Acta Zoologica Hungarica

VOLUME 38, NUMBERS 1–2, 1992

Akadémiai Kiadó, Budapest

ACTA ZOOL. HUNG. 38 (1–2) 1–158 (1992) HU ISSN 0236-7130

ACTA ZOOLOGICA HUNGARICA

A QUARTERLY OF THE HUNGARIAN ACADEMY OF SCIENCES

Acta Zoologica is published in yearly volumes of four issues by

AKADÉMIAI KIADÓ

Publishing House of the Hungarian Academy of Sciences
H-1117 Budapest, Prielle K. u. 19—35

Subscription information

Orders should be addressed to

AKADÉMIAI KIADÓ
P.O.Box 245 H-1519 Budapest

or to its representatives abroad

"This periodical is included in the document delivery program THE GENUINE ARTICLE of the Institute of Scientific Information, Philadelphia. The articles published in the periodical are available through *The Genuine Article* at the Institute for Scientific Information, 3501 Market Street, Philadelphia PA 19104."

Acta Zoologica Hungarica is abstracted/indexed in AGRICOLA, Biological Abstracts, Bibliography of Agriculture, Chemical Abstracts, Current Contents — Agriculture, Biology and Environmental Sciences, Excerpta Medica, Horticultural Abstracts, Hydre — Index, Plant Breeding Abstracts, Nutrition Abstracts and Reviews.

Acta Zoologica Hungarica

Editor-in-Chief

J. Balogh

Assistant editor

J. Papp

Editorial board

I. Andrássy, L. Gallé, T. Jermy, † I. Loksa, S. Mahunka, I. Matskási, † Á. Soós, H. Steinmann, A. Zicsi

Volume 38

Akadémiai Kiadó, Budapest

1992

INDEX

Acta Zoologica Hungarica 38 (1—2), pp. 1—31 (1992)

DIPLOPODA COLLECTED BY THE SOVIET ZOOLOGICAL EXPEDITION TO THE SEYCHELLES ISLANDS IN 1984

S. I. GOLOVATCH & Z. KORSÓS

A. N. Severtzov Institute of Evolutionary Morphology and Ecology of Animals, USSR Academy of Sciences, Leninsky prospect 33, Moscow 117071, USSR

Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross utca 13, Hungary

(Received 5 April, 1991)

A collection of Diplopoda from the Seychelles has turned out to comprise 31 species, of which six are new to science: *Rhinotus densepilosus* sp. n., *?Spirobolellus simplex* sp. n., *?Eucarlia mauriesi* sp. n., *?E. hoffmani* sp. n., *Sechelleptus unilineatus* sp. n. and *Diglossosternoides curiosus* gen. et sp. n. Besides, *Dactylobolus* gen. n. has been erected for *Spirobolus bivirgatus* KARSCH, 1881 and *Mystalides pumilus* ATTEMS, 1910. Three (pan)tropical antropochores are new to the Seychelles fauna: *Rhinotus purpureus* (POCOCK, 1894) (= Orsilochus acuticonus ATTEMS, 1910, = Paraburenia insulana VERHOEFF, 1939, both syn. n.), *Pseudospirobolellus avernus* (BUTLER, 1876) and *Hypocambala helleri* SILVESTRI, 1897. *Solaenobolellus* HOFFMAN, 1981 has been formally synonymized under *Benoitolus* MAURIÈS, 1980, syn. n. *Sechelliosoma* MAURIÈS, 1980, originally proposed as a subgenus of *Cyliosomella* VERHOEFF, 1924, has been elevated to full generic status. A brief zoogeographical analysis of the millipede fauna of the Seychelles (41 species, at least 27 genera, 15 families, and 8 orders) shows the fauna to be a bon mélange of elements of various origins, with Malagasy influence being the strongest, but also with a pronounced participation of Southeastern Asian and Australian (together with Papuan) components. With 54 figures.

Introduction — Upon an agreement between the government of the Republic of Seychelles and the Soviet Union, as a Soviet contribution to the "Man And Biosphere" program, Project No. 7: "Natural Resources of Islands and their Rational Use", on board the research vessel "Akademik Alexandr Vinogradov", in July—August of 1984 a team of Soviet zoologists visited several islands of the Seychelles Republic. The soil biologists Drs S. I. GOLOVATCH, L. B. RYBALOV, A. A. ZAKHAROV, G. M. DLUSSKY (all from Moscow), and L. FILATOVA (Vladivostok) managed, among other soil/litter invertebrates, a good number of millipedes. The purpose of the present paper is to put on record this fine collection. Besides, a sample containing another new species and belonging to the collection of the Zoological Museum of the University of Copenhagen, has been incorporated in our study.

The Seychelles fauna of Diplopoda may be considered as being fairly well-known. Since MAURIÈS (1980a) has already given a complete historical of explorations of the Seychelles millipede fauna, we need not repeat it here. Moreover, MAURIÈS (1980a) provided a full list of the millipedes encountered in that archipelago, as well as presented descriptions of several new taxa and redescriptions of a few poorly known species. Altogether, not fewer than 28 millipede species have hitherto been reported from the Seychelles. Of them, 21 have been rediscovered in the fresh samples at hand, additional 6 appear to be new to science, and 4 more (incl. a *Lophoturus* sp.) new to the fauna of the Seychelles. The material comprising 31 species is mainly deposited in the Zoological Museum of Moscow State University, Moscow (ZMMU), some part has been shared with and/or returned to the Zoological Department of the Hungarian Natural History Museum, Budapest (HNHM), the Senckenberg-Museum, Frankfurt/M. (SMF), and the Zoological Museum of the Copenhagen University, Copenhagen (ZMUC). At the locality data, when otherwise not stated, the collector is the USSR Zoological Expedition.

* * *

Acknowledgements — We are indebted to DRS. J.-P. MAURIÈS (Paris), H. ENGHOFF (Copenhagen) and R. L. HOFFMAN (Martinsville) for sharing their opinions on the identity of some novelties in question.

POLYXENIDA

Lophoproctidae

Lophoturus sp. — Locality: Aldabra, Assumption Atoll, in litter, 12—14. VIII. 1984, 1 ♀ (ZMMU).

Remarks: This species appears to be the first representative of the entire order Polyxenida in the Seychelles millipede fauna. Other congeners are known to be widespread on numerous, even the most remote, archipelagos within the tropical belt (see HOFFMAN 1979). With only one damaged specimen at hand, more material is necessary to establish the identity of the above species.

SPHAEROTHERIIDA

Sphaerotheriidae

Sechelliosoma forcipatum (BRÖLEMANN, 1896) — Localities: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 1 ♂, 1 ♀ and 3 juveniles (ZMMU), 1 ♂ (HNHM). — Silhouette Isl., above La Passe, 2 km E of Mt. Pot-à-Eau, 500 m, tropical mist forest on ridge, 24—25. VIII. 1984, 1 ♂ and 2 ♀♀ (ZMMU). — Félicité Isl., 26—29. VIII. 1984, 1 ♀ and 1 juvenile (ZMMU). Same locality and date, *Calophyllum* forest, 1 ♀ and 1 juvenile (ZMMU). — Material examined: 13 specimens.

Remarks: This species, believed to be endemic to some granitic islands of the Seychelles, has been adequately redescribed and redepicted (as *Cyliosomella furcipatum* — sic !) by MAURIÈS (1980a), who even erected for it a separate subgenus, *Sechelliosoma*. The material at hand fully agrees with the species concept.

The whole combination of the features given by MAURIÈS for his *Sechelliosoma* seems to be very convincing and quite sufficient for allotting *Sechelliosoma* a full generic status.

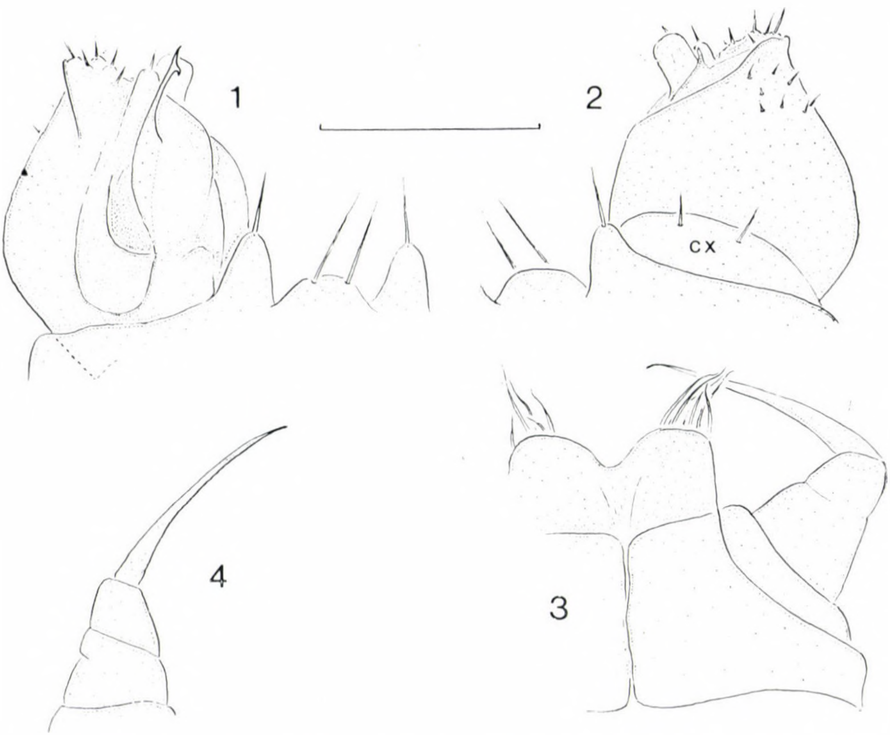
POLYZONIIDA

Siphonotidae

Rhinotus vanmoli MAURIÈS, 1980 — Localities: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 2 ♂♂ and 1 ♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM). — Silhouette Isl., tropical mist forest on ridge, above La Passe, 400 m, on fruits of *Labinia*, 24—25. VIII. 1984, 1 ♀ (ZMMU). — Material examined: 6 specimens.

Remarks: Like *R. crassiceps* (ATTEMS, 1900), this species has two transverse rows of fine, delicate setae, sometimes varying in length from relatively short to short, but the colouration of the sample at hand is uniformly whitish to yellowish. The gonopods show quite a close resemblance with those depicted and described by MAURIÈS (1980a) from the types derived from Silhouette Island. The only difference concerns the presence of a strongly reduced coxite of the anterior gonopods, traceable from the frontal side. This coxal remain carries a couple of strong setae, like in *R. purpureus* and in the new species below (Figs 1—7).

Rhinotus purpureus (POCOCK, 1894) (Figs 1—4) — Localities: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 1 ♂ and 1 ♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM). Same locality, Brillant near Victoria, secondary tropical forest, 30. VIII. 1984, 1 ♂ (ZMMU). — Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 2 ♂♂, 6 ♀♀ (ZMMU), 1 ♂ and 1 ♀ (ZMUC). Same locality and date, in rotten wood, 1 ♂ (ZMMU). Same locality, coconut plantation near soil section, 8. VIII. 1984, leg. L.B. RYBALOV et S.I. GOLOVATCH, 2 ♂♂, 8 ♀♀ and 1 juvenile (ZMMU). — Farquhar Atoll, under *Ficus bengalensis*, 16—19. VIII. 1984, 1 ♂ and 2 ♀♀. Same locality and date, under *Hernandia*, 2 ♀♀. Same locality and date, coconut plantation, under bark, 1 ♂. Same locality, coconut plantation with herbs, ferns & *Tournefortia*, profile 5, site 17, 18. VIII. 1984, leg. L.D. FILATOVA, 2 ♂♂ and 1 ♀. Same locality, a model of soil population in the gradient forest (*Calophyllum*) — coco with *Fimbristylis*, middle part, ca. 250 m offshore from lagoon, 18. VIII. 1984, leg. L.D. FILATOVA, 1 ♀. Same locality, young coconut plantation ca. 150—200 m offshore and N of settlement, with grassland of *Stenotaphrum complanatum*, 16. VIII. 1984, leg. L.B. RYBALOV, 1 ♂ and 1 ♀. Same locality, *Scaevola* bush with sparse coco palms and *Casuarina* trees on lagoon sand embankment ca. 50—70 m off settlement, 17. VIII. 1984, leg. L. B. RYBALOV, 2 ♂♂. Same locality, pitfall traps, line 3, under *Scaevola*, 16—19. VIII. 1984, 1 ♂ and 2 ♀♀. Same locality, under *Scaevola*, singled



Figs 1—4. *Rhinotus purpureus* (POCOCK, 1894): 1—3 = a male from Silhouette Island. 1 = anterior gonopods, frontal view, 2 = anterior gonopods, caudal view, 3 = posterior gonopods. — 4 = telopodite of the left posterior gonopod of a male from Farquhar Atoll. Scale 0.1 mm.

1 ♂ and 1 ♀ (all ZMMU). — Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 2 ♂♂ and 1 ♀ (ZMMU). Same locality and date, 400 m, in rotten *Labinia* fruits, 1 ♀ (ZMMU). — Material examined: 51 specimens.

Remarks: An account of the species name history and its geographical distribution was given by MAURIÈS (1980b). It was originally described from Africa (POCOCK 1894), where it had probably been introduced, and subsequently frequently reported from the native area of the species: Central America, Caribbean Islands, etc. Its occurrence in the samples at hand represents now a species new to the fauna of the Seychelles. In the western part of the Indian Ocean the same species has been reported as *Orsilochus acuticonus* ATTEMS, 1910 (Madagascar) and *Paraburenia insulana* VERHOEFF, 1939 (Mauritius), both syn. n. (s. ATTEMS 1910, VERHOEFF 1939).

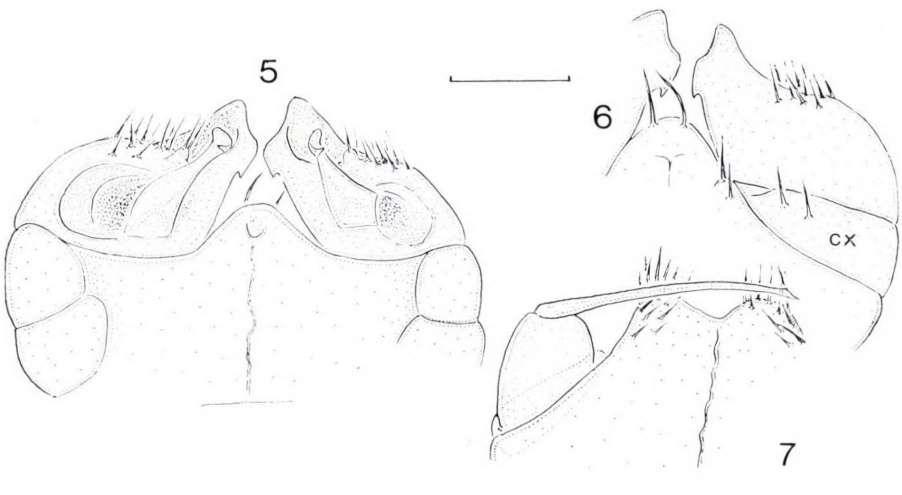
Being an obvious introduction, *R. purpureus* demonstrates a vast distribution in the Seychelles. It occurs both in the seminatural conditions of a mist indigenous forest on granitic islands (Silhouette) and in the evidently deteriorated habitats on granitic islands (Mahé, botanical gardens) and atolls (Poivre, Farquhar).

Rhinotus densepilosus sp. n.
(Figs 5—7)

Localities: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 1 ♂ (holotype). — Silhouette Isl., mist mountainous tropical forest on top of the profile, above La Passe, 560 m, 25. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♂ and 1 juv. ♂. — Material examined: 3 specimens. — Holotype male and 1 juv. male paratype are deposited in ZMMU, 1 male paratype in HNHM.

Description: Length ♂♂ 8—9 mm, juv. 4 mm, midbody width ♂♂ 0.8—0.9 mm, juv. 0.5 mm, number of segments excluding telson 47—48 (♂♂) and 25 (juvenile).

Coloration: Holotype in alcohol marble brownish, with a wide, rather, irregular yellowish-whitish axial stripe on dorsum everywhere but pygidium, which is dark brown. Legs and head (but not antennae) yellowish. Paratype



Figs 5—7. *Rhinotus densepilosus* sp. n., holotype male from Mahé Island: 5—6 = anterior gonopods, frontal and caudal views, respectively, 7 = posterior gonopods. Scale 0.1 mm.

male much paler, uniformly yellowish, but with traces of a whitish axial stripe on dorsum, entire pygidium dark brown.

Eyes rudimentary, blackish: one single big ocellus on each side, antennae very short and clavate, rostrum about two thirds as short as antennae. Ozopores begin from segment 5, where lie evidently more ventrad than on subsequent terga, about midlength of metasomite. Pubescence somewhat shorter to very short, in numerous irregular rows, externally reminding of *Siphonophora;* a couple of strong hairs on vertex. Pilosity in paratype very dense, irregular, relatively long, very fine, the hairs at least in five rows.

Gonopods: Anterior gonopods very much like in *R. crassiceps* (ATTEMS, 1900), but medial sternal elevation carries only a single pair of strong setae (Figs 5—6), coxite traceable on aboral side (*cx* in Fig. 6, like in, e.g., *R. purpureus*), and telopodite stronger subsecuriform distally than in *crassiceps.* Posterior gonopods (Fig. 7) especially abundantly setose on paramedian sternal elevations, telopodite appears to be only two-jointed.

Remarks: This species is marked by its fine, dense and highly irregular pilosity of the metaterga, as well as by certain particulars of the gonopod structure.

SPIROBOLIDA

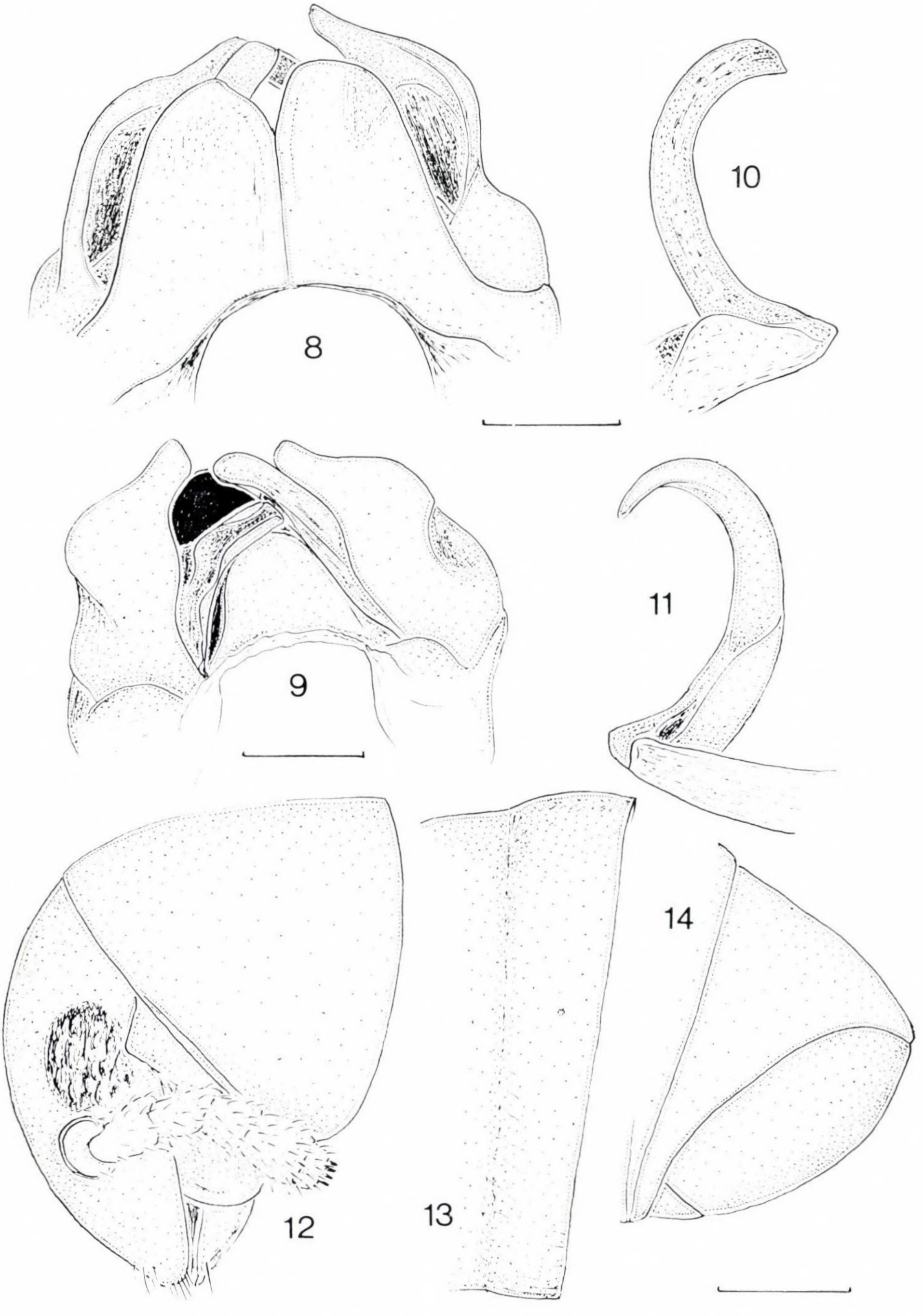
Spirobolellidae

Paraspirobolus dictyonotus (LATZEL, 1895) — Localities: Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 21 ♂♂, 22 ♀♀ and 9 juveniles (ZMMU). Same locality and date, in *Casuarina* litter, 2 ♂♂, 5 ♀♀ and 2 juveniles (ZMMU). Same locality, in rotten wood, 5. VIII. 1984, 13 ♂♂, 12 ♀♀ and 5 juveniles (ZMMU). Same locality, coconut plantation with grass and many coco shells, ca. 350 m S of settlement and 70 m off lagoon coast, 6—7. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 9 ♂♂, 9 ♀♀ and 3 juveniles (ZMMU). Same locality, coconut plantation with single *Scaevola* bushes and herb *Sparobollus*, coastal embankment, 6. VIII. 1984, leg. L. D. FILATOVA, 1 ♀ (ZMMU). Same locality, coconut plantation with *Scinerus*, grazed patch, 6. VIII. 1984, leg. L. D. FILATOVA, 2 ♂♂ and 1 juvenile (ZMMU). Same locality, coconut plantation with ferns and herb *Stenotaphrum*, 7. VIII. 1984, leg. L. D. FILATOVA, 8 ♂♂, 29 ♀♀ and 7 juveniles (ZMMU). Same locality and date, coconut plantation with *Leucenna* fragments, ferns, *Tournefortia*, leg. L. D. FILATOVA, 1 juvenile (ZMMU). Same locality, coconut plantation with *Calocasia* and ferns, 8. VIII. 1984, leg. L. D. FILATOVA, 31 ♂♂, 16 ♀♀ and 19 juveniles (ZMMU), 3 ♂♂ and 3 ♀♀ (HNHM), 2 ♂♂ and 2 ♀♀ (SMF), 2 ♂♂ and 2 ♀♀ (ZMUC). Same locality, singled, 22 ♂♂, ♀♀ and juveniles (ZMMU). Same locality, coconut plantation near soil section, 8. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 3 ♂♂, 11 ♀♀ and 2 juveniles (ZMMU). — Farquhar Atoll, singled, 16—19. VIII. 1984, 1 juvenile (ZMMU). — Silhouette Isl., strand *Calophyllum* and coco forest, fern *Polypodium sphegodes* and herb *Stenotaphrum complanatum* on sand ca. 5—10 m offshore, 25. VIII. 1984, leg. L. B. RYBALOV, 1 juvenile (ZMMU). — Material examined: 280 specimens.

Remark: A species widespread through commerce, it has already been reported from the Seychelles (ATTEMS 1900, MAURIÈS 1980a).

?**Spirobolellus simplex** sp. n.
(Figs 8—14)

Locality: Praslin Isl., 1. IV. 1951, leg. Galathea Expedition, 1 ♂ (holotype) and 1 ♀ (paratype). — Material examined: 2 specimens, both in poor condition. — Holotype male and paratype female are deposited in ZMUC.



Figs 8—14. *?Spirobolellus simplex* sp. n., holotype male from Praslin Island: 8—9 = coleopods frontal and caudal views, respectively, 10—11 = phallopod telopodite. Scale 0.2 mm. — 12 = head and collum, 13 = a midbody ring, 14 = caudal end of body. Scale 0.4 mm.

Description: Length ca. 16 mm (holotype male), and ca. 21 mm (paratype female), width on midbody 1.0 and 1.6 mm, respectively. Body with 34 (—2) and 36 (—1) segments, including telson.

Coloration: Black-brown, metazona marbled and translucent; starting from somites 4—5 dorsum with a paramedian pair of rather wide, pale brownish stripes divided by a similarly wide, blackish, axial stripe until telson; similar but wider and more obscure, paler stripes also ventro-laterally. At least collum and telson a little paler than body rings. Legs and ventrum brownish, also paler than background.

Eyes black, very flat, with about 20 obscure ocelli in a rounded field on each side of head. Antennae very short, clavate (Fig. 12). Supralabral setae 4+4, labral ones 6+6. Collum regularly rounded laterally, with a thin antero-premarginal stria reaching only to lateral curvature. Ozopores obscure, lying at about midlength of metazona. Metazonital striation very thin, rather sparse, incomplete, more or less oblique, far from reaching ozopore level. Prozonital striation even more obscure and more oblique, hardly traceable but sub-ventrally, sometimes almost reaching ozopore level, but normally far below it. Midbody rings modestly constricted (Fig. 13). Epiproct almost continuing outline of rather convex anal valves (Fig. 14), latter very feebly margined, but without traces of a premarginal sulcus.

Legs very short, normal, only male coxae 3 and, less so, 4 somewhat enlarged, being swollen disto-ventrally.

Gonopods (Figs 8—11): Coleopod with a bimodal, medially divided sternum swollen posteromedially in a single, rounded piece; coxites + telopodites only modestly higher than sternum, apically scapuliform, with inner coxal fold being laminate and somewhat groove-shaped. Phallopods unciform, extremely simple, without any traces of outgrowths or lobes more like in e.g., Pseudospirobolellidae.

Remarks: JEEKEL (1986) recently provided an excellent account of Spirobolellidae, with special reference to the Australian fauna. Since the type-species of *Spirobolellus*, *S. chrysodirus* POCOCK, 1894 from Sumatra, is known from the female sex only, the assignment of any species to *Spirobolellus* is bound to be highly arbitrary. Still, *Spirobolellus* s. auct. is a very large genus, with no fewer than 11 generic categories enlisted as its subjective junior synonyms and encompassing at the moment over 80 species from the East Indies, Micronesia, Australia, New Caledonia, Central and Northern America, and the West Indies (except Jamaica) (HOFFMAN 1979, JEEKEL 1986).

Accepting *Spirobolellus* as a temporary accomodation for the above new species, the latter's medially divided sternum of the coleopods deserves special attention. As DR. MAURIÈS (in litt.) pointed out, being a rule in certain American spiroboloids (e.g. Messicobolidae), this character occurs extremely rarely amongst the other Spirobolida. There seems to be only a single hitherto described species vividly resembling *?S. simplex* sp. n., namely *S. chrysogrammus* (POCOCK, 1894) from Celebes, as depicted by CARL (1912b). The similarity is indeed striking, although the coleopods in *?S. simplex* sp. n. appear to be somewhat more elaborate, whereas the phallopods more simple than in *S. chrysogrammus* sensu CARL (1912b). Unfortunately, there are serious doubts if CARL really dealt with POCOCK's species. Besides, to further engrave the situation, Spirobolellidae are known to display quite a degree of variability in coleopod morphology when attaining maturity, with penultimate males displaying particularly simple coleopods (see review in JEEKEL 1986). However, judged from the low (2) number of apodous segments in the holotype of ?S. *simplex* sp. n., we believe we face a fullgrown male possessing the gonopods with fully expressed characters.

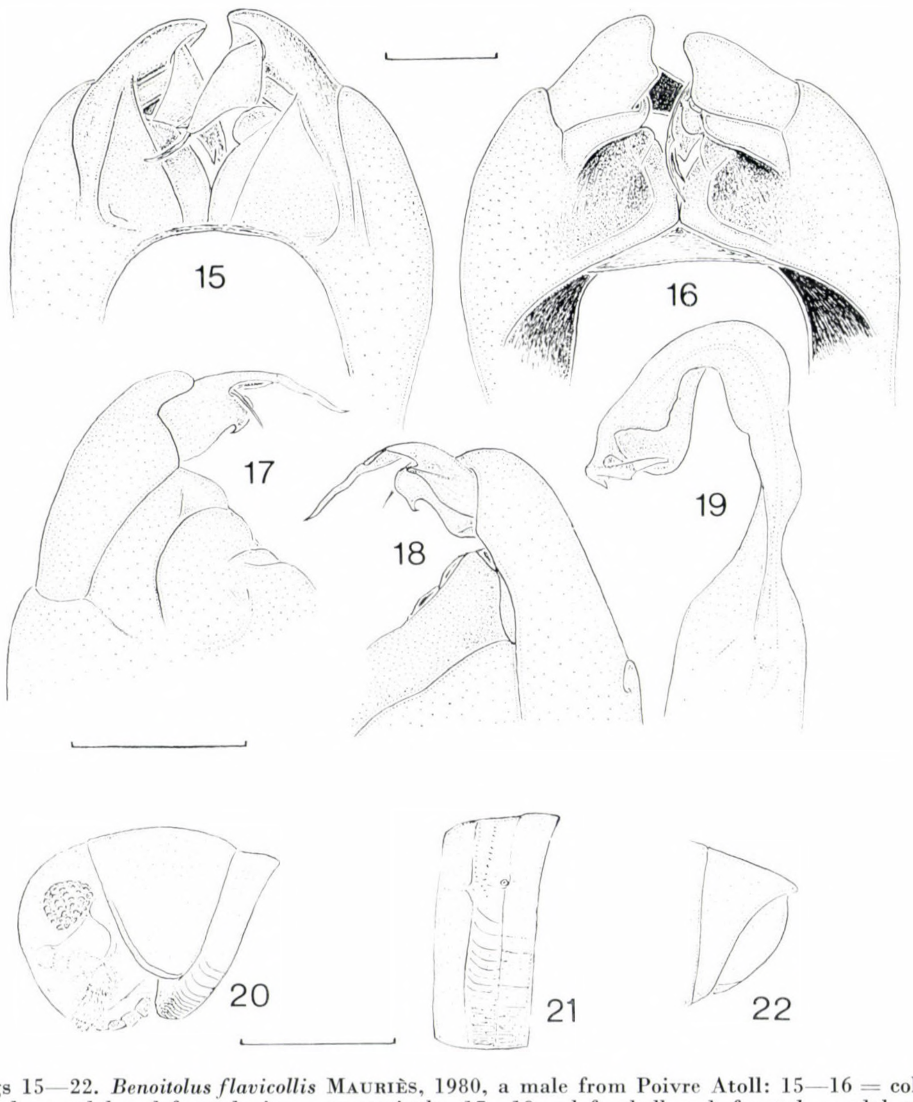
Pseudospirobolellidae

Pseudospirobolellus avernus (BUTLER, 1876). — Localities: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 1 ♂ (HNHM). — Amirantes, Poivre Atoll, coconut plantation, 5—9. VIII. 1984, 1 ♂ (ZMMU). — Félicité Isl., singled 26—29. VIII. 1984, 1 ♂ and 1 ♀ (ZMMU). — Material examined: 4 specimens.

Remarks: This pantropical species has been discussed and adequately illustrated by HOFFMAN (1981). It has been recorded from different islands in the Indian Ocean (e.g. Comoro, Mauritius), being now new to the fauna of the Seychelles !

Benoitolus flavicollis MAURIÈS, 1980 (Figs 15—22). — Localities: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 11 ♂♂, 5 ♀♀ and 1 juveniles (ZMMU), 4 ♂♂ and 4 ♀♀ (SMF), 3 ♂♂ and 3 ♀♀ (HNHM), 3 ♂♂ and 2 ♀♀ (ZMUC). Same locality, Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 2 ♀♀ (ZMMU). — Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 5 ♂♂ and 19 ♀♀. Same locality and date, pitfall traps, 85 ♂♂, ♀♀ and juveniles. Same locality, coconut plantation with grass, ca. 300 m S of settlement, 6. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 295 ♂♂, ♀♀ and juveniles. Same locality, coconut plantation with grass and many coco shells, ca. 350 m S of settlement and 70 m off lagoon coast, 6—7. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 589 ♂♂, ♀♀ and juveniles. Same locality, coconut plantation near soil section, 8. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 594 ♂♂, ♀♀ and juveniles. Same locality, *Cocos nucifera* plantation, rotten wood, 6 ♂♂, 7 ♀♀ and 1 juvenile (all ZMMU). Silhouette Isl., La Passe, 25 m a.s.l., under bark of *Cocos* log, 22. VIII. 1984, 1 ♂ and 3 ♀♀. Same locality, near La Passe, 150 m, 22—25. VIII. 1984, 4 ♂♂, 1 ♀ and 1 juvenile. Same locality, *Cocos* plantation on sandy terrace with *Stenotaphrum complanatum*, pitfall traps, 23—25. VIII. 1984, 3 ♂♂, 5 ♀♀ and 2 juveniles. Same locality, tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 1 ♂ and 3 ♀♀. Same locality, lower forest border with single coco palms, grass *Asistacia* and *Oplismenus*, trees *Cinnamomum*, *Latania*, *Mangolifera*, bush *Tabebia*, slope 15—20 °, 60—70 m a.s.l., E exposition, 24. VIII. 1984, leg. L. B. RYBALOV, 2 ♂♂ and 1 ♀ (all ZMMU). — Praslin Isl., along road to and nearby Vallée-de-Mai, litter, 29. VIII. 1984, 1 ♀ and 5 juveniles. Same locality and date, sifted litter, 3 ♂♂ and 3 ♀♀ (all ZMMU). — No label, 1 ♀ (ZMMU). — Material examined: 1679 specimens.

Remarks: MAURIÈS (1980a, in litt.) described and illustrated his *B. flavicollis* not quite fully, probably due to the limited material he had at his disposal. The abundant samples at hand allow to correct and complete the species variability range quite significantly. Thus at least in Mahé one can notice considerable deviations in both tergal striation and phallopod conformation. Sometimes the collar striae do not extend too much laterally, the body rings' striation is situated rather far below the ozopore level, and the phallopod is relatively slender on the apical third, i.e. close to what MAURIÈS (1980a) noted in the original description. The other extreme in the variation range seems to be especially well represented by Poivre samples (Figs 15—22), often less so by Mahé and Silhouette, when the collar stria practically reaches the caudal margin, the striation on the body rings extends much higher and



Figs 15—22. *Benoitolus flavicollis* MAURIÈS, 1980, a male from Poivre Atoll: 15—16 = coleopods, caudal and frontal views, respectively, 17—19 = left phallopod, frontal, caudal and postero-lateral views, respectively. Scale 0.2 mm. — 20 = head, collum, and first body ring, 21 = a midbody ring, 22 = caudal end of body. Scale 1.0 mm.

almost reaches the ozopore level, behind the suture dividing pro- and mesozona there are two subparallel rows of obscure sigilla starting from about the ozopore level and crossing the entire dorsum, and the phallopod is somewhat thicker and bigger in its distal third. DR. MAURIÈS (in litt.) also advised us that his original illustrations are wrong in showing the collar stria so rudimentarily, and the metazonital striation so low. Our drawings (Figs 15—22) are meant to complete MAURIÈS' (1980a) otherwise good descriptions.

The species has been observed as remarkably abundant on Poivre Atoll, Amirantes, being there a millipede superdominant. As obviously endemic to the Seychelles and most probably originated on the granitic islands, *B. flavicollis* displays, besides the surprisingly pronounced variation range discussed above, a very clear tolerance to synanthropization. We may even predict that, given a chance, it might become some day well established on numerous other oceanic atolls of the tropical belt.

HOFFMAN (in litt.) suggests that his *Solaenobolellus*, a monobasic genus erected for *S. birgitae* HOFFMAN, 1981 from Thailand, is probably nothing else but a junior synonym of *Benoitolus*. Indeed, the similarity between the two genera/species concerned is striking enough to agree with his opinion, with *Benoitolus* having a year's priority over *Solaenobolellus* (syn. n.). Differences between both species, however, are unquestionably strong enough to keep them separate, in particular due to the presence of sole pads, somewhat slenderer phallopods, distally less clear-cut telopodite of the coleopods in *B. birgitae* (comb. n.).

With the above synonymy confirmed, we think it also appropriate to reallocate *Benoitolus* within Pseudospirobolellidae, following HOFFMAN (1981). Besides, MAURIÈS (1980a) also admitted the somewhat arbitrary placement of his *Benoitolus* within Spirobolellidae, regarding the alternative Pseudospirobolellidae plausible as well.

As a result, *Benoitolus* may be regarded as a genus more probably southeastern Asian than Seychellean in origin, thus providing another good example of ancient zoogeographic connections between the millipede faunules of Southeast Asia and the Seychelles.

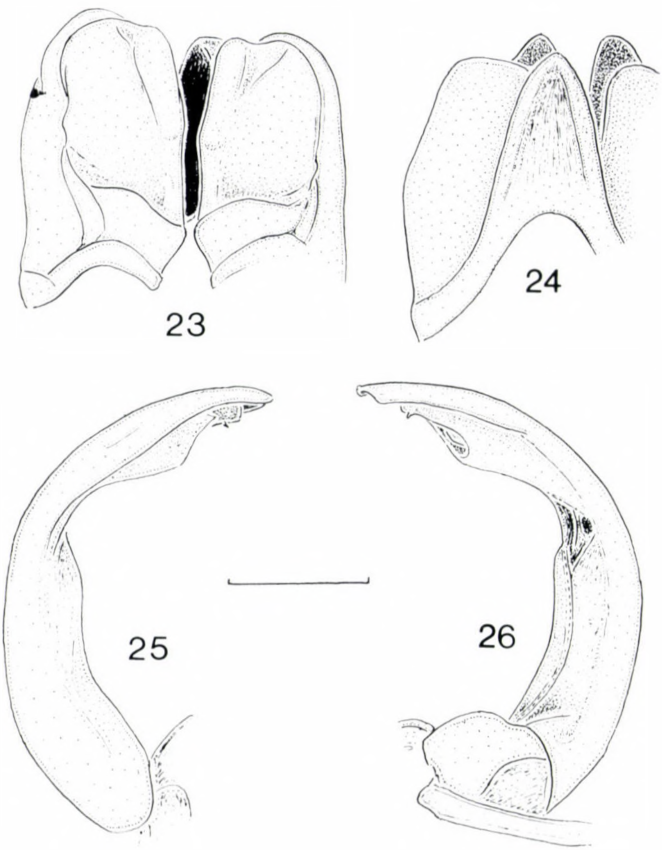
Pachybolidae

?Eucarlia urophora (POCOCK, 1893) (Figs 23—26). — Localities: Aldabra' Assumption Atoll, 12—14. VIII. 1984, 1 ♂ (ZMMU). — Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 1 ♀ (ZMMU). Same locality and date, 480 m a.s.l., leg. L. D. FILATOVA, 1 ♂ (ZMMU). Same locality, in forest of *Albinia*, 24. VIII. 1984, leg. L. D. FILATOVA, 1 ♂ and 3 ♀♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM). — Material examined: 9 specimens.

Remarks: This poorly known species originally described from Mahé (POCOCK 1893) from a single female has since been only once adequately redescribed and illustrated (ATTEMS 1900) sub *Trigoniulus urophorus*. Later, when splitting the obviously too commodius *Trigoniulus*, Attems (1938, 1953) referred this species to *Eucarlia* s. str. Mauriès (1980a) practically agreed with this reallocation, although with reservations, as *Eucarlia* (?) *urophorus* (sic !).

The new samples at hand appear to be somewhat different from what Attems (1900) depicted, in particular the phallopod (Figs 25—26) does not have any proximal mesial branch ("H" in Fig. 35, Attems 1900). Due to this, the resemblance with *Eucarlia* (the type-species *Trigoniulus velox* Carl, 1912 from the Aru and Kei Islands) becomes especially clear at least in phallopod conformation.

If those small differences (cp. Figs 34—36 in Attems 1900 and our Figs 23—26) are not an artifact, and actually two different species possessing the dramatically curved epiproct inhabit the Seychelles, we face a dilemma, for Attems' (1900) assignment of his samples to *urophorus* is no less arbitrary



Figs 23—26. *?Eucarlia urophora* (Pocock, 1893), a male from Assumption Atoll: 23—24 = coleopods, caudal and frontal views, respectively, 25—26 = phallopod telopodite. Scale 1.0 mm.

than ours, same as synonymization of "Spirobolus" *curvicauda* de SAUSSURE et ZEHNTNER, 1897, from Madagascar, under "Spirobolus" *urophorus* (s. SAUSSURE & ZEHNTNER 1902).

Another difficulty arises from the fact that practically the entire classification of Pachybolidae is a real mess. Prior to a thorough revision of this family, almost any generic allocation ought to be understood as temporary. In HOFFMAN's (1979, in litt.) opinion, the name *Eucarlia* should be retained solely for the Papuan species having the deeply indented distal edge of the coleopod telopodite as in *velox* and a few others. However, if one uses this highly stringent definition of *Eucarlia*, a lot of forms from the East Indies and elsewhere would have to be merged/remerged with the big lump which represents nowadays the genus *Trigoniulus*. Therefore, we prefer rather to somewhat broaden the concept of *Eucarlia* stressing the complete absence of a distinct solenophorous branch on the phallopod as the only guideline feature. So redefined for the time being, *Eucarlia* appears to incorporate several Seychelles pachybolids, including *urophora*, although with inevitable qualifications.

?Eucarlia mauriesi sp. n.
(Figs 27—33)

Locality: Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 4 ♂♂, 6 ♀♀ and 1 juvenile, 1 ♂ and 1 ♀♀. — Material examined: 13 specimens. — Holotype male, 3 male, 6 female and 1 juvenile paratypes are deposited in ZMMU, 1 male and 1 female paratypes in HNHM.

Etymology: The species name honours DR. J.—P. MAURIÈS (Paris), prominent specialist in Diplopoda, whose contributions to the Seychelles fauna served us as the main guideline (MAURIÈS 1980a).

Description: Length ca. 32—39 (♂♂) and 35—46 mm (♀♀), width 4.0—4.4 (♂♂) and 4.6—6.5 mm (♀♀). Holotype ♂ ca. 39 mm long and 4.4 mm wide. Number of segments excluding telson 44(0), 46(0) and 50(0) (♂♂, last the holotype) and up to 47—50(0) (♀♀).

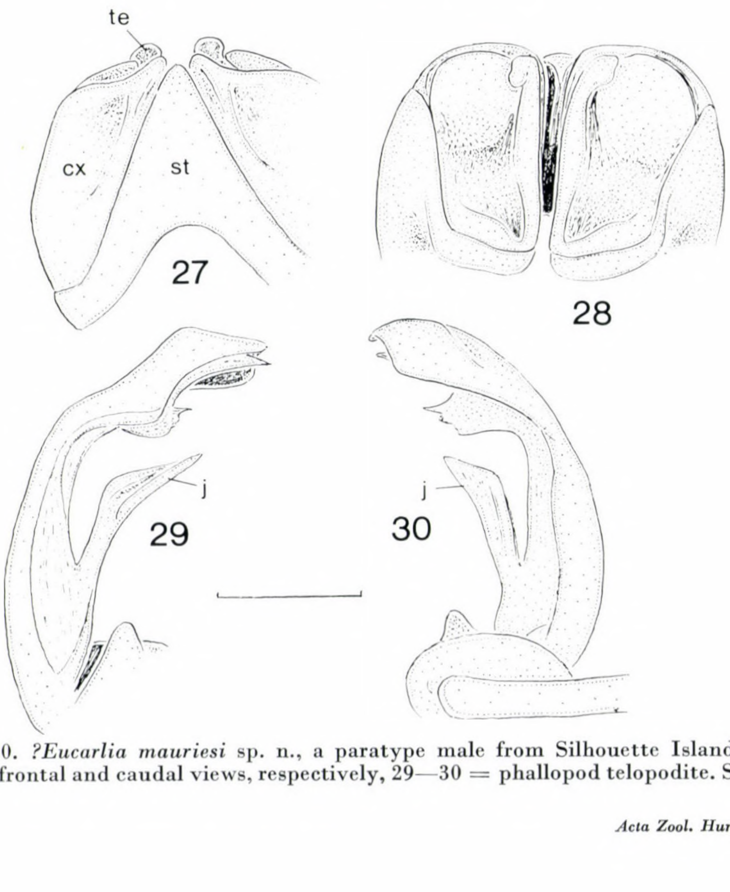
Coloration: Holotype orange-pinkish, with a broad (narrow only on collum), uniformly orange, axial stripe, sides (dark) grey-brown, very modestly annulated due to darker pinkish metazona, closer to and on ventrum gradually turning pale orange, antennae pinkish(-yellowish), legs orange(-yellowish). Paratypes same, sometimes a little more or less bright.

Body cylindrical, anterior postcollar constriction absent, body parallel-sided from collum until last 8—10 somites whereupon rather rapidly attenuating. Antennae relatively slender (Fig. 31), long, apically with four normal sensory cones. Cheeks moderately excavated for antennae to hinge into. Eyes (blackish-)brown, somewhat underdeveloped, about 20 indistinct ocelli in a relatively small, rounded ocular field on each side of head. Frontal suture distinct. Labrum typical, deeply notched, with three medial teeth. Labral setae

6—7+6—7, supralabral setae 2+2, very widely separated on each side. Collum (Fig. 31) laterally normally rounded, stria along anterior margin well-developed, reaching to caudal margin. Surface generally smooth, dull. Metazonital striation rather dense and regular ventrad, tending to grow less regular toward pore-level, with traces sometimes even above pores (Fig. 32); prozonital striation extremely delicate, net-like, oblique, better expressed ventrad and closer to suture between pro- and metazona. Latter suture very poorly developed, almost no constriction, traceable rather as a row of minute sigilla crossing entire dorsum. Tergal limbus practically even, devoid of crenulation. Ozopores inconspicuous, lying in very shallow excavations just behind/at suture, starting from somite 6. Epiproct (Fig. 33) practically wanting, anal valves with a very modest sulcus along margin.

♂♂ legs rather short, stout, pregonopodal coxae ventrally somewhat swollen, more so on pairs 3—4, tarsi of holotype with evident sole pads until the last body quarter, sometimes absent, claws very long, curved, dorsally with a spiniform seta at base, all podomeres sparsely setose.

Gonopods: Coleopods (Figs 27—28) with subtriangular, relatively narrowly rounded sternum (*st*) almost as high as coxites (*cx*), latter subtending



Figs 27—30. *?Eucarlia mauriesi* sp. n., a paratype male from Silhouette Island: 27—28 = coleopods, frontal and caudal views, respectively, 29—30 = phallopod telopodite. Scale 1.0 mm

subquadrate telopodites (*te*); latter with prominent, pubescent swellings on distal half, mesially with rounded ridges turning into thumb-shaped processes at tip. Phallopods (Figs 29—30) unusual in having a strong, lobe-shaped, parabasal, mesial process (*j*) proximad of rather inconspicuous solenophorous part.

Remarks: Differs primarily by the characteristic shape of the phallopod, particularly by its parabasal process and distal fringes.

?**Eucarlia hoffmani** sp. n.
(Figs 34—40)

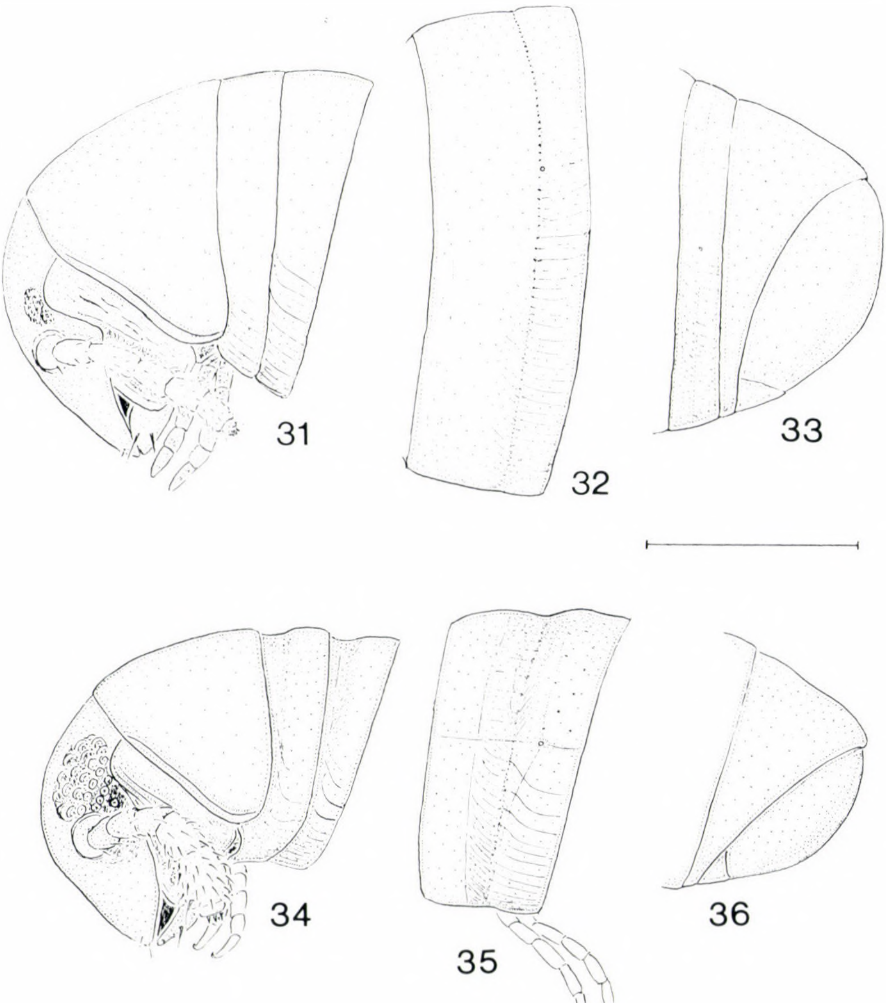
Localities: Farquhar Atoll, coconut plantation with herbs, ferns and *Tournefortia*, profile 5, site 7, 18. VIII. 1984, leg. L. D. FILATOVA, 10 juveniles and 1 fragment. Same locality, sparse coconut plantation with fragments of *Scaevola*, profile 5, site 23, 17. VIII. 1984, leg. L. D. FILATOVA, 1 ♀ and 5 juveniles. Same locality, *Cocos*, profile 5, site 11, 18. VIII. 1984, leg. L. D. FILATOVA, 13 juveniles and 1 fragment. Same locality, *Scaevola* bush with sparse coco palms and *Casuarina* trees on lagoon sand embankment ca. 50—70 m off settlement, 17. VIII. 1984, leg. L. B. RYBALOV, 1 ♀ and 10 juveniles. Same locality, coconut plantation with some *Casuarina* trees ca. 100 m W offshore & 0.5 km S of settlement, 16—17. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♂ (holotype), 3 ♀♀, 2 juv. ♂♂, and 12 juveniles. — Without number, 1 ♀ and 1 juv. ♂ (HNHM), 3 juveniles (ZMMU). — Material examined: 63 specimens. — Holotype male, 5 female and 55 juvenile paratypes are deposited in ZMMU, 1 female and 1 juv. male paratype in HNHM.

Etymology: The species name honours PROF. RICHARD L. HOFFMAN, father of modern diplopodology, whose help and encouragement are noteworthy.

Description: Length of adults and subadults 18—19 (♂♂) and 19—23 mm (♀♀), width 1.4—1.5 (♂♂) and 1.8—1.9 mm (♀♀). Holotype ca. 19 mm long and 1.5 mm wide. Number of segments of both adults and subadults (without telson) 36—38, holotype with 37(0) body rings.

Coloration: Holotype rather uniformly dark grey-brown, somewhat annulated due to pale (yellow-)whitish rear third to quarter metazona; prozona entirely (yellowish-)white, mesozona marble-brown, remaining metazona (blackish-)brown; legs (pinkish-)white, antennae and ventrum pale brownish to whitish. Paratypes sometimes slightly paler or darker, but pattern remains quite constant.

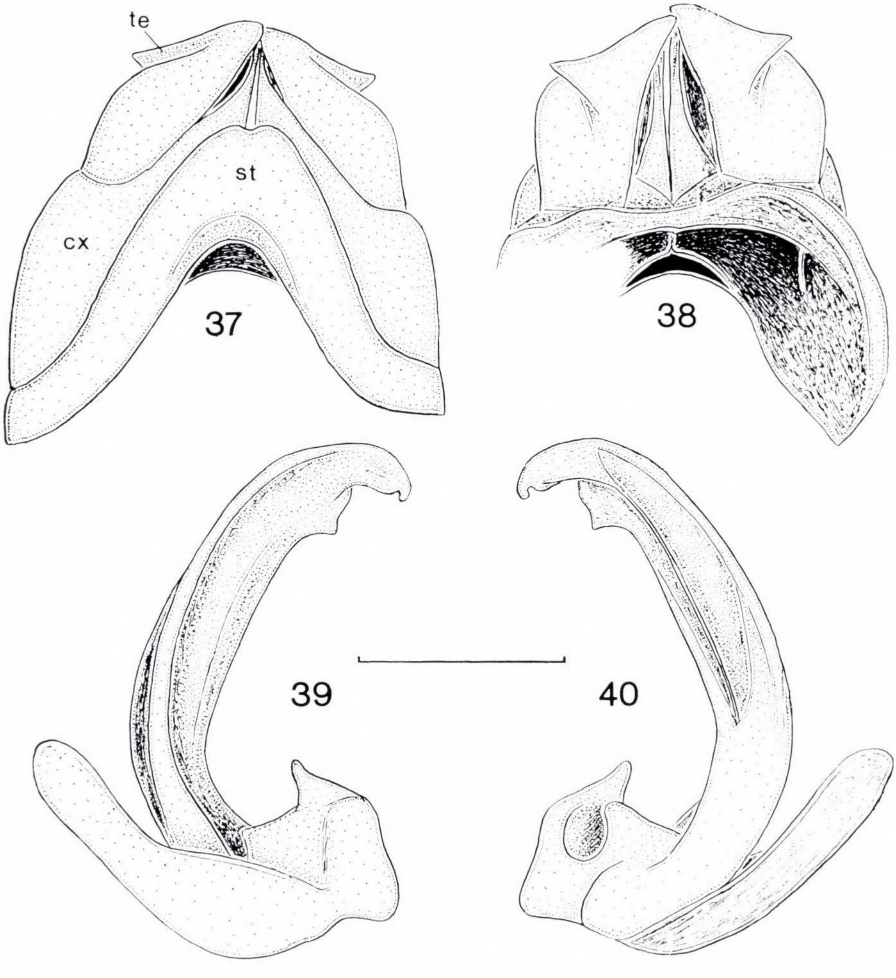
Body relatively slender, slightly moniliform, cylindrical, with anterior postcollar constriction rather evident (somites 2—5), onward parallel-sided, very poorly and gently attenuating on 6—7 penultimate somites, rapidly tapering only on telson. Antennae (Fig. 34) moderately long, clavate, cheeks prominently excavated for antennae to hinge into. Eyes very large, rounded, ocelli convex, black, ca. 35 in each ocular field. Collum normal, premarginal stria anterolaterally reaching to caudal edge, not subtended ventrally by projection on somite 2. Frontal suture distinct. Labrum normal; supralabral setae 2+2, very widely separated and rather poorly set apart from 6—7+6—7 labral setae. Surface dull, smooth. Metazonital striation distinct, sparse, rather far from reaching pore-level; mesozona striated more densely and faintly, with traces of striae over (almost) entire dorsum; prozona completely smooth. Sutures between zona rather distinct, constriction between meso- and metazona very well-developed (Fig. 35), also emphasized by a row of sigilla over entire dorsum. Hind tergal limbus practically even. Ozopores lying at about 1/3 of metazonital length behind suture (Fig. 35), starting from somite 6. Epiproct very poorly developed, just a bit hanging over caudal outline of anal valves (Fig. 36); latter very faintly sulcate along caudal margin.



Figs 31—33. *?Eucarlia mauriesi* sp. n., a paratype male from Silhouette Island: 31 = head, collum and first rings of body, 32 = a midbody ring, 33 = caudal end of body. Scale 2.0 mm. — Figs 34—36. *?Eucarlia hoffmani* sp. n., a paratype male from Farquhar Atoll: 34 = head, collum and first rings of body, 35 = a midbody ring, 36 = caudal end of body. Scale 1.0 mm.

Legs relatively long, slender, when stretched, well surpassing half of midbody diameter in adults. ♂♂ with distinct tarsal sole pads gradually coming to naught till segment 18; ♂♂ coxae 3—4 moderately swollen distoventrally; claws very long, curved, dorsally at base with a moderately long seta; podomeres sparsely setose.

Gonopods: Coleopods (Figs 37—38) with a low, prominent, apically very poorly bimodal sternum (*st*); coxite low, simple, mesially with a ridge-like lobe tending to subtend high telopodite (*te*); latter also simple, somewhat higher than coxa, with a peculiar, triangular, prominent outgrowth distolaterad, apically almost pointed. Phallopod (Figs 39—40) simple, with a coxal



Figs 37—40. *?Eucarlia hoffmani* sp. n., holotype male from Farquhar Atoll: 37—38 = coleopods, frontal and caudal views, respectively, 39—40 = phallopod telopodite. Scale 0.5 mm.

vesicle and a subtriangular projection, without distinct branches mesally, distally with a subtriangular, phylloid lobe, apically narrowly unciform.

R e m a r k s : Differs from congeners by the particularly simple phallopod, as well as by the peculiar shape of the coleopod.

Interestingly, the subadults and adults of this species are extremely difficult to distinguish, for they differ only in the degree of development of the genitalia and some correlated characters. Moreover, the largest specimens at hand overlap in the number of somites. Thus, the single mature male (holotype), also easily recognizable due to the well-developed tarsal pads, has 37(0) body segments, while this number in subadult males varies from 36(0—1), 37(0—4) up to 38(0—3). The same occurs in females, with both adults and subadults having 36(—1), 37(0) to 38(0) somites. Only dissecting reveals the state of development of the vulvae. This strange overlap is perhaps evidence of periodomorphosis.

The fact that *?E. hoffmani* sp. n. has so far been encountered only on a small atoll island lying closer to Madagascar than to the main Seychelles implies that we face an obvious introduction. Indeed, it is just impossible to believe that a local endemic could have evolved on Farquhar, this statement being further reinforced by the evidence that all the other millipede species met on that atoll (5) appear to be introductions widespread through commerce. The source area of *?E. hoffmani* sp. n. is still to be discovered.

Leptogoniulus naresi (Pocock, 1893) — L o c a l i t i e s: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 10 ♂♂, 6 ♀♀ and 14 juveniles (ZMMU), 3 ♂♂ and 3 ♀♀ (HNHM), 1 ♂, 1 ♀, 2 juveniles (ZMUC). Same locality, Brillant near Victoria, secondary tropical forest, 30. VIII. 1984, 2 ♂♂, 3 ♀♀ and 1 juvenile (ZMMU). Same locality, Agricultural Experimental Station, on vegetation, 1. VIII. 1984, 6 ♂♂, 4 ♀♀ and 1 juvenile (ZMMU). Same locality, secondary forest near Victoria, 21. VIII. 1984, 1 ♀ (ZMMU). — Farquhar Atoll, 16—19. VIII. 1984, 3 ♀♀ and 4 juveniles. Same locality, *Scaevola* bush with sparse coco palms and *Casuarina* trees on lagoon sand embankment ca. 50—70 m off settlement, 17. VIII. 1984, leg. L. B. Rybalov, 5 juveniles. Same locality, coconut plantation with herbs, ferns and *Tournefortia*, profile 5, site 17, 18. VIII. 1984, leg. L. D. Filatova, 7 juveniles. Same locality and date, sparse coconut plantation with fragments of *Scaevola*, profile 5, site 23, 1 juvenile. Same locality, *Cocos*, profile 6, site 11, 5 juveniles. Same locality, young coconut plantation ca. 150—200 m offshore and N of settlement, with grassland of *Stenotaphrum complanatum*, 16. VIII. 1984, leg. L. B. Rybalov, 1 juvenile. Same locality, *Scaevola* bush with sparse coco palms and *Casuarina* trees on lagoon sand embankment ca. 50—70 m off settlement, 17. VIII. 1984, leg. L. B. Rybalov, 1 ♀. Same locality and date, under *Scaevola* bushes, pitfall traps, line 3, 1 juvenile. Same locality and date, *Cocos* plantation, singled, 1 juvenile (all ZMMU). — Silhouette Isl., near La Passe, 22—25. VIII. 1984, 2 ♂♂, 6 ♀ and 1 juvenile. Same locality, *Cocos* plantation on a sandy terrace with *Stenotaphrum complanatum*, pitfall traps, 23—25. VIII. 1984, 1 ♀ and 4 juveniles. Same locality, tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 8 ♂♂, 8 ♀♀ and 3 juveniles. Same locality, La Passe, 25 m a.s.l., under bark of *Cocos* log, 22. VIII. 1984, 33 ♂♂, ♀♀ and juveniles. Same locality, coconut stand among huge stones near a path above La Passe, 25 m a.s.l., 23. VIII. 1984, leg. L. B. Rybalov, 3 ♀♀ and 5 juveniles. Same locality, lower forest border with single coco palms, grass *Asistacia* and *Oplismenus*, trees *Cinnamomum*, *Latania*, *Mangolifera*, bush *Tabebia*, slope 15—20°, 60—70 m a.s.l., E exposition, 24. VIII. 1984, leg. L. B. Rybalov, 1 ♂, 1 juv. ♂, 1 ♀ and 1 juvenile. Same locality, strand *Calophyllum* and coco forest, fern *Polypodium sphegodes* and herb *Stenotaphrum complanatum* on sand, ca. 5—10 m offshore, 25. VIII. 1984, leg. L. B. Rybalov, 1 ♀. Same locality, forest of *Albinia*, 24. VIII. 1984, leg. L. D. Filatova, 2 ♀♀. Same locality, tropical forest above La Passe on top of profile, 480 m. a.s.l., 23. VIII. 1984, leg. L. D. FILATOVA, 1 ♀ (all ZMMU). — Félicité Isl., 26—29. VIII. 1984, 1 ♀ and 4 juveniles. Same locality, *Calophyllum* spinney ca. 30 m offshore, 2 m a.s.l., with *Ipomea* at the beginning of the profile, 27. VIII. 1984, leg. L. B. RYBALOV, 1 juvenile. Same locality, coconut plantation with *Stachytorpheta*, *Stenotaphrum* and *Desmodium* on a flat sand terrace ca. 30 m offshore, NE part, 28. VIII. 1984, leg. L. B. RYBALOV, 1 ♂, 1 ♀ and 1 juvenile. Same locality and date, on terrace, singled, 1 ♂, 3 ♀♀ and 1 juvenile. Same locality and date, profile 6, site 3, *Cocos*, leg. L. D. FILATOVA, 4 ♀♀ and 1 juv. male. Same locality and date, site 2, 8 juveniles (all ZMMU). — La Digue Isl., 28. VIII. 1984, 2 ♂♂, 6 ♀♀ and 1 juvenile (ZMMU). — Praslin Isl., along road to and nearby Vallée-de-Mai, 29. VIII. 1984, 6 ♂♂, 10 ♀♀ and 9 juveniles. Same locality and date, secondary forest near Vallée-de-Mai, 3 ♂♂, 2 ♀♀ and 2 juveniles. Same locality and date, in leaves, 1 juvenile. Same locality and date, sifted litter, 1 ♀ (all ZMMU). — Material examined: 239 specimens.

Remark: A pantropical species, it has already been recorded from the Seychelles (POCOCK 1893, BRÖLEMANN 1896, ATTEMS 1900, MAURIÈS 1980a).

Trigoniulus lumbricinus (GERSTÄCKER, 1873) — Localities: Mahé Isl., Agricultural Experimental Station, on vegetation, 1. VIII. 1984, 1 ♂ (ZMMU). — Farquhar Atoll, under *Hernandia*, 16—19. VIII. 1984, 2 juveniles (ZMMU). — Material examined: 3 specimens.

Remarks: This species has already been mentioned from the Seychelles Islands by MAURIÈS (1980a), as *Trigoniulus goesi* (PORAT, 1876). It is a pantropical species, and some comments on its geographical and morphological variability have recently been made by GOLOVATCH & KORSÓS (1990).

Dactylobolus gen. n.

Type-species: *Spirobolus bivirgatus* KARSCH, 1881.

Etymology: The name derives from the presence of a fingershaped process on the aboral side of the coleopod telopodite, a character singular for Pachybolidae.

Diagnosis: A relatively small pachybolid, 25—30 mm long, body typically with about 40 segments. Lateral side of head excavated as a shallow antennal groove but lacking an acutely edged overhanging laterad of ocellaria. Ocelli rather small, numerous, typically about 35 in each ocular field, well-developed. Supralabral setae 2+2, very widely separated; labral setae 6—7+6—7. Antennae short, robust, apically with four normal sensory cones. Collum normal, laterally broadly rounded, not subtended ventrally by projection of somite 2. Segments almost not constricted, very delicately rugose, subventrally striation denser, more longitudinal, growing increasingly oblique dorsad on pro- and mesozona and even slightly surpassing pore-level there but not on metazona. Pores starting from somite 6, lying just in front of suture between meso- and metazona. Dorsum smooth on prozona, with scattered horseshoe-shaped markings on mesozona, and scattered simple pits on metazona. Legs short, male tarsi with sole pads excepting a few posteriormost legpairs, male coxae 3—7 ventrally swollen. Epiproct short, blunt, posterior edge only slightly produced.

Coleopods (Figs 41—42) very stout and strong; sternite (*st*) high, somewhat shorter than both coxite (*cx*) and telopodite (*te*); coxa not subtending telopodite; latter apically produced into a lobe, on aboral side with a characteristic ridge-like finger (*f*). Phallopods (Figs 43—45) with traces of (?)primary articulation at midlength (*k*), free solenomerite (sub)apical and surrounded with more or less phylloid structures.

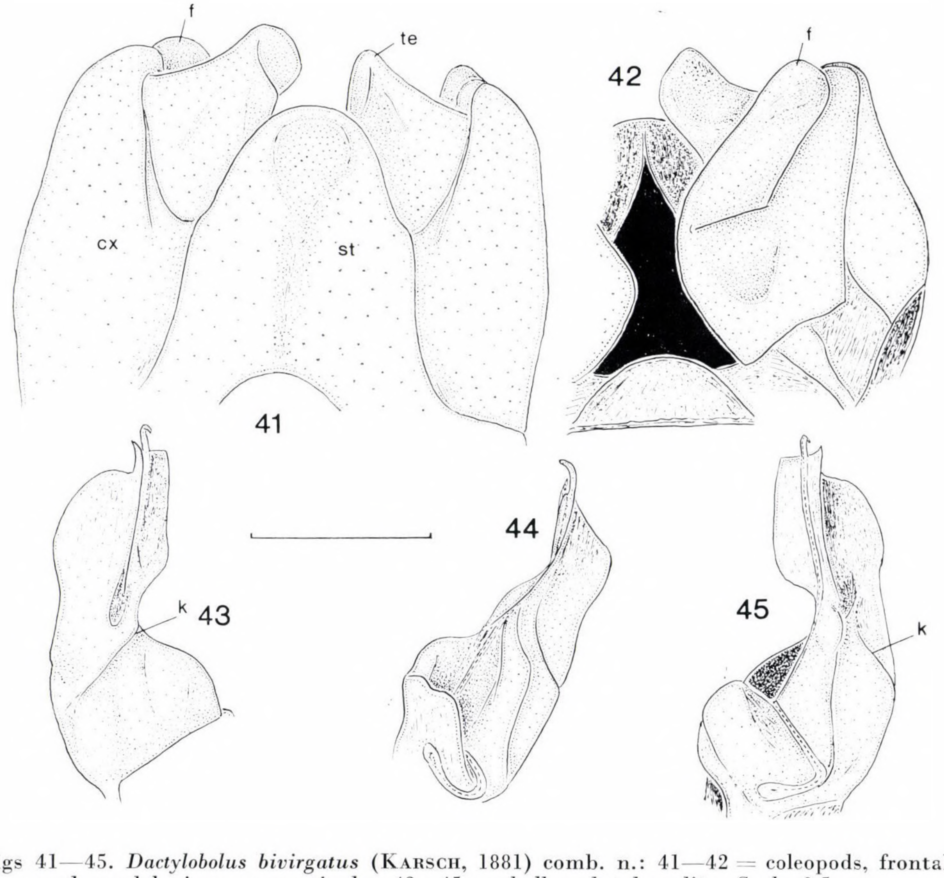
Remarks: Even though *Dactylobolus* gen. n. is really rather close to *Stenobolus* (CARL 1918, HOFFMAN 1962), we perceive the affinities as probably better expressed with *Spiromimus* DE SAUSSURE et ZEHNTNER, 1901 and *Pygodon* DE SAUSSURE et ZEHNTNER, 1901 (both from Madagascar, with the latter perhaps being just a subgenus or even a strict synonym of the former, which is more in accordance with BRÖLEMANN 1914 than with HOFFMAN 1979) as well as with *Atlanticobolus* HOFFMAN, 1979, judged from the phallopod conformation and, in particular, the retension of (?pseudo)segmentation. However, the coleopod morphology and, especially, the development of a finger on the aboral side of the telopodite are unique.

Dactylobolus bivirgatus (KARSCH, 1881) comb. n.
(Figs 41—45)

Localities: Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 1 ♀ and 7 juveniles (ZMMU). Same locality and date, in *Casuarina* litter, 1 juvenile (ZMMU). Same locality, coconut plantation, in rotten wood, 5. VIII. 1984, 1 ♂ and 6 ♀♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM). — Aldabra, Assumption Atoll, 12—14. VIII. 1984, 2 juveniles (ZMMU). Same locality and date, in scrub, 10 juveniles (ZMMU). Same locality and date, pitfall traps, line 2, 3 juveniles (ZMMU). Same locality and date, under *Terminalia*, 1 ♂, 1 ♀ and 2 juveniles (HNHM). Same locality, *Casuarina* on southern coast, 13. VIII. 1984, 10 juveniles (ZMMU). Same locality, *Scaevola*, *Tournefortia* and *Surinama* bush on sand embankment S of settlement, 13. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 1 ♀ and 10 juveniles (ZMMU). Same locality, *Casuarina* spinney S of settlement near coconut plantation, ca. 15 m offshore, 13. VIII. 1984, leg. S. I. GOLOVATCH, 7 juveniles (ZMMU). Same locality, profile 3, site 11, *Scaevola* and *Casito*, 13—14. VIII. 1984, leg. L. D. FILATOVA, 1 ♀ and 5 juveniles (ZMMU). — Farquhar Atoll, 16—19. VIII. 1984, 1 juvenile ♂, 9 juveniles and fragments. Same locality and date, under *Hernandia*, 1 juvenile ♂. Same locality and date, under *Casuarina*, 2 juvenile ♀♀. Same locality and date, *Tournefortia* bush, 4 juveniles. Same locality and date, pitfall traps under *Casuarina*, line 2, 4 juveniles. Same locality and date, under *Scaevola* bushes, 3 juveniles. Same locality and date, under *Ficus*, 5 juveniles. Same locality and date, under *Calophyllum* + *Casuarina*, 1 juvenile. Same locality, *Scaevola* bush withs sparse coco palms and *Casuarina* trees on lagoon sand embankment ca. 50—70 m off settlement, 17. VIII. 1984, leg. L. B. RYBALOV, 4 juveniles. Same locality, coconut plantation, a model of soil population along a radius from a palm trunk till outside canopy, 18. VIII. 1984, leg. S. I. GOLOVATCH, 2 ♀♀ and 47 juvenile. Same locality and date, a model of soil population in the gradient forest (*Calophyllum*) — coco with *Fimbristylis*, middle part, ca. 250 m offshore from lagoon, leg. S. I. GOLOVATCH, 15 juveniles. Same locality, coconut plantation with herbs, ferns & *Tournefortia*, profile 5, site 17, 18. VIII. 1984, leg. L. D. FILATOVA, 1 ♀ and 36 juveniles. Same locality, sparse coconut plantation with fragments of *Scaevola*, profile 5, site 23, 17. VIII. 1984, leg. L. D. FILATOVA, 2 juveniles. Same locality, (all ZMMU). — Material examined: 208 specimens.

Remarks: Originally described as *Spirobolus bivirgatus* by KARSCH (1881) from Comoro Islands and Madagascar, this poorly-known species has since been only once reallocated and illustrated, namely by ATTEMS (1910) who also reported this form from the Seychelles (Aldabra) and Pemba Island near Zanzibar as *Mystalides bivirgatus*. Both CARL (1918) and HOFFMAN (1962) noted the close affinities between *Mystalides bivirgatus* and the monobasic genus *Stenobolus* CARL, 1918 from India and the Maldives. However, JEEKEL (1971) showed that both *M. bivirgatus* and *M. pumilus* ATTEMS, 1910 belong to a genus different from *Aphistogoniulus* SILVESTRI, 1897 (= *Mystalides* ATTEMS, 1910), so both SPAULL (1976) and MAURIÈS (1980a) again referred to this species as "Spirobolus" *bivirgatus*.

We fully agree with JEEKEL's (1971) idea and, with fresh samples at hand, take the opportunity to formalize the issue by establishing a new genus to encompass both *bivirgatus* and *pumilus*.



Figs 41—45. *Dactylobolus bivirgatus* (KARSCH, 1881) comb. n.: 41—42 = coleopods, frontal and caudal views, respectively, 43—45 = phallopod telopodite. Scale 0.5 mm.

CAMBALIDA

Cambalopsidae

Hypocambala anguina (ATTEMS, 1900) — Locality: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 3 ♂♂, 2 ♀♀ and 1 juvenile (ZMMU), 2 ♂♂ and 1 ♀ (HNHM). — Material examined: 9 specimens.

Remarks: It has already been reported from the Seychelles (MAURIÈS 1980a), and is known to be widespread throughout the tropics.

Hypocambala helleri SILVESTRI, 1897 — Locality: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 2 ♂♂ (ZMMU). — Material examined: 2 specimens.

Remarks: New to the fauna of the Seychelles! This species has been adequately known and illustrated (e.g. JEEKEL 1963, MAURIÈS 1983), thus being easily recognizable. It has hitherto been recorded in Celebes, Fiji, Aru Islands, Thailand, as well as strictly synanthropically in the USA and Guiana.

SPIROSTREPTIDA

Spirostreptidae

Charactopygus atratus (KARSCH, 1881) — Localities: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 1 ♂ (ZMMU). — Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 1 juvenile. Same locality, La Passe, 25 m a.s.l., under bark of *Cocos* log, 22. VIII. 1984, 1 ♀ (all ZMMU). — La Digue Isl., 28. VIII. 1984, 5 ♂♂ and 3 ♀♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM), 1 ♂ (ZMUC), 1 ♂ (SMF). — Material examined: 15 specimens.

Remark: This species has been reported from Madagascar (SAUSSURE & ZEHNTNER 1902) and some immediately adjacent islets as well as on several granitic islands of the Seychelles (MAURIÈS 1980a).

Sechelleptus seychellarum (DESJARDINS, 1834) — Localities: Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 5 ♀♀ and 1 juvenile (ZMMU), 1 ♀ (HNHM). — Félicité Isl., 26—29. VIII. 1984, 1 ♂ and 1 juvenile (ZMMU). — Material examined: 9 specimens.

Remark: This large and impressive species, the generotype of *Sechelleptus*, is endemic to several granitic islands of the Seychelles (MAURIÈS 1980a).

Sechelleptus unilineatus sp. n.
(Figs 46—49)

Localities: Silhouette Isl., mist mountainous tropical forest on top of the profile, above La Passe, 560 m, 25. VIII. 1984, leg. S. I. GOLOVATCH, 2 ♂♂ and 4 juveniles (incl. holotype). Same island, oligodominant tropical forest, Mt. Pot-à-Eau, 550 m, 23. VIII. 1984, leg. S. I. GOLOVATCH, 2 ♀♀ and 8 juveniles. — Material examined: 16 specimens. — Holotype male, 1 male, 1 female and 6 juvenile paratypes are deposited in ZMMU, 1 female and 6 juvenile paratypes in HNHM.

Description: Length ♂♂ 50—55 mm, ♀ 53 mm, juv. 25 mm, midbody width 4.0, 4.5—4.8 and 2.6 mm, respectively, number of segments excluding telson 61(—2)—63(—1) (♂♂), 53 (incomplete), 62(—3) (♀) and 51(—8)—52(—7) (juveniles).

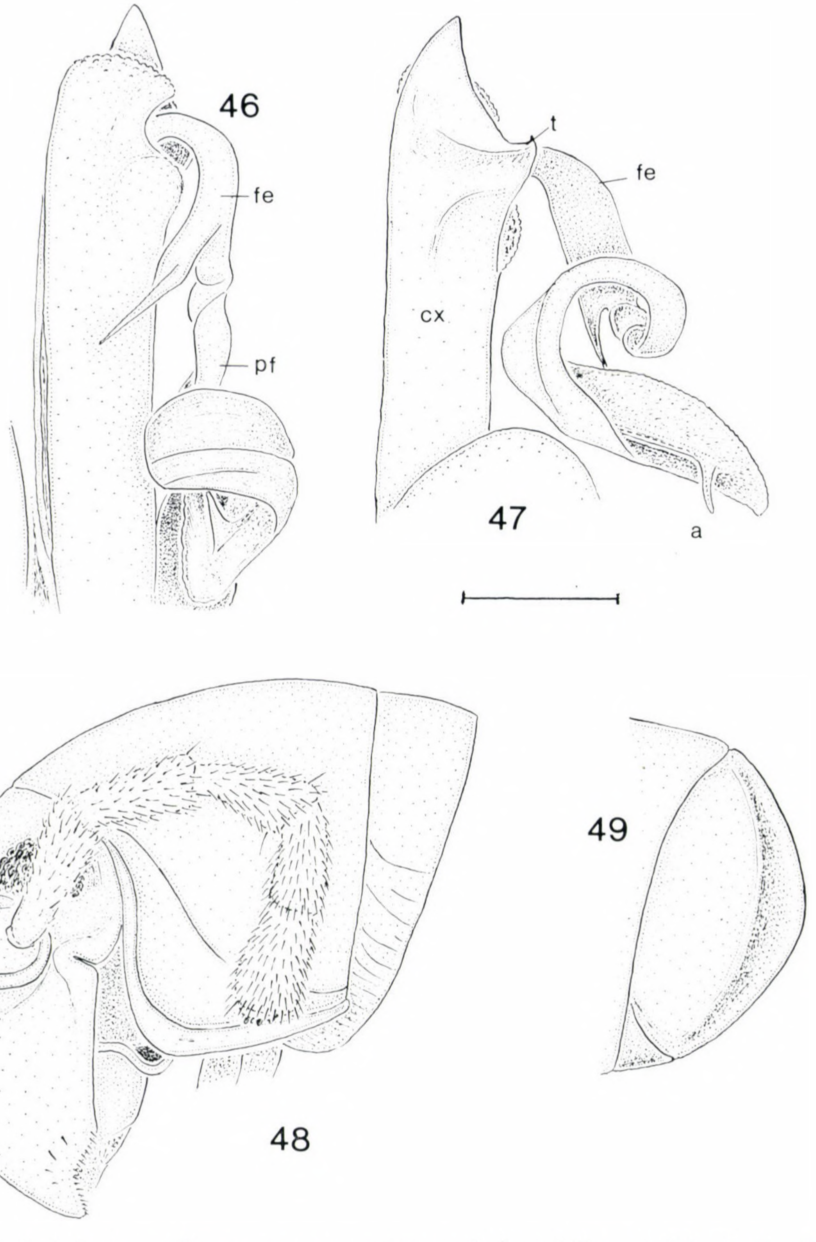
Coloration: Holotype in alcohol reddish brown-greybrown, with an irregular, rather broad, yellowish axial stripe on the dorsum starting from somite 2 and ending on pygidium, axial dorsal line very thin, practically wanting, pore level marked as a rather thin, interrupted, more or less obscure grey line; body below ozopore level somewhat paler, grey-yellowish. Head marble reddish with a paramedian pair of clear marbled spots between antennal sockets and a subtrapeziform brown band between ocular fields; antennae dark brown, ocular field blackish brown. Collum broadly brown along anterior and narrowly brown along posterior margins, inbetween marbled; sides of pygidium and entire anal valves brown. Legs marble reddish.

Body cylindrical, gently and gradually attenuating, anterior body constriction very feeble, traceable on segments 2—6(7). About 30—35, rather convex ocelli in each rounded triangular ocular field; antennae short (a bit shorter in females), in situ reaching to midlength of somite 3, slightly clavate; supralabral setae 2+2, labral setae 8+8 (paratype male 7+7). Collum (Fig. 48) with a pair of distinct lateral striae, one submarginal, beginning from about level of ocular field and ending at caudal corner, and the other slighter sinuate, set obliquely, run close to the anterio-lateral corner (in paratype male somewhat better off and obliquely); surface of collum smooth, very feebly rugose only postero-laterally.

Metazonital striation quite dense, rather irregular, increasingly dense and better visible towards ventrum on several anteriormost somites, at best reaching to ozopore level on somites 5—6, increasingly poorly developed towards posterior body end and towards dorsum, on midbody somites ending rather well below ozopore level, on posterior body third ending very far away from ozopore level. Suture between meso- and metazona as a thin line, rather densely beaded, very feebly sinuated anteriad in front of ozopores; suture between pro- and mesozona as an extremely thin line, sometimes markedly grey; body surface generally shiny, especially dorsally, less so ventrally and subventrally, surface of metazona feebly rugose, that of mesozona entirely smooth, whereas prozona covered with extremely fine and irregular, transverse striae. Ozopores small, inconspicuous, start from segment 6, lie well behind metazonital suture, at about one-third of metazonital length. Epiproct absent (Fig. 49), anal valves very distinctly margined, with a deep premarginal sulcus (intermediate between types b and c of KRABBE 1982), subanal scale darkish, not particularly pale as in females, spindle-shaped.

Legs rather short, slender, on leg-pair 1 no coxal outgrowth, starting from leg-pair 3 sole pads on both postfemora and tibiae well developed, gradually disappearing towards caudal body end, first on postfemora till about hind body third, and later even on tibiae till about the hind quarter; claws very long, about twice as short as tarsus, slightly curved; all telopodite joints subequal in length on midbody somites.

Gonopods: Frontal piece of coxite moderately higher than caudal, almost pointed, on distal quarter with trace of a lateral tooth (*t* in Fig. 47). Caudal piece apically roughly papillate, rounded bluntly. Telopodite (Figs 46—47)



Figs 46—49. *Sechelleptus unilineatus* sp. n., paratype male from Silhouette Island: 46—47 = right gonopod, frontal and caudal views, respectively. Scale 1.0 mm. — 48 = head, collum and first body ring, 49 = caudal end of body. Scale 2.0 mm.

with a distinct demarcation between femoral (*fe*) and postfemoral (*pf*) part, femorite with a prominent, pointed process, postfemorite spiralled, ribbon-shaped, broad and long, preapically with a distinct tooth (*a*) terminating seminal groove.

Paratypes: Coloration in male generally pale grey-brownish, reddish tint, axial stripe is hardly traceable, visible on dark pygidium; head marble reddish brown, with a couple of paler, larger paramedian spots between antennal sockets, and also four little spots inbetween, a subtrapeziform band between ocular fields, latter blackish, occipital suture as a thin grey-brownish line; antennae dark grey-brownish; ozopores may also be markedly blackish dots; otherwise like holotype. Females pale, somewhat less brightly colored, axial dorsal line visible, brownish, rather clear against background of middorsal stripe, pygidium rather grey than brown, subanal scale entirely pale. Juveniles uniformly dark brownish grey.

Legs in females a bit shorter, without any modification.

Remarks: This species appears to belong to a large species swarm mostly assigned to the genus *Rubanostreptus* (KRABBE 1982), a junior synonym of *Sechelleptus* MAURIÈS, 1980, **syn. n.** The new Seychelles species seems to be especially close to *S. praepolitus* (ATTEMS, 1910), *S. obscuratus* ATTEMS, 1910, *S. speculorbis* ATTEMS, 1910, *S. procerus* ATTEMS, 1951 (all from Madagascar), but differs by certain details of gonopod structure.

SIPHONOPHORIDA

Siphonophoridae

Siphonophora braueri (ATTEMS, 1900) — Locality: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 1 juv. ♂ (ZMMU). — Material examined: 1 specimen.

Remarks: Unfortunately, in the absence of mature males, it was impossible to identify the single specimen with complete certainty. However, the identity seems to be well justified, because this species is believed to be endemic to Mahé Island (ATTEMS 1900, MAURIÈS 1980a).

This species is known to be the generotype of *Siphonophorella* ATTEMS, 1953, but MAURIÈS (1980b) correctly sees quite close affinities of this form with his *Siphonophora filiformis* MAURIÈS, 1980, from Guadeloupe. Unfortunately, the type-species of *Siphonophora*, *S. portoricensis* BRANDT, 1837, remains unknown, though the close relationships displayed between the Caribbean and Seychelles species seem to provide a reliable basis for treating them within *Siphonophora*.

Siphonophora silhouettensis MAURIÈS, 1980 — Locality: Silhouette Isl., mist mountainous tropical forest on top of the profile, above La Passe, 560 m, 25. VIII. 1984, leg. S. I. GOLOVATCH, 2 juveniles (ZMMU). Same locality, Mt. Pot-à-Eau, 550 m, oligodominant tropical forest, 23. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♂, 3 ♀♀ and 8 juveniles (ZMMU), 1 juvenile (HNHM). — Material examined: 15 specimens.

Remark: This species seems to be restricted to Silhouette Island. Its reallocation within *Siphonophora* is grounded on the same presumptions as *S. braueri* (see above).

Siphonophora sp. — Locality: Silhouette Isl., mist mountainous tropical forest on top of the profile, above La Passe, 2560 m, 25. VIII. 1984, leg. S. I. GOLOVATCH, 1 juv. ♂, 1 juv. and 5 juveniles (ZMMU). — Material examined: 7 specimens.

R e m a r k s: There is no mature male in the sample at hand, but some external characters (e.g. strong and relatively long tergal pubescence), which differ this form from the only *Siphonophora* recorded so far from Silhouette Island (MAURIÈS 1980a), show that it may well be a distinct species.

Pterozonium tropiphora (ATTEMS, 1900) — L o c a l i t y: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 1 ♂ and 1 juvenile (ZMMU). — Material examined: 2 specimens.

R e m a r k s: This species is endemic to the Seychelles millipede fauna, recorded so far from Mahé, Silhouette, Frégate and Praslin Islands (ATTEMS 1900, MAURIÈS 1980a). Easy to recognize due to its pronounced paraterga.

POLYDESMIDA

Paradoxosomatidae

Chondromorpha xanthotricha (ATTEMS, 1898) — L o c a l i t i e s: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 2 ♂♂ and 4 ♀♀ (ZMMU). — Farquhar Atoll, 16—19. VIII. 1984, 2 ♀♀ and 7 juveniles. Same locality, a model of soil population in the gradient forest (*Calophyllum*) — coco with *Fimbristylis*, middle part, ca. 250 m offshore from lagoon, 18. VIII. 1984, leg. S. I. GOLOVATCH, 3 ♀♀ and 51 juveniles. Same locality and date, under *Scaevola* bushes, 17 ♂♂, ♀♀ and juveniles. Same locality and date, under *Calophyllum* + *Casuarina*, 3 ♀♀. Same locality and date, *Cocos* plantation, 1 ♀ (all ZMMU). — Silhouette Isl., near La Passe, 22—25. VIII. 1984, 1 ♂, 2 ♀♀ and 7 juveniles (ZMMU). Same locality, mist mountainous tropical forest on top of the profile, above La Passe, 560 m, 25. VIII. 1984, leg. S. I. GOLOVATCH, 1 juvenile (ZMMU). — Félicité Isl., *Calophyllum* spinney ca. 30 m offshore, 2 m a.s.l., with *Ipomea* at the beginning of the profile, 27. VIII. 1984, leg. L. B. RYBALOV, 6 ♂♂, 24 ♀♀ and 18 juveniles. Same locality and date, coconut plantation with *Stachytorpheta*, *Stenotaphrum* and *Desmodium* on a flat sand terrace ca. 30 m offshore, NE part, 28. VIII. 1984, leg. L. B. RYBALOV, 2 ♂♂, 8 ♀♀ and 5 juveniles. Same locality and date, singled, 1 juvenile. Same locality and date, profile 6, site 3, *Cocos*, leg. L. D. FILATOVA, 3 ♂♂, 16 ♀♀ and 14 juvenile. Same locality and date, site 2, leg. L. D. FILATOVA, 23 ♂♂, 22 ♀♀ and 78 juveniles (all ZMMU). — La Digue Isl., 28. VIII. 1984, 1 ♀ (ZMMU). — Material examined: 329 specimens.

R e m a r k: A pantropical species, for the first time it has been reported from the Seychelles by MAURIÈS (1980a).

Desmoxytes planata (POCOCK, 1895) — L o c a l i t i e s: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 8 ♂♂ and 4 ♀♀ (ZMMU), 1 ♂ and 2 ♀♀ (HNHM). — Silhouette Isl., near La Passe, 22—25. VIII. 1984, 1 ♂ and 1 juvenile. Same locality and date, tropical mist forest on ridge, above La Passe, 540—590 m, 24—25. VIII. 1984, 3 ♂♂. Same locality and date, in *Labinia* fruits, 2 ♂♂. Same locality and date, 400 m, 1 ♀. Same locality and date, tropical forest above La Passe, 400 m a.sl., in axilla of *Labinia* leaves, 3 ♂♂ and 7 juveniles (all ZMMU). — Praslin Isl., along road to and nearby Vallée-de-Mai, 29. VIII. 1984, 1 ♀ (ZMMU). — Material examined: 30 specimens.

R e m a r k: This species is known to be pantropical and has already been mentioned from the Seychelles by MAURIÈS (1980a) as *Pratinus planatus*.

Orthomorpha coarctata (SAUSSURE, 1860) — L o c a l i t i e s: Mahé Isl., Victoria, Botanical Gardens, 30—31. VII. 1984, 7 ♂♂ and 21 ♀♀ (ZMMU), 1 ♂ and 1 ♀ (HNHM). — Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 1 ♂ and 2 juveniles. Same locality, coconut plantation with grass and many coco shells, ca. 350 m S of settlement and 70 m off lagoon coast, 6—7. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 1 ♂. Same locality and date, singled, 1 ♀. Same locality, coconut plantation with *Scinerus*, grazed patch, 6. VIII. 1984, leg. L. D. FILATOVA, 1 ♂ and 2 juveniles. Same locality, coconut plantation with *Calocasia* and ferns, 8. VIII. 1984, leg. L. D. FILATOVA, 1 ♂ (all ZMMU). — Farquhar Atoll, 16—19. VIII. 1984, 3 ♀♀ and 2 juveniles (ZMMU). — Silhouette Isl., near La Passe, 22—25. VIII. 1984, 1 juvenile. Same locality, coconut plantation on a sandy terrace ca. 640 m offshore, 2 m a.s.l., grassland of *Stenotaphrum complanatum*, 23. VIII. 1984, leg. L. B. RYBALOV, 1 juvenile. Same locality and date, pitfall traps, 3 ♂♂ and 6 ♀♀ (all ZMMU). — Félicité Isl., 26—29. VIII. 1984, 1 juvenile. Same locality and date, *Calophyllum* and *Mangolifera*, 7 juveniles. Same locality, *Calophyllum* spinney ca. 30 m offshore, 2 m a.s.l., with *Ipomea* at the beginning of the profile, 27. VIII. 1984, leg. L. B. RYBALOV, 8 ♂♂, 14 ♀♀ and 1 juvenile.

Same locality, profile 6, site 3, *Cocos*, 28. VIII. 1984, leg. L. D. FILATOVA, 9 ♂♂ and 16 ♀♀. — Same locality and date, site 2, leg. L. D. FILATOVA, 17 ♂♂, 27 ♀♀ and 39 juveniles. Same locality, coconut plantation with *Stachytorpheta*, *Stenotaphrum* and *Desmodium* on a flat sand terrace ca. 30 m offshore, NE part, 28. VIII. 1984, leg. L. B. RYBALOV, 2 ♀♀. Same locality, coconut plantation near site 5 of the profile, slope 5—10°, 27. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♀. Same locality and date, *Cocos* plantation on terrace, pitfall traps, line 2, 4 ♂♂, 3 ♀♀ and 10 juveniles. Same locality and date, singled, 11 ♂♂, 6 ♀♀ and 1 juvenile (all ZMMU). — Material examined: 232 specimens.

Remark: A pantropical species, it has already been reported from the Seychelles (BRÖLEMANN 1896, MAURIÈS 1980a).

Diglossosternoides gen. n.

Type-species: *Diglossosternoides curiosus* sp. n.

Diagnosis: A relatively small (ca. 1 cm long) paradoxosomatid with paranota moderately developed, fore femora of male without adenostyles, sterna between male legpairs 3 and 4 each with a subtrapeziform, setose lamina. Tarsal brushes absent.

Gonopods relatively simple and high, coxite moderately long, prefemur normally shaped, femorite suberect, slender and long, without evidence of torsion; demarcation between femorite and postfemoral part absent, latter with a process; tibiotarsus well-developed, long, ribbon-shaped, with both lamina lateralis and lamina medialis evident, simple, in situ directed laterad, supporting a long, flagelliform, free solenomerite without sheathing it.

Remarks: *Diglossosternoides* gen. n. seems to be referable either to the tribe Sulciferini, known to be especially abundantly represented in mainland Asia (s. recent review by JEEKEL 1988), particularly to the group of members in which the solenophore is directed laterad (JEEKEL 1980), or to Eustrongylosomatini (see review by HOFFMAN 1977—78). However, it differs from all the other Paradoxosomatidae but *Diglossosternum* JEEKEL, 1980 (tribe Orthomorphini, with two species from Java) in the presence of a setose lamina both between the male coxae 3 and 4, and from *Diglossosternum* by quite a disjunct gonopod structure.

The relationships of *Diglossosternoidea* gen. n. seem to be quite obscure, as the laminae between the male coxae 3 and 4, the gonopod femorite long, slender and devoid of any traces of torsion, the absence of a postfemoral sulcus, the well-developed tibiotarsus (= solenophore), curved, directed laterad and supporting a long, simple, flagelliform solenomerite, and also the characteristic, long and slender postfemoral process directed caudad appear to be a unique combination of features. Some of them bring the new genus close enough to the Sulciferini (e.g. *Tylopus*, *Hedinomorpha*, *Cawjeekelia*, etc.), some others to the Eustrongylosomatini (e.g. *Eustrongylosoma*), some more to the group of still unclassified genera formerly placed within the Sulciferini (e.g. *Polylobosoma*, *Antichirogonus*). However, *Diglossosternoides* gen. n. seems best to be grouped amongst the Eustrongylosomatini, at least for the time being. Interestingly, in his review of the Eustrongylosomatini, HOFFMAN (1977—78) mentioned the presence of this otherwise Papuan tribe in the Caroline Islands, Micronesia, in Melanesia and in the Philippines, due to some undescribed *Eustrongylosoma* and/or its immediate allies. One of such allies might well be the new species below.

Diglossosternoides curiosus sp. n.
(Figs 50—54)

Localities: Mahé Isl., Morne Blanc, 350 m, secondary tropical rainforest, 1. VIII. 1984, 1 ♂ and 2 ♀♀ (ZMMU). — Material examined: 3 specimens. — Holotype male and the two female paratypes are deposited in ZMMU.

Description: Length ♂♂ 10 mm, ♀♀ 11—12 mm, width on midbody prozona and metazona 0.9 and 1.3 mm (♂♂), 1.0 and 1.4 mm (♀♀), respectively.

Coloration: Holotype in alcohol pale yellowish brown, rather uniform, anterior body end a little darker than posterior.

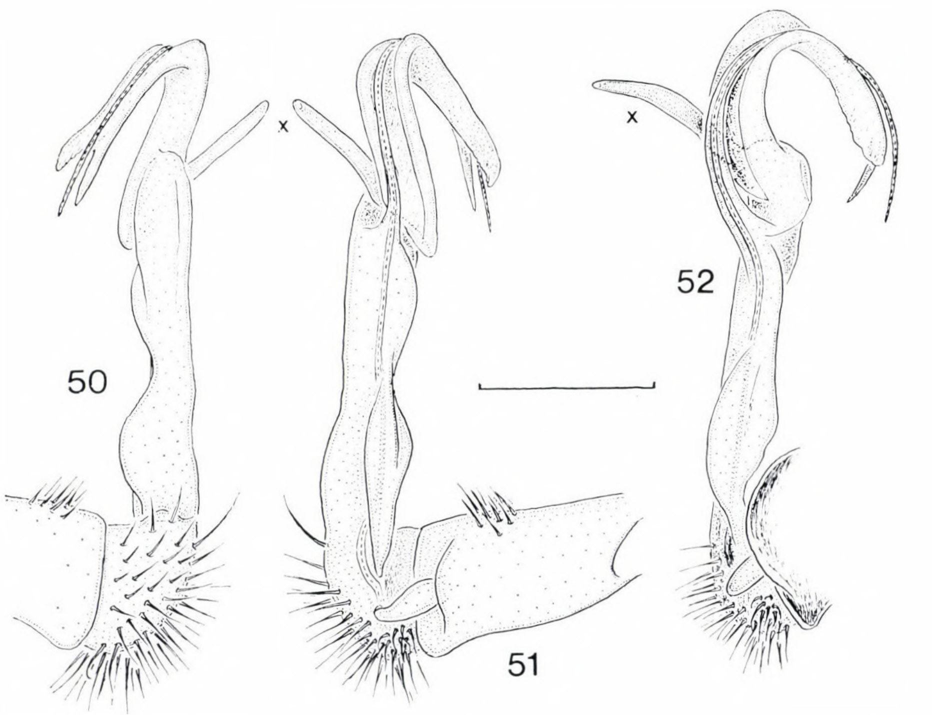
Antennae relatively long, in situ reaching beyond somite 2, slightly clavate; collum a little broader than head, which is subequal in width to somite 2, collum is subequal in width to segments 3—4, from 6th segment body parallel-sided until 16th, onward very gradually, gently tapering. Paraterga moderately developed, on somite 2 well below both collum and subsequent terga, begin to show up already from collum, set quite low, at about midheight on anterior body third and at about one third on subsequent somites, laterally margined and indentated, invariably pointed caudad starting from somite 3, lie within hind tergal contour or just a bit beyond it until somite 15 (Fig. 53), considerably projecting caudad only on somites 16—18, again worse so on 19th; on most somites paraterga slightly elevated; metaterga well convex, with a moderately deep, transverse, long sulcus at about midlength, starting from segment 5 and gradually coming to naught toward rings 18—19; each metatergum carries two transverse rows of very long hairs, one of 2+2 (regardless of the marginal 1+1) well in front of sulcus, and the other of 3+3 on small but distinct tubercles. Surface generally smooth, roughly punctured only on metazona below paraterga, otherwise modestly shiny. Epiproct long, in lateral view pointed (Fig. 54), in dorsal view subtriangular with tip rather narrowly emarginate and carrying a couple of well expressed preapical incisions laterally, sides slightly concave.

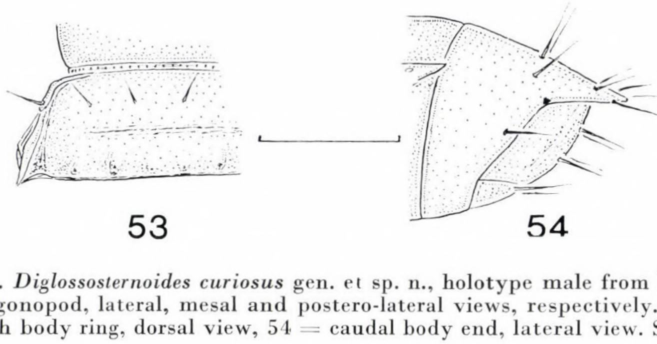
Legs moderately long, slender, not enlarged as compared to female, leg-pairs 1—2 normally reduced, without adenostyles, tarsal brushes absent completely; high, subtrapeziform laminae between both leg-pairs 3 and 4;

sterna moderately setose, between both leg-pairs 6 and 7 naked and especially well excavated.

♀♀ paratypes: Color pinkish yellowish brown, pale, posterior end somewhat paler than anterior one, antennae and legs yellowish brown like in holotype, sterna without peculiarities, legs relatively shorter than in male, without modifications, paraterga set a bit lower than in male.

Gonopods: Gonopods elongate, slender, relatively simple (Figs 50—52), coxite moderately long, telopodite with a usual, densely setose, normally sized





Figs 50—54. *Diglossosternoides curiosus* gen. et sp. n., holotype male from Mahé Island: 50—52 = right gonopod, lateral, mesal and postero-lateral views, respectively. Scale 0.2 mm. — 53 = 10th body ring, dorsal view, 54 = caudal body end, lateral view. Scale 1.0 mm.

prefemur, set off from acropodite by a subtransverse sulcus; femorite particularly long, a little enlarged parabasally, with neither evidence of torsion nor demarcation with postfemoral part, latter preapically with a most conspicuous, long and slender process (x in Fig. 52) directed ventrad; tibiotarsus as a distinct, large piece, arising near base of process x, ribbon-shaped, apically bifid, in situ directed laterad, simple, supporting a long, flagelliform, free solenomerite almost all along its length but not sheathing; seminal groove entirely mesal.

Remarks: Besides the above paradoxosomatid, the Seychelles fauna is known to comprise *?Orthomorpha crinita* ATTEMS, 1900 described from the female sex only. Recently MAURIÈS (1980a) referred to another *?Orthomorpha* sp. However, the new species above is certainly different at least from *?O. crinita*, judged from ATTEMS' (1900) original description.The differences involve, e.g., a smaller size and a paler coloration in *D. curiosus* sp. n. The new form is the first reliable indigenous paradoxosomatid from the entire Malagasy subregion!

Haplodesmidae

Cylindrodesmus hirsutus (POCOCK, 1888) — Localities: Amirantes, Poivre Atoll, coconut plantation, under *Terminalia*, 5—9. VIII. 1984, 1 juvenile. Same locality, coconut plantation with grass and many coco shells, ca. 350 m S of settlement and 70 m off lagoon coast, 6—7. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 1 ♀. Same locality, coconut plantation near soil section, 8. VIII. 1984, leg. L. B. RYBALOV et S. I. GOLOVATCH, 2 ♀♀. Same locality and date, coconut plantation with *Calocasia* and ferns, 8. VIII. 1984, leg. L. D. FILATOVA, 4 ♀♀ and 3 juveniles (all ZMMU). — Farquhar Atoll, under bark, 16—19. VIII. 1984, 2 ♀♀ (ZMMU), 2 ♀♀ and 1 juvenile (HNHM). Same locality and date, *Cocos* plantation with *Stenotaphrum complanatum*, pitfall traps, line 1, 7 juveniles (ZMMU). — Silhouette Isl., tropical mist forest on ridge, above La Passe, 540—590 m 24—25. VIII. 1984, 5 ♀♀ and 3 juveniles. Same locality, mist mountainous tropical forest on top of the profile, above La Passe, 560 m 25. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♂, 4 ♀♀ and 2 juveniles (all ZMMU). — Material examined: 38 specimens.

Remarks: A pantropical species, it has already been reported from the Seychelles (ATTEMS 1900, MAURIÈS 1980a). It is known to be a parthenogenetic species (ENGHOFF 1978), and our samples are in general accordance with this.

Fuhrmannodesmidae

?Sphaeroparia sp. — Locality: Praslin Isl., road to Vallée-de-Mai, 28. VIII. 1984, leg. S. I. GOLOVATCH, 1 fragment and 1 juvenile (ZMMU). — Material examined: 2 specimens.

Remarks: MAURIÈS (1980a) probably referred to the same form. Our specimens are not, unfortunately, closer identifiable in the absence of males.

Cyrtodesmidae

Hyperothrix orophura ATTEMS, 1900 — Localities: Silhouette Isl., Mt. Pot-à-Eau, 550 m, tropical forest, 23. VIII. 1984, leg. S. I. GOLOVATCH, 1 ♂ (ZMMU). — Material examined: 1 specimen.

Remarks: MAURIÈS (1980a) has already recorded this species from Silhouette. He placed it in the Oniscodesmidae, HOFFMAN (1979) regarded this monobasic genus as incertae sedis, but judged from the gonopod conformation, we reassign it within Cyrtodesmidae.

ZOOGEOGRAPHICAL NOTES

Since too many novelties have turned out just after one more short-term cruise to the Seychelles, with no fewer than six species new to science and additional four new to the local list, the following zoogeographical analysis must be understood as fairly tentative. Moreover, quite a proportion (10 out of a total of 41) of the Seychelles fauna are too inadequately known/allocated to warrant any biogeographical speculations.

However, even with evidence at hand, the millipede fauna of the Seychelles may be postulated to represent a mixture of elements of various origins. Disregarding the obvious introductions, such as *Rhinotus purpureus*, *Paraspirobolus dictyonotus*, *Pseudospirobolellus avernus*, *Leptogoniulus naresi*, *Trigoniulus lumbricinus*, *Glyphiulus granulatus*, *Hypocambala anguina*, *H. helleri*, *Oxidus gracilis*, *Chondromorpha xanthotricha*, *Desmoxytes planata*, *Orthomorpha coarctata*, *Cylindrodesmus hirsutus*, the remaining diversity is still impressive. As one might expect, the influence of the Malagasy realm is rather strong: *Charactopygus atratus*, *?Eucarlia urophora*, *Dactylobolus bivirgatus*, as well as *Spiromanes* and *Sechelleptus* (with two species apiece) all demonstrate clear relations with Madagascarian forms. The same seems to hold true at least partly with the endemic Seychellean *Hyperothrix orophura*, *?Propyrgodesmus* sp., *Siphonophora* spp. (2—3 forms), *?Sphaeroparia* sp., although their ties are more obscure.

Oriental faunal connections are rather evident as regards *Benoitolus* (one species in Thailand and the Seychelles apiece) and perhaps *Pterozonium* (several species in Southeast Asia, *P. tropiphora* in the Seychelles). Much less expected, but very clear as well, is the influence of the Australian/Papuan realm, with *Sechelliosoma forcipatum*, *Diglossosternoides curiosus*, *?Spirobolellus simplex* and probably (certain) *?Eucarlia* spp. being evidences of that. Unfortunately, until the tropical millipede fauna is better known, we refrain from further speculations. Much more work is necessary to finally assess the Seychelles diplopod fauna, let alone its zoogeographical composition.

REFERENCES

ATTEMS, C. (1900): Dr. Brauer's Myriopoden-Ausbeute auf den Seychellen im Jahre 1895. — *Zool. Jahrb. Syst.*, **13:** 133—171.

ATTEMS, C. (1910): Myriopoden von Madagaskar, den Comoren und den Inseln Ostafrikas. — In: A. VOELTZKOW: Reise in Ostafrika in den Jahren 1903—1905, **3:** 73—115.

BRÖLEMANN, H. W. (1896): Mission scientifique de M. Ch. Alluaud aux Iles Séchelles. Myriapodes. — *Mém. Soc. Zool. France*, Paris, **8:** 518—538.

BRÖLEMANN, H. W. (1914): Étude sur les spirobolides. — *Ann. Soc. ent. Fr.*, **83:** 1—38.
CARL, J. (1912a): Diplopoden der Aru- und Kei-Inseln. — *Abh. Senckenberg. Naturf. Ges.*, **34:** 269—279.
CARL, J. (1912b): Die Diplopoden-Fauna von Celebes. — *Revue suisse Zool.*, **20:** 73—206.
CARL, J. (1918): Miscellanées diplopodologiques. — *Revue suisse Zool.*, **26:** 417—468.
ENGHOFF, H. (1978): Cylindrodesmus laniger Schubart, a widespread, probably parthenogenetic millipede (Diplopoda, Polydesmida: Haplodesmidae). — *Ent. scand.*, **9:** 80.
GOLOVATCH, S. I. & KORSÓS, Z. (1990): Contributions to the millipede fauna of Vietnam (Diplopoda) III. Spirobolida. — *Acta Zool. Hung.*, **36:** 25—36.
HOFFMAN, R. L. (1962): Studies on spiroboloid millipeds IV. Systematic and nomenclatorial notes on the family Pachybolidae. — *Revue suisse Zool.*, **69:** 759—783.
HOFFMAN, R. L. (1977—78): Diplopoda from Papuan caves (Zoological Results of the British Speleological Expedition to Papua-New Guinea, 1975, 4). — *Int. J. Speleol.*, **9:** 281—307.
HOFFMAN, R. L. (1978): Studies on spiroboloid millipeds. XII. The status of Spirobolus noronhensis Pocock, 1890, and some related species (Pachybolidae). — *Proc. Biol. Soc. Washington*, **91:** 929—935.
HOFFMAN, R. L. (1979): Classification of the Diplopoda. — Genève, 237 pp.
HOFFMAN, R. L. (1981): Studies on spiroboloid millipeds. XIV. Notes on the family Pseudospirobolellidae, and the description of a new genus and species from Thailand. — *Steenstrupia*, **7:** 181—190.
JEEKEL, C. A. W. (1963): Diplopoda of Guiana. — In: Studies on the fauna of Suriname and other Guyanes, **4:** 157 pp.
JEEKEL, C. A. W. (1971): Notes on the genus Aphistogoniulus Silvestri (Diplopoda, Spirobolida, Trigoniulidae). — *Bull. zool. Mus. Univ. Amsterdam*, **2:** 33—40.
JEEKEL, C. A. W. (1980): On the classification of some little known Paradoxosomatidae from Java and Sumatra (Diplopoda, Polydesmida). — *Revue suisse Zool.*, **87:** 323—340.
JEEKEL, C. A. W. (1986): Millipedes from Australia, 10: Three interesting new species and a new genus (Diplopoda: Sphaeroteriida, Spirobolida, Polydesmida). — *Beaufortia*, **36:** 35—50.
JEEKEL, C. A. W. (1988): The generic position of Orthomorpha bucharensis Lohmander and O. muminabadensis Gulicka, and the taxonomic status of Hedinomorpha Verhoeff (Diplopoda, Polydesmida, Paradoxosomatidae). — *Bull. zool. Mus. Univ. Amsterdam*, **11:** 97—104.
KARSCH, F. (1881): Neue Juliden des Berliner Museums, als Prodromus einer Juliden-Monographie. — *Zeitschr. f. D. ges. Naturwiss.*, **54:** 1—79.
KRABBE, E. (1982): Systematik der Spirostreptidae (Diplopoda, Spirostreptomorpha). — *Abh. Naturwiss. Vereins Hamburg*, NF, **24:** 1—476.
MAURIÈS, J.-P. (1980a): Contributions à l'étude de la faune terrestre des iles granitiques de l'archipel des Séchelles (Mission P. L. G. Benoit — J. J. Van Mol 1972). Myriapoda-Diplopoda. — *Rev. Zool. afr.*, **94:** 138—168.
MAURIÈS, J.-P. (1980b): Diplopodes Chilognathes de la Guadeloupe et ses dépendances. — *Bull. Mus. natn. Hist. nat.*, Paris, 4e sér., **2:** 1059—111.
MAURIÈS, J.-P. (1983): Cambalides nouveaux et peu connus d'Asie, d'Amérique et d'Océanie. I. Cambalidae et Cambalopsidae (Myriapoda, Diplopoda). — *Bull. Mus. natn. Hist.-nat.* Paris, sér. 4, **5A**(1): 247—276.
POCOCK, R. I. (1893): Upon the identity of some of the types of Diplopoda contained in the collection of the British Museum, together with descriptions of some new species of exotic Iulidae. — *Ann. Mag. Nat. Hist.*, Ser. 6, **11:** 248—254.
POCOCK, R. I. (1894): Contributions to our knowledge of the arthropod fauna of the West Indies. III. Part. Diplopoda and Malacopoda, with a supplement of the Arachnida of the class Pedipalpi. — *Linnean J. Zoology*, London, **24:** 473—544.
SAUSSURE, H. DE & ZEHNTNER, L. (1901): Myriopoden aus Madagaskar und Zanzibar, gesammelt von Dr. A. Voeltzkow. — *Abh. Senckenberg. Naturf. Ges.*, **26:** 429—460.
SAUSSURE, H. DE & ZEHNTNER, L. (1902): Myriapodes de Madagascar. — In: A. GRANDIDIER: Histoire physique, naturelle et politique de Madagascar, **27**(53): 1—356.
SPAULL, V. W. (1976): The life-history and post-embryonic development of "Spirobolus bivirgatus" (Diplopoda: Spirobolida) on Aldabra, western Indian Ocean. — *J. Zool. London*, **180:** 391—405.
VERHOEFF, K. W. (1939): Diplopoden der Insel Mauritius und ihre zoogeographische Bedeutung. — *Jena. Z. Naturwiss.* **73:** 37—96.

Acta Zoologica Hungarica 38 (1—2), pp. 33—46 (1992)

NEW TAXA AND SYNONYMS IN THE ONCOCNEMIS EXACTA CHRISTOPH, 1887 GROUP (LEPIDOPTERA, NOCTUIDAE)

P. GYULAI, M. HREBLAY & L. RONKAY

Miskolc, Aulich utca 13, H-3529 Hungary
Budapest, Hegyalja út 52, H-1112 Hungary
Budapest, Baross utca 13, H-1088 Hungary

(Received 5 March, 1991)

Descriptions of two new species, *O. beri* sp. n. (W Tien Shan) and *O. mixtazona* sp. n. (Afghanistan, Pakistan, Soviet Turkestan) and a new subspecies, *O. exacta vanensis* ssp. n. (SE Turkey) are given. *O. exacta* is redescribed, *O. mongolica* is downgraded to ssp. of *O. exacta; O. mongolica iranica* is synonymized with *O. exacta. O. asema* BOURSIN and its male genitalia are illustrated for the first time. With 2 photoplates and 30 figures.

1. INTRODUCTION

The *Oncocnemis exacta*-group forms a well-defined unit within the Palaearctic members of the rich Holarctic genus. The taxa of the *exacta*-group can be characterized by the typical wing pattern (see the Plates) and some features of the genitalia. The group contains some few species inhabiting xerothermic habitats of W and C Asia, but no European taxa are known. The majority of the members has been discovered and described in this century, yet, the interpretation of the two oldest ones, *exacta* and *mongolica* has caused a number of difficulties.

The species *Oncocnemis exacta* was described by CHRISTOPH on the basis of a single female from the "mountains near Ashabad", in 1887. He published an excellent colour picture of this species in 1889 which fits well with the details of the description. Within a decade, STAUDINGER gave the description of a taxon from Mongolia (Uliassutai) which he considered as the eastern subspecies of *exacta*. In one of his early works, BOURSIN (1934) published the separation of *exacta* and *mongolica* on specific level. In this paper he illustrated the male genitalia of the two taxa which display really conspicuous differences. He mentioned that the type of *mongolica* had been studied but no information is given about the material identified by him as *exacta*. Now, the type of *exacta* is a female, while the specific separation is based on mainly the male genital characteristics. On the other hand, the typical external features of *exacta* do not match with the original description and the plate of CHRISTOPH, especially the inner dark stripe of the hindwings, stated as good character of *exacta*, is absent on the picture.

