ANNALES

de la
SOCIÉTÉ SUISSE DE ZOOLOGIE
et du
MUSÉUM D'HISTOIRE NATURELLE
de la Ville de Genève

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Il est constitué en outre du président de la Société suisse de Zoologie, du directeur du Muséum de Genève et de représentants des Instituts de zoologie des universités suisses.

Les manuscrits sont soumis à des experts d'institutions suisses ou étrangères selon le sujet étudié.

La préférence sera donnée aux travaux concernant les domaines suivants: biogéographie, systématique, écologie, éthologie, morphologie et anatomie comparée, physiologie.

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Evaluation de l'entretien des prairies sèches du plateau occidental suisse par le biais de leurs peuplements arachnologiques (Arachnida: Araneae)*

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Evaluation of dry grassland management on the Swiss occidental plateau using spider communities (Arachnida: Araneae). - Dry grassland is a seriously endangered habitat in Switzerland. Within the framework of the Swiss Dry Grassland Inventory, the question of whether current management techniques meet the protection requirements was asked. The current research, using spiders as representatives of many epigeic groups, was expected to show what influence the management has on the small animal fauna. For that reason, a valuation method was developed which is based on the assessment of all the captured species at any given site, and does not only consider a few indicator species. It takes into account habitat fidelity and the rarity of individual species. The study showed that very extensive use (mowing in autumn, if possible not in every year) is required for the conservation of the most valuable dry grassland possible. Grazing, either by sheep or cattle, was discovered to be less favourable. Rotation of used and fallow sections of a site is recommended. In areas with different uses in consecutive years, it has been shown that spiders react quickly to changes in use and are therefore good bioindicators. Spiders should therefore be used in the future in case studies for the description of the actual condition or development of specific habitat types, together with other parameters such as vegetation.

Key-words: Araneae - ecology - habitat quality evaluation - dry grassland - conservation management - Switzerland.

INTRODUCTION

Les prairies sèches constituent les milieux herbacés les plus riches en espèces végétales et animales de Suisse (ANTOGNOLI *et al.* 1995). Elles se caractérisent par des communautés végétales qui poussent sur des terrains pauvres en substances nutritives et

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qui souffrent d'un manque d'eau périodique. Ces écosystèmes sont semi-naturels, ils ont été créés et maintenus par les activités agricoles traditionnelles non mécanisées, essentiellement le pâturage et la fauche.

En Suisse, la disparition progressive des prairies sèches a encouragé l'Office fédéral de l'environnement à actualiser l'inventaire de ces milieux. Dans cette logique, les responsables du projet ont reconnu la nécessité d'étudier l'impact de leur entretien sur les communautés animales épiédaphiques. Parmi-celles-ci, les araignées sont connues pour fournir un bon reflet de l'état de leur habitat (Clausen 1986; Maelfait *et al.* 1989; Bauchhenss 1990; Platen 1993; Gonseth & Mulhauser 1995; Pozzi 1996). Présent dans tous les biotopes terrestres, ce groupe d'arthropodes très abondants comprend beaucoup d'espèces dont les peuplements sont révélateurs de conditions écologiques précises (Hänggi *et al.* 1995; Schulz & Finch 1996).

Grâce aux méthodes d'ordination canonique partielle, Pozzi & Borcard (soumis) ont montré que les peuplements d'araignées des prairies sèches sont influencés, d'une part, par leur environnement naturel et d'autre part, par leur entretien par l'homme. Gonseth (1985), Lörtscher *et al.* (1994), Antognoli *et al.* (1995), Baur *et al.* (1996) ont utilisé les araignées pour évaluer la qualité de prairies sèches et l'effet de différents modes d'exploitation. Ces travaux montrent que l'évolution de la faune arachnologique des prairies sèches est intimement liée à l'évolution de leur végétation et par conséquent au traitement qu'elles subissent, mais ne proposent pas de méthode précise pour évaluer la qualité d'une station.

La présentation détaillée d'une méthode d'évaluation de la qualité des prairies sèches par le biais des araignées, basée sur les travaux de Hänggi (1987, 1990), est la principale originalité de notre travail dont les buts étaient les suivants:

- comparer les effets de différents types d'entretien des prairies sèches sur leur peuplement arachnologique;
- définir des mesures susceptibles d'améliorer leur qualité respective pour la faune;
- souligner l'intérêt d'utiliser la faune, et plus particulièrement les araignées, comme outil supplémentaire d'appréciation des mesures de gestions adoptées pour assurer leur conservation.

MATÉRIEL ET MÉTHODES

Stations

En 1995 et 1996, 40 stations ont été étudiées dans les régions de basse altitude (355 à 800 m) du pied du Jura vaudois, dans le canton de Genève, et dans le pays de Gex en France. Ces stations sont décrites par Pozzi (1997). D'après la typologie des milieux de Suisse (Galland & Gonseth 1990), les prairies étudiées peuvent être attribuées aux unités de végétation suivantes: a) prairies très sèches, b) prairies sèches typiques, c) prairies sèches légèrement amendées. Elles se caractérisent toutes par la dominance du brome dressé (*Bromus erectus*). Afin de ne pas compliquer l'interprétation des résultats par des effets de lisière (Heublein 1983; Hänggi 1993a;

BEDFORD & USCHER 1994), le choix des surfaces s'est porté principalement sur des terrains homogènes, aussi bien du point de vue de l'entretien que du point de vue du type de végétation. En ce qui concerne les modes d'entretien, les types suivants ont été sélectionnés: a) pâturage bovin (6 stations), b) pâturage ovin (6 stations), c) fauchage précoce (mi-juin) (8 stations), d) fauchage tardif (automnal) (7 stations), e) entretien irrégulier (4 stations), f) station abandonnée (9 stations). Il faut souligner que la plupart des entretiens sont extensifs. Si l'exploitation devient intensive (surpâturage, fauchage trop précoce, engraissement) les prairies sèches se transforment rapidement en prairies grasses (ANTOGNOLI *et al.* 1995).

RÉCOLTES DES ARAIGNÉES

La récolte des données arachnologiques a été effectuée avec des pièges au sol (Barber): gobelets blancs en polypropylène de 7 cm de haut et 7 cm de diamètre, remplis au tiers d'un liquide conservateur (formaldéhyde 4%). Les pièges (trois par station) étaient disposés en triangle au centre de la parcelle. Ils ont été vidés chaque quinzaine, d'avril à novembre (protocole selon HÄNGGI 1989). Le matériel sera déposé au Muséum d'histoire naturelle de Genève et au Naturhistorisches Museum de Bâle.

Le piège «Barber» est un piège d'activité particulièrement efficace pour l'étude de la macrofaune la plus mobile du sol, de la litière ou de la strate herbacée. Il est inadapté à la capture des espèces sédentaires (araignées à toile par exemple) dont l'activité au sol est, par définition, très limitée ou pour les espèces dont l'essentiel de l'activité a lieu sur les buissons, sur les troncs, les branches ou dans la couronne des arbres. Les résultats qualitatifs et semi-quantitatifs obtenus par cette méthode de piégeage ne concernent donc qu'une partie seulement des peuplements des milieux étudiés et ne permettent pas d'obtenir un reflet fidèle de la diversité réelle d'un milieu à forte structure tridimentionnelle. Par contre, les données rassemblées avec cette méthode sont extrêmement efficaces pour effectuer une comparaison des diverses stations prairiales choisies dans le cadre de cette étude.

LISTE DES ABRÉVIATIONS

Les abréviations suivantes sont utilisées dans l'évaluation des stations, les résultats et la comparaison des stations par type d'entretien:

AB	stations abandonnées
CLpEU	classes de pourcentage des espèces euryèces
CLVM1 et CLVM2	classes des indices VM1 et VM2
CLVST	classes de valeur stationnelle globale (VST)
CLVSTH	classes de valeur stationnelle théorique (VSTH)
EI	stations entretenues irrégulièrement
F	indice de fidélité des espèces
FP	stations fauchées précocement
FT	stations fauchées tardivement
HVL	milieu de haute valeur
IVL	milieu intéressant de valeur limitée
NIND	nombre d'individus
NOS	nombre d'observations en Suisse (versant nord des Alpes uniquement)

NSP	nombre d'espèces
PB	stations pâturées par des bovins
pEU	pourcentage des espèces euryèces
PO	stations pâturées par des ovins
R	indice de rareté des espèces
st.	station
SUM	somme des indices VM1 et VM2
SVP	milieu sans valeur particulière
THVL	milieu de très haute valeur
UGBN	charge en bétail, nombre UGB pour 100 jours de pâture
V	valorisation: SVP, IVL, VAL, HVL et THVL
VAL	milieu de valeur
VM	indices VM1 et VM2
VM1	indice de valeur stationnelle VM1 = CLpEU * CLVST
VM2	indice de valeur stationnelle VM2 = CLpEU * CLVSTH
VSP	valeur spécifique VSP = R * F
VST	valeur stationnelle globale VST est la somme des VSP d'une station

EVALUATION DES STATIONS

Plusieurs méthodes ont été proposées pour l'évaluation d'un milieu du point de vue de la protection de la nature (littérature compilée dans Marti & Stutz 1993). Elles présentent différents objectifs: évaluation qualitative d'un site, évaluation des effets des mesures de gestion, évaluation à différents niveaux de perception de l'espace: paysage, milieu complexe ou station. En Allemagne, plusieurs auteurs ont proposé des méthodes pour des évaluations plutôt globales en considérant différents facteurs abiotiques et divers groupes biologiques (Plachter 1992, 1994; Holstein 1995; Beinlich *et al.* 1995).

La méthode utilisée ici se base sur les travaux de Hänggi (1987) et sur leurs développements ultérieurs (Hänggi 1990). Elle n'est pas basée sur l'ensemble de la faune mais est au contraire focalisée sur les araignées. Cette approche est fondée sur «l'hypothèse» qu'une valorisation «globale» n'est pas réaliste, car ce qui semble bénéfique pour un groupe (lépidoptères par exemple) ne l'est pas forcément pour un autre groupe (araignées par exemple) puisque leur biologie et leurs exigences écologiques sont totalement différentes. D'autre part, cette méthode prend en considération toutes les espèces «piégées» dans une station. Nous pensons en effet, que la valeur d'une station ne peut être définie seulement à partir de quelques espèces indicatrices: la présence de certaines espèces de faible valeur (espèces typiques des stations entretenues de manière très intensive) peut être un indice précoce de changement des conditions du milieu même si toutes les espèces indicatrices de bonne qualité sont encore présentes.

Cette méthode, qui se fonde sur l'étude du peuplement arachnologique d'une station, tient compte de paramètres importants pour l'évaluation de sa qualité: la rareté des espèces capturées et leur fidélité au biotope (Fig. 1). Contrairement aux indices de diversité, qui ne tiennent compte que du nombre d'espèces différentes capturées dans une station et de la distribution d'abondance de ces espèces, cette méthode privilégie la spécificité des peuplements par rapport aux habitats présents. Ainsi, elle permet de ne pas sous-estimer la qualité des biotopes très homogènes renfermant peu d'espèces mais dont les liens avec les conditions du milieu sont très étroits (espèces sténoèces) et parallèlement de ne pas surestimer les stations riches en espèces ubiquistes (euryèces). Par exemple, une roselière renferme peu d'espèces mais de valeur spécifique élevée tandis que certains milieux artificiels bien structurés ont un grand nombre d'espèces triviales.

Cette méthode a été développée afin de déterminer la valeur de chaque station et de faciliter la comparaison des résultats obtenus. Pour cela, nous avons attribué deux indices distincts aux différentes espèces capturées. Ces indices sont les suivants:

RARETÉ (R)

La notion de rareté est intimement liée à la répartition des espèces. Cet indice, qui oscille entre 1 et 6, est basé sur les connaissances faunistiques actuelles provenant de nombreuses publications (MAURER & HÄNGGI 1990; HÄNGGI 1993b; BAUR *et al.* 1996; POZZI 1996). Certaines modifications ont donc été apportées aux indices retenus par HÄNGGI (1990). Ces modifications ont en outre entraîné une révision des limites des classes préalablement établies.

classes	rareté	NOS	% N	% NSP
1	espèce banale	NOS > 30	17.7	9.6
2	espèce très commune	30 ≥ NOS > 20	20.0	12.6
3	espèce commune	20 ≥ NOS > 12	15.8	18.4
4	espèce peu commune	12 ≥ NOS > 6	17.2	21.8
5	espèce rare	6 ≥ NOS > 2	16.3	25.4
6	espèce très rare	2 ≥ NOS	13.0	12.1

NOS	Nombre d'observations en Suisse (versant nord des Alpes uniquement)
%N	Pourcentage du nombre d'espèces recensées pour l'étude des prairies sèches
%NSP	Pourcentage du nombre d'espèce total d'après la littérature
limites des classes	$x^2 + x$ avec x = 1, 2, 3, 4 et 5

FIDÉLITÉ (F)

La fidélité d'une espèce à un habitat précis livre de précieuses indications sur ses exigences écologiques. Cet indice, qui oscille entre 1 et 6, est principalement basé sur les connaissances écologiques actuelles (MAURER & HÄNGGI 1990 et HÄNGGI *et al.* 1995) et sur les connaissances que nous avons acquises pour les milieux du nord des Alpes en Suisse. Cette remarque sous-entend que la valeur de l'indice atrribué à une espèce donnée ne peut être reprise sans autre pour l'évaluation de stations appartenant à une autre région. De manière générale, un indice de faible valeur est attribué à une espèce peu exigeante fréquentant différents milieux de structure peu précise; un indice de valeur élevée est attribué à une espèce liée à un milieu de structure précise. La signification de l'indice attribué à chaque espèce est la suivante:

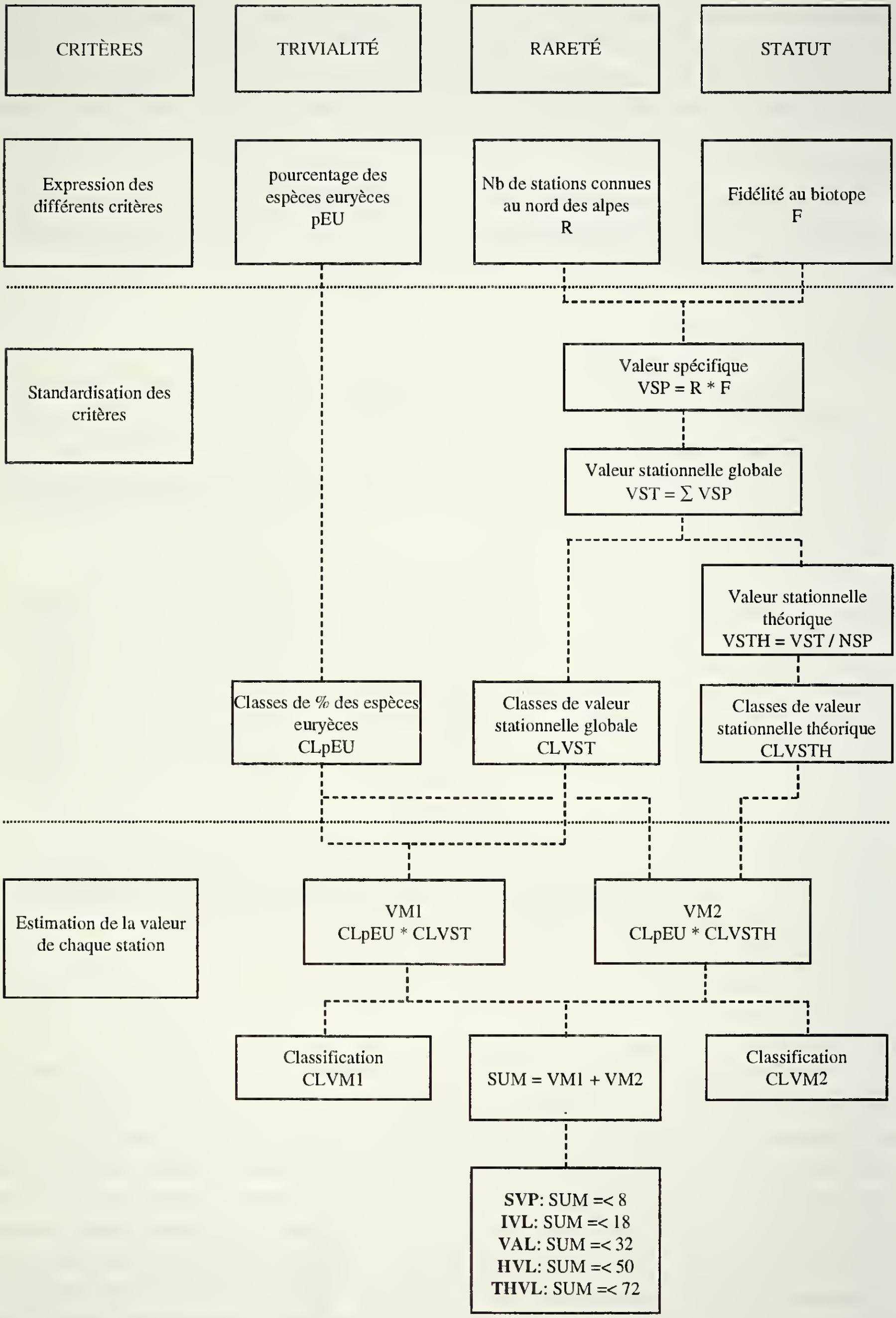

FIG. 1. Méthode d'évaluation des stations. SVP= sans valeur particulière; IVL= intéressant, de valeur limitée; VAL= de valeur; HVL= de haute valeur; THVL= de très haute valeur.

1: espèce très peu exigeante et/ou tolérant les milieux artificiels - euryèce (sans exigence), ubiquiste - ex: forêts et milieux ouverts, secs et humides, zones très artificielles

2: espèce peu exigeante, présente dans plusieurs milieux de structure différente mais absente des milieux très artificiels - euryèce - ex: forêts et milieux ouverts, secs et humides

3: espèce peu exigeante, présente dans différents milieux de structure «particulière» - mésoèce, sans exigences particulières - ex: milieux ouverts, secs et humides

4: expèce exigeante, liée à quelques types de milieux précis - mésoèce (avec exigences) - ex: milieux ouverts, secs

5: espèce exigeante, liée à un type de milieu bien précis - sténoèce modérée - ex: prairies sèches

6: espèce très exigeante, liée à des conditions bien particulières d'un type de milieu bien précis - sténoèce stricte - ex: prairies sèches ouvertes à rocaille (sur sol peu profond)

Estimation de la valeur d'une station

Le produit des deux indices retenus (R * F) donne la «valeur» de chaque espèce (VSP = valeur spécifique). La valeur stationnelle globale (VST) est calculée en effectuant la somme des valeurs des espèces qui y ont été observées. Cette valeur transitoire peut ensuite être reprise directement comme une mesure d'évaluation de la qualité d'une station. Toutefois, VST favorisera les milieux dont le nombre d'espèces est élevé (milieux à forte structure tridimensionnelle par exemple) au détriment des milieux plus homogènes. Ainsi, on a choisi une méthode qui permet de reprendre les deux aspects les plus importants pour une évaluation (diversité et spécificité) représentées par les deux indices VM1 et VM2 (Fig. 1).

Comparaison des indices VM1 et VM2

Les indices VM1 et VM2 expriment des aspects différents de la qualité d'une station donnée. VM1 favorise les stations ayant une haute diversité faunique (milieux mosaïques, écotones); VM2 favorise plutôt les milieux abritant une faune particulière (milieux extrêmes: homogènes, très stables). Ces deux indices sont donc complémentaires (et non contradictoires). De manière générale si leur valeur respective est élevée, la qualité de la station concernée n'en est que plus évidente. En outre, les écarts importants qui les séparent parfois soulignent particulièrement bien la présence de milieux extrêmes dans une étude donnée (par exemple: une roselière aura VM2 très haut et VM1 bas; tandis qu'un milieu mosaïque aura VM2 bas et VM1 très haut).

Afin d'intégrer ces deux aspects de notre méthode d'évaluation dans la hiérarchisation définitive des stations, nous avons effectué la somme de ces deux indices (SUM = VM1+VM2) et réparti les résultats obtenus dans les catégories SVP, IVL, VAL, HVL et THVL en tenant compte des limites de classe présentées ci-dessous:

SVP:	milieu sans valeur particulière	$\mathrm{SUM} \leq 8$
IVL:	milieu intéressant de valeur limitée	$\mathrm{SUM} \leq 18$
VAL:	milieu de valeur	$\mathrm{SUM} \leq 32$
HVL:	milieu de haute valeur	$\mathrm{SUM} \leq 50$
THVL:	milieu de très haute valeur	$\mathrm{SUM} \leq 72$

limites des catégories: $x^2 + x^2$ avec $x = 2, 3, 4, 5, 6$

Le recours aux variables suivantes permet d'obtenir les indices de valeur stationnelle VM1 et VM2:

— pourcentage d'espèces euryèces (pEU) exprimé en classes de pourcentage d'espèces euryèces (CLpEU)

— valeur stationnelle globale (VST, soit somme de toutes les valeurs spécifiques), exprimée en classes de valeur stationnelle globale (CLVST)

— valeur stationnelle théorique (VSTH, soit VST divisé par le nombre d'espèces (NSP)), exprimée en classes de valeur stationnelle théorique (CLVSTH).

Hänggi (1990) répartissait les indices suivants dans 4 classes différentes. Compte tenu de la bonne qualité générale des milieux que nous avons choisis et de notre objectif final (proposition de mesures de gestion susceptibles d'améliorer la qualité de toutes les stations étudiées), il nous a toutefois semblé nécessaire de les répartir en 6 classes afin de mieux distinguer les stations de valeur.

Classes de pourcentage des especes euryeces (CLPEU)

Le pourcentage des espèces euryèces (pEU) est une variable importante pour l'évaluation de la qualité d'une station (Fig. 1). Plus ce pourcentage est élevé, plus le milieu est banal, ou en d'autres termes, plus pEU est faible, plus le milieu est peuplé d'araignées exigeantes (Hänggi 1987). Sous le terme d'euryèces sont comprises les espèces appartenant à la classe de fidélité 1. Les limites de classe sont les suivantes:

1: $\mathrm{pEU} > 30\%$
1: $25\% < \mathrm{pEU} \leq 30\%$
3: $20\% < \mathrm{pEU} \leq 25\%$
4: $15\% < \mathrm{pEU} \leq 20\%$
5: $10\% < \mathrm{pEU} \leq 15\%$
6: $\mathrm{pEU} \leq 10\%$

Classes de valeur stationnelle globale (CLVST)

Les limites de classe de valeur stationnelle globale ont été déterminées sur la base d'une station théorique présentant un nombre moyen de 45 espèces (moyenne des stations étudiées) dont la valeur spécifique serait égale à 2.25 ($F=R=1.5$ $VSP=2.25$ $VST=101.25$), à 4 ($F=R=2$ $VSP=4$ $VST=180$), à 6.25 ($F=R=2.5$ $VSP=6.25$ $VST=281.25$), à 9 ($F=R=3$ $VSP=9$ $VST=405$) et à 12.25 ($F=R=3.5$ $VSP=12.25$ $VST=551.25$)

1: $\mathrm{VST} \leq 101.25$
2: $101.25 < \mathrm{VST} \leq 180$
3: $180 < \mathrm{VST} \leq 281.25$
4: $281.25 < \mathrm{VST} \leq 405$
5: $405 < \mathrm{VST} \leq 551.25$
6: $\mathrm{VST} > 551.25$

Classes de valeur stationnelle théorique (CLVSTH)

Les limites des classes de valeur stationnelle théorique proviennent des valeurs spécifiques théoriques (2.25 pour F=R=1.5; 4 pour F=R=2; 6.25 pour F=R=2.5; 9 pour F=R=3; 12.25 pour F=R=3.5)

1: $VSTH \leq 2.25$
2: $2.25 < VSTH \leq 4$
3: $4 < VSTH \leq 6.25$
4: $6.25 < VSTH \leq 9$
5: $9 < VSTH \leq 12.25$
6: $VSTH > 12.25$

Classes des indices VM1 et VM2 (CLVM1 et CLVM2)

1: $VM = 1$
2: $1 < VM \leq 4$
3: $4 < VM \leq 9$
4: $9 < VM \leq 16$
5: $16 < VM \leq 25$
6: $25 < VM \leq 36$

limites des classes: x^2 avec $x = 1, 2, 3, 4, 5, 6$

Le choix des facteurs d'estimation des milieux et les notes attribuées aux différentes espèces recensées ont été fixées pour cette étude précise. Ils sont donc susceptibles de subir certaines modifications en fonction de l'évolution de nos connaissances faunistiques et écologiques. Toutefois, dans le cadre de ce travail, ces variations potentielles sont tamponnées par le grand nombre de sites inventoriés et d'espèces recensées par station. De plus, les araignées des milieux ouverts sont assez bien connues (Thaler 1985; Gonseth 1985; Delarze 1987; Bauchhenss 1990; Maurer & Hänggi 1990; Hänggi 1992; Lörtscher *et al.* 1994; Hänggi *et al.* 1995, 1996; Baur *et al.* 1996).

RÉSULTATS

Au total, 22057 individus adultes appartenant à 215 espèces ont été récoltés avec les pièges Barber. Les résultats bruts (nombre d'individus de chaque espèce par station) sont publiés ailleurs (Pozzi 1997). Pozzi & Hänggi (1998) présentent les principaux résultats taxonomiques et faunistiques. Les analyses présentées dans le Tab. 1 ont été faites à partir du statut de rareté et de fidélité de chaque espèce (Tab. 2).

La Fig. 2 présente les résultats des évaluations des 40 stations en fonction des différents types d'entretien. Les modifications de la méthode Hänggi (1990) apportent une plus grande clarté dans la répartition des stations de valeur (partie droite de la figure) mais ne modifient pas fondamentalement leur classement respectif (hiérarchisation). Cette amélioration de la méthode permet une meilleure évaluation des sites et de leur entretien.

Premièrement, nous constatons une proportion importante de stations de «valeur»: plus des 3/4 des stations étudiées appartiennent aux catégories VAL, HVL et THVL, seules quelques stations appartiennent à la catégorie SVP (Fig. 2). Cette répartition très inégale des stations dans les 5 catégories susmentionnées trouve son origine dans leur choix initial. Il n'a pas été réalisé au hasard, mais bien au contraire en sélectionnant essentiellement des prairies sèches c'est-à-dire des stations qui à priori étaient de valeur.

TAB. 1. Tableau des indices des différentes stations regroupées par type d'entretien.

		st4	st13	st17	st43	**x̄EI**	st1	st11	st15	st27	st33	st34	st36	st45	st49	**x̄AB**
NIND		1137	408	533	521	**650**	540	562	515	672	273	272	544	537	622	**504**
NSP		44	43	48	54	**47.3**	49	45	50	52	38	51	46	43	48	**46.9**
VST		379	411	375	432	**399**	524	499	529	573	402	484	529	521	506	**507**
VSTH		8.6	9.6	7.8	8	**8.5**	10.7	11.1	10.6	11	10.6	9.5	11.5	12.1	10.5	**10.9**
pEU		27.3	16.3	18.8	20.4	**20.7**	12.3	13.3	18	7.7	10.5	15.7	15.2	11.6	14.6	**13.2**
CLpEU		2	4	4	3	**3.3**	5	5	4	6	5	4	4	5	5	**4.8**
CLVST		4	5	4	5	**4.5**	5	5	5	6	4	5	5	5	5	**5**
CLVSTH		4	5	4	4	**4.3**	5	5	5	5	5	5	5	5	5	**5**
VM1		8	20	16	15	**14.8**	25	25	20	36	20	20	20	25	25	**24**
CLVM1		3	5	4	4	**4**	5	5	5	6	5	5	5	5	5	**5.1**
VM2		8	20	16	12	**14**	25	25	20	30	25	20	20	25	25	**23.9**
CLVM2		3	5	4	4	**4**	5	5	5	6	5	5	5	5	5	**5.1**
SUM		16	40	32	27	**28.8**	50	50	40	66	45	40	40	50	50	**47.9**
V		**IVL**	**HVL**	**VAL**	**VAL**	**VAL**	**HVL**	**HVL**	**HVL**	**THVL**	**HVL**	**HVL**	**HVL**	**HVL**	**HVL**	**HVL**
	st2	st3	st12	st42	st44	st46	st47	**x̄FT**		st8	st24	st25	st26	st32	st48	**x̄PO**
NIND	385	1106	483	629	376	512	772	**609**		371	389	1103	604	424	321	**535**
NSP	46	51	39	54	55	53	45	**49**		50	50	49	41	39	58	**47.8**
VST	613	540	352	499	508	621	436	**510**		464	570	453	403	207	441	**423**
VSTH	13.3	10.6	9	9.2	9.2	11.7	9.7	**10.4**		9.3	11.4	9.2	9.8	5.3	7.6	**8.8**
pEU	15.2	15.7	23.2	22.2	16.4	15.1	15.6	**17.6**		22	22	26.5	19.5	41	24.1	**25.9**
CLpEU	4	4	3	3	4	4	4	**3.7**		3	3	2	4	1	3	**2.7**
CLVST	6	5	4	5	5	6	5	**5.1**		5	6	5	4	3	5	**4.7**
CLVSTH	6	5	5	5	5	5	5	**5.1**		5	5	5	5	3	4	**4.5**
VM1	24	20	12	15	20	24	20	**19.3**		15	18	10	16	3	15	**12.8**
CLVM1	5	5	4	4	5	5	5	**4.7**		4	5	4	4	2	4	**3.8**
VM2	24	20	15	15	20	20	20	**19.1**		15	15	10	20	3	12	**12.5**
CLVM2	5	5	4	4	5	5	5	**4.7**		4	4	4	5	2	4	**3.8**
SUM	48	40	27	30	40	44	40	**38.4**		30	33	20	36	6	27	**25.3**
V	**HVL**	**HVL**	**VAL**	**VAL**	**HVL**	**HVL**	**HVL**	**HVL**		**VAL**	**HVL**	**VAL**	**HVL**	**SVP**	**VAL**	**VAL**
	st14	st30	st35	st38	st39	st40	st41	st51	**x̄FP**	st21	st22	st28	st29	st37	st50	**x̄PB**
NIND	417	500	701	588	266	323	958	589	**543**	250	451	476	296	846	785	**517**
NSP	38	52	48	43	38	41	38	48	**43.3**	34	38	44	32	44	40	**38.7**
VST	429	491	349	492	248	290	245	438	**373**	305	244	389	247	388	354	**321**
VSTH	11.3	9.4	7.3	11.4	6.5	7.1	6.5	9.1	**8.6**	8.9	6.4	8.8	7.7	8.8	8.9	**8.3**
pEU	15.8	26.9	31.3	20.9	29	31.7	36.9	18.8	**26.4**	17.7	23.7	15.9	28.1	31.8	27.5	**24.1**
CLpEU	4	2	1	3	2	1	1	4	**2.3**	4	3	4	2	1	2	**2.7**
CLVST	5	5	4	5	3	4	3	5	**4.3**	4	3	4	3	4	4	**3.7**
CLVSTH	5	5	4	5	4	4	4	5	**4.5**	4	4	4	4	4	4	**4**
VM1	20	10	4	15	6	4	3	20	**10.3**	16	9	16	6	4	8	**9.8**
CLVM1	5	4	2	4	3	2	2	5	**3.4**	4	3	4	3	2	3	**3.2**
VM2	20	10	4	15	8	4	4	20	**10.6**	16	12	16	8	4	8	**10.7**
CLVM2	5	4	2	4	3	2	2	5	**3.4**	4	4	4	3	2	3	**3.3**
SUM	40	20	8	30	14	8	7	40	**20.9**	32	21	32	14	8	16	**20.5**
V	**HVL**	**VAL**	**SVP**	**VAL**	**IVL**	**SVP**	**SVP**	**HVL**	**VAL**	**VAL**	**VAL**	**VAL**	**IVL**	**SVP**	**IVL**	**VAL**

NIND= nombre d'individus; NSP= nombre d'espèces; VST= valeur stationnelle globale; VSTH= valeur stationnelle théorique; pEU= pourcentage des espèces euryèces; CLpEU= classe de pEU; CLVST= classe de VST; CLVSTH= classe de VSTH; VM1/2= indice VM1/2; CLVM1/2= classe de VM1/2; SUM= VM1+VM2; V= valorisation; st1= station no.1; x̄AB= moyennes des stations abandonnées; x̄FT= moyennes des stations fauchées tardivement; x̄FP= moyennes des stations fauchées précocement; x̄EI= moyennes des stations entretenues irrégulièrement; x̄PO= moyennes des stations pâturées par ovins; x̄PB= moyennes des stations pâturées par bovins; SVP= sans valeur particulière; IVL= intéressant, de valeur limitée; VAL= de valeur; HVL= de haute valeur; THVL= de très haute valeur.

AB														36 34 15		33		*E 11 *E 49 1 *A 45 *A	27
FT									12 *F		42 *F			47 *C 44 3 *C	46 *B		2 *B		
FP		41	40 35	39			30			38 *H				51 14 *H					
EI					4				43 *G		17			13 *G					
PO	32						25 *J		48 *D	8 *D		24	26 *J						
PB			37	29		50		22			28 *I 21 *I								
SUM	6	7	8	14	16	18	20	21	27	30	32	33	36	40	44	45	48	50	66
V	SVP (12.5 %)			IVL (10 %)			VAL (30 %)					HVL (45 %)							THVL (2.5 %)

FIG. 2. Tableau des valeurs des stations en fonction de l'entretien. PB= stations pâturées par bovins; PO= stations pâturées par ovins; EI= stations entretenues irrégulièrement; FP= stations fauchées précocement; FT= stations fauchées tardivement; AB= stations abandonnées; SVP= sans valeur particulière; IVL= intéressant, de valeur limitée; VAL= de valeur; HVL= de haute valeur; THVL= de très haute valeur; SUM= VM1+VM2; V= valorisation (% des stations); ☐ = numéro de la station; * = stations étudiées en 95 et 96; A= Moulin-de-Vert1; B= Moulin-de-Vert2; C= Pré-de-Bonne; D= Curtilles; E= Allondon; F et G= La Rippe; H= Gland; I= Chamblon; J= Onnens.

TAB. 2. Tableau du statut de fidélité et de rareté des différentes espèces capturées. Nomenclature et systématique selon MAURER & HÄNGGI (1990); F= indice de fidélité; R= indice de rareté.

espèce	F	R	espèce	F	R
Atypus affinis	5	5	*Walckenaeria dysderoides*	2	3
Atypus piceus	4	3	*Walckenaeria furcillata*	3	5
Dysdera crocata	3	5	*Walckenaeria monoceros*	3	6
Dysdera erythrina	2	2	*Bathyphantes gracilis*	1	1
Harpactea hombergi	2	3	*Centromerita bicolor*	1	2
Harpactocratus drassoides	3	3	*Centromerita concinna*	3	5
Zodarion italicum	3	4	*Centromerus dilutus*	3	4
Pachygnatha degeeri	1	1	*Centromerus incilium*	2	4
Aculepeira ceropegia	3	2	*Centromerus serratus*	3	3
Araneus diadematus	1	2	*Centromerus sylvaticus*	1	1
Hypsosinga albovittata	4	5	*Diplostyla concolor*	1	1
Hypsosinga sanguinea	4	3	*Lepthyphantes arenicola*	3	6
Neoscona adianta	3	6	*Lepthyphantes keyserlingi*	4	5
Ero aphana	2	4	*Lepthyphantes leprosus*	1	3
Ero furcata	3	3	*Lepthyphantes mengei*	1	2
Acartauchenius scurrilis	5	5	*Lepthyphantes pallidus*	2	1
Araeoncus humilis	1	2	*Lepthyphantes tenuis*	1	1
Ceratinella brevis	1	1	*Meioneta mollis*	2	3
Ceratinella scabrosa	3	3	*Meioneta rurestris*	1	1
Cnephalocotes obscurus	3	2	*Meioneta saxatilis*	3	4
Dicymbium brevisetosum	1	4	*Meioneta simplicitarsis*	2	5
Diplocephalus latifrons	3	1	*Microlinyphia pusilla*	2	2
Eperigone trilobata	3	4	*Microneta viaria*	2	1
Erigone atra	1	1	*Neriene furtiva*	4	6
Erigone dentipalpis	1	1	*Porrhomma microphthalmum*	2	4
Erigonella hiemalis	3	5	*Sintula cornigera*	3	4
Erigonoplus globipes	5	5	*Stemonyphantes lineatus*	2	3
Gonatium rubens	3	5	*Theonina cornix*	3	5
Gongylidiellum latebricola	3	3	*Dipoena coracina*	5	5
Jacksonella falconeri	2	6	*Enoplognatha thoracica*	3	2
Metopobactrus prominulus	3	4	*Episinus truncatus*	6	3
Micrargus herbigradus	2	1	*Euryopis flavomaculata*	3	3
Micrargus subaequalis	1	2	*Euryopis laeta*	5	6
Minicia marginella	3	5	*Euryopis quinqueguttata*	5	5
Mioxena blanda	4	5	*Neottiura bimaculata*	2	2
Monocephalus fuscipes	2	2	*Neottiura suaveolens*	5	5
Oedothorax apicatus	1	1	*Robertus lividus*	1	1
Ostearius melanopygius	2	5	*Robertus neglectus*	2	3
Panamomops sulcifrons	4	3	*Steatoda albomaculata*	4	6
Pelecopsis parallela	1	4	*Steatoda phalerata*	5	3
Pocadicnemis juncea	3	3	*Theridion impressum*	3	2
Silometopus bonessi	4	6	*Theridion nigrovariegatum*	4	5
Tapinocyboides pygmaeus	4	4	*Alopecosa accentuata*	4	4
Tiso vagans	1	2	*Alopecosa cuneata*	3	2
Trichoncus saxicola	4	6	*Alopecosa fabrilis*	4	5
Trichopterna cito	5	5	*Alopecosa pulverulenta*	1	1
Typhochrestus digitatus	4	6	*Alopecosa striatipes*	4	5
Typhochrestus simoni	4	6	*Alopecosa trabalis*	5	3
Walckenaeria acuminata	2	2	*Arctosa figurata*	5	5
Walckenaeria antica	2	1	*Aulonia albimana*	2	1
Walckenaeria corniculans	3	2	*Pardosa agrestis*	1	2

espèce	F	R	espèce	F	R
Pardosa bifasciata	5	4	*Micaria fulgens*	5	4
Pardosa hortensis	1	1	*Micaria guttulata*	5	5
Pardosa saltans	2	1	*Micaria pulicaria*	2	1
Pardosa monticola	4	2	*Phaeocedus braccatus*	4	5
Pardosa nigriceps	4	6	*Poecilochroa variana*	5	6
Pardosa palustris	1	1	*Zelotes apricorum*	3	2
Pardosa proxima	4	4	*Zelotes atrocaeruleus*	4	6
Pardosa pullata	2	1	*Zelotes civicus*	6	6
Pardosa riparia	4	4	*Zelotes erebeus*	5	5
Pardosa vittata	3	6	*Zelotes exiguus*	5	5
Pirata hygrophilus	3	1	*Zelotes latreillei*	1	2
Pirata latitans	2	1	*Zelotes lutetianus*	3	4
Tricca lutetiana	3	2	*Zelotes pedestris*	3	2
Trochosa robusta	6	4	*Zelotes petrensis*	3	2
Trochosa ruricola	1	1	*Zelotes praeficus*	4	2
Trochosa terricola	2	1	*Zelotes pumilus*	4	4
Xerolycosa miniata	4	4	*Zelotes pusillus*	2	2
Pisaura mirabilis	2	1	*Zelotes villicus*	5	5
Oxyopes lineatus	3	6	*Zora nemoralis*	2	3
Cicurina cicur	2	1	*Zora parallela*	5	6
Coelotes inermis	3	2	*Zora silvestris*	3	5
Coelotes terrestris	2	1	*Zora spinimana*	2	1
Histopona torpida	2	1	*Philodromus rufus*	3	2
Mastigusa arietina	3	5	*Thanatus formicinus*	4	3
Tegeneria silvestris	3	1	*Thanatus atratus*	5	6
Antistea elegans	5	2	*Oxyptila atomaria*	3	2
Hahnia nava	3	3	*Oxyptila blackwalli*	4	4
Hahnia pusilla	2	2	*Oxyptila claveata*	5	4
Argenna subnigra	5	4	*Oxyptila pullata*	3	6
Dictyna arundinacea	3	4	*Oxyptila scabricula*	5	4
Titanoeca quadriguttata	6	4	*Oxyptila simplex*	3	2
Agroeca brunnea	3	2	*Oxyptila trux*	2	2
Agroeca cuprea	4	4	*Xysticus acerbus*	4	4
Agroeca proxima	3	6	*Xysticus audax*	2	2
Apostenus fuscus	3	3	*Xysticus bifasciatus*	3	2
Phrurolithus festivus	2	1	*Xysticus cambridgei*	3	5
Phrurolithus minimus	4	3	*Xysticus cristatus*	1	1
Phrurolithus nigrinus	6	5	*Xysticus erraticus*	2	2
Scotina palliardi	2	5	*Xysticus kempeleni*	3	4
Cheiracanthium virescens	4	5	*Xysticus kochi*	1	2
Clubiona brevipes	3	3	*Xysticus lineatus*	4	4
Clubiona coerulescens	3	3	*Xysticus robustus*	4	4
Clubiona diversa	3	4	*Ballus chalybeius*	2	3
Clubiona frutetorum	3	4	*Bianor aurocinctus*	4	3
Clubiona neglecta	4	3	*Euophrys aequipes*	2	3
Clubiona pseudoneglecta	4	6	*Euophrys aperta*	3	6
Clubiona terrestris	2	2	*Euophrys frontalis*	2	1
Callilepsis schuszteri	6	6	*Evarcha arcuata*	3	1
Drassodes cupreus	2	4	*Evarcha laetabunda*	4	6
Drassodes lapidosus	2	2	*Heliophanus cupreus*	3	3
Drassodes pubescens	2	2	*Heliophanus flavipes*	3	2
Gnaphosa lucifuga	6	4	*Myrmarachne formicaria*	5	2
Haplodrassus dalmatensis	5	6	*Pellenes tripunctatus*	5	3
Haplodrassus kulczynskii	4	5	*Phlegra fasciata*	3	3
Haplodrassus signifer	1	1	*Phlegra insignata*	6	3
Micaria albimana	4	6	*Synageles hilarulus*	4	6
Micaria formicaria	4	4			

COMPARAISON DES STATIONS PAR TYPE D'ENTRETIEN

PATURAGE BOVIN

Les stations pâturées par les bovins se sont révélées les moins riches en espèces, et celles dont les valeurs stationnelles théorique et globale étaient les plus basses (Tab. 1). Soulignons qu'en plaine la pâture par les bovins n'est pas recommandée pour l'entretien des prairies sèches: les races modernes étant très lourdes, leur activité produit un tassement du sol et une forte dégradation de la prairie (ANTOGNOLI *et al.* 1995). Les surfaces pentues sont particulièrement touchées par cet effet (station 29 par ex.). D'autre part, les prairies sèches ne semblent pas suffisamment riches en substances nutritives pour la production de lait. Ainsi, seul l'élevage de vaches mères (avec des veaux) ou de génisses entre en ligne de compte (MAERTENS *et al.* 1990), ce qui a été le cas dans les parcelles de cette étude.

D'après nos résultats, le pâturage bovin pratiqué de manière extensive (moins de 1 UGBN/ha)[1] peut maintenir des stations de valeurs (st. 21 et 28, voir Fig. 2) mais dès que le pâturage devient trop important (plus de 2 UGBN/ha) ou trop précoce dans l'année, leur qualité baisse (st. 29, st. 37 et st. 50). La charge en bétail est primordiale, une forte pâture entraîne: 1) l'enrichissement en azote du sol qui se traduit par l'évolution vers des prairies plus grasses (Arrhenatherion) et moins intéressantes; 2) la destruction de la diversité structurelle de la végétation.

Soulignons que les variations de pente et de structure (présence de buissons, de rocaille) au sein d'un pâturage permettent souvent le maintien de secteurs intéressants subissant une pression moins forte du bétail. La valeur plus faible de la station 22 (SUM=21), zone plate jouxtant un pâturage extensif de pente par rapport à celle de ce dernier (SUM=32), illustre parfaitement ce fait.

Le pâturage par des bovins, tel qu'il est actuellement pratiqué, semble défavorable au maintien de la qualité faunistique des prairies sèches. Il serait toutefois nécessaire d'étudier les effets réels d'une pâture extensive tardive pour exclure définitivement ce type d'entretien des mesures de gestion des milieux ouverts de qualité. Les travaux de GONSETH (1994) soulignent en effet qu'une pâture tardive même relativement forte, peut être compatible avec le maintien d'une faune lépidoptérique intéressante dans des pâturages maigres.

PATURAGE OVIN

Comme le pâturage bovin, le pâturage ovin ne devrait pas se pratiquer de manière intensive dans une prairie sèche. La st. 32 (SUM=6) est l'exemple typique d'une prairie surpâturée: grande densité de moutons sur une longue période et de plus commençant précocement dans l'année (fin mars). La forte charge dévalorise la station, l'herbe devient rase rapidement et la diminution de la structure de la végétation a un

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[1] La charge en bétail est exprimée en UGBN, nombre UGB pour 100 jours de pâture; elle est calculée à partir des équivalences suivantes pour notre étude: génisse > 2 ans: 4/5 UGB; génisse de 1 à 2 ans: 3/5 UGB; veau: 1/3 UGB.

impact négatif sur les araignées. L'évolution du site des Curtilles (st. 08 et 48) illustre une exploitation défavorable à la faune par son intensité trop grande et sa précocité dans l'année. L'idéal serait de pratiquer un pâturage rotatif extensif (recréer l'impact naturel d'herbivores sauvages) en laissant un petit nombre d'ovins pendant une courte période en fin de saison, ce qui garantirait le maintien de la diversité structurelle du milieu essentielle aux araignées (GIBSON *et al.* 1992). La st. 26 (SUM=36) qui a été exploitée plus tardivement que la st. 25 (SUM=20) illustre ce principe.

A propos des stations entretenues annuellement, on peut remarquer que la fauche touche toutes les plantes d'une prairie à la même hauteur et au même moment, tandis que le pacage agit de façon progressive et sélective (MAERTENS *et al.* 1990; GONSETH 1994). KIRBY (1992) considère qu'un pacage extensif conduit à des milieux de vie richement structurés et très favorables aux invertébrés.

FAUCHAGE PRÉCOCE

Concernant le fauchage précoce (mi-juin) des prairies sèches, deux tendances sont à relever. 1) Pour des milieux exploités intensivement dans le passé (plusieurs fauches dans l'année, engraissement), on peut constater une amélioration de la qualité de la station (par exemple, la st. 39 est une prairie en phase d'extensification). 2) Pour des milieux exploités extensivement dans le passé (pas fauchés toutes les années ou fauchés plus tardivement), on constate une dégradation de la station. La prairie sèche de Gland est un bon exemple de ce cas de figure. En 1995, la st. 14 a une valeur identique à celle de la st. 15 (HVL) qui se situe dans le même site mais qui n'est pas entretenue. Puis en 1996, la st. 38 (équivalente de la st. 14) a perdu de la valeur suite à son fauchage précoce. A signaler également dans ce site que la fauche est très rase ce qui, dans les conditions présentes, ralentit la repousse et fait que certaines araignées ne trouvent plus la structure du milieu nécessaire à leur développement.

En résumé, on peut remarquer que dans un premier temps les prairies intensives vont gagner de la valeur avec un fauchage mi-juin mais à long terme il faut retarder le fauchage de plus en plus et extensifier l'entretien si l'on veut obtenir ou maintenir des stations de haute valeur. GONSETH (1985) confirme d'ailleurs qu'un fauchage précoce effectué sur une longue période (15 ans) contribue à appauvrir la communauté arachnologique des prairies sèches. A relever finalement que le fauchage précoce est le seul entretien à regrouper trois stations sans valeur particulière. Il obtient même la plus basse moyenne finale (SUM) avec le pâturage bovin (Tab. 1).

FAUCHAGE TARDIF

Pour l'ensemble des stations étudiées, le fauchage tardif est le meilleur entretien régulier (SUM la plus élevée pour une station entretenue). La st. 2 obtient même la plus haute valeur stationnelle théorique (13.3) et la st. 46 la plus haute valeur stationnelle globale (621).

Dans certains cas, ce mode d'entretien pourrait être encore amélioré ponctuellement par des entretiens tous les deux ans ou par un fauchage parcellaire en rotation. Le site de La Rippe illustre ce fait: si les stations 12 et 13 se situent dans la même prairie, la première est fauchée tardivement toutes les années alors que la deuxième est fauchée tous les deux ans. Malgré leur proximité, la st. 13 est classée dans les stations de haute valeur (SUM=40) tandis que la st. 12 dans les stations de valeur (SUM=27). Par contre, en 1996, après l'entretien de l'ensemble du site, la st. 43 (équivalente de la st. 13) retrouve une valeur semblable à la st. 12 (ou st. 42). Ainsi, son peuplement arachnologique est moins intéressant que celui de la deuxième année sans entretien. L'expérience montre qu'une modulation des pressions anthropiques par rotation des contraintes entre les divers secteurs d'une même aire protégée permettrait une meilleure conservation des communautés animales, en augmentant leur richesse et en améliorant leur spécificité au biotope par rapport au cas d'une pression anthropique continue.

Globalement, la réponse de la faune aux effets de la fauche varie selon l'intensité de l'intervention, sa fréquence et le moment de l'année où elle se situe. Des coupes bien menées (selon la dynamique du milieu) à des moments adéquats de l'année (automne), semblent favorables à la conservation de la valeur arachnologique des stations.

ENTRETIEN IRRÉGULIER

Vu la variété des entretiens rassemblés dans cette catégorie et le faible nombre de stations étudiées, il est difficile de tirer des conclusions sur ce type d'entretien. Des tendances semblent toutefois se dessiner: les stations fauchées tardivement mais irrégulièrement (st. 13, 17 et st. 43) sont généralement des prairies de valeur voir de haute valeur; la st. 4, quant à elle, entretenue intensivement par le passé (pâturée et légèrement engraissée), est intéressante mais de valeur limitée. Elle nécessiterait, dans un premier temps, un entretien régulier (par exemple une fauche mi-juin) sans fumure mais avec exportation de la matière végétale pour diminuer progressivement la richesse du sol et la densité de la végétation, puis, dans un second temps, un fauchage de plus en plus tard dans la saison.

STATIONS ABANDONNÉES

Les stations abandonnées obtiennent les meilleures valeurs stationnelles et recèlent l'unique station de très haute valeur: st. 27. Elles se caractérisent par la plus faible moyenne des pourcentages d'espèces euryèces (Tab. 1), autrement dit par la présence d'un grand nombre d'espèces exigeantes face aux conditions de leur habitat.

Lorsqu'une prairie sèche est abandonnée, différents facteurs, importants pour les animaux et les plantes sont modifiés. La suppression de la fauche annuelle et l'accumulation de litière qui en résulte sont les plus importants (ANTOGNOLI *et al.* 1995). Elles créent en principe de nouvelles conditions de vie au niveau de la surface du sol. Pour les araignées, l'absence de fauche a pour conséquence que la structure de leur milieu de vie, formée par la végétation, est conservée, et que les conditions microclimatiques qui y sont liées restent plus ou moins constantes.

Dans cette étude, les stations abandonnées sont de deux types: des prairies très xériques à évolution lente et des prairies en voie d'embroussaillement prononcé. Le premier cas est typique des zones xériques qui devraient être entretenues le moins possible. Les stations du plateau du Moulin-de-Vert (st. 1 et 45) et de l'Allondon (st. 11 et 49) illustrent bien cette situation. Pour ces milieux de grande taille, l'absence d'entretien leur convient bien parce que les conditions extrêmes (climat, sol) empêchent un changement microclimatique trop rapide (végétation herbacée dense, buissons). La tendance au feutrage, due au manque de fauche, n'entraîne pas la disparition des espèces les plus xérophiles, puisqu'il existe encore assez de zones ouvertes (terre, cailloux) dans la station. Deux autres stations xériques (st. 24 et 14) entretenues régulièrement pourraient être améliorées en intervenant plus extensivement.

En ce qui concerne les zones moins sèches avec un sol plus profond (st. 15 et 34), il est nécessaire de contenir régulièrement la progression des ligneux sinon la forêt s'installe, mais il ne semble pas nécessaire de faucher toutes les années. D'après nos résultats, le fauchage tardif pourrait être une bonne méthode pour maintenir des zones ouvertes de qualité.

L'évaluation de la qualité de deux stations abandonnées (st. 27 et 33) par le biais de la méthode que nous avons choisie illustre bien la différence de signification des indices VM1 et VM2. L'extrême variabilité du couvert végétal de la station 27, où alternent des zones de dalles nues ou peu colonisées, de pelouses et de buissons, se traduit par sa grande diversité faunistique; dans ce cas, la valeur de VM1 est supérieure à celle de VM2. Par contre, la st. 33 est un milieu extrême (très homogène et de grande stabilité) caractérisé par la valeur de VM2 supérieure à celle de VM1. D'ailleurs dans les analyses multivariées (Pozzi & Borcard soumis), cette prairie sèche se distingue faunistiquement des autres stations.

En résumé, la non-intervention à moyen terme permet de maintenir une structure diversifiée de la végétation favorable à de nombreuses espèces pour réaliser leur cycle de vie (Kirby 1992).

CONCLUSIONS SUR L'ENTRETIEN

Notre étude se base sur une assez grande variété de situations qui reflète l'état des prairies sèches de la région. Si quelques mesures générales peuvent être proposées pour leur entretien (faucher tardivement, laisser des zones non entretenues), chaque station nécessite une gestion particulière en fonction des variables biotiques, abiotiques (pente, surface) et historiques qui l'influencent. Tous ces facteurs doivent être considérés pour définir un plan de gestion de ces milieux. Les propositions suivantes liées aux différents entretiens étudiés permettent d'augmenter la valeur d'une prairie sèche.

- Les stations abandonnées abritent une faune arachnologique plus intéressante (haute valeur VM1 et VM2) que les milieux entretenus. Elles sont utilisées comme refuge par les espèces appréciant un habitat de transition non perturbé. Toutefois, pour éviter leur recolonisation par la forêt à plus ou moins long terme, il est recommandé d'entretenir ces parcelles afin de maintenir l'écosystème prairie sèche et les espèces qui le caractérisent. L'abandon d'une station ne devrait intervenir que dans les zones à végétation stable (sur des sols superficiels avec des conditions très xériques). Si la mise en friche a des effets positifs pour les araignées, la perte d'une partie de la diversité botanique qui en découle peut également être préjudiciable pour la faune à long terme.

- La fréquence de l'entretien peut varier de quelques années pour les stations les plus xériques (steppes, xérobromion) à une intervention annuelle pour les sites plus dynamiques et très productifs.
- En ce qui concerne l'importance de l'entretien, il faut éviter toute intervention intensive et proscrire tout épandage direct d'engrais. Ainsi, on doit diminuer la charge en bétail pour augmenter la valeur d'un site. En plus, il semble primordial de retarder et de réduire la période de pâture. C'est pour ces raisons qu'un pâturage extensif et tournant sur différents sites selon les années pourrait être judicieusement pratiqué.
- La fauche doit être si possible tardive (automnale), ce qui favorise le développement des espèces estivales et ménage des refuges pour les araignées dont la période d'activité est longue ou tardive. Selon nos résultats, une fauche précoce se traduit par une baisse sensible de la qualité arachnologique des stations. De plus, nous recommandons une fauche parcellaire et alternée (sur 2 à 3 ans) en divisant les surfaces pour laisser certaines zones non entretenues. Ceci permet, en plus du maintien de la flore caractéristique des prairies sèches, la conservation de la structure du milieu nécessaire à la survie de nombreuses espèces. Certains buissons peuvent être ainsi conservés. Enfin, il faut éviter de faucher trop ras, car une action aussi brutale a un effet catastrophique sur certains éléments de la faune. De plus, il ne faut pas oublier d'enlever la matière organique fauchée pour ne pas engraisser le sol.

L'ensemble de ces informations doit être considéré comme un apport à la compréhension générale de l'écosystème prairie sèche, mais aussi comme des réponses à des questions individuelles des différentes stations étudiées.

De manière générale, il faut rappeler qu'une gestion orientée sur la persistance de l'ensemble des phases d'une dynamique végétale, favorise la diversité spécifique. Le principe de base est une rotation des interventions sur le site et la mise en place d'un système de corridors permettant une recolonisation des habitats et le maintien de la diversité. *Cependant, il faut préciser que l'objectif de la gestion des prairies sèches ne doit pas être forcément la présence d'une diversité biologique maximale mais le maintien d'une structure du milieu qui favorise les espèces caractéristiques des habitats menacés.*

CONCLUSIONS GÉNÉRALES

Parallèlement à l'actualisation de l'inventaire national des prairies sèches, il nous a semblé important d'étudier la faune arachnologique de ces milieux. Ce travail a permis de perfectionner une méthode d'évaluation de la qualité de stations seminaturelles par les araignées et de discuter des différents types d'entretiens dans une optique de protection de la nature.

La méthode, basée sur l'étude du peuplement arachnologique d'une station permet, par le calcul de deux indices différents (VM1 et VM2), de ne pas sous-estimer la qualité des biotopes homogènes possédant des araignées spécifiques aux conditions du milieu. Les modifications apportées aux analyses permettent une meilleure hiérarchisation des différentes stations, notamment celles de haute valeur. Ce résultat permet de proposer un entretien favorable à la faune arachnologique pour l'ensemble des stations.

Nos résultats prouvent que les araignées sont de bons outils d'évaluation de la qualité des prairies sèches. Par leur position élevée dans la chaîne alimentaire, elles sont capables de donner une information qualitative pour d'autres groupes faunistiques. L'étude de certains sites durant deux années consécutives a permis de mettre en évidence la finesse et la rapidité de réaction des peuplements arachnologiques aux modifications des mesures de gestion. Trois cas de figures ont pu être observés: 1) des stations dont l'entretien inadapté a provoqué la diminution immédiate de leur valeur arachnologique; 2) des stations dont la valeur est restée stable; 3) des stations dont la valeur a rapidement augmenté à la suite d'un entretien plus extensif. Ces résultats sont importants mais devront être confirmés par des études à plus long terme. A l'avenir, il semble donc important d'utiliser les araignées pour caractériser un milieu et son évolution (dynamique) en parallèle de la phytosociologie. Pour cela, il est nécessaire de poursuivre les études autécologiques fines sur la faune arachnologique, en particulier sur les espèces liées à des habitats précis. Cette démarche est indispensable pour l'élaboration de méthodes de gestion permettant la conservation des populations menacées.

Les problèmes relatifs à la protection des prairies sèches ne sont de loin pas tous résolus. La prochaine étape est de compléter les propositions pratiques de mesure de gestion et de mettre sur pied un programme de suivi des effets des mesures proposées. Ce dernier doit servir à vérifier le bien-fondé des buts de protection et à améliorer les mesures de gestion. Le succès de ces différents pas dépend de l'obtention de connaissances scientifiques sur les prairies sèches qui doivent englober des aspects biotiques et abiotiques ainsi que leurs interactions.

Par ce travail, nous espérons avoir contribué à stimuler la sauvegarde de ces écosystèmes qui représentent un milieu de vie primordial pour de nombreuses espèces tant végétales qu'animales.

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A revision of the Habrocerinae of the world. Supplement II (Coleoptera: Staphylinidae)

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A revision of the Habrocerinae of the world. Supplement II (Coleoptera: Staphylinidae). - Further data on the distribution of several species of *Habrocerus* Erichson and *Nomimocerus* Coiffait & Saiz are presented. *H. neglectus* sp. n. from southern Thailand, the sister species of *H. rougemonti* Pace, and *Nomimocerus septentrionalis* sp. n. from Chile, a close relative of *N. longispinosus* Assing & Wunderle, are described. Their primary and secondary sexual characters are figured.

Key-words: Coleoptera - Staphylinidae - Habrocerinae - Thailand - Chile - taxonomy - new species.

INTRODUCTION

Before the present study, the two genera of Habrocerinae comprised 19 species worldwide, 14 species of *Habrocerus* Erichson and 5 species of *Nomimocerus* Coiffait & Saiz. *Habrocerus* is widely distributed in the Palaearctic, the Oriental, the Nearctic and the Neotropical region; the genus is absent from the Ethiopian region, and in the Australian region represented only by the probably introduced and widespread *H. capillaricornis* (Gravenhorst). *Nomimocerus*, in contrast, is confined to the Chilean subregion (ASSING & WUNDERLE 1995, 1996).

In the course of examining new *Habrocerus* material from Thailand it was discovered that what had previously been treated as *H. rougemonti* Pace in fact refers to two closely related species, one of them new to science and described below. An examination of previously unrevised and recently collected material of *Nomimocerus*, deposited in the collections of the University of Kansas, yielded a further species of *Nomimocerus*, so that the figure now stands at 21 species of Habrocerinae worldwide.

In addition to the descriptions, new faunistic data, which have become available since the first supplement (ASSING & WUNDERLE 1996), are presented.

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Material from the following institutions and private collections was studied:

DEI	Deutsches Entomologisches Institut, Eberswalde (L. Zerche)
MHNG	Muséum d'histoire naturelle, Genève (I. Löbl)
UKNHM	University of Kansas Natural History Museum, Lawrence (J. S. Ashe, R. W. Brooks)
cAss	private collection, V. Assing
cWun	private collection, P. Wunderle

NEW SPECIES AND RECORDS OF HABROCERINAE

Habrocerus capillaricornis (Gravenhorst)

Canary Islands: 1♂, 4♀, Gran Canaria, N Teror, E Osorio, El Palmar, 600m, in shady barranco with fragments of Laurisilva, 20.XII.1997, leg. Assing & Wunderle (cWun).

United States of America: 1♂, 3♀, North Carolina, Watauga Co., Boone, 12.III./ 10.V./ 19.V.1973, leg. Ashe (UKNHM).

H. capillaricornis is here for the first time recorded from Gran Canaria. In the Canarian archipelago, the species was previously known only from Tenerife, La Palma and La Gomera. Numerous additional specimens from Central and Southern Europe and from Algeria were examined; the records are not listed in detail, as the species is very common in these regions.

Habrocerus pisidicus Korge

Bosnia-Herzegovina: 3♂, 1♀, Bjelasnica planina (MHNG).

Bulgaria: 2♂, 2♀, Pirin, leg. Weirather (MHNG); 3♀, Ali Botusch, 'N-Seite' near Goleschowo, 1015m, 41°42'13N, 23°35'21E, *Fagus* wood, 15.VI.1997, leg. Behne (DEI); 1♂, Sredna Gora, S Koprivschtiza, 1110m, 42°35'12N 24°22'19E, *Fagus* wood, 29.VI.1997, leg. Zerche & Behne (cAss).

Greece: 1♂, 3♀, Crete, Zakros, 'Tal der Toten', 28.III.1973, leg. Fülscher & Meybohm (MHNG); 5♂, 4♀, Ródhos, M. Kariona, 400m, 11.IV.1977, leg. Besuchet (MHNG, cAss); 2♀, Ródhos, Petaloudes, 8.IV.1977, leg. Besuchet (MHNG).

H. pisidicus is widespread in the southeastern Mediterranean and has been known to occur in the regions indicated above.

Habrocerus ibericus Assing & Wunderle

Spain: 2♂, 1♀, E. Asturias, Cibes, Sierra de la Serrantina, 800m, 16.V.1997, leg. Starke (coll. Feldmann, cAss); 1♀, Albacete, leg. Comellini (MHNG); 1♂, Prov. Albacete, Villaverde, 15.IV.1959, leg. Besuchet (MHNG); 1♂, Prov. Tarragona, Sierra de Moutsant (?), 23.III.1959, leg. Besuchet (MHNG); 1♂, 1♀, Prov. Lèrida, 2.VI.1965, leg. Comellini (MHNG); 2♂, 1♀, Prov. Teruel, Rubielos de Mora, 19.IX.1971, leg. Comellini (MHNG); 1♀, Prov. Murcia, Sierra de Espuña, 26.III.1959, leg. Besuchet (MHNG); 3♂, 1♀, Prov. Jaen, Sierra de Cazorla, 12.IV.1959, leg. Besuchet (MHNG).

Previously, only the type specimens of *H. ibericus* were known from the Iberian Peninsula, where the species seems to be both widely distributed and quite common.

Habrocerus neglectus sp. n. Figs 1-4

Habrocerus rougemonti Pace: ASSING & WUNDERLE 1995 (partim, Figs 9a-g, 11g)

Holotype ♂: THAILAND. NE Bangkok, Khao Yai Nat. Park, Khao Khieo, 1150m, leg. Burckhardt & Löbl, 28.XI.85 (MHNG).

Paratypes: 11♂, 19♀, same data as holotype (MHNG, cAss, cWun); 3♂, Chiang Mai, Mae Nang Kaeo, 900m, 54 km NE Chiang Mai, leg. Burckhardt & Löbl, 3.XI.1985 (MHNG, cAss).

DIAGNOSIS: Closely related to and externally indistinguishable from *H. rougemonti* Pace, its sister species.
♂: tergum and sternum VII slightly broader than in *H. rougemonti* (Fig. 3); modified sternum VIII anteriorly distinctly broader, less convex and mostly without median carina, posteriorly with wider emargination and more distinctly sclerotized margins (Fig. 2); internal sac with shorter row of semitransparent triangles and anteriorly with ca. four weakly sclerotized coniform spines (Fig. 1); appendices of pleurites VIII weakly S-shaped (see Fig. 9a in ASSING & WUNDERLE 1995).
♀: tergum and sternum VIII broader and shorter than in *H. rougemonti* (Fig. 4).

COMMENTS: For further details regarding external and secondary sexual characters, the description and figures in ASSING & WUNDERLE (1995) are referred to. Both the figures and the material listed from the surroundings of Bangkok refer to this species and not to *H. rougemonti*.

DISTRIBUTION: *H. neglectus* is known only from two localities, one in northern and one in southeastern Thailand. It appears doubtful that *H. neglectus* and *H. rougemonti* should have a para- or allopatric distribution; both species are macropterous, and the northern locality of *H. neglectus* (Mae Nang Kaeo) is only some 70 km away from Doi Suthep, where *H. rougemonti* was found.

Habrocerus rougemonti Pace Figs 5 - 9

Habrocerus rougemonti Pace: ASSING & WUNDERLE 1995 (partim)

Additional material examined:
Thailand: 5♂, 1♀, mountains near Umphang, 1250 m, 10.II.1993, leg. Schwendinger (MHNG, cAss).

DIAGNOSIS: ♂: tergum and sternum VII slightly more oblong than in *H. neglectus* (Fig. 8); modified sternum VIII anteriorly more slender and more convex than in *H. neglectus* and with median carina, posteriorly with narrower emargination and relatively weakly sclerotized margins (Fig. 6); internal sac with longer row of semitransparent triangles and anteriorly with a large blackish spine (Fig. 5); appendices of pleurites VIII weakly and evenly curved (Fig. 7).
♀: terminalia similar to *H. neglectus*, but tergum and sternum VIII more oblong (Fig. 9).

DISTRIBUTION: *H. rougemonti* appears to have a more restricted distribution than previously stated. So far, the species has become known from three localities in northern and western Thailand.

Habrocerus schwarzi Horn

Canada: 9♂, 4♀, Alberta, George Lake, 53°57'N, 114°06'W, ex mushrooms, 11./ 22.VIII.1977, leg. Ashe (UKNHM, cAss); 1♂, Alberta, Fort MacKay, aspen spruce, pitfall trap, 2.IX.1978, leg. Ryan & Hilchie (UKNHM).

Previously only one record from Alberta had been known (Assing & Wunderle 1995).

Habrocerus tropicus Wendeler

1♀, Brazil, Linha Facao, Santa Catarina, V.1954, leg. Plaumann (UKNHM).

H. tropicus has become known only from Brazil.

Nomimocerus longispinosus Assing & Wunderle

Chile: 2♂, Chiloé, Isla Chiloé, San Juan de Chadmo, 20.II.1997, leg. Cekalovic (UKNHM, cAss); 2♀, 1 ex., Chiloé, Isla Chiloé, 5km SW Chonchi, 20.II.1997, leg. Cekalovic (UKNHM).

Previously recorded only from Aisén province, Chile, *N. longispinosus* is now also known from Isla de Chiloé, Chiloé province.

Nomimocerus peckorum Assing & Wunderle

Chile: 4♂, 4♀, Osorno, 14 km E Termas de Puyehue, 40°40'S, 71°14'W, 350 m, ex fungus on live vine, 30.XI.1994, leg. Leschen & Carlton (UKNHM, cAss); 1♀, same data, but 450 m, ex sifting leaf litter (UKNHM); 1♂, 1♀, Valdivia, 10 km NW Choshuenco, 39°45'S, 72°20'W, 250 m, sifting leaf litter, 15.XI.1994, leg. Leschen & Carlton (UKNHM, cAss); 1♀, Valdivia, 37 km SE Panguipuli, 39°45'S, 72°20'W, 300 m, 14.XI.1994, leg. Leschen & Carlton (UKNHM); 1♂, Cautin, 8 km S Pucon, 1075 m, 39°21'S, 71°58'W, 23.XI.1994, leg. Leschen & Carlton (UKNHM); 1♂, Cautin, 26.7 km E Pucon, 625 m, 39°39'S, 71°47'W, 24.XI.1994, leg. Leschen & Carlton (UKNHM); 1♂, Cautin, Termas de Palguin, Salto Puma, 725 m, 39°22'S, 71°50'W, 25.XI.1994, leg. Leschen & Carlton (cAss).

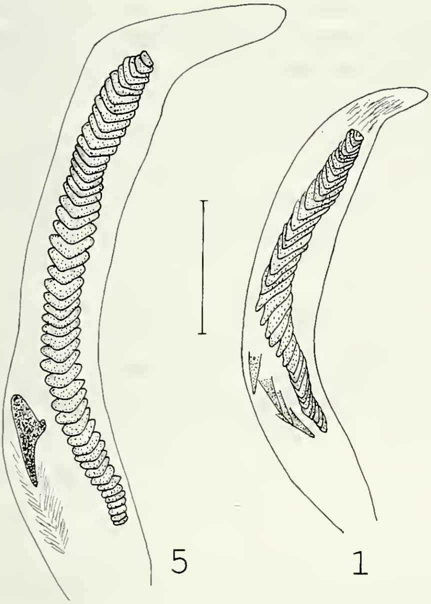
N. peckorum was originally described from Osorno and Llanquihue province, Chile, and is here recorded from two further provinces: Valdivia and Cautin.

Nomimocerus septentrionalis sp. n. Figs 10 - 12

Holotype ♂: CHILE: Coquimbo, 6 km SW Hurtado, 1040 m, Puente Morrillos, 30°16'S, 70°40'W, 28 Oct 1994, R. Leschen & C. Carlton, #021, ex: along stream (UKNHM).

Paratypes: 5♂, 3♀, same data as holotype (UKNHM, cAss); 6♂, 4♀, CHILE: Coquimbo, 850 m, 5 km S. Carén, Pte. El Cuiyano, Río Limari, 30°52'S, 70°45'W, #033, R. Leschen, C. Carlton, ex: leaf litter, 30.X.1994 (UKNHM, cAss); 2♂, 9♀ [2♀ teneral], CHILE: Coquimbo, 6 km W Hurtado, 1040 m, Puente Morrillos, 30°16'S, 70°40'W, 28 Oct 1994, R. Leschen & C. Carlton, #022, ex: sifting litter (UKNHM, cAss).

Figs 1 - 12: *Habrocerus neglectus* sp. n. (1 - 4) and *H. rougemonti* Pace (5 - 9): internal sac in squeezed preparation (1, 5); outlines of ♂ sternum VIII (2, 6); appendix of ♂ pleurite VIII (7); ♂ tergum VII (left) and sternum VII (right) (3, 8); outlines of ♀ tergum VIII (left) and sternum VIII (right) (4, 9). *Nomimocerus septentrionalis* sp. n. (10-12): internal sac in squeezed preparation (10); ♂ tergum VII (11); outline of hind margin of sternum VII of two ♂ (12); setae and pubescence partly or completely omitted in 11 and 12. Scales: 0.25 mm.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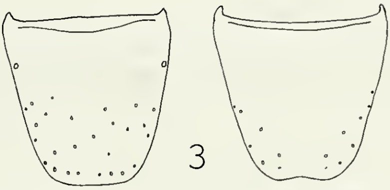
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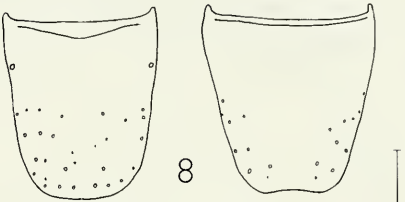
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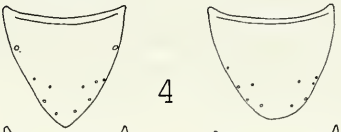
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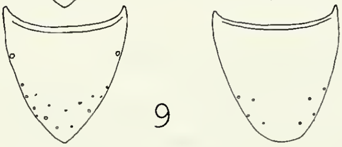
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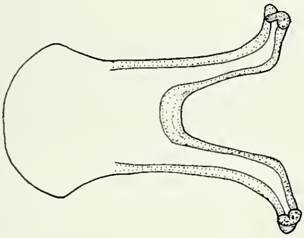
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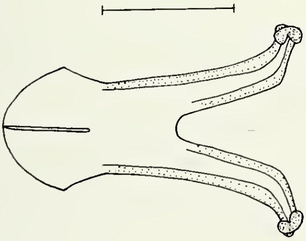
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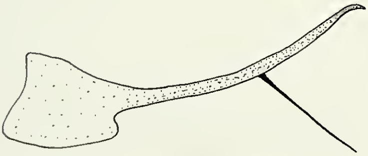
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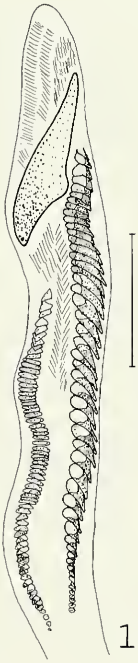
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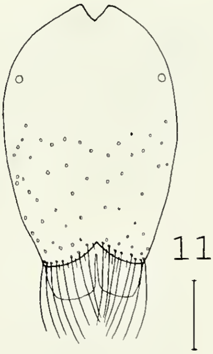
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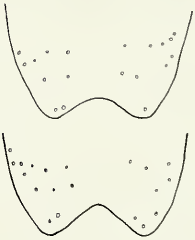
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Diagnosis: Total length: 3.8 - 4.8 mm; pronotal length: 0.68 - 0.76 mm; pronotal width: 1.03 - 1.15 mm; elytral length: 0.71 - 0.80 mm. In external morphology and colour highly similar to *N. peckorum* and *N. longispinosus*, but on average larger (see measurements); hind wings in all the type specimens reduced.
♂: posterior margin of sternum VII with concavity of variable depth and width (Fig. 12); hind margin of tergum VII more deeply incised centrally than in *N. peckorum* and *N. longispinosus* (Fig. 11); internal sac with internal structures similar to *N. longispinosus*, but spines of long series stouter and caudad more gradually decreasing in length (in *N. longispinosus* the transition is ± abrupt), the second (short) series longer, and the sclerotized terminal piece distinctly more massive and less slender than in that species (Fig. 10).

Distribution and bionomics: The species was collected near Coquimbo, Chile (between 30° and 31° southern latitude), distinctly further north (name!) than the known areas of distribution of its congeners. The type specimens were taken in leaf litter and in the vicinity of a stream at altitudes between 850 and 1040 m at the end of October; two of them were teneral.

ACKKNOWLEDGEMENTS

I am indebted to the colleagues indicated in the introduction for the loan of the material which this study is based on.

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REVUE SUISSE DE ZOOLOGIE 105 (2): 493-497; septembre 1998

Beschreibung von vier neuen Arten der Gattung *Derarimus* (Coleoptera, Anthicidae) aus Malaysia

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Description of four new species of the genus *Derarimus* (Coleoptera, Anthicidae) from Malaysia. - Following species are described and illustrated: *Derarimus ampliaticornis* sp. n., *Derarimus bicavatus* sp. n., *Derarimus compacticornis* sp. n. and *Derarimus sabahensis* sp. n.

Key-words: Coleoptera - Anthicidae - Tomoderini - *Derarimus* - new species - Malaysia.

EINLEITUNG

Eine weitere Bestimmungssendung, die mir Herr Dr Ivan Löbl vom Naturhistorischen Museum in Genf übergab, enthält vier bisher nicht beschriebene Arten der Gattung *Derarimus*, die nachfolgend beschrieben werden.

Die Gattung *Derarimus* wurde 1978 für eine neue Art, *D. carinatus* aus Indien von BONADONA beschrieben. Außerdem stellte Bonadona *Tomoderus excisicollis* Heberdey aus Java in die neue Gattung. 1986 versetzte SAKAI *Tomoderus clavipes* Champion in die Gattung *Derarimus*. Zur Zeit sind (einschließlich der hier beschriebenen) 51 Arten beschrieben. Außer *D. clavipes* (Champion) aus der Paläarktis (Japan) sind alle Arten in der Orientalis beheimatet, nämlich in Malaysia, Indonesien, Indien, Vietnam, Thailand und Taiwan.

Eine Bestimmungstabelle der Arten ist bei UHMANN, 1994 zu finden, eine Ergänzung dazu bei UHMANN 1996.

Herrn Dr I. Löbl danke ich sehr, daß er mir die Bearbeitung dieser Tiere ermöglichte sowie für die Überlassung einiger der Käfer für meine Sammlung. Herrn Dr Volker Mahnert, ebenfalls vom Naturhistorischen Museum in Genf danke ich sehr für die redaktionelle Beratung.

Alle Holotypen der hier beschriebenen Arten befinden sich im Naturhistorischen Museum in Genf. Alle Maße sind in mm angegeben.

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59. Beitrag zur Kenntnis der Anthicidae

Manuskript angenommen 05.02.1998

BESCHREIBUNGEN

Derarimus ampliaticornis sp. n. Abb. 1-3

E-Malaysia, Sarawak, Gn Penrissen, 1000 m, 23.5.1994, edge prim. montane for., # 9 a, 1 Ex., leg. Löbl & Burckhardt, Holotypus.

Länge 2,9, größte Breite 1,0. Kopf 0,6 lang, über die Augen gemessen 0,6 breit. Halsschild 0,7 lang, 0,4 breit. Flügeldecken 1,5 lang, 1,0 gemeinsam breit.

Färbung: Braun. Taster, Fühler und Beine gelbbraun.

Kopf: Glänzend. Fein und verstreut punktiert. Behaarung braun, kräftig, ziemlich kurz, gebogen, etwas abstehend, in verschiedene Richtungen weisend. Außerdem mit wenigen, nicht sehr langen, geraden Borsten, Fühler mit langer, kräftiger Behaarung.

Halsschild: Glänzend. In der Mitte ziemlich kräftig, zwischen den Kerben sehr kräftig, sonst sehr fein punktiert. Behaarung braun, kräftig, etwas gebogen, etwas abstehend, größtenteils nach hinten gerichtet. Außerdem mit zahlreichen langen, fast geraden Borsten, die senkrecht abstehen.

Flügeldecken: Glänzend. Sehr kräftig, aber flach punktiert. Die Zwischenräume sind kleiner als die Punkte. Zur Spitze Zur Spitze werden die Punkte etwas feiner und etwas tiefer. Die Zwischenräume werden etwas größer. Behaarung braun, kräftig, ziemlich lang, etwas gebogen, etwas abstehend, nach hinten gerichtet. Außerdem mit zahlreichen, nicht sehr langen, meist geraden, senkrecht abstehenden Borsten.

Beine unauffällig behaart.

Beziehungen: Dem *Derarimus luteipes* Uhmann aus W-Malaysia (Pahang) ähnlich, aber der Halsschild ist schlanker und neben den Kerben befinden sich feine Längskielchen.

Derarimus bicavatus sp. n. Abb. 4 und 5

E-Malaysia, Sarawak, confl. Sun Oyan and Mujong riv., E Kapit, 50 m, 18.5.1994, # 5 a, 1 Ex., leg Löbl & Burckhardt, Holotypus.

Länge 5,2, größte Breite 2,1. Kopf 0,9 lang, über die Augen gemessen 1,0 breit. Halsschild 1,5 lang, 1,0 breit. Flügeldecken 3,0 lang, 2,1 gemeinsam breit.

Färbung: Kopf und Halsschild rotbraun. Flügeldecken etwas dunkler braun. Fühler, Taster und Beine gelbbraun.

Kopf: Glänzend. Sehr fein und flach punktiert. Zwischenräume viel größer als die Punkte. Behaarung braun, kräftig, gebogen, etwas abstehend, in verschiedene Richtungen weisend. Fühlerbehaarung kräftig und abstehend.

Halsschild: Glänzend. Sehr fein, in der Abschnürung kräftig punktiert. Behaarung braun, kräftig, wenig gebogen, abstehend, in verschiedene Richtungen weisend. In der hinteren Hälfte, jederseits der Mitte mit einer flachen, aber deutlichen Grube, so daß in der Mitte und seitlich kielartige Erhebungen stehen bleiben.

Flügeldecken: Glänzend. Ziemlich kräftig punktiert. Zwischenräume kleiner als die Punkte. Zur Spitze wird die Punktur nur etwas feiner, bleibt aber dicht. Behaarung braun, kräftig, etwas gebogen, halb abstehend, ziemlich dicht, nach hinten gerichtet.

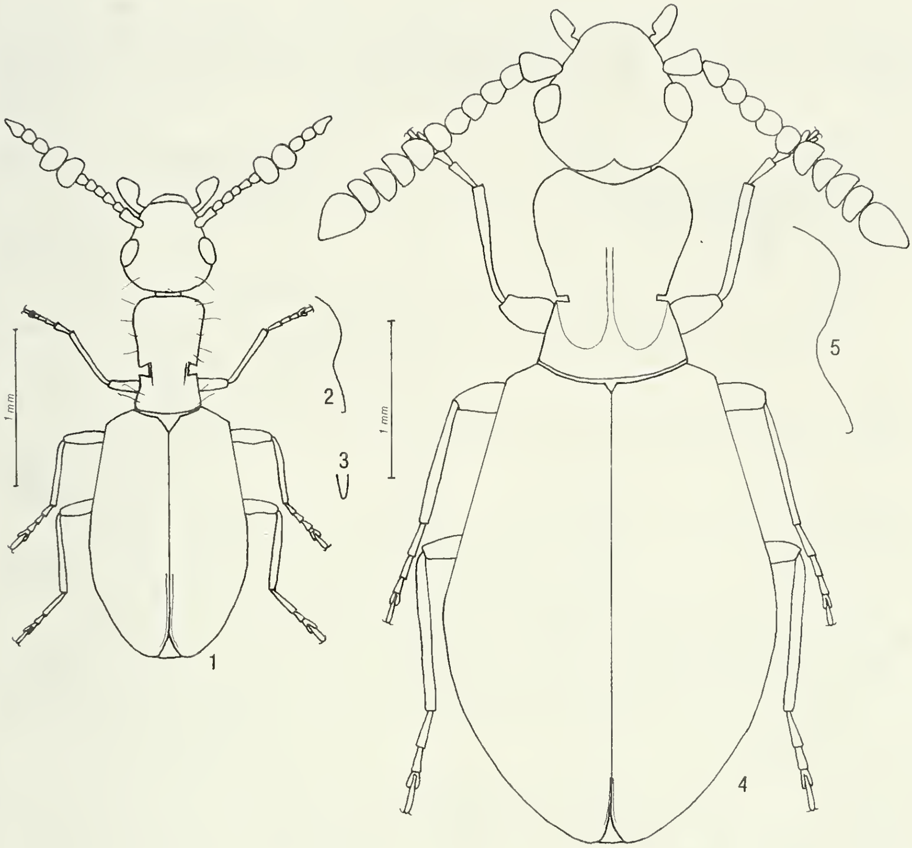

ABB. 1-5

Derarimus ampliaticornis sp. n. (1-3): 1. Habitus; 2. Halsschildprofil; 3. Aedeagusspitze, dorsal. – *D. bicavatus* sp. n. (4-5): 4. Habitus; 5. Halsschildprofil.

Beine mit kräftiger, aber sehr kurzer Behaarung.

Beziehungen: Dem *Derarimus robusticornis* Uhmann aus Sabah etwas ähnlich, aber die Schläfen sind länger, der Halsschild ist schlanker.

Derarimus compacticornis sp. n. Abb. 6 und 7

E-Malaysia, Sarawak, Gn Penrissen, 1000 m, 23.5.1994, edge prim. montane for., # 9 a, 3 Ex., leg. Löbl & Burckhardt, Holotypus, 2 Paratypen. E-Malaysia, Sarawak, Gn Matang, 20 km W Kuching, 800 m, 13.5.1994, submontane forest, # 2 a, 1 Ex., leg Löbl & Burckhardt, Paratypus. E-Malaysia, Sarawak, confl. Sun Oyan and Mujong riv., E Kapit, 50 m, 18.5.1994, # 5 a, 1 Ex., leg. Löbl & Burckhardt, Paratypus.

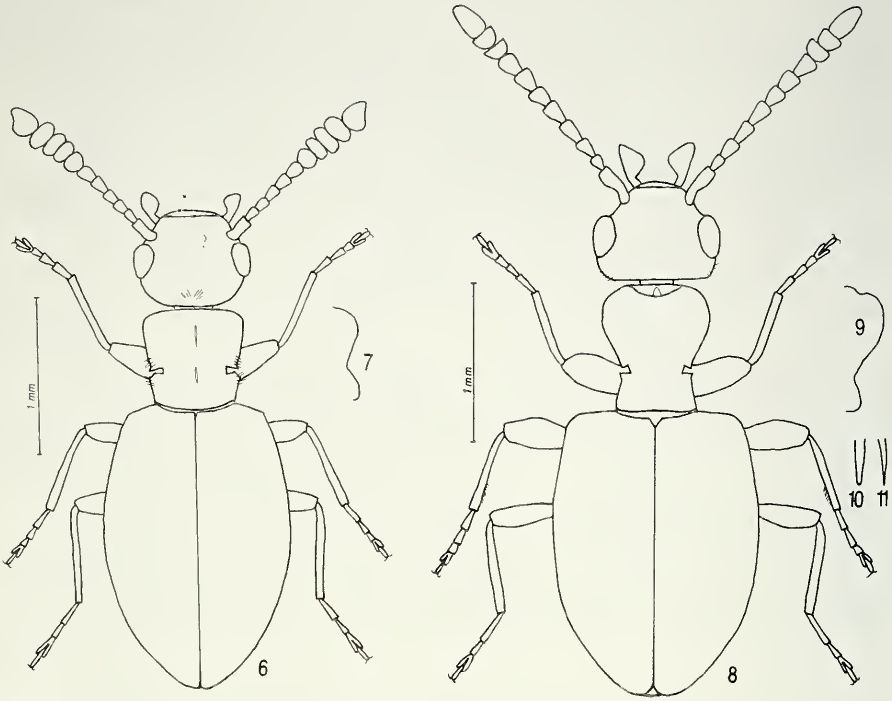

Abb. 6-11

Derarimus compacticornis sp. n. (6-7): 6. Habitus; 7. Halsschildprofil. – *D. sabahensis* sp. n. (8-11): 8. Habitus; 9. Halsschildprofil; 10. Aedeagusspitze, dorsal; 11. Aedeagusspitze, lateral.

Länge 3,0, größte Breite 1,2. Kopf 0,6 lang, über die Augen gemessen 0,7 breit. Halsschild 0,6 lang, 0,6 breit. Flügeldecken 1,8 lang, 1,2 gemeinsam breit.

Färbung: Dunkelbraun. Fühler, Taster und Beine etwas heller braun.

Kopf: Glänzend. Äußerst fein und verstreut punktiert. Behaarung dunkelbraun, sehr kräftig, etwas gebogen, halb abstehend, größtenteils nach hinten gerichtet, ziemlich dicht. Fühler unauffällig behaart.

Halsschild: Glänzend. Ziemlich kräftig, aber unterschiedlich und flach punktiert. In der Einschnürung sehr kräftig und dicht punktiert. Behaarung dunkelbraun, sehr kräftig, wenig gebogen, halb abstehend. Außerdem mit zahlreichen steifen Borsten. In der Einschnürung und vor der Einschnürung mit je einem feinen Längskiel.

Flügeldecken: Glänzend. Fein und etwas unterschiedlich punktiert. Zwischenräume meist etwas größer als die Punkte. Zur Spitze werden die Punkte kaum feiner. Die Zwischenräume werden kaum größer. Behaarung dunkelbraun, kräftig, ziemlich dicht, etwas gebogen, halb abstehend, nach hinten gerichtet.

Beine unauffällig behaart.

Beziehungen: Dem *Derarimus fulvescens* Uhmann aus Malaysia (Taiping) ähnlich, aber kleiner, Punktierung und Behaarung anders, Flügeldecken ohne lange Borsten.

Derarimus sabahensis sp. n. Abb. 8 - 11

Malaysia, Sabah, Babu, Pungpul Resort env., 24.6.-1.7.1996, 11 c vegetation debris and forest floor litter accumulated arround large trees near river, no collector, 7 Ex., Holotypus, 6 Paratypen.

Länge 3,0, größte Breite 1,3. Kopf 0,6 lang, über die Augen gemessen 0,7 breit. Halsschild 0,8 lang, 0,7 breit. Flügeldecken 1,8 lang, 1,3 gemeinsam breit.

Färbung: Dunkelbraun. Fühlerbasis uns Schenkel heller braun. Fühlerspitze, Taster, Schienen und Tarsen gelbbraun.

Kopf: Glänzend. Punktur fein, flach, verstreut. Behaarung braun, kräftig gebogen, halb abstehend, in verschiedene Richtungen weisend. Fühler mit langer, kräftiger Behaarung.

Halsschild: Glänzend. Fein und verstreut punktiert, in der Einschnürung runzelig. Behaarung braun, kräftig, lang, fast gerade, fast senkrecht abstehend. In der Mitte des Vorderrandes ausgehöhlt (nur bei den Männchen).

Flügeldecken: Glänzend: Kräftig punktiert, Zwischenräume etwa so groß wie die Punkte. Zur Spitze werde die Punkte sehr viel feiner, die Zwischenräume sehr viel größer. Behaarung braun, kräftig, lang, steil und fast gerade abstehend. Neben der Naht, hinter dem Schildchen beiderseits etwas niedergedrückt.

Beine unauffällig behaart.

Beziehungen: Dem *Derarimus ovipennis* Uhmann aus W-Malaysia (Pahang) etwas ähnlich, aber mit deutlichen Schultern und größeren Augen.

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REVUE SUISSE DE ZOOLOGIE 105 (3): 499-555; septembre 1998

A taxonomic revision of the family Oncopodidae I. New genera and new species of *Gnomulus* Thorell (Opiliones, Laniatores)

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A taxonomic revision of the family Oncopodidae I. New genera and new species of *Gnomulus* Thorell (Opiliones, Laniatores). - The genera *Oncopus* Thorell, 1876 and *Gnomulus* Thorell, 1890 are rediagnosed; *Pelitnus* Thorell, 1891 is synonymised with *Gnomulus* because of intermediate forms and identical penis structure. Seventeen species described under *Pelitnus* are transferred to *Gnomulus*; generic placement in six of them (known only from females or juveniles) is provisional. Taxonomic characters of Oncopodidae and relationships within the Oncopodidae and with other families are discussed. *Pelitnus thorelli* Schwendinger, 1992 is a primary homonym; the species unduely described under this name is transferred to *Gnomulus* and renamed *G. baharu* Schwendinger nom. n. Three new genera and thirteen new species of mostly small oncopodid opilionids are described. *Palaeoncopus* gen. n., with *P. gunung* sp. n., *P. kerdil* sp. n., *P. katik* sp. n. from Sumatra possess a short, distad-directed, non-expandable glans penis, which is considered plesiomorphic. *Biantoncopus* gen. n., with *B. fuscus* sp. n. from the Philippines, has a similar but expandable glans. This character is regarded as apomorphic. Seven new species are placed in *Gnomulus*, i. e. *G. crucifer* sp. n., *G. maculatus* sp. n., *G. coniceps* sp. n., *G. leyteensis* sp. n., *G. laruticus* sp. n., *G. asli* sp. n. and *G. hirsutus* sp. n. Their penis morphology, with a short proximad-directed glans, is typical for most Oncopodidae (also present in *Oncopus*) and is considered derived from the *Palaeoncopus*-type. *Caenoncopus* gen. n., including *C. tenuis* sp. n., *C. affinis* sp. n. and *C. cuspidatus* (Schwendinger) comb. n. (transferred from *Oncopus*) from Sumatra, has a glans penis comprising a strongly elongated, proximad-directed stylus wrapped in a membraneous collar. This structure appears highly apomorphic and is possibly an extreme modification of the penis type in *Gnomulus* and *Oncopus*. Intermediate states of reduction of glans sclerites and enlargement of stylus are present in *G. crucifer* sp. n. and *G. maculatus* sp. n.,

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though they probably belong to a different evolutionary lineage. Four penis types are distinguished for the Oncopodidae; their evolution, generic significance and functional morphology are discussed.

Key-words: Opiliones - Oncopodidae - Taxonomy - Penis morphology - Evolution - SE Asia.

INTRODUCTION

Since a revisional study on the Oncopodidae of the Natural History Museum of Geneva (SCHWENDINGER 1992), extensive and exceptionally rich new material has become available from the collections of various colleagues and ourselves. Several of the small specimens in this material are particularly interesting, as they look similar to the enigmatic *Oncopus cuspidatus* Schwendinger, which has no genital-morphological resemblance to other Oncopodidae or even to other opilionids previously known. After close examination, surprisingly they turned out to include not only close relatives of *O. cuspidatus* but also other forms with unexpected penis morphology. An account of this remarkable new material is given here; a thorough revision of the remaining taxa with new descriptions shall follow in subsequent papers. Although the newly available material contains plenty of exceptional forms, it nevertheless originates from quite sporadic samplings and we believe that it only represents the tip of an iceberg. With more systematic sampling by sifting and soil extraction in all parts of Southeast Asia, a plethora of small and inconspicuous oncopodid taxa is expected to be discovered.

Abbreviations and terms used in the text: CCD collection of C. Deeleman-Reinhold, Sparrenlaan; MAR collection of J. Martens, Mainz; MCSNG Museo Civico di Storia Naturale, Genova; MHNG Muséum d'histoire naturelle, Genève; SMF Senckenberg Museum, Frankfurt; ZMA Zoological Museum, University of Amsterdam; ZMT Zoological Museum, University of Turku. Body measurements refer to the length of the dorsal scutum (i.e. distance between anterior margin of carapace and posterior margin of abdominal part of dorsal scutum). Leg articles were measured on their dorsal side, from joint to joint. All measurements are given in mm.

TAXONOMIC REMARKS

SPECIES CONCEPT

We tried to find characters for distinctions and relationships between species in their penis morphology, but faced the problem of where to draw the boundaries in regard to the biospecies concept. Allopatric, morphologically similar and obviously closely related populations needed to be divided into "biospecies", without knowing whether or not reproductive isolation exists. As empirical data for such a grouping in Oncopodidae are non-existent (see MARTENS 1978 for Biantidae), we had to draw species boundaries in an arbitrary manner. Each seemingly allopatric population with clear morphological distinctiveness is here regarded as a separate species. Due to the scattered and very localized nature of Oncopodidae collections (formerly caused by restricted accessability, today by habitat destruction), individual finds may show morphological distinctiveness, which does not correspond with species identity in the sense of the biospecies concept. In addition, geographical variation in Oncopodidae remains largely unclear. Therefore the species concept necessarily used here is close to the phylogenetical species concept, which clusters diagnosable populations into so-called "phylospecies" (Zink 1997).

Traditional system and generic limits

Thorell (1876) described the subfamily Oncopodinae (under the family Cosmetoidae Koch) and later (1890) upgraded them to family rank. Within this group he successively distinguished three genera: *Oncopus* (Thorell, 1876), *Gnomulus* (Thorell, 1890) and *Pelitnus* (Thorell, 1891), which remained valid until the present day. The distinction between these genera is essentially based on tarsal formula (*Oncopus* 1-1-1-1, *Gnomulus* and *Pelitnus* 2-2-3-3) and presence (*Pelitnus*) or absence (*Gnomulus*) of an oblique, strong, triangular eye tubercle (Thorell 1891: 93 - "Oculi basi tuberculi transversi fortis trianguli impositi."). The latter character, however, shows all transitions from a plane interocular area to a rounded hump and an acutely pointed prorect or erect eye tubercle in both nominal genera. The interocular area is sexually dimorphic in some species, with a low eye tubercle present in ♀♀ and absent in ♂♂. This was shown for *G. lannaianus* (sub *Pelitnus lannaianus*, Schwendinger 1992) and also occurs in *G. sumatranus* (in preparation). Therefore the traditional distinction between *Gnomulus* and *Pelitnus* cannot be maintained. Penis morphology in both genera (first illustrated for *Gnomulus* by Loman 1903: fig. 5f) is of the same type. A detailed account of this shall be given in our next paper.

In contemporary taxonomy of arthropods ♂ genitalia are regarded to be among the most informative characters explaining relationships between taxa. Within the last decades this view became generally accepted and brought forth significant changes to high level systematics of opilionids. On the base of the genital morphology of ♂♂, the family Fissiphallidae was established recently (Martens 1988) and the traditional suborders Cyphophthalmi and Palpatores were united to one suborder Cyphopalpatores (Martens 1980, 1986). Applying the same criteria to the family Oncopodidae, we place *Pelitnus* in synonymy with *Gnomulus*, as was already suggested by Loman (1902: 183). Three new genera with penis morphology distinctly different from *Gnomulus* and *Oncopus* are established in the following.

Definition of the family Oncopodidae

Oncopodid harvestmen are readily distinguishable by external characters, but most of these seem to be plesiomorphic for opilionids and are therefore not appropriate to define the family. This holds true for the following characters in particular:

extensive dorsal scutum (carapace and abdominal tergites fused); low number (1-3) of tarsal articles; restricted unidirectional articulation of the legs and pedipalps. The large, fused dorsal scutum clearly distinguishes the Oncopodidae from other Laniatores, but similar structures are also found in the Sironoidea and the Trogulidae, which are likewise slow-moving, soil-dwelling opilionids. All three taxa are additionally characterized by a low number of tarsal articles (up to 2 in Sironoidea ♂♂, up to 4 in Trogulidae and up to 3 in Oncopodidae). Obviously the state of both characters is correlated with the mode of life of these cryptic animals. In Sironoidea large dorsal scutum and few tarsalia are considered plesiomorphic, whereas in the taxonomically distant Trogulidae the same most likely represent apomorphic reversals. Though oncopodids already possess clearly derived genital characters (e.g. hemolymph-pressure penis), their large scutum and low number of tarsalia are difficult to evaluate. We assume that they represent plesiomorphies.

Only the following three character states are presently regarded as autapomorphic of the Oncopodidae, defining the family as a monophyletic group:

1. Glans penis with lateral sclerites fused by an intermediate (median) plate (Figs 1, 134). In other families, symmetrical glans structures are not interconnected and can be moved independently from each other (MARTENS 1986).

2. Ovipositor laterally compressed, not dorso-ventrally flattened or circular in cross-section (MARTENS *et al.* 1981). This trait holds true not only for *Oncopus* (MARTENS *et al.* 1981), but was also found in *Gnomulus*, *Biantoncopus* gen. n., *Palaeoncopus* gen. n. and *Caenoncopus* gen. n. In the smallest representatives, however, ovipositor cross-sections generally tend to be more roundish.

3. Cuticular appendages (paired or unpaired) on the carapace and the first abdominal tergite, respectively, form a small "bridge". This character is found only in Oncopodidae (ŠILHAVY 1960).

Regarding the scarcity of derived characters identified by now, the taxonomic position of the family Oncopodidae is again open to question. By no means can we presently trace character states that may warrant the status of a superfamily or a similarly high-ranking taxon for the Oncopodidae alone, as was suggested earlier (ŠILHAVY 1960, MARTENS *et al.* 1981). At the present state of knowledge no sister group can be identified for the Oncopodidae.

DESCRIPTIONS

Caenoncopus gen. n.

Diagnosis: Distinguished by penis with dorso-ventrally depressed truncus, basally bilobed, subbasally not constricted; subapical glans large, composed of a strongly elongated, cylindrical stylus proximally enclosed in a membraneous collar; tip of stylus asymmetrical; glans folded proximad in resting position, lying in a shallow trench on the dorsal surface of the truncus. Body small without elevated scutal areas; interocular area developed as a round hump, not abruptly separated from

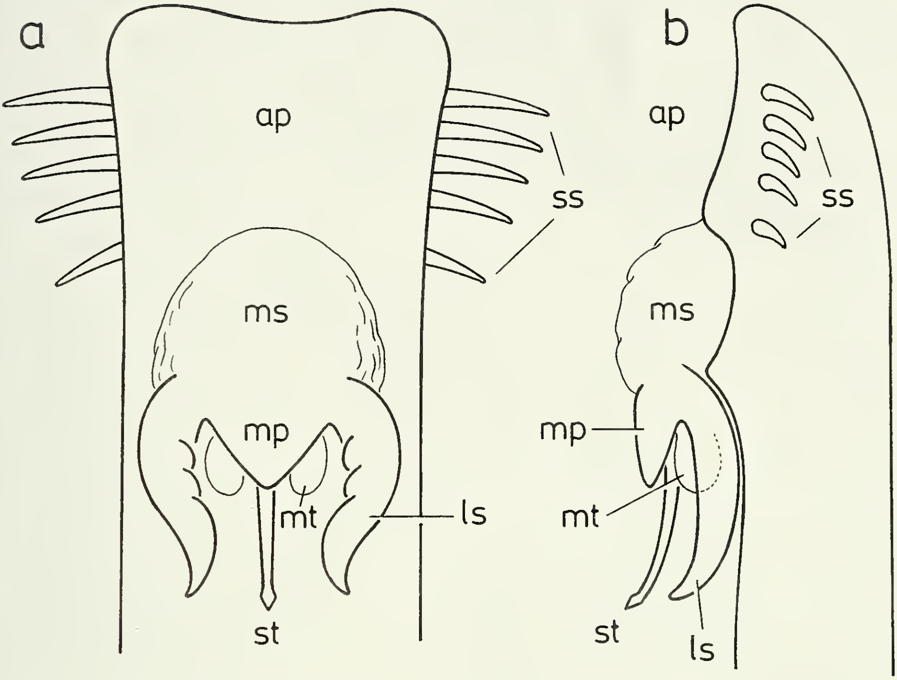


FIG. 1

General scheme of an oncopodid penis of the *Gnomulus/Oncopus* type; ventral (a) and lateral (b) view of distal part. - Apex of truncus (ap); two lateral sclerites (ls); median plate (mp); membraneous socket (ms); two membraneous tubes (mt); subapical setae (ss); stylus (st).

low thoracic area; chelicerae small, weak, with a pronounced dorso-distal and a small ventro-median hump on proximal article, no modifications on cheliceral hand; pedipalps with small ventral processes on proximal femur and trochanter; ventral coxa II with anterio-proximal process; legs 3142, tarsal formula 1-1-2-2 or 1-1-3-3. External sexual dimorphism in shape of palpal trochanter or absent.

Etymology: Greek: *kainos* = new, young; *oncos* = swelling; *podos* = foot; male gender. The Latinized name (correctly spelled "Caenooncopus", one "o" omitted to make it more euphonious) refers to the highly derived genital morphology of this genus and to its relationship with *Oncopus*.

Type species: Oncopus cuspidatus Schwendinger.

Species account and distribution: Three apparently allopatric species, i.e. *C. cuspidatus* comb. n., *C. tenuis* sp. n., *C. affinis* sp. n., are known from Sumatra. The latter two species occur in close proximity and are also closest relatives.

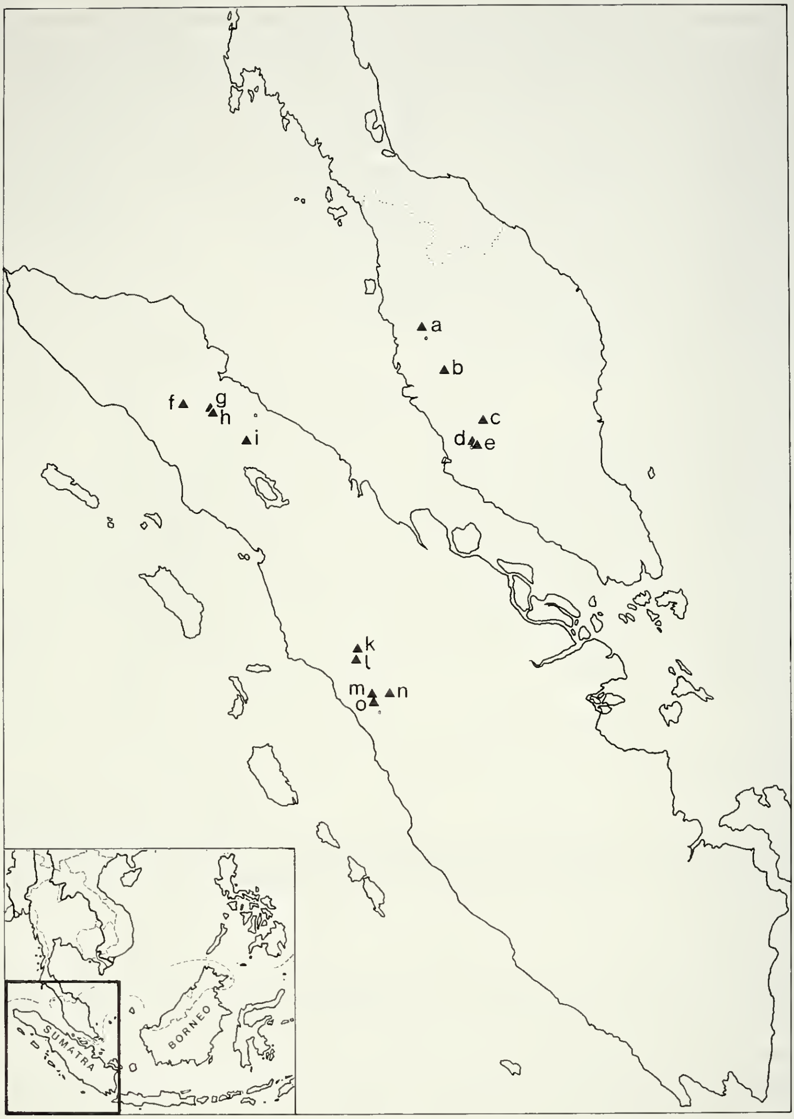


FIG. 2

Distribution of Oncopodidae in the Malay Peninsula and Sumatra. Only localities of species treated in this paper are shown. - a) Maxwell Hill (*Gnomulus laruticus* sp. n.); b) Chenderiang (*G. asli* sp. n.); c) road to Genting Highlands (*G. hirsutus* sp. n.); d) Templer Park (*G. hirsutus* sp. n.); e) Ulu Gombak (*G. hirsutus* sp. n.); f) Ketambe (*Caenoncopus cuspidatus*, *Palaeoncopus kerdil* sp. n.); g) Bukit Lawang (*C. cuspidatus*); h) Bohorok [Langkat Reserve] (*C. cuspidatus*, *P. katik* sp. n.); i) road Brastagi - Sibolangit [Deli Serdang] (*C. cuspidatus*); k) Panti (*C. affinis* sp. n.); l) road Lubuksikaping - Panti (*C. affinis* sp. n.); m) Palopo Nature Reserve (*C. tenuis* sp. n.); n) 5 km SE of Payakumbuh (*C. tenuis* sp. n.); o) Mt. Singgalang (*P. gunung* sp. n.).

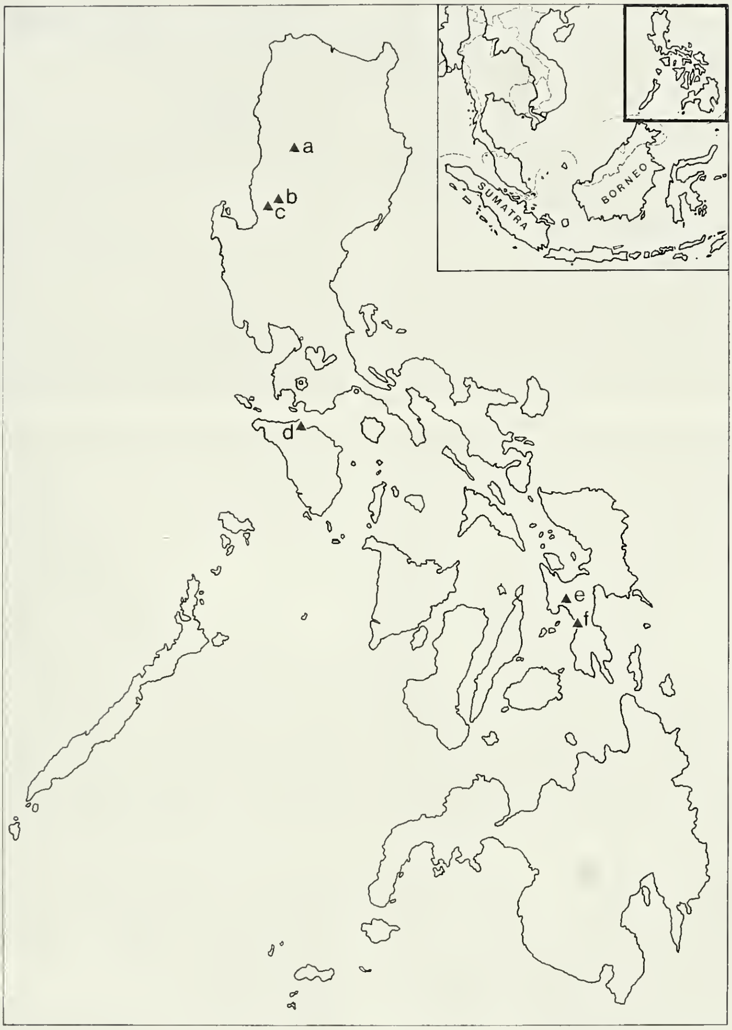


FIG. 3

Distribution of Oncopodidae in the Philippines. Only localities of species treated in this paper are shown. - a) Sagada (*Gnomulus maculatus* sp. n.); b) Baguio, Cristal Cave (*G. coniceps* sp. n.); c) Mt. Santo Thomas (*G. crucifer* sp. n.); d) Puerto Galera (*G. maculatus* sp. n.), doubtful record; e) Lake Danao, Leyte (*Biantoncopus fuscus* sp. n.); f) Visca N of Baybay (*B. fuscus* sp. n., *G. leyteensis* sp. n.).

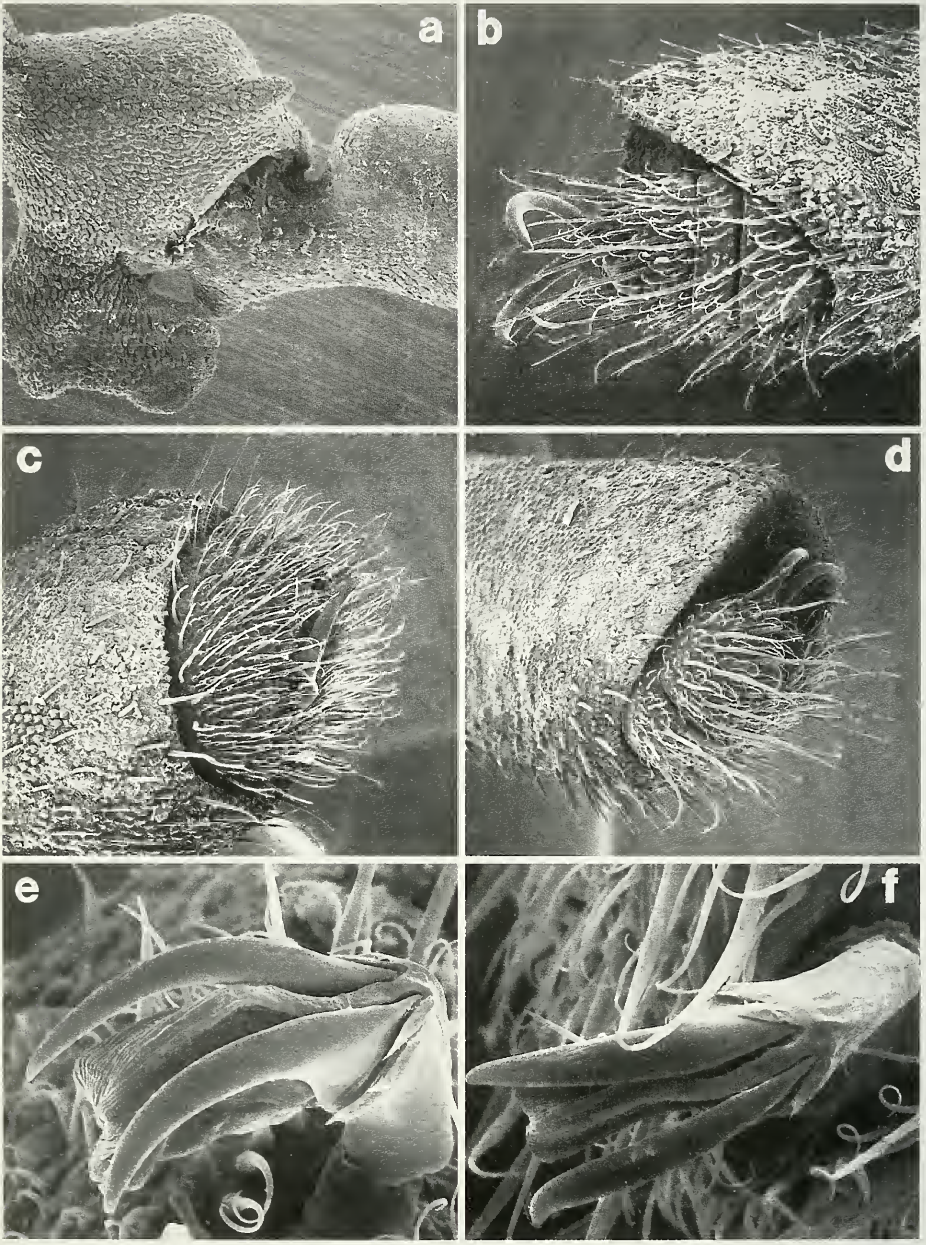


FIG. 4. Scanning electron micrographs showing external characters of Oncopodidae species. - a) *Palaeoncopus gunung* sp. n., left ♀ palpal trochanter and base of femur, prolateral view; b) *Caenoncopus tenuis* sp. n., tarsus and distal part of metatarsus IV; c-f) *C. cuspidatus* (Schwendinger), tarsus and distal part of metatarsus of leg II (c) and leg IV (d) , claws and arolium on leg IV of juvenile (e-f).

Caenoncopus cuspidatus (Schwendinger) comb. n. Figs 4c-f, 5a-d, 6-8

Oncopus cuspidatus Schwendinger, 1992: 190-192, figs. 67-80. Description of ♂.

Types: SUMATRA, Northern Sumatra Province, Langkat, Bukit Lawang Nature Reserve, 180 m, ♂ holotype (MHNG Sum-85/49). - Deli Serdang, north of Brastagi, 1400 m, ♂ paratype (MHNG Sum-85/47); both leg. B. Hauser, 8.-20.XI.1985.

New material: SUMATRA, Aceh Province, Mt. Leuser National Park, Ketambe Research Station, 300-500 m, 23.-30.XI.1989, 4 ♂, 13 ♀; 800 m, 28.XI.1989, 1 ♀; all leg. D. Agosti, I. Löbl & D. Burckhardt (MCSNG, MHNG). - North Sumatra Province, Langkat, Bukit Lawang Nature Reserve, 11.-12.X.1990, 1 ♂, 1 ♀; leg. A. Riedel (MAR). - Bohorok, 7.VIII.1982, 1 ♂, 1 ♀, 13.XI.1983, 1 ♀, 30.XII.1993, 2 ♀; all leg. C. Deeleman-Reinhold & P. Deeleman (CCD). - Langkat, Bukit Lawang Nature Reserve, Bohorok river, 5.VII.1984, 1 ♂, 2 ♀; leg. J. Robert (MHNG). - Forest 7 km north of Brastagi, 1500 m, 2.XII.1989, 1 ♂, 6 ♀; all leg. D. Agosti, I. Löbl & D. Burckhardt (MHNG).

Diagnosis (extended): Relatively large species; scuta smooth, with characteristic pattern; palpal femur with ventro-basal process (Figs 7, 8); palpal trochanter sexually dimorphic, with distinct ventral process only in ♀♀ (Fig. 7); tarsal formula 1-1-2-2; genital operculum with anterior hump (Fig. 6). Truncus penis with rounded apex drawn into an obtuse angle, bearing two widely separated rows of subapical setae on each side; stylus very long, almost reaching base of truncus, wrapped in a membraneous collar almost throughout its entire length; apex of stylus free, corkscrew-shaped (Fig 5a-d, SCHWENDINGER 1992: figs 74-80).

Remark: The small proximal tarsalia on the posterior legs, partly overlapped by the terminal edge of the metatarsus (Fig. 4d), were not recognized in the original description. Therefore *C. cuspidatus* was placed in the genus *Oncopus*. However, this placement was provisional. The author was aware of the uniqueness of the species, but decided not to establish a new genus because of the sparse material (2 ♂) available (SCHWENDINGER 1992: 197).

Variation: Measurements range: ♂: body length 3.65-4.51 (x̄ = 4.09, SD = 0.274), width 2.08-2.68 (x̄ = 2.44, SD = 0.193), n = 10; ♀: body length 3.59-4.39 (x̄ = 4.05, SD = 0.238), width 2.07-2.85 (x̄ = 2.40, SD = 0.187), n = 27. Body size gradually decreases in between the three populations.

Population:	mean ♂ body length (SD)	mean ♀ body length(SD):
Ketambe	4.37 (0.089), n = 4	4.24 (0.090), n =14
Bukit Lawang and env.	4.02 (0.056), n = 4	3.98 (0.052), n = 7
Brastagi and environs	3.67 (0.015), n = 2	3.68 (0.049), n = 6

Distribution (Fig. 2): Known from the southern part of Aceh Province and from the northern part of North Sumatra Province. The specimens examined originate from three separate areas: 1. Ketambe; 2. Bukit Lawang Reserve, Bohorok, Langkat; 3. Brastagi, Deli Serdang.

Bionomics: The specimens were collected from the leaf litter of a lowland rain forest and a montane rain forest with various degrees of disturbance.

Caenoncopus tenuis sp. n. Figs 4b, 9-17

Material: SUMATRA, West Sumatra Province , 5 km southeast of Payakumbuh, 600 m, ♂ holotype (MHNG), 9 ♂, 4 ♀ paratypes (MAR, MCSNG, MHNG), 20.-21.XI.1989. - Palopo Nature Reserve, north of Bukittinggi, 900 m, 1 ♂ paratype (MHNG), 18.-20.XI.1989. All specimens leg. D. Agosti, I. Löbl & D. Burckhardt.

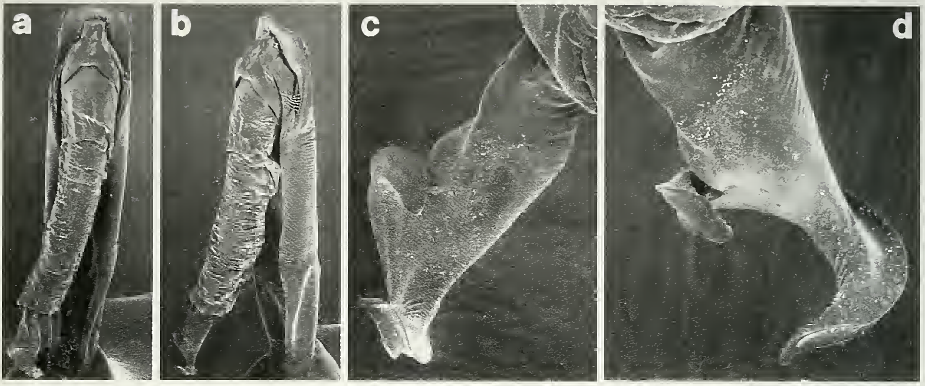
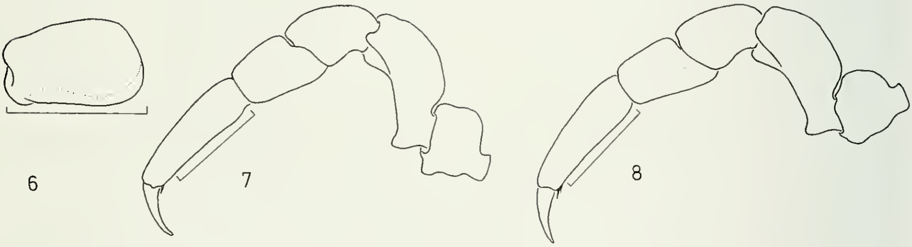


FIG. 5

Scanning electron micrographs of penis of *Caenoncopus cuspidatus* (Schwendinger): total penis, dorsal (a) and lateral (b) view; apex of glans, fronto-dorsal (c) and dorso-distal view (d).



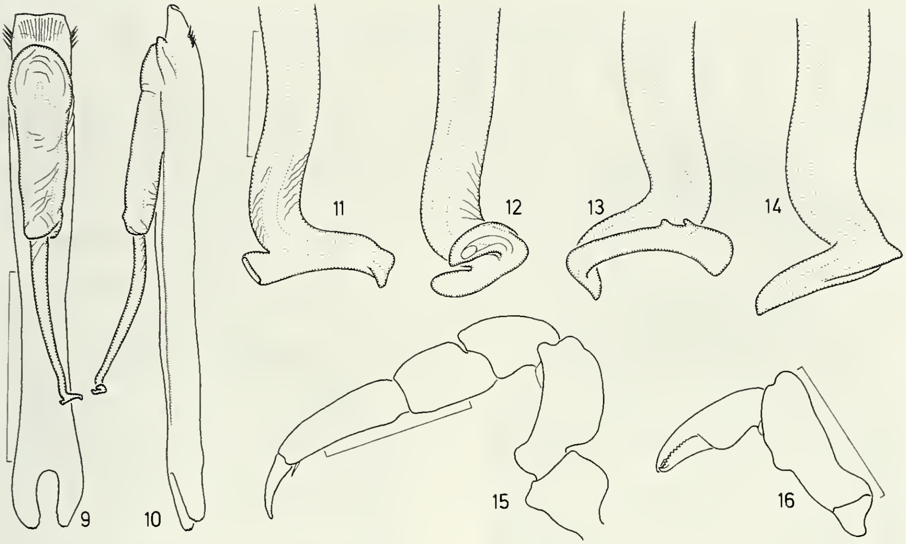
FIGS 6-8

Caenoncopus cuspidatus (Schwendinger); ♂ holotype (8), ♀ (6, 7). - Genital operculum, latero-ventral view (6); left palp, retrolateral view (7, 8). - Scale lines 0.5 mm.

Etymology: Latin: *tenuis* = small, thin, delicate.

Diagnosis: Closely related to *C. cuspidatus*, distinguished by smaller size and less extensive dark patches on dorsal and ventral scuta; distinct ventral process on palpal trochanter also present in ♂♂; tarsal formula 1-1-3-3; genital operculum without anterior hump. Truncus penis with broadly truncate apex carrying only one short row of subapical lateral setae on each side; stylus shorter, not reaching base of truncus; membraneous collar enclosing only basal half of stylus; apex of stylus different in shape (Figs 9-14).

Description: ♂ (holotype). Coloration: Body mostly light amber, except for: dark reticulation on carapace, dark margin and transverse bands on abdominal part of dorsal scutum (Fig. 17a), widely separated lateral pairs of dark transverse patches on



Figs 9-16

Caenoncopus tenuis sp. n.; ♂ holotype (9-12), ♂ paratype (13-14), ♀ paratype (15-16). - Penis, dorsal (9) and lateral view (10); apex of stylus, dorsal (11), lateral (12), ventral (13) and contralateral view (14); left palp, retrolateral view (15); left chelicera, retrolateral view (16). - Scale lines 0.05 mm (11-14), 0.5 mm (9-10, 15-16).

ventral scutum (Fig. 17b). Genital operculum, process on coxae II and proximal zone of tibiae I, II and metatarsus II darkened.

Carapace short, interocular area a low hump; dorsal and ventral scuta smooth, without furrows or elevations (Figs 17a, c). Distinct antero- and posterio-proximal processes on coxa II, two smaller sub-proximal and median processes on coxa I. Genital operculum relatively large (Fig. 17b).

Chelicerae (Fig. 16) small; proximal article with distinct dorso-distal boss and ventro-median process; hand slender, without process.

Palps (Fig. 15) with basally wide ventral process on proximal femur; other articles unarmed.

Legs 3142, tarsal formula 1-1-3-3.

Penis (Figs 9-14): truncus depressed, bearing needle-like subapical setae in one group on each side. Membraneous socket of glans penis distally round; tube-like stylus more than half as long as truncus, resting in a shallow trench on the dorsal surface of truncus. Basal half of stylus covered by membraneous collar; crescent-shaped apex standing at right angles to axis of stylus.

♀. As the ♂; no external sexual dimorphism discernible.

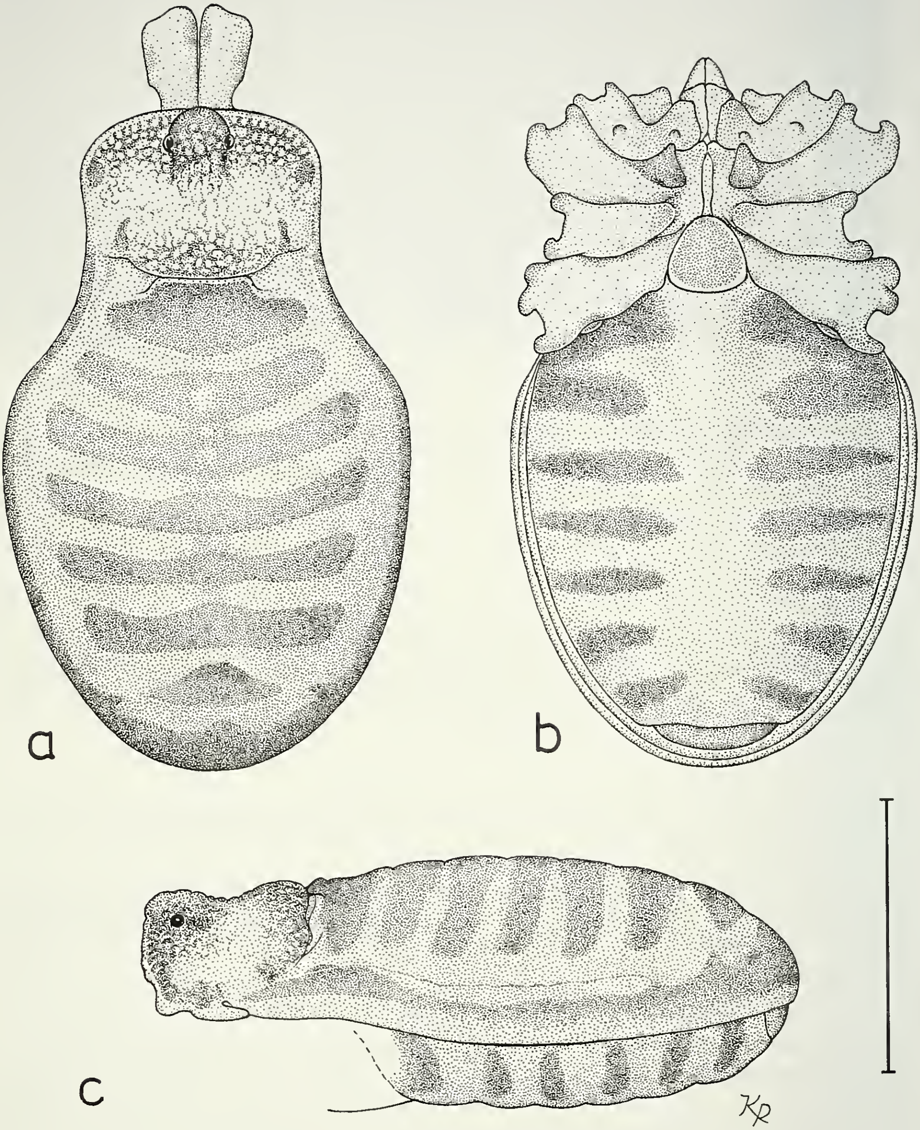


FIG. 17

Caenoncopus tenuis sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Measurements (♂, in brackets ♀): body 2.32 (2.55) long, 1.50 (1.56) wide; carapace region 0.61 (0.64) long, 0.88 (0.93) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.23 (0.27)	0.38 (0.41)	0.32 (0.34)	0.24 (0.24)	- -	0.41 (0.44)	1.58 (1.70)
Leg I	0.23 (0.23)	0.69 (0.69)	0.43 (0.46)	0.35 (0.36)	0.71 (0.72)	0.06 (0.06)	2.47 (2.52)
Leg II	0.27 (0.31)	0.92 (0.94)	0.56 (0.61)	0.61 (0.61)	1.09 (1.09)	0.06 (0.06)	3.51 (3.62)
Leg III	0.23 (0.23)	0.53 (0.54)	0.43 (0.44)	0.37 (0.37)	0.72 (0.72)	0.06 (0.07)	2.34 (2.37)
Leg IV	0.24 (0.26)	0.85 (0.87)	0.56 (0.55)	0.66 (0.69)	0.98 (1.00)	0.06 (0.07)	3.35 (3.44)

Variation: Measurements of body length/width range: ♂ 2.26-2.52/1.38-1.58 (n = 12); ♀ 2.46-2.55/1.50-1.57 (n = 4). Some ♂♂ (including the holotype) have a smaller ventro-basal process on the palpal femur than shown in Fig. 15. In several ♂♂ the carapace is dorsally less distinctly saddle-shaped than in the holotype (Fig. 17c).

Bionomics: The specimens were collected by sifting leaf litter and soil in abandoned rubber and coffee plantations (SE of Payakumbuh) and in a steeply sloping secondary forest (Palopo Nature Reserve).

Caenoncopus affinis sp. n. Figs 18-26

Material: SUMATRA, West Sumatra Province, Panti, 250 m, ♂ holotype (MHNG), 2 ♂, 2 ♀ paratypes (MAR, MHNG), 19.XI.1989; all leg. D. Agosti, I. Löbl & D. Burckhardt. - Road from Lubuksikaping to Panti, ca. 700 m, 26.X.1991, 1 ♀ paratype, leg. A. Riedel (MAR).

Etymology: Latin: *affinis* = related, neighbouring. The species name points to a close relationship with *C. tenuis* sp. n.

Diagnosis: Very close to *C. tenuis* sp. n. but distinguished by posterior carapace low; genital operculum with straight lateral margins; dark lateral patches on ventral scutum larger, interconnected posteriorly; ventral processes on palpal trochanter and femur more pronounced. Membraneous socket of glans penis more pointed distally; stylus shorter, less strongly sigmoid distally, apex different in shape (Figs 18-23).

Description: ♂ (holotype). Coloration: Body mostly light amber, except dark reticulation on carapace, dark margin and transverse bands on abdominal part of dorsal scutum (Fig. 26a); lateral pairs of dark transverse patches on ventral scutum interconnected posteriorly (Fig. 26b). Genital operculum, process on coxae II, tibia II, proximal 2/3 of metatarsus II and proximal 1/2 of metatarsus I darkened.

Carapace short, interocular area elevated above rest of carapace; abdominal parts of dorsal and ventral scuta smooth, without furrows or elevations (Figs 26a, c). Ventral prosoma with distinct conical process on proximal coxa II, smaller knob-shaped processes on sub-proximal and median coxa I and on palpal coxa. Genital operculum with straight lateral margins, almost trapezoidal in shape (Fig. 26b).

Chelicerae (Fig. 25) small; proximal article with dorso-distal boss and low ventro-median process; hand slender.

Palps (Fig. 24) with distinct ventral process on proximal femur and on distal trochanter.

Legs 3142, tarsal formula 1-1-3-3.

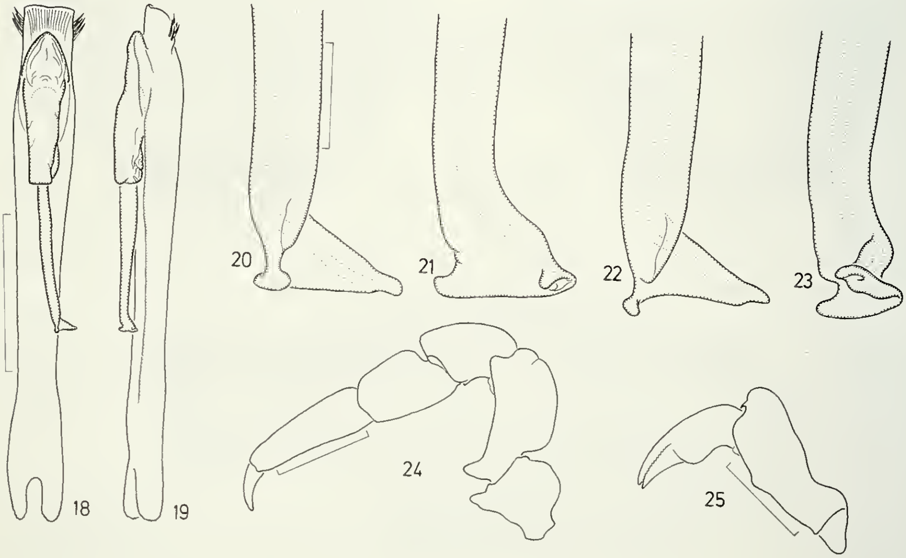
Penis (Figs 18-23): truncus depressed with straight distal margin, bearing a subapical group of needle-like setae on each side. Membraneous socket of glans distally tapering; tube-like stylus less than half as long as truncus, slightly bent below apex, basal half covered by membraneous collar; apex of stylus crescent-shaped, perpendicular to axis.

♀. As the ♂: no external sexual dimorphism discernible.

Measurements (♂, in brackets ♀): body 3.04 (3.20) long, 1.94 (2.06) wide; carapace region 0.75 (0.75) long, 1.14 (1.14) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.37 (0.38)	0.53 (0.52)	0.44 (0.43)	0.35 (0.34)	- -	0.55 (0.56)	2.24 (2.23)
Leg I	0.29 (0.31)	0.87 (0.81)	0.60 (0.58)	0.47 (0.46)	0.92 (0.90)	0.05 (0.06)	3.20 (3.12)
Leg II	0.34 (0.38)	1.16 (1.08)	0.75 (0.72)	0.78 (0.75)	1.40 (1.31)	0.08 (0.11)	4.51 (4.35)
Leg III	0.31 (0.29)	0.69 (0.66)	0.59 (0.58)	0.47 (0.47)	0.99 (0.95)	0.06 (0.08)	3.11 (3.03)
Leg IV	0.34 (0.39)	1.07 (1.01)	0.78 (0.76)	0.85 (0.82)	1.34 (1.28)	0.06 (0.08)	4.44 (4.34)

Variation: Measurements of body length/width range: ♂ 3.04-3.25/1.90-2.00 (n = 3); ♀ 3.20-3.24/1.96-2.12 (n = 3). One ♂ paratype with interocular tubercle lower than in Fig. 26c.



FIGS 18-25

Caenoncopus affinis sp. n.; ♂ holotype (18-21), ♂ paratype (22-23), ♀ paratype (22-25). - Penis, dorsal (18) and lateral view (19); apex of stylus, dorsal (20, 22) and lateral view (21, 23); left palp, retrolateral view (24); left chelicera, retrolateral view (25). - Scale lines 0.05 mm (20-23), 0.5 mm (18-19, 24-25).

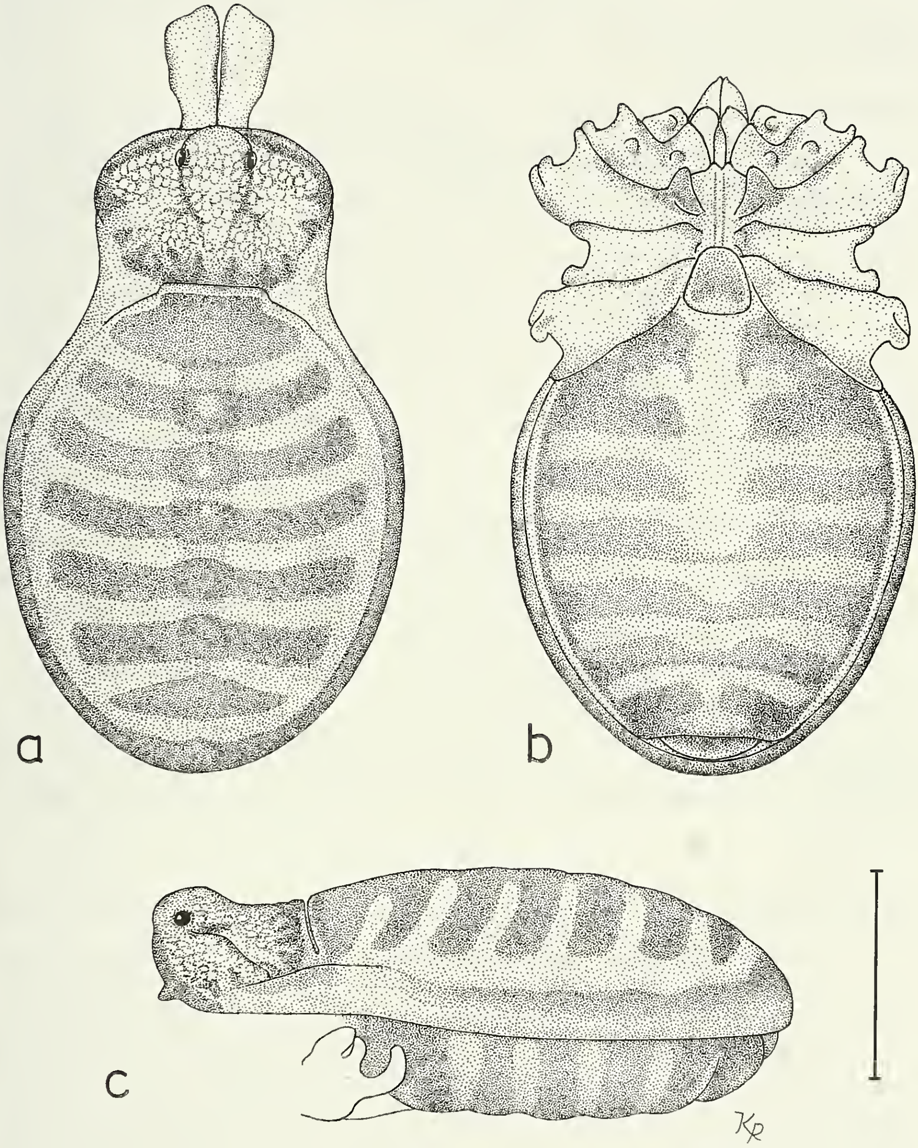


FIG. 26

Caenoncopus affinis sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Bionomics: The specimens were collected by sifting vegetational debris in a lowland swamp forest (near Panti) and in a lowland rain forest (between Lubuksikaping and Panti).

Palaeoncopus gen. n.

Diagnosis: Truncus penis very slender, cylindrical, basally truncate and subbasally constricted; short subapical glans distad-directed, composed of a short thin stylus surrounded by a pair of forceps-like lateral sclerites interconnected by a median plate; pair of membraneous tubes absent; glans not expandable. Body small; interocular area a round hump, abruptly separated from thoracic area carrying a pair of humps. Anterior margin of abdominal part of dorsal scutum with a pair of wide lobes, more or less distinctly separated from carapace hind-margin by a membraneous zone. Scutal areas distinctly elevated, medially subdivided by a deep longitudinal furrow. Chelicerae small, weak, without modifications apart from dorso-distal hump on proximal article. Palpal femur with a distinct ventro-basal process; palpal trochanter with a large, multilobate ventral process and a conical prodorsal process. Legs 1324, tarsal formula 1-1-3-3. External sexual dimorphism unknown.

Etymology: Greek: *palaios* = old; *oncos* = swelling; *podos* = foot; male gender. The Latinized name (correctly spelled "Palaeooncopus", one "o" omitted) refers to the primitive genital morphology of this genus and to its relationship with *Oncopus*.

Type species: Palaeoncopus gunung sp. n.

Species account and distribution: Including three species from Sumatra, i.e. *P. gunung* sp. n., *P. kerdil* sp. n., *P. katik* sp. n.

Relationships: Palaeoncopus gen. n. represents the most basic group within the Oncopodidae. The three species are closely related to each other and are known from distinctly separated localities. Presently, they are all to be considered morphospecies.

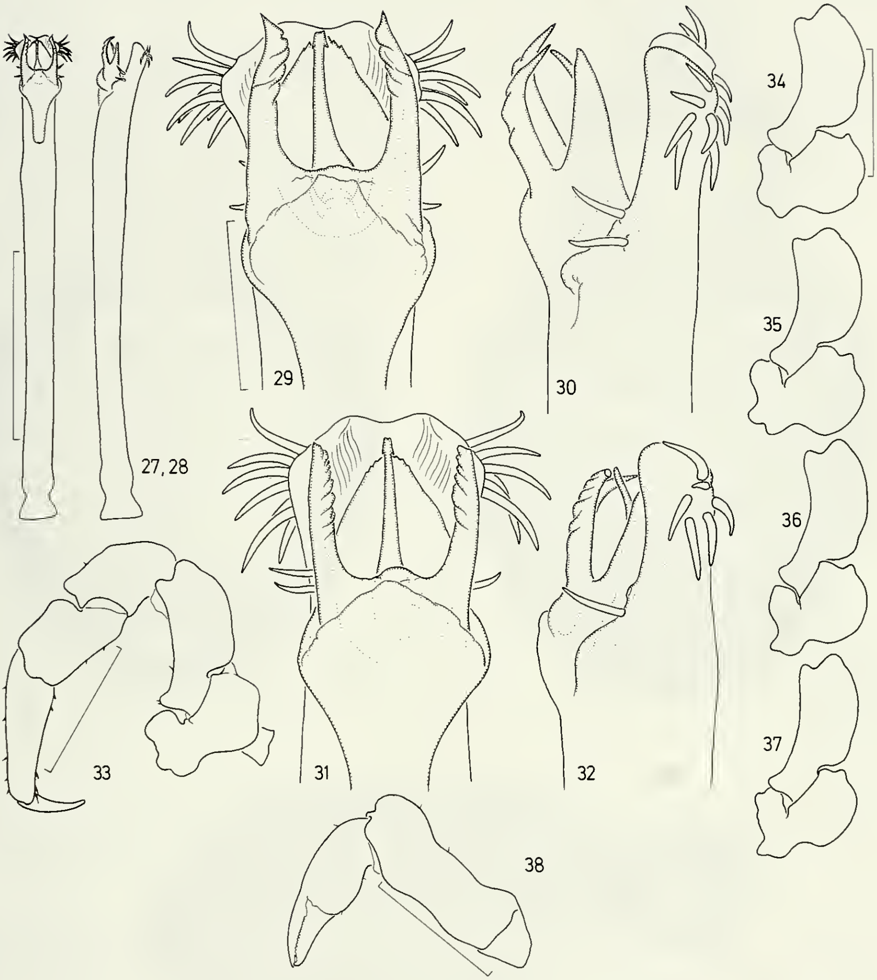
Palaeoncopus gunung sp. n. Figs 4a, 27-39

Material: SUMATRA, West Sumatra Province, Bukittinggi, Mt. Singgalang, 2100-2600 m, ♂ holotype (MHNG), 1 ♂, 4 ♀ paratypes (MAR, MHNG); 16.X.1990, leg. A. Riedel.

Etymology: Malay and Indonesian: *gunung* (*gunong*) = mountain. Noun in apposition.

Diagnosis: Resembling *Caenoncopus affinis* sp. n. in body size, proportions and tarsal formula but thoracic area and scutal areas distinctly elevated and subdivided by a deep median furrow; no ventral process on proximal article of chelicera; palpal trochanter with a large, trilobed ventral process and a conical prodorsal process; anterio-proximal process on ventral coxa III present; legs 1324. Penis with short distad-directed glans bearing forceps-like lateral sclerites connected by a median plate (Figs 27-32).

Description: ♂ (holotype). Coloration: Body mostly light amber; dark reticulations on carapace and dark, medially broken transversal bands on dorsal (Fig. 39a) and ventral scutal areas (Fig. 39b), indistinct in ventral areas III-V. Limbs mostly dark



FIGS 27-38

Palaeoncopus gunung sp. n.; ♂ holotype (27-30, 34), ♂ paratype (31-32, 35), ♀ paratypes (33, 36-38). - Penis, dorsal (27) and lateral view (28); apex of penis, dorsal (29, 31) and lateral view (30, 32), glans slightly expanded (29-30); left palp, retrolateral view (33); left palp, trochanter and femur, retrolateral view (34-37); left chelicera, retrolateral view (38). - Scale lines 0.5 mm (27-28, 33-38), 0.1 mm (29-32).

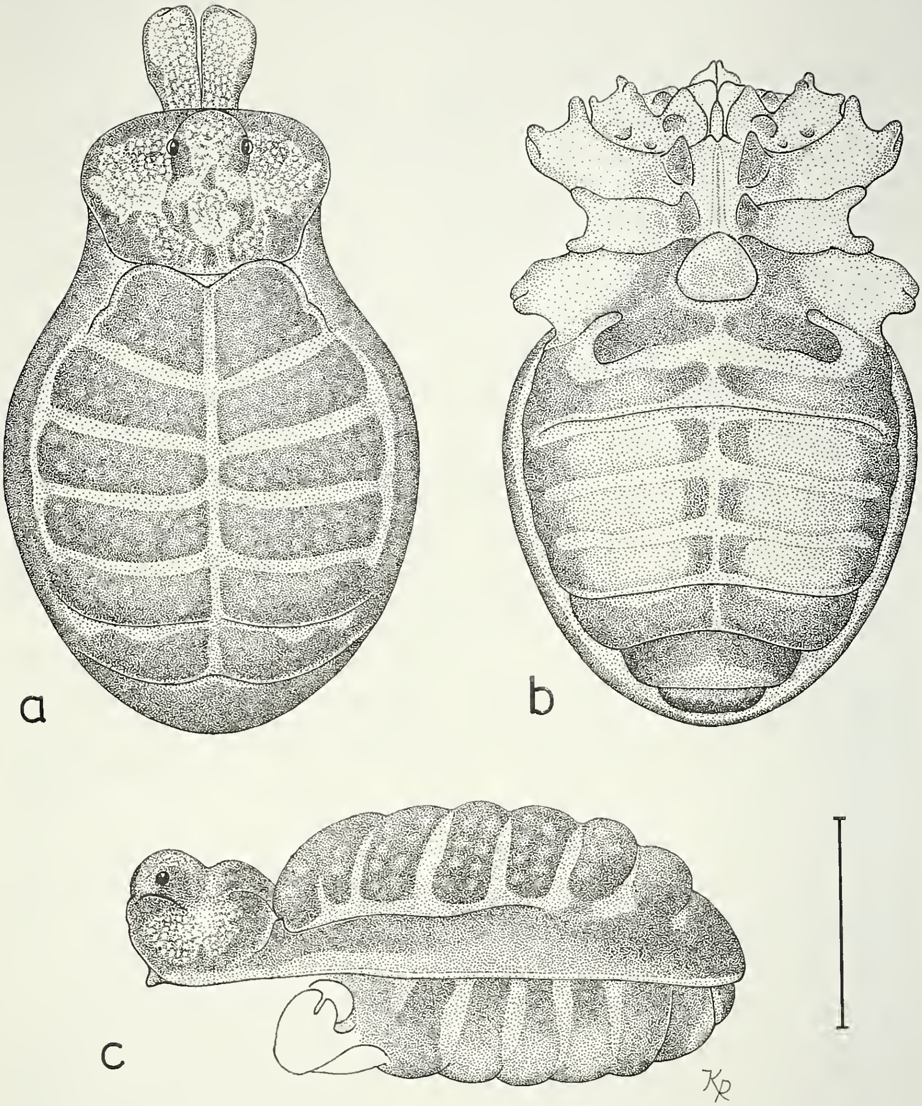


FIG. 39

Palaeoncopus gunung sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

brown, except for light orange cheliceral hand and tarsi, distal tibiae and metatarsi of legs and pedipalps.

Carapace short, narrow depression separating hump on interocular area from pair of humps on thoracic area; dorsal and ventral scutal areas distinctly elevated, dorsal areas separated from each other by deep transverse furrows and by a longitudinal median furrow (Figs 39a, c). Conical anterio-proximal processes on ventral coxae II and III, knob-shaped central ones on median coxa I and palpal coxa. Genital operculum wide, subtriangular (Fig. 39b).

Chelicerae (Fig. 38) small; proximal article with dorso-distal boss but without ventro-median process; hand slender.

Palps (Fig. 33-37): femur with conical ventral process; trochanter with large trilobate ventral process and small conical dorsal process.

Legs 1324, tarsal formula 1-1-3-3.

Penis (Figs 27-32): truncus slender, its distal margin arched and medially invaginated, forming two distinct lobes; strong, curved subapical setae in two distinctly separated groups on each side of truncus. Glans pointing distad, rising from a long, basally narrow membraneous socket; lateral sclerites tapering, with furrows on lower face. Median plate long, triangular; stylus slender.

♀. As the ♂; no external sexual dimorphism discernible.

Measurements (♂, in brackets ♀): body 2.87 (2.94) long, 1.90 (1.99) wide; carapace region 0.75 (0.69) long, 1.11 (1.10) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.34 (0.32)	0.46 (0.42)	0.42 (0.40)	0.29 (0.26)	- -	0.53 (0.50)	2.04 (1.90)
Leg I	0.31 (0.29)	0.75 (0.75)	0.49 (0.50)	0.46 (0.46)	0.85 (0.85)	0.08 (0.08)	2.94 (2.93)
Leg II	0.38 (0.34)	1.05 (1.04)	0.63 (0.64)	0.76 (0.75)	1.30 (1.28)	0.12 (0.11)	4.24 (4.16)
Leg III	0.29 (0.29)	0.70 (0.67)	0.50 (0.53)	0.50 (0.49)	0.99 (0.98)	0.09 (0.08)	3.07 (3.04)
Leg IV	0.32 (0.31)	0.98 (0.95)	0.67 (0.69)	0.82 (0.79)	1.39 (1.36)	0.11 (0.09)	4.29 (4.19)

Variation: Measurements of body length/width range: ♂ 2.87/1.79-1.90 (n = 2); ♀ 2.94-2.97/1.94-2.03 (n = 4). Variation in the shape of the ventral process on palpal trochanter (Figs 33-37) does not show sexual dimorphism.

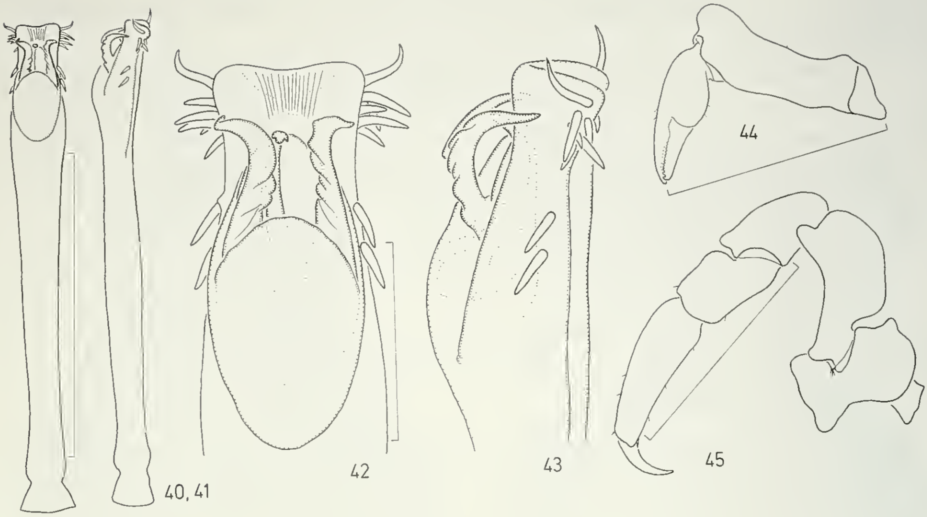
Bionomics: The specimens were sifted from leaf litter in a montane forest.

Palaeoncopus kerdil sp. n. Figs 40-46

Material: SUMATRA, Aceh Province, Mt. Leuser National Park, Ketambe Research Station, 300-500 m, 23.-30.XI.1989, ♂ holotype and ♀ paratype; leg. D. Agosti, I. Löbl & D. Burckhardt (MHNG).

Etymology: Malay and Indonesian: *kerdil* = small, dwarfish.

Diagnosis: Close to *P. gunung* sp. n., distinguished by smaller body size; thoracic area of carapace more elevated; wider gap between carapace and abdominal part of dorsal scutum; dark pattern on ventral scutum different; ventral process on palpal trochanter bilobed. Penis with narrower, truncate apex; short glans more remote from apex; lateral sclerites more strongly bent and closer to each other; membraneous socket at base of glans shorter, ovoid (Figs 40-43).



FIGS 40-45

Palaeoncopus kerdil sp. n.; ♂ holotype (40-43), ♀ paratype (44-45). - Penis, dorsal (40) and lateral view (41); apex of penis, dorsal (42) and lateral view (43); left chelicera, retrolateral view (44); left palp, retrolateral view (45). - Scale lines 0.5 mm (40-41, 44-45), 0.1 mm (42-43).

Description: ♂ (holotype). Coloration: Body light amber; dark reticulations on carapace, abdominal part of dorsal scutum with dark margin and medially broken transversal bands on elevated areas (Fig. 46a); dark transverse bands on ventral scutal areas medially indistinct, not broken (Fig. 46b). Proximal leg articles slightly darkened; pedipalps, chelicerae and distal leg metatarsi and tarsi light orange.

Carapace short, hump-shaped interocular area low, separated from thoracic area (with pair of humps) by a narrow depression; dorsal scutal areas distinctly elevated (Fig. 46c), separated from each other and medially by deep furrows (Fig. 46a, c). Ventral scutum with indistinctly elevated areas and lobes behind spiracles. Ventral coxae II and III with distinct anterio-proximal processes, coxa II also with posterio-proximal one, smaller knob-shaped processes on central coxa I and palpal coxa. Genital operculum widely subtriangular (Fig. 46b).

Chelicerae (Fig. 44) small; proximal article with moderately wide dorso-distal boss, ventral process indistinct; hand slender.

Palps (Fig. 45): femur with conical ventrobasal process; trochanter with large bilobed ventral and small conical dorsal process.

Legs 1324, tarsal formula 1-1-3-3.

Penis (Figs 40-43): truncus slender, apex narrow, distal margin slightly indented; subapical setae in two widely separated groups on each side. Glans short,

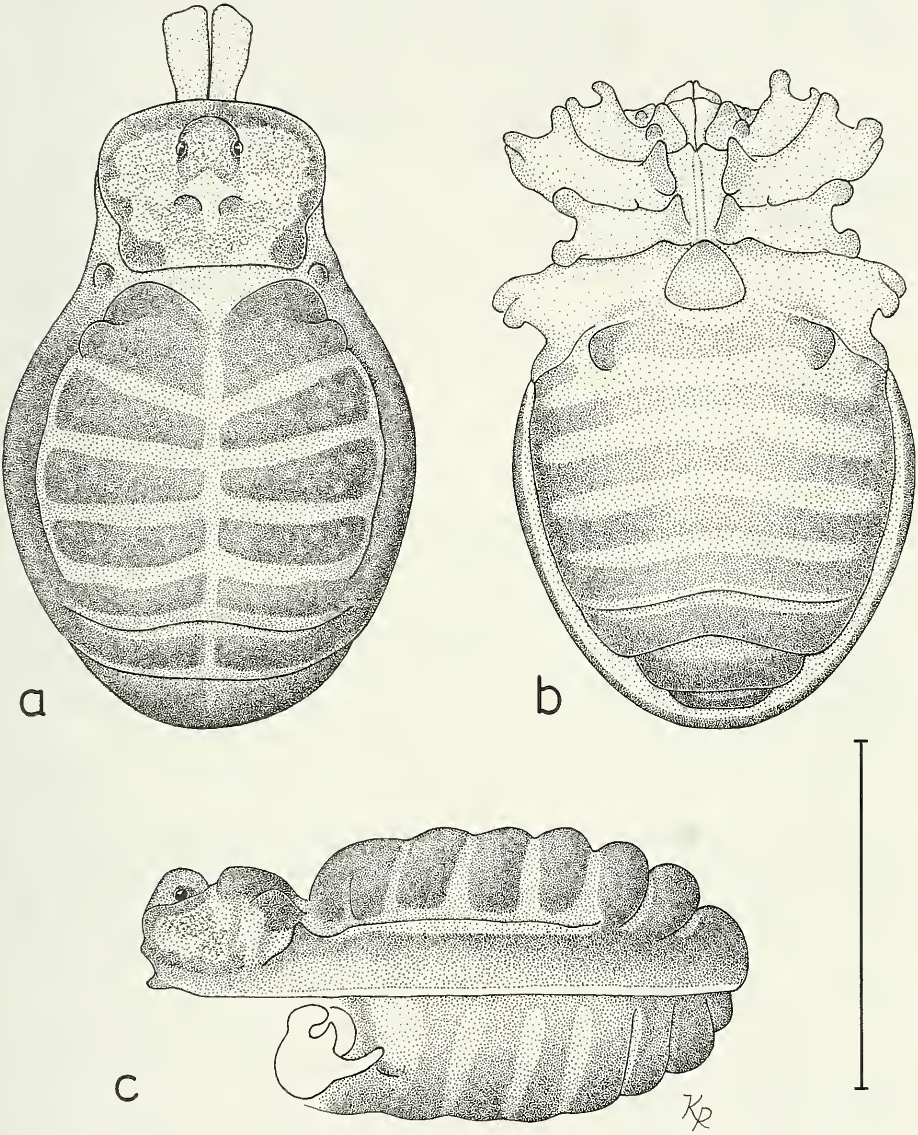


FIG. 46

Palaeoncopus kerdil sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

not reaching apex of penis, rising from a fairly short, ovoid membraneous socket; lateral sclerites distinctly bent, tapering, with furrows on lower face; median plate rounded, its lateral margins hidden under lateral sclerites; stylus slender.

♀. As the ♂; no external sexual dimorphism evident.

Measurements (♂, in brackets ♀): body 1.72 (1.88) long, 1.12 (1.19) wide; carapace region 0.46 (0.47) long, 0.63 (0.71) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.18 (0.21)	0.24 (0.24)	0.24 (0.24)	0.14 (0.14)	- -	0.31 (0.32)	1.11 (1.15)
Leg I	0.16 (0.17)	0.44 (0.46)	0.29 (0.33)	0.24 (0.24)	0.46 (0.50)	0.06 (0.07)	1.65 (1.77)
Leg II	0.20 (0.21)	0.63 (0.64)	0.40 (0.41)	0.37 (0.38)	0.78 (0.77)	0.08 (0.08)	2.46 (2.49)
Leg III	0.17 (0.18)	0.39 (0.40)	0.32 (0.34)	0.26 (0.27)	0.56 (0.56)	0.05 (0.07)	1.75 (1.82)
Leg IV	0.20 (0.20)	0.56 (0.58)	0.43 (0.43)	0.43 (0.46)	0.81 (0.82)	0.07 (0.07)	2.50 (2.56)

Bionomics: The animals were collected by sifting leaf litter in a lowland dipterocarp forest.

Palaeoncopus katik sp. n. Figs 47-57

Material: SUMATRA, North Sumatra Province, Langkat, Bukit Lawang Nature Reserve, Bohorok River, 5.VII.1984, ♂ holotype and ♂ paratype; leg. J. Robert (MHNG).

Etymology: Malay and Indonesian: *katik* = small, stunted.

Diagnosis: Very similar to *P. kerdil* sp. n. but larger, eye tubercle (in dorsal view) closer to anterior carapace margin, anterior borders of abdominal part of dorsal scutum less arched, legs 1342. Apex of truncus penis arched, bearing two indistinctly separated groups of subapical setae on each side; membraneous socket of glans constricted proximally, lateral sclerites of glans distally wider (Figs 47-52).

Description: ♂ (holotype). Body coloration as in *P. kerdil* sp. n. except for darker palpal femora.

Carapace with domed interocular area close to anterior margin, separated from pair of humps on thoracic area by a narrow depression; wide membraneous zone between carapace and abdominal part of dorsal scutum (Figs 55-57); dorsal scutal areas elevated, separated by deep furrows; ventral scutal areas moderately elevated. Processes on ventral coxae I, II, III and palps. Genital operculum wide; area behind spiracles drawn into lobes.

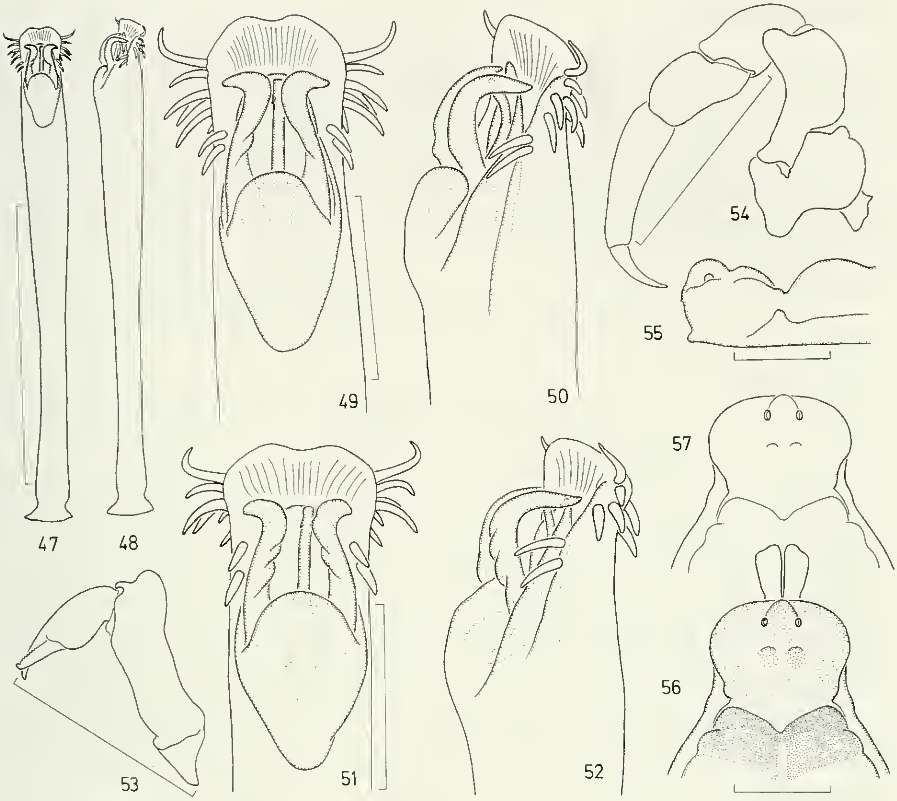
Chelicerae (Fig. 53) small, with dorso-distal boss on proximal article.

Palps (Fig. 54) with conical ventrobasal process on femur and large bilobed ventral plus small conical dorsal process on trochanter.

Legs 1342, tarsal formula 1-1-3-3.

Penis (Figs 47-52): truncus slender, apex slightly widened, distal margin medially invaginated, forming two small lobes; subapical setae in two indistinctly separated groups on each side. Glans short; membraneous socket ovoid, proximally narrow; lateral sclerites strongly bent, distally wide, with furrows on lower face; median plate rounded, mostly hidden under lateral sclerites; stylus slender.

♀. Unknown.



FIGS 47-57

Palaeoncopus katik sp. n.; ♂ holotype (47-50, 55-56), ♂ paratype (51-54, 57). - Penis, dorsal (47) and lateral view (48); apex of penis, dorsal (49, 51) and lateral view (50, 52); left chelicera, retrolateral view (53); left palp, retrolateral view (54); anterior part of body, lateral (55) and dorsal view (56-57). - Scale lines 0.5 mm (47-48, 53-57), 0.1 mm (49-52).

Measurements (♂): body 1.85 long, 1.24 wide; carapace 0.50 long, 0.72 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.20	0.26	0.25	0.15	-	0.36	1.22
Leg I	0.17	0.50	0.37	0.27	0.59	0.05	1.95
Leg II	0.23	0.75	0.47	0.46	0.92	0.07	2.90
Leg III	0.20	0.44	0.37	0.31	0.64	0.05	2.01
Leg IV	0.21	0.66	0.47	0.52	0.92	0.08	2.86

Variation: The ♂ paratype has body length 1.86, width 1.24.

Relationships: This species is very similar to *P. kerdil* sp. n. Minor but consistent differences in external and genital morphology appear adequate for a species discrimination.

Biantoncopus gen. n.

Diagnosis: Penis with stout cylindrical truncus, basally truncate, subbasally constricted; subapical glans distad-directed, composed of a short thin stylus surrounded by a median plate and a pair of lateral sclerites with apices curved away from the truncus; large pair of membraneous tubes present; parts of glans expandable. Body small, scutal areas low; eye tubercle conical. Chelicerae small, without modifications apart from dorso-distal hump on proximal article. Palpal femur with distinct ventrobasal process; palpal trochanter with large ventral process, without dorsal process. Legs 1324, tarsal formula 2-2-3-3. External sexual dimorphism unknown.

Etymology: The genus name refers to similarities in penis morphology with the genus *Biantes* (Biantidae).

Type species: Biantoncopus fuscus sp. n.

Species account and distribution: At present the genus includes only the type species from Leyte Island, Philippines.

Relationships: Biantoncopus gen. n. distinctly stands apart from the other genera of Oncopodidae, but its relationships are not clear. Penis morphology is similar to that of *Palaeoncopus* gen. n., both genera possess a distad-directed glans. However, glans direction is the only diagnostic character shared with *Palaeoncopus* species and according to the interpretation given in this paper, it presents a symplesiomorphy. Additional genital characters (i.e. expandable glans with a pair of membraneous tubes: mt in Figs 62, 64-65 and 134c) actually show *B. fuscus* sp. n. to be quite different from *Palaeoncopus* gen. spp. n. In the expanded state the tip of the stylus far surmounts the tip of the truncus and both inflated membraneous tubes are bent downwards, pointing to the base of the truncus (Figs 64-65). Morphological and operational similarities to the penes of *Biantes* spp. (Biantidae; MARTENS 1978) are considerable.

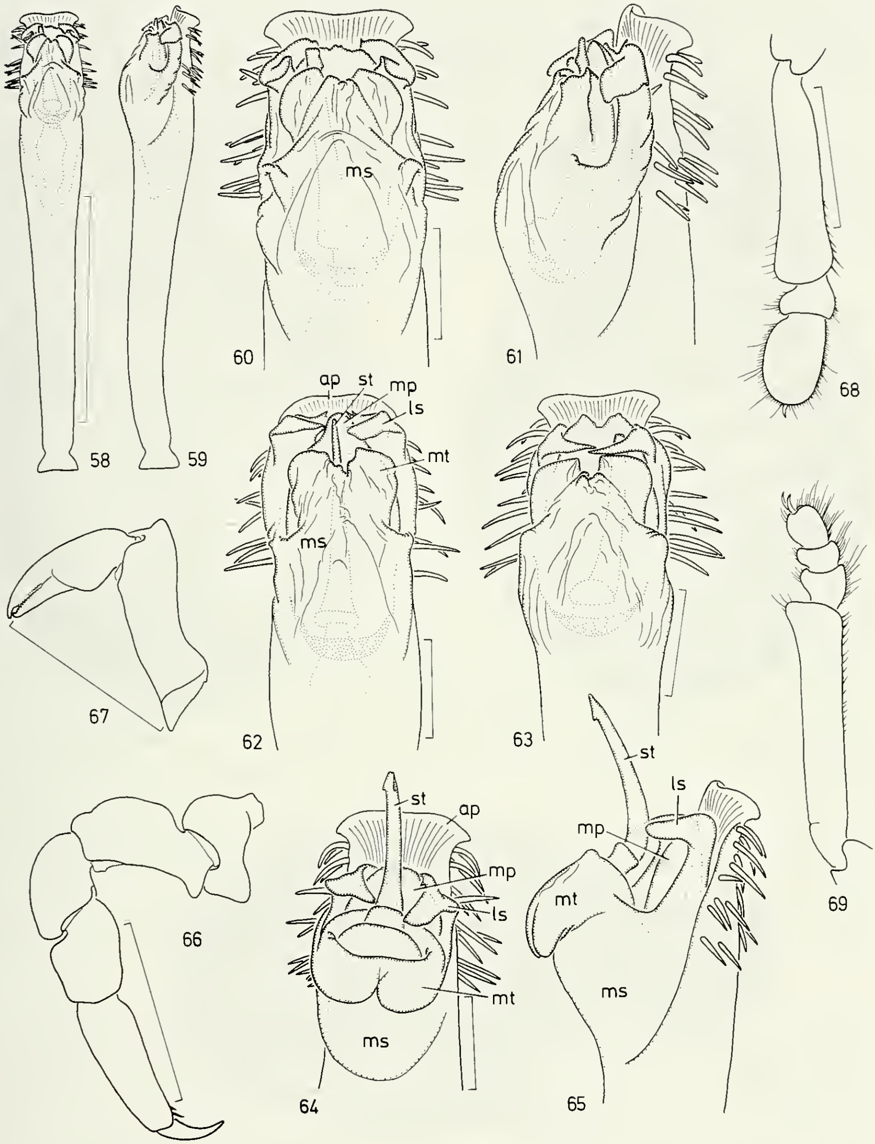
On the other hand the habitus of *B. fuscus* sp. n. generally corresponds well with *Gnomulus* species and they also share the tarsal formula 2-2-3-3. Therefore *Biantoncopus* gen. n. may also be interpreted as a *Gnomulus* with reversal in glans orientation or as a separate lineage with partly conservative and partly derived penis morphology (see Fig. 134). Additional related species are expected to be discovered in the future, which hopefully will elucidate the role this glans type plays in oncopodid evolution.

Biantoncopus fuscus sp. n. Figs 58-70

Material: PHILIPPINES, Leyte, Lake Danao, 500 m, ♂ holotype (MHNG), 2 ♂, 4 ♀ paratypes (MAR, MHNG), 19.II.-9.III.1991, leg. W. Schawaller & J. Martens. - Visca, N of Baybay, 200-500 m, 1 ♂ paratype (MAR), 2.III.1991, leg. W. Schawaller & J. Martens.

Etymology: Latin: *fuscus* = brown; the species name refers to the distinct brownish colour of the body.

Diagnosis: Externally similar to *Gnomulus maculatus* sp. n., but colour pattern different, palpal processes larger and genital operculum wider. Penis stout, glans with distad-directed expandable pair of membraneous tubes and a protrudable stylus (Figs 58-65).



FIGS 58-69

Biantoncopus fuscus n. sp.; ♂ holotype (58-61, 68-69), ♂ paratypes (62-65) [Lake Danao (62, 64-65), N of Baybay (63)], ♀ paratype (66-67). - Penis, dorsal (58) and lateral view (59). Apex of penis, dorsal (60, 62-64) and lateral view (61, 65), glans partly expanded (64-65); left palp, retrolateral view (66); left chelicera, retrolateral view (67); distal part of left leg II, retrolateral view (68); distal part of leg IV, prolateral view (69). - Scale lines 0.5 mm (58-59, 66-69), 0.1 mm (60-65).

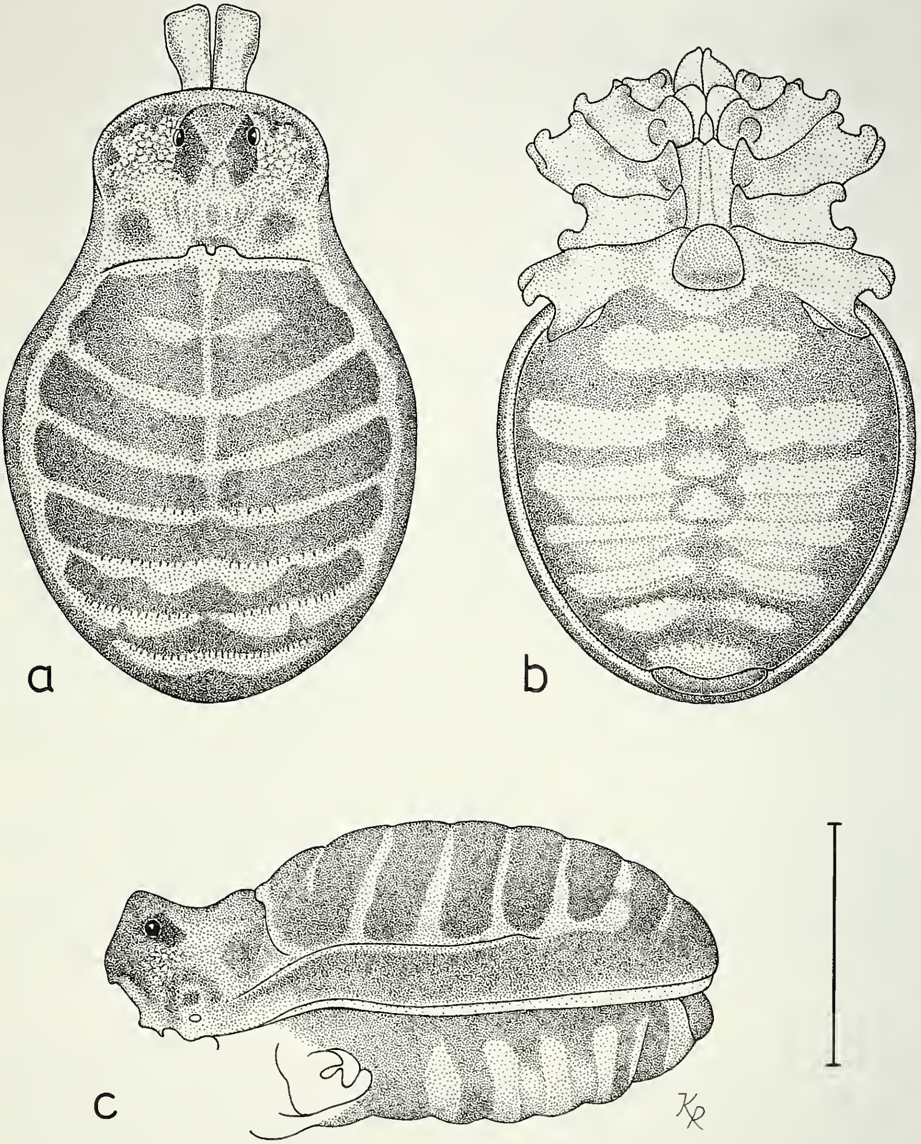


FIG. 70

Biantoncopus fuscus sp. n., ♂ paratype (from the type locality), body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Description: ♂ (paratype). Coloration: Body amber, dark reticulations on: carapace, margin and elevations of scuta, legs (except light orange tarsi) and palps; proximal article of chelicerae dark, cheliceral hand cream; dark transversal bands on dorsal scutal elevations I-IV medially broken (Fig. 70a).

Carapace with conical eye tubercle; a pair of truncate lobes forming bridge between abdominal part of dorsal scutum and carapace (Fig.70a, c); dorsal and ventral scutal areas only slightly elevated (Figs 70c). Ventral coxae II and III with conical anterio-proximal processes, ventral coxae I and palpal coxae with knob-shaped central processes; genital operculum wide, broadly rounded when closed (Fig. 70b), a pointed anterior process visible when opened.

Chelicerae (Fig. 67) weak; proximal article with a conical dorso-distal process, no ventral one; hand slender.

Palps (Fig. 66): ventral femur with distinct conical proximal process; trochanter with large bilobed ventral process, no dorsal process.

Legs (Figs 68-69) 1324, tarsal formula 2-2-3-3.

Penis (Figs 58-65): truncus stout, its distal margin more or less distinctly invaginated medially; subapical setae in one large group on each side. Glans short, not reaching apex, membraneous socket not sharply outlined from truncus; wide lateral sclerites bent dorsad (pointing away from apex), embracing median plate, short, slender stylus and large pair of membraneous tubes (corresponding to titillatores in Biantidae; MARTENS 1978). Expanded glans with membraneous tubes folded downwards and stylus stretching forward, extending far beyond apex of penis (Figs 64-65).

♀. As the ♂; no external sexual dimorphism discernible.

Measurements (♂, in brackets ♀): body 2.48 (2.60) long, 1.69 (1.73) wide; carapace region 0.64 (0.64) long, 0.93 (0.92) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.23 (0.23)	0.34 (0.32)	0.32 (0.32)	0.21 (0.18)	- -	0.43 (0.43)	1.53 (1.48)
Leg I	0.23 (0.23)	0.59 (0.56)	0.40 (0.37)	0.32 (0.32)	0.50 (0.49)	0.37 (0.35)	2.41 (2.32)
Leg II	0.27 (0.27)	0.76 (0.71)	0.47 (0.46)	0.44 (0.44)	0.76 (0.73)	0.43 (0.41)	3.13 (3.02)
Leg III	0.24 (0.24)	0.52 (0.50)	0.40 (0.38)	0.34 (0.34)	0.65 (0.64)	0.28 (0.25)	2.43 (2.35)
Leg IV	0.29 (0.26)	0.72 (0.69)	0.50 (0.49)	0.53 (0.53)	0.93 (0.92)	0.32 (0.31)	3.29 (3.20)

Variation: Body length/width ranges: ♂ 2.25-2.48/1.60-1.69 (n = 4), ♀ 2.37-2.60/1.59-1.73 (n = 4). Bridge teeth connecting abdominal part of dorsal scutum and carapace vary in shape from indistinct and rectangular to distinct and triangular or rounded. One ♂ (from the type locality) has a thin cylindrical stylus and a narrowly rounded median plate with a smooth margin (Fig. 62). In all other ♂♂ the stylus is fairly broad and slightly depressed and the median plate is broadly rounded with a more or less strongly indented anterior margin (Figs 60-61, 63-65).

Bionomics: The specimens were extracted from soil and leaf litter on plane and strongly sloping forest floor of a primary evergreen forest interspersed by clearings with cultivated bananas.

Gnomulus Thorell, 1890

Gnomulus Thorell (1890: 378), type species originally designated but described later, *G. sumatranus* Thorell, 1891; Pocock (1897: 285); Roewer (1923: 60-61); Schwendinger (1992: 197).

Pelitnus Thorell (1891: 757), type species by original designation, *P. armillatus* Thorell, 1891; Pocock (1897: 285); Roewer (1923: 62); Sørensen (1932: 213); Schwendinger (1992: 197). NEW SYNONYMY.

Diagnosis (extended): Penis with basally truncate, subbasally constricted cylindrical truncus. Subapical glans proximad-directed, stylus flanked by a pair of sclerites (both structures variable in shape and length) and a pair of membraneous tubes; median plate present or absent. Interocular area low or elevated into a domed or conical tubercle. Bridge between carapace and abdominal part of dorsal scutum distinct or absent. Dorsal scutal areas elevated or low, with a more or less distinct longitudinal median furrow. Chelicerae weakly or strongly developed, proximal article with a more or less distinct dorso-distal hump or tubercle, rarely with a ventromedian process; hand unarmed. Palpal femur usually with (rarely without) ventrobasal process, rarely with ventro-median one; palpal trochanter with or without ventral process, dorsal process absent. Legs 1324, 1342, 3124, 3142; tarsal formula 2-2-2-2 or 2-2-3-3. External sexual dimorphism in shape or hair cover of ventral scutal elevations, in shape of carapace or in size of chelicerae.

Species account: Twenty nominal oncopodid species (thirteen previously described and seven new), in which penis morphology is known, are here listed under *Gnomulus*. These are:

G. sumatranus Thorell, 1891 [Sumatra] - Loman 1903: fig. 5f; ♂, ♀♀ syntypes in MCSNG examined.

G. segnipes (Loman, 1892) **comb. n.**, transferred from *Pelitnus* [Sumatra; doubtful records from Java and Borneo] - Schwendinger 1992: figs 58-61 (possibly not conspecific); presumably conspecific ♂♂ from Sumatra in CCD, SMF, ZMA, ZMT examined.

G. aborensis (Roewer, 1913), transferred from *Pelitnus* by Roewer (1923: 61-62) [NE-India] - 2 ♂ paratypes in SMF examined.

G. laevis (Roewer, 1915) **comb. n.**, transferred from *Pelitnus* [Borneo] - Schwendinger 1992: figs 63-66.

G. insularis (Roewer, 1927) **comb. n.**, transferred from *Pelitnus* [Malaysia, Penang Island] - ♂ holotype in SMF examined (probably identical with *G. rostratus* - ♀ holotype in MCSNG examined).

