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THE NAUTILUS.

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A REVISION OF THE CLASSIFICATION OF THE NORTH AMERICAN PATELLIFORM ANCYLIDAE, WITH DESCRIPTIONS OF NEW SPECIES.

BY BRYANT WALKER.

The North American patelliform species of *Ancylidae* can be conveniently and naturally arranged in eight genera and subgenera according to their shell characters. These can again be grouped into three subfamilies characterized by the peculiarities of the radula and jaw.

It was hoped that a study of the soft anatomy might reveal other peculiarities co-ordinating with those of the radulae, and for that purpose with the kind assistance of correspondents in England, South Africa and this country a very considerable amount of alcoholic material, representing nearly all of the characteristic groups, was collected, some of which will be very difficult to replace. This material was placed in the hands of a distinguished zoologist, who undertook to work it up. After appropriating and using the material thus obtained, it was a matter of bitter disappointment, after having waited for three years for the completion of the work, reported from time to time to be in progress, to be informed by the gentleman that he should not proceed further with the work as he did not think that it would "pay for the trouble considering the more important anatomical details that await study among other families of mollusks."

Under these circumstances the subfamilies represented in our fauna must for the present be based wholly upon the peculiarities of the radula and jaw.

The arrangement of the *Ancylidae* proposed by Hannibal, (Pr. Mal. Soc. Lond., vol. x, 1912, p. 147), is not based upon any distinctions of systematic value. The genera and subgenera arranged under the different subfamilies are entirely heterogeneous and in several instances genera and their subgenera appear in different subfamilies. The whole arrangement is absolutely futile and must be entirely disregarded.

The arrangement that I would propose is as follows:—

I. Subfamily Lancinæ, Hannibal.

Jaw as in *Lymnaea* with two accessory plates. Radula also Lymnaeid in character. Central tooth unicuspid or tricuspid, laterals bicuspid with large quadrate bases, marginals comb-like, the cusps extending beyond the base.

This group was proposed, but without any definition, by Hannibal (Naut., vol. xxviii, 1914, p. 24).

Genus Lanx Clessin.

Lanx Clessin, Con. Cab., Ancylinen, 1880, p. 10.

Type, *Ancylus newberryi* Lea. Example, *Lanx patelloides* (Lea). Pl. 2, fig. 1.

Subgenus *Walkerola* Hannibal.

Walkerola Hannibal, Pr. Mal. Soc. Lond., X, 1912, p. 149.

Type, *Lanx* (*Walkerola*) *klamathensis* Hannibal, Pl. 2, fig. 2.

Conchologically *Walkerola* appears to bear the same relation to *Lanx* that *Lævapex* does to *Ferrissia*.

Genus Fisherola Hannibal.

Fisherola Hannibal, Pr. Mal. Soc. Lond., X, 1912, p. 151.

Type, *Fisherola lancides* Hannibal.

Nothing has been published on the soft anatomy. It is placed here on account of its size, shape and habitat.

II. Subfamily Ferrissiinæ, n. subf.

Jaw segmented in plates. Radula with a bicuspid central, laterals obliquely reflected with from two to five small cusps arranged somewhat like the teeth of a comb, marginals also comb-like, cusps not (usually) extending to the basal line.

Genus Ferrissia Walker.

Ferrissia Walker, Naut., XVII, 1903, p. 15.

Type, *Ancylus rivularis* Say. Pl. 2, fig. 3.

Subgenus *Lævapex* Walker.

Lævapex Walker, Naut., XVII, 1903, p. 15.

Type, *Ancylus fuscus* C. B. Adams. Example, *Ferrissia (Lævapex) diaphana* (Hald.). Pl. 2, fig. 4.

For reasons stated elsewhere (Naut., XXVI, p. 117), I can not follow Hannibal in subordinating *Ferrissia* to *Lævapex*. I agree fully with Gwatkin (J. of Con., XIV, 1914, p. 147), that *Ferrissia* represents the most primitive type of radula, so far as yet known, in the *Ancylidæ*. The world-wide distribution of the genus is evidence tending in the same direction. *Lævapex* is restricted to America and is, to my mind, clearly an offshoot from the more ancient *Ferrissia* stock. In addition to its peculiar shell characters, there is some evidence tending to show a slight divergence also in the character of the lateral teeth, but hardly sufficient to justify its generic distinction.

Genus Gundlachia Pfeiffer.

Gundlachia Pfeiffer, Zeitschr. fur Malak., VI, 1849, p. 98. Type, *Gundlachia ancyliformis* Pfr. Pl. 3, fig. 1.

Poeyia Bgt., (1862), and *Kincaidella* Hann., (1912), are synonyms, being based on immature or non-septate stages, but the latter name may be retained for the group with striate apices.

Gundlachia, like *Ferrissia*, includes two groups characterized by the presence or absence of radial sculpture on the apex.

I have examined all of the described species except *G. crepidulina* Guppy from Trinidad and *G. lucasi* Suter from New Zealand.

Sub-genus *Gundlachia* s. s.

Apex smooth, except for light concentric wrinkles. Type, *Gundlachia ancyliformis* Pfr., Cuba.

The following species also belong in this group:

G. bakeri Pils., Brazil; *hinkleyi* Walker, Guatemala and *hjalmarsoni* Pfr., Honduras and Texas.

Sub-genus *Kincaidella* Hannibal.

Apex radially striate.

Kincaidella Hannibal, Pr. Mal. Soc., London, XII, 1912, p. 143. Type, *Ancylus fragilis* Tryon—*Gundlachia californica* Row.

Californica Rowell, (March, 1863), has priority over *fragilis* Try., (June, 1863), if the date given by Binney, (L. and F. W. Sh., II, p. 149), is correct.

Kincaidella also includes the following species:

G. beddomei Pett. (MSS.), and *petterdi* John. from Tasmania; *neozelanica* Suter from New Zealand; *l'hotelleriei* "Bgt." Walker from Egypt; a species as yet undescribed from Cape Colony, S. Africa; *californica* Rowell, *meekiana* Stimpson, *stimpsoniana* S. Smith and undetermined species from Starved Rock, Ill. and Mobile, Ala., from the United States.

The generic position of *Ancylus woodsi* John. from Tasmania would seem to be somewhat uncertain, (see Hedley, NAUT., IX, p. 66), but, if not a *Kincaidella*, it is a *Ferrissia*, as the apex is radially striate.

It is interesting to notice that *Gundlachia* s. s. is apparently restricted to the countries bordering the Gulf of Mexico and seems to be a purely American group, similar to *Lævapex*, while *Kincaidella*, like *Ferrissia* s. s., has a range extending quite around the globe. If a natural rather than an artificial system of nomenclature could be used, *Kincaidella* would represent the older and really typical group and *Gundlachia* s. s., as a more recent off-shoot from the original race, would become a subgenus.

I have not seen Troschel's description of the radula of *G. ancyliformis* mentioned by Hedley, (NAUT., IX, p. 62). The radulæ of the three American species that have been figured, *californica*, *meekiana* and *hinkleyi*, are all very similar to each other and quite different from that of either *Ferrissia* or *Lævapex*. That of *G. neozelanica* Suter as figured in T. N. Z., XXVI, pl. 14, fig. 5 is similar in the small number of cusps on the side teeth, but differs in having them longer and sharper, those of the marginals extending beyond the base. This characteristic difference in the radula would seem to definitely establish the generic validity of the group.

III. Subfamily Rhodacmeinæ, n. subf.

Jaw composed of numerous segmented plates. Radula with a long, slender central, unicuspid or faintly bicuspid, and with the base widely expanded in some species: the first lateral very large with an enormous mesocone, the blade-like cusp extending beyond the base, the ectocone is back of the mesocone, entirely separated from it and has several small cusps; there is no endocone. The four laterals are similar in shape but diminish rapidly in size toward the margin, these are succeeded by two or three transition teeth, smaller and with more or less imperfect cusps. The marginals are very small, rapidly decreasing in size toward the outer edge, with large quadrate bases, wider than high, vestigial, the cusps being nearly, if not quite, obsolete.

The rows of teeth are more or less V-shaped and with the immense laterals and minute marginals present a remarkable appearence quite unlike any other group belonging to the family.

Gwatkin, (J. of Con., XIV, 1914, p. 147), has already commented upon the resemblance of the radula to that of *Brachypodella*.

All of the species known to belong to this group have the apex of the shell tinged with pink.

Genus Rhodacmea, n. g.

Shell patelliform, conical, elevated or depressed, apex tinged with pink. Radula and jaw as in the subfamily. Soft anatomy otherwise unknown.

Type, *Ancylus filosus* Conrad. Pl. 3, fig. 2.

The species belonging to this genus are not confined to the Coosa drainage as Gwatkin supposed, but are also found in both the Tennessee and Ohio systems.

As in *Lanx* and *Ferrissia*, two well marked groups are represented in this genus, the one with an elevated and the other with a depressed shell.

Section *Rhodacmea*, s. s.

Shell elevated. Radula with a unicuspid central, which has the base triangularly expanded; laterals with the cusp of the mesocone extending but little beyond the base and not overlapping the base of the central tooth.

Type, *Ancylus filosus* Conrad.

I. Rhodacmea filosa (Conrad).

Ancylus filosa Conrad, F. W. Shells, 1834, p. 57.

When I wrote of this species in 1904, (Naut., XVIII, p. 75) I had not seen any specimens from the Black Warrior River, Conrad's original locality. The specimens then before me as was stated, were not typical in that they lacked the "numerous, radiating, prominent lines" described by Conrad. Since that time a considerable amount of additional material has been received from Mr. H. H. Smith, which fully confirms the original diagnosis. One set from the Black Rock Shoals of the Black Warrior River are rather thin, of a light translucent green color with the apex tinged with rose and are very strongly radiately striate, the ribs extending from the apex to the periphery. The largest specimen measures 4.25 x 3 x 2 *mm*. These shells are undoubtedly typical.

Similar specimens are before me from the Coosa River from several localities, viz., two miles above Coosa Valley, St. Clair Co.; Ten Island Shoal near Lock no. 2; Leota Shoal; Three Island Shoal, Wilsonville, Shelby Co.; and Vincent Shoal, two miles above Upper Clear Creek. Also from Tallassahatchee Creek, four miles east of Childersburg; Beaver Creek at Greensport and Canoe Creek.

All the shells from these localities are quite typical in form, but are uniformly thicker and more heavily striated than the Black Warrior specimens. This heavily striated form seems to be the characteristic expression of the species in the Coosa and its tributaries. The Cahawba River specimens from Lewis and Call mentioned in my former paper, while lacking the strong radial striae, are in texture and shape like the typical shells from the Black Warrior. While this smoother form quite probably represents a local race worthy of recognition, as it has not been found by more recent collectors and no exact localities for it are known, it hardly seems advisable to do more than to call attention to its peculiarities until more definite information as to its precise range can be had.

Rhodacmea cahawbensis, n. sp. Pl. I, figs. 4–6.

Ancylus filosus Walker, Naut., XVIII, 1904, p. 76, pl. vi, figs. 1–6.

Shell elevated, obtusely conical, broad oval, somewhat wider behind the apex than before it; apex obtuse, slightly behind the longitudinal centre of the shell, scarcely, if at all, turned toward the right side, apical sculpture entirely eroded in all specimens seen; yellow horn color slightly tinged with green, apex rose color; anterior slope convex toward the apex, straighter below; posterior slope nearly rectilinear: lateral slopes slightly convex, the left being more oblique than the right; lines of growth strong and irregular, slightly rippled by radial lines, which sometimes become obsolete radial striæ.

Length 4.5; width 3.5; alt. 2.5 mm.

Types, (no. 43453 Coll. Walker), from the Cahawba River, Gurnee, Shelby Co., Ala., collected by H. H. Smith. Cotypes in the collections of the Acad. of Nat. Science, Philadelphia, George H. Clapp and John B. Henderson. Also from Cahatchee Creek and Yellowleaf Creek, Shelby Co., Ala. The single specimen from the latter locality shows subobsolete radial striation very much like the "Coosa River" specimens in the Lewis collection which in my former paper I referred to *filosa*, but which I now think belong to this species. The fact that the heavily striated *filosa* is quite characteristic of the Coosa, where this species has not been found by Mr. Smith in his extensive collections, makes me doubt whether the Lewis shells really did come from the Coosa itself. Unfortunately no exact locality is given by Lewis and the question must remain undetermined.

This species is more closely related to the *elatior* Anth. of the Tennessee drainage than to any of the known species of the

Alabama system. Compared with that, it is smaller, narrower, with a more obtuse apex, the posterior slope is straight and not convex and the lateral slopes less oblique than in that species. The tinted apical area seems smaller than in the other species of the genus and is frequently lost entirely from erosion. The radula has not yet been examined.

Rhodacmea elatior (Anthony).

Ancylus elatior Anthony, Ann. N. Y. Lyc., VI, 1855, p. 158, pl. v, fig. 20.

No additional information in regard to this species can be given at this time except that the radula of a specimen from the Tennessee River at Florence, Ala., collected by Hinkley agrees with that of *filosa* in the characters of the central and lateral teeth. A very considerable collection from the Tennessee made by Mr. H. H. Smith has not yet been worked over and may add materially to our knowledge of the species when critically examined.

Rhodacmea hinkleyi (Walker).

Ancylus (*Ferrissia*) *hinkleyi* Walker, Naut., XXI, 1908, p. 139, pl. ix, figs. 11–13.

The species listed from the Tennessee River at Florence, Ala., as "*Ancylus rhodaceus* Walker" by Hinkley in 1906, (Naut. XX, p. 40), but not described, is the same as that subsequently described under this name in 1908. The radula of the Tennessee River specimens agrees with those of *filosa* and *elatior* in sectional characters.

Section *Rhodocephala*, n. sect.

Shell depressed. Radula with a faintly bicuspid central which has the sides of the base straight and not expanded; laterals with the cusp of the mesocone extending far beyond the base and overlapping the base of the central tooth.

Type *Rhodacmea rhodacme* Walker.

Rhodacmea rhodacme, n. sp. Pl. I, figs. 1, 2 and 8.

Shell depressed, conical, obovate, the greatest width being just behind the apex, apex subcentral, only slightly behind the centre, obliquely elevated, acute, spine-like, somewhat turned toward the right side, finely radially striate, apical depression small, oval and situated on the left side of the tip of the apex; pale green with the apical region deeply tinged with rose color; anterior slope very slightly convex; posterior slope oblique and nearly rectilinear below the base of the apex; lateral slopes slightly convex and about equally oblique; growth lines regular, fine and distinct, the apical striae extend down over the upper part of the shell giving a shagreened appearance to the surface as they intersect the growth lines, but become mere ripples toward the margin.

Length 5.25, width 4, alt. 1.25 mm.

Types, (No. 20371 Coll. Walker), from the Coosa River at Williamsville, Shelby Co., Ala., collected by A. A. Hinkley. Cotypes in the collection of Mr. Hinkley. Also from the Coosa River above Wetumpka (Hinkley) and at Leota Shoals; Fort William Shoals; Shoal two miles above Coosa Valley; Vincent Shoal two miles above Upper Clear Creek and Peckerwood Shoals (H. H. Smith).

All of the Smith shells were found on or under stones, which is apparently the usual habitat of the species, differing in this respect from *filosa*, which is almost invariably found on living *Pleuroceridæ*.

I have adopted for this species the very appropriate name suggested by Dr. Pilsbry soon after its discovery.

The peculiar depressed shell of *rhodacme* with its spine-like apex and characteristic radula differentiate it very sharply from the species included under *Rhodacmea* s. s. and justifies the establishment of a special section for it and similar species.

RHODACMEA GWATKINIANA, n. sp. Pl. I, figs. 3, 7 and 9.

Shell rather small, depressed conic, oval; apex nearly central, somewhat turned to the right, acute and spine-like, finely radially striate; apple-green with the apex tinted with old-rose color; anterior slope slightly convex; posterior slope oblique and nearly straight below the projecting apex; lateral slopes straight below the base of the apex and equally oblique; growth lines rather coarse and irregular, the entire surface covered with low, coarse, rather distant radial striae extending to the edges.

Length 3.5, width 2.5, alt. 1 mm.

Types, (No. 43454 Coll. Walker), from Butting Ram Shoals, Coosa Co., Ala., collected by H. H. Smith. Cotypes in the collections of T. H. Aldrich, George H. Clapp and John B. Henderson.

All of the specimens were found on living *Pleuroceridæ*.

This beautiful little species, which groups with *rhodacme* in its depressed shape and spine-like apex as well as in its radular characteristics, differs from it in its small size, more regularly oval shape and the greater development of radial striæ over the surface.

It is named in remembrance of the late Rev. Prof. H. M. Gwatkin of Cambridge, England, to whom I am indebted for practically all of the radula preparations used in this paper and who was the first to observe and point out the remarkable character of the radula in the different species of the genus.

I am indebted to Dr. Pilsbry for the slide representing the radula of *Lanx patelloides*. All of the other radulæ figured were prepared by Prof. Gwatkin, and all of the figures were drawn by Mrs. Lydia M. H. Green formerly connected with the U. S. National Museum.

A NEW SPECIES OF ASTARTE FROM ALASKA.

BY WILLIAM HEALEY DALL.

In 1865 Dr. Philip Carpenter described from a single specimen a species of *Astarte* from Puget Sound, to which he gave the specific name of *compacta*. This type remains in the collection of the National Museum as number 4509.

This species has remained extremely rare, only three or four others, some eroded and doubtful, have come to hand during the half-century which has passed. This is probably due to the fact that the right locality had not been dredged, for the species of this genus are usually very abundant in their chosen places.

Recently Mr. G. Willett, warden of the Forrester Island reservation in southern Alaska, has succeeded in getting an excellent shell-collection at this isolated spot; among the shells thus obtained was a good series of *Astarte compacta*. With this, and for a time confused with the latter, is what seems to be a new species of *Astarte*, which Mr. Willett in arranging his collection was the first to discriminate. He had the kindness to send me his fine mounted series of both species for examination, the result of which is not only that a new species is identified, but it is shown that *A. compacta* as well as the new form belong to the typical section of the genus, both forming at intervals crenulation of the inner margin of the valves. The only specimens of *A. compacta* previously available happened to be in the stage without crenulations.

The new form is best described by a comparative diagnosis.

ASTARTE WILLETTI, n. sp.

Shell small, of a yellowish-brown externally, milk-white internally; the external sculpture of small concentric waves is more regular and constant than in *compacta*; the form is more oval and the beaks more anterior than in that species, and *willetti* appears to attain a larger size. In *compacta* the lunule is relatively narrower and longer than in the new species. In the interior the hinge of the latter is better developed than in *compacta*, all three teeth being usually represented, while in *compacta* the posterior and particularly the anterior cardinal is frequently obsolete or absent. The shell substance of *A. compacta* is more translucent and bluish, and the crenulations of the valve margin when present are distinctly smaller and less conspicuous than in *willetti*.

The measurements of two forms are as follows, the largest specimen of a series of some twenty-five specimens being selected in each case.

	Height.	Length.	Diameter.
A. willetti	14	16	8 mm.
A. compacta	12	12	6 mm.

The specimens were dredged in about 50 fathoms. The umbones in *A. willetti* are 6.0 mm. behind the anterior end of the shell; in *A. compacta* about 5.5 mm., the result being that the latter has a more triangular outline. The type of *A. willetti* is number 216364 of the catalogue of mollusks of the U. S. National Museum.

NOTES ON BOREAL LAND AND FRESHWATER SHELLS.

BY WM. H. DALL.

The National Museum has received a small lot of fresh-water shells from Dr. T. E. Winecoff, stationed at Fort Yukon, Alaska, nearly on the Arctic circle, which are of more than ordinary interest. They were collected from a small pond near the fort and the large *Lymnaea* abounded in such numbers as to give a pinkish tint to the water in which they were, according to the collector. The species are:

Lymnaea appressa Say, rather small for the species, and of a brownish tint not unlike the usual color of *L. palustris.*

Lymnaea palustris Müller. Ordinary type and size.

Lymnaea emarginata mighelsii Binney. Not known so far northwest.

Planorbis trivolvis Say, medium size, abundant.

Planorbis crista Linné, one specimen. Nearest known locality is Carberry, Manitoba.

Pisidium vesiculare Sterki, one specimen.

During a cruise in Bering Sea last summer, Mr. G. Dallas Hanna touched at St. Mathew Island in the northern part of Bering Sea. From small ponds in the island he obtained the following species:

Aplexa hypnorum Linné.

Planorbis parvus Say.

Valvata mergella Westerlund.

Pisidium scutellatum? Sterki.

Succinea chrysis Westerlund.

Several times during the last few years I have received the two forest snails *Polygyra columbiana* and *Circinaria vancouverensis* from Unalashka. At first I felt confident that some error had occured in labeling, as during my visits at that locality, 1871 to 1880, there was no grove or forest to shelter them and assiduous collecting failed to reveal their presence. However, in 1899 I found the transplanted Sitka spruce planted on one or two of the islets in the bay had made an extraordinary growth, and as these snails are always associated with the spruce and fresh specimens have been lately received from the locality, I can no longer doubt that the introduction of the species and its acclimation have been successful. The *Circinaria* are small and of a dark olive-green, the *Polygyra* normal.

A NEW CALIFORNIAN SIGARETUS.

BY MRS. IDA S. OLDROYD.

Sinum californicum, n. sp.

Shell white, convex, spirally striate above, with epidermis of a rusty yellow; a thin columellar callus reflected nearly over the umbilicus showing only a faint trace of umbilicus; interior snow-white. This has been called *Sigaretus debilis* Gld., but it is not like the specimens from Lower California. It differs from *S. concavum* in not being as convex, and the interior being white, and the early whorls are much smaller, and from *S. debile* in being convex and larger. *S. debile* is very flat, the early whorls are smaller and fewer. Length of shell 38 mm., breadth 18 mm., height 18 mm.

The type comes from San Pedro, California. The type and nine specimens are in the Oldroyd collection at Stanford University. Others are in the collection of the U. S. Nat. Museum, from localities ranging from Monterey, Cal., to Todos Santos Bay, Lower Cal.

A NEW SONORELLA FROM ARIZONA.

BY S. S. BERRY.

Mr. George Willett has sent in specimens of a *Sonorella* from Gila County, Arizona, which do not seem referable to any of the described species. A diagnosis is accordingly offered below.

SONORELLA ROOSEVELTIANA new species.

The shell is depressed. In the type the spire is low conoidal, but in some specimens is higher, while in others is raised but little above the level of the principal whorl; umbilicate, the umbilicus contained about eight times in the major diameter; very thin and fragile. Whorls $4\frac{1}{4}$ to $4\frac{1}{2}$. Embryonic whorls a little less then $1\frac{1}{2}$, the initial half-whorl very finely, irregularly, radially, wrinkled-costulate, the wrinkles becoming finer and more wavy in the following whorl, where they are crossed by a series of fine, delicate, raised lines, passing obliquely downward and forward from the summit of the whorl to the suture, the sculpturing sometimes showing with beautiful regularity over most of the whorl. Yet when a series of shells is examined the finer sculpturing shows great variation. Frequently the incised lines are more or less interrupted, especially near the summit, into elongate papillae which later coalesce. Sometimes lines or papillae are evident running in a direction counter to those just described and intersecting them. Above the summit, where the wrinkly lines of growth come closer together, the appearance is more granular and less distinct, but occasional traces of similar lines apparently pass obliquely downward (actually *upward* on account of the depression of the whorl at the suture) and backward from the superior suture to the summit. In most of the specimens the fine wrinkling becomes almost granulose. The next whorl-and-three-quarters show irregular growth-lines crossed obliquely by lines of minute papillae, though I can make out no bristles with the aid of such magnifying power as happens to be by me. The last whorl is apparently smooth except for the lines of growth. This whorl is moderately wide and descends slightly in front. The aperture is subcircular and very oblique. The peristome is thin, its margin only slightly thickened and scarcely at all expanded or reflexed except at the base. There is an excessively delicate parietal callus. The type measures, alt. 8, major diam. 16.5, lesser diam. 14 mm. ; diam. of umbilicus 2 mm. ; aperture 8 x 8 mm.

Largest specimen, alt. 11, major diam. 19 mm.

Smallest adult, alt. 7, major diam. 15 mm.

Type : Cat. No. 3733 of the writer's collection. A paratype is Cat. No. 117086 of the Academy of Natural Sciences of Philadelphia, and another is in the collection of George Willett.

Type Locality : Roosevelt, Gila County, Arizona ; in rock slides on north slopes, 2200 ft. altitude. 31 specimens examined, taken by Mr. George Willett, December 15, 1914, and November 1916.

Remarks: Although the shell characters of this modest species offer no very striking peculiarities, I have been unable to identify it with any of the sixty or so described members of the genus. There is apparently no end to the Arizonan Sonorellas. As compared with the other species of which I have seen specimens, *S. rooseveltiana* seems more than usually thin and fragile. The general porportions of the shell, as the spire, aperture, and so on, are quite variable.

Some of Mr. Willett's shells have found their way into other collections as *S. coloradoensis* Stearns, from the figures a quite different species.

Redlands, California.

THE DISTINCTIVE CHARACTERS OF LAMPSILIS MINOR AND L. VILLOSA.

BY T. VAN HYNING.

In sending out specimens of the *Unionidae* of Florida from the Florida State Museum, we have stated of *Lampsilis villosa* B. H. Wright, and *Lampsilis minor* Lea, that it was impossible to differentiate with certainty all of the adult specimens; this being due to the eroded umbones, but with young specimens showing umbonal sculpture, it was an easy matter. Simpson says in his Descriptive Catalogue for both species, that the umbonal sculpture was not seen; hence no description. This museum has numerous specimens of young and adult of both species recently collected, and the young show the umbonal sculpture of both species to be composed of about four coarse ridges; in *minor* they are circular and in *villosa* V-shaped looped.

Mr. Frierson, in a letter of November 27, '16, writes that he has discovered how to differentiate the adults of these two species. He calls attention to an additional small muscle scar (cicatricula?) at the upper end of the anterior muscle scar (cicatrix) in *minor*.

I have just found time to go over the specimens in this museum and open them up, and separate them according to Mr. Frierson's discovery, and I am now prepared to give some additional information. In the majority of specimens a glass is required to see the small scar referred to, and then in the majority of specimens the small scar, instead of being separate, is but an extension of the larger one, which makes it still harder to determine. Simpson says, of *minor*, "anterior scars *deep*," and of *villosa* "muscle scars *scarcely impressed*." In opening a shell, the *deep* scar in *minor* is at once noticeable from the *shallow* one of *villosa*. *Minor* is a heavier, wider, and shorter shell than *villosa*, and the anterior distance from the umbo is shorter in *minor*.

Florida State Museum.

NOTES ON REPRODUCTION AND GROWTH IN CERTAIN VIVIPAROUS MUSSELS OF THE FAMILY SPHAERIIDAE.

BY RALPH J. GILMORE.

The present study was undertaken in an effort to determine the nature of the reproductive process in certain common forms of the family *Sphaeriidae*. For a long time incubation of the young has been known to occur in European forms, but no investigation has been made of related forms from America.

Historical. Jacobsen (1828) noted the fact that embryos of Cyclas develop in sacs. He observes that "each ovary is composed of a number of small cylindrical sacs or capsules. When impregnated, these sacs increase in bulk and gradually protrude from the abdomen. By this protrusion they are introduced into the gill cavity but still retain connection with the interior membrane of the ovary. These capsules contain the eggs and the young are developed in them. Each one contains but one egg or young one. As soon as the young has reached a certain size, the capsule bursts and the young is ejected into the gill cavity. We find in the gill cavity at one and the same time, capsules and young both large and small." Apparently the only part of Jacobsen's observations which is correct, is the fact that the young develop in sacs. Later authors fail to confirm his work. Oskar Schmidt (1854) investigated the anatomy of *Cyclas calyculata.* Franz Leidig (1855) studied the anatomy of *Cyclas cornea.* Stepanoff (1865) was the first to point out the brood pouch of Cyclas in its true relation. His observations were confirmed in 1885 by Ziegler. However, the work of both of these men was directed mainly toward segmentation and development of the embryo and their observations on the brood pouch were mere casual notes. In one of his plates Ziegler shows a diagrammatic figure including a small portion of a brood pouch. De Bruyne (1898) in a work on phagocytosis figures a brood pouch. Poyarkoff (1910) published a preliminary note on the incubation of embryos of Cyclas. This was followed in 1911 by a paper on the same form by Schereschewsky. Both of these authors gave considerable attention to the cellular structure of the pouch, its origin and function. The only work that has been published on American forms is that of Drew, who in 1894 described the anatomy of *Sphaerium sulcatum.*

Material. The material for this work was collected during the summer and fall of 1913, from ponds and streams in the neighborhood of Ithaca, N. Y. Two forms were observed, *Calyculina truncata* and *Sphaerium simile.*

Calyculina truncata is one of the smallest of the *Sphaeriidae.* It averages about eight millimeters long, and seven high. The shell is very fragile, rhombic ovate, the posterior part very squarely cut off, the anterior broadly rounded. The surface is smooth and shining with very fine lines of growth. The color is light yellowish green or greenish horn. It occurs in clear fresh-water ponds or the sheltered parts of rivers, usually embedded in soft sticky mud, the siphons protruding just above the surface. Very often it may be seen climbing about on submerged vegetation. The seasons of greatest apparent abundance are the spring and early summer months. It quite frequently occurs in ponds which are dry throughout the greater part of the year.

Sphaerium simile is one of the largest species of the family. An adult specimen may be eighteen millimeters long and thirteen millimeters high. The shell is rather solid, almost equilateral, transversely oval (Fig. 10), the anterior and posterior margins almost equal. The surface is shining, pale green, with coarse growth-lines in young specimens but in older ones it is dull, dark brown to black with only those growth-lines evident which mark the ends of growth periods. It prefers clear, cold streams but may be found in quiet pools of rivers and lakes. It buries itself in soft mud or debris usually an inch or more below the surface. It communicates with the water above through a small hole in the mud. I have no record of this form occurring in places which are not well supplied with water throughout the year.

Methods. During the early part of the work, expanded animals were fixed in hot water or hot mercuric chloride. This method had one great advantage, in that it allowed very litte contraction of organs. But for cell structure the following was found to be better. The animals were prevented from completely closing the shell by a small piece of wood inserted between the valves. In this condition they were placed in cold saturated mercuric chloride with two to three percent of glacial acetic acid. They were kept in the fixer for twenty-four hours. The acidity of the fixer removed nearly all of the calcium salts of the shell. The remainder was removed by one half to one percent of hydrochloric acid in sixty-seven percent alcohol. The entire animal was imbedded in paraffin. Serial sections were cut from six to ten microns in thickness. Delafield's

Haematoxylin and orange G. in ninety-five percent alcohol were used as stains.

In order to establish the relation of the brood pouch to the gill filaments and water spaces a wax model of parts of a gill was constructed from drawings made on an Edinger machine.

Reproductive Organs. The animal is hermaphroditic. The reproductive organs are situated beneath the pericardium and behind the stomach (Figs 1, 2, 3, 4). They consist of a pair of racemose glands, the anterior part of which produce sperm and the posterior eggs. A common genital duct continues backward, opening into the cloacal chamber of the inner gill near the opening of the kidney.

Plate V, Fig. 2, represents the essential parts of an egg follicle. Each follicle is lined with a single layered epithelium supported by a very heavy basement membrane. Eggs develop by the enlargement of certain cells of the lining epithelium. When a developing egg has grown to four or five times the size of the neighboring cells it is pushed out of its position by a pedestal-like growth of the basement membrane. Thus projected into the lumen of the follicle, it continues to develop until mature, when it drops off.

The sperm-producing follicles (Fig. 3) are irregularly spherical and arranged about their common duct like the parts of a raspberry. Each follicle is made up of a mass of sperm mother cells about its outer part and either fully formed or young sperm cells near the center. The center is hollow and communicates with the common sperm duct. This duct (Pl. V, Fig. 3) extends a short distance backward where it receives the product of the egg follicle, continuing from that point to the exterior as a common genital duct.

Regarding maturation and fertilization Stepanoff (1865) observes, "When the egg has reached a certain size it separates more and more from the wall of the basement tissue until it at last becomes free, in the inner part of the follicle and later falls into the outlet of the sex glands. The separation is affected by the increase of the yolk mass and the resulting weight of the egg. Eggs thus fallen into the duct become surrounded by a mass of fully formed sperm, so that, without doubt, fertilization occurs in this place." Schereschewsky says, "Fertilization takes place in the gill chamber." In the majority of the specimens of Calyculina and Sphaerium ripe sperm and eggs were found to occur in the same individual. None of the specimens had eggs in the genital duct.

Breeding Seasons. The breeding season probably continues through the greater part of the year. Observations on this point have been very meager. Animals taken in November and December of 1913 were found to contain, in newly formed brood pouches, eggs some of which were unsegmented and others in very early cleavage stages. Considerably over fifty adult specimens have been sectioned. All were found to contain young in several stages of development.

Gills. Before considering the structure of the brood pouch it will be necessary to look into the structure of the gills. The gills are four in number, an outer and an inner pair. The outer is much smaller than the inner and falls short anteriorly by about a fourth of its length. Each gill has two lamellae. The outer lamella of the outer gill is attached to the mantle; the inner lamella of the outer gill is attached to the outer lamella of the inner gill and the inner lamella of the inner gill is attached to the body. It is the outer lamella of the inner gill which contains the brood pouches.

The lamellae are made up of gill filaments (Figs. 7, 8, and 11). A typical filament may be compared to a rubber tube sharply bent on itself to form a letter Y. Each filament of one lamella is therefore continuous with one of the other lamellae. The open part of the letter Y represents the cloacal chamber. All water which passes between the filaments finds its way into this chamber and from thence to the exterior. In the anterior and posterior parts of the gill the cloacal chamber is very much reduced (Figs. 8 and 11).

Each filament is a hollow tube which in frontal section appears as an irregular ellipse (Figs. 8 and 11). The outer part is made up of a single layer of heavy cells, strengthened by chitinous rods (Fig. 8). The inner part is a single layer of flattened cells forming a very thin membrane. The hollow part of a filament is the blood space. This blood space may be crossed by an irregular loose network of web-like threads. These probably serve to prevent the membrane from collapsing. In the ventral part of the gill, except at the ventralmost part, the blood spaces of the two lamellae are kept separate as is shown (Figs. 5, 7 and 11).

At irregular intervals adjacent filaments are joined by interfilamentary junctions (Figs. 7, 8 and 11). Small ribbon-like bands of fibrous chitin may join several filaments for a short space. These by holding the filaments together give definite shape to the lamellae which would otherwise be a tangle of tubes. Another type of junction (Fig. 8) is made by the direct fusion of the elements of two adjacent filaments. This is the more common form of junction in the dorsal part of the gill. At the most dorsal part the filaments lose their identity entirely and fuse to form large blood spaces.

Between the filaments are water spaces which communicate with the mantle chamber on the outside and the cloacal chamber on the inside. Water is kept flowing from the mantle chamber to the cloacal chamber and the excurrent siphon by cilia. The outer surface of the filaments is covered with short cilia, the sides have a narrow row of longer ones.

Circulation of the Blood. The most important function of the gills is the purification of the blood. Blood leaves the ventricle by two main arterial trunks, the one supplying the anterior and the other the posterior part of the body. These vessels end in blood spaces which have no definite wall. The spaces of the greater part of the body pour their blood into the inner lamella of the inner gill (Fig. 5). Passing first ventrally in this lamella, it turns at the bottom of the gill and comes upward through the outer lamella. In the dorsal part of this lamella the filaments fuse to form a large sinus which becomes the auricle and empties into the ventricle. The outer gill derives its supply of blood from the mantle and such parts of the body as are near by. Blood enters the outer lamella, crosses to the inner lamella and enters the heart by the same channel that carries blood from the inner gill. It should be noted that the brood pouches are admirably located. For they are bathed by blood which has just left the alimentary tract and later received its supply of oxygen.

Brood Pouch. Fig. 8 represents a fully formed brood pouch as seen in frontal section. The pouch has two distinct walls, an outer and an inner. These are direct continuations of the heavier portions of adjacent gill filaments. The outer wall consists of a thin one-celled membrane made of flat expanded cells. This wall is, in every respect, similar to the membranous part of the gill filaments. The inner wall is also made up of a single layer of cells. A part of this wall is similar to the outer wall though the major portion is composed of very thick glandular cells. Between the outer and the inner walls is a blood space. This space is a modification of the spaces of the two filaments to which the two walls are attached (Fig. 11). Numerous web-like cross threads occur in the blood space. These are similar to those which are found in the spaces of typical filaments. They furnish another proof that the two walls are mere modifications of filaments. The brood pouch may contain but one embryo (as in Fig. 8) or it may enclose a number (as in Fig. 11). A pouch may involve two filaments and only two (as in Fig. 8) or it may be constructed from the parts of several. The inner wall of such a pouch is thrown into folds which divide it into communicating chambers. These folds probably represent the contributions of the several filaments.

Just how the pouch originates is still an open question. Stepanoff (1865) and Schereschewsky (1913) believe it to be a modification of gill filaments. In Calyculina and Sphaerium all the available evidence points to such an origin. The wax model shows the pouch to be a modification of ordinary filaments. The same filaments enter into the structure of the pouch throughout its extent.

Poyarkoff (1910) offers this theory for the origin of the pouch: "When the embryo comes into contact with the gill filaments, it is surrounded and enclosed by leucocytes. Later these arrange themselves in two layers forming the brood pouch." He considers "the incubation of embryos in Cyclas as a case of ectoparasitism accompanied by the formation of a follicle at least in part, perhaps altogether mesodermal." Schereschewsky reviews Poyarkoff's work and can find no good evidence to substantiate it.

One fact may be significant to show that the glandular inner wall is not a structure which must be derived from other sources than filaments. In the dorsal part of the gills all of the filaments are fused to form a heavy-walled blood sinus. This wall is made up of cells which, in every respect, resemble those of the inner wall of the brood pouch.

Nutrition of the Embryo. Schereschewsky observes that the embryo in the brood pouch is bathed by a distinct fluid which contains many acidophile granules. This fluid is the secretion of the large gland cells of the inner wall of the pouch.

Poyarkoff has a different theory. He says, "there are large cells of the inner wall of the brood pouch which serve for the nutrition of the embryo. At a certain time they become detached and fall into the lumen of the pouch. Their cytoplasm becomes homogeneous and eosinophile. Their nuclei take a uniform stain. The chromatin granules become almost completely indistinct. The embryo swallows these large cells. I have found these large shells in the intestine of some embryos. Stepanoff (1865) and Ziegler (1885) have noted this mode of nutrition." Poyarkoff further observes that the cells which have thus fallen into the cavity are replaced by leucocytes. Figure 9 is a copy of one of his illustrations. Schereschewsky has reviewed these observations and can find no evidence to justify them. In Calyculina and Sphaerium I have found undoubted evidence of secretion in the brood pouch. I have found a few cells thrown out into the lumen of the pouch but have considered this a normal phenomenon to be expected among actively secreting cells. As to the cells supposed to have been eaten by the embryo, may these not have been parasites?

Sexual Maturity. Gross examination of the gills of Sphaerium revealed young so large that it was thought probable that these young might themselves be bearing embryos. Examination of microscopic sections proved that such a condition does not exist. The smallest specimen found to contain young was ten millimeters long. This is two millimeters longer than the largest young one found within the brood pouch. Several nine-millimeter specimens were sectioned but none were found to contain young. Young six, seven, and eight millimeters long have sex organs fully formed. I have no sections of very small Calyculina. The young of this form within the parent's gills are in the same stages of development as to the sex organs, as those of Sphaerium.

In the table which follows are included the results of gross examination of a number of Sphaeria. This is incomplete, since it was not possible to determine the presence of any young under five tenths of a millimeter. The animals examined were taken during July, 1913.

Size Length in mm.	*Total Examined*	*Total Bearing young*	*Percentage Bearing Young*
7	3	0	0
8	12	0	0
9	27	0	0
10	21	0	0
11	30	0	0
12	45	0	0
13	30	2	6.6
14	40	10	25
15	47	22	46.8
16	64	51	80
17	64	53	83
18	14	14	100
19	4	4	100

SPHAERIUM BEARING YOUNG OVER .5 MM. LONG.

Size	*Number bearing young*	*Total of class*	*Per cent of class*
13	2	30	6.6
14	10	40	25.
15	22	47	46.8
16	51	64	80.
17	53	64	83.
18	14	14	100.
19	4	4	100.

Size of Young taken from above Sphaerium by gross Dissection.

Size	*Frequency*	*Per cent of whole*
.5	1	.04
1.	16	6.
1.5	6	2.
2.	37	14.
2.5	9	3.
3.	26	10.
3.5	3	1.
4.	28	10.
5.	37	14.
6.	41	15.
7.	55	20.
8.	8	3.

267 young from 400 adults taken haphazard.

The size of the young was found to be independent of the size of the parent. An eight-millimeter young is as likely to be in a fourteen-millimeter parent as in one of eighteen millimeters length. The majority of the above contained two young, one in each inner gill. A few contained four.

Similar data were taken from Calyculina which were killed in June 1913.

Length of Parent	*Total Examined*	*Length of young*	*Number of young*
7	1	1.5	7
6	1	1.	4
8	1	1.5	9
7	1	1.5	16
7	1	1.5	10
8	1	2.	5
7	1	5.	3

The great variation in the number of young is probably due to the fact that some had already emerged from the parent pouch. I have no records which include totals of young of all stages. In one specimen I was able to count twenty-four.

No method has been discovered for determining the age of young or the period of incubation. I am inclined to believe that young in Calyculina are carried for one year or more. In a pond which was under observation for a period of over a year, adults were found in April to contain fully formed young. This pond had been dry from July of the year preceding until it became filled by melting snow in March. It had no inlet or outlet and received no overflow floods from any nearby ponds or streams. The number of young produced is probably ten to twenty in Calyculina and two to four in Sphaerium. These figures are based on the fact that these species during early spring contain about the above numbers of young, which when removed from the mother are able to take care of themselves.

Age in Sphaerium. The distinctness of growth-areas or rings in Sphaerium led to the belief that age might be determined by correlating size and number of rings. The entire surface of the shell (Pl. VI, Fig. 10) is thrown into narrow parallel ridges which represent growth-lines. At the beginning of a season these lines are widely separated; at the end they are crowded very closely together. One of these areas constitute a growth ring. In many specimens the several rings are further marked by slight differences of color due to deposits on the shell. The rings are usually very distinct though there are many forms in which they are very faintly differentiated.

The following table includes results obtained by measuring *Sphaerium simile*.

Total rings	*Number examined*	*Range of size in mm.*	*Average size in mm.*
1	46	5–10	8.6
2	58	9–14	11.2
3	86	9–17	13.2
4	116	12–18	16.9
5	67	12–19	17
6	20	12–19	17
7	6	16–19	17
8	1	18	18

While the above results are not conclusive they are certainly not altogether negative. The following facts seem significant.

1. No individuals attain a length of over 19 mm.

2. No individuals show more than 8 rings.

3. The averages of each class show an increase in length of about 2 mm. per ring.

4. The range of size included within each class is from 5 to 7 mm. This seems to indicate either that growth is very irregular in different individuals or that the rings do not indicate seasons. The fact that many specimens have very indistinct lines may account for some of these discrepancies. If one ring represents a year, the average age of a large specimen would be four or five years.

Regarding growth in the *Unionidae* Isely (1913) draws the following conclusions.

1. Rate of growth is exceedingly variable.

2. The summer months are the growth months.

3. Lines of arrested growth may be called rest rings, the conspicuous ones being usually winter rest rings. Occasionally the rest rings may be two or more years apart; more often, however, several equally prominent rings may be formed in one year. Prominent rest rings are generally due to double prismatic and epidermal layers.

Notes on Ecology. So far as observed the food consists mainly of diatoms. Many forms occur in ponds which become dry during the summer, remaining in that condition until the following spring. In aquaria I have observed that Calyculina will burrow down to the water level. Isely reports forms of Unionidae which were turned up by a plow in perfect condition.

The above observations emphasise the fact that very little is known about the habits of the forms considered.

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EXPLANATION OF PLATES IV–VI. (after p. 44

Plate IV. Figure 1. A diagrammatic dissection of Calyculina.

M	—Mouth	*K O*	—Kidney opening
Lp	—Labial palps	*T*	—Sperm follicles
Es	—Esophagus	*O*	—Egg follicles
Lv	—Liver	*G D*	—Genital duct
Sto	—Stomach	*G O*	—Genital opening
Int	—Intestine	*A A*	—Anterior adductor muscle
R	—Rectum	*P A*	—Posterior adductor muscle
A	—Anus	*Ft*	—Foot
Cb G	—Cerebral ganglion	*Cl Ch*	—Cloacal chamber
Ps G	—Parieto-splanchnic ganglion	*Ex S*	—Excurrent siphon
P G	—Pedal ganglion		

Sta	—Statocyst	*In S*	—Incurrent siphon
V	—Ventricle	*G*	—Gill
Au	—Auricle	*Man*	—Mantle
Pl	—Pericardium	*Shl*	—Shell
Kd	—Kidney		

Figure 2. Cross section of egg-bearing follicle of Calyculina.

O	—Egg	*Ep*	—Epithelium
Bt	—Basement membrane	*Yo*	—Young egg

Figure 3. Cross section of sperm-bearing follicle.

Sp Mc	—sperm mother cells.	*Sp*	—sperm

Figure 8. Frontal section of inner gill of Calyculina showing brood pouch. Drawn with Edinger machine.

O L	—Outer lamella	*Ct*	—Cross threads
I L	—Inner lamella	*Em*	—Embryo
Ci	—Cilia	*Sh*	—Shell remains
G Fil	—Gill filament	*Cl Ch*	—Cloacal chamber
Bs	—Blood space	*Gc*	—Gland cells of inner wall.
I W	—Inner wall of brood pouch	*Sec*	—Secretion
O W	—Outer wall of brood pouch		

Plate V. Figure 4. Diagrammatic section of sex organs. *Calyculina.*

T	—Sperm follicles	*Gd*	—Genital duct
Or	—Egg follicle	*G O*	—Genital opening.

Figure 5. Diagrammatic cross section through the region of the reproductive organs. *Calyculina.*

Pp	—Pericardium	*M*	—Mantle
V	—Ventricle	*Ft*	—Foot
Au	—Auricle	*Cl Ch*	—Cloacal chamber
Bs	—Blood space	*O*	—Egg follicle
R	—Rectum	*T*	—Sperm follicles
I G	—Inner Gill	*Nc*	—Nerve cords
O G	—Outer Gill	*C T*	—Connective tissue

Figure 6. Diagrammatic cross section of Calyculina to show opening of genital ducts.

G O	—Genital opening	*P*	—Pericardium
N C	—Nerve cord	*K*	—Kidney
Cl Ch	—Cloacal chamber	*R*	—Rectum
I G	—Inner gill	*Blv*	—Posterior aorta
O G	—Outer gill	*M*	—Mantle
Ft	—Foot		

Figure 7. Frontal section of neutral part of inner gill, showing fusion of the two lamellae. *Calyculina.*

I L	—Inner lamella	*Ifj*	—Interfilamentary junctions
O L	—Outer lamella		
Bls	—Blood space	*Ct*	—Cross threads

Figure 9. Part of inner wall of the brood pouch of Cyclas. (Copied from Poyarkoff).

L —Leucocyte lodged at base of cells
F —Leucocyte just entering wall of pouch
A —Leucocyte beginning to divide
N —Polynucleate cell

Plate VI. Figure 10. Shell of Spaerium simile showing growth lines.

U —Umbo   *1, 2, 3, 4,* —Growth lines

Figure 11. Diagrammatic reconstruction of a portion of the inner gill of Calyculina, showing the relation of brood pouches to gill filaments.

I L	—Inner lamella	*Em*	—Embryo
O L	—Outer lamella	*I W*	—Inner wall of brood pouch
Cl Ch	—Cloacal chamber		
If J	—Interfilamentary junction	*O W*	—Outer wall of brood pouch
G F	—Gill filament	*Bls*	—Blood space

COLLECTING SHELLS IN A CORNER OF THE SIERRA NEVADA.

BY JAS. H. FERRISS.

Prospects along the southern border of Arizona in the summer of 1916 were a little warlike; thus myself and family, two of us, joined with Prof. E. E. Hand, zoological instructor at the Wendell Phillips High School, Chicago, in a vacation to California. The hikers of the Sierra Club were ready for their annual July tramp and we joined their ranks. At Bakersfield we dropped off for a day's collecting along the banks of the Kern river.

That night the club, 260 strong, was overtaken and no further opportunities for collecting were conveniently at hand until we arrived at the forks of the Tulle river the next evening. We left the railroad at Springville in Tulare county.

This conservation club of nearly 2,000 members, Jos. LeConte, jr., President, and Wm. H. Colby, Secretary, seems to feel it to be a part of their work to show the way to the California mountains, to make them accessible and popular, and in this until his death a couple of years ago, John Muir was their leader. The membership is principally Californians, San Francisco and Los Angeles predominating. Our own state was well represented in this outing, for there were sixteen of us from Chicago and Joliet.

These annual excursions show the way to good health, the big trees, the highest mountains and the great canyons and do much to make California attractive to the globe-trotter. We ascended the Kern river Canyon, climbed Kaweah Peak, Mt. Whitney and the Kearsarges, opened the Muir trail and crossed over the range down to Independence, Inyo county, in the Owen valley—a snowbank in camp every night but the last, when we needed it most.

It was a delightful journey with delightful people, and the rivers and snowbanks were crossed without accident. It was the seventeenth year under the Colby régime, and practice has made the arrangements so perfect there was no jar in the program. Next July we ascend the middle fork of Kings river.

After this month of collecting, fishing, music, opera and lectures with the Sierra Club we hit the trail for another month with H. D. Gill, one of our packers acquainted with every corner of the range. We gave other lakes and peaks of that vicinity a thorough combing, via Rae lake, down the south fork of the Kings river, returning by the Giant Forest, Mineral King, and Rattlesnake Gulch, and Volcano creek and the Cottonwood lakes, to have a better acquaintance with the golden trout, (*roosevelti*). I also dropped off at Las Vegas, Nevada, and picked up a few shells.

The opportunities for collecting with the Sierra Club were excellent. When the party moved it was but a ten-mile journey for the day. The packers with about 100 horses and mules carried our baggage, provisions and cooking-ranges. A dozen elderly people and the packers had riding horses, the rest of us men, women, boys and girls walked. There were five good cooks and several commissaries, and our only stunt in drudgery was to pick out a soft spot in the timber at evening, unroll the sleeping bag, and roll it up again at five in the morning. At the most attractive points camp was made for a day or two, or sometimes longer.

In this portion of the Sierras at least, the snails cling to the meadows and wet ground about the springs. We had no success in the rocks or timber. Strangers to the habits of California snails, much time was wasted in our efforts to catch them. A Sierra meadow is much the same as the eastern peatbog and though apparently dry in spots, appearances are deceiving. It is all wet collecting. Wood-fungi, Pisidiums, Physas and land shells were found under the same sticks and all apparently thriving in the wetness.

Nevada is more upon the plan of Arizona and Utah. Shells were found plentiful at timber line under stone and decaying vegetation. As to moisture and cover the Sierra Nevada is favorable to snail growth, travel, distribution. Simply, it seems one of those situations where the large snails had never been—never settled. The collections for the season were identified by Dr. H. A. Pilsbry and myself jointly as follows :

[All stations are within Tulare county, California except when otherwise noted.]

Epiphragmophora callistoderma n. sp. Kern River, 2 miles N. of Bakersfield, Tulare Co., Cal.

Oreohelix handi n. sp. Smaller and thinner than *O. hemphilli*. Charleston Mt., Lincoln Co., Nev. This and the preceding species will be described in the next number.

Epiphragmophora (*Helminthoglypta*) *tudiculata* (Binn.), var. Panther Creek, Giant Forest, Tulare Co. A single dead specimen of a small, compact race, not agree closely with any of the named forms of *tudiculata*.

Pupilla sonorana St., var. Charleston Mt., Lincoln Co., Nevada.

Gastrocopa pilsbryana St., same locality.

Vertigo modesta parietalis Anc., Rae Lake.

Vertigo modesta castanea St., Bubbs Creek Falls, mouth of Big Arroyo, Stas. 5, 6, 7 Funston Meadows, Woods Creek, Panther Creek and Ranger in Giant Forest, Onion Valley in Kearsarge Pass, Inyo Co.

Vallonia cyclophorella Anc., Inyo Mts., Inyo Co., Calif., Charleston Mt., Lincoln Co., Nev., mouth of Big Arroyo, Tulare Co.

Vallonia gracilicosta Reinh., First Kern Butt, Funston Meadows.

Agriolimax campestris (Binn.) var. *occidentalis* (Cooper), Spring Brook at Las Vegas, Nev.

Vitrina alaskana Dall, Bubbs Creek Falls, Funston Meadows, Little Kern Lake, First Kern Butte, Rae Lake, forks of Tulle River, Panther Creek, Woods Creek, Mouth of Big Arroyo, Waucoba Springs, Inyo county Calif., Onion Valley, Inyo county, Charleston Mts., Lincoln Co. Nev.

Euconulus fulvus (Drap.), Bubbs Creek Falls, Stas. 5, 6 and 7 Funston Meadows, Woods creek, mouth of Big Arroyo, forks of Tulle River, Waucoba Springs, Hills near Waucoba Springs and Onion Valley in Inyo Co., Calif., and Charleston Mt., Lincoln Co., Nev.

Euconulus chersinellus (Dall.), Forks of the Tulle River, First Kern Butte, Little Kern Lake, Bubbs Creek Falls.

Pyramidula cronkhitei (Newc.), Funston Meadows, Woods Creek, First Kern Butte, Little Kern Lake, mouth of Big Arroyo, Bubbs Creek Falls, Summit Meadows, Ranger and Panther Creek in Giant Forest, Onion Valley, Inyo Co.

Pyramidula shimeki cockerelli Pils., Tyndall Creek, Tulare Co., Waucoba Springs, Inyo Co.

Punctum californicum Pils., Forks of Tulle River, Little Kern Lake, Bubbs Creek Falls, Onion Valley, Inyo Co.

Succinea stretchiana Bld., First Kern Butte, Stas. 6, 7 and 16 Funston Meadows, Summit Meadow, Giant Forest, Waucoba Springs, Inyo Co. and Charleston Mt., Nev.

The lot comprises a large variety of forms between *avara* and *oregonensis* as well as small specimens that agree with an authentic *S. stretchiana* received from Bland. The Succineas of this region need revision.

Succinea oregonensis Lea, Bakersfield, Big Arroyo and Woods Creek. Also Las Vegas, Lincoln Co., Nevada.

Succinea gabbi Tryon, Tank Springs, Mazuka Canyon, Inyo Co., California.

Physa virginea gabbi Tryon, Bakersfield, Cal., Las Vegas, Nev.

Planorbis traski Lea, (young) Bakersfield, Cal.

Pisidium roperi St., Funston Meadows, Summit Meadow, Onion Valley.

Pisidium rowelli St., Stas. 6 and 7 Funston Meadows, Siliman and Panther Creeks, and Onion Valley.

Pisidium insigne Gabb, First Kern Butte.

MRS. MARIA BALDRIDGE.

We have recently received notice of the death of Mrs. Maria Baldridge of Los Angeles, California, April 7th, in her 82nd year. Mrs. Baldridge was one of the enthusiastic collectors of the Los Angeles group, who up to an advanced age devoted her attention to the shells of California with much success, several additions to the fauna being due to her assiduity and now bear her name. She had an interesting if not large collection, and will be missed by her associates not only for her interest in conchology but for her kindly and cordial character.

W. H. Dall.

PUBLICATIONS RECEIVED.

Mollusca of Australian Antarctic Expedition, 1911–1914, Scientific Rept. Ser. C. Zoology and Botany, vol. iv, pt. 1, 1916. By C. Hedley. A valuable contribution to our knowledge of the Antarctic Mollusca. The dredgings were made along the coast of Adelie Land in Commonwealth Bay and Davis Sea and off Shackleton's Ice-shelf. Collections were also made at Macquarie Island. Two new genera *Ovirissoa* and *Friginatica* and forty-one new species and two varieties are described. Illustrated by nine plates with excellent figures of the new species and many of the other species from that region.

SUMMARY OF THE MOLLUSKS OF THE FAMILY ALECTRIONIDAE OF THE WEST COAST OF AMERICA. By W. H. Dall. Proc. U. S. Nat. Mus. vol. 51, pages 575–579, 1917. Dr. Dall divides the old genus *Nassa*, (a name first applied by Bolten to what was later called *Iopas*) from a conchological standpoint pending anatomical researches, into two groups *Arcularia* with a heavy callus about the aperture and a hump on the back of the last whorl and *Alectrion* for the reticulate species with little or no callus, no hump, and simple or nearly simple outer lip. Eleven new species included in the genera *Phos*, *Nassarina* and *Gouldia* are described.

TEREBRIDAE OF THE JAPANESE EMPIRE. By Y. Hirase. The Hirase Museum 1917. Illustrated by 8 plates with 131 figures. Except for an introductory letter by Marshall R. Gaines the text is in Japanese, but with the excellent figures, explanation to plates and bibliography, the work can be readily used by Western students.

DESCRIPTIONS OF NEW WEST AMERICAN MARINE MOLLUSKS AND NOTES ON PREVIOUSLY DESCRIBED FORMS. By Paul Bartsch. Proc. U. S. Nat. Mus., vol. 52, pages 637–681, plates 42–47. May 1917. Fifty three new species are described, embraced in the following genera: *Pyramidella*, *Turbonilla*, *Odostomia*, *Cerithiopsis*, *Bittium* and *Alvania*. One new subgenus, *Ugartea*, is proposed, the type being *Turbonilla juani* Bartsch.

NOTES.

A SINISTRAL AMPULLARIA.—In his recent review of the genus *Lanistes*, (Proc. Mal. Soc. London, XII, p. 65), Sowerby remarks that the only sinistral *Ampullaria* of which he had heard was that described by Nevill as *A. globosa* subvar. *sinistrorsa*. A sinistral *A. conica* was noticed by Miss E. J. Letson in NAUTILUS XI, p. 33. Through the kindness of Mr. W. F. Webb of Rochester N. Y., I have lately received a fine sinistral specimen of *Ampullaria ampullacea* (L.). It is a fresh, beautifully colored example, wholly without erosion and measures 68 mm. in height by 59.5 mm. in diameter. It was collected at Manuquid, Sarsogon, Luzon.—BRYANT WALKER.

VALVATA TRICARINATA PERCONFUSA n. n.—I find that in 1897 Westerlund, (Ann. Mus. St. Petersb., p. 130), described a Siberian species as *Valvata confusa*. I would therefore change the name of the variety of *V. tricarinata* that I described as var. *confusa*, in 1902 (NAUT. XV. p. 124), to var. *perconfusa*.

THE PONSONBY COLLECTION has been obtained by Dr. Bryant Walker. It contains 7,500 named species and varieties, represented by 12,500 lots. Mr. Fulton, who inventoried it, says: "probably the finest and most complete series of Helicoids ever collected by one individual."

AN ARBOREAL POLYGYRA.—At the beginning of April, taking advantage of the short spring vacation, Mrs. Cockerell went to the Brownsville region of Texas in search of bees and flowers. The bees collected include four new species and a subspecies, and two species new to the U. S. Incidentally, snails were obtained, and from San Benito come *Praticolella berlandieriana*, *Polygyra texasiana*, etc. The specimens of *P. texasiana* are mostly dead shells and of the ordinary form and size, but in the epiphytic Tillandsias on the trees occured a peculiar small variety, with max. diam. 7.3 to 8 mm.; pale brown color, strongly ribbed above, striate beneath. I opened the base of one, and there is no trace of a columellar tubercle such as occurs in *P. mooreana*. This small arboreal race may be called *P. texasiana tillandsiæ*, nov. Type no. 116250 A. N. S.

T. D. A. COCKERELL.

WASHINGTON MEETING, 1914

Bryant Walker Geo. H. Clapp T. H. Aldrich John B. Henderson
H. A. Pilsbry Wm. H. Dall Paul Bartsch

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NOTES ON THE VARIATION OF ISCHNOCHITON CONSPICUUS CPR.

BY E. P. CHACE.

To the naturalist the study of variation and environment and their relation to each other is always interesting and to the conchologist who studies his shells in their natural surroundings as well as in the cabinet many things are revealed. It is not, often, however, that variation in form may be so easily traced to qualities of environment as in the following instance.

Ischnochiton conspicuus, Cpr. is common at San Pedro and is usually found on the under side of rocks in sandy tidepools. In this situation they grow quite regularly, showing but slight variation in form. They are active fellows and evidently sensitive to light; for if the rocks to which they are clinging are turned over, they soon glide away, always taking the shortest route to the under side of the rock.

While cleaning a lot of this species taken at San Pedro last fall two specimens were noticed which differed so widely from the others that they might easily have been mistaken for another species. They were much wider and lower-arched than the typical form and the posterior corners of the valves were rounded off, making the lateral areas very narrow.

Hoping to find more specimens of this odd form, a trip to Point Firmen was devoted wholly to the collection of chitons, with interesting results. The usual species were found in the tidepools including numerous specimens of *Ischnochiton conspicuus* of the ordinary form. Ledges of soft rock beyond the tidepools contained many old pholad holes and in these were found the form for which I was searching. Twenty specimens of various sizes were collected from as many pholad holes. In the larger specimens the foot had become so greatly enlarged to fit the concave bottoms of the holes that it was impossible for them to curl up in the usual manner. Some of these specimens were so badly eroded by the sand and gravel which wash in and out of the holes that the anterior valve was reduced to two thirds of its normal height.

In color pattern, sculpture, and mantle characters these specimens were identical with those from the tidepools, and, as will be seen by referring to the table of measurements, the smaller specimens approach quite closely to the proportions of the typical or tidepool forms.

Typical or Tidepool Forms. (Lot 1)				Specimens From Pholad Holes. (Lot 2)			
Lon.	*Lat.*	*Index.*	*Div.*	*Lon.*	*Lat.*	*Index.*	*Div.*
99	35	2.52	130°	65	33	1.97	135°
83	33	2.51	130°	63	32	1.97	155°
83	30	2.76	125°	62	27	2.29	140°
62	22	2.80	125°	60	30	2.00	130°
59	23	2.56	130°	56	29	1.93	130°
38	14	2.71	130°	42	17	2.47	130°

In brief, Lot 1 shows an angle of divergence constant at 125° to 130°, where Lot 2 shows an angle varying from 130° to 155°, and a proportion of length to width 2.51 to 2.80 as against a proportion ranging from 2.47 to 1.93.

The noticeable differences to the eye are first, the narrow and sharply raised lateral areas, and second, the shape of the posterior edge of the median valves. In the tidepool specimens the posterior or exposed edge of each valve is a straight line, while in specimens from the pholad holes this line becomes a double convex curve, the most posterior portion of the valves being about midway between the beaks and the girdle.

These differences seem to be explained by the following facts. In collecting, the tidepool specimens are usually found on the under side of large rocks and well back from the edge. This situs protects them from the light which they evidently find objectionable, but it makes necessary a nightly journey of about two feet to the nearest growth of algae on which they feed. This activity stretches the girdle downward from the edges of the valves and permits a free play of all the valves so that the mantle deposits its shelly secretions according to the normal habit of the species. The specimens living in the pholad holes, however, apparently never leave them as they are frequently found feeding on the fucus which overhangs them. It protects them from the light, so they have no occasion to move about, and the sand which is washed down into these burrows would make re-entrance almost impossible. A series of these specimens shows a gradual change of form. The young specimens are very similar to young specimens from the tidepools, but as they increase in size they become crowded so that the valves press against each other, especially at the posterior end where the valves are bent back across the bottom of the hole. This crowding of the valves upon each other and the crowding of the girdle against the outer edges of the valves so displaces portions of the mantle as to cause the changes noted above.

Several specimens from each situs were disjointed and a study of the individual valves showed that those from pholad-hole specimens were thicker and had shorter sutural plates and a wider sinus, this last being especially noticeable in the valves from the posterior end. Apparently this change in the sinus is the result of the broadening of the connecting ligaments due to compression by the crowding valves.

A count of the insertion plates of these disjointed specimens was made and considerable variation noticed. So much, in fact, that more specimens were pulled apart for the express purpose of counting these plates. Representative counts were as follows: 9 slits on the anterior valve, 2–3 on the median valves, and 10 on the posterior. Others show 12, 2–3, 8; 11, 2–3; 14, 3–4, 11. Absolutely no difference in this character could be found between specimens from the tidepools and those from the pholad holes.

On page 64 of vol. xiv of the Manual of Conchology, Dr. Pilsbry says, "Carpenter has given a varietal name to a broad, worn specimen which he thus describes:

"Var. *solidus.* Very solid, wide, ashen; inside whitish, the posterior valve with 10, central valve 2–3, anterior valve 12 slits. Length 72, breadth 40, divergence 130°. Carpenteria, near Sta. Barbara, Cal. This is scarcely more than an individual variation. The mantle (girdle) is normal. The sculpture is worn away except at the edge. It has evidently lived in a very exposed situation."

From this description and the figure which he gives of the valves it would seem that this is the same form as my specimens from the pholad holes. I fully agree with Dr. Pilsbry that it is hardly worthy of varietal rank. It is, however, too distinct in appearance to be labeled simply *Ischnochiton conspicuus*, Cpr., and I have therefore marked these specimens from the pholad holes *I. conspicuus*, Cpr., *form solida*, Cpr., using the term *form* as advocated by Dr. Cockerell, "to designate variations plainly due to environment."[1]

LAMPSILIS VENTRICOSA COHONGORONTA IN THE POTOMAC RIVER.

BY WILLIAM A. MARSHALL.

In 1912 Dr. A. E. Ortmann recorded[2] finding in the Potomac River a variety of *Lampsilis ventricosa*[3] to which he gave the name *cohongoronta.* His records were:

September 4, 1909. Potomac River, Hancock, Washington, Co., Md. (about two dozen).

May 9, 1911. South Branch, Potomac River, Southbranch, Hampshire Co., W. Va. (about a dozen).

August 16, 1911. Shenandoah River, Harper's Ferry, Jefferson Co., W. Va. (a single male, below medium size).

May 6, 1912. South Branch, Potomac River, Romney, Hampshire Co., W. Va. (about a dozen).

Dr. Ortmann remarked "It is probable that this species will

[1] NAUTILUS, vol. xx, pp. 58–60.

[2] NAUTILUS, xxvi, pp. 51–55, 1912.

[3] In a later work Ortmann classifies both *ventricosa* and *cohongoronta* as varieties of *ovata* Say.

turn up elsewhere in the Potomac. The localities known at present are all to the west of the Blue Ridge Mountain, that is to say, within the Great Alleghany Valley and the Alleghany Mountains."

Perhaps the above prediction has been realized in a specimen found at Great Falls, Md., by Mr. Manly D. Barber of Knoxville, Tennessee, in Sept. 1915. At that time Mr. Barber brought to the National Museum a basketful of naiades which he had collected the same day at Great Falls, about 18 miles above Washington. Among the shells, which were mostly dead ones, was a specimen of *cohongoronta*, dead, but in a fine state of preservation and with the periostracum nearly unblemished except for the usual erosion at the beaks. Its appearance indicated that it had been recently alive and that its home had been in the immediate vicinity of the place in which it was found. Had it been washed down from Harper's Ferry, some 50 or more miles above Great Falls it probably would have shown ill effects from so long a journey.

When found the two valves were separated, but so accurately do they fit together that it is evident they belong to the same individual. The fact that the valves were separated and yet were found near each other is additional (though not conclusive) evidence that they had not been transported any great distance by currents. At any rate this is the first recorded finding of the species in the Potomac River so far south as Great Falls.

The specimen is rather a small one. It measures, length 71 mm.; height 47 mm.; diameter 28 mm. It is in the collection of the U. S. National Museum, catalogue number 273834.

