{\left(\Delta am \frac{2K}{\pi} x\right)^9} - \frac{120k'^2(1+k'^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^7} + \frac{78k'^2 + 24(1+k'^2)^2}{\left(\Delta am \frac{2K}{\pi} x\right)^5} - \frac{20(1+k'^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^3} + \frac{1}{\Delta am \frac{2K}{\pi} x}\right\}$$

$$P_2^{(5)} = \left(\frac{2K}{\pi}\right)^3 k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{- \frac{105k'^2}{\left(\Delta am \frac{2K}{\pi} x\right)^8} + \frac{50(1+k^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^6} - \frac{15}{\left(\Delta am \frac{2K}{\pi} x\right)^4}\right\}$$

$$P_3^{(3)} = \left(\frac{2K}{\pi}\right)^2 \left\{- \frac{45k'^2}{\left(\Delta am \frac{2K}{\pi} x\right)^7} + \frac{35(1+k'^2)}{\left(\Delta am \frac{2K}{\pi} x\right)^5} - \frac{25}{\left(\Delta am \frac{2K}{\pi} x\right)^3}\right\}$$

$$P_4^{(5)} = \left(\frac{2K}{\pi}\right) k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \frac{10}{\left(\Delta am \frac{2K}{\pi} x\right)^6}$$

$$P_5^{(5)} = \frac{1}{\left(\Delta am \frac{2K}{\pi} x\right)^5}$$

Såsom man af de sednast anförda uttrycken är i tillfälle att se, äro P-funktionerna sammansatta af termer, hvilka förutom konstanta faktorer antingen bestå af hela negativa potenser af den enkla elliptiska funktionen Δ, eller och af sådana potenser multiplicerade med faktorn $k^2 \, am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x$. Byggnaden af de konstanta koefficienterna blifver dock mer och mer invecklad i den mon P-funktionens öfre index växer, eller rättare i den mon differensen emellan den öfre och den nedre index blifver större, hvarföre särskiljda rekursionsformler för dessa koefficienter blifva nödvändiga.

På grund af den bekanta formen för P-funktionerna kunna vi sätta, under antagandet att differensen $\iota - (\iota - n)$ eller n är ett jemnt tal:

$$
(51)\quad \begin{cases} P^{(\iota)}_{\iota-n} = \left(\frac{2K}{\pi}\right)^{n} \left\{ \frac{f^{(\iota,\, n)}_{\iota+n}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n}} + \frac{f^{(\iota,\, n)}_{\iota+n-2}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n-2}} + \ldots \right\} \\ P^{(\iota)}_{\iota-(n+1)} = \left(\frac{2K}{\pi}\right)^{n+1} k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{ \frac{f^{(\iota,\, n+1)}_{\iota+n+1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \frac{f^{(\iota,\, n-1)}_{\iota+n-1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n-1}} + \ldots \right\} \end{cases}
$$

Antages $\iota + 1$ i st. för ι, och $n + 1$ i st. för n, så har man under användande af analoga beteckningar

$$
P^{(\iota+1)}_{\iota-n} = \left(\frac{2K}{\pi}\right)^{n+1} k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{ \frac{f^{(\iota+1,\, n+1)}_{\iota+n+2}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+2}} + \frac{f^{(\iota+1,\, n+1)}_{\iota+n}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n}} + \ldots \right\}
$$

$$
P^{(\iota+1)}_{\iota-(n+1)} = \left(\frac{2K}{\pi}\right)^{n+2} \left\{ \frac{f^{(\iota+1,\, n+2)}_{\iota+n+3}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+3}} + \frac{f^{(\iota+1,\, n+2)}_{\iota+n+1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \ldots \right\}
$$

Man finner slutligen genom att differentiera de båda föregående eqvationerna i afseende på x

$$
(52)\quad \begin{cases} \frac{dP^{(\iota)}_{\iota-n}}{dx} = \left(\frac{2K}{\pi}\right)^{n+1} k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{ \frac{(\iota+n) f^{(\iota,\, n)}_{\iota+n}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \frac{(\iota+n-2) f^{(\iota,\, n)}_{\iota+n-2}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n-1}} + \ldots \right\} \\ \frac{dP^{(\iota)}_{\iota-(n+1)}}{dx} = \left(\frac{2K}{\pi}\right)^{n+2} k^2 \left[\left(\operatorname{Cos} am \frac{2K}{\pi} x\right)^2 - \left(\operatorname{Sin} am \frac{2K}{\pi} x\right)^2\right] \Delta am \frac{2K}{\pi} x \left\{ \frac{f^{(\iota,\, n+1)}_{\iota+n+1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \ldots \right\} \end{cases}
$$

$$
+ \left(\frac{2K}{\pi}\right)^{n+2} k^4 \left(\operatorname{Sin} am \frac{2K}{\pi} x\right)^2 \left(\operatorname{Cos} am \frac{2K}{\pi} x\right)^2 \left\{ \frac{(\iota+n+1) f^{(\iota,\, n+1)}_{\iota+n+1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+2}} + \ldots \right\}
$$

Den sista eqvationen transformeras på grund af relationerna

$$
\left[\operatorname{Sin} am \frac{2K}{\pi} x\right]^2 = \frac{1 - \left[\Delta am \frac{2K}{\pi} x\right]^2}{k^2}
$$

$$
\left[\operatorname{Cos} am \frac{2K}{\pi} x\right]^2 = \frac{\left[\Delta am \frac{2K}{\pi} x\right]^2 - k^{2\prime}}{k^2}
$$

hvarefter man erhåller

$$
\frac{1}{\Delta am \frac{2K}{\pi} x} \frac{dP^{(\iota)}_{\iota-n}}{dx} = \left(\frac{2K}{\pi}\right)^{n+1} k^2 \operatorname{Sin} am \frac{2K}{\pi} x \operatorname{Cos} am \frac{2K}{\pi} x \left\{ \frac{(\iota+n) f^{(\iota,\, n)}_{\iota+n}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+2}} + \ldots \right\}
$$

$$
\frac{1}{\Delta am \frac{2K}{\pi} x} \frac{dP^{(\iota)}_{\iota-(n+1)}}{dd} = \left(\frac{2K}{\pi}\right)^{n+2} \left[2 \left[\Delta am \frac{2K}{\pi} x\right]^2 - (1 + k'^2)\right] \left\{ \frac{f^{(\iota,\, n+1)}_{\iota+n}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \ldots \right\}
$$

$$
+ \left(\frac{2K}{\pi}\right)^{n+2} \left[-\left[\Delta am \frac{2K}{\pi} x\right]^4 + (1 + k'^2)\left[\Delta am \frac{2K}{\pi} x\right]^2 - k'^2\right] \left\{ \frac{(\iota+n+1) f^{(\iota,\, n+1)}_{\iota+n+1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+3}} + \frac{(\iota+n-1) f^{(\iota,\, n+1)}_{\iota+n-1}}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}} + \ldots \right\}
$$

$$
= \left(\frac{2K}{\pi}\right)^{n+2} \left[- k'^2 (\iota + n + 1) f^{(\iota,\, n+1)}_{\iota+n+1}\right] \frac{1}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+3}}
$$

$$
+ \left(\frac{2K}{\pi}\right)^{n+2} \left[(\iota + n)(1 + k'^2) f^{(\iota,\, n+1)}_{\iota+n+1} - (\iota + n - 1) k'^2 f^{(\iota,\, n+1)}_{\iota,\, n-1}\right] \frac{1}{\left[\Delta am \frac{2K}{\pi} x\right]^{\iota+n+1}}
$$

$$+\left(\frac{2K}{\pi}\right)^{n+2}\left[-(\iota+n-1)f^{(\iota,\,n+1)}_{\iota+n+1}+(\iota+n-2)(1+k'^2)f^{(\iota,\,n+1)}_{\iota+n-1}-(\iota+n-3)k'^2f^{(\iota,\,n+1)}_{\iota+n-3}\right]\frac{1}{\left[\Delta am\,\frac{2K}{\pi}x\right]^{\iota+n-1}}$$

$$+\left(\frac{2K}{\pi}\right)^{n+2}\left[-(\iota+n-3)f^{(\iota,\,n+1)}_{\iota+n-1}+(\iota+n-4)(1+k'^2)f^{(\iota,\,n+1)}_{\iota+n-3}-(\iota+n-5)k'^2f^{(\iota,\,n+1)}_{\iota+n-5}\right]\frac{1}{\left[\Delta am\,\frac{2K}{\pi}x\right]^{\iota+n-3}}$$

$+ \ldots$

Insättas de funna uttrycken i eqvationen

$$P^{(\iota+1)}_{\iota-n}=\frac{1}{\Delta am\,\frac{2K}{\pi}x}\left\{P^{(\iota)}_{\iota-(n+1)}+\frac{dP^{(\iota)}_{\iota-n}}{dx}\right\},$$

så finner man genom att liksätta koefficienterna för samma potenser af $\dfrac{1}{\Delta am\,\frac{2K}{\pi}x}$;

$$(A)\qquad\begin{cases}f^{(\iota+1,\,n+1)}_{\iota+n+2}=f^{(\iota,\,n+1)}_{\iota+n+1}+(\iota+n)f^{(\iota,\,n)}_{\iota+n}\\ f^{(\iota+1,\,n+1)}_{\iota+n}=f^{(\iota,\,n+1)}_{\iota+n-1}+(\iota+n-2)f^{(\iota,\,n)}_{\iota+n-2}\\ \text{o. s. v.}\end{cases}$$

$$(B)\qquad\begin{cases}f^{(\iota+1,\,n+2)}_{\iota+n+3}=f^{(\iota,\,n+2)}_{\iota+n+2}-(\iota+n+1)k'^2f^{(\iota,\,n+1)}_{\iota+n+1}\\ f^{(\iota+1,\,n+2)}_{\iota+n+1}=f^{(\iota,\,n+2)}_{\iota+n}+(\iota+n)(1+k'^2)f^{(\iota,\,n+1)}_{\iota+n+1}-(\iota+n-1)k'^2f^{(\iota,\,n+1)}_{\iota+n-1}\\ f^{(\iota+1,\,n+2)}_{\iota+n-1}=f^{(\iota,\,n+2)}_{\iota+n-2}-(\iota+n-1)f^{(\iota,\,n+1)}_{\iota+n+1}+(\iota+n-2)(1+k'^2)f^{(\iota,\,n+1)}_{\iota+n-1}-(\iota+n-3)k'^2f^{(\iota+n+1)}_{\iota+n-3}\\ f^{(\iota+1,\,n+2)}_{\iota+n-3}=f^{(\iota,\,n+2)}_{\iota+n-4}-(\iota+n-3)f^{(\iota,\,n+1)}_{\iota+n-1}+(\iota+n-4)(1+k'^2)f^{(\iota,\,n+1)}_{\iota+n-3}-(\iota+n-5)k'^2f^{(\iota,\,n+1)}_{\iota+n-5}\\ \text{o. s. v.}\end{cases}$$

Medelst dessa formelsystem kunna alla f-koefficienter erhållas; man har dervid att tillse, det n för gifvet värde af ι erhåller värdet af ett jemnt tal. Detta vilkor bestämmer, ur hvilketdera af de båda formelsystemen den sökta koefficienten erhålles. — För att tydliggöra användningen af ofvanstående formler, utsättas här värdena för f-koefficienter, såsom desamma redan finnas anförda i formlerna för $P^{(\iota)}_{\iota-n}$, hvarvid det dock är tillfyllest att endast medtaga dem, som höra till index $\iota = 5$. Sedermera skola dessa läggas till grund för härledningen af f-koefficienter hörande till högre indices.

$$f^{(5\cdot4)}_{9}=105\,k'^4$$
$$f^{(5\cdot4)}_{7}=-120\,k'^2(1+k'^2)$$
$$f^{(5\cdot4)}_{5}=78\,k'^2+24\,(1+k'^2)^2$$
$$f^{(5\cdot4)}_{3}=-20\,(1+k'^2)$$
$$f^{(5\cdot4)}_{1}=1$$

$$f^{(5\cdot3)}_{8}=-105\,k'^2$$
$$f^{(5\cdot3)}_{6}=50\,(1+k'^2)$$
$$f^{(5\cdot3)}_{4}=-15$$

$$f^{(5\cdot2)}_{7}=-45\,k'^2$$

$$f_5^{(5\cdot 2)} = 35\,(1 + k'^2)$$
$$f_3^{(5\cdot 2)} = -\,25$$
$$f_6^{(5\cdot 1)} = 10$$
$$f_5^{(5\cdot 0)} = 1$$

Om vi nu t. ex. söka $f_{11}^{6\cdot 5}$, så hafva vi att använda den första eqvationen i systemet (A). Denna gifver oss för $\iota = 5$, $n = 4$:

$$f_{11}^{(6\cdot 5)} = f_{10}^{(5\cdot 5)} + 9 f_9^{(5\cdot 4)}$$

Men emedan städse

$$f^{(\iota,\,\iota)} = 0$$

så har man

$$f_{11}^{(6\cdot 5)} = 9 f_9^{(5\cdot 4)} = 945\, k'^4$$

För härledningen af $f_{10}^{(6\cdot 4)}$ har man åter att i den första eqvationen af systemet (B) sätta $\iota = 5$ och $n = 2$. Man finner sålunda

$$f_{10}^{(6\cdot 4)} = f_9^{(5\cdot 4)} - 8\,k'^2\, f_8^{(5\cdot 3)}$$
$$= 945\, k'^4$$

På samma sätt har man

$$f_2^{(6\cdot 4)} = f_7^{(5\cdot 4)} + 7\,(1 + k'^2)\, f_8^{(5\cdot 3)} - 6\,k'^2\, f_6^{(5\cdot 3)}$$
$$= -\,1155\, k'^2\,(1 + k'^2)$$

I nedanstående sammanställning äro alla f-koefficienter upptagna, som höra till indices $\iota = 6$, $\iota = 7$ och $\iota = 8$

$$f_{11}^{(6\cdot 5)} = 945\, k'^4$$
$$f_9^{(6\cdot 5)} = -\,840\, k'^2\,(1 + k'^2)$$
$$f_7^{(6\cdot 5)} = 390\, k'^2 + 120\,(1 + k'^2)^2$$
$$f_5^{(6\cdot 5)} = -\,60\,(1 + k'^2)$$
$$f_3^{(6\cdot 5)} = 1$$

$$f_{10}^{(6\cdot 4)} = 945\, k'^4$$
$$f_8^{(6\cdot 4)} = -\,1155\, k'^2\,(1 + k'^2)$$
$$f_6^{(6\cdot 4)} = 768\, k'^2 + 274\,(1 + k'^2)^2$$
$$f_4^{(6\cdot 4)} = -\,265\,(1 + k'^2)$$
$$f_2^{(6\cdot 4)} = 31$$

$$f_9^{(6\cdot 3)} = -\,420\, k'^2$$
$$f_7^{(6\cdot 3)} = +\,225\,(1 + k'^2)$$

$$f_5^{(6\cdot3)} = -90$$

$$f_8^{(6\cdot2)} = -105\,k'^2$$
$$f_6^{(6\cdot2)} = 85\,(1 + k'^2)$$
$$f_4^{(6\cdot2)} = -65$$

$$f_7^{(6\cdot1)} = 15$$

$$f_6^{(6\cdot0)} = 1$$

$$f_{13}^{(7\cdot6)} = -10395\,k'^6$$
$$f_{11}^{(7\cdot6)} = 17010\,k'^4\,(1 + k'^2)$$
$$f_9^{(7\cdot6)} = -11235\,k'^4 - 7560\,k'^2\,(1 + k'^2)^2$$
$$f_7^{(7\cdot6)} = 8520\,k'^2\,(1 + k'^2) + 720\,(1 + k'^2)^3$$
$$f_5^{(7\cdot6)} = -1953\,k'^2 - 840\,(1 + k'^2)^2$$
$$f_3^{(7\cdot6)} = 182\,(1 + k'^2)$$
$$f_1^{(7\cdot6)} = -1$$

$$f_{12}^{(7\cdot5)} = 10395\,k'^4$$
$$f_{10}^{(7\cdot5)} = -10080\,k'^2\,(1 + k'^2)$$
$$f_8^{(7\cdot5)} = 4998\,k'^2 + 1764\,(1 + k'^2)^2$$
$$f_6^{(7\cdot5)} = -1120\,(1 + k'^2)$$
$$f_4^{(7\cdot5)} = 63$$

$$f_{11}^{(7\cdot4)} = 4725\,k'^4$$
$$f_9^{(7\cdot4)} = -6090\,k'^2\,(1 + k'^2)$$
$$f_7^{(7\cdot4)} = 4158\,k'^2 + 1624\,(1 + k'^2)^2$$
$$f_5^{(7\cdot4)} = -1750\,(1 + k'^2)$$
$$f_3^{(7\cdot4)} = 301$$

$$f_{10}^{(7\cdot3)} = -1260\,k'^2$$
$$f_8^{(7\cdot3)} = 735\,(1 + k'^2)$$
$$f_6^{(7\cdot3)} = -350$$

$$f_9^{(7\cdot2)} = -210\,k'^2$$

$$f_7^{(7\cdot2)} = 175\,(1 + k'^2)$$
$$f_5^{(7\cdot2)} = -\,140$$

$$f_8^{(7\cdot1)} = 21$$

$$f_7^{(7\cdot0)} = 1$$

$$f_{15}^{(8\cdot7)} = -\,135135\,k'^6$$
$$f_{13}^{(8\cdot7)} = 187110\,k'^4\,(1 + k'^2)$$
$$f_{11}^{(8\cdot7)} = -\,101115\,k'^4 - 68040\,k'^2\,(1 + k'^2)^2$$
$$f_9^{(8\cdot7)} = 59640\,k'^2\,(1 + k'^2) + 5040\,(1 + k'^2)^3$$
$$f_7^{(8\cdot7)} = -\,9765\,k'^2 - 4200\,(1 + k'^2)^2$$
$$f_5^{(8\cdot7)} = 546\,(1 + k'^2)$$
$$f_3^{(8\cdot7)} = -\,1$$

$$f_{14}^{(8\cdot6)} = -\,135135\,k'^6$$
$$f_{12}^{(8\cdot6)} = 232155\,k'^4\,(1 + k'^2)$$
$$f_{10}^{(8\cdot6)} = -\,155169\,k'^4 - 112392\,k'^2\,(1 + k'^2)^2$$
$$f_8^{(8\cdot6)} = 130866\,k'^2\,(1 + k'^2) + 13068\,(1 + k'^2)^3$$
$$f_6^{(8\cdot6)} = -\,32193\,k'^2 - 17024\,(1 + k'^2)^2$$
$$f_4^{(8\cdot6)} = 4851\,(1 + k'^2)$$
$$f_2^{(8\cdot6)} = -\,127$$

$$f_{13}^{(8\cdot5)} = 62370\,k'^4$$
$$f_{11}^{(8\cdot5)} = -\,64890\,k'^2\,(1 + k'^2)$$
$$f_9^{(8\cdot5)} = 34104\,k'^2 + 13132\,(1 + k'^2)$$
$$f_7^{(8\cdot5)} = -\,9870\,(1 + k'^2)$$
$$f_5^{(8\cdot5)} = 966$$

$$f_{12}^{(8\cdot4)} = 17325\,k'^2$$
$$f_{10}^{(8\cdot4)} = -\,23310\,k'^2\,(1 + k'^2)$$
$$f_8^{(8\cdot4)} = 16338\,k'^2 + 6769\,(1 + k'^2)^2$$
$$f_6^{(8\cdot4)} = -\,7910\,(1 + k'^2)$$
$$f_4^{(8\cdot4)} = 1701$$

$$f_{11}^{(8.3)} = -3150\, k'^2$$

$$f_{9}^{(8.3)} = 1960\,(1 + k'^2)$$

$$f_{7}^{(8.3)} = -1050$$

$$f_{10}^{(8.2)} = -378\, k'^2$$

$$f_{8}^{(8.2)} = 322\,(1 + k'^2)$$

$$f_{6}^{(8.2)} = 266$$

$$f_{9}^{(8.1)} = 28$$

$$f_{8}^{(8.0)} = 1$$

Då numera formen (49) för P-funktionerna blifvit funnen i det bestämningen af f-koefficienterna blifvit utförd, föreligger ingen svårighet att utveckla ifrågavarande funktioner efter argumentet x. I afhandlingen "Studien etc." finnas nämnligen följande utvecklingar utförda

$$\left\{\frac{k'}{\Delta am\,\frac{2K}{\pi}x}\right\}^{2\varrho} = Z_0^{(2\varrho)} - \frac{8q}{1-q^2} Z_2^{(2\varrho)} \operatorname{Cos} 2x + \frac{16q^2}{1-q^4} Z_4^{(2\varrho)} \operatorname{Cos} 4x - \frac{24q^3}{1-q^6} Z_6^{(2\varrho)} \operatorname{Cos} 6x + \ldots$$

$$\left\{\frac{k'}{\Delta am\,\frac{2K}{\pi}x}\right\}^{2\varrho+1} = Z_0^{(2\varrho+1)} - \frac{4q}{1+q^2} Z_2^{(2\varrho+1)} \operatorname{Cos} 2x + \frac{4q^2}{1+q^4} Z_4^{(2\varrho+1)} \operatorname{Cos} 4x - \frac{4q^3}{1+q^6} Z_6^{(2\varrho+1)} \operatorname{Cos} 6x$$

Genom differentiation af dessa formler erhålles åter

$$\frac{1}{k'}\left(\frac{2K}{\pi}\right) 2\varrho\, k^2 \operatorname{Sin} am \frac{2K}{\pi}x \operatorname{Cos} am \frac{2K}{\pi}x \left\{\frac{k'}{\Delta am\,\frac{2K}{\pi}x}\right\}^{2\varrho+1} = \frac{4.2^2 q}{1-q^2} Z_2^{(2\varrho)} \operatorname{Sin} 2x - \frac{4.4^2 q^2}{1-q^4} Z_4^{(2\varrho)} \operatorname{Sin} 4x$$
$$+ \frac{4.6^2 q^3}{1-q^6} \operatorname{Sin} 6x - \ldots$$

$$\frac{1}{k'}\left(\frac{2K}{\pi}\right)(2\varrho+1)\, k^2 \operatorname{Sin} am \frac{2K}{\pi}x \operatorname{Cos} am \frac{2K}{\pi}x \left\{\frac{k'}{\Delta am\,\frac{2K}{\pi}x}\right\}^{2\varrho+2} = \frac{4.2q}{1+q^2} Z_2^{(2\varrho+1)} \operatorname{Sin} 2x - \frac{4.4q^2}{1+q^4} Z_4^{(2\varrho+1)} \operatorname{Sin} 4x$$
$$+ \frac{4.4q^3}{1+q^6} \operatorname{Sin} 6x - \ldots$$

I alla dessa formler betecknar ϱ ett helt positivt tal, och de med Z betecknade koefficienterna äro gifna medelst uttryck, hvilka i den ofvannämnda afhandlingen blifvit utvecklade. — Insättas härpå de anförda serieutvecklingarna i eqvationerna (51), så finner man resultat af följande form:

$$(53)\quad \begin{cases} P_{\iota-n}^{(\iota)} = Q_0^{(\iota,n)} - \frac{4.2q}{1-q^2} Q_2^{(\iota,n)} \operatorname{Cos} 2x + \frac{4.4q^2}{1-q^4} Q_4^{(\iota,n)} \operatorname{Cos} 4x - \frac{4.6q^3}{1-q^6} Q_6^{(\iota,n)} \operatorname{Cos} 6x + \ldots \\ \text{eller} \\ P_{\iota-n}^{(\iota)} = Q_0^{(\iota,n)} - \frac{4q}{1+q^2} Q_2^{(\iota,n)} \operatorname{Cos} 2x + \frac{4q^2}{1+q^4} Q_4^{(\iota,n)} \operatorname{Cos} 4x - \frac{4q^3}{1+q^6} Q_6^{(\iota,n)} \operatorname{Cos} 6x + \ldots \end{cases}$$

samt

$$
(54)\quad \begin{cases}
P^{(\iota)}_{\iota-(n+1)} = \dfrac{4\,.\,2^2 q}{1-q^2}\, Q^{(\iota,\,n+1)}_2 \operatorname{Sin} 2x - \dfrac{4\,.\,4^2 q^2}{1-q^4}\, Q^{(\iota,\,n+1)}_4 \operatorname{Sin} 4x + \dfrac{4\,.\,6^2 q^3}{1-q^6}\, Q^{(\iota,\,n+1)}_6 \operatorname{Sin} 6x - \ldots \\
\text{eller} \\
P^{(\iota)}_{\iota-(n+1)} = \dfrac{4\,.\,2q}{1+q^2}\, Q^{(\iota,\,n+1)}_2 \operatorname{Sin} 2x - \dfrac{4\,.\,4q^2}{1+q^4}\, Q^{(\iota,\,n+1)}_4 \operatorname{Sin} 4x + \dfrac{4\,.\,6q^3}{1+q^6}\, Q^{(\iota,\,n+1)}_6 \operatorname{Sin} 6x - \ldots
\end{cases}
$$

dervid af de båda paren alternativa formler de förra gälla för jemna ι-värden, men de sednare för udda. I båda händelserna äro Q-koefficienterna angifna medelst följande uttryck

$$
(55)\quad \begin{cases}
Q^{(\iota,\,n)}_m = \left(\dfrac{2K}{\pi}\right)^n \left\{ f^{(\iota,\,n)}_{\iota+n} \dfrac{Z^{(\iota+n)}_m}{k'^{\,\iota+n}} + f^{(\iota,\,n)}_{\iota+n-2} \dfrac{Z^{(\iota+n-2)}_m}{k'^{\,\iota+n-2}} + f^{(\iota,\,n)}_{\iota+n-4} \dfrac{Z^{(\iota+n-4)}_m}{k'^{\,\iota+n-4}} + \ldots \right\} \\
Q^{(\iota,\,n+1)}_m = k' \left(\dfrac{2K}{\pi}\right)^n \left\{ \dfrac{f^{(\iota,\,n+1)}_{\iota+n+1}}{\iota+n} \cdot \dfrac{Z^{(\iota+n+1)}_m}{k'^{\,\iota+n+1}} + \dfrac{f^{(\iota,\,n+1)}_{\iota+n-1}}{\iota+n-2} \cdot \dfrac{Z^{(\iota+n-1)}_m}{k'^{\,\iota+n-1}} + \dfrac{f^{(\iota,\,n+1)}_{\iota+n-3}}{\iota+n-4} \cdot \dfrac{Z^{(\iota+n-3)}_m}{k'^{\,\iota+n-3}} + \ldots \right\}
\end{cases}
$$