The statements of BOURSIN have been accepted by the subsequent authors and the two species considered as strictly distinct ones till our recent days (e.g. EBERT 1978, HACKER 1990, HACKER et al. 1986a—b, 1990, etc.). The intensive collectings in this century have shown that *mongolica* is a widespread xeromontane species, ranging from Mongolia through Chinese Turkestan, the Afghan and Soviet Pamirs, the Kopet-Dagh, Khorassan and the Elburs to SE Turkey. The population inhabiting the Elburs Mts. was described as a distinct race ("iranica") by SCHWINGENSCHUSS (1937) and the Turkish ones were published also as *mongolica iranica* (HACKER et al. 1986).

The second species, *exacta* has also been found as more widely distributed and rich populations have discovered in the Fergana Basin, the Soviet and Afghan Pamirs, the Hindukush and in the Karakoram ranges.

The studies on a very recent "*mongolica*" material from the Kopet-Dagh, collected by DUBATOLOV and DUBATOLOVA in 1990, revealed again the disharmony of the external features of "exacta" as published by CHRISTOPH and BOURSIN. The new series from the Kopet-Dagh quite agrees with the original description and the picture given by CHRISTOPH and which originated from the vicinity of Ashabad. But, this species is very close to *mongolica* and surely not identical with the other taxon published by BOURSIN as *exacta*.

We had the great fortune to study the type of *exacta* preserved in the collection of the Zoological Institute, Leningrad. Although the genitalia of it, prepared by the late PROF. RJABOV, are lost, there is no doubt that the holotype of *exacta* is conspecific with the specimens collected recently in the Kopet-Dagh. Consequently, the statement of BOURSIN is erroneus and STAUDINGER was right: the taxa *exacta* and *mongolica* are very close to each other (in our opinion they represent two races of the same species), while the other species, "exacta sensu Boursin", is in fact a well-known but undescribed taxon. The subspecies "mongolica iranica" is an obvious synonym of *exacta exacta*, but the SW Turkish population shows some characteristic morphological differences compared with the Iranian and Turkmenian *exacta* and can be considered as a peripheric race of the species (*exacta vanensis* ssp. n.).

In July 1990, two Hungarian lepidopterists, P. GYULAI and M. HREBLAY had the opportunity to make a zoological expedition in Uzbekistan. 160 Noctuid species were found in the W Tien Shan Mts. near the Chimgan chain and also some ones in the vicinity of Tashkent. The material originated from the Chimgan range contains, beside two other undescribed species (a *Lophoterges* and a *Cucullia*), a new *Oncocnemis* belonging to this species-group. The description of the latter one is given below, the detailed faunistical account will be published in a distinct paper (GYULAI & HREBLAY, under preparation).

2. THE TAXA OF THE SPECIES-GROUP

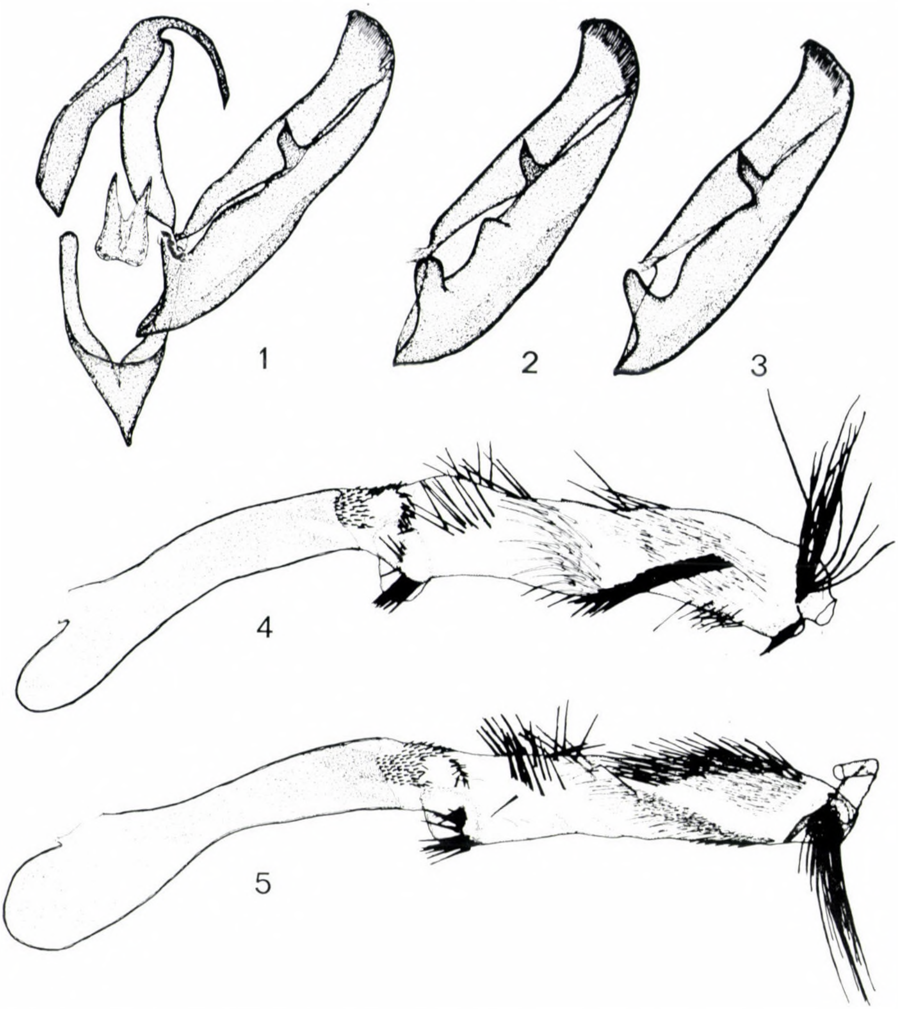
Oncocnemis exacta CHRISTOPH, 1887
= O. iranica Schwingenschuss, 1937
O. exacta mongolica STAUDINGER, 1896 stat. n.
O. exacta vanensis ssp. n.
O. penthina BOURSIN, 1963
O. thomasi PLANTE, 1986
O. beri sp. n.
O. mixtazona sp. n.

3. SYSTEMATIC PART

Oncocnemis exacta CHRISTOPH, 1887 (Plate I: 1—4)

Redescription — *Exacta* has a relatively wide area extending from Mongolia to SE Turkey. The externally often strongly different populations display usually only slight differences in the genital features and the individual variability of these characteristics is relatively large, resulting in a considerable overlap. On the other hand, the different populations have a strictly allopatric area. These facts serve as the principal reasons to treat the *exacta*-complex as a single species in which the most conspicuous differences can be found in the peripheric (Eastern- and Westernmost) populations. The isolation of the Eastern race, *mongolica*, seems much stronger than in the case of the other ones; the interpretation of this taxon is slightly dubious, but, on the basis of the concept mentioned above, a subspecific splitting is more reasonable. The redescription of *exacta* and the diagnoses of the subspecies are given below.

Material examined — Type material: holotype female, Ashabad (coll. the Regent Prince Nikolai Mihailovich, Zoological Institute Leningrad). — Further material examined: 13 males, 5 females, USSR, Turkmenia, C Kopet-Dagh Mts., 15 km W of Firuza, Dushak, 2100—2200 m, 3—13. 07. 1990, leg. DUBATOLOV & DUBATOLOVA (coll. Biological Institute Novosibirsk and HNHM Budapest); 1 male, Iran, S Elburs Mts., Shimshak, 2300 m, 50 km N Teheran, 1—22. 07. 1970, leg. & coll. VARTIAN; 1 male, Aksu, coll. SHELJUZHKO (Zoological Museum, University of Kiev); 2 males, 1 female, USSR, Tadjikistan, Pamir Mts., Chorog (coll. SHELJUZHKO, Kiev and Thöny, Ingolstadt); 1 male, Afghanistan, Prov. Kadaghan, Salang Pass, 11—12. 07. 1971, leg. & coll. VARTIAN. Slide Nos 2832, 3070 RONKAY, 144/1975, 145/1975 VARGA (males), 2252 HREBLAY, 2882, 3776 RONKAY (females).

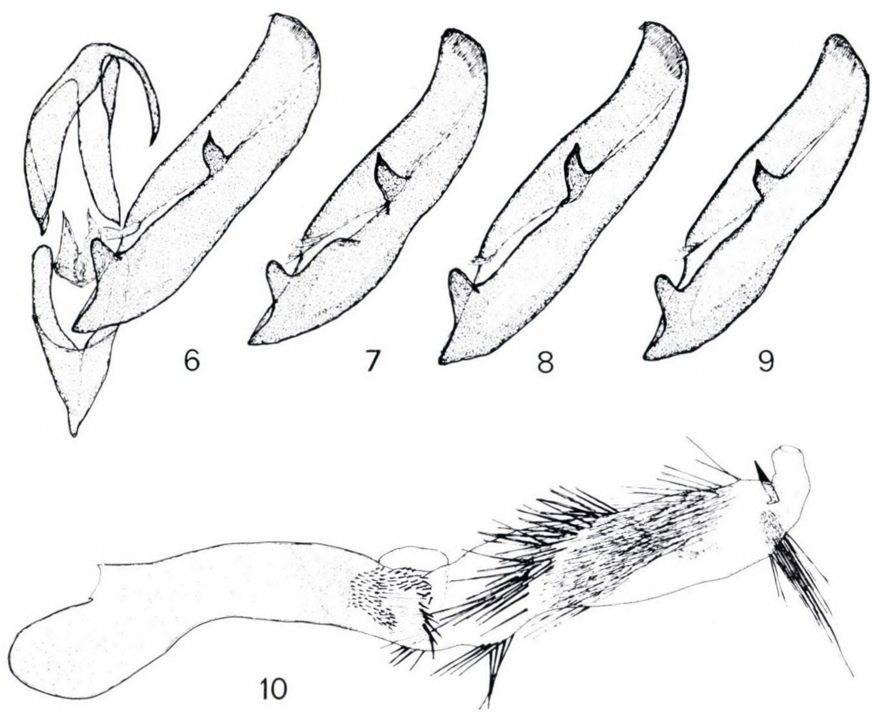


Figs 1—5. 1 = *Oncocnemis exacta exacta* CHRISTOPH, Kopet-Dagh (valva). 2—3 = *O. exacta vanensis* ssp. n., paratypes, SE Turkey (valvae). 4 = *O. exacta exacta* CHRISTOPH, Kopet-Dagh (aedeagus). 5 = *O. exacta vanensis* ssp. n., paratype, SE Turkey (aedeagus)

External morphology — Wingspan 29—32 mm, length of forewings 14—15 mm. — Head, thorax and abdomen greyish-ochreous, collar unicolorous, large and rounded. Forewing shiny, ochreous slate-grey, scaling smooth and fine. Markings sharp, inner part of wing lighter, marginal field wide, dark brownish. Transverse lines sharp, dark brown, strongly sinuous. Median zone narrow with some darker suffusion in inner half. Stigmata present, less strong, encircled with brown and filled with ochreous. Subterminal obsolescent, pale ochreous with darker inner shadow. Terminal line double, fine, cilia whitish-ochreous with darker inner line. Hindwing whitish with wide, dark brown marginal field. Veins covered with brownish, cilia whitish. Underside of wings shiny whitish with some greyish-brown irroration and dark brown-grey marginal zones.

M a l e g e n i t a l i a (Figs 1, 4): uncus slender, relatively short, tegumen wide, fultura shield-like with longer apical arms, vinculum strong, V-shaped. Valvae symmetric, elongated, distally slightly tapering and arcuate; costal part sclerotized. Cucullus less acute, corona present. Clavus well-developed, wide and short digitiform, harpe thick and short, not reaching costa. Apex of harpe acute, apically strongly tapering. Aedeagus long, cylindrical, carina slightly more sclerotized. Vesica long, straight and finely twisted, dorsal bar of carina long, sclerotized. Vesica armed with a great amount of cornuti of different shape and size, terminal cornutus relatively fine, pointed, basal part joined to vesica. Terminal bundle of long, setiform cornuti well-developed, directed opposite to terminal cornutus.

F e m a l e g e n i t a l i a (Figs 20—22): ovipositor short and moderately wide, posterior gonapophyses with strong and short setae at apical edge and



Figs 6—10. 6—7 = *Oncocnemis exacta mongolica* STAUDINGER, Mongolia (valvae). 8 = *O. exacta* (?ssp.), Pamir, Chorog (valva). 9 = *O. exacta* (?ssp.), Aksu (valva). 10 = *O. exacta mongolica* STAUDINGER, Mongolia (aedeagus).

on lateral surface. Ostium bursae sclerotized, long, ventro-lateral sclerotization stronger, calyciform with a longer pedicel, dorsal lamina granulose and short. Ductus bursae cartilaginous, narrow, medially angled. Bursa copulatrix bilobate, cervix about 2/3 as long as corpus; cervix more or less quadrangular, corpus elliptical. Medial zone of corpus granulose with fine, ellipsoid-concentric wrinkles representing a "signum-zone" on both surfaces.

The closest relative of *exacta* is *penthina;* the two species have a partly overlapping area in E Afghanistan. The diagnostic features of the male genitalia are the different shape and size of the harpe, the valvae and of the cornuti fields in the vesica (see Figs 1—10, 13, 15). In the female genitalia *penthina* shows much longer cervix than *exacta* and the ductus seminalis originates from a tubular apical appendage. The differences between *exacta* and the other, new species of the group *(beri* and *mixtazona)* are given in the descriptions of the latter ones.

Distribution: USSR (Kopet-Dagh, Pamir), Iran (Khorassan, Elburs), Afghanistan, China (Turkestan).

Oncocnemis exacta vanensis HREBLAY et RONKAY ssp. n. (Plate I: 5—6)

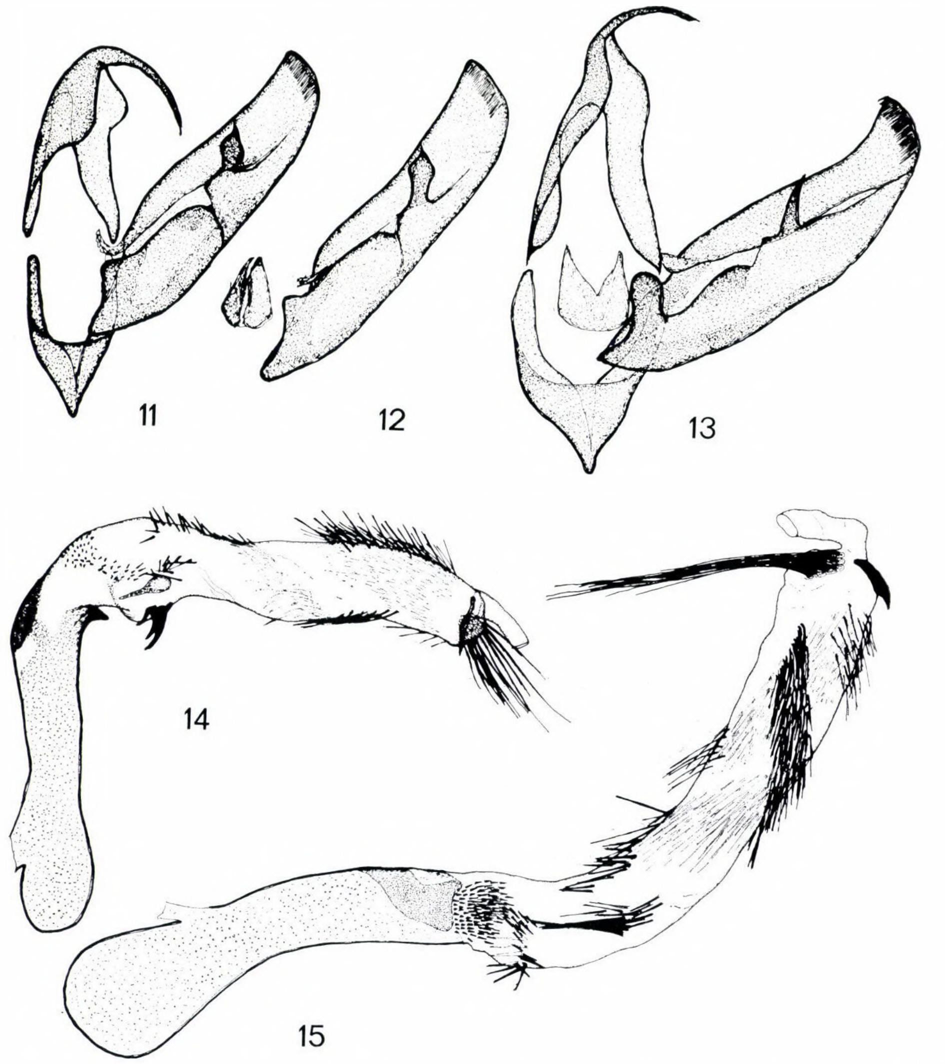
Holotype: male, "Turkey, Prov. Bitlis, 16 km E of Tatvan, 1850 m, 42°21′ E, 38°24′ N, 01. 08. 1988, leg. GYULAI, HREBLAY, RONKAY et RONKAY". Slide No. 3111 RONKAY (coll. HNHM). — Paratypes: 22 males, 14 females, Turkey, Prov. Van, 10 km N of Catak, 43 05E, 38 05N, 20—21. VII. 1989, (coll. HNHM, BEHOUNEK, GYULAI, HREBLAY, PLANTE, G. RONKAY); 2 males, 2 females, Turkey, Prov. Van, Kuskunkiran Pass, 2400 m, 22—23. 07. 1989, leg. et coll. GYULAI; 3 males, 3 females, Turkey, Prov. Bitlis, 16 km E of Tatvan, 1850 m, 42°21′ E, 38°24′ N, 01. 08. 1988, leg. GYULAI, HREBLAY, RONKAY et RONKAY, coll. the collectors and HNHM Budapest; 3 males, 3 females, Turkey, Hakkari, Zab valley, 1350—1400 m, 10—12. 07. 1980. leg. DE FREINA (coll. PLANTE), 1 female, Turkey, Hakkari, 10 km E Uludere, Süvarihalil Pass, 2300—2600 m, 14—15. 07. 1983, leg. DE FREINA (coll. PLANTE). Slide Nos 1163, 2284, 2285 HREBLAY (males), 3095 RONKAY (female).

External morphology — This subspecies is similar in appearance to *exacta exacta*, but the wings are significantly less shiny, the forewings are granulosely scaled, the markings are less sharp. Its ground colour is darker, especially in the marginal field. The configurations of the genitalia generally agree with those of the nominate subspecies; in the females the gonapophyses and the sclerotized ostium of vanensis are shorter (Figs 2—3, 5, 23—25).

Distribution — This westernmost race inhabits the xerothermic montane steppes of SE Turkey southwards from the Lake Van.

Oncocnemis exacta mongolica STAUDINGER, 1896 stat. n. (Plate I: 7—8)

Material examined. — Type material: holotype male, Mongolia, Uliasutai, coll. Staudinger (ZMHU Berlin): — Further material examined: some three hundred specimens from various localities of the Mongolian Altay chain (coll. Hungarian Natural History Museum, colln. FÁBIÁN, GYULAI, HREBLAY, G. RONKAY, SZABÓKY and VARGA). — Slide Nos 2081 HREBLAY, 2022, 2023, 2157 RONKAY (males), 3078 RONKAY (female).



Figs 11—15. 11—12 = *Oncocnemis beri* sp. n., types, W Tien Shan (valvae). 13 = *O. penthina* BOURSIN, Afghanistan (valva). 14 = *O. beri* sp. n., paratype, W Tien Shan (aedeagus). 15 = *O. penthina* BOURSIN, Afghanistan (aedeagus).

This taxon can be interpreted as the easternmost race of a polytypic species, displaying well-discernible differences as compared with the other, western populations in the colouration and some features of the genitalia. The concept of its taxonomic relegation is given in the general characterization of *exacta*.

The ground colour of the forewings of *mongolica* is the darkest within the species, shiny yellowish-brown with some reddish and brownish irroration, the fields, suffused with dark brown, are well-marked. The marginal field of the hindwing is very wide and the darker suffusion of the inner part of wing and the underside is more intensive in *mongolica* than in the other populations of *exacta*.

The basic configuration of the genitalia of *exacta* and *mongolica* is the same; the main differences between them can be found in the armature of cornuti of the vesica in males — *mongolica* have stronger and longer cornuti — and the shape and size of ostium in females — wider and shorter in *mongolica* (see Figs 6—7, 10, 26—28).

Distribution: Mongolia (the Altay chain and the W Hangayn Mts.)

Oncocnemis beri GYULAI et HREBLAY sp. n. (Plate II: 9—10)

Holotype: male, USSR, Uzbekistan SSR, W Tien Shan, Mts. Chimgan, 800—2000 m, 69°58′ E, 41°32′ N, 18—25. VII. 1990, (leg. P. GYULAI et M. HREBLAY, coll. M. HREBLAY). — Paratypes: 35 males, 35 females with same locality and data, coll. GYULAI, HREBLAY and HNHM; 1 male, 1 female, USSR, Kazakhstan, Thalasskiy Alatau, Aksu-Dzhabagli, 1600 m, 26. 07. 1985, leg. I. KOSTYUK (coll. HNHM); 1 male, E Afghanistan, Prov. Kadaghan, 69° E, 35° 40′ N, Salang Pass, 2400 m, 11—12. 07. 1971, leg. et coll. VARTIAN. — Slide Nos 2060, 2087, 2287, 2288, 2666 HREBLAY (males) 3775, 3776 RONKAY (females).

Description — Wingspan 27—31 mm, length of forewing 12—13 mm. Head, thorax and abdomen greyish-ochreous, collar unicolorous, large and rounded. Forewing contrasty, with darker and lighter transverse zones. Transverse lines sharp, dark brown, strongly sinuous. Median zone wide, outer half light ochreous. Stigmata less strong, orbicular and reniform encircled with brown and filled with ochreous; claviform absent or a short dark patch. Subterminal line sharp, bearing dark arrowheads on inner side. Marginal field dark, shiny brown, terminal line ochreous, cilia brownish. Hindwings whitish-ochreous, inner part with variably intensive brownish covering, marginal zone very broad, dark chocolate-brown. Terminal line and cilia whitish with a fine, interrupted brown line. Underside of wings light greyish-white with wide dark marginal areas, inner part of forewing and costal part of hindwing suffused with brown. Cilia of forewings dark brownish. The Afghan specimen has more pointed forewings with a lighter, whitish-ochreous colouration.

The new species resembles externally a well-marked specimen of *O. exacta mongolica* but displays a series of distinctive features, as to external and genital morphology. It differs from all related taxa by the significantly wider medial zone of forewings: the majority of the light outer zone is inside the postmedial line. The subterminal line is sharper than in the different forms of exacta and the cilia of the forewings are darker on both surfaces. The inner parts of wings are darker on the underside than those of the western *exacta* populations.

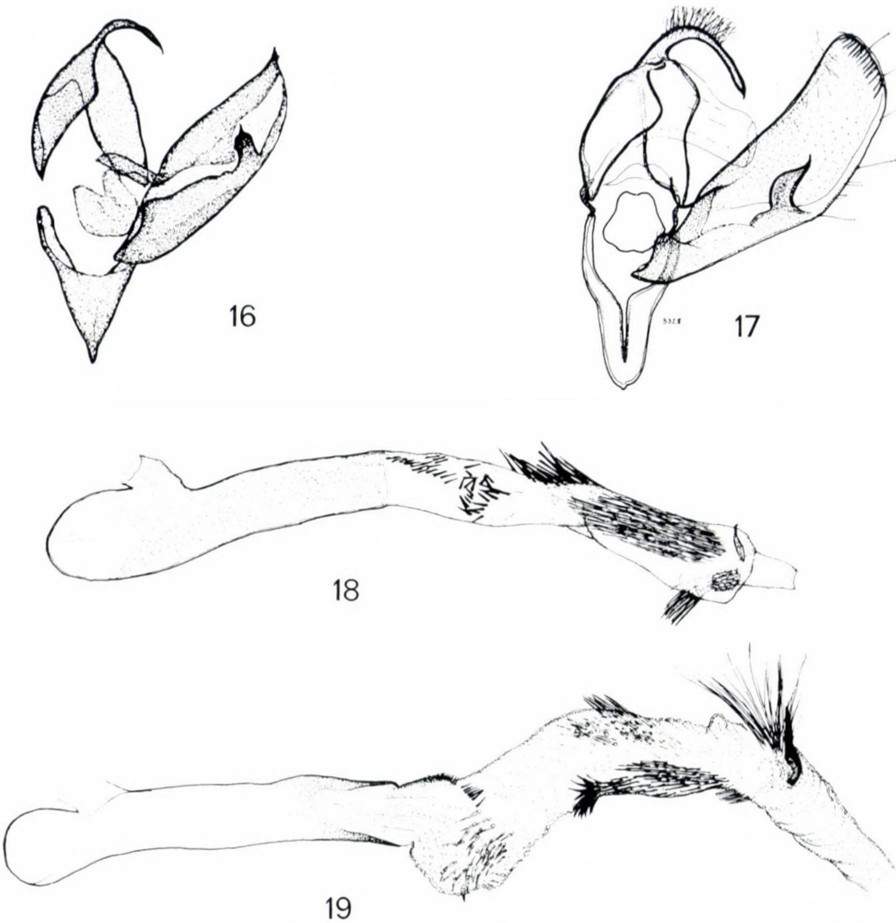
The main specific features in the configuration of the male genitalia (Figs 11—12, 14) are the medially inflated harpe, the vesica is strongly curved at its base and the basal diverticulum bears 4—5 strong, claw-like cornuti. In the structure of the female genitalia the new species differs from exacta by a shorter and narrower ostium with a relatively strong dorsal lamina, the presence of the characteristic appendage of cervix at base of ductus bursae and the different rate of cervix/corpus bursae (Fig. 29).

Distribution — The distribution pattern of the species displays a large disjunction as the known localities lie in the W Tien Shan and in E Afghanistan. It has a possibly wider range in Afghanistan and in Soviet Central Asia, occurs sympatrically with *penthina*, *exacta* and *mixtazona* in the Salang Pass (E Afghanistan).

Oncocnemis mixtazona HREBLAY et RONKAY sp. n. (Plate II: 11—15)

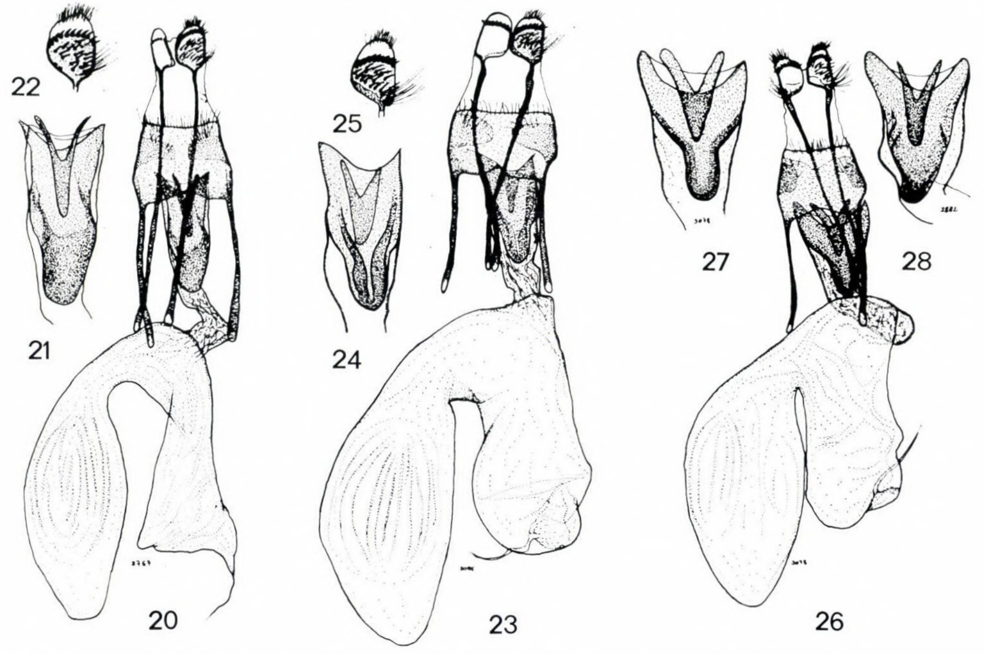
Holotype: male, "NO-Afghanistan, Wakhan-Tal, 3450 m, Darrah-e-Shaur, 25. 7. 1971, UV-Li., EBERT et NAUMANN, coll. Nr. 263", (coll. NAUMANN, Bonn). Slide No. 2082 HREBLAY. — Paratypes: a large series from the same locality and data, coll. the authors and collectors; a series from some higher places of the Wakhan valley, (Kotal-e-Dalez, Zemestani Baharak, Sarhad), 3150—3400 m, 23—30. 7. 1971, leg. EBERT et NAUMANN (coll. LNK, AKMB, HNHM, HREBLAY, G. RONKAY and VARGA); 1 male, Afghanistan, Paghman, 30 km NW Kabul, 2500 m, 19—31. 05. 1965, leg. KASY et VARTIAN (coll. VARTIAN, Vienna); a series from C Afghanistan, Band-i-Amir, 3000 m, 01. 08. 1965, 15—16. 07. 1971, leg. KASY et VARTIAN (coll. VARTIAN); 7 females, Afghanistan, Prov. Kadaghan, Salang Pass, 2100 m, 09. 07. 1969, 11—12. 07. 1971, leg. and coll. VARTIAN; 2 females, Afghanistan, Badakhshan, Bela Kuran, 3500—4200 m, 28. 07.—03. 08. 1963, leg. K. OMOTO (coll. Zoologische Staatssammlung Munich); 11 females, Afghanistan,Panchir valley, 3500 m, 12—14. 08. 1963, leg. K. OMOTO (coll. ZSM); India, Ladakh, Khardung-La, 4100 m, 05. 08. 1988, leg. W. THOMAS, coll. HACKER (Staffelstein) and PEKS (Schwanfeld); 1 female, USSR, Transcaspia, Merw, 1898, coll. TANCRÉ (coll. PÜNGELER, ZMHU Berlin); 1 male, USSR, Turkmenia, Kara-Kala, 10. 05. 1969, leg. KRUSEK (coll. BEHOUNEK); 1 female, USSR, Asia centr., Alai Mts., 30. VI—13. VII. 1914, coll. TANCRÉ (coll. PÜNGELER, Berlin); 3 females, USSR, Pamir Mts, Vanch, 10. 07. 1970, 15. 07. 1973 (coll. THÖNY). — Slides Nos 4162 BEHOUNEK, 5025 HACKER, 2291 HREBLAY, 2384 RONKAY, 76/141, 76/142, VARGA (males); 5006 HACKER, 2253, 2254 HREBLAY, 3781, 3785 RONKAY (females).

Description — Wingspan 29—33 mm, length of forewing 13—15 mm. — Head, thorax and abdomen dark brown with some ochreous-reddish shade, collar unicolorous, large and rounded. Forewing very contrasty, its darker and lighter transverse zones more distinct, median area entirely dark except reniform spot. Transverse lines sharp, dark brown, strongly sinuous. Orbicular small, round, reniform large, encircled with brown and filled with ochreous; claviform absent. Subterminal line slightly visible, ochreous bearing some small dark arrowheads on inner side. Marginal field dark, shiny brown, terminal line ochreous, cilia brownish, more or less spotted. Hindwings whitish-ochreous, inner part suffused with brownish, transverse line present, sinuous, wide and diffuse. Marginal zone very broad, dark chocolate-brown. Terminal line and cilia whitish-ochreous with a fine, interrupted brown line. Underside of wings light greyish-ochreous, restricted to a relatively narrow median zone. Dark brown marginal field of forewing narrow, apical part light(er). Inner part of hindwing suffused with brown, transverse line visible, diffuse; marginal area wide and dark with sinuous inner edge.



Figs 16—19. 16 = *Oncocnemis mixtazona* sp. n., paratype, Afghanistan (valva). 17 = *O. asema* Boursin, USSR, Ferghana (valva). 18 = *O. mixtazona* sp. n., paratype, Afghanistan (aedeagus). 19 = *O. asema* Boursin, USSR, Ferghana (aedeagus).

Male genitalia (Figs 16, 18): uncus short and slender, tegumen wide and low, fultura a wide shield with slight apical incision; vinculum strong and long, V-shaped. Valvae short and wide, apically tapering and acute. Corona restricted to some apical and erected setae forming a small bundle. Sacculus long and sclerotized, clavus less developed and rounded. Harpe situated at ventral margin, short and thick, medio-apically with an acute tip. Aedeagus cylindrical, carina without ventral teeth. Vesica everted forward, slightly twisted, without diverticulum; armed with several cornuti arranged into some cornuti fields. Proximal field of cornuti consists of short and wide-based items, medial part of vesica with a long and swollen cornuti field, densely



Figs 20—22. *Oncocnemis exacta* CHRISTOPH, Kopet-Dagh. 20 = whole copulatory organ, 21 = ostium bursae, 22 = posterior ovipositor lobes (20 and 21 in larger magnification). — Figs 23—25. *Oncocnemis exacta vanensis* ssp. n., paratype, SE Turkey. 23 = whole apparate, 24 = ostium bursae, 25 = posterior ovipositor lobe (24 and 25 in larger magnification). — Figs 26—28. *Oncocnemis exacta mongolica* STAUDINGER, Mongolia. 26 = whole apparatus, 27—28 = ostium bursae in larger magnification.

covered with strong and slightly curved cornuti and a field of very long and fine, spiculiform cornuti. Terminal part with a short, thick cornutus and a batch of long spicules placed oppositely.

Female genitalia (Fig. 30): ovipositor short, apophyses relatively short. Ostium small and narrow, shield-like, its sclerotization granulose and variably intensive. Ductus bursae relatively wide and less curved, cartilaginous. Bursa copulatrix bilobate, cervix nearly as long as corpus. Surfaces of cervix rugulose, "signum-field" well-developed, terminal third of corpus with a more or less visible, membranous diverticulum.

The new species represents a side-arm within the *exacta*-group. It resembles a dark specimen of *thomasi* but the configurations of the genitalia display numerous features unique in this group. The most conspicuous ones in the male clasping apparate are the long and relatively weak vinculum, the shape and size of the valva, the position of the harpe and the structure of the corona. The female genitalia of *mixtazona* differs from the related taxa by its short

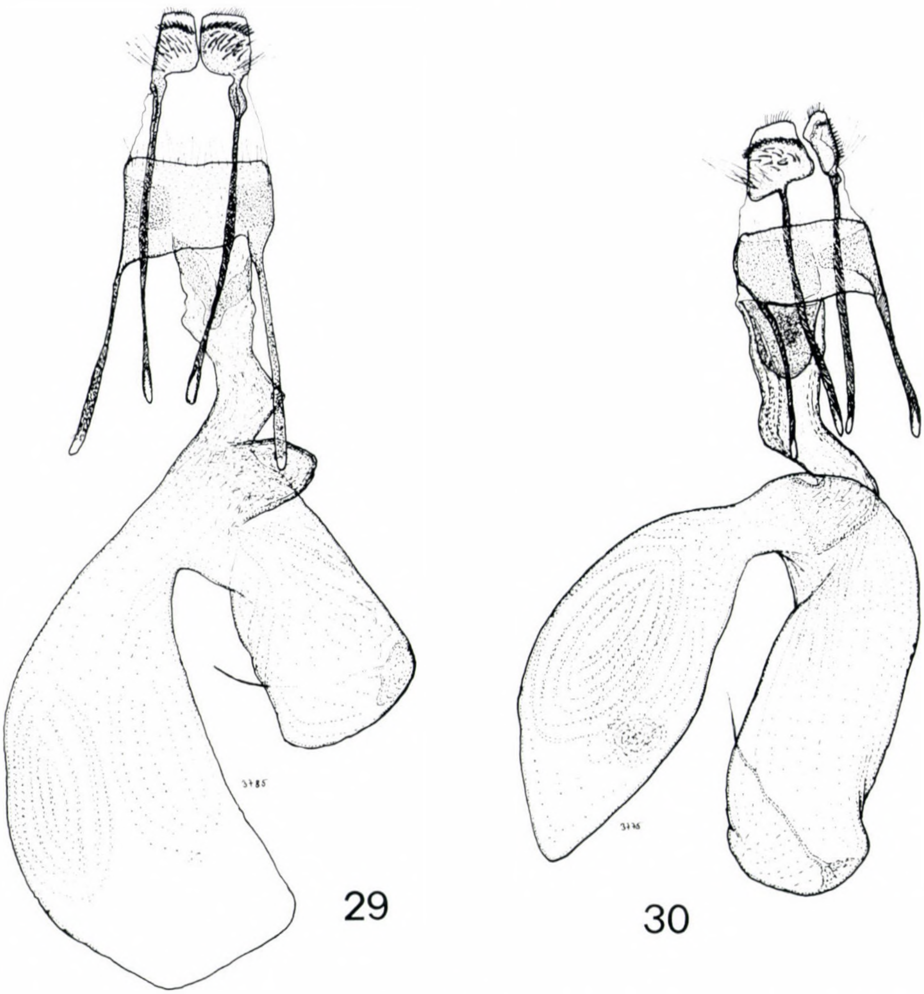


Fig. 29. *Oncocnemis beri* sp. n., paratype, W Tien Shan. — Fig. 30. *Oncocnemis mixtazona* sp. n., paratype, Merv.

and shield-like ostium and relatively short corpus bursae which is not longer significantly than cervix.

The different populations of *mixtazona* show a similar variability in colouration as those of *exacta*: the western ones are generally lighter with more sharp dark markings. These populations are mentioned as possible subspecies by HACKER (1990), but not separated here into distinct geographic races.

Distribution — USSR: Turkmenia (Kara-Kala, Merv), Tadjikistan (Saravshan Pamir), Afghanistan (C and NE), India: Ladakh. The species appears as very local and rare n its western range, more distributed in the Pamir-Hindukush-Karakoram area where it may be abundant in some places.

* * *

Acknowledgements — The authors would like to express their thanks to DR. V. I. KUZNETSOV and DR. I. L. SUKHAREVA (Leningrad), DR. V. V. DUBATOLOV (Novosibirsk), DR. W. MEY (Berlin), DR. W. DIERL (Munich), PROF. DR. C. NAUMANN (Bonn), H. HACKER (Staffelstein), H. THÖNY (Ingolstadt), DR. L. FORRÓ and DR. A. VOJNITS (Budapest) and DR. Z. VARGA (Debrecen) for the loan of the important materials including the types of the group. We are also indebted to DR. O. BER (Tashkent), DR. I. FÉSÜS and J. SURJÁN (Budapest), I. A. SESTOPALOV (Moscow), the MALÉV Hungarian Airlines and the Pegazus Tours for their kind help and financial subvention of the field work.

The research was supported by the OTKA Foundation, Hungarian Academy of Sciences, Budapest.

REFERENCES

BOURSIN, C. (1934): Contributions à l'Etude des Noctuidae-Trifidae. XI(1). Notes sur quelques espèces palearctiques et description de deux formes nouvelles. — *Revue fr. ent.* **1:** 58—64.

BOURSIN, C. (1963): Description de quinze espèces nouvelles provenant de l'expédition 1962 de M. et Mme. A. Vartian en Perse et en Afghanistan et deux genres nouveaux (Lep. Noctuidae). — *Bull. mens. Soc. linn. Lyon* **32:** 290—305.

CHRISTOPH, H. (1887): Lepidoptera aus dem Achal-Tekke-Gebiet. Dritter Theil. — *Mém. Lep.* **3:** 50—125.

CHRISTOPH, H. (1889): Lepidopteren aus dem Achal-Tekke-Gebiet. — *Mém. Lep.* **5:** 1—58.

EBERT, G. (1978): Neue Taxa paläarktischen Noctuidae aus dem wissenschaftlichen Nachlass von Charles Boursin. (Lep./Noct. Trifin.). — *Beitr. naturk. Forsch. SüdwDtl.* **37:** 193—207.

HACKER, H. & DE FREINA, J. (1986): 2. Beitrag zur Erfassung der Noctuidae der Türkei. Beschreibung neuer Taxa, Erkenntnisse zur Systematik der kleinasiatischen Arten und faunistisch bemerkenswerte Funde aus den Aufsammlungen von de Freina aus den Jahren 1976—1983. (Lepidoptera). — *Spixiana* **9:** 25—91.

HACKER, H., KUHNA, P. & GROSS, F. J. (1986): 4. Beitrag zur Erfassung der Noctuidae der Türkei. — *Mitt. münchn. ent. Ges.* **76:** 79—141.

HACKER, H. (1990): Die Noctuidae Vorderasiens (Lepidoptera). — *Neue ent. Nachr.* **27:** 1—707.

HACKER, H. & PEKS, H. (1990): Systematik und Faunistik der Noctuidae (Lepidoptera) des himalayanischen Raumes. 2. Beschreibung neuer Taxa und Übersicht über das Artenspektrum des von Dr. W. Thomas 1980—1988 in Ladakh gesammelten Materials. Teil I. — *Esperiana* **1:** 277—322.

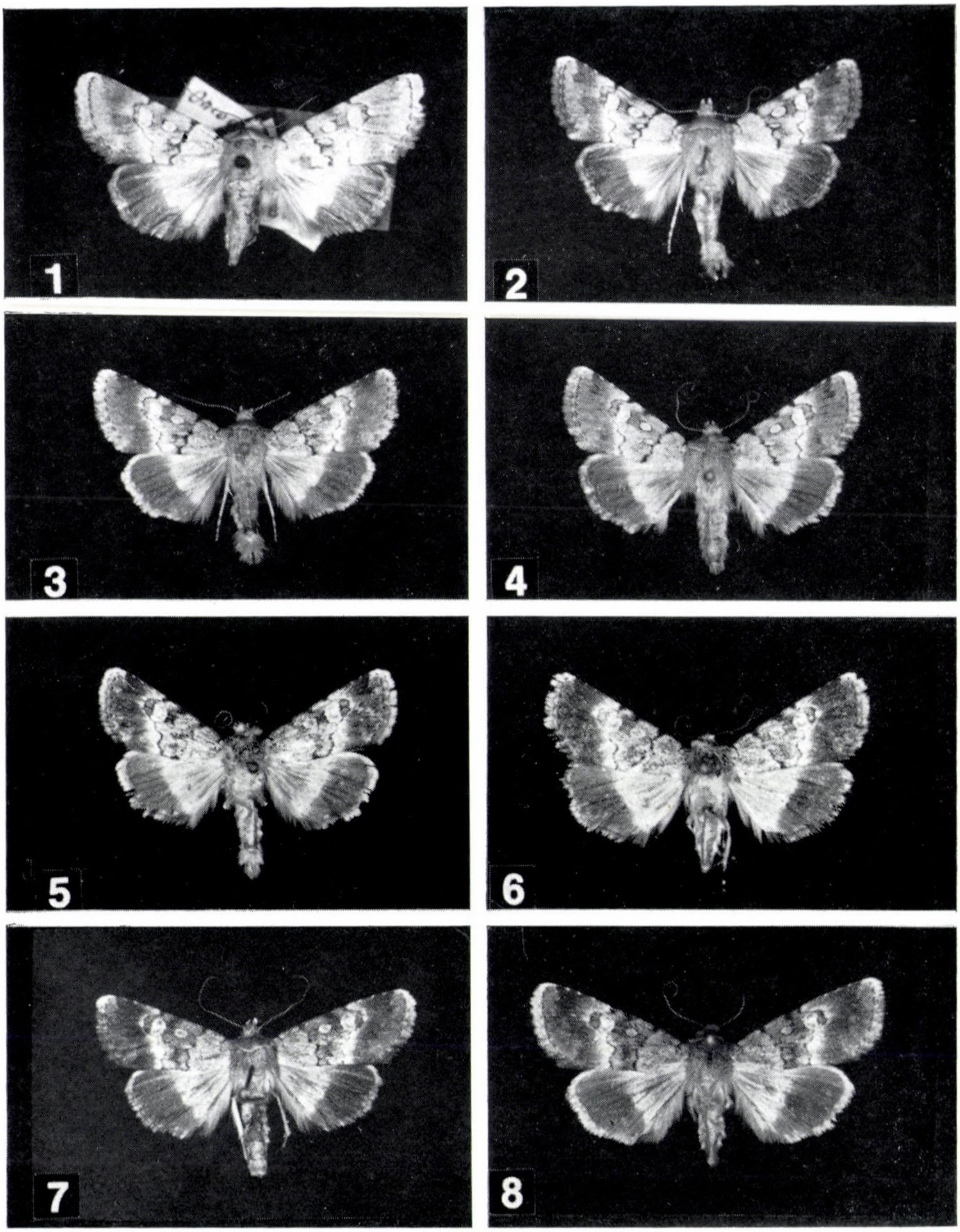
PLANTE, J. (1986): Un Oncocnemis Lederer nouveau du Ladakh (Lepid. Noctuidae Cucullinae). — *Nota lepid.*, **9:** 97—98.

POOLE, R. W. (1990): Lepidopterum Catalogus: Noctuidae. I—III. — E. J. Brill Flora & Fauna Publications pp: 1311.

SCHWINGENSCHUSS, L. (1937): Weitere Neuheiten aus Nord-Persien. — *Z. öst. ent. Vereins,* **22:** 57—61.

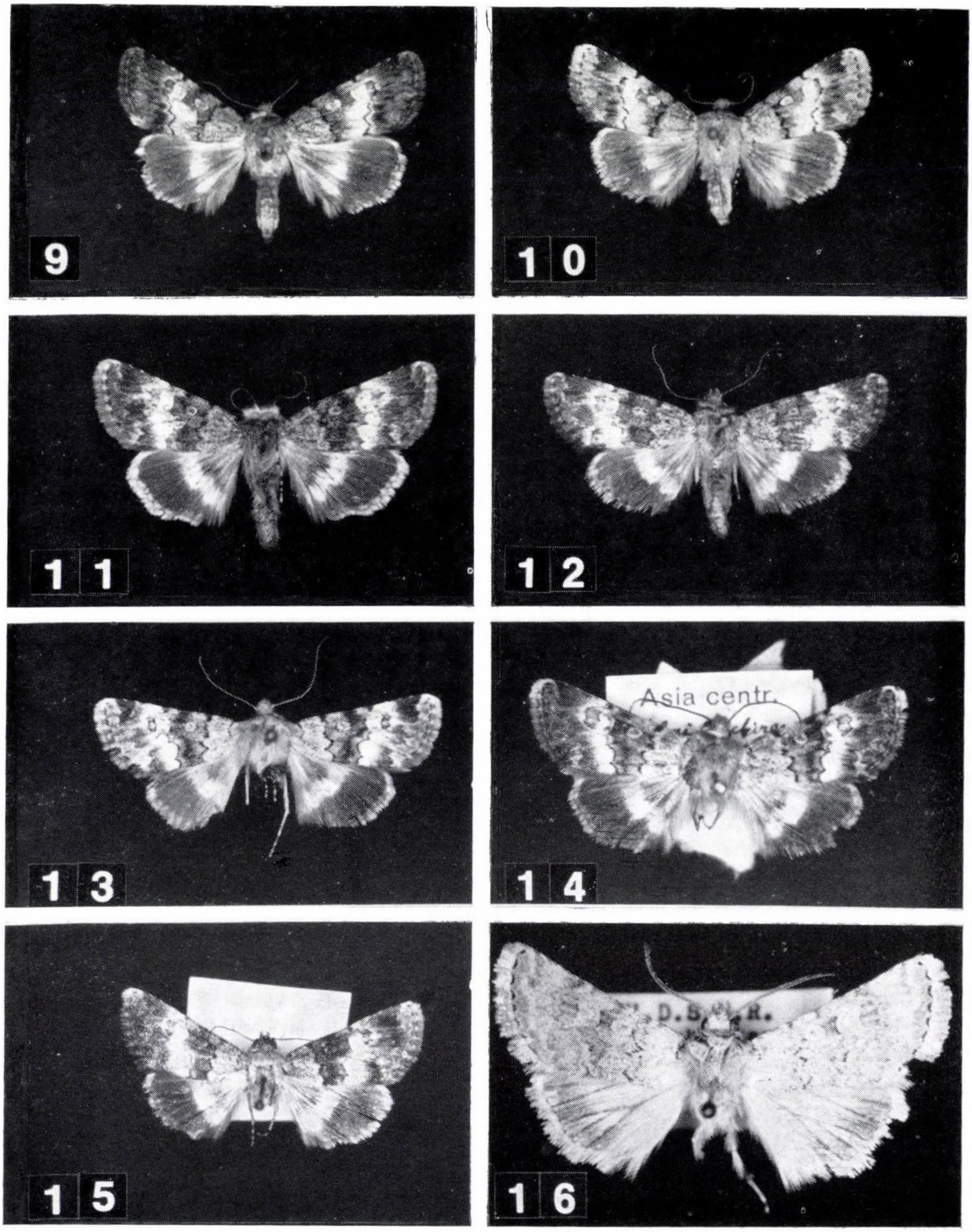
STAUDINGER, O. (1896): Über die Lepidopteren von Uliassutai. — *Dt. ent. Ztschr. Iris,* **8:** 344—366.

Plate I.



1 = *Oncocnemis exacta* Christoph, holotype female, Ashabad. — 2 = *O. exacta* Christoph, male, Kopet-Dagh. — 3 = *O. exacta* Christoph, male, Kopet-Dagh. — 4 = *O. exacta* Christoph (?ssp.), male, Pamir, Chorog. — 5 = *O. exacta vanensis* ssp. n., paratype male, SE Turkey. — 6 = *O. exacta vanensis* ssp. n., paratype female, SE Turkey. — 7 = *O. exacta mongolica* Staudinger, male, Mongolia. — 8 = *O. exacta mongolica* Staudinger, female, Mongolia.

Plate II.



9 = *Oncocnemis beri* sp. n., paratype female, W Tien Shan. — 10 = *O. beri* sp. n., paratype female, W Tien Shan. — 11 = *O. mixtazona* sp. n., paratype male, Afghanistan, Wakhan. — 12 = *O. mixtazona* sp. n., paratype male, Afghanistan, Wakhan. — 13 = *O. mixtazona* sp. n., paratype male, Afghanistan, Band-i-Amir. — 14 = *O. mixtazona* sp. n., paratype female, Alai Mts. — 15 = *O. mixtazona* sp. n., paratype female, Merv. — 16 = *O. asema* BOURSIN, male, Ferghana.

Acta Zoologica Hungarica 38 (1—2), pp. 47—62 (1992)

DISPERSION AND ASSOCIATION OF SOME MARSHLAND-NESTING BIRDS: A MATTER OF SCALE

C. MOSKÁT, Z. WALICZKY & A. BÁLDI

Ecological Research Group, Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

(Received 12 March, 1991)

Dispersion and association of five abundant passerine bird species (*Acrocephalus arundinaceus*, *A. schoenobaenus*, *A. scirpaceus*, *Locustella luscinioides* and *Emberiza schoeniclus*) were studied in a marsh in Hungary, at 7 different levels of spatial scale. The index of dispersion (variance/mean) and Morisita's index gave very similar results for the dispersion of the species. The method block-quadrat variances revealed patterns on much higher scales, connected with the habitat. The Ochiai, Dice, and Jaccard indices, the chi-square test of association, and Kendall's rank correlation coefficient were applied for the measure of association between species. Results on dispersion and association showed a high order dependency on block size. Biological explanation of the results are also discussed.

1. INTRODUCTION

A considerable proportion of ornithological work has focused on the structure of avian communities, by examining several mechanisms like habitat selection, competition, and predation affecting the dispersion of bird populations (CODY 1985, see review in WIENS 1989), but papers on the analysis of spatial pattern are very scarce. Analysis of the spatial pattern of bird populations reveals how individuals are dispersed in space, brought about by mechanisms of intraspecific and interspecific interactions among populations (TAILOR & WOIWOD 1982, SHERRY & HOLMES 1985). Interactions with the spatial pattern of habitat could also be in the centre of interest (SHAW & ATKINSON 1990, LŐRINCZ et al. 1990).

Dispersion of organisms in space and time is not only a population characteristic, it is in close connection with community structure. Spatial variation and changes of the patch structure in time can influence the community pattern in numerous ways (WIENS 1989), so dispersion can indicate environmental changes as well.

Ecological patterns suffer from scale dependency. Which is the right scale, how can we interpret our results on community characteristics? Is there any mathematical solution for the scale problem? As WIENS et al. (1987) and WIENS (1989) pointed out, the term "scale problem" covers effects of a wide variety of scales (biogeographical, regional, local, etc.). However, scale is not a property of the object being observed, but a property of the method of observation (ALLEN & STARR 1982). An accurate analysis of a bird community can be achieved by viewing the community at several levels of resolution (MAURER 1985).

Different levels of the local spatial scale are examined in this paper. We asked the following questions:

— How can we determine by simple spatial statistical tools the main characteristics of dispersion of some selected bird species?
— How consistent are the results in spatial pattern analysis obtained by different methods?

— Do dispersion characteristics of selected marshland passerines depend on spatial scale?
— Is there a consistency in the association of some bird species at different levels of spatial scale?
— Is it worth to apply statistical tools for examining spatial patterns when community characteristics are studied?

To answer these questions, we conducted a study in the marshland Kis-Balaton, in W. Hungary in two consecutive years during the breeding season. Although forested areas have been shown to be better for studies on the structure of avian communities (Sherry & Holmes 1985), this marshland provided some special advantages, like relatively long transect routes in a more or less homogenous habitat. Our study also revealed some ecological characteristics of certain abundant marshland-nesting migratory passerines.

2. STUDY AREA

The study was conducted in the marsh Kis-Balaton, which is situated around the mouth of the river Zala entering Lake Balaton, West Hungary (46°42′ N, 17°21′ E). The area is composed of the following plant associations: *Scirpo phragmitetum*, *Typhetosum angustifoliae*, *Caricetosum elatae*, *C. acutiformis*. Bushes and trees of *Salix alba* and *S. fragilis* were very scarce in the area. Bird surveys were carried out in reed belts (*Phragmitetum communis*) along the small dykes, forming a long continuous transect of circular shape.

3. METHODS

3.1. Bird censuses

Line transect surveys were carried out in May 1989 in the early hours under fine weather conditions. Field surveys were also carried out in 1990. We registered the distance of singing males, or observed specimens/pairs from the starting point of the transect measured in steps (one step was about 0.75 m). Lateral distances of birds from the survey route were also registered. Detections of singing birds dominated over visual observations. Single line transect surveys could not result in well-identified territories, so we examined the dispersion pattern of the location of individual male birds, rather than the dispersion of territories.

3.2. Data manipulation

For the statistical analysis of dispersion and association of bird species we divided the transect data into continuous blocks, and set up a distance limit of 50 m for the width of the transects. In order to study the effect of spatial scale on the results, 7 block sizes were applied: 25, 50, 100, 200, 300, 400, and 500 steps long blocks. Total length of transect was 18000 steps (about 13.5 km).

3.3. Statistical analyses

In vegetation research, plant ecologists generally apply the method quadrat-variance for the detection of dispersion of individuals of a species. The method of block-quadrat variances (BQV) is based on examining changes in the variance and the mean of the number of individuals at different block sizes, as the latter increases in powers of 2 (Greig-Smith 1983, Kershaw & Looney 1985). We tried to apply this technique for bird data. Computations were carried out by the program BQV (Ludwig & Reynolds 1988).

We measured the dispersion of the species by the index of dispersion (ID), which expresses the variance-to-mean ratio as a test for agreement with a Poisson model. This index is the most popular among the group of dispersion indices, because we can test it by *chi*-square test statistic, or for large sample size by the *d* statistic (Elliott 1977). The program POISSON was used for computation of the index of dispersion (Ludwig & Reynolds 1988).

Morisita's dispersion index (MORISITA 1971) was also applied to measure dispersion, using a program written by the first author.

Association of the species was measured by association indices (Ochiai, Dice and Jaccard), and by the *chi*-squre statistic with help of the computer program SPASSOC (LUDWIG & REYNOLDS 1988). A rank correlation coefficient, Kendall's tau was also applied for the measurement of interspecific association (see e.g. SOKAL & ROHLF 1981). Rank correlations were computed by the statistical package SPSS/PC+ (NORUSIS 1986).

4. RESULTS

4.1. Bird species selected for analysis

During the transect surveys 24 passerine bird species were detected in 1989, and 18 in 1990. For statistical considerations we selected the five most abundant species for the calculation of spatial characteristics, namely the Great Reed Warbler (*Acrocephalus arundinaceus* L., 1758), the Sedge Warbler (*Acrocephalus schoenobaenus* L., 1758), the Reed Warbler (*Acrocephalus scirpaceus* (HERM.), 1804), Savi's Warbler (*Locustella luscinioides* (SAVI), 1824), and the Reed Bunting (*Emberiza schoeniclus* L., 1758). A total of 707 occurrences were registered for the selected five species, but only observations within a 50 m lateral distance were used for analyses (615 records). In more details, the data set composed of 16 and 26 records for the Great Reed Warbler, 105 and 83 for the Sedge Warbler, 57 and 76 for the Reed Warbler, 54 and 40 for the Reed Bunting, 80 and 78 for the Savi's Warbler in 1989 and 1990, respectively.

4.2. Dispersion patterns

4.2.1. Block-quadrat variance

The method is usually applied when no visual aggregation in the pattern is detected. Peaks in the graph of the variances plotted against the series of block sizes reveal the scale of pattern. For the Sedge Warbler, the Reed Warbler, the Reed Bunting, and Savi's Warbler the initial block size was 50 steps long. We did not calculate block-quadrat variances for the Great Reed Warbler because of insufficient data.

Each of the graph of block-quadrat variances show one or two peaks (Fig. 1), detecting some tendency for aggregation in dispersion. Each of the species show a peak in variance at block size 32 in 1989, although for Savi's Warbler it is not a primary peak. In 1990 two species also showed the peak at block size 32 (Reed Bunting and Savi's Warbler), but the peak was shifted to block size 16 for the Reed Warbler, and peaks were not so evident for the Sedge Warbler. Since the method of quadrat-variances uses block sizes increasing in powers of 2, the result may be somewhat different from the exact scale. For example, for the Sedge Warbler the BQV method showed a peak at 1600

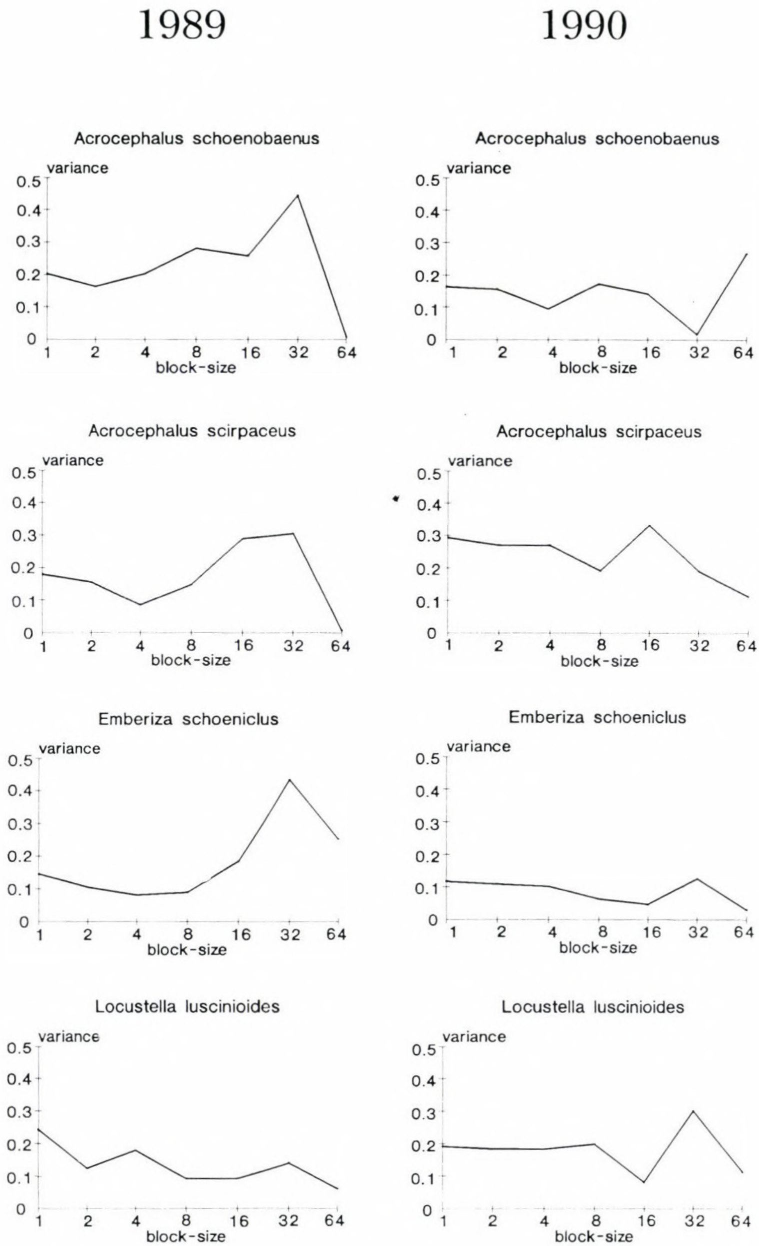


Fig. 1. Plots of variances against block size for the Sedge Warbler (*Acrocephalus schoenobaenus*), Reed Warbler (*A. scirpaceus*), Reed Bunting (*Emberiza schoeniclus*), and Savi's Warbler (*Locustella luscinioides*) in the marsh Kis-Balaton, W. Hungary in 1989 and 1990. (block width = 50 m, block size 1 = 50 steps, 1 step = ca. 0.75 m).

steps, but a more precise estimation by Hill's two-term local quadrat variance method (HILL, 1973) revealed 1900 steps.

Two interesting conclusions may be drawn from the quadrat-variance analyses: (1) there are tendencies for clumping in each of the species analyzed by the BQV technique at least in one of the years, and (2) the block size of clumping seems to be very large. (See more below.)

Table 1

Dispersion types of five abundant passerine bird species based on index of dispersion in the marsh Kis-Balaton in 1989

(U = uniform, R = random, C = clumped pattern)

Species	Block length (steps)						
	25	50	100	200	300	400	500
Acrocephalus arundinaceus	C, R	C	C	C	C	C	C
Acrocephalus schoenobaenus	U	U	R	R	R	R	R
Acrocephalus scirpaceus	R	R	R	R	R	R	R
Emberiza schoeniclus	R	R	U	R	R	R	R
Locustella luscinioides	R	U	U	U	U	U	U

4.2.2. Dispersion indices

The results of computation of the dispersion index (ID) can be consulted in Tables 1 and 2, and the results of Morisita's index in Tables 3 and 4. Although these indices belong to two basically different groups, the results are very similar. For the Great Reed Warbler both of them revealed a clumped pattern in all of the block sizes in 1989, and for Savi's Warbler both of them mostly revealed uniform pattern. For the other three species (Sedge Warbler, Reed Warbler, and Reed Bunting) there is a tendency for showing a random pattern at larger block sizes.

Table 2

Dispersion types of five abundant passerine bird species based on index of dispersion in the marsh Kis-Balaton in 1990

(U = uniform, R = random, C = clumped pattern)

Species	Block length (steps)						
	25	50	100	200	300	400	500
Acrocephalus arundinaceus	R	R	R	R	R	R	R
Acrocephalus schoenobaenus	R	U	R	R	R	R	R
Acrocephalus scirpaceus	R	R	R	R	R	R	R
Emberiza schoeniclus	C	C, R	R	R	R	R	R
Locustella iuscinioides	U	U	U	U	U	U	U

Table 3

Dispersion types of five abundant passerine bird species based on Morisita's index in the marsh Kis-Balaton in 1989

(U = uniform, R = random, C = clumped pattern)

Species	Block length (steps)						
	25	50	100	200	300	400	500
Acrocephalus arundinaceus	C, R	C	C	C	C	C	C
Acrocephalus schoenobaenus	U	U	R	R	C	R	R
Acrocephalus scirpaceus	R	R	R	R	R	R	R
Emberiza schoeniclus	R	R	U	R	R	R	R
Locustella luscinioides	R	U	U	U	U	U	U

Table 4

Dispersion types of five abundant passerine bird species based on Morisita's index in the marsh Kis-Balaton in 1990

(U = uniform, R = random, C = clumped pattern)

Species	Block length (steps)						
	25	50	100	200	300	400	500
Acrocephalus arundinaceus	C	C	R	R	R	R	R
Acrocephalus schoenobaenus	R	U	R	R	R	R	R
Acrocephalus scirpaceus	C	R	R	R	R	R	R
Emberiza schoeniclus	C	C	R	R	C	R	R
Locustella luscinioides	R	U	C	U	U	R	U

The dispersion index (ID) and the Morisita's index of dispersion did not reveal any important tendencies for clumping in the four species analyzed by the BQV method. The scale of clumping for these species revealed by the BQV method (see above) is out of the range chosen for these indices. The limit in block size for these indices was chosen to be 500 steps, but with the BQV method we analyzed variances of blocks up to 3200-step long. We obtained similar results for the interval incommon.

4.3. Association of individual bird species

4.3.1. Association indices

Ludwig & Reynolds (1988) recommended the Ochiai, Dice, and Jaccard indices to measure interspecific association. These indices are relatively simple ones, easy to use and to understand the rationale underlaying them, they use binary (presence/absence) data. Furthermore, their favourable properties have been proven by extensive tests. The three indices applied for Kis-Balaton data revealed nearly the same associations between species, but the indices Ochiai and Dice gave somewhat higher values than the Jaccard index did (Fig. 2). Values of each of these indices showed an increasing tendency in relation to increasing block size. For the sake of simplicity only the values of the Jaccard index are presented for all pairs of species and for all block sizes (Tables 5 and 6).

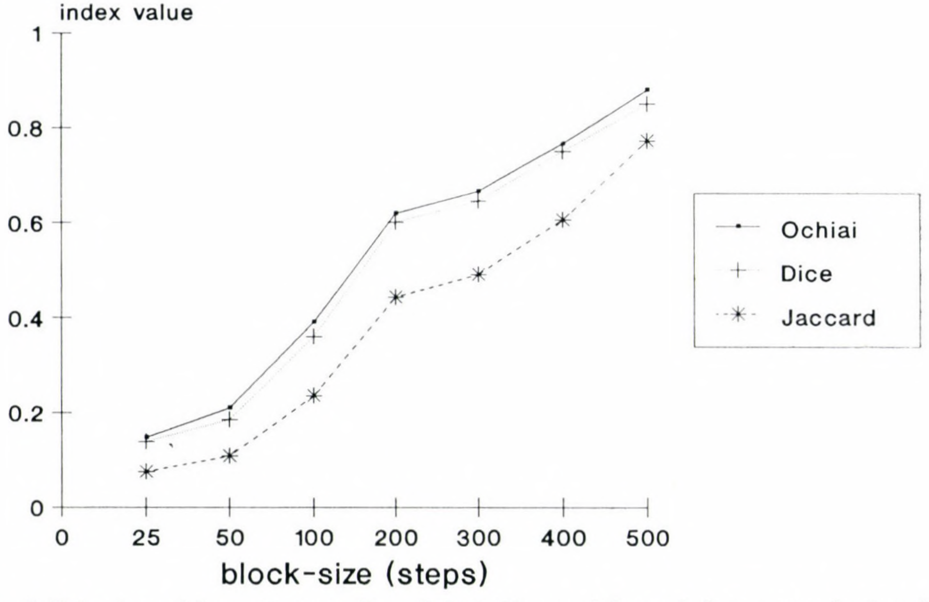


Fig. 2. Behaviour of 3 association indices, Ochiai, Dice, and Jaccard, demonstrated using the Sedge Warbler — Reed Bunting data from 1989.

Table 5

Values of the Jaccard index for pairs of bird species in the marsh Kis-Balaton in 1989 (abbreviations of genera: A. = Acrocephalus, E. = Emberiza, L. = Locustella)

Pairs of species			Block length (steps)						
			25	50	100	200	300	400	500
A. arundinaceus	—	A. schoenobaenus	0.00	0.03	0.04	0.10	0.13	0.18	0.27
A. arundinaceus	—	A. scirpaceus	0.00	0.02	0.07	0.10	0.16	0.23	0.33
A. arundinaceus	—	E. schoeniclus	0.00	0.00	0.05	0.12	0.16	0.19	0.23
A. arundinaceus	—	L. luscinioides	0.01	0.01	0.01	0.06	0.07	0.14	0.24
A. schoenobaenus	—	A. scirpaceus	0.04	0.08	0.15	0.35	0.44	0.51	0.67
A. schoenobaenus	—	E. schoeniclus	0.08	0.11	0.24	0.44	0.49	0.61	0.77
A. schoenobaenus	—	L. luscinioides	0.09	0.14	0.28	0.48	0.66	0.78	0.83
A. scirpaceus	—	E. schoeniclus	0.03	0.08	0.15	0.28	0.41	0.48	0.65
A. scirpaceus	—	L. luscinioides	0.02	0.06	0.19	0.36	0.51	0.59	0.71
E. schoeniclus	—	L. luscinioides	0.08	0.11	0.20	0.42	0.51	0.58	0.72

Table 6

Values of the Jaccard index for pairs of bird species in the marsh Kis-Balaton in 1990 (abbreviations of genera: A. = Acrocephalus, E. = Emberiza, L. = Locustella)

Pairs of species			Block length (steps)						
			25	50	100	200	300	400	500
A. arundinaceus	—	A. schoenobaenus	0.02	0.06	0.12	0.19	0.27	0.36	0.44
A. arundinaceus	—	A. scirpaceus	0.04	0.08	0.14	0.23	0.28	0.34	0.34
A. arundinaceus	—	E. schoeniclus	0.03	0.03	0.09	0.15	0.18	0.34	0.38
A. arundinaceus	—	L. luscinioides	0.03	0.12	0.13	0.22	0.33	0.42	0.44
A. schoenobaenus	—	A. scirpaceus	0.03	0.08	0.16	0.33	0.45	0.53	0.62
A. schoenobaenus	—	E. schoeniclus	0.04	0.11	0.19	0.40	0.48	0.70	0.68
A. schoenobaenus	—	L. luscinioides	0.05	0.09	0.23	0.49	0.62	0.68	0.87
A. scirpaceus	—	E. schoeniclus	0.00	0.02	0.07	0.20	0.31	0.51	0.59
A. scirpaceus	—	L. luscinioides	0.06	0.12	0.20	0.40	0.55	0.62	0.70
E. schoeniclus	—	L. luscinioides	0.09	0.10	0.16	0.31	0.40	0.53	0.62

4.3.2. *Chi*-square test of association

Chi-square test of association has also been applied for binary data. Only few of the *chi*-square values proved to be significant at the 5% probability level (Tables 7 and 8), which means that the two species in question are associated. Although there are several changes in the sign and value of the

Table 7

Values of the *chi*-square statistic for associations of pairs of bird species in the marsh Kis-Balaton in 1989 (abbreviation of species: A. aru = Acrocephalus arundinaceus, A. sch. = Acrocephalus schoenobaenus, A. sci. = Acrocephalus scirpaceus, E. sch. = Emberiza schoeniclus, L. lus. = Locustella luscinioides) (When *chi*-square value > 3.84 reject the hypothesis that the two species are independent; * = biased, *chi*-square values are considered biased if the expected frequency of any cell in a 2×2 table < 1 and/or the expected frequencies of more than 2 cells < 5 following ZAR (1984))

Pairs of species			Association (— or +) and block length (steps)						
			25	50	100	200	300	400	500
A. aru.	—	A. sch.	−2.59	−0.15	−0.92	−0.42	−0.01	+0.01*	+1.09*
A. aru.	—	A. sci.	−1.29	−0.60	+0.20	−0.06	+0.87*	+2.26	+4.00
A. aru.	—	E. sch.	−1.24	−2.33	−0.10	+0.16	+0.87*	+0.30	−0.06
A. aru.	—	L. lus.	−0.29	−1.60	−6.41	−5.66	−7.39	−3.12*	−0.12*
A. sch.	—	A. sci.	−0.68	−1.96	−4.46	−0.67	−2.62	−3.82*	−1.09*
A. sch.	—	E. sch.	+1.66	+0.01	+0.33	+1.88	−0.14	+0.00*	+0.40*
A. sch.	—	L. lus.	+1.48	+0.00	−0.18	−0.09	−0.08	−0.68*	−0.30*
A. sci.	—	E. sch.	−0.40	−0.00	−0.28	−1.12	−0.10	−0.05	+0.06
A. sci.	—	L. lus.	−1.96	−3.22	−0.31	−0.68	−0.50	−0.21*	+0.12*
E. sch.	—	L. lus.	+3.40	+0.24	−0.03	+0.28	−0.50	−2.20*	−0.79*

Table 8

Values of the *chi*-square statistic for associations of pairs of bird species in the marsh Kis-Balaton in 1990 (abbreviation of species: A. aru. = Acrocephalus arundinaceus, A. sch. = Acrocephalus schoenobaenus, A. sci. = Acrocephalus scirpaceus, E. sch. = Emberiza schoeniclus, L. lus. = Locustella luscinioides) (When *chi*-square value >3.84 reject the hypothesis that the two species are independent; * = biased, *chi*-square values are considered biased if the expected frequency of any cell in a 2×2 table <1 and/or the expected frequencies of more than 2 cells <5 following ZAR (1984))

Pairs of species	Association (— or +) and block length (steps)						
	25	50	100	200	300	400	500
A. aru. — A. sch.	−0.26	+0.06	+0.13	−0.11	−0.07	+0.00*	+0.61*
A. aru. — A. sci.	+1.26	+1.60	+1.20	+1.04	+0.18	+0.06	−0.26
A. aru. — E. sch.	+0.45	−0.11	+0.05	−0.09	−0.50	+0.30	+0.19
A. aru. — L. lus.	+0.04	+8.51	+0.66	+0.24	+1.37	+2.01*	+0.78*
A. sch. — A. sci.	−0.97	−1.12	−2.57	−4.31	−4.24	−4.09	−1.66*
A. sch. — E. sch.	+0.31	+2.08	+1.50	+4.93	+4.46	+9.88*	+3.13*
A. sch. — L. lus.	−0.28	−0.96	−0.03	+0.00	−0.46	−1.69	−0.13*
A. sci. — E. sch.	−3.92	−4.07	−4.76	−2.56	−0.58	+0.18	+1.33
A. sci. — L. lus.	+0.13	+0.25	−0.10	−0.14	−0.03	−0.01*	−0.38*
E. sch. — L. lus.	+8.20	+1.44	+0.21	+0.01	+0.02	−0.33*	−0.56*

chi-squares between pairs of species along the quadrat series, this technique gives relatively stable results for the significant species considering all of the scales together (Fig. 3) (see also the next paragraph).

4.3.3. Rank correlation

Kendall's rank correlation provides a robust test of association. Although it does not need simplified binary data, this test is based on the rank order of data elements, not on the values of data. Tables 9 and 10 represent the significant associations between species according to Kendall's rank correlation. There is considerable concordance of Kendall's taus with the associations revealed by the *chi*-square tests. Significant associations revealed by rank correlation seem to be fluctuating along the block size series: some of the associations are not apparent at certain levels, but there is no contradiction among the results (Tables 9 and 10, Fig. 4). Most of the associations apparent at a given block size can be revealed by choosing a not so rigorous significance level.

5. DISCUSSION

5.1. Dispersion types of marshland passerines. A question of technique

We studied the spatial pattern of five abundant passerine birds (Great Reed Warbler, Sedge Warbler, Reed Warbler, Reed Bunting, and Savi's Warbler) in the marsh Kis-Balaton. Several methods were applied for the detection of dispersion type and association between species.

Table 9

Values of Kendall's rank correlation coefficient computed for five passerine bird species in the Kis-Balaton in 1989 (only significant correlations are shown at the probability level <5%) (scale refers to block length measured in steps; 1 step = 0.75 m)

Block-size	Species			Kendall's tau	Significance	n
25	E. schoeniclus	—	L. luscinioides	0.068	0.033	720
50	A. scirpaceus	—	L. luscinioides	—0.092	0.040	360
100	A. arundinaceus	—	L. luscinioides	—0.187	0.006	180
100	A. schoenobaenus	—	A. scirpaceus	—0.159	0.012	180
200	A. arundinaceus	—	L. luscinioides	—0.265	0.004	90
200	A. schoenobaenus	—	E. schoeniclus	0.190	0.021	90
200	A. schoenobaenus	—	A. scirpaceus	—0.202	0.015	90
300	A. arundinaceus	—	L. luscinioides	—0.316	0.004	60
300	A. schoenobaenus	—	E. schoeniclus	0.199	0.034	60
300	A. schoenobaenus	—	A. scirpaceus	—0.379	0.000	60
400	A. arundinaceus	—	L. luscinioides	—0.380	0.002	45
400	A. schoenobaenus	—	E. schoeniclus	0.206	0.047	45
400	A. schoenobaenus	—	A. scirpaceus	—0.324	0.004	45
500	A. arundinaceus	—	L. luscinioides	—0.441	0.002	36
500	A. schoenobaenus	—	A. scirpaceus	—0.493	0.000	36

Table 10

Values of Kendall's rank correlation coefficient computed for five passerine bird species in the Kis-Balaton in 1990 (only significant correlations are shown at the probability level <5%) (scale refers to block length measured in steps; 1 step = 0.75 m)

Block-size	Species			Kendall's tau	Significance	n
25	E. schoeniclus	—	L. luscinioides	0.104	0.002	754
25	A. scirpaceus	—	E. schoeniclus	—0.072	0.024	754
50	A. arundinaceus	—	L. luscinioides	0.148	0.002	377
50	A. scirpaceus	—	E. schoeniclus	—0.104	0.021	377
100	A. scirpaceus	—	E. schoeniclus	—0.166	0.009	188
200	A. schoenobaenus	—	E. schoeniclus	0.187	0.025	94
200	A. scirpaceus	—	E. schoeniclus	—0.183	0.027	94
300		—		—	—	62
400	A. schoenobaenus	—	E. schoeniclus	0.368	0.002	47
400	A. schoenobaenus	—	A. scirpaceus	—0.342	0.002	47
500	A. schoenobaenus	—	E. schoeniclus	0.310	0.012	37
500	A. schoenobaenus	—	A. scirpaceus	—0.279	0.018	37

The method of block quadrat variance revealed the spatial scale of clumping. The block size of clumping was 32 for nearly all of the cases (3200 steps, ca. 2400 m). This value is larger than the average territory size of these species (HUT, 1986), and is possibly connected with habitat structure. In the same study area habitat preferences of passerines were analyzed by the GIS technique (LŐRINCZ et al., 1990). Three main types of vegetation were identified: homogenous reed patch, edge or patch of woody vegetation, and the ecoton of the two former types. This study applied 300 step long blocks of sampling units.

The index of dispersion (ID) and Morisita's index revealed a very similar pattern of dispersion for the five bird species. Although these results show small variations according to block size, they seem to be stable. SHERRY & HOLMES (1985) examined the dispersion of 7 forest passerine birds by the Lloyd's and Morisita's indices, and showed their consistency within a quadrat size.

What are the dispersion types of the bird species studied? Although each of the three basic dispersion types (uniform, random, and clumped) were detected to some extent, we have to punctuate the question. We have to define the circumstances more precisely.

The different methods revealed different aspects of spatial pattern of species. The index of dispersion is applicable for assessing the agreement of the data to the Poisson series. ID has limitations in measuring the degree of clumping, because it is strongly influenced by sample size (ELLIOTT, 1977). Morisita's index is relatively independent of mean density, it is a measure of the departure from randomness based on Simpson's diversity. A number of tests and measures of departure from random expectation are available, but their measures of non-randomness have special characteristics, so they can be considered as relative values (GREIG-Smith, 1983).

All of the results seem to be scale-dependent. For the passerine birds in Kis-Balaton LŐRINCZ et al. (1990) applied the dipersion index proposed by JOHNSON & ZIMMER (1985). It is based on individual-to-nearest-individual distances, so this technique is independent of scale problem. However, the dispersion index of JOHNSON & ZIMMER showed a clear tendency for detecting clumped pattern. According to LŐRINCZ et al. (1990) this distance index applied for all transects revealed only clumped patterns for the same five species analyzed in the present study, but uniform (regular), and random types also occurred in the original transects. Detailed tests and comparisons of dispersion indices based either on blocked or distance data are badly needed, because of the lack of well-defined recipes for field-work and analysis in ornithology. Spatial pattern is an important characteristic of populations, first of all in the landscape ecological viewpoint.

5.2. Interspecific association of abundant bird species

An easy way for the evaluating of interspecific association is the application of association indices. The Jaccard index revealed close associations between the following pairs of species: Sedge Warbler-Reed Bunting, Sedge Warbler-Savi's Warbler, and Reed Bunting-Savi's Warbler, i.e. all possible combinations of these 3 species. The main problem with association indices like the Ochiai, Dice, and Jaccard-index is that there is no way for testing their significance. As their values increase with block size, they can be considered as relative values. *Chi*-square tests of association gave instable results in relation to block size, but the values of Kendall's tau seem to be more stable. From the results gained in different block sizes we constructed the overall plexus-graphs of the five species (Figs 3 and 4), which demonstrate both the positive and negative relationships between species. No contradictions were found in the results, so we can recommend its usage.

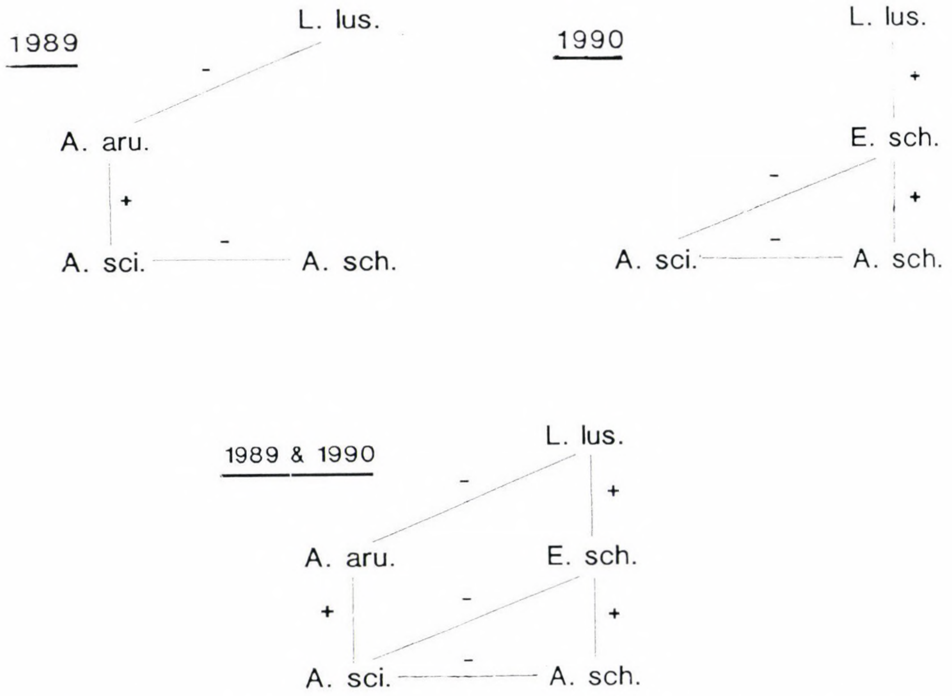


Fig. 3. Associations of five bird species obtained by the *chi*-square test of association. Results at the 7 different spatial scales (block sizes from 50 steps to 500 steps) were pooled into one figure per year, moreover the results from the two years were also pooled to demontsrate the overall association structure. (A. aru. = *Acrocephalus arundinaceus*, A. sch. = *Acrocephalus schoenobaenus*, A. sci. = *Acrocephalus scirpaceus*, L. lus. = *Locustella luscinioides*, E. sch. = *Emberiza schoeniclus*).

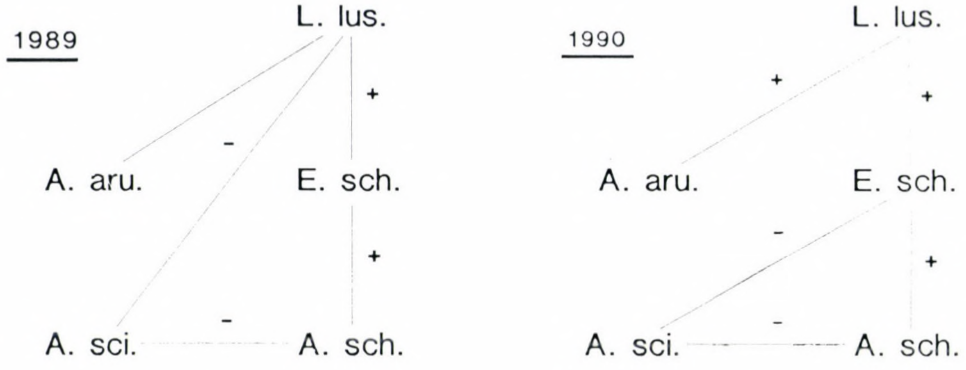


Fig. 4. Associations of five bird species based on the significance of the Kendall's rank correlation coefficient at 5% probability level. Results at the 7 different spatial scales (block sizes from 50 steps to 500 steps) were pooled into one figure per year, to demonstrate the overall association structure. (A. aru. = *Acrocephalus arundinaceus*, A. sch. = *Acrocephalus schoenobaenus*, A. sci. = *Acrocephalus scirpaceus*, L. lus. = *Locustella luscinioides*, E. sch. = *Emberiza schoeniclus*).

Kendall's rank correlation revealed a significant positive association between the Sedge Warbler and the Reed Bunting. This association is likely to be produced by their similarities in habitat preference, because the block-quadrat variance analysis revealed the same spatial scale of clumping for both of these species in 1989 (block size: 32), but in 1990 this similarity was not so evident. The Reed Warbler also showed the highest variance at block size 32, but its relationship was negative with both of these two species.

5.3. Biological aspects versus mathematical solution for the scale problem

Spatial scale affects the distributional pattern of organisms. On a sufficiently large scale, many animals tend to be aggregated (Taylor et al., 1978, Taylor & Woiwod, 1982). Sherry & Holmes (1985) found that dispersion patterns of several forest bird species changed with the size of the area analyzed. These changes were the consequences of both interspecific and intraspecific social interactions and fine-scale habitat patchiness. For all species we also found that the dispersion detected by dispersion indices is highly scale-dependent: the dispersion of individuals show a uniform (regular) or a random pattern on a small scale, but aggregation peaks occur at the higher scales. This is more a property of the habitat than the species itself. If the scale analyzed exceeds greatly the extent of the habitat patches, the individuals will tend to be gathered in the habitats most suitable for them for feeding and nesting. Within each habitat patch territoriality will lead to a more uniform dispersion of pairs.

The same applies to association indices, too. Species with similar habitat affinities show a tendency to occur together when other habitat patches are considered at a greater scale. In our study the Sedge Warbler, Savi's Warbler and the Reed Bunting are such species. According to the results of HUT (1986), these species show a marked overlap in their habitat choice. There are generic differences in their morphologies, however, which enable them to utilize different resources where they co-occur. On the other hand, species with high morphological similarity differ in their habitat selection. LEISLER analyzed the foot morphology of Central European Acrocephalus and Locustella species and stated that the Reed and the Great Reed Warblers are well adopted for clinging to vertical stems, but the Sedge Warbler is well adopted for more heterogenous vegetation structure. Although the foot of Savi's Warbler is adopted for walking, its long hind toe and large claws provide high clinging ability for climbing vertical stems when choosing song perches (LEISLER, 1975). Multivariate analysis of habitat separation in Central European *Acrocephalus* species revealed greater similarity of habitat occupancy between the Reed and the Great Reed Warblers than between the Sedge and the Reed Warblers. The latter two species were separated by the presence or the absence of a dense vegetation layer between 1 and 2 m, while the former pair of species are separated by different densities of the lowest vegetation layers and by differences in vegetation height (LEISLER, 1981). SVENSSON (1978) reported the territorial exclusion of the Sedge Warblers by the Reed Warbler. Dissimilarities in habitat occupancy and a possible background process (territorial exclusion) are reflected by the high negative association between the Reed and the Sedge Warblers revealed by the present study.

At the population scale we have two species, which seem to be scale-independent in their dispersion. For Savi's Warbler in the blocks of up to 500 steps length the dispersion of individuals is uniform. This suggests that this species is highly territorial and very agressive intraspecifically. The other species, the Great Reed Warbler shows the opposite in dispersion type. The males were clumped at every scale in the 1989 analysis. This can be explained in several ways. One can hypothesize that (1) the food resource they utilize is either very abundant or unpredictable in time so that they are not worth to be defended. Another possibility that (2) the microhabitat suitable for nesting is so rare that individuals are forced to breed in close proximity and forage to higher distances. Which explanations is closer to reality cannot be decided because of the small number of individuals recorded in this year (16 singing males within the belt of 50 m lateral width), as the Great Reed Warbler was the least abundant species among the five species selected for analysis. In 1990, when more birds were counted (26), the pattern disappeared when the dispersion index (ID) was used. The second hypothesis seems to be supported by CSÖRGŐ (1983) in some marshes in Hungary. He frequently observed Great

Reed Warblers feeding in the reed far from their nests. Nests of the birds were found close to the reed/water edge. KOSTYRKO (1989) studied the habitat selection of *Acrocephalus* and *Locustella* species on small lakes in the surroundings of Posnan, and stated that the Great Reed Warbler was specialized in habitat selection with respect to vegetation structure. The Great Reed Warblers nested in littoral reeds close to water. A similar result was obtained by LEISLER (1981): principal component and discriminant analyses of six *Acrocephalus* species in Central Europe revealed that the Great Read Warbler inhabit the extreme edge of a marshland habitat gradient.

Although statistical techniques are effective tools in the study of scale problems, they have limitations. We can ask if all of the scales having biological importance could be determined by statistical analyses, or all of the scales revealed have any biological meaning? Most of the results gained in the present study showed great agreement with the statistical and biological aspects, but further research in the methodology of spatial pattern analysis for birds is badly needed.

5.4. Methodological conclusions

We can recommend the parallel use of some alternative techniques both for the characterization of spatial pattern and to reveal interspecific associations. All of the dispersion and association indices (index of dispersion, Morisita's dispersion index, Ochiai, Dice and Jaccard indices of association), and the *chi*-square test of association are powerful tools for detecting patterns. All the methods applied proved to be scale-dependent, so the application of different scales (block sizes) is desirable. The method of block-quadrat variances (BQV), generally applied in vegetation research, is also applicable for bird data. While dispersion and association indices work at the territorial or on somewhat greater fine scales, the method BQV is applicable for the detection of larger, habitat-type scales.

Acknowledgements

Field-work in 1989 and 1990 was carried out within the framework of the "Balaton" project of the Hungarian Natural History Museum supported by Ministry of Environmental Protection and Water Resources (K.V.M.). Data analysis was supported by a grant from the Hungarian Academy of Sciences (grant no.: OTKA I/2. 740/88) to one of the authors (C.M.). — We are grateful to A. DEMETER for checking the English.

REFERENCES

ALLEN, T. F. H. & STARR, T. B. (1982). Hierarchy: perspectives for ecological complexity. — University of Chicago Press, Chicago: 310 pp.

CODY, M. L. (ed.) (1985). Habitat selection in birds. — Academic Press, Orlando: 558 pp.

CSÖRGŐ, T. (1983). Diet niche-study on the populations of the Great Reed Warbler (Acrocephalus arundinaceus) and the Reed Warbler (Acrocephalus scirpaceus). — *Puszta*, **1**/10: 71—80. (in Hungarian with English summary.)

ELLIOTT, J. M. (1977): Some methods for the statistical analysis of samples of benthic invertebrates. 2nd edition. — Scientific publications No. 25, Freshwater Biological Association, Ambleside: 157 pp.

GREIG-SMITH, P. (1983): Quantitative plant ecology. 3rd edition. — Blackwell Scientific Publications, Oxford: 359 pp.

HILL, M. O. (1973): The intensity of spatial pattern in plant communities. — *J. Ecol.* **61:** 225—236.

HUT, M. G. VAN DER. (1986): Habitat choice and temporal differentiation in reed passerines of a Dutch marsh. — *Ardea* **74:** 159—176.

JOHNSON, R. B. & ZIMMER, W. J. (1985): A more powerful test for dispersion using distance measurements. — *Ecology* **66:** 1084—1085.

KERSHAW, K. A. & LOONEY, J. H. H. (1985): Quantitative and dynamic plant ecology. 3rd edition. — Edward Arnold, London: 282 pp.

KOSTYRKO, W. (1989): Birds of Acrocephalus and Locustella genera on the lakes of Wielkopolski National Park (with the consideration of environmental selectivity). — *Badania Fizjograficzne nad Polska Zachodnia.* Ser. C. **38:** 61—84. (in Polish with English summary.)

LEISLER, B. (1975): The significance of foot morphology in the habitat separation of Central European Acrocephalus and Locustella species. — *J. Orn.* **116:** 117—153. (in German with English summary.)

LEISLER, B. (1981): Niche separation in Central European Reed warblers (Acrocephalus, Sylviinae). I. Habitat separation. — *Vogelwarte* **31:** 45—74. (in German with English summary).

LŐRINCZ, G., MOSKÁT, C., WALICZKY, Z. & BANKOVICS, A. (1990): Faunal mapping and environmental quality analysis by a new GIS technique. — In: STASNY, K. & BEJCEK, V. (eds.). Bird census and atlas studies. Proc. XIth Int. Conf. on Bird Census and Atlas Work, Prague, pp. 45—50.

LUDWIG, J. A. & REYNOLDS, J. F. (1988): Statistical ecology. A primer on methods and computing. — John Wiley and Sons, New York: 337 pp.

MAURER, B. A. (1985): Avian community dynamics in desert grasslands: observational scale and hierarchical structure. — *Ecol. Monogr.* **55:** 295—312.

MORISITA, M. (1971): Composition of the I_δ index. — *Res. Pop. Ecol.* **13:** 1—27.

NORUSIS, M. J. (1986): SPSS/PC+. Advanced statistics. — SPSS Incorporation, Chicago.

SHAW, D. M. & ATKINSON, S. F. (1990): An introduction to the use of geographic information systems for ornithological research. — *Condor* **92:** 564—570.

SHERRY, T. W. & HOLMES, R. T. (1985): Dispersion patterns and habitat responses of birds in northern hardwoods forests. — In: CODY, M. L. (ed.). Habitat selection in birds. — Academic Press, Orlando, pp. 283—309.

SOKAL, R. R. & ROHLF, F. J. (1981): Biometry. 2nd edition. — Freeman and Company, New York: 859 pp.

SVENSSON, S. (1978): Territorial exclusion of Acrocephalus schoenobaenus by A. scirpaceus in reedbeds. — *Oikos* **30:** 467—474.

TAYLOR, L. R., WOIWOD, I. P. & PERRY, J. N. (1978): The density-dependence of spatial behaviour and the rarity of randomness. — *J. Anim. Ecol.* **47:** 383—406.

TAYLOR, L. R. & WOIWOD, I. P. (1982): Comparative synoptic dynamics. I. Relationships between inter- and intra-specific spatial and temporal variance/mean population parameters. — *J. Anim. Ecol.* **51:** 879—906.

WIENS, J. A. (1989): The ecology of bird communities. — Cambridge University Press, Cambridge, vol. 1.: 539. pp. + vol. 2.: 316. pp.

WIENS, J. A., ROTENBERRY, J. T. & VAN HORN, B. (1987): Habitat occupancy patterns of North American shrubsteppe birds: the effects of spatial scale. — *Oikos* **48:** 132—147.

ZAR, J. H. (1984): Biostatistical analysis. 2nd edition. — Prentice-Hall, Englewood Cliffs: 718 pp.

Acta Zoologica Hungarica 38 (1—2), pp. 63—73 (1992)

BRACONIDAE (HYMENOPTERA) FROM KOREA, XIV.*

J. PAPP

Zoological Department, Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

(Received 14 March 1991)

Thirty-one braconid species of the families Doryctinae, Exothecinae, Gnaptodontinae, Euphorinae and Opiinae are reported from Korea. Three species are new to science: *Heterospilus anulifer* sp. n. (Doryctinae), *Falcosyntretus elabsus* sp. n. and *Leiophron* (*Leiophron*) *adamantinus* sp. n. (Euphorinae). Seven species are new to the fauna of Korea. With 21 original figures.

1. LIST OF THE SPECIES

Thirty-one species of Braconidae belonging to the subfamilies Doryctinae, Exothecinae, Gnaptodontinae, Euphorinae and Opiinae are listed from the Korean Peninsula (i.e. from the Democractic People's Republic of Korea). The subfamilies are represented by the following genera: (Doryctinae) *Doryctes* HALIDAY, *Heterospilus* HALIDAY, *Ontsira* CAMERON, *Rhaconotus* RUTHE, *Spathiomorpha* TOBIAS, *Spathius* NEES, *Zombrus* MARSHALL; (Exothecinae) *Clinocentrus* HALIDAY, *Colastes* HALIDAY, *Hormius* NEES, *Oncophanes* FOERSTER, *Rhysipolis* FOERSTER, *Shawiana* VAN ACHTERBERG; (Gnaptodontinae) *Gnaptodon* HALIDAY; (Euphorinae) *Aridelus* MARSHALL, *Falcosyntretus* TOBIAS, *Leiophron* NEES, *Loxocephalus* FOERSTER, *Syntretus* FOERSTER; (Opiinae) *Opius* WESMAEL. In the subsequent faunistic enumeration the genera as well as species are listed in alphabetic order. Detailed collecting data are given for every species in an abbreviated form, i.e. only the collecting numbers ("No.") are indicated after the species names, the full collecting data (name of the localities, dates of collecting etc.) are listed separately before the faunistic enumeration. Where necessary the faunistic contributions are completed with taxonomic as well as zoogeographic notes. Further details concerning the participants of the collecting trips to Korea during the years 1970—1988 are presented in the previous paper of my series (PAPP 1990) except the last trip in 1988 (Fol. ent. hung. 1989 vol. 50).

Below the collecting numbers are enumerated in an increasing sequence of the numerals completed with the locality names and collecting time data:

* Zoological Collectings by the Hungarian Natural History Museum in Korea, No. 100.

No. 19. Prov. South Phenan: Bong-ha ri, on the river Te-dong, about 45 km E of Pyongyang, 23 May 1970. — Netted on meadow and in shrubby undergrowth.

No. 87. Prov. Kanwon: Kum-gang san, Sam-ii po; 1 June 1970. — Singled from lakeshore vegetation.

No. 169. Prov. South Pyongan: Chang-lyong san, 50 km N of Pyongan and 15 km E from Sa-gam, 13 August 1971. — Swept from rudimentary vegetation and bushes on slope facing SW.

No. 261. Kaeson: Mts Pakyon, 20—21 km NE from Kaesong both sides of and near to the road between Kaesong and Pakyon popo, 11 September 1971. — Singled on bushy and grassy vegetation.

No. 267. Prov. South Pyongan: Pyongyan, De-sang san, 12 km NE from Pyongyan, 18 July 1975, 17—18^h. — Netting the grass and shrub levels of a coniferous wood.

No. 282. Prov. Ryang-gang: Chann-pay plateau, Sam-zi-yan, 1700 m, 24 July 1975, 16—18.30^h, sunny weather with cloudy sky, 22—24 °C. — Netted in shrubby and grass vegetation of a *Larix-Betula* forest.

No. 304. Prov. Pyong-Sung: Bek-sung-li, Za-mo san, 60 km NE from Pyongyan, 1 August 1975, 12—18^h, at forenoon rainy weather and 22—24 °C, after 13^h cloudy weather with subshine and 28—30 °C. — Singled material in sweet chestnut wood in nature conservancy field.

No. 322. Prov. Gang-von: district On-dzong, Kum-gang san, near Hotel Go-song, 250 m, 6 August 1975, 20—4.30^h. — Collected at MV lamp in a coniferous-locust tree wood.

No. 324. Prov. Gang-von: district On-dzong, Kum-gang san, along Ok-ru dong, 250—300 m, 7 August 1975, 15.30—17^h, cloudy weather with some sunshiny, 22 °C. — Netted material in a coniferous forest on rich soft-stemmed and shrubby vegetation.

No. 372. Mt. Pektusan: wooded environs of the Sam-zi-yan Hotel, 18 July 1977. — Netted in the grass vegetation along the road to Explosion Lake.

No. 374. Same as No. 372, 19 July 1977. — Swept in shrubby and grass vegetation about 16 km E of the hotel, at the edge of a coniferous wood growing on the left side of the road Musan.

No. 376. Same as No. 374.

No. 381. Mt. Pektusan: half-way between Sam-zi-yan and Mupo, 20 July 1977. — Swept in shrubby and flowering grass vegetation in a clearing of about 600—700 m width of a coniferous forest.

No. 488. Kangwon Prov.: Kum-gang san, 12 October 1978. — Swept material mainly from *Dryopteris*-like fern species, rather cold and windy day.

No. 617. South Pyongan Prov.: Lyong-ak san, 15 km W of Pyongyang, 9 September 1980. — Netted in mixed forest.

No. 911. Pyongyang City: Daesong-san, 15 May 1985. — Warm sunny afternoon with wind.

No. 930. North Pyongan Prov.: Myohyang-san, 21 May 1985. — Blue sky with some white clouds, warm afternoon. Swept along road-side by river Hyangsan-chon.

No. 934. Same as No. 930, 22 May 1985. — Warm forenoon, cloudless, blue sky. Pathway Bulyongdae Temple (about 1000 m). Collected by sweeping the vegetation.

No. 940. North Pyongan Prov.: Myohyang san, 23 May 1985. — Warm, sunny forenoon, Specimens collected mainly by singling, also sweeping the sparse vegetation in mixed wood around the hotel.

No. 944. South Pyongan Prov.: Lokam Reserve (some 40 km north of the capital), 25 May 1985. — Cool forenoon with high wind, temperature about 18 °C. Sweeping material from mixed vegetation.

No. 946. Kangwon Prov.: Kum-gang san, 26 May 1985. — Warm, sunny afternoon, temperature about 26 °C. Sweeping material from the underwood of a mixed forest around the rest-house Oe-Kumgang.

No. 962. Pyongyang City: Lyong-ak san, 30 May 1985. — Pleasant night. Collected at a blended light (250 W) fed by a Honda generator.

No. 970. Pyongyang City: Daesong san, 1 June 1985. — Overcast sky, temperature about 20 °C, with a slight wind. Collected by sweeping the vegetation in a mixed forest (*Pinus*, *Quercus*, *Ulmus*, *Fraxinus*).

No. 976. Ryanggan Prov.: Sam-ji-yon, 3 June 1985. — Warm, windy forenoon with occasional showers. Collected by sweeping the very low vegetation in a *Larix* wood with greybeard lichen (*Usnea* sp.).

No. 980. Same as No. 976, clear day, on the way back from Pektusan. Collected in an old *Picea* stand by using sweeping net, altitude about 2100 m.

No. 986. Same as No. 976, 4 June 1985. — Warm, sunny forenoon, temperature about 22 °C. Swept mostly in *Larix* forest around the hotel.

No. 992. Same as No. 976, 4 June 1985. — Warm afternoon, temperature about 22 °C. Singled and swept along the foot-path in a *Larix* forest, some 300 m from the hotel.
No. 1000. Same as No. 976, 5 June 1985. — Warm, sunny afternoon, temperature about 26 °C. Swept the vegetation, mostly shrubs and some grass along the road-side near the hotel.
No. 1317. Pyongyang City: Daesong san, 16 June 1988. — Hot sunny afternoon. Mixed scrub-wood consisting mainly *Castanea crenata*, *Pinus densifolia*, *Quercus dentata*, *Qu. mongolica*, *Syringa vulgaris*. Sweeping and beating the vegetation.
No. 1324. Kangwon Prov.: Kum-gang san, Sam-il po, 18 June 1988. — Warm sunny day. *Pinus densifolia* forest with rich and partly degraded shrub-layer and underweed. Sweeping and beating the vegetation.
No. 1333. Kangwon Prov.: Kumgang san, Onjong-ri, 17—21 June 1988. — Night collecting around lampshades and from illuminated sheet in the Hotel Kumgang san.
No. 1341. Same as No. 1333, 22 June 1988. — Warm cloudy forenoon. Weedy places along the streets of the village and among arable lands. Singling and sweeping the vegetation.
No. 1345. Ryanggang Prov.: Sam-ji-yon, 26 June 1988. — Warm sunny day. *Larix olgensis* forest mixed with *Picea coreana*, *P. ajanensis* and *Betula pendula*, with rich shrub-level and underwood.
No. 1353. Ryanggang Prov.: Paekdu-san-milyong, 1500 m, 27 June 1988. — Cloudy warm afternoon. Dark and dense largely untouched *Larix olgensis* forest mixed with many *Betula pendula*. Rich underwood along a booklet. Sweeping and singling from the vegetation.
No. 1355. Ryanggang Prov.: NW of Sam-ji-yon, 31 km on Paekdu-san road, 2000 m, 28 June 1988. — Cloudy, cool day. *Larix olgensis* forest (not mixed with *Betula pendula*), with rather poor underwood, not far from the borderline. Sweeping and singling from vegetation.
No. 1374. Pyongyang City: Michon-ho, 3 July 1988. — Hot sunny afternoon. Degraded, weedy vegetation around the artificial lake at the foot of Daesong san. Sweeping and singling from the vegetation.

DORYCTINAE

Doryctes mutillator (THUNBERG, 1822) — A Palaearctic and frequent species; new to the fauna of Korea.

Locality — 1 ♂: No. 1000.

Heterospilus anulifer sp. n.: for description see p. 67.

Heterospilus leptosoma FISCHER, 1960 — Locality: 1 ♀: No. 930.

Heterospilus rubricola FISCHER, 1968 — Reported by me from Korea under the synonymous name *H. tobiasi* BELOKOBYLSKIJ (PAPP 1987: 158).

Locality — 1 ♀: No. 970.

Heterospilus tauricus TELENGA, 1941 — Locality: 1 ♀: No. 1317.

Ontsira ignea (RATZEBURG, 1852) — Locality: 1 ♀: No. 1345.

Rhaconotus pictipennis (REINHARD, 1865) — My male specimen from Korea matches well to the Hungarian representatives of this species. Listed in Germany and Hungary. New to the fauna of Korea.

Locality — 1 ♂: No. 1317.

Spathiomorpha longipalpis BELOKOBYLSKIJ, 1985 (= *S. furnata* PAPP, 1987)* — Locality: 1 ♂ :No. 962.

* My name, *S. furnata*, is an evident junior synonym of *S. longipalpis*, sen. syn.:

Spathiomorpha longipalpis BELOKOBYLSKIJ, 1985: Rev. d'Entom. 64 (2): 390—391 ♀♂, type loc.: Primorskiy kray, Suputinskiy zapovednik (USSR: Far East Maritime Territory), holotype (♀) in Leningrad Zoological Institute.

Spathiomorpha furnata PAPP, 1987: Acta Zool. Hung. 33 (1—2): 166—167 ♀, type loc.: Korea, Prov. Kengi (= Kyonggi), Bagyon san, Bagyon popo (= Mt. Pagyon, Pagyon falls), about 7 km SW from Kaesong, holotype in Budapest Természettudományi Múzeum; **syn. n.**

Spathius brevicaudis RATZEBURG, 1844 — Locality: 1 ♂: No. 1317.

Spathius rubidus (ROSSI, 1794) — Locality: 1 ♀: No. 1317.

Zombrus sjoestedti (FAHRINGER, 1929) — Localities: 1 ♀: No. 1333. 1 ♀: No. 1374.

EXOTHECINAE

Clinocentrus exsertor (NEES, 1812) — Localities: 1 ♂: No. 261. 1 ♀: No. 322.

Clinocentrus gracilipes THOMSON, 1892 — Known from England and Sweden; new to the fauna of Korea.

Localities — 1 ♀: No. 19. 1 ♀: No. 944. 1 ♀: No. 992.

Colastes affinis (WESMAEL, 1838) — Locality: 1 ♀: No. 946.

Colastes flavitarsis (THOMSON, 1891) — Localities: 1 ♀: No. 940. 1 ♀: No. 980. 2 ♀♀: No. 1355.

Hormius moniliatus (NEES, 1812) — Localities: 1 ♀: No. 934. 1 ♀: No. 986.

Oncophanes laevigatus (RATZEBURG, 1852) — Localities: 1 ♂: No. 976. 1 ♀ + 1 ♂: No. 986. 5 ♂♂: No. 992. 1 ♀: No. 1355.

Rhysipolis mediator (HALIDAY, 1836) — A Palaearctic and frequent species; new to the fauna of Korea.

Localities — 1 ♂: No. 282. 1 ♀: No. 962.

Rhysipolis setmus PAPP, 1987, ♂ new — Described and up to now known only from Korea. Male sex is similar to female, distinctive by the following features:

Female	Male
1. Body somewhat less cylindrical.	1. Body cylidrical.
2. Antenna with 33 antennomeres.	2. Antennae with 30 (right antenna) and 31 (left antenna) antennomeres, respectively.
3. First tergite more broadening posteriorly, 1.2 times as long as broad at hind.	3. First tergite less broadening posteriorly, 1.33 times as long as broad at hind.
4. Dark colour of body brownish.	4. Dark colour of body blackish brown.
5. Body 3.5 mm long.	5. Body 3.3 mm long.

Shawiana laevis (THOMSON, 1891) — First reported by me from Korea (PAPP 1987: 160); since this time listed also in the USSR (European part, Far East) (TOBIAS 1986: 53).

Localities — 1 ♀: No. 1324. 1 ♀: No. 1353.

GNAPTODONTINAE

Gnaptodon decoris (FOERSTER, 1862) — Frequent in the western Palaearctic Region, reported from Mongolia (PAPP 1983: 443). New to the fauna of Korea.

Localities — 1 ♀: No. 87. 1 ♀: No. 267.

Gnaptodon pumilio (NEES, 1834) — Frequent to common in Europe; new to the fauna of Korea.

Localities — 1 ♂: No. 304. 1 ♂: No. 324. 1 ♀: No. 372. 1 ♀: No. 488. 1 ♂: No. 617. 1 ♂: No. 962.

EUPHORINAE

Aridelus egregius (SCHMIEDEKNECHT, 1907) — Widely distributed still not frequent in the Palaearctic Region. New to the fauna of Korea.

Locality — 1 ♂: No. 169.

Falcosyntretus elabsus sp. n.: for description see p. 69.

Leiophron (Leiophron) adamantinus sp. n.: for description see p. 71.

Leiophron (Peristenus) facialis (THOMSON, 1891) — Locality: 2 ♀♀: No. 1355.

Leiophron (Leiophron) pallidistigma CURTIS, 1833 — Up to now known in Europe eastwards as far as in the Caucasus Mts (Azerbaidzhan) in the USSR. New to the fauna of Korea.

Locality — 1 ♀: No. 267.

Leiophron (Peristenus) pallipes CURTIS, 1833 — Localities: 1 ♂: No. 1000. 1 ♂: No. 1341.

Loxocephalus boops (Wesmael, 1835) — A Holarctic species, in the eastern Palaearctic Region reported from the USSR (Baykal Territory, Far East Maritime Territory, Kamchatka). New to the fauna of Korea.

Localities — 1 ♂: No. 374. 1 ♂: No. 381.

Syntretus parvicornis (RUTHE, 1862) — Locality: 1 ♀: No. 282.

OPIINAE

Opius (Pendopius) helluatus PAPP, 1981 — Locality: 1 ♂: No. 376.

Opius (Opius) pallipes WESMAEL, 1835 — Locality: 1 ♀: No. 1345.

2. DESCRIPTION OF THE NEW SPECIES

Heterospilus (Heterospilus) anulifer sp. n. ♀
(Figs 1—4)

Description of the holotype ♀ — Body 3 mm long. Head in dorsal view subcubic, 1.55 times as broad as long, eye twice as long as temple and not protruding, temple receded, occiput weakly excavated (Fig. 1). Ocelli small, rather near to each other, OOL twice as long as POL. Eye in lateral view 1.3 times as high as wide, temple broadening ventrally and its widest part behind eye about one-third shorter than width of eye. Malar space somewhat longer than breadth of mandible base. Temporal carina approaching and not joining to hypostomal carina (Fig. 2). Head polished. — Antenna about as long as body, filiform, with 24 antennomeres (or 22 flagellomeres). First flagellomere five times and penultimate flagellomere three times as long as broad.

Mesosoma in lateral view 1.75 times as long as high. Notaulix evenly deep, with a few crenulae. Propodeum areolated, areola petiolaris deltoid-shaped, areolae rugulose to uneven, shiny. Mesosoma polished, along hind section of notaulix very faintly chagreened. — Hind femur 3.38 times as long as broad. Hind tibia just longer than tarsus, hind basitarsus just shorter than hind tarsal segments 2—3. Coxae smooth.

Fore wing shorter than body. Pterostigma (Fig. 3) 3.58 times as long as wide, issuing radial vein from its middle, *r1* one-third shorter than width of pterostigma, *Cu2* relatively short: *r2* distintly twice as long as *r1* and onethird shorter than *cuqu1*, *r3* reaching tip of wing and 3.53 times as long as *r2*. *N. rec.* postfurcal. Discoidal cell less high, second section of *n. bas.* one-fourth shorter than *d* (Fig. 4, see arrows).

Metasoma about as long as head + mesosoma together. First tergite distinctly broadening posteriorly, its length equal to hind width, twice as wide behind as basally. Second tergite almost three times as wide behind as long medially. Tergites 1—2 longitudinally striate, hind fifth of second tergite together with further tergites polished, base of third tergite also longitudinally striate. Ovipositor sheath almost as long as metasoma or as long as hind tibia + tarsal segments 1—2.

Ground colour of body black. Head brownish yellow, occiput with dark suffusion, ocellar field black. Palpi light. Scape and pedicel brownish yellow, first four flagellomeres darkening, flagellum blackish. Tegula brownish yellow. Mesosoma medially (scutellum apically, metanotum, metapleuron and mesosternum) with a testaceous ring. Legs yellow, coxae and trochanters pale yellow. Metasoma apically (last two tergites) testaceous. Ovipositor sheath black. Wings hyaline, pterostigma and veins opaque yellowish.

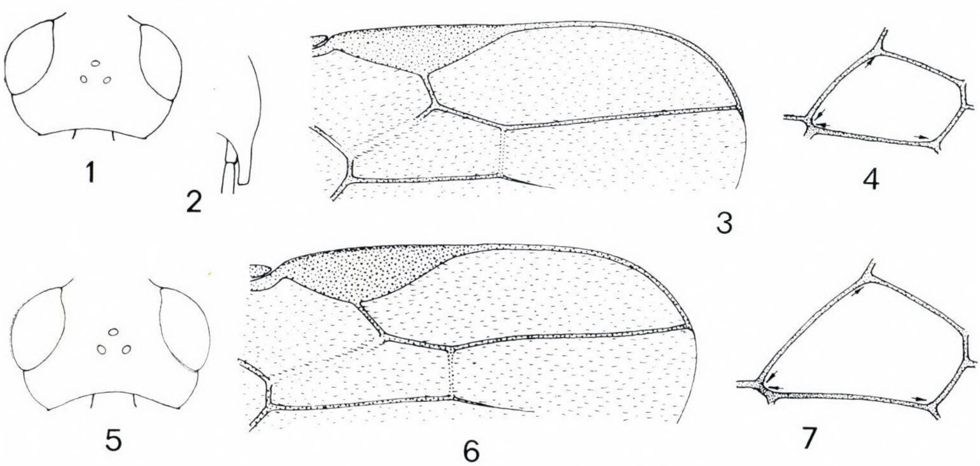
♂ and host unknown.