G. drescoi (Šilhavý, 1962) **comb. n.**, transferred from *Pelitnus* [Sumatra] - Suzuki 1982: figs 13, 14.

G. imadatei (Suzuki, 1969) **comb. n.**, transferred from *Pelitnus* [Brunei] - Suzuki 1969: figs 4a-e.

G. hyatti (Martens, 1977) **comb. n.**, transferred from *Pelitnus* [Nepal] - Martens 1977: figs 3, 4.

G. goodnighti (Suzuki, 1977) **comb. n.**, transferred from *Pelitnus* [Philippines, Mindanao] - Suzuki 1977: figs 2f-i.

G. lannaianus (Schwendinger, 1992) **comb. n.**, transferred from *Pelitnus* [Thailand] - SCHWENDINGER 1992: figs 8-13.

G. baharu Schwendinger **nom. n.** (Malay and Indonesian: *baharu* = new), homonymously described under *Pelitnus thorelli* [Brunei] by SCHWENDINGER 1992: figs 21-26.

G. conigerus (Schwendinger, 1992) **comb. n.**, transferred from *Pelitnus* [Sabah] - SCHWENDINGER 1992: figs 36-41.

G. sundaicus (Schwendinger, 1992) **comb. n.**, transferred from *Pelitnus* [Sarawak] - SCHWENDINGER 1992: figs 48-53.

G. crucifer sp. n. - Philippines, Luzon.

G. maculatus sp. n. - Philippines, Luzon and Mindoro (?).

G. coniceps sp. n. - Philippines, Luzon.

G. leyteensis sp. n. - Philippines, Leyte.

G. laruticus sp. n. - Malaysia, Perak.

G. asli sp. n. - Malaysia, Perak.

G. hirsutus sp. n. - Malaysia, Selangor and Pahang.

In the remaining eight species described under *Gnomulus* and *Pelitnus* penis morphology is yet unknown. Therefore they may belong to either *Gnomulus* or *Biantoncopus* gen. n., which are indistinguishable by external characters. As *Gnomulus* is by far the more widespread of both genera, we provisionally place these species in *Gnomulus*.

G. rostratus Thorell, 1890 [Malaysia, Penang Island] - see *G. insularis* **comb. n.**

G. armillatus (Thorell, 1891) **comb. n.**, transferred from *Pelitnus* [Sumatra].

G. annulipes (Pocock, 1897) **comb. n.**, transferred from *Pelitnus* [Sarawak].

G. pulvillatus (Pocock, 1903) **comb. n.**, transferred from *Pelitnus* [Malaysia, Selangor].

G. piliger (Pocock, 1903) **comb. n.**, transferred from *Pelitnus* [Malaysia].

G. thorelli (Sørensen, 1932) **comb. n.**, transferred from *Pelitnus* [Java].

G. palawanensis (Suzuki, 1982) **comb. n.**, transferred from *Pelitnus* [Philippines, Palawan)].

G. minor Tsurusaki, 1990 [Philippines, Luzon].

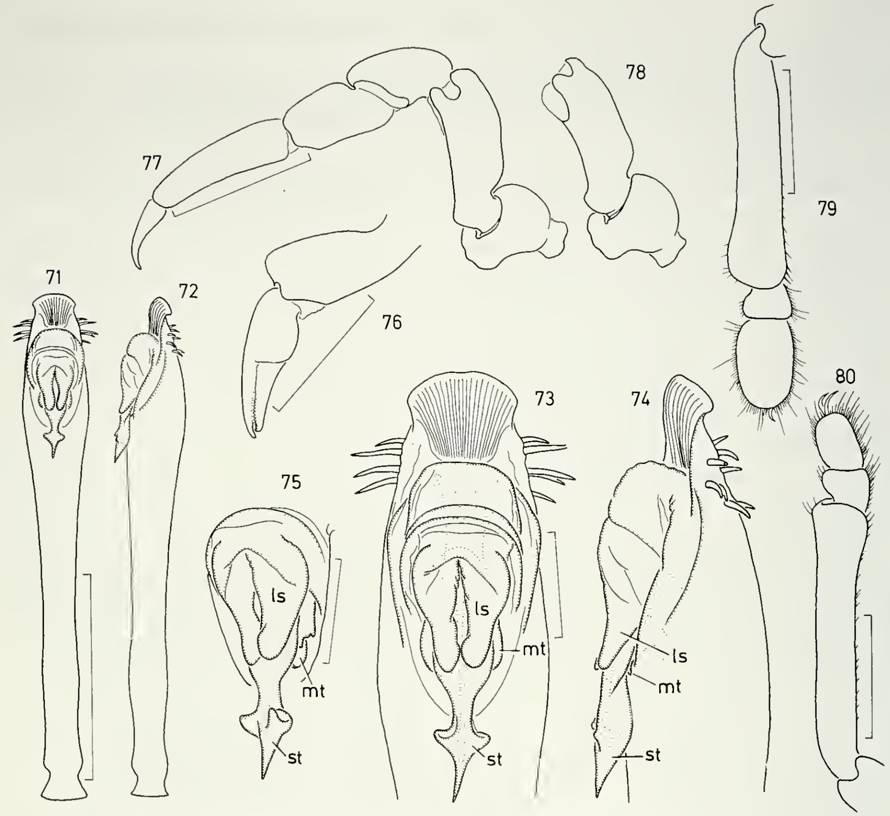
Distribution: Himalayan Region (Nepal and northeastern India) and Southeast Asia (northern Thailand to Java and the Philippines).

NEW SPECIES OF GNOMULUS

Gnomulus crucifer sp. n. Figs 71-81

Material: PHILIPPINES, Luzon, Mt. Santo Thomas close to Baguio, ca. 1850 m, ♂ holotype, 14.I.1980; leg. L. Deharveng (MHNG).

Etymology: Latin: *crux* = cross, *ferre* = to carry; the species name refers to the cross-shaped glans penis of this species.



Figs 71-80

Gnomulus crucifer sp. n., ♂ holotype. - Penis, dorsal (71) and lateral view (72); apex of penis, dorsal (73) and lateral view (74); glans penis, dorso-lateral view (75); left chelicera, retrolateral view (76); left palp, retrolateral view (77); trochanter and femur of left palp, retrolateral view (78); distal part of left leg II, retrolateral view (79); distal part of left leg IV, prolateral view (80). - Scale lines 0.5 mm (71-72, 76-80), 0.1 mm (73-75).

Diagnosis: Similar to *G. minor* Tsurusaki but with elevated interocular area, process on palpal trochanter different in shape, anterio-proximal process on ventral leg coxa II present; legs 1324, tarsal formula 2-2-2-2. Glans penis proximad-directed, bearing an enlarged stylus with cross-shaped apex; lateral sclerites lobate, median plate absent (Figs 71-75).

Description: ♂ (holotype). Coloration: body light amber, with dark reticulations on carapace, dark transversal bands on abdominal part of dorsal scutum and dark, medially broken transverse bands on ventral scutum (Figs 81a, b); genital operculum with indistinct dark reticulation; chelicerae and pedipalps cream, except slightly darker palpal femur; legs grey-brown, except slightly lighter trochanters and cream coxae, tarsi and distal metatarsi.

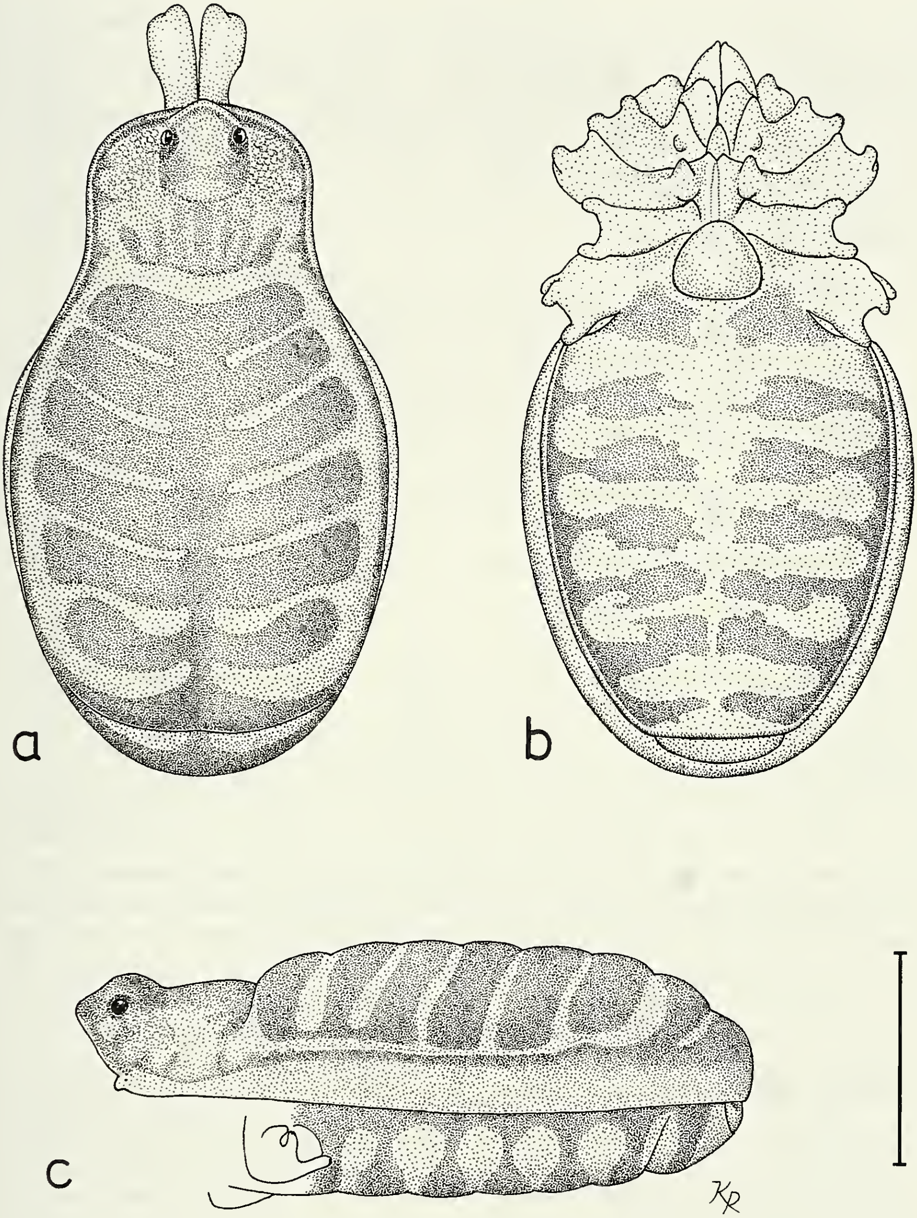


FIG. 81

Gnomulus crucifer sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Carapace with low, broadly rounded eye tubercle (Figs 81a, c); connection between carapace and abdominal part of dorsal scutum indistinct; dorsal and ventral scutal areas only slightly elevated (Fig. 81c). Ventral leg coxae II and III with conical anterio-proximal process, coxa II with rounded posterio-proximal one; ventral coxae I and palpal coxae with knob-shaped paramedian and small central processes, respectively; genital operculum wide (Fig. 81b).

Chelicerae (Fig. 76) weak; proximal article with dorso-distal boss, no ventral process; hand slender.

Palps (Fig. 77-78): ventral femur with low conical proximal process; trochanter with pronounced, somewhat trilobed ventral process, no dorsal process.

Legs (Figs 79-80) 1324, tarsal formula 2-2-2-2.

Penis (Figs 71-75): truncus fairly slender, apex narrow, with broadly rounded distal margin; subapical setae in one small group on each side. Glans with a long, proximally wide stylus, constricted below a cross-shaped apex with acutely pointed tip; lateral sclerites flat, distally rounded, lying above stylus; median plate absent; pair of membraneous tubes partly covered by stylus.

♀. Unknown.

Measurements (♂): body 3.12 long, 1.78 wide; carapace 0.88 long, 1.02 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.31	0.43	0.35	0.26	-	0.49	1.84
Leg I	0.23	0.70	0.41	0.40	0.62	0.43	2.79
Leg II	0.31	0.94	0.50	0.64	1.01	0.49	3.89
Leg III	0.24	0.63	0.44	0.43	0.76	0.30	2.80
Leg IV	0.29	0.93	0.61	0.73	1.11	0.34	4.01

Relationships: Habitus, shape of palps and chelicerae and geographical proximity suggest close relationship with *G. minor* (♂ unknown), although the tarsal formula is different. The penis with an enlarged stylus and without a median plate, on the other hand, distantly resembles that of *Caenoncopus* gen. n. At the present state of knowledge, however, it appears that this partial congruence in penis morphology was caused by parallelism.

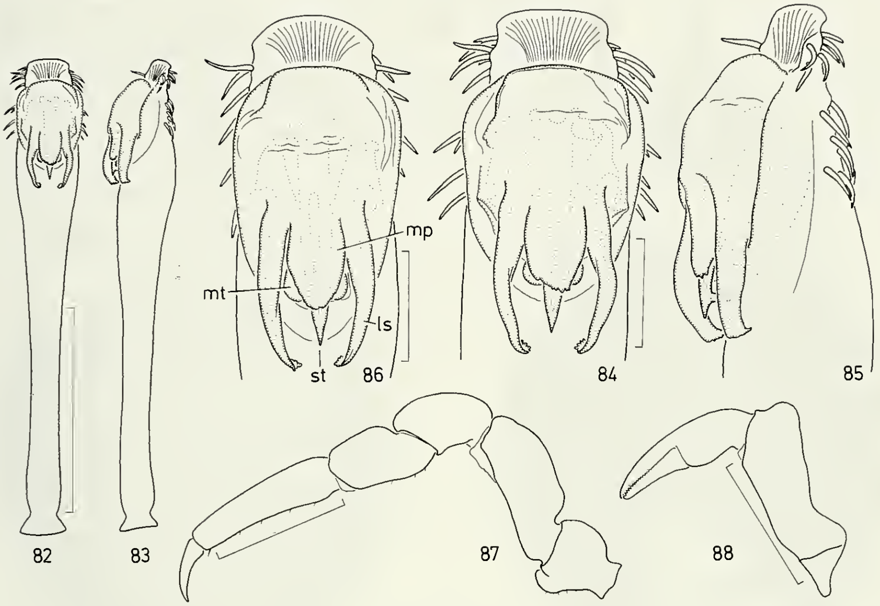
Bionomics: The specimen was extracted from vegetational debris in a humid ravine of an evergreen hill forest.

Gnomulus maculatus sp. n. Figs 82-89

Material: PHILIPPINES, Luzon, Mountain Province, dolines NE of Sagada, ♂ holotype (MHNG), 21.XII.1979; 1 ♂, 1 ♀ paratypes (MAR, MHNG), Sagada, near Latan Cave, 6.I.1980; Sagada, near village and near Sogong Cave, 4., 5., 9.I.1980, 3 juv. (MAR).- Mindoro, Puerto Galera, near San Theodoro Waterfall, 1 ♀ paratype (MAR), 2.-4.I.1979 (probably mislabeled). All specimens leg. L. Deharveng.

Etymology: Latin: *maculatus* = spotted; the species name refers to the conspicuous colour pattern on the dorsal scutum.

Diagnosis: Closely related to *G. goodnighti*, distinguished by distinct colour pattern; eye tubercle lower; dorsal scutum broadly rounded behind, without paramedian humps on posterior scutal areas, with two lobate bridge teeth on anterior



FIGS 82-88

Gnomulus maculatus sp. n.; ♂ holotype (82-85), ♂ paratype (86), ♀ paratype (87-88). - Penis, dorsal (82) and lateral view (83); apex of penis, dorsal (84, 86) and lateral view (85); left palp, retrolateral view (87); left chelicera, retrolateral view (88). - Scale lines 0.5 mm (82-83, 87-88), 0.1 mm (84-86).

margin (none on posterior carapace); small anterio-proximal processes present on leg coxae III. Distal margin of truncus penis rounded; membraneous socket of glans wide; paired lateral sclerites of glans only little bent, terminally truncate; median plate long, tongue-shaped; stylus stout, with bifurcate apex (Figs 82-85).

Description: ♂ (holotype). Coloration: body light yellow, with dark rings around eyes and dark procurved band on posterior carapace; dorsal scutum very dark along margin and on scutal areas, except for conspicuous light yellow median zone on last 3 scutal areas (Fig. 89a, c); dark transversal bands on ventral scutum unbroken, except for the last one (Fig. 89b); genital operculum grey-yellow, tarsus of leg I cream.

Carapace with conical eye tubercle; lobed bridge teeth between abdominal part of dorsal scutum and carapace; dorsal and ventral scutal areas moderately elevated (Fig. 89a, c). Ventral leg coxae II and III with small anterio-proximal processes; ventral coxae I and palpal coxae with knob-shaped median processes; genital operculum wide (Fig. 89b).

Chelicerae (Fig. 88) weak; proximal article with dorso-distal boss, no ventral process; hand slender.

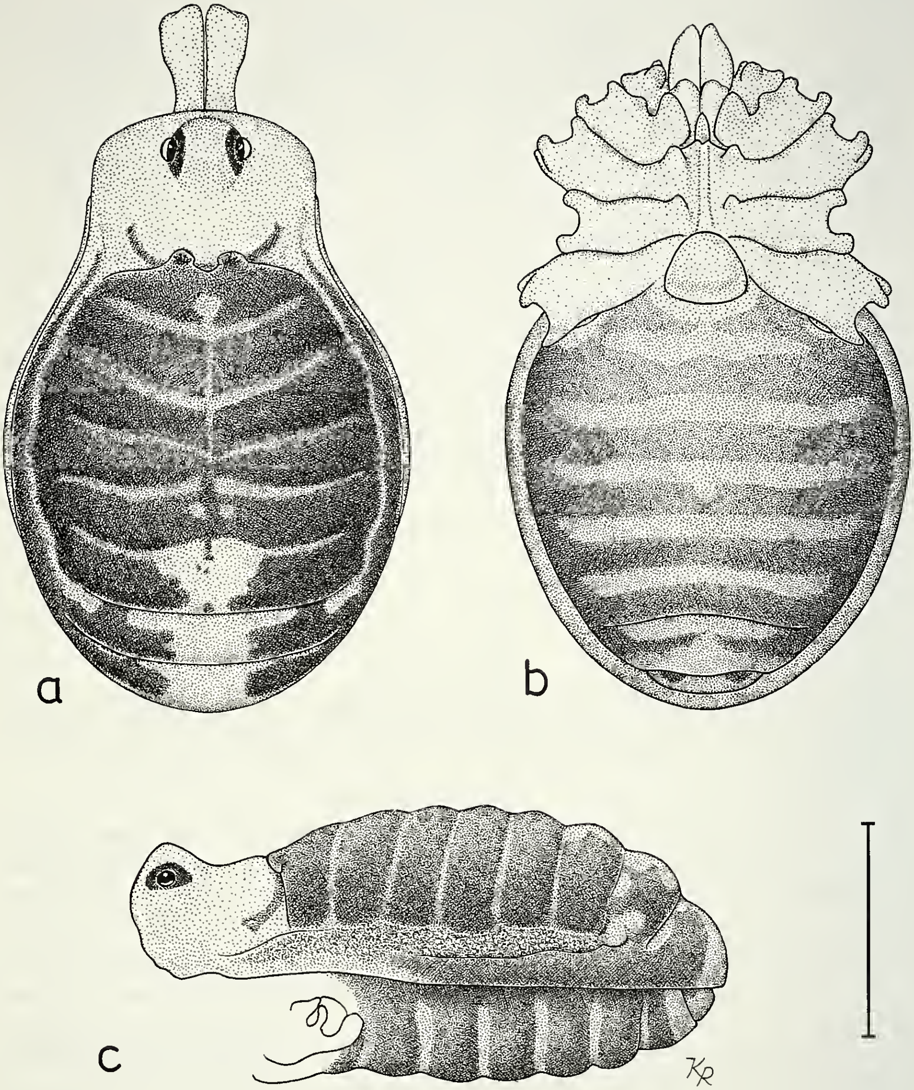


FIG. 89

Gnomulus maculatus sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Palps (Fig. 87): ventral femur with low proximal process; trochanter with distad directed ventral process.

Legs 1324, tarsal formula 2-2-3-3.

Penis (Figs 82-86): truncus fairly slender, apex narrow, distal margin broadly arched, without median indentation; subapical setae in two indistinctly separated groups on each side. Glans rising from a very wide membraneous socket; lateral sclerites long, forceps-like, connected by a long, tongue-shaped median plate with finely serrated distal margin; stylus stout, its apex bifurcate, with tip (carrying opening of sperm duct) bending towards the truncus at right angles below a pointed distad directed process; pair of membraneous tubes mostly covered by median plate.

♀. As the ♂; no external sexual dimorphism discernible.

Measurements (♂, in brackets ♀): body 2.80 (2.94) long, 1.90 (1.90) wide; carapace region 0.76 (0.69) long, 1.03 (1.04) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.29 (0.29)	0.42 (0.44)	0.35 (0.34)	0.24 (0.24)	- -	0.54 (0.55)	1.84 (1.86)
Leg I	0.24 (0.26)	0.67 (0.69)	0.42 (0.41)	0.43 (0.41)	0.64 (0.66)	0.41 (0.41)	2.81 (2.84)
Leg II	0.34 (0.34)	0.91 (0.90)	0.53 (0.53)	0.63 (0.62)	0.96 (0.99)	0.47 (0.48)	3.84 (3.86)
Leg III	0.27 (0.27)	0.61 (0.63)	0.44 (0.44)	0.46 (0.45)	0.81 (0.80)	0.32 (0.33)	2.91 (2.92)
Leg IV	0.32 (0.32)	0.90 (0.93)	0.59 (0.60)	0.76 (0.75)	1.14 (1.17)	0.35 (0.35)	4.06 (4.12)

Variation: Body length/width ranges: ♂ 2.80-2.84/1.87-1.90 (n = 2), ♀ 2.94-3.18/1.90-2.09 (n = 2). Bridge teeth between abdominal part of dorsal scutum and carapace vary in shape; they are generally smaller in the ♀♀ examined, in one of them missing on the left side. The median plate of the glans penis is narrower in the ♂ paratype (Fig. 86). The largest specimen (♀) is darker than all others, i.e. with dark reticulation on: carapace, genital operculum, leg coxae and trochanters, palps (except tarsus) and proximal chelicerae; femora to metatarsi of legs grey-brown.

Relationships: The enlarged, uniquely formed stylus of this species probably represents an earlier stage of glans modification, which is more strongly developed in *G. crucifer* sp. n. In other characters *G. maculatus* sp. n. most closely resembles *G. goodnighti.*

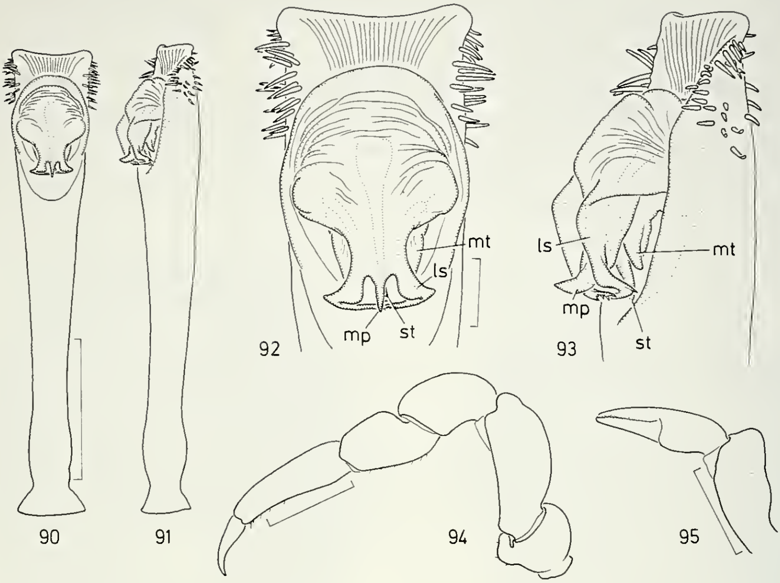
Bionomics: The specimens were collected from humid leaf litter and moss in an evergreen hill forest by means of sifting and Berlèse-extraction.

Distribution (Fig. 3): According to the collecting data the specimens are from two Philippine islands, Luzon and Mindoro. This would be an exceptionally wide distribution for an oncopodid species. The record of a single specimen from Mindoro is very probably due to a confusion of labels (supported by L. Deharveng, pers. comm.).

Gnomulus coniceps sp. n. Figs 90-96

Material: PHILIPPINES, Luzon, Baguio, near Cristal Caves, 1500 m, ♂ holotype (MHNG), 12.I.1980, leg. L. Deharveng.

Etymology: Latin: *conus* = cone; *ceps* (from *caput*) = head; noun in apposition. The name refers to the unusually large eye tubercle of this species.



FIGS 90-95

Gnomulus coniceps sp. n., ♂ holotype. - Penis, dorsal (90) and lateral view (91); apex of penis, dorsal (92) and lateral view (93); left palp, retrolateral view (94); left chelicera, retrolateral view (95). - Scale lines 0.5 mm (90-91, 94-95), 0.1 mm (92-93).

Diagnosis: Closest to *Gnomulus goodnighti*, distinguished by basally wider eye tubercle and narrower genital operculum. Penis with broadly invaginated anterior margin of truncus; glans penis with strongly geniculate lateral sclerites connected to a narrow, pointed median plate (Figs 90-93).

Description: ♂ (holotype). Coloration: body amber, with dark reticulations on carapace (especially around eyes), very dark dorsal scutal areas with a light longitudinal median band between areas II-IV (Fig. 96a); ventral scutal areas with transversal bands becoming increasingly darker posteriorly (Fig. 96b). Chelicerae, pedipalps and legs light amber, except slightly darker metatarsi I-IV and patella and tibia IV; terminal tarsal segment darker than basal ones.

Carapace short, with broadly conical eye tubercle occupying almost entire length of carapace (Fig. 96c); triangular pair of abdominal scutal processes forming bridge with pair of processes from carapace. Abdominal part of dorsal scutum high, with paramedian pairs of humps on scutal areas (largest on V-VII); posterior margin of dorsal scutum slightly pointed (Figs 96a, c); ventral scutum with only slightly elevated areas (Figs 96b, c). Distinct anterio- and posterio-proximal processes on ventral leg coxa II, a smaller one on coxa III; palpal coxae with large ventral processes; genital operculum longer than wide (Fig. 96b).

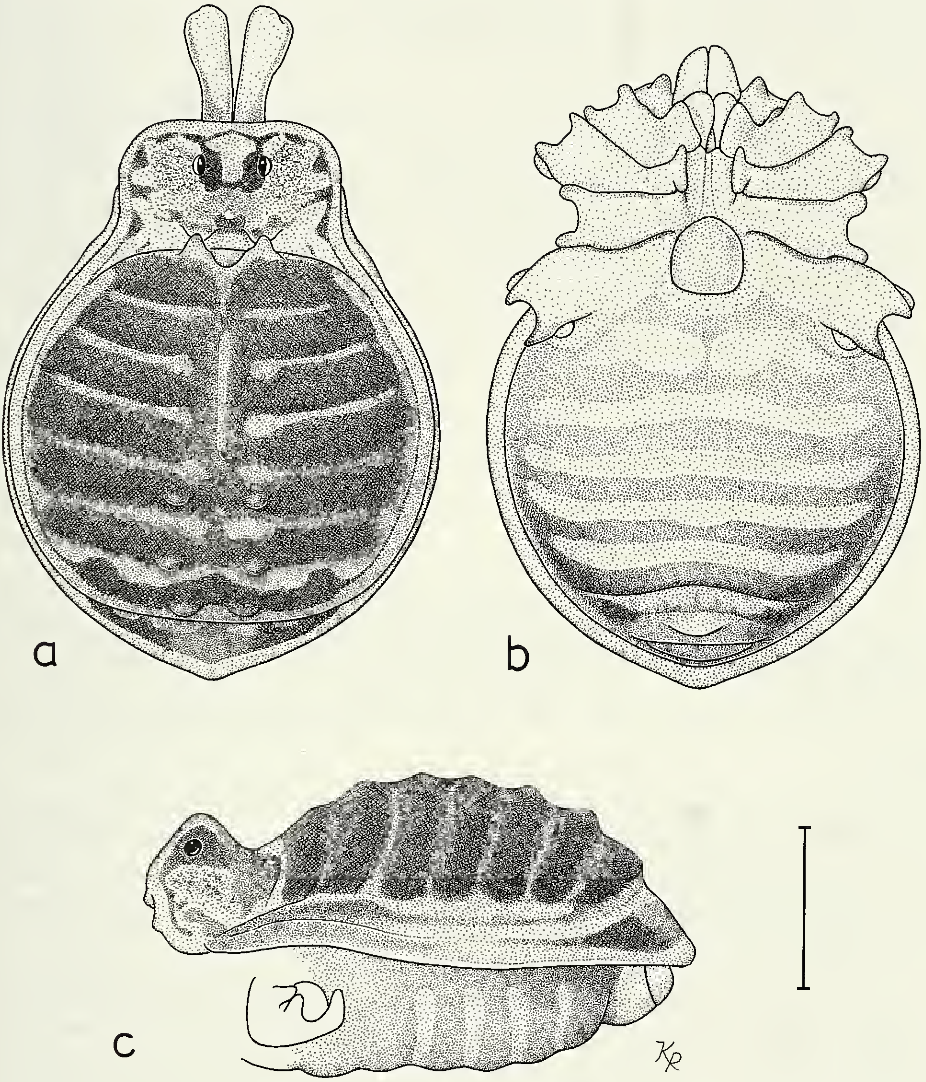


FIG. 96

Gnomulus coniceps sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Chelicerae (Fig. 95) weak; proximal article with dorso-distal boss, no ventral process; hand slender.

Palps (Fig. 94): ventral femur with indistinct proximal process; trochanter with distad-directed ventral process.

Legs 1324, tarsal formula 2-2-3-3.

Penis (Figs 90-93): truncus stout, apex wide, anterior margin broadly invaginated; subapical setae in one large group on each side. Glans medially constricted: lateral sclerites strongly geniculate, proximally divergent, distally convergent, tips ramified, touching each other; lateral sclerites connected by a short, spike-like median plate above slender stylus; pair of membraneous tubes clearly visible at constriction of glans.

♀. Unknown.

Measurements (♂): body 3.37 long, 2.66 wide; carapace region 0.78 long, 1.38 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.42	0.61	0.51	0.33	-	0.65	2.52
Leg I	0.33	1.05	0.56	0.64	1.03	0.59	4.20
Leg II	0.35	1.35	0.73	1.02	1.55	0.65	5.65
Leg III	0.32	1.05	0.61	0.76	1.35	0.53	4.62
Leg IV	0.41	1.40	0.73	1.05	1.89	0.61	6.09

Relationships: According to external morphology *G. coniceps* sp. n. is closest to *G. goodnighti* and (more distant) to *G. maculatus* sp. n., but its glans penis is quite different from both of them and shows no close resemblance with any species known so far.

Bionomics: The specimen was collected from a ravine in an evergreen hill forest.

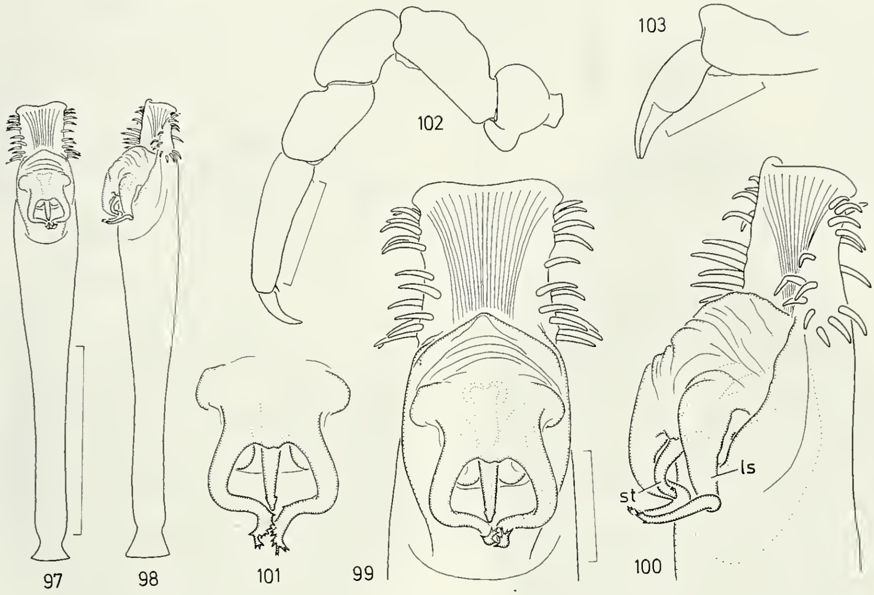
Gnomulus leyteensis sp. n. Figs 97-104

Material: PHILIPPINES, Leyte, Visca, north of Baybay, 200-500 m, ♂ holotype (MHNG), 10.III.1991, leg. J. Martens & W. Schawaller.

Etymology: The specific epithet is taken from the name of the island where the species was collected.

Diagnosis: Closest to *G. goodnighti*, distinguished by more rounded posterior margin of body, narrower genital operculum and basally wider ventral process on palpal trochanter. Penis apically narrower; glans more remote from distal margin; lateral sclerites less strongly bent, with ramified tip; median plate indistinct (Figs 97-101).

Description: ♂ (holotype). Coloration: body amber, with dark reticulations on carapace (especially around eyes); dorsal scutum with very dark margin and transversal bands on elevations, in scutal areas I-IV broken by a light longitudinal median band (Fig. 104a); ventral scutal areas with unbroken dark transversal bands (Fig. 104b). Chelicerae, pedipalps and legs light amber, except slightly lighter tarsi and slightly darker metatarsus II.



Figs 97-103

Gnomulus leyteensis sp. n., ♂ holotype. - Penis, dorsal (97) and lateral view (98); apex of penis, dorsal (99) and lateral view (100); glans with tips of lateral sclerites folded downwards (101); left palp, retrolateral view (102); left chelicera, retrolateral view (103). - Scale lines 0.5 mm (97-98, 102-103), 0.1 mm (99-101).

Carapace short, with conical eye tubercle set back from anterior margin; posterior part of carapace flat, triangular pair of paramedian processes forming bridge with corresponding processes on anterior margin of abdominal part of dorsal scutum. Dorsal scutum high, with paramedian pairs of indistinct humps on areas I-VII; posterior margin of dorsal scutum slightly pointed (Figs 104a, c); ventral scutum with only slightly elevated areas (Figs 104b, c). Ventral leg coxa II with distinct anterio- and posterio-proximal processes, coxa III with small anterio-proximal one; palpal coxa with large ventral process; genital operculum about as long as wide (Figs 104b).

Chelicerae (Fig. 103) small, slender; proximal article with dorso-distal boss, no ventral process; hand slender.

Palps (Fig. 102): ventral femur with indistinct proximal process; trochanter with distad-directed, basally wide ventral process.

Legs 1324, tarsal formula 2-2-3-3.

Penis (Figs 97-101): truncus with narrow apex and slightly invaginated distal margin; subapical setae in one large group on each side. Glans distinctly remote from apex of truncus; lateral sclerites bent towards each other and away from the truncus in distal half, its tips strongly ramified, touching each other; median plate very short, indistinct; stylus fairly stout, its tip bent towards the truncus.

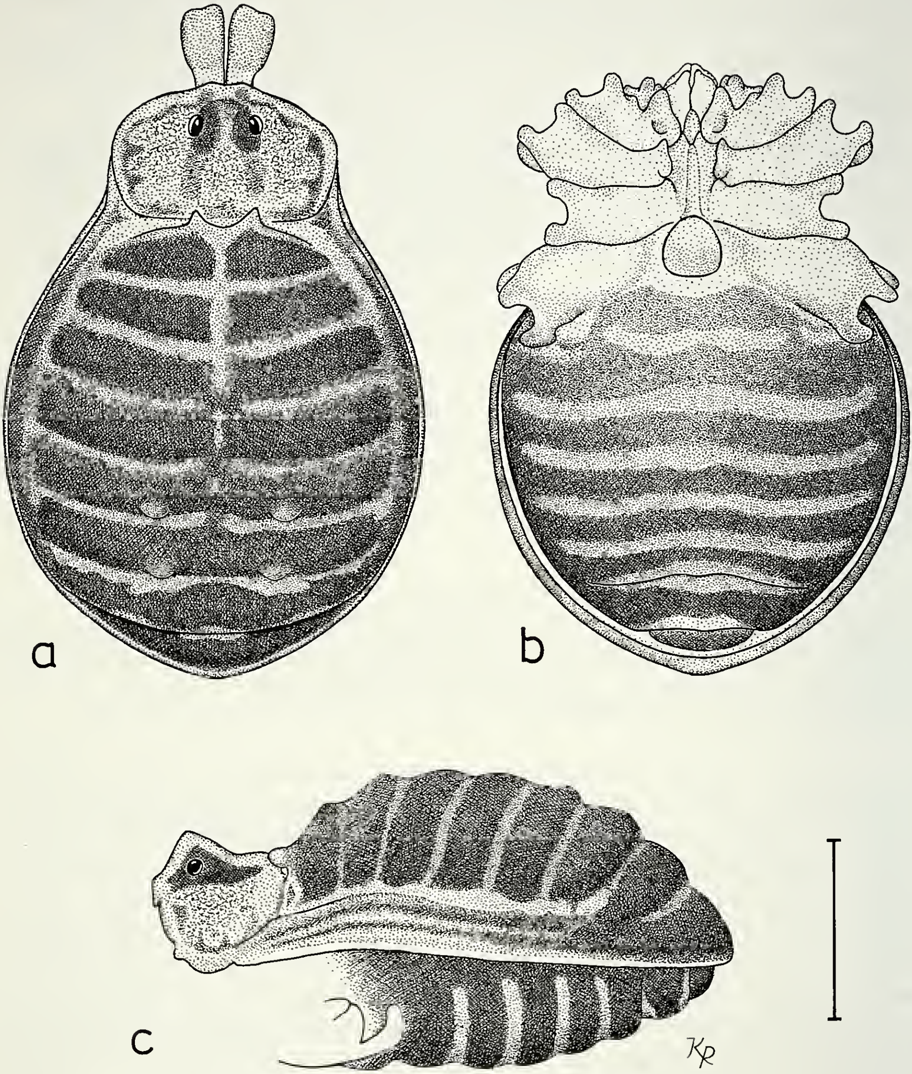


FIG. 104

Gnomulus leyteensis sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

♀. Unknown.

Measurements (♂): body 3.27 long, 2.39 wide; carapace region 0.76 long, 1.24 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.32	0.50	0.43	0.31	-	0.64	2.20
Leg I	0.27	0.85	0.53	0.56	0.87	0.55	3.63
Leg II	0.35	1.14	0.69	0.88	1.33	0.59	4.98
Leg III	0.31	0.87	0.58	0.64	1.11	0.46	3.97
Leg IV	0.41	1.19	0.72	0.96	1.59	0.50	5.37

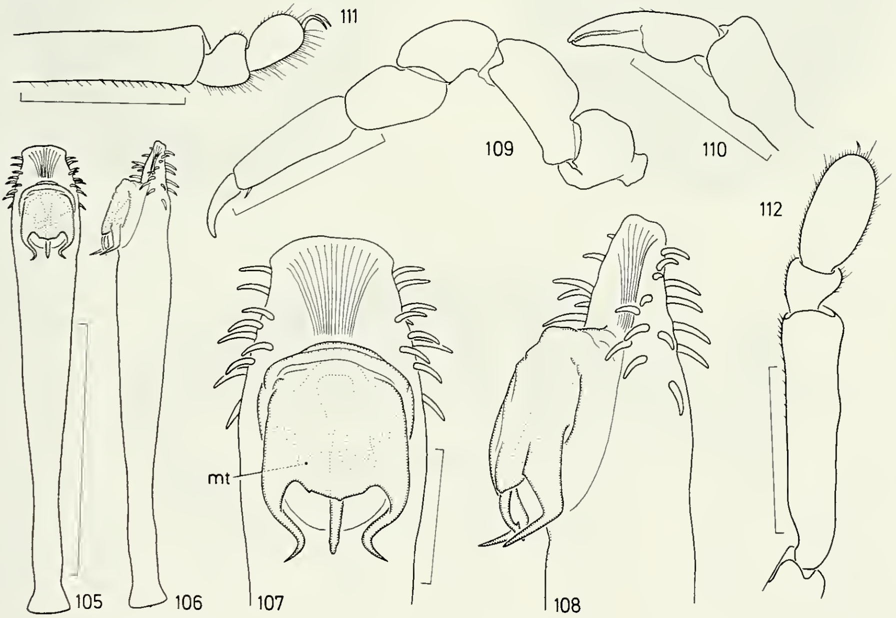
Relationships: According to penis morphology *Gnomulus leyteensis* sp. n. is closest to *G. goodnighti*.

Bionomics: The specimen was sifted from leaf litter and humus on steep slopes of an evergreen primary forest. In small interspersed clearings bananas were grown.

Gnomulus laruticus sp. n. Figs 105-113

Material: MALAYSIA, Perak, Taiping, Maxwell Hill (= Bukit Larut), 1320 m, ♂ holotype (MHNG), 26.I.1995, leg. P. Schwendinger.

Etymology: The species name is taken from Bukit Larut, the Malayan name of the type locality.



FIGS 105-112

Gnomulus laruticus sp. n., holotype. - Penis, dorsal (105) and lateral view (106); apex of penis, dorsal (107) and lateral view (108); left palp, retrolateral view (109); left chelicera, retrolateral view (110); distal part of left leg IV, prolateral view (111) and of leg II, retrolateral view (112). - Scale lines 0.5 mm (105-106, 109-112), 0.1 mm (107-108).

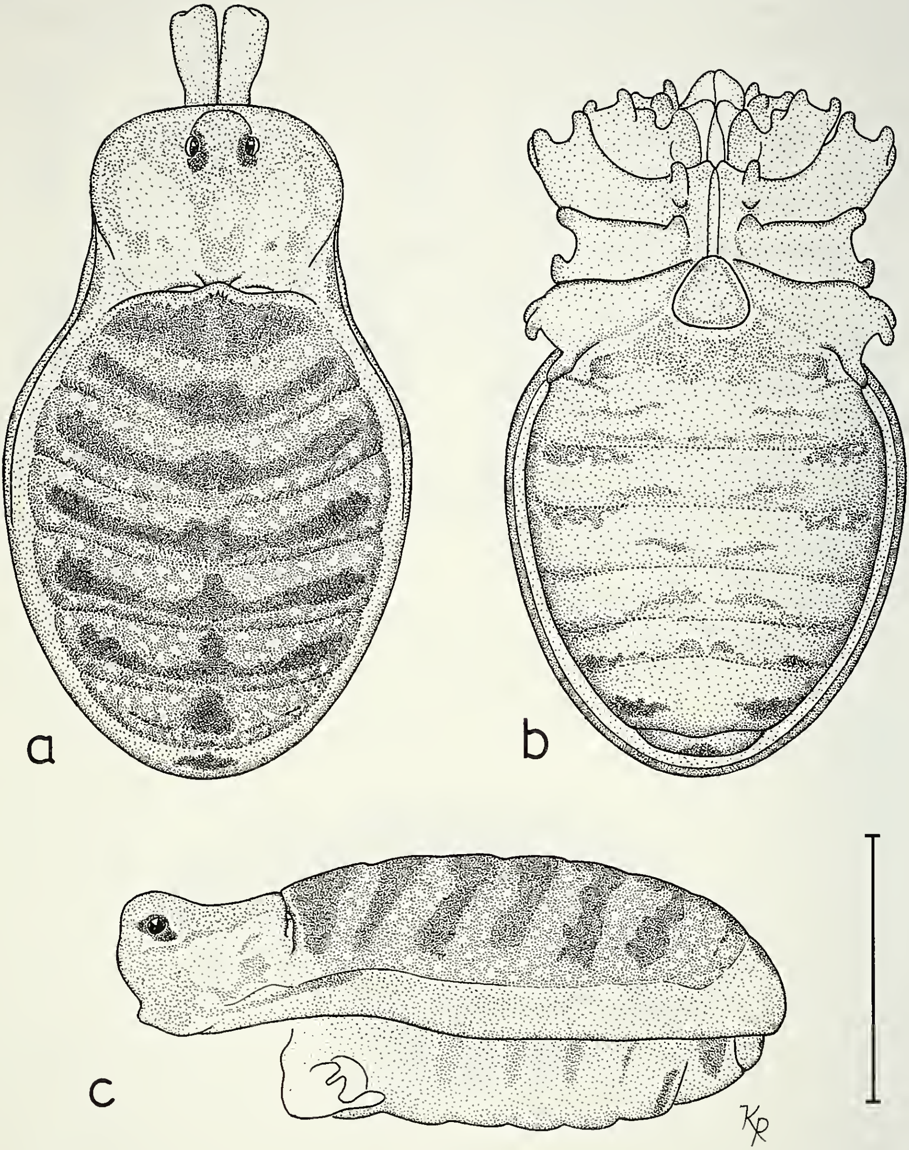


FIG. 113

Gnomulus laruticus sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Diagnosis: Resembling *G. crucifer* sp. n. in body shape and tarsal formula but different in shape of eye tubercle, colour pattern and presence of a wide bridge between carapace and abdominal part of dorsal scutum; genital operculum smaller; process on anterio-lateral margin of leg coxae I present; ventral process on palpal trochanter smaller; low ventro-median hump on proximal article of chelicerae. Glans penis with slender stylus and pair of sigmoid, pointed lateral sclerites interconnected by a short, broadly rounded median plate (Figs 105-108).

Description: ♂ (holotype). Coloration: body mostly light amber. Dark reticulations on carapace and dark transversal bands on abdominal part of dorsal scutum (Fig. 113a); indistinct dark lateral and paramedian patches on ventral scutal areas (Fig. 113b). Femora to metatarsi of legs slightly darkened, metatarsus II and proximal half of tibia IV distinctly darkened.

Carapace with low, broadly rounded eye tubercle; posterior part of carapace slightly elevated; a single short, wide lobe there forming bridge with corresponding lobe (shorter, wider) on anterior margin of abdominal part of dorsal scutum (Figs 113a, c); dorsal and ventral scuta low, areas indistinctly elevated (Fig. 113c). Ventral leg coxa II with anterio- and posterio-proximal processes, coxa III with anterio-proximal one; coxa I with conical process on anterio-lateral margin; palpal coxa with ventral process; genital operculum subtriangular, wider than long (Figs. 113b).

Chelicerae (Fig. 110) weak; proximal article with dorso-distal boss and indistinct ventral process; hand slender.

Palps (Fig. 109): ventral femur with small proximal process; ventral trochanter with pronounced distad directed process.

Legs 3124 (Figs 111-112), tarsal formula 2-2-2-2.

Penis (Figs 105-108): truncus with narrow apex and broadly arched, medially indistinctly invaginated anterior margin; subapical setae in one group on each side. Glans with sigmoid lateral sclerites, their acutely pointed tips bent away from the truncus and away from each other. Median plate short, broadly rounded, with few tiny teeth on margin; pair of membraneous tubes completely covered by median plate; stylus slender.

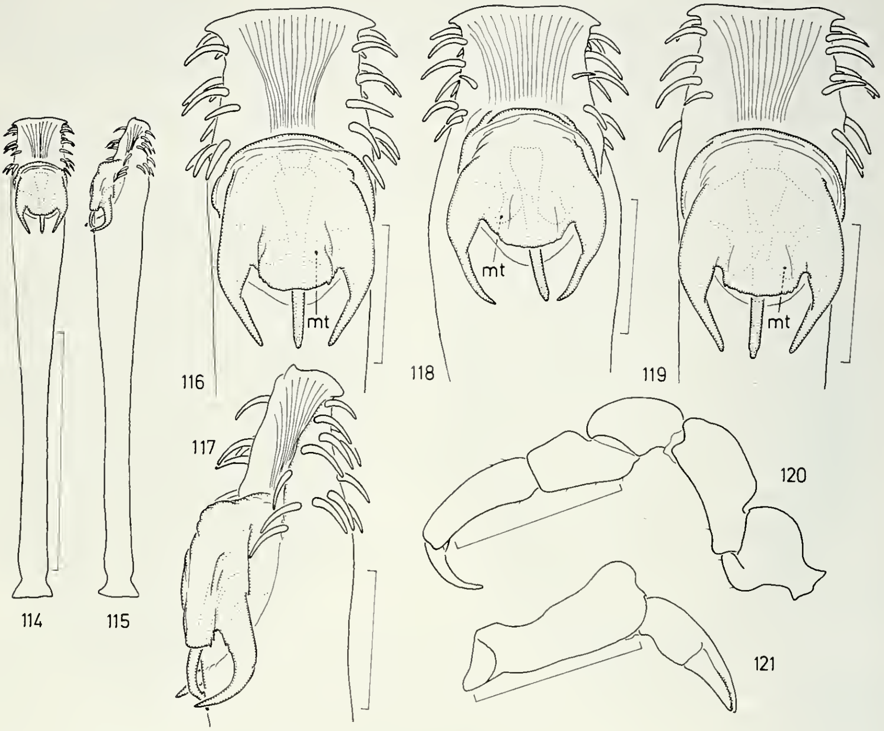
♀. Unknown.

Measurements (♂): body 2.48 long, 1.52 wide; carapace region 0.63 long, 0.94 wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.26	0.31	0.29	0.19	-	0.40	1.45
Leg I	0.23	0.66	0.40	0.35	0.53	0.37	2.54
Leg II	0.27	0.88	0.54	0.57	0.79	0.47	3.52
Leg III	0.23	0.56	0.40	0.38	0.64	0.27	2.48
Leg IV	0.26	0.86	0.55	0.63	0.92	0.31	3.53

Relationships: Congruences in penis morphology show closest relationship between *G. laruticus* sp. n., *G. asli* sp. n. and *G. hirsutus* sp. n. An unusual tarsal formula (2-2-2-2) links *G. laruticus* sp. n. with *G. crucifer* sp. n., but their distinctly diffent penes indicate a parallel retention of the juvenile tarsal number on posterior legs.

Bionomics: The specimen was collected by sifting leaf litter from the floor of a lower montane rain forest.



FIGS 114-121

Gnomulus asli sp. n.; ♂ holotype (114-117), ♂ paratypes (118-119), ♀ paratype (120-121). - Penis, dorsal (114) and lateral view (115); apex of penis, dorsal (116, 118-119) and lateral view (117); left palp, retrolateral view (120); left chelicera, retrolateral view (121). - Scale lines 0.5 mm (114-115, 120-121), 0.1 mm (116-119).

Gnomulus asli sp. n. Figs 114-122

Material: MALAYSIA, Perak, forest 5 km northeast of Chenderiang, 290-330 m, ♂ holotype (MHNG), 2 ♂, 1 ♀ paratypes (MAR, MHNG), 22.-31.I.1994; 330-400 m, 6 ♀ paratypes (MAR, MHNG), 15.-22.I.1995; leg. P. Schwendinger.

Etymology: Malay and Indonesian: *asli* = indigenous, original. The species is named after the Orang Asli, the indigenous people of Malaysia. The specimens were collected from a forest utilized by the inhabitants of an Orang Asli (Semai Senoi tribe) village.

Diagnosis: Close to *G. laruticus* sp. n. but distinguished by different colour pattern, lower eye tubercle, two bridge teeth between carapace and abdominal part of

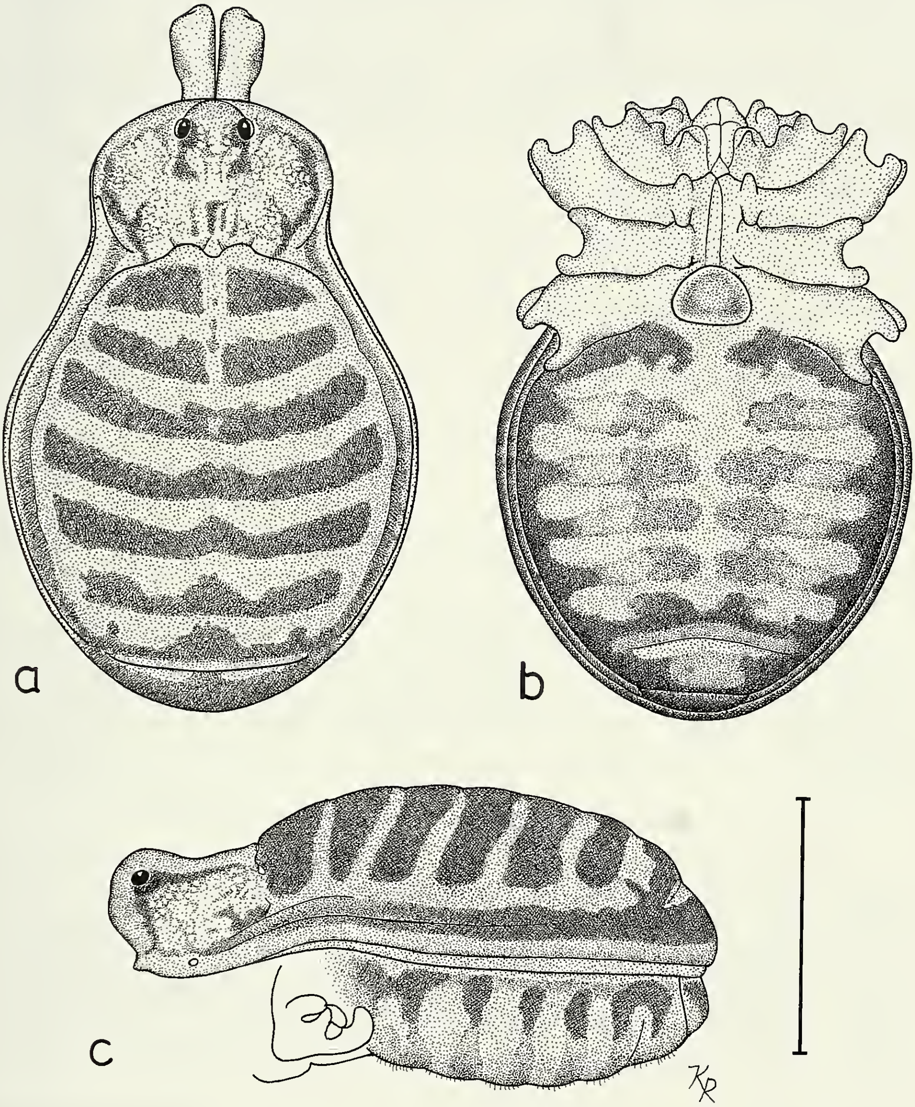


FIG. 122
Gnomulus asli sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

dorsal scutum, process on palpal trochanter basally rounded and tarsal formula 2-2-3-3. Glans penis distally wider; tips of lateral sclerites pointing towards each other (Figs 114-119).

Description: ♂ (holotype). Coloration: body mostly light amber, with dark reticulations on carapace and distinct dark transversal bands on abdominal part of dorsal scutum (Fig. 122a), indistinct ones on ventral scutum (Fig. 122b). Genital operculum and femora to metatarsi of legs dark amber, tarsi light yellow, ventral side of distitarsus I cream.

Carapace with low, broadly rounded eye tubercle; pars thoracica slightly elevated; two tubercles on posterior margin forming bridge with pair of short, obliquely truncate teeth on anterior margin of abdominal part of dorsal scutum (Fig. 122a, c); dorsal and ventral scuta low, areas indistinctly elevated; ventral scutal areas covered by fine short hairs (Fig. 122c). Ventral leg coxa II with distinct anterio- and posterio-proximal processes, coxa III with anterio-proximal one; coxa I with conical process on anterio-lateral margin; palpal coxa with ventral process; genital operculum subtriangular, distinctly wider than long (Fig. 122b).

Chelicerae (Fig. 121) small, slender; proximal article with dorso-distal boss, no ventral process; hand slender.

Palps (Fig. 120): ventral femur with small proximal process; ventral trochanter with pronounced distad directed process.

Legs 1324, tarsal formula 2-2-3-3.

Penis (Figs 114-119): truncus slender, distal margin widely arched and indistinctly invaginated medially; subapical setae in one group on each side. Glans with sigmoid lateral sclerites, their pointed tips distinctly bent away from the truncus and towards each other. Median plate short, broadly rounded, with several denticles on margin; pair of membraneous tubes completely covered by median plate; stylus slender.

♀. As the ♂, except for an indistinct hair cover on ventral scutum.

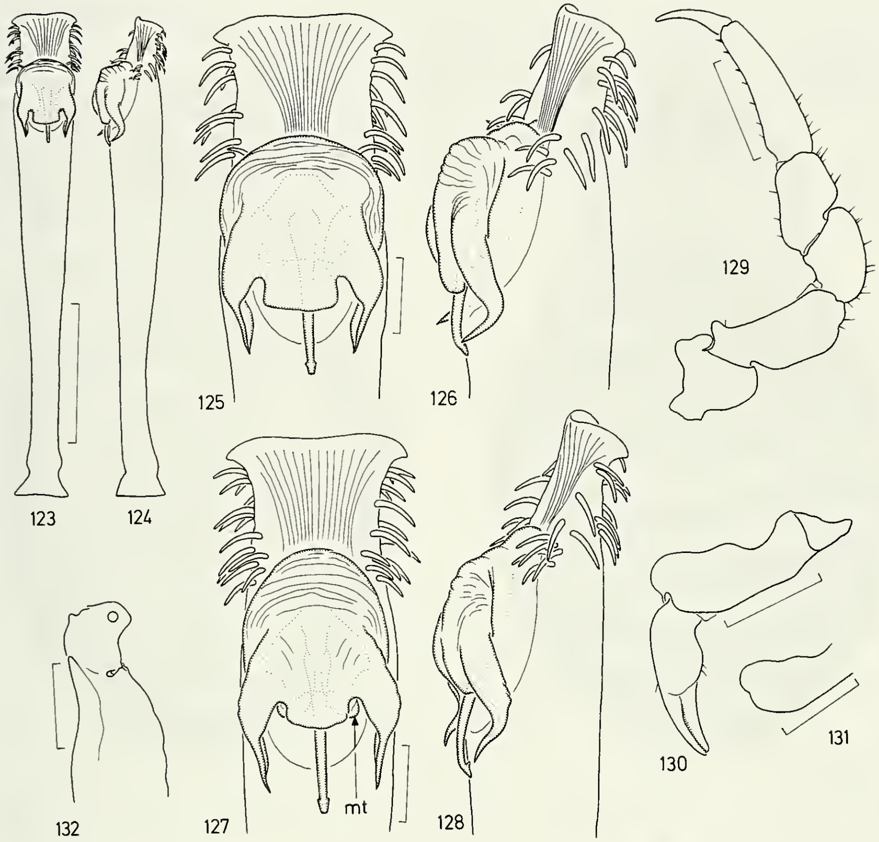
Measurements (♂, in brackets ♀): body 2.34 (2.39) long, 1.59 (1.63) wide; carapace region 0.61 (0.62) long, 0.92 (0.91) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.26 (0.27)	0.31 (0.31)	0.27 (0.27)	0.18 (0.18)	- -	0.38 (0.37)	1.40 (1.40)
Leg I	0.24 (0.24)	0.59 (0.60)	0.38 (0.37)	0.35 (0.34)	0.50 (0.50)	0.40 (0.40)	2.46 (2.45)
Leg II	0.29 (0.29)	0.81 (0.82)	0.47 (0.48)	0.50 (0.50)	0.79 (0.79)	0.48 (0.47)	3.34 (3.35)
Leg III	0.24 (0.24)	0.56 (0.56)	0.40 (0.38)	0.37 (0.37)	0.64 (0.64)	0.29 (0.29)	2.50 (2.48)
Leg IV	0.26 (0.27)	0.79 (0.79)	0.50 (0.50)	0.56 (0.56)	0.96 (0.96)	0.32 (0.32)	3.39 (3.40)

Variation: Body length/width ranges: ♂ 2.29-2.34/1.56-1.59 (n = 3), ♀ 2.28-2.51/1.51-1.69 (n = 7).

Relationships: Penis morphology shows that *G. asli* sp. n. and *G. laruticus* sp. n. are closest relatives, despite differences in the tarsal formula (2-2-3-3 versus 2-2-2-2) and in the shape of the carapace-abdomen bridge.

Bionomics: The specimens were sifted from leaf litter and humus in a lowland rain forest.



FIGS 123-132

Gnomulus hirsutus sp. n.; ♂ holotype (123-126), ♂ paratype (127-128, 131-132), ♀ paratype (129-130). - Penis, dorsal (123) and lateral view (124); apex of penis, dorsal (125, 127) and lateral view (126, 128); left palp, retrolateral view (129); left chelicera, retrolateral view (130); left chelicera, proximal article, retrolateral view (131); anterior part of body, lateral view (132). - Scale lines 0.5 mm (123-124, 129-132), 0.1 mm (125-128).

Gnomulus hirsutus sp. n. Figs 123-133

Material: MALAYSIA, Selangor, Templer Park, ♂ holotype and 1 ♀ paratype (MHNG), 1-3.XII.1990, leg. C. Deeleman-Reinhold. - Ulu Gombak, University of Malaya Field Centre, 200 m, 1 ♂, 1 ♀ paratypes (MAR, MHNG), 26.IX.1991, leg. D. Agosti. - Pahang, on the road to Genting Highlands, 500-800 m, 1 ♀ paratype (MAR), 13.XII.1982, leg. H. Ono.

Etymology: Latin: *hirsutus* = hairy; the specific epithet refers to the relatively hairy body of this species.

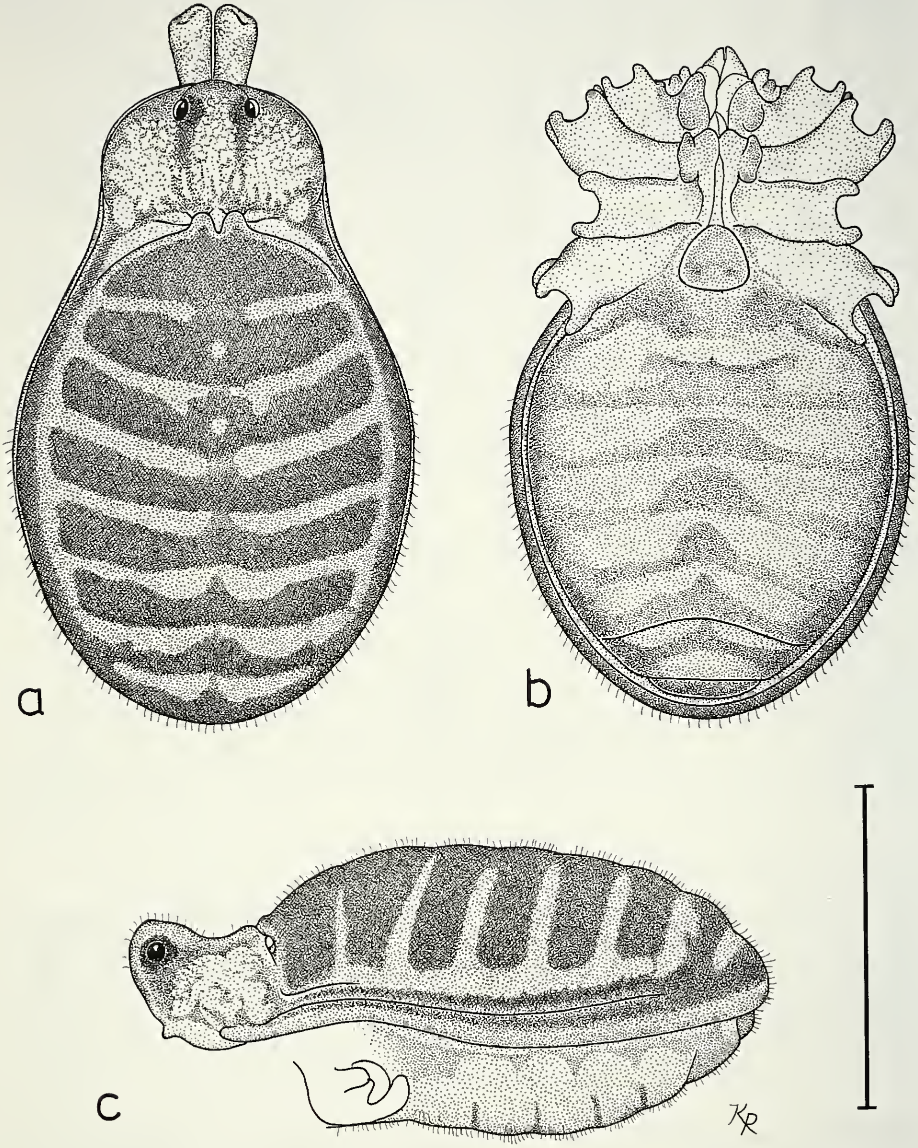


FIG. 133

Gnomulus hirsutus sp. n., ♂ holotype, body, dorsal (a), ventral (b) and lateral view (c). - Scale line 1 mm.

Diagnosis: Close to *G. asli* sp. n. but distinguished by larger body covered by fine hairs; eye tubercle higher, prorect; ventral scutal areas sexually dimorphic; ventral process on palpal trochanter basally narrower; proximal article of chelicerae with distinct dorso-median boss; glans penis with tips of lateral sclerites further apart from each other, median plate without marginal teeth (Figs 123-128).

Description: ♂ (holotype). Coloration: mostly dark amber, with dark reticulation on carapace, dark margin and transversal bands on abdominal part of dorsal scutum (Fig. 133a); ventral scutum light orange, its transversal bands indistinct (Fig. 133b); ventral prosoma light amber. Leg trochanters, chelicerae and pedipalps light yellow with dark spots (except on cheliceral hand and on palpal tarsus); leg tarsi light amber, ventral distitarsus I cream.

Whole body quite densely covered with fine light hairs. Carapace with prorect, rounded eye tubercle; pars thoracica only little elevated; two pairs of tubercles forming bridge between carapace and abdominal part of dorsal scutum; dorsal and ventral scuta low (Figs 133a, c); ventral scutal areas moderately swollen and pale (Figs 133b, c). Ventral leg coxa II with distinct anterio- and posterio-proximal processes overlapping anterio-proximal process on coxa III; coxa I with central and anterio-lateral processes; palpal coxa with ventral process; genital operculum broadly rounded anteriorly, slightly wider than long (Fig. 133b).

Chelicerae (Figs 130-131) weak; proximal article with distinct dorso-distal and smaller dorso-median boss, no ventral process; hand slender.

Palps (Fig. 129): ventral femur with distinct proximal process; ventral trochanter with pronounced distad-directed bilobed process.

Legs 1324, tarsal formula 2-2-3-3.

Penis (Figs 123-128): truncus slender, its distal margin broadly arched, indistinctly invaginated medially; subapical setae in one group on each side. Glans with sigmoid lateral sclerites, their pointed tips slightly bent away from the truncus and towards each other. Median plate short, without teeth on margin; pair of membraneous tubes mostly covered by median plate; stylus slender.

♀. As the ♂, except for less elevated, more strongly pigmented ventral scutal areas.

Measurements (♂, in brackets ♀): body 4.02 (4.07) long, 2.54 (2.63) wide; carapace region 0.86 (0.83) long, 1.45 (1.41) wide. - Palp and legs:

	Tr	Fe	Pa	Ti	Mt	Ta	Total
Palp	0.43 (0.43)	0.52 (0.50)	0.43 (0.43)	0.28 (0.29)	- -	0.70 (0.66)	2.36 (2.31)
Leg I	0.43 (0.41)	0.96 (0.96)	0.59 (0.59)	0.56 (0.57)	0.78 (0.78)	0.61 (0.61)	3.93 (3.92)
Leg II	0.55 (0.53)	1.30 (1.33)	0.79 (0.81)	0.88 (0.88)	1.24 (1.25)	0.70 (0.70)	5.46 (5.50)
Leg III	0.42 (0.42)	0.93 (0.93)	0.64 (0.64)	0.61 (0.59)	1.02 (1.03)	0.47 (0.47)	4.09 (4.08)
Leg IV	0.50 (0.50)	1.36 (1.34)	0.82 (0.84)	0.95 (0.98)	1.55 (1.60)	0.55 (0.53)	5.73 (5.79)

Variation: Body length/width ranges: ♂ 3.81-4.02/2.54-2.57 (n = 2), ♀ 4.02-4.14/2.63-2.78 (n = 3). The ♀ from the type locality and the ♂ from Ulu Gombak have a more distinct dark pattern and a light longitudinal median stripe between areas II and III on their dorsal scutum. The ♀ from Ulu Gombak shows a faint pattern in the central region of its dorsal scutum. The ♂ paratype possesses an obliquely truncate eye tubercle (as seen from laterally; Fig. 132), smaller bridge teeth on the anterior margin of its abdominal part of dorsal scutum and an indistinct dorso-median boss on the proximal article of its chelicerae (Fig. 131).

Relationships: External and genital morphology show closest relationship between *G. hirsutus* sp. n. and *G. asli* sp. n.; *G. laruticus* sp. n. is more distant. Another seemingly related form (only 1 ♀ available) occurs on Maxwell Hill.

Bionomics: The specimens were collected from leaf litter of primary and secondary evergreen forests.

UNDETERMINED MATERIAL

Nine other related forms are available only in ♀♀. We are reluctant to describe new species from ♀♀, since in the absence of penis characters a generic placement is by no means certain, considering the close external resemblance of *Palaeoncopus* gen. n. with *Caenoncopus* gen. n. and *Biantoncopus* gen. n. with *Gnomulus*. Nevertheless these specimens are recorded here, together with their presumed relationships, in the hope that further collecting at their find localities will yield ♂ specimens.

1. 1 ♀, Sumatra, 7 km north of Brastagi, 1500 m, 2.XII.1989, leg. I. Löbl *et al.* (MHNG) --- similar to *C. cuspidatus* (tarsi 1-1-2-2) but distinctly smaller; colour pattern different; interocular area not elevated; posterior margin of body more rounded; ventral process on palpal trochanter blunt. Collected from the same locality as *C. cuspidatus*, probably syntopic.

2. 1 ♀, Sumatra, Bukittinggi, Gunung Merapi, 2000-2200 m, 18.X.1990, leg. A. Riedel (MAR) --- similar to *C. tenuis* sp. n. but different in colour pattern, more slender legs and wider genital operculum.

3. 7 ♀, Sumatra, Mt. Kerinci, 1750-1900 m, 11.-13.XI.1989, leg. I. Löbl *et al.* (MHNG) --- close to *C. affinis* sp. n. but different in colour pattern; eye tubercle more rounded; genital operculum much larger; ventral process on palpal trochanter smaller.

4. 2 ♀, Sumatra, Panti, 250 m, 19.XI.1989, leg. I. Löbl *et al.* (MHNG) --- close to *P. gunung* sp. n. but distinctly smaller; eye tubercle and two humps on pars thoracica more elevated, the latter almost pointed. Apparently syntopic with *C. affinis* sp. n.

5. 1 ♀, Sumatra, Mt. Kerinci, 1750-1850 m, 11.-12.XI.1989, leg. I. Löbl *et al.* (MHNG) --- close to *P. gunung* sp. n. but much larger; pars thoracica lower, without pair of humps; ventral palpal trochanter with much larger, multilobed process; proximal article of chelicerae with pointed prodorsal process on distal corner.

6. 1 ♀, Indonesia, Kalimantan, Kaharian, 2.-16.IX.1985, leg. C. Deeleman-Reinhold (MAR) --- similar to *C. cuspidatus* (tarsi 1-1-2-2), but much larger; leg tarsi longer, more *Oncopus*-like; ventral process on palpal trochanter very long, bifurcate; chelicerae robust, proximal article with pointed prodorsal process on distal corner, second article with ventral process (as in *Oncopus* spp.). Judging from external morphology, this specimen appears intermediate between *Caenoncopus* gen. n. and *Oncopus*.

7. 1 ♀, Philippines, Leyte, Visca north of Baybay, 200-500 m, 23.II.1991, leg. J. Martens & W. Schawaller (MAR) --- similar to *B. fuscus* sp. n. (tarsi 2-2-3-3) but much larger; eye tubercle higher; ventral palpal trochanter and femur with conical processes; proximal article of chelicerae with erect dorso-median process. Syntopic with *G. leyteensis* sp. n.

8. 1 ♀, Philippines, Luzon, Sagada, 9.I.1980, leg. L. Deharveng (MAR) --- similar to *B. fuscus* sp. n. but distinctly larger; ventral process on palpal trochanter smaller. Syntopic with *G. maculatus* sp. n.

9. 1 ♀, Malaysia, Perak, Taiping, Maxwell Hill, ca. 1200 m, 10.IV.1990, leg. A. Riedel (MAR) --- similar to *G. hirsutus* sp. n. (tarsi 2-2-3-3) but smaller, less hairy and without distinct ventral process on proximal palpal femur. Distinct from *G. laruticus* sp. n., which occurs at the same locality.

DISCUSSION

GENITAL MORPHOLOGY

The description of *Caenoncopus cuspidatus* (SCHWENDINGER 1992) already showed that penis morphology in Oncopodidae is not as uniform as previously assumed and the new material uncovers even more complex conditions. At present, we can distinguish four major penis types. Three of them are characteristic for one genus each, the remaining one is shared by two genera.

Hypothetical ancestor. Our interpretation of phylogenetic relationships within the Oncopodidae is rooted in an ancestral penis type (Fig. 134a). Archaic Oncopodidae presumably possessed a cylindrical truncus and a short distad-directed glans with membraneous, slightly movable tubes. From this hypothetical form the four extant penis types may have evolved. These are:

Type 1. In the species of *Palaeoncopus* gen. n. the penis is structurally almost identical with the ancestral form (Fig. 134a), except for the lack of membraneous tubes (Fig. 134b).

Type 2. In *Biantoncopus* gen. n. (only known species *B. fuscus* sp. n.) the penis is similar to type 1, but stylus and membraneous tubes can be expanded by means of hemolymph pressure (Fig. 134c). During expansion the stylus is protruded distally and the membraneous tubes are bent to the opposite direction towards the base of the truncus. Structurally and functionally, this construction is very similar to other "hemolymph-pressure" lanitorean families (MARTENS 1986).

Type 3. The penes of *Gnomulus* and *Oncopus* possess the same elements as the hypothetical ancestor, but the whole glans is proximad-directed (Fig. 134d). This penis form was previously considered typical for the whole family (MARTENS 1976, 1986); it is found in the majority of species. A few of them, however, are already derived in that they have acquired an enlarged, prolonged "atypical" stylus (Fig. 134e; e.g. *G. maculatus* sp. n., *G. crucifer* sp. n.) and/or reduced the median plate (e.g. *G. leyteensis* sp. n., *G. crucifer* sp. n.).

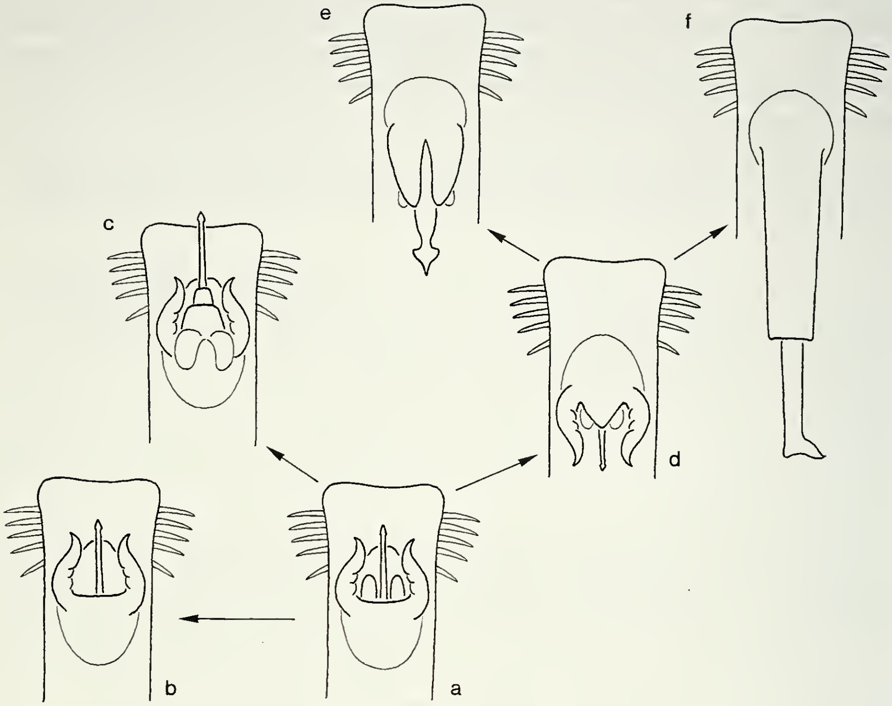


FIG. 134

Hypothetical evolution of the four penis types in Oncopodidae. - a) hypothetical ancestor with glans parts directed distad; b) type 1: *Palaeoncopus* gen. n., similar to state a), but membraneous tubes (see Fig. 1) lost; c) type 2: *Biantoncopus* gen. n. with parts of glans expandable; d) type 3: *Gnomulus* and *Oncopus*, glans bent proximad; e) *Gnomulus crucifer* sp. n., parts of the glans (especially stylus) noticeably elongated; f) type 4: *Caenoncopus* gen. n. with median plate and lateral sclerites reduced, stylus strongly elongated, embraced by proximal sheath. - This scheme does not reflect phylogenetic relationships, but shows trends in the evolution of penis types in Oncopodidae. *Caenoncopus* gen. n., for example, probably has not evolved directly from *Oncopus* or *Gnomulus*, but from a common ancestor with a penis as in d (see Discussion: Evolution).

Type 4. The penes of *Caenoncopus* gen. n. species are structurally unique and quite different from the other types. The truncus is dorso-ventrally depressed, its base not constricted and ending in two lobes. The glans essentially comprises only a very long, thick proximad-directed glans with an asymmetrical apex. Proximally, the stylus is embraced by a sheath-like membraneous collar formed by an extension of the membraneous socket; lateral sclerites, membraneous tubes and median plate are absent (Fig. 134f). This hypertrophic stylus is only partly homologous to the styli of the other penis types described above.

EVOLUTION

Our interpretation of taxonomic characters leads to the following possible evolutionary scenario. Primitive Oncopodidae were small (2-5 mm), sironoid-like opilionids, with large dorsal and ventral scuta, weak chelicerae and few leg tarsalia. The ancestral oncopodid penis was devoid of muscles and already characteristic for the derived group of "hemolymph-pressure" Laniatores. It had a short, distad-directed subapical glans with a free slender stylus surrounded by membraneous tubes and by lateral sclerites connected to a median plate (Fig. 134a). A similar penis morphology as presumed for early oncopodids is characteristic for two other families of "hemolymph-pressure" Laniatores, i.e. Gonyleptidae and Cosmetidae (MARTENS 1976, 1986). We take them as outgroup for our interpretation of relationships within the Oncopodidae. In these opilionids the subdistal glans is movable by means of hemolymph pressure only to a limited extent. As the stylus is pointing straight forwards, there is no need for a greatly movable glans. The penes of *Palaeoncopus gunung* sp. n., *P. kerdil* sp. n. and *P. katik* sp. n. from Sumatra largely accord with this primitive penis form, but are apomorphic in the loss of their membraneous glans tubes (Fig. 134b). *Biantoncopus fuscus* sp. n. from the Philippines also possesses a distad-directed glans penis (with membraneous tubes still present), but it has become expandable (Fig. 134c) in the same way as shown for the Biantidae (Martens 1978: figs 8a-e, 9a-d). The expanding stylus probably increases the insemination rate by enabling the ♂ to ejaculate deeper into the ♀ ovipositor.

From the primitive, generalized penis type with short distad-directed, non-expandable glans, the evolutionary trend in "hemolymph-pressure" Laniatores went towards enlargment and enhanced movability of the stylus. To keep the penis under the genital operculum and protect it from damage, it became necessary to either transpose the glans to a more proximal position on the truncus, or to retreat it deeply into the distal part of the truncus, or to fold it downwards. The latter option was realized in the majority of oncopodid species, the former ones in different lineages, i.e. in the Fissiphalliidae, Assamiidae, Biantidae and Podoctidae (MARTENS 1986, 1988). After the glans became newly adjusted to a position with the stylus pointing to the truncus basis (Fig. 134d), evolution in Oncopodidae apparently went in two directions. *Caenoncopus* gen. spp. n. from Sumatra remained small, but greatly modified their penis morphology. In these species the lateral sclerites, median plate and membraneous tubes of the glans were lost, whereas the stylus gained enormous proportions and became asymmetrical (Fig. 134f). The rest of the Oncopodidae retained the typical penis structure (with short proximad-directed glans) but diversified in external characters instead. Most of them increased size of body and chelicerae (most pronounced in *Oncopus*) and acquired different tarsal formulas (2-2-2-2, 2-2-3-3 in *Gnomulus*, 1-1-1-1 in *Oncopus*). The evolutionary trend for stylus enlargement and reduction of glans sclerites, parallel to that in *Caenoncopus* gen. n., is also evident in the *Gnomulus-Oncopus* lineage, as shown in *G. maculatus* sp. n. (Figs 84-86) and *G. crucifer* sp. n. (Figs 73-75, 134e).

Divergent evolutionary lineages resulted in four distinctly different penis types, but specific distinctions within the same type are often minute. Considering also the rapidly increasing number of newly discovered species with restricted distribution, it appears that the Oncopodidae currently undergo an active process of speciation. Unlike most other Laniatores, specific distinctions in Oncopodidae are expressed in penis modifications rather than in external morphology. Consequently, describing new taxa from ♀♀ or juveniles should be strictly avoided.

GENERIC LIMITS

Our reassessment of the Oncopodidae is primarily based on penis morphology, which is clearly outlined in the genera newly established in this paper. Only in *Gnomulus* penis shapes are fairly variable, with some species (e.g. *G. crucifer* sp. n.) being already as far derived from the usual type that they could be regarded as generically different. The penes of *Gnomulus* and *Oncopus*, on the other hand, are of the same type and no relevant distinctions could be found. Externally, however, *Oncopus* is clearly distinguished by its unique tarsal formula (1-1-1-1) and its robust body. Tarsal formulas, however, do not entirely correspond with genital characters used for generic distinctions. Different tarsal formulas exist in genera clearly defined by genital characters (1-1-2-2 and 1-1-3-3 in *Caenoncopus* gen. n.; 2-2-2-2 and 2-2-3-3 in *Gnomulus*) and the same tarsal formulas are present in different genera (1-1-3-3 in *Caenoncopus* gen. n. and *Palaeoncopus* gen. n., 2-2-3-3 in *Biantoncopus* gen. n. and *Gnomulus*). Consequently, the only reliable traits available at present to delineate genera within the Oncopodidae are genital characters.

The five oncopodid genera that we recognize here are founded on the following putative autapomorphies:

Palaeoncopus gen. n. - glans penis without membraneous tubes; palpal trochanter with prodorsal process.

Biantoncopus gen. n. - glans partly retreated into the distal part of the truncus, expandable by means of hemolymph pressure.

Gnomulus Thorell - glans proximad-directed. No relevant distinctions for *Pelitnus* Thorell, therefore placed in synonymy with *Gnomulus*.

Oncopus Thorell - glans proximad-directed (but this is possibly synapomorphic with *Gnomulus*). Another possible autapomorphy is found in the strong chelicerae with 1-2 ventral processes on the cheliceral hand. At present, however, we cannot recognize any clear autapomorphies, which distinguish *Oncopus* from *Gnomulus*. External morphology (especially tarsal formula 1-1-1-1) is very characteristic for *Oncopus*, but it is not clear whether this (except for the large body size) is plesiomorphic or apomorphic.

Caenoncopus gen. n. - stylus strongly enlarged with membraneous collar and asymmetrical apex; other parts of glans lost.

FUNCTIONAL MORPHOLOGY OF THE ONCOPODID PENIS

The oncopodid penis operates by hemolymph pressure. Like in most other families of Laniatores, muscles and tendons are absent. Internal pressure of the body, transmitted to the penis via hemolymph, causes positioning of the glans in relation to the truncus. Structure and alignment of the subdistal glans was previously regarded as fairly uniform. Only penis type 3 (Fig. 134d) was known and just a small degree of upward movement (less than 180°) by the short proximad-directed glans was thought to be possible (MARTENS 1986).

With the new material, greatly different conditions within the Oncopodidae are pointed out. Some of the new species exhibit penis forms with structural and functional characteristics as otherwise found only in different well-defined opilionid families (Fig. 134).

A similar short, distad-directed glans (considered plesiomorphic for the "hemolymph-pressure" Laniatores) as in *Palaeoncopus* gen. n. is present in Cosmetidae and Gonyleptidae. Within the primitive penis types derived forms can be identified, in which hemolymph pressure protrudes the stylus forward to reach the ♀ receptacula seminis more efficiently during copulation. Such is found in *Biantoncopus fuscus* sp. n., Assamiidae, Biantidae and Podoctidae. A short, proximad-directed glans, comparable to *Gnomulus* and *Oncopus*, is typical for many Phalangodidae, an obviously polyphyletic group. In separate evolutionary lineages the styli became increasingly enlarged. This occurs in the species of *Caenoncopus* gen. n. and, probably parallel to it, also in few *Gnomulus* species. Comparable hypertrophies of the stylus are present also in the family Triaenonychidae, where this phenomenon apparently evolved independently several times in different Australian and South American clades. In this family (belonging to Laniatores with a muscle-tendon complex inside the penis), the distad-directed stylus seems to be only slightly movable. In the cases mentioned, the stylus became a strongly elongated part of the truncus, but it was never folded downwards (HUNT & MAURY 1993).

The different penis types require modifications in mating behaviour. In this study, we did not examine the ovipositors of Oncopodidae in detail, but random samples showed that they are unsegmented, generally short and only movable to a small extent, if at all (MARTENS *et al.* 1981, observations from one *Oncopus* species). In terms of inner skeletal anatomy, the oncopodid ovipositor is very similar to that of other Laniatores.

In order to transfer sperm into the receptacula within the ovipositor, the ♂ needs to adjust his stylus to a suitable position by means of hemolymph pressure. This is done by slightly protruding the stylus in penis type 1 (Fig. 134b), or by inflating the membraneous tubes and strongly protruding the stylus in penis type 2 (Fig. 134c), or by folding the entire glans upwards about 180° (while only slightly protruding the stylus) in type 3 (Fig. 134d, e). It is not quite clear what happens during copulation in penis type 4 (Fig. 134f). Obviously the penis first has to be pushed out of the genital orifice for almost its entire length until the long stylus (Figs 5a, b, 9-10, 18-19) lies free and can be folded upwards. In *Caenoncopus cuspidatus*, with its glans only little shorter than the truncus, probably the maximum length of a proximad-directed glans is reached. To unfold this enormous sub-organ of the penis, the animal presumably has to rise high on its "tiptoes" and lift up its body quite a distance from the substrate. What movement these ♂♂ actually perform during mating can only be learned from observations on living animals.

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Redescription of *Betta picta* (Teleostei: Osphronemidae) and description of *B. falx* sp. n. from central Sumatra

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Redescription of *Betta picta* (Teleostei: Osphronemidae) and description of *B. falx* sp. n. from central Sumatra. - *Betta picta* is redescribed on the basis of material from Java. *Betta falx* sp. n. is described from Jambi, central Sumatra. The new species differs from *B. picta* by having fewer lateral scales (27 vs. 27-30), a narrower head profile and by lacking median caudal-fin extensions in mature males.

Key-words: *Betta* - Osphronemidae - Sumatra - taxonomy - biodiversity.

INTRODUCTION

Betta trifasciata Bleeker, 1850, the type species of the genus *Betta* by monotypy, was described from Ambarawa, Java (BLEEKER 1850). However, Valenciennes (in CUVIER & VALENCIENNES 1846) had earlier described the same fish from Buitenzorg (now Bogor), Java, as *Panchax pictum* and, therefore *B. trifasciata* is a junior subjective synonym of *B. picta*. The type material of *B. picta* is lost and the type(s) of *B. trifasciata* is(are) apparently mixed up with other *Betta* species from several localities (RMNH 6370, 30 ex., 31.8-77.5 mm SL; Indonesia Archipelago; P. Bleeker, bought 1879) and are in a bad condition (pers. obs.). ROBERTS (1993: 72, fig. 39) published a watercolour copy of the original drawing by Kuhl & van Hasselt (labeled as *Panchax pictum*) on which Valenciennes had based his description. A similar looking species, previously identified as *B. picta*, from Jambi, central Sumatra, is here described as a new species. A redescription of *B. picta* is also presented.

The *B. picta* group was first established by WITTE & SCHMIDT (1992) and later emended by TAN & NG (in press). All members of the *B. picta* group share the common features of darkly pigmented anal and caudal distal fin margins, iridescent opercle, and a relatively small adult size (up to 60 mm TL). The *B. picta* group has the unique combination of characters: total anal-fin rays 21-26, dorsal-fin rays 8-10,

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subdorsal scales 5-6, lateral scales 27-30, and vertebrae 27-29. The species group currently contains four species: *B. picta*, *B. taeniata* Regan, 1910, *B. simplex* Kottelat, 1994, and *B. falx* sp. n.

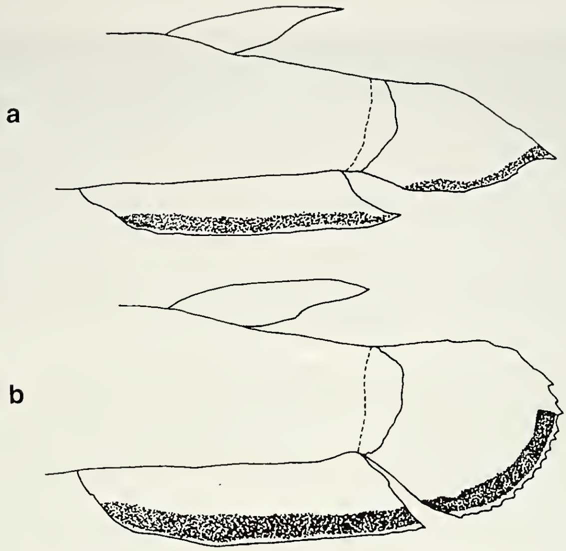
MATERIAL AND METHODS

The species concept used here is the phylogenetic species concept (CRACRAFT 1989; WARREN 1992; see discussion in KOTTELAT 1997). For practical purposes, and especially as used in the present context, the phylogenetic species concept does not differ significantly from the evolutionary species concept; see MAYDEN & WOOD (1995) for a discussion of the hierarchy of species concepts. Species recognition in the genus *Betta* is further discussed in KOTTELAT & NG (1994: 65-67) who also comment on the use of colour marks as diagnostic characters and the limited or lack of use of morphometric characters. Systematic research may take different forms, and different types of publications may fulfill different purposes; our priorities in documenting biodiversity has been discussed in KOTTELAT (1995b, 1997). We call species group (abbreviated group) an assemblage of species sharing a set of diagnostic characters, which may or may not be a monophyletic lineage. In some cases, available data may support the monophyly of a given group, while for other groups such data are (still) missing or have not yet been re-evaluated. Our inability to demonstrate monophyly today does not automatically imply that a given group is not monophyletic, just that we do not know. Meanwhile, the recognition of groups, be they for convenience only, is justified by the necessity of handling subsets of the genus *Betta*, for example for comparing a species with those it seems related with and avoiding trivial and lengthy comparisons with completely and obviously unrelated species.

Methods for counts and measurements and the terminology for elements of the colour pattern follow TAN & NG (in press), modified from WITTE & SCHMIDT (1992). Chin-bar is used to refer to the dark thin stripe running under the preorbital stripe, from the lower margin of the eye forwards and downwards to the throat. The 'second central stripe' is a faint or distinct stripe, continuous or interrupted, usually starting behind pectoral-fin base, situated 1-2 scales ventral to central stripe anteriorly and joining it posteriorly. The dark, narrow, often slightly curved, concentric bars perpendicular to the rays on the interradial membranes of the dorsal and caudal fins are called dorsal (respectively caudal) transverse bars. These descriptive terms follow that of TAN & KOTTELAT (1998). Measurements are point to point on the left side of fish and were obtained with a pair of dial calipers (0.05 mm accuracy).

Specimens examined are deposited in the Muséum d'histoire naturelle, Genève (MHNG); Muzium Zoologicum Bogoriense, Bogor (MZB); Nationaal Natuurhistorisch Museum, Leiden (RMNH); Instituut voor Systematiek en Populatiebiologie, Universiteit van Amsterdam (ZMA); Zoological Reference Collection, National University of Singapore (ZRC); and the collection of the second author in Cornol (CMK).

Fig. 1. *Betta picta*, male, 30.9 mm SL, ZMA 121.675, Java: Cipanas; right side, reversed.
Fig. 2. *Betta falx*, holotype, MZB 9308, male, 32.7 mm SL; Sumatra: Jambi: Sungai Alai.
Fig. 3. *Betta falx*, male, ca. 25 mm SL; Sumatra: Jambi: Pijoan, not preserved.



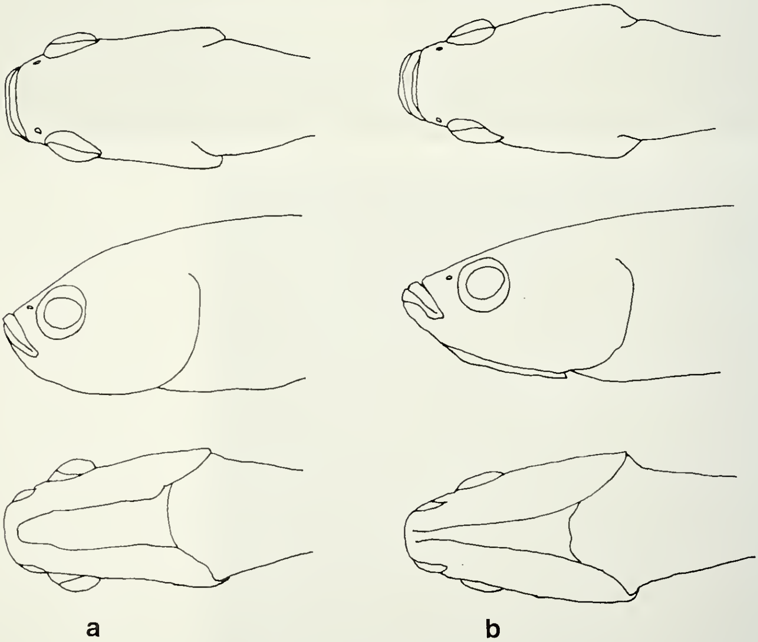


FIG. 4. Schematic drawing of caudal fin and posterior part of anal fin of: a, *Betta picta*, MZB 1325, 32.5 mm SL, male; b, *B. falx*, ZRC 40974, 32.5 mm SL, male.

FIG. 5. Dorsal, lateral and ventral views of head of: a, *Betta picta*, ZMA 121.589, 31.6 mm SL, male; b, *B. falx*, ZRC 40974, 33.3 mm SL, male.

DESCRIPTIONS

Betta picta (Valenciennes, in Cuvier & Valenciennes, 1846) Figs 1, 4a, 5a

Panchax pictum Valenciennes, in Cuvier & Valenciennes, 1846: 385.
Betta trifasciata Bleeker, 1850: 12; Günther 1861: 388; Regan 1910: 781.
Betta picta: Bleeker 1879: 26 (part); Weber & de Beaufort 1922: 360 (part); Witte & Schmidt 1992: 324 (key); Kottelat *et al.* 1993: 163 (part), plate 76; Roberts 1993: 38, fig. 39.

Material examined. ZMA 102.149, 10 ex., 22.3-31.6 mm SL, ZRC 40973, 2 ex., 29.9-32.0 mm SL; Indonesia: Java, ponds near Trogon (ca. 6°21'S 106°34'E, ca. 30 km northwest of Bogor); M. Weber, 1888. - ZMA 121.691, 52 ex., 13.3-32.8 mm SL; Indonesia: Java, Buitenzorg (Bogor); M. Weber, 1888. - MZB 1325, 37 ex., 13.8-32.2 mm SL, ZRC 42495, 5 ex., 28.0-32.1 mm SL; Indonesia: Java, Bogor, Tjidjeruk, Sawahbera; Sukardi, 24 Aug. 1970. - RMNH 10447, 3 ex., 29.3-32.4 mm SL; Indonesia: Java, Buitenzorg (Bogor); M. Weber. - RMNH 15794, 1 ex., 36.4 mm SL; Indonesia: Java, Buitenzorg (Bogor), Tjiblagoeng; A. Bushkiel, 1935. - ZMA 121.675, 30.9 mm SL, male; ZMA 121.589, 13 ex., 19.5-34.3 mm SL, ZRC 40972, 2 ex., 29.9-31.6 mm SL; Indonesia: Java, Tjipanas (Cipanas: ca. 6°43'S 107°2'E, ca. 30 km southeast of Bogor) near Sindanglaja; M. Weber, 1888. - ZMA 121.694, 38 ex., 14.9-31.2 mm SL; Indonesia: Java, Tjinjiroean, after Poentjak Gedeh, ca. 1600m (Gunung Gede: ca. 25 km southeast of Bogor); Kerkhoven, 1921. - MHNG 2090-92, 3 ex., 23.6-30.0 mm SL; Indonesia: Java, Sukabumi (ca. 40 km southeast of Bogor); Walsh, July 1930. - ZMA 121.693, 2 ex., 28.8 mm SL; Indonesia: Java, Bandoeng (Bandung); Huysmans. - ZMA 121.689, 1 ex., 24.5 mm SL; Indonesia: Java, Bandoeng (Bandung), ca. 700m; I. Jacobson, 1934. - RMNH 26940, 4 ex., 31.8-35.3 mm SL; Indonesia: Java, Bezoeki (Besoki) (ca. 7°16'S 109°E, ca. 1050 km southeast of Bogor); J. Semmelink, 1864-65. - RMNH 13698-13699, 2 ex., 32.6-35.2 mm SL; Indonesia: Java, Ambarawa (ca. 7°8'S 110°20'E); J. Sybrandi, 1933. - RMNH 10740, 4 ex., 24.9-34.2 mm SL; Indonesian Archipelago; from P. Bleeker's collections.

Diagnosis. *Betta picta* is distinguished from the other members of the species group in having iridescent yellow-gold opercle scales in male (vs. bluish or greenish), and anal and caudal fins with a narrow bluish distal band in live male (vs. broad band; bluish in *B. taeniata* and *B. simplex*, reddish in *B. falx*). Other characters distinguish *B. picta* are listed under Affinities.

Description. General appearance is shown in Fig. 1; meristics and morphometrics of the *B. picta* group are listed in Table 1. Body relatively slender (body depth 21.5-25.5 % SL), head long (head length 31.1-36.0 % SL). Dorsal and anal fins may be slightly pointed in male, more rounded in female and juvenile; dorsal fin placed relatively far back (predorsal length 63.0-67.6 % SL), anal-fin base length almost half of SL (42.6-48.4 % SL). Caudal fin of male with median rays sligthly elongated, caudal fin of female and juvenile rounded. Pelvic fin falcate with second filamentous ray short (23.8-33.0 % SL).

Coloration. Life coloration illustrated in Linke (1990) and Kottelat (1994). Body light brown, head and dorsal part of body darker brown. Head with distinct pre- and postorbital stripes, chin-bar and second postorbital stripe present. Body with central and second central stripes present, with faint spot on middle of caudal fin base. Male with iridescent yellow-gold opercle scales. Unpaired fins reddish. Anal fin and lower half of caudal fin with a pale blue subdistal band and broad dark blue distal band; dorsal fin with faint transverse bars. Pectoral fin hyaline, pelvic fin reddish with white filament. Female with whitish opercle scales. Unpaired fins yellowish brown with very narrow white distal margin on dorsal and anal fins. Anal fin with a narrow subdistal blue band; dorsal and anal fins with faint transverse bars; caudal fin with transverse bars very faint or absent in some specimens only (based on photographs in LINKE 1990).

Preserved specimens light brownish or yellowish. Opercle pattern distinct in both sexes, both preorbital and postorbital stripes distinct, chin-bar and second postorbital stripe also distinct. Body with distinct central and second central stripes, with spot on middle of caudal fin base. Male with dark reddish distal band on anal and caudal fins, female and juvenile without dark margin. Dorsal and anal fins of only female and juvenile with transverse bars.

DISTRIBUTION. *Betta picta* is known only from the western two-thirds of Java. The easternmost record in Central Java is Ambarawa (Tuntang basin, draining to the north). All known localities are in basins draining to the north, except Sukabumi, Western Java, which is in the Mandiri basin draining to the south. *Betta picta* apparently inhabits hilly areas where it has been observed in slow-flowing side-waters of hill creeks (see LINKE 1990, for habitat description). It is not clear whether this really is its preferred habitat. It might originally have had a larger distribution range in Java and anthropogenic pressure and habitat modification induced from intensive agriculture might be responsible for its restricted distribution.

AFFINITIES. *Betta picta* is distinguished from *B. taeniata* in having iridescent yellow-gold opercle scales in male (vs. bluish-green opercle scales); anal and caudal fins with narrow bluish distal band in live male (vs. broad distal band); reddish caudal fin (vs. brownish); golden iris of eye (vs. dark brown); fewer modal vertebrae (27, vs. 28); fewer anal rays (21-23, mode 22, vs. 23-26, mode 26); fewer modal subdorsal scales (5$^1/_2$, vs. 6); fewer modal lateral scales (28, vs. 29); dorsal-fin origin modally above 13th scale of lateral series (vs. 14-15); more modal predorsal scales (20, vs. 19); smaller body depth (21.5-25.5 % SL, vs. 25.3-30.1); smaller anal-fin base length (42.6-48.4 % SL, vs. 47.9-52.7); slightly greater postorbital length (47.3-53.4 % HL, vs. 45.2-49.2); and slightly smaller interorbital width (26.0-31.1 % HL, vs. 29.2-36.2).

Betta picta is distinguished from *B. simplex* in having iridescent yellow-gold opercle scales in male (vs. greenish-blue opercle scales); anal and caudal fins with narrow bluish distal band in live male (vs. broad distal band); fewer transverse scales (9-9$^1/_2$, mode 9, vs. 9$^1/_2$-11$^1/_2$, mode 11$^1/_2$); dorsal fin origin modally above 13th scale of lateral series (vs. 14-15); greater total length (135.4-143.9 % SL, vs. 132.1-137.2); smaller predorsal length (63.0-67.6 % SL, vs. 66.7-69.8); smaller caudal peduncle depth (14.4-17.3 % SL, vs. 17.8-19.3); smaller body depth (21.5-25.5 % SL, vs. 29.3-32.2); and smaller anal-fin base length (42.6-48.4 % SL, vs. 48.3-50.0).

Betta picta is distinguished from *B. falx* in having the anal and caudal fins with a narrow bluish distal band in live male (vs. reddish and broad band; Fig. 4); iridescent yellow-gold opercle scales in live male (vs. greenish blue opercle scales); faint dorsal transverse bars in preserved male (vs. distinct); faint or absent caudal transverse bars in female (vs. distinct); head broad, width more or less constant (vs narrower anteriorly, resulting in a more pointed appearance in dorsal view; compare

Fig. 5a and 5b); narrow preorbital black stripe (vs. thick); more modal dorsal rays (9, vs. 8); fewer modal subdorsal scales (5½, vs. 6); more modal lateral scales (28, vs. 27); dorsal fin origin modally above 13th scale of lateral series (vs. 12); anal fin origin modally below 7th scale of lateral series (vs. 6); more modal predorsal scales (20, vs. 19); slightly greater predorsal length (63.0-67.6 % SL, vs. 60.0-65.7); and slightly greater anal-fin base length (42.6-48.4 % SL, vs. 46.5-50.3).

	B. picta	*B. falx*	*B. taeniata*	*B. simplex*
sample size	12	12	16	4
MERISTICS [range (mode)]				
vertebrae	2 + 8 + 17-18 total: 27-28 (27)	2 + 8 + 17-18 total: 27-28	2 + 8 + 17-19 total: 27-29 (28)	2 + 8 + 18 total: 28
anal-fin rays	II,19-21 total: 21-23 (22)	II, 19-21 total: 21-23 (22)	I-II, 22-24 total: 23-26 (26)	II, 21-22 total: 23-24 (24)
dorsal-fin rays	0-I, 7-9 total: 8-9 (9)	I-II, 7-8 total: 8-10 (8)	0-II, 8-9 total: 8-10 (9)	0-I, 8-9 total: 9
caudal-fin rays	ii, 5 + 6, ii	ii, 5 + 6, i-ii (ii, 5 + 6, ii)	ii, 5 + 6-7, i-ii (ii, 5 + 7, i)	i, 6 + 7, I
pelvic-fin rays	I, 1, 4	I, 1, 4	I, 1, 4	I, 1, 4
pectoral-fin rays	12	12	11-12 (12)	11-12 (12)
subdorsal scales	5½-6½ (5½)	5½-6½ (5½ or 6)	5-6 (6)	5
transverse scales	9-9½ (9)	9-9½ (9½)	9-9½ (9½)	9½-11½ (11½)
lateral scales	27-30 (28)	27	27½-30 (29)	27-28 (28)
lateral scale below dorsal-fin origin	12-14 (13)	11-12 (12)	12-15 (14)	15
lateral scale above anal-fin origin	6-8 (7)	6-8 (6)	5-7 (7)	-
predorsal scales	19-21 (20)	19-20 (19)	19-21 (19)	20 (20)
postdorsal scales	9-11 (10)	9-11 (10)	9-11 (10)	9-10 (10)
MORPHOMETRICS				
percentage of SL [range]				
total length	135.4-143.9	135.8-142.2	132.9-141.6	132.1-137.2
predorsal length	63.0-67.6	60.0-65.7	62.4-67.7	66.7-69.8
postdorsal length	19.5-25.5	22.7-25.7	19.5-24.8	23.2-25.1
caudal peduncle depth	14.4-17.3	15.8-18.3	14.8-19.7	17.8-19.3
preanal length	48.7-53.6	48.7-52.3	47.2-54.1	51.1-52.7
head length	31.1-36.0	33.1-37.9	30.3-34.5	34.6-37.2
body depth	21.5-25.5	22.6-28.0	25.3-30.1	29.3-32.2
pelvic-fin length	23.8-33.0	24.2-34.3	23.5-37.3	28.1-28.7
anal-fin base length	42.6-48.4	46.5-50.3	47.9-52.7	48.3-50.0
dorsal-fin base length	10.2-13.0	10.5-13.3	10.8-15.1	11.2-11.8
percentage of HL [range]				
orbit diameter	23.4-27.1	24.2-28.1	23.8-30.7	-
postorbital length	47.3-53.4	46.1-53.4	45.2-49.2	-
interorbital width	26.0-31.1	24.7-30.5	29.2-36.2	-

TABLE 1. Meristic and morphometric data of the *Betta picta* species group

REMARKS. *Betta picta* is the only species of the genus naturally occurring on Java. All the preserved specimens we have examined seem to belong to a single species. We cannot exclude, however, that once live specimens from throughout the species' range become available, the status of these populations might have to be revised.

Previous workers have included in *B. picta* numerous populations from Sumatra (BLEEKER 1879; WEBER & DE BEAUFORT 1912, 1922; KOTTELAT *et al.* 1993). These Sumatran populations are described below as *B. falx*.

Betta falx sp. n. Figs 2, 3, 4b, 5b

Betta pictum: WEBER & DE BEAUFORT 1912: 541.
Betta picta: BLEEKER 1879: 26 (part); WEBER & DE BEAUFORT 1922: 360 (part); KOTTELAT *et al.* 1993: 163 (part).

HOLOTYPE. MZB 9308, 32.7 mm SL, male; Indonesia: Sumatra: Jambi Prov.: Sungai Alai, km 19.5 on Muara Bungo - Muara Tebo road (bridge at Sungai Alai: 1°28'42.6"S 102°18'31.7"E); H. H. Ng & S. H. Tan, 22 June 1995.

PARATYPES. All from Indonesia: Sumatra: Jambi Prov.: ZRC 40974, 20 ex., 17.2-33.0 mm SL, ZMA 121.673, 6 ex., 21.8-31.0 mm SL, MZB 9307, 4 ex., 17.5-26.3 mm SL, RMNH 33087, 5 ex., 19.7-26.7 mm SL; same data as holotype. --- ZRC 42496, 10 ex., 17.0-34.9 mm SL, MHNG 2593.95, 5 ex., 29.7-30.1 mm SL; same locality as holotype; H. H. Tan & H. H. Ng, 22 Jul 1997. --- ZRC 38571, 44 ex., 13.8-32.4 mm SL, CMK 11119, 44 ex., 10.5-30.8 mm SL; Sungai Alai at km 28 on Muara Bungo - Muara Tebo road, between half hour downriver of bridge to ca. 1 hour upriver, including small tributaries and Danau Gresik; M. Kottelat & H. H. Tan, 30-31 May 1994. --- ZRC 38254, 3 ex., 31.7-36.1 mm SL; Sungai Alai; M. Kottelat & H. H. Tan, May 1994.

OTHER MATERIAL (non type). All from Indonesia: Sumatra: ZMA 121.590, 29 ex., 17.1-27.4 mm SL, ZRC 40975, 2 ex., 25.2-25.6 mm SL; East Sumatra, Deli [Medan]; L. P. de Bussy - Le Cosquino, 1905-1920. --- ZMA 121.692, 5 ex., 23.7-32.0 mm SL; Aceh: Sungai Gloegoer, beekje by Bohorot, Boven Langkat; L. P. de Bussy, Aug. 1917. --- ZMA 121.688, 2 ex., 32.9-33.8 mm SL; Sumatra Utara: Serdang [Sungai Serdang: 3°42'N 98°52'E]; V. Dedem, 26 July 1909. --- ZRC 38497, 5 ex., 13.1-18.8 mm SL, CMK 11034, 5 ex.; Jambi: Danau Pinang, lake connected to Sungai Pijoan, 1 boat hour upstream of Pijoan (19 km W of Jambi on road to Muara Bungo); M. Kottelat & H. H. Tan, 28 May 1994. --- ZRC 38506, 2 ex., 15.1-22.6 mm SL, CMK 11055, 2 ex.; Jambi: Sungai Pijoan just downriver of confluence with stream draining Danau Pinang; M. Kottelat & H. H. Tan, 28 May 1994. --- ZRC 38590, 11 ex., 15.8-26.5 mm SL, CMK 11136, 10 ex.; Jambi: Danau Kamining near Kampung Transos, ca. km 5 southwards on road branching off road Muara Bungo - Muara Tebo at km 36; M. Kottelat & H. H. Tan, 31 May 1994. --- CMK 11071, 1 ex.; Jambi, Sungai Keruh, ca. 2 km south of mainroad at km 23 on road Jambi - Muara Tembesi, tributary of Sungai Pijoan; M. Kottelat & H. H. Tan, 28 May 1994. --- ZRC 40976, 9 ex., 11.3-31.6 mm SL; Sungai Pijoan, 1°35'35.0"S 103°27'07.2"E; H. H. Tan et al., 8 Jun. 1996. --- ZRC 40977, 2 ex., 24.0-24.1 mm SL; Jambi, Pijoan, Danau Souak Padang, 1°36'34.4"S 103°26'55.1"E; H. H. Tan et al., 8 Jun. 1996.

DIAGNOSIS. *Betta falx* is distinguished from the other members of the *B. picta* group in having anal and caudal fins with reddish distal band in live male (vs. blue), distinct dorsal transverse bars in male (vs. absent in *B. taeniata* and *B. simplex*, faint in *B. picta*) and distinct caudal transverse bars in female (vs. absent in *B. taeniata* and *B. simplex*, faint or absent in *B. picta*). Other characters distinguishing *B. falx* are listed under Affinities.

Description. General appearance as shown in Figs. 2-3; meristics and morphometrics of the *B. picta* group are listed in Table 1. Body relatively slender (body depth 22.6-28.0 % SL), head long (head length 33.1-37.9 % SL). Dorsal and anal fins may be slightly pointed in male, more rounded in female and juvenile; dorsal fin placed relatively far back (predorsal length 60.0-65.7 % SL), anal-fin base length almost half of SL (46.5-50.3 % SL). Caudal fin of male, female and juvenile rounded. Pelvic fin falcate with second filamentous ray short (24.2-34.3 % SL).

Coloration. Life coloration illustrated in Fig. 3. Body light brown, head and dorsal part of body darker brown. Opercle pattern distinct in both male and female, both preorbital and postorbital stripes distinct, chin-bar and second postorbital stripe also distinct. Body with distinct central and second central stripes, with spot on middle of caudal fin base. Male with greenish-blue iridescent opercle scales. Unpaired fins yellowish. Anal fin and lower half of caudal fin with pale reddish subdistal band and broad reddish-brown distal band with very thin white margin; dorsal fin with distinct transverse bars. Pectoral fin hyaline, pelvic fin hyaline with white filament. Female with yellowish opercle scales. Unpaired fins yellowish without narrow dark distal band on dorsal and anal fins. Dorsal, anal and caudal fins with distinct transverse bars. Juveniles (less than 20 mm SL) with distinct transverse bars on unpaired fins, distal dark margin on anal fin absent, usually with a rather marmorated pattern on body. Young males (less than 25 mm SL) with caudal transverse bars which disappear in adult males.

Preserved specimens are brownish. Opercle pattern distinct in both male and female, both preorbital and postorbital stripes distinct, chin-bar and second postorbital stripe also distinct. Body with distinct central and second central stripes, black spot on middle of caudal fin base. Male with dark reddish-brown distal margin on anal and caudal fins, female and juvenile without dark distal margin. Male with distinct dorsal transverse bars only; female and juvenile with distinct transverse bars on dorsal, anal and caudal fins.

Distribution. *Betta falx* is known from the Langkat area and Medan in Sumatra Utara, and Jambi province in central Sumatra. Weber & de Beaufort (1912: 541; 1922: 360, 362) recorded *B. picta* from Palembang, Upper Langkat, Muara Kompeh (Jambi province) and Deli (now Medan). From these localities, they had access only to material from Upper Langkat (ZMA 121.692) and Deli (ZMA 121.590), which we have re-identified as *B. falx*. The other records were based on Bleeker (1879), but the material on which Bleeker based his records has now been mixed with *Betta* material of various species and localities and cannot be sorted (RMNH 6370, 30 ex.).

Notes on biology. We have observed *B. falx* only in swamp forests in the Batang Hari basin, Jambi province. Specimens are typically found among submerged bank vegetation, in near stagnant waters, with pH 4.7-6.8. Syntopic osphronemids are *Belontia hasseltii*, *Betta* aff. *fusca*, *Luciocephalus pulcher*, *Parosphromenus sumatranus*, *Sphaerichthys osphromenoides*, *Trichogaster leerii*, *T. trichopterus* and *Trichopsis vittata*. *Betta falx* adapts well to captivity, where it readily spawns with fortnightly intervals. It is a paternal oralbrooder (THH, pers. obs.).

ETYMOLOGY. From the Latin *falx*, meaning scythe, alluding to the continuous curved shape of the broad anal and caudal distal margins of a male in display. A noun in apposition.

AFFINITIES. *Betta falx* is distinguished from *B. taeniata* in having iridescent greenish-blue opercle scales in male (vs. strongly coloured bluish-green opercle scales); anal and caudal fins with reddish distal band in live male (vs. blue); reddish fins (vs. brownish); distinct dorsal transverse bars in male and caudal transverse bars in female (vs. absence); fewer anal-fin rays (21-23, vs. 23-26); fewer modal dorsal-fin rays (8, vs. 9); fewer modal lateral scales (27, vs. 29); dorsal fin origin above 11-12th scale of lateral series (vs. 12-15); anal-fin origin modally below 16th scale of lateral series (vs. 7); and smaller interorbital width (24.7-30.5 % HL, vs. 29.2-36.2).

Betta falx is distinguished from *B. simplex* in having anal and caudal fins with reddish distal band in live male (vs. blue); distinct dorsal transverse bars in male and caudal transverse bars in female (vs. absence); fewer anal-fin rays (21-23, vs. 23-24); fewer modal dorsal-fin rays (8, vs. 9); more modal subdorsal scales ($5^1/_2$-6, vs. 5); fewer transverse scales (9-$9^1/_2$, mode $9^1/_2$, vs. $9^1/_2$-$11^1/_2$, mode $11^1/_2$); fewer modal lateral scales (27, vs. 28); dorsal-fin origin above 11-12th scale of lateral series (vs. 15); slightly greater total length (135.8-142.2 % SL, vs. 132.1-137.2); smaller predorsal length (60.0-65.7 % SL, vs. 66.7-69.8); greater postdorsal length (22.7-25.7 % SL, vs. 23.2-25.1); and smaller body depth (22.6-28.0 % SL, vs. 29.3-32.2).

Betta falx is distinguished from *B. picta* in anal and caudal fins with broad reddish distal band in live male (vs. narrow and bluish; Fig. 4); iridescent greenish-blue opercle scales (vs. yellow-gold); preserved male with distinct dorsal transverse bars (vs. faint); female with distinct caudal transverse bars (vs. very faint or absent); head narrower anteriorly, resulting in a more pointed appearance in dorsal view (vs. head broad, width more or less constant; compare Figs. 5a and 5b); thick preorbital black stripe (vs. narrow); fewer modal dorsal-fin rays (8 vs. 9); fewer modal lateral scales (27 vs. 28); dorsal fin origin above 11-12th scale of lateral series (vs. 12-14); anal fin origin modally below 6th scale of lateral series (vs. 7); fewer modal predorsal scales (19, vs. 20); and slightly greater anal-fin base length (46.5-50.3 % SL, vs. 42.6-48.4).

REMARKS. The Sumatra species identified by earlier workers (Bleeker, Weber & de Beaufort) as *B. picta* is *B. falx*. WITTE & SCHMIDT (1992: 324) recorded a "*B. (edithae)* sp. B" from Jambi. Our recent collections at numerous localities around Jambi did not yield any species resembling *B. edithae*; *B. falx* is the only species from this area which one might possibly consider as having some similarities with *B. edithae*.

No species of the *B. picta* group is presently known from Lampung, the southernmost province of Sumatra. *Betta falx* might occur there, but *B. picta* could also be present. Some Javanese species also extend over a limited range in southern Sumatra (e.g., *Nemacheilus fasciatus*, see KOTTELAT 1984).

Due to their close morphological similarity, *B. picta* and *B. falx* are apparently closely related, their niche preference, however, is quite marked. *Betta picta* is known (so far) only from hill stream habitats, whereas *B. falx* is known (so far) only from lowland swamp forest habitats. As mentionned above, the possibility cannot be discounted that *B. picta* occupies a secondary niche (a sort of refuge habitat) in the hill stream as a result from anthropogenic pressures. The quasi totality of the lowland and foothills of Java has lost its natural forest cover and has been converted into rice fields. In Sumatra and Borneo, lowland and foothill streams are the habitats with the most diverse fish communities; KOTTELAT (1995a: 422) noted that about half of the fish species recorded from Java at the beginning of the century have not been collected again in the last 40 years. Beside the possible effect of bias as crude as the lack of sampling effort, these extinction may simply reflect the disparition of forest and foot-hill streams.

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Importance of forest structures on four beetle families (Col.: Buprestidae, Cerambycidae, Lucanidae and phytophagous Scarabaeidae) in the Areuse Gorges (Neuchâtel, Switzerland)[1]

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Importance of forest structures on four beetle families (Col.: Buprestidae, Cerambycidae, Lucanidae and phytophagous Scarabaeidae) in the Areuse Gorges (Neuchâtel, Switzerland). - The species richness and abundance of selected xylophagous (Buprestidae, Cerambycidae and Lucanidae) and rhizophagous or saprophagous beetles (phytophagous Scarabaeidae) were compared between various forest stands with different ecotone structures. Window traps and water traps were used to sample the beetles. Among the 65 captured species, 13 belonged to the Buprestidae, 41 to the Cerambycidae, 8 to the phytophagous Scarabaeidae and 3 to the Lucanidae. Forest stand and ecotone type were found to have a significant influence on these beetle communities. In oak stands, typical species such as *Plagionotus arcuatus*, *Anoplodera sexguttata* or *Anthaxia salicis* were found, while in beech forests *Platycerus caprea* was found as a characteristic species. Natural edges are characterised by grassland and shrub species such as *Agapanthia violacea*, *Phytoecia cylindrica* and *Anthaxia nitidula*. In artificial clearings, species living in old stumps such as *Corymbia rubra*, *Prionus coriarius*, *Rhagium bifasciatum*, or *Anastrangalia sanguinolenta* are common as well as species living in the small branches left after a cutting, the most common of which being *Stenurella melanura*. In order to conserve a high diversity of forest beetles, oaks should be favoured (it hosts 9 typical species in our study) and diversified structures such as natural edges and artificial clearings must be maintained or created.

Key-words: Forest ecology - Buprestidae - Cerambycidae - Scarabaeidae Pleurosticti - Lucanidae - Swiss Jura - Bioindicators.

INTRODUCTION

Buprestids, cerambycids and lucanids have xylophagous larvae (Dajoz 1980). Depending on the species, the larvae can colonise living trees, dead wood or rotten stumps. On the other hand, phytophagous scarabaeids are rather rhizophagous or saprophagous as larvae and phytophagous as adults (Allenspach 1970).

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Xylophagous beetles are an important element of forest ecosystems. They actively participate in dead wood decomposition. The larval galleries facilitate wood colonisation by micro-organisms, which considerably increases their efficiency (Dajoz 1980).

Thanks to museum collections, it has been possible to elaborate the rarefaction of several, mainly spectacular, species since the end of the last century, although the forest surface in Switzerland has not decreased during that time. The decline of many species can be attributed to coniferous tree plantings at low altitude, mainly spruce (*Picea abies*), instead of broad-leaved tree forests, causing a considerable loss of habitats for lowland species (Speight 1989). Forest trees are cut down before reaching an age at which they become attractive for xylophagous fauna and isolated old trees have almost disappeared. Regression of traditional orchards and humid habitats has also caused the rarefaction of specialized species (Geiser 1984). For species colonizing more open biotopes, mainly among scarabaeids, agriculture intensification has also been a cause of decline (Allenspach 1970).

Some authors have worked on the influence of forest structures as well as woodland type on beetle communities. In Poland, for instance, Gutowski (1986) compared the fauna of a virgin forest with the fauna of a managed one. The changes in communities of cambio- and xylophagous insects in different age classes of forest stands have also been studied (Starzyk 1977; Starzyk & Witkowski 1981; Gutowski 1995). Starzyk (1976; 1979) and Gutowski (1985) have studied the cerambycid communities occurring in different forest associations.

In Switzerland, the importance of dead wood quantity for xylophagous beetles was underscored by Hartmann & Sprecher (1990). Barbalat (1996) and Barbalat & Borcard (1997) have shown the importance of artificial clearings on xylophagous beetles in managed forests.

The aim of this work is to study, among different edges and clearings, what structures are most favourable for this fauna, in order to be able to make proposals to promote a forest management respecting biodiversity as much as possible. If buprestids, cerambycids and lucanids are good indicators for forest biotopes, only a few species are adapted to forest edges. For this reason, we consider as well a family, the scarabaeids, linked to more open habitats.

MATERIALS AND METHODS

Study area

Our study was carried out in the Areuse Gorges near Neuchâtel (Western Switzerland) on the first Jura slopes (Fig. 1). We chose twelve sites in three forest types: oak, beech and mixed stands. Mixed forests are usually constituted of broad-leaved trees such as beech, oak and maple (*Acer pseudoplatanus*) mixed with coniferous trees such as spruce, pine and fir (*Abies alba*). These mixed forests are usually located on thin calcareous soils where tree growth is weak. In these stands, foresters create artificial clearings ranging from 650 to 10.000 m^2, in order to favour pines which grow quite well on shallow soils and require much light to grow. In these

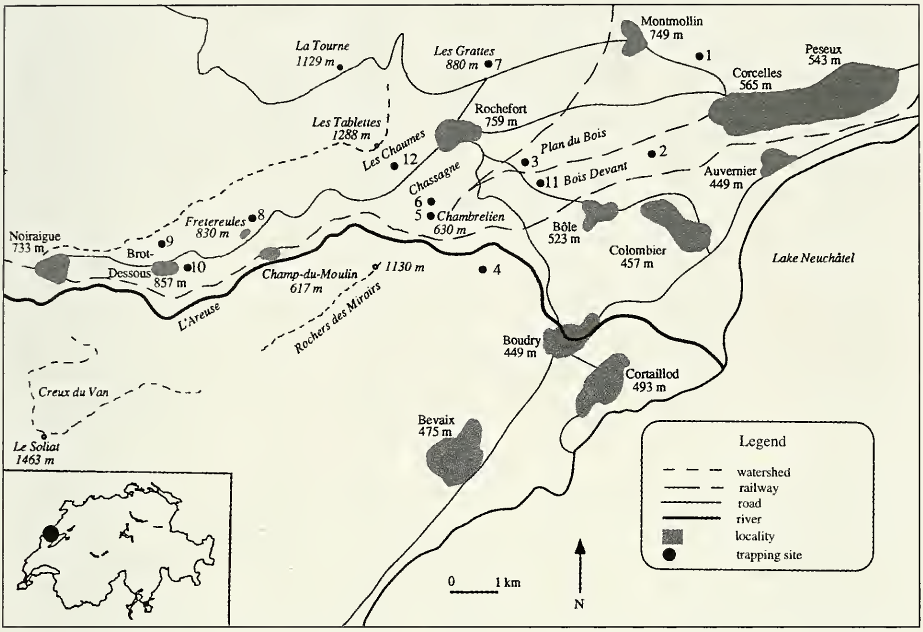

FIG. 1. Study area. After BARBALAT (1997)

station	locality	coordonnates	altitude	expo	slope	forest type	cover	habitat type	edge type
1	Corcelles	556125 204250	695 m	S	20%	oak	80%	edge	natural
2	Colombier, Chanet	555600 202950	555 m		0%	beech	40%	artificial clearing	clean
3	Chambrelien, Plan du Bois	553250 202700	670 m	SE	40%	mixed	60%	artificial clearing	clean
4	Boudry, Chanet	553000 201150	550 m		0%	oak	30%	artificial clearing	clean
5	Chambrelien, Chassagne	552000 201900	725 m	SE	20%	mixed	40%	artificial clearing	clean
6	Chambrelien, Chassagne	551900 202250	770 m	SE	15%	mixed	60%	artificial clearing	clean
7	Rochefort, Les Grattes	552470 204070	880 m	SE	80%	mixed	40%	edge	natural
8	Fretereules	549050 201600	860 m	SE	45%	beech	90%	edge	natural
9	Brot-Dessous	547600 200950	890 m	S	40%	beech	90%	edge	clean
10	Brot-Dessous	547850 200900	790 m	S	40%	beech	50%	natural clearing	natural
11	Chambrelien, Bois-Devant	553500 202450	620 m	SE	15%	mixed	70%	artificial clearing	clean
12	Rochefort, Chaumes	551375 202625	840 m	SE	60%	beech	70%	artificial clearing	clean

expo = exposure; cover = tree cover.

TABLE 1. Site description. After BARBALAT (1997)

clearings all the trees are cut down except a few selected pines, which are left for their seeds. Similar clearings are also created in oak stands in order to favour these trees which also need much light for their growth. This type of clearing is not made in beech forests, because beech can grow in more shady conditions. All the sites have been chosen either in clearings or forest edges with South or South-East exposure (Table 1).

Species	Author	Distribution	Level	Habitat	Main host plants	Site
BUPRESTIDAE						
Agrilus angustulus	(Ill.,1803)	eurosiberian, NA	col	broadl/tran	*Quercus*	1,2,3,4,6,8,10,11
Agrilus biguttatus	(F.,1777)	holomediterranean	col	broadl/tran	*Quercus*	1,2,3,4,5,10,11,12
Agrilus cyanescens	Ratzb.,1837	european	col-mon	broadl/tran	*Lonicera*	10
Agrilus laticornis	(Ill.,1803)	european, ME	col	broadl/tran	*Quercus*	3,4,7
Agrilus olivicolor	Kiesw.,1857	eurosiberian	col	broadl/tran	*Corylus, Carpinus*	2,5
Agrilus sulcicollis	Lacord.,1835	eurosiberian	col	broadl/tran	*Quercus*	1,2,3,4,6,7,11
Agrilus viridis	(L.,1758)	eurosiberian	col-mon	broadl/tran	broadl	2,3,4,5,8,11,12
Anthaxia helvetica	Stierl.,1868	mountain	col-sub	conif/tran	conif	1,2,3,4,5,6,7,8,9,10,11,12
Anthaxia nitidula	(L.,1758)	holomediterranean	col-mon	tran/orch	*Prunus*	1,7
Anthaxia quadripunctata	(L.,1758)	mountain	mon-sub	conif/tran	conif	1,2,3,5,6,7,11,12
Anthaxia salicis	(F.,1777)	holomediterranean	col	broadl/tran	*Quercus*	1,4
Anthaxia similis	Saund.,1871	mountain	mon-sub	conif/tran	conif	3,6,11
Chrysobothris affinis	(F.,1794)	eurosiberian, NA	col-mon	broadl/tran	broadl	1,2,3,4,8,9,11
SCARABAEIDAE						
Amphimallon atrum	(Hbst.,1790)	W. european	col-mon	open/tran	?	7,8,9,10
Cetonia aurata	(L.,1761)	palearctic	col-sub	broadl/tran	broadl	3,4,7,8,11
Hoplia argentea	(Poda,1761)	C. and S. european	col-sub	open/tran	?	4,5,8,9,10
Omaloplia ruricola	(F.,1775)	C. european	col-mon	open	Poaceae, div	10
Phyllopertha horticola	(L.,1758)	eurosiberian	col-sub	open/tran	div	1,3,4,6,7,8,9,10,12
Rhizotrogus aestivus	(Ol.,1789)	pontomediterranean	col-mon	open/tran	div	1
Serica brunnea	(L.,1758)	eurosiberian	col-mon	broadl/tran	div	1,2,4,5,7,8,9,10,11,12
Trichius fasciatus	(L.,1758)	eurosiberian	col-mon	broadl/tran	broadl	1,2,3,4,5,6,7,8,10,11,12
LUCANIDAE						
Platycerus caprea	(Deg.,1774)	C. european	mon-sub	broadl	broadl	4,7,8,9,10,12
Platycerus caraboides	(L.,1758)	C. european	col-mon	broadl	broadl	1,2,4,5,12
Sinodendron cylindricum	(L.,1758)	eurosiberian	col-mon	broadl	broadl	7
CERAMBYCIDAE						
Agapanthia villosoviridescens	(Deg.,1775)	eurosiberian	col-mon	open/tran	Asteraceae, Apiaceae	11
Agapanthia violacea	(F.,1775)	pontomediterranean	col-mon	open	Dipsacaceae	1
Alosterna tabacicolor	(Geer,1775)	palearctic	col-mon	broadl	broadl	1,2,3,4,5,6,7,8,9,10,12
Anaglyptus mysticus	(L.,1758)	european	col-mon	broadl/tran	broadl	3,5,6,12
Anastrangalia dubia	(Scop.,1763)	mountain	mon-sub	conif/tran	conif	2,3,4,5,6,7,10,11,12
Anastrangalia sanguinolenta	(L.,1761)	C. and E. european	mon-sub	conif/tran	conif	1,3,5,6,7,10,11,12
Anoplodera sexguttata	(F.,1775)	european	col	broadl/tran	*Quercus*	1,4,5
Arhopalus rusticus	(L.,1758)	holarctic	col-mon	conif	conif	11
Cerambyx scopolii	Füssl.,1775	european, NA	col-mon	broadl/orch	broadl	10
Clytus arietis	(L.,1758)	european, ME	col-mon	broadl/tran	broadl	1,2,3,4,5,6,7.8,9,10,11,12
Clytus lama	Muls.,1847	mountain	mon-sub	conif/tran	conif	2,6,7,11
Cortodera femorata	(F.,1787)	C. and E. european	col-sub	conif	*Picea*	1,3,12
Corymbia rubra	(L.,1758)	palearctic	col-sub	conif/tran	conif/broadl	1,2,3,4,5,6,7,10,11,12
Dinoptera collaris	(L.,1758)	palearctic	col-mon	broadl/tran	broadl	6,7,8,10,12
Gaurotes virginea	(L.,1758)	boreo-alpine	mon-sub	conif/tran	conif	3,5,6,12
Grammoptera abdominalis	(Steph.,1831)	C. and S. european, ME	col	broadl/tran	*Quercus, Castanea*	7
Grammoptera ruficornis	(F.,1781)	european, ME	col	broadl/tran	broadl	1,2,12
Leiopus nebulosus	(L.,1758)	european	col-mon	broadl/mix	broadl	2,3,7,8,11,12
Leptura maculata	(Poda,1761)	european, ME	col-mon	broadl/tran	broadl	1,2,3,4,5,6,7,8,9,10,11,12
Molorchus minor	(L.,1758)	palearctic	mon-sub	conif/mix	conif	7,9
Obrium brunneum	(F.,1792)	european, ME	mon-sub	conif/mix	conif	3,5,6,7,9,11,12
Oxymirus cursor	(L.,1758)	E. european, ME	mon-sub	conif/mix	conif/broadl	3,6
Pachytodes cerambyciformis	(Schrk.,1781)	C. european, ME	col-mon	broadl/tran	broadl/conif	1,2,3,4,5,6,7,8,10,11
Parmena balteus	(L.,1767)	W. mediterranean	col	broadl/tran	broadl	3,5,7
Phymatodes testaceus	(L.,1758)	holarctic	col-mon	broadl	broadl	3,4,7,9
Phytoecia cylindrica	(L:;1758)	palearctic	col-mon	open	Apiaceae	7,10
Pidonia lurida	(F.,1792)	mountain	mon-sub	conif/mix	*Picea, Fagus*	10
Plagionotus arcuatus	(L.,1758)	european, ME, NA	col	broadl/mix	*Quercus*	1,4,11
Pogonocherus fasciculatus	(Deg.,1775)	palearctic	col-sub	conif/tran	conif	3
Pogonocherus hispidulus	(Pill.Mitt.,1783)	european	col-mon	broadl/mix	broadl	5,6,12
Prionus coriarius	(L.,1758)	palearctic	col	broadl/mix	broadl/conif	3,4
Pseudovadonia livida	(F.,1776)	palearctic	col	open/tran	soil	3,5
Pyrrhidium sanguineum	(L.,1758)	european, NA	col	broadl	*Quercus*	1,3,7,12
Rhagium bifasciatum	F.,1775	european	col-mon	conif/mix	conif/broadl	5,6,7,12
Rhagium inquisitor	(L.,1758)	holarctic	col-mon	conif/mix	conif/broadl	2,3,6,11
Rhagium mordax	(Deg., 1775)	eurosiberian	col-mon	broadl/mix	broadl/conif	4,5,8,10,12
Stenocorus meridianus	(L.,1758)	eurosiberian	col	broadl	broadl	5,6,8,9
Stenostola dubia	(Laich.,1784)	C. and N. european	col-mon	broadl/tran	broadl	8,10,12
Stenurella bifasciata	(Müll.,1776)	palearctic	col	mix/tran	broadl/conif	1,6,7
Stenurella melanura	(L.,1758)	palearctic	col-mon	broadl/mix	broadl/conif	1,2,3,4,5,6,7,8,9,10,11,12
Tetropium castaneum	(L.,1758)	palearctic	mon-sub	conif	conif	3,7

Distribution: ME = Middle East, NA = North Africa, C. = central, E. = east, N. = north, S. = south, W. = west;
Habitat: broadl = broad-leaved forest, conif = coniferous forest, mix = mixed forest, tran = clearings and edges, open = open habitat, orch = orchard;
Level: col = colline, mon = montane, sub =subalpine; Main host plants: conif = coniferous trees, broadl = broad-leaved trees, div = diverse plants.

TABLE 2. Species list and ecological overview. Nomenclature after LOHSE & LUCHT (1992) and BENSE (1995).

	St. 1	St. 4	St. 11	St. 3	St. 2	St. 5	St. 6	St. 12	St. 7	St. 8	St. 10	St. 9	total	
A. violacea	10												10	Oak prefering species
R. aestivus	12												12	
A. salicis	7	6											13	
A. sexguttata	2	10				1							13	
P. arcuatus	7	4	2										13	
A. sulcicollis	26	49	14	22	1		5		1				118	
A. bigutattus	32	167	19	16	2	1		2			1		240	
A. angustulus	35	21	16	8	3		2			1	1		87	
C. affinis	1	6	5	4	1					3		1	21	
G. ruficornis	18				2			1					21	
C. aurata		14	1	2					2	3			22	
A. villosoviridescens			1										1	
A. rusticus			1										1	
A. olivicolor					3	1							4	
P. caraboides	1	1			11	4		1					18	
A. viridis		1	34	2	5	1		1		2			46	
C. femorata	1			1				1					3	
P. livida				1		1							2	
S. bifasciata	15						1		21				37	
P. sanguineum	1			3				1	2				7	
A. laticornis		1		1					1				3	
P. balteus				1		1			1				3	
O. cursor				1			1						2	
A. nitidula	1								6				7	
P. coriarius		1		3									4	Artificial clearings and coniferous tree prefering species
P. fasciculatus				1									1	
R. inquisitor			1	1	1		1						4	
A. similis			2	2			1						5	
A. quadripunctata	3		5	9	2	1	12	30	4				66	
A. dubia		3	12	23	5	13	10	17	4		1		88	
A. sanguinolenta	5		16	2		7	79	17	6		1		133	
C. rubra	5	52	108	48	56	38	75	25	1		3		411	
P. cerambyciformis	6	3	3	7	15	5	10		1	1	1		52	
S. melanura	33	222	53	180	25	673	481	184	42	9	32	21	1955	
P. hispidulus						1	1	1					3	
A. mysticus				1		1	1	1					4	
G. virginea				3		1	5	3					12	
R. bifasciatum						4	4	14	3				25	
C. lama			1		1		2		1				5	
O. brunneum			1	1		1	1	1	2			3	10	
L. nebulosus			2	1	2			1	3			1	10	
T. fasciatus	15	11	15	1	5	15	3	19	4	3	5		96	ubiquitous species
L. maculata	21	13	28	17	5	38	60	51	3	12	28	11	287	
C. arietis	30	33	38	61	17	25	27	59	14	64	61	10	439	
A. helvetica	11	15	46	31	3	43	90	30	112	7	6	3	397	
A. tabacicolor	9	20		27	2	25	23	13	9	13	19	17	177	
T. castaneum				1					1				2	
R. mordax		4				3		7		1	1		16	
G. abdominalis									2				2	
P. testaceus		1		2					1			1	5	
S. brunnea	1	4	2		2	2		1	2	18	25	6	63	Fresh forest and altitude prefering species
H. argentea		4					6			51	1	1	63	
P. horticola	1	2		1			1	4	13	105	10	2	139	
S. cylindricum									1				1	
S. meridianus						1	2			2		4	9	
P. caprea		1						16	12	6	19	6	60	
D. collaris							1	1	3	1	11		17	
P. cylindrica									3		1		4	
M. minor									2			1	3	
S. dubia								1		2	4		7	
A. atrum									2	3	6	15	26	
A. cyanescens											1		1	
C. scopolii											1		1	
P. lurida											1		1	
O. ruricola											1		1	
total	309	669	426	485	169	907	905	503	285	307	241	103	5309	

TABLE 3. Number of collected species in each station, diagonalized according to the biotopes they have been found in.

BEETLE SAMPLING AND ANALYSES

The study was conducted from the end of April until the beginning of September of 1994 and 1995. The following trapping methods were used: window traps and water traps (yellow and white) (BARBALAT 1995). Two traps of each type were placed in each site at about 20 cm above ground level for water traps and 80 cm for window traps. They operated without interuption during the whole season.

The data analysis was made by canonical correspondence analysis (TER BRAAK 1986, 1988a). The program CANOCO (TER BRAAK 1988b) was used in order to determine the most relevant environmental variables influencing species distribution in the studied sites. With this method, it is possible to extract the variance explained by one or more environmental variables introduced a priori in the analysis. These variables can be chosen by a forward selection and their significance tested by a permutation test. The following environmental variables were introduced in the analysis and submitted to a forward selection: "stand type (oak, beech, mixed)", "proportion of broad-leaved/ coniferous trees", "clearing size (small, medium, large)", "altitude", "tree covering", "deadwood quantity", "ecotone type [natural edge (with bush stratum), clean edge (without bush stratum), artificial clearing]", "slope" and "young tree size (< 1m, 1-2 m, >2m)" in the clearings.

RESULTS

A total of 65 species (Table 2) were recorded in our study area: 13 Buprestidae, 41 Cerambycidae, 8 phytophagous Scarabaeidae and 3 Lucanidae. The total number of collected specimens was 5309 (Table 3).

The forward selection showed that two environmental variables ("stand type" and "ecotone type") explain a significant part of the data variation. We tested the environmental variables on each season separately as well as on both seasons together. In the three cases, the same variables ("stand type" and "ecotone type") were found significant ($p < 0.01$ for both variables in the three cases). Axis 1 explains 16.8 % of the variance in 1994, 20.7 % in 1995 and 18.9 % when both years are cumulated. For the second axis, these values are 16.3 %, 17.7 % and 17.7 % respectively. For this part of the analysis, the rare species (less than 3 specimens) were excluded.

The effect of the year of capture on our results has also been tested. It represents only 3.4 % of the variance ($p = 0.74$; NS). The beetle communities can therefore be considered as stable during our two trapping seasons. Table 3 shows the species richness and abundance. It was diagonalized according to the different biotopes.

Fig. 2 shows the species and sites distribution on the first two canonical axes.

DISCUSSION

BIOLOGICAL INTERPRETATION

Several of the tested variables were found collinear and our significant variables have to be considered as synthetic. The variable "stand type" is in fact correlated with the altitude, which implies not only a climatic and vegetation change but also diffe-

FIG. 2. Diagram showing species and sites distribution along the first two canonical axes, representing a linear combination of the synthetic variables "oak stand" and "artificial clearing". The variables "beech stand", "altitude" and "mixed forest" were added a posteriori as passive variables for heuristic purposes.

rences in meadow management. The other significant variable “ecotone type” is also related to other variables such as the number of coniferous trees (mainly pine) in a stand, implying specialized forest management.

On the plane formed by axes 1 and 2, it was possible to identify the three following groups: sites 7, 8, 9 and 10, sites 2, 3, 5, 11 and 12 and sites 1 and 4.

On the left end of axis 1, the variance of which is mainly due to stand type, we find sites 8, 9 and 10 located at a higher altitude in pure beech forests. Site 7 is located in a mixed forest but at a similar altitude. The only species which can be considered as a beech forest indicator is the lucanid *Platycerus caprea*, which usually lives in old stumps in mountain mixed beech forests (KOCH 1992).

The other species found in these four sites seem more related to the edge itself than to the forest type. For instance, the larvae of the scarabaeids *Serica brunnea* and *Phyllopertha horticola* are rhizophagous on many plants and the adults are phyllophagous on diverse plants, including trees. *Serica brunnea*, *Hoplia argentea* and Amphimallon atrum are more common in hilly or mountainous regions (HORION 1958; ALLENSPACH 1970). Their abundance in these sites could also be due to a more extensive agriculture, using less pesticides than in the lowlands.

At the other end of the first axis, sites 1 and 4 are located in almost pure oak stands, which is clearly indicated by species developing mainly in oaks, such as the cerambycids *Plagionotus arcuatus* and *Anoplodera sexguttata* as well as the buprestid *Anthaxia salicis*.

Sites 2, 3, 5, 6, 11 and 12 are in the middle of the first axis and are either located in mixed forests (sites 3, 5, 6 and 11) or in beech stands with some coniferous trees (sites 2 and 12).

Axis 2, the variance of which is principally due to the clearing type, shows an opposition between sites 1, 4, 7, 8, 9 and 10 on the top of the diagram and sites 2, 3, 5, 6, 11 and 12 on the bottom. All the "top" sites except site 4 are located in edges while all the "bottom" sites are in artificial clearings. On the top of the diagram, beside *Hoplia argentea*, *Amphimallon atrum*, *Serica brunnea* and *Phyllopertha horticola*, we can quote as edge indicators the cerambycid *Agapanthia violacea* and *Phytoecia cylindrica*, the scarabaeid *Rhizotrogus aestivus* and the buprestid *Anthaxia nitidula*.

The five scarabaeids live in open or in half open habitats. They are typical for edges without indicating if they are natural or clean. *Agapanthia violacea* and *Phytoecia cylindrica* cannot really be considered as typical edge species because their host plants can be found in other biotopes such as meadows or embankments. Nevertheless, in our case, we would tend to consider these two species as natural edge indicators. Actually meadows are usually mown quite early in the season, often before the beetle emergence. The use of fertilizers leads to the disappearence of certain typical oligotrophic and mesotrophic lawn plants which, among others, host *Agapanthia violacea* and *Phytoecia cylindrica*. In our study area, we should therefore consider that these two species can only live where the edge is wide enough to allow the maintenance of their host plants.

The only species, which can be considered as a typical edge species is the buprestid *Anthaxia nitidula*, which lives in treelike Rosaceae and which is often found on *Crataegus* sp., *Prunus spinosa* or *Rosa canina*, which are typical edge shrubs.

On the bottom of the diagram, we find several species associated with artificial clearings. Some of them, such as the cerambycids *Corymbia rubra*, *Prionus coriarius*, *Rhagium bifasciatum* or *Anastrangalia sanguinolenta* live in old stumps and are favoured by those left in the artificial clearings after cutting.

Species living in small branches seem also favoured by the branch heaps left in artificial clearings after cutting. The little cerambycid *Stenurella melanura* seems to favour particularly these structures. This species is abundant everywhere but particularly in artificial clearings. According to HORION (1974), *Stenurella melanura* lives in rotten branches on the ground. To a lesser extent, species living in little branches such as *Pogonocherus hispidulus*, *Agrilus olivicolor*, *Anthaxia similis*, *Leiopus nebulosus* and *Obrium brunneum* also seem to be favoured by artificial clearings.

RELATIONSHIPS BETWEEN BEETLE COMMUNITIES AND FOREST MANAGEMENT

Taking a closer look at axis 2, we can notice that the opposition between "artificial clearing" and "natural edge" is linked to another opposition: mixed forests against pure forests. This can be explained by a management adapted to each stand type. Sites 1, 4, 8, 9 and 10 on the top of the diagram are located in pure oak or beech forests, while the other sites are in mixed forests with a certain amount of coniferous trees. This is shown on the bottom of the diagram, by a higher number of species, living mainly in coniferous trees such as the cerambycids *Corymbia rubra*, *Anastrangalia dubia*, *A. sanguinolenta*, *Gaurotes virginea*, *Rhagium bifasciatum* and *R. inquisitor*, as well as the buprestids *Anthaxia similis*, *A. qudripunctata* and *A. helvetica*.

In our study area, mixed forests are mainly situated on thin calcareous soils which are unfavourable to the growth of most trees. Pine is the only species which grows quite well under these conditions. It requires much light for its growth and artificial clearings are necessary to favour it. This explains why artificial clearings are opened mainly in this type of forests.

In our study area, pure beech forests are usually located above 800 m, on deeper and more fertile soils. As beech is a shade species, beech forest management does not require the opening of large artificial clearings. These forests are usually quite dark as beech canopy is very thick and their beetle fauna is generally poorer than in mixed or oak forests.

On the contrary, oak forests usually grow below 700 m and young trees need a lot of light for their growth. The management of this type of forests implies the opening of artificial clearings. Unlike beech, oak hosts a large number of specific insect species, much more related to the tree itself than to the forest structure. This explains the position of our site 4, an artificial clearing in a pure oak stand. Its fauna is closer to that of site 1, located at the edge of a pure oak forest, than to the other artificial clearings in mixed stands.

In normally managed forests, most of the trees are cut before reaching an age where the foliage becomes scarcer. A forest of healthy trees is therefore very dark, a feature not favourable for the studied fauna which is thermophilous. To a certain extent, we can consider artificial clearings as a substitute to natural clearings caused in primeval forests by the fall of old trees, all the more so that in addition to the light and the heat they cause, they also provide suitable biotopes for larvae as long as stumps and branch heaps are left on the site. These stumps and branches are more attractive in sunny places, than in dark places deeper in the woods, since not only the adults but also the larvae are thermophilous. This suggests that a careful management respecting local conditions can enhance forest beetle diversity.

Apparently, edge beetle assemblages are rather constituted of species living in herbaceous plants. They would be very sensitive to any edge and surrounding modification, be it a reduction of the edge width or a change in the agricultural practices.

For instance the replacement of a meadow by a field would change the microclimate, supress an important food source and probably increase chemical treatments.

The results therefore suggest that the link existing between the type of forest and the kind of management is reflected by the beetle communities.

CONCLUSION

This study shows that the main factor for the presence of xylophagous beetles is the occurence of their host plants. This concerns chiefly 9 species which are strongly dependant on their host plant. In our case, the species in question are mainly linked to oak and would be very sensitive to a vegetation change. Therefore, this tree of high biological value, hosting many typical species, has to be maintained. It should also be favoured by adapted management.

The second main factor found in our study is the ecotone structure. Species found in artificial clearings are not the same as those trapped in natural edges.

In order to preserve in our forests a diversified beetle fauna including specialized species, it is important to keep the number of indigenous trees adapted to site conditions as high as possible, among them oak. In a mountainous country like Switzerland, oak is not a very common tree since most of the lowlands are intensively cultivated. It is therefore important to favour this species where it is possible. At higher altitude, beech often constitutes monospecific stands. Tree diversity could be enhanced by favouring other species such as linden (*Tilia* sp.) or maple. Diversified structures must also be maintained. Even if artificial clearings have a favourable effect when stumps and branch heaps are left after the cutting, one must keep in mind that they cannot replace natural edges. These have to be maintained where they already exist and encouraged elsewhere in favourable sites. It has also to be recalled that artificial clearings favouring pine have a very favourable effect when young trees are small. Nevertheless, their area should remain limited because the rich mixed forest should not be replaced little by little by a pine monoculture.

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Fossil and extant species of *Cylindromyrmex* (Hymenoptera: Formicidae)

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Fossil and extant species of *Cylindromyrmex* (Hymenoptera: Formicidae). - The genus *Cylindromyrmex* is restricted to the Neotropics and comprises ten Recent species and two fossil ones from Dominican amber. *Cylindromyrmex parallelus* Santschi is a junior synonym of *Cylindromyrmex meinerti* Forel. *Cylindromyrmex whymperi* (Cameron) is re-established as a good species. *Cylindromyrmex escobari* n. sp. is described from Colombia. A cladistic analysis allows grouping of the twelve known species into four clades: the *striatus*, the *boliviae*, the *brevitarsus*, and the *longiceps* clades. No *Cylindromyrmex* has been reported from the Recent fauna of Hispaniola yet. This genus existed on Hispaniola during the Early or Middle Tertiary times and its apparent absence from the extant fauna of the island, if confirmed, should be due to a more recent extinction.

Key-words: Formicidae - neotropical ants - *Cylindromyrmex* - Dominican amber - fossil ants - Tertiary.

INTRODUCTION

The subfamily Cerapachyinae contains 3 tribes: Cerapachyini (three genera), Acanthostichini (one genus) and Cylindromyrmecini (one genus, *Cylindromyrmex*, revised in this work). *Cylindromyrmex* nests in cavities of rotten wood, under bark, in hollow twigs, and in termite galleries. They are said to be termite predators. Among cerapachyines, WILSON (1985) and BARONI URBANI (1995) reported the presence of the genus *Cylindromyrmex* in Dominican amber without further specifications, and DE ANDRADE (in press) describes a new species of *Acanthostichus* from Dominican amber. Only two more species of cerapachyines are known in the fossil record, both assigned to the extinct genus *Procerapachys* from Baltic Amber. Their systematic position is not clear. In fact, BROWN (1975) within *Cerapachys*, considered the two Baltic species to represent a distinctive species group on the basis of their large eyes and complete promesonotal suture. The eyes of these two species, as they have been figured by WHEELER (1915), appear comparable to those described for several Recent representatives, and the promesonotal suture is drawn uninterrupted only for *C. annosus* and not for *C. favosus*. The two Baltic species, as far as I know, have never been re-studied

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since WHEELER's descriptions at the beginning of this century. Most contemporary species, however, show a completely fused mesosoma without traces of suture, but a well visible suture is present at least in the S. African *C. wroughtoni*.

MATERIAL AND METHODS

Two fossil specimens of *Cylindromyrmex* have been examined in two samples of amber from the Dominican Republic:

Do-4130-1 (Fig. 1) of the amber collection of the State Museum of Natural History, Stuttgart (Department of Phylogenetic Research). A light yellow sample containing only one winged gyne of *Cylindromyrmex*. The preservation condition of the specimen is good, though whitish layers surround the right side of the frontal carina, the mesosoma, the wings, the gaster, and part of the legs.

MCZC (Fig. 2) of the collection of the Museum of Comparative Zoology, Harvard, U.S.A. A dark yellow sample containing a dipteron, few impurities, small air bubbles, remaining of insect wings and one winged gyne of *Cylindromyrmex*. The preservation condition of the specimen is good.

The Recent species of *Cylindromyrmex* examined in this study are deposited in the following collections, given here with the relative coden as it will be used in the following text:

BMNH	The Natural History Museum, London, England. Courtesy of Barry Bolton.
CPCC	Centro de Pesquisa do Cacao, CEPLAC, Itabuna, Bahia, Brasil. Courtesy of Dr. Jacques H. C. Delabie.
WEMC	William and Emma MacKay, Texas, United States. Courtesy of Prof. William P. MacKay.
DEIC	Deustches Entomologisches Institut, Eberswalde, Deutschland. Courtesy of Dr. Stephan M. Blank.
IAVH	Instituto de Investigación de Recursos Biológicos Alexander von Humboldt, Villa de Leiva, Santafé de Bogotá, Colombia. Courtesy Fernando Fernández-C.
IEGG	Istituto Di Entomologia "Guido Grandi", Bologna, Italy. Courtesy of Prof. Egidio Mellini.
LACM	Natural History Museum of Los Angeles County, USA. Courtesy of Roy R. Snelling.
MHNG	Muséum d'Histoire Naturelle, Geneva, Switzerland. Courtesy of Dr. Ivan Löbl.
MIZA	Museo del Instituto de Zoología Agrícola "Francisco Fernández Yépes", Maracay, Venezuela. Courtesy of John Lattke and José L. García
MNHN	Muséum National d'Histoire Naturelle, Paris. Courtesy of Dr. Janine Casevitz-Weulersse.
MCSN	Museo Civico di Storia Naturale "Giacomo Doria", Genoa, Italy. Courtesy of Dr.Valter Raineri.
MCZC	Museum of Comparative Zoology, Harvard University, Cambridge, Massachusetts, USA. Courtesy of Stefan Cover.
MPEG	Museu Paraense Emilio Goeldi, Pará, Brazil. Courtesy of Dr. Ana Y. Harada.
MZSP	Museu de Zoologia, Universidade de São Paulo, Brazil. Courtesy of Prof. Carlos Roberto Ferreira Brandão.
NHMB	Naturhistorisches Museum Basel, Switzerland. Courtesy of Dr. Michel Brancucci.
NHMW	Naturhistorisches Museum Wien, Austria. Courtesy of Dr. Stefan Schödl.
USNM	United States Department of Agriculture, Agricultural Research Service, Systematic Entomology Laboratory, c/o National Museum of Natural History, Washington, D. C., USA. Courtesy of Dr. Ted R. Schultz.

FIG. 1

Dominican amber. Specimen Do-4130. Profile (top); dorsal view (bottom).

The measurements and Indices I used are those defined by BROWN (1975); these and other measurements defined here are:

TL	(Total Length): combined head length in full face view (mandibles included), Weber's length, petiole length (side view), and postpetiole and remaining gastral lengths (both in side view).
HL	(Head Length): with head in full frontal view, maximum measurable distance between the middle of the vertexal margin and the middle of the anterior border of the clypeus.
HW	(Head Width): maximum measurable head width behind the eyes in frontal view.
EL	(Eye Length): maximum eye length.
SL	(Scape Length): length of scape shaft, excluding the basal condyle.
SW	(Scape Width): maximum width of scape.
WL	(Weber's Length): diagonal length of mesosoma from the anterior pronotal slope to distal edge of the posterior border of the propodeum.
PeL	(Petiolar Length): maximum measurable distance, in dorsal view, between the middle of the anterior petiolar margin to the middle of its posterior margin.

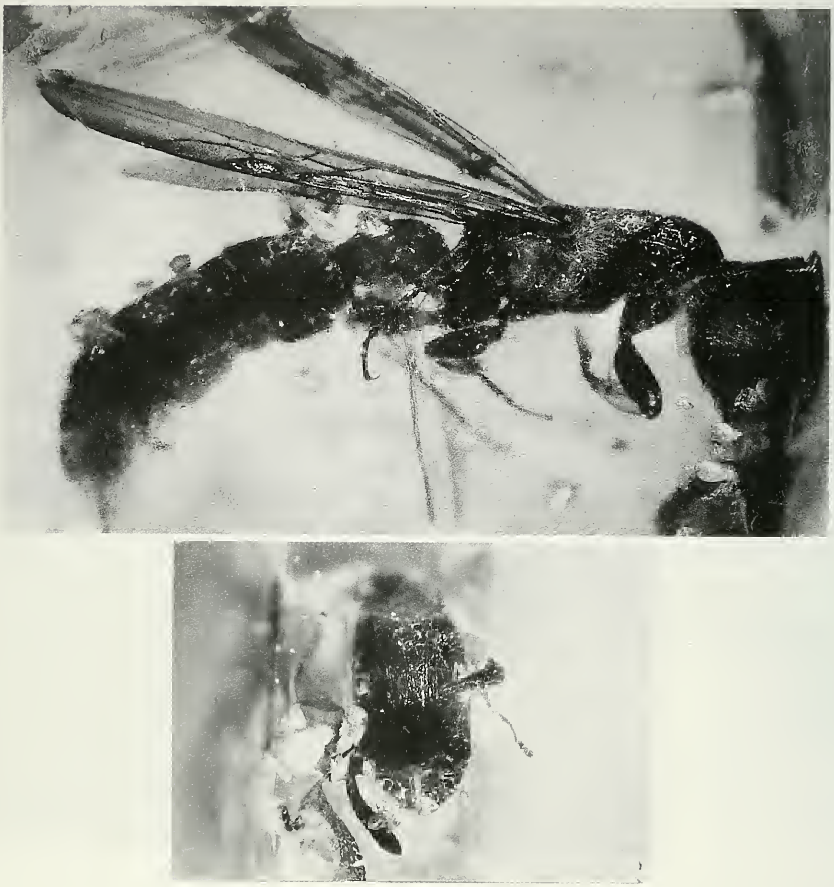


FIG. 2
Dominican amber. Specimen from MCZC. Profile (top); head in dorsal view (bottom).

PeW	(Petiolar Width): maximum measurable width of the petiole in dorsal view.
HFeL	(Hind Femur Length): maximum measurable distance on the anterior face of the hind femur.
HFeW	(Hind Femur Width): maximum measurable width of the anterior face of the hind femur.
HTiL	(Hind Tibia Length): maximum measurable distance on the anterior face of the hind tibia.
HTiW	(Hind Tibia Width): maximum measurable distance on the anterior face of the hind tibia.
HBaL	(Hind Basitarsus Length): maximum measurable distance on the anterior face of the hind basitarsus excluding the spines.
HBaW	(Hind Basitarsus Width): maximum measurable distance on the anterior face of hind basitarsus.
CI	(Cephalic Index): HW/HL x 100
SI	(Scape Index): SW/SL x 100
HFeI	(Hind Femur Index): HFeW/HFeL x 100
HTiI	(Hind Tibia Index): HTiW/HTiL x 100
HBaI	(Hind Basitarsal Index): HBaW/HBaL x 100

A species-level cladistic analysis was performed using as outgroups two representatives of two closely related genera, *Acanthostichus* and *Simopone*. No straightforward autapomorphies have been included in the data matrix. The search for the most parsimonious tree(s) was performed by PAUP 3.1.1 (SWOFFORD 1993). The search was performed by means of the Branch-and-Bound algorithm (HENDY & PENNY 1982).

In order to assess a statistical degree of confidence to the results obtained in this way, 1,000 replicates of a bootstrap analysis as described by FELSENSTEIN (1985) were performed by the algorithm equally implemented in PAUP 3.1.1. The graphic tracing of synapomorphies of Fig. 35 was obatined by MacClade 3.01 (MADDISON & MADDISON 1992).

All characters were assumed to be unordered and with equal weight.

DESCRIPTIONS

Cylindromyrmex Mayr, 1870

Cylindromyrmex Mayr, 1870: 967. Type species *Cylindromyrmex striatus* Mayr, by monotypy.

Holcoponera Cameron, 1891: 92. Type species *Holcoponera whymperi* Cameron, by monotypy. Junior homonym of *Holcoponera* Mayr, 1887. Synonymy with *Cylindromyrmex* proposed by FOREL (1892).

Cylindromyrmex, Wheeler 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex striatus* Mayr, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1975).

Hypocylindromyrmex Wheeler, 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex longiceps* Roger, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1973).

Metacylindromyrmex Wheeler, 1924: 106 (subgenus ad *Cylindromyrmex*). Type species *Cylindromyrmex godmani* Forel, by original designation. Synonymy with *Cylindromyrmex* proposed by BROWN (1973).

DIAGNOSIS AND DESCRIPTION OF THE GENUS *CYLINDROMYRMEX* MAYR

The workers of *Cylindromyrmex* and *Acanthostichus* according to BOLTON (1994) can be separated from those of the other genera of Cerapachyinae (*Sphinctomyrmex*, *Simopone* and *Cerapachys*) for the head dorsum lacking a carina between the antennal socket and the lateral margin of the head. In the same key *Cylindromyrmex* is separated from *Acanthosthichus* by means of the following combination of characters: antennal scrobes present, mid and hind tibiae each with 2 pectinate spurs, presternite of abdominal segment III approximately at midheight of the first gastric segment, side of the head without longitudinal groove, and distinct eyes. To these characters I would add another one, easier to detect: all known *Cylindromyrmex* species have the dorsum of the head, of the mesosoma and of the petiole longitudinally striate while no described *Acanthostichus* shows traces of similar heavy striation on the same body parts (only a very light striation close to the antennal articulation, on the pleurae and on the petiolar sides can be present in a few species). The groove and the size of the eyes are likely to have a weak diagnostic value. All workers and gynes of *Cylindromyrmex* possess a longitudinal groove running posteriorly from the mandibular articulation, but the groove of *Cylindromyrmex* is placed more dorsally than in *Acanthostichus*. The *Cylindromyrmex* groove is somehow difficult to see because all species have a longitudinally striate head, while no *Acanthostichus* are striated. For what corncerns the size of the eyes, I have examined workers of *C. longiceps* with 16 ommatidia and the worker of *A. texanus* should have 10 ommatidia only (MACKAY 1996).

A detailed description of the males, gynes and workers of *Cylindromyrmex* can be found in BROWN (1975). Here, I will complement only BROWN's diagnoses:

Worker. Monomorphic but variable in size. Head longer than broad, with slightly convex, subparallel or parallel sides. Clypeus short. Frontal carinae parallel or subparallel diverging posteriorly. Ocelli present or reduced to an impressed pit. Compound eyes placed on the middle or slightly behind the mid line of the head and with a variable number of ommatidia (16-500). Antennae 12-jointed. Funicular joints 8-10 with spine-like seta on the proximal border; last joint with similar spine-like seta but almost on its all surface (Fig. 3). Scapes reaching or slightly surpassing the anterior border of the eyes. Funiculi thickening from the base to the apex. Mandibles subtriangular, dorsally flat or convex. Masticatory margin of the mandibles with 4-14 irregular denticles or edentate. Apex of the mandibles with pointed apical tooth. Palpal formula 2,2 or 2,3. Mesosoma elongate, cylindric, with parallel sides and weakly convex dorsally. Promesonotal and propodeal sutures absent, simply marked by a pit or superficially impressed. Promesopleural suture superficially or deeply impressed. Meso-metapleural suture superficially impressed. Humeral angles round. Propodeum with basal and declivous faces distinct separated or not by a margin. Propodeal spiracle round or oval and placed at mid height in lateral view. Petiole subcylindric, as long as broad, longer than broad, or shorter than broad. Petiolar sides subparallel and often diverging posteriorly. Ventral petiolar process small or large, subtriangular, subtruncate, or subround. Postpetiole (abdominal segment III or gastral segment I) broader than petiole, broader than long, and as broad as the first gastric segment (abdominal segment IV or gastral segment II). Postpetiolar sternite antero-medially without or with a variably marked triangular "lip". Pygidium obliquely or perpendicularly truncate; apex of pygidium with or without a notch. Sides of pygidium surrounded by a set of many irregularly distributed denticles with in 2-4 larger denticles above the sting, or with a row of denticles enlarging apically. Sting developed, curved upwards and with flat sides. Legs incrassate or slender. Femora with a concavity of variable deepness to receive the tibiae. All tibiae with a large, pectinate spur. Mid and hind tibiae with an additional, smaller, pectinate spur close to the large one. Basitarsi of the three pairs of legs of variable length and with 3-7 spine-like setae on the outer apical edge. First, second and third tarsomeres with similar spines. Fourth (apical) tarsomeres of variable length. Pretarsal claws thicker proximally than distally and with a small denticle or an angle on the proximal part. Head, mesosoma and petiole covered by longitudinal striae of variable thickness. Postpetiole smooth or striate. First, second and third gastric tergites smooth and variably reticulate-punctate or longitudinally striated. Remaining gastric tergites, sternites and pygidium smooth and/ or reticulate-punctate. Legs smooth to superficially punctate; some species with hind or hind and mid coxae longitudinally striated. Body with pointed hairs of different size and variably distributed, generally denser on the gaster. Colour dark ferrugineous to black. Legs concolour with or lighter than the body. Some species with yellowish tibiae.

Gyne. Very similar to the worker but differing from it in the following characters. Size slightly or much larger than the worker. Ocelli and compound eyes larger. Wings as in Fig. 4. Fore wing with well marked veins and pterostigma. Rsf5 connected with R1. Mf2 and r-m medially interrupted. Mf4 and CuA1 variably pigmented. Hind wings with R+Sc, M+CuA and A pigmented. Distal veins faintly pigmented, CuA and 1A more pigmented than Rs and M. In some species the wings have violaceous reflexes. Dorsum of the mesonotum with or without striae on the sides. Mesopleurae striate or not on the anterior part. Scutellum smooth or with variably impressed longitudinal striae.

Male. Size variable, generally smaller, but in some species as large as, or larger than the gyne. Head shorter than broad, as long as broad, or longer than broad. Vertex convex. Frontal carinae developed but never completely hiding the antennal socket. Sides of the frontal carinae subparallel, or broad anteriorly and converging posteriorly, or strongly broad anteriorly and touching each other posteriorly. Antennae 13-segmented, varying from 1/3 to 1/2 of the maximum body length. Ocelli large. Compound eyes very large, slightly longer than 1/2 of the head length and largely on the anterior half of the head sides. Scapes very short. First funicular joint less than or about 1/2 of the length of the second one; second and last two apical joints thinner than joints 3-10. Mandibles slender, edentate except for a visible apical pointed tooth. Mesosoma robust. Pronotum with subparallel or diverging sides. Mesonotum and scutellum gently convex. Pair Mayrian furrows impressed or not. Parapsidal furrows variably impressed. Propodeum with the sides converging posteriorly. Basal face of the propodeum separate from the declivous one by a well marked carina. Petiole cylindric, as long as or longer than broad. Anterior face of the petiole truncate and separate from the dorsal one by a marked carina. Subpetiolar process variable in size, subtriangular or subtruncate. Postpetiole broader than the petiole. Postpetiolar sides diverging posteriorly or gently convex. First gastric segment broader than the postpetiole. Second gastric segment as broad as or slightly narrower the first segment, rarely broader than the first segment. Remaining gastric segments narrowing posteriorly. Legs long and slender. Head with deep punctures or piligerous foveae sometimes separated by irregular or regular striae. Mesosoma pro- and mesopleurae smooth and with punctures or piligerous foveae of variable size. Propodeum and metapleurae with thick, longitudinal rugosities, sometimes irregular. Petiole and postpetiole smooth or with irregular, longitudinal rugosities, very superficial on the postpetiole. Gaster and legs smooth and variably punctate. Body with pointed hairs denser than in the female castes. Sometimes the posterior part of the head, pronotum, gaster and legs with dense pilosity of variable size. Wings as in Fig. 5, similar to the one of the gyne. Colour brown to black. Legs concolour with or lighter than the body. Some species with yellowish tibiae.

LIST OF THE CHARACTERS

The characters listed below are considered as of possible phylogenetic significance:

1. Worker. Eyes small to medium (10-200 ommatidia) (0), or large (more than 400 ommatidia) (1).
2. Worker. Petiolar dorsum with at most 14 striae (0), or with at least 16 striae (1). Species with smooth or foveolate petiole (character 7 state 0) were coded as "?".
3. Worker and gyne. Frons at most slightly broader than 1/3 of the head width (0), or ca. 1/2 or more of the head width (1).
4. Worker and gyne. Base of the mandibles not angulate laterally (0), or angulate laterally (1).
5. Worker and gyne. Occiput high (Fig. 17) (0), or low (Figs. 8, 31) (1).
6. Hypostomal bridge narrow (Fig. 9) (0), or broad (Fig. 32) (1).
7. Worker and gyne. Head, mesosoma and petiole smooth or foveolate but never striate (only traces of fine striation can be present close to the antennal insertions, on the pleurae and on the petiolar sides) (0), or head, mesosoma and petiole clearly striate (1).
8. Worker and gyne. Dorsum of head, mesosoma and petiole with thick striae (Figs. 6, 8, 12) (0), or with thin striae separated by large interspaces (Figs. 29, 31) (1), or with thin striae very close each other (Figs. 17, 20) (2). Species with smooth or foveolate body coded as "?".
9. Worker and gyne. Ventral process of the petiole different shape but never triangular (0), or broad, triangular (1).
10. Worker and gyne. Dorsum of the petiole with more than 7 long pointed hairs (0), or with at most 3 long, pointed hairs (1).
11. Worker and gyne. All gastric tergites smooth or foveolate but never striate (0), or only first gastric tergite striate (1), or first and second gastric tergites striate (2).
12. Worker and gyne. Dorsal face of hind coxae without a concavity close to the articulation with trochanter (0), or with a concavity close to the articulation with the trochanter (1).
13. Worker and gyne. Mid tibiae with no or with one pectinate spur (0), or with two pectinate spurs (1).
14. Worker and gyne. Fore basitarsi longer than mid basitarsi (0), or fore basitarsi at most as long as the mid basitarsi (1).
15. Worker and gyne. Fore basitarsi shorter than hind basitarsi (0), or fore basitarsi as long as or longer than hind basitarsi (1).
16. Worker and gyne. Mid basitarsi longer than 1/2 of the hind basitarsi (0), or mid basitarsi shorter than 1/2 of the hind basitarsi (1).
17. Worker and gyne. Outer apical edge of the hind basitarsi with 0, or 3, or 5 spine-like setae (0), or hind basitarsi with 6-7 spine-like setae (1), or hind basitarsi with 4 spine-like setae (2).
18. Worker and gyne. Apical tarsomeres of hind legs shorter than the sum of second and third tarsomeres (0), or apical tarsomeres of hind legs as long as or longer than the sum of second and third tarsomeres (1).
19. Gyne. Compound eyes largely behind the mid line of the head (0), or on the mid line of the head (1).
20. Gyne. Scutellum smooth, foveolate, or with very thin striae (0), or scutellum with very thick striae (1).
21. Gyne. Hind femora Index < 48 (0), or > 50 (1).
22. Male. Frontal carinae subparallel (0), broad anteriorly and narrower posteriorly (1), or strongly broad anteriorly and touching each other posteriorly (2).
23. Male. Antero-median border of the clypeus convex (0), or straight (1).
24. Male. Anterior face of femora densely covered by hairs (0), or with only few hairs (1).
25. Male. Hypopygium smooth or finely denticulate between the distal apodemes (Figs. 7, 11, 13) (0), or with a simple, umpair, median projection between the apodemes (Figs. 27, 34) (1), or with a bidentate median projection between the apodemes (Figs. 16, 23, 24) (2).
26. Male. Hypopygium not strongly constricted distally (Figs. 23, 27, 34) (0), or strongly constricted distally (Figs. 7, 11, 13) (1).
27. Male. Ventral and dorsal borders of the aedeagus straight or partially concave (Figs. 7, 16, 27, 34) (0), or convex on their entire length (Figs. 11, 13) (1).

Data matrix

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27
C. boliviae	?	1	1	0	1	0	1	0	0	0	0	1	1	0	0	0	0	0	0	0	0	1	0	0	2	0	0
C. brasiliensis	1	1	1	1	1	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	0	0	0	1	0
C. brevitarsus	0	1	1	0	0	0	1	2	0&1	0	1&2	1	1	0	0	1	2	1	0	0	0	1	0	0	2	0	0
C. darlingtoni	0	1	1	0	0	0	1	2	1	0	1	1	1	0	0	1	2	1	0	0	0	?	?	?	?	?	?
C. escobari	0	1	1	0	0	0	1	2	1	0	0	1	1	0	0	1	2	1	?	?	?	?	?	?	?	?	?
C. godmani	?	1	1	0	1	0	1	0&1	0	0	2	1	1	0	0	1	0	1	0	0	0	2	0	0	1	0	0
C. longiceps	0	1	0	0	1	1	1	1	0	0	2	1	1	0	1	0	0	1	1	0	1	?	?	?	?	?	?
C. meinerti	0	1	0	0	1	1	1	1	0	0	2	1	1	0	1	1	0	1	1	0	1	2	0	0	1	0	0
C. striatus	1	0	1	1	1	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0	1	1
C. whymperi	1	0	1	1	1	0	1	0	0	1	0	0	1	1	0	0	1	0	0	1	0	0	1	1	0	1	1
† C. antillanus	?	1	0	0	1	0	1	1	0	0	2	1	1	0	1	1	0	1	1	0	0	?	?	?	?	?	?
† C. electrinus	?	1	1	0	0	0	1	2	1	0	1	1	1	0	0	0	2	0	0	0	0	?	?	?	?	?	?
A. texanus	0	?	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
S. annettae	?	?	0	0	0	0	0	?	0	0	0	0	0	0	0	0	0	0	1	0	0	?	?	?	?	?	?

TAB. 1

Matrix with the presence (1) or absence (0) of the 27 characters described in text among the known species of *Cylindromyrmex* and two outgroups.

RESULTS OF THE CLADISTIC ANALYSIS

The data of Table 1 allows the construction of only one most parsimonious tree of length 41 (Fig. 35). The tree has a Consistency Index of 0.854 (Rescaled CI = 0.782), a Retention Index of 0.915, and a Homoplasy Index of 0.220. The *Cylindromyrmex* species appear grouped in 4 clades with the two fossils, *antillanus* and *electrinus*, in different clades. A bootstrap test (Fig. 36) of significance as described in the methods chapter reveals that only the *striatus* clade (*brasiliensis*, (*striatus*, *whymperi*)), its subclade (*striatus*, *whymperi*), part of the *longiceps* clade (*antillanus*, (*longiceps*, *meinerti*)), and its subclade (*longiceps*, *meinerti*) are represented at frequencies higher than the conventional statistical limits in 1,000 replicates.

THE CLADES OF *CYLINDROMYRMEX* AND THEIR SPECIES

THE *STRIATUS* CLADE

This clade includes three species: *brasiliensis*, *whymperi* and *striatus*. They are characterized by the following synapomorphies: (1) eyes large, (2) base of the mandibles of the worker and of the gyne laterally angulate, (3) dorsum of the postpetiole of the worker and of the gyne with three long, pointed hairs at most, (4) fore basitarsi as long as the mid basitarsi, (5) outer apical edge of the mid and hind basitarsi of the worker and of the gyne with 6 or 7 spine-like setae, (6) scutellum of the gyne with very thick striae, (7) male hypopygium strongly constricted distally.

Cylindromyrmex brasiliensis Emery Figs 3, 6-7

Cylindromyrmex striatus Mayr, MAYR 1887: 545. Worker and male (Santa Catarina), nec gyne from Lima = *whymperi* (nec MAYR 1870). Misidentification.

Cylindromyrmex brasiliensis Emery, 1901: 53. Worker and male (Santa Catarina). Original description. Type locality: Brazil. Type material: 3 syntype workers labelled: "S. Catharina, Schmalz, typus", in MCSN; 1 syntype worker labelled: "Bresil, Mayr, typus, *Cylindromyrmex brasiliensis* Em (*striatus* Mayr 1887)", in MCSN, examined.
Cylindromyrmex brasiliensis Emery, BORGMEIER 1937: 218. Gyne.
Cylindromyrmex brasiliensis Emery, JAFFÉ 1993: fig. 51. Worker.
Cylindromyrmex brasiliensis Emery, FOWLER & DELABIE 1995: 328.

Diagnosis. The basalmost species of the *striatus* clade and differing from both other species, *striatus* and *whymperi*, by the legs dark orange or light brown instead of black with at least part of the tibiae yellowish.

Worker (Fig. 6). Head about 1/5 longer than broad, with subparallel sides. Occiput low. Vertexal angles round. Frontal carinae about half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards and reaching the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, slightly convex and behind the mid line of the head. Ocelli developed. Scapes surpassing the anterior border of the eyes. Proximal fifth of the scapes about 1/2 narrower than the remaining parts. Mandibles weakly convex dorsally. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 5-6 irregular denticles followed by an apical tooth.

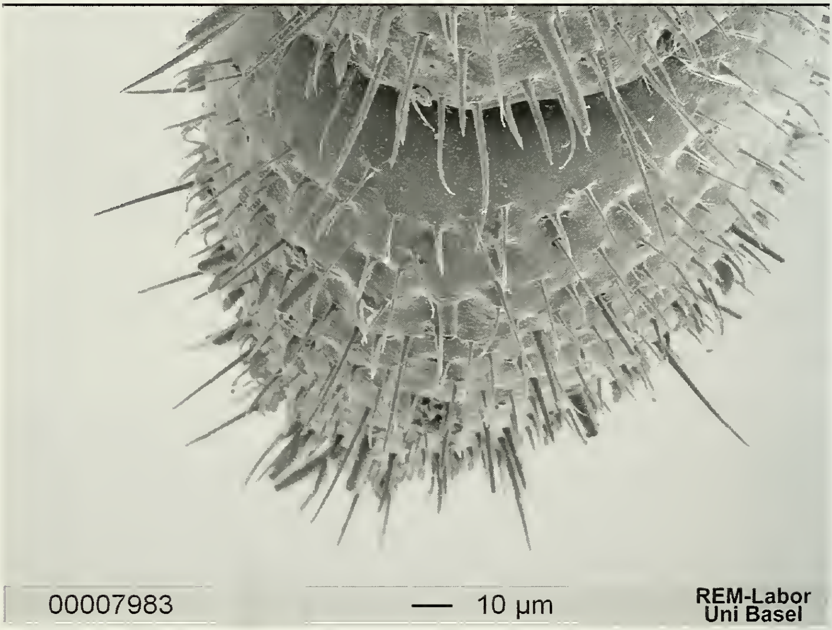


FIG. 3

C. brasiliensis Emery. Worker from Capão Bonito, São Paulo, Brazil. Apical funicular joint with spine-like setae.

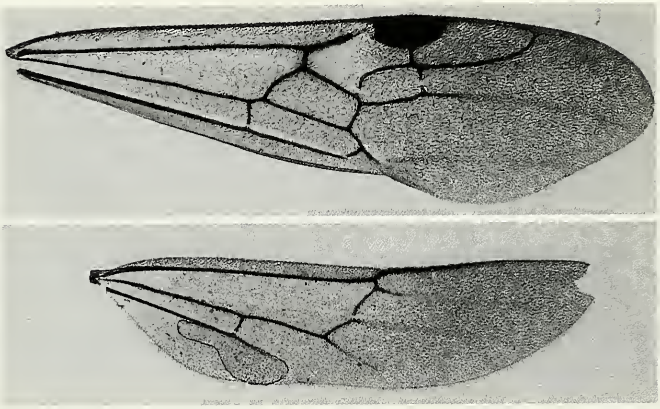


FIG. 4
C. boliviae Wheeler. Gyne from Rancho Grande, Aragua, Venezuela. Fore and hind wings.