Vi återgå nu till eqv. (50) och insätta i densamma 2ν och $2\nu+1$ i stället för ι, samt $\operatorname{Sin} 2ix$ och $\operatorname{Cos} 2ix$ i stället för $f(x)$. Resultaten af dessa substitutioner leda omedelbart till den independenta bestämningen af de med η och θ betecknade koefficienterna. Man finner nämnligen med hänseende till de ofvan funna utvecklingarna för P-funktionerna:

$$
\begin{aligned}
\frac{d^{2\nu} \operatorname{Sin} 2ix}{\left(dam \dfrac{2K}{\pi} x\right)^{2\nu}} = \left(\frac{\pi}{2K}\right)^{2\nu} \Big\{ & 2i \left[\frac{4\,.\,2^2 q}{1-q^2}\, Q^{(2\nu,\,2\nu-1)}_2 \cdot \operatorname{Sin} 2x - \frac{4\,.\,4^2 q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-1)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Cos} 2ix \\
& - (2i)^2 \left[Q^{(2\nu,\,2\nu-2)}_0 - \frac{4\,.\,2\,.\,q}{1-q^2}\, Q^{(2\nu,\,2\nu-2)}_2 \cdot \operatorname{Cos} 2x + \frac{4\,.\,4\,.\,q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-2)}_4 \cdot \operatorname{Cos} 4x - \ldots\right] \operatorname{Sin} 2ix \\
& - (2i)^3 \left[\frac{4\,.\,2^2 q}{1-q^2}\, Q^{(2\nu,\,2\nu-3)}_2 \cdot \operatorname{Sin} 2x - \frac{4\,.\,4^2 q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-3)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Cos} 2ix \\
& + (2i)^4 \left[Q^{(2\nu,\,2\nu-4)}_0 - \frac{4\,.\,2q}{1-q^2}\, Q^{(2\nu,\,2\nu-4)}_2 \cdot \operatorname{Cos} 2x + \frac{4\,.\,4q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-4)}_4 \cdot \operatorname{Cos} 4x + \ldots\right] \operatorname{Sin} 2ix \\
& + \ldots\ldots \Big\}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d^{2\nu} \operatorname{Cos} 2ix}{\left(dam \dfrac{2K}{\pi} x\right)^{2\nu}} = \left(\frac{\pi}{2K}\right)^{2\nu} \Big\{ & -2i \left[\frac{4\,.\,2^2 q}{1-q^2}\, Q^{(2\nu,\,2\nu-1)}_2 \cdot \operatorname{Sin} 2x - \frac{4\,.\,4^2 q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-1)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Sin} 2ix \\
& - (2i)^2 \left[Q^{(2\nu,\,2\nu-2)}_0 - \frac{4\,.\,2q}{1-q^2}\, Q^{(2\nu,\,2\nu-2)}_2 \cdot \operatorname{Cos} 2x + \frac{4\,.\,4\,.\,q^2}{1-q^4}\, Q^{(2\nu,\,2\nu-2)}_4 \cdot \operatorname{Cos} 4x - \ldots\right] \operatorname{Cos} 2ix \\
& + (2i)^3 \left[\frac{4\,.\,2^2 q}{1-q^2}\, Q^{(2\nu,\,2\nu-3)}_2 \cdot \operatorname{Sin} 2x - \frac{4\,.\,4^2}{1-q^4}\, Q^{(2\nu,\,2\nu-3)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Sin} 2ix \\
& + (2i)^4 \left[Q^{(2\nu,\,2\nu-4)}_0 - \frac{4\,.\,2\,.\,q}{1-q^2}\, Q^{(2\nu,\,2\nu-2)}_2 \cdot \operatorname{Cos} 2x + \frac{4\,.\,4\,.\,q}{1-q^4}\, Q^{(2\nu,\,2\nu-4)}_4 \cdot \operatorname{Cos} 4x - \ldots\right] \operatorname{Cos} 2ix \\
& - \ldots\ldots \Big\}
\end{aligned}
$$

$$
\begin{aligned}
\frac{d^{2\nu+1} \operatorname{Sin} 2ix}{\left(dam \dfrac{2K}{\pi} x\right)^{2\nu+1}} = \left(\frac{\pi}{2K}\right)^{2\nu+1} \Big\{ & 2i \left[Q^{(2\nu+1,\,2\nu)}_0 - \frac{4q}{1+q^2}\, Q^{(2\nu+1,\,2\nu)}_2 \cdot \operatorname{Cos} 2x + \frac{4q^2}{1+q^4}\, Q^{(2\nu+1,\,2\nu)}_4 \cdot \operatorname{Cos} 4x - \ldots\right] \operatorname{Cos} 2ix \\
& - (2i)^2 \left[\frac{8q}{1+q^2}\, Q^{(2\nu+1,\,2\nu-1)}_2 \cdot \operatorname{Sin} 2x - \frac{16q^2}{1+q^4}\, Q^{(2\nu+1,\,2\nu-1)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Sin} 2ix \\
& - (2i)^3 \left[Q^{(2\nu+1,\,2\nu-2)}_0 - \frac{4q}{1+q^4}\, Q^{(2\nu+1,\,2\nu-2)}_2 \cdot \operatorname{Cos} 2x + \frac{4q^2}{1+q^4}\, Q^{(2\nu+1,\,2\nu-2)}_4 \cdot \operatorname{Cos} 4x - \ldots\right] \operatorname{Cos} 2ix \\
& + (2i)^4 \left[\frac{8q}{1+q^2}\, Q^{(2\nu+1,\,2\nu-3)}_2 \cdot \operatorname{Sin} 2x - \frac{16q^2}{1+q^4}\, Q^{(2\nu+1,\,2\nu-3)}_4 \cdot \operatorname{Sin} 4x + \ldots\right] \operatorname{Sin} 2ix \\
& + \ldots\ldots \Big\}
\end{aligned}
$$

$$\frac{d^{2\nu+1}\,\mathrm{Cos}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu+1}}=\left(\frac{\pi}{2K}\right)^{2\nu+1}\Big\{-2i\Big[Q_0^{(2\nu+1,\,2\nu)}-\frac{4q}{1+q^2}Q_2^{(2\nu+1,\,2\nu)}\cdot\mathrm{Cos}\,2x+\frac{4q^2}{1+q^4}Q_4^{(2\nu+1,\,2\nu)}\cdot\mathrm{Cos}\,4x-\ldots\Big]\,\mathrm{Sin}\,2ix$$

$$-(2i)^2\Big[\frac{8q}{1+q^2}Q_2^{(2\nu+1,\,2\nu-1)}\cdot\mathrm{Sin}\,2x-\frac{16q^2}{1+q^4}Q_2^{(2\nu+1,\,2\nu-1)}\cdot\mathrm{Sin}\,4x+\ldots\Big]\,\mathrm{Cos}\,2ix$$

$$+(2i)^3\Big[Q_0^{(2\nu+1,2\nu-2)}-\frac{4q}{1+q^2}Q_2^{(2\nu+1,2\nu-2)}\cdot\mathrm{Cos}\,2x+\frac{4q^2}{1+q^4}Q_4^{(2\nu+1,2\nu-2)}\cdot\mathrm{Cos}\,4x-\ldots\Big]\,\mathrm{Sin}\,2ix$$

$$+(2i)^4\Big[\frac{8q}{1+{}^2q}Q_2^{(2\nu+1,\,2\nu-3)}\cdot\mathrm{Sin}\,2x-\frac{16\,.\,q^2}{1+q^4}Q_4^{(2\nu+1,\,2\nu-3)}\cdot\mathrm{Sin}\,4x+\ldots\Big]\,\mathrm{Cos}\,2ix$$

$$-\;\ldots\ldots$$

Man erhåller dessa formler under en vida enklare form genom att införa följande beteckningar:

$$(56)\quad\begin{cases}R_m^{(2\nu,\,2\nu-1)}=\left(\frac{\pi}{2K}\right)^{2\nu}\{2i\,Q_m^{(2\nu,\,2\nu-1)}-(2i)^3\,Q_m^{(2\nu,\,2\nu-3)}+(2i)^5\,Q_m^{(2\nu,\,2\nu-5)}-\ldots\}\\ R_m^{(2\nu,\,2\nu-2)}=\left(\frac{\pi}{2K}\right)^{2\nu}\{-(2i)^2\,Q_m^{(2\nu,\,2\nu-2)}+(2i)^4\,Q_m^{(2\nu,\,2\nu-4)}-(2i)^6\,Q_m^{(2\nu,\,2\nu-6)}+\ldots\}\\ R_m^{(2\nu+1,\,2\nu)}=\left(\frac{\pi}{2K}\right)^{2\nu+1}\{2i\,Q_m^{(2\nu+1,\,2\nu)}-(2i)^3\,Q_m^{(2\nu+1,\,2\nu-2)}+(2i)^5\,Q_m^{(2\nu+1,\,2\nu-4)}-\ldots\}\\ R_m^{(2\nu+1,\,2\nu-1)}=\left(\frac{\pi}{2K}\right)^{2\nu+1}\{-(2i)^2\,Q_m^{(2\nu+1,\,2\nu-1)}+(2i)^4\,Q_m^{(2\nu+1,\,2\nu-3)}-(2i)^6\,Q_m^{(2\nu+1,\,2\nu-5)}+\ldots\}\end{cases}$$

De föregående uttrycken öfvergå då i följande

$$\frac{d^{2\nu}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{3K}{\pi}x\right)^{2\nu}}=\Big\{\frac{4\,.\,2^2.\,q}{1-q^2}R_2^{(2\nu,\,2\nu-1)}\,\mathrm{Sin}\,2x-\frac{4.4^2.q^2}{1-q^4}R_4^{(2\nu,\,2\nu-1)}\,\mathrm{Sin}\,4x+\ldots\Big\}\,\mathrm{Cos}\,2ix$$

$$+\;\Big\{R_0^{(2\nu,\,2\nu-2)}-\frac{4\,.\,2\,.\,q}{1-q^2}R_0^{(2\nu,\,2\nu-2)}\,\mathrm{Cos}\,2x+\frac{4\,.\,4\,.\,q^2}{1-q^4}R_4^{(2\nu,\,2\nu-2)}\,\mathrm{Cos}\,4x-\ldots\Big\}\,\mathrm{Sin}\,2ix$$

$$\frac{d^{2\nu}\,\mathrm{Cos}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu}}=-\Big\{\frac{4\,.\,2^2.\,q}{1-q^2}R_2^{(2\nu,\,2\nu-1)}\,\mathrm{Sin}\,2x-\frac{4.4^2.q^2}{1-q^4}R_4^{(2\nu,\,2\nu-1)}\,\mathrm{Sin}\,4x+\ldots\Big\}\,\mathrm{Sin}\,2ix$$

$$+\Big\{R_0^{(2\nu,\,2\nu-2)}-\frac{4\,.\,2\,.\,q}{1-q^2}R_2^{(2\nu,\,2\nu-2)}\,\mathrm{Cos}\,2x+\frac{4\,.\,4.\,q^2}{1-q^4}R_4^{(2\nu,\,2\nu-2)}\,\mathrm{Cos}\,4x-\ldots\Big\}\,\mathrm{Cos}\,2ix$$

$$\frac{d^{2\nu+1}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu+1}}=\Big\{R_0^{(2\nu+1,\,2\nu)}-\frac{2q}{1+q^2}R_2^{(2\nu+1\,2\,\nu)}\,\mathrm{Cos}\,2x+\frac{4q^2}{1+q^4}R_4^{(2\nu+1,\,2\nu)}\,\mathrm{Cos}\,4x-\ldots\Big\}\,\mathrm{Cos}\,2ix$$

$$+\Big\{\frac{8q}{1+q^2}R_2^{(2\nu+1,\,2\nu-1)}\,\mathrm{Sin}\,2x-\frac{16q^2}{1+q^4}R_4^{(2\nu+1,\,2\nu-1)}\,\mathrm{Sin}\,4x+\ldots\Big\}\,\mathrm{Sin}\,2ix$$

$$\frac{d^{2\nu+1}\,\mathrm{Cos}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu+1}}=-\Big\{R_0^{(2\nu+1,\,2\nu)}-\frac{4q}{1+q^4}R_2^{(2\nu+1,\,2\nu)}\,\mathrm{Cos}\,2x+\frac{4q^2}{1+q^4}R_4^{(2\nu+1,\,2\nu)}\,\mathrm{Cos}\,4x-\ldots\Big\}\,\mathrm{Sin}\,2ix$$

$$+\Big\{\frac{8q}{1+q^2}R_0^{(2\nu+1,\,2\nu-1)}\,\mathrm{Sin}\,2x-\frac{16q^2}{1+q^4}R_4^{(2\nu+1,\,2\nu-1)}\,\mathrm{Sin}\,4x+\ldots\Big\}\,\mathrm{Cos}\,2ix$$

Jemföras nu dessa uttryck med eqvationerna (48), så finner man omedelbart följande relationer:

$$2\eta_{-2\nu,\,2}^{(i)}=2\,\frac{(-q)^{i-1}}{1-q^{2i-2}}\big[(2i-2)^2R_{2i-2}^{(2\nu,\,2\nu-1)}+(2i-2)\,R_{2i-2}^{(2\nu,2\nu-2)}\big]-2\,\frac{(-q)^{i+1}}{1-q^{2i+2}}\big[(2i+2)^2R_{2i+2}^{(2\nu,2\nu-1)}+(2i+2)R_{2i+2}^{(2\nu,2\nu-2)}\big]$$

$$2\eta_{-2\nu,\,4}^{(i)}=2\,\frac{(-q)^{i-2}}{1-q^{2i-4}}\big[(2i-4)^2R_{2i-4}^{(2\nu,\,2\nu-1)}+(2i-4)\,R_{2i-4}^{(2\nu,\,2\nu-2)}\big]-2\,\frac{(-q)^{i+2}}{1-q^{2i+4}}\big[(2i+4)^2R_{2i+4}^{(2\nu,2\nu-1)}+(2i+4)R_{2i+4}^{(2\nu,2\nu-2)}\big]$$

$$\ldots\ldots\ldots$$

$$2\eta^{(i)}_{-2\nu,2i-2} = 2\frac{-q}{1-q^2}\left[2^2 R_2^{(2\nu,2\nu-1)} + 2R_2^{(2\nu,2\nu-2)}\right] - 2\frac{(-q)^{2i-1}}{1-q^{4i-2}}\left[(4i-2)^2 R_{4i-2}^{(2\nu,2\nu-1)} + (4i-2)R_{4i-2}^{(2\nu,2\nu-2)}\right]$$

$$2\eta^{(i)}_{-2\nu,2i} = R_0^{(2\nu,2\nu-2)}$$

$$2\eta^{(i)}_{-2,2i+2} = -2\frac{-q}{1-q^2}\left[2^2 R_2^{(2\nu,2\nu-1)} - 2R_2^{(2\nu,2\nu-2)}\right] - 2\frac{(-q)^{2i+1}}{1-q^{4i+2}}(4i+2)^2 R_{4i+2}^{(2\nu,2\nu-1)} + (4i+2)R_{4i+2}^{(2\nu,2\nu-2)}\Big]$$

. . . .

$$2\eta^{(i)}_{-2\nu,2i+2i'} = -2\frac{(-q)^{i'}}{1-q^{2i'}}\left[(2i')^2 R_{2i'}^{(2\nu,2\nu-1)} - 2i' R_{2i'}^{(2\nu,2\nu-2)}\right] - 2\frac{(-q)^{2i+i'}}{1-q^{4i+2i'}}\left[(4i+2i')^2 R_{4i+2i'}^{(2\nu,2\nu-1)} + (4i+2i')R_{4i+2i'}^{(2\nu,2\nu-1)}\right]$$

$$\theta^{(i)}_{-2\nu,0} = 2\frac{(-q)^i}{1-q^{2i}}\left[(2i)^2 R_{2i'}^{(2\nu,2\nu-1)} + 2i R_{2i}^{(2\nu,2\nu-2)}\right]$$

$$2\theta^{(i)}_{-2\nu,2} = 2\frac{(-q)^{i-1}}{1-q^{2i-2}}\left[(2i-2)^2 R_{2i-2}^{(2\nu,2\nu-1)} + (2i-2)R_{2i-2}^{(2\nu,2\nu-2)}\right] + 2\frac{(-q)^{i+1}}{1-q^{2i+2}}\left[(2i+2)^2 R_{2i+2}^{(2\nu,2\nu-1)} + (2i+2)R_{2i+2}^{(2\nu,2\nu-2)}\right]$$

$$2\theta^{(i)}_{-2\nu,14} = 2\frac{(-q)^{i-2}}{1-q^{2i-4}}\left[(2i-4)^2 R_{2i-4}^{(2\nu,2\nu-1)} + (2i-4)R_{2i-4}^{(2\nu,2\nu-2)}\right] + 2\frac{(-q)^{i+2}}{1-q^{2i+4}}\left[(2i+4)^2 R_{2i+4}^{(2\nu,2\nu-1)} + (2i+4)R_{2i+4}^{(2\nu,2\nu-2)}\right]$$

. . . .

$$2\theta^{(i)}_{-2\nu,2i-2} = 2\frac{-q}{1-q^2}\left[2^2 R_2^{(2\nu,2\nu-1)} + 2R_2^{(2\nu,2\nu-2)}\right] + 2\frac{(-q)^{2i-1}}{1-q^{4i-2}}\left[(4i-2)^2 R_{4i-2}^{(2\nu,2\nu-1)} + (4i-2)R_{4i-2}^{(2\nu,2\nu-2)}\right]$$

$$2\theta^{(i)}_{-2\nu,2i} = R_0^{(2\nu,2\nu-2)} + 2\frac{(-q)^{2i}}{1-q^{8i}}\left[(4i)^2 R_{4i}^{(2\nu,2\nu-1)} + 4i R_{4i}^{(2\nu,2\nu-2)}\right]$$

$$2\theta^{(i)}_{-2\nu,2i+2} = -2\frac{-q}{1-q^2}\left[2^2 R_2^{(2\nu,2\nu-1)} - 2R_2^{(2\nu,2\nu-2)}\right] + 2\frac{(-q)^{2i+1}}{1-q^{4i+2}}\left[(4i+2)^2 R_{4i+2}^{(2\nu,2\nu-1)} + (4i+2)R_{4i+2}^{(2\nu,2\nu-2)}\right]$$

. . . .

$$2\theta^{(i)}_{-2\nu,2i+2i'} = -2\frac{(-q)^{i'}}{1-q^{2i'}}\left[(2i')^2 R_{2i'}^{(2\nu,2\nu-1)} - 2i' R_{2i'}^{(2\nu,2\nu-1)}\right] + 2\frac{(-q)^{2i+i'}}{1-q^{4i+2i'}}\left[(4i+2i')^2 R_{4i+2i'}^{(2\nu,2\nu-1)} + (4i+2i')R_{4i+2i'}^{(2\nu,2\nu-2)}\right]$$

$$\eta^{(i)}_{-(2\nu+1),0} = 2\frac{(-q)^i}{1+q^{2i}}\left[R_{2i}^{(2\nu+1,2\nu)} - 2i R_{2i}^{(2\nu+1,2\nu-1)}\right]$$

$$2\eta^{(i)}_{-(2\nu+1),2} = 2\frac{(-q)^{i-1}}{1+q^{2i-2}}\left[R_{2i-2}^{(2\nu+1,2\nu)} - (2i-2)R_{2i-2}^{(2\nu+1,2\nu-1)}\right] + 2\frac{(-q)^{i+1}}{1+q^{2i+2}}\left[R_{2i+2}^{(2\nu+1,2\nu)} - (2i+2)R_{2i+2}^{(2\nu+1,2\nu-1)}\right]$$

$$2\eta^{(i)}_{-(2\nu+1),4} = 2\frac{(-q)^{i-2}}{1+q^{2i-4}}\left[R_{2i-2}^{(2\nu+1,2\nu)} - (2i-4)R_{2i-2}^{(2\nu+1,2\nu-1)}\right] + 2\frac{(-q)^{i+2}}{1+q^{2i+4}}\left[R_{2i+4}^{(2\nu+1,2\nu)} - (2i+4)R_{2i+4}^{(2\nu+1,1\nu-1)}\right]$$

. . . .

$$2\eta^{(i)}_{-(2\nu+1),2i-2} = 2\frac{-q}{1+q^2}\left[R_2^{(2\nu+1,2\nu)} + 2R_2^{(2\nu+1,2\nu-1)}\right] + 2\frac{(-q)^{2i-1}}{1+q^{4i-2}}\left[R_{4i-2}^{(2\nu+1,2\nu)} - (4i-2)R_{4i-2}^{(2\nu+1,2\nu-1)}\right]$$

$$2\eta^{(i)}_{-(2\nu+1),2i} = R_0^{(2\nu+1,2\nu)} + 2\frac{(-q)^{2i}}{1+q^{4i}}\left[R_{4i}^{(2\nu+1,2\nu)} - 4i R_{4i}^{(2\nu+1,2\nu-1)}\right]$$

$$2\eta^{(i)}_{-(2\nu+1),2i+2} = 2\frac{-q}{1+q^2}\left[R_2^{(2\nu+1,2\nu)} + 2R_2^{(2\nu+1,2\nu-1)}\right] + 2\frac{(-q)^{2i+1}}{1+q^{4i+2}}\left[R_{4i+2}^{(2\nu+1,2\nu)} - (4i+2)R_{4i+2}^{(2\nu+1,2\nu-1)}\right]$$

. . . .

$$2\eta^{(i)}_{-(2\nu+1),2i+2i'} = 2\frac{(-q)^{i'}}{1+q^{2i'}}\left[R_{2i'}^{(2\nu+1,2\nu)} + 2i' R_{2i'}^{(2\nu+1,2\nu-1)}\right] + 2\frac{(-q)^{2i+}}{1+q^{4i+2i'}}\left[R_{4i+2i'}^{(2\nu+1,2\nu)} - (4i+2i')R_{4i+2i'}^{(2\nu+1,2\nu-1)}\right]$$

$$2\theta^{(i)}_{-(2\nu+1),2} = -2\frac{(-q)^{i-1}}{1+q^{2i-2}}\left[R^{(2\nu+1,2\nu)}_{2i-2} - (2i-2)\,R^{(2\nu+1,2\nu-1)}_{2i-2}\right] + 2\frac{(-q)^{i+1}}{1+q^{2i+2}}\left[R^{(2\nu+1,2\nu)}_{2i+2} - (2i+2)\,R^{(2\nu+1,2\nu-1)}_{2i+2}\right]$$

$$2\theta^{(i)}_{-(2\nu+1),4} = -2\frac{(-q)^{i-2}}{1+q^{2i-4}}\left[R^{(2\nu+1,2\nu)}_{2i-4} - (2i-4)\,R^{(2\nu+1,2\nu-1)}_{2i-4}\right] + 2\frac{(-q)^{i+2}}{1+q^{3i+4}}\left[R^{(2\nu+1,2\nu)}_{2i+4} - (2i+4)\,R^{(2\nu+1,2\nu-1)}_{2i+4}\right]$$

. . . .

$$2\theta^{(i)}_{-(2\nu+1),2i-2} = -2\frac{(-q)}{1+q^{2}}\left[R^{(2\nu+1,2\nu)}_{2} - 2R^{(2\nu+1,2\nu-1)}_{2} + 2\frac{(-q)^{2i-1}}{1+q^{4i-2}}\left[R^{(2\nu+1,2\nu)}_{4i-2} - (4i-2)\,R^{(2\nu+1,2\nu-1)}_{4i-2}\right]\right.$$

$$2\theta^{(i)}_{-(2\nu+1),2i} = -R^{(2\nu+1),2i}_{0}$$

$$2\theta^{(i)}_{-(2\nu+1),2i+2} = -2\frac{(-q)}{1+q^{2}}\left[R^{(2\nu+1,2\nu)}_{2} + 2R^{(2\nu+1,2\nu-1)}_{2}\right] + 2\frac{(-q)^{2i+1}}{1+q^{4i+2}}\left[R^{(2\nu+1,2\nu+i)}_{4i+2} - (4i+2)\,R^{(2\nu+1,2\nu-1)}_{4i+2}\right]$$

$$2\theta^{(i)}_{-(2\nu+1),2i+2i'} = -2\frac{(-q)^{i'}}{1+q^{2i'}}\left[R^{(2\nu+1,2\nu)}_{2i'} + 2i'\,R^{(2\nu+1,2\nu-1)}_{2i'}\right] + 2\frac{(-q)^{2i+i'}}{1+q^{4i+i'}}\left[R^{(2\nu+1,2\nu)}_{4i+2i'} - (4i+2i')\,R^{(2\nu+1,2\nu-1)}_{4i+2i'}\right]$$

Framställningen af uttrycken för η- och θ-koefficienterna har varit något utförlig, och detta på den grund att dessa koefficienter icke allenast angifva värden för de i det föregående med $E'(\nu)$ betecknade funktioner, nämnligen för de med positiva ν-värden, utan äfven i andra afseenden i denna afhandling komma att spela en framstående roll.

§ 11.

Bibehåller man algorithmen

$$E'(\nu) = \frac{(-1)}{4i}\,\eta^{(i)}_{-2(\nu+),\,2i'}$$

äfven för negativa värden af ν, så beteckna η-funktionerna, der den första af de nedre indices är positiv, utvecklingskoefficienter i de resultat, som erhållas då funktionen Sin $2ix$ multipliceras med $dam\,\frac{2K}{\pi}\,x$ och resultatet integreras, samt analoga operationer successivt utföras. Vi erhålla nämnligen på grund af eqvationerna (I) och (II)

$$(57)\qquad \int \mathrm{Sin}\,2ix\,.\,d\,.\,am\frac{2K}{\pi}x = \frac{2K}{\pi}\int \mathrm{Sin}\,2ix\,\Delta am\,\frac{2K}{\pi}\,x\,.\,dx$$

$$= -\frac{2}{2}\,\sigma^{(2i)}_{2}\,\mathrm{Cos}\,2am\,\frac{2K}{\pi}\,x - \frac{2}{4}\,\sigma^{(2i)}_{4}\,\mathrm{Cos}\,4am\,\frac{2K}{\pi}\,x - \ldots.$$

$$= -\left\{\frac{2}{2}\,\sigma^{(2i)}_{2}\,\Gamma^{(2)}_{0} + \frac{2}{4}\,\sigma^{(2i)}_{4}\,\Gamma^{(4)}_{0} + \frac{2}{6}\,\sigma^{(2i)}_{6}\,\Gamma^{(6)}_{0} + \ldots\right\}$$

$$-2\left\{\frac{2}{2}\,\sigma^{(2i)}_{2}\,\Gamma^{(2)}_{2} + \frac{2}{4}\,\sigma^{(2i)}_{4}\,\Gamma^{(4)}_{2} + \frac{2}{6}\,\sigma^{(2i)}_{6}\,\Gamma^{(6)}_{2} + \ldots\right\}\mathrm{Cos}\,2x$$

$$-2\left\{\frac{2}{2}\,\sigma^{(2i)}_{2}\,\Gamma^{(2)}_{4} + \frac{2}{4}\,\sigma^{(2i)}_{4}\,\Gamma^{(4)}_{4} + \frac{2}{6}\,\sigma^{(2i)}_{6}\,\Gamma^{(6)}_{4} + \ldots\right\}\mathrm{Cos}\,4x$$

$$-\ldots.$$

Sättes nu å andra sidan, i det med $\eta^{(i)}_{1\cdot 0}$ betecknas en integrationskonstant,

$$\int \mathrm{Sin}\,2ix\,d\,.\,am\,\frac{2K}{\pi}\,x = \eta^{(i)}_{1,0} + 2\eta^{(i)}_{1,2}\,\mathrm{Cos}\,2x + 2\eta^{(i)}_{1,4}\,\mathrm{Cos}\,4x + \ldots,$$

så befinnas

$$2\eta^{(i)}_{1,2} = -\frac{2}{2}\left\{\frac{q^{i-1}}{1+q^{2i-2}} - \frac{q^{i+1}}{1+q^{2i+2}}\right\}$$

$$2\eta^{(i)}_{1,4} = -\frac{2}{4}\left\{\frac{q^{i-2}}{1+q^{2i-4}} - \frac{q^{i+2}}{1+q^{2i+4}}\right\}$$

. . . . .

$$2\eta^{(i)}_{1,2i-2} = -\frac{2}{2i-2}\left\{\frac{q}{1+q^2} - \frac{q^{2i-1}}{1+q^{4i-2}}\right\}$$

$$2\eta^{(i)}_{1,2i} = -\frac{2}{2i}\left\{\frac{1}{2} - \frac{q^{2i}}{1+q^{4i}}\right\}$$

$$2\eta^{(i)}_{1,2i+2} = -\frac{2}{2i+2}\left\{\frac{q}{1+q^2} - \frac{q^{2i+1}}{1+q^{4i+2}}\right\}$$

o. s. v.

och derjemte erhåller man, om σ-koefficienterna uttryckas medelst motsvarande Γ-koefficienter,

$$\eta^{(i)}_{1,0} = -4i\left\{\frac{1}{2^2}\Gamma^{(2)}_{2i}\Gamma^{(2)}_{0} + \frac{1}{4^2}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{0} + \frac{1}{6^2}\Gamma^{(6)}_{2i}\Gamma^{(5)}_{0} + \ldots\right\}$$

$$\eta^{(i)}_{1,2} = -4i\left\{\frac{1}{2^2}\Gamma^{(2)}_{2i}\Gamma^{(2)} + \frac{1}{4^2}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2} + \frac{1}{6^2}\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2} + \ldots\right\}$$

$$\eta^{(i)}_{1,4} = -4i\left\{\frac{1}{2^2}\Gamma^{(2)}_{2i}\Gamma^{(2)}_{4} + \frac{1}{4^2}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{4} + \frac{1}{6^2}\Gamma^{(6)}_{2i}\Gamma^{(6)}_{4} + \ldots\right\}$$

o. s. v.

Således är i allmänhet

$$E'(-1) = -\frac{1}{4i}\eta^{(i)}_{1,2i'}.$$

Multipliceras eqvationen (57) med $d\,.\,am\frac{2K}{\pi}x = \frac{2K}{\pi}\Delta am\frac{2K}{\pi}x\,.\,dx$, så erhålles efter integration af den sålunda uppstående produkten:

$$(58)\quad \left(\frac{2K}{\pi}\right)^2\int\Delta am\frac{2K}{\pi}x\,.\,dx\int\mathrm{Sin}\,2ix\,\Delta am\frac{2K}{\pi}x\,dx = -\frac{2}{2^2}\sigma^{(2i)}_{2}\,\mathrm{Sin}\,2am\frac{2K}{\pi}x - \frac{2}{4^2}\sigma^{(2i)}_{4}\,\mathrm{Sin}\,4am\frac{2K}{\pi}x - \ldots$$

För utvecklingskoefficienterna efter argumentet x finner man på samma sätt som ofvan, i det dessa koefficienter betecknas med $\eta^{(i)}_{2,2i'}$:

$$\eta^{(i)}_{2,2i'} = -4i\left\{\frac{1}{2^3}\Gamma^{(i)}_{2i}\Sigma^{(2)}_{2i'} + \frac{1}{4^3}\Gamma^{(4)}_{2i'}\Sigma^{(4)}_{2i} + \frac{1}{6^3}\Gamma^{(6)}_{2i}\Sigma^{(6)}_{2i'} + \ldots\right\}$$

$$= -4i\frac{1-q^{2i'}}{1+q^{2i'}}\left\{\frac{1}{2^3}\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + \frac{1}{4^3}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + \frac{1}{6^3}\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

Men å andra sidan erhålles äfven, efter multiplikation af serien

$$\eta^{(i)}_{1,0} + 2\eta^{(i)}_{1,2}\,\mathrm{Cos}\,2x + 2\eta^{(i)}_{1,4}\,\mathrm{Cos}\,4x + \ldots$$

med

$$\frac{2K}{\pi}\Delta am\frac{2K}{\pi}x\,.\,dx = \left\{1 + \frac{4q}{1+q^2}\mathrm{Cos}\,2x + \ldots\right\}dx,$$

samt genom att integrera denna produkt:

$$0 = \eta^{(i)}_{1,0} + \frac{4q}{1+q^2}\eta^{(i)}_{1,2} + \frac{4q^2}{1+q^4}\eta^{(i)}_{1,4} + \ldots$$

$$2\eta^{(i)}_{2,2} = \frac{1}{2}\left\{2\eta^{(i)}_{1,2} + \frac{4q}{1+q^2}(\eta^{(i)}_{1,0} + \eta^{(i)}_{1,4}) + \frac{4q^2}{1+q^4}(\eta^{(i)}_{1,2} + \eta^{(i)}_{1,6}) + \ldots\right\}$$

$$2\eta^{(i)}_{2,4} = \frac{1}{4}\left\{2\eta^{(i)}_{1,4} + \frac{4q}{1+q^2}(\eta^{(i)}_{1,2} + \eta^{(i)}_{1,6}) + \frac{4q^2}{1+q^4}(\eta^{(i)}_{1,0} + \eta^{(i)}_{1,8}) + \ldots\right\}$$

o. s. v.