Type material — Holotype ♀: Korea, Kangwon Prov., Kum-gang san, 20 June 1988, leg. O. MERKL et GY. SZÉL, No. 1331.

Holotype is deposited in the Hungarian Natural History Museum, Budapest, Hym. Typ. No. 7367.

Etymology — The species-name "anulifer" refers to the testaceous ring of black mesosoma.

The new species, *Heterospilus* (*Heterospilus*) *anulifer* sp. n., is related to *H.* (*H.*) *separatus* FISCHER, 1960 (Palaearctic Region) by their (1) polished upper part of head, (2) smooth to at most uneven and shiny mesonotum, (3) first tergite as long as broad at hind and (4) dark ground colour of body. The separation of the two species is difficult, the distinctive features are little and hard to recognize:

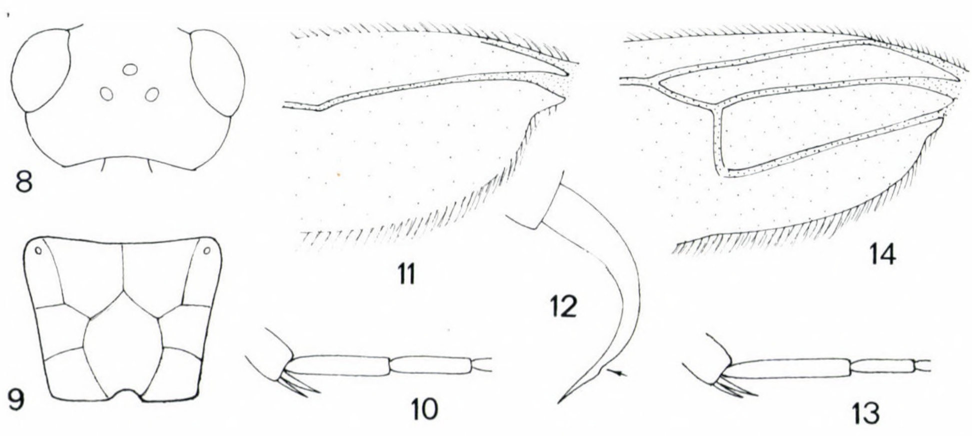


Figs 1—4. *Heterospilus anulifer* sp. n.: 1 = head in dorsal view, 2 = temporal and hypostomal carina, 3 = distal part of right fore wing, 4 = discoidal cell, arrows indicate length of second section of *n. bas.* and *d.* — Figs 5—7. *Heterospilus separatus* FISCHER: 5 = head in dorsal view, 6 = distal part of right fore wing, 7 = discoidal cell, arrows indicate length of second section of *n. bas.* and *d.*

H. anulifer sp. n.	*H. separatus* FISCHER
1. Temple in dorsal view receded, eye not protruding (Fig. 1).	1. Temple in dorsal view rounded, eye slightly protruding (Fig. 5).
2. Antenna with 22 flagellomeres.	2. Antenna with 27—31 flagellomeres.
3. *Cu2* less long, *cuqu1* clearly less than twice, i.e. 1.56 times, as long as *r2* (Fig. 3); discoidal cell high, second section of *n. bas.* one-fourth shorter than *d* (Fig. 4 see arrows).	3. *Cu2* long, *cuqu1* twice as long as *r2* (Fig. 6); discoidal cell high, second section of *n. bas.* almost as long as *d* (Fig. 7, see arrows).
4. Head brownish yellow, occiput with dark suffusion; mesosoma medially with a testaceous ring.	4. Head blackish with reddish tint along eye, mesosoma medially without testaceous ring.

Falcosyntretus elabsus sp. n. ♀
(Figs 8—12)

Description of the holotype ♀ — Body 3.4 mm long. Head in dorsal view (Fig. 8) transverse, 1.75 times as broad as long, eye lightly protruding and 1.57 times as long as temple, latter distinctly rounded. Eye in lateral view 1.43 times as high as wide and almost twice as wide as temple. Head behind carinated, temporal carina not meeting hypostomal carina. Ocelli small, elliptic, POL = OOL. Face one-third wider than high. Cheek short, basal width of mandible 1.6 times as long as malar space. Maxillar palp long, 1.5 times as long as height of head. — Antenna as long as head, mesosoma and first tergite together, with 19 antennomeres. First flagellomere three times, further flagellomeres gradually attenuating and shortening so that penultimate flagellomere also three times as long as broad.



Figs 8—12. *Falcosyntretus elabsus* sp. n.: 8 = head in dorsal view, 9 = propodeum, 10 = hind tarsal segments 1—2, 11 = base of hind wing, 12 = ovipositor with its dorsal notch (↑). — Figs 13—14. *Falcosyntretus falciger* TOBIAS: 13 = hind tarsal segments 1—2, 14 = base of hind wing.

Mesosoma in lateral view 1.34 times as long as high. Notaulix and sternaulix indistinct. Prescutellar furrow shallow and finely crenulated. Mesosoma polished. Propodeum areolated as in Fig. 9, along carinae uneven, otherwise smooth and shiny. — Hind femur 4.5 times as long as broad; hind tarsus just longer than hind tibia, hind basitarsus 1.2 times as long as second tarsal segment (Fig. 10).

Fore wing as long as body. Pterostigma 2.6 times as long as wide, issuing radial vein distally from its middle; *r1* short, *r2* three times as long as *cuqu1*. Nervellus and submediellus indistinct, i.e. veins effaced (Fig. 11).

Metasoma somewhat shorter than head + mesosoma together. First tergite petiolate, twice as long as broad at hind, glymna situated laterally, rather longitudinally striated. Further tergites smooth and shiny. Ovipositor sheath short, as long as hind second tarsal segment, ovipositor falcate and apically with a faint notch (Fig. 12 ↑).

Body yellow. Apex of mandible brown. Flagellum distally darkening. Palpi, coxae and trochanters rather straw yellow. Wings hyaline, pterostigma and veins pale yellow.

♂ and host unknown.

Type material — Holotype ♀: Korea, Kaesong, 28 August 1982, leg. P. BERON et V. POPOV.

Holotype is deposited in the Hungarian Natural History Museum, Budapest, Hym. Typ. No. 7368.

Etymology — The species-name "elabsus" refers to the effaced nerves of nervellus and submediellus of hind wing.

Remark — Hitherto three species are known in the genus *Falcosyntretus* TOBIAS, 1965, they are as follows: *F. elabsus* sp. n. (Korea), *F. falcifer* TOBIAS, 1965 (USSR: Kirghizia) and *F. venustus* (MUESEBECK, 1936) (U.S.A.). TOBIAS (1986: 247) supposes that possibly the fourth species is *Syntretus xanthocephalus* (MARSHALL, 1887) (England).

The new species, *Falcosyntretus elabsus* sp. n., is related to *F. falcifer* TOBIAS, 1965 (USSR: Kirghizia), their specific distinction is presented in a tabular form:

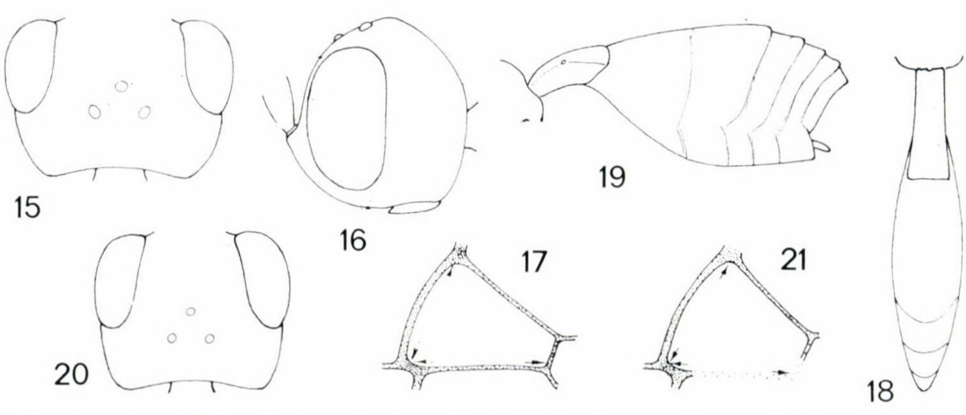
F. elabsus sp. n.	*F. falcifer* TOBIAS
1. Temple in dorsal view short, one-third shorter than eye (Fig. 8).	1. Temple in dorsal view long, distinctly longer than eye (Fig. 1 in TOBIAS 1965: 843).
2. Antenna with 19 antennomeres, every flagellomere distinctly longer than broad.	2. Antenna with 25—30 antennomeres, flagellomeres, except first two ones, hardly longer than broad.
3. Nervellus and submediellus indistinct (Fig. 11).	3. Nervellus and submediellus distinct (Fig. 4 l.c., Fig. 14).
4. Hind basitarsus 1.2 times as long as second tarsal segment (Fig. 10).	4. Hind basitarsus twice as long as second tarsal segment (Fig. 6 l.c., Fig. 13).
5. Body entirely yellow.	5. Body black, laterally and below with rich brownish yellow pattern.

Leiophron (Leiophron) adamantinus sp. n. ♀
(Figs 15—19)

D e s c r i p t i o n o f t h e h o l o t y p e ♀ — Body 2.9 mm long. H e a d in dorsal view (Fig. 15) subcubic, 1.42 times as broad as long, eye distinctly one-third as long as temple, latter receded-rounded. Occiput hardly excavated and immargined, temple margined. Ocelli small and far from each other, distance between fore and a hind ocelli greater than diameter of an ocellus, POL = OOL. Eye in lateral view (Fig. 16) 1.88 times as high as wide, temple and eye of equal width; frons deep, antenna inserted below middle of eye. Malar space short, base of mandible 1.66 times as broad as malar space. Head polished, face with hair-punctures. — A n t e n n a about as long as head + mesosoma together, with 19 antennomeres. Scape 1.3 times as long as first flagellomere, latter 1.66 times as long as apically broad, further flagellomeres shortening and slightly thickening so that penultimate six flagellomeres subcubic, i.e. 1.2 times as long as broad.

M e s o s o m a in lateral view 1.75 times as long as high. Pronotum medially crenulated, otherwise almost smooth and shiny. Mesonotum polished with disperse hair punctures, notaulix indistinct, scutellum also polished. Sternaulix distinct and sculptured. Propodeum rugose. — L e g s relatively strong, femora thick. Fore femur 2.6 times, middle femur three times and hind femur 3.1 times as long as broad. Hind tibia about one-fifth shorter than hind tarsus; hind basitarsus as long as hind tarsal segments 2—4.

F o r e w i n g shorter than body, with full venation, median and submedian cells glabrous. Pterostigma wide, 1.78 times as long as wide, issuing



Figs 15—19. *Leiophron* (*Leiophron*) *adamantinus* sp. n.: 15 = head in dorsal view, 16 = head in lateral view, 17 = discoidal cell, arrows indicate length of second section of *n. bas.* and *d*, 18 = metasoma in dorsal view, 19 = metasoma in lateral view. — Figs 20—21. *Leiophron* (*Leiophron*) *deficiens* (RUTHE): 20 = head in dorsal view, 21 = discoidal cell, arrows indicate length of second section of *n. bas.* and *d*.

first intercubital and radial veins hardly distally from its middle; radial cell very short, one-fifth as long along metacarp as length of pterostigma. Discoidal cell wide, 1.25 times as wide as high (Fig. 17, see arrows). Brachial vein effaced. Submediellan cell closed.

Metasoma slightly longer than mesosoma, laterally compressed (Figs 18—19). First tergite 2.47 times as long as broad at hind, somewhat broadening posteriorly, small spiracles at its middle, longitudinally striate and shiny, sides beneath open. Further tergites polished, second tergite long. Hypopygium rounded, ovipositor sheath short.

Ground colour of head, mesosoma and first tergite black, that of metasoma brownish black. Scape, pedicel and flagellomeres 1—7 brownish yellow, further flagellomeres dark brown. Tegula yellow. Legs brownish; fore femur distinctly, fore tibia and all tarsi brownish yellowish, base of tibiae 2—3 also brownish yellowish. Wings hyaline, pterostigma brown with pale yellow basal spot, veins brownish.

♂ and host unknown.

Type material — Holotype ♀: Korea, Kangwon province, Kumgang san, near rest-house Oe-Kumgang, 27 May 1985, leg. A. Vojnits et L. Zombori, No. 952.

Holotype is deposited in the Hungarian Natural History Museum, Budapest, Hym. Typ. No. 7369.

Etymology — The species-name "adamantinus" refers to the name of the mountains (Kum-gang san or Diamond Mts) where the holotype specimen was collected.

The new species, *Leiophron* (*Leiophron*) *adamantinus* sp. n., runs to *L. (L.) reclinator* (Ruthe, 1856) (Central Europe) with the help of Loan's key (1974) considering their common features as (1) submediellan cell closed, (2) alar venation complete and (3) face in lateral view deep, i.e. frons long and antenna inserted below the middle level of eyes. The two species are distinguished by the following features:

L. adamantinus sp. n.	*L. reclinator* (Ruthe)*
1. In lateral view posterior part of propodeum not abrupt, i.e. declivous as usually	1. In lateral view posterior part of propodeum abrupt vertically, its anterior (horizontal) part short.
2. Notaulix indistinct.	2. Notaulix distinct by deep punctures.
3. Antenna with 17 flagellomeres.	3. Antenna with 19 flagellomeres.
4. Metasoma laterally compressed (Figs 18—19).	4. Metasoma laterally not compressed.
5. Ground colour of head + mesosoma black, first tergite and metasoma brownish black.	5. Ground colour of body light reddish; mesonotum, propodeum and first tergite reddish brown.

In Tobias's key (1986) the new species runs to *L. (L.) deficiens* (Ruthe, 1856) (Europe, Siberia: Yakutia), their common features are (1) closed sub-

* I know this species on the basis of its description (Ruthe 1856) and of the interpretation by C. C. Loan (1974), V. I. Tobias (1986) given in their keys as well as Loan (l.c.) in his redescription.

mediellan cell, (2) glabrous median and submedian cells and (3) indistinct notaulix. The two species are separated by the features tabulated below:

L. adamantinus sp. n.	*L. deficiens* (Ruthe)
1. Antenna with 17 flagellomeres.	1. Antenna with 13 (♀♀) and 14—15 (♂♂) flagellomeres.
2. Metasoma compressed laterally (Figs 18—19).	2. Metasoma usual in form, i.e. not compressed laterally.
3. Femora somewhat thick, hind femur 3.1 times as long as broad.	3. Femora not thick, hind femur (3.8—)4—4.2 times as long as broad.
4. Discoidal cell wide, 1.25 times as wide as high (Fig. 17, see arrows).	4. Discoidal cell less wide, as wide as high (Fig. 21, see arrows).
5. In dorsal view temple receded-rounded; head subcubic, 1.42 times as broad as long (Fig. 15).	5. In dorsal view temple rounded; head cubic, 1.25 times as broad as long (Fig. 20).
6. Ground colour of body black, metasoma brownish black.	6. Ground colour of body reddish yellow with black(ish) pattern (propodeum, first tergite).

REFERENCES

Achterberg, C. van (1983): Revisionary notes on the subfamily Gnaptodontinae, with description of eleven new species (Hymenoptera, Braconidae). — *Tijds. Ent.* **126** (1—2): 25—57.

(Belokobylskij, S. A.) Белокобыльский, С. А. (1983): К познанию родов Heterospilus Hal. и Dendrosotinus Tel. (Hymenoptera, Braconidae) фауны СССР. — *Труды Всес. Энтом. Общ.* **65:** 168—186. (in Russian.)

(Belokobylskij, S. A.) Белокобыльский, С. А. (1984): Бракониды рода Doryctes Hal. (Hymenoptera, Braconidae) азиатской части СССР. — *Систематика Насекомых Дальнего Востока*, стр. 94—100. (in Russian.)

(Belokobylskij, S. A.) Белокобыльский, С. А. (1985): Новые виды наездников-браконид (Hymenoptera, Braconidae) из азиатской части СССР и Монголии. — *Энт. Обозр.* **64** (2): 388—394. (in Russian.)

Fischer, M. (1960): Revision der paläarktischen Arten der Gattung Heterospilus Haliday (Hymenoptera, Braconidae). — Polskie Pismo Ent. 30 (4): 33—64.

Loan, C. C. (1974): The European species of Leiophron Nees and Peristenus Foerster (Hymenoptera: Braconidae, Euphorinae). — *Trans. R. Ent. Soc. Lond.* **126** (2): 207—238.

Papp, J. (1975): Three new European species of Colastes Hal. with taxonomic remarks (Hymenoptera: Braconidae, Exothecinae). — *Acta Zool. Hung.* **21** (3—4): 411—423.

Papp, J. (1983): Braconidae (Hymenoptera) from Mongolia, IX. — *Acta Zool. Hung.* **29** (4): 441—449.

Papp, J. (1987): Braconidae (Hymenoptera) from Korea, VIII. — *Acta Zool. Hung.* **33** (1—2): 157—175.

Papp, J. (1990): Braconidae (Hymenoptera) from Korea, XII. — *Acta Zool. Hung.* **36** (1—2): 87—119.

Richards, O. W. (1967): Some British species of Leiophron Nees (Hymenoptera: Braconidae, Euphorinae), with description of two new species. — *Trans. R. ent. Soc. Lond.* **119** (5): 171—186.

Ruthe, J. F. (1856): Prodromus einer Monographie der Gattung "Microctonus Wesm." — *Ent. Z.* (Stettin) **17:** 289—308.

(Tobias, V. I.) Тобиас, В. И. (1965): Родовые группировки и эволюция паразитических перепончатокрылых подсем. Euphorinae (Hymenoptera, Braconidae). Часть I. — *Энт. Обозр.* **44** (4): 841—865. (in Russian.)

(Tobias, V. I.) Тобиас, В. И. (1986): 27. Отряд Hymenoptera — Перепончатокрылые, Семейство Braconidae — Бракониды. — *Определитеь Насекомых Европейской Части СССР* **III/4:** 1—501. (in Russian.)

Acta Zoologica Hungarica 38 (1—2), pp. 75—88 (1992)

FLY COMMUNITIES IN PASTURE DUNG: SOME RESULTS AND PROBLEMS (DIPTERA)

L. Papp

Zoological Department, Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

(Received 19 March, 1991)

Fly samples collected/reared from Hungary, Spain, Afghanistan, Mongolia, Kenya and Tanzania (cow-pats, horse/donkey dung, elephant dung) are studied for species composition and community structure; Shannon's diversity index (H'), evenness index (J') and two similarity indices (Czekanowski's and Renkonen's) were calculated. There are no rules in the type of diversity of the separate (individual) imago samples or of the flies reared from separate droppings. The differences in the sizes of populations of the fly species breeding in droppings are as high as (10^3)—10^4—(10^5); consequently, 10 to 100 thousands of specimens are to be collected on a given place in order to have a fair chance for obtaining rare species. Dominance data were tested to fit to the log-normal distribution.

A method is proposed to a) collect flies/dung samples on/from the separate droppings and identify the flies separately; b) extract results from the data based on the rules of sequential sampling up to a stage (i.e. over ten-thousand specimens) when a lognormal distribution is reached for the consequence of species. It is stressed that much more methods of quantitative (statistical) ecology must be also used in order to go further in understanding the structure and community organization of coprophagous fly communities. With 2 original figures.

The coprophagous flies on pastures have always attracted attention in dipterology, since fly larvae play an important (in some cases a key) role in the normal decomposition of cow-pats and the larvae of the haematophagous and secretophagous flies of veterinary importance develop in horse dung and cow-pats on pastures.

Several authors, recently Legner (1986) stressed that the interactions between dung inhabiting flies, their natural predators (parasitoids) and other insects breeding in dung are far more complex than anticipated or reported before. We plan to make a review of the biology and control of the pasture flies developing in dung elsewhere in the near future, so a bibliographical overview of the related questions will be given there. In this paper we concentrate to the problems of studies on community organization of dipterous species but it does not mean that we are not aware of the importance of population interactions of other insect and non-insect populations in the dung.

As regards the quantitative aspects of species composition, community structure or community organization, we are afraid, these are the least known aspects in studies of dung inhabiting flies on pastures. Hammer (1941) performed fundamental investigations on dipterous species of veterinary importance in Denmark; he published invaluable data on the life-habits of the other species too, but nothing about the quantitative aspects (dominance or else). Some authors who measured the biomass of larval inhabitants of pasture dung (e.g. for their role in energy flow) paid little attention to the relative frequencies, community organization, etc. Harris & Blume (1986) tabulated 196 dipterous species emerged from cow-pats in the U.S.A. (unfortunately, they listed only families with species numbers and not species names). One of their statements, that there are several species of Muscidae that breed in cattle droppings, and a few of these compete with horn fly and face fly for food, is somewhat questionable for me; I mean, the above relationship is a seldom realized possibility for a competition only (see below). There are rather few papers in the literature hitherto for quantitative studies in species composition, like that of Nibaruta (1982) who studied dipterous community of cow-pats by rearing imagos; for the earlier literature see Hammer (1941), Papp (1971) and Nibaruta (1982).

The present author commenced studies on imagos and larvae of coprophagous flies as a "production biological study" of the significance of flies breeding in cow-pats in Hungary (PAPP 1971), when cow-pats were regarded as "ecological units" (they are anything but not units). However, the author was eager to know the species composition of fly communities of droppings from the very beginning as well. In the last two decades fly samples were collected and identified from Hungary, Austria, Spain, Afghanistan, Mongolia, etc. on/from cow-pats, horse/donkey droppings, sheep droppings, etc. Hitherto more than 150 000 fly imagos have been identified. The species composition of dung on pastures of Hungary has become comparatively well known. In our Table 1 a list of the dipterous species which develop in pasture dung in Hungary is given; some species which have been reared from dung but not in pasture conditions are also included. Some faunistical, zoogeographical and production biological results of the works hitherto (PAPP 1971, 1976, etc., PAPP & GARZÓ 1985) can be summarized as follows: It was found that the droppings have no autochtonous faunas (independent of their geographic position and faunal "environment"), not even in Europe. The species composition of horse (donkey) droppings seems to be the least dependent on the geographical position. The larval communities are formed from progenies of female flies which once found that dropping and were ready to lay eggs there. That is, it seems obvious that not every specimen caught on a dropping represents a species-population developing there.

This paper is not to revisit all the data we possess on dung inhabiting flies but rather to make a step towards elaborating methods for studies in the community structure and organization of these flies.

MATERIALS AND METHODS

A majority of the primary data (identifications of species in fly samples) was published formerly (PAPP 1971, 1976), at least in a data matrix form, i.e. some materials collected/reared by the author are revisited below in order to illustrate the problems with these fly communities and to show a possible method we propose. Much more data in my previous papers (e.g. in PAPP & GARZÓ 1985) are still awaiting similar processing. Only a small part of the primary data (identifications) are published here first. Voucher specimens of the species are deposited in the Zoological Department of the Hungarian Natural History Museum, Budapest.

The values of relative frequencies, H' (Shannon's diversity index), J' evenness index and two similarity indices (Czekanowski's and Renkonen's) were computed by a domestic software developed for Commodore 64 microcomputers. The lognormal distribution was fitted (tested) with the *chi*-square statistic with LOGNORM. BAS program of LUDWIG & REYNOLDS (1988) on an IBM-PC. (We have found the lognormal distribution as the best fit to community (guild) composition of the flies on dung heaps, of the dung beetles on sheep pastures, of the drosophilid flies in low mountain valleys in Hungary, etc.)

RESULTS AND DISCUSSION

As we can see in Table 1, the number of species inhabiting pasture dung is very high, though not all of them develop in all kind of dung and not all of them occur in a given pasture in Hungary.

It was found earlier that the mean dry biomass of flies emerged from cow-pat samples is only 0.462% of the dry biomass of dung; the maximal value we measured (i.e. a possible case in nature) is 2.54%, i.e. 5.5 times more than the mean value (from PAPP 1971: Table II). This ratio is about 25 in sheep droppings on pastures in Hungary. Though this paper aimed at a study of community structure of dung inhabiting flies, we can always be aware of the fact that the size (abundance) of fly larval populations in dung are not limited by the amount of food — except for very rare occasions.

To illustrate a possible approach of a study in community composition, nine imago samples collected on horse or donkey droppings are shown in

Table 2 (1-1 samples from Hungary and Spain, two samples from Afghanistan and five samples from Mongolia). These are 51 species, all but seven have been collected in Hungary and may occur also in Spain or Afghanistan. All but two samples (Mongolia: No. 5, 8) were collected on individual droppings by covering them quickly with a net, i.e. the numbers represent all the fly visitors of the dropping. The values of the Shannon's diversity and evenness indices are extremely variable, the values of Czekanowski's similarity index are low to very low, even for pairs from the same country. The values of the Renkonen's similarity index (which compensate the differences caused by the uneven sample sizes) are usually higher but still vary considerably. The whole picture we have got is rather chaotic. We may have a feeling that these materials are too small, the differences in the local faunas are possibly significant and it would be better to exclude the species which are attracted by the dung smells but do not develop there.

Logically there are two possibilities to avoid the above mentioned inadequacies in sampling on dung: 1) to collect more dipterous imagos on a given piece of dung (pats, droppings); 2) to collect numerous dung samples for rearing flies, i.e. to exclude the populations of species which are attracted by dung smells but do not develop there.

In order to show an example for case 1, one large sample collected on elephant dung ("Tanzania: Morogoro region, Mikumi Tented Camp, Mikumi National Park, Feb 1, 1987, netting over excrement of elephant, leg. S. MAHUNKA") was identified to species (or at least selected into species). The results are as follows:

Sphaeroceridae (in a taxonomical order): *Ischiolepta flava* VANSCH. 1, *Ischiolepta vanschuytbroecki* L. PAPP 2, *Ischiolepta* sp. n. 3, *Lotobia elegans* VANSCH. 37, *Lotobia simia* SÉGUY (= kanongensis VANSCH.) 18, *Metaborborus flavior* VANSCH. 2 209, *Metaborborus stichosus* NORRBOM 36, *Gymnometopina clunicrus* DUDA 1, *Gymnometopina lucida* SÉGUY 9, *Norrbomia elephantis* L. PAPP 6, *Coproica ferruginata* STENH. 8, *Coproica* sp. n. 1, *Coproica* sp. 1. 664, *Coproica* sp. 2. 36, *Coproica* sp. 3. 21, *Coproica* sp. 4. 3, *Philocoprella* sp. n. 2, *Elachisoma afrotropicum* L. PAPP 202, *Elachisoma* sp. 1. 1, *Elachisoma* sp. 2. 1, *Trachyopella* sp. 1. 25, *Trachyopella* sp. 2. 14, *Trachyopella* sp. 3. 3, *Trachyopella* sp. 4. 3, *Spelobia* sp. 36, *S.* (*Bifronsina*) *bifrons* STENH. 266, *L.* (*Leptocera*) *nigra-group* sp. 1, *L.* (*Leptocera*) sp. 7, *Telomerina* sp. 2, gen. n.: 3 species, 4 + 3 + 2 ex.; flies other than sphaerocerids: Cecidomyiinae indet .1, Lestremyiinae indet. 1, Ceratopogonidae indet.: 5 spp., 6 + 3 + 1 + 1 + 1, Syrphidae indet. 1, Chloropidae indet.: 2 spp., 2 + 1, Musca sp. 1, Muscidae indet. 1, Calliphoridae indet. 1, Sepsidae indet.: 4 spp., 16 + 7 + 4 + 2. Altogether 3 677 specimens of 49 species.

The relative frequencies of the species were plotted against their rank in Fig. 1. An analysis of the results (incl. of the graph presented) suggests/indicates a smaller than required sampling size. In this sample *Metaborborus flavior* VANSCH. is overdominant (60.08%) *and* 16 species are represented by single specimens only. Though the fit of the sequence of species to the lognormal distribution is not bad, its modal octave is the 2nd one of the 13 octaves. It is quite sure that these 49 species observed represent a part of the possibly

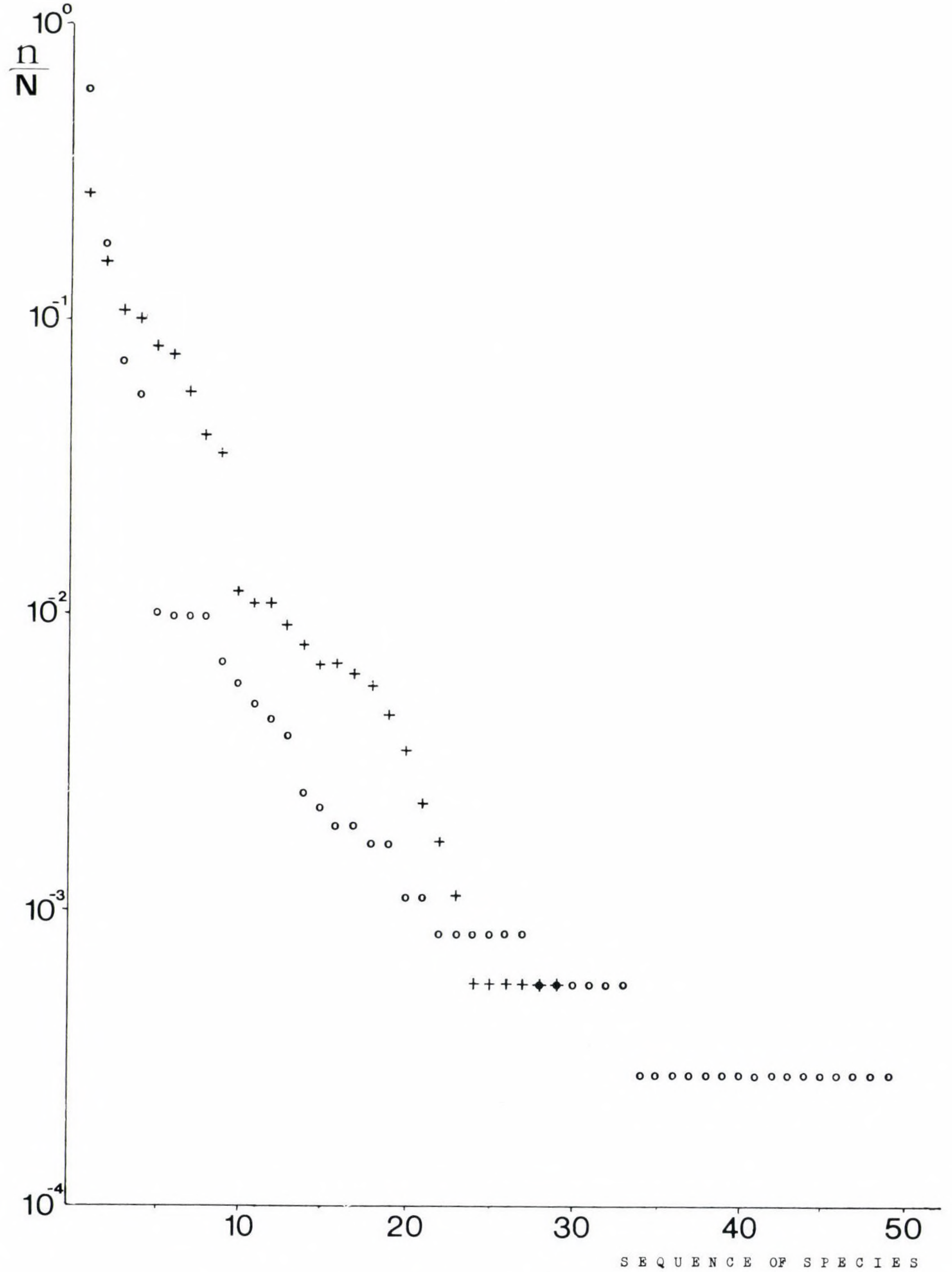


Fig. 1. Relationship between relative frequencies of species and their rank (from most common to most rare): in a fly sample collected on elephant dung in Tanzania (small circles, see in text) and in the fly community emerging from cow pats in Hungary (small crosses, sum of the nine samples of Table 3). Both indicate a smaller than required sampling size.

present species only. Indeed, LUDWIG & REYNOLD's (1988) formula of $S^* = 1.77 \cdot S_0/a$ predicts 86 species possibly present. (For the best fit of the sequence of species to the lognormal distribution $S_0 = 7.9$ with $a = 0.163$, or $S_0 = 8.0$ with $a = 0.164$, both with *chi*-square = 10.30.) It must be noted here, that it is not always the case of the collector's decision only to collect sample(s) large enough. Here is another sample collected on elephant dung in Africa:

North Kenya, Marsabit, on elephant dung, 18. 03. 1988, "Teleki Exped.", leg. A. VOJNITS, No. 208: *Norrbomia marginatis* (ADAMS) 29, *Norrbomia hypopygialis* (Rich.) 20 *Achaetothorax vojnitsi* sp. n. 4, *Achaetothorax rhinocerotis* (Rich.) or sp. n. 2, *Sepsis* sp. 2, *Coproica* sp. n. 1, *Musca* sp. 1, Muscidae indet. 1. 60 ex. of eight species. (A dominance of *Norrbomia* species shows that the dung was fresh, however, some other circumstances resulted in a scarce representation of specimens there.)

We may draw another lesson from the above data: a possible effect of the reduction or disappearance of the original populations of the African big ungulates and their replacement by domestic animals is that the dipterous and other insect species developing in their droppings will also disappear. However, considering the methodological problems discussed in this paper, it seems advisable not to risk any statement on the presence or absence of such an insect species below a given level of dominance in its community.

The other possibility of a better sampling on the structure of dipterous communities in dung is to collect dung samples of equal or subequal quantity in order to a) avoid populations which are attracted by the smells of dung but not develop there; b) avoid any subjective aspects of the collecting of imagos. Table 3 summarizes data of the flies reared from cow-pat samples of subequal weight (35—45 g dwt) from four localities in Hungary (with some omissions and corrections this is Table I in PAPP 1976). There are 1784 specimens of 29 species in nine samples. The values of the Shannon's diversity index and of the J' evenness index vary strongly. Czekanowski's similarity index between samples from the same locality is low to very low; if we reduce data per localities, the similarity values between localities are similarly low. The summarized numbers of specimens per species (No. 13 in Table 3) were used to calculate relative frequencies; the relative frequencies and the rank of species are shown on Fig. 1. They were also fitted to the lognormal distribution. The best fit is with $a = 0.176$, $S_0 = 4.0$ or 4.1 (instead of 6.0, observed), with *chi*-square = 6.00. S_0 is in the 5th octave of 10 octaves, S^* is 41, i.e. not too far from the observed 29. The graph presented fits rather well also to the logarithmic distribution (which seems rather usual case in this magnitude of sum of the specimen numbers in guilds of flying insects; observed e.g. also in drosophilid communities in Hungary). Summarily, we feel that this method is better than just to collect imagos on dung but the sample size is smaller than required.

In order to fulfil the requirement of samples of larger size, the data published by PAPP (1971, Table 2) were revisited from another point of view. Our Fig. 2 shows the relationship between relative frequencies of the species and their rank. The sequence of species in dominance follows a lognormal distribution (and obviously not a logarithmic distribution). Its parameters are: $S_0 = 4.8$ (instead of 8.0, observed), a = 0.182 to 0.185, *chi*-square for all these values is 9.59*. Its modal octave is the 6th of the 14 octaves, Ludwig & Reynolds' formula predicts S* = 46. 68, i.e. 47 species are possibly present instead of 38 species observed. Indeed, at the right edge of the graph there lies the 5th order of minorities, where representatives of several other species may lie hidden but this sample size of 12 631 is not enough yet to have a single representative specimen of them to be involved. I must stress that the last four species (each represented by a single specimen) are not accidental visitors but all the four develop exclusively in dung: *Ischiolepta pusilla*, *Telomerina pseudoleucoptera* ("*Limosina* sp." in PAPP 1971), *Hydrotaea albipuncta* and others are always so rarely emerging from dung samples in Hungary.

If one looks at the original table of rearing data, the pattern of the specimens of the dipterous species emerged are quite the same, i.e. as chaotic as in our Table 2 above. That is, one horse dropping or cow-pat is not a unit at all but if we collect systematically numerous samples on a given pasture, our results will be reliable and repeatable (at least for the dominant and subdominant species). I must remind my readers here that these 12 631 specimens were reared from 54 dung samples collected on a pasture of ca. 5 hectares. One month is enough to spend for collecting cow-pats samples and rearing flies from them, another month is required for a small team of Diptera taxonomists for the identification of the flies. Since the differences in the sizes of populations of the species of this guild of pasture dung inhabiting flies are as high as 10^3—10^4 (or possibly 10^5), we must collect 10 000 or more specimens to have an "adequately" large sample. There is another problem, too. If females of all coprophagous species were of the same fertility, the probability of finding fresh droppings were the same for every fly specimen, and all the populations were of the same mortality, our collecting results would not depend on the number of collected droppings in cases of adequately large samples. However, these are not fully realistic requirements. In addition, if one collects too many specimens at a given locality, he/she will not be able to identify them. We have a better chance for a good representation of species if we collect smaller but numerous samples.

Here we made a review of the species of one guild only. One can imagine how many thousands of flies (or other insects) we must collect in the frame of

* The level of fitness to the three curves is $0.50 < P < 0.70$ for all, in the case of the last one it is nearly 0.70, i.e. very good.

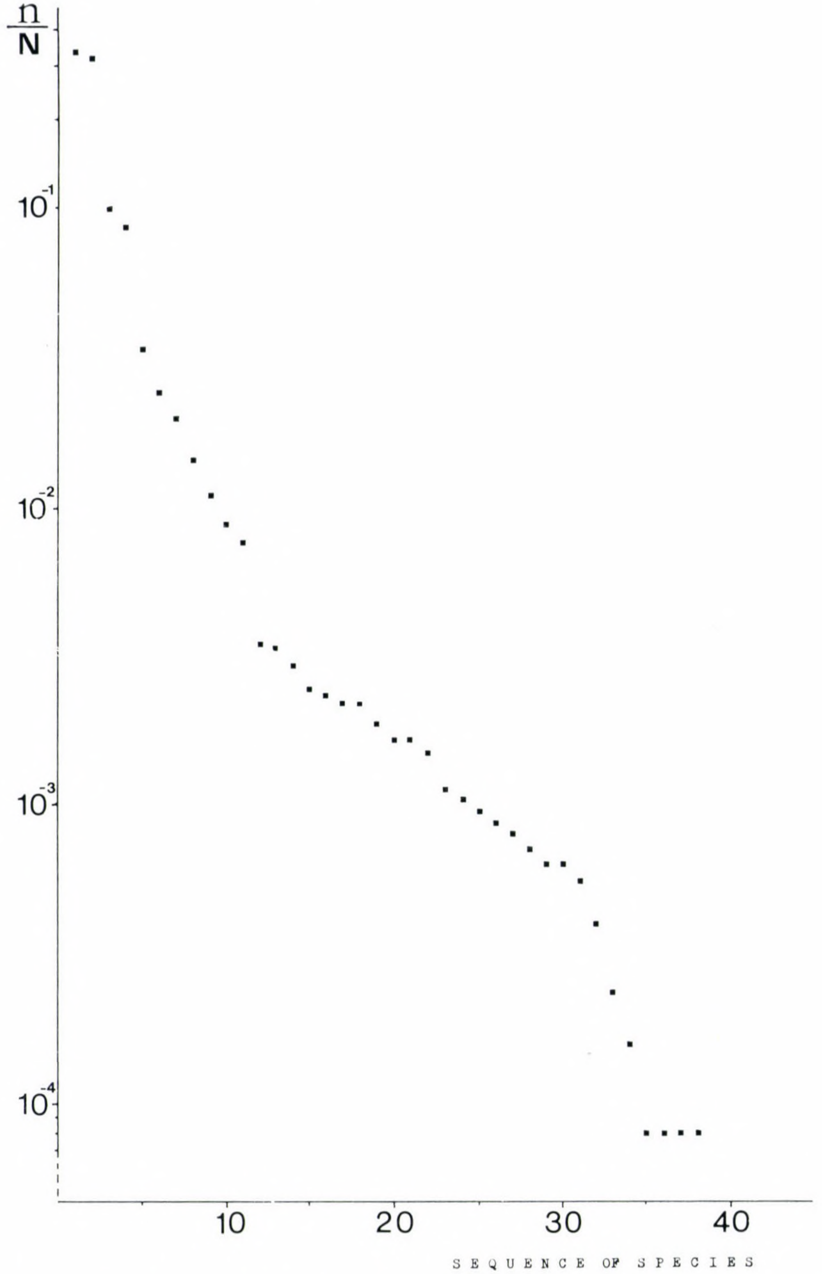


Fig. 2. Relationship between relative frequencies of the species and their rank in the fly community developing in cow pats on a pasture of Aranyosgadány, Hungary (sum of 54 samples, 12 631 ex., see Table II of Papp 1971). The sequence of species in dominance follows a lognormal distribution, see more in text.

the so-called "classical" faunistical work in order to produce faunal lists, which would include the true rare species in fair numbers as well, since the number of the guilds are so numerous in a given area, e.g. in a national park, or even in a country.

CONCLUSIONS

As a consequence of the extremely large differences in the abundance (i.e. the sizes of populations) of species in the same guild of flying insects, even if we want to produce only "simple" faunal lists (e.g. for a national park) we have to collect several 100 000-s of flies in order to have a fair chance for obtaining representatives of rare species.

It is to be feared that we are unable to collect and identify "adequately" large samples of coprophagous flies: the differences in the sizes of populations of these species breeding in droppings are as high as 10^4-10^5.

In the present circumstances of research, all the future collecting or sampling work must be planned more cautiously. Our present formula is,

a) collect flies on separate droppings and identify them separately;

b) extract results from the data based on the rules of sequential sampling (if necessary and possible) up to the stage when a lognormal distribution is reached for the sequence of species. We have to regard "the smallest detectable population size" as 1 at this stage. We must use much more methods of the "arsenal" of quantitative (statistical) ecology in order to know more about the structure and community organization of coprophagous fly communities.

REFERENCES

HAMMER, O. (1941): Biological and ecological investigations of flies associated with pasturing cattle and their excrements. — *Vidensk. Meddr dansk naturh. Foren.* **105:** 141—393.

HARRIS, R. L. & BLUME, R. R. (1986): Beneficial insects inhabiting bovine droppings in the United States. — In: PATTERSON, R. S. & RUTZ, D. A. (eds): *Biological control of muscoid flies, Misc. Publ. Ent. Soc. Am.* **62:** 10—15.

LEGNER, E. F. (1986): The requirement for reassessment of interactions among dung beetles, symbovine flies, and natural enemies. — In: PATTERSON, R. S. & RUTZ, D. A. (eds): *Biological control of muscoid flies, Misc. Publ. Ent. Soc. Am.* **62:** 120—131.

LUDWIG, J. A. & REYNOLDS, J. F. (1988): Statistical ecology. A primer on methods and computing. — John Wiley & Sons, New York-Chichester-etc., pp. 337.

NIBARUTA, G. (1982): Étude écologique des Diptères associés aux excréments de la vache domestique en milieu tempéré. — *Rev. Écol. Biol. Sol.* **19** (2): 203—223.

PAPP, L. (1971): Ecological and production biological data on the significance of flies breeding in cattle droppings. — *Acta zool. hung.* **17** (1—2): 91—105.

PAPP, L. (1976): Ecological and zoogeographical data on flies developing in excrement droppings (Diptera). — *Acta zool. hung.* **22:** 119—138.

PAPP, L. & GARZÓ, P. (1985): Flies (Diptera) of pasturing cattle: some new data and new aspects. — *Folia ent. hung.* **46** (2): 153—168.

Table 1

Dipterous species developing in pasture dung in Hungary

Anisopodidae:

Sylvicola cinctus Fabr.
fenestralis Scop.

Bibionidae:

Bibio johannis L.
spp.
Dilophus antipedalis Meig.
bispinosus Lundst.
febrilis L.
humeralis Zett.

Scatopsidae:

Ectaetia clavipes Lw.
Rhegmoclema halteratum Meig.
Colobostema nigripenne Meig.
Holoplagia albitarsis Zett.
sp.
Reichertella nigra Meig.
Scatopse notata Meig.
Coboldia fuscipes Meig.
Swammerdamella brevicornis Meig.

Cecidomyiidae:

10 to 20 species
of low importance

Sciaridae:

more than 10 species
(mainly in old dung)

Psychodidae:

Tinearia alternata Say
Psychoda sp.

Chironomidae:

unknown number of species
(probably more than 10 spp.)

Ceratopogonidae:

8—10 species

Stratiomyidae:

Microchrysa flavicornis Meig.
polita L.
Chloromyia formosa Scop.
Sargus cuprarius L.
iridatus Scop.
(rarely other 1—2 species)

Empididae:

Drapetis: 2—3 spp.
Crossopalpus: 5—6 spp.

Syrphidae:

4—5 spp. (mainly in stables)

Phoridae:

8—10 spp. in old dry dung

Sepsidae:

Meroplius minutus Wied.
Nemopoda nitidula Fall.
pectinulata Lw.
Ortalischema albitarse Zett.
Saltella nigripes R.-D.
sphondylii Schrank
Sepsis biflexuosa Strobl
cynipsea L.
duplicata Halid.
flavimana Meig.
fulgens Meig.
neocynipsea Mel. et Spul.
orthocnemis Frey
punctum Fabr.
thoracica R.-D.
violacea Meig.
Themira annulipes Meig.
leachi Meig.
lucida Staeg.
minor Halid.
nigricornis Meig.
Themira putris L.
superba Halid.

Ulidiidae:

Physiphora demandata Fabr.
Ulidia erythrophthalma Meig.

Platystomatidae:

rarely, 2—3 spp.

Heleomyzidae:

Oecothea fenestralis Fall.
praecox Lw.
Tephrochlamys rufiventris Meig.
(other 8—10 rare species)

Sphaeroceridae:

Sphaerocera curvipes Latr.
Ischiolepta nitida Duda
oedopoda L. Papp
pusilla Fall.
scabricula Halid.
vaporariorum Halid.
Lotobia pallidiventris Meig.
africana Beck.
Lotophila atra Meig.

Table 1 (cont'd)

Sphaeroceridae (cont'd)

Copromyza equina Fall.
  similis Coll.
Borborillus costalis Zett.
  hispanicus Duda
  nitidifrons Duda
  somogyii L. Papp
  sordidus Zett.
  szelenyii L. Papp
  uncinatus Duda
  vitripennis Meig.
Alloborborus pallifrons Fall.
Crumomyia nigra Meig.
Coproica acutangula Zett.
  dentata L. Papp
  digitata Duda
  ferruginata Stenh.
  hirticula Coll.
  hirtula Rond.
  lugubris Halid.
  pusio Zett.
  vagans Halid.
Philocoprella italica Deem.
  quadrispina Laur.
Elachisoma aterrimum Halid.
  bajzae L. Papp
  kerteszi Duda
  pilosum Duda
Trachyopella atomus Rond.
  coprina Duda
  lineafrons Spuler
  leucoptera Halid.
  melania Halid.
  straminea Roh. & Marsh.
Halidayina spinipennis Halid.
Chaetopodella scutellaris Halid.
Leptocera caenosa Rond.
Paralimosina fucata Rond.
Pullimosina heteroneura Halid.
Spinilimosina brevicostata Duda
Opalimosina albinervis Duda
  calcarifera Roh.
  collini Rich.
  denticulata Duda
  mirabilis Coll.
  simplex Coll.
Telomerina flavipes Zett.
  pseudoleucoptera Duda
Spelobia (E.) ochripes Meig.
Spelobia (B.) bifrons Stenh.
Spelobia clunipes Meig.
  luteilabris Rond.
  palmata Rich.
  pseudosetaria Duda
(rarely other 5—10 spp.)

Drosophilidae:

rarely, 1—2 spp.

Milichiidae:

Madiza glabra Fall.
Desmometopa m-nigrum Zett.
  sordidum Fall.
Leptometopa latipes Meig.
  niveipennis Strobl

Carnidae:

Hemeromyia anthracina Coll.
Meoneura flavifacies Coll.
  freta Coll.
  hungarica L. Papp
  minutissima Zett.
  neglecta Coll.
  prima Beck.
other 4—5 rare spp.

Scathophagidae:

Scathophaga scybalaria L.
  stercoraria L.
(rarely other 1—2 spp.)

Fanniidae:

rare on pastures, mainly in stables

Muscidae:

Muscina stabulans Fall.
Azelia aterrima Meig.
  cilipes Halid.
  nebulosa R.-D.
  parva Rond.
  triquetra Wied.
  zetterstedti Rond.
Hydrotaea aenescens Wied.
  albipuncta Zett.
  armipes Fall.
  dentipes Fabr.
  floccosa Macq.
  glabricula Fall.
  ignava Harris
  irritans Fall.
  meteorica L.
  pellucens Prsth.
  tuberculata Rond.
  velutina R.-D.
Mesembrina meridiana L.
  mystacea L.
Polietes domitor Harris
  lardaria Fabr.
  meridionalis P. & Ll.
Musca autumnalis De Geer
  (domestica L.)
  larvipara Prtsh.
  osiris Wied.
  tempestiva Fall.
Morellia aenescens R.-D.
  asetosa Bar.
  hortorum Fall.
  simplex Lw.

Table 1 (cont'd)

Muscidae (cont'd)

Neomyia cornicina Fabr.
viridescens R.-D.
Pyrellia rapax Harris
vivida R.-D.
Eudasyphora cyanella Meig.
cyanicolor Zett.
zimini Hennig
Dasyphora albofasciata Macq.
penicillata Egger
pratorum Meig.
(Stomoxys calcitrans L.,
in stables only)
Haematobia irritans L.
titillans Bezzi
Haematobosca atripalpis Bezzi
stimulans Meig.
Mydaea corni Scop.
urbana Meig.
Myospila meditabunda Fabr.
Hebecnema umbratica Meig.
Graphomyia maculata Scop.
Brontaea pappi Mihályi
humilis Zett.
tonitrui Wied.
(and some other rare species)

Anthomyiidae:

Paregle cinerella Fall.
radicum Meig.
Hylemya strenua Macq.
variata Macq.
Calythea albicincta Fall.
(and ca. other 10 spp.)

Calliphoridae:

1 or 2 species only

Sarcophagidae:

Ravinia striata Fabr.
Bercaea haemorrhoidalis Fall.

Altogether 270—280 species of 26 dipterous families

Table 2

Fly samples collected on horse/donkey dung on pastures

No.	1	2	3	4	5	6	7	8	9
	Hungary Újszent-margita 27. 08. 74	Spain P. Andraitx 25. 05. 72	Afghanistan Kabul 30. 04. 74	Afghanistan Kabul 03. 05. 74	Mongolia 1971				
					Altan Bulak 13. 07	Ulan Baator 11. 07	Ulan Baator 21. 07	Cecerleg 23. 07	Cecerleg 24. 07
Ceratopogonidae sp. 1	1	—	—	—	—	—	—	—	—
sp. 2	—	—	5	—	—	—	—	—	—
Chironomidae sp.	—	—	1	—	—	—	—	—	—
Sepsis flavimana	—	—	—	—	47	4	40	42	5
fulgens	—	—	—	4	—	—	—	—	—
neocynipsea	—	—	—	—	—	—	5	—	1
orthocnemis	—	—	1	—	—	—	—	—	—
thoracica	27	—	7	—	4	—	1	—	12
Sphaerocera curvipes	—	3	—	—	—	—	—	3	—
Ischiolepta horrida	—	—	—	—	5	—	2	—	—
I. vaporariorum	—	5	—	—	—	—	—	—	—
Lotobia pallidiventr.	1	4	—	—	4	5	4	10	—
Richardsia mongolica	—	—	—	—	22	—		—	2
Lotophila atra	—	20	—	45	—	—	—	—	—
Borborillus costalis	—	—	—	—	883	189	41	13	81
crypticus	—	—	—	—	5	7	1	—	1
hispanicus	2	2	—	—	—	—	—	—	—
micropyga	—	—	—	—	24	—	—	1	—
nitidifrons	—	1	—	—	—	—	—	—	—
somogyii	—	—	—	—	13	2	2	—	—
sordidus	1	1	—	—	2	1	—	—	—
uncinatus	—	—	—	—	—	—	—	2	—
Coproica acutangula	81	—	—	—	174	4	94	799	74
dentata	—	—	—	—	48	71	13	23	9
digitata	104	613	—	—	—	—	—	—	—
ferruginata	5	3	—	—	—	—	—	—	—
hirticula	31	1	—	—	—	—	—	—	—
lugubris	13	—	8	—	—	—	—	—	—
pusio	—	—	—	—	—	5	—	5	—
vagans	—	—	53	—	—	—	—	—	—
Elachisoma aterrimum	2	2	—	—	—	—	—	—	—
kerteszi	—	1	—	—	—	—	—	—	—
Philocop- mongolica	—	—	—	—	—	—	1	—	—
rella rectiradiata	—	—	—	—	—	—	2	—	—
H. spinipennis	1	—	—	—	—	—	—	—	—
Chaetop. scutellaris	7	—	—	4	—	—	—	—	—

Spelobia clunipes		—	—	—	64	—	—	—	3	—
palmata		—	13	—	—	—	—	—	—	—
simplicipes		—	42	—	—	—	—	—	—	—
villosa		—	2	—	—	—	—	—	—	—
Pullim. heteroneura		—	9	1	—	—	—	—	—	—
Meoneura setipyga		—	—	—	—	7	1	—	—	—
Scathophaga stercor.		1	—	—	—	—	—	—	—	—
Paregle cinerella		109	—	47	23	—	—	—	—	—
Musca autumnalis		1	—	—	—	—	—	—	—	—
osiris		1	—	—	—	—	—	—	—	—
Neomyia cornicina		1	—	—	—	—	—	—	—	—
Myospila meditabunda		—	—	—	10	—	—	—	—	—
Azelia parva		1	—	—	—	—	—	—	—	—
Muscidae sp. 1		—	—	2	3	—	—	—	—	—
sp. 2		—	—	—	—	1	1	10	15	2
		390	722	125	153	1239	290	216	916	187
Number of species		19	16	9	7	14	11	13	11	9
Specimens/species		20.5	45.1	13.9	21.9	88.5	26.4	16.6	83.3	20.8
Sh.-W. diversity		1.8545	0.7249	1.3797	1.4553	1.0898	1.0646	1.6669	0.6168	1.3013
Evenness		0.6298	0.2615	0.6279	0.7479	0.4130	0.4440	0.6499	0.2572	0.5923
Similarity (Czekanowski)	*2*	0.2050								
	3	0.2408								
	4	0.0994		0.1799						
	6					0.3388				
	7					0.2735	0.2767			
	8					0.2394	0.0912	0.5476		
	9					0.2482	0.4193	0.6650	0.1868	
(Renkonen)	*2*	0.2817								
	3	0.3688								
	4	0.1683		0.1663						
	6					0.7381				
	7					0.4315	0.3098			
	8					0.2228	0.0867	0.5476		
	9					0.6578	0.5177	0.6857	0.4725	

Table 3

Flies reared from cow-pats (Hungary); samples of subequal weight (35—45 g dwt)

Species	Locality and date									Σ
		Csévharaszt		Szentendre		Apaj		Aranyosgadány		
	12. 05	23.05.		18.07.		6.09.		06.08.		
Cecidomyiidae indet.	—	—	—	—	—	—	4	6	4	14
Psychoda sp.	—	9	2	—	—	—	—	—	1	12
Cricotopus sp.	—	—	—	—	1	—	132	—	—	133
Sargus iridatus Scop.	—	10	—	—	—	—	—	—	—	10
Drapetis aenescens W.	—	—	—	1	—	—	—	—	11	12
Phoridae indet.	—	—	—	—	—	—	1	—	—	1
Saltella sphondylii	—	—	—	—	—	—	—	—	1	1
Sepsis biflexuosa St.	5	37	143	—	—	1	—	—	—	184
Sepsis cynipsea L.	8	—	8	—	—	—	—	—	—	16
Sepsis fulgens Hoffm.	—	37	236	1	—	—	—	—	—	274
Sepsis orthocnemis	113	14	6	3	6	—	—	—	—	142
Sepsis thoracica R.-D.	2	—	8	20	25	4	10	27	3	99
Sphaerocera curvipes	—	1	—	—	—	—	—	—	—	1
Ischiolepta pusilla	—	—	—	—	—	—	—	8	—	8
L. pallidiventris Mg.	—	—	—	—	—	—	—	17	4	21
Coproica lugubris	16	1	1	38	54	—	10	14	43	177
Elachisoma aterrimum	—	—	—	—	—	—	1	—	3	4
Ch. scutellaris Hal.	—	—	—	—	—	—	1	2	—	3
Chloropidae indet.	1	—	—	—	—	—	—	—	—	1
Neomyia cornicina	—	—	—	21	—	51	—	—	—	72
Musca autumnalis Deg.	288	6	15	66	27	76	—	—	—	478
Musca tempestiva Fll.	—	—	—	19	—	—	—	—	—	19
Myospilla meditabunda	11	—	1	4	3	—	—	—	—	19
Morellia hortorum	—	—	1	—	—	—	—	—	—	1
Hydrotaea armipes	—	—	2	—	—	—	—	—	—	2
Hebecnema umbratica	3	—	2	—	—	—	—	—	1	6
Fannia sp. (♀)	—	1	—	—	—	—	—	—	—	1
Paregle cinerella Fll.	—	—	—	20	19	23	—	—	—	62
Ravinia striata Fabr.	—	—	—	11	—	—	—	—	—	11
	445	116	425	204	135	155	159	74	71	1784

Sample No.	1	2	3	4	5	6	7	8	9	13
Sh.-W. diversity	1.0183	1.6699	1.1393	1.9374	1.5359	1.1252	0.6907	1.4986	1.3642	2.3636
Evenness	0.4635	0.7600	0.4585	0.8079	0.7893	0.6991	0.3550	0.8364	0.6209	0.7019
Similarity (Czekanowski) *2*	0.0856									
3	0.0874	0.3290								
5				0.6490						
8							0.1546			
9							0.1565	0.3866		

	10 (1—3)	11 (4+5)
11	0.2083	
12 (7—9)	0.0465	0.3390

Acta Zoologica Hungarica 38 (1—2) pp. 89—94, (1992)

CONIOPTERYGIDAE FROM YEMEN (NEUROPTERA)

GY. SZIRÁKI

Zoological Department, Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

(Received 14 March 1991)

Ten specimens belonging to six species of Coniopterygidae were found in a Neuroptera material collected in 1970 in Yemen. *Coniocompsa arabica* sp. n. and *Conioptéryx ujhelyii* sp. n. are described as new species, while the genus *Cryptoscenea* ENDERLEIN, 1914 is recorded from the Palaearctic Region for the first time. With 10 figures.

In the year 1970 ALADÁR SZALAY-MARZSÓ collected a lot of specimens of different insect orders at Wadi Zabid in Yemen. Due to his expending care on such small bodied insects, there are ten coniopterygid exemplars in the Neuroptera collection of Hungarian Natural History Museum from this southernmost Palaearctic territory. Examination of this material showed, that they belong to six species. Two of them are hitherto undescribed species, and are represented by males in the present material. Two others are represented by females only, however, at least one of them is also very likely to belong to an undescribed species.

ALEUROPTERYGINAE

Aleuropteryx arabica MEINANDER, 1977

Material: Yemen, Wadi Zabid, August 1970, at light, 1 male specimen, leg.: A. SZALAY-MARZSÓ.

Distribution: Two previous records were published, both from Saudi Arabia: Lith (MEINANDER 1977) and Abha-Gizan (MEINANDER 1979).

Remarks: When I have described the Tanzanian *Aleuropteryx cruciata* SZIRÁKI 1990, which is closely related to *A. arabica*, I compared the holotype of the new species with MEINANDER's description and figures (MEINANDER 1977). Examination of the present material confirmed the validity of *A. cruciata*. The Yemenian specimen of *A. arabica* entirely agrees with the original description of the species, and distinctly differs from *A. cruciata*. The most striking differences: 1) The shape of the ninth sternite of *A. arabica* — in dorsal, or in vetral view — is rounded, while it is angular in the case of *A. cruciata*. 2) In *A. arabica* the caudal appendage of the ninth sternite ends in a flange, and the transverse plate is situated dorsally and simultaneously proximally of it, while in *A. cruciata* the caudal appendage itself ends in a "transverse plate" with a deep incision (SZIRÁKI 1990).

Coniocompsa arabica sp. n.
(Figs 1—5)

Holotype: male; Yemen, Wadi Zabid, October 1970, at light, leg. A. SZALAY-MARZSÓ — deposited in the collection of the Hungarian Natural History Museum, Budapest.

Head pale yellowish brown. Eyes black. Antennae 23-segmented, brown. Segments 3—15, apart from the conic connecting parts, more than twice as broad as long. Length of antennae 1.0 mm.

Thorax pale ochrous with brown sutures and shoulder spots.

Length of fore wing 2.6 mm. Membrane between R and A_1 hyaline, otherwise very light brown with darker brown spots (Fig. 1). Basal cross-veins distinct. Cross-vein $Rs - M$ at the knee of Rs is very weak, while $M - Cu_1$ distinct. Length of hind wing 2.4 mm, its membrane hyaline.

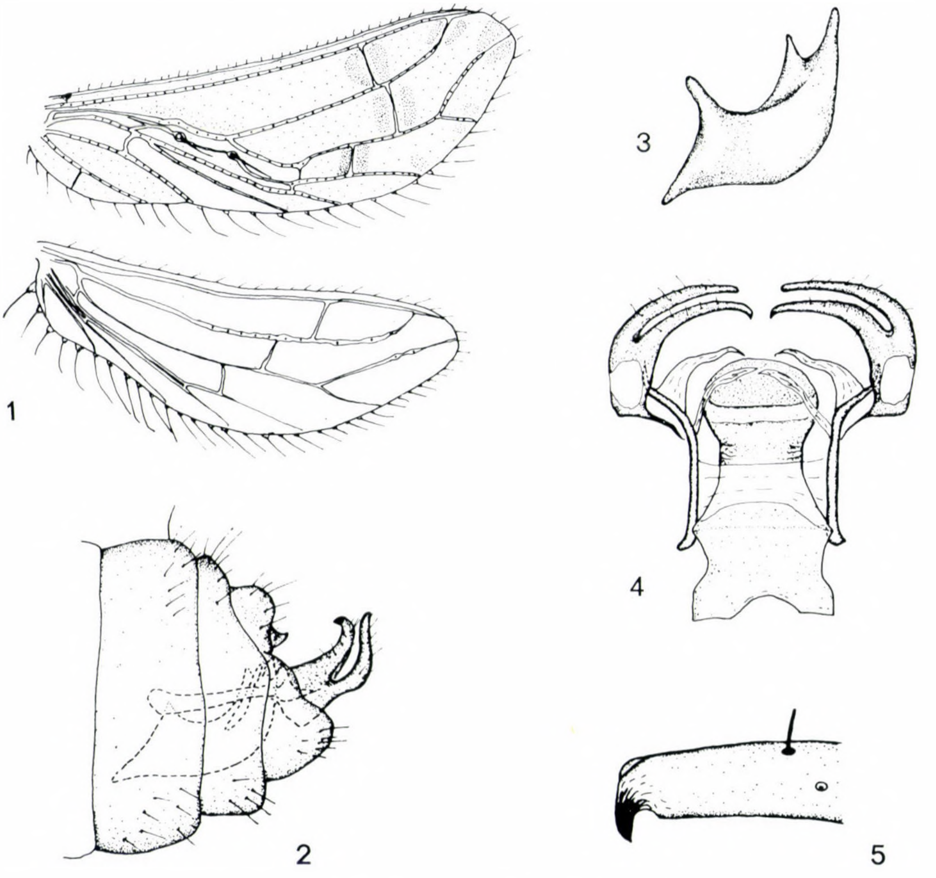
Male terminalia: as Figs 2—5. Ectoproct weakly sclerotized. Ninth sternite rounded. Penis in lateral view very thick, dorsally strongly concave, its apex only slightly tapering and distinctly bifurcated; in dorsal view its middle somewhat slender, while apex bulblike. Laterally and dorsally of penis a paired chitinized structure. Styli very large: as long as parameres. The median tooth of outer clasper absent, while the inner clasper ending in a pointed, perpendicular tooth.

All of the 12 *Coniocompsa* species described before, as well as the *C. arabica* sp. n. are rather close to each other. On the basis of the structure of male genitalia, the new species is especially close to *Coniocompsa indica* WITHICOMBE 1925 (known from India and Sri Lanka; MEINANDER 1990), and to *Coniocompsa silvestriana* ENDERLEIN 1914 (known from Guinea and Nigeria; MEINANDER 1975).

Distinctive features of the new species:

— Fore wing much longer than that of the other two species.
— Ninth sternite of males round, while that of *C. indica* angular in lateral view.
— Penis dorsally much more concave than in the case of *C. indica*. Moreover, in lateral view, basally very broad, and apically only slightly tapering, while the penis of *C. silvestriana* basally moderately broad and apically strongly tapering.

Remarks: MEINANDER (1977) wrote about two specimens of a *Coniocompsa* species (one female and an other specimen without abdomen), which were collected in Yemen. He figured its wings and female terminalia, but noted that "Because of lack of male specimens the species could not be identified." In the recent checklist of Coniopterygidae the supposed *Coniocompsa* species from Yemen is listed again (MEINANDER 1990). It is possible that the mentioned Yemenian *Coniocompsa* specimens belong to *C. arabica* sp. n., how-



Figs 1—5. *Coniocompsa arabica* sp. n.; wings (1), male terminalia, lateral view (2), penis, lateral view (3), male internal genitalia, dorsal view (4), end of the inner clasper, dorsal view (5).

ever, the venation of the fore wing figured by MEINANDER slightly differs from that of the new species.

Cryptoscenea sp.

M a t e r i a l: Yemen, Wadi Zabid, July 1970, at light, 1 male specimen, leg. A. SZALAY-MARZSÓ.

The greatly elongated wings (fore wings 2.8 times, hind wings more than 3 times as long as broad), running of *M* and Cu_1 together for more than half their length in hind wing without membrane visible between the veins, the prominent marginal fringers on hind wings and short ones on fore wings and the structure of terminalia together with the general characteristics of subfamily show that the examined female belongs to the genus *Cryptoscenea*.

Presence of hairs on all longitudinal veins of fore wing and the long flagellar segments of antennae give the possibility, that it stays relatively close to the Australian species: *Cryptoscenea evansorum* SMITHERS 1984. However, there is a single outstanding seta on *M* of fore wing. It is probable that the examined specimen belongs to an undescribed species. Nevertheless its correct description as new species is impossible without examination of male.

Earlier the genus *Cryptoscenea* was known only from Indonesia, Australia, New-Zealand, New-Guinea and from Lord Howe Island (Pacific Ocean) (MEINANDER 1990). Recently it was discovered in West Africa too (MONSERRAT & DIAZ-ARANDA 1988). The present exemplar is the first one found in the Palaearctic Region. This finding underlines the rather strong connections between the fauna of Yemen and that of palaeotropic regions.

CONIOPTERYGINAE

Coniopteryx (Xeroconiopteryx) deserta MEINANDER, 1979

Material: Yemen, Wadi Zabid, August 1970, at light, 2 males, leg. A. SZALAY-MARZSÓ; same locality and collector, October 1970, at light, 1 male.

Distribution: Previously a single exemplar of this species was known: the holotype from SW Saudi Arabia (MEINANDER 1979).

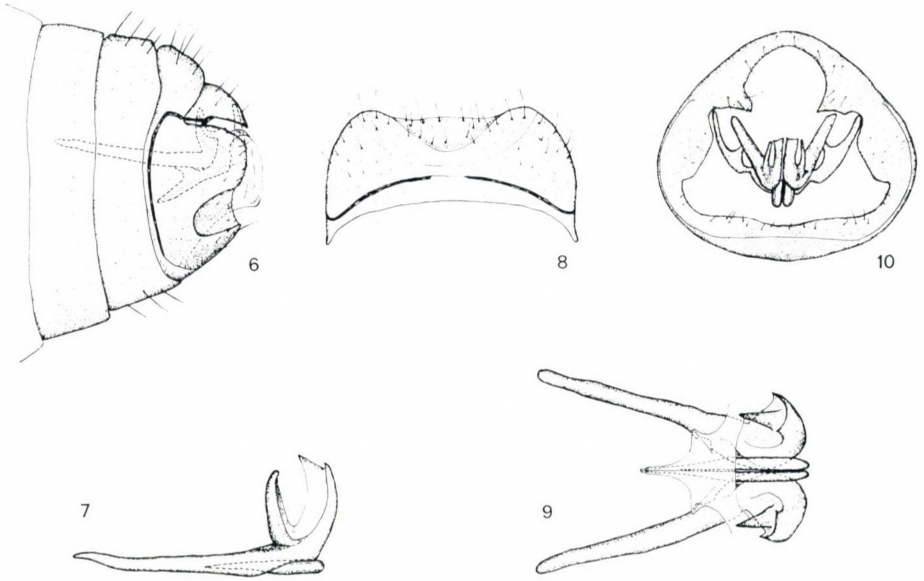
Coniopteryx (Xeroconiopteryx) ujhelyii sp. n. (Figs 6—10)

Type material: Yemen, Wadi Zabid, October 1970, at light, leg. A. SZALAY-MARZSÓ, male: holotype; same data as holotype, male: paratype; same locality and collector as holotype, August 1970, male: paratype. Type material is deposited in the collection of the Hungarian Natural History Museum, Budapest.

Head light brown, frons normal, eyes dark brown. Scale like hairs absent. Flagellar segments 8—10 slightly broader than long.

Thorax light greyish yellow, with light brown shoulder spots. Membrane of wings light brown. Length of fore wing 1.5 mm, length of hind wing 1.2 mm.

Abdomen light yellowish with rather weakly sclerotized genitalia. Male terminalia: as Figs 6—10. Hypandrium in lateral view less than 1.5 times higher than broad. Apodeme along the anterior margin ventrally medially very weak, or interrupted. Processus laterales rounded. Processus terminales short and widely rounded. Median incision very broad and shallow. Parameres without processus ventralis. Processus apicalis bifurcate, its caudal part plate-like, with distinct edge. Basal part of styli thin and greatly curved. Later the styli fused, forming an arch below the parameres. Laterally this arch has a caudal apophysis continuing in a membraneous structure, while medially it has an acute, rather long, split apophysis. Penis sclerotized, consisting of two, proximally very acute sclerites.



Figs 6—10. *Coniopteryx ujhelyii* sp. n.: male terminalia, lateral view (6), paramere and penis, lateral view (7), hypandrium, ventral view (8), male internal genitalia, ventral view (9), male terminalia, caudal view (10).

Coniopteryx ujhelyii sp. n. is a member of *Coniopteryx loipetsederi*-group sensu MEINANDER (1981), and it comes very close to *C. deserta*. The main distinctive characteristics are in the male genitalia:

- The hypandrium is wide, and has processus terminales.
- Parameres thin without processus ventralis.
- The ventral apophysis of bandlike arch of styli is acute, split and relatively long.

Etymology — I dedicate this new species in honour of DR. SÁNDOR ÚJHELYI, senior of Hungarian neuropterologists.

Hemisemidalis sp.

Material: Yemen, Wadi Zabid, August 1970, at light, 1 female specimen, leg. A. SZALAY-MARZSÓ.

The venation of the examined specimen resembles that of *Neosemidalis*, because cross-vein $M - Cu_1$ in the first wing strikes the stem of M, but the same in the hind wing strikes the posterior branch of M. However, the structure of (female) terminalia is typical of the genus *Hemisemidalis*: there is a strong transverse plate (= subanal plate according to ASPÖCK & ASPÖCK 1965) with numerous long hairs, and ventrally of it there is a paired chitinized structure (ninth sternite — according to MEINANDER 1972, or gonapophyses laterales — according to ASPÖCK & ASPÖCK 1965) with very long, hooked hairs.

Without male specimens the species could not be identified.

REFERENCES

ASPÖCK, H. & ASPÖCK, U. (1965): Die Neuropteren Vorderasiens. I. Coniopterygidae. — *Beitr. Naturk. Forschung SW—Deutschland* **24:** 159—181.

MEINANDER, M. (1972): A revision of the family Coniopterygidae (Planipennia). — *Acta Zool. Fennica* **136:** 1—357.

MEINANDER, M. (1975): Coniopterygidae from West Africa (Insecta: Neuroptera). — *Entomol. Scand.* **6:** 247—252.

MEINANDER, M. (1977): Coniopterygidae from the Arabian Peninsula (Neuroptera). — *Entomol. Scand.* **8:** 81—85.

MEINANDER, M. (1979): Insects of Saudi Arabia. Neuroptera: Fam. Coniopterygidae. — *Fauna of Saudi Arabia* **1:** 334—341.

MEINANDER, M. (1981): A review of the genus Coniopteryx (Neuroptera, Coniopterygidae). — *Ann. Entomol. Fennici* **47:** 97—110.

MEINANDER, M. (1990): The Coniopterygidae (Neuroptera, Planipennia). A check-list of the species of the world, descriptions of new species and other new data. — *Acta Zool. Fennica* **189:** 1—95.

MONSERRAT, V. J. & DIAZ-ARANDA, L. M. (1988): Contribution al conocimento de los coniopterígidos de la Isle de Bioco (Guinea Equatorial) (Neuropteroidea, Planipennia: Coniopterygidae). — *J. Afr. Zool.* **102:** 493—502.

SMITHERS, C. N. (1984): The Neuroptera of Barrow and nearby islands off the west coast of western Australia. — *Australian Entomol.* **Mag. 11:** 61—68.

SZIRÁKI, GY. (1990): Two Aleuropteryx species from Tanzania (Planipennia: Coniopterygidae). — *Folia Ent. Hung.* **51:** 117—121.

Acta Zoologica Hungarica 38 (1—2), pp. 95—112 (1992)

TAXONOMIC NOTES ON THE GENUS HADERONIA STAUDINGER, 1896 WITH DESCRIPTIONS OF ONE NEW GENUS AND FOUR NEW SPECIES (LEPIDOPTERA, NOCTUIDAE)

Z. VARGA

Department of Zoology and Evolution, Lajos Kossuth University
H-4010 Debrecen, Egyetem-tér 1, Hungary

(Received 28 March 1991)

Descriptions of a new genus (*Ctenoceratoda* gen. n.), four new species, *H. kalikotei* sp. n. (Napal), *Ct. argyrea* sp. n. (Mongolia), *Ct. juliannae* sp. n. (Mongolia) and *Ct. oxyptera* sp. n. (Mongolia) and a new subspecies, *Ct. zetina rhodoptera* ssp. n. (Afghanistan) are given. With four photoplates and 60 figures.

1. INTRODUCTION

The genus *Haderonia* was created by STAUDINGER (1896, Iris VIII: 320) as a subgenus of *Hadena* (sensu DUPONCHEL 1829 et auctorum, nec SCHRANK 1802), for the simultaneously described single species: *subarschanica* STAUDINGER (l.c.). Further species, enumerated by BOURSIN (1964b) as *Haderonia*, were mentioned by different authors under numerous generic names (*Hadena* auct. nec SCHRANK 1802, *Hadula* STAUDINGER 1889, *Mamestra* OCHSENHEIMER 1816, *Polia* OCHSENHEIMER 1816, *Trichestra* HAMPSON 1805 etc.). BOURSIN has characterized the genus *Haderonia* as closely related with *Polia* OCHSENHEIMER, however, differing, by the weaker uncus and shorter saccular processes in the male genitalia. He has not mentioned that the species of the genus *Polia* have not only elongated but also conspicuously dyssymmetric saccular processes. They have a brush-like field densely covered by on the right side by strong bristles, whereas the left processus often has a specialized (e.g. fork-like: *serratilinea* TREITSCHKE, *lamuta* HERZ, *richardsoni* CURTIS, *conspicua* BANG-HAAS) shape.

The vesica seminalis of the *Polia* species is usually long, tubular, coiled (in *P. altaica* LED. pronouncedly helicoid), with or without lateral diverticula and with a distal strip of fasciculate cornuti, which can be missing exceptionally (*P. altaica* LED.).

The *Haderonia* species closely related with *H. subarschanica* STAUDINGER also have a slightly dyssymmetric genital capsula. Their saccular processes have a symmetric shape, but the bristled tufts on them are dyssymmetric. Some of the larger species (e.g. *culta* MOORE, 1881, *sublimis* DRAUDT, 1950) have elongated processes, densely covered by strong setae on both sides. The question, whether the two main species groups, which differ from each other externally as well, represent two distinct subgenera or only the extremes of a single series of transition, can be answered only in the frames of a complete revision of the genus *Haderonia* and related genera.

The other part of the former genus *Haderonia* STAUDINGER represents a compact, rather homogenous group of species which can be easily characterised both by external and genital features (male and female). Hence, here I describe this group as a separate genus.

2. DESCRIPTION OF THE NEW GENUS *CTENOCERATODA* GEN. N.

Type-species: *Haderonia sukharevae* VARGA, 1974.

The name refers to the long, bipectinated antennae of all species belonging to this genus. They are large or medium-sized, robust Noctuid moths. They are covered by fairly rough hairs, with tufts only on the 1st—2nd abdominal segments. Abdominal coremata are present in numerous species. The antennae of the males are rather long, reaching or overranging the 2/3 length of the forewings. They are more or less strongly bipectinate and ciliate in the males; shorter, filiform and weakly ciliate in the females. The females of some species (e.g. *Ct. lupa* CHRISTOPH) wear a tuft of specialized hairs at the end of the abdomen. Forewings are elongated with acute apex. The markings are complete in most species, sometimes obsolescent (*H. turpis* STAUDINGER), often with a characteristic modification of the reniform (*khorgossi* ALPHERAKY, *tancrei* GRAESER, *graeseri* PÜNGELER etc. — in *sukharevae* VARGA as an individual aberration).

The male genital capsula completely symmetric, saccular processes short, usually acute. Harpe plate-like, ampulla short or medium-sized, varying in size and shape, covered by setae. Cucullus and corona well developed, the latter consisting of numerous rows of setae. Fultura inferior shield-like, saccus often distended. Vesica seminalis elongated, tubular with a proximal loop and with a proximo-medial lateral diverticulum. The distal field of fasciculate cornuti well-developed. — The females have a shield-like sclerotized subgenital plate firmly attached to the genital orifice. Ductus bursae heavily sclerotized, flattened, often folded and rugulose. Bursa globular, regularly with signa, apex bursae elongted, saccate; the ductus seminalis conspicuously broad. The loop of the elongated vesica and the specialized bursa incl. apex bursae representing a complete lock-and-key mechanism are unical autapomorphic features within the subfamily Hadeninae.

Haderonia STAUDINGER (= *Lasiridia* DRAUDT, 1950) must be restricted to the species closely related with *subarschanica* STGR. No generic names are available for the species belonging to the new genus, enumerated below. The most species were originally described as *Hadena*, *Hadula*, *Mamestra* and *Polia* which genera have completely different type-species. *Turpis* STAUDINGER (1900) 1899 was originally described as *Phoebophilus* STAUDINGER 1888 (type-species *amoenus* STGR.).

The genus seems to be restricted to the eremic mountains of Central and Inner Asia from N Iran to the C and W Mongolia. More species are known from the Tien-Shan mts. (e.g. the mountain ranges near the lake Issyk Kul) and Chinese Turkestan (e.g. the old, famous locality: "Aksu"). I could capture the greatest number of individuals (more than 100 *Haderonia* spp. in a night and three species) in the S part of the Mongolian Altaj (between 1800—2600 m, in three different localities).

3. CHECK-LIST OF THE *CTENOCERATODA* SPECIES

argyrea sp. n. described below (TL: Mongolia, Mongol Altaj)

arschanica ALPHERAKY 1882 (TL: China, Kuldja distr.)

graeseri Püngeler 1898 (TL: "O-Turkestan", Chamil Hami) (bona sp.)

juliannae sp. n. described below (TL: Mongolia, Dzhungar Gobi)

khorgossi ALPHERAKY 1882 (TL: China, Kuldja distr.)
longicornis GRAESER 1892 (TL: China, Kashgar)
lupa CHRISTOPH 1893 (TL: N-Iran, "Hyrcania", Shahkuh)
(= contempta PÜNGELER 1914, TL: China, Aksu, **syn. n.** perhaps subsp. of the former)
nefasta PÜNGELER 1907 (TL: China, Lop-Nor)
optima ALPHERAKY 1897 (TL: China, Nan-Shan mts.)
oxyptera sp. n. described below (TL: Mongolia Mongol Altaj)
sukharevae VARGA 1974 (TL: Mongolia, Bajanchongor aimak)
sukharevae excellens VARGA 1974, TL: Mongolia, Chövsgöl aimak
tancrei GRAESER 1892 (TL: SU, Tien Shan, Alexander mts.)
thermolimna BOURSIN 1964 (TL: SU, Kirghisia, Issyk Kul)
turpis STAUDINGER (1900) 1899 (TL: "Tien Shan")
zetina STAUDINGER (1900) 1899 (TL: "Tien Shan")
(= desquamata FILIPJEV 1931, TL: SU, Pamir mts.)
(= impia PÜNGELER 1905, TL: China, Aksu)
zetina rhodoptera ssp. n., described below, TL: Afghanistan, Band-i-Amir.

4. DESCRIPTION OF THE NEW SPECIES AND SUBSPECIES

Haderonia kalikotei sp. n. (Plate I: 1)

Holotype: male: Nepal, Prov. 3, East Jumbesi, 2750 m, 25—31. 7. 1964., leg. W. DIERL (Zoologische Staatssammlung, Munich). Slide No. 5674 VARGA. — Paratypes: 2 males and 32 females from the same locality (ZSM) — Slide No. MM 870 BOURSIN (male).

The new species is dedicated to Mr. Kalikote, mountain guide in Nepal, et Dr. W. DIERL's request.

Closely related to *Haderonia culta* MOORE, but slightly larger, forewings more elongated, unicolorous without greenish and copper-shine, hindwings lighter, less marked.

Head, thorax and tegulae dark brownish-grey, densely irrorated with black scales. Abdomen dark brownish-grey with black tufts on the 1st—4th abdominal segments. Antennae dark brown, pectinated in the male, filiform in the female. Forewing blackish grey, irrorated with brownish scales, having a reddish-yellowish shine near the margin. Without metallic scales. All markings obsolescent, on the outer edge of the reniform only a diminishing, small light spot. Hindwings light (males) or dark (females) brownish grey, with a diffuse darker suffusion at the margin. Wingspan 44—46 mm.

The male genitalia (Figs 1—2) display some conspicuous features. Cucullus has a very broad ventral lobe; saccular processes short and broad, clavus (or simply the dorsal part of the sacculus?) extremely distended, fultura inferior elongated, vesica with a very long but not dense stripe of fasciculate cornuti.

Similar species: only *H. culta* MOORE (Plate I: 2), but the latter species is more broad- and short-winged, with metallic scales and with a conspicuous light spot at the basis of the forewings and at the under edge of the reniform. All markings are more expressed.

The genital capsula of *H. culta* (Figs 3—4) is very dissimilar, its cucullus has no ventral lobe, saccular processes are very long, stripe of fasciculate cornuti is shorter.

The new species is known only from the type-locality in a fairly large series. The males are not completely fresh, they were captured probably at the end of the flying period (the majority of the collected specimens are females !). *H. culta* has a much broader range of distribution in the Himalaya and in the Karakoram Mts.

Ctenoceratoda argyrea sp. n. (Plate II: 9—10)

H o l o t y p e, male: Mongolia, Govi Altaj aimak, Govi Altaj mts., 6 km S of Tögrög, 6. 08. 1988, leg. PEREGOVITS et VARGA (coll. VARGA in the Zool. Inst. Univ. Debrecen). Slide No. 5104 VARGA. — P a r a t y p e s: 2 males and 1 female with the same data; 4 males Chovd aimak, 40 km S from Chovd, toward Manchan, 28—29. 07. 1986, leg. P. GYULAI et Z. VARGA; 1 male, Ömnögovi aimak, 80 km NW Dalanzadgad, 25. 07. 1986 leg. FÁBIÁN, HREBLAY, PEREGOVITS et RONKAY; Bajanchongor aimak, 1 male, Ih Bogd Uul, 1850 m, 24. 07. 1987, leg. PEREGOVITS, HREBLAY et STÉGER; 1 male, Ömnögovi aimak, between Cogt-ovoo and Dalanzadgad, Tachilga Uul, 1550 m, 8. 07. 1967, leg. Z. KASZAB (coll. HNHM Budapest, coll. GYULAI, HREBLAY, G. RONKAY et VARGA) Slide Nos 4842, 5109 (males), 5159 (female), prep. Z. VARGA.

Closely related to *Ct. khorgossi* ALPHERAKY, partially sympatric and syntopic with it in the Mongol Altai Mts. The new species has abdominal coremata while *khorgossi* has not. *Argyrea* has a fine silvery whitish-grey colouration (derivatio nominis).

Head and thorax whitish-grey with a light ochraceous shine, patagia with a double blackish-grey margin, tegulae with greyish edges. Abdomen whitish-greyish with grey and ochraceous irroration. Antennae reaching the 2/3 of the length of the forewings, bipectinate (male) or filiform (female). Forewings whitish-grey with darker grey suffusion. Reniform large, encircled with white, inner edge often with an acute extension on lower edge of cell; filled with grey. Orbicular large, somewhat obsolescent, claviform regular. Subterminal white, marginal field dark grey. Fringes irrorated. Hindwings light grey with a darker marginal field, fringes white. Measures: 36—39 mm (wingspan).

The m a l e g e n i t a l i a (Figs 5—10, 16—17) have the same basic configuration as those of *khorgossi* (Figs 11—15), but clavus and cucullus are more distended, fultura inferior is broader; the stripe of fasciculate cornuti in the vesica is longer and narrower. The female genitalia (Fig. 19) can be easily separated by the deeper incision of the subgenital plate, the smaller papillae of the ovipositor and the narrower and more folded ductus bursae.

The new species is fairly distributed but uncommon in the Mongol and Govi Altai Mts. It is on wing in the summer period. Since *khorgossi* is a mainly spring species, their flying periods are partly overlapping. The localities of *argyrea* lie usually in moderate altitudes.

Ctenoceratoda juliannae sp. n. (Plate III: 19)

H o l o t y p e: male, Mongolia, Chovd aimak, Dzhungar Gobi, Bulgan sum (in the village), 31.7.—1.8. 1986, leg. Z. VARGA. Slide No. 4025 VARGA. — P a r a t y p e s: 1 male from the same locality, leg. et coll. P. GYULAI; 2 males, Mongolia, Bayan-Ölgiy aimak, Bulgan village, 6—7. 08. 1986, leg. et coll. P. GYULAI et Z. VARGA.
Slide No. 4030 VARGA.

The new species is dedicated to my wife, DR. JULIANNA VARGA-SIPOS, who as botanist participated in our Mongolian expeditions in 1986 and 1988 and helped in entomological samplings too.

Very large species (one of the largest *Ctenoceratoda*, cf. *zeta rhodoptera* ssp. n.) with elongated forewings. Wingspan 45—48 mm (in *sukharevae* 40—46 mm). It is closely related to *H. sukharevae* but differs in the structure of antennae, shape and markings of forewings and in the genital configuration.

Head and thorax unicolorous, ochraceous-grey, irrorated with darker grey. Antennae overranging the 2/3 of forewings, widely bipectinate. Abdomen ochraceous-grey, without coremata. Forewings pure grey, without bluish colouration, in the medial field brownish-grey. Reniform and orbicular large, whitish-grey; claviform regular. Transversal lines sharp, blackish-grey, undulate and serrate, resp. Fringes light and dark grey irrorate. Hindwing light grey with darker margin. Female unknown.

The m a l e g e n i t a l i a (Figs 33—36) have the same basic configuration as those of *H. sukharevae* (Figs 21—32) but the neck of the cucullus is broader, the cucullus is more lobate, the ampulla is broader and shorter and the vesica is very large and wide, the lateral diverticulum is ample.

The new species is seemingly a rare one and only the holotype is in good condition, the other specimens are rather worn. It occurs seemingly in low or moderate elevations of the Dzhungarian Govi, where *sukharevae* has not been found.

Ctenoceratoda oxyptera sp. n. (Plate III: 17—18)

H o l o t y p e: male, Mongolia, Govi Altay aimak, Mts. Govi Altay, 6 km S of Tögrög, 1750 m, 06. 08. 1988, leg. PEREGOVITS et VARGA, coll. VARGA (Zool. Inst. Univ. Debrecen). Slide No. 5103 VARGA. — P a r a t y p e s: 2 males, 2 females with the same data; 5 males, Mongolia, Chovd aimak, 40 km S from Chovd toward Manchan, 28—29. 07. 1986, leg. P. GYULAI et Z. VARGA; 1 male, Chovd aimak, Chovd, in the village, 09—10. 08. 1986, leg. P. GYULAI; 5 males, Chovd aimak, 5 km S of Chovd at the pass, 10—11. 08. 1986, leg. GYULAI et VARGA; 1 male, Mongolia, Bayanhongor aimak, Mts. Ih Bogd Uul, 2150 m, valley of Pitut river, 25. 07. 1987, leg. PEREGOVITS, HREBLAY et STÉGER (coll. HNHM Budapest, P. GYULAI, G. RONKAY and Z. VARGA). — Slide Nos 4135, 4152, 4840, 5111 VARGA (males), 5154, 5205 VARGA (females).

The new species is closely related to *Ct. sukharevae*, but smaller in average, forewings are narrower and more elongated. Hindwings are lighter and more marked. There are numerous minor differences in the genital configuration of both sexes. It is sympatric and syntopic with *Ct. sukharevae* in some places.

D e s c r i p t i o n — Head and thorax grey with blackish irroration, abdomen lighter grey. No abdominal coremata. Antennae long, bipectinate in males, filiform with short and finer cilia in the females. Forewings light bluish-grey with some ochraceous shine, and often with an obsolescent lighter radial stripe. Maculation regular. Hindwings lighter grey with darker margin, but with a characteristic lighter area at the inner edge of the wings. Wingspan: 36—39 mm. The sexes are completely similar.

The male genital capsula (Figs 37—43) has the same basic configuration as in *Ct. sukharevae* (Figs 21—32), but the uncus longer, ampulla longer and more acute, the neck of cucullus narrower and the vesica with a shorter and narrower stripe of fasciculate cornuti. In the female genitalia the ductus bursae more folded and rugulose and the subgenital plate has a deeper incision (cf. Figs 50—53).

The new species is probably widely distributed in the Mongol and Govi Altaj mts, but it seems to be rare. It occurs only in moderate altitudes, while on the high plateau of the Adz Bogd mts. (Bungijn davaa, 2700 m) we collected only *Ct. sukharevae* (ca 120 ex.). The flying period is the same as in *Ct. sukharevae*, however, the habitat preferences are, slightly different.

Ctenoceratoda zetina rhodoptera ssp. n. (Plate I: 7)

Holotype, male: Afghanistan centr., Band-i-Amir, 3600 m, 29. 07. 1965, leg. KASY et VARTIAN (coll. VARTIAN, Vienna). — Paratypes: 3 females with the same data, 5 females from the same place, but 3000 m, 30—31. 7. 1965 (coll. VARTIAN). Slide No. 3845 RONKAY (female).

Relatively large specimens (wingspan 46—48 mm). Head, thorax and forewings light reddish ochraceous, with a light violet shine. Markings obsolescent. Medial ghost darker brownish. Hindwings brownish ochraceous. In the female genitalia we have found some minor differences in the folding of the ductus and in the proportions of the bursa and cervix, but they could not have a specific value.

The rather homogenous series probably represents a well-differentiated local population, isolated in the environs of the Three-Kings-Lakes (Band-i-Amir) in the Central Hindukush range. Other local forms of Noctuidae from here have also this characteristic reddish-rosaceous-ochraceous coloration (very light reddish-ochraceous rocks).

* * *

Acknowledgements — The author is very indebted to DR. L. RONKAY for his valuable help and for his critical comments on the manuscript. I wish to express my sincere thanks to MRS. E. VARTIAN (Vienna), DR. W. DIERL (Munich), MR. G. EBERT (Karlsruhe), H. HACKER (Staffelstein), PROF. DR. C. M. NAUMANN (Bonn) as well for the possibility of the study of their materials and MRS. K. REMETE, MR. P. KOZMA and MR. G. RONKAY for their kind technical assistance. The research was supported by the Humboldt-Foundation (Bonn, Germany) and the OTKA Foundation (Hungarian Academy of Sciences, Budapest).

REFERENCES

Boursin, C. (1963): Eine neue Hadula Stgr. aus Zentralasien. (Beiträge zur Kenntnis der "Noctuidae-Trifinae", 134). — *Z. Wien. ent. Ges.* **48:** 43—45.

Boursin, C. (1964a): Noctuidae Trifinae. Zweiter Beitrag zur Kenntnis der Fauna der Noctuidae von Nepal. (Beiträge zur Kenntnis der "Noctuidae Trifinae" 146). — *Veröff. zool. Stslg. München* **8:** 1—40.

Boursin, C. (1964b): Eine neue Haderonia Stgr. aus Russisch-Turkestan. (Beiträge zur Kenntnis der "Noctuidae-Trifinae", 1.). — *Z. wien. ent. Ges.* **49:** 174—175.

Draudt, M. (1950): Beiträge zur Kenntnis der Agrotiden-Fauna Chinas. — *Mitt. münchn. ent. Ges.* **40:** 1—174.

Hampson, G. F. (1905): Noctuidae V. — *Cat. Lep. Phal. V., British Museum* (*N. H.*).

Heydemann, F. (1944): Zur Kenntnis der Gattung Aplecta und zweiter "Dual spezies" in derselben. — *Stett. ent. Z.* **105:** 12—33.

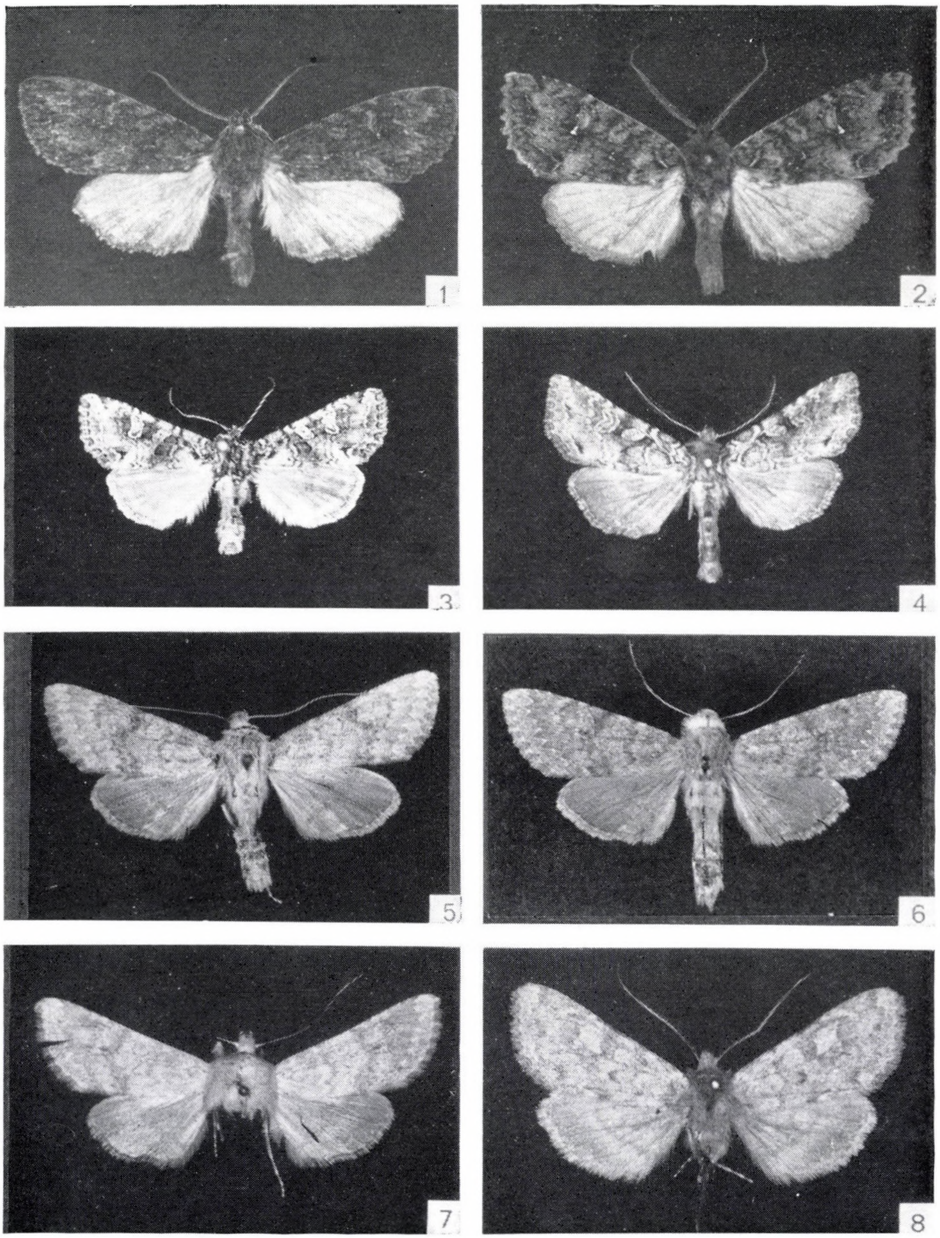
Nye, I. W. B. (1975): The Generic Names of the World Lepidoptera, I. Noctuidae. — *British Museum* (*Natural History*), pp. 1—568.

Staudinger, O. (1896): Beschreibung neuer Lepidoptera aus Tibet. — *Dt. ent. Z. Iris* **8:** 300—343.

Staudinger, O. (1900): Ueber Lepidopteren aus dem östlichsten Thian-Schan-Gebiet. — *Dt. ent. Z. Iris* **12** (1899): 331—351.

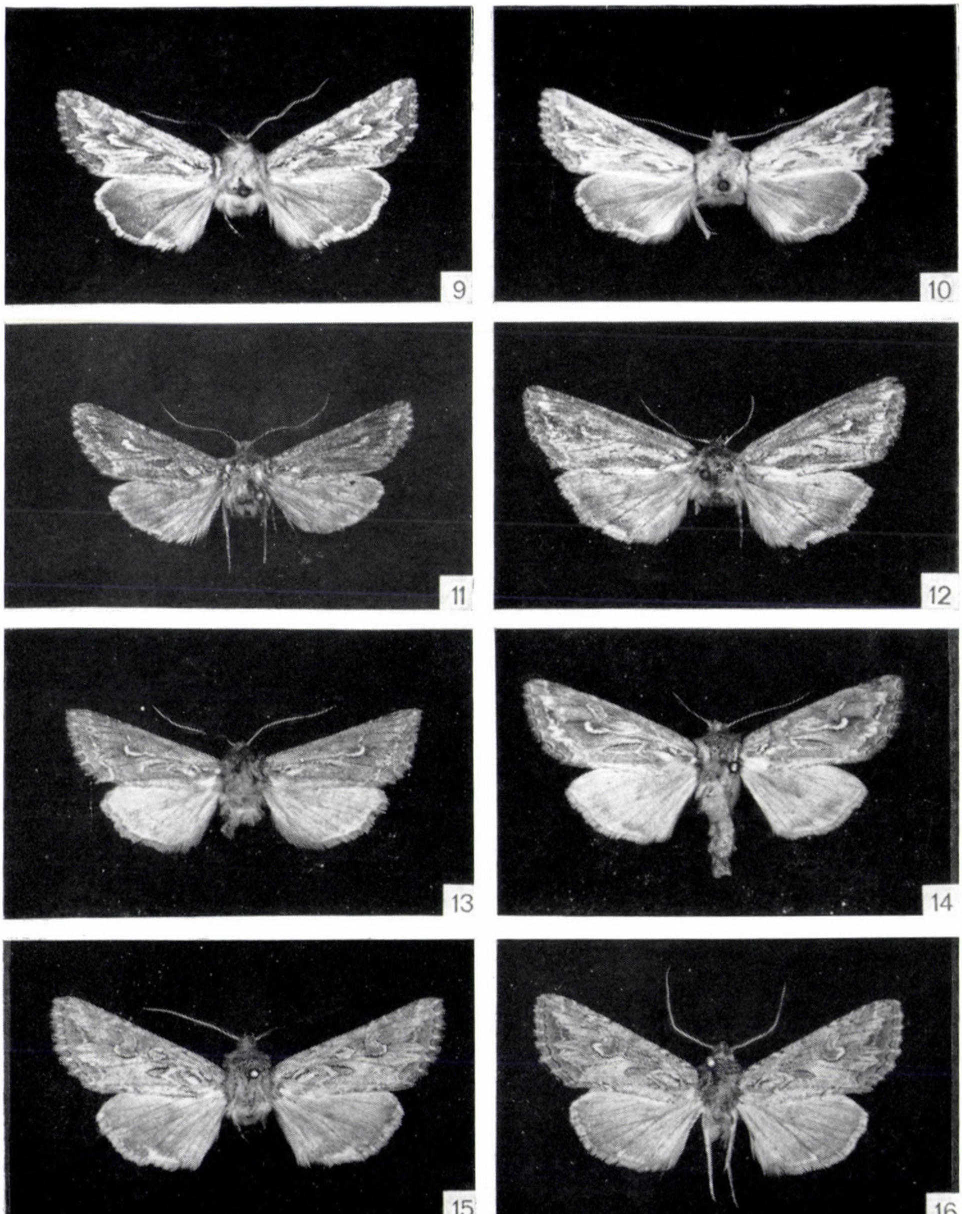
Varga, Z. (1974): Hadeninae (Lepidoptera, Noctuidae) aus der Mongolei. — *Annls hist.-nat. Mus. natn. hung.* **66:** 289—322.

Plate I.



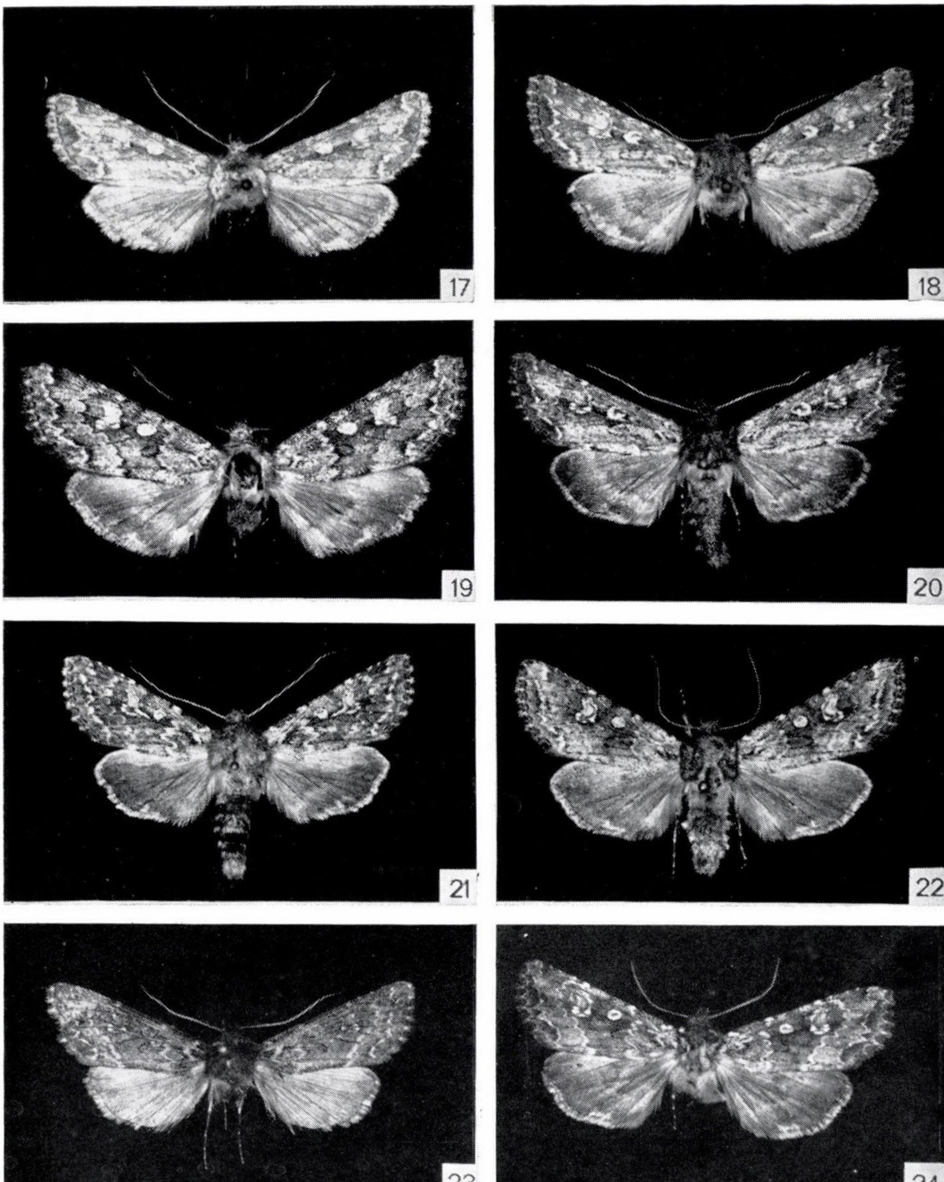
1 = *Haderonia kalikotei* sp. n. male, Holotype, Nepal, Jumbesi. — 2 = *Haderonia culta* MOORE, male, Nepal, Khumbu. — 3 = *Haderonia subarschanica* STAUDINGER, male, Holotype, Tibet, Kuku-Noor. — 4 = *Haderonia arschanica* ALPHERAKY, male, Korla. — 5 = *Ctenoceratoda zetina* STAUDINGER, male, "Cotype", Altyn-Tagh. — 6 = *Ctenoceratoda zetina* STAUDINGER, male, NO Afghanistan, Wakhan valley. — 7 = *Ctenoceratoda zetina rhodoptera* ssp. n. female, Paratype, C. Afghanistan. — 8 = *Ctenoceratoda longicornis* GRAESER, male, Holotype, Kisyl-Yart.

Plate II.



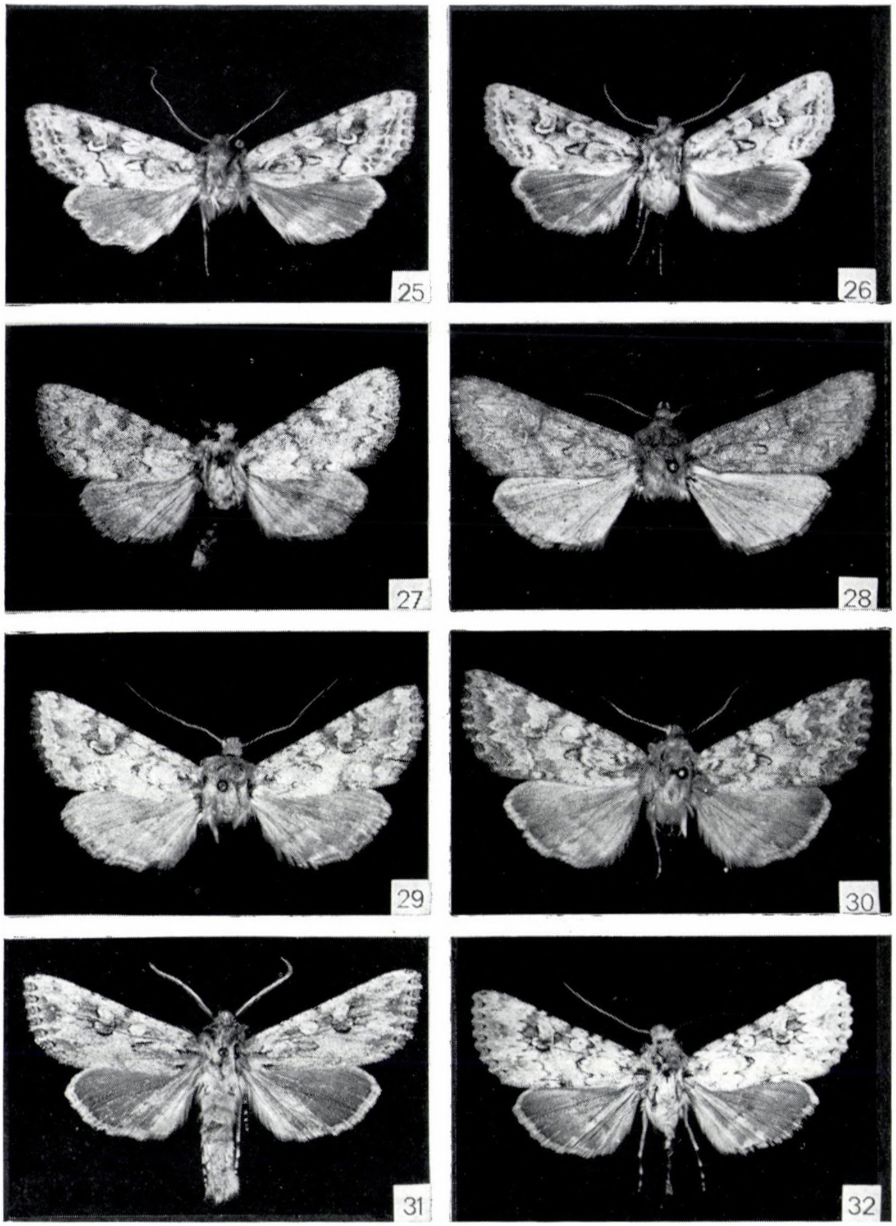
9 = *Ctenoceratoda argyrea* sp. n. male, Holotype, Mongolia, Govi Altay aimak, Tögrög. — 10 = *Ctenoceratoda argyrea* sp. n. female, Paratype, same locality. — 11 = *Ctenoceratoda khorgossi* ALPHERAKY, male, Mongolia, Adz Bogd Uul. — 12 = *Ctenoceratoda khorgossi* ALPHERAKY, female, same locality. — 13 = *Ctenoceratoda khorgossi* ALPHERAKY, male, Kuldja. — 14 = *Ctenoceratoda khorgossi* ALPHERAKY, female, Naryn. — 15 = *Ctenoceratoda tancrei* GRAESER, male, Alexander mts. — 16 = *Ctenoceratoda tancrei graeseri* PÜNGELER, male, ALPHERAKY, Chamil Hami.

Plate III.

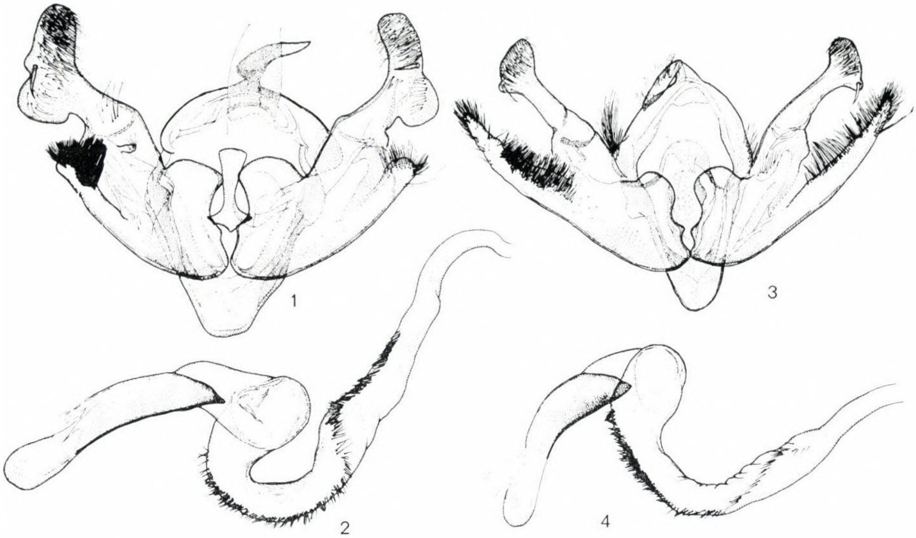


17 = *Ctenoceratoda oxyptera* sp. n. male, Holotype, Mongolia. Govi Altay aimak, Tögrög. — 18 = *Ctenoceratoda oxyptera* sp. n. female, Paratype, same locality. — 19 = *Ctenoceratoda juliannae* sp. n. male, Holotype, Mongolia, Chovd aimak, Bulgan sum. — 20 = *Ctenoceratoda sukharevae* VARGA, male, Mongolia, Govi Altay aimak, Adz Bogd. — 21 = *Ctenoceratoda sukharevae* VARGA, male, Mongolia, same locality, aberration in maculation. — 22 = *Ctenoceratoda sukharevae* VARGA, female, same locality. — 23 = *Ctenoceratoda sukharevae* VARGA, male, same locality, melanistic aberration. — 24 = *Ctenoceratoda sukharevae excellens* VARGA, male, Holotype, Mongolia, Hövsgöl aimak.

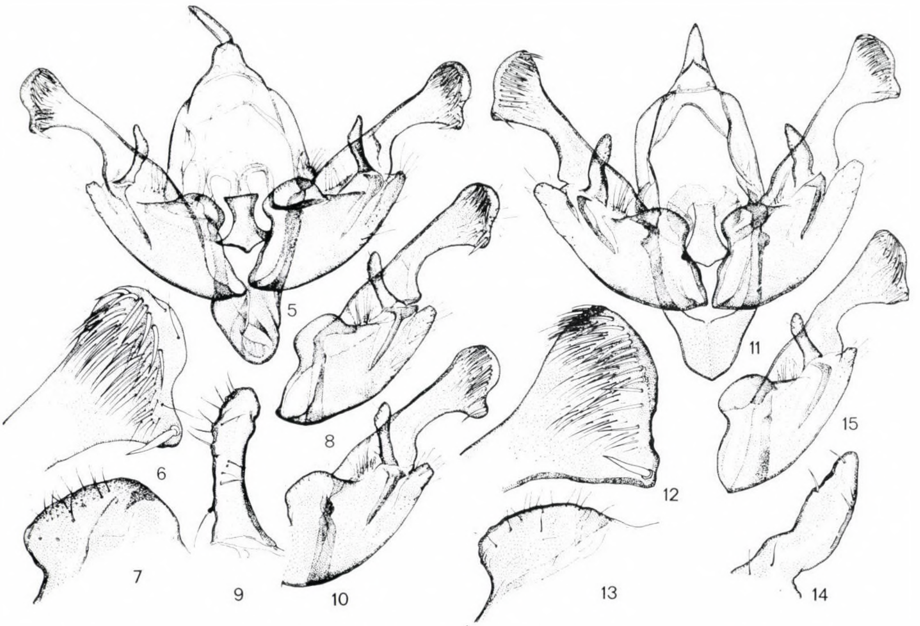
Plate IV.