COLLECTING DAYS ABOUT THE NAVAL STATION, GUANTANAMO BAY, CUBA.

BY JOHN B. HENDERSON.

In March last, while waiting for a boat to take us to Haiti, Dr. Bartsch and I spent nearly three weeks at the U. S. Naval Station at the entrance to Guantanamo Bay. We employed our time in exploring the country about and subjecting it to a high degree of intensive collecting. In this eastern corner of Cuba the coastal strip of some ten miles in width is a semi-arid region with a complex of mountains that are either quite bare of trees or, at most, covered with a scrub forest and low-growing spiny shrubs, with, here and there, a wealth of cacti that almost suggests Lower California. The rock foundation of all this region,—barring some shore strips of very recently elevated coral, is everywhere composed of about everything in the line of rocks except limestone. This is a condition that in the Antilles usually spells disappointment and failure to the snail hunter. North of the big bay and then across several miles of low flat country, just where the foothills of the sierras begin, lies the city of Guantanamo, interesting to us as the home of Charles Ramsden, the naturalist. Just north of Guantanamo is a great rampart of high limestone mountains which beckon most alluringly to the collector. Sections of this rampart, somewhat arbitrarily marked off, are the "Monte Verde," the "Monte Toro" and the "Monte Libano" of classic fame in Cuban Natural History.

In company with Ramsden we spent a wonderful day on nearby Monte Libano but a revolution that was then devastating the province and filling the land with incendiaries and bandits drove us out of this richer field and obliged us to confine our attentions thereafter to the arid country lying within the safer limits of the Naval Station,—some fifty square miles upon which Uncle Sam holds a long lease.

It seems to be a natural law that arid or desert lands support but few species of snails, but that these few species exist in great numbers and that they take on a very considerable range of variation. All this is perfectly true of this region. We were constantly amazed by the great number of specimens to be found; and each day of exploration in some new valley or over some range of hills added even greater figures of abundance to our already astonishing records.

The "prevailing" snail of this region is *Cepolis ovumreguli* Lea. Its shell is very suggestive of the true helix of Spain or Algeria of the *lactea* group. The variation is exceedingly great in color, size and shape, and it would make a dozen excellent species if the intermediates were left out of account. Those living near the coast and among the cacti of the most arid parts of the district are of whiter and more dull color, are more banded and show a decided tendency to abnormalities, especially about the apertures. Specimens from further inland are more polished and shining, even as though varnished, and are much more given to a dotted or fly-specked type of ornamentation than to bands. A fence-post or a dead tree-limb with a hundred specimens closely assembled in aestivation was no unusual sight. We learned finally to pay no attention to them. Upon the low bushes in certain localities the lovely little *Cepolis lucipeta* Poey cling like berries. These are the largest and finest of the species I have ever seen. The range of color variation in this delightful little snail is also very great, but the colors never blaze out in the vivid flash of the Polymitas. The blues and purples and chestnut browns are subdued but very rich and splendid. One very noticeable color form is the subsp. *velasqueziana* of Poey where the many broken bands of the type coalesce into two broad bluish-black zones of solid color.

As nearly all the vegetation of this dry region bears thorns we did not at first discover that many of these thorns were in reality Macrocerami. When we did find this out we could see nothing else. Bartsch and I finally agreed, and shook hands upon it, that we would gather no more of them, and a stiff penalty was placed upon any violation of the compact. Two hundred and more from one bush is an earlier record before we really got started. This is the *Macroceramus festus* (Gundl.) Pfr., blue and yellow and buff in color. Another arboreal snail of this section is *Polymita versicolor* Born and it is probably very abundant in places although we never saw more than fifteen or twenty on any one tree. This is to me the least attractive species of that wonderful genus of richly painted snails. The brilliant yellow and pink are too primitive and the two colors do not seem to harmonize very well. It always impresses me as an experimental species that was laid aside in nature's laboratory as not wholly a success.

There were some ground snails too, but to secure living ones required much grubbing up of tufts of tall grass and shaking out their roots, like digging up miniature potatoes. These are the *Annularia putris* (Gundl.) Pfr. and the *Chondropoma marginalbum* Gundl.) Pfr., the latter apparently quite rare. There are no minute things beyond some few *Thysanophora inaguensis* Weinland.

Some days we spent gathering marines on the little pebbly beaches hidden far down under the lofty cliffs that mark this rugged shore line, and we obtained some unusual species washed up from the exceedingly narrow island-shelf; blue water is but a few hundred yards out. Among these are some *Conus cedonulli* Lam. Beach collecting is, however, an aggravation; and too much of it becomes a misdemeanor in the collector's ethical code, for it obliges an acceptance of something short of the best.

AMNICOLIDÆ FROM ONEIDA LAKE, N. Y.

BY HENRY A. PILSBRY.

The New York College of Forestry, under the direction of Professor Hugh P. Baker, is carrying on a biological survey of Oneida Lake and has issued an interesting bulletin[1] upon the relations of mollusks to fish, by Frank C. Baker. Some *Amnicolidæ* obtained during this work, and subsequent to the preparation of the bulletin were submitted to the writer. The collection proves to be of considerable interest, including some species not before noticed.

AMNICOLA BAKERIANA, n. sp.

The shell is umbilicate, turrited-conic, thin, whitish-corneous, somewhat translucent, with unevenly developed striation, dis-

[1] The relations of mollusks to fish in Oneida Lake. By Frank Collins Baker. Technical Publication No. 4, New York State College of Forestry at Syracuse University. Pp. 366. Syracuse, N. Y., 1916. We are informed that it may be obtained free by those interested in the study of Mollusca by applying to the dean of the college, Dr. Hugh P. Baker.

tinct, and close in places, weaker and sparse elsewhere. The summit is decidedly obtuse, as in *A. limosa*, the first whorl being nearly planorboid; subsequent whorls are evenly, strongly convex. The aperture is very shortly ovate, almost round, its length contained almost 2½ times in that of the shell. Peristome thin, in contrast with the preceding whorl for a short distance.

Length 4.3, diam. 2.7 mm. ; 5 whorls (type).

Length 3.75, diam. 2.3, length of aperture 1.35 mm.; 4⅔ whorls.

Length 4.1, diam. 2.75, length of aperture 1.65 mm.; 4⅔ whorls.

Oneida Lake; off Short Point in 8½ ft., mud bottom. Lower South Bay, in 18 ft., on mud bottom.

This species resembles *A. limosa* in the conspicuously obtuse apex, but differs by the more elevated, turrited spire and the smaller calibre of the whorls, hence smaller aperture. It is also a weaker shell, with more whorls in specimens of the same length.

There is also an abundant smaller form, resembling the typical form in texture, apex and shape of the whorls, varying in form, but relatively broader than the type. There are some intermediate examples, but as Mr. Baker considers it desirable to have a designation for this form, it may be called *A. bakeriana* form *nimia*. The type measures: length 3, diam. 2.5, length of aperture 1.4 mm.; 4 whorls.

AMNICOLA CLARKEI, n. sp.

The shell is narrowly umbilicate, conic, a little obtuse at the apex, corneous, nearly smooth. The whorls are very convex, separated by a deep suture, the last whorl tubular. The aperture is distinctly oblique, almost circular, the upper end rounded, but a trifle more narrowly so than the base. It projects but little beyond the preceding whorl laterally. The peristome is thin, continuous, scarcely or barely in contact with the preceding whorl above.

Length 3.1, diam. 1.9, length aperture 1.1 mm.; 5 whorls (type).

Length 2.8, diam. 1.6, length aperture 0.85 mm.

Operculum having the spiral rather large, the nucleus being above the lower third.

This little species resembles *Lyogyrus* by its tubular whorls of small calibre. The whorls are more convex and increase less rapidly than in *Amnicola walkeriana*, which is also less slender. *A. schrockingeri* Fild. has less deeply convex whorls, and the apex is more acute. *A. bakeriana* is much larger, with a more obtuse apex.

Found in Short Point Bay, Oneida Lake, near shore, in 3 feet of water, bottom of sand with algae; also in Lower South Bay, etc. Collected by Mr. F. C. Baker.

It is named for Dr. John M. Clarke, the distinguished Director of the Museum of the State of New York.

AMNICOLA ONEIDA, n. sp.

The shell is typically more slender than *A. lustrica*, turrited-conic, narrowly umbilicate, corneous, minutely striate. The apex is slightly obtuse, but the first whorl projects visibly, as in *lustrica*, whorls *very convex*, parted by a *deep suture*. The aperture is ovate, small, its length contained more than 3 times in that of the shell; upper extremity narrowly rounded. The peristome is continuous, thin, very briefly in contact with the preceding whorl above.

Length 4, diam. 2, length of aperture 1.25 mm.; 6 whorls.

Lower South Bay, Oneida Lake, N. Y., collected by F. C. Baker, 1916.

This species is typically narrower than *A. lustrica* Pils,, with a smaller aperture and shorter whorls; but it is chiefly distinguished by the more convex whorls (deeper suture), and the rounded instead of angular posterior end of the aperture. In *Paludestrina nickliniana* the last whorl is much longer. Possibly it may be a subspecies of *lustrica*, yet it has so distinct an appearance that a special name seems desirable. There are also wider examples, which still differ from *lustrica* by the deeper suture and aperture.

NEW GENERA AND SPECIES OF CENTRAL AMERICAN NAIADES.

BY L. S. FRIERSON.

In 1893 Messrs Crosse and Fischer divided the Mexican Naiades into quite a number of sections, to which they assigned names. Almost simultaneously (in 1900) von Martens and C. T. Simpson, in treating the Central American Naiades, accepted some of these sections of Crosse and Fischer, raising them to generic or subgeneric rank. Because of paucity of material, considerable diversity of opinion concerning the specific identity of several species may be noted in the works of these authors. Furthermore, their work of classification being done independently and from different points of view, the same species was sometimes placed by them in different genera.

Thanks to the arduous labors of A. A. Hinkley, who has again and again enriched our cabinets with material and data from these tropical countries, we are enabled to offer the following suggestions concerning some of the genera of these shells, and also the description of an unpublished species.

NEPHRONAIAS. This genus has for its type the *Unio plicatulus*, Küster, a species identified by von Martens as belonging to the Lampsiline shells, as *aztecorum*. Mr. Simpson however believed it to be nearly allied to the *persulcatus*, a markedly Unioid shell. In this the writer follows Mr. Simpson.

The genus *Nephronaias* as constituted by Mr. Simpson embraces two quite distinct groups, divisible as follows.

Nephronaias (*s. s*) embraces *plicatulus*, *persulcatus*, *melleus*, *dysoni*, *ortmanni*, *ravistellus*, etc. Ample material of these two latter species show that they are anatomically very closely allied to *Elliptio*. There is no sexual difference of shape, and the gill is gravid in its whole length. *Nephronaias* differs from *Elliptio* in its sulcated disc, in its beak sculpturing, etc.

Included in *Nephronaias* by Simpson are, however, shells of a totally different type, such as *medellinus*, *gundlachi*, *sapotalensis*, etc. These latter are sexually dimorphic, smoother, more generally rayed, and the gravid uterus is of Lampsiline type.

The position of the dorsal scars within the beak cavities is different, in the examples of the pseudo *Nephronaias* seen by the writer. *Nephronaias* (*s. s.*) posseses an (accessory?) adductor scar attached to the frontal portion of the cardinal teeth, which is either absent or obsoletely marked in the second assemblage. For this latter group the writer, therefore, proposes to use the generic term of *Actinonaias* Crosse and Fischer, 1893, type *U. sapotalensis* Lea. The female of this species has been described by Dr. Ortmann (1912). *Actinonaias* embraces, besides the type, *medellinus*, *gundlachi*, (accepting Simpson's interpretation of this latter species), and others.

Psoronaias, Crosse and Fischer (1893). This group of remarkable shells, embracing *crocodilarum*, *psoricus*, *semigranosus*, etc., was provisionally treated by Simpson as a group of *Elliptio*, but their remarkable sculpturing, and the deap beak cavities of some of their species, led him to observe that it was possible that the group should, after all, be placed in *Quadrula*.

I follow von Martens, in giving generic rank as above to the group. The type is *Unio psoricus*. To this genus we are enabled to add a species hitherto undescribed, under the name of

Psoronaias kuxensis, n. sp., Pl. VII, figs. 1, 2.

Shell small, compressed, rough, brown, biangular. Length 50, height 30, diam. 17 mm.

Shell hyperbolically rounded before, the extreme frontal point below the centre. Dorsum slightly arched, descending behind the ligament to the widely biangular posterior; the upper angle of which is midway the height, the lower angle very little above the base, which is nearly straight. The beaks are small, low, acute, approximate; and *apparently*, concentrically ridged. Epidermis dark brown (olivaceous and obsoletely rayed in the young), rough, the lines of growth numerous and well impressed. The discs are covered with fine pustulations, more pustular in front, biradially linear behind. The post ridge is low, but distinctly double, making the shell biangulate behind. The teeth are double in the left valve, single in the right. The cardinals are deeply sulcate and stout. Laterals slightly curved or nearly straight, separated by an interdentum. Nacre purple, beak cavities rather deep. Dorsal scars numerous, extending in a row from above the centre of the cavity down and forward upon the base of the cardinal teeth. Three well impressed muscle scars in front, two behind, the later almost confluent. Habitat, Kux Creek, Chama, Guatemala. Collected by Mr. A. A. Hinkley, Feb. 6, 1917. A few dead specimens were obtained on the bank of the Isaibha River (Chama) of which the Kux Creek is a tributary. Type in Academy Natural Sciences. Cotypes in collection of A. A. Hinkley, the author and U. S. N. Museum.

I place this species in *Psoronaias* Crosse and Fischer, type *U. psoricus*, because of its evident relationship to *crocodilarum*, and *distinctus*, differing mainly from the latter in size and degree of inflation, being much inferior in both respects to *distinctus*.

ON THE RATE OF GROWTH OF POND UNIOS.

BY L. S. FRIERSON.

During the latter part of March 1916, the writer, for the purpose of constructing a fish pond, excavated a barrow-pit near the bank of a small creek, about ten feet wide, and at the time nearly dry. The barrow-pit was perhaps one hundred feet long, fifty feet wide and three feet deep. Early in April, 1916, the pit became full of water, overflowing from the adjacent creek, and together with two subsequent overflows, supplemented with seepage from the newly constructed fish pond, the pit remained more or less full of water, until May 25, 1917, when it was drained by a ditch into the nearby creek. From the dried bottom of this pit some thirty Unios were picked up by the writer. Ten of these were *Unio tetralasmus* Say, and the rest were *T. texasensis* Lea. All the specimens were of remarkably uniform size and appearance. The *texasensis* being about one and a half inches, and the *tetralasmus* two and a half inches long. Exact dimensions of a *texasensis*: length 43, height 24, diam. 16 mm.; of *tetralasmus* 75, 40, and 25 mm.

Both of these species had attained puberty. A female *texasensis* has its gills fairly full of young glochidia. A *tetralasmus* had several (three or four) ovisacs with a few (remaining) glochidia. In assigning an age to these shells it is quite sure that the *tetralasmus* discharges its glochidia in March and early April, so that when picked up on May 25, these shells were just about fourteen months old, from the date of discharge from their mother's gills.

In the case of the *texasensis* (which spawns somewhat later) it is possible that these were dropped by fish of which, at least six species) obtained access to the pit on May 7, 1916 (on which date an overflow occurred), thus making about thirteen months. At any rate the maximum age of either species is fourteen months from their mother's ovisacs. One of the *U. tetralasmus* is shown of natural size in Pl. VII, fig. 4.

Another observation concerning pond mussels might here prove of interest. A large pond was cut into two by a railroad enbankment, a culvert preserving the level and providing communication between the two. In the lower and larger pond a half-bushel of Yonkapin (*Nelumbium luteum*) seed was sown. It was six years before these seed germinated. These plants, during the summer, cover the entire surface of the pond with their broad peltate leaves. In this pond the writer planted a colony of a dozen *Anodonta grandis*. Several years after, taking advantage of extreme low water, the writer made a careful survey of these twin ponds, with the result that hundreds of Anodons could be found in the upper pond, but not a single one was found in the lower pond. Either the shade killed the young shells, or else the glochidia-laden fish avoided the shade of the lotus plants and congregated in the upper pond (there are no Nelumbii in the upper pond). Is not this avoidance of shade a reason for the paucity of unios in the tropics?

A NEW SOUTH AFRICAN NESOPUPA.

BY H. A. PILSBRY.

NESOPUPA FARQUHARI, n. sp.

Among Pupillidae sent by Mr. J. Farquhar there is a new species from Grahamstown which may be defined by comparison with *Nesopupa griqualandica* (Melv. and Pons.).[1] The new form is ovate, of about the size of the other species, which it resembles in sculpture and in the lamellae of the parietal wall and columella. The two palatal plicae are subequal, the upper emerging to the lip, the lower one also long, reaching to the inner edge of the peristome. There is a very small nodule on the base of the columella. In *griqualandica* the lower palatal plica is short and very deeply immersed and there is a distinct though small basal plica within the base, in front of the lower palatal plica. In *griqualandica* there is a deep sulcus outside, over the upper palatal plica, and a flattening or short groove over the lower palatal; but in *farquhari* the sulcus is far less impressed except quite close to the lip. The color is reddish brown. Length 1.65, diam. 0.9 mm.

Mr. Burnup's figure 9, in Melvill and Ponsonby's Revision,[2] may perhaps represent this species, while their description in the same paper appears to comprise both *griqualandica* and *farquhari*, though chiefly relating to the former. Their pl. I, figs. 8 and 10 represent *griqualandica*. The new form is named in honor of one of the most successful South-African collectors. It will be figured in the Manual of Conchology.

A NEW GUNDLACHIA FROM GUATEMALA.

BY BRYANT WALKER.

GUNDLACHIA HINKLEYI, n. sp., Pl. I, figs. 10–16; Pl. III, fig. 1.

Shell subovate, being much wider posteriorly, the anterior margin rather shortly rounded, the right margin nearly rectilinear, but somewhat diverging anteriorly, the left margin obliquely expanded and broadly rounded, anterior margin wider and much more curved than the posterior; apex very excentric, depressed and decidedly turned toward the right side, bluntly rounded, smooth except for a few concentric wrinkles; color a very pale corneous, nearly pure white; lines of growth rather strong and

[1] *Pupa griqualandica* M. and P., 1893; the specimens used being from Pretoria.

[2] Ann. Mag. N. H. (8), i, p. 76, pl. i, 1908.

irregular; anterior slope with strong radial striae originating below the septate growth and extending to the anterior margin, similar striæ appear on the left lateral slope, but are scarcely, if at all, visible on the right slope; the septate portion of the shell is small in comparison with the adult expansion, it is narrow and the posterior portion covered by the septum is free from and projects over, but scarcely beyond, the posterior margin of the adult aperture; the first growth of the shell from the septate form is continued on the sides in a nearly direct continuation of the lateral slopes of the septate shell for some little distance, the anterior slope of this stage is also a continuation of the anterior slope of the septate stage but owing to the oblique position assumed by the septate shell is at first somewhat convex, as viewed laterally, later as the side slopes begin to expand, the anterior slope is continued in a nearly straight line to the margin; the left lateral slope of the adult shell below the secondary constriction is concave at first, becoming nearly straight toward the margin; the right lateral slope is less concave above and straighter and more oblique than the left; owing to the small size of the septum and consequent large aperture of the septate shell and the narrow first growth of the adult shell there is no distinct aperture to the septate portion visible in the adult shell from below, the whole interior of the adult shell appears to pass, practically unconstricted, directly into the septate portion; the posterior margin of the adult shell narrow and somewhat abruptly expanded and reflected.

Length 5.5; width 3.75; alt. 1.75 mm.

The septate shell is oblong, the sides being nearly parallel, but slightly expanding anteriorly, the right slightly convex and the left slightly concave; the posterior margin is regularly rounded; the anterior more broadly rounded; the apex depressed, bluntly rounded, excentric, reaching nearly to the right margin, smooth except for slight concentric wrinkles, lines of growth fine and regular; the anterior slope is slightly convex; the very short posterior slope below the projecting apex to the line of the septum is straight and oblique; the right lateral slope is steep and nearly straight, the left slope very convex; the septum is very short, being less than half of the length of the septate shell, convex on its lower surface, the margin is very short, being less than half of the length of the septate shell, convex on its lower surface, the margin is very concave and on the right side, extends further forward than it does on left, there does not seem to be the distinct thickening of the margin so noticeable in other species; aperture much larger than in any other species yet described.

Length 2; width 1.5; alt. .75 mm.

Type (43455 Coll. Walker) from the Maya Farm, Quirigua, Guatemala, collected by A. A. Hinkley. Cotypes in the collection of Mr. Hinkley.

This fine species is the first from either Central or South America, of which both the septate and adult forms are known.

It differs from all other described species except *crepidulina* Guppy in the small size of the septum and the consequent difference in the position of the aperture of the septate stage in the adult shell. The septum in the specimen figured appears very like the incomplete septum in the North American species, but as the three adult specimens before me are exactly alike in the position of the septate shell, this would seem to be the normal condition in this species. The specimen figured, which is 3.25 mm. in length, has apparently slightly passed the septate stage and begun the growth of the constricted portion of the adult shell and shows the beginnings of the radial striæ.

With the Gundlachias was associated a species of *Lævapex*, very like the *excentricus* Morelet. Whether it has any closer relations with the *Gundlachia* remains to be determined as the radula has not yet been examined. While the general aspect of the two species, if such they be, is very similar, the *Lævapex* has a very much more acute apex than the *Gundlachia*.

As shown by the figure, the radula of this species is quite typical of the genus.

A LIST OF SHELLS FROM THE EAST COAST OF FLORIDA.

BY BRYANT WALKER.

The late Dr. Charles A. Davis, the well known peat-expert of the U. S. Bureau of Mines, in addition to his special acquirements in geology and botany, was a good all-round zoologist and had a lively and unaffected interest in the work that any of his friends might be carrying on in that department. It was his kindly habit in his travels about the country to preserve any specimens that he came across that seemed to him likely to be of interest to any of his zoological friends. It will be remembered that the conchologists owe to him the rediscovery of the long lost *Planorbis multivolvis* Case, (NAUT., XXI, p. 16), and also the little *Lymnæa davisi* Walker, (NAUT. XXII, p. 17), which bears his name.

In the spring of 1911 Dr. Davis' professional duties took him to Florida and while there he collected quite a number of samples of "drift," which in due time came into my possession. Several of the localities represented in the collection, such as Maimi and St. Augustine, have already been reported upon by previous collectors and there seems to be no occasion to duplicate their work, but quite a number of the places visited by Dr. Davis have not been covered by any of the previous collectors in Florida and a record of the species found by him seems worthy of publication as a contribution to the distribution of the Mollusca along the east coast of the state.

I am indebted to Dr. George H. Clapp for the identification of the Gastrocoptas and Vertigos.

The list of localities and species represented in the collection is as follows:

MARSHES NEAR CHESTER SHOALS.

Euglandina rosea Fér.
Polygyra cereolus carpenteriana Bld.
Zonitoides minuscula (Binn.).
Zonitoides minuscula alachuana (Dall).
Vitrea dalliana ('Simpson' Pils.).
Pupoides modicus (Pfr.).
Gastrocopta rupicola (Say).
Gastrocopta pellucida hordeacella (Pils.).
Gastrocopta tappaniana (C. B. Ads.)?
Gastrocopta pentodon (Say).
Vertigo milium (Gld.).
Melampus coffeus (L.).
Detracia bulloides (Mont.).
Chrondropoma dentatum (Say.)
Plecotrema cubense (Pfr.).
Blauneria heteroclita (Mont.).
Microtralia minuscula (Dall).
Truncatella clathrus Lowe.
Truncatella caribæensis pulchella Pfr.
Truncatella bilabiata Pfr.
Littoridina monroensis (Ffld.).

Paludestrina? sp.? A single specimen that I can not approximate to any of the described species.

This is the first record, I believe, for *Plecotrema cubense* from the mainland of Florida. Originally described from Cuba, it was listed from the Bermudas by Dr. Pilsbry in 1900, (Trans. Conn. Acad., X, p. 504, pl. lxii, fig. 11), and there figured by him for the first time. Both he and Mr. John B. Henderson inform me that they have collected it on several of the Keys and I am indebted to both of them for the opportunity of comparing my specimen with theirs.

Chester Shoals Refuge Station.

Euglandina rosea (Fer.).
Polygyra auriculata (Pfr.).
Polygyra uvulifera (Shutt.).
Polygyra cereolus (Mühlf.).
Polygyra cereolus carpenteriana (Bld.).
Polygyra cereolus septemvolva Say.
Polygyra cereolus volvoxis (Pfr.).
Praticolella jejuna (Say.).
Melampus coffeus (L.).
Detracia bulloides (Mont.)
Lymnaea humilis Say.
Physa cubensis Pfr.
Planorbis tumidus Pfr.
Planorbis alabamensis Pils.
Chrondropoma dentatum (Say).
Truncatella bilabiata Pfr.
Truncatella clathrus Lowe.
Littoridina monroensis (Ffld.).

Between Chester Shoals and Cape Canaveral.

Polygyra cereolus (Muhlf.).
Polygyra cereolus carpenteriana (Bld.).
Polygyra cereolus volvoxis (Pfr.).
Polygyra uvulifera (Shutt.).
Zonitoides minuscula (Binn.).
Pupoides modicus (Pfr.).
Gastrocopta pentodon (Say).
Gastrocopta pellucida hordeacella (Pils.).
Gastrocopta rupicola (Say).
Melampus coffeus (L.).
Detracia bulloides (Mont.).
Blauneria heteroclita (Mont.).
Chrondropoma dentatum (Say).
Truncatella bilabiata Pfr.
Truncatella clathrus Lowe.
Truncatella caribæensis pulchella Pfr.

Amnicola. sp.? A single immature specimen.

CANAVERAL P. O.

Euglandina rosea (Fer.).
Polygyra cercolus septemvolva Say.
Polygyra cereolus volvoxis (Pfr.).
Polygyra cercolus carpenteriana (Bld.).
Pupoides modicus (Pfr.).
Helicina orbiculata Say.

EAU GALLIE.

Polygyra cercolus septemvolva Say.
Polygyra cereolus volvoxis (Pfr.).
Polygyra uvulifera (Shutt.).
Physa cubensis Pfr.
Helicina orbiculata Say var.

ISLAND OF EAU GALLIE.

Polygyra uvulifera (Shutt.).
Praticolella jejuna (Say).
Lymnaea humilis Say.
Physa cubensis Pfr.

PALM BEACH.

Euglandina rosea (Fer.).
Polygyra auriculata Say.
Polygyra cereolus carpenteriana (Bld.).
Strobilops floridana Pils.
Strobilops hubbardi (Brown).
Pupoides modicus (Pfr.).
Gastrocopta contracta (Say).
Gastrocopta rupicola Say.
Gastrocopta pellucida hordeacella (Pils.).
Gastrocopta pentodon (Say).
Vertigo milium (Gld.).
Vitrea dalliana ('Simp.' Pils.).
Vitrea indentata (Say).
Zonitoides arborea (Say).
Zonitoides minuscula (Binn.).
Zonitoides minuscula alachuana (Dall).
Guppya gundlachi (Pfr.).
Thysanophora granum (Streb.).
Physa cubensis Pfr.
Helicina orbiculata Say.

LONG KEY

Euglandina rosea (Fer.).
Polygyra cereolus (Mühlf.).
Polygyra cereolus carpenteriana (Bld.).
Strophia incanum (Binn.).
Pupoides modicus (Pfr.).
Gastrocopta pentodon (Say).
Gastrocopta rupicola (Say)?
Gastrocopta pellucida hordeacella (Pils.).
Gastrocopta pellucida hordeacella (Pils.) var. Small form.
Thysanophora incrustata (Gld.).
Thysanophora granum (Streb.).
Thysanophora dioscoricola (Guppy).

Guppya gundlachi (Pfr.).
Varicella gracillima floridana Pils.
Succinea campestris Say?
Melampus coffeus (L.).
Detracia bulloides (Mont.).
Microtralia minuscula (Ball).
Lymnæa columella Say.
Physa cubensis Pfr.
Helicina tantilla Pils.
Chrondropoma dentatum (Say).
Truncatella caribæensis "Sby.; Rve.
Truncatella caribæensis pulchella Pfr.
Truncatella clathrus Lowe.
Truncatella bilabiata Pfr.
Littoridina monroensis (Ffld.).

Amnicola. ***sp?*** A single specimen of a very small, globose form that may be an n. sp. Alt. 1 mm.

COLLECTING IN DIGBY, NOVA SCOTIA.

BY LILLIAN DYER THOMPSON.

While traveling through Nova Scotia and New Brunswick last summer, we stayed for about six weeks at Digby, N. S. Digby is about 200 miles northeast of Boston, and is situated near the Bay of Fundy, opposite St. John, N. B. The town is located on the southeast shore of the Annapolis Basin,—a sheet of water about twenty miles long and ten miles wide. This basin is connected with the Bay of Fundy by a channel about three-fourths of a mile wide at its greatest width. This channel, known as Digby Gap, is noted for its rapid tides,—the rate of flow through the Gap being about eight miles an hour. The tide fall at Digby is thirty feet. The shores of the Basin are sandy, with the exception of the two rocky promentories on each side of the Gap; the one which is nearest to Digby being Point Prim. The town is on a small peninsula on either side of which are two inlets of the Annapolis Basin, known as the Racquet, on the west, and the Jacquet, on the east of Digby proper. On the ebb tide these are almost dry, exposing long mud flats.

There is one island in the Basin, about opposite the Gap and at the mouth of Bear River, called Bear island. From this a long bar extends, called Bear Island Bar, which is covered to a depth of about six feet at low water, and is covered with eel-grass.

Near the Yacht Club pier were found many *Polinices heros*, and their red-brown "sand-collars." In the Jacquet were many *Litorina littorea* and *Litorina rudis*. On the exposed beach, nearer the town, we found *Mytilus edulis*. On the rocks, in the Racquet, we found *Thais lapillus* and a host of *Acmaea testudinalis* ranging in size from one-eighth of an inch to about an inch in diameter. In the mud, at the base of the rocks, were a multitude of *Buccinum undatum*, *Neptunea decemcostata*, ranging in size from one-eighth of an inch to about an inch in diameter. In the mud, at the base of the rocks, were a multitude of *Buccinum undatum*, *Neptunea decemcostata*, and *Colus stimpsoni*, all alive and half-buried. Some dead specimens of *Aporrhais occidentalis* were also found, five of them being full-grown.

On the suggestion of Capt. Danforth, we constructed a dredge, and endeavored to dredge Bear Island Bar from his motor-boat. Here we found quantities of *Lacuna vincta*, *Alectrion obsoleta*, *Cylichna alba*, and two *Polinices triseriata*.

There were some soldiers encamped at Digby, and they used to gather *Litorina littorea* and steam and eat them, without any flavoring. They sometimes ate *Thais lapillus* also. One day, after a rain, we found two *Helix hortensis* crawling along the road.

A NEW TYPE OF THE NAYAD-GENUS FUSCONAIA. GROUP OF F. BARNESIANA LEA.

BY A. E. ORTMANN.

During the study of the nayad-fauna of the upper Tennessee, the present writer found that there exists, in this region, a peculiar type of shells, belonging to the genus *Fusconaia*, the various forms of which have been described previously under a great number of specific names, which, however, seem to belong all to one species. In addition, among material received from L. S. Frierson from the Ozark Mountains, a form was discovered which presented the same structure.

The oldest name for the upper Tennessee form is *Unio barnesianus* Lea. A more detailed account of its various phases is to be given elsewhere, and it suffices here to mention only those forms which belong here. According to obesity, I distinguish three local, or ecological races:

1. Fusconaia barnesiana (Lea) 1838.

U. barnesianus Lea, '38. *U. meredithi* Lea, '58. *U. pudicus* Lea, '60. *U. Lyoni* Lea, '65. *U. tellicoensis* Lea, '72. *U. lenticularis* Lea, '72.

As the normal (most abundant) forms we may regard *U. meredithi*, *pudicus* and *lenticularis*, which differ from each other only in the development of the rays (topotypes examined). *U. barnesianus* is a slightly more elongated individual, with poorly developed rays. *U. tellicoensis* (topotypes examined) is a *lenticularis* slightly more swollen; and *U. lyoni* forms the transition toward var. *tumescens*, having a little more elevated beaks, greater obesity, and rather distinct rays.

2. Fusconaia barnesiana bigbyensis (Lea) 1841.

U. bigbyensis Lea, '41. *U. estabrookianus* Lea, '45. *U. fassinans* Lea, '68. *Pleurobema fassinans rhomboidea* Simpson, '00.

The most frequent form is *fassinans rhomboidea* (topotypes examined), with rays poorly developed. *U. bigbyensis* has more distinct rays; *U. estabrookianus* (topotypes examined) is an old, overgrown form, without rays; *U. fassinans* is founded upon an individual (type examined, also topotypes), which is exceptionally elongated, without rays.

3. Fusconaia barnesiana tumescens (Lea) 1845.

U. tumescens Lea, '45. *U. crudus* Lea, '71. *U. radiosus* Lea, '71.

U. tumescens is the most typical form, greatly swollen, with more or less developed rays; *U. radiosus* (type and topotypes examined) is less swollen, but for the rest like *tumescens*; *U. crudus* (topotypes examined) lacks rays, and has much eroded beaks, but stands close to *radiosus*.

The mutual relations of these forms may be understood by the help of the following key. Only the three largest divisions are to be regarded as varieties, in the other forms the characters are merely individual, although specimens representing only one (or a few) of these "forms" often prevail at a given locality.

a_1. Flat, compressed, dia. of shell less than 40 per cent of the length (var. *bigbyensis*).

  b_1. No rays, or rays obscure, color of epidermis brown, dark.

    c_1. Rhomboid in shape.

      d_1. Large. *Estabrookianus.*

      d_2. Smaller. *Fassinans rhomboidea.*

    c_2. More ovate, tapering behind. *Fassinans.*

  b_2. Rays distinct, well developed over most of the disk. Ground color of epidermis lighter. *Bigbyensis.*

a_2. Moderately convex, dia. 40–49 per cent of length. *Barnesiana typica.*

  b_1. Beaks not elevated, shape trapezoidal, rhomboid, or subovate.

    c_1. Dia. about 41 or 42 per cent; size small.

      d_1. Shape somewhat elongate (trapezoidal); rays obscure. *Barnesianus.*

      d_2. Shape shorter (rhomboidal).

        e_1. Rays obscure. *Lenticularis.*

        e_2. Rays present, color of epidermis lighter.

          f_1. Rays few. *Meredithi.*

          f_2. Rays numerous. *Pudicus.*

    c_2. Dia. about 45 per cent; larger. Shape subovate. Rays obscure. *Tellicoensis.*

  b_2. Beaks more elevated, shape subtriangular. Dia. 46 per cent, with rather distinct rays. *Lyoni.*

a_3. Much swollen, dia. over 50 per cent. Beaks elevated. (var. *Tumescens*).

  b_1. Without rays. Dia. 51 per cent. Beaks much eroded. *Crudus.*

  b_2. With rays. Dia. about 56 per cent or more.

    c_1. Dia. about 56 per cent. *Radiosus.*

    c_2. Dia. about 64 per cent. *Tumescens.*

As to the geographical distribution, it should be briefly stated that the swollen forms (a_3) inhabit the largest rivers; the compressed forms (a_1) are found in the headwaters, and the intermediate forms (a_2) belong to the streams of moderate size. Intergrades are frequent.

ANATOMY.[1]

All these shells have the same, and an extremely characteristic and unique structure of the soft parts, so that there is not the slightest question that they belong together. I have examined the soft parts of some 200 specimens in the field, and over three dozens have been preserved in alcohol, and have been examined at leisure in the laboratory. They include representatives of the three main varieties, and of practically all of the individual variations.

Gravid females have been found on the following dates: May 11, '13; May 15, '13; May 16, '13; May 20, '13; May 20, '14, May 22, '14; May 25, '14; July 5, '13; July 9, '13; July 10, '13; July 13, '13; July 14, '13. *Glochidia* have been observed on May 20, '14 (immature), and July 14, '13. Thus this species evidently is a summer breeder (tachytictic).

The soft parts are those of the genus *Fusconaia*: the *supraanal* is separated from the *anal* by a very short mantle-connection, which is absent (or torn?) in rare cases. Inner lamina of inner gills free from abdominal sac. All four gills are marsupial. Placentae well developed and subcylindrical.

Branchial opening with well developed papillae, *anal* with distinct, but small papillae. *Palpi* subfalciform, posterior margins connected at base only.

While thus the *Fusconaia* structure is typically developed, this species is quite unique in its color. This concerns chiefly the color of the gonads, eggs, and placentae.

The soft parts are often uniformly pale, whitish, but may shade to orange, and the orange is most prominent on foot, adductors, and mantle-margin; but the paler tints prevail, and often the orange is replaced by yellowish or brown. The gills

[1] In NAUTILUS, 28, 1914, p. 31, I have described the anatomy of "*Pleurobema fassinans.*" This is a mistake: the shells examined belong to *Pleurobema* all right, but are the form known as *U. argenteus* Lea, which belongs to the *oviforme-group*, and should be called : *Pleurobema oviforme argenteum* (Lea). These will be treated more fully elsewhere.

are pale, but are generally suffused with blackish. The gonads are brown to red, mostly of a peculiar dull lavender color in the female, and the latter color, or purplish brown, is the prevailing color of the eggs and placentae. The charged gills become thus rather dark purple, or purple-brown, shading sometimes to dull red or blackish, in other cases to brownish, brownish pink, brick-red, or even pale brown. These are very peculiar tints, by which this species is easily recognized in the field: four marsupial gills of this blackish-purple color are not known in any other Nayad.

Glochidia have been found only in specimens belonging to the headwaters variety (*barnesiana bigbyensis*). They are subelliptical, slightly higher than long, L. 0.15, H. 0.16 mm.

Although a true *Fusconaia*, this species (or group of forms) stands isolated within the genus, in characters of the shell as well as in the soft parts. It differs from the species of the *subrotunda*-group (incl. *ebena*, *pilaris* etc.) very markedly by its smaller size and by the very shallow beak cavities. The forms of the *undulata*-group (incl. *flava*, and the *cuneolus*- and *cor*-forms) have generally also somewhat deeper beak cavities, and the shell has a more or less distinct posterior ridge, with a flattening or a shallow groove in front of it, characters which are missing in the *barnesiana*-group. As has been pointed out, in the latter group, the color of eggs and placentae is remarkable: in all other forms of *Fusconaia*, this varies from white to bright red.

I introduce here another species, in order to show that the *barnesiana*-type is also represented outside of the Cumberland-Tennessee drainage, namely in the Ozarks.

Fusconaia ozarkensis (Call) 1887.

F. ozarkensis Call, Pr. U. S. Mus. 10, '87, p. 499, pl. 27. Tr. St. Louis Ac. 7, '95, p. 33, pl. 18. *Lampsilis ozarkensis* Meek & Clark, Bur. Fisher. Doc. no. 759, '12, p. 18. *Pleurobema utterbacki* Frierson, in: Utterback, Naiad. Missouri (Amer. Midland Natural 4, 1916, p. 86, pl. 5, pl. 20, f. 63).

I have specimens from James River, Galena Stone Co., Mo., and White River, Cotter and Norfolk, Baxter Co., Ark., donated by L. S. Frierson and collected by A. A. Hinkley on July 30 and Aug. 2 and 5, '14, A number of specimens (8) were preserved in alcohol, coll. July 30 and Aug 2, which all were gravid females, and one of each date had glochidia. This marks probably the end of the breeding season, and the species is tachytictic.

There is some confusion with regard to this species. After the first description by Call, it has not again been recorded, except by Meek and Clark, and I believe, the identification of these authors (supported by B. Walker) is correct. But I think that other authors have seen this form, but have not recognized it, and, for instance, Simpson's *pannosus* and *subellipticus* (regarded as varieties of *Pleurobema argenteum* and *breve* respectively) are also this. Frierson's *utterbacki* is surely this, since my specimens were thus labeled by Frierson.

Walker, Frierson, and Simpson (in part) believe this to be a *Pleurobema*, and not a *Lampsilis* (see also Simpson, '00, p. 557, and '14, p. 131), and this comes nearest to the truth, in fact, it is the most plausible assumption to be made from the study of the shell alone. The shell "resembles a very elongated *Quadrula coccinea*," according to Meek and Clark, and the comparison with *Pleurobema argenteum* and *breve* (which, by the way, are synonyms), made by Simpson, is significant. We must keep in mind that Call's fig. 4 represents the normal shape of the shell, while his fig. 1 is rather abnormal, and possibly does not belong here at all. These two figures by no means represent the female and male, as Call believes.

The investigation of the soft parts has shown that this actually is a *Fusconaia*. Corresponding, both in soft parts and shell, to the *barnesiana*-type of the upper Tennessee region. *F. ozarkensis* differs from *barnesiana* by the more elongated (subtrapezoidal) outline of the shell, more anterior beaks, and the weak development of the rays, which are faint at the best, and often entirely absent. A swollen form of it is not known to me, but specimens from White River are slightly more convex than those from James River (farther up). Also Utterback's quota- of Frierson (p. 87, footnote) make it probable that there are differences in obesity.

Anatomy.

Supraanal opening probably separated from the *anal* by a short mantle-connection, but in all my specimens this is torn by rough handling. Inner lamina of inner gills free from abdominal sac. All four gills marsupial in the female. *Placentae* well developed and *subcylindrical*.

Anal opening with small papillae, branchial opening with well developed papillae. *Palpi* as usual, their posterior margins connected for about one third of their length or less.

As to the color of the soft parts, which is so characteristic in *barnesiana*, not much can be said, since my material has been too long in alcohol. But in most of my specimens the gills are yet distinctly suffused with black. The placentae have been rendered whitish, but here and there traces of a dark stain are preserved (which is disappearing gradually). It is quite possible that the color of the placentae originally was similar to that of *barnesiana*.

The *glochidia* are subelliptical, slightly higher than long; L. O. 15, B. O. 18, thus agreeing with those of *F. barnesiana*.

NOTE ON THE RELATION OF SNAIL FAUNA TO FLOODS.

BY A. RICHARDS.

During the years 1911 to 1916, while the writer was a member of the faculty of the University of Texas, a series of incidental observations on the snail fauna of Waller Creek was made. These observations have now come to an end due to the change of residence of the observer. It seems not unwise, therefore, to publish a short note on the subject in the hope that the facts recorded, although fragmentary, may have a bearing on the work of some other follower of snail life.

Waller Creek is a small stream near the University of Texas at Austin. It is some four miles in length and empties into the Colorado River at a distance of perhaps two miles below the University. That portion of the stream close to the University between Fifteenth and Twenty-seventh Streets, was most closely observed, but data was also collected from the region below.

During the hot months, from about July 1st to October 1st usually, the stream is dry, or water is to be found only in an occasional pool ; during the rest of the year the water flows to a depth of a few inches. The bed is scoured out of limestone (Austin Chalk) and has for much of its length a solid flat rock bottom. The banks of the creek have in general a gradual slope. In time of flood and during heavy rains, this stream rises very rapidly and quickly becomes bank-full, so that the water rushes down in a torrent, the roar of which may at times be heard for a distance of some blocks. The fall of the creek is considerable, being about 75 feet in two miles from Twenty-seventh Street to the Colorado, and this fall in connection with the shape of the bed gives to the current in times of flood a tremendous force.

During the first two years of this observation, 1912–1913, the snail population of the creek in its middle stretches was dense. There were in particular two species very thickly represented, *Planorbis lentus* and *Physa halei.* So numerous were they that one could in a few moments within a very few feet gather a pint of either kind. Wherever a little ripple or a tiny waterfall occurred were many snails oriented in relation to the current, their heads pointing into it. Elsewhere in the more quiet water they were also to be found, but in less numbers. These conditions obtained especially in the early spring; as the breeding season, which in that latitude extends over half the year, passes by, the snails of course become much less numerous.

It is to be noted that previous to the time when the snails had become so abundant, there had been no heavy rains of sufficient importance to be recorded since 1908. Excessive rains occurred in May 1908, November and May 1907, June and March 1905, May and April 1904, July and February 1903, July and November 1902. There was a very severe flood in the creek in April 1900. It will be seen that between the time when my observations began and the last excessive rain considerable time had elapsed and the snails had had the opportunity to reinstate themselves in the creek, assuming that they had suffered in those floods as they have done in the later ones.

In the fall of 1913 there were two floods of unusual proportions in the creek. In October it rose very rapidly, but shortly subsided, and in November, at the time when the entire state was visited by the most severe flood since 1869, it was again subjected to a very thorough scouring. Excessive rains fell on several consecutive days, and streams in the entire Colorado watershed were out of their banks.

After the heavy rains of the earlier part of the month there were several days upon which the rainfall, while comparatively light, was sufficient to keep the creek much higher than its normal level. When the water finally subsided to its normal amount the bed was covered completely with a layer of detritus and soft green humus and algae from a half an inch to an inch in thickness. This deposit and the acids formed from it have been the cause of a much more rapid disintegration of the limestone than had been the case in the immediately preceding years. Loose pieces of limestone which were exposed to the action of the water had in many cases fallen apart by the end of January. Further rises occurred on April 27 and on May 20th, 1914, but were not sufficient to remove all of the accumulated layer of detritus.

In January 1914, a search for snails where they had before been numerous failed to reveal a single specimen of *Planorbis* and less than half a dozen *Physa*. Even in the deeper pools they could scarcely be found. Later in the spring in the lowest part of the stream a number of very small *Physa*, as well as some clusters of eggs were found. The force of the current had been so great as to wash the snails down to the river, and it is possible that the condition of the water due to the decomposing humus may have affected those which were able to escape the flood danger. That some of the Physa were left after the flood may be attributed to their pointed shape which decreases the amount of force that the water was able to exert on them as compared with that on the flat Planorbis shells. Except as noted above in April and May 1914, the conditions in the creek remained as normal.

In January 1915, Physa has again made its appearance in the middle parts of the stream, although in small numbers only. Diligent search, however, failed to reveal a single Planorbis.

The snails which were present were found only under fair-sized rocks where they were well protected; they did not occur out in the open stream as had been the case when the creek was more densely populated with snails.

In April 1915, on the 22d and 24th, Waller Creek was swept by three scouring floods which devastated the entire bottoms. The water rose higher during the night than it had at any time since 1886; bridges were washed away and much damage done. The bottom of the creek was again washed clean except under the larger stones and in deep holes in the bed. Snails were not observed in any numbers following this flood during the rest of that year. Early in January 1916, however, Physa had again appeared fairly abundantly where they had formerly been very thick, in the region just above the University; later in the spring they became quite numerous here. In January of this year the first Planorbis were found that had been seen in the creek since the autumn floods of 1913. Between Fifteenth and Sixteenth Streets in a pocket containing good-sized stones over which the water flows rather swiftly a number of specimens were taken, although none were found above or below this locality. It is noted that below this region the creek is frequently covered with oily scum and that it receives the refuse from the adjoining properties. Except after high water which would clean it out, the creek in this region would hardly be expected to support much snail life. It must be supposed either that the Planorbis had made their way up to Sixteenth Street during the short time following the floods before the water became badly contaminated, or else that in this particular place a few specimens from the previous years had withstood the floods and reproduced themselves in sufficient numbers to be noticeable in January. Of these two suppositions the latter seems much the more rational.

After the flood of 1915 the water subsided very quickly so that a new layer of humus and algae was not deposited, but that the bed was again restored to its former condition of a clean smooth rock bottom. Upon the return to this condition the snail population increased very rapidly, and at the time when the last observation was made in the early summer of 1916, seemed in a fair way to return to the condition of 1912.

It seems to the writer that the slow return of the snails during the year 1914 was due not only to the repeated rains of the fall and winter of 1913–14, but also to the condition of the creek bed at this time. Although the heavy rains of 1915 were more severe, they were confined to one month, and the creek bed was left in a very much cleaner condition than during the preceding year.

The conditions of life which obtain now in Waller Creek are those of a new life region. This must of necessity be so in an intermittent stream to a certain extent, but owing to the flood conditions here they are doubly so.

The chief facts of interest in regard to the habits of snails as shown by these observations, are these: 1, The snails of both species are to be found commonly in uncontaminated water which is running at a fairly rapid rate, and the most common orientation is with the heads pointing up stream; 2, The snail population in any stream is subject to wide fluctuations depending upon flood conditions; 3, Physa because of its shape is less affected by floods than Planorbis; 4, The return of the snail population to a given stream is determined not only by the frequency and severity of the floods, but also by the condition of the bottom of the stream after the subsidence of the high water; 5, The snails thrive best where there is a constantly renewed supply of clean water which contains little decaying vegetation.

Wabash College, Crawfordsville, Ind.

WILLIAM BULLOCK CLARK.

Dr. William Bullock Clark, professor of geology in the Johns Hopkins University, eminent for his contributions to geology, died suddenly from apoplexy on July 27, at his summer home at North Haven, Maine.

Wm. Bullock Clark was born at Brattleboro, Vermont, December 15, 1860. Since 1894 he was professor of geology in Johns Hopkins Univesity. In 1896 Professor Clark organized the Maryland Geological Society, and has been State Geologist since that time. The admirable volumes on paleontology of

Maryland, issued under his direction, are widely used by conchologists interested in fossil mollusks. This series of reports will be his enduring memorial. Professor Clark's chief paleontological interest was in the *Echinoidea*, upon which he published several monographs.

PUBLICATIONS RECEIVED.

A Monograph of West American Melanellid Mollusks. By Paul Bartsch (Pro. U. S. Nat. Museum, Vol. 53, pp. 295–356, pls. 34–39, Aug. 1917). This completes the discussion of the West American mollusks of the super-family Pyramidelloideae, comprising the family Pyramidellidae, which has been previously treated, and the Melanellidae here considered. The former are readily distinguished by having the "nepionic whorls sinistral and tilted; the axis of the early whorls usually being at right angles to that of the succeeding turns, in the first of which the nuclear whorls are frequently quite strongly imbedded." In the latter the early whorls are dextral and never tilted or immersed. A review of the work done in this group is followed by the descriptions of the species, including forty-nine new species and one new genus *Eulimostraca*. The illustrations are excellent.

New and Little Known Species of South American Mussels of the genus Diplodon. By William B. Marshall (Proc. U. S. Nat. Museum, Vol. 53, pp. 381–388, Pls. 50–55, August, 1917). Two new species *Diplodon felipponei* and *D. fortis* are described and figured, together with six species described by Mr. C. T. Simpson in his Descriptive Catalogue of the Naiades and not previously figured.

Notes on the Shells of the Genus Epitonium and its Allies of the Pacific Coast of America. By William H. Dall, (Proc. U. S. Nat. Museum, Vol. 53, pp. 471–488, August, 1917). An interesting account of the various groups and subgenera is followed by descriptions of forty-two new species.

The name Pictoscala is proposed for a section, type *Scalaria lineata* Say.

Studies on Australian Mollusca. Pt. XIII. By C. Hedley (Proc. Linn. Soc. New South Wales, 1916, vol. 41, pt. 4, pp. 680–719, pls. 46–52, issued April 4, 1917). The author's notes under *Tridacna gigantea* Perry are of such general interest that we quote them in part. "Under the name of *Chama gigas* the father of Natural History seems to have embraced the whole of the modern genus *Tridacna*. For the name *gigas*, as restricted to a single species, the candidates are the shell subsequently named *squamosa* by Lamarck and a huge species whose valves in the Ulrica Museum, together weighed 498 pounds.

"After careful examination, Hanley decided that the furbelowed clam, such as Reeve has figured for *T. squamosa*, ought rightly to bear the name *gigas*. He based his verdict on the ground that the actual shell owned by Linné as representing *gigas*, is the Lamarckian *squamosa*, and that to this apply most of the literary references. Linnean contemporaries such as Born, Regenfuss and Chemnitz, while making casual references to the giant, all agree in figuring and describing *squamosa* as the Linnean *gigas*.

"Discriminating in 1819 between the species his predecessors had confused, Lamarck unlawfully used the name *gigas* for the largest form, while for the Linnean *gigas* he proposed *squamosa*. Attentive to the remarks of Hanley, Hidalgo in 1903, renamed the biggest species *T. lamarcki*. But in 1811, Perry had already used the name *Chama gigantea* for 'the largest shell at present known.' As the young of the giant has not yet been traced to the adult, it is still possible that *squamosa* is a juvenile deeper-water form of the large intertidal and abraded *gigantea*.

"The heaviest known are a pair weighing 550 lbs., which Cuvier and Lamarck relate were presented by the Venetian Republic to Francis I. These still exist, their edges bound with brass, as holy-water basins in the cathedral of St. Sulpice, in Paris.

"The photographs of Saville Kent show the giant clams in their natural position on the Great Barrier Reef, where they occur free and exposed at low tide, standing on their umbones, and showing their brightly colored mantle and so-called eyes as they gape."

There are many other interesting notes bearing on nomenclature, and the animals of Australian species. Six new species are described and twenty-nine species figured.—C. W. J.

An Annotated List of Shells from Northern Michigan. By Mina L. Winslow (Occasional papers, Mus. Zool., Univ. Mich., No. 42, July 1, 1917) a list of sixty-five species from Schoolcraft, Alger and Chippewa counties, also a list from Isle Royale.

NOTES.

The Oldroyd Collection.—Mr. and Mrs. J. S. Oldroyd have given their collection of shells to the Leland Stanford Jr. University, and are now permanently employed in the Museum, Mrs. Oldroyd being the curator. The collection has been placed in the Department of Geology and Mining. The Stanford alumni purchased the collection and library of the late Henry Hemphill, which, with the Law collection and several others, forms an unusually fine working series. Mr. and Mrs. Oldroyd have spent about eight weeks at Friday Harbor, Puget Sound and British Columbia making large collections for the Stanford University, California Academy of Science and University of California.

North Carolina Land Shells.—The following species of land shells were picked from leaf-mold collected at Spruce Pine, Mitchell Co., North Carolina, by Samuel G. Gordon while on a mineralogical excursion. The specimens are in the collection of the Acad. Nat. Sci., Phila., *Gastrocopta contracta* Say, *G. pentodon* Say, *Circinaria concava* Say, *Polita indentata* Say, *Taxeodonta lamellidens* Pils., *Gastrodonta elliotti* Redf., *G. gularis* Say, *Euconulus sterkii* Dall., *Punctum pygmæum* Drap., *Carychium exile* Lea.—E. G. Vanatta.

A Correction.—In my little paper, "Descriptions of New West American Marine Mollusks and Notes on Previously Described Forms," Proc. U. S. Nat. Mus., Vol. 52, pp. 670–671, plate 46, figure 2, 1917, I published *Cerithiopsis* (*Cerithiop-*

sis) *helena* from Panama, type Cat. No. 204128, U. S. N. M. Mr. Vignal, of Paris, has been kind enough to call my attention to fact that the same combination was used by O. Boettger in 1901 for a fossil in his contribution "Zur Kenntnis der Fauna der mittelmiocänen Schichten von Kostej im Krassò-Szörényer Komitat," in "Verhandlungen und Mitteilungen des siebenbürgischen Vereins für Naturwissenchaften zu Hermannstadt," p. 128, 1901. It is therefore necessary to bestow a new designation on my shell, and it may be known as *Cerithiopsis* (*Cerithiopsis*) *anaitis*.—Paul Bartsch.

Albinistic Epiphragmophora fidelis.—A few days ago, I had two hours in Gladstone Park. The Park is wooded, and there are large moss-covered rocks. *E. fidelis* was out freely. I found one light one. The one sent you some years ago was uniform in color. This one shows two distinct dark narrow bands around the lower whorl but not showing anywhere else. This is the fourth one I have found in the Park in twenty years or more, though I have been there often.

—J. G. Malone, *Portland*, *Ore.*

The many friends of Dr. Hermann von Ihering will hear with deep regret that he has been removed by political intrigue from his position of Director of the Museu Paulista at Sao Paulo, Brazil. This museum was founded by Dr. von Ihering. His eminence as a zoologist and unceasing activity as an investigator of the South American fauna, had won for it an honorable place among scientific institutions. We understand that his successors are men without knowledge of the biological sciences. As the only scientific assistant, Mr. Rudolph von Ihering has resigned, it appears that the scientific activity of the State Museum of Sao Paulo has come to an end—a real calamity to American zoology and paleontology.

Dr. von Ihering is located at present at Hansa de Joinville, State of Santa Catharina. He is in good health, and is engaged in the preparation of his work: "Die biogeographischen Grundgesetze," several chapters of which will deal with mollusks.—H. A. P. & C. W. J.

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THE NAUTILUS.

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NEW SOUTHERN FORMS OF CARYCHIUM AND THYSANOPHORA.

BY GEO. H. CLAPP.

CARYCHIUM EXIGUUM FLORIDANUM new subspecies. Pl. 8, fig. 4–6.

Differs from the type by its constantly smaller size and the *greatly thickened lip*. The shell is also more tapering, making the last whorl appear swollen.

Of 25 shells measured, from 5 different localities, the largest is 1.73 × 0.81 mm. and the smallest 1.52 × 0.78 mm., the average being 1.64 × 0.78 mm.

Fig. 5, "Snapper Creek Hammock" about 8 miles south of Miami, Fla., measures 1.64 × 0.72 mm. Length of aperture 0.63, width 0.58 mm. Average of 6 shells, 1.61 × 0.70 mm.

Fig. 4, near Coot Bay, Cape Sable, measures 1.73 × 0.78 mm. Length of aperture 0.69, width 0.63 mm. Average of 6 shells 1.67 × 0.78 mm.

Fig. 6, Miami, collected by S. N. Rhoads, measures 1.78 × 0.86 mm. South side of Miami River, about 2 miles above Miami, average of 6 shells 1.61 × 0.77 mm.

Musa Isle, edge of Everglades at entrance to Miami River, average of 6 shells 1.58 × 0.79 mm. The Musa Isle shells are more globose than those from the other localities, the diameter being exactly one-half of the length.

This subspecies is of wide distribution in Florida and I first noticed it in 1895 when I collected a single specimen at Homosassa, Citrus Co. So far as I have seen it is the only form found in the Miami and Cape Sable regions.

Carychium is apparently not present on the Florida Keys as

I have examined "rubbish" from over 20 of them from Key Biscayne to Garden Key, Dry Tortugas; and while I found over 60 species of land shells, there was not even a fragment of *Carychium*, and it is not mentioned in any of Pilsbry's published lists of Key shells.

Types from Snapper Creek Hammock, No. 8569 of my collection.

THYSANOPHORA MACNEILLI n. sp. Pl. 8, fig. 1.

Shell small, globose, with about four well-rounded whorls, suture deep; color chestnut-brown, somewhat shining; surface with faint growth lines and microscopically granulated; apex obtuse, large, more densely granulated than the body of the shell; widely umbilicate with the umbilicus extending to the apex and contained about 5 times in the diameter of the shell. Aperture well rounded slightly oblique, lip thin, partly reflected around the umbilicus.

The type measures alt. 1.50, diam. 1.38, umbilicus 0.29 mm.

Types, fig. 1, from Magazine Point, 8 miles north of Mobile, Ala., No. 8572 of my collection. Also found at Spring Hill and along the Fowl River about 3 miles from the coast in the southern part of Mobile Co.

This species is named after the late L. H. McNeill of Mobile, Ala., who first found it in 1914. Mr. McNeill, although handicapped by poor health, was an enthusiastic collector and added much to our knowledge of the molluscan fauna of southern Alabama.

There are two species found in Florida, and probably others of the Gulf states, with which this species may be confused. From *T. dioscoricola* (C. B. Ad.) it differs in the wider umbilicus, less oblique aperture and in having about $\frac{1}{2}$ whorl more in the same diameter.

T. caeca (Guppy) is a larger, more depressed shell, subangular at the periphery, umbilicus nearly covered, and surface with *distinct spiral sculpture.*

EXPLANATION OF PLATE 8.

Fig. 1, T. macneilli Clapp $\times$ 16.6, alt. 1.50, diam. 1.38 mm.

Fig. 2, T. dioscoricola (C. B. Ad.) × 16.6, alt. 1.38, diam. 1.27 mm.
Fig. 3, T. caeca (Guppy) × 16.6, alt. 1.67, diam. 1.73 mm.
Fig. 4, C. e. floridanum Clapp × 21, alt. 1.73, diam. 0.78 mm.
Fig. 5, C. e. floridanum Clapp × 21, alt. 1.64, diam. 0.72 mm.
Fig. 6, C. e. floridanum Clapp × 20, alt. 1.73, diam.0.66 mm.

THE ANATOMY OF TWO AFRICAN NAYADES, UNIO CAFFER AND SPATHA WAHLBERGI.

BY A. E. ORTMANN.

UNIO CAFFER Krauss, Sued Afr. Moll. 1848.

Nodularia caffer Simpson, Synopsis, 1900, p. 825.

Unio caffer Simpson, Descript. Catal. 1914, p. 574.

When Simpson placed this species in *Nodularia*, the anatomy of only two species of this genus was known, and these had the inner gills marsupial. We know now, that Simpson's *Nodularia* is altogether a conglomerate of entirely heterogeneous forms. The present species was placed by Simpson (in 1914) in *Unio*, since he had seen gravid specimens. But he does not give any particulars as to the structure of the soft parts, and thus it is desirable to give an account of them.

I am indebted to B. Walker for the soft parts of a number of specimens of this species, collected at two localities; Lindague Spruit, Natal (trib. to Little Tugela River, coll. in July 1913); and Premier Mine Pumping Station, junction of Elands and Wilge River, near Pretoria, Transvaal (coll. April 1914).

The gravid females collected in July had mostly eggs, but one of them had glochidia; of those collected in April only one female was gravid, and also had glochidia. It is hardly possible to draw from these dates a conclusion as to the breeding season, except that it might begin in July, provided that there is at all a definite season.

Anatomy: *Anal opening* separated from the *supraanal* opening by a moderate mantle connection, slightly shorter than the anal. Supraanal about as long as or slightly longer than the anal. The latter with the inner edge almost smooth. *Branchial* *opening* with distinct papillae. No differentiating structures on mantle-edge in front of branchial. *Palpi* subfalciform, of medium size, their posterior margins united for nearly half their length.

Gills of the Unionid-type: gill diaphragm complete, separating anal and branchial openings. Anterior end of inner gills widely remote from the palpi. Inner lamina of inner gill free from abdominal sac, except at anterior end.

Septa and *water-tubes* present, the former continuous and not interrupted, parallel to the gill-filaments. In the male, and in the inner gill of the female, they are weak and distant from each other. *The outer gill of the female is marsupial* practically in its entire length, with heavy and crowded septa.

When charged, the marsupium is moderately swollen, the edge remaining sharp. *Placentae* lanceolate and compressed, moderately developed, when eggs are present, less so, when glochidia are present.

Glochidia subtriangular in shape, longer than high, lower margin bluntly pointed in the middle; hooks have not been observed, but there is a slight swelling of the margin at the point, without any spinules. It might be that both of my specimens contain only immature glochidia, and that the mature glochidia have hooks of the Unio-type: but the glochidia do not look like immature ones. Size of glochidium: L. 0.23 to 0.25; H. 0.20 to 0.21 mm. (in *Unio pictorum*, L. and H. is 0.21 mm.).

The structure is that of the subfamily *Unioninae*, and especially of those genera which have only the outer gills marsupial. Considering the general shape of the shell, zig-zag beak sculpture, anatomy and glochidia (tringular shape of the latter and their size), this species stands very near to the genus *Unio* in the modern sense (Ortman, Ann. Carm. Mus. 8, 1912, p. 273); the only difference is, that the glochidia, although possessing the characteristic triangular shape, have no hooks but this might be due to immature condition.

For the present, it is advisable to retain this species in the genus *Unio* (*U. pictorum* as type), and there is no doubt that it stands at least *very close to it.* If a separate generic (or subgeneric) name should be found to be necessary, *Cafferia* Simpson should be considered.

SPATHA (SPATHA) WAHLBERGI (Krauss).

Simpson, Descr. Cat. 1914, p. 1326.

From Mr. W. Israël I have received two specimens from Mkata River (tributary to Wami R.), and two specimens from Ngerengere River (tributary to Kingani or Ruwu R.) both near Mrogoro, German East Africa (collected by Mr. Rudolf). They all resemble each other, but the specimens from the Mkata have a brownish epidermis, those from the Ngerengere a blackish brown one. They agree well with the description and figure of *S. natalensis* Lea (Obs. xi. 1887, pl. 20, f. 58), which is a synonym of *wahlbergi* Krauss.

The specimens from the Mkata are both females, those from the Ngerengere are male and female.

In NAUTILUS 24, 1910 pp. 39–42, I have described the soft parts of *Spatha kamerunensis* Walker, a West African form, which belongs to the subgenus *Aspatharia* Bourguignat. The present species is a real *Spatha*, and the examination has shown, that it closely resembles *kamerunensis* in its anatomy, with the exception of one detail.

Anal opening ovate, about as long as the branchial, closed above by the union of the inner edges of the mantle, *without a supraanal opening.* Edge of anal thickened and wrinkled, but without papillae, probably capable of a moderate tubular extension (siphon). Anal separated from the branchial opening by a *solid connection of the mantle edges. Branchial defined below (or anteriorly) by connection of the inner mantle edges*, which, however, is short, shorter than the branchial (about one fourth to one third as long). In one of my specimens, this connection is torn apart, but still distinctly recognizable. Edge of branchial somewhat elevated and with small or indistinct papillae, probably also forming a short siphon. Farther in front, the mantle edges are unconnected and smooth.

Palpi and *gills* exactly of the structure described in *Spatha kamerunensis.* Also here the inner lamina of the inner gills is free from the abdominal sac, and the septa of the gills are of the same general character. In the female, the septa of the of the inner gill possess, close to the outer lamina, a marked swelling, by which the female may be recognized at once (the swellings are distinctly seen with a hand-lens).

Thus *Spatha wahlbergi* differs from *S. kamerunensis* only by the *presence of a mantle connection below* (*or in front of*) *the branchial opening*, by which this opening becomes perfectly closed and subtubular. Whether this is a general character, which distinguishes the subgenera *Spatha* and *Aspatharia*, remains to be seen. There is no doubt, however, that this character indicates a higher specialisation of *S. wahlbergi*, as compared with *S. kamerunensis.* Attention should be called to the fact, that in the South American shells of the Hyriine-type, this mantle connection anterior to the branchial is rather variable, and may or may not form a generic character (Nautilus, 24, 1911, pp. 117, 118).

A NEW CUBAN ZACHRYSIA.

BY H. A. PILSBRY.

Zachrysia ramsdeni n. sp. Pl. 7, figs. 5, 6.

The shell is depressed-globose, imperforate, of an olive-ocher color, glossy. First 1⅝ whorls smooth, following neanic whorls irregularly wrinkled, the last whorl sharply striate above, the base nearly smooth. The periphery is rounded, last whorl descending in front. The aperture is very oblique; outer lip slightly thickened, unexpanded. The base-columellar margin is slightly concave, narrowly reflected and depressed, having a very small nodule nearer to the columella than to the base.

Alt. 13.5, diam. 17.5 mm.; 4 whorls (type).

Alt. 12.5, diam. 15.8 mm.

Manati, Los Canos estate, near Guantanamo, Cuba. Type No. 117482 A. N. S. P., collected by Charles T. Ramsden.

This species resembles *Z. emarginata* Pfr., but differs by the much thinner peristome and especially the narrower base-columellar lip. This forms a wide, flat plate in *emarginata*, but is much narrower in *ramsdeni* than in any other species of the group. The tooth on the basal lip is much smaller than in *emarginata.*

Specimens have been in the collection of the Academy for many years labeled "*H. emarginata*?" One lot from Bland has the query "can these be young *emarginata*?" on the label —Another lot was in the Van Nostrand collection, two specimens having been given to the Academy. The collector of these shells is unknown.