Att den första af dessa eqvationer måste äga bestånd, inses på grund deraf att ingen mot vinkeln x proportionell term kan hafva uppstått i den sökta utvecklingen. Samma eqvation leder äfven till en ny bestämning af $\eta^{(i)}_{1,0}$; man har nämnligen

$$\eta^{(i)}_{1,0} = -\frac{4q}{1+q^2}\eta^{(i)}_{1,2} - \frac{4q^2}{1+q^4}\eta^{(i)}_{1,4} - \ldots$$

$$= \frac{1}{1}\frac{2q}{1+q^2}\left[\frac{q^{i-1}}{1+q^{2i-2}} - \frac{q^{i+1}}{1+q^{2i+2}}\right] + \frac{1}{2}\frac{4q^2}{1+q^4}\left[\frac{q^{i-2}}{1+q^{2i-4}} - \frac{q^{i+2}}{1+q^{2i+4}}\right] + \ldots$$

Man erhåller vidare på den beträdda vägen medelst eqv. (58)

$$\eta^{(i)}_{3,2i'} = 4i\left\{\frac{1}{2^4}\Gamma^{(2)}_{2i}\Gamma^{(2)}_{2i'} + \frac{1}{4^4}\Gamma^{(4)}_{2i}\Gamma^{(4)}_{2i'} + \frac{1}{6^4}\Gamma^{(6)}_{2i}\Gamma^{(6)}_{2i'} + \ldots\right\}$$

då dessa η-koefficienter framgå ur utvecklingen

$$\left(\frac{2K}{\pi}\right)^3\int\Delta am\frac{2K}{\pi}x\,.\,dx\int\Delta am\frac{2K}{\pi}x\,.\,dx\int \mathrm{Sin}\,2ix\,.\,\Delta am\frac{2K}{\pi}x\,.\,dx$$

$$= \eta^{(i)}_{3,0} + 2\eta^{(i)}_{3,2}\,\mathrm{Cos}\,2x + 2\eta^{(i)}_{3,4}\,\mathrm{Cos}\,4x + \ldots$$

$$= \int\{2\eta^{(i)}_{2,2}\,\mathrm{Sin}\,2x + 2\eta^{(i)}_{2,4}\,\mathrm{Sin}\,4x + \ldots\}\left\{1 + \frac{4q}{1+q^2}\mathrm{Cos}\,2x + \frac{4q^2}{1+q^4}\mathrm{Cos}\,4x + \ldots\right\}dx$$

Häraf erhållas följande uttryck

$$2\eta^{(i)}_{3,2} = -\frac{1}{2}\left\{2\eta^{(i)}_{2,2} + \frac{4q}{1+q^2}\eta^{(i)}_{2,4} + \frac{4q^2}{1+q^4}\left[\eta^{(i)}_{2,6} - \eta^{(i)}_{2,2}\right] + \frac{4q^3}{1+q^6}\left[\eta^{(i)}_{2,8} - \eta^{(i)}_{2,4}\right] + \ldots\right\}$$

$$2\eta^{(i)}_{3,4} = -\frac{1}{4}\left\{2\eta^{(i)}_{2,4} + \frac{4q}{1+q^2}\left[\eta^{(i)}_{2,6} + \eta^{(i)}_{2,2}\right] + \frac{4q^2}{1+q^4}\eta^{(i)}_{2,8} + \frac{4q^3}{1+q^6}\left[\eta^{(i)}_{2,10} - \eta^{(i)}_{2,2}\right] + \ldots\right\}$$

$$2\eta^{(i)}_{3,6} = -\frac{1}{6}\left\{2\eta^{(i)}_{2,6} + \frac{4q}{1+q^2}\left[\eta^{(i)}_{2,8} + \eta^{(i)}_{2,4}\right] + \frac{4q^2}{1+q^4}\left[\eta^{(i)}_{2,10} + \eta^{(i)}_{2,2}\right] + \frac{4q^3}{1+q^6}\eta^{(i)}_{2,12} + \ldots\right\}$$

o. s. v.

Deremot spelar $\eta^{(i)}_{3,0}$ rollen af en integrationskonstant, hvilken bestämmes på samma sätt, som $\eta^{(i)}_{1,0}$; man finner dervid

$$\eta^{(i)}_{3,0} = -\frac{4q}{1+q^2}\eta^{(i)}_{3,2} - \frac{4q^2}{1+q^4}\eta^{(i)}_{3,4} - \ldots.$$

Huruledes man medelst liknande operationer erhåller de följande systemen af η-koefficienter, är på grund af det föregående fullkomligen tydligt.

Vi skola nu uppsöka de resultat, hvilka erhållas på grund af eqvationen

$$(59)\qquad \frac{2K}{\pi}\int(\mathrm{Cos}\,2ix - \gamma^{(2i)}_{0})\,\Delta am\frac{2K}{\pi}x\,.\,dx = \frac{2}{2}\gamma^{(2i)}_{2}\,\mathrm{Sin}\,2am\frac{2K}{\pi}x + \frac{2}{4}\gamma^{(2i)}_{4}\,\mathrm{Sin}\,4am\frac{2K}{\pi}x + \ldots$$

såsom utgångspunkt. Betecknas utvecklingen häraf medelst serien

$$2\theta^{(i)}_{1,2}\,\mathrm{Sin}\,2x + 2\theta^{(i)}_{1,4}\,\mathrm{Sin}\,4x + \ldots.,$$

så finner man för koefficienterna i densamma dels

$$2\theta^{(i)}_{1,2i'} = 4i\left\{\frac{1}{2^2}\Sigma^{(2)}_{2i}\Sigma^{(2)}_{2i'} + \frac{1}{4^2}\Sigma^{(4)}_{2i}\Sigma^{(4)}_{2i'} + \frac{1}{6^2}\Sigma^{(6)}_{2i}\Sigma^{(6)}_{2i'} + \ldots\right\},$$

dels

$$2\theta^{(i)}_{1,2} = \frac{2}{2}\left\{\frac{q^{i-1}}{1+q^{2i-2}} + \frac{q^{i+1}}{1+q^{2i+2}}\right\}$$

$$2\theta^{(i)}_{1,4} = \frac{2}{4}\left\{\frac{q^{i-2}}{1+q^{2i-4}} + \frac{q^{i+2}}{1+q^{2i+4}}\right\}$$

. . . .

$$2\theta^{(i)}_{1,2i-2} = \frac{2}{2i-2}\left\{\frac{q}{1+q^2} + \frac{q^{2i-1}}{1+q^{4i-2}}\right\}$$

$$2\theta^{(i)}_{1,2i} = \frac{2}{2i}\left\{\frac{1}{2} + \frac{q^{2i}}{1+q^{4i}}\right\}$$

$$2\theta^{(i)}_{1,2i+2} = \frac{2}{2i+2}\left\{\frac{q}{1+q^2} + \frac{q^{2i+1}}{1+q^{4i+2}}\right\}$$

o. s. v.

Någon integrationskonstant behöfver icke tillfogas, emedan vilkoret

$$\frac{2q^i}{1+q^{2i}} - \gamma^{(2i)}_0 = 0$$

redan i och för sig är uppfyldt.

För utvecklingskoefficienterna af

$$\left(\frac{2K}{\pi}\right)^2 \int \Delta am \frac{2K}{\pi} x \int (\operatorname{Cos} 2ix - \gamma^{(2i)}_0)\; am \frac{2K}{\pi} x\,.\,dx = -\frac{2}{2^2}\gamma^{(2i)}_2 \operatorname{Cos} 2am\frac{2K}{\pi}x - \frac{2}{4^2}\gamma^{(2i)}_4 \operatorname{Cos} 4am\frac{2K}{\pi}x - ..$$

$$= \theta^{(i)}_{2,0} + 2\theta^{(i)}_{2,2} \operatorname{Cos} 2x + 2\theta^{(i)}_{2,4} \operatorname{Cos} 4x + \ldots$$

finner man i främsta rummet

$$\theta^{(i)}_{2,2i'} = -4i\left\{\frac{1}{2^3}\Sigma^{(2i)}_2 \Gamma^{(2i')}_2 + \frac{1}{4^3}\Sigma^{(2i)}_4 \Gamma^{(2i')}_4 + \frac{1}{6^3}\Sigma^{(2i)}_6 \Gamma^{(2i')}_6 + \ldots\right\}$$

$$= -4i\frac{1-q^{2i}}{1+q^{2i}}\left\{\frac{1}{2^3}\Gamma^{(2i)}_2 \Gamma^{(2i')}_2 + \frac{1}{4^3}\Gamma^{(2i)}_4 \Gamma^{(2i')}_4 + \frac{1}{6^3}\Gamma^{(2i)}_6 \Gamma^{(2i')}_6 + \ldots\right\}$$

hvilken eqvation äfven gäller för $i' = 0$.

Vidare erhållas genom att utföra de i uttrycket

$$\int \{2\theta^{(i)}_{1,2} \operatorname{Sin} 2x + 2\theta^{(i)}_{1,4} \operatorname{Sin} 4x + \ldots\}\left\{1 + \frac{4q}{1+q^2}\operatorname{Cos} 2x + \ldots\right\} dx$$

betecknade operationerna:

$$2\theta^{(i)}_{2,2} = -\frac{1}{2}\left\{2\theta^{(i)}_{1,2} - \frac{4q}{1+q^2}\theta^{(i)}_{1,4} + \frac{4q^2}{1+q^4}[\theta^{(i)}_{1,6} - \theta^{(i)}_{1,2}] + \ldots\right\}$$

$$2\theta^{(i)}_{2,4} = -\frac{1}{4}\left\{2\theta^{(i)}_{1,4} + \frac{4q}{1+q^2}[\theta^{(i)}_{1,6} + \theta^{(i)}_{1,2}] + \frac{4q^2}{1+q^4}\theta^{(i)}_{1,8} + \frac{4q^3}{1+q^6}[\theta^{(i)}_{1,10} - \theta^{(i)}_{1,2}] + \ldots\right\}$$

o. s. v.

Den konstanta termen $\theta^{(i)}_{2,0}$ spelar härvid rollen af en integrationskonstant och bestämmes i utvecklingen af

$$\left(\frac{2K}{\pi}\right)^3 \int \Delta am \frac{2K}{\pi} x\,.\,dx \int \Delta am \frac{2K}{\pi} x\,.\,dx \int (\operatorname{Cos} 2ix - \gamma^{(2i)}_0)\, \Delta am \frac{2K}{\pi} x\,.\,dx = -\frac{2}{2^3}\gamma^{(2i)}_2 \operatorname{Sin} 2am\frac{2K}{\pi}x$$

$$-\frac{2}{4^3}\gamma^{(2i)}_4 \operatorname{Sin} 4am\frac{2K}{\pi}x - \ldots$$

$$= 2\theta^{(i)}_{3,2} \operatorname{Sin} 2x + 2\theta^{(i)}_{3,4} \operatorname{Sin} 4x + ..$$

Man finner nämnligen på grund af den omständighet, att ingen mot vinkeln x proportionell term här förekommer,

$$\theta^{(i)}_{2,0} = -\frac{4q}{1+q^2}\theta^{(i)}_{2,2} - \frac{4q^2}{1+q^4}\theta^{(i)}_{2,4} - \ldots$$

För öfrigt erhållas

$$2\theta^{(i)}_{3,2} = \frac{1}{2}\left\{2\theta^{(i)}_{2,2} + \frac{4q}{1+q^2}\left[\theta^{(i)}_{2,4} + \theta^{(i)}_{2,0}\right] + \frac{4q^2}{1+q^4}\left[\theta^{(i)}_{2,6} + \theta^{(i)}_{2,2}\right] + \ldots\right\}$$

$$2\theta^{(i)}_{3,4} = \frac{1}{4}\left\{2\theta^{(i)}_{2,4} + \frac{4q}{1+q^2}\left[\theta^{(i)}_{2,6} + \theta^{(i)}_{2,2}\right] + \frac{4q^2}{1+q^3}\left[\theta^{(i)}_{2,8} + \theta^{(i)}_{2,0}\right] + \ldots\right\}$$

. . . . .

I det ofvananförda har man fullständig ledning för bestämningen af alla ifrågakommande θ-koefficienter.

De relationer emellan dessa koefficienter och η-koefficienterna, hvilka äro uttryckta genom eqvationerna (49), gälla äfven här, d. v. s. för negativa ν-värden; men förutom dessa må äfven följande märkas, hvilkens riktighet omedelbart inses på grund af ifrågavarande koefficienters betydelse,

$$\eta^{(\,)}_{\nu,\,2i'} = \frac{i'}{i}\,\eta^{(i')}_{\nu,\,2i};$$

och denna relation bibehåller för öfrigt sin giltighet för alla ν-värden, positiva och negativa, jemna och udda.

§ 12.

I eqvationen (44) skola vi nu uttrycka Γ-koefficienterna medelst bestämda integral med stöd af formeln

$$\Gamma^{(2n)}_{2i} = \frac{1}{2}(-k_1)^n \frac{1+q^{2i}}{q^i}\frac{1}{K_1}\int_0^{K_1} \operatorname{Sin} amu_1^{2n} \operatorname{Cos} 2i\left(\frac{\pi}{2K_1}\right)u_1 . du_1$$

Betecknas härvid qvantiteten

$$\frac{1}{4}\,\frac{1+q^{2i}}{qi}\cdot\frac{1+q^{2i'}}{q^{i'}}\,\frac{1}{K_1{}^2}$$

med C, så hafva vi

$$T'(\nu,s) = C\int_0^{K_1}\!\!\int_0^{K_1} \operatorname{Cos} 2i\left(\frac{\pi}{2K_1}\right)u_1 \operatorname{Cos} 2i'\left(\frac{\pi}{2K_1}\right)v_1 . du_1\, dv_1 \int_0^{\frac{\pi}{2}} \sum_0^h \frac{(2n+1)^{2\nu+1}\alpha^{(h)}_{2n+1}}{(2n+1)-\left(\frac{2p}{\mu}\right)^2}\operatorname{Cos}(2n+1)t \begin{Bmatrix} 2^{2\nu}k_1^2 \operatorname{Sin} amu_1^2 \operatorname{Sin} amv_1^2 \operatorname{Cos} 2t \\ -4^{2\nu}k_1^4 \operatorname{Sin} amu_1^4 \operatorname{Sin} amv_1^4 \operatorname{Cos} 4t \\ +6^{2\nu}k_1^6 \operatorname{Sin} amu_1^6 \operatorname{Sin} amv_1^6 \operatorname{Cos} 6t \\ \text{o. s. v.} \end{Bmatrix} dt$$

På grund af summationsformeln (30) och efter substitution af

$$\eta = -k_1^2 \operatorname{Sin} amu_1^2 \operatorname{Sin} amv_1^2$$

$$x = e^{\sqrt{-1}\,t}$$

antager det föregående uttrycket följande form

$$\frac{1}{2^{2\nu}}T'(\nu,s) = \sqrt{-1}\,C\int_0^{K_1}\!\!\int_0^{K_1} \operatorname{Cos} 2i\left(\frac{\pi}{2K_1}\right)u_1 \operatorname{Cos} 2i'\left(\frac{\pi}{2K_1}\right)v_1 . du_1 dv_1 \int_1^{\sqrt{-1}} \sum_0^h \frac{(2n+1)^{2\nu+1}\alpha^{(h)}_{2n+1}}{(2n+1)^2-\left(\frac{2p}{\mu}\right)^2}\,\frac{1}{2}\left(x^{2n}+x^{-2n-2}\right)$$

$$\times \begin{Bmatrix} Q^{(\nu)}_1 \dfrac{\eta x^2}{(1-\eta x^2)^2} + Q^{(\nu)}_2 \dfrac{\eta^2 x^4}{(1-\eta x^2)^3} + \ldots \\ + Q^{(\nu)}_1 \dfrac{\eta x^{-2}}{(1-\eta x^{-2})^2} + Q^{(\nu)}_2 \dfrac{\eta^2 x^{-4}}{(1-\eta x^{-2})^3} + \ldots \end{Bmatrix} dx$$

Behandlingen af detta uttryck kan ske alldeles på samma väg, som följdes i § 8. Vi sätta nämnligen

$$\tau'(f,g) = \sqrt{-1}\, C \int_0^{K_1}\!\!\int_0^{K_1} \eta^f.\ \mathrm{Cos}\, 2i\left(\frac{\pi}{2K_1}\right) u_1\ \mathrm{Cos}\, 2i'\left(\frac{\pi}{2K_1}\right) v_1\, du_1\, dv_1\ \frac{1}{2}\int_1^{\sqrt{-1}} \left\{\frac{x^{2g}}{(1-\eta x^2)^{f+1}} + \frac{x^{-2g-2}}{(1-\eta x^{-2})^{f+1}}\right\} dx$$

då

$$\frac{1}{2^{2\nu}} T'(\nu, s) = Q_1^{(\nu)} \sum_0^h \frac{(2n+1)^{2s+1}\, \alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \{\tau'(1, n+1) + \tau'(1, -n)\}$$

$$+ Q_2^{(\nu)} \sum_0^h \frac{(2n+1)^{2s+1}\, \alpha_{2n+1}^{(h)}}{(2n+1)^2 - \left(\frac{2p}{\mu}\right)^2} \{\tau'(2, n+2) + \tau'(2, -(n-1))\}$$

$$+ \ldots\ldots$$

För utvecklingen af $\tau'(f,g)$ betrakta vi främst funktionen

$$\sigma'(f,g) = -\frac{1}{2}\sqrt{-1}\int_1^{\sqrt{-1}} \left\{\frac{x^{2g}}{(1-\eta x)^{f+1}} + \frac{x^{-2g-2}}{(1-\eta x^{-2})^{f+1}}\right\} dx,$$

hvilken vi, såsom skedde § 8, skola utveckla efter potenserna af den ur eqvationen

$$k_1^2 = \frac{2\gamma}{1+\gamma^2}$$

härflytande qvantiteten γ. Sålunda erhålles, i det koefficienterna $L_i^{(f+1)}$ bibehålla betydelsen från nämnde paragraf,

$$\sigma'(f,g) = -\frac{1}{2}\sqrt{-1}\, \frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}} \int_1^{\sqrt{-1}} \{L_0^{(f+1)} [x^{2g} + x^{-2g-2}] - 2\gamma L_1^{(f+1)} [x^{2g}\, \mathrm{Cos}\, T + x^{-2g-2}\, \mathrm{Cos}\, T_1] + \ldots\} dx$$

der

$$\mathrm{Cos}\, rT = \frac{1}{2}\{[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2\, x^2]^r - \frac{r}{1}[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2\, x^2]^{r-2} + \ldots\}$$

$$\mathrm{Cos}\, rT_1 = \frac{1}{2}\{[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2\, x^{-2}]^r - \frac{r}{1}[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2\, x^{-2}]^{r-2} + \ldots\}$$

Då nu dessa värden införas i det föregående uttrycket för $\sigma'(f,g)$, så erhålles

$$\sigma'(f,g) = \frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}} \left\{\frac{(-1)^g}{2g+1} L_0^{(f+1)} - 2\gamma \frac{(-1)^{g+1}}{2(g+1)+1}\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2\, L_1^{(f+1)} + \ldots\right.$$

$$+ 2\gamma^r \frac{1}{2}\left\{\frac{(-1)^{g+r}}{2(g+r)+1}[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2]^r - \frac{r}{1}\frac{(-1)^{g+r-2}}{2(g+r-2)+1}[2\, \mathrm{Sin}\, amu_1^2\, \mathrm{Sin}\, amv_1^2]^{r-2} + \ldots\right\} L_r^{(f+1)}$$

$$\left. - \ldots\ldots \right\}$$

Det återstår oss nu endast för den slutliga bestämningen af funktionen $\tau'(f,g)$ att uttrycka de bestämda integralen medelst Γ-koefficienter. Sker detta, så framgår följande formel

$$\tau'(f,g) = (-1)^f k_1^{2f} C \int_0^{K_1}\!\!\int_0^{K_1} \sigma'(f,g)\, \mathrm{Sin}\, amu_1^{2f}\, \mathrm{Sin}\, amv_1^{2f}\, \mathrm{Cos}\, 2i\left(\frac{\pi}{2K_1}\right) u_1\, \mathrm{Cos}\, 2i'\left(\frac{\pi}{2K_1}\right) v_1\, du_1\, dv_1$$

$$= k_1^{2f} \frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}} \{L_0^{(f+1)}\, V_0(f,g,i,i') - 2\gamma L_1^{(f+1)}\, V_1(f,g,i,i') + \ldots\}$$

der

$$V_r(f,g,i,i') = \frac{1}{2}\left\{2^r \frac{(-1)^{g+f+r}}{2(g+r)+1} \frac{\Gamma_{2i}^{(2f+2r)}\Gamma_{2i'}^{(2f+2r)}}{k_1^{2f+2r}} - \frac{r}{1} 2^{r-2} \frac{(-1)^{g+f+r-2}}{2(g+r-2)+1} \frac{\Gamma_{2i}^{(2f+2r-2)}\Gamma_{2i'}^{(2f+2r-2)}}{k_1^{2f+2r-2}} + \ldots\right\}$$

Vid numeriska räkningar är dock fördelaktigt att använda en något förändrad form för $\tau'(f, g)$, nämnligen

$$\tau'(f,g) = \frac{(1+\gamma^2)^{f+1}}{(1-\gamma^2)^{2f+1}}\left\{L_0^{(f+1)}\left[k_1^{2f}\, V_0(f,g,i,i')\right] - 2\frac{\gamma}{k_1^2} L_1^{(f+1)}\left[k_1^{2f+2}\, V_1(f,g,i,i')\right] + \ldots\right\},$$

der man har

$$k_1^{2f+2r} V_r(f,g,i,i') = \frac{1}{2}\left\{2^r \frac{(-1)^{g+f+r}}{2(g+r)+1} \Gamma_{2i}^{(2f+2r)}\Gamma_{2i'}^{(2f+2r)} - \frac{r}{1} 2^{r-2} \frac{(-1)^{g+f+r-2}}{2(g+r-2)+1} k_1^2\, \Gamma_{2i}^{(2f+2r-2)}\Gamma_{2i'}^{(2f+2r-2)} + \ldots\right\}$$

Antages $f+r$ vara större än både i och i', så innehåller produkten $k_1^{2f+2r} V_r(f,g,i,i')$ faktorn $k^{2f+2r-i-i'}$; efter den term, som motsvarar ett sådant värde af r att ifrågavarande olikheter äga rum, konvergerar den för $\tau(f,g)$ funna serien således efter potenserna af γ [1]).

§ 13.

Funktionerna $F'(\nu, p)$ kunna underkastas en transformation, hvilken blifver af vigt för den numeriska beräkningen af koefficienterna $\Phi_{i'}^{(i)}$. Utgångspunkten till ifrågavarande transformation vinnes genom eqvationen

$$\frac{1}{(2p)^2-(2m\mu)^2} = \frac{1}{\mu^2}\frac{\mu}{2p}\frac{1}{\operatorname{Sin}\left(\frac{2p}{\mu}\right)\pi}\int_0^\pi \operatorname{Cos}\left(\frac{2p}{\mu}\right)t\operatorname{Cos}2mt\,dt;$$

man erhåller nämnligen medelst denna:

$$F'(\nu,p) = \frac{1}{2p}\frac{1}{\operatorname{Sin}\frac{2p}{\mu}\pi}\int_0^\pi \operatorname{Cos}\left(\frac{2p}{\mu}\right)t\,.\left\{2^{2\nu}\,\Gamma_{2i}^{(2)}\Gamma_{2i'}^{(2)}\operatorname{Cos}2t + 4^{2\nu}\,\Gamma_{2i}^{(4)}\Gamma_{2i'}^{(4)}\operatorname{Cos}4t + \ldots\right\}dt, \tag{60}$$

i hvilket uttryck serien under integraltecknet kan summeras medelst en bestämd integral. För att finna denna differentiera vi eqvationen

$$\operatorname{Sin}2iy = 2\sigma_2^{(2i)}\operatorname{Sin}\,2am\frac{2K}{\pi}y + 2\sigma_4^{(2i)}\operatorname{Sin}4am\frac{2K}{\pi}y + \ldots$$

$2\nu+1$ gånger i afseende på $\frac{2K}{\pi}y$, hvarigenom erhålles

$$\frac{d^{2\nu+1}\operatorname{Sin}2iy}{\left(dam\frac{2K}{\pi}y\right)^{2\nu+1}} = (-)^\nu\, 2\left\{2^{2\nu+1}\,\sigma_2^{(2i)}\operatorname{Cos}2am\frac{2K}{\pi}y + 4^{2\nu+1}\,\sigma_4^{(2i)}\operatorname{Cos}4am\frac{2K}{\pi}y + \ldots\right\}$$

Tänker man sig vidare en ny variabel x, hvilken är beroende af y, såsom denna eqvation utvisar

$$am\frac{2K}{\pi}x + t = am\frac{2K}{\pi}y;$$

och uttryckas multiplerna af $am\frac{2K}{\pi}y$ medelst multipler af $am\frac{2K}{\pi}x$, så finner man

---

[1]) Mot log. $k_1^2 = 9.8085102$ svarar värdet log. $\gamma = 9.5616441$.

$$\frac{d^{2\nu+1}\operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}} = (-1)^\nu\, 2\,\{2^{2\nu+1}\,\sigma_2^{(2i)} \operatorname{Cos} 2am\,\frac{2K}{\pi}x\,\operatorname{Cos} 2t + 4^{2\nu+1}\,\sigma_4^{(2i)} \operatorname{Cos} 4am\,\frac{2K}{\pi}x\,\operatorname{Cos} 4t + \ldots\}$$
$$- (-1)^\nu\, 2\,\{2^{2\nu+1}\,\sigma_2^{(2i)} \operatorname{Sin} 2am\,\frac{2K}{\pi}x\,\operatorname{Sin} 2t + 4^{2\nu+1}\,\sigma_4^{(2i)} \operatorname{Sin} 4am\,\frac{2K}{\pi}x\,\operatorname{Sin} 4t + \ldots\}$$

Detta uttryck leder omedelbart till den sökta summationsformeln. På grund af eqvationerna

$$\Gamma_{2i}^{(2n)} = \frac{1}{\pi}\int_0^\pi \operatorname{Cos} 2n\,am\,\frac{2K}{\pi}x\,\operatorname{Cos} 2i'x\,dx$$

$$0 = \frac{1}{\pi}\int_0^\pi \operatorname{Sin} 2n\,am\,\frac{2K}{\pi}x\,\operatorname{Cos} 2i'x\,dx$$

erhåller man nämnligen

$$(61)\qquad \frac{1}{\pi}\int_0^\pi \frac{d^{2\nu+1}\operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}} \operatorname{Cos} 2i'x\,.\,dx = (-1)^\nu\, 2\,\{2^{2\nu+1}\,\sigma_2^{(2i)}\,\Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + 4^{2\nu+1}\,\sigma_4^{(2i)}\,\Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$
$$= (-1)^\nu\, 4i\,\{2^{2\nu}\,\Gamma_{2i}^{(2)}\,\Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + 4^{2\nu}\,\Gamma_{2i}^{(4)}\,\Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

medelst hvilken formel den ifrågavarande summationen är verkstäld.

Det vigtigaste bruk, som af denna formel kan göras, består emellertid icke i en direkt utveckling af den förelagda integralen, utan endast i en sönderdelning af densamma, hvarigenom serien till höger om likhetstecknet reduceras till en följd af analoga serier, hvilka dock icke innehålla termer, multiplicerade med positiva potenser af de hela talen 2, 4, o. s. v. — Ifrågavarande sönderdelning verkställes med stöd af den tredje af eqvationerna (48).

Man erhåller nämnligen genom substitution af utvecklingen för $\frac{d^{2\nu+1}\operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}}$ följande relation

$$(62)\qquad \int_0^\pi \frac{d^{2\nu+1}\operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}} \operatorname{Cos} 2i'x\,dx = \eta^{(i)}_{-(2\nu+1),0}\int_0^\pi \operatorname{Cos} 2i'x\,dx + 2\eta^{(i)}_{-(2\nu+1),2}\int_0^\pi \operatorname{Cos} 2y\,\operatorname{Cos} 2i'x\,dx$$
$$+2\eta^{(i)}_{-(2\nu+1),4}\int_0^\pi \operatorname{Cos} 4y\,\operatorname{Cos} 2i'x\,dx + 2\eta^{(i)}_{-(2\nu+1),6}\int_0^\pi \operatorname{Cos} 6y\,\operatorname{Cos} 2i'x\,dx + \ldots$$

Nu är dock, om s betecknar ett helt tal,

$$\operatorname{Cos} 2s\,y = \gamma_0^{(2s)} + 2\gamma_2^{(2s)} \operatorname{Cos} 2am\,\frac{2K}{\pi}x\,\operatorname{Cos} 2t + 2\gamma_4^{(2s)} \operatorname{Cos} 4am\,\frac{2K}{\pi}x\,\operatorname{Cos} 4t + \ldots$$
$$- 2\gamma_2^{(2s)} \operatorname{Sin} 2am\,\frac{2K}{\pi}x\,\operatorname{Sin} 2t - 2\gamma_4^{(2s)} \operatorname{Sin} 4am\,\frac{2K}{\pi}x\,\operatorname{Sin} 4t + \ldots,$$

af hvilken eqvation omedelbart inses, att

$$(63)\qquad \frac{1}{\pi}\int_0^\pi \operatorname{Cos} 2sy\,\operatorname{Cos} 2i'x\,dx = 2\{\gamma_2^{(2s)}\,\Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + \gamma_4^{(2s)}\,\Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$
$$= 4s\left\{\frac{1}{2}\,\Sigma_{2s}^{(2)}\,\Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + \frac{1}{4}\,\Sigma_{2s}^{(4)}\,\Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\right\}$$
$$= 4s\,\frac{1-q^{2s}}{1+q^{2s}}\left\{\frac{1}{2}\,\Gamma_{2s}^{(2)}\,\Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + \frac{1}{4}\,\Gamma_{2s}^{(4)}\,\Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\right\}$$

På grund af dessa uttryck finner man slutligen

$$(-1)^\nu 4i\{2^{2\nu} \Gamma^{(2)}_{2i} \Gamma^{(2)}_{2i'} \operatorname{Cos} 2t + 4^{2\nu} \Gamma^{(4)}_{2i} \Gamma^{(4)}_{2i'} \operatorname{Cos} 4t + \ldots\} =$$

$$2\eta^{(i)}_{-(2\nu+1),2}\, 4 \,.\, 1 \frac{1-q^2}{1+q^2}\left\{\frac{1}{2} \Gamma^{(2)}_{2} \Gamma^{(2)}_{2i'} \operatorname{Cos} 2t + \frac{1}{4} \Gamma^{(4)}_{2} \Gamma^{(4)}_{2i'} \operatorname{Cos} 4t + \ldots\right\}$$

$$+ 2\eta^{(i)}_{-(2\nu+1),4}\, 4 \,.\, 2 \frac{1-q^4}{1+q^4}\left\{\frac{1}{2} \Gamma^{(2)}_{4} \Gamma^{(2)}_{2i'} \operatorname{Cos} 2t + \frac{1}{4} \Gamma^{(4)}_{4} \Gamma^{(4)}_{2i'} \operatorname{Cos} 4t + \ldots\right\}$$

$$+ 2\eta^{(i)}_{-(2\nu+1),6}\, 4 \,.\, 3 \frac{1-q^6}{1+q^6}\left\{\frac{1}{2} \Gamma^{(2)}_{6} \Gamma^{(2)}_{2i'} \operatorname{Cos} 2t + \frac{1}{4} \Gamma^{(4)}_{6} \Gamma^{(4)}_{2i'} \operatorname{Cos} 4t + \ldots\right\}$$

$$+ \ldots\ldots$$

För funktionen $F'(\nu, p)$ finner man härpå, om det sistfunna uttrycket införes i eqv. (60)

$$(64) \qquad (-1)^\nu F'(\nu, p) = 2\eta^{(i)}_{-(2\nu+1),2} \frac{1}{i} \frac{1-q^2}{1+q^2}\left\{\frac{1}{2} \frac{\Gamma^{(2)}_{2} \Gamma^{(2)}_{2i'}}{(2p)^2-(2\mu)^2} + \frac{1}{4} \frac{\Gamma^{(4)}_{2} \Gamma^{(4)}_{2i'}}{(2p)^2-(4\mu)^2} + \ldots\right\}$$

$$+ 2\eta^{(i)}_{-(2\nu+1),4} \frac{2}{i} \frac{1-q^4}{1+q^4}\left\{\frac{1}{2} \frac{\Gamma^{(2)}_{4} \Gamma^{(2)}_{2i'}}{(2p)^2-(6\mu)^2} + \frac{1}{4} \frac{\Gamma^{(4)}_{2} \Gamma^{(4)}_{2i'}}{(2p)^2-(4\mu)^2} + \ldots\right\}$$

$$+ \ldots\ldots$$

Genom en högst enkel substitution kan denna formel omställas på så sätt, att konvergensen hos de oändliga serierna till höger om likhetstecknet ökas. Det är nämnligen

$$\frac{1}{(2p)^2-(2m\mu)^2} = -\frac{1}{(2m\mu)^2} + \frac{\left(\frac{2p}{2m\mu}\right)^2}{(2p)^2-(2m\mu)^2}$$

Vid införandet af detta värde i den föregående eqvationen uppstå en del serier, hvilkas summa omedelbart är bekant på grund af analysen i § 11. Vi erhålla med stöd af en derstädes uppställd formel

$$\frac{1-q^2}{1+q^2}\left\{\frac{1}{2^3} \Gamma^{(2)}_{2} \Gamma^{(2)}_{2i'} + \frac{1}{4^3} \Gamma^{(4)}_{2} \Gamma^{(4)}_{2i'} + \ldots\right\} = -\frac{1}{4i'} \eta^{(i')}_{2,2}$$

$$\frac{1-q^4}{1+q^4}\left\{\frac{1}{2^3} \Gamma^{(2)}_{4} \Gamma^{(2)}_{2i'} + \frac{1}{4^3} \Gamma^{(4)}_{4} \Gamma^{(4)}_{2i'} + \ldots\right\} = -\frac{1}{4i'} \eta^{(i')}_{2,4}$$

o. s. v.