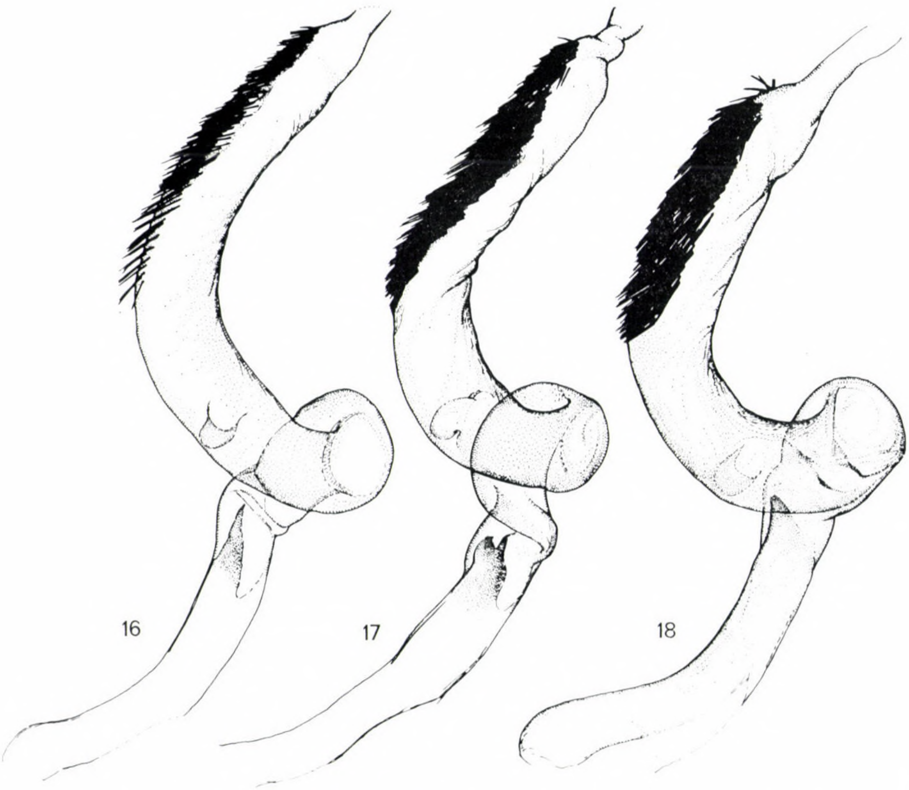
25 = *Ctenoceratoda nefasta* Püngeler, male, Lop-noor. — 26 = *Ctenoceratoda nefasta* Püngeler, male, Holotype, Lop-noor. — 27 = *Ctenoceratoda optima* Alpheraky, male, Altyn-Tagh. — 28 = *Ctenoceratoda turpis* Staudinger, male, Aksu. — 29 = *Ctenoceratoda thermolimna* Boursin, (identified as "turpis Staudinger"), male, Aksu. — 30 = *Ctenoceratoda thermolimna* Boursin (identified as "turpis Staudinger"), male, Aksu. — 31 = *Ctenoceratoda lupa* Christoph, male, NO. Afghanistan, Wakhan valley. — 32 = *Ctenoceratoda lupa* Christoph, (= Type of *contempta* Püngeler), male, Altyn-Tagh.



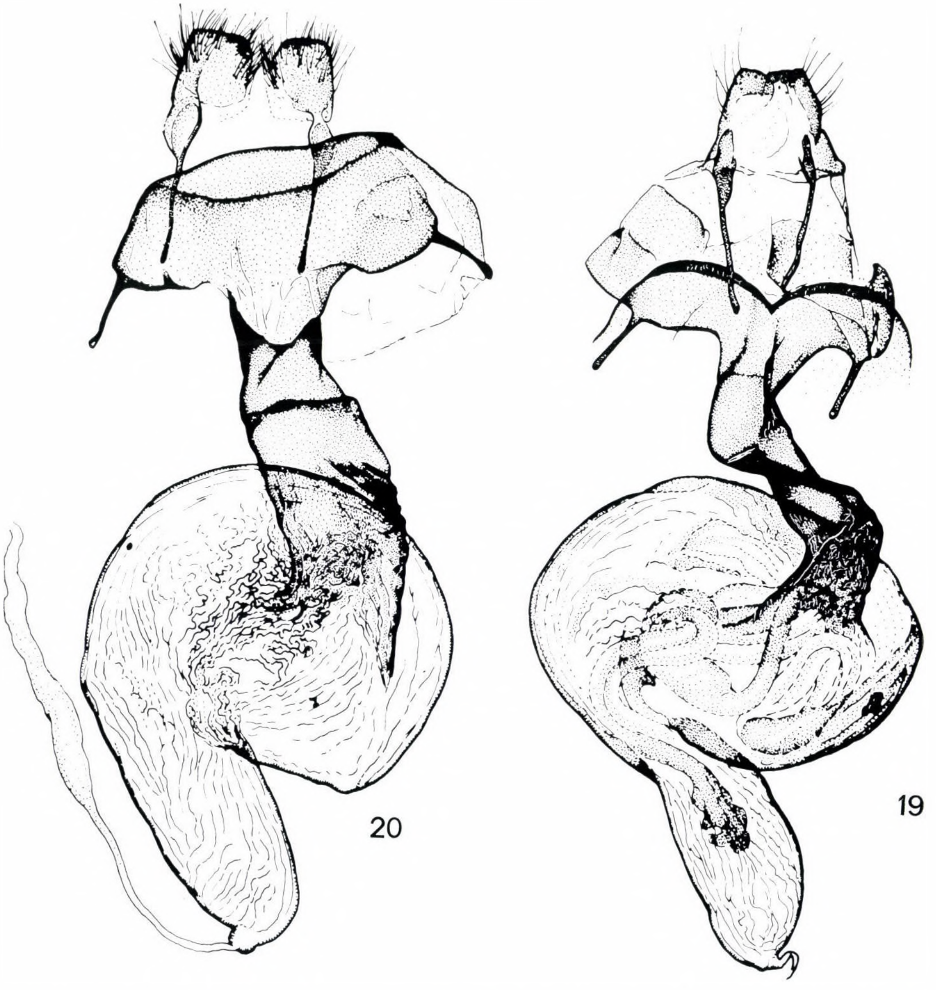
Figs 1—4. 1—2 = *Haderonia kalikotei* sp. n. male, Holotype, Nepal, Jumbesi, Slide 5674 VARGA; 1 = genital capsula, 2 = The same, aedoeagus. 3—4 = *Haderonia culta* MOORE, male, Nepal, Khumbu; Slide 5442 VARGA; 3 = genital capsula, 4 = the same, aedoeagus.



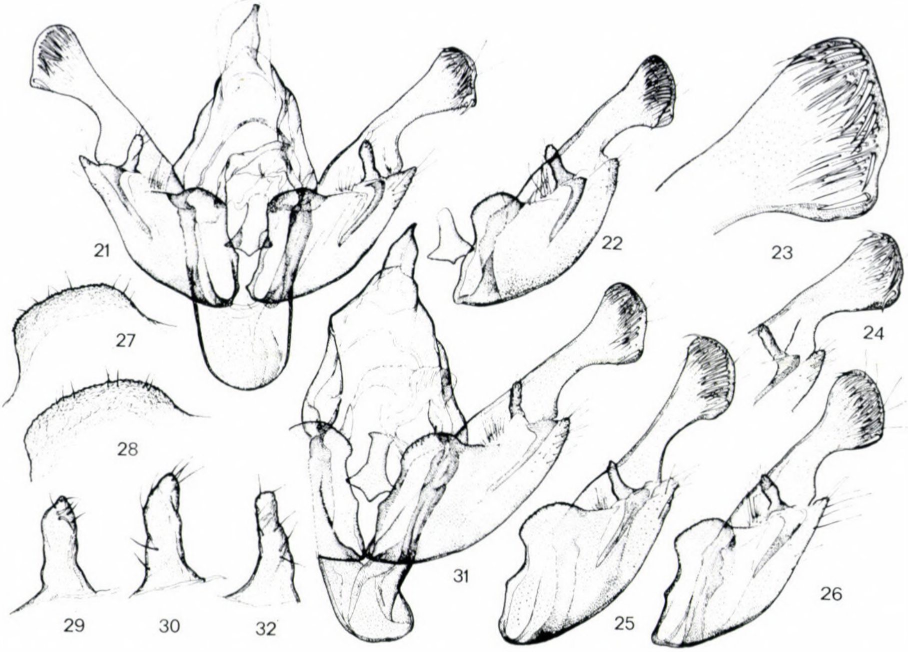
Figs 5—15. 5—10 = *Ctenoceratoda argyrea* sp. n. 5—7 = Holotype, Mongolia, Govi Altay aimak, Tögrög; Slide 5104 Varga, 5 = genital capsula, 6 = cucullus and corona, 7 = distended upper margin of sacculus. 8—9 = paratype, from the same locality, Slide 5109 VARGA; 8 = valva, 9 = ampulla. 10 = paratype, Mongolia, Bayanchongor aimak, Ih Bogd uul; Slide 4842 VARGA, valva. 11—15 = *Ctenoceratoda khorgossi* ALPHERAKY. 11—14 = Transcaspia, Merw, Slide 4847 VARGA, 11 = genital capsula, 12 = cucullus and corona, 13 = distended upper margin of sacculus, 14 = ampulla. 15 = Turkestan, Naryn, Slide 4153 VARGA, valva.



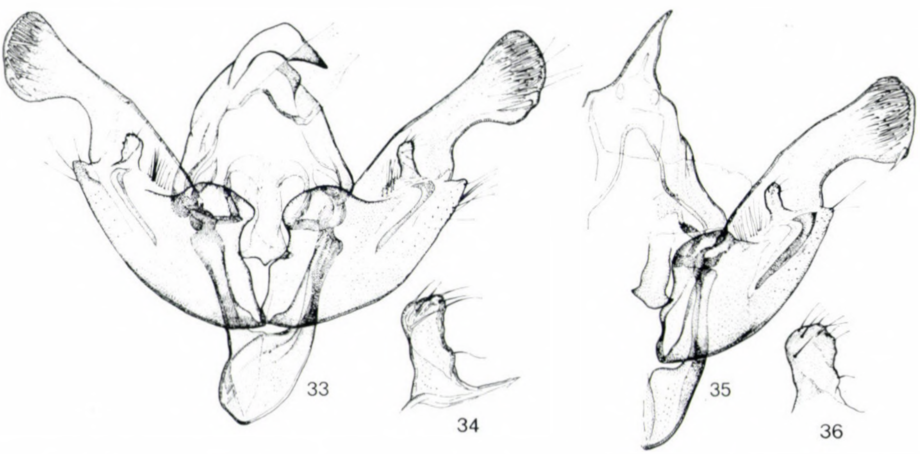
Figs 16—18. 16—17 = aedeagi of *Ctenoceratoda argyrea* sp. n. 16 = Holotype, 17 = Paratype. 18 = aedeagus of *Ctenoceratoda khorgossi* ALPHERAKY.



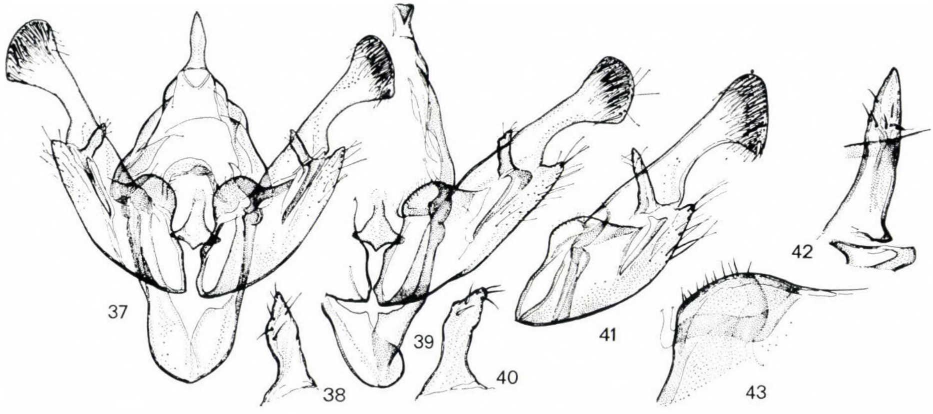
Figs 19—20. 19 = *Ctenoceratoda argyrea* sp. n. female, Paratype, Govi Altay aimak, Tögrög; Slide 5153 VARGA. 20 = *Ctenoceratoda khorgossi* ALPHERAKY, female, Govi Altay aimak, Adz Bogd, Bungijn davaa; Slide 5209 VARGA.



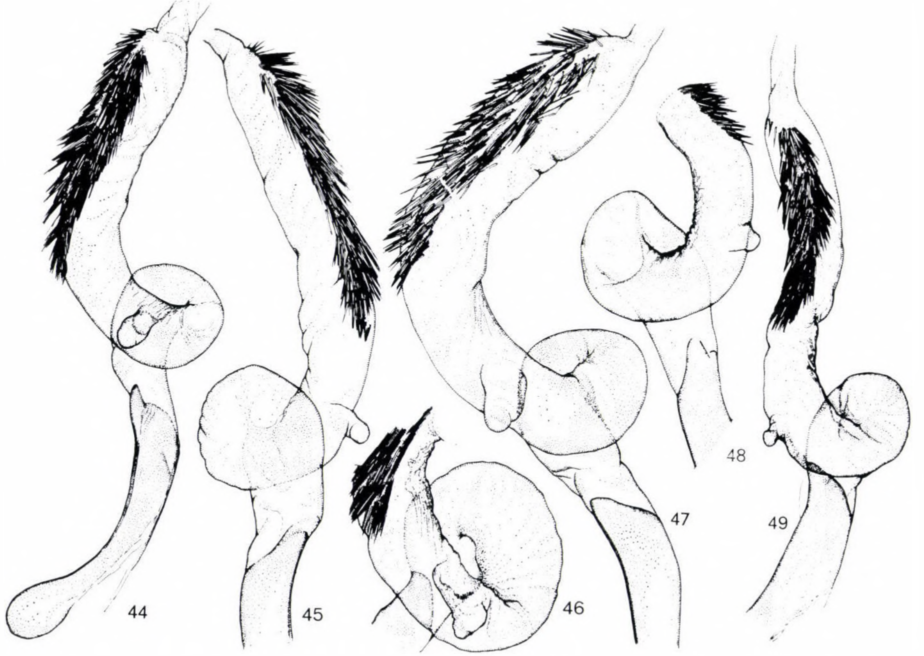
Figs 21—32. 21—30 = *Ctenoceratoda sukharevae* VARGA, (Type-species of *Ctenoceratoda* gen. n.), Mongolia. 21 = Holotype, Mongolia, Bayanchongor aimak, Zinst uul; Slide 4331 VARGA, genital capsula. 22—30 = details of the genital capsula, 22 = valva and fultura inf. Slide 4898 VARGA, 23 = the same, cucullus and corona, 24 = distal part of valva, Slide 4151 VARGA, 25—26 = valvae, Slide 4840 and 5159 VARGA, 27 = distended part of the sacculus, Slide 4898 VARGA, 28 = distended part of sacculus (holotype), 29 = the same, ampulla, 30 = ampulla, Slide 4898 VARGA. 31—32 = *Ctenoceratoda sukharevae excellens* VARGA, Holotype, Mongolia Chövsgöl aimak; Slide 4330 VARGA, 31 = genital capsula, 32 = ampulla.



Figs 33—36. *Ctenoceratoda juliannae* sp. n. 33—34 = Holotype, Mongolia, Chovd aimak, Bulgan sum; Slide 4025 VARGA, 33 = genital capsula, 34 = ampulla. 35—36 = Paratype, Mongolia, Bayan Ölgiy aimak, Bulgan; Slide 4030 VARGA, 35 = genital capsula, 36 = ampulla.

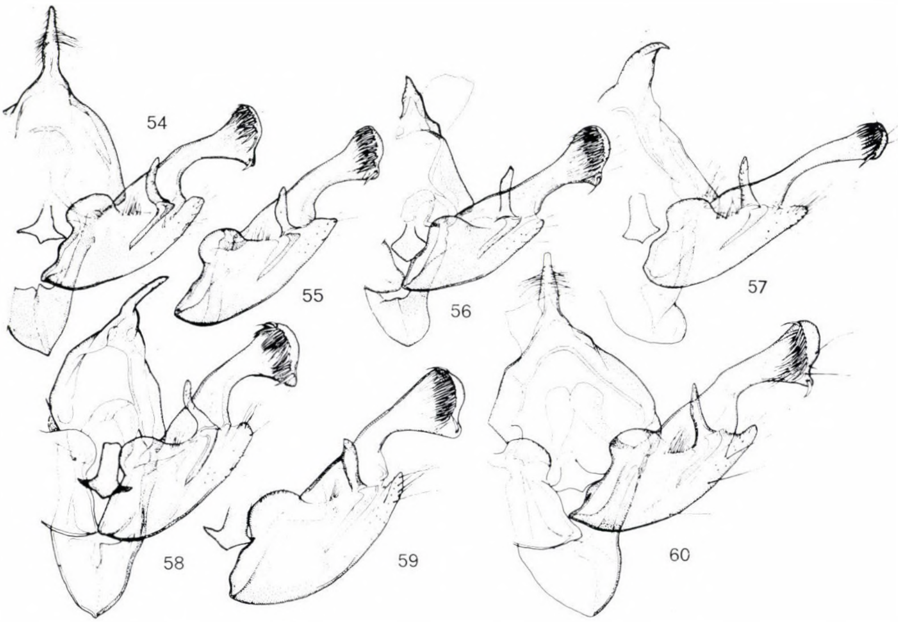


Figs 37—43. *Ctenoceratoda oxyptera* sp. n. 37—38 = Paratype, Mongolia, Chovd aimak, near Chovd; Slide 4382 VARGA, 37 = genital capsula, 38 = ampulla. 39—40 = Paratype, Mongolia, Chovd aimak, near Chovd; Slide 4382 VARGA, 39 = genital capsula, 40 = ampulla. 41—43 = Holotype, Mongolia, Govi Altay aimak, Tögrög; Slide 5103 VARGA, 41 = valva, 42 = ampulla, 43 = distended margin of sacculus.



Figs 44—49. Aedeagi of *Ctenoceratoda* species. 44—45 = *C. sukharevae* VARGA, 44 = Mongolia, Govi Altay aimak, Adz Bogd uul; Slide 5198 VARGA, 45 = same locality; Slide 5160 VARGA. 46—47 = *C. juliannae* sp. n.: 46 = Holotype, Slide 4025 VARGA, 47 = Paratype, Slide 4030 VARGA. 48—49 = *C. oxyptera* sp. n.: 48 = Paratype, Mongolia, Govi Altay aimak, Tögrög; Slide 4840 VARGA, 49 = Holotype, Slide No. 5103 VARGA.

Figs 50—53. Female genitalia of *Ctenoceratoda* species. 50—51 = *C. sukharevae* VARGA, 50 = Mongolia, Govi Altay aimak, Adz Bogd uul; Slide 5207 VARGA, 51 = same locality; Slide 5205 VARGA, detail of female genitalia. 52—53 = *C. oxyptera* sp. n.: 52 = Paratype, Mongolia, Govi Altay aimak, Tögrög; Slide 5157 VARGA, 53 = Paratype, same locality; Slide 5155 VARGA.



Figs 54—60. Male genitalia of *Ctenoceratoda* species. 54—55 = *C. turpis* STAUDINGER, 54 = "Tien San"; Slide No. 551 (ZSM) BOURSIN, genital capsula, 55 = Aksu; Slide No. 583 (ZSM) BOURSIN, valva. 56 = *C. nefasta* ALPHERAKY, "Lop Noor"; Slide 4069 VARGA, genital capsula. 57 = *C. lupa* CHRISTOPH, Aksu; Slide 5409 VARGA, genital capsula 58—59 = *C. tancrei* GRAESER, 58 = (ssp. auct sp.) *graeseri* PÜNGELER, "Chamil Hami"; Slide 4844 VARGA, genital capsula, 59 = *tancrei tancrei*, "Alexander-Gebirge", Slide 4067 VARGA, valva. 60 = *C. thermolimna* BOURSIN, Holotype, Issyk-Kul; Slide No 556 (ZSM) BOURSIN, genital capsula.

Acta Zoologica Hungarica 38 (1—2), pp. 113—124 (1992)

STUDIES ON THE PALAEARCTIC NOCTUIDAE, SECT. AMPHIPYRINAE, III. THE MESAPAMEA HEDENI GRAESER COMPLEX (LEPIDOPTERA)

Z. VARGA & L. RONKAY

Institute of Zoology, Lajos Kossuth University
H-4010 Debrecen, Egyetem tér 1, Hungary
Zoological Department, Hungarian Natural History Museum,
H-1088 Budapest, Baross utca 13, Hungary

(Received 15th March, 1991)

The revision of the *Mesapamea hedeni*-group with the descriptions of a new subgenus, *Resapamea* subgen. n., two new species, *M.* (*R.*) *megaleuca* sp. n. (Mongolia) and *M.* (*R.*) *tibeticola* sp. n. (Tibet) and a new subspecies, *M.* (*R.*) *hedeni rhodochrea* ssp. n. (W Tien Shan) are given. The phylogeny and zoogeography of the subgenus are discussed. With three photoplates and 38 figures.

1. INTRODUCTION

The genus *Mesapamea* was erected by HEINICKE in 1959 for the following species: *moderata* EVERSMANN, 1843 (type species), *calcirena* PÜNGELER, 1902, *concinnata* HEINICKE, 1959, *evidentis* HEINICKE, 1959, *monotona* HEINICKE, 1959 and *secalis* LINNAEUS, 1758). Later the taxa *acorina* PINKER, 1969, *maderensis* PINKER et BACALLADO, 1972, *secalella* REMM, 1983 (= didyma ESPER, 1794), *remmi* RÉZBÁNYAI-RESER, 1985, and *secalindica* RÉZBÁNYAI-RESER, 1986, have also been relegated to this genus. The group displays considerable homogeneity both in external features and genital configuration. The genus is discussed in details by RÉZBÁNYAI-RESER (1984, 1985, 1986).

On the basis of the studies on E Asian and Armenian materials, VARGA (1979) pointed out that the members of the "Luperina" *hedeni*-group cannot belong to the genus *Luperina* BOISDUVAL, 1828, but are congeneric with *Mesapamea moderata* (EVERSMANN, 1843). He synonymized the taxa *L. radicosa* (GRAESER, 1892), *subaquila* (GRAESER, 1892) and *subornata* (STAUDINGER, 1896) with *hedeni* (GRAESER, 1888) and described the westernmost known species of this species group, *vaskeni* VARGA, 1979. The main argument of this relegation was the overall similarity of the male genitalia of the two species groups and the same tendencies in the external variation. The obvious fact that the species of the latter group are significantly larger than the *Mesapamea* s.str. taxa and have different wing shape and pattern was neglected in this original concept. In his revisional works on *Mesapamea*, RÉZBÁNYAI-RESER, stated that the female genitalia of the large *Mesapamea* pronouncedly differ from those of *Mesapamea* s.str., but display closer connections with the "large" *Apamea* species. Beyond this, however, he could not propose any solution for the exact relegation of this group of species.

The problem of the *hedeni* group was discussed more detailedly at the 7th Meeting of Lepidopterologists in Innsbruck where the authors presented the evidences supporting the monophyly of the *hedeni* group with *Mesapamea* s.str. On the other hand, the taxa related to *hedeni* form a compact species group [including the taxa *hedeni* GRAESER, *vaskeni* VARGA, *megaleuca* sp. n., *tibeticola* sp. n. and the Nearctic species, *passer* (GUENÈE, 1852), *stipata* (MORRISON, 1875), *trigona* (SMITH, 1902)] of a parallel evolution and tendencies of distribution pattern with the species of *Mesapamea*.

For the expression of this phylogenetic parallelism we propose the separation of the *hedeni*-group, as an adequate taxonomic solution, on the subgeneric level.

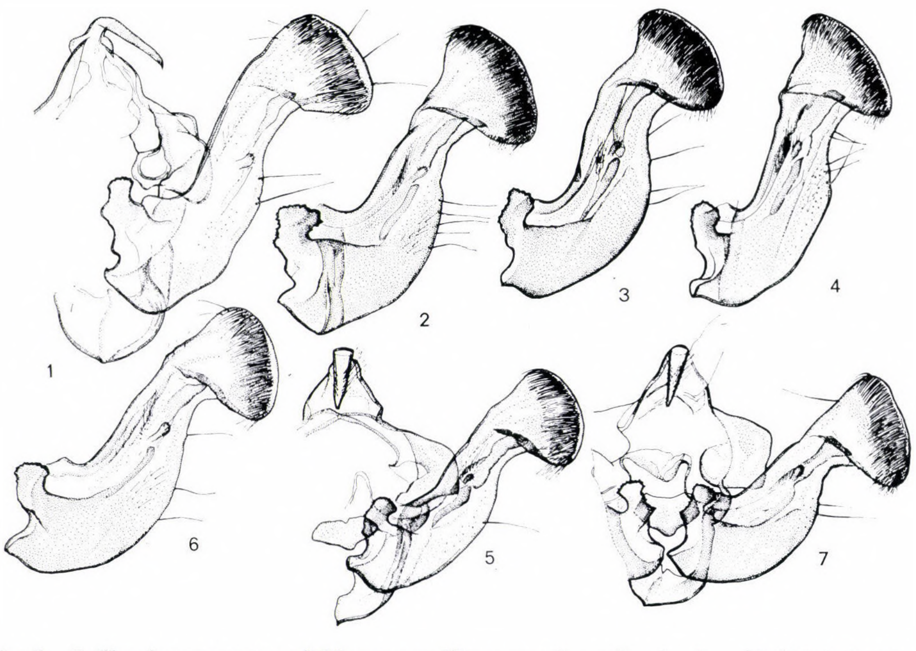
2. GENERAL CHARACTERIZATION OF THE SUBGENUS *RESAPAMEA*

Resapamea subgen. n.

Type species: *Luperina hedeni* GRAESER 1888.

Diagnosis — External morphology: usually large species with elongated forewings and slightly rounded apex and outer margin. Head small, eyes large and roun ded, palpi relatively short, slightly upturned. Antennae relatively short, in males finely bipectinate, in females filiform with fine and short cilia. The body is robust, the thorax with a dense, fur-like pubescence; the abdomen long and cylindrical. The dorsal crest is reduced to one or two small and flattened tufts; the abdominal coremata are reduced (present in most *Apamea* and *Luperina* species). The wing pattern displays a good parallelism with the most widespread species of *Mesapamea* (see the colour forms of *secalis* and *didyma* versus *hedeni* and *vaskeni*).

Male genitalia (see Figs 1—35): described and figured in VARGA (1979, 1982). RÉZBÁNYAI-RESER (1984, 1985, 1986); the differences between *Mesapamea* and *Resapamea* are as follows: valvae of *Resapamea* essentially larger and more sclerotized, especially the costal part. Clavi of *Resapamea* more specialized, curved and cristate, densely covered with setae. Saccular processus



Figs 1—7. Clasping apparates of *Mesapamea* (*Resapamea*) species: 1—5 = *M.* (*R.*) *hedeni hedeni* GRAESER, 1 = Raddefka, 2 = Ussuri, 3—5 = Mongolia. 6 = *M.* (*R.*) *hedeni rhodochrea* ssp. n., paratype, W Tien Shan. 7 = *M.* (*R.*) *tibeticola* sp. n., holotype, Tibet.

never present (see *Mesapamea* (*M.*) *calcirena* which has a spiculiform saccular extension). Ampulla club-like, relatively long; digitus broad, and flattened, its distal part extends behind sclerotized inner border of the cucullus. Aedeagus with curved and recurved carina, densely covered by teeth, with specific features in the single taxa. Vesica with one or two bundles of strong, fasciculate cornuti.

The *Mesapamea* species have usually a more simple form of clavus, a reduced ampulla and costal extension (digitus). The carina displays in *Mesapamea* a claw- or thorn-like form, which is usually cristate but never elongated and recurved. The cornuti fields are absent (except calcirena).

The female genitalia (Figs 36—38) of *Resapamea* is characterizable with a heavily sclerotized ovipositor, covered densely by strong setae. Ostial plate with sclerotized subtriangular ligula, ductus bursae short, caudally tapering. The surfaces of ductus are granulosely sclerotized and rugulose, connected with a wide zone to the bursa copulatrix. Bursa short, spacious, more or less globular, without signa.

In *Mesapamea* s. str. the ovipositor is shorter and less strong, ostial plate with a different, often lip-like configuration; the ductus bursae is longer, caudally constricted, generally less sclerotized. Bursa copulatrix is more elongated and narrow, terminally saccate.

We dedicate the new subgenus to our friend, DR. LADISLAUS RÉZBÁNYAI-RESER, who pointed out some important taxonomic characters of the group.

The Palearctic taxa of the subgenus *Resapamea*.

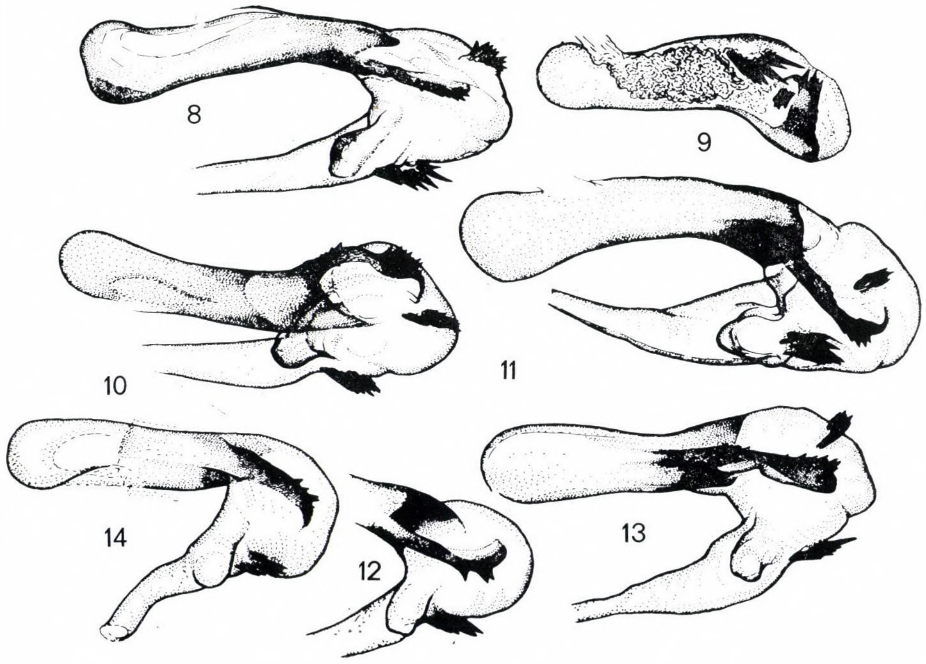
M (*R.*) *hedeni* (GRAESER, 1888) — Synonyms: radicosa (GRAESER, 1892), subaquila (GRAESER, 1892), subornata (STAUDINGER, 1896)
Subspecies: *M.* (*R.*) *hedeni vargai* HACKER, 1988 (E. Turkey)
M. (*R.*) *hedeni rhodochrea* ssp. n. (Tien-Shan)
M. (*R.*) *hedeni takanensis* (Marumo, 1932)
M. (*R.*) *tibeticola* sp. n. (Tibet)
M. (*R.*) *vaskeni* VARGA, 1979 (Armenia, E. Turkey)
Subspecies: *M.* (*R.*) *vaskeni kazbekiana* RONKAY et VARGA, 1985 (Caucasus)
M. (*R.*) *megaleuca* sp. n. (Mongolia)

Distribution — The subgenus *Resapamea* has a Holarctic distribution. This group is represented by 3 species in the Nearctic (RÉZBÁNYAI-RESER 1986, LAFONTAINE pers. comm.). The Palearctic species can be arranged into two main groups. The species *vaskeni* and *megaleuca* seem closely related to (see below), but fairly localised and widely isolated from, each other. We suppose that they are relatively less differentiated, relict-like species within this group. These species are usually represented by not polymorphic populations. They can vary from locality to locality, but the individuals are fairly constant within one population (max. some color variation in *M.* (*R.*) *vaskeni vaskeni*).

On the other hand, the taxa closely related to *hedeni* show a wide, but scattered range from E. Turkey to Japan. The most ancestral representative of this group may be *M.* (*R.*) *tibeticola* sp. n. which displays the closest relationships with the Nearctic taxa [cf. *M.* (*R.*) *passer*]. *Mesapamea* (*R.*) *hedeni* has only three geographical races which have been isolated, on one hand, in the mountaneous, peripheric parts of the distribution (E. Turkey and Tien-Shan, resp.), on the other one, however, in a broad south-eastern stripe of the area (Ussuri, Manchuria, Japan, S Kurili Isles: *takanensis* MARUMO). *Hedeni hedeni* GRAESER has a large distribution from Southern Russia to Amur area, and it seems a steppicolous species. Its populations are usually polymorphic, the relative abundance of contrasted and unicolorous, reddish or brownish individuals may be fairly different from place to place.

Life history — The early stages of the species are unknown but the larvae feed very probably on roots of grasses (and other herbaceous plants), similarly to the other members of the *Apamea*-like Amphipyrinae. One of the N American taxa is known as feeding on *Rumex* (CRUMB 1956). The structure of the ovipositor is the same as in the genera *Apamea*, *Amphipoea*, *Luperina*, etc.; this fact suggests that the females of *Resapamea* lay the eggs also into the vaginae of the leaves of Gramineae.

Although the adults have relatively well-developed proboscis, no observations are known about their feeding on flowering plants and sugar baits but



Figs 8—14. Aedeagi of *Mesapamea (Resapamea)* species: 8—12 = *M.* (*R.*) *hedeni hedeni* GRAESER, 8, 10, 12 = Mongolia, 9 = Raddefka, 11 = Ussuri. 13 = *M.* (*R.*) *hedeni rhodochrea* ssp. n., paratype, W Tien Shan. 14 = *M.* (*R.*) *tibeticola* sp. n. holotype, Tibet.

the dissected specimens often contain the rests of the digested nectar and the fat-bodies are also well-developed. They are attracted by artificial light, their flight is strong and rapid.

3. DESCRIPTION OF THE NEW TAXA

Mesapamea hedeni rhodochrea ssp. n. (Plate I: 8)

Holotype: male, (USSR, Uzbekistan), W Tien Shan, Bolshoj Chimgan Mts., leg. PAVLITZKAYA et SHELJUZHKO, coll. SHELJUZHKO (Zoological Museum, University of Kiev). — Paratypes: numerous specimens from the same locality, (coll. ZM Kiev, HNHM Budapest and PEKS, Schwanfeld). — Slide No. 5127 Varga (male).

Description — The whole series of specimens is remarkably uniform in size, pattern and colouration; the thorax is somewhat darker than ground colour since the abdomen is light ochreous-grey. All markings obsolescent, reniform relatively broad, light ochreous with rosaceous-brownish filling. Orbicular brownish or ochreous, slightly lighter than median field; claviform absent. Basal and outer parts of forewings ochreous with light rosy-pinkish shine. Transverse lines simple, inner one oblique and obsolescent, outer one sharply serrated but also obsolescent. Hindwings very light ochreous with a slight rosaceous shine, without markings.

The male genitalia display no significant differences as compared with those of the other populations of *hedeni* (perhaps proportionally smaller) (Figs 6, 13, 34).

We could find no specimens so extremely unicolorous and light in the material from other localities, although *hedeni* is one of the most varying trifine Noctuidae species in the Palaearctic region. Another important feature of this population is, on the basis of the known material, the high uniformity in the external features. Hence, we think that it must be a very homogeneous, strictly localized population separable at subspecific rank.

Distribution — Known only from the W Tien Shan chain.

Mesapamea (Resapamea) megaleuca sp. n. (Plate II: 9—12)

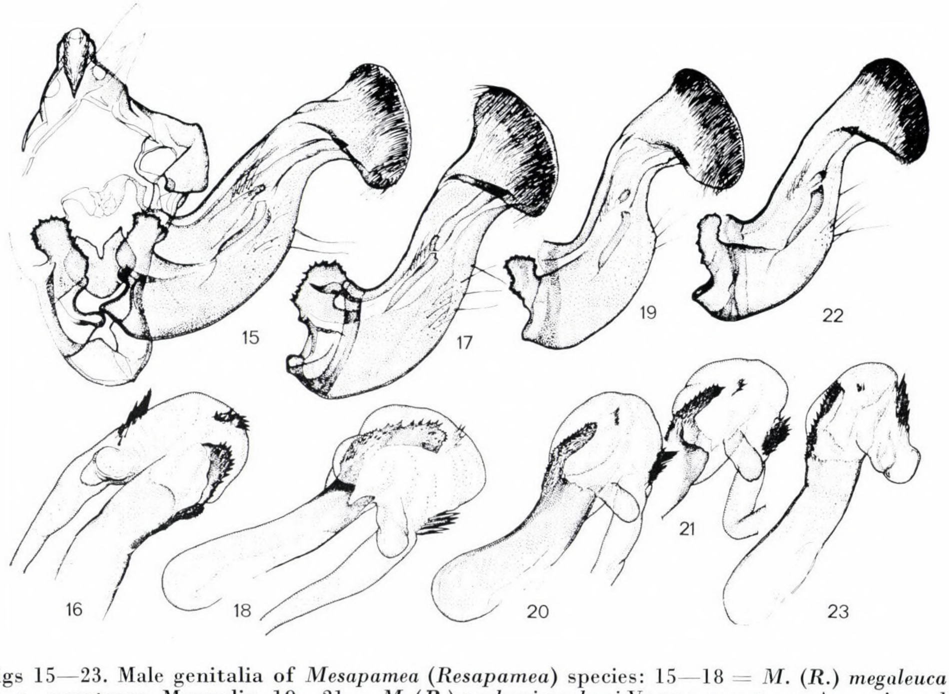
Holotype: male, "Mongolia, Bulgan aimak, 64 km W of Erdenecant, 1260 m, 104° 05′ E, 47° 05′ N, 01.08.1987, leg. PEREGOVITS, HREBLAY et STÉGER", deposited in coll. Hungarian Natural History Museum, Budapest (= HNHM). — Paratypes, a large series of both sexes from the same locality, 01. 08. 1987, leg. HREBLAY, PEREGOVITS et STÉGER; 07. 08. 1988, leg. SZABÓKY. The specimens are deposited in the collections of the collectors, HNHM, FÁBIÁN, HERCZIG, G. RONKAY and VARGA.

Slides Nos 2689, 2725, 2726, 2727, 2728 RONKAY, 5004, 5116, 5145 VARGA (males); 2707 RONKAY (female).

D e s c r i p t i o n — Wingspan 44—48 mm, length of forewings 20—23 mm. Head, thorax and forewings pale sandy ochreous, sometimes with reddish or reddish-brown suffusion. Basal and marginal areas nearly unicolorous, median area always a bit darker, veins usually covered with some darker scales. Transverse lines very pale, double and less sinuous, filled with pale ochreous. Orbicular spot very small and partly deleted, reniform large, narrow and curved, whitish-ochreous, filled with ground colour. Claviform absent or a hardly visible shadow, lower part of cell and subcellular vein often covered with darker grey-brown. Cilia unicolorous, same as ground colour. Hindwing clean, shiny milk-white with some ochreous shade, veins slightly darker in marginal field; cilia whitish. Underside of wings shiny ochreous-whitish, costal margins and apices with fine ochreous-reddish irroration, veins often with brownish covering. Shadows of reniform and costal part of postmedial line usually visible.

The variability of the species is significantly smaller than in the other taxa of the subgenus and appears usually in the shade of the ground colour.

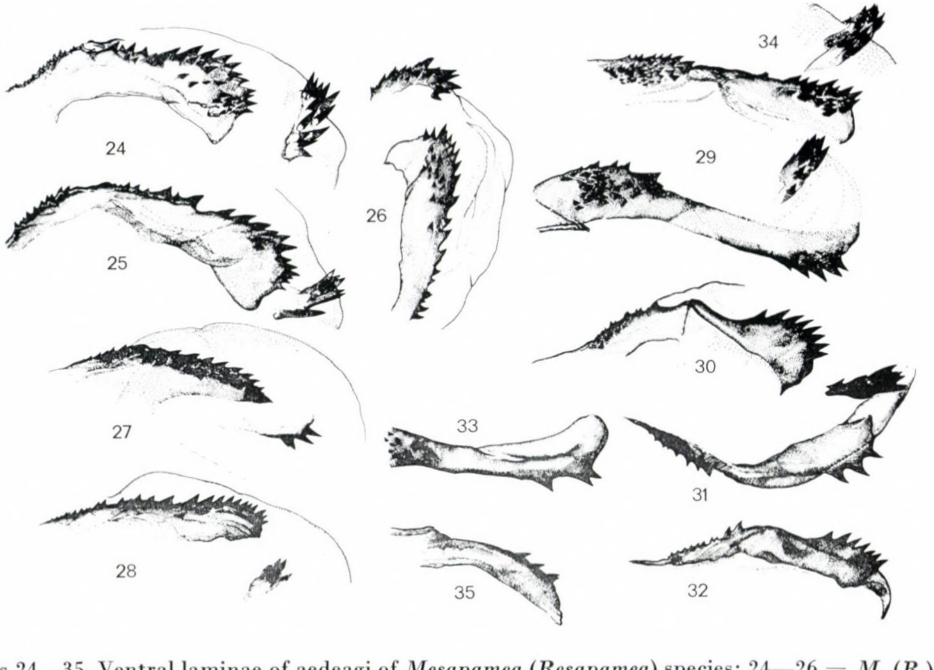
The new species belongs to the *vaskeni*-line and differs from the related *vaskeni* by a series of characteristic features as follows: *megaleuca* is of a larger size and has more elongated wings, lighter, usually ochreous-reddish coloura-



Figs 15—23. Male genitalia of *Mesapamea* (*Resapamea*) species: 15—18 = *M.* (*R.*) *megaleuca* sp. n., paratypes, Mongolia, 19—21 = *M.* (*R.*) *vaskeni vaskeni* VARGA, paratype, Armenia and 22—23 = *M.* (*R.*) *vaskeni kazbekiana* RONKAY et VARGA, holotype, Georgia.

tion of forewings and clear light whitish-ochreous hindwings; the darker pattern at the lower edge of the cell is also typical for *megaleuca*. In the male genitalia (Figs 15—18, 24—26) the new species has a significantly larger clasping apparatus with longer and stronger valvae, more rounded cucullus, larger and more serrated clavus. The eversible ventral bar of aedeagus is much more robust than in *vaskeni* and armed with larger and more numerous teeth. The female genitalia (Plate III: 19, 22; Fig. 38) of *megaleuca* differ from vaskeni (Plate III: 17—18, 23—25; Fig. 37) by the shape and size of the sclerotized ostial plate and the size of ductus bursae, these parts of the genitalia are larger and more sclerotized in *megaleuca* than in *vaskeni*. (In case of *hedeni* (Plate III: 20—21; Fig. 36) the ostial plate is larger than in *megaleuca*, nearly quadrangular, while the ductus bursae is shorter and less strong).

Distribution — The new species is known from only a small, northern, relict-like steppe-fragment SW from Ulaanbaatar, this population appears to be rich, since the species is frequent in the first part of August (and possibly by the end of July). It occurs sympatrically (and syntopically) with the different colour forms of *hedeni*.



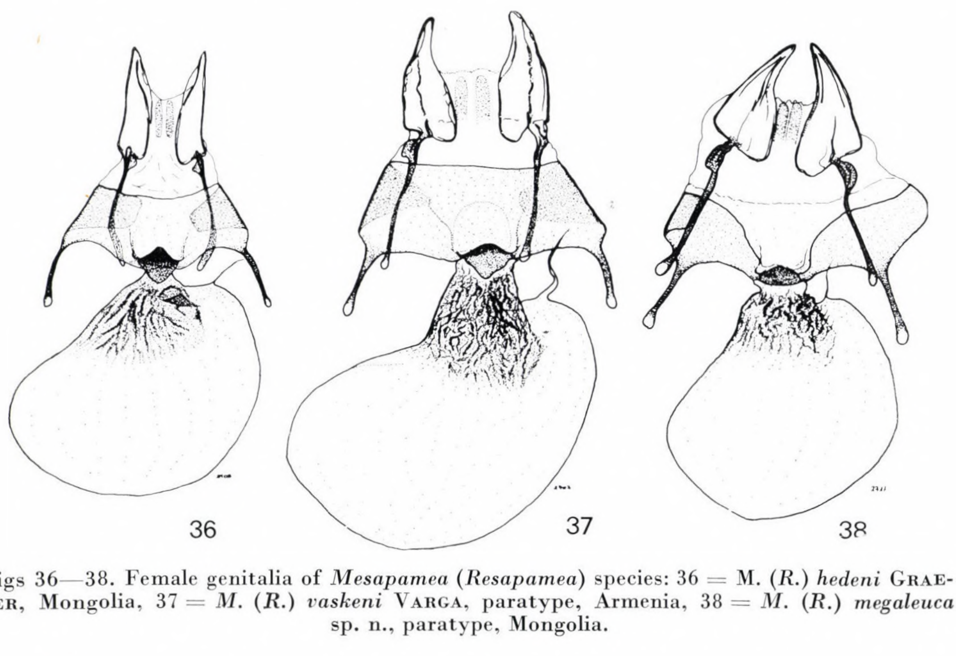
Figs 24—35. Ventral laminae of aedeagi of *Mesapamea* (*Resapamea*) species: 24—26 = *M.* (*R.*) *megaleuca* sp. n., paratypes, Mongolia, 27 = *M.* (*R.*) *vaskeni vaskeni* VARGA, paratype, Armenia, 28 = *M.* (*R.*) *vaskeni kazbekiana* RONKAY et VARGA, holotype, Georgia, 29—33 = *M.* (*R.*) *hedeni hedeni* GRAESER, 34 = *M.* (*R.*) *hedeni rhodochrea* ssp. n., paratype, W Tien Shan, 35 = *M.* (*R.*) *tibeticola* sp. n., holotype, Tibet.

Mesapamea (Resapamea) tibeticola sp. n. (Plate II: 16)

Holotype: male, "132) Südlichstes Steppenland, 4300 m, 98 öL, 32,5nB (Tibet), 22. 7. 1935. H. HÖNE". Slide No. 4951 Varga. Deposited in coll. Alexander Koenig Museum, Bonn. — Paratype: 1 male, China, Quinghai, Quinghai Lake, 3300 m, 11. 08. 1990, leg. G. G. BOZANO (coll. THÖNY, Ingolstadt). Slide No. 282 THÖNY.

Description — Wingspan 39 mm, length of forewing 18 mm. Head, thorax and forewings light ochreous-brown with some reddish-brown suffusion. Markings darker brown, usually diffuse. Transverse lines single, strongly sinuous, postmedial line defined by an ochreous zone on outer side extending to subterminal line. Stigmata present, encircled incompletely with brown. Orbicular small and round, reniform large and curved, filled (partly) with ochreous, claviform narrow and long. Terminal line a row of dark brown spots, cilia as ground colour. Hindwing light, shiny ochreous with pale brownish suffusion, vestiges of cellular lunule and transverse line visible; marginal area only slightly darker than other parts of wing. Terminal line brown, cilia ochreous. Underside of wings less shiny, ochreous-whitish with fine brownish-grey covering. Inner part of forewing darker, transverse line and outline of reniform visible but obsolescent. Hindwing paler, cellular lunule big but not sharp, transverse line a wide and diffuse stripe.

The holotype specimen resembles externally to a dull-coloured *Apamea lateritia* (HUFNAGEL, 1767) but having more rounded forewings, less distinct tegulae and shorter antennae. The specimen from the Kuku-Noor has much sharper pattern and lighter colouration, it is more similar to the light specimens



Figs 36—38. Female genitalia of *Mesapamea* (*Resapamea*) species: 36 = M. (*R.*) *hedeni* GRAESER, Mongolia, 37 = *M.* (*R.*) *vaskeni* VARGA, paratype, Armenia, 38 = *M.* (*R.*) *megaleuca* sp. n., paratype, Mongolia.

of the *passer*-group. The configuration of the male genitalia (Figs 7, 14, 35) is similar to that of *hedeni* (Figs 1—5, 8—12, 29—33) but having shorter and broader valvae and narrower and longer clavi. The eversible bar of aedeagus is less specialized, relatively weak, bearing some few teeth only on its apical part.

Distribution — The two known specimens of this species originated from the E edges of the Tibet plateau, from humid high montane steppe areas.

* * *

Acknowledgements — The authors wish to express their thanks to Mrs. E. Vartian (Vienna) and Prof. Dr. Z. F. Klyuchko (Kiev), Prof. Dr. C. Naumann and Dr. D. Stüning (Bonn), Dr. W. Dierl (Munich), G. Behounek (Deisenhofen), H. Hacker (Staffelstein), H. Thöny (Ingolstadt), Dr. L. Rézbányai-Reser (Luzern), Dr. K. Mikkola (Helsinki), Mr. Gy. Fábián, M. Hreblay, L. Peregovits, G. Ronkay and Cs. Szabóky (Budapest), Dr. I. Yu. Kostyuk (Kiev) and Dr. J. D. Lafontaine (Ottawa) for their kind help.

The research was supported by the OTKA Foundation, Hungarian Academy of Sciences, Budapest.

REFERENCES

Crumb, S. E. (1956): The larvae of Phalaenidae. — *US Department of Agriculture, Techn. Bull.* 1135, *Washington*, pp. 1—356.

Franclemont, J. G. & Todd, E. L. (1983): Noctuidae. — in: Hodges, R. W. et al.: *Check List of the Lepidoptera of America North of Mexico*, Classey, London, pp. 120—159.

Hacker, H., Huber, K. & Kuhna, P. (1988): Achter Beitrag zur systematischen Erfassung der Noctuidae der Türkei. Beschreibung von sechs neuen Taxa und Notizen uber bemerkenswerte Funde aus neueren Aufsammlungen (Lepidoptera). — *Atalanta* **18:**339—369.

Hacker, H. (1990): Die Noctuidae Vorderasiens (Lepidoptera). — *Neue ent. Nachrichten* **27:** 1—707.

Hacker, H. & Peks, H. (1990): Beitrag zur Kenntnis der Noktuidenfauna Russisch-Zentralasiens. — *Esperiana* **1:** 402—420.

Heinicke, W. (1959): Revision der Gattung Apamea Ochs., 1816 (Lep., Noctuidae). I. — *Dtsch. ent. Z.* Neue Folge **6** (1—3): 100—111.

Lempke, B. J. (1988): Mesapamea secalella Remm — a junior synonym of Mesapamea didyma Esper (Lep.: Noctuidae). — *Ent. Rec. J.* var., **100:** 147—152.

Pinker, R. (1969): Neue und interessante Lepidopteren aus Madeira und den Azoren mit faunistischen Hinweisen auf die Kanaren. — *Z. wien. ent. Ges.* **54:** 101—131.

Poole, R. W. (1989): Noctuidae. — in: *Lepidopterorum Catalogus* (New Series, Fasc. 118). Brill, Leiden.

Remm, H. (1983): New species of Noctuidae (Lepidoptera) from the USSR. — *Ent. Obozr.* **62** (3): 596—600. (in Russian).

Rézbányai-Reser, L. (1984): Angaben zur Morphologie von Mesapamea secalella Remm, 1983, der vor kurzem erkannten Zwillingsart von M. secalis Linnaeus, 1758, und zu deren Vorkommen in der Schweiz und in Ungarn (Lep., Noctuidae). — *Mitt. schweiz. ent. Ges.* **57:** 239—250.

Rézbányai-Reser, L. (1985): Mesapamea-Studien II. Mesapamea remmi sp. n. aus der Schweiz, sowie Beiträge zur Kenntnis der westpalaerktischen Arten der Gattung Mesapamea Heinicke, 1959 (Lep., Noctuidae). — *Ent. Ber. Luzern*, Nr. **14:** 127—148.

Rézbányai-Reser, L. (1986): Mesapamea-Studien IV. Mesapamea secalindica sp. nova aus Nordwest-Indien sowie Beiträge zur Kenntnis der ostpalaearktischen Arten der Gattung Mesapamea Heinicke und der "Luperina" hedeni-Gruppe (Noctuidae). — *Ent. Ber. Luzern* Nr. **15:** 47—84.

Ronkay, L. & Varga, Z. (1985): Neue Noctuiden aus Armenien bzw aus dem Kaukasus-Raum (Lepidoptera: Noctuidae). — *Z. arbgem. öst. Ent.* **36:** 86—94.

Sugi, S. (1982): Noctuidae. — In: Inoue, H.: Moths of Japan. Kodansha, Tokyo, 1—2, pp. 669—913, 344—405.

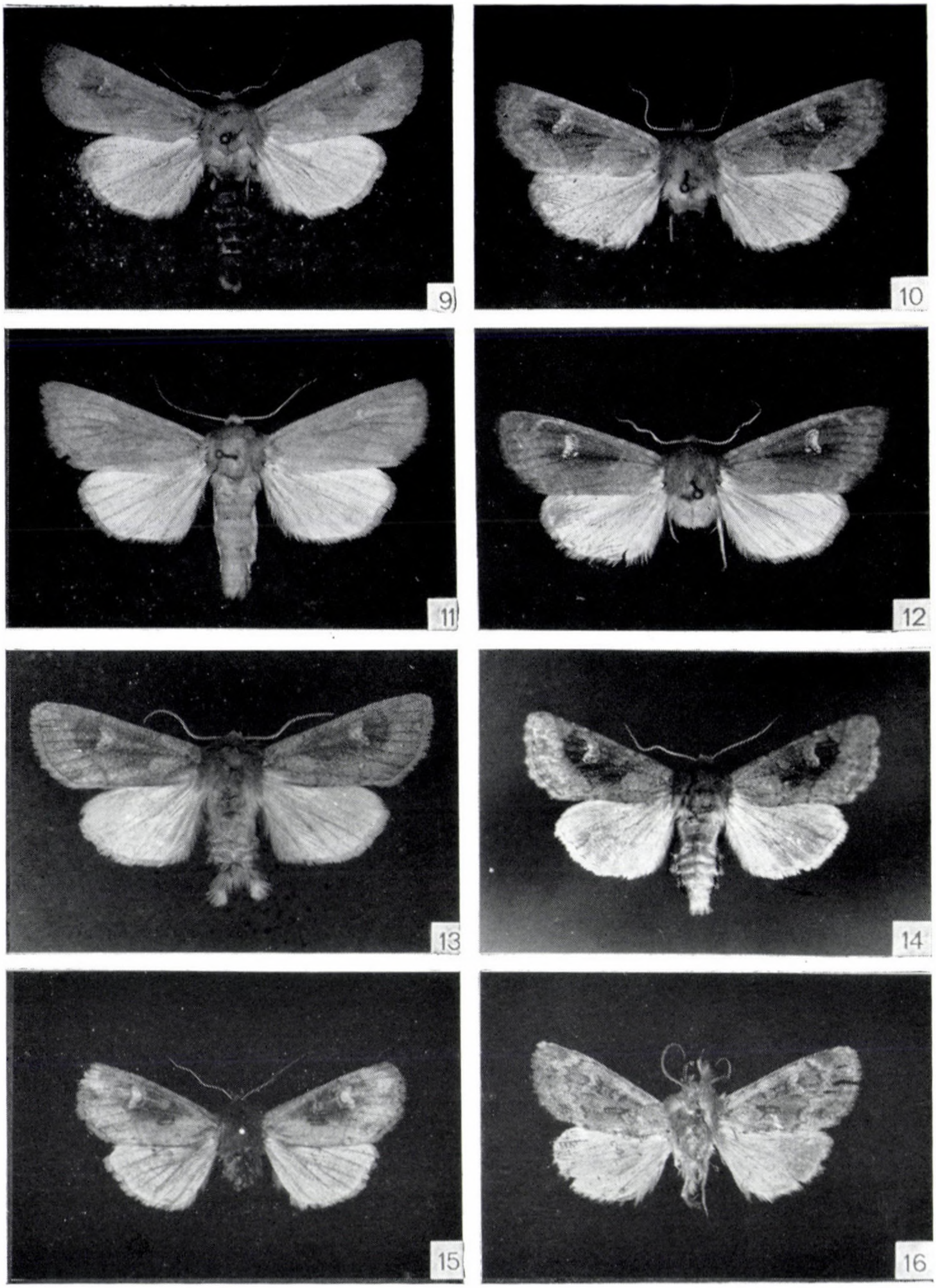
Varga, Z. (1979): Neue Noctuiden aus der Sammlung Vartian (Wien) I. (Lepidopt., Noctuidae, Noctuinae). — *Z. Arbg. öst. Ent.* **31** (1—2): 1—12.

Varga, Z. (1982): Noctuidae (Lepidoptera) aus der Mongolei, IV. Subfamilie Amphipyrinae. — *Folia ent. hung.* **33** (1): 205—227.

Plate I.

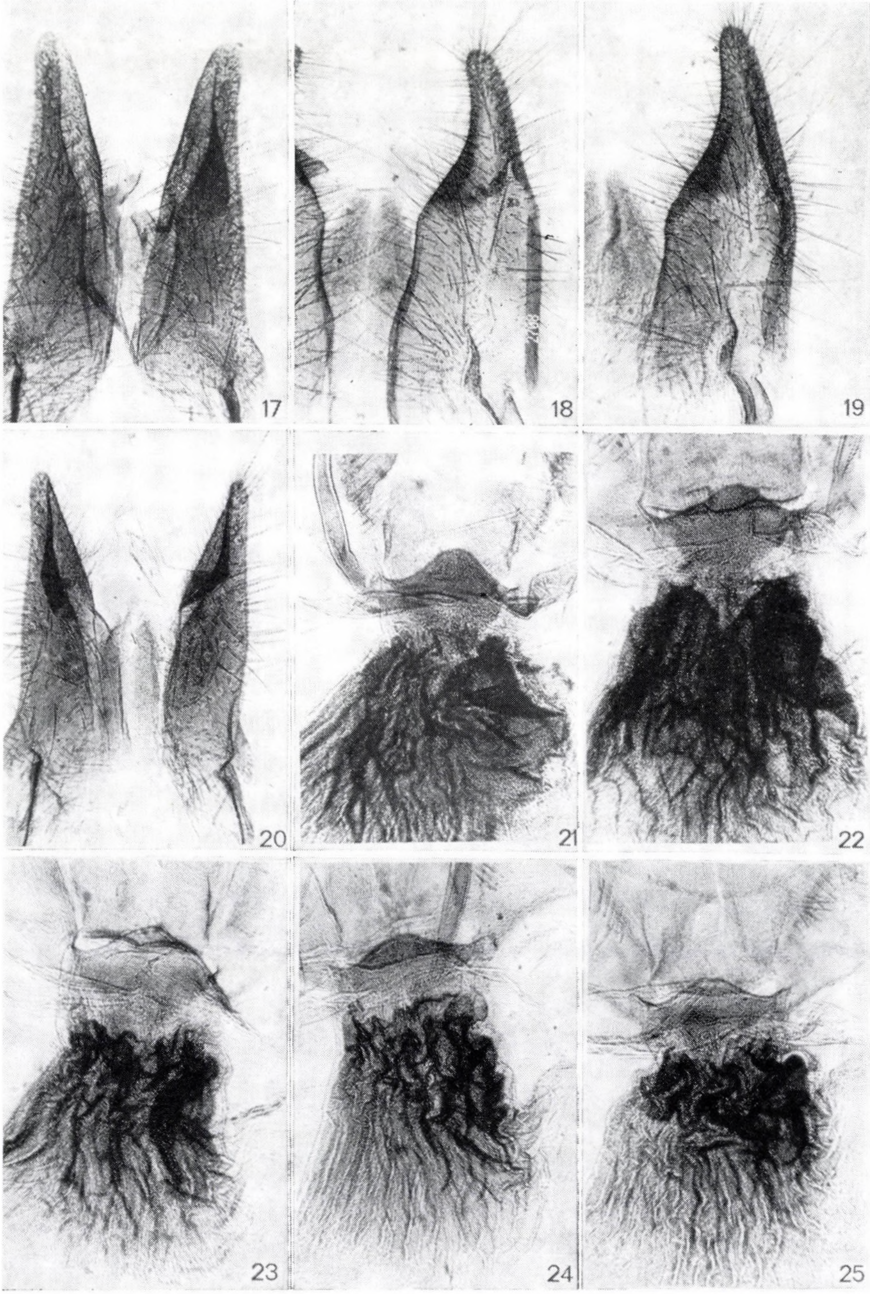
1 = *Mesapamea (Resapamea) hedeni hedeni* GRAESER, male, Amur valley. -- 2 = dito, male, Mongolia. — 3 = dito, f. *subornata* (dark), male, Mongolia. — 4 = dito, f. *subornata*, male, Tannu-Ola. — 5 = dito, f. *subornata* (typical), male, Mongolia. — 6 = dito, f. *subornata*, male, Uralsk. — 7 = dito, (ochreous form), male, Mongolia. — 8 = *Mesapamea (Resapamea) hedeni rhodochrea* ssp. n., type male, W Tien Shan.

Plate II.



9 = *Mesapamea (Resapamea) megaleuca* sp. n., holotype male, Mongolia. — 10 = dito, paratype female, Mongolia. — 11 = dito, (unicolorous form), paratype male, Mongolia. — 12 = dito, (dark form), paratype male, Mongolia. — 13 = *Mesapamea (Resapamea) vaskeni* Varga, paratype male, USSR, Armenia. — 14 = dito, paratype female, USSR, Armenia. — 15 = *Mesapamea (Resapamea) trigona* Smith, male, USA. — 16 = *Mesapamea (Resapamea) tibeticola* sp. n., holotype male, Tibet.

Plate III.



Posterior lobes of the ovipositor: 17 = *Mesapamea (Resapamea) vaskeni vaskeni* VARGA, paratype, USSR, Armenia. — 18 = *Mesapamea (Resapamea) vaskeni kazbekiana* RONKAY & VARGA, paratype, USSR, Georgia. — 19 = *Mesapamea (Resapamea) megaleuca* sp. n., paratype, Mongolia. — 20 = *Mesapamea (Resapamea) hedeni* GRAESER, Mongolia.

Ostium and ductus bursae: 21 = *Mesapamea (Resapamea) hedeni* GRAESER, Mongolia. — 22 = *Mesapamea (Resapamea) megaleuca* sp. n., paratype, Mongolia. — 23 = *Mesapamea (Resapamea) vaskeni kazbekiana* RONKAY et VARGA, paratype, USSR, Georgia. — 24 = *Mesapamea (Resapamea) vaskeni vaskeni* VARGA, E Turkey. — 25 = *Mesapamea (Resapamea) vaskeni vaskeni* VARGA, paratype, USSR, Armenia.

Acta Zoologica Hungarica 38 (1—2), pp. 125—143 (1992)

NEW DATA TO THE EUPITHECIA FAUNA OF CHILE AND PERU (LEPIDOPTERA, GEOMETRIDAE)

A. M. VOJNITS

Zoological Department, Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

(Received 14 March, 1991)

The description of eleven new species (*Eupithecia cabreria* sp. n., *calientes* sp. n., *cautin* sp. n., *chapo* sp. n., *jorge* sp. n., *kinga* sp. n., *elbuta* sp. n., *ovalle* sp. n., *pucon* sp. n., *rindgei* sp. n. and *selva* sp. n.), the representation of the male of *Eupithecia vallenarensis* RINDGE are presented. Some notes on the taxa *Eupithecia pucatrihue* RINDGE, *trancasae* RINDGE and *yelchoensis* RINDGE are given. With 8 original photo-plates.

The basis of the present work, as well as that of my previous one (VOJNITS 1985), is the material I received on loan by the kindness of MR. D. R. DAVIS (Smithsonian Institution, Washington) for study. My first aim was to write the revision of the South American Eupitheciini species. The execution of this work was delayed on the one hand by my different tasks and lack of time, and on the other by the information that MR. FREDERICK H. RINDGE (American Museum of Natural History, New York) was actually working on the elaboration of the whole *Eupithecia* fauna of Chile.

As it was also mentioned by RINDGE (1987), we did not know about our individual project and later when contacts were made and the opinions were exchanged we have decided to continue our own researches on both sides. However I thought it better not to publish new papers within the scope of this study after the publication of my first work on Eupitheciini originating from Chile (which was already in press when the first contact with MR. RINDGE was made) until the planned comprehensive work of the American author will have been published.

RINDGE (1987) lists 43 *Eupithecia* species from Chile, and 29 of them were newly described by him. His descriptions are precise and the paper is well illustrated. Even though our opinions do not always agree, as will be seen in the subsequent papers.

Our conception is different with respect to the systematic units above species level and the distinctness of some species; we are not of the same mind on the taxonomic value of some morphological characters (eyes, palpi and size of bursa copulatrix, and their proportion), and the illustrations given by RINDGE are not informative enough on the specimens and slides. The most striking case is the description of a new *Eupithecia* species based on a single specimen without abdomen. What is to be done — in this genus! — with

such a taxon and its diagnosis "male and female genitalia unknown"? (*Eupithecia grappleri* RINDGE, 1987: 293.)

Without prejudging the comprehensive analysis and phylogenetic consideration of the South American Eupitheciini fauna, I should like to point out some typical features. These characters are rather important in my view. The South American Eupitheciini species have very variable external appearances, they form well separable groups according to the construction of their antennae, but the structure of their genitalia is fairly uniform. It is quite surprising that the aedoeagus and sternite VIII of males are so weakly differentiated, even if other characters are very distinct. This is very remarkable when compared to the Eupitheciini from China (VOJNITS 1979, 1980, 1984) or Nepal (VOJNITS 1981, 1983), or even from Europe (PETERSEN 1909).

Eupithecia yelchoensis RINDGE, 1987 (Bulletin of the American Museum of Natural History, 186 (3): 318–320, Figs 21, 63, 90, 124, 165, 166.) — Two male specimens from Chile; 1 km E from Lago Tepuhueco, ca 40 air km SW from Castro, and near Puntra, ca 30 air km S from Ancud. The palpi are dark brown with yellowish scaling; extending beyond front of eyes, a distance 1, 2 times as long as diameter of eyes (the head of the holotype male partially flattened, and palpi almost totally descaled). Flying period December (Plate I: 1; Pl. III: 17, 23; Pl. IV: 29; Pl. V: 35, 41).

The specimens are deposited in the United States National Museum of Natural History, Smithsonian Institution (USNM). — Slides: No. 15482 (♂), gen. prep. A. Vojnits.

Eupithecia pucatrihue RINDGE, 1987 (Bulletin of the American Museum of Natural History, 186 (3): 332–336, Figs 33, 70, 98, 131, 179, 180.) — One male specimen from Villarica, 16 km S from Pucon. Flying period December (Plate I: 2; Pl. III: 18, 24; Pl. IV: 30; Pl. V: 36, 42).

The specimen is deposited in the USNM. — Slides: No. 15541 (♂), gen. prep. A. Vojnits.

Eupithecia trancasae RINDGE, 1987 (Bulletin of the American Museum of Natural History, 186 (3): 298–299, Figs 13, 54, 81, 113, 153, 154.) — One male specimen from Temuco Prov., Fundo La Selva, 48 km NW from Nueva Imperial (Plate I: 3; Pl. III: 18, 25; Pl. IV: 31; Pl. V: 37, 43), and one female specimen from Malleco Prov., Los Gringos Camp, Nahuelbuta Nat. Park (Plate VI: 48–49). Flying period December (male) and January (female).

The specimens are deposited in the USNM. — Slides: Nos 15509 (♂) and 15540 (♀), gen. prep. A. Vojnits.

Eupithecia vallenarensis RINDGE, 1987 (Bulletin of the American Museum of Natural History, 186 (3): 356–357, Figs 41, 42, 189, 190.) — One male specimen from Nuble Prov., near Alto Tregualemu, ca 20 km SE from Chovellen. Flying period December.

The specimen is deposited in the USNM.

Diagnosis of male (RINDGE examined only females): Palpi light grey with dark grey scales, extending beyond front of eyes, a distance 1.1 times as long as diameter of eyes. Antennae with asymmetrical basal pair of processes. Length of fore wings 8 mm. Fore wings and hind wings moderately wide, apex moderately pointed. Basic colour of fore wings ligth brownish grey. Postmedian black, very sharp. Discal spots dim, dark grey. Hind wings light grey. Transverse lines dim, greyish, discal spots very small, grey. Cilia striated dark grey and light grey on fore wings, grey and greyish white on hind wings. Underside of wings yellowish grey, transverse lines and discal spots grey (Plate I: 4).

Male genitalia: Uncus with two separated, sclerotized, laterally flattened points. Valves with broadly sclerotized sacculus, outer margin straight, half length of valve, terminating in broad, triangular, rounded projection, and with apex of valva broadly rounded. Ampullae two and half as long as wide, their pilority short. Clavulus well developed, long, with medium size spines. Aedoeagus cylindrical, with C-shaped basal piece, vesica apparently with large, sclerotized plate in area of convoluted, minutely spinose membrane (Plate III: 22; Pl. IV: 28; Pl. V: 40).

Sternite VIII: Ventral plate elongate, with small base, arms very long (Pl. VI: 46).

Slides: No. 15490 (♂), gen. prep. A. VOJNITS.

Eupithecia cabreria sp. n.

Specific differences: The new species externally resembles *Eupithecia pucatrihue* RINDGE, but its ampullae of male genitalia are shorter (the ampullae of *E. pucatrihue* are four times as long as wide), and sternite VIII is different.

Diagnosis: A medium-size *Eupithecia* species. Palpi yellow with brown scales, long, beak-shaped extending beyond front of eyes, a distance 1.8 times as long as diameter of eyes (male; female without head). Antennae of males with basal pair of setae widely separated at their origin, elongate, slender, extending beyond sides of segment, distal pair of processes shorter, connected medially. Length of fore wings 9 mm (male) and 9.5 mm (female). Fore wings and hind wings wide, fore wings isosceles triangles, apex moderately pointed. Basic colour of fore wings greyish brown, at termen with dark brown spots. Transverse lines yellowish, discal spots black. Median field reddish. Hind wings light greyish yellow (male) or dark grey (female), transverse lines and small discal spots dark grey. Cilia striated brown and greyish brown on fore wings, brown and greyish yellow on hind wings. Underside of wings yellow, transverse lines and discal spots grey (Plate I: 5—6).

Male genitalia: Uncus with two separated, sclerotized, laterally flattened points. Valvae with broadly sclerotized sacculus, outer margin straight, half length of valve, terminating in broad, triangular, pointed projection; and with apex of valva broadly rounded. Ampullae three times as long as wide, their pilosity long. Clavulus well developed, with medium-sized spines. Aedoeagus short, cylindrical, with small C-shaped basal piece, vesica apparently with a large, sclerotized plate in area of convoluted, minutely spinose membrane (Plate III: 21; Pl. IV: 2, 7, 33; Pl. V: 39).

Sternite VIII: Ventral plate elongate, slender, with large base, arms narrow, 40 percent length of plate (Plate VI: 45).

Female genitalia: Bursa copulatrix bag-like, membranous, its surface minutely spinulose. Ductus bursae sclerotized, as long as wide. Ductus seminalis arising around half length of bursa. Anterior and posterior apophyses short, papillae anales wide (Plate VI: 50—52).

Holotype male: "CHILE: Malleco Province Nahuelbuta Nat. Park Cabreria, 1200 meters 4 February 1979 D. & M. DAVIS & B. AKERBERGS" "21 E 84 Photo gen. prep. No. 15474 ♂ det. A. VOJNITS" "Eupithecia antenna 15498 det. A. VOJNITS". — Paratype: "CHILE: Malleco Prov. Nahuelbuta Nat. Park near Los Gringos Camp 29. Jan. — 5. Feb. 1979, 1300 m, D. & M. DAVIS & B. AKERBERGS" "4 E 84 gen. prep. No. 15478 ♀ det. A. VOJNITS". — Holotype and paratype are deposited in the USNM.

Biology: First stages and foodplant unknown. Flight period January and February.

Distribution: Nahuelbuta National Park, Chile. Locus typicus: Cabreria, 1200.

E t y m o l o g y: The specific name is a noun in apposition taken from the type locality. Slides: Nos 15474 (♂) and 15478 (♀), gen. prep. A. VOJNITS.

Eupithecia jorge sp. n.

S p e c i f i c d i f f e r e n c e s : *Eupithecia caburgua* RINDGE has a similar but more elongated bursa copulatrix; externally the two species are totally different.

D i a g n o s i s : A rather variegated *Eupithecia* species. Palpi dark brown, long, extending beyond front of eyes, a distance 1.5 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 10 mm. Fore wings broad, apex obtuse. Basic colour greyish brown, transverse lines wide, yellow. Median field reddish, terminal field with a yellowish submarginal line. Discal spots small and black. Hind wings light yellowish grey, transverse lines and elongated discal spots dark grey. Cilia striated brownish yellow and greyish brown on fore wings, and light yellowish grey on hind wings. Underside of fore wings yellowish grey, hind wings light yellow. Transverse lines and discal spots grey (Plate I: 7).

F e m a l e g e n i t a l i a : Bursa copulatrix pear-like, membranous, its surface minutely spinulose. Ductus arising bursae sclerotized, as long as wide. Ductus seminalis near the half length of bursa. A sclerotized, concave band extending from ductus bursae for about 35 percent length of bursa. Anterior and posterior apophyses short. Papillae anales small and elongated (Plate VII: 53—54).

M a l e g e n i t a l i a : Unknown.

H o l o t y p e female: "CHILE: Coquimbo Prov. Fray Jorgé Nat. Pk. ca. 70 km W. Ovalle 6—9. Nov. 1981 D. & M. DAVIS" "11 E 84 Photo gen. prep. No. 15470 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

B i o l o g y : First stages and foodplant unknown. Flight period November.

D i s t r i b u t i o n : Coquimbo, Chile. Locus typicus: Fray Jorgé Nationa Park, near Ovalle.

E t y m o l o g y: The specific name is a noun in apposition taken from the type locality. Slides: No. 15470 (♀), gen. prep. A. VOJNITS.

Eupithecia cautin sp. n.

S p e c i f i c d i f f e r e n c e s : The small species is externally different from all known Chilean *Eupithecia* species; its bursa copulatrix is very characteristic.

Diagnosis: A small *Eupithecia* species. Palpi dark brown, long, extending beyond front of eyes, a distance 1.4 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 8 mm. Fore wings moderately broad, isosceles triangles. Apex obtuse. Basic colour of fore wings brown, basal and median fields greyish, terminal field reddish. Postmedian yellowish. Discal spots large, elongated, black. Hind wings grey, transverse lines and small discal spots dark grey. Cilia dark grey. Underside of wings grey, transverse lines dark grey and greyish yellow, discal spots dark grey, elongated on fore wings and rotund on hind wings (Plate I: 8).

Female genitalia: Bursa copulatrix small, sacculiform membranous with two groups of sclerotized spines, one in posterior half of bursa of 12 spines and another one anteriorly, of 10 spines. Ductus bursae sclerotized, two times as long as wide. Anterior and posterior apophyses short. Papillae anales medium size, obtuse (Plate VII: 55—56).

Male genitalia: Unknown.

Holotype female: "CHILE: Cautin; 15 Km SE Pucon 22 Dec. 1982 R. L. Brown" "8 E 84 Photo gen. prep. No. 15469 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

Biology: First stages and foodplant unknown. Flight period December.

Distribution: Cautin, Chile. Locus typicus: 15 km SE from Pucon.

Etymology: The specific name is a noun in apposition taken from the type locality. Slides: No. 15469 (♀), gen. prep. A. VOJNITS.

Eupithecia kinga sp. n.

Specific differences: This large *Eupithecia* species externally resembles *E. spurcata* WARREN, but the fore wings are more elongated, the basic colour is lighter and the bursa copulatrix different.

Diagnosis: A large *Eupithecia* species. Palpi greyish brown, rather long, extending beyond front of eyes a distance 1.5 times as long as diameter of eyes. Antennae very shortly ciliate. Length of fore wings 12.5 mm. Fore wings moderately elongated, apex pointed. Basic colour brown, transverse lines grey, postmedian yellowish. Terminal field grey. White spots at tornus. Discal spots medium-sized, black. Hind wings greyish white, lighter at costa, darker at base, termen and inner margin. Transverse lines grey and dark grey, discal spots very small, grey. Cilia striated brownish grey and yellowish brown on fore wings, and yellowish grey and grey on hind wings. Underside of fore wings yellowish grey, hind wings yellowish white. Transverse lines and discal spots grey (Plate II: 9).

F e m a l e g e n i t a l i a : Bursa copulatrix very small as related to the other parts of the genitalia; elongated pear-like, membranous. Ductus bursae sclerotized, one and half as long as wide. Ductus seminalis arising near half length of bursa. Anterior and posterior apophyses robust and medium long. Papillae anales large and elongated (Plate VII: 57—58).

M a l e g e n i t a l i a : Unknown.

H o l o t y p e female: "PERU: 2450 m Machu Picchu 16—18 Oct. D. & M. DAVIS" "34 E 84 Photo gen. prep. No. 15508 ♀ det. A. VOJNITS". Holotype is deposited in the USNM.

B i o l o g y : First stages and foodplant unknown. Flight period October.

D i s t r i b u t i o n : Cuzco, South Peru. Locus typicus: Machu Picchu, 2450 m.

E t y m o l o g y: I dedicate the new species to my daughter, Kinga.
Slides: No. 15508 (♀), gen. prep. A. VOJNITS.

Eupithecia rindgei sp. n.

S p e c i f i c d i f f e r e n c e s : The new species externally resembles *E. jorge* sp. n., but it is smaller, its wings are wider and the bursa copulatrix is different.

D i a g n o s i s : A rather small *Eupithecia* species. Palpi yellowish brown, extending beyond front of eyes, a distance 1.2 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 8 mm. Fore wings broad, isosceles triangles, with obtuse apex. Basic colour dark brown, median field greyish, terminal field reddish. Postmedian very wide, yellow. Submarginal yellow. Discal spots dark brown. Hind wings greyish yellow, transverse lines grey, small discal spots black. Cilia striated greyish brown and greyish yellow on fore wings, dark brown and yellow on hind wings. Underside of fore wings yellowish grey, hind wings light yellow. Transverse lines and discal spots grey (Plate II: 10).

F e m a l e g e n i t a l i a : Bursa copulatrix small, sacculiform membranous, its surface minutely spinulose, with a large pine-like batch of chitinous spines. Ductus bursae chitinous, twice as long as wide. Ductus seminalis arising near antrum. Anterior and posterior and posterior apophyses strong and medium long. Papillae anales large and wide (Plate VII: 59—60).

M a l e g e n i t a l i a : Unknown.

H o l o t y p e female: "CHILE: Chiloe ld. Hueque Trumao 22 km N. Ouellon 26—27 Dec. 1981 D. R. DAVIS 50 m." "Eupithecia 7 E 84 Photo gen. prep. No. 15486 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

B i o l o g y : First stages and foodplant unknown. Flight period December.

D i s t r i b u t i o n : Chiloé, Chile. Locus typicus: Hueque Trumao.

E t y m o l o g y: I dedicate the new species to FREDERICK H. RINDGE, American Museum of Natural History, New York, renowned specialist of the Geometridae of Chile.
Slides: No. 15486 (♀), gen. prep. A. VOJNITS.

Eupithecia pucon sp. n.

S p e c i f i c d i f f e r e n c e s : A very small species, only *E. elbuta* sp. n. is smaller among all described Chilean species. The pine-like batches in the bursa copulatrix are unequal.

D i a g n o s i s : A truly pigmeous *Eupithecia*. Palpi brownish yellow, extending beyond front of eyes a distance 1.1 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 7 mm. Fore wings moderately broad, triangular, with obtuse apex. Basic colour greyish brown, with reddish scaling concentrated in median field. Postmedian wide, light. Discal spots black, elongated and of medium size. Veins in median field partly reddish. Hind wings grey, with fine transverse lines. Discal spots very small, black. Cilia striated brown and yellowish brown on fore wings, and grey on hind wings. Underside of wings yellowish grey, hind wings lighter than fore wings. Transverse lines and discal spots brownish grey (Plate II: 11).

F e m a l e g e n i t a l i a : Bursa copulatrix ovoid, membranous, its surface minutely spinulose, in the median area with two big pine-like batches of sclerotized spines. Ductus bursae sclerotized, twice as long as wide. Ductus seminalis arising near half length of bursa. Anterior and posterior apophyses medium short and medium thick. Papillae anales moderately elongated (Plate VII: 61; Pl. VIII: 62).

M a l e g e n i t a l i a : Unknown.

H o l o t y p e female: "CHILE: Cautin; 14 km SE Pucon 21 Dec. 1982 R. L. BROWN" "gen. prep. No. 15466 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

B i o l o g y : First stages and foodplant unknown. Flight period December.

D i s t r i b u t i o n : South of Middle Chile, Cautin. Locus typicus: near Pucon.

E t y m o l o g y: The specific name is a noun in apposition taken from the type locality.
Slides: No. 15466 (♀), gen. prep. A. VOJNITS.

Eupithecia elbuta sp. n.

S p e c i f i c d i f f e r e n c e s : Smaller than *Eupithecia pucon* sp. n. and with a totally different bursa copulatrix.

D i a g n o s i s : The smallest of all described Chilean *Eupithecia* species. Palpi greyish brown, extending beyond front of eyes a distance 1.2 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 6.5 mm. Fore wings moderately broad, triangular, with pointed apex. Basic colour reddish brown, in median area greyish. Postmedian yellow. Discal spots small, ellipsoid, black. Veins in median field partly brown. Hind wings light grey, with fine transverse lines. Discal spots very small, black. Cilia yellowish-grey on fore wings and grey on hind wings. Underside of wings light greyish brown, hind wings yellowish. Transverse lines and discal spots light grey (Plate II: 12).

Female genitalia: Bursa copulatrix pear-like, membranous, its surface minutely spinulose, with two large areas of 15—16 strong, partly curved spines. Ductus bursae sclerotized, twice and half as long as wide. Ductus seminalis arising near half length of bursa. Anterior and posterior apophyses medium short and medium thick. Papillae anales moderately elongated (Plate VIII: 63—64).

Male genitalia: Unknown.

Holotype female: "CHILE: Malleco Province Nahuelbuta Nat. Park Cabreria, 1200 meters 4 February 1979 D. & M. DAVIS & B. AKERBERGS" "2 F 84 Photo gen. prep. No. 15512 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

Biology: First stages and foodplant unknown. Flight period February.

Distribution: South of Central Chile, Malleco Province. Locus typicus: Cabreria, 1200 m.

Etymology: The specific name is a noun in apposition taken from the type locality. Slides: No. 15512 (♀), gen. prep. A. VOJNITS.

Eupithecia ovalle sp. n.

Specific differences: Near *Eupithecia frequens* BUTLER, but externally lighter, larger, its bursa copulatrix more elongated.

Diagnosis: A rather large *Epithecia* species. Palpi yellowish dark brown, extending beyond front of eyes a distance 1.3 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 10 and 11 mm. Fore wings moderately elongated, apex pointed. Basic colour greyish yellow, terminal field darker. Postmedian wide, submarginal line narrow, both yellowish. Transverse lines grey. Discal spots dark grey. Hind wings yellow, discal spots dark grey, transverse lines grey. Cilia striated brown and yellowish white on fore and hind wings. Underside of wings light yellow (hind wings lighter), transverse lines and discal spots brownish grey (Plate II: 13).

Female genitalia: Bursa copulatrix pear-like, elongated, large, membranous, its surface minutely spinulose. A sclerotized concave band extending from ductus bursae for about 30 percent length of bursa. Ductus bursae as long as wide. Ductus seminalis arising from ductus bursae for about

33 percent length of bursa. Anterior and posterior apophyses small and short. Papillae anales moderately elongated, small (Plate VIII: 65—66).

Male genitalia: Unknown.

Holotype female: "CHILE: Coquimbo Prov. Fray Jorge Nat. Pk. ca 70 km W. Ovalle 6—9 Nov. 1981 D. & M. Davis" "35 F 84 gen. prep. No. 15455 ♀ det. A. VOJNITS". — Paratype: one female from the same locality, "36 F 84 gen. prep. No. 15465 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM, paratype in the Hungarian Natural History Museum, Budapest (HNHM).

Biology: First stages and foodplant unknown. Flight period November.

Distribution: Coquimbo, Chile. Locus typicus: Fray Jorgé National Park, near Ovalle.

Etymology: The specific name is a noun in apposition taken from the type locality Slides: Nos 15455, 15465 (♀♀), gen. prep. A. VOJNITS.

Eupithecia selva sp. n.

Specific differences: *Eupithecia ovalle* sp. n. has a similar bursa copulatrix, but externally the two species are totally different.

Diagnosis: A medium-size *Eupithecia* species. Palpi dark grey and grey, extending beyond front of eyes a distance 1.3 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 9.5 and 9 mm. Fore wings wide, isosceles triangles, with obtuse apex. Basic colour brownish yellow, terminal field greyish brown. Submarginal line white, discal spots rounded, black. Hind wings greyish yellow, transverse lines grey, discal spots very small, dark grey. Cilia striated greyish dark brown and yellowish brown on fore wings, greyish yellow on hind wings. Underside of fore wings grey, hind wings greyish yellow. Transverse lines and discal spots dark grey (Plate II: 14).

Female genitalia: Bursa copulatrix pear-like, elongated, membranous, its surface minutely spinulose. A sclerotized concave band extending from ductus bursae for about 40 percent length of bursa. Ductus bursae as long as wide. Ductus seminalis arising near half length of bursa. Anterior and posterior apophyses medium short and medium thick. Papillae anales small, moderately elongated (Plate VIII: 67—68).

Male genitalia: Unknown.

Holotype female: "CHILE: Temuco Prov. Fundo La Selva, 48 km NW Nueva Imperial 9—11 Dec. 1981 D. R. DAVIS 700 m" "24 F 84 Photo gen. prep. No. 15534 ♀ det. A. VOJNITS". — Paratype: "CHILE: Chiloe Id. 1 km E Lago Tepuhueco ca. 40 air km SW Castro, 23—25 Dec. 1981 D. R. DAVIS, ca. 100 m". The paratype without abdomen. — The holotype is deposited in the USNM, the paratype in the HNHM.

Biology: First stages and foodplant unknown. Flight period December.

Etymology: The specific name is a noun in apposition taken from the type locality. Slides: No. 15534 (♀), gen. prep. A. VOJNITS.

Eupithecia chapo sp. n.

Specific differences: *Eupithecia taracapa* RINDGE has similar male genitalia, but externally the two species are totally different, and the new species has also different antennae and sternite VIII.

Diagnosis: A small *Eupithecia* species. Palpi dark greyish brown with greyish yellow, extending beyond front of eyes a distance 1.2 times as long as diameter of eyes. Antennae of males bipectinate, with posterior pair of setose swellings short and thick, being 80 percent length of their basal segments, and with anterior pair small but projecting at angle to segment, median, with terminal seta five times their length. Length of fore wings 8 mm. Fore wings wide, isosceles triangles, with pointed apex. Basic colour yellowish dark brown, median field greyish, basal field reddish. Postmedian and submarginal lines yellow. Discal spots black. Hind wings grey, transverse lines and discal spots dark grey. Cilia brownish yellow on fore wings and greyish yellow on hind wings. Underside of wings grey, transverse lines and discal spots dark grey (Plate II: 15).

Male genitalia: Uncus with two separated, sclerotized, laterally flattened points, valvae with lightly sclerotized sacculus, apex broadly rounded. Ampullae two and half times as long as wide, their pilosity short. Clavulus with medium-size spines. Aedoeagus small, cylindrical, with small L-shaped basal piece, vesica apparently with large, sclerotized plate in area of convoluted, minutely spinose membrane (Plate III: 20; Pl. IV: 26, 32; Pl. V: 38).

Sternite VIII: Ventral plate elongate, with medium-size base, arms 60 percent length of plate (Plate VI: 44).

Female genitalia: Unknown.

Holotype male: "CHILE: Llanquihue Prov. Hornohuinco 11 km SW Lago Chapo 29—31 Dec. 1981 DR. R. DAVIS 300 m" "gen. prep. No. 15481 ♂ det. A. VOJNITS" "Eupithecia antenna 15491 ♂ det. A. VOJNITS". — Holotype is deposited in the USNM.

Biology: First stages and foodplant unknown. Flight period December.

Distribution: Hornohuinco, Chile. Locus typicus: 11 km SW from Lago Chapo.

Etymology: The specific name is a noun in apposition taken from the type locality. Slides: No. 15481 (♂), gen. prep. A. VOJNITS.

Eupithecia calientes sp. n.

Specific differences: *Eupithecia vallenarensis* RINDGE has a similar bursa copulatrix, but externally the two species are totally different.

D i a g n o s i s : A medium-size *Eupithecia* species. Palpi light brown with yellow scales, extending beyond front of eyes a distance 1.2 times as long as diameter of eyes. Antennae shortly ciliate. Length of fore wings 9 mm. Fore wings wide, isosceles triangles, with obtuse apex. Basic colour dark greyish brown, postmedian and submarginal lines yellowish, discal spots rounded, black. Hind wings yellowish grey, transverse lines and discal spots grey, obsolescent. Underside of fore wings grey, hind wings greyish yellow, transverse lines and discal spots dark grey (Plate II: 16).

F e m a l e g e n i t a l i a : Bursa copulatrix pear-like, membranous, its surface minutely spinulose. A sclerotized concave band extending from ductus bursae for about 35 percent length of bursa. Ductus bursae as long as wide. Ductus seminalis arising from end of the sclerotized band. Anterior and posterior apophyses short, posterior apophyses medium-size, papillae anales small, rice-shaped (Plate VIII: 69—70).

M a l e g e n i t a l i a : Unknown.

H o l o t y p e female: "CHILE: Osorno province P. N. Puyehue, 600 meters Ag. Calientes to 2 km S 10—22 February 1979 D. & M. DAVIS & B. AKERBERGS" "14 E 84 Photo gen. prep. No. 15479 ♀ det. A. VOJNITS". — Holotype is deposited in the USNM.

B i o l o g y : First stages and foodplant unknown. Flight period February.

D i s t r i b u t i o n : Osorni, Chile. Locus typicus: Calientes.

E t y m o l o g y: The specific name is a noun in apposition taken from the type locality. Slides: No. 15479 (♀), gen. prep. A. VOJNITS.

* * *

A c k n o w l e d g e m e n t s — I would like to express my thanks to MR. F. H. RINDGE (New York) and MR. D. R. DAVIS (Washington) for their kind help. I am also indebted to the Alexander von Humboldt Foundation (Bonn-Godesberg) and the OTKA Foundation of the Hungarian Academy of Sciences (Budapest) for their support of my research.

REFERENCES

PETERSEN, W. (1909): Ein Beitrag zur Kenntnis der Gattung Eupithecia Curt. — *D. ent. Z. Iris* **22:** 203—314.

RINDGE, F. H. (1987): The Eupithecia (Lepidoptera, Geometridae) of Chile. — *Bull. Am. Mus. Nat. Hist.* **186** (3): 269—363.

VOJNITS, A. M. (1979): New and rare Eupithecia species from China (Lepidoptera: Geometridae). — *Acta Zool. Hung.* **25:** 193—211.

VOJNITS, A. M. (1980): Data to the Eupithecia fauna of China (Lepidoptera: Geometridae). — *Acta Zool. Hung.* **26:** 433—449.

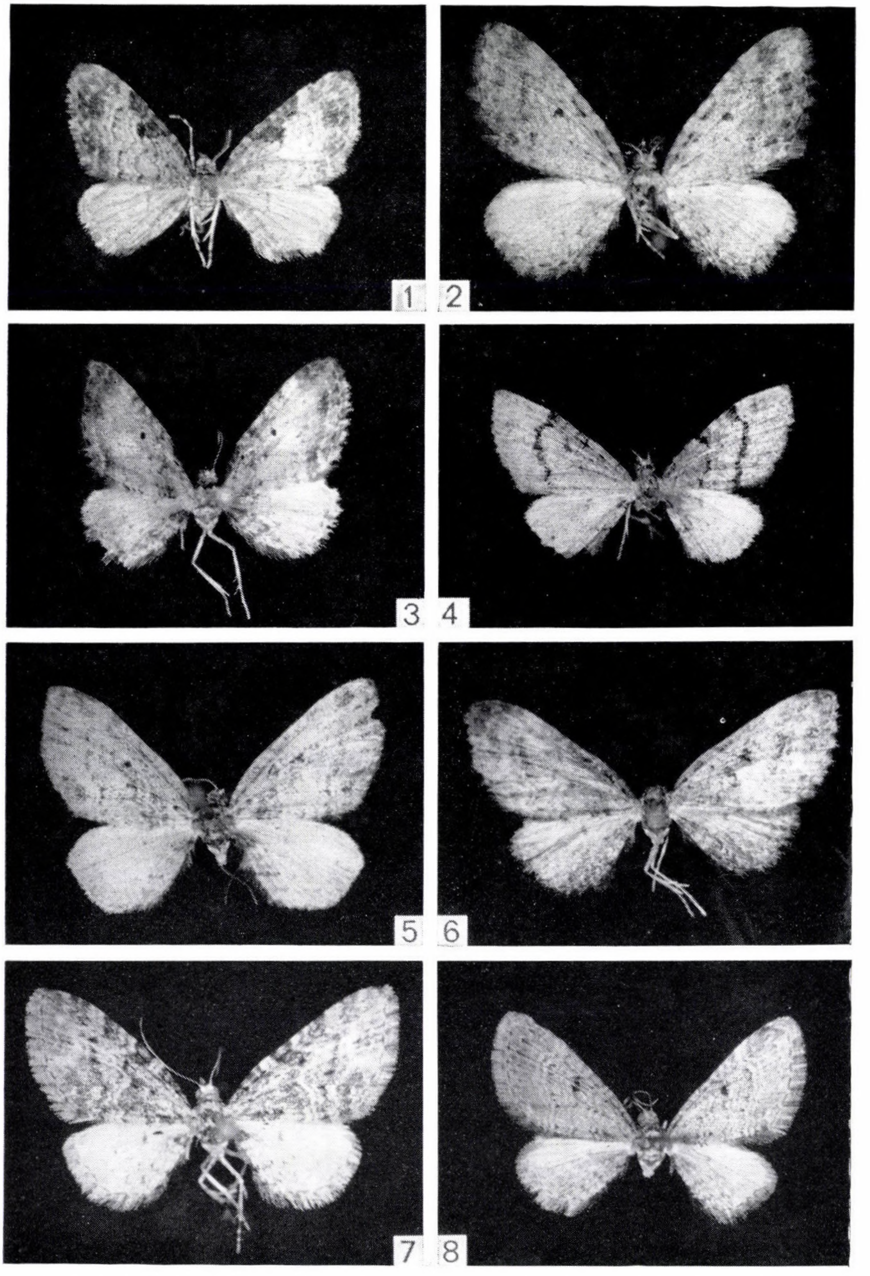
VOJNITS, A. M. (1981): Data to the Eupithecia fauna of Nepal. I (Lepidoptera: Geometridae). — *Acta Zool. Hung.* **27:** 217—238.

VOJNITS, A. M. (1983): Data to the Eupithecia fauna of Nepal. II (Lepidoptera: Geometridae). — *Acta Zool. Hung.* **29:** 261—282.

VOJNITS, A. M. (1984): New data to the Eupitheciini fauna of China based on Höne's collections. — *Acta Zool. Hung.* **30:** 213—240.

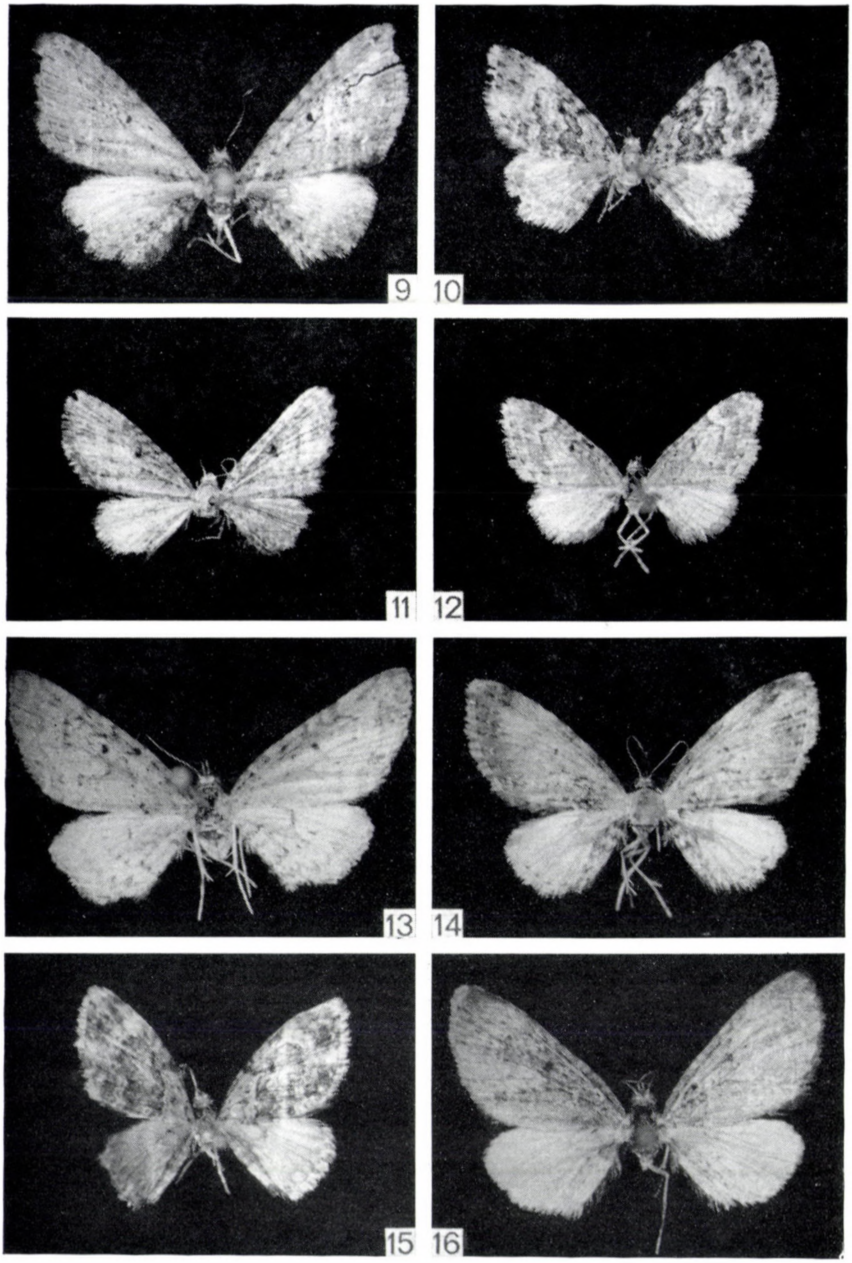
VOJNITS, A. M. (1985): New South American genera and species of Eupitheciini (Lepidoptera: Geometridae) — *Acta Zool. Hung.* **31:** 405—418.

Plate I.



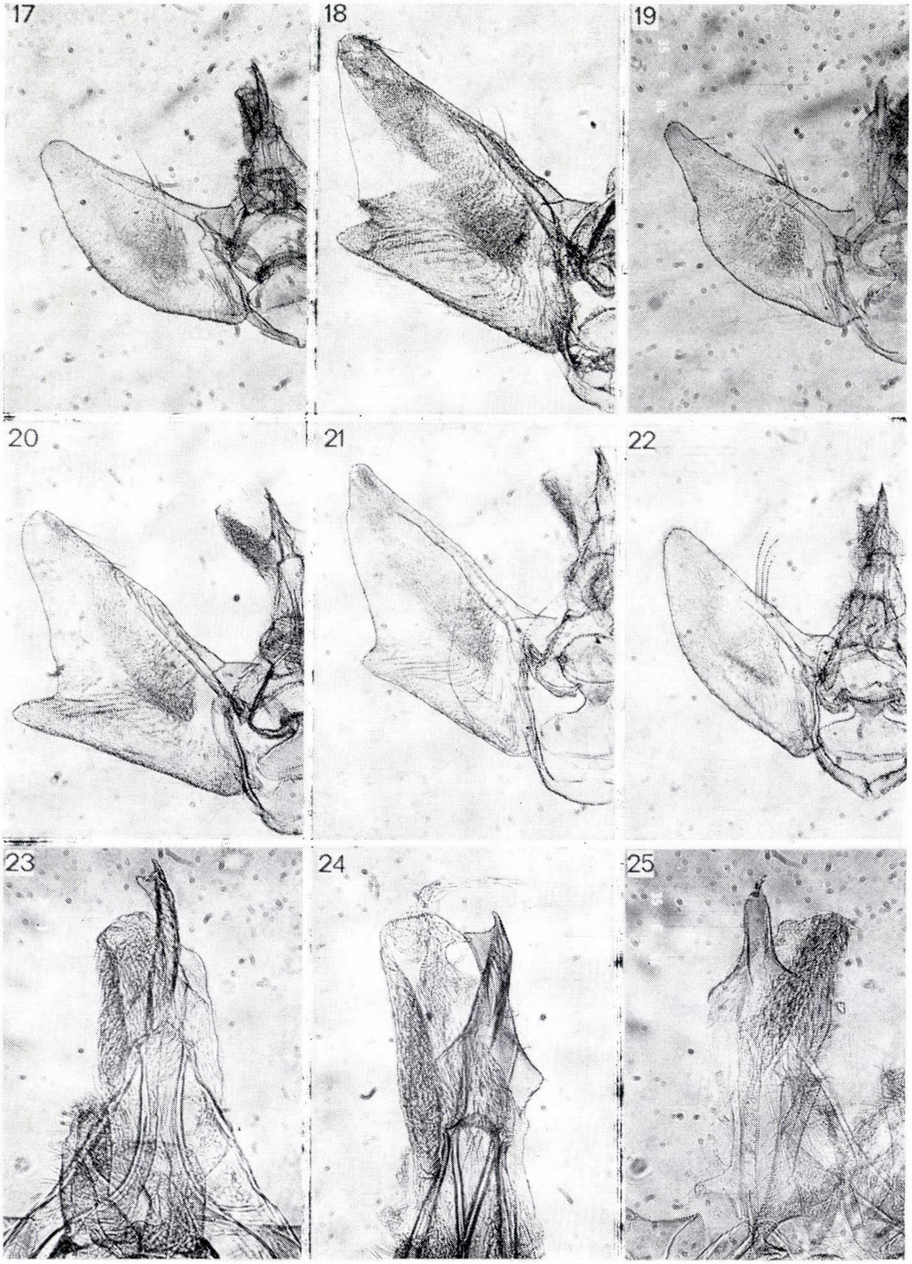
1 = *Eupithecia yelchoensis* RINDGE, male. — 2 = *E. pucatrihue* RINDGE, male. — 3 = *E. trancasae* RINDGE, female. — 4 = *E. vallenarensis* RINDGE, male. — 5 = *E. cabreria* sp. n., holotype male. — 6 = *E. cabreria* sp. n., paratype female. — 7 = *E. jorge* sp. n., holotype female. — 8. *E. cautin* sp. n., holotype female.

Plate II.



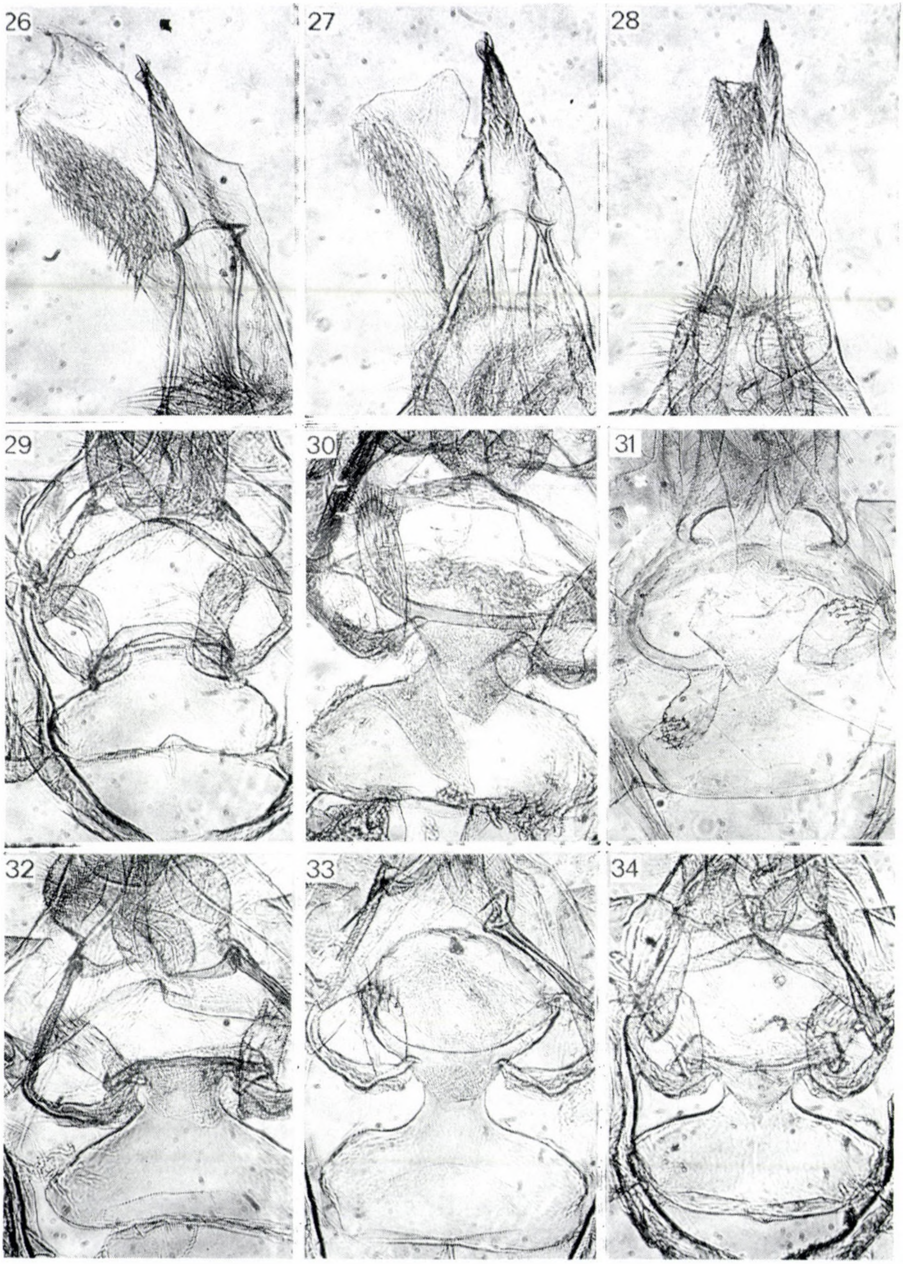
9 = *Eupithecia kinga* sp. n., holotype female. — 10 = *E. rindgei* sp. n., holotype female. — 11 = *E. pucon* sp. n., holotype female. — 12 = *E. elbuta* sp. n., holotype female. — 13 = *E. ovalle* sp. n., paratype female. — 14 = *E. selva* sp. n., paratype female. — 15 = *E. chapo* sp. n., holotype male. — 16 = *E. calientes* sp. n., holotype female.

Plate III.



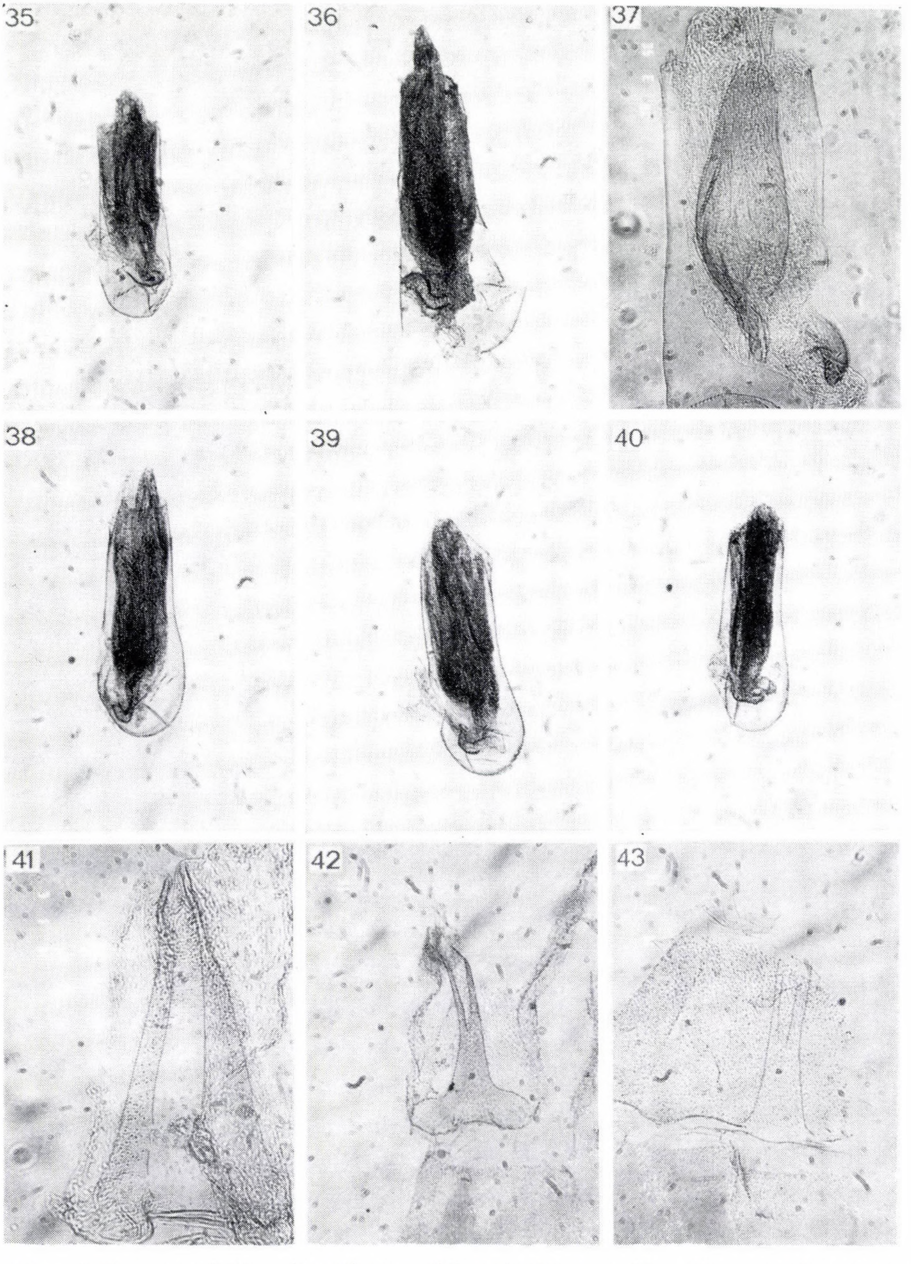
17–21 = Valva of 17 = *Eupithecia yelchoensis* RINDGE, 18 = *E. pucatrihue* RINDGE, 19 = *E. trancasae* RINDGE, 20 = *E. chapo* sp. n. 21 = *E. cabreria* sp. n. and 22 = *E. vallenarensis* RINDGE. — 23–25 = Uncus and clavulus of 23 = *E. yelchoensis* RINDGE, 24 = *E. pucatrihue* RINDGE and 25 = *E. trancasae* RINDGE.

Plate IV.



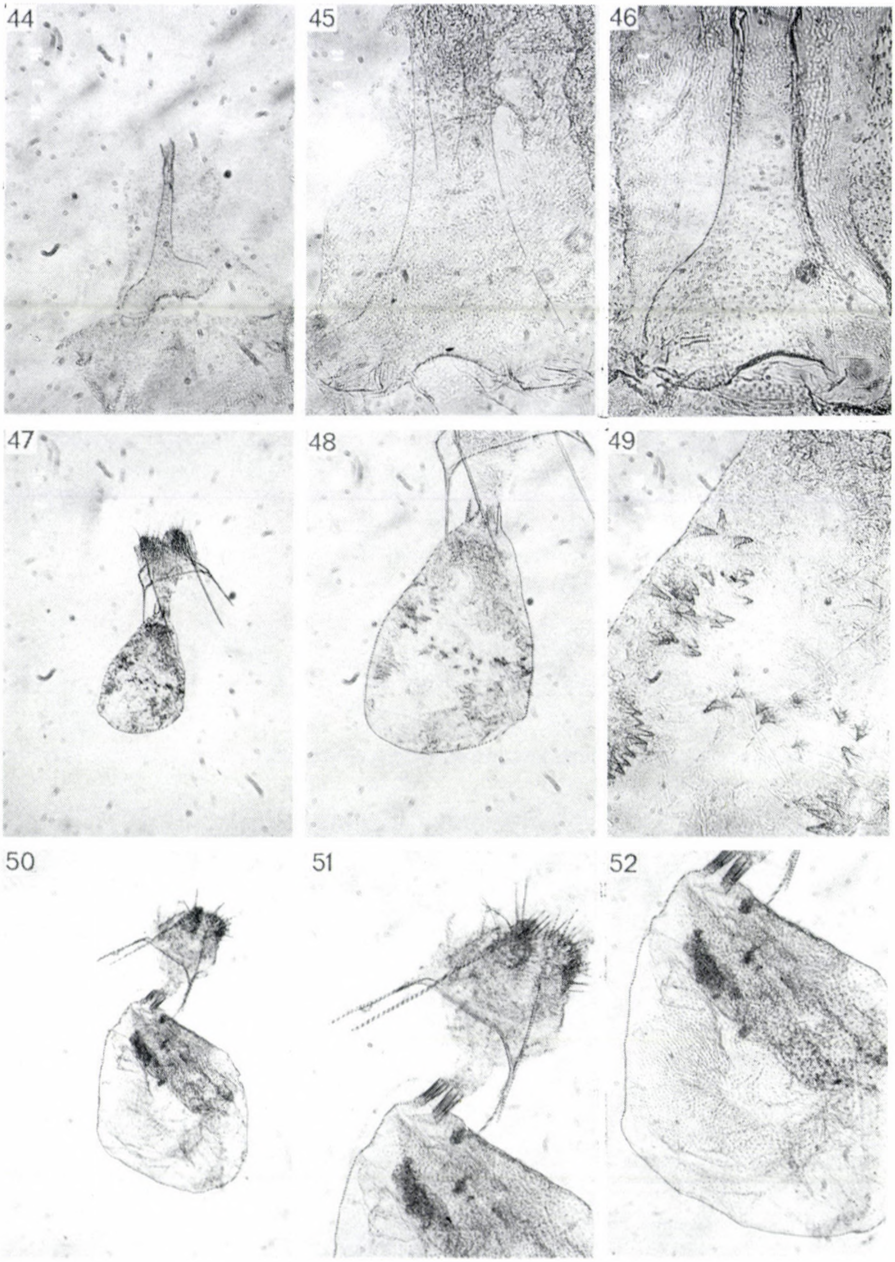
26—28 = Uncus and clavulus of 26 = *Eupithecia chapo* sp. n., 27 = *E. cabreria* sp. n. and 28 = *E. vallenarensis* RINDGE. — 29—34 = Ampullae of 29 = *E. yelchoensis* RINDGE, 30 = *E. pucatrihue* RINDGE, 31 = *E. trancasae* RINDGE, 32 = *E. chapo* sp. n., 33 = *E. cabreria* sp. n. and 34 = *E. vallenarensis* RINDGE.

Plate V.