Other views of the specimens now figured were given in Nautilus, vol. 28, April, 1915, pl. 6, figs. 2, 2*a*, when I first recognized the form as new.

Z. emarginata (pl. 7, fig. 7) was first found by Gundlach at Caimanera, on Guantanamo Bay, only dead ones in this arid place. Afterwards he collected it at Mayari. Mr. Ramsden has sent it from the following localities: Boca de Jaibo, 1 mile below confluence of Jaibo and Guantanamo rivers. Arroyo Hondo, Los Caños, Guantanamo, Vinculo de Guantanamo. Colonia "Blanco," 2 miles southeast of Guantanamo. Also a dead shell from Caimanera, Gundlach's original locality. Fossil specimens were sent by Mr. Aman some years ago from a deposit of clay at Guamo, on the Rio Cauto. Specimens from all of these localities have been examined by the winter. There is not much variation except in the height of the spire.

REICHENBACH'S ZOOLOGIE.

Allgemeine Taschenbibliothek der Wissenschaften. Fünfter Theil. Zoologie oder Naturgeschichte des Thierreichs. Erstes Bändchen. Dresden. P. G. Hilschersche Buchhandlung. 1828.

Zoologie oder Naturgeschichte des Thierreichs, nach eigenen Ansichten bearbeitet von H. G. Ludwig Reichenbach, etc., etc. Erstes Bändchen.

The series and special title pages quoted above are those of a little-known book which I have been able to examine by the kindness of Dr. Charles W. Richmond, the well-known ornithologist and expert on bird nomenclature. Except for the new names introduced in the work, there is little original for its time, or of interest now; but a notice of the generic names is in order. A few of the new names are merely variations of the spelling of well-known older names, some perhaps changed inadvertently, others being feminine forms of originally masculine names. Reichenbach appeared to favor Venus, as Montfort favored Mars. I note the following; the names which they presumably equal are supplied in brackets.

Lithotornus Cuv.; p. 88 [*Lithodomus*].
Padollia Montf.; p. 91 [*Padollus*].
Ricinella Lam.; pp. 92 138 [*Ricinula*].
Melampa Drap.; p. 93 [*Melampus*].
Scarabaea Montf.; p. 93 [*Scarabus*]. Also p. 152, where *S. imbrium* is mentioned as typical.

Another series of names, for which no authorities are given, and which are therefore to be credited to Reichenbach, are defined by references to vernacular names in Montfort, or are substitutes for earlier generic names. All of the following except the last are evidently considered to be subgenera or other subdivisions of *Murex* L.

Lathiria (les lathires Montf.); p. 91 [*Latirus* Montf.].
Brontesia (Brontes Montf.); p. 91 [*Brontes* Montf.].
Typhlia (les Typhlis Montf.); p. 91 [*Typhis* Montf.].
Cichorax (les Chicoracés Montf.); p. 91 [*Chicoreus* Montf.].
Aquilla (les Aquilles Montf.); p. 91 [*Aquillus* Montf.].
Trophones (les Trophones Montf.); p. 91 [*Trophon* Montf.].
Appollia (les Apolles Montf.); p. 91. [*Apollon* Montf.].
Chondrina R. (*Chondrus* Cuv. non Lamx.); p. 93.

The Zweites Bändchen was published in 1836. The author notes the delay on p. 272. The pagination is continuous with the first volume. The system is developed, with some description of the genera and one or more species mentioned.

On p. 152 the name *Chondrina* is defined (as a subgenus or subordinate group of *Helix*) with the words: "mit eiförmiger Schale—*H. avenacea*, Hafer Sch." *Avenacea* was one of the species of Cuvier's *Chondrus* (for which *Chondrina* was proposed as a substitute). As it is the only species cited under

Chondrina, it becomes type of that group. No type had been selected previously for *Chondrus*. *Chondrina* will therefore replace *Modicella* Ads., 1854, as used by Boettger and Westerlund. So far as I know, the other names proposed had all been provided with valid names previously.

The work covers the invertebrates only. There are some new generic names in other Classes, as well as those in *Mollusca* noticed above.

H. A. PILSBRY.

FURTHER NOTES ON THE MOLLUSCA OF ONEIDA LAKE, NEW YORK; THE MOLLUSKS OF LOWER SOUTH BAY.

BY FRANK C. BAKER.

In a previous paper[1] the writer listed the fresh-water mollusks of the west end of Oneida Lake, 62 species and races being represented. In the present paper the fresh-water mollusks of a large bay in Oneida Lake are listed, the additional material bringing the total molluscan fauna of the lake to 91 species and races, of which 5 are new to science. It is highly probable that half the species of fresh-water mollusks inhabiting the State will be found in Oneida Lake when the east end, the deep water, and the small tributary streams are examined. The additional Sphæriidæ collected in 1916 is noteworthy, bringing the total number to 32, of which 23 are Pisidia. The deeper water also added several species of note not found in 1915.

Mollusks were abundant everywhere, being absent from less than one percent of the area examined. Associated with the mollusks were oligochæte worms, planarians, leeches, amphipods and other crustaceans, fresh-water insects and insect larvæ, and the little water mites, forming together a veritable microcosm, in which the majority of fresh-water groups of animals were represented. In point of numbers the mollusks usually predominated. The studies in Lower South Bay were carried on quantitatively for the purpose of ascertaining the available amount of fish food present in this body of water and its im-

[1] The NAUTILUS, xxx, pages 5–9, 1916.

mediate vicinity. During the field work, 18,440 specimens were collected, of which, 9335 were mollusks. Ecological notes were made on all of the species in connection with the environment and with the associated animals. The discussion of these topics, many of which are of an economic nature, will be published as a technical bulletin by the New York State College of Forestry, and the interested reader is referred to this publication for details concerning these and kindred subjects.

When the field work was made for the material upon which Technical Bulletin Number IV (page 89) is founded the deeper water of the west end of the lake was examined with a crowfoot dredge, and, naturally, only a few mussels were obtained. For the field work of 1916 a large dredge with a 16-inch frame was used with very satisfactory results, a large number of clams as well as gastropods being collected. When these results were tabulated an interesting variation in bathymetrical distribution was observed. This is indicated in the table below:

Table showing decrease of mollusks with depth.

Shore to six inches	6 species
1 to 3 feet	46 species
3 to 6 feet	40 species
6 to 9 feet	39 species
9 to 12 feet	29 species
12 to 15 feet	26 species
15 to 18 feet	11 species

Lower South Bay is the largest embayment of Oneida Lake and is situated at the southwest end. It is about one by two miles in extent and covers an area of approximately 881 acres. It is well protected on the north by Long Point which extends eastward into the lake for nearly a mile, forming an effectual barrier to the heavy north and northwest storms. Between Long Point and Short Point (see the map in Technical Bulletin, IV) lies Short Point Bay where the water is usually quiet and the habitats are sheltered from strong waves. The greater part of the shore is of sand or clay, a very small proportion being of gravel and boulders. The deeper water has a mud bottom. The 881 acres included in the area of Lower South Bay is divided as follows:

Boulder and gravel bottom	20 acres
Sand bottom	85 acres
Clay bottom	92 acres
Mud bottom	684 acres
Total acreage	881

Plant life is very abundant in the bay and it is due to the great quantity of this life that the animal life is so abundant. The submerged plants are the most abundant in species, *Potamogeton*, *Najas*, *Elodea*, *Vallisneria* and *Myriophyllum* being the principal genera represented. *Scirpus*, *Pontederia*, *Nymphæa* and *Castalia* are the most abundant of the emergent types of vegetation. The most surprising result of the plant analysis has been the presence of great quantities of filamentous and other algæ, the former in places fairly choking the water. Upwards of 36 species were found in the material examined by Dr. E. N. Transeau, including *Cladophora*, *Oedogonium*, *Ulothrix* and *Spirogyra* among the filamentous species. It was in this mass of algæ, which often formed a thick blanket, that the greater number of mollusks and other animals were found.

In the list of species to follow, reference is made to the depth of water and to the character of bottom upon which the species was found. As all but a very few were collected in Lower South Bay, the locations are given only where the species was found in a habitat outside of this area. My thanks are due Dr. H. A. Pilsbry, Dr. Bryant Walker, and Dr. V. Sterki for the determination of critical material. To Dr. C. C. Adams and Dr. Hugh P. Baker, of the New York State College of Forestry I am indebted for the opportunity of making the studies from which these notes are abstracted.

Unionidae.

Elliptio complanatus ("Solander" Dillwyn). In Technical Bulletin, IV, page 252, and in the Nautilus, XXX, page 8. reference is made to the presence of *Margaritana margaritifera* (L) in the lake. This should be eliminated from the lists as it was founded upon pathologic individuals of *Elliptio complanatus*. This *Elliptio* is the commonest mussel in the lake occurring on all kinds of bottom and in all depths of water examined. The deeper water individuals run considerably smaller than those from shallow water.

Anodonta cataracta Say. On all kinds of bottom in 3–8 feet of water.

Anodonta implicata Say. Found only on exposed shores in water two and a half to four feet deep, in sand between boulders.

Anodonta grandis footiana Lea. Occurs on all kind of bottom except boulder in water one and a half to 15 feet deep.

Lampsilis luteola (Lam.). On all varieties of bottom except gravel in water 3–18 feet deep.

Lampsilis radiata (Gmelin). Found only in water one and a half to three feet deep on boulder, gravel, and sand bottom. Typical *radiata* is very rare in Oneida Lake.

Lampsilis radiata oneidensis Baker. Common in water from 8–18 feet deep on gravel and mud bottom, usually the latter. This species replaces *Lampsilis borealis* (Gray)[1] which does not occur in Oneida Lake.

Sphaeriidae.

Sphærium vermontanum Prime. The most abundant of these small clams, occurring in water from one and a half to 14 feet deep and on all varieties of bottom except boulder.

Sphærium solidulum (Prime). Occurs sparingly in water 8–18 feet deep on a mud bottom. Dr. Sterki characterizes it as a small eastern form.

Sphærium sulcatum (Lam.). Found only on a mud bottom in 8–13 feet of water. It is the rarest of these small clams and is a small, slight form, quite unlike the large heavy individuals found in other parts of New York State. It is an interesting case of bathymetrical distribution that *vermontanum* should occur at all depths examined but that *solidulum* and *sulcatum* should be found only at 8 feet and deeper. The last mentioned species was obtained only between 8 and 13 feet.

Musculium truncatum (Linsley). Clay bottom in four feet of water.

[1] See Technical Bulletin, IV, page 257; Nautilus, XXX, pages 74–77, 1916.

Musculium transversum (Say). Occurred on a sand and clay bottom in water one and a half to four feet deep. The individuals are smaller than is normal for the species.

Pisidium abditum Haldeman. Small specimens of this species were found on sand, clay, and mud bottoms, in one and a half to 8 feet of water.

Pisidium adamsi affine Sterki. Gravel bottom in 3 feet of water.

Pisidium complanatum Sterki. Gravel, sand and mud bottoms in water two to 8½ feet deep.

Pisidium compressum Sterki. Common in water one and a half to 14 feet deep on gravel, sand, clay and mud bottoms.

Pisidium compressum lævigatum Sterki. Mud bottom in 13 feet of water.

Pisidium ferrugineum Prime. Occurs in water 3—8 feet deep on sand, clay, or mud bottom. It resembles eastern specimens from New England.

Pisidium neglectum Sterki. A few quite small specimens were collected on a mud bottom in 8½ feet of water.

Pisidium overi Sterki. A single valve of this western species was found in a dredging from a mud bottom in 8 feet of water. This species was first described from South Dakota and was later found in Minnesota. Its occurrence in New York State gives it a wide range eastward.

Pisidium pauperculum Sterki. On sand and mud bottoms in one and a half to 8 feet of water.

Pisidium punctatum simplex Sterki. On sand and sandy clay bottoms in water 1½ to 3½ feet deep.

Pisidium sargenti Sterki. Small individuals were collected on a sand bottom in one and a half feet of water.

Pisidium scutellatum Sterki. One of the most abundant of these minute clams, occurring on gravel, sand, clay, and mud bottoms in water one and a half to 13 feet deep.

Pisidium scutellatum cristatum Sterki. More common than the typical form and occurring usually with it.

Pisidium splendidulum Sterki. Occurs on a clay bottom in 5 feet of water.

Pisidium variabile Prime. Found in water 2–13 feet deep on gravel, sand, clay, and mud bottoms. Most abundant in mud in 4–11 feet of water. The specimens are smaller than normal.

Pisidium vesiculare Sterki. Mud bottom in water 8–11 feet deep.

A number of *Pisidia* and *Musculia* are still in the hands of Dr. Sterki awaiting identification. They are either peculiar forms of well known species or are undescribed, and several species are represented. Of the material collected in 1915 Dr. Sterki says; "You should have 30 species or more of Sphæriidæ in your vicinity; and there ought to be more than 20 species (plus varieties) of *Pisidium.*" With the 1916 material we nearly reach Sterki's estimate of probabilities—26 species of the family named and six unnamed. Of *Pisidium* there are 18 named species and five unnamed. Several of the species listed are recorded from New York State for the first time. The Sphæriidæ of Lower South Bay consist of small individuals with slight shells and more or less weak hinges due to some physical property of the water, perhaps a lack of lime. The maximum development of this family, both in species and individuals, appears to be in comparatively deep water.

Viviparidae.

Vivipara contectoides W. G. Binney. Collected from a mud bottom in 9 feet of water. Only one specimen, half grown, was found and this was probably brought to its location by currents. This species is abundant in the west end of the lake, near Brewerton, where it lives on a sand bottom in shallow water.

Campeloma decisum (Say.) Collected from a sand and clay bottom in water one and a half to 5 feet deep. More abundant on a clay bottom. The majority of the individuals of *decisum* collected in July 1916 were young or immature, adults being very rare. It seems evident that the young of this species are born in the spring and attain their first year's growth by September or early October. Information concerning the details of the breeding habits of this group of mollusks are desirable.

AMNICOLIDAE.

Gillia altilis (Lea). Occurs on boulder, gravel, sand, and mud bottoms in water 1–14 feet deep. Half-grown and adult individuals were abundant in some habitats.

Somatogyrus subglobosus (Say). A few specimens were collected associated with *Gillia*. All were immature.

Bythinia tentaculata (Linn.). This common species occurs abundantly in Lower South Bay on gravel, sand, clay, and mud bottoms in water 1–14 feet deep. Most abundant on clay and mud bottoms in water 4–14 feet deep. A large percentage of the individuals collected were young or immature. This species is especially abundant in filamentous algæ (mostly *Cladophora fracta*) and a single specimen was collected from a leaf of the arrowhead, *Sagittaria arifolia*. A pint of algæ, representing 100 square inches of area on an old log in 5 feet of water, yielded 97 adult and 1270 young individuals of this species.

Amnicola limosa porata (Say). This is the largest *Amnicola* in the lake, and was found only in three habitats: boulder bottom in one foot of water, sand bottom in four and a half feet, and mud bottom in 18 feet of water. It was most abundant on a rocky shoal in water a foot deep, a single boulder having 54 specimens. Typical *limosa* is apparently not found in this part of the lake.

Amnicola bakeriana nimia Pils.[1] This is the most abundant *Amnicola* in the lake, easily known by its wide swollen shell. It occurs on all kinds of bottom in water from 1–18 feet deep; about 10 per cent of the material collected was immature. Most abundant, as are all of the species of the genus, in filamentous algæ. A single specimen was found on the leaf of *Sagittaria arifolia*.

Amnicola bakeriana Pilsbry. One of the most abundant species in the lake easily recognized by its long spire and deep-sutured whorls. It occurs on all varieties of bottom, though least numerous on boulder and most numerous on clay and mud bottoms where there is a heavy growth of algæ. In depth it is most abundant in water from 3–6 feet deep, and occurs from

[1] NAUTILUS, xxxi, pp. 44–46, 1917.

1–18 feet deep. It was dredged in great abundance on a mud bottom covered with *Cladophora fracta*, in 8½ feet of water. Many immature individuals occur with the adults.

Amnicola oneida Pilsbry. This is the narrowest species in the lake, greatly resembling *Amnicola lustrica* but being more slender. It was first seen in 1915 in a lot of shells from Frenchman Island[1] but only one specimen was secured. It occurs on all varieties of bottom and in all depths of water from one and a half to 15 feet. It is not common on boulder or gravel bottoms, but on sand, clay, and mud bottoms, where there is a covering of filamentous algæ (*Cladophora*, *Oedogonium* or *Spirogyra*) in 2½ to 4 feet of water, it is the commonest mollusk in the region. In one or two dredgings it was found in abundance in 8–9 feet of water but it is not usually plentiful in deeper water. Many young and immature individuals were collected with the adults.

Amnicola clarkei Pils. This small, subacute species was found associated with *bakeriana* in four places, though it is not as abundant as that species. Occurs on sand, clay, and mud bottoms, in water 3–8½ feet deep, usually in filamentous algæ.

Amnicola emarginata (Küster). This characteristic species occurred sparingly in water from 10–18 feet deep on mud and gravel bottoms, usually with the filamentous algæ *Cladophora* and *Spirogyra*.

Pleuroceridaė.

Goniobasis livescens (Menke). Found only on boulder and gravel bottoms, on exposed shores or points, in water one and a half to four feet deep. Most abundant in water 1–3 feet deep on a boulder shore. Many young and immature individuals occur. The species as it is found in Lower South Bay varies in the obesity of the body whorl, narrow forms occurring, some with faint bands resembling the shell from Illinois called *depygis*. The columella is deeply tinged with purple. Several young individuals were collected having strongly keeled whorls and measuring 16 mm in width and 7 mm in width.

[1] See Technical Bulletin, IV, page 269, fig. 45, No. 21.

VALVATIDAE.

Valvata tricarinata (Say). Found on all varieties of bottom, except sandy clay, and in all depths of water down to 18 feet. It occurs in numbers on a sand bottom at four feet, on clay bottom at 3½ feet, on a mud bottom at 8 and 18 feet, and on a gravel bottom at 15 feet. It is rare on gravel and boulder bottoms in shallow water. In this area it is usually associated with filamentous algæ, *Cladophora* or *Oedogonium*. Many young and immature specimens occurred as well as some variations in the position of the carinæ.

Valvata bicarinata normalis Walker. Occurred sparingly on gravel, sand, clay, and mud bottoms in water 2–6 deep.

Valvata sincera (Say). This is a deep water form and ocurred on gravel and mud bottoms in water 11½–18 feet deep, usually associated with the alga *Cladophora fracta*. It was most abundant in water 15–18 feet deep.

PHYSIDAE.

Physa warreniana Lea. This tadpole snail occured on all varieties of bottom in water from one half to 11½ feet deep. It is abundant, however, only in water one half to one and a half feet deep and the the numbers decrease with depth. A gravel or boulder bottom is the normal habitat of this species when adult, but when young or immature, as was the case with the greater number of individuals collected (1–3 mm) it lives in filamentous algæ (*Oedogonium*, *Cladophora*, *Spirogyra*). Of 47 lots collected in 1916 but six contained adult animals. This seems to be another species that attains maturity in the fall, adults being abundant the previous year, in September, in shallow water where but few immature shells were seen. This form of *Physa* seems to differ sufficiently from *ancillaria* to be considered a species and there seems to be no reason why it should not be called *Physa warreniana*. It varies greatly in the sculpturing of the shell, many individuals occurring that have a smooth, polished shell.

Physa integra Haldeman. Occurs on boulder, sand, clay and mud bottoms in water one and a half to ten feet deep. Most abundant on a sand bottom in water one and a half feet deep, and on a clay bottom in water two feet deep. The majority of the individuals were young or immature (3–5 mm.) and were frequently associated with algæ (*Oedogonium*, *Chara*, *Nitella*) or with the higher vegetation. In one habitat they were found on *Potamogeton interruptus* and *Myriophyllum verticillatum*.

Physa heterostropha Say? Several young shells (7 mm. long) thought to be this species were found in Tuttle Brook, Chittenango Creek. The surface is smooth and shining and the general slope agrees with shells from Philadelphia which are undoubted *heterostropha*. No adult shells were observed.

ANCYLIDAE.

Ancylus parallelus Haldeman. This characteristic fresh-water limpet was collected from all bottoms except boulder in water one and a half to 11 feet deep, the greater number occurring on a sandy clay bottom in one and a half feet of water. In this area it is associated with filamentous algæ (*Oedogonium*, *Cladophora*) but it is usually more abundant on such plants as *Nymphæa*, *Castalia*, *Typha* and *Sparganium*.

Ancylus fuscus Adams. Young individuals of this species were found in one habitat on a sandy clay bottom in one and a half feet of water.

Ancylus species. A single specimen of *Ancylus* was found on a boulder bottom in two and a half feet of water. It was submitted to Dr. Bryant Walker who says of it, "I cannot be sure of the species and therefore prefer to leave it with a question until you get more, which would be very desirable. It does not seem to be any of the more common species."

PLANORBIDAE.

Planorbis trivolvis Say. Specimens of typical *trivolvis* were found in but one habitat, a quiet lagoon on a mud bottom in one and a half feet of water.

Planorbis trivolvis variety. This form of *trivolvis*, listed in Technical Bulletin No. IV, page 277, was again obtained in 1916, on sand, boulder, gravel and clay bottoms in water one and a half feet deep. Ecologically this form of *trivolvis* differs from the typical form and it would be convenient for it to have a name. It is suggested that the name *fallax* of Haldeman is applicable and seems to represent a shell of the kind here indicated.

Planorbis binneyi Tryon. Common on a boulder shore in one half to one and a half feet of water. Also collected on sand and clay bottoms in one and a half to five feet of water. The majority of the specimens were young or immature. Three young individuals were found on a leaf of *Sagittaria arifolia.*

Planorbis antrosus Conrad. Occurs on all varieties of bottom, in water one and a half to 18 feet deep. It is more abundant at a depth of one and a half to three feet on a sand or clay bottom, and is usually associated with the filamentous algæ *Cladophora* and *Oedogonium.* Also found on floating leaves of *Potamogeton natans.* The majority of individuals were young or immature and the adults were smaller than normal.

Planorbis campanulatus Say. Common on all varieties of bottom in water 1–9 feet deep. It is most abundant on a sand bottom in 1½–5 feet of water. In most habitats it is associated with filamentous algæ (*Oedogonium*, *Cladophora*, *Spirogyra*). About half the individuals collected were young or immature.

Planorbis parvus Say. Occurs on all varieties of bottom in water 1½–12 feet deep, but is most abundant on clay, sand, and mud bottoms in water 1½–4 feet deep. It is usually rarest on boulder bottoms, but on a shoal north of Dunham Island a single boulder 6x4x3 inches had 15 *parvus* on its surface. This species is usually associated with the algæ mentioned under the last species and is also frequently found on the leaves of *Nymphaea*, *Castalia*, *Sagittaria arifolia*, *Myrioyhyllum*, and *Potamogeton interruptus* and *Richardsoni.* *Parvus* is the most abundant *Planorbis* in the region the algæ in many places being filled with this species and one of the Amnicolas.

Planorbis hirsutus Gould. This species occurs on all varieties of bottom except clay, in water 1½–9 feet deep, being most abundant at 3–4 feet on a sand bottom. Rare on boulder and gravel bottoms. Associated with filamentous algæ.

Planorbis deflectus Say. This species is apparently rare in Lower South Bay occurring in but three habitats, on a gravel bottom in 2½ feet of water.

Planorbis exacuous Say. Occurs on all varieties of bottom in 1½–15 feet of water. Most abundant on sand and mud bottoms in 2–5 feet of water. It is rare on gravel bottom but is fairly common on boulder bottom, two to four individuals being found on each stone.

Segmentina armigera (Say). This species was collected in two habitats, one a swampy shore in Short Bay among the alga *Oedogonium* and the other in a protected bay on the north side of Frenchman Island, on leaves of *Sagittaria arifolia*. Both habitats are in shallow water with mud bottoms.

Lymnaeidae.

Lymnæa stagnalis lillianæ Baker. This, the largest of the gastropods in the lake, was found only in one habitat, the rocky shore of the lake, east of Norcross Point, in water a few inchés to two feet in depth. All were immature, half or three-quarters grown. A single young shell (dead) 14 mm. in length was found in a small bay on the south shore of Long Point in water 3½ feet deep, but it had evidently been brought there from some other habitat.

Pseudosuccinea columella chalybea (Gould). Collected in two habitats, a protected bay on *Nymphæa* leaves, and a partly enclosed lagoon among filamentous algæ, *Oedogonium*. All specimens were immature.

Acella haldemani ("Deshayes" Binney). Observed in two habitats on submerged vegetation, always in a protected situation, in water from 1—4 feet deep. All of the specimens were young, none exceeding 10 mm. in length, and were invariably found on the narrow leaves of *Potamogeton interruptus*. For the ecology of this species see the Nautilus, XXX, pages 135–138.

Galba catascopium (Say). One of the most abundant of Oneida Lake mollusks, found on all varieties of bottom in water 1½ to 14 feet deep. It is most abundant on sand and mud bottoms, associated with filamentous algæ, when young, and on boulder and gravel bottoms when adult.

Galba obrussa (Say). A single dead shell of this species was found in a dredging on a bar near a small lagoon east of the steamboat landing in 1½ feet of water. It was young, 5 mm.

long, and had evidently been washed into this habitat from some region along shore.

Galba humilis modicella (Say). Found in two habitats, one a lagoon among floating algæ (*Oedogonium*) and the other in Tuttle Brook, a tributary of Chittanango Creek, near the shore, in a few inches of water among the algæ *Oedogonium* and *Cladophora*. In the latter the mollusks were very abundant crawling on the shore at the margin of the water.

Succineidae.

Succinea retusa Lea. Small specimens of this species were very abundant along the shore at Becker's landing, crawling over the rocks on the shore near the margin of the lake.

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NEW LAND SHELLS FROM CALIFORNIA AND NEVADA.

H. A. PILSBRY AND JAS. H. FERRISS.

Epiphragmophora callistoderma n. sp. Pl. 7, fig. 3.

The shell is narrowly umbilicate, thin, cinnamon-brown, fading on the base to tawny olive, having a chesnut-brown band at the shoulder, with a wide border below and a narrow one above of olive buff. Sculpture of inconspicuous growth-wrinkles, and under the microscope, it is seen to be set with rounded pustules in high relief (about 35 in a square mm. on the upper part of the last whorl); they are rather irregularly arranged, along the growth-wrinkles the surface between pustules having very beautiful fine and close sculpture of wrinkles, which are parallel in spiral bands on the shell, elsewhere irregular and interrupted. This gives the shell a many-banded appearance, in certain lights.

Whorls nearly 5½, narrow and closely wound, the last relatively very wide, broadly rounded peripherally, descending a little in front. The aperture is large, oblique, margins but slightly expanding, at the columella dilated partly over the umbilicus. Alt. 16, diam. 23 mm. oblique alt. of aperture 13, width 14 mm.

Margin of Kern River 2 miles north of Bakersfield, Tulare Co., Cal., on an island formed by an irrigation ditch ; on dead vegetation at the water's edge. Collected by Ferriss and Hand, July 1, 1916.

This species differs from all forms of *E. mormonum* and *E. hillebrandi* by its much smaller umbilicus, far wider spire, and the more inflated last whorl. The embryonic whorls of the two species mentioned are densely papillose, while the new form has a pattern of close, irregularly radial wrinkles. It is not closely related to any other species known to us.

OREOHELIX HANDI n. sp.

A member of the *O. hemphilli* group. The shell is thin, depressed, very strongly keeled throughout, irregularly striate, decussated by spiral lines producing a rather indistinct granulation. On the other base there are spiral series of granules. In young shells and mostly adults, there are short cuticular processes on the granules and at the periphery. There are 4½ whorls. The first 1½, forming the embryonic shell, are strongly convex, the first whorl almost smooth, after which a few radial ripples appear. The first part, embryonic whorl, is very convex but begins to be impressed near the periphery. Subsequently the whorls are excavated on both sides of the suture, and the last one is concave above and below the peripheral keel. In fact it descended a little below the keel. The umbilicus is rather large and funicular. Aperture rather small, the margins converging, thin. There is a band of dark livid brown above and one close below the keel, the rest of the upper surface being clouded or suffused with the same color with lighter patches and streaks ; keel usually whitish. Alt. 5.7, diam. 10.2 mm.

Charleston Mountain, Lincoln Co., Nevada. This is about 30 miles north of Las Vegas, Nevada. Collecting was done for about a mile southward from Griffith's Hotel, the elevation about 9000 to 9500 ft.

This species is related to *O. hemphilli* and *O. eurekensis*, but differs from both by its more depressed, much more strongly keeled form. *O. hemphilli* is also much larger and more solid. Its locality is about 200 miles northeast from Charleston

Mountain. Whether these three forms will eventually be ranked as species or *eurekensis* and *handi* as subspecies of *hemphilli* cannot be determined definitely until further collections are made in Nevada and western Utah. At the present time, there is no evidence of intergradation, yet the territory where such evidence would be looked for is wholly unexplored.

Some hundreds of specimens were collected. There is slight variation in sculpture, but very little in form.

Vallonia cyclophorella Ancey.

A race which may be called *V. c. septuagentaria* P.&F. was taken at Bubb's Creek Falls, Tulare Co. It has fully 70 ribs on the base. Alt. 1.25, diam. 3 mm.

A SUMMER'S COLLECTION AT FRIDAY HARBOR, WASHINGTON.

BY T. S. OLDROYD.

Mrs. Oldroyd and myself had the pleasure of spending our vacation at the marine biological station of the University of Washington at Friday Harbor, San Juan Co., Washington. This group of islands, so wonderful in their wild beauty, is situated between the Strait of Fuca and the Strait of Georgia, north of Port Townsend. The San Juan group comprises more than 100 islands of varying sizes, the most important being San Juan, noted as having been the scene of the last struggle between the British and Americans in the boundary-line dispute from 1852 to 1872; the ruins of the old English camp and blockhouse still remain near Roach Harbor. Friday Harbor, the chief town of the islands, is the county seat of San Juan Co. which includes all the islands of the group. The town is situated on a beautiful bay and is the shipping-point for a large area of unsurpassed agricultural land. They have also one or two large salmon canneries. The islands are nearly all high and prominent and covered with a dense growth of trees, mostly fir. Mount Constitution on Orcus Island is the highest point. From its summit, 2094 feet above the sea, is the finest view to be obtained anywhere of the great panoramic picture of Puget Sound. The biological station is about one-quarter mile from Friday Harbor, and is under the able management of Dr. T. C. Frye. The camp is situated on a beautiful picturesque heavy-timbered slope and is one of the most healthy places in the world. The islands are a paradise for the botanist and student, as all forms of marine life is here very abundant. Students and visitors are accommodated from all over; tent houses, cots, mattresses, and other things are furnished, all but the bedding; and one needs plenty of covering for the nights are cold. Good table board can be had at nominal rates and visitors are required to pay a small registration fee which entitles them to the use of the boats and the week-end excursions on the dredge boat to places of interest on the islands, and it is well worth the price. The excursions sometimes take two days with a camp out over night, and they have bonfire chats and clambakes in the evenings. Sometimes in the main channels the tide runs swift, but in the bays and protected places and along shore it is as smooth as a mill pond. Although there is a difference of 14 feet sometimes in the tides yet it creeps in and out without a splash or a ripple. This makes it fine for shore collecting on the rocky reefs. It is the best I ever saw. The dredging was done by a small tug-boat, a shrimp dredger, and Captain Burnham understood the business thoroughly, having been 25 years on the Sound. He always knew the character of the bottom in nearly every place. We were allowed to go out on the dredge boat every day. At this we were treated especially fine, there being nobody there very much interested in shells, and often for two or three days at a time when they had no special use for the dredge they turned the boat over to us to go dredging where we pleased, an opportunity we were not slow to grasp and make good use of. And just imagine our having to sweep overboard bushels and bushels of those beautiful *Chlamys hericius* Gld. and *hindsii* Cpr. dredged in from 25 to 50 fathoms, not knowing what to do with so many. Mrs. Oldroyd worked like a beaver all the time and did not let many good things get away. The summer school lasted six weeks and a pleasanter time we never spent.

The following is a list of the species we collected during the six weeks:

List of Species Collected at Friday Harbor Summer School.

Nucula castrensis Hds.
Nucula tenuis Mont.
Leda 2 sp.
Leda minuta.
Leda cellulita Dall.
Yoldia amygdala.
Yoldia limatula Say.
Yoldia thraciaeformis Storer.
Yoldia ensifer Dall.
Glycimeris subobsoleta Cpr.
Ostrea lurida Cpr.
Pecten hericius Gld.
Pecten hindsii Cpr.
Pecten hindsii navarchus Dall.
Pecten islandicus Müll.
Hinnites gigantea Gray.
Pododesmus machoschisma Desh.
Mytilus californianus Conr.
Mytilus edulis Linn.
Modiolus rectus Conr.
Musculus laevigatus Gray.
Musculus niger Gray.
Crenella decussata Mont.
Kennerlyia grandis Dall.
Kennerlyia filosa Cpr.
Entodesma saxicola Baird.
Astarte willotti Dall.
Astarte esquimalti Baird.
Venericardia ventricosa Gld.
Miodontiscus prolongatus Cpr.
Thyasira barbarensis Dall.
Axinopsis sericatus Cpr.
Phacoides annulata Rve.
Phacoides tenuisculpta Cpr.
Pseudopythina rugifera Cpr.
Kellia suborbicularis Mont.
Cardium corbis Mart.
Cardium californiense Desh.
Cardium fucanum? Dall.
Serripes gronlandicus Gml.
Transennella tantilla.
Saxidomus giganteus Desh.
Saxidomus giganteus brevis? Dall.
Marcia kennerlyi (Cpr.) Rve.
Marcia subdiaphana Cpr.
Paphia tenerrima Cpr.
Paphia staminea Conr.
Psephidia lordi Baird.
Tellimya tumida.
Tellina salmonea Cpr.
Macoma inquinata Desh.
Macoma balthica Linn.
Macoma yoldiiformis Cpr.
Macoma expansa Cpr.
Macoma secta Conr.
Semele rubropicta Dall.
Psammobia californica Conr.
Solen sicarius Gld.
Mactra nasuta Gld.
Spisula polynyma alaskana Dall.
Schizothaerus nuttallii Conr.
Mya truncata Linn.
Mya arenaria Linn.
Panomya sp.
Saxicava arctica Linn.
Mytilinaria nuttallii Conr.
Hemithyris psittacea L.

Laqueus californicus
Laqueus vancouverensis David.
Terebratulina caputserpentis L.
Terebratulina var. unguicula Cpr.
Terebratalia transversa Cpr.
Terebratalia transversa caurina Gld.
Leptothyra carpenteri Pils.
Leptothyra lurida Dall.
Barleeia sp.
Melanella 2 sp.
Cerithiopsis sp.
Odostomia 2 sp.
Amalthea cranioides Cpr.
Crepidula dorsata Brod.
Crepidula nivea v.
Crepidula adunca Sby.
Tritonalia interfossa Cpr.
Tritonalia lurida Midd.
Bela fidicula Gld.
Boreotrophon stewartii E. A. Sm.
Boreotrophon tenuisculpta Cpr.
Bittium esuriens Cpr.
Fissuridea aspera Esch.
Trichotropis cancellata Hds.
Chrysodomus dirus Rve.
Admete sp.
Haminea virescens Sby.
Chrysodomus tabulatus Baird.
Purpura foliata Mart.
Thais lima Mart.
Thais lamellosa
Thais emarginata Desh.
Margarites helicina Fabr.
Acmaea patina Esch.
Acmaea patina pintadina.
Acmaea pelta Esch.
Acmaea persona digitata Esch.
Acmaea mitra Esch.
Lepeta concentrica Midd.
Velutina prolongata Cpr.
Velutina laevigata mulleri? Desh.
Calyptraea mamillaris fastigiata Gld.
Littorina sitchana Phil.
Littorina scutulata Gld.
Puncturella cucullata Gld.
Puncturella galeata Gld.
Lamellaria sp. may be new.
Columbella aurantica Dall.
Amphissa corrugata Rve.
Calliostoma annulatum Mart.
Calliostoma variegatum Cpr.
Calliostoma costatum Mart.
Margarita pupilla Gld.
Argobuccinum oregonensis Redf.
Buccinum liratum.
Natica pallida.
Natica clausa.
Lacuna 4 sp.
Cancellaria modesta.
Opalia sp.
Olivella sp.
Tornatina sp.
Mopalia wossnesenskii Midd.
Tonicella submarmorea.
Tonicella lineata.
Mopalia lignosa.
Katharina tunicata.
Mopalia muscosa.
20 sp. of Chitons not identified.

NOTES ON SOME HAWAIIAN SPECIES OF DRUPA AND OTHER SHELLS.

BY H. A. PILSBRY AND ELIZABETH L. BRYAN.

The dredging of the channel of Honolulu Harbor by the government has brought to light many shells which were either unknown before or among the greatest rarities to Honolulu collections. The specimens picked up on the "dump" are often quite perfect, though usually somewhat faded. Part of the same species have been dredged alive by Mr. D. B. Kuhns, the senior author having received specimens though Mr. D. Thaanum of Hilo.

Drupa walkerae n. sp. Pl. 9 fig. 4.

Honolulu Harbor, W. A. and E. L. Bryan.

The shell is oblong-fusiform, very solid, the ground color light buff. It is rather weakly plicate longitudinally, the folds and valleys crossed by spiral cords, of which five on the last whorl are larger, bearing *erect liver-brown spines* upon the folds ; two or three small spirals are between each pair of the larger ones ; all of the cords being densely scaly, the scales weaker between the cords. On the penult whorl there are two spiral series of colored spines, and one on each of several earlier whorls. The spine is straightly conic, the apex rather acute (not perfect in any of the specimens). The aperture is rather narrow, white. There is a series of about 6 teeth within the outer lip. The columella is straight, massive, excised at the canal ; below the middle there are several short, transverse and inconspicuous folds.

Length 25, diam. (including spines) 16 mm. (type).

Length 27, diam. (including spines) 16 mm. (old specimen with worn spines).

This handsome species is named for Miss Mary Walker, of Buffalo, N. Y., long an enthuisastic collector of shells. It has some resemblance to *S. fragum* (Blainville), but in that species the aperture is wide, there is a row of spots in place of spines below the suture, and the details of sculpture differ. *S. concatenatum* (Lam.) differs in color, in the absence of strong subsutural spines, the more open aperture, and details of sculpture. Both have shorter spines than the Hawaiian shell, often tubercles rather than spines.

Drupa foliacea (Conrad). Pl. 9, figs. 1, 2, 3.

P. [*urpura*] *foliacea* Conrad. Journ. A. N. S. Phila., vol. 7, 1837, p. 268, pl. 20, fig. 24.

Atooi [= Kauai] Conrad. Kaena, Kauai and Honolulu Harbor, W. E. and E. L. Bryan. Kewalo beach, east of Honolulu, Pilsbry. "Shell short fusiform, ventricose, with longitudinal undulations and spiral costæ; whorls with crowded spiral foliated striæ; labrum costate within, margin foliated; columella with an obtuse or obsolete fold. Inhabits the Island of Atooi" (*Conrad.*)

We do not know that this species has been recognized hitherto, though it was quite recognizably described and figured. Tryon in Manual of Conchology, vol. 2, considered it a synonym of the very different *Coralliophila bulbiformis* (Conrad). It has been found in some abundance in material dredged from Honolulu Harbor, by Professor and Mrs. Bryan, and the senior writer picked up a living specimen on the reef at Kewalo.

The shape is rather variable, as shown in the figures. The longitudinal folds, eight or ten on the last whorl, are crossed by four or five larger cords and numerous small threads. The cords and intervals are densely, minutely scaly, the whole shell being particularly rough and prickly. The shoulder is either nodular, or in some specimens spinose. There are about seven well developed teeth within the outer lip. The columella is heavy, straight, with a small, blunt, median prominence, recalling the fold of *Cymia* on a small scale.

The ground tint varies from light buff to pallid neutral gray, the summits of the folds and spines or tubercles being dull dark vinaceous. The aperture varies from fawn color to nearly white.

Two specimens measure:

Length 33.5, diam. 21.5 mm.

Length 28.5, diam. 21.5 mm.

There is also a small specimen in the Bryan collection from Ocean Island, collected by Capt. J. H. Brown.

Fusinus sandvichensis (Sowb.) Pl. 9, fig. 8.

Honolulu Harbor channel, D. Thaanum, W. A. and E. L.

Bryan ; off Honolulu in 5–8 fms., and off Waikiki in 30 fathoms, D. B. Kuhns.

The shell is white, covered with a thin, straw-yellow cuticle, and stained with russet at the tip, having a very long anterior canal, and a long spire ; longitudinally folded, the folds broad, rounded, about seven on a whorl, crossed by numerous spiral cords, parted by wider, concave intervals, with weak, fine spirals over the cords and intervals. On the earlier post-nuclear whorls there are four large and one small spiral cords. The cuticle has minute, close longitudinal raised threads, which are slightly bristly at intersections of the spirals (the bristles deciduous, and mainly lost in dry shells). The aperture is short, oval, lirate within ; canal long and slender. The whorls are strongly convex. Embryonic shell of two whorls, the first bulbous, obliquely swollen, smooth, 0.7 mm. in diameter ; the next whorl narrower, less convex, its last half closely costulate ; the total length of the embryonic shell is 1.1 mm.

Length 71.5, diam. 19.5 mm. ; 12 whorls.

Length 105, diam. 29.5 mm. ; 12 post-embryonic whorls, the apex broken.

This species resembles *F. turricula* Kiener,[1] which however has a decidedly deeper suture, and the embryonic whorl is much larger. The type was an immature but perfect shell. The larger ones, from the "dump" of the harbor channel, are without cuticle and apical whorls. In them the folds became shortened on the last whorl, into nodes at the shoulder. It is a handsome and graceful species.

PERISTERNIA THAANUMI n. sp. Pl. 9, figs. 6, 7.

Off Waikiki in 35 to 50 fathoms, D. B. Kuhns, 1916; Honolulu Harbor, W. A. and E. L. Bryan.

The shell is fusiform, thick and solid, pecan-brown, sculpture of strong, rounded, longitudinal folds, 8 on the last whorl, continuous from whorl to whorl. These are crossed by rather coarse spiral cords, of which there are four on the penult, nine or ten on the last whorl; usually a minor cord divides the intervals ; and under the lens numerous spiral and axial threads are seen,

[1] Iconogr. Cog. vii, p. 6, pl. 5, fig. 1.

resembling a loosely woven fabric. The aperture is somewhat oblique, contracted, obtuse posteriorly, tourmaline-pink around the lips, paler, nearly white, in the throat. The outer lip is thickened within except posteriorly where it is excavated; the thickening bearing about seven teeth, the upper ones larger. The columella has two or three blunt and low but deeply entering folds. The inner lip has a thin free edge. The siphonal fasciole is deeply striate spirally.

Length 21, diam. 11 mm. (type).

Length 23.8, diam. 12.3 mm. (Honolulu Harbor).

The specimens from the Honolulu Harbor dump, though quite perfect in appearance, are evidently bleached. The color is a handsome maize-yellow, uniform, or sometimes a shade darker on the high points of the sculpture. The aperture is pure white (fig. 6.)

This species, though differing in color and sculpture, is related to *P. incarnata* Dh., "*Ricinula*" *pulchra* Reeve, and *P. carolinæ* Kiener—species somewhat like *Cantharus* or *Drupa*. A section shows that the two columellar plaits are strong within, ascending the pillar.

Drupa morus (Lam.). Pl. 9, fig. 11.

Ricinula morus Lam., An. s. Vert. vii, 1822, p. 232. Encycl. Meth., pl. 395, fig. 6 *a*, *b*.

Haena, Kauai, Honolulu Harbor; Mokumanu, off Mokapuu Point, and Kainalu, Oahu.

The specimens from the harbor are rather small, length up to about 16–18 mm., but otherwise they appear typical. A specimen from Kainalu is 22 mm. long. Lamarck referred to excellent figures in the Encycl. Methodique, but also to Lister, 954: 4, 5, and Martini III, 101: 970; both are dubious and inconclusive illustrations, which served as the sole basis of *Drupa uva* Bolten, Mus. Bolt., p. 56, no. 703. They look more like some forms of *D. tuberculata* than like *morus*; and we prefer to use the positively identified name.

The common Hawaiian species of the genus is *Drupa tuberculata* (Blainv.), which the authors have from various places in Kauai, Oahu, Molokai, and on Molokini. It occurs at low tide, and may be picked up on any reef or rocky shore (pl. 9, fig. 10.)

LIST OF SHELLS COLLECTED AT ANAHEIM BAY AND VICINITY.

BY E. P. CHACE.

Collected in the Bay.

Acanthina spirata, Blainville.
Alectrion fossata, Gld.
Alectrion mendica cooperi, Fbs.
Alectrion perpinguis, Gld.
Arcularia tegula, Rve.
Bullaria gouldiana, Pils.
Calliostoma gemulatum, Cpr.
Calliostoma tricolor, Gabb.
Cerithidea californica, Hald.
Cerithiopsis carpenteri, Bartsch
Cerithiopsis pedroana, Bartsch.
Columbella gausapata, Gld.
Columbella gausapata carinata, Hds.
Conus californicus, Hds.
Crepidula onyx rugosa, Nutt.
Crucibulum spinosum, Sby.
Haminea vesicula, Gld.
Littorina scutulata, Gld.
Lucapina crenulata, Sby.
Lucapinella calliomarginata, Cpr.
Melampus olivaceus, Cpr.
Olivella biplicata, Sby.
Olivella pedroana, Cpr.
Phasianella compta, Gld.
Polynices lewisii, Gld.
Polynices recluziana, Desh.

Cardium quadragenarum, Conr.
Cardium substriatum, Conr.
Chione fluctifragra, Sby.
Chione succincta, Val.
Chione undatella, Sby.
Cooperella subdiaphana, Cpr.
Diplodonta orbella, Gld.
Donax californica, Conr.
Heterodonax bimaculatus, D'Orb.
Macoma indentata, Cpr.
Macoma nasuta, Conr.
Mactra californica, Conr.
Modiolus capax, Conr.
Ostraea lurida rufoides, Cpr.
Paphia staminea, Conr.
Paphia staminea laciniata, Cpr.
Pecten circularis aequisulcatus, Cpr.
Petricola denticulata, Sby.
Pholas pacifica, Stearns.
Platyodon cancellatus, Conr.
Psammobia californica.
Sanguinolaria nuttallii, Conr.
Saxidomus nuttallii, Conr.
Schizothaerus nuttallii, Conr.
Tagelus californianus, Conr.
Tagelus californianus subteres, Conr.
Tellina carpenteri, Dall.
Zirfaea gabbi, Tryon.

Collected on the Sandbars and Beach near the Entrance of the Bay. Alive.

Bursa californica.
Donax levigata, Desh.
Murex festivus, Hds.
Tivela crassatelloides, Conr.
Turris ophioderma, Dall.

Washed up on the Beach After Storms, Alive or Very Fresh.

Amiantis callosa, Conr.
Chama exogyra, Conr.
Chama pellucida, Sby.
Cryptomya californica, Conr.
Glottidea albida, Hds.
Macoma secta, Conr.
Mactra hemphilli, Dall.
Mactra planulata.
Metis alta, Conr.
Modiolus flabellatus, Gld.
Modiolus rectus, Conr.
Paphia tenerrima, Cpr.
Periploma discus, Stearns.
Periploma planiuscula, Sby.
Siliqua lucida, Conr.
Solen rosaceus, Cpr.

Dead Shells Collected on the Beach.

Bathytoma tryoniana.
Dentalium neohexagonum, S. & P.
Epitonium hindsii, Cpr.
Sinum debilis, Gld.
Turritella cooperi, Cpr.
Anomia peruviana, (upper valves).
Labiosa undulata, Gld. (broken valves).
Mactra catilliformis, Conr.
Panopea generosa, Gld.
Pecten giganteus, Gray.
Thracia plicata.
Yoldia cooperi, Gabb. (valves only).

Collected on the Piles of the Bridge Across the Entrance of the Bay.

Acmaea patina, Esch.
Acmaea persona, Esch.
Littorina planaxis, Nutt.
Littorina scutulata, Gld.
Cypraea spadicea, Gray. (1 only).
Lasaea rubra, Mont.
Myrina diegensis, Dall.
Mytilus californianus, Conr.

Occasionally a rock washes in on the beach containing some Lithophagus plumula, Cpr. and Kellia laperousii, Desh., and the kelp brings in Acmaea incessa, Hds. Eulima (species undetermined) has been found in a kelp holdfast and a dead Polynices lewisii with 7 Crepidula excavata Brod. on it washed in after a storm.

The territory covered by this list is quite limited. It includes about 2 miles of shore along the Bay and a short distance along the ocean-front on either side of the narrow entrance of the Bay. A total distance of 3 miles of shore.

All the species listed have been collected within the last three years, most of them by Mrs. Chace and myself. A few were collected by Mrs. J. E. Herbst, Mr. Valentine Herbst and Mr. Otto Kiem of Seal Beach.

A HOME MADE VIVARIUM.

BY LILLIAN DYER THOMPSON.

I am having such success with a vivarium which I made that I thought perhaps some other conchologists might like to make some so that they, too, could study more closely the living animal, and become acquainted with the way they eat, walk, build their shells, etc.

I first bought a large roasting pan and a smaller pan that was as long as the other wide. These cost me twenty cents. Then I had a box made that the bigger pan would snugly fit and had it made six inches deep. The cover was of a fine-meshed wire netting fastened to a hinged frame. The box, of $\frac{7}{8}''$ spruce stock, was made at odd moments and cost me twenty-five cents.

In one or two places, where the larger pan did not fit the case, I stuffed the cracks with wadded paper. Then I put the smaller pan across one end of the larger and filled any cracks with moss and earth.

I put a tuft of grass (which I shall supplant with a fresh-water alga soon) and a dead *Busycon* shell that I had washed to remove all traces of salt, which I have been told is injurious to snails. I then partially filled the pan with water, and my little fresh-water pond was ready for occupancy.

The remainder of the larger pan I filled with moss and bunches of grass containing growing plantain (of which the snails are very fond). As some snails love to hide under dead leaves, I put some in for them, and I also put in a stick that formed a stairway from the moss to the cover. I knew that the snails would want some lime to aid them in constructing shell-forming material, so I put in a *Modiola* after I had washed it.

I gave them corn meal on half a scallop shell and put a *Polynices* shell full of water beside it, sinking the shell into the earth until the lip was level with the surface. The snails are very fond of corn meal; they also relish lettuce and cabbage leaves, green grass, plantain, and all succulent weeds.

As I live in Cambridge, Mass., where limestone formations are scarce, I have had largely to depend upon the kindness of others for my pets. As I have received quite a few specimens through the mail, I thought others might want to do the same; so will, in as few words as possible, tell how mine were sent. Some came way from California in a tin box, with a little grass. As they could not get much air, they built epiphragms over the apertures, which they broke down soon after they were put in the vivarium. The majority were sent with a little grass or lettuce in pasteboard or wooden boxes (which are the only things to send specimens in, as they can breathe freely).

In closing, I shall give a list of species that I now have in my vivarium, with the localities. Those with the asterisk (*) have raised families since they came.

Lymnaea palustris Müll, from Livingston Co., Michigan.

Campeloma decisum Say *, from Shawsheen River, Bedford, Mass.

Physa heterostropha Say *, from Shawsheen River, Bedford, Mass.

Planorbis antrosus Conrad *, Shawsheen River, Bedford, Mass.

Succinea ovalis Say *, Waverly, Mass.

Epiphragmophora tudiculata Binn, near Los Angeles, Cal.

Polygyra tridentata Say, Livingston Co., Mich., and New York City.

Polygyra thyroides Say, Livingston Co., Mich., and Upper Montclair, N. J.

Polygyra multilineata Say, Livingston Co., Mich.

Polygyra monodon Rach., Livingston Co., Mich.

Polygyra albolabris, Blue Hills, Mass.

Polygyra thyroides Say, Middlesex Fells, Melrose, Mass.

Zonitoides arboreus Say, Middlesex Fells, Melrose, Mass.

NOTES.

Helix nemoralis in Knoxville, Tenn.: One day, while playing in an alley the two small sons of Prof. J. F. Voorhees, in charge of the U. S. Weather Bureau here, found some handsome snails crawling on a brick wall, and knowing that I was making a special study of the fauna of this vicinity, brought some of them to me.

I had never seen any like them in the State, and sent some of them to Mr. Bryant Walker of Detroit for identification. He pronounced them the European species *Helix nemoralis* Linné. He said this was the first authentic colony reported to him West of the Alleghany Mountains.

He suggested it would be interesting if I could trace out how they came to be here, and send an account to the Editor of the Nautilus, as the readers of the Nautilus would be interested to know that such a colony existed here in Knoxville, Tennessee.

I made investigations, and found that the wife of Prof. Chas. C. Ross connected with the University of Tennessee brought them here.

Mrs. Ross says that eight years ago she went to visit the graves of her grandfather and grandmother who were buried in the cemetery at Lexington, Va. As she approached the tombstones she noticed they looked spotted, as if boys had marked or defaced them, but upon a nearer approach found the peculiar appearance was due to the presence of numbers of *H. nemoralis* crawling upon the face of the stones.

When Mrs. Ross came away she dug up and brought with her some of the vines and shrubs, being careful to bring with them some of the beautiful shells. She transplanted the plants in the rear of the yard, and now after 8 years, amongst dense growths of English Ivy, and on adjoining trees and other shrubbery, this colony has become thoroughly acclimated and is thriving magnificently. Mrs. Ross met the person who originally brought them from Italy to Lexington, Virginia.

—Manly D. Barber.

Viviparus malleatus and contectoides in Massachusetts: Eight fresh specimens, one with the operculum in place, were collected by Mr. C. H. Rowe, in Lake Quinsigamond, near Worcester, Sept. 29, 1917. Whether these represent a recent introduction he could not ascertain. The Boston colony referred to in THE NAUTILUS, Vol. 29, p. 36 and Vol. 30, p. 48, still exists. The colony of *V. contectoides* in the Public Garden, Boston, mentioned in THE NAUTILUS, Vol. 30, p. 72, has increased greatly during the summer, nothwithstanding that the lake was drained for a short time in the early spring.

—C. W. JOHNSON.

POLYGYRA ALBOLABRIS MARITIMA IN MASSACHUSETTS. Several years ago, when I was at Wood's Hole, Mr. V. Edwards described to me some snails which he had seen on Ram Island, off that coast, I thought he had found *H. hortensis*, and expressed a wish to visit the colony. He kindly took me to the place, and instead of *H. hortensis*, we found *Polygyra albolabris*, of a small greenish variety according well with my recollection of var. *maritima*, which Dr. Pilsbry showed me years before in the collection at Philadelphia. I think we may refer the shells to that variety or race, which is not cited in Mr. Johnson's list of New England Mollusca.—T. D. A. COCKERELL.

[I can confirm the identification from specimens sent by Prof. Cockerell.—H. A. PILSBRY].

PUBLICATIONS RECEIVED.

THE CALIFORNIAN LAND SHELLS OF THE EPIPHRAGMOPHORA TRASKII GROUP. By Paul Bartsch (Proc. U. S. Nat. Museum vol. 51, pp. 609–619, plates 114–117). This species and its allies have not been well understood. Numerous forms of the group had been named by Hemphill and others, without descriptions. Dr. Bartsch therefore undertook a revision, utilizing the considerable material contained in the National Museum and the Academy of Natural Sciences of Philadelphia, with a few specimens from other sources. Descriptions are given of—

E. cayamacensis n. sp. with the new subspecies *avus* and *venturensis*.

E. traskii (Newc.) with subsp. *tularica* new, *zechae* Pils. *proles*, *coronadoensis*, *coelata* and *phlyctaena*, new, *carpenteri* (Newc.)

As synonyms under *E. traskii traskii*, Dr. Bartsch places Hemphill's undescribed varieties *major*, *verna* and *saucius*, and *Epi. petricola* Berry. All of the species and races are figured.

This revision should lead to a further increase in our knowledge of these difficult Helices, as conchologists collecting in southern California can now identify their finds.—H. A. P.

THE NAUTILUS.

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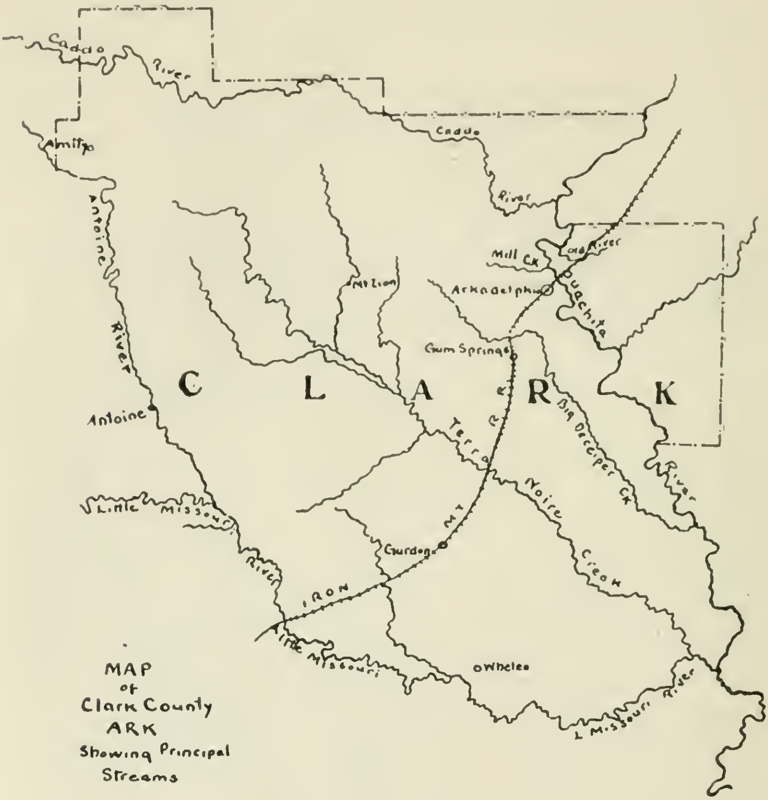
THE MOLLUSCA OF CLARK COUNTY, ARKANSAS.

BY REV. H. E. WHEELER, CONWAY, ARK.

Clark County lies in the south-central portion of the state of Arkansas and has an area of 875 square miles and a population of about 25,000. About one-third of the county—the southeastern section—is of tertiary and quarternary age. The northwestern third of the county forms a part of the southern exposure of a vast carboniferous area in the state which is generally referred to the Mississippian sub-division, and consists of non-coalbearing sandstones and shales lying above the Batesville sandstones. Between these formations lies a wedge-shaped section of cretaceous marls and clays, which form the eastern boundary of these limited rocks in the state. The alluvial lowlands of southeastern Arkansas are developing a prosperous agriculture, cotton and corn being naturally the most prolific crops, but rice is now being successfully cultivated. The county does not extend into the mountainous paleozoic region, and hence cannot boast any elevations of consequence.

The general course of the streams in the county is from northwest to southeast. The Antoine and Little Missouri rivers form the western and southern boundaries of the county, while the Caddo river crosses the county along its northern boundary, emptying into the Ouachita river some five miles above Arkadelphia. The latter river rises in the mountains of Polk County and throughout its tortuous course of several hundred miles is one of the most beautiful watercourses in the entire southwest. It passes through the eastern extension of the county, but constitutes, in part, the natural boundary between the counties of Dallas and Clark. The Terra Noire creek is an intra-county stream flowing in a southeasterly course and dividing the county into two nearly equal parts. Several smaller creeks supply this vigorous stream from either side. Little Deceiper



creek is a small tributary of the Big Deceiper, and the latter creek flows in parallel direction with the Terra Noire, emptying into the Ouachita at the lower end of the county. This whole section, then, is furnished with a most complete drainage system, and the streams in question are not less inviting opportunities for an earnest and patient collector. Practically no work, however, has been done in the Antoine or Little Missouri rivers, while the Caddo and the upper Ouachita are almost unknown to the malacologist, and promise generous remuneration to whomsoever first will require their secrets.

Although something like fifty species have been described from Arkansas,[1] and the mountainous regions of northern, central and western Arkansas have been often visited by conchologists, the fauna of the low-lands, particularly the *Unione* fauna, of the lower courses of all rivers, is practically unknown. Before a satisfactory catalogue of the Mollusca of the state can be written, not less than forty counties call for a conchological survey.[1]

A three year's pastorate in Arkadelphia,[2] the capital of Clark County, gave the writer frequent opportunities for collecting the mussels of Ouachita river and such land, and fresh-water snails as were to be had. Through the kindness of Mr. George H. Clapp the identification of the land shells has been made nearly complete, and he has determined all of the rarer forms here listed. Dr. A. E. Ortmann and Mr. L. S. Frierson have been very generous in the help given on the *Unios*, but for the most part this is the result of much patient study on the part of Dr. Bryant Walker. Most of the specimens on which the determination of the *Unionidæ* depended are now in the Walker collection.

The country around Arkadelphia would be quite discouraging

[1] The richness of the Arkansas fauna is well indicated by a comparison of species described from this state and those described from the adjoining state, Missouri, portions of each being included in the Ozarkian uplift. Exclusive of the *Unionidae*, thirty-four species have been described from Arkansas, twenty-three of which are land snails. From Missouri nine species and varieties are listed, all of which with one exception, are fresh-water forms. Consult: Simpson, "A Preliminary List of the Mollusca of Missouri," Proc. Acad. Scien. St. Louis, Vol. XXII, No. 8, p. 68, and Pilsbry's Note in the NAUTILUS, Vol. XXVIII, p. 12. This is especially significant in view of the fact that the State of Missouri has been favored with the residence of faithful and efficient conchologists, among whom may be mentioned Mr. Sampson, and more recently Professor Utterback.

[2] From November 1910 to December 1913.

to a casual collector. The swamps and "cray-fish land" offer little attraction to ambitious snails, and even the hill country has not yet organized a molluscan colonization bureau. In the cretaceous limestones of the central area the conditions are a little more promising. The entire portion of the County lying east of the Ouachita river is typical tertiary soil, but there are no exposures of strata in these lowlands, and fossils are to be secured only from occasional well borings.

Since there are many creeks and bayous the collector would expect a few colonies of *Sphaeriidæ*, or at least a larger list of the *Lymnaeidæ*. As will be seen, however, the *Unios* fully make up for any disappointment on this score. Not only are there many species and varieties, but specimens in finer condition could not be desired. The mussel beds of the Ouachita river, while worked to some extent for pearls, have not been found profitable, and button factories are too far away to make the exportation of shells for commercial purposes practicable. From the mouth of the Caddo river (five miles above Arkadelphia), the Ouachita abounds in mussel "beds" throughout the rest of its course, and the accessible and prolific breeding "bars" are less disturbed than is usually found in the experience of the uniologist. Arkadelphia was at one time the head of navigation, but steamers now seldom ascend the river above Camden.

"Old River," the type locality of the genus *Arkansia*, is really an "ox-bow" lake, a former channel of the Ouachita, and it is still connected with it by a small creek which does not appear to dry up in summer. Its mouth is about two miles north of Arkadelphia on the left bank, almost lost in a rather dense and difficultly passable swamp. Here, and for a mile or more up stream, Old River is deep and rather wide, with a very sluggish current. In this habitat are found very large specimens of *Anodonta suborbiculata* Say, which are of great beauty, and the largest specimens of *Arkansia wheeleri* Walker and Ortmann. One of the latter measured 109.25 by 87 by 58 mm. In the summer "Half-Moon Lake," the upper channel of Old River, is set off by the subsidence of water on the sand bars, and through the narrow creek which connects it with its lower course it is quite impossible to navigate even a small canoe.

Young *Arkansia* are found in the shallow waters both on the sand bars and muddy bottoms, but like other *anodontine* species they prefer the oozy mud of the river margins where there is little or no current. So far, the most patient effort to secure gravid females of this new genus has not been successful, the breeding season being winter, and the localities just described being almost inaccessible at this season.

Mr. Sampson in his "Preliminary Report of the Mollusca of Arkansas,"[1] enumerates twelve species of mollusks collected in Clark County. Five of these I have not been able to verify, namely: *Physa gyrina* (Say), which is possibly the same as *Physa anatina* of my list, *Campeloma subsolidum* (Anth.) which is certainly what is now described by Walker as *Campeloma lewisii*, *Pleurocera subulare* (Lea) which may be *Pleurocera elevatum* (Say), *Pleurocera canaliculatum* (Say), and *Goniobasis lawrencei* Lea. Mr. Call in his "Study of the Unionidæ of Arkansas,"[2] reports three species from the Ouachita collected in Clark County, namely: *Unio parvus* Barnes, *Unio subrostratus* Say, and *Unio tumescens* Lea. What Professor Call took to be *tumescens* is very likely a juvenile *Fusconaia undata* (Barnes). Many shells collected in late summer have a clear "honey yellow color," and they are "abundantly rayed over the entire surface," just as he describes the so-called *tumescens*. Lea was surely mistaken in the locality given for his type specimen, for the species belongs to the Tennessee drainage, and has not been found, so far as I am aware, west of the Mississippi River. The Arkansas range of this species is also questioned by Dr. Walker in Simpson's "Catalogue of the Naiades."[3]

Annotated List of Species.

Carychium exile H. C. Lea. Collected in one place only, a marshy pasture along Mill Creek, an insignificant stream just North of Arkadelphia.

Lymnæa columella Say. Ouachita River under the Railroad

[1] In Annual Report of the Geological Survey of Arkansas for 1891, Vol. II, pp. 179–199.

[2] Transactions Acad. Scien., St. Louis, 1895, pp. 1–65, Plates I–XXI.

[3] See in loco, p. 751.

bridge at Arkadelphia; also Caddo River near County bridge five miles North of Arkadelphia.

Lymnæa humilis modicella Say. Found in the environs of Arkadelphia; in Mill Creek; rarely in the Ouachita River margins. Rare!

Planorbis trivolvis Say. Ouachita River, Old River, and Big Deceiper Lake, nine miles south of Arkadelphia.

Planorbis dilatatus Gould. Ouachita and Old Rivers. There are possibly two forms in this lot.

Planorbis sampsoni (Ancey). Clear Lake, two miles east of Arkadelphia, and ponds south of Arkadelphia (young shells only). This species seems to be exceedingly perishable.

Ancylus kirklandi Walker. Caddo River (common) Clear Lake.

Ancylus walkeri Pilsbry and Ferriss. Ouachita River at Arkadelphia. Very rare.

Ancylus sp.? Ouachita River near Arkadelphia.

Physa anatina Lea. Mill Creek, ponds south of Arkadelphia, and Big Deceiper Creek at Gum Springs, six miles south of Arkadelphia.

Physa sp.? Clear Lake east of Arkadelphia.

Strobilops labyrinthica (Say). Arkadelphia. Everywhere common in suitable localities.

Strobilops labyrinthica texasiana Pilsbry and Ferriss. Arkadelphia. Not uncommonly there is found what seems to be a hybrid between this variety and the species proper.

Strobilops virgo (Pils). Arkadelphia, but found also in the bordering county of Grant.

Pupoides marginatus (Say). Arkadelphia.

Gastrocopta contracta (Say). Arkadelphia.

Gastrocopta contracta climeana Van. Arkadelphia, very rare.

Gastrocopta pentodon (Say). Arkadelphia.

Gastrocopta tappaniana (C. B. Ads). Arkadelphia. Collected also in adjacent counties north and east of Clark.

Succinea avara Say. Environs of Arkadelphia, not common.

Omphalina friabilis (W. G. Binn.). Arkadelphia. Very rare !

Vitrea indentata (Say). Arkadelphia ; Gurdon.

Vitrea radiatula circumstriata Taylor. Arkadelphia. Quite rare, generally associated with *arborea*.