Med hänseende härtill blifver nu

$$(-1)^\nu F'(\nu, p) = \frac{1}{\mu^2} \frac{1}{2i\,i'}\left\{\eta^{(i)}_{-(2\nu+1),2}\, \eta^{(i')}_{2,2} + 2\eta^{(i)}_{-(2\nu+1),4}\, \eta^{(i')}_{2,4} + 3\eta^{(i)}_{-(2\nu+1),6}\, \eta^{(i')}_{2,6} + \ldots\right\}$$

$$+ \left(\frac{2p}{\mu}\right)^2 2\eta^{(i)}_{-(2\nu+1),2} \frac{1}{i} \frac{1-q^2}{1+q^2}\left\{\frac{1}{2^3} \frac{\Gamma^{(2)}_{2} \Gamma^{(2)}_{2i'}}{(2p)^2-(2\mu)^2} + \frac{1}{4^3} \frac{\Gamma^{(4)}_{2} \Gamma^{(4)}_{2i'}}{(2p)^2-(4\mu)^2} + \ldots\right\}$$

$$+ \left(\frac{2p}{\mu}\right)^2 2\eta^{(i)}_{-(2\nu+1),4} \frac{2}{i} \frac{1-q^4}{1+q^4}\left\{\frac{1}{2^3} \frac{\Gamma^{(2)}_{4} \Gamma^{(2)}_{2i'}}{(2p)^2-(2\mu)^2} + \frac{1}{4^3} \frac{\Gamma^{(4)}_{4} \Gamma^{(4)}_{2i'}}{(2p)^2-(4\mu)^2} + \ldots\right\}$$

$$+ \ldots\ldots$$

Man kunde tillämpa samma förfarande än vidare; dock blifva resultaten af mindre vigt och kunna dessutom ytterst lätt erhållas, hvarföre det synes öfverflödigt att utsätta desamma. Deremot skola vi i och för transformation af $F'(\nu, p)$ följa tvenne andra vägar. Först och främst göra vi bruk af den lätt härledda formeln

$$-\int_0^\pi \operatorname{Cos} 2s\,y\, \operatorname{Cos} 2i'x\, dx = \frac{1}{2i'}\int_0^\pi \frac{d \operatorname{Cos} 2s\,y}{dam\,\frac{2K}{\pi}y} \operatorname{Sin} 2i'x\, dam\,\frac{2K}{\pi}x$$

$$= \frac{2K}{\pi}\frac{1}{2i'}\int_0^\pi \frac{d \operatorname{Cos} 2s\,y}{dam\,\frac{2K}{\pi}x} \operatorname{Sin} 2i'x\, \Delta am\,\frac{2K}{\pi}x\,.\,dx$$

Riktigheten häraf beror i främsta rummet derpå, att t vid dessa integrationer får betraktas såsom en konstant, hvarföre

$$d\,.\,am\,\frac{2K}{\pi}x = d\,.\,am\,\frac{2K}{\pi}y$$

Man finner nu

$$-\int_0^\pi \frac{d^{2\nu+1} \operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}} \operatorname{Cos} 2i'x\, dx = 2\eta^{(i)}_{-(2\nu+1),\,2}\cdot\frac{2K}{\pi}\cdot\frac{1}{2i'}\int_0^\pi \frac{d \operatorname{Cos} 2y}{dam\,\frac{2K}{\pi}y} \operatorname{Sin} 2i'x\, \Delta am\,\frac{2K}{\pi}x\, dx$$

$$+\ 2\eta^{(i)}_{-(2\nu+1),\,4}\cdot\frac{2K}{\pi}\cdot\frac{1}{2i'}\int_0^\pi \frac{d \operatorname{Cos} 4y}{dam\,\frac{2K}{\pi}y} \operatorname{Sin} 2i'x\, \Delta am\,\frac{2K}{\pi}x\, dx$$

$$+\ \ldots$$

Substitueras för $\Delta am\,\frac{2K}{\pi}x$ den bekanta serieutvecklingen, så erhålles resultatet i form af en dubbelserie, nämnligen

$$-\int_0^\pi \frac{d^{2\nu+1} \operatorname{Sin} 2iy}{\left(dam\,\frac{2K}{\pi}y\right)^{2\nu+1}} \operatorname{Cos} 2i'x\, dx = \Sigma\Sigma\, \varepsilon^{(\nu)}_{s,\,s'}\int_0^\pi \frac{d \operatorname{Cos} 2sy}{dam\,\frac{2K}{\pi}y} \operatorname{Sin} 2s'x\, dx$$

der koefficienterna äro på följande sätt sammansatta

$$\varepsilon^{(\nu)}_{s,\,2} = \frac{1}{i'}\,\eta^{(i)}_{-(2\nu+1),\,2s}\left\{\frac{2q^{i'-1}}{1+q^{2i'-2}} - \frac{2q^{i'+1}}{1+q^{2i'+2}}\right\}$$

$$\varepsilon^{(\nu)}_{s,\,4} = \frac{1}{i'}\,\eta^{(i)}_{-(2\nu+1),\,2s}\left\{\frac{2q^{i'-2}}{1+q^{2i'-4}} - \frac{2q^{i'+2}}{1+q^{2i'+4}}\right\}$$

. . . . .

$$\varepsilon^{(\nu)}_{s,\,2i'-2} = \frac{1}{i'}\,\eta^{(i)}_{-(2\nu+1),\,2s}\left\{\frac{2q}{1+q^{2}} - \frac{2q^{2i'-1}}{1+q^{4i'-2}}\right\}$$

$$\varepsilon^{(\nu)}_{s,\,2i'} = \frac{1}{i'}\,\eta^{(i)}_{-(2\nu+1),\,2s}\left\{1 - \frac{2q^{2i'}}{1+q^{4i'}}\right\}$$

$$\varepsilon^{(\nu)}_{s,\,2i'+2} = \frac{1}{i'}\,\eta^{(i)}_{-(2\nu+1),\,2s}\left\{\frac{2q}{1+q^{2}} - \frac{2q^{2i'+1}}{1+q^{4i'+2}}\right\}$$

o. s. v.

Vidare erhåller man genom omedelbar differentiation

$$\frac{d \operatorname{Cos} 2sy}{dam\,\frac{2K}{\pi}y} = -\,2\{2\gamma^{(2s)}_2 \operatorname{Sin} 2am\,\frac{2K}{\pi}x \operatorname{Cos} 2t + 4\gamma^{(2s)}_4 \operatorname{Sin} 4am\,\frac{2K}{\pi}x \operatorname{Cos} 4t + \ldots\}$$

$$-\,2\{2\gamma^{(2s)}_2 \operatorname{Cos} 2am\,\frac{2K}{\pi}x \operatorname{Sin} 2t + 4\gamma^{(2s)}_4 \operatorname{Cos} 4am\,\frac{2K}{\pi}x \operatorname{Sin} 4t + \ldots\}$$

hvaraf följer

$$\frac{1}{\pi}\int_0^\pi \frac{d \operatorname{Cos} 2sy}{dam \frac{2K}{\pi} y} \operatorname{Sin} 2s'x \, dx = -2\{2\gamma_2^{(2s)} \Sigma_{2s'}^{(2)} \operatorname{Cos} 2t + 4\gamma_4^{(2s)} \Sigma_{2s'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

$$= -4s\{\Sigma_{2s}^{(2)} \Sigma_{2s'}^{(2)} \operatorname{Cos} 2t + \Sigma_{2s}^{(4)} \Sigma_{2s'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

$$= -4s \frac{1-q^{2s}}{1+q^{2s}} \cdot \frac{1-q^{2s'}}{1+q^{2s'}} \{\Gamma_{2s}^{(2)} \Gamma_{2s'}^{(2)} \operatorname{Cos} 2t + \Gamma_{2s}^{(4)} \Gamma_{2s'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

Med hänseende härtill finner man

$$\frac{1}{\pi}\int_0^\pi \frac{d^{2\nu+1} \operatorname{Sin} 2iy}{\left(dam \frac{2K}{\pi} y\right)^{2\nu+1}} \operatorname{Cos} 2i'x \, . \, dx = \Sigma\Sigma\, 4s\, \varepsilon_{s,s'}^{(\nu)} \frac{1-q^{2s}}{1+q^{2s}} \cdot \frac{1-q^{2s'}}{1+q^{2s'}} \{\Gamma_{2s}^{(2)} \Gamma_{2s'}^{(2)} \operatorname{Cos} 2t + \ldots\}$$

hvarvid summationen såväl i afseende på s som på s' bör utsträckas från 1 till ∞.

Det sednast funna uttrycket leder till följande reduktionsformel:

$$2^{2\nu} \Gamma_{2i}^{(2)} \Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + 4^{2\nu} \Gamma_{2i}^{(4)} \Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots$$

$$= (-1)\ \frac{1}{i}\ \Sigma\Sigma\ s\varepsilon_{s,s'}^{(\nu)} \frac{1-q^{2s}}{1+q^{2}} \cdot \frac{1-q^{2s'}}{1+q^{2s'}} \{\Gamma_{2s}^{(2)} \Gamma_{2s'}^{(2)} \operatorname{Cos} 2t + \Gamma_{2s}^{(4)} \Gamma_{2s'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

hvilken, insatt i eqvationen (60) omedelbart låter följande resultat träda i dagen:

$$(65) \qquad F'_{i,i'}(\nu, p) = (-1)^\nu \frac{1}{i}\ \Sigma\Sigma\ s\varepsilon_{s,s'}^{(\nu)} \frac{1-q^{2s}}{1+q^{2s}} \cdot \frac{1-q^{2s'}}{1+q^{2s'}} F'_{s,s'}(o, p)$$

I stället för denna dubbelserie kan man äfven härleda en enkel sådan, och finner denna lättast direkt ur den första af eqvationerna (48). Differentierar man nämnligen ifrågavarande likhet, så erhålles

$$\frac{d^{2\nu+1} \operatorname{Sin} 2iy}{\left(dam \frac{2K}{\pi} y\right)^{2\nu+1}} = 2\eta_{-2\nu,2}^{(i)} \frac{d \operatorname{Sin} 2y}{dam \frac{2K}{\pi} y} + 2\eta_{2\nu+1,4}^{(i)} \frac{d \operatorname{Sin} 4y}{dam \frac{2K}{\pi} y} + \ldots;$$

multiplicerar man vidare denna eqvation med $\operatorname{Cos} 2i'x\, dx$, samt integrerar resultatet emellan gränserna 0 och π, så erhålles med stöd af eqvationen (61)

$$(-1)^\nu i\{2^{2\nu} \Gamma_{2i}^{(2)} \Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + 4^{2\nu} \Gamma_{2i}^{(4)} \Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

$$= 1 \, . \, 2\eta_{-2\nu,2}^{(i)} \{\Gamma_2^{(2)} \Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + \Gamma_2^{(4)} \Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

$$+ \ 2 \, . \, 2\eta_{-2\nu,4}^{(i)} \{\Gamma_4^{(2)} \Gamma_{2i'}^{(2)} \operatorname{Cos} 2t + \Gamma_4^{(4)} \Gamma_{2i'}^{(4)} \operatorname{Cos} 4t + \ldots\}$$

$$+ \ldots\ldots$$

och härmed finner man slutligen i enlighet med eqv. (60)

$$(66) \qquad F'_{i,i'}(\nu, p) = (-1)^\nu \frac{1}{i}\, \Sigma\, s \, . \, 2\eta_{-2\nu,2s}^{(i)} F'_{s,i'}(o, p)$$

en likhet, hvars analogi med eqv. (64) är uppenbar.

Medelst formlerna (65) och (66) har beräkningen af funktionen $F'(\nu, p)$ blifvit reducerad till beräkningen $F'(o, p)$, hvarvid de i §§ 8—10 anförda methoder med större fördel kunna användas. De sistnämnda funktionerna kunna likväl äfven hänföras till analoga funktioner med negativ ν-index, hvilkas numeriska värden än lättare erhållas på grund af den större konvergensen hos serien

$$F'(-\nu, p) = \frac{1}{2^{2\nu}} \frac{\Gamma_{2i}^{(2)} \Gamma_{2i'}^{(2)}}{(2p)^2 - (2\mu)^2} + \frac{1}{4^{2\nu}} \frac{\Gamma_{2i}^{(4)} \Gamma_{2i'}^{(4)}}{(2p)^2 - (2\mu)^2} + \ldots$$

Vid framställningen af de härvid ifrågakommande uttrycken skola vi utsträcka betydelsen af beteckningen $F'(\nu, p)$ äfven till brutna ν-indices, sålunda att

$$F'(-\nu - \tfrac{1}{2}, p) = \frac{1}{2^{2\nu+1}} \frac{\Gamma_{2i}^{(2)} \Gamma_{2i'}^{(2)}}{(2p)^2 - (2\mu)^2} + \frac{1}{4^{2\nu+1}} \frac{\Gamma_{2i}^{(4)} \Gamma_{2i'}^{(4)}}{(2p)^2 - (4\mu)^2} + \ldots$$

Härefter gifver oss eqvationen (64), sedan i densamma blifvit satt $\nu = o$,

$$F'(o, p) = \Sigma\, 2\eta_{-1,\,2s}^{(i)} \cdot \frac{s}{i} \frac{1 - q^{2s}}{1 + q^{2s}} F'_{s,\,i'}(-\tfrac{1}{2}, p)$$

Från denna eqvation, såsom utgångspunkt, kan man rekurrera till F'-funktioner, der den negativa ν-index har än större värden.

Emedan

$$\int_0^\pi \operatorname{Cos} 2i'x\, dx = 0,$$

så kunna vi sätta

$$\int_0^\pi \operatorname{Cos} 2sy \operatorname{Cos} 2i'x\, dx = \int_0^\pi (\operatorname{Cos} 2sy - \gamma_0^{(2s)}) \operatorname{Cos} 2i'x\, dx$$

$$= \frac{2K}{\pi} \int_0^\pi \frac{\operatorname{Cos} 2i'x\, dx}{\Delta am \frac{2K}{\pi} x} (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x;$$

eller, om nämnaren under integraltecknet utvecklas i serie,

$$\int_0^\pi \operatorname{Cos} 2sy \operatorname{Cos} 2i'x\, dx = \Sigma\, \zeta_{2s_1}^{(i')} \int_0^\pi \operatorname{Cos} 2s_1 x\, (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x \tag{67}$$

I detta uttryck beteckna $\zeta_{2s_1}^{(i')}$ vissa koefficienter, hvilka, såsom man ganska lätt finner, på det närmaste sammanhänger med dem, hvilka i det föregående blifvit betecknade med $\eta_{-2,\,2s_1}^{(i')}$; det är nämnligen i allmänhet

$$\zeta_{2s_1}^{(i')} = \frac{1}{i'} \eta_{-1,\,2s_1}^{(i')}$$

hvarifrån dock $\zeta_0^{(i')}$ gör ett undantag. För denna koeffficient har man

$$\zeta_0^{(i')} = \frac{2}{i'} \eta_{-1,\,0}^{(i')}$$

Medelst delvis integration finner man vidare

$$\int_0^\pi \operatorname{Cos} 2s_1 x\, (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x = \Big/_0^\pi \operatorname{Cos} 2s_1 x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

$$+ 2s_1 \int_0^\pi \operatorname{Sin} 2s_1 x \,.\, dx \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

På grund af eqvationen

$$\int(\text{Cos}\,2sy - \gamma_0^{(2s)})\,dam\,\frac{2K}{\pi}x = \frac{2}{2}\gamma_2^{(2s)}\,\text{Sin}\,2am\,\frac{2K}{\pi}x\,\text{Cos}\,2t + \frac{2}{4}\gamma_4^{(2s)}\,\text{Sin}\,4am\,\frac{2K}{\pi}x\,\text{Cos}\,4t + \ldots$$

$$+ \frac{2}{2}\gamma_2^{(2s)}\,\text{Cos}\,2am\,\frac{2K}{\pi}x\,\text{Sin}\,2t + \frac{2}{4}\gamma_4^{(2s)}\,\text{Cos}\,4am\,\frac{2K}{\pi}x\,\text{Sin}\,4t + \ldots$$

inser man dock ögonblickligen, dels att första termen till höger i den näst sista eqvationen försvinner, dels riktigheten af följande uttryck

$$\frac{1}{\pi}\int_0^\pi \text{Cos}\,2s_1x\,(\text{Cos}\,2sy - \gamma_0^{(2s)})\,dam\,\frac{2K}{\pi}x = 4s_1\left\{\frac{1}{2}\gamma_2^{(2s)}\,\Sigma_{2s_1}^{(2)}\,\text{Cos}\,2t + \frac{1}{4}\gamma_4^{(2s)}\,\Sigma_{2s_1}^{(4)}\,\text{Cos}\,4t + \ldots\right\}$$

$$= 8ss_1\,\frac{1-q^{2s}}{1+q^{2s}}\cdot\frac{1-q^{2s_1}}{1+q^{2s_1}}\left\{\frac{1}{2^2}\Gamma_{2s}^{(2)}\,\Gamma_{2s_1}^{(2)}\,\text{Cos}\,2t + \frac{1}{4^2}\Gamma_{2s}^{(4)}\,\Gamma_{2s_1}^{(4)}\,\text{Cos}\,4t + \ldots\right\}$$

Genom att införa detta värde i eqv. (67) och genom att sedan jemföra det funna resultatet med eqv. (63) erhåller man omedelbart

$$\frac{1}{2}\Gamma_{2i'}^{(2)}\,\Gamma_{2i'}^{(2)}\,\text{Cos}\,2t + \frac{1}{4}\Gamma_{2s}^{(4)}\,\Gamma_{2i'}^{(4)}\,\text{Cos}\,4t + \ldots = 1\,.\,2\,\zeta_2^{(i')}\,\frac{1-q^2}{1+q^2}\left\{\frac{1}{2^2}\Gamma_{2s}^{(2)}\,\Gamma_2^{(2)}\,\text{Cos}\,2t + \frac{1}{4^2}\Gamma_{2s}^{(4)}\,\Gamma_2^{(4)}\,\text{Cos}\,4t + \ldots\right\}$$

$$+ 2\,.\,2\,\zeta_4^{(i')}\,\frac{1-q^4}{1+q^4}\left\{\frac{1}{2^2}\Gamma_{2s}^{(2)}\,\Gamma_4^{(2)}\,\text{Cos}\,2t + \frac{1}{4^2}\Gamma_{2s}^{(4)}\,\Gamma_4^{(4)}\,\text{Cos}\,4t + \ldots\right\}$$

$$+ \ldots\ldots$$

hvarefter man slutligen vinner följande resultat genom multiplikation med faktorn

$$\frac{1}{\mu^2}\,\frac{\mu}{2p}\,\frac{1}{\text{Sin}\,\frac{2p}{\mu}\pi}\,\text{Cos}\,\frac{2p}{\mu}t\,.\,dt$$

och derpå följande integration emellan gränserna o och π:

(68) $$F'_{s,i'}(-\tfrac{1}{2},p) = \Sigma\,2s_1\,\zeta_{2s_1}^{(i')}\,\frac{1-q^{2s_1}}{1+q^{2s_1}}\,F'_{s,s_1}(-1,p)$$

På samma väg finner man funktionen $F'_{s,s_1}(-1,p)$, uttryckt såsom en serie, der de särskilda termerna bestå af $F_{s_1,s_2}(-\frac{3}{2},p)$-funktioner, multiplicerade med vissa, af de inom parenthesen utsatta indices oberoende faktorer. Utgångspunkten har man härvid i eqvationen

(69) $$\int_0^\pi \text{Sin}\,2s_1x\,dx\int(\text{Cos}\,2sy - \gamma_0^{(2s)})\,dam\frac{2K}{\pi}x = \frac{\pi}{2K}\int_0^\pi \frac{\text{Sin}\,2s_1x}{\Delta am\,\frac{2K}{\pi}x}\,dam\,\frac{2K}{\pi}x\int(\text{Cos}\,2sy - \gamma_0^{(2s)})\,dam\,\frac{2K}{\pi}x$$

$$= \Sigma\,\xi_{2s_2}^{(s_1)}\int_0^\pi \text{Sin}\,2s_2x\,dam\,\frac{2K}{\pi}x\int(\text{Cos}\,2sy - \gamma_0^{(2s)})\,dam\frac{2K}{\pi}x$$

der utvecklingskoefficienterna af funktionen

$$\frac{\pi}{2K}\,\frac{\text{Sin}\,2s_1x}{\Delta am\,\frac{2K}{\pi}x}$$

blifvit betecknade med $\xi_{2s_2}^{(s_1)}$. I afseende å dessa koefficienter finner man lätt följande relation

$$\xi^{(s_1)}_{2s_2} = -\frac{1}{s_1}\theta^{(s_1)}_{-1,\,2s_2}$$

$$= \frac{1-q^{2s_1}}{1+q^{2s_1}}\frac{1-q^{2s_2}}{1+q^{2s_2}}\zeta^{(s_1)}_{2s_2}$$

Behandlas nu hvarje term i den sednast funna utvecklingen enligt regeln för delvis integration, så framgår

$$\int_0^\pi \operatorname{Sin} 2s_2 x\, dam\frac{2K}{\pi}x\int(\operatorname{Cos} 2sy-\gamma_0^{(2s)})\, dam\frac{2K}{\pi}x = \Big/_{\!0}^{\pi}\operatorname{Sin} 2s_2x\int dam\frac{2K}{\pi}x\int(\operatorname{Cos} 2sy-\gamma_0^{(2s)})\, dam\frac{2K}{\pi}x$$

$$-2s_2\int_0^\pi \operatorname{Cos} 2s_2x\, dx\int dam\frac{2K}{\pi}x\int(\operatorname{Cos} 2sy-\gamma_0^{(2s)})\, dam\frac{2K}{\pi}x$$

Såsom man omedelbart inser, försvinner första termen till höger i detta uttryck; värdet af den andra erhålles åter med stöd af eqvationen

$$\int dam\frac{2K}{\pi}x\int(\operatorname{Cos} 2sy-\gamma_0^{(2s)})\, dam\frac{2K}{\pi}x = -\frac{2}{2^2}\gamma_2^{(2s)}\operatorname{Cos} 2am\frac{2K}{\pi}x\operatorname{Cos} 2t-\frac{2}{4^2}\gamma_4^{(2s)}\operatorname{Cos} 4am\frac{2K}{\pi}x\operatorname{Cos} 4t+\ldots$$

$$+\frac{2}{4^2}\gamma_2^{(2s)}\operatorname{Sin} 2am\frac{2K}{\pi}x\operatorname{Sin} 2t+\frac{2}{4^2}\gamma_4^{(2s)}\operatorname{Sin} 4am\frac{2K}{\pi}x\operatorname{Sin} 4t-\ldots$$

Sedan detta uttryck blifvit multipliceradt med $-2s_2\operatorname{Cos} 2s_2x\,dx$, erhåller man medelst integration emellan gränserna 0 och π, samt på grund af den föregående eqvationen:

$$\frac{1}{\pi}\int_0^\pi \operatorname{Sin} 2s_2x\, dam\frac{2K}{\pi}x\int(\operatorname{Cos} 2sy-\gamma_0^{(2s)})\, dam\frac{2K}{\pi}x = 4s_2\left\{\frac{1}{2^2}\gamma_2^{(2s)}\Gamma^{(2)}_{2s_2}\operatorname{Cos} 2t+\frac{1}{4^2}\gamma_4^{(2s)}\Gamma^{(4)}_{2s_2}\operatorname{Cos} 4t+\ldots\right\}$$

$$= 8ss_2\left\{\frac{1}{2^3}\Sigma^{(2)}_{2s}\Gamma^{(2)}_{2s_2}\operatorname{Cos} 2t+\frac{1}{4^3}\Sigma^{(4)}_{2s}\Gamma^{(4)}_{2s_2}\operatorname{Cos} 4t+\ldots\right.$$

$$= 8ss_2\frac{1-q^{2s}}{1+q^{2s}}\left\{\frac{1}{2^3}\Gamma^{(2)}_{2s}\Gamma^{(2)}_{2s_2}\operatorname{Cos} 2t+\frac{1}{4^3}\Gamma^{(4)}_{2s}\Gamma^{(4)}_{2s_2}\operatorname{Cos} 4t+\ldots\right\}$$

Utföras äfven de till venster om likhetstecknet i eqv. (69) betecknade operationerna, så vinner man följande eqvation

$$\frac{1-q^{2s_1}}{1+q^{2s_1}}\left\{\frac{1}{2^2}\Gamma^{(2)}_{2s}\Gamma^{(2)}_{2s_1}\operatorname{Cos} 2t+\frac{1}{4^2}\Gamma^{(4)}_{2s}\Gamma^{(4)}_{2s_1}\operatorname{Cos} 4t+\ldots\right\}$$

$$= 2\Sigma\, s_2\xi^{(2s_2)}_{2s_2}\left\{\frac{1}{2^3}\Gamma^{(2)}_{2s}\Gamma^{(2)}_{2s_2}\operatorname{Cos} 2t+\frac{1}{4^3}\Gamma^{(4)}_{2s}\Gamma^{(4)}_{2s_2}\operatorname{Cos} 4t+\ldots\right\},$$

hvilken slutligen leder till följande

(70) $$\frac{1-q^{2s_1}}{1+q^{2s_1}}F'_{s,\,s_1}(-1,p) = 2\Sigma s_2\xi^{(s_1)}_{2s_2}F_{s,\,s_2}(-\tfrac{3}{2},p)$$

der summationen sträcker sig från $s_2 = 1$ till $s_2 = \infty$.

För att gå vidare begynner man med att uppställa eqvationen

$$\int_0^\pi \operatorname{Cos} 2s_2 x\, dx \int dam \frac{2K}{\pi} x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

$$= \frac{\pi}{2K} \int_0^\pi \frac{\operatorname{Cos} 2s_2 x}{\Delta am \frac{2K}{\pi} x}\, dam \frac{2K}{\pi} x \int dam \frac{2K}{\pi} x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

$$= \Sigma \zeta_{2s_3}^{(2s_2)} \int_0^\pi \operatorname{Cos} 2s_3 x\, dam \frac{2K}{\pi} x \int dam \frac{2K}{\pi} x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

hvilken, enär vid delvis integration de första termerna försvinna, öfvergår i följande

$$\int_0^\pi \operatorname{Cos} 2s_2 x \int dam \frac{2K}{\pi} x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x =$$

$$= \Sigma 2s_3\, \zeta_{2s_3}^{(s_2)} \int_0^\pi \operatorname{Sin} 2s_3 x \int dam \frac{2K}{\pi} x \int dam \frac{2K}{\pi} x \int (\operatorname{Cos} 2sy - \gamma_0^{(2s)})\, dam \frac{2K}{\pi} x$$

Sedan de betecknade operationerna blifvit utförda på samma sätt som i det föregående, erhålles

$$F'_{s,\, s_2}(-\tfrac{3}{2}, p) = 2\Sigma s_3 \frac{1 - q^{2s_3}}{1 + q^{2s_3}} \zeta_{2s_3}^{(s_2)} F'_{s,\, s_3}(-2, p).$$

Riktigheten af de allmänna uttrycken

$$(71) \quad \begin{cases} F'_{s,\, s'}(-\nu + \tfrac{1}{2}, p) = 2\Sigma s'' \dfrac{1 - q^{2s''}}{1 + q^{2s''}} \zeta_{2s''}^{(s')} F'_{s,\, s''}(-\nu, p) \\ \dfrac{1 - q^{2s'}}{1 + q^{2s'}} F'_{s,\, s'}(-\nu, p) = 2\Sigma s''\, \zeta_{2s''}^{(s')} F'_{s,\, s''}(-\nu - \tfrac{1}{2}, p) \end{cases}$$

kan för öfrigt särdeles lätt ådagaläggas, sedan desamma en gång blifvit härledda för ett enda specielt värde af ν. Vi återgå för detta ändamål till någon af de under formen af Cosinus-serie redan bevisade reduktionsformlerna, t. ex. till eqvationen

$$\tfrac{1}{2}\Gamma_{2s}^{(2)}\Gamma_{2s'}^{(2)} \operatorname{Cos} 2t + \tfrac{1}{4}\Gamma_{2s}^{(4)}\Gamma_{2s'}^{(4)} \operatorname{Cos} 4t + \ldots = 2\Sigma s'' \frac{1 - q^{2s''}}{1 + q^{2s''}} \zeta_{2s''}^{(s')} \left\{ \tfrac{1}{2^2}\Gamma_{2s}^{(2)}\Gamma_{2s''}^{(2)} \operatorname{Cos} 2t + \tfrac{1}{4^2}\Gamma_{2s}^{(4)}\Gamma_{2s''}^{(4)} \operatorname{Cos} 4t + \ldots \right\}$$

Vid integration af denna likhet, sedan densamma blifvit multiplicerad med dt, uppstår ett resultat, der den genom integrationen inkomna konstanta termen tydligen måste försvinna. Vid en följande integration försvinner äfven integrationskonstanten; ty om detta icke vore händelsen, så skulle man vid en tredje integration erhålla ett resultat af formen

$$c_3 + c_2 t = A_1 \operatorname{Sin} 2t + A_2 \operatorname{Sin} 4t + \ldots$$

hvilket, enär detsamma bör gälla för alla värden af t, ej kan äga bestånd med mindre än att $c_2 = c_3 = 0$. Genom upprepade integrationer erhåller man således

$$\frac{1}{2^{2\nu-1}}\,\Gamma_{2s}^{(2)}\,\Gamma_{2s'}^{(2)}\,\mathrm{Cos}\,2t+\frac{1}{4^{2\nu-1}}\,\Gamma_{2s}^{(4)}\,\Gamma_{2s'}^{(4)}\,\mathrm{Cos}\,4t+\ldots$$

$$=2\Sigma s''\,\frac{1-q^{2s''}}{1+q^{2s''}}\,\zeta_{2s'}^{(s')}\left\{\frac{1}{2^{2\nu}}\,\Gamma_{2s}^{(2)}\,\Gamma_{2s''}^{(2)}\,\mathrm{Cos}\,2t+\frac{1}{4^{2\nu}}\,\Gamma_{1s}^{(4)}\,\Gamma_{2s''}^{(4)}\,\mathrm{Cos}\,4t+\ldots\right\}$$

hvilken genom ett, i det föregående ofta upprepadt förfarande leder till den första af eqvationerna (71). På analogt sätt finner man äfven riktigheten af den andra.