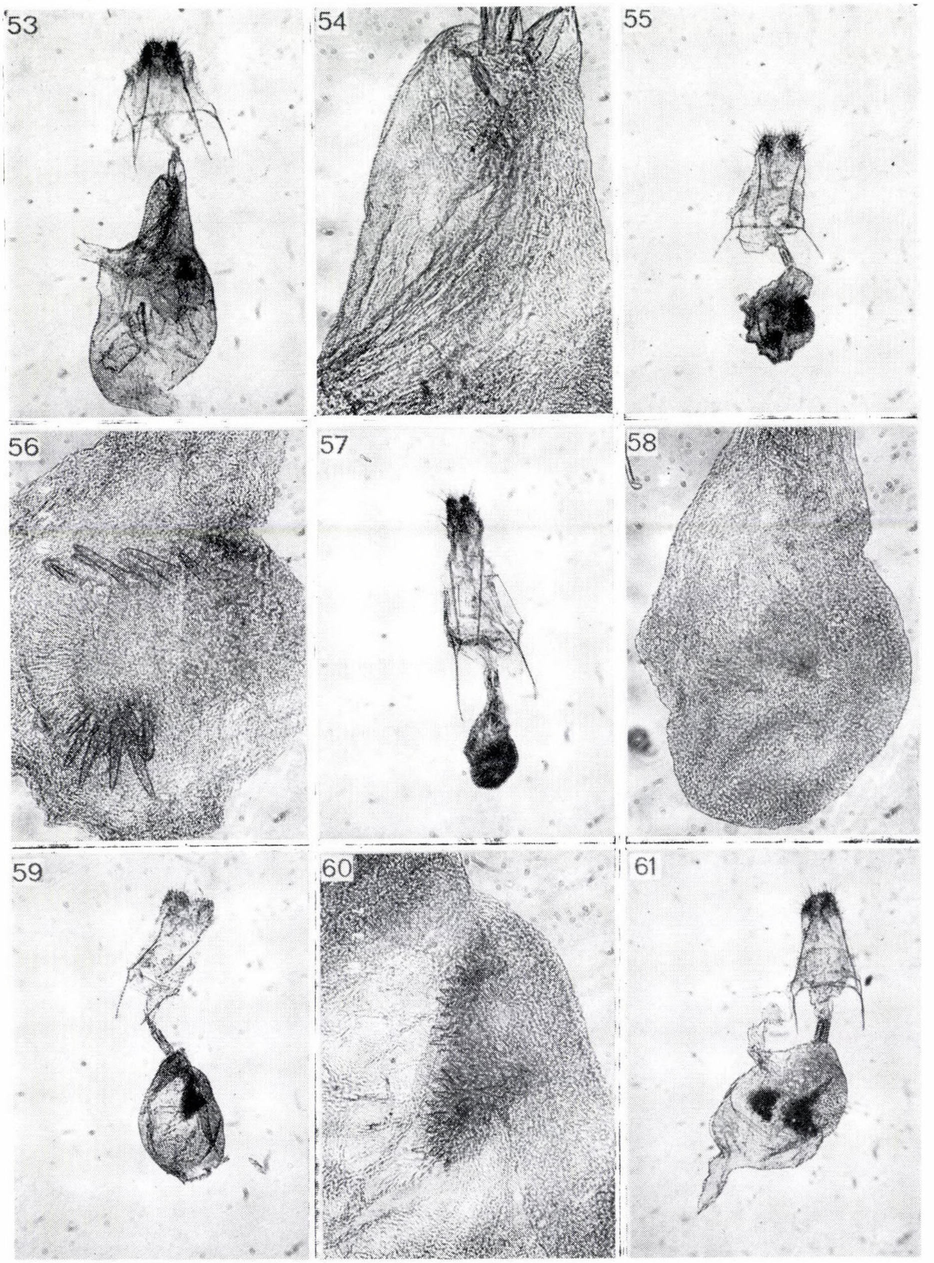
35—40 = Aedoeagus of 35 = *Eupithecia yelchoensis* RINDGE, 36 = *E. pucatrihue* RINDGE, 37 = *E. trancasae* RINDGE, 38 = *E. chapo* sp. n., 39 = *E. cabreria* sp. n. and 40 = *E. vallenarensis* RINDGE. — 41—43 = Sternit VIII of 41 = *E. yelchoensis* RINDGE, 42 = *E. pucatrihue* RINDGE and 43 = *E. trancasae* RINDGE.

Plate VI.



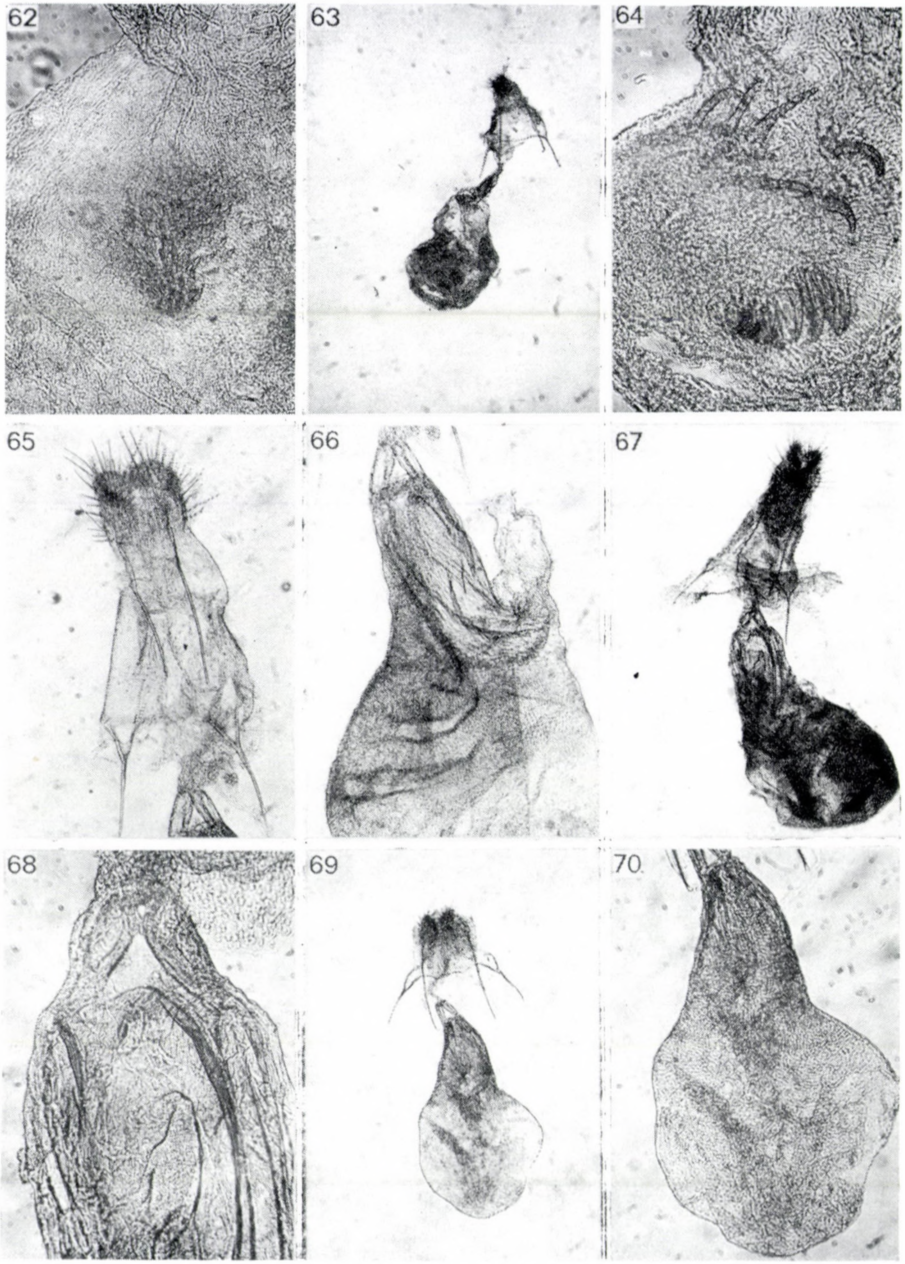
44–46 = Sternit VIII of 44 = *Eupithecia chapo* sp. n., 45 = *E. cabreria* sp. n. and 46 = *E. vallenarensis* RINDGE. — 47 = Female genitalia of *E. trancasae* RINDGE. — 48–49 = Bursa copulatrix of *E. trancasae* RINDGE. — 50 = Female genitalia of *E. cabreria* sp. n. — 51 = Apophyses and papillae anales of *E. cabreria* sp. n. — 52 = Bursa copulatrix of *E. cabreria* sp. n.

Plate VII.



53 = Female genitalia of *Eupithecia jorge* sp. n. — 54 = Bursa copulatrix of *E. jorge* sp. n. — 55 = Female genitalia of *E. cautin* sp. n. — 56 = Bursa copulatrix of *E. cautin* sp. n. — 57 = Female genitalia of *E. kinga* sp. n. — 58 = Bursa copulatrix of *E. kinga* sp. n. — 59 = Female genitalia of *E. rindgei* sp. n. — 60 = Bursa copulatrix of *E. rindgei* sp. n. — 61 = Female genitalia of *E. pucon* sp. n.

Plate VIII.



62 = Bursa copulatrix of *Eupithecia pucon* sp. n. — 63 = Female genitalia of *E. elbuta* sp. n. — 64 = Bursa copulatrix of *E. elbuta* sp. n. — 65 = Apophyses and papillae anales of *E. ovalle* sp. n. — 66 = Bursa copulatrix of *E. ovalle* sp. n. — 67 = Female genitalia of *E. selva* sp. n. — 68 = Bursa copulatrix of *E. selva* sp. n. — 69 = Female genitalia of *E. calientes* sp. n. — 70 = Bursa copulatrix of *E. calientes* sp. n.

Acta Zoologica Hungarica 38 (1—2), pp. 145—147 (1992)

PHANEROTOMA PUCHNERIANA SP. N. AUS UNGARN UND DER TÜRKEI (HYMENOPTERA, BRACONIDAE: CHELONINAE)

H. ZETTEL

Naturhistorisches Museum, 2. Zoologische Abteilung
Burgring 7, A-1014 Wien, Österreich

(Eingegangen am 25. Februar 1991)

Phanerotoma puchneriana sp. n. from Hungary and Turkey (Hymenoptera, Braconidae: Cheloninae). Description of the new species as well as its related species are presented. With 6 original figures.

In den letzten Jahren hat die Erforschung europäischer *Phanerotoma*-Arten große Fortschritte gemacht, und zwar nicht nur durch meine Dissertation an der Universität Wien (ZETTEL 1990). Besonders hervorzuheben ist die Revision der westpaläarktischen Arten durch meinen hochgeschätzten Kollegen DR. C. VAN ACHTERBERG (ACHTERBERG 1990).

Hier soll eine weitere, bisher unbeschriebene Art bekannt gemacht werden. *Ph. puchneriana* sp. n. nimmt im System der bekannten *Phanerotoma*-Arten eine Sonderstellung ein: Die meisten Gruppenmerkmale, nämlich Form des Kopfes und der Antennen, kleine Augen und Ocellen, Flügelgeäder, Skulptur und die Form des Carapax, stellen sie ganz offensichtlich in die Verwandtschaft der Arten *Ph. moravica* ŠNOFLÁK 1951 und *Ph. waitzbaueri* ZETTEL 1987; also in die *popovi*-Gruppe (ZETTEL 1990), welche in ihrer Charakterisierung etwa mit dem Subgenus *Unica* ŠNOFLÁK 1951 übereinstimmt (ŠNOFLÁK 1951, ZETTEL 1987). Jedoch befinden sich anstatt der typischen zwei großen Zähnchen am Clypeusvorderrand drei kleine. Auch fehlt die charakteristische kräftige Bänderung der Vorderflügel. Diese Merkmale hat *Ph. puchneriana* mit den meisten Arten der *fasciata*-Gruppe (ZETTEL 1990) gemeinsam.

Ich bedanke mich herzlich bei DR. A. BEYARSLAN (Trakya Universität, Edirne) und DR. J. PAPP (Naturwissenschaftliches Museum, Budapest), welche mir die Tiere zur Bearbeitung überlassen haben.

Phanerotoma puchneriana sp. n. ♀♂
(Abb. 1—6)

Untersuchtes Material: Holotypus (♀): Ungarn, Peszér (leg. Uhl), im Naturwissenschaftlichen Museum, Budapest; Allotypus (♂): Türkei, Edirne, Haciumur, 13. VI. 1987 (leg. F. INANC), in der Trakya Universität, Edirne.

♀: K o p f nur sehr wenig quer; Augen sehr klein, nicht über die Schläfen vorgewölbt; Occiput tief eingebuchtet (Abb. 2); Schläfe 1,45mal so breit wie das Auge; Malarraum 0,7mal so hoch wie das Auge lang (Abb. 1); Gesicht

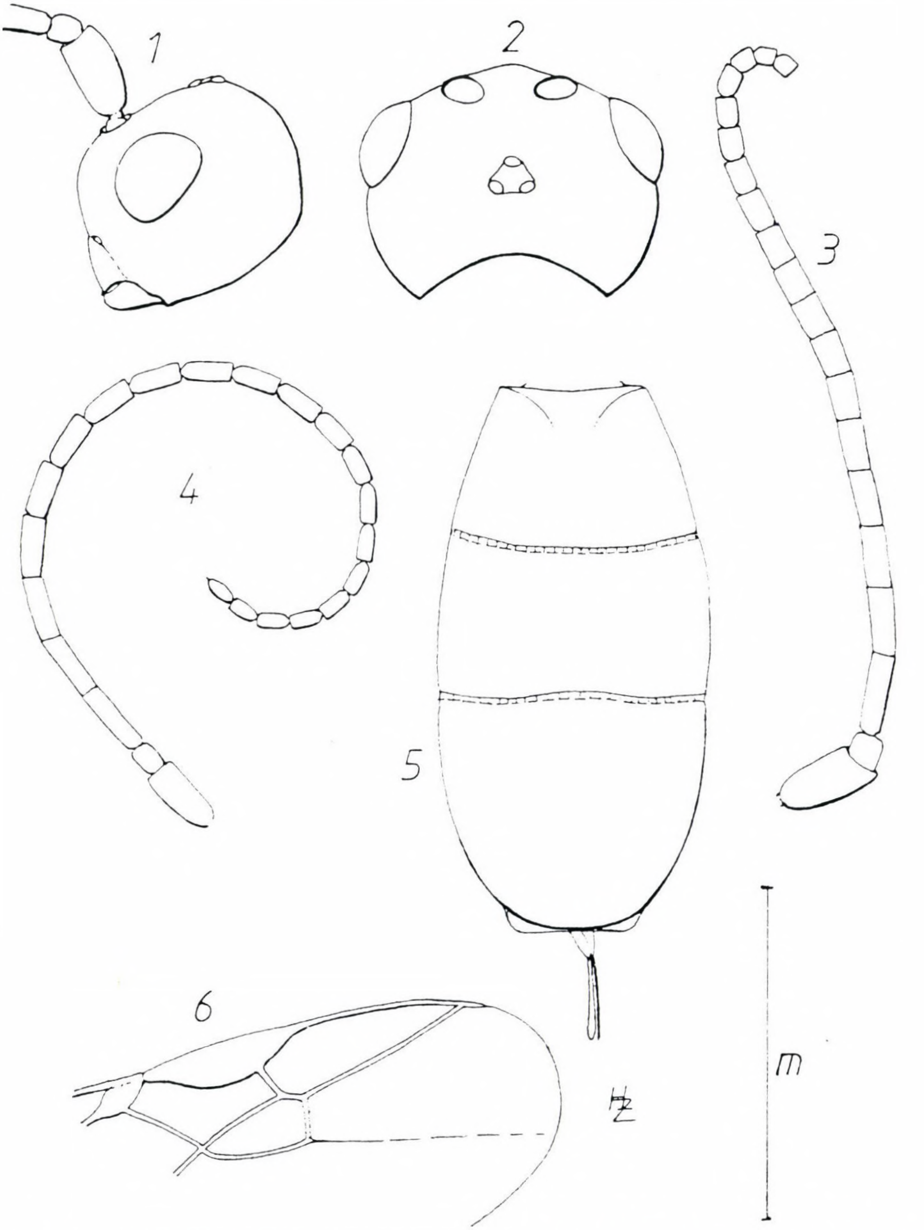


Abb. 1—6: *Phanerotoma puchneriana* n. sp.: 1—3, 5—6 = Holotypus, ♀; 4 = Allotypus, ♂; 1 = Kopf, lateral, 2 = Kopf, dorsal, 3 und 4 = Antennen, 5 = Carapax, dorsal, 6 = Vorderflügel, Ausschnitt (m = 1 mm).

1,17mal so breit wie Gesicht und Clypeus zusammen hoch, dicht granuliert, matt; Clypeus zwischen der spärlichen Punktur erloschen granuliert, etwas glänzender, am Vorderrand mit drei kleinen Zähnchen; Mandibel breit, ihr Zahn wenig kürzer als die Spitze; Stirn runzelig-granuliert, matt; Vertex und Schläfen dicht gerunzelt, matt; Ocellen sehr klein, POL 1,2, OOL 7,5 (Abb. 2). — Antenne nach dem 20. Glied abgebrochen; 3. Glied 1,15mal so lang wie das 4., 10. Glied 1,35mal, 15. 1,35mal und 20. 1,1mal so lang wie breit (Abb. 3).

Mesoscutum dicht und fein gerunzelt, matt; Parapsiden vorne schwach erkennbar; Mesopleuren gerunzelt-granuliert, matt; Sternauli etwas gröber gerunzelt, undeutlich; Mesosternum dicht granuliert, matt; Propodeum gröber gerunzelt, matt, ohne Querleiste und Seitenecken, in Seitenansicht stumpf gewinkelt. — Flügel (Abb. 6): R wenig länger als das Stigma (1,15mal); *r1* : *r2* : *r3* : = 1,1 : 1 : 6,1; *r2* : *cuqu2* = 0,75; *n. rec.* interstitial; *d1* : *d2* = 0,35. — Beine: Mitteltibia nur mit schwacher Ausbuchtung, ihr längerer Sporn 0,45mal so lang wie der Basitarsus; Hinterfemur 3,85mal so lang wie breit.

Carapax (Abb. 5) 1,2mal so lang wie der Thorax und 2,05mal so lang wie breit, schwach gewölbt, fein und dicht netzrunzelig, mit kurzen Basalkielen, am Hinterrand (von hinten gesehen) flach eingebuchtet; Länge der drei Tergite wie 0,9 : 1 : 1,5; Bohrer kurz vorgestreckt. Färbung: (bräunlich-)orange, Scutellum, Postscutum, Propodeum und 3. Metasomaltergit dunkler braun, 1. und 2. Metasomaltergit gelb, Antenne dunkel gebräunt; Flügel milchig trüb, stellenweise schwach bräunlich, Geäder gelbbraun, Beine gelblich-orange. — Körperlänge: 3,5 mm; Vorderflügellänge: 2,3 mm.

♂: Kopf schwächer skulpturiert und etwas glänzender; Antenne 23-gliedrig und schlanker, ihr 10. Glied 2,5mal, 15. und 20. 2,0mal so lang wie breit (Abb. 4); Carapax hinten abgerundet; Klauen der Hintertarsen lang gezähnt; Thorax und die gesamten Antennen dunkelbraun, Beine stärker gebräunt und Flügel bräunlich getrübt; Körperlänge 3,4 mm.

Diese Art widme ich meinem Freund, dem Carabus-Kenner ALFRED PUCHNER in Ternitz, Niederösterreich.

SCHRIFTTUM

ACHTERBERG, C. VAN (1990): Revision of the Western Palearctic Phanerotomini (Hymenoptera: Braconidae). — *Zool. Verh. Leiden* **255:** 1—106.

ŠNOFLÁK, J. (1951): La Monographie de Phanerotoma Wesm. et de Phanerotomella Szépl. (Hym., Braconidae) de la Tchécoslovaquie. — *Ent. Listy* **13:** 5—33.

ZETTEL, H. (1987): Beiträge zur Kenntnis der Sigalphinen- und Cheloninen-Fauna in Österreich (Hymenoptera, Braconidae). — *Linzer biol. Beitr.* **19:** 359—376.

ZETTEL, H. (1990): Beiträge zu einer Revision der Cheloninae unter besonderer Berücksichtigung der Tribus Phanerotomini (Hymenoptera, Braconidae). — Dissertation an der Universität Wien, 2 Bände, 573 pp.

Acta Zoologica Hungarica 38 (1—2), pp. 149—158 (1992)

REGENWÜRMER AUS DEM KRÜGER NATIONAL PARK IN SÜD-AFRIKA (OLIGOCHAETA, EUDRILIDAE)

A. ZICSI & J. A. REINECKE

Bodenzoologische Forschungsgruppe der Ungarischen Akademie der Wissenschaften, am Lehrstuhl für Tiersystematik und Ökologie der Eötvös-Loránd-Universität, H-1088 Budapest, Puskin utca 3, Ungarn

Instituut vor Dierkundige Navorsing, Departement Dierkunde, Potchefstroomse Universiteit vir C.H.O., Potshefstroom, Süd-Afrika

(Eingegangen am: 5. April 1991)

Description of two new *Nemertodrilus* species are given: *N. kruegeri* sp. n. and *N. transvaalensis* sp. n. Collectings carried out in the vicinity of Kruger National Park were studied and elaborated. With 5 original figures.

Mit der Erkundung der Regenwurm Fauna des Krüger National Parkes wurde vor einigen Jahrzehnten begonnen (LJUNGSTRÖM 1972, REYNOLDS & REINECKE 1976, REINECKE & ACKERMANN 1977). Bei den bisher bekanntgewordenen Arten handelte es sich hauptsächlich um peregrine Formen aus der Familie Glossoscolecidae, Lumbricidae, Megascolecidae und Octochaetidae. Allein die von REINECKE & ACKERMANN (1977) beschriebenen Spezies der Gattung *Dichogaster*, Familie Octochaetidae scheinen endemische Formen im Krüger National Park zu sein. Mit Sicherheit sind hingegen die von PLISKO & ZICSI (1991) unlängst beschriebenen neuen und bekannten Arten der Gattung *Tritogenia*, Familie Microchaetidae als Endemismen aus diesem Gebiet zu betrachten. Nachstehend sollen aus dem Krüger National Park jetzt Vertreter einer weiteren Familie der terrestrischen Oligochaeten, u. zw. Arten aus der Gattung *Nemertodrilus* der Familie Eudrilidae angeführt werden. Die zur Beschreibung gelangenden neuen Arten sind durch die Direktion des National Parkes in der Zwischenzeit vom 5. 5. 1976—9. 10. 1976 gesammelt lassen worden. Ebenfalls werden auch die Aufsammlungen bekanntgegeben, die von den Autoren im Mai 1990 ausserhalb des Nationalparkes gemeinsam gesammelt wurden.

Beschreibung der Arten

Familie EUDRILIDAE CLAUS, 1880

Unterfamilie PAREUDRILINAE BEDDARD, 1894

Gattung **Nemertodrilus** MICHAELSEN, 1890

Wie bekannt (SIMS 1987) sind aus der Gattung *Nemertodrilus* MICHAELSEN, 1890 bisher nur 2 Arten beschrieben worden. Es sind dies *N. griseus* MICHAELSEN, 1890 aus dem Mündungsgebiet des Sambesi Flusses, Mosambique und *N. kellneri* MICHAELSEN 1910 aus der Orange-Colony, Bloemfontein in Süd-Afrika. Die bekanntgewordenen beiden Fundorte liegen weit voneinander entfernt, letzterer ist auch das südlichste Verbreitungsgebiet der Vertreter der Familie Eudrilidae (MICHAELSEN 1910, 1913; OMODEO 1958). Das Vorkommen der jetzt zur Beschreibung gelangenden zwei neuen Arten aus dem Krüger National Park, zwischen dem 23. und 25. südlichen Breitegrad, liegt zwischen den beiden bisher angegebenen Fundorten und unterstützt die bisher fragliche Annahme, dass der Fundort in Bloemfontein ein natürliches Vorkommen dieser Art sein kann.

Die Arten der Gattung *Nemertodrilus* unterscheiden sich von allen übrigen Arten der Unterfamilie Pareudrilinae dadurch, dass sie über zwei gesonderte Samentaschenöffnungen und zwei ebenfalls gesonderte Prostataporen verfügen und keine Penialborsten besitzen. Wie aus der Beschreibung der beiden erwähnten Arten hervorgeht, gestaltet sich der weibliche Geschlechtsapparat samt Samentaschen besonders kompliziert und lässt verschiedene Vermutungen bezüglich ihrer Funktion aufkommen. Obwohl ausführliche Beschreibungen von beiden Arten vorliegen, war es erforderlich durch Überprüfung des Typenmaterials beider Arten, die Stichhaltigkeit der neuen Arten zu sichern. Während eines Studienaufenthaltes des Erstautors im Zoologischen Institut und Museum von Hamburg, gelang es von beiden Arten das Typenmaterial einzusehen. Für den Aufenthalt im Zoologischen Institut und Museum von Hamburg sprechen wir der Direktion sowie Herrn Prof. Dr. M. Dzwillo auch an dieser Stelle unseren besten Dank aus.

Unter Inv. Nr. V. 230 lagen zahlreiche mehr oder weniger erweichte, doch noch nachbestimmbare juvenile und adulte Exemplare von *N. griseus* MICHAELSEN, 1890 aus Quilimane (Mosambique) leg. STUHLMANN 2. III. 1889, vor. Ebenfalls waren zahlreiche Exemplare auch von der anderen Art *N. kellneri* MICHAELSEN, 1912 anzutreffen (Inv. Nr. V. 3304 Orange-Colony, Bloemfontein leg. B. O. KELLNER 1909). Auch diese Tiere sind ziemlich erweicht, Nachbestimmungen liessen sich gut durchführen.

Bei beiden Arten konnte der cölomatische Sack wieder erkannt werden in dem ausser Eizellen auch Spermatophoren von MICHAELSEN erkannt werden konnten. Wie diese aus den Samentaschenporen her gelangen können soll bei den beiden Arten verschieden sein. Bei *N. griseus* ist von dem Dissepiment 12/13 und 13/14 verwachsen eine Kammer gebildet worden in die die Samentaschenöffnungen münden. Am hinteren Rand öffnen sich diese in die paarigen, langestreckten auch bis ins 17. Segment reichenden Säcke. Bei *N. kellneri* sind die mutmasslichen Samentaschenporen, die sich nur während der Begattung öffnen und später verwachsen, innen von zahlreichen Gewebselementen umstellt und einen kleinen Samentaschenraum einschliessen. Dieser Sack umhüllt den Eileiter ohne den Eitrichter einzuschliessen, steht jedoch mit dem cölomatischen Sack in Verbindung. Da bei den beiden neuen Arten ähnliche Ausbildungen in Erscheinung treten, musste vor allem die Form dieser Gebilde wieder erkannt werden. An dieser Stelle sei noch bemerkt und hervorgehoben, dass bei *N. griseus* die Samensäcke bei allen geöffneten Tieren auf das 12. Segment beschränkt waren und nicht wie in der Originalbeschreibung angegeben bis ins 18. Segment reichen sollen. Ausserdem konnte entweder bei *griseus* noch bei *kellneri* das Vorhandensein von Fettkörperchen hinter dem Muskelmagen liegenden Segmenten erkannt werden.

Da in der Originalbeschreibung von MICHAELSEN kein Holotypus festgelegt wurde, soll unter Inv. Nr. V. 230/A von *N. griseus*, unter Inv. Nr. V. 3304/A von *N. kellneri* ein Lectotypus designiert werden.

Nemertodrilus kruegeri sp. n.

Holotypus: Länge 88 mm, Dicke 3 mm Segmentzahl 193. Bei den Paratypen: Länge 65—95 mm, Dicke 2,5—3,2 mm, Segmentzahl 117—196.

Farbe abgetötet rötlichgrau.

Kopf proepilobisch bis epilobisch 1/4 geschlossen. Erstes Segment mit Längsfurchen dicht versehen. Borsten zart eng gepaart. Borsten vor dem Gürtel *ab* = *cd*; *aa* etwas grösser als *bc*. Borsten hinter dem Gürtel ventrolateral gelegen, Borstendistanz *aa* : *ab* : *bc* : *cd* : *dd* wie 17 : 3 : 16 : 1,8 : 100. Rückenporen fehlen. Nephridialporen in der Borstenlinie *ab*. Weibliche Poren auf dem 14. Segment, unterhalb der Borstenlinie *cd*, kleine weisse Punkte. Männliche Poren paarig auf Intersegmentalfurche 17/18 auf einer kegelförmigen Erhebung beiderseits (Abb. 1).

Gürtel vom 13.—21. Segment oder nur vom 14.—20. Segment deutlich ausgebildet.

Samentaschenporen paarig auf Intersegmentalfurche 13/14 in der Borsteinlinie ab. Die Samentaschenporen sind von einer kreisförmigen Erhellung umgeben.

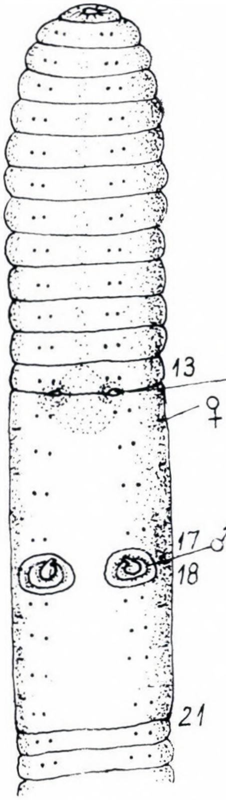
Innere Organisation: Dissepimente 5/6 mässig, 6/7—8/9 stark, 9/10—12/13 mässig verdickt. Muskelmagen im 5. Segment. Fettkörperchen am Ösophagus nicht erkannt. Intestinalherzen im 7.—9. Segment, 2 grosse Lateralherzen im 10. und 11. Segment. Nephridialsystem meganephridish, Nephridien vom 16. Segment beginnend mit dicken Blasenzellenbesatz, erinnert an die Nephridien solcher Regenwürmer die im Wasser oder an sehr feuchten Örtlichkeiten vorkommen. Mitteldarm im 19.—20. Segment beginnend ohne Typhlosolis.

Hoden und Samentrichter im 10. und 11. Segment, sind von aufgefranzten Testikelblasen umgeben. Samensäcke im 11. und 12. Segment, die Samensäcke sind auf die entsprechenden Segmente beschränkt. Samenrinnen verlaufen dicht nebeneinander und münden im 17. Segement oben in die Euprostaten ein. Euprostaten muskulös, etwas gewunden, nehmen ein oder anderthalb Segmente ein.

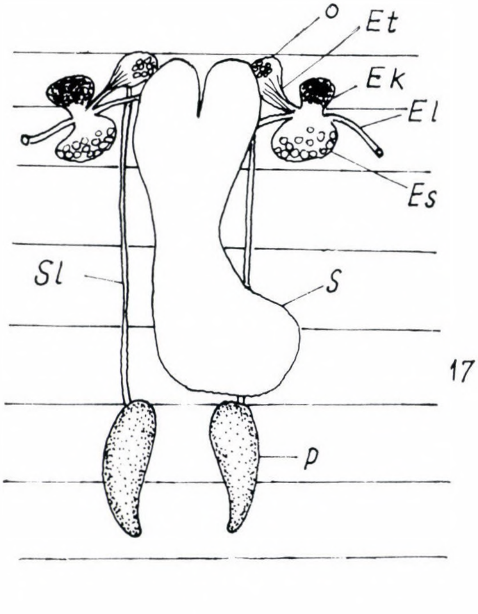
Weiblicher Geschlechtsapparat (Abb. 2). Weibliche Geschlechtsorgane sind vollständig getrennt paarig. Ein Paar büschlige Ovarien ragen vom ventralen Rand des Dissepimentes 12/13 in die Leibeshöhle des 13. Segmentes. Der Eileiter geht in den Eitrichter über, im oberen Teil ist ein Eikämmerchen, im unteren Teil ein grosser Eiersack vorhanden. Der Eitrichter ist auf der Ventralseite mit der Samentasche in Verbindung.

Samentasche im 13. Segment mit einer mehr oder weniger deutlich doppelköpfigen Ampulle beginnend die auch bis ins 17. Segment reichen kann, wo sie angeschwollen oder auch etwas verzweigt, oder nur einfach gebogen enden kann (Abb. 2). Insbesondere am Ende voll mit Samenmassen.

Die neue Art steht innerhalb ihrer Gattung dem N. griseus am nächsten, unterscheidet sich jedoch von ihr durch das Vorhandensein der Samentasche. Ausserdem steht die neue Art auch Stuhlmannia zielae (OMODEO 1958) im Bau des weiblichen Geschlechtsapparates nahe, unterscheidet sich jedoch von dieser dadurch, dass sie keine Penialborsten besitzt.



1



2

Abb. 1—2. *Nemertodrilus kruegeri* sp. n.: 1 = Ventralansicht Sp = Samentaschenporen. — Geschlechtsorgane O = Ovarien, Et = Eitrichter, El = Eileiter, Es = Eiersack, S = Samentasche, Sl = Samenteiter, P = Prostata.

F u n d o r t e: Sämtliche Exemplare wurden im Krüger National Park zwischen dem 24. und 25. südlichen Breitegrad gesammelt. — H o l o t y p u s: AF/1880 Marumbeni 2 24°43′36″—31°38′40″. — P a r a t y p e n: AF/1881—1882 10 + 6 praead. Ex. Fundort wie beim Holotypus. — AF/1884—85 10 + 8 juv. Ex. Eileen 24°47′18″—31°52′. AF/1883. 5 + 1 juv. Ex. Sundwini 24°45′30″—31°40′. — AF/1886. 1 + 7 praead. Ex. Mafagalamba 24°45′30″—31°51′27″.

Nemertodrilus transvaalensis sp. n.

Von dieser im Krüger National Park, zwischen dem 23. und 24. südlichen Breitegrad weit verbreiteten Art, wurden zahlreiche in verschiedenen Entwicklungsstadien angetroffene Exemplare gesammelt. Obwohl zwischen den einzelnen Populationen, aber auch innerhalb der von einem Fundort stammenden Tiere gewisse Unterschiede in Grösse und anderen Kennzeichen bestehen, betrachten wir sie als eine Art und führen bei der Beschreibung die Unterschiede bzw. das Variieren der Merkmale an.

Holotypus: Länge 95 mm, Dicke 2 mm, Segmentzahl 168. Paratypen: Länge 45—105 mm, Dicke 1,8—2,8 mm, Segmentzahl 64—190.

Farbe abgetötet rauchgrau bis gelbgrau.

Kopf prolobisch bis proepilobisch. Erstes Segment nicht gefurcht. Segmente einfach geringelt. Borsten zart eng gepaart. Borsten vor dem Gürtel *aa* nur etwas grösser als *bc*; *ab* = *cd*. Borstendistanz hinter dem Gürtel *aa* : *ab* : *bc* : *cd* : *dd* = 10 : 2 : 12 : 2 : 50. Rückenporen fehlen. Nephridialporen in der Borstenlinie *ab*. Weibliche Poren auf dem 14. Segment, dicht unterhalb der Borstenlinie *c*. Männliche Poren paarig auf einer kleinen kegelförmigen Erhebung, dicht nebeneinander innerhalb der Borstelinie *aa* (Abb. 3). Bei einigen Exemplaren fehlen die Männliche Poren, in diesen Fällen fehlen auch die Prostata.

Gürtel vom 13., 1/2 13., 14.—1/2 18., 18. Segment gürtelförmig, stark angeschwollen. Die Lage des Gürtels variiert auch innerhalb einer Population.

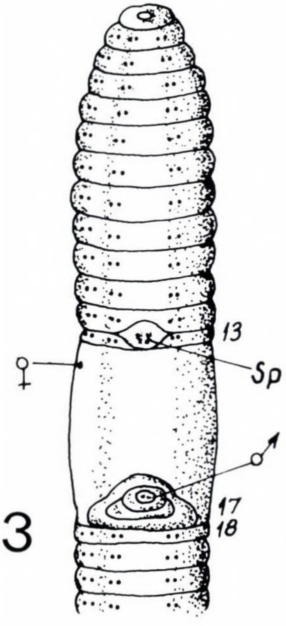
Samentaschenporen auf dem 13. Segment von einer runden, weissen Papille umgeben. Die Papille geht entweder etwas auf das 12. Segment oder auf das 14. Segment über. Die Öffnungen der Samentaschenporen sind sehr dicht nebeneinander, nur bei juvenilen und praeadulten Exemplaren zu erkennen. Bei adulten Tieren sind die Öffnungen vollkommen verwachsen und von einer Haut überdeckt.

Innere Organisation: Dissepimente 5/6—8/9 stark verdickt, 9/10—12/13 mässig stark verdickt. Muskelmagen im 5. Segment. Fettkörperchen am Ösophagus hinter dem Muskelmagen nicht erkannt. Intestinalherzen im 7.—9. Segment, Lateralherzen im 10. und 11. Segment. Nephridialsystem meganephridisch, Nephridien vom 18. Segment beginnend mit etwas dickerem Blasenzellenbesatz versehen, der an die Nephridien solcher Regenwürmer erinnert die in sehr feuchten Örtlichkeiten vorkommen. Die Ausbildung dieses Blasenzellenbesatzes war bei den einzelnen Populationen verschieden stark. Mitteldarm im 18. Segment ebginnend, ohne Typhlosolis.

Hoden und Samentrichter im 10. und 11. Segment, letztere grosse Gebilde. Beide von mächtigen Testikelblasen umgeben, die auch die Samensäcke des 11. Segmentes umgeben. Diese Testikelblasen, oder diesen ähnliche Gebilde, lassen sich nicht bei allen Exemplaren nachweisen und sind von verschiedener Stärke und Grösse ausgebildet. Samensäcke im 11. und 12. Segment, klein auf die entsprechenden Segmente beschränkt. Die Samenrinnen verlaufen dicht nebeneinander und münden seitlich im oberen Teil der Euprostata ein. Euprostata grosse muskulöse Gebilde die verschieden lang sein können und auch bis ins 22. Segment reichen.

Weiblicher Geschlechtsapparat (Abb. 4). Weibliche Geschlechtsorgane sind vollständig getrennt paarig. Bei den meisten Exemplaren ist das 13.—15. Segment von Samenmassen umhüllt, die ähnlich wie die Gebilde der Testikelbalsen, die Öffnungen der Samentaschenporen und deren Zottenbildungen, den weiblichen Geschlechtsapparat und das 15. Segment umgeben und einhüllen. Nach Ablösen dieser Hülle lässt sich ein gewundener Eileiter erkennen der in einen Eiersack übergeht. Vom ventralen Rand des Dissepimentes 12/13 ragen büschlige Ovarien in die Leibeshöhle des 13. Segmentes hinein und werden von einem Eitrichter der den Eiersack und Eierleiter umhüllt, umgeben. Der Eileiter mündet im 14. Segment aus.

3



4

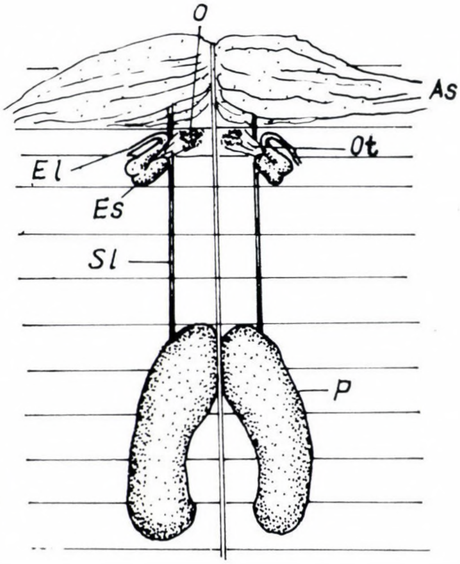


Abb. 3—4. *Nemertodrilus transvaalensis* sp. n.: 3 = Ventralansicht, Sp = Samentaschenporen. 4 = Geschlechtsorgane: O = Ovarien, Ot = Ovarientrichter, As = Samentaschenkämmerchen, Sl = Samenleiter, Es = Eiersack, El = Eierleiter, P = Prostata.

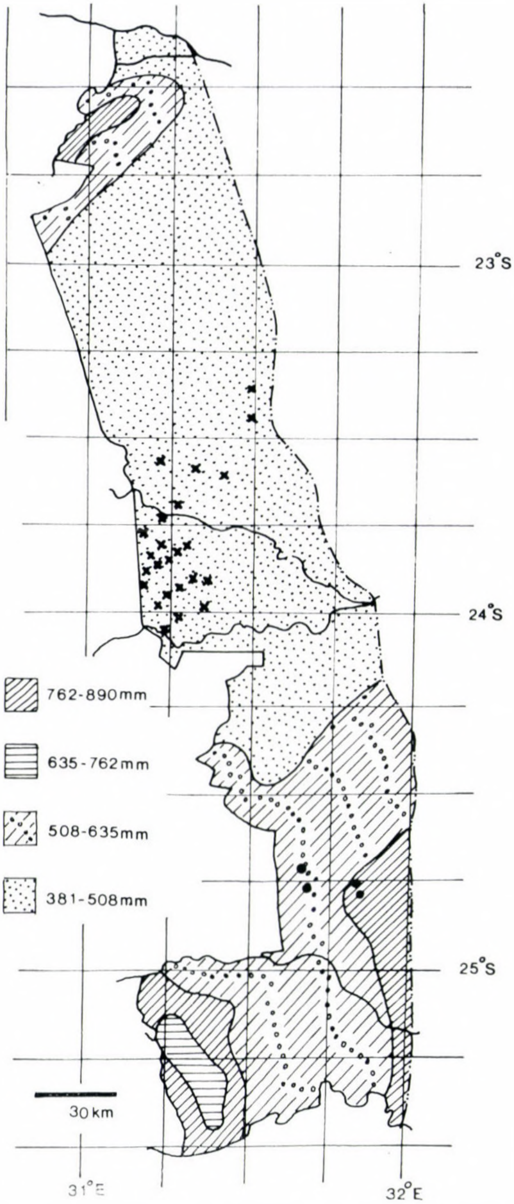


Abb. 5. Die Verbreitung von *Nemertodrilus kruegeri* sp. n. und *Nemertodrilus transvaalensis* sp. n. im Krüger National Park, mit Angaben der durchschnittlichen Jahresniederschläge.

Von eigentlichen Samentaschen kann überhaupt nicht gesprochen werden, diese sind bis auf ein fast geschlossenes Kämmerchen im 13. Segment reduziert und bestehen aus Gewebselementen, die beim Öffnen des Tieres in die Leibeshöhle hineinragen. Ein cölomatischer Sack wie bei N. kellneri konnte nicht erkannt werden.

Die neue Art steht dem *N. kellneri* am nächsten. Unterscheidet sich jedoch von dieser durch die Lage der Prostataporen, der weiblichen Poren und durch die Ausbildung des weiblichen Geschlechtsapparates. In der Form des weiblichen Geschlechtsapparates steht sie auch *Scolecillus tantillus* OMODEO 1958 nahe, doch unterscheidet sie sich von dieser Art durch das Fehlen der Samentasche und durch die paarigen männlichen Poren sowie andere Kennzeichen.

Fundorte: Sämtliche Exemplare wurden im Krüger National Park zwischen dem 23. und 24. südlichen Breitegrad gesammelt. — Holotypus: AF/1945 Shabarumbe 23°35′10″—31°25′30″. — Paratypen: AF/1944 13 + 2 Ex. Fundort wie beim Holotypus. — AF/1922 8 + 2 Ex. Zwischen Malopeni und Veldwagterspos 23°51′—31°10′. — AF/1923 9 Ex. Nhlarweni 23°46′—31°10′. — AF/1924 4 Ex. Fundort wie zuvor. — AF/1925 2 Ex. Ka Gnobene 23°47′—31°19′30″. — AF/1926 11 Ex. Nanzane 23°50′—31°18′. — AF/1927 4 + 12 Ex. Ngwenyeni 23°51′40″—31°14′30″. — AF/1928 13 + 4 Ex. Letaba 23°43′30″—31°15′. — AF/1929 13 Ex. Malopeni Noord 23°49′50″. — AF/1930 5 + 8 Ex. Shikumbu 23°52′12″—31°14′06″. AF/1931 6 + 4 Ex. Phalaborwa 23°53′30″—31°12′. — AF/1932 13 + 2 Ex. Phalaborwahek 23°57′42″—31°11′30″. — AF/1933 16 + 4 Ex. Vudogwa 23°58′42″—31°14″. — AF/1935 6 Ex. Shilamisi 24°30′—31°41′. AF 1937 2 Ex. Fundort wie zuvor. AF/1937 6 + 4 Ex. Mthimkulu 24°01′—31°16′. — AF/1938 13 + 3 Ex. Zwischen Shilandu und Macetse 23°58′—31°16′. — AF/1939 7 Ex. Zwischen Shilandu und Marubeni 23°55′30″—31°22′30″. — AF/1940 7 + 2 Ex. Masorini 23°55′—31°19′. — AF/1941 5 Ex. Von Masorini in Richtung Phalaborwahek 23°56′—31°17′30″. — AF/1942 1 Ex. Shimuwinidam 23°43′—31°16′30″. — AF/1943 11 Ex. Mahubyeni 23°33′—31°13′. — AF/1946 10 + 1 Ex. Vor Shabarumbe 23°34′30″—31°23′. — AF/1947 11 Ex. Mhlatubapan 23°22′—31°09′30″. — AF/1948 10 Ex. Matiwosuka 23°28′30″—31°09′30″.

Familie MEGASCOLECIDAE ROSA, 1891

Gattung **Amynthas** KINBERG, 1867 emend. EASTON, 1982

Amynthas rodericensis (GRUBE, 1879)

AF/1888 11 Ex. Krüger National Park, Skukuza, 26. 5. 1990 leg. ZICSI et REINICKE. — AF/1890 29 + 105 Ex; AF/1893 5 Ex. Umgebung von Sabie, 25.—26. 5. 1990. leg. ZICSI et REINECKE. — AF/1899 1 Ex. Witriver 25. 5. 1990. leg. ZICSI et REINECKE. — AF/1901 8 Ex., AF/1904 2 Ex. Umgebung von Nelspruit 680—750 m. 25. 5. 1990. leg. ZICSI & REINECKE. AF/1909 13 Ex., AF/1911 5 Ex. Montrose 24. 5. 1990 leg. ZICSI et REINECKE. — AF/1913 10 Ex. Graskop, Kreuzung Bosbokra und Eukaliptus 1100 m. 27. 5. 1990 leg. ZICSI et REINECKE.

Amynthas corticis (KINBERG, 1867)

AF/1889 3 + 7 Ex., AF/1894 8 + 6 Ex., AF/1895 6 + 1 Ex., AF/1896 7 Ex. Umgebung von Sabie Nadelwald 1000 m 25. 5. 1990 leg. ZICSI et REINECKE. — AF/1897 2 Ex. Witriver 25. 5. 1990 leg. ZICSI et REINECKE. — AF/1902 8 Ex. Brigadoon vor Nelspruit, 750 m. 25. 5. 1990 leg. ZICSI et REINECKE. — AF/1908 5 Ex. Montrose, Flussufer, 24. 5. 1990. leg. ZICSI et REINECKE. — AF/1912 1 Ex., AF/1914 1 Ex. Umgebung Graskop, 1300 m. Panorama Gorge Wasserfall. 27. 5. 1990 leg. ZICSI et REINECKE. — AF/1916 31 Ex. Stytfontain beim Fluss Ohrigstad 27. 5. 1990 leg. ZICSI et REINECKE. — AF/1919 3 Ex. Potschefstroom Bachufer 22. 5. 1990 leg. ZICSI et REINECKE.

Amynthas morrisi (BEDDARD, 1892)

AF/1891 17 + 7 Ex. Sabie. 25. 5. 1990 leg. ZICSI et REINECKE. — AF/1917 6 Ex. Potschefstromm Bachufer, 22. 5. 1990 leg. ZICSI et REINECKE.

Amynthas minimus (Horst, 1893)

AF/1893 2 + 2 Ex. Sabie, 25. 5. 1990 leg. Zicsi et Reinecke.
AF/1907 2 Ex. 20 km vor Nelspruit 680 m. 24. 5. 1990 leg. Zicsi et Reinecke.

Amynthas gracilis (Kinberg, 1867)

AF/1905 2 Ex. 20 km vor Nelspruit, 680 m. 24. 5. 1990. leg. Zicsi et Reinecke. AF/1918 4 Ex., AF/1920 4 Ex. Potschefstroom, Bachufer und Kompost. 22.—23. V. 1990 leg. Zicsi et Reinecke.

Familie GLOSSOSCOLECIDAE Michaelsen, 1900

Gattung **Pontoscolex** Schmarda 1861

Pontoscolex corethrurus (F. Müller, 1857)

AF/1887 1 Ex. Krüger National Park Skukuzu 26. 5. 1990. leg. Zicsi et Reinecke. — AF/1988 1 Ex. — Witriver 25. 5. 1990. leg. Zicsi et Reinecke. — AF/1900 20 Ex. Krüger National Park Skukuzu 25. 5. 1990. leg. Zicsi et Reinecke. — AF/1901 15 Ex. — Brigadoon, 750 m. 25. 5. 1990. leg. Zicsi et Reinecke. — AF/1906 Nelspruit 680 m. 24. 5. 1990. leg. Zicsi et Reinecke. — AF/1910 16 Ex. Montrose, Flussufer, 24. 5. 1990. leg. Zicsi et Reinecke. — AF/1914 1 Ex. Graskop, Kreuzung Bosbokra und Eukaliptus 1100 m. 27. 5. 1990 leg. Zicsi et Reinecke.

Familie LUMBRICIDAE Rafinesque-Schmaltz, 1815

Gattung **Allolobophora** Eisen, 1874

Allolobophora caliginosa (Savigny, 1826)

Z/11151 2 Ex. Stytfontain 27. 5. 1990 leg. Zicsi et Reinecke.

Gattung **Dendrodrilus** Omodeo 1956

Dendrodrilus rubidus (Savigny, 1826)

Z/11149 3 + 3 Ex. Sabie 1000 m, 25. 5. 1990 leg. Zicsi et Reinecke.

Gattung **Octolasium** Örley, 1885

Octolasium lacteum (Örley, 1885)

Z/1148. Sabie Waéd, 1000 m 25. 5. 1990 leg. Zicsi et Reinecke.

SCHRIFTTUM

Easton, E. G. (1982): Australian Pheretimoid Earthworms (Megascolecidae, Oligochaeta): A synopsis with the description of a new genus and five new species. — *Aust. J. Zool.* **30:** 711—735.

Ljungström, P. O. (1972): Introduced earthworms of South Africa, on their taxonomy, distribution, history of introduction and on the extermination of endemic earthworms. — *Zool. Jb. Syst.* **99:** 1—81.

Michaelsen, W. (1890): Beschreibung der von Herrn Dr. F. Stuhlmann im Mündungsgebiet des Sambesi gesammelten Terricolen. — *Mitt. Naturhist. Mus. Hamburg.* **7:** 1—30.

Michaelsen, W. (1910): Die terrestrischen Oligochaeten des tropischen Afrikas und ihre geographischen Beziehungen. — *Wiss. Erg. D. Zentr.—Afr. Exp.* **1907—08.** (Zool. 1): 1—90.

Michaelsen, W. (1913): Oligochaeten vom tropischen und südlich-subtropischen Afrika II. — *Zoologica* **27:** 1—63.

Omodeo, P. (1958): Oligochétes. — In: *La reserve naturelle intégrale du Mont Nimba. Mém. Inst. fr. Afr. Noire.* **53:** 9—109.

Plisko, J. & Zicsi, A. (1991): Über neue Tritogenia-Arten aus Süd-Afrika (Oligochaeta, Microchaetidae). — *Mitt. hamb. zool. Mus. Inst.* 88: 111–123.

Reinecke, A. J. & Ackerman, D. (1977): New earthworms species (Octochaetinae) from the northeastern Transvaal, South-Afrika. — *Wet. Bydraes van die P. U.* 90: 1—12.

Reynolds, J. W. & Reinecke A. J. (1976): A preliminary survey of the earthworms of the Kruger National Park, South-Afrika (Oligochaeta, Glossoscolecidae, Megascolecidae and Octochaetidae). — *Wet. Bydraes van die P. U.* **89**: 1—19.

Sims, R. W. (1987): Review of the Central Africa earthworm family Eudrildae (Oligochaeta). — *Proc. Int. Symp. on Earthworms. ed. Pagliai and Omodeo, Bologna, Select. Symp. and Monographs* **2:** 359—388.

PRINTED IN HUNGARY

Akadémiai Kiadó és Nyomda Vállalat, Budapest

NOTES TO CONTRIBUTORS

I. PAPERS will be considered for publication in *Acta Zoologica* only if they have not previously been published or submitted for publication elsewhere. They may be written in English, French, German or Russian.

Papers should be submitted to

Prof. Dr. J. Balogh
Zoosystematical and Ecological Institute
Eötvös Loránd University
H-1088 Budapest, Puskin utca 3, Hungary

Papers may be either articles with abstracts or short communications. Both should be as concise as possible, articles in general not exceeding 25 typed pages, short communications 8 typed pages.

II. MANUSCRIPTS

1. Papers should be submitted in *two copies.*

2. The text of papers must be of high stylistic standard, requiring minor corrections only.

3. Manuscripts should be typed double spaced on good quality paper, with generous margins.

4. The name of the author(s) and of the institutes where the work was carried out should appear on the first page of the manuscript.

5. *References* should be listed at the end of the paper in the following form:

Bello, A. & Geraert, E. (1972): Redescription of eight species belonging to the superfamily Tylenchoidea (Nematoda). — Nematologica, **18**: 190–200.

For books, please give the initials and family name of the author(s), title of the book, name of publisher, place and year of publication.

References to the literature in the text should be made using the name and date system.

6. *Captions* to illustrations should be listed on a separate sheet, not inserted in the text.

III. ILLUSTRATIONS AND TABLES

1. Each paper should be accompanied by two sets of illustrations, one of which must be ready for the blockmaker. The other set attached to the second copy of the manuscript may be rough drawings in pencil or photocopies.

2. Illustrations must not be inserted in the text.

3. All illustrations should be identified in blue pencil by the author's name, abbreviated title of the paper and figure number.

4. Tables should be typed on separate pages and have captions describing their content. Clear wording of column heads is advisable. Tables should be numbered in Roman numerals (I, II, etc.).

IV. RETURN OF MATERIAL

Owing to high postage costs, the Editorial Office cannot undertake to return *all* material not accepted for any reason for publication. Of papers to be revised (for not being in conformity with the above Notes or for other reasons) only *one* copy will be returned. Material rejected for lack of space or on account of the referees' opinion will not be returned to authors outside Europe.

CONTENTS

Index: 26027

Acta Zoologica Hungarica

VOLUME 38, NUMBERS 3–4, 1992

1828

Akadémiai Kiadó, Budapest

ACTA ZOOL. HUNG. 38 (3—4) 159—391 (1992) HU ISSN 0236-7130

ACTA ZOOLOGICA HUNGARICA

A QUARTERLY OF THE HUNGARIAN ACADEMY OF SCIENCES

Acta Zoologica is published in yearly volumes of four issues by

AKADÉMIAI KIADÓ

Publishing House of the Hungarian Academy of Sciences
H-1117 Budapest, Prielle K. u. 19–35

Subscription information

Orders should be addressed to

AKADÉMIAI KIADÓ
H-1519 Budapest, P.O. Box 245

"This periodical is included in the document delivery program THE GENUINE ARTICLE of the Institute of Scientific Information, Philadelphia. The articles published in the periodical are available through *The Genuine Article* at the Institute for Scientific Information, 3501 Market Street, Philadelphia PA 19104."

Acta Zoologica Hungarica is abstracted/indexed in AGRICOLA, Biological Abstracts, Bibliography of Agriculture, Chemical Abstracts, Current Contents — Agriculture, Biology and Enviromental Sciences, Excerpta Medica, Horticultural Abstracts, Hydre — Index, Plant Breeding Abstracts, Nutrition Abstracts and Reviews, Zoological Records.

Acta Zoologica Hungarica 38 (3–4), pp. 159–174 (1992)

NEW PHTHIRACARID TAXA FROM BRAZILIAN SOILS (ACARI, ORIBATIDA)

J. BALOGH & S. MAHUNKA

Zoosystematical and Ecological Institute, Eötvös Loránd University, H-1088 Budapest, Puskin utca 3, Hungary
Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross utca 13, Hungary

(Received 26th February, 1992)

Description of six new Phthiracaridae species from Brazil are given, some of them represent also new genera: *Mantigueracarus* gen. n., *Neosteganacarus* gen. n. and *Nortonacarus* gen. n. Discussion of the characters in generic level. Rostral furrow a new term for the morphology of the aspis. With 39 original figures.

The study of soil samples collected by the senior author in Brazil, revealed a large number of Phthiracaridae specimens. The greater part of these species belongs to species groups which may be characterised by ano-adanal neotrichy. This character according to many authors, firstly NIEDBAŁA (1986a), not a generic feature.

However, having studied these species we unambiguously verify that this feature in combination with other characters (e.g. the rostral furrow*) is stable, and at the same time, species with this combination form distinct species-group being indicative of supraspecific taxa.

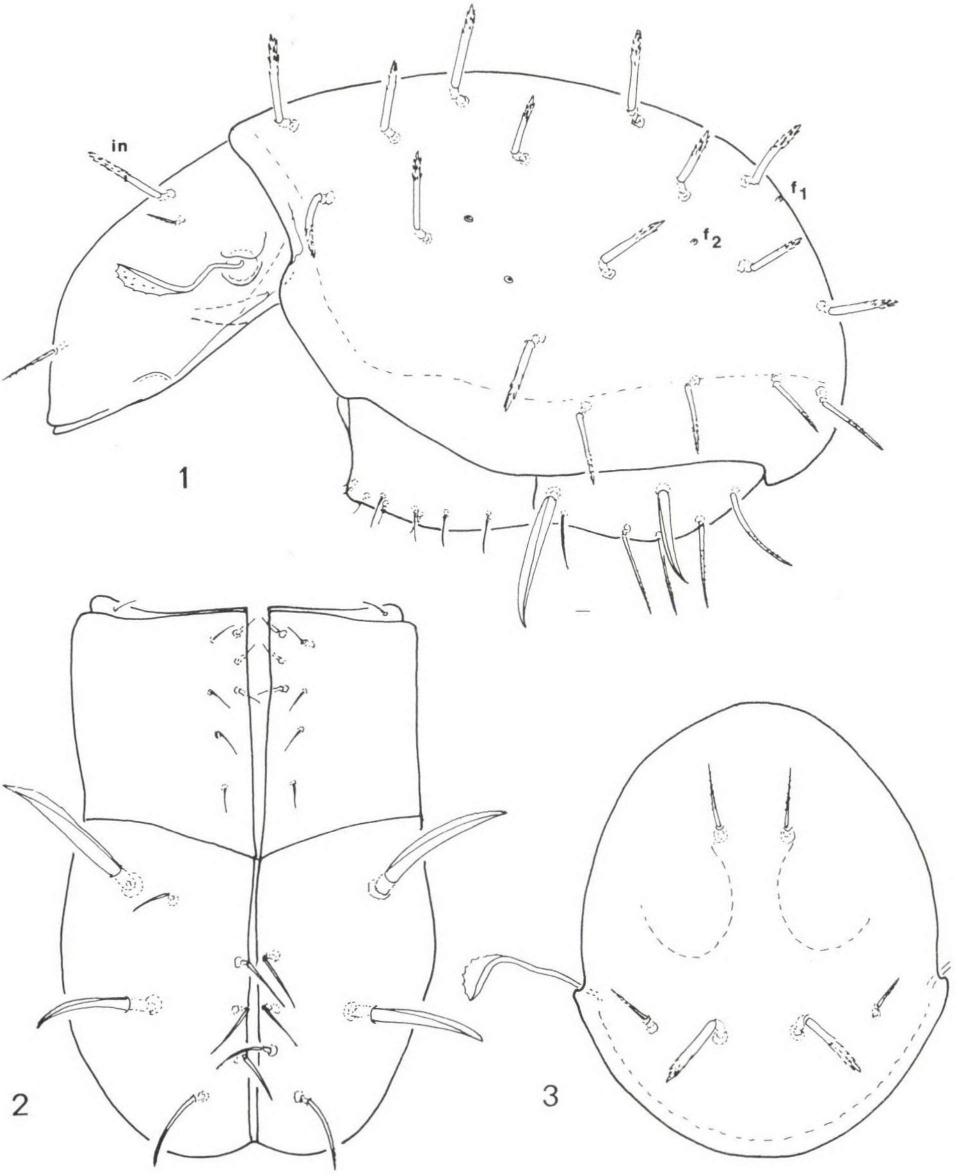
The statement suggests a revision of the system of the family, since certain exclusively used features in this group along with the rejection of specific characteristics can no longer be sustained.

In this paper we describe six species, all new to the science. Neither of them can be placed in any known genera, therefore, we establish now three new genera: *Mantigueracarus* gen. n., *Neosteganacarus* gen. n. and *Nortonacarus* gen. n. On the basis of the leg chaetotaxy and the position of the genital setae all three belong to the subfamily Steganacarinae. Among the species one belongs to *Nortonacarus*, two belong to *Mantigueracarus* and three belong to *Neosteganacarus*.

* The anterior margin of rostrum is deeply invaginated like a furrow, superior margin projecting over inferior one. This may be explained by a fusion (*kag* tectum) with the genito-aggenital plate.

In this material we have examined two species with normal ano-adanal and leg chaetotaxy (seta *d* on tibia IV minute). These will be publish separately, later.

In the description we follow the terminology used by MAHUNKA (1990) and AVANZATI & BERNINI (1989).



Figs 1–3. *Mantigueracarus baggioi* gen. n., sp. n.: 1 = body in lateral aspect, 2 = anogenital region, 3 = aspis in dorsal aspect.

Mantigueracarus gen. n.

Diagnosis: Aspis with strong rostral furrow, median crista and lateral carina absent. Sinus line present. Seventeen pairs of notogastral setae, two pairs of lyrifissures present. Genital setae arranged in two longitudinal rows, setae g_6 located behind setae g_4 and g_5. Ano-adanal neotrichy (7 pairs of ano-adanal setae). Three pairs of setae arising on the inner margin of the ano-adanal plates. Seta *d* on tibia IV long and independent from the solenidium.

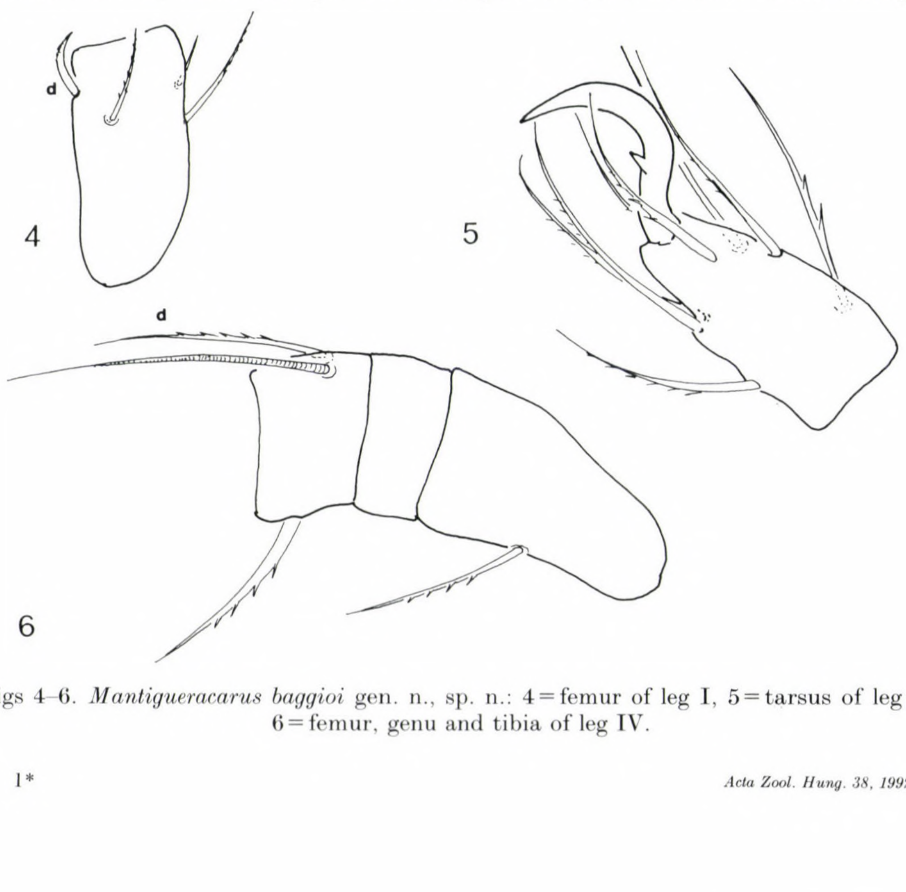
Type species: *Mantigueracarus baggioi* sp. n.

Remarks: The new genus is distinguished from the other newly described genera by the number of setae arising on the inner margin of ano-adanal plates.

Mantigueracarus baggioi sp. n.
(Figs 1–6)

Measurements – Length of aspis: 114–126 μm, length of notogaster: 218–229 μm, height of notogaster: 158–175 μm.

Aspis: Rostral furrow well observable. Lateral rim short, lateral carina absent, sinus line present. Sculpture weak. Rostral setae straight,



Figs 4–6. *Mantigueracarus baggioi* gen. n., sp. n.: 4 = femur of leg I, 5 = tarsus of leg IV, 6 = femur, genu and tibia of leg IV.

finely roughened. Interlamellar setae erect, strong, with 7–8 strong spicules on their distal end. Lamellar setae much shorter than the preceding one, spiniform. Sensillus with a unilaterally dilated, spiculate velum (Fig. 3). Exobothridial setae minute.

Notogaster: Seventeen pairs of strong, erect notogastral setae present, four pairs in the series of *p* setae thinner and weakly spiculate than the others (Fig. 1). These latter with 5–6 strong spicules on their distal end. Two pairs of lyrifissures (*ia*, *im*) located anteriorly, and the alveoli of the vestigial setae (f_1, f_2) present.

Anogenital region (Fig. 2): Nine pairs of genital setae arranged in two longitudinal rows, setae g_4 and g_5 arising beside g_7. Setae g_6–g_9 much longer than the others. Seven pairs setae arising on the ano-adanal plates. Three pairs on the inner margin, four pairs in a semicircle. Two pairs in adanal position much broader than the others, sword-shaped.

Legs: Seta *d* on femur I (Fig. 4) inserted near to the anterior margin. Seta *d* on tibia IV (Fig. 6) long, and independent from the solenidium. Legs setal formulae are:

I: 1 – 4 – 2 + 2 – 5 + 1 – 17 + 3 – 1

IV: 2 – 1 – 0 – 2 + 1 – 8(!) – 1 (Fig. 5).

Material examined – Holotype (1431–HO–92): Brazil, Saõ Paolo, Serra do Mantiguera, V. 1990, rain forest litter, leg. J. Balogh. – 1 paratype from the same sample.

We dedicate the new species to Dr. D. Baggio, the renown Oribatidologist (Brazil).

Remarks: See the remarks after the next species.

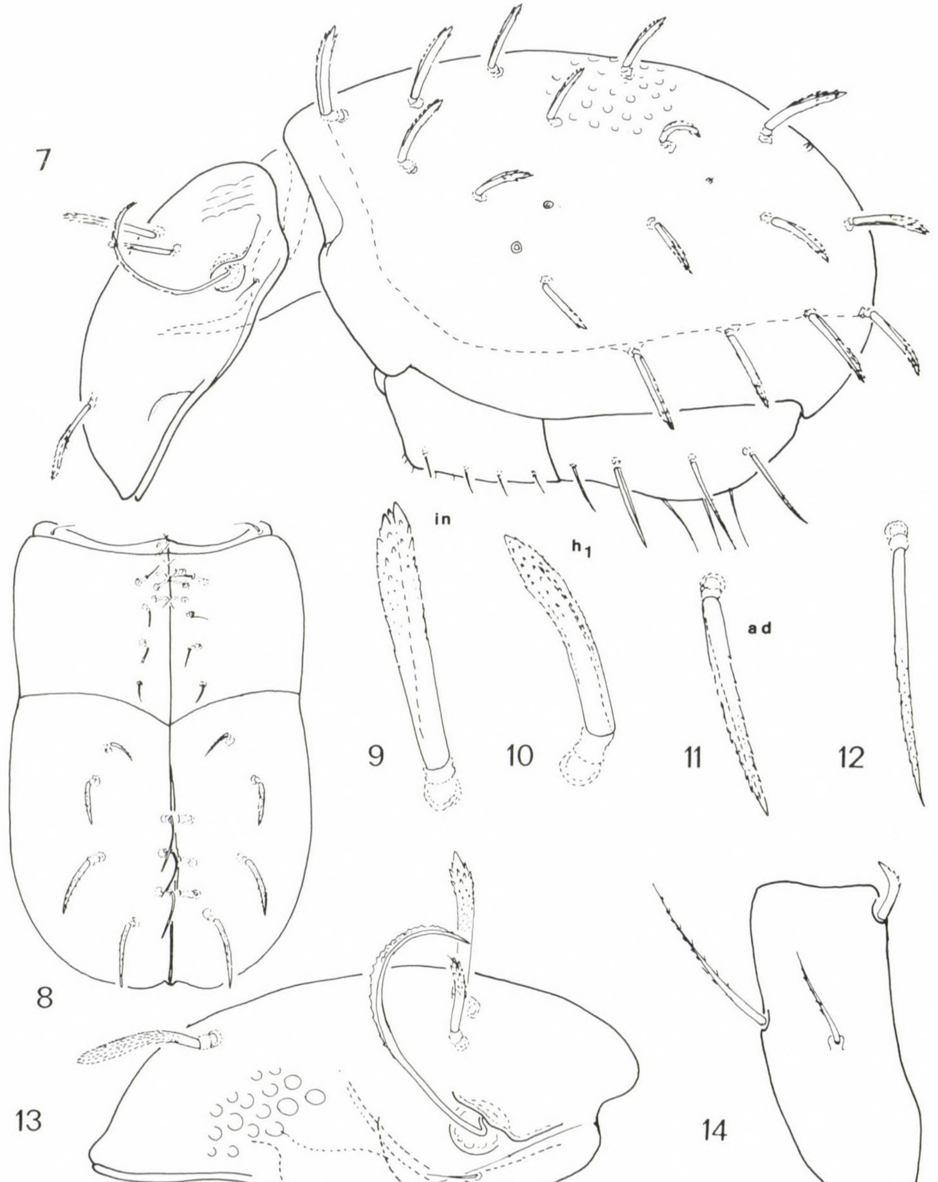
Mantigueracarus perezinigoi sp. n.
(Figs 7–14)

Measurements – Length of aspis: 150–162 µm, length of notogaster: 258–273 µm, height of notogaster: 146–169 µm.

Aspis: Rostral furrow well developed, reaching far posteriorly. Sinus line fine. Surface alveolate dorsally and some rugae in the posteromarginal position also observable. Rostral, lamellar and interlamellar setae (Fig. 9) similar, all three pairs slightly dilated distally and well spiculate and barbed on their distal half. Sensillus very long, curved backwards, with narrow, serrate velum (Fig. 13).

Notogaster: Surface well foveolate. Seventeen pairs of short but erect and dilated notogastral setae (Fig. 10) present. No essential difference among them, all spiculate like the interlamellar setae having also and a narrow edge on them (Fig. 7). Two pairs of lyrifissures, located near to each other, and the alveoli of the vestigial setae present.

A n o g e n i t a l r e g i o n: Genital setae arising in two longitudinal rows, setae g_1–g_5 thin and minute, the others much thicker and longer. Seven pairs of ano-adanal setae present, three pairs arising on the inner margin of the plates and four pairs (Figs 11–12) far from these, in a semicircle (Fig. 8).



Figs 7–14. *Mantigueracarus perezinigoi* gen. n., sp. n.: 7 = body in lateral aspect, 8 = anogenital region, 9 = seta *in*, 10 = seta h_1, 11–12 = setae from adanal position, 13 = aspis in lateral aspect, 14 = femur of leg I.

Legs: Seta *d* of femur I (Fig. 14) inserted near to the distal end of the joint. Seta *d* on tibia IV long and independent from the solenidium. Legs setal formulae are:

$$\text{I: } 1-4-2+2-5+1-17+3-1$$
$$\text{IV: } 2-1-0-2+1-8(!)-1.$$

Material examined – Holotype (1432–HO–92): Brazil, Saõ Paolo, Serra do Mantiguera, V. 1990, rain forest litter, leg. J. BALOGH.

We dedicate the new species to DR. C. PÉREZ–IÑIGO, the renown Oribatidologist (Spain).

Remarks: The new species is distinguished from the now described other species of the new genus by the form of the sensillus and by the two sword-shaped setae on the ano-adanal plates (all simple in the former one).

Neosteganacarus gen. n.

Diagnosis: Rostral furrow, sinus line and lateral rim present, median crista and lateral carina mostly absent or hardly observable. 17–20 pairs of normal notogastral setae and two pairs of alveoli of the vestigial setae (*f*) and two pairs of lyrifissures present. Nine pairs of genital setae arranged in two longitudinal rows, seta g_6 stands behind setae g_5 and g_4. Seven pairs of anal setae present, four arising on the inner margin, the other three pairs located farther from them. Seta *d* on femur I arising near to the anterior margin of joint, seta *d* on tibia IV long and independent from the solenidium.

Type species: *Neosteganacarus cataracta* sp. n.

Remarks: The new taxon belongs to the relationships of subfamily Steganacarinae. The ano-adanal neotrichy was in this group unknown.

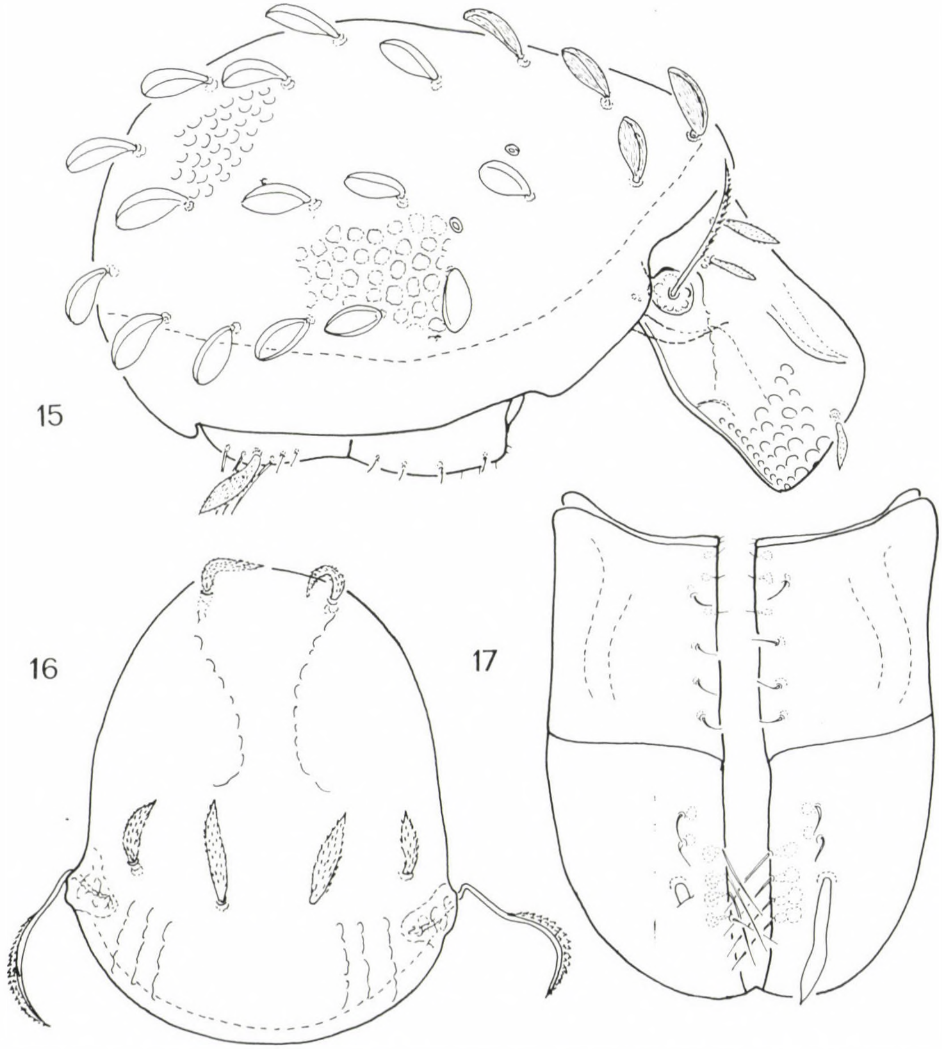
Neosteganacarus angulatus sp. n.
(Figs 15–17, 22–24)

Measurements – Length of aspis: 137–181 µm, length of notogaster: 241–334 µm, height of notogaster: 126–230 µm.

Aspis: Conspicuously angular in lateral view. Median crista present, but only slightly raised from the outline (Fig. 15). True lateral carina absent, but a vague line of the lateral part visible. Lateral margin weakly developed. Surface ornamented by large alveoli medially and by smaller ones marginally. Basal part with some longitudinal wrinkles. Rostral, lamellar and interlamellar setae characteristically dilated (Fig. 16), fusiform, well barbed. Lamellar ones slightly thinner and shorter than the interlamellar ones. Exobothridial setae minute, sensillus long, directed upwards and unilaterally slightly dilate, with serrate, aciculate margin.

N o t o g a s t e r: Sculpture rough, consisting of large alveoli. Twenty pairs of well dilated, spoon-shaped notogastral setae present. Two pairs of lyrifissures (*ia*, *im*) and the alveoli of the vestigial setae (f_1 and f_2) also observable.

A n o g e n i t a l   r e g i o n: Typical for this genus. The genital setae arranged in two longitudinal rows, setae $g_1 - g_5$ closer to the inner margin,



Figs 15–17. *Neosteganacarus angulatus* gen. n., sp. n.: 15 = body in lateral aspect, 16 = aspin in dorsal aspect, 17 = anogenital region.

$g_6 - g_9$ far from the margin. Seta g_6 stands behind g_5 and g_4. Among the seven pairs of ano-adanal setae four pairs, along the inner margin equal in length, setiform, straight, one pair dilated, sword-shaped and two pairs smaller, curved setae anteriorly (Fig. 17).

Legs: Seta *d* of femur I (Fig. 25) long, comparatively thin and strongly curved inwards reaching the anterior margin of the joint. Seta *d* of tibia IV long, independent from the solenidium (Fig. 22). The setal formulae are:

I: $1-4-2+2-5+1-16+3-1$ (Fig. 23),
IV: $2-1-0-2+1-10-1$.

Material examined – Holotype (1433–HO–92): Brazil Saõ Paolo, Serra do Mantiguera, V. 1990, rain forest litter, leg. J. BALOGH. – 5 paratypes from the same sample.

Remark: This is a unique, newly described species having spathulate notogastral setae.

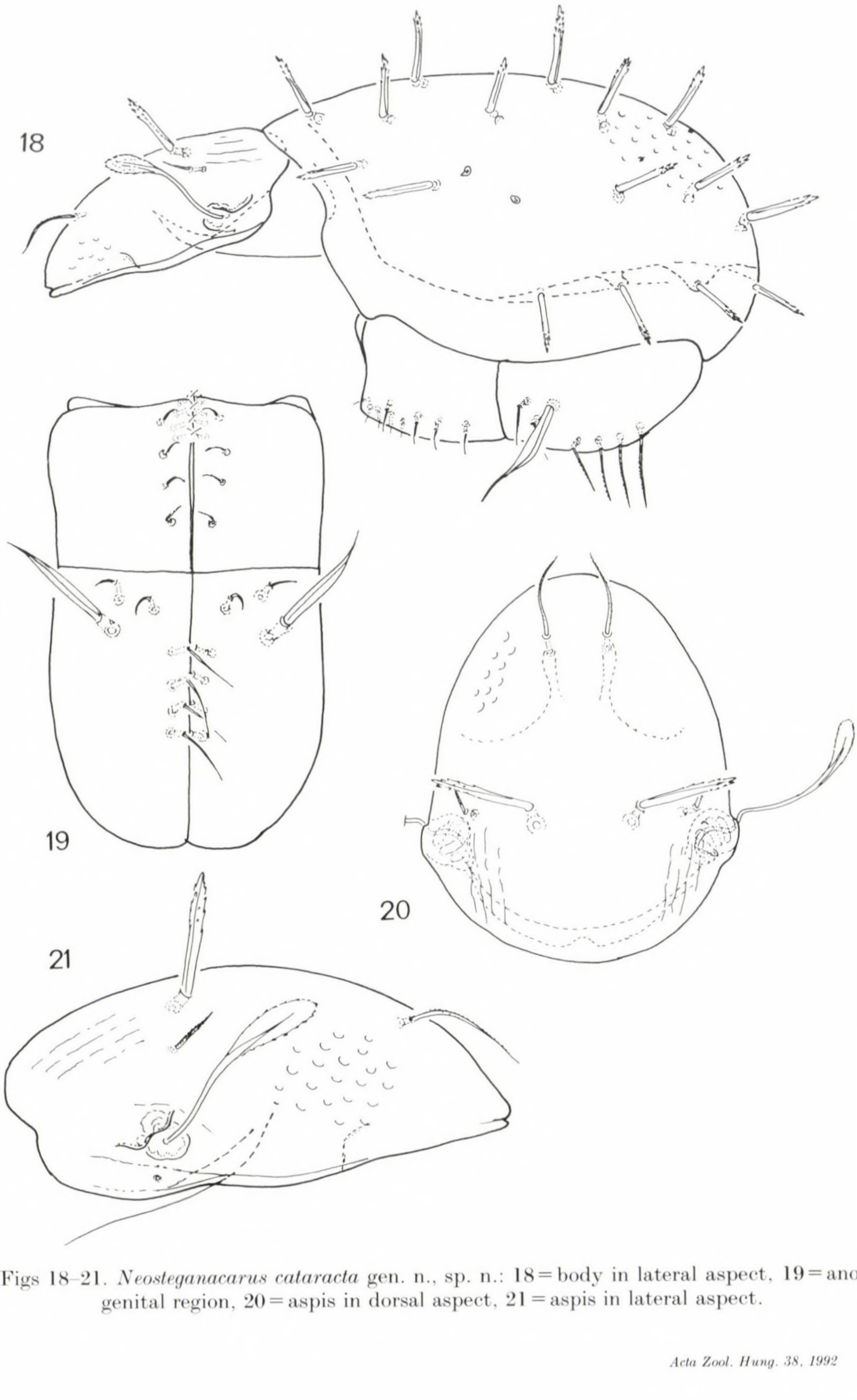
Neosteganacarus cataracta sp. n.
(Figs 18–21, 25–26)

Measurements – Length of aspis: 131–148 μm, length of notogaster: 224–269 μm, height of notogaster: 137–176 μm.

Aspis: Rostrum deeply incised anteriorly, it is observable only in lateral aspect (Fig. 21). Sinus line weakly developed, median crista and lateral carina absent. Median surface alveolate, lateral part smooth, basal part with some weak longitudinal wrinkles (Fig. 20). Rostral setae setiform, long, longer than the other prodorsal setae. Interlamellar setae strong, thick, erect, its distal half spiculate. Lamellar setae spiniform and much shorter than the perceding ones. Exobothridial setae represent only by their alveoli. Sensillus long, with dilated elliptical head. Its margin spiculate.

Notogaster: Surface weakly foveolate. Seventeen pairs of strong, erect notogastral setae present. They are similar to the interlamellar setae. Two pairs of lyrifissures (*ia*, *im*) and the alveoli of vestigial *f* setae also observable.

Anogenital region: Typical for the genus, setae $g_1 - g_5$ arranged marginally, setae $g_6 - g_9$ farther from the inner margin of the genito-aggenital plates. On the ano-adanal plates three pairs of setae arising anteriorly in one group on each side (Fig. 19), one of them sword-shaped. Other four pairs located marginally in one longitudinal row. Anterior ones shorter than the others, arising behind them.



Figs 18–21. *Neosteganacarus cataracta* gen. n., sp. n.: 18 = body in lateral aspect, 19 = anogenital region, 20 = aspis in dorsal aspect, 21 = aspis in lateral aspect.

Figs 22–24. *Neosteganacarus angulatus* gen. n., sp. n.: 22 = leg IV, 23 = leg I, 24 = femur of leg I. – Figs 25–26. *Neoscutacarus cataracta* gen. n., sp. n.: 25 = femur of leg I, 26 = leg IV.

Legs: Setae *d* on femur I (Fig. 25) falciform, arising near to the anterior margin of joint. Solenidium of tibia IV conspicuously shorter (Fig. 26) than the independent seta *d*. Legs setal formulae are:

I: 1 – 4 – 2 + 2 – 5 + 1 – 16 + 3 – 1
IV: 2 – 1 – 0 – 2 + 1 – 10 – 1.

Material examined – Holotype (1434–HO–92): Brazil, Saõ Paolo Serra do Mantiguera, V. 1990, rain forest litter, leg. J. BALOGH. – 13 paratypes from the same sample.

Remarks: The new species shows high similarity with the type species of the genus *Rafacarus* NIEDBAŁA, 1981 (!), however, one of the most important characters (the form of the seta *d* of tibia IV) is different. This species is distinguished from the following two species by the position and the form of the ano-adanal setae.

Neosteganacarus relictus sp. n.
(Figs 27–30, 38–39)

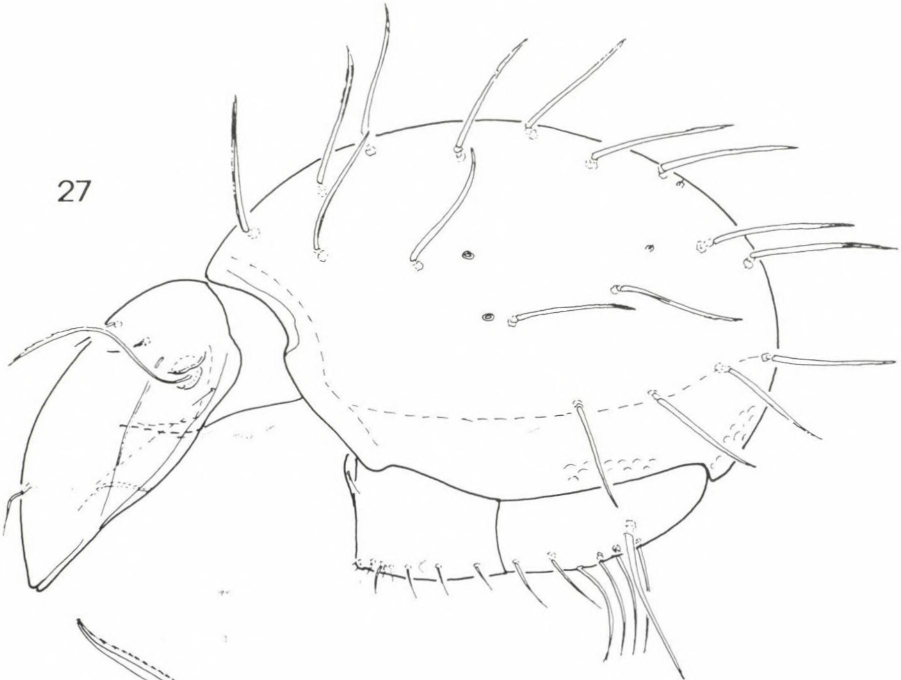
Measurements – Length of aspis: 208–247 µm, length of notogaster: 361–428 µm, height of notogaster: 252–324 µm.

Aspis: Low in lateral aspect, dorsal outline gradually convex (Fig. 27). Surface smooth, median crista absent. Lateral carina present, it is conspicuously strong. Lateral rim short, sinus line present. Rostral setae slightly longer than the lamellar and interlamellar ones. These two latter are nearly equal in length (Fig. 29). Sensillus very long, well curved upwards and forwards. Its distal part with a narrow, dentate velum.

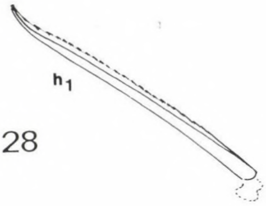
Notogaster: Polygonate sculpture observable only in lateral and posteromarginal position (Fig. 27). All seventeen pairs of notogastral setae (Fig. 28) strong, partly erect. A narrow, spiculate-dentate edge on the distal part of setae mostly visible. Two pairs of lyrifissures (*ia*, *im*) and the alveoli of the vestigial setae (f_1 and f_2) present.

Anogenital region: Nine pairs of genital setae arranged in two longitudinal rows, setae g_6–g_9 much longer than the anterior ones. The position of the ano-adanal setae typical for this genus, four pairs among them arising along the inner margin of the plates, three other pairs in adanal position. Posterior pairs in adanal position much longer than the other, the four pairs of setae in anal position nearly equal in length. All adanal setae slightly pilose (Fig. 30).

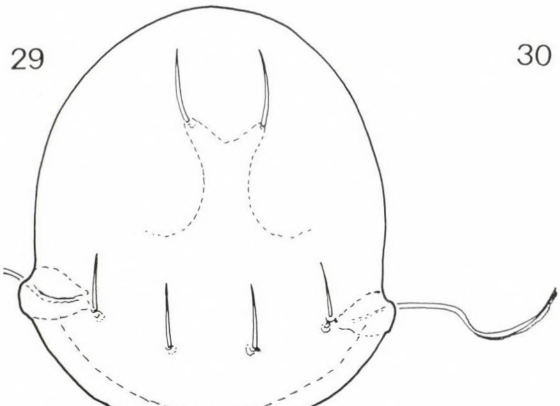
27



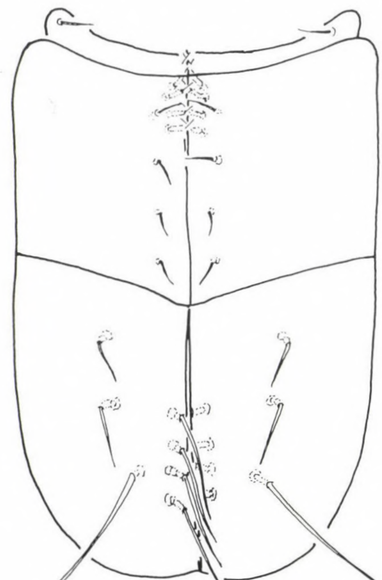
28



29



30



Figs 27–30. *Neosteganacarus relictus* gen. n., sp. n.: 27 = body in lateral aspect, 28 = seta h_1. 29 = aspis in dorsal aspect, 30 = anogenital region.

Legs: Seta *d* of femur I arising near the distal end of the joint (Fig. 38). Solenidium of tibia IV long and independent from seta *d* (Fig. 39). Legs setal formulae are:

$$\text{I}: 1-4-2+2-5+1-16+3-1$$
$$\text{IV}: 2-1-0-2+1-8(?)-1.$$

Material examined – Holotype (1435–HO–92): Brazil, Saõ Paolo, Serra do Mantiguera, V. 1990, rain forest litter, leg. J. BALOGH.

Remarks: The new species is well characterised by the long and conspicuously curved sensillus and the peculiar shape of the notogastral setae. These characters combined with the notogastral sculpture distinguish the new species from its congeners.

Nortonacarus gen. n.

Diagnosis: Rostral part of prodorsum with a strong rostral furrow. Median crista absent, lateral carina, sinus line and lateral rim present. Strong notogastral neotrichy, except around setae c_1, c_2, d_1 and d_2, with characteristically branched setae. Two pairs of lyrifissures (*ia, im*) present. Nine pairs of genital setae arranged in two longitudinal rows. Eight pairs of ano-adanal setae, 4 pairs arising along the inner margin of the plates, near to each other. Other four pairs in adanal position far removed from these and from each other. Seta *d* of femur I arising near to the distal end of the joint, seta *d* of tibia IV independent and inserted far from the solenidium.

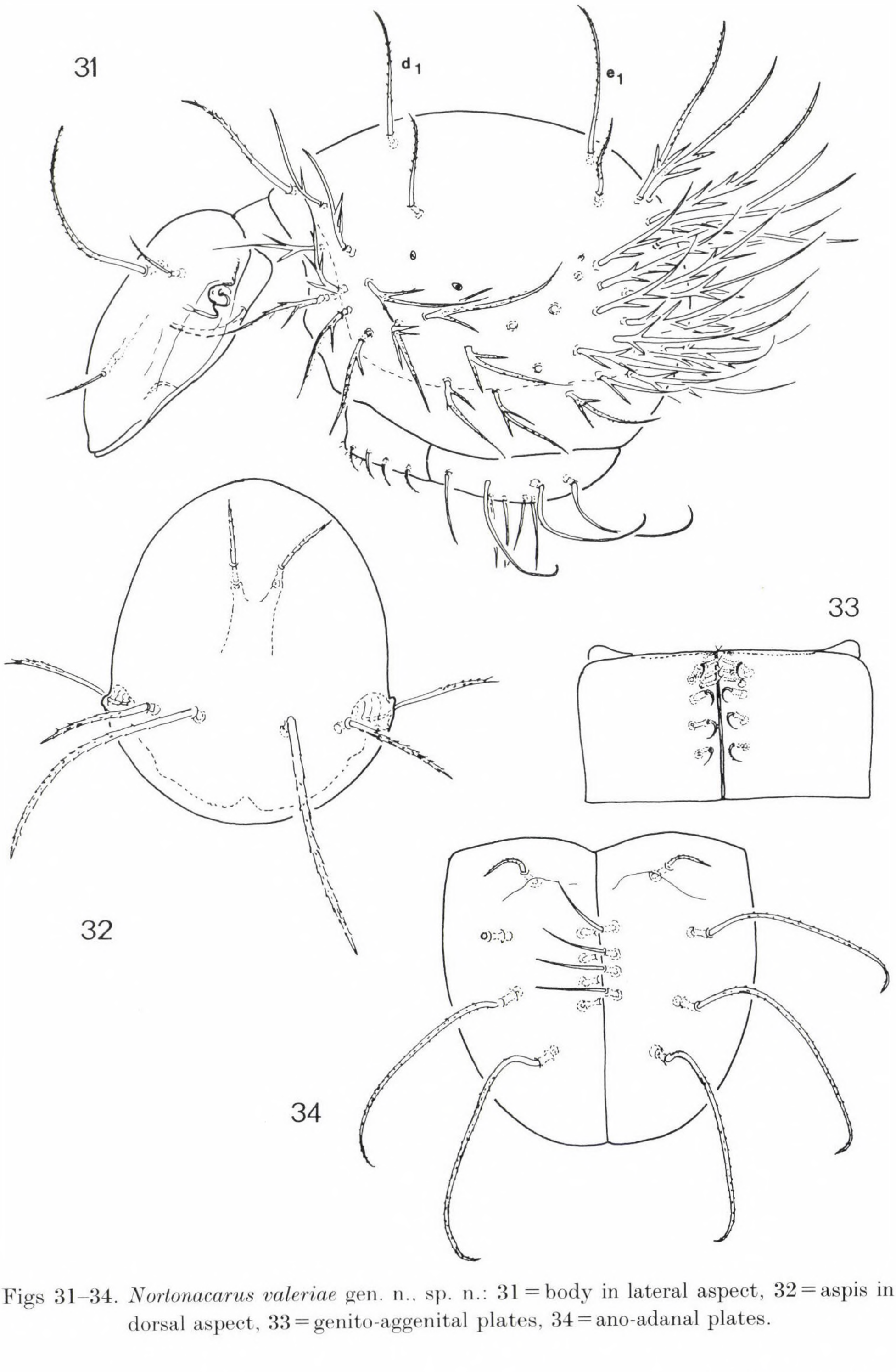
Type species: *Nortonacarus valeriae* sp. n.

Remarks: On the basis of the independent *d* seta on tibia IV, the position of the ano-adanal setae (four pairs on the inner margin) the new taxon shows relationships with the *Steganacarus* groups. However, the notogastral and ano-adanal neotrichy were unknown in this relation.

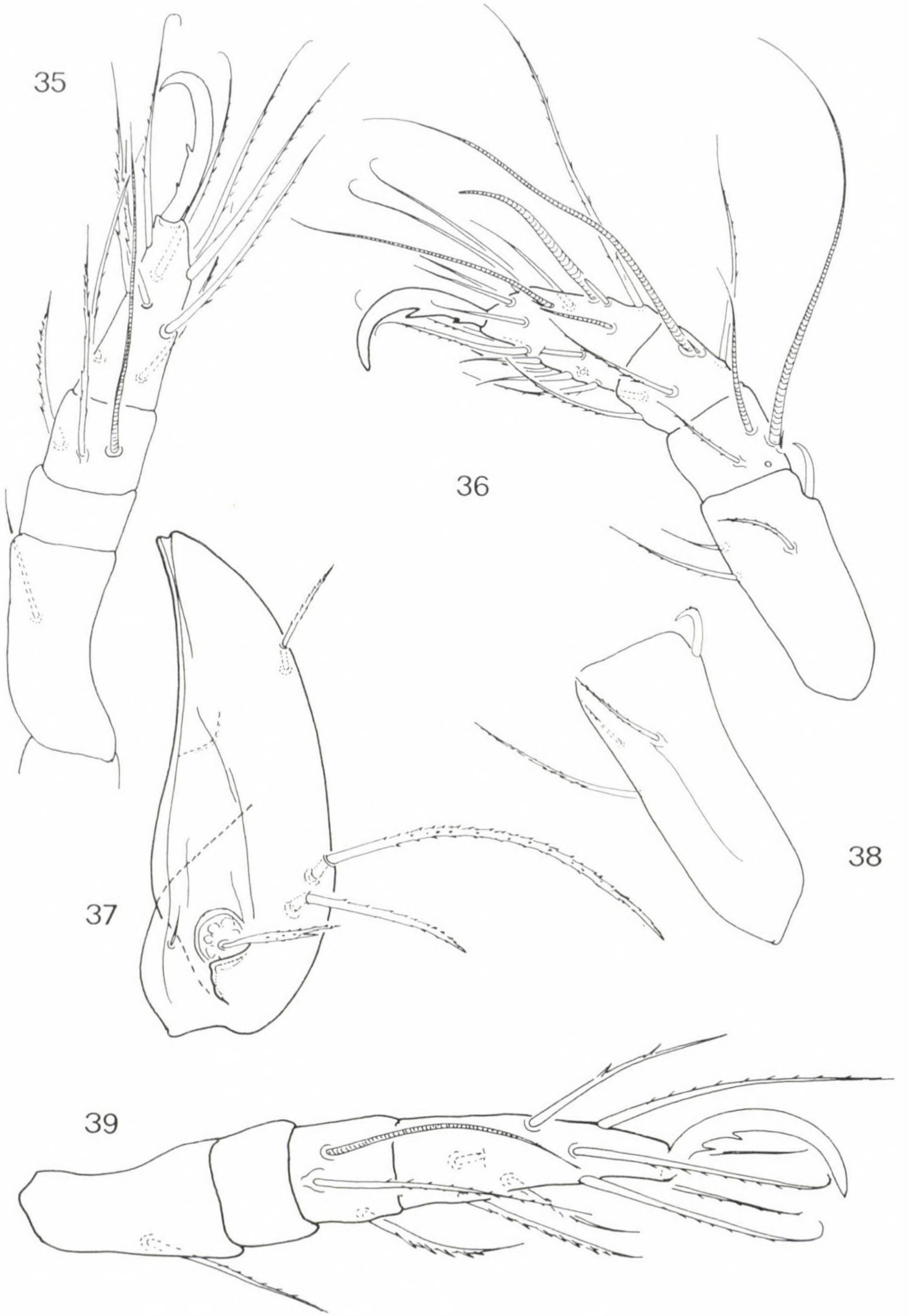
Nortonacarus valeriae sp. n.
(Figs 31–37)

Measurements – Length of aspis: 196 µm, length of notogaster: 332 µm, height of notogaster: 248 µm.

Aspis: Rostrum independently from lateral rim though parallel with it furrow like (Fig. 37). This is well visible only in lateral aspect. Dorsal sculpture very weak or absent. Sinus line short, a weak lateral rim also present. Median crista absent. Dorsal surface nearly smooth. All four pairs of prodorsal setae developed, three median pairs erect, spiculate or spinose.



Figs 31–34. *Nortonacarus valeriae* gen. n., sp. n.: 31 = body in lateral aspect, 32 = aspis in dorsal aspect, 33 = genito-aggenital plates, 34 = ano-adanal plates.



Figs 35–37. *Nortonacarus valeriae* gen. n., sp. n.: 35 = leg IV, 36 = leg I, 37 = aspis in lateral aspect. – Figs 38–39. *Neoscutacarus relictus* gen. n., sp. n.: 38 = femur of leg I, 39 = leg IV.

Rostral setae much thinner than lamellar and interlamellar ones. These two latter pairs bent backwards. Sensillus comparatively short, slightly dilated, seems to be bifurcate (Fig. 32).

Notogaster: Without well observable sculpture. Only six pairs of notogastral setae normal (c_1, c_2, and both pairs of e and f), all others branched, with 2–5 strong branches, mostly at the basal part of the setae (Fig. 31). (We were not able to establish the exact number of setae.) Two pairs of lyrifissures (*ia, im*) and the alveoli of setae f_2 were visible.

Anogenital region: The genito-aggenital plates have the usual one pair of aggenital and nine pairs of genital setae. These latter are arranged in two longitudinal rows (Fig. 33). The setae of the anterior row (g_1–g_5) minute, the posterior setae are much larger and well visibly barbed. The setae of the anal plates arise also in two rows (Fig. 34), four pairs arranged marginally, at the inner margin, near to each other. The other four pairs laterally, far from each other. The anterior pair short, the posterior three pairs very long, and curved distally.

Legs: Setae *d* of femur I arising near to the anterior margin of the joint (Fig. 36), slightly curved inwards Setae *d* of tibia IV long and independent from the solenidium (Fig. 35). The setal formulae are:

$$\text{I: } 1-4-2+2-5+1-17+3-1$$
$$\text{IV: } 2-1-0-2+1-10-1.$$

Material examined – Holotypus (1436–HO–92): Brazil, Saõ Paolo, Serra do Mantiguera, V. 1990, rain forest litter, leg. J. BALOGH.

We dedicate the new species to our friends DR. R. NORTON (U. S. A.) and DR. V. BEHAN–PELLETIER (Canada), the excellent explorer of the world Oribatids.

Remarks: Beside the characters, mentioned in the generic diagnosis, the new species is well characterisable by the shape of the sensillus and the form of the unique neotrichial setae. On the basis of the form of these latter the new species is unambiguously distinguishable from all heretofore known Phthiracaridae taxa.

REFERENCES

AVANZATI, A. M. & BERNINI, F. (1989): Notulae Oribatologicae L. The redescription of Steganacarus (S.) spinosus (Sellnick, 1920) (Acarida, Oribatida). – Redia **62**: 149–167.

MAHUNKA, S. (1990): Notes and remarks on Oribatid taxa (Acari, I. – *Annls hist.-nat. Mus. natn. hung.* **82:** 191–215.

NIEDBAŁA, W. (1986a): Système des Phthiracaroidea (Oribatida, Euptyctima). – *Acarologia* **27:** 61–84.

NIEDBAŁA, W. (1986b): Catalogue des Phthiracaroidea (Acari) clef pour la détermination des espèces nouvelles. – *Ann. Zool. Warszawa* **40:** 309–326.

Acta Zoologica Hungarica 38 (3–4), pp. 175–182 (1992)

DREI NEUE SÜDAMERIKANISCHE CORTICEUS-ARTEN (COLEOPTERA, TENEBRIONIDAE: HYPOPHLOEINI)

H. J. BREMER

Section Tropenpädiatrie, Universität Heidelberg, Im Neuenheimer Feld 150, D–6900 Heidelberg 1, Deutschland

(Eingegangen am 29. November 1991)

Three new Corticeus species from South America (Coleoptera, Tenebrionidae: Hypophloeini). – Three new species of *Corticeus* PILLER et MITTERPACHER, 1783 (=Hypophloeus FABRICIUS, 1791) from South America are described: *Corticeus merkli* sp. n., *Corticeus humilis* sp. n. and *Corticeus expeditus* sp. n. *Corticeus merkli* sp. n. and *Corticeus humilis* n. sp. form, together with *Corticeus brevis* KULZER, 1964 and with *Corticeus plaumanni* BREMER, 1990, a group of related and very tiny species living in the southeastern part of Brazil. A key for these species is given. *Corticeus expeditus* sp. n. from Paraguay is related to the Oriental *Corticeus filum* FAIRMAIRE, 1893. With 3 original figures.

Einleitung – Die *Corticeus*-Arten Südamerikas wurden bisher nicht systematisch bearbeitet. Nur wenige Arten wurden bisher beschrieben. Von den drei in dieser Arbeit beschriebenen neuen Arten gehören zwei, *Corticeus merkli* sp. n. und *Corticeus humilis* sp. n., zusammen mit *Corticeus brevis* KULZER, 1964 und *Corticeus plaumanni* BREMER, 1990 zu einer Gruppe nahe verwandter, sehr kleiner Arten, die in demselben Gebiet Brasiliens (Sta. Catarina) vorkommen (KULZER 1964, BREMER 1990). Sie zeichnen sich durch sehr geringe Größe, durch sehr schmale Wangen, durch eine flache und meist schmale Stirn, durch quer und längs gewölbten Halsschild mit verrundeten Vorderecken und durch Verbreiterung der Fühlerglieder 5 bis 11 aus.

Die dritte neue Art, *Corticeus expeditus* sp. n., ist nahe mit *Corticeus filum* FAIRMAIRE, 1893 aus der orientalischen Region verwandt.

BESCHREIBUNG DER NEUEN ARTEN

Corticeus merkli sp. n.
(Abb. 1-2)

Länge: 2,76–3,33 mm. – Breite: 0,83 mm. – Farbe: Charakteristische Färbung: Schwarz oder schwarzbraun sind Kopf, Halsschild, Pygidium, Prosternum, Mesosternum, Metasternum und Sternite. Distal der Schultern der Flügeldecken findet sich eine aufgehellte, längliche Makel (gelbbraun); der übrige Teil der Flügeldecken ist braun. Beine hellbraun; Fühlerglieder 1, 2 und 11 sind braun, die dazwischen liegenden Glieder sind dunkler. Mäßiggradige mikroretikuläre Zeichnung der Oberfläche und dadurch herabgesetzter Glanz.

Gestalt: Klein, kräftig, deutlich seitlich vorstehende Augen; Halsschild annähernd so lang wie breit, mit verrundeten Ecken.

Kopf: Augen ragen zusammen mit den Schläfen kugelartig seitlich aus dem Kopf hervor; Stirn liegt etwas höher, ist flach; Verhältnis der Kopfbreite zur Stirnbreite wie 1,83–1,88 : 1. Wangen nur schwach entwickelt; sie treffen auf den Vorderrand der Augen am Übergang zum inneren Drittel; sie verengen sich halbkreisförmig nach vorne und erreichen nicht den abgeschnitten wirkenden Vorderrand des Kopfes; dieser wird nur durch den Clypeus gebildet. Clypeus sehr leicht quer gewölbt, besonders seitlich etwas tiefer als die Stirn gelegen, deutlich mikroretikuliert (stärker als die Stirn), Punkte flacher und undeutlicher als auf der Stirn. Stirnnaht sehr deutlich eingedrückt. Stirn nicht vom Halse abgegrenzt, mit großen Punkten bedeckt, deren Abstände voneinander den 1- bis 2fachen der Punkt-

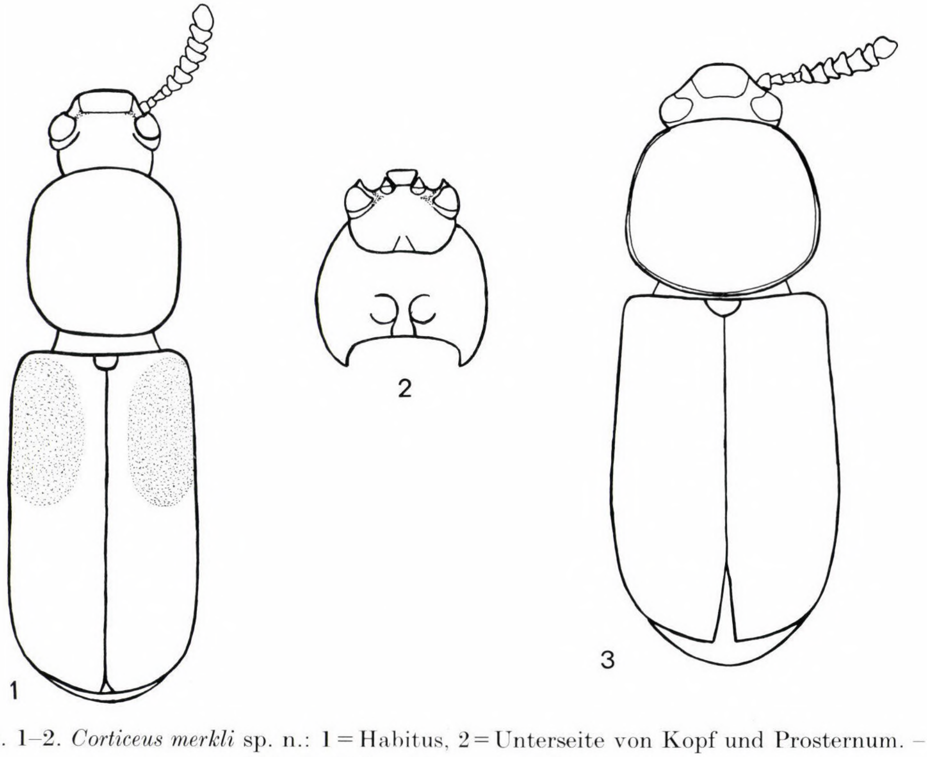


Abb. 1–2. *Corticeus merkli* sp. n.: 1 = Habitus, 2 = Unterseite von Kopf und Prosternum. – Abb. 3. *C. humilis* sp. n.: Habitus.

durchmesser entsprechen. Die Augen erreichen auf der Unterseite des Kopfes nicht die Basis der Maxillarpalpen; der Hals ragt auf der Unterseite kugelförmig hervor, er ist wenig punktiert, und er glänzt stark.

Halsschild: Vorderrand (etwas weniger) und Hinterrand (etwas mehr) nach vorne bzw. hinten verrundet vorgezogen; Vorderecken und Hinterecken verrundet. Verhältnis der Länge zur Breite wie 1,04–1,09 : 1. Quer deutlich gewölbt, längs ebenfalls gewölbt, wenn auch etwas schwächer. Vorderrand bis auf die Mitte sehr schwach gerandet; Seiten subparallel mit schmaler aber deutlicher Randung; ähnlich ist die Randung der Basis. Oberfläche mittelgroß und deutlich punktiert; Abstände der Punkte voneinander entsprechen den 1- bis 4fachen der Punktdurchmesser. – Schildchen: Breit verrundet.

Flügeldecken: Kräftig, quer deutlich und gleichmäßig gewölbt. Verhältnis der Länge zur Breite wie 1,81–1,87 : 1; Verhältnis der Flügeldekkenlänge zur Halsschildlänge wie 1,98–2,04 : 1. Schultern nicht vorgezogen; Apex verrundet. Punktreihen undeutlich, die Zahl der Punkte in den Primärreihen etwas größer als auf den Intervallen.

Pygidium: Sehr fein punktiert. – Prosternum: Seiten sehr groß und tief punktiert. Scheibe quer verrundet, etwas angehoben und unpunktiert. Die Prosternalapophyse überragt, sich verbreiternd, etwas die Hüften, um dann herabgebogen zu werden. – Mesosternum: Grob und dicht punktiert. – Metasternum: Scheibe stark glänzend, ohne Mikroretikulierung, dadurch stark gegen die mikroretikulierten Sternite abgehoben; seitliche Bereiche des Metasternums mit großen und tiefen Punkten. – Sternite: Fettiger Glanz; fein und schütter punktiert; 4. und 5. Sternit längs etwas gewölbt; apikaler Teil des Analsterniten mit mittelgroßen Punkten besetzt, deren Abstände voneinander die 1/2- bis 1fachen der Punktdurchmesser betragen.

Fühler: 5. bis 10. Fühlerglied annähernd dreieckig verbreitert; Endglied längsoval; 2. Glied annähernd quadratisch; 3. Glied schmal, sich verbreiternd, etwa doppelt so lang wie breit; 4. Glied etwa so lang wie breit.

Beine: Schmal, angedeutete Spitze an den Mesotibiae außen apikal. Klauenglied der Hintertarsen so lang wie die vorherigen Glieder zusammen.

Typen: Der Holotypus aus dem Ungarischen Naturwissenschaftlichen Museum Budapest ist beschriftet: *Hypophloeus* sp. 5, det. Kaszab; Brasilia, Nova Teutonia, Sta. Catarina, 14. 8. 1944, leg. Plaumann. – 1 Paratypus mit denselben Angaben, jetzt in der Sammlung des Autors.

Bemerkungen – Die durch die Makeln der Flügeldecken charakterisierte Art kann mit keiner anderen südamerikanischen Art verwechselt werden. Sie sei Herrn DR. O. MERKL vom Ungarischen Naturwissenschaftlichen Museum in Budapest gewidmet, der mir die Bearbeitung dieser Tiere ermöglichte.

Corticeus humilis sp. n.
(Abb. 3)

Länge: 2,54 mm. – Breite: 0,92 mm. – Farbe: Dunkelbraun sind Kopf, Halsschild, Schildchen und Beine (mit Ausnahme der hellgelben Tarsen); Flügeldecken gelbraun (etwas dunkler um das Schildchen herum); Pygidium schwarzbraun; Fühler braun mit dunklerem Zentrum. Oberfläche kaum mikroretikuliert.

Gestalt: Breit, klein, flach; kaum entwickelte Wangen.

Kopf: Kurzer, breiter Kopf mit großen, nach außen weit vorragenden Augen, die von vorne etwas eingedellt sind; hinterer Teil der Wangen sehr schmal, so daß das erste Fühlerglied von oben frei sichtbar ist, vorderer Teil der Wangen nicht vorhanden, so daß dort der Clypeus den Seitenrand des Kopfes bildet; der schmale, ausgeschnittene hintere Teil der Wangen hat dieselbe Oberflächenstruktur wie die Stirn, er kontrastiert dadurch sehr deutlich gegenüber dem Clypeus, der glatt und wesentlich feiner punktiert ist. Kopfvorderrand gerade, Clypeus liegt etwas tiefer als die Stirn. Stirn schmal, Verhältnis der Kopfbreite zur Stirnbreite wie 2,0 : 1; Stirn längs kurz, quer eben, am Augenrand lateral durch einen etwas aufgeworfenen Rand begrenzt. Auf der Unterseite erreichen die Augen gerade die Basis der Maxillarpalpen. Mentum umgekehrt trapezförmig mit verrundeten Vorderecken, kaum punktiert. Hals auf der Unterseite mit großen Punkten schütter punktiert.

Halsschild: Etwa so breit wie lang; Verhältnis der Länge zur Breite wie 0,94 : 1; oben längs und quer deutlich gewölbt; mit deutlich nach hinten vorgezogenem Hinterrand und mäßig nach vorne vorgezogenem Vorderrand. Seitlich verrundet mit der breitesten Stelle hinter der Mitte, nach vorne bis zu den kaum akzentuierten Vorderecken stärker als nach hinten eingezogen; Hinterecken nicht auszumachen, in die kontinuierliche Verrundung des Seiten- und des Hinterrandes einbezogen. Vorderrand bis auf die Mitte sehr fein gerandet, Randung der Seiten und der Basis schmal und deutlich. Oberfläche mit mittelgroßen Punkten bedeckt, deren Abstände voneinander den 1- bis 2fachen der Durchmesser entsprechen. – Schildchen: Breit verrundet; dunkler als die Flügeldecken.