Vitrea (*Paravitrea*) *significans* (Bland). West of Arkadelphia in the foothills. Rare!

Vitrea wheatleyi (Bland)? Arkadelphia. This species, which cannot be placed anywhere else among the *Zonitidæ* collected, is either *wheatleyi*, or a variety of it.

Euconulus chersinus trochulus (Rein.). Arkadelphia. Fairly common.

Euconulus chersinus polygyratus (Pils.)? Arkadelphia.

Zonitoides arborea (Say). Arkadelphia; also along Little Deceiper Creek, and at Gurdon. Generally distributed.

Zonitoides (*Pseudohyalina*) *minuscula* (Binney). Arkadelphia.

Gastrodonta demissa brittsi (Pils.). In the hills five miles northwest of Arkadelphia. Smaller than typical *brittsi*, and rare.

Pyramidula alternata (Say). Arkadelphia, Gurdon, Whelen, and six miles east of Whelen in the southeast end of the County.

Helicodiscus parallelus (Say). Arkadelphia, west of the town near Little Deceiper Creek. Very rare!

Circinaria concava (Say). Limestone region west of Arkadelphia, and "Big Bluff" on the Ouachita River, two miles north of Arkadelphia.

Polygyra leporina Gould. Arkadelphia and Gurdon. Common in most of the low lands.

Polygyra dorfeuilliana Lea. In low hills west of Arkadelphia, Gurdon. Rare! Nearly always found under small pieces of bark, seldom under logs and stones.

Polygyra inflecta (Say). Arkadelphia, Gurdon, Whelen, and southeastern corner of the County.

Polygyra albolabris (Say). Arkadelphia. Rare! This does not appear to be the variety *alleni* Wetherby, to which all of the shells of this type west of the Mississippi River have been referred.

Polygyra divesta (Gould). Arkadelphia, Crawford's Mill on Big Deceiper Creek, Gurdon.

Polygyra zaleta (Binney). Woods west of Arkadelphia. Rare!

Polygyra obstricta carolinensis (Lea). Typical shells collected in heavy woods along the Little Missouri River in the southeast corner of the County. Here there is much cypress. Clark County corners at the confluence of the Little Missouri and the Ouachita rivers, the former making the southern and the latter the eastern boundary line.

Polygyra clausa (Say). Arkadelphia. Generally distributed. The commonest of the *Helices* in all this region!

Polygyra stenotrema ("Fer." Pfr.). Arkadelphia and Crawford's Mill on Big Deceiper Creek.

Polygyra monodon (Rack) var. Whelen and southeast corner of the County.

Polygyra fraterna aliciæ (Pils.). Crawford's Mill on Big Deceiper Creek.

Bulimulus sp.? Fragments of a *Bulimulus* were collected in the hills west of Arkadelphia. It is probably *dealbatus* (Say).

Amnicola cincinnatiensis (Anth.). Big Deceiper Creek at Gum Springs.

Somatogyrus wheeleri Walker. Ouachita River, type locality, under railroad bridge, Arkadelphia. Rare.

Somatogyrus amnicoloides Walker. Ouachita River, type locality, under railroad bridge, Arkadelphia. Rare.

Campeloma lewisii Walker.[1] Ouachita and Old Rivers, Arkadelphia, very common; Big Deceiper Lake, nine miles south of Arkadelphia; Caddo River.

[*Pleurocera canaliculata* Say]. Reported by Sampson on authority of Call from the Ouachita River in Clark County. Not found.

Pleurocera elevatum (Say). Ouachita, Caddo and Old Rivers near Arkadelphia; Big Deceiper Lake.

[*Pleurocera subulare* (Lea)],[2] reported from Clark County, Ouachita River, by Call in Sampson,[3] was not located. Possibly young *elevata* were mistaken for this species.

[1] *Vide*, NAUTILUS, Vol, XXVIII, pp. 126, 127.

[2] *Vide* NAUTILUS, Vol, XXX, pp. 122–124, On "Pleurocera subulare, Lee," by Calvin Goodrich.

[3] See "Preliminary List of the Mollusca of Arkansas," Geol. Surv. of Ark., 1891, Vol. II, p. 197.

Goniobasis plebeius (Anth).[1] Ouachita and Caddo Rivers, Arkadelphia. Very common.

Goniobasis lawrencei (Lea), described from the Ouachita River in Garland County, was not found. Search was made for it in the Ouachita River at Cove Creek station, Hot Springs County, near the boundary of Garland County, about twelve miles east of Hot Springs, but without success.

Helicina orbiculata Say. Dead shells only were collected from creek and river drift at Arkadelphia, these being evidently brought down from the limestone hills in the western part of the County.

Lampsilis ventricosa satur (Lea). Ouachita River below Arkadelphia and at Skillern's Shoals; Old River. In form it is closely related to *excavatus*. Specimens from the Ouachita are "gorgeously appareled", some of a deep solid yellow color, others with varying and elaborate patterns of green.

Lampsilis hydiana (Lea). The Southern form of *luteola*, common in all the rivers, and also in Big Deceiper Creek on the Huie farm and at Gum Springs; also in Salt Bayou east of Arkadelphia.

Lampsilis orbiculata (Hild). Old River. This species is admitted to the list on the authority of Dr. Ortmann. In a letter dated June 5, 1911, Dr. Ortmann writes: "Among the *Lampsilis ventricosa satur* was one individual (female, sterile) which I must regard as *Lampsilis orbiculata* (Hildreth). This species also is not listed from your region. The specimen agrees in shape etc. completely with the Ohio forms of *orbiculata*, only the color is not *quite typical.*" Again on June 19, 1911: "And there is [among the shells received] a fine typical male of *Lampsilis orbiculata*, preserving even the characteristic *pink* stain of the nacre." If *orbiculata* and *ligamentina gibba* are so similar as to make differentiation difficult as is stated by Wilson and Clark,[2] then our Ouachita specimens are *not* this species.

[1] *Vide* Proc. Ac. Nat. Sc., Phila., 1900, pp. 458, 459. Both *elevatum* and *plebeius* are here figured.

[2] See "The Mussels of the Cumberland River and Its Tributaries", Bureau Fisheries, Doc. No. 781, p. 49.

Lampsilis higginsi (Lea). A fine typical series of this species was collected from the Ouachita River below Arkadelphia, at Skillern's Shoals, and also in Old River.

Lamsilis higginsi grandis Simpson. Old River. These shells are larger and *less inflated* than typical *higginsi*. The feeble posterior ridge, high beaks, shining surface, and the absence of growth ridges make the identification satisfactory.[1]

Lampsilis (*Nephronaias*) *ligamentina* (Lam.). Everywhere common in the Ouachita and Old Rivers. The common "mucket" of the pearlers.

Lampsilis fallasiosa (Smith) Simpson. A common species collected in the Ouachita River, Old River, and Terra Noire Creek. The validity of this species as distinct from *anodontoides* Lea presents no difficulty to one who has a series of shells from Arkansas localities to compare with those from regions further North. Consult Simpson's diagnosis in his "Descriptive Catalogue."

Eurynia recta (Lam.). Ouachita and Old Rivers.

Eurynia subrostrata (Say). Though not common this species has been found in Ouachita and Old Rivers, Big Deceiper Creek at Gum Springs, Big Deceiper Lake, and a few "sloughs" south of Arkadelphia.

Micromya lienosa (Con). Ouachita and Old Rivers. Rare.

Micromya lienosa nigerrima (Lea). Common in both Ouachita and Old Rivers, Big Deceiper Creek at Gum Springs, and Caddo River. The nacre is *white*, and the epidermis a lead-black, unpolished.

Eurynia (*Micromya*) *arkansasensis* (Lea). On July 28, 1913, two females from the Ouachita River south of Arkadelphia were sent to Dr. Ortmann, who reported: "I think here we have *arkansasensis* again! These agree rather well with females received previously (from you) from Saline River, Benton." The species is smaller than *lienosa*, lighter in color, and with a silvery nacre. Of the *arkansasensis* collected from the Saline River on July 13, 1911, of which there were four males and two females, Ortmann says: "Here it is! The males, although

[1] See "Descriptive Catalogue of the Naiades," Simpson, p. 78.

slightly differing from one another, agree well with Lea's original figure. The female has never been figured. According to these specimens, the species would be an *Eurynia*, subgenus *Micromya*, but the papillæ of the mantle margin are very poorly developed. They may be larger in *gravid* females." With this identification Dr. Walker is satisfied. See NAUTILUS, vol. XXX, p. 54.

Carunculina texasensis (Lea). Ouachita and Old Rivers; Terra Noire Creek; Caddo River; Big Deceiper Lake. Common.

Carunculina parva (Bar.) Ouachita and Old rivers; Caddo River; Terra Noire Creek at Mount Zion; Big Deceiper creek at Gum Springs; Big Deceiper Lake. The shells from the last named locality are different from the usual form, but are not "*corvinus*," as at first supposed.

Carunculina glans (Lea). Ouachita and Old rivers; Terra creek at Mt. Zion; Caddo River near Arkadelphia. Rare. These shells have an unusual *cream-colored* nacre, but in other respects are entirely typical.

Carunculina cromwellii (Lea). Big Deceiper creek, Gum Springs; Big Deceiper Lake; Terra Noire Creek; Caddo River, near Arkadelphia. The beak sculpture agrees exactly with *cromwellii*, and the identification is well confirmed. The beaks are unusually perfect. "This is another example of the remarkably close relationship that exists, without as yet a sufficient explanation, between the fauna of Arkansas and Alabama." Walker in letter.

Proptera purpurata (Lam.). Ouachita and Old River. Common. See Ortmann, Ann. Car. Mus., VIII, 1912, p. 334.

Paraptera gracilis (Bar.). Ouachita River below Arkadelphia, and Skillern's Shoals; Old River. See Ortmann, Ann. Car. Mus., VIII, 1912, p. 331.

Lampsilis leptodon Raf. A rare shell collected only at Skillern's shoals and in one place below Arkadelphia. So far we have been unable to secure gravid females. This species delights in burrowing under sharp and rather heavy rocks in the swiftest part of the current, and it is with difficulty that any specimens are secured.

Obovaria castanea (Lea). Ouachita River below Arkadelphia, Skillern's Shoals and Old River. This species and *Nephronaias ligamentina* are the most prolific shells in the river. The epidermis of *castanea* is a most beautiful silken black, sometimes with a deep purple bloom, but young shells are yellowish brown and frequently rayed !

Amygdalonaias securis (Lea). Ouachita River below Arkadelphia, Skillern's Shoals, and Old River. This is considered a pearl shell. Very fine specimens are from Old River.

Amygdalonaias elegans (Lea). Ouachita River below Arkadelphia, Skillern's Shoals, and Old River. Quite common.

Amygdalonaias donaciformis (Lea). Found only in one bed below Arkadelphia and in the swift current at Skillern's Shoals. Later at Old River.

Tritogonia tuberculata (Barnes). Ouachita River, Skillern's Shoals and below Arkadelphia; Old River; Terra Noire creek. The river specimens are much inferior in size to those collected in the Tennessee drainage.

Tritogonia nobilis (Con.). Old River. *Rare!* Simpson now places this species as given.

Cyprogenia aberti (Con.). Ouachita River, Skillern's Shoals, and in many beds below Arkadelphia. Specimens are not as large as typical *aberti*, and may eventually be referred to the variety *lamarckiana* Lea.

Cyprogenia aberti lamarckiana (Lea). Ouachita River, Arkadelphia. This was also collected in the Caddo River in Montgomery County.

Obliquaria reflexa Raf. Ouachita River below Arkadelphia, Skillern's Shoals, Old River. The young are, in these localities, beautifully sculptured.

Ptychobranchus phaseolus (Hild). Ouachita River, Arkadelphia, and Skillern's Shoals; Old River. It is fairly common on the rocky shoals, sometimes on the sand bars. There seems to be no dividing line between this species and its variety *clintonense*, Simp.

Ptychobranchus clintonense Simp. Ouachita River above and below Arkadelphia, but not in Old River. Typical specimens with wavy lines are more common at Skillern's shoals. Dr. Walker is disposed to refer all Ouachita forms to *clintonense*.

Strophitus edentulus (Say). Ouachita River and Old River. In the latter locality specimens are quite thick and heavy.

Anodonta imbecilis Say. Ouachita River, Arkadelphia, Old River, and Deceiper Creek and Gum Springs. Common.

Anodonta suborbiculata Say. From Old River only. The young are perfect and most beautifully rayed. In the lower channel of the "river" they attain an unusual size.

Anodonta grandis leonensis (Lea). Ouachita River, Arkadelphia, and Old River. One must go deep in the mud for these fine shells but they are fairly common.

Anodonta virens Lea, var. Ouachita River and Old River, Arkadelphia. Distinguished from *leonensis* by having much higher and more prominent beaks, and by being less elongated.

Arkansia wheeleri, Walker and Ortmann. Old River and (rarely) Ouachita River below Arkadelphia. This is likely to remain one of the rarest of *Unios*. The nacre of this species is one of its most attractive characteristics. In young shells the entire margin is widely bordered with a rich *salmon*, in most adults it is a warm cream color, while in some specimens it is an opalescent blue. In very young specimens the plications are sometimes entirely wanting, but it could not be mistaken, even then, for any other species. Pearlers sometimes open this shell mistaking it for *Quadrula pustulosa* (Lea).

Symphynota costata (Raf.). Ouachita and Old Rivers, but very rare indeed. This species is quite common, however, in the Saline River (at Benton), and it has been a surprise not to find it more abundant in the Ouachita. It is also common in the Caddo far up in Montgomery County.

Symphynota complanata (Bar.). One specimen only was collected in 1913 in the Ouachita River below Arkadelphia. This and *Cumberlandia monodonta* (Say) remain the rarest of all the *Unios* in this region.

Cumberlandia monodonta (Say). Ouachita River above Skillern's Shoals, Arkadelphia. This record extends the range of this species much further to the southwest than was to be expected, for heretofore it has not been known west of the Mississippi *south of Iowa!* A full discussion of the distribution will be found in Walker's "Distribution of *Margaritana margaritifera* in North America", Proc. Mal. Soc., IX, June 1910, pp. 137-139; and in "Notes on the Distribution of *Margaritana monodonta* (Say)", NAUTILUS, Vol. XXV, pp. 57, 58. For the generic data consult Ortmann, "Cumberlandia, a New Genus of Naiades", NAUTILUS, Vol. XXVI, pp. 13, 14, where this species is made the type of the genus.

Alasmidonta marginata Say. Ouachita River below Arkadelphia; Skillern's Shoals; Old River. This is also a rare species in this region.

Unio gibbosus subgibbosus (Lea). Ouachita River, Arkadelphia and Skillern's Shoals; Old River. All specimens collected have given to this variety, though some approach very closely Simpson's *delicatus*.

Uniomerus tetralasmus (Say). In "sloughs" and shallow ponds near Arkadelphia, and in Big Deceiper Creek at Gum Springs. Not found in any of the larger streams. It is common in Malvern Creek, at Malvern, Hot Springs County.

Pleurobema pyramidata (Lea). Ouachita River, Arkadelphia, and Skillern's Shoals; Old River. Common, attaining, in quiet waters, a splendid development.

Pleurobema friersoni (B. H. Wright). Ouachita River, Arkadelphia and Skillern's Shoals; Old River. The nacre of these shells is often a beautiful rose or pink, but more commonly white. They were formerly considered to be *ridellii*, but it is now agreed to refer them to *friersoni*, though they are not altogether typically that species. See NAUTILUS, Vol. XXVIII, pp. 30, 31.

Crenodonta perplicata (Con.). Ouachita River, Arkadelphia and Skillern's Shoals; Old River; Caddo River. In Old River this species attains great size, and there is little erosion on the beaks even in the largest specimens. Dr. Ortmann reports finding an Ouachita female (Old River), collected June 29, 1911, with glochidia, a very early date. See NAUTILUS, Vol. XXVIII, p. 21.

Crenodonta undulata (Bar.). Terra Noire Creek at Mt. Zion.

Crenodonta trapezoides (Lea). Ouachita River, Skillern's Shoals and near Arkadelphia; Old River. Common.

Quadrula cylindrica (Say). Ouachita River, Skillern's Shoals and in nearly every mussel bed of the river; Old River. At Cove Creek station in Hot Springs County, specimens were collected from the Ouachita River with the cuneiform blotching wonderfully developed.

Quadrula metanerva (Raf.). Ouachita River, Arkadelphia and Skillern's Shoals. Not found in Old River. Very common. The variety *wardii* was nowhere located in this region.

Quadrula aspera (Lea). Old River; Terra Noire Creek at Mt. Zion.

Quadrula lachrymosa (Lea). Ouachita River at Skillern's Shoals and below Arkadelphia. "A comparatively small compressed form with large tubercles, quite different from the typical form." Dr. Walker in letter to the author.

Quadrula pustulosa (Lea). Ouachita River, Arkadelphia and Skillern's Shoals; Caddo River; Terra Noire Creek west of Arkadelphia; Old River. The shells from the last named locality are very perfect. Their brilliant color and handsome appearance make them easily the most attractive of all the "Ouachita" shells. Some excellent pearls have been obtained from this species. Dr. Walker distinguishes three "forms" among the Old River shells, as follows:

a. Very oblique, usually densely pustulate.

b. Quadrate, with a silky, polished epidermis.

c. Intermediate. Shaped more like "b," but in epidermis and sculpture like "a." He thinks that several local races of this species are perhaps worthy of recognition.

Fusconaia rubiginosa (Lea). Big Deceiper Creek, Gum Springs, south of Arkadelphia. Two males from this locality were stated by Dr. Ortmann to be indistinguishable in shape from the Pennsylvania specimens, but they had a lighter and more glossy epidermis. Some specimens collected in the Terra Noire Creek, west of Arkadelphia, on July 3, 1911, are more compressed than *cerina*, *chunii*, or *undata*. Dr. Ortmann says, "*Rubiginosa* is the small creek form—in Pennsylvania, passing into a more swollen form (*trigona*) in the rivers of medium size, and finally, in large rivers, into the true *undata*, with high beaks. The anatomy of all the forms named (including *chunii*, and *cerina*) is *absolutely identical*." A form perfectly intergrading between these Terra Noire *rubiginosas* and the Ouachita *undatas* was collected in the Saline River, at Benton, and this Dr. Walker unhesitatingly calls *cerina.*

Fusconaia cerina (Con). Caddo River, Arkadelphia.

Fusconaia undata (Bar).[1] Ouachita River, Arkadelphia and Skillern's Shoals; Old River. A common species.

Quadrula coccineum (Con.). A typical specimen was taken from the Ouachita at Arkadelphia in 1913; another was collected in June 1914.

Quadrula solida (Lea). A rare species collected only from the Ouachita River near Arkadelphia.

Fusconaia ebena (Lea). Ouachita River, Arkadelphia and Skillern's Shoals; Old River. Abundant.

Sphaerium striatinum Lam. Big Deceiper Creek five miles West of Arkadelphia; Gum Springs: Big Deceiper Lake.

Musculium transversum (Say). Big Deceiper Lake (teste Sterki).

Summary.

Pulmonate Gastropoda	45
Operculate Gastropoda	7
Pelecypoda, all of which are *Naiades* except two	60
Total species	112

Bibliography.

Sampson, "Preliminary List of the Mollusca of Arkansas," Published in the Annual Report of the Geological Survey of Arkansas, Vol. II for 1891, pp. 181-199.

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Ortmann, "Notes upon the Families and Genera of the Najades", Annals of the Carnegie Museum, Vol. VIII, No. 2, 1912, pp. 222-365, Three Plates.

Ortmann, "Studies in the Najades". Nautilus, Vol. XXVIII, pp. 129-131 (*Caruncnlina parva*); Ditto, XXVIII,

[1] See Nautilus, Vol. XXIV, pp. 6-10, 16-24, with plates. On the Validity of *Unio undatus*, Barnes, by Bryant Walker.

141, 142 (*Carunculina texasensis*, and *C. glans*), Ditto, XXX. 54-57 (*Eurynia lienosa*, *E. subrostrata*, and *Lampsilis ventricosa satur*).

Walker, "On Paludina coarctata and incrassata, Lea". Nautilus, Vol. XXVIII, pp. 121-127. Description of *Campeloma lewisii.*

Walker, "Apical Characters in Somatogyrus, with Description of Three New Species." Nautilus, Vol. XXIX, pp. 37-41, 49-53. Description of *Somatogyrus wheeleri*, and *S. amnicoloides.*

Walker and Ortmann, "A New North American Naiad", Nautilus, Vol. XXV, pp. 97-100, Pl. VIII. Description of *Arkansia* (genus) and *Arkansia wheeleri.*

Note.—The paper of E. G. Vanatta entitled, "Unionidæ from Southeastern Arkansas and N. E. Louisiana", Nautilus, Vol. XXIII, pp. 102-104, should be compared for a list of species reported from the lower Ouachita, some of which may be yet located in Clark County sections of the river.

DESCRIPTIONS OF NEW SPECIES OF MOPALIA AND TRACHYDERMON.

BY HENRY A. PILSBRY.

Mopalia lowei n. sp.

The chiton is rather small, oblong, moderately elevated, carinate, the lateral slopes straight. The valves are irregularly mottled with ferruginous, sea-green and olive. The anterior valve has ten radial ribs, those at the suture bearing compressed tubercles, the others rounded tubercles. The intervals are also tuberculose, with some interstitial granulation. Valves ii to vii have low, tuberculose sutural and diagonal ribs, the lateral areas tuberculose and granular. Central areas with the jugal tract closely striate longitudinally, the striæ converging forward near the beaks, elsewhere subparallel, but slightly irregular in places. Pleural tracts having longitudinal ribs, near the ridge converging forward somewhat, becoming divergent towards the lateral borders. These are intersected by a system of much weaker curved ribs radiating forward and laterally, forming oblong tubercles on the longitudinal ribs. The posterior valve is short, nearly flat, with a broad, shallow posterior sinus, the scarcely raised mucro being at the posterior third.

The interior is nearly white, strongly striate across the central part, where some valves may show a green or pink stain. The posterior valve has a rather deep posterior sinus and a single slit on each side.

The girdle is rather narrow in dry specimens, and bears coarse processes covered with sharp white spines.

Length 23, width 12.2 mm.

San Pedro, California, collected by Mr. Herbert N. Lowe. Type no. 117951 A. N. S. P., paratype in Lowe coll., no. 1538.

This species is related to *M. sinuata, M. imporcata* and *M. porifera*, but it apparently differs from all of them by the profusely spiny girdle processes, which are not exclusively localized at the sutures, though often present there, as well as scattered over the girdle elsewhere. The allied forms mentioned are all from northern localities.

In some of the specimens there are 10 to 12 ribs on the anterior valve. The younger shells are suffused with lilac inside.

MOPALIA IMPORCATA LIONOTUS n. subsp.

This chiton agrees closely with *M. imporcata* except that there is a narrow, smooth jugal tract. The lateral areas are granose between the coarsely tubercular diagonal and sutural ribs. The anterior valve has 10 ribs. Posterior valve is depressed behind the mucro, which is at the posterior fourth. Interior light Niagara-green, darker posteriorly on each valve. The girdle bears branching processes, often like the branches of spines on a cactus. These are scattered, sometimes sutural.

Length 15.5, width 9 mm. Divergence 95°.

White Point, collected by Mr. H. N. Lowe. Also San Pedro, same collector. Type no. 117952 A. N. S. P.; paratype no. 1542 Lowe coll.

MOPALIA MUSCOSA LAEVIOR n. subsp.

This name has long been used in the collection for the form figured and described in Man. Conch., vol. 14, p. 300, pl. 63, figs. 60, 61. It is from Olympia, Wash.

TRACHYDERMON LOWEI n. sp.

Oval, rather depressed, dirty buff, a little darker towards the beaks, which project somewhat. Surface of the valves finely, closely and evenly granose throughout, the granules oblong. The anterior valve and posterior area of the posterior valve have a few very weak, low radial impressions. The mucro of the posterior valve is slightly post-median, but little raised, the slope behind it being convex towards the edge. The interior is white, stained buff or pinkish near the sinus, where it is conspicuously porous. The eaves are *wide* and closely porous throughout. Teeth smooth, those of the posterior valve being directed forward. Girdle is densely covered with minute elongate scales.

Length about 17, width 12 mm. (San Pedro).

Length about 19, width 13 mm. (San Pedro).

Length about 16, width 11 mm. (White Point).

San Pedro, Cal. Collected by Mr. H. N. Lowe. Type no. 117955 A. N. S. P., paratype no. 1545 Lowe coll.

This species is much more distinctly granulate than *T. raymondi*, and the eaves are much wider and more porous.

The paratype in Lowe coll. is from White Point. There is also a smaller specimen, red with blue-green spots, from San Pedro, but as it has not been disarticulated I do not feel certain of its identity.

DESCRIPTION OF NEW SPECIES OF SHELLS CHIEFLY FROM MAGDALENA BAY, LOWER CALIFORNIA. By W. H. Dall. (Proc. of the Biol. Soc. of Washington, vol. 31, pp. 5-8, 1918.) The following new species are described: *Scintilla chloris*, *Macron orcutti*, *Phenacolepas magdalena*, *Trichotropsis lomana*, *Liotia rammata*, *L. olivacea*, *L. cookeana*, and three new varieties.

THE IDENTITY OF THE NAYAD-GENUS NODULARIA CONRAD WITH UNIO RETZIUS.

BY DR. A. E. ORTMANN.

The type of Conrad's genus *Nodularia* (Proc. Ac. Philad. 6, 1853, p. 268) is *Unio douglasiae* Griffith & Pidgeon. Simpson (Syn., 1900, p. 806, and Descr. Cat., 1914, p. 949) has associated, in this genus, a large number of species from Asia and Africa, and places it in his subfamily *Hyrianæ*, to which he assigns radial beak sculpture and a marsupium formed by the inner gills only, the latter character resting upon the observation of two species only.

Already Haas (System. Conchyl. Cabinet, vol. 9, Heft 44, 1911, p. 65 ff.) has pointed out that this conception of *Nodularia* cannot be maintained, since just the type-species (*douglasiae*) does not possess the characters assigned to the subfamily by Simpson: its beak sculpture is essentially of the zic-zac type, and its marsupium is formed by the outer gills. His examination of this species (and several others, l. c., p. 67) has revealed several other differences from Simpson's description of the anatomy of *N. japanensis*, and, as far as it goes, we are to conclude that "*Nephronaias douglasiae*" is not allied to the Hyriine type of Nayades, but rather to that type represented by *Unio* Retzius (1788) in the restricted sense as defined by myself (Ann. Carnegie Mus. 8, 1912, p. 273); that is to say, it belongs to the family *Unionidæ*, subfamily *Unioninæ*. This is clearly shown by the existence of a supraanal opening separated from the anal ("Mantelschlitz unten geschlossen"), and by the marsupium.

From the characters of the shell, chiefly the zic-zac beak sculpture, it was to be inferred that *U. douglasiae* comes close to the genus *Unio* (compare my key of genera, l. c., pp. 239 and 240); but the chief character of *Unio*, the subtriangular, hooked glochidium, has not been observed hitherto, the gravid females investigated by Haas having only eggs, and not glochidia.

Recently Mr. B. Walker has been kind enough to send to me the soft parts of two gravid females of *U. douglasiae* Griff.

& Pidg., which had been communicated to him by Mr. L. P. Gratacap of the American Museum, New York. They are from Wladiwostok, southeast Siberia. Both had glochidia, which proved to be similar to those of *Unio*.

The examination of these specimens has established the following facts: All of the features of the family *Unionidæ* (l. c., p. 223) are present. The diaphragm is complete, and formed only by the gills (no mantle connection between anal and branchial openings), and the outer lamina of the outer gills is connected with the mantle to its posterior end. The anterior end of the inner gills is separated from the palpi by a gap. A supraanal opening is separated from the anal by a mantle connection. The gills possess continuous septa, forming water tubes running parallel to the gill filaments.

The characters of the family *Unioninæ* (l. c., p. 224) are also present. The marsupium is formed by the outer gills, and, when charged, these gills swell only moderately, leaving the edge sharp. There are no secondary water tubes.

For the rest, it should be said that the mantle connection between anal and supraanal openings is moderately long, about half as long as either. The anal has the inner edge distinctly crenulated; the branchial opening has distinct papillæ; but in front of the branchial the mantle edge is smooth. *Palpi* subfalciform, their posterior margins united for about one-third of their length.

Gills rather long and narrow, the inner the wider, chiefly anteriorly; their anterior ends as usual. Inner lamina of inner gills free from abdominal sac posteriorly, but connected anteriorly; in one of my specimens the connection extends to one-third of the length of the abdominal sac, in the other to nearly one-half of it: thus this character is variable, as in certain other forms of Nayades (Haas says only: connected anteriorly).

Septa and *water tubes* well developed in the outer gills of the female, this character extending all along the gill. *Placentæ* present, but not very solid, the glochidia easily falling apart. *Glochidia* essentially agreeing with those of *Unio* [type, *pictorum* (L.); see Ortmann, Naut., 28, '14, pp. 32, 33]. They are subtriangular in outline, and have spinulose hooks. However, they differ in being slightly oblique, the point of the ventral margin being placed a little posteriorly, so that the anterior portion of the ventral margin is longer than the posterior; the point is also sharper (more projecting); and, finally, they are smaller, and longer than high. While, in *U. pictorum*, L. and H. are 0.21 mm., in *U. douglasiae* the L. is 0.18 mm. and the H. is 0.15 mm.

Thus it is perfectly clear that *U. douglasiae* has the typical anatomical structure of the genus *Unio* (s. s., type *U. pictorum*), and that it cannot be separated from that genus on anatomical grounds. The question is, whether shell characters permit such a separation, and in this respect it should be pointed out that the general shape of the shell, the hinge teeth, and other characters are very like those of *U. pictorum*, and that the chief difference is in the beak sculpture, which is more complex, and covers more of the disk (upon this character Conrad seems to have relied when he created *Nodularia*. But when we compare other species, for instance the European *U. tumidus* Retz., we see that in all these species the beak sculpture is of the same general type, that is to say, of the zic-zac pattern, and that *U. douglasiae* represents the most extreme development of this, while *U. pictorum* has it in much obliterated condition, and *U. tumidus* is intermediate between these to a degree. Thus there is only a difference in the degree of development, and it should also be born in mind that even in *U. douglasiae* the beak sculpture varies a good deal (see the account given by Haas of the various forms of *douglasiae*).

Consequently we cannot escape the conclusion that *U. douglasiae* is a true *Unio* in all respects, and that it should stand as *Unio douglasiae* Griffith & Pidgeon. *Nodularia* Conrad, with *douglasiae* as type, becomes then a synonym of *Unio* Retzius.

This, probably, refers to those species which are related to *douglasiae*, that is to say, preëminently to all those associated by Haas in the "group of *N. douglasiae*." It remains to be seen what should become of the other species of *Nodularia* in

Simpson's sense. They cannot be called any more by this generic name, but where they finally will land cannot be told before they have been examined as to their anatomy. Already Haas has separated a number of them under other generic names, but these genera are mostly founded upon shell-characters only.

THE GENUS ELYSIELLA (VERRILL OR BERGH?).

BY SILAS C. WHEAT.

In 1872 Prof. A. E. Verrill and Dr. Rudolph Bergh each found an undescribed Nudibranch, and each erected a new genus for his species. As the forms were minute and resembled *Elysia* both authors chose the name *Elysiella*. The two species have in common the respiratory sac on which Verrill founded the genus, although they differ in the form of the head and tentacles, on which Dr. Bergh lays emphasis.

On the question of priority,—Prof. Verrill published his genus *Elysiella* in the American Journal of Science for April, 1872; Dr. Bergh published his *Elysiella* in Heft iv, Band I, Malacologische Untersuchungen in Dr. Semper's Reisen im Archipel der Philippinen. Dr. Bergh's *Band I* was issued at the rate of one *Heft* each year except in the year 1872 when both *iii* and *iv* appeared. Probably *Heft iv* came out in the autumn of 1872, several months later than the American Journal for April. A letter addressed to the publisher in Germany during the second month of the present war remains unanswered. Inquiries of American libraries for the month on which they received *Heft iv* have brought only the year 1872, copied from the title-page, not from their accession records. It seems proper to credit the genus to Prof. Verrill.

Genus Elysiella Verrill.

"*Elysiella*, gen. nov. Allied to Elysia and Placobranchus. Head rounded, with two short, obtuse tentacles; eyes sessile behind the bases of the tentacles on the neck. Lateral lobes united behind, rounded and separate in front, and raised from the back, leaving a cavity beneath for respiration.

Bloodvessels, commencing in the anterior part of the back, extend backward forking and diverging in the area enclosed by the lateral lobes. This genus differs from Placobranchus and Elysia in having the lateral lobes united together posteriorly over the back so that the respiratory cavity partly enclosed by them is closed behind." — Verrill, Amer. Jour. Soc., April, 1872, p. 284, pl. 7, f. 5–5*a*.

"Genus *Elysiella* Bergh. Head laterally subcarinate; tentacles minute, conic. This somewhat doubtful genus is based upon the new form of Elysian stated below. Undoubtedly the same differs from all known Elysians. The head on the side is carinated almost as in *Limapontia*; the tentacles are quite small and conic."—Bergh, Mal. U., Band I, Heft iv, p. 201, pl. 9, f. 3; pl. 24, f. 20-25.

Continuing, Dr. Bergh says of this new form of Elysian: "*Elysiella pusilla* Bergh. Color grass-green, punctate on both sides with minute obscure dots; on the margin of the body small white dots in one or two series, and *at the extremity a sac;* tentacles with small white dots. Length 2 mm." A single specimen found by Dr. Semper in the East Indies in 1862 was preserved in Damar balsam and was delivered to Dr. Bergh about eight years later. (The italics are mine.— S. C. W.)

Elysiella catula Verrill. Amer. Jour. Soc., 1872, April, p. 284, pl. 4, f. 5–5a.—Inv. of Vineyard Sd. (U. S. Fish., 1872, pt. 1), 1873, p. 668, pl. 25, f. 172—*not f. 171,* and *not Placobranchus catulus* Gould.

On plate 25, U. S. F., 1872, the numbers 171 and 172 are transposed. Prof. Verrill believed that Dr. Gould's *Placobranchus catulus* (Inv. Mass., 1870, p. 256, pl. 17, f. 249-250) was founded on specimens of the same species from Boston Harbor, and did not give a new name to the type of his genus. He says: "This species is well described by Dr. Gould, but the figure is incorrect in representing the lateral lobes as separate posteriorly — perhaps a theoretical mistake on the part of the artist. It is common in harbors and estuaries from Boston [?] to New Jersey. Great Egg Harbor, N. J. (Verrill & Smith); New Haven, Ct., and Woods Hole, Mass. (Smith)."

Dr. Gould's description agrees perfectly with his figure. Both text and figure prove that his *Placobranchus* was a true *Elysia* with lateral lobes not united dorsally. He says: "Body ovate-lanceolate, the lateral expansions about two-thirds its length and not quite meeting when reflected upon the back."

The species will stand thus:

Genus ELYSIELLA Verrill, 1872: type

Elysiella catula Verrill, 1872.

Elysiella pusilla Bergh, 1872.

Genus ELYSIA: *Elysia catula* Gould (*Placobranchus catulus* Gould, 1870).

HELIX NEMORALIS AT KNOXVILLE, TENNESSEE.

BY T. D. A. COCKERELL.

Mr. M. D. Barber has very kindly sent me a series of *H. nemoralis* collected at Knoxville; descendants of the Lexington, Va., colony, as explained by him in NAUTILUS, xxxi, p. 107. The specimens all have the yellow ground color (var. *libellula*), and sort out as follows:

Adults.

00000.	16, four of which are *bimarginate* (the dark peristome bordered inwardly with a white rib).
10345.	2, one having max. diam. 26 mm.
12345.	21, of which five are *bimarginate.*
123(45).	14, of which two are *bimarginate;* two have max. diam. 25 mm.
123$_4$45.	one.

Immature.

00000.	16.
12345.	15. Some would doubtless have become 123(45) on maturity, the formula being taken from near the mouth.
123(45).	six (var. *reaumuria* Moq.).
(12)3(45).	three.
10345.	two (var. *argenvillea* Moq.).

(12345).	one (var. *kleinia* Moq.).
(12)345.	one.
12×345.	one.
00345.	one (var. *listeria* Moq.).
1(23)(45).	one (var. *brardia* Moq.).
₁0345.	one.

Every one of these band varieties is known from the Lexington colony (*cf.* J. L. Howe, American Naturalist, Dec., 1898). Among 102 shells are two with split or extra bands, which is scarcely half the percentage of such forms in the Lexington colony. It would require a much larger collection to show whether this is accidental. The absence of the varieties with a pink ground, of which 40 are reported from Lexington, is remarkable.

DESCRIPTION OF A NEW PANDORA OF THE SUBGENUS KENNERLYIA FROM FORRESTER ISLAND, ALASKA.

BY GEORGE WILLETT.

During the summers of 1916 and 1917 a Kennerlyia which seems to differ materially from previously known species of the subgenus was taken by the writer at Forrester Island, southeastern Alaska, at an average depth of about fifty fathoms. A considerable number of living specimens were secured and, when carefully compared with specimens of allied species, certain distinctive characteristics seem to be maintained throughout the series. Therefore I propose for this shell the following name:

Kennerlyia forresterensis, new species.

Shell moderately heavy; short and deep (depth in twelve typical specimens averaging .67 of length). Color white, with brownish periostracum generally visible on both ends but most conspicuous on posterior. Left valve moderately convex, smooth except for rather faint incremental lines. Right valve flat or slightly convex, except near basal margin where it becomes abruptly concave; smooth except for several (generally 7-9) irregular impressed lines running from apex to basal

LOUIS POPE GRATACAP

margin. Length 22, height 15, diameter 5, beaks behind anterior end 6.

Distribution. — Type locality Forrester Island, Alaska, in 50 fathoms. A. N. S., No. 118200. Paratypes are in the California Academy of Sciences and in the collection of the writer.

In shape of shell *forresterensis* is about midway between *K. grandis* Dall and *K. glacialis* Leach. It differs from *grandis* in smaller size, lighter structure, greater proportional diameter, more truncate posterior end and in straight or nearly straight hinge-line, the basal curve meeting the posterior dorsal margin at an angle a little greater than a right angle. It differs from *glacialis* in greater size, heavier structure, greater proportional depth, and in prominence of impressed line setting off anterior portion of left valve and inset at basal margin, which, however, is less prominent than in *K. grandis*.

LOUIS POPE GRATACAP.

Louis Pope Gratacap, curator of mineralogy and of mollusk, at the American Museum of Natural History, died suddenly on December 14, 1917. Born in Brooklyn, N. Y., November 1s 1851, he was educated in the College of the City of New York and Columbia School of Mines, graduating from the latter in 1876.

"Mr. Gratacap has been identified with the American Museum of Natural History since October 1876, when the collections were still housed in the old Arsenal Building. Since the death of Professor R. P. Whitfield, he has been dean of the scientific staff, having been in service more than forty years. During this period he has held successively the positions of assistant curator of mineralogy, assistant curator of geology, curator of mineralogy and conchology and curator of mollusca, the last of these since 1909, when he was placed in entire charge of the mineralogical and conchological collections".

Of his many papers upon various subjects, only a few relate to conchology. In 1901 he published a "Catalogue of the Binney and Bland collection of Terrestrial Air-breathing Mollusks of the United States and Territories in the American Museum of Natural History, with Enumeration of Types and figured Specimens, and Supplementary Notes". The paper is illustrated by six maps showing the distributional intensity of Zonites, Polygyra (typical), Stenotrema, Triodopsis, Mesodon, and Epiphragmophora. Mr. Gratacap contributed several articles to THE NAUTILUS including "Note upon the insufficiency of the operculum as a basis of classification in the round-mouth shells" and "Tertiary fossils on Long Island". He also published, Geology of the City of New York, 1901, 3rd edition 1909; Guide to the Mineral Collections; "The Museum", a valuable paper on museums and museum technique; A Trip around Iceland, and others.

Mr. Gratacap was a man of pleasing manners and always had a warm welcome for visitors to his department.

HENRY W. WINKLEY.

The Rev. Henry W. Winkley, rector of the Calvary Episcopal church, Danvers, Mass. died at his home, February 4, 1918. Born in Boston, Mass., March 24, 1858, he graduated from Harvard University in 1881 and from the Episcopal Theological School in 1884. He was ordained rector of Grace Episcopal church, Newton, Mass. in 1885 and later was rector of churches in St. Stephens, New Brunswick, Saco, Me., and Branford, Conn.

Mr. Winkley had for many years taken a great interest in the study of mollusks, contributing since 1891 over thirty articles to the pages of THE NAUTILUS, giving interesting accounts of his various collecting trips along the New England and Canadian coasts, with many useful hints as to methods of collecting. He described three new species, *Caecum johnsoni*, *Pyramidella bartschi* and *Odostomia katherinæ*, while a number of species were named in his honor. His entire collection of shells went to the Museum of Comparative Zoology, Harvard University.

He was a most enthusiastic and careful collector, specializing on New England mollusks, his favorite places for collecting being Woods Hole, Mass. and Eastport, Me., although he has collected at most of the favorable collecting grounds along our coast. He also enjoyed collecting the small fresh-water species and was an expert in the use of the sieves, obtaining Sphaeriidae

REV. HENRY W. WINKLEY

FRANCIS ASBURY SAMPSON

by the thousand. He had a keen sense of humor and always saw the bright side of life. We shall greatly miss his frequent visits to the museum.

Mr. Winkley was a charter member and the first Secretary and Treasurer of the Boston Malacological Club. He leaves two sons, Frank H. and Robert L. Winkley, and a daughter, Miss Ruth Winkley. C. W. J.

FRANCIS ASBURY SAMPSON.

Prof. Francis Asbury Sampson died of pneumonia at the Parker Memorial Hospital, University of Missouri, on the morning of February 4th at the age of 76. Prof. Sampson was born in Harrison County, Ohio, February 6th, 1842, from which place he emigrated to Missouri in 1867, locating at Sedalia, Pettis County, where with a brother he engaged in the practice of law. He enjoyed a lucrative practice and for twenty years acted as legal advisor and vice-president of the Missouri Trust Company.

From the time he came to Missouri he had been an active collector of Missouriana and his private collection of books and pamphlets, relating to Missouri and Missourians is the most complete known.

In 1901 Prof. Sampson was elected Secretary of the Missouri Historical Society and his library of Missouriana was presented to the society. The collection represented approximately twenty thousand titles.

As secretary of the Historical Society he gave his entire time to building up the library and owing to his efforts the society today has the largest library on Missouri history in existence, consisting of sixty thousand different titles. Its value cannot be appreciated except by one who has examined its contents and understands their rarity.

Prof. Sampson gave his leisure moments to collecting shells and fossils and in late years it was his only recreation. The vast number of carefully selected land and fresh-water shells contained in his cabinets bear witness to the fact that his "idle moments" were not in any sense wasted. The writer once heard him say that he had discovered over two hundred new species of fossils and recent shells. He wrote but little on his discoveries in conchology and paleontology but generously turned them over to those especially interested. Of the numerous finds made by him, at least twenty-five species bear his name.

Prof. Sampson received his A.B. degree from the College of the City of New York, in 1864 and an A.M. and LL.B. at New York University in 1868. Prof. Sampson was a member of the American Historical Society, The Mississippi Valley Historical Association, The Academy of Sciences of St. Louis. He was a Delta Kappa Epsilon, a Phi Beta Kappa and a Knight Templar. The bulk of his writings relate to library work, consisting in the main of bibliographies and catalogues. The following list covers his work in conchology and kindred subjects.

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Southern shells in Missouri.
THE NAUTILUS, Vol. 8, No. 2, p. 18, June, 1894.

Arkansas shell collecting.
THE NAUTILUS, Vol. 25, No. 4, pp. 40-41, August, 1911.

Polygyra albolabris alleni Wetherby and other Missouri Helices.
THE NAUTILUS, Vol. 25, No. 11, pp. 130-131, March, 1912.

Shells of Southeast Missouri.
THE NAUTILUS, Vol. 26, No. 8, pp. 90-95, December, 1912.

A preliminary list of the Mollusca of Missouri (exclusive of the Unionidae).
Transactions Academy of Science, St. Louis, Vol. 22, No. 3, pp. 67-108, July, 1913.

Postpliocene shells of Providence and Lupus, Missouri.
THE NAUTILUS, Vol. 28, No. 2, pp. 15-17, June, 1914.

Reversed or sinistral shells.
THE NAUTILUS, Vol. 29, No. 11, pp. 128-129, March, 1916.

DARLING K. GREGER.

Department of Geology, University of Missouri.

PUBLICATIONS RECEIVED.

Notes on the Victorian Species of Bullinus. By Charles Hedley (Records of the Australian Museum, vol. 12, pp. 1-8, pls. 1-2, 1917). The following interesting note preceeds the systematic treatise of the species: "Those fresh-water snails once known in Australia as *Physa*, but now referred to as *Bullinus*, have recently acquired an unpleasant interest. For the spread and nurture of haematura, a severe, painful and incurable complaint has recently been traced to Egyptian representatives of *Bullinus*.

"The newly hatched embryo of a Trematode, called *Bilharzia*, enters the *Bullinus* snail and there turns into a sporocyst. Then Bilharzid cercariæ are discharged from the infected snail every day for weeks, more plentifully and continuously in summer. The free-swimming larvæ swarm on the surface of the water in search of a victim. Should they fail to find a host within forty-eight hours they must die. A successful parasite enters the human body either by the mouth or through the skin, and proceeds to establish itself in the rectum or bladder. Arrived at maturity, the parasite sheds innumerable hard-shelled eggs. These erode the mucous membrane, thus causing internal bleeding, a symptom of the disease. Victims may even die from necrosis of the liver or blockage of portal veins."

It is to be presumed if this plague were to be introduced from Africa or Asia, the Australian species of *Bullinus* would serve as an intermediate host and so transmit it. Previously an Australian *Bullinus* had been indicated as an intermediate host for the sheep fluke.—C. W. J.

The Economics of Trochus niloticus. By Charles Hedley (The Australian Zoologist, vol. 1, pt. 4, pp. 69-73, pl. 6, 1917). A very interesting account of its economic value, distribution, etc. Its dense, firm nacre proves good material for buttons, and during the past six years the demand for Trochus by button-makers has caused the price to advance from twenty to thirty pounds a ton. The export of Trochus from Queensland in 1916 was 950 tons, worth £23,000. The Philippines export about 320 tons annually. The more careful of the Japanese fishermen save both meat and shell. From ten tons of shell a ton of meat is obtained, worth in China £20 a ton. Dried and smoked for two days, it is then ready for export, and is considered a delicacy.—C. W. J.

THE CERCARIAL INFECTION OF SOUTH AFRICAN SNAILS. By F. G. Cawston, M. D. (Reprint from The Medical Jour. of S. Africa, 18 pp., 1917.) The species of snails harboring various kinds of cercariæ are given, with special reference to *Physopsis africana*, which harbors the Bilharzia cercariæ. After describing his work on this line, the following is part of a summary: "The foregoing experiments and observations would seem to show that the urine of a person who harbors the Bilharzia parasite in South Africa becomes dangerous to the community only when it reaches fresh water containing specimens of *Physopsis africana*. It is interesting to observe that the intermediary host of *Schistosoma haematobium* both belong to the same subfamily of molluscs, *Limnæinæ*, *Physopsis africana* in South Africa and *Bullinus dybowski* in Egypt; that the intermediary host of *Schistosoma mansoni* belongs to the *Planorbinæ* — *Planorbis boissyi* in Egypt and *Planorbis guadelupensis* in South America; whilst the intermediary host of *Schistosoma japonicum* is *Blanfordia* (*Katayama*) *nosophora* (Robson)."—C. W. J.

FURESÖENS MOLLUSKFAUNA, by C. M. Steenberg (D. Kgl. Danske Vidensk. Selsk. Skrifter, Naturv. og Math. Afd., 8, Raekke III, 1, 1917, pp. 78-200, Tar. I–VIII). A very exhaustive account of the bathymetric distribution and variation of the molluscan fauna of Furesö, a lake near Copenhagen, with a comparison of the bathymetric distribution of the mollusca in other European lakes. A résumé is given in French. The illustrations are excellent.

ANATOMIE DES ACANTHINULA ET DES VALLONIA. LES ORGANES GÉNITAUX. Par C. M. Steenberg. (Vidensk. Meddel. fra Dansk Naturh. Foren., Bd. 69, 1917.) The minute size of these snails has hitherto hindered a knowledge of their anatomy, the accounts given by Lehmann being very incorrect. *Acanthinula aculeata* proves to have genitalia comparable to those organs in *Pupillidæ*. *A. lamellata* Jeffr. is without male end organs (vasdeferens and penis). This condition Mr. Steenberg is disposed to regard as secondary. *Vallonia costata* has pallial and reproductive organs of the group *Orthurethra*. Mr. Steenberg has rendered an important service in working out the characters of these difficult snails.

The Philippine Land Shells of the Genus Amphidromus. By Paul Bartsch. Bull. U. S. Nat. Mus., no. 100, pp. 47; 22 plates. Having at hand a large amount of authentically localized material, Dr. Bartsch has been able to trace relationships and define species and subspecies in this difficult group of beautiful tree snails with precision and detail not reached hitherto by the authors who have treated of them. The Philippine series is traced to two routes of migration from Borneo, one through Palawan to the Calamianes, the other by way of the Jolo group to Mindanao, etc. On Mindanao the relation of topography to the distribution of species and races suggests to the author "that this island is composed of a series of smaller islands which have been fused into the large territory by a comparatively moderate raising of that part of the ocean floor." Numerous new forms are described, and all are figured.—H. A. P.

Some New Species of Amastra. By C. Montague Cooke. Occasional Papers Bernice Pauahi Bishop Museum, vol. 3, no. 3, pp. 29, 3 plates. While this paper is especially valuable on account of the new forms made known from Kauai (6) and from Hawaii (9), there are also interesting species from Oahu, Molokai and Maui. Two sinistral species (one Pleistocene) from Maui, and one Pleistocene species from Oahu are added to the short list of sinistral Amastras. *A. hitchcocki* is a very large new Amastra from Molokai. Many of the new forms are from Pleistocene deposits. Excellent photographic figures are given.—H. A. P.

An Unusual Extension of the Distribution of the Shipworm in San Francisco Bay, California. By Albert L. Barrows. (Univ. of Cal. Publications in Zool., vol. 18, no. 2, pp. 27-43, 1917.) A valuable contribution to our knowledge of shipworms. "It is said that the shipworm was unknown in San Francisco Bay in the early history of the port, and that wood-boring molluscs did not become an extensive menace to marine woodwork here until some years after the great increase in the shipping entering the bay which followed upon the discovery of gold in California. Be that as it may, a species of the Teredidæ, *Xylotrya setacea* Tryon now thoroughly infests the main portion of the bay. . . . Another species of shipworm, *Teredo diegensis* Bartsch, has also recently caused damage in the upper part of San Francisco Bay."

In conclusion, the author states that *T. diegensis* may be an intermittent resident of the vicinity of Mare Island; that the excessive damage caused by this borer in 1913 came about through the marked increase in the average salinity of the water in this part of the bay, caused by two consecutive dry seasons. A salinity of at least 10 parts per 1000 (approximately) seems to be required for the existence of *T. diegensis* at temperatures ranging from 6° to 19° C.—C. W. J.

A Systematic List of the Marginellidæ. By J. R. Le Brockton Tomlin. (Proc. Mal. Society London, vol. 12, pp. 242-306, 1917.) A very useful list in which the author has endeavored to bring together all specific and varietal names that has ever been used, giving the synonymy and reference to where each species is described. The list contains some 950 names representing 519 species.

Pirates of the Deep—Stories of Squid and Octopus. By Paul Bartsch. (Annual Report Smith. Inst., 1916, pp. 347-375, 19 plates.) An exceedingly interesting review. A brief account of their past history is followed by a number of narratives of the captures of some of these remarkable creatures, together with much useful information pertaining to their economic use.

NOTES.

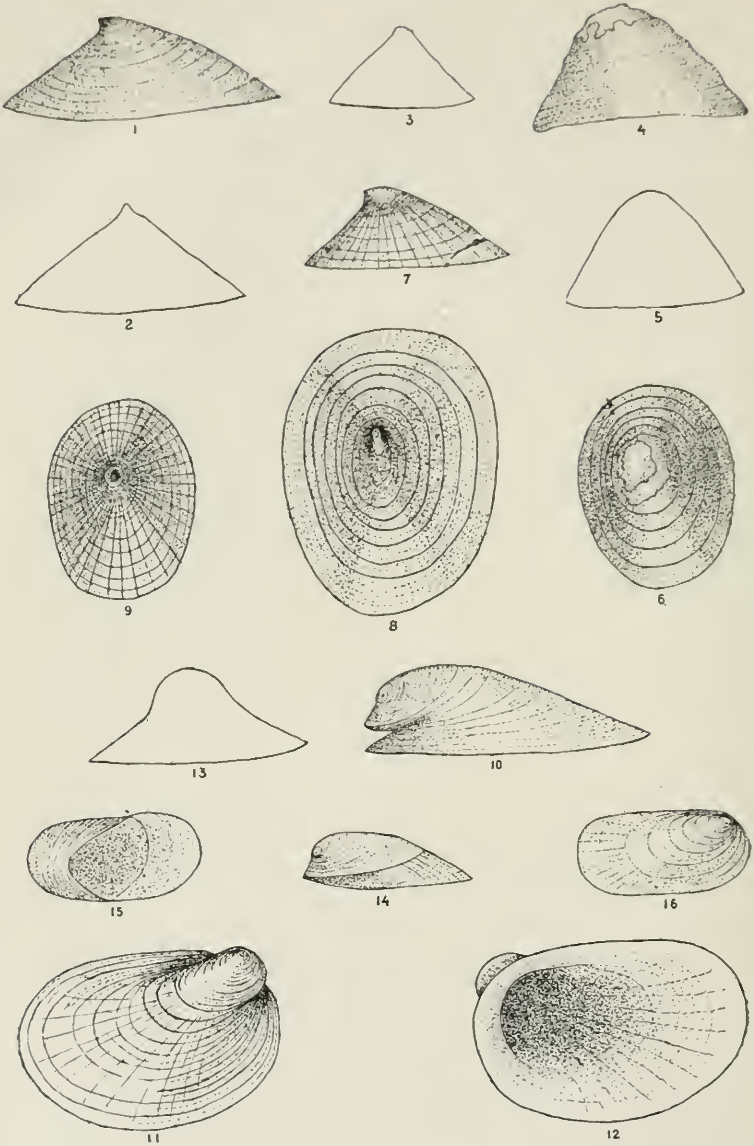
Note on a Preoccupied Name in Polyplacophora.—Mr. Tom Iredale has recently been good enough to call my attention to the fact that the specific name *pilsbryanus*, recently proposed by me [1] for a chiton dredged by the United States Fisheries steamer *Albatross* off the coast of Japan, is preoccupied in the genus *Ischnochiton*, where I had placed it, by *I. pilsbryanus* Bednall, 1896,[2] a South Australian species. Although it is by no means certain that the *Lepidozona* group to which this species belongs is correctly referred to *Ischnochiton* even as a subgenus, the fact that it was so referred in my paper as printed necessitates the adoption of a new name for the later species. The Japanese form I therefore propose to denominate *I. (L.) nipponica*.

It was my intention originally to describe the species as an outright *Lepidozona*, but, not being ready to give my opinion as to the proper position for the group, I thought it wisest in the final draft of the paper conservatively to refer it back to *Ischnochiton*. It happened at that time that Bednall's paper was inaccessible to me, and this fact, together with my unfamiliarity with its contents, prevented my discovery of the existence of his prior name until too late for the proper correction to be made in my paper.—S. S. Berry.

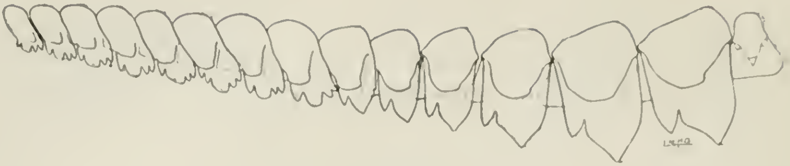
I ran into a curious bit of coincidence on Cerros Island. I took *Epiphragmophora veatchii* only on one very peculiar tree and never more than two to a tree. I brought home the flowers and leaves, which I sent to the California Academy for diagnosis. The tree turns out to have been taken originally on Cerros Island. It was described originally as *Rhus veatchiana*, and Dr. Gray afterwards made a genus *Veatchia* for it.—Fred Baker.

[1] Proc. U. S. Nat. Mus., vol. 54, pp. 1, 10 (1917).

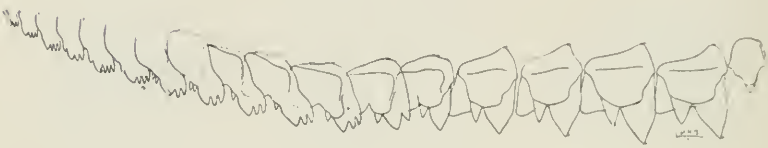
[2] Proc. Malac. Soc. London, vol. 2, p. 142 (1896).



WALKER: ANCYLIDÆ

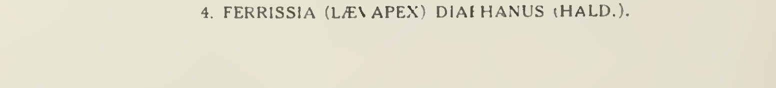


1. LANX PATELLOIDES (LEA).

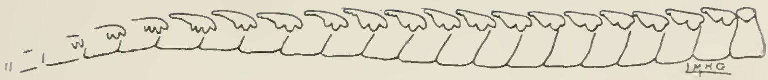


2. LANX KLAMATHENSIS HAN.

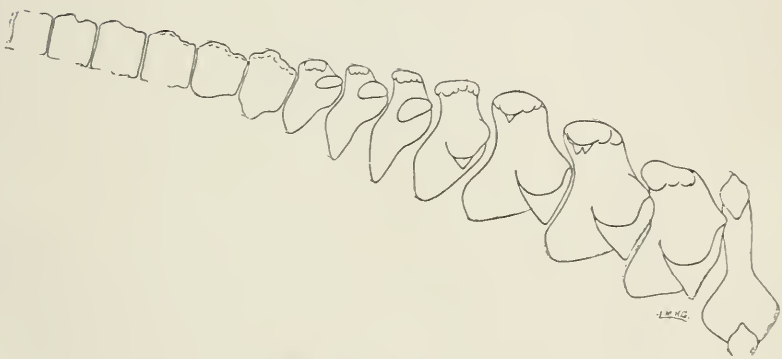
3. FERRISSIA RIVULARIS (SAY).



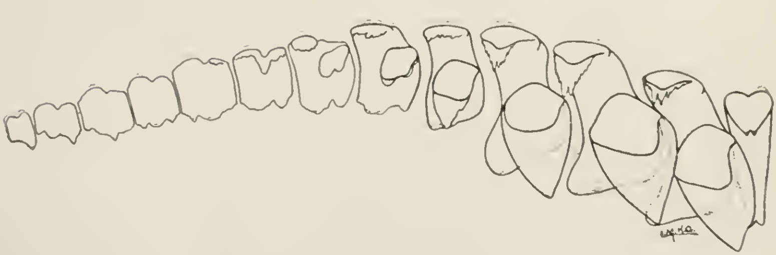
4. FERRISSIA (LÆVAPEX) DIAPHANUS (HALD.).



1. GUNDLACHIA HINKLEYI WALKER.



2. RHODACMEA FILOSA (CON.).



3. RHODACMEA RHODACME WALKER.

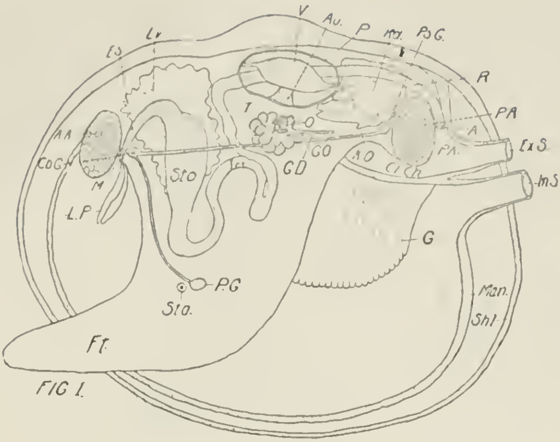


FIG 1.

FIG 2

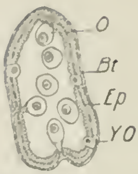


FIG 3.

FIG 8.

GILMORE: REPRODUCTION OF SPHÆRIIDÆ

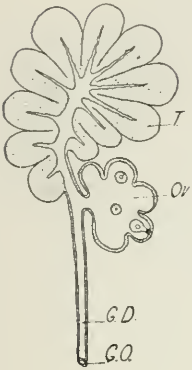


FIG. 4.

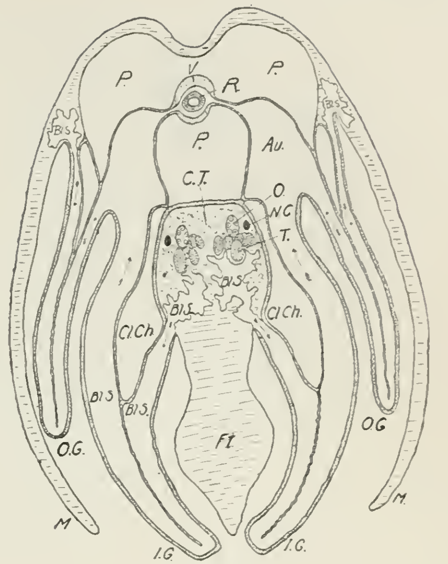


FIG. 5.

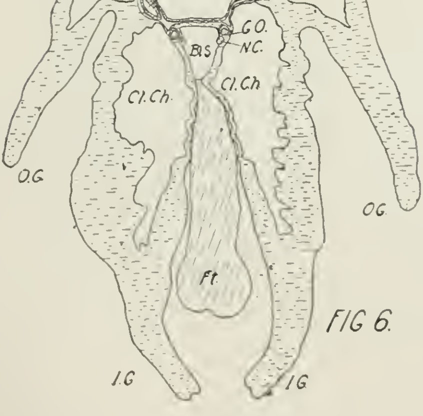


FIG 6.

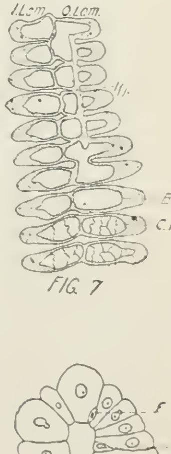


FIG. 7

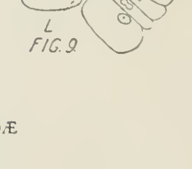


FIG. 9.

GILMORE: REPRODUCTION OF SPHÆRIIDÆ

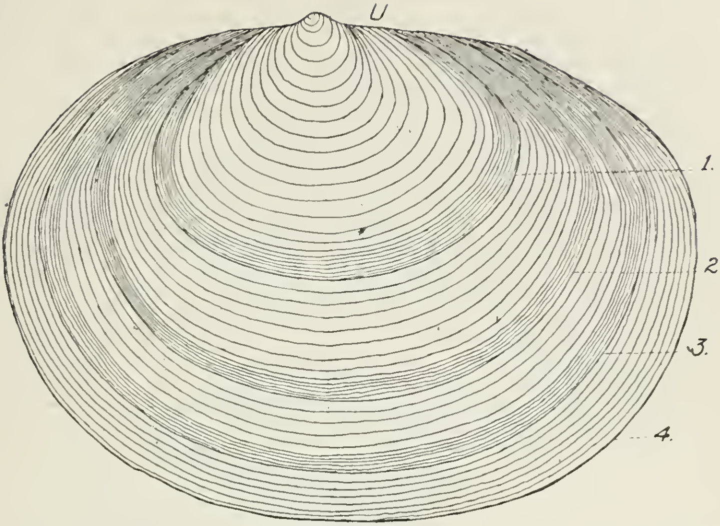


FIG. 10.