§ 14.

Den utveckling för koefficienten $\Phi_{i'}^{(i)}$, hvilken vi funnit i formeln (39), är icke den enda, som kan uppställas; genom att i eqvationerna (13) substituera andra utvecklingar för Cotg $n_{\prime}\mu\pi$ än den, på hvilken formeln (39) blifvit grundad, kan man tvertom erhålla flere andra och olika uttryck för de ifrågavarande koefficienterna. Alla dessa uttryck hafva dock den gemensamma egenskapen att bestå af serier, der termerna utgöras af $E'(\nu)$- eller $F'(\nu, p)$-funktioner, för hvilkas numeriska beräkning i de nästföregående paragraferna tjenliga uttryck blifvit härledda. Användningen af de olika uttrycken för Cotang $n_{\prime}\mu\pi$ är alldeles densamma som i § 9, men man ernår dervid uttryck, hvilka ofta äro att föredraga framför formeln (39). Af denna orsak skola vi här anföra den allmänna typen för desamma, för hvilket ändamål vi i den sednare af eqvationerna (13) införa utvecklingen

$$\mathrm{Cotang}\,n_{\prime}\mu\pi=\frac{2}{\pi}\left\{1-b_1^{(h)}(2n_{\prime}\mu)^2+b_2^{(h)}(2n_{\prime}\mu)^4-\ldots\pm b_4^{(h)}(2n_{\prime}\mu)^{2h}\right\}\left\{\frac{X_0^{(h)}}{2n_{\prime}\mu}+\frac{4n_{\prime}\mu\,X_1^{(h)}}{(2n_{\prime}\mu)^2-2^2}+\frac{4n\mu\,X_2^{(h)}}{(2n_{\prime}\mu)^2-4^2}+\ldots\right\}$$

Såväl b- som X-koefficienterna kunna ganska lätt erhållas, såsom blifvit framhållet i afhandlingen »Om summation af periodiska funktioner». De förra finner man såsom utvecklingskoefficienter af produkten

$$\left(1-\frac{x^2}{1^2}\right)\left(1-\frac{x^2}{3^2}\right)\ldots\left(1-\frac{x^2}{(2h-1)^2}\right);$$

de sednare åter ur formeln

$$X_n^{(h)}=\frac{(-1)^h\,1^2\,.\,3^2\ldots(2h-1)^2}{[(2n)^2-1^2]\,[(2n)^2-3^2]\ldots[(2n)^2-(2h-1)^2]}$$

Utföres nu ifrågavarande substitution, så erhålles under iakttagande af de i § 9 införda beteckningarna:

$$\begin{aligned}(72)\qquad \Phi_{i'}^{(i)}=&-4i\,\frac{X_0^{(h)}}{\mu\pi}\left\{E'(-1)-b_1^{(h)}\mu^2\,E'(0)+b_2^{(h)}\mu^4\,E'(1)-\ldots\pm b_h^{(h)}\mu^{2h}\,E\,(h-1)\right\}\\&+\frac{2}{\pi}\,4i\mu\,X_1^{(h)}\left\{F'(0,1)-b_1^{(h)}\mu^2\,F'(1,1)+b_2^{(h)}\mu^4\,F'(2,1)-\ldots\pm b_h^{(h)}\mu^{2h}\,F'(h,1)\right\}\\&+\frac{2}{\pi}\,4i\mu\,X_2^{(h)}\left\{F'(0,2)-b_1^{(h)}\mu^2\,F'(1,2)+b_2^{(h)}\mu^4\,F'(2,2)-\ldots\pm b_h^{(h)}\mu^{2h}\,F'(h,2)\right\}\\&+\ldots\ldots\end{aligned}$$

Detta uttryck erhåller en för numeriska räkningar vida fördelaktigare form genom reduktion af de i detsamma förekommande F'-funktionerna till andra dylika funktioner, dervid ν-index öfverallt har värdet 0 eller värdet $-\frac{1}{2}$. Denna reduktion sker antingen med stöd af formeln (64) eller (66). Vid användningen af den sistnämnda reduktionsformeln införa vi beteckningarna

$$k_1 = 2\eta^{(i)}_{0,2} + 2\mu^2 b_1^{(h)} \eta^{(i)}_{-2,2} + 2\mu^4 b_2^{(h)} \eta^{(i)}_{-4,2} + \ldots + 2\mu^{2h} b_h^{(h)} \eta^{(i)}_{-2h,2}$$

$$k_2 = 2\eta^{(i)}_{0,4} + 2\mu^2 b_1^{(h)} \eta^{(i)}_{-2,4} + 2\mu^4 b_2^{(h)} \eta^{(i)}_{-4,2} + \ldots + 2\mu^{2h} b_h^{(h)} \eta^{(i)}_{-2h,4}$$

o. s. v.

dervid är att bemärkas, det

$$2\eta^{(i)}_{0,2i} = 1;$$

men att de öfriga $\eta^{(i)}_0$-koefficienterna försvinna.

Härefter erhålles för $\Phi^{(i)}_{i'}$-koefficienten följande uttryck:

$$(73) \quad \Phi^{(i)}_{i'} = -4i\frac{X^{(h)}}{\mu\pi}\{E'(-1) - b_1^{(h)}\mu^2 E'(0) + b_2^{(h)}\mu^4 E'(1) - \ldots \pm b_h^{(h)}\mu^{2h} E'(h-1)\}$$
$$+ \frac{2}{\pi}4\mu X_1^{(h)}\{k_1 F'_{1,i'}(0,1) + 2k_2 F'_{2,i'}(0,1) + 3k_3 F'_{3,i'}(0,1) + \ldots\}$$
$$+ \frac{2}{\pi}4\mu X_2^{(h)}\{k_1 F'_{1,i'}(0,2) + 2k_2 F'_{2,i'}(0,2) + 3k_3 F'_{3,i'}(0,2) + \ldots\}$$
$$+ \frac{2}{\pi}4\mu X^{(h)}\{k_1 F'_{1,i'}(0,3) + 2k_2 F'_{2,i'}(0,3) + 3k_3 F'_{3,i'}(0,3) + \ldots\}$$
$$+ \ldots\ldots$$

Vill man åter utföra reduktion till F'-funktioner med index $\nu = -\frac{1}{2}$, så böra följande beteckningar användas

$$g_1 = 2\frac{1-q^2}{1+q^2}\{\eta^{(i)}_{-1,2} + \mu^2 b_1^{(h)}\eta^{(i)}_{-3,2} + \mu^4 b_2^{(h)}\eta^{(i)}_{-5,2} + \ldots + \mu^{2h} b_h^{(h)}\eta^{(i)}_{-(2h+1),2}\}$$

$$g_2 = 2\frac{1-q^4}{1+q^4}\{\eta^{(i)}_{-1,4} + \mu^2 b_1^{(h)}\eta^{(i)}_{-3,4} + \mu^4 b_2^{(h)}\eta^{(i)}_{-5,4} + \ldots + \mu^{2h} b_h^{(h)}\eta^{(i)}_{-(2h+1),4}\}$$

o. s. v.

Man finner nu

$$(74) \quad \Phi^{(i)}_{i'} = -4i\frac{X_0^{(h)}}{\mu\pi}\{E'(-1) - b_1^{(h)}\mu^2 E'(0) + b_2^{(h)}\mu^4 E'(1) - \ldots \pm b_h^{(h)}\mu^{2h} E'(h-1)\}$$
$$+ \frac{2}{\pi}4\mu X_1^{(h)}\{g_1 F'_{1,i'}(-\tfrac{1}{2},1) + 2g_2 F'_{2,i}(-\tfrac{1}{2},1) + 3g_3 F'_{3,i'}(-\tfrac{1}{2},1) + \ldots\}$$
$$+ \frac{2}{\pi}4\mu X_2^{(h)}\{g_1 F'_{1,i'}(-\tfrac{1}{2},2) + 2g_2 F'_{2,i}(-\tfrac{1}{2},2) + 3g_3 F'_{3,i'}(-\tfrac{1}{2},2) + \ldots\}$$
$$+ \ldots\ldots$$

Dessa uttryck synas vara bland de lämpligaste, som kunna uppställas för de ifrågavarande koefficienternas numeriska beräkning. Serierna inom hvarje parenthes äro äfven vid mycket stora värden för de elliptiska funktionernas modyl åtminstone ej svagt konvergerande åt båda sidor om den största termen, eller de största termerna, hvilka ligga i granskapet af $k_i F'_{i,i'}(o,p)$ eller $g_i F'_{i,i'}(-\frac{1}{2},p)$. Den härvid erforderliga beräkningen af funktionerna $F'_{s,i'}(o,p)$ eller $F'_{s,i'}(-\frac{1}{2},p)$ låter temligen lätt utföra sig med stöd af formlerna (41)—(46).

§ 15.

I stället för att särskildt söka hvar och en af utvecklingskoefficienterna $\Phi^{(i)}_{i'}$ kan man omedelbart härleda hela funktionen $\Phi^{(i)}$. De operationer, som vid en sådan härledning kunna komma i fråga, äro till en del motsvarande dem, hvilka i det föregående blifvit använda, men till en annan del från dessa helt och hållet afvikande. Såsom en gemensam utgångspunkt för de härvid uppträdande utvecklingsmethoderna skola vi använda den form för den ifrågavarande funktionen, som erhålles då de ändliga summorna (11) uttryckas medelst konvergenta följder af qvadraturer, en form hvilken vinnes med stöd af ètt i afhandlingen »Om summation af periodiska funktioner» bevisadt theorem. Ifrågavarande theorem är följande:

Låt eqvationen

$$u = \varphi(\mu t)$$

uttrycka en allmän relation emellan u och t, ur hvilken, i det t successivt erhåller värdet af talen 0, π, 2π, o. s. v. följande speciella värden för u härflyta:

$$\begin{aligned} u_0 &= \varphi(0) \\ u_1 &= \varphi(\mu\pi) \\ u_2 &= \varphi(2\mu\pi) \\ &\ldots\ldots \\ u_s &= \varphi(s\mu\pi); \end{aligned}$$

låt vidare z_s beteckna den ändliga summan

$$\frac{1}{2} f(u_0) + f(u_1) + f(u_2) + \ldots + f(u_{s-1}) + \frac{1}{2} f(u_s)$$

der $f(u)$ betecknar en periodisk funktion af t; då är

$$(75) \qquad z_s = \frac{1}{\pi}\int\limits_0^{s\pi}\left\{f(u) + b_1^{(h)}\frac{d^2f(u)}{dt^2} + \ldots + b_h^{(h)}\frac{d^{2h}f(u)}{dt^{2h}}\right\}\left\{X_0^{(h)} + 2X_1^{(h)}\operatorname{Cos} 2t + 2X_2^{(h)}\operatorname{Cos} 4t + \ldots\right\}dt,$$

i hvilken formel koefficienterna $b^{(h)}$ och $X^{(h)}$ hafva samma betydelse som i föregående paragraf.

Vid tillämpningen af denna formel på föreliggande problem har man att sätta

$$u = \int\limits_0^{H+\mu t}\frac{d\varphi}{\sqrt{1-k^2\operatorname{Sin}\varphi^2}}$$

samt

$$f(u) = \operatorname{Cos} 2i\frac{\pi}{2K}u$$

eller

$$f(u) = \operatorname{Sin} 2i\frac{\pi}{2K}u$$

Vi välja den sednare formen och sätta till afkortning

$$\frac{\pi}{2K}u = x,$$

då följande uttryck med lätthet erhålles

$$f(u) + b_1^{(h)}\frac{d^2f(u)}{dt^2} + \ldots = \operatorname{Sin} 2ix + b_1^{(h)}\mu^2\frac{d^2\operatorname{Sin} 2ix}{\left(dam\frac{2K}{\pi}x\right)^2} + \ldots + b_h^{(h)}\mu^{2h}\frac{d^{2h}\operatorname{Sin} 2ix}{\left(dam\frac{2K}{\pi}x\right)^{2h}}$$

Med stöd af den första af eqvationerna (48) kan dock detta uttryck utvecklas i en oändlig men konvergent serie, fortlöpande efter sinerna för multiplerna af vinkeln $2x$. Denna seri erhåller således formen

$$k_1^{(i)} \operatorname{Sin} 2x + k_2^{(i)} \operatorname{Sin} 4x + \ldots,$$

der koefficienterna äro gifna medelst de i föregående paragraf anförda uttrycken. Införes nu detta uttryck i eqvationen (75), så erhåller man tydligen z_s eller $\Phi^{(i)}$ under den åsyftade formen. Vid utförandet af denna substitution skola vi begagna oss af denna funktionsbeteckning

$$H_r = \frac{1}{\pi} \int_0^{s\pi} \operatorname{Sin} 2rx \{X_0^{(h)} + 2X_1^{(h)} \operatorname{Cos} 2t + 2X_2^{(h)} \operatorname{Cos} 4t + \ldots\} \, dt \tag{76}$$

hvarefter resultatet blifver

$$\Phi^{(i)} = k_1^{(i)} H_1 + k_2^{(i)} H_2 + \ldots \tag{77}$$

Uttrycket (76) består af en följd termer, hvilka oafsedt konstanta faktorer hafva formen

$$W_p^{(r)} = \frac{1}{\pi} \int_0^{s\pi} \operatorname{Sin} 2rx \operatorname{Cos} pt \, dt; \tag{78}$$

det är uttryck af denna form, som vi i det följande hufvudsakligen komma att behandla.

§ 16.

Utvecklas Sin $2rx$ efter argumentet $amu = H + \mu t$ och substitueras denna utveckling eller

$$2\sigma_2^{(2r)} \operatorname{Sin} 2(H + \mu t) + 2\sigma_4^{(2r)} \operatorname{Sin} 4(H + \mu t) + \ldots$$

i eqv. (78), så erhålles

$$W_p^{(r)} = \frac{1}{\pi} \int_0^{s\pi} \{2\sigma_2^{(r)} \operatorname{Sin} 2(H + \mu t) + 2\sigma_4^{(r)} \operatorname{Sin} 4(H+\mu t) + \ldots\} \operatorname{Cos} 2pt \, . \, dt$$

Genom delvis integration kan man ur denna formel härleda följande

$$W_p^{(r)} = \frac{1}{\mu\pi} \left\{\frac{2}{2}\, \sigma_2^{(2r)} [\operatorname{Cos} 2H - \operatorname{Cos} 2(H + \mu s\pi)] + \frac{2}{4}\, \sigma_4^{(2r)} [\operatorname{Cos} 4H - \operatorname{Cos} 4(H + \mu s\pi)] + \ldots\right\}$$

$$- \frac{1}{\pi} \frac{2p}{\mu} \int_0^{s\pi} \left\{\frac{2}{2}\, \sigma_2^{(2r)} \operatorname{Cos} 2(H + \mu t) + \frac{2}{4}\, \sigma_4^{(2r)} \operatorname{Cos} 4(H + \mu t) + \ldots\right\} \operatorname{Sin} 2pt \, . \, dt$$

$$= \frac{1}{\mu\pi} \left\{\frac{2}{2}\, \sigma_2^{(2r)} [\operatorname{Cos} 2H - \operatorname{Cos} 2(H + \mu s\pi)] + \frac{2}{4}\, \sigma_4^{(2r)} [\operatorname{Cos} 4H - \operatorname{Cos} 4(H + \mu s\pi)] + \ldots\right\}$$

$$+ \frac{1}{\pi} \left(\frac{2p}{\mu}\right)^2 \int^{s\pi} \left\{\frac{2}{2^2}\, \sigma_2^{(2r)} \operatorname{Sin} 2(H + \mu t) + \frac{2}{4^2}\, \sigma_4^{(2r)} \operatorname{Sin} 4(H + \mu t) + \ldots\right\} \operatorname{Cos} 2pt \, . \, dt$$

Ett fortsatt begagnande af denna formel leder till nedanstående uttryck

$$W_p^{(r)} = \frac{1}{\mu\pi}\left\{\frac{2}{2}\sigma_2^{(2r)}[\mathrm{Cos}\,2H - \mathrm{Cos}\,2(H+\mu s\pi)] + \frac{2}{4}\sigma_4^{(2r)}[\mathrm{Cos}\,4H - \mathrm{Cos}\,4(H+\mu s\pi)] + \ldots\right\}$$

$$+ \frac{1}{\mu\pi}\left(\frac{2p}{\mu}\right)^2\left\{\frac{2}{2^3}\sigma_2^{(2r)}[\mathrm{Cos}\,2H - \mathrm{Cos}\,2(H+\mu s\pi)] + \frac{2}{4^3}\sigma_4^{(2r)}[\mathrm{Cos}\,4H - \mathrm{Cos}\,4(H+\mu s\pi)] + \ldots\right\}$$

$$+ \ldots\ldots$$

$$+ \frac{1}{\mu\pi}\left(\frac{2p}{\mu}\right)^{2\nu-2}\left\{\frac{2}{2^{2\nu-1}}\sigma_2^{(2r)}[\mathrm{Cos}\,2H - \mathrm{Cos}\,2(H+\mu s\pi)] + \frac{2}{4^{2\nu-1}}\sigma_4^{(2r)}[\mathrm{Cos}\,4H - \mathrm{Cos}\,4(H+\mu s\pi)] + \ldots\right\}$$

$$+ \frac{1}{\pi}\left(\frac{2p}{\mu}\right)^{2\nu}\int_0^{s\pi}\left\{\frac{2}{2^{2\nu}}\sigma_2^{(2r)}\,\mathrm{Sin}\,2(H+\mu t) + \frac{2}{4^{2\nu}}\sigma_4^{(2r)}\,\mathrm{Sin}\,4(H+\mu t) + \ldots\right\}\mathrm{Cos}\,2pt\,.\,dt,$$

der ν betecknar ett helt positivt tal.

Serierna i detta uttryck, hvilka blifvit befriade från integraltecknet, kunna serdeles lätt ordnas efter argumentet x, hvarigenom deras konvergens blifver vida större. För sådant ändamål behöfver man endast substituera de bekanta utvecklingarna för

$$\mathrm{Cos}\,2H = \mathrm{Cos}\,2amu_0 = \mathrm{Cos}\,am\frac{2K}{\pi}x_0;\ \mathrm{Cos}\,2(H+\mu s\pi) = \mathrm{Cos}\,2amu_s = \mathrm{Cos}\,2am\frac{2K}{\pi}x_s,$$

$$\mathrm{Cos}\,4H = \mathrm{Cos}\,4amu_0 = \mathrm{Cos}\,am\frac{2K}{\pi}x_0;\ \mathrm{Cos}\,4(H+\mu s\pi) = \mathrm{Cos}\,4amu_s = \mathrm{Cos}\,4am\frac{2K}{\pi}x_s,$$

o. s. v. o. s. v.

Begagnar man sig dertill af beteckningarne

$$\eta^{(r)}_{(2\nu-1),0} = (-1)^\nu\,4r\left\{\frac{1}{2^{2\nu}}\Gamma^{(2)}_{2r}\Gamma^{(2)}_0 + \frac{1}{4^{2\nu}}\Gamma^{(4)}_{2r}\Gamma^{(4)}_0 + \frac{1}{6^{2\nu}}\Gamma^{(6)}_{2r}\Gamma^{(6)}_0 + \ldots\right\}$$

$$\eta^{(r)}_{(2\nu-1),2} = (-1)^\nu\,4r\left\{\frac{1}{2^{2\nu}}\Gamma^{(2)}_{2r}\Gamma^{(2)}_2 + \frac{1}{4^{2\nu}}\Gamma^{(4)}_{2r}\Gamma^{(4)}_2 + \frac{1}{6^{2\nu}}\Gamma^{(6)}_{2r}\Gamma^{(6)}_2 + \ldots\right\}$$

$$\eta^{(r)}_{(2\nu-1),4} = (-1)^\nu\,4r\left\{\frac{1}{2^{2\nu}}\Gamma^{(2)}_{2r}\Gamma^{(2)}_4 + \frac{1}{4^{2\nu}}\Gamma^{(4)}_{2r}\Gamma^{(4)}_4 + \frac{1}{6^{2\nu}}\Gamma^{(6)}_{2r}\Gamma^{(6)}_4 + \ldots\right\}$$

o. s. v.

samt

(79) $$N^{(r)}_\nu(x_s) = -\frac{2}{2^{2\nu-1}}\sigma_2^{(2r)}\,\mathrm{Cos}\,2(H+\mu s\pi) - \frac{2}{4^{2\nu-1}}\sigma_4^{(2r)}\,\mathrm{Cos}\,4(H+\mu s\pi) - \ldots,$$

så blifver

(80) $$N^{(r)}_\nu(x_s) = \eta^{(r)}_{(2\nu-1),0} + 2\eta^{(r)}_{(2\nu-1),2}\,\mathrm{Cos}\,2x_s + 2\eta^{(r)}_{(2\nu-1),4}\,\mathrm{Cos}\,4x_s + \ldots$$

Dessutom sätta vi

(81) $$U^{(r)}_{\nu,p}(x_s) = \int_0^{s\pi}\left\{\frac{2}{2^{2\nu}}\sigma_2^{(2r)}\,\mathrm{Sin}\,2(H+\mu t) + \frac{2}{4^{2\nu}}\sigma_4^{(2r)}\,\mathrm{Sin}\,4(H+\mu t) + \ldots\right\}\mathrm{Cos}\,2pt\,.\,dt,$$

och erhålla då

(82) $$W^{(r)}_p = \frac{1}{\mu\pi}\{N^{(r)}_1(x_s) - N^{(r)}_1(x_0)\} + \frac{1}{\mu\pi}\left(\frac{2p}{\mu}\right)^2\{N^{(r)}_2(x_s) - N^{(r)}_2(x_0)\} + \ldots$$

$$+ \frac{1}{\mu\pi}\left(\frac{2p}{\mu}\right)^{2\nu-2}\{N^{(r)}_\nu(x_s) - N^{(r)}_\nu(x_0)\} + \frac{1}{\mu\pi}\left(\frac{2p}{\mu}\right)^{2\nu}U^{(r)}_{\nu,p}(x_s)$$

Framför allt skola vi härleda funktionen $U^{(r)}_{\nu,p}(x_s)$ under formen af en efter argumentet x fortgående trigonometrisk serie. För sådant ändamål utföra vi den betecknade integrationen, hvarigenom vi erhålla

$$(83)\quad U^{(r)}_{\nu,p}(x_s) = \frac{2}{2^{2\nu}}\sigma^{(2r)}_2 \frac{2\mu}{(2p)^2-(2\mu)^2}[\mathrm{Cos}\,2(H+\mu s\pi)-\mathrm{Cos}\,2H] + \frac{2}{4^{2\nu}}\sigma^{(2r)}_4 \frac{4\mu}{(2p)^2-(4\mu)^2}[\mathrm{Cos}\,4(H+\mu s\pi)-\mathrm{Cos}\,4H]+\dots$$

Detta uttryck leder omedelbart till den åsyftade formen, då man inför utvecklingarne efter argumenten x_s och x_0 i stället för $\mathrm{Cos}\,2(H+\mu s\pi)$ o. s. v.; man finner sålunda, i det ett redan i det föregående användt beteckningssätt begagnas,

$$(84)\quad \begin{aligned} U^{(r)}_{\nu,p}(x_s) &= 8\mu r\,F'_{r,1}(-\nu,p)\,[\mathrm{Cos}\,2x_s - \mathrm{Cos}\,2x_0] \\ &+ 8\mu r\,F'_{r,2}(-\nu,p)\,[\mathrm{Cos}\,4x_s - \mathrm{Cos}\,4x_0] \\ &+ \dots\dots \end{aligned}$$

I det föregående hafva vi redan vunnit dessa resultat, ehuru under en något annan form; vi skola nu utföra en väsentlig förenkling af desamma, hvartill de nu framlagda uttrycken synas mest egnade. Härtill erfordras att funktionen $U(x_s)$ uttryckes under formen af en bestämd integral, der integrationsintervallen ej får öfverskrida talet π. Det är dock ganska lätt att härleda denna form, ty densamma erhålles omedelbart med stöd af relationen

$$\frac{2m\mu}{(2p)^2-(2m\mu)^2} = -\frac{1}{\mathrm{Sin}\,2m\mu\pi}\int_0^\pi \mathrm{Cos}\,2m\mu t\,\mathrm{Cos}\,2pt\,dt;$$

man finner sålunda ur eqv. (83)

$$(85)\quad \begin{aligned} U^{(r)}_{\nu,p}(x_s) &= -\frac{2}{2^{2\nu}}\sigma^{(2r)}_2\,[\mathrm{Cos}\,2(H+\mu s\pi) - \mathrm{Cos}\,4H]\,\frac{1}{\mathrm{Sin}\,2\mu\pi}\int_0^\pi \mathrm{Cos}\,2\mu t\,\mathrm{Cos}\,2pt\,dt \\ &- \frac{2}{4^{2\nu}}\sigma^{(2r)}_4\,[\mathrm{Cos}\,4(H+\mu s\pi) - \mathrm{Cos}\,4H]\,\frac{1}{\mathrm{Sin}\,4\mu\pi}\int_0^\pi \mathrm{Cos}\,4\mu t\,\mathrm{Cos}\,2pt\,dt \\ &- \dots\dots \end{aligned}$$

§ 17.

De transformationer, som vi i slutet af föregående paragraf åsyftat, bestå i summation af vissa termer i uttrycket för H_r. I enlighet med eqvationerna (76) och (78) hafva vi

$$H_r = X^{(h)}_0 W^{(r)}_0 + 2X^{(h)}_1 W^{(r)}_1 + 2X^{(h)}_2 W^{(r)}_2 + \dots$$

Då nu de olika delarne af W-funktionerna införas i detta uttryck uppstå olika delar af H_r, hvilka vi skola beteckna antingen med $H^{(1)}_r, H^{(2)}_r, \dots H^{(r)}_r$ och $H^{(r)}_{r,1}, H^{(r)}_{r,2}$, o. s. v., allteftersom desamma uppkomma af funktionerna $N^{(r)}_1, N^{(r)}_2, \dots N^{(r)}_\nu$ eller af de olika termerna i uttrycket (84). Vi hafva således

$$\begin{aligned} H_r &= H^{(1)}_r + H^{(2)}_r \dots + H^{(\nu)}_r \\ &+ H^{(\nu)}_{r,1} + H^{(\nu)}_{r,2} \dots \end{aligned}$$

samt

$$
(86)\begin{cases}
H_r^{(1)} = \frac{1}{\mu\pi}\{N_1^{(r)}(\mu_s) - N_1^{(r)}(\mu_0)\}\{X_0^{(h)} + 2X_1^{(h)} + 2X_2^{(h)} + \ldots\} \\
H_r^{(2)} = \frac{1}{\mu\pi}\frac{1}{\mu^2}\{N_2^{(r)}(\mu_s) - N_2^{(r)}(\mu_0)\}\{2\,.\,2^2 X_1^{(h)} + 2\,.\,4^2 X_2^{(h)} + 2\,.\,6^2 X_3^{(h)} + \ldots\} \\
\ldots\ldots \\
H_r^{(\nu)} = \frac{1}{\mu\pi}\frac{1}{\mu^{2\nu-2}}\{N_\nu^{(r)}(\mu_s) - N_\nu^{(r)}(\mu_0)\}\{2\,.\,2^{2\nu-2} X_1^{(h)} + 2\,.\,4^{2\nu-2} X_2^{(h)} + 2\,.\,6^{2\nu-2} X_3^{(h)} + \ldots\}
\end{cases}
$$

$$
(87)\begin{cases}
H_{r,1}^{(\nu)} = -\frac{1}{\mu\pi}\frac{1}{\mu^{2\nu}}\frac{2}{2^{2\nu}}\sigma_2^{(2\nu)}\left[\operatorname{Cos} 2(H + \mu s\pi) - \operatorname{Cos} 2H\right]\frac{1}{\operatorname{Sin} 2\mu\pi} \\
\qquad\qquad \times \int_0^\pi \operatorname{Cos} 2\mu t\,\{2\,.\,2^{2\nu} X_1^{(h)} \operatorname{Cos} 2t + 2\,.\,4^{2\nu} X_2^{(h)} \operatorname{Cos} 4t + \ldots\}\,dt \\
H_{r,2}^{(\nu)} = -\frac{1}{\mu\pi}\frac{1}{\mu^{2\nu}}\frac{2}{4^{2\nu}}\sigma_4^{(2\nu)}\left[\operatorname{Cos} 4(H + \mu s\pi) - \operatorname{Cos} 4H\right]\frac{1}{\operatorname{Sin} 4\mu\pi} \\
\qquad\qquad \times \int_0^\pi \operatorname{Cos} 4\mu t\,\{2\,.\,2^{2\nu} X_1^{(h)} \operatorname{Cos} 2t + 2\,.\,4^{2\nu} X_2^{(h)} \operatorname{Cos} 4t + \ldots\}\,dt
\end{cases}
$$

Med stöd af ett i den redan ofta anförda afhandlingen »Om summation af periodiska funktioner» bevisadt theorem kunna dock alla i dessa uttryck förekommande serier summeras, såvida det hela talet h antages större än det hela talet ν. Man har nämnligen i enlighet med eqv. (13) i nämnda afhandling

$$\frac{2}{\pi}\{X_0^{(h)} + 2X_1^{(h)} \operatorname{Cos} 2t + 2X_2^{(h)} \operatorname{Cos} 4t + \ldots\} = \frac{1\,.\,3\,.\,5\,..\,(2h-1)}{2\,.\,4\,..\,(2h-2)} \operatorname{Sin} t^{2h-1}$$

hvilket uttryck förblifver gällande så länge i ej öfverskrider gränserna 0 och π.