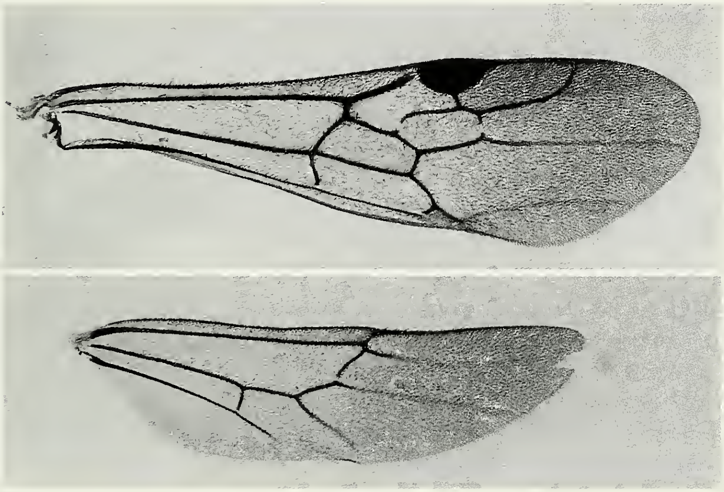
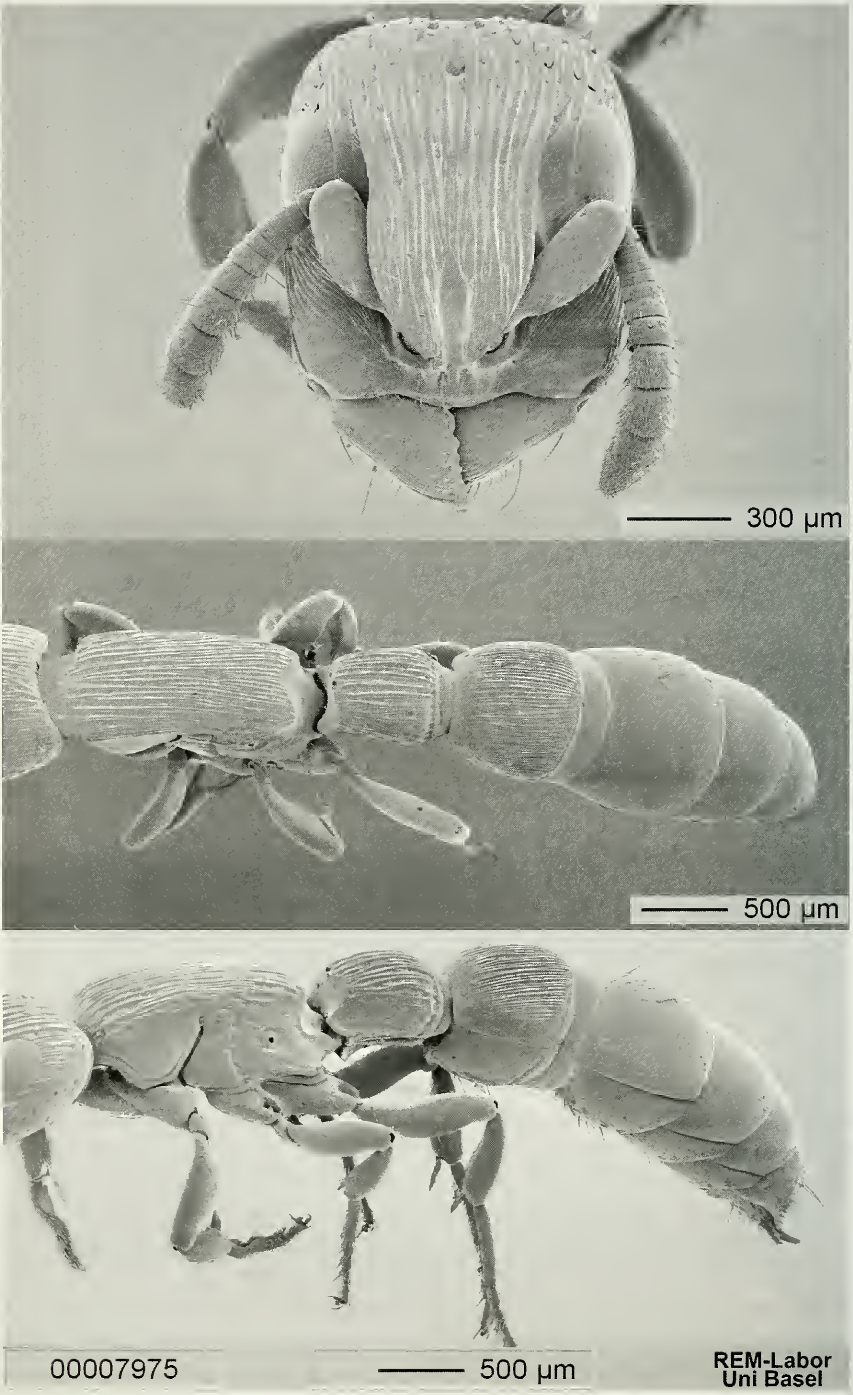


FIG. 5
C. godmani Forel. Male from Turrialba, Costa Rica. Fore and hind wings.

Mesosoma slightly convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with parallel sides. Mesonotum narrower than pronotum. Propodeal sides gently convex. Basal face of the propodeum separate from the declivous one by a marked margin superficially interruped medially.

Petiole sub-cylindrical, slightly longer than broad, anteriorly truncate and dorsally convex. Ventral process of the petiole small and triangular. Postpetiole slightly broader than long. Postpetiolar sides diverging backwards. Postpetiolar sternite antero-medially with a salient triangular "lip" pointed backwards. Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing irregularly distributed small denticles followed by a row of larger denticles converging towards a pair of small teeth over the sting.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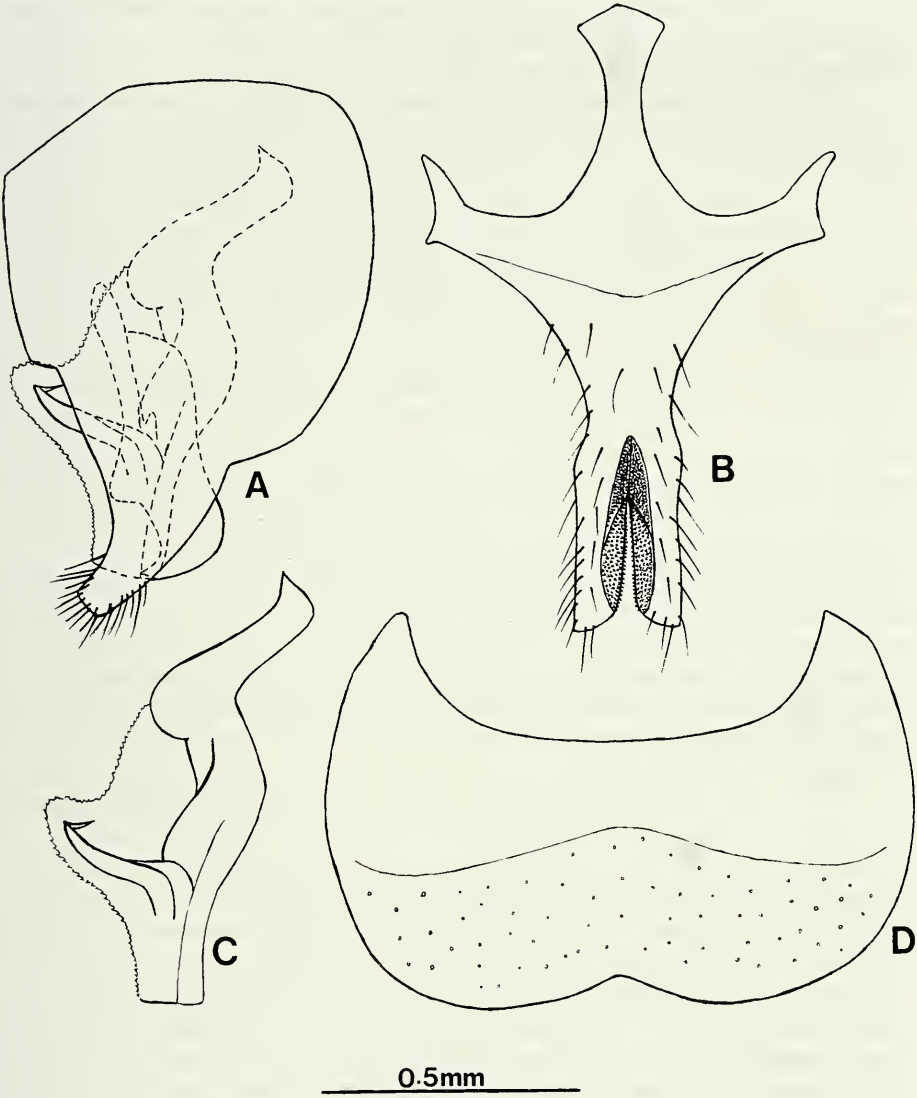


FIG. 7

C. brasiliensis Emery. Male from Santa Catarina, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 6. *C. brasiliensis* Emery. Worker from Capão Bonito, São Paulo, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Legs. Femora and tibiae not inflated. Hind basitarsi long and about 1/5 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Posterior third of the head dorsum and frontal carinae with longitudinal striae, thinner on the anterior half of the frontal carinae; some striae bifurcated. Posterior third of the head dorsum with additional, small, sparse, piligerous foveae. Anterior half of the head dorsum in front of the eyes with striae converging towards the scrobes, these striae thinner than those on the anterior part of the frontal carinae. Ventral part of the head smooth, with sparse piligerous foveae and longitudinal, slightly irregular striae on the antero-lateral half only. Mesosoma longitudinally striate and with sparse, superficial, piligerous foveae. Dorsum of the pronotum with 17-21 striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging onto the mesonotum and to the propodeum but thinner. Pleurae with thin, longitudinal striae and rare piligerous foveae, the striae absent on the lower propleurae. Lower mesopleurae smooth in small specimens. Piligerous foveae on the meso- and metapleurae denser in large specimens. Petiolar dorsum with 15-17 striae similar to those on the pronotum and with piligerous foveae. Petiolar sides minutely and superficially reticulate; their dorsal half with piligerous foveae, in some specimens the foveae separated by few, thin, longitudinal striae. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 33-35 striae as those on the mesonotum and propodeum and with few piligerous foveae, more impressed on the anterior third; postpetiolar sternite smooth and with sparse piligerous foveae. First, second, third and fourth gastric tergites and first gastric sternite smooth and with sparse punctuations. Remaining gastric segments superficially reticulate-punctate. Legs with very superficial, minute punctures.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) one long, erect to suberect on the external border of the scape, a pair between the frontal carinae and clypeus, sparse on the external border of the mandibles, one close to each pronotal angle, two or three on the postpetiole, sparse on the gaster, and denser on the pygidium; (2) shorter than type (1), variably distributed on the whole body; (3) shorter than type (2), suberect or subdecumbent on the head dorsum, subdecumbent on the mesosoma, on the petiole and on the postpetiole, decumbet on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a row of hairs similar to those of type (1) but appressed and apically curved. Outer ventral border of the mandibles with hairs similar to those of the hypostomal bridge but shorter.

Colour black and shining. Mandibles castaneous red. Antennae and tarsi ferrugineous-brown. Legs dark orange or light brown.

Measurements (in mm) and indices: TL 5.56-8.48; HL 1.16-1.64; HW 0.93-1.32; EL 0.37-0.49; SL 0.51-0.73; SW 0.17-0.22; WL 1.40-2.20; PeL 0.55-0.96; PeW 0.51-0.84; HFeL 0.67-1.02; HFeW 0.25-0.34; HTiL 0.65-1.04; HTiW 0.19-0.26; HBaL 0.53-0.83; HBaW 0.09-0.12; CI 78.1-80.5; SI 30.7-34.4; HFeI 33.3-37.3; HTiI 25.0-29.2; HBaI 14.4-15.1.

Gyne. Similar to the worker but differing from it in the following details: head with parallel sides; ocelli larger; mesosoma broader; parapsidal furrows impressed;

anterior corners of the postpetiole more angulate; striae on the head dorsum less regular; piligerous foveae on the vertexal angles and on the ventral part of the head denser and deeper; pronotum with longitudinal striae as in the worker; one specimen has the pronotal striae irregular and separated by piligerous foveae; mesonotum medially with irregular, short striae and few piligerous foveae; sides of mesonotum smooth; scutellum with sculpture similar to the one on the mesonotum; pro- and mesopleurae almost completely smooth; petiolar dorsum with 10 longitudinal, irregular striae.

Measurements (in mm) and indices: TL 8.56; HL 1.44; HW 1.14; EL 0.45; SL 0.60; SW 0.19; WL 2.40; PeL 0.81; PeW 0.77; HFeL 0.77; HFeW 0.30; HTiL 0.75; HTiW 0.22; HBaL 0.61; HBaW 0.10; CI 79.2; SI 31.7; HFeI 39.0; HTiI 29.3; HBaI 16.4.

Male. Head as broad as long. Vertexal margin subtruncate. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior half of the head. Borders of the frontal carinae raised and diverging backwards. Frons anteriorly superficially concave, medially convex and posteriorly sloping towards the impair ocellus. Clypeus declivous; its anterior border gently convex medially. Mandibles long, with edentate masticatory margins and a pointed apical tooth. Scapes about half longer than broad. Second and last two funicular joints thinner than joints 3-10.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Parapsidal furrows impressed. Scutellum slightly higher than the mesonotum. Basal face of the propodeum separated from the declivous one by a marked carina.

Petiole cylindric, its anterior face truncate and separated from the dorsal one by a marked carina. Ventral process of the petiole subtriangular. Postpetiole anterolaterally angulate, broadening backwards and much narrower than the first gastric tergite.

Genitalia as in Fig. 7.

Legs. Femora not inflated. Mid and hind metatarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate, with transversal striae around the ocelli and on the antennal scrobes, and with large foveae on the vertexal angles and on the ventral part of the head. Dorsum of the pronotum punctate and densely covered by foveae slightly larger than those on the head. Mesonotum smooth and with very sparse, small foveae. Scutellum with foveae larger than those on the pronotum. Basal face of the propodeum and petiole covered by slightly irregular foveae of different sizes, separated by longitudinal striae. Declivous face of the propodeum with longitudinal striae. Pro- and mesopleurae smooth and with short striae close to the posterior borders. Metapleurae with irregular, longitudinal striae. Postpetiole, first gastric segment and legs smooth and with sparse, superficial punctures. Remaining gastric segments punctate.

Pilosity. Body covered by pointed hairs of three types: (1) long and suberect, dense on the head, mesosoma, sparse on the gaster and on the legs; (2) shorter than type (1) variably distributed on the body, dense on the gaster; (3) shorter than type (2), decumbent, sparse on the vertexal angles, dense on the legs.

Colour. Black . Mandibles brown. Antennae and legs yellowish-orange.

Measurements (in mm) and indices: TL 8.78; HL 1.16; HW 1.16; EL 0.59; SL 0.32; SW 0.17; WL 2.76; PeL 0.81; PeW 0.72; HFeL 1.00; HFeW 0.23; HTiL 0.88; HTiW 0.18; HBaL 0.77; HBaW 0.07; CI 100.0; SI 53.1; HFeI 23.0; HTiI 20.4; HBaI 10.4.

Material examined. **BRAZIL**: no further locality, 1 worker (syntype), Mayr [MCSN]; 18 workers, G. Mayr [MCZC, MHNG, MNHN, NHMB, NHMW, USNM]. PERNAMBUCO: Caruaru, IV.1972, 1 worker, M. Alvarenga [MZSP]. BAHIA: Encruzilhada, 980 m, XI.1974, 2 workers, Seabra & Alvarenga [MZSP]; Buerarema, 22.IX.1996, 1 worker, R. Blatrix [CPCC]. RIO DE JANEIRO: Floresta da Tijuca, II.1957, 14 workers, C. A. Campos Seabra [MZSP]; Represa do Rio Grande, 08.II.1961, 6 workers [MZSP]. SÃO PAULO: Piracicaba, Escola Superior de Agricultura "Luiz de Queiróz", 25.X.1974, 10 workers, 1 gyne, E. Berti Filho [MZSP, MPEG]; Agudos, VIII.1958, 5 workers, R. Mueller [MZSP]; Barueri, 03.VI.1967, 88 workers, K. Lenko [MZSP]; Botucatu, 13.X.1987, 1 worker, L. C. Forti & I. M. P. Rinaldi [MZSP]; São Paulo, Butantan 23-31.VII.1969, 13.VIII.1969, 31.VII.1973, 5 workers, L. Travassos Filho [MZSP]; Ilha de São Sebastião, VII.1987, 500 m, 13 workers, C. R. F. Brandão [MZSP]; Salesópolis, Estação Biológica de Boracéia, 3-5.V.1996, 1 worker, C. R. F. Brandão et al. [MZSP]; Capão Bonito, 14.XI.1990, 1 worker, M. L. de Andrade [LACM]. PARANA: Londrina, VII,1987, 1 worker, M. E. M. Tomotake [MZSP]. SANTA CATARINA: no further locality, 3 workers (syntypes), Schmalz [MCSN]; no further locality, 8 workers, 1 male, G. Mayr [NHMW]; no further locality, 1 worker [IEGG]; Gaspar, 123 workers, 1 gyne, M. Silva Fontes [MZSP]; Blumenau, 2 workers, Hetschko [NHMW]; same locality, 1 worker [NHMW]. RIO GRANDE DO SUL: Pareci Novo, 10.V.1927, 3 workers, Hansen [MCZC, MZSP]; same locality, 18.III.1926, 4 workers, P. Rambo SJ [IEGG, MZSP]. **PARAGUAY**: LA CORDILLERA: San Bernardino, 1 gyne, Fiebrig [MHNG].

Discussion. The workers and the gynes of *brasiliensis* possess on the mesosoma, on the petiole and on the postpetiole, striae thinner and less regular than *striatus* and *whymperi*. These three species are very similar each other but the characters already given in the diagnosis should be sufficient to clearly allow separation of *brasiliensis* from the other two.

MAYR (1887) reported specimens of "*striatus*" collected by Hetschko in Brazil in termite galleries. BORGMEIER (1937) cited specimens of *brasiliensis* collected by P. Rambo from Pareci Novo (Brazil) in a branch of *Erythroxylum obovatum* (Erythroxylaceae).

Distribution. Brazil and Paraguay.

Cylindromyrmex whymperi (Cameron) sp. rev. Figs 8-11

Cylindromyrmex striatus Mayr, MAYR 1887: 546 (gyne, Lima), nec worker and male (=*brasiliensis*). Nec MAYR 1870. Misidentification.

Holcoponera whymperi Cameron, 1891: 92, fig. Worker. Original description. Type locality: Ecuador. Type material: holotype worker labelled: "Whymp. Supp. App. p. 92, *Holcoponera wympheri* Cam. type", in BMNH, examined. First combination in *Cylindromyrmex* by FOREL 1892: 256.

Cylindromyrmex striatus Mayr, EMERY 1901: 53. Misidentification.

Cylindromyrmex whymperi (Cameron), WHEELER 1910: 228, fig. 127 (worker).

Cylindromyrmex striatus Mayr, WHEELER 1919: 266. Misidentification.

Cylindromyrmex williamsi Wheeler, 1924a: 101, fig. 19. Worker and gyne. Original description. Type locality: Seymour Island. Type material: 1 worker labelled: "S. Seymour I., Galapagos, W. M. Wheeler", in MCZC, examined. **Syn. nov.**

Cylindromyrmex striatus var. *tibialis* Stitz, 1932: 367. Worker. Original description. Type locality: Galapagos Islands. Type material: not available for the present study. Not synonym of *striatus* as proposed by BROWN 1975: 82. **Syn. nov.**

Cylindromyrmex schmidti Menozzi, 1931: 191, fig. 3. Partim. Worker. Nec gyne (= *meinerti*). Original description. Type locality: La Caja, Costa Rica. Type material: 2 workers (syntypes) labelled: "La Caja: 8 kil. w. San José C. R., Heinr. Schmidt, TYPUS, *Cylindromyrmex schmidti* Typus, Menoz.", in IEGG, examined. Synonymia nova.
Cylindromyrmex striatus Mayr, Brown 1975: different pages, Fig. 94. Partim (only material from Peru, Ecuador, Galapagos = *whymperi*). Misidentification.
Cylindromyrmex striatus Mayr, Snelling & Hunt 1975. Partim (only material from Peru, Ecuador, Galapagos, Chile = *whymperi*), Figs 19-22 (= gyne, male and worker of *whymperi*). Misidentification.
Cylindromyrmex striatus Mayr, Fowler & Delabie 1995. Partim (only material from Peru, Ecuador, Galapagos, Chile = *whymperi*). Misidentification.
Cylindromyrmex whymperi (Cameron), Hölldobler & Wilson 1990: 85, n. n. Fig. (worker).
Cylindromyrmex, Bolton 1994: Figs 9 & 10, worker.

Diagnosis. A *Cylindromyrmex* species belonging to the *striatus* clade, resulting as sister species of *striatus*, but differing from it in the worker and gyne by the thicker body striation, and by the posterior third of the head dorsum with 25 longitudinal striae at most instead of more than 34.

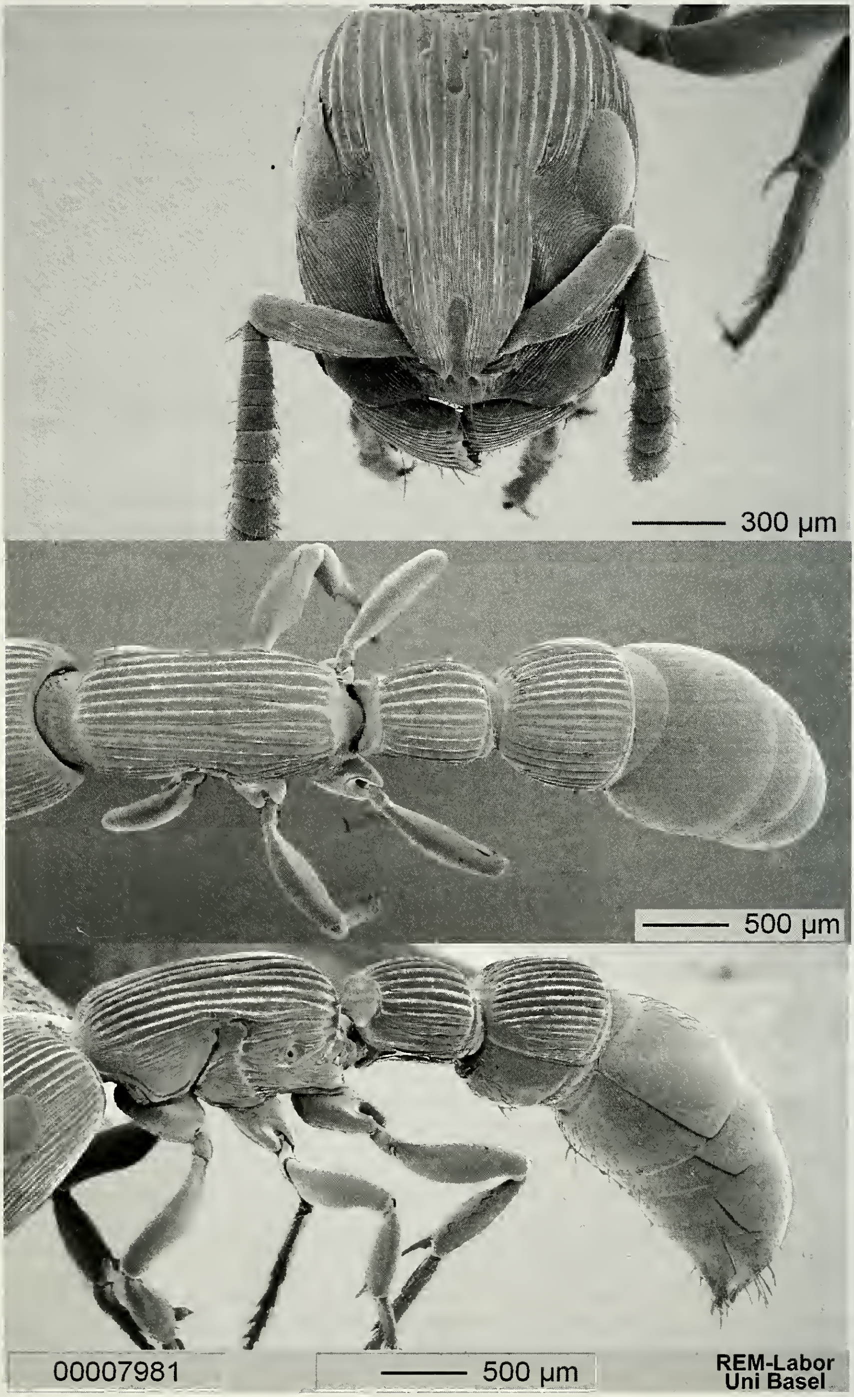
Worker (Fig. 8). Head about 1/6 longer than broad, with slightly convex sides. Occiput low. Vertexal angles round. Frontal carinae about half broad as the maximum head width. Sides of the frontal carinae diverging posteriorly or gently convex medially. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, convex and slightly behind the mid line of the head. Ocelli developed. Scapes surpassing the anterior border of the eyes. Proximal fifth of the scape 1/2 narrower than the remaining parts. Mandibles flat dorsally and shorter than in brasiliensis. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 4-5 irregular denticles followed by an apical tooth. Hypostomal bridge narrow, with the antero-lateral margin concave (Fig. 9).

Mesosoma gently convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with parallel sides. Mesonotum narrower than pronotum. Propodeal sides converging posteriorly. Basal face of the propodeum separated from the declivous one by a marked margin converging medially.

Petiole sub-quadrate, with the sides gently diverging backwards. Anterior face of the petiole truncate and the dorsal one convex. Ventral process of the petiole triangular and slightly smaller than in *brasiliensis*. Postpetiole broader than long and with convex sides. Postpetiolar sternite antero-medially with a variably marked triangular "lip". Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing a row of denticles strongly converging to a pair of small teeth over the sting.

Legs. Femora and tibiae not inflated. Hind metatarsi long and about 1/5 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Posterior third of the head dorsum and frontal carinae with thick, longitudinal striae, thinner on the anterior half of the frontal carinae. Rare, small, piligerous foveae can be present behind the ocelli. Anterior half of the head dorsum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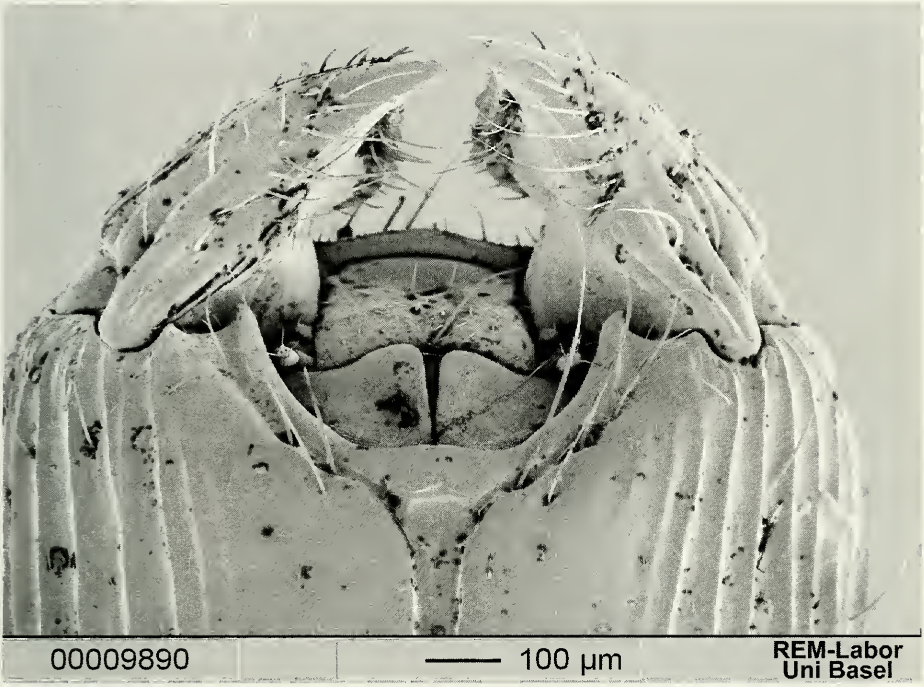
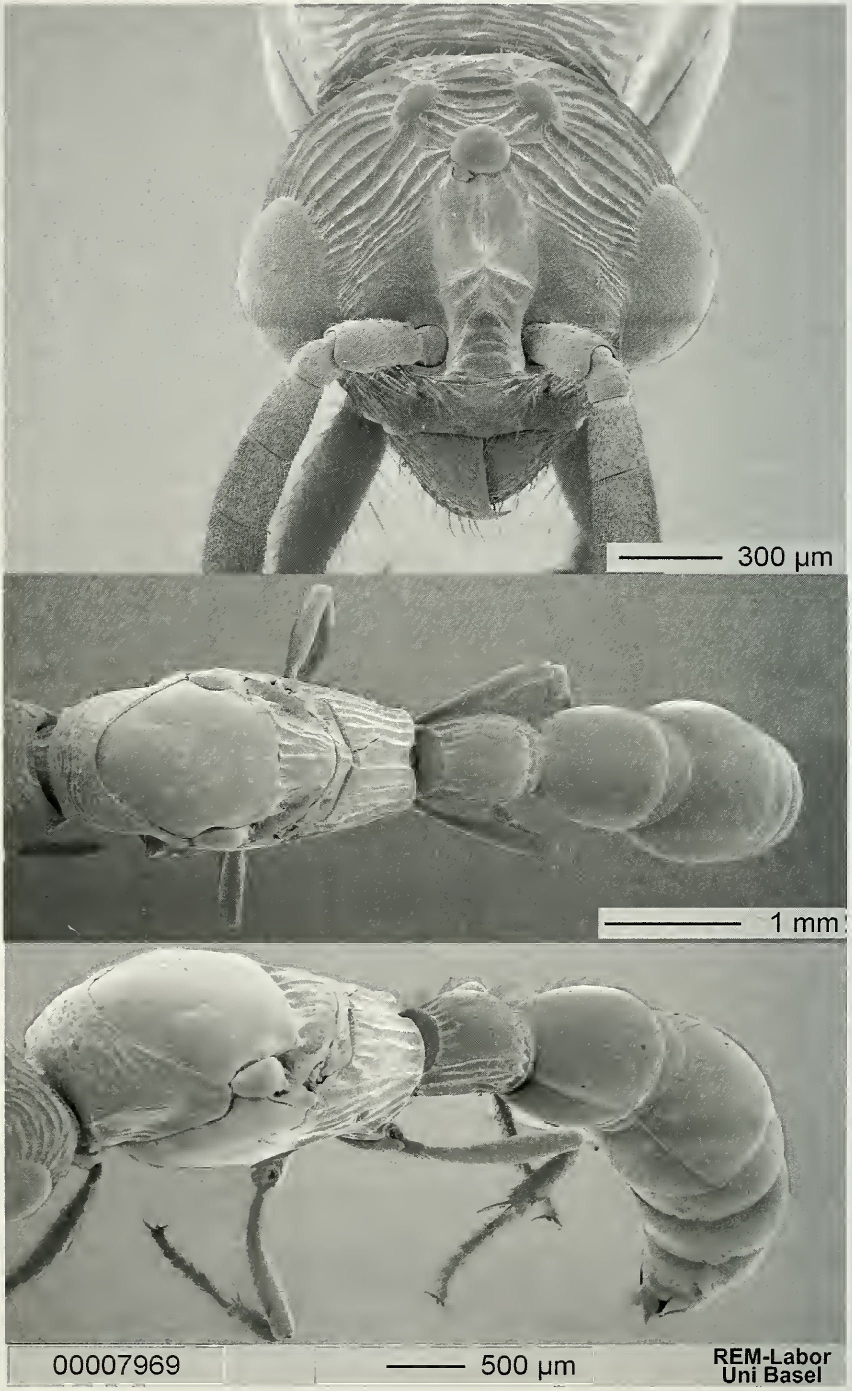


FIG. 9

C. whymperi (Cameron). Worker from Antofagasta, Chile. Anterior portion of the cephalic capsule and mandibles in ventral view to show the narrow hypostomal bridge (character 6 state 0). Notice the concavity of the anterior margin of the hypostomal bridge, a character not verified in all species of the genus.

with striae converging towards the scrobes, these striae thinner than those on the anterior half of the frontal carinae. Ventral part of the head with longitudinal striae laterally, smooth and superficially punctate medially. Mesosoma with 11-15 longitudinal striae similar or slightly thicker than those on the posterior third of the head dorsum. Lower pro- and metapleurae, and mesopleurae with thin longitudinal striae similar to those on the anterolateral part of the head dorsum. Upper pro- and metapleurae with striae as on the anterior part of the frontal carinae. Petiolar dorsum with 9-14 striae similar to those on the mesosoma. Petiolar sides minutely reticulate and with less regular and thinner striae than those on its dorsum. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 19-25 striae as thick as or slightly thinner than those on the mesosoma. Postpetiolar sternite smooth or reticulate and with sparse piligerous foveae.

FIG. 8. *C. whymperi* (Cameron). Worker from Ecuador. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).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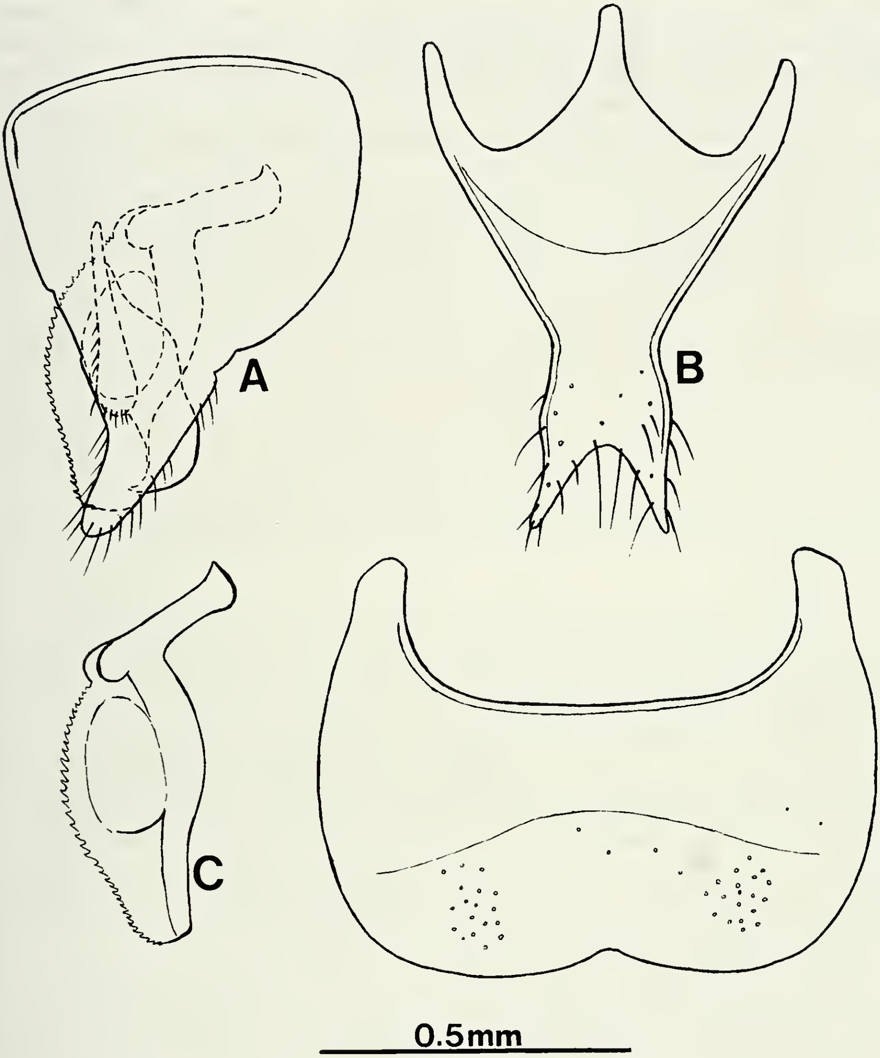


FIG. 11

C. whymperi (Cameron). Male from Lima, Peru. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 10. *C. whymperi* (Cameron). Male from Lima, Peru. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

First, second and third gastric tergites and first gastric sternite smooth and with sparse punctuations. Remaining gastric segments reticulate-punctate. Hind coxae with few, faint, longitudinal striae. Legs with very superficial, minute punctures.

Pilosity similar to *brasiliensis*.

Colour black and shining. Tibiae of three pairs of legs yellowish with the distal borders brown. Tarsomeres brown.

Measurements (in mm) and indices: TL 5.02-7.40; HL 1.08-1.56; HW 0.90-1.28; EL 0.31-0.45; SL 0.44-0.68; SW 0.15-0.19; WL1.12-1.88; PeL 0.44-0.76; PeW 0.48-0.80; HFeL 0.61-0.93; HFeW 0.22-0.30; HTiL 0.60-0.97; HTiW 0.16-0.23; HMeL 0.46-0.76; HMeW 0.07-0.10; CI 78.9-83.3; SI 27.9-34.1; HFeI 32.4-36.1; HTiI 23.7-26.2; HBaI 13.0-15.2.

Gyne. Similar to the worker, from which it differs by the following peculiarities: vertex less concave medially; mesosoma broad medially; parapsidal furrows impressed; petiole slightly longer than broad; pronotum with 14-17 thick, longitudinal striae; mesonotum medially with 9-10 longitudinal striae, slightly thinner than those on the pronotum, those on the sides less regular and shorter than the median ones; scutellum with 7-8 striae as those on the pronotum; dorsum of the propodeum with 14 striae as those on the pronotum; petiolar dorsum with 9-10 longitudinal striae as those on the pronotum; postpetiolar dorsum with 22-30 longitudinal striae slightly thinner than those on the pronotum

Wings as in fig. 4.

Measurements (in mm) and indices: TL 7.58-8.16; HL 1.44-1.46; HW 1.16-1.20; EL 0.45-0.46; SL 0.56-0.60; SW 0.16-0.18; WL2.36-2.40; PeL 0.73-0.76; PeW 0.69-0.72; HFeL 0.82; HFeW 0.30-0.31; HTiL 0.75-0.78; HTiW 0.23-0.24; HBaL 0.64-0.66; HBaW 0.09-0.11; CI 80.5-82.2; SI 29.2-34.1; HFeI 36.6-37.8; HTiI 23.9-26.7; HBaI 13.3-15.5.

Male (Fig. 10). Head as broad as long. Vertexal margin subtruncate or convex. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Borders of the frontal carinae raised and diverging backwards. Frons anteriorly slightly concave, medially convex and posteriorly sloping towards the impair ocellus. Clypeus declivous; its anterior border straight. Mandibles long with edentated masticatory margins and with a pointed apical tooth. Scapes thick and shorter than first and second funicular joints. Funicular joints as in brasiliensis.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum convex. Pair Mayrian carinae superficially impressed. Parapsidal furrows impressed. Scutellum slightly higher than the mesonotum. Basal face of the propodeum narrowing backwards and separated from the declivous one by a developed and well marked carina. Middle of the basal face of the propodeum sometimes with a longitudinal sulcus.

Petiole sub-quadrate. Anterior face of the petiole truncate and separated from the dorsal one by a marked carina. Ventral process of the petiole subtriangular. Postpetiole broadening backwards and narrower than the first gastric tergite.

Genitalia as in Fig. 11.

Legs. Femora not inflated. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum with striae converging from the posterior half of the compound eyes to the ocelli. Striae behind the ocelli slightly transversal. Striae between the pair ocelii transversal and converging from the pair to the impair ocellus. Posterior half of the frontal carinae with traces of longitudinal striae. Anterior half of the frontal carinae with striae converging posteriorly. Head dorsum behind the clypeus with striae diverging to the compound eyes. Area close to the insertion of the scape sometimes smooth or with few traces of irregular striae. Ventral part of the head minutely punctate and with sparse, superficial piligerous foveae and thin striae; the striae slightly longitudinal on the middle of the head and perpendicular close to the eyes. Dorsum of the pronotum with irregular, transversal striae and few irregular foveae. Mesonotum and mesopleurae smooth, with sparse piligerous punctures Scutellum with variably impressed longitudinal striae. Basal face of the propodeum and metapleurae covered by thick longitudinal striae. Declivous face of the propodeum smooth. Propleurae with longitudinal striae as those on the scutellum. Petiole with longitudinal striae and few foveae, the striae sometimes very superficial or absent on the dorsum and marked on the sides. Postpetiole, first gastric segment and legs smooth and with sparse, superficial punctures. Remaining gastric segments superficially punctate.

Pilosity. Body covered by pointed hairs of three types: (1) long, suberect, dense on the last gastric segments; (2) shorter and denser than the type (1); (3) shorter than the type (2), decumbent, dense on the coxae, on the anterior face of the fore and mid femora and on the ventral face of the tibiae.

Colour. Black and shining. Anterior third of the head dorsum, mandibles, funiculli and tibiae yellowish-orange to light brown, scapes, coxae, femora and tarsi darker.

Measurements (in mm) and indices: TL 7.58-8.14; HL 1.04-1.12; HW 1.02-1.14; SL 0.24-0.28; SW 0.15-0.16; WL 2.40-2.72; PeL 0.68-0.80; PeW 0.67; HFeL 0.91-0.98; HFeW 0.18-0.20; HTiL 0.79-0.87; HTiW 0.17-0.18; HBaL 0.62-0.71; HBaW 0.07-0.08; CI 96.3-101.8; SI 57.1-62.5; HFeI 19.8-21.3; HTiI 20.6-21.5; HBaI 11.3.

Material examined. **GUATEMALA**: near Tikal, Peten, 24.III.1963, 2 workers, R. M. C. Williams [BMNH]. **COSTA RICA**: La Caja, 8 km W of San José, 2 workers (syntypes of *schmidti*), H. Schmidt [IEGG]; same locality, 1931, 1 gyne (wrongly labelled as syntype of *schmidti*) Schmidt [IEGG]; same locality, 1931, 2 workers, Schmidt [IEGG]; S. José, 2 workers (wrongly labelled as holotype and paratype of *schmidti*) [DEIC]; same locality, in house, sting people, 17.V.1937, 1 worker, F. Quirós [USNM]; same locality, 1940, 1 worker, H. Schmidt [MZSP]; Guanacaste, Santa Rosa, 20.X.1996, 1 worker, F. Fernández-C [IAVH]; Cartago Prov., Turrialba, Catie, 25.V.1995, 1 gyne, J. Rifkind [LACM]. **GALAPAGOS ISLANDS**: S. Seymour, 1 worker (syntype of *williamsi*), W. M. Wheeler [MCZC]; Academy Bay, Indefatigable Is. 11-22.I.1906, 1 worker (erroneous labelled as syntype of *williamsi*), F. X. Williams [MCZC]; Fernandina I., 3 km inland from coast on N side, 450 m, 25-27.III.1970, 19 workers, R. Silberglied [MCZC, MZSP, WEMC]; Fernandina I., Punta Espinosa, 13.V.1983, 9 workers, Y. D. Lubin [LACM]; Isabela I., Caleta Tagus, 9.V.1983, 15 workers, Y. D. Lubin [LACM]. **ECUADOR**: no further locality, 1 worker (holotype of *whymperi*) [BMNH]. Hac de Tenguel, 09.VI.1934, 15 workers, W. von Hagen [LACM, MCZC, USNM]. Los Rios: Babahoyo, III.1938, 1 gyne, H. Hanson & W. H. W. Komp [MCZC]. Guayas: Guayaquil, X.1922, 1 worker, F. X. Williams [MCZC]; same locality, 1 gyne, C. T. Brues [MCZC]. **PERU**: no further locality, 3 workers, 1 gyne, 2 males, E. A. Martínez [LACM, USNM]; Lismaco, 1 gyne, Radoszkowski [MCSN]; Valle Chanchamayo, 800 m, 5 workers, Weyrauch [USNM]. Piura: Sullana, Hda. Mallares, 24.VII.1957, 1 worker, 1 gyne, W. Markl [NHMB]. Lambayeque: Chiclayo, 4 workers, Weyrauch [MCZC]; same locality, Hda. Pátapo, in wood for construction, 2 workers, 1 gyne [MZSP]. Lima: Lima, 2 gynes, Radoszkowski [MCSN, NHMW]; same locality, in wood, 4 males, P. Aguiar [USNM]; same locality, 9.VII.1982, 8 males, J. M. Wilson [LACM]; Ancon, 15.V.1913, 1 gyne, [LACM]. Cuzco: Cuzco, I.1995, 2 workers, M. A. B. Smith [CPCC].

BOLIVIA: Beni: Trinidad, 1 worker, Lizer & Deletang [NHMB]. **CHILE**: Tarapaca: Arica, 18°29' S 70°20' W, 40 m, 24.IX.1966, 1 worker, 1 gyne, M. E. Irwin [LACM]. Antofagasta: Antofagasta, 1988, 13 workers, J. Vidal [MZSP]. **BRAZIL**: Santa Catarina: Blumenau, 1 male, G. Mayr [NHMW].

Discussion. Forel (1892) considered *H. whymperi* a species disctinct from all the other *Cylindromyrmex*. Few years later Emery (1901) proposed the synonymy of *Cylindromyrmex whymperi* (Cameron) with *Cylindromyrmex striatus* because the description of *whymperi* fits well Peruvian gynes of what he thought to be "*striatus*". Wheeler (1910), without justifying his point of view, published a figure of a *Cylindromyrmex* worker under the name *whymperi*. A few years later, Wheeler (1924) described *williamsi* as a new species from the Galapagos, supposed to be different from his "*striatus*" from Guayaquil (Ecuador) and from the worker of *whymperi*. The examination of the type material of *striatus*, *williamsi* and *whymperi* reveals that *whymperi* and *striatus* are distinct species and *williamsi* is a junior synonymy of *whymperi*.

Examination of the material labelled as "typus" of *schmidti* by Menozzi shows several contradictory points. The type locality of *schmidti* is La Caja (Costa Rica) and the "type" (worker?) should have been deposited in the Deutsches Entomologiches Museum and a "cotype" in his own collection. Two workers labelled "S. José, Costa Rica, Holotypus, Paratypus, *Cylindromyrmex schmidti*, Typus! Menoz., Menozzi deter." are preserved in the Deutsches Entomologiches Institut of Eberswalde. These workers are identical to *whymperi*. They are unlikely to be the holotype and paratype of *schmidti* because the locality name does not correspond to the one given by Menozzi (1931). Two workers and a gyne of *schmidti* labelled "La Caja: 8 kil. w. San José C. R., Heinr. Schmidt, TYPUS, are preserved in the Menozzi collection (IEGG). These workers are similar to *whymperi* and are likely to be the true syntypes of *schmidti*. The gyne does not fit the description and drawing of the gyne of *schmidti* by Menozzi (1931). Additional material in the IEGG contains two other gynes with labels similar to those of the "syntype" workers of *schmidti* and fit exactly the description of Menozzi (1931). These two gynes correspond to *meinerti* Forel.

C. whymperi has a much broader distribution than *striatus*. A male in the NHMW labelled "Blumenau (Brazil), *striatus*" (handwriting of Mayr) is definitively not *striatus*. It is identical to all the other males of *whymperi* I examined in this study. I have some doubts about the autenticity of this locality record which is the only one from Brazil for this species.

The species *whymperi* and *striatus* are very similar each other in both worker and gyne. Examination of the sculpture shows that the striae of *whymperi* are much thicker than those of *striatus*, especially on the head dorsum and postpetiole. The head of *whymperi* is shorter and with more convex sides than the one of *striatus*. There seems to be little variation in the thickness of the striae on the mesosoma and on the postpetiole of workers of *whymperi*. The specimens from Hac de Tenguel are those with thickest mesosomal and postpetiolar striation. Two workers, one from Bolivia (NHMB) and the other from Costa Rica (IAVH) have thinner striation on the postpetiole but still definitively thicker than that of *striatus*. Normally gynes of *whymperi* have thicker and less striae on the postpetiole than the gynes of *striatus*. Ten out of eleven gynes of *whymperi* have 22-24 striae on the postpetiole. Only a gyne from Costa Rica (LACM) has 30 striae on the postpetiole, approaching in this way the gynes of *striatus* with 30-34. *Whymperi* exhibits also some colour variation. Rare workers and gynes have the distal half of the tibiae dark brown. The subspecies *striatus tibialis* Stitz is based on specimens with a similar type of coloration.

There are no elements to assert whether *whymperi* is introduced or indigenous in the Galapagos Islands. The most remarkable fact about its distribution is that, judging from the collection records, it seems to be common on the islands. Its success there, however, can be explained in both ways, i. e. by being native of the islands and by the lack of competitors after its introduction (see discussion chapter).

WHEELER (1919) mentioned "*striatus*" from a house of Indefatigable Island (Galapagos Is.). WHEELER (1924, 1936) reports "*williamsi*" nesting in dead branches of the Celastraceous shrub *Maytenus obovata* whose dead parts contained flourishing colonies of *Calotermes pacificus*. The specimens collected on the Ferdinanda Is. by R. Silberglied were under the bark of *Bursera graveolens* (Burseraceae).

Distribution. Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, and Brazil.

Cylindromyrmex striatus Mayr Figs 12-13

Cylindromyrmex striatus Mayr, 1870: 967. Gyne. Nec MAYR 1887 (worker and male = *brasiliensis*). Original description. Type locality: Surinam. Type material: two gynes labelled: "Surinam, Coll. G. Mayr, *striatus*, G. Mayr, Type"; one gyne labeled: "Surinam, M. Haab, Collect. G. Mayr, *striatus*, G. Mayr, Type"; all in NHMW, examined.

Cylindromyrmex striatus Mayr, BROWN 1975. Partim (only material from Guyanas = *striatus*). Nec *Cylindromyrmex williamsi* Wheeler, BROWN 1975: 82. Incorrect synonymy of *striatus*. Misidentification.

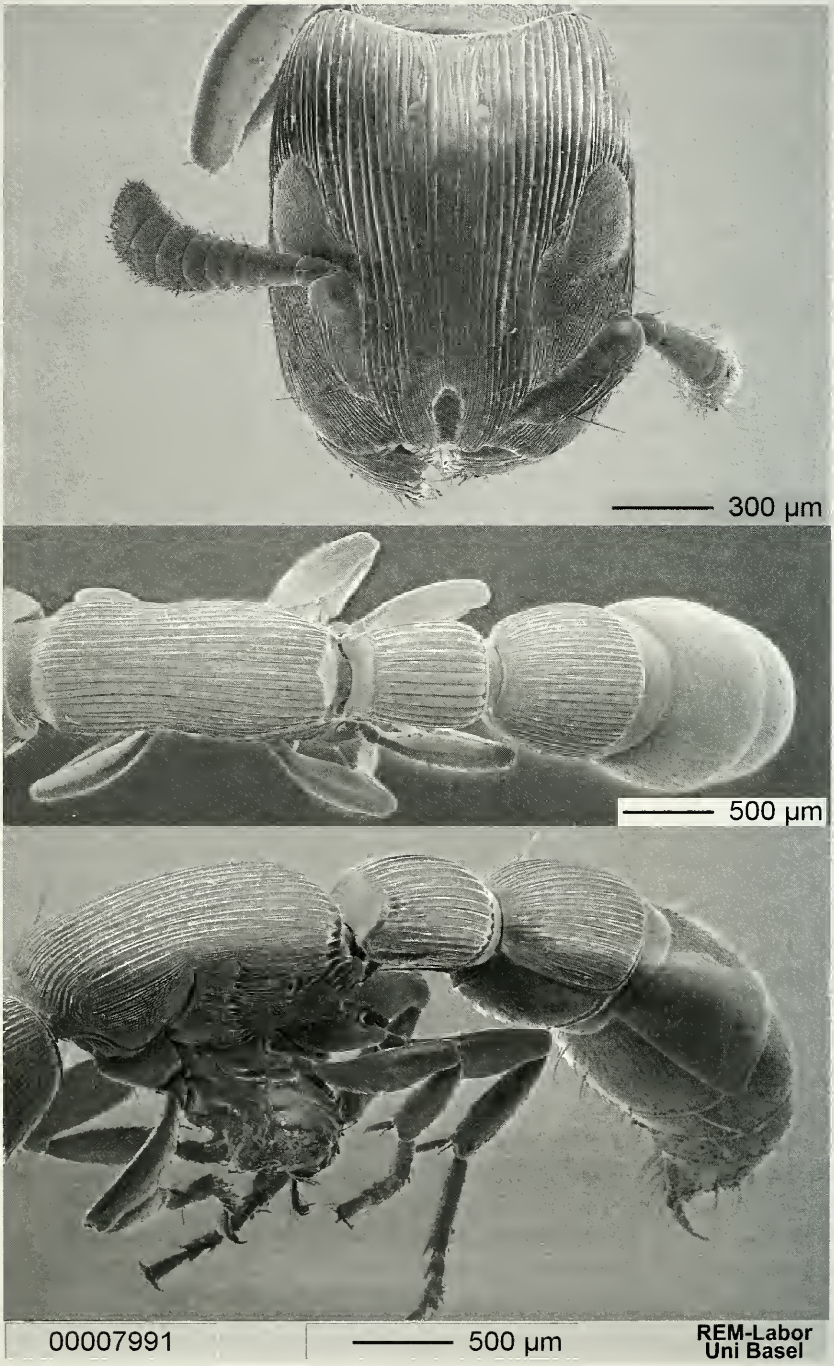
Cylindromyrmex striatus Mayr, SNELLING & HUNT 1975. Partim (only material from Surinam and French Guiana = *striatus*). Nec figs. 19-22 (= *whymperi*).

Cylindromyrmex striatus Mayr, OVERAL & BANDEIRA 1985.

Cylindromyrmex striatus Mayr, FOWLER & DELABIE 1995. Partim (only material from Manaus = *striatus*).

Diagnosis. A Cylindromyrmex species belonging to the *striatus* clade, resulting as sister species of *whymperi* in my analysis, but differing from it by the thinner body striation, by the posterior third of the head dorsum with more than 34 striae instead of 25 at most.

Worker (previously undescribed) (Fig. 12). Head 1/5 longer than broad. Sides of the head subparallel. Occiput low. Vertexal angles round. Frontal carinae about half broad as the maximum head width. Sides of the frontal carinae anteriorly diverging and posteriorly gently convex. Dorsum of the frontal carinae with an impressed, short, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Compound eyes large, convex and slightly behind the mid line of the head. Ocelli well defined. Scapes reaching the anterior border of the eyes. Proximal fifth of the scapes 1/2 narrower than the remaining parts. Mandibles flat and short. Mandibles laterally angulate at the base. Masticatory margin of the mandibles with a set of 4 irregular denticles followed by an apical tooth.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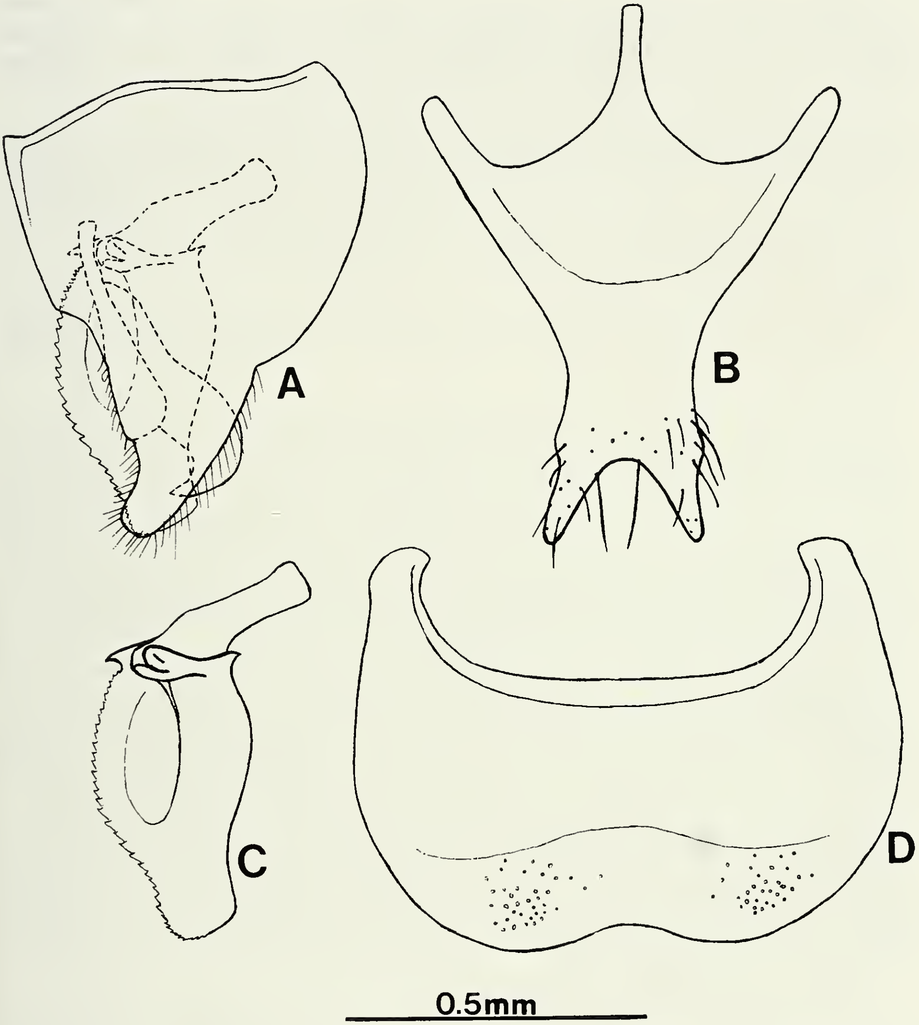


FIG. 13

C. striatus Mayr. Male from French Guyana. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 12. *C. striatus* Mayr. Worker from Pará, Rio Curuá-Una, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Mesosoma gently convex dorsally and as long as or slightly longer than the head (mandibles included). Pronotum with subparallel sides. Mesonotum narrower than pronotum. Propodeal sides slightly convex. Basal face of the propodeum separated from the declivous one by a marked margin converging medially.

Petiole slightly longer than broad, anteriorly truncate and dorsally convex. Petiolar sides gently diverging backwards. Ventral process of the petiole small and triangular. Postpetiole slightly more than 1/4 broader than long. Postpetiolar sides gently convex. Postpetiolar sternite antero-medially with a marked triangular "lip" pointing backwards. Postpetiole in dorsal view antero-laterally angulate. Pygidium as in *whymperi*.

Legs. Femora and tibiae not inflated. Hind basitarsi long, ca. 1.4 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 6 or 7 spine-like setae.

Sculpture. Head mesosoma and postpetiole with thinner striation than those in *whymperi*. Posterior third of the head dorsum and frontal carinae with longitudinal striae, thinner on the anterior part of the frontal carinae. Sides of the head dorsum in front of the compound eyes with thinner striae than on the anterior part of the frontal carinae. Ventral part of the head antero-laterally with longitudinal striae; remaining parts of the ventral part of the head smooth and with minute, superficial piligerous punctures. Mesosoma with longitudinal striae thicker than those on the posterior half of the head dorsum. Pronotum with 20-22 striae. Propodeum with ca. 17 striae. Pleurae with thin longitudinal striae as those in front of the compound eyes, the striae thicker on the upper pro- and metapleurae. Petiolar dorsum with 12-14 striae thicker than those on the mesosoma. Petiolar sides minutely reticulate and with less regular and thinner striae than those on its dorsum. Declivous face of the propodeum and anterior face of the petiole minutely and superficially reticulate. Dorsum of the postpetiole with ca. 29-30 striae similar to those on the mesosoma. Postpetiolar sternite smooth and with small, sparse piligerous foveae. First, second and third gastric tergites and first gastric sternite smooth and with sparse punctuations. Remaining gastric segments reticulate-punctate. Hind coxae with few, thin, longitudinal striae. Legs with very superficial, minute punctures.

Pilosity as in *whymperi* and *brasiliensis*.

Colour black and shining with lighter legs. Tibiae of three pairs of legs yellowish with the distal borders brown.

Measurements (in mm) and indices: TL 6.18-6.56; HL 1.24-1.28; HW 0.99-1.04; EL 0.35-0.36; SL 0.52-0.56; SW 0.15-0.16; WL 1.52-1.72; PW 0.72-0.75; PeL 0.65-0.75; PeW 0.59-0.65; HFeL 0.72-0.78; HFeW 0.25-0.28; HTiL 0.71-0.80; HTiW 0.19-0.21; HBaL 0.52; HBaW 0.09; CI 79.8-81.2; SI 28.6-28.8; HFeI 34.7-35.9; HTiI 26.2-26.8; HBaI 17.3.

Gyne. Similar to the worker but differing from it in the following peculiarities: mesosoma broad medially; parapsidal furrows impressed; posterior part of the head dorsum with slightly thicker striae than on those the anterior part; pronotum with 22-24 longitudinal striae slightly thicker than those on the posterior part of the head dorsum; mesonotum smooth to weakly striated medially, the striae very thin and incomplete; scutellum with 8-10 striae similar to those on the pronotum; dorsum of the propodeum with 18-20 striae similar to those on the pronotum; petiolar dorsum with 13-15 longitudinal striae thicker than those on the pronotum; postpetiolar dorsum with 30-34 longitudinal striae slightly thinner than those on the pronotum

Wings as in fig. 4.

Measurements (in mm) and indices: TL 7.50-7.72; HL 1.30-1.32; HW 1.00; EL 0.40-0.42; SL 0.50-0.51; SW 0.16; WL 2.08-2.12; PW 0.76-0.80; PeL 0.67-0.70; PeW 0.63; HFeL 0.68; HFeW 0.27; HTiL 0.67-0.68; HTiW 0.21-0.22; HBaL 0.53; HBaW 0.09; CI 75.7-76.9; SI 31.4-32.0; HFeI 39.7; HTiI 30.9-32.8; HBaI 17.0.

Male (previously undescribed). Very similar to the one of *whymperi* but differing from it in the following details: head (eyes excluded) slightly longer than broad; vertexal angles less convex. Scutellum with the sides less converging and with the posterior border less truncate.

Genitalia as in Fig. 13.

Wings as in Fig. 5.

Sculpture. Ventral part of the head smooth and with few, small piligerous foveae. Scutellum, propleurae, petiole, postpetiole, gaster and legs smooth and with minutele, superficial punctures, more impressed on the last gastric segments. Ventral border of the propleurae with two-three longitudinal striae.

Colour. Head and mesosoma dark brown-black and shining. Gaster brown. Mandibles, antennae and legs yellow to light brown. The specimen in question is imature.

Measurements (in mm) and indices: TL 7.74; HL 1.05; HW 1.00; SL 0.26; SW 0.15; WL 2.54; PeL 0.73; PeW 0.68; HFeL 0.95; HFeW 0.20; HTiL 0.81; HTiW 0.17; HBaL 0.62; HBaW 0.08; CI 95.2; SI 57.7; HFeI 21.0; HTiI 21.0; HBaI 12.9.

Material examined. **SURINAM**: no further locality, 3 gynes (syntypes), G. MAYR [NHMW]. **FRENCH GUYANA**: no further locality, 1 gyne, 1 male [MNHN]. **BRAZIL**: AMAZONAS: Manaus, 15.II.1989, 1 worker, H. G. FOWLER [CPCC]. PARA: Rio Curuá-Una, 13.XII.1984, 1 worker, W. L. OVERAL [MZSP].

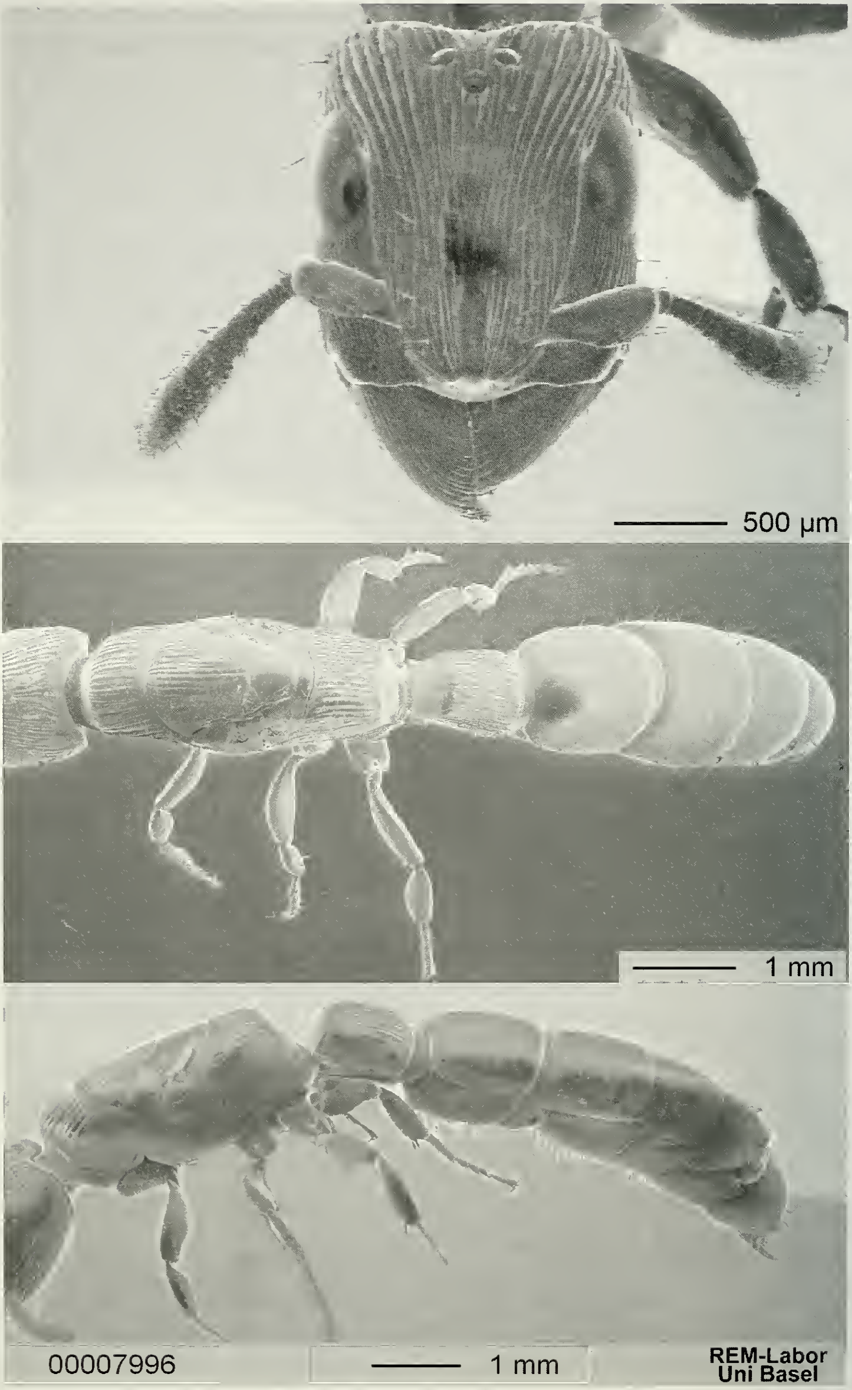
Discussion. C. striatus is a rarely collected species occuring only in the northern part of South America. The similarities between *striatus* and *whymperi* and the small number of *striatus* specimens available for study is one of the reasons for which *whymperi* has been considered a junior synonymy of *striatus*. The sole male of *striatus* I examined is also very similar to *whymperi*. Few differences are visible in their genitalia (Figs. 10 & 13). *Striatus* and *whymperi* are allopatric (Fig. 37).

OVERAL & BANDEIRA (1985) found specimens of *striatus* in nests of *Nasutitermes* sp. and *N. surinamensis*.

Distribution. Surinam, French Guyana and Brazil.

THE *BOLIVIAE* CLADE

C. boliviae is an isolate species representing a clade of its own. It differs from the species of the *striatus* clade by the following characters: (1) hind coxae with a concavity close to the articulation with trochanter, (2) male with frontal carinae broad anteriorly and narrower posteriorly, and (3) male hypopygium with a bidentate median projection between the apodemes. It differs from the species of the *brevitarsus* and *longiceps* clades by the following characters: (1) mid basitarsi longer than 1/2 of the hind basitarsi, and (2) apical tarsomeres of hind legs shorter than the sum of second and third tarsomeres.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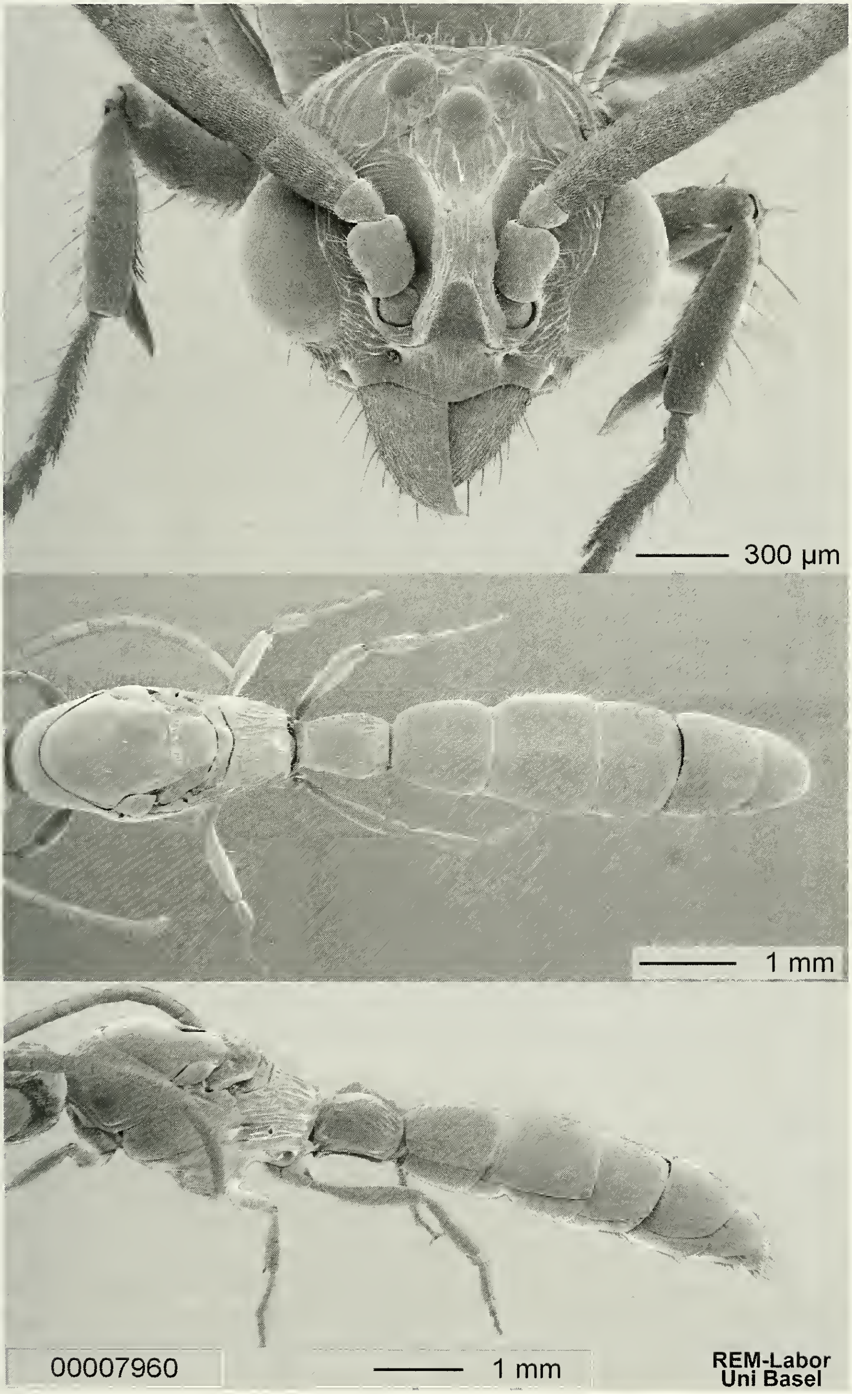
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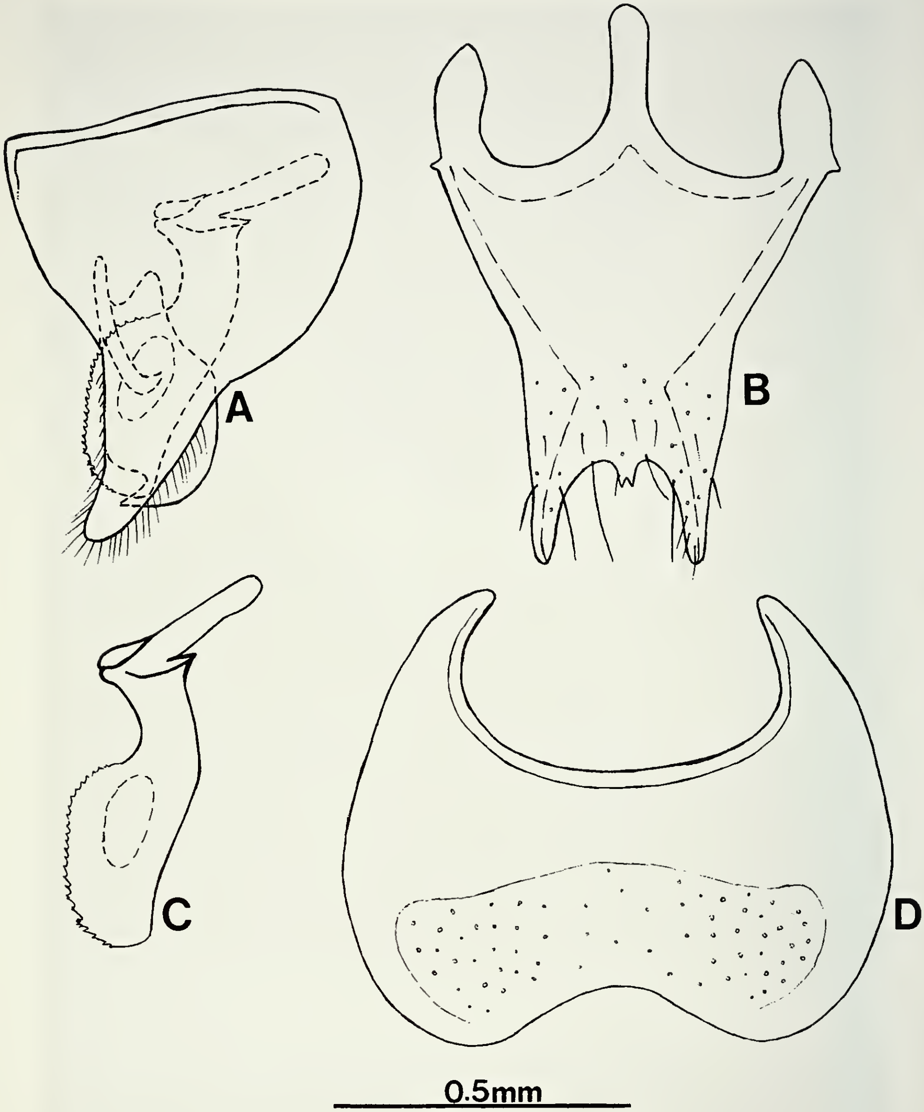


FIG. 16

C. boliviae Wheeler. Male from Rancho Grande, Aragua, Venezuela. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 14. *C. boliviae* Wheeler. Gyne from Rancho Grande, Aragua, Venezuela. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Fig. 15. *C. boliviae* Wheeler. Male from Rancho Grande, Aragua, Venezuela. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Cylindromyrmex boliviae Wheeler Figs 4, 14-16

Cylindromyrmex boliviae Wheeler, 1924: 104, fig. 20. Gyne. Original description. Type locality: Mapiri, Bolivia. Type material: 1 alate gyne (head missing) labelled: "Mapiri, Bolivia: Cotype; Gift of W. M. Wheeler; M.C.Z. Cotype, 20336", in MCZC, examined.

Cylindromyrmex striatus Mayr, Emery 1901: 54 (male, Peru). Nec Mayr 1870. Misidentification.

Diagnosis. A Cylindromyrmex species differing from all the others by the postpetiole smooth or at most with traces of superficial, short striae on the the posterior half.

Gyne (Fig. 14). Head ca. 1/4 longer than broad, with parallel sides. Occiput slightly higher than in the species of the *striatus* clade. Frontal carinae ca. 1/3 narrower than the maximum head width. Sides of the frontal carinae diverging backwards and reaching at least the middle of the compound eyes posteriorly. Dorsum of the frontal carinae with an impressed, median sulcus anteriorly. Frontal carinae reaching the anterior border of the clypeus. Compound eyes large, gently convex and largely on the posterior half of the head. Ocelli well developed. Scapes reaching the anterior border of the compound eyes. Proximal third of the scapes ca. 1/2 narrower than the remaining parts. Mandibles massive and strongly convex dorsally. Masticatory margin of the mandibles each with a set of 10-12 irregular, minute denticles followed by an apical tooth.

Mesosoma dorsally flat and slightly more than 1/3 longer than the head (mandibles included). Pronotal dorsum with the sides superficially marginate. Propleurae concave. Mesopleurae gently convex. Propodeal sides converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a superficial margin.

Petiole ca. 1/5 longer than broad, anteriorly truncate and the dorsally gently convex. Petiolar sides diverging backwards. Ventral process of the petiole large, subround or obliquely truncate. Postpetiole subquadrate and slightly broader posteriorly. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially only with superficial traces of a triangular "lip". Pygidium in side view subtruncate. Pygidium in dorsal view with the sides bearing many irregularly distributed small denticles converging to 4-6 small teeth over the sting.

Legs. Femora and tibiae not strongly inflated. Hind basitarsi 1/4 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi with 5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by longitudinal striae, thicker on the posterior half of the head dorsum. Striae close to the antennal scrobes thinner than those on the remaining parts of the anterior half of the head. Dorsum of the pronotum with about 18-21 striae similar to those on the posterior part of the head dorsum. Center of the mesonotum with about 9-12 striae, thinner than those on the pronotum; remaining parts of the mesonotum and scutellum smooth, or sides of the mesonotum with thin, superficial, short striae. Dorsum of the propodeum with about 21-24 striae similar to those on the mesonotum. Propleurae, lower mesopleurae, metapleurae and sides of the petiole minutely and superficially reticulate-punctated and with longitudinal striae similar to those close to the atennal scrobes. Upper mesopleurae smooth. Petiolar dorsum with about 15-17 striae similar to those on the propodeum. Declivous face of the propodeum and anterior face of the petiole minutely reticulate-punctate. Postpetiolar dorsum smooth and sometimes with very thin, short, superficial striae on the center of the posterior half. Postpetiolar sternite and gaster smooth and with variably impressed punctuations, denser and larger on the the postpetiolar sternite. Last three gastric sternites and sides of their corresponding tergites minutely and superficially reticulate-punctated. Coxae not striated. Legs with very superficial, minute punctures.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, rare on the head, on the mandibles, on the anterior border of the clypeus, on the mesosoma, on the pedicel, on the ventral process of the petiole and on the gaster, dense on the pygidium; (2) shorter than the type (1) rare and suberect on the whole body except on the sternites these hairs are sub- or decumbent; (3) shorter than the type (2), erect to suberect on the whole body except on the posterior half of the ventral part of the head, on the gaster and on the legs these hairs are sub- or decumbent. In addition, the hypostomal bridge surrounded by a row of hairs similar to those of type (1) but appressed and apically curved.

Colour black and shining. Legs dark orange-brown with darker tarsi and black coxae. Imature specimens with mandibles, antennae, coxae and pygidium reddish-brown, last funicular joints orange.

Measurements (in mm) and indices: TL 9.64-10.28; HL 1.60-1.64; HW 1.24-1.28; EL 0.50-0.54; SL 0.65-0.67; SW 0.23-0.24; WL 2.72-2.76; PeL 0.90-1.00; PeW 0.80-0.81; HFeL 0.88-1.02; HFeW 0.37-0.45; HTiL 0.80-0.92; HTiW 0.24-0.29; HBaL 0.60-0.65; HBaW 0.10-0.11; CI 77.5-78.0; SI 35.4-35.8; HFeI 42.0-43.1; HTiI 30.0-32.5; HBaI 16.4-16.9.

Male (Fig. 15). Head as broad as long. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior half of the head. Frontal carinae high. Borders of the frontal carinae broad, convex on the anterior third and subparallel posteriorly. Frons anteriorly concave, medially gently convex and posteriorly sloping to the impair ocellus. Anterior border of the clypeus convex medially. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes short and thick. Funicular joints stout; first joint about 1/2 shorter than the second one. Second and last two funicular joints thinner than joints 3-10.

Mesosoma robust. Pronotum in dorsal view with diverging sides. Mesonotum convex. Parapsidal furrows superficially impressed. Scutellum subround and as high as the mesonotum. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina. Posterior border of the basal face of the propodeum with a short sulcus in the middle.

Petiole slightly longer than broad, broader on the posterior half. Anterior face of the petiole truncate and separated from the dorsal one by a marked carina. Ventral process of the petiole subtriangular. Postpetiole with the sides gently convex and narrower than the first gastric tergite.

Genitalia as in Fig. 16.

Legs not inflated. Hind basitarsi about 1/4 shorter than the hind tibiae. Mid basitarsi slightly more than 1/2 of the lenght of the hind basitarsi.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and striated, the punctures more impressed on the anterior half, the striae thicker on the posterior half, slightly longitudinal and short on the frons, concentric and irregular close to the internal border of the eyes, and converging from the posterior border of the compound eyes to the pair ocelli. Vertexal angles and sides of the ventral part of the head with small, deep, piligerous foveae, larger on the vertexal angles. Middle of the ventral part of the head with thick tranversal striae. Pronotum smooth and with sparse piligerous foveae on the center; some specimens with additional irregular, transversal rugosities between the foveae. Mesonotum and scutellum smooth, with rare, small foveae. Basal face of the propodeum and petiole covered by thick, irregular, longitudinal striae, sometimes missing on the center of the petiole. Declivous face of the propodeum punctate and with rare, very thin, transversal rugosities close to the borders. Pro- and mesopleurae smooth. Metapleurae striated as on the basal face of the propodeum. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the three last gastric segments.

Pilosity. Body covered by pointed hairs of four types: (1) long, sparse and suberect; (2) shorter than the type (1), sparse and suberect, dense, decumbent on the gaster and on the femora; (3) shorter than the type (2) dense, decumbent on the vertexal angles, on the posterior half of the ventral part of the head, appressed on the mandibles on the scapes, on the first funicular joints, on the coxae, on the tarsi and tarsomeres; (4) very short, thick and dense on the 2-12 funicular joints.

Colour. Black and shining. Mandibles, antennae and legs lighter.

Measurements (in mm) and indices: TL 8.22-9.54; HL 1.16; HW 1.16; EL 0.60-0.62; SL 0.25-0.27; SW 0.18-0.19; WL 2.64-2.74; PeL 0.76; PeW 0.70-0.74; HFeL 1.02-1.09; HFeW 0.23-0.25; HTiL 0.89-0.92; HTiW 0.18-0.19; HBaL 0.71-0.74; HBaW 0.08; CI 100.0; SI 66.7-73.1; HFeI 21.1-24.5; HTiI 19.8-20.6; HBaI 10.8-11.3.

Material examined. **COLOMBIA**: CUNDINAMARCA: Medina, Quebrada Ardita, 1475 m, 28.II.1997, 1 gyne, F. Escobar [IAVH]. **VENEZUELA**: ARAGUA: Rancho Grande, 17.VII.1972, 1 gyne, N. A. Weber [MCZC]; same locality, 1100 m, IV.1987, 1 gyne, C. Bordon [MIZA]; same locality, 1200 m, 15.V & 22.VI.1987, 3 males, C. Bordon [MIZA]. **PERU**: LIMA: Calanga, 1 male, Staudinger [MCSN]. **BOLIVIA**: Songo, 1 male [MCSN]. LA PAZ: Mapiri, 1 gyne (holotype), Staudinger [MCZC].

Discussion. Boliviae is known only on the sexuals. The gyne of *boliviae* is easily distinguished from all other species by the characters already listed before and by the very broad frontal carinae reaching the internal border of the eyes. In body shape the gyne of *boliviae* resembles the one of *godmani* of the *longiceps* clade and the worker of *escobari* of the *brevitarsus* clade. *Boliviae*, *godmani* and *escobari* have broad frontal carinae and large, convex mandibles. *Boliviae* and *godmani* share also a broad and large ventral process of the petiole, and *boliviae* and *escobari* have mandibles with more than 11 denticles, and no gastric striae.

The male of *boliviae* can be distinguished from the other *Cylindromyrmex* males by the legs dark brown or black. *Boliviae* males, in addition, have the frontal carinae more similar to males of the *brevitarsus* clade than to males of the *striatus* or *longiceps* clades.

EMERY (1901) attributed with doubts two Peruvian males to "*striatus*". I found in the Emery collection only one of these males and it belongs to *boliviae*.

The size of the eyes of workers was considered an important diagnostic character in *Cylindromyrmex*. The workers of the longiceps clade have small and flat eyes. The workers of the *brevitarsus* clade have the eyes as in the species of the longiceps clade or slightly larger. The workers of the *striatus* clade have relatively large eyes. There is no difference in the size of the eyes of gynes of species with workers with large or small eyes.

Material available for the present study proves that the range of *boliviae*, previously known only from Bolivia and Venezuela, is much broader than what was previously supposed (Fig. 38). A Bolivian locality (Songo) has not been plotted on the map of Fig. 38 because I was unable to localte it.

Distribution. Colombia, Venezuela, Peru and Bolivia.

THE *BREVITARSUS* CLADE

This clade includes four species: *escobari*, *electrinus*, *brevitarsus* and *darlingtoni*. They are characterized by the following synapomorphies: (1) occiput high, (2) ventral process of the petiole triangular, and (3) hind basitarsi wit 4 spine-like setae.

Cylindromyrmex escobari n. sp. Fig. 17

Cylindromyrmex brasiliensis Emery, FERNANDEZ-C. & ESCOBAR, 1997: 347. Worker. Nec EMERY 1901. Misidentification.

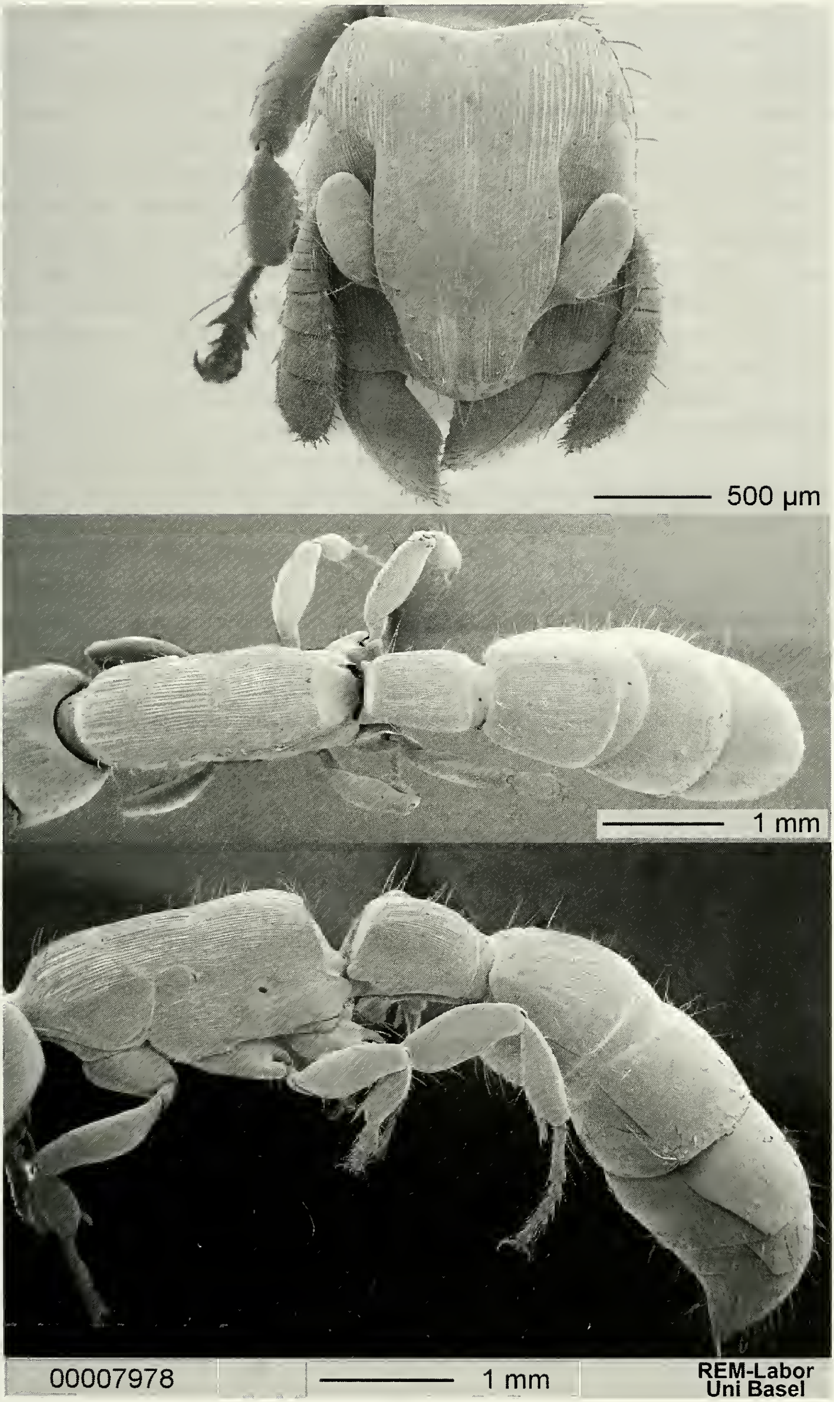
Holotype: Worker labelled: "Colombia, Nariño, Ricaurte La Planada, 1°17' N 78°15' W, 1800 m, interior bosque, bmh-PM, Col: F. Escobar", in IAVH.

Derivatio nominis. *C. escobari* is named after Federico Escobar, the collector of this species.

Diagnosis. The basalmost species of the brevitarsus clade, differing from all the other species by the antero-median margin of the clypeus convex and by the absence of striae on the gaster.

Worker (Fig. 17). Head ca. 1.5 times longer than broad, with subparallel sides. Occiput high. Vertexal angles convex. Frontal carinae more than half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards and reaching at least the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae not reaching the anterior border of the clypeus. Antero-median clypeal margin strongly convex. Compound eyes intermediate in size between the species of the *longiceps* and *striatus* clades, slightly flat and on the posterior half of the head. Ocelli represented by superficial impression only. Scapes stout and surpassing the anterior border of the eyes posteriorly. Proximal third of the scapes 1/2 narrower than the remaining parts. Mandibles strongly convex dorsally. Masticatory margin of the mandibles each with a set of 13-14 irregular denticles followed by an apical tooth.

FIG. 17. *C. escobari* de Andrade. Worker from Ricaurte, La Planada, Nariño, Colombia. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).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Mesosoma gently convex dorsally and slightly less than 1/5 longer than the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures superficially impressed. Mesonotum slightly narrower than pronotum. Tegula superficially marked. Propodeum with the sides weakly convex. Basal face of the propodeum separated from the declivous one by a superficial margin.

Petiole rectangular, anteriorly truncate and the dorsally convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subtriangular. Postpetiole ca. 1.5 broader than long. Postpetiolar sides diverging posteriorly. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially with a superficial triangular "lip" pointing backwards. Pygidium in side view obliquely truncate. Pygidium in dorsal view with the sides bearing many irregularly distributed small denticles converging to 4 small teeth over the sting.

Legs. Coxae and tibiae slightly inflated. Mid basitarsi strongly broadening distally. Hind basitarsi about 1/3 shorter than the maximum length of the hind tibiae. Mid basitarsi 1/2 of the length of the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, slightly thicker on the posterior third of the head dorsum and on the center of the ventral part of the head, absent on the posterior corners of the ventral part of the head. Mesosoma longitudinally striated. Pronotum and mesonotum with striae thicker than those on the propodeum. Pronotum with about 28-30 longitudinal striae similar to those on the posterior part of the head dorsum. Propodeum with about 30-35 longitudinal striae. Pleurae with very thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 30-35 striae slightly thinner than those on the propodeum. Petiolar sides with very thin, superficial striae. Declivous face of the propodeum and anterior face of the petiole with superficial reticulation. Dorsum of the postpetiole with striae thinner than those on the petiolar dorsum. Remaining gastric tergites, sternites and legs smooth, with minute, superfical reticulation more impressed on the distal segments of the gaster. Ventral face of the hind coxae with thin, longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, sparse on the head, on the mesosoma, on the pedicel and on the gaster, dense on the pygidium; (2) shorter than the type (1), suberect and variably distributed on the whole body; (3) shorter than the type (2), sparse, suberect or subdecumbent on the whole body. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved. Outer ventral border of the mandibles with hairs similar to those of the hypostomal bridge but shorter.

Colour black. Mandibles, antennae and coxae dark ferrugineous-brown. Legs yellow-orange to light brown with darker tarsi.

Measurements (in mm) and indices: TL 8.16; HL 1.56; HW 1.28; SL 0.732 SW 0.25; WL 2.16; PeL 0.68; PeW 0.56; HFeL 1.00; HFeW 0.37; HTiL 0.85; HTiW 0.26; HBaL 0.50; HBaW 0.09; CI 82.0; SI 34.7; HFeI 37.0; HTiI 30.5; HBaI 18.0.

Material examined. **COLOMBIA**: Nariño: Ricaurte, Reserva La Plananda, 1°17' N 78°15'W, 1800 m, 1 worker (holotype), F. Escobar [IAVH].

Discussion. Escobari differs from the other species of the *brevitarsus* clade mainly by the absence of striae on the first gastric tergite. In particular, it differs from *electrinus* by the larger and more massive mandibles with 13-14 denticles instead of smaller and less massive and with 6-7 denticles. From *darlingtoni* and *brevitarsus*, *escobari* differs by the more elongate body. *Escobari* in general body shape resembles more *darlingtoni* than *brevitarsus*. A comparison of *escobari* and *darlingtoni* proves that they are very different each other. *Escobari* can be separated from *darlingtoni* by the strongly convex anterior border of the clypeus, by the frontal carinae not reaching the anterior clypeal border and by the more enlongate femora.

Comparisons were made also between the worker of *escobari* and the gynes of *boliviae* and *godmani*, two species the workers of which are still unknown and occurring close to the area where *escobari* was collected. *Escobari* has concolour femora and tibiae (yellowish-orange to light brown) and *godmani* has black femora and yellow tibiae. *Escobari* differs from *boliviae* by the postpetiole striate instead of smooth or with very superficial, short striation restricted to the center of the posterior half, and by thinner striation.

FERNANDEZ- C. & ESCOBAR (1997) reported this species from decayed wood.

Distribution. Colombia.

Cylindromyrmex electrinus sp. n. Figs 2 & 18

Holotype: Winged gyne in an amber sample without reference number from the MCZC.

Derivatio nominis. From the Latin electrinus (= made of amber).

Diagnosis. A species appearing in an unresolved position together with *brevitarsus* and *darlingtoni* within the *brevitarsus* clade, but differing from both other species by the following combination of characters: basal face of the propodeum separated from the declivous one by a marked margin, by the coxae and femora black instead of dark brown, and by the mid basitarsi long and not broad distally.

Gyne (Figs 2 & 18). Head ca. 1/4 longer than broad, with parallel sides. Occiput high. Vertexal angles convex. Frontal carinae about half broad as the maximum head width. Anterior third of the frontal carinae diverging backwards. Dorsum of the frontal carinae with an impressed, median sulcus anteriorly. Frontal carinae reaching the anterior border of the clypeus. Compound eyes large, slightly flat and mostly on the posterior half of the head. Ocelli well developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes about 1/2 narrower than the remaining parts. Mandibles convex dorsally. Masticatory margin of the mandibles with a set of 6-7 irregular denticles followed by a pointed apical one.

Mesosoma dorsally flat and ca. 1.3 longer than the length (mandibles included). Pronotum dorsally with the sides superficially marginate. Propleurae gently concave. Mesopleurae gently convex. Propodeum with the sides converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a margin.

Petiole ca. 1/4 longer than broad, snteriorly truncate and the dorsally convex. Ventral process of the petiole triangular. Postpetiole diverging backwards and broader posteriorly. Anterior corners of the postpetiole angulate. Postpetiole in dorsal view antero-laterally angulate. Postpetiolar sternite antero-medially with a salient, triangular "lip" pointing backwards. Pygidium obliquely truncate; its sides bearing many irregularly distributed small denticles converging to 4 small teeth over the sting.

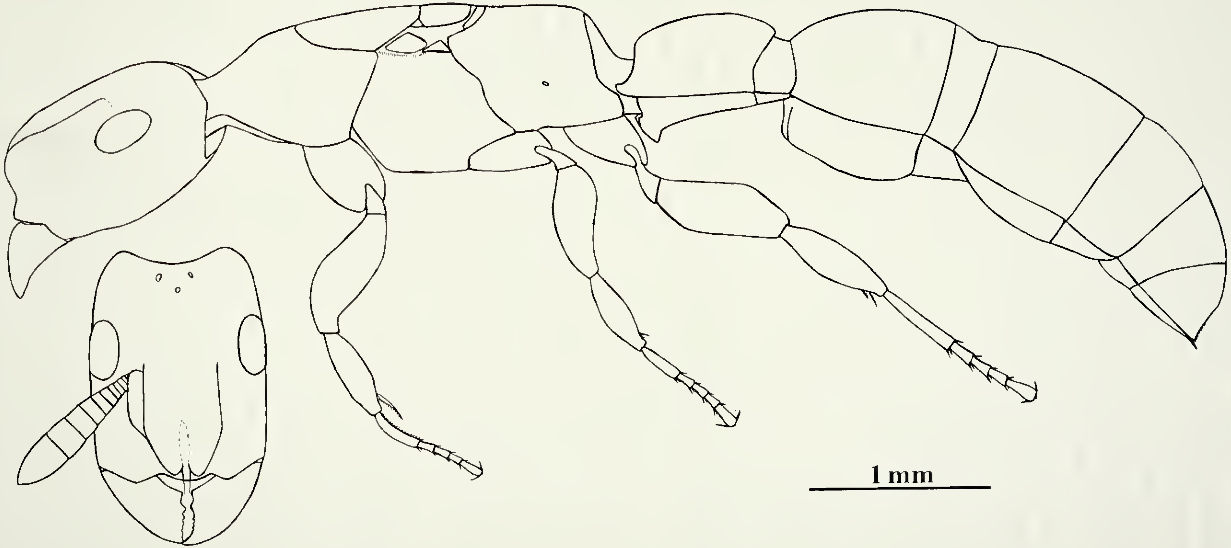

FIG. 18
C. electrinus de Andrade. Gyne from Dominican amber. Body in profile (top), head in full dorsal view (bottom).

Legs. Femora slightly inflated. Mid basitarsi with parallel sides. Hind basitarsi slightly less than 1/3 shorter than the length of the hind tibiae. Mid basitarsi ca. 1/2 of the length of the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior part of the dorsum, thinner close to the antennal scrobes, absent on the posterior third of the ventral part of the head. Posterior third of the ventral part of the head minutely punctate and smooth. Dorsum of the pronotum with at least 40 striae similar to those on the posterior part of the head dorsum. Mesonotum with at least 25 striae thinner than those on the pronotum. Scutellum covered by striae slightly thinner than those on the mesonotum. Dorsum of the propodeum covered by striae similar to those on the mesonotum. Pleurae and petiole with longitudinal striae similar to those on the scutellum, the striae more superficial on the upper mesopleurae and on the sides of the petiole. Petiolar dorsum with at least 25 striae. Postpetiole covered by at least 50 striae similar to those on the mesonotum. First gastric tergite with very thin, short striae on the center of the anterior half only. Remaining gastric tergites and sternites smooth and with variably impressed punctuations more impressed on the last segments. Legs with very superficial, minute punctures. Hind coxae with thin, longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae and the clypeus, rare on the external border of the mandibles, rare on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), erect to suberect, sparse on the whole body. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1).

Colour black. Tibiae of three pairs of legs partially yellowish and transparent or dark brown. Tarsi dark brown, tarsomeres lighter.

Measurements (in mm) and indices: TL 7.36; HL 1.24; HW 0.94; EL 0.36; SL 0.46; SW 0.16; WL 2.20; PeL 0.68; PeW 0.56; HFeL 0.75; HFeW 0.30; HTiL 0.64; HTiW 0.21; HBaL 0.47; HBaW 0.08; CI 75.8; SI 36.9; HFeI 40.0; HTiI 32.8; HBaI 17.0.

Material examined. **Dominican amber**: 1 gyne (holotype) without reference number [MCZC].

Discussion. C. electrinus, in the phylogeny proposed in this paper, appears close to the Recent *brevitarsus* and *darlingtoni*. These three species differs from the basalmost species of the clade, *escobari*, by the presence of striae on the first gastric tergite. *Electrinus* shares with *brevitarsus* the frontal carinae reaching the anterior border of the clypeus and the mandibles with 6-7 denticles, and with darlingtoni the striae on the first gastric tergite thin, short and restricted on the anterior part only. *Electrinus* is very similar to both *brevitarsus* and *darlingtoni*, but the characters listed in the diagnosis allow an easy separation of the fossil from both Recent species.

Distribution. Dominican amber.

Cylindromyrmex darlingtoni Wheeler Fig. 19

Cylindromyrmex darlingtoni Wheeler, 1937: 441. Worker and gyne. Original description. Type locality: Cuba. Type material: 2 workers and 2 gynes labelled: "Gran Piedra Rge. Ote, Cuba, 2-3000 ft., 30.VI.1936, P. J. Darlington, MCZ cotype", in MCZC, examined.

Diagnosis. A species belonging to the *brevitarsus* clade and resulting in a unresolved position together with *brevitarsus* and *electrinus*, but differing from both by the frontal carinae surpassing the anterior border of the clypeus instead of as long as the clypeus, and by the mandibles with 9-10 denticles instead of 6-8. *Darlingtoni* differs from *electrinus* by the mid and fore basitarsi shorter and broader distally instead of long and with parallel sides, and from *brevitarsus*, by the ventral face of the hind femora with only traces of longitudinal striae instead of markedly striate.

Worker (Fig. 19). Head ca. 1.5 times longer than broad, with parallel sides. Occiput high. Vertexal angles convex. Frontal carinae about half broad as the maximum head width. Frontal carinae anteriorly diverging backwards and reaching at the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae slightly longer than the anterior border of the clypeus. Compound eyes small, flat and behind the mid line of the head. Impar ocellus minute, pair ocelli reduced to a superficial pit. Scapes almost reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles convex dorsally. Masticatory margin of the mandibles each with a series of 9-10 irregular denticles followed by an apical one.

Mesosoma convex dorsally and as long as the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures superficially impressed. Mesonotum narrower than pronotum. Propodeal sides gently convex and converging posteriorly. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole subquadrate, slightly broader than long, anteriorly truncate and dorsally convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subtriangular. Postpetiole ca. 1.3 broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiole in dorsal view gently angulate antero-laterally. Postpetiolar sternite antero-medially with a superficial, triangular lip pointing backwards. Pygidium truncate; its sides bearing many irregularly distributed, small denticles converging to 4 small teeth over the sting.

Legs. Femora and tibiae slightly inflate. Fore and mid basitarsi strongly broadening distally. Hind basitarsi short, ca. 1/2 shorter than the maximum length of the hind tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior third of the head dorsum, absent on the angles of the ventral part of the head. Meso-

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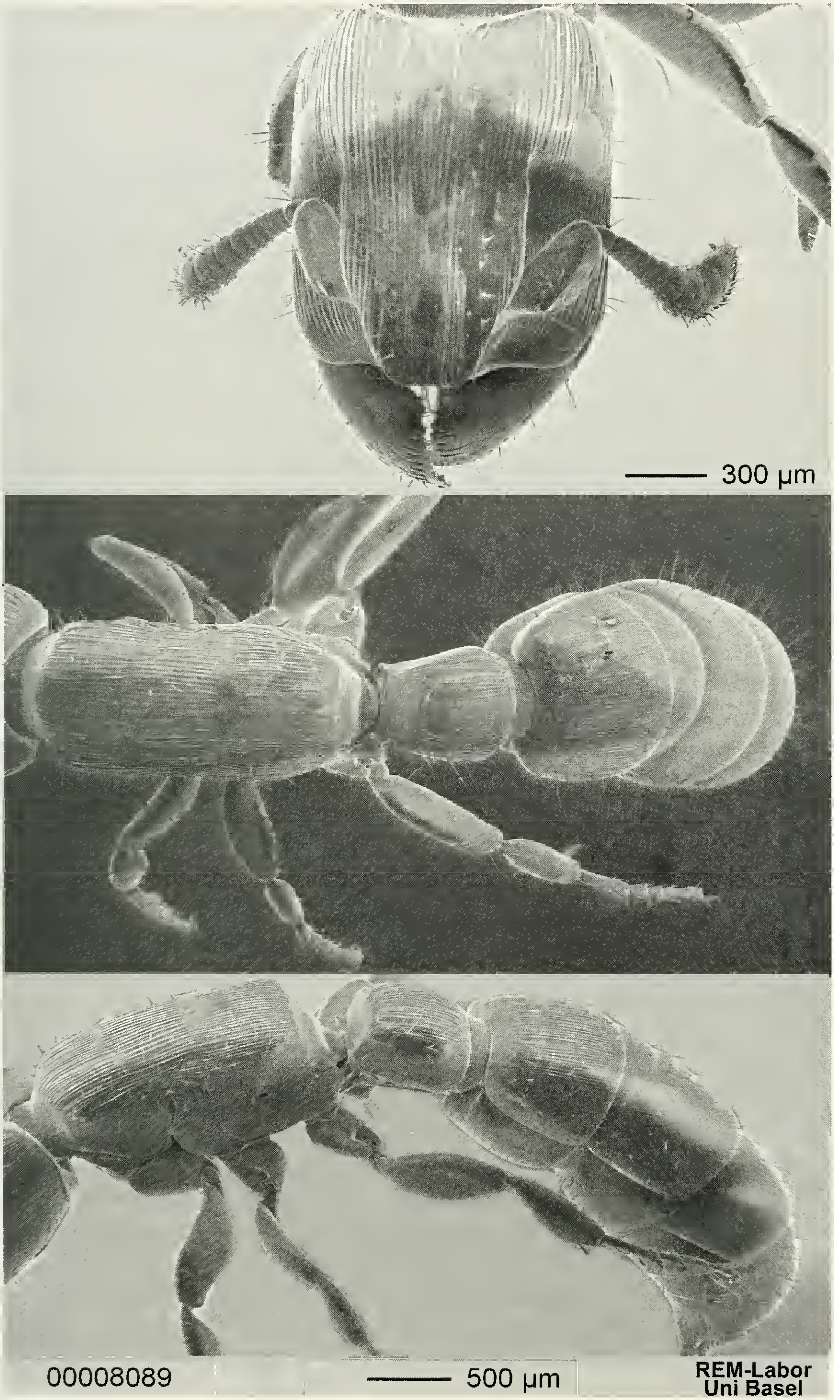
FIG. 19. *C. darlingtoni* Wheeler. Worker from Gran Piedra, Range Oriente, Cuba. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).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soma longitudinally striated, some mesosomal striae bifurcated. Dorsum of the pronotum with about 40 longitudinal striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging to the dorsum of the mesonotum and propodeum. Pleurae with thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 30 striae similar to those on the pronotum. Petiolar sides with minute and superficial reticulation. Declivous face of the propodeum superficially and sparsely reticulate. Anterior face of the petiole smooth. Dorsum of the postpetiole densely covered by striae similar to those on the petiolar dorsum. Second gastric tergite with extremely thin, superficial, longitudinal striae on the center of the anterior half only. Postpetiolar sternite and remaing gastric segments smooth and with sparse punctures. Pygidium, border of the sternites, and legs superficially reticulate. Hind coxae with traces of longitudinal striae.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae nd clypeus, rare on the mandibles, on the mesosoma, on the pedicel, on the gaster and on the legs, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), suberect on the head dorsum and mesosoma, subdecumbent on the pedicel, decumbet on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and antennae browish red. Coxae and femora dark brown. Last funicular joints, tibiae and tarsomeres yellowish-orange, tarsi darker.

Measurements (in mm) and indices: TL 6.52; HL 1.28; HW 1.08; EL 0.25; SL 0.54; SW 0.20; WL 1.64; PeL 0.58; PeW 0.60; HFeL 0.73; HFeW 0.33; HTiL 0.63; HTiW 0.23; HBaL 0.34; HBaW 0.08; CI 84.4; SI 37.0; HFeI 45.2; HTiI 36.5; HBaI 23.5.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large, flat and mostly on the posterior part of the head; ocelli well defined; mesosoma broad medially; parapsidal furrows superficially impressed; petiole slightly longer than broad; anterior half of the mesonotum and of the scutellum with very thin, superficial striae; posterior half of the mesonotum and of the scutellum with few traces of short striae or simply smooth.

Measurements (in mm) and indices: TL 8.16-8.44; HL 1.34-1.36; HW 1.08-1.10; EL 0.46-0.47; SL 0.57; SW 0.21; WL 2.28-2.36; PeL 0.70-0.72; PeW 0.66; HFeL 0.76-0.77; HFeW 0.35-0.36; HTiL 0.66; HTiW 0.24; HBaL 0.40; HBaW 0.08; CI 80.6-80.9; SI 36.8; HFeI 45.4-46.0; HTiI 36.4; HBaI 20.0.

Material examined. **CUBA**: Gran Piedra Range, Oriente, 2-3000 ft 30.VI.1936, 2 workers, 2 gynes (all syntypes), P. J. Darlington, [MCZC].

Discussion. C. darlingtoni is the northernmost species of the genus. It is known only from the type series from Cuba and it is likely to be endemic on the island. Differences between *darlingtoni* and its closest relatives, *brevitarsus* and *electrinus*, are listed in the diagnosis and in the discussion of these species.

The type series of *darlingtoni* was collected in decayed wood.

Distribution. Cuba.

Cylindromyrmex brevitarsus Santschi Figs 20-24

Cylindromyrmex brevitarsus Santschi, 1925: 5. Worker. Original description. Type locality: Brazil. Type material: 1 worker labelled: "Brésil, Rio Negro, Reichensperger", in NHMB, examined.

Diagnosis. A species belonging to the homonymous clade and resulting in an unresolved position with *darlingtoni* and *electrinus*, but differing from *darlingtoni* by the frontal carinae reaching the anterior border of the clypeus instead of longer than the clypeus, and by the mandibles with 6-8 denticles instead of 9-10; and from *electrinus*, by the mid and fore basitarsi shorter and broader distally instead of long, with parallel sides, and by the yellow-light brown femora instead of black.

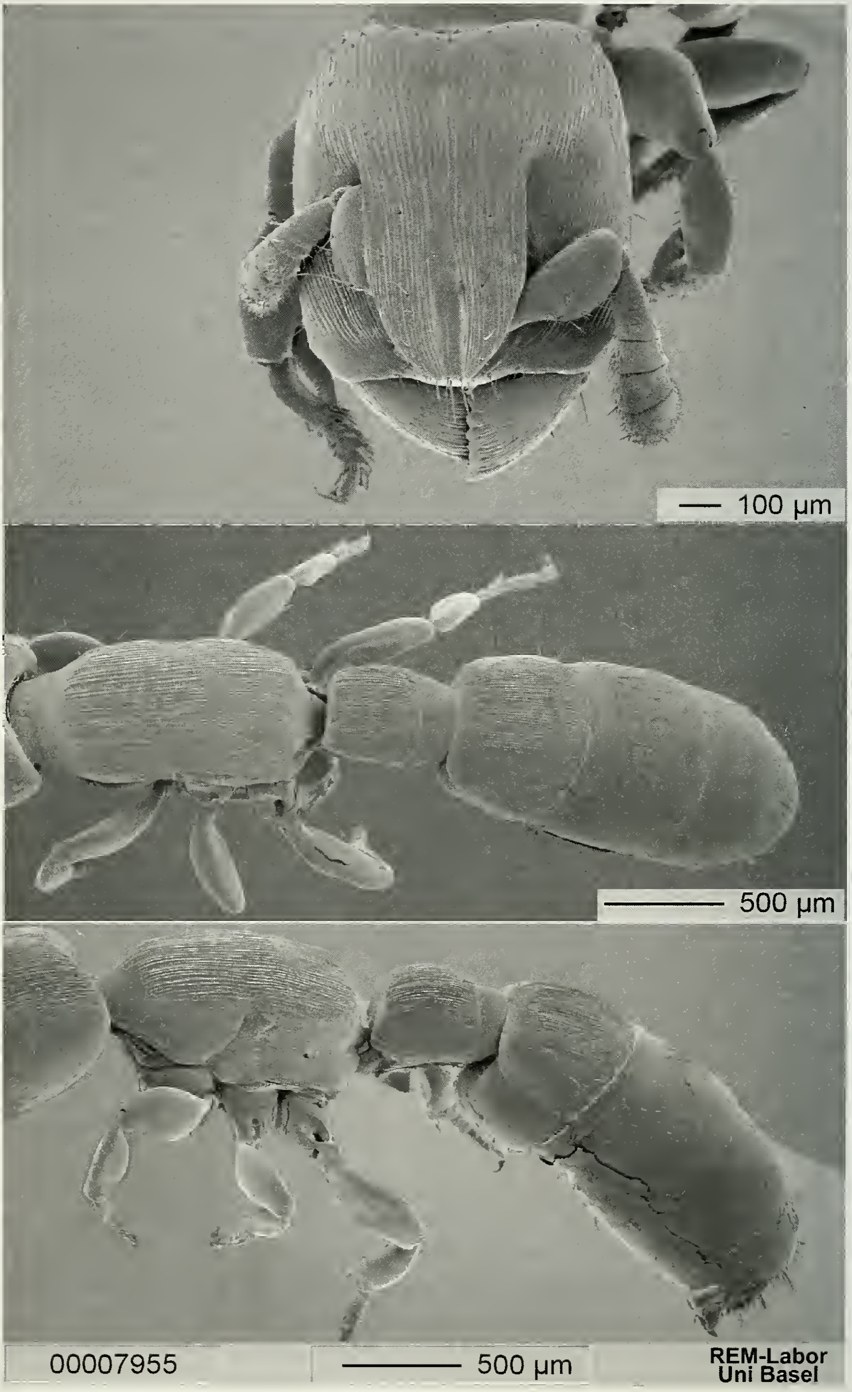
Worker (Fig. 20). Head ca. 1.6-1.7 times longer than broad, with subparallel sides. Occiput high. Vertexal angles convex. Frontal carinae about half broad as the maximum head width. Anterior half of the frontal carinae diverging backwards and reaching the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed, broad, median sulcus anteriorly. Frontal carinae as long as the anterior border of the clypeus. Compound eyes small (minimum 30 and less than 150 ommatidia), flat and on the posterior half of the head. Ocelli reduced to very superficial pits. Scapes reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles convex dorsally. Masticatory margin of the mandibles each with a series of 6-8 irregular denticles followed by an apical one.

Mesosoma convex dorsally and slightly longer or shorter than the head (mandibles included). Pronotum with parallel sides. Promesonotal and propodeal sutures less impressed than in *darlingtoni*. Mesonotum slightly narrower than pronotum. Propodeum with the sides gently convex and converging posteriorly. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole quadrate, slightly broader than long, anteriorly truncate and the dorsally convex. Ventral process of the petiole large and triangular. Postpetiole ca. 1.4 broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiole in dorsal view slightly angulate antero-laterally. Postpetiolar sternite antero-medially with traces of a triangular "lip". Pygidium truncate; its sides bearing many irregularly distributed denticles converging to 4-6 small teeth over the sting.

Legs. Femora and tibiae inflated. Fore and Mid basitarsi strongly broadening distally. Hind basitarsi short, ca. 1/2 shorter than the maximum length of the hind tibiae. Mid basitarsi about 1/2 shorter than the hind basitarsi. Outer apical edge of the hind and of the mid basitarsi respectively with 4,5 spine-like setae.

Sculpture. Head covered by thin, longitudinal striae, thicker on the posterior third of the head dorsum and absent on the corners of the ventral part of the head. Mesosoma longitudinally striated. Dorsum of the pronotum with about 34-38 longitudinal striae similar to those on the posterior part of the head dorsum. Pronotal striae prolonging to the dorsum of the mesonotum and propodeum. Pleurae with thin, superficial, longitudinal striae, less impressed on the propleurae. Petiolar dorsum with about 31-35 striae similar to those on the propodeum. Petiolar sides minutely and superficially reticulate. Declivous face of the propodeum and anterior face of the petiole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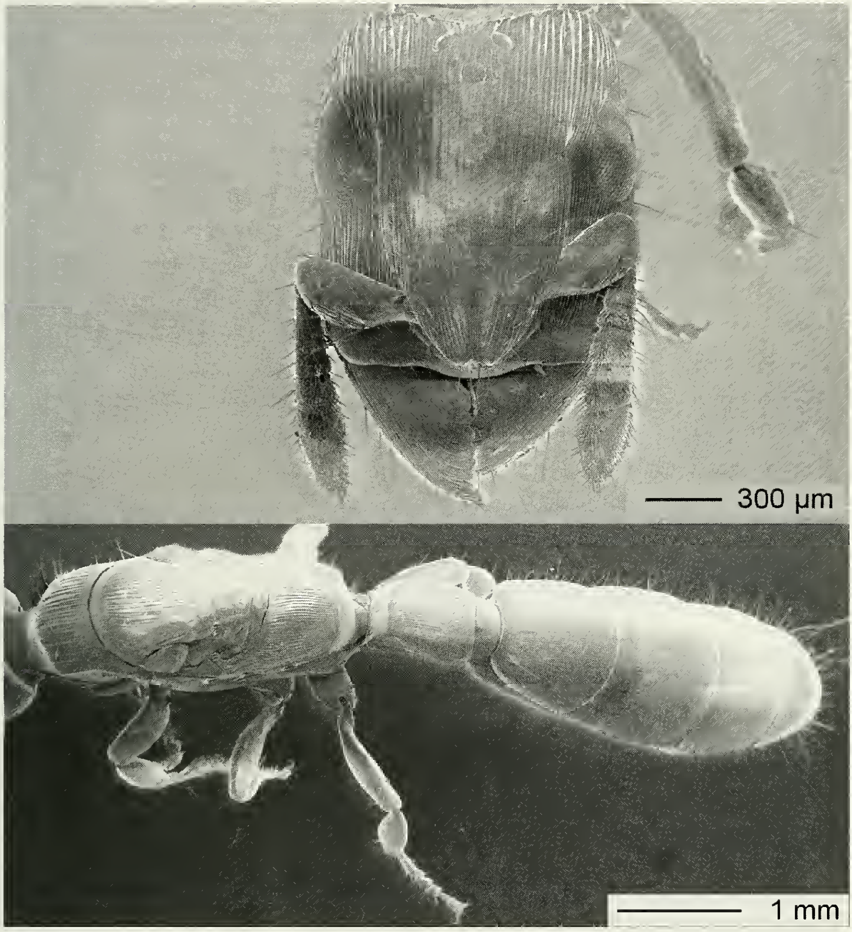
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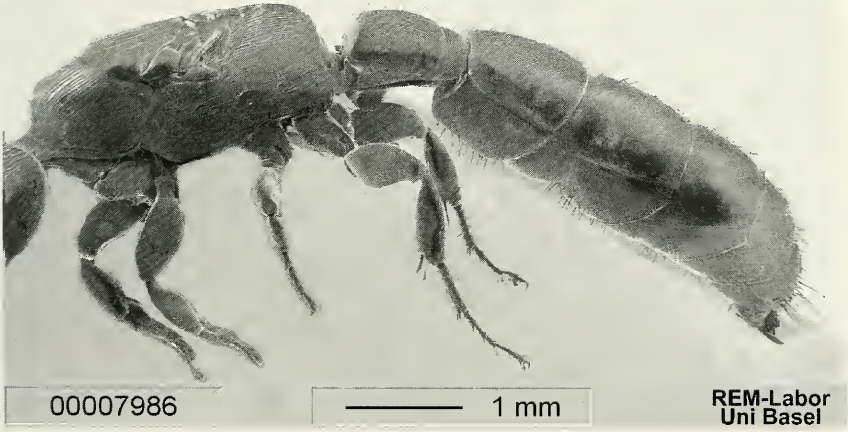
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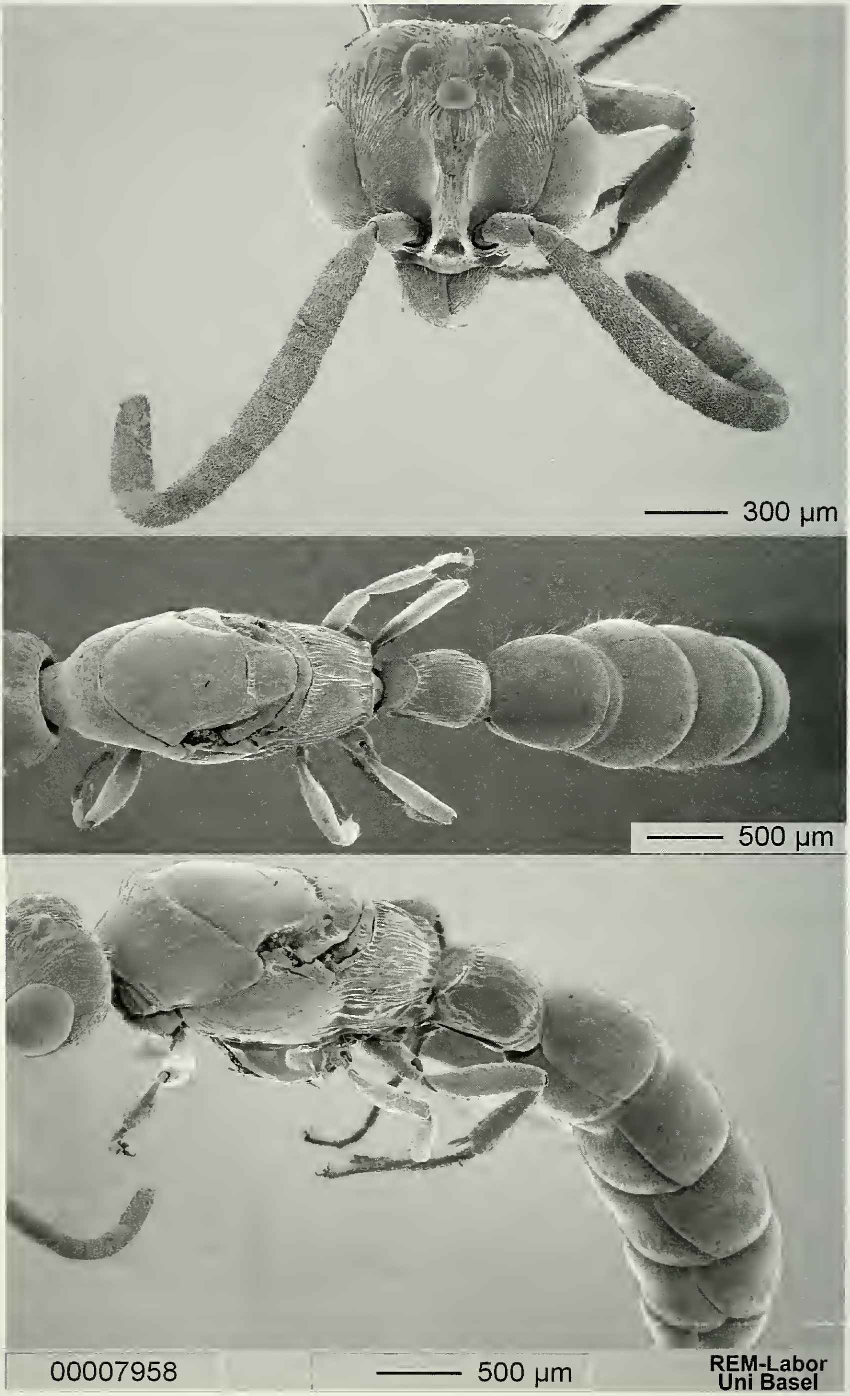
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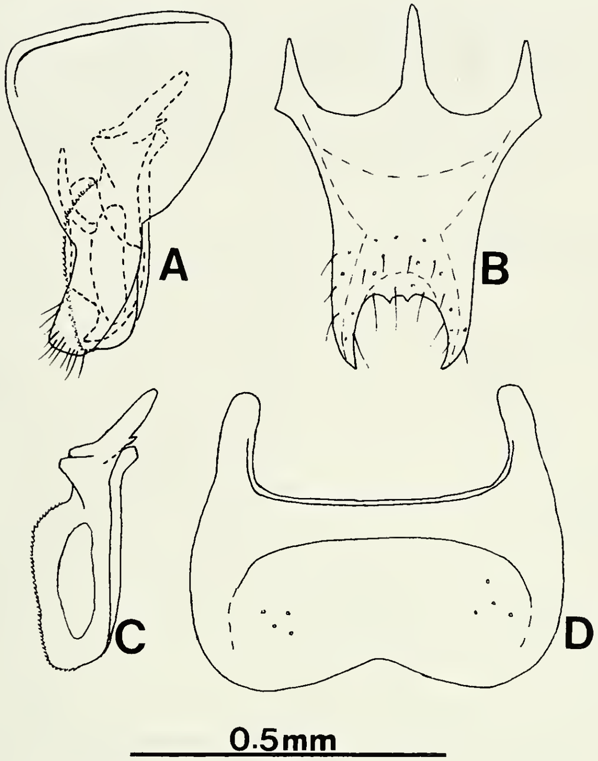


FIG. 23

C. brevitarsus Santschi. Male from Corcovado, Rio de Janeiro, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

FIG. 20. *C. brevitarsus* Santschi. Worker from Corcovado, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

FIG. 21. *C. brevitarsus* Santschi. Gyne from Serra do Mar, Nova Friburgo, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

FIG. 22. *C. brevitarsus* Santschi. Male from Corcovado, Rio de Janeiro, Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

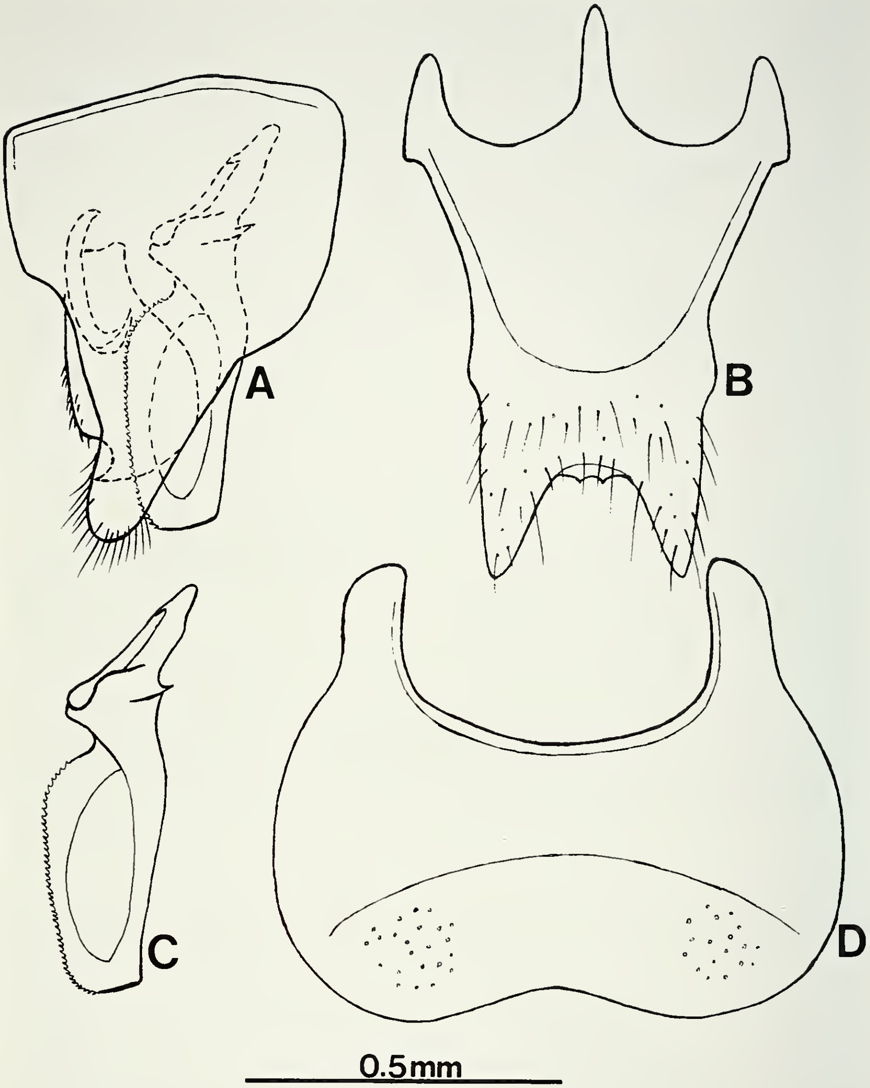


FIG. 24

C. brevitarsus Santschi. Male from Butantan, São Paulo, Brazil. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

smooth or with similar sculpture as on the petiolar sides. Dorsum of the postpetiole densely covered by striae similar to those on the petiolar dorsum. Center of the first gastric tergite with thin, short, longitudinal striae, thinner than those on the postpetiole; mature specimens have the whole first gastric tergite covered by striae and the second gastric tergite with striae on the center only. Postpetiolar sternite and remaing gastric segments smooth and with sparse punctures. Pygidium, border of the sternites, and legs superficially reticulate. Hind coxae with thin, longitudinal striate. Mid coxae with few, fainter striate than those on the hind coxae.

Pilosity as in *darlingtoni.*

Colour light or dark brown. Legs yellowish-orange to light brown with darker coxae and basitarsi.

Measurements (in mm) and indices: TL 4.20-6.44; HL 0.86-1.20; HW 0.75-0.98; SL 0.36-0.43; SW 0.16-0.19; WL 1.04-1.50; PeL 0.36-0.56; PeW 0.41-0.58; HFeL 0.49-0.64; HFeW 0.26-0.30; HTiL 0.40-0.54; HTiW 0.16-0.19; HBaL 0.20-0.29; HBaW 0.06-0.08; CI 81.7-89.2; SI 42.5-45.0; HFeI 45.3-46.9; HTiI 35.2-40.5; HBaI 26.9-31.8.

Gyne (previously undescribed) (Fig. 21). Very similar to the worker but differing from it in the following details: compound eyes very large, flat or gently convex and largely on the posterior part of the head; mandibles with 6-8 denticles; ocelli well defined; mesosoma broad medially; parapsidal furrows weakly impressed; petiole slightly longer than broad; scutellum with very thin, superficial striae, sometimes on the anterior half only; propodeal dorsum with striae thinner than those on the pronotum and on the mesonotum. Some gynes have short striae on the second gastric tergite.

Colour dark brown or black. Antennae, mandibles and coxae dark ferrugineous or brown. Some specimens have the anterior half of the head dorsum dark ferrugineous. Legs dark yellowish-orange or light brown with darker coxae and tarsi. The gyne from Ecuador (LACM) and Serra Norte (MPEG) have the femora light brown with yellowish tibiae.

Measurements (in mm) and indices: TL 5.88-9.40; HL 0.95-1.52; HW 0.80-1.28; EL 0.35-0.46; SL 0.37-0.64; SW 0.16-0.24; WL 1.52-2.04; PeL 0.47-0.78; PeW 0.45-0.72; HFeL 0.53-0.93; HFeW 0.25-0.40; HTiL 0.46-0.81; HTiW 0.18-0.27; HBaL 0.28-0.50; HBaW 0.06-0.09; CI 78.5-84.5; SI 37.5-43.2; HFeI 42.5-47.9; HTiI 32.4-39.1; HBaI 17.4-22.6.

Male (previously undescribed) (Fig. 22). Head slightly longer than broad. Vertexal angles converging to the subtruncate vertexal margin. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Borders of the frontal carinae broad, convex anteriorly, converging and subparallel posteriorly. Frons anteriorly concave, medially convex and posteriorly sloping towards the impair ocellus. Anterior border of the clypeus medially convex. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes about 1/4 longer than broad. Funicular joints narrowing from the base to the apex.

Mesosoma robust. Pronotum in dorsal with the sides diverging posteriorly. Mesonotum slightly convex. Mayrian carinae absent. Parapsidal furrows superficialy impressed. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina.

Petiole slightly longer than broad; anteriorly truncate and dorsally convex. Petiolar sides broadening backwards. Ventral process of the petiole subtriangular. Postpetiole broadening backwards and narrower than the first gastric tergite. Postpetiole antero-laterally subround.

First gastric segment broader than the postpetiole. Second gastric segment narrower or as broad asthe the first segment. Remaining gastric segments narrowing backwards.

Genitalia as in Fig. 23 (normal size males) and Fig. 24 (large size male).

Legs. Femora not inflate. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and with thin striae, the punctures more impressed on the anterior half, the striae slightly longitudinal between the ocelli and on the frons, diverging from the eyes to the frontal carinae. Vertex and sides of the ventral part of the head smooth and with variably distributed small piligerous foveae. Middle of the ventral part of the head with short, tranversal striae. Pronotum smooth and with sparse piligerous foveae on the center; some specimens with additional irregular, transversal striae between the foveae. Mesonotum and scutellum smooth and with rare, small foveae. Basal face of the propodeum and petiole covered by thick, irregular, longitudinal striae, sometimes missing on the center of the petiole. Declivous face of the propodeum punctate and with rare, very thin, transversal rugosities close to the border. Pro- and mesopleurae smooth. Metapleurae striated as on the basal face of the propodeum, the striae thicker and less regular ventrally. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the three last gastric segments.

Pilosity. Body covered by pointed hairs of three types: (1) long, sparse and suberect, denser on the last three gastric segments; (2) shorter than the type (1) and variably distributed on the body; (3) mixed and shorter than the type (2), dense on the vertexal angles, on the posterior half of the ventral part of the head, on the coxae and on the gaster.

Colour. Black and shining. Some specimens with the anterior third of the head dorsum, mandibles and antennae orange-ferrugineous or brown. Legs orange-light brown with darker coxae and basitarsi.

Measurements (in mm) and indices: TL 5.98-8.96; HL 0.85-1.18; HW 0.81-1.24; EL 0.44-0.61; SL 0.19-028; SW 0.13-0.19; WL 1.80-2.84; PeL 0.48-0.84; PeW 0.43-0.76; HFeL 0.68-1.06; HFeW 0.17-0.23; HTiL 0.59-0.85; HTiW 0.14-0.19; HBaL 0.44-0.69; HBaW 0.05-0.07; CI 89.6-105.1; SI 57.1-73.1; HFeI 22.3-27.9; HTiI 21.0-25.4; HBaI 10.1-13.6.

Material examined. **VENEZUELA**: Aragùa: Rancho Grande, 1100 m, 9.IV.1987, 1 gyne [MIZA]; same locality, 1200 m, 22.VI.1987, 1 gyne, C. Bordon [MIZA]; same locality, 1100 m, 28.X.1987, 1 gyne, C. Bordon & H. Romero [MIZA]. **ECUADOR**: Pichincha: Tinalandia, 16 km SE of Santo Domingo de los Colorados, VI.1975, 1 male, S. Peck & J. Peck [MCZC]; Sucumbios, 0.5° S, 76.5° W, 290 m, Sacha Lodge, 22.II-4.III.1994, 1 gyne, 1 male, P. Hibbs [LACM]. **PERU**: Apurimac: no further locality, 14.VIII.1962, 1 worker, M. Dourojeanni [USNM]. **BRAZIL**: Para: Serra Norte, Estação. Manganês, 5-9.IX.1983, 1 gyne, F. F. Ramos [MPEG]. Goias: Jataí, XII.1972, 1 gyne, F. M. Oliveira [MZSP]. Bahia: Ilhéus, Reserva Botânica, CEPEC, 23-24.IV.1987, 1 male [CPCC]. Mato Grosso: Sinop, 55°37' W, 12°31' S, X.1974, 1 male, M. Alvarenga [MZSP]. Rio de Janeiro: Ilha Grande, 16.X.1944, 2 workers, H. Sick [MCZC, MZSP]; Rio de Janeiro, Corcovado, 25.IX.1962, 4 workers, 21 gynes, 23 males, R. L. Araujo [MZSP]; Guanabara, Floresta da Tijuca, I.1974, C. A. C. Seabra & M. Alvarenga [MZSP]; Nova Friburgo, Serra do Mar, Bacco farm, forest, 4769 ft., 1991, 2 gynes, K. P. Bland [BMNH]; Silva Jardim, VIII.1974, 1 gyne, F. M. Oliveira [MZSP]. São Paulo: São Paulo, Butantan, Horto Osvaldo Cruz, 17.I.1971, 1 male, L. Travassos Filho [MZSP]. Parana: Rio Negro, 1 worker (holotype), Reichensperger [NHMB]; same locality and collector, 1 gyne, [NHMB]; same locality, II.1929, 1 male [NHMB].

Discussion. Brevitarsus is very similar to *darlingtoni*. Both species can be separated as stated in the diagnosis and, in addition, also by the hind coxae ventrally markedly striate in *brevitarsus* instead of superficially striate in *darlingtoni*. WHEELER (1937) gave the following characters to separate *brevitarsus* from *darlingtoni*: mandibular shape and dentition, body colour, and size of the eyes. Material available for the present study proves that the body colour and the size of eyes are too variable to be useful to separate *brevitarsus* from *darlingtoni*. The gynes of *brevitarsus* vary remarkably in size (see measurements). The gynes from Corcovado (MZSP) and Jataí (MZSP) are small (TL: 5.88-5.96). Those from Aragua (MIZA), Rio Negro (NHMB), Silva Jardim (MZSP), and Sucumbios (LACM) are intermediate (TL: 7.44-7.64). Those from Nova Friburgo (BMNH) and from Floresta da Tijuca (MZSP) are the largest (TL: 8.20-9.40). There seems to be no relevant morphological differences between small and intermediate size gynes, only the mandibles are shorter and less convex in the small ones. The large gynes differ from the others by the ventral process of the petiole more round. The large size gynes also have the mandibles convex and massive as in the medium ones. From the material available for the present study I find insufficient evidence to regard them as belonging to two (or three) different species.

A Brazilian male from Butantan which I also consider *brevitarsus* has larger size 8.96 instead of 5.98-8.04 (see measurements), more impressed sculpture and darker legs. A comparison of its genitalia with those of two males of "normal" size (Fig. 23) and (Fig. 24) shows no significant differences.

Some workers and gynes of *brevitarsus* may also have the second gastric tergite striate.

Distribution. Venezuela, Ecuador, Peru and Brazil.

THE *LONGICEPS* CLADE

This clade includes four species: *godmani*, *antillanus*, *longiceps* and *meinerti*. They are characterized by the following synapomorphies: (1) first and second gastric tergites striate, (2) male frontal carinae strongly broad anteriorly and touching each other posteriorly, (3) male hypopygium with a simple, impair, median projection between the apodemes.

Cylindromyrmex godmani Forel Figs 25-27

Cylindromyrmex godmani Forel, 1899: 4, pl. 1, fig. 2. Gyne. Original description. Type locality: Panama. Type material: 1 gyne labelled: "V. de Chiriqui, 2-3000 ft., Champion, Holotype, B. C. A. Hym. *Cylindromyrmex godmani*, Forel, Type", in BMNH, examined.

Diagnosis. The basalmost species of the *longiceps* clade differing from all the others by the distance between the frontal carinae, about 2/3 of the head width instead of about 1/3, and by the superficial gastric striae.

Gyne (Fig. 25). Head ca. 1/4 longer than broad. Sides of the head behind the eyes gently converging posteriorly and in front of the eyes slightly convex. Occiput low. Vertexal angles convex. Frontal carinae about 2/3 as broad as the maximum head width. Anteriorpart od the frontal carinae gently diverging posteriorly. Dorsum of the frontal carinae with an impressed median sulcus anteriorly. Frontal carinae in full face view with a deep incision antero-medially and as long as the anterior border of the

FIG. 25

C. godmani Forel. Gyne from Volcan Chiriqui, Panama. Body in profile (left), head in full dorsal view (right).

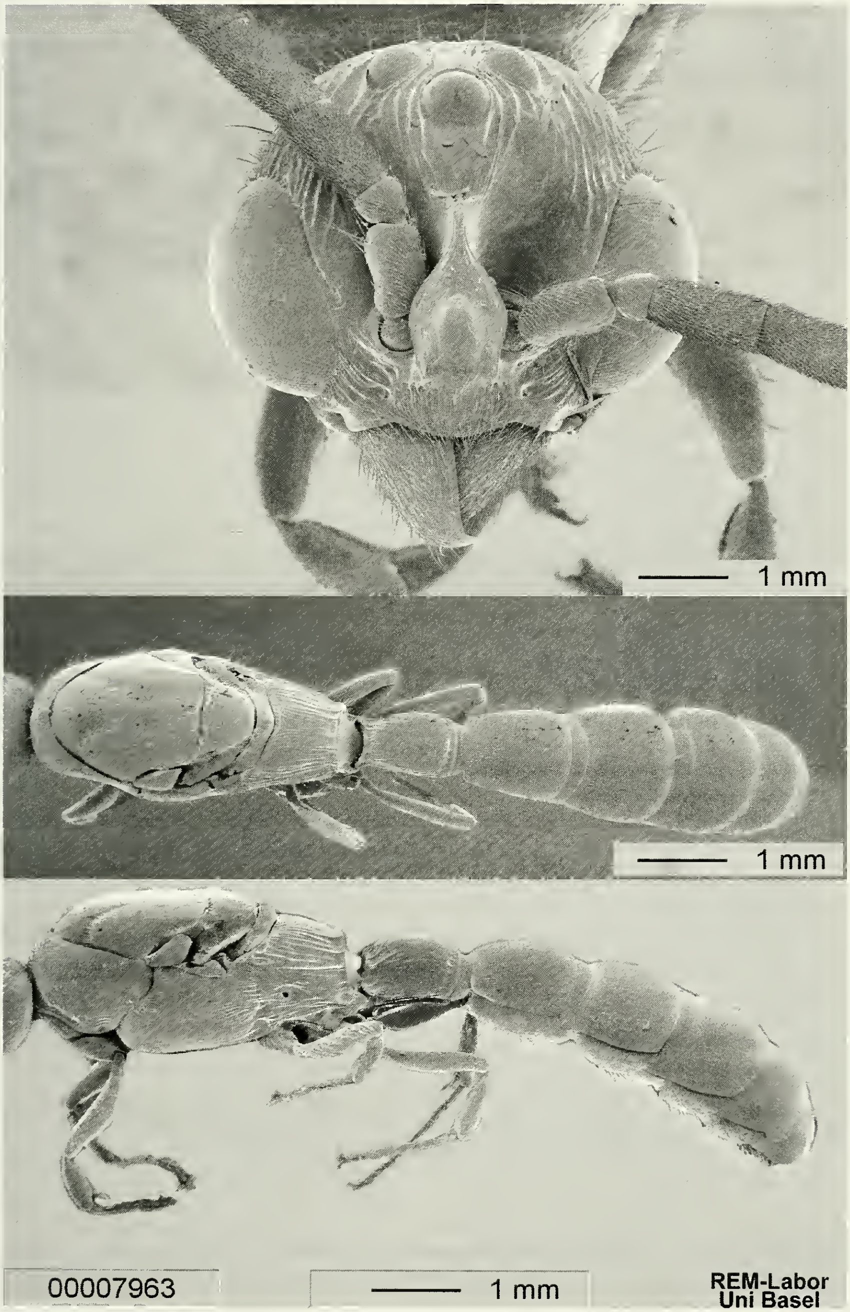


FIG. 26. *C. godmani* Forel. Male from Turrialba, Costa Rica. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

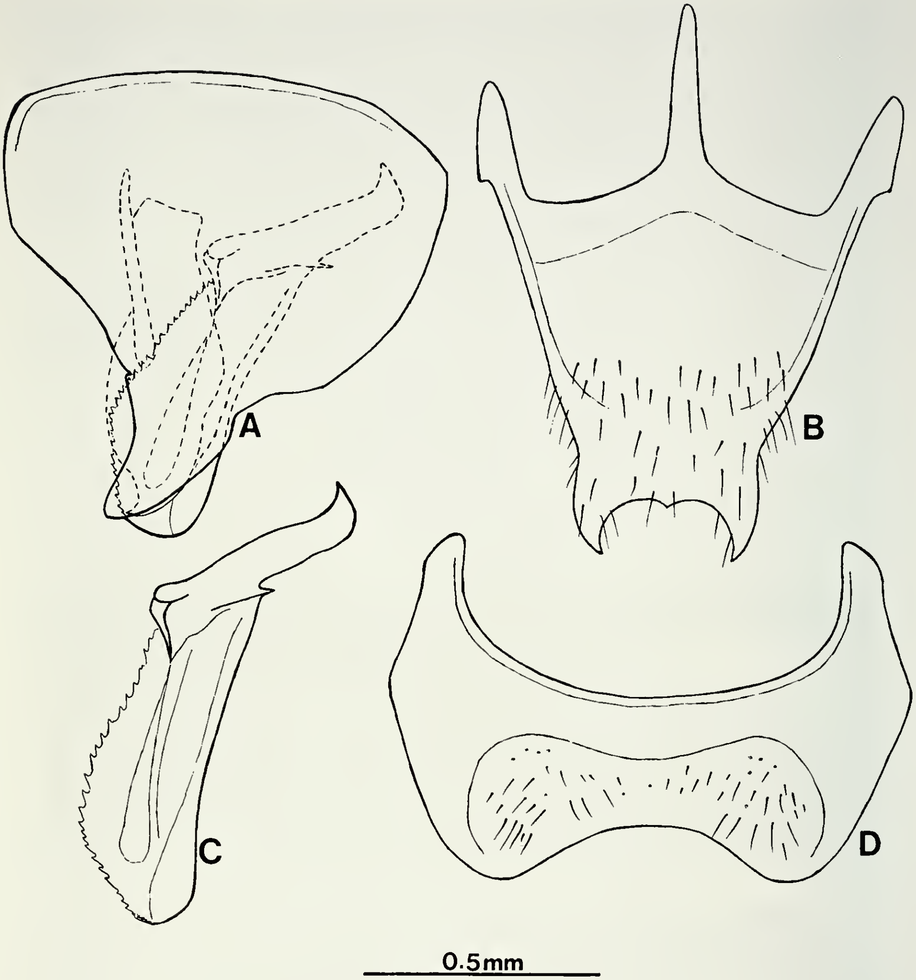


Fig. 27

C. godmani Forel. Male from Turrialba, Costa Rica. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

clypeus. Compound eyes large, gently convex and largely on the posterior half of the head. Ocelli developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes ca. 1/2 narrower than the distal parts. Mandibles massive and strongly convex dorsally. Masticatory margin of the mandibles with 4-5 irregular denticles followed by an apical tooth.

Mesosoma dorsally flat and 1/4 longer than the head (mandibles included). Pronotum dorsally with the sides superficially marginate.Propleurae concave. Mesopleurae gently convex. Propodeum with the sides gently converging posteriorly. Basal and declivous faces of the propodeum subequal in size and delimited by a superficial margin.

Petiole ca. 1/3 longer than broad,anteriorly truncate and dorsally gently convex. Ventral process of the petiole subround. Postpetiole subquadrate and broader posteriorly. Postpetiole in dorsal view antero-laterally angulate. Pygidium in side view truncate and postero-laterally concave. Pygidium in full face view the sides with a series of small denticles converging to a pair of large, pointed teeth separted by a deep notch over the sting.

Legs. Femora not inflated. Tibiae strongly inflate. Hind basitarsi ca. 1/3 shorter than the maximum length of the hind tibiae.

Wings as in Fig. 4.

Sculpture. Head covered by thick, longitudinal striae, thicker on the anterior half of the ventral part, thinner on the scrobes and on the postero-lateral half of the ventral part of the head. Head with additional thin striae between the thick ones. Dorsum of the pronotum with ca.20 thick striae similar to those on the head dorsum, some striae separated by thin, bifurcated ones. Mesonotum medially with thin striae, fainter posteriorly; remaining parts of the mesonotum and scutellum simply smooth. Dorsum of the propodeum covered with about 24 striae thinner than those on the pronotum. Pleurae covered by thin, longitudinal striae, more impressed on the metapleurae. Petiolar dorsum with ca. 20 striae similar to those on the propodeum. Declivous face of the propodeum, anterior face of the petiole minutely reticulate-punctate. Postpetiole smooth, irregularly, minutelly and superficially punctate and with longitudinal striae, slightly sparsed, very thin and more impressed posteriorly. Center of the first gastric tergite with similar sculpture on the postpetiole, the striae thinner, sparser and fainter. Second gastric tergite with similar sculpture on the first tergite, the striae fainter. Remaining gastric tergites, sternites and legs punctate, denser on the two last sternites.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, sparse on the head, on the mandibles, on the anterior border of the clypeus, on the mesosoma, on the pedicel and on the gaster, dense on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body, dense on the sternites; (3) shorter than the type (2), subdecumbent to decumbent, very sparse on the whole body, dense on the tergites. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black and shining. Anterior half of the head, antennae, mandibles, femora and pygidium ferrugineous, tarsi lighter. Proximal half of the last four funicular joints orange to light brown. Tibiae yellow.

Measurements (in mm) and indices: TL 14.38; HL 2.18; HW 1.54; EL 0.64; SL 0.82; SW 0.31; WL 4.04; PeL 1.16; PeW 1.00; HFeL 1.16; HFeW 0.49; HTiL 1.00; HTiW 0.39; HBaL 0.71; HBaW 0.14; CI 70.6; SI 37.8; HFeI 42.2; HTiI 39.0; HBaI 19.7.

Male (tentative attribution) (Fig. 26). Head slightly longer than broad. Vertexal margin convex. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Frontal carinae with raised borders and partially covering the antennal socket. Borders of the frontal carinae subparallel anteriorly, slightly convex medially, and strongly converging, almost touching each other posteriorly. Frons of the frontal carinae concave anteriorly, raised medially and declivous posteriorly. Anterior border of the clypeus gently convex medially. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes half longer than broad. Funicular joints thick.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Pair of Mayrian carinae impressed but not connected each other posteriorly. Parapsidal furrows impressed. Basal face of the propodeum narrowing backwards and separated from the declivous one by a marked carina.

Petiole about 1/4 longer than broad, anteriorly truncate and dorsally convex. Ventral process of the petiole subtriangular. Postpetiole broadening backwards and narrower than the first gastric tergite. Postpetiole in dorsal view antero-laterally angulate. First gastric segment broader than the postpetiole. Second gastric segment broader than the first segment. Remaining gastric segments narrowing backwards.

Genitalia as in Fig. 27.

Legs. Femora not inflated. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum minutely punctate and with longitudinal, slightly irregular striate, the punctures more impressed on the anterior half, the striae more impressed on the posterior half and behind the the clypeus. Vertexal angles with additional small, deep, piligerous foveae, continuing to the sides of the ventral part of the head. Middle of the ventral part of the head with thick tranversal rugae and piligerous foveae. Pronotum densely covered by deep, small piligerous foveae separated by thin, transversal striae. Mesonotum smooth and with sparse, minute piligerous punctures. Scutellum smooth. Basal face of the propodeum covered by thin, longitudinal striae. Petiolar dorsum smooth, with rare, superficial, small piligerous foveae and with short, longitudinal rugosities on the anterior part. Petiolar sides minutely reticulate and with sculpture similar to those on the anterior part of its dorsum, but sometimes with larger foveae and longer rugosities. Declivous face of the propodeum minutely and superficially punctate and with rugosities converging to the center. Pro- and mesopleurae smooth, with variably impressed punctuations and with traces of longitudinal rugosities, more impressed on the posterior border of the mesopleurae. Metapleurae striated as on the basal face of the propodeum. Postpetiole, first gastric segment and legs smooth and with superficial punctures, denser and deeper on the remaining gastric segments.

Pilosity. Body covered by pointed hairs of four types: (1) long, sparse and suberect, denser on the last three gastric segments; (2) shorter than the type (1) and variably distributed on the body, dense on the mesopleurae; (3) mixed and shorter than the type (2), dense on the vertexal angles, on the posterior half of the ventral part of the head, on the pronotal dorsum, on the coxae, on the ventral face of the femora and tibiae, and on the gaster; (4) short and thick on the funicular joints.

Colour. Black and shining. Anterior third of the head dorsum, mandibles, antennae, tibiae and tarsi ferrugineous to dark brown, femora darker. Outer face of the mid and of the hind tibiae, and tarsomeres yellowish to light brown.

Measurements (in mm) and indices: TL 10.1-10.7; HL 1.28-1.36; HW 1.20-1.26; EL 0.66-0.76; SL 0.30-0.33; SW 0.16-0.17; WL 3.04-3.44; PeL 0.80-0.96; PeW 0.60-0.72; HFeL 1.04-1.17; HFeW 0.23-0.27; HTiL 0.90-1.02; HTiW 0.20-0.23; HBaL 0.74-0.79; HBaW 0.07; CI 92.6-93.7; SI 51.5-53.3; HFeI 22.1-23.1; HTiI 22.2-22.5; HBaI 8.8-9.4.

Material examined. **COSTA RICA**: Turrialba, 15-18.VII.1965, 1 male, P. J. Spangler [USNM]. **PANAMA**: Volcan de Chiriqui, 1 gyne (holotype), Champion [BMNH]. **ECUADOR**: PICHINCHA: Tinalandia, 16 km SE of S. Domingo de los Colorados, VI.1975, 1 male, S. Peck & J. Peck [MCZC].

Discussion. C. godmani is the largest species of the genus. It is a rare species previously known only on the holotype and on a gyne from Ecuador (WHEELER 1924) not available for the present study. A striking character shared by *godmani*, *antillanus* and *meinerti* is a notch on the apex of the pygidium, more impressed in *godmani* and *antillanus*. The function of the notch is probably to facilitate the movement of the sting.

The isolate males described here as *godmani* are tentatively referred to this species for the following reasons: 1- frontal carinae and genitalia similar to those of *meinerti*; 2- tibiae partially yellowish brown (yellowish in the gyne); 3- they originate from the geographic range of *godmani*; 4- the males of the other species occuring in Central and northermost countries of South America, i. e. *striatus*, *whymperi*, *boliviae*, *brevitarsus* are already known, except *escobari*. I exclude the possibility that the two males referred here to *godmani* could be attributed to the Colombian *escobari* because this species belongs to another clade the male of which (*brevitarsus*) differs significantly from the those of the *longiceps* clade by the frontal carinae and genitalia. If the attribution of these two males to *godmani* is not correct, they should represent an undescribed species.

Distribution. Costa Rica, Panama and Ecuador.

Cylindromyrmex antillanus n. sp. Figs. 1 & 28

Holotype: Winged gyne in the amber sample Do-4130-1 from the SMNS.

Derivatio nominis. The name *antillanus* is a neologism indicating the provenance of this amber sample from the Antilles.

Diagnosis. A species resulting as outgroup of *longiceps* and *meinerti*, and differing from both for the CI > 77 (instead of ≤ 70) and HFeI < 46 (instead of > 50).

Gyne (Figs. 1 & 28). Head slightly less than 1/3 longer than broad. Occiput low. Vertexal angles convex. Frontal carinae about 1/3 broad as the maximum head width. Sides of the frontal carinae parallel and reaching at least the middle of the eyes posteriorly. Dorsum of the frontal carinae with an impressed median sulcus anteriorly. Frontal carinae as long as the anterior border of the clypeus. Antero-median border of the clypeus with a minute pair of denticles. Compound eyes large, flat and on the middle of the head. Impar ocellus developed. Scapes reaching the anterior border of the eyes. Proximal third of the scapes 1/2 narrower than the distal parts. Mandibles gently convex dorsally. Masticatory margin of the mandibles each with a set of 4 irregular denticles followed by an apical tooth.

Mesosoma slightly convex dorsally. Pronotum with parallel sides. Parapsidal furrows superficially impressed. Propodeum with the sides gently convex and converging posteriorly. Basal face of the propodeum separated fromthe declivous one by a thin margin.

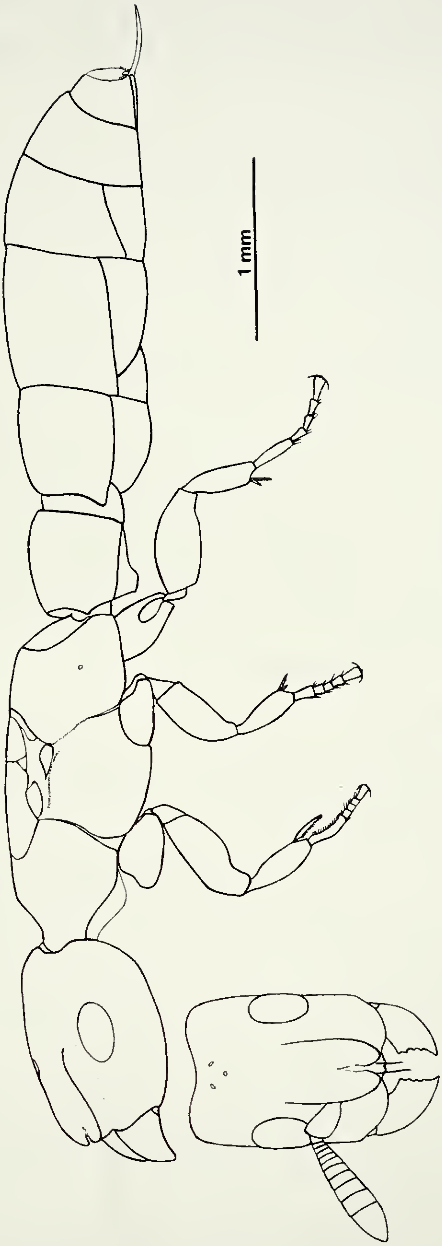


Fig. 28

C. antillanus de Andrade. Gyne from Dominican amber. Body in profile (top), head in full dorsal view (bottom).

Petiole subquadrate, slightly broader than long, anteriorly truncate and dorsally gently convex. Petiolar sides diverging backwards. Ventral process of the petiole large and subround. Postpetiolar sides gently diverging posteriorly. Postpetiolar sternite antero-medially with a marked, triangular "lip" pointing backwards. Pygidium in side view truncate. Posterior half of the pygidium in full dorsal view with the sides bearing a row of small denticles converging to a deep notch.

Legs. Femora and tibiae slightly inflated. Hind basitarsi short, slightly less than 1/3 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 3,5 spine-like setae.

Wings as in Fig. 4.

Sculpture. Head covered by thin, longitudinal striae, slightly thicker on the posterior third of the head dorsum. Mesosoma longitudinally striated. Dorsum of the pronotum with about. 30 longitudinal striae similar to those on the posterior part of the head dorsum; some pronotal striae bifurcated. Mesonotum and propodeum coverd by longitudinal striae thinner than those on the pronotum. Scutellum, pleurae, declivous face of the propodeum, petiolar sides and ventral face of mid and hind femora with very thin, longitudinal striae, thinner on the scutellum, propleurae, petiolar sides and mid femora. Petiolar dorsum with about 28 striae similar to those on the propodeum. Anterior face of the petiole smooth. Dorsum of the postpetiole densely covered by striae as those on the petiole. First gastric tergite with thin, superficial, longitudinal striae on the center only. Second gastric sculptured as the first tergite but the striae extremely thin. Postpetiolar sternite, remaing gastric segments and legs smooth and with sparse punctures. Hind coxae covered by thin, longitudinal striae; mid coxae with similar sculpture but sparser and fainter.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one on the external border of the scape, a pair between the frontal carinae and clypeus, rare on the mandibles, on the mesosoma, on the gaster and on the legs, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), suberect on the head dorsum and mesosoma, subdecumbent on the pedicel, decumbet on the ventral part of the head, on the gaster and on the legs. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour dark brown. Tibiae yellowish to light brown.

Measurements (in mm) and indices: TL 6.36; HL 1.08; HW 0.84; EL 0.35; SL 0.32; SW 0.15; WL1.68; PeL 0.524 PeW 0.56; HFeL 0.53; HFeW 0.24; HTiL 0.44; HTiW 0.16; HBaL 0.25; HBaW 0.07; CI 77.8; SI 46.9; HFeI 45.3; HTiI 36.4; HBaI 28.0.

Material examined. **Dominican amber:** 1 gyne (reference number Do-4130) [SMNS].

Discussion. Antillanus, *longiceps* and *meinerti* share the narrow frontal carinae, the eyes on the middle of the sides of the head, the mesosoma 2/3 longer than high, and the petiole with a short anterior face. The workers of *longiceps* and *meinerti* possess reduced and flat eyes. It is likely that the unknown worker of antillanus also has similar eyes.

Distribution. Dominican amber.

Cylindromyrmex longiceps André Figs 29-30

Cylindromyrmex longiceps André, 1892: 47. Worker. Original description. Type locality: Brazil. Type material: 1 worker labelled: "Brésil, Type, Museum Paris, Collection Ernest André, 1914, *longiceps* André", in MNHN, examined.
Cylindromyrmex longiceps André, Kempf 1968: 372. Gyne.

Diagnosis. *Longiceps* is the sister species of *meinerti* and differs from it in the worker and gyne by the narrower frontal carinae not reaching the anterior border of the clypeus.

Worker (Fig. 29). Head about 1/3 longer than broad and with paralllel sides. Occiput very low. Vertexal angles round and protruding backwards. Frontal carinae slightly less than 1/3 broad as the maximum head width. Anterior fourth of the frontal carinae diverging backwards and not reaching the anterior border of the eyes posteriorly. Dorsum of the frontal carinae with a median sulcus anteriorly. Frontal carinae shorter than the anterior border of the clypeus. Antero-median border of the clypeus superficially notched and bearing a minute denticle. Compound eyes very small (Fig. 30), flat and behind the mid line of the head. Ocelli reduced to a superficial pit, some specimens with the impair ocellus more developed than the pair ones. Scapes stout and short. Anterior fourth of the scapes half narrower than the distal parts. Mandibles short and flat dorsally. Masticatory margin of the mandibles edentated and with a pointed apical tooth.

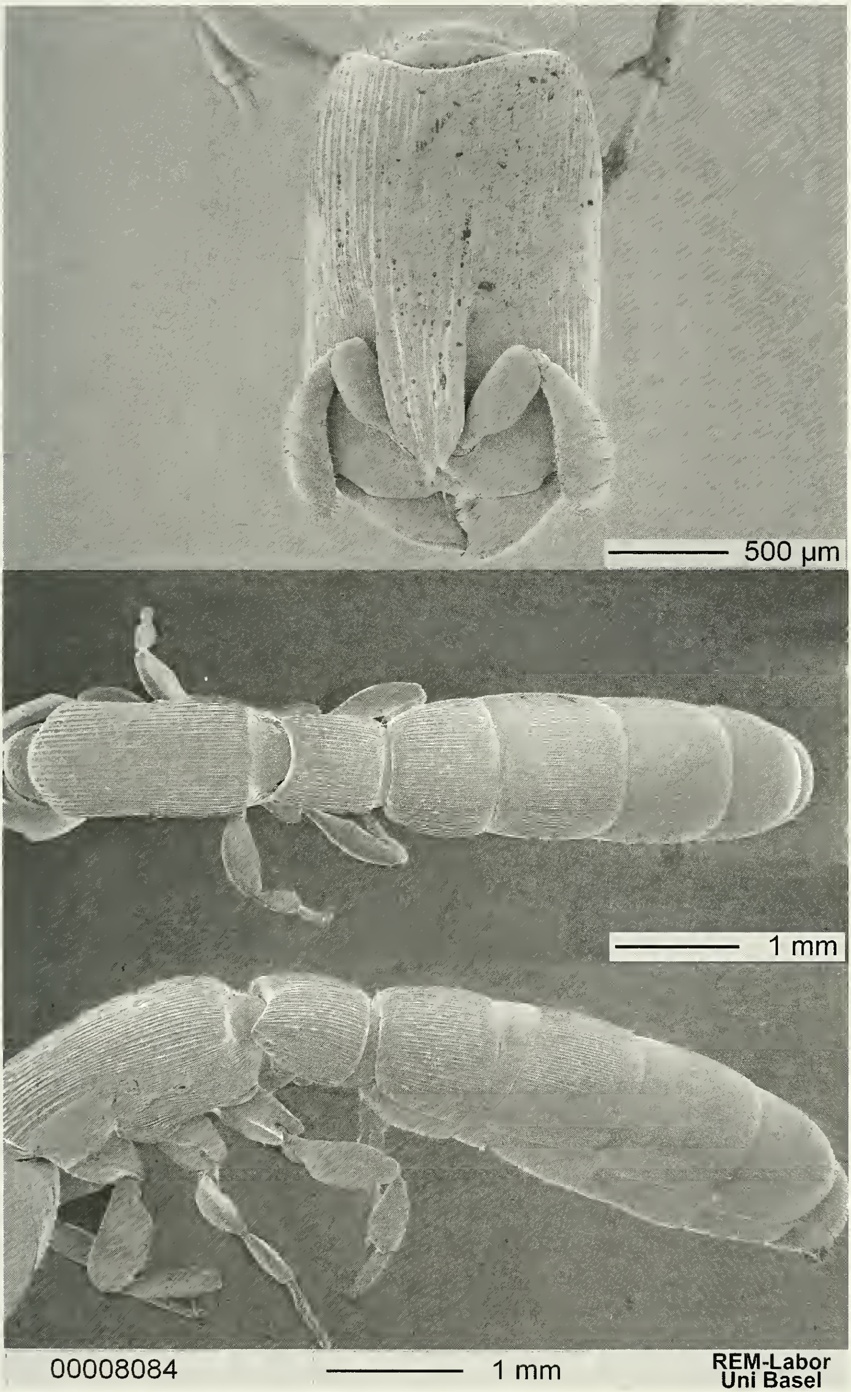
Mesosoma weakly convex dorsally and about 1/5 shorter than the head (mandibles included). Sides of the mesosoma slightly narrower in the mesonotum. Propodeum with the sides gently convex and converging posteriorly. Declivous face of the propodeum ca. 1/3 of the length of the basal face. Basal face separated from the declivous one by a very superficial margin.

Petiole subquadrate. Anterior face of the petiole very short and deeply concave; dorsal face of the petiole weakly convex. Ventral process of the petiole small and subround. Postpetiole broader than long. Postpetiolar sides gently diverging posteriorly. Postpetiolar sternite antero-medially with a triangular "lip" pointing backwards. Pygidium truncate; its border with a semicircle of small teeth of similar size.

Legs. Femora and tibiae inflated. Hind basitarsi slightly less than 1/2 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi respectively with 5,6 spine-like setae.

Sculpture. Head dorsum covered by thin longitudinal striae, more superficial and thinner close to the antennal scrobes. Ventral part of the head with small, superficial, oval piligerous foveae and with longitudinal striae, fainter on the posterior half, absent on the middle and on the posterior angles. Mesosoma with longitudinal striae thicker on the pronotum. Pronotum with 22-25 striae thicker than those on the posterior half of the head dorsum. Pleurae and petiolar sides with longitudinal striae similar to those on to the atennal scrobes. Petiolar dorsum with 24-26 striae similar to those on the propodeum. Declivous face of the propodeum and anterior face of the petiole minutely

Fig. 29. *C. longiceps* André. Worker from Rio de Janeiro. Brazil. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).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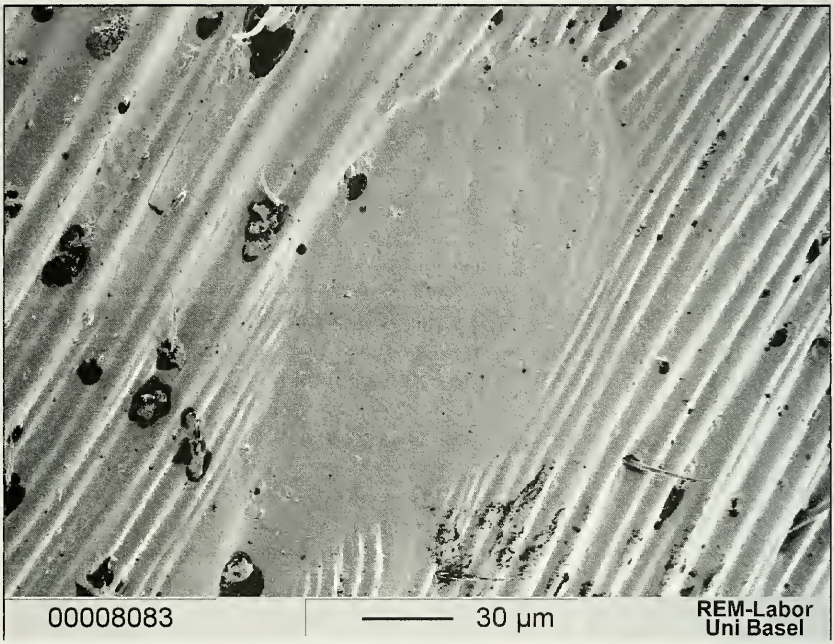


FIG. 30
C. longiceps André. Worker from Rio de Janeiro, Brazil. Compound eye.

punctate. Dorsum of the postpetiole and of the first gastric tergite covered by striae thinner than those on the petiole. Second gastric tergite with thin and superficial striae on the center only. Remaining gastric tergites and sternites sparsely and minutely reticulate and densely punctate. Legs with very superficial, minute punctures. Hind coxae covered by thin, longitudinal striae; mid coxae with similar sculpture but sparser and fainter.

Pilosity. Body with pointed hairs of at least three lengths and distributed as follows: (1) long, erect to suberect, one pair on the clypeus, one close to each pronotal angle, rare on the on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), sparse and suberect on the head dorsum and on the mesosoma, sparse and subdecumbent on the pedicel, and on the first gastric tergite, decumbent but sparse on the ventral part of the head and on the legs, dense on the postpetiolar and on the remaing gastric sternites. In addition the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and anterior third of the head dark ferrugineous. Scapes, first funicular joints and tarsi brown. Legs orange to light brown.

Measurements (in mm) and indices: TL 7.44-8.50; HL 1.68-1.92; HW 1.08-1.28; EL 0.15-0.22; SL 0.47-0.52; SW 0.20-0.22; WL 1.68-1.96; PeL 0.57-0.70; PeW 0.70-0.83; HFeL 0.69-0.78; HFeW 0.33-0.38; HTiL 0.65-0.76; HTiW 0.25-0.29; HBaL 0.36-0.38; HBaW 0.10-0.11; CI 64.3-66.7; SI 42.3-42.5; HFeI 47.8-48.7; HTiI 38.1-38.5; HBaI 27.8-28.9.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large, flat and on the middle of the dorsolateral part of the head; ocelli well defined and marked; mesosoma broad medially; parapsidal furrows superficially impressed; petiole slightly longer than broad; pronotum with about 28 striae; mesonotum and scutellum with very superficial, short, thin striae; postpetiolar striae as thick as on the pronotum.

Wings as in Fig.4.

Measurements (in mm) and indices: TL 9.94; HL 1.84; HW 1.18; EL 0.54; SL 0.49; SW0.21; WL 2.76; PeL 0.74; PeW 0.76; HFeL 0.73; HFeW 0.38; HTiL 0.75; HTiW 0.27; HBaL 0.44; HBaW 0.11; CI 64.1; SI 42.8; HFeI 52.0; HTiI 36.0; HBaI 25.0.

Material examined. **BRAZIL**: no further locality, 1worker (holotype), MNHN. São Paulo: São Paulo, 5.I.1974, 1 gyne, R. L. Araujo [MZSP]. Rio de Janeiro: Rio de Janeiro, 25.VIII.1962, 28 workers, R. L. Araujo [MZSP, NHMB].

Discussion. Longiceps is the species of the genus with the highest number of autapomorphies. They are the following: hypostomal bridge Y-shaped, broad and semitransparent; head very elongate; frontal carinae very narrow; mandibles edentate; anterior border of the clypeus medially notched and denticulate; ventral process of the petiole very short; pygidium with a semicircle of small teeth.

The largest known series of *longiceps* was collected by Araujo (a brazilian termitologist). It is very likely that all these specimens were collected in termite nests.

Distribution. Brazil.

Cylindromyrmex meinerti Forel Figs 31-34

Cylindromyrmex meinerti Forel, 1905: 155. Worker. Original description. Type locality: Venezuela. Type material: 4 workers, two of which labelled: "*C. meinerti*, type, Forel, Las Trincheras, Venezuela, Meinert, in altem Baume", in MHNG, MCZC and MCSN; examined.

Cylindromyrmex schmidti Menozzi, 1931: 192, fig. 4. Partim. Gyne. Nec worker (= *whymperi*). Original description. Type locality: Costa Rica. Type material: 2 gynes labelled: "La Caja: 8 kil. w. San José, C. R., Heinr. Schmidt", in IEGG, examined. Synonymia nova.

Cylindromyrmex parallelus Santschi, 1932: 410, fig. 19. Gyne. Original description. Type locality: Panama. Type material: 1 gyne labelled: "Panama, France Field, Bierig, VI-30, *Cylindromyrmex parallelus* Sant. type", in NHMB, examined. Synonymia nova.

Cylindromyrmex parallelus Santschi, Wheeler 1937: 443. Misidentification.

Cylindromyrmex parallelus Santschi, Brown 1975: 38. Figs. 117 & 130, male genitalia. Misidentification.

Diagnosis. Meinerti is the sister species of *longiceps* and differs from it in the worker and gyne by the frontal carinae as long as the anterior border of the clypeus instead of shorter.

Worker (Fig. 31). Head ca. 1/4 longer than broad and with paralllel sides. Occiput very low. Vertexal angles round. Frontal carinae at most slightly broader than 1/3 as the maximum head width. Anterior third of the frontal carinae diverging, remaining parts parallel and reaching the eyes posteriorly. Dorsum of the frontal carinae

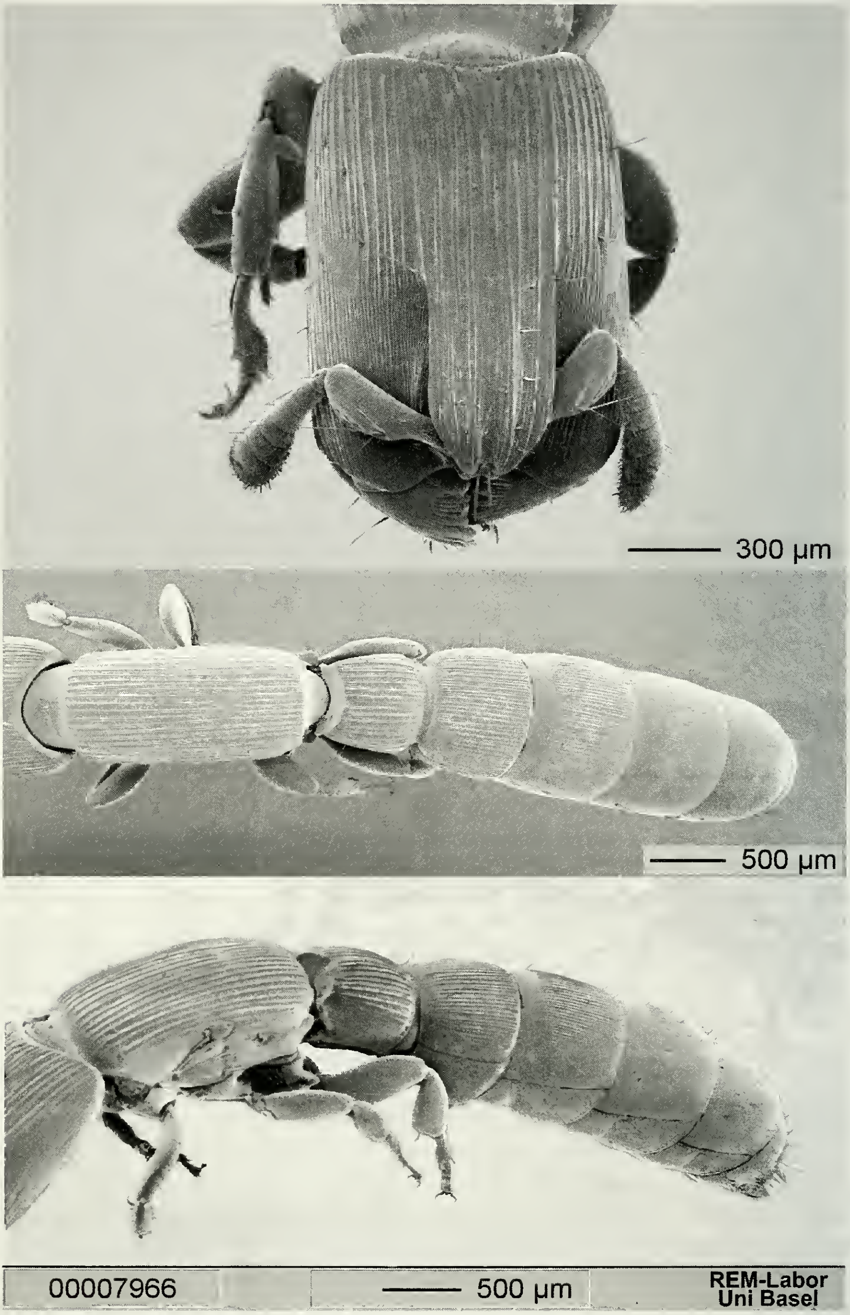


FIG. 31. *C. meinerti* Forel. Worker from Panama. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

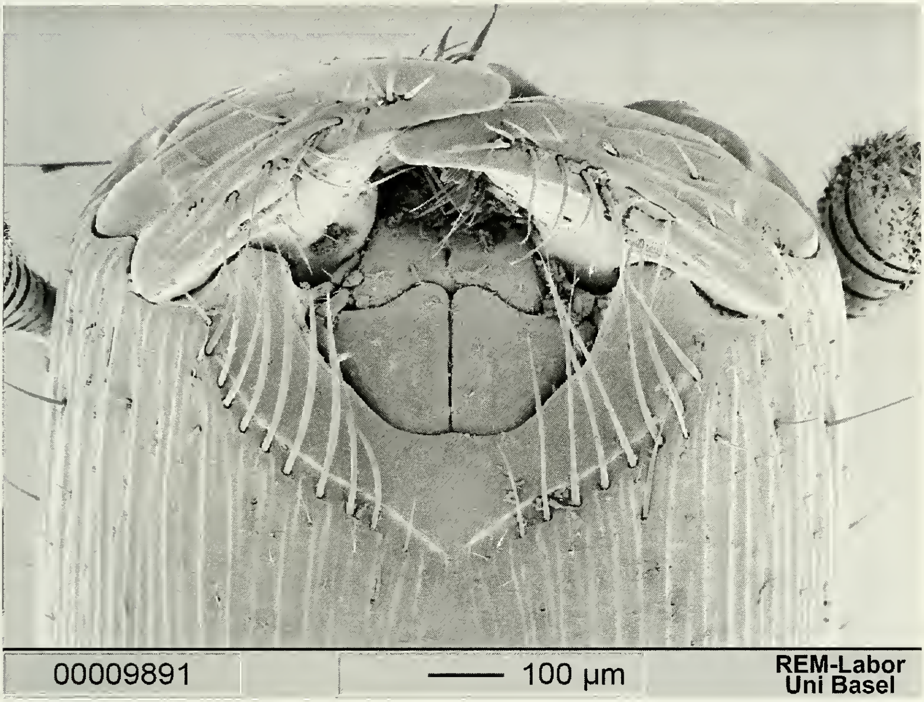


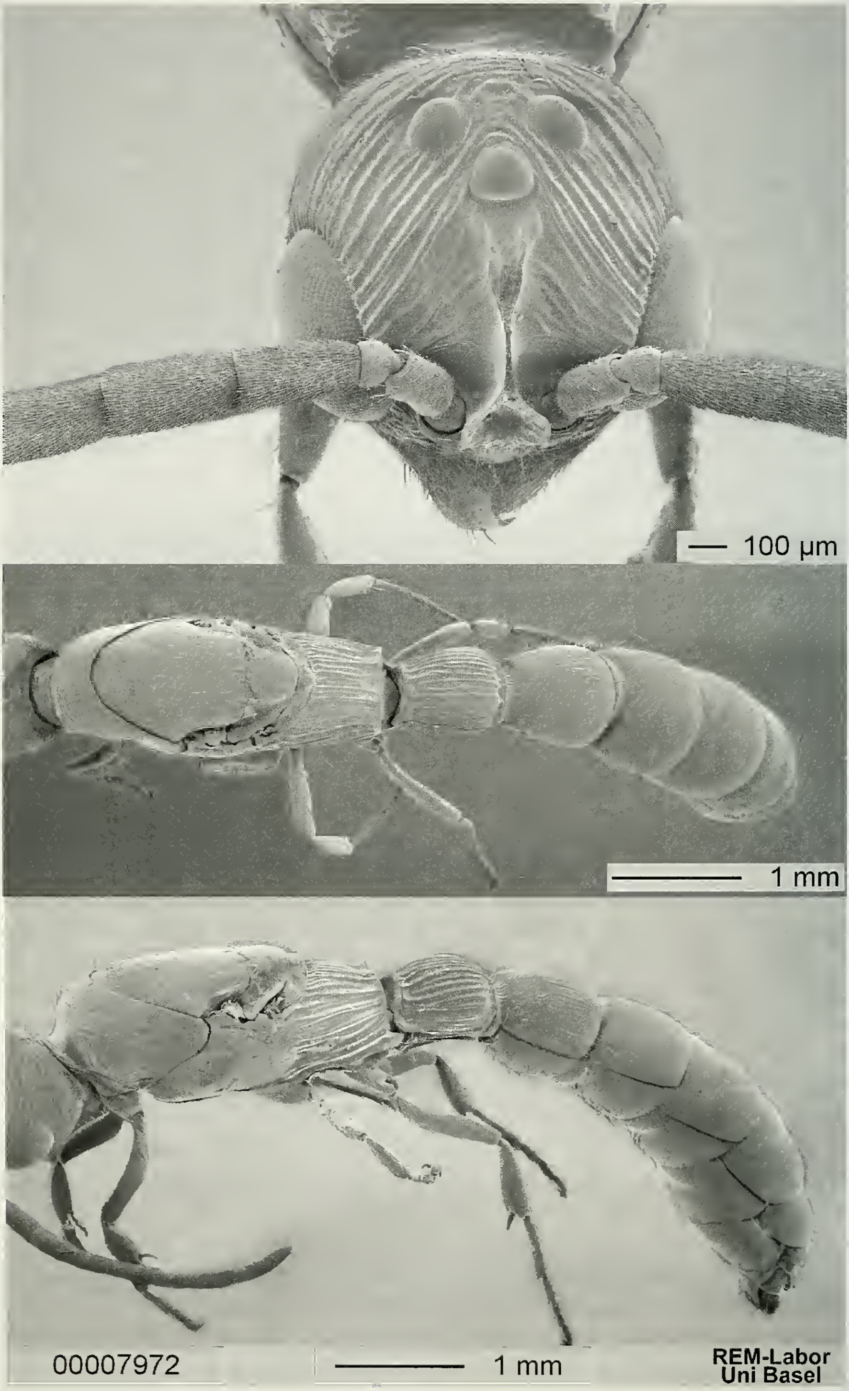
FIG. 32

C. meinerti Forel. Worker from Panama. Anterior portion of the cephalic capsule and mandibles in ventral view to show the broad hypostomal bridge (character 6 state 1). Notice the convexity of the anterior margin of the hypostomal bridge, a character not verified in all species of the genus.

with a median sulcus anteriorly. Frontal carinae as long as the clypeus. Anterior border of the clypeus laterally convex, medially concave and bearing a pair of small denticles. Compound eyes very small, flat and on the mid of the dorsolateral part of the head. Ocelli reduced to superficial pits, more developed in large specimens. Scapes not reaching the anterior border of the eyes. Proximal fourth of the scapes1/2 narrower than the distal parts. Mandibles flat. Masticatory margin of the mandibles with 4 irregular denticles followed by an apical tooth. Hypostomal bridge broad, with the antero-lateral margin convex (Fig. 32).