Flügeldecken: Breit, kurz, oben relativ flach; Verhältnis der Länge zur Breite wie 1,52 : 1. Schultern nicht akzentuiert; Seiten nach hinten bis kurz vor dem Apex etwas breiter werdend. Apex breit verrundet. Primärreihen sehr unregelmäßig punktiert; da auch die Intervalle sehr unregelmäßig punktiert sind, entsteht das Bild einer völlig unregelmäßigen Punktierung. Verhältnis der Flügeldeckenlänge zur Halsschildlänge wie 1,93 : 1. – Pygidium: Breit verrundet, mit extrem feinen Punkten, aus denen (bei 50facher Vergrößerung gerade sichtbar) feine, kurze, gelbe Härchen ragen. – Prosternum: Kurz; Vorderrand in der Mitte etwas gegen den Kopf vorgezogen. Scheibe mit kurzen, gelben, anliegenden Härchen; nahezu unpunktiert; seitlich davon große Punkte. Prosternalapophyse zwischen den Procoxae schmal, nach hinten, sich etwas verbreiternd, etwas die Hüften überragend und herabgebogen. – Mesosternum: Grob und dicht punktiert. – Metasternum: Quer und längs etwas gewölbt; Mittellinie etwa bis zur Mitte sichtbar; Scheibe unpunktiert; vorne einzelne, seitlich etwas häufigere, große Punkte. – Sternite: 1. Sternit zwischen den Metacoxae längs geriffelt, dahinter ebenso wie die weiteren drei Sterniten sehr fein und schütter punktiert. Analsternit im apikalen Teil grob und zusammenfließend punktiert.

Fühler: Elfgliedrig. Ab dem 5. Glied deutlich verbreitert, angenähert dreieckig; Endglied unregelmäßig längsoval; 3. Glied nur wenig länger als das 2. Glied; 4. Glied deutlich kürzer als das 3. Glied. Fühlerglieder mit vielen, kurzen, feinen Härchen besetzt. Zurückgelegt erreichen die Fühler etwa die Mitte des Halsschildes.

Beine: Kurz, schmal, ohne Besonderheiten.

Typus: Der Holotypus, dessen Geschlecht ich nicht untersuchte, aus dem Ungarischen Naturwissenschaftlichen Museum, Budapest, ist beschriftet: Brasilia, Nova Teutonia, Sta. Catarina, 14. 6. 1944, leg. PLAUMANN.

Bemerkungen – *Corticeus humilis* sp. n. hat große Ähnlichkeit mit *Corticeus brevis* KULZER. *C. humilis* ist jedoch breiter und flacher als *C. brevis*. Die Unterschiede beider Arten seien gegenüber gestellt:

	C. humilis sp. n.	*C. brevis* KULZER
Länge	2,54 mm	1,97–2,44 mm
Verhältnis von Halsschildlänge zur -breite	0,94 : 1	1,05–1,11 : 1
Verhältnis von Flügeldeckenlänge zur -breite	1,52 : 1	1,62–1,82 : 1
Verhältnis von Kopfbreite zur Stirnbreite	2,00 : 1	1,67–1,89 : 1
Mikroretikulierung des Halsschildes	kaum	sehr deutlich

TABELLE DER *CORTICEUS*-ARTEN DER *BREVIS*-GRUPPE

Die Arten dieser Gruppe, alle kleiner als 3,5 mm, lassen sich wie folgt trennen:

1. Einfarbig (kastanienbraun), schmal, langegestreckt
C. plaumanni BREMER
– zweifarbig (Kopf und Halsschild dunkler als die Flügeldecken) 2

2. Unterhalb der Schultern findet sich auf den Flügeldecken eine längliche, gelbbraune Makel, umgeben von braun gefärbten Flügeldecken. Kopf und Halsschild sind schwarz oder schwarzbraun **C. merkli** sp. n.
– Arten ohne Makeln auf den Flügeldecken 3
3. Kleiner (1,97–2,44 mm lang) mit relativ schmalen Flügeldecken (Verhältnis der Länge zur Breite wie 1,62–1,82 : 1), sehr deutliche Mikroretikulierung des Halsschildes **C. brevis** KULZER
– größer (2,54 mm), mit breiten, kurzen Flügeldecken (Verhältnis der Länge zur Breite wie 1,52 : 1), Halsschild kaum mikroretikuliert **C. humilis** sp. n.

Corticeus expeditus sp. n.

Länge: 2,95 und 3,59 mm. – Breite: 0,67 und 0,80 mm. – Farbe: Hellbraun; etwas angedunkelter Kopf und Fühlerglieder 1 bis 9; Prosternum braun; Metasternum hellbraun; Sternite zunehmend dunkler; deutlich glänzend; keine mikroretikuläre Zeichnung auf der Oberseite.

Gestalt: Klein, schmal, halbzylindrisch im Querschnitt.

Kopf: Relativ kleine Augen, die seitlich aus dem Kopf hervorragen. Die hinten schmalen Wangen enden in der Mitte des Augenvorderrandes; sie sind zunächst nach vorne stark eingezogen, im vorderen Teil sind sie annähernd parallel; dadurch bilden hinterer und vorderer Teil der Wangen einen sehr deutlichen, stumpfen Winkel; zum Rand zu stark aufgebogen, wobei der aufgebogene Rand etwas auf den Kopfvorderrand übergeht; dadurch erhält der vordere Teil des Kopfes ein schnabelartiges Aussehen. Clypeusvorderrand gerade, im vorderen Teil eben, hinten etwas gewölbt. Undeutliche, gebogene, clypeofrontale Naht. Stirn quer stark gewölbt, so daß die Augen deutlich tiefer als die Stirn liegen; in die weniger starke Längswölbung ist der Hals mit einbezogen. Verhältnis der Kopfbreite zur Stirnbreite wie 1,63 – 1,77 : 1. Kopf mittelgroß und dicht punktiert; Punktabstände entsprechen etwa den Punktdurchmessern. Mentum umgekehrt trapezförmig, dicht punktiert. Die Augen erreichen auf der Ventralseite nicht ganz die Basis der Maxillarpalpen.

Halsschild: Länger als breit; Verhältnis der Länge zur Breite wie 1,24 + 1,31 : 1. Vorderecken etwas spitz und einwärts gebogen, dazu vorgezogen. Seiten subparallel; Vorderrand etwas nach vorne vorgezogen, nicht gerandet; Seiten schmal gerandet; Seitenrand geht verrundet in den Hinterrand über; dieser ist gegen die Flügeldecken verrundet vorgezogen, nicht gerandet. Quer deutlich gewölbt, am stärksten kurz vor der Mitte, Querwölbung hinten wesentlich schwächer; längs nur sehr schwach gewölbt. Oberfläche dicht und relativ groß punktiert; Punktabstände entsprechen den halben bis einfachen der Punktdurchmesser. – Schildchen: Quer, angedeutet fünfeckig.

Flügeldecken: Seiten strikt parallel; Schultern etwas vorgezogen; Apex verrundet. Quer deutlich und gleichmäßig gewölbt. Verhältnis der Länge zur Breite wie 2,16–2,28 : 1. Verhältnis der Flügeldeckenlänge zur Halsschildlänge wie 1,80–1,81 : 1. Sehr deutliche, etwas eingedrückte Punktreihen mit großen Punkten, deren Abstände voneinander etwa den Punktdurchmessern entsprechen. Auf den Intervallen wenige, etwa gleichgroße Punkte, wobei auf 2 bis 10 Punkte der Primärreihen ein Punkt auf den Intervallen kommt. – Pygidium: Halbelliptisch; mit etwas kleineren Punkten als auf den Flügeldecken dicht punktiert. – Prosternum: Scheibe vor den Procoxae quer schwach gebogen, mit flachen und großen Punkten; seitlich wie bei den meisten *Corticeus*-Arten mit tief eingestanzten Punkten. Prosternalapophyse zwischen den Coxae auffallend breit, mit breiter, medianer Rinne, nach hinten zu verbreitert und etwas herabgebogen. – Mesosternum: Auffallend wenig punktiert, glänzend. – Metasternum: Quer gleichmäßig gewölbt, Scheibe schütter punktiert, die Seiten tiefer, aber nicht sehr groß punktiert. – Sternite: Dicht und groß punktiert, wobei die Punktierung nach hinten zu dichter wird; auf den letzten beiden Sterniten sind die Abstände zwischen den Punkten kleiner als die Punktdurchmesser.

Fühler: Sehr kurz, nur wenig länger als der Kopf breit ist; sehr dicht gefügte Fühlerglieder; nach apikal zu allmählich breiter werdend; letztes Glied schmaler als das vorletzte Glied. Drittes Fühlerglied etwa so lang wie das zweite Glied, aber mit schmalerer Basis.

Beine: Tibiae mit scharfer Außenkante; kleiner Ausschnitt am apikalen Ende des Außenrandes der Mesotibiae. Klauenglied der Hintertarsen deutlich länger als die vorherigen Glieder zusammen.

Typen: Der Holotypus (Geschlecht nicht untersucht) aus dem Ungarischen Naturwissenschaftlichen Museum ist beschriftet: Paraguay, K. Fiebrig, San Bernandino; *Hypophloeus* sp. 4, det. Kaszab. – Ein beschädigter Paratypus (ohne Fühler) mit denselben Angaben, jetzt in der Sammlung des Verfassers.

Bemerkungen – *Corticeus expeditus* sp. n. ist nahe mit dem orientalischen *C. filum* Fairmaire verwandt. In der orientalischen, papuanischen und australischen Region gibt es weitere, noch unbeschriebene Arten dieser Gruppe. *C. filum* hat zwei angedeutete Längserhebungen auf dem Clypeus, während dieser bei *C. expeditus* vorne völlig eben ist. *C. filum* hat nicht den deutlichen Winkel zwischen vorderem und hinteren Teil der Wangen wie *C. expeditus;* die Basis des Halsschildes ist bei *C. filum* gerandet, bei *C. expeditus* nicht gerandet; bei *C. filum* sind die Punkte auf Kopf und Halsschild deutlich kleiner und schütterer als bei *C. expeditus*, außerdem weis *C. filum* nicht die eingedrückten Punktlinien auf den Flügeldecken wie *C. expeditus* auf.

SCHRIFTTUM

BREMER, H. J. (1990): Eine neue Corticeus-Art aus Brasilien sowie Anmerkungen zur Synonymie orientalischer und papuanisch-australischer Corticeus-Arten (Coleoptera, Tenebrionidae, Hypophloeini). – *Entomofauna* **11:** 313–320.

KULZER, H. (1964): Über neue Tenebrionidenarten (Col.). 27. Beitrag zur Kenntnis der Tenebrioniden. – *Ent. Arb. Mus. Frey* **15:** 221–276.

Acta Zoologica Hungarica 38 (3–4), pp. 183–197 (1992)

THE IMPORTANCE OF SCALE IN STUDYING BEETLE COMMUNITIES: HIERARCHICAL SAMPLING OR SAMPLING THE HIERARCHY?

T. FUISZ & C. MOSKÁT

Ecological Research Group, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 18th December 1991)

A hierarchical sampling procedure was designed to reveal community structure parameters such as species richness, diversity and equitability of ground-dwelling beetle communities in two different habitats at 5 different levels of the local spatial scale. Results indicated differences in community structure parameters as different observational levels were applied. However, scale-dependency changed considerably, when different statistical methods were applied. Instead of the traditional one-level studies we suggest that hierarchical sampling and scale-centered data analysis should be used in community ecology. The importance of detection of scales in community ecological studies is discussed with respect to hierarchy theory. With 4 original figures.

Introduction – Ecological patterns and community structure changes may be investigated on a wide variety of scales, such as those of time and space. One must be aware of the fact that scale is not a community property, but a property of the methods used for observation (ALLEN & STARR 1982). Detected ecological patterns are dependent on the spatial scales they are viewed at. The chosen scale influences not only the obtained observations but the interpretation of results as well, and it determines what kind of questions might be addressed (WIENS & ROTENBERRY 1981).

The importance of scale in studying avian communities was shown by WIENS et al. (1987). They concluded that the detected spatial patterns of shrubsteppe birds depend on the scale of investigation. MOSKÁT et al. (1992) studied the possibilities of mathematical solutions for the scale problem in territorial birds, and compared several statistical methods of spatial analysis. PINEL–ALLOUL & PONT (1991) investigated the role of scale in the study of spatial patterns of freshwater macrozooplankton, and found that spatial heterogeneity occurs from very fine scale (<1m) to the whole lake scale.

In the present study we investigated ground-dwelling beetle communities at five levels of the local spatial scale. The following questions were asked:

(i) Is the detected community structure influenced by the applied level of observation? In other words, is community structure invariant when spatial scale is changed in iterative steps, or does the structure show any kind of inherent hierarchical variability?

(ii) What principles should be followed when planning a sampling strategy for the analysis of community structure of ground-dwelling beetles? Is it worth to arrange traps in a clustered pattern and analyze the obtained data at different scales?

We tried to answer some of these particularly important questions of community ecology by analyzing community structure parameters such as species richness, diversity and equitability of ground-dwelling beetles in two stages of dolomitic succession in Hungary. Although there is much controversy about the use of the different diversity indices (KREBS 1989), diversity is still one of the most important characteristics of ecological communities (MAGURRAN 1988).

STUDY AREA

The study area is situated on the Kutya hill in the Buda Hills, ca. 20 kilometres west of Budapest, near Nagykovácsi (47° 35′ N, 18° 90′). A complete series of dolomitic succession from the lichen-moss phase to the closing sessile-turkey oak forest phase is present in the study area, where the basic rock is Triassic dolomite. The soil of the grassy vegetation patches is rendzina, in the forested area brown soil. Two sites were selected which represent a medium and a mature stage of the successional sere, respectively:

I. Dolomite steppe meadow (*Chrysopogono-Caricetum humilis*, JAKUCS 1981). The characteristic species are: *Carex humilis* and *Chrysopogon gryllus*. This plant community is almost closed, rock/grass ratio is about 5/95.

II. Sessile-turkey oak forest (*Quercetum-petraea cerris*, JAKUCS 1981). It is composed mainly of *Quercus cerris* and *Quercus petraea*. Because of the shallow soil trees are only 10 to 15 metres high.

METHODS

Pitfall trapping is a generally accepted method for sampling ground-dwelling beetle communities (THIELE 1977), and it gives not only qualitative, but reliable quantitative data as well. Ground-dwelling beetles were collected from 7th April to 23rd October in 1988. A total of 108 pitfall traps were placed in each vegetation type. Plastic jars with a mouth diameter of 9 centimetres were used as traps, and contained ethyleneglycol as killing agent. Traps were emptied fourteen times during the six-month study period, approximately once in every fortnight. For the present analysis we selected two series of three consecutive captures from the summer and the autumn period in both successional stages, when the number of missing traps was less than 15% of all traps. For every species the numbers of caught individuals in all of the traps were summed up, and average number of caught individuals was used in further computations.

The 108 pitfall traps were placed in a hierarchically clustered manner, in an arrangement shown in Fig. 1. To analyze the effect of scale on community structure, the traps were grouped into clusters with increasing number of traps. These clusters were called sampling units. First all the 108 individual traps were regarded as single sampling units. Then a group of four traps was considered a sampling unit, thus the 108 traps were divided into 27 units. Then 12, 36, and 108 traps formed a cluster. The complete grouping procedure is shown in Table 1.

The Shannon-Weaner formula of diversity and equitability were calculated for each groupings of data.

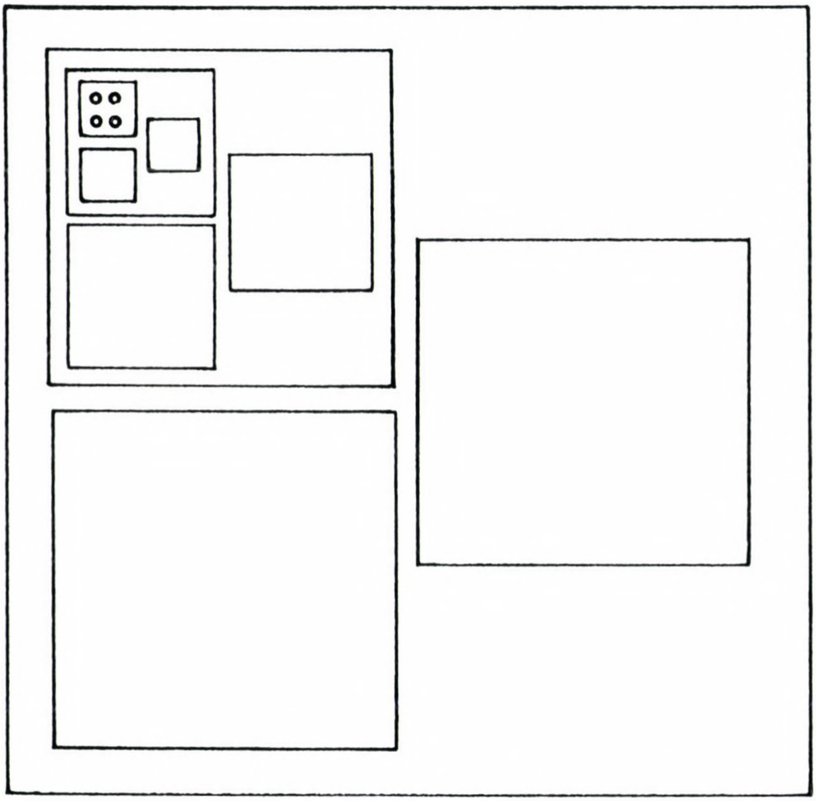


Fig. 1. Spatial arrangement of the hierarchically clustered traps.

Shannon-Weaner diversity formula: $H = -\Sigma p_i \ln p_i$
equitability is: $J = H/\ln S$
where p_i is the proportion of individuals in the *i*th species,
S is the number of species.

Table 1

The number of traps and the number of sampling units at different levels of observation at a site

number of traps in the sampling unit	108	36	12	4	1
number of sampling units	1	3	9	27	108

To adjust for the effect of sample size we used the corrected version of Shannon-Weaner diversity and equitability indices, as it was proposed by JÄRVINEN et al. (1978):

$$H_{cor} = H + f(N)$$

$$J_{cor} = H_{cor}/\ln S$$

and

$$\mathrm{var}H = [\Sigma p_i \ln^2 p_i - (\Sigma p_i \ln p_i)^2]/N + (S-1)/2N^2 +$$

$$+ (-1 + \Sigma p_i^{-1} - \Sigma p_i^{-1} \ln p_i + \Sigma p_i^{-1} \Sigma p_i \ln p_i)/6N^3$$

where H is the Shannon-Weaner formula

$$f(N) = (S-1)/2N - (1 - \Sigma p_i^{-1})/12N^2 - \Sigma(p_i^{-1} - p_i^{-2})/12N^3$$

S is the number of species,

N is the number of observations.

We used the method proposed by HUTCHESON (1970) to test whether the differences between two diversity values are significant or not:

$$t = |H_A - H_B| / (\mathrm{var}H_A + \mathrm{var}H_B)^{1/2}$$

where t is the t-value, H_A and H_B are diversities, $\mathrm{var}H_A$ and $\mathrm{var}H_B$ are variances. (A is sample 1, B is sample 2), and

$$\mathrm{d.f.} = (\mathrm{var}H_A + \mathrm{var}H_B)^2 / \left[\frac{(\mathrm{var}H_A)^2}{N_A} + \frac{(\mathrm{var}H_B)^2}{N_B}\right]$$

In the present study $p = 0.05$ probability level was applied.

RESULTS AND DISCUSSION

Basic structure of beetle communities

Altogether 23 789 individuals of 219 species were caught during the 6 months of trapping. In summer and autumn in the open dolomitic grassland, and in the closed forest 1856, 2805, 5238 and 3515 individuals of 75, 42, 94 and 52 species were caught, respectively. Most of the species were caught in low numbers, but a few species were superabundant. Detailed list of captured species and number of individuals is given in the Appendix.

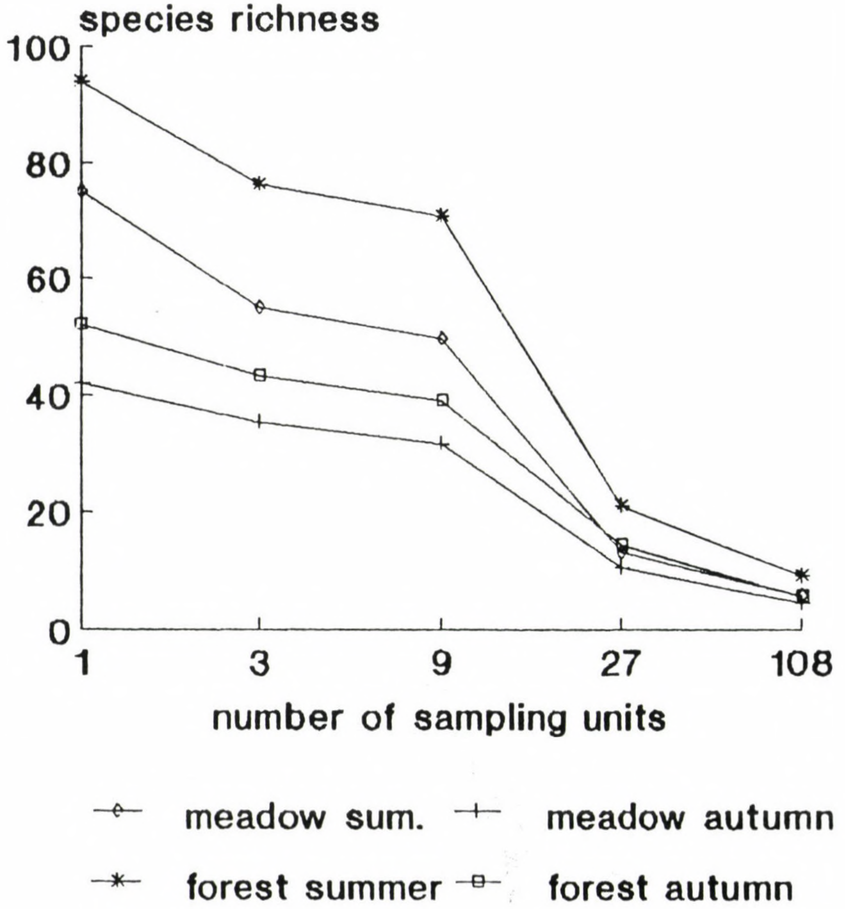


Fig. 2. Species richness as a function of the number of sampling units in the successional stages. – meadow sum.: open dolomite steppe meadow in summer; meadow autumn: open dolomitic steppe meadow in autumn; forest summer: sessile-turkey oak forest in summer; forest autumn: sessile-turkey oak forest in autumn.

Species richness was higher in the climax successional stage in the oak forest both in the summer and autumn period than in the open dolomitic steppe meadow. Species richness of the summer period was higher than in the autumn period in both association. The number of caught species decreases in relation to the decreasing number of traps in the sample units. The shape of the curve is very similar in all cases (Fig. 2), which may be explained by the species-area relationship. There was a sharp decrease in species number and diversity as the number of traps is reduced from 12 to 4, and from 4 to 1 in the sampling units (Fig. 3). The equitability values

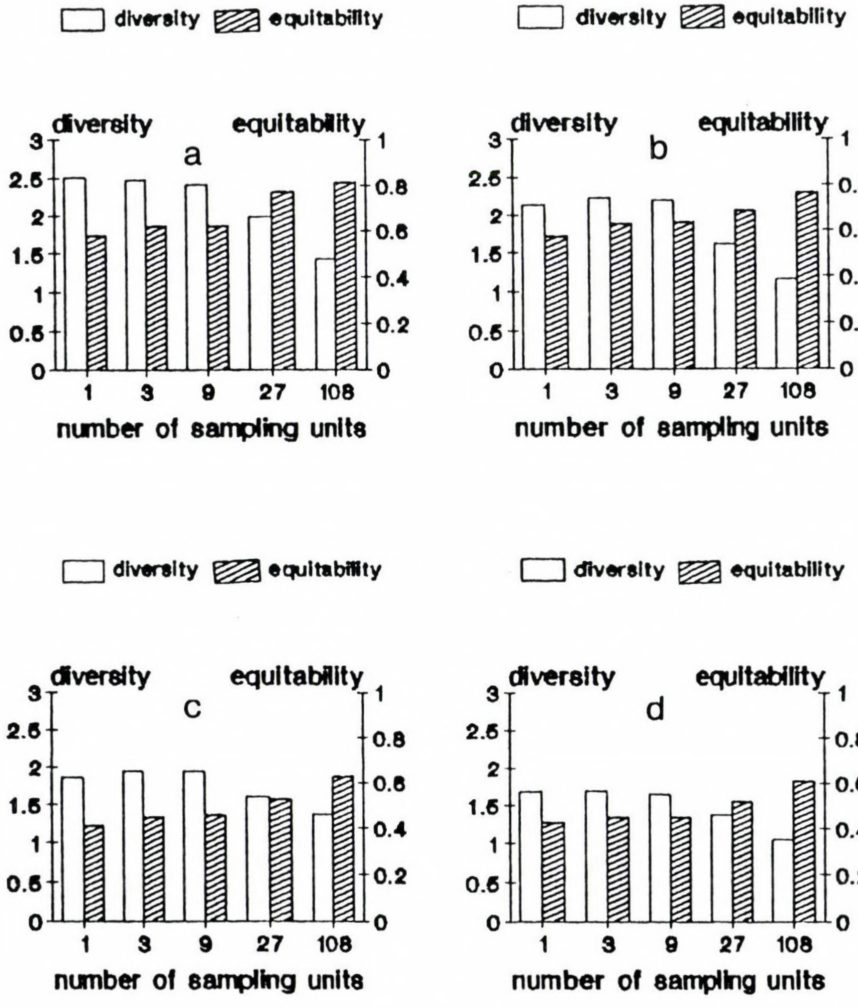


Fig. 3. Diversity and equitability values as a function of the number of sampling units: a = open dolomitic steppe meadow in summer; b = open dolomitic steppe meadow in autumn; c = sessile-turkey oak forest in summer; d = sessile-turkey oak forest in autumn.

changed in the opposite direction at the same changes of scale. This pattern is very pronounced in all the studied cases. Diversity showed a decreasing trend, whereas values of equitability increased.

Diversity is dependent on sample size. Computer simulations by MOSKÁT (1988) have revealed that the Shannon-Weaner diversity index shows

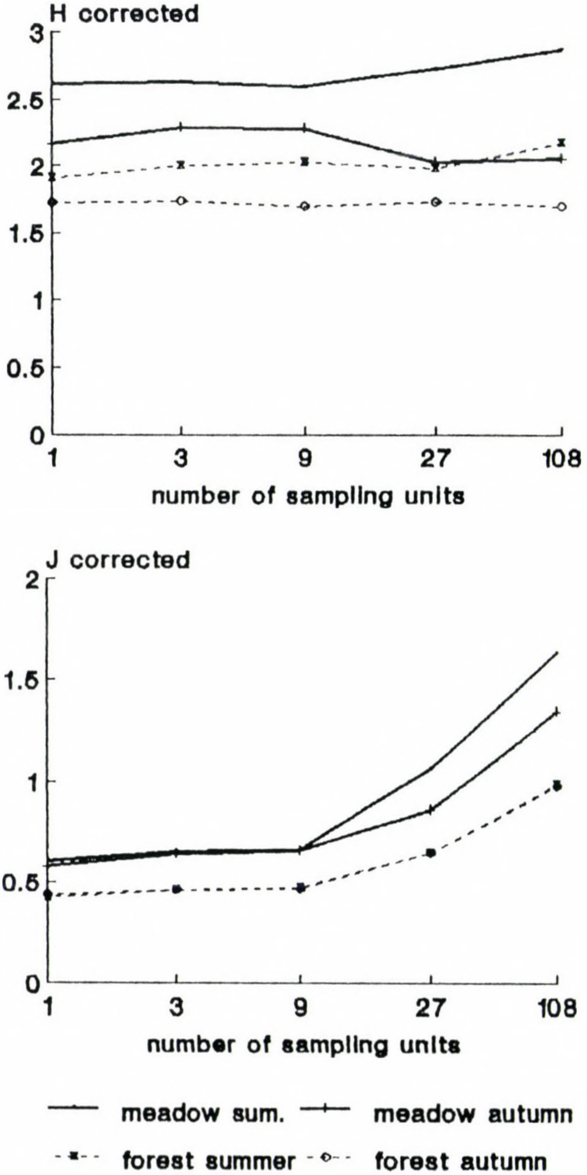


Fig. 4. Corrected diversity and equitability values as a function of the number of sampling units.

a slightly increasing trend in relation to sample size. When sample size is low ($n < 50$), the increase is greater. KOBAYASHI (1981) proved that this index is more stable than the other well-known diversity indices when sample size changes. Equitability shows a slightly decreasing trend with sample size (MOSKÁT 1988). We also calculated diversity values by the corrected formula (JÄRVINEN et al. 1978), which reduces this error (Fig. 4). When we applied the corrected formula the original monotonous decreasing trend of diversity values disappeared. The trend of the uncorrected Shannon-Weaner diversity index seems to be an artifact due to sample size. Hutcheson's test did not show any significant difference between the consecutive values of corrected diversity within one habitat. However, the increasing trend of equitability values became more pronounced. This possibly arose from the decreasing species number in smaller sample sizes.

BÁLDI (1990) also detected higher number of species of ground-dwelling beetles caught in the forest than in the open dolomitic grassland in the same study site. He concluded that greater heterogeneity of vegetation may support higher species richness. WALICZKY (1991) showed that the diversity of the guild of predator beetles was highest in the closing forest stage. LIEBHERR & MAHON (1979) stated that carabid diversity is related to habitat heterogeneity. Increased niche specialization and smaller resource overlap may explain the increased species richness (MACMAHON 1980). The higher diversity values in the dolomitic steppe meadow agrees with the results of BÁLDI (1990), who analysed three stages of dolomitic succession, and found that diversity was highest in the dolomitic steppe meadow. In concordance with this result the decomposer and the phytophagous guild of beetles (WALICZKY 1991), and grasshoppers (KISBENEDEK 1992) are also the most diverse in the dolomitic steppe meadow stage. BROWN & HYMAN (1986) also detected highest diversity values of phytophagous beetles in middle successional stages.

Detected scales and hierarchy

The possible spatial scales at which communities can be investigated form a continuum (WIENS 1989). In the present study we selected five discrete scales of observation, which cover only a small range of the spatial scales. A larger-scale pattern relates to the context of what is found in a smaller-scale pattern (ALLEN & HOEKSTRA 1991), although broad scale processes may influence the community at the local scale (DAYTON & TEGNER 1984). It is advisable to take into consideration many different scales when one analyzes a complex hierarchical structure. When abrupt changes of community structure occur between adjacent scales, we need to analyze the community on both scales. This practical guideline is especially useful when different communities are compared. Hierarchical composition of community structure in different habitats could be similar, as our study demonstrated it.

MacMahon et al. (1978) focused on the application of hierarchy theory to the study of the levels of biological organization. System dynamics of biological communities can be observed at discrete scales, where interacting entities are isolated from dynamics at much larger or smaller scales (Allen & Starr 1982). Hierarchical structure is an important feature of complex systems because it is a possible way to increase stability (O'Neil et al. 1986).

In the present study we sampled five local levels of the community pattern. We constructed a hierarchical sampling procedure in order to cover a range of scales, tracing the variability of community structure parameters. This approach can be applied as an initial step to explore the inherent structure and to generate hypothesis. Hierarchical sampling procedure may also be useful when testing hypotheses. When we consider neighbouring or close microscales, noise in data may hide relationships. Gauch (1982) reflected that eigenordination is a possible way for noise reduction.

Hierarchical sampling strategy is a powerful tool for detecting structure of hierarchically complex systems. However, the levels of observations or the levels detected by mathematical tools do not necessarily reflect real scale (Moskát et al. 1992). Important scales in ecology are connected with organisms, populations or communities. The following factors can cause differences in community structure at the different scales of observation:

(1) high order hierarchy in community structure,
(2) close relationship with habitat patchiness (habitat suitability, habitat use),
(3) instability (randomness, autogenous flexibility, loose connectivity between elements),
(4) noise (perturbation, sampling error),
(5) unsaturation caused randomness,
(6) inter- and intraspecific relationships (association, competition, behaviour, etc.),
(7) food availability.

Detailed studies on the effects of these components are badly needed.

CONCLUSIONS

(1) Use of the classical one-level community studies is limited. This was demonstrated by the changes of some community structure parameters at five scales of observation in ground-dwelling beetles in two habitats and two seasons.

(2) Hierarchical sampling strategies should be used for community studies. It is another task, a subsequent step to test whether the results are biologically meaningful or not (valid scales vs. sampling or mathematical artifacts). In some cases reduction of the noise in the data is necessary.

(3) Although the use of diversity indices and related parameters have been discussed by several authors (LUDWIG & REYNOLDS 1988, KREBS 1989), detailed tests of these indices with respect of the scale problem are badly needed.

(4) When community structure shows great variability at different scales of observation, this underlies some kind of hierarchy in structure.

* * *

Acknowledgements – Fieldwork of the study was carried out within the framework of the "Succession Project", an OKKFT programme of the Hungarian Natural History Museum. We are grateful to L. ÁDÁM and G. HRASKÓ for technical help during the fieldwork, and also to L. ÁDÁM for identifying the Coleoptera material. Data analysis was supported by an OTKA I/3 grant (No. 3188). Some parts of the study were also supported by an OTKA I/2 grant (No. 740/88). We are grateful to A. DEMETER for checking the English.

REFERENCES

ALLEN, T. F. H. & HOEKSTRA, T. W. (1991): Role of heterogeneity in scaling of ecological systems under analysis. In: KOLASA, J. & PICKETT, S. T. A. (eds.) Ecological heterogeneity. – Springer, New York, pp. 47–68.

ALLEN, T. F. H. & STARR, T. B. (1982): Hierarchy: perspectives for ecological complexity. – University of Chicago Press, Chicago: 310 pp.

BÁLDI, A. (1990): Species richness, abundance and diversity of beetles (Coleoptera) in relation to ecological succession. – *Fol. ent. hung.* **51:** 17–24.

BROWN, V. K. & HYMAN, P. S. (1986): Successional communities of plants and phytophagous coleoptera. – *J. Ecol.* **74:** 963–975.

DAYTON, P. K. & TEGNER, M. J. (1984): The importance of scale in community ecology: a kelp forest example with terrestrial analogs. – In: PRICE, P. W., SLOBODCHIKOFF, C. N. & GAUD, W. S. (eds.) A new ecology. Novel approaches to interactive systems. – Wiley, New York.

GAUCH, H. G. Jr. (1982): Noise reduction by eigenvector ordinations. – *Ecology* **63:** 1643–1649.

HUTCHESON, K. (1970): A test for comparing diversities based on the Shannon formula. – *J. theor. Biol.* **29:** 151–154.

JAKUCS, P. (1981): The most important plant associations of Hungary. – In: HORTOBÁGYI, T. & SIMON, T. (eds.) Plantgeography, coenology and ecology. – Tankönyvkiadó, Budapest. (In Hungarian.)

JÄRVINEN, O., VÄISÄNEN, R. & WALANKIEWICZ, W. (1978): Efficiency of the line transect method in Central European forests. – *Ardea* **66:** 103–111.

KISBENEDEK, T. (1992): Structure of grasshopper (Orthoptera) communities in relation to ecological succession of dolomitic grasslands. – *Fol. Ent. Hung.* **52:** 51–58.

KOBAYASHI, S. (1981): Diversity indices: relations to sample size and spatial distribution. – *Jap. J. Ecol.* **31:** 231–236.

KREBS, C. J. (1989): Ecological methodology. – Harper and Row Publ., New York: 654 pp.

LIEBHERR, J. & MAHON, J. (1979): The carabid fauna of the upland forest in Michigan: survey and analysis. – *The Coleopts. Bull.* **33:** 183–197.

LUDWIG, J. A. & REYNOLDS, J. F. (1988): Statistical ecology. – Wiley, New York: 337 pp.

MACMAHON, J. A. (1980): Ecosystem over time: Succession and other types of change. – In: WARING, R. H. (ed.) Forests: Fresh perspectives from ecosystem analysis. – Oregon State University Press, Corvallis, Oregon.

MACMAHON, J. A., PHILLIPS, D. L., ROBINSON, J. V. & SCHIMPF, D. J. (1978): Levels of biological organization: an organism-centered approach. – *Bioscience* **28:** 700–704.

MAGURRAN, A. E. (1988): Ecological diversity and its measurement. – Croom Helm, London: 179 pp.

MOSKÁT, C. (1988): Diversity and rarefaction. – *Aquila* **95:** 97–104. (In Hungarian with English summary.).

MOSKÁT, C., WALICZKY, Z. & BÁLDI, A. (1992): Dispersion and association of some marshland-nesting birds: a matter of scale. – *Acta Zool. Hung.* **38**(1–2): 47–62.

O'NEIL, R. V., DEANGELIS, D. L., ALLEN, T. F. H. & WAIDE, J. B. (1986): A hierarchical concept of ecosystems. – Princeton University Press, Princeton: 253 pp.

PINEL-ALLOUL, B. & PONT, D. (1991): Spatial distribution patterns in freshwater macrozooplankton. – *Can. J. Zool* **69:** 1557–1570.

THIELE, H. U. (1977): Carabid beetles in their environments. A study on habitat selection by adaptation in physiology and behaviour. – Springer Verlag, New York: 355 pp.

WALICZKY, Z. (1991): Guild structure of beetle communities in three stages of vegetational succession. – *Acta. Zool. Hung.* **37**(3–4): 313–324.

WIENS, J. A. (1989): The ecology of bird communities. – Cambridge University Press, Cambridge, vol. 1: 539 pp. + vol. 2: 316 pp.

WIENS, J. A. & ROTENBERRY, J. T. (1981): Habitat associations and community structure in shrubsteppe environments. – *Ecol. Monogr.* **51:** 21–41.

WIENS, J. A., ROTENBERRY, J. T. & VAN HORNE, B. (1987): Habitat occupancy patterns of North American shrubsteppe birds: the effects of spatial scale. – *Oikos* **48:** 132–147.

APPENDIX

Number of captured individuals

A = sum of three sampling phases during summer (7th July—11th August, 1988) in the dolomitic steppe-meadow habitat
B = sum of three sampling phases during autumn (22nd September—23rd October, 1988) in the dolomitic steppe-meadow habitat
C = sum of three sampling phases during summer (7th July—11th August, 1988) in the sessile-turkey oak forest
D = sum of three sampling phases during autumn (22nd September—23rd October, 1988) in the sessile-turkey oak forest

	A	B	C	D
Abax parallelepipedus (PILLER et MITTERPACHER, 1783)	0	0	56	4
Acalles camelus (FABRICIUS, 1792)	0	0	2	0
Agrypnus murinus (LINNAEUS, 1758)	0	0	5	0
Aleochara curtula (GOEZE, 1777)	2	0	7	0
Amara aenea (DE GEER, 1774)	0	0	5	0
Amara communis (PANZER, 1797)	0	0	1	0
Amara consularis (DUFTSCHMID, 1812)	0	0	2	1
Amara eyrinota (PANZER, 1797)	0	2	2	0
Amphotis marginata (FABRICIUS, 1781)	0	3	0	0
Anotylus sculpturatus (GRAVENHORST, 1806)	0	0	55	3
Anthobium atrocephalum (GYLLENHAL, 1827)	0	0	1	4
Antipa macropus ILLIGER, 1800	2	0	0	0
Aphodius distinctus (O. F. MÜLLER, 1776)	0	7	0	20
Aphodius equestris (PANZER, 1798)	0	0	0	46
Aphodius erraticus (LINNAEUS, 1758)	1	0	0	0
Aphodius lugens CREUTZER, 1799	5	0	0	0
Aphodius maculatus STURM, 1800	0	0	0	65
Aphodius obliteratus PANZER, 1823	0	0	0	38
Aphodius prodromus (BRAHM, 1790)	0	2	0	9
Aphodius rufipes (LINNAEUS, 1758)	0	0	1	2
Aphthona euphorbiae (SCHRANK, 1781)	2	0	0	0
Aptinus bombarda (ILLIGER, 1800)	0	0	3	1
Atheta crassicornis (FABRICIUS, 1792)	0	0	0	2
Atheta ravilla (ERICHSON, 1839)	0	0	1	0
Atheta triangulum (KRAATZ, 1856)	0	0	2	0
Atholus duodecimstriatus (SCHRANK, 1781)	2	0	3	0
Baeoglena praecox (ERICHSON, 1839)	1	0	1	0
Blaps lethifera MARSHAM, 1802	4	0	0	0
Calathus fuscipes (GOEZE, 1777)	86	112	9	14
Calosoma inquisitor (LINNAEUS, 1758)	0	0	5	0
Carabus convexus FABRICIUS, 1775	0	1	403	163
Carabus coriaceus LINNAEUS, 1758	1	0	2	0
Carabus hortensis LINNAEUS, 1758	0	0	1	8
Carabus scheidleri PANZER, 1797	0	0	1	0
Catops grandicollis ERICHSON, 1837	0	0	0	1
Cetonia aurata (LINNAEUS, 1758)	6	0	2	0
Coccinella septempunctata LINNAEUS, 1758	2	0	2	0
Copris lunaris (LINNAEUS, 1758)	0	13	0	14
Coprochara bipustulata (LINNAEUS, 1761)	1	0	0	0
Coraebus elatus (GMELIN, 1790)	1	0	0	0

Cryptarcha strigata (Fabricius, 1787)	2	0	0	0
Crypticus quisquilius (Linnaeus, 1761)	159	0	0	0
Cymindis axillaris (Fabricius, 1794)	0	17	0	0
Datomicra nigra (Kraatz, 1856)	0	0	0	3
Dermestinus frischii (Kugelann, 1792)	6	1	0	0
Dermestinus murinus (Linnaeus, 1758)	0	1	0	0
Dermestinus undulatus (Brahm, 1790)	2	0	0	0
Diastictus vulneratus (Sturm, 1805)	1	0	0	0
Dicronychus rubripes (Germar, 1824)	2	0	0	0
Drusilla canaliculata (Fabricius, 1787)	0	0	0	1
Gabrius vernalis (Gravenhorst, 1806)	0	0	3	0
Galeruca pomonae (Scopoli, 1763)	0	3	0	0
Galeruca tanaceti (Linnaeus, 1758)	0	17	0	0
Geotrupes spiniger (Marsham, 1802)	0	13	0	2
Geotrupes stercorosus (Scriba, 1791)	0	0	3	1
Geotrupes vernalis (Linnaeus, 1758)	292	837	3107	2245
Gnaptor spinimanus (Pallas, 1781)	32	1	0	0
Gonodera luperus (Herbst, 1783)	6	0	0	0
Gymnopleurus geofroae (Fuessly, 1775)	2	0	0	0
Gyrophaena joyioides (Wüsthoff, 1937)	0	0	1	0
Harpalus atratus Latreille, 1804	0	0	11	0
Harpalus dimidiatus (Rossi, 1790)	1	0	0	0
Harpalus rufipes (De Geer, 1774)	1	0	6	0
Heptaulacus villosus (Gyllenhal, 1806)	9	0	0	0
Hister illigeri Duftschmid, 1805	2	1	0	0
Hister quadrimaculatus Linnaeus, 1758	12	0	0	0
Ischnopoda aterrima (Gravenhorst, 1802)	0	1	0	0
Judolia erratica (Schönherr, 1817)	3	0	0	0
Kryptophagus pseudodentatus (Bruce, 1934)	0	0	4	0
Kryptophagus schmidti (Sturm, 1845)	0	0	1	0
Labidostomis longimana (Linnaeus, 1761)	1	0	0	0
Leistus rufomarginatus (Duftschmid, 1812)	0	0	0	28
Leptinus testaceus P. W. S. Müller, 1817	0	0	1	0
Lycoperdina succincta (Linnaeus, 1767)	1	0	0	0
Margarinotus obscurus (Kugelann, 1792)	1	0	27	0
Masoreus wetterhallii (Gyllenhal, 1813)	0	0	0	1
Megasternum obscurum (Marsham, 1802)	1	0	0	0
Melanotus castanipes (Paykull, 1800)	0	0	1	0
Melanotus erythropus (Gmelin, 1790)	1	0	0	0
Meneidophallus roubali (Coiffait, 1956)	1	0	0	0
Mocyta fungi (Gravenhorst, 1806)	0	0	1	0
Mocyta negligens (Mulsant et Rey, 1873)	0	0	1	0
Mycetodrepa formosa (Kraatz, 1856)	0	0	1	0
Necrodes littoralis (Linnaeus, 1758)	3	0	26	0
Netocia cuprea obscura (Andersch, 1797)	2	2	0	0
Nicrophorus vespillo (Linnaeus, 1758)	86	39	473	45
Nicrophorus vespilloides Herbst, 1784	75	241	103	318
Nicrophorus fossor (Erichson, 1837)	0	1	1	1
Nicrophorus germanicus (Linnaeus, 1758)	1	0	0	0
Nicrophorus humator (Gleditsch, 1767)	9	16	25	19
Nothiophilus rufipes (Curtis, 1829)	0	0	5	0
Ocypus biharicus (G. Müller, 1926)	1	0	0	0
Ocypus olens (O. F. Müller, 1764)	3	27	6	58
Ocypus similis semialatus (G. Müller, 1904)	0	1	0	0

Odonteus armiger (SCOPOLI, 1772)	0	0	1	0
Oiceoptoma thoracicum (LINNAEUS, 1758)	0	0	33	0
Omalium caesum (GRAVENHORST, 1806)	0	0	7	5
Omalium rivulare (PAYKULL, 1789)	0	0	0	14
Omiamima mollina (BOHEMAN, 1834)	0	0	1	0
Ontholestes murinus (LINNAEUS, 1758)	8	12	18	12
Onthophagus coenobita (HERBST, 1783)	0	6	43	16
Onthophagus fracticornis (PREYSSLER, 1790)	1	703	5	83
Onthophagus grossepunctatus REITTER, 1905	27	2	20	0
Onthophagus lemur (FABRICIUS, 1781)	7	0	4	0
Onthophagus nutans (FABRICIUS, 1787)	2	1	59	12
Onthophagus ovatus (LINNAEUS, 1767)	0	0	21	2
Onthophagus ruficapillus BRULLÉ, 1832	28	3	7	0
Opilo mollis (LINNAEUS, 1758)	0	0	1	0
Otiorhynchus hungaricus GERMAR, 1824	0	0	2	1
Otiorhynchus raucus (FABRICIUS, 1777)	6	0	17	0
Oxytelops tetracarinatus (BLOCK, 1779)	0	0	1	0
Palporus nitidulus (FABRICIUS, 1781)	0	0	1	0
Pedinus femoralis (LINNAEUS, 1767)	341	60	0	0
Pella limbata (PAYKULL, 1789)	1	0	0	0
Philonthus atratus (GRAVENHORST, 1802)	0	0	1	0
Philonthus cognatus STEPHENS, 1832	1	0	27	0
Philonthus decorus (GRAVENHORST, 1802)	0	0	2	0
Philonthus intermedius (LACORDAIRE, 1835)	0	0	4	1
Philonthus laminatus (CREUTZER, 1799)	0	43	5	35
Philonthus pachycephalus NORDMANN, 1837	1	0	0	0
Philonthus proximus KRAATZ, 1859	0	0	11	0
Philonthus tenuicornis REY, 1853	0	0	2	0
Phloeopora teres (GRAVENHORST, 1802)	0	0	0	1
Platyderes rufus (DUFTSCHMID, 1812)	0	0	0	1
Platydracus chalcocephalus (FABRICIUS, 1801)	0	0	36	0
Platydracus stercorarius (OLIVIER, 1795)	10	6	0	0
Prionus coriarius (LINNAEUS, 1767)	0	0	1	0
Pristonychus terricola (HERBST, 1784)	0	0	15	17
Prosternon tessellatum (LINNAEUS, 1758)	1	0	0	0
Pseudocleonus cinereus (SCHRANK, 1781)	2	0	0	0
Pseudocypus fulvipennis (ERICHSON, 1840)	0	2	0	0
Pseudocypus picipennis (FABRICIUS, 1792)	1	103	3	23
Psylliodes aerea (FOUDRAS, 1860)	1	0	0	0
Pterostichus melas (CREUTZER, 1799)	2	0	244	83
Pterostichus niger (SCHALLER, 1783)	0	0	1	0
Ptinus nitidus DUFTSCHMID, 1825	0	1	0	0
Ptinus rufipes OLIVIER, 1790	0	0	3	0
Quedius fuliginosus (GRAVENHORST, 1802)	0	0	1	0
Saprinus semistriatus (SCRIBA, 1790)	7	0	6	0
Sauridus limbatoides (COIFFAIT, 1963)	1	0	0	0
Schinomosa forticornis (FAUVEL, 1875)	1	0	0	0
Sciodrepoides watsoni (SPENCE, 1815)	0	0	1	2
Sepedophilus marshami (STEPHENS, 1832)	0	0	1	3
Sepedophilus pedicularius (GRAVENHORST, 1802)	0	0	0	1
Silpha carinata HERBST, 1783	3	0	10	0
Silpha obscura LINNAEUS, 1758	0	0	3	0
Silpha tristis ILLIGER, 1798	1	0	2	0
Sisyphus schaefferi (LINNAEUS, 1758)	480	401	138	70

Stenomax aeneus (SCOPOLI, 1763)	0	0	21	1
Stomodes gyrosicollis BOHEMAN, 1843	3	0	0	0
Tachinus signatus GRAVENHORST, 1802	0	0	9	4
Thanatophilus rugosus (LINNAEUS, 1758)	60	71	62	9
Thanatophilus sinuatus (FABRICIUS, 1775)	2	3	1	0
Timarcha goettingensis (LINNAEUS, 1758)	1	21	0	0
Trionthus lepidus (GRAVENHORST, 1802)	0	0	1	0
Trox asiaticus FALDERMANN, 1835	14	2	3	0
Trox cadaverinus ILLIGER, 1801	0	0	1	0
Trox sabulosus (LINNAEUS, 1758)	1	0	1	0
Typhaea stercorea (LINNAEUS, 1758)	0	0	1	2
Zabrus spinipes (FABRICIUS,1798)	4	6	0	0
Zabrus tenebrioides (GOEZE, 1777)	4	0	1	0

Acta Zoologica Hungarica 38 (3–4), pp. 199–205 (1992)

ON THE PHYLOGENY OF ARADID SUBFAMILIES (HETEROPTERA, ARADIDAE)

S. M. GROZEVA & I. M. KERZHNER

Institute of Zoology, Bulgarian Academy of Sciences, BG–1000 Sofia, boul. Izar Osvoboditel 1, Bulgaria
Zoological Institute, Academy of Sciences of Russia, Sankt Peterburg 199034, Universitetskaya nab. 1, Russia

(Received 25th November, 1991)

A new scheme of the phylogeny of aradid subfamilies is proposed. It is based mainly on the characters used by T. VÁSÁRHELYI (1987), though some of them are reinterpreted. Prosympiestinae and Isoderminae are regarded as monophyletic group, Calisiinae + Aradinae as a sister group of Tretocorini. With 3 figures.

There are about 1800 species and 211 genera of Aradidae in the world (KORMILEV & FROESCHNER 1987). On the basis of the egg type, the form of pulvillus and the external male and female genitalia the Aradidae belong to the infraorder Pentatomomorpha. Differently from the other Pentatomomorpha, Aradidae and related Termitaphididae have no abdominal trichobothria and therefore they hold a unique place in the infraorder. USINGER & MATSUDA (1959) described eight major groups within Aradidae as subfamilies. They constructed the relationships of subfamilies on the basis of the structure of the head apex, presence or absence of the opening of the scent glands and other characters (Fig. 1).

After USINGER & MATSUDA several studies on the Aradidae have been published, but only a few of them had given new information about systematics at the subfamily level. KUMAR (1967) investigated reproductive and alimentary organs of many representatives of 5 subfamilies of Aradidae and of Termitaphididae. On the basis of several primitive features in both reproductive and alimentary organs Aradoidea, as a whole, are regarded by him as representing one of the very early offshoot in evolution of terrestrial Heteroptera. KUMAR on the whole confirmed the current classification, but he thinks that Carventinae and Mezirinae could be combined into a single subfamily and Termitaphididae do not seem sufficiently distant from the various aradid subfamilies to warrant family status.

ŠTYS (1969) found that the species of the genus *Aradus* have free labrum, whereas species of the genera *Aneurus* and *Mezira* have labrum and clypeus fused in clypeolabrum.

LEE & PENDERGRAST (1976) investigated the stylets in the family and found three types: the "clockwise type" (Aradinae, Calisiinae and the genus *Tretocoris* of Chinamyersiinae), the "figure of eight type" *(Chinamyersia)* and "anticlockwise type" (other five subfamilies). Later MONTEITH (1980) examined the stylets of two other genera of Chinamyersiinae and found that the genera of this subfamily form two groups – *Gnostocoris–Chinamyersia* and *Kumaressa–Tretocoris*.

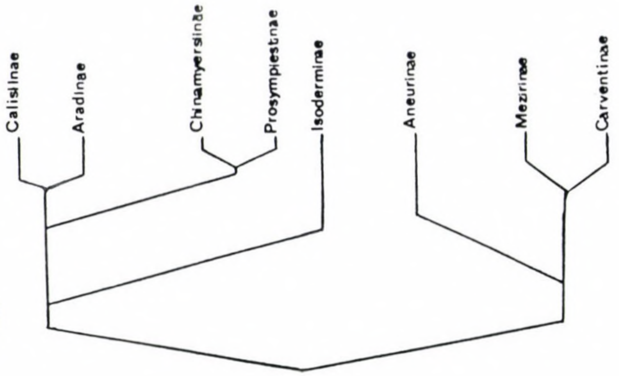
JACOBS (1980) discussed relationships of the subfamilies of Aradidae (except the Chinamyersiinae). He treated Aradinae and Calisiinae as the most primitive among examined subfamilies, more primitive than Isoderminae and Prosympiestinae, because they show the greatest number of plesiomorphic character states. JACOBS supported the view of KUMAR (1967) that Mezirinae and Carventinae are very close and Aneurinae are quite closely related to the latter two subfamilies.

LEE & PENDERGRAST (1983) investigated the structure of the female spermatheca of the eight subfamilies. The opinion that Isoderminae and Prosympiestinae are closely related is confirmed by them. The results show that two distinct lines *(Chinamyersia–Gnostocoris, Tretocoris–Kumaressa)* are present in Chinamyersiinae. Later KORMILEV & FROESCHNER (1987) described these lines as tribes (Chinamyersiini and Tretocorini).

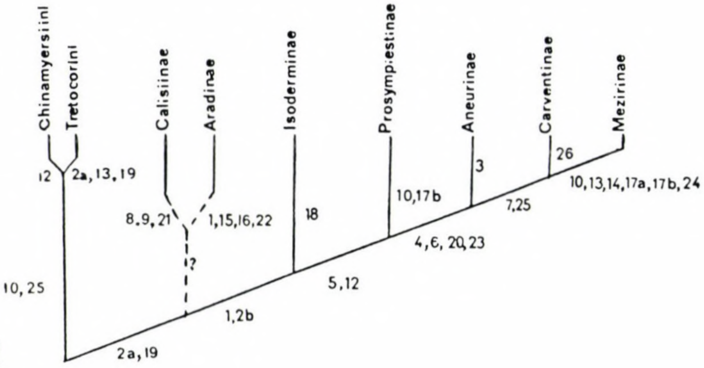
The last phylogenetic scheme is that of VÁSÁRHELYI (1987). It is based on 26 characters (Fig. 2, Table 1). Thirteen of these characters are autapomorphies of a single subfamily (3, 8, 9, 11, 13, 14, 15, 16, 18, 21, 22, 24, 26). Character 13 (reduction of pulvillus to bristle-like and peg-like structure) is indicated in this paper for Tretocorini and Mezirinae, but in a former paper (VÁSÁRHELYI 1986) it is indicated only for few species of the Mezirinae. Characters 17a and 17b (modification of the parempodia) are typical for some genera of two not related subfamilies (VÁSÁRHELYI 1986) and they can not be used for phylogenetic reconstructions. Two of the rest 11 characters according to VÁSÁRHELYI's scheme have a parallel transformation: character 2 (type of coiling of the stylets) and 10 (the increase of size of the metathoracic scent gland opening and of the evaporative area). Some mistakes in VÁSÁRHELYI's scheme should be corrected: in the branch of Aradinae character 1 should be 11; character 5 (rostrum is enclosed by bucculae at the base) should be entered in all subfamilies except Isoderminae and character 12 – in all the Chinamyersiinae. Finally, in contrast to VÁSÁRHELYI's opinion the representatives of Isoderminae have a developed evaporative area (character 10).

We suggest a new phylogenetic scheme (Fig. 3), which is based on the same characters (Table 2) used by VÁSÁRHELYI, but 15 autapomorphic and unsuitable characters (see above) are eliminated. The opposed evolution of characters 5, 10 and 12 is assumed: we accept that the presence of bucculae

1



2



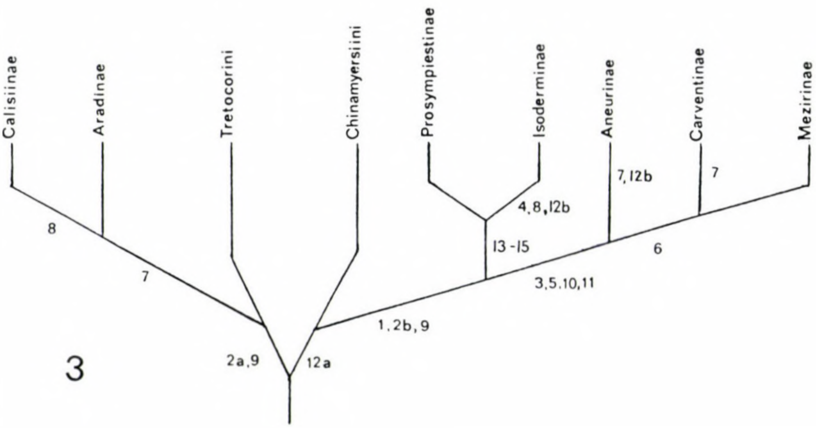


Fig. 1. Phylogenetic relationships of subfamilies of Aradidae (after USINGER & MATSUDA 1959). – Fig. 2. Cladogram of the Aradid subfamilies (after VÁSÁRHELYI 1987). – Fig. 3. New scheme of phylogenetic relationships of subfamilies of Aradidae.

Table 1

Character states investigated (after Vásárhelyi 1987)

Plesiomorphous	Apomorphous
1 Labrum free	Labrum fused with clypeus
2 Stylets coiled in a "figure of eight"	Stylets coiled either in clockwise (2a) or in anticlokwise (2b) direction
3 Rostrum 4-jointed	Rostrum 3-jointed
4 Rostrum long, surpassing the hind border of head	Rostrum short, not reaching beyond head
5 Rostrum free at base	Rostrum enclosed by bucculae at base
6 Genae not large	Genae large, often surpassing clypeus
7 Rostral atrium open	Rostral atrium closed
8 Antennal joint IV not the longest, other joints various in length	Antennal joint IV tends to be the longest, joints I-III tend to be subequilongous
9 Scutellum of macropterous form not covering most of the abdomen	Scutellum of macropterous form large, covering most of the abdomen
10 Metathoracic scent gland opening slit-like	Metathoracic scent gland opening large, often with large evaporative area
11 Pulvillus present	Pulvillus absent
12 Pulvillus laminate	Pulvillus lobe-like
13 Pulvillus lobe-like	Pulvillus reduced to bristle-like, hair-like or peg-like structure
14 Empodium and parempodium present	Empodium and parempodium may be absent
15 Empodium bifurcated	Empodium pentangular
16 Parempodium long	Parempodium short
17 Parempodium a typical sensory seta	Parempodia may be either long, widened and flattened or long, helically curved, appearing together as a single median curled seta
18 Wings not deciduous	Wings deciduous
19 One lateral apodemal impression on tergites III – VII (1 : 1 : 1 or 1 : 1 : 0)	Two lateral apodemal impressions on tergites III – VII (2 : 1 : 1)
20 One midlateral apodemal impression on tergites 3 – 7 (2 : 1 : 1)	Two midlateral apodemal impressions on tergites 3 – 7 (2 : 2 : 1)
21 Lateral edge of dorsolaterotergites with a single row of granules	Lateral edge of dorsolaterotergites with double row of granules
22 Ventral opaque area exposed on abdomen of adults	Ventral opaque area sank into the longitudinal furrow on the adult
23 Opening of the larval abdominal scent glands equally developed	Opening of the first gland more developed than the others
24 First larval abdominal scent gland opening without ejaculating channel	First larval abdominal scent gland opening with two ejaculating channels

Table 1 continued

Plesiomorphous	Apomorphous
25 Larval abdominal scent gland openings on hind margin of tergites III – V	Larval abdominal scent gland openings positioned backwards (hind margin of tergites III – V is deflected backwards medially)
26 Body uncovered	Body mostly covered by incrustations

is primary (Table 2, character 4) like in most infraorders of Heteroptera and their reduction is secondary. For the metathoracic scent glands (character 10) we assume that the large opening with an evaporative area is primary (Table 2, character 7) and they are reduced independently in some subfamilies. We assume that the lobe-like pulvillus (character 12) is plesiomorphic, and the lack of pulvillus (Aradinae) and laminate distipulvillus (Calisiinae and Isoderminae) are apomorphic (Table 2, character 8). VÁSÁRHELYI divided the subfamilies into two groups: one with deflected backwards hind margin of tergites III–V (Carventinae and Mezirinae) and one with this margin less bent (the rest of subfamilies) (character 25). In our opinion it is better to divide Aradidae into other groups (character 12): those with hind margin of tergites III–V straight or nearly so, and those with this margin distinctly bent backwards (Carventinae, Mezirinae, Chinamyersiini and Prosympiestinae). In Carventinae and Mezirinae the hind margin with the opening of larval scent glands are strongly shifted backwards, in Chinamyersiini and Prosympiestinae slightly curved and in Isoderminae and Aneurinae they returned to ancestral form (straight).

We agree with VÁSÁRHELYI that the "figure of eight type" of stylets coiling (as in Chinamyersiini) was ancestral for the family, but we differ in the opinion on evolution of this character: according to VÁSÁRHELYI's scheme the ancestral type was transformed to "clockwise type" independently in the two groups, and the "anticlockwise type" originated from the "clockwise type"; in our scheme both "clockwise" and "anticlockwise" types originated independently and only once from the ancestral type.

Three additional characters are included in our scheme, all are synapomorphies for Isoderminae and Prosympiestinae: the venation of hind wings is reduced up to one vein; the rostral groove on gula is absent; the lateral lobes of VIII abdominal segment are reduced.

In our scheme Prosympiestinae and Isoderminae are considered as a monophyletic group, that agrees with the widespread opinion on their close relationship (USINGER & MATSUDA 1959, PENDERGRAST 1965). Calisiinae + Aradinae are considered as a sister group of Tretocorini, as supported

Table 2

Plesiomorphous and apomorphous character states used by the authors for construction of the new phylogenetic scheme (see also Fig. 3)

Character number in the new scheme (Fig. 3)	Character number in VÁSÁRHELYI's scheme	Plesiomorphous	Apomorphous
1	1	Labrum free	Labrum fused with clypeus
2	2	Stylets coiled in a "figure of eight"	Stylets coiled either in clockwise (2a) or in anticlockwise (2b) direction
3	4	Rostrum long, surpassing the hind border of head	Rostrum short, not reaching beyond head
4	5	Rostrum enclosed by bucculae at base	Rostrum free at base
5	6	Genae not large	Genae large, often surpassing clypeus
6	7	Rostral atrium open	Rostral atrium closed
7	10	Metathoracic scent gland opening large, often with large evaporative area	Metathoracic scent gland opening slit-like
8	12	Pulvillus lobe-like	Pulvillus laminate
9	19	One lateral apodemal impression (glabrous area) on tergites III–VII (1 : 1 : 0 or 1 : 1 : 1)	Two lateral apodemal impressions on tergites III–VII (2 : 1 : 1)
10	20	One midlateral apodemal impression on tergites III–VII (2 : 1 : 1)	Two midlateral apodemal impressions on tergites III–VII (2 : 2 : 1)
11	23	Opening of the larval abdominal scent glands equally developed	Opening of the first gland more developed than others
12	25	Hind margin of tergites III–V straight or nearly so	Hind margin of tergites III–V distinctly bent backwards
13	—	The venation of hind wings includes more than one vein	The venation of hind wings is reduced up to one vein
14	—	The rostral groove on gula present	The rostral groove on gula absent
15	—	The lateral lobes of VIII abdominal segment present	The lateral lobes of VIII abdominal segment absent

by the "clockwise type" of stylets coiling. The evolution of stylets coiling and stink gland opening becomes simpler and less contradictory in our scheme.

* * *

Acknowledgement – We wish to thank DR. T. VÁSÁRHELYI for helpful manuscript discussion and suggestions.

REFERENCES

JACOBS, D. H. (1980): Evolution and relationships in the Aradidae (Heteroptera). – *Proc. 3rd entomol. Congr. Pretoria* **3:** 2–3.

KORMILEV, N. A. & FROESCHNER, R. C. (1987): Flat bugs of the world: a synonymic list (Heteroptera, Aradidae). – *Entomography* 5 + 246 pp.

KUMAR, R. (1967): Morphology of the reproductive and alimentary systems of the Aradoidea (Hemiptera), with comments on relationships within the superfamily. – *Ann. Entomol. Soc. Am.* **60**(1): 17–25.

LEE, C. E. & PENDEGRAST, J. G. (1976): A comparative study of the stylets in the Aradidae (Hemiptera-Heteroptera). – *J. nat. Hist.* **10:** 489–496.

LEE, C. E. & PENDERGRAST, J. G. (1983): The spermathecae of New Zealand Aradidae (Hemiptera–Heteroptera). – *J. nat. Hist.* **17:** 113–122.

MONTEITH, G. B. (1980): Relationships of the genera of Chinamyersiinae, with description of a relict species from mountains of North Queensland (Hemiptera: Heteroptera, Aradidae). – *Pacif. Insects* **21**(4): 275–285.

PENDERGRAST, J. G. (1965): The Aradidae of New Zealand (Hemiptera, Heteroptera) II. The Isoderminae. – *Trans. Roy. Soc. N. Zeal. Zool.* **6**(23): 235–243.

ŠTYS, P. (1969): On the morphology of the labrum in Heteroptera. – *Acta Entomol. Bohemoslov.* **66:** 152–158.

USINGER, R. L. & MATSUDA, R. (1959): Classification of the Aradidae (Hemiptera–Heteroptera). – London VII + 410 pp.

VÁSÁRHELYI, T. (1986): The pretarsus in Aradidae. – *Acta Zool. Hung.* **32**(3–4): 377–383.

VÁSÁRHELYI, T. (1987): On the relationships of the eight Aradid subfamilies (Heteroptera). – *Acta Zool. Hung.* **33**(1–2): 263–267.

Acta Zoologica Hungarica 38 (3–4), pp. 207–211 (1992)

TRIDISCUS OETVOESI SP. N. AND SOME ZOOGEOGRAPHIC FEATURES OF SCALE-INSECT FAUNA OF CANADA (HOMOPTERA, COCCOIDEA)

F. KOZÁR & R. G. FOOTIT

Plant Protection Institute, Hungarian Academy of Sciences, H–1525 Budapest, P. O. Box 102, Hungary

Biosystematics Research Institute, Agriculture Canada, K. W. Neatby Bldg., C. E. F. Ottawa, Ontario K1A 0C6, Canada

(Received 10th January, 1992)

A species of the genus *Tridiscus*, *T. oetvoesi* sp. n., is described from Canada. Including this species the Canadian scale-insect fauna contains 86 species in 9 families. However, in the future about 300 scale-insect species are expected in Canada. Especially high number would be expected in the South-Western Canada. With 1 figure.

According to SCUDDER (1979) there are 56 scale-insect species in Canada. He estimated the number of undescribed or unrecorded Canadian species of Coccoidea almost nil (4). FOOTIT & WILLIAMS (1989) collected a recent list of scale-insects in the Canadian National Collection, which contains 57 species from Canada. The known scale-insect fauna of the USA contains about 900 species (MILLER pers. com.). DANKS (1979, 1988) showed that the Canadian insect species number in general is about one third of the USA fauna. He estimates the number of insect species in Canada about twice as that we know nowadays. According to these data we can not consider the Canadian scale-insect fauna well known.

In the recent paper we will describe a scale-insect species new for science collected in Victoria B. C. in Canada, by the senior author in 1988. On the basis of the current species lists and on the basis of the collection of the senior author published elsewhere (KOZÁR et al. 1989), we will give a preliminary zoogeographic characterization of Canadian scale-insect fauna which can help in its better exploration.

Tridiscus oetvoesi sp. n.
(Fig. 1)

Diagnosis – A species of the *Tridiscus* genus separated by 1–2 circuli, 7-segmented antennae, by having multilocular pores on both surfaces of abdomen and by the lack of dorsal ostioles.

Description – Female: Mounted specimens elongated, 2–3 mm long, 1–1.5 mm wide. Antennae 7-segmented, short, moderately stout. Eyes circular. Labium short, the stylet loop somewhat longer than the labium. Legs small, hind coxae with noticeably sclerotization and with cluster of translucent pores at base, claw slender, without denticle. Circuli two in number, the posterior bigger than the anterior one, they are situated on the intersegmental line of the third and fourth segments. Dorsal ostioles absent sometimes there are traces of posterior pair. Anal lobes not protruding. Cerarii on anal lobes only, each with a pair of elongated, rather stout setae, with 2 slender auxiliary setae and with very few trilocular pore with mostly only one. Anal ring with one outer row of small, rounded pores and with 1–2 inner row of big, elongated and irregular form of pores. Anal ring not closed in anterior and posterior sides. Dorsal and ventral surfaces with numerous setae, between them on the venter they are twice longer than on the dorsum. Spiracles with 3–5 trilocular pores. Trilocular pores sparsely distributed on both surfaces. Multilocular pores distributed on both sides mostly on abdomen, and some of them in the venter of thorax. Oral collar tubular ducts of one size, scattered on both surfaces.

Type material – Holotype: female on *Agropyron* sp. (in the leaf sheaths), Victoria B. C. (sea coast), 10. 7. 1988, by F. KOZÁR (KOZÁR'S collection number 3320), deposited in the Zoological Department of the Plant Protection Institute, Hungarian Academy of Sciences (Budapest, Hungary). The paratypes are on 4 slides with 4 females and some dry material. 1–1 paratypes are deposited in the Collections of Biosystematics Research Institute (Ottawa, Canada), USDA Systematic Entomology Laboratory (Beltsville, USA), and the dry material in the Pacific Forestry Research Centre (Victoria B. C., Canada).

The species is named in honour of entomologist, DR. IMRE S. ÖTVÖS (Pacific Forestry Research Centre, Victoria B. C., Canada) who gave a substantial help in organisation of this collecting trip.

Remarks – In some specimens the first circuli was absent and in this case the number of multilocular pores was higher on the thorax and head. These characters show similarities with *T. sporoboli* (COCKERELL, 1902), but it has only 6-segmented antennae and known only from New Mexico (FERRIS 1953). There are some similarities with *T. distichlii* (FERRIS, 1918), which has multilocular pores on the head, it has posterior ostioles and usually 3 circuli (MCKENZIE 1967).

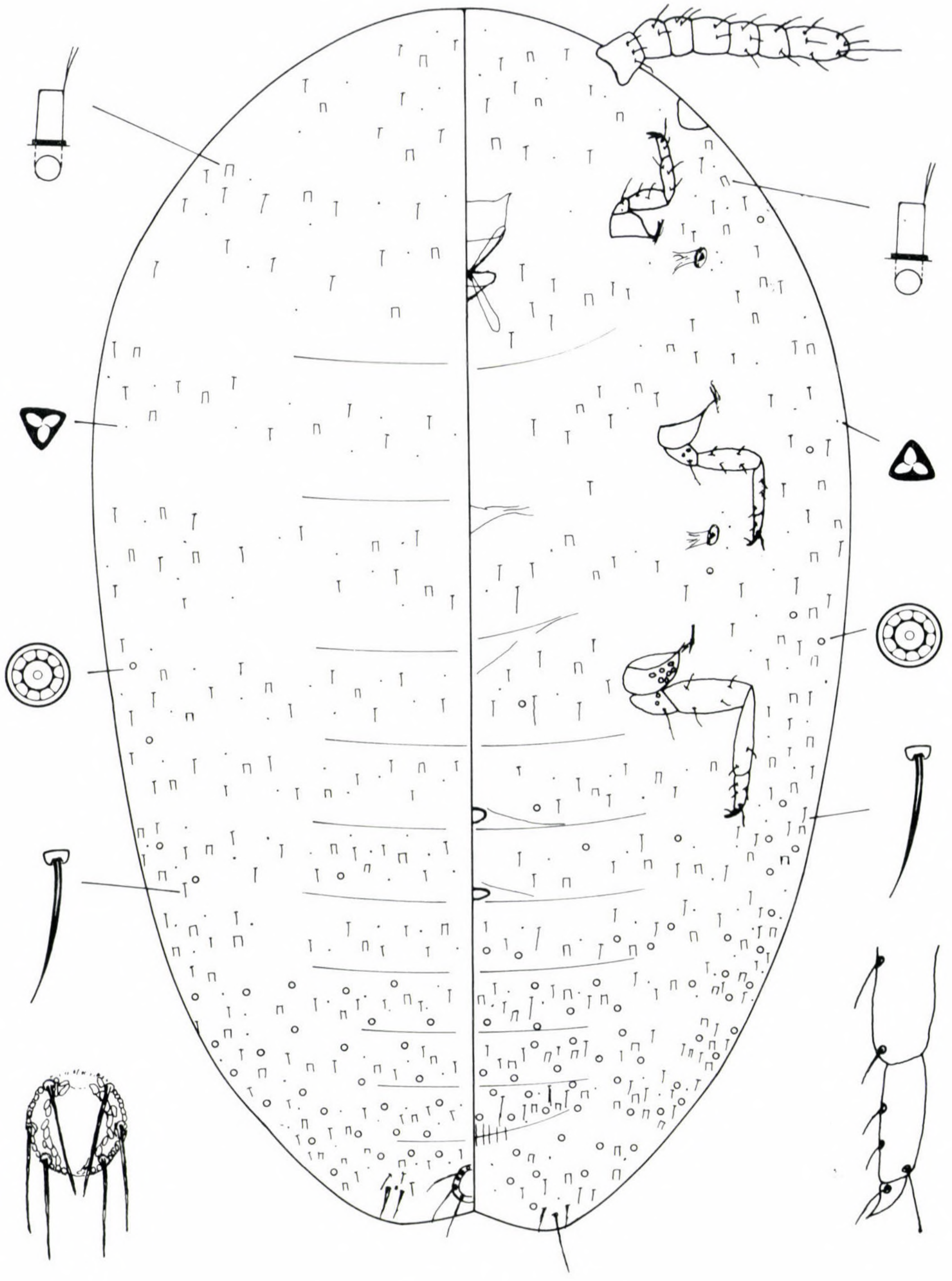


Fig. 1. *Tridiscus oetvoesi* sp. n.

KEY OF *TRIDISCUS* SPECIES IN NORTH AMERICA. ADULT FEMALES (MODIFIED AFTER FERRIS 1953 AND MCKENZIE 1967)

1. Only one circuli present, antennae 6-segmented . . . . **T. sporoboli**
   With at least two circuli present 2
2. With two circuli, antennae 7-segmented. . . . . **T. oetvoesi**
   With 3–5 circuli present. 3
3. Antennae 6-segmented, with 4–5 circuli . . . . **T. multiorbis**
   Antennae 7-segmented, with 3 circuli . . . . **T. distichlii**

The genus *Tridiscus* shows close similarity with the Palaearctic genus *Mirococcopsis* BORCHSENIUS, 1948 and with *Volvicoccus* GOUX, 1945, but not with *Rhodania* GOUX, 1935 as FERRIS (1953) stated. The difference is the total lack of cerarii, the special structure of the tubular ducts in *Mirococcopsis*, and the close associations of *Mirococcopsis* species with its host plant genus *Stipa* (Poaceae), while *Tridiscus* is associated with another Poaceae genus.

SCALE-INSECT FAUNA IN CANADA

On the basis of species lists, literature and new collections (KOZÁR et al. 1989) the Canadian scale-insect fauna contains 86 species in 9 families (Ortheziidae 5, Margarodidae 5, Pseudococcidae 18, Eriococcidae 4, Coccidae 26, Asterolecaniidae 2, Kermesiidae 1, Aclerdidae 1, Diaspididae 24 species). However, from this species number 10 occurs only indoor conditions and some literature data needs further verification.

In the future we can expect especially great increase in the number of Pseudococcidae and Eriococcidae.

SOME ZOOGEOGRAPHICAL CONSIDERATION

On the basis of earlier species lists we could find relatively high ratio of well-known Nearctic (32), Holarctic (14) and Cosmopolitan species (11), most of them are known pest species. On the basis of the 36 species collected in B. C. 19 proved to be Nearctic, 4 were Cosmopolitan, like *P. affinis, Q. perniciosus,* and only 13 were Holarctic. Most of them were also well-known pest species, like *P. aceris, G. spuria, E. tiliae, P. corni, L. ulmi,* etc. Among Nearctic species there were 6 species with wide distribution (mostly pests, like *C. pinifoliae* or *N. californicus*). However, among Nearctic species we found more species of Great Bassin origin (5) and 4 species which are widely distributed in the southern part of Nearctic Region. There were only 2 species of Pacific costal *(P. taxifoliae, T. oetvoesi)* and one of Boreal distribution *(T. caricis)*. Only one Montan species was found *(A. occidentalis)*.

Generally speaking about scale-insect fauna of Canada, we can suppose, that analogously to total number of insects in North America (90,000 in the USA and 30,000 in Canada) (DANKS 1979) and 900 species of scale-insects in the USA (MILLER pers. com.) we can expect about 300 scale-insect species in Canada. Further if we consider that there are more than 600 species in California and only 150 in Virginia (MILLER pers. com.), we can expect 2–3 times more species in Western Canada than in the Eastern parts. It is also in concordance with heterogenous habitats of South Western Canada and with special needs of scale-insects.

In Eastern Canada we can expect the appearance of several Appalachian boreal scale-insects, mostly on various trees (*Quercus, Pinus, Acer* etc.), especially from Coccidae and Diaspididae families. In the middle parts of Canada on the prairie rout we can expect great number of mealybug species (Pseudococcidae) on various grasses. In the western part of Canada we can expect the appearance of great number of mealybug species on coastal route on evergreen plants (in California about 30 species were found, according to MCKENZIE 1967). Great number of mealybug species could be find in Cordillera valleys on succulents (in California 20 species), on xerophitic shrubs and herbaceous plants, especially on Compositae, Chenopodiaceae and Polygonaceae (in California only on *Eriogonum* 30, and on *Artemisia* 20 species are known). There will be a lot of mealybug species on grasses as well (on the roots, leaves, leaf sheaths) (in California on *Agropyron* about 10, on *Elymus* and *Stipa* about 20 species were published).

* * *

Acknowledgement – The authors would like to thank DR. IMRE S. ÖTVÖS and DR. LEE M. HUMBLE (Pacific Forestry Research Centre, Victoria B. C., Canada) for help in the organization and participation in collecting trips, DOUG R. MILLER (USDA Systematic Entomology Laboratory, Beltsville, USA) for the information the species number and OTKA grant No. 1334 for the financial support.

REFERENCES

DANKS, H. V. (Ed.) (1979): Canada and its insect fauna. – *Memoirs of the Entomological Society of Canada* No.108: 1–573.

DANKS, H. V. (1988): Insects of Canada. – XVIIIth International Congress of Entomology (Vancouver, 1988). Biological Survey of Canada Document Series No.1: 1–17.

FERRIS, G. F. (1953): Atlas of the scale insects of North America. Vol. 6. The Pseudococcidae (Part II). – *Stanford Univ. Press.*, Stanford, California 506 pp.

FOOTIT, R. G. & WILLIAMS, D. J. (1989): The Coccidae Slide Collection, Canadian National Collection, Ottawa. – *The Scale* **14** (1): 1–14.

KOZÁR, F., HUMBLE, L. M., FOOTIT, R. G. & ÖTVÖS, I. S. (1989): New and little known scale-insects species from Canada (Homoptera: Coccoidea) from British Columbia. – *J. Entomol. Soc. Brit. Columbia* 1989 **86:** 70–77.

MCKENZIE, H. L. (1967): Mealybugs of California. – *University of California Press,* Berkeley and Los Angeles 525 pp.

SCUDDER, G. G. E. (1979): Hemiptera: In: DANKS, H. V. (Ed.) Canada its insect fauna. – *Memoirs of the Entomological Society of Canada* No.108: 329–348.

Acta Zoologica Hungarica 38 (3–4), pp. 213–260 (1992)

"PELOPS" AND "ORIBATES" SPECIES IN THE BERLESE-COLLECTION (ACARI)

S. MAHUNKA

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 28th January, 1992)

Discussion of seventeen "*Pelops*" and twenty-two "*Oribates*" species deposited in the Berlese-Collection (Florence). Among them 14 valid species belong in the genus *Eupelops* (Phenopelopidae), 1 valid species in the genus *Neoribates* (Paragalumnidae), 1 valid species in the genus *Acrogalumna*, 2 in the *Allogalumna*, 5 in the *Galumna*, 1 in the *Galumnella*, 9 in the genus *Pergalumna*, 2 in the genus *Pilogalumna* and 1 in the genus *Stictozetes* (Galumnidae). With 77 original figures.

INTRODUCTION

Having recognized the significance of HAMMEN's (1959) work, which was most unfortunately discontinued, about a decade ago I began to publish (MAHUNKA 1980a, 1980b, 1991) redescriptions, complementary diagnoses and notes concerning some "forgotten", inadequately known or misunderstood BERLESE species by studying the material of the Berlese-Collection. Obviously my primary aim was to decrease the uncertainty prevailing in faunistics, taxonomy and of course the systematics helping thereby more reliable identifications and access to zoogeographical data of various authors.

Following the appearence of my two papers in 1980 a basic work appeared (CASTAGNOLI & PEGAZZANO 1985) on the "Berlese species" which now finally clarified many earlier incomplete and error-laden publications (e.g. LOMBARDINI 1936) and listed the taxa and the approximate localities whence the material derive. A similarly significant work came out in 1989 written by NORTON & KETHLEY which historically shows BERLESE's activity and his relationship with contemporary North American acarologists throwing light on the exact circumstances of collectings, and at the same time collecting material of topotype value. Furthermore, they endeavoured to present new comparative material for those difficult to study in the slides which much contributed to a better understanding, identification of North American BERLESE species helping thereby the correct placing of species into the present-day categories and system. NORTON & KETHLEY also discussed the *Oribates* species described from North America, I do not deal with these species in my present contribution. These species are:

Oribates centropterus BERLESE, 1908 = **Parakalumma robusta** (BANKS, 1895) sen. name
Oribates emarginatus columbianus BERLESE, 1916 = **Pergalumna emarginata** (BANKS, 1895) sen. name
Oribates cribriger BERLESE, 1916 = **Pergalumna cribriger** (BERLESE, 1916) sen. name
Oribates fissuratus BERLESE, 1914 = **Protogalumna fissurata** (BERLESE, 1914) sen. name
Oribates tantillus BERLESE, 1908 = **Pergalumna curva** (EWING, 1907) sen. name

Unfortunately, the above discussed works and several other papers (e.g. BERNINI 1970, 1973; FUJIKAWA 1978) publishing redescriptions did not consider a large number of taxa, which in fact have not been properly treated eversince their introduction into the acarological literature. Thus, today their recognition is well-nigh impossible mostly due to their insufficient original descriptions, consequently, they must be considered as uncertain species. Their number is especially large in the tropics (Africa, South-East Asia). Recently I decided to clarify the faunal relationships South and East Africa, and Madagascar with South-East Asia, thus it is absolutely essential for me to study the yet uncertain and unclarified BERLESE species of these regions.

Taking advantage of the opportunity in the bilateral agreement signed by the Hungarian Academy of Sciences and the Consiglio Nationale della Ricerche (CNR) and in my Hungarian-grant*, in 1991 carried out further studies on the material preserved in the Istituto Sperimentale per la Zoologia Agraria of Florence. Here my kind and helping host was again DR. M. CASTAGNOLI. This time I could survey a large number of species which were more or less clarified. At this place I should like to thank the colleagues of the institute but especially DR. F. PEGAZZANO, DR. R. NANELLI and MR. S. SAURO who helped me extensively as did my wife (L. MAHUNKA–PAPP) in Florence and at home.

Subsequently I propose to discuss 47 species, of which 17 belong to the "*Pelops*" and 25 to the "large winged" *(Oribates)* groups according to BERLESE. Today these species represent only 37 valid species. In the interpretation of the type my earlier works in principle has been the same as is NORTON & KETHLEY'S by adapting the regulations of the ICZN (1985), with some modification, that I always endeavoured to designatee the lectotype when a series of syntypes was on hand. It goes without saying that the monotypes are also considered by me as holotypes.

In the descriptions I generally apply the terminology given in NORTON & BEHAN–PELLETIER (1989) based on GRANDJEAN'S work. According to my investigations the position of the solenidia on the tibia and tarsus of leg I

* This research program sponsored also by the Hungarian National Scientific Research Foundation (OTKA 3165).

related to ε and ft″ seat is important, and apparently will be useful in separating genera. Thus, when it is perceivable I refer to it as solenidial group.

In the subsequent Table 1 list the discussed species according to the method given in the publication of NORTON & KETHLEY (l.c.).

Table 1

Original, BERLESE'S and current combinations of the studied species

Notaspis acromios HERMANN, 1804	Pelops phytophylus BERLESE: 1916	Eupelops acromios (HERMANN, 1804)
Pelops affinis BERLESE, 1916	–	Eupelops affinis (BERLESE, 1916)
Pelops claviger BERLESE, 1916	–	Eupelops claviger (BERLESE, 1916)
Pelops curtipilus BERLESE, 1916	–	Eupelops curtipilus (BERLESE, 1916)
Pelops depilatus BERLESE, 1916	–	Eupelops depilatus (BERLESE, 1916)
Pelops geminus BERLESE, 1916	–	Eupelops geminatus (BERLESE, 1916)
Pelops hirtus BERLESE, 1916	–	Eupelops hirtus (BERLESE, 1916)
Pelops nepotulus BERLESE, 1916	–	Eupelops nepotulus (BERLESE, 1916
Pelops siculus BERLESE, 1916	–	Eupelops siculus (BERLESE, 1916)
Pelops similis BERLESE, 1916	–	Eupelops similis (BERLESE, 1916)
Pelops simplex BERLESE, 1916	–	Eupelops simplex (BERLESE, 1916)
Pelops curtipilus var. somalicus BERLESE, 1916	–	Eupelops somalicus (BERLESE, 1916)
Pelops subexutus BERLESE, 1916	–	Eupelops subexutus (BERLESE, 1916)
Pelops subuliger BERLESE, 1916	–	Eupelops subuliger (BERLESE, 1916)
Pelops torulosus C. L. KOCH, 1840	Pelops duplex BERLESE, 1916	Eupelops torulosus (C. L. KOCH, 1840)
Oribates roubali BERLESE, 1910	–	Neoribates roubali (BERLESE, 1910)
Oribates longiplumus BERLESE, 1904	–	Acrogalumna longipluma (BERLESE, 1904)
Oribates alatus var. integer BERLESE, 1904	–	Allogalumna integer (BERLESE, 1904)
Oribates parvus BERLESE, 1916	–	Allogalumna parva (BERLESE, 1916)
Oribates australis BERLESE, 1914	–	Galumna australis (BERLESE, 1914)
Oribates elimatus C. L. KOCH, 1841	Oribates elimatus BERLESE: 1914	Galumna elimata (C. L. KOCH, 1841)

Table 1, continued

Oribates emarginatus var. europaeus BERLESE, 1914	–	Galumna europaea (BERLESE, 1914)
Oribates medius BERLESE, 1914	–	Galumna media (BERLESE, 1914)
Oribates obvius BERLESE, 1914	–	Galumna obvia (BERLESE, 1914)
Galumnella paradoxa BERLESE, 1916	–	valid
Oribates clericatus BERLESE, 1914	–	Pergalumna clericata (BERLESE, 1914)
Oribates (O.) emarginatus var. comparandus BERLESE, 1920	–	Pergalumna comparanda (BERLESE, 1920)
Oribates elimatus var. corniculatus BERLESE, 1905	–	Pergalumna corniculata (BERLESE, 1905)
Oribates formicarus BERLESE, 1914	–	Pergalumna formicaria (BERLESE, 1914)
Oribates (Stictozetes) fuscus BERLESE, 1916	–	Pergalumna fusca (BERLESE, 1916)
Oribates longiplumus var. myrmophilus BERLESE, 1914	–	Pergalumna myrmophila (BERLESE, 1914)
Oribates nervosus BERLESE, 1914	–	Pergalumna nervosa (BERLESE, 1914)
Oribates pterinervis G. CANESTRINI, 1898	Oribates pterinervis BERLESE: 1095	Pergalumna pterinervis (G. CANESTRINI, 1898)
Oribates ovalis var. somalicus BERLESE, 1916	–	Pergalumna somalica (BERLESE, 1916)
Oribates crassiclavus BERLESE, 1914	–	Pilogalumna crassiclava (BERLESE, 1914)
Oribates tenuiclavus BERLESE, 1908	–	Pilogalumna tenuiclava (BERLESE, 1908)
Oribates (Stictozetes) scaber BERLESE, 1916	–	Stictozetes scaber (BERLESE, 1916)
Oribates (Stictozetes) stupendus BERLESE, 1916	–	Vaghia stupendus (BERLESE, 1916)
Oribates obvius var. norvegicus BERLESE, 1914	–	Galumna norvegica (BERLESE, 1914)
Oribates atomarius BERLESE, 1914	–	?

COMMENTS ON THE SURVEYED TAXA

PHENOPELOPIDAE PETRUNKEVICH, 1955

Eupelops acromios (HERMANN, 1804)

Notaspis acromios HERMANN, 1804: 91. – *Pelops acromios:* GRANDJEAN, 1936: 83. – *Eupelops acromios:* PÉREZ–IÑIGO, 1972: 259. – *Pelops phytophylus* BERLESE, 1916a: 50.

A long series of slides and also some unexamined vials in the Berlese–Collection. One slide (149/21) contains an other species, bearing BERLESE'S (?) handwriting "longipilus". Slide 41/9 and three specimens in slide 39/5 unambiguously belong to this species.

Eupelops affinis (BERLESE, 1916)
(Figs 1–3)

Pelops affinis Berlese, 1916a: 53. – *Pelops affinis:* CASTAGNOLI & PEGAZZANO 1985: 7.

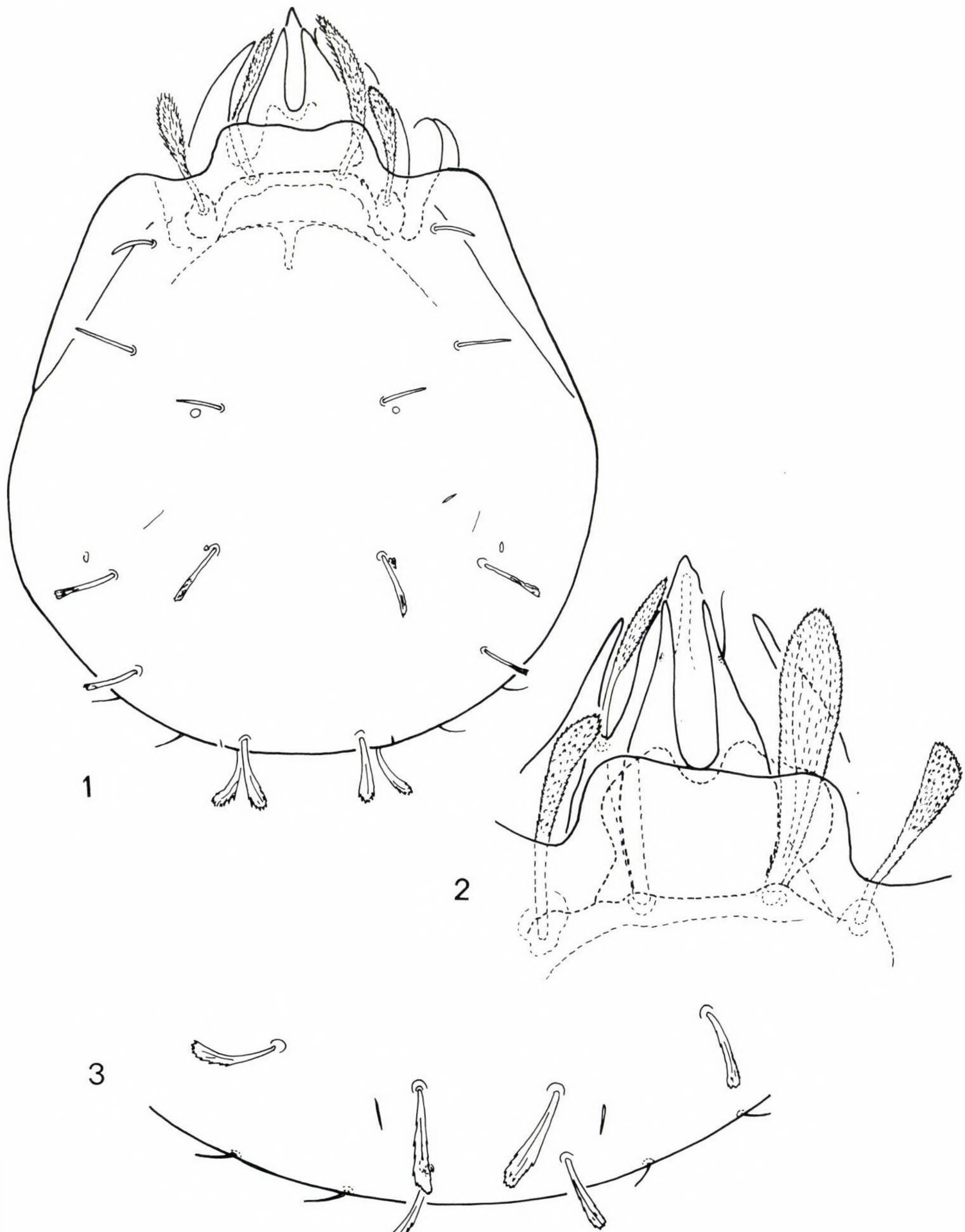
There are two slides (163/29, 32) in the Collection, one labelled "tipico" and respecting BERLESE'S declaration, I consider it lectotype.

Complementary morphological characters: Lamellar cuspis long, inner margins parallel, interlamellar lobus comparatively narrow (Fig. 2). Distal part of rostral setae cylindrical, basal part thin, like a peduncle. Lamellar setae thin, setiform, interlamellar ones phylliform, but not conspicuously wide. Selsillus clavate, depending on the position irregularly asymmetric, but its basal part always strongly narrowed. Anterior median tectum of notogaster slightly waved, but median part lower than outer ones. The shape of notogastral setae greatly differs (Fig. 1): c_2, *la, lm* bacilliform, *lp*, h_2 and h_3 slightly, h_1 and p_1 hardly dilated, the latter two pairs spathulate. Setae p_2 and p_3 simple, thin, much shorter than the others (Fig. 3). Setae l_p and h_3 far removed from each other.

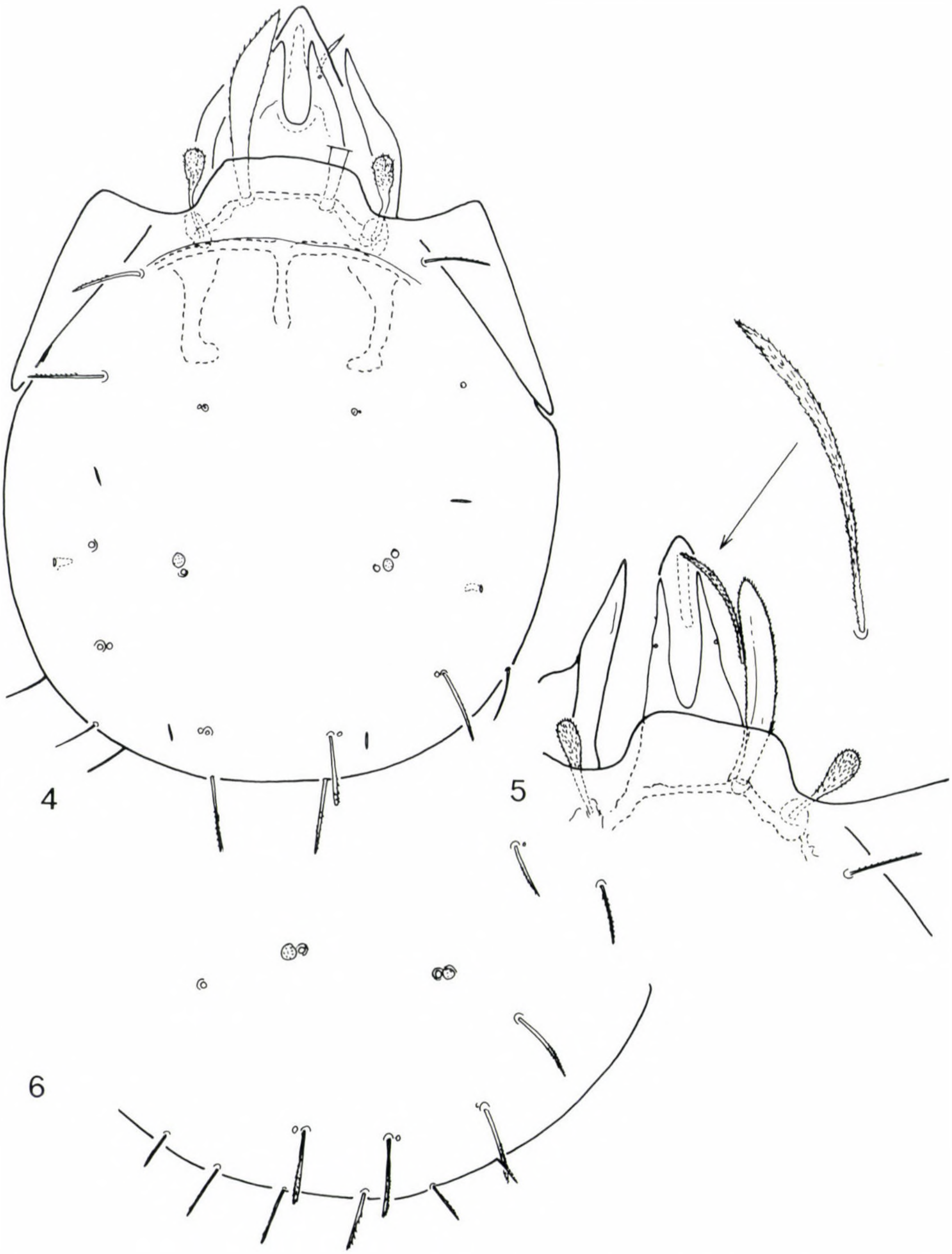
Eupelops claviger (BERLESE, 1916)
(Figs 4–6)

Pelops claviger BERLESE, 1916a: 53. – *Pelops claviger:* CASTAGNOLI & PEGAZZANO 1985: 75.

There are two specimens in the Collection, but only one slide (163/19) labelled "tipico". This slide contains also the type of this species (il piu piccolo) and of *Eupelops subuliger* (il piu grande). The other specimen



Figs 1–3. *Eupelops affinis* (BERLESE, 1916): 1 = dorsal side, 2 = prodorsum with notogastral tectum, 3 = posterior part of the notogaster.



Figs 4–6. *Eupelops claviger* (BERLESE, 1916): 4 = dorsal side, 5 = prodorsum with notogastral tectum, 6 = posterior part of notogaster.

(163/28) is slightly damaged, therefore, I consider it – agreeing with BERLESE – the holotype by monotypy.

Complementary morphological characters: Lamellar cuspis originating nearly parallel with each other, therefore, interlamellar lobus not dilated basally. Rostral setae dilated only in the last (distal) third (Fig. 5). Interlamellar setae phylliform, their margin finely ciliate. Sensillus short, with wide, blunt head. Anterior margin of the median notogastral tectum straight or slightly convex. Some of the notogastral setae were broken of both exemplars (Fig. 4), however, it seems that all bacilliform, blunt at tip and scarcely dilated. Their distal part spiculate or roughened. A conspicuous difference in length is among them, setae *p1* and *h1* much longer than p_2 and p_3 (Fig. 6). The position of *lp* and h_3 is not clear, on the left side of the type specimen originating far from each other, on the right side near to each other. In the other specimen in both sides are far removed these setae from each other. In the type specimen there are two setae in the place of p_2. Area porosae A_1 conspicuously large, much larger than in the others.

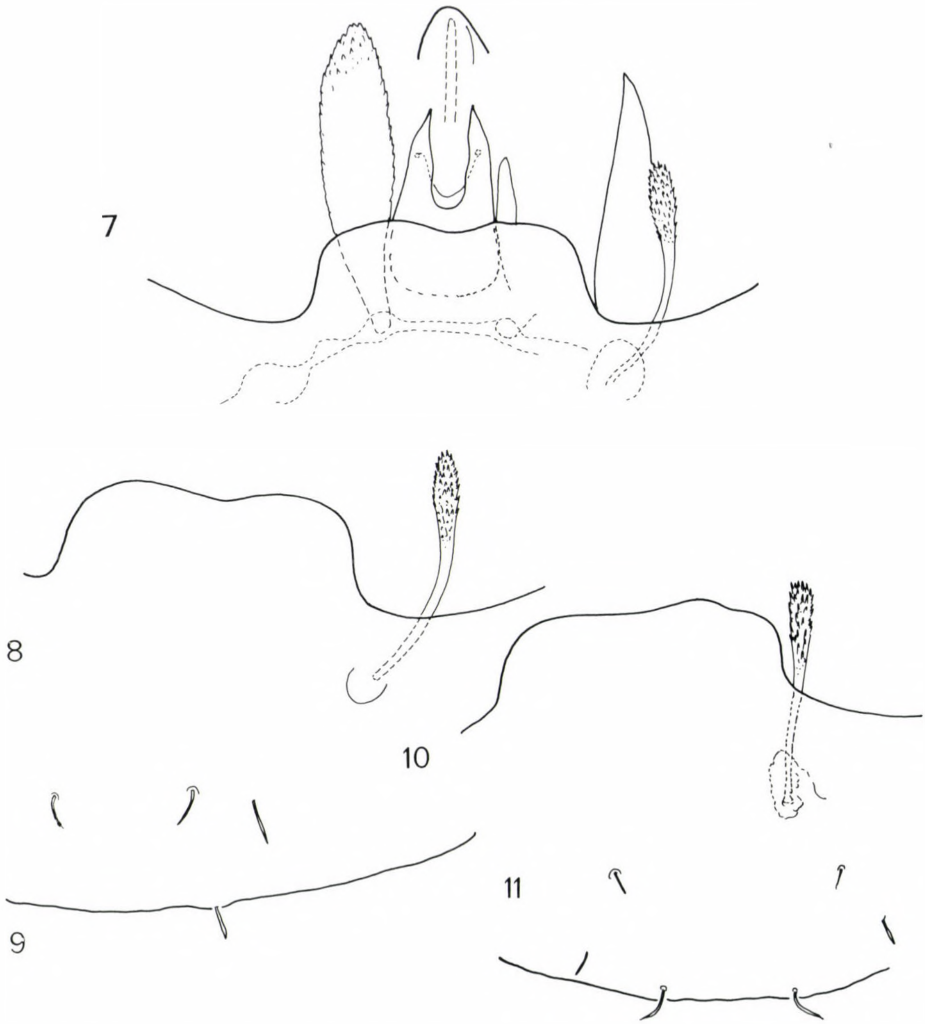
Eupelops curtipilus (BERLESE, 1916)
(Figs 7–9)

Pelops curtipilus BERLESE, 1916a: 55. – *Pelops curtipilus:* CASTAGNOLI & PEGAZZANO 1985: 103. – *Eupelops curtipilus:* BERNINI 1970: 418. – *Eupelops curtipilus:* PÉREZ–IÑIGO 1972: 252.

The Collection contains a single slide with one specimen (41/10) and 2 unexamined vials. The slide without type designation, but I consider it as holotype by monotypy.

This and the next species *(E. depilatus)* seems to be identical, however, for this examination only the two, damaged type specimens were at disposal, and I have found some minor differences. It is also remarkable that BERLESE (1916a) described both in the same time, in one paper, one after the other! Therefore, a definitive decision would be unethical.

Complementary morphological characters (Fig. 7): Lamellar cuspis short, lamellar lobus simple, U-shaped. Rostral setae slightly dilated on their distal half, interlamellar setae phylliform. Sensillus with long peduncle, its head clavate. This part spiculate, the size of the spicules gradually growing towards the distal end (Fig. 8). Anterior notogastral tectum hollowed medially. All setae of the notogaster very short or minute. Most of them stick-shaped, but with pointed distal end. Setae *lp* and h_3 originating very near to each other (Fig. 9). Tibia IV with one spine.



Figs 7–9. *Eupelops curtipilus* (BERLESE, 1916): 7 = prodorsum with notogastral tectum. 8 = notogastral tectum with sensillus, 9 = posterior end of notogaster. – Figs 10–11. *Eupelops depilatus* (BERLESE, 1916): 10 = notogastral tectum with sensillus, 11 = posterior end of notogaster.

Eupelops depilatus (BERLESE, 1916) (Figs 10–14)

Pelops depilatus BERLESE, 1916: 55. – *Pelops depilatus:* CASTAGNOLI & PEGAZZANO 1985: 112.

There is a single slide (163/1) in the Collection which is labelled "tipico" and contains one specimen, so it is the holotype by monotypy. The specimen is slightly damaged, but it is in observable condition.

Almost certain that this species is identical with the previous one (see there).

The single small difference is the blunter sensillus (Fig. 10), which maybe slightly shorter and that setae p_1 curved outwards (Fig. 11), being straight in curtipilus.

Eupelops geminus (BERLESE, 1916) comb. n. (Figs 15–17)

Pelops geminus BERLESE, 1916: 52. – *Pelops geminus:* CASTAGNOLI & PEGAZZANO 1985: 158.

A single slide (163/24) is present in the Collection labelled "tipico"; it is considered the holotype by monotypy.

Complementary morphological characters: Interlamellar lobus U-shaped (Fig. 16). Sensillus gradually dilated, it is widest in the last (distal) third. Anterior notogastral tectum waved (Fig. 17), the median part lower and smaller than the two lateral ones. All notogastral setae – excepting p_2 and p_3 – long, the setae arising in the anterior part of notogaster thinner (stick-shaped), some (h_1, h_2, p_1) of the posterior part of notogaster dilate, spathulate (Fig. 15). Setae *lp* and h_3 arising near to each other (between them only the area porosa A_1). The distance between the two setae h_1 smaller than between setae p_1.

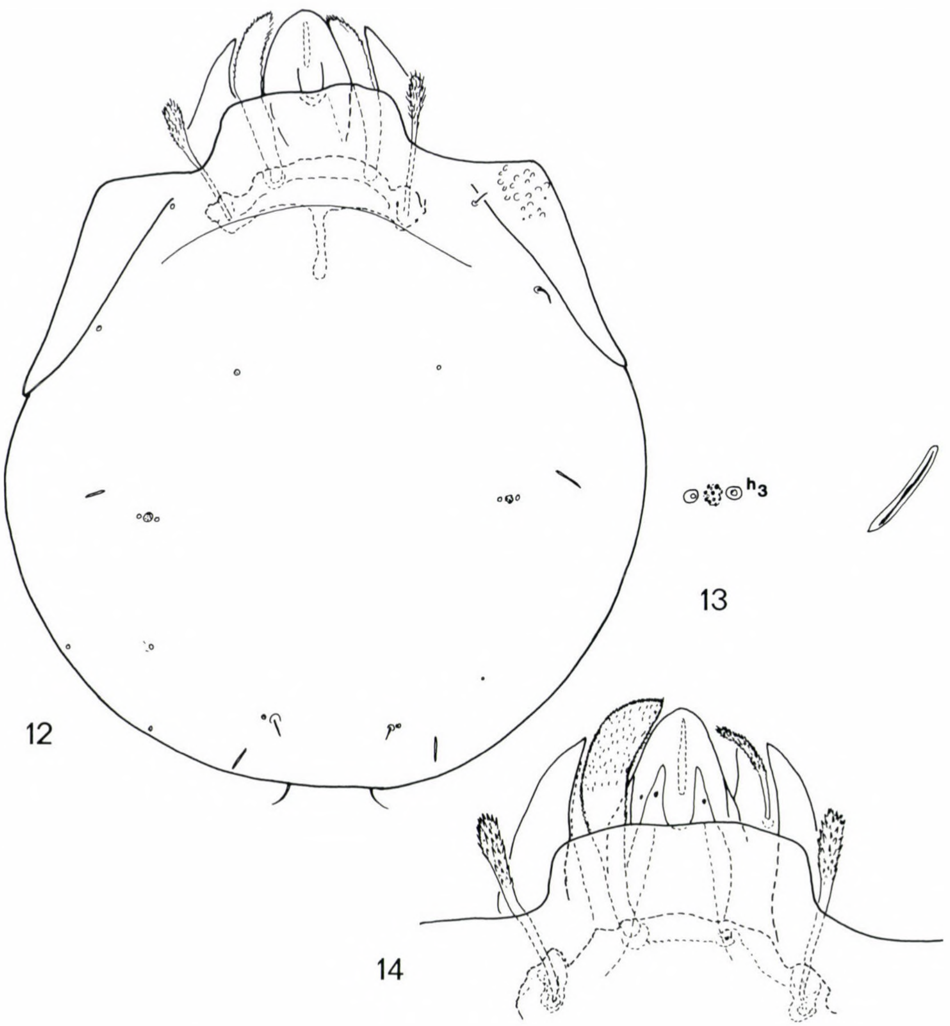
This species well resembles *E. torulosus* and *E. nepotulus*. However, the sensillus of *torulosus* is much thinner and the distance between setae p_1 smaller than between h_1. In *nepotulus* the ratio and size of setae *h* and p_1 are different, and the form of the interlamellar lobus is other.

Eupelops hirtus (BERLESE, 1916) (Figs 18–21)

Pelops hirtus BERLESE, 1916: 51. – *Pelops hirtus:* CASTAGNOLI & PEGAZZANO 1985: 183.

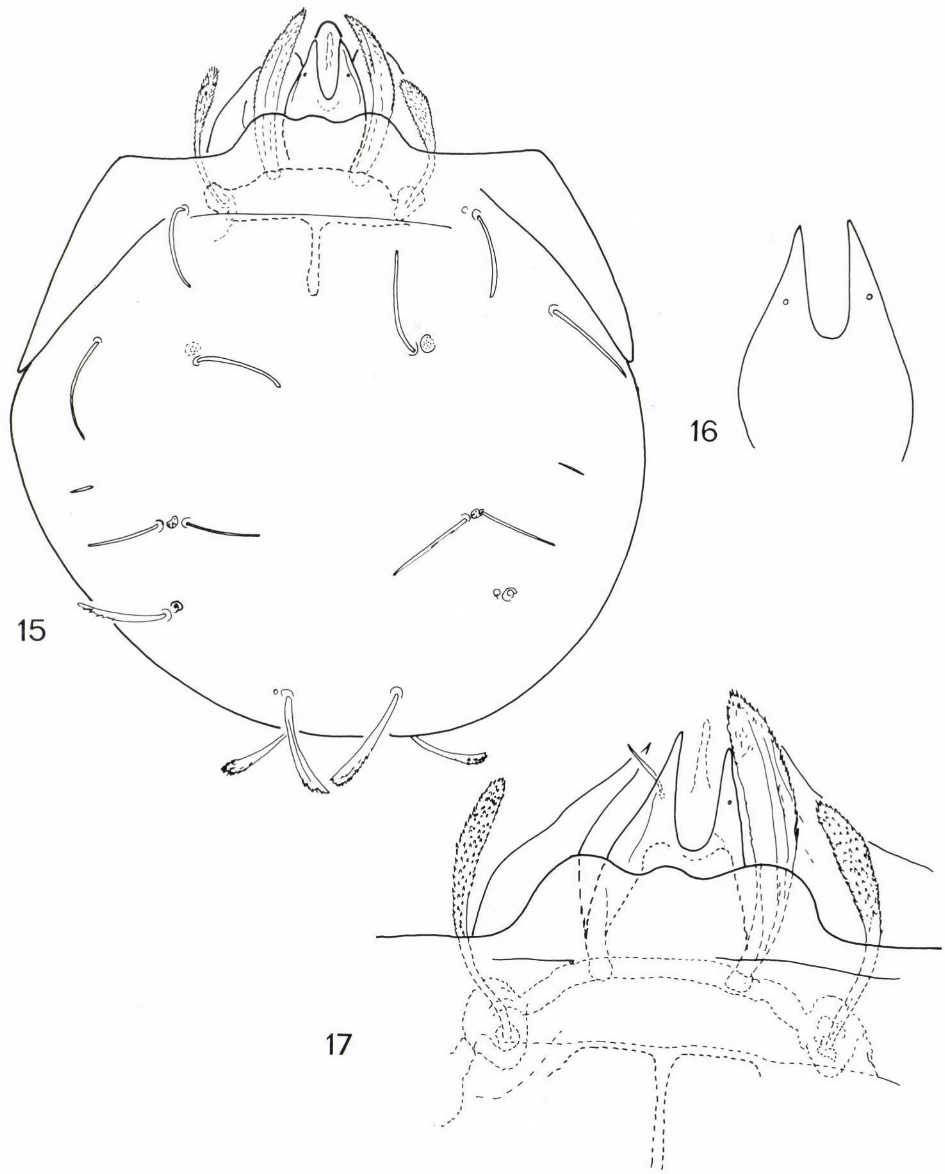
Seven slides (163/9, 10, 11, 12, 13, 15, 39/1) are present in the Collection and on the basis of the consequent numbers 6 specimens were presumably available for BERLESE at the description. Inspite of the fact only one slide (163/9) bears type ("tipico") designation. In respecting BERLESE's opinion I designate it as lectotype. All slides contain the same species, excepting 163/10, all are in good condition.