Genom att sätta $t = 0$ i ofvanstående uttryck finner man omedelbart

$$\frac{2}{\pi}\{X_0^{(h)} + 2X_1^{(h)} + 2X_2^{(h)} + \ldots\} = 0$$

Om $h > \nu$, så gäller äfven utvecklingen

$$\frac{2}{\pi}\{2\,.\,2^{2\nu} X_1^{(h)} \operatorname{Cos} 2t + 2\,.\,4^{2\nu} X_2^{(h)} \operatorname{Cos} 4t + \ldots\} = (-1)^\nu \frac{1\,.\,3\,.\,5\,..\,(2h-1)}{2\,.\,4\,..\,(2h-2)} \frac{d^{2\nu} \operatorname{Sin} t^{2h-1}}{dt^{2\nu}}$$

Funktionen till höger om likhetstecknet innehåller emellertid faktorn Sin t, hvarföre densamma försvinner för $t = 0$; man har derföre

$$\frac{2}{\pi}\{2\,.\,2^{2\nu} X_1^{(h)} + 2\,.\,4^{2\nu} X_2^{(h)} + \ldots\} = 0$$

så länge $h > \nu$.

I följd häraf är

$$H_r^{(1)} = H_r^{(2)} = \ldots = H_r^{(\nu)} = 0$$

allt under förutsättning att ifrågavarande vilkor är tillfredsställdt.

Vi betrakta nu funktionen

(88) $$\varphi_n = -\frac{1}{(2n\mu)^{2\nu}}\frac{1}{\mathrm{Sin}\,2n\mu\pi}\frac{2}{\pi}\int_0^\pi \mathrm{Cos}\,2n\mu t\,\{2\,.\,2^2\,X_1^{(h)}\,\mathrm{Cos}\,2t + 2\,.\,4^2\,\mathrm{Cos}\,4t + \ldots\}\,dt$$

I detta uttryck skola vi införa det ofvan angifna ändliga värdet för serien under integraltecknet, men dessförinnan angifva detta värde under en annan, här mera lämplig form. Det är nämnligen (pag. 13 af den anförda afhandlingen)

$$\frac{1.3.5..(2h-1)}{2.4..(2h-2)}\,\mathrm{Sin}\,t^{2h-1} = \alpha_1^{(h-1)}\,\mathrm{Sin}\,t - 3\alpha_3^{(h-1)}\,\mathrm{Sin}\,3t + \ldots \pm (2h-1)\,\alpha_{2h-1}^{(h-1)}\,\mathrm{Sin}\,(2h-1)\,t,$$

hvaraf omedelbart följer

$$(-1)^\nu\,\frac{1.3.5..(2h-1)}{2.4..(2h-1)}\,\frac{d^{2\nu}\,\mathrm{Sin}\,t^{2h-1}}{dt^{2\nu-1}} = 1^{2\nu+1}\alpha_1^{(h-1)}\mathrm{Sin}\,t - 3^{2\nu+1}\alpha_3^{(h-1)}\mathrm{Sin}\,3t + \ldots \pm (2h-1)^{2\nu+1}\alpha_{2h-1}^{(h-1)}\mathrm{Sin}\,(2h-1)\,t$$

På grund deraf att likhet måste äga rum emellan de båda utvecklingarne för $\frac{d^{2\nu}\,\mathrm{Sin}\,t^{2h-1}}{dt^{2\nu-1}}$, finna vi nu

$$\varphi_n = -\frac{1}{(2n\mu)^{2\nu}}\frac{1}{\mathrm{Sin}\,2n\mu\pi}\int_0^\pi \mathrm{Cos}\,2n\mu t\,\{1^{2\nu+1}\alpha_1^{(h-1)}\mathrm{Sin}\,t - 3^{3\nu+1}\alpha_3^{(h-1)}\mathrm{Sin}\,3t + \ldots \pm (2h-1)^{2\nu+1}\alpha_{2h-1}^{(h-1)}\mathrm{Sin}(2h-1)t\}\,dt$$

Vid fortsatta delvisa integrationer försvinna alla från integraltecknet befriade termer på lätt insedda grunder, och man erhåller följande resultat

$$\varphi_n = -\frac{1}{\mathrm{Sin}\,2n\mu\pi}\int_0^\pi \mathrm{Cos}\,2n\mu t\,\{\alpha_1^{(h-1)}\,\mathrm{Sin}\,t - 3\alpha_3^{(h-1)}\,\mathrm{Sin}\,3t + \ldots \pm (2h-1)\,\alpha_{2h-1}^{(h-1)}\,\mathrm{Sin}\,(2h-1)\,t\}\,dt$$

$$= \left\{\mathrm{Cotg}\,2n\mu\pi + \frac{1}{\mathrm{Sin}\,2n\mu\pi}\right\}\left\{\frac{1^2\,\alpha_1^{(h-1)}}{1^2-(2n\mu)^2} - \frac{3^2\,\alpha_3^{(h-1)}}{3^2-(2n\mu)^2} + \ldots \pm \frac{(2h-1)^2\,\alpha_{2h-1}^{(h-1)}}{(2h-1)^2-(2n\mu)^2}\right\}$$

Nu är emellertid (»Summation af per. funkt.» pag. 11)

$$\frac{1^2\,\alpha_1^{(h-1)}}{1^2-(2n\mu)^2} - \frac{3^2\,\alpha_3^{(h-1)}}{3^2-(2n\mu)^2} + \ldots \pm \frac{(2h-1)^2\,\alpha_{2h-1}^{(h-1)}}{(2h-1)^2-(2n\mu)^2} = \frac{1}{\left[1-\left(\frac{2n\mu}{1}\right)^2\right]\left[1-\left(\frac{2n\mu}{3}\right)^2\right]\ldots\left[1-\left(\frac{2n\mu}{2h-1}\right)^2\right]}$$

och dessutom

$$\mathrm{Cotang}\,2n\mu\pi + \frac{1}{\mathrm{Sin}\,2n\mu\pi} = \mathrm{Cotg}\,n\mu\pi;$$

vi erhålla derföre slutligen

(89) $$\varphi_n = -\frac{\mathrm{Cotg}\,n\mu\pi}{\left[1-\left(\frac{2n\mu}{1}\right)^2\right]\left[1-\left(\frac{2n\mu}{3}\right)^2\right]\ldots\left[1-\left(\frac{2n\mu}{2h-1}\right)^2\right]}$$

Detta resultat innebär tillika följande anmärkningsvärda likhet

$$\frac{2}{\pi}\left\{\frac{2\,.\,2^{2\nu}\,X_1^{(h)}}{2^2-(2n\mu)^2} + \frac{2\,.\,4^{2\nu}\,X_2^{(h)}}{4^2-(2n\mu)^2} + \ldots\right\} = -\frac{(2n\mu)^{2\nu-1}\,\mathrm{Cotg}\,n\mu\pi}{\left[1-\left(\frac{2n\mu}{1}\right)^2\right]\left[1-\left(\frac{2n\mu}{3}\right)^2\right]\ldots\left[1-\left(\frac{2n\mu}{2h-1}\right)^2\right]}$$

$$= \frac{2}{\pi}\,(2n\mu)^{2\nu}\left\{-\frac{X_0^{(h)}}{(2n\mu)^2} + \frac{2X_1^{(h)}}{2^2-(2n\mu)^2} + \frac{2X_2^{(h)}}{4^2-(2n\mu)^2} + \ldots\right\},$$

hvilken naturligtvis endast gäller för de händelser då $h > \nu$ och $\nu > 0$.

På grund af den bestämning, vi erhållit för funktionerna $H_{r,n}^{(\nu)}$, inses äfven riktigheten af följande resultat

$$H_r = \frac{1}{\mu}\,\sigma_2^{(2r)}\left[\operatorname{Cos} 2(H + \mu s\pi) - \operatorname{Cos} 2H\right] \frac{\operatorname{Cotg} \mu\pi}{\left[1-\left(\frac{2\mu}{1}\right)^2\right]\left[1-\left(\frac{2\mu}{3}\right)^2\right]\cdots\left[1-\left(\frac{2\mu}{2h-1}\right)^2\right]}$$

$$+ \frac{1}{\mu}\,\sigma_4^{(2r)}\left[\operatorname{Cos} 4(H + \mu s\pi) - \operatorname{Cos} 4H\right] \frac{\operatorname{Cotg} 2\mu\pi}{\left[1-\left(\frac{4\mu}{1}\right)^2\right]\left[1-\left(\frac{4\mu}{3}\right)^2\right]\cdots\left[1-\left(\frac{2\mu}{2h-1}\right)^2\right]}$$

$$+ \ldots\ldots$$

Denna utveckling kunna vi ganska lätt ordna efter argumentet x; dervid beteckna vi

$$\omega_{r,\,1} = \frac{r}{\mu}\left\{\frac{1}{1}\,\Gamma_2^{(2)}\,\Gamma_{2r}^{(2)}\,\varphi_1 + \frac{1}{2}\,\Gamma_2^{(4)}\,\Gamma_{2r}^{(4)}\,\varphi_2 + \frac{1}{3}\,\Gamma_2^{(6)}\,\Gamma_{2r}^{(6)}\,\varphi_3 + \ldots\right\}$$

$$\omega_{r,\,2} = \frac{r}{\mu}\left\{\frac{1}{1}\,\Gamma_4^{(2)}\,\Gamma_{2r}^{(2)}\,\varphi_1 + \frac{1}{2}\,\Gamma_4^{(4)}\,\Gamma_{2r}^{(4)}\,\varphi_2 + \frac{1}{3}\,\Gamma_4^{(6)}\,\Gamma_{2r}^{(6)}\,\varphi_3 + \ldots\right\}$$

$$\omega_{r,\,3} = \frac{r}{\mu}\left\{\frac{1}{1}\,\Gamma_6^{(2)}\,\Gamma_{2r}^{(2)}\,\varphi_1 + \frac{1}{2}\,\Gamma_6^{(4)}\,\Gamma_{2r}^{(4)}\,\varphi_2 + \frac{1}{3}\,\Gamma_6^{(6)}\,\Gamma_{2r}^{(6)}\,\varphi_3 + \ldots\right\}$$

o. s. v.,

hvarefter den ifrågavarande utvecklingen blifver följande

$$(90) \qquad 2\omega_{r,\,1}\left[\operatorname{Cos} 2x_s - \operatorname{Cos} 2x_0\right] + 2\omega_{r,\,2}\left[\operatorname{Cos} 4x_s - \operatorname{Cos} 4x_0\right] + \ldots$$

De anförda uttrycken för ω-koefficienterna äro under vissa förhållanden särdeles lämpliga vid numeriska räkningar; i synnerhet då μ är större än enheten, d. v. s. då den störande planetens medelrörelse är större än kometens, äro ofta ett ganska litet antal termer nog att angifva de ifrågavarande koefficienterna med tillbörlig säkerhet. Men äfven i de händelser då μ har ett mindre numeriskt värde än 1, är de anförda seriernas konvergens ej ofördelaktig. I sådant fall kan man dock förfara på ett annat sätt, som synes vara än mera ändamålsenligt. Den transformation af summationsformeln (75), hvilken blifvit anförd i afhandlingen »Om summation af per. funkt.» pag. 12, erbjuder ett härtill tjenligt medel.

§ 17.

Ifrågavarande transformation leder närmast till följande likhet:

$$z_s = \frac{1}{\pi}\int_0^{s\pi}\left\{f(u) + b_1^{(h)}\,\frac{d^2 f(u)}{dt^2} + \ldots + b_h^{(h)}\,\frac{d^{2h} f(u)}{dt^{2h}}\right\} dt + T(u_s),$$

der

$$T(u_s) = -\,\frac{1}{2}\,c_2^{(h-1)}\int_0^{s\pi}\left\{\frac{df(u)}{dt} + b_1^{(h)}\,\frac{d^3 f(u)}{dt^3} + \ldots + b_h^{(h)}\,\frac{d^{2h+1} f(u)}{dt^{2h+2}}\right\}$$

$$-\,\frac{1}{2}\,c_4^{(h-1)}\int_0^{s\pi}\left\{\frac{d^3 f(u)}{dt^3} + b_1^{(h)}\,\frac{d^5 f(u)}{dt^5} + \ldots + b_h^{(h)}\,\frac{d^{2h+3} f(u)}{dt^{2h+3}}\right\}$$

$$-\,\ldots\ldots$$

$$-\frac{1}{2}c_{2\nu}^{(h-1)}\int_0^{s\pi}\left\{\frac{d^{2\nu-1}f(u)}{dt^{2\nu-1}}+b_1^{(h)}\frac{d^{2\nu+1}f(u)}{dt^{2\nu+1}}+\ldots+b_h^{(h)}\frac{d^{2\nu+2h-1}f(u)}{dt^{2\nu+2h-1}}\right\}$$

$$+(-1)^\nu\frac{2}{\pi}\int_0^{s\pi}\left\{\frac{d^{2\nu}f(u)}{dt^{2\nu}}+b_1^{(h)}\frac{d^{2\nu+2}f(u)}{dt^{2\nu+2}}+\ldots+b_h^{(h)}\frac{d^{2\nu+2h}f(u)}{dt^{2\nu+2h}}\right\}\left\{\frac{1}{2^{2\nu}}X_1^{(h)}\operatorname{Cos}2t+\frac{1}{4^{2\nu}}X_2^{(h)}\operatorname{Cos}4t+\ldots\right\}dt$$

I detta uttryck beteckna ν och h, såsom i det föregående godtyckligt valda, hela tal; de numeriska, endast af dessa hela tal beroende konstanterna $c_\nu^{(h)}$ äro i allmänhet definierade genom uttrycket

$$\frac{2}{\pi}\left\{\frac{1}{2^{2\nu}}X_1^{(h)}+\frac{1}{4^{2\nu}}X_2^{(h)}+\frac{1}{6^{2\nu}}X_3^{(h)}+\ldots\right\}=\frac{1}{2}(-1)^\nu c_{2\nu}^{(h-1)} \tag{91}$$

Antager man nu i likhet med förut

$$f(u)=\operatorname{Sin}2i\frac{\pi}{2K}u=\operatorname{Sin}2ix$$

samt

$$H+\mu t=amu,\ \text{mod}\ k,$$

så erhålles på grund af den anförda formeln:

$$\Phi^{(i)}=\frac{1}{\mu\pi}\int_{x_0}^{x_s}\left\{\operatorname{Sin}2ix+\mu^2 b_1^{(h)}\frac{d^2\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^2}+\ldots+\mu^{2h}b_h^{(h)}\frac{d^{2}_{h}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2h}}\right\}\cdot\frac{2K}{\pi}\Delta am\frac{2K}{\pi}x\cdot dx \tag{92}$$

$$+T(x_s)$$

och

$$T(x_s)=-\tfrac{1}{2}c_2^{(h-1)}\mu\int_{x_0}^{x_s}\left\{\frac{d\operatorname{Sin}2ix}{dam\frac{2K}{\pi}x}+\mu^2 b_1^{(h)}\frac{d^3\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^3}+\ldots+\mu^{2h}b_h^{(h)}\frac{d^{2h+1}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2h+1}}\right\}$$

$$-\tfrac{1}{2}c_4^{(h-1)}\mu^3\int_{x_0}^{x_s}\left\{\frac{d^3\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^3}+\mu^2 b_1^{(h)}\frac{d^5\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^5}+\ldots+\mu^{2h}b_h^{(h)}\frac{d^{2h+3}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2h+3}}\right\}$$

$$-\ \ldots\ldots$$

$$-\tfrac{1}{2}c_{2\nu}^{(h-1)}\mu^{2\nu-1}\int_{x_0}^{x_s}\left\{\frac{d^{2\nu-1}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu-1}}+\mu^2 b_1^{(h)}\frac{d^{2\nu+1}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu+1}}+\ldots+\mu^{2h}b_h^{(h)}\frac{d^{2\nu+2h-1}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu+2h-1}}\right\}$$

$$+(-1)^\nu\frac{2}{\pi}\mu^{2\nu}\int_0^{s\pi}\left\{\frac{d^{2\nu}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu}}+\mu^2 b_1^{(h)}\frac{d^{2\nu+2}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu+2}}+\ldots+\mu^{2h}b_h^{(h)}\frac{d^{2\nu+2h}\operatorname{Sin}2ix}{\left(dam\frac{2K}{\pi}x\right)^{2\nu+2h}}\right\}\left\{\frac{X_1^{(h)}}{2^{2\nu}}\operatorname{Cos}2t+\frac{X_2^{(h)}}{4^{2\nu}}\operatorname{Cos}4t+\ldots\right\}dt$$

Hvad nu den första delen af ofvanstående uttryck för $\Phi^{(i)}$ vidkommer, så kan densamma med största lätthet bringas under formen af en trigonometrisk serie, fortgående efter argumentet x, hvarefter den betecknade integrationen omedelbart låter utföra sig. De operationer, som härvid måste utföras, grunda sig helt och hållet på utvecklingar, hvilka redan i det föregående blifvit behandlade och derföre här icke behöfva upprepas.

Sådant är äfven förhållandet med de från integrationstecknet befriade delarne af $T(x_s)$. Den sista termen af denna funktion kan deremot icke omedelbart reduceras till en sådan serie, utan densamma måste för detta ändamål underkastas operationer liknande dem, hvilka användas vid reduktionen af funktionerna H_r. Härvid skola vi, för att vinna någon öfverensstämmelse med de i det föregående använda beteckningarne, sätta

$$(-1)^\nu \mu^{2\nu}\left\{\frac{d^{2\nu}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu}} + \mu^2 b_1^{(h)} \frac{d^{2\nu+2}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu+2}} + \ldots + \mu^{2h} b_h^{(h)} \frac{d^{2\nu+2h}\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^{2\nu+2h}}\right\}$$

$$= k_1^{i,\nu}\,\mathrm{Sin}\,2x + k_2^{i,\nu}\,\mathrm{Sin}\,4x + \ldots$$

$$J_r^{(\nu)} = \frac{2}{\pi}\int_0^{s\pi} \mathrm{Sin}\,2r\,x\left\{\frac{1}{2^{2\nu}} X_1^{(h)}\,\mathrm{Cos}\,2t + \frac{1}{4^{2\nu}} X_2^{(h)}\,\mathrm{Cos}\,4t + \ldots\right\} dt$$

För koefficienterna $k_r^{i,\nu}$ finner man dervid med lätthet följande uttryck

$$(93)\qquad k_r^{i,\nu} = (-1)^\nu \mu^{2\nu}\left\{2\eta^{(i)}_{-2\nu,\,2r} + 2\mu^2 b_1^{(h)} \eta^{(i)}_{-2\nu-2,\,2r} + \ldots + 2\mu^{2h} b_h^{(h)} \eta^{(i)}_{-2\nu-2h,\,2r}\right\}$$

Den sista termen af uttrycket för $T(x_s)$ erhåller sålunda följande form

$$k_1^{i,\nu} J_1^{(\nu)} + k_2^{i,\nu} J_2^{(\nu)} + k_3^{i,\nu} J_3^{(\nu)} + \ldots$$

Funktionen $J_r^{(\nu)}$ sönderfaller i en följd af termer, hvilka, så när som på konstanta faktorer, äro identiska med de genom eqv. (78) definierade $W_p^{(r)}$-funktionerna; man har nämnligen

$$(94)\qquad J_r^{(\nu)} = 2\left\{\frac{1}{2^{2\nu}} X_1^{(h)} W_1^{(r)} + \frac{1}{4^{2\nu}} X_2^{(h)} W_2^{(r)} + \frac{1}{6^{2\nu}} X_3^{(h)} W_3^{(r)} + \ldots\right\}$$

Insättas nu här de uttryck för funktionerna $W_p^{(r)}$, som erhållas då man i likheten (82) i stället för p inför de hela talen 1, 2, o. s. v., så finner man

$$(95)\qquad J_r^{(\nu)} = \frac{(-1)^\nu}{2\mu} c_{2\nu}^{(h-1)}\left\{N_1^{(r)}(x_s) - N_1^{(r)}(x_0)\right\} + \frac{(-1)^{\nu-1}}{2\mu^3} c_{2\nu-2}^{(h-1)}\left\{N_2^{(r)}(x_s) - N_2^{(r)}(x_0)\right\} + \ldots$$

$$- \frac{c_2^{(h-1)}}{2\mu^{2\nu-1}}\left\{N_\nu^{(r)}(x_s) - N_\nu^{(r)}(x_0)\right\}$$

$$+ \frac{2}{\pi\mu^{2\nu+1}}\left\{X_1^{(h)} U_{\nu,1}^{(r)}(x_s) + X_2^{(h)} U_{\nu,2}^{(r)}(x_s) + X_3^{(h)} U_{\nu,3}^{(r)}(x_s) + \ldots\right\}$$

Denna formel, ehuru under den anförda formen redan ganska användbar, kan likväl med fördel underkastas en transformation, beroende på summationer af samma slag, som användes i föregående §; hvilken transformation dock berör endast den sista termen af ofvanstående uttryck. För detta ändamål införa vi i stället för funktionerna $U_{\nu,p}^{(r)}$ deras värden i enlighet med likheten (85) och erhålles då för ifrågavarande term, hvilken vi beteckna med $S(x_s) - S(x_0)$,

$$(96)\quad S(x_s) = -\frac{1}{\mu\pi}\frac{1}{\mu^{2\nu}}\frac{2}{2^{2\nu}}\sigma_2^{(2r)}\,\mathrm{Cos}\,2(H+\mu s\pi)\frac{1}{\mathrm{Sin}\,2\mu\pi}\int_0^\pi \mathrm{Cos}\,2\mu t\left\{2X_1^{(h)}\,\mathrm{Cos}\,2t + 2X_2^{(h)}\,\mathrm{Cos}\,4t + \ldots\right\} dt$$

$$-\frac{1}{\mu\pi}\frac{1}{\mu^{2\nu}}\frac{2}{4^{2\nu}}\sigma_4^{(2r)}\,\mathrm{Cos}\,4(H+\mu s\pi)\frac{1}{\mathrm{Sin}\,4\mu\pi}\int_0^\pi \mathrm{Cos}\,4\mu t\left\{2X_1^{(h)}\,\mathrm{Cos}\,2t + 2X_2^{(h)}\,\mathrm{Cos}\,4t + \ldots\right\} dt$$

$$- \ldots\ldots$$

Vi sågo i föregående paragraf att faktorerna φ_n äro oberoende af det hela talet ν, såvida detta är större än 0; bibehålles äfven i sådan händelse den genom eqv. (89) angifna definitionen för φ_n, så hafva vi

$$-\frac{2}{\pi}\frac{1}{\operatorname{Sin} 2n\mu\pi}\int_0^\pi \operatorname{Cos} 2n\mu t\,\{2X_1^{(h)} \operatorname{Cos} 2t + 2X_2^{(h)} \operatorname{Cos} 4t + \ldots\}\,dt = \varphi_n + \frac{2}{\pi}\frac{1}{2n\mu}$$

Insättes nu detta värde i det sistanförda uttrycket för $S(x_s)$, så ernås följande utveckling

$$S(x_s) = \frac{1}{\mu^{2\nu+1}}\left\{\frac{1}{2^{2\nu}}\sigma_2^{(2\nu)}\left(\varphi_1 + \frac{2}{\pi}\frac{1}{2\mu}\right)\operatorname{Cos} 2(H + \mu s\pi) + \frac{1}{4^{2\nu}}\sigma_4^{(2\nu)}\left(\varphi_2 + \frac{2}{\pi}\frac{1}{4\mu}\right)\operatorname{Cos} 4(H + \mu s\pi) + \ldots\right\}$$

Faktorn $\frac{1}{\mu^{2\nu}}$ i detta uttryck upphäfves af faktorn $\mu^{2\nu}$ i uttrycket för $k_r^{i,\nu}$, och synas således dessa båda faktorer kunna utelemnas. Det är dock med afsigt, som desamma blifvit bibehållna, och det på följande grund. Alla i denna paragraf meddelade utvecklingar äro förnämligast afsedda för de händelser då μ är mindre än enheten. Faktorn $\mu^{2\nu}$ förminskar derföre de i och för sig ofta betydliga koefficienterna $k_r^{i,\nu}$, hvaremot faktorn $\frac{1}{\mu^{2\nu}}$ förstorar funktionerna $S(x_s)$, hvilka i och för sig oftast hafva små numeriska värden. Genom dylika utjemningar blifver den numeriska beräkningen beqvämare och man erhåller produkterna af funktionerna $S(x_s)$ med sina tillhörande k-koefficienter säkrare än om man hade bortlemnat de utjemnande faktorerna $\mu^{2\nu}$ och $\frac{1}{\mu^{2\nu}}$.

I analogi med föregående beteckningar sätta vi slutligen

$$\omega_{r,0}^{(\nu)} = \frac{r}{\mu}\frac{1}{(2\mu)^{2\nu}}\left\{\frac{1}{1^{2\nu+1}}\Gamma_0^{(2)}\Gamma_{2r}^{(2)}\varphi_1 + \frac{1}{2^{2\nu+1}}\Gamma_0^{(4)}\Gamma_{2r}^{(4)}\varphi_2 + \frac{1}{3^{2\nu+1}}\Gamma_0^{(6)}\Gamma_{2r}^{(6)}\varphi_3 + \ldots\right\} - \frac{1}{2}\frac{2}{\pi}\frac{(-1)^\nu}{\mu^{2\nu+2}}\eta_{(2\nu+1),0}^{(r)}$$

$$\omega_{r,1}^{(\nu)} = \frac{r}{\mu}\frac{1}{(2\mu)^{2\nu}}\left\{\frac{1}{1^{2\nu+1}}\Gamma_2^{(2)}\Gamma_{2r}^{(2)}\varphi_1 + \frac{1}{2^{2\nu+1}}\Gamma_2^{(4)}\Gamma_{2r}^{(4)}\varphi_2 + \frac{1}{3^{2\nu+1}}\Gamma_2^{(6)}\Gamma_{2r}^{(6)}\varphi_3 + \ldots\right\} - \frac{1}{2}\frac{2}{\pi}\frac{(-1)^\nu}{\mu^{2\nu+2}}\eta_{(2\nu+1),2}^{(r)}$$

$$\omega_{r,2}^{(\nu)} = \frac{r}{\mu}\frac{1}{(2\mu)^{2\nu}}\left\{\frac{1}{1^{2\nu+1}}\Gamma_4^{(2)}\Gamma_{2r}^{(2)}\varphi_1 + \frac{1}{2^{2\nu+1}}\Gamma_4^{(4)}\Gamma_{2r}^{(4)}\varphi_2 + \frac{1}{3^{2\nu+1}}\Gamma_4^{(6)}\Gamma_{2r}^{(6)}\varphi_3 + \ldots\right\} - \frac{1}{2}\frac{2}{\pi}\frac{(-1)^\nu}{\mu^{2\nu+2}}\eta_{(2\nu+1),4}^{(r)}$$

o. s. v.

hvarefter funktionen $S(x_s)$ erhåller följande form

(97) $$S(x_s) = \omega_{r,0}^{(\nu)} + 2\omega_{r,1}^{(\nu)}\operatorname{Cos} 2x_s + 2\omega_{r,2}^{(\nu)}\operatorname{Cos} 4x_s + \ldots;$$

och på samma sätt

$$S(x_0) = \omega_{r,0}^{(\nu)} + 2\omega_{r,1}^{(\nu)}\operatorname{Cos} 2x_0 + 2\omega_{r,2}^{(\nu)}\operatorname{Cos} 4x_0 + \ldots$$

Vid användningen af de i denna och föregående paragraf härledda uttryck behöfver man alldeles icke välja stora värden för de hela talen h och ν; det är tvertom oftast tillräckligt att antaga $h = 2$ och $\nu = 1$, d. v. s. redan med dessa värden erhålla de oändliga serierna, som här förekomma, en sådan konvergens att icke några anmärkningsvärda svårigheter uppstå vid numeriska användningar af desamma. — Vi sammanställa här, under antagande af de anförda värdena för h och ν, de uttryck, hvilka leda till kännedom af funktionen $T(x_s)$ i formeln (90). Först och främst anföra vi dervid värdena för de numeriska konstanter, som ingå i dessa uttryck. Vi hafva då

$$b_1^{(2)} = \frac{10}{9}$$

$$b_2^{(2)} = \frac{1}{9}$$

$$\text{Log}\ \frac{1}{2^2} X_1^{(2)} = 9.1760913_n$$

$$\frac{1}{4^2} X_2^{(2)} = 7.728933$$

$$\frac{1}{6^2} X_3^{(2)} = 6.42251$$

$$\frac{1}{8^2} X_4^{(2)} = 5.6084$$

$$\frac{1}{10^2} X_5^{(2)} = 4.9996$$

$$\frac{1}{12^2} X_6^{(2)} = 4.5072$$

$$\frac{1}{14^2} X_7^{(2)} = 4.1001$$

$$\frac{1}{16^2} X_8^{(2)} = 3.747$$

$$\frac{1}{18^2} X_9^{(2)} = 3.436$$

$$\frac{1}{20^2} X_{10}^{(2)} = 3.159$$

$$\text{Log}\ c_2^{(1)} = 9.2642425$$

Funktionerna $J_r^{(1)}$ kunna nu antigen beräknas enligt formeln

$$J_r^{(1)} = 2\left\{\frac{1}{2^2} X_1^{(2)} W_1^{(r)} + \frac{1}{4^2} X_2^{(2)} W_2^{(r)} + \ldots\right\},$$

dervid åter funktionerna $W_p^{(r)}$ bibehålla sin betydelse i enlighet med eqv. (76), eller ock medelst uttrycket

$$J_r^{(1)} = -\frac{c_2^{(1)}}{2\mu}\{N_1^{(r)}(x_s) - N_1^{(r)}(x_0)\} + S(x_s) - S(x_0)$$

För beräkningen af $N_1^{(r)}(x_s)$ använder man likheten (80) samt för härledningen af $S(x_s)$ formeln (97), hvarvid

$$\varphi_n = -\frac{\text{Cotg}\ n\mu\pi}{\left[1-\left(\frac{2n\mu}{1}\right)^2\right]\left[1-\left(\frac{2n\mu}{3}\right)^2\right]}$$

Vid beräkningen af koefficienterna $\omega_{r,r'}^{(\nu)}$ påträffar man understundom långt aflägsna termer, hvilka blifva märkliga och vida större än de närliggande. Orsaken härtill ligger i faktorn Cotg $n\mu\pi$, hvilken ingår i koefficienten φ_n. En sådan aflägsen term är dock mycket lätt att beräkna, i synnerhet om man får antaga att index n är mycket stor i jemförelse med indices r och r'. I en sådan händelse kan man nämnligen begagna sig af assymptotiska uttryck för $\Gamma_{2r}^{(2n)}$ och $\Gamma_{2r'}^{(2n)}$, sådana som blifvit framstälda i afhandlingen »Studien auf dem Gebiete der Störungstheorie» § 34. Ofta ernår man härvid tillbörlig noggrannhet genom användningen af den enkla formeln

$$\Gamma^{(2n)}_{2r}\,\Gamma^{(2n)}_{2r'} = \frac{(-1)^{r+r'}}{4}\,\frac{k_1^{2n}}{\pi n\beta_1}\,\frac{1+q^{2r}\,.\,1+q^{2r}}{q^{r+r'}}\,e^{-\frac{r^2+r'^2}{n\beta_1}}$$

der

$$\beta_1 = \sqrt{1-k_1^2}\,\sqrt{1-k_2^2}\,\sqrt{1-k_3^2}\ldots.$$

Då denna formel ej uppfyller sitt ändamål, måste man använda flere af de termer, hvilka blifvit angifna i den citerade § *).