Mesosoma gently convex dorsally and slightly shorter than the head (mandibles included). Mesosoma 2/3 longer than heigh. Sides of the mesosoma parallel. Propodeal sides gently convex. Declivous face of the propodeum ca. 1/2 of the length of the basal face. Basal face of the propodeum separated from the declivous one by a faint margin.

Petiole subquadrate. Petiolar sides diverging backwards. Anterior face of the petiole very short and concave; dorsal face of the petiole slightly convex. Ventral process of the petiole very large and subround. Postpetiole broader than long. Postpetiolar sternite antero-medially with traces of a triangular "lip" pointing backwards. Pygidium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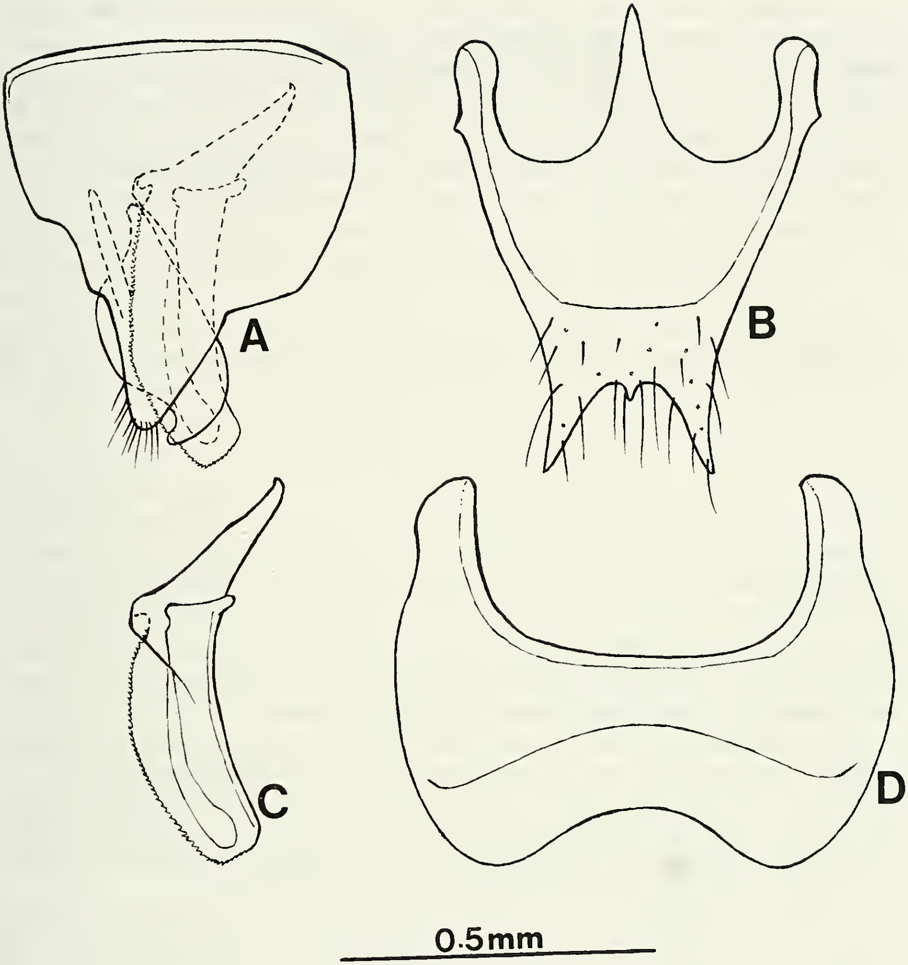

FIG. 34

C. meinerti Forel. Male from Barro Colorado ls., Panama. Genital appendages: a) lateral view of left parameres; b) hypopygium; c) left aedeagus in profile; d) sternite VIII.

truncate; its sides with a row of small teeth converging to a pair of larger teeth separated by a variably impressed notch over the sting.

Legs. Femora and tibiae inflated. Hind basitarsi ca. 1/2 shorter than the maximum length of the tibiae. Outer apical edge of the hind and of the mid basitarsi with 3 spine-like setae.

FIG. 33. *C. meinerti* Forel. Male from Barro Colorado ls., Panama. Head in full dorsal view (top), body in full dorsal view (middle), body in profile (bottom).

Sculpture. Head dorsum covered by thin longitudinal striae, fainter and thinner on the antennal scrobes. Anterior half of the ventral part of the head with longitudinal striae as thick as those on the posterior part of the head dorsum but sparser; posterior half of the ventral part of the head with striae similar to those on the antennal scrobes. Mesosoma with longitudinal striae similar to those on the posterior part of the head dorsum. Pronotum with 20-21 striae. Pleurae and petiolar sides with longitudinal striae similar to those on the atennal scrobes. Petiolar dorsum with 17-19 striae similar to those on the mesosoma. Declivous face of the propodeum and anterior face of the petiole minutely punctate. Dorsum of the postpetiole covered by striae thinner than those on the petiole. First gastric tergite covered by striae thinner than those on the postpetiole. Second gastric tergite with thin and very superficial striae on the center only. Remaining gastric tergites and sternites sparsely and minutely reticulate and densely punctate. Legs with very superficial, minute punctures. Hind coxae covered by longitudinal striae; mid coxae with similar sculpture but fainter and sparser.

Pilosity. Body with pointed hairs of at least of three lengths and distributed as follows: (1) long, erect to suberect, one pair between the frontal carinae and clypeus, one close to on each pronotal angle, rare on the on the gaster, sparse on the pygidium; (2) shorter than the type (1) and sparsely distributed on the whole body; (3) shorter than the type (2), sparse and suberect on the head dorsum and on the mesosoma, sparse and subdecumbent on the pedicel, and on the first gastric tergite, decumbent but sparse on the ventral part of the head and on the legs, dense on the postpetiolar and on the remaing gastric sternites. In addition, the hypostomal bridge surrounded by a layer of hairs similar to the type (1) but appressed and apically curved.

Colour black. Mandibles and anterior third of the head dark ferrugineous. Antennae, coxae, femora, tarsi and tarsomeres light brown. Tibiae yellowish.

Measurements (in mm) and indices: TL 5.32-6.58; HL 1.20-1.28; HW 0.88-0.94; EL 0.11-0.15; SL 0.40-0.41; SW 0.17; WL 1.32-1.50; PeL 0.44-0.51; PeW 0.52-0.62; HFeL 0.53-0.60; HFeW 0.26-0.30; HTiL 0.44-0.49; HTiW 0.19-0.21; HBaL 0.22-0.25; HBaW 0.07-0.08; CI 72.0-73.4; SI 41.5-42.5; HFeI 49.0-50.1; HTiI 41.7-43.2; HBaI 30.4-32.0.

Gyne. Very similar to the worker but differing from it in the following details: compound eyes very large; ocelli well defined; impar ocellus higher than the posterior border of the compound eyes; mesosoma broad medially; parapsidal furrows superficially impressed; petiole as broad. as long; pronotum with about 22-27 striae as thick as in the worker: mesonotum with thinner striae than on the pronotum; some specimens with striae only on the middle of the mesonotum; scutellum smooth or with striae on the anterior half only; propodeal striae thinner than on the pronotum.

Wings as in Fig. 4.

Measurements (in mm) and indices: TL 7.56-8.60; HL 1.24-1.44; HW 0.86-1.00; EL 0.40-0.41; SL 0.41-0.42; SW 0.18; WL 1.96-2.24; PeL 0.71-0.72; PeW 0.70-0.72; HFeL 0.56; HFeW 0.28-0.32; HTiL 0.48-0.56; HTiW 0.20-0.23; HBaL 0.26-0.31; HBaW 0.09-0.10; CI 69.3-70.0; SI 42.8-43.9; HFeI 50.0-50.8; HTiI 41.1-41.8; HBaI 32.2-34.6.

Male (Fig. 33) (previously undescribed). Head longer than broad. Vertexal margin convex. Ocelli protuberant. Compound eyes broadly convex and largely on the anterior part of the head. Frontal carinae with raised borders and partially covering the antennal socket. Sides of the frontal carinae subparallel anteriorly, slightly convex medially, and strongly converging and almost touching each other posteriorly. Frons concave anteriorly, raised medially and declivous posteriorly. Anterior border of the clypeus gently convex medially. Mandibles long; their masticatory margin edentated and with a pointed apical tooth. Scapes slightly less 1/2 longer than broad. Funicular joints stouts.

Mesosoma robust. Pronotum in dorsal view with subparallel sides. Mesonotum slightly convex. Scutellum at the same level as the mesonotum. Pair Mayrian and parapsidal furrows superficially marked. Impar Mayrian furrow absent. Basal face of the propodeum separated from the declivous one by a developed and well marked carina.

Petiole subcylindric; anteriorly truncate and dorsally convex. Ventral process of the petiole small and subtriangular. Postpetiole broadening backwards and smaller than the first gastric tergite.

Genitalia as in Fig. 34.

Legs. Femora not inflated. Mid and hind basitarsi long.

Wings as in Fig. 5.

Sculpture. Head dorsum covered striae converging from the internal border of the eyes to the ocelli; striae behind the pair ocelli thinner, tranversal, irregular and mixed with small piligerous foveae. Ventral part of the head variably punctate and with small, piligerous foveae; some specimens with diverging striae on the anterior part only. Pronotum punctate and with transversal, irregular striae, sometimes mixed with irregular piligerous foveae. Mesonotum and scutellum smooth and with minute punctures, denser on the mesonotum. Basal face of the propodeum, metapleurae and petiole covered by longitudinal striae. Declivous face of the propodeum smooth; some specimens with tranversal striae on the middle of the posterior half only. Propleurae punctate and with traces of thin, longitudinal striae. Mesopleurae smooth, minutely punctate and with rugosities on the posterior border. Postpetiole, first gastric segment and legs smooth and with sparse, superficial punctures; some specimens with longitudinal, irregular rugosities on the postpetiole. Remaining gastric segments superficially reticulate-punctate; this sculpture more impressed posteriorly.

Pilosity. Body covered by pointed hairs of thrre types: (1) long, sparse, subdecumbent, denser on the gaster, rare on the head; (2) shorter than the type (1), sparse on the head and legs, dense on the mesosoma and gaster; (3) short and thick on the funicullus.

Colour. Head, mesosoma and petiole black. Anterior third of the head dorsum, mandibles, antennae and legs yellowish to light brown. Postpetiole, first and second gastric segments dark brown, remaing gastric segments lighter.

Measurements (in mm) and indices: TL 7.90-8.30; HL 1.08-1.16; HW 0.92-1.04; EL 0.56-0.59; SL 0.22; SW 0.13; WL 2.48-2.64; PeL 0.70-0.72; PeW 0.64-0.68; HFeL 0.77-0.84; HFeW 0.20-0.24; HTiL 0.68-0.82; HTiW 0.18-0.19; HBaL 0.52-0.61; HBaW 0.07-0.08; CI 85.2-89.6; SI 59.1; HFeI 26.0-28.6; HTiI 23.2-26.5; HBaI 13.1-13.5.

Material examined. **COSTA RICA**: no further locality, 1 gyne, F. Nevermann [MZSP]; no further locality, 1 gyne, 1920, P. Serre [MNHN]; La Caja, 8 km W of San José, 2 gynes (corresponding to the description and drawing of Menozzi, 1931), H. Schmidt [IEGG]; Santa Rosa, Natural Park, Guanacaste Province, May-August 1984, 300 m, 1 gyne, D. H. Janzen & I. Gauld [BMNH]; Hambrug Farm, Santa Clara Province, 23.IV.1926, 1 worker, 2 gynes, 2 males, F. Nevermann [USNM]; same locality, Reventazón River, 1 worker, F. Nevermann [USNM]; same locality, IV.1921, 4 gynes, 3 males, 1 pupa, F. Nevermann [USNM]. **PANAMA**: France Field, VI.1930, 1 gyne (holotype of *parallelus*), A. Bierig [NHMB]; Barro Colorado Is. Canal Zone, 9.VI.1935, 1 gyne, 3 gynes pupae, A. Emerson [MCZC]; same locality, 4.V.1935, 4 males, A. Emerson [MCZC, USNM]; same locality, 2 workers, in termite nest, L. Schneider [IAVH, MZSP]; same locality, 1 worker, in termite nest, [WEMC]; same locality, III.IV.1949, Zetek, 1 male [USNM]. **VENEZUELA**: ZULIA: El Tucuco 45 km SW of Machiques, 5-6.VI.1976, 1 male, A. S. Menke & D. Vincent [WEMC]; same locality, IV.1984, 1 male, E. Inciarte & E. Rubio [MIZA]. DISTRITO FEDERAL: Los Canales, 120 m, 23.III.1938, 1 male, G. Vivas-Berthier [WEMC]. BOLIVAR: Las Trincheras, in altem Baume, 4 workers (syntypes of *meinerti*), Meinert [MHNG, MCZC, MCSN]. **BRAZIL**: AMAZONAS: Ilha de Curari, várzea, 2.IX.1976, 1 gyne, J. Adis [LACM].

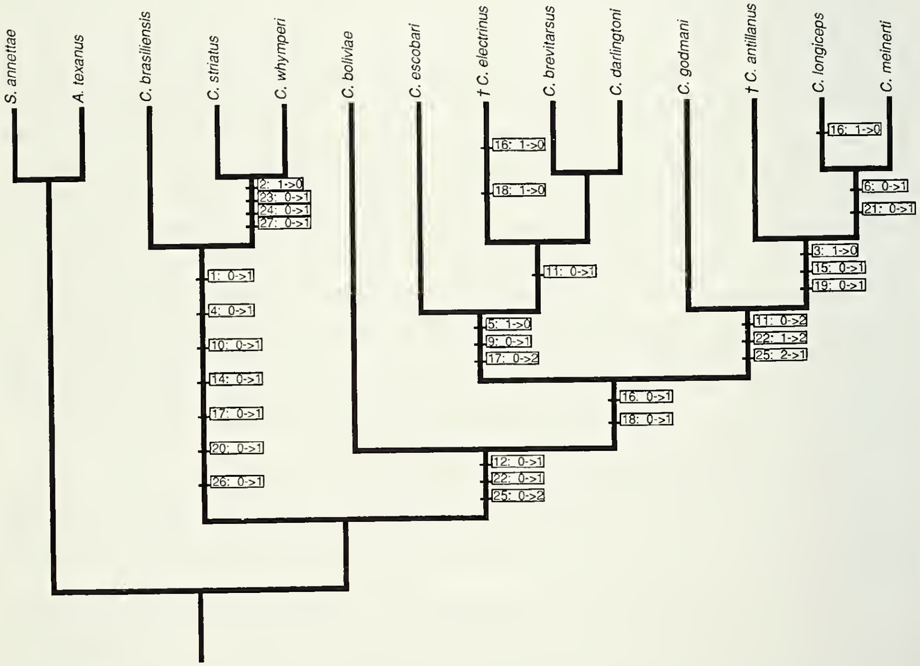

FIG. 35

Unique most parsimonious phylogeny of the known species of *Cylindromyrmex*. *Acanthostichus texanus* and *Simopone annettae* have been included into the analysis for outgroup comparison. The frames include the character changes at each branch with their respective identification number as given in the text and the apomorphic state change.

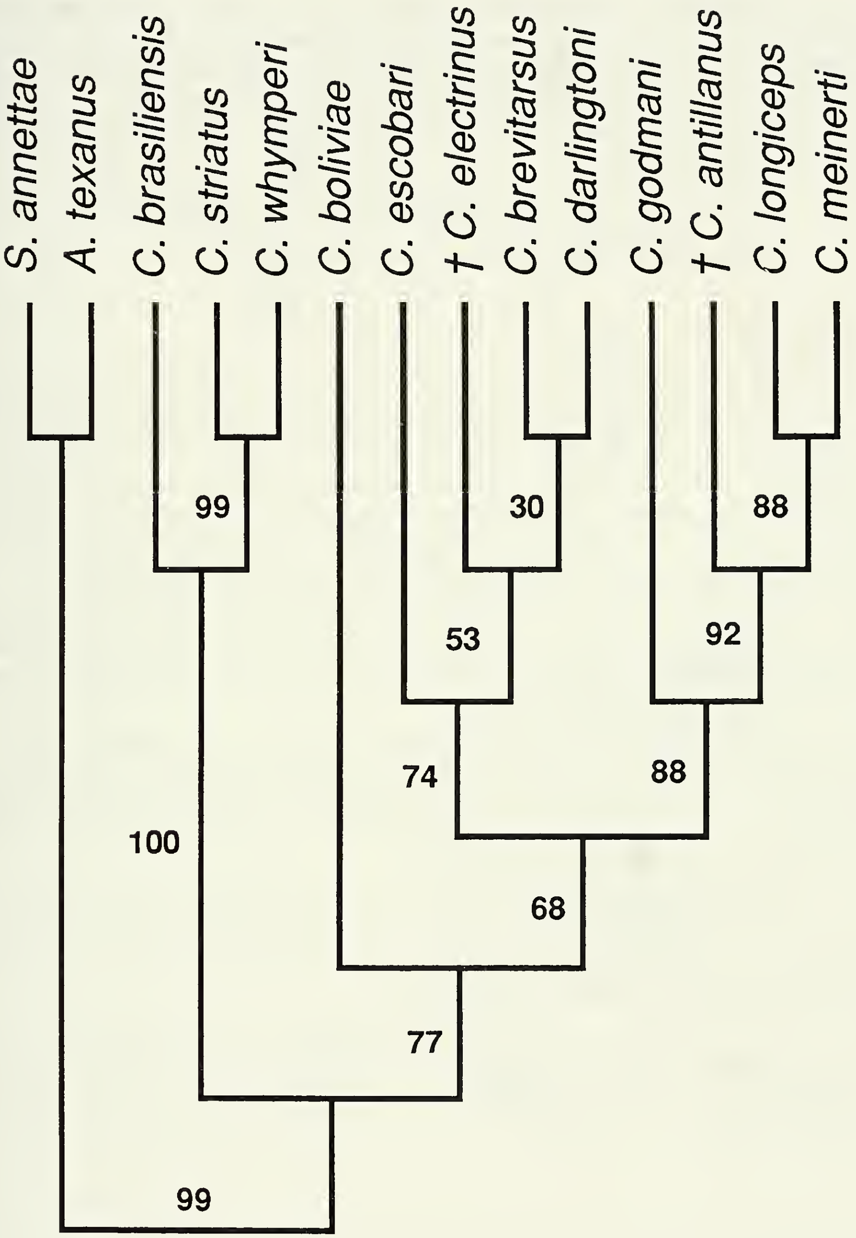

FIG. 36

Same phylogeny as in Fig. 35 with the frequency of the clades resulting from 1,000 bootstrap replicates. Further explanations in text.

Discussion. Meinerti, from my cladistic analisys, results as the sister species of *longiceps* although it resembles more *antillanus* in body shape. This is because *longiceps* and *meinerti* share synapomorphically the HFeI ≥ 50 and the broad hypostomal bridge (Fig. 32), the first of which is of doubtful phylogenetic importance.

The composite nature of the type series of *schmidti* Menozzi has been already described under *whymperi*.

FOREL (1905) reported *meinerti* from an old tree. Some specimens of *meinerti* were collected in termite nests (see material examined).

Distribution. Costa Rica, Panama, Venezuela, Brazil.

DISCUSSION

The nesting place and feeding habits of *Cylindromyrmex* are still fragmentarily known. Part of the specimens examined during this study bear some biological information (see the discussion under each Recent species). WHEELER (1936) listed *brasiliensis* and "*williamsi*" (=*whymperi*) as termite inquilines. OVERAL & BANDEIRA (1985) equally supposed that specimens of *striatus* collected in a termite nest should be termite inquilines. Their statement is partly contradicted by their report in the same paper of *striatus* workers attacking *Nasutitermes surinamensis* in laboratory.

TOMOTAKE & CAETANO (1997) described the digestive tract of *C. brasiliensis* and compare it with the one of the same subfamily *Acanthostichus serratulus*. Significant differences have been found neither between the two genera nor between the two Cerapachyinae and other ants.

CLARK *et al.* (1982) reported *williamsi* (= *whymperi*) as "endemic" in the North arid zone of Santa Cruz (Galapagos Is.). They collected "*williamsi*" in two out of 429 samples and mention that "*williamsi*" has escaped the competition with *Wasmannia* because of its adaptation to inhabit the arid zone. LUBIN (1984) uses the term native for "*striatus*" (=*whymperi*) from the Galapagos.

The distribution of the members of the *striatus*, *boliviae*, *brevitarsus* and *longiceps* clades are given respectively in Figs. 37-40. The figures are based only on the material examined during this study. Previous literature records I have been able to verify revealed often erroneous identifications.

The three species of the *striatus* clade appear to be allopatric (Fig. 37). The unique male of *whymperi* from Blumenau in NHMW is likely to be wrongly labelled. The allopatry of *brasiliensis* and *striatus* had been already stressed by FOWLER & DELABIE (1995).

Fig. 37
Distribution of the species of the *striatus* clade.

FIG. 38
Distribution of the species of the *boliviae* clade.

FIG. 39
Distribution of the species of the *brevitarsus* clade.

FIG. 40
Distribution of the species of the *longiceps* clade.

IDENTIFICATION KEYS

WORKERS

The workers of *antillanus*, *boliviae*, *electrinus* and *godmani* are not included in this key because they are not yet known.

1. Eyes large and convex (≥ 400 ommatidia). Ocelli present and well defined (Figs. 6, 8, 12) 2
- Eyes small or of medium size (> 16 and < 200 ommatidia), flat or slightly convex. Ocelli absent or represented by superficial pits (Figs 17, 19, 29) 3
2. Legs dark orange to light brown. Dorsum of the petiole with thin, irregular striae (Fig. 6). Brazil, Paraguay . . . . *brasiliensis*
- Legs dark ferrugineous to black, with at least part of the tibiae yellowish. Dorsum of the petiole with thick, regular striae (Figs 8, 12) 4
3. Posterior third of the head dorsum at most with 25 striae. Postpetiole with 19-25 longitudinal striae. Guatemala, Costa Rica, Galapagos Is., Ecuador, Peru, Bolivia, Chile, Brazil . . . . *whymperi*
- Posterior third of the head dorsum with more than 34 striae. Postpetiole with about 29-30 striae. Surinam, French Guyana, Brazil . . . . *striatus*
4. Head length (mandibles excluded) ca. 1/3 longer than broad; frons, slightly more than 1/3 of the head width. Mandibles dorsally flat (Figs 29, 31) 5
- Head length (mandibles excluded) ca. 1/5 longer than broad; frons broad, slightly less than 1/2 or more than 1/2 of the head width. Mandibles dorsally convex (Figs. 17, 19, 20) 6
5. Frontal carinae not reaching the anterior clypeal border. Pygidium with a semicircle of teeth of similar size. Brazil . . . . *longiceps*
- Frontal carinae reaching the anterior clypeal border. Pygidium with a semicircle of teeth with two larger ones over the sting. Costa Rica, Panama, Venezuela, Brazil . . . . *meinerti*
6. Frontal carinae not reaching the anterior clypeal border. Clypeus strongly convex medially (Fig. 17). Gaster without striation. Mesosoma, petiole and legs elongate. Hind femora Index (HFeI) = 37. Colombia . . . . *escobari*
- Frontal carinae reaching or surpassing the anterior clypeal border. Clypeus not strongly convex medially (Fig. 19, 20). At least the first gastric tergite with thin striation on the anterior part. Mesosoma, petiole and legs stout. Hind femora Index (HFeI) ≥ 45 7
7. Frontal carinae surpassing the anterior clypeal border. Mandibles with 9-10 denticles. Scape Index (SI) = 37. Cuba . . . . *darlingtoni*
- Frontal carinae reaching the anterior clypeal border. Mandibles with 6-7 denticles. Scape Index (SI) > 42. Venezuela, Ecuador, Peru and Brazil . . . . *brevitarsus*

GYNES

The gyne of *escobari* is not included in this key because it is not yet known.

1. First gastric tergite smooth 2
- First gastric tergite sculptured 5
2. Postpetiole smooth or with very thin, short, superficial striae on the posterior half. Frontal carinae very broad, reaching the internal border of the eyes (Fig. 14). Mandibles not angulate basally, convex dorsally and with 10-12 denticles. Colombia, Venezuela, Peru and Bolivia . . . . *boliviae*
- Postpetiole entirely striate. Frontal carinae not reaching the internal border of the eyes. Mandibles angulate basally, slightly convex or flat dorsally, with maximum 7 denticles 3
3. Legs dark yellowish-orange to light brown. Body striation more irregular. Brazil, Paraguay . . . . *brasiliensis*
- Legs dark ferrugineous to black with large part of the tibiae yellowish. Body striation regular 4
4. Cephalic Index (CI) ≥ 80. Posterior third of the head dorsum at most with 25 striae. Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, Brazil . . . . *whymperi*
- Cephalic Index (CI) ≤ 77. Posterior third of the head dorsum with more than 34 striae. Surinam, French Guyana, Brazil . . . . *striatus*
5. Frons at most slightly more than 1/3 the head width. Eyes on the middle of the head sides 6
- Frons at least slightly less than 1/2 or more than 1/2 of the head. Eyes behind the middle of the head sides 8
6. Frontal carinae not reaching the anterior clypeal border. Pygidium apically without a distinct pair of large teeth. Distal border of hind basitarsi with 5 spine-like setae. Brazil . . . . *longiceps*
- Frontal carinae reaching the anterior clypeal border. Pygidium apically with a distinct pair of large teeth. Distal border of hind basitarsi with 3 spine-like setae. 7
7. Outer apical edge of the mid basitarsi with 3 spine-like setae on the outer face. Cephalic Index (CI) ≤ 70. HFeI ≥ 50. Costa Rica, Panama, Venezuela, Brazil . . . . *meinerti*
- Outer apical edge of mid basitarsi with 5 spine-like setae on the outer face. Cephalic Index (CI) > 77. HFeI < 46. Dominican amber . . . . . . *antillanus*
8. Head and mesosoma covered by thick and thin striae. Pygidium apically with a distinct pair of large teeth separated by a deep notch. Size large ≥ 12.5 mm. Cephalic Index (CI) < 71. Costa Rica, Panama, Ecuador . . *godmani*
- Head and mesosoma covered by uniform thin striae. Pygidium apically with 4-6 large teeth not separated by a notch. Size small < 9.5 mm. Cephalic Index (CI) > 78 9
9. Coxae and femora black. Mid basitarsi with parallel sides and more than half longer than the hind basitarsi. Dominican amber . . . . *electrinus*

- Coxae, femora dark brown. Mid basitarsi broad apically and half as long as the hind basitarsi 10

10. Frontal carinae not surpassing the anterior clypeal border. Mandibles with 6-8 small denticles. Femora yellowish to light brown. Venezuela, Ecuador, Peru and Brazil . . . . *brevitarsus*

- Frontal carinae surpassing the anterior clypeal border. Mandibles with 9-10 small denticles. Femora dark brown. Cuba . . . . *darlingtoni*

MALES

The males of *darlingtoni*, *escobari*, *electrinus*, *antillanus* and *longiceps* are not considered because they are not yet known. *Whymperi* and *striatus* are not separated because the unique specimen of *striatus* available for the present study is immature and does not allow a sure recognition of diagnostic characters.

1. Frontal carinae strongly converging and almost touching each other posteriorly and broadly separated anteriorly (Figs 26, 33). Hypopygium with a simple, umpair, median projection between the apodemes (Figs 27b, 34b) 2

- Frontal carinae not strongly converging posteriorly (Figs 10, 15, 22), if almost touching each other posteriorly (few males of brevitarsus) then never broadly separated anteriorly. Hypopygium smooth, or finely denticulate, or with a bidentate median projection between the apodemes (Figs. 7b, 11b, 23b) 3

2. Total length (TL) > 9.5 cm. Mesosoma massive. Petiole with traces of striae only anteriorly. Postpetiole smooth. Costa Rica, Panama, Ecuador . . . . *godmani*

- Total length (TL) < 8.5 cm. Mesosoma elongate. Petiole entirely striate. Postpetiole superficially striate. Costa Rica, Panama, Venezuela, Brazil . . . . *meinerti*

3. Head and basal face of the propodeum with thick striae (Fig. 10), sometimes with thick foveae between the striae. Hypopygium smooth or finely denticulate between the distal apodemes 4

- Head and basal face of the propodeum with thinner striae (Figs 15, 22). Hypopygium with a simple, umpair, median projection between the apodemes 5

4. Anterior clypeal border slightly convex. Scape Index (SI) ≤ 53.1. Hypopygium finely denticulate between the distal apodemes (Fig. 7b). Brazil and Paraguay . . . . *brasiliensis*

- Anterior clypeal border straight (Fig. 10). Scape Index (SI) > 57.1. Hypopygium smooth between the distal apodemes. (Figs 11b, 13b). Guatemala, Costa Rica, Galapagos Island, Ecuador, Peru, Bolivia, Chile, Brazil . . . . *whymperi*

- Surinam, French Guyana, Brazil . . . . *striatus*

5. Coxae black with the remaining parts of the legs yellow to light brown. Ventral border of the aedeagus with at least 42 denticles. Venezuela, Ecuador, Peru and Brazil . . . . *brevitarsus*
- Coxae dark or black, concolour with the remaining parts of the legs. Ventral border of the aedeagus with at most 32 denticles. Colombia, Venezuela, Peru and Bolivia . . . . *boliviae*

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Aleocharinae della Cina: Parte III (Coleoptera, Staphylinidae)

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Aleocharinae from China: Part III (Coleoptera, Staphylinidae). - In this paper further 69 species are described as new to science. These new species belong to the tribe Athetini (part II). Two new synonymies are proposed. The main diagnostic caracters are illustrated.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - Taxonomy - China.

INTRODUZIONE

Con il presente lavoro continua la descrizione delle specie nuove delle Aleocharinae della Cina raccolte dal Dr Ales Smetana e dal collega Guillaume de Rougemont di Londra. Le specie note o nuove per la Cina sono elencate nella prima parte di questa serie (Pace 1998a). Le specie descritte nel presente lavoro appartengono alla vasta tribù degli Athetini la cui trattazione sarà conclusa nella quarta parte di questa serie.

Gli holotypi delle nuove specie sono conservati nelle collezioni del Museo di Storia Naturale di Ginevra, Svizzera (MHNG).

ATHETINI (parte II)

Atheta (Chaetida) elephanticola sp. n. Figg. 1-3

Holotypus ♂, China, Yunnan, Xishuangbanna, Sanchahe, elephant res., 24.I.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,1 mm. Corpo lucido e nero con elitre giallo-brune; antenne nere; zampe anteriori e medie giallo-brune, posteriori pure giallo-brune, ma con tarsi gialli. Sulla superficie corporea non vi è traccia di reticolazione. La punteggiatura del capo è distinta. I tubercoletti che coprono la superficie del pronoto e dell'addome sono salienti, quelli delle elitre sono svaniti. Il pronoto ha un debole e stretto solco mediano.

Comparazioni. La nuova specie è simile ad *A. drescheri* Cameron, 1939, dell'India. Se ne distingue per il colore giallo-bruno delle elitre e l'estremità addo-

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(141° Contributo alla conoscenza delle Aleocharinae).

Manoscritto accettato il 13.02.1998

minale nera e non rossiccia come in *drescheri*. L'estremità delle antenne dell'holotypus ♂ di *drescheri* è perduta, perciò non comparabile. L'edeago della nuova specie è un terzo più breve, nonostante ciò è più largo nella regione mediana, se visto ventralmente. Inoltre la lunga armatura genitale interna dell'edeago stesso corrisponde a un'armatura genitale corta e sinuata nell'edeago di *drescheri*.

Atheta (Philhygra) conferta sp. n. Figg. 7-9

Holotypus ♂, China, Yunnan, Dali, 9.II.1993, de Rougemont leg. (MHNG).
Paratypi: 2 ♂ e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,8 mm. Corpo lucido e nero-bruno; antenne brune con l'antennomero basale bruno-rossiccio; zampe bruno-rossicce. La reticolazione della superficie del capo e del pronoto è nettissima, quella delle elitre è estremamente svanita e quella dell'addome è distinta e a maglie trasverse. Il capo e il pronoto non presentano distinta punteggiatura. Tubercoletti fini ed estremamente svaniti coprono le elitre. Uroterghi con tubercoletti distinti. Edeago figg. 8-9, spermateca indistinta.

Comparazioni. La nuova specie è affine ad *A. homoeopyga* Eppelsheim, 1893 della Siberia orientale (Baikal), se si osserva l'edeago. Se ne distingue per l'apice dell'edeago largamente ricurvo al lato ventrale, mentre *homoeopyga* ha l'apice dell'edeago strettamente ricurvo. Lo stesso, in visione ventrale è stretto nella nuova specie e largo in *homoeopyga*. L'armatura genitale interna dell'edeago della nuova specie è composta da un fascio di robuste spine che nell'edeago di *homoeopyga* sono esili e in numero molto minore. Inoltre nell'edeago della nuova specie esiste una lama ricurva appartenente all'armatura genitale interna, assente nell'edeago di *homoeopyga*.

Atheta (Philhygra) dalijiensis sp. n. Figg. 10-12

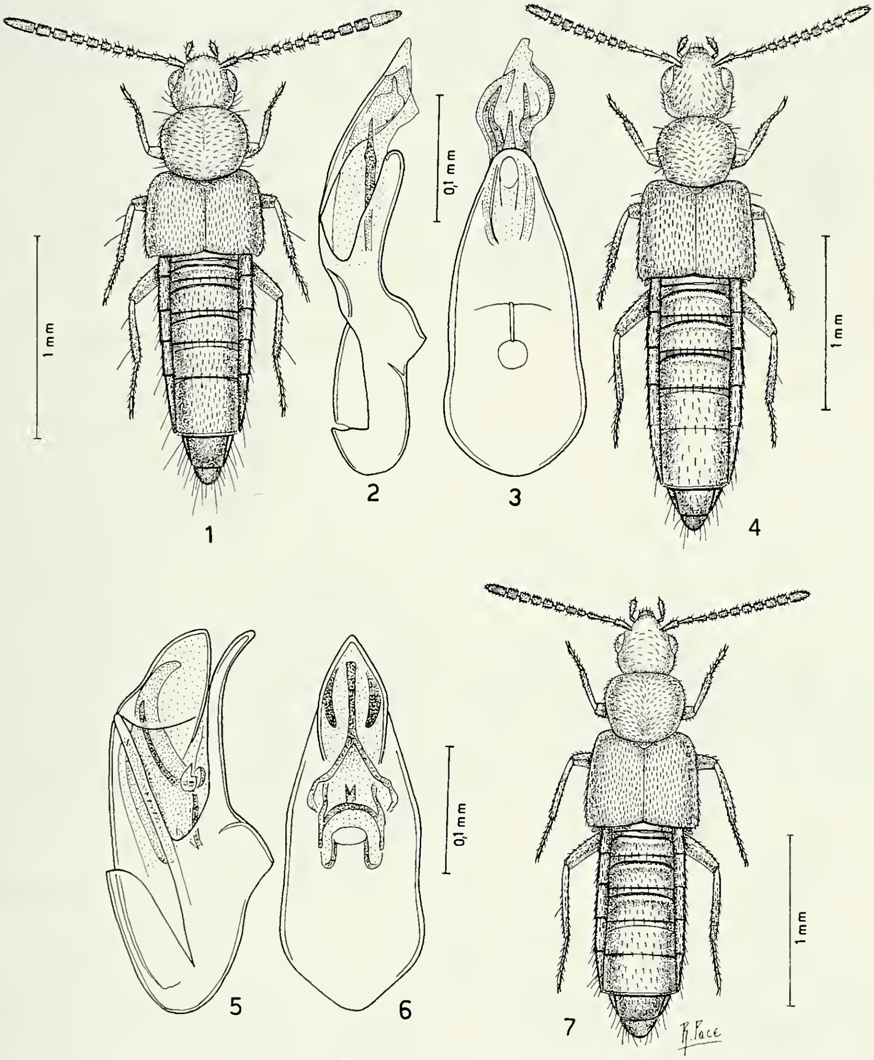
Holotypus ♂, China, Gansu, Dalijia Shan, 46 Km W Linxia, 2980 m, 10.VII.1994, A. Smetana leg. (MHNG).

Descrizione. Lunghezza 3,9 mm. Corpo lucido e nero pece con addome nero; antenne nero-brune; zampe rossicce. La reticolazione della superficie dell'avancorpo è netta, quella degli uroterghi libero 4°, 5° e 6° è estremamente trasversa e distinta. I tubercoletti che coprono la superficie del capo sono distinti e assenti sulla fascia mediana, quelli del pronoto e delle elitre sono svaniti. Edeago figg. 11-12.

Comparazioni. Per la forma dell'edeago, la nuova specie è tassonomicamente vicina ad *A. terminalis* (Gravenhorst, 1806) della regione paleartica occidentale. La nuova specie se ne distingue per avere l'estremità dell'edeago non dentata, sottile e molto prolungata (estremità dell'edeago breve e larga in *terminalis*).

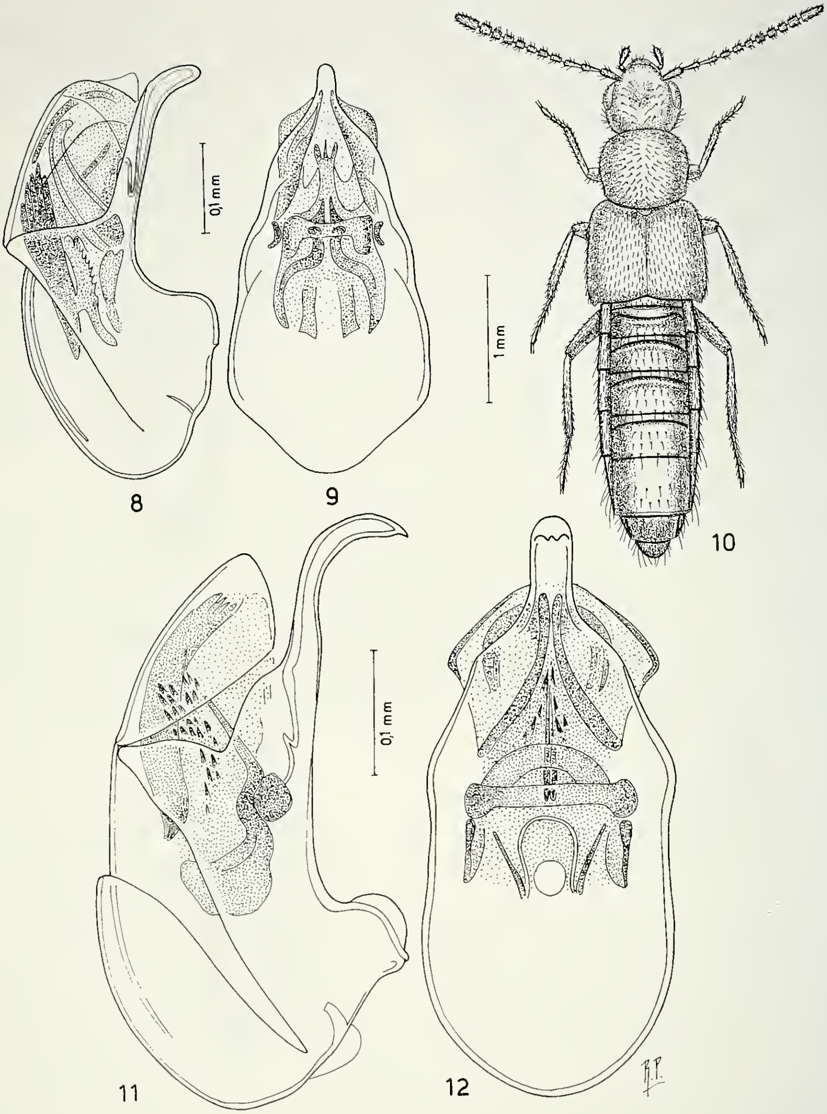
Atheta (Philhygra) gansuicola sp. n. Figg. 13-15

Holotypus ♂, China, Gansu, M. ts 25 Km E Xiahe, 3000 m, 5.VIII.1994, A. Smetana leg. (MHNG).
Paratypi: 2 ♂, stessa provenienza.



FIGG. 1-7

Habitus, edeago in visione laterale e ventrale. 1-3: *Atheta (Chaetida) elephanticola* sp. n.; 4-6: *Atheta (Philhygra) yokkaichiana* Bernhauer; 7: *Atheta (Philhygra) conferta* sp. n.



FIGG. 8-12

Edeago in visione laterale e ventrale e habitus. 8-9: *Atheta (Philhygra) conferta* sp. n.; 10-12: *Atheta (Philhygra) dalijiensis* sp. n.

Descrizione. Lunghezza 3,7 mm. Corpo lucido e nero; antenne brune; zampe giallo-brune. La reticolazione del capo è nettissima, quella del pronoto è vigorosa, quella delle elitre è netta e quella dell'addome è svanita e a maglie molto trasverse. Il capo presenta una debole e larga bozza tra le antenne e tubercoletti salienti e assenti sulla fascia mediana. I tubercoletti del pronoto sono salienti, quelli delle elitre svaniti. Edeago figg. 14-15.

Comparazioni. La nuova specie, simile per il capo e il pronoto nettamente reticolati ad *A. pseudoelongatula* Bernhauer, 1907 del Giappone, ne è distinta per avere l'edeago sinuato al lato ventrale (arcuato in *pseudoelongatula*) e la parte terminale dello stesso organo larga e non stretta come in *pseudoelongatula*.

Atheta (Philhygra) tianmushanensis sp. n. Figg. 16-19

Holotypus ♂, China, Zhejiang Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 3,9 mm. Corpo lucido e bruno con elitre bruno-rossicce e addome nero; antenne brune; zampe rossicce con femori bruno-rossicci. La reticolazione del pronoto è netta e quella sul resto della superficie del corpo è distinta. I tubercoletti della superficie del capo sono svaniti, assenti sulla fascia mediana, quelli del pronoto sono netti e quelli delle elitre e dell'addome sono distinti. Spermateca fig. 16, edeago figg. 17-18.

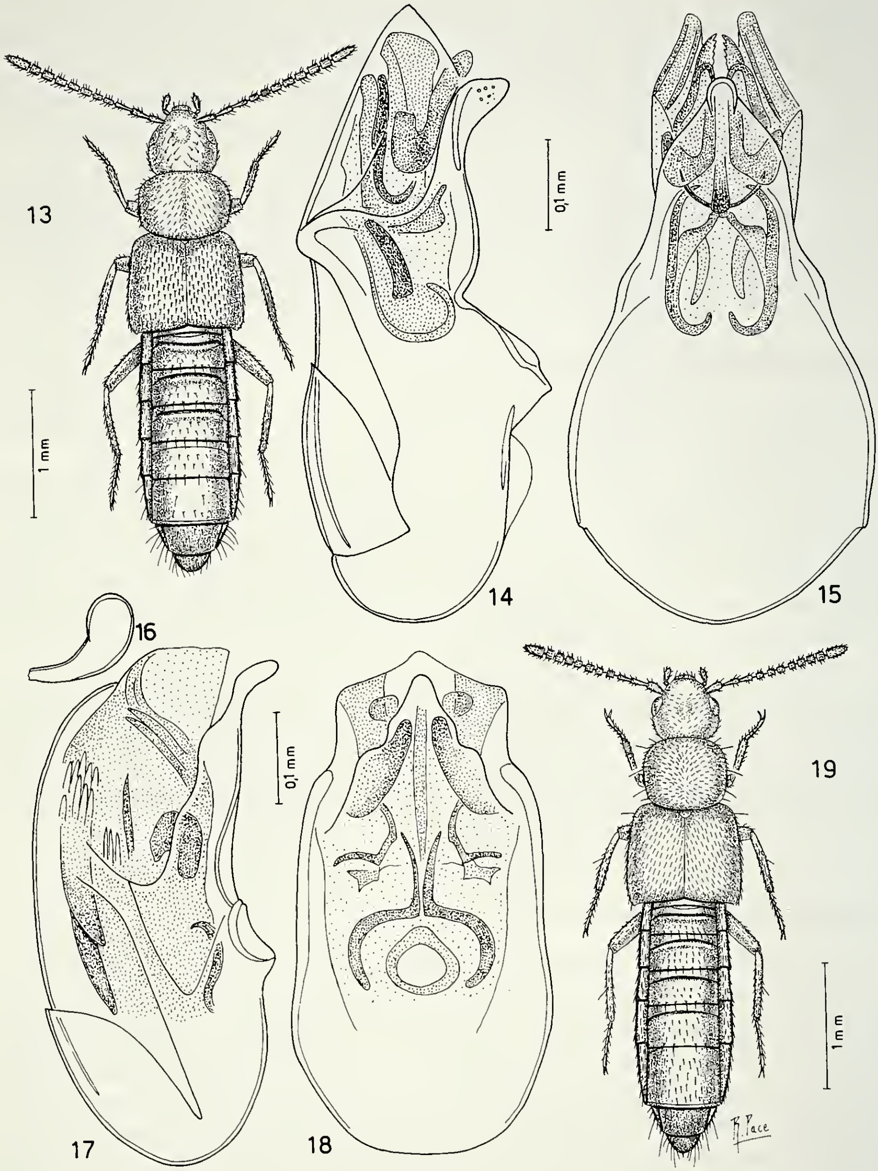
Comparazioni. La nuova specie è ben distinta da *A. palustris* Kiesenwetter, 1844, a diffusione paleartica, per il capo e il pronoto distintamente o nettamente reticolati (assenza di reticolazione in *palustris*). L'edeago della nuova specie pur avendo profilo ventrale simile a quello dell'edeago di *palustris*, ha l'armatura genitale interna molto differente. Ad esempio le due armature genitali dentate dell'edeago di *palustris* sono assenti nell'edeago della nuova specie.

Atheta (Philhygra) ideogrammifera sp. n. Figg. 20-22

Holotypus ♂, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg. (MHNG).

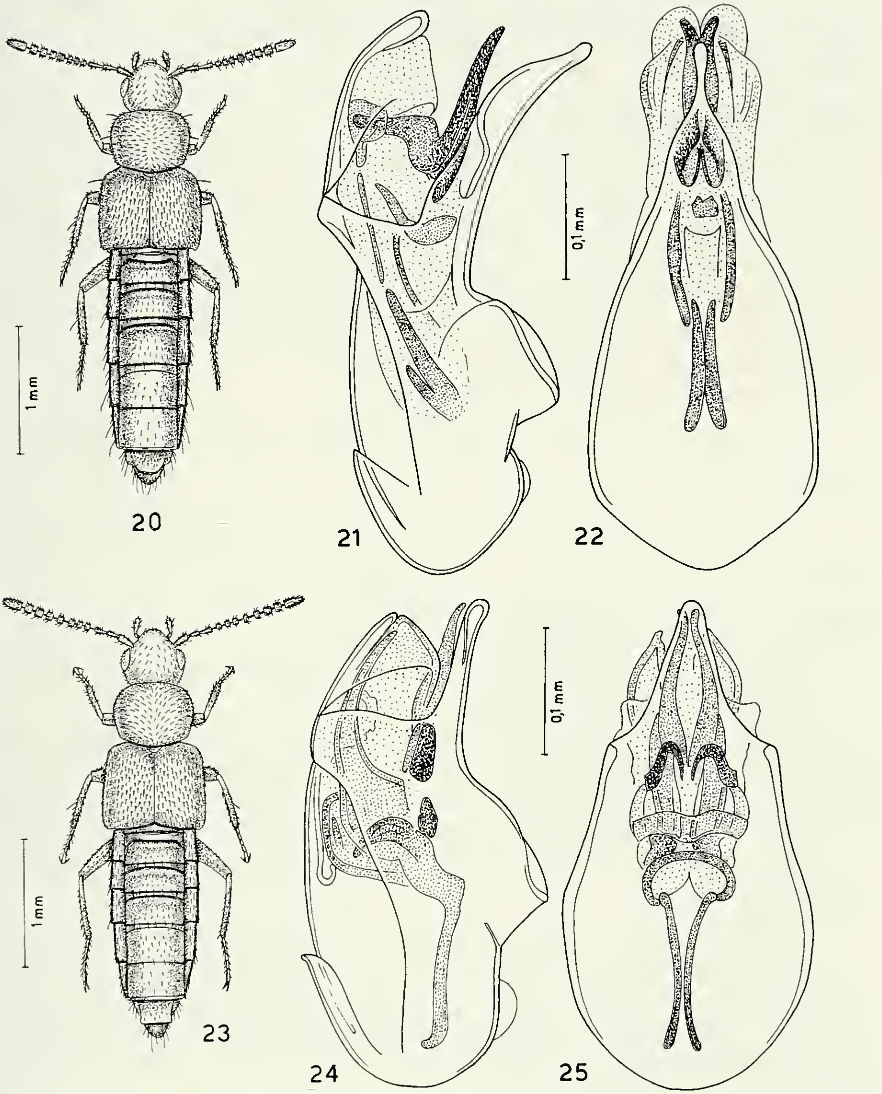
Descrizione. Lunghezza 3,2 mm. Corpo lucido e nero-bruno con elitre giallo-brune e il margine posteriore dei due uriti basali bruno-rossiccio; antenne brune con i due antennomeri basali rossicci; zampe rossicce. La reticolazione della superficie del capo è quasi vigorosa, quella del pronoto è distinta, quella delle elitre è netta e quella dell'addome è a maglie molto trasverse e ondulate, distinte. La punteggiatura del capo è distinta e assente sulla fascia mediana. I tubercoletti che coprono il pronoto sono ben svaniti, quelli delle elitre sono salienti. Edeago figg. 21-22.

Comparazioni. Il profilo ventrale dell'edeago della nuova specie è simile a quello dell'edeago di *A. pseudoelongatula* Bernhauer, 1907, del Giappone, ma la robusta armatura genitale interna dell'edeago della nuova specie è assente nell'edeago di *pseudoelongatula*. Inoltre l'edeago della nuova specie, in visione ventrale, è strettissimo, mentre è largo in *pseudoelongatula*.



FIGG. 13-19

Habitus, edeago in visione laterale e ventrale e spermateca. 13-15: *Atheta (Philhygra) gansuicola* sp. n.; 16-19: *Atheta (Philhygra) tianmushanensis* sp. n.



Figg. 20-25

Habitus ed edeago in visione laterale e ventrale. 20-22: *Atheta (Philhygra) ideogrammifera* sp. n.; 23-25: *Atheta (Philhygra) vulnerans* sp. n.

Etimologia. Il nome della nuova specie significa "Portatrice di ideogramma". Infatti l'armatura genitale dell'edeago in visione laterale ha la vaga forma di un ideogramma cinese.

Atheta (Philhygra) vulnerans sp. n. Figg. 23-25

Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 3,1 mm. Corpo lucido e nero-bruno con elitre giallo-brune, con margine posteriore dei tre uroterghi basali giallo-brunicci e con gli uriti liberi 4° e la base del 5° neri; antenne brune con l'antennomero basale giallo-rossiccio e il successivo bruno rossiccio; zampe giallo-rossicce. La reticolazione dell'avancorpo è netta, quella dell'addome è svanita e a maglie molto trasverse. La punteggiatura del capo è estremamente svanita. Il pronoto è coperto di tubercoletti svaniti, le elitre di tubercoletti distinti. Edeago figg. 24-25.

Comparazioni. In visione laterale, l'armatura genitale dell'edeago della nuova specie possiede due distinte lame ricurve che nell'edeago di *A. pseudoelongatula* Bernhauer, 1907, non sono presenti.

Etimologia. Data la presenza di lame dell'armatura genitale interna dell'edeago, la nuova specie è nominata "colei che ferisce".

Atheta (Psammostiba) apicipilae sp. n. Figg. 26-28

Holotypus ♂, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 3,3 mm. Avancorpo debolmente lucido, addome lucido. Corpo nero-bruno con addome nero; antenne nero-brune; zampe rossicce con femori nero-bruni. Una netta reticolazione copre la superficie del corpo. Il capo ha il disco impresso e la punteggiatura distinta, assente sulla fascia mediana. I tubercoletti del pronoto sono finissimi e radi, quelli del pronoto sono netti. Edeago figg. 27-28, spermateca indistinta.

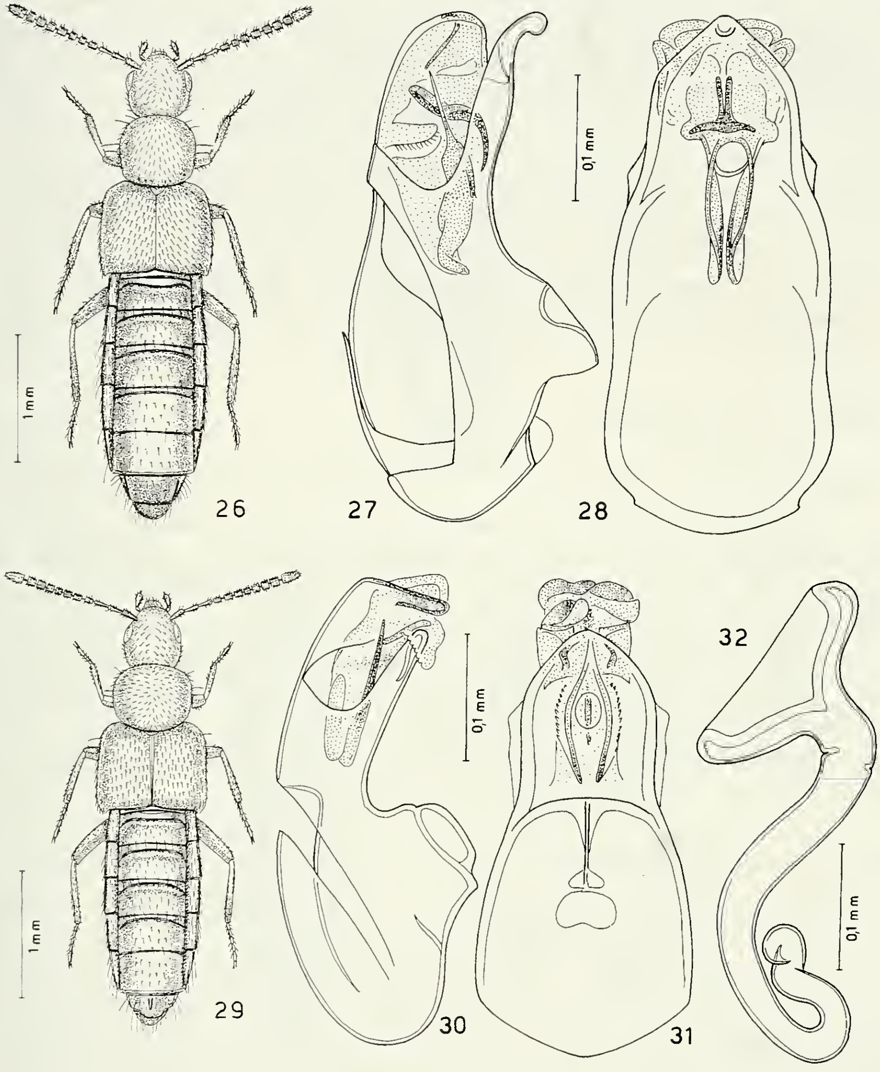
Comparazioni. La nuova specie, in base alla forma dell'edeago è affine ad *A. kamtschatica* Brundin, 1943, della Siberia. Se ne distingue per avere l'edeago più ampiamente ricurvo al lato ventrale e con profilo sinuato (non sinuato in *kamtschatica*), per la parte apicale dell'edeago, in visione ventrale, più larga, con appendice membranosa a ciascun lato e per la presenta di setoline nell'armatura genitale interna dell'edeago (assenti in *kamtschatica*).

Etimologia. La nuova specie prende nome dai peli dell'armatura genitale interna dell'edeago. Il nome significa "Peli apicali".

Atheta (Coprothassa) iucunda sp. n. Figg. 29-33

Holotypus ♂, China, Yunnan, Kunming, I-II.1993, de Rougemont leg. (MHNG).
Paratypi: 2 ♀, stessa pronenienza.

Descrizione. Lunghezza 3,2 mm. Corpo lucidissimo e nero con elitre nero-brune; antenne nere con i due antennomeri basali nero-bruni; zampe bruno-rossicce



FIGG. 26-32

Habitus, edeago in visione laterale e ventrale e spermateca. 26-28: *Atheta (Psammostiba) apicipilae* sp. n.; 29-32: *Atheta (Coprothassa) iucunda* sp. n.

con tarsi rossicci. Sulla superficie corporea non vi è traccia di reticolazione, tranne che sul quinto urotergo libero dove è visibile una reticolazione estremamente svanita e a maglie molto trasverse. La punteggiatura del capo e del pronoto è svanita, quella dell'addome è netta. Tubercoletti svaniti coprono la superficie delle elitre. Edeago figg. 30-31, spermateca fig. 32, sesto urotergo libero del maschio fig. 33.

Comparazioni. In base alla forma della spermateca la nuova specie sembra affine ad *A. melanaria* (Mannerheim, 1830), diffusa nella regione paleartica occidentale. Tuttavia la spermateca della nuova specie ha il bulbo distale molto più sviluppato e la parte prossimale dello stesso organo, a stretta spira e non con due spire, di cui una ampia come in *melanaria*. Inoltre l'edeago della nuova specie è profondamente arcuato al lato ventrale, mentre l'edeago di *melanaria* è debolmente arcuato.

Atheta (Coprothassa) hsin sp. n. Figg. 34-35

Holotypus ♀, China, Sichuan, Langmui, 3500-3600 m, 13.VII.1994, A. Smetana leg. (MHNG).

Descrizione. Lunghezza 2,3 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali bruno-rossicci; zampe giallo-brune. La reticolazione del pronoto è netta, quella sul resto del corpo è distinta, trasversa e ondulata sull'addome. I tubercoletti che coprono la superficie del corpo sono salienti. Spermateca fig. 34-35.

Comparazioni. La nuova specie è ben distinta da *A. melanaria* (Mannerheim, 1830), per avere il bulbo distale della spermateca molto sviluppato e la parte prossimale dello stesso organo a spirale schiacciata.

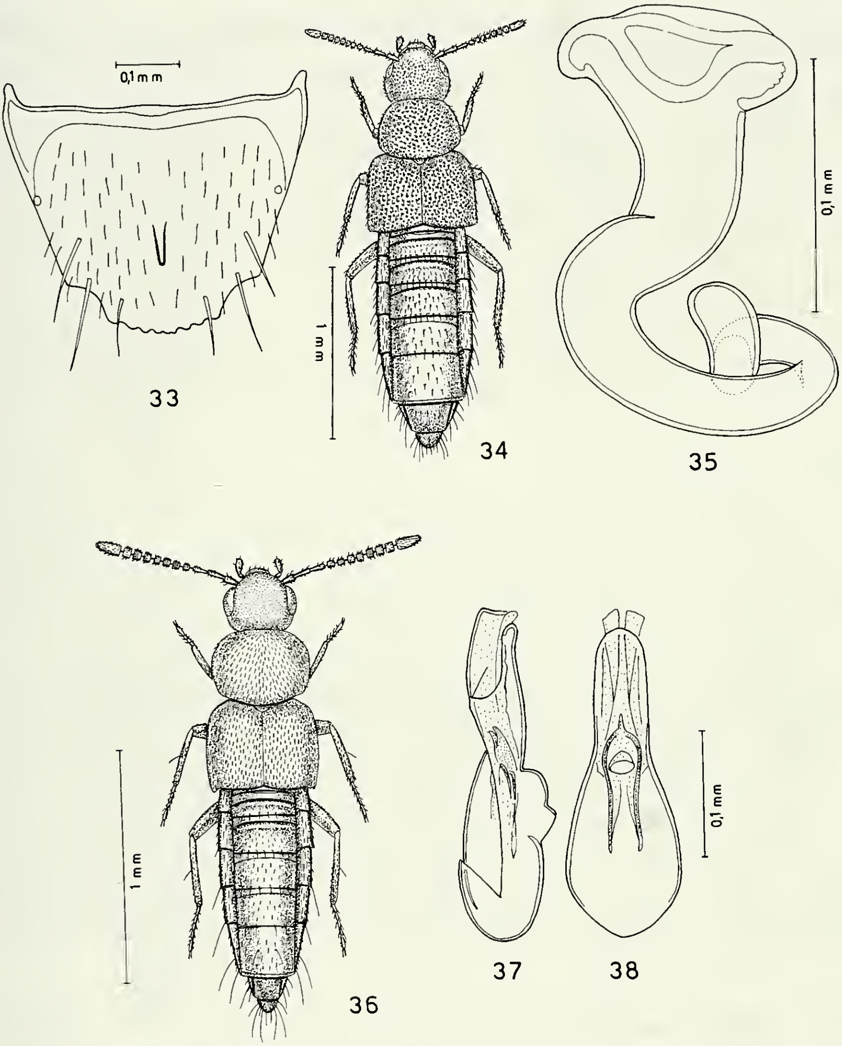
Etimologia. La nuova specie prende nome dall'aggettivo cinese "hsin" che significa nuova.

Atheta (Acrotona) setipyga sp. n. Figg. 36-38

Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♂, stessa provenienza.

Descrizione. Lunghezza 1,8 mm. Corpo lucido e bruno con pronoto bruno-rossiccio e con i due uriti basali e l'apice dell'addome giallo-bruni; antenne brune con il primo antennomero basale giallo-rossiccio con una macchia apicale bruna; zampe giallo-rossicce. Il capo e il pronoto sono privi di reticolazione, quella delle elitre è molto svanita. L'intero corpo è coperto di tubercoletti fini e distinti, fitti sul-avancorpo e radi sull'addome. Edeago figg. 37-38.

Comparazioni. Per la presenza di lunghe setole dell'addome e per la forma e dimensione dell'edeago, la nuova specie può essere tassonomicamente vicina ad *A. borneana* Cameron, 1943, del Borneo, ma la nuova specie ha occhi più lunghi delle tempie (lunghi quanto le tempie in *borneana*) e l'edeago in visione ventrale non è sinuato ai lati come in *borneana* e la robusta armatura genitale interna flessa ad angolo dell'edeago di *borneana*, nell'edeago della nuova specie è sostituita da un'ovale piastra con punta.



FIGG. 33-38

Sesto urotergo libero del maschio, habitus, spermateca ed edeago in visione laterale e ventrale. 33: *Atheta (Corpothassa) iucunda* sp. n.; 34-35: *Atheta (Coprothassa) hsin* sp. n.; 36-38: *Atheta (Acrotona) setipyga* sp. n.

Atheta (Acrotona) exsuperans sp. n. Figg. 39-42

Holotypus ♂, China, Beijing, B.N.U., flight interception trap, 10.VI-10.VII.1993, de Rougemont leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza; 1 ♂, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg.

Descrizione. Lunghezza 2,4 mm. Corpo lucido e bruno con elitre ed estremità addominale bruno-rossicci; antenne nere con antennomero basale bruno; zampe giallo-brune con tarsi gialli. La reticolazione è distinta sul capo e svanita sul resto del corpo. I tubercoletti dell'avancorpo sono salienti, quelli dell'addome sono estremamente svaniti. Edeago figg. 40-41, spermateca fig. 42.

Comparazioni. La nuova specie è simile ad *A. suspiciosa* Motschulsky, 1859, diffusa dallo Sri Lanka al Nepal. Se ne distingue per avere l'armatura genitale interna dell'edeago più robusta e per la presenza di una lunga spina all'interno del bulbo basale dello stesso edeago, poco evidente nel bulbo basale dell'edeago di *suspiciosa*.

Atheta (Acrotona) collusa sp. n. Figg. 43-46

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

Paratypi: 23 es., stessa provenienza; 24 es., China, Shanxi, Wutaishan; 4-5.VI.1993, de Rougemont leg.; 3 es., China, Gansu, pass btw Hezuo-Amqog, 3300 m, 12.VII.1994, A. Smetana leg.

Descrizione. Lunghezza 2,8 mm. Corpo lucido e nero pece con elitre nero-brune; antenne nere; zampe bruno-rossicce. La reticolazione della superficie delle elitre è netta, quella sul resto del corpo è svanita, tranne che sul quinto urotergo libero dove è distinta. I tubercoletti delle elitre sono salienti, quelli sul resto della superficie corporea sono superficiali. Edeago figg. 44-45, spermateca fig. 46.

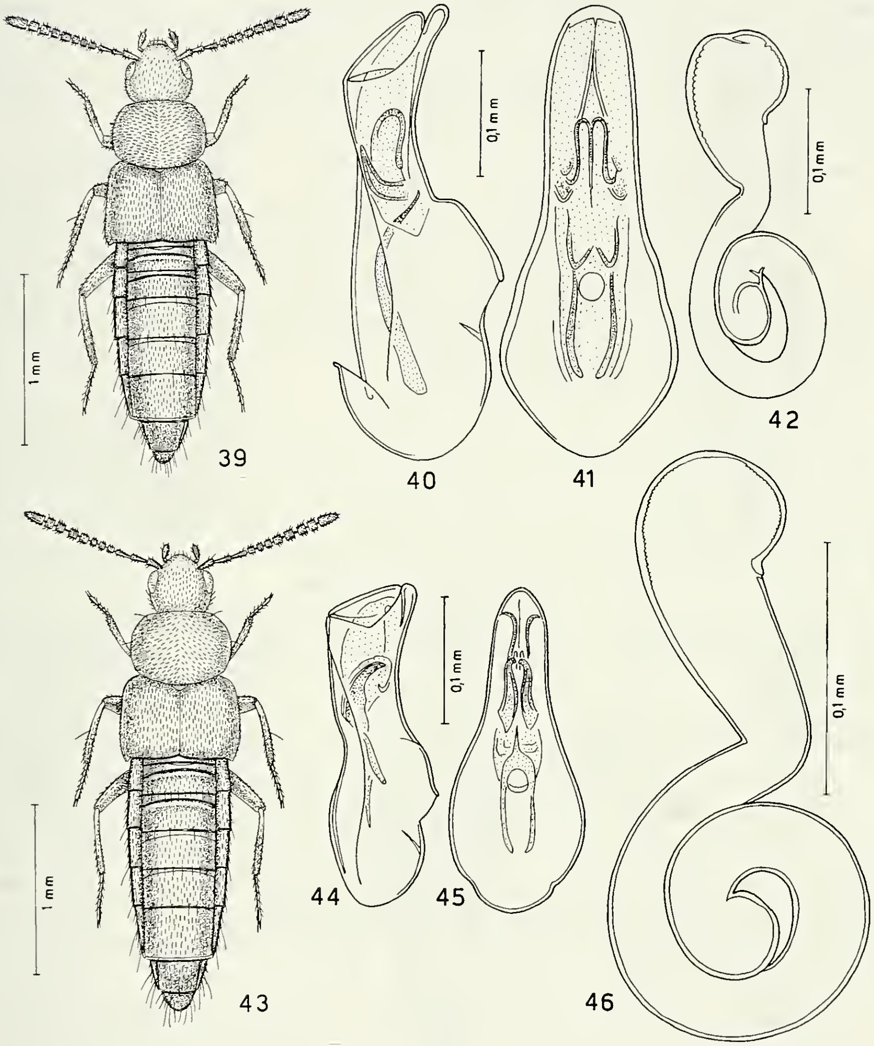
Comparazioni. Per i caratteri dell'edeago, la nuova specie è simile ad *A. ostentata* Pace, 1991. Tuttavia l'armatura genitale falciforme interna dell'edeago è meno robusta e assai meno ricurva nella nuova specie, mentre l'apice dell'edeago della nuova specie è più largo. Il bulbo distale della spermateca è meno dilatato nella nuova specie.

Atheta (Acrotona) adesiana sp. n. Figg. 47-49

Holotypus ♂, Hong Kong, N.T., IV.1996, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,8 mm. Corpo lucido e bruno con capo e addome neri; antenne nere con antennomero basale giallo-rossiccio e i due successivi bruno-rossicci; zampe rossicce. Il capo e il pronoto mostrano una reticolazione svanita, le elitre e l'addome hanno reticolazione distinta, quella addominale a maglie molto trasverse. L'intero corpo è coperto di tubercoletti salienti. Edeago figg. 48-49.

Comparazioni. La nuova specie per i caratteri dell'edeago è simile ad *A. paedida* (Kraatz, 1859), largamente diffusa in oriente, in Africa meridionale e nel Madagascar. Se ne distingue per avere il bulbo prossimale dell'edeago di maggiore



FIGG. 39-46

Habitus, edeago in visione laterale e ventrale e spermateca. 39-42: *Atheta (Acrotona) exsupernans* sp. n.; 43-46: *Atheta (Acrotona) collusa* sp. n.

sviluppo rispetto la parte distale (in *paedida* la parte distale ha maggiore sviluppo della parte basale), per l'apice dell'edeago, in visione ventrale, largo e non sinuato ai lati preapicali come in *paedida*.

ETIMOLOGIA. La nuova specie è dedicata a Garry Ades, zoologo che ha raccolto Aleocharinae della Cina, pure oggetto della presente serie di lavori.

Atheta (Acrotona) litura sp. n. Figg. 50-52

Holotypus ♂, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,8 mm. Corpo lucido e bruno con elitre giallo-brune con lati esterni oscurati di bruno e con i due uriti basali e la metà distale del quinto libero bruno-rossicci; le antenne mancano; zampe giallo-rossicce. L'avancorpo è coperto di reticolazione superficiale, l'addome è privo di reticolazione. L'intero corpo è coperto di tubercoletti salienti. Edeago figg. 51-52.

COMPARAZIONI. La nuova specie, poiché ha occhi molto sviluppati, lunghe setole all'estremità addominale e l'edeago poco arcuato, mostra qualche affinità con *A. subscabrosa* Cameron, 1939, dell'India. Tuttavia la presenza di un'armatura genitale interna dell'edeago robusta e flessa differenzia la nuova specie da *subscabrosa* che non presenta tale armatura genitale. Inoltre le lunghissime setole sporgenti ai lati del corpo della nuova specie, sono ridotte in *subscabrosa*.

ETIMOLOGIA. Il nome della nuova specie significa "scarabocchio" a motivo della forma simile a uno scarabocchio dell'armatura genitale interna dell'edeago in visione laterale.

Atheta (Acrotona) appulsina sp. n. Figg. 53-55

Holotypus ♂, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).

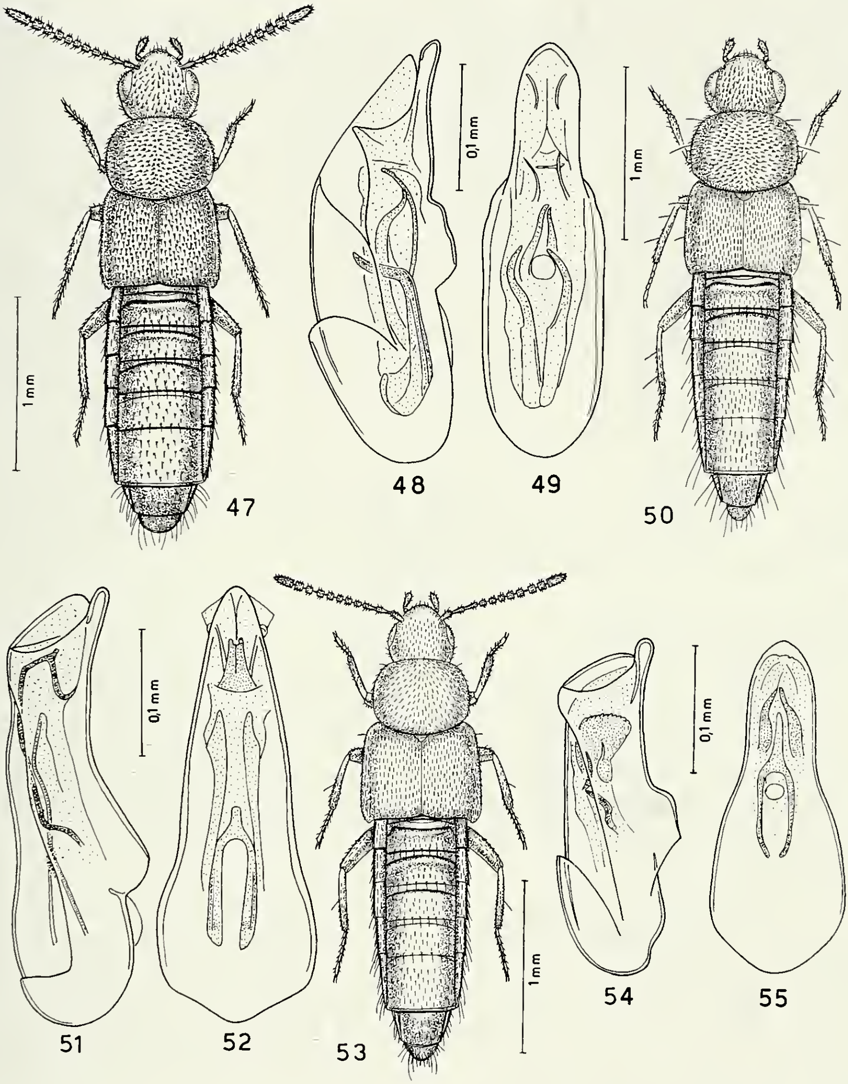
DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido e nero-bruno con pronoto ed elitre brune; antenne nere con i due antennomeri basali bruno-rossicci; zampe rossicce. La reticolazione del capo e delle elitre è svanita, quella del pronoto è distinta e quella dell'addome è netta. I tubercoletti della superficie del capo sono svaniti, quelli del pronoto sono molto superficiali e quelli delle elitre e dell'addome sono distinti. Edeago figg. 54-55.

COMPARAZIONI. Per la forma dell'edeago, la nuova specie sembra affine ad *A. subscabrosa* Cameron, 1939, dell'India. Ma l'edeago è meno profondamente arcuato al lato ventrale e in visione ventrale ha lati sinuati e non arcuati come in *subscabrosa*. L'armatura genitale interna dell'edeago della nuova specie è molto più sviluppata, mentre l'armatura genitale bisinuata è più esile rispetto quella dell'edeago di *subscabrosa*.

Atheta (Acrotona) appulsinoides sp. n. Figg. 56-58

Holotypus ♂, China, Shaanxi, Nanwutai, 17.IX.1995, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,1 mm. Corpo lucido e nero pece con elitre brune; antenne nere; zampe giallo-brune. La reticolazione del corpo è molto superficiale. I



FIGG. 47-55

Habitus, edeago in visione laterale e ventrale. 47-49: *Atheta (Acrotona) adesiana* sp. n.; 50-52: *Atheta (Acrotona) litura* sp. n.; 53-55: *Atheta (Acrotona) appulsina* sp. n.

tubercoletti del capo sono svaniti, quelli del pronoto e delle elitre sono nettamente salienti. Edeago figg. 57-58.

COMPARAZIONI. La nuova specie è affine ad *A. subscabrosa* Cameron, 1939, dell'India. Se ne distingue per l'edeago meno sviluppato con armatura genitale interna differente, figg. 54-55 e 57-58.

Atheta (Acrotona) intercepta sp. n. Figg. 59-61

Holotypus ♂, China, Beijing, B.N.U., flight interception trap, 10.VI.VII.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,2 mm. Corpo lucido e nero-bruno con elitre giallo-brune ed estremità addominale bruna; antenne nere; zampe bruno-rossicce. La reticolazione del capo è svanita, quella del pronoto è distinta, quella delle elitre netta e quella dell'addome è estremamente svanita e a maglie molto trasverse. I tubercoletti della superficie del capo e dell'addome sono superficiali, quelli delle elitre e dell'addome sono salienti. Edeago figg. 60-61.

COMPARAZIONI. La nuova specie, in base alla forma dell'edeago, è forse affine ad *A. scabrosa* Cameron, 1939, dell'India, ma l'edeago della nuova specie è nettamente più sviluppato, più profondamente arcuato al lato ventrale e con due armature genitali lamellari assenti nell'edeago di *scabrosa*.

Atheta (Acrotona) filia sp. n. Figg. 62-64

Holotypus ♂, China, Yunnan, Xishuangbanna, Mengdien, 26.I.1993, de Rougemont leg. (MHNG).

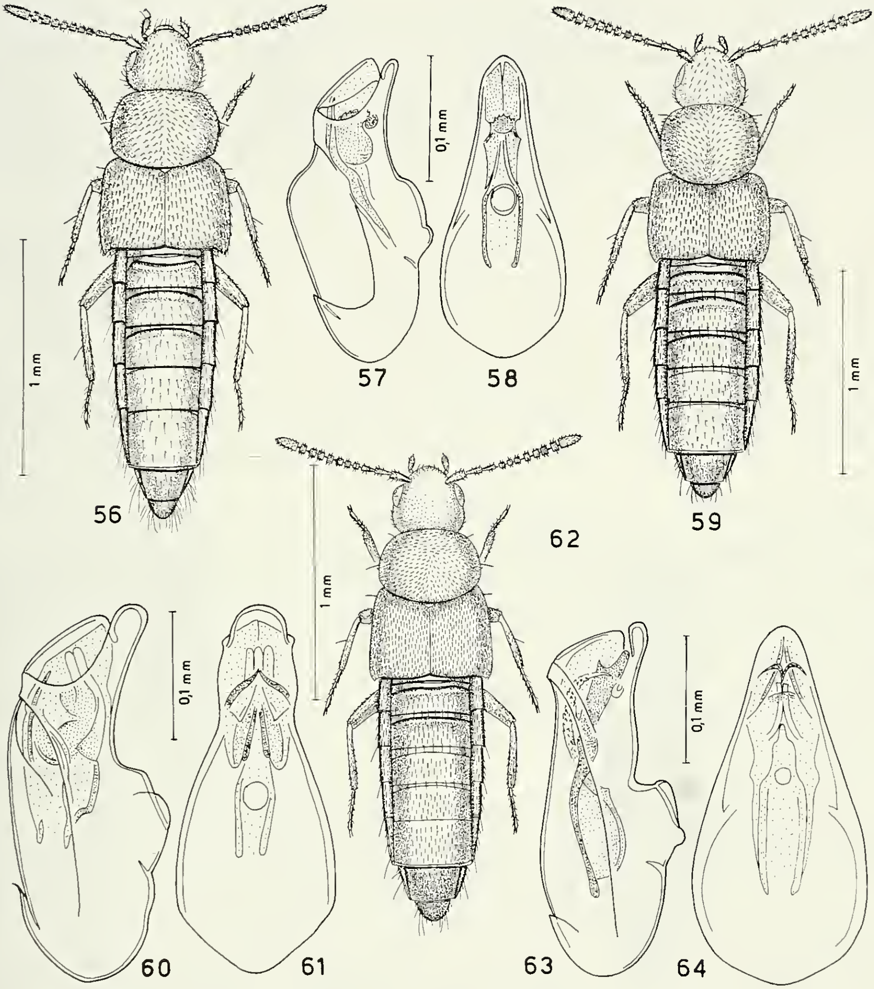
DESCRIZIONE. Lunghezza 1,9 mm. Corpo lucido e nero-bruno con elitre brune; antenne nere; zampe giallo-brune. Sull'avancorpo non vi è traccia di reticolazione, quella sull'addome è estremamente superficiale. I tubercoletti della superficie del pronoto sono svaniti, quelli sul resto della superficie del corpo sono salienti. Edeago figg. 63-64.

COMPARAZIONI. La nuova specie appartiene al gruppo di specie affini ad *A. fletcheri* Cameron, 1939, dell'India. L'armatura genitale finemente squamiforme si osserva anche in *fletcheri*, ma è molto più lunga e arcuata nell'edeago della nuova specie e retta in *fletcheri*. Inoltre l'edeago della nuova specie, al lato ventrale, presenta un angolo retto, assente nell'edeago di *fletcheri* e specie affini e la sua lunghezza al livello del bulbo basale, in visione ventrale, è doppia rispetto quella del bulbo basale dell'edeago di *fletcheri*.

Atheta (Acrotona) singularis sp. n. Figg. 73-75

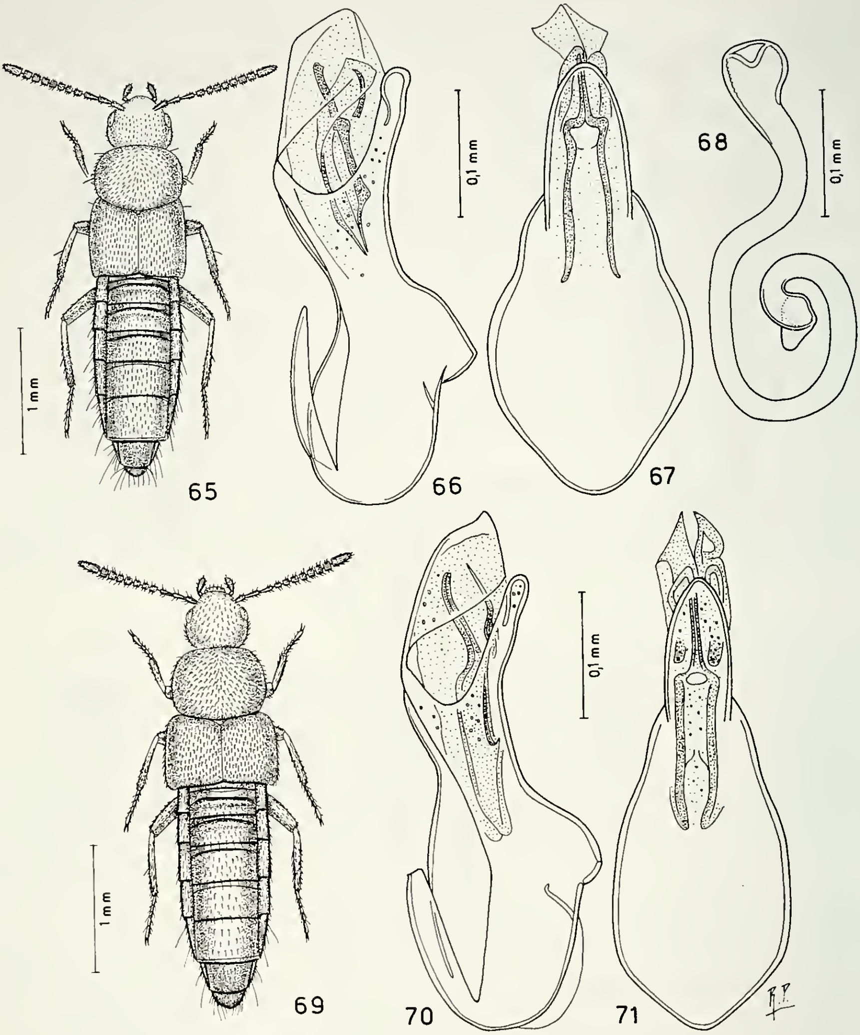
Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,9 mm. Corpo debolmente lucido e bruno con elitre giallo-brune e margine posteriore dei tre uriti basali e apice addominale bruno-rossicci; antenne brune con antennomero basale giallo-bruno macchiato di bruno all'apice; zampe gialle. Il corpo è coperto di reticolazione superficiale e di tubercoletti



FIGG. 56-64

Habitus ed edeago in visione laterale e ventrale. 56-58: *Atheta (Acrotona) appulsinoides* sp. n.; 59-61: *Atheta (Acrotona) intercepta* sp. n.; 62-64: *Atheta (Acrotona) filia* sp. n.



FIGG. 65-71

Habitus, edeago in visione laterale e ventrale e spermateca. 65-71: *Atheta (Acrotona) inquinata* Cameron.

fini e svaniti. La pubescenza dell'addome è fitta, simile a quella di molte specie di *Myllaena*. Edeago figg. 74-75.

COMPARAZIONI. La nuova specie è simile ad *A. inquinata* Cameron, 1939, dell'India e della Cina, dato che l'edeago è nettamente meno sviluppato, con armatura genitale interna robusta e lati dell'edeago, in visione ventrale, convergenti verso l'apice e non paralleli come in *inquinata*. Due armature genitali interne dell'edeago, in visione ventrale, a forma di piastre con appendice falciforme, non si osservano nell'edeago di *fletcheri*.

Atheta (Acrotona) lingicola sp. n. Figg. 76-77

Holotypus ♀, China, Gansu, Dalijia Shan, 46 Km W Linxia, 2980 m, 10.VII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 3,4 mm. Corpo lucido e nero pece con il quarto urite libero e la base del quinto neri; antenne nere; zampe rossicce. L'avancorpo è privo di reticolazione, l'addome la mostra estremamente svanita e a maglie molto trasverse. Tubercoletti distinti o molto salienti coprono la superficie dell'avancorpo. Spermateca fig. 76.

COMPARAZIONI. La nuova specie è probabilmente tassonomicamente vicina ad *A. inquinata* Cameron, 1939, dell'India e della Cina. Se ne distingue per il bulbo distale della spermateca più sviluppato e con robusta introflessione apicale e per la parte prossimale della stessa spermateca non ampiamente sviluppata come in *inquinata*.

ETIMOLOGIA. Il nome della nuova specie significa "colei che abita le catene montuose". Infatti il sostantivo cinese "ling" significa catena montuosa.

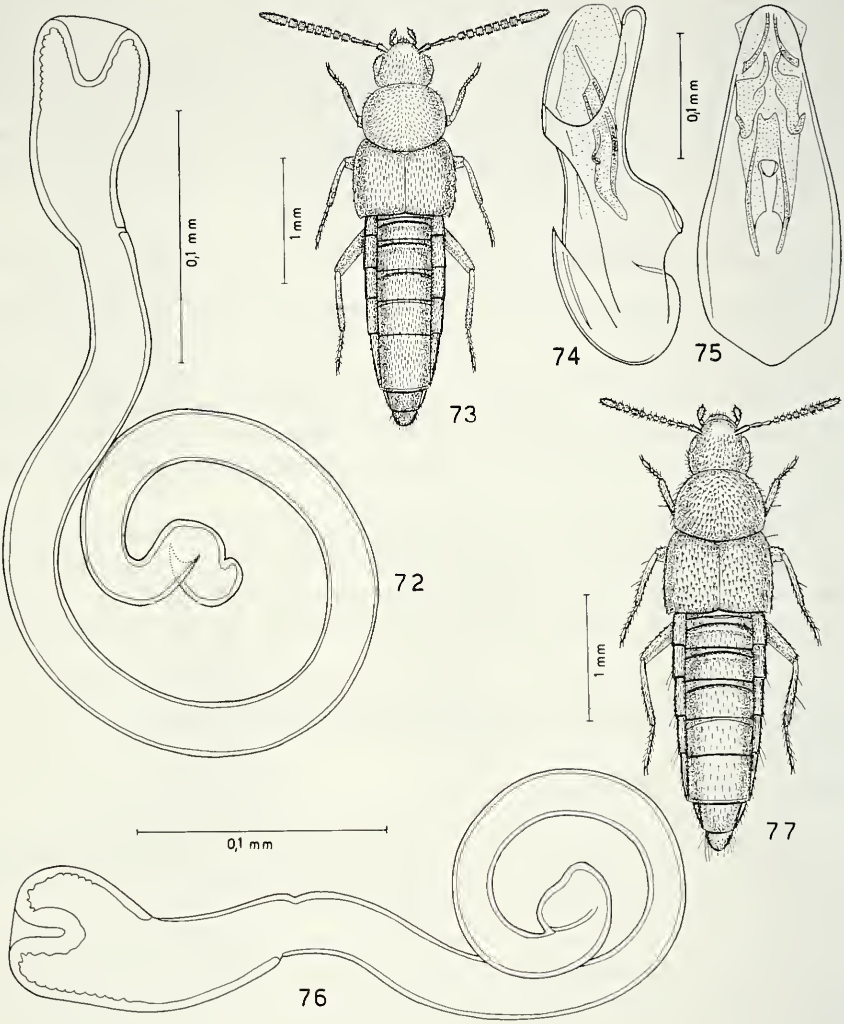
Atheta (Acrotona) biserrula sp. n. Figg. 78-81

Holotypus ♂, China, Beijing, Xishan, IX.1992, de Rougemont leg. (MHNG).

Paratypi: 14 es., stessa provenienza; 1 ♀, Beijing, B.N.U., flight interception trap, 10.VI-10.VII.1993, de Rougemont leg.; 7 es., China, Hebei, Chengde, 3.X.1993, de Rougemont leg.; 8 es., Beijing, Yingtaogou, III.1993, de Rougemont leg.

DESCRIZIONE. Lunghezza 1,8 mm. Corpo ben convesso, lucido e bruno con pronoto bruno chiaro, elitre giallo-brune e margine posteriore dell'urotergo basale bruno rossiccio; antenne brune con l'antennomero basale giallo-rossiccio e il successivo rossiccio; zampe giallo-rossicce. L'intero corpo è coperto di tubercoletti distinti ed è privo di reticolazione. Edeago figg. 79-80, spermateca fig. 81.

COMPARAZIONI. Una specie che presenta una robustissima armatura genitale interna dell'edeago, come quella dell'edeago della nuova specie, è *A. iperarmata* Pace, 1987a, del Nepal. La nuova specie è nettamente distinta da essa per l'edeago di un terzo minore, con apice largo in visione ventrale (appuntito e diviso in *iperarmata*). Inoltre le due lamelle apicali a margine seghettato dell'armatura genitale interna dell'edeago della nuova specie, non sono presenti in *iperarmata*. La parte prossimale della spermateca della nuova specie è esile a confronto della corrispondente parte della spermateca di *iperarmata*.



FIGG. 72-77

Spermateca, habitus ed edeago in visione laterale e ventrale. 72: *Atheta (Acrotona) inquinata* Cameron; 73-75: *Atheta (Acrotona) singularis* sp. n.; 76-77: *Atheta (Acrotona) lingicola* sp. n.

Etimologia. Il nome della nuova specie significa "con due seghette" per la presenza di due lamelle a margine seghettato all'estremità dell'armatura genitale interna dell'edeago.

Atheta (Acrotona) villaekadooriensis sp. n. Figg. 82-85

Holotypus ♂, Hong Kong, N.T., Kadoorie Farm, VI.1992, Malaise trap, G. Ades leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 3,3 mm. Avancorpo debolmente lucido, addome lucido. Capo bruno, pronoto, elitre e i due uriti basali bruno-rossicci, restanti uriti neri; antenne nere con i due antennomeri basali rossicci e l'apice dell'undicesimo bruno; zampe giallo-rossicce. La reticolazione del capo e delle elitre è svanita, quella del pronoto è distinta e quella dell'addome è estremamente svanita o assente. La punteggiatura del capo e del pronoto è molto superficiale, quella delle elitre è distinta. I due uroterghi basali mostrano una pubescenza piuttosto fitta, i restanti uroterghi appaiono nudi, senza setole, tranne quelle al margine posteriore e sul quinto libero quelle più robuste. Spermateca fig. 83, edeago figg. 84-85.

Comparazioni. In base alla forma della spermateca e per la presenza di una larga lamella dell'armatura genitale interna dell'edeago, la nuova specie, nonostante le apparenze esteriori del corpo, va attribuita al sottogenere assegnatole e probabilmente si colloca tassonomicamente presso *A. fletcheri* Cameron, 1939, dell'India. L'edeago della nuova specie è sinuato ventralmente presso l'apice: ciò non si osserva nell'edeago di *fletcheri* che inoltre non presenta l'angolo ventrale, evidente, al contrario, nella parte ventrale dell'edeago della nuova specie. Il bulbo distale della spermateca della nuova specie è molto più sviluppato di quello corrispondente della spermateca di *fletcheri*.

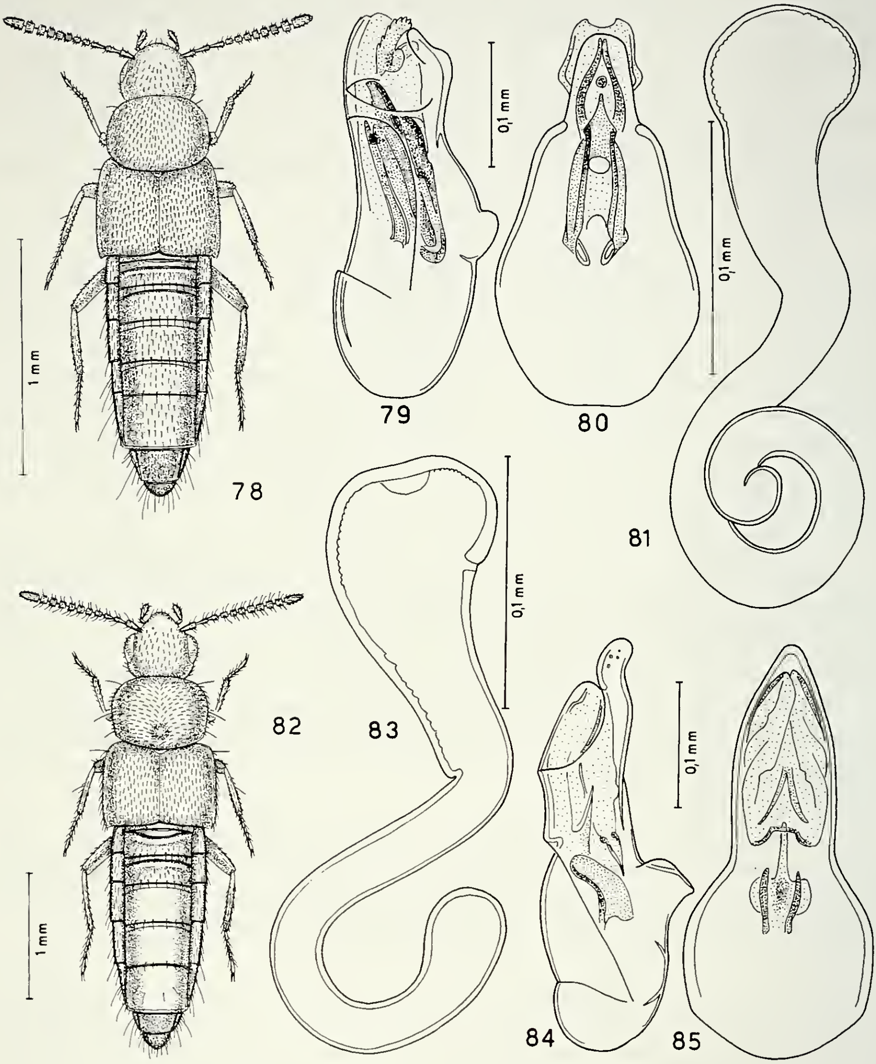
Etimologia. Il nome della nuova specie ricorda la "farm" dei fratelli Kadoorie, grandi filantropi di Hong Kong, fondatori del "Kadoorie Agricultural Research Centre" dell'Università di Hong Kong. In questo centro è stata raccolta la nuova specie il cui nome significa "dell'azienda agricola dei Kadoorie".

Atheta (Acrotona) pseudofungi sp. n. Figg. 86-87

Holotypus ♀, China, Gansu, Dalijia Shan, 46 Km W Linxia, 2580 m, 10.VII.1994, A. Smetana leg. (MHNG).

Descrizione. Lunghezza 2,7 mm. Corpo lucido e bruno con capo e uriti liberi 4° e 5° neri; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. La reticolazione della superficie del capo e del pronoto è svanita, quella delle elitre è distinta e quella dell'addome è confusa. I tubercoletti che coprono la superficie del corpo sono fini e superficiali. La reticolazione degli uriti liberi 4° e 5° è a maglie molto trasverse. Spermateca fig. 87.

Comparazioni. Per i caratteri delle antenne e altri esoscheletrici, la nuova specie è determinabile come *A. fungi* (Gravenhorst, 1806), specie subcosmopolita



FIGG. 78-85

Habitus, edeago in visione laterale e ventrale e spermateca. 78-81: *Atheta (Acrotona) biserrula* sp. n.; 82-85: *Atheta (Acrotona) villaekadooriensis* sp. n.

della regione paleartica, ma la spermateca della nuova specie ha bulbo distale nettamente più sviluppato e la parte mediana della stessa spermateca è robusta (esile in *fungi*).

Atheta (Acrotona) parasuspiciosa sp. n. Figg. 88-89

Holotypus ♀, China, Gansu, M. ts 25 Km E Xiahe, 2805-2925 m, 3.VII.1994, A. Smetana leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,7 mm. Corpo lucido e nero-bruno, comprese le antenne; zampe giallo-brunicce. L'avancorpo è privo di reticolazione, l'addome è coperto di reticolazione a maglie poligonali irregolari svanite. Tubercoletti distinti coprono la superficie del corpo. Spermateca fig. 89.

Comparazioni. Per la forma della spermateca, la nuova specie sembra affine ad *A. suspiciosa* Motschulsky, 1859, diffusa dallo Sri Lanka al Nepal. La spermateca della nuova specie è distinta da quella di *suspiciosa* per la taglia nettamente minore (circa un quarto minore), per il bulbo distale nettamente meno sviluppato e per l'estremità della parte prossimale della stessa spermateca, meno robusta e prolungata per un breve tratto (non prolungata la parte corrispondente in *suspiciosa*). Esternamente il capo di *suspiciosa* rispetto alla larghezza del pronoto è distintamente poco sviluppato, mentre nella nuova specie lo è di più, rispetto al pronoto.

Atheta (Acrotona) yuzhongensis sp. n. Figg. 90-91

Holotypus ♀, China, Gansu, Yonghai, ca. 20 Km SW Yuzhong, 2700-2800 m, 9.VIII.1994, A. Smetana leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

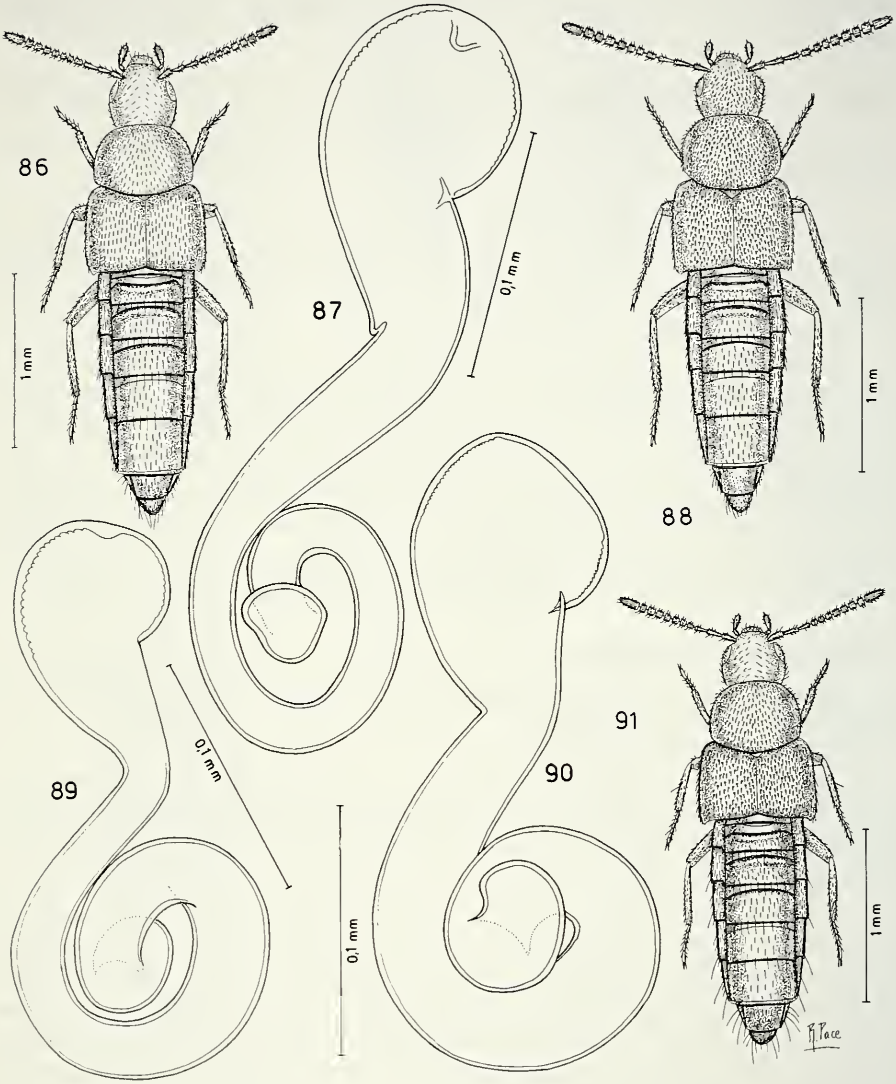
Descrizione. Lunghezza 2,4 mm. Corpo lucido e nero pece; antenne nere; zampe brune. L'avancorpo è privo di reticolazione, l'addome presenta una reticolazione poligonale irregolare distinta. Tubercoletti distinti coprono la superficie del corpo. Spermateca fig. 90.

Comparazioni. In base alla forma della spermateca, la nuova specie si collocherebbe in posizione intermedia tra *A. parasuspiciosa* sp. n. sopra descritta e *A. suspiciosa* Motschulscky, 1859. La nuova specie si distingue da *parasuspiciosa* per il bulbo distale della spermateca più sviluppato e per il prolungamento più accentuato della parte prossimale della stessa spermateca. E' distinta da *suspiciosa* per la spermateca evidentemente di taglia minore e per il prolungamento prossimale della stessa spermateca (assente in *suspiciosa*).

Atheta (Acrotona) xiahensis sp. n. Figg. 92-95

Holotypus ♂, China, Gansu, M. ts 25 Km E Xiahe, 2805-2925 m, 3.VIII.1994, A. Smetana leg. (MHNG).
Paratypi: 20 es., stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e nero pece; antenne nere; zampe bruno-rossicce. La reticolazione della superficie del capo e del pronoto è



FIGG. 86-91

Habitus e spermateca. 86-87: *Atheta (Acrotona) pseudofungi* sp. n.; 88-89: *Atheta (Acrotona) parasuspiciosa* sp. n.; 90-91: *Atheta (Acrotona) yuzhongensis* sp. n.

distinta, quella delle elitre è assente e quella dell'addome è svanita. I tubercoletti che coprono il capo sono salienti e assenti sulla fascia mediana, quelli del pronoto sono poco salienti e quelli delle elitre sono distinti. Edeago figg. 93-94, spermateca fig. 95.

COMPARAZIONI. In base alla forma della spermateca e dell'edeago, la nuova specie sembra tassonomicamente affine ad *A. scabrosa* Cameron, 1939, dell'India. Tuttavia l'edeago della nuova specie è di taglia nettamente maggiore, con una rudimentale carena ventrale e lati lievemente sinuati, in visione ventrale, mentre l'edeago di *scabrosa* è privo di quasiasi carena ventrale e i suoi lati sono regolarmente convergenti verso l'apice, in visione ventrale. La spermateca della nuova specie ha bulbo distale subsferico, mentre quello di *scabrosa* è allungato.

Atheta (Acrotona) mutans sp. n. Figg. 96-97

Holotypus ♀, China, Gansu, M. ts 25 Km E Xiahe, 2806-2925 m, 3.VIII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 2,3 mm. Corpo lucido e bruno con capo e uriti liberi 4° e 5° neri; antenne rossicce con i tre antennomeri basali giallo-rossicci; zampe gialle. Assente è la reticolazione della superficie del capo e delle elitre, essa è estremamente svanita sul pronoto e a maglie trasverse, ondulate e distinte sull'addome. I tubercoletti della superficie del capo e delle elitre sono poco distinti, quelli del pronoto sono ben salienti. Spermateca fig. 97.

COMPARAZIONI. La nuova specie appare affine sia ad *A. xiahensis* sp. n. sopra descritta, che ad *A. scabrosa* Cameron, 1939, dell'India. Si distingue da entrambe per la minuscola introflessione apicale del bulbo distale della spermateca che ha taglia minore rispetto quella delle due specie a confronto. Inoltre la parte mediana della spermateca della nuova specie mostra alcune maglie di scultura interna, carattere questo assente nelle altre due specie.

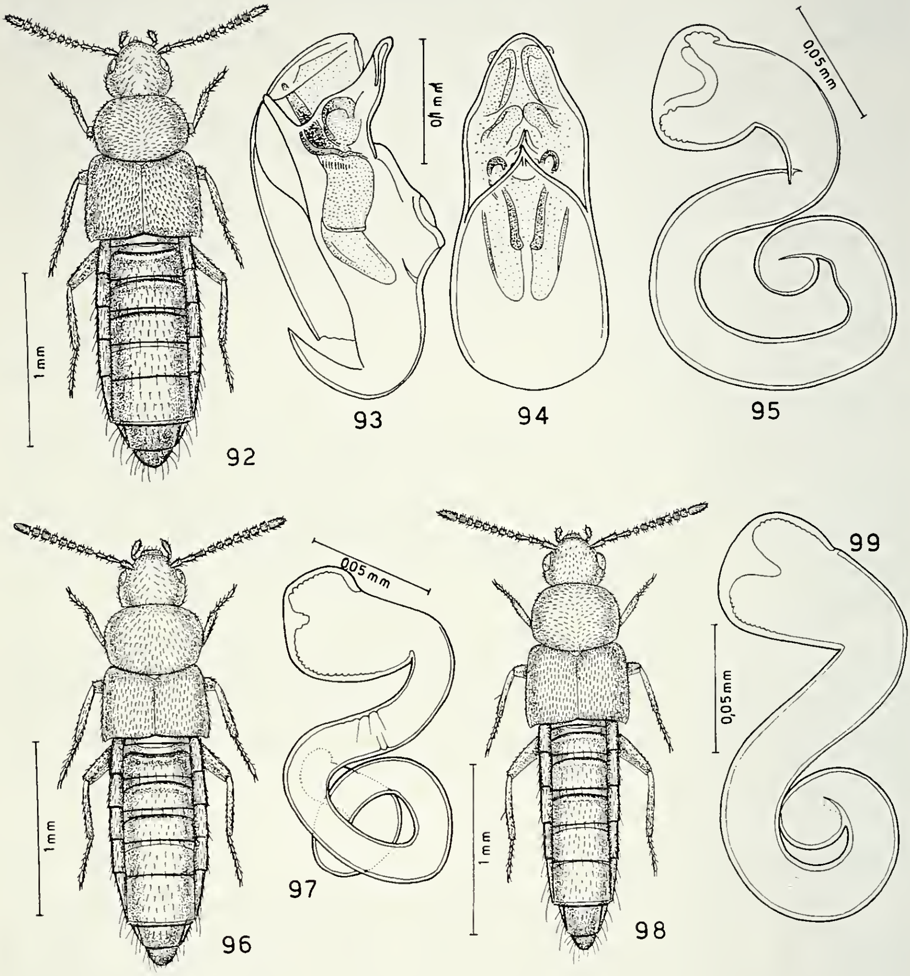
Atheta (Acrotona) xishanensis sp. n. Figg. 98-102

Holotypus ♂, China, Beijing, Xishan, IX.1992, de Rougemont leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza; 1 ♀, Beijing, Songshan, 15.V.1993, de Rougemont leg.; 23 es., Beijing, B.N.U., at light, V-VI.1993, de Rougemont leg.; 1 ♂ e 1 ♀, Beijing, B.N.U. campus, from birds nesting box, 7.VII.1993, de Rougemont leg.; 1 ♂, Beijing, B.N.U., flight interception trap, 10.VI-10.VII.1993, de Rougemont leg.; 2 ♀, China, Henan, Luoyang, 10.IX.1994, de Rougemont leg.; 1 ♂, China, Jiangsu, Suzhoo, 3.IX.1994, de Rougemont leg.; 13 es., China, Hebei Prov., Yongnian, 6.X.1995, Shuqiang Li leg.

DESCRIZIONE. Lunghezza 2,4 mm. Corpo lucido e nero con pronoto giallo rossiccio, elitre giallo-brune e i tre uriti basali bruni con margine posteriore giallo rossiccio. La reticolazione è netta sul disco del capo e sulle elitre, svanita al di fuori del disco del capo e sul pronoto ed è assente sull'addome. I tubercoletti del capo e delle elitre sono svaniti, quelli del pronoto e dell'addome sono salienti, presenti anche nel fondo dei solchi trasversi basali dell'addome. Spermateca fig. 99, edeago figg. 100-101, sesto urotergo libero del maschio fig. 102.

COMPARAZIONI. Per la presenza di un'armatura genitale interna a squame dell'edeago, la nuova specie si presenta simile ad *A. birmana* Pace, 1984, della



Figg. 92-99

Habitus, edeago in visione laterale e ventrale e spermateca. 92-95: *Atheta (Acrotona) xiahensis* sp. n.; 96-97: *Atheta (Acrotona) mutans* sp. n.; 98-99: *Atheta (Acrotona) xishanensis* sp. n.

Birmania e della Cina, e ad *A. siamensis* Pace, 1984, della Thailandia. Da entrambe la nuova specie è differente per avere tale armatura genitale a squame estremamente sottile e con squame minute (squame larghe e armatura genitale robusta nelle due specie a paragone). Inoltre la spermateca della nuova specie ha dimensioni ridotte rispetto quelle della spermateca delle due specie citate, con parte prossimale avvolta a spirale come in *birmana*, ma con profonda introflessione apicale del bulbo distale della stessa spermateca, introflessione assente nel bulbo distale della spermateca di *birmana*.

Atheta (Acrotona) nanjingensis sp. n. Figg. 103-105

Holotypus ♂, China, Jiangsu, Nanjing, 17.VIII.1994, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 1,8 mm. Avancorpo debolmente lucido, addome lucido. Corpo bruno con margini laterali del pronoto bruno-rossicci, elitre giallo-brune, i due uriti basali bruno-rossicci e l'estremità addominale rossiccia; antenne brune con i due antennomeri basali rossicci; zampe giallo-rossicce. La reticolazione della superficie del capo è confusa, quella del pronoto è svanita, quella delle elitre è distinta e quella dell'addome è assente. La superficie del capo ha un aspetto rugoso. Tubercoletti fini e fitti coprono il pronoto. La punteggiatura delle elitre è distinta. Edeago figg. 104-105.

COMPARAZIONI. La nuova specie è affine ad *A. birmana* Pace, 1984, ma da essa distinta per avere l'edeago maggiore di quasi un terzo. Nonostante ció le squame dell'armatura genitale interna dell'edeago della nuova specie sono minuscole rispetto quelle ampie di *birmana*. Inoltre, in visione ventrale, l'edeago della nuova specie è decisamente più largo sia al livello del bulbo basale che della parte apicale.

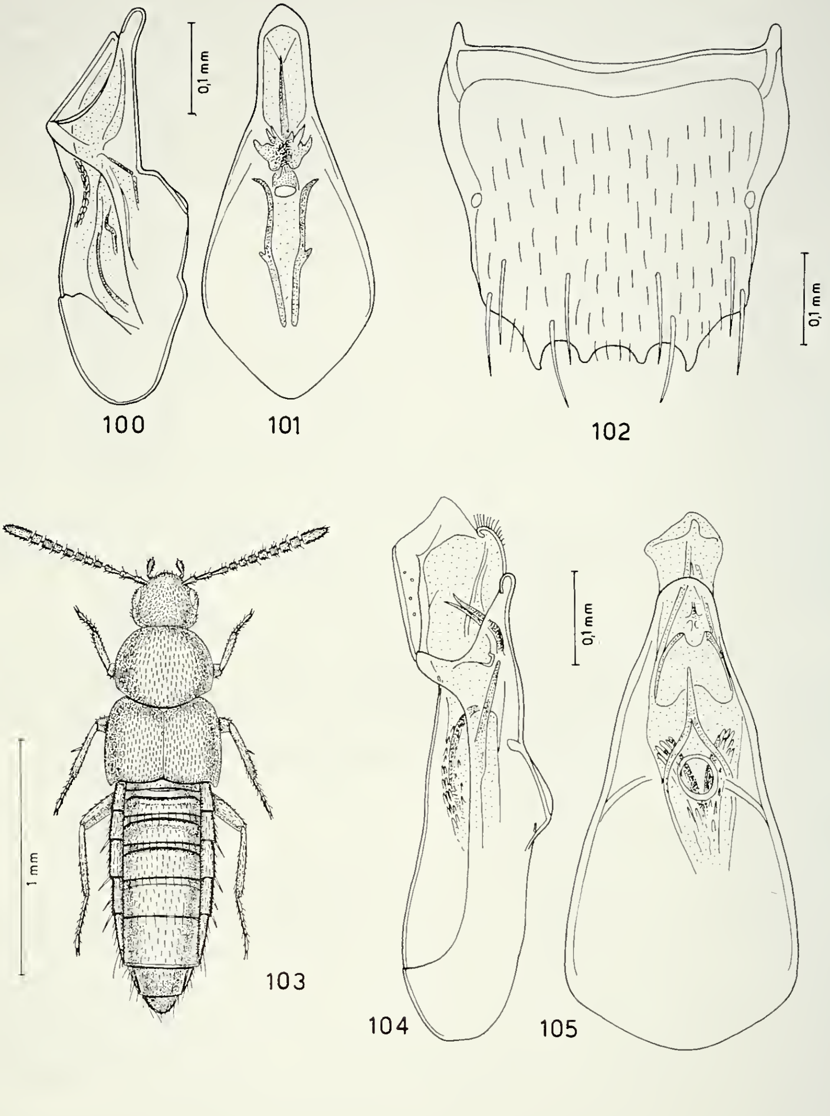
Atheta (Acrotona) guandongensis sp. n. Figg. 106-107

Holotypus ♀, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido e bruno con capo e quarto urite libero neri; antenne brune con i due antennomeri basali bruno-rossicci; zampe gialle. L'avancorpo è coperto di tubercoli robusti e molto salienti su un fondo non reticolato su capo e pronoto, con reticolazione svanita sulle elitre. I quattro uroterghi basali presentano una reticolazione estremamente trasversa e distinta, il quinto urotergo libero ha una reticolazione pure estremamente trasversa, ma svanita. I tubercoletti della superficie dell'addome sono salienti e fini. Spermateca fig. 107.

COMPARAZIONI. In base alla forma della spermateca, vi è forse qualche affinità tassonomica tra la nuova specie ed *A. xishanensis* sp. n. sopra descritta. I caratteri distintivi più evidenti sono che la nuova specie ha l'avancorpo coperto di robusti tubercoletti e ha il bulbo distale della spermateca largo, con larga introflessione apicale. In *xishanensis* il bulbo distale è stretto come l'introflessione apicale.

ETIMOLOGIA. La nuova specie prende nome dalla peninsola di Hong Kong che appartiene alla provincia cinese di Guandong.



FIGG. 100-105

Edeago in visione laterale e ventrale, sesto urotergo libero del maschio e habitus. 100-102: *Atheta (Acrotona) xishanensis* sp. n.; 103-105: *Atheta (Acrotona) nanjingensis* sp. n.

Atheta (Acrotona) fraudolenta sp. n. Figg. 108-110

Holotypus ♂, China, Beijing, Xishan, IX.1992, de Rougemont leg. (MHNG).
Paratypus: 1 ♂, stessa provenienza.

DESCRIZIONE. Lunghezza 2,3 mm. Corpo lucido e bruno con pronoto ed elitre giallo-bruni, uriti liberi 3°, 4° e 5° neri; antenne brune con antennomero basale giallo e il successivo rossiccio; zampe gialle. Sul corpo non vi è traccia di reticolazione e i tubercoletti sono fini e distinti. Edeago figg. 109-110.

COMPARAZIONI. La forma dell'edeago dell nuova specie ricorda quella di *A. vicaria* (Kraatz, 1859), a larga diffusione orientale. L'edeago della nuova specie però non presenta un dente apicale, in visione laterale, nè robusta armatura genitale interna, come in *vicaria*, nè l'apice dell'edeago stesso, in visione ventrale, ad ogiva come in *vicaria*.

Atheta (Acrotona) mimannuliventris sp. n. Figg. 111-114

Holotypus ♂, Hong Kong, Tai Po, III.1996, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

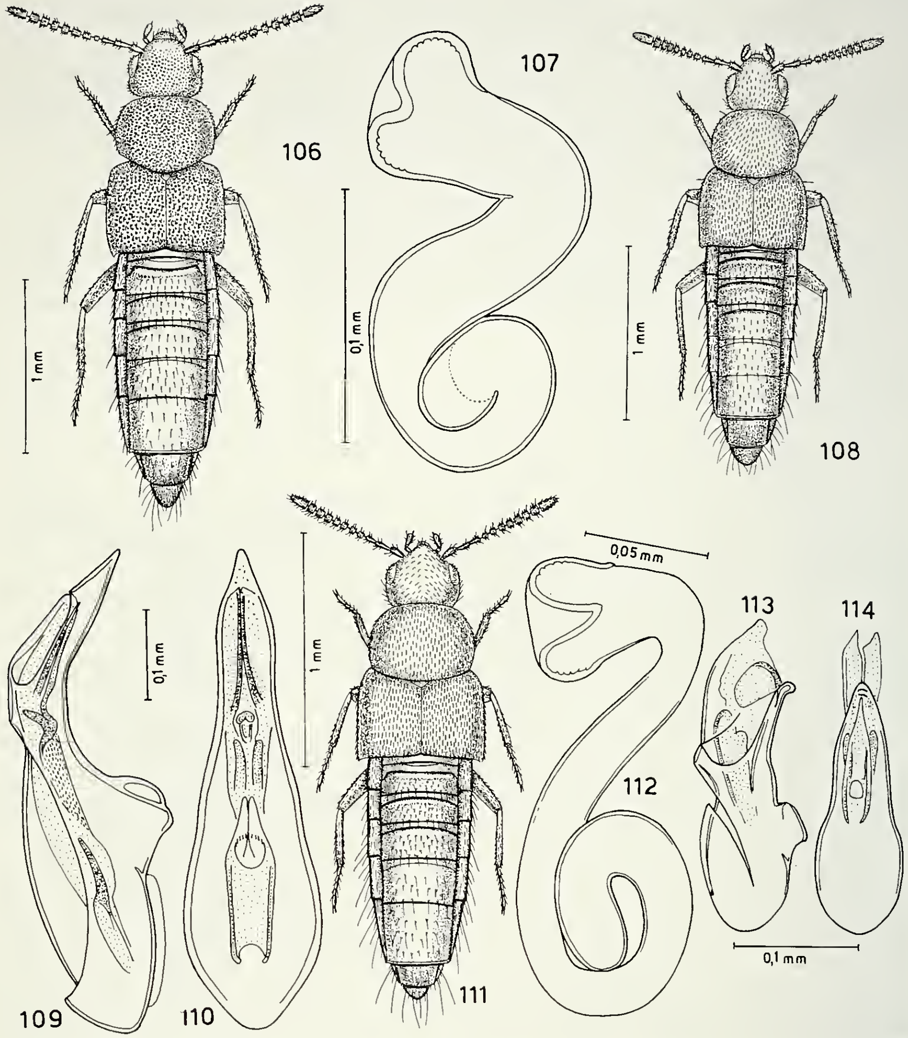
DESCRIZIONE. Lunghezza 1,9 mm. Corpo lucido e giallo-rossiccio con elitre giallo-brunicce e con urite libero 4° e base del 5° bruni; antenne bruno-rossicce con i due antennomeri basali gialli; zampe gialle. Solo sulla superficie delle elitre è presente una reticolazione distinta, sul resto della superficie corporea è assente. La punteggiatura del capo e del pronoto è fitta e superficiale. I tubercoletti della superficie delle elitre sono molto superficiali, quelli dell'addome sono salienti. Spermateca fig. 112, edeago figg. 113-114.

COMPARAZIONI. Il colore del corpo della nuova specie è molto simile a quello di *A. annuliventris* (Kraatz, 1859) dello Sri Lanka, Taiwan, ecc. e può portare a un'errata determinazione senza l'esame dell'edeago o della spermateca. Questi organi sono charamente differenti da quelli di *annuliventris*. L'edeago della nuova specie è di taglia minuscola rispetto quella di *annuliventris*, senza una robusta armatura genitale crestata interna, come al contrario si osserva nell'edeago di *annuliventris*. La spermateca di *annuliventris* ha il bulbo distale con introflessione apicale a base stretta ed è distinto da una strozzatura che lo divide dal resto della spermateca. La spermateca della nuova specie, al contrario, ha base larga dell'introflessione apicale del bulbo distale che non è separato da una strozzatura dal resto del corpo della stessa spermateca.

Atheta (Dimetrota) insinuata sp. n. Figg. 117-118

Holotypus ♀, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

DESCRIZIONE. Lunghezza 2,8 mm. Corpo lucido e nero, antenne comprese; zampe nere con tarsi rossicci. Una reticolazione netta sta sul disco del capo, sul pronoto e sulle elitre. La reticolazione dell'addome è a maglie trasverse distinte al di fuori dei solchi trasversi basali che mostrano una reticolazione non trasversa e netta.



FIGG. 106-114

Habitus, spermateca ed edeago in visione laterale e ventrale. 106-107: *Atheta (Acrotona) guandongensis* sp. n.; 108-110: *Atheta (Acrotona) fraudolenta* sp. n.; 111-114: *Atheta (Acrotona) mimannuliventris* sp. n.

La reticolazione del capo al di fuori del disco è svanita. I tubercoletti che coprono l'avancorpo sono salienti, quelli dell'addome distinti. Spermateca fig. 118.

COMPARAZIONI. La nuova specie è distinta da *A. introducta* Pace, 1991, per l'undicesimo antennomero più lungo, per le elitre meno larghe e per la spermateca di dimensioni molto ridotte, con debole introflessione apicale del bulbo distale e con parte prossimale non sinuata come in *introducta*.

Atheta (Dimetrota) sericoides sp. n. Figg. 119-120

Holotypus ♀, China, Beijing, Yingtaogou, III.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido e bruno con elitre bruno-rossicce e quarto urite libero nero; antenne brune con i due antennomeri basali bruno-rossicci; zampe bruno-rossicce. La reticolazione è netta sul disco del capo che è impresso e sulle elitre, è distinta sul pronoto e sull'addome dove è inoltre trasversa. La punteggiatura del capo è superficiale e assente su una larga fascia longitudinale mediana. I tubercoletti della superficie del pronoto e dell'addome sono fini e poco salienti, quelli delle elitre sono salienti. Spermateca fig. 120.

COMPARAZIONI. La forma della spermateca della nuova specie è simile a quella di *A. orphanella* Cameron, 1944a, del Kashmir. Se ne distingue per la minuscola introflessione apicale del bulbo distale della stessa spermateca (introflessione apicale larghissima in *orphanella*) e per il bulbo prossimale sempre della spermateca appena più largo della parte mediana della stessa spermateca (bulbo prossimale delle spermateca di *orphanella* nettamente più largo).

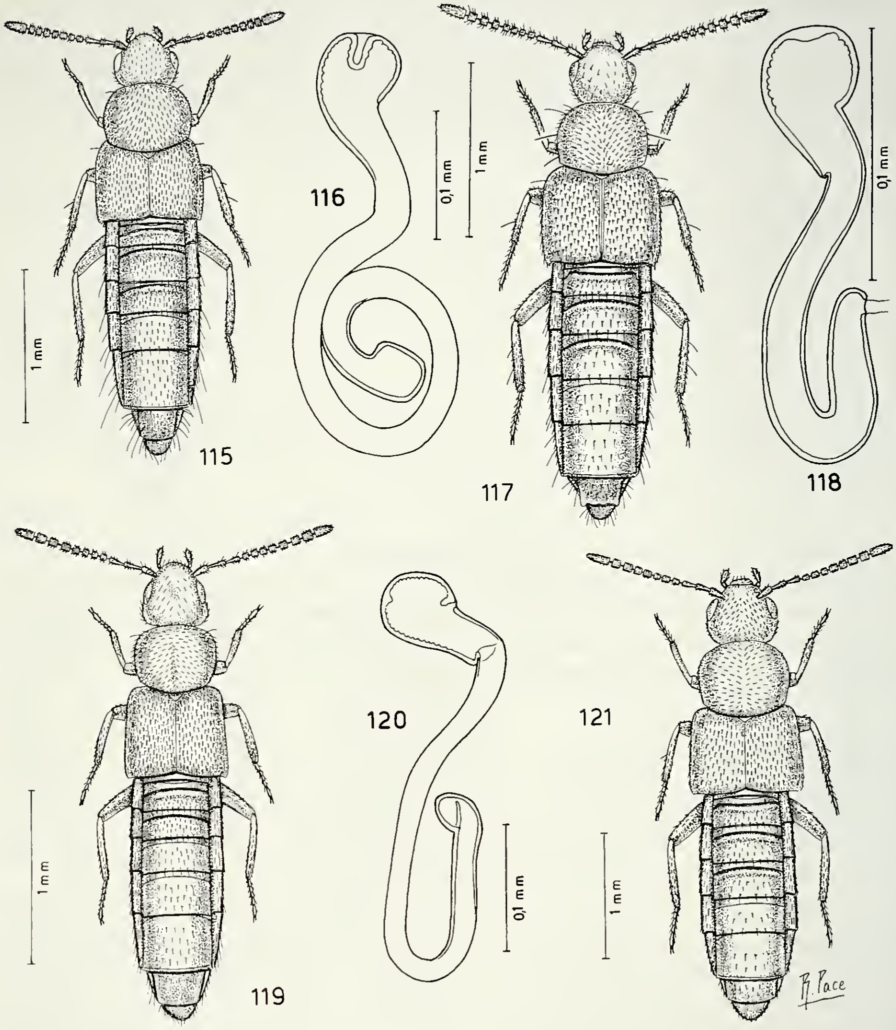
Atheta (Dimetrota) apicalis sp. n. Figg. 121-124

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 26.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza, ma above camp 3, 3050 m, 22.VII.1994, A. Smetana leg.; 2 ♀, China, Shanxi, Nonwutai, de Rougemont leg.

DESCRIZIONE. Lunghezza 3,6 mm. Corpo lucido e nero-bruno con elitre brune e addome nero; antenne nere con i tre antennomeri basali bruno-rossicci; zampe giallo-rossicce. L'avancorpo è coperto di reticolazione distinta, l'addome da reticolazione molto trasversa e molto superficiale. La punteggiatura del capo è svanita. Tubercoletti fini e distinti coprono il pronoto e gli uroterghi basali, sulle elitre sono svaniti. Edeago figg. 122-123, spermateca fig. 124.

COMPARAZIONI. Soprattutto in base alla forma della spermateca la nuova specie potrebbe essere tassonomicamente vicina ad *A. kotgarhensis* Cameron, 1939, dell'India. Ma l'edeago di *kotgarhensis* è molto più profondamente e ampiamente arcuato al lato ventrale e, in visione ventrale, l'apice dello stesso edeago è molto più largo, cioè largo quanto la metà della larghezza del bulbo basale dell'edeago stesso, mentre nella nuova specie l'apice è molto stretto. Inoltre l'introflessione apicale del bulbo distale della spermateca della nuova specie è profonda e a base molto larga in *kotgarhensis*, mentre nella nuova specie tale introflessione è breve e a base stretta.



FIGG. 115-121

Habitus e spermateca. 115-116: *Atheta (Acrotona) inornata* (Kraatz); 117-118: *Atheta (Dimetrota) insinuata* sp. n.; 119-120: *Atheta (Dimetrota) sericoïdes* sp. n.; 121: *Atheta (Dimetrota) apicalis* sp. n.

Atheta (Dimetrota) paritetica sp. n. Figg. 125-127

Holotypus ♂, China, Yunnan, Kunming, 1.II.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,2 mm. Corpo lucido e nero; antenne nere con i due antennomeri basali giallo-bruni; zampe anteriori gialle, medie gialle con femori giallo-bruni e posteriori con tarsi gialli e tibie e femori giallo-bruni. La reticolazione della superficie del capo è estremamente superficiale, quella del pronoto e delle elitre è svanita e quella dell'addome è netta, anche nel fondo dei solchi trasversi basali degli uroterghi. Il capo e il pronoto sono coperti di tubercoletti poco distinti, essi sulle elitre sono distinti. Il capo ha un debole e largo solco mediano posteriore. Edeago figg. 126-127.

Comparazioni. La nuova specie appare simile ad *A. prodita* Cameron, 1939, dell'India e del Nepal. Se ne distingue per il pronoto largo quanto il capo (pronoto più largo del capo in *prodita*) e per l'edeago a profilo ventrale angoloso (senza angolo in *prodita*). L'armatura genitale interna dell'edeago di *prodita* è meno sviluppata di quella della nuova specie.

Atheta (Dimetrota) mixtior sp. n. Figg. 128-131

Holotypus ♂, China, Hebei, Beidaihe, 29.V.1993, de Rougemont leg. (MHNG).
Paratypi: 9 es., stessa provenienza.

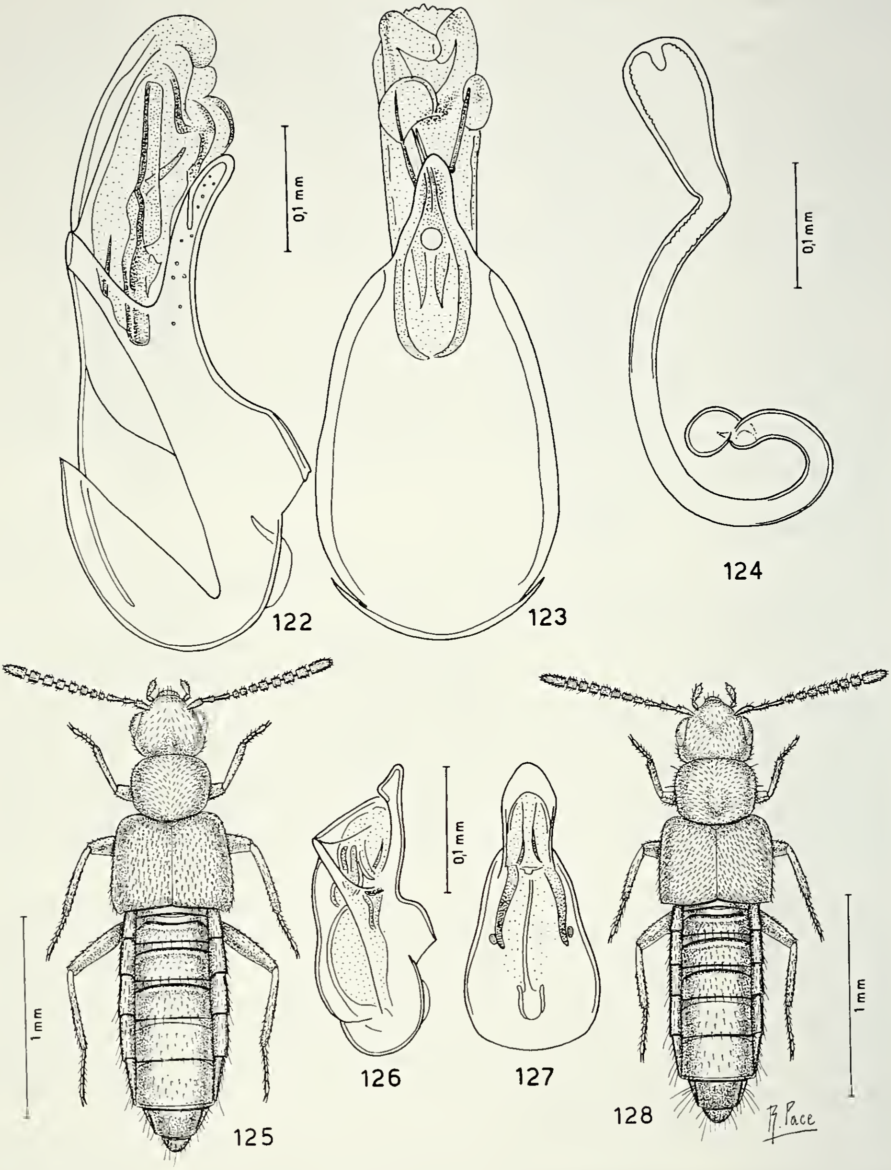
Descrizione. Lunghezza 2,1 mm. Corpo lucido e bruno con gli uriti liberi 3°, 4° e 5° neri; antenne nere con i tre antennomeri basali bruno-rossicci; zampe anteriori e medie bruno-rossicce con tarsi gialli, posteriori brune con tarsi gialli. La reticolazione della superficie del pronoto è netta, quella sul resto della superficie corporea è distinta. Le maglie di reticolazione degli uroterghi sono trasverse, ma non nel fondo dei solchi basali dove non sono trasverse. La punteggiatura del capo e delle elitre è svanita, quella del pronoto è quasi indistinta. Edeago figg. 129-130, spermateca fig. 131.

Comparazioni. La nuova specie presenta occhi grandi, edeago poco sviluppato, con dente apicale dorsale (in visione laterale) e apice (in visione ventrale) assai stretto. Simili caratteri si riscontrano nel corpo e nell'edeago di *A. putridula* (Kraatz, 1859) dello Sri Lanka. Tuttavia il margine posteriore del sesto urotergo libero del maschio di *putridula* è dentellato, mentre nella nuova specie è lineare. L'edeago di *putridula* ha bulbo basale enorme, privo di "crista apicalis" e l'apice dell'edeago stesso è tronco, mentre nell'edeago della nuova specie il bulbo basale è poco sviluppato e l'apice è appuntito.

Atheta (Dimetrota) salamannai sp. n. Figg. 132-135

Holotypus ♂, China, Shaanxi, Nanwutai, 17.IX.1995, de Rougemont leg. (MHNG).
Paratypi: 3 ♀, stessa provenienza.

Descrizione. Lunghezza 1,8 mm. Corpo lucido. Avancorpo bruno, addome rossiccio con uriti liberi 4° e 5° bruni; antenne brune con antennomero basale rossiccio; zampe gialle. La reticolazione della superficie del capo e dei tre uroterghi



FIGG. 122-128

Edeago in visione laterale e ventrale, spermateca e habitus. 122-124: *Atheta (Dimetrota) apicalis* sp. n.; 125-127: *Atheta (Dimetrota) paritetica* sp. n.; 128: *Atheta (Dimetrota) mixtior* sp. n.

basali è svanita, quella del pronoto è estremamente svanita, quella delle elitre è distinta e quella degli uroterghi liberi 4° e 5° è molto trasversa e molto superficiale. I tubercoletti che coprono la superficie del capo sono fitti e superficiali, quelli del pronoto e delle elitre sono fitti e salienti. Edeago figg. 133-134, spermateca fig. 135.

COMPARAZIONI. Per alcuni caratteri somatici esterni, della spermateca e dell'edeago, sembra che la nuova specie sia tassonomicamente vicina ad *A. sublugens* Cameron, 1939, dell'India. Essa presenta però occhi più lunghi delle tempie e non molto più corti delle tempie come in *sublugens*. L'edeago della nuova specie è di taglia minuscola rispetto a quella dell'edeago di *sublugens*, con armatura genitale interna composta di due lame ricurve corte e non strette e lunghissime quanto quelle dell'armatura genitale interna dell'edeago di *sublugens*. Il bulbo distale della spermateca della nuova specie, pur avendo simile introflessione apicale, non è flesso verso sinistra come quello della spermateca di *sublugens*.

ETIMOLOGIA. La nuova specie è dedicata al Prof. Giovanni Salamanna dell'Università di Genova che per tanti anni è stato ottimo direttore delle pubblicazioni della Società Entomologica Italiana.

Atheta (Dimetrota) muta sp. n. Figg. 136-140

Holotypus ♂, China Shaanxi, Nanwutai, 17.IX.1995, de Rougemont leg. (MHNG).
Paratypi: 3 ♀, stessa provenienza.

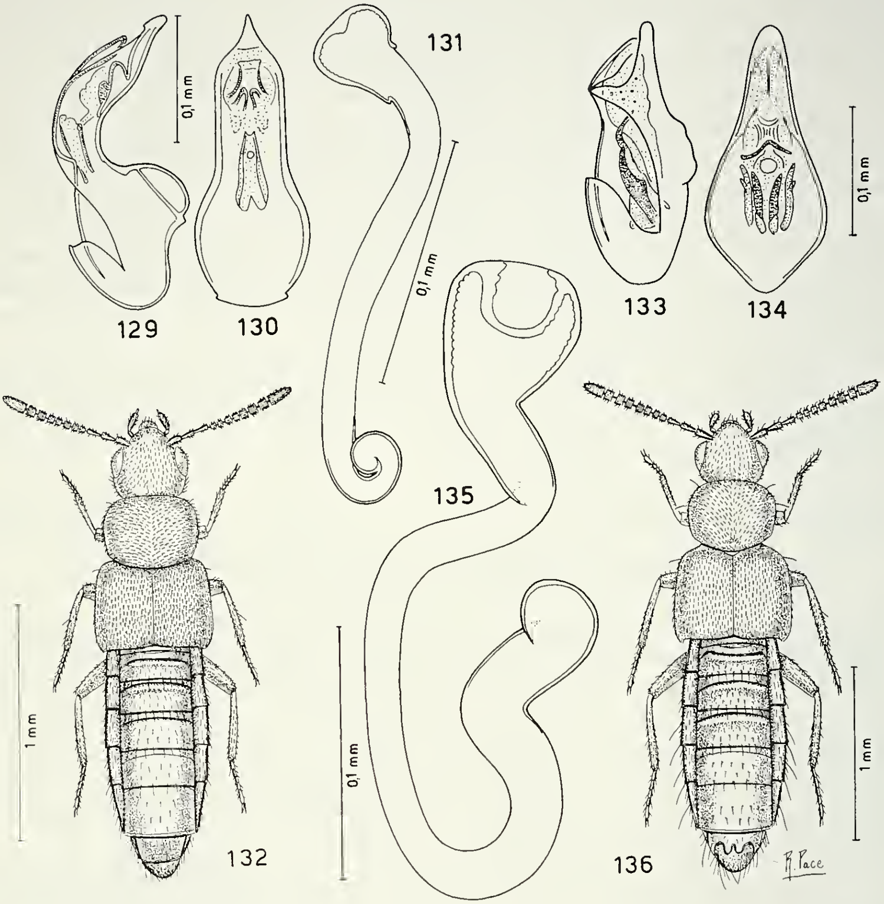
DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido. Avancorpo bruno con margini laterali del pronoto e base delle elitre bruno-rossicci; addome giallo-rossiccio con gli uriti liberi 3°, 4° e 5° nero-bruni; antenne brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La reticolazione della superficie del capo e dell'addome è distinta, quella del pronoto e delle elitre è netta. I tubercoletti che coprono la superficie dell'avancorpo sono svaniti, quelli dell'addome sono salienti. La reticolazione degli uroterghi è a maglie molto trasverse. Edeago figg. 137-138, spermateca fig. 139, sesto urotergo libero del maschio fig. 140.

COMPARAZIONI. La nuova specie sembra avere qualche affinità tassonomica con *A. sublugens* Cameron, 1939, dell'India e Nepal, a motivo della presenza del bulbo distale della spermateca flesso al lato sinistro come quello di *sublugens*. Ma la parte prossimale della spermateca della nuova specie è poco sviluppata in lunghezza, mentre è lunghissima e avvolta in spire quella di *sublugens*. L'edeago della nuova specie ha profilo ventrale simile a quello di *sublugens*, ma l'armatura genitale interna non presenta due lunghe e strette lame come quelle presenti all'interno dell'edeago di *sublugens*.

Atheta (Dimetrota) reelsi sp. n. Figg. 141-144

Holotypus ♂, Hong Kong, N.T., IV.1996, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,3 mm. Corpo lucido e nero; antenne brune con i due antennomeri basali bruno-rossicci; zampe gialle con femori bruno-rossicci. La reticolazione della superficie del capo, del pronoto e dei quattro uroterghi basali è



Figg. 129-136

Edeago in visione laterale e ventrale, spermateca e habitus. 129-131: *Atheta (Dimetrota) mixtior* sp. n.; 132-135: *Atheta (Dimetrota) salamannai* sp. n.; 136: *Atheta (Dimetrota) muta* sp. n.

distinta, quella del quinto urotergo libero è lievemente trasversa e svanita. I tubercoletti della superficie dell'avancorpo sono fini e superficiali. Edeago figg. 142-143, sesto urotergo libero del maschio fig. 144.

COMPARAZIONI. In base alle dimensioni e alla forma dell'edeago, la nuova specie sembra simile ad *A. subatomaria* Cameron, 1939, dell'India. Tuttavia la taglia corporea di *subatomaria* è di 1,5 mm e gli occhi sono assai ridotti. L'edeago della nuova specie è meno profondamente ricurvo al lato ventrale e presenta un'armatura genitale interna distinta, mentre quella dell'edeago di *subatomaria* è poco distinta.

ETIMOLOGIA. La nuova specie è dedicata allo zoologo inglese Graham Reels che ha raccolto Aleocharinae in Cina.

Atheta (Dimetrota) beijingensis sp. n. Figg. 145-148

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).
Paratypi: 11 es., stessa provenienza.

DESCRIZIONE. Lunghezza 2,9 mm. Corpo lucidissimo e bruno con capo e uriti liberi 4° e 5° nero-bruni e con il margine posteriore dei tre uriti basali bruno-rossiccio; antenne brune; zampe giallo-rossicce. Sulla superficie del corpo non vi è presenza di reticolazione. La punteggiatura del capo è superficiale sul disco e netta ai lati, quella del pronoto è fine e più fitta sulla fascia mediana e quella delle elitre è netta. Tubercoletti distinti coprono la superficie degli uroterghi. Edeago figg. 146-147, spermateca fig. 148.

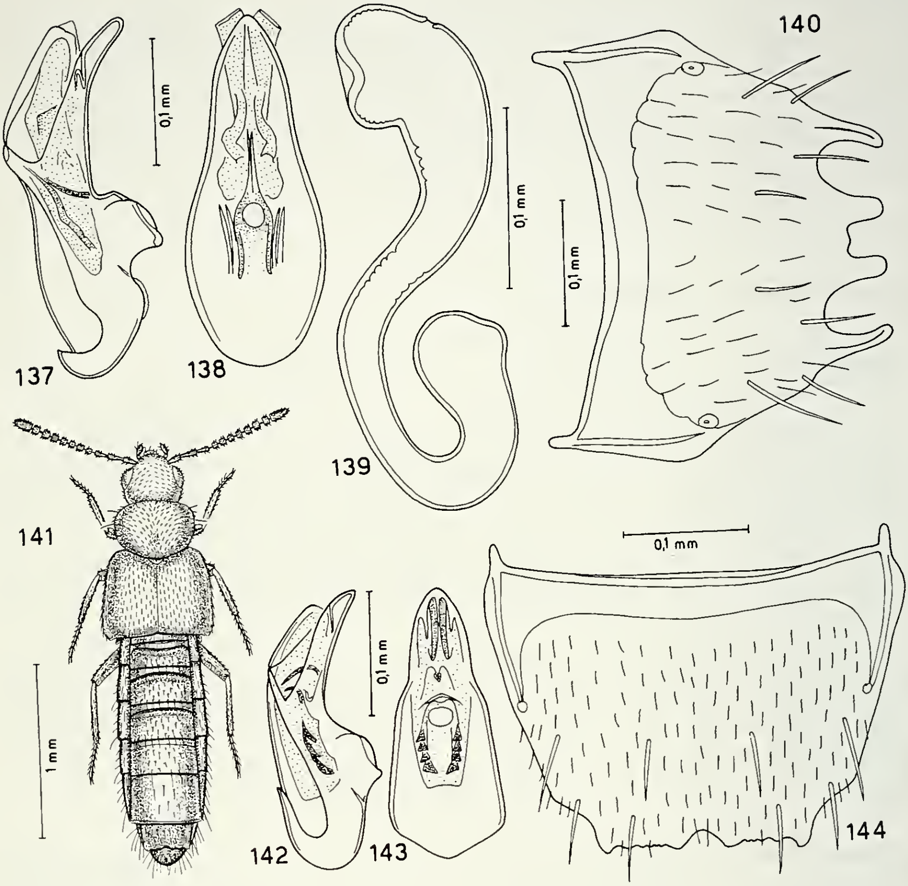
COMPARAZIONI. La nuova specie ha l'armatura genitale interna dell'edeago priva di pezzi copulatori evidenti come quelli dell'edeago di *A. congruens* Cameron, 1939, dell'India. La nuova specie inoltre possiede un'evidente "crista apicalis" dell'edeago, quasi assente in *congruens*, e la parte apicale dello stesso edeago è molto larga nella nuova specie e stretta quella dell'edeago di *congruens*.

Atheta (Dimetrota) amplificata sp. n. Figg. 149-151

Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).
Paratypi: 2 ♂, stessa provenienza.

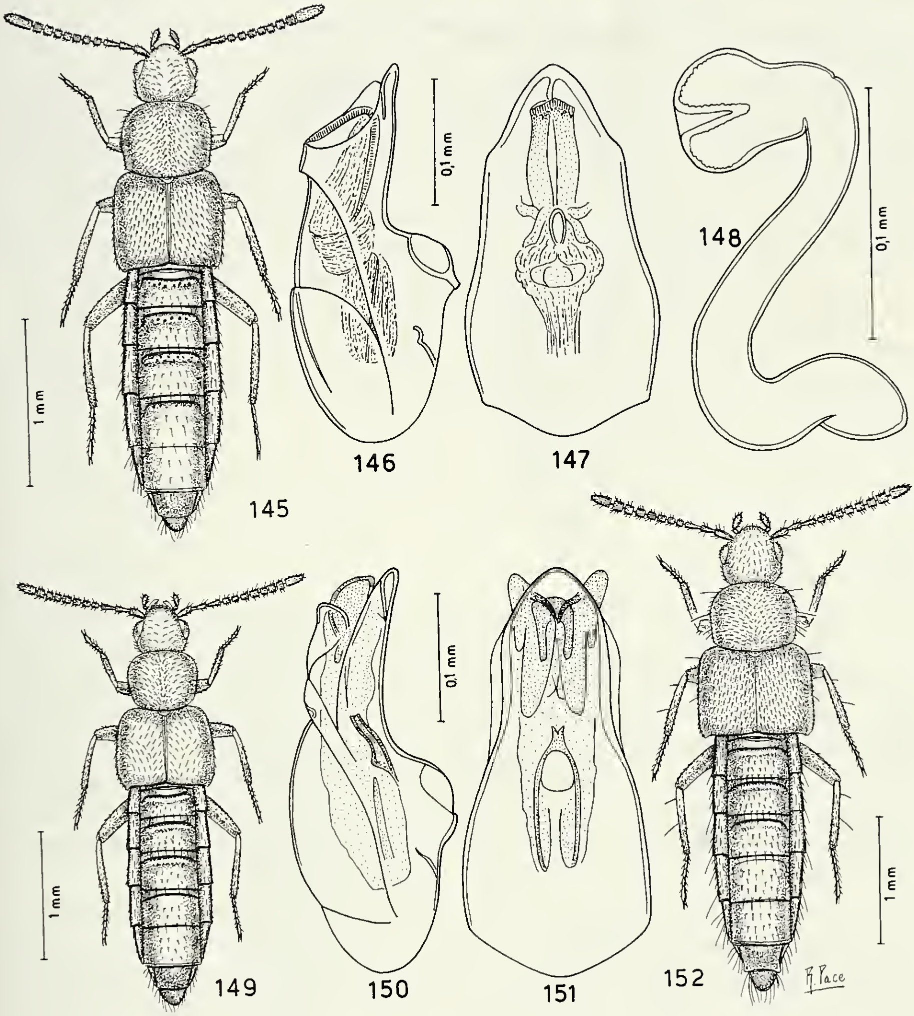
DESCRIZIONE. Lunghezza 3,0 mm. Corpo lucidissimo e nero con elitre nero-brune; antenne nere con i due antennomeri basali bruni; zampe gialle. Sulla superficie corporea non vi è presenza di reticolazione. La punteggiatura del capo è svanita ed è largamente assente sulla fascia mediana, quella del pronoto è superficiale, assente ai lati e agli angoli posteriori e addensata sulla linea mediana. La punteggiatura delle elitre è svanita. Tubercoletti salienti stanno sulla superficie degli uroterghi. Edeago figg. 150-151.

COMPARAZIONI. La nuova specie è distinta da *A. kotgarhensis* Cameron, 1939, dell'India, per gli antennomeri 4° a 6° più lunghi che larghi e non nettamente trasversi come in *kotgarhensis*, per l'edeago meno sviluppato e assai largo, se visto dal lato ventrale (edeago stretto visto dal lato ventrale in *kotgarhensis*).



FIGG. 137-144

Edeago in visione laterale e ventrale, spermateca, sesto urotergo libero del maschio e habitus. 137-140: *Atheta (Dimetrota) muta* sp. n.; 141-144: *Atheta (Dimetrota) reelsi* sp. n.



FIGG. 145-152

Habitus, edeago in visione laterale e ventrale e spermateca. 145-148: *Atheta (Dimetrota) beijingensis* sp. n.; 149-151: *Atheta (Dimetrota) amplificata* sp. n.; 152: *Atheta (Dimetrota) khitana* sp. n.

Atheta (Dimetrota) khitana sp. n. Figg. 152-154

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VIII.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 3,8 mm. Avancorpo debolmente lucido, addome lucido. Corpo nero-bruno con elitre giallo-brune; antenne nere; zampe anteriori giallo-rossicce, medie bruno-rossicce con tarsi gialli, posteriori giallo rossicce con femori bruno-rossicci. La reticolazione del capo e delle elitre è netta, quella del pronoto è quasi vigorosa e quella degli uroterghi a maglie molto trasverse ondulate distinte. I tubercoletti della superficie del capo e del pronoto sono distinti e quelli delle elitre sono salienti. Il pronoto ha un'impressione mediana posteriore. Edeago figg. 153-154.

COMPARAZIONI. La nuova specie è simile ad *A. reminiscens* Pace, 1988, del Nepal, a giudicare dalla forma dell'edeago. Se ne distingue perché l'edeago non è così ampiamente ricurvo al lato ventrale quanto l'edeago di *reminiscens* e l'armatura genitale interna dell'edeago stesso è poco distinta, mentre in *reminiscens* sono ben distinte due lamelle, in visione laterale.

ETIMOLOGIA. La nuova specie prende nome dai Khitani, invasori di Pekino nell'anno 936 d.C.

Atheta (Dimetrota) effulta sp. n. Figg. 155-156

Holotypus ♀, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,9 mm. Corpo lucido con capo e uriti liberi 4° e 5° nero-bruni, pronoto bruno-rossiccio, elitre giallo-brune e i due uriti basali giallo-rossicci con area mediana bruno-rossiccia e il terzo libero bruno-rossiccio; antenne brune con i due antennomeri basali rossicci; zampe gialle. La reticolazione del capo è svanita, quella del pronoto e delle elitre è distinta e quella dell'addome è a maglie estremamente trasverse e svanite. La punteggiatura del capo è fine e distinta. I tubercoletti della superficie del capo sono salienti, quelli delle elitre sono molto svaniti e quelli degli uroterghi sono evidenti. Spermateca fig. 155-156.

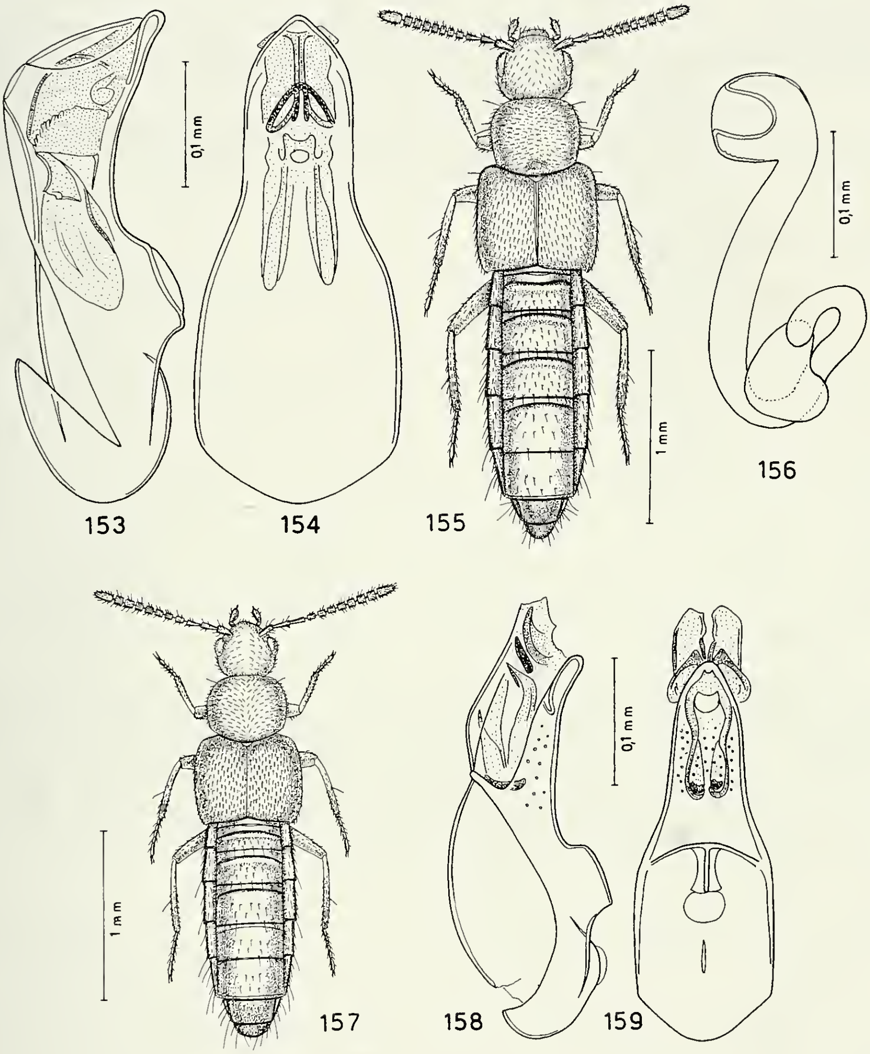
COMPARAZIONI. La nuova specie ha il bulbo distale della spermateca volto al lato sinistro, pertanto è probabile la sua affinità con *A. sublugens* Cameron, 1939, dell'India. Ma l'introflessione apicale del bulbo distale della spermateca della nuova specie è ampia e profonda e non poco profonda come quella di *sublugens*. Inoltre il pronoto della nuova specie è poco trasverso (molto trasverso in *sublugens*), gli occhi sono lunghi quanto le tempie (e non più corti delle tempie come in *sublugens*) e il colore del corpo è del tutto differente nelle due specie.

ETIMOLOGIA. Il nome della specie significa "sostenuta".

Atheta (Dimetrota) furtivoides sp. n. Figg. 157-160

Holotypus ♂, China, Yunnan, Dali, 9.II.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,4 mm. Corpo lucido e nero-bruno con elitre e i due uriti basali bruni; antenne nero-brune con antennomero basale rossiccio; zampe rossicce. La reticolazione del capo è distinta, quella del pronoto è netta e quella delle



FIGG. 153-159

Edeago in visione laterale e ventrale, habitus e spermateca. 153-154: *Atheta (Dimetrota) khitana* sp. n.; 155-156: *Atheta (Dimetrota) effulta* sp. n.; 157-159: *Atheta (Dimetrota) furtivoides* sp. n.

elitre e dell'addome è svanita, sull'addome a maglie estremamente trasverse. La punteggiatura del capo è superficiale. I tubercoletti della superficie del pronoto e dell'addome sono fini e poco distinti, quelli delle elitre sono svaniti. Edeago figg. 158-159, sesto urotergo libero del maschio fig. 160.

Comparazioni. La nuova specie è distinta da *A. furtiva* Cameron, 1939, dell'India e del Nepal, per l'edeago meno robusto, privo di bozza ventrale e nettamente più stretto in visione ventrale.

Atheta (Dimetrota) shanxiensis sp. n. Figg. 161-165

Holotypus ♂, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg. (MHNG).
Paratypi: 2 ♂ e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 4,5 mm. Corpo lucido e nero con elitre nero-brune; antenne nere; zampe bruno-rossicce con femori nero-bruni e tarsi rossicci. La reticolazione è distinta sul disco del capo che è impresso, quella del pronoto è ben visibile, quella delle elitre è netta, quella dei quattro uriti basali è a maglie appena trasverse e svanite, quella sul quinto urite libero è pure a maglie appena trasverse, ma distinte e quella posta alla base del quarto urite libero è netta. La punteggiatura del capo è distinta e assente sulla fascia mediana, quella del pronoto è svanita. Tubercoletti superficiali coprono la superficie delle elitre e tubercoletti salienti coprono quella degli uroterghi. Edeago figg. 162-163, spermateca fig. 164, sesto urotergo libero del maschio fig. 165.

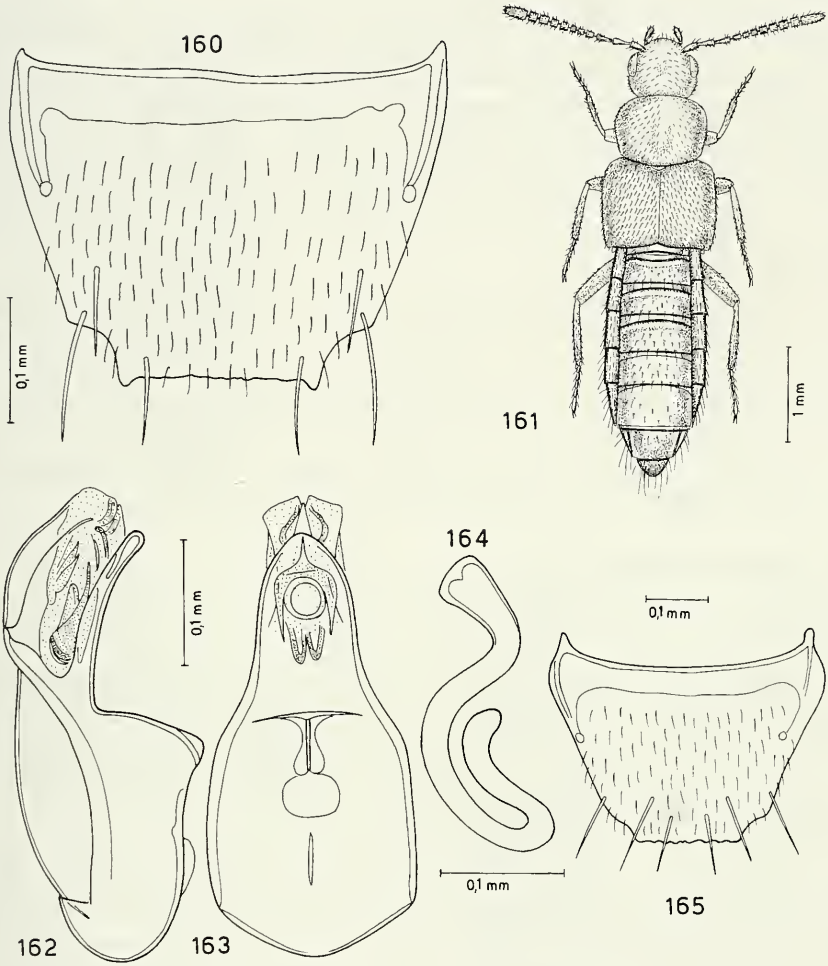
Comparazioni. L'angolo ventrale dell'edeago della nuova specie è molto più ampio di quello corrispondente dell'edeago di *A. kotgarhensis* Cameron, 1939, dell'India, e la parte distale dell'edeago della nuova specie è ben distinta dal bulbo basale dell'edeago stesso, in visione ventrale, grazie alla presenza di sinuosità laterali, mentre nell'edeago di *kotgarhensis* il bulbo basale non è distinto dalla parte apicale. Inoltre l'introflessione apicale del bulbo distale della spermateca è profonda e a base larga in *kotgarhensis* e minuscola nella nuova specie.

Atheta (Dimetrota) inflatescens sp. n. Figg. 166-167

Holotypus ♀, China, Beijing, Xiaolongmen, 1100-1500 m, 9.VII.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,7 mm. Corpo lucido e nero-bruno con elitre e margine posteriore dei due uriti basali bruni; antenne nere con i due antennomeri basali e la base del terzo bruno-rossicci; zampe rossicce. La reticolazione del capo e delle elitre è svanita, quella del pronoto e degli uroterghi è distinta: su questi ultimi è a maglie estremamente trasverse. La punteggiatura del capo è fine e poco distinta. I tubercoletti della superficie del pronoto e delle elitre sono poco salienti, quelli degli uroterghi sono distinti. Spermateca fig. 167.

Comparazioni. Per la forma della spermateca, la nuova specie è tassonomicamente vicina ad *A. mitis* Pace, 1988, del Nepal. La nuova specie è distinta da essa per le elitre chiaramente meno sviluppate in lunghezza e larghezza e per la spermateca di un terzo minore, con bulbo distale meno dilatato.



Figg. 160-165

Sesto urotergo libero del maschio, habitus, edeago in visione laterale e ventrale e spermateca. 160: *Atheta (Dimetrota) furtivoides* sp. n.; 161-165: *Atheta (Dimetrota) shanxiensis* sp. n.

Atheta (Dimetrota) fengicola sp. n. Figg. 168-170

Holotypus ♂, China, Sichuan, Langmusi, 3500-3600 m, 13.VII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 4,0 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali rossicci; zampe rossicce. La reticolazione del capo è distinta, quella del pronoto e delle elitre è svanita e quella degli uroterghi è a maglie molto trasverse e quasi non visibili tanto sono superficiali: su alcune aree della superficie di essi è del tutto assente. La punteggiatura del capo è distinta e assente sulla fascia mediana. La superficie del pronoto e delle elitre è coperta di tubercoletti distinti. Edeago figg. 169-170.

COMPARAZIONI. L'edeago della nuova specie ha forma simile a quella dell'edeago di *A. imbrium* Pace, 1988, del Nepal. La nuova specie ha elitre meno larghe rispetto alla larghezza del pronoto, undicesimo antennomero nettamente più lungo di quello di *imbrium*, edeago con netto angolo ventrale (angolo smussato in *imbrium*) e parte apicale dell'edeago stesso più stretta di quella dell'edeago di *imbrium*.

ETIMOLOGIA. Il nome della nuova specie significa "abitatrice dei picchi montani". Infatti il sostantivo cinese "feng" significa picco montano.

Atheta (Dimetrota) langmuicola sp. n. Figg. 171-172

Holotypus ♀, China, Sichuan, Langmui, 3500-3600 m, 13.VII.1994, A. Smetana leg. (MHNG).

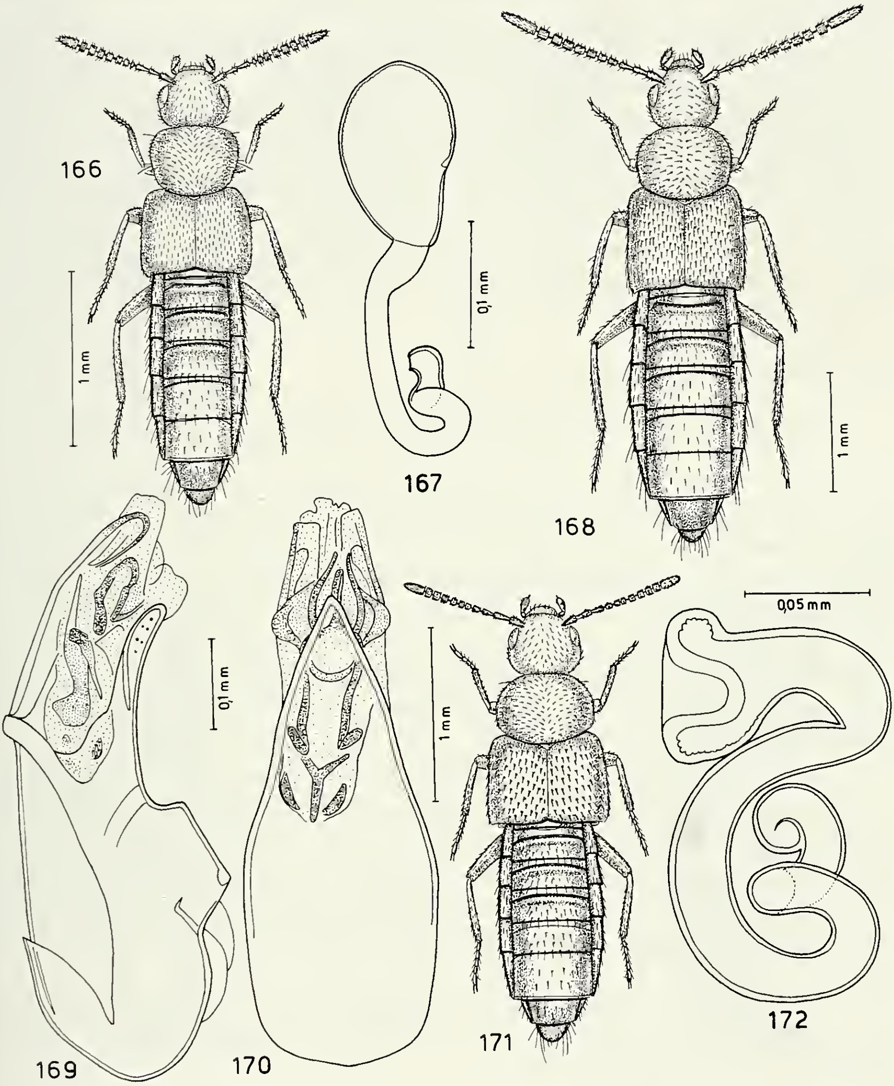
DESCRIZIONE. Lunghezza 2,6 mm. Corpo lucido e nero-bruno; antenne nere con antennomero basale bruno; zampe giallo-rossicce. La reticolazione del capo e del pronoto è netta, quella delle elitre è svanita e quella degli uroterghi a maglie molto trasverse e distinte. I tubercoletti della superficie del capo sono svaniti, quelli del resto della superficie corporea sono salienti. Spermateca fig. 172.

COMPARAZIONI. La spermateca della nuova specie ha struttura simile a quella della spermateca di *A. andrewesiana* Cameron, 1939, dell'India. Se ne distingue per il grande sviluppo in larghezza e profondità dell'introflessione apicale del bulbo distale della spermateca (introflessione stretta in *andrewesiana*) e per la maggiore taglia della stessa spermateca della nuova specie. Inoltre il pronoto della nuova specie mostra una netta reticolazione, mentre quello di *andrewesiana* ha reticolazione estremamente superficiale.

Atheta (Dimetrota) subchiniphila sp. n. Figg. 173-176

Holotypus ♂, China, Sichuan, Langmusi, 3500-3600 m, 13.VII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido e nero-bruno con elitre giallo-brune e addome nero; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. La reticolazione del capo è netta, quella del pronoto e dell'addome è distinta (a maglie lievemente trasverse sull'addome) e quella delle elitre è assente. I tubercoletti della superficie del capo e delle elitre sono distinti, quelli del pronoto sono svaniti e



FIGG. 166-172

Habitus, spermateca ed edeago in visione laterale e ventrale. 166-167: *Atheta (Dimetrota) inflatescens* sp. n.; 168-170: *Atheta (Dimetrota) fengicola* sp. n.; 171-172: *Atheta (Dimetrota) lengmuicola* sp. n.

quelli degli uroterghi sono salienti. Edeago figg. 174-175, sesto urotergo libero del maschio fig. 176.

Comparazioni. La nuova specie ha la forma dell'edeago simile a quella dell'edeago di *A. kotgarhensis* Cameron, 1939, dell'India. Se ne distingue per il minore sviluppo di quest'organo, per la minore profondità ventrale, per i lati della zona preapicale (in visione ventrale) paralleli e non convergenti verso l'apice largamente arrotondato dell'edeago di *kotgarhensis*. L'armatura genitale interna dell'edeago della nuova specie, in visione laterale, è divisa in due gruppi, mentre in *kotgarhensis* vi è un'ampia lamella sormontata da un pezzo copulatore sclerificato corto e stretto. La nuova specie ha occhi molto più corti delle tempie, mentre *kotgarhensis* ha occhi lunghi quanto le tempie.

Atheta (Dimetrota) kadooriana sp. n. Figg. 177-179

Holotypus ♀, Hong Kong, Kadoorie Farm, V.1996, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, Hong Kong, Tai Po, VII.1996, de Rougemont leg.

Descrizione. Lunghezza 2,7 mm. Corpo lucido e nero con pronoto, metà basale delle elitre, i due uroterghi basali e la base del terzo giallo-rossicci; antenne nere con i due antennomeri basali giallo-rossicci e il successivo bruno; zampe gialle. La reticolazione del capo e dei due uroterghi basali è molto svanita, quella del pronoto e dei restanti uroterghi è svanita e quella delle elitre è netta. Le maglie di reticolazione degli uroterghi 3°, 4° e 5° sono molto trasverse. I tubercoletti che coprono la superficie del capo sono fini e superficiali, quelli del pronoto sono fini e distinti, quelli delle elitre sono poco salienti e quelli degli uroterghi sono distinti. Spermateca figg. 178-179.

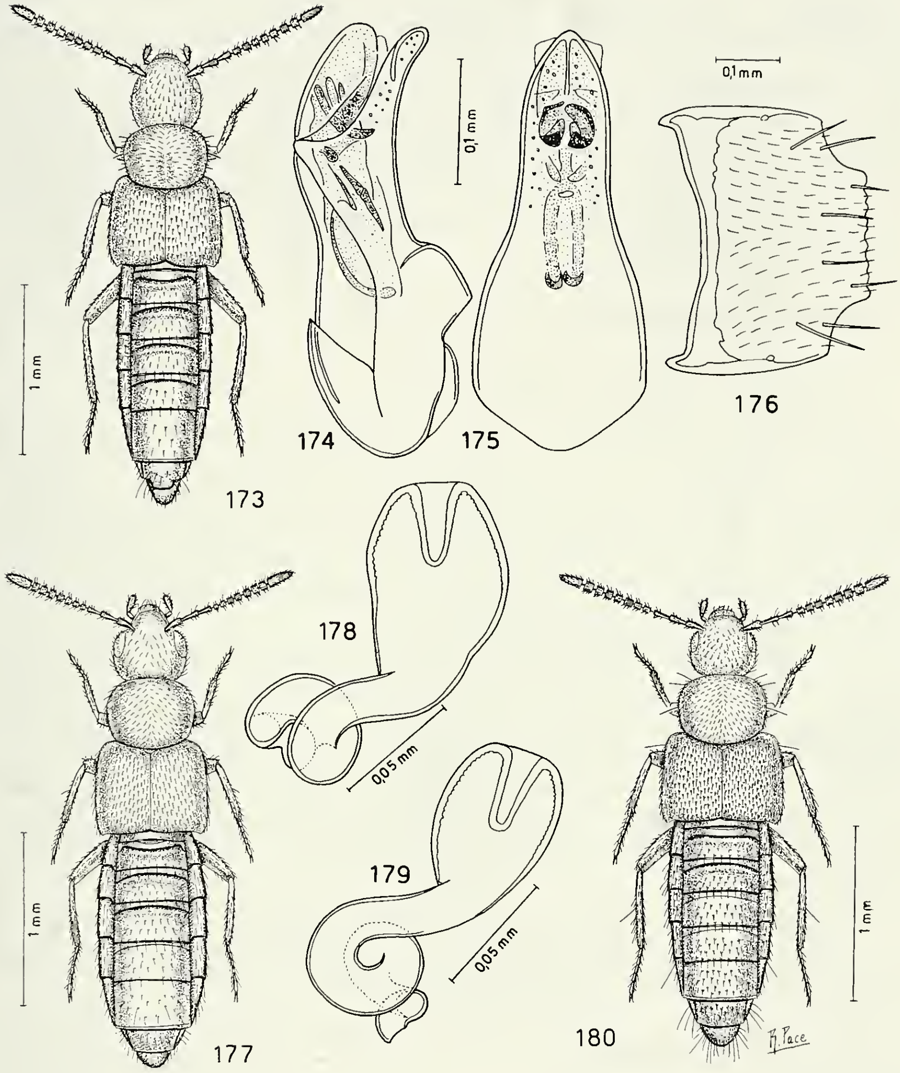
Comparazioni. Per la forma della spermateca, la nuova specie è comparabile con *A. subincisa* Cameron, 1939, dell'India, che presenta la spermateca a bulbo distale molto sviluppato e sua parte prossimale a ridottissimo sviluppo, come nella spermateca della nuova specie che però ha minore sviluppo generale e profonda introflessione apicale del bulbo distale, assente in *subincisa*. Gli occhi di *subincisa* sono molto più corti delle tempie e non lunghi quanto le tempie come nella nuova specie.

Etimologia. La nuova specie è dedicata ai fratelli Kadoorie, noti filantropi di Hong Kong nella cui "farm" sono state raccolte varie specie di Aleocharinae esaminate nella presente serie di lavori.

Atheta (Diometrota) pseudocollusa sp. n. Figg. 180-183

Holotypus ♂, China, Gansu, pass btw Herzuo-Amqog, 3300 m, 12.VII.1994. A. Smetana leg. (MHNG).
Paratypi: 9 ♀, stessa provenienza; 11 es., China, Sichuan, Langmusi, 3500-3600 m, 13.VII.1994, A. Smetana leg.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e nero; antenne nere con antennomero basale bruno; zampe bruno-rossicce. La reticolazione del capo, del pronoto e dell'addome è svanita, quella delle elitre è distinta. La reticolazione degli



FIGG. 173-180

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del maschio e spermateca. 173-176: *Atheta (Dimetrota) subchiniphila* sp. n.; 177-179: *Atheta (Dimetrota) kadooriana* sp. n.; 180: *Atheta (Dimetrota) pseudocollusa* sp. n.

uroterghi è a maglie trasverse. I tubercoletti della superficie del capo e del pronoto sono distinti quelli della elitre sono salienti. Edeago figg. 181-182, spermateca fig. 183.

Comparazioni. La spermateca della nuova specie è simile a quella di *A. congruens* Cameron, 1939, dell'India, però è più sviluppata, con parte prossimale più prolungata. L'edeago della nuova specie non è profondamente arcuato al lato ventrale quanto quello di *congruens* e l'apice dello stesso edeago, in visione ventrale, meno sottilmente appuntito rispetto all'apice di quello di *congruens*. Inoltre il pronoto di *congruens* è poco trasverso.

Atheta (Dimetrota) variolosa sp. n. Figg. 184-188

Holotypus ♂, Hong Kong, Tai Po, III.1996, de Rougemont leg. (MHNG).
Paratypi: 13 es., stessa provenienza.

Descrizione. Lunghezza 3,8 mm. Corpo lucido e nero pece con elitre brune; antenne nere con i tre antennomeri basali nero-bruni; zampe rossicce con femori bruni. La reticolazione del capo è svanita, quella del pronoto è distinta, quella delle elitre è netta e quella degli uroterghi è molto trasversa, superficiale e assente alla base di ciascun urotergo. La superficie dell'avancorpo è coperta di tubercoletti salienti, quella dell'addome di tubercoletti superficiali. Edeago figg. 185-186, sesto urotergo libero del maschio fig. 187, spermateca fig. 188.

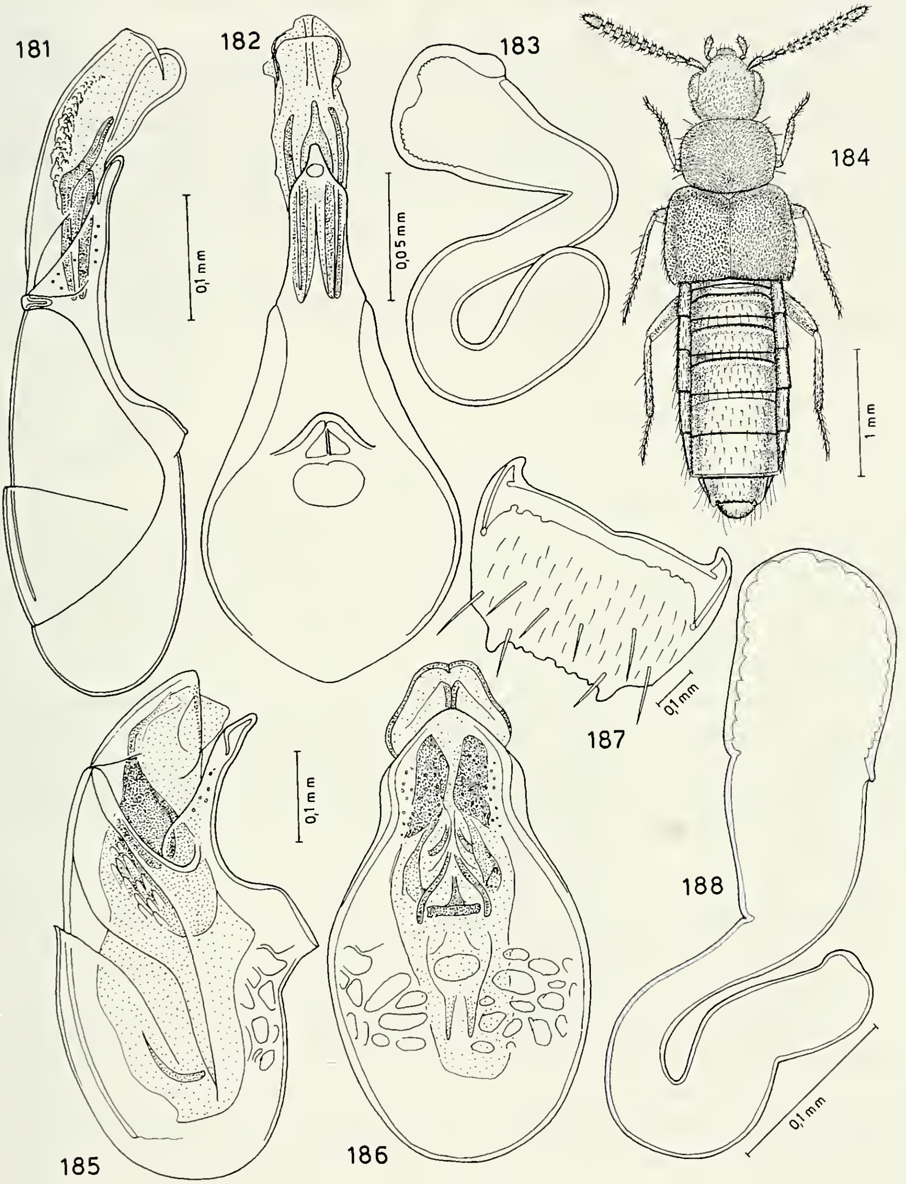
Comparazioni. In base alla forma della spermateca, la nuova specie sembra affine ad *A. subincisa* Cameron, 1939, dell'India. Tuttavia il bulbo distale della spermateca della nuova specie è meno sviluppato e la parte prossimale non è piegata strettamente per due volte come in *subincisa*. L'edeago della nuova specie ha maggiore taglia rispetto quello di *subincisa*, ha l'apice assai largo (in visione ventrale) e non inciso come quello di *subincisa*. Inoltre gli occhi della nuova specie sono appena più lunghi delle tempie, mentre quelli di *subincisa* sono molto ridotti, circa tre volte più brevi delle tempie.

Etimologia. Il nome della nuova specie significa "butterata di vaiolo" a motivo della presenza di formazioni chitinose ventrali del bulbo basale dell'edeago, simili a cicatrici lasciate dal vaiolo sulla specie umana.