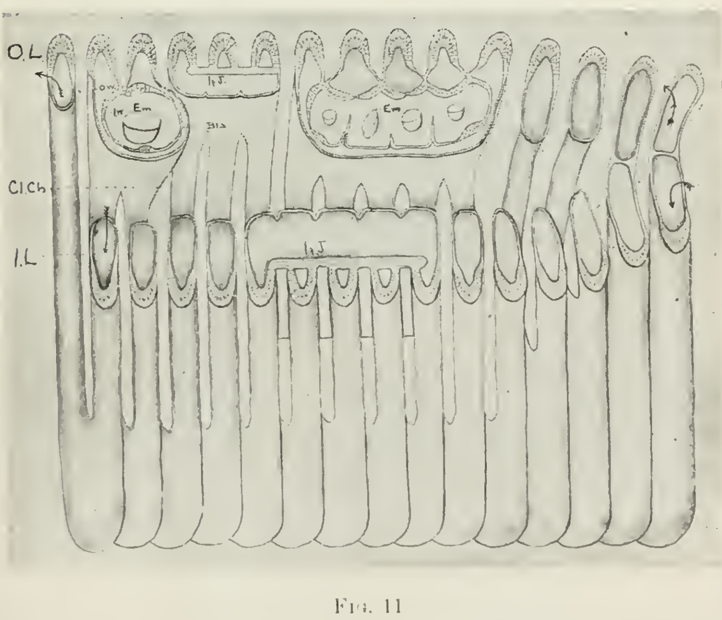
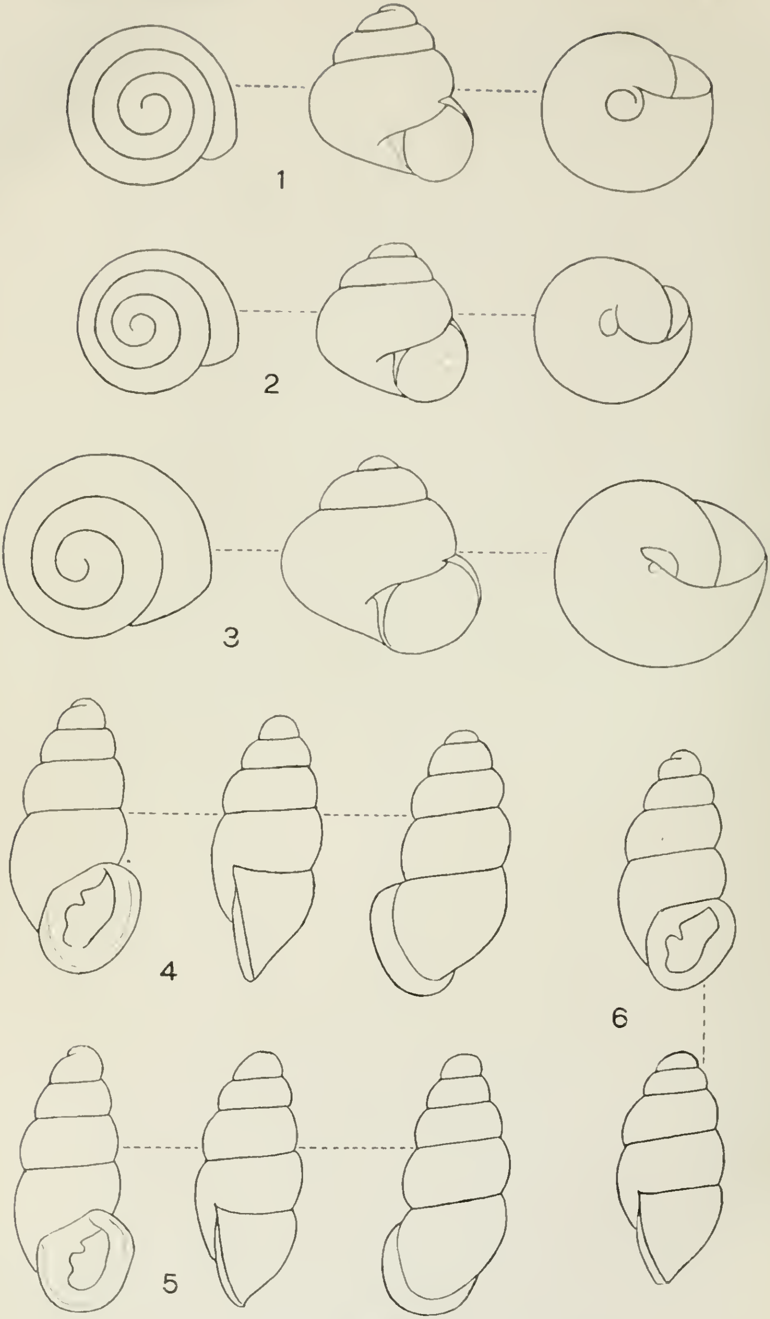


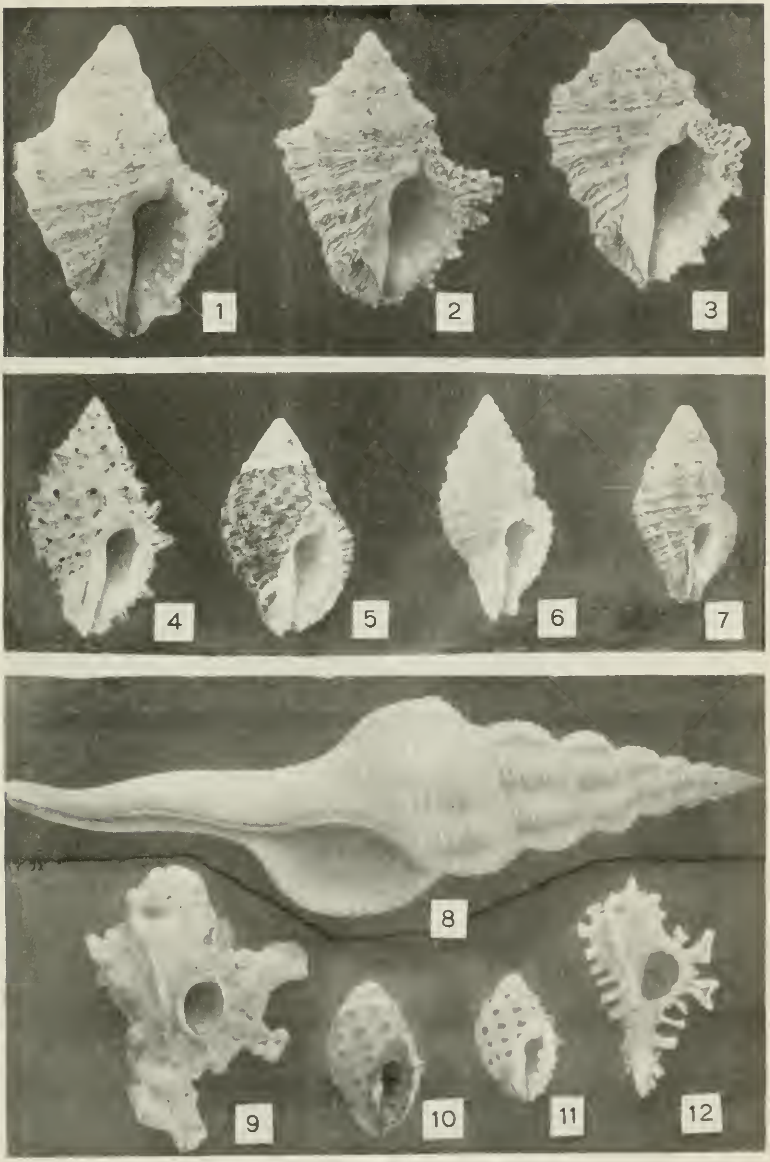
FIG. 11

GILMORE: REPRODUCTION OF SPHÆRIIDÆ

1, 2 PSORONAIAS KUXENSIS FRIERSON.
3. EPIPHRAGMOPHORA CALLISTODERMA PILS & FERR
4. UNIO TETRALASMUS SAY.
5, 6. ZACHRYSIA RAMSDENI PILS.
7. Z. EMARGINATA PFR.



CLAPP: NEW CARYCHIUM AND THYSANOPHORA.



1-3. DRUPA FOLIACEA CONR.
4. DRUPA WALKERAE P. & B.
5. " VITIENSIS PILS.
6, 7. PERISTERNIA THAANUMI P. & B.

8. FUSINUS SANDVICHENSIS SOWB.
9, 12. MUREX PELE PILS.
10. DRUPA TUBERCULATA BLV.
11. " MORUS LAM.

THE

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OF CONCHOLOGISTS

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VIII

THE NAUTILUS.

Vol. XXXII. JULY, 1918. No. 1

NOTES ON THE GENUS TRACHYDERMON CARPENTER.

BY WILLIAM HEALEY DALL.

Iredale has already called attention to the two names for Chitons by Gray in 1821. A little fuller discussion of the consequences of the adoption of Gray's name *Lepidochitona* seems desirable to make the situation perfectly clear. The synonymy which is pertinent is as follows:

Lepidochitona Gray, London Medical Rep., XV, p. 234, 1821. *Chiton marginatus* (Pennant, = *cinereus* L., not of Montagu).

Stenosemus Middendorff, Malac. Ross. 1, pp. 103, 109, 117, 122, 1848; (1st sp. *C. marmoreus* Fabr.).

Ischnochiton sect.††, Gray, Guide Moll., p. 182, 1857 (*Chiton marginatus*).

Trachydermon Carpenter, Suppl. Rep. Br. Assoc., 1864, p. 612 (*Chiton dentiens* Gould); ibid., p. 649: Bull. Essex Inst., p. 153, 1873 (*Chiton ruber* (L.) Lowe, not of Spengler).

Craspedochiton G. O. Sars, Moll. Reg. Arct. Norv., p. 114, 1878 (*Chiton marginatus* Pennant, = *cinereus* L., not of Montagu).

Leptochitona Pilsbry, Man. XIV, p. 150, 1892 (err. typ.).

Section *Tonicella* Carpenter.

Platysemus Middendorff, (part) Mal. Ross. 1, p. 98, 1848 (*C. submarmoreus* Midd.).

Tonicella Carpenter, Bull. Essex Inst. V, p. 154, 1873 (*Chiton marmoreus* Fabricius).

Boreochiton G. O. Sars, Moll. Reg. Arct. Norv., p. 116, 1878 (*Chiton ruber* L., and *C. marmoreus* Fabricius).

Toniciella Thiele, Gebiss d. Schnecken, II, p. 389, 1891 (*T. marmorea* Fabr.).

Section *Cyanoplax* Pilsbry.

Cyanoplax Pilsbry, Man. XIV, pp. 40, 44, 1892 (*Chiton hartwegii* Carpenter).

Subgenus *Spongioradsia* Pilsbry.

Spongioradsia Pilsbry, Man. XV, p. 65, 1894 (*Trachyradsia aleutica* Dall).

In view of the similarity of names the following synonymy may be useful:

Genus Lepidopleurus Risso.

Lepidopleurus (Leach Ms.) Risso. Hist. Nat. Eur. Mérid. IV, p. 267, 1826 (1st sp. *L. cayetanus* (Poli) Risso); G. O. Sars, Moll. Reg. Arct. Norv., p. 110, 1878.

Section *Leptochiton* Gray.

Leptochiton Gray, P. Z. S., 1847, p. 127 (*Chiton cinereus* Montagu (not Linné) = *C. asellus* Spengler); Carpenter, Suppl. Rep. Brit. Assoc., pp. 530, 612, 650, 1864 (1st sp. mentioned as a real member of the genus is *Leptochiton nexus* Carpenter).

? *Lepidochiton* Carpenter, Rep. Brit. Assoc., pp. 317, 349, 1857 (1st sp. *C. lividus* Midd.). Includes also *C. mertensii* Midd., *C. scrobiculatus* Midd., and *C. proprius* Reeve; the latter = *C. dispar* Cpr., not Sowerby.

I confess to an inability to get anything like systematic order out of Middendorff's extraordinary tangle of names, except where some subsequent author has fixed a species as type, as in the case of *Symmetrogephyrus* (Midd., Feb. 1848), which Chenu (Man., p. 383) has declared to be typified by

Chiton pallasii Middendorff, thus displacing the more familiar *Amicula* (auct. not Gray, 1847) for that group.

Lepidochitona Gray, supersedes *Trachydermon* as indicated by Iredale (Proc. Mal. Soc. London, XI, p. 127, 1914). With the first mention of the latter genus Carpenter associates only two species, *C. pseudodentiens* Cpr. (= *dentiens* Gould) and an undescribed *C. gothicus*. The former must therefore be taken as type, instead of *flectens*, though they are really congeneric. As type of *Lepidochiton* Carpenter, I select his first species, *C. lividus* Midd., which is an *Ischnochiton*, but Carpenter apparently regarded it as synonymous with *Leptochiton*, to which he refers the species in his index of 1872. Pilsbry refers the species, in the order above cited, respectively to *Ischnochiton, Lepidozona, Ischnochiton*, and *Ischnoradsia*. The genus would best be considered a synonym of *Ischnochiton*, especially as no one seems to have quoted it after Carpenter, and he did not clear it up in his MS.

In regard to *Leptochiton*, I am inclined to agree with Berry that the west coast and Arctic forms are so different from the typical *Lepidopleurus cayetanus* that a sectional separation is appropriate.

CAMPING IN THE SIERRAS AND THE DESERT. PLATE I.

BY JAS. H. FERRISS.

Late in June of last year, facing westward I departed from the home snailery in search of adventure, and returned about the first of May this year.

At the Grand Canyon of the Colorado a couple of very warm days was devoted to the Bright Angel trail, digging vainly for *Sonorella betheli*.

The Vernal Falls, Yosemite Valley, California, offered another opportunity, with a yield of three Epiphragmophoras, one of these the *E. hillebrandi yosemitensis*, discovered there by Mr. Herbert N. Lowe. This was the opening of another season of delight in the California mountains. For nearly a month we camped with the Sierra Club at the Tuolumne Meadows, making side trips from there in search of snails and other kinds of trout. Then eastward with our own pack train for more than another month over the high passes, with a side trip to Silver Lake, down into the branches of the San Joaquin, and over the John Muir Pass to the Middle Fork of the Kings River. At Tehipite valley we left the Middle Fork, westward crossed the North Fork, and hit the main river at Trimmer, where we left our mules and took the auto stage for Sanger and Fresno.

Out for health, and in no hurry, the opportunities for collecting were the best. The high altitudes, glaciers and snow banks were another world. In the valleys, with a wealth of flowers, birds, and trout, and the grandest scenery upon the continent, we rested several days at every camping place, as a rule. At Palisade creek we halted nearly a week and had golden trout for every meal.

But the snails were small, and few in number of specimens and species. Riding up the zigzag out of the Tehipite valley the silvery track of a snail was found on the trail, and in half a day I dug up a dozen Epiphragmophoras, looking like *E. traski*, the only large shell found since leaving the Yosemite. Like a Sonorella, they were living in a pile of rocks well covered with leaves and rotten wood.

Between trips we hunted up old friends and collections. Some of these were mail-order friends of long standing, and we were greatly pleased to see what they looked like. At Berkeley it was the Alaska bear skins, H. S. Swarth and Robert Grinnell. At Oakland, Fred L. Button, who gave us a two-night exhibition of his shells. At the Academy of Sciences, Golden Gate Park, Barton W. Evermann and the Henry Hemphill collection of western land shells. At the Leland Stanford University, Mr. and Mrs. Oldroyd and the Hemphill duplicates. At Los Angeles, the fossil bones from the asphalt beds. The collections and the collectors demonstrate the California spirit, and were far beyond our expectations.

Tucson likewise, Thornber, Cummins, Voorhies and Taylor at the University of Arizona, McDougal and Shreve at the

Carnegie Desert Laboratory are "live wires" in the natural sciences. Also explorers. Exploring begets good health, and good health begets enthusiasm. Also, Arizona is apparently the head center of natural history, so many species in botany and zoology have their beginning here. By the way, a newspaper reporter at Tucson gave us a reputation for the discovery of 650 new species of snails in Arizona! In figures it is well to give out type-written copy to the press. Then no embarrassing apologies to university clubs will be needful.

To eliminate a limp which interfered with snail-catching more and more, I went into a hospital at Tucson, and a month or two was taken out of this great vacation; but on the whole a large collection was made. With mules for the high desert ranges and a Ford for the smaller ones, one in the convalescent stage may make a good showing. Some of the hills are only 150 feet in height, and with a level desert floor we could almost collect from the machine. At one point it was not more than ten feet from snails to Ford. We seldom walked ten miles in one day, for with the larger mountains and their long and rough mesas we could ride within a half-mile of the snails.

Within the recent geologic period apparently there was a heavy rainfall (Noah's perhaps), so heavy that the large boulders were thrown out upon both sides of the channel, and thus these gulches are often heavily diked on the lower slopes of the mountain. These dikes are often the best collecting grounds, especially in dry weather; the fortifications of five or six feet in depth and twenty wide are easily explored. To catch a live snail at home in some of the larger slides higher up, a steam shovel and a full equipment of quarrymen is needed.

On horseback, with Frank Cole as guide, a trapper, hunter, prospector, forester, now a good snail-hunter and a wonderful cook, I made another trip through the Catalinas and Rincons, finding more of the rough-barked Sonorellas. Then into the Galuras, where we captured a smooth-bark *Sonorella* with a diameter of 32 millimeters. At Tucson my partner on the California trips and many others joined the party for a winter in the desert. To her it seemed a dreary prospect, but a short trip into the Tucson range with its mesas forested with orchard-like trees and giant cactus, the ever-changing botanical societies, wild pigs, deer, mountain sheep, quail and very toothsome cottontails, told another story. The desert was as interesting as the mountains, and the weather in winter was summer-like without excessive heat or annoying insects. With extra tanks of gasoline upon our running-board, any place was home, the tent a parlor, and auto cushions a mattress. There was no lack of firewood or water.

The Tucson range, only an hour or so from the city, was particularly home-like. The first day in camp, Cole brought in a wild pig and baked it. With hot biscuit and steaming coffee, and the fruit and goodies brought from town, we had such a Christmas dinner, with surely as good an appetite, as in ye good old days, and it was on Christmas day. And, too, in a dining hall with columns and arches of living green, with prickers so long an unruly guest would not scratch the varnish. Our mistletoe decorations were generous, for there are eleven species and varieties in Arizona. Here we found our largest catch in Sonorellas, the rare fern *Cheilianthes pringleyi* and the most beautiful member of the fish-hook group of cactus, *Echinocactus lecontei.* From our camps westward towards the Silver Bell range, twenty miles away, it was a thick forest of the giant cactus, paloverde, mesquite and iron wood as far as the eye could see. Cole brought in a good pair of mountain sheep horns laid out by some lion or wolf about a year ago, and I dug up a nice diamond rattler the second day out. There are eleven species and varieties of rattlers in this state also.

We made seven camps on the west side of the range—Pictured Rocks, Rattler, Sheephorn, Wild Pig, Twin Cacti (Plate I), Cat Mountain and Limekiln. Sonorellas were found at 37 stations in five weeks. I worked about half time.

We also gave about the same amount of time to the ranges west, going as far as Ajo, and then I was in trim to work full time. These mountains west of the city of Tucson rise from a lower level than the Catalinas, Santa Ritas and the ranges eastward. The higher peaks are supposed to run up to 8,000 feet above the sea. Very few are named, and so far as we could learn none have been surveyed. The Baboquivari system starts at the Mexican line and runs a little west of north. As the Baboquivaris, they are 40 miles in length, then known as Coyotes for 7 miles, as the Roskruge 20, as the Abbie Waterman 10, and as the Silver Bell 10 miles. We hit only a few high spots in the first three, and I collected at one small slide in the latter.

On the road to Ajo we had good success in Sonorellas in the small hills along the Comovo route, and here we first saw the organ cactus and the crucifix tree. Around the Ajo mountains—Wall's Wells and Montezuma Head—and the several nearby ranges, we were unable to find any traces of Sonorellas. The last Sonorella station west was at a small group of hills where the sign board of the Interior Department read "Tucson 101 miles". Beyond that the basalt rocks were covered with white dust that may have been alkali, or the granite had a face so sharp and dry the snails on a hike would require tennis shoes and a canteen. A mining prospector afterwards told us shells were to be found near the south end of the Big Ajo range where there was a small spring and walnut trees, and that they were also in the Mesquites, a range near the Mexican border. We anticipated a change in conditions, and perhaps Mexican or new groups of snails, and we still feel that something may be found in this field—perhaps in the Mesquite and border ranges, or in the Growlers, a forty-mile range west of Ajo—when the Mexican bandits are a little less active among the southern cattle ranges.

On the back track we returned by way of the Covered Wells and White Wells crossing the Quijota range, but found only a few Pupas, Succineas, and other small ones until we camped near some abandoned silver prospects in the southern end. We hunted the placer holes for rattlers without success but found a tiger rattler and Sonorellas in the rocks. We also had further luck in the foot-hills at the southern end of the Cababi range, where Mr. Cole had found Sonorellas in 1914.

Nearly all of this western half of Pima County is occupied by the Papago Indians. Their horses, cattle, corn and wheat fields, and villages are numerous, and we were under many obligations to them for their good wells. Converted by the Catholic Fathers some three hundred years ago, and with the assistance of the Presbyterians since, they have become an industrious people, fat and very rich. Their housing is not pretentious, as with wealthy white men, but evidently sanitary, for the male in weight averages about 260 and his helpmeet about 180. The white men covet the Papago's grass and browsing, and would like a mix-up; but Uncle Sam at present is plainly giving the Indian a square deal.

Between the Tucson Range and the Ajo we collected at 55 stations, sampling the hills here and there. Other expeditions were made to the Serritas, to the Rosemont and Greaterville mining districts on the east side of the Santa Ritas, and to the Empire and Mustang Ranges on our way to visit old friends in the Huachucas. A. F. Berner, an old friend of the botanists and snail hunters, was found in hard luck. He is now blind and has been confined to his bed with rheumatism for two years. The entomologist, Biedermann, is more fortunate. He has been remarkably successful with beetles and moths, and he is now an acknowledged leader in grafting. With 99 per cent success he has made the Carr Canyon walnuts produce the best of European walnuts, and the Black Hamburgs are now picked from the wild vines of his homestead. He hopes to exhibit home-grown chestnuts in another year, from the mountain oaks. They do it in France. Happy Jack is a prosperous merchant on the Ocean-to-Ocean auto way.

In the Empire Range, draining into the Santa Cruz River, and the Mustangs, draining into the San Pedro, we found both *Holospira* and *Oreohelix* as well as *Sonorella*. Here was further evidence of ancient "Noah flood" mischief. Deep in the clay of the gulches of the Mustang slopes were Sonorellas and Oreohelix, not to be found alive, or mixed in with the species now living. I worked hard a day and a half to find them alive or freshly dead, but other peaks and gulches had only subfossils of their kind. A like condition existed along the Bright Angel trail in the Grand Canyon. Since my former visit floods had cut the clay banks and turned up a subfossil species of *Oreohelix* not now found alive on the south rim.

Thus ends my longest adventure, and perhaps the most fruitful. Collections were made at 187 stations, and with something over 140 sets of duplicates thrown into the basket by generous California friends, we will have about 500 separate lots to check up and discuss later.

Joliet, Ill., June, 1918.

NEW VARIETIES OF NAIADES FROM LAKE ERIE.

BY N. M. GRIER.

While the general distinction between the Naiades of Lake Erie and their parent forms of the Ohio drainage have already been commented upon by Walker, (1) representatives in Lake Erie of at least three of the parental forms have never been given the varietal distinction they deserve. The parent species following the nomenclatorial changes proposed by Frierson (2) and Vanatta (3) are *Fusconaia flava* (Raf.), *Elliptio dilatatus* (Raf.), and *Symphynota* (*Lasmigona*) *costata* (Raf.). The comparisons between them and their Lake Erie representatives were made with the aid of Simpson's Descriptive Catalogue.

Elliptio dilatatus var. sterkii, new variety.

Differs from typical *dilatatus* by its smaller size, less elongated and proportionately higher shell. Always inflated, not so pointed posteriorly. Ventral line rather straight, beaks more anterior in position. Epidermis in *dilatatus* dark brown and horn or yellowish, surface usually with uneven growth lines. In *sterkii*, epidermis always smooth or polished, light olive green to yellowish brown to reddish brown. Nacre in *dilatatus* mostly dark purple, salmon and white; that of *sterkii* is lavender, light reddish purple, pearl-blue.

The following table gives maximum, minimum and mean dimensions of 52 shells each of parent and variety:

E. dilatatus			Var. *sterkii*		
Length	Height	Diameter	Length	Height	Diameter
130 mm.	60 mm.	35 mm.	87 mm.	46 mm.	28 mm.
86 mm.	41 mm.	24 mm.	59 mm.	31 mm.	18 mm.
30 mm.	16 mm.	7 mm.	26 mm.	13 mm.	7 mm.

Factors obtained from above by comparison of length with height and diameter show that greater height and inflation rest with *sterkii*—51% and 30% as against 48% and 25%. In variety *sterkii*, the average distance of the beaks from the anterior extremity of the shell is 18% of the total length; in *dilatatus* this is 25%. There appears to be no substantial difference between values obtained with Simpson's measurements and my own.

This new variety is respectfully dedicated to Dr. V. C. Sterki, who first commented upon the distinction between it and the stream forms. (4) Type no. 61. 4268, card catalogue Carnegie Museum.

Lasmigona costata var. ereganensis, new variety.

Variety *eriganensis* is smaller, less elongated and proportionately lower than *costata*. Ventral line straight. Epidermis in *costata* light horn-color to dark chestnut in old specimens, surface usually with uneven growth lines. In *eriganensis* always smooth or polished, greenish olive to reddish brown to chocolate-brown, even growth lines. Nacre in *costata* cream-color to lavender or blue. In variety *eriganensis*, pinkish, buff or salmon-color.

Average for 20 shells:

costata			var. *eriganensis*		
Length	Height	Diameter	Length	Height	Diameter
137 mm.	78 mm.	42 mm.	90 mm.	46 mm.	31 mm.
96 mm.	55 mm.	27 mm.	72 mm.	40 mm.	23 mm.
55 mm.	31 mm.	14 mm.	65 mm.	36 mm.	19 mm.

Factors secured as previously show that *costata* is proportionately higher than var. *eriganensis*, 56% against 53%, but is not so inflated 27% against 32%. My measurements of *costata* check readily with those of Simpson.

Type no. 61.4720, card catalogue, Carnegie Museum.

FUSCONAIA FLAVA var. PARVULA, new variety.

Variety *parvula* differs chiefly in size from *flava*, being smaller although proportionately higher and more inflated. Epidermis of *flava* yellowish to dark horn-color; in var. *parvula*, yellowish green, greenish olive. Surface with even growth lines. Nacre of typical *flava* mostly white, tinged with salmon in the beak; of *parvula*, pinkish-color or to pale blue.

Dimensions:

flava			var. *parvula*		
Length	Height	Diameter	Length	Height	Diameter
91 mm.	60 mm.	37 mm.	59 mm.	45 mm.	30 mm.
36 mm.	43 mm.	25 mm.	36 mm.	28 mm.	18 mm.
27 mm.	24 mm.	25 mm.	13 mm.	11 mm.	8 mm.

Ratio of length to height and diameter in *flava*—77% and 42%.

Ratio of length to height and diameter in var. *parvula*—79% and 51%.

Similar results are obtained from Simpson's measurements of *flava*.

Type no. 61.4513 card catalogue, Carnegie Museum.

The type specimens of the above three new varieties were collected by Dr. A. E. Ortmann at Big Bend, Presque Isle Bay, Lake Erie, July 8-12, 1910, and kindly entrusted to me for description. They appear to be generally distributed throughout Lake Erie.

1. Walker, Bryant. "Unione Fauna of the Great Lakes." Nautilus, 27, 1913.
2. Frierson, L. S. "Remarks on Classification of Unionidæ." Nautilus, 28, 1914.

3. Vanatta, E. S. "Rafinesque Type of Unio." Proc. Acad. Nat. Sciences, Philadelphia, 1916.
4. Sterki, V. "A Preliminary Catalogue of the Land and Freshwater Mollusca of Ohio." Proc. Ohio Acad. Science, IV, pt. 8.

A FURTHER NOTE ON THE GENUS TRACHYDERMON.

BY S. STILLMAN BERRY, REDLANDS, CALIFORNIA.

Since the publication of my note on the chiton genus *Trachydermon* in the Proceedings of the California Academy of Sciences, (4), vol. 7, p. 245, September, 1917, Mr. Tom Iredale has supplied me with the interesting information that *Trachydermon* Carpenter 1864 is preoccupied, and hence cannot be used in *Polyplacophora* in any sense. This considerably clarifies the whole situation by rendering needless any further investigation as to which species is properly to be regarded as the type of the genus. At the same time the peculiar group of West American chitons comprising the old *Trachydermon flectens* Carpenter and the remarkable *Mopalia heathii* of Pilsbry is automatically left without a name. Having ascertained from Mr. Iredale that he is chiefly concerned with certain other consequences of the nomenclatural tangle we have discussed and has, himself, no intention of taking up the present question, I feel at liberty to propose the new generic name, *Basiliochiton*, based upon *Mopalia heathii* Pilsbry 1898 as its typical representative. A cogent argument for the selection of this rather than the older species as the type of the genus is that the whereabouts, if not the very existence, of the type specimen of Carpenter's *flectens* appears to be unknown. I had supposed it to be in the British Museum, but Mr. Iredale writes me that it is not there. It is possible that it was destroyed along with so many other Carpenterian specimens in the San Francisco conflagration of 1906.

A further and fuller discussion of this group of chitons will appear in a forthcoming publication.

THE SYSTEMATIC POSITION OF TWO SPECIES OF MUSSELS FROM THE OZARKS.

BY DR. A. E. ORTMANN.

EURYNIA (MICROMYA) VENUSTA (Lea).

Lampsilis venusta Simpson, Synopsis, 1900, p. 543. — Descr. Catal., 1914, p. 89.

A large number of specimens has been received from L. S. Frierson, collected by A. A. Hinkley on July 30, 1914, in James River, at Galena, Stone Co., Mo.

Specimens of this lot have been sent to B. Walker, who also believes them to belong to *U. venustus* Lea, a species closely allied, on the one hand, to *L. ellipsiformis* (Conr.) (Simpson, 1914, p. 128), and, on the other hand, to *L. pleasi* (Marsh) (Simpson, p. 129). In fact, the latter is hardly anything else but a smaller and thinner *venusta*. I have no doubt that all three group together, and very likely the anatomy will be the same. Utterback (Amer. Midl. Natural, 4, 1916, p. 141) places *ellipsiformis* in the genus *Nephronaias*, but I do not think that this is correct, since he describes the *papillæ* on the mantle edge.

Call (Tr. Acad. St. Louis, 7, 1895, p. 57) believes that *pleasi* is identical with *venustus*, and, according to Frierson (in litt.), *venustus* is the same as *ellipsiformis*. Meek & Clark (Bur. Fisher, Doc. no. 759, 1912, p. 19) mention, from Big Buffalo Fork, *Lampsilis venusta*, which, according to their remarks, is this form.

Anatomy: Soft parts (3 ♂♂ and 3 sterile ♀♀ are at hand) of the usual *Eurynia*-structure. Anal and supraanal openings separated by a moderate mantle connection. Anal with distinct crenulations, branchial with papillæ. Posterior margins of palpi connected at base only. Inner lamina of inner gill entirely connected with abdominal sac.

Marsupium in posterior half of outer gill, with a rather larger non-marsupial section at posterior end. Ovisacs about 15 to 20. *Mantle margin*, in front of branchial, slightly lamellar, with small, irregular papillæ, which are not crowded.

and extend forward nearly to the middle of the lower margin, becoming quite distant and small in front.

Color of soft parts whitish, with black pigment around anal and branchial openings, and a brown or blackish streak running forward on mantle margin on the inside of the papillæ. Edge of marsupium with brown pigment.

This species undoubtedly belongs near the group, of which *E. vanuxemensis* may be regarded as the type. The anatomy is practically the same, and the papillæ on the mantle margin are very much alike. Also in the shell are certain common peculiarities, since *E. venusta* has, in the female, an indication of that peculiar "constriction" seen in the *vanuxemensis* group. Our species, however, differs in the more elongate shell, weak development of postbasal expansion of the female, which is located rather more anteriorly, thus suggesting, to a degree, the shape seen in *Medionidus plateolus* (= *conradi*), with which species *U. pleasi* has been compared by Marsh. My specimens have a strong tendency to become more or less intensely of a salmon-color in the nacre.

This seems to be a species characteristic for the Ozark region.

Lampsilis brevicula (Call).

L. brevicula and *L. brevicula brittsi* Simpson, 1900, p. 533.—1914, pp. 57, 58.

L. brittsi Simps. is an absolute synonym of *brevicula* Call: the differences mentioned by Simpson do not hold good at all. The emargination of the posterior basal margin of the female shell is not always present, probably only in old specimens [as in L. satura (Lea)]. Among my material there are no specimens which show it.

A number of individuals is at hand from James River, Galena, Stone Co., Mo., and from White River, at Cotter and Norfolk, Baxter Co., Ark. (L. S. Frierson donor). From Galena and Cotter I have specimens with soft parts, collected July 31 and August 2, 1914 (by A. A. Hinkley). Among them is a gravid female, caught in the act of discharging glochidia (July 31), so that this date indicates the end of the breeding season.

Anatomy of the *Lampsilis* type, and agreeing almost completely with that of *L. luteola* (see: Ann. Carn. Mus., 8, 1912, p. 348). The mantle flap is of the same shape as in this species, with the edge irregularly toothed, the largest teeth standing on the free, anteriorly projecting lobe, giving it a lacerated appearance. Also the color markings are the same (streak of black or brown pigment, and I think I can distinguish in some of my specimens an indistinct eye-spot).

Glochidia suboval, agreeing in shape and size with those of *L. luteola;* their L. is 0.23, their H. 0.28 mm. Surber has figured them [Rep. U. S. Comm. Fish. for 1914, App. 1915 (Fish. Doc. no. 313), pl. 1, f. 14]. His measurements are: 0.230×0.290, while Utterback (for var. *brittsi,* Am. Midl. Nat., 4, 1916, p. 173 gives: 0.250×0.305.

According to its anatomy, this species falls in the *luteola* group of *Lampsilis*, and represents a peculiar type of it, which seems to be restricted to the Ozark region, and may be regarded as having the same relation to *L. luteola* as has *L. fasciola* (= *multiradiata*) to *L. ventricosa.* (Smaller, thin-shelled form, with numerous fine, broken rays; the shell is, in the average, less elongated than that of *luteola*).

I do not understand why Utterback (l. c.) places this species in the genus *Eurynia*, since he describes very well the *flap* of the mantle margin.

NEW LANDSHELLS FROM THE PHILIPPINES.[1]

BY PAUL BARTSCH.

HEMIPLECTA SAGITTIFERA BATANENSIS, new subspecies.

Mr. Walter F. Webb, of Rochester, N. Y., has sent to the U. S. National Museum two *Hemiplectas* from the island of Batan, off northern Luzon, which belong to the *sagittifera* complex. This is a dark-colored race, which agrees fairly well in size with typical *sagittifera* from the Sinait region of Luzon, the type locality of *Hemiplecta sagittiffera*, but is considerably

[1] Published by permission of the Secretary of the Smithsonian Institution.

more depressed and of much darker coloration. The basal portion of the last whorl is also less inflated. The aperture is proportionately longer and more compressed. The type, Cat. No. 218765, U. S. N. M., has 4.4 whorls and measures: altitude, 23 mm.; greater diameter, 50.2 mm.; lesser diameter, 38.5 mm.

Obba listeri batanensis, new subspecies.

The *Obba* from the island of Batan, is also distinct from any of the other forms known from the Philippines, as shown by specimens received from Mr. Webb. It belongs to the *Obba listeri* complex. It is nearest related to *Obba listeri costata* Semper, from the island of Camigin, of the Babuyan Group, north of Luzon. It differs from this markedly by its more regularly conic outline, somewhat greater elevation, paler ground color, and rougher incremental sculpture. The type, Cat. No. 218764, U. S. N. M., has 4.4 whorls and measures: altitude, 10 mm.; greater diameter, 26.7 mm.; lesser diameter, 22.1 mm.

Cochlostyla polychroa buriasensis, new subspecies.

Specimens of the *Cochlostyla polychroa* complex sent to the U. S. National Museum for determination have made it necessary to critically examine that group. This examination has revealed the fact that most of the specimens in collections passing under this name are from the island of Burias. The type locality for *Cochlostyla polychroa* is Temple Island, an island adjacent to Burias. A series of specimens from this island in the collection of the National Museum show that the shells of the typical form, that is *Cochlostyla polychroa polychroa*, are larger, decidedly more elevated and conic than the specimens from the island of Burias. The coloration, too, is much more vivid in the Burias shells than those from Temple Island. I shall therefore bestow the name *Cochlostyla polychroa buriasensis* upon the shells from Burias Island.

The type of this shell, Cat. No. 218788, U. S. N. M., has 4.7 whorls and measures: altitude, 35 mm.; greater diameter, 30.7 mm.

NOTES ON THE GLOCHIDIA OF STROPHITUS EDENTULUS PAVONIUS (LEA) FROM COLORADO.

BY M. M. ELLIS AND MARIE KEIM.

While collecting material for class use from St. Vrain Creek, near Longmont, Colorado, December 6, 1817, 25 specimens of *Strophitus edentulus pavonius* (Lea) (det. J. Henderson) were obtained. Of these, 15 contained large numbers of well-developed glochidia. These glochidia soon freed themselves from the cords when the cords were placed in water after being removed from the gills of the parent mussels, and each individual glochidium began active snapping movements. Many individuals lived for two or three days after leaving the cords and continued active all the while.

This record of gravid specimens of *Strophitus edentulus pavonius* is later in the year than any record given by Surber (Bur. Fish. Doc. 771, 1912) for *Strophitus edentulus* from the Mississippi River, November being the last month in which he found glochidia-bearing individuals of that species.

When compared with the figures and description given by Surber (l. c.) for *Strophitus edentulus*, the glochidia of these Colorado mussels of the variety *pavonius* were found to differ in both size and proportion from the *Strophitus edentulus* type. As these differences may have some taxonomic significance, occurring as they do in the glochidia of a variety of *Strophitus edentulus* taken near the western edge of the range of that variety, the following description of the glochidium of *Strophitus edentulus pavonium* is given.

General shape that of the *Anodonta* type as given by Surber (l. c.) but of a form intermediate between that of *Strophitus edentulus* (fig. 3, l. c.) and that of *Anodonta grandis* (fig. 45, l. c.); hinge line straight; depth slightly greater than the length; marginal spines three, well developed, the median spine being slightly longer than the two lateral spines; from seven to ten rows of spines, counting the marginal row, on each valve; end of the adductor muscle showing from 35 to 50 distinct bundles of fibers. The exact measurements of 20 specimens are given below.

Length in micra	*Depth in micra*	*Length in micra*	*Depth in micra*
254	280	260	264
256	260	260	264
258	264	260	280
260	266	264	274
260	280	266	272
260	272	266	272
260	270	268	272
260	272	270	280
260	270	272	280
260	270	272	280

The modal average of the specimens examined gives an average length of about 260 and an average depth of about 270, the range of variation being 254 to 272 for the length and 260 to 280 for the depth. Surber (p. 8, l. c.) states that the length is greater than the depth in *Strophitus edentulus* and gives 350 for the length and 285 for the depth as average measurements.

The behavior of the living glochidia was interesting in the light of the work of Lefevre and Curtis (Bur. Fish. Doc. 756, 1912) on the metamorphosis of *Strophitus edentulus* without parasitism. These writers state (p. 173) that they were unable to bring about the attachment of the glochidia to fish. Our glochidia of *Strophitus edentulus pavonius* were offered gills from the Topminnow, *Fundulus zebrinis* Jordan & Gilbert and of the Sunfish *Lepomis cyanellus* Rafinesque (these two species of fishes are found in St. Vrain Creek) immediately after the gills were removed from the body of the fish. Fish blood caused an evident increase in the activity of the glochidia and several glochidia seized gill filaments. Once attached the glochidia remained on the gill filament until the experiment was discontinued, i. e. for several hours. No attempt to infect living fish with the glochidia of *Strophitus edentulus pavonius* was made, but the behavior of the living glochidia suggests physiological differences between the glochidia of *Strophitus edentulus* and these western specimens of *Strophitus edentulus pavonius*.

University of Colorado, May, 1918.

NOTES ON NIDIFICATION IN GILLIA AND AMNICOLA.

BY FRANK COLLINS BAKER.

Observations on the nidification and embryology of our American fresh-water mollusks are rare; and contributions to our knowledge of this subject, though they may not be extensive, are of value. With this need for additional knowledge in mind, the writer ventures to present the following fragmentary notes on the nidification of two common genera of American Amnicolidæ, two species of which have but recently been described.

The observations were made while conducting quantitative studies of the animal life of Oneida Lake, New York State's largest inland body of water. The eggs of four genera of mollusks were observed at this time (the latter part of July and the first part of August), *Gillia, Amnicola, Galba*, and *Physa*. Only the first two genera are considered in this paper. It was hoped that time would permit a more extensive study of these embryos, but the quantitative studies extended to such a late date that there was no opportunity to carry on the very interesting studies on the development of these snails, which would have been of great interest and some value. The information gathered, however, may be considered a contribution to our knowledge of the embryology of these mollusks and may stimulate other students to a study of our fresh-water gastropods.

Gillia altilis (Lea). Pl. 2, figs. 1-8.

Gillia altilis is a very common species in Oneida Lake in the quiet bays, among vegetation. Egg-laying apparently takes place late in June or early in July. In eggs examined July 31st, the embryos were nearly ready to be hatched, the embryonic shell being fully formed. Eggs were observed on six species of plants; *Vallisneria spiralis* (abundant near base), *Pomatogeton robbinsii* (on lower three or four leaves), *Potamogeton perfoliatus, Scirpus smithii, Scirpus americanus*, and *Sagittaria latifolia*.

The eggs are laid singly (never in a capsule as in the fresh-water pulmonates), either alone or in groups of one, two, or more, but never exceeding six in any one group (as far as observed). As a rule, many eggs were crowded in a small space on the plant surface (see figures 1-3). On some plants but one side of a leaf contained eggs while other leaves contained eggs on both sides of the leaf. Several areas of the leaves of different plants were measured and the number of eggs in this area were counted, with the result shown in table No. 1. These figures indicate the great abundance of the eggs of this mollusk. The leaf used for attachment was generally of a living plant, but in many cases the dead and partly decayed leaves and pieces of plants were utilized for this purpose. In the table all leaves were about 6 mm. wide.

Table No. 1. Number of Eggs of *Gillia altilis* on Plants.

Plant.	Length of Leaf.	No. of Eggs.
Vallisneria spiralis	50 mm.	70
" "	60 mm.	160
" "	50 mm.	22
" "	100 mm.	69
" "	75 mm.	132
" "	75 mm.	73
" "	90 mm.	68
" "	45 mm.	33

The eggs are somewhat hemispherical in form, 1.25 mm. in diameter, the thickness being about a third of the diameter. Upwards of 80 per cent of the eggs contained living embryos, the balance being dead; a number of these were filled with protozoa. The envelope of the egg is very transparent and the embryo is transparent enough to permit some of the organs of the body to be seen through the mantle and transparent shell. The heart, placed near the aperture of the shell, was observed to pulsate very rapidly in all the embryos, in one individual 87 pulsations per minute.

Nearly all of the embryos were in an advanced stage of development, the embryonic shell as well as the external organs of the body—rostrum, tentacles, eyes, operculum, etc.—being fully formed (fig. 4). The embryos moved about in the egg in the same manner that adult *Gillia* and other Amnicolidæ browse over vegetation, the proboscis moving slowly about and the radula being protruded as in the adult animal. There appeared to be a regular circular movement of the embryo around the area of the egg capsule. A favorite position of the young animal when at rest is shown in figure 5. The rostrum appears to be cleft at the extremity in some individuals and the anterior part of the foot varies greatly in form when the young animal is active (fig. 6).

The embryonic shell is transparent, spermaceti-white in color and about 1.25 mm. in diameter. It consists of rather more than one whorl which enlarges rapidly (fig. 7). The nucleus and a large part of the shell is covered with very fine spiral lines, the lines of growth beginning abruptly near the aperture. The umbilicus is of medium size and rather deep (fig. 8).

Amnicola oneida or *bakeriana* Pilsbry. Pl. 2, figs. 9, 10.

The lenticular eggs of *Amnicola* (figs. 9, 10) were notably abundant in many localities covering all objects on the bottom, including living and dead vegetation, dead and living shells, and bottom debris. Two species, recently described,[1] are represented. It is impossible to differentiate the eggs of the two species, as both occurred with the eggs, but it is suspected that the narrower form of egg (fig. 9) is from *oneida* and the wider form from *bakeriana* (fig. 10). It will be noted that the form of these eggs differs from the figure given by Stimpson [2] for *Amnicola limosa* in which the egg is much attenuated at both ends. The eggs of the new *Amnicola* were especially abundant in filamentous algæ (*Cladophora fracta* and *Œdogonium* species), the long filaments often being covered with the lens-shaped eggs. *Scirpus, Vallisneria,* and other plants were also used for attachment. An effort was made to ascertain the number of eggs on certain species of plants in a measured area, with the result shown in table No. 2. In *Vallisneria*, eggs occurred on both sides of the leaf.

[1] Pilsbry, NAUTILUS, XXX, pp. 44-46, 1917.

[2] Researches upon the Hydrobiinae, etc., Smith, Miss. Coll., fig. 7, 1865.

TABLE No. 2. Number of Eggs of *Amnicola* on Plants.

Plant.	Size.	No. of Eggs.
Vallisneria spiralis	70 x 5 mm.	44
" "	70 x 5 mm.	27
" "	153 x 5 mm.	257
" "	140 x 5 mm.	58
" "	140 x 5 mm.	222
" "	89 x 5 mm.	23
" "	53 x 5 mm.	93
Potamogeton perfoliatus, leaf ..	64 x 10 mm.	16
" "	165 x 28 mm.	150
" "	25 x 5 mm.	21
Potamogeton perfoliatus, stem ..	72 x 2 mm.	42
Potamogeton robbinsii, leaf	19 x 10 mm.	55
" "	38 x 10 mm.	42
Scirpus occidentalis	95 x 12 mm.	33
" "	111 x 12 mm.	54
" "	77 x 6 mm.	76
" "	77 x 8 mm.	141
Scirpus americanus	111 x 3 mm.	200
" "	111 x 3 mm.	36
" "	165 x 3 mm.	150

Quantitative studies show that *Amnicola* is the dominant genus of mollusks in the part of Oneida Lake examined, and the vast number of the eggs of this snail indicates that the group is fully maintaining itself. This fact is of importance economically, as several fish of food value—perch, pumpkin-seed, bluègill, sunfish, catfish, sucker—as well as a few smaller fish preyed upon by larger and valuable food fish, use these snails as food. The eggs of *Amnicola* were observed in mid-summer (July 25 to Aug. 4), and the condition of the embryos (in the trochosphere stage) indicate that they would be hatched from the middle to the latter part of August.

EXPLANATION OF FIGURES, PLATE 2.

1. Eggs of *Gillia altilis* on leaf of *Scirpus smithii*.
2. Eggs of *Gillia altilis* on leaf of *Vallisneria spiralis*.
3. A single egg of *Gillia* on leaf of *Vallisneria*.
4. Embryo of *Gillia* about ready to hatch.
5. Embryo of *Gillia* in resting position.

6. Embryo of *Gillia;* forms assumed by fore part of foot.
7. Shell of *Gillia altilis*, top view showing rapid enlargement of whorl.
8. Shell of *Gillia* viewed from the front.
9. Egg of Amnicola (? *oneida*) on leaf of *Vallisneria.*
10. Egg of *Amnicola* (? *bakeriana*).

PLEISTOCENE FOSSILS OF MAGDALENA BAY, LOWER CALIFORNIA, COLLECTED BY CHARLES RUSSELL ORCUTT.

BY WILLIAM HEALEY DALL.

In a recent visit to Magdalena Bay, Mr. Orcutt obtained a series of Pleistocene fossils from a deposit on Magdalena Island which prove very interesting. A number of the species average larger than the recent forms of the same name, others, like *Strombus granulatus*, are uniformly smaller. Many of the species have not been reported from so far north in the recent state, and on the whole the assembly has a more topical aspect than that of the recent fauna. One or two of the largest forms appear to be new. The list follows:

Bullaria aspersa A. Adams.
Terebra armillata Hinds.
Conus fergusoni Sowerby.
Conus vittatus Hwass.
Conus, *cf.* ximenes Gray.
Conus purpurascens Broderip.
Conus lucidus Mawe.
Conus tornatus Broderip.
Surcula maculosa Sowerby.
Crassispira nigerrima Sowerby.
Cancellaria obesa Sowerby.
Cancellaria candida Sowerby.
Cancellaria cassidiformis Sowerby.
Lyria (Enaeta) cumingi Broderip.
Vasum caestus Broderip.
Oliva incrassata Solander.
Olivella dama Mawe.
Phyllonotus stearnsii Dall, n. sp.
Phyllonotus bicolor Valenciennes.
Phyllonotus princeps Broderip.
Solenosteira anomala Reeve.
Patellipurpura patula Lamarck.
Thais biserialis Blainville.
Thais kiosquiformis Duclos.
Macron aethiops Reeve.
Arcularia tegula Reeve.
Strombina dorsata Sowerby.

Strombina solidula Reeve.
Strombus gracilior Sowerby.
Strombus granulatus Wood.
Cypraea annettae Dall.
Trivia radians Lamarck.
Cerithium gemmatum Hinds.
Turritella nodulosa King.
Neverita recluziana Deshayes, small variety.
Polinices uber Valenciennes.
Crepidula excavata Broderip.
Crucibulum imbricatum Sowerby.
Crucibulum spinosum Sowerby.
Fissurella volcano Reeve.
Fissuridea murina Carpenter.
Astraea undosa Wood.

Ostrea veatchi Gabb.
Pecten circularis Sowerby.
Cardium biangulatum Sowerby.
Cardium procerum Sowerby.
Metis alta Conrad.
Tagelus violaceus Carpenter.
Parvilucina approximata Dall.
Phacoides lamprus Dall.
Phacoides lingualis Carpenter.
Diplodonta (Felaniella) sericata Reeve.
Diplodonta orbella Gould.
Divaricella eburnea Reeve.
Aligena cerittensis Arnold.
Dosinia ponderosa Gray.
Macrocallista squalida Sowerby.
Macrocallista orcutti n. sp.
Chione succincta Valenciennes.
Chione undatella Sowerby.
Anomalocardia rugosa Sowerby.
Cyathodonta undulata Conrad.
Cryptomya californica Conrad.
Schizothaerus nuttallii Conrad, var. capax Gould.
Panope generosa var. taeniata n. var.

Macrocallista orcutti n. sp.

Shell ovate-triangular, convex, inequilateral, solid and very heavy, six inches long, the beaks two and one-half inches behind the anterior end, incurved, prosocoelous, having neither lunule nor escutcheon; the surface smooth except for slight incremental undulations, irregular, but stronger toward the ends and near the base, where they are sometimes supplemented by fine striations; anterior slope more abrupt than the posterior, both ends rounded, the posterior moderately attenuated, the base roundly arcuate; hinge of the type of that of *M. squalida* but more concentrated, the posterior cardinal more than half as long as the nymphal callosity; muscular scars large, the anterior deeply impressed; there is no subumbonal cavity; pallial sinus short, extending forward less than half the length of the shell, acute, subtriangular; margin of the valves smooth. Length of shell 158; height 135+; diameter of right valve 40 mm.

A single slightly imperfect right valve was obtained on Magdalena Island. Than its nearest recent relative, *M. squalida*, it is larger, more rounded, much heavier, with a less uniformly smooth surface, and more concentrated hinge. In *M. squalida* the right posterior cardinal is less than one-third the length of the nymph, and the pallial sinus somewhat more than half as long as the shell. The type specimen is in the National Museum collection. It seems to be the heaviest Venerid of the coast except *Tivela stultorum.*

Panope (*generosa* Gould var.?) *taeniata* n. sp.?

Shell in a general way resembling *P. generosa*, from which it is best distinguished by a differential diagnosis. The shell of *taeniata* is more arcuate, more attenuated behind, less squarely truncate, the valve more inflated, with more of a cavity under the beak, with a shorter ligament, and with the posterior adductor scar nearly circular, while in *generosa* it forms an elongate oval; the anterior scar is also larger and wider than in *generosa*. Length of shell six and three-quarter inches, height three and seven-eighths, diameter of left valve an inch and a quarter. Compared with *generosa* the dimensions are as follows in millimeters.

M. taeniata, lon. 170, alt. 103, diam. 60, truncation 65.

M. generosa, lon. 172, alt. 97, diam. 48, truncation 78.

The left valve of *taeniata*, from which this description is drawn up, has a narrow rounded low rib extending from near the beak to the lower margin near the base of the truncation, but none of the specimens of *generosa* show anything of the kind. This, however, may be an individual mutation and requires confirmation by other specimens. The valve described was found on the beach, probably washed out of the deposit from which the fossils were obtained.

Murex (*Phyllonotus*) *stearnsii* new species.

Shell small, white, tinted with reddish brown on the varices of which there are eight, thick and wide, on the early whorls and seven on the last whorl; nucleus small, smooth, of two whorls, followed by about five subsequent whorls; shoulder high, rounded, the space between it and the suture pit-like between the varices; spiral sculpture of nine or ten low, strong ridges, incurved and guttered on the summit of the varices, with an intercalary series of smaller cords, the whole sharply spirally threaded and crossed by fine, rather sharp axial threads between the cords; aperture oval, hardly lirate, canal short, broad, almost closed, the base of the whorl somewhat constricted. Height 50, diameter of shell 35, length of aperture and canal 33 mm.

Fossil on Magdalena Island. Recent from Acapulco to Manta, Ecuador.

This is nearest to *P. humilis* Broderip, of Panama, which has recurved spines, is generally more compact, and when adult much smaller.

LIST OF SHELLS FROM ANGEL AND TIBURON ISLANDS, GULF OF CALIFORNIA, WITH DESCRIPTION OF A NEW SPECIES.

Collected by L. C. Decius and A. D. Fyfe, November, 1917.

BY I. S. OLDROYD.

ACANTHINA ANGELICA, n. sp.

Shell elongate with sloping shoulders, surface with heavy revolving striæ crossed by fine longitudinal ribs, which overlap forming a net-work; color grayish with markings of chocolate-brown here and there. Whorls five; aperture purplish within; columella straight, same color as aperture; outer lip thickened, dentate and with a strong tooth at its base. Alt. 26, diameter 13 mm. Canal short, open. It is nearest to *Acanthina engonata* Conr., but differs from it in slope of shoulders, sculpture, and color of aperture.

Type is in the Stanford Collection.

Type locality, Redondo Bay, Angel Island, Gulf of California.

ANGEL ISLAND SPECIES.

Polinices recluziana Desh.
Columbella fuscata Sowb.
Trivia solandri Gray.
Pecten subnodosa Sowb.
Fusinus dupetithouarsi Kien.
Bullaria gouldiana Pils.
Pecten dentatus Sowb.
Pododesma adamsi Gray.
Arca multicostata Sowb.
Chione undatella Sowb.
Crucibulum imbricatum Brod.
Turbo flexuosa Wood.
Murex elenensis Dall.
Cassis abreviata Lam.
Conus dalli Stearns.
Pinna rugosa Sby.
Trivia solandri Gray.
Cypraea annetta Dall.
Phacoides sp.
Cardita affinis Sby.
Hipponix barbatus Sby.
Nerita sp.
Diplodonta orbella Gld.
Opalia crenatoides Cpr.
Terebra variegata Gray.
Natica bifaciata Gray.
Acanthina sp. worn.
Cassis coarctata Gray.
Pecten circularis Sowb.
Phyllonotus bicolor Val.
Olivella dama Mawe.
Paphia grata Say.
Modiolus modiolus Linn.
Glycimeris giganteus Rve.
Crepidula onyx Sby.
Cerithium interruptum C. B. Ad.
Conus regularis Sowb.
Thais haemastoma Linn.
Acanthina muricata Brod.
Surcula olivaceus fumiculata Val.
Chiton 2 sp.
Chione fluctifraga Sowb.
Turritella gonostoma Val.
Alectrion versicolor C. B. Ad.
Arca solida Sby.
Tegula viridula reticulata Wood.
Alectrion affinis Sby.
Arca reeviana Orb.

TIBURON ISLAND SPECIES.

Diplodonta sericata Rve.
Paphia grata Say.
Pecten dentata Sby.
Hipponix antiquata Linn.
Heterodonax bimaculatus Orb.
Arca reeviana Orb.
Diplodonta orbella Gld.
Olivella dama Mawe.
Conus ximenes Gray.
Cardita affinis Brod.
Hipponix barbata Sby.
Pododesma adamsi Gray.

A NEW SPECIES OF CUSPIDARIA FROM MONTEREY.

BY I. S. OLDROYD, STANFORD UNIVERSITY, CALIFORNIA.

Cuspidaria (Tropidomya) nana, n. sp.

Shell small and slender; subventricose, the surface sculpture with numerous fine concentric lines of growth; the umbo anterior to the middle of the shell. Anterior portion obese, posterior slender, prolonged and slightly twisted, not gaping; with a sulcus reaching from the umbones to the rear of the shell. Hinge with no lateral teeth, a small anterior cardinal in the right valve, ligament obsolete, internal resilium strong, set in a prominent, posteriorly inclined resilifer with a strong quadrate lithodesma immediately in front of it. Pallial sinus short rounded, margins entire. Length 25, height 13 mm.

Type in the Oldroyd collection, Stanford University, Cal.

Type locality, Monterey Bay, California. Living in clay. Two specimens were found.

There is one specimen in the Hemphill collection, collected by Mr. Hemphill at Bolenas, California.

ANOTHER "MARTYN".

BY BRYANT WALKER.

The arrival in this country of a third[1] four-volume copy of Martyn's "Universal Conchologist" seems worthy of record, especially as this differs in several details from those that have been described by Dall, Johnson and Dautzenberg.

It was obtained from Messrs. William Wesley and Son of London, England, and is now in my library. There is nothing to show who had previously owned it.

The four volumes are bound as two in finely-tooled calf,

[1] This is probably a fourth copy, as a four volume set was acquired a few years ago by the Academy of Natural Sciences, No. 406 Conch., of the library.—Eds.

which was rather the worse for wear when received. The plates measure 12 $^{13}/_{16}$ by 10½ inches.

None of the circulars mentioned in connection with certain other copies are found with this.

Bound in with the original indices is a MSS. index written in a large engrossing hand. The plates are numbered consecutively in the upper right-hand corner in ink and evidently by the same hand that wrote the index, with the following exceptions: Plate 5 has no number at all; twenty-four plates have the original engraved numbers in the upper right-hand corner and eleven others, in addition to the written numbers in the upper corner, have the original engraved number, running longitudinally with the page, in the lower right-hand corner. Of these thirty-five engraved numbers, three are simply numerals. The others have in addition to the number a letter appended. Thus plate 8 is engraved "Fig^{e} 8—d" and plate 153 is engraved "Fig^{e} 153 —ppp". All of the plates with written numbers in volumes I and II are written "No I", &c., while those in volumes III and IV, down to and including plate 155, are written "Fig. 81", &c. The remaining plates have simply the numerals.

In all of the four volumes there are considerable differences in the neat-lines surrounding the figures. Some have an inner border of three lines, of which the center one is much the heavier and an outer narrow one, while others have only a single heavy line for the inner border. Eighteen of the plates in volumes III and IV have no neat-lines at all. The neat-lines, when present, were evidently added by hand and not engraved.

Plate 73 and eighteen others in volumes III and IV are initialed "H", evidently in the same handwriting as the written index, and plate 82 has endorsed on it: "(26 plates) H".

Two of the additional plates in volume IV are signed "E. Sewell", one in plain Roman letters and the other entirely in capital letters.

Volumes I and II, with the possible deviations noted above, are in all other respects the same as the copy in the National Museum described by Dr. Dall in 1905, excepting:

(1) That the French title-page reads "Les Figures", &c., instead of "Des Figures", as in that copy.

(2) There are two plates numbered "30—1" and "30—2" giving an upper and under view of the shell figured, and two numbered "72—1" and "72—2". The written index states that "72—2" is a variety of "72—1".

(3) Plates 43 and 59 have two views of the shell as in the Henderson copy, but plate 57 has only one figure as in the National Museum copy. The figures on plates 61 and 63 are also arranged as in the Henderson copy.

Volumes III and IV have no separate title-pages, simply the engraved explanatory tables. These tables agree with those quoted by Dr. Dall from the Sydney copy except that the generic name is frequently omitted in the second column, usually from lack of room when a varietal name was given.

The first species on plate 109 is given as "Pellis Armeniana" and not Arminiana.

Plate 129 is indexed as (Voluta) "Aplustre Ducis Navalis".

The second species on plate 135 is given as "Denrachates".

The first species on plate 137 is indexed as "Cælata".

Plate 143 is given as (Cochlea) "Albida".

Plate 154 is given as "Ostrea Echinata".

The first species on plate 156 is indexed as "Tellina cinnamea".

There are forty-three plates in volume III.

Plate 88 is a costate shell and would seem to agree with the name given in the engraved index. Plate 88* is a smooth shell. No specific names are given for either species in the written index.

Plate 115 is duplicated. The first plate contains two figures of the typical form of *Amphidromus aureus* (Martyn) corresponding to those given in the Manual of Conchology, XIII, pl. 54, figs. 70 and 71. The front view is of a sinistral specimen, the back view is from a dextral one. The second plate gives two views of a dextral specimen of the unstriped form corresponding to fig. 72 of the plate in the Manual of Conchology.

Plate 116 is also duplicated and represents two color forms of a beautiful sinistral *Amphidromus*, which I cannot assign to any of the species figured in the Manual of Conchology. The habitat is given as "Barbadoes", an impossibility, and the shells figured are stated to be in the cabinet of Mr. Forster. In the introduction (p. 18) Martyn states that "For exquisite taste and judgment in the various subjects of Conchology, Mineralogy and every other species of fossil bodies, perhaps no collector has more distinguished himself than Mr. Jacob Forster, to whose constant application in the pursuit of everything rare and beautiful in these branches it is chiefly owing that such matchless specimens now adorn his own, as well as other principal cabinets of Natural History in this kingdom".

A very large proportion of the shells figured in volumes III and IV are stated to be in Mr. Forster's collection. His address is given as "Piazza, Covent Garden".

There are fifty-two plates in volume IV.

In addition to the forty plates enumerated in the engraved index, there are twelve additional plates numbered 161 to 172 inclusive. It is probable that these plates are part, at least, of those prepared for the fifth volume before the project was abandoned as stated by Chenu (Dall, 1905, p. 420).

No names are given on any of the plates except No. 169, which has the following legend in ink:

"Strombus Fusus."

"This curious shell was taken up by the anchor of the Albion, East Indianman, in the Straits of Macassar (quere Sunda) in 1794 by Wm. Wells Esq'r and given to Mrs. Robson, who sold it and it was afterwards in the possession of Mr. Troward."

Only a portion of the species represented by these plates are identified in the written index. The following are named:

Plate 161. Murex neritoideus (Ricinula Lam.).
162. M. hippocastaneum "
165. Cook's Turbo.
169. Strombus fusus.

170. "Same as 89."
172. Murex babylonius.

Plate 156 was represented only by a blank, but numbered, page in this copy when received. Through the courtesy of Mr. C. W. Johnson, I have been able to supply the omission by an admirable water-color copy of the plate in the copy owned by the Boston Society of Natural History.

The written index, while of course of no scientific value, is of interest both as showing the changes that had been adopted in current nomenclature between the date of the engraved index and that of the written one and as affording an, at least, approximate date when the present copy was put together and bound.

In the nomenclature of the species represented on the 160 plates covered by the engraved index, there are no less than 89 changes in generic and 87 in specific names in the written index. The accepted nomenclature of the written index is apparently that Gmelin, whose Systema Natura was published in 1788-1792. Thus the two species illustrated on plate 67 are given in the engraved index as *Limax nucleus* and *L. faba*. The former is now known as *Cassidula nucleus* (Martyn) and the latter as *Partula faba* (Martyn). In the written index both are referred to "*Helix*". According to Pilsbry (Man. Con., XX, p. 236) Gmelin was the first to designate the latter as "*Helix faba*" in 1791, and according to Kuster (Con. Cab., Auriculacea, 1841, p. 29) he also referred *nucleus* to the same genus.

Everything in the make-up of this copy seems to indicate that it must have been one of the latest copies issued and was made up of such plates as were then on hand. The entire omission of plate 156 would seem to show that there were no copies left of that plate. The numeration, part written, part engraved, and some both written and engraved; the lack of uniformity in the matter of the neat-lines and the addition of twelve plates not included in the original work, all point in the same direction.

In the written index under plate 67 (*Cypræa aurantium*) is appended the following note: "N. B. See Ency. Brit., v. 9,

p. 508. A fine young shell of this species was brought from Guam, one of the Ladrona Islands in the Pacific Ocean near Japan, in 1822 and was sold for £25''.

This clearly fixes the date of the written index as later than 1822.

Plate 67 has written on it in the lower corner in pencil and in a handwriting entirely different from that of the written index (presumably by some subsequent owner), ''This is not plate 69''. The same note and in the same handwriting also appears on plates 94, 111, 135 and 152. Possibly a comparison with a perfect copy would show that the missing plates are included in the additional plates in volume IV and were misplaced by careless handling in arranging the plates for the binder.

BOSTON MALACOLOGICAL CLUB.

The Boston Malacological Club has held its regular meetings during the past season—its eighth year. These meetings have been well attended; many interesting papers have been given and specimens exhibited. The general enthusiasm and good-fellowship prevailing shows that the Club has a permanent place among the scientific activities of Boston.

At the October meeting Mr. William F. Wells, Scientific Assistant in Shell-fish, U. S. Bureau of Fisheries, gave an interesting communication on the ''Possibilities of Scientific Oyster Culture.'' The Club also had the pleasure of a visit from Dr. William H. Dall, of the U. S. National Museum.

In November the Rev. Oliver P. Emerson gave a talk on ''Collecting Achatinellidæ.'' A residence in Hawaii for thirty-five years gave him every opportunity for studying these interesting shells and to make a large and beautiful collection.

In December Mr. J. Henry Blake spoke on ''Collecting at Provincetown, Mass.,'' noting the many changes that have occurred affecting the molluscan fauna. Mr. C. J. Maynard spoke on collecting Cerion in the Bahamas. The Club at this meeting also had the pleasure of a visit from Professor William A. Bryan, of the College of Hawaii, Honolulu. He gave a very interesting account on the variation of species of Melaniidæ in different parts of the same stream.

The January meeting was devoted to paleontology, Dr. Hervey W. Shimer, speaking on the Cephalopoda and Pelecypoda, and Dr. Percy E. Raymond on the Gastropoda.

In February Mr. Charles W. Johnson spoke on the variation of *Litorina rudis, L. obtusata palliata* and *Thais lapillus*, illustrated by a large series of specimens from various localities on the New England coast and Europe.

At the March meeting Dr. Edward C. Van Dyke, of San Francisco, spoke on collecting on the Pacific slope, and gave some interesting points bearing on the zoogeography of the region. It being the annual meeting, Mr. J. Henry Blake was elected president to succeed Mr. John Ritchie, Jr.

In April Mr. John Ritchie, Jr.'s subject was "Miscellany," and Mr. Arthur F. Gray exhibited photographs and letters of noted conchologists.

At the May meeting an interesting discussion was presented by Professor Edward S. Morse on "Protective Coloration," and by Mr. Francis N. Balch on "Problems of Coloration in Mollusca."

The field meeting of the year was to Fresh Pond, Cambridge, classic collecting ground for fresh-water mollusks.

E. G. Humphrey, *Secretary.*

NOTES.

Olivella biplicata angelena, var. nov.

This variety differs from Sowerby's type in being more delicate and slender, with callous not so heavy, spire more elevated, sloping more gradually from the middle of the shell to the apex. Sowerby's type came from Monterey and does not occur near San Pedro living, but is found fossil there in the Pliocene and lower Pleistocene. Variety *angelena* is found fossil in both the upper and lower San Pedro beds of the Pleistocene.

Length of type 27, width 13 mm.

Type is in the Oldroyd collection, Stanford University.

T. S. OLDROYD.

PRESSODONTA *rediviva*.—In some notes on the *Unionidæ* recently published (Occ. Papers, Mus. Zool., Univ. Mich., 49, 1918, p. 2) I proposed to replace *Pressodonta* Simp. (1900) by *Calceola* Sw. (1840) on the ground of priority, both groups having the same type. Dr. Dall has since called my attention to the fact that "*Calceola* was used by Lamarck in 1799 for a coral (long supposed to be a Brachiopod)." This restores *Pressodonta* to its place as the proper name for the subgenus. The error is one of the unfortunate results of not having access to a general scientific library.—BRYANT WALKER.

Mr. Horace F. Carpenter has presented to the City of Providence and has installed in the museum at Roger Williams Park his entire collection of minerals and shells. It consists of about 4,000 species of shells, 75,000 specimens, 1,200 species and varieties of minerals, over 200 rare chemical salts, and 50 wooden models of mineral crystals. A microscope with accessories for conchological and mineralogical work, and a library of about 200 volumes on natural history and chemistry, worth about $1,500. This collection represents a life labor of 60 years. Mr. Carpenter has spent nearly a year in installing, arranging and labeling these specimens at the museum.

PUBLICATIONS RECEIVED.

NOTES ON WEST AMERICAN CHITONS, I. By S. Stillman Berry. Proc. Calif. Acad. Sci., 4 ser., vol. vii, pp. 229-248., Sept. 1917 (received May 17, 1918). These interesting notes are based on a large and valuable collection made by Mr. George Willett in southern Alaska, comprising 25 species and 622 specimens. Two new species, *Ischnochiton* (*Lepidozona*) *willetti* and *Placiphorella rufa*, are described and figured, followed by a note on the genus *Trachydermon*.

PRELIMINARY DESCRIPTIONS OF NEW SPECIES OF PULMONATA OF THE GALAPAGOS ISLANDS. By W. H. Dall. Proc. Calif. Acad. Sci., 4 ser., vol. ii, pt. 1, pp. 375-382, Dec. 1917 (received May 17, 1918). Thirteen new species of *Bulimulus* subgenus *Naesiotus*, a new *Helicina* and *Williamia galapagana* are described.

NOTE ON CHRYSODOMUS AND OTHER MOLLUSKS FROM THE NORTH PACIFIC OCEAN. By W. H. Dall. Proc. U. S. Nat. Mus., vol. 54, pp. 207-234, 1918. An exhaustive account of the genus and the allied forms now grouped under the family Chrysodomidæ. The nuclei or larval shells of the various genera present several distinct types and numerous mutations. "In many cases, as in *Buccinum* and *Busycon*, it was shown many years ago by Lovèn and others that a single ovicapsule contains a number of ova fertile and unfertile. The unfertile eggs serve as food for the larvæ developed from the fertile ones and there is a certain amount of competition between the larvæ in the capsule which results in the most vigorous larvæ getting more food and making a larger growth than the more weakly coinhabitants of the capsule. Thus at the time of leaving the capsule and coming into the outer world, it sometimes happens that there will be perceptible differences between the individuals issuing from a single capsule, not only in actual size but in the length of the coil of whorls and the size and compactness of the larval apex." The rules of nomenclature necessitates the use of *Chrysodomus* instead of *Neptunea*. Under the genus *Searlesia* is placed the *C. dirus* of the west coast. The other genera comprising the family are: *Ecphora, Colus, Siphonorbis, Kryptos, Plicifusus, Exilia, Volutopsius, Pyrulofusus, Beringius, Liomesus* and *Ancistrolepis*. Fifteen new species are described. C. W. J.