Sedan ifrågavarande beräkningar och numeriska utvecklingar blifvit utförda, finner man

$$T(x_s) = -\tfrac{1}{2}\,c_2^{(1)}\,\mu\int_{x_0}^{x_s}\left\{\frac{d\,\mathrm{Sin}\,2ix}{dam\,\frac{2K}{\pi}x} + \frac{10}{9}\,\mu^2\,\frac{d^3\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^3} + \frac{1}{9}\,\mu^4\,\frac{d^5\,\mathrm{Sin}\,2ix}{\left(dam\,\frac{2K}{\pi}x\right)^5}\right\}$$

$$+\,k_1^{i,\,2}\,J_1^{(2)} + k_2^{i,\,2}\,J_2^{(2)} + k_3^{i,\,2}\,J_3^{(2)} + \ldots$$

§ 18.

Genom utvecklingarne i de sednaste paragraferna har det visat sig, att lösningen af det i föreliggande afhandling undersökta summationsproblem i väsentlig mån är beroende på utvecklingen $W_p^{(r)}$. Alla de lösningar till ifrågavarande problem, hvilka i det föregående finnas meddelade, bero äfven i grunden på dylika utvecklingar, ehuru desamma understundom varit förtäckta; dessa utvecklingar hafva dock hitintills blifvit utförda i enlighet med en enda princip, de äro nämnligen ytterst grundlagda på de serier, hvilka i § 1 af denna afhandling blifvit angifna medelst eqvationssystemen (I) och (II). Utvecklingen af funktionen $W_p^{(r)}$ kan likväl erhållas på åtskilliga andra vägar; af dessa skola vi i det följande uppsöka dem, hvilka, såsom det synes, äro de fördelaktigaste.

Den method, som vi härvid i första rummet gå att belysa, är i sina allmänna drag användbar äfven då man åt störingsdifferentialen gifvit en annan form än den, hvilken i det föregående blifvit förutsatt. Af denna orsak skola vi anföra densamma,

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*) För att i ett exempel meddela beräkningen af en sådan aflägsen term skola vi från räkningarne öfver den Enckeska kometens Jupitersstöringar antaga

$$\mu = 0.2778888$$

eller

$$\mu\pi = 50^\circ\,1'\,11''.965$$

Härmed finner man

$$18\mu\pi = 180^\circ\,21'\,35''.352$$

$$\mathrm{Log\ Cotg}\ 18\mu\pi = 2.2060317$$

$$-\frac{1}{18^3}\,\varphi_{18} = 5.439048$$

Man ser häraf först och främst att faktorn φ_{18} erhåller ett ganska litet värde ehuru Cotg $18\mu\pi$ är mycket stor.

Med de redan angifna värdena för k_1 och q finner man

$$\mathrm{Log}\,\beta_1 = 9.76173$$

$$\mathrm{Log}\,\frac{1}{4}\,\frac{k_1^{36}}{18\pi\beta} = 4.43697$$

Häraf synes utan vidare räkning att den ifrågavarande termen är mycket liten så länge r och r' ej erhålla större värden, d. v. s. så länge ofvanstående formel är användbar.

betraktad från en något allmännare synpunkt än som erfordrades för härledningen af funktionen $W_p^{(r)}$. Vi betrakta således denna funktion såsom ett specielt resultat af de operationer, hvilka antydas i något af uttrycken

$$A = \int \mathrm{Cos}\, 2ix\, \mathrm{Cos}\, 2mt\,.\, dt$$

och

$$B = \int \mathrm{Sin}\, 2ix\, \mathrm{Cos}\, 2mt\,.\, dt,$$

der relationen emellan x och t är gifven medelst den allmänna eqvationen

$$x = f(t)$$

Vi förutsätta nu, i det med M och N betecknas tvenne funktioner af x, att A kan reduceras till formen

$$A = M\, \mathrm{Cos}\, 2mt + N\, \mathrm{Sin}\, 2mt$$

Denna likhet leder, efter differentiation i afseende på t, samt under iakttagande af att

$$\frac{dA}{dt} = \mathrm{Cos}\, 2ix\, \mathrm{Cos}\, 2mt$$

till följande:

$$\mathrm{Cos}\, 2ix\, \mathrm{Cos}\, 2mt = \left. \frac{dM}{dx} \mathrm{Cos}\, 2mt + \frac{dN}{dx} \mathrm{Sin}\, 2mt \right\} f'(t) - 2m\, \{M\, \mathrm{Sin}\, 2mt - N\, \mathrm{Cos}\, 2mt\}$$

hvilken åter sönderfaller i tvenne, nämnligen

$$(98) \qquad \begin{cases} \mathrm{Cos}\, 2ix = \frac{dM}{dx} f'(t) + 2mN \\ \qquad\;\; 0 = \frac{dN}{dx} f'(t) - 2mM \end{cases}$$

I stället för detta eqvationssystem kan man lätt uppställa en enda lineär differentialeqvation af andra ordningen, genom hvars integration man finner endera af funktionerna M eller N; den andra framgår derefter omedelbart och utan någon vidare integration. För detta ändamål differentiera vi den första af eqvationerna (98) och erhålla

$$-2i\, \mathrm{Sin}\, 2ix\, f'(t) = \frac{d^2M}{dx^2} (f'(t))^2 + \frac{dM}{dx} f''(t) + 2m \frac{dN}{dx} f'(t);$$

eller om termen $2m \frac{dN}{dx} f'(x)$ elimineras med stöd af den andra af nämnde eqvationer,

$$(99) \qquad -2i\, \mathrm{Sin}\, 2ix\, f'(t) = \frac{d^2M}{dx^2} (f'(t))^2 + \frac{dM}{dx} f''(t) + 4m^2 M$$

På samma sätt erhålles, i det man sätter

$$B = P\, \mathrm{Cos}\, 2mt + Q\, \mathrm{Sin}\, 2mt$$

$$\mathrm{Sin}\, 2ix = \frac{dP}{dx} f'(t) + 2mQ$$

$$0 = \frac{dQ}{dx} f'(t) - 2mP$$

hvilka eqvationer åter leda till denna

$$(100) \qquad 2i\, \mathrm{Cos}\, 2ix\, f'(t) = \frac{d^2P}{dx^2} (f'(t))^2 + \frac{dP}{dx} f''(t) + 4m^2 P$$

Visserligen kan hvarken denna eqvation eller den föregående (99) i allmänhet omedelbart integreras, men så ofta $f'(t)$ är gifven medelst en serie af formen

$$f'(t) = \varkappa_0 + \varkappa_1 \operatorname{Cos} 2x + \varkappa_2 \operatorname{Cos} 4x + \ldots,$$

kan man äfven härleda uttryck för funktionerna M eller P under formen af periodiska serier, hvilka utgöra integral till eqv. (99) eller (100). Uppställer man t. ex. denna eqvation

$$\begin{aligned} P = \gamma_i \operatorname{Cos} 2ix &+ \gamma_{i+1} \operatorname{Cos} (2i+2)\, x + \gamma_{i+2} \operatorname{Cos} (2i+4)\, x + \ldots \\ &+ \gamma_{i-1} \operatorname{Cos} (2i-2)\, x + \gamma_{i-2} \operatorname{Cos} (2i-4)\, x + \ldots, \end{aligned}$$

så blifver den nämnda integrationen af eqv. (100) verkställd i och med bestämningen af koefficienterna γ_i, γ_{i-1}, γ_{i+1} o. s. v. För att utföra denna bestämning sätta vi:

$$(f'(t))^2 = \lambda_0 + \lambda_1 \operatorname{Cos} 2x + \lambda_2 \operatorname{Cos} 4x + \ldots$$

$$f''(t) = -\eta_1 \operatorname{Sin} 2x - \eta_2 \operatorname{Sin} 4x - \ldots,$$

samt införa dessa värden såväl som uttrycket för P i eqv. (100), hvilken då erhåller nedanstående form

$$2i \operatorname{Cos} 2ix \{\varkappa_0 + \varkappa_1 \operatorname{Cos} 2x + \varkappa_2 \operatorname{Cos} 4x + \ldots\} =$$

$$- \left\{ \begin{aligned} &(2i)^2 \gamma_i \operatorname{Cos} 2ix + (2i+2)^2 \gamma_{i+1} \operatorname{Cos} (2i+2)\, x + \ldots \\ &\qquad + (2i-2)^2 \gamma_{i-1} \operatorname{Cos} (2i-2)\, x + \ldots \end{aligned} \right\} \{\lambda_0 + \lambda_1 \operatorname{Cos} 2x + \lambda_2 \operatorname{Cos} 4x + \ldots\}$$

$$+ \left\{ \begin{aligned} &(2i)\, \gamma_i \operatorname{Sin} 2ix + (2i+2)\, \gamma_{i+1} \operatorname{Sin} (2i+2)\, x + \ldots \\ &\qquad + (2i-2)\, \gamma_{i-1} \operatorname{Sin} (2i-2)\, x + \ldots \end{aligned} \right\} \{\eta_1 \operatorname{Sin} 2x + \eta_2 \operatorname{Sin} 4x + \ldots\}$$

$$+ 4m^2 \left\{ \begin{aligned} &\gamma_i \operatorname{Cos} 2ix + \gamma_{i+1} \operatorname{Cos} (2i+2)\, x + \gamma_{i+2} \operatorname{Cos} (2i+4)\, x + \ldots \\ &\qquad + \gamma_{i-1} \operatorname{Cos} (2i-2)\, x + \gamma_{i-2} \operatorname{Cos} (2i-4)\, x + \ldots \end{aligned} \right\}$$

Denna likhet innebär bestämningen af koefficienterna γ_i, γ_{i+1}, o. s. v.; genom att sätta koefficienten för hvarje Cosinus lika med noll, erhålles nämnligen följande resultat

$$(101) \quad \left\{ \begin{aligned} 2i\varkappa_0 &= h^{(i)}_{0,\,i}\, \gamma_i + h^{(i)}_{0,\,i+1}\, \gamma_{i+1} + h^{(i)}_{0,\,i+2}\, \gamma_{i+2} + \ldots \\ &\qquad + h^{(i)}_{0,\,i-1}\, \gamma_{i-1} + h^{(i)}_{0,\,i-2}\, \gamma_{i-2} + \ldots \\ i\varkappa_1 &= h^{(i+1)}_{1,\,i+1}\, \gamma_{i+1} + h^{(i+1)}_{1,\,i+2}\, \gamma_{i+2} + h^{(i+1)}_{1,\,i+3}\, \gamma_{i+3} + \ldots \\ &\qquad + h^{(i+1)}_{1,\,i}\, \gamma_i + h^{(i+1)}_{1,\,i-1}\, \gamma_{i-1} + \ldots \\ i\varkappa_1 &= h^{(i-1)}_{-1,\,i-1}\, \gamma_{i-1} + h^{(i-1)}_{-1,\,i}\, \gamma_i + h^{(i-1)}_{-1,\,i+1}\, \gamma_{i+1} + \ldots \\ &\qquad + h^{(i-1)}_{-1,\,i-2}\, \gamma_{i-2} + h^{(i-1)}_{-1,\,i-3}\, \gamma_{i-3} + \ldots \\ i\varkappa_2 &= h^{(i+2)}_{2,\,i+2}\, \gamma_{i+2} + h^{(i+2)}_{2,\,i+3}\, \gamma_{i+3} + h^{(i+2)}_{2,\,i+4}\, \gamma_{i+4} + \ldots \\ &\qquad + h^{(i+2)}_{2,\,i+1}\, \gamma_{i+1} + h^{(i+2)}_{2,\,i}\, \gamma_i + \ldots \\ &\text{o. s. v.} \end{aligned} \right.$$

De med h betecknade qvantiteterna äro härvid, såsom man lätt finner, på följande sätt sammansatta:

$$h^{(i)}_{0,\,i} = 4m^2 - (2i)^2\left(\lambda_0 + \frac{1}{2}\lambda_{2i}\right) + i\eta_{2i}$$

$$h^{(i)}_{0,\,i+1} = -\frac{1}{2}(2i+2)^2(\lambda_1 + \lambda_{2i+1}) + \frac{1}{2}(2i+2)(\eta_1 + \eta_{2i+1})$$

$$h^{(i)}_{0,\,i+2} = -\frac{1}{2}(2i+4)^2(\lambda_2 + \lambda_{2i+2}) + \frac{1}{2}(2i+4)(\eta_2 + \eta_{2i+2})$$

o. s. v.

$$h^{(i)}_{0,\,i-1} = -\frac{1}{2}(2i-2)^2(\lambda_1 + \lambda_{2i-1}) - \frac{1}{2}(2i-2)(\eta_1 - \eta_{2i-1})$$

$$h^{(i)}_{0,\,i-2} = -\frac{1}{2}(2i-4)^2(\lambda_2 + \lambda_{2i-2}) - \frac{1}{2}(2i-4)(\eta_2 - \eta_{2i-2})$$

o. s. v.

$$h^{(i+1)}_{1,\,i+1} = 4m^2 - (2i+2)^2\left(\lambda_0 + \frac{1}{2}\lambda_{2i+2}\right) + \frac{1}{2}(2i+2)\eta_{2i+2}$$

$$h^{(i+1)}_{1,\,i+2} = -\frac{1}{2}(2i+4)^2(\lambda_1 + \lambda_{2i+3}) + \frac{1}{2}(2i+4)(\eta_1 + \eta_{2i+3})$$

$$h^{(i+1)}_{1,\,i+3} = -\frac{1}{2}(2i+6)^2(\lambda_2 + \lambda_{2i+4}) + \frac{1}{2}(2i+6)(\eta_2 + \eta_{2i+4})$$

o. s. v.

$$h^{(i+1)}_{1,\,i} = -\frac{1}{2}(2i)^2(\lambda_1 + \lambda_{2i+1}) - \frac{1}{2}2i(\eta_1 - \eta_{2i+1})$$

$$h^{(i+1)}_{1,\,i-1} = -\frac{1}{2}(2i-2)^2(\lambda_2 + \lambda_{2i}) - \frac{1}{2}(2i-2)(\eta_2 - \eta_{2i})$$

o. s. v.

$$h^{(i-1)}_{-1,\,i-1} = 4m^2 \quad (2i-2)^2\left(\lambda_0 + \frac{1}{2}\lambda_{2i-2}\right) + \frac{1}{2}(2i-2)\eta_{2i-2}$$

$$h^{(i-1)}_{-1,\,i} = -\frac{1}{2}(2i)^2(\lambda_1 + \lambda_{2i-1}) + \frac{1}{2}2i(\eta_1 + \eta_{2i-1})$$

$$h^{(i-1)}_{-1,\,i+1} = -\frac{1}{2}(2i+2)^2(\lambda_2 + \lambda_{2i}) + \frac{1}{2}(2i+2)(\eta_2 + \eta_{2i})$$

o. s. v.

$$h^{(i-1)}_{-1,\,i-2} = -\frac{1}{2}(2i-4)^2(\lambda_1 + \lambda_{2i-3}) - \frac{1}{2}(2i-4)(\eta_1 - \eta_{2i-3})$$

$$h^{(i-1)}_{-1,\,i-3} = -\frac{1}{2}(2i-6)^2(\lambda_2 + \lambda_{2i-4}) - \frac{1}{2}(2i-6)(\eta_2 - \eta_{2i-4})$$

o. s. v.

$$h^{(i+2)}_{2,\,i+2} = 4m^2 - (2i+4)^2\left(\lambda_0 + \frac{1}{2}\lambda_{2i+4}\right) + \frac{1}{2}(2i+4)\eta_{2i+4}$$

$$h^{(i+2)}_{2,\,i+4} = -\frac{1}{2}(2i+6)^2(\lambda_1 + \lambda_{2i+5}) + \frac{1}{2}(2i+6)(\eta_1 + \eta_{2i+5})$$

$$h^{(i+2)}_{2,\,i+4} = -\frac{1}{2}(2i+8)^2(\lambda_2 + \lambda_{2i+6}) + \frac{1}{2}(2i+8)(\eta_2 + \eta_{2i+6})$$

o. s. v.

$$h^{(i+2)}_{2,\,i+1} = -\frac{1}{2}(2i+2)^2(\lambda_1+\lambda_{2i+3}) - \frac{1}{2}(2i+2)(\eta_1-\eta_{2i+3})$$

$$h^{(i+)2}_{2,\,i} = -\frac{1}{2}(2i)^2(\lambda_2+\lambda_{2i+2}) - \frac{1}{2}\,2i\,(\eta_2-\eta_{2i+2})$$

o. s. v.

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o. s. v.

Ännu återstår det oss att angifva värden för koefficienterna λ_0, λ_1, o. s. v., samt η_1, η_2, o. s, v., hvilka tydligen äro beroende endast af $\varkappa_0$, $\varkappa_1$, o. s. v. samt ganska lätt kunna uttryckas medelst dessa. Först och främst finner man omedelbart:

$$\lambda_0 = \varkappa_0^2 + \frac{1}{2}\varkappa_1^2 + \frac{1}{2}\varkappa_2^2 + \ldots$$

$$\lambda_1 = 2\varkappa_0\varkappa_1 + \varkappa_1\varkappa_2 + \varkappa_2\varkappa_3 + \ldots$$

$$\lambda_2 = 2\varkappa_0\varkappa_2 + \frac{1}{2}\varkappa_1\varkappa_1 + \varkappa_1\varkappa_3 + \varkappa_2\varkappa_4 + \ldots$$

o. s. v.

För att erhålla de med η betecknade koefficienterna, observeras att

$$f''(t) = \frac{df'(t)}{dx}\cdot\frac{dx}{dt} = f'(t)\frac{df'(t)}{dx} = \frac{1}{2}\frac{d[f'(t)]^2}{dx}$$

På grund af denna relation erhållas omedelbart

$$\eta_1 = \frac{1}{1}\lambda_1$$

$$\eta_2 = \frac{1}{2}\lambda_2$$

$$\eta_3 = \frac{1}{3}\lambda_3$$

o. s. v.

Härledningen af de obekanta ur eqvationssystemet (101) sker genom upprepade tillnärmelser. Betraktar man $\varkappa_n$, således äfven λ_n och η_n, såsom små qvantiteter af n:te storleksordningen, så äro äfven $h^{(i+m)}_{i+m+n}$ och γ_{i+n} att anses såsom varande af samma storleksordning. Lösningen af ifrågavarande eqvationssystem kan man nu inleda derigenom, att de termer, som öfverstiga en viss storleksklass, bortlemnas. Bibehåller man t. ex. i de trenne första eqvationerna endast termerna

$$(102)\qquad \begin{cases} 2i\varkappa_0 = h^{(i)}_{0,\,i}\gamma_i + h^{(i)}_{0,\,i+1}\gamma_{i+1} + h^{(i)}_{0,\,i-1}\gamma_{i-1} \\ i\varkappa_1 = h^{(i+1)}_{1,\,i+1}\gamma_{i+1} + h^{(i+1)}_{1,\,i+2}\gamma_{i+2} + h^{(i+1)}_{1,\,i}\gamma_i \\ i\varkappa_1 = h^{(i-1)}_{-1,\,i-1}\gamma_{i-1} + h^{(i-1)}_{-1,\,i}\gamma_i + h^{(i-1)}_{-1,\,i-2}\gamma_{i-2}, \end{cases}$$

så erhåller man omedelbart värden för γ_i, γ_{i+1} och γ_{i-1}, uttryckta i bekanta qvantiteter och koefficienterna γ_{i+2} och γ_{i-2}. Man finner dock lätt, genom att insätta de sålunda framgångna uttrycken i de tvenne följande likheterna af systemet (101), värden för dessa koefficienter, uttryckta såsom funktioner af γ_{i+3} och γ_{i-3}, dervid de med γ_{i+4}, γ_{i-4} o. s. v. multiplicerade termer bortlemnas. De förra kunna härpå uttryckas såsom funktioner af

γ_{i+4} och γ_{i-4} o. s. v. Då man nu på denna väg kommit till tvenne relationer emellan γ_{i+n}, γ_{i-n}, γ_{i+n+1} och γ_{i-n-1}, der n betecknar ett tal, nog stort att γ_{i+n+1} och γ_{i-n-1} multiplicerade med sina koefficienter, som äro af första ordningen, kunna anses omärkliga, så har man omedelbart värden för γ_{i+n} och γ_{i-n}, hvarefter de föregående γ-koefficienterna erhållas genom rekursion.

De genom detta eliminationsförfarande funna koefficienterna äro naturligtvis endast tillnärmelsevis riktiga, hvarföre man genom upprepade tillnärmelser måste söka noggrannare värden för desamma. I och för detta ändamål har man att i alla de termer af eqvationssystemet (101), hvilka vid den första bestämningen af de obekanta γ_i etc. blifvit lemnade utan afseende, insätta de tillnärmelsevis funna värdena för dessa koefficienter. Härigenom erhålles en följd af likheter, fullkomligt analoga med dem, genom hvilkas upplösning den första bestämningen af de obekanta framgick; den enda skilnaden som här visar sig, består deruti, att de konstanta termerna hafva något förändrade värden. Man erhåller således den förnyade bestämningen af de sökta koefficienterna genom ett förfarande, som i allo liknar det ofvan beskrifna, och genom att upprepade gånger förnya detsamma, kan man erhålla ifrågavarande koefficienters numeriska värden med all den noggrannhet, som åstundas.

Vid utförandet af ofvan antydda räkningar, kan man med fördel begagna sig af följande förfarande. Den allmänna formen för de, genom de successiva substitutionerna framgångna relationer emellan trenne, till olika indices hörande γ-koefficienter, kan lätt bringas till följande

$$1 = a_{i+n}\,\gamma_{i+n} + b_{i+n+1}\,\gamma_{i+n+1} + c_{i-n-1}\,\gamma_{i-n-1}$$

eller

$$1 = a_{i-n}\,\gamma_{i-n} + b_{i-n-1}\,\gamma_{i-n-1} + c_{i+n+1}\,\gamma_{i+n+1}$$

der a, b och c äro till sina numeriska värden bekanta. Af dessa koefficienter är likväl den tredje af en vida högre storleksgrad än de öfriga, hvarföre de sednaste termerna i de anförda uttrycken antingen helt och hållet kunna bortlemnas eller ock betraktas såsom bekanta, sedan approximativa värden för γ_{i-n-1} och γ_{i+n+1} finnas att tillgå. I detta fall erhåller man genom att dividera de ifrågavarande uttrycken med $1 - c_{i-n-1}\,\gamma_{i-n-1}$ eller med $1 - c_{i+n+1}\,\gamma_{i+n+1}$ den form, som i den förra händelsen, då de yttersta termerna blifvit bortlemnade, omedelbart hade framgått, nämnligen

$$1 = a_{i+n}\,\gamma_{i+n} + b_{i+n+1}\,\gamma_{i+n+1}$$

eller

$$1 = a_{i-n}\,\gamma_{i-n} + b_{i-n-1}\,\gamma_{i-n-1}$$

Betrakta vi den första af dessa likheter och sätta $n+1$ i st. för n, så hafva vi

$$1 = a_{i+n+1}\,\gamma_{i+n+1} + b_{i+n+2}\,\gamma_{i+n+2}$$

hvarefter erhålles

$$0 = -a_{i+n}\,\gamma_{i+n} + \left(a_{i+n+1} - b_{i+n+1}\right)\gamma_{i+n+1} + b_{i+n+2}\,\gamma_{i+n+2},$$

hvilken likhet antager följande form

$$1 = p_{i+n+1}\left(1 + \vartheta_{i+n+2}\,p_{i+n+2}\right),$$

om man infört beteckningarna

$$p_{i+n+1} = \frac{a_{i+n+1} - b_{i+n+1}}{a_{i+n}} \frac{\gamma_{i+n+1}}{\gamma_{i+n}}$$

$$\vartheta_{i+n+1} = \frac{b_{i+n+2}}{a_{i+n}} \cdot \frac{a_{i+n}}{a_{i+n+1} - b_{i+n+1}} \cdot \frac{a_{i+n+1}}{a_{i+n+2} - b_{i+n+2}}$$

Så ofta nu förhållandena $\frac{b_{i+n+1}}{a_{i+n}}$, $\frac{b_{i+n+2}}{a_{i+n+1}}$, $\frac{a_{i+n}}{a_{i+n+1}}$ och $\frac{a_{i+n+1}}{a_{i+n+2}}$ kunna betraktas såsom små qvantiteter af första ordningen, så är ϑ_{i+n+1} en qvantitet af andra ordningen; man kan derföre för ett stort n-värde sätta

$$p_{i+n+1} = 1,$$

hvarefter de olika p-värdena erhållas genom fortsättningen af kedjebråket

$$p_{i+n+1} = \cfrac{1}{1 + \cfrac{\vartheta_{i+n+1}}{1 + \cfrac{\vartheta_{i+n+2}}{1 + \ldots}}}$$

Genom fullkomligt analoga operationer härleder man värden för p_{i-n-1}, hvilka leda till kännedom af förhållandena $\frac{\gamma_{i-n-1}}{\gamma_{i-n}}$. Sedan man sålunda funnit de tvenne värdena

$$\frac{\gamma_{i+1}}{\gamma_i} = f_i$$

och

$$\frac{\gamma_{i-1}}{\gamma_i} = g_i$$

gifver den första af eqvationerna (102)

$$\gamma_i = \frac{2i\varkappa_0}{h_{0,\,i}^{(i)} + f_i\, h_{0,\,i+1}^{(i)} + g_i\, h_{0,\,i-1}^{(i)}}$$

Sedan man medelst denna formel bestämt γ_i, finner man omedelbart alla öfriga γ-koefficienter, enär de respektive förhållanden emellan dessa koefficienter genom de föregående räkningarne äro bekanta.

Vid förekomsten af sådana fall, der $\frac{1}{f'(t)}$ låter utveckla sig i en starkare konvergerande serie än $f'(t)$, underlättas användningen af methoden för de obestämda koefficienterna, om eqv. (99) eller (100) divideras med $f'(t)$ eller med $[f'(t)]^2$. De i det föregående med h betecknade koefficienterna blifva då något annorlunda sammansatta än som ofvan uppgafs, men någon väsentligare ändring af det redan antydda kommer ej i fråga. Huruledes h-koefficienterna i de sednast tänkta fallen äro bildade, torde dock ej vidare behöfva anföras, då desamma, vid förefallande behof med största lätthet och i öfverensstämmelse med de föregående kunna härledas.

Den i det föregående behandlade integrationsmethoden är likväl ej, åtminstone ej alltid, den fördelaktigaste, ehuru densamma direkt leder till kännedom af de sökta funktionerna A och B. Man vinner nämnligen i viss mon enklare räkneföreskrifter vid behandlingen af funktionen

$$\theta = \int \mathrm{Sin}\,(2ix + 2mt + F)\, dt,$$

der F betecknar en konstant vinkel. De ofvan med A och B betecknade funktionerna kunna åter ganska lätt uttryckas medelst den sist anförda. Det är nämnligen

$$A = \frac{1}{2}\int \mathrm{Sin}\left(2ix + 2mt + \frac{\pi}{2}\right) dt + \frac{1}{2}\int \mathrm{Sin}\left(2ix - 2mt + \frac{\pi}{2}\right) dt$$

$$B = \frac{1}{2}\int \mathrm{Sin}\,(2ix + 2mt)\, dt + \frac{1}{2}\int \mathrm{Sin}\,(2ix - 2mt)\, dt$$

I och för utvecklingen af funktionen θ förutsätta vi att densamma kan uttryckas under följande form

$$\theta = X_m \,\mathrm{Sin}\,(2mt + F) + Y_m \,\mathrm{Cos}\,(2mt + F)$$

Med stöd af de sednast anförda uttrycken för A och B finner man nu, då tillika den för dessa funktioner i det föregående använda formen iakttages,

$$M = \frac{1}{2}(X_m + X_{-m})$$

$$N = -\frac{1}{2}(Y_m - Y_{-m})$$

$$P = \frac{1}{2}(Y_m + Y_{-m})$$

$$Q = \frac{1}{2}(X_m - X_{-m})$$

Genom differentiation af det föregående uttrycket för θ finner man, under iakttagande af denna funktions ursprungliga betydelse:

$$\mathrm{Cos}\, 2ix \,\mathrm{Sin}\,(2mt + F) + \mathrm{Sin}\, 2ix \,\mathrm{Cos}\,(2mt + F)$$

$$= \left\{\frac{dX_m}{dx}\,\mathrm{Sin}\,(2mt + F) + \frac{dY_m}{dx}\,\mathrm{Cos}\,(2mt + F)\right\} f'(t)$$

$$+ 2m\,\{X_m \,\mathrm{Cos}\,(2mt + F) - Y_m \,\mathrm{Sin}\,(2mt + F)\},$$

en likhet som gifver upphof till de tvenne följande

$$(103) \qquad \begin{cases} \mathrm{Cos}\, 2ix = \frac{dX_m}{dx} f'(t) - 2m\, Y_m \\ \mathrm{Sin}\, 2ix = \frac{dY_m}{dx} f'(t) + 2m\, X_m \end{cases}$$

I stället för detta system kan man uppställa ett annat, hvars användning är fördelaktigare i de händelser då utvecklingen af $\frac{1}{f'(t)}$ är mera konvergent än den af $f'(t)$. För härledningen af detta nya system har man först att transformera uttrycket för θ medelst delvis integration. Man finner sålunda

$$\theta = -\frac{1}{2m}\,\mathrm{Cos}\,(2ix + 2mt + F) - \frac{i}{m}\,\theta'$$

der

$$\theta' = \int \mathrm{Sin}\,(2ix + 2mt + F)\, dx$$

Sättes

$$\theta' = X'_m \,\mathrm{Sin}\,(2mt + F) + Y'_m \,\mathrm{Cos}\,(2mt + F),$$

så erhålles på samma sätt som ofvan:

$$(104)\qquad \begin{cases} \text{Cos } 2ix = \frac{dX'_m}{dx} - 2m \frac{1}{f'(t)} Y'_m \\ \text{Sin } 2ix = \frac{dY'_m}{dx} + 2m \frac{1}{f'(t)} X'_m \end{cases}$$

Såväl eqvationssystemet (103) som (104) skulle kunna ersättas medelst en enda lineär differential eqvation af andra ordningen; af någon egentlig fördel blifver en sådan reduktion dock ej här, emedan en viss egenskap hos funktionerna X_m och Y_m eller X'_m och Y'_m möjliggör deras bestämning ur en enda af de ifrågavarande eqvationerna. Denna egenskap består deruti, att så snart den ena af ifrågavarande funktioner, t. ex. X_m är känd under formen

$$X_m = \alpha_i \text{ Sin } 2ix + \alpha_{i+1} \text{ Sin } (2i+2)\, x + \ldots$$
$$+ \alpha_{i-1} \text{ Sin } (2i-2)\, x + \ldots$$

der koefficienterna ej afbrytas med α_0 utan fortsättas för negativa indices, så finner man den andra Y_m omedelbart efter ändring af tecknen, genom att förvandla hvarje Sinus till Cosinus; det är således

$$-Y_m = \alpha_i \text{ Cos } 2ix + \alpha_{i+1} \text{ Cos } (2i+2)\, x + \ldots$$
$$+ \alpha_{i-1} \text{ Cos } (2i-2)\, x + \ldots$$

Dessa liktidigt gällande uttryck för X_m och Y_m äro partikulera integral till eqvationssystemet (103); på samma sätt äro äfven

$$X'_m = \beta_i \text{ Sin } 2ix + \beta_{i+1} \text{ Sin } (2i+2)\, x + \ldots$$
$$+ \beta_{i-1} \text{ Sin } (2i-2)\, x + \ldots$$

och

$$-Y'_m = \beta_i \text{ Cos } 2ix + \beta_{i+1} \text{ Cos } (2i+2)\, x + \ldots$$
$$+ \beta_{i-1} \text{ Cos } (2i-2)\, x + \ldots$$

partikulära integral till systemet (104).