Atheta (Dimetrota) cooteri sp. n. Figg. 189-193

Holotypus ♂, China, Zhejiang Prov., Anji County, ca. 480 m, Long Wang Shan, N.R., 11.V.1996, J. Cooter leg. (MHNG).
Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,9 mm. Avancorpo debolmente lucido, addome lucido. Capo e pronoto bruni con riflessi bronzei, elitre brune, addome nero pece; antenne brune con i due antennomeri basali giallo-rossicci e il successivo rossiccio; zampe gialle. La reticolazione dell'avancorpo è netta, quella dell'addome è a maglie molto trasverse, distinte sui tre uroterghi basali e svanita sui restanti. I tubercoletti della superficie delle elitre sono superficiali, quelli sul resto della superficie corporea



FIGG. 181-188

Edeago in visione laterale e ventrale, spermateca, habitus e sesto urotergo libero del maschio. 181-183: *Atheta (Dimetrota) pseudocollusa* sp. n.; 184-188: *Atheta (Dimetrota) variolosa* sp. n.

sono salienti. Edeago figg. 190-191, spermateca fig. 192, sesto urotergo libero del maschio fig. 193.

Comparazioni. Per i caratteri dell'edeago e del margine posteriore del sesto urotergo libero del maschio, la nuova specie sembra tassonomicamente vicina ad *A. swayambunathana* Pace, 1991, del Nepal. Ma la parte apicale dell'edeago, in visione ventrale, nella nuova specie è nettamente più stretta, gli occhi della nuova specie sono più lunghi delle tempie e non molto ridotti come nella specie del Nepal che mostra inoltre antennomeri 4° a 6° più lunghi che larghi e non lunghi quanto larghi come nella nuova specie.

Etimologia. La nuova specie è dedicata al suo raccoglitore Jonathan Cooter di Hereford (Gran Bretagna), noto studioso di Liodidae.

Atheta (Dimetrota) inaroides sp. n. Figg. 194-195

Holotypus ♀, China, Beijing, Yingtaogou, III.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,1 mm. Corpo lucido e nero, antenne comprese; zampe brune. La reticolazione del capo è quasi vigorosa, quella del pronoto è nettissima, quella delle elitre netta e quella degli uroterghi lievemente trasversa e distinta. I tubercoletti della superficie della fronte sono svaniti, quelli sul resto del capo sono salienti come quelli del pronoto. Le elitre presentano tubercoletti distinti e l'addome li ha salienti. Spermateca fig. 195.

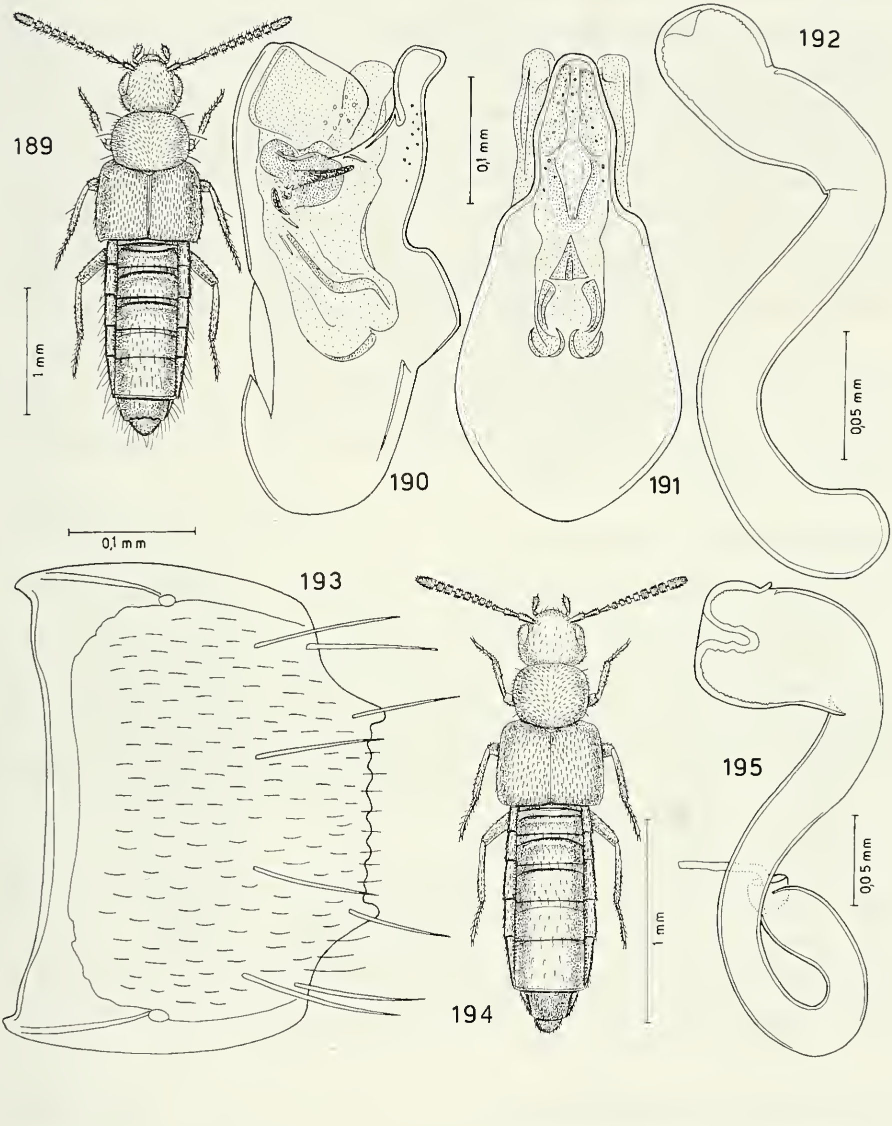
Comparazioni. Per la forma della spermateca, la nuova specie sembra affine ad *A. inari* Sawada, 1977, del Giappone. Se ne distingue per avere il bulbo distale della spermateca più allungato e la parte prossimale della stessa spermateca, corta: essa non raggiunge la metà della parte mediana della stessa spermateca (parte prossimale che raggiunge la metà della parte mediana della spermateca in *inari*).

Atheta (Datomicra) vacua sp. n. Figg. 196-198

Holotypus ♂, China, Beijing, Xishan, IX.1992, de Rougemont leg. (MHNG).
Paratypus: 1 ♂, stessa provenienza.

Descrizione. Lunghezza 1,5 mm. Corpo lucido e nero con estremità addominale bruna; antenne nere; zampe gialle con femori giallo-bruni. Su un fondo non reticolato i tubercoletti della superficie del capo e del pronoto sono fini e salienti, quelli delle elitre sono superficiali e quelli dell'addome sono distinti, più fitti sugli uroterghi basali. Il sesto urotergo libero è coperto di reticolazione distinta. Edeago figg. 197-198.

Comparazioni. La nuova specie è distinta da *A. sordiduloides* Cameron, 1939, dell'India, oltre che per l'edeago di taglia nettamente minore, per l'assenza di distinta armatura genitale interna dell'edeago stesso. Inoltre la nuova specie ha elitre meno sviluppate e il margine posteriore del sesto urotergo libero dal maschio non sinuato come quello di *sordiduloides*.



FIGG. 189-195

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 189-193: *Atheta (Dimetrota) cooteri* sp. n.; 194-195: *Atheta (Dimetrota) inaroides* sp. n.

Atheta (Datomicra) viduoides sp. n. Figg. 199-202

Holotypus ♂, China, Yunnan, Xishuangbanna, Jinghong, II.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 1,8 mm. Corpo lucido e bruno con capo nero-bruno, con margine posteriore dei tre uroterghi basali ed estremità addominale bruno-rossicci; antenne nere con i due antennomeri basali giallo-bruni; zampe gialle. La reticolazione del capo e delle elitre è svanita, quella del pronoto e dell'addome è estremamente superficiale. Le maglie di reticolazione degli uroterghi sono molto trasverse. I tubercoletti del capo sono superficiali, quelli del pronoto e delle elitre distinti e quelli dell'addome sono salienti. Edeago figg. 200-201, spermateca fig. 202.

Comparazioni. La nuova specie è simile ad *A. vidua* Pace, 1988, del Nepal, in base alla forma della spermateca. Tuttavia il bulbo distale della spermateca della nuova specie è più sviluppato, con introflessione apicale larga (stretta in *vidua*). Inoltre gli occhi di *vidua* sono più corti delle tempie e non più lunghi delle tempie come nella nuova specie.

Atheta (Datomicra) antesericea sp. n. Figg. 203-207

Holotypus ♂, China, Zhejiang, Tianmushan, 29.IX.1993, de Rougemont leg. (MHNG).
Paratypi: 1 ♂ e 1 ♀, stessa provenienza.

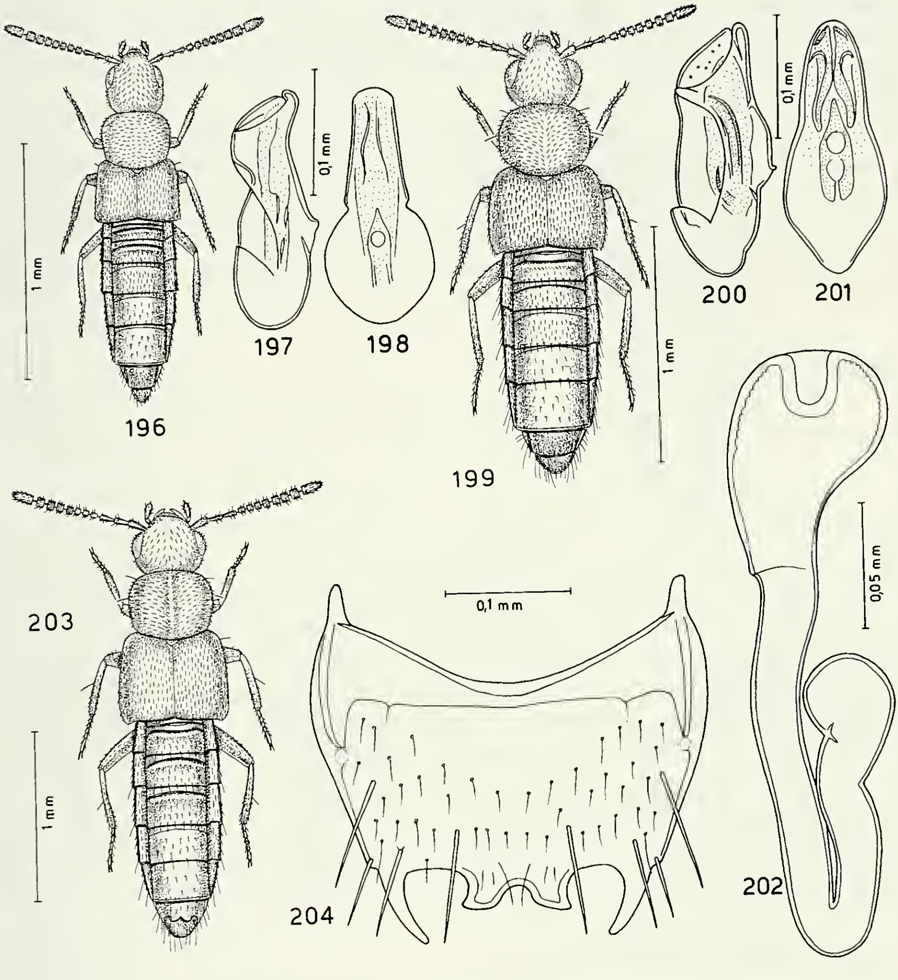
Descrizione. Lunghezza 4,1 mm. Avancorpo quasi opaco, addome lucido. Corpo bruno con elitre giallo-brune e uriti liberi 3°, 4° e 5° neri; antenne nere con i due antennomeri basali giallo-rossicci. La reticolazione dell'avancorpo è netta, quella dell'addome è a maglie estremamente trasverse e distinte. La punteggiatura del capo è assai superficiale, quella del pronoto è indistinta. Superficiali tubercoletti coprono le elitre, quelli dell'addome sono salienti. Sesto urotergo libero del maschio fig. 204, edeago figg. 205-206, spermateca fig. 207.

Comparazioni. In base alla forma della spermateca, la nuova specie sembra simile ad *A. formicetorum* Bernhauer, 1907, del Giappone, ma il bulbo distale della stessa spermateca è meno sviluppato nella nuova specie e la parte prossimale, sempre della spermateca, è notevolmente prolungata nella nuova specie e brevissima in *formicetorum*. La parte apicale dell'edeago della nuova specie è strettissima, mentre in *formicetorum* è il doppio più larga.

Atheta (Datomicra) permimetica sp. n. Figg. 208-212

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 26.VII.1994, A. Smetana leg. (MHNG).
Paratypi: 23 es., stessa provenienza; 1 ♂, Gongga Shan, above camp 3, 3050 m, 22.VII.1994, A. Smetana leg.

Descrizione. Lunghezza 2,8 mm. Corpo lucido con pronoto debolmente lucido. Corpo bruno con capo bruno scuro e addome giallo-rossiccio con uriti liberi 3°, 4° e 5° nero-bruni; antenne brune con i tre antennomeri basali giallo-rossicci;



Figg. 196-204

196-198: *Atheta (Datomicra) vacua* sp. n.; 199-202: *Atheta (Datomicra) viduoides* sp. n.; 203-204: *Atheta (Datomicra) antesericea* sp. n.

zampe gialle. La reticolazione del capo e del pronoto è nettissima, quella delle elitre è distinta e quella dell'addome è a maglie molto trasverse e molto superficiali. I tubercoletti della superficie del capo e del pronoto sono distinti, quelli delle elitre sono svaniti. Edeago figg. 209-210, spermateca fig. 211, sesto urotergo libero del maschio fig. 212.

COMPARAZIONI. La forma della spermateca potrebbe indicare che la nuova specie può essere tassonomicamente vicina ad *A. formicetorum* Bernhauer, 1907, del Giappone. La più evidente differenza nella spermateca è la presenza di una gibbosità alla base del bulbo distale, assente nella spermateca di *formicetorum*. L'edeago, al lato ventrale, ha un distinto angolo smussato, esso in *formicetorum* appare come debolissimo e molto ottuso angolo.

Atheta (Datomicra) bimacula sp. n. Figg. 213-217

Holotypus ♀, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).

Paratypus: 1 ♂. China, Yunnan, Xishuangbanna, Mengdien, 26.I.1993, de Rougemont leg.

DESCRIZIONE. Lunghezza 3,2 mm. Corpo lucido. Capo nero, pronoto giallo-rossiccio, elitre giallo-brune, due uriti basali giallo-rossicci con macchia bruna sulla linea mediana, uriti liberi 3°, 4° e metà beasele del 5° bruni, estremità addominale giallo-rossiccia; antenne brune con i due antennomeri basali e la base del terzo giallo-rossicci; zampe rossicce. La reticolazione del capo è distinta, quella sul resto della superficie del corpo è netta. Sugli uroterghi è ben trasversa. I tubercoletti della superficie del capo sono svaniti sul disco e ben salienti sul resto del capo, quelli del pronoto, delle elitre e dell'addome sono altrettanto salienti. Edeago figg. 214-215, spermateca fig. 216, sesto urotergo libero del maschio fig. 217.

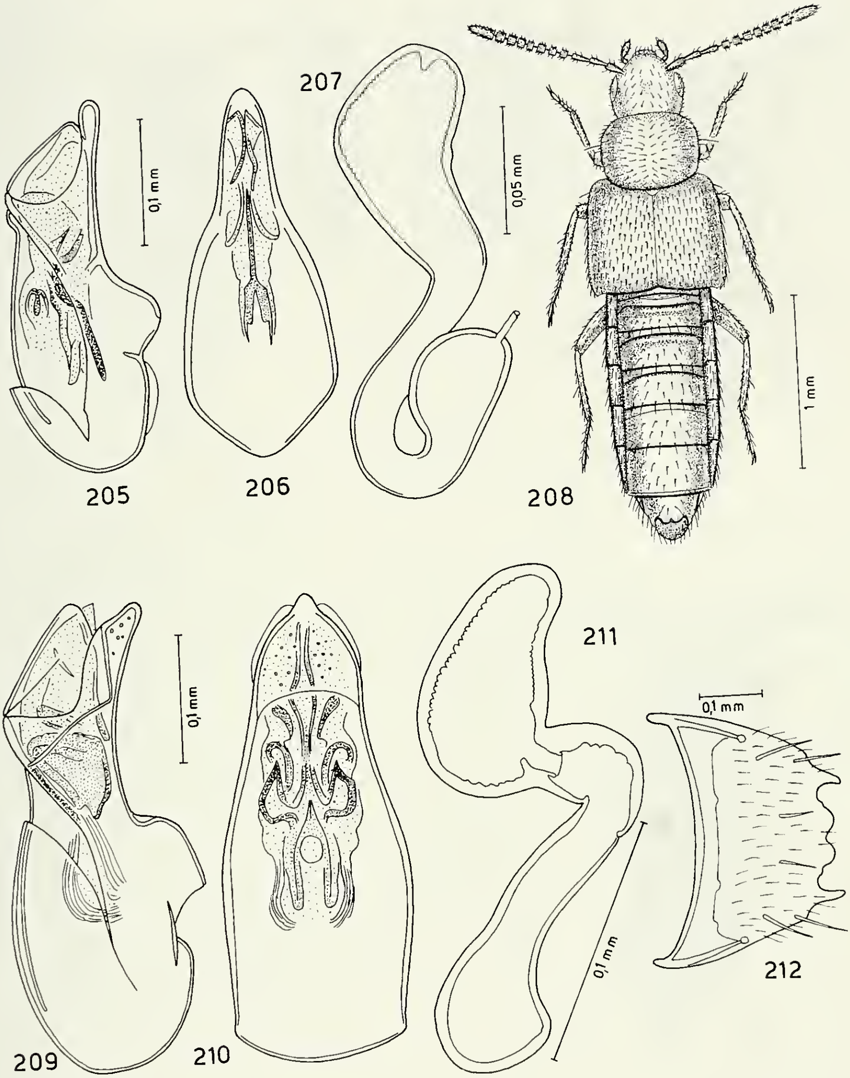
COMPARAZIONI. La nuova specie per la forma della spermateca sembra affine ad *A. permimetica* sp. n. sopra descritta, ma il colore del corpo è differente, come differenti sono l'edeago e il margine posteriore del sesto urotergo libero del maschio (figg. 209-212 e 214-217).

Atheta (Datomicra) mimoformosa sp. n. Figg. 218-219

Holotypus ♀, Hong Kong, Kadoorie Agricultural Research Centre, Malaise trap, 19-31.V.1996, de Rougemont leg. (MHNG).

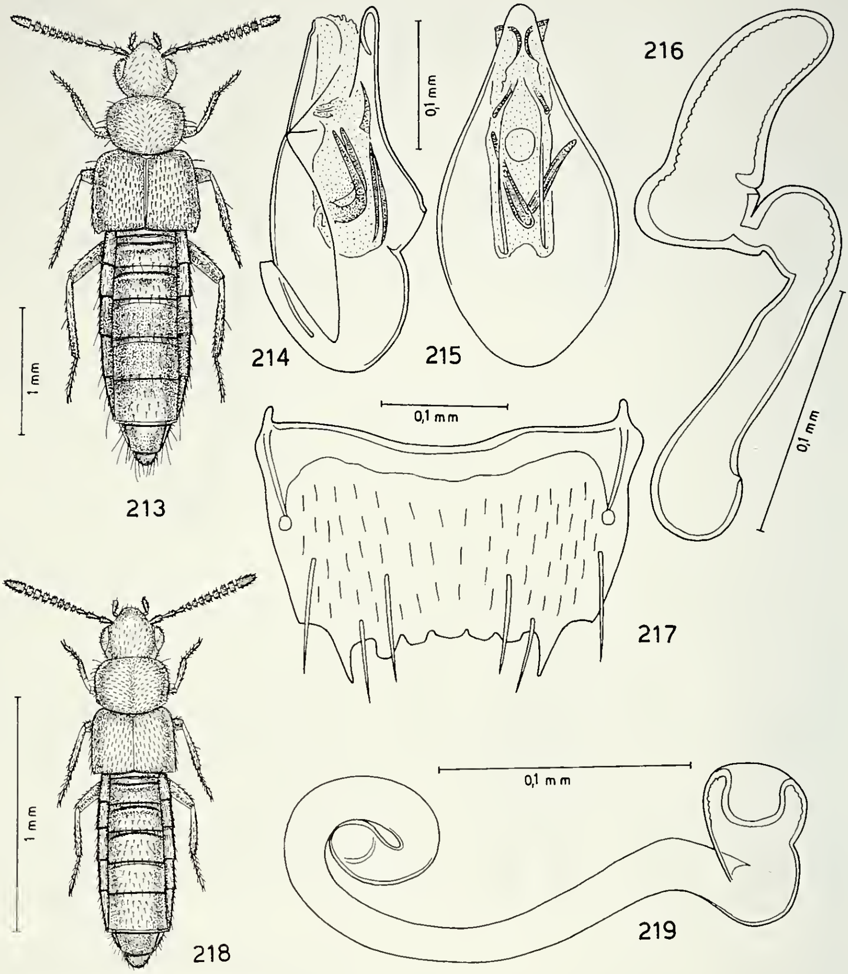
DESCRIZIONE. Lunghezza 1,6 mm. Corpo lucido e nero pece con elitre nero-brune; antenne nere con i due antennomeri basali nero-bruni; zampe gialle. Su tutto il corpo vi è una reticolazione svanita. La punteggiatura del capo è estremamente superficiale. I tubercoletti del pronoto e delle elitre sono indistinti, quelli dell'addome sono salienti. Spermateca fig. 219.

COMPARAZIONI. La struttura della spermateca della nuova specie è simile a quella della spermateca di *A. formosa* Cameron, 1939, dell'India, ma è esile e non robusta come quella di *formosa*. Inoltre l'introflessione apicale del bulbo distale della spermateca della nuova specie è emisferica, mentre è conica in *formosa*.



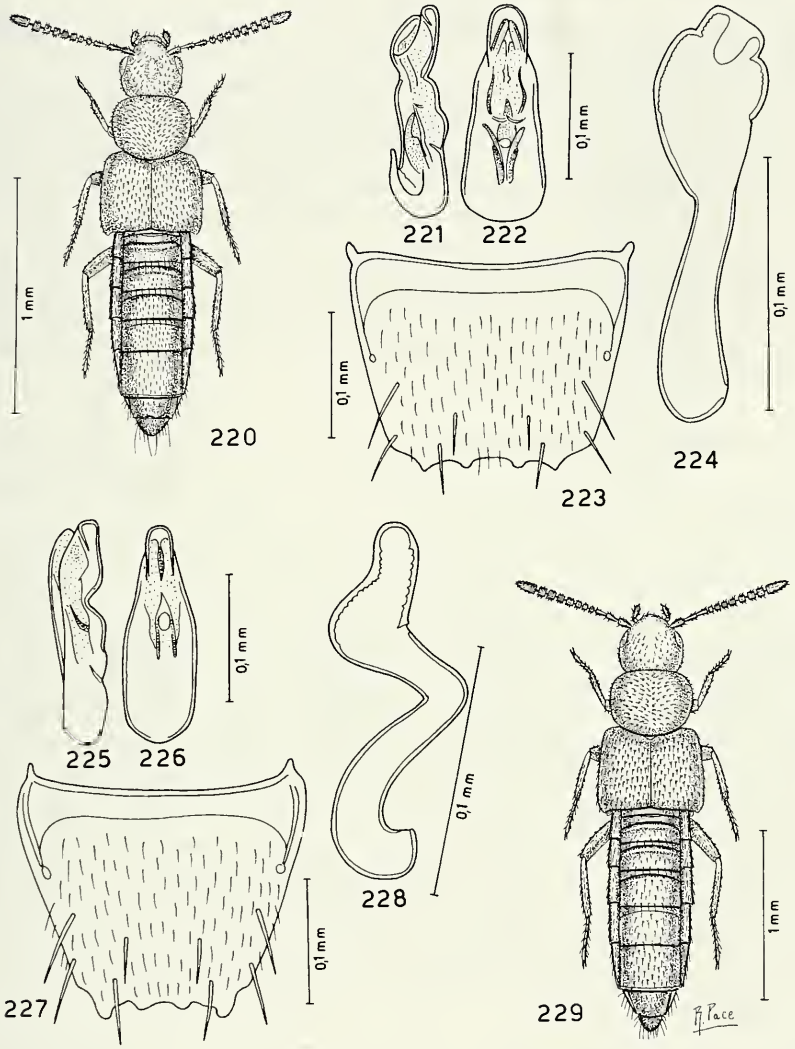
FIGG. 205-212

Edeago in visione laterale e ventrale, spermateca, habitus e sesto urotergo libero del maschio. 205-207: *Atheta (Datomicra) antesericea* sp. n.; 208-212: *Atheta (Datomicra) permimetica* sp. n.



FIGG. 213-219

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 213-217: *Atheta (Datomicra) bimacula* sp. n.; 218-219: *Atheta (Datomicra) mimoformosa* sp. n.



FIGG. 220-229

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 220-224: *Atheta (Datomicra) canescens* (Sharp); 225-229: *Atheta (Datomicra) dadopora* Thomson.

Atheta (Datomicra) dalijiamontis sp. n. Figg. 230-231

Holotypus ♀, China, Gansu, Dalijia Shan, 46 Km W Linxia, 2980 m, 10.VII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 2,7 mm. Corpo lucido e bruno con uriti liberi 4° e 5° neri; antenne giallo-brune con i tre antennomeri basali giallo-rossicci; zampe gialle. La reticolazione del capo è distinta, quella del pronoto e delle elitre è svanita e quella dell'addome è assente. La punteggiatura del capo è superficiale e assente sulla fascia mediana. Sul resto del corpo stanno dei tubercoletti superficiali. Spermateca fig. 231.

COMPARAZIONI. Per la forma della spermateca, la nuova specie sembra affine ad *A. sordidula* (Erichson, 1839), a diffusione paleartica. Se ne distingue per la taglia corporea maggiore, per gli antennomeri 4° e 5° più lunghi che larghi (trasversi in *sordidula*) e per il bulbo distale della spermateca meno sviluppato, con introflessione apicale stretta (larga in *sordidula*).

Atheta (Datomicra) zhejiangensis sp. n. Figg. 232-235

Holotypus ♂, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).
Paratypi: 3 ♂ e 2 ♀, stessa provenienza.

DESCRIZIONE. Lunghezza 2,4 mm. Corpo lucido e nero con elitre brune; antenne nere; zampe brune con tarsi gialli. La reticolazione del disco del capo è vigorosa, quella sul resto della superficie del capo è svanita. Il resto della superficie del corpo è coperta di reticolazione distinta, a maglie trasverse solo sugli uroterghi. La punteggiatura del capo è superficiale e assente sulla fascia mediana che è impressa. Il pronoto è coperto da fine punteggiatura. Tubercoletti distinti coprono la superficie delle elitre e tubercoletti svaniti quella dell'addome. Il quinto urotergo libero mostra una reticolazione molto trasversa. Edeago figg. 233-234, spermateca fig. 235.

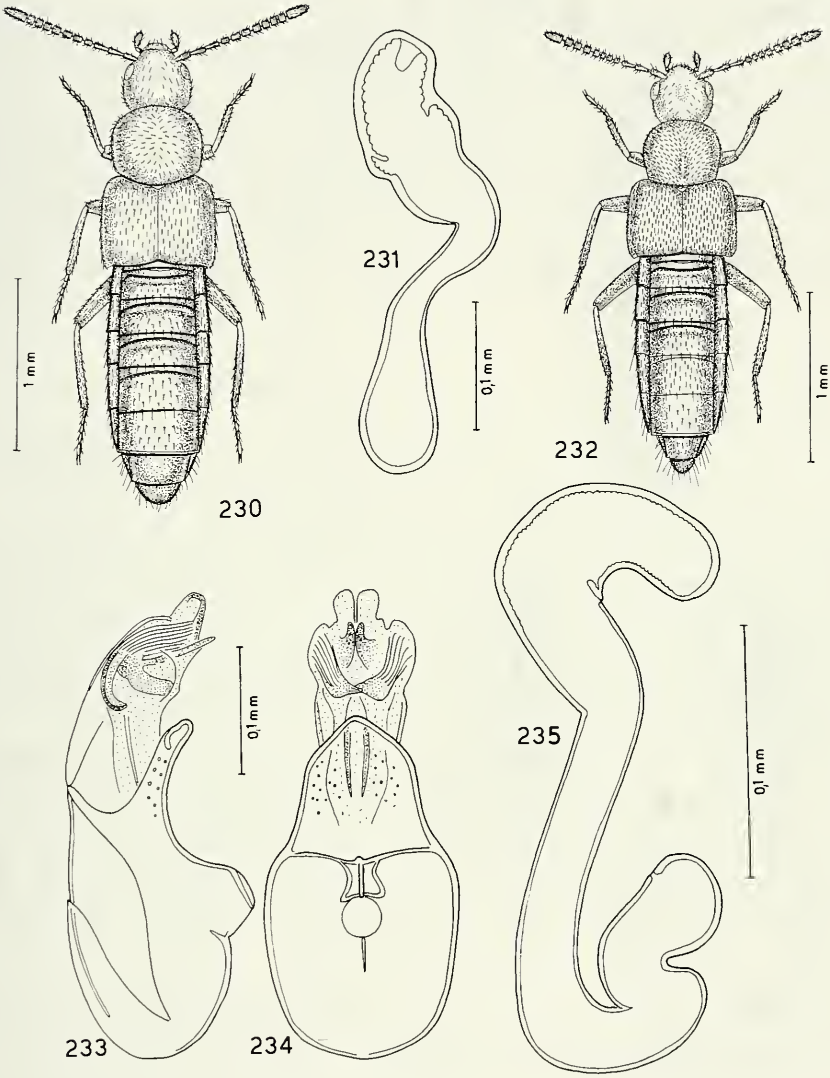
COMPARAZIONI. Per la forma della spermateca, la nuova specie sembra affine ad *A. nigra* (Kraatz, 1858) a diffusione olartica, Ma il bulbo distale della spermateca della nuova specie è ricurvo e senza introflessione apicale (rettilineo e con profondissima introflessione apicale in *nigra*) e la parte prossimale della stessa spermateca della nuova specie è bisinuata, al contrario descrive un'ampia curva in *nigra*.

L'edeago è profondamente arcuato al lato ventrale nella nuova specie e a profilo ventrale sinuoso in *nigra*.

Atheta (Datomicra) subinopinata sp. n. Figg. 236-240

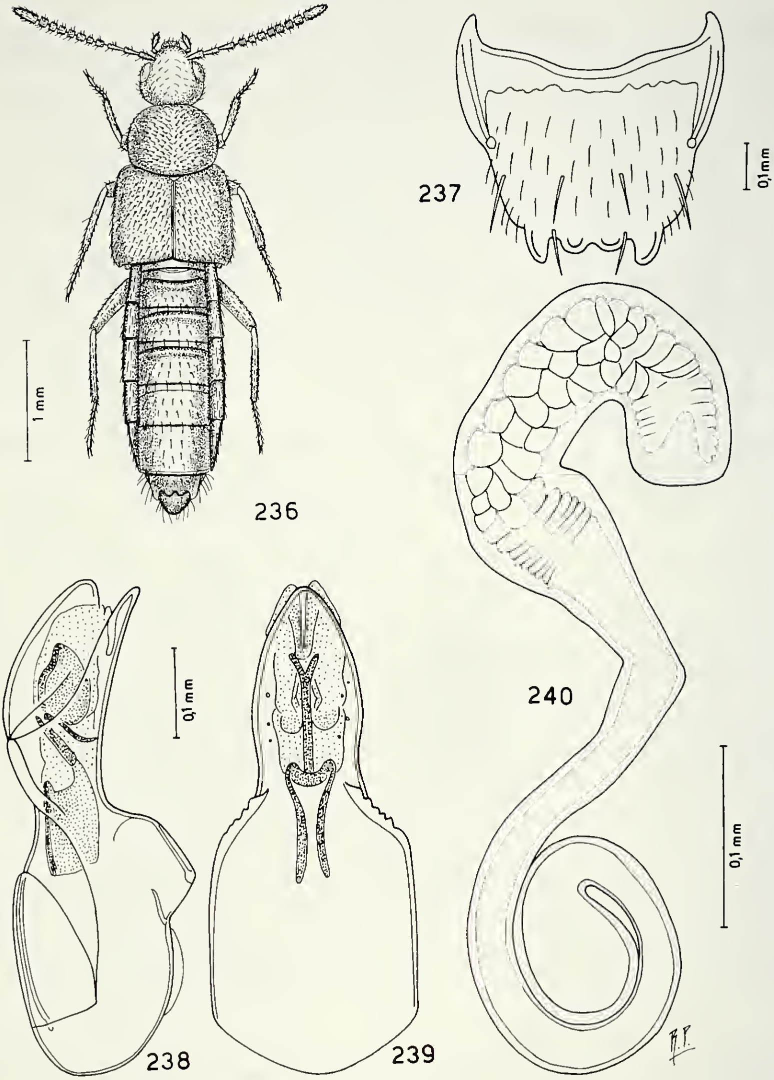
Holotypus ♀, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 26.VII.1994, A. Smetana leg. (MHNG).
Paratypi: 35 es., stessa provenienza.

DESCRIZIONE. Lunghezza 4,0 mm. Corpo lucido e bruno con addome giallo-rossiccio avente gli uriti liberi 3°, 4° e la base del 5° neri; antenne brune con i quattro antennomeri basali giallo-rossicci; zampe rossicce. La reticolazione del capo e del pronoto è netta, quella delle elitre è distinta e quella dell'addome è molto svanita e composta di maglie molto trasverse. I tubercoletti della superficie del capo sono poco



FIGG. 230-235

Habitus, spermateca ed edeago in visione laterale e ventrale. 230-231: *Atheta (Datomicra) dalijiamontis* sp. n.; 232-235: *Atheta (Datomicra) zhejiangensis* sp. n.



FIGG. 236-240

Habitus, sesto urotergo libero del maschio, edeago in visione laterale e ventrale e spermateca. 236-240: *Atheta (Datomicra) subinopinata* sp. n.

distinti e assenti sulla fascia mediana, quelli del pronoto sono salienti, quelli delle elitre sono distinti e quelli dell'addome sono fini. Sesto urotergo libero del maschio fig. 237, edeago figg. 238-238, spermateca fig. 240.

Comparazioni. Per la forma della spermateca, la nuova specie è tassonomicamente vicina ad *A. inopinata* Pace, 1991, del Nepal. Se ne distingue per avere il bulbo distale della spermateca flesso e non rettilineo e lievemente sinuato come in *inopinata*. L'edeago della nuova specie non è ventralmente bisinuato e profondamente arcuato come in *inopinata*, nè la regione preapicale dello stesso edeago (in visione ventrale) è larghissima con margine angoloso. Il margine posteriore del sesto urotergo libero del maschio di *inopinata* è rettilineo con un dente arrotondato a ciascun lato, mentre nella nuova specie è come da fig. 237.

Atheta (Datomicra) parainopinata sp. n. Figg. 241-245

Holotypus ♂, China, Sichuan, Gongga Shan, above capo 3, 3050 m, 22.VII.1994, A. Smetana leg. (MHNG).
Paratypi: 32 es., stessa provenienza, ma 2800 m, 28.VII.1994, A. Smetana leg.

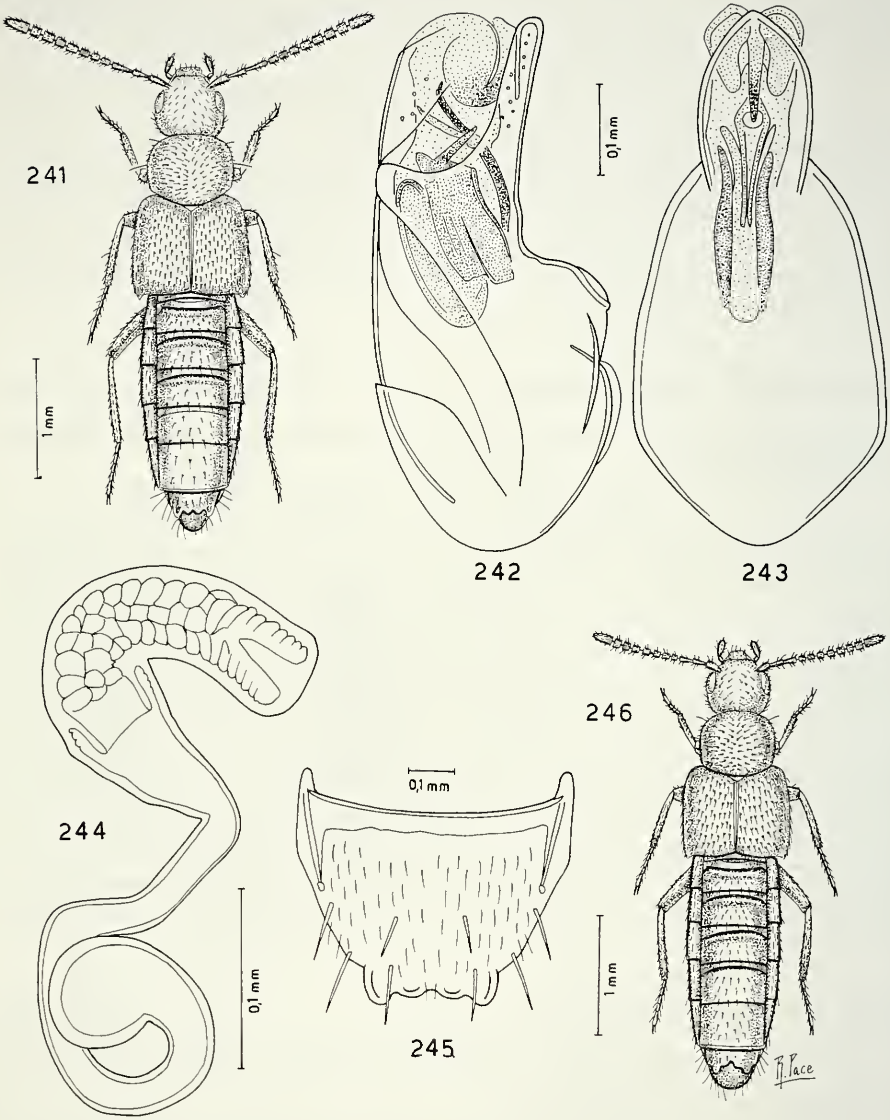
Descrizione. Lunghezza 3,8 mm. Corpo lucido e bruno con addome nero-bruno avente il margine posteriore dei due uriti basali e l'estremità addominale rossicci; antenne brune con i sei antennomeri basali giallo-rossicci; zampe giallo-rossicce. Il capo e il pronoto presentano una reticolazione netta. Le elitre mostrano d'essere coperte di tubercoletti poco salienti. L'addome è privo di reticolazione. Edeago figg. 242-243, spermateca fig. 244, sesto urotergo libero del maschio fig. 245.

Comparazioni. La nuova specie è affine ad *A. inopinata* Pace, 1991, del Nepal, ma più affine ad *A. subinopinata* sp. n. sopra descritta, se si osserva la forma della spermateca che ha il bulbo distale flesso. Tuttavia questo prende origine al livello delle docce interne della stessa spermateca e non dopo un tratto più o meno lungo come in *subinopinata*. Il confronto della forma dell'edeago delle due specie (figg. 238-238 e 242-243) insieme a quello della forma del margine posteriore del sesto urotergo libero del maschio (figg. 237 e 245) conferma che si è in presenza di specie distinte.

Atheta (Datomicra) xinlongensis sp. n. Figg. 246-250

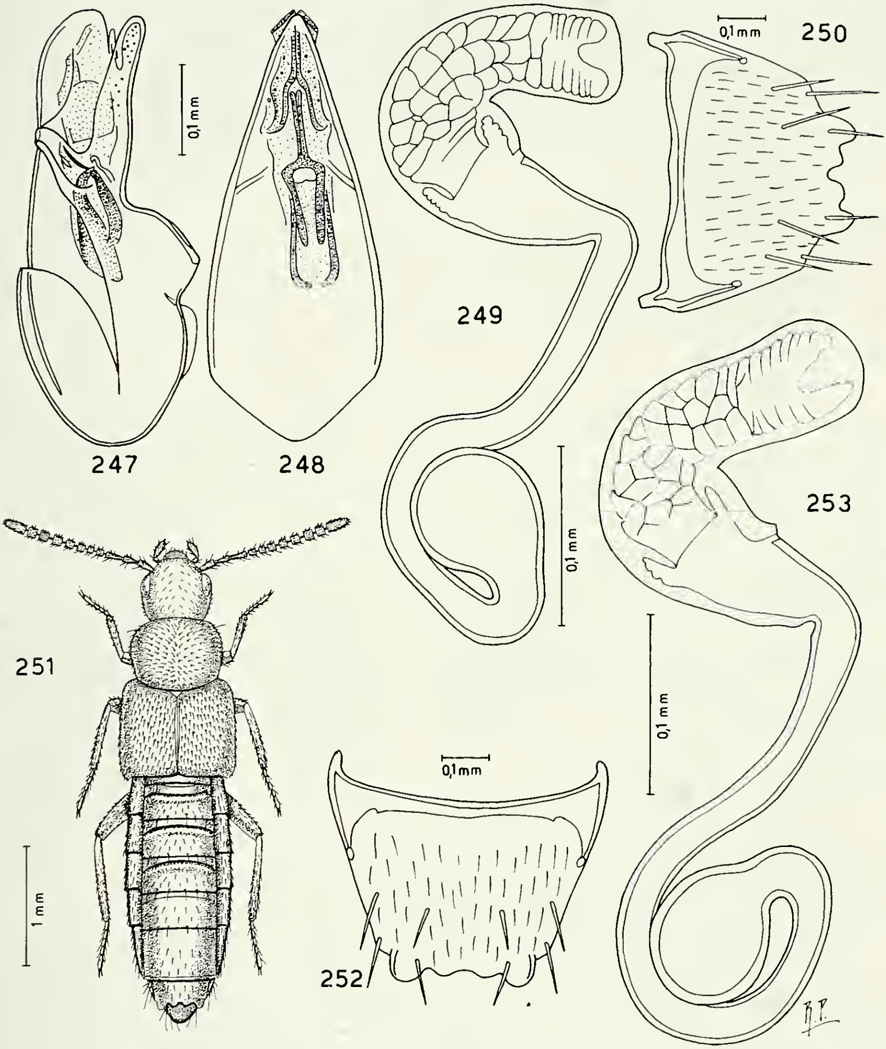
Holotypus ♂, China, Gansu, Xinlong Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VII.1994, A. Smetana leg. (MHNG).
Paratypi: 13 es., stessa provenienza.

Descrizione. Lunghezza 3,7 mm. Corpo lucido e nero-bruno con elitre brune e con margine posteriore dei tre uroterghi basali ed estremità addominale rossicci; antenne brune con i cinque antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione dell'avancorpo è netta, quella dell'addome è estremamente svanita, composta di maglie estremamente trasverse. Tubercoletti distinti o salienti coprono la superficie dell'avancorpo. Edeago figg. 247-248, spermateca fig. 249, sesto urotergo libero del maschio fig. 250.



Figg. 241-246

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 241-245: *Atheta (Datomicra) parainopinata* sp. n.; 246: *Atheta (Datomicra) xinlongensis* sp. n.



Figg. 247-253

Edeago in visione laterale e ventrale, spermateca, sesto urotergo libero del maschio e habitus. 247-250: *Atheta (Datomicra) xinlongensis* sp. n.; 251-253: *Atheta (Datomicra) regressa* sp. n.

Comparazioni. Per la forma della spermateca, la nuova specie è affine ad *A. parainopinata* sp. n. sopra descritta. Ma l'introflessione apicale del bulbo distale della spermateca è breve nella nuova specie e lunga in *parainopinata* e il bulbo prossimale della stessa spermateca è più sviluppato nella nuova specie che in *parainopinata*. Tuttavia è la forma dell'edeago (figg. 242-243 e 247-248) e del margine posteriore del sesto urotergo libero del maschio (figg. 245 e 250) che permettono di distinguere nettamente le due specie.

Atheta (Datomicra) regressa sp. n. Figg. 251-255

Holotypus ♂, China, Gansu, Xinlon Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VIII. 1994, A. Smetana leg. (MHNG).

Paratypus: 1 ♀, China, Sichuan, Gongga Shan, above camp 3, 3300-3350 m, 23.VII. 1994, A. Smetana leg.

Descrizione. Lunghezza 3,9 mm. Corpo lucido e bruno con elitre bruno-rossicce e con uriti liberi quarto e quinto neri; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo e delle elitre è distinta, quella del pronoto netta e quella dell'addome è estremamente superficiale e a maglie molto trasverse. La punteggiatura del capo è svanita e assente sul disco che è appena impresso. Tubercoletti distinti coprono il pronoto e le elitre. Sesto urotergo libero del maschio fig. 252, spermateca fig. 253, edeago figg. 254-255.

Comparazioni. La nuova specie è affine ad *A. xinlongensis* sp. n. sopra descritta a motivo della forma della spermateca. Se ne distingue per l'angolo ventrale dell'edeago stretto e non ampio come quello di *xinlongensis* e per il differente profilo del margine posteriore del sesto urotergo libero del maschio (figg. 250 e 252).

Atheta (Datomicra) graffa sp. n. Figg. 256-260

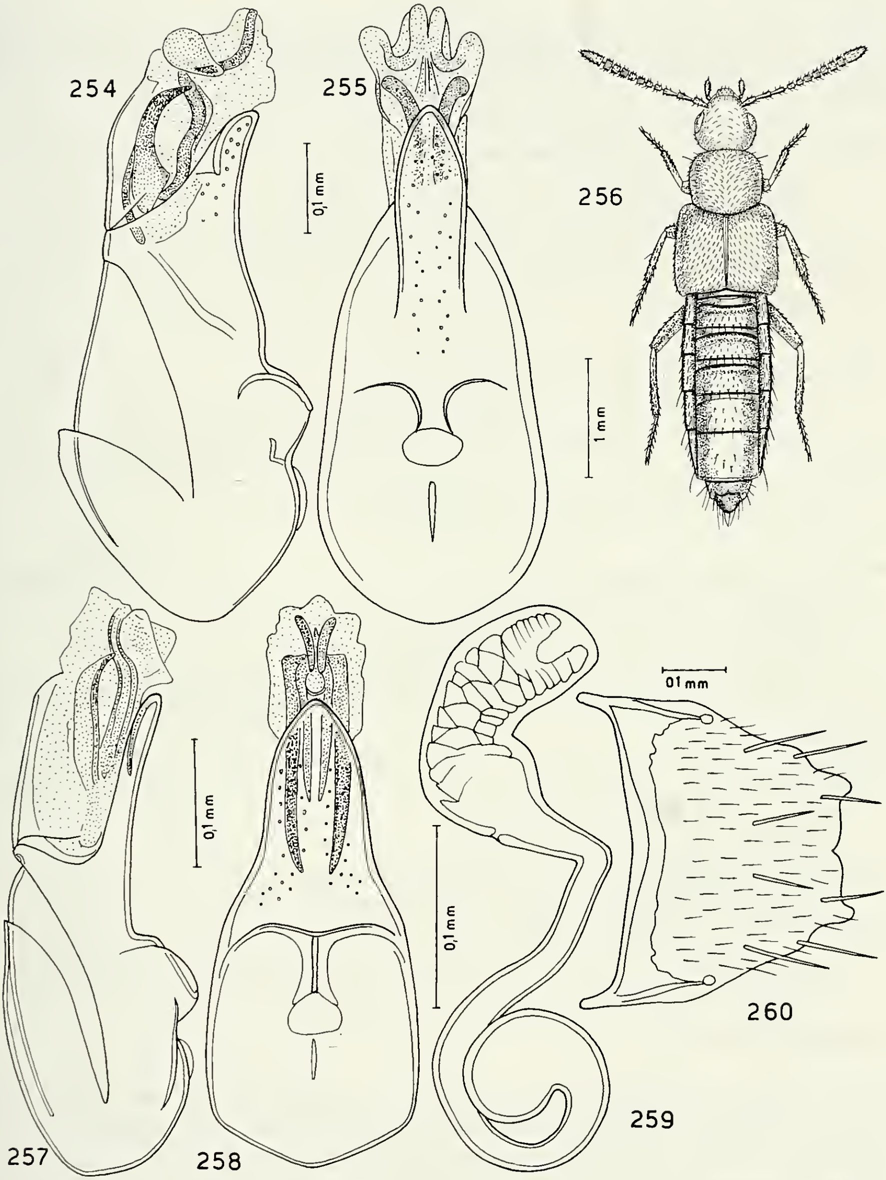
Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 25.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza; 1 ♂ e 1 ♀, China, Gansu, Xinlong Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VIII.1994, A. Smetana leg.

Descrizione. Lunghezza 3,4 mm. Corpo lucido e bruno con elitre bruno-rossicce e con uriti liberi 4° e 5° neri; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo è netta, quella del pronoto è nettissima, quella delle elitre è svanita e quella dell'addome è molto superficiale, composta di maglie molto trasverse. La punteggiatura del capo è svanita. Tubercoletti fini e distinti coprono il pronoto, quelli delle elitre sono svaniti. Edeago figg. 257-258, spermateca fig. 259, sesto urotergo libero del maschio fig. 260.

Comparazioni. La nuova specie è affine alle quattro precedenti immediatamente descritte. Il carattere differenziale più evidente è la forma del margine posteriore del sesto urotergo libero del maschio: essa non si osserva in nessuna delle specie del gruppo note.

Etimologia. La nuova specie prende nome dalla parentesi graffa il cui andamento si osserva al margine posteriore del sesto urotergo libero del maschio.



FIGG. 254-260

Edeago in visione laterale e ventrale, habitus, spermateca e sesto urotergo libero del maschio. 254-255: *Atheta (Datomicra) regressa* sp. n.; 256-260: *Atheta (Datomicra) graffa* sp. n.

ADDENDA

All'elenco delle specie note o nuove per la Cina dato nella parte I della presente serie di lavori sulle Aleocharinae della Cina, sono da aggiungere le seguenti specie:

Atheta (Philhygra) yokkaichiana Bernhauer, 1907 Figg. 4-6

Atheta (Metaxya) yokkaichiana Bernhauer, 1907: 410
Atheta (Philhygra) yokkaichiana: Sawada 1977: 177
1 ♂, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg.; 18 es. China, Zhejiang, Hangzhou, 27.IV.1993, de Rougemont.

Specie giapponese ora nota anche in Cina.

Atheta (Acrotona) inquinata Cameron, 1939 Figg. 65-72

Atheta (Acrotona) inquinata Cameron, 1939: 407
4 es., China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg.; 1 ♂ e 1 ♀, China, Ganzu, Dalijia Shan, 46 Km W Linkia, 2980 m, 10.VII.1994, A. Smetana leg.; 1 ♂ e 1 ♀, China, Gongga Shan, above camp 3, 3050 m, 22.VII.1994, A. Smetana leg.

La specie era finora nota solo del Kashmir.

Atheta (Datomicra) canescens (Sharp, 1869) Figg. 220-224

Homalota canescens Sharp, 1869: 239
Atheta (Datomicra) canescens: Palm 1968: 269
19 es., China, Shanxi, Nanwutai, 17.IX.1995, de Rougemont leg.

Specie diffusa dall'Europa centrale e settentrionale alla Siberia. Nuova per la Cina.

Atheta (Datomicra) dadopora Thomson, 1867 Figg. 225-229

Atheta dadopora Thomson, 1867: 282
Atheta (Datomicra) dadopora: Lohse 1974: 189
Atheta (Datostiba) poroshirica Sawada, 1978: 243, **syn. n.**
Atheta (Datomicra) shuteae Pace, 1987: 420, **syn. n.**
1 ♂ e 2 ♀, China, Gansu, Pass btw Hezuo-Amqog, 3300 m, 12.VII.1994, A. Smetana leg.

Specie diffusa dall'Europa alla Siberia, all'India settentrionale e al Giappone.

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Rivolgo i miei più sentiti ringraziamenti a coloro che mi hanno affidato in studio le Aleocharinae della Cina oggetto del presente lavoro e frutto di recenti raccolte: il collega Guillaume de Rougemont di Londra, il Dr Ales Smetana di Ottawa, Jonathan Cooter di Hereford (Gran Bretagna), Garry Ades, Graham Reels e il Dr Shuquang Li di Stuttgart (Germania). Per il prestito di tipi e di materiale di confronto rigrazio sentitamente il Dr A.F. Newton del "Field Museum of Natural History" di Chicago, il Dr P.M. Hammond del "Natural History Museum" di Londra, il Dr L. Baert dell'"Institut Royal des Sciences Naturelles" di Bruxelles e il Dr L. Zerche del D.E.I. di Eberswalde.

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Abstracts

(alphabetically by first author)

ALTWEGG Res[1], RINGSBY Thor-Harald[2] & SAETHER Bernt-Erik[2]

[1] Department of Zoology; University of Zurich; Winterthurerstrasse 190; CH-8057 Zürich; Switzerland

[2] Department of Zoology; Norwegian University of Science and Technology; N-7034 Trondheim; Norway

Natal dispersal in a metapopulation of house sparrows (*Passer domesticus*); characteristics and fate of the dispersing individuals

In this study, we examine dispersal between local populations in a metapopulation of house sparrows (*Passer domesticus*) on an archipelago in Northern Norway. The following questions were addressed: 1) Is dispersal random movement, or is it influenced by the spatial arrangement of the islands? Are there differences in dispersal tendency or dispersal distance between age classes and between the sexes? 2) What is the relationship between dispersal probability and variation in several traits that are important for life history in birds, and 3) How do dispersers perform compared to residents in terms of survival. The observed distribution of dispersal distances differed significantly from the expected distribution under the assumption of equal colonization and emigration rates across islands. Dispersal was more intense among less isolated islands. In accordance with the general trend in passerine birds, dispersal was almost exclusively performed by juveniles. There was no significant sex bias in dispersal tendency and dispersal distance. Among females, dispersers tended to be larger and had higher adult survival compared to residents. Among males, early hatched and low ranking individuals were more likely to disperse. They did not differ from resident males in adult survival rate but had lower survival than female dispersers. Dispersal seemed thus to be performed by viable and successful females, and by subordinate males. These results idicate that dispersal within the studied metapopulation is a phenomenon influenced by many factors which may act in different ways on different parts of the population.

AVISE John

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The history and purview of phylogeography

About 10 years have passed since the birth of phylogeography as a formal discipline. However, the field's gestation began in the mid-1970's with the introduction of mitochondrial DNA analyses to population genetics, and to the profound shift toward genealogical thought at the intraspecific level (now formalized as coalescent theory) that these methods prompted. Here, I will briefly trace the history and explosive growth of phylogeography, consider some of the conceptual ramifications of the field for conservation and population biology, and close with a few thoughts on future challenges for the discipline.

BAIROCH Amos

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How can protein sequence database the helpful for phylogenetic studies

No abstract available.

BALLABENI Pierluigi, CONCONI Davide & RAHIER Martine

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Oviposition preference and larval performance in a leaf beetle

No abstract available.

Balloux François, Goudet Jérôme & Perrin Nicolas

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Breeding system and genetic variance in the monogramous, semi-social shrew, *Crocidura russula* (Insectivora, Soricidae)

The population-genetics consequences of monogamy and male philopatry (a rare breeding system in mammals) were investigated in the semi-social and anthropophilic shrew *C. russula* with the use of microsatellite markers. Genetic diversity was large (H=0.813) with significant differentiation among subpopulations (5-6%) over a small geographical scale (16 km). Subpopulations were themselves structured into smaller units («breeding groups») comprising an estimate of four breeding pairs each. Members of the same breeding groups displayed significant coancestries (9-10%), essentially due to strong male kinship: syntopic males were on average related at the half-sib level. Female dispersal among breeding groups was not complete (estimate 39%), and insufficient to prevent inbreeding. From our results, the breeding strategy of *C. russula* seems less efficient than classical mammalian systems (polygyny and male dispersal) in disentangling coancestry from inbreeding, but much more so in boosting the effective size of subpopulations, and thereby retaining genetic variance.

Bernasconi Giorgina[1,3] **& Keller Laurent**[2]

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[2] IZEA; University of Lausanne; Switzerland
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Phenotype and individual investment of cooperating ant queens

Fire ant (*Solenopsis invicta*) queens founding a colony with unrelated nestmates potentially face a trade-off. Increased individual investment enhances worker production, colony survival and growth. However, increased investment may reduce a queen's probability of surviving fights that invariably arise after worker eclosion. Indeed, previous studies showed that (i) queens lose less weight (a mesure of investment) when initiating colonies with cofoundresses than when alone and (ii) within associations the queen losing more weight is more likely to die. In this study, we tested whether queens adjust weight loss to social environment and fighting ability, and whether restraining weight loss directly increases survival prospects. Experimental manipulation of colonies showed that reduced investment by queens within associations is primarily a response to the presence of a nestmate and not simply a response to differences in per-queen brood care demands. Differences in head width were associated with relative and combined weight loss of cofoundresses, as well as queen survival. Manipulation of the queens' relative weight by feeding and exposure to contrasting social environment (queens kept alone or in groups) did not significantly affect survival. These results indicate that head width differences, or other correlated phenotypic attributes of fighting ability, influenced both investment strategies and survival probability of queens. That the queens with larger heads both invested less energy into brood rearing and were more likely to survive suggests that early foundress associations of ants may not be as peaceful as previously assumed.

Bernasconi Marco[1,2]**, Valsangiacomo Claudio**[2]**, Piffaretti Jean-Claude**[2] **& Ward Paul**[1]

[1] Zoologisches Museum der Universität; Abt. Ökologie; Winterthurerstrasse 190; CH-8057 Zürich; Switzerland
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Phylogeny of Scathophagidae (Diptera, Calyptratae) based on mitochondrial DNA sequences

Scathophagids flies, with more than 250 species, are mainly confined to the Holarctic region. Individuals of most species feed on vertebrate dung or decomposing carcasses, performing the ecologically-important function of resource recycling. One species, *Scathophaga stercoraria* has been used extensively to investigate questions in animal ecology and evolution. However, the taxonomy and phylogeny of this family still remain unclear. This study represents the first molecular approach aimed at uncovering the phylogenetic relationships among species of this family. A portion of nearly 800 bp of the terminal region of the mitochondrial gene COI (the subunit I of the cytochrome oxidase gene) was sequenced in over 30 species covering a wide geographic area, as well as a diverse spectrum of ecological habitats. In general, molecular data are in agreement with previous morphological information. However, some peculiarities reveal discrepancies between the two approaches. Some examples which will be discussed are: (i) *S. taeniopa* and *S. suilla*, morphologically distinct species, are molecular indistinct taxa (ii) the subdivision of the *Norellia genus* in two different subgenera, as proposed by morphological characters, is not supported by molecular data.

Bersier Louis-Félix[1], **Dixon Paul**[2] **& Sugihara George**[2]
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The behaviour of the link density in food webs with increasing sampling effort: from scale invariance to scale dependence

We examined the scaling behaviour of the link density property of food webs with varying levels of sampling effort used to document the webs. The results of two models as well as empirical evidence concur in showing that the link density tends toward scale invariance with low sampling effort, and that it becomes scale dependent with increasing resolution in documenting the webs. This is a reasonable explanation for the discrepancies found in the literature on this question, suggesting that, for this property, scale-invariant and scale dependent hypotheses may not be exclusive hypotheses, but rather elements of a continuum. This finding raises two significant issues. First, in cross-system comparisons, it points to the difficulty of disentangling between effects due to differences in sampling effort and to biological differences. Second, in giving an equal weight to all trophic relations, binary links tend to distort the image of a web with increasing sampling effort, where weaker and weaker links (in term of biomass transferred) are reported. Both issues highlight the need of considering links quantitatively in the description of food webs.

Buner Francis
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Habitat utilization of overwintering Kestrels (*Falco tinnunculus*) in relation to perch availability, vole abundance and distribution

In the last two decades Kestrel numbers declined in most European areas, presumably because of agricultural changes. To this day most studies about Kestrels were looking at its finding behaviour, very little is known about its winter behaviour and ecology.

In winter 1996/97 I radio tracked 30 Kestrels in an area of about 20 km^2 in the Klettgau (Canton of Schaffhausen) from December till April. In soon became clear that the studies winter population consisting of territorial pairs, individual birds, winter guests, migrants and cold weather migrants, was more complicated and dynamic as believed so far. During a cold spell at the end of December, beginning January, about 50% of the Kestrels did leave the study area. The movements were mainly observed in an area which held most individuals in late

autumn. This about 5 km^2 big area called «Widen» is intensively used agricultural land, characterized by a relatively high abundance of «ökologische Ausgleichsflächen» and small mammal numbers. I could show that the winter distribution and movements of the Kestrels were not only due to the weather situation but also to the combined influence of habitat distribution and quality, perch availability as well as vole abundance and distribution.
To support our overwintering Kestrels it seems to be essential to lay out further «ökologische Ausgleichsflächen» and bigger extensively cultivated ares in combination with erecting more perches.

CASTELLA Vincent, GOUDET Jérôme & PERRIN Nicolas

Institut de Zoologie et d'Ecologie Animale; Bâtiment de Biologie; Université de Lausanne; CH-1015 Lausanne; Switzerland

Allozyme variance and habitat in the freshwater snail *Physa acuta*

The wide-spread freshwater Gastropod *Physa acuta* colonizes big lakes as well as small, temporary ponds. Both habitats show a pronounced difference in temporal and spatial structure. Populations living in these two distinct habitats might then be genetically differentiated.
460 snails were collected from 12 different sites, six sites being of lake habitats (Léman and Neuchâtel) and six sites being of pond habitats. All individuals were genotyped using six polymorphic allozyme loci.
Differentiation was high between ponds' populations. Despite their low dispersal abilities snails from the lake Léman were genetically weakly differentiated. All populations showed a strong heterozygotes deficiency which was independent of their environment. This suggests that this deficiency is due to selfing and consanguineous matings. In spite of their recent colonization, the genetic variability of some pond's populations was as high as those from the lakes. The presence of two genetically different gene pools between these distinct habitats suggests the existence of two sibling species or the possible action of selection.

CUENOUD Philippe[1], MANEN Jean-François[1], LOIZEAU Pierre-André[1], ANDREWS S.[2] & SPICHIGER Rodolphe[1]

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Molecular Phylogeny and Biogeography of the Genus *Ilex* L. (Aquifoliaceae)

The genus *Ilex* L. (Aquifoliaceae) contains about 600 species of trees and shrubs distributed worldwide with a maximum diversification in east Asia and south America. It is a quite ancient genus, with fossils known from 90 my ago. The phylogeny of *Ilex* has been investigated using chloroplastic DNA. The atpB/rbcL spacer has been sequenced for 110 species. For 41 of these species, the rbcL gene has been sequenced in addition to the spacer. The phylogenies inferred from this database are presented, and their implications for the taxonomy and biogeography of the genus are discussed. In general, this genus appears to be a difficult taxon to study. In particular, the taxonomical treatments published by classical authors show only limited correlation with the molecular information. The biogeographical interpretation of the molecular phylogenies is problematic too. These difficulties may arise from the very long history of the genus, in which many extinctions and subsequent radiations have probably blurred the patterns that could have existed.

CURCIC Bozidar P. M. & MAKAROV Slobodan

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Endemic differentiation of millipedes (Diplopoda, Myriapoda) in Serbia, Montenegro and Macedonia: taxonomic implications

The fauna of diplopods in Serbia, Montenegro and Macedonia is very rich and diverse. Out of 136 species inhabiting the areas studied, 48 (or 35.29%) are endemic to these regions; furthermore, of 48 genera, only 4 (or 8.33%) are endemic to the same areas, but none of the families. In Serbia, 70 diplopod species have been found, and 59 and 59 in Montenegro and Macedonia, respectively. There exist no endemic genera in Serbia, but Montenegro and Macedonia are inhabited by 1 and 3 endemic general respectively.
Serbia, Macedonia and Montenegro have in common 33 species, 23 genera and 14 families of diplopods. Serbia and Montenegro are inhabited by 18 common species, 15 genera and 9 families, while Serbia and Macedonia have in common 29 species, 21 genus and 13 families; and Montenegro and Macedonia are characterized by shared 16 species, 12 genera and 7 families. There are neither endemic species nor genera shared either by Serbia and Montenegro or by Montenegro and Macedonia. Only 5 endemic species and 1 genus are endemic both to Serbia and Macedonia; these are: *Albanoglomus ljubetensis* Attems, *Brachydesmus* (*Stylobrachydesmus*) *ljubetensis* Attems, *Xestoiulus* (*Oroiulus*) *macedonicus* (Attems), *Megaphylllum crassum* (Attems) and *Typhloiulus* (*Typhloiulus*) *albanicus* Attems. The majority of endemic diplopods in the areas studies belong to the families Polydesmidae (16 species, or 33.33% of all endemic forms), and Julidae (14 species, or 29.17% of all endemic forms).
The abundance of both higher and lower taxa of endemic diplopods in Serbia, Montenegro and Macedonia may be partly explained by the long-lasting tectonic movements by the folding and faulting processes, by the epeirogenetic movements and by the evolution of the karstic relief which have greatly influenced the distribution of the ancient diplopod fauna in the Balkan Peninsula.
In conclusion, Serbia, Montenegro and Macedonia are inhabited by an extremely varied fauna of endemic diplopods pertaining to different phyletic lineages; these forms are of different origins and ages. Therefore the Balkan Peninsula represents one of the main global centres of endemic differentiation of the millipede fauna.

CURCIC Bozidar P. M. & MAKAROV Slobodan
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On geographic distribution and historical development of some cave-dwelling diplopods (Myriapoda) in Serbia, Montenegro and Macedonia (FYROM)

The analysis of geographic distribution and taxonomic interrelationships of cave millipedes has clearly shown that Serbia, Montenegro and Macedonia are characterized by an extremely rich and diverse diplopod fauna inhabiting the underground habitats of the areas studied. Therefore, this study has shown that each of these regions is inhabited by 16, 8, and 3 cavernicolous species, classified into 9, 5, and 2 genera, and 7, 5, and 2 families, respectively. Each endemic species is restricted to one of the areas studied. A single genus is common both to Serbia and Montenegro, while no genera have been found either common to Serbia and Macedonia, or to Montenegro and Macedonia, respectively. Only one millipede family is common both to Serbia and Macedonia, as well as to Montenegro and Macedonia, respectively; additionally, two diplopod families are common both to Serbia and Montenegro. Of all cave species, 13 troglobitic forms inhabit Serbia (3 are either troglophiles or trogloxenes), 6 - Montenegro (2 are troglophiles and trogloxenes), and 1 - Macedonia (2 trogloxene and troglophile species).
The underground diplopods of Serbia, Montenegro, and Macedonia are probably the remains of some ancient hygrophilic forms. With the climatic changes (and the subsequent increase of aridity) and the origin and development of different niches, these forms evolved as cave inhabitants. However, the main reasons for the outstanding variety of cave diplopods in the Balkan Peninsula (including the areas studied) are: the presence of a varied diplopod fauna once inhabiting the Proto-Balkans, the evolution of the underground karstic relief, the favourable climatic changes and the subsequent radiation of the diplopod taxa in numerous isolated habitats.

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Cryptic diversity in the open Ocean

To estimate the biodiversity of the open ocean and to understand how speciation can occur in such a hormogeneous environment mixed by water currents, is a new deal for oceanography. We have examined the genetic diversity in the foraminifer *Orbulina universa*, one of the most commonly encountered planktonic organism inhabiting the world Ocean between 50° N and 50° S. This species appeared in the fossil record 16 Myr ago and is largely used as a stratigraphic and paleoclimatic index. By sequencing SSUrRNA genes of several specimens collected in 33 stations across the Atlantic, we have shown large and geographically localized genetic differences among *O. universa*. This variability reveals three cryptic allopatric species, adapted to different water masses. The molecular timing of their speciation is compared to the history of the Atlantic.

Devore-Scribante Ariane
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The Pseudoscorpions (Arachnida) of Switzerland: systematic, faunistic and biogeographical study

Presently, 58 species of pseudoscorpions are recorded from Switzerland, 13 of which are recorded for the first time from this country.
The aims of the present study are:
- to provide a detailed description of male, female and the 3 postembryonic stages, of each species,
- to examine the taxonomic status of each species and to give reliable keys for the Swiss fauna,
- to complete to knowledge the distribution (maps) and the ecology of the treated species.

The systematic study includes morphometrical measures and chaetotaxy (tables); the diagnostic characters are figured.
The distributional data are based on the material of the collection of the Museum of Natural History, Geneva.
Switzerland, due to its specific position in Europe enhances the presence of a large range of species with different distributions patterns:
- the widely distributed and cosmopolitan-type
- the Mediterranean-type (South of Alps)
- the eastern-type (North-East)
- the western-type (along the Jura mountain)
- the alpine-type
- the endemics and apparent endemics (cavernicolous and other species from specific localities).

Dietrich Barbara & Wehner R.
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Parapatric distribution of desert ants: Inter- and intraspecific variation of mitochondrial DNA of desert ants, *Cataglyphis* Foerster, 1950

The ants of the genus *Cataglyphis* are a highly specialized species, which inhabit the food impoverished areas of the Old World deserts. *Cataglyphis* has evolved amazing navigational abilities to cope with this scanty environment. The three prominent species of the *bicolor* group, formerly described as one species ("*bicolor*"), show a strongly parapatric North-South distribution (Wehner, R. *et al.* 1994: Senckenbergia biologica 74: 163).

Restriction fragment length polymorphism (RFLP) analysis of mitochondrial DNA (mt-DNA) was chosen as the technique to investigate the ants population structures on a molecular basis. In within species comparisons mt-DNA phylogenies have been proven useful in population studies as well as in the defining themselves. Many disadvantages of traditional RFLP analysis for analysing population variation using individual insects, such as the small amount of DNA, are eliminated by carrying out polymerase chain reactions (PCR) in advance. Two primer pairs wer used (CoI->CoII, N1NFA->CB3FC) to amplify the mt-DNA sequences. To cut them we used three restriction enzymes DraI, SspI and TaqI.

Ants of eleven different *C. bicolor* populations (oasis- and steppe populations) were analysed. A comparison between populations from continuous and disruptive habitats showed that these two population series hardly differ.

The results of genetic variation in different populations of *C. bicolor* were compared with the results received by examining closely related species of the same genus (*C. savignyi*, *C. viaticus*, *C. velox* and *C. rosenhauri*). Especially the N1NFA->CB3FC sequence confirms that all species of the bicolor group are clearly distinct species. Methodically the results reveal which part of the mt-DNA of *Cataglyphis* is effective in resolving the phylogeny and population structures of the bicolor species group.

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Phylogenies, TreeBASE, and comparative biology

Many evolutionary studies require access to multiple phylogenetic trees. I will illustrate a variety of such studies, including analyses of (1) general patterns in homoplasy, (2) change in particular characters over composite phylogenies (supertrees), (3) the sensitivity of particular comparative results to alternative phylogenetic hypotheses, (4) gene trees with respect to species trees, and (5) species trees with respect to biogeography and conservation. Access to original phylogenetic data is needed for reanalysis with the same or with different methods, and for the combination of different sources of evidence. In view of such needs, the development of databases of phylogenetic knowledge should be a high priority, yet this endeavor has received little attention. I will briefly describe the TreeBASE database in order to explore a number of issues surrounding the design and use of a database of published trees and data matrices.

DONZE Gérard

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Do non-hosts help Swallowtail butterflies to find their host plants?

Most caterpillars will only grow on a limited range of plant species so that the biochemical tolerance of larvae and female oviposition must be in accordance even as they are distinct physiological processes. Host choice by females is crucial for the survival of first instar caterpillars which are themselves unable to select a host. When searching for host plants, in a pre-landing phase, females receive visual and olfactory inputs. After landing on a plant, the female can further assess the quality of the plant by mechanical and gustatory stimuli. The efficiency of the host-finding depends on the ability to quickly differentiate the non-host species from suitable host plants.

I have studied the pre-landing perception of plants by butterflies and hypothesized that *Papilio polyxenes* (Papilionidae) females use their previous experiences (i.e., both acceptances and rejections) in order to enhance their judgement. We tested this hypothesis using olfactory cues from a host plant, the carrot (*Daucus carota*), and from a non-host plant, the yarrow (*Achillea millefolium*). To simplify the model, I controlled visual stimuli (i.e., shape and color) and gustatory stimulants with the help of model plants cut from sponge. The results showed that experienced females, which had previously had been in contact with both the host and the non-host plants, were better able to avoir landings on sponges odorified with no-host odour compared to females which had contact only with the host plant.

As the sensory input is multi-modal, and since insects are able to learn, use of previous positive and negative experiences reduces the error of landings on plants unsuitable for their caterpillars.

Duboule Denis

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Regulation and function of vertebrate Hox genes during limb development and evolution

The function of *Hoxd* genes during development and their potential role in the evolution of the vertebrate limb has been studied in two different systems. In mice, single, double as well as triple inactivations (cre-mediated deletions) have been produced to assess the function of these genes during development. The results demonstrate that *Hoxd* genes act in a coordinated and cooperative way, where quantitative interactions seem to be at least as important as qualitative ones. In a different approach, we analysed the development of fish appendicular skeletons. Pectoral fins are the appendicular structures which are, in fishes, homologous to the tetrapod forelimbs. We initiated a comparative study in lower vertebrates in the aim of understanding the ontogenetic and phylogenetic relationships between these two structures. We have undertaken a detailed analysis of the development of the endoskeletal component of the pectoral fins of the zebrafish (*Danio rerio*). The sequence of appearance of the various mesenchymal prechondrogenic condensations has been determined as well as the mitotic dynamics in the mesenchymal sheets. In parallel, we cloned and characterized the posterior halves of the fish *HOXA* and *HOXD* complex, i.e. the *Hoxd*-9 to *d-13* genes as well as the *Hoxa*-9 to *Hoxa-13* genes. These genes were shown, in mammals, to play an important function in limb pattern formation. The expression of these genes during pectoral fin development were analysed in details and compared to the expression of a potential morphogen molecule encoded by the fish gene *hedgehog*. The significance of these results will be discussed in the light of the current theories (mainly derived from paleothological data) which account for the fin to limb transitions. The fin to limb transition will be taken as an example to illustrate some aspects of the functional organization of the *Hox* gene family in vertebrates, in relation with the evolution of functions. In particular, the involvement of this genetic system both in the evolution of morphologies through heterochrony and in the maintenance of a vertebrate body plan will be discussed.

Dupanloup Isabelle, Schneider Stefan & Excoffier Laurent

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Inferring genetic impact of cultural and ecological barriers: a new approach

Several techniques have been developed to detect the presence of genetic boundaries which can be defined as areas where the rate of change of gene frequencies is particularly high. These boundaries may correspond to either steep ecological gradients or regions of limited gene flow between populations. Sometimes these frontiers are even defined a priori based on non genetic factors like ecology, geography or culture. We present here a new method to infer the biological impact of these frontiers on gene flow between populations.

Because the processes acting on different portions of the frontier may be heterogeneous, we first divide the frontier into segments of arbitrary sizes and then evaluate the "permeability" of each segment independently. For each segment, we compute a statistic equivalent to the proportion of genetic distances between samples located on different sides of the barrier that are larger than the distances between samples located on the same side of the barrier taking into account the observed geographic distances between samples. The confidence intervals of this statistic are also evaluated. The program output is a graphical representation of the populations and of the frontier; the width of the segments of the frontier is drawn proportional to the statistic computed for this segment and to its statistical significance.

FAUCCI Anuschka
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Structure of a hydroid-seaweed community

Epiphytism is a strategy for opportunistic species to escape high competition in marine hard bottom communities. In the present study the seasonal and spatial distribution of epiphytic hydroids on three species of the widespread brown algae *Cystoseira* have been investigated on two sites of different water exposure at the rocky shore of Porto Cesareo (Ionian Sea/Italy). The addressed questions were:

1) Is there seasonal pattern in the hydroid community on *Cystoseira*?
2) Which factors influence the community structure: a) exposure to wave action? b) substrate differences?
3) Do the more fragile athecate hydroids occur at different sites than thecate hydroids?

Ordination by Canonical Correspondence Analysis (CCA) was used to summarize the variation in species composition and frequency related to site and date. The two sites of different exposure are clearly separated and show a seasonal cycle. The algal stems from the exposed site are shorter and less colonized than the one from the sheltered site. Exposure to wave action has a bigger influence on the community than the differences in algal substrate. Athecate hydroids prefer clearly sites with less wave action and higher structured algae, i.e. sites with less mechanical stress than thecate hydroids.

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Examining hypotheses of grasshopper evolution with molecular sequence data

We have used nuclear and mitochondrial DNA sequences to examine the systematics of the insect order Orthoptera. Phylogenies reconstructed from the molecular data have proved robust at different taxonomic levels and have enabled us to make inferences about various aspects of orthopteran evolution. An important finding of the work concerns the phylogeny of the superfamily Acridoidea (true grasshoppers and relatives). Analysis of a large, representative taxonomic sample indicates that mtDNA sequences of several of the major acridoid lineages have diverged to an approximately equal degree. One interpretation of this pattern is that the major acridoid groups arose simultaneously during evolution. Alternatively, the observed similarity in branch lengths separating members of different lineages may reflect site saturation in the mtDNA sequences. We have examined the two possibilities by

(i) comparing sequence divergence within acridoid lineages;
(ii) comparing sequence divergence between other orthopteran groups;
(iii) estimating rates of intra-specific variability;
(iv) analysing patterns of among site rate variation, and;
(v) analysing the assumption of substitution rate constancy.

We conclude that the observed pattern of sequence divergence does reflect a sudden radiation of acridoid species. The analyses also indicate that the mtDNA sequences are evolving at an approximately equal rate, allowing us to make inferences concerning the ages of the main acridoid groups. We discuss the implications of these findings for our understanding of orthopteran evolution and relate the results to existing systematic hypotheses.

FREY Daniel

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RAPDs reveal extensive genetic variability in the apomictic *Erigeron annuus*

Erigeron annuus is considered an obligate apomictic taxa of the Asteraceae. It is native in eastern North America and has successfully spread all over the world, mainly the northern hemisphere. Four RAPD primers were used to assess genetic variability in about 800 individuals from a total of 100 Western European sampling locations. Up to 35 distinct and reliable bands were found per primer, most of them polymorphic. Different approaches were used to assess intra- and interpopulation variability, such as an analysis of molecular variance (AMOVA) and spatial autocorrelation analysis. Preliminary results are presented.

GALLAND Nicole, SAVOLAINEN Vincent, SALAMIN Nicolas & SANJOVO Alexandre

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Phylogeographic relationships among the polyploid complex *Ornithogalum umbellatum* (Liliaceae), based on allozyme and RAPD data

O. umbellatum forms a polyploid complex in Mediterranean and temperate Europe. Several former "species" have been recognized as 3 infraspecific entities: morph 1 (2x), morph 2 (3x) and morph 3 (4x, 5x, 6x). A close taxon, *O. algeriense* (6x) was identified as a separate species in Northern Africa and Southern Spain. The study of allozyme variation allows to confirm the conspecific nature of all diploids; their genetic distances are highly correlated with geographic distances, suggesting a trend to geographic speciation. Allozyme patterns of polyploids suggest an autopolyploid origin for *O. umbellatum*, whereas *O. algeriense* displays a fixed heterozygosity typical for an amphiploid origin. RAPDs were used to look for clusterings within the *Ornithogalum* complex: their use turned out to be informative for the segretion of *O. algeriense* and the remaining *umbellatum* s. str. A comparison of the informativity of RAPDs versus allozymes is presented in this context.

GANTENBEIN Benjamin & SCHOLL Adolf

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Allozymes show an unusually high genetic differentiation of *Euscorpius germanus* (Scorpiones: Chactidae) populations

We examined the genetic population structure of *Euscorpius germanus* (C. L. Koch, 1837) using horizontal starch gel enzyme electrophoresis (18 loci surveyed). We collected eight population samples from Switzerland (Valais, Ticino, Grison), 19 samples from northern Italy (Lombardia, Trentino, Alto Adige), and two samples from Austria (Carinthia). These samples include the subspecies *E. g. germanus* (C. L. Koch, 1837) and *E. g. alpha* di Caporiacco, 1950. Eight of the north Italian samples come from the Valle Brembana (Alpi Bergamasci), where Bonacina (1980) suggested hybridization between the two subspecies, based on asymmetric numbers of trichobothria on the pedipalp tibia and of the pectinal teeth. We included four samples of *E. flavicaudis* (de Geer, 1778), two samples of *Buthus occitanus* (Amoreux, 1789), and four samples of *Mesobuthus gibbosus* (Brullé, 1832) for comparison. The analysis revealed two highly differentiated population groups in *E. germanus* which are separated by the river

Etsch in northern Italy. These population groups are fixed for alternative alleles at eight out of 18 gene loci and coincide roughly with the subspecies *E. g. germanus* and *E. g. alpha*. However, there is no evidence of introgressive hybridization from the allozyme data. The easternmost population from Austria (Carinthia, Karawanken) indicates a third population group that is separated from the former groups by allele substitution at nine out of 18 gene loci. In the phenogram (UPGMA cluster analysis using Nei's (1972) genetic distance), the branching points of the *E. germanus* population groups are found at unusually high distances as compared to the outgroup taxa.

GOUDET Jérôme & SAVOLAINEN Vincent

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Key innovations and rate of speciation: statistical artefact or real phenomenon?

Investigations have often shown that key innovations such as phytophagy in insects or nectar spurs in angiosperms have led to an increased rate of speciation. Recently, evidence for correlation in the rate of microevolution (e.g. number of mutations along the branches in a cladogram) and macroevolution (number of species in families connected to these branches) was found. Here we review the statistical methods use to put forward these claims and suggest a new test. Extended data in angiosperms show that, despite tending toward a positive correlation between rate of micro and macroevolution, this relation is severely influenced by the taxonomies employed, the phylogenetic sampling and in turn the accuracy of the phylogenies.

GRIFFIN Andrea

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Updating the path integrator through a visual fix

To survive and to reproduce it is essential for any sedentary animal to know its way around its environment. Inded it must be able to relocate reliable food sources, shelter and water, avoid predators, find mates and provision offspring. Mammals can navigate through path integration (dead reckoning) by updating their position on the basis of internal signals generated during locomotion, without using any external references. However, being open to cumulative errors, path integration remains functional over short excursions only, unless it is corrected by positional information from familiar landmarks. The hypothesis that reference to learned landmarks can update the path integrator was examined in golden hamsters (*Mesocricetus auratus* W.) during hoarding excursions occurring in darkness, within a large open arena. The subjects proceeded from their peripheral nest to a platform located at one of seven feedingssites. During food uptake, they were submitted to more than 10 full rotations. Self-generated positional information having been jammed, the animals no longer oriented towards the nest. By contrast, when the subjects were rotated at the food source and then briefly presented with the familiar visual environment, before the initiation of homing, they returned significantly towards the nest. However, their homing performance was less accurate than in control trials involving neither rotations nor the opportunity for a visual fix. Our results suggest that the visual fix provided the animals with directional, but not positional information.

HEER Lorenz

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Rank-specific mate expenditure of males in the polygynandrous Alpine Accentor *(Prunella collaris)*

By grouping and cooperating for territory defense, male Alpine Accentor of one breeding unit get into conflict for the access to fertile females within their group. Dominant males (alpha, sometimes beta) invest most in direct competition (social hierarchy, mate guarding, frequent copulations), while subordinate males are mostly restricted therefrom and invest more in the indirect competition (song, sitting self-advertisely). Dominant males are present full-time in their territory guarding a fertile female. Subordinate males spend only part-time in the territory and are preponderant present therein during the time of the 'insemination window'. Accordingly, dominant males sire most of the young.

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Phylogeny of Eucestoda: morphological and molecular congruence

Advances in our understanding of relationships among the 12 orders of the Eucestoda have been achieved based on independent approaches linked to comparative morphology and analysis of sequence data from 18s rDNA. Historically, the phylogeny for tapeworms has been problematic; numerous conflicting hypotheses have been presented over the past century. Recent studies indicate that resolution of relationships among the 12 orders appears near at hand. Maximum parsimony analysis of morphological and molecular databases yielded largely congruent trees supporting monophyly for the Eucestoda. Monozoic Caryophyllidea are the basal taxon; difossate forms such as the Pseudophyllidea are primitive; tetrafossate groups including the Tetraphyllidea, Proteocephalidea, Nippotaeniidea, Tetrabothriidea and Cyclophyllidea are highly derived. Hypotheses differed in the placement of the Trypanorhyncha and the Diphyllidea. These studies are a robust foundation for resolution of higher-level relationships among the tapeworms linked to 'total evidence' analyses. Through a top-down approach this has also supported phylogenetic studies among families of Cyclophyllidea, the most diverse and economically significant group of tapeworms in avian and mammalian hosts. Comparative data from morphology, ontogeny and ultrastructure are validated; a complementary nature for morphological and molecular approaches is emphasized. Phylogenetic data bases for the eucestodes represent model systems for evolutionary biology, cospeciation analysis and historical biogeography.

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Molecular, morphological and ecological evidence for species recognition in *Ammonia* (Foraminifera)

The genus *Ammonia* is one of the most common shallow water benthic foraminifers. Taxonomic identification of Ammonia species, however, is impeded by their great morphologic variability. In the present study, we combined molecular, morphological and ecological data to define two *Ammonia* species, termed *Ammonia* sp. 1 and *Ammonia* sp. 2. We obtained partial large subunit ribosomal DNA (LSU rDNA) sequences from 42 living specimens collected from the Mediterranean Sea, North Atlantic and South Pacific. DNA sequence analysis confirms that *Ammonia* sp. 1 and *Ammonia* sp. 2 form two genetically distinct species. Cluster analysis of their morphological characters shows that both species differ by the size of their tests and size of wall perforations. They may also be adapted to different environmental conditions as suggested by differences in their distribution in the Lagoon of Venice.

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Aspects of sperm competition in yellow dungflies

Sperm competition occurs when the ejaculates of different males compete to fertilize a given set of a females ova. How ejaculates compete is generally inferred from paternity data and mathematical modelling rather than by direct observation. Yellow dungflies are particularly well studied in this respect. Female dungflies store sperm in fixed volume sperm stores (spermathecae), and models of dungfly sperm competition suggest constant random sperm displacement with instantaneous mixing from the stores when females copulate more than once, with each subsequent male displacing about 80% of the previous stored sperm. However, histological evidence suggests some model assumptions are possibly incorrect, and examination of the large female accessory glands indicates functions not previously described. Furthermore, since males vary consistently in sperm length it is possible to use sperm length variation in the female sperm stores as a means of testing the current dungfly sperm competition model: if random displacement with instantaneous mixing occurs it is unlikely that the sperm from more than two males would be detected in the spermathecae. The variance in sperm length in samples from field captured females was compared to expectations based on variance distributions generated using sperm length data from field captured males. It appears females contain sperm from more males than expected with 80% displacement.

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Use of the ITS rDNA for elucidation of the life cycles of Mesometridae (Trematoda, Digenea)

Identification of larval stages is crucial for elucidating the life cycles of various Digenea. However, in many digenean species, the larvae are morphologically indistinguishable and it is very difficult to establish the affiliation between the larval and adult stages by using the morphological criteria. The molecular methods, based on DNA sequencing or PCR-RFLP analysis, can offer a new tool for larval stage identification. In this study, the sequences of internal transcribed spacer of the ribosomal DNA (ITS rDNA) were used to identify the cercariae of three out of five species of the family Mesometridae (*Centroderma spinosissima*, *Elstia stossichianum*, and *Wardula capitellata*). These species differ among the others by the number of repeats in the ITS1 region. The phylogeny of Mesometridae was inferred from their ITS rDNA sequences.

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Eggs as a subject of phylogenentic research in Paussinae (Coleoptera: Carabidae)

The ant nest bettles (Paussinae) are a monophyletic taxon of approximately 450 myrmecophilous species. Together with Metriinae, Ozaeninae and Protopaussinae they form the monophyletic paussine complex within the ground beetles.

Despite the conspicuous structural diversity of the Paussinae, the external characters of the adults are insufficient to reconstruct well-founded genealogical relationships of the main lineages. The monophyly of the individual tribes and subtribes, however, is proven by several synapomorphic character states each. Preliminary studies indicate that the chorion structure of the eggs may represent a good character for the phylogenetic reconstruction of the Paussinae. We distinguished two different types of chorion:

A) Chorion thin, without aerenchym, netlike. A similar chorion type 'A' exists in several subfamilies of the Carabidae representing lineages without close relationship (examined taxa: Brachininae (*Pheropsophus*), Carabinae (*Carabus*), Paussinae: Paussini (*Paussus*)). These findings indicate that this type of chorion structure represents an ancestral (plesiomorphic) character state within the Paussinae.

B) Chorion thick, with spongiformous intrachorionic aerenchym. So far, this particular structure was only found in three tribes of Paussinae (examined taxa: Cerapterini (*Cerapterus*), Heteropaussini (*Heteropaussus*), Pentaplatarthrini (*Pentaplatarthrus*). The currently available results indicate that this structure represents the first known shared-derived character state (synapomorphy) of these three taxa.

All figured eggs were recovered by dissection of dried or alcohol-preserved specimens.

LOCHER Rolf & BAUR Bruno

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Is the sperm pool in the hermaphroditic land snail *Arianta arbustorum* limited?

Many species of gastropods have different forms of sperm storage which provide the potential for sperm competition. However direct evidence for sperm competition is so far lacking, except in the simultaneously hermaphroditic land snail *Arianta arbustorum*. In this species multiple mating, multiple paternity and differential male fertilization success has been demonstrated. Sperm number is an important feature in sperm competition. We conducted a mating experiment to examine how long individuals of *A. arbustorum* need to recover from sperm depletion after a copulation. The results show that a delay of 8 and more days between two matings is enough to replenish the sperm reserves entirely. Furthermore, egg laying between two matings had no effect on the number of sperm transferred in the second copulation regardless the intermating interval. These findings contribute to a better understanding of sperm competition and sex allocation in simultaneous hermaphrodites.

LUGON-MOULIN Nicolas, GOUDET Jérôme, BRÜNNER Harald, WYTTENBACH Andréas & HAUSSER Jacques

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Microsatellites reveal the fine-sacle structure of a bybrid zone in *Sorex araneus* (Insectivora, Soricidae)

The common shrew (*Sorex araneus*) is subdivided into numerous chromosomes races and several interracial hybrid zones have been discovered. Microsatellites were used to unravel the fine-scale genetic structure of a hybrid zone between chromosome races Valais and Cordon located in the French Alps. A total of 269 individuals collected between 1992 and 1995 were typed for seven microsatellite loci. Several approaches were used to study genetic structuring. We introduce the exact *G*-test to microsatellite data. The exact *G*-test was recently shown to be a powerful test of differentiation for diploid populations. Gene flow is clearly reduced between these chromosome races and has been estimated at one migrant every two generations using *R*-statistics and one migrant per generation using *F*-statistics. Hierarchical *F*- and *R*-statistics are compared and their efficiency to detect inter- and intraracial patterns of divergence is discussed. Within-race genetic structuring is significant, but remains weak. F_{st} display similar values on both sides of the hybrid zone, although no environmental barriers are found on the Cordon side, whereas the Valais side is divided by several mountain rivers. A modified version of the classical Multiple Correspondence Analysis (CRT-MCA) is carried out. This analysis clearly shows the dichotomy between the two races. Further analyses are realized to assess the genetic background of karyotypic hybrids to compare it with the genetic background of pure parental forms. Our results indicate that these karyotypic hybrids represent the trace of an ancient hybridization event.

LÜSCHER Beatrice[1,2], GROSSENBACHER Kurt[2], GÜNTERT Marcel[2] & SCHOLL Adolf[1]
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Genetic differentiation of the common toad (*Bufo bufo*) in the Alps

Bufo bufo occurs throughout Europe (except in northern Scandinavia) and in parts of northern Africa and western Asia. In the Swiss Alps, it is found up to 2200 m above sea level. Three subspecies are recognized. Two of them occur in our study area. *Bufo b. spinosus* is found in the Mediterranean region and *B. b. bufo* in the other parts of Europe, including the north of the Alps. We analyse the genetic differentiation of 30 populations of both subspecies in the Alpine region, using horizontal starch gel electrophoresis of ten enzymes from tadpoles. For comparison, we include three populations from more distant localities: Doupov (Bohemia, Czech Republic, *B. b. bufo*), Genova (Italy, *B. b. spinosus*), and Arles (Provence, France, *B. b. spinosus*), respectively.

A very low level of genetic differentiation is found among the populations from the Alpine region, including the *B. b. bufo* population from Bohemia and the *B. b. spinosus* populations from southern Switzerland and Genova. All these populations form a compact cluster in the dendrogram (UPGMA, using Nei's genetic distance in pairwise comparisons of populations as matrix for cluster construction). However, the Provence *B. b. spinosus* population is clearly differentiated from this cluster.

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Comparison of the utility of different data partitions of the 28S rRNA for the reconstruction of caeliferan phylogeny

We amplified and sequenced 2300 base pairs of the 28S riboromal RNA gene in 50 caeliferan species (Insecta: Orthoptera). The sequenced region includes variable regions D1-D7b variable regions (based on the *D. melanogaster* model of Hancock, 1988), and 4 hypervariable regions. After calculating the secondary structure for the orthopteran 28S gene we partitioned the data according to pairing properties of different positions. We also partitioned data according to the pattern of sequence conservation and reconstructed phylogenies from different data sets. We then used objective criteria (e.g. consistency indices, nonparametric bootstrapping) to assess the utility of different regions of the 28S gene for phylogenetic reconstruction. Using the most informative character set we show that the 28S gene is useful for resolving phylogenetic relationships among the basal groups of the caeliferan Acridomorpha.

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Selection and life-history responses to size-dependent predation in *Physa acuta* (Gastropoda)

In order to investigate the evolutionary response of life-histories to a size-dependent predation, we performed two long-term (20 months) laboratory experiments involving the freshwater snail *Physa acuta*.

1. A selection experiment on juvenile length - simulating predation - resulted in a significant response in the line selected for larger size, as well as correlated responses for growth rate, size at maturity, and asymptotic size.
2. The second experiment involved controlled predation by two flatworm species on artificial populations, and also showed a significant increase in juvenile size in the populations under predation.
3. These two results show that important life-history parameters of the species under study may evolve quite rapidly (12 generations) under size-dependent predation.

MONTOYA-BURGOS Juan-Ignacio & PAWLOWSKI Jan

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Enlightening the history of Neotropical river systems by using loricariid catfish phylogeny

The catfish family Loricariidae (Siluroidei) includes more than 600 species inhabiting almost all Neotropical freshwater systems. The analysis of loricariids phylogeny is used here to unravel some aspects of paleohydrogeography in Tropical South America. We have sequenced the ITS1 - 5.8S - ITS2 region for several representatives of eight closely related loricariid genera. Three lineages have been identified in our phylogenetic tree. Within each lineage, the combination of present geographical distribution of species and their phylogenetic relationships is discussed. The results are compared to current knowledge on past drainage patterns.

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Female choice for larger males in the dung fly *Sepsis cynipsea* - Fisher's runaway or good genes?

In *Sepsis cynipsea* females show a characteristic vigorous shaking behaviour to dislodge the male on her back trying to copulate. We investigated the mechanisms of sexual selection in the laboratory. In a mate choice experiment we showed that females preferred larger males, and that copulations with larger males ensued faster.

Female choice was expressed in the duration of her shaking. The full sib heritability of head width (i.e. body size) was high, as expected. Female shaking duration was also heritable. The crucial genetic correlation between male size and female shaking (i.e. choice) was nil, however either due to low sample sizes, because it does not exist, or because of a genetic constraint suggested by the genetic correlation structure. We have evidence that large body size indicates good genes, as large males have a higher larval survival, large females enjoy a higher fecundity, and larger individuals of both sexes benefit from a longer adult life. The data support the good genes hypothesis as both preference and trait are heritable, and as there are fitness benefits other than mating success. Although the genetic correlation of trait and preference was not substantiated by our data, we cannot exclude that the Fisher process is also partly responsible for the evolution of this mating system.

MULLER Sonia

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Genetic diversity and relationships in the neotropical catfish genus *Ancistrus* (Siluriformes, Loricariidae) as revealed by allozyme electrophoresis

Genetic differentiation was examined among 46 samples of *Ancistrus* representing 15 putative species from the main cis-Andean river systems. Further samples of other Ancistrinae genera

were examined for outgroup comparison. Protein electrophoresis were performed on polyacrylamid gels using a Pharmacia Phastsystem; the gels were stained for 8 enzyme systems. All of the 11 presumptive loci analysed are polyallelic. Fixed allelic differences at 4 loci demonstrate the existence of two syntopic species which were not diagnosed by morphology. High variability is showed in populations of a largely sampled species from Amazonian and Paraguayan systems. The genetic distances are compared in regard to taxonomic distinctiveness. Hypothesis of phylogenetic relationships are given using phenetic and cladistic methods.

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The evolution of pollen heteromorphism in *Viola*: a phylogenetic approach

Pollen heteromorphism (the production within a plant of several pollen morphs that differ in aperture number) occurs in 30% of Angiosperm species. Variation in aperture number may be selected, because the aperture is the only point of the pollen wall where the pollen tube germinates. We have focused on the evolutionary significance of pollen heteromorphism in the genus *Viola* in which about 1/3 of the 500 recorded species are pollen heteromorphic. In several species of *Viola*, the different pollen morphs have different fitnesses: aperture number is positively correlated with germination speed, but negatively with life expectancy. We aim to study the distribution of pollen heteromorphism in *Viola* and to understand which selective pressures act on its maintenance, using a molecular phylogeny based on ITS sequence data. Taxonomic studies on *Viola* distinguish two main groups: Violets and Pansies, based on differences in flower morphology; Pansies are monophyletic, Violets are polyphyletic. Pollen heteromorphism has evolved independently at least 7 times in *Viola*. Variations in sporophytic ploidy level are linked to the apparition of pollen heteromorphism in all groups of Violets, not in Pansies. The proportion of pollen-heteromorphic species, variance in mean aperture number and range of variation of pollen morphs is significantly higher in Pansies than in all Violet groups. Together with predictions of the theory about the maintenance of pollen heteromorphism, this suggests that selective pressures may render pollen heteromorphism adaptive in Pansies, not in Violets. Our data indicate that its maintenance and development are probably contingent upon several prerequisites such as fitness differences between the different pollen morphs, pollination conditions and traits of flower morphology, which differ between Pansies and Violets.

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Mitochondrial DNA sequences as a means to deduce human history

DNA sequences from archaeological and palaeontological finds could potentially contribute substantially to our understanding of human history. However, most human remains are devoid of endogenous sequences that can be amplified by PCR. In those cases, contamination by contemporary human DNA poses serious problems. In the small proportion of remains where endogenous DNA exists, chemical degradation and modification make the retrieval of ancient DNA sequences difficult. For example, large amounts of oxidative base damage is present in most samples and correlate with the inability to amplify sequences. In order to overcome some of these problems, we have used HPLC to analyze the state of racemization of amino acids in ancient remains. This allows large numbers of samples to be screened in order to identify those where the state of conservation of amino acids is suggests that DNA retrieval may be possible. By this approach, samples from the Neandertal type specimen were analyzed and a mitochondrial DNA sequence was determined by sequencing clones from short overlapping PCR products. Our experience with this and other ancient remains will be reviewed.

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Morphology and molecules in conflict: the phylogenetic relationship of *Callimico* within the Callitrichidae

The New World monkeys are divided into two main groups, Callitrichidae and Cebidae. Recent morphological phyletic studies generally place *Callimico* asthe most basal offshoot within the Callitrichidae. By contrast, genetic studies have consistently placed *Callimico* somewhere within the Callitrichidae, not basal to this clade. In addition, the detailed nodal relationships of the two tamarin genera, *Saguinus* and *Leontopithecus*, remain controversial. A DNA sequence data set from a subfragment of the mitochondrial ND4 gene and the tRNA^{His}, tRNA^{Ser}, and tRNA^{Leu} genes was generated in an attempt to clarify the phylogenetic relationships within the Callitrichidae. We extracted DNA from hair or tissue samples from 8 species (*Ateles geoffroyi*, *Callimico goeldii*, *Callithrix jacchus*, *Cebuella pygmaea*, *Cebus apella*, *Leontopithecus rosalia*, *L. chrysomelas*, and *Saguinus midas*), amplified the fragment containing those genes by PCR and directly sequenced the template. Additional data from outgroup taxa were available from GenBank. The 887 bp sequences were analysed by maximum parsimony, neighbor-joining, and maximum likelihood methods. The main results are that the phylogenetic position of *Callimico* is resolved between the marmosets (*Callithrix*, *Cebuella*) and the tamarins (*Saguinus*, *Leontopithecus*), while *Leontopithecus* and *Saguinus* together form the most basal clade of the Callitrichidae. Combined analyses of all previously published nuclear and mitochondrial gene sequences (5201 base pairs) confirm these results. As available molecular evidence indicates that *Callimico* is more closely related to the marmosets than to the tamarins, a reconsideration of the morphological evidence in the light of the consensus tree from DNA sequence analyses is warranted.

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Calibrating ribosomal clocks in foraminifera

Because of their well known fossil record, foraminifera offer unusual opportunity to provide temporal dimension to the molecular phylogeny and to study the tempo and mode of molecular evolution. In order to test the current palaeontological hypotheses on evolution of foraminifera, we have obtained partial SSU rDNA sequences of 50 benthic and 18 planktonic species. By comparing the number of substitutions with the divergence times inferred from the fossil record we evaluated absolute rates of rDNA evolution for several species. Our study reveals important differences in rates of molecular evolution between different groups of foraminifera, ranging from 4.0x10-9 subst./site/year in planktonic species to less than 0.1x10-9 subst./site/year in some benthic species. However, with few exceptions, the rates are relatively stable within two planktonic (Globigerinidae, Globorotaliidae) and one benthic (Soritidae) families, suggesting that the local ribosomal clocks may exist in foraminifera.

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Evolution of pollination systems in Sinningieae (neotropical Gesneriaceae); insights from molecular phylogenetics

The study of long-term patterns and processes of organisms diversification is a major challenge in evolutionary biology and ecology. In this context, we intend to study the evolution of plant-

pollinator systems within Sinningieae (Gesneriaceae). This tribe, distributed throughout the Neotropics, includes herbaceous plant and shrubs which are pollinated by a wide range of animals like bees, butterflies, moths, hummingbirds and bats. The systematic, morphological diversity and geographical distribution of the Sinningieae are well studied, but little has been done to understand how ecological relationships with their pollinators originate and evolve. To study these mechanisms, we intend to map the pollination systems onto an accurate phylogeny and to trace the evolutionary events that have given rise to the modern distribution of ecological festures. Until now, half of the currently described species have been collected for which the trnL-trnF and rbcL-atpB chloroplast intergenic spacer has been sequenced. Our intention is to present probable evolutionary scenarios (multiple syndromes) that can be inferred from the molecular phylogeny, and discuss them in the light of the actual morphological and biogeographical knowledge.

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Evaluation of dry grassland management using spider communities

In Switzerland, the inventory of dry grasslands, with the aim to protect these semi-natural habitats, has triggered interest in studying the effects of their management on their fauna. A special emphasis is put on spiders, since they are one of the most important groups of terrestrial predators, and, thanks to their diversity and abundance, they are known as good bioindicators of the ecological state of their habitat.

In 1995 and 1996, we worked on 40 sites on the Swiss occidental plateau, collecting spiders by means of pitfall traps. The evaluation method used takes into account biotop fidelity and the rarity of the speices. This method privileges the specificity of the population in relation to its present habitat. Therefore, it allows us to not underestimate the quality of the biotops, which although very homogeneous, comprise very few species but for whom the ties with their surroundings are very close (stenoecious species) and at the same time not to over-estimate the stations rich with ubiquitous (euryoecious) species.

This study allows us to discuss the different management strategies. For dry grasslands conservation, it seems important to upkeep them extensively. This operation must be done late in the year (autumn). In addition, we recommend to divide the surface of a dry grassland in order to alternate the upkeep. This way of management allows us to maintain an abandoned part indispensable for some species to carry out their life cycle. The continued study of certain stations showed the capacity of spiders to reflect the effects of management. In future, it seems important to use spiders for research in habitat descriptions and evolutions together with phytosociological transects.

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Genetic, environmental and condition-dependent effects on female and male ornamentation in the barn owl *Tito alba*

In birds, usually the males only are ornamented. Interestingly, in the barn owl *Tito alba* both female and males display sex-limited plumage traits. Males are commonly lighter coloured, and females spottier. A partial cross-fostering experiment tested the relative importance of shared genes and a shared environment for the resemblance of related birds. Siblings raised in different nests converged towards similar trait values, offspring resembled the true but not the foster parents, and plumage traits of unrelated nestlings sharing the same nest were not correlated. Results were not inflated by maternal effects detectable in the mother's phenotype, since mid-daugther to mother resemblance was not higher than mid-son to father resemblance. This suggest the plumage coloration and spottiness are largely genetically inherited traits, and that the rearing environment has not a strong impag on the expression of these traits. The further investigate whether the two sex-limited traits are condition-dependent, brood sizes were manipulated. Enlargement or reduction of broods by two netlings resulted in lower and higher body mass of nestlings respectively. However, nestlings raised in enlarged or reduced broods did not show a significantly darker or lighter, or a more or less spotted plumage. No genotype by environment interaction was detected. In conclusion, additive genetic variance for plumage coloration and spottiness is maintained, and both the rearing environment and boyd condition do not account for a large proportion of the phenotypic variance in female and male ornamentations.

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Identifying ambiguous landmarks through vector addition

Path integration (PI) is the process by which an animal uses information about its own movements in order to keep track of its current position relative to the starting point of its trip. PI and stable spatial information (such as memorized landmarks) complement each other. In particular, PI can help the animal solve the problem of locating a goal specified by ambiguous landmarks. An experiment was devised to test this.

Each subject (hamsters) inhabited a round, optically shielded arena with a peripheral nest. There were four identical cylinders in a square pattern around the arena centre. One of the cylinders (always in the same position relative to the nest) was baited with food, and the animal was trained to climb into it and hoard the food. This allowed the animal to establish a long-term memory of the location of the baited cylinder relative to the nest. In test trials, the animals was lured in darkness along the periphery of the arena, then the lights were switched on, and the animal could now see the array of cylinders under a new perspective. Only by keeping track of its own movements could the animal identify which, among the four visually indistinguishable cylinders, was the correct one. Results indicate that the animal can indeed combine PI to a memory of goal position in order to reach the goal from novel points. This is akin to saying that the animal can vectorially add its current position vector to the vector stored in long-term memory.

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Molecular phylogeography: A glimpse to the past of a Pocket Gopher hybrid zone

Mitochondrial DNA (mtDNA) variation in the cytochrome b gene was determined for two divergent taxa of pocket gophers, *Thomomys bottae actuosus* and *T. b. ruidosae*. These two taxa hybridize in a narrow contact zone in New Mexico (USA), but introgression of nuclear markers such as allozymes or chromosomes does not extend much beyond the hybrid zone. We found that despite their distinctness, the two subspecies shared very similar mtDNA haplotype. By a comparison of phylogenetic histories derived from nuclear markers (allozymes) and from mtDNA haplotypes sampled in different populations of *T. bottae* from New Mexico, we show that apparent similarity is due to an introgression of *T. b. ruidosae* mtDNA into *T. b. actuosus* nuclear background. Evidence of introgression is not limited to the present-day contact zone between these two taxa, but extends at least 75 km away from it. Of several potential mechanisms which could lead to such a geographic pattern of variation, we argue that a combination of range shifts due to climatic fluctuations, and genetic drift are most likely. We also discuss why selection, which might have promoted the spread of one haplotype across the hybrid zone, is a less likely explanation. Horizontal gene transfers due to hybridization are not uncommon historical events among animals and plants. Although they can be identified with careful phylogenetic study using independent data sets, the potential for misinterpreting a gene tree as an organismal tree is great.

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Phylogenetics of flowering plants based upon a combined analysis of plastid atpB and rbcL gene sequences

In plant molecular systematics, since the broad scale rbcL analysis of Chase, Soltis, Olmstead *et al.*, there has been much debates on the use of such large datasets. Recently, Hillis showed using simulations based on a new 18S dataset from Soltis *et al.*, that recovering complex phylogenies were surprisingly easier than previously thought. We present here a new phylogenetic analyses for angiosperms, based upon the atpB and rbcL chloroplast gene sequences for 358 taxa representing all major lineages. The results obtained by combining these genes, the feasibility of such analyses as well as the support/resolution of these phylogenies are presented.

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Population dynamics of lynx in relation to its prey - A comparison between Canada and Europe

Periodic fluctuations of mammalian populations and their potential causes have received considerable attention. One of the main hypothesis concerning predator-prey dynamics predicts that only populations of specialist predators follow the population fluctuations of their prey. The lynx (*Lynx lynx*) populations in Canada and Europe are an ideal system to test this hypothesis. The Canadian lynx is a specialist predator and its main prey, the snowshoe hare (*L. americanus*), shows periodic population fluctuations. The European lynx is a generalist with a diverse diet including roe deer (*C. capreolus*), reindeer (*Rangifer tarandus*) and red deer (*Cervus elaphus*). Therefore the European lynx should not show any periodic or even cyclic population fluctuations relative to its prey. I tested this hypothesis by analysing the hunting statistics of lynx shot in Norway from 1846-1980 and population size estimates from the lynx in Bialowieza Primeval Forest in Poland (1958-1994) with time series analysis. No regular or even cyclic fluctuations of the European lynx populations could be detected, in either population. These results support the hypothesis that only populations of specialist predators follow the population fluctuations of their prey.

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Estimation of past demographic parameters using the mismatch distribution

The distribution of pairwise differences between the sequences observed in a sample (the mismatch distribution) can be very informative about the recent demographic history of the population (Rogers and Harpending, 1992). The theoretical model developed by Li (1977) describing the expected mismatch distribution was based on the infinite sites model and assumed the homogeneity of mutation rates over the sequence. However in the control region of human mitochondrial DNA, quite large amount of heterogeneity of mutation rates has been observed (Wakeley 1993). In this case, because most mutations occur at a small number of loci, the effect of reverse mutations cannot be neglected. To take into account this effect, we have extended a model introduced by Yang (1996), to provide the expected mismatch distribution under more realistic conditions. We thus explicitly take into account the finiteness of the sequence under consideration, the transition bias observed for mtDNA, and up to 4 different mutation rates in the sequence. We also provide a way to compute confidence intervals for the estimated parameters (population size before and after the expansion and the time elapsed since the expansion), as well as for the expected mismatch distribution. We apply this new methodology to the case of human mtDNA.

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SCHNEITER Beat & SAUCY Francis

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Juvenile dispersal in the vole *Arvicola terrestris* (Rodentia, Arvicolidae) during rainy nights

Abnormally high densities recorded in enclosed populations of small mammals suggest that dispersal may be an important component of their population dynamics. For practical reasons, dispersal is a difficult phenomenon to address because it is uneasy to distinguish dispersers from residents.

Previous studies conducted using the classical below-ground trapping approach have shown that fossorial *Arvicola terrestris* move mostly over short distances, but high turnover of young individuals suggest that our understanding is still incomplete. Taking advantage of the fact that this vole usually lives in underground tunnels, we have attempted to catch individuals dispersing above the ground in traps set along drift fences. Observations were conducted in two permanent grasslands where we fenced two 50 x 50 m trapping grids. Fences were also established along the edges of neighbouring forests. Two unfenced grids served as controls. From March to July 1997, the average density of the below-ground populations increased approximately from 70 to about 250 ind/ha. A total of 734 captures and recaptures of 450 *A. terrestris* were recorded along the fences during 121 days of continuous trapping (March 22-July 20 1997). Interestingly, 91% of the voles caught above the ground were either juveniles or subadults, as compared to only 44% in our below-ground samples. No bias in sex-ratio could be found among dispersers. More surprisingly, most captures occurred during few rainy nights indicating that fossorial *A. terrestris* disperse *en masse* above ground during rainy periods.

SCHUCHERT Peter

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Phylogeny and Classification of the Hydrozoa (Cnidaria)

Traditional hydrozoan systematics is characterized by a primary dichotomy separating the Siphonophora from all other members of the class. The lack of complex characters, the frequent homoplasy, and their enormous morphological and life-history variation make the hydrozoans not an easy taxon for a phylogenetic analysis. Some progress towards a more natural classification has eben made in recent years by recognizing that the Hydrocorallina (hydrozoans with a calcareous skeleton) are polyphyletic. In the present work, a phylogenetic analysis and classification is attempted. Even the few characters available evidently show that the traditional dichotomy Siphonophora versus Hydroidomedusae is no longer acceptable. While some of the traditional orders like the Narcomedusae, Trachymedusae and the Thecata are recognized as monophyletic groups, the order Limnomedusae must be revised and the order Athecata-Anthomedusae must be abolished. The Siphonophora clearly belong to a clade named Gastrogonae containing also the former members of the Athecata as well as the Hydrocorallina. The following classification is proposed:

- HYDROZOA:
  - NARCOMEDUSAE
  - MANUBRIOGASTRAE (new name)
    - TRACHYMEDUSAE
    - HYDROIDEA
      - LIMNOMEDUSAE
      - STOLONATA (new name)
        - THECATA
        - GASTROGONAE (new name).

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Teaching botany in a molecular world

The application of molecular biology in botany has drastically changed our knowledge in systematics and evolution. The most recent systems of classification proposed by Takhtajan, Dahlgren, Thorne and Cronquist are questioned by molecular phylogenetics whereas these results are not yet fully accepted. However, molecular botany is now close to draw the picture of plant phylogeny since large datasets are currently analysed in several institutes. It is consequently a difficult period for the teaching of academic botany where modern results have to be integrated into the conventional classification. This poster is not a new classification of flowering plants since such work will be published later by the angiosperm phylogeny group. However we present a general picture of the angiosperms as based on our formal botanical course (using idiosyncratic terminology), according to affinities (mainly based on Chase *et al.*) and macroscopic features, and in comparison with the classifications of Cronquist and Thorne.

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Evolution and Development of the Chordate Body Plan

Metazoan phyla are classified as either protostomes or deuterostomes based on morphological, phylogenetic and developmental studies. Deuterostomes have radial cleavage patterns, development of the embryonic blastopore into the adult anus and coelomic formation by enterocoely. Within the deuterostomes, chordates have a distinct body plan which is thought to have evolved from an ancestral deuterostome similar to extant hemichordates or urochordates, but studies of chordate evolution within the deuterostome phlya are hampered by the poor fossil record left by the soft-bodied ancestors. The urochordate ascidians possess definite chordate characteristics as tadpole larvae including a tail containing a dorsal neural tube, notochord, and muscle cells flanking the notochord. The head contains the sensory organs, a brain and most of the endoderm, or gut. We have used two closely erlated ascdian species with dramatically different larval phenotypes to look for genes involved in the specification of the chordate body plan during development. One of these genes, *manx*, appears to be a transcription factor that is necessary very early in development for the specification of tissues in the larval tail.

We have isolated several other maternal genes implicated in specifying the larval body plan, including *p58* and *cymric*. *P58* appears to be urochordate specific and is also implicated in autonomous muscle development. Recent studies conducted in my laboratory are aimed towards establishing a robust phylogeny of the deuterostomes, with special emphasis on the urochordates

and hemichordates. We will use this phylogeny to infer which organisms may closely resemble the ancestral chordates in an effort to understand the evolution of chordates. We will study the expression of genes we believe are involved in specifying the chordate body plan in extant embryos and larvae in an effort to understand which developmentally regulated genes may have been co-opted in a non-chordate ancestor to elaborate the chordate phenotype. Current progress on these studies will be discussed in my lecture.

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Accounting for evolutionary rate variation among sequence sites consistently changes universal phylogenies deduced from rRNA and protein-coding genes

Identification of the primary lineages of life and of their evolutionary relationships is essential for understanding early cellular evolution, particularly the transition between prokaryotes and eukaryotes. Most molecular phylogenetic analyses of small subunit (SSU) and large subunit (LSU) ribosomal RNA sequences as well as analyses of isoleucyl-tRNA synthetase and of the largest subunit of RNA polymerase support the existence of three monophyletic domains, Archaea, Bacteria, and Eukarya. In contrast, analyses of elongation factors 1alpha/Tu and 2/G and of the second largest subunit of RNA polymerase suggested that Archaea are paraphyletic and that Eukaryota are specifically related to a subset of Archaea. Crenarchaeota (previously eocytes) as advocated by Lake. We have re-analyzed this question using the large numbers of sequences now publicly available and recently developed methods of phylogenetic analysis. These methods differ mainly from previous ones in using more realistic models of molecular evolution which account for the extensive variation among sequence sites of the rate of substitution. We report here that this approach gives considerable support to the crenarchaeote - eukaryote relationship, both from rRNA and protein sequence data.

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Effect of the habitat complexity on the size distribution of marine invertebrates

The spatial arrangement of the habitat, also known as spatial structure, may affect the body size distribution of the inhabitant organisms by constraining the available space. In spite of the generalized idea of the existence of such a relationship, methodological problems in the measurement of habitat complexity have constrained studies in this topic. In the present study, the size distribution of diverse and discrete communities of marine invertebrates was analyzed and correlated with the spatial complexity of the habitat. This complexity was represented by the fractal dimension of the sessile macroalgae that serve as habitat to the communities. The fractal dimension offers a direct measure of the ruggedness of a surface, thus allowing the quantitative characterization of the habitat complexity. The fractal dimension is scale-invariant. This feature allows the characterization of the habitat a different scales without bias in the measure, covering all the range of organisms that may be affected and offering a "organismal" point of view. The size of the invertebrates present different distributions according to the fractal dimensions of the studied macroalgae.

WÄCKERS Felix

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Extrafloral nectar production as a herbivore-induced plant defense

The effect of herbivory on the quantity of extrafloral nectar production, as well as its composition and distribution was studied in castor, cotton, and faba bean plants. In ricinus and cotton, herbivore damage increased the total volume of secreted nectar by a factor 3 and 12 respectively. No significant increase due to herbivory could be measured in faba beans. Inductio of nectar production was mainly restricted to the damaged leaf. Systemic effects were found in adjacent younger leaves only. The increased nectar production could be detected within 16 hours following the onset of herbivore feeding. The induced increase in nectar production ceased within 48 hours following herbivore removal.

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The evolution of the pheromone dispersing apparatus in some Hesperidae (Lepidoptera)

Within the family Hesperidae, we studied the organization of the male pheromone dispersing apparatus, which is localized on the forewings, in 3 species, *Thymelicus lineola*, *Th. actaeon* and *Hesperia comma*. The organization of the apparatus, as well as the morphology of the androconias, present a growing degree of complexification, perhaps representing the way in which the apparatus and androconias were elaborated during evolution of this group. The apparatus is formed simply by patches of androconias in *Th. lineola*. In *Th. actaeon*, around the patches of androconias, the adjacent scales are slightly modified and orientated towards the androconial line. In *H. comma*, the patches of androconias are completely covered by the adjacent scales, which form a closed space above the androconias. In Hesperidae, the androconias are tubular scales containing the pheromone within the hollow medulla. These scales can break into pieces named osmophores, which are the dispersing mean of the pheromone. In *Th. lineola*, the scales are tubular and non-breakable, but some rare scales present constrictions which can be hypothesized as precursors of the dehiscent zones present in the two other species. In *Th. actaeon*, all the androconias present dehiscent zones and break into osmophores, but they often remain unbroken. In *H. comma*, all the androconias are broken and the liberated osmophores are glued together into a net just under the roof made of the adjacent scales.

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Parasites as selective agents in two host sister taxa: Prevalences of trematode infection in molluscan intermediate hosts in dependence of habitat factors

Adaptation to parasitism can be an important selective factor which determines distribution and relative abundances of closely related species. In this study the trematode communities infecting two closely related freshwater snails which differ in habitat choice and distribution, *Lymnaea peregra* and *L. ovata*, were examined in a field survey.

Trematodes commonly lead to complete castration of their molluscan intermediate host, thus the selective pressure imposed by these parasites upon snail populations is strong. The parasite life cycle involves further hosts, therefore factors external to snail populations are important to its maintenance.

Several habitat factors were tested for an impact upon parasite prevalences. The surrounding of a freshwater habitat, which might determine presence of end hosts, the substrate, which influences habitat choice of the snails, and habitat permanence showed the largest effects. Habitats with high prevalences were disproportionately often inhabited by *L. peregra*, the host with significantly more infections in total. The prevailing cercarial types were not the same in both snail species, suggesting that the snails differ in susceptibility to the various parasite types. *L. ovata* was far more abundant in the lowlands, while *L. peregra* was more abundant at higher altitudes. Sympatric sites were rare, and intermediate snail forms which would suggest hybridization were found extremely rarely.

Since parasite prevalences vary across habitat types, the snail species meet differential selection pressures for parasite resistance in the varying habitats, and separation through habitat specialization may be enhanced by parasites.

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Phylogeography of the vole *Arvicola terrestris* as revealed by mtDNA: The role of historical factors?

Arvicola terrestris is a large vole (family Arvicolidae) with a wide geographic distribution covering most Eurasia. It is a highly polymorphic species with more than 35 subspecies which can be grouped, according to their ecology, into aquatic and fossorial forms. Aquatic animals are large and live in wet lowlands, whereas fossorial ones are smaller and live in mountainous areas. Aquatic populations, transitionally colonising drier habitat, have often been described. Aquatic transitional populations show fossorial behaviour and adopt fossorial life-history traits. The origin of these forms which are differentiated by characters such as habitat, body size, colour, weight, population dynamics, home range size and mating behaviour is still controversial.

In order to solve this problem, we studied allozyme and mitochondrial DNA polymorphism for aquatic and fossorial animals originating from populations from most parts of the geographic distribution of the species. Whereas morphology and habitat suggest some hybridisation between forms, the mitochondrial phylogeny, based on 150 sequences of 800bp of the cytochrome b gene, distinguish three main groups. Fossorial populations living in mountainous areas of Europe are monophyletic. Aquatic populations from the south of the Alps form a separate monophyletic clade which has probably emerged first from the aquatic ancestral pool of populations. Finally, the remaining populations of northern Europe, England and the east of Eurasia belong to the last most diversified clade. The fossorial clade seems to result from a single, more recent, historical differentiation coupled with some morphological and behavioural adaptive traits. Phylogeographic hypotheses will be discussed with the aim to propose a scenario which could explain the actual distribution of populations of *Arvicola terrestris* in relation to climatic events of the early Pleistocene.

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Molecular phylogenetic analysis of the tapeworm order Proteocephalidea based on mitochondrial 16S rDNA sequences

Systematics of the tapeworm order Proteocephalidea (Eucestoda) whose members are obligatory parasites of the alimentary tract of fishes, amphibians and reptiles has until recently been addresses using morphological and life-cycle data. These approaches failed so far to yield satisfactory results: other sources of characters, DNA sequences in particular, are being explorer to better understand the evolution of this tapeworm order.

I attempt here to infer phylogenetic relationships among a variety of proteocephalidean representatives using a fragment of the mitochondrial 16S rDNA molecule. A 478 bp sequence was obtained for 41 proteocephalidean cestodes as well as for two outgroup species (a tetraphyllid and a cyclophyllid). 415 sites were unambiguously aligned, 115 of which were phylogenetically informative. Both parsimony and distance method-analyses yielded similar results:

- the two traditional families: Monticelliidae and Proteocephalidae are not recognised
- the monophyly of the type genus *Proteocephalus* is not supported, although a clade consisting of palearctic *Proteocephalus* species only is well defined, thus excluding species from the New World. Morphological fetures that distinguish the two groups of *Proteocephalus* need yet to be carified
- resolution of relationships among the remaining Proteocephalidea is poor. Paucity of synapomorphies and high homoplasy indices (HI=0.702) leading to a large number of equally parsimonious trees account for this result.

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Louis de ROGUIN
(1948 - 1998)

Un ami nous a quittés le 9 mai 1998 en laissant un grand vide au département de Mammalogie et Ornithologie du Muséum d'histoire naturelle de Genève.

Né le 31 août 1948 à Lausanne, Louis de Roguin fit ses études de sciences naturelles à l'université de cette ville après avoir suivi une scolarité classique, latin-grec. Licencié ès sciences en 1976 (zoologie, botanique, physiologie, biochimie) il travaillera plusieurs mois sous mandat pour la «Ligue suisse pour la protection de la nature» actuellement «Pro Natura». En janvier 1977, il entre comme collaborateur scientifique temporaire au Muséum de Genève et commence une thèse de doctorat sous la direction du Prof. W. Huber de l'université de Berne. En 1983 il défend sa thèse sur le sujet «Biologie et gestion d'une population de chamois du Jura vaudois» et obtient le grade de docteur ès sciences de l'université de Lausanne.

Il est nommé chargé de recherche au Département de Mammalogie et Ornithologie du Muséum de Genève la même année.

Personnalité attachante, esprit ouvert, humaniste, Louis de Roguin était toujours disponible. Ses intérêts multiples l'ont amené à s'intéresser à toutes les branches des sciences dites naturelles: botanique, zoologie, écologie.

Zoologue de terrain, il a parcouru le Jura durant des semaines en toutes saisons à la recherche des chamois, sujets de sa thèse. Dormant souvent à la belle étoile, il savait nous transmettre ses émotions lorsqu'il voyait ces animaux, parfois à moins de deux mètres de son poste d'observation.

Homme de laboratoire, il a étudié les micromammifères d'Europe, d'Asie et d'Amérique du Sud, et décrit une nouvelle espèce de campagnol d'Iran ainsi qu'une sous-espèce de chauve-souris de cette région. Il a également participé à l'étude de la faune des micromammifères de sites archéologiques du moyen âge en Rhône-Alpes et en Bourgogne (programme PIREN / CNRS).

«Naturaliste» il maîtrisait la botanique et ses applications dans des domaines aussi divers que l'écologie des zones humides ou l'herboristerie.

Historien, il participa à la publication d'un livre sur le «Voyage aux Antilles et au Mexique» de Henri de Saussure et travaillait encore sur le «journal» de cette personnalité genevois du 19^{e} siècle.

Rédacteur de 1991 à 1997 de la publication scientifique des «Archives des Sciences» organe de la société de Physique et d'Histoire Naturelle de Genève, il venait de prendre la corédaction de la revue «Le Rhinolophe» du Centre de coordination ouest pour l'étude et la protection des chauves-souris.

Son travail scientifique s'est concrétisé par de nombreuses publications, mais hélas, il n'eut pas le temps de réaliser tous ses buts. Dans son bureau, plus d'une douzaine de travaux resteront inachevés...

Louis de Roguin savait écouter sans interrompre et donner un avis sans l'imposer. Personne n'hésitait à venir à lui pour toutes sortes de renseignements, de conseils, parfois personnels. Nous rendons hommage à cet homme de parole, à ce collègue, ce camarade et surtout cet ami... Adieu Louis...

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REVUE SUISSE DE ZOOLOGIE 105 (4): 771-775; décembre 1998

Description of a new troglophilous species of the genus *Maxchernes* Feio, 1960 (Pseudoscorpiones, Chernetidae) from Brazil (Sao Paulo State)

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Description of a new troglophilous species of the genus *Maxchernes* Feio, 1960 (Pseudoscorpiones, Chernetidae) from Brazil (Sao Paulo State). - *Maxchernes iporangae* n. sp. is described and figured. It occurs mainly in the Caverna Alambari de Baixo, Iporanga, in guano of fruit-feeding bats. It is compared with the two other known species of the genus, *M. birabeni* Feio from Argentina and *M. plaumanni* Beier from Brazil. Some biological observations are given.

Key-words: Pseudoscorpiones - Chernetidae - Brazil - caves - guano - taxonomy.

INTRODUCTION

The cave-dwelling fauna of Brazil is the richest one of South America, at least one animal species has been recorded in more than 280 caves out of 1537 explored ones (PINTO-DA-ROCHA 1995). But only one pseudoscorpion species, *Pseudochthonius strinatii*, has been upto now mentioned from Brazilian caves (BEIER 1969), although the presence of this group (in general or identified to family or genus level) had been currently recorded (e.g. TRAJANO & GNASPINI-NETTO 1991; PINTO-DA-ROCHA 1995). A large collection of pseudoscorpions of approximately 100 caves (mainly collected by Eleonora Trajano, Ricardo Pinto-da-Rocha and Pedro Gnaspini-Netto) is under final study by the senior author, but it is necessary to publish this new species separately since the junior author has to submit her PhD thesis on the biology of this yet undescribed species (ANDRADE & GNASPINI 1998) till end of this year.

Chernetidae belonging to other genera are common cave pseudoscorpions in Brazil.

Acronyms used:

MHNG Muséum d'histoire naturelle, Geneva, Switzerland
MZUSP Museu de Zoologia Universidade de Sao Paulo, Brazil

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DESCRIPTION

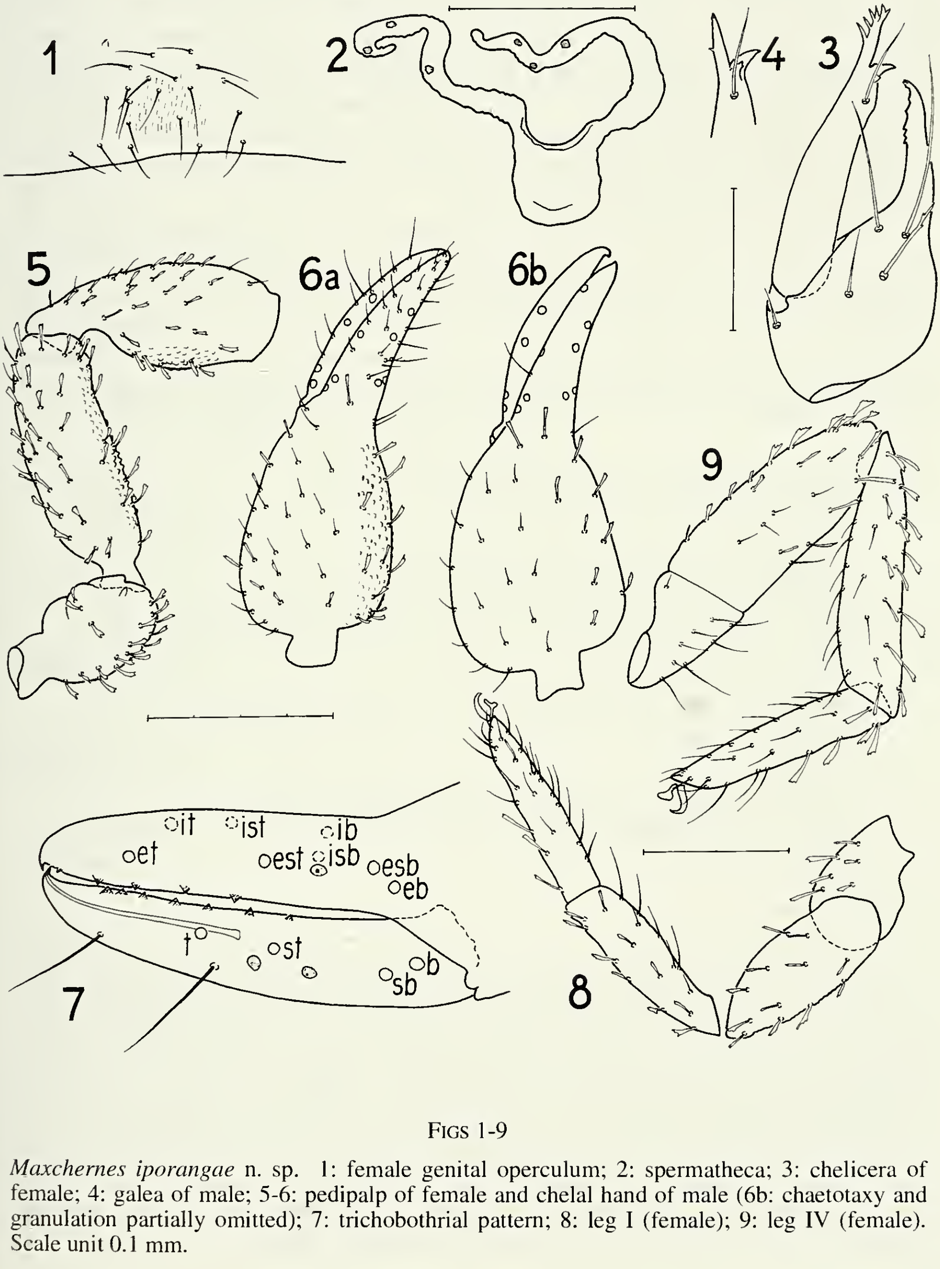
Maxchernes iporangae n. sp. Figs 1- 9

Material: Sao Paulo state, Caverna Alambari de Baixo, Iporanga, in guano of fruit-feeding bats, lg. P. Gnaspini-Netto, 16.X.1988: 1♀ (holotype) 3♂ 1♀ 2 tritonymphs (MZUSP 10298); 2 protonymphs (bred in captivity: from female 65, 2.12.97, and female 56, 12.1.98) (paratypes); Gruta das Aguas Quentes, Iporanga, lg. P. Gnaspini-Netto, 2.V.1986: 1♀ (paratype) (MZUSP 10297) (2♂ 1♀ paratypes in MHNG).

Description: Carapace and palps yellowish brown; carapace laterally coarsely granulate, central parts of pro- and mesozone smooth, posterior margin granulate, two distinct, granulate transverse furrows, the subbasal one clearly nearer to posterior margin than to medial furrow, no eyes or eye-spots; 1,0-1,1 times as long as broad, in middle broadest; setae distinctly clavate, 4+1 nearly smooth preocular ones on anterior, 7-10 on posterior margin; tergites (XI excepted) divided, scaly sculpture, setae clavate, longer on last tergites, 5-6 setae on posterior margin, III-IX also with a lateral and medial anterior one, XI 8-10 (2 medial discal setae); apical lobe of palpal coxa with 3 marginal and 1-2 discal setae, palpal coxa 19-22, coxa I 10-12, II 13-15, III 18-21, IV approx. 32; anterior genital operculum of male with 25-30 long setae (semicircular arrangement), of female (fig. 1) with 17-21 setae in central group, genital chamber of male with 2-3/2-3 smooth setae, spermatheca of female (fig. 2) with two short tubules and a few tiny cribillate plates on them. Sternites divided (excepted III, XI), scaly, setae on anterior sternites smooth, VII-XI also with clavate setae, III 13-15, 3 suprastigmal setae, half-sternite IV 3-5, 1 suprastigmal seta, normally 5-6 setae on posterior margin of following ones, VII-X also with a medial anterior seta, XI 6-7 (2 lateral and 2 medial discal tactile setae, all relatively short). Chelicera (fig. 3): palm with 6-7 setae (2-3 apically denticulate), fixed finger with 4 bigger and 3 small teeth, movable finger with tooth-like subapical lobe, galea of female with 6 branches, of male (fig. 4) nearly smooth, serrula exterior 16-17 blades, flagellum 4 setae (distal one dentate). Palps (figs 5-7) distinctly granulate, setae short, clavodentate, lateral setae on femur and patella longer, dentate; trochanter with well developped dorsal hump, femur 2,8-2,9 times as long as broad, patella 2,4-2,5, club 1,74-1,80 times as long as broad, hand with pedicel 1,7 times (male: 1,5-1,6 times) as long as broad and 1,18-1,24 times longer than finger, chela with pedicel 2,8-2,9 times (male: 2,6-2,7) as long as broad; fixed finger with 36-38 marginal teeth, 4-7 external and 3-4 internal accessory teeth, movable finger 38-41 marginal teeth, 4-7 external and 2-4 internal accessory teeth. Trichobothria see fig. 7; no long smooth seta on dorsal side of finger, near *ist*. Claws of legs (figs 8, 9) smooth, longer than undivided arolia, subterminal seta on tarsus IV smooth, curved. Leg I: femur 1,4-1,6 times as long as broad, patella 2,7-3,0 times as long as broad and 1,46-1,51 times longer than femur, tibia 3,7-4,1 times, tarsus 5,1-6,1 times as long as broad; leg IV: lateral setae clavodentate, femur+patella 3,6-4,2 times, tibia 4,3-4,8 times, tarsus without tactile seta, 4,7-5,4 times as long as broad.

Measurements in mm (3♂/3♀): Carapace 0.60-0.72/0.55-0.65; palps: femur 0.57-0.64/0.20-0.24, patella 0.53-0.61/0.21-0.25, hand with pedicel 0.54-0.62/0.32-0.37, finger length 0.45-0.50, chelal length 0.92-1.04; leg I: femur 0.18-0.22/0.11-

0.16, patella 0.26-0.31/0.10, tibia 0.27-0.31/0.07-0.08, tarsus 0.28-0.32; leg IV: femur+patella 0.48-0.57/0.12-0.16, tibia 0.38-0.43/0.08-0.10, tarsus 0.31-0.36/0.06-0.07.



FIGS 1-9

Maxchernes iporangae n. sp. 1: female genital operculum; 2: spermatheca; 3: chelicera of female; 4: galea of male; 5-6: pedipalp of female and chelal hand of male (6b: chaetotaxy and granulation partially omitted); 7: trichobothrial pattern; 8: leg I (female); 9: leg IV (female). Scale unit 0.1 mm.

Tritonymph: similar to adults; sternite II with 4 central setae; palps: femur 2,6 times as long as broad (0.46mm/0.18mm), patella 2,1 times (0.42/0.20), chela with pedicel 3,1 times as long as broad (0.76/0.25).

Protonymph: Carapace smooth in posterior half; 26 clavate setae (4 on anterior, 6 on posterior margin; a dentate preocular seta on each side); tergites I-X 6 setae, divided, XI 4; stergites V-IX 6, X-XI 4 setae, on the last sternites the lateral setae clearly dentate. Chelicera: palm with 4 smooth setae, galea with 2 apical and 1 subapical branch, serrula exterior 10 blades, flagellum 4 setae. Palps: femur 2,2 times as long as broad (0.21mm/0.09mm), patella 1,8 times (0.19/0.11), chela with pedicel 3,0 times as long as broad (0.40/0.13), finger shorter than hand without pedicel; fixed finger with 19, movable finger with 21 teeth.

Discussion: We place this new species in the genus described by Feio (1960) from Argentina (Jujuy prov.), since it shares the following characters with the type species *birabeni* Feio, 1960: flagellum with 4 setae; trichobothrial pattern (*est* clearly proximad *ist*; *st* clearly nearer to *t* than to *sb*); long venomous duct; no tactile seta on tarsus IV, no tactile setae on tergite XI and absence of discal setae on tergites. It differs from both *birabeni* and *plaumanni* Beier, 1974 (from Nova Teutonia, Brazil) in bigger size and more slender pedipalps, mainly femur and patella.

KEY TO THE SPECIES OF *MAXCHERNES* (ADULTS)

1 Small species, length of femur at most 0.46mm; stout pedipalps (femur at most 2.4 times, patella 2.4 times longer than broad) 2
\- Bigger species, length of femur 0.57-0.64mm; pedipalps more slender, femur 2.8-2.9 times, patella 2.3-2.4 times longer than broad. Brazil, Sao Paulo (caves). .... *iporangae* n. sp.
2 Length of palpal femur 0.45-0.46mm; anterior transverse furrow in middle of carapace; serrula exterior with 17 blades. Brazil, Santa Catarina. .... *plaumanni* Beier
\- Length of palpal femur 0.40-0.42mm; anterior transverse furrow in basal third of carapace; serrula exterior with 15 blades. Argentina, Jujuy. .... *birabeni* Feio

BIOLOGY

Maxchernes iporangae n. sp. is very abundant on frugivorous bat guano piles in Alambari de Baixo cave, individuals can frequently be seen wandering around. It should be pointed out that Brazilian cave pseudoscorpions, although rather common, have been never observed in large numbers. Only one or two individuals are normally observed in cave passages and/or on guano piles. The new species seems to be restricted to the guano piles of this particular cave, although one single specimen has been collected in a cave nearby (Aguas Quentes). Frugivorous bat guano piles of the same kind and extension, and including a very similar fauna, have been found in other caves from the same region. Nevertheless, *M. iporangae* n. sp. has not been recorded from these other caves so far, in spite of similar collection effort.

Considering its biology, *iporangae* n. sp. seems to fit very well into the guanobite concept (sensu GNASPINI 1992) - a species restricted to guano deposits in caves. Its reproductive and behavioural biology is being studied in laboratory, and is the subject of a paper in preparation by the junior author.

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New species and records of *Masuria* Cameron from Nepal (Coleoptera, Staphylinidae, Aleocharinae)

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New species and records of *Masuria* Cameron from Nepal (Coleoptera: Staphylinidae: Aleocharinae). - Further data on the distribution of *Masuria plumbea* Cameron, *M. picipes* Cameron, and *M. loebli* Pace are presented. Three new species are described from Nepal: *M. rugosepunctata* sp. n., *M. ancoriformis* sp. n., and *M. longicornis* sp. n. Primary and secondary sexual characters are figured.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - *Masuria* - Nepal - Himalaya - taxonomy - new species - distribution.

INTRODUCTION

The genus *Masuria* was described by Cameron (1928), according to whom the new taxon was near *Pronomaea*, but separated from that genus especially by the anteriorly less produced head and the different mouthparts with three-jointed labial palpi, transverse labrum and not bifid ligula. Later the same author attributed the genus to the tribe Masuriini (containing only *Masuria*) and keyed the six species known to him, all of them from northern India (Cameron 1939). Recently Pace (1989) revised the species of *Masuria*, describing five new species and referring the former genus *Oncosomechusa* Pace with three species to *Masuria* as a subgenus. In the revision a total of 13 species were recognized, ten in *Masuria* s. str. and three in *Oncosomechusa*. Almost all the species of *Masuria* have become known from the Himalayan region of northern India (seven species) and Nepal (eight species). The obviously widespread *M. plumbea* Cameron and *M. picipes* Cameron have been recorded from various localities both in India and in Nepal; most species, however, are known only from their respective type localities. Very recently, one further species of the subgenus *Oncosomechusa* was described from Gansu, northern China (Pace 1997).

Though very diverse in external characters such as body shape, length of elytra, punctation, colour, microsculpture etc. (see figures in Pace 1989), the genus, particularly *Masuria* s. str., is readily identified by the long labial palpi, whose two terminal joints in normal preparation distinctly protrude from below the labrum and especially by the morphology of the primary sexual characters. For details regarding the morphology of the mouthparts and external characters see Figs 1 a - d and the descriptions by

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Cameron (1928, 1939). These descriptions, however, lack a reference to dimorphisms of the secondary sexual characters: tergum VIII is usually of slightly different shape; the hind margin of the ♀ sternum VIII, apart from being often more strongly convex, is characterized by a row of rather long marginal setae and by the presence of micropubescence in the central area, whereas in the ♂ sternum IX the posterior setae insert at some distance from the hind margin, and the micropubescence is absent.

The aedeagus, though often remarkably different in size, and the spermatheca are somewhat uniform in shape among the species of *Masuria* s. str. On the other hand, the internal structures of the aedeagus, particularly the shape of the base of the flagellum are characteristic and therefore the most reliable characters for the identification of the species.

Unidentified material of Staphylinidae mainly from the collections of the Muséum d'histoire naturelle, Genève (MHNG), but also from the Staatliches Museum für Tierkunde, Dresden (SMTD), contained numerous Nepalese specimens of *Masuria*. An examination of this material and a comparison with types of similar species yielded three new species. In view of the fact that most species of *Masuria* are known only from their type localities and that the material from almost every locality, where *Masuria* was collected, contained at least one new species it can be assumed that our knowledge of this genus, presently comprising 17 species, is far from complete and that numerous further species remain to be discovered.

NEW SPECIES AND RECORDS OF *MASURIA*

Masuria (s. str.) **plumbea** Cameron

50 ex., Nepal, Rasuwa District, Langtang Khola Valley, 2.5 km E Syabru, 1720-1730m, 14.IV.1985, leg. Smetana (MHNG, cAss).

The species was previously known from several localities in Northern India (Chakrata, Mussoorie, Almora) and one locality in Nepal (Tal) (Pace 1988, 1989).

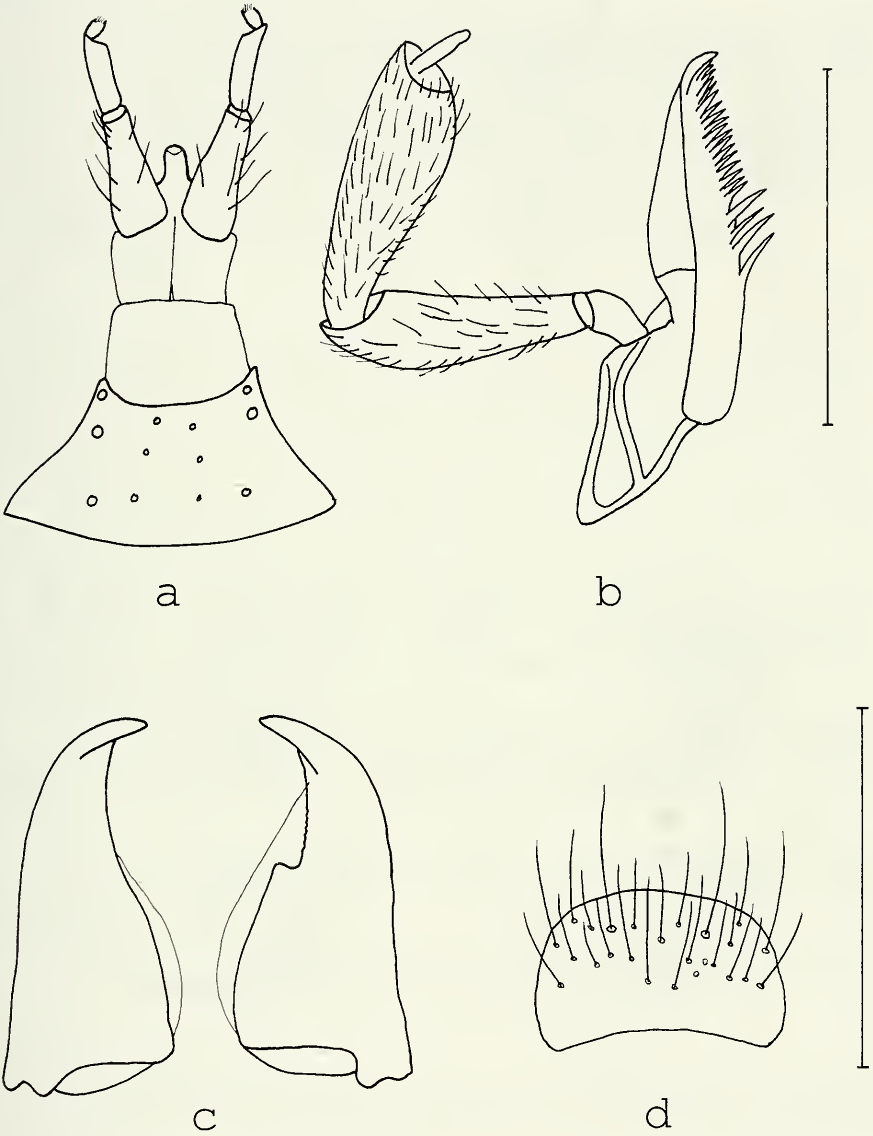
Masuria (s. str.) **picipes** Cameron

11 ex., Nepal, Rasuwa District, Langtang Khola Valley, 2.5 km E Syabru, 1720-1730m, 14.IV.1985, leg. Smetana (MHNG, cAss); 7 ex., Nepal, Annapurna mountains, Lamjung Himal, below Taunja Danda, 2350m, 6.V.1996, leg. O. Jäger (SMTD, cAss).

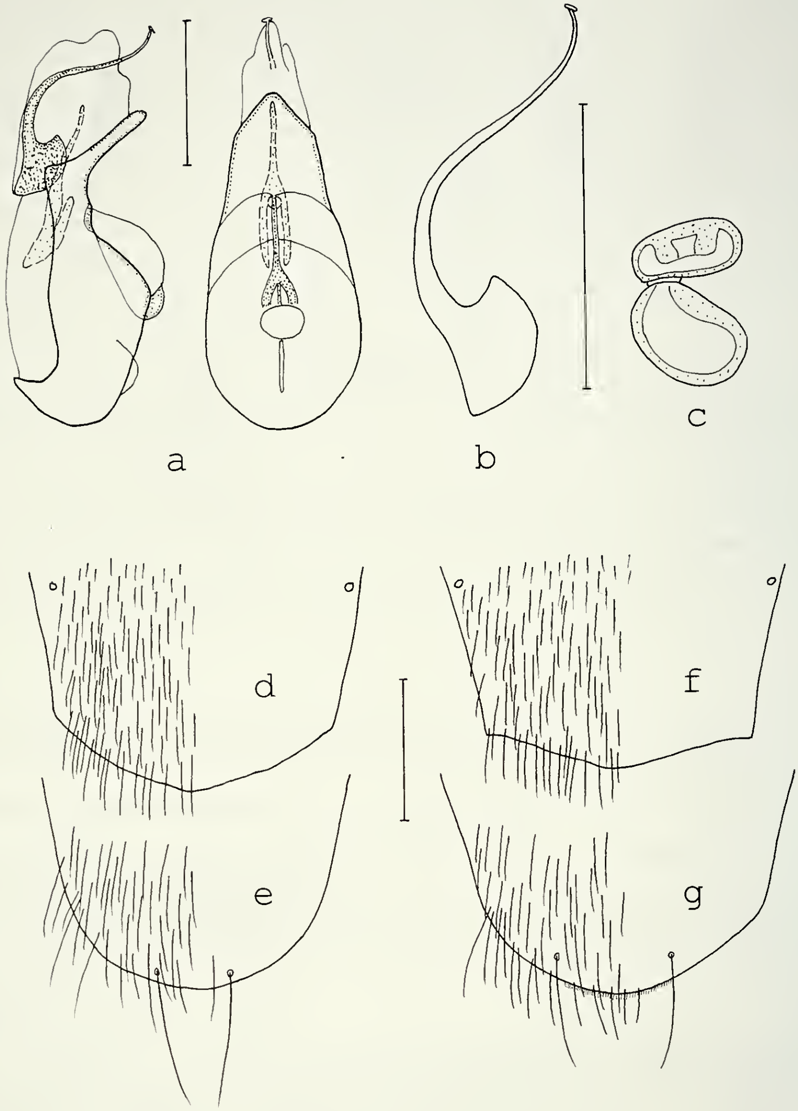
Like *M. plumbea*, *M. picipes* is apparently widespread and was previously known from several localities in Nepal and northern India (Pace 1989). The material was compared with two ♂ paralectotypes.

Masuria (s. str.) **loebli** Pace Figs 2 a - g

38 ex., Nepal, Nuwakot District, between Ghopte and Thare Pati, 3200m, 23.IV.1985, leg. Smetana (MHNG, cAss).



Figs 1 a - d: *Masuria plumbea* Cameron: labium (a); maxilla (b); mandibles (c); labrum (d). Scales: 0.2 mm.



FIGS 2 a - g: *Masuria loebli* Pace: aedeagus in lateral and in ventral view (a); flagellum of internal sac (b); spermatheca (c); posterior part of ♂ tergum (d) and sternum VIII (e); posterior part of ♀ tergum (f) and sternum VIII (g). Scales: 0.2 mm.

Comments and comparative notes:

Using the key in Pace (1989), most specimens belonging to this species would key out with *M. rufescens* Cameron, because the pronotum is mostly of the same colour as the head and elytra; a brief diagnosis is presented below. *M. loebli* is distinguished from *M. rufescens* by a less densely punctured head and pronotum, different coloration (in *P. rufescens* the body is reddish with the elytra and abdominal tergum VII darker) and by the different shape of the internal structures of the aedeagus (cf. Fig. 25 in Pace 1989). The specimens indicated above were compared with type material.

Diagnosis:

2.9 - 3.6 mm. Size and proportions similar to *M. picipes*. Colour somewhat variable; usual coloration: pronotum and elytra ± reddish or light brown; head at least slightly darker, reddish brown to dark brown; abdomen brown to dark brown with the tergal hind margins slightly and the apex distinctly lighter; legs and basal antennomeres ferrugineous; antennae distally at least slightly darkened. Whole body without distinct microsculpture and shining; punctation of forebody distinct, but not very dense, with the interstices at least on head and pronotum on average at least as wide as, usually wider than punctures; punctation of abdomen sparse and extremely fine.

Head with eyes in dorsal view approximately as long as temples; antennae slender and long, with antennomeres I - III distinctly oblong and subequal in length, IV - X gradually decreasing in absolute and relative length, but at least VI still clearly oblong, and X weakly transverse.

Pronotum with weakly pronounced, ± obtuse posterior angles, lateral margins in posterior half usually weakly concave. Elytra distinctly wider and at suture (from apex of scutellum to hind margin) usually slightly longer than pronotum; hind wings fully developed.

♂: hind margin of tergum VIII weakly pointed posteriorly, that of sternum VIII evenly convex (Figs 2 d - e); aedeagus in ventral view broad, base of flagellum shaped like an axe (Figs 2 a - b).

♀: hind margin of tergum VIII weakly pointed, that of sternum VIII more strongly convex than in ♂ (Figs 2 f - g); spermatheca as in Fig. 2c.

Distribution:

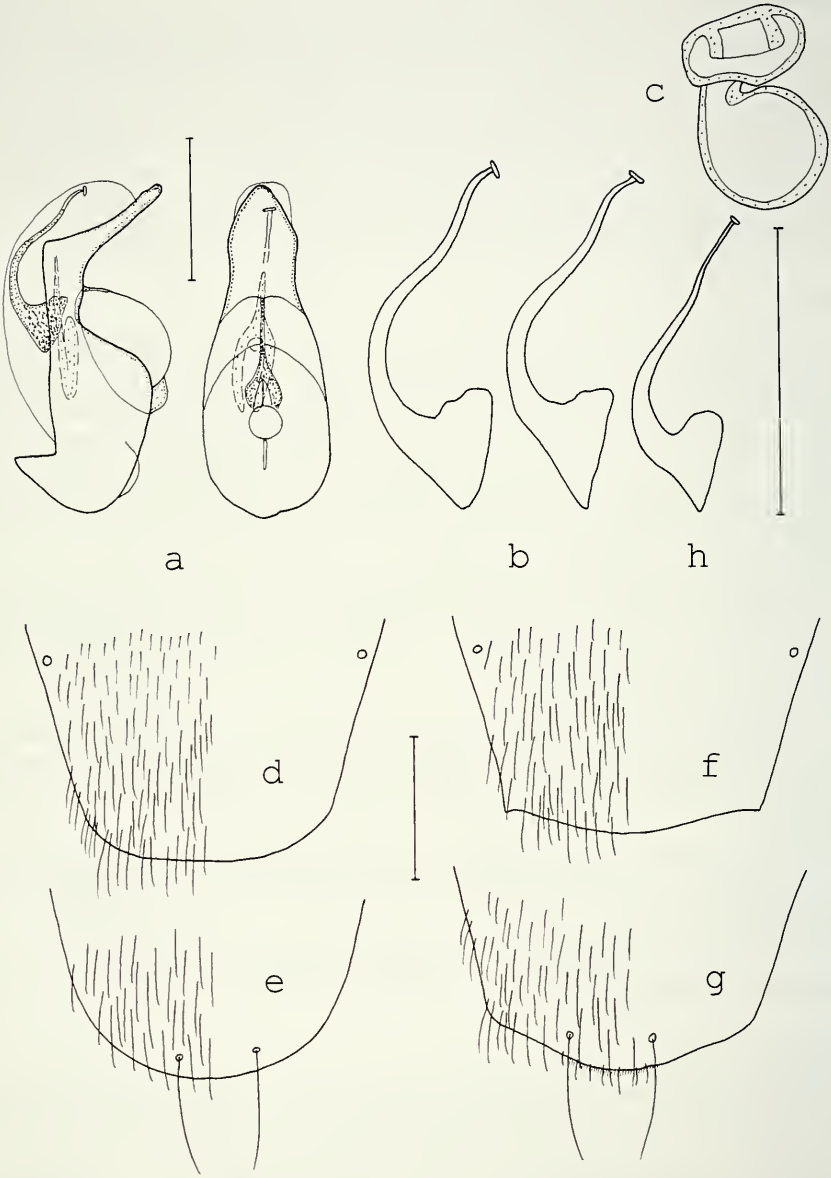
The material indicated above was collected near the type locality in northern central Nepal.

Masuria (s. str.) **longicornis** sp. n. Figs 3 a - g

Holotype ♂: NEPAL, Khandbari Distr., Induwa Khola Valley, 2050m, 16.IV.1984, Smetana & Löbl (MHNG).

Paratypes: 1♂, 2♀♀, same data as holotype (MHNG, cAss).

Derivatio nominis: The name (lat.: with long antennae) refers to one of the characters distinguishing this species from the similar *M. picipes*.



FIGS 3 a - h: *Masuria longicornis* sp. n. (a - g) and *M. picipes* Cameron (h): aedeagus in lateral and in ventral view (a); flagellum of internal sac (b, h); spermatheca (c); posterior part of ♂ tergum (d) and sternum VIII (e); posterior part of ♀ tergum (f) and sternum VIII (g). Scales: 0.2 mm.

Diagnosis:

3.5 - 3.8 mm. Externally very similar to *M. picipes*, but of larger, more slender and lighter appearance. Colour of body blackish brown to black, with the hind margins of the abdominal terga and the margins of the pronotum slightly lighter; legs brown to dark brown with the tarsi yellowish; antennae dark brown with antennomere I and often parts of II and III lighter. Whole body without distinct microsculpture and shining; punctation of forebody distinct and moderately dense, interstices on average less wide than punctures; punctation of abdomen fine, much finer than in *M. picipes.*

Head with eyes in dorsal view approximately as long as temples or slightly shorter; antennae of similar shape as in *M. loebli*, more slender and longer than in *M. picipes*; antennomere V distinctly oblong (in *M. picipes* indistinctly oblong or subquadrate), VI usually weakly oblong (in *M. picipes* subquadrate or weakly transverse), and X subquadrate to weakly transverse (in *M. picipes* distinctly transverse).

Pronotum with ± obtuse posterior angles, lateral margins in posterior half usually concave. Elytra distinctly wider and at suture (from apex of scutellum to hind margin) slightly shorter than pronotum; hind wings fully developed. Legs longer than in *M. picipes*, mesotarsomeres I - IV distinctly oblong (in *M. picipes* at most weakly oblong), length of metatarsomeres I - V 0.5 - 0.6 mm (in *M. picipes* 0.3 - 0.4 mm).

♂: hind margin of tergum VIII weakly convex posteriorly, that of sternum VIII moderately convex (Figs 3 d - e); aedeagus in ventral view slender (Fig. 3a), base of flagellum as in Fig. 3b (for comparison with flagellum of *M. picipes* see Fig. 3h).

♀: hind margins of tergum and sternum VIII as in Figs 3 f - g; spermatheca as in Fig. 3c.

Comparative notes:

Using Pace (1989), the species would key out with *M. picipes* and *M. kali* Pace. For distinction from the former see diagnosis; from the latter *P. longicornis* is distinguished by larger eyes, a more slender pronotum, the much more slender and smaller aedeagus and the different shape of the base of the flagellum (cf. Figs 13 - 15 in Pace 1989).

Distribution:

The species is known only from the type locality in eastern Nepal.

Masuria (s. str.) **rugosepunctata** sp. n. Figs 4 a - g

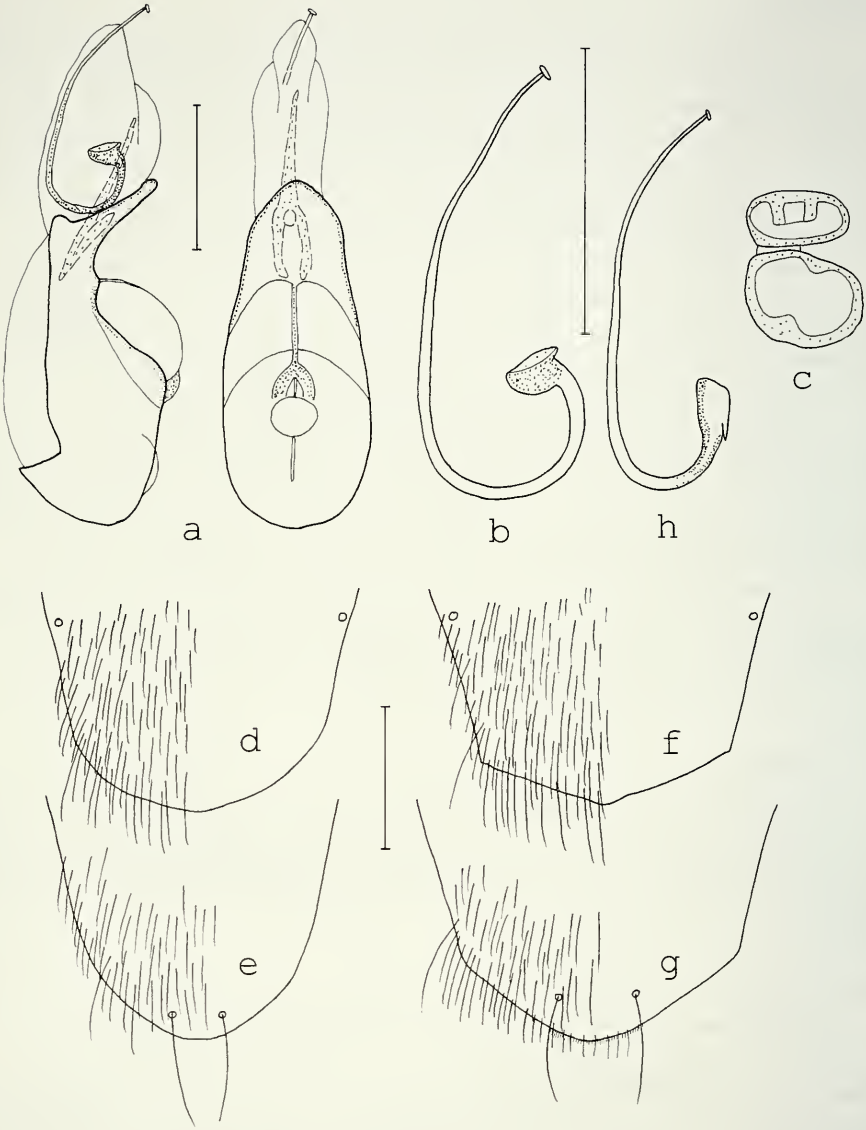
Holotype ♂: NEPAL, Khandbari Distr., Induwa Khola Valley, 2050m, 16.IV.1984, Smetana & Löbl (MHNG).

Paratypes: 15 ex., same data as holotype (MHNG, cAss).

Derivatio nominis: The name (lat.: rugosely punctured) refers to the conspicuously dense, coarse and partly rugose punctation, a character only shared with the similar *M. plumbea*.

Diagnosis:

3.0 - 3.5 mm. Externally (size, proportions, punctation, colour) highly similar to *M. plumbea* Cameron, though on average of slightly lighter colour, with smaller eyes,



FIGS 4 a - h: *Masuria rugosepunctata* sp. n. (a - g) and *M. plumbea* Cameron (h): aedeagus in lateral and in ventral view (a); flagellum of internal sac (b, h); spermatheca (c); posterior part of ♂ tergum (d) and sternum VIII (e); posterior part of ♀ tergum (f) and sternum VIII (g). Scales: 0.2 mm.

which in dorsal view are somewhat shorter than temples (in *M. plumbea* as long as or longer than temples), and with slightly less densely punctured abdomen.

♂: tergum and sternum VIII broader and shorter than in *M. plumbea* (Figs 4 d - e); aedeagus of similar shape and size as in *M. plumbea*, but base of flagellum of different shape (Figs 4 a - b); for comparison with flagellum of *M. plumbea* see Fig. 4h.

♀: tergum and sternum VIII broader and shorter than in *M. plumbea* (Figs 4 f - g); spermatheca as in Fig. 4c.

Comparative notes:

M. rugosepunctata is distinguished from its congeners by the extremely dense and coarse punctation, a character which it only shares with *M. plumbea*; for separation from that species see diagnosis.

Distribution:

The species is known only from the type locality in eastern Nepal, where it was collected together with *M. longicornis*.

Masuria (s. str.) **ancoriformis** sp. n. Figs 5 a - g

Holotype ♂: NEPAL, Rasuwa Dis., Langtang Kh. Vall., 2.5km E Syabru, 1730m, 14.IV.1985, A. Smetana (MHNG).

Paratypes: 1♂, 1♀, same data as holotype (♂ paratype: 1720m) (MHNG, cAss).

Derivatio nominis: The name (lat.: shaped like an anchor) refers to the characteristic anchor-like shape of the base of the flagellum, which distinguishes this species from the similar *M. plumbea*.

Diagnosis:

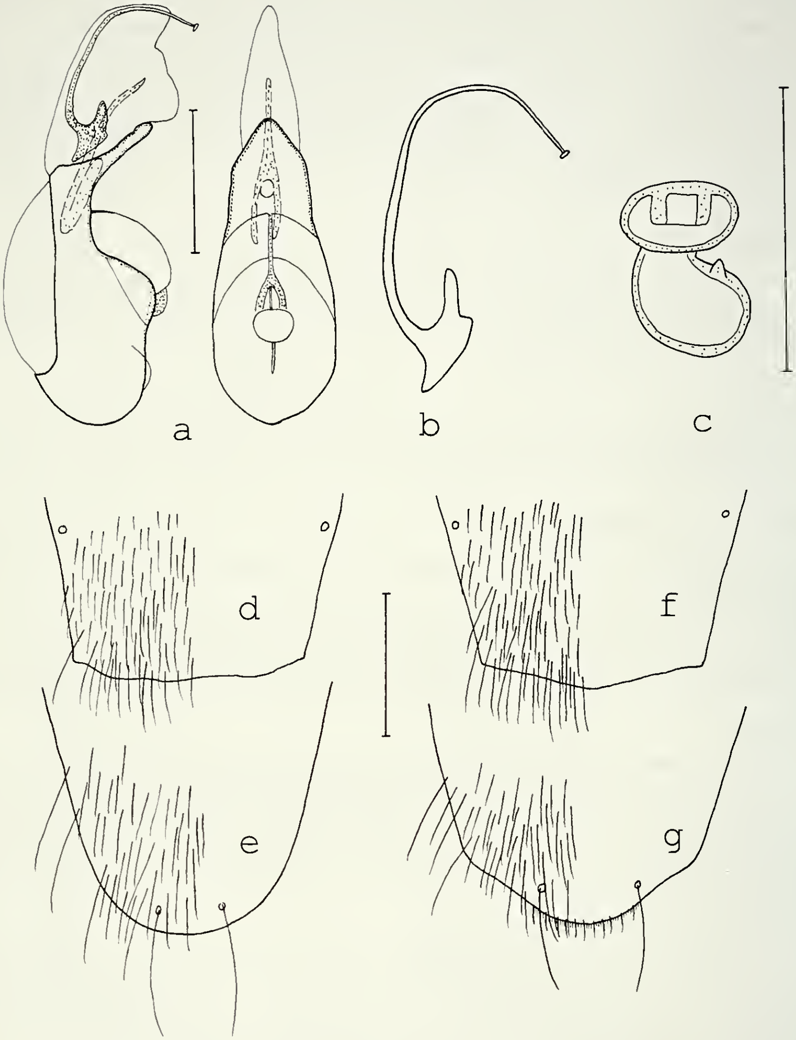
3.0 - 3.5 mm. Externally (size, proportions, colour) highly similar to *M. plumbea*, but punctation of forebody and abdomen less dense, that of head and pronotum less coarse than in that species; surface of body therefore more shiny. In addition, eyes slightly smaller; pronotum more transverse (1.2 - 1.3x wider than long) than in average *M. plumbea* (usually ca. 1.1 - 1.2x wider than long), and with less distinctly concave lateral margins in posterior half.

♂: tergum VIII broader and shorter than in *M. plumbea*, its hind margin ± truncate (in *M. plumbea* strongly convex); hind margin of sternum VIII evenly convex (in *M. plumbea* almost pointed) (Figs 5 d - e); aedeagus of similar shape and size, but ventral process longer and base of flagellum of different shape (Figs 5 a - b).

♀: tergum and sternum VIII broader and shorter than in *M. plumbea*; hind margin of tergum VIII weakly pointed (in *M. plumbea* distinctly pointed) (Figs 5 f - g); spermatheca as in Fig. 5c.

Comparative notes:

For distinction from *M. plumbea* (and also *M. rugosepunctata*) see diagnosis. From *M. parva* Cameron from northern India (type specimens examined), *M. ancoriformis* is separated by the slightly larger size, the longer antennae - with antennomere IV almost 2x wider than long and V distinctly oblong (in *M. parva* antennomere IV is weakly oblong and V subquadrate) -, the more finely punctured pronotum, the clearly



FIGS 5 a - g: *Masuria ancoriformis* sp. n.: aedeagus in lateral and in ventral view (a); flagellum of internal sac (b); spermatheca (c); posterior part of ♂ tergum (d) and sternum VIII (e); posterior part of ♀ tergum (f) and sternum VIII (g). Scales: 0.2 mm.

less dense punctation and pubescence of the elytra, the more distinct punctation of the abdomen, and especially by the much larger size of the aedeagus, the longer flagellum and the different shape of the flagellar base (cf. Figs 17-19 in Pace 1989).

Distribution:

The species is known only from the type locality in northern central Nepal, where it was collected together with *M. plumbea*.

ACKKNOWLEDGEMENTS

I am indebted to Dr. Ivan Löbl (MHNG), Mr Olaf Jäger (SMTD) and Mr Martin Brendell (BMNH) for arranging the loan of the material which this study is based on.

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REVUE SUISSE DE ZOOLOGIE 105 (4): 789-796; décembre 1998

Redescription of *Compsobuthus rugosulus* (Pocock, 1900) (Scorpiones, Buthidae) based on specimens from Pakistan

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Redescription of *Compsobuthus rugosulus* (Pocock, 1900) (Scorpiones, Buthidae) based on specimens from Pakistan. - A redescription of *Compsobuthus rugosulus* (Pocock, 1900) is given on the basis of 15 specimens from Pakistan (9 males and 6 females), 10 of which were collected in Hyderabad, the type locality, from where a lectotype is designated.

Key-words: Scorpiones - *Compsobuthus* - taxonomy - Pakistan.

INTRODUCTION

Compsobuthus rugosulus, was first described by POCOCK (1900), as a subspecies of *Buthus acutecarinatus* Simon, based on specimens collected both in Gwalior, India and Hyderabad, Sind, which today is in Pakistan. By the time of his publication the generic classification of Middle East and Oriental scorpions was still very poor. Consequently most of the buthid scorpions were associated to the very large and complex genus *Buthus* Leach.

In his monographic work, dealing mainly with the scorpions of North Africa, VACHON (1949) revised the relationships of several species included in the genus *Buthus*, and proposed a number of different genera, including *Compsobuthus* for the species associated with *Buthus acutecarinatus* Simon. In the following years, other species have been included in the new genus. A more detailed synthesis was proposed by VACHON (1952).

The exact composition of the genus *Compsobuthus* remains uncertain at present. SISSOM (1990) proposed 12 species to be included in the genus, with a geographic distribution ranging from northern Africa to the Middle East and India. More recently SISSOM (1994) revised the taxonomic positions of *Compsobuthus acutecarinatus* (Simon), *Compsobuthus brevimanus* (Werner), *Compsobuthus werneri werneri* (Birula), and described the new species *Compsobuthus vachoni*. He also discussed a supplementary unnamed subspecies of *Compsobuthus werneri*, thereby attesting to the problematical status of species and subspecies within this genus.

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For *Compsobuthus rugosulus* the status of species is accepted by some authors, while others only regard it as a subspecies of *Compsobuthus acutecarinatus*. In our opinion *Compsobuthus rugosulus* is to be considered as a valid species, and we give in this paper a precise redescription.

Compsobuthus rugosulus (Pocock, 1900) Figs 1 to 10

Syntypes: 4 females (the original description mentions males and females), BMNH. 1896.12.15.14-17. Gwalior (26.13 N 78.10 E), India and Hyderabad (25.22 N 68.22 E), Sind, now in Pakistan. One female syntype from Hyderabad (examined by the senior author) is here designated as **lectotype**.

Buthus acutecarinatus rugosulus Pocock, 1900: 20; TAKASHIMA 1945: 76.

Buthus acuterinatus rugulosus (sic!) Birula, 1905: 139; KRAEPELIN 1913: 127.

Buthus (Buthus) acutecarinatus rugulosus (sic!): BIRULA 1910: 173; BIRULA 1917; WERNER 1936: 204.

Compsobuthus rugolosus (sic!): VACHON 1949: 99; VACHON 1952: 219.

Compsobuthus rugulosus (sic!): VACHON 1966: 211; HABIBI 1971 : 43; FARZANPAY 1988: 37.

Compsobuthus rugosulus: LEVY *et al*. 1973: 114; PÉREZ 1974: 23; LEVY & AMITAI 1980: 60.

Compsobuthus acutecarinatus rugosulus: TIKADER & BASTAWADE 1983: 169.

Material studied (deposited in the Natural History Museum, Geneva): PAKISTAN: Hyderabad (type locality), I/1962 (Anderson leg.): 6 males, 4 females. Kavahari, XII/1958 (Anderson leg.): 1 male-juvenile, 1 female. Mirpur-Sakro, south of Karachi, II/1962 (Anderson leg.): 2 males. Near Karachi, III/1962 (Anderson leg.): 1 female.

Redescription (based on male and female topotypes).

Morphometric measurements in Table I.

Coloration. Basically yellowish with some darker reddish brown areas on the tergite keels. Prosoma: carapace yellowish with reddish areas over the keels; eyes surrounded by black pigment. Mesosoma: yellowish with two longitudinal reddish areas and longitudinal reddish brown pigment over longitudinal keels. Metasoma: segments I to V yellowish. Vesicle yellowish; aculeus reddish. Venter yellowish. Chelicerae yellowish; fingers reddish. Pedipalps: globally yellowish; chela with some reddish yellow areas on the articulations. Legs yellowish.

Morphology. Carapace moderately granular; anterior margin with a feeble concavity. Anterior and posterior ocular keels strong; furrows moderate to feeble. Median ocular tubercle slightly anterior to the center; median eyes separated by one ocular diameter. Three pairs of lateral eyes. Sternum triangular. Mesosoma: tergites with moderate to strong granulations. Median keel strong in all tergites. Two latero-longitudinal keels, which arise after the posterior ocular keel of carapace, very strong in all tergites. Tergite VII pentacarinate; all keels strong. Venter: genital operculum divided longitudinally. Pectine: pectinal tooth count 19-19; basal middle lamellae of each pecten not dilated. Sternites feebly granular with moderately elongated stigmata; two feeble longitudinal keels on each sternite; VII with four keels. Metasoma: segments I to IV with 10 keels, crenulate. Segment V with 5 keels. Tegument moderate to strongly granular. Telson less granulated than segments, with a long and strongly curved aculeus. Subaculear tooth absent, with only a vestigial granule present.

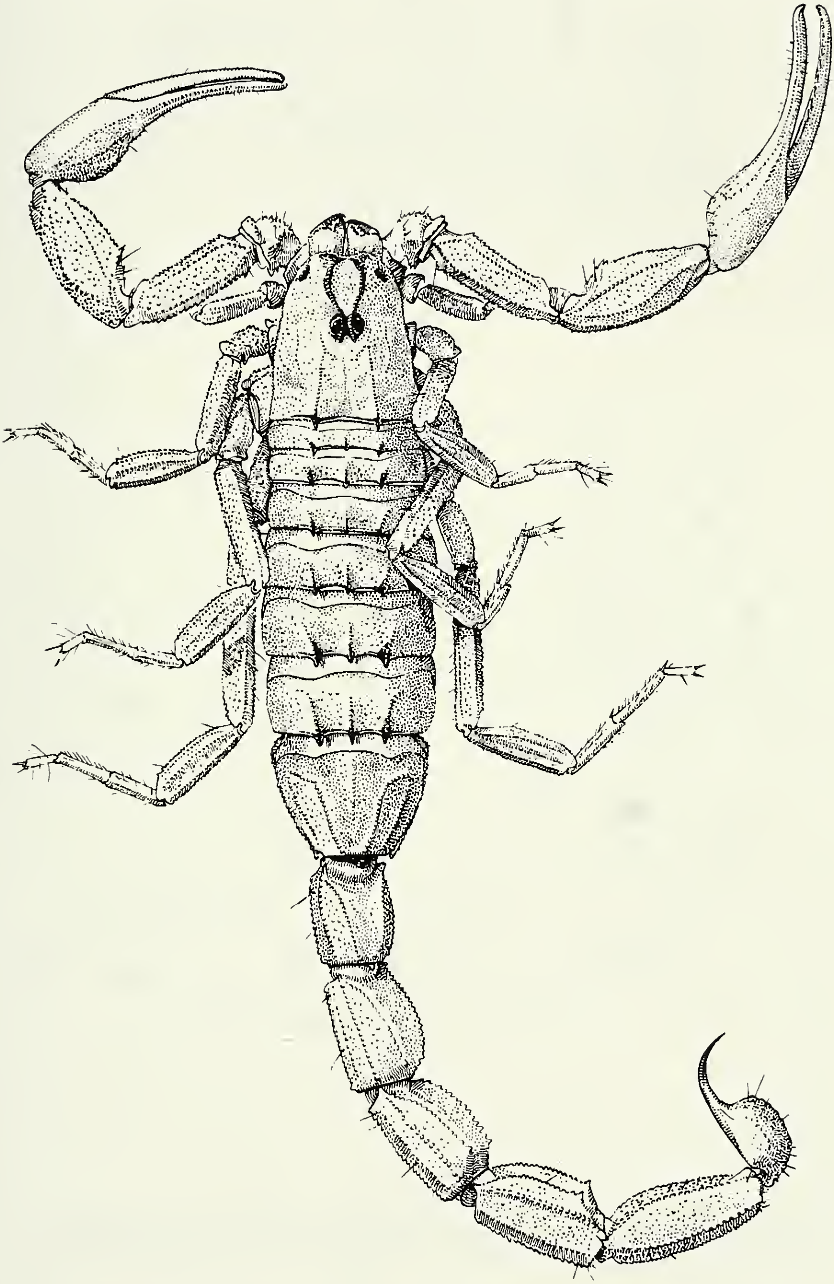
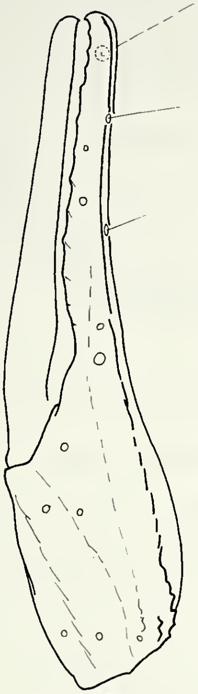


FIG. 1

Compsobuthus rugosulus, female from Hyderabad in dorsal view.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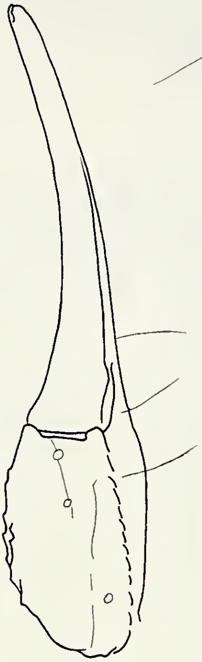
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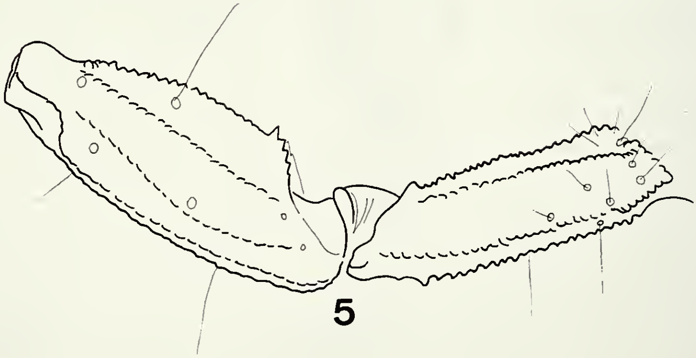
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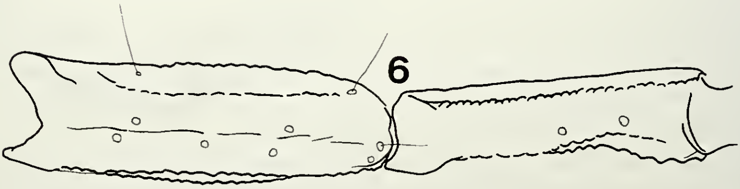
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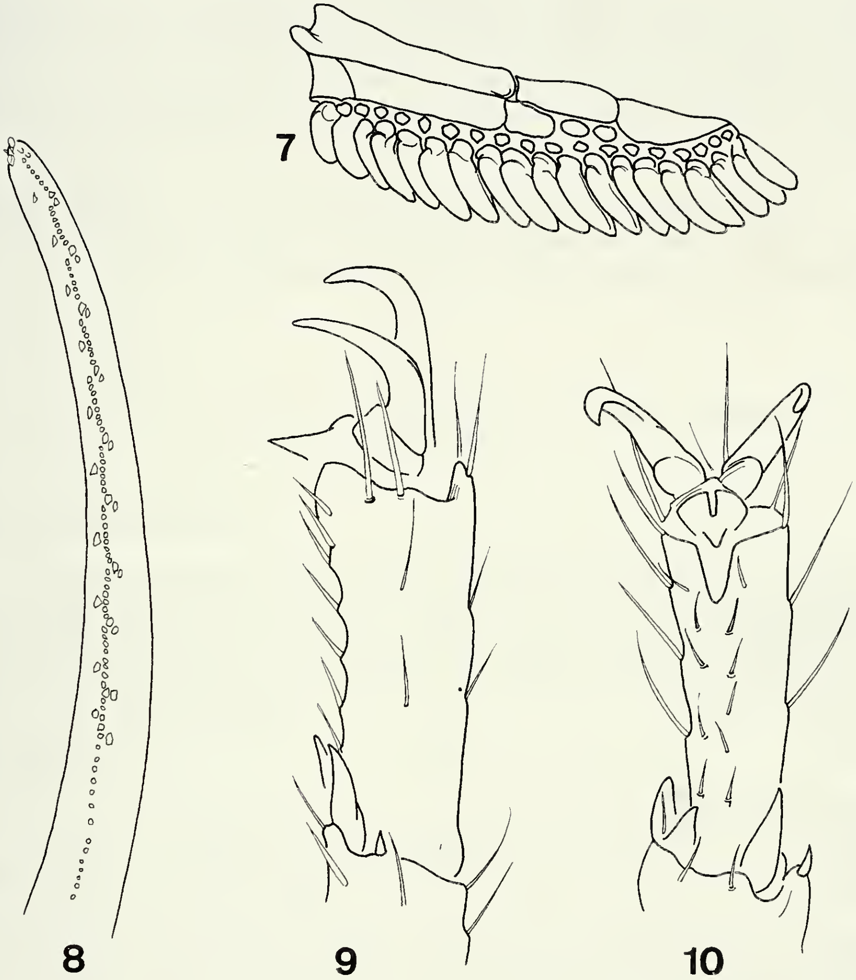

FIGS 2 to 6: *Compsobuthus rugosulus*, male from Hyderabad. 2 to 4: Trichobothrial pattern. Chela, dorso-external, ventral and internal aspects. 5 and 6: Tibia and femur, dorsal and external aspects.