NOTES ON THE NOMENCLATURE OF THE MOLLUSKS OF THE FAMILY TURRITIDÆ. By W. H. Dall. Proc. U. S. Nat. Mus., vol. 54, pp. 313-333, 1918. A very useful and timely paper.

THE NAUTILUS.

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THE AVICULA CANDEANA OF D'ORBIGNY, FROM BERMUDA.

BY CHARLES W. JOHNSON.

Among the mollusca collected by Mr. Owen Bryant at Bermuda in the summer of 1903, was a specimen referable to the genus Malleus of authors. At the time I urged Mr. Bryant to describe it and he started to do so. I do not wonder that the monographs in the Conchologia Iconica (Vol. XI) and in the Conchylien Cabinet (VIII, 1) baffled him, and when I showed him d'Orbigny's description of *Avicula candeana* in La Sagra's Cuba, he "threw up the sponge," and on leaving Boston turned the specimen over to me.

The specimen was put aside, and the press of museum work has prevented me from recording this interesting shell before. At this time the pleasure of doing so is greatly marred by the possibility that the appropriate and familiar name of *Malleus* Lamarck 1799, might have to fall before the older name of *Pinctado* Bolten, 1798.

My friend Mr. Charles Hedley in his list of the mollusca of New South Wales, ingeniously places *Malleus vulgaris* under the genus *Pinctado* and *M. albus* under *Malleus*. This is a very nice way of arranging them so as to retain the old genus *Malleus*; but do they really represent two genera? What shall we do with all of the smaller, auriculate forms? Although the species seem difficult to separate in the early stages of their growth, the adult shells of the auriculate species are quite readily separated from the true "hammer oysters," and the simplest plan would be to adopt provisionally a third name to cover these.

In 1884 De Gregorio proposed the name *Fundella* for a shell, with the hinge as in *Malleus*; structure of the shell and inequality of the valves as in *Ostrea*; cardinal line straight, and a wing as in *Avicula*, shell gaping on one side; external aspect of the summits as in *Anomia*; interior as in *Ostrea*. Type *F. lioyi*, n. sp., 25 mm., in a sponge from the abyssal zone of the mediterranean, off Tunis. E. von Martens, who compiled the mollusca in the Zool. Record for 1884, in commenting on the species says: "photograph, not very clear figure, much resembles the young state of *Malleus regula* (Forsk.) from the Red Sea." Fischer in his Manuel makes *Fundella* a section of *Malleus*, with the following diagnosis: anterior ear obsolete, and with a longitudinal, median ridge on the interior of the valves; giving as the type, *M. candeanus* d'Orbigny. Did Fischer consider De Gregorio's species to be the same as d'Orbigny's? I am inclined to think he did. From the description and figures I see no characters to separate them. Orbigny looked upon it as a deformed *Avicula* (*Pteria*), with the characteristics of that genus when young and of *Malleus* when in the adult stage. Dr. Dall under *Electroma* Stoliczka, (type *Avicula smaragdina* Reeve) says: "The latter (*Electroma*) may be represented in the recent fauna of the Antilles by *Avicula candeana* Orb., which seems to owe its characters to commensalism with sponges."

FUNDELLA CANDEANA (d'Orbigny).

Avicula candeana d'Orb. Hist. de Cuba, La Sagra, Moll. II, 343, pl. 28, figs. 25–27, 1853.

Malleus vesiculatus Reeve, Conch. Icon. (*Malleus*) XI, pl. 3, fig. 12, 1858.

Malleus rufipunctatus Reeve, Conch. Icon., XI, pl. 3, fig. 8, 1858.

Fundella lioyi De Gregorio, Bull. Soc. Mal. Ital., X, 73, pl. 4, fig. 6, 1884.

Malleus candeanus Fischer, Manuel de Conch., p. 954, 1887.

Electroma (?) *candeana* Dall., Trans. Wagner Free Inst. Sci., III, pt. 4, p. 668, 1898.

The shell in question was removed from a coralline growth and is greatly deformed as so many of the species of this group usually are. It measures 45 mm. in length and is of a dark purplish color, with a dull yellowish margin; the structure of the shell is vesiculate, making it thin and brittle; umbones smooth followed by a radial sculpture, which soon changes to irregular, concentric laminae. At this point the growth of the shell was arrested and commenced to grow at right angles to the hinge; byssal opening large, affecting both valves. The pallial line is conspicuously raised, forming a deep, nacre-lined body cavity; from about the middle of the pallial line and extending to the margin of the shell is a median, longitudinal ridge. The object of this ridge seems to be that of strengthening the thin vesiculate portion of the shell, for it is much more prominent in the smaller than in the larger and thicker species, including the two "hammer oysters." This ridge is not present in *Pteria.*

From the descriptions and figures given by Reeve, this species cannot be satisfactorily separated from several species from the Pacific, especially *Malleus vesiculatus* from Isle of Plata, West Columbia. It also resembles except in color *M. rufipunctatus* and *M. aquatilis* from the same locality.

The metropolis of the Malleaceae being the Central Pacific, their presence in the Antillean waters might possibly be due to water connection by the Isthmus of Panama during the late Eocene or early Oligocene, a period when so many of the analogous species now living on the west coast of Central America and in the West Indies, probably had a common origin, but its occurrence in the Mediterranean makes this theory less plausiable.

Explanation of Plate III.

Figs. 1 and 2. *Fundella candeana* (d'Orb.). Bermuda. Specimen in the Museum of Comparative Zoology.

Figs. 3 and 4. *Fundella candeana* (d'Orb.). From a photograph of d'Orbigny's figures.

Fig. 5. *Malleus rufipunctatus* Reeve. From a photograph of Reeve's figure.

Fig. 6. *Malleus vesiculatus* Reeve. From a photograph of Reeve's figure.

A MOLLUSK HUNT IN WYOMING.

BY JUNIUS HENDERSON.

The recent molluscan fauna of Wyoming is probably less known than that of any other state in the Union. A number of mountain chains, more or less isolated by broad expanses of plains unfavorable to land snails, promise interesting results from a conchological exploration of the region, especially with reference to the genus *Oreohelix*. I have long looked in that direction with covetous eyes. In 1917 it was my privilege to spend the two weeks from August 23 to September 7 in that region, in company with Edward L. Schwabe. We traveled hastily by auto, with camp outfit, passing almost entirely across the state from south to north. The great distance traveled, together with long stretches of barren territory between collecting places, and the lack of opportunity for side trips into more favorable territory, prevented great results, but we obtained an acquaintance with the region that will be invaluable in planning another and longer season's work in the future. Unfortunately the war conditions have prevented a continuance of the work during the present year. Dr. H. A. Pilsbry has rendered valued assistance in the determination of some of the land shells, and Dr. Bryant Walker has identified or confirmed the identity of most of the fresh-water snails. The *Pisidia*, of which we found very few, were submitted to Dr. V. Sterki some time ago, but as yet I have no report from him. In the card index of the University of Colorado Museum, I find noted the published records of the following species and subspecies for Wyoming:

Columella alticola (Ing.)
Euconulus fulvus alaskensis Pils.
Lymnæa apicina Lea
Lymnæa binneyi Tryon
Lymnæa elodes var.?
Lymnæa jacksonensis Baker
Lymnæa proxima Lea
Lymnæa traski Tryon
Oreohelix cooperi (W. G. B.)
Oreohelix cooperi minor (Ckll.)

Oreohelix cooperi maxima Pils.
Oreohelix pygmæa Pils.
Oreohelix strigosa Gld. (*depressa* Ckll.?)
Oreohelix strigosa extremitatis Pils. & Ferr.
Physa sayi Tappan
Planorbis bicarinatus (*antrosus* Conr.)
Pomatiopsis robusta Walker
Pupilla muscorum (L.)
Pyramidula cronkhitei anthonyi Pils.
Pyramidula striatella Anth.
Succinea avara Say
Vallonia cyclophorella Ancey
Vitrina pfeifferi Newc. (*alaskana* Dall)

Oreohelix cooperi minor should be eliminated from the list, because, in the first place, a re-examination of the material so recorded shows that it is true *cooperi*, and in the second place, investigations recently carried on by me at the type locality of *minor* convince me that the small form so named was based upon examples merely dwarfed by adverse conditions in one portion of a normal *cooperi* colony. Baker has placed the Ft. Bridger record of *Lymnæa elodes* var. in the synonymy of *L. palustris*. The *Pyramidula striatella* record is probably *P. c. anthonyi*, which would still further reduce the list, but it may possibly be *P. shimeki cockerelli* Pils. *Pupilla muscorum* is probably *P. m. xerobia* Pils., but one cannot be certain of it. *Physa sayi* is doubtful, but if not that, it refers to some other *Physa*, so its elimination would not reduce the number of species. This leaves a list of about 22 species, 12 of which are confined to two genera, with no recorded pelecypods at all. Possibly some recorded species have been overlooked by me. The only large land snails are in the genus *Oreohelix; Polygyra*, which occurs to the northward in Montana, not having been found in Wyoming. *Oreohelix* is an ancient genus in the state, *O. grangeri* Ckll. & Hend. and *O. megarche* Ckll. & Hend. occurring in rocks of Eocene age.

Our two weeks' work, besides furnishing new localities for some of the species already recorded from the state, adds the following species, including four additional genera, two of which are pelecypods:

Agriolimax campestris (Binn.)
Ferrissia rivularis Say
Lampsilis ventricosa (Barnes)
Lymnæa bulimoides cockerelli Pils. & Ferr
Lymnæa caperata Say
Lymnæa humilis modicella Say?
Lymnæa obrussa Say
Physa anatina Lea
Physa gyrina Say
Physa integra Hald.?
Physa sayi warreniana Lea?
Physa walkeri Crand.
Planorbis parvus Say
Vallonia gracilicosta Reinh.
Zonitoides arborea (Say)

In a recent paper Daniels and I asserted the probable occurrence of *L. b. cockerelli* in Wyoming, which is now confirmed.

Following is an account of the stations visited and the mollusks obtained at each:

Sta. 232, reservoir where the road from Cheyenne to Casper crosses Lodgepole Creek, about thirteen miles north of Cheyenne.

Pisidium sp.
Agriolimax campestris (Binn.)
Lymnæa obrussa Say
Physa sayii warreniana Lea?
Planorbis parvus Say
Succinea avara Say
Vallonia gracilicosta Reinh.

Sta. 233, a branch of Bear Creek, north of Horse Creek.

Pisidium sp.
Lymnæa obrussa Say
Physa walkeri Crand.

Sta. 234, small reservoir six miles northeast of Wheatland.

Lymnæa caperata Say
Physa gyrina Say
Planorbis parvus Say

Sta. 235, bridge over Laramie river, below Uva.

Lampsilis ventricosa (Barnes)
Lymnæa obrussa Say
Lymnæa humilis modicella Say? (two specimens)
Oreohelix cooperi (W. G. B.)
Pyramidula cronkhitei anthonyi Pils.
Succinea avara Say
Vallonia gracilicosta Reinh.
Zonitoides arborea (Say)
Physa gyrina Say
Physa integra Hald.?
Planorbis parvus Say

Only a single broken example of the *Oreohelix* was found, in the river bottom, and it may have been brought by the stream from far away in the spring flood.

Sta. 236, creek bottom about ten or twelve miles north of Uva, under willows and cottonwoods.

Vallonia gracilicosta Reinh.
Vitrina alaskana Dall.
Zonitoides arborea (Say)

Sta. 237, five miles northwest of Douglas, in a small spring brook.

Lymnæa obrussa Say
Physa gyrina Say
Planorbis parvus Say

Sta. 238, Boxelder Creek, about 18 or 20 miles northwest of Douglas.

Ferrissia rivularis Say
Lymnæa obrussa Say
Physa gyrina Say
Planorbis parvus Say
Pyramidula cronkhitei anthonyi Pils.
Succinea avara Say
Vallonia gracilicosta Reinh.
Vitrina alaskana Dall
Zonitoides arborea (Say)

Sta. 239, a very small reservoir formed by throwing an earth dam across a dry draw to catch the storm waters for stock, four miles west of Arminta. A few very rotten shells of *Lymnæa bulimoides cockerelli* Pils. & Fer. were found.

Many dead salamanders were along the bank and a few live ones were seen in the water. This shallow water-hole did not look as though it could have existed very long, and it was a long distance from any other water. We were much surprised to see several great blue herons fly from the water at our approach, and wondered what they were feeding upon, or we should not have looked for any mollusks there. It would be interesting to know by what agency they got there. Hand (NAUTILUS, XXVII, 1914, p. 144) noted *Planorbis vermicularis* in a small artificial pond in California, and raised the same question, "How did they get there?"

Sta. 240, at base of a rocky sandstone ledge about twelve miles north of Lost Cabin on the road to Ten Sleep.

Pupilla muscorum xerobia Pils.
Vallonia cyclophorella Ancey

Sta. 241, creek bottom about three miles above Ten Sleep.

Agriolimax campestris (Binney).
Oreohelix cooperi (W. G. B.)?
Physa gyrina Say ("peculiar long form")
Pyramidula cronkhitei anthonyi Pils.
Succinea avara Say
Vallonia gracilicosta Reinh.
Vitrina alaskana Dall
Zonitoides arborea (Say)

Only one fragment of *Oreohelix* was found, apparently *O. cooperi*, and it may have been brought down from up-stream in the spring flood. *Agriolimax* is represented by two very small examples.

Sta. 242, creek bottom at Hyattville, among willows, narrow-leafed cottonwoods, etc. *Vallonia gracilicosta* Reinh.

Sta. 243, bottom lands on Shell Creek, at mouth of White Water Creek, about five miles east of Shell.

Lymnæa obrussa Say
Physa anatina Lea
Planorbis parvus Say
Pyramidula cronkhitei anthonyi Pils.
Vallonia gracilicosta Reinh.

Physa anatina is so identified by Dr. Bryant Walker. We have another lot of the same species, also identified by Dr. Walker, collected by Mr. Don W. Walker two and a half miles east of Shell.

Sta. 244, just within the mouth of Shell Creek Canyon, on south side of creek, about two miles above Sta. 243, on limestone ledge devoid of shrubbery and other vegetation except close-clinging lichens on the rock. *Oreohelix yavapai extremitatis* Pils. & Ferr. was plentiful, clinging to the open face of the rocks in plain sight, though the weather was hot and dry. This form has been recorded from the same canyon by Dr. Pilsbry. There were no rock slides or other cover, such as *Oreohelix* usually requires, anywhere near. We obtained 145 live examples and over 200 dead shells in a short search, one of the latter being reversed. I have never before seen any member of this genus in such an exposed position.

Sta. 245, about a mile or so from Sta. 244, same side of creek, under shrubbery. We obtained 31 *Oreohelix yavapai extremitatis* Pils. & Ferr. and 46 *O. pygmæa* Pils. alive, together with many dead shells. This is the type locality of the latter. Two of them were albinos. We also found *Pupilla muscorum xerobia* Pils., *Vallonia gracilicosta* Reinh., and *Zonitoides arborea* (Say).

Sta. 246, just within the mouth of White Creek Canyon, on south side, a couple of miles south of Sta. 245, in a small brush patch a few feet in diameter at the base of a low cliff near an old log building.

Euconulus fulvus alaskensis Pils.
Oreohelix cooperi form *obscura* Hend.
Oreohelix pygmæa Pils.
Oreohelix yavapai extremitatis Pils. & Ferr.
Pupilla muscorum (L.)
Vallonia gracilicosta Reinh.
Vitrina alaskana Dall.

Sta. 247, bluff 50 yards east of Sta. 246. *O. y. extremitatis* Pils. & Ferr. abundant, clinging to rocks and under scant mountain mahogany, clematis, etc., a few out on open ground, all active after the rain of the night before. Two dead shells of *O. pygmæa* Pils. and seven dead shells of *O. s. obscura* were also found here. The *extremitatis* from this canyon are much less prominently carinated than those from Shell Creek Canyon.

Sta. 248, at base of bluff from 100 to 150 yards east of Sta. 247, under fairly good cover of shrubbery. *O. c. obscura* numerous, with quite a number *O. y. extremitatis* (two albinos) and a few *O. pygmæa*.

Sta. 249, a short distance up the canyon from Sta. 248, where the vegetation about small rock slides at the foot of a high cliff forms good cover for snails, which were very abundant. In a short time we observed 600 live *O. pygmæa*, the same number of *O. c. obscura*, and 58 live *O. y. extremitatis*. Four of the *pygmæa* and six of the *obscura* are albinos.

OREOHELIX COOPERI OBSCURA new form.

Ordinarily forms of *Oreohelix* based upon color alone are of doubtful value, but in this case the color is so striking and so uniform that I feel justified in giving to the form from this canyon a name. Of the hundreds of live examples and more hundreds of dead shells examined from stations 246, 247, 248 and 249, not one resembles typical *cooperi* in color, though I detect no other difference. With the exception of the eight albinos, they are all very dark, mostly quite black, not dark red or brown usually, with a rather broad light peripheral band, though this is wanting in many examples. In color they resemble *O. peripherica albofasciata* (Hemph.), but would not be mistaken for that form by anyone familiar with *Oreohelices*. In numbering thousands of *O. cooperi* in the last few weeks I have noticed that there is a scratch beneath the pen, as though it were being dragged across a fine. sharp file, quite different from the sensation experienced in using the pen on other species, of which I have numbered thousands recently. This scratch I noticed in the color form now described.

Most of the shells of the *yavapai* group in White Creek Canyon have the spire much more elevated, scarcely any being as flat as those from Shell Creek Canyon, and, as would be expected, the keel is much less pronounced. In fact, many of them have the keel as rounded as in *O. s. depressa* (Ckll.) and some have the color bands well developed. A striking feature of this district is the number of albinos occurring in both *pygmæa* and *obscura*. Another unusual feature is the occurrence of three forms of *Oreohelix* intermingled. It is seldom that I have found even two together until the season of 1917, and never before have I found three together, yet at all of the stations in White Creek Canyon this occurs. These stations are really different portions of one great colony, as scattered dead shells were found all along the canyon as far as we traversed it, but we divided it into stations because of differences in cover and other conditions, and variance in the proportionate numbers of the several forms.

A NEW PRIOTROCHATELLA FROM THE ISLE OF PINES, CUBA.

BY WM. F. CLAPP.

Priotrochatella torrei, n. sp.

Shell depressed, trochiform, thin, fragile, above with numerous oblique plications, crossed by raised spiral lines ; below *smooth ;* whorls, nine, the first smooth, white, the spiral lines beginning on the fourth. Suture of early whorls simple, of later whorls denticulate, and of the last two or three whorls covered with a white moderately denticulate flange. Last whorl descending slightly, aperture very oblique. Color yellow, with irregular white patches and white denticulate sutural flange above, uniform yellow below.

Greatest diam. 13 mm., l. d. 11½ mm., alt. 8 mm. Type in Museum of Comparative Zoölogy, Cambridge, Massachusetts. No. 36888.

This species was discovered by Mr. W. S. Brooks near the *southern* end on the eastern face of the Sierra de Casas, Isle of Pines, Cuba, and later a large series was collected by Mr. Brooks and Dr. Thomas Barbour.

No genus of the great host of West Indian land mollusks is so famed for its beauty and delicacy of structure as *Priotrochatella*. Hitherto but two well-defined species have been known, and it is indeed rare good fortune to be able now to associate with a third the name of Dr. Carlos de la Torre of the University of Havana. No one has shown a keener or more sympathetic appreciation for, or knowledge of, the shells of his native land than has he.

P. torrei differs from the two species of *Priotrochatella* previously described, *P. constellata* Morelet and *P. stellata* Velasquez, in having the base of the shell smooth, instead of granulose as in *P. constellata*, or with transverse plications as in *P. stellata*. The sutural flange is less coarsely denticulate than in *constellata*, more strongly than in *stellata*. In *P. constellata* the average number of teeth on the periphery of the last whorl is less than 40, in *P. torrei* between 40 and 50, and in *P. stellata* more than 50. *P. constellata* Morelet,[1] was described as from "Sierra de Cristalles." In the southern part of the Isle of Pines there is a hill called the Sierra de Cristales, but the entire local formation is igneous and therefore this certainly was not the type locality of the species. It is possible that some one told Morelet that the Sierra de Casas was called the Sierra de Cristales, which he misspelled. Poey[2] gives the habitat of *constellata* as "Sierra de Caballa, esta sierra esta al Sud de la poblacion llamada Nueva-Gerona." This locality is now definitely known as the Sierra de Casas.[3]

Poey transposed the names of the two mountain ranges in the northern part of the Isle of Pines, referring to the Sierra de Casas by the name of Sierra de Caballa, and to the Sierra de Caballas by the name of Sierra de Casas. Pfeiffer[4] repeats Morelet's locality of Sierra de Cristales. Arango[5] in 1878 gives the habitat of *constellata* correctly as "En los paredones de las faldas E. y. O. de la Sierra de Casas situada al O. de Nueva Gerona en Isla de Pinos," probably as a direct result of Gundlach's own collecting. Crosse[6] repeats the last named habitat.

1 Morelet: Rev. Zool., p. 144, 1847.

2 Poey: Mem. Cuba, I, p. 116, t. 5, fig. 15-17, 1851.

3 Todd: Ann. Carnegie Mus., vol. X, pl. XXVII.

4 Pfeiffer: Mon. Pneum., I, p. 334, 1852.

5 Arango: Contribucion a la Fauna Malacologica Cubana, p. 45, 1878.

6 Crosse: J. de Conch., vol. 38, p. 310, 1890.

The true habitat of *Priotrochatella constellata* is the *northern* portion of the Sierra de Casas, that of *P. stellata* the Sierra de Caballos and possibly in its northern extension now called the Sierra de Columbus. I do not know of any records of either species being found on the opposite side of the river from its true habitat. Due to the fact that *P. torrei* does not possess a rapidly descending ultimate whorl, as in *P. constellata*, therefore lacking that species' pagoda-form appearance, one would be inclined to suppose that it is most closely related to *P. stellata*, in spite of its habitat in that region theoretically occupied only by *P. constellata*. Admitting as a possible premise that *P. constellata* and *P. stellata* are derivatives of a common ancestor; that due to separation on opposite sides of the river Sierra de Casas, the two species have assumed characters rendering them specifically distinct, there are then several possible explanations of the origin of *P. torrei*. 1. A direct descent from the original *Priotrochatella* stock isolated by geographical change in its own particular habitat at approximately the same period as *P. constellata* and *P. stellata*. 2. A more recent geographical separation from either *P. stellata* or *P. constellata*. In an attempt to throw some light on this question I have examined the radulae of three specimens of each of the three species of *Priotrochatella*. That too much stress must not be placed on the value of the radula as an important character in deciding specific values has been repeatedly demonstrated. I nevertheless believe that sufficient differences appear in the radulae of the species mentioned to furnish some foundation for my belief that *P. torrei*, in spite of its outward similarity to *stellata*, is probably more closely related to *constellata*.

The name *Priotrochatella* was given as a subgenus by Crosse[7] to those species of *Eutrochatella* possessing an operculum similar to that of *constellata*. Wagner[8] raises *Priotrochatella* to a genus and includes the species *constellata* Mor. and *stellata* Vel. As far as I know no figures of the radulae of *Priotrochatella* have been published.

[7] Crosse: J. de Conch., vol. 41, p. 88, 1893.

[8] Wagner: Denkschriften Akad. Wissenschaften. Band LXXVII, p. 369, 1905.

The radula of *P. torrei* is approximately 14.5 mm. long, and 1 mm. wide, and contains in the vicinity of 250 rows of teeth. The central tooth and the four laterals on each side are perpendicular to the long axis of the radula, the rest of the row comprised of approximately 100 uncini, curves back toward the posterior end of the radula. The central tooth (pl. 4, fig. 1, c.) has a very slight cusp at its summit. The laterals (i, ii, iii) possess very strong cusps which are not denticulate. The major lateral (iv) cannot be described as denticulate, the cutting edge being merely slightly sinuous. In this respect the radula of *Priotrochatella* differs from that of any of the other Helicinidae. If this major lateral is composed of two teeth, they are so firmly interlocked that I have been unable to separate them. The uncini (Fig. 1, u) (Fig. 2) are numerous and densely packed. The innermost (1, 2) are simple, possessing but one cutting edge, later (38, 39) becoming bidentate. In the 45th (45) tooth of the radula figured, the inner denticle is again divided, and the increase in the number of denticles continues to about the 98th row where the cusp is twelve-denticled. The curve of the outer edge of the radula causes the cutting edge of the outermost uncini to be turned inward toward the center of the radula and parallel to its long axis. The three or four outermost uncini are very broad flat plates and the denticles entirely disappear.

The radulae of *P. constellata* and *P. stellata* are very similar to that of *torrei* excepting in the central teeth. In *P. stellata* (Fig. 4) the central tooth is large, with a very strong broad cusp. In *P. constellata* (Fig. 3) and in *P. torrei* the central teeth are very similar in size, differing only in the shape of a very small cusp. There do not seem to be any constant differences in the radulae of the *Priotrochatella* excepting in the central teeth.

Summary (1). The radulae of the three species of *Priotrochatella* exhibit sufficient differences in structure from other groups of Helicinidae to sustain the raising of *Priotrochatella* to generic rank.

Summary (2). The similarity of the radula of *P. torrei* to that of *P. constellata* is of sufficient importance to lend considerable weight to a theory that *P. torrei* is more closely related to *P. constellata* than to *P. stellata*.

EXPLANATION OF FIGURES, PLATE 4.

All figures were drawn with the aid of a camera lucida.

Fig. 1. *P. torrei:* c. central; i, iv laterals; u. uncini.

Fig. 2. Uncini 1 and 2, 38 and 39, 45, 55, 70, 90, 102 (the outermost).

Fig. 3. Central tooth of *P. constellata.*

Fig. 4. Central tooth of *P. stellata.*

Figs. 5, 6, shell of *P. torrei.*

LAMPSILIS VENTRICOSA COHONGORONTA IN THE POTOMAC VALLEY.

BY WM. B. MARSHALL.

In the NAUTILUS for October, 1917, I recorded the finding of two valves (belonging to the same individual) of this shell by Manly D. Barber in the Potomac River, at Great Falls, Maryland, about eighteen miles above Washington, D. C. Dr. Ortmann had already recorded the finding of a single specimen as far south as the Shenandoah River, at Harper's Ferry, W. Va., some fifty miles above Great Falls, and the finding of others at places farther up the river.

On July 7, 1918, Dr. C. Wythe Cooke of the U. S. Geological Survey, found a superb specimen living in a sandy pass at Midriver Island, which is only about a mile and a half above the Falls.

On July 28, 1918, he and I donned bathing suits and made a careful examination of the spot in the hope of finding more specimens, and especially the very young. For two or three hours we explored the sand and the mud beneath with our fingers and toes and passed quantities of sand and mud through our hands and through a fine mesh sieve. The spot thus investigated was about 20 feet wide and 75 feet long. Our efforts were rewarded by the finding of four specimens of *cohongoronta*, the smallest having a length of 40 mm., the largest a length of

72 mm. The specimen found by Dr. Cooke on July 7th had a length of 90 mm. Their occurrence thus in a colony and of different ages establishes *cohongoronta* as a member of the naiad fauna of that vicinity. That the locality is well fitted for them is shown by the great beauty of the specimens, which are highly polished, much rayed with dark green on a ground color varying from yellowish-olive to light green and to very dark brownish-olive. The shells are perfect except for a slight erosion of the beaks. The posterior ridge is high and fairly sharp. The angle at the junction of the posterior and ventral margins is prominent.

Other naiads found at the same station were *Lampsilis cariosa* (9), *Strophitus edentulus undulatus* (1), *Symphynota viridis* (1 dead), *Alasmidonta undulata* (2), *Margaritana marginata* (6), *Unio complanatus* (many), *Unio productus* (many).

Until the present time *Unio productus* and *Unio fisherianus* have been the only naiads in this vicinity which have offered any great difficulty in identification. They are not yet well understood. Further study may show that they belong to the same species or, on the other hand, it may bring to light characters which will more surely differentiate them. *Lampsilis cariosa* and *L. ochracea* have been confusing to some students. Simpson[1] has pointed out the differences between them. To me very rarely have they offered any difficulty. The coming of *cohongoronta* into this neighborhood may probably lead to problems in future times. With passing time this shell, in accommodating itself to new surroundings, may be modified in form and color, and these modifications may trend in the direction of *cariosa*, making it difficult to distinguish between the two species. Whence *cariosa* came and how and why it came we have no positive knowledge, but it has been here since prehistoric times and its make-up must be well established and best suited to its environment. We hardly may expect any great change in this species. *Cohongoronta* is a new arrival. It may find conditions here approximately like those in its an-

[1] Nautilus, VIII, pp. 121-123, 1895. Both species are figured, but the legends beneath the figures should be transposed.

cestral home, but it is more probable that it will find some conditions different. Environment will not make a change to suit the mollusk and hence if its residence is not to its liking the naiad will have to adapt itself to the residence or else retire from the field.

Then, too, there is a possibility that the two species will hybridize and produce one or more other forms or races. Hybridizing might wipe out either *cariosa* or *cohongoronta*, or it might wipe out both of them, replacing them by a race of mixed blood. Bearing a resemblance to each other close enough to suggest a common ancestry or a converging development and living now side by side in the same spot, it seems to the writer that a crossing of the two species will be not only possible but highly probable. Indeed, one of the specimens of *cohongoronta* collected in that spot may be a hybrid. Its anterior portion has the glossy, peculiar straw-colored periostracum of *cariosa*, while the other features of the shell are distinctly those of *cohongoronta*. It will be interesting and profitable to note the future history of the two species in this vicinity, especially as the specimens of *cohongoronta* in the U. S. National Museum (Cat. Nos. 219057 and 219058) will show the characters of the shell at the time of its first arrival and form a basis of comparison with the shells of future generations. The specimens of *cariosa* collected at the same time and place form catalogue number 219059.

THE STATUS OF LOBOA BRUNOI VON IHERING.

BY PAUL BARTSCH.

In the "Nautilus" for February, 1917, vol. 30, on pl. 4, fig. 7, and in the number for March, 1917, pp. 121-122, Dr. H. von Ihering describes a new genus and species of landshell from the Island of Trinidad, as *Loboa brunoi*.

During a recent visit to Washington, Dr. Carlos Moreira, of Brazil, submitted a shell to me for determination. This specimen, which is in a subfossil state, also came from the Island of Trinidad, off the coast of Brazil, in approximately latitude 21° S., longitude 29° W. Comparing it with the description published by Dr. von Ihering, I feel certain that it is the species described by him. In fact, I am not altogether sure but what this may be the same specimen described by Dr. von Ihering.

Unfortunately, the figure cited above is a mere outline figure, and rather poor at that, so much so in fact that one would not recognize the present shell were its status dependent upon the figure alone, but the description is positive. The rareness and isolated distribution of this species justifies rediagnosis and a good photographic figure, which are here presented. The shell will have to be known as *Bulimulus* (*Protoglyptus*) *brunoi* von Ihering (Plate IV, fig. 7).

Shell very elongate-ovate, dingy white. The nepionic portion consists of not quite one turn, which is well rounded, and marked by slender, slightly protractively slanting axial riblets. The succeeding turns are well rounded, appressed at the summit, and separated by a somewhat constricted suture. They are marked by almost rib-like, decidedly retractively curved incremental elements and slender spiral lirations, the junctions of which form feeble tubercles. Base somewhat prolonged, moderately rounded, very narrowly perforated, marked by the continuation of the rib-like elements and spiral lirations, both of which agree in strength with those on the spire, but becoming more crowded on the anterior portion of the base. Aperture oval; posterior angle acute (outer lip fractured at the edge); inner lip slightly sinuous and narrowly reflected; parietal wall covered by a moderately thick callus.

The specimen, which may be the type, belongs to the National Museum of Brazil. It has 7.3 whorls, and measures: altitude, 19.5 mm.; greater diameter, 8.3 mm.

HELIX AREOLATA.

BY C. R. ORCUTT.

The month of March, 1917, was spent by the writer almost entirely on Magdalena Island, Baja California, Mexico. One day was spent on Santa Margarita Island, separated from Magdalena Island by a channel about ten miles wide, which serves as the main entranee to Magdalena bay to-day, which can be entered, though by small boats, by the two other ehannels north and south whieh separate these islands from the peninsula. By dropping the "Santa," as is often done in conversation, we have "Margarita Island," so often mentioned in shell literature, whieh in turn lent its name to the bay which it helps to protect—henee "Margarita bay," where W. Harper Pease had collected for him seventy-four speeies of mollusks, as reported by Carpenter.

The industry in orehilla (*Roccella tinctoria*), for dye-stuff, that was developed about forty years ago, when, I am told, as mueh as a million dollars worth of this liehen was exported to Germany around the Horn in a single year, led to the present settlement on Magdalena Island. Mining for magnesite has now led to another settlement on Santa Margarita Island in recent years, though it seems probable that this settlement really antedated that on Magdalena Island.

Helix areolata was the only land shell reported by Carpenter from Margarita bay in the Pease colleetion. In vain I searehed for the Pupas, found so abundantly further north at San Quintin bay in 1886, on *Roccella tinctoria*, but I doubt not these may yet be found in the vieinity of the bay. on the peninsula if not on the islands, by some more persistent observer upon more thorough exploration of the bay shores. One specimen, not at hand, that may have been *Assiminea californica*, two dead specimens of *Pedipes* (probably *P. liratus*), and numerous living *Melampus olivaceus* were found.

Pilsbry is no doubt right in taking Magdalena bay as the type loeality for *Helix areolata* (see Proc. Phil. Acad. 1913, 391), but I would seleet Santa Margarita Island as probably the exact location.

I would select the same island as the type locality of *Helix pandorae*, credited by Dall to "Margarita Island," I believe, though Pilsbry selects the San Benito Islands, to the northwest of Cedros Island, instead.

Pilsbry selects San Bartolome bay, on the peninsula, as the type locality of *Helix levis*, but it seems to me that Santa Margarita Island could be selected with equal propriety, and this would give us these three "species" as from one "type locality." It can never be exactly known where these types were actually collected, so that any designation of a type locality must be more or less arbitrary.

My series of *Helix areolata* was all collected on Magdalena Island, in a space perhaps a mile square, extending from the ocean to the bay. The species was not confined to this area by any means, and probably occurs in equal abundance over the entire region around Magdalena bay. In places the ground is white with the dead shells, and millions may be found drifting in the adjacent sand hills on Magdalena Island.

The scant desert vegetation, such as agave, fouquiera, and other plants, often harbored considerable colonies of living snails. The shells on the bushes would often be found in the morning covered with sand, indicating that they burrow in the soil, probably climbing the plants for feeding purposes and some staying over time. All my specimens were obtained from the plants, however, and not by digging. I doubt not that every figure on Pilsbry's two plates (Proc. Phil. Acad. 1913, plants 15 and 16, figs. 1 to 52) could be matched by specimens living in the area of the square mile referred to.

Many specimens were a solid chalky white, with no trace of bands or color. Some have a strongly developed tooth; most of the individuals show no trace of one. Some specimens, old and mature, but usually rather small, were of a uniform pale olivaceous-brown color, without signs of bands or other color, that would answer well for Binney's figure of *Helix pandorae*. Some individuals were as elevated as *Helix veatchii* is figured as being, and other shells are nearly as depressed as *Helix Traskii*. Young individuals would answer for Pfeiffer's figures of *Helix decorata* or *H. levis*.

A colony of these snails, on leafy shrubs growing on sand hills near the ocean, supplied the smallest individuals. Snails on salicornia and other plants providing abundant shade furnished perhaps the largest number of solid white shells.

Midway between the ocean and the bay, on an exposed plateau, I found the largest number of highly-colored shells, many immature or just come to maturity, on leafless plants like fouquiera, where the variegated color was an excellent protection. It was very difficult to see these snails on the bushes, even near at hand, except as projecting knobs on the stems against a background of sky.

The usually chalky-white shell seems to have a chocolate-brown epidermis, which varies in intensity at different stages of its growth, often nearly or quite absent, thus producing the irregularly interrupted and very variable bands. This colored stratum is thin and can be worn away with a knife-blade without injury to the shell, and in age seems to naturally but irregularly wear away, producing as many designs as there are individuals.

I have collected thousands of specimens called *Helix levis* at San Quintin bay, at the Rosario mission some eighty miles southward, and on the peninsula east of Cedros Island, which seem to me to only differ from the Magdalena Island shells in size. All these localities are arid; rains occur at irregular periods, sometimes three years or more apart, but copious fogs from the sea nightly refresh the vegetation.

Pilsbry speaks of the known areas of *levis* and *areolata* as separated by a "long reach of coast whence no land snails are known." From Turtle bay (a portion of, and not synonymous with San Bartolome bay, as I am told) to Magdalena bay is an arid coast unexplored by naturalists, from the lack of water and landing places, mainly unknown because overland trails traverse this portion of the peninsula away from the sea. But there is no reason to doubt the presence of this snail in some form through the entire region from San Quintin bay to Cape San Lucas.

I presume that the older naturalists, like many modern naturalists, collected sparingly, but selected specimens showing the extreme variations. These were usually described by other naturalists, not the collectors, who based upon them as many species as they had individuals, through ignorance rather than intent. In conclusion, therefore, I would express agreement with the opinion of the late Dr. R. E. C. Stearns, who said (in N. Y. Acad. Ann., 2 : 136) that he regarded "*H. areolata*, *pandorae*, *veatchii* and *levis* as varieties of a single species." Pfeiffer's *H. decorata* may evidently be added to the long list of synonymy. Doubtless more than a hundred varietal names may consistently be given to the various insular and peninsular forms occurring between San Quintin bay and Cape San Lucas when the whole region is fully explored.

SOME PHILIPPINE SNAILS.

BY T. D. A. COCKERELL.

My friend and former student, Dr. Cipriana Subejano, returning from the Philippine Islands, kindly brought a number of living snails collected by Mr. Maximo Oro at Los Baños, Luzon. We have now had them alive for many weeks in glass bowls, feeding them on cabbage, lettuce and sliced apples. Some have died, but three of the immense *Rhysota ovum*, four *Cochlostyla metaformis* and one *C. rufogastra* still remain in good health. The following notes may be of interest; but I have not access to the large works of Semper, Hidalgo, etc., and do not know how far the observations are new.

Rhysota ovum Val.

When giving us the snails Miss Subejano stated that these emitted a cry at times, resembling that of a young child or small animal. For some time we wondered what she could have heard, but at length the snails favored us with several separate performances. The cry, a plaintive, high-pitched note, is produced as the snail contracts into the shell, and is due to the emission of air. It is very distinctive, but is only occasionally noticed. The habits of *R. ovum* are very different from those of the species of *Cochlostyla*. It appears to be nocturnal, and is very inactive. Never once has it been seen stretched at full length. The animal is a remarkable creature. The mantle is whitish, and the lung is extremely capacious, with a wide orifice. The foot above is white, with a large caudal mucus gland. Anterior three-fifths of sole pale brownish-grey, the posterior two-fifths dull white, contrasting. Head blackish; oculiferous tentacles blackish, stout basally, eye-bulb pale ochreous; lower tentacles white at end, with the bulb pale ochreous. The shell has a diameter of about 75 mm.

Cochlostyla rufogastra Less.

Kindly determined by Dr. Bartsch, who states that it belongs to the typical subspecies. In both the species of *Cochlostyla* the foot is emarginate anteriorly, but in other respects the animals of the two present marked differences. *C. rufogastra* has the mantle black; and the very broad sole plumbeous in the middle, with the lateral areas (not so wide as the middle one) black; the extreme edge of the sole is narrowly reddish. The body above and on the sides is reddish-brown, with the conspicuous rugæ darker; the dorsum is strongly blackened. The eye-bearing tentacles are very long. A couple of these snails mated, and later one laid a great quantity of eggs, which, however, did not develop. The eggs are spherical, soft, opaque white, with a diameter of 7 mm.

Cochlostyla metaformis Fér.

A much smaller species than the last, with a pale-colored shell. There are two varieties, one banded, the other bandless; the soft parts are the same in both. The species was identified by comparison with a specimen determined by Dr. Bartsch. The oculiferous tentacles are very long, 24 mm.; head rather elongated, lower tentacles about 5 mm. from base of eye-bearing ones. Body anteriorly pale greyish-brown, tentacles reddish; posteriorly the body is pale grey dorsally, the sides of the foot washed with ochreous; mantle light reddish ochreous. The sole is light ochreous, without longitudinal zones differentiated by color, but the margin is suffusedly a little darker. Both species of *Cochlostyla* are quite active by daylight.

THE NOMENCLATURE AND SYSTEMATIC POSITIONS OF SOME NORTH AMERICAN FOSSIL AND RECENT MOLLUSKS.

BY JUNIUS HENDERSON.

Pholadomya undata Meek and Hayden (Proc. Acad. Nat. Sci., Phila., VIII, 1856, p. 81), now generally known as *Liopistha* (*Cymella*) *undata*, Cretaceous, Rocky Monntain region, is preoccupied by *P. undata* Dana (Wilkes U. S. Expl. Exped., X, 1849, p. 687, Atlas, Pl. 2, figs. 11, 11 a, 11 b), Carboniferous, Australia. It is unfortunate to have to abandon Meek and Hayden's name for the well-known American species, but the rules of nomenclature require it, so I propose the name *Liopistha* (*Cymella*) *montanensis*, in reference to both the type locality and the geological group from which it was described.

Anodonta parallela White, was described from the Cretaceous of Colorado in 1878 (Hayden Survey, IV, p. 709). Binney used the same name in his Bibliography of North American Conchology, Pt. I, 1863, p. 46, citing Ferussac, "Hyde, in litt." As neither Ferussac nor Binney, so far as I know, ever published any description to accompany that name, White's name will stand.

Unio rectoides White, Tertiary, Utah (U. S. Geol. Surv., Bull. 34, 1886, pp. 11, 15, 21), is preoccupied by *U. rectoides* Whitfield, "Cretaceous," New Jersey (U. S. Geol. Surv., Monog., Vol. 9, 1885, pp. 250, 258). As Pilsbry and others have shown, Whitfield's *rectoides* is itself a synonym of *Lampsilis recta* (Lam.), and is from Quaternary deposits, instead of Cretaceous. Under the circumstances it seems too bad to abandon White's name, but the rules adopted in the interest of ultimate stability of nomenclature require it. I propose for it the name *Unio whitei*. It should likely be removed to some other genus.

Unio browni Whitfield, Cretaceous, Montana (Bull. Am. Mus. Nat. Hist., XIX, 1903, p. 485), is preoccupied by *U. brownii* Lea, recent, Asia (Proc. Acad. Nat. Sci., VIII, 1856, p. 95), so Pilsbry renamed it *Parreysia barnumi* (NAUTILUS, XVIII, 1904, p. 12), a fact that seems to have been overlooked by subsequent writers, which is likely to be the case where new names are proposed in brief notices of publications in reviews. Even if Conrad's Africo-Asiatic genus *Parreysia* is to be considered valid, the reference to it of Whitfield's species seems to me incorrect. In the present unsettled condition of the classification and nomenclature of recent Unionidæ, it is doubtful whether any good purpose is served by removing the fossil forms from the genus *Unio*, though perhaps few, if any, would be placed there if we had sufficient knowledge of the family, and had the anatomy and perfect shells with which to work.

Melania (*Goniobasis?*) *sculptilis* Meek, Tertiary, Hot Springs Mts., "Idaho" [Nevada] (Proc. Acad. Nat. Sci., Phila., XXII, 1870, p. 58), is preoccupied by *Melania sculptilis* Lea, recent, Tennessee (Transac. Philos. Soc., X, 1853, p. 297; Tryon, L. & F.-W. Shells, Pt. 1, 1873, p. 297), so Meek's name must be abandoned, but I refrain from renaming it until further investigation, for the following reasons: Meek himself later expressed a doubt as to whether *sculptilis* and *subsculptilis*, from the same locality and position, are distinct, and also suggested that it is not distinct from *M. taylori* Gabb. Furthermore, Dr. T. W. Stanton informs me that on Meek's separate copy of his paper in which *sculptilis* and *subsculptilis* are described is the following penciled note in Meek' s handwriting: "Prob. the same named *M. decurata* Con. Am. Jour. Conch. 6, p. 200, Ap. 1871, and both are prob. synonyms of a species descr. by Gabb in Cal. Report." The reference to Conrad's *decurata* probably means *decursa*, which is said to have come from Colorado. The figure does not look like any of the species mentioned. Gabb's species to which he refers is *M. taylori* (Paleont. Cali., II, 1869, p. 13, Pl. 2, fig. 21), the figure of which is much more slender than Meek's figures, but perhaps because drawn from a more mature specimen, as Meek suggests. If Meek's *M. sculptilis* is the same as any or all of the other three, then no new name is needed. I believe it is identical with *subsculptilis*.

Melania convexa var. *impressa* Meek and Hayden, "Tertiary" [Cretaceous], Montana (Proc. Acad. Nat. Sci., Phila., IX, 1857, p. 138), is preoccupied by *Melania impressa* Lea (Proc. Philos. Soc., II, 1841, p. 83; Transac., IX, p. 19; Obs., IV, p. 19). Hence Meek and Hayden's name must be abandoned, but as their *impressa* is probably not sufficiently distinct irom their *convexa* to deserve a name, I propose the use of that name *convexa*, and do not rename it. Probably all should be referred to *Goniobasis*, as is usually done.

Cerithium tenerum Hall was described from the western Tertiary in 1845 (Fremont's Expl. Exped., Ore. & Cali., p. 308, Pl. 3, fig. 6), and was transferred to *Goniobasis* by Meek in 1870. Meantime, *Melania tenera* Anthony, was published by Reeve in 1861 (Monog. *Melania*, sp. 407), and was transferred to *Goniobasis* by Tryon in 1872 (L. & F.-W. Shells, Pt. 1, p. 264). This gives Hall's species priority, and Anthony's should be renamed unless it has already been renamed or is considered a synonym of something else. A revision of the group including *G. tenera* Anth., based upon adequate material, is desirable.

Melania multistriata Meek and Hayden, now known as *Campeloma multistriata*, was described in 1856 from the Fort Union Tertiary (Proc. Acad. Nat. Sci., Phila., VIII, 1856, p. 124). Wheatley used the same name in 1845, attributing it to Lea (Cat. of Shells of U. S., p. 147). His catalogue was a list, without descriptions, and I do not find that Lea or anyone else ever used that specific name in either *Melania* or *Campeloma*. Hence Meek and Hayden's name should stand. Dr. Pilsbry writes that he finds no specimens bearing such a name in Wheatley's collection in the Academy of Natural Sciences at Philadelphia. Dr. Bryant Walker, in a letter just received, says: "Neither Wheatley nor Lea ever described a species as *Melania multistriata*. The use of that name by both of them seems to be owing to a *lapsus calami* of Lea, who in his remarks on his *M. buddii* compared it with 'the striate variety of Mr. Say's *virginica*, which he called *multistriata*.' Say's species was *M. multilineata*, and Tryon makes the correction on p. 295 of his monograph."

Paludina multilineata Meek and Hayden, Fort Union Tertiary, Fort Clarke, North Dakota, was described in 1856 (Proc. Acad. Nat. Sci., Phila., VIII, p. 120), and renamed by the same authors *Viviparus nebrascensis* (Proc. Acad. Nat. Sci., Phila., XII, 1860, p. 430), because they said *multilineata* was preoccupied in *Paludina* by Say, 1829. Later, after the Meek and

Hayden species had been removed to *Campeloma*, Meek restored the first name, calling it *Campeloma multilineata*, in accordance with his custom, a practice forbidden by modern rules of nomenclature. Since then, everyone has followed Meek. A difficult question as to what constitutes a description is involved, but I believe the second specific name should be used and that the name should be written *Campeloma nebrascensis* (Meek and Hayden). Say's *Paludina multilineata*, now placed in *Viviparus*, was described after a fashion by indicating the species to which he referred. He says: "I described it nearly four years since under the name *multilineata* [evidently in unpublished manuscript]; but recently, being about to publish it, on a more attentive examination and comparison with a specimen of the *elongata* from Calcutta, I have concluded that it varies from that specimen only in having the umbilicus a little smaller." Tryon, after quoting this, says: "I have compared the original specimen with shells from Calcutta, and find that it differs as little from them, as they do from each other. It is smaller than the foreign specimens, but I think a larger native shell was mislaid, or placed accidentally among the foreign ones, in the same collection; so that, rather than commit an error, I have chosen the reputed American example for my illustration. If this is not the *bengelensis* of Lamarck, it must have the name given to it by Say; that of Swainson [*elongata*] having been previously given to a fossil species." It is plain then, that the name *multilineata* was definitely applied to the Florida species by both Say and Tryon, provided it proved distinct from the Asiatic species, which it probably is, and the designation was accompanied by a figure of the Florida species and a brief description by comparison with the Asiatic species. All this appears to me to preclude the use of the name *multilineata* for Meek and Hayden's species.

Helix occidentalis Meek and Hayden, Judith River, Cretaceous, Montana, is another instance of the same kind. The name was changed by Meek to *nebrascensis*, because *occidentalis* was preoccupied in *Helix* by Recluz. Then Meek, in removing the Cretaceous species to *Hyalina*, restored the original name, in accordance with his custom, but contrary to present usage. From the figures it is impossible to definitely ascertain to what genus either this species or *H. evansi* M. & H., from the same locality and formation, belong, but whatever the genus, the name *occidentalis* should not be used. As to *H. evansi*, which is based upon poor and probably immature material, we agree with Dr. Pilsbry, who writes: "It is better to leave uncertain shells of this kind in '*Helix*,' as uncertain generic reference may lead some one to baseless deductions. Paleontology is full of the most reckless generic references." He also calls attention to the fact that *H. occidentalis* Recluz, is now considered a *Hygromia*, ranking as a variety, but that does not restore Meek and Hayden's first name for their species.

Planorbis vetulus Meek and Hayden, was described from the Tertiary of South Dakota in 1860 (Proc. Acad. Nat. Sci., Phila., XII, pp. 175, 431). In 1864 (Smithsonian Check-list of Invertebrate Fossils of North America—Miocene, p. 13) Meek called it *P. vetustus*, since which time the latter name has been almost universally used, though no reason was given for the change. The change was likely inadvertent, though possibly deliberate, as authors in those days did not always hesitate about changing names to suit their own notions. Unless *vetulus* is preoccupied, of which I have found no evidence, it must stand as the name for this species.

A somewhat similar case is that of *Campeloma vetula* Meek and Hayden, which was first described as *Paludina vetula*, and afterwards cited by the same authors as *P. vetusta* and changed to *Vivipara vetusta*, but fortunately in that case the original name has been used by most subsequent authors, though White (U. S. Geol. Surv., Bull. 128, p. 77) made the curious mistake of supposing that *V. vetusta* and *C. vetula* are distinct species.

Limnæa tenuicosta Meek and Hayden, Eocene, near Fort Union, N. D., was described in 1856 (Proc. Acad. Nat. Sci., Phila., VIII, p. 119). In 1860 the same authors (Proc. Acad. Nat. Sci., Phila., XII, p. 431) cited the original description but spelled the name *tenuicostata*, without offering any reason, and the majority of subsequent writers have used the latter name, instead of the former.

NOTES ON THE MOLLUSCA OF FORRESTER ISLAND, ALASKA.

BY GEORGE WILLETT.

During the past four months (1914 to 1917 inclusive), which were spent by the writer on Forrester Island, Alaska, some attention was given to the study of the mollusca of the locality. The shore line was rather thoroughly traversed and some dredging was done in various depths down to seventy-five fathoms.

Forrester Island lies well out to sea, a few miles north of the Canadian boundary line. It is about fifteen miles west of Dall Island, and seventy-five miles out from the mainland shore. The island is small, being approximately five miles in length and from a half mile to a mile and a half in width. It is very rocky along shore but is well timbered from the high-water line to the summits of the hills. There are a number of small islets and groups of rocks lying off the main island and practically all of these were visited one or more times.

As Forrester Island is well within the sweep of the Japan current, the water is much warmer than in the inside channels around Dall and Prince of Wales islands. The effect of this difference in temperature is shown in the fact that several species of shells that occur in 10–15 fathoms in inside waters were not found in less than 40–50 fathoms at Forrester Island. Also a number of species that were rather common on Dall and Prince of Wales islands were not noted on Forrester Island at all. As there are neither sand beaches nor mud flats on the island. many forms requiring such situations were conspicuously absent. The tidal currents in the vicinity are very strong at times, and it is quite possible that some species of which fragments or dead shells were found do not properly belong to the island fauna but were carried to the locality by the strong currents. One of the most interesting features of this region from a conchological standpoint is the fact that in many instances it seems to be a meeting point between boreal species and those from the southern fauna.

A number of species taken have since been described as new. In such cases I have mentioned the paper in which the description was given. The chitons obtained were made the subject of a paper by Dr. S. S. Berry in the Proceedings of the California Academy of Sciences (Fourth Series, Vol. VII, No. 10, September 1, 1917, pp. 229–248). All species of which I was doubtful as to identity were submitted to Dr. Wm. H. Dall and named by him. For this kind assistance I wish to express here my very great appreciation.

The following is a list of species of bivalves taken with brief notes on same:

Terebratulina caput-serpentis Linn. Several young specimens dredged in 50–60 fathoms.

Terebratalia transversa Sby. Common 5–30 fathoms.

Laqueus jeffreysi Dall. Abundant in 65–75 fathoms.

Nucula tenuis Mont. Rare. One or two dead valves and one living young specimen dredged.

Nucula (*Acila*) *castrensis* Hds. Common 40–50 fathoms. At Waterfall, Prince of Wales Island, plentiful in 10 fathoms.

Leda minuta Fabr. Fairly common 20–40 fathoms.

Leda penderi Dall. One dead valve dredged. Rather common at Waterfall in 10 fathoms.

Leda fossa Baird. A few dead valves dredged in 75 fathoms.

Glycymeris septentrionalis Midd. Rather uncommon.

Glycymeris corteziana Dall. Abundant 20–40 fathoms.

Glycymeris migueliana Dall. Fairly common 20–40 fathoms.

Philobrya setosa Cpr. Fairly common.

Pecten (*Chlamys*) *hericeus* Gld. Found occasionally.

Pecten (*Chlamys*) *hindsi* Cpr. Abundant from low-tide line to 60 fathoms.

Pecten (*Chlamys*) *islandicus* Mull. A few specimens taken in dredge with last species.

Pecten (*Chlamys*) *caurinus* Gld. Single dead valve dredged.

Pecten (*Pseudamusium*) *randolphi* Dall. Two young specimens dredged in 50 fathoms.

Pecten (*Propeamusium*) *alaskense* Dall. Fairly common in 50–60 fathoms.

Hinnites giganteus Gray. Rather common. More abundant in inside channels.

Lima (*Limatula*) *subauriculata* Mont. Dead valves common 25–50 fathoms. Living specimens rarely taken.

Monia macroschisma Desh. Rather common.

Mytilus californianus Conr. Abundant. Some specimens attaining a length of nine or ten inches.

Modiolus modiolus Linn. Occasional. Abundant in inside waters.

Musculus niger Gray. *Musculus seminudus* Dall. A few specimens of each of these species were taken in about 30 fathoms.

Musculus laevigatus Gray. One or two dead valves dredged.

Musculus vernicosus Midd. Common at times in sea weed at extreme low tide mark.

Thracia curta. One dead valve dredged. Rather common at Waterfall in 12 fathoms.

Thracia challisiana Dall. A few dead specimens taken in 30–40 fathoms. Living specimens were probably all too deep in gravel to be secured by the dredge.

Pandora (*Kennerlyia*) *forresterensis* Willett. (NAUTILUS, xxxi. 1918, p. 134.) Abundant in 60–70 fathoms; less plentiful in more shallow water.

Pandora (*Kennerlyia*) *bilirata* Conr. Common 25–50 fathoms.

Lyonsia (*Entodesma*) *saxicola* Baird. Dredged rarely. Rather plentiful in inside waters.

Lyonsia (*Entodesma*) *inflata* Conr. One living specimen dredged in 50 fathoms.

Lyonsia striata Mont. Occasional 30–60 fathoms.

Mytilimeria nuttalli Conr. Fairly common.

Cuspidaria planetica Dall. Not rare 50–60 fathoms.

Astarte compacta Cpr. Abundant 25–60 fathoms.

Astarte willetti Dall. (NAUTILUS, xxxi, July, 1917, p. 10.) Abundant with the last species. Adults mostly found in the deeper water.

Astarte alaskensis Dall. Abundant in company with the last two. *A. esquimaulti* Baird, was found to occur plentifully in 10 fathoms at Waterfall, but was not noted at Forrester Island.

Venericardia crebricostata Krause. Rather common 20–50 fathoms.

Venericardia (*Miodontiscus*) *prolongata* Cpr. Rather common with the last.

Thyasira trisinuata polygona Jeff. A few valves dredged in 50–60 fathoms. Also taken at north end of Dall Island.

Diplodonta orbella Gld. Rather common. Much less globose than California specimens.

Phacoides (*Lucinoma*) *annulatus* Rve. A few specimens dredged in 40–60 fathoms.

Phacoides (*Parvilucina*) *tenuisculptus* Cpr. Fairly common 25–50 fathoms.

Kellia laperousii Desh. Abundant in dead shells of *Marcia kennerlyi*.

Rochefortia tumida Cpr. A few valves dredged.

Cardium (*Cerastoderma*) *californiense* Desh. Abundant 10–40 fathoms.

Protocardia centifilosa richardsoni Whiteaves. Common 50–60 fathoms.

Saxidomus giganteus Desh. Dead valves found occasionally. Abundant in inside waters.

Marcia kennerlyi (Cpr.) Rve. Abundant 20–40 fathoms.

Marcia subdiaphana Cpr. Rather common 50-60 fathoms.

Paphia (*Protothaca*) *staminea* Conr. Occasional in gravel between boulders. Very abundant in inside waters.

Psephidea ovalis Dall. Common 15–40 fathoms.

Tellina (*Oudardia*) *buttoni* Dall. Rather common in 50 fathoms.

Tellina (*Angulus*) *carpenteri* Dall. Fairly common with last.

Tellina (*Moerella*) *salmonea* Cpr. One pair of dead valves dredged in 40 fathoms.

Macoma calcarea Gmel. A few immature specimens dredged in 50–60 fathoms.

Semele rubropicta Dall. Occasional 25–40 fathoms.

Psammobia (*Gobraeus*) *californica* Conr. Rather common.

Siliqua patula Dixon. One dead young specimen dredged. Common in inside waters.

Spisula (*Hemimactra*) *polynyma alaskana* Dall. Dead valves found occasionally. Common in mud flats on inside waters.

Mya truncata Linn. Fairly common.

Panope generosa Gld. Single valves dredged occasionally.

Panomya arctica Lam. A few specimens taken in 50–60 fathoms.

Panomya ampla Dall. Several dredged in 25–50 fathoms.

Saxicava arctica Linn. Common. Many living specimens found in dead shells of *Marcia kennerlyi*.

Saxicava pholadis Linn. Less plentiful than the last.

PUPLICATIONS RECEIVED.

A Check-list of the Marine Fauna of New South Wales, Part I, Mollusca. By Charles Hedley. (Suppl. Jour. Royal Soc. N. S. W., Vol. 51, 120 pp., 1917. Issued June, 1918.) A very useful and interesting paper. The list by T. Whitelegge, of Port Jackson invertebrata, published in 1889, contained 802 marine mollusca. The present catalogue contains over 1200 species. The list has been purified notably by eliminating a block of Atlantic species included by mistake in the Challenger series of 410 fathoms off Sydney. The author estimates that future research will recognize 2000 species from the waters of this State. The nomenclature is up to date and one notes many changes, and in the position of certain families some surprises. The following new genera are proposed: *Attenuata*, *Austrodrilla*, *Epideira*, *Etrema*, *Exomilus*, *Guraleus*, *Inquisitor*, *Hemidaphne*, *Macteola*, *Nepotilla*, *Provexillum* and *Scabrella*.—C. W. J.

Mollusca. By Charles Hedley. (Reprint from the Proc. Royal Geog. Soc. Australasia. S. Australian Branch, Session 1916–17, 21 pp., 1 pl., 1918.) A report on some mollusca collected in Western Australia by Dr. H. Basedow, adding about sixty species to the fauna of that State. The new species described and figured are: *Tellina piratica*, *Eucithara basedowi*, and an interesting fresh-water shell *Bulimus sisurnius*.

Report on the Cephalopoda Obtained by the F. I. S. "Endeavour" in the Great Australian Bight and Other Southern Australian Localities. By S. Stillman Berry. (Biol. Results of the Fishing Experiments carried on by the F. I. S. "Endeavour," 1909–14. Commonwealth of Australia, Dept. of Trade and Customs, Fisheries, Vol. IV, pt. 5, pp.

203–298, pls. 59–88, 1918.) A valuable contribution to our knowledge of the Cephalopods of that region. The material studied consisted of 104 specimens, representing 9 genera and 13 species. On the whole the material was in good condition, but the author can find little to commend the use of formalin in preserving Cephalopods, unless it be for some of the more delicate and transparent pelagic forms. Nine new species are described and figured and two new subgeneric names are proposed—*Austrossia*, a subgenus of *Rossia*, type *R. australis*, and *Teuthidiscus*, a subgenus of *Opisthoteuthis*, type *O. pluto*. The illustrations based on the preserved specimens themselves, which are apparently much contracted and distorted, often fail to convey as clear an idea of the animal in life as a good drawing.—C. W. J.

Fresh-water Biology. By Henry Baldwin Ward, Ph. D., and George Chandler Whipple, with the collaboration of a staff of specialists. Pp. viii + 1111. New York: John Wiley and Sons Inc., 1918. This work treats of all groups of fresh-water plants and animals. In each group (except the Bacteria and fishes) there is a comprehensive outline of the system arranged in the form of a key, so that any form in hand may be run down to its genus or subgenus with the least labor. Typical species in each genus are described and in most cases figured. The figures, of which there are 1547, appear to be admirably selected, and as a rule are well engraved. The chapter on mollusks, by Dr. Bryant Walker (pp. 957–1020, 144 figs.), forms an excellent introduction to this group, as the clear definitions and abundant figures carry the classification to subgenera. As most of the figures represent the more common forms, a large number of the species most likely to be encountered can be determined. The well-illustrated synopsis of Unionid groups will be especially useful. There is no other publication giving an up-to-date and complete classification of our fresh-water mollusks, the data being scattered in many books and periodicals.

The chapter on Conditions of Existence, by Prof. Victor E. Shelford, will be of value to collectors of fresh-water shells for its clear though condensed exposition of modern methods of observation and study.

The typography of the volume is particularly agreeable. The work deserves and will doubtless have a wide circulation. —H. A. P.

NOTES.

Colorado Mollusk Notes.—The latest find in Colorado is a fine specimen of *Limax maximus* L., found out-of-doors by D. M. Andrews, the well-known botanist, in one of his nurseries at Boulder, under a board. As he has imported some plants from France, it is possible that it came from there.

Several years ago a few *Lymnæa auricularia* (L.) were reported from Colorado Springs. Lately G. B. Warner sent me about 200 dead shells of that species found by him on the shore of Dotson Reservoir near Fowler, which is in the same drainage basin as Colorado Springs.

Lymnæa hendersoni Baker, therefore known only from the type locality west of Fort Collins, has been found by Dr. M. M. Ellis in a small pool west of Louisville. Like the one at the type locality, the pool contains water during only a few months each year.—Junius Henderson.

Viviparus contectoides limi, new name for *V. c. compactus* Pils., Nautilus, Vol. 30, p. 42. Dr. Walker has kindly called my attention to the prior use of *compactus* in *Viviparus* (Kobelt, Syst. Conch. Cab., *Vivipara*, p. 113, 1906), and the name is accordingly changed.—H. A. Pilsbry.

Commandant Paul Dupuis, of the Belgian Army, and well known to malacologists for his useful papers upon the shells of the Belgian Congo, having been severely wounded, has been transferred to the garrison of Paris, where he is employing leisure time in zoological studies, particularly upon the chitons.

Gonave Island Shells.—The following species of land shells were collected by Dr. W. L. Abbott at La Mahotiere on the S. W. coast of Gonave Island, off the west coast of Hayti: *Pleurodonte semiaperta* v. Mart. (this is the same as *Helix gaskoini gonavensis* Crosse), *Cepolis loxodon* Pfr., *Urocoptis guigouana* Petit, *Gastrocopta pellucida* Pfr., *Chondropoma browniana* Weinld., *Alcadia gonavensis* Weinld., and *Trochatella brownia* Weinld.—E. G. Vanatta.

HENRY SUTER.

The well-known conchologist, Mr. Henry Suter, died at Christchurch, New Zealand, on July 30, 1918, at the advanced age of 77 years. He will be remembered best for his important work, the "Manual of New Zealand Mollusca," published in 1913.

Mr. Suter was a native of Zurich, Switzerland, and from his boyhood was an enthusiastic naturalist. He was educated as an analytical chemist and was engaged for several years in various commercial pursuits without much success. At last, to improve his prospects he emigrated with his family to New Zealand in 1887.

He commenced his colonial career by taking a farm in a rough bush district. When a middle-aged foreigner, accustomed to a town life, turns back-woodsman it is only in a novel that he ever succeeds. But when this last venture came to the inevitable end, Mr. Suter had fortunately attracted the attention of Capt. Hutton, who obtained scientific employment for him. Thereafter the remainder of his life was spent in the congenial work of zoology. He held no regular post, but was engaged in turn by various institutions to arrange collections, to make reports or as relieving officer.

So long did he continue in harness that he used finally to claim to be the oldest man in New Zealand earning, not drawing, government pay. His last occupation was the preparation of palaeontological bulletins for the geological survey.—Charles Hedley.

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NEW FORMS OF CAECUM IN NEW ENGLAND.

BY EDWARD S. MORSE.

A few years ago I collected from several scoops of sand from Easton's Beach, Newport, R. I., over two hundred specimens of Caecum. From the variety of forms discovered, not including the three New England species[1] which were more or less abundant, one might imagine that the Marquis de Folin had been wrecked off the coast of New England at this place and his collection of Caecidae had been washed ashore. In de Folin's monograph of the group he says that the species vary greatly among themselves. The same species may vary from a smooth to a ribbed surface, not only that but the three sub-genera established by Carpenter[2] under the names of Elephantulum, Anellum and Fartulum are not based on permanent characters.

A reference to Carpenter's monograph of Caecidae shows that he gave little value to his groupings, for he says "The groups described under Caecum can scarcely be regarded even as subgenera, so very gradually do they pass one into the other; but they are found convenient, to avoid the frequent repetition of characters, and to aid in the identification of species." He does not give a single illustration, which greatly diminishes the value of the monograph.

Bearing in mind this dictum of de Folin, one might believe that here is a distinct group of mollusks in which permanent

[1] *C. pulchellum*, Stimpson. *C. cooperii*, Smith. *C. johnsoni* Winkley.

[2] Proc. Zool. Soc. of London, 1858.

specific characters had not been established—nascent species, in fact. Marquis de Folin published a monograph of the family but I have never been able to refer to his memoir. So far as I can learn it is not to be found in any scientific library in the United States. Tryon in preparing his Manual of Conchology has been equally unfortunate. He was unable to obtain the memoir. Agents of the Philadelphia Academy of Sciences in Europe were specially instructed to obtain the work but without success.[1]

Tryon in his Manual presents two plates of figures of Caecum depicting thirty-nine species. I have compared my forms with these figures and under the names given have presented a few drawings of these forms which more or less resemble the figures as given by Tryon.