Complementary morphological characters: Lamellar cuspis slightly convergent (Fig. 21), interlamellar lobus wide, broadened basally. Distal half of rostral setae slightly dilate, lamellar setae stick-

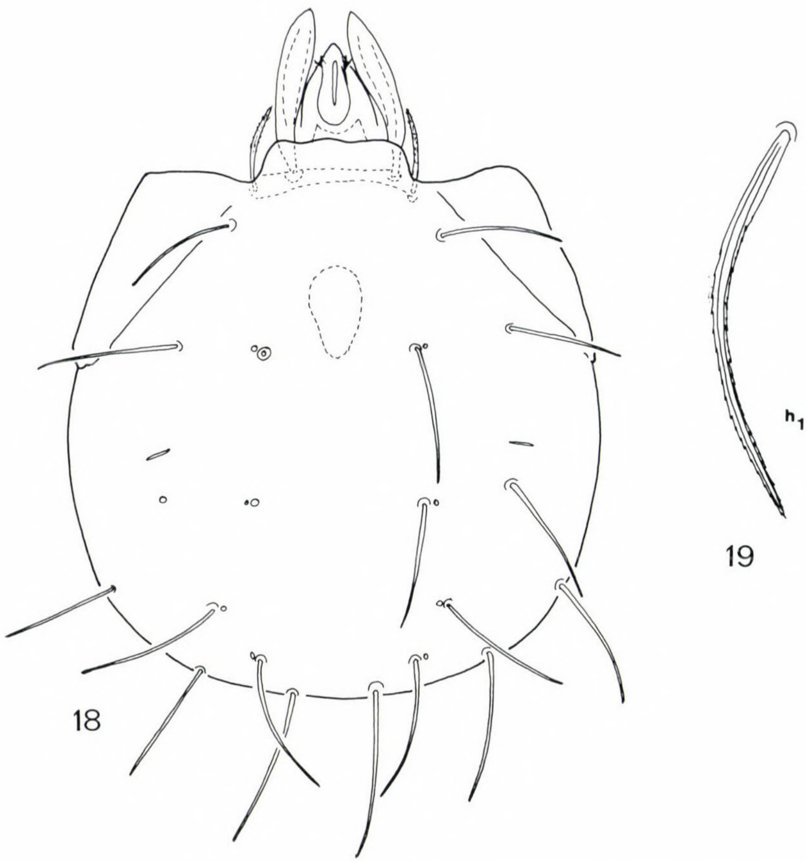


Figs 12–14. *Eupelops depilatus* (BERLESE, 1916): 12 = dorsal side, 13 = area porosa A_1 and the insertions of setae l_p and h_3, 14 = prodorsum with the notogastral tectum.

shaped, distinctly barbed, interlamellar setae very large, serrate marginally (Fig. 19). Sensillus spindle-shaped, with short unspiculate peduncle, which gradually dilated from basally. Anterior notogastral tectum waved, but the median projection sometimes weaker (Fig. 20). All notogastral setae long, nearly sword-shaped and with finely serrate margin (Fig. 18). Seta *lp* longer than the distance between setae *lp* and h_2. Setae p_1 slightly longer than the others. Seta h_3 far removed from area porosa A_1. – All legs tridactylous. Tibia IV with two spines.



Figs 15–17. *Eupelops geminus* (BERLESE, 1916): 15 = dorsal side, 16 = lamellae, 17 = prodorsum with notogastral tectum.



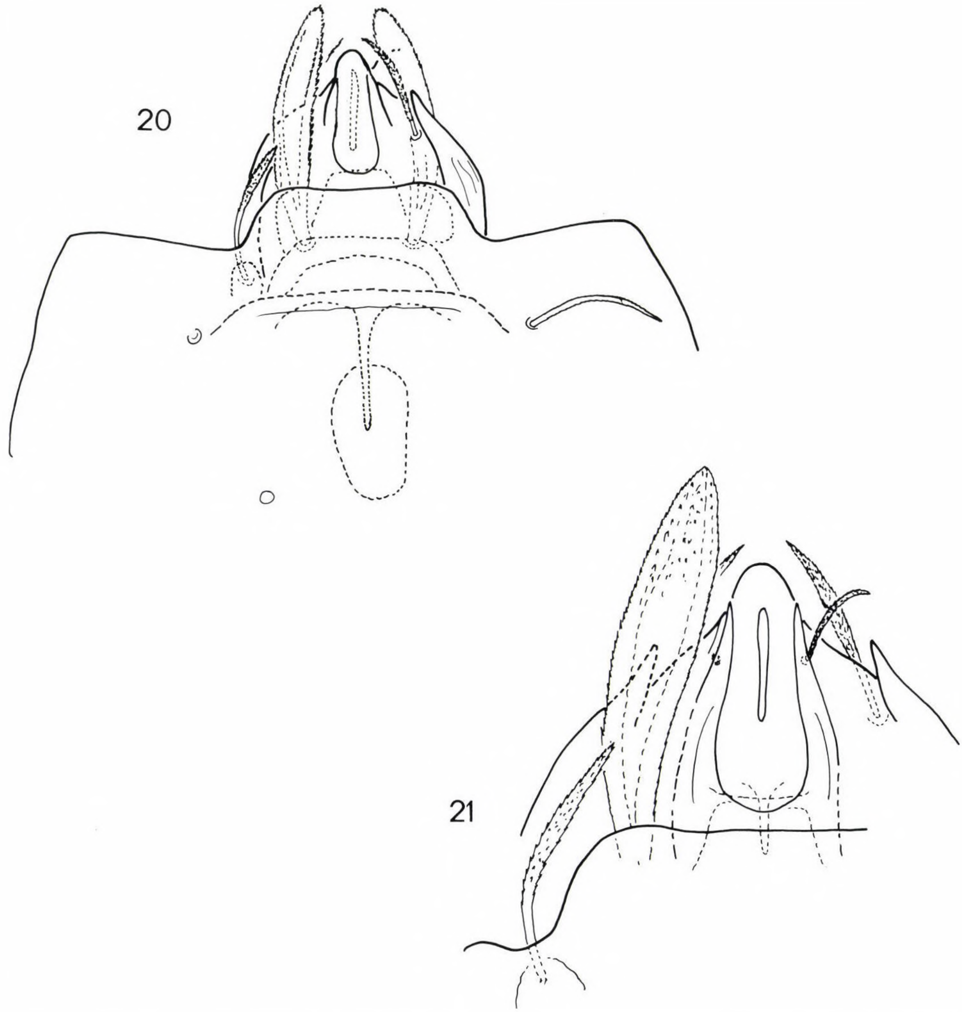
Figs 18–19. *Eupelops hirtus* (BERLESE, 1916): 18 = dorsal side, 19 = seta h_1.

Eupelops nepotulus (BERLESE, 1916)
(Figs 22–23)

Pelops nepotulus BERLESE, 1916: 54. – *Pelops nepotulus:* CASTAGNOLI & PEGAZZANO 1985: 272. – *Eupelops nepotulus:* PÉREZ-IÑIGO 1972: 257. – *Pelops pulchellus* BERLESE, 1916: 54.

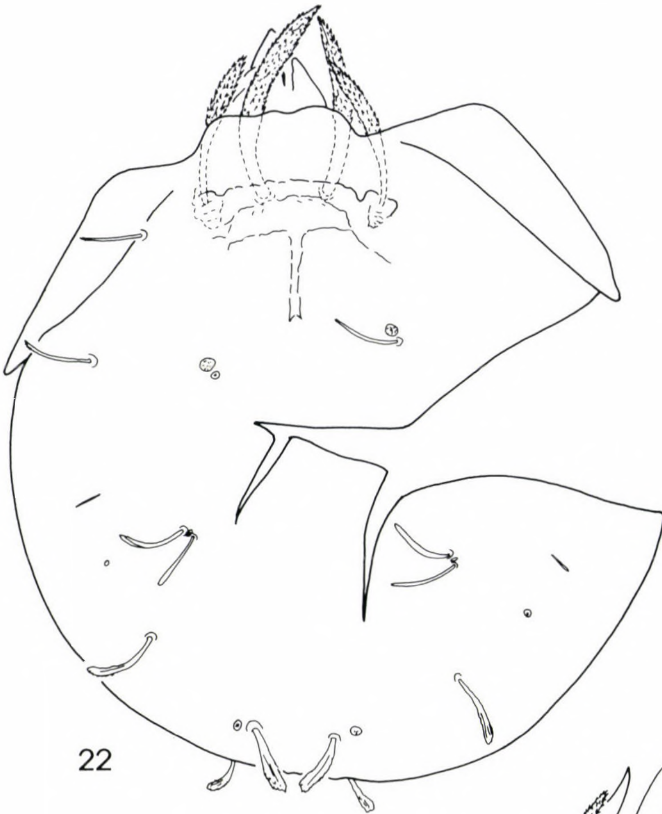
There are three slides (164/14, 15, 16) in the Collection. Two of them labelled "tipico" (164/16 is not), I designate 164/14 as lectotype, which is in better condition.

Complementary morphological characters: Lamellar cuspis long, interlamellar lobus narrowed basally, nearly V-shaped, its inner margin not straight. Sensillus cylindrical, but only the distal half dilated. Interbothridial setae comparatively narrow. Median notogastral tectum

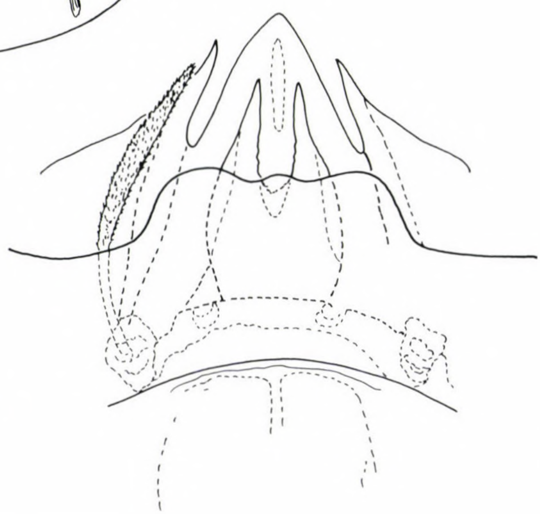


Figs 20–21. *Eupelops hirtus* (BERLESE, 1916): 20 = prodorsum with notogastral tectum, 21 = lamellae.

waved (Fig. 23), median part slightly smaller than the outer ones. Notogastral setae – excepting setae p_2 and p_3 – comparatively large, stick-shaped, or dilate. Setae *lp* and h_3 stand very near to each other. Setae h_1 much broader than *lp*, setae p_1 much shorter than h_1, but the distance between the two p_1 setae is greater than between the two preceding ones (Fig. 22).

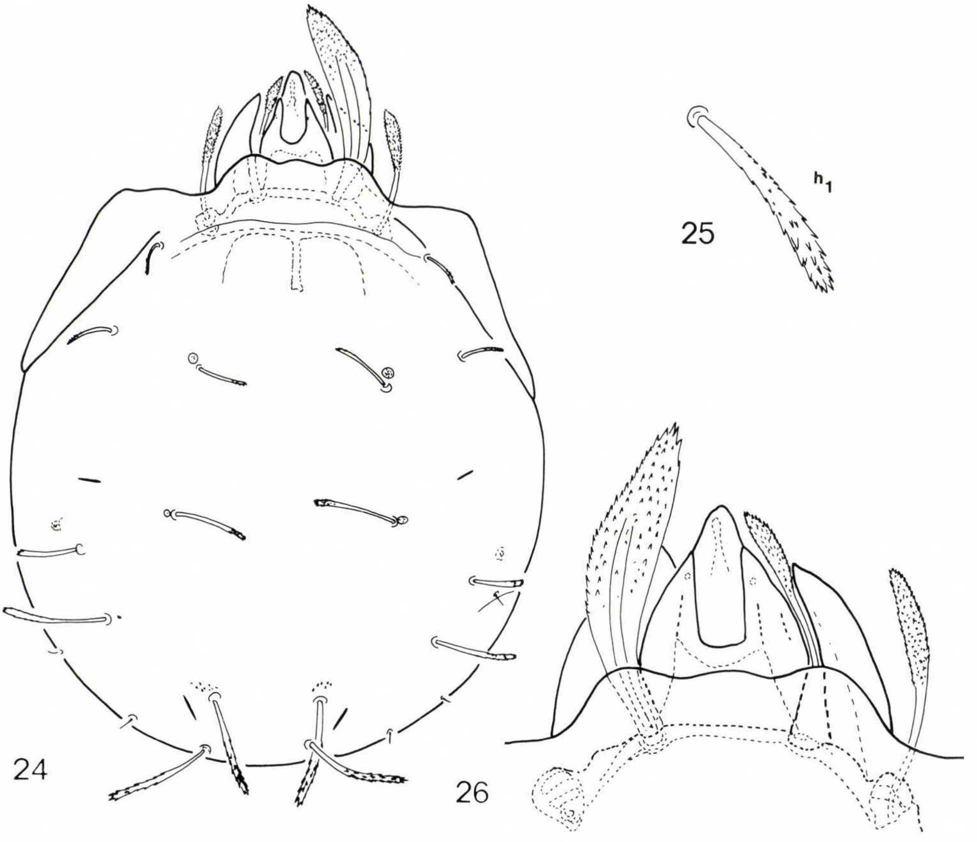


22



23

Figs 22–23. *Eupelops nepotulus* (BERLESE, 1916): 22 = dorsal side, 23 = prodorsum with notogastral tectum.



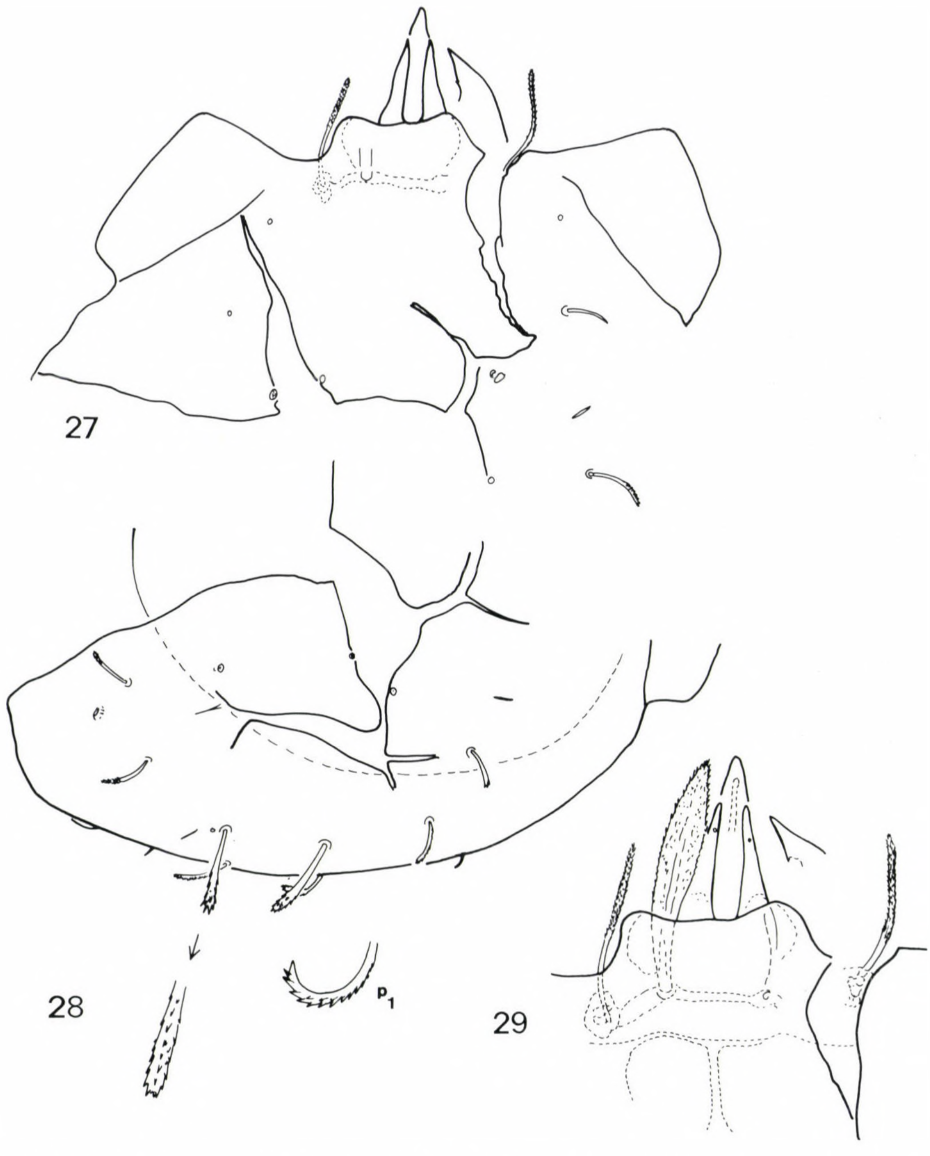
Figs 24–26. *Eupelops siculus* (BERLESE, 1916): 24 = dorsal side, 25 = seta h_1, 26 = prodorsum with notogastral tectum.

Eupelops siculus (BERLESE, 1916)
(Figs 24–26)

Pelops siculus BERLESE, 1916: 53. – *Pelops siculus* CASTAGNOLI & PEGAZZANO 1985: 380.

There are six slides in the Collection, one of them (164/8) is labelled "tipico". On the basis of the numbers the three others (164/9, 10, 11) obviously belong to the original series. Two slides with "var.?" from Sardinia indeed represent an other species. Respecting BERLESE's opinion, I designate the specimen in slide 164/8 as the lectotype.

Complementary morphological characters: Lamellar cuspis normal, interlamellar lobus U-shaped, comparatively wide. The distal half of the rostral setae cylindrical. Interlamellar setae wide-phylliform, their surface and the margin covered by minute spicules, distal end finely



Figs 27–29. *Eupelops similis* (BERLESE, 1916): 27–28 = dorsal side, 29 = prodorsum with the notogastral tectum.

split. Sensillus with long peduncle, its head cylindrical, this part barbed. Median notogastral tectum waved, median part lower than the lateral ones (Fig. 26). Notogastral setae – excepting p_2 and p_3 – gradually increasing in length posteriorly, c_2 the smallest, h_1 (Fig. 25) and p_1 the greatest. All setae bacilliform or slightly dilated (h_1), their distal end or distal half spiculate or spinose. Setae h_3 originating far from *lp*, and much shorter than the latter. Only two pairs of normal porosae areas present, *Aa* normal, A_1 well visible. Areae porosae A_2 absent, A_3 represented as sporadic, minute pori (Fig. 24). Tibia IV with 2 spines.

Eupelops similis (BERLESE, 1916)
(Figs 27–29)

Pelops similis BERLESE, 1916: 54. – *Pelops similis* CASTAGNOLI & PEGAZZANO 1985: 382.

There are two slides (164/6, 7) in the Collection, one of them 164/6 labelled "tipico". The other contains one specimen of a different species. Therefore I designate the preceding specimen as the lectotype of this species.

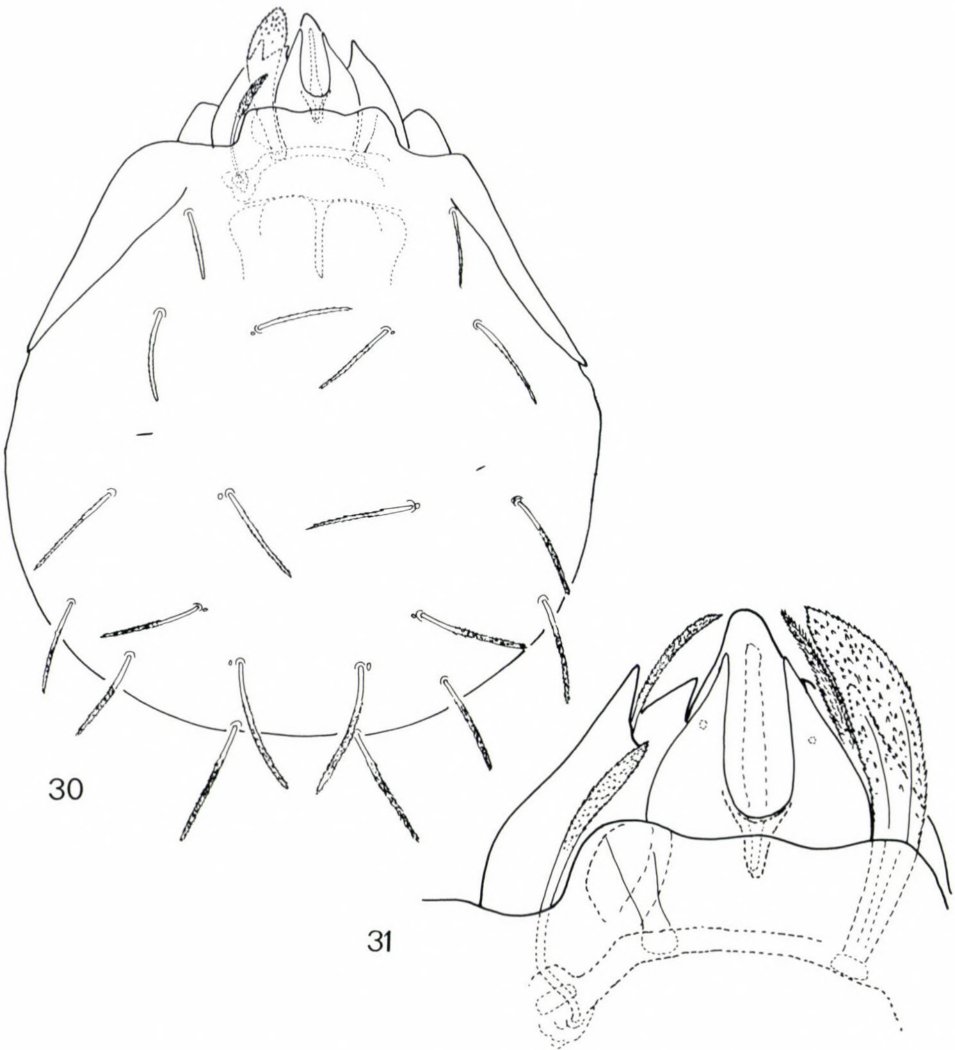
Complementary morphological characters: Lamellae with conspicuously long cuspis, the interlamellar lobus also very long, narrow U-shaped. Rostral and lamellar setae not visible, interlamellar ones normal, phylliform. Sensillus stick-shaped, its distal half distinctly barbed. Median notogastral tectum waved (Fig. 29), but the median part much smaller and lower than the outer ones. Among the notogastral setae great differences exist, setae h_1 the largest, p_1 and p_2 the smallest, h_1 dilated. Most of setae spiculate or spinose (Figs 27–28).

Eupelops simplex (BERLESE, 1916)
(Figs 30–31)

Pelops simplex BERLESE, 1916: 51. – *Pelops simplex* CASTAGNOLI & PEGAZZANO 1985: 383.

Two slides (162/1, 162/26) are present in the Collection and both bearing the designation "tipico". I choose the former one, which is in better condition and designate it as lectotypus.

Complementary morphological characters: Lamellar cuspis long, their inner margin straight, interlamellar lobus simple U-shaped. Rostral setae only hardly dilated, its distal part well barbed. Interlamellar setae very large, conspicuously wide. Their whole surface spiculate. Sensillus small, only its distal third dilated cylindrical, this part barbed. Median notogastral tectum waved (Fig. 31), median part not smaller than the lateral ones. All notogastral setae long, no great difference in length and in shape among them. All stick-shaped, their distal half spiculate. Seta h_3 stands laterally, far from seta *lp*. All porose areas very small (Fig. 30). Tibia IV only with 1 spine.

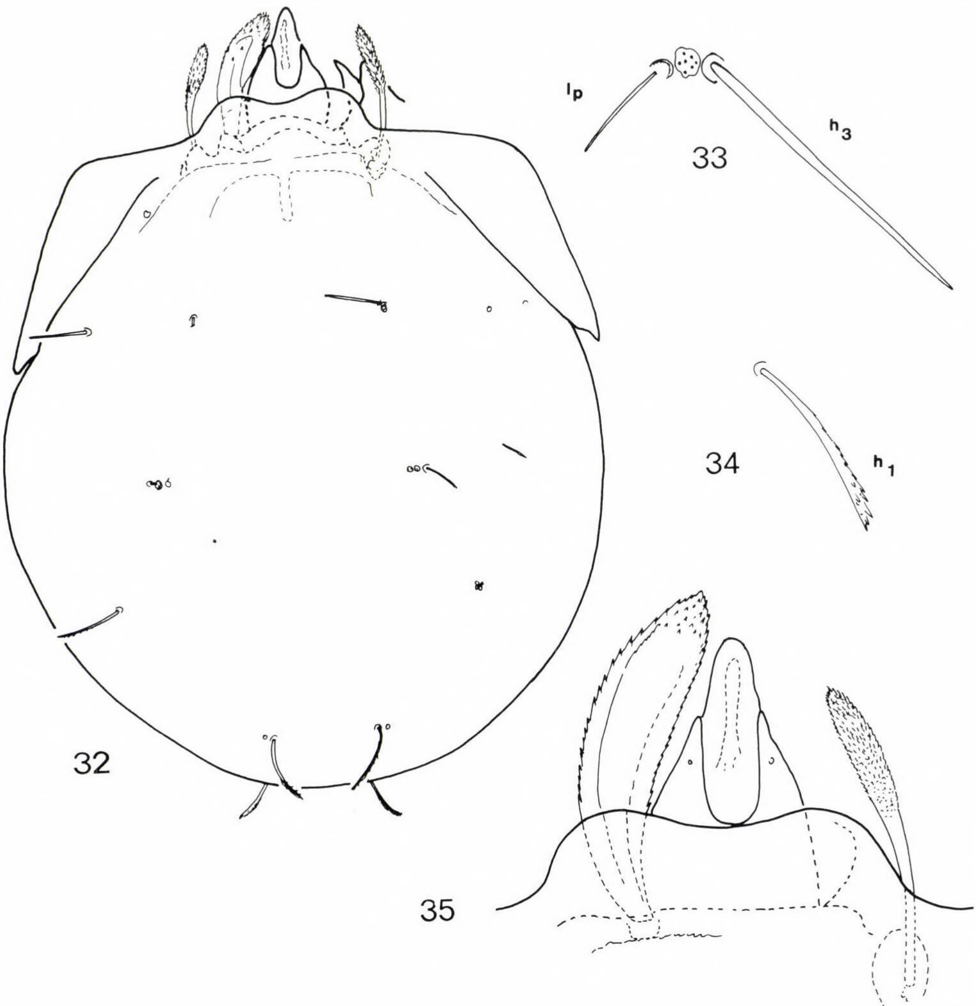


Figs 30–31. *Eupelops simplex* (BERLESE, 1916): 30 = dorsal side, 31 = prodorsum with the notogastral tectum.

Eupelops somalicus (BERLESE, 1916)
(Figs 32–35)

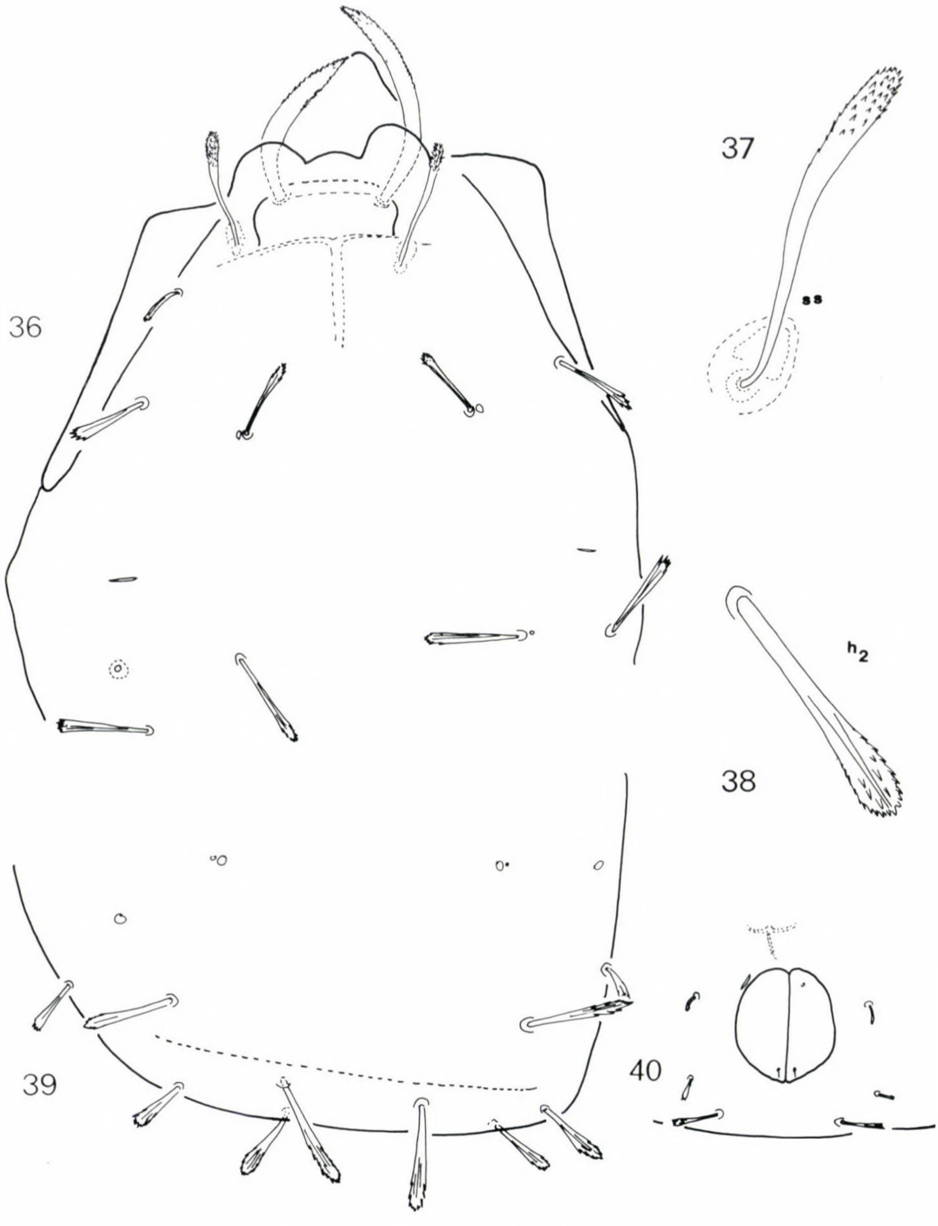
Pelops curtipilus var. *somalicus* BERLESE, 1916a: 55. – *Pelops curtipilus* var. *somalicus:* CASTAGNOLI & PEGAZZANO 1985: 386.

There are eight slides (163/35, 36, 38–43) in the Collection, two of the labelled "tipico", four slides (163/40–43) contain only immature specimens. I designate the specimen in slide 163/36 as lectotype.



Figs 32–35. *Eupelops somalicus* (BERLESE, 1916): 32 = dorsal side, 33 = area porosa A_1 and setae l_p and h_3, 34 = seta h_1, 35 = prodorsum with the notogastral tectum.

Complementary morphological characters: Lamellar cuspis normal, their inner margin straight, therefore the interlamellar lobus U-shaped. Interlamellar setae very large, with serrate margin. Distal half of the long sensillus cylindrical, this part well barbed. Median notogastral tectum excavate medially (Fig. 35). Notogastral setae short, most of them stick-shaped, setae h_1 (Fig. 34) asymmetrically dilated, spinose. Setae h_3 and lp originating very near to each other (Fig. 33), the latter three times longer than the preceding one. All porose areas small (Fig. 32). Tibia IV with 1 spine.



Figs 36–40. *Eupelops subexutus* (BERLESE, 1916): 36 and 39 = dorsal side, 37 = sensillus, 38 = seta h_2, 40 = anal region.

Eupelops subexutus (BERLESE, 1916)
(Figs 36–40)

Pelops subexutus BERLESE, 1916a: 51. – *Pelops subexutus:* CASTAGNOLI & PEGAZZANO 1985: 401. – *Eupelops subexutus:* BERNINI 1973: 444.

On the basis of the type series and of the newly collected material the species was completely redescribed by BERNINI (1972).

BERLESE labelled the slides 163/48, 49 and 164/2 "tipico". BERNINI did not designate lectotype. One of the three slide (164/2) contains an immature specimen, slide 163/49 contains two, dried specimens, so only the specimen in the slide 163/48 is still suitable for study. Therefore, I designate it as lectotype. My drawings was made after it (Figs 36–40).

Eupelops subuliger (BERLESE, 1916)
(Figs 41–44)

Pelops subuliger BERLESE, 1916a: 52. – *Pelops subuliger:* CASTAGNOLI & PEGAZZANO 1985: 404. – *Eupelops subuliger:* SITNIKOVA in GHILYAROV 1975: 323. – *Eupelops longifissus:* WILLMANN 1951: 174.

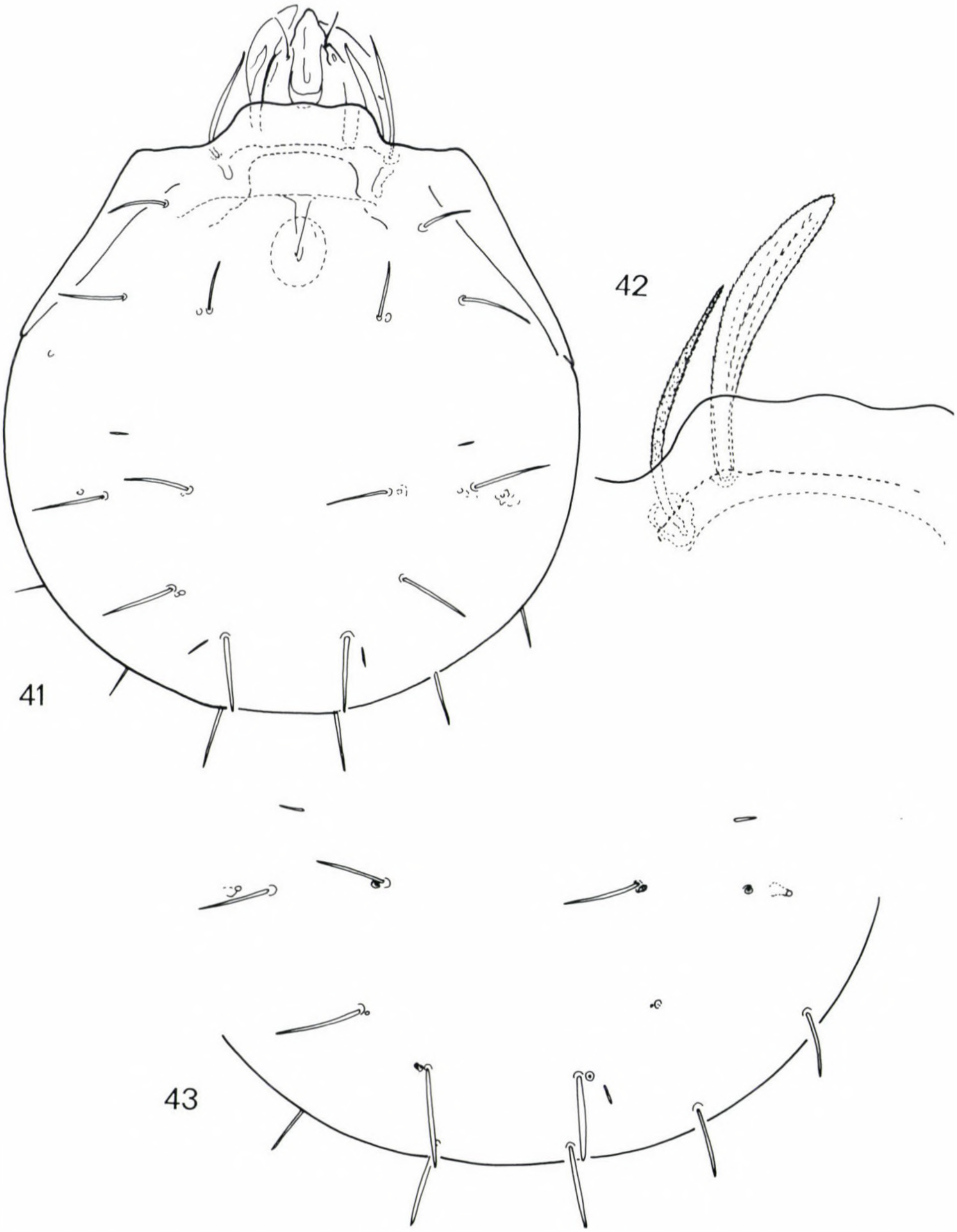
There is a single specimen ("il piu grosso") in the Collection in slide 163/19 with the type of *E. claviger* ("il piu piccolo"). The slide labelled "tipico" is the holotype by monotypy.

Complementary morphological characters: Cuspis of lamellae slightly convergent, interlamellar lobus elliptic. Lamellar setae setiform, rostral ones not, interlamellar ones strongly dilated. Sensillus (Fig. 42) not dilated, stick-shaped, but its distal end sharply pointed. Median notogastral tectum (Fig. 44) waved, its median part not lower than the outer ones. The notogastral setae nearly equal in shape (Fig. 41), all spine-shaped, no essential difference among them, only p_2 and p_3 shorter than the others. Setae in the posteromarginal position ambiguously sharply pointed (Fig. 43). Tibia IV with 2 spines.

Eupelops torulosus (C. L. KOCH, 1840)
(Fig. 45)

Pelops torulosus C. L. KOCH, 1840: 30, 13. – *Eupelops torulosus:* PÉREZ–IÑIGO 1972: 254. – *Eupelops torulosus:* SITNIKOVA in GHILYAROV 1975: 323. – *Pelops duplex* BERLESE, 1916: 52.

Seven slides (162/4, 163/16, 17, 18, 46, 47, 164/17) are present in the Collection, only one (163/17) of which is labelled "tipico". This slide is



Figs 41–43. *Eupelops subuliger* (Berlese, 1916): 41 = dorsal side, 42 = form of the interlamellae setae and the sensillus, 43 = posterior part of the notogaster.

damaged, the specimen is not observable. But all others are in very good condition, the figure (Fig. 45) was made after 163/16. All slides contain the same species, the synonymisation was made earlier.

PARAKALUMMIDAE GRANDJEAN, 1936

Neoribates roubali (BERLESE, 1910) (Figs 46–49)

Oribates roubali BERLESE, 1910: 385. – *Oribates (Neoribates) roubali* BERLESE 1914: 128. – *Oribates (Neoribates) roubali:* CASTAGNOLI & PEGAZZANO 1985: 364.

There are two specimens in two slides in the Collection (107/42 and 165/34). Only one (107/42) is labelled "tipico", the other is not a type specimen and was presumably mounted later. It can be considered the holotype by monotypy (see NORTON & KETHLEY 1989: 434). The slide was broken, and although the specimen was also damaged, examination was yet possible. All of my drawings were made after the holotype.

Complementary morphological characters: Lamellae not reaching to the insertion of the lamellar setae (the specimen was compressed!), their distal end seems bifurcate in laterodorsal aspect (Fig. 49). All three pairs of median prodorsal setae very long and finely ciliate. Sensillus with clavate head, its distal end spiculate, the end spine longer than the other spicules. Dorsosejugal suture strong. Notogastral setae represented only by their alveoli. The form of the sacculi is characteristic, as shown in Figs 46–48.

GALUMNIDAE JACOT, 1925

Acrogalumna longipluma (BERLESE, 1904) (Figs 50–51)

Oribates longiplumus BERLESE, 1904: 30. – *Oribates longiplumus:* CASTAGNOLI & PEGAZZANO 1985: 226. – *Acrogalumna longiplumus:* GRANDJEAN, 1956: 135.

There is a long series of slides of this species, but only 26/42 labelled "tipico". I follow the BERLESE's designation and I regard the male specimen as lectotype.

Complementary morphological characters: Prodorsal line (L) absent (Fig. 51). Lamellar and interlamellar setae finely roughened, a true, weak ciliation is observable only on the lamellar setae. Sensillus

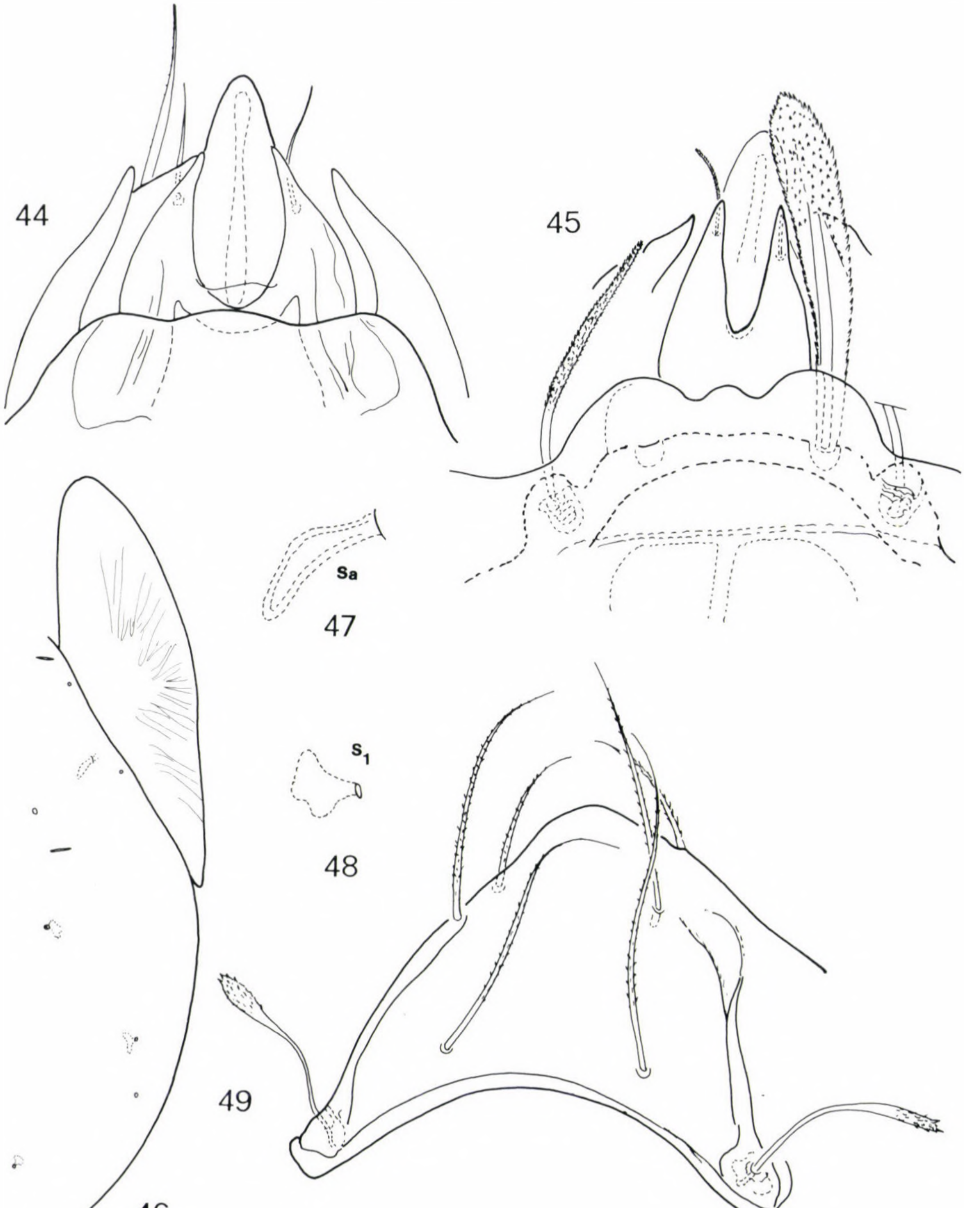


Fig. 44. *Eupelops subuliger* (BERLESE, 1916): prodorsum with the notogastral tectum. – Fig. 45. *Eupelops torulosus* (C. L. KOCH, 1840): prodorsum with the notogastral tectum. – Figs 46–49. *Neoribates roubali* (BERLESE, 1910): 46 = lateral part of notogaster, 47 = sacculus *Sa*, 48 = sacculus S_2, 49 = prodorsum.

setiform, finely ciliate. Dorsosejugal suture interrupted medially. The form of the areae porosae varying, mostly the two *Aa* and A_3 (Fig. 50). The length of the latter could be much shorter. The median porose area either larger or smaller.

Allogalumna integer (BERLESE, 1904) comb. et stat. n.
(Fig. 52)

Oribates alatus var. *integer* BERLESE, 1904: 30. – *Oribates alatus var. integer:* CASTAGNOLI & PEGAZZANO 1985: 200.

Six slides are present in the Collection, none of them are labelled "tipico". CASTAGNOLI & PEGAZZANO (l.c.) considered – on the basis of BERLESE's handwritten catalogue, wherein BERLESE made the designation himself (I have seen it too) – slide 24/39 as "tipico". Slide 24/38 contains the same species. Since the "typus slide" contains 2 specimens, I designate the one near the slide-number as lectotype. The other slides contain specimens belonging to other taxa (species or genera).

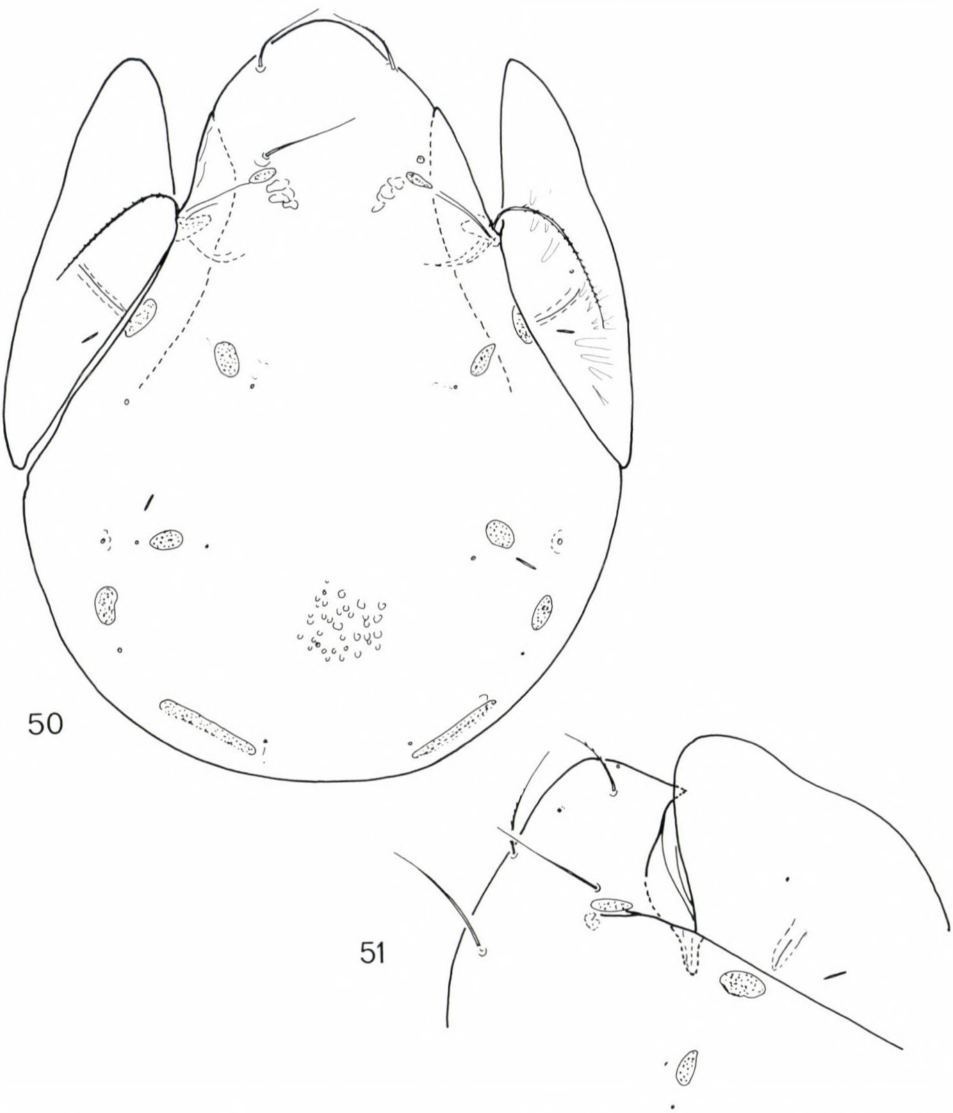
With the replacement of this species to the genus *Allogalumna* GRANDJEAN, 1936, the status of the other related species becomes questionable. In my opinion *Allogalumna alamellae* (JACOT, 1935) sensu PÉREZ–IÑIGO 1972 (=*neerlandica* HAMMEN, 1952) is identical or stands nearest to it, however, on the basis of the form of the sensillus the previous species is distinguishable. The typus examination is necessary.

Complementary morphological characters (Fig. 52): Prodorsal line (L) absent. Lamellar and interlamellar setae equal length. Sensillus directed outwards and forwards, its head lanceolate and barbed. Dorsosejugal suture absent medially. Four(!) pairs of porose areas, I was not able to find the fifth, which was shown by Berlese. Median pore present.

Allogalumna parva (BERLESE, 1916) comb. n.
(Figs 53, 55–56)

Oribates parvus BERLESE, 1916a: 56. – *Oribates parvus:* CASTAGNOLI & PEGAZZANO 1985: 307.

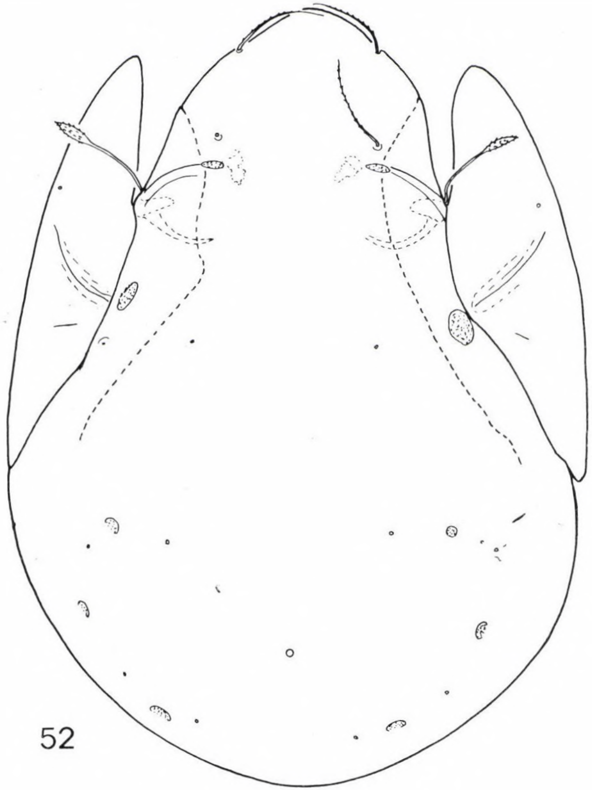
I studied 4 slides (two unexamined vials also present) and all four contain the same species. Two of them (163/35, 163/36) are labelled "tipico". The second one is in better condition, so I designate it as lectotype, although the specimen in slide 193/40 is the best for future investigation or drawing. Slide 224/9 contains 2 specimens. The following figure (Fig. 53) were made after the specimen of the slide 193/40.



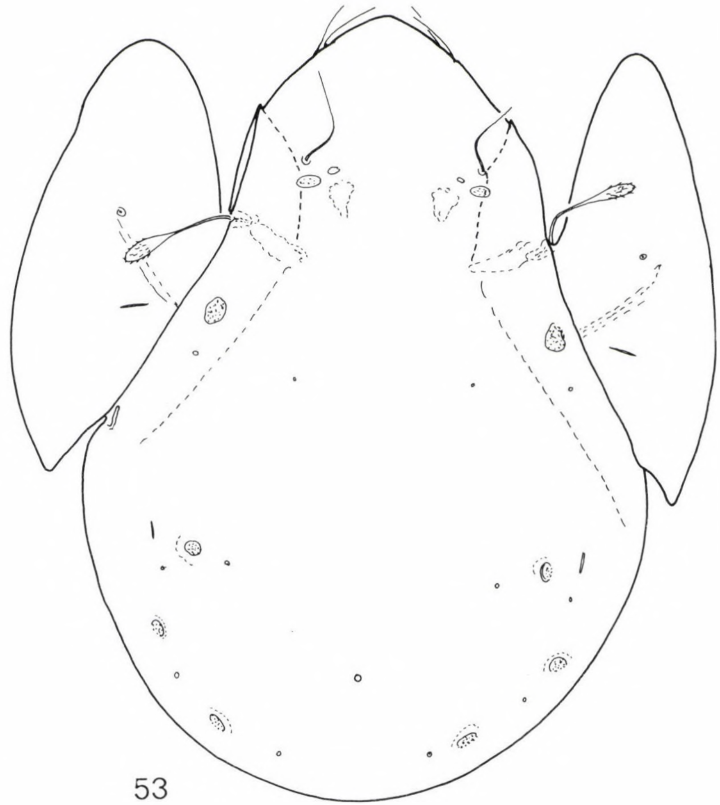
Figs 50–51. *Acrogalumna longiplumus* (BERLESE, 1904): 50 = dorsal side of male, 51 = prodorsum in lateral aspect.

In spite of the fact that I was unable to study the specimens from lateral aspect, it is no doubt that on the basis of the absence of linea *L* it belongs to the genus *Allogalumna* GRANDJEAN, 1936.

Complementary morphological characters (Fig. 53): Rostral and linear setae much shorter and thinner than the interlamellar ones. These latter are long, S-shaped, distinctly pilose. Sensillus clavate,

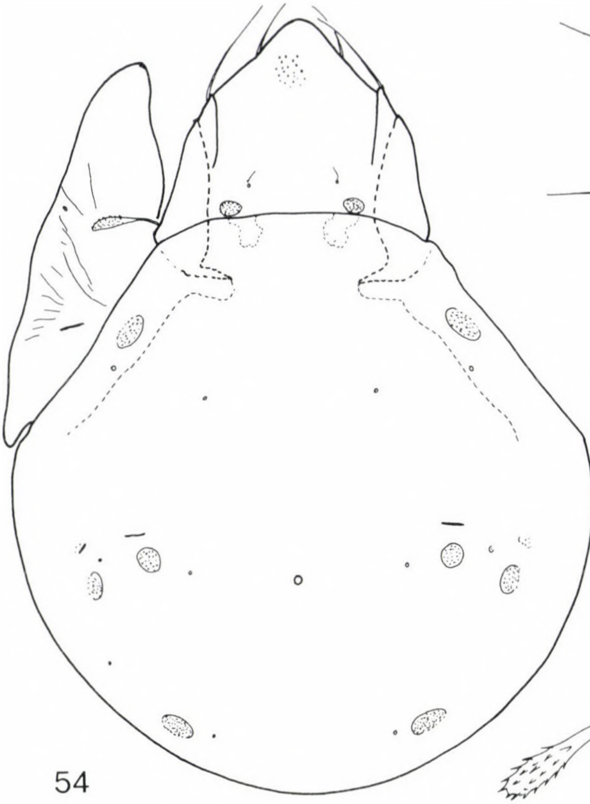


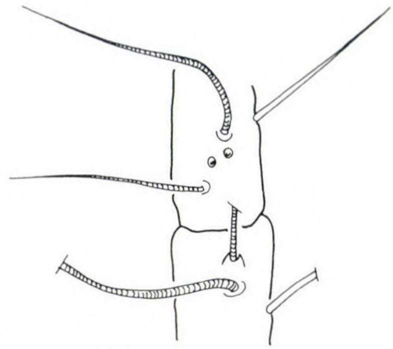
52



53

Fig. 52. *Allogalumna integer* (Berlese, 1904): dorsal side. – Fig. 53. *Allogalumna parva* (Berlese, 1916): dorsal side.


54


55

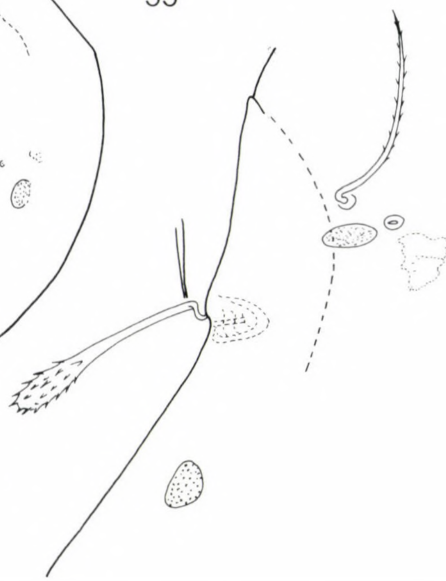

56

Fig. 54. *Galumna australis* (BERLESE, 1914): dorsal side. – Figs 55–56. *Allogalumna parva* (BERLESE, 1916): 55 = solenidial group, 56 = lateral part of prodorsum with the sensillus.

with rather spiculate head. Sometimes the end spine is larger than the others. Dorsosejugal suture absent. Areae porosae sejugales elliptical, close to them a small knob (?) observable (Fig. 56). Among the porose areas Aa larger than the others, slightly angulate, the others round or elliptical with a weak ring around them. Median pore present, it set behind A_1. All legs tridactyle. The position of the solenidial group of leg I as shown in Fig. 55.

Galumna australis (BERLESE, 1914)
(Fig. 54)

Oribates australis BERLESE, 1914: 121. – *Oribates australis:* CASTAGNOLI & PEGAZZANO 1985: 30.

This species is represented in the Collection by a long series of slides from different localities of South America. In the original description BERLESE listed Brasil, Uruguay and Paraguay as localities of this species. However, only one slide (148/43) with two specimens was labelled "tipico". Although, at least a part of the other slides was available for BERLESE in the time of the description, and only two slides (76/15, CXLIX/41) contain other species, I designate as lectotype the specimen closer to the number. The drawings was made after the typus.

Complementary morphological characters (Fig. 54): Anterior part of prodorsum punctate. Lamellar and sublamellar lines well observable, lamellar setae arising clearly between them. Interlamellar setae very short, fine. Sensillus dilated, its head distinctly barbed. Areae porosae sejugales round. The position of the notogastral porose areas characteristic, A_1 and A_2 stand very near to each other, far from A_3. No great difference in their shape. Median pore present. Postanal area porosa also large.

Galumna elimata (C. L. KOCH, 1841)
(Fig. 57)

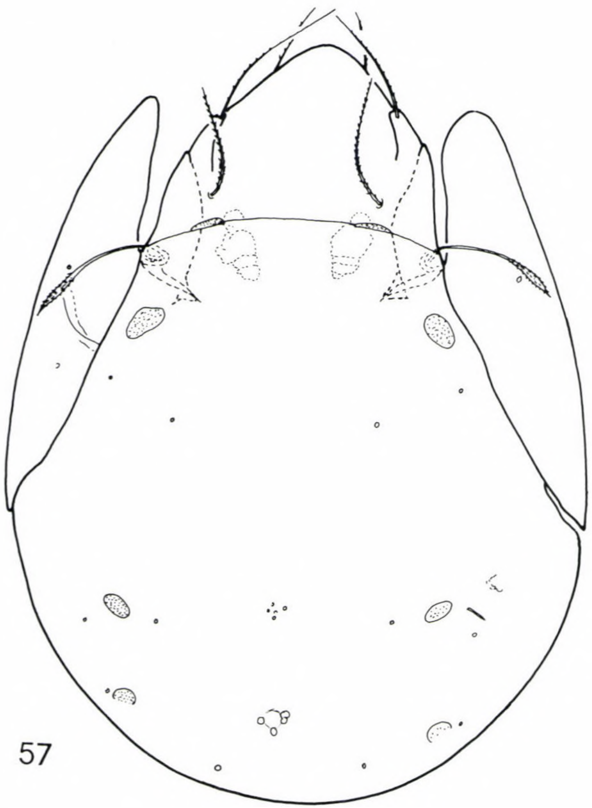
Oribates elimatus C. L. KOCH, 1841: 31/5 (climatus sic!). – *Oribates elimatus:* BERLESE 1914: 122. – *Galumna elimata* SHALDYBINA in GHILYAROV 1975: 353.

The identity of this species was rather thoroughly discussed by MARSHALL et al. (1987: 333). Nevertheless, I feel that their conception is uncertain. Firstly, a species having a very restricted area in the USA (California) is very unlikely live also in Europe or in the whole of Palaearctic.

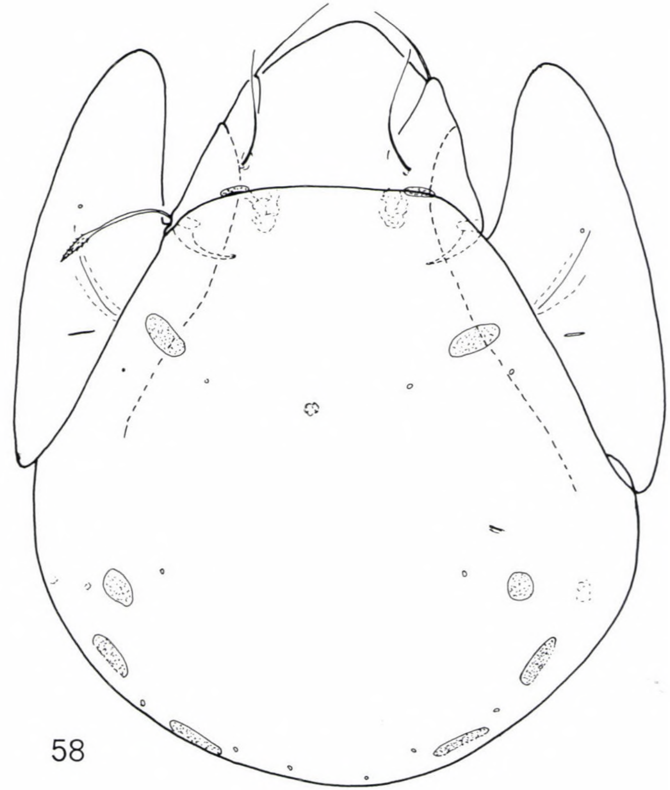
On the other hand BERLESE (1914) was the first, who interpreted clearly this species after the description and I – respecting his opinion – follow him.

There are some slides and vials in the Collection. I was not sure, that all of them contain specimens of this species. However, slides 153/24 and 153/29 are well identifiable with his redescription and drawing (1914: 122, Tav. I: 7). Therefore, for practical reason I designate the specimen in slide 153/24 as the lectotype of this species.

Complementary morphological characters (Fig. 57): Lamellar and interlamellar setae nearly equally long, but the latter more heavily ciliate. Sensillus directed outwards and backwards, lanceolate in its



57



58

Fig. 57. *Galumna elimata* (C. L. KOCH, 1841): dorsal side. – Fig. 58. *Galumna europaea* (BERLESE, 1914): dorsal side.

distal part, here finely ciliate. Dorsosejugal suture thinned medially, but observable. Notogaster with three pairs of porose areas, but – as already BERLESE represented – two groups of pori present on the posterior half of the notogaster, one in the position of the median pore, and one posteriorly.

Galumna europaea (BERLESE, 1914)
(Fig. 58)

Oribates emarginatus var. *europaeus* BERLESE, 1914: 125. *Galumna europea* (sic!): SHALDYBINA in GHILYAROV 1975: 351. *Oribates emarginatus* var. *europaeus:* CASTAGNOLI & PEGAZZANO 1985: 134.

There are two slides in the Collection. One of which (149/13) contains three specimens. The second slide (46/23) was unambiguously designated by BERLESE as typus, and in this case it is the holotype.

The identity of this species has been also confused in the literature, although considering the position of the median pore it is well distinguishable from all related species. It is sure, that it cannot be a synonym of *Pergalumna emarginata* (MARSHALL et al. 1987: 341).

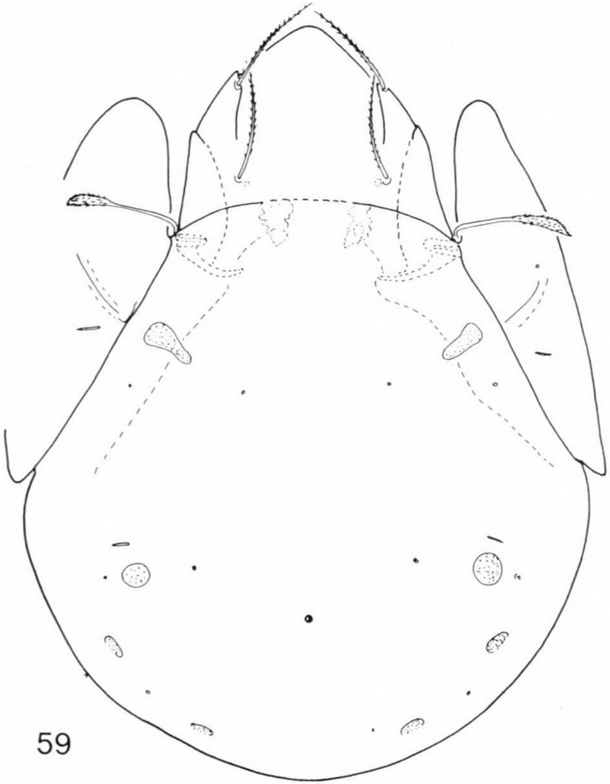
Complementary morphological characters (Fig. 58): Lamellar and interlamellar setae nearly equally long, hardly ciliate. The latter characteristically bent outwards. Sensillus also thin, its head lanceolate, finely ciliate. Dorsosejugal suture complete. Four pairs of porose areas present on the notogaster, Aa, A_2 and A_3 elliptical, A_1 more rounded. Median pore located far anteriorly, only slightly behind areae porosae Aa.

Galumna media (BERLESE, 1914)
(Fig. 59)

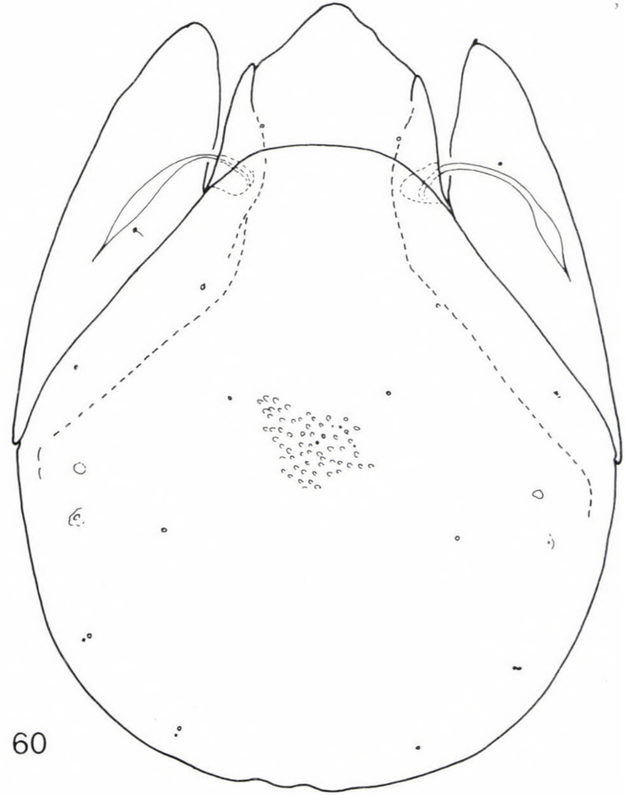
Oribates medius BERLESE, 1914: 124. – *Oribates (Oribates) medius:* CASTAGNOLI & PEGAZZANO 1985: 244.

The single specimen in slide 149/3 labelled "tipico" is the holotype. The specimen is very dark and hardly observable.

Complementary morphological characters (Fig. 59): Lamellar and interlamellar setae characteristically distinctly pilose, the interlamellar ones slightly longer and thicker than the previous ones. Sensillus directed outwards, with an asymmetrically dilated, lanceolate head being well pilose. Dorsosejugal suture strongly thinned medially, hardly observable. Four pairs of porose area present (not two pairs as represented by BERLESE), Aa elongate and narrowed inwards. Areae porosae A_1 round, much larger than A_2 and A_3.



59



60

Fig. 59. *Galumna media* (BERLESE, 1914): dorsal side. – Fig. 60. *Galumnella paradoxa* BERLESE, 1916: dorsal side.

Galumna obvia (BERLESE, 1914)

Oribates obvius BERLESE, 1914: 119. – *Oribates obvius:* CASTAGNOLI & PEGAZZANO 1985: 285. – *Galumna obvia:* SHALDYBINA in GHILYAROV 1975: 353.

A long series of slides and three now unexamined tubes exist in the Collection, but only one slide (76/1) is labelled "tipico", although at least three others (on the basis of the number) belongs to the type series which was examined by BERLESE at the time of the description. I respect his opinion, therefore, I designate this slide (76/1) as lectotype. SHALDYBINA'S (l.c.) interpretation seems to be right.

Galumnella paradoxa BERLESE, 1916
(Fig. 60)

Galumnella paradoxa BERLESE, 1916a: 58. – *Galumnella paradoxa:* CASTAGNOLI & PEGAZZANO 1985: 302.

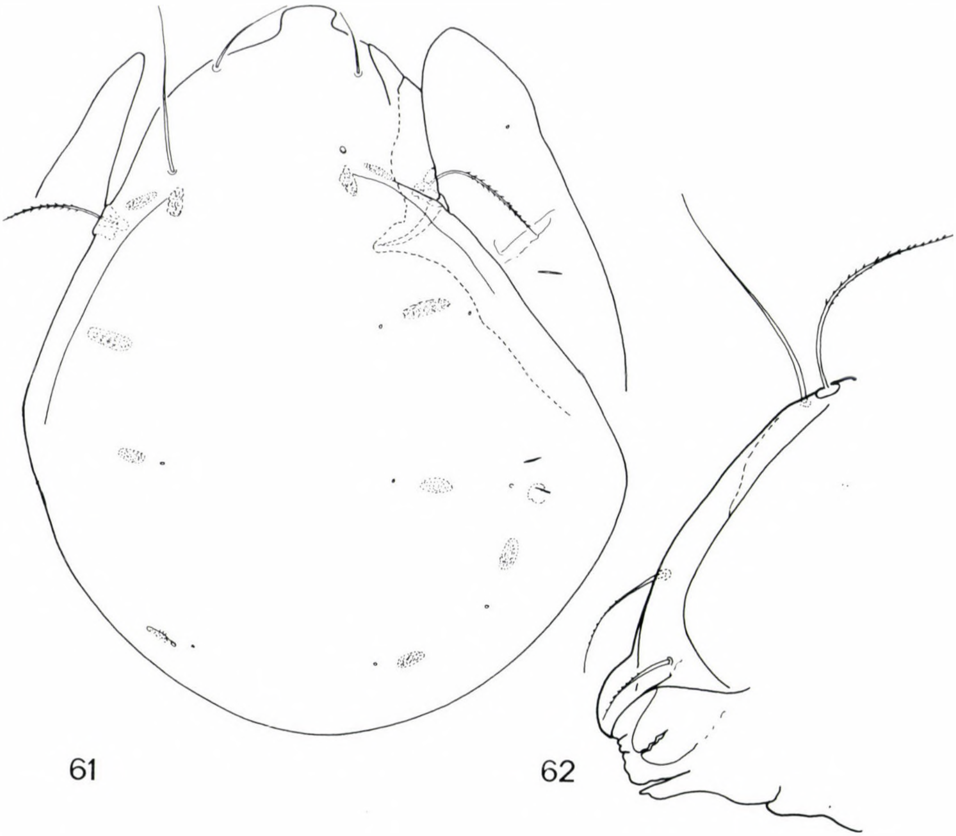
There is a long series of slides (160/1, 2, 3, 4, 5, 6, 7, 8, 9), all labelled "tipico" and one unexamined vial with specimens in alcohol in the Collection. They are mostly in good condition. I designate slide 160/8 as lectotype. Some specimens are embedded also in dorsolateral or lateral position.

Complementary morphological characters: Rostrum comparatively blunt in dorsal aspect, its apex observable only in lateral view. Lamellar *(L)* line strong, it seems that the sublamellar ones shorter and not reaching to the prodorsal margin. (I was not able to find any prodorsal setae, the interlamellar setae are certainly absent.) Sensillus very large, gradually thickened, after that gradually thinned to the sharply pointed distal end, slightly asymmetric in lateral aspect. The outline of the notogaster waved posteriorly in dorsal aspect. The whole surface equally foveolate, the same sculpture (but with smaller alveoli) is present on the pteromorphae. All legs monodactylous.

Pergalumna clericata (BERLESE, 1914)
(Figs 61–62)

Oribates clericatus BERLESE, 1914: 124. – *Oribates clericatus:* CASTAGNOLI & PEGAZZANO 1985: 77.

The largest part of the specimens of this species is in alcohol, in tubes. Only five slides (148/46, 47, 48, 159/39, 40) exist, without designation "tipico". All slides contain the same species. In the catalogue of CASTAGNOLI & PEGAZZANO (l.c.) type (syntypes) was mentioned (probably after BERLESE'S unpublished catalogue) to be in the tubes 340/1664, 340/1666. How-



Figs 61–62. *Pergalumna clericata* (BERLESE, 1914): 61 = dorsal side, 62 = prodorsum in lateral aspect.

ever, the slides 148/46, 47, 48 are from the same locality and the specimens in them are well identifiable with BERLESE's description and figure, therefore, I designate one of them (148/46) as lectotype. Figure 61 was made after the lectotype, Fig. 62 after the specimen in slide 159/39.

Complementary morphological characters: Rostrum wide nasiform, with rounded apex. I was not able to find the three rostral apices in this part, which were clearly figured by BERLESE (1914, Tav. I: 17). It is possible that he showed the lamellar lines, which really run in rostral direction and diverge from the sublamellar line. Lamellar and rostral setae setiform, finely ciliate, interlamellar setae conspicuously long, longer than the sensillus and smooth. The latter directed backwards, filiform and well ciliate. Dorsosejugal suture absent. Four pairs of porose areas exist on the notogaster, all narrow, elliptic, *Aa* the longest of all. Pteromorphae with heavy sculpture consisting of short, radiate thickenings.

Pergalumna comparanda (BERLESE, 1920) comb. et stat. n. (Figs 63–64)

Oribates (O.) emarginatus var. *comparandus* BERLESE, 1920: 151. – *Oribates (Oribates) emarginatus* var. *comparandus:* CASTAGNOLI & PEGAZZANO 1985: 82.

A single specimen (202/14) is labelled "tipico", but also three other slides (206/3, 4, 209/9) contain specimens of the same species. The number of the slides shows that the latter were mounted nearly the same time, and therefore, I consider them to be syntypes. However, I follow BERLESE'S interpretation and consider the specimen labelled "tipico" the holotype of this species. Alcoholic materials from different localities are also present, but were not examined. The drawing was made after the specimen in slide 209/9.

Complementary morphological characters: Interlamellar setae very long, distinctly ciliate on their whole surface, lamellar setae much shorter and unilaterally ciliate. Sensillus long, with a small, gradually dilated head, its distal part barbed. Dorsosejugal suture complete (Fig. 63). Notogastral porose areas large, *Aa* gradually narrowed inwards, typical V-shaped, but its size slightly varying (Fig. 64). Other porose areas round or elliptical. Median pori and postanal area porosa present.

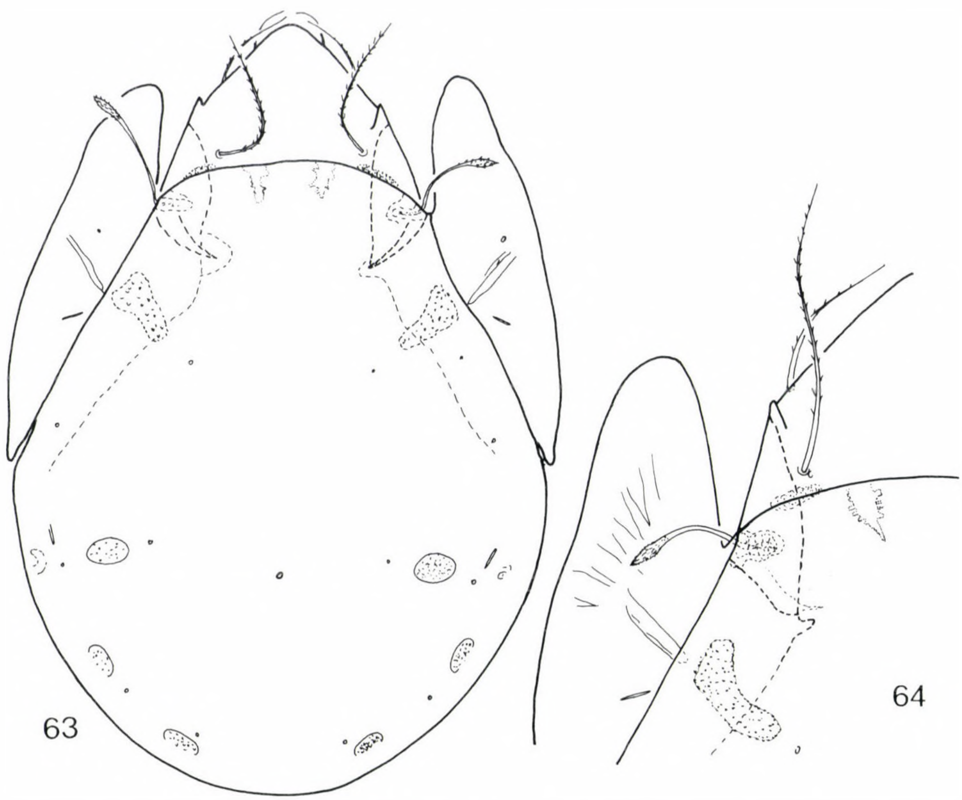
Pergalumna corniculata (BERLESE, 1905) comb. n. (Fig. 65)

Oribates elimatus var. *corniculatus* BERLESE, 1905: 171. – *Oribates corniculatus:* BERLESE 1914: 127. – *Oribates corniculatus:* CASTAGNOLI & PEGAZZANO 1985: 89.

Only a single specimen in slide 149/4 exists in the Collection without "tipico". BERLESE himself noted that "I due esemplari tipici sono conservati nella collezione del Museo di Budapest. . . ". These slides I could not find in our Collection, probably it was destroyed in 1956, or earlier. The exemplar is in good condition, well identifiable with the original description and figure of the author. Therefore, I designate it as neotype for this species.

Unfortunately, the specimen is hardly observable and an asymmetry exists between the two side of the notogaster. In spite of this fact on the basis of the unique position of the interlamellar setae the species is unambiguously distinguishable from all related species.

Complementary morphological characters: Large, broad species. Interlamellar setae thin, shorter than the lamellar ones and the sensillus, and originating laterally very far from each other, on the contour of the sublamellar lines. Sensillus directed laterally, comparatively long, with small, lanceolate head. Dorsosejugal suture clearly complete. Three pairs of porose areas exist on the notogaster, but, on the one side, A_1 divided into two parts (Fig. 65).



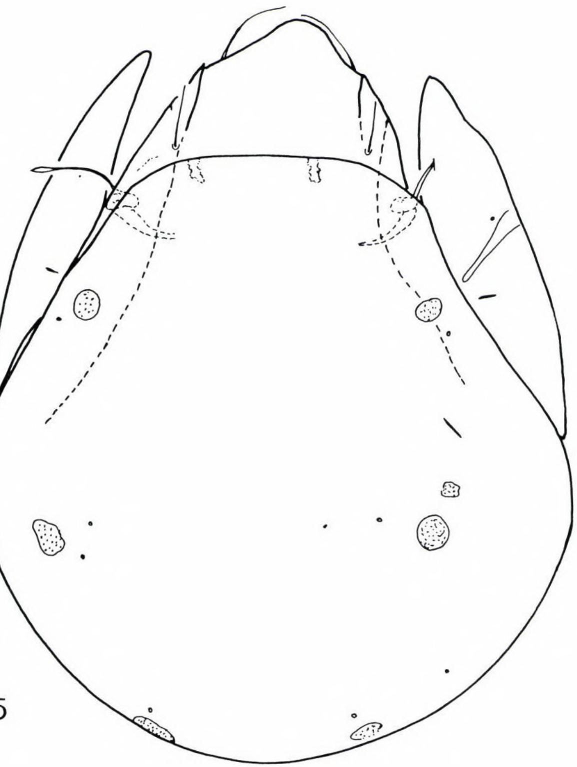
Figs 63–64. *Pergalumna comparanda* (BERLESE, 1920): 63 = dorsal side, 64 = dorsosejugal region.

Pergalumna formicaria (BERLESE, 1914)
(Figs 67–68)

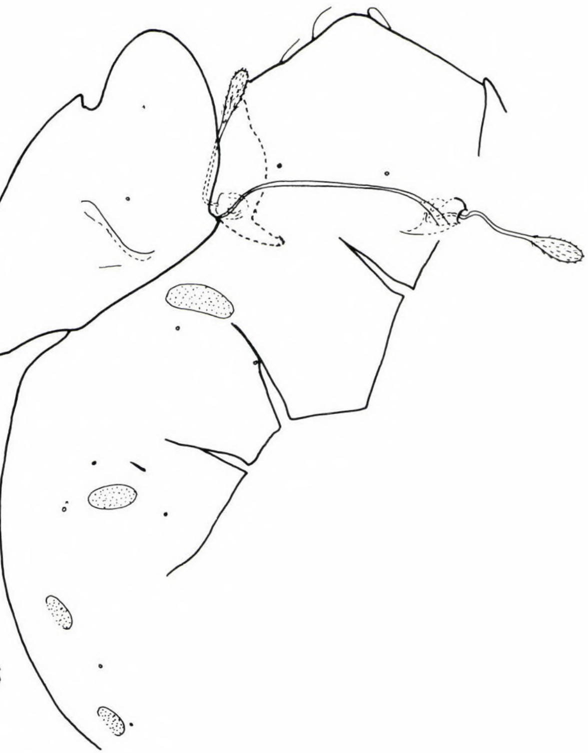
Oribates formicarius BERLESE, 1914: 121. – *Oribates formicarius:* CASTAGNOLI & PEGAZZANO 1985: 150.

There are four slides in the Collection, two (7/1, 7/3) labelled "tipico", but the numbering of the slides (7/1, 2, 3 and 4) convinces me that all belong to the type series (syntypes). The slide of 7/1 is not examinable, 7/2 destroyed, 7/3 contains three, 7/4 contains seven specimens. The best specimen which I designate lectotype is embeded in slide 7/3: two specimens lying in dorsoventral position, one of them near to the letter "O".

Complementary morphological characters (Figs 67–68): Lamellar setae normal setiform, interlamellar setae minute. Sensillus small, directed outwards, with small, clavate, finely barbed head. Dorsosejugal

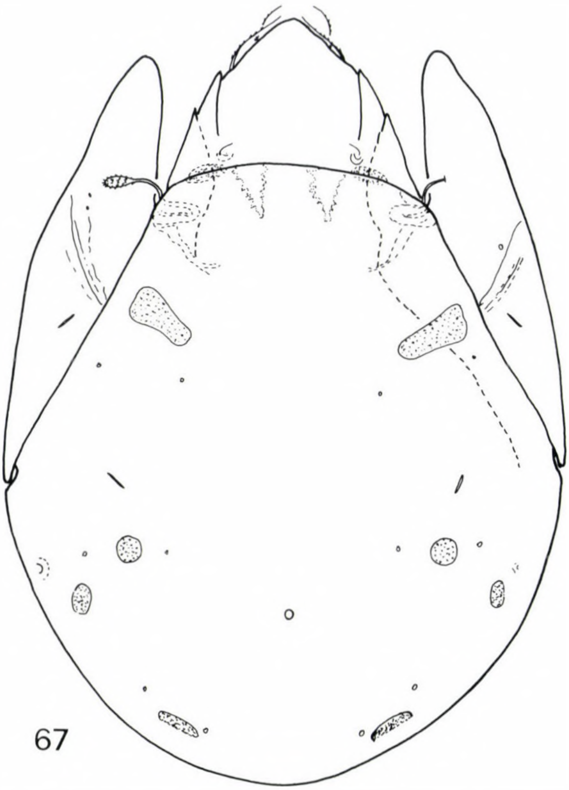


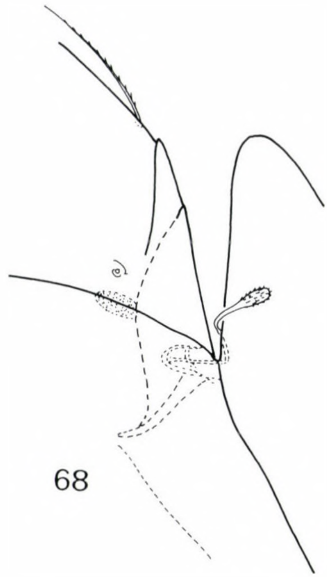
65



66

Fig. 65. *Pergalumna corniculata* (Berlese, 1905): dorsal side. – Fig. 66. *Pergalumna fusca* (Berlese, 1916): dorsal side.





Figs 67–68. *Pergalumna formicaria* (BERLESE, 1914): 67 = dorsal side, 68 = dorsosejugal region.

suture complete. Four(!) pairs of porose areas present (I was not able to find on any of the specimens the fifth area porosa), *Aa* directed inwards, elongate, all the others round. A median pore present.

Pergalumna fusca (BERLESE, 1916) comb. n. (Fig. 66)

Oribates (Stictozetes) fuscus BERLESE, 1916a: 57. – *Oribates (Stictozetes) fuscus:* CASTAGNOLI & PEGAZZANO 1985: 155.

A single specimen (158/36) is present in the Collection. It is considered the holotype by monotypy (see NORTON & KETHLEY 1989). The single specimen is damaged, broken, but still observable.

Complementary morphological characters (Fig. 66): Prodorsal setae short, unfortunately, both interlamellar setae absent. Sensillus long, its head clavate, rounded, surface ciliate. Dorsosejugal suture complete. Notogaster with four pairs of porose areas, *Aa* large, bean-shaped lying transversally, A_1 larger than A_2 and A_3, all three elliptic. On the basis of the form of porose areas this species is readily recognisable.

Pergalumna myrmophila (BERLESE, 1914)

Oribates longiplumus var. *myrmophilus* BERLESE, 1914: 123. – *Oribates longiplumus* var. *myrmophilus:* CASTAGNOLI & PEGAZZANO 1985: 268. – *Pergalumna myrmophila* SHALDYBINA in GHILYAROV 1975: 357. – *Pergalumna myrmophila:* MAHUNKA 1987: 394.

Only a single slide (6/46) is present in the Collection. According to CASTAGNOLI & PEGAZZANO (l.c.) it is the type. However, in the slide there is one specimen which is a doubtful *Acrogalumna longiplumus*, i.e. the typus is lost! On the basis of some well useful characters the species is recognizable and I have found it in Hungary recently.

Pergalumna nervosa (BERLESE, 1914)

Oribates nervosus BERLESE, 1914: 127. – *Oribates nervosus:* CASTAGNOLI & PEGAZZANO 1985: 272. – *Pergalumna nervosa:* SHALDYBINA in GHILYAROV 1975: 357.

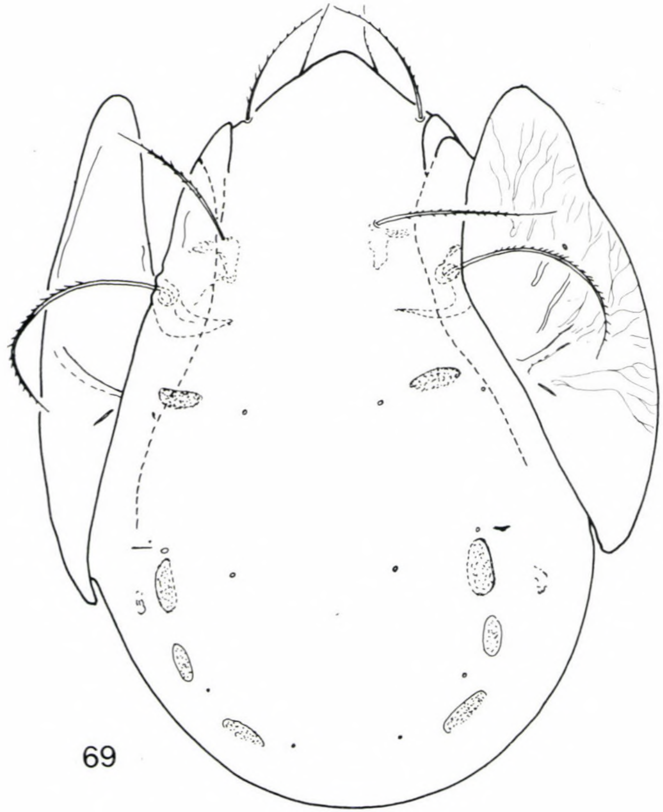
Three mounted specimens are present in the Collection, one of them (17/1) is labelled "tipico" from Norway. The second slide (75/48) contains presumably the same species, but the third one (224/8) certainly does not; it is a *Galumna* species. The known interpretations (WILLMANN 1931, SHALDYBINA in GHILYAROV 1975) are well identifiable with BERLESE's original description.

Pergalumna pterinervis (G. CANESTRINI, 1898)
(Fig. 69)

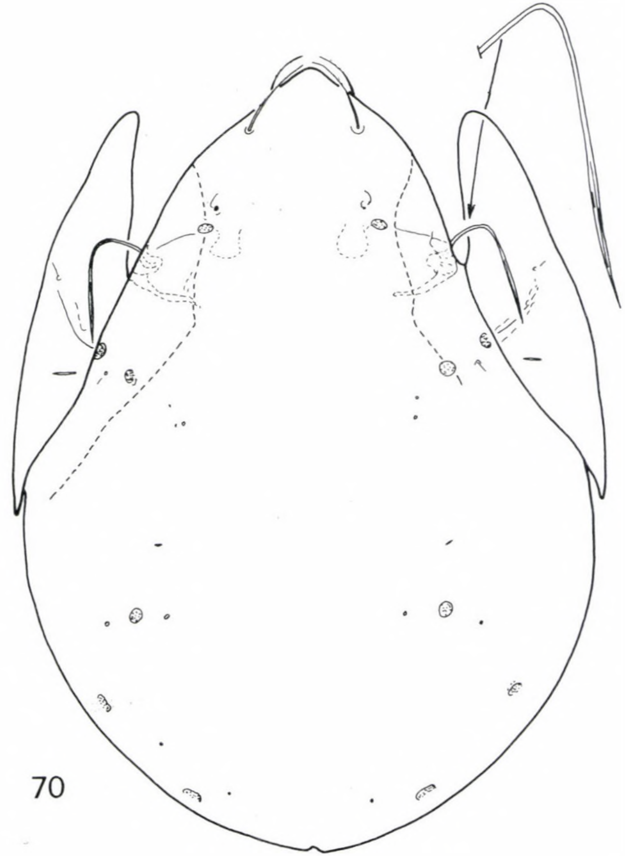
Oribates pterinervis G. CANESTRINI, 1898: 194 – *Oribates pterinervis:* BERLESE 1905: 176, 1914: 124.

There are two specimens in one slide (37/40) in the Collection. No type designation, therefore I designate the specimen in dorsoventral position, nearer to the label as lectotype.

Complementary morphological characters (Fig. 69): Rostral, lamellar and interlamellar setae rarely pilose, their ratio: *in*>*le*>*ro*. Sensillus setiform, directed backwards, distinctly pilose. Dorsosejugal su-



69



70

Fig. 69. *Pergalumna pterinervis* (G. CANESTRINI, 1905): dorsal side. – Fig. 70. *Pilogalumna tenuiclava* (BERLESE, 1908): dorsal side.

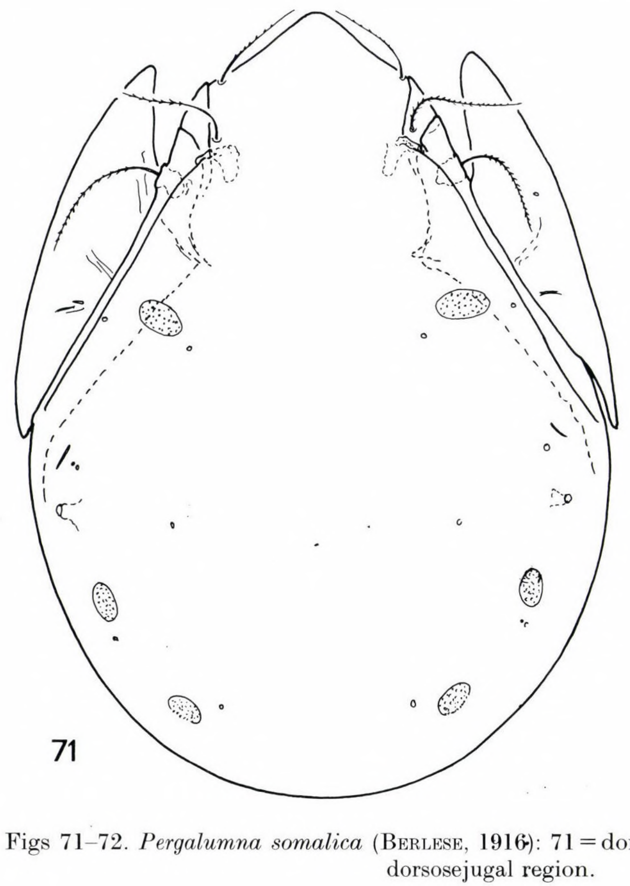
ture completely reduced, areae porosae sejugales very small. Four pairs of porose areas, nearly *equal* in size on notogaster. The distance between A_1, A_2 and A_3 not greater than the longitudinal diameter of these structures.

Pergalumna somalica (BERLESE, 1916) comb. et stat. n. (Figs 71–72)

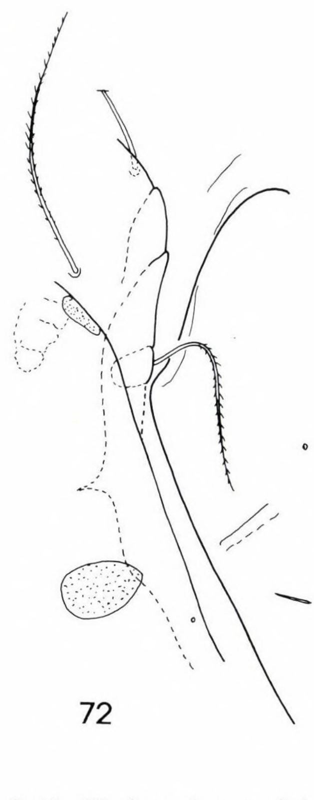
Oribates ovalis var. *somalicus* BERLESE, 1916a: 56. – *Oribates ovalis* var. *somalicus:* CASTAGNOLI & PEGAZZANO 1985: 386.

The original series, consists of seven slides: 159/37, 38, 41, 42, 44, 45, 47, all labelled as "tipico". I designate the specimen which is mounted in slide 159/47 as lectotype, but almost all specimens are in good condition and all well observable.

Complementary morphological features: Lamellar setae clearly originating between the lamellar lines *(L)*. These setae slightly



71



72

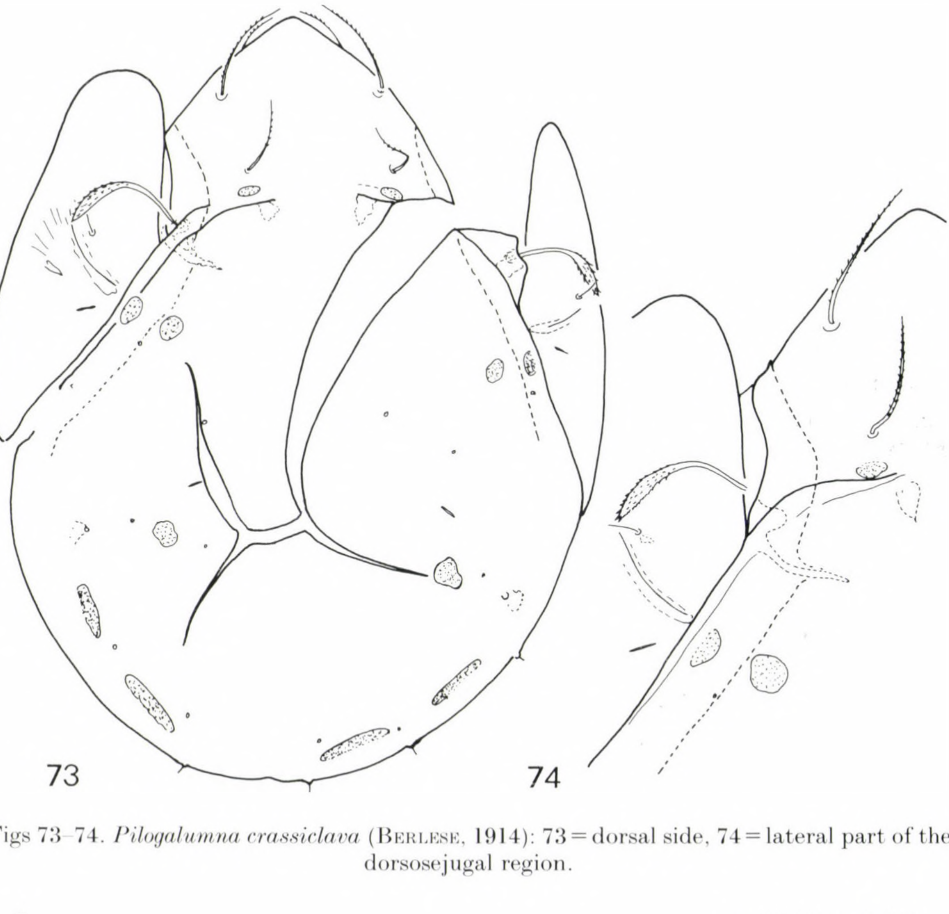
Figs 71–72. *Pergalumna somalica* (BERLESE, 1916): 71 = dorsal side, 72 = lateral part of the dorsosejugal region.

stronger than the interlamellar ones and unilaterally ciliated, while the latter on the whole surface. Sensillus also simple, setiform, distinctly ciliated, directed backwards (Fig. 72). Dorsosejugal suture absent. Only three pairs of areae porosae present on notogaster, the anterior pair *(Aa)* are always in transverse position and larger than the others (Fig. 71).

Pilogalumna crassiclava (BERLESE, 1914) comb. n.
(Figs 73–74)

Oribates crassiclavus BERLESE 1914: 125. – *Oribates crassiclavus:* CASTAGNOLI & PEGAZZANO 1985: 94. – *Galumna allifera* OUDEMANS, 1919: 54, **syn. n.**

This species is represented in the Collection only by one slide (26/41) labelled "tipico", however, it contains two specimens. Both belongs to this species and I designate one of them as lectotype, which lies in dorsoventral



Figs 73–74. *Pilogalumna crassiclava* (BERLESE, 1914): 73 = dorsal side, 74 = lateral part of the dorsosejugal region.

position. It is no doubt that this species belongs to the genus *Pilogalumna* and on the basis of the mentioned characters below I consider *Pilogalumna allifera* (OUDEMANS, 1919) to be a junior subjective synonym of *crassiclava*.

Complementary morphological characters: Both prodorsal lines (*L* and *S*) are absent. Lamellar setae slightly longer than the interlamellar ones, the latter characteristically bent. Sensillus directed laterally, its head asymmetrical, well barbed (Fig. 74). Dorsosejugal suture interrupted medially. Five pairs of porose areas present on motogaster, *Aa* double. Ten pairs of minute, but well visible notogastral setae present, setae arising on small tubercles (Fig. 73).

Pilogalumna tenuiclava (BERLESE, 1908)
(Fig. 70)

Oribates tenuiclavus BERLESE, 1908: 7, 1914: 120. – *Oribates tenuiclavus:* CASTAGNOLI & PEGAZZANO 1985: 411. – *Pilogalumna tenuiclava:* SHALDYBINA in GHILYAROV 1975: 359.

I have found a long series of slides in the Collection bearing this name (see CASTAGNOLI & PEGAZZANO l.c.) from various sites. Slide 76/21 is labelled "tipico", but slide 76/22 containing 4 specimens, belongs presumably to the typus series and was prepared in the same time. Unfortunately, the third slide from Norway (76/23) and one more from France (179/35) contain other species. I designate 76/21 as lectotype. The following figure was made after it (Fig. 73).

Complementary morphological characters: Rostral and lamellar setae normal, interlamellar setae minute. Sensillus reclinate, its distal end slightly dilated, lanceolate (Fig. 70), smooth. Dorsosejugal suture absent medially, but its lateral parts observable up to the dorsosejugal porose areas. Five pairs of small, nearly round porose areas on notogaster, the two areae porosae adalares *Aa* are equal in size.

Stictozetes scaber (BERLESE, 1916)
(Figs 75–76)

Oribates (Stictozetes) scaber BERLESE, 1916: 57. – *Oribates (Stictozetes) scaber:* CASTAGNOLI & PEGAZZANO 1985: 370.

Five slides (159/26, 27, 28, 29, 30) are present in the Collection, four of these (159/28 not) are labelled "tipico", but the fifth certainly belongs to the examined series by BERLESE. I designate the specimen 159/26 as lectotype. The figures were made after the lectotype and after the specimen in slide 159/28 (partly broken).

Figs 75–76. *Stictozetes scaber* (BERLESE, 1916): 75–76 = dorsal side.

Complementary morphological characters (Figs 75–76): Lamellar lines *(L)* absent, sublamellar lines *(S)* present (?, I could not see it clearly). All three pairs of prodorsal setae short, simple. Sensillus reclinate, slightly and gradually thickened to its distal end. Its distal part spiculate. Dorsosejugal suture completely absent, areae porosae sejugales also reduced. Ten pairs well developed, but thin, simple notogastral setae and 3 pairs of small, round sacculi or pori present on notogaster. The whole surface is strongly punctulate, therefore, I was not able to decide the true function of these structures, but they are probably not real areae porosae. All legs tridactylous.

Vaghia stupendus (BERLESE, 1916)

Oribates (Stictozetes?) stupendus BERLESE, 1916: 305. – *Oribates (Stictozetes) stupendus:* CASTAGNOLI & PEGAZZANO 1985: 399. – *Vaghia (Stictozetes?) stupendus:* OUDEMANS 1919: 79. – *Vaghia stupendus:* GRANDJEAN 1956: 267.

One, completely destroyed (dried) specimen is present in the Collection (179/30) labelled "tipico". In this condition the examination was impossible.

SPECIES INCERTAE SEDIS

Galumna norvegica (BERLESE, 1914) comb. n.

Oribates obvius var. *norvegicus* BERLESE, 1914: 120. – *Oribates obvius* var. *norvegicus:* CASTAGNOLI & PEGAZZANO 1985: 277.

Two slides (both with number 75/50) are present in the Collection and both contain two specimens. For an exact interpretation further examinations are necessary.

The specimens are large, dark. Their sensillus comparatively short, stick-shaped. It is possible that this species is identical with *G. obvia*.

Oribates atomarius BERLESE, 1914
(Fig. 77)

Oribates atomarius BERLESE, 1914: 121. – *Oribates atomarius:* CASTAGNOLI & PEGAZZANO 1985: 28.

Two specimens are in the Collection, but the original description was made presumably after slide 149/2, labelled "tipico". Unfortunately, this slide contains only a very damaged *Protoribates* specimen. The other slide (179/32), mounted later contains really a Galumnid specimen (Fig. 77). Further investigations are necessary.

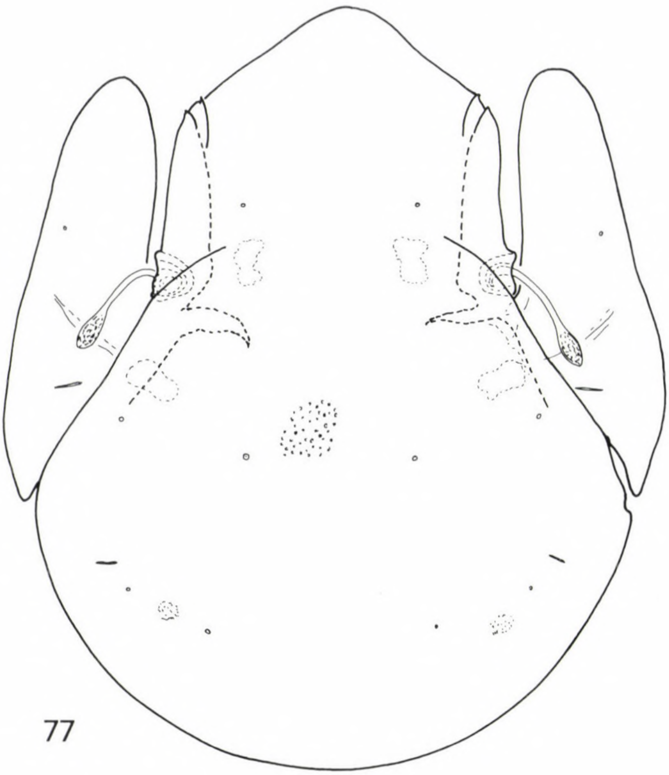


Fig. 77. *Oribates atomarius* BERLESE, 1914: dorsal side.

NOMINA NUDA

Unfortunately, CASTAGNOLI & PEGAZZANO (1985) listed in their catalogue the unpublished species of BERLESE, thereby a number of nomina dubia was introduced into the literature. The preparations of these species are deposited in the Collection, and in fact, they are yet undescribed species. The following ones belong to the discussed groups:

Oribates imponderabilis
Oribates moderatus
Oribates emarginatus var. *calaber*
Oribates succinctus

REFERENCES

BERLESE, A. (1905): Acari nuovi. Manipulus IV. – *Redia* **2:** 154–176.

BERLESE, A. (1908): Elenco di generi e specie nuove di Acari. – *Redia* **5:** 1–15.

BERLESE, A. (1914): Acari nuovi. Manipulus IX. – *Redia* **10:** 113–150.

BERLESE, A. (1910): Brevi diagnosidi generi e specie di Acari. – *Redia* **6:** 346–388.

BERLESE, A. (1914): Acari nuovi. Manipulus IX. – *Redia* **10:** 113–150

BERLESE, A. (1916a): Centuria prima di Acari nuovi. – *Redia* **12:** 19–67.

BERLESE, A. (1916b): Centuria seconda di Acari nuovi. – *Redia* **12:** 126–177.

BERLESE, A. (1916c): Centuria terza di Acari nuovi. – *Redia* **12:** 283–338.

BERLESE, A. (1920): Centuria quinta di Acari nuovi. – *Redia* **14:** 143–195.

BERNINI, F. (1970): Notulae Oribatologicae II. Gli Oribatei (Acarida) delle Alpi Apuane (1[a] serie). – *Lav. Soc. It. Biogeog.*, N. Ser. **1:** 390–429.

BERNINI, F. (1973): Notulae Oribatologicae VII. Gli Oribatei (Acarida) dell'isolotto di Basiluzzo (Isole Eolie). – *Lav. Soc. It. Biogeogr.*, N. Ser. **3:** 355–480.

CANESTRINI, G. (1898): Nuovi Acaroidei della N. Guinea. – *Természetr. Füz.* **21:** 193–197.

CASTAGNOLI, M. & PEGAZZANO, F. (1985): Catalogue of the Berlese Acaroteca. – Inst. Sper. Zool. Agr., Firenze, 490 pp.

FUJIKAWA, T. (1978): Revision of the family Banksinomidae (Acari, Oribatei). – *Acarologia* **20:** 433–467.

GHILYAROV, M. S. (1975): Opredelitel obitayushchih v pochve kleschej. – Izdatelstvo Nauka. Moskva, 491 pp. (in Russian).

GRANDJEAN, F. (1956): Galumnidae sans carenes lamellaires (Acariens, Oribates), 1[re] série. – *Bull. Soc. Zool. France* **81:** 134–150.

HAMMEN, L. VAN DER (1959): Berlese's primitive oribatid mites. – *Zool. Verh.* **40:** 1–93.

LOMBARDINI, G. (1936): Elenco alfabetico di specie esistenti nell' acaroteca della R. Statione di Entomologia Agraria di Firenze. – *Redia*, **22:** 37–51.

MAHUNKA, S. (1980a): Data to the knowledge of mites preserved in the "Berlese Collection" (Acari: Tarsonemida, Oribatida). – *Acta Zool. Hung.* **27:** 377–399.

MAHUNKA, S. (1980b): Data to the knowledge of mites preserved in the "Berlese Collection" (Acari: Tarsonemina, Oribatida). – *Fol. Ent. Hung.* **41:** 105–121.

MAHUNKA, S. (1987): A survey of the Oribatids of the Kiskunság National Park (Acari: Oribatida). – in: MAHUNKA, S. (ed.): The Fauna of the Kiskunság National Park II. Akadémiai Kiadó, Budapest, pp. 346–397.

MAHUNKA, S. (1991): Notes, additions and redescriptions of the Oribatid species of Berlese (Acari). – *Acta Zool. Hung.* **37:** 27–58.

MARSHALL, V. G., REEVES, R. M. & R. A. NORTON (1987): Catalogue of the Oribatida (Acari) of continental United States and Canada. – *Mem. Entomol. Soc. Can.* **139:** 1–418.

NORTON, R. A. & BEHAN–PELLETIER, V. M. (1986): Systematic relationships of Propelops, with a modification of family-group taxa in Phenopelopoidea (Acari: Oribatida). – *Can. J. zool.* **64:** 2370–2383.

NORTON, R. A. & J. B. KETHLEY (1986): Berlese's North American Oribatid mites: historical notes, recombinations, synonymies and type designations. – *Redia* **62:** 421–499.

OUDEMANS, C. (1919): Notizen über Acari, 26. Reihe. – *Arch. Naturg.* **83** (A/4): 1–84.

PÉREZ–IÑIGO, C. (1972): Åcaros Oribátidos de suelos de España peninsular e Islas Baleares (Acari, Oribatei). Parte IV. – *EOS* **47:** 247–333.

WILLMANN, C. (1931): Moosmilben oder Oribatiden. – *Tierw. Deutschl.* **22:** 79–200.

WILLMANN, C. (1951): Die hochalpine Milbenfauna der Mittleren Hohen Tauern insbesondere des Großglockner–Gebietes (Acari). – *Bonn. Zool. Beitr.* **2:** 141–176.

Acta Zoologica Hungarica 38 (3–4), pp. 261–280 (1992)

TENEBRIONIDAE (COLEOPTERA) FROM LAOS AND VIETNAM, WITH RECLASSIFICATION OF OLD WORLD "DOLIEMA"*

O. Merkl

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 25th November 1991)

Locality data of 59 Tenebrionidae collected in Laos and/or Vietnam are listed. *Gonocnemis kondorosyi* sp. n., *Dicraeosis datangla* sp. n., *Menimus lamdong* sp. n. and *Stethotrypes baoloc* sp. n. are described. Five species are new to Laos, 9 to Vietnam. The Old World species of *"Doliema"* are transferred to *Adelina* and *Platycotylus;* checklist and keys to the species are given. New synonymies (junior synonyms first): Doliema kannegieteri Pic, 1923 = *Adelina platisoides* (Pascoe, 1860); Doliema laticollis Pic, 1923, Platycotylus coloratus Blackburn, 1903, P. inusitatus Olliff, 1883 and P. nigripes Olliff, 1883 = *Platycotylus nitidulus* (Macleay, 1827). With 27 original figures.

This paper is based mainly on the tenebrionid material collected by the zoological expeditions of the Hungarian Natural History Museum (HNHM) to Vietnam, within the framework of an interstate agreement between the Hungarian Academy of Sciences and the National Center for Scientific Research of Vietnam. Until now, four trips were organized to Vietnam, the first three (see details in Mahunka & Oláh 1986; Mészáros, Oláh & Vásárhelyi 1987; Matskási, Oláh & Topál 1989) to the northern part, while the fourth (Mahunka, Oláh & Vásárhelyi 1989) to the southern part of the country. A few further Vietnamese specimens collected by Russian entomologists in the Gia Lai-Con Tum province have been passed on to the author by Dr. T. Kompantzeva (Moscow). Mr. J. Matejícek (Hrádec Kralové, Czechoslovakia) has also presented specimens from that country. These are now deposited in the HNHM and have also been included in the material studied.

On the other hand, in the spring of 1990, Mr. E. Kondorosy (Keszthely, Hungary) made collectings in Laos, almost exclusively in or in the vicinity of the capital. He brought back a small but interesting beetle collection that he kindly donated to the HNHM. As the Laotian and the Vietnamese tenebrionid faunae have a great deal of similarity, it makes sense to write up the materials in a common paper.

* Hungarian Zoological Studies in Vietnam, No. 17.

The subfamilial and tribal placement of the species follows the most updated (yet in some respects tentative) suprageneric classification of the Tenebrionidae (see DOYEN, MATTHEWS & LAWRENCE 1989 and the references therein). Alleculini (Alleculinae) and Lagriini (Lagriinae) which were traditionally given family status, are not included in this study.

PRESENTATION OF DATA

For the material studied, the locality, the date of collecting and the name of collector(s) are submitted as precisely as stated in the labels tagged to the specimens. The collectors are indicated by the following abbreviations:

K – E. KONDOROSY
MOT – I. MATSKÁSI, J. OLÁH and GY. TOPÁL
MOV – F. MÉSZÁROS, J. OLÁH and T. VÁSÁRHELYI
MV – S. MAHUNKA and T. VÁSÁRHELYI

The number of specimens is given in parentheses. In the Vietnamese data, the numbers given after the date of collecting refer to the numbered lists of zoological samples published in the reports on the expeditions mentioned in the introduction. These provide some information on the collecting methods and sometimes on the habitat in which the collecting was made.

The distribution of species is outlined partly on the basis of literature sources and partly on unpublished data of specimens deposited in the HNHM.

* * *

Acknowledgements – I am indebted to DR. T. KOMPANTZEVA, DR. E. KONDOROSY and MR. J. MATEJÍČEK for donating material to the HNHM. My thanks are also due to MR. D. KEMPSTER (the Natural History Museum, formerly British Museum, Natural History, London) for the loan of type specimens of *Stethotrypes* and *Platycotylus*. The drawings were prepared by MR. J. PÁL.

LIST OF SPECIES

Anaedus spinicornis KASZAB, 1973 (Lagriinae: Goniaderini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (1). – Distribution: Nepal (KASZAB 1973), Vietnam (new record).

Luprops cribrifrons (MARSEUL, 1876) (Lagriinae: Lupropini) – LAOS: Dong Dok, 20. III. 1990, K (1); id., 29. III. 1990, K (1); Vientiane, 14. III. 1990, K (1). VIETNAM: Hai Phong Prov., Ang Soi, Cat Ba, 20° 44′, 107° 02′ E, singling, No. 152, 15. V. 1987, MOT (1); Lam Dong Prov., Thanh Loc, 15 km N of the city, 12. X. 1988, No. 274, MV (1); Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (1); Lam Dong Prov., Bao Loc, 27. X.

1988, No. 402, MV (1). – Distribution: Japan (GEBIEN 1938–42), Vietnam (KASZAB 1980), Laos (new record), Taiwan (KASZAB 1941), Thailand (collection data in the HNHM).

Luprops yunnanus FAIRMAIRE, 1887 (Lagriinae: Lupropini) – LAOS: Naphok, 23. III. 1990, K (1). – Distribution: North India, Nepal, Bhutan, South China (KASZAB 1975a), Laos (new record).

Spinolyprops himalayicus KASZAB, 1965 (Lagriinae: Lupropini) – VIETNAM: Ha Noi, at light, 8. V. 1987, No. 122, MOT (1). – Distribution: India (West Bengal), Bhutan (KASZAB 1975a), Vietnam (new record), Burma (collection data in the HNHM).

Stenosida bremeri KASZAB, 1981 (Pimeliinae: Epitragini) – LAOS: Vientiane, 17. III. 1990, K (1); id., 18. III. 1990, K (5); id., 29. III. 1990, K (5). – Distribution: Thailand (KASZAB 1981), Laos (new record).

Gebieniella stenosides (PASCOE, 1862) (Pimeliinae: Stenosini) – LAOS: Dong Dok, 20. III. 1990, K (6). – Distribution: Burma, Thailand, Laos, Vietnam (KOCH 1940).