FIGS 7 to 10: 7: Pectine. 8: Disposition of the granulations over the dentate margins of pedipalp-chela fingers. 9 and 10: Tarsus of leg IV, lateral and ventral aspects.

Cheliceral dentition characteristic of the family Buthidae (Vachon 1963); ventral aspect of both finger and manus with long but not very dense setae. Pedipalps: femur pentacarinate strongly crenulate; tibia with 7 keels; chelae with 7/8 keels strongly crenulate; all faces moderately granular. Movable fingers with 10/11 oblique rows of granules. Trichobothriotaxy; A-β, orthobothriotaxy (Vachon 1973, 1975). Legs: tarsi with numerous fine setae ventrally. Tibial and pedal spurs present, moderate to strong on all legs.

Females: bigger and more bulk than males (see Table I). General coloration similar to that of males, but slightly darker yellowish. Pectines smaller (see Table II for variability in the number of teeth). Basal middle lamellae not dilated.

TABLE I

Morphometric values (in mm) of male and female of *Compsobuthus rugosulus* from Hyderabad.

	Male	Female
Carapace:		
- length	3,0	4,3
- anterior width	1,9	2,8
- posterior width	3,4	4,8
Metasomal segment I:		
- length	1,9	2,4
- width	2,1	2,6
Metasomal segment V:		
- length	3,2	4,0
- width	1,5	2,2
- depth	1,5	2,1
Vesicle:		
- width	1,2	1,8
- depth	1,1	1,5
Pedipalp:		
- Femur length	2,5	3,7
- Femur width	0,8	1,2
- Tibia length	3,2	4,1
- Tibia width	1,3	1,7
- Chelae length	5,2	7,2
- Chelae width	1,4	1,8
- Chelae depth	1,3	1,7
Movable finger:		
- length	3,6	5,2

TABLE II

Variability of the number of pectines teeth in males and females of *Compsobuthus rugosulus*

Number of teeth	Males	Females
14-15		1
15-15	1	3
16-16		1
16-17	1	
17-16		1
17-17	2	
17-18	1	
18-17	1	
18-18	2	
19-19	1	

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The jumping plant-lice of Lebanon (Hemiptera: Psylloidea)

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The jumping plant-lice of Lebanon (Hemiptera: Psylloidea). - Based on collections made in the last two decades, 35 species are recorded from Lebanon. Only four species have been previously recorded from the country, two of which are misidentifications ("*Psylla pyricola*" and "*Euphyllura olivina*", for *Cacopsylla bidens* and *Euphyllura straminea* respectively). The biogeographical composition of the Lebanese fauna is briefly discussed and compared to that of the neighbouring countries.

Key-words: Psylloidea - Lebanon - Middle East - Biogeography.

INTRODUCTION

Jumping plant-lice or psylloids are a small group of plant sap-sucking sternorrhynchous insects. They are generally highly specific with respect to their larval food plants. Unlike the closely related aphids, psylloids are particularly diverse in the Southern hemisphere from where they probably originate. The fauna of the Palaearctic is highly derived and relatively well-studied. KLIMASZEWSKI (1973) lists 505 species from there, and GEGECHKORI & LOGINOVA (1990) record 521 species from the territory of the former USSR.

The knowledge of the psylloid fauna of the Middle East is very uneven. Following numbers of species have been recorded: Egypt 13 (SAMY 1973); Arabian Peninsula 52 (BURCKHARDT & MIFSUD 1998); Iraq 3 (LOGINOVA 1974; OSSIANNILSSON 1992; BURCKHARDT & LAUTERER 1997); Iran 89 (BURCKHARDT & LAUTERER 1993); Turkey 93 (BURCKHARDT & ÖNUÇAR 1993; GÜÇLÜ & BURCKHARDT 1996); Jordan 33 (AL-KHAWALDEH *et al.* 1997); Syria 6 (TALHOUK 1969; MUSTAFA 1991); Israel 66 (BODENHEIMER 1937; HALPERIN *et al.* 1982; HALPERIN 1986; HALPERIN *et al.* 1988; BURCKHARDT & HALPERIN 1991; BURCKHARDT & LAUTERER 1997).

Up to now, only four species were known from Lebanon. TALHOUK (1969) recorded *Homotoma ficus* (L.), *Psylla pyricola* Foerster and *Euphyllura olivina* (Costa); subsequently, the last two species have been recognised as species complexes (BURCKHARDT & HODKINSON 1986; LOGINOVA 1973). HALPERIN *et al.* (1982) listed *Euphyllura straminea* Loginova from Lebanon; this is the same species as Talhouk's *Euphyllura olivina*. Lebanese material of *Cacopsylla myrthi* (Puton) was mentioned by BURCKHARDT (1989) but without detailing collecting data.

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The present paper aims to fill this gap and reports 35 species from Lebanon with collecting dates and localities. Information is added on known host plants and general distribution, and a key is provided for the identification of adults.

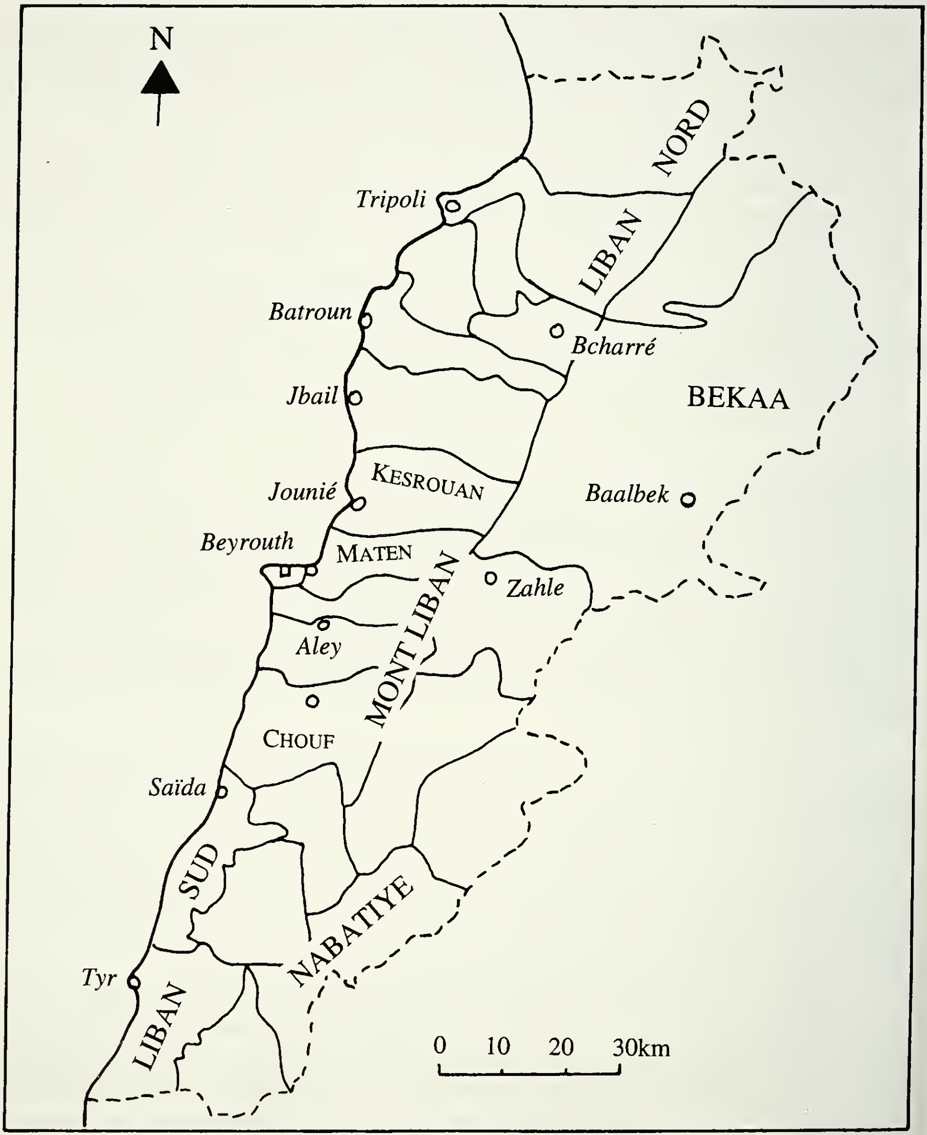

FIG. 1

Simplified map of Lebanon. The names accord with "Carte du Liban" (Anonymous 1997).

MATERIEL AND METHODS

The specimens were collected by sweeping vegetation with a net, or with pan, light or sticky traps. The material is preserved in the collections of the Muséum d'Histoire Naturelle du Liban, Faculté des Sciences II de l'Université Libanaise (MHNL), the Naturhistorisches Museum Basel (NHMB), and the Muséum d'histoire naturelle, Genève (MHNG). Most of the studied material comes from following Lebanese regions ("casas"): Kesrouan, Maten, Batroun, Jbeil, Chouf, Aley, Saida and the North (Fig. 1). The geographical names are cited according to "Carte du Liban" (Anonymous 1997).

The classification is that of WHITE & HODKINSON (1985) with the changes proposed by BURCKHARDT (1987). The morphological terminology follows mostly OSSIANNILSSON (1992). The treated taxa are arranged in alphabetical order.

KEY TO ADULTS

1 Antennal flagellar segments flattened bearing long black setae. Male proctiger distinctly 2-segmented. On *Ficus carica*. .... Homotomidae: *Homotoma ficus* (L.)

\- Antennal flagellar segments more or less cylindrical. Male proctiger 1-segmented, sometimes indistinctly subdivided.......................... 2

2 Forewings with vein R+M+Cu_1 bifurcating into R and M+Cu_1; if trifurcating then anal break close to apex of vein Cu_{1b} and metabasitarsus with 1 or 2 black spurs. Costal break and/or pterostigma often developed. Psyllidae 3

\- Forewings with vein R+M+Cu_1 trifurcating into R, M and Cu_1 or bifurcating into R+M and Cu_1; anal break distant from apex of vein Cu_{1b}; costal break and pterostigma always absent. Metabasitarsus without black spurs. Triozidae 24

3 Metacoxae without meracanthus; trochanteral cavity with weakly sclerotised tubercle. Rhinocolinae 4

\- Metacoxae with horn-shaped meracanthus; trochanteral cavity without tubercle. 5

4 Forewings without expanded pattern. Male parameres simple, lanceolate. Antenna length/head width ratio more than 1.5. Coronal suture fully developed. On *Pistacia vera*. .... *Megagonoscena gallicola* Burckhardt & Lauterer

\- Forewings with dark, sometimes very faint pattern forming a zig-zag band along outer margin. Male parameres with posterior process. On *Pistacia* spp. .... *Agonoscena pistaciae* Burckhardt & Lauterer

5 Vertex longer than large. Liviinae: *Livia* 6

\- Vertex larger than long. 7

6 Antennal segment 2 long pear-shaped. Forewings oval. On *Juncus* spp. .... *Livia juncorum* (Latreille)

\- Antennal segment 2 short, cylindrical. Forewings oblong with subparallel fore and hind margins. Host plant unknown. . . . . *Livia mediterranea* Loginova

7 Head with large anterior flattened lobes enclosing median ocellus which is, therefore, visible only in dorsal view. Euphyllurinae: *Euphyllura*. . 8

\- Head different, either regularly rounded anteriorly, or with separated lobes or cones. Median ocellus visible in frontal and/or ventral view. 9

8 Pterostigma of forewings long, more than 3 times the distance between the apices of pterostigma and vein Rs; with transverse veins which are more or less well-developed. Parameres in profile short with flattened anterior lobe in apical two thirds. Apex of female proctiger pointed. On *Olea europaea*. . . . . *Euphyllura straminea* Loginova

\- Pterostigma short, shorter than twice the distance between the apices of pterostigma and vein Rs; usually without transverse veins. Parameres in profile long with subparallel fore and hind-margins. Apex of female proctiger truncate. On *Phillyrea*, *Olea*, *Osmanthus* spp. . . . . *Euphyllura phillyreae* Foerster

9 Basal metatibial spine always absent. Apical metatibial spurs more or less evenly spaced, forming a crown, or grouped and then vertex flattened, rectangular with anterior lobes. Metabasitarsus with two black spurs. Posterior margin of male proctiger bearing wing-like processes. Aphalarinae 10

\- Basal metatibial spine often developed. Apical metatibial spurs always grouped. Vertex trapezoidal; head with genal cones. 12

10 Proepimeron much larger than proepisternum; propleural suture diagonal. On *Tamarix* spp. . . . . *Colposcenia kiritshenkoi* Loginova

\- Proepimeron and proepisternum subequal; propleural suture vertical. *Craspedolepta* 11

11 Antennae 10-segmented. On *Leontodon autumnale*. . . . . *Craspedolepta sonchi* (Foerster)

\- Antennae 9-segmented. On *Achillea*, *Anthemis*, *Pyrethrum* spp. . . . . *Craspedolepta pontica* Dobreanu & Manolache

12 Metabasitarsus without or with a single black spur. 13

\- Metabasitarsus with two black spurs. 15

13 Male proctiger with posterior wing-like lobes. Forewings with long cell m_{1+2} and high cell cu_{1a}, vein Cu_{1b} longer than Cu_1. On *Acacia*, *Albizia* spp. . . . . Acizziinae: *Acizzia uncatoides* (Ferris & Klyver)

\- Male proctiger without posterior wing-like lobes. Forewings with shorter and lower M_{1+2} and Cu_{1a} cells, vein Cu_{1b} shorter than Cu_1. Arytaininae p. p. 14

14 Genal cones about half vertex length. On *Calicotome* spp. . . . . *Arytainilla cytisi* (Puton)

\- Genal cones longer than vertex length. On *Spartium junceum*. . . . . *Livilla spectabilis* (Flor)

15 Forewings with long cell m_{1+2} and high cell cu_{1a}. Male parameres truncate apically. On *Astragalus* spp. .... Arytaininae: *Cyamophila stoklosai* Klimaszewski & Lodos

\- Forewings with shorter and lower m_{1+2} and cu_{1a} cells. Male parameres different. Psyllinae 16

16 Forewing membrane yellow, bearing irregularly, densely spaced surface spinules. *Psylla* 17

\- Forewing membrane colorless or with brown pattern; surface spinules sparse forming regular rhombi or squares, or reduced to narrow stripes in the middle of the cells. *Cacopsylla* 18

17 Genal processes more than half vertex length. Antennae less than 2.0 times head width. On *Ostrya carpinifolia*. .... *Psylla colorata* Löw

\- Genal processes less than half vertex length. Antennae more than 2.0 times head width. On *Alnus* spp. .... *Psylla foersteri* Flor

18 Pattern of forewings consisting of well-defined dark patches at the apices of pterostigma and veins Rs, M_{1+2}, M_{3+4}, Cu_{1a} and Cu_{1b}, as well as a more or less interrupted band from apex of vein Rs to the middle of vein Cu_{1a}. On *Cercis siliquastrum*. .... *Cacopsylla pulchella* (Löw)

\- Pattern of forewings different. 19

19 Forewings with brown band along outer margin. On *Crataegus* spp. .... *Cacopsylla mariannae* (Baeva)

\- Forewings without brown band along outer margin. 20

20 Surface spinules present in all cells forming broad fields; apart from narrow stripes along the veins, covering the whole surface of cell c+sc; spinules present in basal part of cell rs proximal to bifurcation of vein R; fields in apical part not tapering towards wing margin. 21

\- Combination of characters absent. 22

21 Hindmargin of parameres, in lateral view, convex. Dorsal margin of female proctiger weakly convex. On *Salix* spp. .... *Cacopsylla brunneipennis* (Edwards)

\- Hindmargin of parameres, in lateral view, concave. Dorsal margin of female proctiger weakly concave. On *Salix* spp. .... *Cacopsylla subpropinqua* (Loginova)

22 Forewings with brown clavus. On *Pyrus* spp. ...... *Cacopsylla bidens* (Šulc)

\- Forewings with clavus of the same colour as surrounding membrane. 23

23 Surface spinules forming broad fields in apical half of forewings. On *Pyrus* spp. .... *Cacopsylla pyrisuga* (Foerster)

\- Surface spinules forming narrow stripes in apical half of forewings. *On* *Rhamnus* spp. .... *Cacopsylla myrthi* (Puton)

24 Forewings with vein R+M+Cu_1 bifurcating in veins R+M and Cu_1. Host plant unknown. .... *Eutrioza opima* Loginova

\- Forewings with vein R+M+Cu_1 strictly trifurcating into R, M and Cu_1. 25

25 Metatibiae with 1+3 black apical spurs. *Trioza* p. p. 26

\- Metatibiae with 1+2 black apical spurs. 27

26 Forewing hind margin with conspicuous dark spots in the middle of the cells. Parameres truncate apically. Female genitalia short, truncate apically. On *Rhamnus alaternus*. . . . . *Trioza marginepunctata* Flor

\- Forewings without conspicuous dark spots in the middle of the cells along the hind margin. Parameres with small forward directed hook apically. Female genitalia long, pointed apically. On *Urtica* spp. . . . . *Trioza urticae* (L.)

27 Bifurcation of vein M of forewings distinctly distal to line from apices of veins Rs to Cu_{1a}. 28

\- Bifurcation of vein M of forewings on, or proximal to line from apices of veins Rs to Cu_{1a}. 31

28 Vein Rs of forewings sinuous to almost straight; vein M_{1+2} more than twice the length of vein M_{3+4}; fore margin of forewings strongly arched, hind margin only weakly curved. Male proctiger with large posterior lobes. Female proctiger long. On *Rubus* spp. . . . . *Phylloplecta trisignata* (Löw)

\- Vein Rs of forewings concave; vein M_{1+2} less than twice as long as M_{3+4}; fore margin of forewings only slightly stronger curved than hind margin. Hind margin of male proctiger weakly produced. Female genitalia short. *Trioza* p. p. 29

29 Forewings narrow, more than 2.7 times as long as wide, without surface spinules in apical half. On *Laurus nobilis*. . . . . *Trioza alacris* Flor

\- Forewings wide, less than 2.7 times as long as wide, with surface spinules. 30

30 Surface spinules present in all cells of forewings, forming large fields. On deciduous *Quercus* spp. . . . . *Trioza remota* Foerster

\- Surface spinules largely reduced in apical half of forewings. On evergreen *Quercus ilex*. . . . . *Trioza ilicina* (de Stefani)

31 Antennal segments 4-7 light. Body coloration green or yellow. Posterior lobes of male proctiger large, semicircular and bearing long marginal setae. Female proctiger with pointed posterior process, with long dorsal setae ending almost at apex of proctiger. On *Elaeagnus angustifolia*. . . . . *Trioza neglecta* Loginova

\- Antennal segments 4-7 dark brown or black. Body coloration in mature specimens with dark parts. Posterior lobes of male proctiger small, without long marginal setae. Female proctiger short, subacute or blunt apically, without very long dorsal setae. *Bactericera* 32

32 Forewings bearing surface spinules. On *Salix* spp. . . . . *Bactericera albiventris* (Foerster)

\- Forewings without surface spinules in apical half. 33

33 Genal cones longer than half vertex length. On *Salix* spp. . . . . *Bactericera curvatinervis* (Foerster)

\- Genal cones shorter than half vertex length. Polyphagous. . . . . *Bactericera nigricornis* (Foerster)

LIST OF SPECIES

HOMOTOMIDAE

Homotoma ficus (L.)

Material examined. Jabal Moussa: Kesrouan, 15.VI.1997; Naas: Maten, 14.VI.1997; Darh El Souan: Maten, 16.VII.1997; Meyrouba: Kesrouan, 24.IX.1994 (MHNL, NHMB, MHNG).

Distribution. Albania, Algeria, Armenia, Austria, Azerbaijan, Bulgaria, France, Georgia, Great Britain, Greece, Israel, Italy, Jordan, Lebanon, Morocco, Portugal, Russia (European part), Spain, Switzerland, Syria, Turkey, USA (California), former Yugoslavia (AL-KHAWALDEH *et al.* 1997; BURCKHARDT 1989; GEGECHKORI & LOGINOVA 1990). Fig is probably native to SW Asia from where it spread early to the Mediterranean; Egyptians were cultivating it 4000 BC (MABBERLEY 1990). It is likely that the host specific *H. ficus* has a similar history of distribution.

Host plant. *Ficus carica* L. (Moraceae).

Comments. The larvae can cause an irregular growth of the leaves, but the species has not been reported to be of economic importance (BURCKHARDT 1994).

PSYLLIDAE: ACIZZIINAE

Acizzia uncatoides (Ferris & Klyver)

Material examined. Naas: Maten (MHNL).

Distribution. Australia, introduced into Algeria, Chile, France, Israel, Italy, Mexico, New Zealand, Portugal, USA (California, Hawaii) (BURCKHARDT 1989).

Host plants. *Acacia*, *Albizia* spp. (Fabaceae).

Comments. *A. uncatoides* damages its hosts by honeydew secretion and by sucking on young tissue which produces necrosis of flower racemes and young twigs (BURCKHARDT 1994).

PSYLLIDAE: ARYTAININAE

Arytainilla cytisi (Puton)

Material examined. Kfar Debiane: Kesrouan, 7.X.1984; Laklouk: Kesrouan, 10.VI.1986; Yahchouch: Kesrouan, 16.VI.1981 and 2.V.1983; Dahr El Souan: Maten, 1.V.1983 and 22.V.1983 (MHNL).

Distribution. Algeria, France, Greece, Israel, Italy, Jordan, Spain, Turkey, former Yugoslavia (AL-KHAWALDEH *et al.* 1997; BURCKHARDT 1989).

Host plants. *Calicotome* spp. (Fabaceae).

Cyamophila stoklosai Klimaszewski & Lodos

Material examined. Kfar Debiane: Kesrouan, 8.VII.1985 (MHNL; NHMB; MHNG).

Distribution. Turkey (BURCKHARDT & ÖNUÇAR 1993).

Host plants. *Astragalus* spp. (Fabaceae).

Livilla spectabilis (Flor)

Material examined. Dahr El Souan: Maten, 26.I.1981 and 23.VII.1986; Chabrouh: Kesrouan, 22.XI.1983; Ghazir: Kesrouan, 2.I.1982; Hyata: Kesrouan, 27.VII.1995 and 2.VIII.1996; Kartaba: Kesrouan, 22.IV.1985; Meyrouba: Kesrouan, 24.IX.1994; Kfar Abida: Kesrouan, 23.VI.1995 (MHNL; NHMB; MHNG).

Distribution. Algeria, France, Greece, Italy, Portugal, Spain, Switzerland, former Yugoslavia (BURCKHARDT 1989).

Host plant. *Spartium junceum* L. (Fabaceae).

PSYLLIDAE: APHALARINAE

Colposcenia kiritshenkoi Loginova

Material examined. Janné: Jbeil, 30.X.1985 (MHNL; NHMB).

Distribution. Armenia, Azerbaijan, Bulgaria, Georgia, Iran, Russia (European part), Turkey (GEGECHKORI & LOGINOVA 1990).

Host plants. *Tamarix* spp. (Tamaricaceae).

Craspedolepta pontica Dobreanus & Manolache

Material examined. Meyrouba: Kesrouan, 5.V.1985; Yahchouch: Kesrouan, 16.VI.1981 (MHNL).

Distribution. Armenia, Azerbaijan, former Czechoslovakia, Georgia, Greece, Israel, Kazakhstan, Kyrgyzstan, Romania, Russia (European part), Tajikistan, Turkey, Turkmenistan (GEGECHKORI & LOGINOVA 1990).

Host plants. *Achillea*, *Anthemis*, *Pyrethrum* spp. (Asteraceae).

Craspedolepta sonchi Foerster

Material examined. Bhamdoun: Aley, 21.IX.1979 (MHNL).

Distribution. Armenia, Central Europe, Denmark, Finland, Georgia, Great Britain, Norway, Russia (European part, Dagestan, Siberia, Maritime Territory), Sweden (OSSIANNILSSON 1992).

Host plant. *Leontodon autumnale* L. (Asteraceae).

Comments. Literature records my concern a complex of closely related species (Lauterer & Burckhardt, in prep.).

PSYLLIDAE: EUPHYLLURINAE

Euphyllura phillyreae Foerster

Material examined. Nahr-Ibrahim: Kesrouan, 4.V.1985; Meyan: Jbeil, 23.IV. 1983 (MHNL).

Distribution. Algeria, Bulgaria, France, Georgia, Greece, Israel, Iran, Italy, Morocco, Russia (European part), Spain, Tunisia, Turkey, former Yugoslavia (BURCKHARDT 1989; GEGECHKORI & LOGINOVA 1990).

Host plants. *Phillyreae*, *Olea*, *Osmanthus* spp. (Oleaceae).

Euphyllura straminea Loginova

Material examined. Bchamoun: Chouf, 9.III.1981 (MHNL).

Distribution. Cyprus, Iran, Iraq, Israel, Jordan, Lebanon, Turkey (AL-KHAWALDEH *et al.* 1997).

Host plant. *Olea europaea* L. (Oleaceae).

Comments. The presence of *E. olivina* in Lebanon recorded by TALHOUK (1969) is unlikely. *E. olivina* is Western, *E. straminea* Eastern Mediterranean in distribution (BURCKHARDT 1994).

PSYLLIDAE: LIVIINAE

Livia juncorum (Latreille)

Material examined. Dahr El Souan: Maten (MHNL).

Distribution. Widely distributed throughout the Palaearctic (OSSIANNILSSON 1992).

Host plants. *Juncus* spp. (Juncaceae).

Livia mediterranea Loginova

Material examined. Kfarkatra: Chouf, 22.II.1981 (MHNL).

Distribution. Algeria, Bulgaria, Caucasus, Crimea, Israel, Italy, Spain (CONCI *et al.* 1993).

Host plant. Unknown

PSYLLIDAE: PSYLLINAE

Cacopsylla bidens (Šulc)

Material examined. Bhamdoun: Aley, 10.VIII.1978 and 21.IX.1979; Kfar-Katra: Chouf, 8.III.1981; Bhannés: Maten, 4.IV.1980 and 23.VII.1986; Dahr El Souan: Maten, 17.VII.1997; Hajar El Afrit: Kesrouan, 16. IX. 1994; Hrajel: Kesrouan, 27. VI.1994; Kfar Debiane: Kesrouan, 19.VII.1994 (MHNL, NHMB).

Distribution. Armenia, Central Asia, Crimea, France, Greece, Iran, Israel, Italy, Jordan, Ukraine and introduced into Argentina and Chile (AL-KHAWALDEH *et al.* 1997).

Host plants. *Pyrus* spp. (Rosaceae).

Comments. The record of *Psylla pyricola* from Lebanon (TALHOUK 1969) probably concerns *Cacopsylla bidens* (BURCKHARDT & HODKINSON 1986).

Cacopsylla brunneipennis (Edwards)

Material examined. Laklouk: Kesrouan, 10.VI.1986 and 22.VI.1986; Yahchouch: Kesrouan, 16.VI.1981; Zaarour: Maten, 1.VI.1997; Naas: Maten,19.VI.1997; Broumana: Maten, 14.VI.1997 (MHNL, NHMB, MHNG).

Distribution. Armenia, Austria, Bulgaria, Czech Republic, Denmark, England, Finland, France, Georgia, Ireland, Italy, Kazakhstan, Norway, Poland, Romania, Russia (European part, Siberia), Scotland, Slovakia, Spain, Sweden, Switzerland, Ukraine, former Yugoslavia (LAUTERER & BURCKHARDT 1997).

Host plants. *Salix* spp.

Cacopsylla mariannae (Baeva)

Material examined. Naas: Maten, 14.VI.1997; Zaarour: Maten, 28.VI.1997; Meyrouba: Kesrouan, 24. IX.1994; Hrajel: Kesrouan, 27.VI.1994; Kfar Debiane: Kesrouan, 26.V.1985 and 8.VII.1985; Hajar el Afrit: Kesrouan, 24.IX.1994 and 16.IX. 1994; Achkout: Kesrouan, 17.IX.1994; Baskinta: Kesrouan, 22.IX.1994 (MHNL, NHMB, MHNG).

Distribution. Tadzhikistan, Turkey (GEGECHKORI & LOGINOVA 1990; BURCKHARDT & ÖNUÇAR 1993).

Host plants. *Crataegus* spp. (Rosaceae).

Cacopsylla myrthi (Puton)

Material examined. Jaj: Batroun, IV-VI.1984; Dahr El Souan: Maten, 23.VII. 1986; Naas: Maten, 14.VI.1997; Zaarour: Maten, 1.VI.1997; Achkout: Kesrouan, 17.IX.1994; Baskinta: Kesrouan, 19. IX.1994; Hajar El Afrit: Kesrouan, 17.IX.1994, 24.IX.1994 and 16.IX.1994; Hrajel: Kesrouan, 27.VI.1994; Jabal Moussa: Kesrouan, 15.VI.1997 and 21.VI.1994; Kartaba: Kesrouan, 22.XI.1985; Meyan: Kesrouan, 23.IV.1983; Meyrouba: Kesrouan, 5.V.1985 and 24.IX.1994; Yahchouch: Kesrouan, 16.VI.1981; Becharré: Nord, 20.V.1987; Tannourine: Batroun, 31.V.1997; Saida: Saida, 28.X.1978 (MHNL, NHMB, MHNG).

Distribution. Algeria, Crimea, France, Greece, Israel, Italy, Jordan, Spain, Turkey (AL-KHAWALDEH 1997).

Host plants. *Rhamnus* spp. (Rhamnaceae).

Cacopsylla pulchella (Löw)

Material examined. Jaj: Batroun 4.V.1984; Naas: Maten, 8.VI.1997 and 18.VII.1997; Hajar El Afrit: Kesrouan, 24.IX.1994; Jouret Bedrane: Kesrouan, 2.V.1983; Jabal Moussa: Kesrouan, 15.VI.1986, 14.VI.1997 and 15.VI.1997; Tannourine: Nord, 30.V.1997 (MHNL, NHMB, MHNG).

Distribution. Austria, France, Great Britain, Greece, Italy, Russia (European part), Switzerland, Turkey, former Yugoslavia (GEGECHKORI & LOGINOVA 1990).

Host plant. *Cercis siliquastrum* L. (Fabaceae).

Comments. The assignment of *C. pulchella* to *Cacopsylla* needs to be revised (BURCKHARDT 1994).

Cacopsylla pyrisuga (Foerster)

Material examined. Hajar El Afrit: Kesrouan, 24.IX.1994; Achkout: Kesrouan, 17.IX.1994; Jabal Moussa: Kesrouan, 15.VI.1997 and 21.VI.1994; Jaj: Batroun, IV-VI.1984 (MHNL, NHMB, MHNG).

Distribution. Throughout the Palaearctic (CONCI *et al.* 1993).

Host plants. *Pyrus* spp. (Rosaceae).

Cacopsylla subpropinqua (Loginova)

Material examined. Naas: Maten, 8.VI.1997; Broumana: Maten, 14.6.1997; Zaarour: Maten, 28.VI.1997 (MHNL, NHMB, MHNG).

Distribution. Mongolia, Russia (Siberia, Far East) (GEGECHKORI & LOGINOVA 1990).

Host plants. *Salix* spp. (Salicaceae).

Cacopsylla sp.

Material examined. Hrajel: Kesrouan, 27.VI.1994; Hajar El Afrit: Kesrouan, 16.IX.1994 (MHNL).

Comments. The material at hand is insufficient for identification.

Psylla (Baeopelma) colorata Löw

Material examined. Achkout: Kesrouan, 17.IX.1994; Dahr El Souan: Maten, 13.VIII.1985 (MHNL).

Distribution. SE European (CONCI *et al.* 1993).

Host plant. *Ostrya carpinifolia* Scop. (Betulaceae).

Psylla (Baeopelma) foersteri Flor

Material examined. Naas: Maten, 8. X. 1997; Dahr El Souan: Maten, 16. VII. 1997 (MHNL, NHMB, MHNG).

Distribution. Throughout the Palaearctic (KLIMASZEWSKI 1973).

Host plants. *Alnus* spp. (Betulaceae).

PSYLLIDAE: RHINOCOLINAE

Agonoscena pistaciae Burckhardt & Lauterer

Material examined. Bhamdoun: Aley, 16.X.1978; Ghazir: Kesrouan, 2.I.1982; (MHNL).

Distribution. Iran, Israel, Jordan, Turkey (AL-KHAWALDEEH 1997).

Host plants. *Pistacia* spp. (Anacardiaceae).

Megagonoscena gallicola Burckhardt & Lauterer

Material examined. Kfar Katra: Chouf, 17.V.1981; Jabal Moussa: Kesrouan, 15.VI.1986 and 15.VI.1997; Naas: Maten, 14.VI.1997; Broummana: Maten, 14.VI.1997 (MHNL, NHMB, MHNG).

Distribution. Israel, Jordan (AL-KHAWALDEH 1997).

Host plant. *Pistacia vera* L. (Anacardiaceae).

TRIOZIDAE

Bactericera albiventris (Foerster)

Material examined. Zaarour: Maten, 28.VI.1997; Kfar Debiane: Kesrouan, 31.VII.1985 (MHNL, NHMB, MHNG).

Distribution. Austria, former Czechoslovakia, Demark, Finland, France, Germany, Great Britain, Greece, Hungary, Italy, Latvia, Norway, Poland, Russia (European part, Siberia, Far East), Spain, Sweden, Switzerland, Turkey, Turkmenistan (BURCKHARDT & LAUTERER 1997).

Host plants. *Salix* spp. (Salicaceae).

Bactericera curvatinervis (Foerster)

Material examined. Broumana: Maten, 12.VI.1997 and 14.VI.1997; Naas: Maten, 8.VI.1997, 14.VI.1997 and 18.VII.1997; Zaarour: Maten, 28.VII 1997 (MHNL, NHMB, MHNG).

Distribution. Most of Europe, Caucasus, Russian Far East, Japan (BURCKHARDT & LAUTERER 1997).

Host plants. *Salix* spp. (Salicaceae).

Bactericera nigricornis (Foerster)

Material examined. Nahr Ibrahim: Kesrouan, 24.I.1981; Zaarour: Kesrouan, 28.VII.1997 (MHNL).

Distribution. West Palaearctic, Central Asia, Siberia, Mongolia (BURCKHARDT & LAUTERER 1997).

Host plants. Polyphagous on herbaceous plants.

Eutrioza opima Loginova

Material examined. Laklouk: Kesrouan, 22.VII.1986 (MHNL, NHMB).

Distribution. Caucasus, France, Italy, Tunisia, Turkey, Ukraine (CONCI et al. 1996).

Host plant. Unknown.

Phylloplecta trisignata (Löw)

Material examined. Bhannés: Maten, 6.VIII.1985; Dahr El Souan: Maten, 16.XI.1983; Faraya: Kesrouan, 16.VIII.1985 (MHNL)

Distribution. Mediterranean without North Africa (CONCI *et al.* 1996).

Host plants. *Rubus* spp. (Rosaceae).

Trioza alacris Flor

Material examined. Nahr Ibrahim: Kesrouan, 24.I.1981 and 4.VI.1985 (MHNL).

Distribution. Native to the Mediterranean, now occuring in the West Palaearctic from Portugal, Southern Great Britain and Fennoscandia to the Caucasus, Turkey and the Crimea; introduced into North and South America (CONCI *et al.* 1996).

Host plant. *Laurus nobilis* L. (Lauraceae).

Trioza ilicina (de Stefani)

Material examined. Meyrouba: Kesrouan, 5.V.1985 (MHNL, NHMB, MHNG).

Distribution. Algeria, France, Italy, Spain, Turkey (CONCI *et al.* 1996).

Host plant. *Quercus ilex* L. (Fagaceae).

Trioza marginepunctata Flor

Material examined. Jaj: Batroun, IV-VI.1984; Kartaba: Kesrouan, 22.XI.1985 (MHNL).

Distribution. Croatia, France, Israel, Italy, Spain (CONCI *et al.* 1996).

Host plant. *Rhamnus alaternus* L. (Rhamnaceae).

Trioza neglecta Loginova

Material examined. Broumana: Maten, 12.VI.1997 (MHNL, NHMB).

Distribution. Armenia, Azerbaijan, Georgia, Iran, Rumania, Russia (European part), Turkey (GEGECHKORI & LOGINOVA 1990).

Host plant. *Elaeagnus angustifolia* L. (Elaeagnaceae).

Trioza remota Foerster

Material examined. Meyrouba: Kesrouan, 5.V.1985 (NHML, NHMB, MHNG).

Distribution. Throughout the Palaearctic, though the records from the Far East and Central Asia need to be revised (CONCI *et al.* 1996).

Host plants. On deciduous *Quercus* spp. (Fagaceae).

Trioza urticae (L.)

Material examined. Janné: Kesrouan, 16.V.1997; Yahchouch: Kesrouan, 16.VI.1981 (MHNL, NHMB, MHNG).

Distribution. Throughout the Palaearctic (KLIMASZEWSKI 1973).

Host plants. *Urtica* spp. (Urticaceae).

CONCLUSIONS

To the four psylloid species previously recorded from Lebanon, 31 are added here. Compared to the 66 species known from neighbouring Israel, the 35 species listed here constitute probably less than half of the existing Lebanese psylloid species.

Due to the incomplete knowledge, a biogeographical analysis of the Lebanese psylloid fauna is premature. Here a narrative summary of the current knowledge is provided (Table 1). Except for *Cacopsylla* sp., an unidentified species with unknown distribution, the known Lebanese species are generally widely distributed. Species endemic to Lebanon are not known so far. Mediterranean species (Table 1: columns ME and EM) make up 41.2 % of the identified species; eleven species are widely distributed over the Mediterranean Basin, whereas only 3 species are Eastern Mediterranean in distribution. Eighteen species (52.9 %) (Table 1: column PA) are

TABLE 1. Distribution of Lebanese psylloids. PA = Palaearctic; ME = Mediterranean; EM = E Mediterranean; IN = introduced; IS = Israel (based on records by BODENHEIMER 1937; HALPERIN *et al.* 1982; HALPERIN 1986; HALPERIN *et al.* 1988; BURCKHARDT & HALPERIN 1991; BURCKHARDT & LAUTERER 1997); SY = Syria (based on records by TALHOUK 1969; MUSTAFA 1991).

Lebanese species	PA	ME	EM	IN	IS	SY
Acizzia uncatoides (Ferris & Klyver)				+	+	
Agonoscena pistaciae Burckhardt & Lauterer	+				+	+^{1}
Arytainilla cytisi (Puton)		+			+	
Bactericera albiventris (Foerster)	+				+	
Bactericera curvatinervis (Foerster)	+					
Bactericera nigricornis (Foerster)	+					
Cacopsylla bidens (Šulc)	+				+	+^{2}
Cacopsylla brunneipennis (Edwards)	+					
Cacopsylla mariannae (Baeva)	+					
Cacopsylla myrthi (Puton)		+			+	
Cacopsylla pulchella (Löw)			+		+	
Cacopsylla pyrisuga (Foerster)	+					
Cacopsylla subpropinqua (Loginova)	+					
Cacopsylla sp.						
Colposcenia kiritshenkoi Loginova	+					
Craspedolepta pontica Dobreanu & Manolache	+				+	
Craspedolepta sonchi (Foerster)	+				+	
Cyamophila stoklosai Klimaszewski & Lodos	+					
Euphyllura phillyreae Foerster		+			+	
Euphyllura straminea Loginova			+		+	+^{3}
Eutrioza opima Loginova		+				
Homotoma ficus (L.)		+			+	+
Livia juncorum (Latreille)	+					
Livia mediterranea Loginova		+			+	
Livilla spectabilis (Flor)		+			+	
Megagonoscena gallicola Burckhardt & Lauterer			+		+	
Phylloplecta trisignata (Löw)		+			+	
Psylla (Baeopelma) colorata Löw	+					
Psylla (Baeopelma) foersteri Flor	+					
Trioza alacris Flor		+			+	
Trioza ilicina (de Stefani)		+				
Trioza marginepunctata Flor		+			+	
Trioza neglecta Loginova				+		
Trioza remota Foerster	+					
Trioza urticae (L.)	+				+	

[1] Recorded as *Agonoscena targionii* (Lichtenstein) by TALHOUK (1969).

[2] Recorded as *Psylla pyricola* Foerster by TALHOUK (1969), and as *Cacopsyalla pyricola* by OSSIANNILSSON (1992).

[3] Recorded as *Euphyllura olivina* (Costa) by TALHOUK (1969).

more or less widely distributed in the Palaearctic but are not restricted to the Mediterranean or Eastern Mediterranean Basin. Of interest is here the occurrence of *Cacopsylla subpropinqua* in Lebanon, previously known only from Mongolia, Siberia and the Russian Far East. A similar disjunct known distribution has *Cacopsylla saligna* (Loginova) in Spain and Kazakhstan (LAUTERER & BURCKHARDT 1997).

Two species, viz. *Acizzia uncatoides* and *Trioza neglecta*, have been introduced from Australia and East Asia respecitively. *Homotoma ficus* is treated here as Mediterranean element as it is established there for probably several thousands of years (see comments to *Homotoma ficus*).

A comparison with the fauna from Israel (Table 1) indicates that the Lebanon constitutes the Southern limit of a series of species associated with deciduous trees and shrubs such as *Alnus*, *Ostrya*, *Quercus*, *Salix* spp. etc. (*Bactericera albiventris*, *Cacopsylla brunneipennis*, *C. mariannae*, *C. pyrisuga*, *C. subpropinqua*, *Psylla colorata*, *P. foersteri* and *Trioza remota*). The psylloid fauna from Syria is insufficiently studied. Apart from the six species mentioned by TALHOUK (1969) and MUSTAFA (1991), there is one additional record from Syria which probably concerns Israel: *Livilla syriaca* (Löw) (HODKINSON & HOLLIS 1987). The species was originally recorded from "Syria: Kaifa (Reitter)" (LÖW 1882); this is a likely misspelling of Haifa in Israel.

Apart from two species with unknown host relationships (*Cacopsylla* sp. and *Eutrioza opima*), a vast majority of the known Lebanese psylloids develops on woody plants: 26 spp. on woody plants, 7 spp. on herbaceous plants. At this stage of knowledge it is difficult to judge whether this is real or due to the applied collecting techniques.

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Les organes producteurs de phéromones de quelques Hespérides (Lepidoptera, Hesperiidae, Hesperiinae)[1]

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The pheromone dispersing apparatus in some Hesperiinae (Lepidoptera: Hesperiidae). - In Hesperiinae (*Thymelicus lineola*. *Th. acteon* and *Hesperia comma*), the organization of the pheromone dispersing apparatus, as well as the morphology of the androconia, present a growing degree of complexification, possibly reflecting the evolution within the group. The apparatus is simply formed of patches of androconia in *Th. lineola*. In *Th. acteon*, the scales adjacent to the patches of androconia are slightly modified and oriented towards the androconial line. In *H. comma*, the patches of androconia are completely covered by the adjacent scales. In Hesperiinae, the androconia are tubular scales containing pheromone within hollow medulla. These scales can break into pieces named osmophores, which are the dispersing means of the pheromone. In *Th. lineola*, the androconia are tubular and do not break, but some of them present constrictions, which can be hypothesized as a precursor state of the dehiscent zones present in the two other species. In *Th. acteon*, all androconia present dehiscent zones and can break into osmophores, but they often remain unbroken. In *H. comma*, all androconia are broken and the freed osmophores are glued together into a net just under the roof of the covering scales.

Key-words: Lepidoptera - Hesperiidae - Androconia - Osmophores - Pheromone apparatus.

INTRODUCTION

Dans un précédent article (WÜEST 1997), nous avons présenté les appareils à phéromone des mâles de quelques papillons de jour du genre *Argynnis* sensu lato. Nous avons poursuivi notre étude au moyen du microscope électronique à balayage sur quelques espèces de la famille des Hespérides, sous-famille des Hesperiinae, qui présentent un appareil tout à fait original et sans exemple comparable connu: ce sont des écailles androconiales contenant le principe attractif actif, qui se rompent et jouent

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le rôle de support "macroscopique" de l'odeur. Ces éléments se comportent comme une poudre et peuvent être dispersés par le mâle au cours de ses battements d'ailes. On peut en retrouver collés sur les antennes de la femelle (SELLIER 1972) et il semble que la phéromone impliquée soit fort peu volatile et ait plutôt une action par contact. Ces écailles spécialisées avaient fait l'objet d'une étude de REVERDIN (1916) qui les avait décrites en microscopie optique et avait déjà vu les différences entre *Thymelicus lineola* et les autres espèces, celle-là présentant des écailles filiformes qui ne se rompent pas en segments alors que les autres espèces présentent des écailles en chapelets se rompant aisément. Les segments de ces écailles, en forme de petites saucisses, ont été appelés osmophores (SELLIER 1971, 1972; GRASSÉ 1975). Cependant, la morphologie de l'appareil à phéromone (disposition des écailles, types d'écailles, etc.) ne semble jamais avoir été étudiée en détail, malgré quelques indications chez SELLIER (1971), et nous voudrions en faire la description ici. Notre étude porte sur trois espèces qui illustrent bien la complexification de l'appareil et des écailles.

MATÉRIEL ET MÉTHODES

Les trois espèces étudiées [*Thymelicus lineola* (Ochsenheimer, 1808), *Th. acteon* (Rottemburg, 1775) et *Hesperia comma* (Linné, 1758)] proviennent du Valais (val d'Hérens, 1996). Les ailes ont été observées, après pulvérisation cathodique à l'or, dans un microscope électronique à balayage Zeiss 940A.

L'APPAREIL À PHÉROMONE

Chez les mâles des Hespérides de couleur générale orange (représentant la sous-famille des Hesperiinae, genres *Hesperia* et *Thymelicus* présentés ici), on peut remarquer à la face supérieure des ailes antérieures une sorte de dilatation noire de la nervure cubitale, le "trait androconial". Il s'agit d'une zone spécialisée dans la production et la diffusion des attracteurs sexuels de ce groupe de Rhopalocères (HIGGINS & RILEY 1971).

La partie essentielle de cet appareil est constituée d'une masse d'écailles plus ou moins fortement modifiées, les androconies (Figs 1, 5 & 11). Elle est organisée en plusieurs massifs placés à la suite l'un de l'autre et suivant plus ou moins le tracé de la nervure cubitale, qui borde la cellule discoïdale vers l'arrière. Si la coloration noire n'est pas présente à la face inférieure de l'aile, les massifs d'androconies s'y retrouvent chez *Th. lineola*. Les tissus de l'aile sont fortement épaissis à cet endroit, comme le signalent PIVNICK *et al.* (1992), renfermant probablement les cellules glandulaires à phéromones.

A partir de ce schéma, des états de complexification peuvent être mis en évidence en comparant les appareils de diverses espèces d'Hespérides.

Chez *Thymelicus lineola*, on trouve l'appareil le plus simple (Fig. 1). Les écailles entourant et bordant les massifs d'androconies ne sont pas modifiées, ni dans leurs formes, ni dans leurs orientations. Elles ont alignées longitudinalement comme la grande majorité des écailles de l'aile. Ce qui est visible sur l'aile, ce sont directement les androconies. Il n'y a pas spécialisation d'une des faces de l'aile, les androconies se trouvant sur les deux faces.

Chez *Thymelicus acteon*, une légère modification apparaît dans les écailles adjacentes à la zone des osmophores (Figs 5 & 6), qui deviennent plus larges et s'orientent perpendiculairement à la nervure médiane. Mais la zone des écailles à osmophores n'est pas couverte. Par contre, la face inférieure de l'aile ne présente aucun appareil androconial.

Hesperia comma présente l'appareil à phéromone le plus complexe. Cet organe est constitué de deux parties, une proximale arrondie, qui s'étend entre les nervures cubitale et anale, et une plus distale et allongée, qui court parallèlement à la nervure cubitale bordant la cellule discoïdale vers l'arrière (Figs 11 & 12). Les massifs d'osmophores, qui ont pourtant la même organisation que chez *Thymelicus acteon*, ne sont plus visibles de l'extérieur. Ils sont totalement recouverts par des écailles de couverture qui forment une sorte de toit au-dessus des osmophores (Figs 12 & 13). Ces écailles sont très nettement plus larges que les écailles banales des ailes. Elles sont recourbées dans le sens de la longueur, ce qui assure une couverture efficace des osmophores, et orientées perpendiculairement à la nervure médiane. Du côté antérieur, une partie des écailles adjacentes, de morphologie semblable aux écailles banales des ailes, est orientée vers la base de l'aile (Fig. 12). Cette zone est de couleur noire et tranche avec la couleur orange de l'aile. Les écailles à osmophores sont mélangées à des écailles classiques, filiformes ou légèrement aplaties, à côtes rectilignes (Fig. 14). A la face inférieure de l'aile, une légère boursouflure des écailles permet de localiser la zone, sans que des androconies soient présentes.

LES ANDROCONIES DE LA ZONE À PHÉROMONE

Chez *Thymelicus lineola*, les androconies ne sont pas modifiées en écailles porteuses d'osmophores. Les éléments diffuseurs de phéromone se présentent comme de simples écailles filiformes à côtes longitudinales (Fig. 2). Leur tige d'implantation est relativement longue; l'apex est lisse et résulte de la coalescence des côtes. Elles ne présentent pas d'amincissements de déhiscence et ne se rompent pas. La phéromone doit ici être diffusée sous la forme de vapeur. Pourtant, en examinant un grand nombre de ces écailles, on peut repérer sur certaines des zones où les côtes s'effacent, et où le cylindre de l'écaille a tendance à se boursoufler, préfigurant une zone de déhiscence (Fig. 4). Mais les côtes restent toujours strictement longitudinales.

Chez *Thymelicus acteon* et *Hesperia comma*, les écailles portant le principe attractif sont fortement modifiées et forment des segments appelés osmophores.

Il s'agit d'écailles très allongées, filiformes, présentant sur leur longueur un certain nombre de restrictions ou zones de déhiscence. Les segments ou osmophores se détachent et peuvent reformer un réseau (Figs 7, 8 & 13), leurs extrémités étant adhésives (particulièrement chez *H. comma*), peut-être du fait de la présence de la substance active sous forme non volatile qui remplit la cavité centrale (GRASSÉ 1975).

Il est rare de rencontrer de telles écailles entières. En effet, elles sont destinées à se rompre au niveau de chaque zone de dehiscence, libérant ainsi de courts tronçons en forme de saucisses qui sont les éléments de transport de la phéromone. On peut cependant trouver parfois plusieurs segments encore attachés les uns aux autres (Fig. 8). La zone d'implantation de ces écailles montre qu'elles présentent dès la base la structure des segments osmophores (Figs 7 & 14).

La forme des osmophores est assez constante d'une espèce à l'autre. Par contre, leur longueur est extrêmement variable d'un osmophore à l'autre et peut mesurer entre 10 µm et 50 µm et plus. Quelques petits détails de structure ou d'ornementation différencient les espèces étudiées ici, en particulier dans les zones de déhiscence.

D'une manière générale, les osmophores présentent une partie renflée terminée à chaque extrémité par les zones de déhiscence. La partie renflée présente des côtes, avec des perforations dans les parties creuses entre les côtes, comme dans la plupart des écailles. Cependant, les côtes, au lieu d'être rectilignes, sont enroulées autour du cylindre de l'osmophore, avec un pas variable. Les zones de déhiscence, ou d'accrochage d'un osmophore à son voisin, forment un petit renflement lisse, porteur de l'orifice de communication entre les osmophores. C'est à ce niveau surtout que se constatent les différences spécifiques.

Les écailles à osmophores de *Th. acteon* ne semblent pas très fragiles, puisqu'on trouve beaucoup d'entre elles portant encore des chapelets d'osmophores; d'autre part, les masses d'osmophores consistent en majeure partie en baguettes de plusieurs osmophores non séparés (Figs 7 & 8). Les massifs d'osmophores sont constitués de ces baguettes emmmêlées, sans qu'un réseau d'osmophores collés se mette en place comme chez *H. comma*. La zone d'écailles à osmophores consiste presque exclusivement en ce type d'écailles, avec quelques rares écailles étroites en général peu modifiées (Fig. 7). La base des écailles à osmophores présente une morphologie en tous points semblable à celle des osmophores (longueur du segment, largeur, ornementation) (Fig. 7).

Chez *Th. acteon*, les segments ont environ 2,5 µm de diamètre. Huit côtes garnissent la surface et font environ 2,5 fois le tour du segment pour un osmophore de 15 µm de long (Fig. 9). Les côtes ne présentent pas d'ornementation et les perforations ont des dimensions variables (Fig. 10). Les extrémités de chaque segment présentent un renflement très bombé et lisse. L'ouverture du canal est placée latéralement (Fig. 9). La longueur des osmophores peut être très variable (Fig. 8). L'orientation des côtes peut également varier et parfois onduler le long des écailles (Fig. 8). On peut trouver des figures aberrantes d'osmophores présentant des chapelets de boules de jonction entre eux.

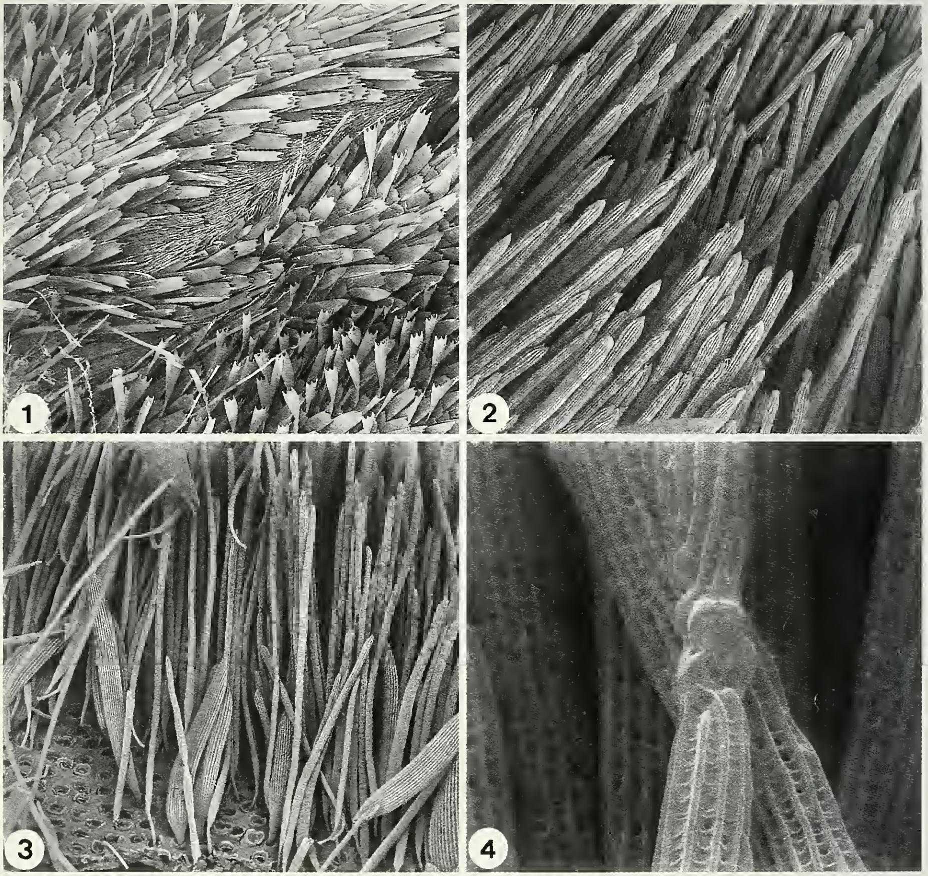
Chez *H. comma*, les écailles à osmophores semblent très fragiles, puisque nous n'avons trouvé aucun osmophore en place (Fig. 14). Tous les osmophores sont regroupés à la surface de la zone, sous les écailles de couverture où ils forment des aggrégats collés en réseau (Fig. 13). On peut voir, entre les écailles peu modifiées qui parsèment la zone à androconies, les bases des écailles à osmophores restées en place (Fig. 14). Les osmophores ont toujours le même diamètre de 2,5 µm. Les huit côtes présentent un pas plus ou moins serré et peuvent faire 1,5 à 3,5 fois le tour d'un segment de 20 µm de long. Les extrémités du segment sont fusiformes et l'ouverture est latérale (Fig. 15). Par contre, les côtes présentent une ornementation transversale particulière sous la forme de petits bourrelets (Fig. 16). La base des écailles à osmophores est beaucoup plus courte que les osmophores, mais présente la même ornementation superficielle. Les osmophores de cette espèce ont la faculté de se recoller à un autre segment et de former un réseau très intriqué qui remplit tout l'espace entre les écailles banales qui sont mélangées aux androconies et les écailles de couverture (Figs 13 & 14). Ce réseau d'osmophores collés a tendance à se localiser en surface de la zone à androconies, peut-être poussé vers le haut par les écailles banales (Fig. 13).

DISCUSSION

Parmi les trois espèces étudiées, on peut distinguer une gradation nette dans la complexité de l'appareil à phéromone. Chez *Thymelicus lineola*, la zone à androconies se présente simplement comme une zone à écailles modifiées, sans que les écailles adjacentes aient subi une quelconque transformation (forme ou orientation). De plus, les massifs d'androconies se trouvent chez cette seule espèce sur les deux faces de l'aile, indiquant un état non encore spécialisé. Chez *T. acteon*, par contre, on note que les écailles bordant la zone à osmophores sont plus larges et s'orientent perpendiculairement à la zone à osmophores, préfigurant l'apparition d'écailles de recouvrement. Mais les osmophores restent bien visibles de l'extérieur. C'est chez *Hesperia comma* enfin, que l'appareil est le plus complexe. La zone à osmophores est entièrement cachée par des écailles de recouvrement, et la libération des osmophores doit être plus restreinte, dans des étapes bien précises de l'accouplement. Chez cette dernière espèce, la présence d'écailles filiformes normales parmi les écailles à osmophores permettrait d'envisager que ces dernières par leurs mouvements réciproques facilitent la rupture des segments osmophores et les conduisent vers la surface de la zone à androconies.

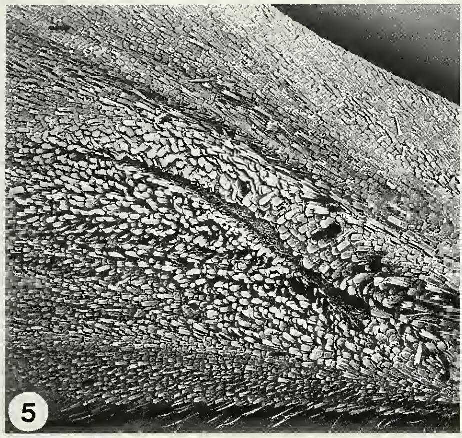
Ces étapes évolutives discutées ci-dessus rappellent ce que nous avions décrit chez les espèces du groupe des *Argynnis* Fab. 1807 (Wüest 1997). Chez *Speyeria aglaja* (Linné, 1758), la zone des androconies (qui ne libère pas d'osmophores) n'est pas recouverte par des écailles de recouvrement, contrairement à ce que nous pouvons trouver chez *Argynnis paphia* (Linné, 1758) sur la seconde nervure cubitale; cependant la zone modifiée (contenant des écailles à phéromone) des autres nervures (médiane, cubitale 1 et anale) de *A. paphia* ne présente pas ce toit d'écailles de recouvrement. Nous devons être chez les Argynnes en présence d'un cas montrant les étapes de l'évolution de l'appareil à phéromone, entre deux espèces et aussi entre les nervures à l'intérieur d'une même espèce.

Il semblerait donc que l'évolution ait tendance à protéger de tels appareils du milieu extérieur en recourant à plusieurs occasions (exemple de phénomènes de convergence entre des superfamilles différentes, quoique proches, les Hesperioidea et les Papilionoidea) à des écailles de couverture, aussi bien chez les Hespérides



Figs 1-4. *Thymelicus lineola*. - 1. Zone à phéromone de l'aile antérieure (face supérieure). On distingue directement les massifs d'androconies. G = 40x. - 2. Détail de la surface des massifs d'androconies. Il n'y a pas d'osmophores. G = 600x. - 3. Zone à androconies en coupe, montrant quelques rares restrictions sur la longueur des écailles filiformes. G = 430x. - 4. Androconie présentant une restriction et amorçant le processus de formation des osmophores. G = 6300x.

Figs 5-10. *Thymelicus acteon*. - 5. Zone à phéromone. G = 12x. - 6. Détail de la zone à phéromone. Les écailles adjacentes sont élargies et orientées perpendiculairement à la nervure. G = 60x. - 7. Zone à phéromone en coupe. Les osmophores restent en baguettes non détachées. G = 300x. - 8. Massifs d'osmophores. De nombreux segments restent attachés les uns aux autres. G = 1220x. - 9. Osmophore. G = 3100x. - 10. Détail de la partie centrale d'un osmophore. G = 18'500x.



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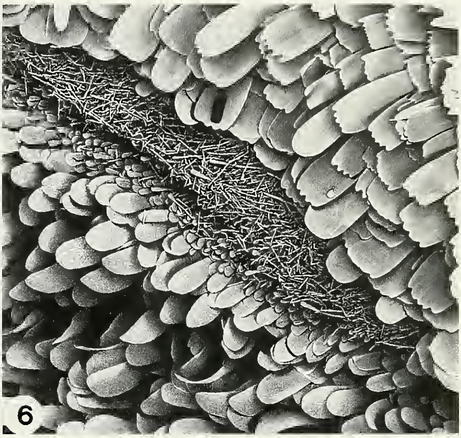

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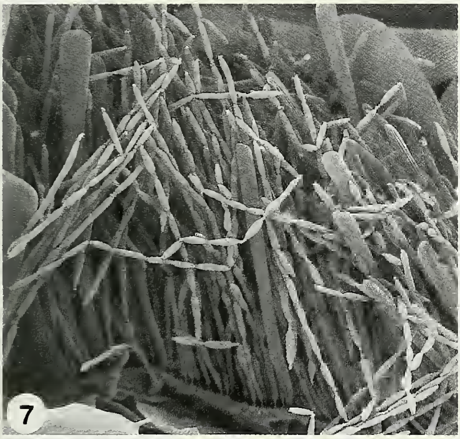

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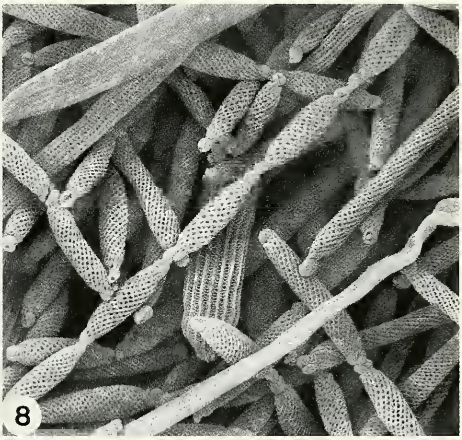

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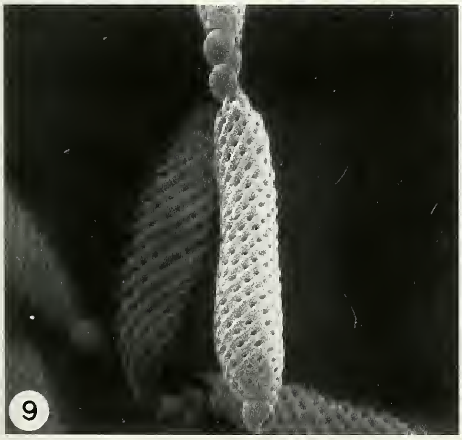

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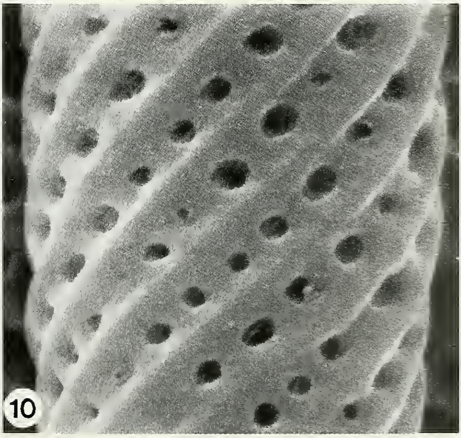

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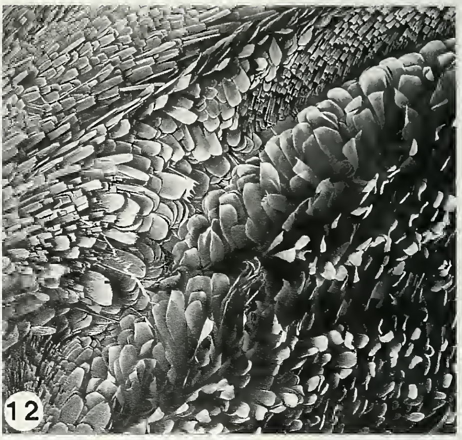
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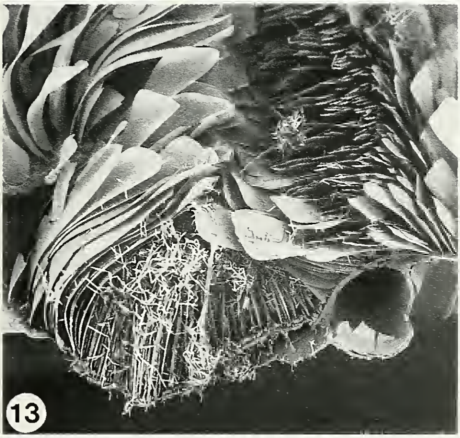
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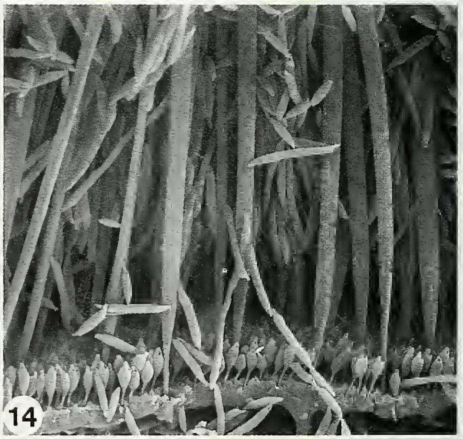
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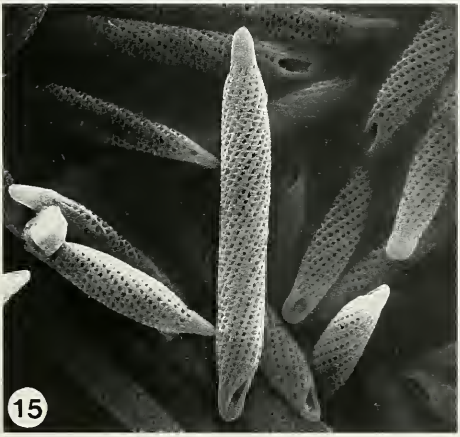
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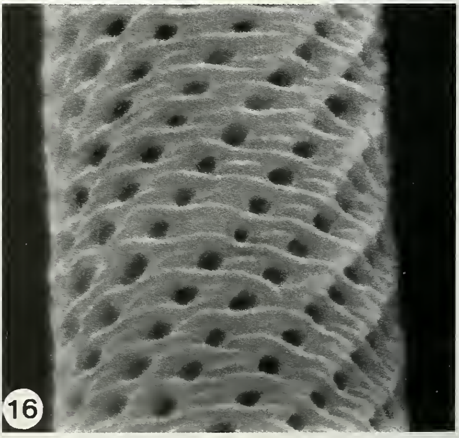
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(Hesperiinae, mais aussi Pyrginae, qui feront l'objet d'un prochain travail) que chez les Argynnes (Sellier 1971; Barth 1944). On peut penser que cela permettrait d'éviter un gaspillage des principes actifs, ou d'assurer leur diffusion seulement dans certaines phases du comportement de cour. Mais il est bien sûr illusoire de penser vérifier cette hypothèse en visualisant la position des écailles de recouvrement pendant les différentes étapes de l'accouplement, même si Barth (1944) a décrit les déplacements des écailles de l'appareil des Argynnes pendant le vol, permettant la libération des phéromones. Il serait intéressant de vérifier si on retrouve une telle architecture des appareils à phéromone (massifs d'androconies recouverts par des écailles de couverture) chez d'autres groupes de rhopalocères: chez les papillons de jour, les phéromones jouent un rôle dans les phases rapprochées de l'accouplement, après les informations visuelles, contrairement aux papillons nocturnes où les sémio-chimiques ont une action primaire à longue distance. Il serait aussi intéressant de chercher de tels exemples chez d'autres Lépidoptères diurnes n'appartenant pas aux Rhopalocères.

Quant aux androconies elles-mêmes, nous avons pu mettre en évidence ici également une gradation entre les espèces étudiées, et cette gradation recouvre celle concernant la complexité de l'appareil lui-même. *Thymelicus lineola* représente un état peu différencié, puisque les androconies se présentent comme de simples écailles filiformes peu modifiées. Cependant, quelques-unes de ces écailles montrent une tendance à former des zones modifiées rappelant les zones de déhiscence des autres espèces, et Pivnick *et al.* (1992) ont montré que ces zones de déhiscence semblent se multiplier au cours de la vie imaginale, sans en expliquer le mécanisme. *Thymelicus acteon*, lui, présente deux types d'écailles dans la zone à androconies, des écailles filiformes semblables à celles de *Th. lineola*, et de véritables écailles à osmophores. Il faut noter que les écailles filiformes peuvent présenter des côtes non plus longitudinales, mais inclinées, et rappeler ainsi les écailles à osmophores. Nous trouvons donc ici aussi des intermédiaires entre les deux types d'androconies. Enfin, *Hesperia comma* présente des osmophores un peu différents de ceux de *Th. acteon*, avec des extrémités fusiformes. Les écailles normales parsemées dans la zone à osmophores sont filiformes ou légèrement aplaties, mais ne présentent pas d'intermédiaires avec les androconies à osmophores.

Un autre critère concerne la fragilité des androconies à osmophores. Chez *Th. lineola*, les limites entre segments de type osmophore n'étant que partiellement indiquées, ces écailles ne se rompent pratiquement pas et restent entières dans la zone à androconies, quoique Pivnick *et al.* (1992) démontrent que les cassures, comme les zones de déhiscence, se multiplient avec l'âge de l'imago. Chez *Th. acteon*, les

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Figs 11-16. *Hesperia comma*. - 11. Zone à phéromone. Les massifs d'osmophores sont recouverts par des écailles de couverture. G = 9x. - 12. Détail montrant les écailles de couverture élargies et recourbées à l'apex. G = 23x. - 13. Coupe d'une chambre à osmophores. G = 60x. - 14. Détail d'une coupe de chambre à androconies montrant les écailles filiformes non modifiées et les écailles à osmophores toutes rompues. G = 435x. - 15. Osmophore. G = 2400x. - 16. Détail d'un osmophore. G = 18'500x.

osmophores sont libérés par rupture, mais on peut trouver des androconies entières ou de longs chapelets d'osmophores intacts. Enfin, chez *Hesperia comma*, toutes les androconies ont libéré leurs osmophores qui, par leurs hautes propriétés collantes, ont reformé un réseau en surface des androconies, poussés peut-être par les écailles filiformes présentes dans la zone, et peuvent se retrouver collés sur les antennes des femelles.

Nous avons voulu rechercher si les espèces étudiées ici (*Th. lineola* et *Th. acteon, H. comma*) avaient fait l'objet de travaux sur la constitution chimique de leurs phéromones, ou sur les séquences de certains de leurs gènes, ce qui aurait permis de déduire des liens de parentés entre ces trois espèces, et de vérifier si notre hypothèse d'une complexification et donc d'une évolution, dont les étapes se seraient maintenues chez *Th. lineola*, *Th. acteon* et *H. comma*, était corroborée par les méthodes moléculaires. A notre connaissance, seuls Pivnick *et al.* (1992) ont effectué des électroantennogrammes sur *Th. lineola*, qui ont permis de prouver l'émission de phéromones chez les Hespériides. Nous avons en outre consulté des banques de données sur les phéromones et sur les séquences de DNA, ainsi que le Zoological Record (entre 1972 et 1997), mais sans parvenir à trouver aucun représentant de la famille des Hespérides. Nous envisageons dans un prochain travail d'orienter nos recherches dans cette direction.

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REVUE SUISSE DE ZOOLOGIE 105 (4): 823-833; décembre 1998

Nouvelles espèces asiatiques du genre *Bryaxis* et quelques données sur des espèces connues (Coleoptera: Staphylinidae: Pselaphinae)

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New Asian species of the genus *Bryaxis*, and data on previously known species (Coleoptera: Staphylinidae: Pselaphinae). - The following new species of *Bryaxis* from China are described: *B. kimi* sp. n. and *B. nametkini* sp. n. from the prov. Sichuan, *B. pletnevi* sp. n. from the prov. Hubei, *B. ruidus* sp. n. and *B. mendax* sp. n. from the prov. Zhejiang, *B. fictor* sp. n. from the prov. Shaanxi. *Bryaxis valentulus* sp. n. is described from the Russian western Altai. An unidentified member of *Bryaxis* is recorded from Burma, and new records are given for *B. sacrificus* Kurbatov & Löbl and *B. panda* Kurbatov & Löbl.

Key-words: Coleoptera - Staphylinidae - Pselaphinae - *Bryaxis* - China - Russia - Burma.

INTRODUCTION

Avec quelque 300 espèces recensées, dont de très nombreux endémiques locaux, *Bryaxis* Kugelann est certainement le genre de Pselaphinae paléarctiques ayant la plus forte diversité spécifique et écologique. La plupart des espèces de *Bryaxis* se rencontrent dans les régions circum-méditerranéennes et à l'extrême Est de la Russie, en Corée, au Japon et à Taiwan. Hormis *B. bulbifer* (Reichenbach) qui est répandu en Europe et en Sibérie, le genre est apparemment absent d'un territoire immense s'étirant de la Mer Caspienne au bassin du fleuve Amour et incluant toute la région himalayenne ainsi que les pays limitrophes.

Actuellement, 12 espèces de *Bryaxis* ont été recensées en République Populaire de Chine (ci-dessous: Chine), dont une, *B. koltzei* (Reitter), est largement répandue (COULON & LI 1995; KURBATOV & LÖBL 1995), et une autre, *B. heilongjiangensis* (LI & CHEN 1993), comporte dans l'illustration adjointe à sa description originale des caractères manifestement artefactuels. La faune des *Bryaxis* de Chine semble pauvre par rapport à certaines régions voisines où l'on en dénombre 13 espèces de Corée (LÖBL 1977; NOMURA & LEE 1993), 19 à Taiwan (LÖBL & KURBATOV 1996) et 34 au Japon (LÖBL *et al.* 1998).

Basée sur des récoltes récentes, cette étude comporte la description d'une espèce nouvelle de *Bryaxis* de l'Altaï russe et de six espèces nouvelles de Chine.

Manuscrit accepté le 11.09.1998

D'autre part, une espèce vraisemblablement nouvelle pour la science, mais non-décrite en l'absence des caractères essentiels du mâle, est signalée de Birmanie, et de nouvelles données sur la distribution de deux espèces de *Bryaxis* sont fournies.

Abréviations utilisées:

CSKM	Collection privée de S. A. Kurbatov, Moscou
MHNG	Muséum d'histoire naturelle, Genève
ZMAN	Muséum Zoologique de la Division Sibérienne de l'Académie Russe de Sciences, Novosibirsk
ZMUM	Muséum Zoologique, Moscou

DESCRIPTIONS

Bryaxis kimi sp. n. Figs 1, 12

Holotype ♂: Chine, sud de la province de Sichuan, environs de Xichang, 1700 m, débris végétaux, 26.VII.1996, leg. S. A. Kurbatov (ZMUM). Paratypes: mêmes données que l'holotype, 2 ♂, 10 ♀ (ZMUM, MHNG, CSKM).

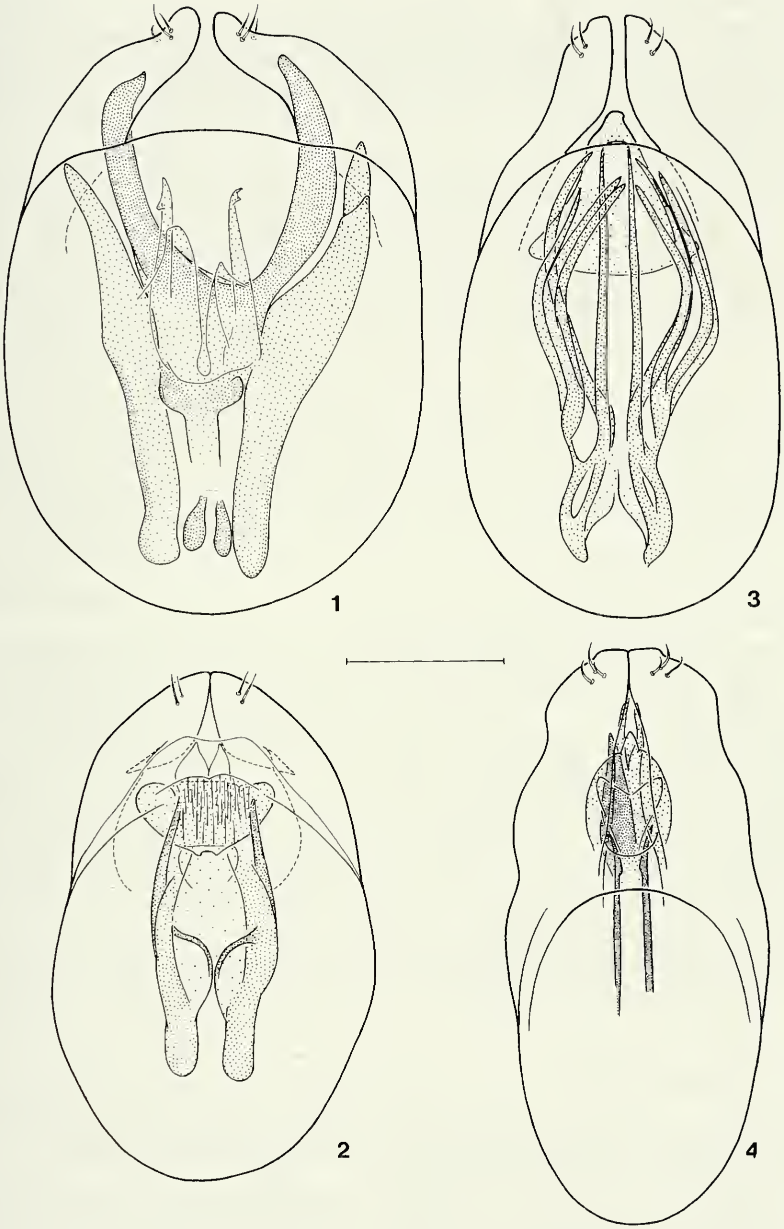
Longueur: 1,45-1,55 mm; largeur maximale: 0,65-0,68 mm. Corps brun. Pubescence semi-érigée, plus longue sur les élytres et sur l'abdomen que sur l'avant-corps. Tête densément et presque entièrement ponctuée, les diamètres des points plus grands que les intervalles entre eux. Moitié basale de la dépression frontale et tubercules antennaires lisses. Lobe frontal large de 0,19-0,20 mm, très légèrement rétréci en arrière. Bord antérieur du front incliné en avant. Centre des fossettes du vertex situé en arrière du bord antérieur des yeux. Carène occipitale atteignant le bord postérieur de la dépression frontale. Yeux ♂ nettement plus longs que les tempes en vue latérale, comportant 20-25 ommatidies; yeux ♀ aussi longs que les tempes en vue latérale, comportant 10-12 ommatidies. Articles 2 et 3 des palpes maxillaires dépourvus de tubercules. Articles antennaires: 3 plus long que large, 4-8 égaux, aussi longs que larges ou 7-8 à peine transverses, 9 aussi long et plus large que 8, 10 plus long et plus large que 9, 11 plus long que 8 à 10 réunis. Pronotum plus large que long, avec la même ponctuation que le vertex. Elytres à ponctuation plus grande et plus superficielle que celle du pronotum, diamètres des points le plus souvent plus grands que les intervalles entre eux.

♂. Articles 1 à 3 de l'antenne comme Fig. 12; scape long de 0,17 mm, pédicelle long de 0,06 mm. Protibias dépourvus d'échancrure, métatibias avec une petite dent apicale. Edéage (Fig. 1) long de 0,40 mm.

♀. Scape cylindrique, 2 fois plus long que large, pédicelle ovale, plus long que large, plus long que l'article 3.

Cette espèce est proche de *B. emeicus* Kurbatov & Löbl, 1995. Elle en offre l'ensemble des caractères, notamment la forme de l'édéage, très similaire à ceux de *B. emeicus* dont elle diffère nettement par le nombre et la forme des pièces sclérifiées du sac interne de l'édéage, en particulier par les branches du sclérite apical plus étroites et moins asymétriques.

Etymologie. L'espèce est nommée en l'honneur du Dr Boris B. Kim (Université de Moscou), dont l'aide a permis au premier auteur de réaliser un de ses voyages en Chine.



FIGS 1 à 4

Bryaxis, édéages, vue dorsale: 1. *B. kimi* sp. n.; 2. *B. nametkini* sp. n.; 3. *B. pletnevi* sp. n.; 4. *B. ruidus* sp. n. Echelles = 0,1 mm.

Bryaxis nametkini sp. n. Figs 2, 13

Holotype ♂: Chine, sud de la province de Sichuan, au sud de Xichang, Mt. Luoji, 2300 m, débris végétaux, 17.VII.1996, leg. S. A. Kurbatov (MHNG). Paratypes: mêmes données que l'holotype, 4 ♂, 7 ♀; mêmes données mais 18.VII.1996, 4 ♂, 5 ♀; mêmes données mais 2500 m, 23.VII.1996, 2 ♂, 2 ♀; mêmes données mais 2500 M, 24.VII.1996, 1 ♂ (ZMUM, MHNG, CSKM).

Longueur: 1,45-1,55 mm; largeur maximale: 0,65-0,69 mm. Corps d'un brun rougeâtre à brun. Pubescence semi-érigée, plus longue sur les élytres et sur l'abdomen que sur l'avant-corps. Tête densément ponctuée, les diamètres des points plus grands que les intervalles entre eux. Moitié basale de la dépression frontale lisse, ponctuation sur les tubercules antennaires très fine et éparse. Lobe frontal comme chez *B. kimi*, large de 0,19-0,20 mm. Bord antérieur du front, fossettes du vertex et carène occipitale comme chez *B. kimi*. Yeux ♂ plus longs que les tempes en vue latérale, comportant 20 ommatidies environ; yeux ♀ plus courts que les tempes en vue latérale, comportant 5-10 ommatidies. Palpes maxillaires comme chez *B. kimi*. Articles antennaires: 3 plus long que large, 4-5 aussi longs que larges, 6-7 à peine transverses, 8 de la même longueur, mais à peine plus large, 9 plus large et à peine plus long que 8, 10 plus long et plus large que 9, 11 aussi long que 8-10 réunis. Pronotum plus large que long, ponctué comme le vertex. Ponctuation des élytres formée de points plus grands et plus superficiels que ceux du pronotum, les diamètres des points généralement plus grands que les intervalles entre eux.

♂. Articles 1 à 3 de l'antenne comme Fig. 13; scape long de 0,17 mm, pédicelle long de 0,06 mm. Protibias et métatibias comme chez *B. kimi*. Edéage (Fig. 2) long de 0,32 mm.

♀. Scape cylindrique, environ 2 fois plus long que large, pédicelle ovale, plus long que large, plus long que l'article 3.

Espèce ressemblant à *B. kimi* par les caractères externes, mais en différant par la proportion des articles antennaires 6-11 et par la forme du scape chez le ♂. L'édéage diffère très nettement de celui de *B. kimi* et de *B. emeicus* par les paramères plus larges, ornés chacun d'une seule paire de soies, et par la forme de pièces sclérifiées symétriques du sac interne de l'édéage.

Etymologie. L'espèce est nommée en l'honneur du Dr Serguei N. Nametkin (Université de Moscou) qui a soutenu les missions du premier auteur effectuées en Chine.

Bryaxis pletnevi sp. n. Figs 3, 14

Holotype ♂: Chine, est de la province de Hubei, à 30 km au nord-est de Macheng, environ 500 m, débris végétaux, 25.V.1995, leg. S. A. Kurbatov (ZMUM). Paratypes: mêmes données que l'holotype, 2 ♀ (ZMUM, MHNG).

Longueur: 1,5 mm; largeur maximale: 0,64-0,70 mm. Corps brun. Pubescence comme chez les deux espèces précédentes. Ponctuation sur la tête et le pronotum encore plus dense, les intervalles entre les points beaucoup plus petits que les diamètres des points. Fond de la dépression frontale et les tubercules antennaires lisses. Yeux ♂ bien plus grands que les tempes en vue latérale, comportant 20 ommatidies environ; yeux ♀ aussi longs que les tempes en vue latérale, comportant 10-12 ommatidies. Autres caractères de la tête comme chez *B. kimi* et *B. nametkini*. Articles antennaires: 3 un peu plus long que large, 4-8 progressivement raccourcis, 4 aussi long que large, 8 nettement plus large que long, 9 aussi long que 8, mais nettement plus large, 10 encore plus large et un peu plus long, presque 2 fois plus large que long, 11 aussi long que 7-10 réunis. Pronotum plus large que long, ponctué aussi densément que le vertex. Ponctuation sur les élytres formée de points plus grands, plus superficiels et beaucoup plus épars que les points sur l'avant-corps, les diamètres des points en général un peu plus grands que les intervalles.

♂. Articles 1 à 3 de l'antenne comme Fig. 14; scape long de 0,165 mm, pédicelle long de 0,06 mm. Fémurs renflés; protibias, sur leur quart distal, ornés d'une échancrure nette, délimitée par une dent; métatibias munis d'une longue dent apicale. Edéage (Fig. 3) long de 0,39 mm.

♀. Scape et pédicelle comme chez les espèces précédentes.

Cette espèce ressemble à *B. kimi* par la forme du scape et du pédicelle ♂. Elle en diffère par la ponctuation de l'avant-corps plus dense et par l'édéage beaucoup plus étroit, à sac interne symétrique, orné de nombreux stylets et d'une plaque apicale.

Etymologie. L'espèce est dédiée à Vladimir A. Pletnev, entomologiste de Moscou et ami du premier auteur.

Bryaxis ruidus sp. n. Figs 4, 15

Holotype ♂: Chine, province de Zhejiang, Tienmushan, 2.IX.1994, leg. G. de Rougemont (MHNG). Paratypes: mêmes données que l'holotype, 1 ♂, 2 ♀ (MHNG).

Longueur: 1,5-1,55 mm; largeur maximale: 0,63-0,70 mm. Corps brun, élytres parfois plus clairs, brun rougeâtres. Pubescence comme chez les espèces précédentes. Tête comme chez *B. pletnevi*, mais dépourvue d'une carène occipitale. Yeux comportant 22-25 ommatidies chez le ♂ et 8-10 chez la ♀. Articles antennaires: 3 plus long que large, 4 et 5 aussi longs que larges, 6 à 8 à peine transverses, 9 à peine plus large et plus long que 8, légèrement transverse, 10 nettement plus large et à peine plus long que 9, 11 plus long que 8-10 réunis. Pronotum plus large que long, sa ponctuation très dense, presque aussi dense que celle du vertex; les diamètres des points beaucoup plus grands que les intervalles. Elytres avec la ponctuation plus éparse, les points plus grands et plus superficiels que sur le pronotum, à peine plus grands que les intervalles entre eux.

♂. Articles 1 à 3 de l'antenne comme Fig. 15; scape long de 0,13 mm, pédicelle long de 0,10 mm. Pattes comme chez *B. pletnevi*, mais la dent apicale des métatibias plus courte. Edéage (Fig. 4) long de 0,37 mm.

♀. Scape cylindrique, à peu près 1,5 fois plus long que large, pédicelle ovale, d'un tiers plus court que le scape.

L'espèce ressemble à *B. holciki* Löbl, 1964 par l'absence de la carène occipitale, par la forte ponctuation sur la tête et sur le pronotum et par les caractères sexuels secondaires. Elle en diffère notamment par le sac interne de l'édéage plus complexe, muni de stylets très fins et de pièces sclérifiées pus larges, progressivement rétrécies vers l'apex.

Bryaxis mendax sp. n. Figs 5, 16

Holotype ♂: Chine, province de Zhejiang, Tienmushan, 2.IX.1994, leg. G. de Rougemont (MHNG). Paratypes: mêmes données que l'holotype, 2 ♀ (MHNG).

Longueur: 1,45-1,55 mm; largeur maximale: 0,64-0,67 mm. Uniformément brun, pubescence comme chez *B. kimi*. Tête comme chez *B. ruidus*. Yeux deux fois plus longs que les tempes en vue latérale et comportant 25 ommatidies environ chez le ♂; yeux ♀ un peu plus longs que les tempes en vue latérale et comportant 10 ommatidies environ. Articles antennaires: 3 un peu plus long que large, 4-8 à peine plus larges que longs, égaux, 9 plus large et plus long que 8, légèrement transverse, 10 aussi long et plus large que 9, 11 plus long que 8-10 réunis. Pronotum à peine plus large que long, sa ponctuation nettement moins dense que celle du vertex. Elytres à ponctuation aussi dense que celle du pronotum, mais formée de points plus grands et plus superficiels; les diamètres des points en général un peu plus grands que les intervalles entre eux.

♂. Articles 1 à 3 de l'antenne comme Fig. 16; scape long de 0,10 mm, pédicelle long de 0,09 mm. Protibias très légèrement échancrés sur leur quart distal, dépourvus de dent à la base de l'échancrure; métatibias munis d'une dent apicale légèrement pointue. Edéage (Fig. 5) long de 0,35 mm, paramères fortement courbés dorsalement à l'apex.

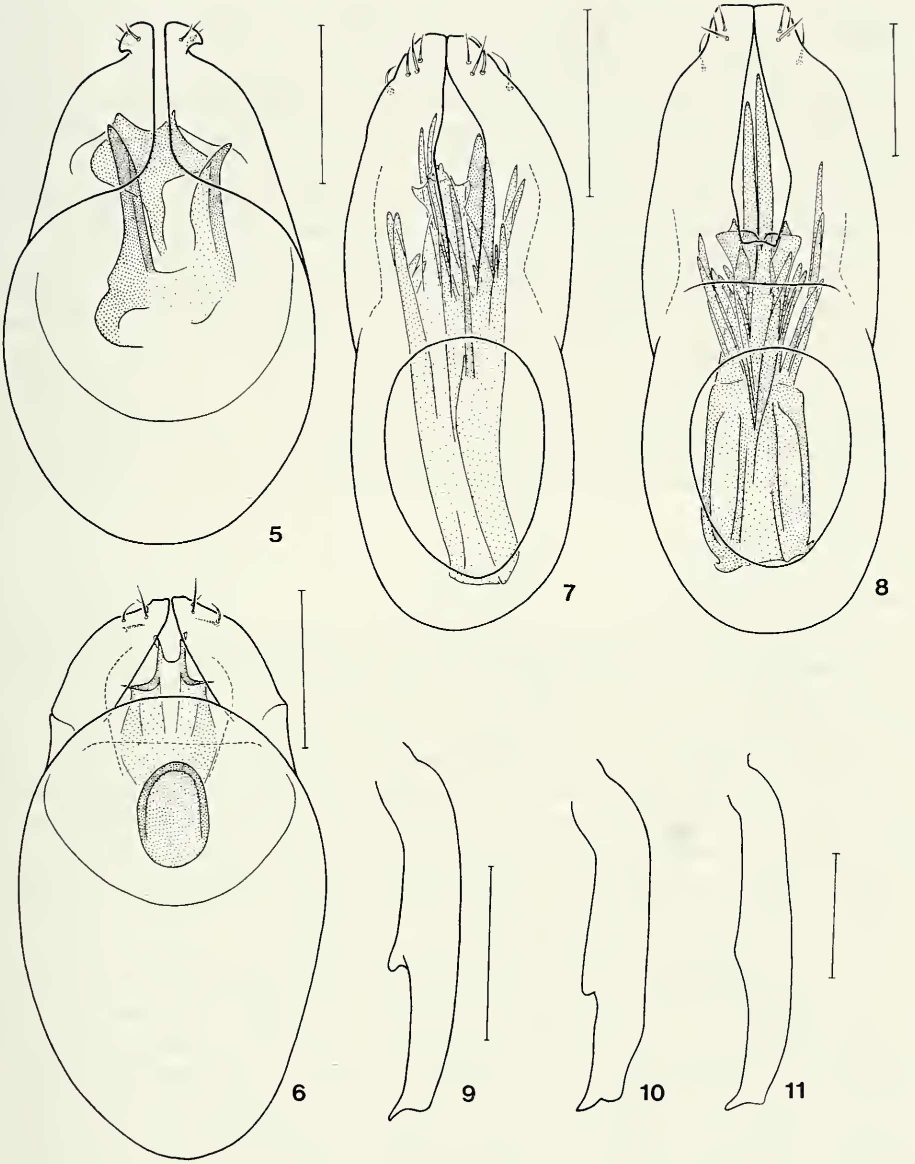
♀. Scape cylindrique, à peine plus long que large, pédicelle allongé, un peu plus court que le scape.

Cette espèce ressemble à *B. ruidus*, notamment par la conformation de la tête. Elle en diffère par le pronotum à ponctuation nettement moins dense et, surtout, par l'édéage. Les paramères sont échancrés subapicalement chez *B. mendax*, semblables à ceux de *B. smetanai* Löbl; les pièces sclérifiées du sac interne, constituées d'une paire de grandes dents latérales et d'une plaque centro-apicale, sont très caractéristiques chez ces espèces.

Bryaxis fictor sp. n. Figs 6, 17

Holotype ♂: Chine, province de Shaanxi, Nonwutai, à peu près 25 km sud de Xian, 400-800 m, 17.IX.1995, débris végétaux, leg. G. de Rougemont (MHNG).

Longueur: 1,5 mm; largeur maximale: 0,67 mm. Corps uniformément brun. Pubescence comme chez *B. kimi*. Tête densément ponctuée, la dépression frontale et les tubercules antennaires lisses. Lobe frontal long de 0,20 mm, à côtés subparallèles. Bord antérieur du front incliné en avant. Centre des fossettes du vertex situé en arrière du niveau du bord antérieur des yeux. Carène occipitale presque absente, à peine visible au niveau de la moitié postérieure des fossettes du tentorium. Yeux plus longs que les tempes en vue latérale, comportant 20 ommatidies environ. Articles 2 et 3 des palpes maxillaires dépourvus de tubercules. Articles antennaires: 3 plus long que large, 4-8 subégaux, à peine transverses, 9 plus long et à peine plus large que 8, légèrement transverse, 10 plus grand que 9, plus transverse, 11 aussi long que 7-10 réunis. Pronotum légèrement plus large que long, ayant la même ponctuation que le vertex. Elytres à ponctuation un peu moins dense que celle du pronotum; les points



Figs 5 à 11

Bryaxis, édéages, vue dorsale, et métatibias ♂, vue latérale: 5. *B. mendax* sp. n., édéage; 6. *B. fictor* sp. n., édéage; 7, 10 et 11. *B. valentulus* sp. n., édéage (7) et métatibias (10 et 11); *B. femoratus* (Aubé), édéage (8) et métatibia (9). Echelles = 0.1 mm (Figs 5 à 8); = 0.2 mm (Figs 9 à 11).

plus grands et plus superficiels que sur le pronotum; les diamètres des points plus grands que les intervalles entre eux.

♂. Articles 1 à 3 de l'antenne comme Fig. 17; scape long de 0,10 mm, pédicelle long de 0,10 mm, large de 0,12 mm. Partie centrale du métasternum avec une ponctuation fine mais particulièrement dense. Profémurs légèrement mais nettement déprimés à la base du bord inférieur, sur une surface à peu près aussi grande que le protrochanter. Protibias légèrement échanrés sur leur quart distal; échancrure limitée par une dent. Métatibias munis d'une petite dent apicale. Tubercule gulaire grand et complexe, saillant en avant en vue latérale. Edéage (Fig. 6) long de 0,36 mm.

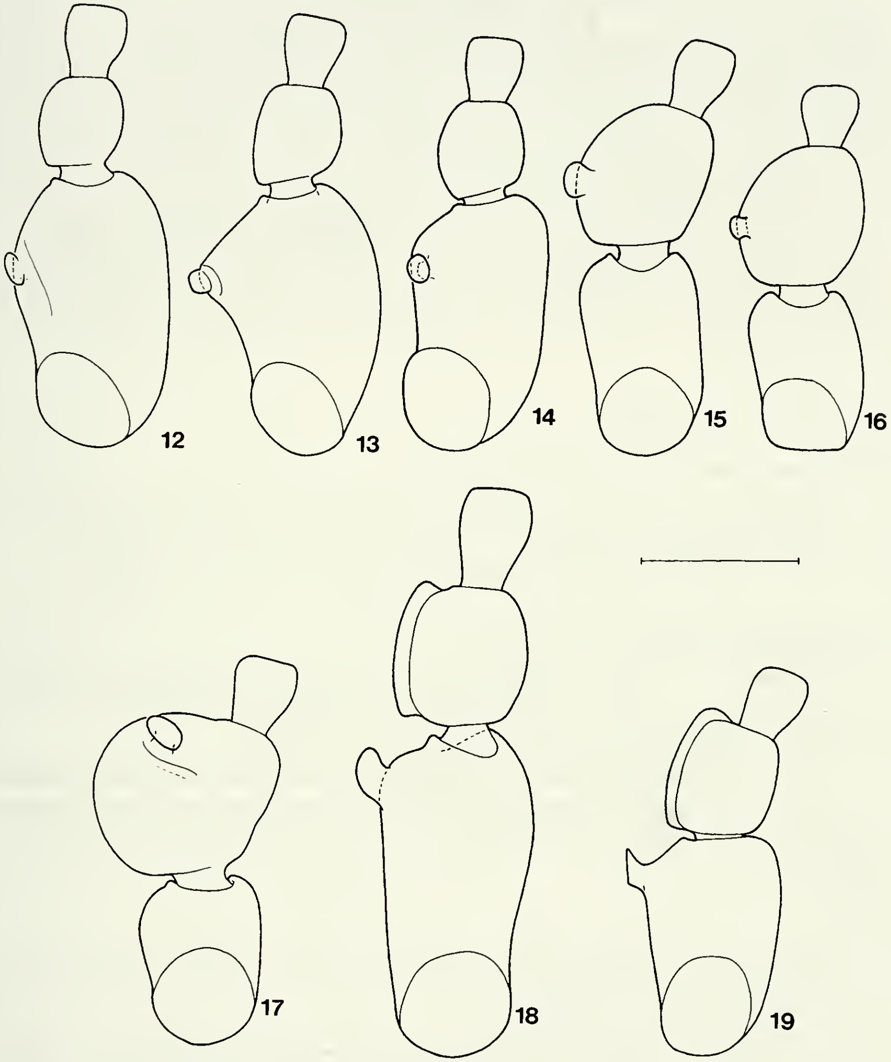
Cette espèce présente des caractères uniques sur le métasternum, les profémurs, les antennes et l'édéage. La ponctuation particulière du métasternum et les dépressions profémorales sont considérées comme étant liées au sexe ♂. *Bryaxis fictor* semble être isolé au sein du genre. Les lobes dorsaux sur les paramères rapproche la nouvelle espèce de *B. wolongensis* Kurbatov & Löbl du Sichuan ainsi que de la plupart des espèces de Taiwan, dont elle diffère nettement par le sac interne de l'édéage relativement simple, muni d'un sclérite circulaire basal joint au sclérite apical bifide.

Bryaxis valentulus sp. n. Figs 7, 10, 11, 18

Holotype ♂: Russie, Altaï occidental, chaîne Ivanovsky, à 10 km au sud de Leninogorsk, forêt clairsemée d'*Abies*, 1400 m, 30.V.1996, leg. R. Dudko (ZMAN). Paratypes: mêmes données que l'holotype, 3 ♂, 1 ♀ (ZMAN, MHNG, CSKM).

Longueur: 2,05-2,2 mm; largeur maximale: 0,77-0,85 mm. Corps brun rougeâtre ou uniformément brun. Pubescence double, à soies mi-dressées assez denses et à soies plus longues, plus dressées et beaucoup moins nombreuses. Tête lisse, aux points épars et très petits. Lobe frontal très légèrement rétréci en arrière, large de 0,19-0,20 mm. Bord antérieur du front incliné en avant. Centre des fossettes du vertex un peu postérieur au niveau du bord antérieur des yeux. Carène occipitale atteignant le bord postérieur de la dépression frontale. Yeux aussi longs que les tempes en vue latérale, comportant 12-16 ommatidies chez ♂, un peu plus petits chez ♀. Articles 2 et 3 de palpes maxillaires dépourvus de tubercules. Articles antennaires: 3-8 de la même largeur, 3 plus long que large, 4-5 égaux, plus longs que larges, plus courts que 3, 6-8 aussi longs que larges ou à peine plus longs que larges, plus courts que les précédents, 9 aussi long que large, plus grand que 8 (8 et 9 à peine transverse chez ♀), 10 plus large, à peine plus long que 9, légèrement transverse, 11 plus long que 8-10 réunis. Pronotum presque aussi long que large (longueur/largeur = 19/20), lisse. Elytres à ponctuation formée de grands points; les diamètres des points aussi grands que les intervalles entre eux.

♂. Articles 1 à 3 comme Fig. 18; scape long de 0,20 mm, pédicelle long de 0,085 mm. Métasternum orné d'une dépression triangulaire. Fémurs et tibias, surtout les antérieurs et postérieurs, renflés. Protibias ornés d'une échancrure profonde, limités proximalement par une grande dent aiguë; en arrière de l'échancrure, une petite saillie prolongée par une carène très fine. Métatibias soit pourvus d'une saillie



Figs 12 à 19

Bryaxis, articles 1 à 3 de l'antenne ♂: 12. *B. kimi* sp. n.; 13. *B. nametkini* sp. n.; 14. *B. pletnevi* sp. n.; 15. *B. ruidus* sp. n.; 16. *B. mendax* sp. n.; 17. *B. fictor* sp. n.; 18. *B. valentulus* sp. n.; 19. *B. femoratus* (Aubé). Echelles = 0.1 mm.

anguleuse, soit ornés d'une dent au milieu de leur bord intérieur; dent apicale longue (Figs 10, 11). Edéage (Fig. 7) long de 0,67 mm; sac interne éventuellement inversé.

♀. Scape cylindrique, presque deux fois plus long que large, pédicelle ovale, nettement plus long que large, presque 2 fois plus court que le scape.

Cette espèce semble proche de *B. femoratus* (Aubé) par ses caractères sexuels secondaires et par la structure de l'édéage. Chez *B. femoratus*, le scape et le pédicelle sont plus petits, le scape est seulement 1,5 fois plus long que large et orné d'un tubercule glandulaire tronqué (Fig. 19), l'échancrure des protibias n'est pas limitée apicalement par une saillie et les paramères de l'édéage sont moins arqués. La nouvelle espèce en diffère également par la taille du corps plus grande, la coloration plus claire (les téguments sont foncés chez *B. femoratus*, les élytres parfois noirâtres), les proportions des articles antennaires (chez *B. femoratus* les articles 4-5 sont aussi longs que larges, 6-8 légèrement transverses, 9-10 nettement transverses), la forme des métatibias chez le ♂ (Figs 9 à 11) et par la forme des structures sclérifiées du sac interne de l'édéage que comporte une large dent apicolatérale, absente chez *B. femoratus* (Fig. 8).

NOUVELLES LOCALITÉS

Bryaxis sacrificus Kurbatov & Löbl, 1995

Matériel: 4 ♂, 2 ♀, Chine, ouest de la province de Hubei, Shennongjia Nat. Res., 2000-2200 m, débris végétaux, 7.VI.1995, leg. S. A. Kurbatov (CSKM).

Note. L'espèce n'était connue que de la province chinoise de Shaanxi.

Bryaxis panda Kurbatov & Löbl, 1995

Matériel: 1 ♂, Chine, ouest de la province de Hubei, Shennongjia Nat. Res., 2000-2200 m, débris végétaux, 7.VI.1995, leg. S. A. Kurbatov (CSKM).

Notes. Espèce décrite et connue seulement de Sichuan.

Le ♂ de Shennongjia Nat. Res. diffère des spécimens de la série-type par l'absence totale de tubercule sur le pédicelle. Ainsi, nous interprétons la présence ou l'absence du tubercule glandulaire chez *B. panda* comme un cas de variabilité infraspécifique.

Bryaxis sp.

Matériel: 5 ♀, Birmanie, Shan province, Namhsan, 1600 m, litière, 19.02. 1996, leg. S. A. Kurbatov (CSKM).

L'absence de ♂ ne permet pas de donner une description basée sur des caractères sûrs. Toutefois, la découverte d'une espèce de Bryaxis en Birmanie est importante. Le genre est inconnu de la région himalayenne, du Tibet, de Yunnan et de Thaïlande.

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A new species of *Stetholiodes* Fall, 1910 (Coleoptera, Leiodidae, Agathidiini) from Taiwan

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A new species of *Stetholiodes* Fall, 1910 (Coleoptera, Leiodidae, Agathidiini) from Taiwan. - *Stetholiodes magnifica* n. sp. is described from Taiwan. A new generic record from Taiwan.

Key-words: Coleoptera - Leiodidae - *Stetholiodes* - Taiwan.

INTRODUCTION

A hitherto undetected unique specimen of *Stetholiodes*, collected by Dr Ales Smetana during 1991, was found amongst undetermined Leiodidae in the collection of the Natural History Museum, Geneva. This species is described here, it represents the first known occurrence of the genus *Stetholiodes* in Taiwan.

DESCRIPTION

Stetholiodes magnifica n. sp. Figs 1-5

Length 4.1 mm (holotype ♂). Dorsum black, posterior margin of pronotum broadly lighter, raised lateral margin of elytra narrowly lighter. Each elytron with a testaceous 'C'-shaped macula, internally limited by stria 2, anterior lobe extending as far as the 6th stria and the posterior lobe just reaching the 8th stria (figs 1 & 2). Mesosternum dark reddish-brown, metasternum black; antennae testaceous with segments 7-10 and basal part of 11 dark; legs reddish-brown. Microreticulation clear on head, more superficial on pronotum and absent on elytra, puncturation distinct on head an pronotum; each elytron with 9 punctured striae. Sutural striae clear, well defined, confined to apical half of elytron.

Head. Microreticulation clear, well impressed, surface somewhat dull; punctures clear, moderately large, separated from each other by 1-3 times their own diameter. Antero-lateral margins rounded, uniform. Clypeus rectilinear. Clypeal line absent. Eyes protuberant, head widest just behind the eyes, temples very short. Antennae with 3rd segment 1·7 times longer than 2nd and longer than 4th+5th together.

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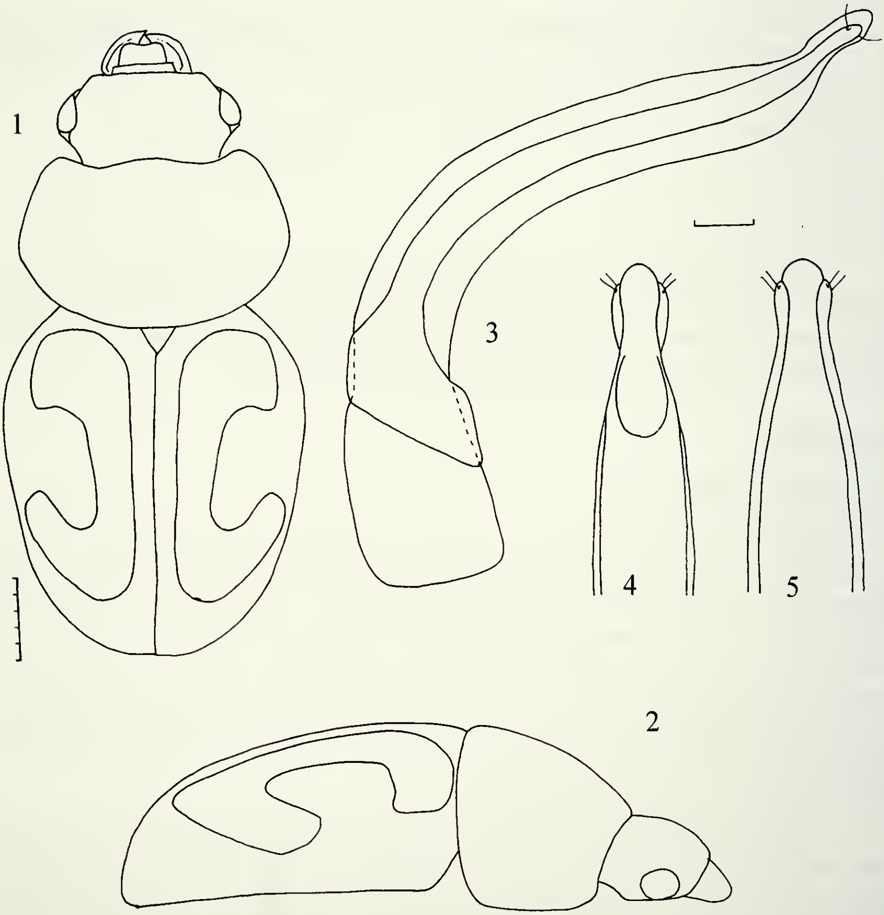
Pronotum. Microreticulation more superficial than on head; puncturation more superficial than on head and the punctures smaller, separated from each other by 2-5 times their own diameter. 1·6 times as broad as head, moderately broader than long (width/length = 1·67) and moderately convex (width/height = 1·74). Anterior margin slightly curved, sides sharply curved anteriorly, lateral outline with anterior and posterior margins sub-parallel. Measurements of pronotum of holotype: length 1·15 mm, width 1·92 mm and height 1·10 mm.



FIGS 1-5

Stetholiodes magnifica n. sp. ♂: body outline 1, dorsal and 2, lateral, scale line = 1·0 mm; 3, aedeagus lateral, apex of aedeagus 4, ventral and 5, dorsal view, scale line = 0·5 mm.

Elytra. Microreticulation absent. The 9 striae composed of large clear punctures, separated from each other by 0·5-1 times their own diameter; punctures in interstices in the order of one-quarter, or less, the diameter of those of the striae, clearly impressed and separated by 0·5-2 times their own diameter. Distinctly broader than the pronotum and slightly longer than broad (width/length = 0·97) slightly convex (width/height = 2). Lateral outline with sharp humeral angle. Measurements of elytra of holotype: length 2·15 mm, width 2·10 mm and height 1·05 mm.

Metathoracic wings present.

Meso- and metasternum: with weak median carina, lateral lines complete, femoral lines absent.

Legs: Tarsal formula of male 5-5-4, segments 1-3 of anterior tarsi somewhat dilated (female not known).

Aedeagus as in figures 3, 4 & 5.

Holotype: ♂, Taiwan, Taichung Hsien, Hseuhshan, above Shan-Lin-Gien Hut, 3360 m, 10.v.1991, leg A. Smetana, in Geneva Natural History Museum collection.

Discussion: *Stetholiodes magnifica* sp. n. is very similar to *Stetholiodes turnai* Angelini & Švec. It differs by having large conspicuous testaceous maculae on the elytra, larger size, the microreticulation of the head more clearly impressed, colouring of the antennae, in the greater length ratio of 3rd/2nd antennal segments, and in having a differently formed aedeagus.

Distribution: Taiwan (Taichung Hsien). First record of *Stetholiodes* Fall from Taiwan.

ACKNOWLEDGEMENTS

The authors wish to express their thanks to Dr Ivan Löbl, Department of Entomology, Geneva Museum of Natural History, for the loan of this material.

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New data on Oribatids (Acari: Oribatida) from St. Lucia (Antilles). (*Acarologica Genavensia* LXXXIX)[1]

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New data on Oribatids (Acari: Oribatida) from St. Lucia (Antilles). (*Acarologica Genavensia* LXXXIX). - Elaboration of the material collected by T. Jaccoud and L. de Roguin in St. Lucia in 1989. 67 species are identified and listed, 16 of them are described as new to science and one of them also represents a new genus: *Paracarinogalumna* gen. n. (Galumnidae). *Licneremaeus antillensis* Mahunka, 1985 = *Licneremaeus discoidalis* (Willmann, 1930): new synonymy.

Key-words: Acari - Oribatida - Taxonomy - New taxa - St. Lucia (Antilles).

INTRODUCTION

The soil-mite fauna of the Caribbean territory including the Lesser and the Greater Antilles is fairly well-known. The richness and the zoogeographical significance of the area have been shown by several authors (e.g. GRANDJEAN 1929, 1930; WILLMANN 1933, BALOGH & MAHUNKA 1974). The oribatids of St. Lucia have already been discussed by the present author (MAHUNKA 1985). The study of additional material preserved in the Muséum d'histoire naturelle, Geneva proves our fragmentary knowledge of this fauna. Part of this material is presented in this paper[2].

The material comprises 67 species of which 16 are new to science. For one of them a new genus is established. 25 known species are recorded for the first time for St. Lucia. Several endemic species, only known from the original descriptions, are recorded again together with many species already known from various regions of the Neotropics. In my previous paper (MAHUNKA 1985) 69 species are recorded for St. Lucia, now a total of 110 species are known from this island.

The terminology and the taxonomic arrangement correspond to my previous papers (e.g. MAHUNKA 1994).

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[1] New title for the series "Neue und interessante Milben aus dem Genfer Museum I-LX" and "New and interesting mites from the Geneva Museum LXI-LXXX".

[2] This research programme was partly sponsored by the Hungarian Scientific Research Fund (OTKA 16729).

Manuscript accepted 16.10.1998

LIST OF LOCALITIES

STL-79/1: Saint Lucia (Castries): Hotel Halcyon Sands et environs immédiats (jardin, forêt), sur la presqu'île de Vigie; (st.1), 14.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/2: Saint Lucia (Gros Islet): Pied du Mont Layau, avant le village de Monchy, vallée de l'Espérance River, rivière presque à sec, dans forêt de Lauriers et Manguiers; (st.2) 50 m; 15.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/3: Saint Lucia (Dennery): Entre Barre de l'Isle Ridge et la Mabouva Valley, avant le col, près de Thomaso, E de Morne Panache, forêt claire, prélèvement sur souche d'arbres pourris; (st.3.), 50 m; 16.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/4: Saint Lucia (Dennery/Dauphin): Pied du Piton Flore, au NW de Dernière Rivière, récolte de feuilles dans forêt dense, très en pente, avec falaises et abris sous roche; (st.4), 300 m; 17.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/5: Saint Lucia (Dennery): Entre Barre de l'Isle Ridge et la Mabouva Valley, avant le col, près de Thomaso, E de Morne Panache, forêt claire, prélèvement sur souche d'arbres pourris; (st.3.), 50 m; 16.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/6: Saint Lucia (Dennery): Entre Barre de l'Isle Ridge et la Mabouva Valley, avant le col, près de Thomaso, E de Morne Panache, forêt claire, prélèvement sur souche d'arbres pourris; (st.3.), 50 m; 16.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/7: Saint Lucia (Dennery): Entre Barre de l'Isle Ridge et la Mabouva Valley, avant le col, près de Thomaso, E de Morne Panache, forêt claire, prélèvement sur souche d'arbres pourris, tamisage, Berlese à Genève; (st.3.), 50 m; 16.VI.1979; leg. T. Jaccoud et L. de Roguin (WB)[4].

STL-79/8: Saint Lucia (Anse la Raye): Vers Massecré, au NE de Anse la Raye, végétation arbustive, dense mais peu haute, nombreux épineux, sol caillouteux; (st.5), 100 m; 17.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/11: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide prélèvement de sol; (st.6.), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/13: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide prélèvement de sol; (st.6), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/15: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide prélèvement de sol; (st.6), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/17: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide, tamisage; (st.6), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin.

STL-79/18: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide prélèvement de sol; (st.6.), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

STL-79/19: Saint Lucia (Micoud/Soufrière): Quiless Reserve, à 500 m de Piton St. Esprit, forêt de pluie typique, très bien conservée (protégée), très humide prélèvement de sol; (st.6), 200-350 m; 19.VI.1979; leg. T. Jaccoud et L. de Roguin (B)[3].

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[3] (B): extraction par appareils Berlese à Genève.

[4] (WB): extraction par appareils Winkler-Moczarski sur place et par appareils Berlese à Genève.

LIST OF IDENTIFIED SPECIES

Mesoplophoridae Ewing, 1917

Mesoplophora hauseri Mahunka, 1982
Localities: STL-79/5: 8 specimens; STL-79/7: 2 specimens.
Distribution: Costa Rica (known from the type locality only); first record for St. Lucia.

Mesoplophora (*Parplophora*) *subtilis* Niedbała, 1981
Localities: STL-79/12: 5 specimens; STL-79-18: 3 specimens.
Distribution: Well distributed in the Neotropical and Oriental Region (see Niedbała 1985); first record for St. Lucia (Figs 1-3).

Phthiracaridae Perty, 1841

Hoplophorella lanceosetoides Mahunka, 1985
Locality: STL-79/8: 9 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Hoplophorella scapellata (Aoki, 1965)
Locality: STL-79/8: 2 specimens.
Distribution: Perhaps Circumtropical; first record for St. Lucia.

Lohmanniidae Berlese, 1916

Meristacarus longisetosus Mahunka, 1978
Locality: STL-79/1: 3 specimens.
Distribution: Dominican Republic (known from the type locality only); first record for St. Lucia.

Torpacarus omittens Grandjean, 1950
Locality: STL-79/8: 1 specimen.
Distribution: Well distributed in Central- and South America; second record.

Trhypochthoniidae Willmann, 1931

Afronothrus incisivus neotropicus Balogh & Mahunka, 1974
Locality: STL-79/8: 2 specimens.
Distribution: Cuba (known from the type locality only); first record for St. Lucia.

Allonothrus neotropicus Balogh & Mahunka, 1969
Locality: STL-79/1: 2 specimens.
Distribution: Bolivia (known from the type locality only); first record for St. Lucia.

Archegozetes magnus mediosetosus Mahunka, 1978
Localities: STL-79/4: 4 specimens; STL-79/8: 25 specimens.

Distribution: Mauritius (known from the type locality only); first record for St. Lucia.

Epilohmanniidae Oudemans, 1923

Epilohmannia pallida americana Balogh & Mahunka, 1981
Locality: STL-79/4: 1 specimen.
Distribution: Paraguay (known from the type localities only); first record for St. Lucia.

Nanhermanniidae Sellnick, 1928

Cyrthermannia simplex Mahunka, 1985
Locality: STL-79/5: 3 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Hermanniellidae Grandjean, 1934

Sacculobates horologiorum Grandjean, 1962
Localities: STL-79/1: 1 specimen; STL-79/8: 1 specimen.
Distribution: Central America and Northern part of South America; second record.

Liodidae Grandjean, 1954

Teleioliodes zikani (Sellnick, 1930)
Locality: STL-79/4: 3 specimens.
Distribution: Brazil; first record for St. Lucia.

Microtegeidae Balogh, 1972

Microtegeus borhidii Balogh & Mahunka, 1974
Locality: STL-79/19: 3 specimens.
Distribution: Cuba (known from the type localities only); first record for St. Lucia.

Microtegeus hauseri sp. n.
Localities: STL-79/1; STL-79/17.

Microtegeus lucianus sp. n.
Localities: STL-79/2; STL-79/7; STL-79/17; STL-79/19.

Eremaeozetidae Piffl, 1962

Eremaeozetes lineatus Mahunka, 1985
Locality: STL-79/8: 1 specimen.
Distribution: St. Lucia (known from the type locality only); second record.

Eremaeozetes roguini sp. n.
Locality: STL-79/7.

Microzetidae Grandjean, 1936

Berlesezetes auxiliaris Grandjean, 1936
Localities: STL-79/2: 1 specimen; STL-79/4: 1 specimen; STL-79/5: 4 specimens; STL-79/6: 5 specimens; STL-79/7: 7 specimens.
Distribution: Circumtropical; second record for St. Lucia.

Cosmozetes jaccoudi sp. n.
Locality: STL-79/19.

Eremulidae Grandjean, 1965

Eremulus nigrisetosus Hammer, 1958
Locality: STL-79/8: 3 specimens.
Distribution: South America; first record for St. Lucia.

Damaeolidae Grandjean, 1965

Fosseremus laciniatus (Berlese, 1905)
Locality: STL-79/4: 2 specimens.
Distribution: Cosmopolitan; first record for St. Lucia.

Eremobelbidae Balogh, 1961

Eremobelba piffli Mahunka, 1985
Localities: STL-79/1: 2 specimens; STL-79/4: 2 specimens; STL-79/8: 2 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Basilobelbidae Balogh, 1961

Basilobelba insularis Mahunka 1985
Localities: STL-79/4: 1 specimen; STL-79/8: 4 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Zetorchestidae Michael, 1898

Zetorchestes schusteri Krisper, 1984
Locality: STL-79/8: 3 specimens.
Distribution: Brazil; first record for St. Lucia.

Carabodidae C. L. Koch, 1837

Kalloia simpliseta Mahunka, 1985
Locality: STL-79/1: 5 specimens.
Distribution: St. Lucia (known the type locality only); second record.

Klapperiches penicillus sp. n.
Localities: STL-79/2; STL-79/12.

Tectocepheidae Grandjean, 1954

Tegeozetes tunicatus Berlese, 1913
Locality: STL-79/4: 3 specimens.
Distribution: Circumtropical; second record for St. Lucia.

Dampfiellidae Balogh, 1961

Beckiella vitiosa Mahunka, 1985
Localities: STL-79/3: 1 specimen; STL-79/7: 2 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Cuneoppiidae Balogh, 1983

Cuneoppia laticeps Balogh & Mahunka, 1969
Locality: STL-79/4: 1 specimen.
Distribution: Bolivia (known from the type locality only); first record for St. Lucia.

Oppiidae Grandjean, 1951

Aeroppia adjacens Mahunka, 1985
Localities: STL-79/1: 2 specimens; STL-79/4: 1 specimen; STL-79/8: 1 specimen.
Distribution: St. Lucia (known from the type locality only); second record.
Aeroppia hammerae Mahunka, 1985
Localities: STL-79/1: 1 specimen; STL-79/3: 4 specimens.
Distribution: St. Lucia (known from the type locality only); second record.
Aeroppia asymmetrica Mahunka 1985
Localities: STL-79/1: 5 specimens; STL-79/8: 3 specimens.
Distribution: St. Lucia (known from the type locality only); second record.
Amerioppia extrema Mahunka 1985
Localities: STL-79/1: 3 specimens; STL-79/3: 1 specimen; STL-79/8: 1 specimen; STL-79/13: 2 specimens.
Distribution: St. Lucia (known from the type locality only); second record.
Amerioppia paraguayensis Balogh & Mahunka, 1981
Locality: STL-79/3: 5 specimens.
Distribution: Paraguay, Brazil; first record for St. Lucia.

Dissorhina neotropicalis sp. n.
Locality: STL-79/19.

Gittella insularis sp. n.
Locality: STL-79/17.

Machuella ventrisetosa Hammer, 1961
Locality; STL-79/19: 2 specimens.
Distribution: Neotropics and Oriental Region; first record for St. Lucia.

Moritzoppia subfallax sp. n.
Locality: STL-79/17.

Multioppia insularis Mahunka, 1985
Locality: STL-79/19: 2 specimens.
Distribution: St. Lucia (known from the type locality only); second record.

Oppiella nova (Oudemans, 1902)
Localities: STL-79/5: 2 specimens; STL-79/11: 8 specimens; STL-79/13: 1 specimen.
Distribution: Cosmopolitan; second record for St. Lucia.

Oxyoppia antillensis sp. n.
Localities: STL-79/6; STL-79/13.

Striatoppia tribuliformis Balogh & Mahunka, 1981
Locality: STL-79/4: 2 specimens.
Distribution: Paraguay (known from the type locality only); first record for St. Lucia.

Suctobelbidae Jacot, 1938

Suctobelbella baculifera Balogh & Mahunka, 1981
Locality: STL-79/19: 2 specimens.
Distribution: Paraguay (known from the type locality only); first record for St. Lucia.

Suctobelbella complexa (Hammer, 1958)
Locality: STL-79/19: 2 specimens.
Distribution: Neotropics; first record for St. Lucia.

Suctobelbella variosetosa (Hammer, 1961)
Localities: STL-79/13: 3 specimens; STL-79/19: 2 specimens.
Distribution: Circumtropical; second record for St. Lucia.

Cymbaeremaeidae Sellnick, 1928

Scapheremaeus longilamellatus Mahunka, 1985
Locality: STL-79/1: 1 specimen.
Distribution: St. Lucia (known from the type locality only); second record.

Licneremaeidae Grandjean, 1931

Licneremaeus discoidalis (Willmann, 1930)
= *Licneremaeus antillensis* Mahunka, 1985 **nov. syn.**

Localities: STL-79/18: 1 specimen; STL-79/19: 2 specimens.

Distribution: Guatemala; St. Lucia.

Scutoverticidae Grandjean, 1954

Arthrovertex hauseri Mahunka, 1985

Localities: STL-79/2: 1 specimen; STL-79/3: 1 specimen; STL-79/19: 2 specimens.

Distribution: St. Lucia (known from the type locality only); second record.

Parakalummidae Grandjean, 1936

Parakalumma piton sp. n.

Localities: STL-79/3; STL-79/6; STL-79/7; STL-79/12; STL-79/17.

Mochlozetidae Grandjean, 1960

Mochlozetes asculpturatus Mahunka, 1985

Locality: STL-79/1: 6 specimens.

Distribution: St. Lucia (known from the type locality only); second record.

Unguizetes similis sp. n.

Localities: STL-79/1; STL-79/19.

Oripodidae Jacot, 1925

Benoibates minimus Mahunka, 1985

Localities: STL-79/12: 1 specimen; STL-79/17: 2 specimens.

Distribution: St. Lucia (known from the type locality only); second record.

Oripoda lobata Mahunka, 1985

Localities: STL-79/8: 2 specimens; STL-79/17: 3 specimens.

Distribution: St. Lucia (known from the type locality only); second record.

Haplozetidae Grandjean, 1936

Nasobates mirabilis Balogh et Mahunka, 1969

Locality: STL-79/2: 2 specimens.

Distribution: South- and Middle-America; first record for St. Lucia.

Peloribates antillensis (Mahunka, 1985)

Localities: STL-79/4: 1 specimen; STL-79/7: 1 specimen; STL-79/19: 3 specimens.

Distribution: St. Lucia (known from the type locality only); second record.

Peloribates capucinus (Berlese, 1908)
Locality: STL-79/18: 1 specimen.
Distribution: Cosmopolitan; first record for St. Lucia.

Rostrozetes carinatus Beck, 1962
Localities: STL-79/1: 2 specimens; STL-79/3: 3 specimens; STL-79/13: 1 specimen.
Distribution: Neotropical; first record for St. Lucia.

Rostrozetes ovulum (Berlese, 1908)
Localities: STL-79/4: 2 specimens; STL-79/13: 1 specimen.
Distribution: Circumtropical; first record for St. Lucia.

Austrachipteriidae Luxton, 1985

Lamellobates molecula (Berlese, 1916)
Localities: STL-79/4: 2 specimens; STL-79/8: 6 specimens.
Distribution: Circumtropical; first record for St. Lucia.

Phenopelopidae Petrunkevitch, 1955

Eupelops spongiosus sp. n.
Locality: STL-79/8.

Epactozetidae Grandjean, 1930

Truncozetes rugosus sp. n.
Locality: STL-79/1.

Galumnidae Jacot, 1925

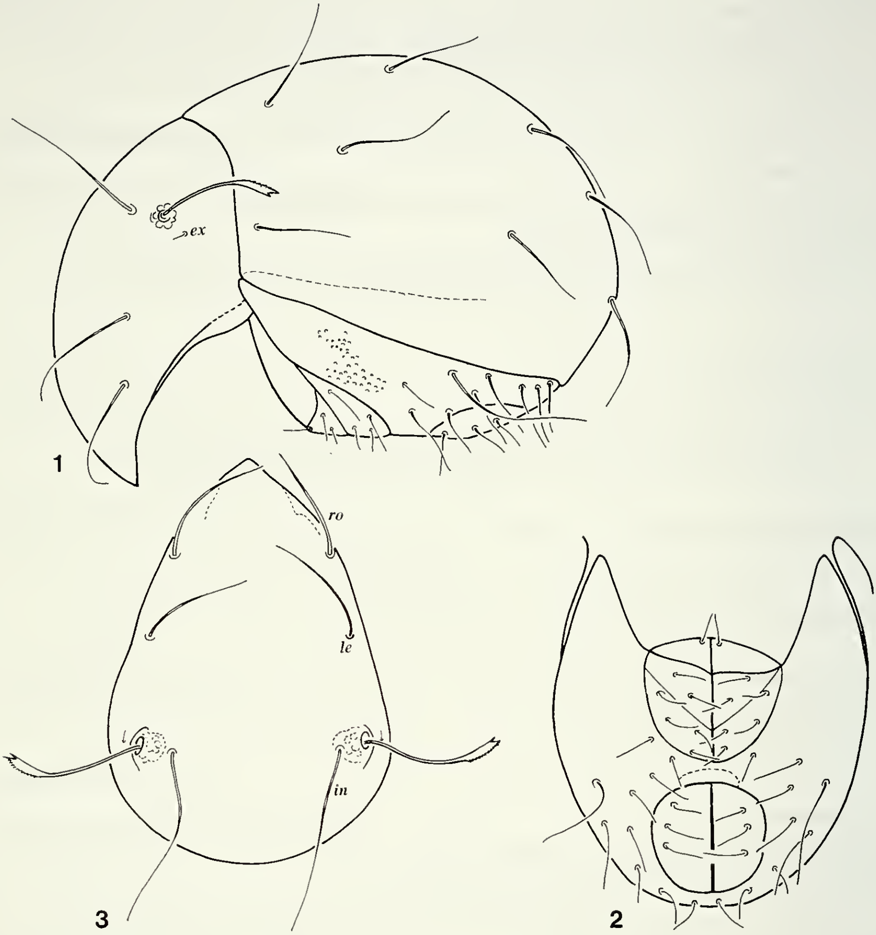
Galumna flabellifera Hammer, 1958
Locality: STL-79/1: 15 specimens.
Distribution: Circumtropical; second record for St. Lucia.

Galumna hamifer Mahunka, 1985
Localities: STL-79/5: 3 specimens; STL-79/8: 9 specimens.
Distribution: Guadeloupe, Brazil; first record for St. Lucia.

Paracarinogalumna genavensium gen. n., sp. n.
Localities: STL-79/1; STL-79/5; STL-79/8; STL-79/11; STL-79/15; STL-79/17.

Pergalumna cucheae sp. n.
Locality: STL-79/1.

Pilogalumna antillensis sp. n.
Locality: STL-79/8.



FIGS 1-3

Mesoplophora (*Parplophora*) *subtilis* Niedbała, 1981 – 1: body in lateral aspect, 2: anogenital region, 3: aspis in dorsal aspect.

DESCRIPTION OF THE NEW TAXA

Microtegeus hauseri sp. n. Figs 4-5

Material examined: Holotype: St. Lucia: STL-79/17; 1 paratype: STL-79/1. Holotype: MHNG[6], 1 paratype (1556-PO-96): HNHM[7].

Measurements. – Length of body: 198-214 µm, width of body: 126-134 µm.

Prodorsum: Rostral apex conical. Lamellae wide, without sharp inner spur, but a well developed incisure present. Surface of prodorsum granulated, the granules only partly composing a polygonal reticulation. Rostral setae simple, straight, lamellar setae arising on the anterior margin of the lamellae, slightly dilated basally. Interlamellar setae short, bacilliform, a characteristic, strong thickening present at their insertion. Sensillus conspicuously long, directed laterally and backwards, its capitulum elongate, with strong spines on its surface (Fig. 4).

Notogaster: Well granulated, the granules form a polygonal reticulation. Larger protruding tubercles absent, in lateral view surface appearing irregular. Ten pairs of short, straight, bacilliform or spiniform notogastral setae present. Two median setae arising very near to each other.

Ventral regions (Fig. 5): Weakly sclerotised, apodemes and epimeral borders composing a disjoint reticulation. Sternal apodeme absent between apodemes 2 and the sejugal ones. Discidium smaller than in the following species. Ventral plate irregularly granulated. One shorter, one long longitudinal and one transversal lath observable. Neither tubercles nor protuberances along the genital aperture. All setae in the anogenital region minute, simple, excepting the median anterior genital setae.

Remarks: Refer to the remarks on the following species.

Derivatio nominis: I dedicate the new species to my friend Dr Bernd Hauser, in recognition of his enormous efforts in managing research on soil-microarthropods during his activity as curator of the Department of Arthropods of the Geneva Museum from 1968 to 1998.

Microtegeus lucianus sp. n. Figs 6-7

Material examined: Holotype: St. Lucia: STL-79/7; 1 paratype: STL-79/2; 3 paratypes: STL-79/17; 1 paratype: STL-79/19. Holotype and 3 paratypes: MHNG, 2 paratypes (1555-PO-96): HNHM.

Measurements. – Length of body: 198-235 µm, width of body: 105-139 µm.

Prodorsum: Rostrum conical. Lamellae very wide, with well developed incisure and spur on their anteromedian corner, with a transversal lath between them. Lamellar surface covered by smaller, interlamellar region with greater, pustules or granules, the latter form a polygonal sculpture. Rostral setae thin, arched inwards,

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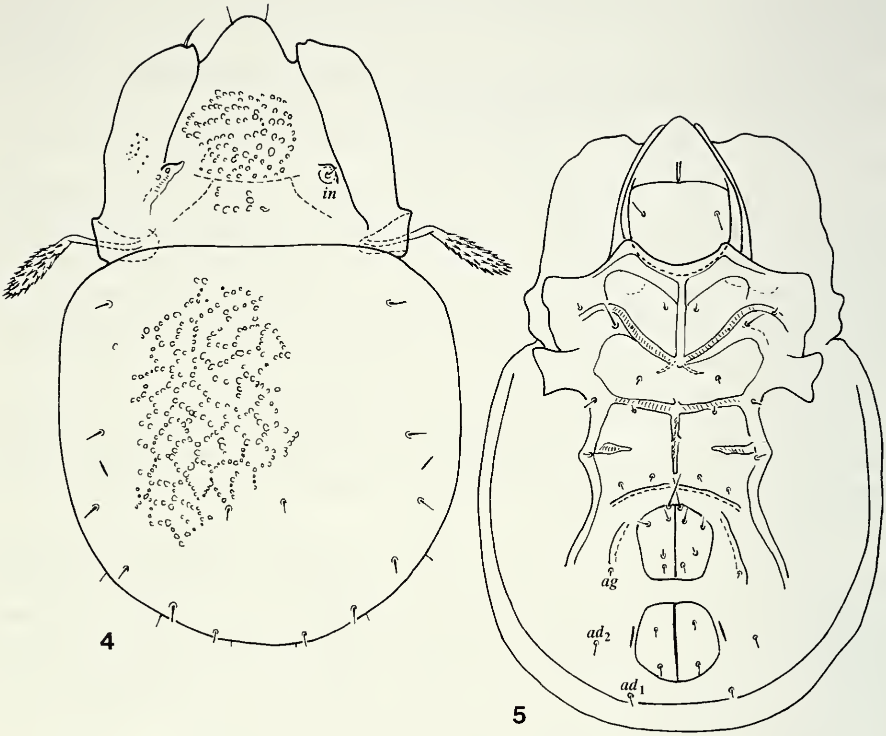
[6] MHNG: deposited in the Muséum d'histoire naturelle, Geneva.

[7] HNHM: deposited in the Hungarian Natural History Museum, Budapest, with an identification number of the specimen in the Collection of Arachnida.



FIGS 4-5

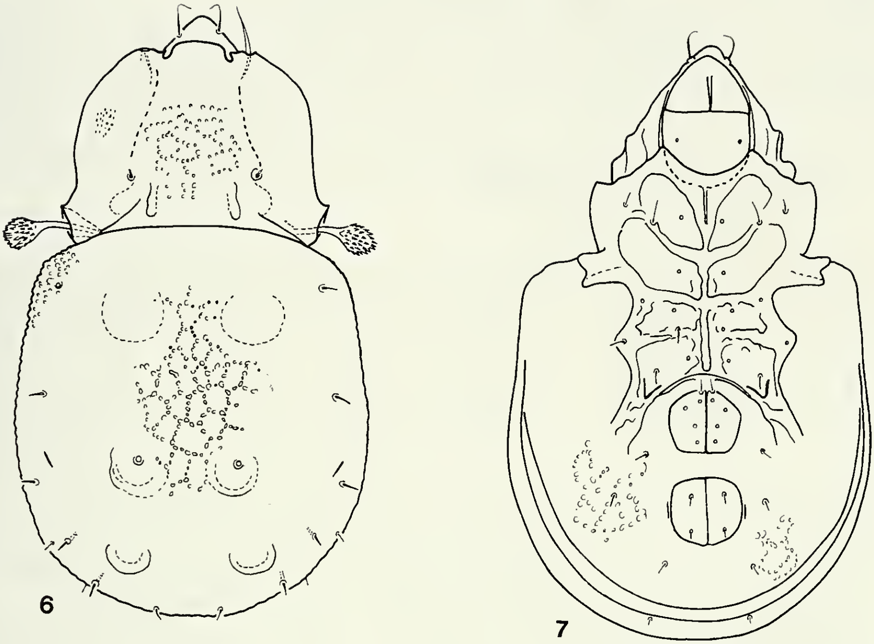
Microtegeus hauseri sp. n. – 4: body in dorsal aspect, 5: body in ventral aspect.

lamellar setae arising on the rounded anterior margin of lamellae, they are basally dilated. Interlamellar setae short, slightly bacilliform. Sensillus capitate, its dorsal surface with blunt spines.

Notogaster (Fig. 6): Three pairs of large projections (clearly visible under low magnification) on the notogaster. Its surface covered also by pustules and granules like the prodorsal ones and mostly also forming a kind of polygonal pattern. Ten pairs of spiniform, short notogastral setae present, their position typical for the family.

Ventral regions (Fig. 7): Coxisternal region strongly sclerotised, all epimeral borders and the apodemes conspicuous. Epimeral setal formula: 3 - 1 - 3 - 3. All epimeral setae slightly spiniform. Anogenital setal formula: 5 - 1 - 2 - 2. Lyrifissures *iad* in adanal position.

Legs: All legs monodactylous.



FIGS 6-7

Microtegeus lucianus sp. n. – 6: body in dorsal aspect, 7: body in ventral aspect.

Remarks: On the basis of the sculpture of the notogaster (resembling *Eremobelba*) these two new species are readily distinguished from all heretofore known species of the genus. *M. hauseri* is distinguished from *M. lucianus* by the unique form of the sensillus.

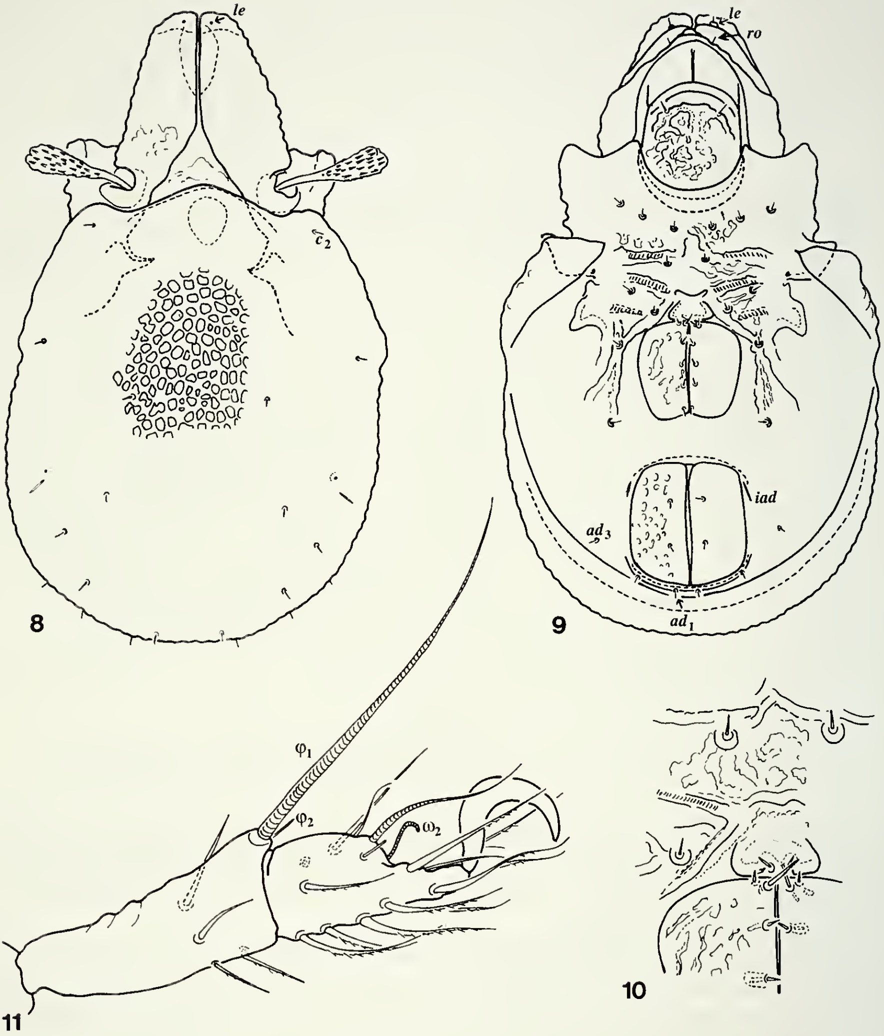
Derivatio nominis: Named after St. Lucia.

Eremaeozetes roguini sp. n. Figs 8-11

Material examined: Holotype: St. Lucia: STL-79/7; 1 paratype: from the same sample. Holotype: MHNG, 1 paratype (1557-PO-96): HNHM.

Measurements. - Length of body: 346-367 μm, width of body: 205-226 μm.

Prodorsum: Lamellae large, covering the whole prodorsal surface, except posteromedially. Cerotegument layer (as on the rest of the body) thick, composed of irregular rugae. None of the prodorsal setae visible in dorsal view, rostral and lamellar setae minute, interlamellar setae absent. Sensillus conspicuously long and narrow, fusiform, its margin waved, surface mostly with bacilliform spines (Fig. 8).



Figs 8-11

Eremaeozetes roguini sp. n. – 8: body in dorsal aspect, 9: body in ventral aspect, 10: posteromedian part of the coxisternal region, 11: tarsus and tibia of leg. I.

Notogaster: Pteromorphae very large, ventrally reflexed to the ventral plate. Notogastral surface ornamented by a polygonate design, created by irregular foveolae. The distance among the foveolae comparatively large, so the border-lines mostly wide. Lacking separate median and or lateral part of the notogaster. Ten pairs of minute, straight and simple, spiniform notogastral setae present, two pairs among them arising medially. Lyrifissures *im* and the glandular opening also seen.

Gnathosoma: Mentum strongly rugose having a characteristic transversal lath anteriorly.

Ventral regions (Fig. 9): The whole surface well sclerotised, but the epimeral borders and the apodemes faint and only partly observable. A characteristic median thickening exists in front of the genital aperture (Fig. 10). Epimeral setal formula: 3 - 1 - 2 - 2, setae *3c* and *4c* absent or not visible. Surface of the genital plate also rugose, the anal plate foveolate. Along the genital opening a pair of strong longitudinal rugae visible. Anogenital setal formula: 6 - 1 - 2 - 3. All setae minute, excepting the inner pair of anterior genital setae. Both pairs of posterior adanal setae (ad_1, ad_2) inserted on an arched lath.

Legs: All legs with strong claws. The surface of the joints well rugose, the femur of leg III and IV widened, bearing a blade-like formation. Solenidia φ_1 and φ_2 of leg I arising on a large process (Fig. 11), φ_2 very small.

Remarks: On the basis of the characteristic polygonate sculpture of the notogaster, the new species stands very near to *Eremaeozetes undulatus* Mahunka, 1985, also described from St. Lucia. The new species may be distinguished from *Eremaeozetes undulatus* by its much longer sensillus and the much smaller "cell" of the sculpture, and especially by the sculpture of the coxisternal region in front of the genital opening.

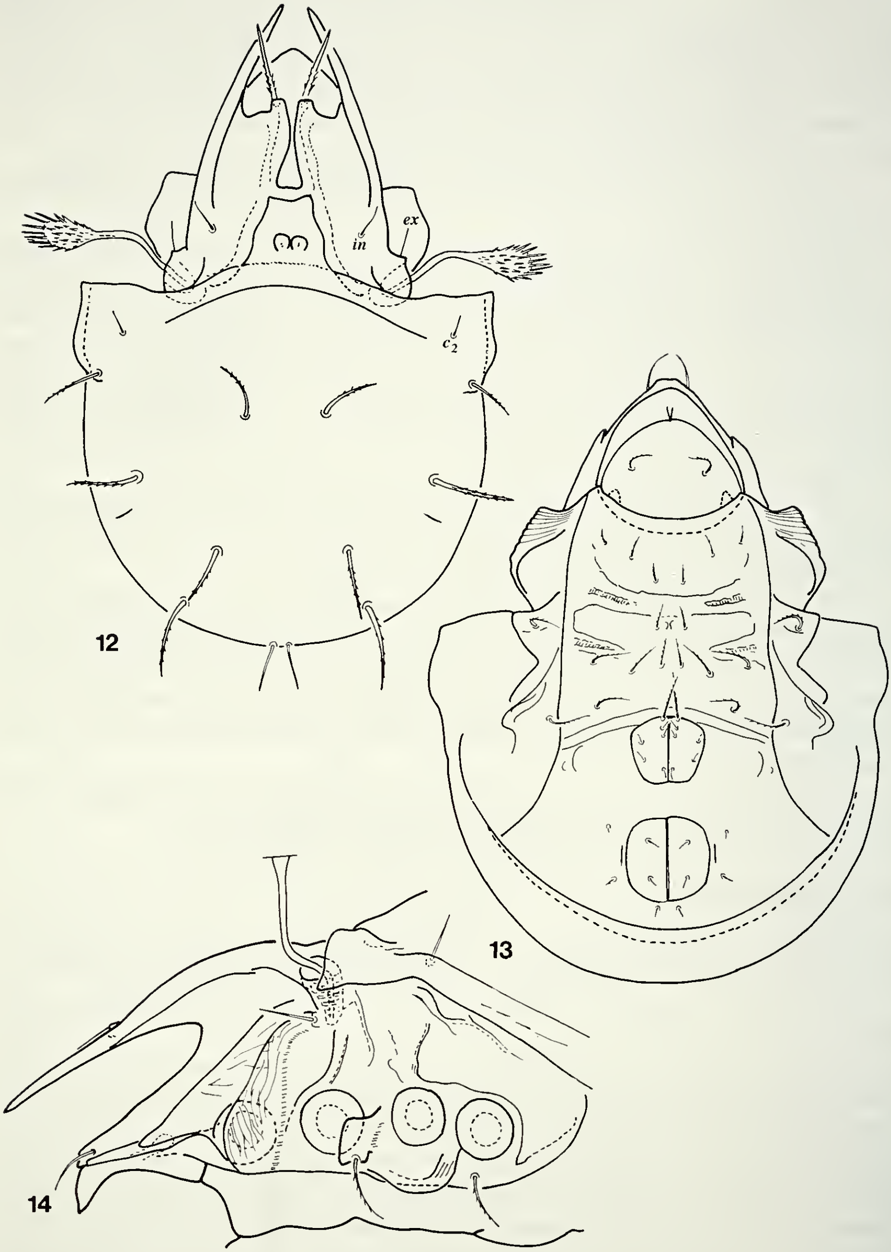
Derivatio nominis: I dedicate the new species to the collector of this material, late Dr L. de Roguin (Muséum d'histoire naturelle, Geneva).

Cosmozetes jaccoudi sp. n. Figs 12-14

Material examined: Holotype: St. Lucia: STL-79/19; 27 paratypes: from the same sample. Holotype: MHNG and 18 paratypes: MHNG, 9 paratypes: (1558-PO-96): HNHM.

Measurements. - Length of body: 223-251 μm, width of body: 166-186 μm.

Prodorsum: Rostral apex triangulate in dorsal aspect (Fig. 12), beak-shaped in lateral aspect (Fig. 14). Lamellae typical for the genus, connected by an arched translamella medially. Their lateral cusps very long and strong, median cusps resembling tubercles, hardly protruding; lamellar seta arising on it. Rostral setae slightly, lamellar seta strongly, thickened, the latter spiniform, directed outwards, crossing the outer cusps of lamellae. Interlamellar setae fine, short, located on the lamellar surface. One pair of nearly round structures present in the interlamellar region. Exobothridial setae conspicuously long, straight, arising on small tubercles. Sensillus directed outwards, its pedicel long, capitulum rounded with long spines, which are shorter proximally than distally.



Figs 12-14

Cosmozetes jaccoudi sp. n. – 12: body in dorsal aspect, 13: body in ventral aspect, 14: podosoma in lateral aspect.

Notogaster: Dorsosejugal suture indistinct. Pteromorphae small, ending in sharp, triangular lateral cusps. Notogastral margin slightly excavated laterally. Strong heterotrichy among the notogastral setae, c_2 the shortest. All slightly ciliate.

Lateral part of podosoma: Tutorium well developed, it is simple with a normal, spiniform apex, continued in a long lath, reaching the insertion of the rostral setae (Fig. 14). Pedotecta I distinctly rugose, pedotecta 2-3 conspicuously large, seta *3c* arising on its surface. Discidium also well developed. Circumpedal carina not reaching to the lateral margin of the ventral plate.

Gnathosoma: All setae and eupathidium of the palpal tarsus spiniform, nearly equal in length and arising marginally around the joint. Setae of palpal tibia much thinner than tarsal ones.

Ventral regions (Fig. 13): Apodemes and epimeral borders typical for the family. Epimeral setal formula: 3 - 1 - 3 - 3. All setae conspicuously ciliate. Anogenital setal formula: 6 - 0 - 2 - 3. Anterior pair of genital setae much longer than the others, conspicuously ciliate. All the other setae in this region small and fine.

Remarks: The heretofore known species of the genus *Cosmozetes* Balogh & Mahunka, 1969 are distributed in Bolivia, Brazil and Cuba. On the basis of the spiniform lamellar setae the new species stands nearest to *C. striatissimus* Balogh & Mahunka, 1969 (from Bolivia). However, in the new species the characteristic striation of the lamellae is absent and the outer lamellar cusp is much longer than the lamellar setae (equal in length in *C. striatissimus*) and no interlamellar structure is present in *C. striatissimus*.

Derivatio nominis: I dedicate the new species to Mr T. Jaccoud (Muséum d'histoire naturelle), collector of this material.

Klapperiches penicillus sp. n. Figs 15-18

Material examined: Holotype: St. Lucia: STL-79/12; 4 paratypes: from the same sample; 2 paratypes: STL-79/2. Holotype and 3 paratypes: MHNG, 3 paratypes: (1559-PO-96): HNHM.

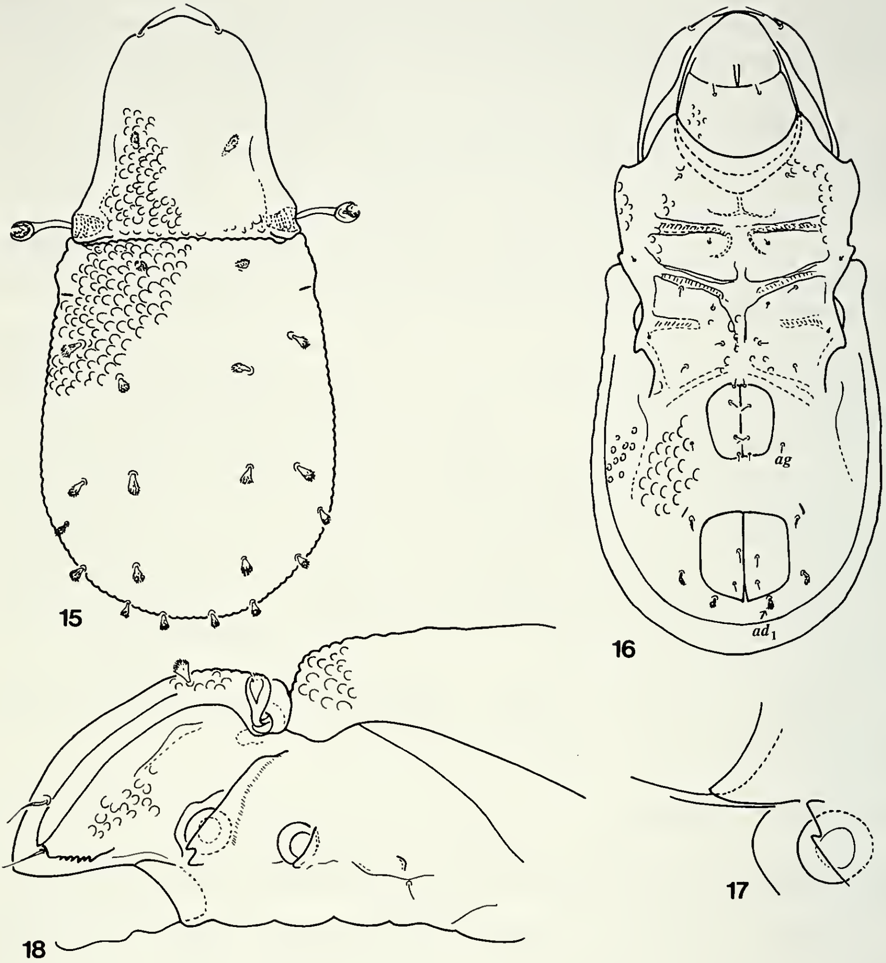
Measurements. - Length of body: 341-372 μm, width of body: 155-180 μm.

Prodorsum: Rostrum widely rounded, lamellae narrow, running marginally. Rostral and lamellar setae thin, simple, interlamellar ones penicillate. Lamellar surface smooth, interlamellar region distinctly pustulate. Sensillus comparatively long, directed outwards, its capitulum calyciform, open laterally (Fig. 15).

Notogaster: Whole surface pustulate. Dorsosejugal suture nearly straight. Ten pairs of small, penicillate notogastral setae present.

Lateral part of podosoma: Tutorium present. Near to the rostral margin a characteristic, serrate minitectum present (Fig. 18), it is connected with the lamellar apex. Surface of the lateral part also ornamented by large foveolae. Pedoctecta I with a sharp tooth on its distal end (Fig. 17).

Ventral regions (Fig. 16): Mentum and coxisternal region medially and laterally foveolate. Ventral plate pustulate medially and foveolate laterally.



FIGS 15-18

Klapperiches penicillus sp. n. – 15: body in dorsal aspect, 16: body in ventral aspect, 17: pedotecta I, 18: podosoma in lateral aspect.

Epimeral borders, excepting the posterior ones, conspicuous. Epimeral setae minute, epimeral setal formula: 1 - 1 - 3 - 3. Four pairs of genital, one pair of aggenital, two pairs of anal setae simple, the aggenital setae thickened, conspicuously ciliate, ad_1 penicillate, like the notogastral setae.

Remarks: On the basis of the position of the genital plates, the new species is readily classified with the hitherto monotypic genus *Klapperiches* Mahunka, 1978. It is distinguished from the type species (*K. nigrisetosus* Mahunka, 1978) by the small and penicillate notogastral setae and the much longer sensillus.

Derivatio nominis: Named after the characteristic form of the notogastral setae.

Dissorhina neotropicalis sp. n. Figs 19-21

Material examined: Holotype: St. Lucia: STL-79/19; 6 paratypes: from the same sample. Holotype and 4 paratypes: MHNG, 2 paratypes: (1560-PO-96): HNHM.

Measurements. - Length of body: 276-302 µm, width of body: 155-171 µm.

Prodorsum: Rostral apex separated by two incisions, as typical for the genus. Rostral setae arising on this small, triangular apex. Prodorsal costulae of typical design, composing a strong structure, but not reaching to the lamellar setae. Bothridium also well sclerotised, with two separate tubercles behind it. Sensillus directed outwards, with fusiform, well-dilated capitulum, 2-3 minute spicules visible on its distal end.

Notogaster: Median part of the dorsosejugal region protruding anteriorly, straight medially (Fig. 19). Ten pairs of simple notogastral setae, c_2 short, setae h_1 much longer than setae p_2 and p_3.

Lateral part of podosoma: Exobothridial surface smooth, granules visible only around the acetabula. A well sclerotised longitudinal lath, and the two tubercles behind the bothridium, mentioned above, observable. Exobothridial setae extremely strong (Fig. 21).

Ventral regions (Fig. 20): Coxisternal plate well sclerotised. Epimeral borders linked by transversal crests resembling small bridges. Epimeral setae short, simple; setae *1c* arising on a longitudinal crest, setae *3c* the longest of all. Anogenital setae conspicuously short, minute (excepting the anteromedian pair of genital ones). Their number and position typical for this genus.

Remarks: The new species stands very close to *Dissorhina ornata* (Oudemans, 1900). The two species are difficult to distinguish, because of the high variability of several characters. However the form of the sensillus is decisive in the separation of these two species. The sensillus of *D. ornata* is much longer than that of *D. neotropicalis* sp. n. and bacilliform, only gradually thickened distally (Fig. 22). In the new species the sensillus is fusiform and has a well-separated head. An other distinguishing feature could be the degree of sclerotization of the coxisternal region (stronger in *D. neotropicalis*).

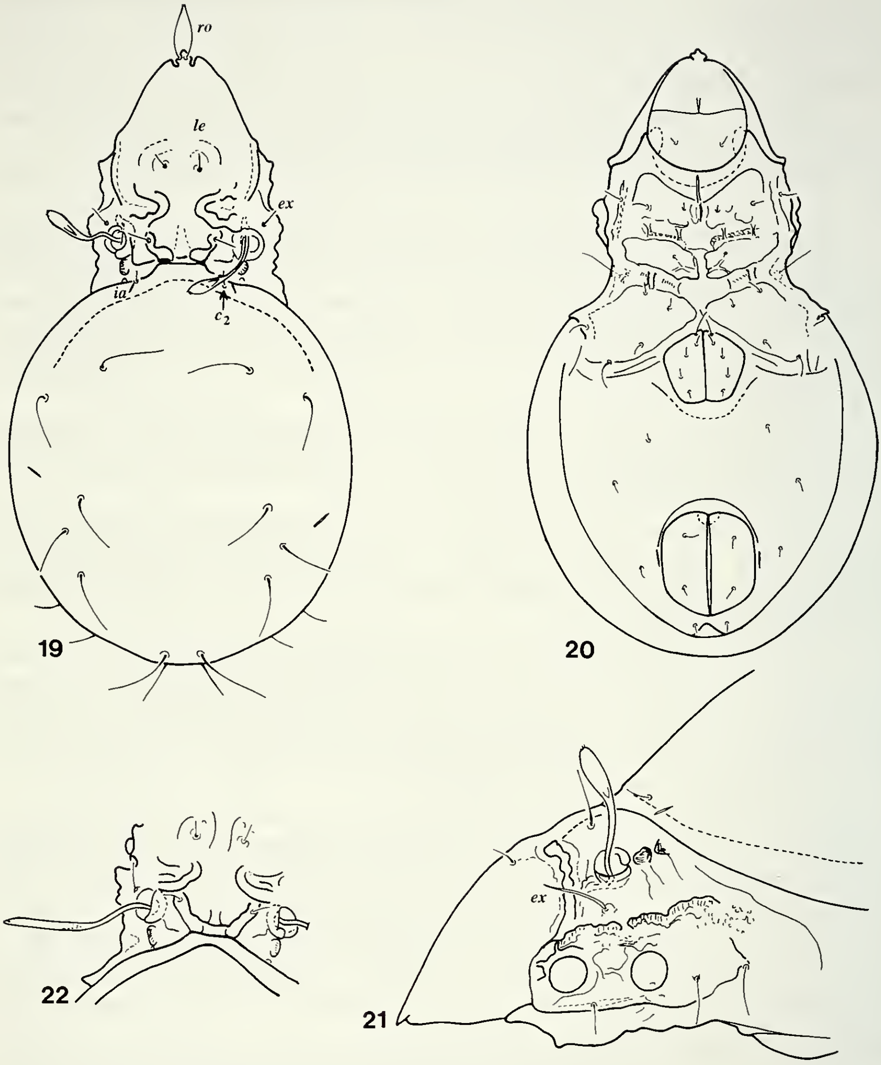
Derivatio nominis: This is the first *Dissorhina* species from the Neotropical region, all others are known from the Holarctic.

Gittella insularis sp. n. Figs 23-26

Material examined: Holotype: St. Lucia: STL-79/17; 3 paratypes: from the same sample. Holotype and 2 paratypes: MHNG, 1 paratype: (1561-PO-96): HNHM.

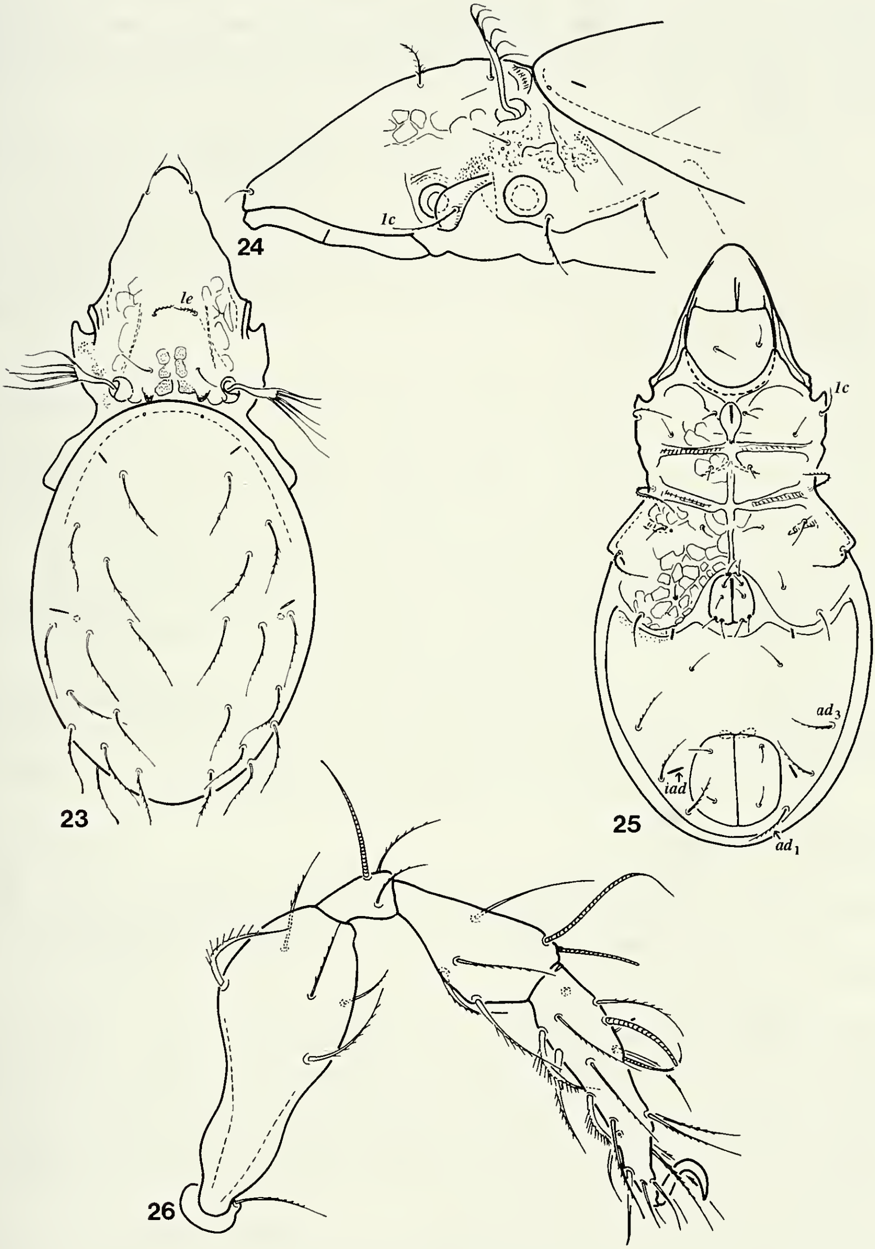
Measurements. - Length of body: 576-642 µm, width of body: 255-297 µm.

Prodorsum: Rostral part elongated, rostrum rounded. Weak lamellar lines present, which reach over to the insertion point of the lamellar setae. Three pairs



FIGS 19-22

Dissorhina neotropicalis sp. n. – 19: body in dorsal aspect, 20: body in ventral aspect, 21: podosoma in lateral aspect.
Dissorhina ornata (Paoli, 1908). – 22: basal part of prodorsum in dorsal aspect.



FIGS 23-26

Gittella insularis sp. n. – 23: body in dorsal aspect, 24: podosoma in lateral aspect, 25: body in ventral aspect, 26: leg I.

of large spots and a pair of strong tubercles present in the interbothridial region (Fig. 23). The latter directed posteriorly. Rostral setae thin and simple, arising near to the lateral margin. Lamellar setae conspicuously ciliated, rostral and interlamellar setae smooth. Sensillus slightly dilated, with 5-6 long flagellate branches. Exobothridial region granulate.

Notogaster: Twelve pairs of long notogastral setae and the alveoli of setae c_2 present. All notogastral setae with 4-6 comparatively long cilia. A pair of spots, near to the lyrifissures *iad* visible.

Lateral part of podosoma: Pedotecta I narrow, setae *1c* arising on it. The tectum, below the acetabula, disconnected behind pedotecta I (Fig. 24). A weak polygonal sculpture anteriorly and some crests and granulated areas above the acetabula of leg II-III present.

Ventral regions (Fig. 25): Some parts of the surface (e.g. along the apodemes) covered by cerotegument granules. Epimeral borders and apodemes conspicuous, *ap. 2* in straight transversal position, with a rounded thickening in front of it. Genital opening located comparatively posteriorly, epimera IV completely framing it. This surface has a polygonal sculpture. Epimeral setal formula: 3 - 1 - 3 - 3. Some of these setae conspicuously ciliate. Anogenital setal formula: 5 - 1 - 2 - 3. Adanal setae with long cilia. Lyrifissures *iad* in inverse apoanal position.

Legs: All joints of legs thick, somewhat narrowed at both ends. Especially thick is the femur of leg I (Fig. 26). Their setal formula typical for the family:

I: 1 - 5 - 2+1 - 4+2 - 20+2 - 1

Remarks: The new species fits well into the genus *Gittella* Hammer, 1961. It is distinguished from the other species by the size of the prodorsal condyles, the length of the notogastral setae and the form of the sensillus.

Derivatio nominis: It is named for its island locality.

Moritzoppia subfallax sp. n. Figs 27-29

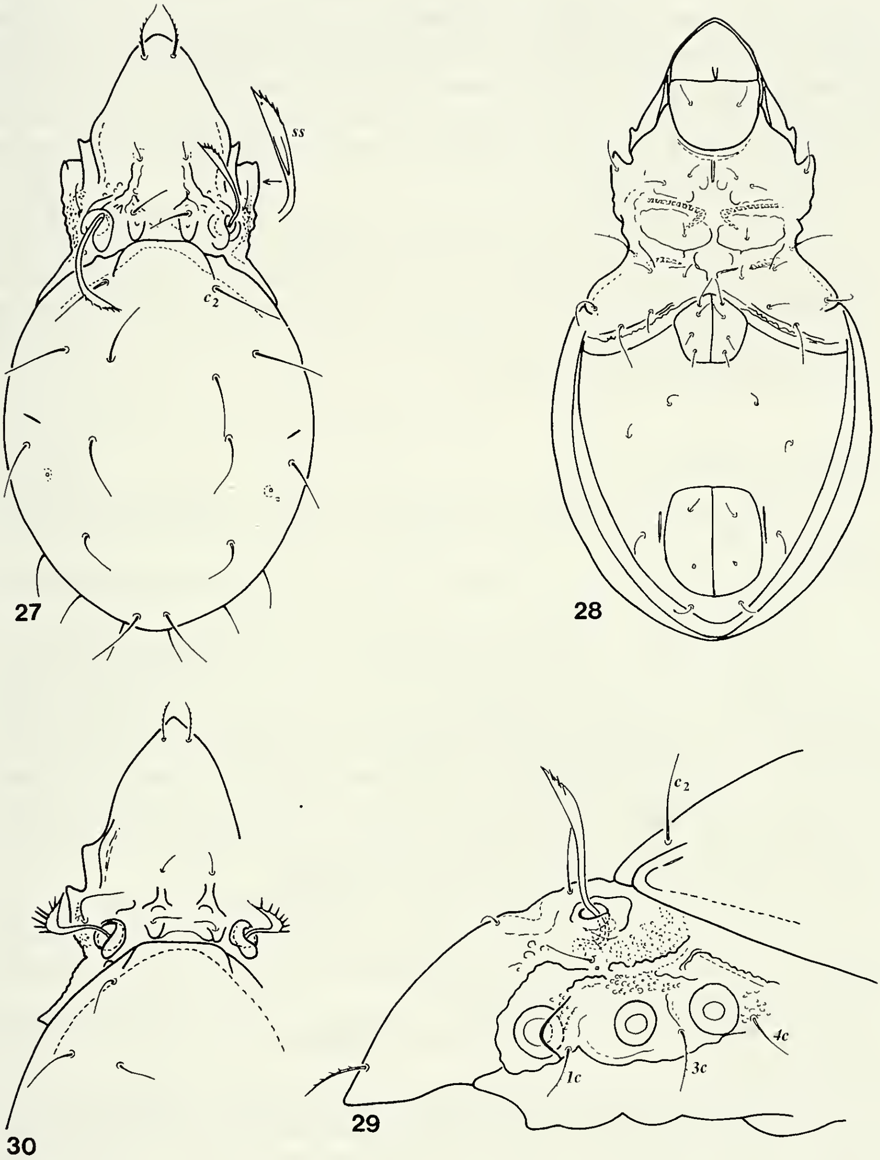
Material examined: Holotype: St. Lucia: STL-79/17; 5 paratypes: from the same sample. Holotype and 3 paratypes: MHNG, 2 paratypes: (1562-PO-96): HNHM.

Measurements. - Length of body: 266-317 μm, width of body: 145-171 μm.

Prodorsum: Rostrum rounded, ciliated, rostral setae arising on the prodorsal surface. Well developed, inverse Y-shaped costulae. A pair of other laths run forwards from the bothridia, they do not connect with the costula. Some small tubercles visible in front of them. One pair of V-shaped laths also present in the interbothridial region basally. Lamellar and interlamellar setae smooth, thinner and shorter than the rostral ones. Bothridia with basal tubercles. Sensillus asymmetrically expanded, with short spines unilaterally.

Notogaster: Dorsosejugal suture nearly straight medially, carina and a pair of humeral apophyses conspicuous. Setae c_2 not shorter than the other nine pairs of notogastral setae (Fig. 27).

Lateral part of podosoma: Well granulated, with some stronger laths (Fig. 29). Exobothridial setae hardly shorter than the interlamellar ones.



FIGS 27-30

Moritzoppia subfallax sp. n. – 27: body in dorsal aspect, 28: body in ventral aspect, 29: podosoma in lateral aspect.
Lauroppia fallax (Paoli, 1908). – 30: prodorsum in dorsal aspect.

Ventral regions: Coxisternal region well sclerotised, most of the apodemes and borders well visible. A characteristic, serrate, transversal crista present along the posterior border of the coxisternal region. Sejugal borders thick, with longitudinal, parallel lines. Epimeral setae simple, thin, setae *1c* arising laterally on the margin of pedotecta I (Fig. 28). Anogenital setal formula: 4 - 1 - 2 - 3. Setae ad_1 in postanal, setae ad_3 in preanal position. The latter inserted closer to the aggenital setae than to other adanal setae.

Remarks: The habitus, primarily the prodorsal and notogastral structure closely resembles the type species of the genus *Lauroppia* Subías & Rodriguez, 1986 (*cf. Fig. 30: fallax* Paoli, 1908). But on the basis of the number of genital setae and the well developed setae c_2, the new species would be better be placed in the genus *Moritzoppia* Subías & Rodriguez, 1988 (Subías & Balogh 1989), however I consider this as a somewhat provisional solution.

Derivatio nominis: It is named after the closely related species.

Oxyoppia antillensis sp. n. Figs 31-33

Material examined: Holotype: St. Lucia: STL-79/13; 7 paratypes: from the same sample; 2 paratypes: STL-79/6. Holotype and 6 paratypes: MHNG, 3 paratypes: (1563-PO-96): HNHM.

Measurements. - Length of body: 193-211 µm, width of body: 91-102 µm.

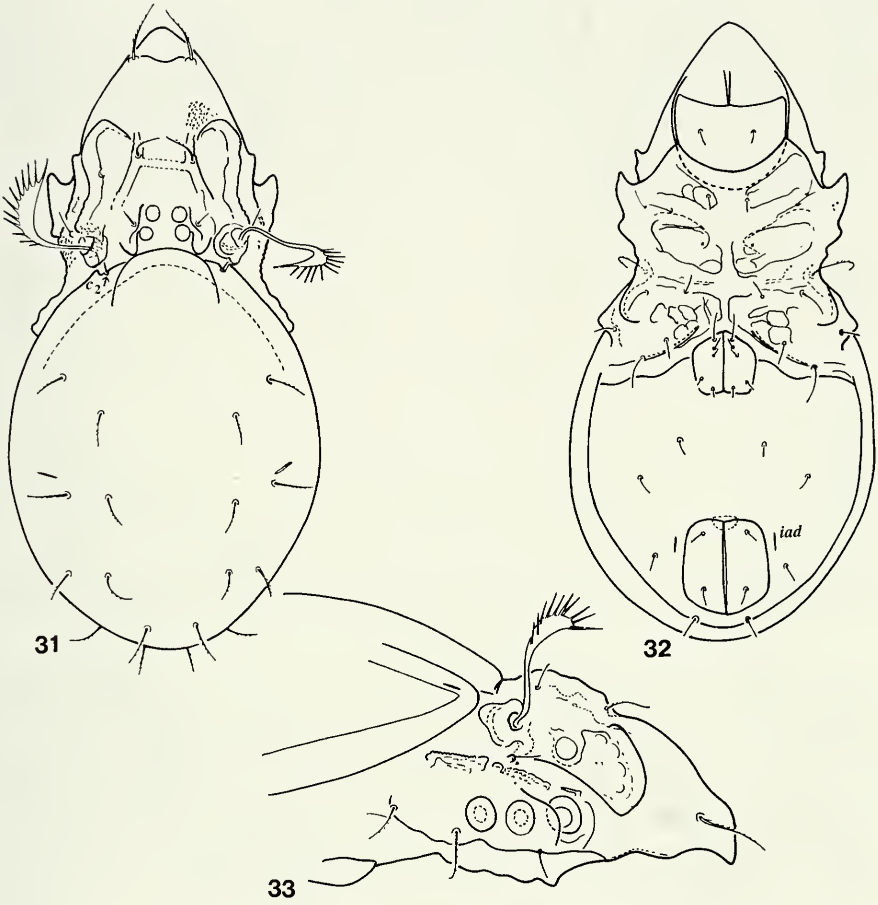
Prodorsum. Rostrum widely rounded, rostral setae arising laterally on small tubercles. Between them an arched line observable. Costulae reaching far out to the insertion of the interlamellar setae, a weak transcostula seen between their insertions. A pair of well-seclerotised basal tubercles passing into a longitudinal crest present in the interbothridial region, they frame two pairs of round spots and the interlamellar setae (Fig. 31). A pair of well-developed and arched lateral laths, directed toward the costula. Nearly the whole surface granulated. Sensillus large, asymmetrically dilated and unilaterally spinose, pectinate.

Notogaster: Dorsosejugal suture arched medially, with a well-developed crista. Humeral processes normal, standing opposite to the posterior bothridial tubercles. Ten pairs of notogastral setae present, they are all slightly thickened, bacilliform and pilose, excepting setae c_2.

Lateral part of podosoma: Well sclerotised, the surface mostly granulated (Fig. 33).

Ventral regions (Fig. 32): Epimeral borders conspicuous, epimeral fields separated by thick bands. Epimeral fields ornamented by a polygonal sculpture. A sharp, arched minitectum present along the posterior border, near the genital opening. Anogenital setal formula: 5 - 1 - 2 - 3. All setae short (excepting the anterior genital ones), setae ad_1 in postanal, setae ad_3 in preanal position.

Remarks: The new species stands nearest to *Oxyoppia pilosa* Balogh & Mahunka, 1981 described from Paraguay but differs from it by the conspicuously long crista, the longer costulae, the position of the weak transcostula and by the strongly arched laths near to the posterior epimeral borders.



FIGS 31-33

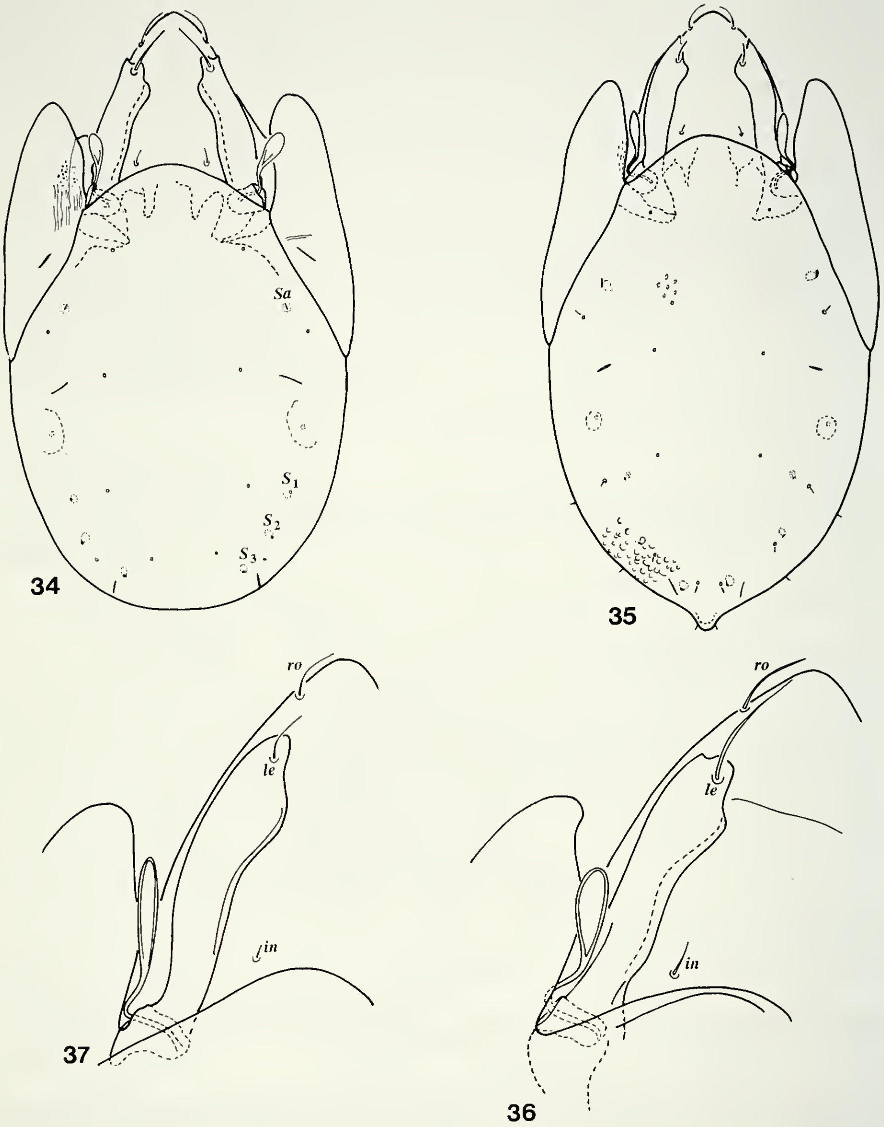
Oxyoppia antillensis sp. n. – 31: body in dorsal aspect, 32: body in ventral aspect, 33: podosoma in lateral aspect.