Riktigheten af det framstälda sammanhanget emellan X_m och Y_m samt emellan X'_m och Y'_m inses omedelbart, då man medelst methoden för de obestämda koefficienterna söker att bestämma α_i, o. s. v. Insätter man för sådant ändamål

$$f'(t) = \varkappa_0 + \varkappa_1 \text{ Cos } 2x + \varkappa_2 \text{ Cos } 4x + \ldots$$

i den första af eqvationerna (103), så framgår följande relation

$$\text{Cos } 2ix = \begin{Bmatrix} 2i\alpha_i \text{ Cos } 2ix + (2i+2)\, \alpha_{i+1} \text{ Cos } (2i+2)\, x + \ldots \\ + (2i-2)\, \alpha_{i-1} \text{ Cos } (2i \quad 2)\, x + \ldots \end{Bmatrix} \{\varkappa_0 + \varkappa_1 \text{ Cos } 2x + \ldots\}$$
$$+ 2m \begin{Bmatrix} \alpha_i \text{ Cos } 2ix + \alpha_{i+1} \text{ Cos } (2i+2)\, x + \ldots \\ + \alpha_{i-1} \text{ Cos } (2i-2)\, x + \ldots \end{Bmatrix}$$

hvilken åter leder till följande vilkorseqvationer:

$$1 = [2i\varkappa_0 + 2m]\,\alpha_i + \frac{1}{2}(2i+2)\,\varkappa_1\,\alpha_{i+1} + \frac{1}{2}(2i+4)\,\varkappa_2\,\alpha_{i+2} + \ldots$$

$$+ \frac{1}{2}(2i-2)\,\varkappa_1\,\alpha_{i-1} + \frac{1}{2}(2i-4)\,\varkappa_2\,\alpha_{i-2} + \ldots$$

$$0 = [(2i+2)\,\varkappa_0 + 2m]\,\alpha_{i+1} + \frac{1}{2}(2i+4)\,\varkappa_1\,\alpha_{i+2} + \frac{1}{2}(2i+6)\,\varkappa_2\,\alpha_{i+3} + \ldots$$

$$+ \frac{1}{2}\,2i\varkappa_1\,\alpha_i + \frac{1}{2}(2i-2)\,\varkappa_2\,\alpha_{i-1} + \ldots$$

$$0 = [(2i-2)\,\varkappa_0 + 2m]\,\alpha_{i-1} + \frac{1}{2}\,2i\varkappa_1\,\alpha_i + \frac{1}{2}(2i+2)\,\varkappa_2\,\alpha_{i+1} + \ldots$$

$$+ \frac{1}{2}(2i-4)\,\varkappa_1\,\alpha_{i-2} + \frac{1}{2}(2i-6)\,\varkappa_2\,\alpha_{i-3} + \ldots$$

$$0 = [(2i+4)\,\varkappa_0 + 2m]\,\alpha_{i+2} + \frac{1}{2}(2i+6)\,\varkappa_1\,\alpha_{i+3} + \frac{1}{2}(2i+8)\,\varkappa_2\,\alpha_{i+4} + \ldots$$

$$+ \frac{1}{2}(2i+2)\,\varkappa_1\,\alpha_{i+1} + \frac{1}{2}\,2i\,\varkappa_2\,\alpha_i + \ldots$$

o. s. v.

Alldeles samma likheter uppstå i händelse man använder den andra af eqvationerna (103) till bestämningen af α-koefficienterna, hvaraf riktigheten af den angifna formen för X_m och Y_m blifver ådagalagd.

För bestämningen af koefficienterna β_i har man åter denna relation

$$\mathrm{Cos}\,2ix = 2i\beta_i\,\mathrm{Cos}\,2ix + (2i+2)\,\beta_{i+1}\,\mathrm{Cos}\,(2i+2)\,x + \ldots$$

$$+ (2i-2)\,\beta_{i-1}\,\mathrm{Cos}\,(2i-2)\,x + \ldots$$

$$+ 2m \left\{ \begin{array}{l} \beta_i\,\mathrm{Cos}\,2ix + \beta_{i+1}\,\mathrm{Cos}\,(2i+2) + \ldots \\ \qquad + \beta_{i-1}\,\mathrm{Cos}\,(2i-2) + \ldots \end{array} \right\} \{\varkappa'_0 + \varkappa'_1\,\mathrm{Cos}\,2x + \ldots\}$$

der $\varkappa'_0$, $\varkappa'_1$ o. s. v. beteckna utvecklingskoefficienterna af $\frac{1}{f(t)}$ efter argumentet $2x$. Man erhåller nu följande uttryck

$$1 = [2i + 2m\varkappa'_0]\,\beta_i + m\varkappa'_1\,\beta_{i+1} + m\varkappa'_2\,\beta_{i+2} + \ldots$$

$$+ m\varkappa'_1\,\beta_{i-1} + m\varkappa'_2\,\beta_{i-2} + \ldots$$

$$0 = [2i + 2 + 2m\varkappa'_0]\,\beta_{i+1} + m\varkappa'_1\,\beta_{i+2} + m\varkappa'_2\,\beta_{i+3} + \ldots$$

$$+ m\varkappa'_1\,\beta_i + m\varkappa'_2\,\beta_{i-1} + \ldots$$

$$0 = [2i - 2 + 2m\varkappa'_0]\,\beta_{i-1} + m\varkappa'_1\,\beta_i + m\varkappa'_2\,\beta_{i+1} + \ldots$$

$$+ m\varkappa'_1\,\beta_{i-2} + m\varkappa'_2\,\beta_{i-3} + \ldots$$

$$0 = [2i + 4 + 2m\varkappa'_0]\,\beta_{i+2} + m\varkappa'_1\,\beta_{i+3} + m\varkappa'_2\,\beta_{i+4} + \ldots$$

$$+ m\varkappa'_1\,\beta_{i+1} + m\varkappa'_2\,\beta_i + \ldots$$

o. s. v.

Lösningen af dessa eqvationssystem, hvilka innehålla bestämningen af de sökta koefficienterna, sker, i likhet med ett ofvan behandladt fall, medelst successiva substitutioner, sedan koefficienter till de obekanta blifvit numeriskt beräknade. Lika litet, som då, torde här någon analytisk utveckling af denna lösning i allmänhet vara tjenlig, enär en sådan alltid blefve vidlyftig och svår att öfverse. Deremot skola vi ej underlåta den anmärkning, att den praktiske räknaren ofta kan tillgodogöra sig åtskilliga genvägar, afpassade med hänseende till hvarje särskildt fall, hvarigenom den numeriska räkningen ofta betydligt kan underlättas. Hufvudsaken är alltid, att med möjligaste ringa möda förskaffa sig tillnärmelsevärden af sådan noggrannhet, att följden af de sedermera förestående räkningarna blifver konvergent. Vi hafva i det föregående redan antydt en utväg härtill; i än enklare fall, d. v. s. i sådana, der $\varkappa'$, och än mer de följande af dessa koefficienter, äro mycket små, kan man begynna med att sätta

$$\beta_i = \frac{1}{2i + 2m\varkappa'_0}$$

$$\beta_{i+1} = -\frac{m\varkappa'_1}{2i + 2 + 2m\varkappa'_0} \cdot \frac{1}{2i + 2m\varkappa'_0}$$

$$\beta_{i-1} = -\frac{m\varkappa'_1}{2i - 2 + 2m\varkappa'_0} \cdot \frac{1}{2i + 2m\varkappa'_0}$$

o. s. v.

Om likväl produkten $m\varkappa'_1$ ej är nog liten, så är den med dessa värden ernådda tillnärmelsen illusorisk. Med den noggrannhet, som åter kan ernås vid användningen af det afkortade eqvationssystemet (102) har man

$$\beta_i = \frac{1}{2i + 2m\varkappa'_0 - \frac{m^2 \varkappa_1'^2}{2i + 2 + 2m\varkappa'_0} - \frac{m^2 \varkappa_1'^2}{2i - 2 + 2m\varkappa'_0}}$$

$$0 = m\varkappa_1 [2i - 2 + 2m\varkappa'_0 - m\varkappa'_2]\,\beta_i + [(2i + 2 + 2m\varkappa'_0)(2i - 2 + 2m\varkappa'_0) - m^2 \varkappa_2'^2]\,\beta_{i+1}$$
$$+ [m\varkappa'_1 (2i - 2 + 2m\varkappa'_0) - m^2 \varkappa'_2 \varkappa'_3]\,\beta_{i+2}$$

$$0 = m\varkappa_1 [2i + 2 + 2m\varkappa'_0 - m\varkappa''_2]\,\beta_i + [(2i + 2 + 2m\varkappa'_0)(2i - 2 + 2m\varkappa'_2) - m^2 \varkappa'_2]\,\beta_{i-1}$$
$$+ [m\varkappa'_1 (2i + 2 + 2m\varkappa'_0) - m^2 \varkappa'_2 \varkappa'_3]\,\beta_{i-2}$$

o. s. v.

§ 19.

Användningen af den i föregående § framstälda methoden för utvecklingen af funktionerna $W_p^{(r)}$ leder i analytiskt hänseende icke till några svårigheter; den numeriska räkningen kan detta oaktadt antaga ganska betydande dimensioner, en följd af nödvändigheten att upplösa eqvationssystem med ett stort antal obekanta. — Vi hafva då först och främst att angifva koefficienterna $\varkappa$, sådana dessa äro i det fall som här föreligger.

Ur eqvationen

$$\frac{2K}{\pi} x = \int_0^{H+\mu t} \frac{\delta\varphi}{\sqrt{1 - k^2 \operatorname{Sin}\varphi^2}}$$

eller

$$\mu t + H = am \frac{2K}{\pi} x$$

erhåller man genom differentiation

$$\frac{dt}{dx} = \frac{1}{\mu} \frac{2K}{\pi} \Delta am \frac{2K}{\pi} x$$

Man har således

$$\frac{dx}{dt} = f'(t) = \mu \frac{\pi}{2K} \frac{1}{\Delta am \frac{2K}{\pi} x}$$

Med hänseende till den bekanta utvecklingen af $\frac{1}{\Delta am \frac{2K}{\pi} x}$ finner man således

$$\varkappa_0 = \frac{\mu}{k'} \left(\frac{\pi}{2K}\right)^2$$

$$\varkappa_1 = - \frac{\mu}{k'} \left(\frac{\pi}{2K}\right)^2 \frac{4q}{1+q^2}$$

$$\varkappa_2 = \frac{\mu}{k'} \left(\frac{\pi}{2K}\right)^2 \frac{4q^2}{1+q^4}$$

$$\varkappa_2 = - \frac{\mu}{k'} \left(\frac{\pi}{2K}\right)^2 \frac{4q^2}{1+q^6}$$

o. s. v.

samt å andra sidan

$$\varkappa_0 = \frac{1}{\mu}$$

$$\varkappa_1' = \frac{1}{\mu} \frac{4q}{1+q^2}$$

$$\varkappa_2' = \frac{1}{\mu} \frac{4q^2}{1+q^4}$$

$$\varkappa_3' = \frac{1}{\mu} \frac{4q^3}{1+q^2}$$

o. s. v.

Vid användandet af eqvationen (99) eller (100) erfordras förutom de redan anförda koefficienterna ännu de, som höra till $(f(t))^2$ och $f''(t) = \frac{1}{2} \frac{d[f'(t)]^2}{dx}$, men äfven dessa kunna angifvas medelst enkla uttryck. Det är nämnligen

$$(f'(t))^2 = \mu^2 \left(\frac{\pi}{2K}\right)^2 \frac{1}{\left(\Delta am \frac{2K}{\pi} x\right)^2} = \frac{\mu^2}{k^2} \left(\frac{\pi}{2K}\right)^4 \left\{1 + c - \frac{8q}{1-q^2} \operatorname{Cos} 2x + \frac{16\,q^2}{1-q^4} \operatorname{Cos} 4x - \ldots\right\}$$

der

$$c = \frac{8q^2}{1-q^2} - \frac{16q^4}{1-q^4} + \frac{24q^6}{1-q^6} - \ldots$$

Genom differentiation finner man slutligen

$$f''(t) = \frac{\mu^2}{k'^2}\left(\frac{\pi}{2K}\right)^4 \left\{\frac{1.8q}{1-q^2}\operatorname{Sin} 2x - \frac{2.8q^2}{1-q^4}\operatorname{Sin} 4x + \ldots\right\}$$

Sedan man nu på sätt, som i föregående § blifvit angifvet, bestämt koefficienterna α_i etc. eller β_i etc. eller γ_i etc., och således funnit funktionen P i form af en efter argumentet x fortlöpande trigonometrisk serie, så har man äfven funnit den sökta utvecklingen för integralen

$$W_p^{(r)} = \int_0^{s\pi} \operatorname{Sin} 2r\,x \operatorname{Cos} 2pt\, dt$$

Ty såväl för öfre som för nedre gränsen försvinner Sin $2pt$, hvaremot Cos $2pt$ förblifver lika med ett. I det man, såsom förut, med x_s och x_0 betecknar de dessa gränser motsvarande värden af x, har man derföre

$$\begin{aligned} W_p^{(r)} &= P(x_s) - P(x_0) \\ &= \gamma_r\{\operatorname{Cos} 2rx_s - \operatorname{Cos} 2rx_0\} + \gamma_{r+1}\{\operatorname{Cos}(2r+2)x_s - \operatorname{Cos}(2r+2)x_0\} + \ldots \\ &\qquad + \gamma_{r-1}\{\operatorname{Cos}(2r-2)x_s - \operatorname{Cos}(2r-2)x_0\} + \ldots \end{aligned}$$

§ 20.

Efter en substitution, fullkomligt analog med den s. k. landenska, kan man förvandla en W-funktion, hvars modyl är k i en konvergent serie af andra W-funktioner, hvilkas modyl är k_1. För att verkställa ifrågavarande substitution sätta vi

$$\psi = H + \mu t$$

samt införa i st. f. ψ en ny föränderlig ψ_1, hvilken bestämmes ur eqvationen

$$\operatorname{tang} \psi_1 = \frac{\operatorname{Sin} 2\psi}{k_1 + \operatorname{Cos} 2\psi};$$

då blifver

$$x = \frac{\pi}{2K}\int_0^{\psi} \frac{d\varphi}{\sqrt{1 - k^2 \operatorname{Sin}\varphi^2}} = \frac{1+k_1}{2}\,\frac{\pi}{2K}\int_0^{\psi_1} \frac{d\varphi}{\sqrt{1 - k_1^2 \operatorname{Sin}\varphi^2}}$$

samt

$$\psi = \frac{1}{2}\psi_1 + \frac{1}{2}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)$$

Den betydelse, vi fästat vid ψ_1, leder vidare till likheten

$$pt = \frac{p}{\mu}\left(\frac{1}{2}\psi_1 - H\right) + \frac{p}{2\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)$$

och

$$dt = \frac{1}{2\mu}\left(1 + \frac{k_1 \operatorname{Cos}\psi_1}{\sqrt{1 - k_1^2 \operatorname{Sin}\psi_1^2}}\right) d\psi_1$$

Insättas dessa värden i det ofvan angifna uttrycket för $W_p^{(r)}$, så erhåller man

$$(105)\; W_p^{(r)} = \frac{1}{2\mu}\int_{\psi_{1,0}}^{\psi_{1,s\pi}} \operatorname{Sin} 2rx \left\{\begin{aligned} &\operatorname{Cos} 2\tfrac{p}{\mu}\left(\tfrac{1}{2}\psi_1 - H\right)\operatorname{Cos}\left(2\tfrac{p}{2\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)\right) \\ &- \operatorname{Sin} 2\tfrac{p}{\mu}\left(\tfrac{1}{2}\psi_1 - H\right)\operatorname{Sin}\left(2\tfrac{p}{2\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)\right)\end{aligned}\right\}\left\{1 + \frac{k_1 \operatorname{Cos}\psi_1}{\sqrt{1 - k_1^2 \operatorname{Sin}\psi_1^2}}\right\} d\psi_1$$

der vi med $\psi_{1,0}$ och $\psi_{1,s\pi}$ betecknat de värden af ψ_1, hvilka motsvara $t=0$ och $t=s\pi$. Man har på grund häraf

$$\operatorname{Cos} 2\frac{p}{\mu}\left(\frac{1}{2}\psi_{1,0}-H\right)=\operatorname{Cos}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_{1,0})\right)$$

$$\operatorname{Sin} 2\frac{p}{\mu}\left(\frac{1}{2}\psi_{1,0}-H\right)=-\operatorname{Sin}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_{1,0})\right)$$

$$\operatorname{Cos} 2\frac{p}{\mu}\left(\frac{1}{2}\psi_{1,s\pi}-H\right)=\operatorname{Cos}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_{1,s\pi})\right)$$

$$\operatorname{Sin} 2\frac{p}{\mu}\left(\frac{1}{2}\psi_{1,s\pi}-H\right)=-\operatorname{Sin}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_{1,s\pi})\right)$$

hvilka värden böra införas i uttrycket för $W_p^{(r)}$ sedan integrationen blifvit utförd.

För att erhålla $W_p^{(r)}$ under den åsyftade formen är det framförallt erforderligt att utveckla

$$\operatorname{Cos}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)\right)$$

och

$$\operatorname{Sin}\left(\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)\right)$$

efter argumentet x. Dessa utvecklingar erhållas ur en enda, nämnligen ur

$$e^{\sqrt{-1}\frac{p}{\mu}\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)}$$

Vi sätta för korthetens skull

$$\frac{p}{\mu}=\beta,$$

samt erinra oss att

$$arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)=\int\frac{k_1 \operatorname{Cos}\psi_1\, d\psi_1}{\sqrt{1-k_1^2 \operatorname{Sin}\psi_1^2}}$$

Då nu

$$\psi_1 = am\frac{2K}{\pi}\frac{2}{1+k_1}x = am\frac{2K_1}{\pi}2x,$$

så har man

$$\frac{k_1 \operatorname{Cos}\psi_1\, d\psi_1}{\sqrt{1-k_1^2 \operatorname{Sin}\psi_1^2}} = 2k_1\frac{2K_1}{\pi}\operatorname{Cos} am\frac{2K_1}{\pi}2x\,.\,dx$$

$$=2\left\{\frac{4q}{1+q^2}\operatorname{Cos}2x+\frac{4q_3}{1+q^6}\operatorname{Cos}6x+\ldots\right\}dx;$$

således äfven

$$arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi_1)=\frac{1}{1}\frac{4q}{1+q^2}\operatorname{Sin}2x+\frac{1}{3}\frac{4q^3}{1+q^6}\operatorname{Sin}6x+\ldots$$

Utvecklingen af

$$e^{\sqrt{-1}\,\beta\, arc \operatorname{Sin}(k_1 \operatorname{Sin}\psi)} = e^{\sqrt{-1}\,\beta\left\{\frac{1}{1}\frac{4q}{1+q^2}\operatorname{Sin}2x+\frac{1}{3}\frac{4q^3}{1+q^6}\operatorname{Sin}6x+\ldots\right\}}$$

i trigonometriska serier efter argumentet x, sker med lätthet efter de methoder, hvilka finnas anförda i afhandlingen »Studien auf dem Gebiete der Störungstheorie etc. § »14, hvarefter man, genom att frånskilja den reella delen från den imaginära, erhåller utvecklingen af de båda ifrågavarande trigonometriska funktionerna.

Insättas dessa utvecklingar tillika med den af

$$\frac{k_1 \operatorname{Cos} \psi_1}{\sqrt{1 - k_1^2 \operatorname{Sin} \psi_1^2}}$$

i uttrycket (105), så sönderfaller detta i en konvergent följd af termer, hvilka, oafsedt konstanta faktorer, äro gifna medelst de allmänna formerna

$$\int \operatorname{Sin} 2r'x \operatorname{Sin} 2pt_1 \, dt_1$$

$$\int \operatorname{Cos} 2r'x \operatorname{Sin} 2pt_1 \, dt_1$$

$$\int \operatorname{Sin} 2r'x \operatorname{Cos} 2pt_1 \, dt_1$$

$$\int \operatorname{Cos} 2r'x \operatorname{Cos} 2pt_1 \, dt_1$$

I dessa betecknar t_1 qvantiteten $\frac{1}{2\mu}\psi_1 - \frac{1}{\mu}H$; det är således

$$\frac{1}{2\mu} d\psi_1 = dt_1$$

Relationen emellan x och t_1 är åter denna

$$2x = \frac{\pi}{2K_1} \int_0^{2\mu t_1 + 2H} \frac{d\varphi}{\sqrt{1 - k_1^2 \operatorname{Sin} \varphi^2}}$$

I anseende till det ringare beloppet af modylen k_1 kunna ofvanstående integral särdeles lätt utvecklas efter argumentet x; man kan dervid antingen använda någon af de i föregående framställda methoderna, eller ock genom fortsatta transformationer af den beskaffenhet, som i denna paragraf blifvit begagnade, ytterligare nedtrycka modylen, då man ganska snart kan anse densamma vara lika med noll, i hvilken händelse de ifrågavarande integralen omedelbart erhållas.

Tillägg.

Under tryckningen af föregående afhandling har jag bemärkt att eqvationssystemen (103) och (104) direkt kunna integreras utan användande af methoden för obestämda koefficienter. Visserligen torde den nya integrationsmethoden i praktiskt hänseende ej erbjuda några synnerligt stora fördelar framför den förut angifna, men man vinner genom densamma en tydligare föreställning om naturen af de funktioner, som framgå genom integration af ifrågavarande system. Då härtill kommer att framställningen af den direkta integrationsmethoden kan göras ganska kort, så synes densamma är ej böra utelemnas. Vi vända oss då till systemet (104), hvars behandling här något enklare än det föregående systemets, samt sätta

$$\operatorname{Cos} 2ix + \sqrt{-1} \operatorname{Sin} 2ix = w$$

samt

$$X'_m + \sqrt{-1}\, Y'_m = y$$

eller

$$- Y'_m + \sqrt{-1}\, X'_m = \sqrt{-1}\, y$$

Häraf följer

$$\frac{dy}{dx} = \frac{dy}{dw} \cdot \frac{dw}{dx} = \sqrt{-1}\; 2iw \cdot \frac{dy}{dw}$$

Adderar man nu den första af eqvationerna (104) till produkten af den andra med faktorn $\sqrt{-1}$, så befinnes

$$w = \sqrt{-1}\; 2iw \frac{dy}{dw} + \sqrt{-1} \frac{2m}{f'(t)} y$$

eller

$$\frac{dy}{dw} + \frac{m}{i} \frac{1}{wf'(t)} y = - \sqrt{-1} \frac{1}{2i}$$

Häraf erhålles omedelbart

$$\text{(A)} \qquad y = e^{-\frac{m}{i}\int \frac{dw}{wf'(t)}} \left\{ \text{Const} - \frac{\sqrt{-1}}{2i} \int dw\, e^{\frac{m}{i}\int \frac{dw}{wf'(t)}} \right\}$$

Emellertid är

$$\frac{dw}{w} = \sqrt{-1}\; 2i \cdot dx;$$

vi hafva således under antagande af den ofvan använda utvecklingen för $\frac{1}{f'(t)}$:

$$e^{\frac{m}{i}\int \frac{dw}{wf'(t)}} = e^{\sqrt{-1}\, 2m \left\{ \varkappa'_0 x + \frac{1}{2} \varkappa'_1 \operatorname{Sin} 2x + \frac{1}{4} \varkappa'_2 \operatorname{Sin} 4x + \ldots \right\}}$$

Med tillhjelp af de methoder, som finnas angifna i afhandlingen »Studien etc.» § 14, kan detta uttryck lätt bringas till följande form:

$$e^{\frac{m}{i}\int \frac{dw}{wf'(t)}} = e^{\sqrt{-1}\, 2m\varkappa_0 x} \left\{ \begin{aligned} & L_0 + 2L_2 \operatorname{Cos} 2x + 2L_4 \operatorname{Cos} 4x + \ldots \\ & + \sqrt{-1} \{ 2L'_2 \operatorname{Sin} 2x + 2L'_4 \operatorname{Sin} 4x + \ldots \} \end{aligned} \right\}$$

$$e^{-\frac{m}{i}\int \frac{dw}{wf'(t)}} = e^{-\sqrt{-1}\, 2m\varkappa_0 x} \left\{ \begin{aligned} & L_0 + 2L_2 \operatorname{Cos} 2x + 2L_4 \operatorname{Cos} 4x + \ldots \\ & - \sqrt{-1} \{ 2L'_2 \operatorname{Sin} 2x + 2L'_4 \operatorname{Sin} 4x + \ldots \} \end{aligned} \right\}$$

Slutligen hafva vi

$$- \frac{\sqrt{-1}}{2i} dw = e^{\sqrt{-1}\, 2ix} dx,$$

hvarmed vi finna

$$\text{(B)} \qquad - \frac{\sqrt{-1}}{2i} \int dw\, e^{\frac{m}{i}\int \frac{dw}{wf'(t)}} = \int e^{\sqrt{-1}\,(2i + 2m\varkappa_0) x} \left\{ \begin{aligned} & L_0 + 2L_2 \operatorname{Cos} 2x + \ldots \\ & + \sqrt{-1} \{ L'_2 \operatorname{Sin} 2x + \ldots \} \end{aligned} \right\}$$

De här förekommande integrationerna utföras efter bekanta formler; man finner sålunda, i det med h betecknas ett helt tal:

$$\int e^{\sqrt{-1}\,(2i + 2m\varkappa_0)\,x} \operatorname{Cos} 2h\,x\,.\,dx = \frac{\sqrt{-1}\,(2i + 2m\varkappa_0) \operatorname{Cos} 2h\,x + 2h \operatorname{Sin} 2h\,x}{(2h)^2 - (2i + 2m\varkappa_0)^2}\, e^{\sqrt{-1}\,(2i + 2m\varkappa_0)\,x}$$

$$\int e^{\sqrt{-1}\,(2i + 2m\varkappa_0)\,x} \operatorname{Sin} 2h\,x\,.\,dx = \frac{\sqrt{-1}\,(2i + 2m\varkappa_0) \operatorname{Sin} 2h\,x + 2h \operatorname{Cos} 2h\,x}{(2h)^2 - (2i + 2m\varkappa_0)^2}\, e^{\sqrt{-1}\,(2i + 2m\varkappa_0)\,x}$$

Uttrycket (B) bör nu multipliceras med $e^{-\frac{m}{i}\int\frac{dw}{wf'(t)}}$, eller med den utveckling för denna funktion, som ofvan blifvit angifven. Man finner då att argumentet $2m\varkappa'_0 x$ helt och hållet försvinner ur denna produkt. Emedan detta argument ej heller bör förekomma i resultatet, så måste integrationskonstanten försvinna. Sedan man uppmärksammat dessa omständigheter, förefinnes ingen theoretisk svårighet vid bestämningen af y; alltsammans reducerar sig till en följd af mekaniska multiplikationer. Kännedomen af y leder slutligen direkt till det åsyftade ändamålet, eller bestämningen af X'_m och Y'_m i form af serier, fortlöpande efter argumentet x. De nu framstälda formlerna skulle äfven direkt kunna härledas ur uttrycket för θ' (pag. 86); denna väg blefve likväl ej väsentligen kortare än den nu följda.

Rättelser.

Förutom några mindre rent typografiska fel hafva följande blifvit bemärkta:

Sid. 19 eqv. 25. Tecknet framför andra termen inom parenthesen bör vara — i st. f. +

Sid. 23 eqv. 34. I täljaren står $\operatorname{Cos} \varphi^2$, bör vara $\operatorname{Cos} \varphi^{2n}$.

Sid. 24 rad. 1, 2 och 4. Tecknen framför termerna med udda ordningsnummer böra ändras.

Sid. 26 rad. 8 n. är faktorn du_1 bortlemnad.

Sid. 38 rad. 13 n. längst till höger står $2\eta^{(i)}_{-2\nu,\,2}$, bör vara $2\eta^{(i)}_{-2\nu,\,4}$.