The family Caecidae consists for the most part of minute tubular shells from one to two millimeters in length. These shells are slightly curved backward. The earliest stage shows a closely coiled shell discoid in form ; after a few symmetrical whorls it abruptly straightens out into a tubular shape and as the shell grows the coiled nucleus is discarded, leaving a tubular shell which in many species is also discarded after the permanent shell begins to form. The end exposed after this separation is closed by a plug, or septum having a form which may be ungulate, mucronate or mammillate. The tubular shell may be smooth, longitudinally ribbed or transversely marked by encircling ribs, these annulations being more or less prominent and crowded. They vary in color from a light brown to a chalky white resembling a dead shell, though often preserving the operculum. When smooth the shell is often hyaline.

If one desires specimens of this interesting group he may usually find them in the sand which drops out of sponges kept in a druggists' box or drawer.

It must be understood that the following designations do not imply that I regard the forms as representing the species assigned to them. Doubtless some of them are different; but re-

[1] De Folin's work, "Les Fonds de la Mer," is now contained in the library of the Academy.

calling what de Folin and Carpenter say in regard to the extreme variability of what are supposed to be species, I judge it better not to encumber the synonymy by creating new names.

Caecum annulatum Brown. Pl. V, Fig. 1.

A single specimen in the collection resembles the figure given by Tryon. At first sight it suggests *pulchellum* but enlarges more rapidly towards the aperture. It differs also in having three or four large costae next to the margin or lip.

Caecum cooperii Smith. Pl. V, Fig. 2.

This species was discovered by Sanderson Smith in Gardiner's Bay at the end of Long Island in five fathoms. This is a very distinct form. From one specimen which was white and chalky and resembled a dead shell I obtained the operculum which was orbicular, thick, brown in color, concave with six sharp revolving ribs, sinistral in direction, indicating that the shell was dextral. In various references to the operculum of Caecidae no mention is made of the direction of the revolving striae.

Stimpson in his "Shells of New England" figures accurately the operculum of *Caecum pulchellum*, showing the sinistral spiral of the lines of growth, yet makes no reference to its significance. Even Carpenter in his monograph while describing a number of opercula of different species makes no mention of the direction of the striae. He describes the shape of the operculum, whether flat, convex or concave, whether thick or thin, the color, etc., but not a word is given as to whether the spiral lines are dextral or sinistral. In his examination he used a ¼in. obj. and the direction of the lines must have been very plain. With the lowest power of Zeiss the direction of the spiral was easily detected.

Caecum johnsoni Winkley. Pl. V, Fig. 3.

This was first discovered at Woods Hole. The drawing is made from a co-type in the collection of the Boston Society of Natural History. I am indebted to Mr. C. W. Johnson for the loan of it and for other kindnesses. The septum is subungulate and has transverse lines of growth. It resembles the figure in Tryon of *C. achirona* of de Folin.

Caecum auriculatum de Folin. Pl. V, Fig. 4.

A number of specimens in the collection resemble the figure of this species as given by Tryon. The shell is thin, white, hyaline, very narrow for its length, faintly enlarging toward the aperture. Near the aperture faint lines of growth are seen. The septum is distinctly hemispherical or mammillate.

Caecum clarkii Carpenter. Pl. V, Fig. 5.

A number of these glassy tubes were found identical in shape to *C. auriculatum* but only half the size. It cannot be an early deciduous stage because the diameter of the tube is much smaller. *C. clarkii* as figured by Tryon bears some resemblance to this form. It has the same hemispherical septum. The operculum is light corneous in color, flat with a central smooth area with a distinct knob in the centre; this area surrounded by minute lines of growth. The form approaches *C. cornubovis* of Carpenter.

Caecum nitidum Stimpson. Pl. V, Fig. 6.

This form of which a number of specimens were found is without question Stimpson's species described as a Florida shell.

Meioceras sp., Carpenter. Pl. V, Fig. 7.

Two specimens in the collection are identical with the figure given by Tryon. Its distribution is given from Florida to Rio de la Plata.

Stimpson described under the name of *pulchellum* the first Caecum discovered on the New England coast and gives an excellent figure of it in his "Shells of New England." The species was dredged in ten fathoms of water in New Bedford harbor. The other two species of New England Caecum were also found south of Cape Cod. By far the larger number of Caecum collected at Easton's Beach consisted of *C. pulchellum.* Miss M. W. Brooks also collected a number of Caecum at Narragansett Pier and most of these were *C. pulchellum.* The shell is light horn color and easily distinguished. The second deciduous stage of *pulchellum* was very common in the collection. The shell enlarges quite rapidly towards the aperture and is more sharply curved than in the adult. A few of the forms figured by Tryon suggest the second deciduous stage of other species.

In the foregoing attributions I am indebted to the two plates of Caecidae given in Tryon's Manual of Conchology, Vol. 8. I may remark that all the species referred to are Atlantic coast forms, the west coast of Europe, the east coast of the United States south of Cape Cod, Teneriffe, Florida, West Indies and Brazil.

Explanation of Plate V.

1. *Caecum annulatum*, Brown.
2. *Caecum cooperii*, Smith.
3. *Caecum johnsoni*, Winkley.
4. *Caecum auriculatum*, de Folin.
5. *Caecum clarkii*, Carpenter.
6. *Caecum nitidum*, Stimpson.
7. *Meioceras* sp., Carpenter.

A EUROPEAN MOLLUSK, HELCION PELLUCIDUM, NEVER BEFORE RECORDED IN AMERICA.

BY EDWARD S. MORSE.

In looking over the sand from Easton's Beach, Newport, containing Caecum, I discovered a minute specimen of the beautiful limpet *Helcion pellucidum* of Great Britain. It was not over a millimeter in length. I first detected it by the opalescent markings like iridescent glass. These markings appeared as four irregular-shaped areas near the anterior margin. In my paper on An Early Stage of Acmaea (Proc. B. S. N. H., Vol. 34, pp. 313–323), I became familiar with the protoconchs of *Acmaea testudinalis* and *A. alveus* and they do not even remotely resemble the young *pellucidum*. The shell is corneous, narrowing slightly behind. Without the metallic markings it would have suggested *Helcion pellucidum*, but with these iridescent spots it was unmistakable. So far as I know this species has never been found on this side of the Atlantic. Miss M. W. Brooks discovered another European species, *Homalogyra atomus* at Newport and Narragansett Pier.

In the American Journal of Science, Vol. 20, 1880, Verrill in a brief note records finding in the docks at Newport a European species never before recorded as American, *Truncatella truncatula*.

With the tremendous traffic going on for nearly two years in the conveyance of troops and provisions we may confidently look for other introductions of European species.

PRATICOLELLA CAMPI, SP. NOV. (PLATE VI, FIGS. 1 TO 4.)

BY GEO. H. CLAPP AND JAS. H. FERRISS.

Shell narrowly umbilicated, globose, shining, opaque white with translucent corneous bands, usually one just above the periphery, one just below and numerous bands down to the umbilicus, or the shell may be all opaque or all translucent below the periphery. Whorls 4 with well impressed suture, body whorl rounded, periphery high some shells showing a slight angularity at the periphery. Aperture lunate-rounded, slightly oblique, somewhat dilated above, lip thickened within and widely dilated at the columellar insertion; there is a distinct, though thin, callous deposit connecting the ends of the lip.

Diameter 6, altitude 4 mm. There is a slight variation in size but above is about the average. Animal not observed.

Type locality, Fort Brown, Brownsville, Texas. "In sandy soil from 1 to 6 inches below the surface, at the foot of the brick piers" (J. H. F.). It was also found in the "axils of banana plants" and in the soil on the eastern side of the parade ground, in both instances with a number of other snails. Collected by Jas. H. Ferriss and R. D. Camp in midwinter, 1913–1914. Camp reports, Nov., 1918, that "the old building where we found it has been removed and the parade ground torn up by changes for the war."

We take pleasure in naming this species after Mr. R. D. Camp who, for several years, has been collecting in the Brownsville region.

Mr. Ferriss noticed this form when first collected and insisted that it was not the young of either *P. berlandieriana* or *griseola* which were found with it; there was too much evidence of maturity and its subsequent detection in drift from the Rio Grande confirms this opinion.

It differs from the young of the other species in being more solid and less translucent, and by the *constantly thickened and dilated lip and the presence of the callous deposit.* The umbilicus is also wider, being nearly double the diameter of that of the young shells. The aperture is wider and more rounded, that of the young of the above-named species being distinctly sub-angular at the base. As a rule the spire of the young shells is more prominent and the suture deeper, the young shells are also *distinctly angular at the periphery.*

Figs. 1, 2, 3, 4, *Praticolella campi* Clapp and Ferriss.

Figs. 5, 6, 7, *Praticolella griseola* (Pfr.) juv.

STYLOBATES, A WARNING.

BY WILLIAM HEALEY DALL.

Some fifteen years ago a colleague interested in crustacea and whose habit it was to bring me the empty shells from which he had extracted hermit crabs, left on my desk a jar of alcohol containing half a dozen horny objects having the aspect of a large gastropod shell, flexible, yet keeping shape fairly well while moist. The specimens were of a brownish color with beautiful coppery or bronze reflections. Some were torn, but several retained their shape in a nearly perfect manner. Of the most perfect one, the drawings were made which illustrate this note (Plate VI, figs. 8, 9, 10). The specimens recall the large horny *Velutina* so common in Bering Sea, but of course being nearly three inches in greatest diameter are immensely larger. They were obtained in water between 220 and 436 fathoms deep between Oahu and Molokai islands of the Hawaiian group, by the U. S. Fish Commission steamer Albatross, in 1903.

The "shells" when collected contained each a hermit crab of large size and served as a pedestal for from one to three large Actinias.

After due consideration, and the exhibition to my colleagues in the Museum of these singular specimens, I described them as a new genus in the NAUTILUS.[1] Had there been any marked

[1] *Stylobates aeneus*, NAUTILUS. Vol. XVII, No. 6, pp. 61–2, October, 1903.

irregularity in the different specimens I should have been more cautious, but this was not the case in this instance. However, a year or two later another batch was received, and this time the "shells" were no two alike, and most of them with comparatively little resemblance to a normal shell.

The blunder was clear. These specimens were secretions from the bases of the Actinias, but how the first lot attained the regularity shown by the figures is still a mystery. The readers of this article must assess my culpability.

NENIA COOKI N. SP. (PLATE VII, FIGS. 11, 12, 13.)

BY H. A. PILSBRY.

The shell is thin, obesely fusiform, the diameter contained about 2½ times in the length, composed of six whorls, the first 1½ strongly convex. The first four whorls form a rapidly enlarging cone; the next whorl is much inflated; and the last whorl is large, somewhat flattened peripherally in its first half, then rapidly contracting, concave a short distance below the suture; the neck rounded and shortly descending, free in front. Surface mat, of a chamois tint, but darker on the antepenult, paler on the last whorl; covered with a very thin cuticle. The apex is entire, obtuse. First whorl smooth, the next having delicate striae; on the third whorl low, coarse wrinkles appear, and the following whorls have coarse sculpture of irregular, retractive wrinkles. On the neck they become sharper, more crowded, and less oblique to the growth lines. The aperture is but slightly longer than wide, rounded, ivory-yellow within. Peristome broadly expanded, faintly flesh-tinted within, with a narrowly reflexed white edge. The superior lamella is high, sinuous, continuous with the spiral lamella. The inferior lamella is strongly developed. Subcolumellar lamella is deeply immersed. The principal plica is lateral, running in to the middle of the dorsal side, where its inner end is closely contiguous to the upper end of the lunella. The lunella is crescentic, deeply curved, and wholly visible in the aperture (seen foreshortened in fig. 11).

Length 27.8 mm., diam. 11.5 mm.; aperture, length 9.7 mm., width 8.6 mm.

The clausilium is widest in the middle, tapering towards both ends. It is a little thickened at the distal end, and the main curvature is near the filament.

Type, Cat. No. 215084 U. S. Nat. Mus., from the Peruvian Andes, in the vicinity of San Miguel (6,000 ft.), Urubamba Valley, Province of Caxamarca, Peru, collected by Dr. O. F. Cook, and referred to the writer by Dr. Wm. H. Dall.

This species is strongly differentiated from all known Neniæ by its very obese figure and small number of whorls, none being deciduous. The sculpture allies it to such forms as *N. taczanowskii* (Lub.), which also agrees in the armature of the throat. The inflation of the penult and contraction of the last whorl give the shell an appearance of deformity. Dr. Paul Ehrmann has remarked of the genus *Nenia*[1] that Ecuador and northern Peru are its distribution center; the group here reaches its acme of differentiation, and is most numerous in species. The present species, of a shape hardly to be matched in the whole family Clausiliidæ, is a further illustration of the diversity of forms found in this focal region for Nenia.

MY JOURNEY TO THE BLUE AND WHITE MOUNTAINS, ARIZONA.

BY JAS. H. FERRISS.

At the close of a summer in the Catalina mountains, Frank Cole, the guide for tourists and bug hunters to the wilds, led me into the seventh heaven. Something over 200 miles northeast of Tucson, Mt. Thomas, also known as Sierra Blanca and Old Baldy, in this region of perfect delight, stands 13,496 feet above sea level, the highest in Arizona, and at that time unknown to conchology. Here was the chance at that mythical Oreohelix "big as a tea saucer."

[1] The late Dr. C. Boettger (1909) and most other recent authors on this group consider *Nenia* generically distinct from *Clausilia*. Its nearest affinity in the old world appears to be the Indo-Chinese genus *Garnieria*.

We left Tucson early in September, 1913, and the second night out camped at the Shaw goat ranch in the southern foothills of the Rincon group. Those hills seemed too naked and dry for our purpose and were left undisturbed. However, with more knowledge of the ways of the snail, passing that way again late in the winter of 1918, we dug into the Shaw ranch and filled two cans with Sonorellas (*S. hesterna*).

On the eastern side of the San Pedro river, John Lyon's mountain and the southern end of the Bonito range gave up only a couple of *Thysanophora hornii.* Snails have been reported in the Little Dragoons, only four miles from our trail, but were passed by. The White mountains were ahead and high. Physas and Succineas were abundant at the watering places for cattle, and box tortoises and rattlers plentiful in the desert.

The Graham mountains on the south bank of the Gila river, so high that there is yellow pine and quaking asp, plentiful enough for saw-mills, has Sonorella and Oreohelix. Camp was made in Stockton pass for a day, and a collection gathered at Mud Springs on the summit. However, between climbing and the descent made by moonlight, only a couple of hours could be given to the real work, and the collection was small. The *Sonorella* reminds one of the odorous species of the Santa Catalinas, and has been described as a new species, *S. grahamensis.* The deep forest on the north side of this range is promising. Safford, on the railway not over ten miles from the peak, with an easy ascent, would be a convenient base for an explorer.

From Solomonville to Coronado (on other branches of both river and railway) a toll road is graded more or less, between low hills of the Peloncillo range. Rock slides were plentiful, but at that time also seemed to be too naked and dry. Cnly one slide, six miles from Coronado, was disturbed, and this one had Sonorella (*S. delicata*) and one of the rare Price's rattlers. The snake was hustled into a Velvet Joe tobacco can with the snails, and all drowned in the Gila. Here I had another walk by moonlight in a strange country, but Cole had a hot supper ready. This Peloncillo range needs further investigation. It is about 130 miles in length, from Clifton to a point on the

Mexican border, and has been worked less than half a day. Daniels and I discovered *Sonorella hachitana peloncillensis* near Rodeo, New Mexico, in 1907, and F. H. Fowler found the same species in Doubtful Canyon, S.-W. New Mexico. Otherwise the shells of the range are unknown.

The wagon was stored at Clifton, a $30 saddle horse purchased, of course including saddle and bridle, and two pack mules hired. Here is a beautiful and prosperous city of about ten thousand people, out on the side of the world. The dwellings seem to hang on brackets from the cliffs. The smelters and business houses are huddled together in pockets along the San Franciso river wherever the castellated cliffs will permit.

There were some attractions for weary travelers and it was late in the day when our train got under headway. Before the packs were lashed the new mules had sung out symptoms of homesickness, and to hold them true to the trail the pack animals were tied together in a string, Cole leading, and leading fast. At a sharp turn in the trail the swing mule was swung upside down into a creek. A few groceries were dampened this time and a mule repacked. Then the mules were turned loose. Going up a steep hill a packhorse heavily loaded, carrying two guns on top of its pack, tipped over backwards, unhorsed Cole and came down the hill like a wheel on its spokes. A fat, shiny, blue-black stage driver, so joyful he was not attending to his business, ran his four-in-hand into our belongings, adding considerably to both annoyance and oratory.

A new and wide trail from Clifton to Metcalf, high up on the cliffs, ended in the blacksmith shop of the trail builders, forcing us down the hill upon the old trail along a railroad track with many tunnels. By that time it was dark in the open country, and not a time-table or a lantern in the outfit.

At Metcalf one of the new mules dashed through a group of celebrating miners and hid under an outside stairway. That intellectual animal would have missed a glorious trip had it not been for the assistance of those helpful miners.

With the mule tied in line again we ate a cold snack in the saddle and pushed on and on in search of a country level enough to tie up mules and spread blankets. At a late hour we compromised and camped anyhow. Beds were made in the trail. Before saying good-night a couple of heavily armed men came riding rapidly up the trail in search of a horse thief. We were questioned closely and our steeds inspected by flashlight. They did not find a chestnut horse, and we escaped.

Next a ranchman, we had heard helping the Metcalf Mexicans celebrate their independence day, came riding, roaring, questioning and horse inspecting. Easily satisfied or something, and without declaring intentions, he dropped his bridle reins on the ground and plumped into bed with Cole, hat, boots and pistol.

These adventures of an afternoon were all we had. In the morning light Cole recognized in the roaring midnight rider an old and generous acquaintance, and gave a monster breakfast in his honor. Every day after is a delightful memory—in snails, venison, bear meat, mountain trout, interesting people, magnificent forests, beautiful parks and newness botanically. Here was a paradise in gentian time, fringed and unfringed, with mountain asters and pentstemons.

From Clifton to the Double Circle ranch on Eagle creek it is a rough country, mostly forested and with sufficient rock slides for cover; but the snails do not like it. The trail here ran northwesterly for about 35 miles. Then directly north on Eagle creek to the south rim of the Blue mountains, 16 miles, except a short diversion eastward to get an easier climb.

Pupas and Vallonias were found near the Honeymoon U. S. ranger station, and a mile or two farther came in the Oreohelix, fifty miles from Clifton and fourteen days from Tucson. Here Cole found the bear. A party of Tucson friends in camp had been looking for it, so we split fifty-fifty, the rug going with the snail collection.

The rim of the Blue has a wall of broken granite. We found *Ashmunella mogollonensis* and a greyish form of *Oreohelix cooperi*. The latter is also found in the quaking asp and cork-bark fir groves of the vicinity, and upon the slopes of the White mountains. Our route lay northwesterly again across the K. P. *ciénaga*, down Corduroy and Fish creeks and across Black river to Reservation creek, the eastern boundary of the Apache nation, perhaps 20 miles. This is in Apache county.

Here were the mountain trout, the Colorado river Cut Throat (Salmo mykiss pleuriticus, Cope), a pound each; wild turkeys in flocks of one and two hundred, blue grouse, beaver, Abert's squirrel with its tufted ears, and a deep forest untouched by axe, fire or wind; and please do not complain if the shell collection is not as large as it ought to be. Upon this high plateau it was a continuous forest of the largest yellow pine, blue spruce, Douglas spruce, thickets of quaking asp 150 feet high, alder and cork-bark fir—(*Abies arizonica*, Merriam). There are wild peas and black gama grass, and cattle fatter than the average corn-fed herds.

The Black river, known as the Salt river farther down, is one of the beautiful streams of America. No dirty water or naked banks here, but a robust forest and a sodded turf. It takes a good part of an hour to climb to the plateau above. Well swept lawns with enough of the large pines for landscape beauty, and wide enough for the snail-hunter's camp and his horse feed, either on one or both sides of the stream, and Oreohelix from white to black, from high to low, in every rock pile.

Physas and Pisidiums were plentiful in Reservation creek and a few Oreohelix were in the rocks. The next twelve or fifteen miles north the country was higher, with prairie parks and a few lakes. Besides the few *Oreohelix cooperi* on the south slope of Mt. Thomas there was an abundance of the Vertigos, Pupillas and other small species. The trees were so close together here that the horses were left at the camp and we climbed the easy slope on foot. The dome-like summit of Thomas, with its stunted spruces, bogs and moss, had a few shells, and none were found alive.

The scenic effect was concealed by flurries of snow. At camp in the morning the snow was ankle-deep and still falling. It was cold. Our packing ropes were like rods of iron, and we moved. In an hour we rode into pleasant weather and the days after were perfect. On the return trip the Raspberry trail from the rim of the Blue mountain to the Blue river was taken, landing us at Cosper's ranch.

Down the Blue and San Francisco rivers Ashmunellas (*A. pilsbryana*), two new Sonorellas and Oreohelix were found in the slides investigated, but it was again a hurried journey. The next year with the assistance of L. E. Daniels the work was thorough.

Oct. 17th, a month and a half from Tucson, the collector, snails, snakes and ferns were on the train homeward bound, and Cole wending his way over the toll road Tucson-ward. Theodore, that splendid thirty-dollar horse, and also one of Cole's, ate too much of a dry, short, delicate, mischievous grass, and died at the end of the trip.

A NEW OPISTHOSIPHON FROM CUBA.

BY WILLIAM F. CLAPP.

Opisthosiphon berryi sp. nov. Plate VII, fig. 14.

Shell longitudinally, finely plicate, ochraceous buff, encircled with a broad chocolate-brown band on the periphery of the last whorl and on the lower half of the earlier whorls; slightly shining; decollated; suture deep, crenate; four or five spiral ridges appearing in the umbilical region; whorls (remaining) four, very convex; aperture vertical, circularly oval, peristome white, double; the inner, a brief continuation of the whorl; the outer, on the right side, smooth, slightly expanded, at the suture broadly expanded and excavated over the breathing tube, adnate to the penultimate whorl; columellar margin expanded horizontally above in a broad flange adnate to the penultimate whorl, a large lobe curving over and nearly covering the umbilical region, interrupted below by a broad sinus where the lip is abruptly reflexed and attached to the whorl, a smaller lobe expanded horizontally below. A minute breathing hole within the aperture near the posterior angle, connects with a tube, somewhat concealed in the expanded and excavated lip, which curving back to the suture, descends and ends in the narrow space between the ultimate and penultimate whorls. Numerous strong raised lamellae mostly originating on the inner lip but occasionally extending along the parietal lip, cover that portion of the tube visible within the lip. Operculum as in Opisthosiphon pupoides.

Length (type) 13.5 mm. *g.d.* 9 mm. *l.d.* 7.3 mm. *g.d. aperture* 4.7 mm. *l.d.* 4 mm.

Length (paratype) 14.5 mm. *g.d.* 9.7 mm. *l.d* 7.5 mm. *g.d. aperture* 5.5 mm. *l.d.* 4.3 mm.

Collected by Dr. S. S. Berry, March 1, 1814, at Cariji, Cerro de Tuabaquey, Prov. Camaguey, Cuba.

Type M. C. Z. No. 42005; Paratype, collection of Dr. S. S. Berry.

The chocolate-colored band is the most striking character of *Opisthosiphon berryi.* Compared with *O. pupoides* Mor. it has more convex whorls, more numerous and finer plicae, the outer lip is smooth, much less broadly expanded below and over the breathing tube is bent forward rather than being reflected back, as in *O. pupoides.* The columellar lip does not completely cover the umbilicus, as in *pupoides.* and its two lobes are much more widely separated. The operculum is very similar to *O. pupoides*, differing only in being slightly more oval. In the larger specimen very faint traces of fine chestnut-colored widely interrupted spiral bands may be seen on the upper half of each whorl, very similar in arrangement and color to those seen in *O. pupoides.* A young specimen shows the embryonic shell to consist of about 1½ smooth whorls, the brown band and longitudinal plicae beginning at about the second whorl, the plicae becoming gradually more numerous and the intervening spaces less wide.

I am indebted to Mr. Berry for the opportunity to examine this species. It is closely related to *Opisthosiphon pupoides* Morelet from the Isle of Pines. The similarity of the shell fauna of Camaguey, Santa Clara, and the Isle of Pines, has been noted by Mr. John B. Henderson (Naut., Vol. 27, p. 137; Naut., Vol. 29, p. 18). Mr. Henderson also calls attention to the confusion in the genera of the Cyclostomatidae.

The species described above belong to Opisthosiphon, Dall (Proc. Mal. Soc. Lond., 1905, p. 209). Shells which possess the operculum of a Rhytidopoma and in addition are provided with a tubular projection behind the outer lip belong here. Undoubtedly when all of the characters of the species placed in this group are known, it will be found to be a natural one, and yet it is true that the value for showing relationships, of accessory breathing apparatus among the land operculates, is to be questioned. The necessity for obtaining air when the aperture is tightly sealed with the operculum has apparently caused many genera not at all closely related to develop ingenious and occasionally somewhat similar breathing contrivances. Species of Pterocyclos, Spiraculum, Rhiostoma and Tomocyclos, while not closely related to our American land operculates have developed breathing apparatus similar to that of some of the American species. The American shells belonging to the Ericiidae, the genera of which are founded to a great extent on the characters of the operculum, show great variation in the apparatus through which air is introduced into the lumen of the whorl when the aperture is closed by the operculum. At least three types of accessory breathing apparatus may be seen.

First. With perforation connecting with visible external tube.

a. Operculum of Rhytidopoma.

1. Tube greatly prolonged, entering umbilicus.

Opisthosiphon rugulosum Pfr. Matanzas.

Opisthosiphon denegatum Poey. Isle of Pines.

2. Tube short, external opening towards and close to preceding whorl.

Opisthosiphon bahamense Sh. Bahamas.

3. Tube short, disappearing in the suture between the ultimate and penultimate whorl.

Opisthosiphon pupoides Mor. Isle of Pines.

4. Tube short, straight, not recurved.

Opisthosiphon sculptum Gundl. Cabo Cruz.

b. Operculum of Choanopoma.

1. Tube as in *Opisthosiphon pupoides* Mor.

Choanopoma uncinatum Arango. Sta. Clara, Cuba.

Second. With perforation opening directly into umbilical region or exterior of shell.

a. Operculum of Choanopoma.

Choanopoma blaini Gundl. Galalon, Cuba.

b. With operculum of Cistula.

Cistula limbifera Mke. Matanzas.

c. With operculum of Chondropoma.

Chondropoma egregium Gundl. Pinar del Rio, Cuba.

d. With operculum unknown.

Licina percrassa Wright. Pinar del Rio.

Third. With perforation not penetrating to exterior of whorl but connecting with an internal air space which is situated in the upper angle of the whorl and extends back from the aperture for a considerable distance. In some specimens it may be traced for over two whorls.

Rhytidopoma bilabiatum Orb. Pinar del Rio.

The first group has a restricted geographical distribution extending from the Bahamas through central Cuba to the Isle of Pines. *Choanopoma uncinatum* Arango while possessing the typical Opisthosiphon breathing tube has the very different operculum of a Choanopoma. It therefore cannot be included in Opisthosiphon, and until a careful study of the animal shows its true relationships may be retained as an aberrant Choanopoma.

The second group is confined to western Cuba and while containing species with very different opercula, and therefore a group of apparently no systematic value, is nevertheless interesting, in that it is confined almost entirely to Pinar del Rio, and entirely to western Cuba.

The third group, of which I have seen but one species, is of interest because of the fact that in this case the perforation and internal tube appear to be of no practical value; for, though one might be led to expect that at certain stages of growth, communication to the exterior might exist through the external sutural flanges, I have been unable to find any structural evidence of such connection.

It would appear from the above that if the breathing tube is to be considered of value as a generic character together with the operculum, as in the case of Opisthosiphon, *Choanopoma uncinatum* Arango would have to be placed in a new genus, the operculum being very different from that of Opisthosiphon; while the breathing tube, having been considered of sufficient importance to separate Opisthosiphon from Rhytidopoma, would also have the same consideration in separating *C. uncinatum* from Choanopoma.

It would also seem that if the breathing tube restricted for Opisthosiphon is of generic importance that the modified perforation seen in so many of the Ericiidae from western Cuba should also be considered of value generically. This would mean, providing that the operculum was still considered of generic value, the removal of species of Choanopoma, of Cistula and of a large number of Chondropoma to new genera.

This would merely be substituting chaos for confusion and, until the anatomy of many of the species has been carefully examined, it would seem better to merely call attention to the peculiarly restricted distribution of those species of the Ericiidae, which have made structural changes in the shell, probably, as Dr. Dall suggests (Proc. Mal. Soc. Lond., 1905, p. 309) to enable them to obtain air when the aperture is closed by the operculum.

SOME MARINE MOLLUSCA ABOUT NEW YORK CITY.

BY ARTHUR JACOT.

To aid any New-Yorkers interested in the shells of their vicinity, I am taking this opportunity of giving them the results of a few studies which were made during the past year in that region.

The coast of Staten Island from Fort Wadsworth to Great Kills was carefully gone over at low tide several times. Along this strip are three definite stations. The first (1) is an expanse of red sand flats (exposed only at low tide) at the mouth of the stream which drains the marshland between South and Midland Beaches. This is the only place where I found *Periploma leanum, Pandora gouldiana and Lyonsia hyalina*. Another station (2) opposite the Oakwood Heights station on the steam railroad to Tottenville, is a "sod-bank" formation, beautifully showing the encroachment of the sea on the land. The "banks" wherever submerged, are covered with *Modiolus plicatulus* among which and over which crawl *Littorina littorea* and *L. rudis*. The third station (3) is inside the isthmus which encloses the bay near the second station. Here there is an eel-grass bed which is exposed at low water.

The only species of note at Rockaway Beach (4) is *Astarte castanea* which can be picked up in front of or a little beyond the hospital to the west of the pleasure beach. Far Rockaway Beach (5) yielded the greatest number of species. This is especially due to the rift of fine shell material left by the receding tide at the angles of the bar which begins to the west of the "bathing beach."

The numbers in the following list correspond to the stations as designated above.

Pelecypoda.

Nucula proxima truncula Dall. A valve at 5.

Yoldia sp? Fragment at 5.

Arca campechiensis pexata Say. Generally distributed.

Arca transversa Say. Less common than preceding.

Ostrea virginica Gmelin. Generally distributed.

Pecten gibbus borealis Say. Most common at 4 and 5.

Anomia simplex d'Orbigny. Generally distributed.

Mytilus edulis Linnaeus. Generally distributed.

Mytilus edulis pellucidus Pennant. Not as common as on Conn. coast.

Modiolus demissus plicatulus (Lam.). Local. Abundant where found.

Periploma leanum (Conrad). Rare and only at 1.

Pandora gouldiana Dall. One valve at 1.

Lyonsia hyalina (Conrad). Only at 1.

Astarte castanea (Say). At 4, very small specimens at 5.

Venericardia borealis (Conrad). Only at 5.

Divaricella quadrisulcata (d'Orbigny). Occasional at 4 and 5.

Rochefortia planulata (Stimpson). Occasional at 5.

Aligena elevata (Stimpson). Not as common as preceding.

Cardium pinnulatum Conrad. One valve at 5.

Callocardia morrhuana (Linsley). At 1 and 5.

Venus mercenaria Linnaeus. Becoming less common.

Venus mercenaria notata Say. True form very rare.

Gemma gemma (Totten). Generally distributed.

Gemma gemma purpurea (H. C. Lea). Different habitat than preceding.

Petricola pholadiformis Lamarck. Generally distributed.

Tellina tenera Say. Fine specimens at 1.

Tellina tenella (Verrill). One valve at 1.

Tellina versicolor De Kay. Fine specimens at 5.

Macoma balthica (Linnaeus). Commonest at 2.

Tagelus gibbus (Spengler). At 5.

Ensis directus (Conrad). Generally distributed.

Siliqua costata (Say). Found only at 5.

Spisula solidissima (Dillwyn). Very abundant at 4.

Spisula solidissima similis (Say). Occasional.

Mulinia lateralis (Say). Generally distributed.

Mya arenaria Linnaeus. Generally distributed.

Corbula contracta Say. Found only at 5.

Barnea truncata (Say). At 1, 3 & 5, but especially common at 3.

Zirfaea cripata (Linnaeus). One valve at 5.

Teredo navalis Linnaeus. At 5.

Gasteropoda.

Dentalium sp? Fragment at 5.

Pyramidella fusca (C. B. Adams). Several specimens at 5.

Pyramidella winkleyi Bartsch? Two or three specimens which seem to be this species.

Turbonilla nivea (Stimpson). Only at 5, where it is the commonest *Turbonilla*.

Turbonilla aequalis (Say). I have referred 7 of my specimens to this species.

Turbonilla vinea Bartsch. Two specimens from 5.

Turbonilla areolata Verrill. One specimen, but with six rather than five spiral rows of pits, from 5.

Turbonilla interrupta (Totten). This is the typical form, not as described by Bartsch, but as described by Bush. The color band is well marked in all my specimens (six). Found only at 5.

Odostomia (*Chrysallida*) sp? Two specimens at 5.

Odostomia impressa (Say). Several specimens at 5.

Odostomia trifida (Totten). Abundant at 5, found also at 3.

Odostomia bisuturalis Say. At 3 and 5.

Epitoneum multistriatum (Say). Three specimens at 5.

Polinices duplicata (Say). Generally distributed, fine specimens at 4.

Polinices heros (Say). Generally distributed, fine specimens at 4.

Polinices triseriata (Say). Occasional.

Crepidula fornicata (Linnaeus). Generally distributed.

Crepidula glauca Say. Found only at 2.

Crepidula glauca convexa Say. Generally but thinly distributed.

Crepidula plana Say. Generally distributed.

Paludestrina minuta (Totten). Occasional at 5.

Paludestrina laevis (De Kay). Common at 5, a few at 3.

Adeorbis supranitidus lirata (Verrill). Several specimens at 5, all being of this subspecies.

Litorina littorea (Linnaeus). At 2, 3 and 4.

Litorina obtusata palliata (Say). Only found at 5.

Litorina rudis (Donovan). Abundant at 2.

Lacuna vincta (*fusca*) Gould. Found at 2, 3 & 5.

Triphoris perversa nigrocincta (C. B. Adams). Several specimens at 5.

Certhiopsis greenii (C. B. Adams). Several specimens at 5.

Bittium alternatum (Say). Fine specimens at 5.

Eupleura caudata (Say). Generally distributed.

Urosalpinx cinerea (Say). Generally distributed.

Columbella avara similis Ravenel. A specimen at 2.

Columbella lunata (Say). Generally distributed.

Alectrion obsoleta (Say). Generally distributed.

Alectrion trivittata (Say). Generally distributed.

Busycon canaliculata (Linnaeus). Generally distributed.

Actaeon punctostriatus (C. B. Adams). Several specimens at 5.

Tornatina canaliculata (Say). Fairly common at 5.
Cylichna oryza (Totten). Several specimens at 5.
Melampus lineatus Say. Most common at 2.
Alexia myosotis (Drap.) Fairly common at 3.

On a tramp up and down the western end of Long Beach point, Long Island, I picked up the following interesting forms, besides forty-eight of the commoner species:

Yoldia limatula (Say). 1 valve.
Arca ponderosa Say. 3 valves.
Astarte castanea (Say). Common.
Tellina tenella (Verrill). 1 valve.
Tellina versicolor De Kay. 2 valves.
Barnea costata (Linné). 1 valve (fragment).
Cavolina telemus (Linné). 1 specimen.

DESCRIPTION OF A NEW SPECIES AND VARIETY OF PLANORBIS FROM POST-GLACIAL DEPOSITS.*

BY FRANK C. BAKER.

Planorbis parvus urbanensis n. var. Pl. VII, figs. 4-6.

Shell differing from *parvus* by having a round aperture, the last third of the body whorl being depressed below the general level of the spire, deeper sutures, channelled in most individuals, and a deeper umbilical region. The body whorl has not quite as great transverse diameter as in typical *parvus*. In *parvus* (pl. 1, figs. 1-3), the whorls are typically in the same plane, the aperture is oblong or long ovate and the sutures are impressed but not channelled. The umbilical region is also less impressed and has a ''reamed out'' appearance.

Height at aperture, 1.00; greatest diameter, 3.00 mm. Holotype.

Height at aperture, 1.00; greatest diameter, 3.00 mm.

*Contribution from the Museum of Natural History, University of Illinois, No. 1.

Height at aperture, .80; greatest diameter, 2.75 mm. Cotype.

Height at aperture, .80; greatest diameter, 2.50 mm. Cotype.

Holotype, number Z 10772 and paratypes number Z 10773, Museum of Natural History, University of Illinois. Cotypes of *urbanensis* and *altissimus* have been placed in A. N. S. Phila.

About 40 specimens of this form of *parvus* occur in the marl collections taken from the University of Illinois campus. The characteristics mentioned above appear to be very constant and the race or variety of *parvus* seems distinguishable enough for a distinct name. There were none of the *parvus* form in the material. This may be a Pleistocene species that has become extinct. Nothing similar has been seen in other marl collections available for study, but it would seem that it should be looked for in marl deposits, especially the older marl beds overlying the earlier drift sheets, or in deposits between these sheets—interglacial.

Planorbis altissimus n. sp. Pl. VII, figs. 7-10.

Shell depressed, with flatly rounded periphery which is placed below the center of the whorl; lines of growth fine, crowded, but surface without spiral ornamentation; whorls 4, regularly increasing in diameter, sloping flatly to the rounded periphery; spire whorls sunken below the general level of the surface, the whorls forming a rather sharp v-shaped suture, causing the shell to resemble a miniature *Planorbis antrosus* and producing a subacute carina on the upper surface of the whorls; base of shell deeply concave, forming a wide, saucer-shaped depression and umbilicus; the earlier whorls are carinate on the under side but the last whorl is rounded; the last half of the last whorl is markedly deflected, forming a contact with but half of the preceding whorl; aperture roundly ovate, shouldered above, the dorsal margin much produced over the ventral margin, the parietal callus joining the margins and causing the aperture to be continuous.

Height at aperture, 2.00; greatest diameter, 4.50 mm. Holotype.

Height at aperture, 1.75; greatest diameter, 4.25 mm. Cotype.

Height at aperture, 2.00; greatest diameter, 4.00 mm. Cotype.

Height at aperture, .90; greatest diameter, 2.00 mm. (young, 3 whorls).

Holotype; number Z 10775 and cotypes number Z 10776, Museum of Natural History, University of Illinois.

This small Planorbis is related to *deflectus*, but differs markedly in the form of the upper whorls which are more sharply carinated, and in the spire which is more sunken below the general level of the whorls. The umbilical region is deeper and the aperture is higher than wide. The lower part of the body whorl is more exposed below the first half of this whorl than in *deflectus*. Young specimens very strongly resemble *Planorbis campanulatus* in form.

Specimens of *deflectus* from marl deposits in Milwaukee (30th Street) Wisconsin, have occasional individuals that somewhat resemble *altissimus* in the greatly deflected last whorl but these are otherwise quite different. The new species may be looked for in marl deposits associated with *Galba obrussa decampi* and the Pisidia peculiar to the northern marl beds. Only 5 adult and 9 immature specimens occurred in the Urbana marl deposit and the new species was not, seemingly, a common inhabitant of the pond or lake.

The new forms described above occurred in a lot of post-glacial fossils found in a deposit on the campus of the University of Illinois, in a ditch and in excavations for the basement of the new greenhouses. The shells were about four feet below the surface, in a deposit of marl underlying two feet of black, clayey soil. The fauna contains several species which now have a more northern range, as *Pisidium costatum, P. tenissimum calcareum, Valvata sincera*, and *Galba obrussa decampi*, and there is reason to believe that the pond in which these fossils lived occupied a kettle hole on the inner face of the Champaign moraine when the ice of the late Wisconsin glaciation was at or near Chicago. If this is so, then the deposit is interglacial between the early and late Wisconsin invasions. A paper covering this point is in preparation.

EXPLANATION OF FIGURES, PLATE VII.

1-3. *Planorbis parvus* Say. Owasco Lake, N. Y. X9
4-6. *Planorbis parvus urbanensis* Baker, new variety. X9
7. *Planorbis altissimus* Baker, young. X9.
8-10. *Planorbis altissimus* Baker, new species. X7.

MOLLUSKS INFESTED WITH PARASITIC WORMS.

BY FRANK C. BAKER.

While carrying on biological work for the New York State College of Forestry at Oneida Lake in the fall of 1917, many animals were examined to ascertain the degree of parasitation by worms. The hosts studied included fish, birds, batrachians, reptiles, and mollusks. Among the latter many interesting cases occurred, both of infestation and absence of infestation, the degree of infestation varied from none to fifty per cent. Of the twelve species examined, five were without trace of parasites and seven were infested in varying degrees. It is noteworthy that none of the Amnicolidae or Valvatidae were parasitized, and that no worms were found in the small Planorbes (*parvus* and *hirsutus*). Of those infested, five are fresh water pulmonates. The examinations were carried on under the direction of Dr. H. S. Pratt, of Haverford College. The table below indicates the species infested and the degree of infestation. All are trematode worms the species of which have not yet been determined.

Bythinia tentaculata 17 examined; no worms.
Amnicola limosa 20 examined; no worms.
Valvata tricarinata 20 examined: no worms.
Planorbis parvus 3 examined; no worms.
Planorbis hirsutus 7 examined; no worms.
Planorbis antrosus 2 examined; 1 with cercariae, 1 without.

Planorbis campanulatus 15 examined; 3 with cercariae, 12 without.

Galba catascopium 10 examined; 6 with sporocysts and cercariae, 4 without.

Galba emarginata 5 examined; 3 with cercariae, 2 without.

Campeloma integrum 3 examined; 2 with cercariae, 1 without.

Physa warreniana 9 examined; 3 with cercariae, 6 without. Small leech in mantle cavity of 3 specimens.

Goniobasis livescens 2 examined; 1 with cercariae, 1 without.

University of Illinois,
Museum of Natural History.

TYPES OF GENERIC NAMES PROPOSED FOR ACHATINAE.

BY H. A. PILSBRY.

When working on Congo Valley mollusks I noticed that while the generic names applied to the Achatinae were discussed in Manual of Conchology, vol. xvi, genotypes were not selected for some names there considered absolute synonyms. This lack is supplied in the following list. Where a type had already been selected the authority and date of selection are added in parentheses.

Achatina Lam., 1799, type *Bulla achatina* L. (Lam., 1799).

Ampulla Bolten, 1798, type *A. priamus* Bolt. (Pilsbry, 1908).

Chersina [Humphrey], 1797, type *Bulla achatina.*[1]

Achatium Link, 1807, type *A. elegans* Link = *A. achatina* (L.).

Achatinus Montfort, 1810, type *A. zebra* (Montfort, 1810).[2]

[1] The Museum Calonnianum has been rejected as a source of nomenclature by the International Commission.

[2] De Montfort appears to have confused *A. zebra* and *A. panthera* under the former name, but as he stated that *Achatinus zebra* is the type, the name belongs rather to *Cochlitoma* than to *Achatina.* Since he says that Lamarck founded the genus, it is evident that he intended *Achatinus* merely as an emendation of *Achatina* Lam., and not as a new name. It cannot therefore displace *Cochlitoma*, but will be regarded merely as a variation in orthography.

Cochlitoma Fér.. 1817, type *Bulimus zebra* Brug. (Pilsbry, 1904).

Archachatina Albers, 1850, type *A. bicarinata* Brug. (Pilsbry, 1904).[3]

Geodes Gistel, 1848, type *Bulla achatina*.[4]

Oncaea Gistel, 1848, type *Oncaea perdix*[5] = *A. perdix* Lam., = *A. achatina* (L.).

Parachatina Bourguignat, 1889, type *A. dohrniana* Pfr. (Pilsbry, 1904).

Serpæa Bourguignat, 1889, type *A. hortensiae* Morel. (Pilsbry, 1904).

Pintoa Bourguignat, 1889, *A. pfeiffer* Dkr. (Pilsbry, 1904).

Urceus (Klein) Jousseaume, 1884, type *Achatina achatina* (L.).[6]

LORENZO E. DANIELS.

L. E. Daniels was born at Mazon, Grundy Co., Illinois, March 4th, 1852. The son of a farmer, his early life was spent on the farm, and so far as known his education was in the local schools.

While a farmer in Illinois, though a Democrat in politics, he was called from the plow in that strong Republican community to take the office of sheriff. Though modest to a fault and with none of the politician or office-holder in thought or manner, the administration was nevertheless a success. The term of office was enlivened by puzzling criminal cases, including murder, and there were also serious strikes in the coal fields;

[3] *A. bicarinata*, the type of *Archachatina*, is a decidedly aberrant species. For the dextral continental species, which have the surface smoothish and even, I propose the subgenus *Calachatina*, *A. marginata* (Swains.), Man. Conch., XVI, 109, being the type.

[4] Gistel, Naturgeschichte des Thierreichs für höhere Schulen, 1848, p. viii. Geodes is a substitute for *Achatina* Lam., no species mentioned.

[5] Gistel, *tom. cit.*. p. 168. *Oncaea* is a substitute for *Achatina* Auct.; several species are briefly described.

[6] Jousseaume merely mentioned "le genre *Urceus* Klein (*Achatina* Lam.)" without any species. It therefore takes the same type as Lamarck's genus.

but this quiet farmer had courage, a known reputation for fair play, and was trusted by both workmen and employer. There were no complaints of violence in labor disputes during the Daniels regime.

The sheriff's rooms in the Grundy county court house at that time contained one of the best collections of Mazon creek fossils; for back in boyhood days the sheriff had become interested in those famous Upper Carboniferous beds near his home. In types, especially of insects, the collection contained many of the rarest species. They were worked up in a memoir by Dr. Handlirsch of Vienna, published by the National Museum. Mr. Daniels still owned this collection, together with the accumulations of many years of research in conchology, and the old Illinois homestead at the time of his death.

Mr. Daniels became interested in mollusks while a young man, and for many years collected assiduously, particularly in Indiana. For some years he was Assistant State Geologist of Indiana. Some of the results of his investigations during this period were published, in collaboration with Dr. W. S. Blatchley, the State Geologist, under the title "On some Mollusca known to occur in Indiana," and by Daniels alone, "A Check-list of Indiana Mollusca." Both appeared in 1903. At this time herpetology was added to his other interests, and in later trips the collection of snakes, horned toads and especially turtles claimed part of his attention.

Subsequently with Dr. Pilsbry, Junius Henderson and the writer, he was associated in field work many seasons in the wild places of North Carolina, Tennessee, Arizona, New Mexico, Utah and Idaho. In 1910 he joined Dr. Pilsbry and the writer in a collecting trip of several months in southern New Mexico and Arizona, and in 1914, in company with the writer, explored the Blue River region in Arizona and the Mogollon Mts., New Mexico. Many new species of *Sonorella*, *Ashmunella*, *Oreohelix* and *Holospira* were found on these excursions. In 1915 and 1916 Mr. Daniels joined forces with Prof. Junius Henderson in hunting Oreohelices in Utah and Idaho. Their results were set forth in two admirable papers, published jointly, the first exact and critical records for this fauna.

As a collector Daniels was untiring. His bag was always among the largest. He seemed to have the knack of finding unusual or abnormal shells. Some of these were illustrated by him in a special article.

Species of the molluscan genera *Sonorella*, *Ashmunella*, *Holospira*, *Hemphillia*, *Pisidium*, *Lymnæa*, of *Gerarus* and *Asemoblatta* (Upper Carboniferous insects), and probably other groups, have been named in his honor. His collections of land and fresh water shells, and of Mazon creek fossils are among the best.

Mr. Daniels was unmarried. Of late years he made his home with a sister, Mrs. James Foster, at La Porte and later at Rolling Prairie, Indiana. While on the farm be became interested in Masonry, often driving across the unbroken prairie a dozen miles on winter nights to attend lodge sessions at the county seat. He continued up to the thirty-third degree and the final services at La Porte were conducted by the Masonic fraternity.

In person Daniels was of the tall, strongly but loosely built Illinois type, of which Lincoln was an example. He was rather serious, but by no means lacking in humor, a good camp-fire companion. In character enterprising, interested, upright.

Seemingly in good health, nevertheless for some years he had need of a surgeon, and in October submitted to an operation at a Chicago hospital. Unforseen complications developed and he died October 23, 1918. By his death conchology has lost one of its best explorers, and his associates a loyal and loving friend.—J. H. Ferriss.

JOSEPH WILLCOX.

Mr. Joseph Willcox, a member of the Board of Trustees of the Wagner Free Institute of Science for forty years, died in Philadelphia, October 1, 1918. Mr. Willcox was born at Ivy Mills, Delaware Co., Pa., August 11, 1829. After graduating from St. Mary's College, Baltimore, he became engaged in paper making with his father. This business was founded in 1729 by Thomas Willcox, who made paper for the continental currency, the firm continuing to make paper for the government up to 1875. Mr. Willcox was in the Pennsylvania militia during the Civil War, and attained the rank of colonel.

On retiring from business Mr. Willcox took up the study of mineralogy and geology, and during his frequent visits to Florida became greatly interested in the geology of that State. In the spring of 1886, under the auspices of the Wagner Free Institute of Science, he organized with Prof. Angelo Heilprin of the Academy of Natural Sciences, an expedition to explore the gulf coast of Florida. Leaving Cedar Keys and proceeding south, they examined the silex beds of Tampa Bay, and in ascending the Caloosahatchie to enter Lake Okeechobee, discovered the Caloosahatchie Pliocene. An account of this expedition appeared in Transactions Wagner Free Institute, Vol. I. In company with Dr. Wm. H. Dall, he again visited these beds in the spring of 1887, and with the writer in 1888 made another trip to this and adjacent streams, making large collections to aid Dr. Dall in his great work on the Tertiary Fauna of Florida, also published in the Transactions of the Wagner Free Institute (Vol. III, six parts, 1654 pages, 60 plates, 1890–1903). In the work of obtaining additional material in other southern states and in many ways assisting Dr. Dall and others, he took great pleasure. On the various collecting trips he always obtained many undescribed species, of which some sixteen have been named in his honor. He made a large collection of Miocene and Pliocene shells and specialized on the genus Busycon (*Fulgur*) both recent and fossil. This collection he presented to the Academy of Natural Sciences.

For many years Mr. Willcox was Honorary Curator of the Isaac Lea collection of Eocene fossils at the Academy of Natural Sciences of Philadelphia. He was Chairman of the Committee on Museum of the Wagner Free Institute, and always took the greatest interest in the development of both institutions. A warm friend of Dr. Isaac Lea and Dr. Joseph Leidy, he lived to see the scientific work and progress of practically two generations. He is survived by a son, Mr. C. Percy Willcox, of Philadelphia.—C. W. Johnson.

NOTES.

Note on Thyasira bisecta Conrad.—In 1889 I gave an account of the microscopic anatomy of a species of *Thyasira* (under the name of *Cryptodon*) in my report on the Blake dredgings, p. 438. This was I believe the first general account of the unique features of this genus, the data on *Cryptodon* furnished by Pelseneer in the Challenger report relating to *Lyonsiella* or a similar genus rather than to *Thyasira*. Pelseneer himself referred them to "*Cryptodon*" with doubt. The specimen described in the Blake report was 17 mm. high, and regarded as exceptionally large. The species referred to *Thyasira*, under the name of *bisecta* Conrad, was so placed by me because of its agreement conchologically with that genus, although it had been referred to several different genera and a new genus had been proposed for it by Gabb.

I had long been anxious to examine the anatomy of this mollusk, which reaches a height of 75 mm., to see whether it conformed to the primitive features of the small typical forms of the genus, and by the kindness of Mrs. Oldroyd and Dr. Frye of the Friday Harbor Biological Station, Puget Sound, this wish has been granted. The specimen was found in about four fathoms, muddy bottom among the San Juan Islands.

Rather to my surprise I find that the description written of the small species nearly thirty years ago applies almost word for word to this giant of the genus. The only difference seems to be the greater proportional length of attachment of the W-shaped gills, and the only addition is the presence of a glandular area within the basal edges of the mantle extending nearly the whole length of the free edges. Something of this sort might have occurred in the earlier specimen but have been overlooked on account of its minuteness. The arborescent hepaticogenital organs occupy the greater part of the mantle cavity, while the absence of papillae on the mantle edge and around the efferent aperture in the mantle, and of oral palpi, the worm-like foot, etc., are essentially the same as in the smaller forms.

Geologically, *T. bisecta* recedes to the Miocene.—W. H. Dall.

Cuban Mollusks Colonized in Florida.—Last April Mr. C. T. Simpson sent me 10 fine *Pleurodonte auricoma* (Fér.) and 2 *P. marginella* (Gmel.), one adult and one immature, which he had collected in his "hammock" at Lemon City, Fla. The largest *auricoma* measures 40 x 29 and the smallest 30 x 20 mm. The adult *marginella* is 27 x 16 mm., while the young shell would probably have grown larger.

As these species appear to be permanently established I wrote for further information, and below give his response.—"Little River, Fla., April 20, 1918. I have *Pleurodonte auricoma* living on the place but cannot give locality from whence taken. It has become completely established and every year I find hundreds of living and dead examples scattered throughout my cultivated pine land, but never in the hammock. I find most of the living specimens when hoeing, buried just under the surface of the sandy soil, sometimes in dry weather with a sort of epiphragm. The other day I found a perfect var. *provisoria* in fine condition. I do not remember whence it came.

"Two varieties of *Liguus fasciatus*, which were derived from the general Camaguay to Holguin (Cuba) region, seem to be established here. The ground color of one is a warm slate and the other has some yellowish on it. I have found two specimens lately in fairly fresh condition and as it has been about four years since any were brought in I am sure they have grown here, especially as one was not fully grown.

"*Polymita muscarum*, white var. with dark dots, is occasionally seen and the dead shells are rarely found. J. B. Henderson sent the parents of these and they are from some part of Eastern Cuba. Our specimens are large, solid and fine.

"*Pleurodonte marginella* seems to be pretty well established in my hammock, probably from Cayo del Rey, and there are several variations. Most are bluntly keeled and rather dark colored. They keep strictly in the hammock and tho not yet numerous they seem to be spreading and slowly increasing. They remain under trash and the fallen leaves of palms during most of the dry season, but have just begun to appear since we had a heavy shower yesterday. They climb palms and live oaks, sometimes to a height of seven feet and seem to be given greatly to breeding.

"I have introduced a number of other snails from Cuba and Bimini including some of the land operculates, but have never found living or dead specimens since. That does not prove that they may not be living, as it seems to take a long time for a species to become established. Until a short time ago I supposed that no Cuban *Liguus* were living in my hammock. I have none of the original stock of these that I can be sure of; I simply introduced the things for 'company' and not for any 'scientific results.'"

I think the above is well worth putting on record.—Geo. H. Clapp.

Some Rare Shells Collected in Puget Sound, Washington, During July, 1918.—Thinking it would be of interest to the readers of the Nautilus, I send you a short list of some of the very rare species we collected this summer at the Biological Station of the University of Washington at Friday Harbor, San Juan Island.

Thyasira bisecta Conrad.

This rare shell we dredged in mud in between 3 and 4 fms. Three live specimens and a few dead ones were obtained.

Macoma nasuta kelseyi Dall.

This species we found with the above; the specimens were larger than those from California.

Thracia curta Conrad.

One specimen of this species was obtained in 25 fms. between San Juan Is. and O'Neal Island.

Thracia trapezoides Conrad.

This species is the pride of the collection. So far as we have been able to find out, this has never been reported living. One living and two dead specimens were obtained in about 20 fms. off O'Neal Island. This with the first two are found in the Pliocene at San Pedro, Cal.

A fine species in the Naticidae may prove to be a new genus.

Velutina laevigata Linn.

The specimens we obtained were the largest and finest I have ever seen. The largest one is 8.2 mm. in length.

Panomya ampla Dall.

Of this odd and rare species we were fortunate to obtain several specimens.

A report will be published about April, 1919, and will have a full description of each species; and we hope to have figures of most of them.—IDA S. OLDROYD, Stanford University, California.

PUBLICATIONS RECEIVED.

FOREIGN LAND SNAILS IN MICHIGAN. Occ. Pap. Mus. Zool. Univ. of Mich., no. 58. By Bryant Walker. The following are recorded:

Arion ater (L.), garden in Detroit, one specimen.

Arion circumscriptus Johns. "Cat Hole," near Ann Arbor.

Subulina octona (Brug.) and *Opeas clavulinum kyotense* Pils., conservatory in Lansing.

Vitrea lucida (Dr.), conservatory, Bell Isle Park.

PLEUROBEMA CLAVA (Lam.) AND PLANORBIS DILATATUS BUCHANENSIS LEA IN MICHIGAN. Occ. Pap., etc., no. 51. By Mina L. Winslow. *P. clava* was taken by the author in Hillsdale Co., the *Planorbis* near Harbert, Berrien Co. Excellent figures of *P. dilatatus* and *P. d. buchanensis* are given, with a bibliography of the species and notes on distribution.—H. A. P.

MOLLUSCAN FAUNA FROM SAN FRANCISCO BAY. By. E. L. Packard (Univ. of Cal. Publications, vol. 14, no. 2, pp. 199–452, pls. 14–60, 1918). This valuable publication is the results of the work of U. S. Steamer "Albatross," commissioned in Oct., 1911, by the Bureau of Fisheries to make a biological survey of San Francisco Bay. A thorough study of the fauna of a given area presents many interesting facts pertaining to distribution, and a basis for making further observations. The number described are 173 species and 13 varieties collected by the survey or previously recorded from the San Francisco Bay, San Francisco Co., or the Farallon Islands. The number obtained by the survey within the limits of San Francisco Bay comprises 81 species and varieties. The illustrations are excellent, and charts show the local distribution of 18 of the more common species. A map of San Francisco Bay showing the dredging stations is also given.—C. W. J.

THE PRODUCTIVITY OF INVERTEBRATE FISH FOOD ON THE BOTTOM OF ONEIDA LAKE WITH SPECIAL REFERENCE TO MOLLUSKS. By Frank C. Baker (N. Y. State College of Forestry, Tech. Pub., no. 9, vol. 18, no. 2, 1918, pp. 1–264. A most interesting publication that brings to our attention a great factor little considered by most conchologists, *i. e.*, the importance of the smaller fresh-water mollusks as fish food. Animal life was found to be most abundant at the 6-foot contour and a sandy bottom the richest in animal life.—C. W. J.

A NEW MARINE MOLLUSK OF THE GENUS CERITHIOPSIS FROM FLORIDA. By Paul Bartsch (Proc. Biol. Soc., Wash., vol. 31, p. 135, 1918). *Cerithiopsis vanhyningi*, Tampa Bay.

FOUR NEW MOLLUSKS FROM THE PHILIPPINE ISLANDS. By Paul Bartsch (Proc. Biol. Soc., Wash., vol. 31, p. 153, 1918).

CHANGES AND ADDITIONS TO MOLLUSCAN NOMENCLATURE. By W. H. Dall (Proc. Biol. Soc., Wash., vol. 31, p. 137, 1918). The following new generic and section names are proposed: *Tromina*, *Algaroda*, *Littorivaga*, *Algamorda*, *Boetica*, *Iselica*, *Elachisina*, *Kurtziella*, *Progabbia*, *Crawfordia*, *Boreomelon*, *Phenacoptygma* and *Atrimitra*.

The Homing Habits of the Pulmonate Mollusk Onchidium. By L. B. Arey and W. J. Crozier (Proc. Nat. Acad. Sci., vol. 4, pp. 319-321, 1918).

Growth and Duration of Life of Chiton tuberculatus and Growth of Chiton tuberculatus in Different Environments [2 papers]. By W. J. Crozier (Proc. Nat. Acad. Sci., vol. 4, pp. 322–328, 1918).

The Nayades (Fresh Water Mussels) of the Upper Tennessee Drainage, with Notes on Synonymy and Distribution. By A. E. Ortmann (Proc. Amer. Phil. Soc., vol. 57, pp. 521–626, 1918). Exhaustive studies of this character of the molluscan fauna of our rivers constitutes one of the most important works in biology. The constantly increasing pollution of our streams will locally exterminate many species. The author says: "The region in question is known as one of the chief centers of nayad development, and may be called the most prolific section of the world in this particular group." The species often assume different shapes in the larger rivers than in the smaller streams and headwaters. Some 88 species and varieties are recorded from this drainage.—C. W. J.

Los Moluscos de la Republica de Panama por James Zetek (Revista Nueva, Jul.-Aug., 1918). This catalogue of the mollusks is prefaced by a discussion of the distribution, peculiarities of the fauna, etc., and followed by a list of synonyms and a bibliography. Besides having many species additional to those of C. B. Adams's well-known catalogue, it has the advantage of modern nomenclature.

Cephalopoda, Australian Antarctic Expedition. By S. S. Berry. A new species of *Stauroteuthis* and four of *Moschites* are described and well figured in this interesting report.

L. E. DANIELS

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NOTES ON CERTAIN PHILIPPINE SPECIES OF VIVIPARUS.

BY BRYANT WALKER.

Several months ago Mr. Walter F. Webb, of Rochester, N. Y., placed in my hands for identification a small collection of Philippine *Vivipari.* The very considerable search of the literature that was found necessary to determine the proper names to be used for certain species has brought about some interesting results in the matter of nomenclature.

I.

Paludina (Vivipara) carinata Auct.

No less than four distinct species have been described by as many different authors as *Paludina carinata* or *Vivipara carinata*, viz:

1820–3. *Paludina carinata* Swainson. Ganges.
1827. *Paludina carinata* Valenciennes. Mexico.
1863. *Paludina carinata* Reeve. Philippine Is.
1867. *Vivipara carinata* Bartsch. Philippine Is.

It will be more convenient to treat these species separately.

II.

Paludina carinata Sw. Pl. VIII, fig. 1.

Paludina carinata Swainson. Zool. Ills., Series I, 1820–3, pl. 93, center figure.

Swainson's original figure is reproduced as above and his brief description is as follows:

"*P. testa parva, olivacea; spira apertura longiore, apice obtuso, rufo; anfractu basili medio leviter carinato; umbilico obsoleto.*

"Shell small, olive; spire longer than the aperture; the tip obtuse, rufous; basal whorl slightly carinated in the middle; umbilicus obsolete.

"A distinct species which is never found larger than the figure. I once saw near 100 which had been picked up on the banks of the Ganges; the spire is rather lengthened, always obtuse, and the umbilicus even less than the last" (*P. unicolor*).

No measurements are given, but the figure (there is only one) measures: alt. 21, diam. 16 mm.

This species seems to have entirely dropped out of sight in recent years. It has been referred to *V. dissimilis* (Müll.) by Mörch (Cat. Yoldi, 1852, p. 52), Troschel (ubi?) and von Martens (Mal. Blätt., 1865, p. 148). Frauenfeld (Verzeichniss, Paludina, 1864, p. 584) referred it to *V. remossii* (Phil.). Hanley and Theobald (Con. Ind., 1876; p. xvii, n. 7) simply give the above opinions. The species is not referred to by Kuester (Con. Cab., Paludina, 1852) nor by Reeve in the Conchologia Iconica (1863) except as hereinafter stated, nor by Kobelt in his recent (1906–9) monograph in the Conchylien Cabinet, nor by Bartsch (Pr. U. S. Nat. Mus., XXXII, 1907, pp. 135–150), nor by Preston in "The Fauna of British India" (1915).

But it is clear that Swainson's species was an Indian one and, whatever may be its standing at the present time in the Indian fauna, it is entirely different from any Philippine species and by its priority prevents the use of the name by any subsequent author either in *Paludina*, *Vivipara* or *Viviparus*.

III.

Paludina carinata Valenciennes.

See No. X.

IV.

Paludina carinata Reeve.

Paludina carinata Reeve. Con. Icon., Paludina, 1863, Sp. 53, pl. IX, fig. 53.

Reeve in his text gives no authority for the specific name and the species is usually credited to him, but in the index the species is credited to Swainson. It is possible that he thought that the shell that he described and figured was the same as Swainson's species. Frauenfeld (Verzeichniss, Paludina, 1864, p. 584) expresses the opinion that Reeve's species is really the same, but the figure, description, such as it is, and the locality, if correct, renders it quite improbable.

I do not think either that the shell figured by Bartsch as this species is really the same.

Reeve as usual gives no dimensions, but his figure measures: alt. 25, diam. 20; aperture, alt. 13.5, diam. 12 mm.

The type, said by Reeve to be in the Cuming Collection, seems to have been lost or mislaid as Mr. H. C. Fulton, who made a search for it at my request, was unable to find it at the British Museum.

I have before me four shells that I believe represent this species and which are figured on pl. IX, figs. 1–4. Two (figs. 1 and 2) are from the Andrews collection and were sent to Mrs. Andrews by Dr. Wesley Newcomb as *V. amplior* Rve., and as from the Philippine Islands. They are clearly not Reeve's *amplior*, which Frauenfeld (Verzeichniss, p. 569) considers the same as Mousson's *V. lineolatus amplus* and Kobelt (Con. Cab., Viviparidae, 1908, p. 260) calls a variety of *V. javanicus*.

The third specimen (fig. 3) is No. 3252 of the collection of the Museum of Zoology, University of Michigan, and formed a part of the collection of Joseph Monds, of Salem, Mass., purchased by the University in 1855. It was originally unnamed and is labeled "Manilla."

The fourth (fig. 4), (Coll. Walker, No. 31774) was part of the Quadras collection and has his original label "*Pal. carinata* Rve., Rio Pasig, Manila." With it was a larger shell of apparently a different species.

As Reeve's type has disappeared, I propose to call the species represented by these specimens *Viviparus pseudocarinatus*, fig. 1 being the type and the others paratypes. If Reeve's type should be found and prove to be identical, his specific name will be superseded by *pseudocarinatus*.

Viviparus pseudocarinatus may be described as follows: Shell globose-conic, apex obtuse, narrowly but deeply, umbilicate; whorls five; apical whorls dark purple, which after the third whorl becomes lighter and gradually fades into a yellowish-green on the body-whorl; the dark color of the upper whorls is lighter towards the sutures; on the last half of the body-whorl of Nos. 1 and 3 are several darker, longitudinal strigations representing, probably, rest periods. The lips of Nos. 1 and 2 are sharp and uncolored, having been taken apparently between rest periods; No. 3 has the remains of a dark brown or blackish margin on the lip, and on No. 4 the lip is thickened and deep black. All four shells are quite acutely carinated on the periphery of the upper whorls and in the three larger ones the body-whorl drops slightly below the carina of the preceding whorl and exposes it above the suture, but the carina rapidly diminishes in prominence and is practically obsolete before reaching the lip, which is regularly rounded. The lines of growth are regular but very light, and the entire surface is covered with exceedingly fine, spiral striæ, scarcely discernible on the upper whorls, but becoming stronger on the base of the body-whorl; these lines especially on the upper whorls are more or less interrupted by the growth lines giving the appearance of very minute punctations.

The four shells measure as follows:

No. 1, alt. 22.5, diam, 17.5; aperture, alt. 12.8, width, 11.4 mm.

No. 2, alt. 20.00, diam. 14.5; aperture, alt. 11.2, width, 8.9 mm.

No. 3, alt. 22.1, diam. 17.1; aperture, alt. 13.0, width, 10.0 mm.

No. 4, alt. 16.9, diam. 12.8; aperture, alt. 9.6, width, 8.4 mm.

Unfortunately No. 4 is the only one with its operculum. This (Pl. 8, fig. 7) is like that of *V. costatus* (Q. and G.) in having the inner surface divided into three distinct areas with the central and outer portions smooth and polished, but it differs from that species in having the intermediate area without granulation, it being finely and concentrically striate.

V.

Vivipara carinata Bartsch. Pl. IX, fig. 5.