Derivatio nominis: This is the first *Oxyoppia* species known from the Antilles.

Parakalumma piton sp. n. Figs 34-36

Material examined: Holotype: St. Lucia: STL-79/7; 6 paratypes: from the same sample: 4 paratypes: STL-79/3; 2 paratypes: STL-79/6; 2 paratypes: STL-79/12; 3 paratypes: STL-79/17. Holotype and 11 paratypes: MHNG, 6 paratypes: (1566-PO-96): HNHM.

Measurements. - Length of body: 291-376 µm (female), 331-352 µm (male), width of body: 160-211 µm (female), 175-181 µm (male).



Figs 34-37

Parakalumma piton sp. n. – 34: body in dorsal aspect (♀), 35: body in dorsal aspect (♂), 36: lamella and sensillus (♀).
Parakalumma foveolata Balogh & Mahunka, 1969. – 37: lamella and sensillus (♀).

Prodorsum: (Female): Rostrum rounded, rostral setae simple. Lamellae with a small anterolateral incision and a spine (Fig. 34). Lamellar setae twice as long as the rostrals, interlamellar setae conspicuous. Sensillus comparatively short, its capitulum wide. (Male): Lamellae without anterolateral incision and spine, gradually narrowing anteriorly. Sensillus thinner and longer (Fig. 35) than in the female.

Notogaster: In both sexes: Ten pairs of minute notogastral setae. Four pairs of sacculi present, *Sa* much larger than the others and their inner surface punctate (resembling a porose area). Pustulate sculpture in males (Fig. 35).

Lateral part of podosoma: Tutorium very short, without cusp, a conspicuous line runs from acetabulum I to the insertion of rostral seta. Pedotecta I and II-III normally developed, discidium large. Circumpedal carinae conspicuous, reaching the lateral margin of ventral plate and running far anteriorly.

Gnathosoma: Palpal femur with strong transversal ridges. Palp setal formula: 2 - 1 - 3 - 9+1. Eupathidium *acm* and the solenidium fused with each other.

Ventral regions: Median part of the coxisternal region ornamented by weak foveolae, on the ventral plate some rounded, but even weaker foveolae present. Epimeral setal formula: 3 - 1 - 3 - 3. Anogenital setal formula: 4 - 1 - 2 - 3. Lyrifissures *iad* in adanal position. All setae in the ventral regions short and simple.

Legs: All legs monodactylous, with large claws. Seta *ft*" and ϵ inserted behind solenidia ω_1 and ω_2. φ_1 and φ_2 arising on a projection. A well developed blade-like formation on femora III and IV ventrally.

Remarks: The new species stands very near *Parakalumma foveolata* Balogh & Mahunka, 1969. Re-examination of a paratype of this species shows that it can unambiguously be distinguished from the new species by the form of the lamellae (Fig. 37) in the female and the lacking of the peculiar pustulate sculpture of the notogaster (shown in Fig. 35) in the male. In both sexes of the new species the foveolate sculpture is much weaker than in *P. foveolata*. This species differs also from the new one by the form of the sensillus (much thinner in *P. foveolata*) and the length and ratio of the prodorsal setae (much longer in the female of the new species, Fig. 36).

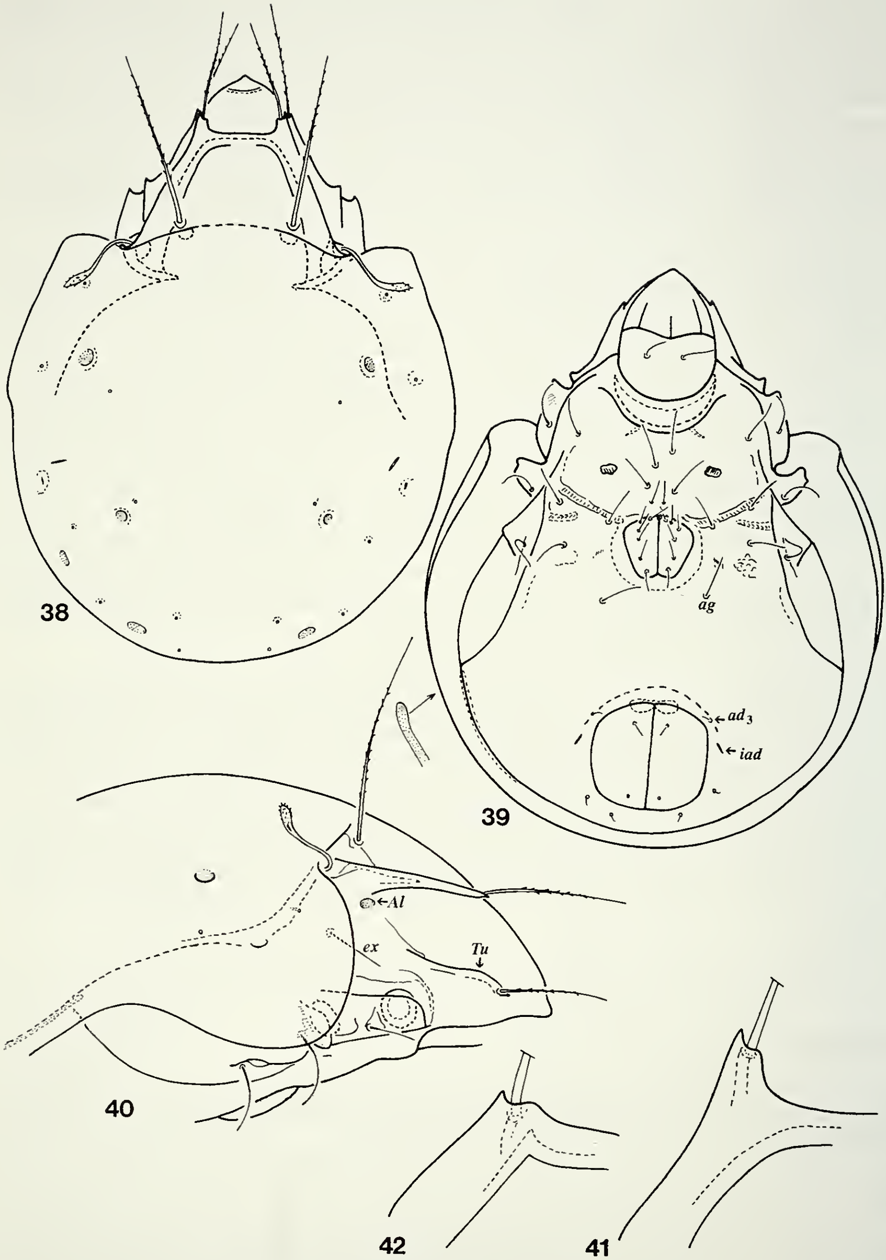
Derivatio nominis: named after the characteristic mountain of St. Lucia Island.

Unguizetes similis sp. n. Figs 38-41

Material examined: Holotype: St. Lucia: STL-79/19; 4 paratypes: from the same sample; 1 paratype: STL-79/1. Holotype and 3 paratypes: MHNG, 2 paratypes: (1564-PO-96): HNHM.

Measurements. - Length of body: 560-691 µm, width of body: 477-544 µm.

Prodorsum: Rostrum nearly triangular in dorsal view. Lamellae with comparatively long and narrow cusps (Fig. 41), their outer apex sharply pointed. Rostral, lamellar and interlamellar setae simple, setiform, somewhat ciliated. Sensillus directed outwards and backwards, with a long pedicel and a small, finely ciliate capitulum.



FIGS 38-42
Unguizetes similis sp. n. – 38: body in dorsal aspect, 39: body in ventral aspect, 40: podosoma in lateral aspect, 41: lamellar cusp.
Unguizetes incertus Balogh & Mahunka, 1969. – 42: lamellar cusp.

Notogaster: Surface finely punctate. Dorsosejugal suture faint between the insertion of interlamellar setae. Four pairs of small and round areae porosae and ten pairs of setal alveoli present on the notogaster (Fig. 38).

Lateral part of podosoma (Fig. 40): Tutorium well developed, with a short cusp, rostral seta inserted close to it. Exobothridial setae conspicuously long and thin. Pedotecta II-III and the discidium large.

Ventral regions (Fig. 39): Apodemes short or absent (excepting the sejugal ones). Epimeral borders hardly discernible. All epimeral setae long, but their length variable. Anogenital setal formula: 6 - 1 - 2 - 3. The setae in this region short and simple. A band of areae porosae observable along the margin of the ventral plate, beginning at the connecting of the circumpedal carina.

Legs: All legs tridactylous, haterodactyly present. Solenidia of tibia I inserted on a protuberance. Femora of legs II-IV wit a blade-like formation ventrally.

Remarks: The new species stands nearest to *Unguizetes incertus* Balogh & Mahunka, 1969. It is distinguished from the latter by the absence of the characteristic, polygonal sculpture, by the much narrowed lamellae running near to each other (broadened in *U. incertus*) and by the form of the lamellar cusps (for *U. incertus* see in Fig. 42). In *U. incertus* the dorsosejugal suture is also faint medially, but not absent, as mentioned in the original description.

Derivatio nominis: The species is similar to *Unguizetes incertus* · (Balogh & Mahunka, 1969).

Eupelops spongiosus sp. n. Figs 43-44

Material examined: Holotype: St. Lucia: STL-79/8: MHNG.

Measurements. - Length of body: 476 μm, width of body: 372 μm.

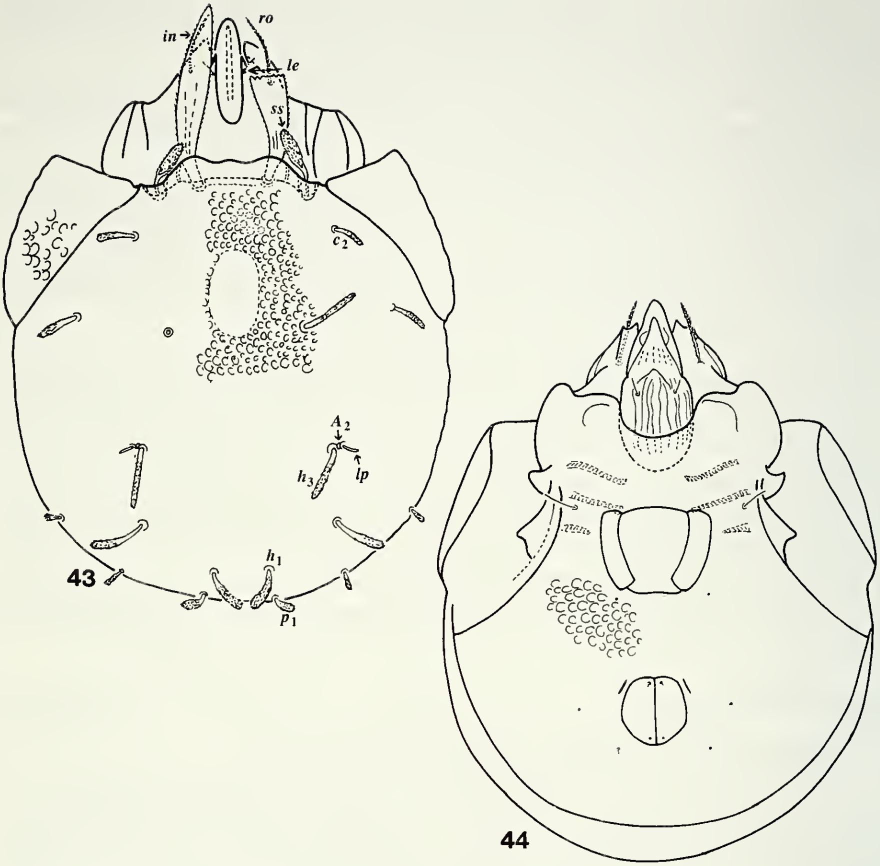
Prodorsum: Its size typical for the genus. Interlamellar region U-shaped, wide. Lamellar surface finely foveolated. Tutorium also wide, well developed (Fig. 43). Rostral and lamellar setae distinctly barbed, interlamellar setae very large, phylliform. Sensillus short, its capitulum fusiform.

Notogaster: Cerotegument thick, excepting the well separated notogastral lenticulus and the lateral part of the pteromorphae. It seems to be foveolate. Pteromorphae large, the hinge-like line conspicuous. Anterior notogastral tectum covering the basal part of prodorsum, its anterior margin waved. Ten pairs of mostly dilated notogastral setae present, setae lp and h_3 stand close to one another. The former much smaller than the latter (Fig. 43). Owing to the cerotegument sculpture I was unable to find all four pairs of areae porosae and the position of the lyriffisures.

Ventral regions: Mentum ornamented by mostly longitudinal, anteriorly converging striations. Coxisternal and ventral surface covered by thick cerotegument. Its sculpture similar to that of the notogaster; therefore, most of the epimeral setae invisible (Fig. 44).

Legs: All legs tridactylous, a strong heterodactyly present.

Remarks: The new species is well characterised by the sculpture of the cerotegument layer. Within the species group which is characterised by the closely



Figs 43-44

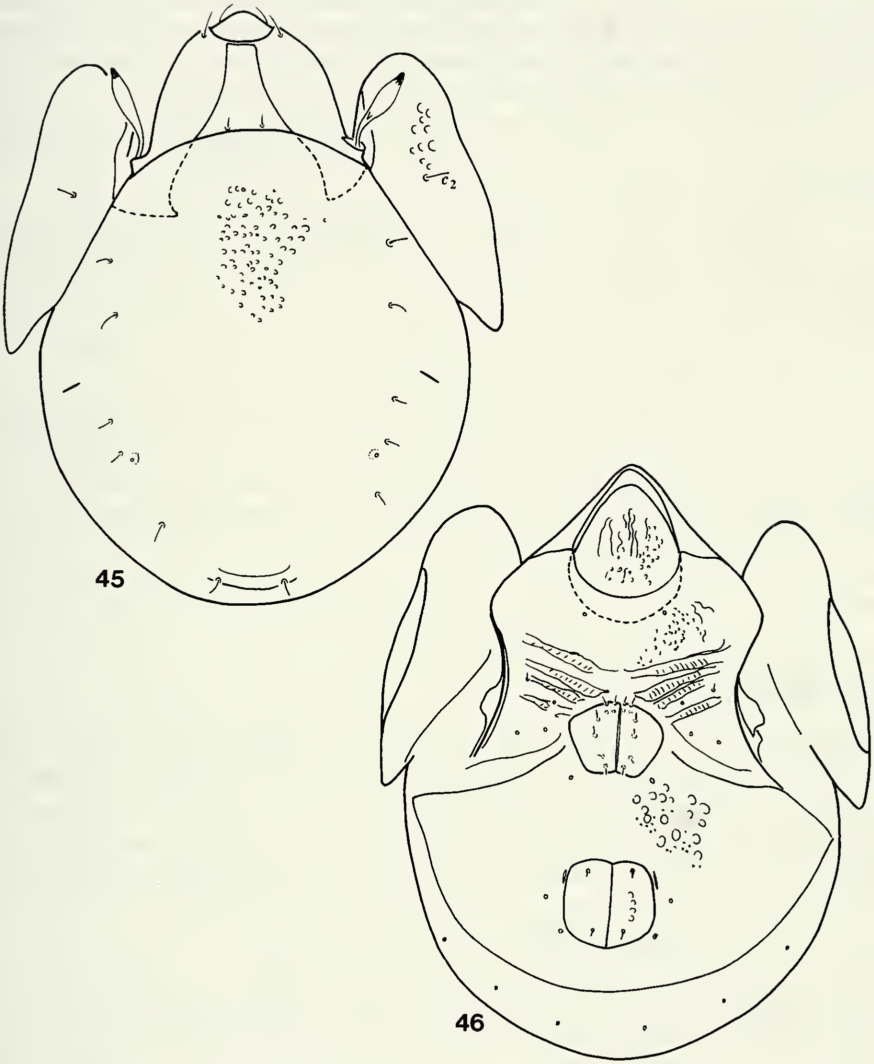
Eupelops spongiosus sp. n. – 43: body in dorsal aspect, 44: body in ventral aspect.

adjacent setae *lp* and h_3, a similar sculpture is known in *E. foveolatus* Engelbrecht, 1975 described from South Africa. However, the sensillus of the latter species is much shorter and its head is truncate.

Derivatio nominis: named after the characteristic sculpture of the notogaster.

Truncozetes rugosus sp. n. Figs 45-46

Material examined: Holotype: St. Lucia: STL-79/1; 3 paratypes: from the same sample. Holotype and 2 paratypes: MHNG, 1 paratype: (1565-PO-96): HNHM.



FIGS 45-46

Truncozetes rugosus sp. n. – 45: body in dorsal aspect, 46: body in ventral aspect.

Measurements. - Length of body: 233-244 µm, width of body: 171-176 µm.

Integument: Nearly the whole surface covered by cerotegument granules which, on some parts of body (e.g., dorsosejugal region), is more distinct than on other parts. Cuticle foveolate or punctate, mentum with irregular longitudinal rugae.

Prodorsum: Rostrum elongated, rounded. Lamellae wide, obliquely truncate anteriorly. Translamella narrow, almost linear (Fig. 45). Lamellar and rostral setae thin setiform, interlamellar ones minute. Sensillus fusiform, its distal end elongate, this part much darker than the rest. Bothridium opened anteriorly.

Notogaster: Surface well foveolate. One pair of sacculi (?) and ten pairs of short notogastral setae present. A weak but conspicuous elevation in posteromarginal position.

Ventral regions (Fig. 46): Mentum rugose and foveolate. Epimeral region ornamented by smaller, ventral plate by larger, foveolae. The smaller foveolae sometimes confluent. Epimeral borders and some apodemes also conspicuous, bo_2 forming a transversal band, the others compose a network in front of the genital opening. Epimeral setae hardly visible, minute. Six pairs of genital setae present.

Legs: All legs tridactylous, a strong heterodactyly present.

Remarks: The new species stands near to the type species of the genus, *Truncozetes mucronatus* Balogh & Mahunka, 1969. However it is clearly distinguishable by the absence of the longitudinal pattern on the coxisternal region and the much weaker and irregular sculpture on the mentum, which consists of regular longitudinal sulci in *T. mucronatus*.

Derivatio nominis: This species is named after the sculpture of the mentum.

Paracarinogalumna gen. n.

Diagnosis: Family *Galumnidae*. Prodorsal surface with a well sclerotised, sharp, median keel, resembling a crest or carina. Lamellar lines protruding anteriorly and composing a keel-shaped formation like a costula and similar to the median keel. All three crests run to the rostral apex, which is characteristically triangular. Sublamellar lines strong, normally developed, well arched. Lamellar setae arising on lamellar keel, rostral setae very near to it. Dorsosejugal suture complete. Notogaster with 4 pairs of areae porosae, 10 pairs of setal alveoli (true setae absent). Median pori absent. Coxisternal region normal, pedotecta I sharply pointed. Anogenital setal formula: 6 - 1 - 2 - 3. Lyriffissures *iad* located far laterally from the anal aperture. Porose area postanalis absent. All legs tridactylous, heterodactyly weak. Solenidium ω_2 and ϵ stand behind ω_1.

Type species: *Paracarinogalumna genavensium* sp. n.

Remarks: The lamellar line is formed like a blade. This feature, along with the median keel, is known in the family Galumnidae (*Carinogalumna* Engelbrecht, 1973). The new taxon stands close to this genus, although the blade-like formation is only partial and it is the lamellar line which continues in an arched, sharp blade not bearing the lamellar seta; furthermore, the sublamellar line is reduced, or at least partly missing, while the porose area postanalis is completely lacking. The genus *Carinogalumna* has median pori and the lyrifissure *iad* is in the adanal position; on the other hand, in the new species, the median pori are missing, while lyrifissure *iad* is far removed from anal aperture. Consequently, it is not considered here as a member of the South African genus *Carinogalumna*.

Derivatio nominis: The new genus is very near to *Carinogalumna* Engelbrecht, 1973.

Paracarinogalumna genavensium sp. n. Figs 47-51

Material examined: Holotype: St. Lucia: STL-79/8; 9 paratypes: from the same sample; 18 paratypes: STL-79/1; 1 paratype: STL-79/5; 4 paratypes: STL-79/11; 2 paratypes: STL-79/15; 1 paratype: STL-79/17. Holotype and 23 paratypes: MHNG, 12 paratypes: (1569-PO-96): HNHM.

Measurements. - Length of body: 766-865 µm, width of body: 589-642 µm.

Prodorsum: Rostral apex sharply pointed. Lamellar keel running toward the rostral apex but not reaching it. The position of the rostral and lamellar setae as shown in Fig. 50. Interlamellar setae reduced, hardly visible or represented only by their alveoli. Sensillus lanceolate, its head with some spicules (Fig. 47).

Notogaster: Dorsosejugal suture complete. Four pairs of porose areae present, *Aa* gradually widened to the lateral margin of notogaster. A_3 narrow, long. Median pori absent, lyrifissures *im* located near to porose area A_1.

Lateral part of podosoma: As shown in Fig. 50. Circumpedal carina reaching to the lateral margin of the ventral plate.

Ventral regions (Fig. 48): Coxisternal region without spots or other sculpture. All setae minute, hardly discernible. Epimeral setal formula: 1 - 0 - 2 - 2 . Only two pairs of genital setae arising on the anterior margin of the plates, the others inserted along longitudinal lines. Aggenital, anal and adanal setae also minute, setae ad_3 arising in front of lyrifissures *iad*.

Legs: All legs tridactylous, a weak heterodactyly present. End of lateral claws slightly dilated. The position of the solenidial group of leg I as shown in Fig. 51. Genu IV conspicuously long, bearing two very long setae.

Legs setal formulae:

I: 1 - 5 - 3+1 - 4+2 - 20+2 - 3
IV: 1 - 2 - 2 - 3+1 - 12 - 3

Remarks: See the remarks after the generic diagnosis.

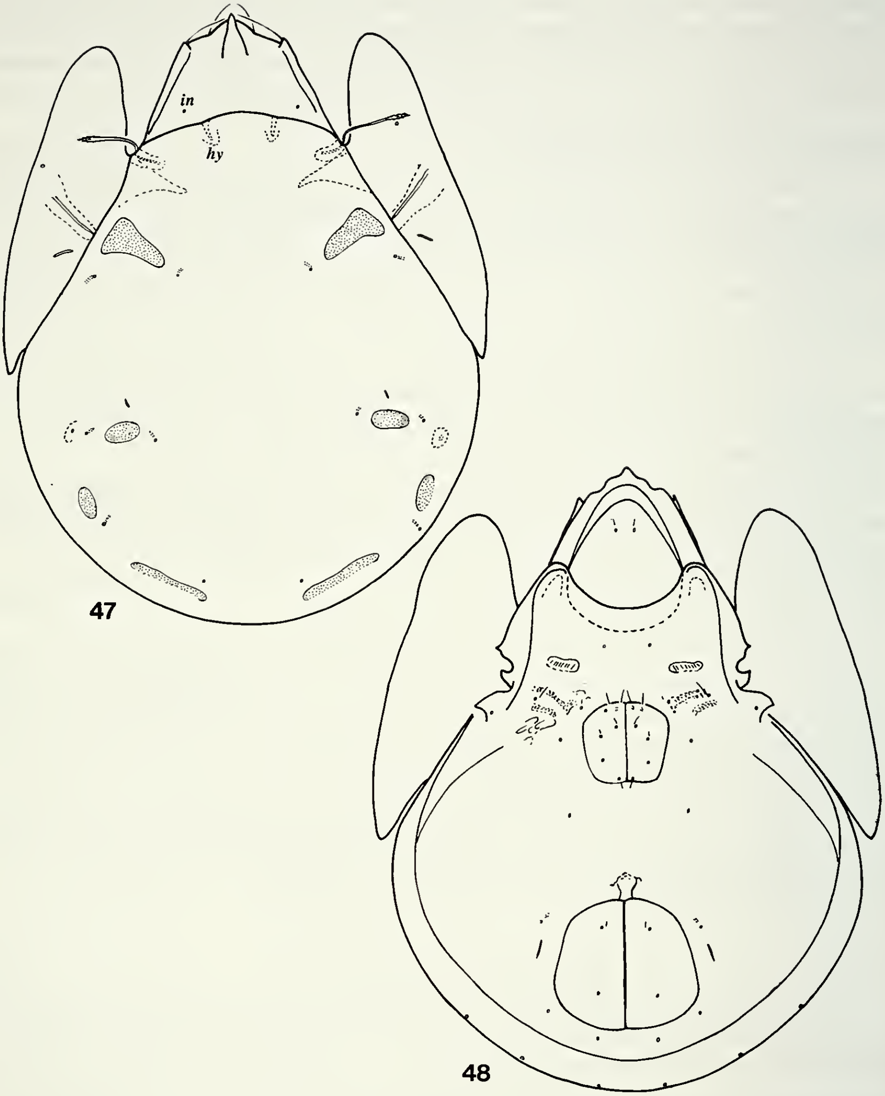
Derivatio nominis: In honour of the staff of the Geneva Museum and especially of T. Jaccoud and L. de Roguin.

Pergalumna cucheae sp. n. Figs 52-55

Material examined: Holotype: St. Lucia: STL-79/1; 17 paratypes: from the same sample. Holotype and 10 paratypes: MHNG, 7 paratypes: (1567-PO-96): HNHM.

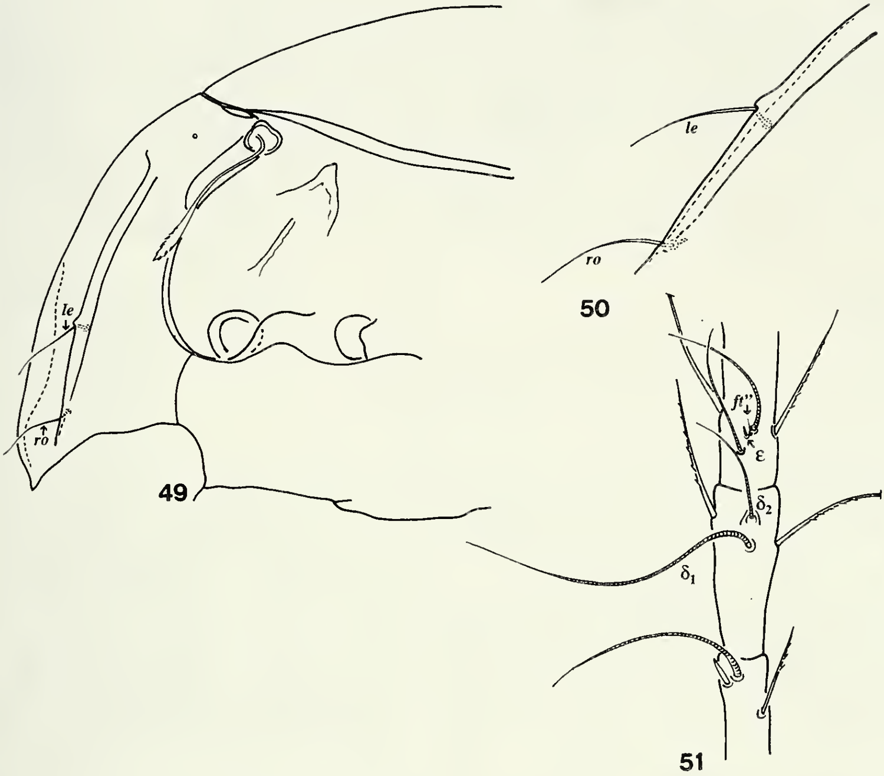
Measurements: - Length of body: 650-758 µm, width of body: 460-552 µm.

Prodorsum: Rostral part characteristically modified, rostral apex protruding in a wide nose forwards, with a weak but wide transversal band behind it. Both anterior prodorsal setae long, thin, nearly equal in length. Interlamellar setae represented only by their alveoli. Sensillus setiform, smooth, simple.



FIGS 47-48

Paracarinogalumna genavensium gen. n., sp. n. – 47: body in dorsal aspect, 48: body in ventral aspect.



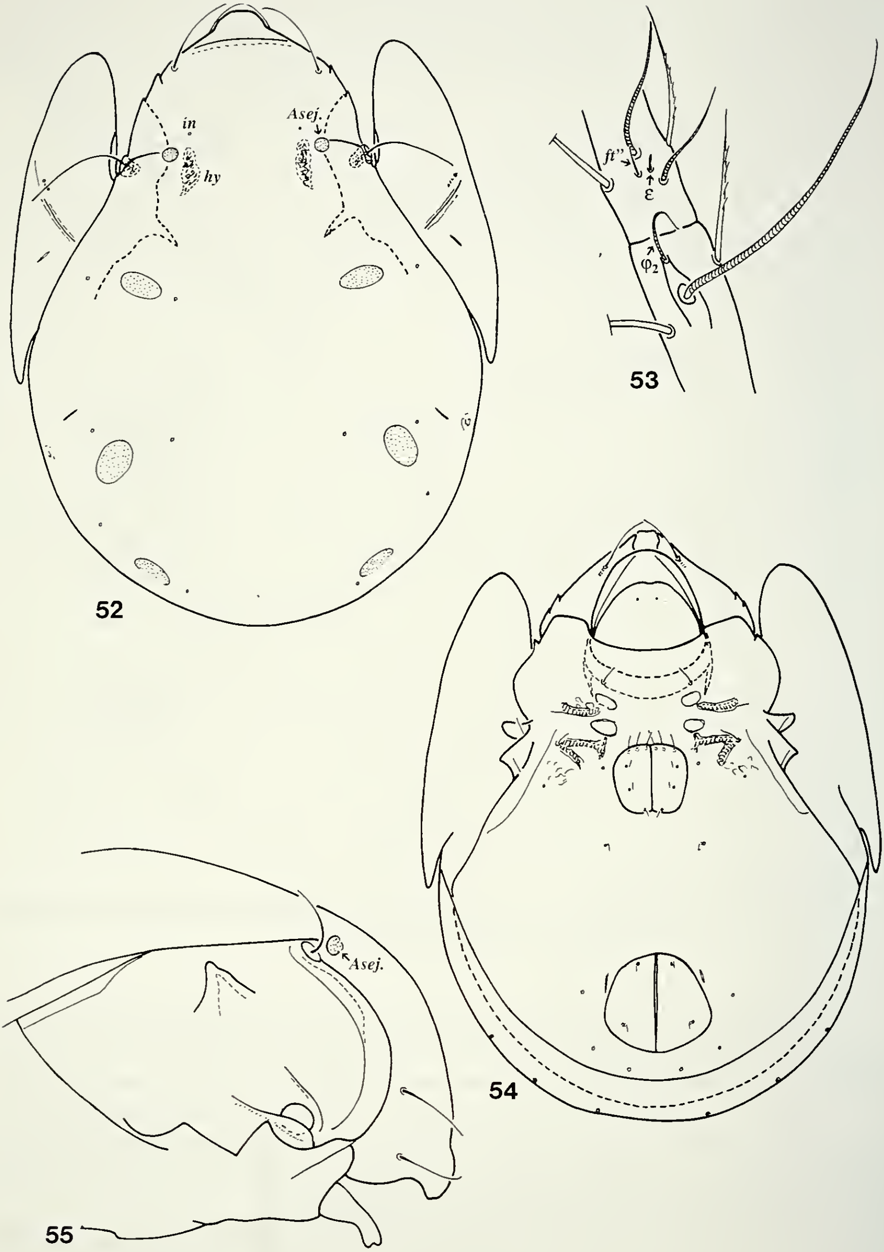
Figs 49-51

Paracarinogalumna genavensium gen. n., sp. n. – 49: podosoma in lateral aspect, 50: lamellar line, 51: solenidial group of leg I.

Notogaster (Fig. 52): Dorsosejugal suture interrupted between the round sejugal porose area. Structure *hy* conspicuously large. Three pairs of areae porosae and 10 pairs of setal alveoli present, no essential difference among the areae porosae.

Lateral part of podosoma: Lamellar and sublamellar line well developed, gradually arching toward the margin of the coxisternal region. They run parallel to each other. Anterior margin of mentum very thick (Fig. 55). Circumpedal carina reaching to the lateral margins of the ventral plate.

Ventral regions (Fig. 54): Epimeral surface without characteristic sculpture. All epimeral setae simple and conspicuous, epimeral setal formula: 1 - 0 - 2 - 3. Three pairs of genital setae inserted on the anterior margin of the genital plates. Aggenital, anal and adanal setae minute, hardly visible. Their position typical for the family.



Figs 52-55

Pergalumna cucheae sp. n. – 52: body in dorsal aspect, 53: solenidial group of leg I, 54: body in ventral aspect, 55: podosoma in lateral aspect.

Legs: The solenidial group of leg I as shown in Fig. 53.

Remarks: The new species is well characterised by the form of the rostrum. It slightly resembles *Pergalumna clericata* (Berlese, 1914), which was designated by PÉREZ-IÑIGO & BAGGIO (1994) as the type of the genus *Pseudogalumna*. However, the rostrum of the new species is rounded and, without a keel. The three pairs of notogastral porose areas are also typical for the genus *Pergalumna* Grandjean, 1936. Therefore it fits well to the latter genus.

Derivatio nominis: I dedicate the new species to Mrs T. Cuche (Geneva Museum) in recognition of her invaluable help during my stay in Geneva.

Pilogalumna antillensis sp. n. Figs 56-59

Material examined: Holotype: St. Lucia: STL-79/82; 7 paratypes: from the same sample. Holotype and 4 paratypes: MHNG, 3 paratypes: (1568-PO-96): HNHM.

Measurements. - Length of body: 683-781 µm, width of body: 526-622 µm.

Prodorsum: Rostrum simple, conical. Lamellar lines absent, sublamellar lines (S) well developed, arched downwards and fused with the epimeral margin (Fig. 59). Prodorsal setae short or reduced, rostral setae longer than the lamellar ones. Interlamellar setae represented only by their alveoli. Sensillus directed forwards, narrow lanceolate, with a few capitular spicules.

Notogaster: Dorsosejugal suture complete, the thickening behind it (*hy*) round (Fig. 56). Notogaster smooth, pteromorphae with some radiate crests. Four pairs of comparatively small porose areae present. Aa and A_3 characteristically elongated, A_1 irregular. Ten pairs of minute notogastral setae or their alveoli present, at least setae c_2, da and p_1 clearly visible.

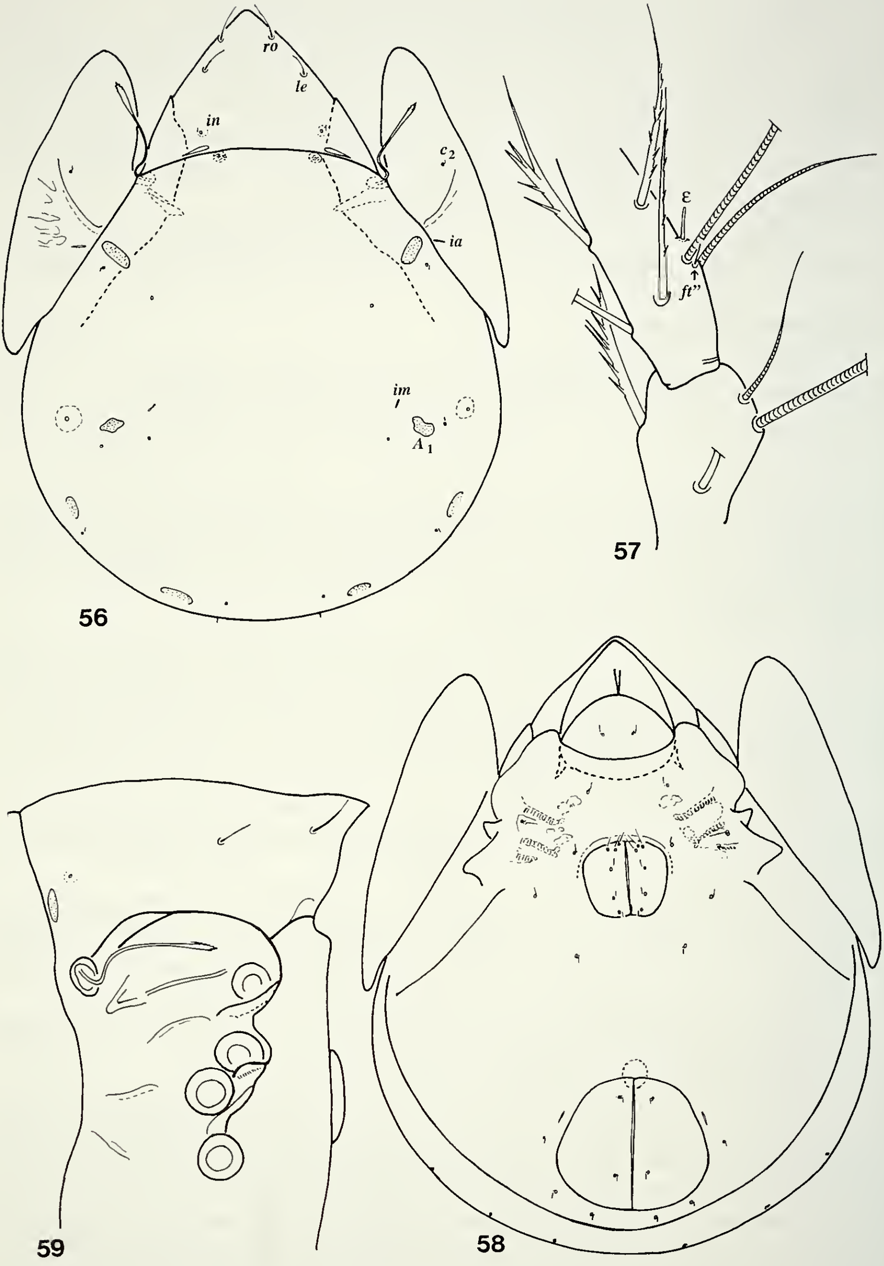
Lateral part of podosoma: Pedotecta I small, pedotecta II-III normal, discidium rounded laterally. Circumpedal carina short, ending far from the lateral margin on the ventral plate.

Ventral regions (Fig. 58): Epimeral surface hardly ornamented, only a few spots visible. Epimeral setal formula: 1 - 0 - 2 - 1, all setae minute. Anogenital setal formula: 6 - 1 - 2 - 3, all setae also minute. Three pairs of setae concentrated on the anterior margin of genital plates. Lyrifissure *iad* in adanal position.

Legs: All legs tridactylous, a weak heterodactyly observable. Both solenidia of tarsus I inserted near to each other, in a transversal line (Fig. 57).

Remarks: The classification of this species is rather problematic, because the absence of the sublamellar lines is one of the main characteristics of the genus *Pilogalumna* Grandjean, 1956. They are well developed in this species! However, on the basis of the other characters (minute notogastral setae, position of ϵ on tarsus I) it fits well into this group. Further studies are necessary to decide the final position of this species. Hitherto, the genus has not been recorded from the Neotropical region.

Derivatio nominis: Named after the zoogeographical region, where the species was collected.



FIGS 56-59

Pilogalumna antillensis sp. n. – 56: body in dorsal aspect, 57: solenidial group of leg I, 58: body in ventral aspect, 59: podosoma in lateral aspect.

ACKNOWLEDGEMENTS

I would like to express my gratitude to Mr T. Jaccoud and to late Dr L. de Roguin (1948 - 1998), both collaborators of the Geneva Museum, for their assistance in 1979. In that year my wife and I planned and paid for a trip to St. Lucia, but we did not get a visa. At the last minute T. Jaccoud and L. de Roguin offered to undertake – at their own expense – this collecting trip instead of us and helped us in this way to save our money and postpone our trip for the following year (1980). This exemplary help between colleagues should be especially emphasized.

I am also very grateful to Dr Malcolm Luxton (National Museum of Wales, Cardiff) for critical reading of the manuscript and for his valuable suggestions.

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Japygoidea (Diplura) du Sud-Est asiatique n° 8: Indonésie (Java, Bali), Singapour et Brunei
- *Dicellurata Genavensia* XXIII -

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Japygoidea (Diplura) from South-East Asia n° 8: Indonesia (Java, Bali), Singapore and Brunei - *Dicellurata Genavensia* XXIII. - In this note are studied 14 specimens of Parajapygidae collected in 1987 and 1988. *Parajapyx* (*Grassjapyx*) *sabahnus* Pgs, formerly described from Sabah (Malaysia), exists in Singapore where it may have been imported. Three new species are recognized: *P.* (*Parajapyx*) *hauseri* n. sp., *P.* (*Grassjapyx*) *temburong* n. sp. from Brunei, and *P.* (*Grassjapyx*) *reniformis* n. sp. from Java and Bali. One specimen from Teraja (Brunei) shows a mixture of characters which hinders me to describe it as a n. sp. until further specimens will be collected in the same area. New nomenclature and definition of the different instars of ♂ and ♀ are proposed. The subgeneric position of *Parajapyx hwashanensis* Chou, *Parajapyx yangi* Chou and *Parajapyx jinghongensis* Xie & Yang is precised. The possibility for *Parajapyx paucidentis* Xie *et al.* to be an anomaly or a casual mutation of *Parajapyx* (*Parajapyx*) *isabellae* (Grassi) is discussed.

Key-words: Diplura - Parajapygidae - Indonesia - Singapore - Brunei - Taxonomy - New species - Instars.

INTRODUCTION

Au cours de ses missions entomologiques dans le Sud-Est asiatique, l'équipe du Département des Arthropodes et d'Entomologie I du Muséum d'histoire naturelle de Genève (B. Hauser et C. Lienhard), a recueilli 14 représentants de la famille des Parajapygidae. Cette famille cosmopolite n'était connue de ces régions que par les *Parajapyx* (*Grassjapyx*) *sepilok* et *P.* (*G.*) *sabahnus* que j'ai décrit du Sabah (Malaysia) (PAGÉS 1987).

A ma connaissance, douze autres taxons peuvent être cités d'Asie et des îles du Pacifique. L'espèce cosmopolite, *Parajapyx* (*P.*) *isabellae* (Grassi) a été signalée de Chine, du Japon et des Îles Hawaï (SILVESTRI 1928, CHOU 1966, ZWALUWENBURG 1934, ZIMMERMAN 1948).

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L'énigmatique *P.* (*G.*) *grassianus* var. *indica* Silv. du Sikkim (Silvestri 1913) est l'unique Parajapygidé signalé de la région indienne. D'Australie, Womersley (1934, 1945) a fait connaître *P.* (*P.*) *swani* Wom. d'Australie occidentale et *P.* (*G.*) *queenslandica* Wom. du Queensland; enfin, des îles du Pacifique, on peut citer, outre l'ubiquiste *Parajapyx* (*P.*) *isabellae* (Grassi) des Îles Hawaï, une ♀ d'un *Parajapyx* (*Grassjapx*) sp. des Îles Marianes du Nord (Nakamura 1994) et *P.* (*G.*) *samoanus* Silv. de l'archipel des Samoa (Silvestri 1930).

De Chine, 5 espèces et une "var." ont été décrites: *Parajapyx* (*P.*) *emeryanus* Silv. et sa "var." *centralis* Silv. (Silvestri 1928, Chou 1966); *Parajapyx hwashanensis* Chou du Shensi et *Parajapyx yangi* Chou de Pékin (Chou 1966), ainsi que *Parajapyx jinghongensis* Xie & Yang du Yunnan (Xie & Yang 1990) ont été décrits sans indication de sous-genre; il me semble que les marges internes des cerques figurés justifient leur attribution au sous-genre *Grassjapyx* Pgs: *Parajapyx* (*Grassjapyx*) *hwashanensis* Chou, *Parajapyx* (*Grassjapyx*) *yangi* Chou, *Parajapyx* (*Grassjapyx*) *jinghongensis* Xie & Yang.

Quant au *Parajapyx paucidentis* décrit récemment par Xie *et al.* (1990) du Zhejang, je ne crois pas que l'on puisse le considérer comme une espèce valable, mais vraisemblablement plutôt comme une aberration ou une mutation accidentelle ou non de *P.* (*P.*) *isabellae* (Grassi) dont il semble posséder les antennes, la chétotaxie générale et surtout les organes subcoxaux latéraux. En effet, pratiquement tous les stades de régression de l'armature de la marge interne des cerques dans le groupe *isabellae* ont été décrits. Le premier exemple est peut-être celui du *Parajapyx* (*P.*) *isabellae*, variant IV d'El Golea (Maroc) (Pagès 1954) dont la d_1 droite n'est plus qu'un minuscule denticule, le reste de la marge étant normal[2]. Le cas le moins atypique de dégradation de la marge interne est celui que j'ai signalé (1952b) chez un *Parajapyx* (*P.*) *normandi* Pgs. de Tunisie dont le cerque droit montre des dents mal formées, peu saillantes, mais encore reconnaissables. On peut citer ensuite l'exemplaire de *Parajapyx* (*P.*) *isabellae* (Grassi) figuré par Silvestri (1948a) chez lequel on ne distingue plus que quelques minuscules denticules à peine visibles. *Parajapyx* (= *Hemijapyx*) *unidentatus* Ewing de l'Alabama ne montrerait plus que la d_1, le reste des marges étant totalement lisse (Ewing 1941). *P. paucidentis* pourrait être considéré comme le stade ultime de la régression, les marges ne présentant plus qu'un minuscule denticule près de l'apex des cerques ne correspondant à aucune des dents normales.

Des régressions semblables ont été signalées par Silvestri (1948a) d'une part chez un autre Parajapygidé, *P.* (*G.*) *grassianus* Silv. d'Amérique du Nord, dont les cerques sont dépourvus de toutes dents, mais avec 2 minuscules denticules près de l'apex; c'est le même type d'anomalie que présente *paucidentis*, mais dans l'autre sous-genre; d'autre part chez un *Japyx solifugus* Hal. d'Italie dont la marge interne du cerque droit est complètement dépourvue d'armature. Il me semble inutile de nommer

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[2] La fig. 6 représentant cette anomalie a été attribuée par erreur à un variant IV d'In Salah.

de telles anomalies à moins que la même station ne fournisse, au fil des années, que de ces individus apparemment “hors normes”.

C’est pourquoi la synonymie *Parajapyx paucidentis* Xie et al. = *Parajapyx (Parajapyx) isabellae* (Grassi) ne peut être établie avec certitude actuellement.

Dans cette note, je répartis les 14 spécimens de Parajapygidés récoltés en 1987 à Java et Bali (Indonésie) et en 1988 à Singapour et au Brunei entre 4 espèces dont 3 inédites: *Parajapyx* (*P.*) *hauseri* n. sp. et *Parajapyx* (*G.*) *temburong* n. sp. du Brunei, *Parajapyx* (*G.*) *reniformis* n. sp. de Java et Bali et *Parajapyx* (*G.*) *sabahnus* Pgs de Singapour; enfin un spécimen de Teraja au Brunei présente des caractères ambigus et trop peu nets qui ne me semblent pas permettre pour l’instant une détermination précise.

La découverte chez *Parajapyx* (*P.*) *hauseri* n. sp. d’un nouveau stade du développement postembryonnaire des ♂, de celle du plus jeune stade ♀ connu et chez *Parajapyx* (*G.*) *reniformis* n. sp. du stade ♀ le plus âgé me font proposer une nouvelle nomenclature des stades pour les deux sexes.

Tous les spécimens étudiés dans ce travail sont conservés dans les collections du Muséum d’histoire naturelle de Genève.

DESCRIPTION DES ESPÈCES

On trouvera la description des chétotaxies typiques, la définition des rapports et des abréviations utilisés dans PAGÉS 1952a, 1952b et 1954. La nouvelle numérotation des stades du développement postembryonnaire des ♂ et des ♀ est exposée ci-après.

Parajapyx (Parajapyx) hauseri n. sp. Figs 1-18

Matériel étudié[3]: Bru-88/24: BRUNEI (Brunei-Muara District): “Berakas Forest Reserve” au nord de Bandar Seri Begawan sur la route, à 19,5 km de Muara (= à 102,5 km de Muala Belait), forêt “Kerangas” (= “Tropical heath forest”), prélèvemenet de sol au pied de *Casuarina nobilis* Whitmore (Casuarinaceae), 30 m; 20.XI.1988; leg. B. Hauser (B_2); **holotype**: ♂ $_{4n}$ de 2,14 mm; **paratypes**: 1 ♂ $_{3n}$ de 1,94 mm, 1 ♂ $_{2n}$ de 1,66 mm, 1 ♀ st. I de 1,55 mm, 1 ♀ de 2,02 mm, 1 ♀ st.4 de 2,22 mm, 1 sexe? (urites 8 à 10 et les cerques absents).

TÊTE

Vertex: chétotaxie typique.

Pli oral: sans la soie 4.

Antennes: de 18 articles assez pileux, pas d’aires pileuses différenciées; sensilles recourbées présentes à partir du 5e article; 4 sensilles placoïdes en position typique sur l’article apical.

Pièces buccales: typiques du genre.

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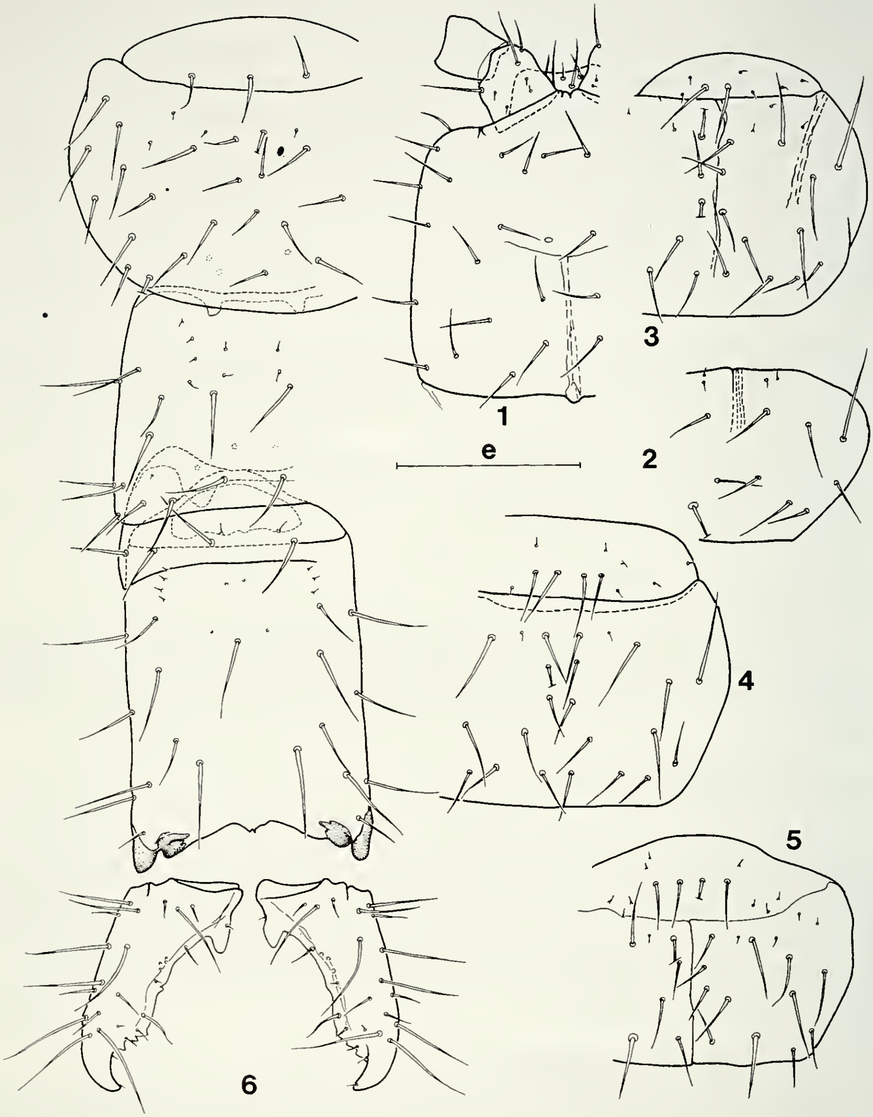
[3] Basé sur les listes établies par le Dr B. Hauser pour les stations de récolte des missions de 1987 et 1988 en Insulinde. Les spécimens ont été capturés soit directement à vue, soit après traitement des prélèvements par entonnoir Berlese, soit à Bogor (Java) (B_1), à Bandar Seri Begawan (Brunei) (B_2), Hong Kong (B_3) ou à Genève (B_4).



FIGS 1-6

Parajapyx (*Parajapyx*) *hauseri* n. sp., ♂ holotype. - 1. Vertex, e = 105 µm. - 2. Pronotum, e = 105 µm. - 3. Mésonotum, e = 105 µm. - 4. Métanotum, e = 105 µm. - 5. Tergite 1, e = 105 µm. - 6. Tergites 7 à 10 et les cerques, e = 105 µm.

THORAX

Face tergale

Pronotum: les 5+5M typiques, M_3 près de 2 fois aussi longs que les autres M qui sont subégaux; s_1 nulles.

Mésonotum: Préscutum: 1+1 M assez longs. Scutum: les 5+5 M typiques, les M_3 les plus longs, les M_5 les plus courts, les 5+5 s typiques assez courtes, 1+1 soies supplémentaires entre s_1 et s_2 et 1+1 autres entre s_4 et s_5.

Métanotum: Préscutum: 2+2 M assez longs. Scutum: M, s et soies supplémentaires comme au mésonotum.

Face sternale

Par rapport à la chétotaxie de *P.* (*P.*) *isabellae* (Grassi) prise comme type (PAGÉS 1952a), les seules variations rencontrées sont la présence d'une soie supplémentaire au présternite du mésosternum ou l'absence de la soie médiane typique à celui du métasternum.

Pattes: peu pileuses; tarses avec 2+2 soies sternales dont les 2 distales sont aiguës, dépassant de peu l'apex de la griffe postérieure; celle-ci est à peine plus longue que l'antérieure; unguiculus minuscule, aigu.

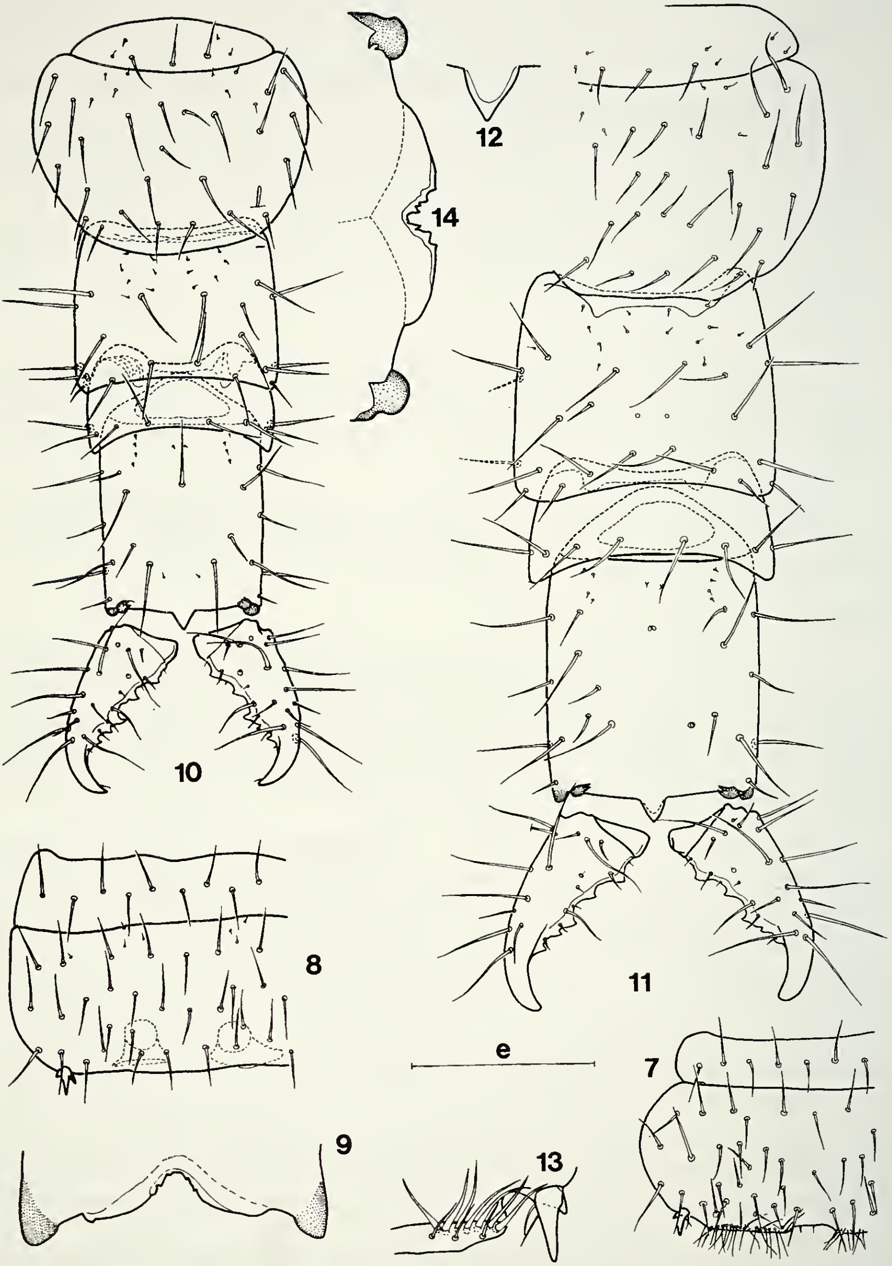
ABDOMEN

Tergite 1: Préscutum: 2+2 soies assez longues et environ 5+5 microsoies. Scutum: les 5+5 M typiques, les M_4 les plus longs, 2 fois aussi développés que les M_5 qui sont les plus courts de tous; les 6+6 s typiques assez courtes, sauf les s_5 qui sont longues; on note sur certains spécimens, sans que le sexe ou le stade de développement soit en cause, l'absence d'une des s_3 et/ou la présence d'une soie supplémentaire entre M_3 et s_6.

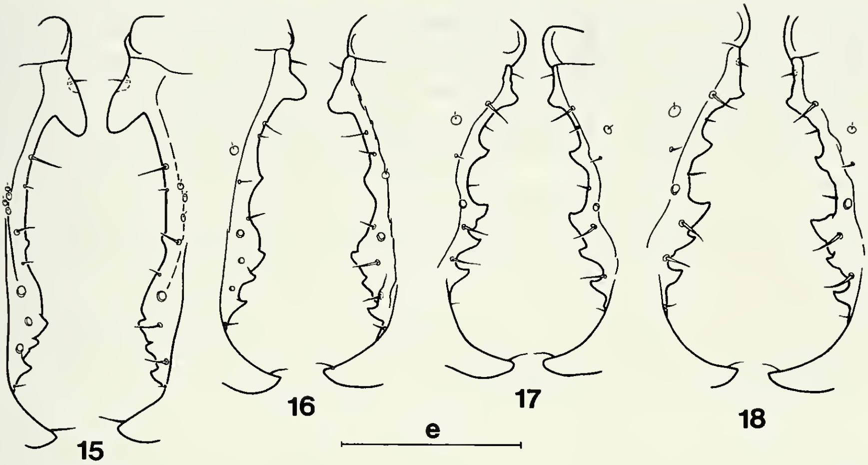
Tergites 2 à 7: Préscutum: 1+1+1 M typiques; le ♂ holotype présente 2+2 M sur le préscutum du tergite 6. Scutum: les 8+8 M typiques longs, les M_2 et M_3 les plus développés; les 7+7 s peuvent être présentes, l'une d'entre elles peut cependant manquer d'un côté ou de l'autre comme cela semble être la norme chez les espèces du genre; la ♀ st.1 qui ne montre qu'une seule et unique paire de soies sur la papille génitale, n'est pourvue sur ces tergites que des seules s_1, s_5-s_7, de la s_2 gauche et d'une soie supplémentaire près de la s_7 gauche; cette soie supplémentaire peut être présente chez les individus plus âgés, ainsi que deux autres entre M_1 et s_4 ou M_7 et s_6.

Tergite 8: un peu moins de 1,25 fois aussi large que long (l/L = 1,25 chez le ♂ holotype, 1,22 chez la ♀ st.1, 1,16 chez la ♀ st.4); 7+7 M subégaux longs, ceux de la moitié postérieure du segment légèrement plus courts que ceux de la moitié antérieure; 4+4 s (s_1 nulles) chez les ♂ et la ♀ st.4, seules s_3 et s_5 sont présentes chez la ♀ st.1.

Tergite 9: l/L = 2,24 en moyenne (2,25 chez l'holotype, 2,07 chez la ♀ st.1, 2,48 chez la ♀ st.4); les 3+3 M typiques longs; aucune s chez le ♂ holotype; chez les autres spécimens, seules les s_1 sont présentes si l'on admet que cette paire de phanères est venue se placer entre M_1 et M_2.



FIGS 7-14. *Parajapyx* (*Parajapyx*) *hauseri* n. sp., ♂ holotype. - 7. Urosternite 1, e = 105 µm. - 8. Urosternite 3, e = 105 µm. - 9. Hypopyge, e = 84 µm. - 10. ♀ st.1, tergites 7 à 10 et les cerques, e = 105 µm. - 11. ♀ st. 3, tergites 7 à 10 et les cerques, e = 105 µm. - 12. idem, acropyge, e = 51 µm. - 13. idem, angle externe de l'organe subcoxal gauche et style, e = 42 µm. - 14. idem, hypopyge, e = 51 µm.



FIGS 15-18

Parajapyx (*Parajapyx*) *hauseri* n. sp., évolution de l'armature de la marge interne des cerques suivant le sexe et le stade de développement. - 15. ♂ holotype (= ♂$_{4n}$), e = 60 µm. - 16. ♂$_{3n}$, e = 60 µm. - 17. ♂$_{2n}$, e = 51 µm. - 18. ♀ st. 2, e = 46 µm.

Tergite 10 : L/l = 1,61 en moyenne (v. ex. = 1,54-1,74), 1,56 chez le ♂ holotype; 6+1+6 M (M_1 nuls) longs, le M_4 droit manque chez la ♀ st.4; 4+4 s (s_4 nulles) courtes, la s_1 droite est nulle chez la ♀ st.1; le phanère situé entre M_7 et s_2 peut être interprété comme un M_4 qui est typiquement inséré au-dessus de la ligne joignant M_7 et s_2, ce qui le place entre M_2 et M_7, ou bien comme une s_3 typiquement située presqu'exactement entre M_7 et s_2; sur certains individus, se phanère peut être considéré comme un M_4 à droite et comme une s_3 à gauche ou inversement. Toutes les combinaisons sont possibles entre 6+6 M et 4+4 s ou 5+5 M et 3+3 s.

Longueurs relatives des segments 8 à 10 : 63-33-100 en moyenne; ♂ holotype: 61-33-100; ♂$_{2n}$: 61-29-100; ♀ st.1: 64-35-100; ♀ st.4: 64- 29-100.

Acropyge : triangulaire, simple, aussi long que large à la base; chez le ♂ holotype il est beaucoup plus large que long, à sommet bifide et très en avant de la ligne joignant les condyles d'articulation des cerques; il ne s'agit pas d'un artefact, cet individu ayant été préparé et monté exactement comme tous ceux de la série; ceci est à rapprocher de ce que SILVESTRI (1929) représente chez son *P.* (*P.*) *dorianus* ou moi-même chez *P.* (*P.*) *genavensium* (PAGÉS 1978).

Sternite 1 : Préscutum: chétotaxie typique, la soie médiane peut être absente. Scutum: les 10+10 M typiques assez longs, M_5, M_6 et M_9 un peu moins longs que les autres; 1+2+1 s (c nulles); 8+8 soies disposées sur deux rangées en avant des organes subcoxaux latéraux; on peut observer jusqu'à 4 soies supplémentaires à droite ou à gauche de la ligne médiane: 1 entre M_1 et M_2, 1 entre M_5 et b, 1 ou 2 entre M_9 et b.

Organes subcoxaux latéraux : ils occupent chacun environ le 1/3 de la largeur interstylaire et sont peu saillants; de 14 à 22 soies glandulaires disposées sur une seule rangée, en moyenne SG/st_1 = 1 (v. ex. = 0,96-1,04); 4 à 7 soies sensorielles régulièrement espacées, SS/st_1 = 0,6 en moyenne (v. ex. = 0,50-0,64); SG/SS = 1,90 chez l'holotype, 1,61 en moyenne chez les autres exemplaires.

La partie médiane postérieure du sternite porte les 1+1 minuscules soies typiques.

Sternites 2 à 7 : Préscutum: les 5+1+5 soies typiques assez longues. Scutum: les 12+12 *M* typiques assez longs, 4+3+4 *s*, la *c* peut faire défaut comme au sternite 1.

Styles : typiques du genre, le cône secondaire aigu, égal aux 2/5 de la longueur du cône principal; aux st_{1-3} la soie recourbée (*s'*) est subégale à la soie droite (*s*); $s_1/st_1 = s'_1/st_1 = 0{,}47$; $s_1/st_7 = 0{,}38$; $s_7/st_7 = 0{,}34$; $st_1/st_7 = 0{,}83$.

Vésicules exsertiles : typiques du genre.

Hypopyge : Chez le ♂$_{4n}$, il occupe les 8/10 de la largeur intercondylaire et on constate que comme pour l'acropyge, l'allongement vers l'arrière des bords latéraux du segment 10 portant les condyles d'articulation des cerques amène une déformation remarquable de l'hypopyge, semblable à celle décrite par SILVESTRI (1929) chez son *dorianus*; chez les autres spécimens l'hypopyge est saillant comme c'est la règle, occupant environ les 3/4 de la largeur intercondylaire, à sinus largement ouvert, à bords présentant des dents irrégulières.

Papille génitale ♂ : j'ai défini dans ma note de 1975 sur *Parajapyx* (*P.*) *botosaneanui*, 4 stades du développement postembryonnaire des ♂ caractérisés par le nombre de soies présentes sur la papille génitale: ♂$_1$ = 6 soies, ♂$_2$ = 12 soies, ♂$_3$ = 14 soies, ♂$_4$ = 16 soies. Or, parmi les 3 ♂ reconnus ici, un a 12 soies, un autre 14 et le troisième en présente 10, ce qui le rend intermédiaire entre mes ♂$_1$ et ♂$_2$. Je crois qu'il faut donc maintenant définir 5 stades dans le développement des ♂ et modifier par conséquent la nomenclature précédente. Si l'on part toujours d'un ♂$_1$ à 6 soies (1+1 latérales, 1+1 submédianes antérieures et 1+1 submédianes postérieures), le nouveau ♂$_2$ possédant 10 soies s'obtient par dédoublement des soies submédianes antérieures et postérieures, ce qui donne 1+1 soies sublatérales antérieures et 1+1 soies sublatérales postérieures; pour le nouveau ♂$_3$ c'est le dédoublement des 1+1 soies latérales qui donne bien 12 soies; quant aux 1+1 soies supplémentaires du ♂$_4$, elles proviennent du dédoublement des 1+1 soies sublatérales antérieures, ce qui corrobore ce que j'écrivais pour *botosaneanui*: "les nouvelles soies apparaissent dans les angles latéraux de l'orifice génital, médialement par rapport aux soies latérales"; enfin le ♂$_5$ voit cette fois le dédoublement des 1+1 soies sublatérales postérieures. En résumé, la nouvelle succession des stades postembryonnaires des ♂ de *Parajapyx* s'établit ainsi:

♂$_{1n}$ = 6 soies; ♂$_{2n}$ = 10 soies; ♂$_{3n}$ = 12 soies; ♂$_{4n}$ = 14 soies; ♂$_{5n}$ = 16 soies. On a donc les équivalences suivantes entre la nouvelle nomenclature ♂$_{xn}$ et l'ancienne ♂$_x$:

♂$_{1n}$ = ♂$_1$, ♂$_{2n}$ nouveau, ♂$_{3n}$ = ♂$_2$, ♂$_{4n}$ = ♂$_3$, ♂$_{5n}$ = ♂$_4$.

Papille génitale ♀ : typique de la famille. En 1952a, grâce à l'abondant matériel en ma possession, mais ne comprenant que des individus pourvus de cerques indurés, j'ai défini 1 stade asexué st.I et 4 stades du développement postembryonnaire des ♀, st.II à st.V caractérisés par le plus ou moins grand développement du canal antérieur de la spermathèque. Or en 1961, SMITH découvre des pontes de *P.* (*P.*) *isabellae* et peut ainsi décrire les 2 premiers stades suivant l'éclosion. Il faut donc considérer que chez les Parajapygidés et les Japygidés existent 3 stades asexués dont le troisième possède des cerques indurés; il s'ensuit que logiquement, mon st.I doit être dénommé st.III par analogie avec celui des Japygidés; l'absence de trichobothries antennaires ne permet pas de le subdiviser en A ou B. La succession des stades chez les ♀ doit être lui aussi modifié pour 2 raisons: tout d'abord, la ♀ de 1,55 mm ne possède qu'une seule et unique soie sur chacune des valves supérieures, aucun autre phanère sur la papille et la spermathèque est indicernable; vu la taille de l'individu, je ne crois pas qu'il s'agisse d'une régression temporaire, mais du premier stade reconnaissable du développement postembryonnaire des ♀; je le nomme st.1. La deuxième raison est l'extraordinaire développement de la spermathèque des ♀ de *P.* (*G.*) *reniformis* n. sp. décrite plus loin (p. 892). En conclusion, je propose la succession suivante des stades ♀ (avec entre parenthèses l'ancienne notation): st.1 nouveau, st.2 (= st.II), st.3 (= st.III), st.4 (= st.IV), st.5 (= st.V) et st.6 nouveau.

CERQUES

Aussi longs en moyenne que les 4/5 de la partie normalement découverte du tergite 10, L_{cq}/L_{10d} = 0,8 (v. ex. = 0,77-0,82); environ 2 fois 1/5 aussi longs que larges à la base; L/l = 2,14 (v. ex. = 2,05-2,27); leur largeur au niveau de la d_3 égale en moyenne le 1/3 de leur longueur, le $1d_3/1cq$ = 0,58 chez le ♂ holotype alors qu'il est en moyenne égal à 0,73 (v. ex. = 0,70-0,76) chez les paratypes. Un sinus peu profond entre d_1 et d_3 chez les paratypes, plus net chez l'holotype.

Marges internes: celles du ♂$_{2n}$ et des ♀ sont semblables; toutes les dents sont aiguës, à sommet dirigé vers la base du cerque; d_3 la plus forte, les autres plus petites subégales; d_1 avec un très faible épaulement postérieur, obsolète chez le ♂$_{2n}$; seule la d_3 montre un épaulement postérieur net; en faisant l'intervalle d_1-d_2 égal à 100 ceux entre les dents et entre d_5-apex du cerque sont en moyenne comme 100-96-62-59-170; il faut noter qu'il n'y a jamais une symétrie parfaite entre les 2 cerques d'un même individu, mais les écarts sont minimes; les plus grands se rencontrent chez le ♂$_{2n}$: 100-105-63-63-168 au cerque droit, 100-90-60-60-173 au gauche. Les marges internes des 2 autres ♂ sont bien différentes par la forme de la d_1 d'une part, et d'autre part, par le déplacement des d_3 à d_5 les unes vers les autres et vers l'apex du cerque: chez le ♂$_{3n}$ la d_1 devient prépondérante, son sommet est saillant et arrondi, la d_2 s'aplatit et ne forme plus qu'une légère élevure mousse, peut saillante sur le sinus, les d_3 à d_5 sont identiques à celles des ♀, et les intervalles sont comme 100-93-37-33-96 au cerque droit et comme 100-81-26-29-90 au gauche.

Chez le ♂$_{4n}$ il y a une déformation remarquable des deux d_1 qui s'allongent vers l'apex du cerque, le sommet reste arrondi; elles ont le même aspect que celle du seul cerque gauche de *P.* (*P.*) *dorianus* Silv.; les d_2 sont réduites à de minuscules tubercules arrondis, les d_3 à d_5 sont assez semblables à celles des ♀, mais à sommet moins aigu; les intervalles sont comme: 100-74-23-23-54 au cerque droit et comme 100-72-21-23-62 au gauche, on voit bien le tassement vers l'apex des cerques des d_3 à d_5.

Plaques d'évaporation: les ♀ et le ♂$_{2n}$ ne montrent qu'une seule plaque d'évaporation assez grande située sur une ligne joignant M_3 à *c* et près de cette dernière; le ♂$_{3n}$ en possède 1 à gauche et 2, plus ou moins jointives, à droite, quant au ♂$_{4n}$ il en présente 3 à droite et 4 à gauche assez petites; chez ces 2 ♂ les plaques tendent à se déplacer d'une part vers la minuscule soie insérée au niveau de d_2 et, d'autre part, vers la marge interne du cerque. La présence d'une seule plaque d'évaporation ne peut donc plus être considérée, à elle seule, comme indiquant un stade asexué; il faut tenir compte en outre de la présence d'une seule soie sur les préscutum des tergites 2 à 7 (PAGÉS 1952a).

Chétotaxie: les 10 *M* typiques présents, M_6 courts, les autres, longs; 7 *s* courtes, les soies typiques *d* et *e* étant nulles.

AFFINITÉS

L'évolution de la marge interne des cerques des ♂ rapprocherait cette espèce, en premier lieu de *P.* (*P.*) *dorianus* Silv. par les modifications de la d_1, mais aussi le *bonetianus* Silv. (SILVESTRI 1948b), *kocheri* Pgs (PAGÉS 1954), *botosaneanui* Pgs (PAGÉS 1975) et *genavensium* Pgs (PAGÉS 1978) par le rejet vers l'apex des cerques des d_3 à d_5. Le nombre d'articles antennaires, l'absence de *M* ou de *s* sur certains tergites, en particulier le dixième et, sur les cerques, la présence d'une seule plaque d'évaporation chez les ♀ et les ♂ jeunes caractérisent cette espèce.

DERIVATIO NOMINIS

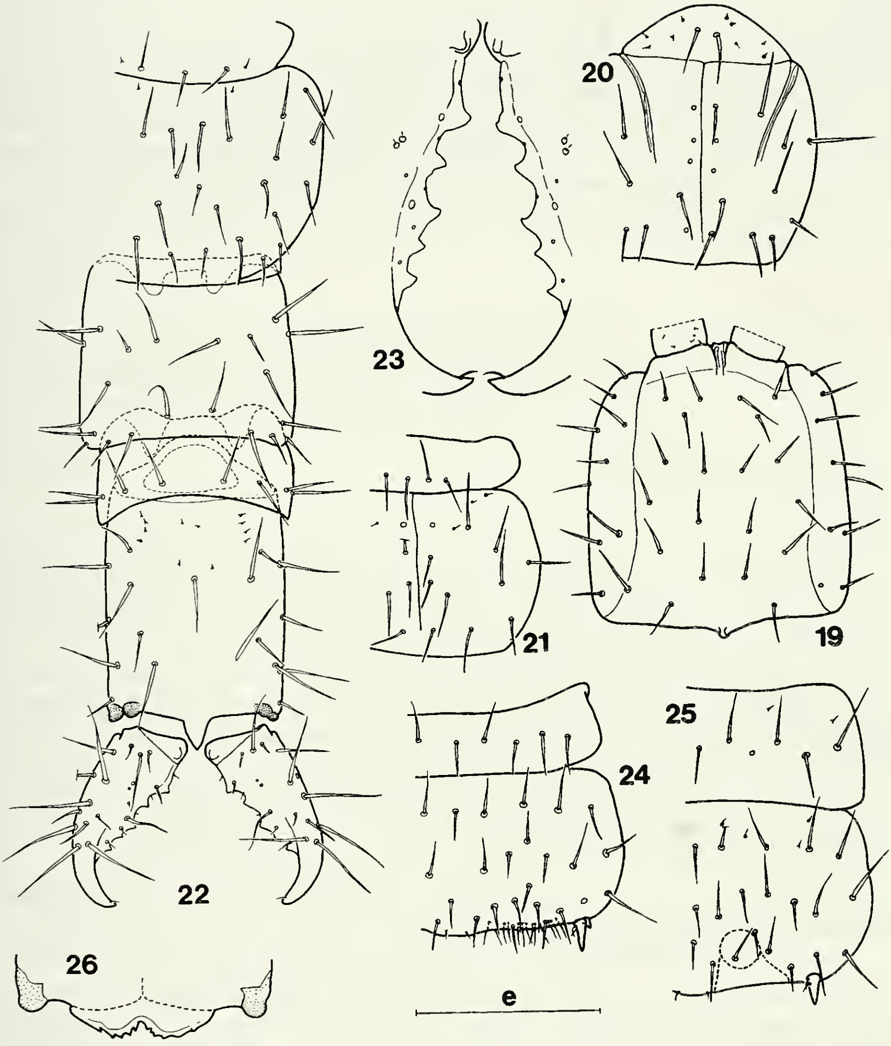
Ce m'est un réel plaisir que de dédier cette remarquable espèce au Dr B. Hauser, Conservateur du Département des Arthropodes et d'Entomologie I au Muséum d'histoire naturelle de Genève. Grâce à ses nombreuses missions vouées avant tout à la récolte de la faune du sol de régions peu prospectées ou écologiquement sensibles, il a réuni, parmi d'autres, une très importante collection de Diploures dont d'innombrables Japygoidea, mes préférés. Invité il y a plus de vingt ans à venir étudier ce "trésor", j'ai pu apprécier la compétence, la grande gentillesse et la disponibilité totale de ce Collègue et ami.

Parajapyx (Grassjapyx) temburong n. sp. Figs 19-26

Matériel étudié: Bru-88/38: BRUNEI (Temburong District): "Peradayan Forest Reserve" (= "Bukit Patoi"), à 14,5 km de Bangar (= 2,5 km de Labu), forêt primaire ("Mixed dipterocarp forest"), prélèvement de sol dans les angles formés par les contreforts de grands arbres morts, 80 m; 24.XI.1988; leg. B. Hauser (B_3); **holotype**: ♀ st. 4 de 2,35 mm.

TÊTE

Vertex: les 11+11 soies typiques assez courtes, aucune soies supplémentaires.



FIGS 19-26

Parajapyx (*Grassjapyx*) *temburong* n. sp., ♀ st. 4 holotype. - 19. Vertex, e = 126 µm. - 20. Mésonotum, e = 126 µm. - 21. Tergite 1, e = 126 µm. - 22. Tergites 7 à 10 et les cerques, e = 126 µm. - 23. Marges internes des cerques, e = 63 µm. - 24. Urosternite 1, e = 105 µm. - 25. Urosternite 3, e = 105 µm. - 26. Hypopyge, e = 84 µm.

Pli oral: typique.

Antennes: de 18 articles; chétotaxie typique du genre; 4 sensilles placoïdes sur l'article apical.

Pièces buccales: typiques du genre.

THORAX

Face tergale

Pronotum: les 5+5 *M* typiques; 2+2 *s*, s_1 nulles.

Mésonotum: Préscutum: 1+1 *M* longs et 5-6+5-6 microsoies. Scutum: les 5+5 *M* typiques, M_2 et M_5 assez courts, les autres longs; 5+5 s typiques assez courtes; 2+2 soies supplémentaires dont 1+1 entre s_1 et s_2 et 1+1 entre s_4 et s_5.

Métanotum: Préscutum: 2+2 *M*. Scutum: en tout point identique à celui du mésonotum.

Face sternale

Chétotaxie: typique, identique à celle de *P.* (*P.*) *isabellae*, sauf pour le préscutum du métasternum qui ne porte que 4+4 soies, la médiane étant absente.

Pattes: peu pileuses; 2+2 soies sternales aux tarses dont les subapicales sont courbées et aiguës dépassant la griffe postérieure; celle-ci 1 fois 1/3 aussi longue que l'antérieure; unguiculus normal.

ABDOMEN

Tergite 1: Préscutum: 2+2 *M* assez longs. Scutum: les 5+5 *M* typiques, M_3 assez longs, les autres longs; les 6+6 *s* typiques, les 3+3 postérieures assez longues, les 3+3 médianes courtes; pas de soies supplémentaires.

Tergites 2 à 7 : Préscutum: les 1+1 *M* typiques assez courts. Scutum: les 8+8 *M* typiques, M_1, M_3 et M_4 longs, les autres assez longs; s_1 et s_{5-7} en paires typiques, s_2 et s_3 présentes d'un seul côté de la ligne médiane, en général l'une d'elles à droite et l'autre à gauche; 1+1 soies supplémentaires entre s_6 et s_7.

Tergite 8: un peu moins de 1 fois 1/5 aussi large que long (l/L = 1,15); 6+6 *M* longs (M_5 nuls); 4+4 *s* typiques (s_2 nulles), s_3 aussi longues que les *M*, les 3+3 autres courtes.

Tergite 9 : 2 fois 1/5 aussi large que long; les 3+3 *M* typiques longs ou assez longs; ni *s*, ni soies supplémentaires.

Tergite 10: 1 fois 3/4 aussi long que large, à côtés parallèles; 6+6 *M* (M_1 nuls), M_4 courts, les autres longs ou assez longs; 3+3 *s* (s_3 et s_4 nulles), les remarques faites chez l'espèce précédente à propos du choix à faire entre M_4 et s_3 s'appliquent parfaitement ici.

Longueurs relatives des segments 8 à 10: 58-29-100.

Acropyge: en triangle isocèle très allongé, 1 dent sur le côté gauche.

Sternite 1: Préscutum: 4+1+4 soies assez longues. Scutum: les 10+10 *M* typiques. M_3 et M_{10} plus longs que les autres qui sont assez longs; 1+2 soies typiques assez courtes (*c* nulles); 1+1 soies supplémentaires entre M_5 et M_6; 7+7 soies assez courtes, unisériées en avant des organes subcoxaux latéraux.

Organes subcoxaux latéraux: peu saillants, ils occupent environ le 1/3 de la largeur interstylaire; 16 soies glandulaires à droite, 15 à gauche, unisériées, toutes de même longueur, $SG/st_1 = 0,77$; 5 soies sensorielles régulièrement espacées, $SS/st_1 = 0,46$; $SG/SS = 1,65$.

La partie médiane postérieure du sternite porte les 1+1 minuscules soies typiques.

Sternites 2 à 7 : Préscutum: 5+1+5 soies typiques longues, les 1+1 les plus externes les plus longues. Scutum: les 12+12 *M* typiques, M_3 et M_8 longs, les autres assez longs ou assez courts; 4+3+4 *s* typiques assez courtes ou courtes; une soie supplémentaire peut s'observer entre M_5 et M_6.

Styles : typiques du genre, le cône secondaire, aigu, aussi long que le 1/4 ou le 1/3 du cône principal qui est plutôt étroit; la soie recourbée (*s'*) des $st_{1\text{-}3}$ est à peine plus courte que la soie droite (*s*): $s_1/st_1 = 0{,}38$; $s'_1/st_1 = 0{,}35$; $s_1/s_7 = 1{,}3$; $st_1/st_7 = 0{,}90$; $s_1/st_7 = 0{,}34$.

Vésicules exsertiles : typiques du genre.

Hypopyge : il occupe les 3/4 de la largeur intercondylaire, saillant, à sinus large et peu profond, orné de nombreuses dents aiguës.

Papille génitale : typique d'une ♀ st.4.

CERQUES

Allongés, aussi longs que les 7/10 de la partie normalement découverte du tergite 10; un peu plus de 2 fois 1/3 aussi longs que larges à la base; leur largeur au niveau de la d_3 égale le 1/3 de la longueur d'un cerque et les 3/4 de sa largeur à la base.

Marges internes : dents aiguës à sommet dirigé vers la base du cerque; d_1 et d_3 les plus fortes, les 3 autres subégales, petites; épaulements nuls; les intervalles entre les *d* et entre la d_5 et l'apex du cerque sont assez différentes d'un cerque à l'autre, à droite ils sont comme 100-120-78-53-240 et à gauche comme 100-83-67-61-211; cela peut indiquer que les *d* s'engrènent bien les unes dans les autres quand les cerques se referment; les fortes valeurs des intervalles d_5-apex des cerques montrent que le crochet terminal du cerque est bien dégagé de la rangée des dents.

Plaques d'évaporation : 2 petites plaques par cerques situées à l'intersection des lignes joignant M_1 à M_5 et M_4 à *c*.

Chétotaxie : les 10 *M* typiques, M_6 courts, les autres longs; 7 *s* typiques, *d* et *e* étant nulles, apparemment comme chez toutes les espèces de ces régions.

AFFINITÉS

Cette espèce est surtout caractérisée par ses organes subcoxaux latéraux et ses cerques, ainsi que par quelques détails de la chétotaxie de l'abdomen. Proche de *P.* (*G.*) *sepilok* Pagés, les marges internes des cerques permettent de les différencier facilement.

DERIVATIO NOMINIS

Le District de Temburong est situé dans la partie N de l'Etat de Brunei, séparée de la partie S, la plus importante, par un étroit territoire appartenant au Sabah.

Parajapyx (Grassjapyx) reniformis n. sp. Figs 27-37

Matériel étudié: Sar-87/37: INDONÉSIE: **Bali:** Ubud, "Monkey Forest", dans le virage de la route traversant la forêt, sous des pierres de la pente, 200 m; 30.XI.1987; leg. B. Hauser; **holotype:** ♀ st.6 de 2,22 mm. Sar-87/8: INDONÉSIE: **Java:** Bogor, Jardin Botanique, prélèvement de sol dans les angles formés par les contreforts de grands arbres près du "Guest House", env. 250 m; 24.XI.1987; leg. B. Hauser (B_1); **paratype:** ♀ st.6. de 2, 20 mm.

TÊTE

Vertex et pli oral: chétotaxie typique.

Antennes: typiques de 18 articles peu pileux, sans aires pileuses différenciées; 4 sensilles placoïdes en position typique sur l'article apical.

Pièces buccales: typiques du genre.

THORAX

Face tergale

Pronotum: 5+5 M typiques, M_2 et M_5 assez courts, les autres longs; 3+3 s typiques courtes, s_1 à mi-distance de M_3 et M_4, s_2 et s_3 rapprochées l'une de l'autre, seules les s_3 sont à leur place normale.

Mésonotum: Préscutum: 1+1 M assez courts et 3+3 microsoies. Scutum: les 5+5 M typiques, M_3 les plus longs de tous, M_5 les plus courts, les autres subégaux, longs; les 5+5 s typiques assez courtes; 1+1 soies supplémentaires entre les s_1 et s_2, celle de droite nulle chez la ♀ de Java qui présente une soie supplémentaire à droite entre M_2 et s_2..

Métanotum: Préscutum: 2+2 M assez longs et 6+6 microsoies. Scutum: les 5+5 M typiques, M_3 longs, M_5 courts, les autres subégaux et assez longs; la ♀ de Bali possède les 5+5 s typiques et 3+3 soies supplémentaires entre les s_1 et s_2, M_2 et s_2, s_4 et s_5; chez la ♀ de Java, on note que si ces 2 dernières paires de soies supplémentaires sont présentes et les s_2 nulles, il y a 2+2 soies supplémentaires, 1+1 entre les M_5 et la seconde paire de soies supplémentaires de la ♀ de Bali et 1+1 entre les s_4 et les soies supplémentaires postérieures; tous ces phanères sont assez courts.

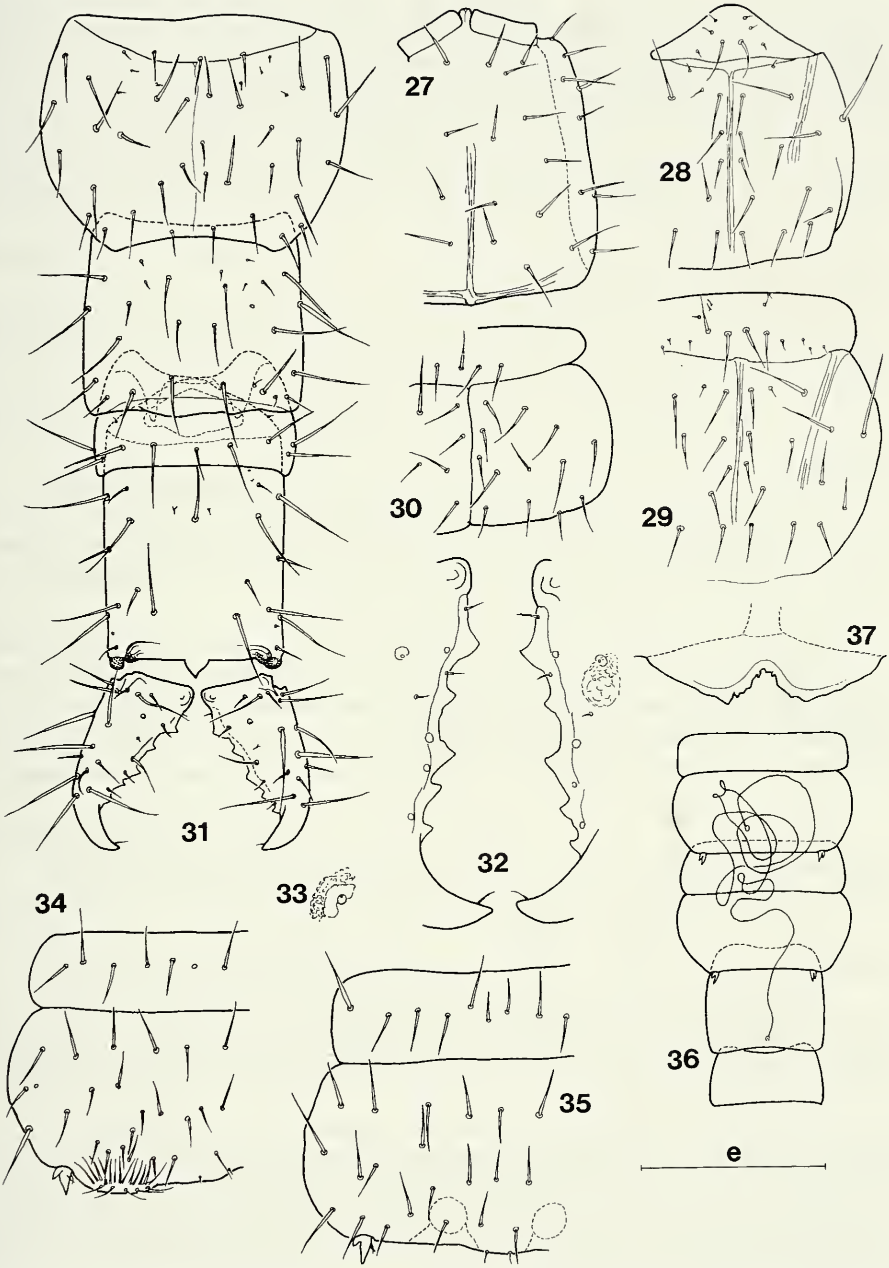
Face sternale

Chétotaxie: identique à celle de *P.* (*P.*) *isabellae*, sauf pour les aires infracoxales des sternites des méso- et métasternum qui portent chacune 4 soies dont 1 supplémentaire entre les 2 postérieures; en outre, on observe une petie soie supplémentaire dans la rangée antérieure de la plage médiane des mêmes sternites.

Pattes: peu pileuses; 2+2 soies sternales aux tarses, les subapicales sont aiguës, atteignant au plus le milieu des griffes qui sont typiques; unguiculus petit, aigu.

ABDOMEN

Tergite 1: Préscutum: 2+2 M assez longs. Scutum: les 5+5 M typiques assez longs, les M_4 un peu plus développés que les autres, M_2 les plus courts; les 6+6 s typiques assez courtes, la s_3 droite manque chez la ♀ de Java; 1+1 soies supplémentaires entre M_4 et M_5 et une autre paire entre s_5 et s_6.



Figs 27-37. *Parajapyx* (*Grassjapyx*) *reniformis* n. sp., ♀ st. 6, holotype. - 27. Vertex, e = 126 µm. - 28. Mésonotum, e = 126 µm. - 29. Métanotum, e = 126 µm. - 30. Tergite 1, e = 126 µm. - 31. Tergites 7 à 10 et les cerques, e = 126 µm. - 32. Marges internes des cerques, e = 63 µm. - 33. Plaque d'évaporation du cerque gauche, e = 32 µm. - 34. Urosternite 1, e = 105 µm. - 35. Urosternite 3, e = 105 µm. - 36. Canal de la spermathèque caractéristique du st. 6, e = 238 µm. - 37. Hypopyge, e = 51 µm.

Tergites 2 à 7 : Préscutum: les 1+1+1 *M* typiques. Scutum: les 8+8 *M* typiques, M_6 assez courts, les autres longs ou assez longs; les 7+7 *s* typiques présentes, assez courtes, s_1 et s_6 les plus longues, une des s_3 manque le plus souvent chez la ♀ de Java; 1+1 soies supplémentaires entre M_2 et M_8 et une autre paire entre s_6 et s_7.

Tergite 8 : à peine plus large que long chez la ♀ de Java, chez celle de Bali l/L = 1,20; 6+6 *M* longs, M_3 les plus longs, M_5 nuls; 3+3 *s* (s_2 et s_5 nulles), s_3 longues, s_1 et s_4 courtes, s_1 nulles chez la ♀ de Java; 1+1 soies supplémentaires courtes entre M_1 et M_3 et 1+1 entre M_1 et M_7.

Tergite 9 : entre 1,70 et 2 fois aussi large que long; les 3+3 *M* typiques longs; seules les s_1 sont présentes et longues.

Tergite 10 : en moyenne 1 fois 3/4 aussi long que large; 6+1+6 *M* (M_1 nuls) longs; on constate la même ambiguïté entre M_4 et s_3 que chez *P.* (*G.*) *hauseri* n. sp.; il y a au plus 4+4 *s* (s_4 nulles) ou 3+3 si s_3 est nulle elle aussi.

Longueurs relatives des segments 8 à 10 : 65-35-100 en moyenne.

Acropyge : saillant, triangulaire, un peu plus long que large à la base.

Sternite 1 : Préscutum: 5+1+5 phanères longs à assez courts. Scutum: 8+8 *M*, M_9 et M_{10} nuls, M_5 assez courts, les autres longs, les M_8 les plus développés; 1+2+1 *s* courtes; 1+1 soies supplémentaires entre M_4 et M_8 et 1+1 autres entre M_5 et *b*; 6-7 + 6-7 soies en avant des organes subcoxaux latéraux.

Organes subcoxaux : chacun occupe environ le 1/4 de la largeur interstylaire et est relativement saillant; 15 soies glandulaires unisériées et 5 soies sensorielles régulièrement espacées à chaque organe chez les 2 exemplaires; SG/st_1 = 0,86, SS/st_1 = 0,60, SG/SS = 1,50 en moyenne.

La partie médiane postérieure du sternite porte les 1+1 minuscules soies habituelles.

Sternites 2 à 7 : Préscutum: 5+5 soies longues, la médiane est plutôt courte et est dédoublée chez la ♀ de Bali. Scutum: les 12+12 *M* typiques longs; 4+2+4 *s* typiques, les *c* étant nulles; à noter que le sternite 7 de la ♀ de Bali n'a pas de s_3.

Styles : typiques du genre; la soie recourbée des $st_{1\text{-}3}$ est égale à la soie droite. $s_1/st_1 = 0{,}40$; $s'_1/st_1 = 0{,}40$; $s_1/st_7 = 0{,}32$; $s_7/st_7 = 0{,}40$; $st_1/st_7 = 0{,}80$.

Vésicules exsertiles : typiques du genre.

Hypopyge : Il occupe le 3/4 de la largeur intercondylaire, saillant à sinus médian largement ouvert et à bords ornés de tubercules plus ou moins développés, ceux du fond du sinus aigus.

Papille génitale ♀ : Typique du genre; chez la ♀ de Bali, le canal de la spermathèque est extraordinairement long formant un peloton lâche logé dans l'urite 6. Les circonvolutions de la spermathèque sont un peu moins complexes chez la ♀ de Java. C'est la première fois que j'observe un tel développement de ce canal qui caractérise à mon avis un st.6 qui est pour l'instant le stade le plus "âgé" des ♀ du genre *Parajapyx* (cf. p. 887).

CERQUES

Leur longueur est égale à un peu moins des 3/4 de la partie normalement découverte du tergite 10, assez élancés, ils sont 2 fois (♀ de Bali) à 2 fois 1/4 (♀ de

Java) aussi longs que larges à la base; leur largeur au niveau de la d_3 égale un peu moins des 2/5 de leur longueur et les 4/5 de leur largeur à la base.

Marges internes: les dents sont aiguës à sommet dirigé vers la base; d_1 et d_3 les plus fortes, les 3 autres subégales; pas d'épaulements antérieurs ou postérieurs nets; les intervalles entre les *d* et l'apex du cerque sont comme 100-88-77-63-154 en moyenne; on constate que la d_5 est plus proche de l'apex du cerque à droite qu'à gauche: d_5-apex = 142 au cerque droit des 2 spécimens, alors que pour le cerque gauche, cet intervalle est de 163 chez l'exemplaire javanais et de 170 chez le balinais.

Plaque d'évaporation: d'un type inédit; on observe une surface réniforme lisse; au milieu de son bord concave s'ouvre un pore glandulaire qui est le débouché d'un canal à bords épaissis visible par transparence; la fig. 32 montre la petite masse de sécrétion, coagulée par le fixateur, issue de la (ou des) cellule(s) glandulaire(s) associée(s) à la plaque d'évaporation du cerque droit.

Chétotaxie: les 10+10 *M* typiques, M_2, M_5 et M_6 assez courts ou courts, les autres longs; 5+5 *s* typiques, *d* et *e* nulles; à noter que je considère le phanère situé dans le triangle formé par M_5, M_7 et *h* comme un M_6 uniquement parce qu'il est inséré en dessous de la ligne joignant M_5 et *i* et sur celle joignant *f* et *i*, la soie *e* se plaçant typiquement au dessus de la ligne M_5-*i* et plus près de M_7 que de M_8.

AFFINITÉS

Par l'allure générale de ses cerques, *P.* (*G.*) *reniformis* n. sp. rappelle *P.* (*G.*) *sepilok* du Sabah. On séparera sans difficulté ces 2 espèces par des détails de la chétotaxie tergale, la forme et la disposition des dents des cerques et avant tout par la plaque d'évaporation qui est d'un type jusqu'à présent unique chez les Parajapygidés.

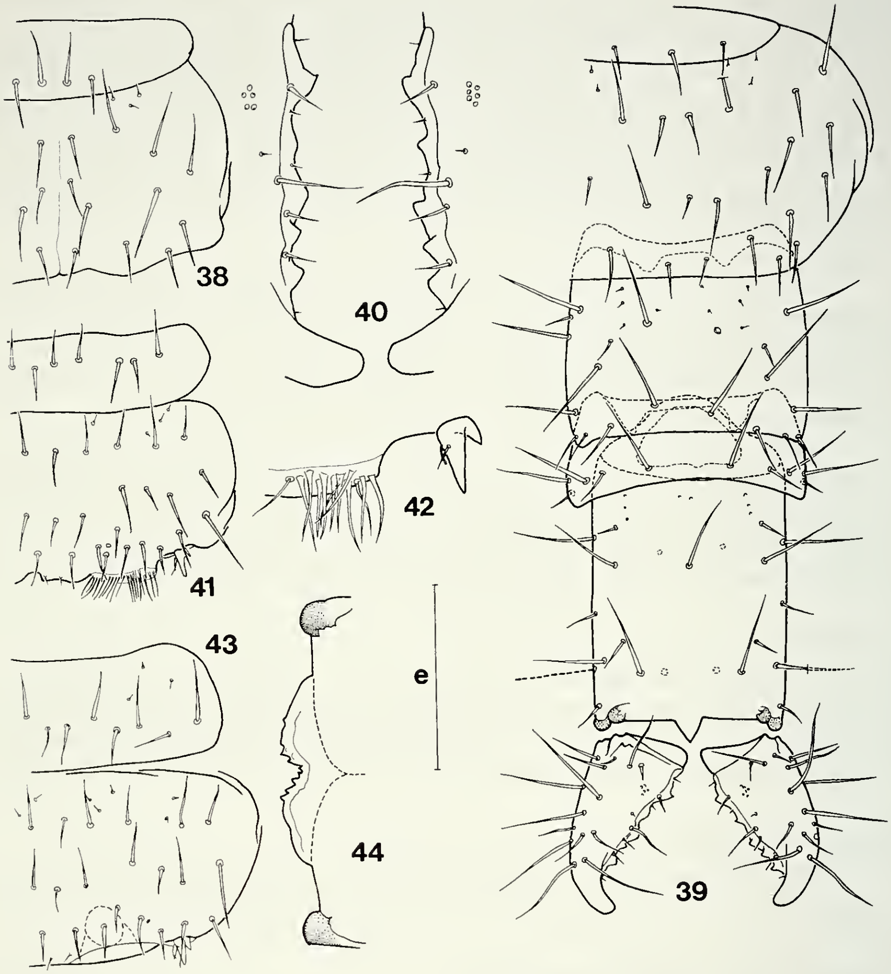
DERIVATIO NOMINIS

Allusion à la forme très particulière de l'unique plaque d'évaporation des cerques.

Parajapyx (Grassjapyx) sabahnus Pagés Figs 38-44

Matériel étudié: Bru-88/70: SINGAPOUR: Sentosa Island (partie orientale), forêt près de la "Earth Satellite Station", prélèvement de sol dans les angles formés par les contreforts d'un grand arbre, 70 m; 6.XII.1988; leg. B. Hauser (B_4); 3 ♀ st.3 de 2,17 mm, 2,34 mm et 2,54 mm.

Ces exemplaires correspondent parfaitement à la description de cette espèce du Sabah (PAGÉS 1987). La chétotaxie tergale, les rapports 1/L et L/1 des segments abdominaux et des cerques entrent dans les limites de variations de l'espèce; les intervalles entre les dents sont en moyenne un peu plus faibles que chez les spécimens du Sabah: 100-90-65-63, au lieu de 100-87-70-68, mais ces nombres entrent aussi dans les limites de variations rencontrées au Sabah. Le fait le plus remarquable est que les exemplaires de Singapour ont les d_3 à d_5 et l'apex des cerques émoussés comme ceux de la ♀ st.3 de 2,1 mm du Sabah. Comme je le laissais entendre en 1987,



FIGS 38-44. *Parajapyx* (*Grassjapyx*) *sabahnus* Pagés, ♀ st. 3 de 2,54 mm. - 38. Tergite 1, e = 112 µm. - 39. Tergites 7 à 10 et les cerques, e = 112 µm. - 40. Marges internes des cerques, e = 49 µm. - 41. Urosternite 1, e = 112 µm. - 42. Angle latéral de l'organe subcoxal gauche, e = 42 µm. - 43. Urosternite 3, e = 112 µm. - 44. Hypopyge, e = 63 µm.

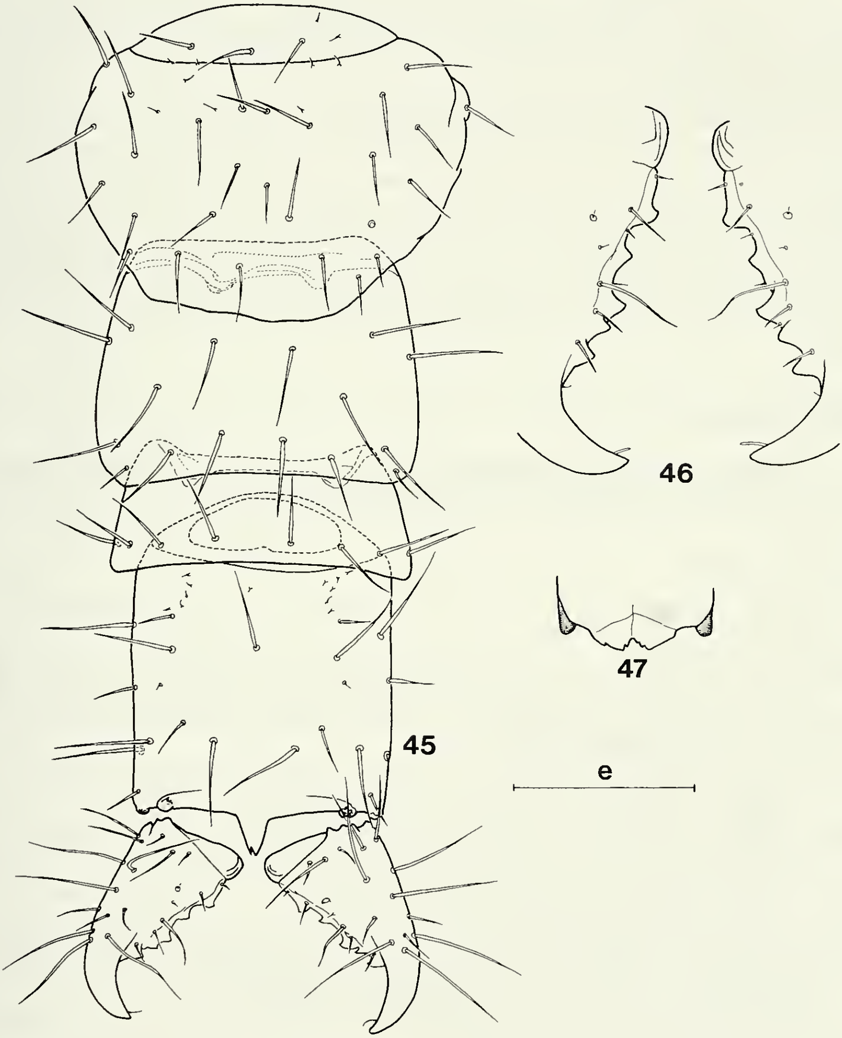
on ne peut donc pas expliquer cet aspect par une "usure" anormale des dents; le problème reste entier.

Plaques d'évaporation: très petites, mais plus nettes que chez les exemplaires du Sabah; au nombre de 4-5 par cerque, elles sont inscrites dans un trapèze dont les sommets sont les M_1, M_3, M_5 et la soie *c* comme au Sabah.

Chétotaxie: caractérisée par l'absence des soies *d* et *e* et la brièveté des M_6.

Parajapyx (subgen. ?) sp.? Figs 45-47

Matériel étudié: Bru-88/32: Brunei (Belait District): “Labi Hills Forest Reserve”, “Teraja”, à 42 km au sud de Sungai Liang (= 12 km au Sud de Labi), environs de “Rumah Panjang” (= Longhouse du Kampong Teraja), forêt primaire (“Mixed dipterocarp forest”), prélèvement de sol dans les angles formés par les contreforts d’un très grand arbre, 40 m; 22.XI.1988; leg. B. Hauser (B_2); 1 ♀ st.3 de 1,80 mm.



Figs 45-47

Parajapyx (subgen. ?) sp.?, ♀ st. 3. - 45. Tergites 7 à 10 et les cerques, e = 79 µm. - 46. Marges internes des cerques, e = 45 µm. - 47. Hypopyge, e = 105 µm.

Cet exemplaire possède des cerques dont les caractéristiques ambiguës me font hésiter à le classer spécifiquement.

Les cerques sont nettement plus trapus que chez les espèces précédentes et se rapprocheraient de ceux de *P.* (*G.*) *sabahnus*, mais la forme de la d_2 et la présence d'une seule plaque d'évaporation située sur une ligne joignant M_5 et c l'en écartent incontestablement.

Ces 2 caractéristiques se retrouvent chez *P.* (*P.*) *hauseri*, mais si les chétotaxies sont semblables, l'absence d'un sinus entre d_1 et d_3, même aussi peu marqué que chez la ♀ st.2 de *P. hauseri*, et l'aspect plus trapus des cerques rendent ce rapprochement difficile.

Les intervalles entre les dents des cerques de cet exemplaire sont comme 100-107-73-80-213 à droite et comme 100-94-59-65-212 à gauche, valeurs voisines de celles rencontrées chez *P.* (*G.*) *temburong*, mais cette dernière espèce a des cerques beaucoup plus élancés et de petites plaques d'évaporation situées elles aussi, il est vrai, sur une ligne joignant M_5 et c, enfin les acropyges sont identiques, présentant une dent sur le côté gauche. Je ne crois ni utile, ni souhaitable de créer un taxon nouveau en l'absence d'autres exemplaires, en particulier de ♂ provenant de la même station.

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Redescription of *Diplomystes mesembrinus* (Siluriformes, Diplomystidae)

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Redescription of *Diplomystes mesembrinus* (Siluriformes, Diplomystidae). - New specimens of *Diplomystes mesembrinus* collected in the río Chubut, Argentina, allow a thorough description of the species, hitherto known only by four specimens. *Diplomystes mesembrinus* may be distinguished from *D. viedmensis* and *D. cuyanus* by the possession of a low number of maxillary teeth, no more than 23 in adults. This character is shared by *D. mesembrinus* and the Chilean species *D. chilensis*, *D. camposensis*, and *D. nahuelbutaensis*. The suture between basibranchials 2 and 3 differentiates *D. mesembrinus* from the three Chilean species and *D. viedmensis*. Some ontogenetic changes in *D. mesembrinus* are commented upon.

Key-words: Siluriformes - Diplomystidae - *Diplomystes mesembrinus* - Neotropical Region - Patagonia.

INTRODUCTION

Patagonia, in southern South America, is an extense region with scarce rivers. Most of the Patagonian rivers have headwaters in the Cordillera de los Andes, many of them at high altitude, and run from the West to the East, pouring into the Atlantic Ocean. In the rivers of Patagonia, fresh water fishes are scarce. Only species of the siluriform families Diplomystidae and Trichomycteridae are recorded within the ichthyofauna of the area. Six species are included into the family Diplomystidae; three of them are present in Chile and other three species in Argentina. The three East-Andean species *Diplomystes cuyanus*, *D. viedmensis* and *D. mesembrinus* respectively occur in the Colorado, Negro, and Chubut-Senguerr basins. Chubut-Senguerr basin is one of the most important Patagonian basins; it mainly occurs in the province of Chubut between 41° 30 and 46° S. From the mouth of the río Senguerr, Ringuelet (1982) described *Diplomystes mesembrinus* based on two specimens. Although several records of the "bagre pintado" appeared in a chronicle of an expedition to the río Chubut in 1865-66 (CLARAZ 1988), only material type and two very small specimens of *D. mesembrinus*, captured by one of the authors in that river (GOSZTONYI 1988), were known until five years ago, and the adults of *D. mesembrinus* were unknown.

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The objective of this paper is to redescribe *D. mesembrinus* using external and osteological characters. Remarks about disgnostic characters and ontogenetic changes of the species are added.

MATERIAL AND METHODS

Specimens of *D. mesembrinus* were cleared and counterstained following Taylor & Van Dyke (1985). Measurements are straight distances taken with calliper to nearest 0.1 mm, on the left side of the body whenever possible.

Cleared and stained specimens (C&S) of *Diplomystes viedmensis* Mac Donagh, 1931, *D. cuyanus* Ringuelet, 1965, *D. chilensis* Molina, 1782, *D. camposensis* Arratia, 1987, and *D. nahuelbutaensis* Arratia, 1987, have been examined.

Material is deposited in Centro Nacional Patagónico (CENPAT), Muséum d'histoire naturelle de Genève (MHNG) and Museo de La Plata (MLP).

REDESCRIPTION

Diplomystes mesembrinus Ringuelet, 1982 Figs 1-8, table 1

Diplomystes viedmensis mesembrinus Ringuelet, 1982: 350.
Diplomystes mesembrinus; Azpelicueta 1994a: 13.

Material examined. 66 specimens, provincia del Chubut, Argentina. Holotype: MLP 8452, 168.0 mm, mouth of río Senguerr. MLP uncat., 1 ex., 33.8 mm, río Chubut inferior (C&S), col. A. Gosztonyi. MLP uncat., 9 ex., 80.4-170.7 mm (1 ex., C&S), río Chubut near Los Altares (43° 51' 30'' S-68° 28' W), 18-12-95. MLP uncat., 3 ex., 65.0-101.0 mm (2 ex. C&S), río Chubut near km 261 provincial road 25, 19-12-95, col. A. Gosztonyi and R. Taylor. MLP uncat., 20 ex., 63.0-135.3 mm (2 ex. C&S), río Chubut en cañadón Carbón /43° 49' 8'' S- 67° 53' 8''), 18-4-97, col. A. Gosztonyi, L. Kuba, and R. Taylor. MLP uncat., 1 ex., 103.2 mm, río Chubut en Los Altares, same date and collectors. MLP uncat., 8 ex., 99.0-159.5 mm, río Chubut, near cerro Cóndor (43° 19' 1''-69° 8' 2''), 19-4-97, same collectors. CENPAT uncat., 2 ex., 137.0-187.0 mm (C&S), río Chubut near Los Altares, 9-12-1993, col. R. Taylor. CENPAT uncat., 14 ex., 82.2-215.0 mm, same locality, 18-12-95, col. A. Gosztonyi and R. Taylor. CENPAT uncat., 5 ex., 69.0-122.0 mm, km 261 of the provincial road 25, 19-12-95, same collectors. MHNG 2593.66-67, 2 ex., 127.0-134.0 mm, río Chubut, near cerro Cóndor, 19-4-97, col. A. Gosztonyi, L. Kuba, and R. Taylor.

Diagnosis. *Diplomystes mesembrinus* is differentiated from *D. cuyanus* and *D. viedmensis* by the presence of few maxillary teeth, no more than 23 in adults, a character of uncertain polarity shared with the Chilean *D. chilensis*, *D. cuyanus*, and *D. nahuelbutaensis*. The suture between basilbranchials 2 and 3 distinguishes *D. mesembrinus* from the three Chilean species and *D. viedmensis*. *Diplomystes mesembrinus* has the narrowest mouth (0.26-0.32 vs. 0.34-0.42 in head length of the other species).

Redescription. The previously known descriptions of *D. mesembrinus* were based on the holotype (Ringuelet 1982; Azpelicueta 1994b). Completing those descriptions, only the differences found in the new material are mentioned below. Measurements are listed in table 1, as percentages of different lengths.

Dorsal fin with first spine small, second spine well developed and 7 rays branched, as in all diplomystid species. Second spine with 6-8 small serrae in half or distal one third of posterior margin, serrae worn in adults; anterior margin of second spine smooth. Adipose-fin origin placed at same level of anal-fin origin or scarcely anteriorly (Fig. 1). Adipose depth in percentage of its length 16.67-30.0.

Pectoral fin with one spine and 8-10 branched rays; pectoral-fin tip extended beyond pelvic-fin origin in juveniles (Fig. 2), not reaching such origin in adults. Pectoral spine with 18 posterior serrae in adults, highest number found in diplomystid species.

Two pectoral axillary gland pores present; posterior one usually divided into two apertures.

Pelvic-fin origin always,placed in anterior half of standard length. Pelvic-fin tip extended beyond origin of anal fin in youngs and some juveniles, but not in adults.

Anal fin with 4-5 unbranched rays and 8-9 branched rays. Last simple ray or first branched ray longer. Dorsal and anal fins with fleshy bases.

Lower caudal lobe scarcely longer and wider than upper one. Lateral line end usually curved dorsally, sometimes straight (five specimens). Dorsal procurrent caudal rays 16-17 and ventral procurrent rays 16-18.

Dorsal head surface on supraoccipital smooth. Fleshy fold around posterior nare completely or partially covering the aperture. Mouth narrow; premaxillary tooth plate wide in relation to mouth width. Maxillary barbel reaching beyond pectoral-fin origin in small specimens, and near branchiostegal membrane in adults.

Total number of vertebrae 42-44, including the Weberian apparatus and preural centrum 1+ural centrum 1. Anterior gill rakers on first arch as follows: 6-8 in epibranchial, 1 in cartilage, 12-14 in ceratobranchial and hipobranchial. Pseudobranch bearing 14-15 filaments in adults. Eleven or twelve pairs of ribs present; first rib reduced and fused to 5th parapophysis. A well-developed rib joined to 5th. parapophysis present in one specimen (140 mm SL).

Coloration in life: Body grey, upper area of flanks dark, lower area light; body whitish ventrally. Small black dots on flanks, more abundant dorsally. Few dots on dorsal surface of head, more concentrated on snout. Small specimens grey, without dots (Fig. 2).

Pectoral fins dark grey, pelvic fins light grey. Dark chromatophores only on dorsal surface of both paired fins. Dorsal and caudal fins with very small dots and distal margin dark; five specimens with caudal margin unpigmented. Larger specimens with dots scattered on anal fin, anal-fin base of small specimens whitish, and light grey distally. Adipose fin completely covered by very small dots.

Papillae: Filamentous papillae, scarce in juveniles and numerous in adults, cover the entire body; also, papillae are present at the base of dorsal and pectoral fins, and spines. Papillae are short in juveniles and long in adults (1.5 mm). There are rounded papillae around mouth, posterior surface of maxilla, and branchiostegal area. Many of those papillae around mouth become prismatic during growth. The dorsal area of each papilla has eight taste-buds. Scarce rounded or filamentous papillae are always found in mouth roof.

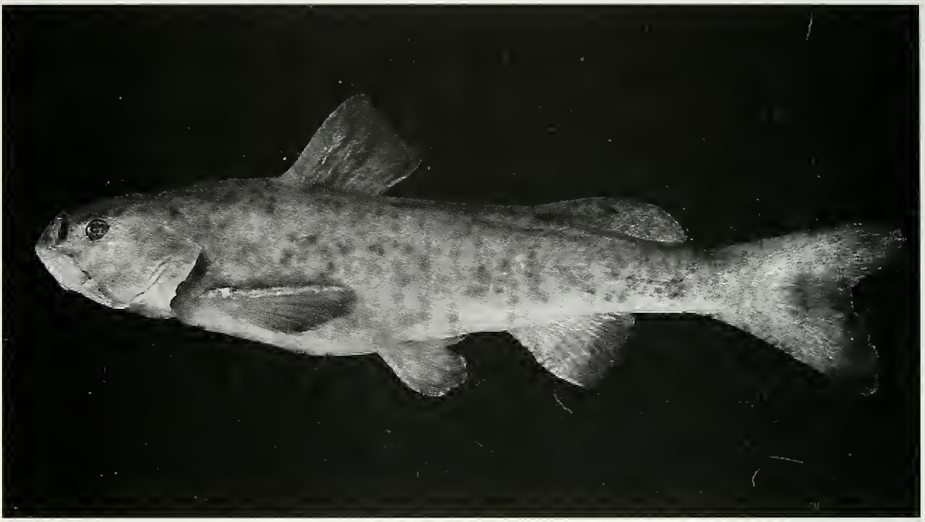
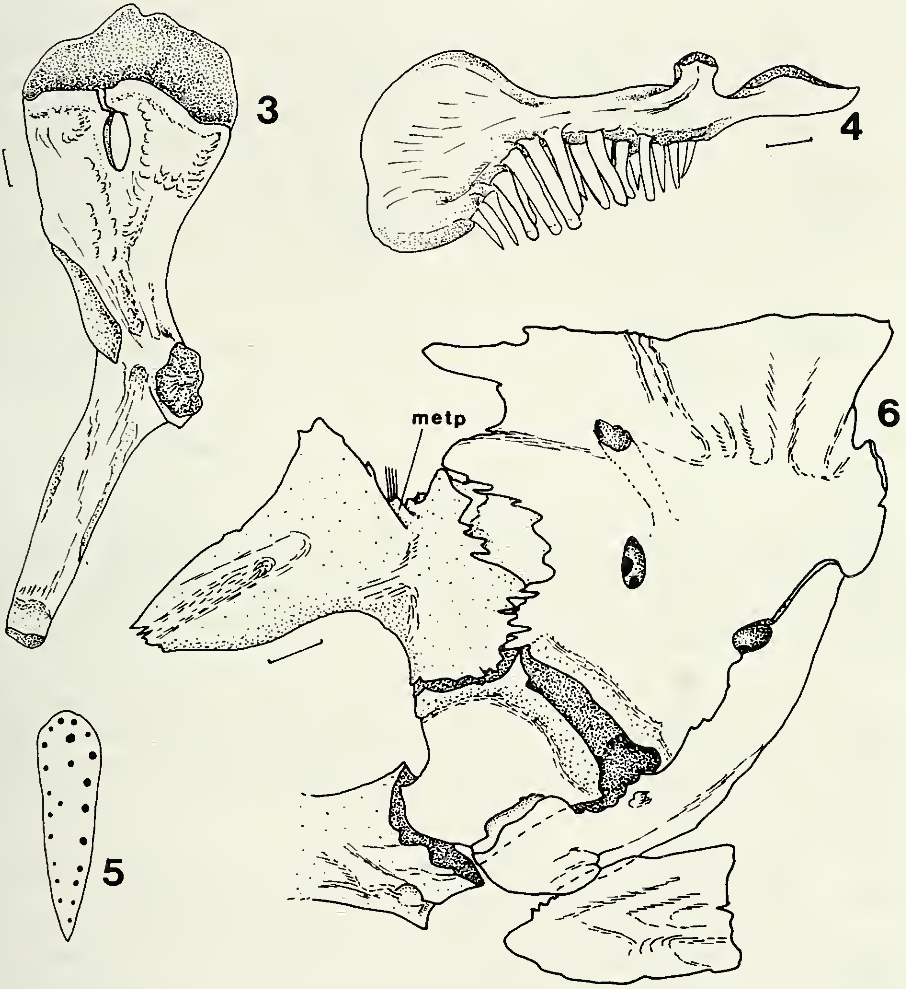


FIG. 1
Diplomystes mesembrinus, río Chubut near cerro Cóndor, 150.5 mm SL.

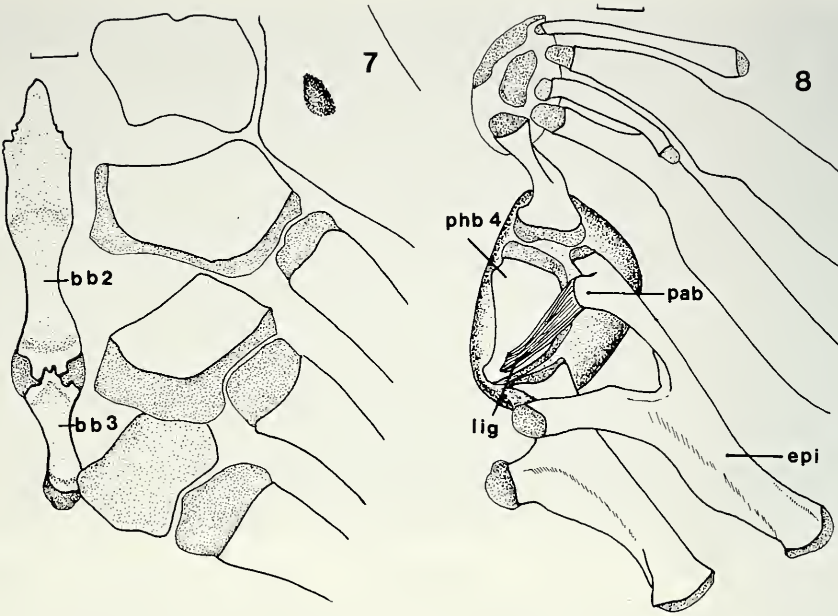
FIG. 2
Young specimen of *Diplomystes mesembrinus*, río Chubut near cerro Cóndor, 102.2 mm SL, without dots on body.

Large pit-organs in a line, parallel to lateral line, present along the entire flanks (AZPELICUETA 1993). Also, large pit-organs occur in lines in the dorsal surface of head and in front of dorsal fin, on body (AZPELICUETA 1994a; ARRATIA & GAYET 1995).



FIGS 3-6

Diplomystes mesembrinus, 187 mm SL. 3: Right autopalatine, dorsal view, an incomplete fusion between the two anterior autopalatine processes; 4: Right maxilla, with conic and spatulate teeth, lateral view; 5: Right maxilla, ventral view, schematic illustration showing the arrangement of the maxillary teeth; 6: Right suspensorium, mesial view, a small metapterygoid process present. metp: metapterygoid process. Scale bar: 1 mm.



FIGS 7-8

Diplomystes mesembrinus, 215 mm SL, right branchial elements, dorsal view; 7: Suture between basibranchial 2 and 3; 8: Process in the anterior branch of the uncinate epibranchial 3 with the ligament attached. bb 2: basibranchial 2; bb 3: basibranchial 3; epi: uncinate epibranchial 3; lig: ligament; pab: process in the anterior branch of the third epibranchial; phb: pharyngobranchial 4. Scale bar: 1 mm.

Osteology: The sphenotic of small specimens is short and wide whereas the sphenotic of large specimens has a very long anterior process. The wide frontal of early ontogenetic stages becomes narrow posteriorly in adults and extremely narrow in very large specimens. One crest for muscle attachment crosses along dorsal surface of the extrascapula.

The number of maxillary teeth does not exceed 23 in adults; teeth are arranged in three somewhat unordered rows anteriorly and two rows posteriorly (Figs 4, 5).

Tooth plates develop under autopalatine on both sides in 18 specimens (N = 40); only on one side in seven specimens, and they are absent in the rest. Tooth plates have irregular number of teeth and different size; also, more than one tooth plates may occur under autopalatine, on each side. All specimens have two vomerine tooth plates. The autopalatine of small specimens and juveniles has two anterior processes that fuse during ontogeny, although they are not completely fused in some large specimens (Fig. 3). Ectoperygoid and entopterygoid always occur under the autopalatine posterior process which is long in adults. The metapterygoid process only develops in one specimen (Fig. 6). A large crest for insertion of levator arcus palatini is present on the hyomandibula.

Posterior margin of basibranchial 2 and anterior one of basibranchial 3 suture during ontogeny (Fig. 7); the beginnig of this trend is observed at 130 mm SL. A small process directed posteriorly, for attachment of a short and strong ligament that firmly joins the bone to pharyngobranchial 4, grows in the anterior branch of the uncinate third epibranchial (Fig. 8).

In the Weberian apparatus, the reabsorption of the horizontal process of the intercalarium occurs in early stages of ontogeny. One supraneural develops between the supraoccipital and the neural arch of the complex vertebrae, not reaching the supraoccipital in large specimens. The dorsal margin of the claustrum does not contact the supraneural in the largest specimen (215 mm SL).

There are three proximal radials in the pectoral fin. The number of pectoral distal radials is reduced from five to two during ontogeny. The pelvic bone has three anterior processes and one pelvic radial in all specimens; the youngest specimen examined has the medial process yet cartilaginous (Azpelicueta 1994b, fig. 14c).

Table 1

Measurements of 35 specimens of *Diplomystes mesembrinus* in percentage of indicated lengths. SL = 33.8-215.0 mm.

	x̄	min	max
Percentage of standard length			
Predorsal-fin length	37.8	35.1	39.2
Preadipose fin-length	64.2	57.8	68.2
Preventral-fin length	48.6	44.5	51.0
Preanal-fin length	66.7	59.9	69.0
Dorsal-fin base	13.7	12.3	16.4
Adipose-fin base	25.9	21.4	31.9
Anal-fin base	14.0	11.0	17.3
Pelvic-fin length	16.6	13.6	20.0
Pectoral-spine length	18.4	15.2	21.5
Dorsal-spine length	18.0	11.8	21.7
Greatest body depth	20.0	14.4	23.3
Greatest head depth	15.7	13.0	20.0
Head length	26.6	24.2	29.0
Head width	18.4	16.2	22.2
Mouth width	7.7	6.0	7.7
Interorbital length	8.1	6.8	8.1
Preorbital length	11.2	8.3	13.1
Percentage of head length			
Head width	69.1	61.6	86.7
Mouth width	20.0	22.6	35.9
Greatest head depth	59.2	50.0	74.5
Interorbital length	30.5	25.7	35.8
Preorbital length	42.1	33.3	49.2
Orbital length	16.4	11.3	29.8
Maxillary length	23.9	17.7	28.4
Premaxillary length	22.7	15.6	27.3
Percentage of mouth width			
Premaxillary tooth plate	82.7	65.8	99.9

BIOLOGY

Little is known about the biology of the family (ARRATIA 1983; AZPELICUETA 1994a). Examination of a few specimens shows that five stomach contents include adult Hymenoptera, large amount of terrestrial Coleoptera, and numerous specimens of the gasteropod *Chilina* sp.

Males have testes with broad lobes, similar in anterior and posterior regions. As in other species of diplomystids, the females only have one gonad. At the beginning of the warm season (December), the females were not ripe.

Large specimens have been collected in a slow, deep run on the southern side of a wide turn in a meandering section of Chubut river. The medium-sized specimens were collected in shallow waters, usually with faster current. According to the observations of GOZSTONYI (1988) the small specimens were caught in a fast flowing narrow section of the river.

DISCUSSION

The family Diplomystidae is the only group of living catfishes retaining a dentate maxilla with long medial process and laminar lateral expansion. Maxillary teeth are placed along most of the oral surface of the bone and are arranged in somewhat unordered rows. A low number of maxillary teeth, not exceeding 23 in adults, have been considered by ARRATIA (1987) as a diagnostic character for the species living in the Western slope of the Andes. Nonetheless, the same number is present in adults of *D. mesembrinus* (Figs 4, 5). This number of maxillary teeth distinguishes *D. mesembrinus* from *D. viedmensis* and *D. cuyanus* which have a high number of teeth. At 215 mm SL, specimens of *D. cuyanus* and *D. viedmensis* have about 40 teeth. Such number changes during ontogeny and about 60 maxillary teeth, placed in five rows anteriorly, occur in the largest *D. viedmensis* (324 mm SL; AZPELICUETA 1994b, fig. 16f). The teeth of *D. mesembrinus* are arranged in three unordered rows anteriorly and two rows posteriorly. *Diplomystes camposensis*, *D. nahuelbutaensis*, and *D. chilensis* have two rows anteriorly and one row posteriorly (ARRATIA 1992), an arrangement that differentiates them from *D. mesembrinus*.

The autopalatine of diplomystid species has two anterior processes in early stages of ontogeny. *D. nahuelbutaensis* and *D. camposensis* retain those processes in large specimens (ARRATIA 1987) whereas both processes fuse during grow in *D. viedmensis*, *D. cuyanus*, *D. chilensis*, and *D. mesembrinus*; nonetheless, some large specimens of *D. mesembrinus* have an incomplete fusion (Fig. 3).

A metapterygoid process is found in large specimens of *D. cuyanus* and in different ontogenetic stages of *D. viedmensis* (AZPELICUETA 1994b); such process bears a small ligament attached to parasphenoid. This process only occurs in one specimen of *D. mesembrinus* (Fig. 6).

The presence of a suture between basilbranchial 2 and 3 differentiates *D. mesembrinus* from all diplomystid species, but *D. cuyanus*. The small process developed in the anterior branch of the uncinate third epibranchial is a character shared by *D. mesembrinus* and *D. cuyanus*.

Fink & Fink (1981, 1996) listed the absence of third supraneural as a Characiphysan character. Usually, one supraneural appears in the Weberian apparatus of all *Diplomystes*, although some specimens of *D. chilensis* and *D. cuyanus* have one ossified element posterior to the first ossification (Arratia 1987, fig. 9b; Azpelicueta 1994b). Arratia (1992) mentioned one supraneural with two centers of ossification. In two juveniles of *D. cuyanus*, the suture between both elements is clearly distinguished but none of the adult specimens examined have two elements. The examination of larval and postlarval specimens of *D. chilensis* or *D. cuyanus* will confirm the origin of the second ossification which may represent other supraneural. The very small *D. viedmensis*, *D. nahuelbutaensis* and *D. mesembrinus* examined have only one supraneural (30, 26, and 33 mm of SL respectively).

During ontogeny, the cranium of the diplomystid species becomes narrow, specially at the epiphyseal bar level. The shape of some skull bones as sphenotic, frontal, and supraoccipital strikingly changes in large specimens of *D. mesembrinus*, as in the remaining species of *Diplomystes*. The presence of one crest for muscle attachment on the extraescapula of *D. mesembrinus* distinguishes this species from adult *D. viedmensis*.

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Aleocharinae della Cina: Parte IV (Coleoptera, Staphylinidae)

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Aleocharinae from China: Part IV (Coleoptera, Staphylinidae). - In this paper further 69 species are described as new to science. These new species belong to following tribes: Athetini (part III) (42 species), Thamiaraeini (4), Pygostenini (6) and Myrmedoniini (17). One subgenus and two genera are described as new, assigned to following tribes: Pygostenini (*Mesomegaskela* n. gen. and *Cephaplakoxena* n. gen.) and Thamiaraeini (*Aidemonusa* n. subgen. of *Mimoxypoda*). The main diagnostic characters are illustrated.

Key-words: Coleoptera - Staphylinidae - Aleocharinae - Taxonomy - China.

INTRODUZIONE

Nel presente lavoro viene esaurita la descrizione di nuove specie dell'estesissima tribù Athetini ed è compresa la descrizione di nuove specie delle tribù Thamiaraeini, Pygostenini e Myrmedoniini. Anche queste descrizioni, come quelle dei tre precedenti lavori di questa serie (Pace 1998a, b, c), sono fatte su materiali di recente raccolta da parte dei colleghi studiosi di Staphylinidae Guillaume de Rougemont e Dr Ales Smetana di Ottawa. Ho incluso in questo lavoro due specie nuove che non appartengono propriamente al territorio cinese: una del Kazachistan, l'altra della Siberia.

Gli holotypi contrassegnati con la sigla (MHNG) sono conservati nelle collezioni del Museo di Storia naturale di Ginevra. Un holotypus contrassegnato con la sigla (CASS) è conservato in collezione Volker Assing di Hannover.

ATHETINI (parte III)

Atheta (Phanerosphaena) retroarmata sp. n. Figg. 1-3

Holotypus ♂, Hong Kong, Kadoorie Agricultural Research centre, flight interception trap, 19-31.V.1996, de Rougemont leg. (MHNG).

(142° Contributo alla conoscenza delle Aleocharinae)

Manoscritto accettato il 14.02.1998.

Descrizione. Lunghezza 2,1 mm. Corpo lucido e bruno con estremità addominale giallo-rossiccia; Antenne brune con i due antennomeri basali e l'apice dell'undicesimo giallo-rossicci; zampe giallo-rossicce. La reticolazione della superficie del capo è estremamente superficiale, quella sul resto del corpo è assente. I tubercoletti che coprono la superficie dell'avancorpo sono svaniti, quelli dell'addome sono salienti e fini. Edeago figg. 2-3.

Comparazioni. La nuova specie è chiaramente distinta da *A. tronqueti* Pace, 1987a del Nepal e della Thailandia, sia per i caratteri esterni che per l'edeago. Gli enormi occhi della nuova specie contrastano con quelli ridotti di *tronqueti*. Inoltre l'edeago della nuova specie è strettamente e profondamente infossato al livello della "crista apicalis" e l'armatura genitale interna è costituita da due lamine falciformi. Questi caratteri, insieme a molti altri non elencati, non si riscontrano nell'edeago di *tronqueti*.

Atheta (Microdota) iperintroflexa sp. n. Figg. 4-5

Holotypus ♀, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).

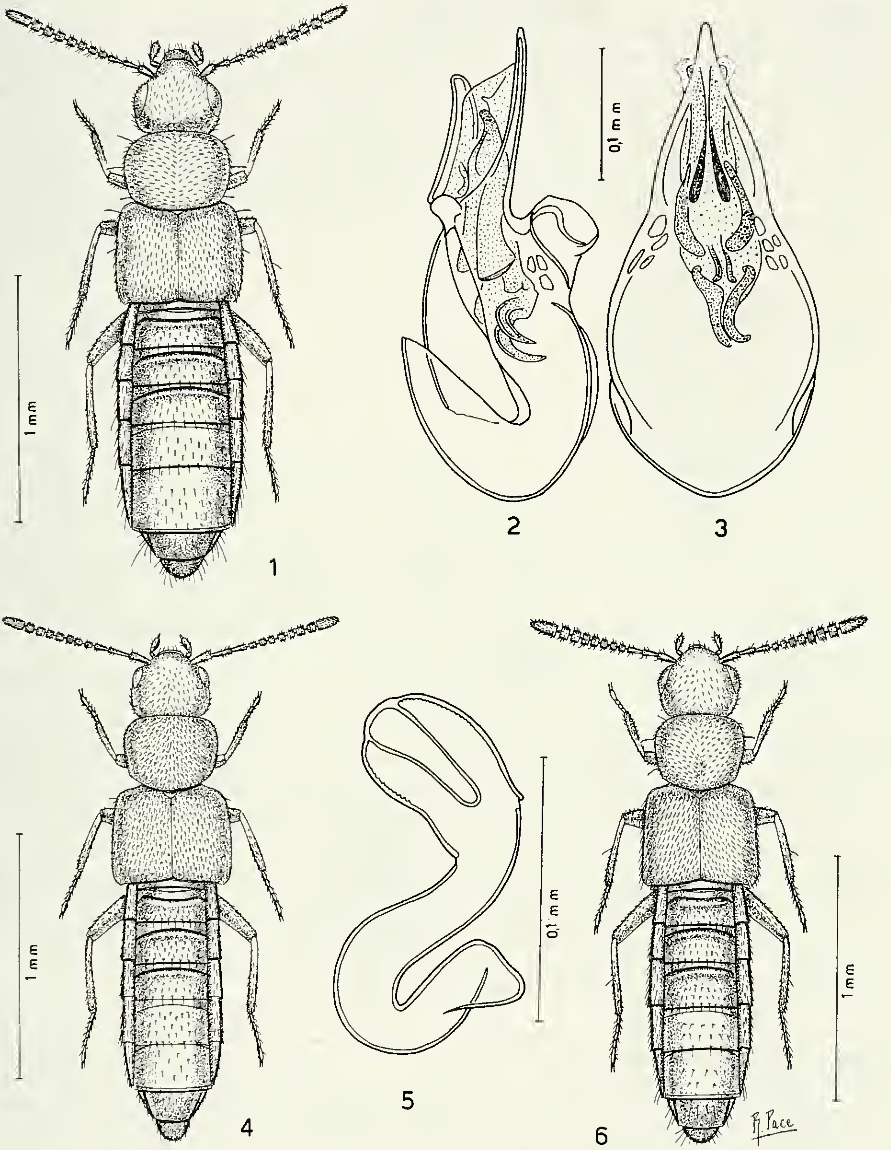
Descrizione. Lunghezza 2,0 mm. Corpo lucido e bruno con capo e uriti liberi 4° e 5° nero-bruni e con elitre giallo-brune; antenne brune con antennomero basale rossiccio e il successivo rossiccio; zampe gialle. La reticolazione del capo è superficiale, quella del pronoto, delle elitre e dei tre uroterghi basali è estremamente svanita, quella del quarto urotergo libero è ben trasversa come quella degli uroterghi anteriori ma è netta, quella del quinto e sesto urotergo libero è quasi vigorosa e a maglie isodiametriche. I tubercoletti della superficie del capo sono fittissimi e poco salienti, quelli del resto della superficie del corpo sono fini e salienti. Spermateca fig. 5.

Comparazioni. In base alla struttura della spermateca, la nuova specie è comparabile con *A. pseudocoprophila* Cameron, 1950, di Selangor, ma la nuova specie ha taglia corporea maggiore (2,1 mm invece di 1,6 mm), il quarto antennomero più lungo che largo (e non trasverso come in *pseudocoprophila*) e per la spermateca che ha una profondissima introflessione apicale del bulbo distale (breve in *pseudocoprophila*).

Atheta (Microdota) tricoloroides sp. n. Figg. 6-10

Holotypus ♂, China, Zhejiang, Hangzhou, 27.IV.1993, de Rougemont leg. (MHNG).
Paratypi; 8 es., stessa provenienza.

Descrizione. Lunghezza 2,0 mm. Corpo lucido. Capo e uriti liberi 3° e 4° bruni, pronoto, i due uriti basali ed estremità addominale giallo-rossicci, elitre giallo-brune; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. La reticolazione della superficie del capo e dell'addome è distinta, quella del pronoto è netta e quella delle elitre è svanita. Le maglie di reticolazione della superficie dell'addome sono poligonali irregolari. I tubercoletti della superficie dell'avancorpo sono superficiali, quelli dell'addome sono salienti. Edeago figg. 7-8, sesto urotergo libero del maschio fig. 9, spermateca fig. 10.



FIGG. 1-6

Habitus, edeago in visione laterale e ventrale e spermateca. 1-3: *Atheta (Phanerosphaena) retroarmata* sp. n.; 4-5: *Atheta (Microdota) iperintroflexa* sp. n.; 6: *Atheta (Microdota) tricoloroides* sp. n.

Comparazioni. La nuova specie è simile ad *A. masuriensis* Cameron, 1939, dell'India. Il solo carattere distintivo somatico esterno più evidente è la maggiore lunghezza dell'undicesimo antennomero della nuova specie, rispetto quello di *masuriensis*. La spermateca ha forma e grandezza simili nelle due specie, tuttavia l'introflessione apicale del bulbo distale della stessa spermateca è minuscula nella nuova specie e profonda in *masuriensis*. E' nell'edeago che si notano le maggiori differenze morfologiche tra le due specie. Tra le molte è da segnalare che l'armatura genitale falciforme interna dell'edeago della nuova specie, non si riscontra nell'edeago di *masuriensis*.

Atheta (Microdota) jiensis sp. n. Figg. 11-14

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

Paratypi: 9 es., stessa provenienza.

Descrizione. Lunghezza 1,9 mm. Corpo lucido e bruno-rossiccio con capo bruno; antenne nere con antennomero basale rossiccio; zampe gialle. La reticolazione del disco del capo è netta, quella sul resto della superficie del capo e sulle elitre è svanita, quella del pronoto è quasi virorosa, quella dell'addome è distinta e a maglie poligonali irregolari. I tubercoletti della superficie del capo e del pronoto sono poco salienti e assenti sulla fascia mediana del capo, quelli della superficie delle elitre sono distinti. Edeago figg. 12-13, spermateca fig. 14.

Comparazioni. La nuova specie è simile ad *A. placita* Cameron, 1939, dell'India, ma il colore del corpo è differente (corpo bruno-rossiccio con capo nero invece di corpo giallo-rossiccio con capo, elitre e fascia addominale bruni come in *placita*) e le elitre di *placita* hanno maggiore sviluppo in lunghezza e larghezza. Il bulbo basale dell'edeago della nuova specie è più sviluppato di quello di *placita* e l'armatura genitale interna dello stesso edeago della nuova specie è nettamente più robusta di quella di *placita*. La spermateca della nuova specie ha sviluppo maggiore di quello della spermateca di *placita*.

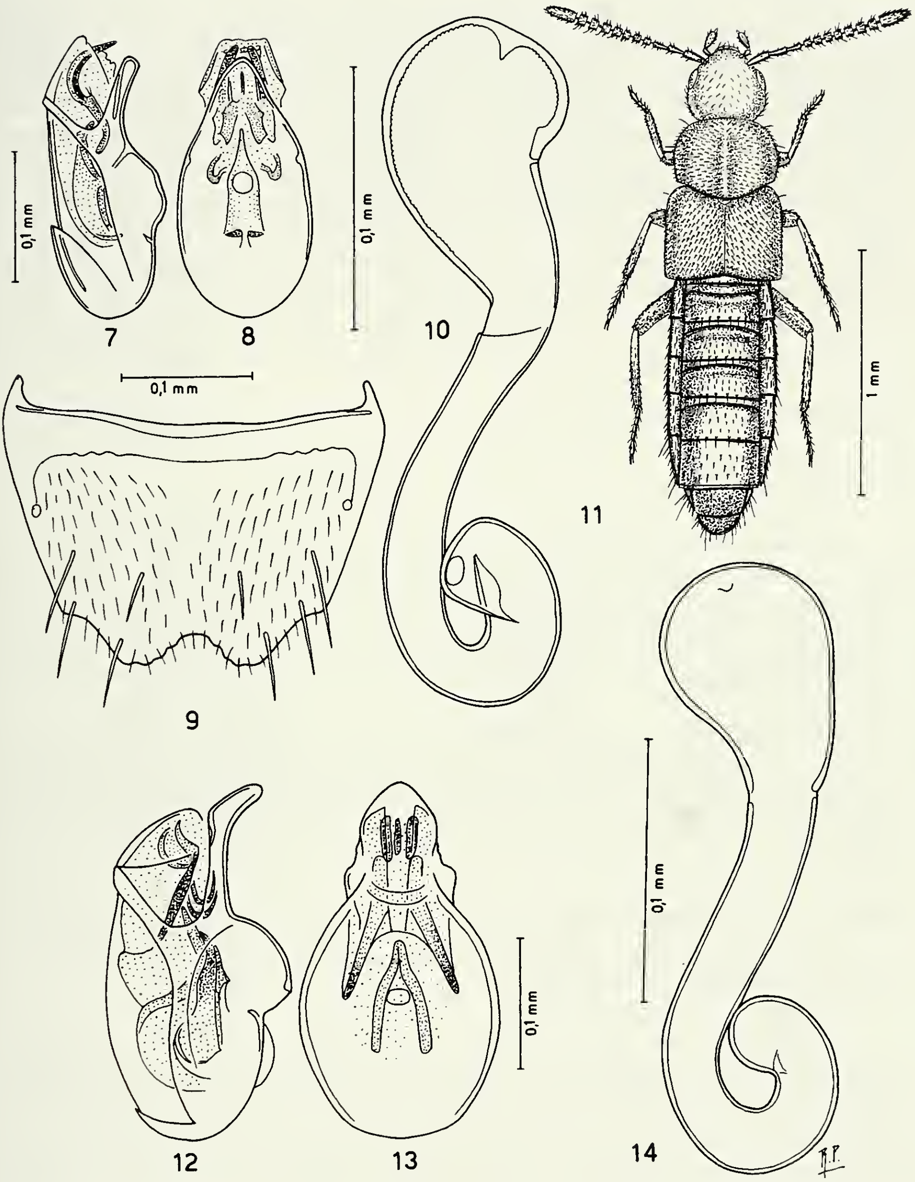
Etimologia. La nuova specie prende nome dall'antico nome "Ji" di Pekino, risalente all'ottavo secolo a.C.

Atheta (Microdota) yanensis sp. n. Figg. 15-18

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

Paratypi: 8 es., stessa provenienza.

Descrizione. Lunghezza 1,6 mm. Corpo lucido e bruno; antenne brune con antennomero basale bruno-rossiccio; zampe gialle con femori bruni. La reticolazione sul disco del capo è netta, sul resto della superficie del capo e sul resto del corpo superficiale. I tubercoletti della superficie del capo, del pronoto e delle elitre sono salienti: sono assenti sulla fascia mediana sia del capo che del pronoto. I tubercoletti dell'addome sono svaniti. Edeago figg. 15-17, spermateca fig. 18.



FIGG. 7-14

Edeago in visione laterale e ventrale, sesto urotergo libero del maschio, spermateca e habitus. 7-10: *Atheta (Microdota) tricoloroides* sp. n.; 11-14: *Atheta (Microdota) jiensis* sp. n.

Comparazioni. La nuova specie è affine ad *A. sororcula* Cameron, 1939, dell'India, a motivo della forma dell'edeago e della spermateca. Ha elitre appena più larghe del pronoto e non nettamente più larghe del pronoto come in *sororcula*. L'edeago della nuova specie ha minore sviluppo, la sua parte apicale, in visione laterale, meno ampia di quella dell'edeago di *sororcula* che ha struttura dell'armatura genitale interna dell'edeago più robusta e più ricca di pezzi copulatori rispetto quella dell'edeago della nuova specie. Il bulbo distale della spermateca della nuova specie ha maggiore sviluppo della parte restante della stessa spermateca e ha profonda e robusta introflessione apicale, mentre in *sororcula* il bulbo distale, con introflessione apicale breve, ha minore sviluppo rispetto al resto della stessa spermateca.

Etimologia. La nuova specie prende nome dallo Stato feudale Yan dell'ottavo-quinto secolo a.C. della regione di Pekino dove è stata raccolta.

Atheta (Microdota) gonggaensis sp. n. Figg. 19-21

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 25.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 2 ♂, stessa provenienza.

Descrizione. Lunghezza 2,1 mm. Corpo lucido e bruno con capo e uriti liberi 3°, 4° e 5° neri e con pronoto bruno-rossiccio; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione è netta solo sul pronoto, sul resto del corpo è svanita. Quella dell'addome è a maglie poligonali irregolari. I tubercoletti che coprono la superficie dell'avancorpo sono poco distinti. Edeago figg. 20-21.

Comparazioni. La nuova specie è affine ad *A. placita* Cameron, 1939, dell'India. Se ne distingue per avere la parte apicale ventrale sporgente del bulbo basale dell'edeago poco saliente (molto saliente in *placita*) e per l'assenza di una lamella copulatrice ricurva basale del sacco interno dell'edeago (presente al contrario in *placita*).

Atheta (Microdota) ipercristata sp. n. Figg. 22-25

Holotypus ♂, China, Gansu, Xinlong Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VIII.1994, A. Smetana leg. (MHNG).

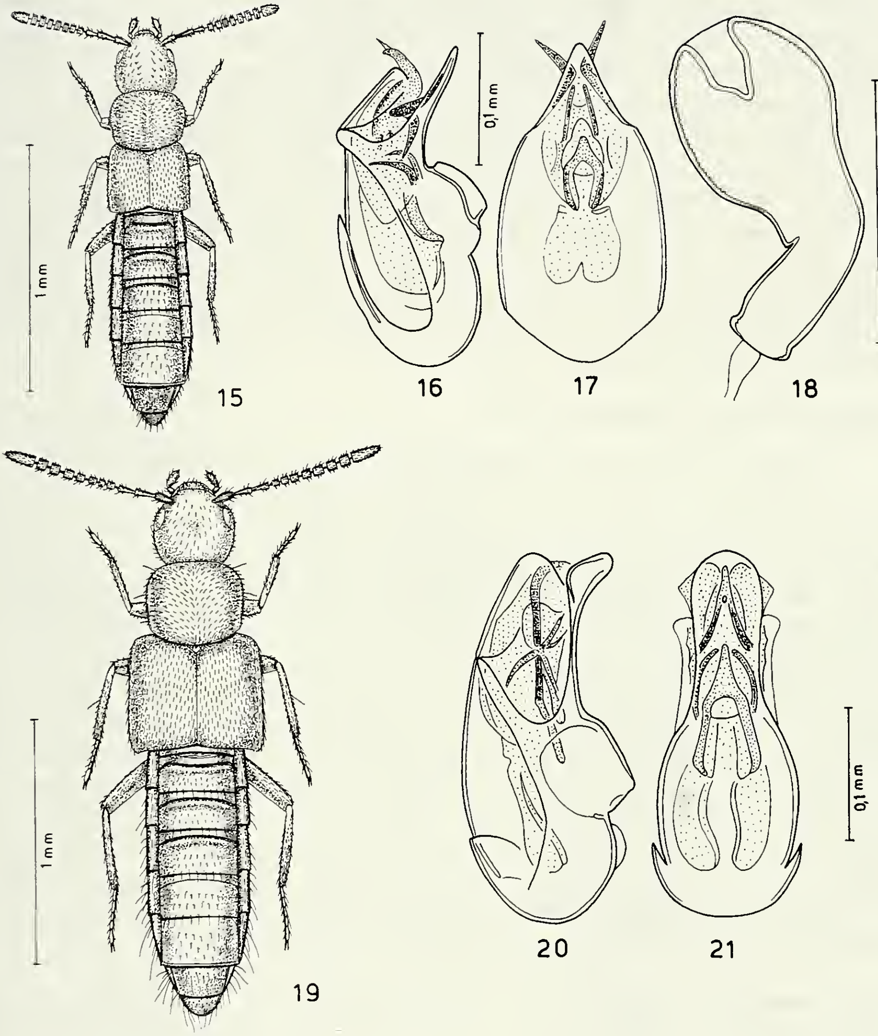
Paratypus; 1 ♂, stessa provenienza.

Descrizione. Lunghezza 2,2 mm. Corpo lucido e nero, antenne comprese; zampe giallo-brune. La reticolazione del capo è netta, quella del pronoto e dell'addome è distinta e quella delle elitre è svanita. Le maglie di reticolazione dell'addome sono appena trasverse. I tubercoletti della superficie del capo sono poco salienti, più fitti ai lati e assenti sulla fascia mediana, quelli del pronoto e delle elitre sono salienti. Edeago figg. 23-24, sesto urotergo libero del maschio fig. 25.

Comparazioni. A mia conoscenza la nuova specie è unica nell'ambito del sottogenere, dato che presenta una "crista apicalis" a sviluppo abnorme.

Atheta (Microdota) lanzhouensis sp. n. Figg. 26-29

Holotypus ♂, China, Gansu, 120 Km S Lanzhou, Guanghe Xian Mai Jia, 2300 m, 8.VII.1994, A. Smetana leg. (MHNG).



FIGG. 15-21

Habitus, edeago in visione laterale e ventrale e spermateca. 15-18: *Atheta (Microdota) yanensis* sp. n.; 19-21: *Atheta (Microdota) gonggaensis* sp. n.

Descrizione. Lunghezza 1,8 mm. Corpo lucido e bruno scuro con uriti liberi 3°, 4° e 5° neri; antenne nero-brune con i tre antennomeri basali giallo-bruni; zampe gialle. La reticolazione del capo è distinta, quella del pronoto è netta e quella delle elitre e dell'addome è svanita. L'avancorpo è coperto di tubercoletti poco distinti, l'addome di tubercoletti salienti. Edeago figg. 27-28, sesto urotergo libero del maschio fig. 29.

Comparazioni. Per la forma dell'edeago e per alcuni caratteri dell'esoscheletro, la nuova specie può essere tassonomicamente vicina ad *A. tuberculata* (Kraatz, 1859) dell'India. Infatti entrambe le specie presentano occhi ridotti ed edeago di dimensioni pure ridotte, con poco accentuata parte apicale ventrale sporgente dal bulbo basale. La nuova specie se ne differenzia per gli occhi ancor più ridotti, per le elitre appena più larghe del pronoto (e non molto più larghe del pronoto come in *tuberculata*) e per l'edeago, in visione ventrale, stretto, con apice largamente arrotondato e non con apice appuntito come si osserva in *tuberculata*.

Atheta (Microdota) philamicula sp. n. Figg. 30-31

Holotypus ♀, China, Sichuan, Langmusi, 3500-3600 m, A. Smetana leg. (MHNG).

Descrizione. Lunghezza 2,1 mm. Corpo lucido e nero, antenne comprese; zampe giallo-brune con tibie nere. La reticolazione del capo e del pronoto è netta, quella del pronoto è dell'addome è distinta. I tubercoletti della superficie del capo e del pronoto sono distinti, quelli delle elitre sono svaniti e quelli dell'addome sono salienti. Il capo presenta un debole solco discale. Spermateca fig. 31, con parte prossimale nera, fortemente chitinizzata.

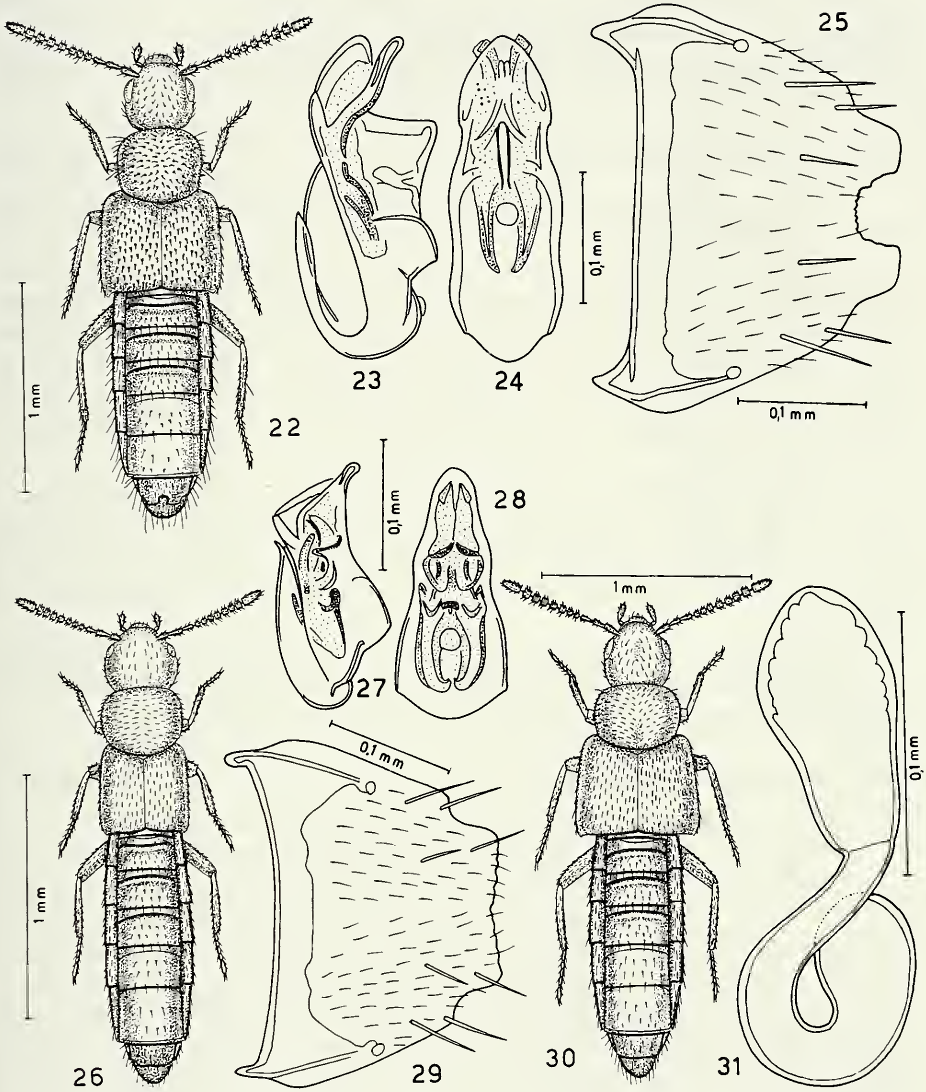
Comparazioni. La forma della parte prossimale della spermateca della nuova specie è pressoché identica a quella della spermateca di *A. amicula* (Stephens, 1832), diffusa nella regione paleartica occidentale. Ma questa parte della spermateca della nuova specie è nera, mentre è incolore in *amicula* e il bulbo distale della spermateca della nuova specie ha scultura interna a maglie ampie ed è privo di introflessione apicale, mentre in *amicula* le maglie sono finissime ed è presente un'introflessione apicale. Gli occhi della nuova specie sono più corti delle tempie, mentre in *amicula* sono lunghi quanto le tempie. Le elitre della nuova specie sono molto più larghe del pronoto, mentre in *amicula* sono poco più larghe del pronoto.

Atheta (Microdota) permixta sp. n. Figg. 32-33

Holotypus ♀, China, Gansu, Yonghai, ca. 20 Km SW Yuzhong, 2700-2800 m, 9.VIII.1994, A. Smetana leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e nero pece; antenne nere; zampe bruno-rossicce con femori bruni. La reticolazione del capo, del pronoto e dell'addome è svanita, quella delle elitre è distinta. Le maglie di reticolazione della superficie dell'addome sono trasverse, quelle del quinto urotergo libero sono appena trasverse e distinte. I tubercoletti che coprono la superficie dell'avancorpo sono molto superficiali. Spermateca fig. 33.

Comparazioni. La posizione sistematica della nuova specie è problematica. La forma della spermateca è tipica e simile a quella di alcune specie del genere *Aloconota*



FIGG. 22-31

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del maschio e spermateca. 22-25: *Atheta (Microdota) ipercristata* sp. n.; 26-29: *Atheta (Microdota) lanzhouensis* sp. n.; 30-31: *Atheta (Microdota) philamicula* sp. n.

Thomson, 1858, ma la ligula non è propria del genere *Aloconota*, ma del genere *Atheta*. La forma della spermateca della nuova specie è simile a quella di *A. nana* (Kraatz, 1859) dello Sri Lanka, ma le dimensioni di quest'organo sono maggiori e la parte prossimale è notevolmente più dilatata.

Atheta (Microdota) kadooriorum sp. n. Figg. 34-38

Holotypus ♂, Hong Kong, N.T., Kadoorie Agricultural Research Centre, IX-X.1991, Malaise trap, Ades leg. (MHNG).

Descrizione. Lunghezza 1,4 mm. Corpo lucido e nero-bruno con pronoto e i due uriti basali bruni e con elitre giallo-brune; antenne nero-brune con i due antennomeri basali bruno-rossicci; zampe gialle. La reticolazione del capo è superficiale, quella del pronoto e delle elitre è molto svanita e quella dell'addome è assente. La punteggiatura del capo è fitta e assai superficiale. I tubercoletti che coprono la superficie del pronoto e delle elitre sono fini e molto svaniti, quelli dell'addome sono salienti. Edeago figg. 34-35, spermateca fig. 38.

Comparazioni. Poiché ha taglia corporea minuta ed edeago di ridotte dimensioni, la nuova specie potrebbe essere vicina ad *A. nana* (Kraatz, 1859), dello Sri Lanka. Se ne distingue per l'enorme sviluppo degli occhi (occhi molto più corti delle tempie in *nana*) e per l'edeago notevolmente ricurvo al lato ventrale (appena ricurvo in *nana*).

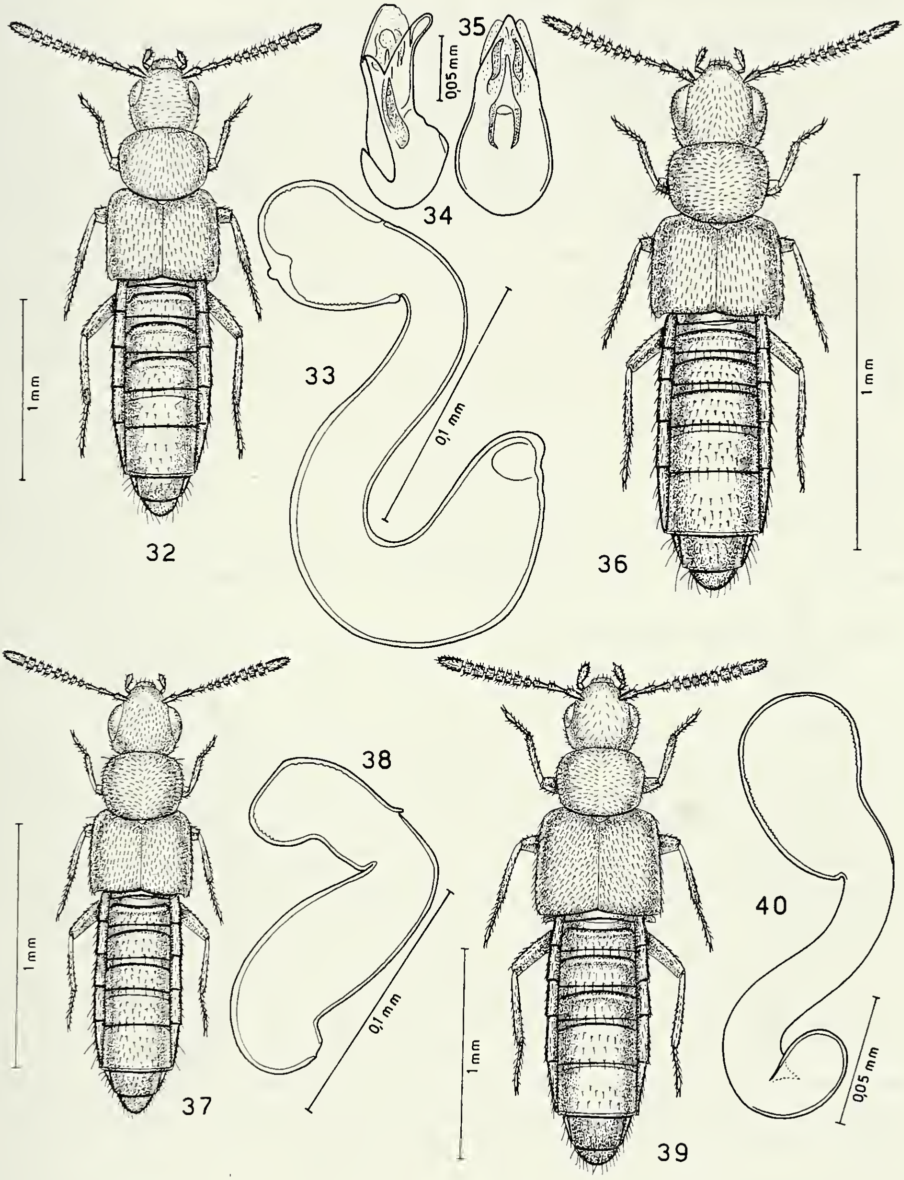
Etimologia. La nuova specie è dedicata ai fratelli Kadoorie, noti filantropi di Hong Kong, nella cui tenuta agricola sono state raccolte varie specie di Aleocharinae esaminate per la presente serie di lavori sulle Aleocharinae cinesi.

Atheta (Microdota) alternantoides sp. n. Figg. 39-40

Holotypus ♀, China, Yunnan, Dali, 9.II.1993, de Rougemont leg. (MHNG).
Paratypi: 1 ♂ (edeago non rinvenuto dentro l'addome) e 1 ♀, stessa provenienza.

Descrizione. Lunghezza 2,2 mm. Corpo lucido. Capo e uriti liberi 3°, 4° e metà basale del 5° neri, pronoto, i due uriti basali, la metà distale del 5° urotergo libero e l'estremità addominale giallo-rossicci, elitre giallo-brune con base gialla; antenne brune con i due antennomeri basali e la metà basale del terzo giallo-rossicci; zampe gialle. La reticolazione è distinta sul disco del capo, sulle elitre e sull'addome, sul pronoto è quasi vigorosa, sulle tempie e sul sesto urotergo libero è svanita. I tubercoletti della superficie del capo e del pronoto sono poco distinti, quelli delle elitre e dell'addome sono salienti. Spermateca fig. 40.

Comparazioni. Per il colore del corpo e per la forma della spermateca, la nuova specie potrebbe essere affine ad *A. placita* Cameron, 1939, dell'India. Se ne distingue per la base delle elitre e l'estremità addominale gialle o giallo-rossicce (elitre e addome interamente bruni in *placita*). Inoltre la nuova specie ha la spermateca a dimensioni minori nonostante la taglia corporea sia maggiore (2,2 mm invece di 2,0 mm come in *placita*), priva di introflessione apicale del bulbo distale (presente invece nel bulbo distale della spermateca di *placita*) e per la parte prossimale della stessa spermateca, breve e non lungamente protratta come in *placita*.



FIGG. 32-40

Habitus, edeago in visione laterale e ventrale e spermateca. 32-33: *Atheta (Microdota) permixta* sp. n.; 34-38: *Atheta (Microdota) kadooriorum* sp. n.; 39-40: *Atheta (Microdota) alternantoides* sp. n.

Atheta (Microdota) chinamicula sp. n. Figg. 41-45

Holotypus ♂, China, Zhejiang, Hangzhou, 27.IV.1993, de Rougemont leg. (MHNG).
Paratypi: 13 es., stessa provenienza.

Descrizione. Lunghezza 1,7 mm. Corpo lucido e bruno con uriti liberi 3°, 4° e 5° neri; antenne brune con i due antennomeri basali giallo-bruni; zampe gialle. La reticolazione del disco del capo è netta, composta di maglie isodiametriche ampie, quella del pronoto è vigorosa, quella delle elitre è svanita, quella dei quattro uroterghi basali è a maglie lievemente trasverse e distinte e quella del quinto urotergo libero è netta, composta di maglie appena ovali. Il capo presenta una superficie coperta di tubercoletti distinti posti ai lati e sulla regione occipitale: sono assenti sulla fascia mediana che dal disco all'occipite è impressa da un solco. I tubercoletti della superficie del pronoto e delle elitre sono superficiali, quelli dell'addome sono salienti. Edeago figg. 42-43, spermateca fig. 44, sesto urotergo libero del maschio fig. 45.

Comparazioni. In base alla struttura della spermateca, la nuova specie è probabilmente affine ad *A. contingens* Cameron, 1939, dell'India. Infatti la parte distale di quest'organo è molto simile nelle due specie. Tuttavia la spermateca della nuova specie ha minore sviluppo in lunghezza. Inoltre le elitre della nuova specie sono distintamente più corte, con loro sutura lunga quanto il pronoto, mentre in *contingens* la sutura delle elitre è un quinto più lunga della lunghezza del pronoto.

Atheta (Microdota) elytralis sp. n. Figg. 46-49

Holotypus ♂, China, Zhejiang, Trianmushan, 29.IV.1993, de Rougemont leg. (MHNG).
Paratypi: 6 ♂ e 2 ♀, stessa provenienza.

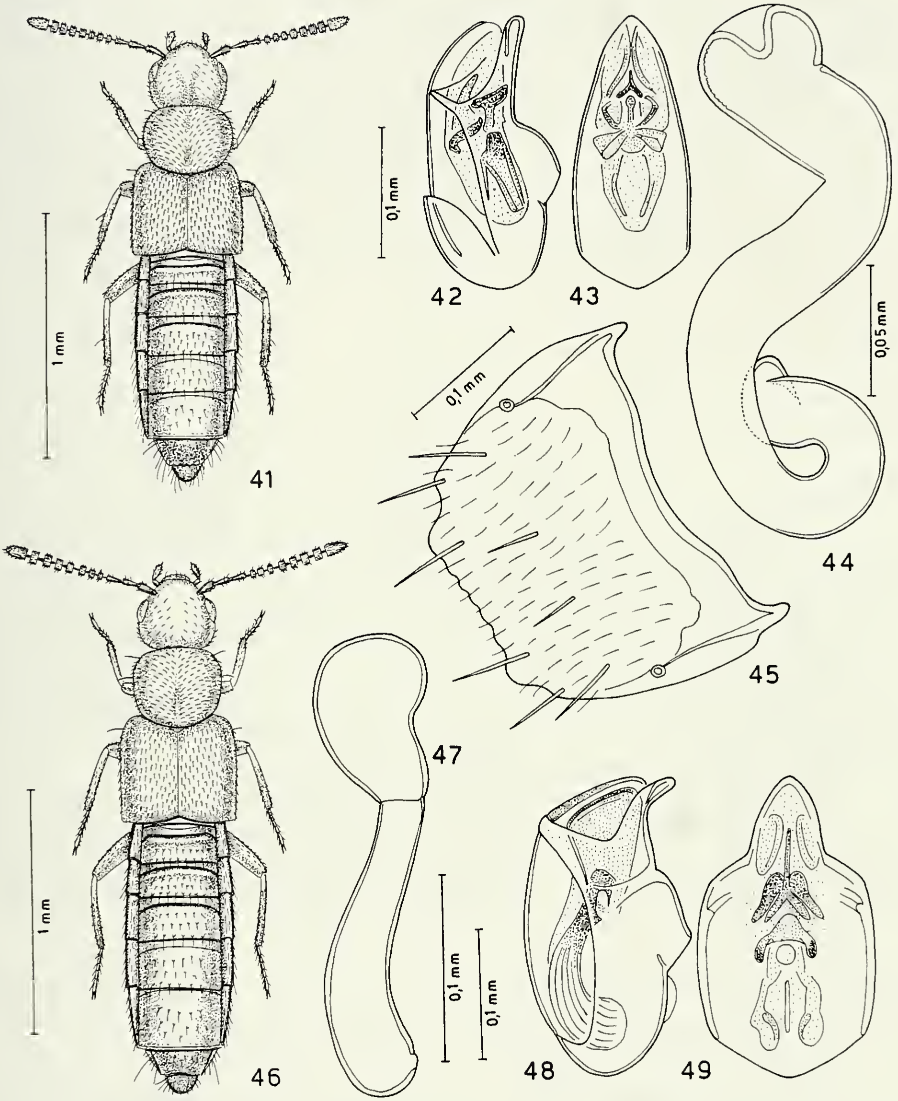
Descrizione. Lunghezza 2,1 mm. Corpo lucido e bruno con elitre, base ed estremità addominale di un bruno chiaro; antenne brune con i due antennomeri basali giallo-bruni; zampe giallo-rossicce. La reticolazione dell'avancorpo è netta e a maglie isodiametriche ampie sul capo. La reticolazione dell'addome è distinta e lievemente trasversa sui quattro uriti basali, sul quinto libero è isodiametrica e pure distinta. La punteggiatura del capo è distinta e assente per una larga fascia longitudinale mediana. I tubercoletti che coprono il pronoto e le elitre sono poco distinti, quelli dell'addome sono molto salienti. Spermateca fig. 47, edeago figg. 48-49.

Comparazioni. La nuova specie è distinta da *A. subluctuosa* Cameron, 1939, dell'India, per avere le elitre appena più lunghe e poco più lunghe e più larghe del pronoto come in *subluctuosa*. L'edeago della nuova specie, in visione ventrale, ha bulbo basale molto largo, mentre in *subluctuosa* tale bulbo basale è poco largo. Il bulbo distale della spermateca della nuova specie è privo di introflessione apicale, presente al contrario nel bulbo distale della spermateca di *subluctuosa*.

Atheta (Microdota) nanior sp. n. Figg. 50-53

Holotypus ♂, China, Yunnan, Xishuangbanna, Sanchahe, elephant res., 24.I.1992, de Rougemont leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 1,3 mm. Corpo lucido e nero-bruno con uriti liberi 4° e 5° neri; antenne nere; zampe giallo-brune. La reticolazione del capo e dell'addome è



FIGG. 41-49

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 41-45: *Atheta (Microdota) chinamicula* sp. n.; 46-49: *Atheta (Microdota) elytralis* sp. n.

estremamente svanita, quella sul resto della superficie del corpo è assente. L'intera superficie corporea è coperta di tubercoletti molto salienti e fitti. Edeago figg. 51-52, spermateca fig. 53.

COMPARAZIONI. Per la taglia corporea estremamente ridotta (1,3 mm), la nuova specie sembra *A. inquinula* (Gravenhorst, 1802), diffusa nella regione paleartica occidentale. Ma l'edeago e la spermateca sono nettamente differenti. L'edeago di *inquinula* non è profondamente arcuato al lato ventrale come quello della nuova specie e la spermateca di *inquinula*, breve e tozza con distinti bulbi distale e prossimale, si distingue nettamente dalla spermateca della nuova specie che è sottile, lunga e variamente sinuata.

Atheta (Microdota) laminarum sp. n. Figg. 54-56

Holotypus ♂, China, Yunnan, Xishuangbanna, Chayanhe F.P., 24.I.1993, de Rougemont leg. (MHNG).

Paratypi: 5 ♂ e 6 ♀, stessa provenienza, ma Sanchahe, elephant res., 24.I.1992, de Rougemont leg.

DESCRIZIONE. Lunghezza 1,8 mm. Corpo lucido e nero con elitre nero-brune; antenne nere; femori bruni, tibie e tarsi anteriori e medi giallo-bruni, i posteriori bruno chiari. La reticolazione del disco del capo è nettissima e a maglie isodiametriche ampie, quella del resto della superficie del capo è svanita come quella delle elitre e dei quattro uroterghi basali che l'hanno a maglie lievemente trasverse, quella del quinto urotergo libero è netta come quella del pronoto e a maglie isodiametriche. La punteggiatura del capo è indistinta. I tubercoletti della superficie del pronoto sono salienti, quelli delle elitre sono superficiali e quelli dell'addome sono molto salienti. Edeago figg. 55-56, la spermateca non è sufficientemente sclerificata perciò indistinta.

COMPARAZIONI. La nuova specie è distinta da *amiculoides* Cameron, 1939, dell'India, per avere lunghissime setole isolate ai lati del corpo e delle meso-metatibie, assenti in *amiculoides*, per avere l'edeago meno sviluppato, in visione ventrale allargato nella regione preapicale, carattere questo assente nella regione preapicale dell'edeago di *amiculoides*.

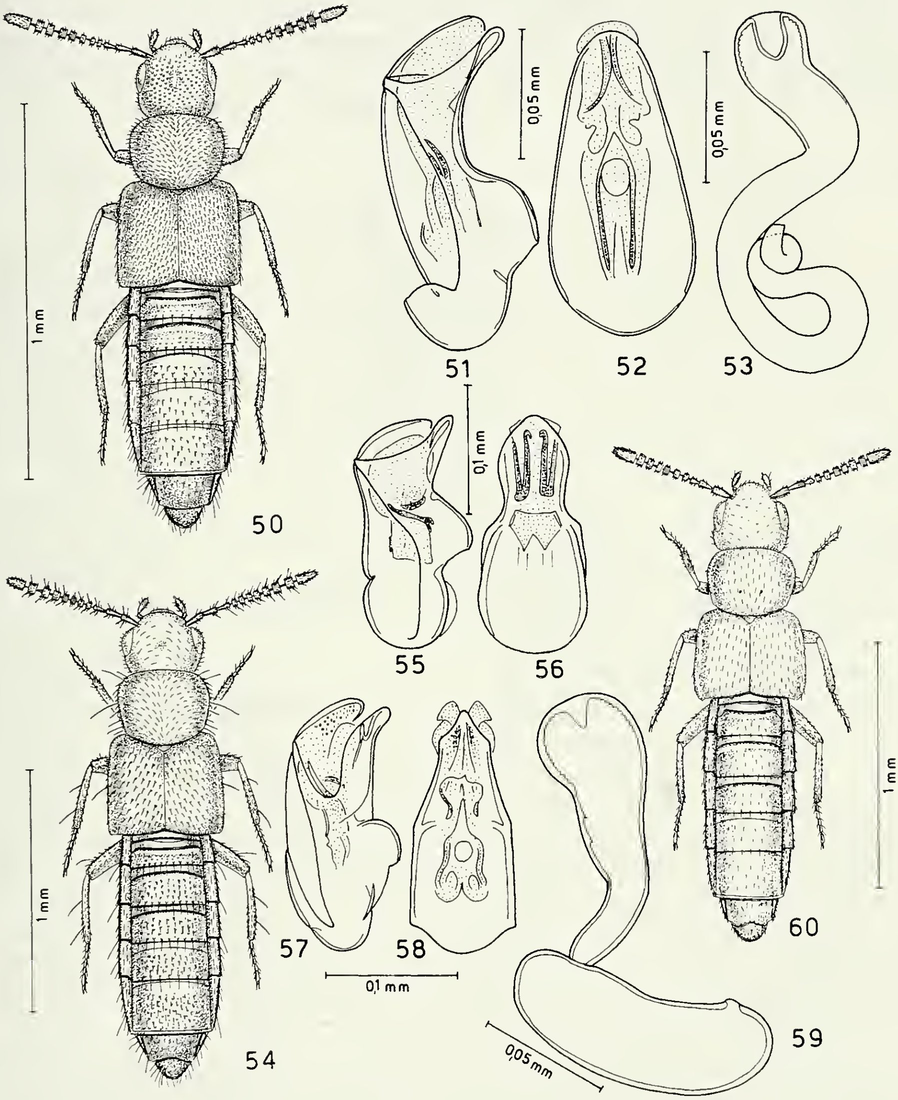
Atheta (Dicolyota) hongkongiphila sp. n. Figg. 57-61

Holotypus ♂, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).

Paratypi: 7 es., stessa provenienza.

DESCRIZIONE. Lunghezza 1,8 mm. Corpo lucidissimo e nero, antenne comprese con i due antennomeri basali nero-bruni; zampe gialle. La reticolazione del capo e del pronoto è netta e a maglie molto ampie, quella delle elitre è a maglie ancor più ampie di quelle del pronoto e altrettanto nette, la reticolazione dell'addome è trasversa e svanita. La punteggiatura del capo e del pronoto è rada e fine, quella delle elitre è indistinta. Tubercoletti fini e radi stanno sulla superficie del pronoto. Edeago figg. 57-58, spermateca fig. 59, sesto urotergo libero del maschio fig. 61.

COMPARAZIONI. In base alla forma della spermateca, la nuova specie sembra affine ad *A. scabriventris* Cameron, 1939, del Tibet. Il bulbo basale della spermateca



Figg. 50-60

Habitus, edeago in visione laterale e ventrale e spermateca. 50-53: *Atheta (Microdota) nanior* sp. n.; 54-56: *Atheta (Microdota) laminarum* sp. n.; 57-60: *Atheta (Dicolyota) hongkongiphila* sp. n.

della nuova specie è molto lungo, mentre quello di *scabriventris* è corto, quasi ovale. Inoltre la sutura delle elitre della nuova specie è lunga quanto la lunghezza del pronoto, mentre la sutura delle elitre di *scabriventris* è nettamente più lunga del pronoto, circa un quarto più lunga. Il pronoto della nuova specie è nettamente trasverso, mentre quello di *scabriventris* è appena trasverso. Non è noto il maschio di *scabriventris*.

Atheta (Dicolyota) ponderata sp. n. Figg. 62-63

Holotypus ♀, China, Yunnan, Ruili, ca. 700 m, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 1,9 mm. Corpo lucido e nero con estremità addominale bruno-scura; antenne nere; zampe brune con tibie anteriori e tarsi gialli. La reticolazione del capo e del pronoto è netta, quella delle elitre è distinta e quella dell'addome è superficiale. I tubercoletti della superficie del capo sono molto salienti. La punteggiatura del pronoto è svanita. Le elitre presentano una superficie d'aspetto rugoso per la presenza di tubercoletti fini, fitti e superficiali. I tubercoletti della superficie dell'addome sono molto salienti. Il capo ha un solco mediano distinto. Il pronoto presenta una impressione mediana posteriore allungata. Spermateca fig. 63.

Comparazioni. Il base alla forma della spermateca, la nuova specie, anche se evidentemente affine, è nettamente distinta da *A. scabriventris* Cameron, 1939 del Tibet. Infatti il bulbo prossimale della spermateca della nuova specie è esile come il resto della spermateca e non largamente ellittico come quello di *scabriventris*.

Atheta (Diaprepota) ruiliensis sp. n. Figg. 64-69

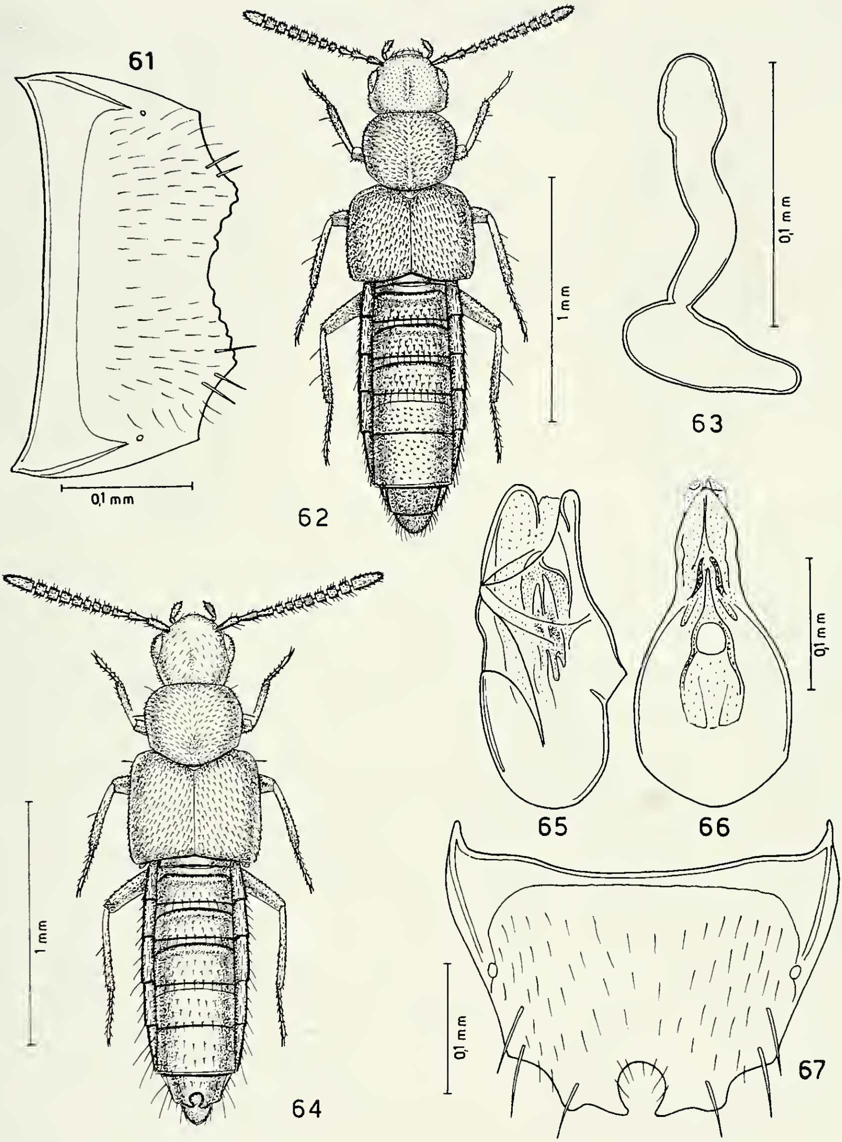
Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).
Paratypus: 1 ♀ stessa provenienza.

Descrizione. Lunghezza 2,1 mm. Corpo lucido e giallo rossiccio con capo e uriti liberi 3°, 4° e base del 5° neri e con elitre di un giallo sporco con lati estermi e zona periscutellare bruni; antenne nere con i due antennomeri basali e la base del terzo giallo-rossicci; zampe gialle. La reticolezione del disco del capo è nettissima e svanita ai suoi lati, quella del pronoto è netta e quella delle elitre e dell'addome è distinta. La punteggiatura del capo è svanita e assente sulla fascia mediana, quella del pronoto è poco distinta sul disco e distinta ai lati. I tubercoletti che coprono la superficie delle elitre sono poco distinti, quelli dell'addome sono salienti. Edeago figg. 65-66, sesto urotego libero del maschio fig. 67, spermateca fig. 69.

Comparazioni. La nuova specie è distinta da *A. subnigritula* Cameron, 1950, di Selangor, per le elitre di un giallo sporco con lati bruni e non uniformemente bruno rossicce, per il quarto antennomero trasverso e non più lungo che largo come in *subnigritula* e per le tempie sfuggenti, e non largamente arrotondate come in *subnigritula*. Di quest'ultima specie non è noto il maschio.

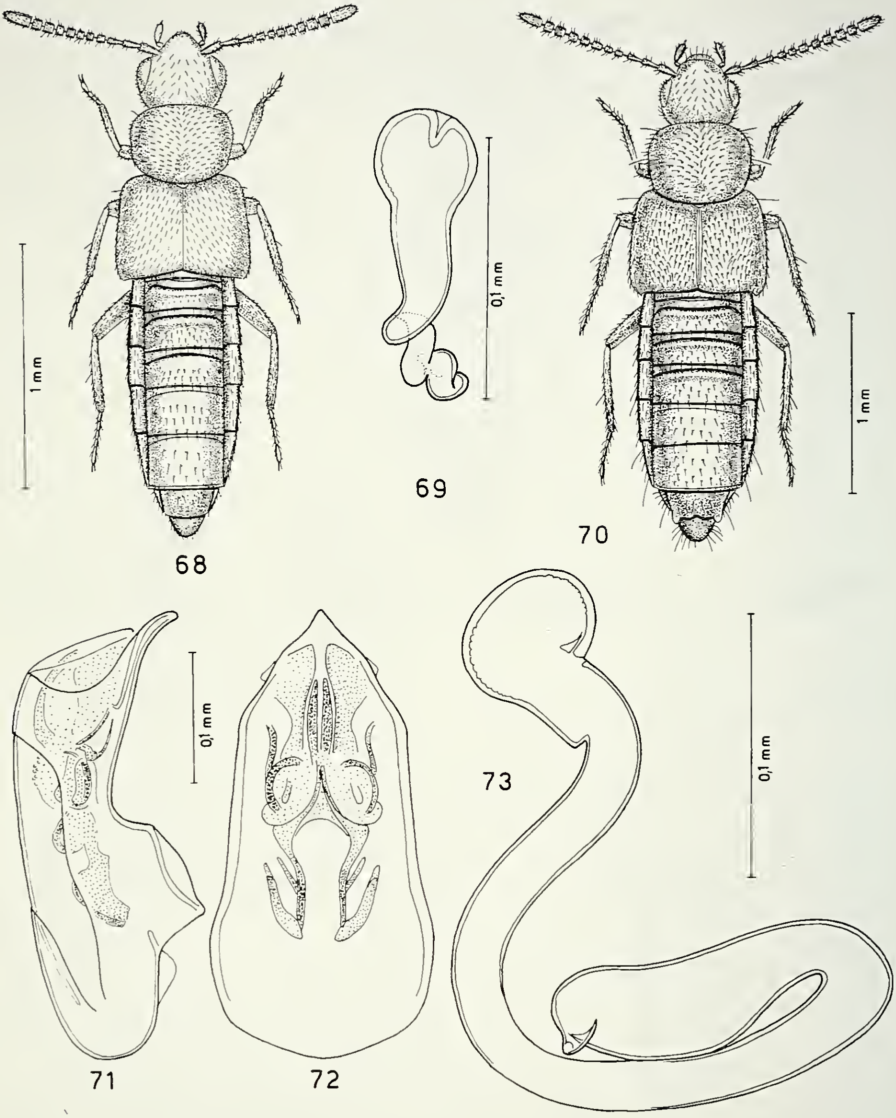
Atheta (Bessobia) gentilior sp.. n. Figg. 70-74

Holotypus ♀, China, Yunnan, Kunming, 1.II.1993, de Rougemont leg. (MHNG).
Paratypi: 1 ♂, stessa provenienza; 1 ♂, China, Yunnan, Dali, 9.II.1993, de Rougemont leg.



FIGG. 61-67

Sesto urotergo libero del maschio, habitus, spermateca ed edeago in visione laterale e ventrale. 61: *Atheta (Dicolyota) hongkongiphila* sp. n.; 62-63: *Atheta (Dicolyota) ponderata* sp. n.; 64-67: *Atheta (Diaprepota) ruiliensis* sp. n.



FIGG. 68-73

Habitus, spermateca ed edeago in visione laterale e ventrale. 68-69: *Atheta (Diaprepota) ruiliensis* sp. n.; 70-73: *Atheta (Bessobia) gentilior* sp. n.

Descrizione. Lunghezza 2,7 mm. Corpo lucido e bruno scuro con elitre brune e con addome nero; antenne nere; zampe bruno-rossicce con femori bruni. La reticolazione dell'avancorpo è netta, quella dell'addome è molto svanita, composta di maglie estremamente trasverse. Il capo è coperto di tubercoletti superficiali, il pronoto di tubercoletti salienti e le elitre di tubercoletti svaniti. Edeago figg. 71-72, spermateca fig. 73, sesto urotergo libero del maschio fig. 74.

Comparazioni. La nuova specie è simile, ma ben distinta da *A. smetanaorum* Pace, 1991, del Nepal, per avere l'edeago non ristretto nella regione mediana, in visione ventrale, per l'assenza di due prominenze semicircolari mediane al margine posteriore del sesto urotergo libero del maschio, per l'assenza di doppia carena mediana al quinto urotergo libero del maschio e per le elitre meno larghe rispetto al pronoto (più larghe in *smetanaorum*). La spermateca della nuova specie ha forma simile a quella di *A. occulta* (Erichson, 1839), diffusa dall'Europa, alla Siberia e al Giappone, ma quella della nuova specie è priva della profonda e larga introflessione apicale del bulbo distale della spermateca stessa.

Atheta (Bessobia) wutaishanensis sp. n. Figg. 75-78

Holotypus ♂, China, Shanxi, Wutaishan, 4-5.VI.1993, de Rougemont leg. (MHNG).

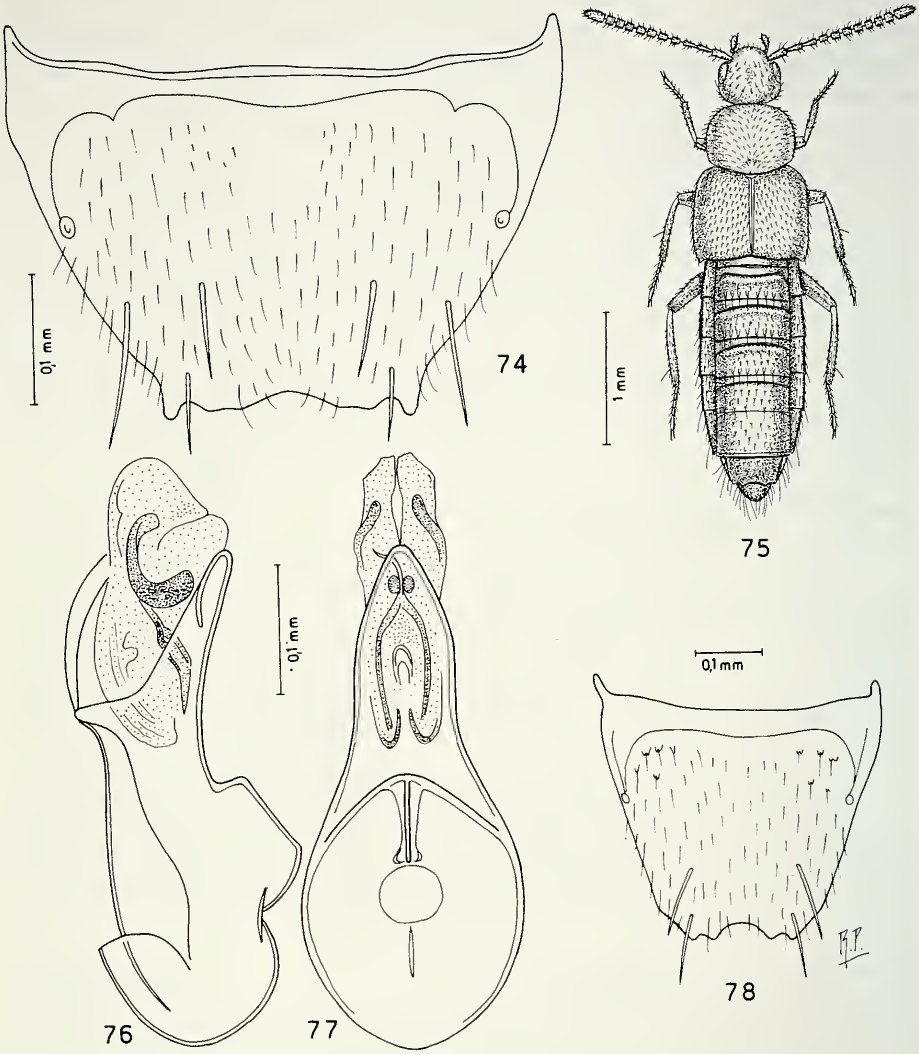
Descrizione. Lunghezza 3,5 mm. Corpo lucido e nero, antenne comprese; zampe brune con femori neri. L'avancorpo è coperto di reticolazione nettissima, l'addome l'ha svanita e a maglie molto trasverse, ma nel fondo dei solchi trasversi basali è vigorosa. I tubercoletti della superficie del capo e del pronoto sono salienti, quelli delle elitre sono svaniti. Edeago figg. 76-77, sesto urotergo libero del maschio fig. 78.

Comparazioni. Poiché la parte apicale dell'edeago, in visione ventrale, è notevolmente stretta, la nuova specie è chiaramente distinta da *A. smetanaorum* Pace, 1991, del Nepal che presenta tale parte apicale larga. Inoltre il margine posteriore mediano del sesto urotergo libero del maschio della nuova specie è arcuato. mentre quello di *smetanaorum* presenta due prominenze arcuate mediane.

Atheta (Bessobia) peranomala sp. n. Figg. 79-82

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 26.VII.1994, A. Smetana leg. (MHNG).
Paratypi: 10 ♂, stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e bruno con capo nero-bruno e con addome giallo-rossiccio con uriti liberi 3° e 4° neri; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo è netta, quella del pronoto è nettissima, quella delle elitre è distinta, quella dei tre uroterghi basali è svanita e composta di maglie lievemente trasverse e quella degli uroterghi liberi 4° e 5° è distinta. Il quinto urotergo libero del maschio presenta dei robusti tubercoli salienti. La punteggiatura del capo è svanita. I tubercoletti che coprono la superficie del pronoto e delle elitre sono distinti. Edeago figg. 80-81, sesto urotergo libero del maschio fig. 82.



FIGG. 74-78

Sesto urotergo libero del maschio, habitus ed edeago in visione laterale e ventrale. 74: *Atheta (Bessobia) gentilior* sp. n.; 75-78: *Atheta (Bessobia) wutaishanensis* sp. n.

COMPARAZIONI. Il margine posteriore del sesto urotergo libero del maschio della nuova specie è molto simile a quello di *A. smetanaorum* Pace, 1991, ma l'edeago delle due specie presenta numerosi caratteri differenziali, tra cui l'apice strettissimo, in visione ventrale, della nuova specie, mentre in *smetanaorum* è larghissimo.

Atheta (Bessobia) pergranulosa sp. n. Figg. 83-85

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 3, 3050 m, 22. VII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 2,6 mm. Avancorpo debolmente lucido, addome lucido. Corpo bruno con capo bruno scuro e addome giallo-rossiccio con gli uriti liberi 3° e 4° neri; antenne brune con i quattro antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo e del pronoto è netta, quella delle elitre e dell'addome è distinta. La punteggiatura del capo è indistinta. I tubercoletti che stanno sulla superficie del pronoto e delle elitre sono poco salienti. Il quinto urotergo libero del maschio presenta robusti tubercoli salienti. Edeago figg. 84-85.

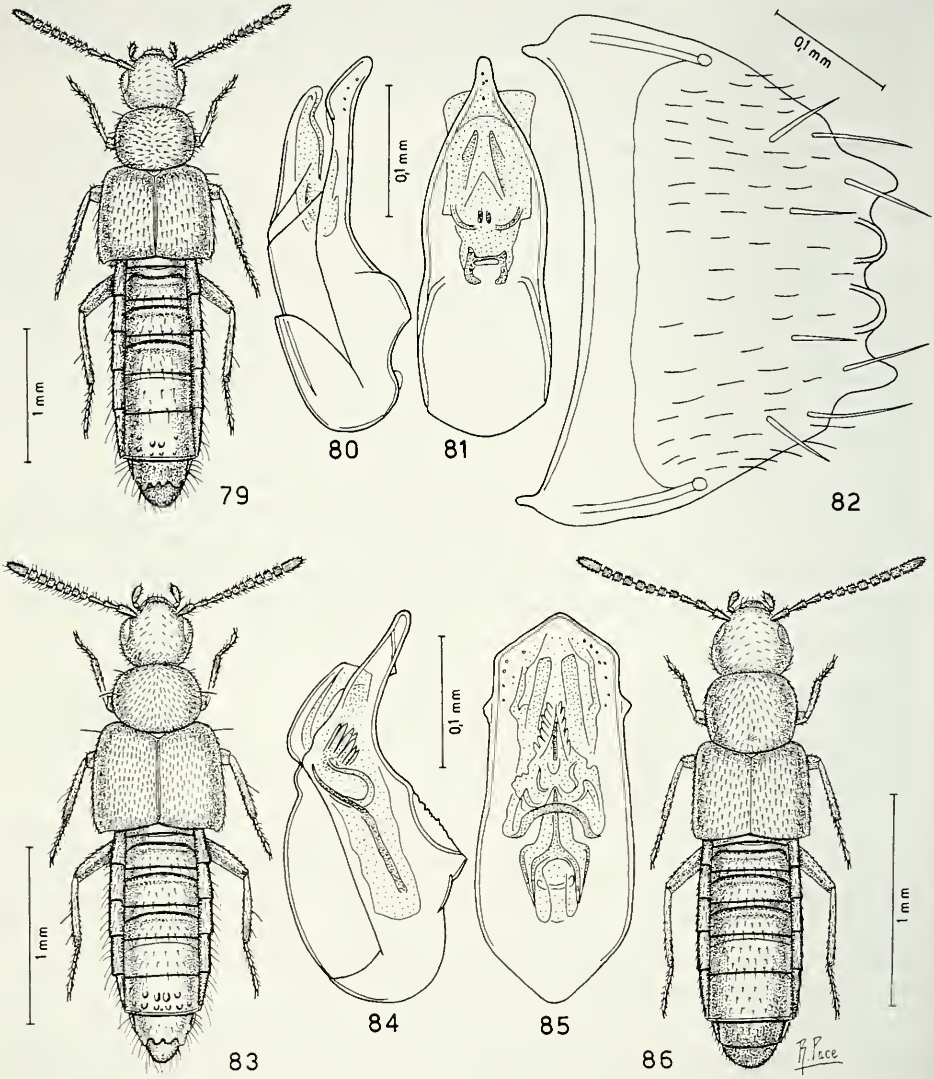
COMPARAZIONI. La nuova specie per la forma del margine posteriore del sesto urotergo libero del maschio sembra affine ad *A. smetanaorum* Pace, 1991, del Nepal, ma l'edeago ha minore sviluppo rispetto all'edeago di *smetanaorum*, ha lati, in visione ventrale, rettilinei e non profondamente sinuati come in *smetanaorum* ad apice bruscamente ristretto a triangolo (in visione ventrale) e non ristretto gradualmente come in *smetanaorum*.

Atheta (Oreostiba) yonghaicola sp. n. Figg. 86-89

Holotypus ♂, China, Gansu, Yonghai ca. 20 Km SW Yuzhong, 2700-2800 m, 9.VIII.1994, A. Smetana leg. (MHNG).
Paratypus: 1 ♀, stessa provenienza.

DESCRIZIONE. Lunghezza 2,2 mm. Corpo lucido e nero-bruno con capo e addome neri; antenne brune con i due antennomeri basali bruno-rossicci; zampe bruno-rossicce. La reticolazione del capo e degli uroterghi liberi 5° e 6° è netta, quella del pronoto è distinta e quella delle elitre e dei quattro uroterghi basali è svanita. La punteggiatura del capo è svanita, quella del pronoto è fine e distinta. Tubercoletti superficiali coprono la superficie delle elitre. Edeago figg. 87-88, spermateca fig. 89.

COMPARAZIONI. La nuova specie è affine ad *A. tibialis* (Heer, 1842) e specie affini diffuse dalla Scozia alla regione alpina, Pirenei e Caucaso. Infatti alcuni caratteri dell'edeago e della spermateca della nuova specie come il colore nero o nero bruno del corpo, si rinscontrano anche in *tibialis*. La nuova specie è distinta da essa, oltre che per la differente armatura genitale interna dell'edeago, per avere la parte apicale ventrale sporgente del bulbo basale, molto più sviluppata in modo tale che la lunghezza della "crista apicalis" è uguale in lunghezza alla lunghezza del segmento che prende origine dalla stessa "crista apicalis" e termina all'angolo ventrale, mentre in *tibialis* e specie affini, tale segmento è nettamente molto più breve della lunghezza della corrispondente "crista apicalis". Inoltre l'apice dell'edeago della nuova specie, in visione laterale, non presenta alcun dentino smussato come si osserva in *tibialis*. La spermateca della nuova



FIGG. 79-86

Habitus, edeago in visione laterale e ventrale e sesto urotergo libero del maschio. 79-82: *Atheta (Bessobia) peranomala* sp. n.; 83-85: *Atheta (Bessobia) pergranulosa* sp. n.; 86: *Atheta (Oreostiba) yonghaicola* sp. n.

specie non possiede una netta introflessione apicale del bulbo distale, ben presente e profonda in *tibialis*, e ha la parte prossimale con evidenza molto più sviluppata in lunghezza.

Atheta (Oreostiba) semitibialis sp. n. Figg. 90-93

Holotypus ♂, China, Gansu, 120 Km S Lanzhou, Guanghe Xian Ma Jia, 2300 m, 8.VII.1994, A. Smetana leg. (MHNG).

Paratypus: 1 ♂, stessa provenienza.

Descrizione. Lunghezza 2,6 mm. Corpo lucido e nero-bruno; antenne nere; zampe giallo-brune. La reticolazione è svanita sul capo, sulle elitre e sui quattro uroterghi basali, è distinta sul pronoto ed è netta sul quinto urotergo libero. La punteggiatura del capo è ombelicata e svanita. I tubercoletti della superficie del pronoto sono distinti, quelli delle elitre sono superficiali. Edeago figg. 91-92, sesto urotergo libero del maschio fig. 93.

Comparazioni. La nuova specie è probabilmente affine ad *A. tibialis* (Heer, 1842) per i caratteri dell'edeago, per il colore del corpo e per il profilo del margine posteriore del sesto urotergo libero del maschio. E' tuttavia da essa ben differenziata per avere la parte apicale dell'edeago nettamente più stretta, in visione ventrale, per avere la parte mediana del margine posteriore del sesto urotergo libero del maschio nettamente protratta all'indietro (appena protratta in *tibialis*) e per l'armatura genitale interna dell'edeago, composta di un pezzo copulatore ricurvo e stretto, assente all'interno dell'edeago di *tibialis*.

Atheta (Oreostiba) shanicola sp. n. Figg. 94-95

Holotypus ♀, China, Sichuan, Lang Musi, 3500-3600 m, 13.VII.1994, A. Smetana leg. (MHNG).

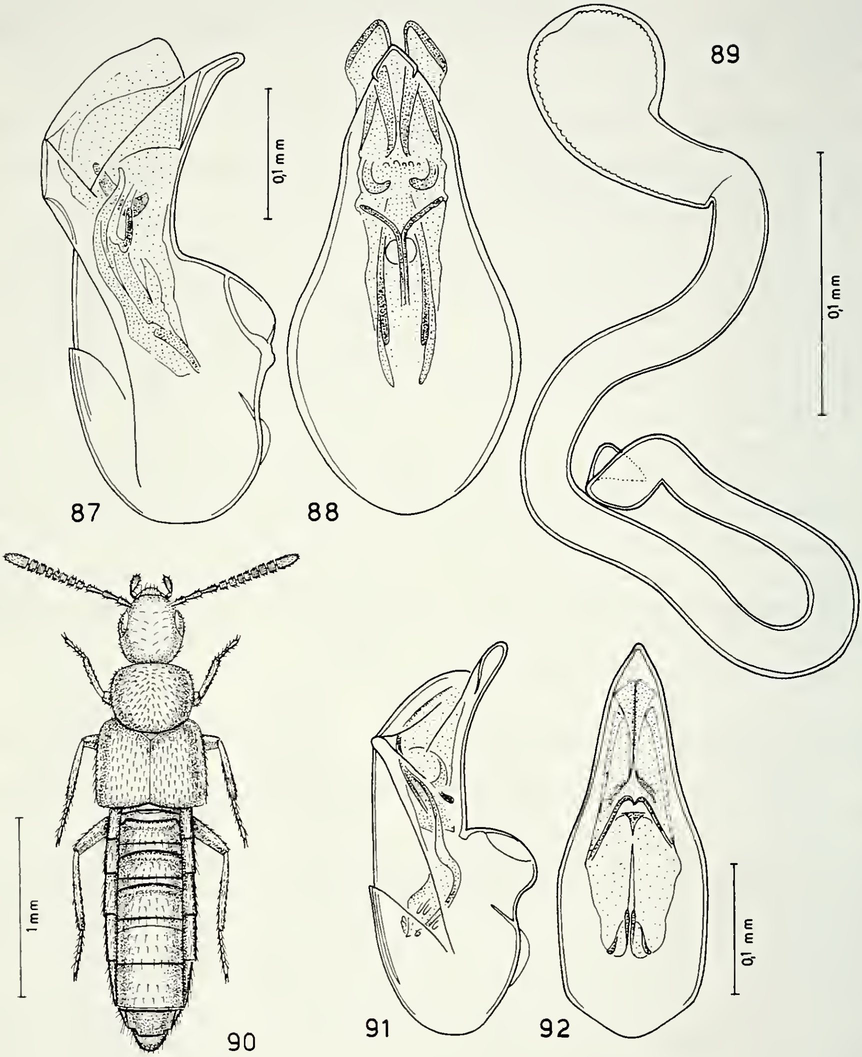
Descrizione. Lunghezza 3,2 mm. Corpo lucido e nero-bruno con addome nero; antenne brune con i tre antennomeri basali bruno-rossicci; zampe giallo-rossicce. La reticolazione del capo e del pronoto è netta, quella delle elitre e dell'addome è svanita, sull'addome è a maglie molto trasverse. I tubercoletti della superficie del capo e del pronoto sono distinti, quelli delle elitre sono superficiali. Spermateca fig. 94-95.

Comparazioni. La forma della spermateca della nuova specie è simile a quella di *A. sibirica* Maeklin, 1880, diffusa in Siberia, ma il bulbo distale della spermateca della nuova specie è nettamente più robusto, con forte introflessione apicale, mentre in *sibirica* non vi è distinta introflessione apicale. Inoltre la lunghezza della sutura delle elitre è maggiore della lunghezza del pronoto (indice 1,16), mentre in sibirica la sutura delle elitre è un po' più corta della lunghezza del pronoto (indice 0,90).

Etimologia. Il nome della nuova specie significa "colei che abita i monti", dal sostantivo cinese "shan" che significa monti.

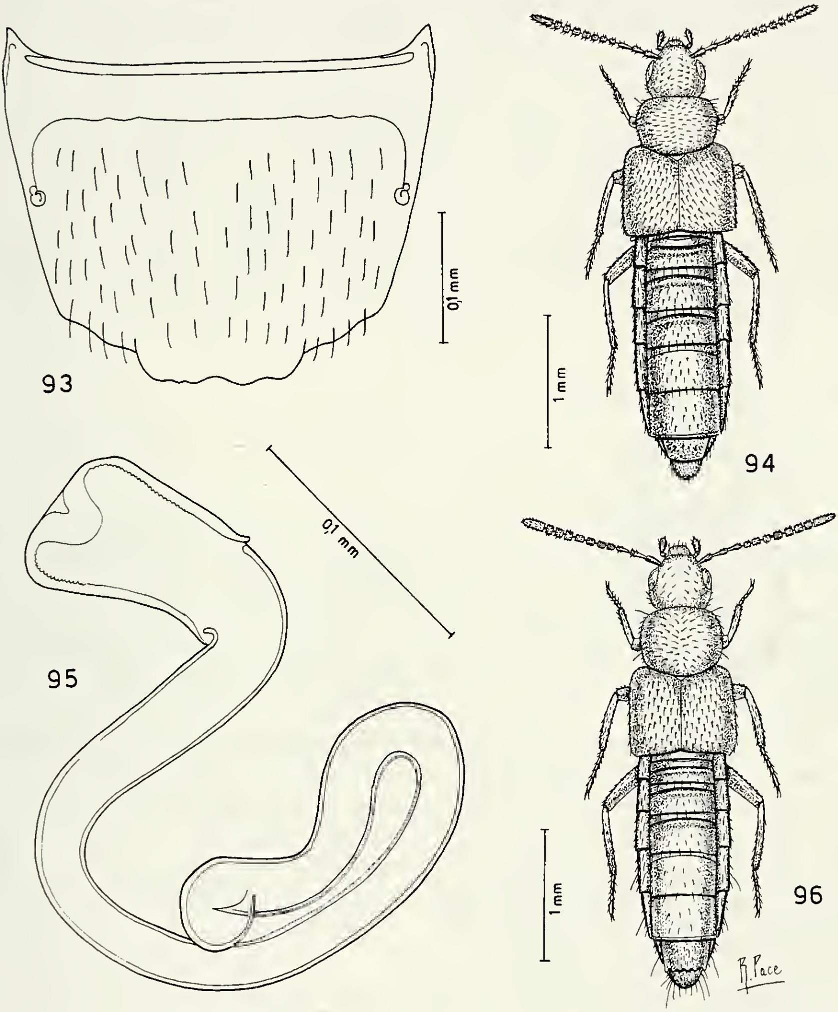
Atheta (s. str.) linxiensis sp. n. Figg. 96-99

Holotypus ♂, Gansu, Dalijia Shan, 60 Km W Linxia, 3475 m, 11.VII.1994, A. Smetana leg. (MHNG).



Figg. 87-92

Edeago in visione laterale e ventrale, spermateca e habitus. 87-89: *Atheta (Oreostiba) yonghaicola* sp. n.; 90-92: *Atheta (Oreostiba) semitibialis* sp. n.



FIGG. 93-96

Sesto urotergo libero del maschio, habitus e spermateca. 93: *Atheta (Oreostiba) semitibialis* sp. n.; 94-95: *Atheta (Oreostiba) shanicola* sp. n.; 96: *Atheta* (s. str.) *linxiensis* sp. n.

Descrizione. Lunghezza 3,4 mm. Corpo lucidissimo e nero pece con addome nero; antenne nere; zampe bruno-rossicce con femori bruni. La reticolazione del capo e del pronoto è netta, quella delle elitre è superficiale e quella dell'addome è molto svanita. Il corpo è coperto di tubercoletti distinti. Edeago figg. 97-98, sesto urotergo libero del maschio fig. 99.

Comparazioni. La nuova specie si pone in posizione tassonomica intermedia tra *A. triangulum* (Kraatz, 1858a) e *A. aquatica* (Thomson, 1852), entambe della regione paleartica occidentale. Della prima la nuova specie ha il profilo ventrale dell'edeago, della seconda una prominenza ventrale presso la "crista apicalis". In visione ventrale l'apice dell'edeago è più largo di quello di entrambe le specie note. Inoltre il colore nero del corpo è ben differente da quello di *triangulum* che mostra elitre chiare con fascia obliqua oscura a partire dagli omeri e diretta verso la sutura.

Atheta (s. str.) serraculter sp. n. Figg. 100-104

Holotypus ♂, China, Gansu, pass btw Hezuo-Amqog, 3300 m, 12.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 19 es., stessa provenienza.

Descrizione. Lunghezza 3,9 mm. Corpo lucido e bruno con elitre giallo-brune e con addome nero; antenne brune con i tre antennomeri basali bruno-rossicci; zampe rossicce. La reticolazione del capo è netta, quella del pronoto e delle elitre è distinta e quella dell'addome è molto svanita, composta di maglie molto trasverse e ondulate. La punteggiatura del capo è molto svanita. I tubercoletti della superficie del pronoto e delle elitre sono distinti. Edeago figg. 101-102, spermateca fig. 103, sesto urotergo libero del maschio fig. 104.

Comparazioni. In base alla forma dell'edeago e particolarmente per la presenza del robusto dente ventrale dell'edeago stesso, la nuova specie appare affine ad *A. iturupensis* Bernhauer, 1907, del Giappone. Se ne distingue per il profilo ventrale apicale dell'edeago, sinuato (arcuato in *iturupensis*), per il lato distale del dente ventrale seghettato (non seghettato in *iturupensis*), per l'apice dell'edeago, in visione ventrale, stretto e lungo (corto e largo in *iturupensis*) e per il margine posteriore del sesto urotergo libero del maschio polilobato (non lobato, ad andamento quasi rettilineo in *iturupensis*).

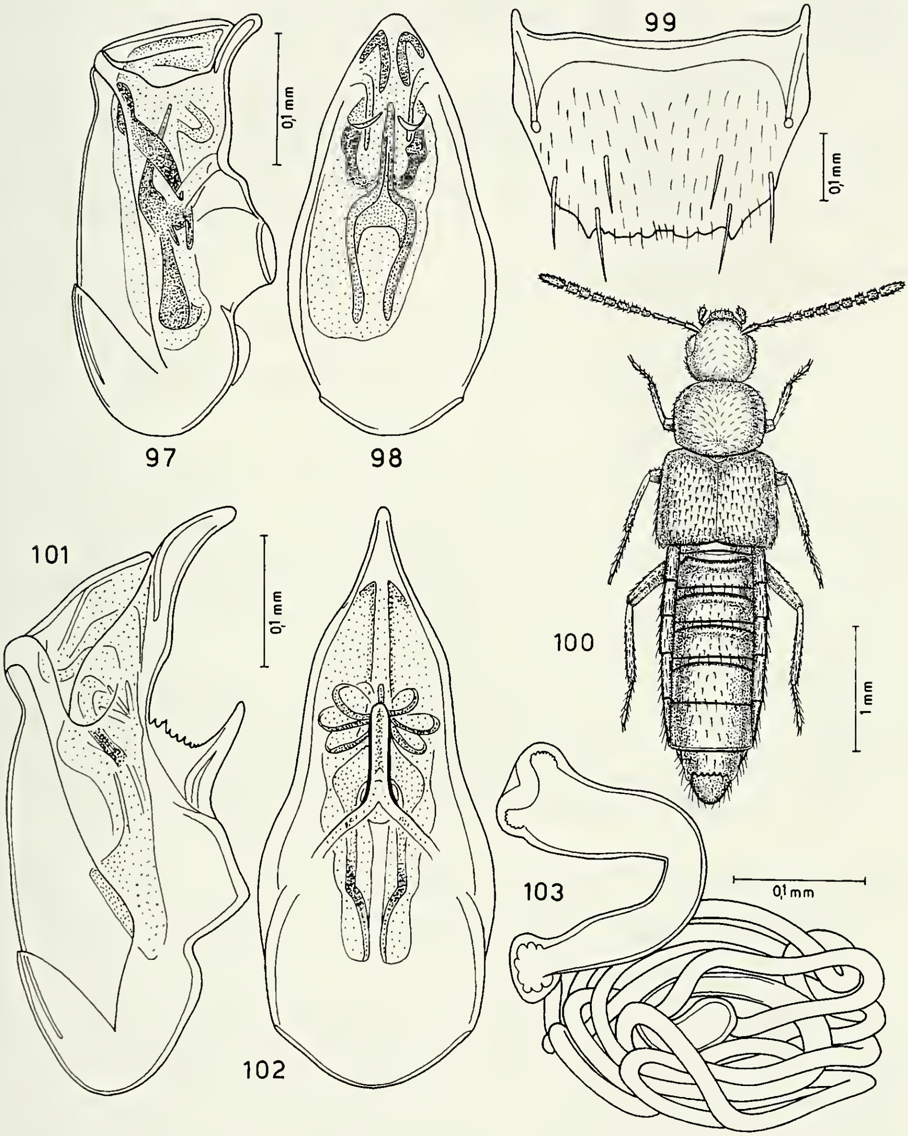
Etimologia. Il nome della nuova specie significa "coltello a sega" a motivo del margine seghettato del dente ventrale dell'edeago.

Atheta (s. str.) **kazakhstanensis** sp. n. Figg. 105-108

Holotypus ♂, Kazakhstan, Alma Ata, 1000 m, 18.IX.1994, de Rougemont leg. (MHNG).

Paratypi: 5 ♀, stessa provenienza.

Descrizione. Lunghezza 3,8 mm. Corpo lucido e nero con elitre brune con zona periscutellare nera; antenne brune con antennomero basale bruno-rossiccio; zampe giallo-rossicce con femori posteriori bruni e i medi con lato esterno bruno. La reticolazione del capo e del pronoto è distinta, quella delle elitre è netta, quella degli uroterghi anteriori è molto svanita e quella degli uroterghi posteriori è superficiale. I



FIGG. 97-103

Edeago in visione laterale e ventrale, sesto urotergo libero del maschio, habitus e spermateca. 97-99: *Atheta* (s. str.) *linxiensis* sp. n.; 100-103: *Atheta* (s. str.) *serraculter* sp. n.

tubercoletti della superficie del capo sono poco salienti e assenti sulla fascia mediana, quelli del pronoto sono distinti e quelli delle elitre sono salienti. Edeago figg. 106-107, spermateca fig. 108.

COMPARAZIONI. La presenza del dente ventrale dell'edeago permette di porre la nuova specie in posizione tassonomica vicina ad *A. castanoptera* (Kraatz, 1858a), diffusa nella regione paleartica occidentale. Ma il lungo dente ventrale dell'edeago della nuova specie è robusto e più corto (lungo e sottile in *castanoptera*) e la struttura della spermateca della nuova specie ha parte prossimale a matassa meno aggrovigliata.

Pelioptera (Tropimenelytron) viatica sp. n. Figg. 109-113

Holotypus ♀, China, Sichuan, Gongga Shan, above camp 3, 3050 m, 22.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 1 ♀, stessa provenienza; 1 ♀, stessa provenienza, ma 3300-3350 m, 23.VII. 1994, A. Smetana leg.; 8 es., stessa provenienza, ma camp 2, 2800 m, 28.VII.1994, A. Smetana leg.

DESCRIZIONE. Lunghezza 3,6 mm. Corpo lucido con addome lucidissimo. Corpo nero pece con addome nero; antenne nero pece con i tre antennomeri basali bruni; zampe rossicce. La reticolazione dell'avancorpo è netta, quella dell'addome è svanita, composta di maglie poligonali irregolari. I tubercoletti della superficie del capo sono svaniti, quelli dell'addome sono netti. La punteggiatura del pronoto è netta, quella delle elitre è indistinta. Edeago figg. 110-111, spermateca fig. 112, sesto urotergo libero del maschio fig. 113.

COMPARAZIONI. La nuova specie appare simile a *P. angusticollis* Cameron, 1939, dell'India, se si osservano edeago e spermateca. Ma le elitre e il quinto urotergo libero del maschio non presentano carene come in *angusticollis*. Inoltre il bulbo distale della spermateca è molto più trasverso in *angusticollis* che nella nuova specie e la parte prossimale è molto protratta in *angusticollis* e breve nella nuova specie.

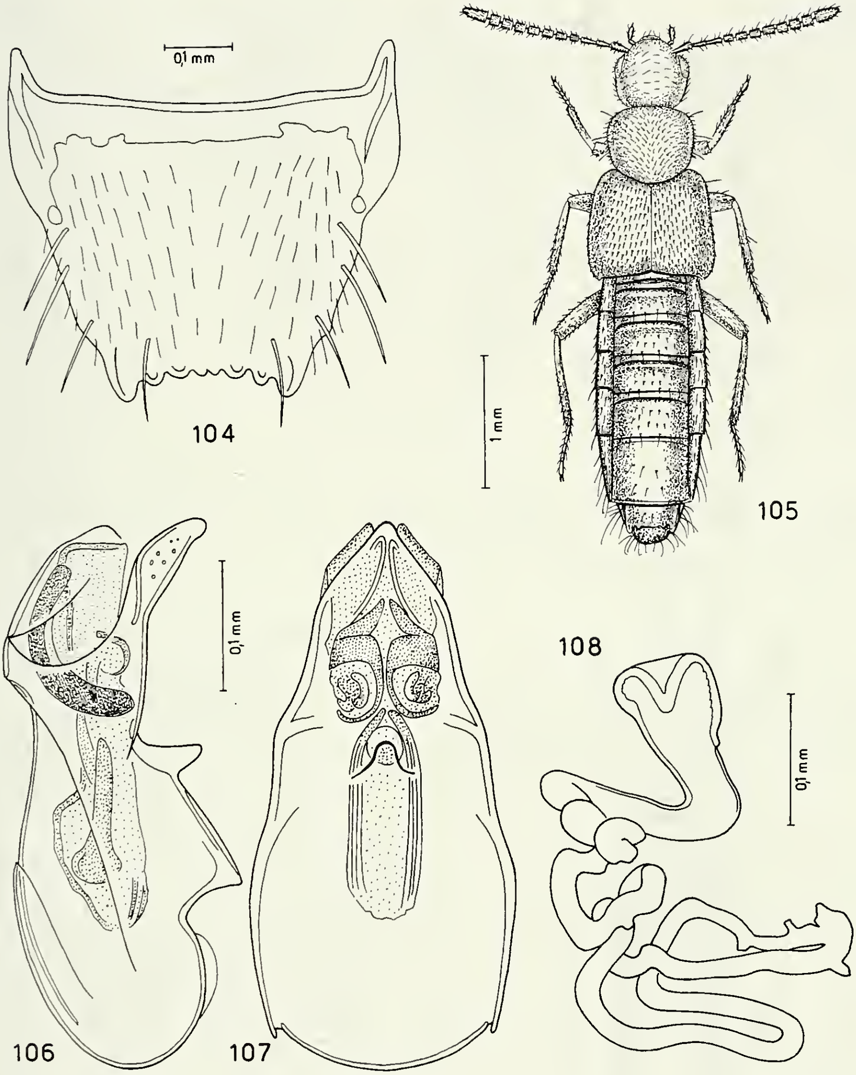
Pelioptera (Tropimenelytron) sakhalinensis sp. n. Figg. 114-117

Holotypus ♂, Russia, Sakhalin, Aniva distr. 5 Km W Petropaulovskiy, tributary of Lyutoga river, 20-21.VII.1993, Putz & Wrase leg. (CASS).

Paratypus: 1 ♀, stessa provenienza.

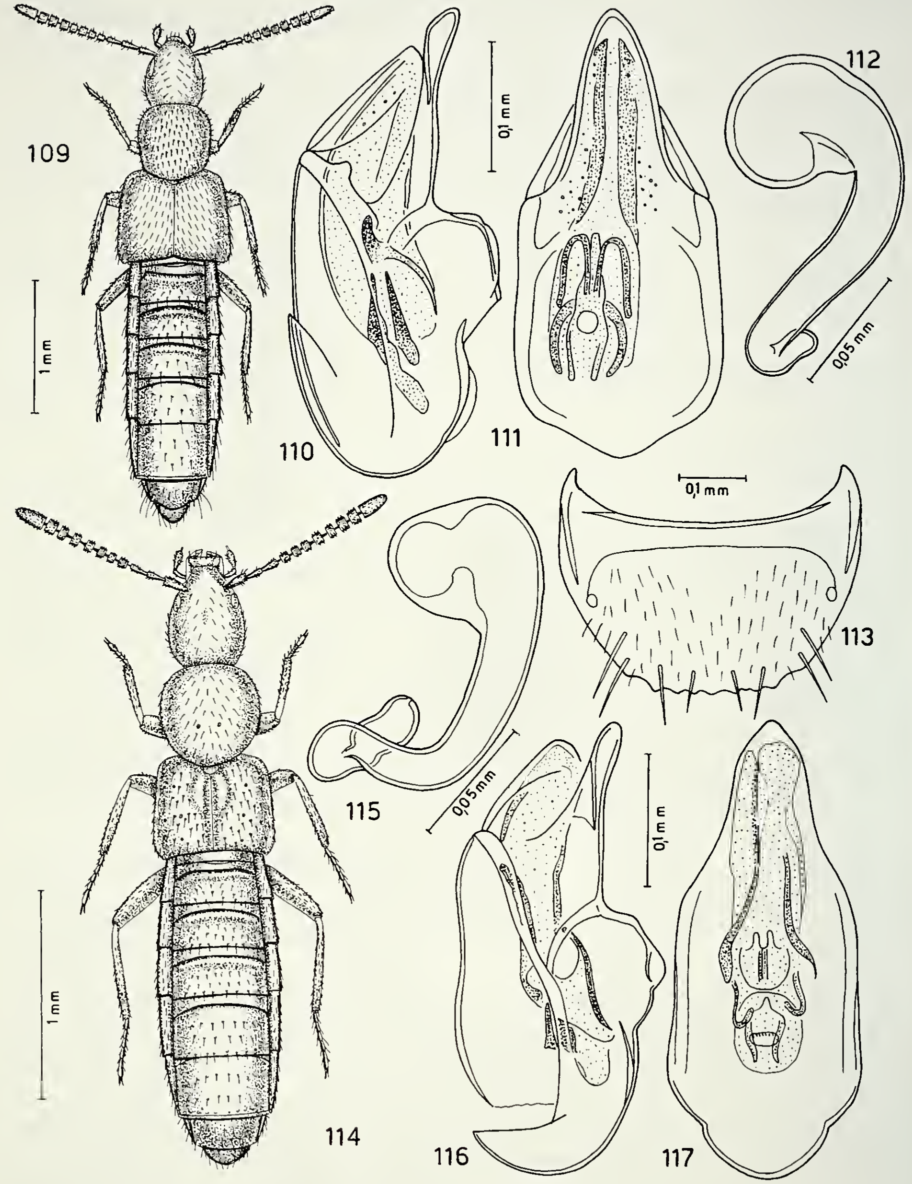
DESCRIZIONE. Lunghezza 2,8 mm. Corpo lucido e bruno con pronoto, elitre, margine posteriore dei tre uroterghi basali, metà posteriore del quarto urite libero e l'intero urite quinto giallo-bruni; antenne brune con i tre antennomeri basali bruno-rossicci; zampe gialle. La reticolazione del capo è più netta in avanti che all'indietro, quella del pronoto e dell'addome è pure netta, quella delle elitre è svanita. I tubercoletti della superficie del capo sono svaniti, quelli del pronoto e delle elitre sono salienti. Spermateca fig. 115, edeago figg. 116-117.

COMPARAZIONI. La nuova specie è simile a *P. angusticolis* Cameron, 1939, dell'India, ma ha occhi ed elitre molto ridotti (occhi lunghi quanto le tempie ed elitre molto più lunghe del pronoto in *angusticollis*). Il bulbo distale della spermateca è voluminoso e piriforme nella nuova specie, schiacciato e reniforme è quello di *angusticollis*.



FIGG. 104-108

Sesto urotergo libero del maschio, habitus, edeago in visione laterale e ventrale e spermateca. 104: *Atheta* (s. str.) *serraculter* sp. n.; 105-108: *Atheta* (s. str.) *kazakhstanensis* sp. n.



FIGG. 109-117

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 109-113: *Pelioptera (Tropimenelytron) viatica* sp. n.; 114-117: *Pelioptera (Tropimenelytron) sakhalinensis* sp. n.

Pelioptera (s. str.) **samchunensis** sp. n. Figg. 118-121

Holotypus ♀, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).

Paratypi: 4 es., stessa provenienza; 3 ♀, Hong Kong, Kadoorie Agricultural Research Centre, flight interception trap, 19-31.V.1996, de Rougemont leg.; 1 ♀, stessa provenienza, ma VI.1996, de Rougemont leg.; 69 es., Hong Kong, Kadoorie Farm, V.1996, de Rougemont leg.; 1 ♂ e 1 ♀, China, Zhejiang Prov., Lin'an County, 1000 m, W Tianmu Shan N.R., 18.V.1996, J. Cooter leg.

DESCRIZIONE. Lunghezza 2,1 mm. Corpo lucido e nero con elitre giallo-brune sul disco; antenne nere; zampe giallo-rossicce. L'avancorpo è coperto di reticolazione molto svanita, la superficie dell'addome è priva di reticolazione. La punteggiatura del capo è superficiale. I tubercoletti della superficie del pronoto sono fini e poco distinti, quelli delle elitre sono salienti. Edeago figg. 119-120, spermateca fig. 121.

COMPARAZIONI. La nuova specie, in base alla forma dell'edeago e della spermateca, è affine a *P. opaca* Kraatz, 1857, dello Sri Lanka, e a *P. exasperata* (Kraatz, 1859), dell'India, dello Sri Lanka e del Nepal. Essa è distinta da entrambe per avere gli occhi più lunghi delle tempie (occhi nettamente più corti delle tempie in *opaca* ed *exasperata*) e per l'introflessione apicale del bulbo distale della spermateca voluminosa e non conica come in *opaca* o strettissima e profonda come in *exasperata*.

ETIMOLOGIA. La nuova specie prende nome da Samchun, il fiume di Hong Kong.

Pelioptera (s. str.) **kwantungensis** sp. n. Figg. 122-125

Holotypus ♂, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).

Paratypi: 18 es., stessa provenienza; 2 ♂, Hong Kong, Kadoorie Agricultural Research Centre, 19-31.V.1996, de Rougemont leg.; 1 ♂, stessa provenienza, ma flight interception trap, VI.1996, de Rougemont; 1 ♀, stessa provenienza, ma VIII.1996, de Rougemont leg.; 1 ♂, Hong Kong, Kadoorie Farm, V.1996, de Rougemont leg.; 6 es., Hong Kong, Tai Po, III.1996 e V.1996, de Rougemont leg.

DESCRIZIONE. Lunghezza 2,2 mm. Avancorpo debolmente opaco, addome lucido. Corpo bruno con apice addominale bruno-rossiccio; antenne brune; zampe gialle. La reticolazione del capo è netta, quella del pronoto e delle elitre è svanita. La punteggiatura del capo e del pronoto è quasi indistinta. Tubercoletti svaniti coprono la superficie delle elitre. I caratteri sessuali secondari dell'addome del maschio possono essere assenti. Edeago figg. 123-124, spermateca fig. 125.

COMPARAZIONI. Per la forma dell'edeago e della spermateca, la nuova specie è affine sia a *P. unituberculata* (Bernhauer, 1915a), della Nuova Britannia, che da *P. sagadensis* Pace, 1990a, delle Filippine e del Vietnam. Da entrambe è distinta per avere la spermateca più sviluppata, con parte prossimale più protratta.

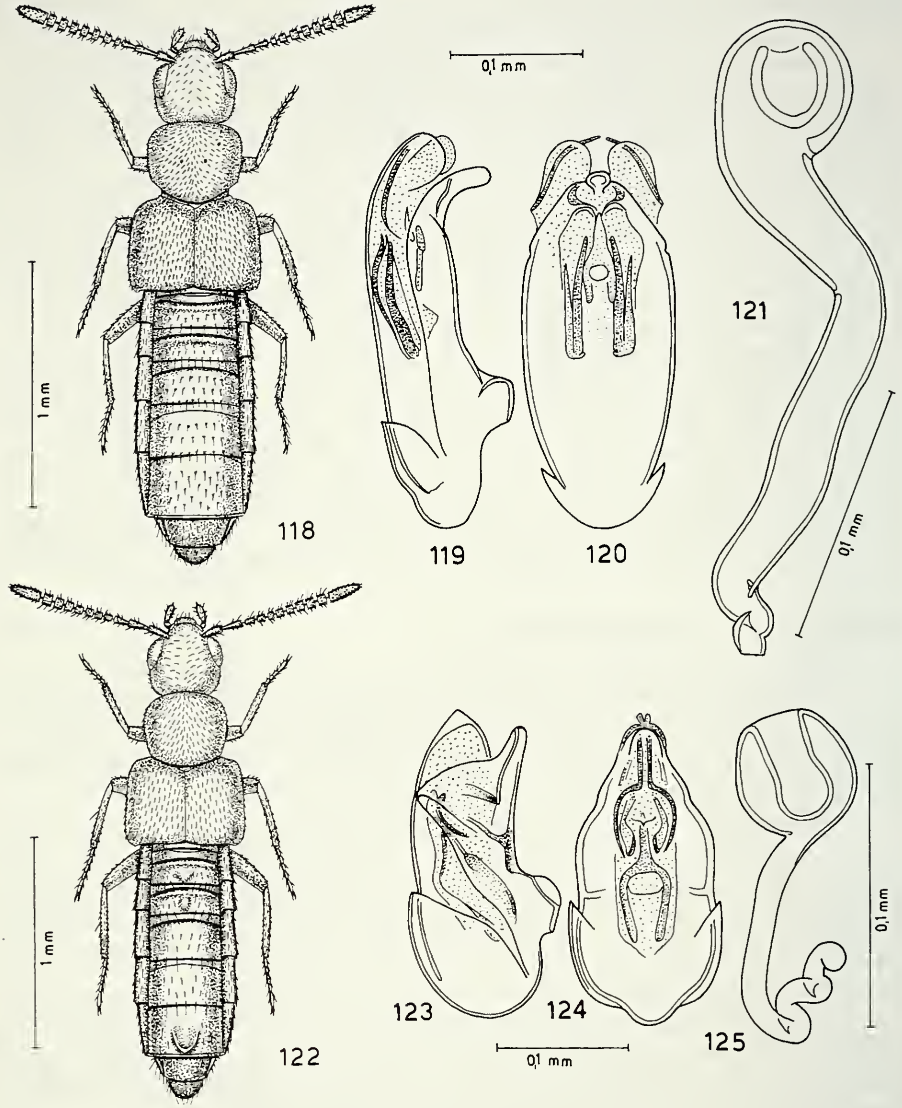
ETIMOLOGIA. La nuova specie prende nome dalla provincia cinese di Kwangtung confinante con Hong Kong, sua località tipica.

Pelioptera (Geostibida) lii sp. n. Figg. 126-127

Holotypus ♀, China, Hebei Prov., Yongniang, 6.X.1995, Shuqiang Li leg. (MHNG).

Paratypi: 2 ♀, stessa provenienza.

DESCRIZIONE. Lunghezza 2,0 mm. Corpo lucidissimo e giallo-rossiccio con capo e uriti liberi 3°, 4° e 5° (tranne il margine posteriore rossiccio) bruni, elitre giallo-brune;



FIGG. 118-125

Habitus, edeago in visione laterale e ventrale e spermateca. 118-121: *Pelioptera* (s. str.) *samchunensis* sp. n.; 122-125: *Pelioptera* (s. str.) *kwantungensis* sp. n.

antenne giallo-rossicce con undicesimo antennomero rossiccio; zampe gialle. La reticolazione della superficie del corpo è svanita. L'avancorpo è coperto di tubercoletti estremamente svaniti o indistinti, l'addome ha tubercoletti distinti. Spermateca fig. 127.

COMPARAZIONI. La nuova specie è distinta da *P. indica* Cameron, 1939, dell'India, per avere le elitre giallo-rossicce e non brune come in *indica*, per il quarto antennomero molto trasverso (lungo quanto largo in *indica*) e per la presenza di introflessione apicale del bulbo distale della spermateca (introflessione assente nel bulbo distale della spermateca di *indica*).

ETIMOLOGIA. La nuova specie è dedicata al suo raccoglitore, il Dr. Shuqiang Li di Stuttgard (Germania).

Pelioptera (Geostibida) kowloonensis sp. n. Figg. 128-132

Holotypus ♀, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).
Paratypi: 1 ♀, stessa provenienza; 5 es., Hong Kong, Tai Po, III.1996, de Rougemont leg.

DESCRIZIONE. Lunghezza 1,9 mm. Corpo lucidissimo e nero-bruno, antenne comprese; zampe gialle con femori giallo-bruni. La reticolazione del capo è molto svanita, quella del pronoto è superficiale e quella delle elitre e dell'addome è distinta, sull'addome a maglie trasverse. La punteggiatura del capo e del pronoto è indistinta, quella delle elitre è rada e fine. I tubercoletti della superficie dell'addome sono distinti. Edeago figg. 129-130, sesto urotergo libero del maschio fig. 131, spermateca fig. 132.

COMPARAZIONI. La nuova specie è distinta da *P. indica* Cameron, 1939, dell'India, per avere l'edeago molto meno sviluppato e la spermateca con bulbo distale ellittico e con parte prossimale a spirale e non con bulbo distale sferico e con parte prossimale rettilinea come in *indica*.

ETIMOLOGIA. La nuova specie prende nome da Kowloon, la penisola di Hong Kong.

Pelioptera (Geostibida) eremita sp. n. Figg. 133-134

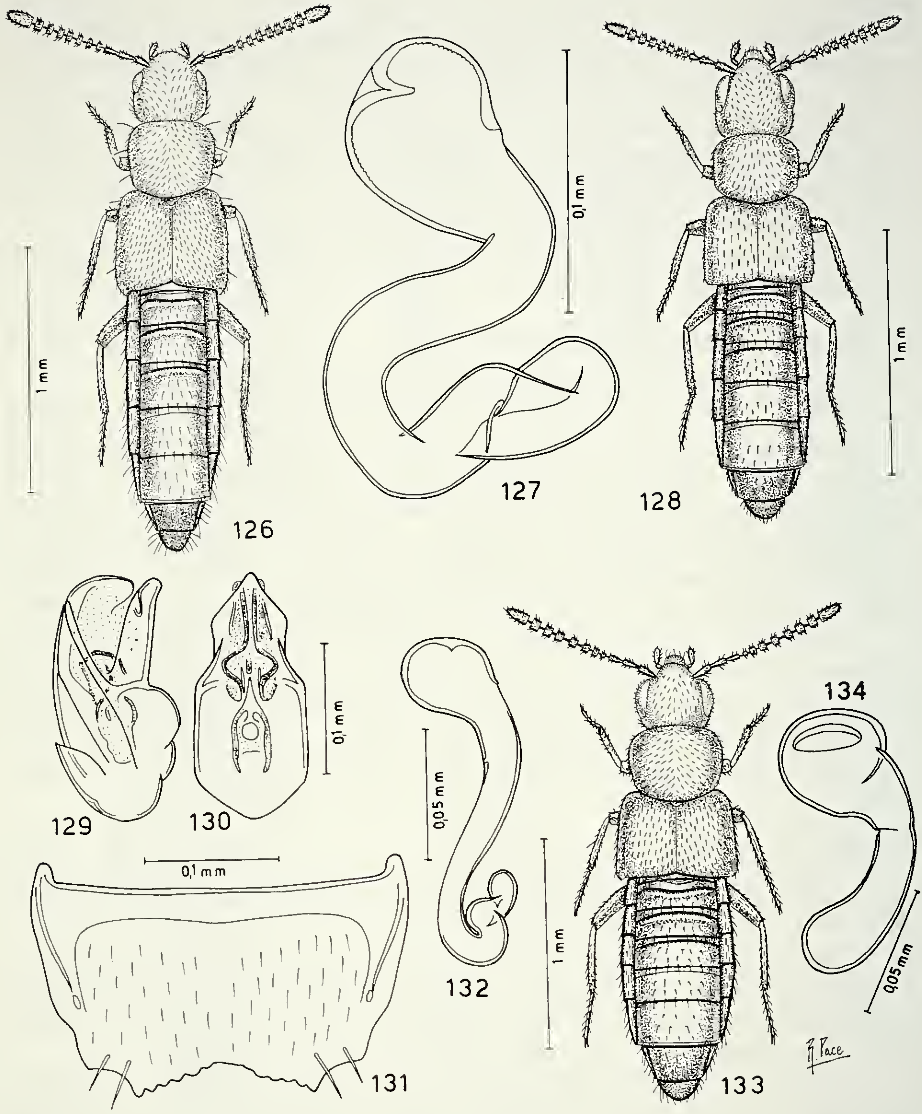
Holotypus ♀, Hong Kong, Kadoorie Agricultural Research Centre, flight interception trap, 19-31.V.1996, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,1 mm. Corpo lucido e giallo-bruno (immaturo); antenne brune; zampe gialle. La reticolazione delle superficie del capo e dell'addome è superficiale, quella del pronoto e delle elitre è molto svanita. I tubercoletti che coprono la superficie dell'avancorpo sono molto superficiali. Spermateca fig. 133.

COMPARAZIONI. Per la forma della spermateca e per gli occhi molto sviluppati, la nuova specie è forma affine a *P. championi* Cameron, 1939, dell'India. Se ne distingue per la minore dimensione della spermateca che ha bulbo distale poco dilatato e parte prossimale breve (bulbo distale assa dilatato e parte prossimale lunga della spermateca di *championi*).

Nepalota gansuensis sp. n. Figg. 135-138

Holotypus ♂, China, Gansu, Xinlong Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VIII.1994, A. Smetana leg. (MHNG).
Paratypi: 17 es., stessa provenienza.



FIGG. 126-134

Habitus, spermateca, edeago in visione laterale e ventrale e sesto urotergo libero del maschio. 126-127: *Pelioptera* (s. str.) *lii* sp. n.; 128-132: *Pelioptera (Geostibida) kowloonensis* sp. n.; 133-134: *Pelioptera (Geostibida) eremita* sp. n.

DESCRIZIONE. Lunghezza 4,1 mm. Corpo lucido e bruno con addome bruno-rossiccio avente gli uriti liberi 4° e 5° bruni; antenne brune con i due antennomeri basali giallo-rossicci; zampe gialle. La reticolazione del capo e del pronoto è netta, quella delle elitre è distinta. L'addome è quasi privo di reticolazione: su alcune aree ristrette è a maglie molto trasverse e molto svanite. I tubercoletti della superficie del capo e del pronoto sono molto svaniti, quelli delle elitre sono indistinti. Edeago figg. 136-137, spermateca fig. 138.

COMPARAZIONI. La nuova specie è affine a *N. franzi* Pace, 1987b, del Nepal. Ne è distinta per l'edeago più ampiamente arcuato al lato ventrale e avente armatura genitale interna composta da due lamine ricurve di cui una corta e altri pezzi copulatori, mentre in *franzi* è presente un'unica lamina ricurva e di dimensioni intermedie.

Nepalota globifera sp. n. Figg. 139-140

Holotypus ♀, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 3,4 mm. Corpo lucidissimo e nero-bruno con uriti liberi 4° e 5° neri; antenne nere con i due antennomeri basali nero-bruni; zampe bruno-rossicce. Una reticolazione svanita è presente solo sulla superficie delle elitre, sul resto del corpo non vi è traccia di reticolazione. La punteggiatura del capo e del pronoto è fine, quella delle elitre poco saliente. Spermateca fig. 140.

COMPARAZIONI. L'addome della nuova specie non è con evidenza ristretto all'indietro, nè il pronoto è più fortemente ristretto in avanti che all'indietro, pertanto la nuova specie sembra affine a *N. pernitida* (Pace, 1984) della Brimania. La nuova specie se ne differenzia essenzialmente per la forma asimmetrica del bulbo distale della spermateca, con introflessione apicale brevissima e non come in *pernitida* con bulbo distale della spermateca simmetrico, con profonda e larga introflessione apicale.

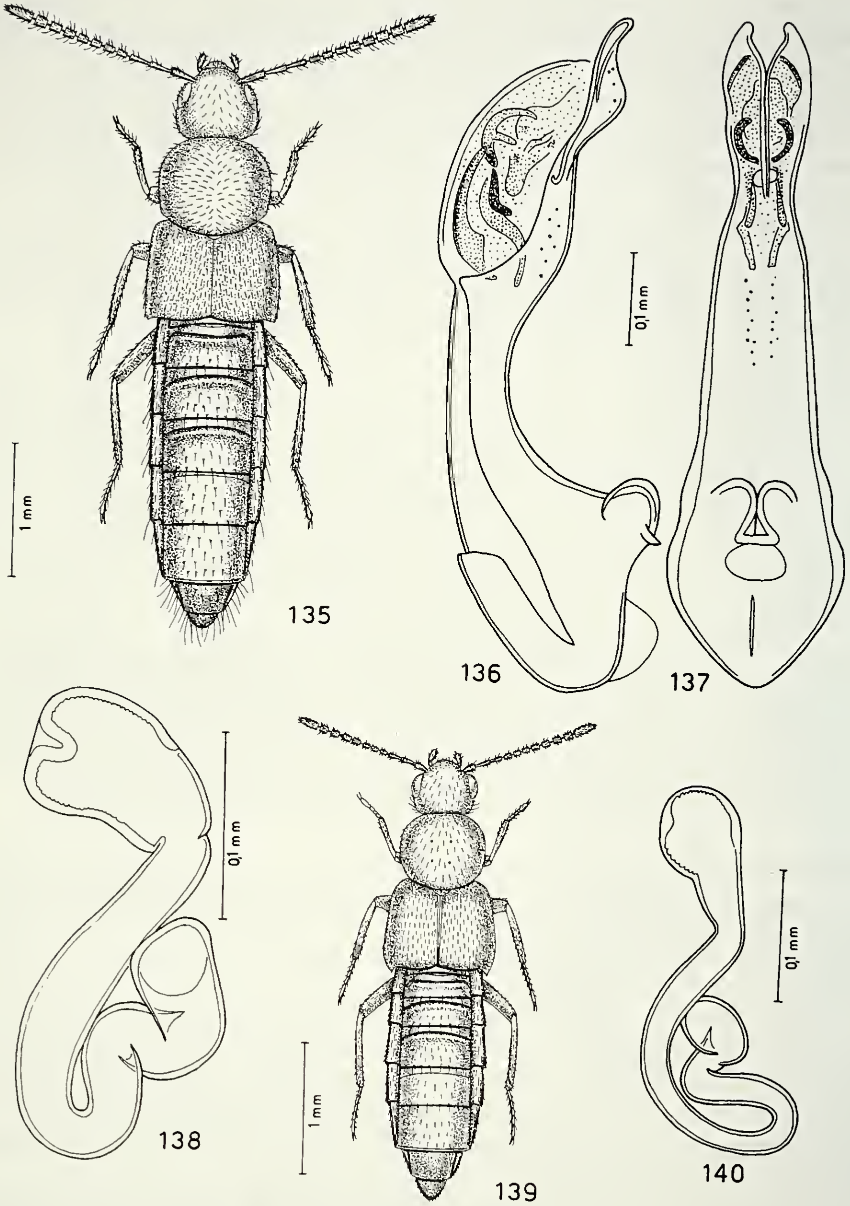
Nepalota smetanai sp. n. Figg. 141-144

Holotypus ♂, China, Sichuan, Gongga Shan, above camp 2, 2800 m, 25.VII.1994, A. Smetana leg. (MHNG).

Paratypi: 15 es., China, Gansu, Xinlong Shan, ca. 70 Km S Lanzhou, 2225-2380 m, 7.VIII.1994, A. Smetana leg. (MHNG).

DESCRIZIONE. Lunghezza 3,8 mm. Corpo lucido e bruno; antenne brune con i due antennomeri basali giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo è distinta, quella del pronoto è netta, quella delle elitre è superficiale e quella dell'addome è assai svanita e a maglie molto trasverse. La punteggiatura del capo è svanita. I tubercoletti che coprono il pronoto e le elitre sono molto superficiali. Edeago figg. 142-143, spermateca fig. 144.

COMPARAZIONI. Per la forma dell'edeago e della spermateca, la nuova specie sembra affine a *N. fessa* Pace, 1987c, del Nepal. Tuttavia l'addome non è evidentemente molto ristretto all'indietro e gli occhi sono più sviluppati di quelli di *fessa*. Le differenze più vistose sono nell'edeago che ha uno sviluppo minore e il profilo ventrale, in visione laterale, largamente arcuato, ma in modo poco profondo e non arcuato strettamente e profondamente come in *fessa*.



FIGG. 135-140

Habitus, edeago in visione laterale e ventrale e spermateca. 135-138: *Nepalota gansuensis* sp. n.; 139-140: *Nepalota globifera* sp. n.

ETIMOLOGIA. La nuova specie è dedicata al suo raccoglitore, il noto studioso di Staphylinidae Dr. Ales Smetana di Ottawa.

Nepalota granulosella sp. n. Figg. 145-146

Holotypus ♀, China, Beijing, Xialongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 3,2 mm. Corpo lucido e bruno con elitre e margine posteriore dei tre uriti basali bruno-rossicci e con uriti liberi 4° e 5° nero-bruni; antenne brune con i quattro antennomeri basali giallo-rossicci; zampe rossicce. La reticolazione del capo è molto svanita, quella del pronoto è poco superficiale, quella delle elitre è distinta e quella dell'addome è assente. La punteggiatura del capo è svanita. Il pronoto presenta due punti isolati molto superficiali e superficie coperta di distinti tubercoletti che sulle elitre sono svaniti. Spermateca fig. 146.

COMPARAZIONI. L'habitus della nuova specie è molto simile a quello di *N. fessa* Pace, 1987c, del Nepal, ma gli occhi sono lunghi quanto le tempie (e non molto più corti come in *fessa*) e la spermateca è priva di introflessione apicale del bulbo distale e di parte prossimale molto lunga, con bulbo prossimale molto sviluppato come in *fessa*.

Nepalota chinensis sp. n. Figg. 147-150

Holotypus ♂, China, Zhejiang, Tianmushan, 23.IV.1993, de Rougemont leg. (MHNG).

Paratypi: 49 es., stessa provenienza; 1 ♂ e 2 ♀, stessa provenienza, ma 2.IX.1994, de Rougemont leg.; 18 es., China, Zhejiang Prov. Anji County, ca. 500 m, Long Wan Shan N.R., 12.V.1996, J. Cooter leg.; 1 ♂, China, Zhejiang Prov., Lin'an County, 1000 m, W Tianmu Shan N.R., 18.V.1996, J. Cooter leg.; 1 ♀, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg.; 1 ♂ e 1 ♀, China, Shaanxi, Nanwutai, 17.IX.1995, de Rougemont leg.

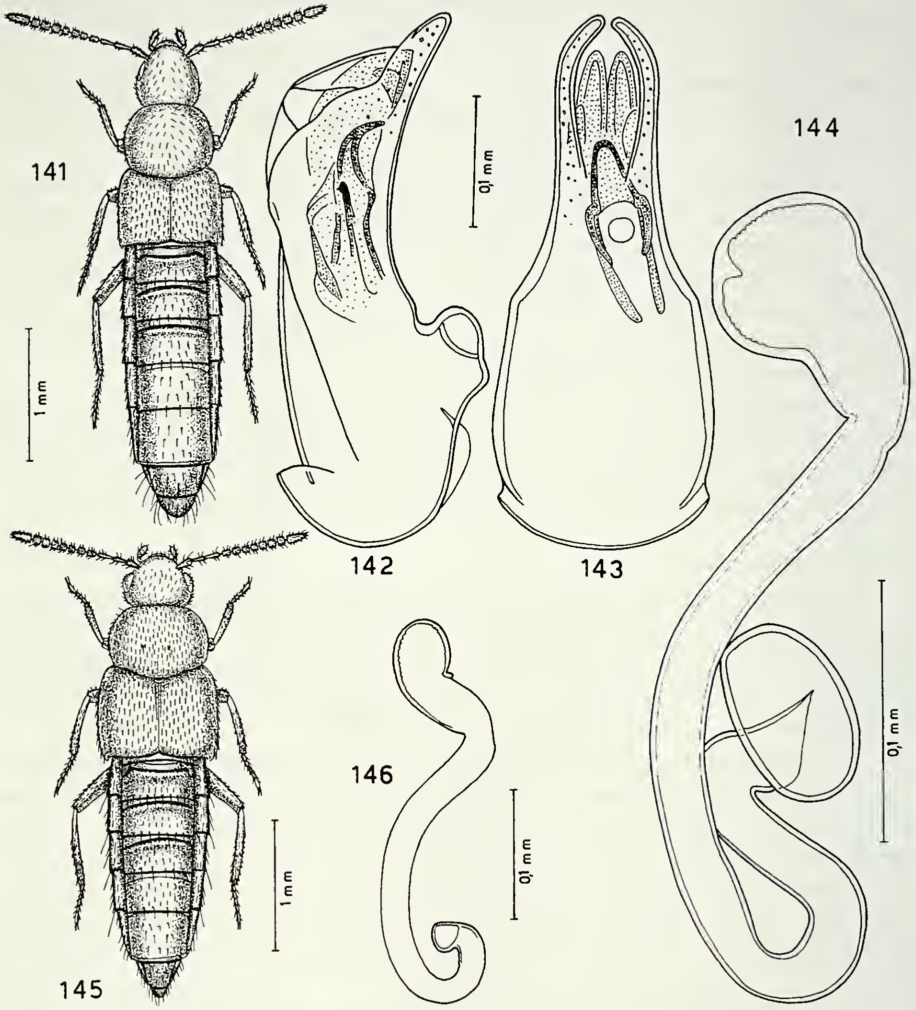
DESCRIZIONE. Lunghezza 4,6 mm. Corpo lucido e nero-bruno con elitre brune; antenne nero-brune con antennomero basale rossiccio; zampe rossicce. La reticolazione del capo è netta, quella del pronoto è nettissima, quella delle elitre è distinta e quella dell'addome è assente. I tubercoletti del disco del capo sono svaniti, quelli del resto della superficie epicraniale sono distinti, quelli del pronoto sono distinti, quelli delle elitre sono svaniti e quelli dell'addome sono assenti. Il primo urotergo libero del maschio mostra una carena mediana affilata. Edeago figg. 148-149, spermateca fig. 150.

COMPARAZIONI. La nuova specie è chiaramente distinta da *N. fessa* Pace, 1987c, del Nepal, se si osservano l'edeago e la spermateca. La parte apicale dell'edeago della nuova specie è a profilo ventrale pressoché rettilineo, mentre in *fessa* è profondamente arcuato. L'armatura genitale interna dell'edeago di *fessa* è più sviluppata e più robusta di quella della nuova specie. La spermateca della nuova specie è molto meno sviluppata, con introflessione apicale del bulbo distale profonda (appena sporgente in *fessa*).

Alevonota sericata sp. n. Figg. 151-154

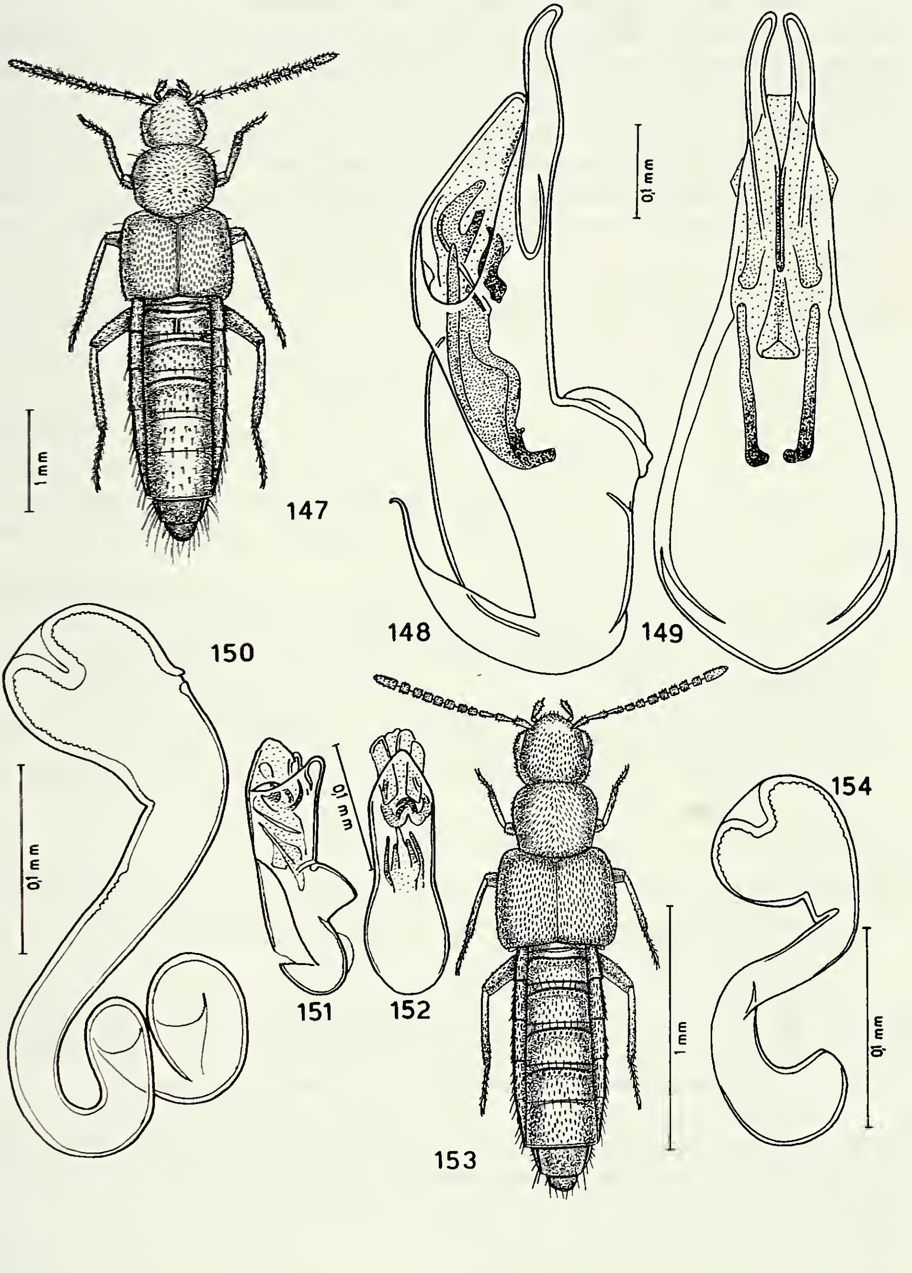
Holotypus ♂, China, Beijing, Panshan, 8.V.1993, 8.V.1993, de Rougemont leg. (MHNG).

Paratypus: 1 ♀, stessa provenienza.



FIGG. 141-146

Habitus, edeago in visione laterale e ventrale e spermateca. 141-144: *Nepalota smetanai* sp. n.; 145-146: *Nepalota granulosella* sp. n.



Figg. 147-154

Habitus, edeago in visione laterale e ventrale e spermateca. 147-150: *Nepalota chinensis* sp. n.; 151-154: *Alevonota sericata* sp. n.

Descrizione. Lunghezza 1,9 mm. Corpo debolmente lucido e nero bruno; antenne brune; zampe giallo-brune. L'intera superficie corporea è coperta di tubercoletti fittissimi e distinti, posti su un fondo non reticolato. Edeago figg. 151-152, spermateca fig. 154.

Comparazioni. La nuova specie è distinta da *A. chinensis* Pace, 1993, della Cina, per la taglia corporea nettamente minore (1,9 mm invece di 2,8 mm), per gli occhi lunghi quanto le tempie (molto più corti delle tempie in *chinensis*) e per la parte prossimale della spermateca descrivente un semicerchio e non una spira completa come in *chinensis*.

Gastropaga (Rougemontia) rougemonti sp. n. Figg. 155-156

Holotypus ♀, Hong Kong, N.T., IX.1996, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 1,7 mm. Avancorpo lucido, addome lucidissimo. Corpo giallo-rossiccio comprese le antenne e le zampe. La reticolazione del capo e delle elitre è svanita, quella del pronoto è molto svanita e quella dell'addome è assente. La punteggiatura del capo è distinta e composta di punti grandi, quella del pronoto è svanita. I tubercoletti della superficie delle elitre sono svaniti, quelli dell'addome sono fini e distinti. Spermateca fig. 156.

Comparazioni. La nuova specie si distingue da *G. siamensis* Pace, 1984, della Thailandia e della Cina, per gli occhi più sviluppati, per le elitre larghe quanto il pronoto (elitre più larghe del pronoto in *siamensis*) e per la parte prossimale della spermateca più prolungata.

Etimologia. La nuova specie è dedicata al suo raccoglitore, il noto studioso di Staphylinidae Guillaume de Rougemont di Londra.

THAMIARAEINI

Mimacrotona (s. str.) **taiwanensis** sp. n. Figg. 157-160

Holotypus ♂, Taiwan, 95° 323, epiphytes, Ieng-Tze Yang leg. (MHNG).
Paratypi: 60 es., stessa provenienza.

Descrizione. Lunghezza 1,35 mm. Corpo molto convesso, lucido e giallo-rossiccio con capo, elitre e parte posteriore del quarto urotergo libero bruni; antenne e zampe gialle. La superficie corporea è coperta da tubercoletti fitti e assai superficiali, posti su un fondo non reticolato. Edeago figg. 158-159, spermateca fig. 160.

Comparazioni. La nuova specie è distinta da *M. orousseti* Pace, 1990b, del Nepal, per la taglia corporea minore (1,70 in *orousseti*), per l'edeago poco arcuato al lato centrale e per il bulbo distale della spermateca poco sviluppato (molto sviluppato in *orousseti*).

Mimacrotona (s. str.) **rougemonti** sp. n. Figg. 161-163

Holotypus ♂, Hong Kong, Tai Po, V.1996, flight interception trap, de Rougemont leg. (MHNG).
Paratypus: 1 ♂, stessa provenienza.

Descrizione. Lunghezza 1,7 mm. Corpo debolmente lucido e rossiccio con elitre bruno-rossicce; antenne e zampe rossicce. La reticolazione del capo è estremamente superficiale, quella del pronoto e delle elitre è svanita e quella dell'addome è assente. I tubercoletti della superficie del capo e del pronoto sono fini e distinti, quelli delle elitre sono svaniti. Solo il terzo urotergo libero è coperto di scultura a distinte squame, gli altri l'hanno confusa o ne sono privi. Edeago figg. 162-163.

Comparazioni. La nuova specie è affine a *M. orousseti* Pace, 1990b, del Nepal, a motivo della forma dell'edeago. Ma la nuova specie ha l'undicesimo antennomero del maschio lungo quanto i tre precedenti antennomeri considerati insieme, mentre in *orousseti* è più corto dei tre precedenti presi insieme. L'edeago della nuova specie ha minore sviluppo, è più ampiamente arcuato al lato ventrale e, in visione ventrale, ha l'apice più largo.

Etimologia. La nuova specie è dedicata al suo raccoglitore il collega Guillaume de Rougemont di Londra.

Aidemonusa subgen. n. di *Mimoxypoda* Cameron, 1925

Il nuovo sottogenere *Aidemonusa* del genere *Mimoxypoda* Cameron, 1921 si distingue come segue;

1 Capo nascosto sotto il pronoto (in fig. 165 il capo è stato forzatamente tratto fuori da sotto il pronoto); ligula intera, ma larghissima e corta; spermateca piegata come la lettera C. . . . . *Aidemonusa* subgen. n.
(Typus subgeneris: *Mimoxypoda (Aidemonusa) fasciatipennis* sp. n.)

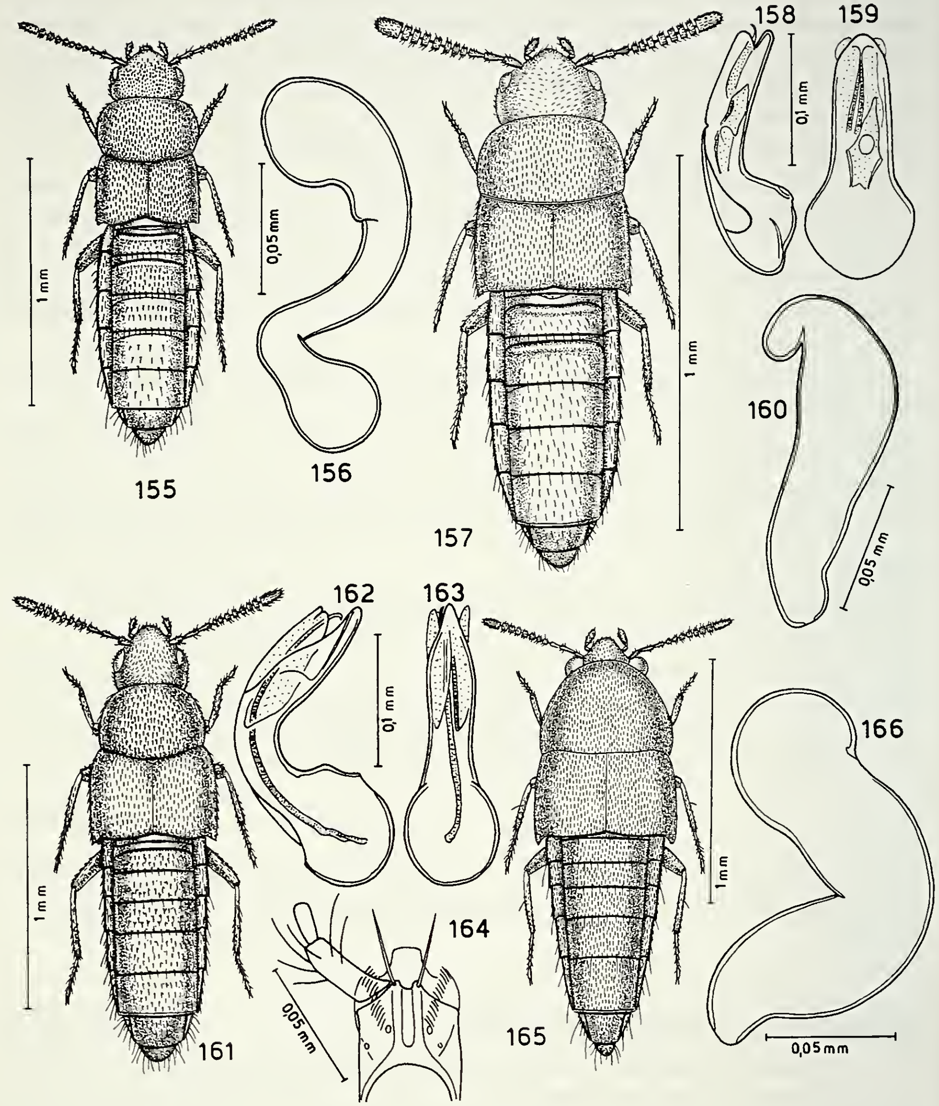
- Capo normalmente sporgente da sotto il pronoto; ligula intera, ma stretta e di media lunghezza; spermateca piegata secondo la lettera S. . . . . *Mimoxypoda s.* str.
(Typus subgeneris: *Mimoxypoda* (s. str.) *rufa* Cameron 1925)

Etimologia. Il nome del nuovo sottogenere significa "Essenza vereconda", dato che il capo è nascosto sotto il pronoto, tale atteggiamento suggerisce timore e verecondia.

Mimoxypoda (Aidemonusa) fasciatipennis sp. n. Figg. 164-166

Holotypus ♀, Hong Kong, Tai Po, V.1996, de Rougemont leg. (MHNG).
Paratypi: 2 ♀, stessa provenienza.

Descrizione. Lunghezza 1,6 mm. Corpo debolmente lucido e giallo-rossiccio con occhi bruni, con elitre brune aventi base, sutura e margine posteriore giallo-rossicci e con addome rossiccio avente estremità giallo-rossiccia; antenne con i tre antennomeri basali gialli, gli antennomeri 4° a 9° giallo-bruni e il decimo e l'undicesimo giallo-rossicci; zampe giallo-rossicce. La reticolazione del pronoto è molto svanita, quella sul resto del corpo è assente. La punteggiatura del capo è rada e distinta. I tubercoletti della superficie del pronoto sono assai poco distinti, quelli delle elitre sono fini e salienti. L'addome è coperto di fitta pubescenza sericea. Spermateca fig. 166.



FIGG. 155-166

Habitus, spermateca, edeago in visione laterale e ventrale, spermateca e labio con palpo labiale. 155-156: *Gastropaga (Rougemontia) rougemonti* sp. n.; 157-160: *Mimacrotona* (s. str.) *taiwanensis* sp. n.; 161-163: *Mimacrotona* (s. str.) *rougemonti* sp. n.; 164-166: *Mimoxypoda* (*Aidemonusa* subg. n.) *fasciatipennis* sp. n.

Mimoxypoda (s. str.) **chinensis** sp. n. Figg. 167-169

Holotypus ♂, China, Yunnan, Dali, 9.II.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 1,9 mm. Corpo lucido e nero-bruno con addome nero; antenne brune con antennomero basale bruno rossiccio; zampe brune. La reticolazione delle elitre è molto svanita (le elitre forse non sono pertinenti dato che staccate dal corpo sono state recuperate nel liquido di conservazione in provetta), quella del capo e del pronoto è assente. I tubercoletti della superficie dell'avancorpo sono superficiali, quelli dell'addome sono salienti. Edeago figg. 168-169.

Comparazioni. La nuova specie è simile a *M. indica* Cameron, 1939, dell'India, ma la taglia corporea è maggiore (1,6 mm in *indica*). L'edeago della nuova specie è meno ampiamente arcuato al lato ventrale, ha "crista apicalis" più lunga e ha apice, in visione ventrale, a punta e non ampiamente semicircolare come in *indica*.

PYGOSTENINI

Mesomegaskela gen. n. Figg. 176-184

Diagnosi. Il nuovo genere è affine al genere *Pygostenus* Kraatz, 1858b, unicamente diffuso nella regione etiopica. Con questo genere, il nuovo condivide la forma fusiforme del corpo, ma le antenne non sono corte e fusiformi.

Descrizione. Occhi sviluppati; le procoxe e le mesocoxe sono molto larghe; femori molto dilatati, particolarmente i pro-mesofemori; tibie cortissime; formula tarsale 4-5-5 (figg. 179-189); palpi labiali di tre articoli (fig. 183); ligula larghissima, divisa in due lobi; paraglosse molto prominenti in avanti; palpi mascellari di quattro articoli (fig. 184); meso-metasterno come da fig. 178; nono segmento addominale fig. 182; parte prossimale della spermateca avvolta in quattro spire (al massimo con una stretta spira in *Pygostenus*).

Typus generis: *Mesomegaskela adesi* sp. n.

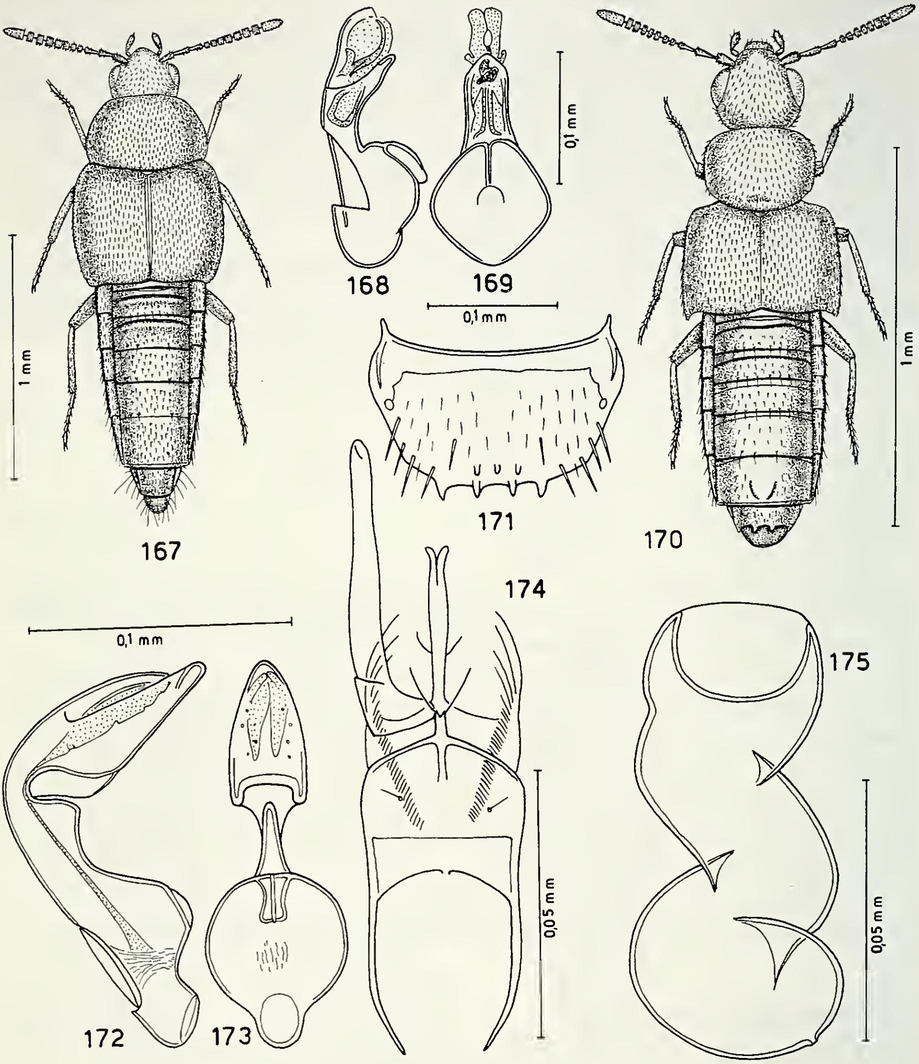
Etimologia. Il nome del nuovo genere significa "Coxe intermedie grandi".

Mesomegaskela adesi sp. n. Figg. 176-184

Holotypus ♀, Hong Kong, Kadoorie Agricultural Research Centre, N.T., IX.1990, G. Ades leg. (MHNG).

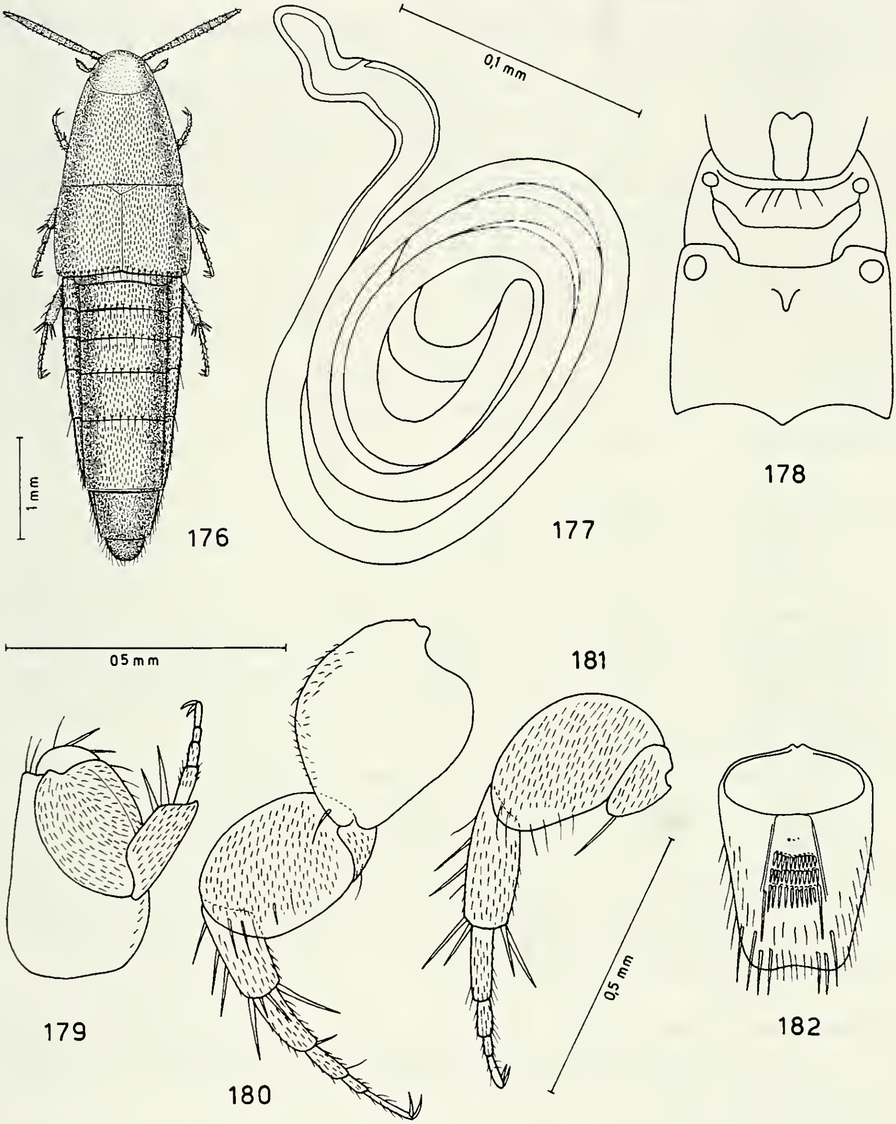
Descrizione. Lunghezza 5 mm. Corpo lucido e bruno-rossiccio con metà posteriore delle elitre bruna e con addome gradualmente giallo rossiccio verso l'apice; antenne e zampe bruno-rossicce. L'avancorpo è privo di reticolazione ed è coperto da pubescenza cortissima e fittissima. Le elitre presentano una fila di lunghe setole al margine posteriore. La pubescenza dell'addome è coperto da una pubescenza aderente, posta su un fondo non reticolato. Spermateca fig. 172.

Etimologia. La nuova specie è dedicata al suo raccoglitore Garry Ades noto zoologo inglese.



FIGG. 167-175

Habitus, edeago in visione laterale e ventrale, sesto urotergo libero del maschio, labio con palpo labiale e spermateca. 167-169: *Mimoxypoda* (s. str.) *chinensis* sp. n.; 170-175: *Medeterusa minima* Pace.



Figg. 176-182

Habitus, spermateca, pro-mesometasterno, zampa anteriore (179), media (180) e posteriore (181) e nono segmento addominele. 176-182: *Mesomegaskela adesi* gen. n., sp. n.

Doryloxenus hongkongensis sp. n. Figg. 185-188

Holotypus ♂, Hong Kong, Kadoorie Farm, flight interception trap, 15.IX.1996, de Rougemont leg. (MHNG).

Paratypus: 1 ♀, stessa provenienza, ma 26.V.1996, de Rougemont leg.

Descrizione. Lunghezza 1,7 mm. Corpo lucidissimo e bruno-rossiccio con elitre brune; antenne brune; zampe non visibili da sopra. Sul corpo non vi è traccia di reticolazione. La punteggiatura del capo è assai rada e debole, quella del pronoto e delle elitre è fine e distinta. Una corta pubescenza è presente solo sulla metà posteriore di ciascun urotergo. Edeago figg. 186-187, spermateca fig. 185.

Comparazioni. La nuova specie è la prima specie asiatica del genere *Doryloxenus* Wasmann, 1898, finora noto solo della regione etiopica. Una specie che ha la parte prossimale della spermateca avvolta in numerose spire come quella della nuova specie, non è nota. Solo *D. castaneus* Cameron, 1938, diffuso in Tanzania, Uganda, Rodesia, Angola e Ghana, ha parte prossimale avvolta in spire simili a quelle della nuova specie, ma esse sono solo due.

Doryloxenus rougemonti sp. n. Figg. 189-190

Holotypus ♀, Hong Kong, Kadoorie Farm, 15.IX.1996, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 2,1 mm. Corpo lucidissimo, non reticolato e rossiccio con estremità addominale giallo-rossiccia; antenne bruno-rossicce; zampe non visibili dall'alto. La punteggiatura del capo e del pronoto è molto rada ed estremamente superficiale, quella delle elitre è meno superficiale. Le setole posteriori marginali di ciascun urotergo sono erette. I tubercoli del margine posteriore dei quattro uroterghi basali sono ben salienti. Spermateca fig. 190.

Comparazioni. La nuova specie è la seconda specie asiatica del genere *Doryloxenus* Wasmann, 1898, dopo quella descritta sopra. Essa si distingue da tutte le specie africane per la parte prossimale della spermateca avvolta a fitta matassa e dalla specie sopra descritta, oltre che per la spermateca di taglia maggiore con bulbo distale sferico, per la taglia corporea maggiore.

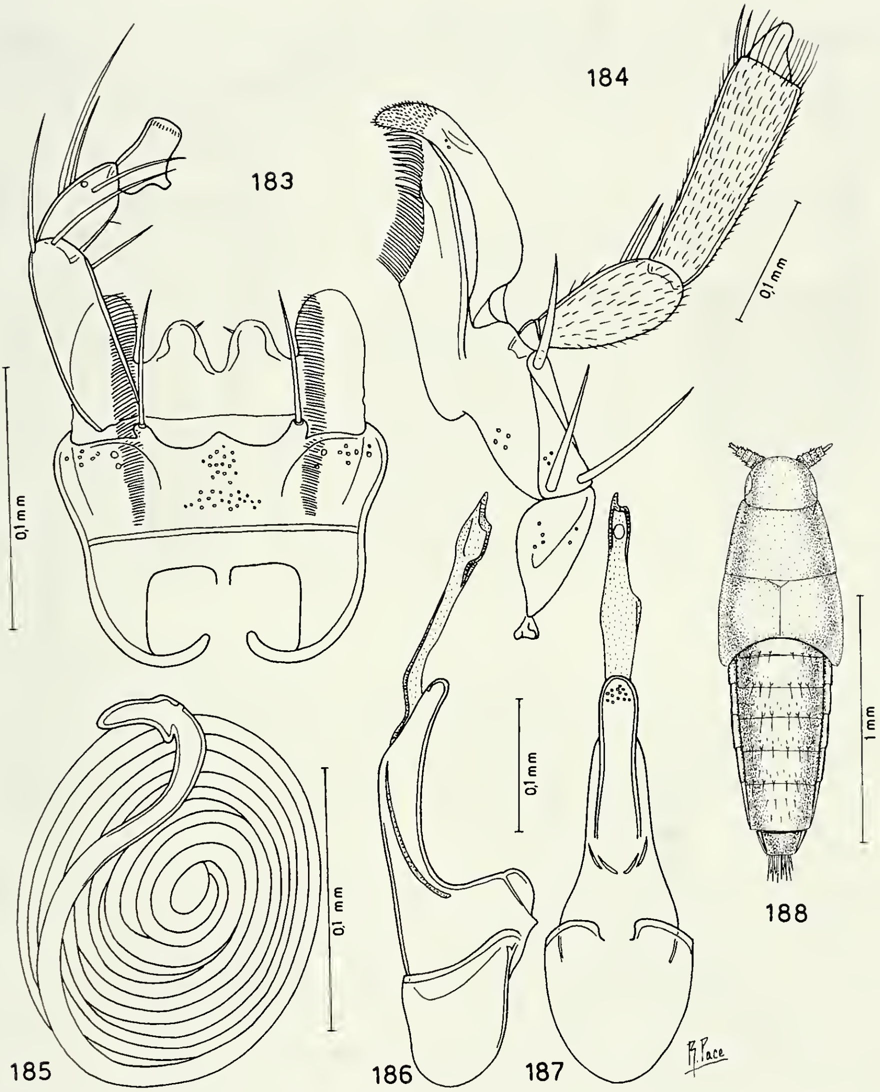
Etimologia. La nuova specie è dedicata al suo raccoglitore, il noto studioso di Staphylinidae Guillaume de Rougemont.

Odontoxenus rougemonti sp. n. Figg. 191-194

Holotypus ♂, Hong Kong, Kadoorie Farm, flight interception trap, 15.IX.1996, de Rougemont leg. (MHNG).

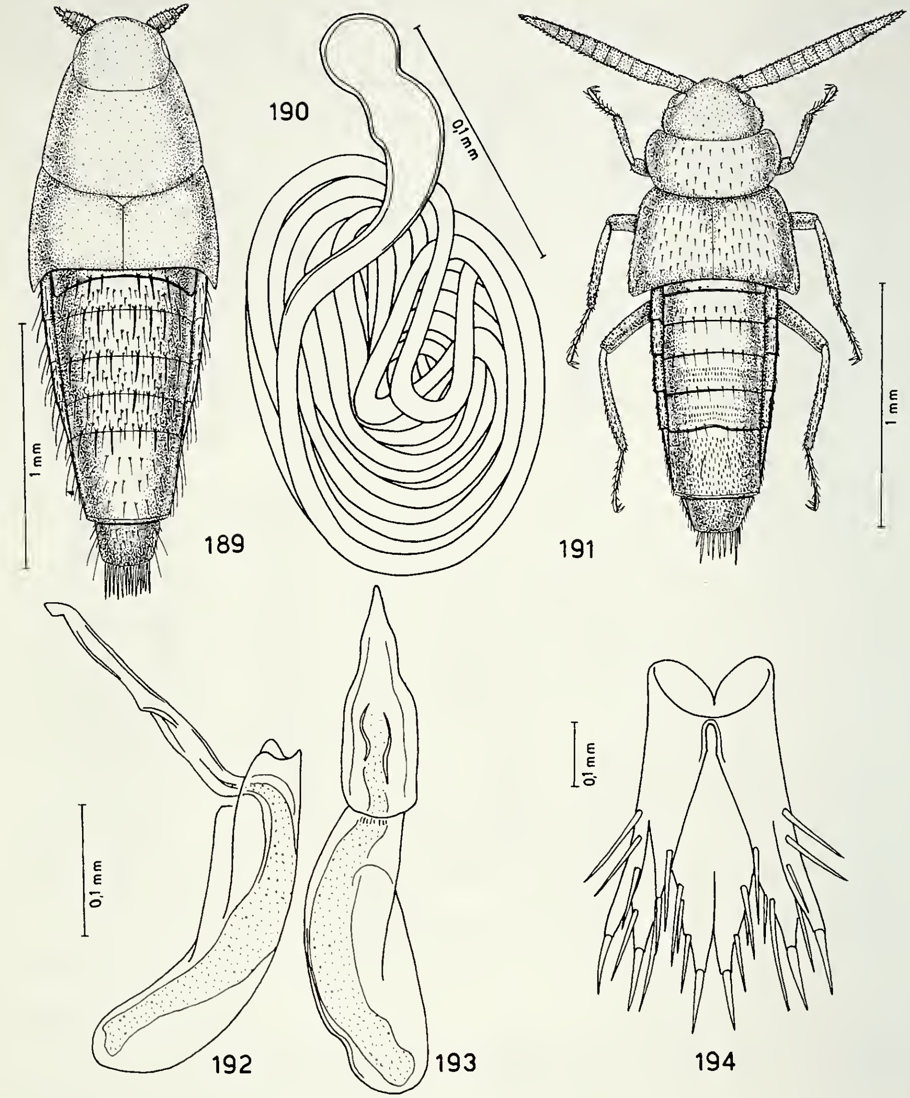
Paratypus: 1 ♀, stessa provenienza.

Descrizione. Lunghezza 1,9 mm. Corpo lucido e giallo-bruno con elitre brune e addome giallo rossiccio; antenne bruno-rossicce; zampe rossicce con tibie bruno-rossicce. La punteggiatura del capo è doppia costituita da radi punti superficiali più grandi e fitti puntini fini, quella del pronoto è rada e netta come quella delle elitre. Gli uroterghi liberi 3° a 5° mostrano delle setoline fitte allineate trasversalmente. Sul corpo non vi è traccia di microscultura reticolare. Edeago figg. 192-193, nono segmento addominale fig. 194.



FIGG. 183-188

Labio con palpo labiale, maxilla con palpo mascellare, spermateca, edeago in visione laterale e ventrale e habitus. 183-184: *Mesomegaskela adesi* gen. n., sp. n.; 185-188: *Doryloxenus hongkongensis* sp. n.



FIGG. 189-194

Habitus, spermateca, edeago in visione laterale e ventrale e nono segmento addominale. 189-190: *Doryloxenus rougemonti* sp. n.; 191-194: *Odontoxenus rougemonti* sp. n.

Comparazioni. La nuova specie è distinta da *O. krishnai* Kistner & Jacobson, 1975, della Birmania, la specie geograficamente più vicina alla nuova, per avere la punteggiatura del pronoto e delle elitre netta. Non è noto il maschio di *krishnai*.

Etimologia. La nuova specie è dedicata al suo raccoglitore studioso di Staphylinidae Guillaume de Rougemont di Londra.

Odontoxenus hongkongensis sp. n. Figg. 195-196

Holotypus ♀, Hong Kong, Kadoorie Farm, flight interception trap, 15.IX.1996, de Rougemont leg. (MHNG).

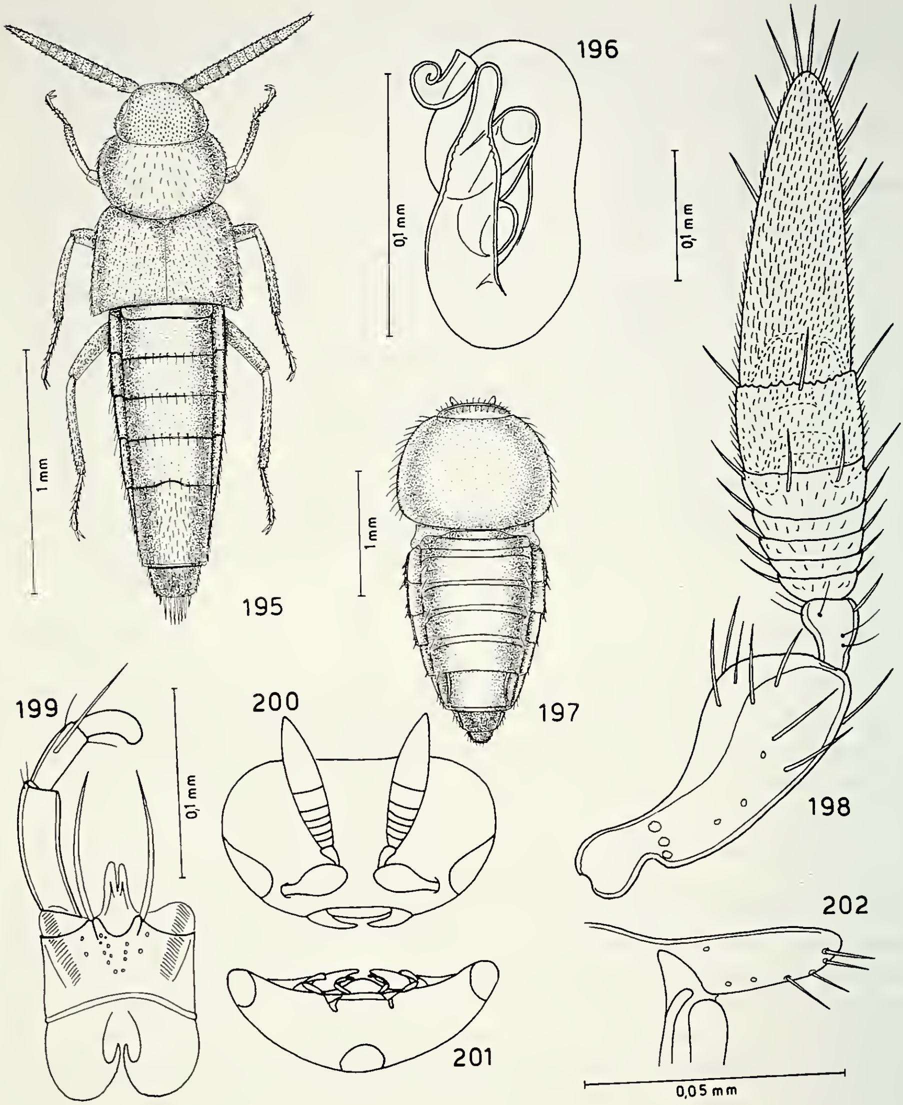
Descrizione. Lunghezza 2,1 mm. Corpo lucido, senza traccia di reticolazione, bruno-rossiccio con pronoto e addome giallo-rossicci; antenne rossicce con undicesimo antennomero giallo-rossiccio; zampe rossicce con tarsi gialli. La punteggiatura del capo è distinta e fitta, quella del pronoto è estremamente svanita, quella delle elitre è doppia composta da punti grandi assai radi e svaniti e puntini fitti e fini, quella dell'addome è fine e fitta. Spermateca fig. 196.

Comparazioni. Non esistono specie note con spermateca avvolta in più spire, come la spermateca della nuova specie. La doppia punteggiatura delle elitre, oltre che al pronoto poco trasverso, distinguono la nuova specie da *O. rougemonti* sp. n. sopra descritta.

Cephaplakoxena gen. n. Figg. 197-208

Diagnosi. Il nuovo genere è vicino al genere *Aenictoxenus* Seevers, 1953, delle Filippine, per la forma delle antenne. Se ne distingue per avere le antenne composte di 9 antennomeri (invece di 8 come in *Aenictoxenus*), per il capo compresso e per il pronoto molto poco trasverso e quasi emisferico (pronoto fortemente trasverso in *Aenictoxenus*).

Descrizione. Pronoto convesso; addome appiattito; capo nascosto sotto il pronoto, fortemente compresso e concavo (figg. 200-201) al fine di rinserrare il robusto primo antennomero basale; antenne di 9 antennomeri, in stato di riposo sporgenti dal contorno del pronoto mediante il solo antennomero terminale che è lunghissimo; palpi labiali di tre articoli (fig. 199); ligula larga e divisa; paraglosse appena sporgenti; palpi mascellari di quattro articoli (fig. 205); lobo esterno delle maxille molto più lungo dell'interno; pronoto molto sviluppato, convesso e senza angoli posteriori distinti; elitre ed ali non presenti, forse perdute in fase di raccolta: l'esemplare essendo stato raccolto al volo deve essere provvisto di ali ed elitre; prosterno non carenato sulla linea mediana; procoxe poco convesse (fig. 206); mesocoxe medie grandi e ovali, contigue fra loro dato che il processo mesosternale è appena accennato da una sinuosità mediana volta all'indietro (fig. 208); metasterno non visibile perché coperto dalle metacoxe che sono molto trasverse; formula tarsale 4-5-(5) (la parentesi indica che le zampe posteriori sono andate perdute forse nella fase di raccolta dell'esemplare; è indicato 5 anche per i tarsi posteriori perché nelle Aleocharinae tutte le specie che presentano tarsi medi di 5 articoli, sempre presentano i posteriori di 5); piastra apicale dei parameri minuscola (fig. 202).



FIGG. 195-202

Habitus, spermateca, antenna, labio con palpo labiale, capo in visione frontale everticale e piastra apicale di paramero. 195-196: *Odontoxenus hongkongensis* sp. n.; 197-202: *Cephaplakoxena rougemonti* gen. n., sp. n.

TYPUS GENERIS: *Cephaplakoxena rougemonti* sp. n.

ETIMOLOGIA. Il nome del nuovo genere significa "Ospite con capo schiacciato". Ospite di formicai. Il genere grammaticale è femminile.

Cephaplakoxena rougemonti sp. n. Figg. 197-208

Holotypus ♂, Hong Kong, Kadoorie Farm, flight interception trap, 12.X.1996, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 2,8 mm. Corpo lucidissimo e giallo-bruno con capo bruno, con pronoto traslucido avente lati di un giallo-rossiccio sporco e con estremità addominale giallo-rossiccia; antenne brune con i due antennomeri basali giallo-rossicci ed apice del nono antennomero (l'ultimo) giallo-bruno; zampe giallo-rossicce, non visibili dall'alto, tanto sono corte. La reticolazione del capo è svanita, quella del pronoto è assente, le elitre sono andate perdute, quella dell'addome è distinta e composta di maglie molto trasverse, sul quinto libero la reticolazione è meno trasversa. La punteggiatura del pronoto è sparsa, fine e superficiale. Il quinto urotergo libero ha un profondo solco a ciascun lato. Edeago figg. 203-204.

MYRMEDONIINI

Chaetosogonocephus chinensis sp. n. Figg. 209-210

Holotypus ♀, China, Zhejiang, Tianmushan, 2.IX.1994, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 3,5 mm. Corpo lucidissimo e rossiccio con elitre soffuse di bruno; antenne rossicce con i tre antennomeri basali giallo-rossicci; zampe rossicce. Sul corpo non vi è traccia di reticolazione. La punteggiatura del capo è distinta, irregolarmente distribuita e composta di punti grandi. Il pronoto e le elitre sono coperti di tubercoletti salienti, essi sono assenti sulla fascia mediana del pronoto. La metà posteriore del quinto urotergo libero della femmina e il sesto sono coperti di profonde strie longitudinali. Spermateca fig. 210.

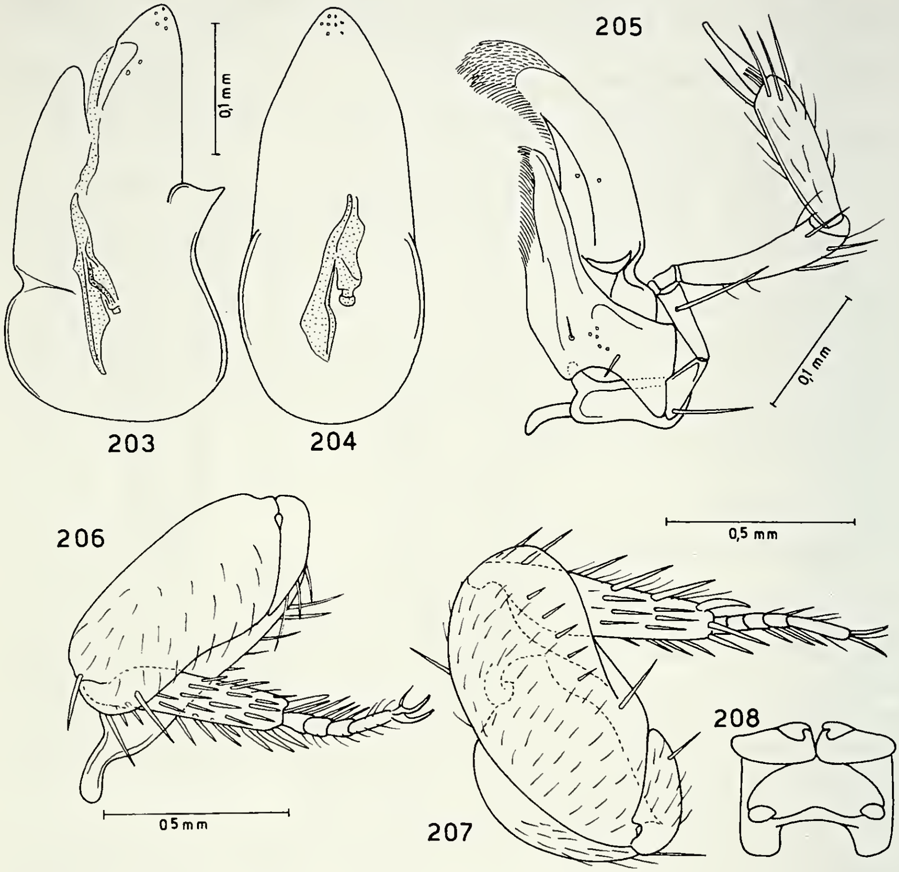
COMPARAZIONI. La nuova specie è simile a *C. rougemonti* Pace, 1986 della Malaysia. Ne è distinta per la taglia corporea maggiore, le tempie nettamente divergenti all'indietro (appena divergenti in *rougemonti*), per le elitre meno larghe, per l'addome più appuntito, per la striatura longitudinale della metà posteriore del quinto urotergo libero della femmina (assente nella femmina di *rougemonti*) e per la notevole lunghezza della parte prossimale della spermateca, descrivente una spira (parte prossimale della spermateca di *rougemonti* cortissima).

Tetrabothrus rougemonti sp. n. Figg. 211-214

Holotypus ♂, Hong Kong, Tai Po, flight interception trap, V.1996, de Rougemont leg. (MHNG).

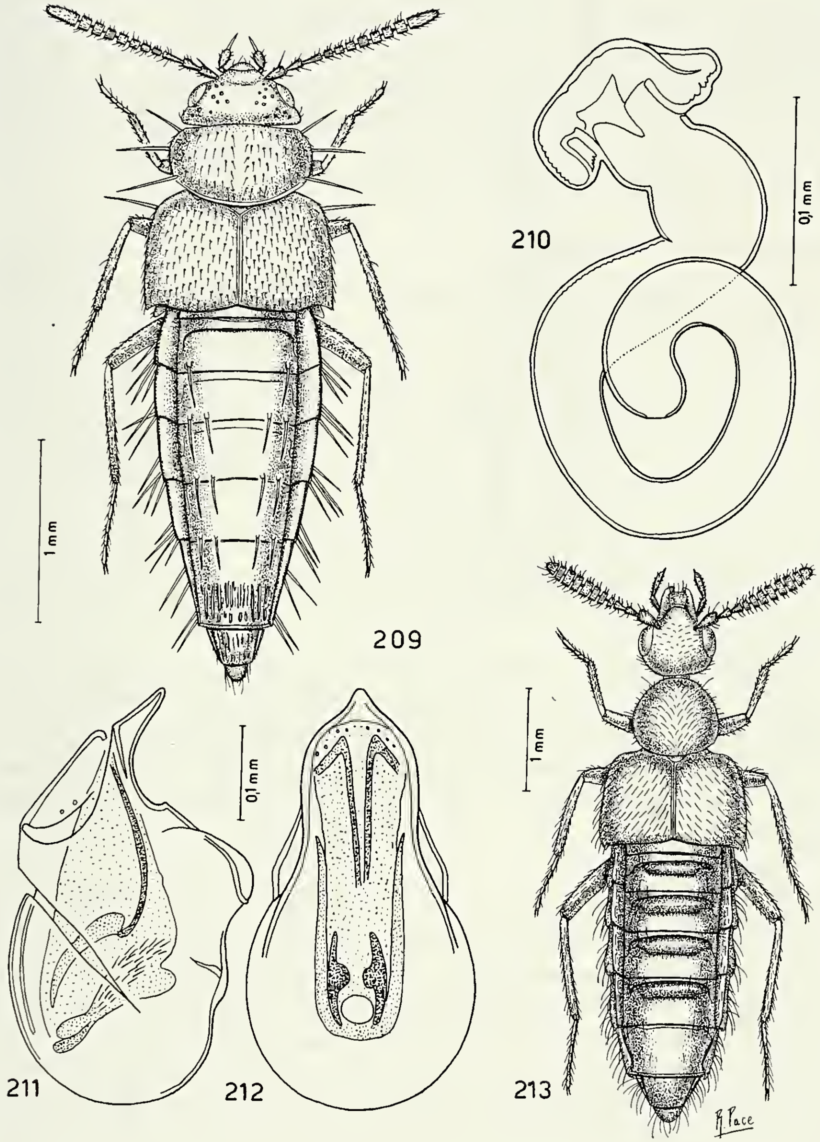
Paratypus: 1 ♀, Hong Kong, Ng Fai Tin, at light, 22.VIII.1996, G.T. Reels leg.

DESCRIZIONE. Lunghezza 5,0 mm. Corpo lucido, senza reticolazione e rossiccio, antenne comprese; zampe rossicce con femori gialli aventi l'estremità distale bruna. La punteggiatura dell'avancorpo è quasi indistinta. Gli uroterghi sono privi di punteggiatura e di setole, tranne alcune isolate. Edeago figg. 211-212, spermateca fig. 214.



FIGG. 203-208

Edeago in visione laterale e ventrale, maxilla con palpo mascellare, zampa anteriore (206) e media (207) e meso-metasterno. 203-208: *Cephaplakoxena rougemonti* gen. n., sp. n.



FIGG. 209-213

Habitus, spermateca ed edeago in visione laterale e ventrale. 209-210: *Chaetosogonocephus chinensis* sp. n.; 211-213: *Tetrabothrus rougemonti* sp. n.

Comparazioni. La nuova specie è simile a *T. indicus* Cameron, 1939, dell'India, ma ha antenne chiaramente fusiformi (non fusiformi in *indicus*), elitre unicolori (rossicce con metà posteriore brune in *indicus*), edeago nettamente meno sviluppato, con apice, in visione ventrale, a margini preapicali nettamente sinuati (quasi rettilinei in *indicus*). La nuova specie è pure distinta da *T. laticornis* (Wasmann, 1896), per avere la spermateca più semplice, con parte prossimale avvolta in tre o quattro spire e non avvolta in numerosissime spire (circa 15) come in *laticornis*.

Amaurodera yunnanensis sp. n. Figg. 215-217

Holotypus ♂, China, Yunnan, Ruili, ca. 700 m, 3.II.1993, de Rougemont leg. (MHNG).
Paratypi: 3 ♀, stessa provenienza.

Descrizione. Lunghezza 3,7 mm. Corpo lucido, tranne il pronoto molto opaco d'aspetto vellutato, tranne la parte anteriore che è lucida. Corpo rossiccio con elitre bruno-rossicce e con addome giallo avente la metà posteriore del terzo urotergo libero, il quarto e macchie ai lati dei due uriti basali bruni, quinto urite libero bruno-rossiccio; antenne rossicce con antennomero basale giallo; zampe anteriori bruno-rossicce con tarsi gialli, medie e posteriori brune con base dei femori e i tarsi gialli ed estremità distale delle tibie rossiccia. Il capo presenta punteggiatura fine e molto svanita e un debole e largo solco mediano. Il pronoto ha un solco mediano profondo, nel fondo di una larga depressione. I tubercoletti della superficie delle elitre sono distinti. Edeago figg. 216-217.

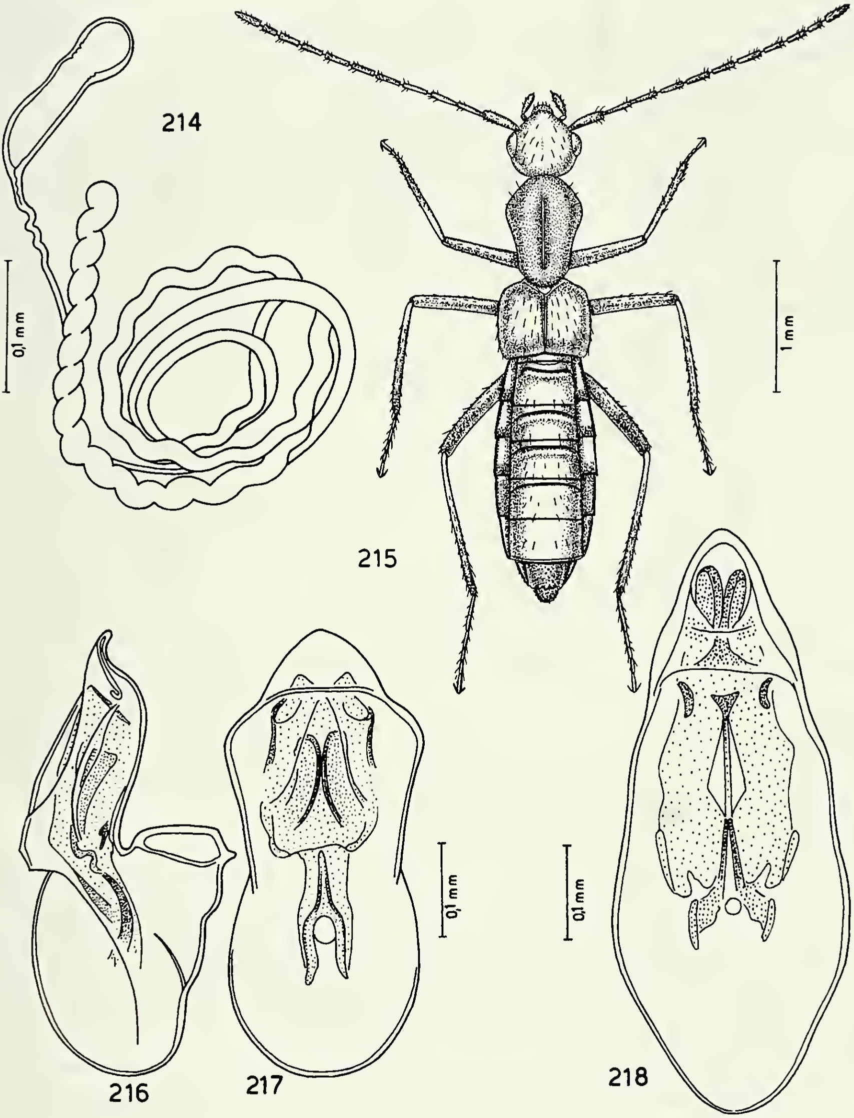
Comparazioni. In base alla forma dell'edeago, la nuova specie è affine ad *A. veluticollis* (Motschulsky, 1858), dell'India, ma è attera, perciò ha elitre più corte e più strette. Il profilo ventrale dell'edeago della nuova specie è bisinuato in modo molto più accentuato rispetto il corrispondente profilo ventrale dell'edeago di *veluticollis* e le espansioni preapicali laterali dello stesso edeago, sono più ampie nella nuova specie che in *veluticollis*.

Drusilla zhejiangensis sp. n. Figg. 218-220

Holotypus ♂, China, Zhejiang, Tianmushan, 29.IV.1993, de Rougemont leg. (MHNG).

Descrizione. Lunghezza 5,0 mm. Avancorpo debolmente lucido, addome lucido. Avancorpo nero pece, addome bruno con uriti liberi 4° e 5° neri; antenne rossicce con i cinque antennomeri basali bruno-rossicci; zampe rossicce con metà distale dei femori medi e posteriori nero-brune e la metà basale gialla. La reticolazione del capo è distinta, quella del pronoto e delle elitre è svanita. La punteggiatura del capo è distinta e fitta. I tubercoletti della superficie del pronoto e delle elitre sono fitti e superficiali. Il pronoto presenta un fine solco mediano profondo. Edeago figg. 218-220.

Comparazioni. La nuova specie differisce da *D. obliqua* (Bernhauer), della Birmania e dell'India, per il capo nettamente più stretto del pronoto (appena più stretto del pronoto in *obliqua*), per la minore taglia dell'edeago che presenta una notevole gibbosità preapicale ventrale (poco marcata in *obliqua*), per l'assenza di "crista apicalis" (presente in *obliqua*) e per lo scarso sviluppo dell'armatura genitale interna (sviluppo molto marcato in *obliqua*).



FIGG. 214-218

Spermateca, habitus ed edeago in visione laterale e ventrale. 214: *Tetrabothrus rougemonti* sp. n.; 215-217: *Amaurodera yunnanensis* sp. n.; 218: *Drusilla zhejiangensis* sp. n.

Drusilla kadooriorum sp. n. Figg. 221-224

Holotypus ♂; Hong Kong, N.T., Kadoorie Agricultural Research Centre, Malaise trap, VIII.1991, G. Ades leg. (MHNG).

Paratypi: 2 es., stessa provenienza.

Descrizione. Lunghezza 4,1 mm. Corpo lucidissimo e giallo-rossiccio con capo e uriti liberi 3°, 4° e base del 5° bruni, tranne il margine posteriore degli uroterghi liberi 3° e 4° che è rossiccio; antenne brune con i tre antennomeri basali giallo-rossicci; zampe giallo-rossicce. La superficie del corpo non è reticolata. La punteggiatura del capo è distinta e diradata sul disco, quella delle elitre è ben conformata. Tubercoletti distinti sono addensati in avanti e all'indietro del pronoto che ha un netto solco mediano e un'ampia depressione laterale a ciascun lato. La punteggiatura dell'addome è fine. Gli uroterghi liberi 2° e 3° hanno un'ampia bozza basale mediana, il 4° e il 5° hanno una concavità mediana. Una depressione laterale obliqua sta sul quinto urotergo libero. Edeago figg. 222-223, spermateca fig. 224.

Comparazioni. In base alla forma della spermateca, la nuova specie sembra tassonomicamente vicina a *D. assamensis* (Cameron, 1939), della Birmania e dell' India, ma l'introflessione apicale del bulbo distale della spermateca della nuova specie è profonda e robusta ed esile in *assamensis*. Ma è la parte apicale stretta e lunga dell'edeago che distingue nettamente la nuova specie da *assamensis* che ha edeago larghissimo in visione laterale e l'apice a forma di larga ogiva, in visione ventrale.

Etimologia. La nuova specie è dedicata ai fratelli Kadoorie, noti filantropi di Hong Kong, nel cui centro agricolo di ricerca è stata raccolta la nuova specie.

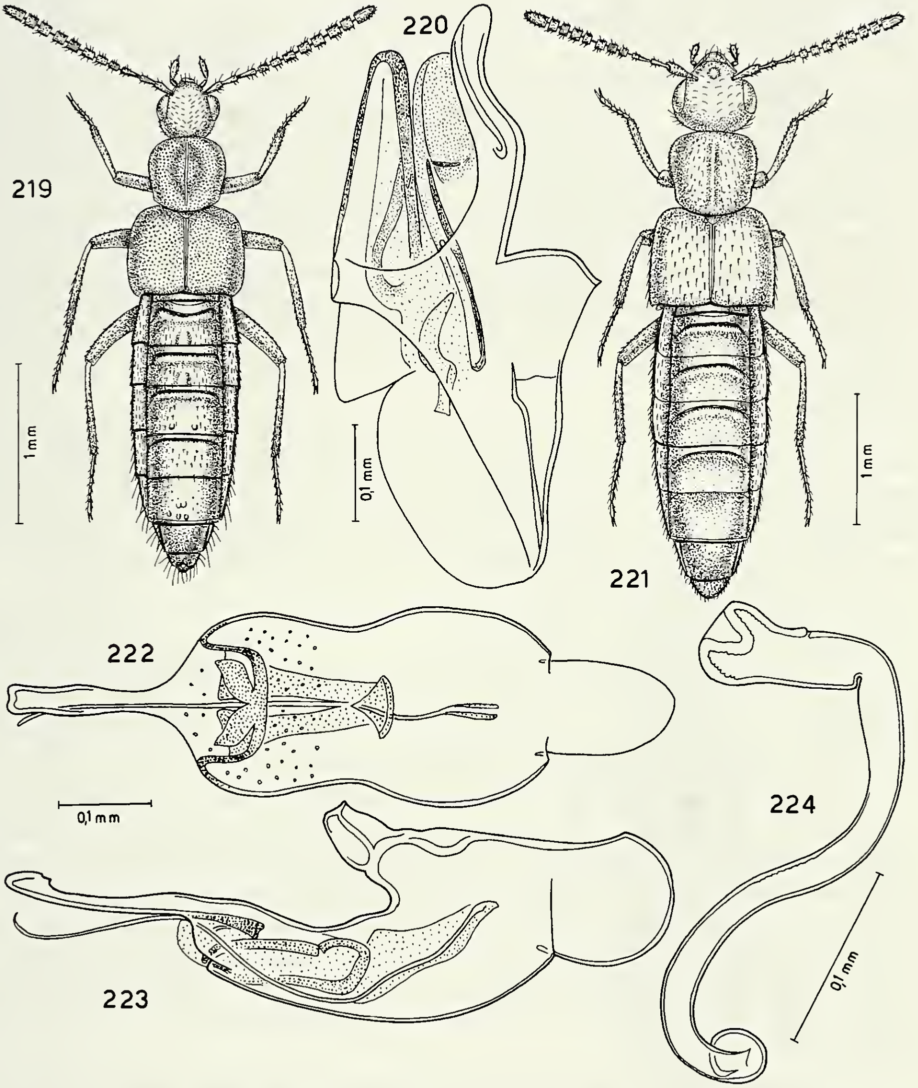
Drusilla gibberella sp. n. Figg. 225-228

Holotypus ♀, Hong Kong, Kadoorie Agricultural Research Centre, flight interception trap, 19-31.V.1996, de Rougemont leg. (MHNG).

Paratypus: 1 ♂, Hong Kong, Tai Po, VII.1996, de Rougemont.

Descrizione. Lunghezza 4,2 mm. Corpo lucido e giallo-bruno con capo nero e uriti liberi 3°, 4° e 5° bruni; antenne brune con il secondo antennomero e la base del terzo basali giallo-rossicci; zampe giallo-brune. La reticolazione del capo e del pronoto è distinta, quella delle elitre e del pronoto è svanita. La punteggiatura del capo è fine, quella del pronoto è distinta. Tubercoletti salienti coprono la superficie delle elitre. Il pronoto presenta una larga depressione mediana posteriore e a ciascun lato di essa un'altra larga depressione della superficie. Edeago figg. 226-227, spermateca fig. 228.

Comparazioni. In base alla forma dell'edeago e della spermateca, come dei caratteri dell'esoscheletro, la nuova specie è tassonomicamente vicina a *D. aerea* (Cameron, 1933), del Borneo. I penultimi antennomeri della nuova specie sono molto trasversi, mentre quelli di *aerea* sono appena trasversi. Il quinto urotergo libero del maschio della nuova specie non ha un rilevante tubercolo, presente in due file trasverse in *aerea*. L'edeago della nuova specie ha dimensioni minori, ha l'appendice preapicale ventrale poco saliente (ben distinta in *aerea*) e situata più vicina alla "crista apicalis" che all'apice dell'edeago stesso (situata più vicina all'apice che alla "crista apicalis" in *aerea*).



FIGG. 219-224

Habitus, edeago in visione laterale e ventrale e spermateca. 219-220: *Drusilla zhejiangensis* sp. n.; 221-224: *Drusilla kadooriana* sp. n.

Diplopleurus cooteri sp. n. Figg. 229-230

Holotypus ♀, China, Zhejiang Prov., Lin'an County, W Tianmu Shan N.R., 16-22.V. 1996, J. Cooter leg. (MHNG).

Descrizione. Lunghezza 4,2 mm. Corpo lucido e nero con margine posteriore degli uroterghi liberi 2° a 5° bruno-rossiccio come l'apice addominale; antenne nero-brune con i tre antennomeri basali rossicci e l'undicesimo bruno-rossiccio; zampe giallo-rossicce. La superficie del corpo non è reticolata. La punteggiatura del capo è profonda e assente sulla fascia mediana, quella del pronoto è pure profonda, ma a punti contigui, quella delle elitre è come quella del pronoto e con punti fusi tra loro ai lati esterni. La punteggiatura degli uroterghi è netta e assente in alcuni tratti della superficie. Il disco del capo è lievemente concavo. Il pronoto presenta una concavità mediana posteriore, un'impressione a ciascun lato e uno spigolo basale senza punteggiatura. Il margine posteriore del sesto urosterno della femmina è incavato a metà. Spermateca fig. 4,2 mm.

Comparazioni. Per la presenza della plica basale del pronoto che è fittamente e profondamente punteggiato, la nuova specie è attribuibile al genere *Diplopleurus* Bernhauer, 1915b, finora noto solo della regione etiopica. Non è nota ancora una specie che presenti occhi minori delle tempie (occhi molto più lunghi delle tempie nelle specie africane), nè parte prossimale della spermateca così ampiamente avvolta a matassa.

Zyras (s. str.) **fratrumkadooriorum** sp. n. Figg. 231-234

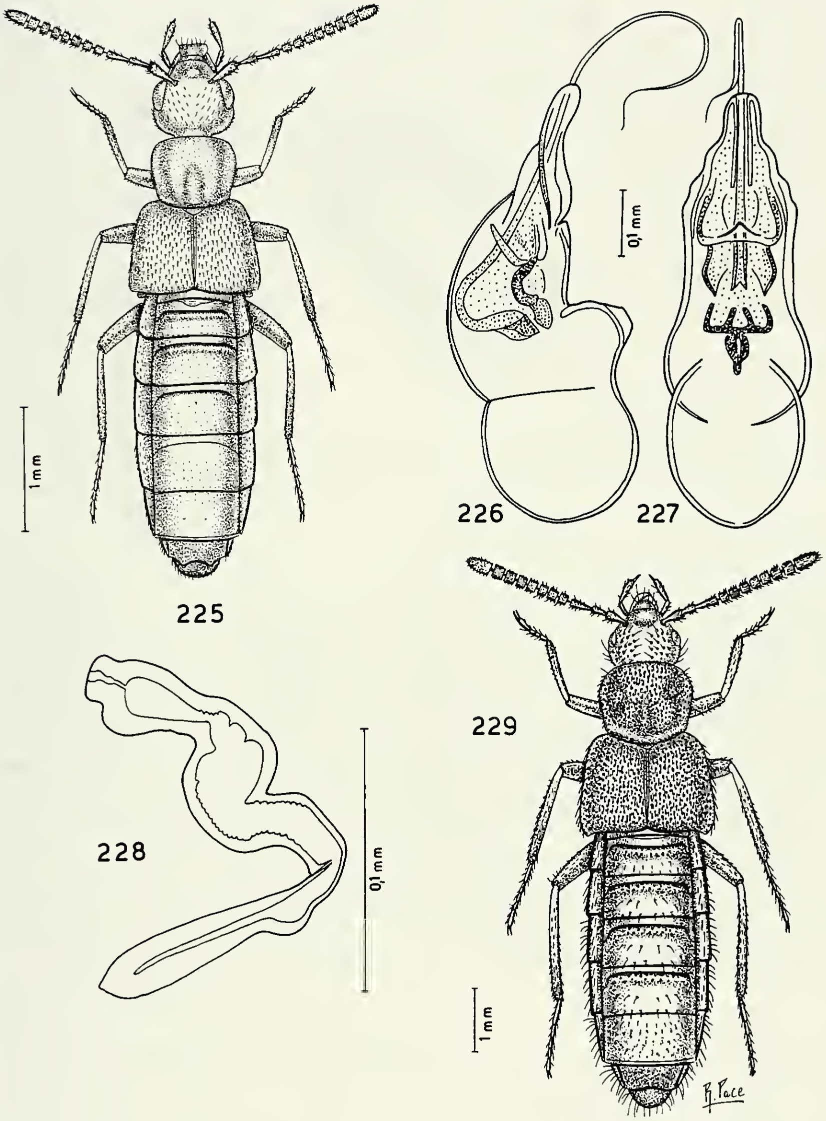
Holotypus ♂, Hong Kong, Kadoorie Farm, Malaise trap, VI.1991, G. Ades leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza, ma VII.1992, G. Ades leg.; 8 es., stessa provenienza, ma V.1996, VIII.1996, IX.1996, de Rougemont leg.

Descrizione. Lunghezza 4,0 mm. Corpo lucidissimo e non reticolato. Capo e pronoto neri, elitre giallo-rossicce con angolo posteriore esterno largamente bruno, addome giallo-rossiccio con una macchia bruna a metà degli uroterghi liberi 2°, 3° e 4°, con gli uroterghi liberi 5° e 6° bruni e con una macchia pure bruna ai lati degli uroterghi liberi 2°, 3° e 4°; antenne brune con i tre antennomeri basali rossicci; zampe gialle. La punteggiatura del capo è netta e assai rada, quella del pronoto è distinta e irregolarmente distribuita e quella delle elitre è profonda e assente lungo il margine posteriore. Il pronoto ha una profonda fossetta mediana posteriore. Spermateca fig. 232, edeago figg. 233-234.

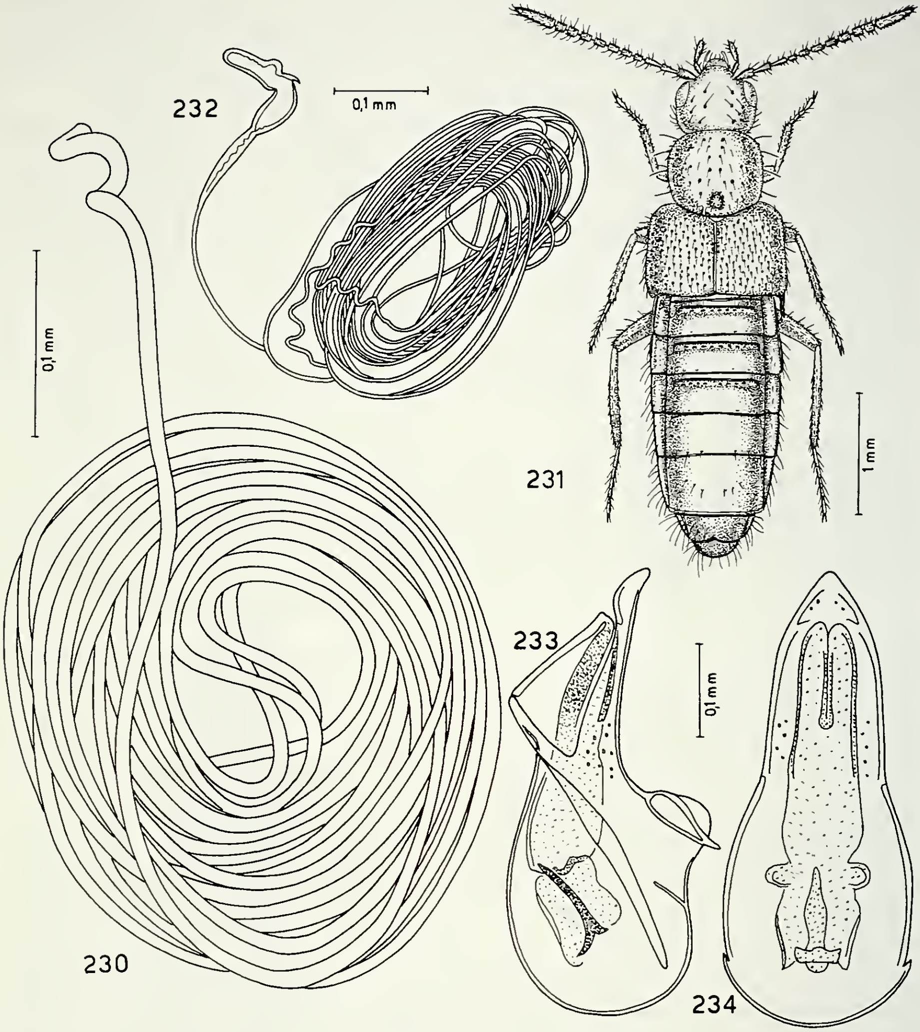
Comparazioni. In base alla forma dell'edeago e per alcuni caratteri dell'esoscheletro, la nuova specie sembra simile a *Z. chinkiangensis* Bernhauer, 1939a, pure della Cina. Ma i tre antennomeri apicali non hanno il colore giallo paglierino come quelli di *chinkiangensis* e l'antennomero terminale del maschio della nuova specie è lunghissimo, mentre è corto in *chinkiangensis*. Inoltre l'edeago della nuova specie ha dimensione di una metà inferiore e la spina basale dell'armatura genitale interna dell'edeago è lunga nella nuova specie e breve in *chinkiangensis*.

Etimologia. La nuova specie è dedicata ai fratelli Kadoorie, insigni benefattori di Hong Kong, nella cui azienda agricola è stata raccolta la nuova specie.



FIGG. 225-229

Habitus, edeago in visione laterale e ventrale e spermateca. 225-228: *Drusilla gibberella* sp. n.; 229: *Diplopleurus cooteri* sp. n.



FIGG. 230-234

Spermateca, habitus ed edeago in visione laterale e ventrale. 230: *Diplopleurus cooteri* sp. n.; 231-234: *Zyras* (s. str.) *fratrumkadooriorum* sp. n.

Zyras (s. str.) **notaticornis** sp. n. Figg. 235-238

Holotypus ♂, Hong Kong, Kadoorie Agricultural Research Centre, flight interception trap, 19-31.V.1996, de Rougemont leg. (MHNG).

Paratypi: 4 es., stessa provenienza, ma III.1996, VI.1996, de Rougemont leg.; 1 ♂, China, Zhejiang Prov., Anji County, ca. 480 m, Long Wan Shan N.R., 13.V.1996, J. Cooter leg.

DESCRIZIONE. Lunghezza 5,4 mm. Corpo lucido e non reticolato. Capo e pronoto nero-bruni, elitre brune con omeri e sutura rossicci, addome bruno con margine posteriore e base degli uroterghi giallo-rossicci; antenne nere con il secondo antennomero basale e l'undicesimo giallo-rossicci; zampe gialle. La punteggiatura dell'avancorpo è profonda, assente su una fascia mediana del capo e del pronoto, irregolarmente distribuita su quest'ultimo e radi sulla metà posteriore delle elitre. Spermateca fig. 236, edeago figg. 237-238.

COMPARAZIONI. La nuova specie è simile a *Z. chinkiangensis* Bernhauer, 1939a, pure della Cina, ma l'antennomero apicale è giallo rossiccio e lungo nella nuova specie e non giallo-paglierino come i due precedenti e corto come in *chinkiangensis*. L'edeago della nuova specie è minore e più ampiamente arcuato al lato ventrale, con armatura genitale interna robusta (esile in *chinkiangensis*).

Zyras (s. str.) **shaanxiensis** sp. n. Figg. 239-241

Holotypus ♂, China, Shaanxi, Nanwutai, 17.IX.1995, de Rougemont leg. (MHNG).

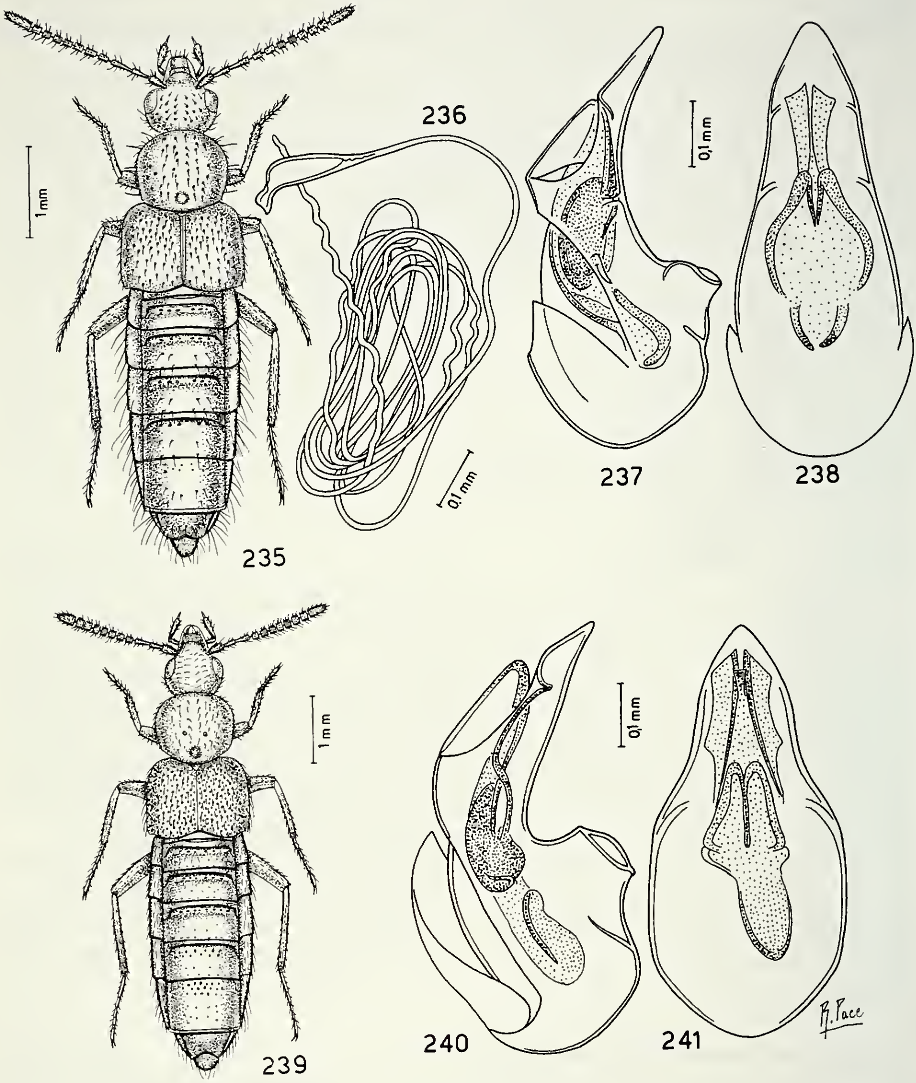
DESCRIZIONE. Lunghezza 6,4 mm. Corpo lucido e non reticolato. Capo e pronoto neri, elitre giallo-rossicce con angolo posteriore esterno largamente bruno, addome bruno avente i lati e il margine posteriore degli uroterghi giallo-rossicci; antenne brune con i tre antennomeri basali giallo-rossicci e l'undicesimo rossiccio; zampe gialle. La punteggiatura dell'avancorpo è netta e profonda, assente sulla fascia mediana del capo e del pronoto e lungo il margine posteriore di quest'ultimo che presenta una profonda fossetta mediana posteriore e due punti discali robusti. Edeago figg. 240-241.

COMPARAZIONI. La nuova specie è ben distinta da *Z. chinkiangensis* Bernhauer, 1939a, pure della Cina, per avere l'undicesimo antennomero rossiccio (e non i tre antennomeri apicali di colore giallo paglierino come in *chinkiangensis*), per l'edeago meno sviluppato e per la sua robusta armatura genitale interna (esile armatura in *chinkiangensis*).

Zyras (Rynchodonia) longwangmontis sp. n. Figg. 242-244

Holotypus ♂, China, Zhejiang Prov., Anji County, ca. 400 m, 13.V.1996, J. Cooter leg. (MHNG).

DESCRIZIONE. Lunghezza 9,0 mm. Capo opaco, resto del corpo lucido. Capo ed elitre bruni, pronoto rossiccio, addome bruno-rossiccio con base rossiccia; antenne rossicce con margine distale di ciascun antennomero bruno; zampe rossicce. La reticolazione del capo è vigorosa e d'aspetto di velluto, ai suoi lati e all'indietro è svanita, quella del pronoto è estremamente svanita, quella delle elitre è superficiale e quella dell'addome è distinta. La punteggiatura del capo è distinta, quelle del pronoto e delle elitre è netta, fitta e profonda e quella dell'addome è doppia: a punti robusti e a



FIGG. 235-241

Habitus, spermateca ed edeago in visione laterale e ventrale. 235-238: *Zyras* (s. str.) *notaticornis* sp. n.; 239-241: *Zyras* (s. str.) *shaanxiensis* sp. n.

punti fini. Il rilievo mediano posteriore del terzo urotergo libero del maschio è privo di punteggiatura. Edeago figg. 243-244.

Comparazioni. L'edeago della nuova specie è simile a quello di Z. *nepalensis* Pace, 1992, del Nepal, ma l'estremità distale dell'armatura genitale sporgente dell'edeago ha forma di due lame ricurve, di cui una più stretta, mentre in *nepalensis* l'estremità distale di detta armatura genitale ha forma di due larghi lobi. Inoltre il secondo urotergo libero del maschio presenta due spine larghe e corte in *nepalensis* e lunghe nella nuova specie..

Zyras (Diaulaconia) kadoorianus sp. n. Figg. 245-248

Holotypus ♂, Hong Kong, N.T., Kadoorie Agricultural Research Centre, Malaise trap, VIII.1991, G. Ades leg. (MHNG).

Paratypi: 1 ♂ e 1 ♀, stessa provenienza, ma VI.1991, G. Ades leg.; 1 ♀, Hong Kong, Shing Mun, 8.VII.1996, G. Reels leg.; 1 ♀, Hong Kong, N.T., Shek Kong, 21.VI.1990, G. Ades leg.

Descrizione. Lunghezza 10,0 mm. Corpo lucidissimo e giallo rossiccio, antenne comprese; zampe gialle. La reticolazione del capo è netta, quella del pronoto e dell'addome è assente, quella delle elitre è obliqua, molto trasversa e distinta. La punteggiatura del capo è distinta, ombelicata e assente sulla fascia mediana, quella del pronoto è netta e assente sulla linea mediana e a ciascun lato di essa, quella delle elitre è netta e profonda e quella dell'addome è fine. Il quarto urotergo libero del maschio presenta una concavità mediana, il quinto ha un tubercolo mediano spianato su un appiattimento triangolare della superficie che è distintamente reticolata. Edeago figg. 245-246, spermateca fig. 247.

Comparazioni. La nuova specie è simile a Z. *orientalis* Bernhauer, 1929, pure di Hong Kong. Ne è distinta perché non ha una fila di punti profondi a ciascun lato della linea mediana del pronoto, come in *orientalis* e perché il margine posteriore del terzo urotergo libero del maschio è sinuoso e non profondamente incavato a metà come in *orientalis* (fig. 249).

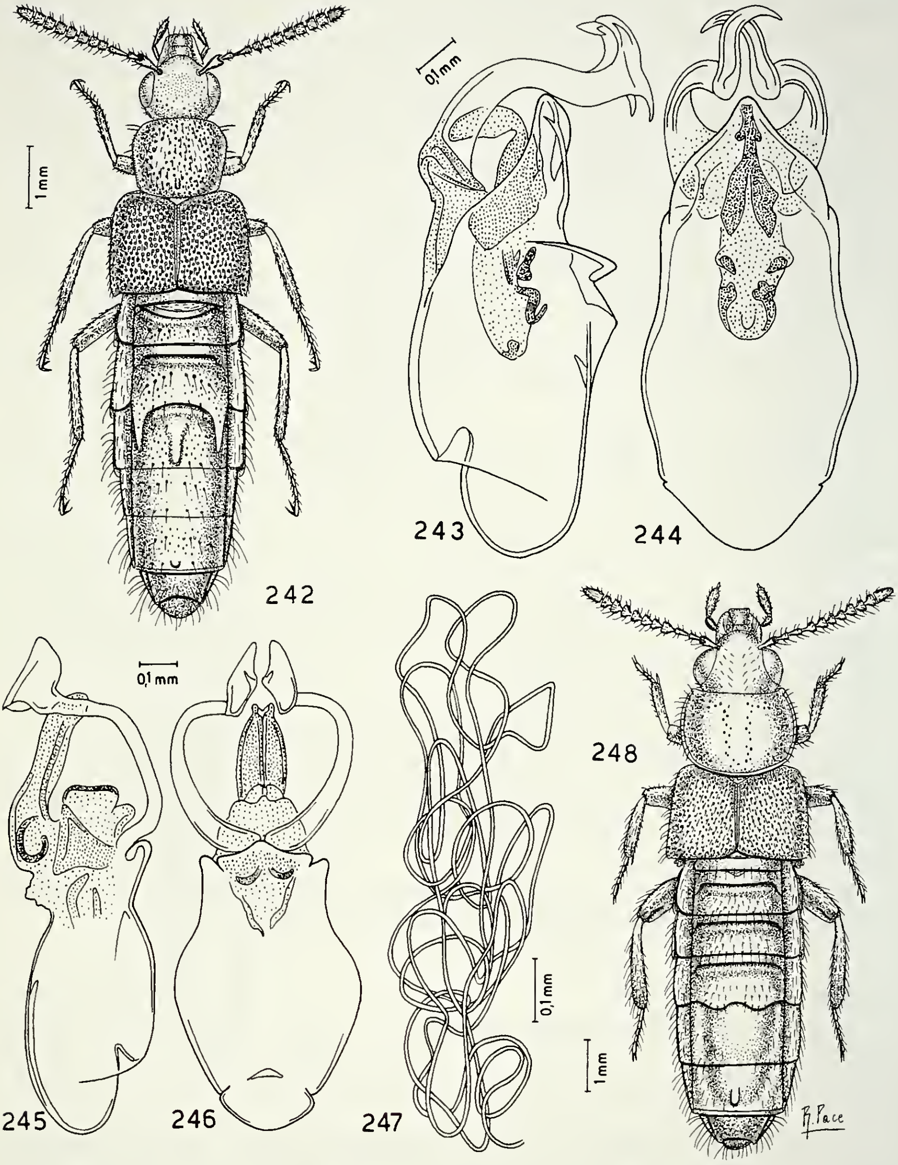
Etimologia. La nuova specie è dedicata ai fratelli Kadoorie noti filantropi di Hong Kong, nel cui centro agricolo è stata raccolta la nuova specie.

Zyras (Pella) reelsi sp. n. Figg. 253-256

Holotypus ♂, Hong Kong, Shek Kwu Chao, 3.VII.1996, M.V. light, G.T. Reels leg. (MHNG).

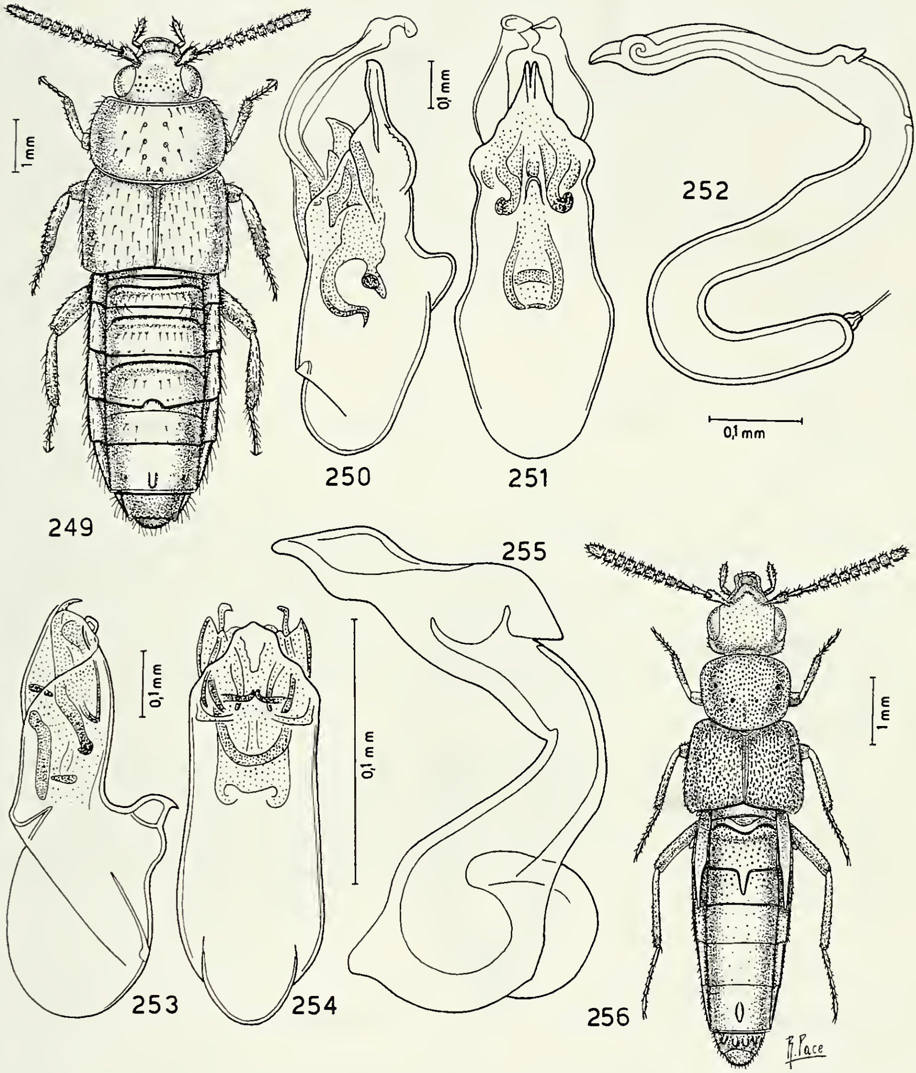
Paratypi: 12 es., stessa provenienza; 34 es., Beaufort Island, 1.V.1996, M.V. light, G.T. Reels leg.

Descrizione. Lunghezza 7,0 mm. Avancorpo lucido, addome lucidissimo. Capo e addome nero-bruni, pronoto, elitre e lati dell'addome rossicci; antenne brune con i tre antennomeri basali rossicci; zampe rossicce con femori giallo-rossicci. La reticolazione è vigorosa sul disco del capo e svanita sul resto della sua superficie, quella del pronoto è netta, quella delle elitre è svanita e quella dell'addome è assente. Netta è la punteggiatura sull'intera superficie del corpo. Il pronoto presenta una depressione a ciascun lato. Il quinto urotergo libero del maschio ha una saliente



FIGG. 242-248

Habitus, edeago in visione laterale e ventrale e spermateca. 242-244: *Zyras (Rynchodonia) longwangmontis* sp. n.; 245-248: *Zyras (Diaulaconia) kadoorianus* sp. n.



FIGG. 249-256

Habitus, edeago in visione laterale e ventrale e spermateca. 249-252: *Zyras (Diaulaconia) orientalis* Bernhauer; 253-256: *Zyras (Pella) reelsi* sp. n.

carena mediana, il sesto presenta due tubercoli mediani. Edeago figg. 253-254, spermateca fig. 255.

COMPARAZIONI. La nuova specie è distinta da *Z. coloratus* Cameron, 1939, dell'India, di cui condivide parte del colore del corpo, per la maggiore taglia corporea (4,0 mm in *coloratus*), per gli occhi più lunghi delle tempie (occhi lunghi quanto le tempie in *coloratus*), per la presenza di netta reticolazione del pronoto (reticolazione assente sul pronoto di *coloratus*) e per la presenza di una spina mediana al margine posteriore del primo urotergo libero del maschio e di un'altra a ciascun lato posta sul margine laterale del primo urotergo libero (spine assenti in *coloratus*).

ETIMOLOGIA. La nuova specie è dedicata al suo raccoglitore, lo zoologo inglese Graham Reels.

Zyras (Pella) micropterus sp. n. Figg. 257-261

Holotypus ♂, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

Paratypi: 15 es., stessa provenienza.

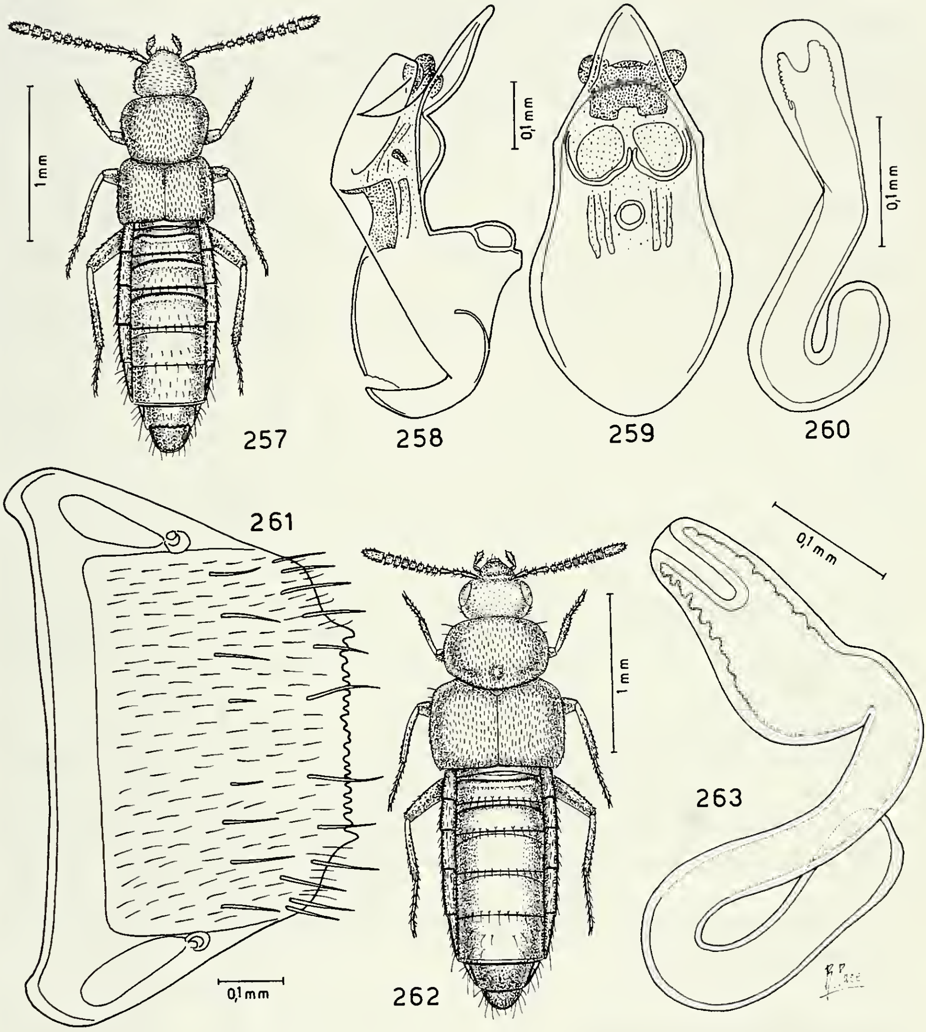
DESCRIZIONE. Lunghezza 4,2 mm. Corpo lucido e nero-bruno con margine posteriore dei due uroterghi basali rossiccio; antenne rossicce con antennomero basale bruno; zampe bruno-rossicce con femori bruni, tarsi anteriori giallo-rossicci. La reticolazione del capo e del pronoto è netta, quella delle elitre è distinta e quella dell'addome è trasversa. La punteggiatura del capo è fitta e distinta. I tubercoletti della superficie del pronoto e delle elitre sono fitti e distinti, quelli dell'addome sono salienti e radi. Edeago figg. 258-259, spermateca fig. 260, sesto urotergo libero del maschio fig. 261.

COMPARAZIONI. La nuova specie è distinta da *Z. ceylonicus* Cameron, 1939, dello Sri Lanka, per gli occhi più corti delle tempie (occhi lunghi quanto le tempie in *ceylonicus*), per l'assenza di una fossetta mediana basale del pronoto (presente sul pronoto di *ceylonicus*) e per le elitre più corte del pronoto (elitre lunghe quanto il pronoto in *ceylonicus*).

Zyras (Pella) beijingorum sp. n. Figg. 262-263

Holotypus ♀, China, Beijing, Xiaolongmen, 1100-1500 m, 1.VII.1993, de Rougemont leg. (MHNG).

DESCRIZIONE. Lunghezza 4,8 mm. Corpo lucido. Capo e pronoto bruni, elitre giallo-brune con macchia laterale bruna, addome bruno con margine posteriore dei due uroterghi basali largamente giallo-bruni, degli uroterghi terzo e quarto strettamente rossiccio, apice addominale bruno-rossiccio; antenne bruno-rossicce con i tre antennomeri basali rossicci; zampe rossicce. La reticolazione del capo e dell'addome è distinta, quella addominale è a maglie molto trasverse, quella del pronoto è superficiale e quella delle elitre è netta. Il capo presenta una fossetta trasversa tra le antenne e i tubercoletti che coprono la superficie salienti. Il pronoto presenta una superficie coperta di tubercoletti distinti, le elitre li ha quasi indistinti. Spermateca fig. 263.



FIGG. 257-263

Habitus, edeago in visione laterale e ventrale, spermateca e sesto urotergo libero del maschio. 257-261: *Zyras (Pella) micropterus* sp. n.; 262-263: *Zyras (Pella) beijingorum* sp. n.

Comparazioni. La nuova specie è distinta da Z. *coloratus* Cameron, 1939, dell'India, per le elitre giallo-brune con macchia laterale bruna (elitre bruno-rossicce in *coloratus*), per il capo nettamente più stretto del pronoto (capo poco più stretto del pronoto in *coloratus*) e per gli uroterghi basali privi di punteggiatura al di fuori dei tubercoletti marginali.

Zyras (Zyrastilbus) adesi sp. n. Figg. 264-267

Holotypus ♂, Hong Kong, Kadoorie Agricultural Research Centre, flight interception trap, 19-31.V.1996, de Rougemont leg. (MHNG).

Paratypi: 415 es., stessa provenienza, ma anche IX-X.1991, G. Ades leg., VI.1992, G. Ades leg., V-VIII.1996, de Rougemont leg., IX.1996, de Rougemont; 6 es., Hong Kong, Tai Po, VIII.1992, J. Fellow leg. e VI.1996, de Rougemont leg.; 12 es., Hong Kong, Ng Kai Tin, Malaise trap, 23.VIII.1996, G.T. Reels leg.

Descrizione. Lunghezza 3,9 mm. Capo ed elitre debolmente lucidi, pronoto opaco, addome lucidissimo. Capo ed elitre bruni, pronoto bruno-rossiccio, addome giallo-rossiccio; antenne bruno-rossicce con gli antennomeri terminali da 8° a 11° giallo-rossicci; zampe giallo-rossicce. La reticolazione del capo è vigorosa. Il pronoto è coperto da tubercoletti contigui a diametro maggiore sulla linea mediana: essi danno un aspetto vellutato o pruinoso alla superficie. Non vi è reticolazione sulle elitre e sugli uroterghi. I tubercoletti della superficie del capo sono indistinti, quelli delle elitre sono fini. La metà posteriore del quinto urotergo libero è coperta da robusta punteggiatura e il sesto urotergo presenta una punteggiatura ancor più robusta. Edeago figg. 265-266, spermateca fig. 267.

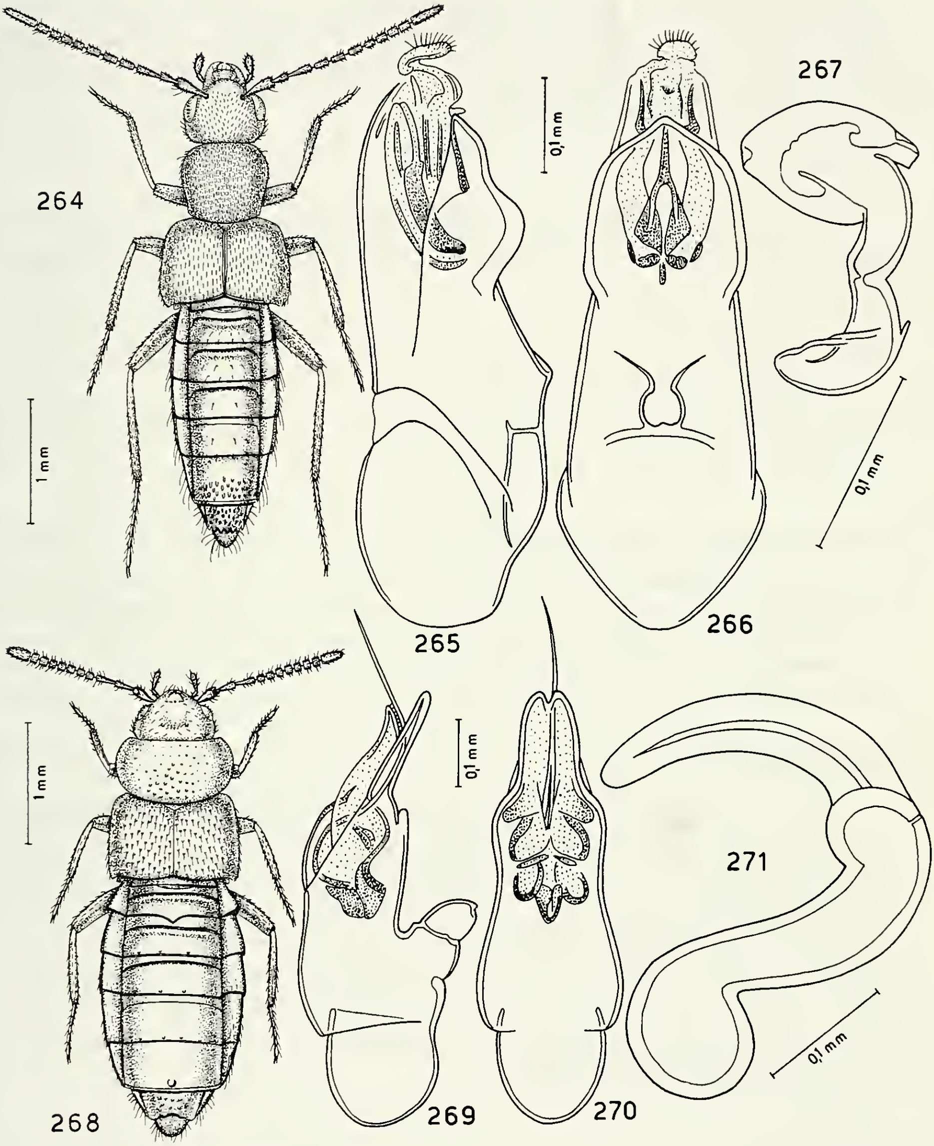
Comparazioni. La nuova specie è distinta da Z. *almorensis* Cameron, 1939, dell'India, per gli occhi più lunghi delle tempie (occhi più corti delle tempie in *almorensis*), per gli antennomeri 4° a 10° non trasversi (trasversi in *almorensis*) e per l'ultimo antennomero lungo quanto i tre antennomeri precedenti compresi insieme (ultimo antennomero lungo quanto i due antennomeri precedenti insieme in *almorensis*).

Etimologia. La nuova specie è dedicata a Garry Ades, zoologo che ha raccolto Aleocharinae in Cina.

Pedinopleurus hongkongicola sp. n. Figg. 268-271

Holotypus ♂, Hong Kong, XII.1995-I.1996, de Rougemont leg. (MHNG).
Paratypi: 2 ♀, stessa provenienza.

Descrizione. Lunghezza 3,8 mm. Corpo lucido e rossiccio con pronoto giallo-rossiccio ed elitre giallo-brune con margine suturale largamente oscurato di bruniccio; antenne rossicce con i due antennomeri basali e la base del terzo giallo-rossicci; zampe rossicce. La reticolazione della superficie del corpo è distinta, quella del pronoto e dell'addome è a maglie trasverse. L'avancorpo è coperto di tubercoletti salienti, essi sul pronoto sono radi in avanti e lateralmente e discretamente fitti dal disco al margine posteriore. Il capo presenta il disco concavo e due pori discali salienti. La stria suturale delle elitre è poco distinta. Edeago figg. 269-270, spermateca fig. 271.



FIGG. 264-271

Habitus, edeago in visione laterale e ventrale e spermateca. 264-267: *Zyras (Zyrastilbus) adesi* sp. n.; 268-271: *Pedinopleurus hongkongensis* sp. n.

Comparazioni. La nuova specie è distinta da *P. indicus* Cameron, 1939, dell'India, per la taglia corporea minore, per gli occhi ridotti e per la presenza di un tubercolo mediano lungo quanto largo al margine posteriore del quinto urotergo libero del maschio (tubercolo trasverso in *indicus*).

ADDENDA

All'elenco delle specie note e nuove per la Cina dato nella parte I della presenta serie di lavori sulle Aleocharinae della Cina vanno aggiunte le seguenti specie:

Medeterusa minima Pace Figg. 170-175

Medeterusa minima Pace, 1987c: 427
13 es., Hong Kong, Tai Po, IV.V.1996, de Rougemont leg.; 1 ♀, Hong Kong, N.T., sifted litter, IX.1996, de Rougemont leg.

Specie finora nota solo del Nepal.

Zyras (Diaulaconia) orientalis Bernhauer Figg. 249-252

Zyras (Diaulaconia) orientalis Bernhauer, 1929: 3
1 ♂, Hong Kong, N.T. Shek Kong, 19.XI.1990, G. Ades leg.; 2 ♂ e 1 ♀, Hong Kong, N.T. Kap Lung, 26.IX.1996, G.T. Reels leg., at light.

Hong Kong è la località tipica di questa specie che è finora nota solo di questa località.

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Abstract. The abstract is in English, composed of the title and a short text of up to 200 words. It should summarise the contents and conclusions of the paper. The abstract is followed by less than 10 key-words, separated by hyphens, which are suitable for indexing.

Introduction. A short introduction to the background and the reasons for the work.

Materials and methods. Sufficient experimental details must be given to enable other workers to repeat the work. The full binominal name should be given for all organisms. The Zoological Code must be strictly followed. Cite the authors of species on their first mention. Use SI units and the appropriate symbols.

Results. These should be concise and should not include methods or discussion. Text, tables and figures should not duplicate the same information. New taxa must be distinguished from related taxa. The abbreviations gen. n., sp. n., syn. n. and comb. n. should be used to distinguish all new taxa, synonymies or combinations. Primary types should be deposited in a museum or similar institution. In taxonomic papers the species heading should be followed by synonyms, material examined and distribution, description and comments. All material examined should be listed in similar, compact and easily intelligible format; the information should be in the same language as the text.

Sex symbols should be used rather than "male" and "female".

Discussion. This should not be excessive and should not repeat results nor contain new information, but should emphasize the significance and relevance of the results reported.

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Penard, E. 1888. Recherches sur le Ceratium macroceros. Thèse, Genève, 43 pp.

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Mertens, R. & Wermuth, H. 1960. Die Amphibien und Reptilien Europas, Kramer, Frankfurt am Main, XI + 264 pp.

Handley, C. O. Jr. 1966. Checklist of the mammals of Panama, pp. 753-795. In: Wenzel R. L. & Tipton, V. J. (eds). Ectoparasites of Panama. Field Museum of Natural History, Chicago, XII + 861 pp.

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The text should be in roman (standard) type face throughout, including headings, with genus and species names underlined with pencil; bold, small capitals, large capitals, italics and other type faces should not be used. Footnotes and cross-references by page should be avoided.

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