Vivipara carinata Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 141, pl. XI, fig. 14.

As already stated I do not think that the shell figured by Bartsch as *carinata* Rve. is really that species. Bartsch's specimen apparently belongs to a larger, more elongated species and, if mature, lacks the black peritreme that seems characteristic of *carinata* Rve. The color is also different.

The specimen that I have figured for comparison with what I believe to be the genuine *carinata* Rve. and which seems to agree very exactly with that figured by Bartsch, was sent by Dr. Wesley Newcomb to the late Mrs. George Andrews with another, which was correctly named as *V. cumingii* Rve. It is No. 47035 Coll. Walker and measures: alt. 28.5, diam. 21.7; aperture, alt. 16.2, width 13.1 mm.

As "carinata" can not be used for either Reeve's or Bartsch's species and the two are evidently different, the better course would seem to be to rename the form figured and described by Bartsch and to leave Reeve's *carinata* to stand for further consideration. I would propose that the species figured and described by Bartsch be called *V. bartschi*, the type being No. 103666, U. S. Nat. Museum.

VI.

Paludina cumingii Reeve. Pl. IX, fig. 7.

Paludina cumingii Reeve. Con. Icon., Paludina, 1862, Sp. 11, pl. III, fig. 11.

This species will also have to be renamed, as "*Paludina cumingii*" was used by d'Orbigny in 1835 for the South American species now known as *Littoridina cumingii* (d'Orb.). Reeve himself says that the name had been used by d'Orbigny, but attempts to avoid the duplication by stating that d'Orbigny's species is a *Paludestrina*. This, of course, is impossible under the international code.

To make the change as inconspicuous as possible, I would propose that the species hereafter be known as *Viviparus cumingianus*.

Cumingianus is a large, well-marked species and was excellently figured by Reeve. It was the first of the more-widely umbilicated Philippine species to be described and is not likely to be confounded with any of its contemporaneous species.

The characteristic specimen figured is from the MacAndrew collection (Coll. Walker, No. 46916) and measures: alt. 39.7, diam. 30.5 mm. Another with it measures: alt. 36.5, diam. 29 mm. This specimen has its operculum, which is of the characteristic *javanicus* type.

The specimen figured by Bartsch (Pr. U. S. N. M., XXXII, 1907, pl. X, fig. 7) is apparently immature as it measures only alt. 17.1, diam. 14.8 mm.

Autoptically unknown to Frauenfeld, von Martens and Kobelt, the first two express no opinion in regard to it, but the latter (Con. Cab., Viviparidae, 1908, p. 273) thinks that it is probably a thick-shelled variety of *V. costatus* (Q. and G.); but that view is not tenable.

VII.

Viviparus angularis (Müller). Pl. VIII, figs. 4–5.

Nerita angularis Müller. Hist. Verm., II, 1774, p. 187.

Helix angularis Chemnitz. Con. Cab., IX, 1786, p. 160, pl. 134, figs. 1222–1223.

Müller's description of his *Nerita angularis* is as follows:

"*Nerita testa imperforata, virescente, anfractibus spiraliter angulatis, fauce alba.*

"*Cochlea virginiana e flavo viridescens non fasciata.*"

"List. Syn. t. 127, f. 27.

"Dan. Kant-neriten

long. 12 lin. lat. 6 lin.

"*Testa opaca, conica, glabra virescens striis transversis subtillimis, spiralibus tribus in singulo anfractu elevatis, acutis. Anfractus quinque prope perpendiculares.*

"*Apertura retundata, ad anfractum vicinum in angulum producta. Foramen vel umbilicus nullus. Faux calcarea. Striæ spirales in quibusdam evanescunt.*

"*Figura Listeri nostris major, caeterum refert. In flumine Chinensi emporium Canton alluente.*"

His reference to Lister was an unfortunate one as the two species have nothing in common. Chemnitz in 1786 expressed his surprise at the approximation. Lister's species was undoubtedly that subsequently described by Say (1817) as *Limnæa decisa* and now known as *Campeloma decisum*. As the facsimile of Lister's figure given by Binney (L. and F.-W. Shells, III, 1865, p. 43, fig. 86) is not a satisfactory reproduction of the original figure, I give a photographic copy on pl. VIII, fig. 6.

As to whether Müller's species was the Chinese species commonly known as *V. quadratus* (Bens.) or the Philippine species often referred to *V. costatus* (Q. and G.), there has been a very radical and long-continued difference of opinion among conchologists.

Mousson in 1849 (Moll. Jav., p. 62) according to von Martens (Moll. Weber, 1897, p. 21) recognized that the shell figured by Chemnitz as *Helix angularis* was different from that figured by Philippi as *Paludina angularis*, but overlooked the fact that it was the *P. quadrata* of Benson.

Philippi (Abbildungen, I, 1845, pl. I, fig. 10) identified it with the species described by Quoy and Gaimard in 1832 as *P. costata.*

Kuester (Con. Cab., Paludina, 1862, p. 26) followed Philippi.

Reeve (Con. Icon., Paludina, 1862) referred the Philippine species to *angularis*, which he considered distinct from *costata*, though he remarks that the two species are very closely allied.

Frauenfeld in 1864 (Verzeichniss, Paludina, p. 571) also referred the Philippine species to *angularis.*

Von Martens in 1869 (Mal. Blätt., p. 145) seems to have been the first to refer Müller's species to the well-known Chinese form commonly called *quadrata* Bens.

Morelet in 1869 (J. de Con., XVII, p. 403) argued the question at considerable length and refused to follow von Martens. But he makes no reference to Chemnitz either in his synonymy or in his discussion.

Issel in 1874 (Moll. Born., p. 90) followed von Martens.

The Sarasins (Suessw. Moll. Celebes, 1898, p. 59), while they make no reference either to *angularis* Müll. or to *quadrata* Bens., refer the Celebes species to *costata* Q. and G. and therefore impliedly endorse von Martens' position.

In 1897 von Martens (Moll. Weber, p. 20) reaffirmed his position of 1865.

Bartsch in his monographic paper on "The Philippine Pond Snails of the Genus Vivipara" (Pr. U. S. Nat. Mus., XXXII, 1907, pp. 135–150) followed Philippi and referred the Philippine species to *angularis* Müll.

Kobelt in his recent monograph of the Viviparidæ (Con. Cab., 1908, p. 230) adopts von Martens' position and calls the Philippine species *costata* Q. and G. But while he states (l. c. p. 122) that in his opinion the smaller, spirally-sculptured Chinese species should be divided into groups represented by *angularis* Müll. and *quadrata* Bens., he retains Benson's name for practically the whole Chinese series and neither figures nor describes, except in a very general way, the particular Chinese form that he would consider to be the real *angularis*.

None of the above-mentioned authors with the exception of Philippi, Kuster and von Martens, refer in any way to the figures and remarks of Chemnitz in the original Conchylien Cabinet. If they were acquainted with that work they omitted to make any reference to it, and if they were not it is difficult to understand how they came to refer *costata* Q. and G. to Müller's species.

I am indebted to Dr. Pilsbry for the reference to Chemnitz, the photographs of his figures reproduced on pl. VIII, the translation of his remarks and for permission to use the illuminating note that follows.

The translation is as follows:

"Tab. 134. Fig. 1222. 1223.

"Ex Museo Spongleriano.

"The greenish river-snail with three-fold keels on each whorl.

"*Helix angularis, testa conica, viridescente, in quovis anfractu tricarinata, apertura rotunda subangulari.*"

Müller, Histor. Verm. no. 373, p. 187.

Then follows Müller's diagnosis.

"This river snail is covered with a dark green coat. It has a quite conic formation, and a mainly circular, but still somewhat angular, aperture. It will be most conspicuously and recognizably distinguished from other snails by the three white angles or perceptibly raised, parallel, transverse striæ, which are seen upon the whorls. Because it is seen to be thus somewhat angular in its formation and aperture, our renowned Müller has called it *Cochleam angularem.* It lives in the Chinese rivers, has a length of only sixteen lines and is certainly unknown at present to most lovers of shells; hence it is rare and uncommon. I do not comprehend how Müller could find it like the figure of Lister, tab. 127, no. 27, which he refers to in his Hist. Verm."

Dr. Pilsbry adds: "Müller's *angularis* does not depend upon Lister, he notes a discrepancy in size. I have therefore had Chemnitz's figures copied. Nearly all of Müller's exotic shells were from the Spengler collection. and there is every reason to believe that Chemnitz figured one of the type lot from the same collection."

It is only necessary, in addition, to compare Chemnitz's figures with a typical specimen of *quadrata* Bens. from China (Coll. Walker, No. 46135) figured on pl. IX, fig. 10, and Quoy and Gaimard's figures of the Celebes type of their *costata* (pl. VIII, figs. 9–10) to come to the conclusion reached by von Martens.

Morelet's remark (l. c. p. 407) that *Paludina quadrata* is distinguished by its more elongated form, less shouldered spire and a proportionately smaller aperture is a very apt statement of the difference between Chemnitz's and Quoy and Gaimard's figures and practically convicts him out of his own mouth.

To which of the many described forms of the protean Chinese species, *angularis* should be referred is "another story" and outside the purview of this paper. But there can be no doubt but that Müller's specific name should be associated with the Chinese rather than with the Philippine species.

VIII.

VIVIPARUS COSTATUS (Quoy and Gaimard . Pl. VIII, figs. 9–13.
Pl. IX, fig. 6.

Paludina costata Quoy and Gaimard. Voy. Astrolabe, III, 1832, p. 170, pl. 58, figs. 1–5.

Type locality: Lac de Tondano, N. Celebes.

It is not entirely certain that Quoy and Gaimard's name can be retained for this species.

Frauenfeld (Verzeichniss, Paludina, 1864, p. 571) has considered it to be the same as Lesson's *P. tricostata* from New Guinea described in 1830 (Voy. Coquille, Zool., II, p. 349).

Von Martens (Moll. Weber, 1897, p. 21) has also made the same suggestion. If so, Lesson's name would have priority.

Lesson did not figure his species, but his description may be translated as follows:

"Shell conic, inflated, of a uniform yellowish-green color, ornamented with vertical striæ, very fine and very close together. Spire moderate, conic, acute, with convex whorls separated by a linear and excavated suture. The fifth whorl is the largest, inflated and dilated, three prominent keels mark its contour, beginning on the preceding whorl. These three light lineations form a ribbon-like, flat carina. The aperture is as high, as wide, rounded, with a thin, sharp lip and smooth on the columellar border, thickened a little at its base by a small lamella, which covers in part the narrow umbilicus.

"Several individuals in all respects alike were 7 lines in height and 6 in diameter. This Paludina inhabits the sweet, fresh waters of the brooks of New Guinea."

While in some respects this description would apply to *V. costatus*, the dimensions given, alt. 17, diam. 15 mm., if from mature specimens, would indicate a much smaller and more globose species and his statement that the three lirations form a flat, ribbon-like (*rubanée et aplatie*) carina would seem to indicate that they were close together and, probably, at the periphery of the shell.

Moreover, Tapparone-Canefri (Fauna Moll. N. Guinea, Pt. I, 1883, p. 23) states that Beccari and d'Albertis found nothing like it in their collections. On the other hand, Pilsbry in commenting on another of Lesson's lost species, *Partula lineata* (Man. Con., XX, 1909, p. 312), remarks on "the general reliability of the locality records in the Zoology of the Coquille."

Thinking that possibly Lesson's type had been preserved in the Paris Museum, I requested Dr. Louis Germain to ascertain whether they were in the Museum. But he replied that much of their collection and nearly all of their types had been stored in the cellars for safety and that consequently the desired information could not be obtained at present. Now that the war is over, the Museum collections will, no doubt, be returned in due time to their normal condition and then, if the original types have been preserved, a critical examination can be made.

In view of the uncertainty as to just what Lesson's species is, it does not seem to be desirable to change the well-known and unquestioned name for the species until more definite information can be had in regard to the earlier one.

Viviparus costatus (Q. and G.) came from Lake Tondano, North Celebes and is described as being "very ventricose, fragile and thin, spire obtuse, whorls rounded, carinated by a considerable number of acute lirations, of which two or three are more prominent, and very finely longitudinally striate. Aperture almost circular, slightly angled above, umbilicus narrow and deep. Length 27.66, diam. 22.56 mm."

As shown by the original figures copied on pl. IX, figs. 9–10 and fig. 6 on pl. X from a specimen from Sukur, Celebes, labeled "*angularis* Müll." by Brot, the shell has two principal carinas, one at the periphery and the other forming the edge of the prominent, wide shoulder; between these are a number of lesser lirations, of which two are usually somewhat stronger than the others. The penultimate whorl is much smaller than the body-whorl owing to the width of the shoulder, and the spire is short and obtusely conical.

I have not seen any typical *V. costata* from the Philippine Islands.

Kobelt (Con. Cab., Viviparidæ, 1908, p. 230) has called attention to the fact that the shell figured by Bartsch (Pr. U. S. Nat. Mus., XXXII, 1907, pl. X, fig. I) from Luzon as typical "*angularis*" (*costatus*) does not represent the type from North Celebes. It was very properly united with *V. burroughianus* by Bartsch and will probably, when large series are obtained, be found to intergrade with it quite completely, but at present, at least, it seems entitled to varietal rank.

IX.

Viviparus burroughianus (Lea).

Paludina burroughiana Lea. Trans. Am. Phil. Soc., V, 1834, p. 113, pl. XIX, fig. 80; Obs.. I, 1834, p. 225, pl. XIX, fig. 80.

Paludina angularis Reeve. Con. Icon., Paludina, 1862, Sp. 14, pl. III, fig. 14.

Vivipara angularis burroughiana Bartsch. Pr. U. S. Nat. Mus., 1907, p. 136, pl. X, fig. 1.

Vivipara costata burroughiana Kobelt. Con. Cab., Viviparidæ, 1908, p. 232, pl. 46, figs. 7–8.

This is a characteristic species of the Philippine Islands. It differs from the *V. costatus* from Celebes by its larger size, more sloping shoulder, more elevated spire and stronger carination. As the oldest available name Lea's becomes the specific designation.

X.

Viviparus burroughianus trinominis n. n.

Paludina carinata Valenciennes. Rec. d'Observ. de Zool., 1833, p. 252, pl. LVI, figs. 2a–b; Haldeman, Mon., 1841, p. 27, pl. VIII; Kuster, Con. Cab. Paludina, 1852, p. 28, pl. VI, figs. 6–7; *non* Swainson, 1820–3.

Paludina multicarinata Haldeman. Mon., 1842, Pt. 4, p. 4 of cover; W. G. Binney, L. and F.-W. Shells, Pt. III, 1865, p. 22, fig. 40; *non* Cailliaud, 1826.

Vivipara angularis Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 135, pl. X, fig. 1; *non* Müller, 1774.

Valenciennes states that his species came from Mexico, but W. G. Binney (J. de Con., XV, 1867, p. 430) and Morelet (*Ibid.*, XVII, 1869, p. 405) from an examination of the types have confirmed the opinions of Frauenfeld (Verzeichniss, Paludina, 1864, p. 583) and von Martens (Mal. Blätt., 1865, p. 149) that it is undoubtedly the Philippine species commonly known as *V. costatus* (Q. and G.). The author himself states that his specimens were given to Humboldt by a member of the Royal Council of Manilla. Valenciennes' figure copied by

Haldeman is almost exactly the same as that given by Bartsch (l. c.) as the typical form of *V. angularis* (Müll.).

Haldeman's name was proposed on account of the priority of *Paludina carinata* Sw., but *multicarinata* has already been used by Cailliaud (Voy. Meroe, 1826, pl. IX, fig. 6) for another species, so that it is not available at the present time even in a varietal sense.

None of the earlier names proposed for this form being available and, as in the light of our present knowledge, the race seems worthy of varietal recognition, a new one is given as above.

Frauenfeld (Verzeichniss, Paludina, 1864, p. 571) considers this form as the same as *tricarinata* Ant., but if the figures given of that species by Philippi and Kuester correctly represent it, it is quite different.

XI.

Viviparus tricarinatus (Anton).

Paludina tricarinata Anton. Verzeichniss, 1839, p. 52.

Anton did not figure his species and I have not been able to consult his original description. Kuester (Con. Cab., Paludina, 1852, p. 27) considered it to be a variety of *angularis* Müll. (*costatus* Q. and G.) "differing only in the sharper carinæ, two on the upper whorls and three on the last," and remarks that every gradation between the two forms is to be found.

Tricarinata is not mentioned by Reeve in the Conchologia Iconica nor by Kobelt in his recent monograph in the Conchylien Cabinet.

I have not seen any Philippine specimens that are referable to this species, but Bartsch's *zamboangensis* evidently groups with it, if we are justified in assuming that Kuester's figure (pl. 6, fig. 5), which he gives as a "mittelform" in the series between the typical form and the variety, fairly represents the species.

I have two specimens in the James Lewis collection (Coll. Walker, No. 12553) from Celebes (pl. IX, fig. 11), which agree fairly well with Kuster's figure above mentioned. They differ from typical *costatus* by their more elevated form, the sloping shoulder of the whorls and in the accentuation of the three principal carinas.

Philippi's figures of *tricarinatus* copied on pl. VIII, figs. 2–3, are not quite so much elevated and look not unlike *V. javanicus luzonicus* as figured by Kobelt (pl. 46, fig. 9) and herein. Philippi notes several minor differences between his specimens and Anton's description, but "has no doubt" but that his shells are correctly identified.

In the absence of specimens with their opercula, the standing of Anton's species and its relations to both *costatus* and *javanicus* must remain uncertain.

XII.

Viviparus javanicus luzonicus Kobelt. Pl. IX, fig. 8.

Vivipara javanica luzonica Kobelt. Con. Cab., Viviparidæ, 1909, p. 378, pl. 46, figs. 5, 9 and 10.

The Sarasins (Suessw. Moll. Celebes, 1898, p. 59) were the first to call attention to the radical difference in the opercula of the two species, *V. costatus* Q. and G. and *V. javanicus* v. d. Busch, which in their shell characters are often quite indistinguishable.

In *javanicus* and its allies the central part of the inner side of the operculum is occupied by a granulated area, which is surrounded by a smooth, polished border.

In *costatus*, on the other hand, the central portion is smooth and polished, but is surrounded by a narrow, distinctly granulated area and outside of this the remainder of the surface is smooth and polished like the centre.

Kobelt (l. c.) has described a race from Daraga, Luzon, which has the typical *javanicus* operculum, but in other respects closely resembles *costatus*. I have similar specimens with their opercula, figured above, which were collected in the Philippines by Steere, but no exact locality is given.

Among the shells received from Mr. Webb was a single specimen from Panique, Tarlac Prov., Luzon, which agrees in its shell characters with the Steere specimens, but unfortunately has no operculum.

If Anton's *tricarinata* should prove to be identical with this form, his name would have priority.

XIII.

VIVIPARA ZAMBOANGENSIS Bartsch. Pl. VIII, fig. 8.

Vivipara zamboangensis Bartsch. Pr. U. S. Nat. Mus., XXXII, 1907, p. 137, pl. XI, fig. 19.

This species was also collected by Steere many years ago at Zamboanga. The operculum (fig. 8) shows that it belongs to the *javanicus* group. I have also received it from the Geneva (Switzerland) Museum, but without exact locality, labeled "*angularis* Müll." by Brot.

A single specimen (pl. IX, fig. 9) from Bugasong, Antique, Panay, was received from Mr. Webb, which resembles the typical form in shape, but differs in the details of the carination. The peripheral and shoulder keels are as in the type, but the central one has disappeared and the space between the two that remain is divided by four lesser keels, of which the two in the middle are a little more prominent; the whole surface is very finely, spirally lirate as in the type but rather stronger. The lip is black-edged and bluish-white within. The apical whorls are dark purple, which passes into a yellowish-green on the intermediate whorls and become a darker green on the body-whorl. The umbilicus is as in the typical form.

This form may be called *V. zamboangensis duplocinctus*.

The type (No. 45204 Coll. Walker) has 5½ whorls and measures: alt. 25.2, diam. 17.2 mm.

I am indebted to Dr. Pilsbry for photographic copies of Lister's description and figure and also of *P. carinata* Sw. and *N. angularis* Müll. And to Miss Mina L. Winslow of the Museum of Zoology, University of Michigan, for the reproduction of Philippi's figures of *P. tricarinata* Ant.

SUPPLEMENTAL NOTE.

Since the foregoing paper was written I find that Bavay found the original and unique type of *Paludina tricostata* Lesson in the Museum of Paris and figured it in his paper on the "Land and Fresh-Water Shells of New Guinea" (Nova Guinea, 1908, p. 270, pl. XIV, fig. 1). Unfortunately he added nothing to the meagre description of Lesson, but contented himself with giving an apparently excellent, life-size figure. Although he followed von Martens in considering it identical with *P. costata* Q. and G., I do not think that the figure in any way supports his conclusion. As shown by his figure, *tricostata* is a small, globose form with two visible carinas, the upper one scarcely more than a strong angle, the peripheral one is well developed, the third (and intermediate?) one, if it exists, is not shown in the figure.

Bavay associates with this as varieties two forms, one much larger and the other about of the same size, both of which are much more strongly carinated and have a funicular umbilicus surrounded with a strong carina. *Tricostata* has no indication of an umbilicus of this form and no umbilical carina. Bavay's varieties are certainly clearly distinct from *costata* and apparently so from *tricostata*.

Lesson's type came from Lac Sentani at Asc.

So far as can be determined from Bavay's figure *tricostata* is apparently specifically distinct from *costata* and Quoy and Gaimard's name should be used for the species described by them.

A HAWAIIAN FORM OF TAPES PHILIPPINARUM.

BY WM. ALANSON BRYAN.

From a reliable native fisherman I learn that this species of clam was plentiful at a certain locality in the mud-flats at Ewa, on Oahu, more than thirty years ago, but that it apparently completely disappeared from that locality. The native name "Okupi" was commonly used for the species then though more recently the name "Mahamoi" is sometimes used to distinguish it from the more common edible "Olepi" (*Tellina rugosa* Born).

The story given in accounting for the unusual nature name "okupi," which means leg-weary, tired or exhausted, is that "a long time ago a native chief with his family and attendants, while spending a day at the seashore, accidentally discovered this clam as they were wading in the soft oozie black mud, deposited in the estuary of the stream. None of them knew a name for the clam; no one had ever seen it before: it was a new comer and a stranger to the oldest inhabitants. After wading about in the sticky mud for a time and having gathered a quantity of the shells, the company, exhausted from their labor, sat down on the shore to rest. It was decided that the chief must name the *malihini* (stranger). Being a stout man and not accustomed to such strenuous labor as he had just been engaged in, he declared that the name of the new clam should be "okupi."

A few hours spent collecting specimens was sufficient to convince me that the name was most appropriately bestowed.

The species seems to be entirely restricted to brackish water mud-flats and is easily killed by either fresh or sea water. My native informant states that after the okupi had been abundant for several years during his youth, there came a period of very heavy rain which flooded the lowlands about his home in Ewa. After the flood went down there was not one of this species of clam alive in that locality. Although he is a professional fisherman he had not seen the clam either in Ewa or at Kalihi (where he had resided since 1886) until a few months ago, when the natives began to secure them in quantity from the Kalihi and Moanalua mud-flats, not a mile distant from his home.

In a large series of 456 specimens 68 have deep purple interiors; 374 bluish-white and 14 are from yellow to salmon colored, the proportions remaining the same in full grown and immature shells. When this clam is cooked the varied dark greenish-brown or purple-brown markings[1] change to a rich chestnut (or between russet and cinnamon-brown of Ridgeway) but the interior of the shell is not affected. The majority of the colored figures of this genus that we have examined are apparently made from sun-bleached shells or those that have been opened in hot water and accordingly do not show the color as in life.

While these shells agree in the main with the figure and description of *Tapes philippinarum*, and with Japanese specimens they differ by the somewhat larger size and bolder markings. It may be as well to have a varietal name, *Tapes philippinarum okupi*, for the Hawaiian form.

[1] Bone-brown to clove-brown in the dry shells.

A NEW EPIPHRAGMOPHORA FROM THE COAST RANGE OF CALIFORNIA.[1]

BY PAUL BARTSCH.

Epiphragmophora tudiculata colusaensis, new subspecies.

Shell depressed helicoid, pale brown with an olive tinge above and olive with a brownish tinge below, provided with a narrow chestnut-brown supraperipheral spiral band which is fringed on each side by a narrow zone a little lighter than the ground color; inside of the aperture and the slightly reflected lip, pale purplish, the spiral brown band and its bordering lighter zones well marked. Nuclear whorls one and three-fourths, well rounded, minutely granulated; the succeeding turns marked by more or less regular obliquely retractively curved riblets, which are about half as wide as the spaces that separate them. The last turn shows a few irregularly distributed malleations on the upper surface. Base narrowly umbilicated, the umbilicus about half covered by the reflected columella. The under surface of the whorls are well rounded and marked by the continuations of the axial riblets which extend feebly into the umbilical area, becoming crowded in this region. The peripheral half of the base shows numerous malleations while the umbilical half is almost devoid of them. Immediately behind the reflected peristome there is a concentration of fine pustules which are densely scattered over about one-twentyfifth of the last whorl; within the umbilicus they extend back a little farther covering probably a tenth of a turn. Aperture large, very broadly oval; peristome slightly reflected, inner lip decidedly reflected, parietal wall covered by a thin callus.

The type, Cat. No. 334721, U. S. N. M., and two additional specimens were collected by Mr. G. Willett "in an old rock slide on the north slope near the summit of a hill about a mile southeast of Sites, Colusa County, California, January 29, 1919," that is, on the east slope of the coast range north of San Francisco Bay. The type has 5¼ turns and measures: altitude 15 mm., greater diameter 24.4 mm., lesser diameter 19.6 mm.

[1] Published by permission of the Secretary of the Smithsonian Institution.

The largest of the three specimens, a dead individual, measures: altitude, 16 mm.; greater diameter 27.1 mm.; lesser diameter 21.2 mm.

No race of *Epiphragmophora tudiculata* appears to have been described from that general region. The general form and the weak malleations of the surface distinguish this race from the other members of the *tudiculata* group and strongly suggest *Epiphragmophora traski*, but the nuclear characters as well as the other sculptural features all ally it with the *tudiculata* complex.

NOTES ON VARIATION IN PLANORBIS CAMPANULATUS SAY, FROM BLUE SEA LAKE, QUEBEC.[1]

BY E. J. WHITTAKER.

Variability in *Planorbis campanulatus* is much less common than it is in a related species, *P. trivolvis*, in which variation with reference to size and aperture of the shell has resulted in many varieties being established by conchologists. The shell in *P. campanulatus* may vary in size in certain localities, due to differences in bottom environment and food supply, but in the same area the form is apt to be constant. While at Blue Sea Lake, Wright County, Quebec, about eighty miles north of Ottawa, in the summer of 1918, the writer secured a large series of *P. campanulatus*, in which several well-marked deviations from the normal type were observed.

Previous Observations.

Various observations have been made on variation in this species among which are the following:

Tryon[2] remarks: "The plan of the spiral in this genus (*i. e.* Planorbis) is such as to yield readily to pressure, hence monstrosities are rather frequent. This consists of a tilting-up of the whorls on one side, or even a conical elevation of the spire. The smaller forms appear to be most liable to this distortion."

[1] Published by permission of the Director of the Geological Survey of Canada.

[2] Tryon, Geo., Jr., Manual of Conchology, vol. 3, p. 106.

Dall[1] remarks of *P. campanulatus rudentis*: "Very similar specimens were obtained from Anticosti, and from Marl Lake, Michigan, in which the coil is even more irregularly wound, a condition I take to be pathological."

Bryant Walker[2] remarks of *P. multivolvis*: "When it (*i. e.* the abnormality) occurs, it bears the appearance of an abnormal extension of the last whorl being more or less irregular in form and usually deflected from the plane of the rest of the whorls;" and adds that occasionally *P. campanulatus* has a similar abnormality. This would appear to be the closest approach to No. 8 in the plate accompanying this paper.

Dr. Frank C. Baker[3] describes *P. campanulatus smithii*. This species would seem to be very similar, with regard to the deflection of the last whorl, to the ones discussed here, but the whorls of that variety are "strongly carinated above and below, the last whorl being particularly so marked." This serves to distinguish the forms. Mr. Baker observes, however, as in the specimens from Blue Sea Lake, the presence of the typical form of *P. campanulatus* which shows marked variation toward the *smithii* type.

Robertson[4] states: "Often distorted so that the tops of the whorls are inclined at various angles. Varies considerably in the length of campanulate expansion and thickness of shell." This is of interest because the area, which his report covers, lies within the Archaean region of Georgian Bay, where similar conditions to those at Blue Sea prevail.

Tryon[5] describes and illustrates an abnormal specimen of *Planorbis bicarinatus*, which has developed in exactly the same

[1] Dall, W. H., Land and Fresh-Water Mollusca, Harriman Alaska Expedition, vol. XVIII, p. 90.

[2] Walker, B., Mollusca of Michigan, NAUTILUS, vol. 6, p. 136.

[3] Baker, F. C., A New Planorbis from Michigan, NAUTILUS, vol. 25, p. 119.

[4] Robertson, A. D., Mollusca of Georgian Bay, Contributions to Canadian Biology, Supp. 47th Annual Report, Dept. of Marine and Fisheries, Fisheries Branch, Pt. 2, p. 101.

[5] Tryon, Geo., Jr., An Abnormal Specimen of Planorbis bicarinatus. Journ. of Conchology, vol. 2, p. 3.

manner as has the specimen No. 8 of this plate. From the illustration it would be taken for an ordinary dextral shell.

Description.

In the following description only the characters of interest in this discussion are noted: "Shell sinistral, discoidal, more or less rounded; surface shiny, lines of growth oblique; whorls four, rounded above and below, rather subcarinated; gently and regularly expanding; spire flat or on a level with the general plane of the whorls; periphery rounded, aperture lunate, mouth of the aperture dilated to a great extent forming a bell-shaped expansion; last whorl contracts slightly just before the dilation commences; heavy ridge inside aperture beneath constriction forms narrow throat."

The last whorl in many cases shows a tendency to turn slightly upwards, the effect of which is accentuated by the rapidly flaring aperture. In the normal type this is so inconsiderable as to be omitted in most descriptions of the species. Gould[1] and Haldeman,[2] however, mention this feature. The former says: "The whorls enclose each other in a very regular spiral to the last fifth of the outer one, where there is a sudden enlargement and distortion toward the left" (*i. e.* upward). The latter says: "Remarkable for the deflection and dilatation of the last whorl." The figures accompanying the above show the deflection of the lower edge of the aperture to be not more in any case than one-quarter the height of the body whorl. Binney's figure 184, reprinted by Call[3] and others, shows a similar slight deflection. Dr. Baker's[4] plates show no such deflection, and the writer has many specimens in the collections here in which that feature is very inconsiderable. It appears from the fact that so many descriptions are silent on this point,

[1] Gould, Invertebrata of Massachusetts, ed. Binney, p. 493.

[2] Haldeman, Monograph of the Fresh-water Univalve Mollusca of the United States, part 7, p. 9.

[3] Call, R. E., A Descriptive Illustrated Catalogue of the Mollusca of Indiana, p. 410, pl. 8, fig. 12.

[4] Baker, F. C., Mollusca of the Chicago Area, Bull. 3, pt. 2, Natural History Survey, Chicago Academy of Sciences.

that this distortion upwards is not readily observed on normal specimens, and any large degree of upturn of the aperture would seem to be a variation worthy of note.

VARIATION (PLATE X).

In the form from Blue Sea Lake this tendency of the extremity of the last whorl has been greatly accentuated, as a study of Series c in the accompanying plate will show. Fig. cl, a form from Mackay Lake, near Ottawa, shows no deflection at all. The others are all from Blue Sea. In this series there is a gradual elevation of the extremity throughout. In c7 the lower edge of the aperture is more than half-way up the preceding whorl. In c8 the last whorl has been removed completely from the plane of the others, and the aperture is directed upwards at a high angle. The gradation throughout is such that all must be considered as variations within the species, though the end members are quite different. Such variation, however, if followed by the disappearance of intermediate forms would result in new species.

The last shell of the series, No. 8, represents the extreme development of the tendency to deflection from the plane of the shell of the outer whorl. Viewed by itself, it would appear to be merely a rather odd dextral form. On closer inspection it proves to have four and a-half whorls to the point, where there is a small campanulate expansion and where the distortion commenees. Therefore, so far, it is normal. The contraction forming the throat of the shell is much less than usual. The last whorl turns upward rapidly and, in a horizontal plane, almost at a right angle to the one preceding as shown in Figs. c8 and b8 respectively. In contrast to the latter, which is subcarinated above and below, the last whorl is broadly rounded above, and irregularly sub-carinated below. The lines of growth on the body whorl, though inconspicuous, are spaced normally, and those on the small campanulate portion are much finer. However on passing this enlargement, the striae become coarse again, though more oblique and irregular than on the preceding whorl. A short distance from the aperture the shell thickens slightly but there is no pronounced expansion at the extremity of this additional whorl.

In addition to the variation noted above, which is observable throughout the series, certain individuals show others. Normally the spire is on a level with, or slightly below, the plane of the whorls. Shells 1 and 4 conform to this feature fairly well. But in 2 and 3 the second to the last whorl is higher than either those preceding or the body whorl, and in 3 its plane is quite oblique. Shell *g* shows this in a less degree. Series *c* and *d* show this variation well.

Normally the whorls increase slowly and gradually to the beginning of the campanulate expansion. From this nearly all the specimens show various diversions, as shown in series *a*. Shells 4 and 5 approach the type most closely. In 3 and 6 the second to the last whorl is proportionately much the largest. In 3, 4 and 5, the whorls are rounded above except for the last volution, which is sub-carinate. In 2 and 7 the tops of the whorls are quite carinate. From the umbilical aspect as shown in series *b*, these differences are not apparent, the whorls being rounded to sub-carinate below.

The lines of growth are coarser, though not to a large degree, in some specimens than others. Shell 5 is unique in having a series of revolving lines as well. These fade away as they approach the aperture, and are most numerous about the middle of the whorl. Several individuals have also rib-like striae on the campanulate portion of the body whorl, but not elsewhere. Revolving lines on the shell were seen only on this one specimen of those from Blue Sea Lake.

The aperture itself is subject to considerable variation. There is a considerable difference in the degree of flare, and as one would expect from the varying amounts of upturn of the last whorl in the obliquity of the aperture also. Shell 6 and of course 8 are extreme in this regard. In 1 the degree of obliquity from the vertical of the plane of the aperture is 15°; in 6 it is 40°.

One feature, seldom seen in *Planorbis campanulatus*, but which is comparatively common in these specimens, is a rudimentary color banding. Unfortunately, this feature has not shown well in the plate. These colored areas are generally confined to the lower half of the whorl and consist usually of two brown revolving lines whose upper and lower boundaries are well defined. Occasionally the two are merged into one broad band. The majority of the specimens in this collection show traces of this ornamentation and in many the lines are quite clearly marked.

Factors Affecting Variation.

As seen from the above paragraph, considerable variation occurs in *Planorbis campanulatus* in the area under discussion. Although, in the literature, references to deviations from type are not common, this form would seem to be a somewhat plastic species reacting to some unusual external condition. In this case the writer attributes these modifications mainly to bottom environment. The habitat of *P. campanulatus* is usually given as *ponds or streams with a muddy bottom, or weedy areas with a muddy or sandy bottom, presumably in well-protected places.* At Blue Sea we have an entirely different set of conditions. This lake is wholly within the Archaean granite and limestone area; its shores, especially toward the north, are precipitous and rocky; and its floor, with the exception of some small muddy bays is composed of bed rock. No streams of any size enter the lake and consequently little sediment is being deposited. The larger of these bays are at the south end, and none of the specimens here discussed were collected there. The shells are often found in from one to three feet of water attached to the rock. Upon these rocks, absolutely devoid of sediment, the waves during a storm beat with great force. Yet, while waves of considerable strength were beating upon the shore, causing small pebbles, which were placed as markers, to be tossed violently to and fro, this gastropod would remain firmly attached by its foot to the rock. This habitat differs vastly from the muddy bottom of rivers or ponds. The animal holds its shell erect. Any increase in obliquity of the aperture causes the shell to be carried more horizontally, and consequently better adapted to resist wave action. In all probability this environment has developed the high degree of obliquity of the specimens from Blue Sea. *Planorbis deflectus* is an example of a form which has a somewhat oblique aperture so that it can lie almost flat, and is found occasionally on exposed rocky shores.

The problem of food may have some influence in the production of these forms. The discrepancies in size of the whorls may be connected with periods of scarcity and abundance of food. With the exception of the small muddy bays above mentioned, the bottom is very free from weeds and algae, the usual food of this gastropod. It is indeed remarkable that the lake can support so large a molluscan fauna as it does. Of plankton there is none. The gastropods are not abundant, but certain of the Unionidae in the bays occur in thousands.

The temperature of the water and range in depth of the gastropods are not sufficiently distinctive to be an important factor in this connection. The average water temperature is not much colder than it would be in the Ottawa valley.

Summary.

To summarize the results of this study it would appear that the specimens of *P. campanulatus* from Blue Sea Lake show considerable variation as follows:

a. Progressively in an increasing deflection upwards of the extremity of the last whorl and aperture from the general plane of the whorls.

b. In degree of elevation and obliquity of the spire.

c. In size and shape of the whorls, which vary from rounded to sharply carinate.

d. In presence in one specimen of well-marked revolving lines.

e. In the flare and obliquity of the aperture.

f. In presence or absence of color-banding.

Of these the first only is regularly progressive, and the latter deviations bear no relation either to it or to each other. To the writer, bottom environment, wave action, and food conditions appear to be the main factors in producing such a series of forms as have been above described. Such conditions are favorable for the development of new varieties and species.

Note.—The writer wishes to gratefully acknowledge the assistance and helpful criticism received from Dr. E. M. Kindle of the Geological Survey of Canada, and from Mr. Frank C. Baker.

Explanation of Plate X.

Variation in Planorbis campanulatus Say.

Series *a*. Apical aspect.

1. From fossil marl beds Mackay Lake, Ottawa.

2–8. From Blue Sea Lake, Quebec.

Series *b*. Umbilical aspect of the above.

Series *c*. Profile view, showing aperture of the above.

Series *d*. Profile view, from side opposite aperture, of the above.

The four views of each specimen are shown in vertical rows, *e. g.*, the four figures at left of plate represent a single shell. All figures natural size.

ON THE LAND SHELLS OF MONROE, CONNECTICUT.

BY ARTHUR JACOT.

Twelve miles north of Bridgeport, Conn. is situated Monroe Center. That part of the town of Monroe lying between the Center and the Housatonic River was searched at several localities for terrestrial mollusca by my wife and me. This region presents five well-marked biological associations in which land shells are common. Of these, the upland swamp (1) was found to be richest in number of species and individuals. A tract which has not been burned over for a great number of years lying west of my father's house and barns (1) we considered to be the best example of the upland swamp association. Water can here be found throughout the year, though much less in summer than at other times. The trees are mainly elm and soft maple with clumps of black ash rising here and there from the water. On each side of the wet area, among the maples and elms are yellow birches, white ashes, and various swamp or wet-land oaks. Lichens and mosses are very numerous, among the latter being sphagnum. The cinnamon fern grows waist-high. The dry wooded hill slopes to the south and southwest of this tract represents the second (2) association, characterized by *Polygyra fraterna* and *Succinea retusa*. The lowland swamp association (3) was chiefly studied as typified by the swamp at the head of Cargyles Pond to the east of the above-mentioned localities and at the foot of the hill. This association seems to be characterized by *Succinea ovalis* (*totteniana*). A limestone cave association (4) was merely outlined by the fauna found in a limestone fissure known as Devil's Den, situated on the north side of the Boy's Half-way River (the brook flowing from the above-mentioned artificial pond) a mile below the pond. The limestone is partly leached out, with three entrances, and partially blasted out, making a fissure cavern. Here the larger shells were quite common while the small ones were not noticed. The fifth or fluvio-terrestrial association (5) borders the Housatonic River and is characterized by *Succinea avara*. Although many other localities were examined, all the species found are represented in at least one of the above associations as outlined in the following list.

The method of collecting the smaller species was to gather leaf mould, moss and rubbish (always keeping each collection separate), dry the material in the oven, pass it through a graded series of sieves and carefully sort over each sifting. The method used for finding the larger shells, as well as the smaller, was to carefully scrutinize old wood and stones, especially the under or moist side, bases of stumps and trees, especially the "sawdust" in their cavities, the underside of bark, etc. My wife rendered me the greatest assistance in all of this tedious work.

Notice is called to the absence of *Cochlicopa lubrica* which I have found near Bridgewater, fifteen miles further north. The *Omphalinas* also were not found. No distinctly Canadian fauna species were noticed.

Carychium exiguum (Say). Common at 1, less so at 3.

Polygyra tridentata (Say). Found at 4.

Polygyra albolabris (Say). Occasionally at 1, 3 and 5, common at 2 and 4.

Polygyra thyroides (Say). Found at 4.

Polygyra hirsuta (Say). Found at 2 and 4.

Polygyra fraterna (Say). Found at 2 and 4.

Circinaria concava (Say). Found only at 4.

Vitrea binneyana (Morse). Rare, and only found at 1.

Vitrea indentata (Say). Occasionally at 1, 2, 3 and 4.

Vitrea rhoadsi (Pilsbry). Uncommon, found at 1.

Striatura ferrea (Morse). Rare, and only found at 1.

Striatura milium (Morse). Common at 1, occasionally at 2, 3 and 5.

Euconulus fulvus (Müller). Not satisfactorily distinguished from the next species.

Euconulus chersinus (Say). Common at 1, fairly common at 3 and 5.

Zonitoides hammonis (Ström). Common at 1, 2, 3 and 5.

Zonitoides arborea (Say). Abundant everywhere.

Zonitoides minuscula (Binney). Rarest of the *Zonitidae*, found only at 1.

Zonitoides exigua (Stimpson). Common at 1, fairly common at 3.

Philomycus carolinianus (Bosc). Occasional at 2 and 3.

Pallifera dorsalis (Binney). Occasional at 2 and 3.

Pyramidula alternata (Say). Occasional at 2, common at 4.

Pyramidula cronkhitei anthonyi (Pilsbry). Occasional and generally distributed.

Helicodiscus parallelus (Say). Common and generally distributed.

Punctum pygmaeum minutissimum (Lea). Occasional at 1.

Succinea retusa (Lea). Fairly common at 2.

Succinea ovalis (Say). Uncommon at 2 and 3.

Succinea ovalis totteniana (Lea). Common at 3.

Succinea avara (Say). Common at 5.

Strobilops labyrinthica (Say). Common in one spot (about a decaying tree-top) at 1.

Bifidaria contracta (Say). Found at 1.

Bifidaria pentodon (Say). Common at 1 and 3, the commonest Pupillid.

Bifidaria tappaniana (C. B. Adams). Found at 1 and 3.

Vertigo gouldii (Binney). A few specimens from 1 were considered to be this species.

Vertigo bollesiana (Morse). Occasional at 1.

Vertigo ventricosa (Morse). Fairly common at 1.

Vertigo ovata (Say). Fairly common at 1.

Vallonia pulchella (Müller). Rare, at 1 only.

SOME FURTHER COMMENTS UPON THE WORK OF LORENZO EUGENE DANIELS.

BY JUNIUS HENDERSON.

My good friend Ferriss, in the interesting account of the life, character and scientific work of Mr. Daniels, has briefly mentioned the principal items of his work, but there is opportunity for enlargement upon some of the items. Daniels' work is a good text for a sermonette upon the great value of the non-professional and semi-professional in science. His vocation was agriculture, which furnished the means for carrying on his avocation, the collection and study of natural history material. Perhaps there is no branch of natural science that has profited more from the labors of such men than has conchology. There are few strictly professional conchologists or malacologists—that is, men whose living is derived from such work. Therefore, the progress of the science is dependent upon those to whom the work is an avocation, done for the pure love of it, with no thought of financial remuneration. After all, is not that the best reward?

Many of us may not realize the extent and value of Daniels' work so fully as we would had his modesty not kept him so much in the background. His mind was a fountain of information concerning the habits and habitats of snails and methods of caring for material, which information was freely at the disposal of his friends. He was usually content to allow others to do the publishing, or to appear only as joint author. I only recall seven papers bearing his name as the sole author. Probably there are others. In the former account his Minnesota and Montana work was not mentioned. His Minnesota paper covered a field where work was much needed, for the literature of that state was scant compared with that of many states. His Montana work, published by Vanatta, was in a vast territory that has only been scratched in a few places by students of Mollusca. His two seasons in Indiana, prior to 1903, forming the basis for his Catalogue, added 91 to the 184 species and varieties listed for that state by Call, and he has since added others. It is impossible to estimate, without a great deal of time spent in searching the literature, the forms new to science discovered by him individually or jointly with others, or the extent to which his discoveries have added to the known range of species. Only a small proportion of the species he discovered bear his name. In view of the large amount of work he did in collecting snails of the genus *Oreohelix* in six states, sometimes by himself, sometimes with others, and the number of new forms of *Oreohelix* discovered on those expeditions, it is a shock to realize that no member of that genus is dedicated to him by name.

Another thought has been in my mind for some time. In estimating the work of such an enthusiastic and indefatigable collector, do we place a high enough value upon the benefit to science of the wide distribution of the material, accompanied by reliable data, to other collections and particularly to museums? Material obtained by Mr. Daniels in out-of-the-way places has reached many institutions where it will be studied by hundreds of students for perhaps a century to come, and doubtless will result or assist in adding many facts to our knowledge of natural history, especially of the distribution and variation of species, and straightening out problems of nomenclature and classification, in the years to come.

Mr. Daniels' collections in eleven states have resulted in published reports. I believe he also made one or two trips to Florida, but do not know whether those trips resulted in any publications. Wright, in his description of *Unio danielsi*, from Georgia, stated that Mr. Daniels partly financed some work in that state too.

In addition to the loss to science, those of us who have endured hardships with him in a difficult country, and enjoyed his quiet companionship, looking forward to other trips, feel a deep personal loss in his removal from our midst.

REMARKS UPON THE IDENTITY OF "UNIO FASCIATA," RAFINESQUE.

BY L. S. FRIERSON.

Lampsilis fasciata, Rafinesque.
Unio fasciata, Rafinesque, 1820.
Unio siliquoideus, Barnes, 1823.
Unio inflatus, Barnes, 1823.
Unio distans, Anthony, 1865.
Unio luteolus, Auct. as of Lamarck.

The above wide-spread, common, and well-known Naiad, is seldom given the name which we adopt ("fasciata, Rafinesque") but is all but universally known as "luteolus" as of Lamarck. The use of the latter as the specific name of the shell is merely the unquestioning acceptation of the dictum of Dr. Lea, who on returning from Europe in 1833, wrote that the "specimen cited by Lamarck" seen by him in the "Garden of Plants" was a "true siliquoideus" of Barnes. Against this application of Lamarck's name for the species, the following reasons seem just.

(1) Lamarck's description does not describe the species in question, but does fairly well describe the Unio cariosus, Say, as evidenced by the unanimous opinion of all writers previous to Lea's pronouncement of 1833 (as well as by some of the more courageous spirits since that event).

(2) Lamarck gives as habitats (he must have seen more than one?) the "Susquehanna and Mohawk Rivers."

The cariosus abounds in these streams, but from neither of them did Lamarck obtain specimens of the species *luteolus*, Auct. (The shell does not live in the Susquehanna; but according to Marshall the species is now an immigrant in the Mohawk through the Erie canal, and this is confirmed as to the Genesee by Ortmann.)

(3) Lea claimed that the specimen seen by him, "cited by Lamarck," was a "true siliquoideus, Barnes;" but his identification was disputed by Férussac, who stated that according to Lamarck's "example" the shell was "cariosus, Say."

The use of "luteolus" as the specific name of the species in question is therefore unwarranted by the description; is absolutely contradicted by the habitats assigned, and rests solely upon the identification of a specimen made by one student, which was at once contradicted by another of equal ability, for it must not be overlooked that in 1832 Lea was by no means the "authority" that he afterwards became.

(In 1829 Lea considered the "Unio cornutus" to be a "protean species" whose "varieties run into the aesopus," and embraced those species which Lea afterwards knew as "Unio perplexus" and "foliatus." It was still later before he appreciated the specific differences existing between "Unio verrucosus" and "pustulosus;" or between the "Unio plicatus and multiplicatus.")

Notwithstanding that Lea in 1832 conversed with Férussac over the cabinet of the latter, concerning their "favorites, the Unios," the latter student (who had specimens of the present species in his cabinet) stuck to his opinion that the "luteolus of Lamarck" was the "cariosus, Say."

In view of the above the continued use of Lamarck's name for the present species is clearly unwarranted, except by the rather flimsy claim of usage.

Turning now to the name we adopt (fasciata, Rafinesque) we find from its description that Rafinesque had before him an extremely wide-spread species, found practically all over the Ohio drainage, occurring, he writes, "in the rivers Ohio, Alleghany, Muskingum, Kentucky, Green, Salt, etc."

Aside from other characters he states that his species (which though ordinarily small, attains a length of three inches) is inequilateral, elliptical, ventricose and rather thick.

Its epidermis is olive, with brownish rays; a variety has dark rays; another is greenish with blackish rays, alternately wider and narrower; others are copper-colored, with olive rays.

The nacre is bluish, except that in the last variety it is coppery-white. The cardinal tooth is "divaricate."

A handsome species approaching the "ochraceus, Say."

The above characters can be ascribed to no known Naiad from the Ohio drainage except to the species in question.

(A conclusion made doubly certain when we know that even Dr. Lea thought that the "Lampsilis fasciola, Rafinesque" might be the species which he (Lea) had afterwards named "Unio multiradiatus.")

It is true that the name "Unio fasciata, Rafinesque," was given by Conrad to a rayed specimen of "ligamentinus, Lamarck" (Monography, Plate I, 1836), an error which may yet quite often be found duplicated in cabinets.

But this patent error of Conrad's scarcely militates against the conclusions drawn, since we find in the same work (Monography) figured as one species, specimens of the very diverse shells, Unio fisherianus, Lea, and Unio nasutus, Say (Plate 18).

We find, too, that Conrad figured under the name of "Unio glans, Lea," a specimen of the very different Unio perpurpureus, Lea (Monography, Plate 9), etc.

As bearing upon Conrad's figure referred to, Dr. Lea cogently remarks: "Mr. Conrad thinks the 'crassus, Say,' is the 'fasciata' of Rafinesque. An examination of his description ought to satisfy any one that the 'crassus, Say' could not have been under the eye of the author when he made his description of 'fasciata.'"

As bearing upon the identification of "fasciata" with the "pseudo-luteolus"—the "Unio siliquoideus, Barnes," it is a matter of history that Rafinesque often sent to Ferussac specimens of shells from the West, bearing names given by the donor.

Dr. Lea records the fact that specimens of the "siliquoideus, Barnes" were seen by him in the cabinet of Ferussac in 1832, labeled "Unio fasciata, Rafinesque."

All of the available evidence therefore goes to show that the name "fasciata, Rafinesque" must supplant as the specific name of the species, the "luteolus, Lamarck," the latter being a synonym of the early "Unio cariosus, Say."

ELIZABETH LETSON BRYAN, SC. D.

Elizabeth Letson Bryan died on February 28th at her home in Honolulu, of an organic heart affection after an illness of nearly eight months.

Mrs. Bryan was born April 9, 1874, at Griffin's Mills, Erie Co., New York, the only child of Augustus F. and Nellie Webb Letson. She was a direct descendant from Governor Bradford, first governor of Massachusetts, and was a member of the Mayflower Society of New York. She early became interested in natural history, especially conchology. In 1892 she entered upon her long service in the Buffalo Society of Natural Sciences, of which she became Director in 1899, finally retiring, after a connection of seventeen years, upon her marriage to Professor William Alanson Bryan in 1909. This long period was interrupted by several years given to study in the Academy of Natural Sciences of Philadelphia and the United States National Museum.

In 1899 the Conchological Society of Buffalo was organized by her, and a new period of local enthusiasm for the study of mollusks began. In 1906 Alfred University conferred the honorary degree of Doctor of Science. She was a member of the American Association for the Advancement of Science, the Conchological Society of Great Britain and Ireland, and various other scientific bodies.

Dr. Letson's publications relate chiefly to the mollusks of New York, the more extensive being a Check List of the Mollusca of New York, Bull. 341, N. Y. State Education Department, 1905; Post-Pliocene Fossils of the Niagara River Gravels, published in a Bulletin of the State Museum, 1901; a partial list of the shells found in Erie and Niagara counties and the Niagara frontier, Bull. Buffalo Soc. Nat. Sci., IX, 1909. At the time of her marriage to Professor Bryan, of the College of Hawaii, and her removal to Honolulu, she was working on a monograph of the New York Mollusca.

In Honolulu Mrs. Bryan engaged ardently in the collection of marine shells. Professor Bryan, who had before been chiefly known for his work on birds, added the mollusks to his other interests, and together, on many an island collecting trip, they amassed the largest collection of Hawaiian marine shells yet brought together.

For several years she had served as librarian of the College of Hawaii, a congenial task bringing many young people under her influence.

In 1917–18 Professor and Mrs. Bryan traveled in California and the East, spending several months at the Academy of Natural Sciences in studying Hawaiian shells. For the same purpose the museums of Cambridge and Washington were also visited.

Mrs. Bryan's gracious personality and sunny outlook, no less than the genuine love of nature which determined the course of her life, made her many warm friends who mourn her untimely death. H. A. P.

Dr. Herbert Huntington Smith, Curator at the Museum of the University of Alabama, was killed by a train on March 22. A notice of his life and work will appear later.

NOTES.

The Introduction of Acanthinula harpa (Say) and Circinaria vancouverensis (Lea) into St. Paul Island, Alaska. —In order that there may be a definite record of the introduction of these two species by man into St. Paul Island, I wish to state that I placed about ten specimens of each of these species behind the laboratories on St. Paul Island, of the Pribiloff Group, in June, 1916. It may also be well to note that I was unable to find any trace of these in 1918. This, of course, does not mean that they may not still be in existence there.—G. Dallas Hanna.

HENDERSON COLLECTION OF ANTILLEAN LAND MOLLUSKS.—The National Museum has recently received as a gift from Mr. John B. Henderson, one of the Regents of the Smithsonian Institution and a prominent malacologist, his entire collection of Antillean land mollusks, comprising approximately 400,000 specimens. The bulk of the collection is the result of expeditions to the Antilles made by Mr. Henderson and his assistants for the sole purpose of visiting unexplored or little known regions, or for collecting specimens in the identical localities from which the original types were obtained.

Dr. H. A. PILSBRY has recently been elected a Corresponding Member of the Zoological Society of London.

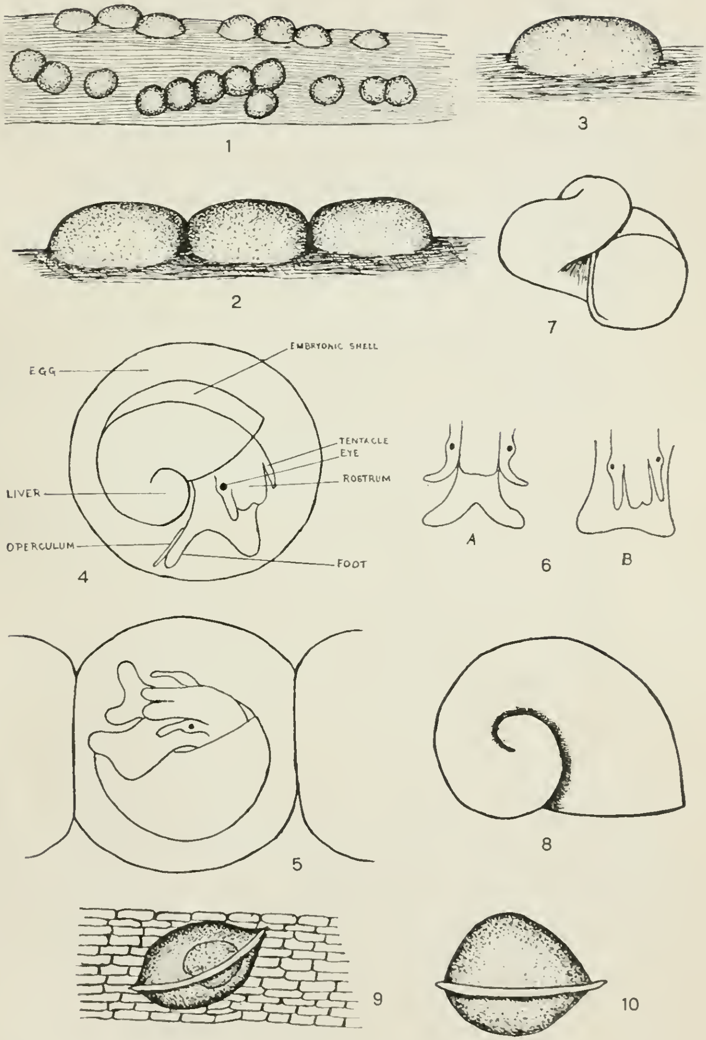
PUBLICATIONS RECEIVED.

THE PLIOCENE MOLLUSCA OF GREAT BRITAIN. By F. W. Harmer (Palaeontographical Society, Vol. I, parts 3 and 4, pp. 303–483, plates 33–44, 1918 and 1919). This completes Vol. I. Part 1 was published in 1914 and part 2 in 1915, the whole being supplementary to S. V. Wood's Monograph of the Crag Mollusca. It brings the subject up to date and adds much to our knowledge of the distribution of some of the American species in Pliocene times. Aside from some of the species which are circumpolar in distribution, *Sipho pygmaea*, *Bela bicarinata*, a var. of *Eupleura caudata*, *Turritella erosa* and *Nassa trivittata* are also recorded from the pliocene and pleistocene of Great Britain. Part IV contains the title page and index to the volume.—C. W. J.

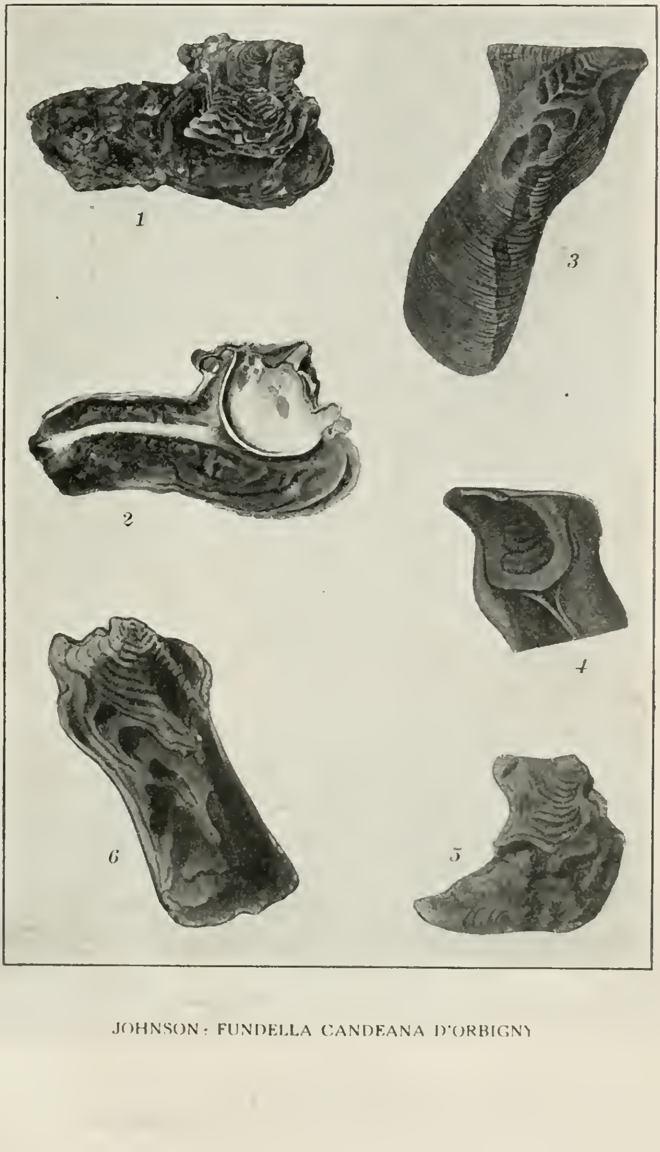
POST-GLACIAL MOLLUSCA FROM THE MARLS OF CENTRAL ILLINOIS. By Frank C. Baker (Jour. of Geol., Vol. 26, pp. 659–671, 1918).

ON SOME TERTIARY FOSSILS FROM PRIBILOF ISLANDS. By W. H. Dall (Jour. Washington Acad. Sci., Vol. 9, 1919). The collection of some 47 species made by Mr. G. Dallas Hanna, is of interest as linking up the age of the strata with the beach deposits at Nome which are referred to the late Pliocene.

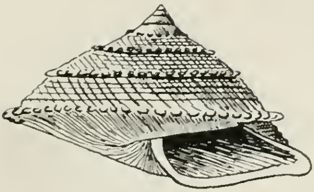
SNOWBANKS IN AUGUST—GODDARD PASS, SIERRA NEVADA.
NINETY ABOVE IN JANUARY—TWIN CACTI CAMP, ARIZONA.



BAKER: GILLIA AND AMNICOLA.



JOHNSON: FUNDELLA CANDEANA D'ORBIGNY



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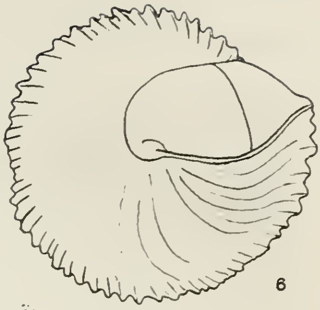

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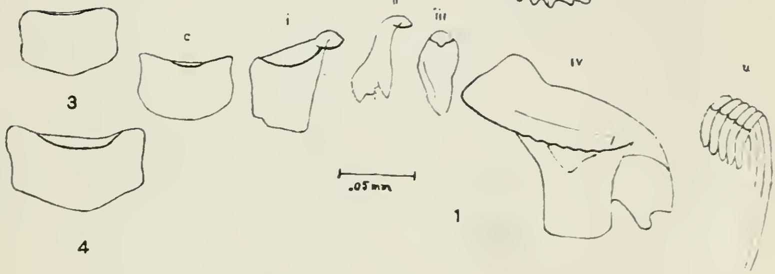

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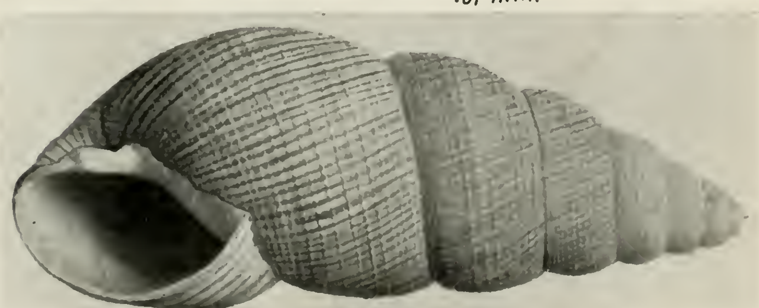

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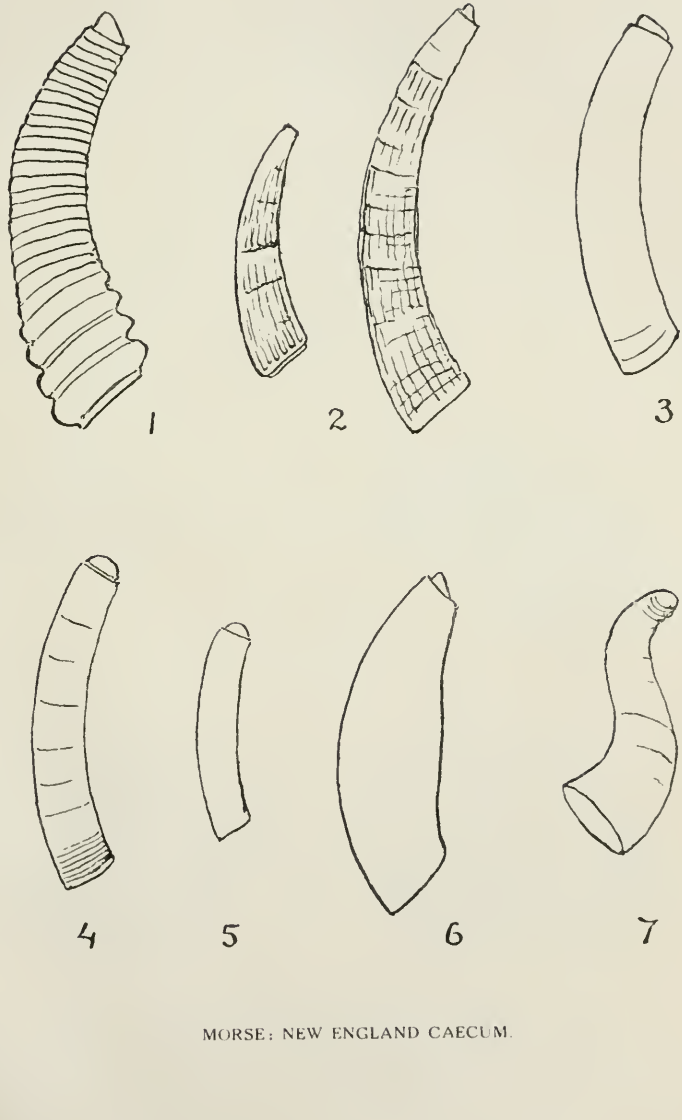
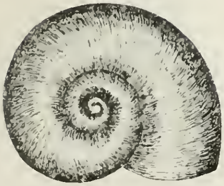
1-6. W. F. CLAPP: A NEW PRIOTROCHATELLA.
7. PAUL BARTSCH: BULIMULUS (PROTOGLYPTUS) BRUNOI × 5



MORSE: NEW ENGLAND CAECUM.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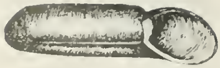
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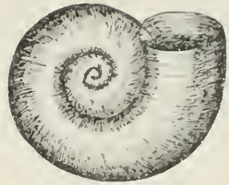
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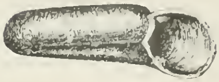
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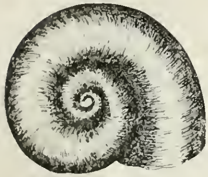
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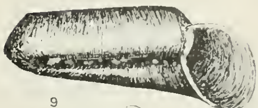
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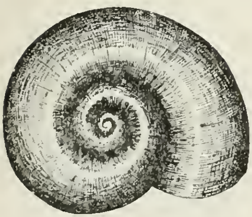
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1-10 BAKER: ON PLANORBIS.
11-13. NENIA COOKI PILSBRY.
14. OPISTHOSIPHON BERRYI W. F. CLAPP.

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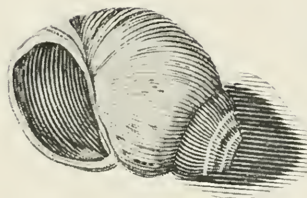

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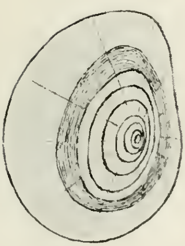

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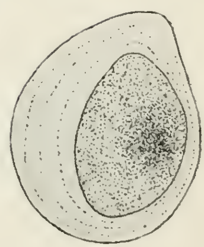

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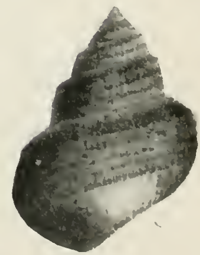

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BRYANT WALKER: PHILIPPINE VIVIPARIDÆ.

BRYANT WALKER: PHILIPPINE VIVIPARIDÆ.

WHITTAKER: VARIATION IN PLANORBIS CAMPANULATUS