Cryphaeus gazella (FABRICIUS, 1798) (Tenebrioninae: Toxicini) – VIETNAM: Son La Prov., Moc Chau, under bark, 27. X. 1986, No. 95, MOV (3). – Distribution: "As. mer. I. Sunda" (GEBIEN 1938–42), Vietnam (KASZAB 1980), China, Thailand, Laos, Philippines, Greater and Lesser Sunda Islands, Moluccas (collection data in the HNHM).

Alphitobius laevigatus (FABRICIUS, 1781) (Tenebrioninae: Alphitobiini) – LAOS: Vientiane, 6. III. 1990, K (1) – Distribution: cosmopolitan.

Diaclina tonkinea (PIC, 1923) (Tenebrioninae: Alphitobiini) – VIETNAM: Son La Prov., Moc Chau, under bark, 27. X. 1986, No. 95, MOV (1); Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (1). – Distribution: Vietnam (KASZAB 1980).

Platycotylus ferrugineus (KASZAB, 1939), comb. n. (Tenebrioninae: Triboliini) – VIETNAM: Lam Dong Prov., Da Lat, 15 km NW of the town, 31. X. 1988, No. 316, MV (1). – Distribution: Burma (GEBIEN 1938–42), Taiwan (KASZAB 1941), Vietnam (new record).

Platycotylus nitidulus (MACLEAY, 1872) (Tenebrioninae: Triboliini) – VIETNAM: Son La Prov., Moc Chau, under bark, 27. X. 1986, No. 95, MOV (1); Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, singling, 13. X. 1986, No. 41, MOV (4). – Distribution: Indochina, Andamans, Queensland (GEBIEN 1938–42), Nepal, New Guinea (KASZAB 1973), Vietnam (KASZAB 1965, 1980), Thailand (collection data in the HNHM).

Platycotylus parvicollis (PIC, 1923), comb. n. (Tenebrioninae: Triboliini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, singling, 13. X. 1986, No. 41, MOV (1). – Distribution: Sumatra (GEBIEN 1938–42), Borneo, Philippines (collection data in the HNHM), Vietnam (new record).

Cneocnemis haemorrhoea (FAIRMAIRE, 1893) (Tenebrioninae: Ulomini) – VIETNAM: Lam Dong Prov., Bao Loc, 21. X. 1988, No. 350, MV (1). – Distribution: Borneo (GEBIEN 1938–42), Vietnam (KASZAB 1980).

Eutochia lateralis (BOHEMAN, 1858) (Tenebrioninae: Ulomini) – LAOS: Vientiane, 17. III. 1990, K (1). – Distribution: "Ind. bis Phil. Hawai" (GEBIEN 1938–42), Vietnam (KASZAB 1965, 1980).

Uloma picicornis FAIRMAIRE, 1882 (Tenebrioninae: Ulomini) – VIETNAM: Son La Prov., Moc Chau, under bark, 27. X. 1986, No. 95, MOV (1). – Distribution: "indomal. Gebiet" (GEBIEN 1938–42), Vietnam (KASZAB 1980).

Ulomimus indicus F. BATES, 1873 (Tenebrioninae: Ulomini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (2). – Distribution: India, Srí Lanka, Indochina (KASZAB 1979), Vietnam (KASZAB 1980).

Mesomorphus annamitus KASZAB, 1963 (Tenebrioninae: Opatrini) – VIETNAM: Son La Prov., Moc Chau, at light, 26. X. 1986, No. 105, MOV (2). – Distribution: Laos (KASZAB 1963), Vietnam (new record).

Mesomorphus rugulosus CHATANAY, 1917 (Tenebrioninae: Opatrini) – VIETNAM: Lam Dong Prov., Da Lat, Da Thien, 18. X. 1988, No. 324, MV (6); Lam Dong Prov., Duc Me

(Maria stream), 15 km S of Bao Loc, 23. X. 1988, No. 372, MV (1); Lam Dong Prov., Bao Loc, 27. X. 1988, No. 402, MV (1). – Distribution: Vietnam, Burma, Hainan, South India, Java, Philippines (KASZAB 1963).

Mesomorphus villiger (BLANCHARD, 1853) (Tenebrioninae: Opatrini) – LAOS: Vientiane, 18. III. 1990, K (4). VIETNAM: Bac Thai Prov., Quang Chu, 22° 00′ N, 105° 50′ E, singling, 25. V. 1987, No. 236, MOT (1). – Distribution: whole Indo-Malayan Region, Afghanistan, China, Ussuri (Soviet Union), Korea (KASZAB 1963), Madagascar, tropical Africa, Australia (KASZAB 1973), Srí Lanka (KASZAB 1979).

Mesomorphus vitalisi CHATANAY, 1917 (Tenebrioninae: Opatrini) – LAOS: Dong Dok, 20. III. 1990, K (1); Naphok, 23. III. 1990, K (1). – Distribution: Burma, Vietnam, Laos (KASZAB 1963).

Caedius orientalis (FAIRMAIRE, 1893) (Tenebrioninae: Opatrini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (6). – Distribution: Taiwan, Laos (KASZAB 1942), Vietnam (KASZAB 1965, 1980).

Scleron ferrugineum (FABRICIUS, 1801) (Tenebrioninae: Opatrini) – LAOS: Dong Dok, 2. III. 1990, K (1); Vientiane, 4. III. 1990, K (1); id., 23. III. 1990, K (1). VIETNAM: Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (1). – Distribution: "Im ganzen orientalischen Gebiet" (KASZAB 1942).

Gonocephalum annamita CHATANAY, 1917 (Tenebrioninae: Opatrini) – LAOS: Vientiane, 8. III. 1990, K (1); id., 11. III. 1990, K (3). VIETNAM: Ha Son Binh Prov., Hoa Binh, at light, 21. X. 1986, No. 85, MOV (1); Bac Thai Prov., Thai Nguyen, 40 m, 21° 24′ N, 105° 50′ E, at light, 23. V. 1987, No. 223, MOT (1); Lam Dong Prov., Suoi Loc chau, 5 km E of Bao Loc, 24. X. 1988, No. 377, MV (1). – Distribution: Japan, India, China, Thailand, Laos, Vietnam, Malaysia, Greater and Lesser Sunda Islands, Moluccas (KASZAB 1952).

Gonocephalum bilineatum (WALKER, 1858) (Tenebrioninae: Opatrini) – LAOS: Vientiane, 18. III. 1990, K (1). VIETNAM: Son La Prov., Moc Chau, at light, 26. X. 1986, No. 105, MOV (1); Bac Thai Prov., Thai Nguyen, 40 m, 21° 24′ N, 105° 50′ E, at light, 23. V. 1987, No. 223, MOT (2); Bac Thai Prov., Thai Nguyen, 40 m, 21° 24′ N, 105° 50′ E, at light, 23. V. 1987, No. 224, MOT (1); Lam Dong Prov., Thanh Loc, 15 km N of the city, 12. X. 1988, No. 274, MV (1); Lam Dong Prov., Da Lat, Da Thien, 18. X. 1988, No. 324, MV (1); Lam Dong Prov., Prenn (waterfall), 15 km S of Da Lat, 19. X. 1988, No. 336, MV (1); Lam Dong Prov., Bao Loc, 21. X. 1988, No. 350, MV (18); Lam Dong Prov., Bao Loc, Dai Binh, 22. X. 1988, No. 364, MV (1); Lam Dong Prov., Suoi Loc chau, 5 km E of Bao Loc, 24. X. 1988, No. 377, MV (23); Lam Dong Prov., Suoi Baco, 12 km S of Bao Loc, 26. X. 1988, No. 401, MV (4). – Distribution: Kamchatka, Japan, Nepal, India, Bhutan, Srí Lanka, China, Burma, Thailand, Laos, Vietnam, Singapore, Greater and Lesser Sunda Islands, Philippines, Moluccas, Caroline Island, Sandwich Island, New Caledonia, Fiji, Hawaii (KASZAB 1952).

Gonocephalum crassepunctatum KASZAB, 1952 (Tenebrioninae: Opatrini) – VIETNAM: Lam Dong Prov., Bao Loc, 21. X. 1988, No. 350, MV (1). – Distribution: India, Burma, Vietnam (KASZAB 1952), Nepal, Kampuchea (KASZAB 1973).

Gonocephalum depressum (FABRICIUS, 1801) (Tenebrioninae: Opatrini) – LAOS: Vientiane, 14. III. 1990, K (1). – Distribution: India, Nepal, Srí Lanka, China, Vietnam, Laos, Philippines, Moluccas, New Guinea (KASZAB 1952).

Gonocephalum gebienianum KASZAB, 1952 (Tenebrioninae: Opatrini) – VIETNAM: Ha Noi, singling, 6. V. 1987, No. 118, MOT (1). – Distribution: India, Java, Lombok (KASZAB 1952), Vietnam (new record).

Gonocephalum moluccanum (BLANCHARD, 1853) (Tenebrioninae: Opatrini) – LAOS: Vientiane, 14. III. 1990, K (1); id., 18. III. 1990, K (14). VIETNAM: Lam Dong Prov., Da Lat, Da Thien, 18. X. 1988, No. 324, MV (3); Lam Dong Prov., Bao Loc, 21. X. 1988, No. 350, MV (1). – Distribution: India, Srí Lanka, China, Burma, Kampuchea, Vietnam, Laos, Japan, Taiwan, Philippines, Greater and Lesser Sunda Islands, Moluccas, New Guinea (KASZAB 1952).

Gonocephalum coutreyi CHATANAY, 1917 (Tenebrioninae: Opatrini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (6); Bac Thai Prov., Thai Nguyen, 40 m, 21° 24′ N, 105° 50′ E, at light, 23. V. 1987, No. 223, MOT (1). – Distribution: Korea, China, India, Laos, Kampuchea (KASZAB 1952), Vietnam (KASZAB 1980).

Gonocephalum schusteri KASZAB, 1952 (Tenebrioninae: Opatrini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (1). – Distribution: Vietnam (KASZAB 1952).

Gonocephalum subspinosum (FAIRMAIRE, 1894) (Tenebrioninae: Opatrini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, at light, 12. X. 1986, No. 35, MOV (7); Bac Thai Prov., Quang Chu, 22° 00′ N, 105° 50′ E, at light, 24. V. 1987, No. 226, MOT (1); Lam Dong Prov., Da Lat, Da Thien, 18. X. 1988, No. 324, MV (3); Lam Dong Prov., Da Lat, 18. X. 1988, No. 325, MV (1). – Distribution: India, Srí Lanka, China, Kampuchea, Vietnam, Taiwan, Lesser Sunda Islands (KASZAB 1952), Nepal (KASZAB 1973).

Gonocephalum tuberculatum (HOPE, 1831) (Tenebrioninae: Opatrini) – LAOS: Dong Dok, 20. III. 1990, K (1); Naphok, 23. III. 1990, K (1). VIETNAM: Lam Dong Prov., Suoi Loc chau, 5 km E of Bao Loc, 24. X. 1988, No. 377, MV (2). – Distribution: Afganistan, Nepal, India, China, Burma, Laos, Vietnam, Taiwan (KASZAB 1952).

Heterotarsus carinula MARSEUL, 1876 (Tenebrioninae: Opatrini) – VIETNAM: Bac Thai Prov., Quang Chu, 22° 00′ N, 105° 50′ E, at light, 24. V. 1987, No. 226, MOT (1). – Distribution: Soviet Union (Primorye), Korea, Japan, China, Vietnam, Laos, Taiwan, India (KASZAB 1976).

Notocorax javanus (WIEDEMANN, 1819) (Tenebrioninae: Opatrini) – LAOS: Dangyen, 24. III. 1990, K (1); Vientiane, 11. III. 1990, K (1); id., 17. III. 1990, K (1); id., 18. III. 1990, K (8). – Distribution: China, India, Burma, Thailand, Kampuchea, Laos, Vietnam, Greater and Lesser Sunda Islands, Moluccas (Kaszab 1975b). – This well-known and widely distributed species was designated as the type species of the genus *Platydendarus* KASZAB, 1975 and was mentioned from Vietnam under this generic name (KASZAB 1980). However, IWAN (1990) revealed that *Notocorax* DEJEAN, 1833 and *Platydendarus* KASZAB, 1975 have the same type species: the correct combination is therefore *Notocorax javanus*.

Gonocnemis hispidus PIC, 1915 (Tenebrioninae: Amarygmini) – VIETNAM: Gia Lai-Con Tum Prov., Buen Loy, 6. VI. 1982, J. M. Zaitzev (1). – Distribution: Burma, Laos (ARDOIN 1964), Vietnam (new record).

Gonocnemis kondorosyi sp. n. (Tenebrioninae: Amarygmini) – see description, p. 267.

Menimus lamdong sp. n. (Diaperinae: Gnathidiini) – see description, p. 269.

Stethotrypes baoloc sp. n. (Diaperinae: Leiochrini) – see description, p. 271.

Adelina platisoides (PASCOE, 1860) (Diaperinae: Diaperini) – LAOS: Dangyen, 24. III. 1990, K (1). VIETNAM: Son La Prov., Moc Chau, under bark, 27. X. 1986, No. 95, MOV (1). – Distribution: Srí Lanka, Philippines, Moluccas (KASZAB 1979), Vietnam (Kaszab 1965), Laos (new record).

Ceropria induta (WIEDEMANN, 1819) (Diaperinae: Diaperini) – LAOS: Dong Dok, 20. III. 1990, K (2). VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, singling, 13. X. 1986, No. 41, MOV (2); Lam Dong Prov., Da Lat, 15 km NW of the town, 31. X. 1988, No. 316, MV (2); Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (4); Lam Dong Prov., Bao Loc, Dai Binh, 22. X. 1988, No. 362, MV (1). – Distribution: Japan, China, India, Srí Lanka, Sunda Islands, Philippines (GEBIEN 1925a), Taiwan (KASZAB 1941), Vietnam (KASZAB 1965, 1980).

Platydema ceroprioides GEBIEN, 1927 (Diaperinae: Diaperini) – VIETNAM: Lam Dong Prov., Bao Loc, 27. X. 1988, No. 402, MV (1). – Distribution: Sumatra (GEBIEN 1927), Vietnam (new record).

Platydema recticorne LEWIS, 1894 (Diaperinae: Diaperini) – VIETNAM: Gia Lai-Con Tum Prov., Buen Loy, 10. VI. 1982, L. N. MEDVEDEV (3). – Distribution: Japan, Srí Lanka (KASZAB 1979), Vietnam (new record).

Platydema subfascia (WALKER, 1858) (Diaperinae: Diaperini) – VIETNAM: Lam Dong Prov., Da Lat, 15 km NW of the town, 31. X. 1988, No. 316, MV (1). – Distribution: Japan, China, India, Srí Lanka, Burma, Laos (GEBIEN 1925b), Vietnam (KASZAB 1980).

Artactes cyaneolimbatus FAIRMAIRE, 1893 (Coelometopinae: Coelometopini) – VIETNAM: Bac Thai Prov., Quang Chu, 22° 00′ N, 105° 50′ E, at light, 24. V. 1987, No. 226, MOT (1). – Distribution: Indochina (GEBIEN 1938–42), Vietnam (KASZAB 1980), Japan, China, Sumatra (collection data in the HNHM).

Campsiomorpha imperialis (FAIRMAIRE, 1903) (Coelometopinae: Coelometopini) – VIETNAM: Hoang Lien Son Prov., Sapa, V. 1990, J. MATEJÍCEK (1). – Distribution: Vietnam (GEBIEN 1938–42).

Campsiomorpha ducalis FAIRMAIRE, 1903 (Coelometopinae: Coelometopini) – VIETNAM: Hoang Lien Son Prov., Sapa, V. 1990, J. MATEJÍCEK (1). – Distribution: Vietnam (GEBIEN 1938–42).

Catapiestus tonkineus PIC, 1912 (Coelometopinae: Coelometopini) – VIETNAM: Lam Dong Prov., Da Lat, 15 km NW of the town, 31. X. 1988, No. 316, MV (1); Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (2). – Distribution: Vietnam (KASZAB 1965, 1980), China (Yunnan), Laos (collection data in the HNHM).

Derosphaerus pici KASZAB, 1987 (=laosensis PIC, 1923, nec laosensis PIC, 1922) (Coelometopinae: Coelometopini) – LAOS: Dong Dok, 29. III. 1990, K (1). – Distribution: Vietnam (KASZAB 1980), Laos (GEBIEN 1938–42).

Derosphaerus sinensis (HOPE, 1842) (Coelometopinae: Coelometopini) – VIETNAM: Vinh Phu Prov., Tam Dao, 7. VI. 1981, L. N. MEDVEDEV (1). – Distribution: South China (GEBIEN 1938–42), Vietnam (KASZAB 1965).

Dicraeosis datangla sp. n. (Coelometopinae: Coelometopini) – see description, p. 273.

Eucyrtus anthracinus KRAATZ, 1880 (Coelometopinae: Coelometopini) – LAOS: Dong Dok, 2. III. 1990, K (1). – Distribution: Sunda Islands (GEBIEN 1938–42), Vietnam (KASZAB 1980), Laos (new record).

Promethis crenatostriata (MOTSCHULSKY, 1872) (Coelometopinae: Coelometopini) – VIETNAM: Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (2); Lam Dong Prov., Bao Loc, 27. X. 1988, No. 402, MV (1). – Distribution: India, China, Burma, Thailand, Kampuchea, Laos, Vietnam (KASZAB 1988).

Promethis pauperula (GEBIEN, 1918) (Coelometopinae: Coelometopini) – VIETNAM: Lam Dong Prov., Da Lat, 15 km NW of the town, 31. X. 1988, No. 316, MV (1). – Distribution: South China, Laos, Vietnam (KASZAB 1988).

Promethis punctatostriata (MOTSCHULSKY, 1872) (Coelometopinae: Coelometopini) – VIETNAM: Son La Prov., Moc Chau, at light, 26. X. 1986, No. 105, MOV (2). – Distribution: India, Nepal, Korea, China, Burma, Laos, Kampuchea, Vietnam, Thailand, Malay Peninsula (KASZAB 1988).

Promethis rectangula (MOTSCHULSKY, 1872) (Coelometopinae: Coelometopini) – VIETNAM: Lam Dong Prov., Da Lat, 18 km S of the town, 19. X. 1988, No. 332, MV (1). – Distribution: Southeast Asia, from Korea to Philippines and Borneo (KASZAB 1988).

Rhopalobates villardi FAIRMAIRE, 1896 (= Encyalesthus klapperichi KASZAB, 1954) (Coelometopinae: Coelometopini) – VIETNAM: Hoang Lien Son Prov., Sapa, V. 1990, J. MATEJÍCEK (1). – Distribution: Himalaya, Indochina (GEBIEN 1938–42), China (Fukien) (KASZAB 1987), Vietnam (KASZAB 1980).

Strongylium crurale FAIRMAIRE, 1893 (Coelometopinae: Strongyliini) – VIETNAM: Bac Thai Prov., Quang Chu, 22° 00′ N, 105° 50′ E, at light, 24. V. 1987, No. 226, MOT (2). – Distribution: Vietnam (KASZAB 1980).

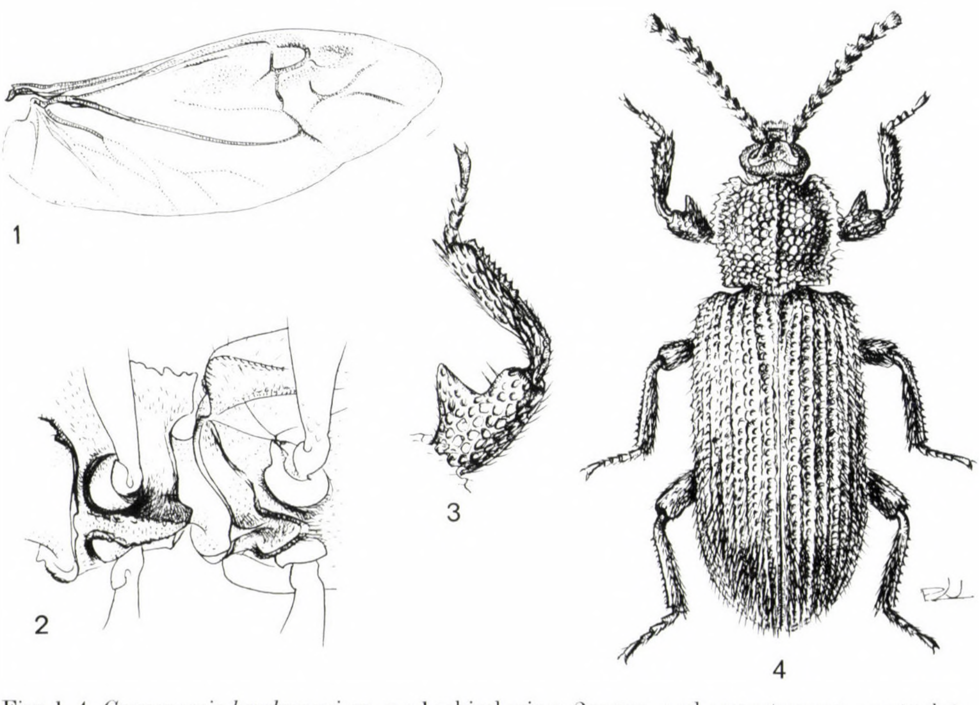
Strongylium erythrocephalum (FABRICIUS, 1903) (Coelometopinae: Strongyliini) – VIETNAM: Ha Noi, singling, 6. V. 1987, MOT (1). – Distribution: India, China, Burma, Thailand, Vietnam, Sumatra, Java, Philippines (GEBIEN 1913), Taiwan (KASZAB 1941).

Strongylium undulatum FAIRMAIRE, 1903 (Coelometopinae: Strongyliini) – VIETNAM: Vinh Phu Prov., Tam Dao, 21° 26′ N, 105° 38′ E, singling, 11. V. 1987, No. 139, MOT (1). – Distribution: Vietnam (KASZAB 1980).

DESCRIPTION OF NEW SPECIES

Gonocnemis kondorosyi sp. n.
(Figs 1–4)

Female – Colour dark reddish brown, elytra slightly paler; pubescence light yellowish red. Length 7.5 mm. – Head with preocular carinae above antennal sockets highly elevated, lamelliform, contiguous but not confluent; frons concave with coarse punctures; antennae short and thick. – Pronotum subcordiform, slightly transverse (length/width ratio = 31 : 35); disc unevenly convex, with strong midlongitudinal carina.



Figs 1–4. *Gonocnemis kondorosyi* sp. n.: 1 = hind wing, 2 = pro- and mesosternum, ventrolateral view, 3 = fore leg, 4 = habitus, female.

reaching both anterior and posterior margins and with two humps anteriorly; surface set with large, rounded to polygonal punctures separated by narrow, elevated interspaces; lateral margin explanate and denticulate; anterior margin deeply emarginate; posterior margin straight but medial portion slightly produced; anterolateral angles rounded, posterolateral angles sharply rectangular; pubescence erect and scattered, somewhat shorter than that of elytra. – Elytra parallel-sided, about twice as long as wide (length/combined width ratio = 88 : 45); humerus slightly produced; 2nd to 9th interstriae carinate from base to apex; 1st interstria carinate only at apical 1/4; punctural striae deeply impressed; punctures rounded, separated by 1/2 diameter; vestiture consisting of rows of erect hairs on both sides of interstriae. – Ventral surface with much finer punctation than that of dorsal, except prothoracic hypomeron which is coarsely punctate; prosternal process produced posteriorly (Fig. 2); mesosternum bilevelled, anteriorly with a median carina and posteriorly with a deep, triangular impression bordered laterally by keels (Fig. 2). Legs relatively short and strong, coarsely punctate; tooth of fore femora with external margin straight (Fig. 3); tibiae with external margin finely denticulate; fore tibiae slightly curved. – Hind wing: Fig. 1. – Habitus: Fig. 4.

Male unknown.

Type material – Holotype, female, labelled as follows: "LAOS, Nam Souang, 28. III. 1990, E. KONDOROSY"; "Holotypus ♀ Gonocnemis kondorosyi Merkl, 1992" [red]. Deposited in HNHM.

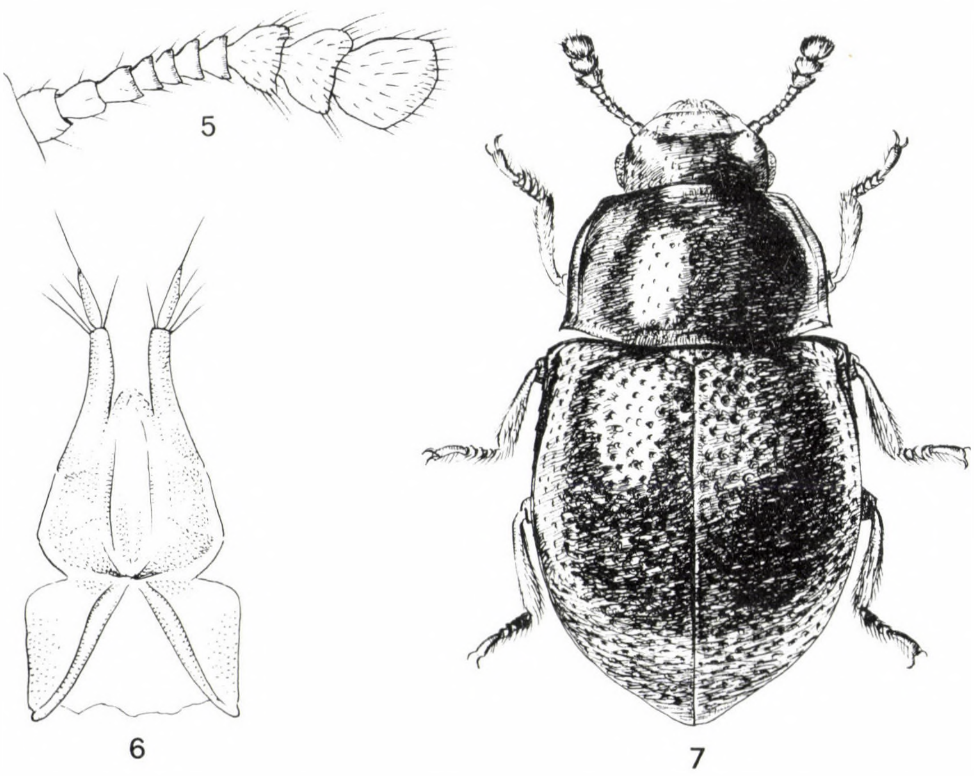
Remarks – In ARDOIN'S (1964) key to the Asian species of *Gonocnemis*, this new species runs to the couplet of *G. hispidus* PIC, 1915 and *G. sericeus* FABRICIUS, 1801. However, the denticulate lateral margin and the strong medial carina of pronotum as well as the robust antennae and legs will clearly separate *G. kondorosyi*. These 3 species are compared as follows:

	G. hispidus	*G. sericeus*	*G. kondorosyi*
preocular carina	relatively low	relatively low	elevated, lamelliform
lateral margin of pronotum	finely crenulate	smooth	denticulate
punctation of pronotum	fine	fine	coarse
midlongitudinal carina of pronotum	hardly traceable	absent	distinct elevated
antennae and legs	long, gracile	long, gracile	short, robust
strial punctures of elytra	rather superficial	rather superficial	deep
external margin of femoral tooth	convex	straight	straight

Derivatio nominis — This species is dedicated to MR. ELŐD KONDOROSY, the collector of the Laotian material.

Menimus lamdong sp. n.
(Figs 5–7)

Female – Apterous; colour reddish brown, shining; mouthparts, antennae and legs paler, yellowish; body glabrous (except antennae, tibiae and tarsi). Length 3.5 mm. – Head with clypeus very shallowly emarginate; cranium with punctures much coarser than those of pronotum but finer than those of elytra, separated by 2 to 5 diameters; a slightly elevated, oblique area at the lateral side of frons impunctate; eyes small, slightly protruding; temples subparallel-sided; antennae short, 10-segmented, with loosely articulated 3-segmented club (Fig. 5). – Pronotum strongly transverse (length/width ratio = 38 : 63); lateral sides slightly arched, narrowly explanate; anterior margin feebly emarginate, finely margined in the left and right 1/4; posterior margin slightly bowed, with a row of coarse punctures except medially; anterolateral angles rounded, posterolateral angles rectangular; disc with minute but distinct punctures separated by 4 to 8 diameters. – Elytra strongly convex, slightly longer than wide



Figs 5–7. *Menimus lamdong* sp. n.: 5 = antenna, 6 = ovipositor, 7 = habitus, female.

(length/combined width ratio = 76 : 89), rounded laterally; from above, lateral margins visible only in anterior 1/4; humeral callus absent; punctation coarse, irregular, without any trace of rows; punctures separated by 1 to 3 diameters. – Ventral surface coarsely and densely punctured; abdominal sternites with somewhat finer punctation; prosternal process acutely produced posteriorly. – Legs short; femora not surpassing body outline; tarsi with long setae below. – Ovipositor: Fig. 6. – Habitus: Fig. 7.

Male unknown.

Type material – Holotype, female, labelled as follows: "VIETNAM, Lam Dong Prov. Da Lat, 15 km NW of the town"; "No. 316, 31. X. 1988 leg. MAHUNKA S. & VÁSÁRHELYI T."; "Holotypus ♀ Menimus lamdong Merkl, 1992" [red]. Deposited in the HNHM.

Remarks – Of the Indo-Malayan species, *Menimus lamdong* sp. n. is somewhat similar to *M. wittmeri* KASZAB, 1982 (described from Sikkim, India) in having 3-segmented antennal club and irregularly scattered, coarse punctation of elytra. However, this new species is much smaller (length 6–6.3 mm in *wittmeri*), the elytra are more convex and shorter, the intervals on the head and pronotum are smooth and shining (microreticulate, therefore opaque in *wittmeri*) and the segments of the antennal club are loosely articulated (last two antennal segments connate in *wittmeri*). Three-segmented antennal club occurs also in all *Menimus* species of New Caledonia and in the Australian *Menimus triclavatus* (CARTER, 1921) and *M. castaneus* (CARTER, 1919). These are, however, either elongate, alate species or subhemisphaerical creatures with elytral punctation indistinct to absent.

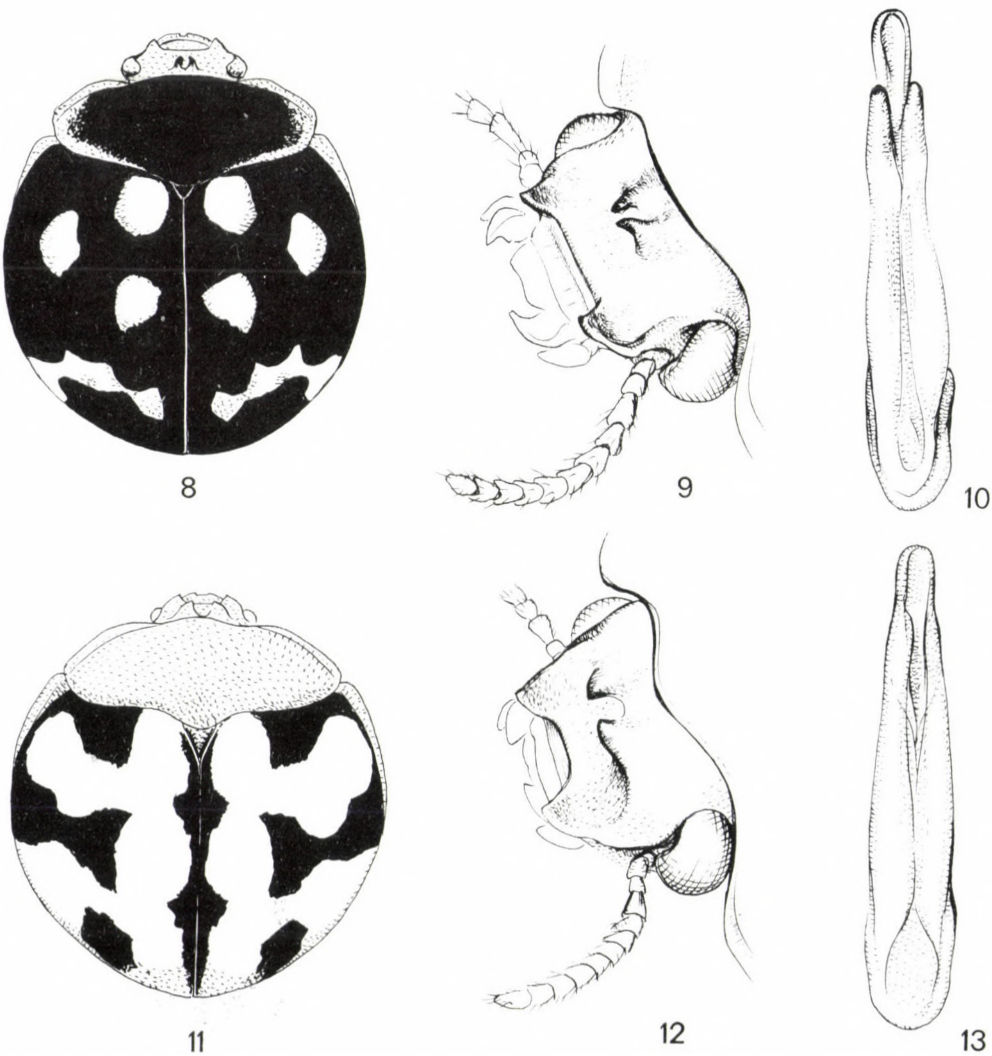
Menimus is a composite genus comprising very different forms from Japan to New Zealand and Mauritius. The number of segments of the antennal club varies from 3 to 5. Members of the African genus *Gnathidium* GEBIEN, 1921 also have 3-segmented club so the separation of the two genera is still unclear. The whole complex of the subtribe Gnathidiina needs a thorough revision which may result in a different delimitation of the present genera (DR. H. J. BREMER, personal communication).

In the report on the collecting trip (MAHUNKA, OLÁH & VÁSÁRHELYI 1989) the following note is given under the locality number 316: "Singled under bark of lying trunks of broad-leaf trees in a wood-stack".

Derivatio nominis – The species name comes from the Vietnamese province Lam Dong where the type specimen has been collected.

Stethotrypes baoloc sp. n.
(Figs 8–10, 14)

Male – Body short, semiglobose; head reddish brown with borders of mandibulae, semiocular area and 5th to 11th antennal segments infuscate; pronotum black with borders reddish brown in variable extent; elytra black, with three yellow, rounded spots and a preapical zigzag band arranged as in Fig. 8, lateral and apical margin narrowly reddish; ventral

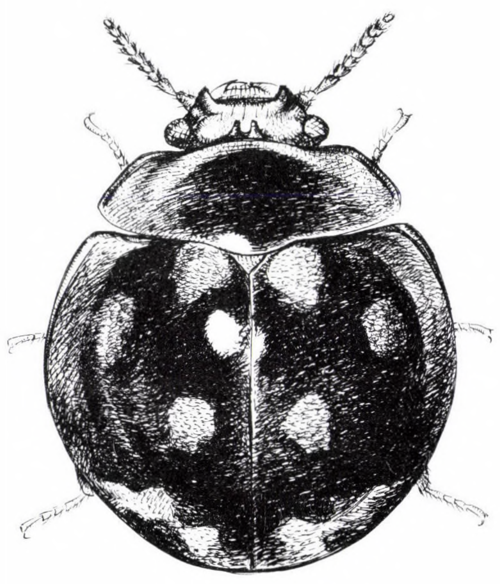


Figs 8–10. *Stethotrypes baoloc* sp. n.: 8 = dorsal pattern, 9 = head of male, dorsolateral view, 10 = aedeagus, ventral view. – Figs 11–13. *Stethotrypes bituberculatus* Kaszab: 11 = dorsal pattern, 12 = head of male, dorsolateral view, 13 = aedeagus, ventral view.

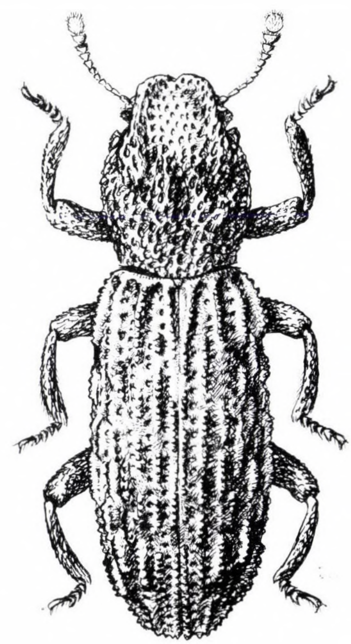
surface and legs reddish brown; dorsal surface glabrous, except a few setae on head. Length 2.4–2.5 mm. – Head with clypeus broadly emarginate medially, prominent laterally; frons concave, medially with two small, parallel, horn-like tubercles directing onwards (Fig. 9); antennae short and thick. – Pronotum strongly transverse (length/width ratio = 30 : 77); anterior margin bisinuate; lateral margins narrowly explanate; posterior margin broadly arcuate but medially produced backwards; anterolateral angles broadly rounded, posterolateral angles very weakly angulate; surface practically smooth except very minute, indistinct, widely scattered punctures. – Elytra widest near middle, broader than long (length/combined width ratio = 84 : 105); from dorsal aspect, lateral margin visible only in the first 1/4, slightly sinuate preapically; surface lacking any punctation. – Ventral surface unmodified, impunctate. – Legs typical to *Stethotrypes*. – Aedeagus: Fig. 10. – Habitus: Fig. 14.

Female – Head with clypeus truncate anteriorly; frons nearly plane, without tubercles. In other respects, similar to male.

Type material – Holotype, male, labelled as follows: "VIETNAM, Lam Dong Prov. Suoi Baco (stream) 12 km S of Bao Loc"; "No. 354, 22. X. 1988 leg. Mahunka S. & Vásárhelyi T."; "Holotypus ♂ Stethotrypes baoloc Merkl, 1992" [red]. Paratypes, 2 males and one female, labelled as holotype. All the types are deposited in HNHM.



14



15

Fig. 14. *Stethotrypes baoloc* sp. n.: habitus, male. – Fig. 15. *Dicraeosis datangla* sp. n.: habitus, male.

Remarks – In the most recent key to *Stethotrypes* (KASZAB 1961), this new species run to *Stethotrypes bituberculatus* KASZAB, 1946 (described from "Südost-Borneo") as both species have two horn-like tubercles on the frons. However, the clypeus of the new species is broadly and slightly angulately emarginate (emargination narrower and rounded in *bituberculatus*); the frontal horns are narrower, raised from a narrow base and directing onwards (horns broader, subconical, raised from broad base and not directing onwards in *bituberculatus*, Fig. 12). The elytral pattern is also different in the two species but the yellow markings of *bituberculatus* (Fig. 11) can be traced back to the confluence of separated yellow spots arranged as in *baoloc* (Fig. 8). The aedeagus has a different shape, too (Figs 10, 13).

In the report on the collecting trip (MAHUNKA, OLÁH & VÁSÁRHELYI 1989) the following note is given under the locality number 354: "Berlese and Nematode samples: moss from rocks, humus and root system from splits of rocks, litter of broad-leaf forest".

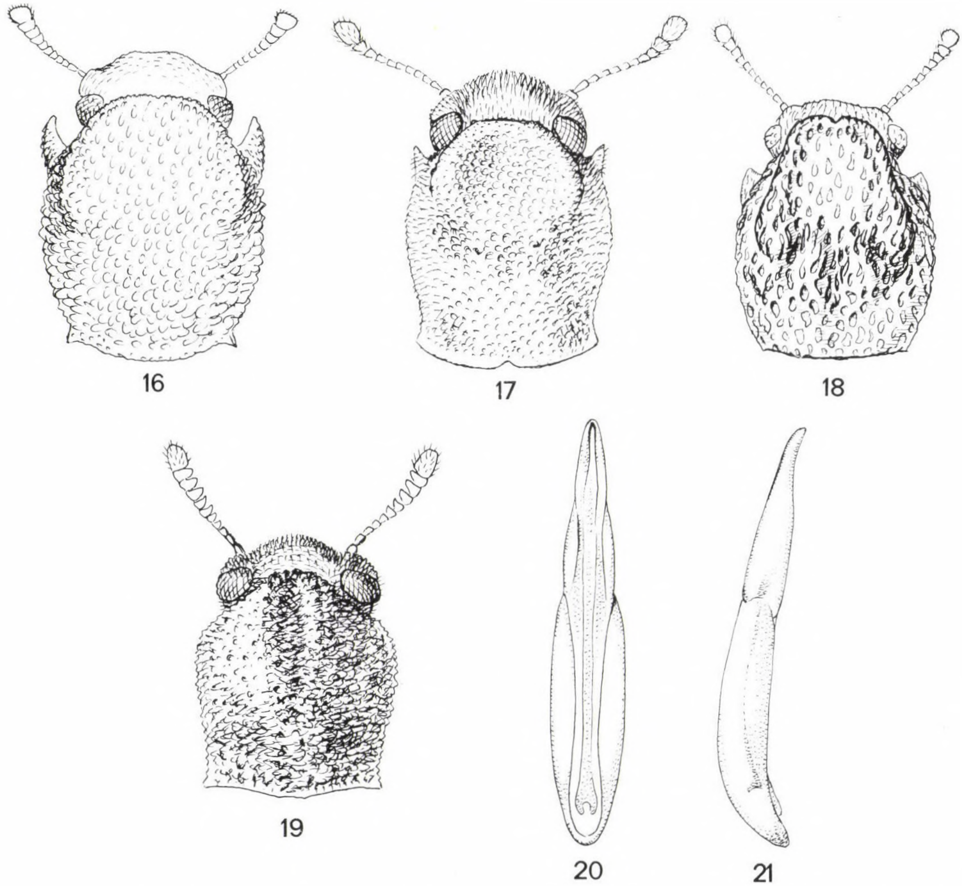
Derivatio nominis – The species name comes from the Vietnamese town Bao Loc in the vicinity of which the type specimens have been collected.

Dicraeosis datangla sp. n.
(Figs 15, 18, 20–21)

Male – Apterous; colour dark brown, generally dull; apical declivity of elytra slightly paler; tarsi and antennae yellowish; body glabrous (except antennae, tibiae and tarsi); surface elements partly obscured by incrustation. Length 4.8–5 mm. – Head with clypeus truncate; cranium rugose–punctate with scattered granules on vertex; eyes not emarginated by epistomal canthus, small; their diameter much smaller than distance between eyes and anterior margin of clypeus; antennae shorter than head width measured across eyes. – Pronotum longer than broad (length/width ratio=64 : 53), slightly tapering posteriorad; anterolateral angles subacutely produced; posterior margin not bordered, gently arched; anterior part deeply impressed; this impression is framed laterally and anteriorly with prominent ridges; ridges laterally straight, converging anteriorad, swollen posteriorly, with a small notch anteriorly; posterior part of pronotum with shallow midlongitudinal impression and indistinct concavities at base of ridges (Fig. 18); surface of impression sparsely set with ovate punctures separated by 2 to 3 diameters; rest of pronotum coarsely set with very deep, confluent punctures and rugose intervals. – Elytra subparallel-sided, twice as long as broad (length/combined width ratio=95 : 47); both even-numbered and odd-numbered interstriae slightly costate and closely set with small, shiny, pearl-like tubercles; costae irregularly interrupted by flat, smooth, tubercle-free areas; 3rd, 5th and 7th interstriae with large prominence in apical declivity; strial punctures deep, shining, separated by 2 to 5 diameters. – Ventral surface sparsely set with fine punctures except last abdominal sternite which is densely and coarsely punctate. – Legs short and robust, rugulosepunctate; femora feebly clavate; inner margin of tibiae nearly straight; tarsal segments with long, yellowish pubescence below. – Aedeagus: Figs 20–21. – Habitus: Fig. 15.

Female unknown.

Type material – Holotype, male, labelled as follows: "VIETNAM, Lam Dong Prov. Da Tang La (waterfall), 5 km S of Da Lat"; "No. 347, 21. X. 1988 leg. MAHUNKA S. & VÁSÁRHELYI T."; "Holotypus ♀ Dicraeosis datangla Merkl, 1992" [red]. Paratypes, 2 males, labelled as holotype. All the types are deposited in HNHM.



Figs 16–19. Head and pronotum of *Dicraeosis* species: 16 = *bacillus* (MARSEUL), 17 = *sculpturatus* (FAIRMAIRE), 18 = *datangla* sp. n., 19 = *longicornis* PIC. – Figs 20–21. *Dicraeosis datangla* sp. n., aedeagus: 20 = ventral view, 21 = lateral view.

Remarks – With the small size, glabrous pronotum and elytra and pearl-like tubercles on elytral interstriae, *Dicraeosis datangla* sp. n. is similar to *D. bacillus* (MARSEUL, 1876) and *D. sculpturatus* (FAIRMAIRE, 1896) (=nodipennis GEBIEN, 1913). The differences are summarized as follows:

	D. bacillus	*D. sculpturatus*	*D. datangla*
eyes	medium	large	small
epistoma	glabrous	pubescent	glabrous
length of antenna	shorter than head width	as long as head width	shorter than head width
pronotal configuration	Fig. 16	Fig. 17	Fig. 18
even-numbered interstriae	costate, without tubercles	flat	costate, with tubercles
odd-numbered interstriae	costate, with tubercles	costate, with tubercles	costate, with tubercles
costae	entire	entire	interrupted
costal tubercles	minute, sparsely set	large, sparsely set	small, densely set
preapical tuberosity on interstriae 3, 5, 7	absent	present	present

Somewhat similar costal arrangement is found in *Dicraeosis longicornis* PIC, 1921, i.e. it has interrupted costae on 3rd, 5th and 7th interstriae. This species is, however, covered dorsally with squamiform setae and has entirely different pronotum (Fig. 19) as well as well-developed hind wings.

In the report on the collecting trip (MAHUNKA, OLÁH & VÁSÁRHELYI 1989) the following note is given under the locality number 347: "Sifted litter, soil and decaying wood to be extracted in Moczarsky-Winkler apparatus" [in a primary rain forest].

Derivatio nominis – The species name comes from the Da Tang La waterfall near Da Lat where the type specimens have been collected.

RECLASSIFICATION OF THE OLD WORLD "*DOLIEMA*"

The genus *Adelina* DEJEAN, 1835 (=Doliema PASCOE, 1860) consists of a series of New World species as well as a few members from the Old World. The New World species were revised by ARDOIN (1977) and DOYEN (1984) added one more species bringing the total number to 19. The catalogue of GEBIEN (1938–42) lists 8 species from the Old World, under the name *Doliema*. This genus was traditionally placed in Ulomini but, based on studies of internal structures, DOYEN (1984) transferred it to Diaperinae (Diaperini: Adelinina).

DOYEN (1984) noted that not all the Old World species could be congeneric with the members of the New World. He examined two species (*platisoides* and *nitidula*) and revealed that the former is a genuine *Adelina* while the latter lacks the diagnostic features of Diaperinae: Diaperini and it must belong to *Platycotylus* OLLIFF, 1863. According to DOYEN, MATTHEWS & LAWRENCE (1989) the genus *Platycotylus*, originally described as cucujid, is a member of Tenebrioninae: Triboliini.

While belonging to entirely different subfamilies, *Adelina* and *Platycotylus* show striking superficial resemblance, obviously because of the similar way of life, i.e. association with hardly loosened bark of dead trees. The external diagnostic features separating the two genera are as follows:

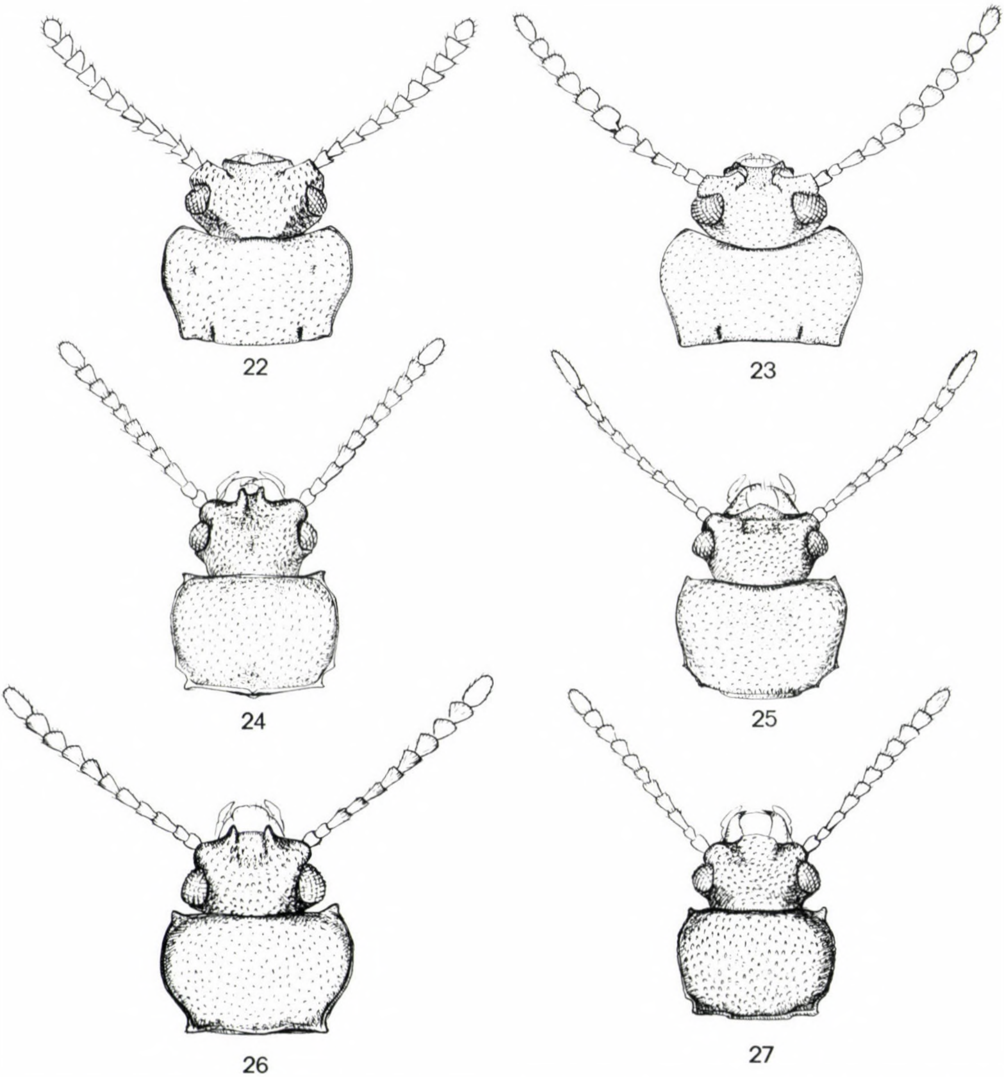
1 (2) Anterolateral angles of pronotum broadly rounded. Pronotum with two elongate fossae just before the base (Figs 22–23). 6th to 11th antennal segments with compound sensoria (studied by ordinary microscope these sensoria appear as dull, elevated surfaces in the inner side of distal end of antennomeres). 7th elytral interstria simple, 8th interstria carinate. Outer edge of protibiae denticulate. Outer surface of meso- and metatibiae with a finely serrate longitudinal ridge **Adelina** DEJEAN, 1835

2 (1) Anterolateral angles of pronotum forming a more or less dentiform process, varying intraspecifically from well-developed to minute, linked to sex and body size. Pronotum without fossae (Figs 23–27). Antennal segments without compound sensoria. 7th elytral interstria angulate, 8th interstria simple. Protibiae unarmed. Meso- and metatibiae without ridge **Platycotylus** OLLIFF, 1863

The subsequent treatment is based only on the relevant material of the HNHM and therefore, although all the species regarded as valid have been represented in this collection, it is no more than a preliminary review of the species. The aim of this study is merely to present keys to the species and clarify the synonyms. No attempt is made to present detailed redescriptions, since two of the species included (*Platycotylus parvicollis* and *P. tenuicollis*) are represented only by females in the material investigated. Consequently, the identification key to *Platycotylus* lacks statements on the armature of the male head (which must be important in distinguishing the species as it is obvious from Figs 24 and 26) and other sexual characters. Figures 24 and 26 represent males, while Figs 25 and 27 depict females of the two species of *Platycotylus* mentioned above. It should be noted, furthermore, that the species of *Platycotylus* (except *P. nitidulus*) have angulations in the posterior 1/4 of the pronotal border as in Figs 24–25 and 27; these vary intraspecifically in great extent and may be reduced almost completely.

The types of *Doliema kannegieteri* PIC, 1923 and *Doliema laticollis* PIC, 1923 have not been seen by the author. However, the late DR. Z. KASZAB, when visiting the Musée National d'Histoire Naturelle in Paris in 1970, examined them; then he designated two specimens as "cum typo comp." and these are now in the collection of the HNHM. The first specimen is identical with *Adelina platisoides* in all respects. The other specimen clearly belongs to *Platycotylus nitidulus* as stated in an additional label by KASZAB himself.

Holotypes of *Platycotylus coloratus* BLACKBURN, 1903 (type locality: Townsville, Queensland), *P. inusitatus* OLLIFF, 1883 (type locality: Sandakan, North Borneo) and *P. nigripes* OLLIFF, 1883 (type locality: Kaioa Island) are housed in the Department of Entomology, the Natural History Museum, London and have been studied by the author. These differ in size and colouration but fall into the range of variation of *Platycotylus nitidulus* and should be synonymized to that species.



Figs 22–23. Head and pronotum of *Adelina* species: 22 = *turcica* (REITTER), 23 = *platisoides* (PASCOE). – Figs 24–27. Head and pronotum of *Platycotylus* species: 24 = *ferrugineus* (KASZAB), 25 = *tenuicornis* (FAIRMAIRE), 26 = *nitidulus* (MACLEAY), 27 = *parvicollis* (PIC).

CHECKLIST OF THE OLD WORLD *ADELINA* AND *PLATYCOTYLUS*

Adelina Dejean, 1835	
= Doliema Pascoe, 1860	
platisoides (Pascoe, 1860), comb. n.	Southeast Asia
= kannegieteri Pic, 1923, syn. n.	
turcica (Reitter, 1877), comb. n.	Balcan Peninsula, Creta, Turkey
Platycotylus Olliff, 1863	
ferrugineus (Kaszab, 1939), comb. n.	Southeast Asia
nitidulus (Macleay, 1872), comb. n.	Nepal to North Queensland
= coloratus Blackburn, 1903, syn. n.	
= inusitatus Olliff, 1883, syn. n.	
= laticollis Pic, 1923, syn. n.	
= nigripes Olliff, 1883, syn. n.	
= spinicollis Fairmaire, 1893	
= suturalis Fairmaire, 1893	
parvicollis (Pic, 1923), comb. n.	Southeast Asia
tenuicornis (Fairmaire, 1893), comb. n.	Southeast Asia

KEY TO *ADELINA* OF THE OLD WORLD

1 (2) Yellowish brown but elytral disc blackish. Eyes smaller, not protruding. 3rd antennal segment as long as 4th. Pronotum slightly convex, about twice as broad as long. Femora feebly clavate and less compressed. Male with genal canthus slightly expanded, triangular; clypeus emarginate, lateral angles not upturned (Fig. 22) **A. turcica** (Reitter)

2 (1) Unicolorous light yellowish brown. Eyes large and protruding. 3rd antennal segment 1.5 times longer than 4th. Pronotum plane to slightly concave, more than twice as broad as long. Femora strongly clavate and compressed. Male with genal canthus enlarged, lamellate, weakly emarginate anteriorly; clypeus truncate, lateral angles produced, upturned (Fig. 23) **A. platisoides** (Pascoe)

KEY TO *PLATYCOTYLUS*

1 (2) Pronotal interspaces and elytral interstriae reticulate; dorsal surface dull, weakly convex. Elytral punctures widely separated, superficial; striae vaguely impressed; 7th and 8th striae obsolete in part. 7th interstria feebly angulate. Head and pronotum: Fig. 24 **P. ferrugineus** (Kaszab)

2 (1) Pronotal interspaces and elytral interstriae nearly smooth; dorsal surface shining, somewhat flatter. Elytral punctures subcontiguous, striae deeply impressed; 7th and 8th striae distinct. 7th interstria distinctly angulate.

3 (4) Antennae slenderer, with 10th segment longer than broad (Fig. 25). Pronotal disc plane. Elytral interstriae entirely flat **P. tenuicornis** (Fairmaire)

4 (3) Antennae stouter, with 10th segment subequal in length and width or slightly transverse (Figs 26–27). Pronotal disc weakly convex. Elytral interstriae slightly convex.

5 (6) Pronotal disc, including lateral portion, with punctures separated by 2–5 puncture diameters. Pronotum more transverse (length/width ratio = 35 : 56), with anterolateral angles well developed (Fig. 26). Elytra usually reddish with broad sutural band and lateral margins black; reddish area rarely restricted to smaller spots or absent **P. nitidulus** (Macleay)

6 (5) Pronotal disc with punctures separated by 1–2 puncture diameters; lateral portion confluently rugulose–punctate. Pronotum less transverse (length/width ratio=32 : 45), with anterolateral angles less developed (Fig. 27). Elytra black with narrow reddish band along suture **P. parvicollis** (PIC)

REFERENCES

ARDOIN, P. (1964): Contribution à l'étude des Gonocnemis asiatiques (Col. Tenebrionidae). – *Bull. Soc. ent. Fr.* **69:** 126–135.

ARDOIN, P. (1977): Contribution à l'étude des espèces américains du genre Doliema Pascoe (Col. Tenebrionidae). – *Annls Soc. ent. Fr.* (N. S.) **13** (1): 1–20.

DOYEN, J. T. (1984): Reconstitution of the Diaperini of North America, with new species of Adelina and Sitophagus (Coleoptera: Tenebrionidae). – *Proc. Ent. Soc. Wash.* **86** (4): 777–789.

DOYEN, J. T., MATTHEWS, E. G. & LAWRENCE, J. F. (1989): Classification and annotated checklist of the Australian genera of Tenebrionidae (Coleoptera). – *Invertebr. Taxon.* **3:** 229–260.

GEBIEN, H. (1913): Die Tenebrioniden der Philippinen. – *Phil. J. Sci.* **8** (5–6): 373–433.

GEBIEN, H. (1925a): Die Tenebrioniden (Coleoptera) des indomalayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, V. Die Gattung Ceropria. – *Phil. J. Sci.* **27** (2): 257–289.

GEBIEN, H. (1925b): Die Tenebrioniden (Coleoptera) des indomalayischen Gebietes, unter Berücksichtigung der benachbarten Faunen, VII. Die Gattung Platydema Castelnau und Brulle. – *Phil. J. Sci.* **27** (4): 539–595.

GEBIEN, H. (1927): Fauna sumatrensis (Beitrag Nr. 31.). Tenebrionidae (Col.). – *Suppl. Ent.* **25:** 22–58.

GEBIEN, H. (1938–42): Katalog der Tenebrioniden, Teil II. – *Mitt. Münch. Ent. Ges.* **28–32:** 370–744 [repaged].

IWAN, D. (1990): New species of Platyburak nom. n. (Coleoptera, Tenebrionidae: Platynotini) with an illustrated key to all species in the genus. – *Annls hist. nat. Mus. natn. hung.* **82:** 123–135.

KASZAB, Z. (1941): Tenebrioniden aus Formosa (Col.). – *Stett. Ent. Z.* **102:** 51–72.

KASZAB, Z. (1942): Beiträge zur Kenntnis der orientalischen Opatrinen (Col. Teneb.). – *Mitt. Münch. Ent. Ges.* **42** (1): 1–43.

KASZAB, Z. (1952): Die indomalaischen und ostasiatischen Arten der Gattung Gonocephalum Solier (Coleoptera, Tenebrionidae). – *Ent. Arb. Mus. Frey* **3** (2): 416–688.

KASZAB, Z. (1961): Beiträge zur Kenntnis der Tenebrioniden–Tribus Leiochrini (Coleoptera). – *Annls hist. nat. Mus. natn. hung.* **53:** 357–380.

KASZAB, Z. (1963): Die paläarktischen und orientalischen Arten der Gattung Mesomorphus Seidl. (Coleoptera, Tenebrionidae). – *Acta Zool. Hung.* **9** (3–4): 333–354.

KASZAB, Z. (1965): Zoologische Ergebnisse der Forschungen von Dr. T. Pócs in der Volksrepublik Vietnam. – *Annls hist.-nat. Mus. natn. hung.* **57:** 287–296.

KASZAB, Z. (1973): Tenebrioniden (Coleoptera) aus Nepal. – *Acta Zool. Hung.* **19** (1–2): 23–74.

KASZAB, Z. (1975a): Ergebnisse der Bhutan–Expedition 1972 des Naturhistorischen Museum in Basel. Coleoptera: Fam. Tenebrionidae. – *Ent. Basiliensa* **1:** 313–333.

KASZAB, Z. (1975b): Revision der asiatischen Platynotinen (Coleoptera: Tenebrionidae). – *Acta Zool. Hung.* **21** (3–4): 277–367.

KASZAB, Z. (1976): Revision der Arten der Gattung Heterotarsus Latreille, 1829 (Coleoptera: Tenebrionidae). – *Acta Zool. Hung.* **22** (1–2): 33–63.

KASZAB, Z. (1979): Faunistik der Tenebrioniden von Sri Lanka (Coleoptera). – *Folia ent. hung.* **32** (2): 43–128.

KASZAB, Z. (1980): Angaben zur Kenntnis der Tenebrioniden Nordvietnams (Coleoptera). – *Annls hist.-nat. Mus. natn. hung.* **72:** 169–221.

KASZAB, Z. (1981): Die Arten der Gattung Stenosida Solier, 1835 (Coleoptera, Tenebrionidae). – *Annls hist.-nat. Mus. natn. hung.* **73:** 147–157.

KASZAB, Z. (1987): Die papuanisch-australischen Arten der Gattung Derosphaerus Thomson, 1858 (Coleoptera: Tenebrionidae). – *Acta Zool. Hung.* **33** (1–2): 41–85.

KASZAB, Z. (1988): Katalog und Bestimmungstabelle der Gattung Promethis Pascoe, 1869 (Coleoptera: Tenebrionidae). – *Acta Zool. Hung.* **34** (2–3): 67–170.

KOCH, C. (1940): Phylogenetische, biogeographische und systematische Studien über ungeflügelte Tenebrioniden (Col. Tenebr.) II. – *Mitt. Münch. Ent. Ges.* **30** (2): 683–750.

MAHUNKA, S. & OLÁH, J. (1986): Hungarian zoological studies in Vietnam 1. The outline of the research programme and the report of the first collecting trip in 1986. – *Folia ent. hung.* **47** (1–2): 103–107.

MAHUNKA, S., OLÁH, J. & VÁSÁRHELYI, T. (1989): Report on a collecting trip to Vietnam in 1988. – *Folia ent. hung.* **50:** 61–65.

MATSKÁSI, I., OLÁH, J. & TOPÁL, GY. (1989): Report on a collecting trip to Vietnam in 1987. – *Folia ent. hung.* **50:** 81–86.

MÉSZÁROS, F., OLÁH, J. & VÁSÁRHELYI, T. (1987): Report on a collecting trip to Vietnam in 1986. – *Folia ent. hung.* **48:** 265–269.

Acta Zoologica Hungarica 38 (3–4), pp. 281–292 (1992)

NEW SPECIES OF DRYINIDAE (HYMENOPTERA)

M. OLMI

Dipartimento di Protezione delle Piante, Università della Tuscia, Via S. Camillo de Lellis, I-01100 Viterbo, Italia

(Received 20th December 1991)

The following new species of Dryinidae were described: *Anteon topali* sp. n. from Argentina (Anteoninae); *Bocchus opacus* sp. n. from Argentina (Bocchinae); *Dryinus klapperichi* sp. n. from Afghanistan, *D. biroi* sp. n. and *D. moczari* sp. n. from New Guinea (Dryininae); *Donisthorpina nabatea* sp. n. from Jordan, and *Pentagonatopus baloghi* sp. n. from New Guinea (Gonatopodinae); *Australodryinus pappi* sp. n. from Australia (Apodryininae). With 8 original figures.

In the collection of the Hungarian Natural History Museum (Budapest), there are a lot of Dryinidae. They were only in part identified. The following descriptions of new species are based on the study of unidentified material.

The taxonomy and terminology are those of OLMI (1984, 1990).

Aknowledgements – Many thanks to DR. J. PAPP, Hungarian Natural History Museum, for his help during my 1991 trip to Hungary and for the loan of the material of his Museum.

Subfamily Anteoninae / Neotropic region

Anteon topali sp. n. ♀ (Fig. 1)

Description of the female. – Fully winged; length 3.06 mm; head black, with mandibles testaceous; antennae testaceous, with segments 6–10 brown; prothorax reddish-testaceous; mesothorax, metathorax and propodeum black; abdomen brown; legs testaceous, with mid and hind tibiae darkened; antennae distally thickened; antennal segments in following proportions: 10 : 5 : 5 : 4 : 4 : 6 : 7.5 : 7 : 6.5 : 11; head dull, granulated, with frons granulated and reticulate rugose; frontal line absent; frons with two lateral keels around the orbits and directed towards the antennal toruli; occipital carina complete; distance between the posterior ocelli

(POL) = 7; distance between anterior and posterior ocelli (OL) = 4; distance between posterior ocelli and eyes (OOL) = 6; distance between posterior ocelli and occipital carina (OPL) = 7; length of the temples (TL) = 9 – pronotum dull, granulated, with two dorsal lobes near the posterior margin; pronotal tubercles reaching tegulae; posterior surface of pronotum shorter than scutum (7 : 14); scutum dull, granulated; notaulices incomplete, reaching approximately 0.3 length of scutum; scutellum shiny, smooth, without sculpture; metanotum dull, rugose; propodeum dull, reticulate rugose, with a strong transversal keel between dorsal and posterior surface; posterior surface with two longitudinal keels; median area as rugose as lateral areas – fore wing with two dark transversal bands; distal part of radial vein shorter than proximal part (4.5 : 10) – fore tarsal segments in following proportions: 8 : 2.5 : 3 : 4 : 14; enlarged claw (Fig. 1) with a proximal prominence bearing a long bristle; segment 5 of front tarsus (Fig. 1) with two rows of approximately 29 lamellae; apex with a group of approximately 5 lamellae; tibial spurs 1, 1, 2.

Male: unknown.

Holotype 1 ♀: "Argentina, Buenos Aires, 10 XII 1961, Ezeiza, TOPÁL coll., n. 769" (Hym. Typ. No. 7459, Hungarian Natural History Museum, Budapest).

The new species is dedicated to its collector, DR. GYÖRGY TOPÁL, mammologist in the Hungarian Natural History Museum. The species is close to *Anteon clavatum* OLMI et CURRADO, 1979 and *Anteon perniciosum* OLMI, 1990. It is different mostly because its pronotum is showing two distinct dorsal lobes near the posterior margin. These lobes are absent in the above two species. In the key to the females of the Neotropic *Anteon* proposed by OLMI (1990) *A. topali* may be inserted as follows:

2 Posterior surface of propodeum with two longitudinal keels. 3
– Posterior surface of propodeum without longitudinal keels. 4
3 The pronotum is showing two dorsal lobes near the posterior margin.
54. **A. topali** sp. n.
– The pronotum is not showing two dorsal lobes near the posterior margin. 3′
3′ Segment 5 of front tarsus with basal part much longer than distal part; scutum partly granulated and reticulate rugose; notaulices invisible.
1. **A. clavatum** OLMI et CURRADO
– Segment 5 of front tarsus with basal part approximately as long as distal part; scutum punctate, without sculpture among the punctures; notaulices visible, reaching approximately 0.4 length of scutum.
49. **A. perniciosum** OLMI

Subfamily Bocchinae / Neotropic region

Bocchus opacus sp. n. ♂

Description of the male. – Fully winged; length 2.06 mm; black; mandibles testaceous; antennae testaceous-brown; legs brown, with tarsi and fore tibiae testaceous; antennae not distally thickened – antennal segments in following proportions: 7 : 5 : 6 : 6 : 6 : 6 : 5 : 5 : 5 : 7; head dull, swollen, fully reticulate rugose; frontal line complete; occipital carina complete; distance between the posterior ocelli (POL) = 5; distance between anterior and posterior ocelli (OL) = 3; distance between posterior ocelli and eyes (OOL) = 7; distance between posterior ocelli and occipital carina (OPL) = 4; length of the temples (TL) = 6 – scutum dull, granulated; notaulices complete, posteriorly separated; minimum distance between the notaulices longer than the breadth of the ocelli (8 : 3); scutellum granulated; metanotum rugose; propodeum reticulate rugose, with posterior surface with two longitudinal keels; median area rugose – fore wing hyaline, without dark transversal bands; distal part of radial vein shorter than proximal part (7 : 11) – tibial spurs 1, 1, 2.

Female unknown.

Holotype 1 ♂: "Argentina, Salta, Urundel, 25–31 I 1950, R. GOLBACH coll." (Hym. Typ. No. 7470, Hungarian Natural History Museum, Budapest).

This species is close to *Bocchus boharti* OLMI, 1990. It is different for its strongly reticulate rugose head and for its median area of propodeum fully rugose. The following key to the males of the Neotropic *Bocchus* may be proposed:

1 Head granulated, with a few weak irregular keels; posterior surface of propodeum with median area almost fully smooth and without sculpture ... 2. **B. boharti** OLMI
– Head fully strongly reticulate rugose; posterior surface of propodeum with median area fully rugose and dull ... 5. **B. opacus** sp. n.

Subfamily Dryininae / Palaearctic region

Dryinus klapperichi sp. n. ♀
(Fig. 2)

Description of the female. – Fully winged; length 5.56 mm; head black, with clypeus and mandibles testaceous; antennae missing in the only known specimen; thorax, propodeum and abdomen black, except for sides and posterior margin of pronotum testaceous; legs testaceous, with hind coxae partly black; head flat, reticulate rugose; frontal line complete; occipital carina complete; distance between posterior ocelli (POL) = 4; distance between anterior and posterior ocelli (OL) = 3; distance between posterior ocelli and eyes (OOL) = 9; distance between posterior ocelli and occipital carina (OPL) = 3.5; length of the temples (TL) = 5 – pronotum shiny, hairy, strongly punctate, without sculpture among the punctures; pronotum almost flat, with a weak anterior transversal impression; disc little humped; posterior collar and posterior transversal impression not visible; pronotal tubercles not reaching tegulae; scutum fully reticulate rugose; notaulices little visible, incomplete, reaching approximately 0.5 length of scutum; scutellum strongly punctate, almost reticulate rugose; metanotum reticulate rugose; propodeum reticulate rugose, with two longitudinal keels on the posterior surface – fore wing hyaline, without dark transversal bands; distal part of radial vein slightly longer than proximal part (11 : 10); fore tarsal segments in following proportions: 28 : 3 : 6 : 12 : 19 – fore tarsal segment 3 produced into a hook; enlarged claw (Fig. 2) with a subapical tooth and a row of 5 lamellae; segment 5 of front tarsus (Fig. 2) with two rows of 2 + 8 lamellae (all approximately of the same length); apex with a group of approximately 9 lamellae; tibial spurs 1, 1, 2.

Male unknown.

Holotype 1 ♀: "E Afghanistan, Nuristan, Bashgultal, m 1150, 9-VI-1953, J. KLAPPERICH coll." (Hym. Typ. No. 7471, Hungarian Natural History Museum, Budapest). This species is named in honor of the collector, MR. J. KLAPPERICH.

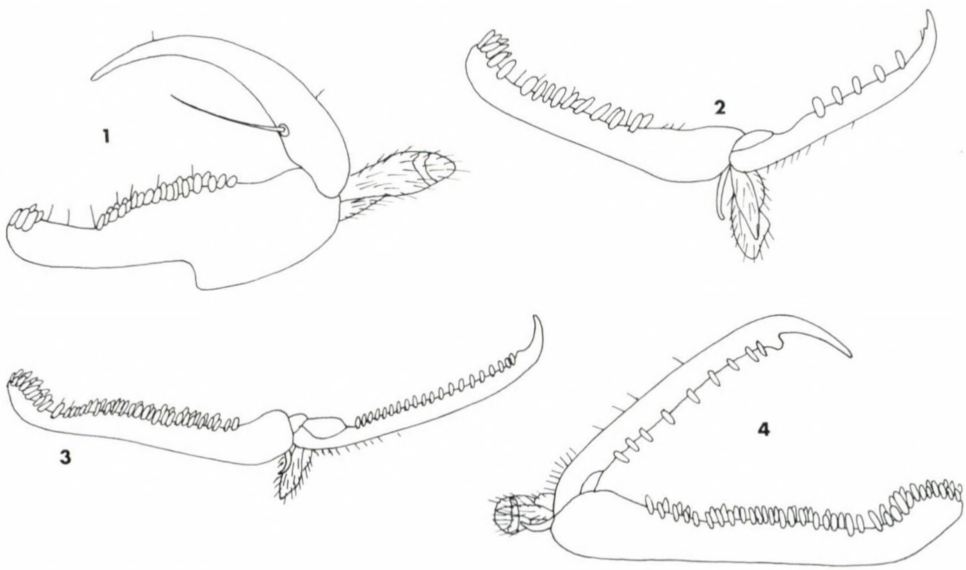
For its segment 1 of front tarsus more than twice as long as segment 4 *D. klapperichi* is in the group of *D. corsicus* (MARSHALL), together with *D. maroccanus* (OLMI) and *D. tussaci* OLMI. From the other species it differs in shape of segment 5 of front tarsus. In the key to the females of the Palaearctic *Dryinus* proposed by OLMI (1990) *D. klapperichi* may be inserted as follows:

3 Segment 1 of front tarsus twice or more than twice as long as segment 4 — 3′
– Segment 1 of front tarsus approximately as long as or slightly shorter or slightly longer than segment 4 — 6
3′ Segment 5 of front tarsus with two rows of lamellae approximately same length (Fig. 2) — 12. **D. klapperichi** sp. n.
– Segment 5 of front tarsus with a row of some very long lamellae, in addition to a second row composed of numerous shorter lamellae — 4
4 Head fully granulated, not reticulate rugose — 8. **D. maroccanus** (OLMI)
– Head fully reticulate rugose and granulated — 5

Australian region

Dryinus biroi sp. n. ♀
(Fig. 3)

Description of the female. – Fully winged; length 5.68 mm; head black, with mandibles and part of the clypeus testaceous; antennae brown, with segments 1 and 8–10 testaceous; thorax and propodeum black; abdomen brown; legs testaceous, with clubs of femora and tibiae brown; mid coxae partly brown; hind coxae partly black – antennae distally thickened; antennal segments in following proportions: 12 : 6 : 43 : 20 : 17 : 13 : 10.5 : 10 : 7 : 11; head dull, excavated, granulated, with frons sculptured by some irregular longitudinal keels; frontal line complete; occipital carina incomplete, only visible behind and on the sides of the ocellar triangle, laterally not reaching the eyes; distance between the posterior ocelli (POL) = 2; distance between anterior and posterior ocelli (OL) = 2; distance between posterior ocelli and eyes (OOL) = 10; distance between posterior ocelli and occipital carina (OPL) = 0.5; temples distinct – pronotum crossed by strong anterior and postrior transversal impressions; disc humped; posterior collar long; pronotal tubercles not reaching tegulae; pronotum granulated, with numerous striae around the disc; scutum dull, fully reticulate rugose; notaulices incomplete, reaching approximately 0.9 length of scutum; scutellum dull, granulated; metanotum



Figs 1–4. Chelae of holotypes of *Anteon topali* sp. n. (1), *Dryinus klapperichi* sp. n. (2), *Dryinus biroi* sp. n. (3) and *Dryinus moczari* sp. n. (4).

rugose, dull; propodeum with dorsal surface slightly longer than posterior surface (26 : 20); dorsal surface sculptured by numerous parallel longitudinal keels, among which there are numerous transversal keels; posterior surface reticulate rugose, with no longitudinal keels – fore wing with two dark transversal bands; distal part of radial vein longer than proximal part (21 : 14) – fore tarsal segments in following proportions: 25 : 5 : 8 : 25 : 36; fore tarsal segment 3 produced into a hook; enlarged claw (Fig. 3) with a subapical tooth and a row of 21 lamellae; segment 5 of front tarsus (Fig. 3) with two rows of 40 lamellae; apex with a group of at least 22 lamellae; tibial spurs 1, 1, 2.

Male unknown.

Holotype 1 ♀: "New Guinea, Graget Island, 8 I 1901, L. BÍRÓ coll." (Hym. Typ. No. 7472, Hungarian Natural History Museum, Budapest).

This species is named in honor of the collector, MR. L. BÍRÓ.

For its propodeum sculptured by numerous parallel longitudinal keels it's close to *Dryinus speciosus* (DODD). It differs however in the sculpture of scutum and scutellum and in colour. In the key to the females of the Australian *Dryinus* proposed by OLMI (1990) *D. biroi* may be inserted as follows:

4 Propodeum with numerous parallel longitudinal keels 4′
– Propodeum with numerous parallel transversal keels 5
4′ Scutum and scutellum sculptured by numerous parallel longitudinal keels; head and prothorax almost fully reddish-testaceous 2. **D. speciosus** (DODD)
– Scutum and scutellum not sculptured by numerous parallel longitudinal keels; scutum reticulate rugose; scutellum granulated; head and prothorax almost fully black 31. **D. biroi** sp. n.

Dryinus moczari sp. n.
(Fig. 4)

Description of the female. – Fully winged; length 7.18 mm; head black, with lateral margins of clypeus whitish; antennae brown, with ventral face of segment 1, dorsal faces of segments 6–10 and distal dorsal third of segment 5 testaceous; thorax and propodeum black; abdomen black, with distal apex testaceous; legs testaceous-brown, with mid and hind coxae black, mid and hind trochanters black and proximal apexes of mid and hind femora brown – antennae distally thickened, with segments 4 and 5 not cylindric, but flat, broader than the other segments (as in the Oriental *Dryinus browni* ASHMEAD); antennal segments in following proportions: 11 : 8 : 50 : 30 : 22 : 15 : 14 : 10 : 8 : 10; head flat, shiny, punctate, without sculpture among the punctures; frontal line incomplete, not visible near the clypeus; occipital carina complete; temples short; distance between posterior ocelli (POL)=4; distance between anterior and posterior ocelli (OL)=2; distance between posterior ocelli and eyes (OOL)=8; distance between posterior ocelli and occipital carina (OPL)=0.5; length of the temples (TL)=0.5 – pronotum crossed by a weak anterior transversal impression and by a strong posterior transversal impression; anterior collar very hairy; disc humped; posterior collar long; pronotum shiny, without sculpture, smooth, with some longitudinal striae on the sides; pronotal tubercles not reaching tegulae; propleura very hairy; scutum dull, hairy, punctate, without sculpture among the punctures; notaulices incomplete, reaching approximately 0.8 length of scutum; scutellum dull, hairy, strongly punctate, without sculpture among the punctures; metanotum shiny, smooth, without sculpture; propodeum dull, reticulate rugose, with dorsal surface shorter than posterior surface (20 : 30); posterior surface without longitudinal keels – fore wing with three dark transversal bands; distal part of radial vein longer than proximal part (26 : 8) – fore tarsal segments in following proportions: 25 : 5 : 11 : 25 : 44; fore tarsal segment 3 produced into a hook; enlarged claw (Fig. 4) with a subapical tooth and a row of 9 lamellae; segment 5 of front tarsus (Fig. 4) with two rows of 35 lamellae; apex with a group of at least 42 lamellae; tibial spurs 1, 1, 2.

Male unknown.

Holotype 1 ♀: "New Guinea, Papua, Wau, 10–14 IX 1972, L. Móczár coll." Malaise-trap (Hym. Typ. No. 7473, Hungarian Natural History Museum, Budapest).

This species is named in honor of the collector, Dr. L. Móczár.

For its head and scutum differently sculptured it differs from *Dryinus quatei* Olmi and *D. dahmsi* Olmi. In the key to the females of Australian *Dryinus* proposed by Olmi (1990) *D. moczari* may be inserted as follows:

24 Scutum without keels or with very short keels near scutellum 24′
– Scutum almost fully sculptured by longitudinal keels 26
24′ Head and scutum punctate, without sculpture among the punctures
32. **D. moczari** sp. n.
– Head and scutum granulated, with or without irregular keels 25
25 Posterior ocelli touching the occipital carina; head with TL shorter than POL
18. **D. quatei** Olmi
– Posterior ocelli not touching the occipital carina; head with TL longer than POL
19. **D. dahmsi** Olmi

Subfamily Gonatopodinae / Palaearctic region

Donisthorpina nabatea sp. n. ♀♂
(Figs 5–6)

Description of the female. – Apterous; length 2.87 mm; head brown, with mandibles, clypeus and anterior half of frons testaceous; antennae brown, with segments 1–3 testaceous; prothorax and scutum reddish-testaceous; scutellum brown; metathorax + propodeum black, except for posterior apex of propodeum testaceous; abdomen brown; legs testaceous – antennae distally thickened; antennal segments in following proportions: 6.5 : 5 : 9 : 6 : 5 : 4.5 : 4 : 4 : 4 : 6; head excavated, dull, granulated; frontal line complete; occipital carina absent; distance between posterior ocelli (POL) = 1; distance between anterior and posterior ocelli (OL) = 2; distance between posterior ocelli and eyes (OOL) = 7 – pronotum crossed by a strong transversal impression, shiny, smooth, without sculpture; scutum shiny, smooth, with a few longitudinal striae; meso-metapleural suture obsolete; metathorax + propodeum shiny, without sculpture, except for pleura and posterior surface of propodeum transversely striate; metanotum not hollow behind the scutellum, short and inclined – fore tarsal segments in following proportions: 11 : 2 : 3 : 10 : 17; enlarged claw (Fig. 5) with a subapical tooth and a row of 4 lamellae; segment 5 of front tarsus (Fig. 5) with two rows of 17 lamellae; apex with a group of at least 9 lamellae; maxillary palpi with 5 segments; labial palpi with 2 segments; tibial spurs 1, 0, 1.

Description of the male. – Fully winged; length 2.18 mm; black; antennae, abdomen and legs brown; antennae not distally thickened; antennal segments in following proportions: 5 : 4 : 6 : 6 : 6 : 5.5 : 5.5 : 5.5 : 5.5 : 8 – antennal segment 3 approximately three times as long as broad (6 : 2); head dull, granulated and rugose; frontal line absent; occipital carina absent; distance between posterior ocelli (POL) = 6; distance between anterior and posterior ocelli (OL) = 2,5; distance between posterior ocelli and eyes (OOL) = 3.5; temples distinct – scutum dull, granulated; notaulices complete, posteriorly separated; minimum distance between the notaulices shorter than the breadth of the ocelli (1 : 1.5); scutellum and metanotum shiny, smooth, finely punctate, without sculpture among the punctures; propodeum dull, reticulate rugose, without longitudinal or transversal keels – fore wing hyaline, without dark transversal bands; distal part of radial vein longer than proximal part (15 : 6); dorsal process of gonoforceps (Fig. 6) long and slender; maxillary palpi with 5 segments; labial palpi with 2 segments; tibial spurs 1, 1, 2.

Holotype 1 ♀: "E JORDAN, Zerkatal, near Romana, m 500, 1 III 1958, J. K. KLAPPERICH coll." (Hym. Typ. No. 7474, Hungarian Natural History Museum, Budapest).

Paratype 1 ♂: same label (Hym. Typ. No. 7475, Hungarian Natural Museum, Budapest).

D. nabatea is the third species of *Donisthorpina* of the Palaearctic region. For its meso-metapleural suture obsolete it is different from *D. tussaci* OLMI and close to *D. pallida* (CEBALLOS). In the key to the females of the Palaearctic *Donisthorpina* proposed by OLMI (1990) this species may be inserted as follows:

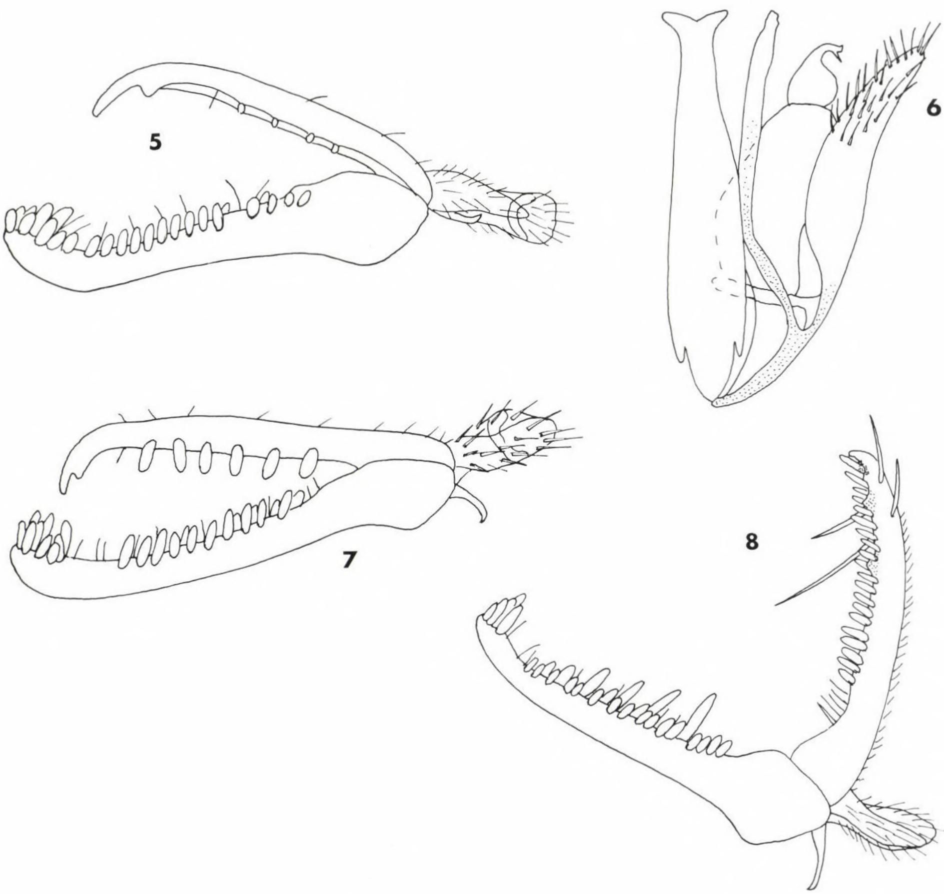
1 Meso-metapleural suture distinct and complete — 2. **D. tussaci** OLMI
– Meso-metapleural suture obsolete — 2
2 Metathorax + propodeum testaceous; enlarged claw with subapical tooth nearer the apex (Fig. 890 in OLMI 1984) — 1. **D. pallida** (CEBALLOS)
– Metathorax + propodeum black; enlarged claw with subapical tooth farther from the apex (Fig. 5) — 3. **D. nabatea** sp. n.

Australian region

Pentagonatopus baloghi sp. n. ♀
(Fig. 7)

Description of the female. – Apterous; length 3.12 mm; testaceous, with abdomen brown; antennae distally thickened – antennal segments in following proportions: 8 : 5 : 11 : 7 : 6 : 6 : 5 : 4.5 : 4.5 : 7; head excavated, shiny, smooth, without sculpture, except for a few striae near the ocellar triangle; frontal line complete; occipital carina absent; distance between posterior ocelli (POL) = 1.5; distance between anterior and posterior ocelli (OL) = 1.5; distance between posterior ocelli and eyes (OOL) = 6 – pronotum crossed by a very weak transversal impression, shiny, smooth, without sculpture; scutum shiny, smooth, without sculpture, without lateral points; metanotum not hollow behind the scutellum, transversely striate; meso-metapleural suture obsolete; metathorax + propodeum shiny, smooth, without sculpture, except for numerous transversal striae on the posterior surface; mesopleura and metapleura not transversely striate; – fore tarsal segments in following proportions: 15 : 2.5 : 4 : 12 : 19; segment 3 of front tarsus produced into a hook; enlarged claw (Fig. 7) with a subapical tooth and a row of 6 lamellae; segment 5 of front tarsus (Fig. 7) with two rows of 15 lamellae; apex with a group of approximately 7 lamellae; maxillary palpi with 5 segments; labial palpi with 2 segments; tibial spurs 1, 0, 1.

Male unknown.



Figs 5–8. Chelae of holotypes of *Donisthorpina nabatea* sp. n. (5), *Pentagonatopus baloghi* sp. n. (7) and *Australodryinus pappi* sp. n. (8); genitalia (right half) of paratype *Donisthorpina nabatea* sp. n. (6).

Holotype 1 ♀: "New Guinea, Papua, Wau, Mt. Missim, Haus Copper, No. 56, 22–24 IV 1965, J. BALOGH et J. J. SZENT-IVÁNYI coll." (Hym. Typ. No. 7476, Hungarian Natural History Museum, Budapest).

This species is named in honor of one of the collectors, DR. J. BALOGH.

It is the second species of *Pentagonatopus* of the Australian region. The following key to the females of the Australian *Pentagonatopus* may be proposed:

1 Thorax and propodeum black; meso-metapleural suture distinct 1. **P. montanus** OLMI
– Thorax and propodeum testaceous; meso-metapleural suture obsolete 2. **P. baloghi** sp. n.

Subfamily Apodryininae / Australian region

Australodryinus pappi sp. n. ♀
(Fig. 8)

Description of the female. – Apterous; length 3.25 mm; head black, with anterior surface of frons, clypeus and mandibles reddish-testaceous; antennae testaceous; mesosoma black, except for anterior third of pronotum brown-reddish; abdomen brown; legs testaceous-dark, with hind coxae darkened; head swollen, dull, granulated and rugose, with fine and short hairs; frontal line long, reaching the vertex; occipital carina absent; ocelli absent; temples very long, less than twice as long as eyes (11 : 7); clypeus with ventral margin rounded; subocular sulcus absent – antennal toruli contiguous with upper margin of clypeus; antennae geniculated, distally thickened; antennal segments in following proportions: 33 : 7 : 13 : 11 : 10 : 9 : 8 : 7.5 : 7 : 11; antennal segments 3–10 with rhinaria (one per segment; segment 10 with 2 rhinaria) – propleura not dorsally visible, laterally visible; pronotum clearly distinct, with a visible complete suture separating pronotum from mesothorax + metathorax + propodeum; pronotum dull, humped, with dorsal surface rugose and with lateral surfaces strongly sculptured by longitudinal striae; pronotum not crossed by a transversal impression, without posterior tubercles; mesothorax, metathorax and propodeum fused, not clearly separated by sutures; only the following sutures are visible: a complete meso-metapleural suture and a complete suture around the posterior surface of propodeum; scutum and scutellum are not recognizable; the dorsal area is dull and fully sculptured by strong transversal keels; mesopleura reticulate rugose; the lateral surfaces corresponding to metapleura and lateral areas of propodeum are reticulate rugose; posterior surface of propodeum strongly transversely striate, except for lateral margins partly reticulate rugose and for distal apex smooth; pronotum with fine and short hairs; mesothorax + metathorax + propodeum almost fully hairless; the propodeal spiracles are normally prominent – fore tarsal segments in following proportions: 20 : 3 : 3 : 15 : 18; segment 3 of front tarsus produced into a hook; fore trochanters less than twice as long as broad (7 : 4); enlarged claw (Fig. 8) with 3 subapical teeth, a row of 20 lamellae and numerous bristles on outer and inner side; on the outer side two very long bristles are visible; segment 5 of front tarsus (Fig. 8) with two rows of approximately 25 lamellae, among which 6 longer; apex with a group of 7 lamellae; tibial spurs 1, 1, 1.

Male unknown.

Holotype 1 ♀: "Australia, New South Wales, Kioloa State Forest, 4 I 1979, by a soil trap of the Australian Museum of Sydney (N. 1225)" (Hym. Typ. No. 7477, Hungarian Natural History Museum, Budapest).

This species is named in honor of the curator of the Hymenoptera Collection in the Hungarian Natural History Museum, DR. J. PAPP.

A. pappi is the third species of the genus *Australodryinus* and the fourth species of the interesting transantarctic subfamily Apodryininae. The following new key to the females of the genus *Australodryinus* may be proposed:

1 Head smooth, without sculpture; thorax and propodeum smooth, except for the visible sutures and for numerous transversal striae on posterior surface of propodeum 2. **A. monteithi** OLMI
– Head dull, fully granulated or partly rugose; thorax and propodeum irregularly rugose, in addition to the visible sutures; posterior surface of propodeum with or without numerous transversal striae 2
2 Posterior surface of propodeum fully transversely striate; dorsal surface of mesonotum + metanotum + propodeum strongly transversely striate 3. **A. pappi** sp. n.
– Posterior surface of propodeum irregularly rugose, partly reticulate rugose, partly smooth, without numerous transversal striae, only with one transversal stria near the petiole; dorsal surface of mesonotum + metanotum + propodeum irregularly rugose, not strongly transversely striate 1. **A. naumanni** OLMI

REFERENCES

OLMI, M. (1984): A revision of the Dryinidae (Hymenoptera Chrysidoidea). – *Mem. Amer. Ent. Inst.*, **37:** I–XXXI, 1–1913.

OLMI, M. (1990): Supplement to the revision of the world Dryinidae (Hymenoptera Chrysidoidea). – *Frust. Entom.*, N. S., **12** (25): 109–395.

Acta Zoologica Hungarica 38 (3–4), pp. 293–312 (1992)

BRACONIDAE (HYMENOPTERA) FROM MONGOLIA, XII*

J. PAPP

Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross utca 13, Hungary

(Received 20th November 1991)

Sixty-eight braconid species are reported from Mongolia, two species (*Chelonus kaszabi* sp. n. and *Ch. triquestrus* sp. n.) are new to science. The species are assorted in seven subfamilies, in brackets the number of the species is given; Cheloninae (57), Meteorinae (2), Opiinae (1), Doryctinae (1), Braconinae (3), Exothecinae (2) and Rogadinae (2). Nineteen species are new to the fauna of Mongolia. *Phanerotoma excisa* PAPP, 1971 is a junior new synonym of *Ph. katkowi* KOKUJEV, 1900. With 22 original figures.

1. List of the species

Sixty-eight species of braconids are listed from the Republic of Mongolia, the species belong to seven subfamilies. The species represent the following genera, in brackets the subfamilies to which the genera are assigned as well as the number of the respective species are indicated: (Cheloninae) *Ascogaster* WESMAEL (5), *Chelonus* JURINE (25), *Microchelonus* SZÉPLIGETI (20), *Phanerotoma* WESMAEL (7) – (Meteorinae) *Meteorus* HALIDAY (2) – (Opiinae) *Biosteres* FOERSTER (1) – (Doryctinae) *Heterospilus* HALIDAY (1) – (Braconinae) *Bracon* FABRICIUS (3) – (Exothecinae) *Rhysipolis* FOERSTER (2) – (Rogadinae) *Aleiodes* WESMAEL (2). Detailed collecting data are given for every species in an abbreviated form, i.e. only the collecting numbers ("No.") are indicated after the species names, the full collecting data (name of localities, dates, etc.) are listed separately before the faunistic enumeration. Where necessary, taxonomic, faunistic and zoogeographic notes are added. The braconid material was collected by the late DR. Z. KASZAB (1915–1986), well-known specialist of Tenebrionidae / Meloidae and ardent explorer of the Mongolian fauna (see also KASZAB's reports of his six collecting trips to Mongolia in Folia Ent. Hung. 1963–1968 vols 16–21); the braconid material is deposited in the Hungarian Natural History Museum, Budapest.

* Ergebnisse der zoologischen Forschungen von DR. Z. KASZAB in der Mongolei, Nr. 505.

No. 98. Central aimak: Zuun-Chara, 1390 m, auf den Kulturfeldern der Versuchsanstalt des Pflanzeschutz-Institutes der Akademie der Wissenschaften geköschert, 8. 7. 1963.

No. 113. Central aimak: Songino, 24 km SW von Ulan-Baator, 1300 m, im Überschwemmungsgebiet des Flusses Tola im Galeriewald (*Salix* und *Populus*) geköschert, die niedrigeren Bäume geklopft und vom Boden einzeln gesammelt, 13. 7. 1963.

No. 223. Uburchangaj aimak: Changaj Gebirge, 18 km S von Somon Chužirt, 1830 m, Hochgebirgs-Wiese mit Blumen, von Pflanzen geköschert, 29. 6. 1964.

No. 273. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 12 km SO vom Zentrum, 1500 m, am Waldrand vom Unterholz und im Tal auf der Steppenwiese von den Pflanzen geköschert, 6. 7. 1964.

No. 281. Central aimak: Zuun-Chara, 850 m, auf Feldern des Forschungsinstituts für Pflanzenschutz, von Kulturpflanzen und Unkraut geköschert, 8. 7. 1964.

No. 298. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 12 km SO vom Zentrum, 1500–1800 m, am Waldrand und auf den Steppenwiesen geköschert, 22.–23. 7. 1965.

No. 316. Chentej aimak: Candagan tal, 40 km 0 von Žargalt-chaan, 1300 m, Federgras-Steppe, geköschert, 28. 7. 1965.

No. 319. Chentej aimak: 7 km NO von Somon Mörön, 1200 m, trockene Gebirgssteppe, an den Hängen mit *Amygdalus*-Gebüsch, geköschert, 29. 7. 1965.

No. 327. Chentej aimak: 15 km 0 von Öndörchaan, 1 km S von Fluß Kerulen, 1000 m, geköschert, 30. 7. 1965.

No. 331. Chentej aimak: 150 km ONO von Öndörchaan, 10 km S vom Fluß Kerulen und 10 km von Somon Tumunzogt, 1000 m, Gebirgssteppe mit sehr üppiger Vegetation, breites Tal, mit niedrigen Bergen umkreist, nördlich vom Lager ein kleiner Waldfleck, von den Pflanzen geköschert, 30. 7. 1965.

No. 349. Suchebaator aimak: 44 km SSW von Baruun urt, 1050 m, geköschert, 2.–3. 8. 1965.

No. 377. Suchebaator aimak: Fluß Bajan gol, 85 km NO von Somon Dariganga, 1100 m, im Tal von den feuchten Stellen geköschert, 8. 8. 1965.

No. 383. Suchebaator aimak: 55 km N von Somon Erdenezagan, 900 m, Großer Salzsee, am flachen Ufer breite Schilfgürtel, *Lasiagrostis*, geköschert, 9. 8. 1965.

No. 401. Čojbalsan aimak: Chamardavaa ul, 80 km SO von Somon Chalchingol, 600 m, geköschert, 13. 8. 1965.

No. 416. Čojbalsan aimak: 160 km W vom See Bujr nur, Menengijn tal, 600 m, Federgras-Steppe, viele *Artemisia, Linaria* etc., geköschert, 15. 8. 1965.

No. 425. Čojbalsan aimak: 44 km NW von Čojbalsan, 750 m, bei starkem Wind und Regen geköschert, 17. 8. 1965.

No. 429. Čojbalsan aimak: 80 km NW von Čojbalsan, 700 m, zwischen Hügeln blumenreiche Wiese mit *Galium, Scabiosa, Aster* etc., geköschert, 17. 8. 1965.

No. 433. Čojbalsan aimak: 15 km N von Somon Galuut, 850 m, breites Tal mit blumenreicher Wiese, geköschert, 17. 8. 1965.

No. 439. Čojbalsan aimak: 32 km SO von Somon Bajan-uul, 750 m, nasse Wiese mit Tümpeln und Wassergruben, von den Gräsern geköschert, 18. 8. 1965.

No. 444. Čojbalsan aimak: 20 km SW von Somon Bajan-uul, 820 m, geköschert neben dem am linken Ufer des Flusses Uls gol emporstehende Berge, Birkenwald-Steppe, blumenreiche, nasse Täler und trockene Wiesen am Berghang, 18. 8. 1965.

No. 486. Same as No. 273, 1600 m, Tal mit einem Bach, beiderseitig mit steilen Berghängen, an der nördlichen Seite Nadelwald, am Bachufer Birkenbäume, die Südseite ist eine trockene, steinige Steppe, am Waldrand und im Tal sowie auf den üppigen Wiesen geköschert, 27. 8. 1965.

No. 493. Same as No. 273, 1650 m, im Talgrund mit Hilfe der Malaise-Falle gefangen, der Apparat war in einer Waldlichtung aufgestellt, 4. 6. 1966.

No. 494. Same as No. 273, 1650–1950 m, im Vorfrühling charakteristische Pflanzen (*Viola, Adonis, Ranunculus* etc.), vom Gesträuch (die Erle hat noch keine Sprößlinge) sowie von trockenem Gras geköschert, 4. 6. 1966.

No. 497. Same as No. 273, 1950 m, am Rand des Plateau, in einer größeren Waldlichtung, aus feuchten Graswurzeln und *Carex*-Blüten gesiebt, 4. 6. 1966.

No. 499. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 5 km S vom Zentrum, 1600 m, im Talgrund vom Gesträuch (sie waren knospentragend oder eben die Blätter entfaltend), von trockenem Gras, von Frühlingsblumen (*Trollius*, *Ranunculus* etc.) geköschert, 6. 6. 1966.

No. 504. Central aimak: Songino, 24 km SW von Ulan-Baator, 1300 m, im Galeriewald des Überschwemmungsgebietes geköschert, 7. 6. 1966.

No. 508. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 1880–2000 m, geköschert, vorwiegend von den Erlen und Birken, 9. 6. 1966.

No. 514. Same as No. 508, 1600–1750 m, im Talgrund geköschert, 10. 6. 1966.

No. 519. Central aimak: SO von Somon Bajanzogt, 1600 m, am Waldrand von blühendem Gesträuch (Weiden und Birken) geköschert, 11. 6. 1966.

No. 523. Central aimak: etwa 30 km O von Somon Nalajch, 1530 m, geköschert im feuchten Talgrund sowie an den trockeneren, kahlen Berghängen bis zum Waldrand, 14. 6. 1966.

No. 531. Bulgan aimak: etwa 20 km W von Somon Bajannuur (220 km W von Ulan-Baator), 1100 m, von den blühenden *Caragana* geköschert, 18. 6. 1966.

No. 540. Archangaj aimak: Changaj-Gebirge, 8 km W von Somon Urdtamir, 1620 m, von Steppenpflanzen geköschert, 19. 6. 1966.

No. 614. Chovd aimak: 3 km N von Somon Uenč, im Tal des Flusses Uenč gol, 1450 m, geköschert im Talgrund neben dem Bach, 2.–3. 7. 1966.

No. 628. Chovd aimak: 10 km SSW von Somon Bulgan, 1200 m, in der Nähe eines linken Nebenarmes des Flusses Bulgan gol, neben großen Sandhügeln, welche mit *Tamariscus*, *Saxaul* und *Ephedra* gebunden sind, in einem großen, abflußlosen, salzigen Becken, am Rand mit sehr üppiger Vegetation, geköschert, 4.–5. 7. 1966.

No. 632. Same as No. 628, mit Hilfe der Malaise-Falle gefangen, 4.–6. 7. 1966.

No. 633. Same as No. 628, nachts gesammelt bei Lampenlicht (um 22^h: 15 °C, 2^h in der Nacht: 10 °C, früh morgens: 6 °C), 5. 7. 1966

No. 637. Chovd aimak: Mongol-Altaj-Gebirge, Uljasutajn gol, 45 km NNO von Somon Bulgan. 1400 m, linker Nebenfluß des Bulgan gol, etwa 6–8 km vor der Mündung des Bulgan gol, tiefer Engpaß, sehr steil abhängende Berge mit spärlicher Vegetation, im Talgrund kleines bewässertes Ackerfeld, an den felsigen Berghängen blühende *Caragana*, im Talgrund geköschert und am Berghang von *Caragana* geklopft, 6. 7. 1966.

No. 644. Chovd aimak: Somon Uenč, im Flußtal Uenč gol, etwa 2 km N vom Dorf, 1450 m, im Talgrund geköschert, 7. 7. 1966

No. 646. Chovd aimak: Mongol-Altaj-Gebirge, etwa 35 km N von Somon Uenč, 1750 m, im Tal eines kleinen linken Nebenbaches vom Fluß Uenč gol, blumenreiche feuchte Wiese im Talgrund, geköschert, 8. 7. 1966.

No. 657. Chovd aimak: Mongol-Altaj-Gebirge, etwa 45 km S von Somon Manchan, 2100 m, im Engtal, an den steilen Berghängen und Felsen, von blühender *Caragana* geklopft, 9. 7. 1966.

No. 680. Gobi Altaj aimak: Baga nuuryn urd els, an der SO-Ecke des Sees Döröö nuur, 1200 m, Flugsand mit großen Barchanen und sehr spärlicher Vegetation, nachts gesammelt bei Lampenlicht (um 22^h: 17 °C, $2^h45'$: 10 °C, früh morgens: 10 °C), 12. 7. 1966.

No. 693. Gobi Altaj aimak: Chasat chajrchan ul, etwa 20 km S von Somon Zargalan, 2400 m, in einem nach W geöffneten Tal mit sehr üppiger Vegetation, blumenreichen Wiesen, vor allem an einem Wasserscheide bis zur Waldgrenze geköschert, 15.–16. 7. 1966.

No. 724. Archangaj aimak: Changaj-Gebirge, 8 km W von Somon Urdtamir, 1620 m, auf den blumenreichen Gebirgssteppen geköschert, 21. 7. 1966.

No. 727. Archangaj aimak: Chaalgsim chundi bei Somon Tövschruulech, 63 km O von Somon Urdtamir, 1500 m, von den Unkräutern geköschert, 22. 7. 1966.

No. 730. Bulgan aimak: 9 km O von Somon Abzaga, 1300 m, mit Hilfe der Malaise-Falle gefangen, 23. 7. 1966.
No. 732. Same as No. 730, geköschert, 23. 7. 1966.
No. 735. Bulgan aimak: 4 km S von Somon Daschinčilen, 1200 m, von den Pflanzen, vorwiegend von *Urtica* geköschert, 23. 7. 1966.
No. 739. Central aimak: Ulaan chodag, 16 km S von Somon Öndörschireet, 1500 m, vorwiegend von blühender *Urtica* etc. geköschert, 24. 7. 1966.
No. 742. Central aimak: Tal des Flusses Tola, zwischen Somon Altanbulag und Somon Tariat, etwa 30 km ONO von Somon Tariat, 1200 m, *Caragana*-Steppe an einem Berghang mit Sandboden, gesammelt bei Lampenlicht (um 22^h: 19 °C, 3^h in der Nacht: 14 °C, früh morgens: 12 °C), bei tröpfelndem Regen, 24. 7. 1966.
No. 749. Central aimak: SO von Somon Bajanzogt, 1600 m, von der üppigen Vegetation im Talgrund und am Waldrand geköschert, 27. 7. 1966.
No. 771. Central aimak: 11 km S vom Paß Zosijn davaa, 90 km S von Ulan-Baator, 1650 m, auf der Gebirgssteppe, vorwiegend neben den Wasserrissen von Blumen (*Thermopsis, Rosa, Prunus* usw.) geköschert, 7. 6. 1967.
No. 777. Central aimak: 12 km S von Somon Bajanbaraat, 1380 m, von blühender *Caragana* geköschert, 9. 6. 1967.
No. 800. Südgobi aimak: Gurban Sajchan ul Gebirge, zwischen Somon Churmen und Somon Bajandalaj, 24 km NW von Churmen, 1550 m, nachts gesammelt bei Lampenlicht (um $21^h30'$: 16 °C, früh morgens: 4 °C), gesammelt bis 1^h in der Nacht, 14. 6. 1967.
No. 810. Südgobi aimak: Sevrej ul Gebirge, 10 km SW von Somon Sevrej, 1600 m, nachts gesammelt bei Lampenlicht (um $21^h30'$: 17 °C, 24^h: 13 °C, früh morgens: 9 °C), gesammelt bis Mittelnacht bei klarem Himmel, bei Mondschein und Wind, 17. 6. 1967.
No. 817. Südgobi aimak: SW-Rand des Salzsees Dund-gol (am "alten" Somon Gurban-res), 1300 m, nachts gesammelt bei Lampenlicht (um $21^h30'$: 16 °C, um 24^h: 10 °C, in der früh: 10 °C), gesammelt bei Licht bis Mittelnacht, 18. 6. 1967.
No. 819. Same as No. 817, von blühenden *Thermopsis, Iris* und *Nitraria* geköschert, 19. 6. 1967.
No. 826. Südgobi aimak: Nojon nuruu Gebirge, Grenzposten Ovot Chuural, 1500 m, an den Ruinen des alten Lama-Klosters, Grenzwache, in der Umgebung eine kleine Quelle und ein Salzsee, neben dem Wasser mit üppiger Vegetation, mit Hilfe der Malaise-Falle gefangen, aufgestellt neben dem Salzsee, 20.–21. 6. 1967.
No. 834. Südgobi aimak: 100 km W vom Grenzposten Ovot Chuural, 22 km W von Sajryn chudag, 1250 m, ein inselartig separierter, groß ausgedehnter Sandhügel mit alten *Tamariscus*- und *Haloxylon*-Beständen auf dem mit Kies und Schotter bedeckten Plateau, außer Saxaul *(Haloxylon)* und *Tamariscus* noch viele *Ephedra* und *Caragana,* nachts gesammelt bei Lampenlicht an 3 Stellen zwischen den Sandhügeln (um $21^h30'$: 20 °C, 24^h: 15 °C und früh morgens: 10 °C), ruhige Nacht mit Vollmond, 22. 6. 1967.
No. 835. Same as No. 834, von *Haloxylon* geklopft, 23. 6. 1967.
No. 838. Bajanchongor aimak: Talyn Bilgech bulag, Quelle zwischen Tost ul und Cagan Bogd ul Gebirge, 47 km O vom Grenzposten Caganbulag, 1200 m, kleine Quelle, in der Umgebung mit *Tamariscus* und neben dem Wasser auch *Phragmites,* in den tieferen Lagen auf Salzboden mit verschiedenartigem Pflanzenwuchs, stellenweise *Nitraria,* in der Umgebung der Quelle geköschert, 23. 6. 1967.
No. 840. Same as No. 834, nachts gesammelt bei Lampenlicht (um $21^h30'$: 15 °C, um 24^h: 13 °C und früh morgen: 5 °C), gesammelt bis 1 Uhr in der Nacht, 23. 6. 1967.
No. 842. Bajanchongor aimak: Cagan Bogd ul Gebirge, etwa auf dem halben Weg zwischen der Quelle Talyn Bilgech bulag und dem Grenzposten Caganbulag, 25 km WSW von der Quelle, 1450 m, von steinigen Bergen umgebenes kleines Becken, im Talgrund mit blühenden *Tamariscus,* von *Tamariscus* geeinzelt, resp. geköschert, 24. 6. 1967.

No. 855. Bajanchongor aimak: Oase Echin gol, etwa 90 km NO vom Grenzposten Caganbulag, 950 m, breit ausgedehnte Oase mit Agrikultur, im Talgrund eine wasserreiche Quelle, mit Hilfe der Kanalisation Melonen, Gurken und Tomaten angebaut, in der weiten Umgebung sehr große *Tamariscus*-Bestände, auch ein *Populus*-Auwald, am Bach *Phragmites*, in tieferen Lagen *Nitraria*, an trockenen Stellen *Haloxylon*, an nassen Stellen blühender *Juncus*, geköschert, 27.–28. 6. 1967.

No. 857. Same as No. 855, mit Hilfe der Malaise-Falle gefangen, aufgestellt auf einer mit blühendem *Tamariscus* umgebenen kleinen Lichtung, wo der *Juncus* in voller Blüte gestand, 27.–29. 6. 1967.

No. 859. Same as No. 855, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 22 °C, 24^{h}: 20 °C, früh morgens: 17 °C), gesammelt bis 2 Uhr in der Nacht, 28. 6. 1967.

No. 869. Bajanchongor aimak: Oase Dzun mod, etwa 100 km S von Somon Sohine zinat, 1300 m, Pappel-Auenwald mit einer wasserarmen Quelle, in der Umgebung eine breit ausgedehnte sandige Halbwüste mit *Haloxylon*, *Caragana* und *Ephedra* sowie *Zygophyllum*, weiters *Nitraria*, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 16 °C, 24^{h}: 17 °C, früh morgens: 16 °C), gesammelt bis 1 Uhr in der Nacht bei ruhigem Wetter, 29. 6. 1967.

No. 879. Bajanchongor aimak: 8 km OSO von Somon Bajanleg, 1350 m, Sandwüste auf Schotterboden, mit altem *Haloxylon*-Bestand, hie und da mit großen *Nitraria*- und *Lasiagrostis*-Stellen, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 22 °C, 24^{h}: 19 °C, früh morgens: 15 °C), bis 23 Uhr in der Nacht und von halb 2 in der Nacht bis morgens Regen und Wind, 2. 7. 1967.

No. 882. Uburchangaj aimak: auf dem halben Weg zwischen Somon Bajanleg und Somon Bulgan, etwa 130 km OSO von Bajanleg, 1150 m, abflußloses Salzbecken, im Talgrund mit Salzauskrüstung, in der Umgebung *Tamariscus*, *Haloxylon*, *Zygophyllum* usw., nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 22 °C, 24^{h}: 14 °C, früh morgens: 10 °C), gesammelt bis 1 Uhr in der Nacht, 2. 7. 1967.

No. 885. Südgobi aimak: 7 km W von Somon Bulgan, 1350 m, sandige *Caragana*-Halbwüste, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 15 °C, 24^{h}: 12 °C, früh morgens: 10 °C), gesammelt bis Mittelnacht bei tröpfelndem Regen, 4. 7. 1967.

No. 897. Südgobi aimak: abflußloses Becken 10 km NNO von der Stadt Dalanzadgad, 1450 m, Flachland mit *Anabasis* und *Nitraria*, an tieferen Stellen sandig-lehmiger Salzboden, in höheren Lagen ist der Boden mit Schotter bedeckt, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 18 °C, 24^{n}: 17 °C, früh morgens: 10 °C), gesammelt bis halb 2 in der Nacht, bei bewölktem, ruhigem Wetter, 7. 7. 1967.

No. 898. Same as No. 897, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 18 °C, 24^{h}: 17 °C, früh morgens: 10 °C), gesammelt bis 2 Uhr in der Nacht, bei bewölktem, ruhigem Wetter, 7. 7. 1967.

No. 900. Südgobi aimak: Tachilga ul Gebirge, zwischen Somon Zogt-Ovoo und Dalanzadgad, 68 km S von Zogt-Ovoo, 1550 m, geköschert vorwiegend von *Artemisia*, *Lasiagrostis* und von blühenden Cruciferen, 8. 7. 1967.

No. 905. Mittelgobi aimak: 8 km NW von den Ruinen des Klosters Oldoch Chijd, 54 km NNW von Somon Zogt-Ovoo, 1350 m, *Artemisia*-Steppe mit *Stipa*, an der tiefsten Stelle eine breit ausgedehnte Wasseransammlung mit *Lasiagrostis*, nachts gesammelt bei Lampenlicht (um $21^{h}30'$: 22 °C, 24^{h}: 20 °C, früh morgens: 18 °C), 9. 7. 1967.

No. 908. Mittelgobi aimak: Delgerchangaj ul Gebirge, 6 km S von Somon Delgerchangaj, 1650 m, geköschert vorwiegend von *Amygdalus*, *Caragana*, *Iris*, *Artemisia* und *Lasiagrostis*, 11. 7. 1967.

No. 915. Mittelgobi aimak: 20 km S von Somon Delgerzogt, 1480 m, Steppe mit *Stipa*, blühendem *Allium*, *Urtica*, mit großen *Lasiagrostis*-Flecken, wenigen *Caragana*, geköschert, 13.–14. 7. 1967.

No. 918. Central aimak: 12 km S von Somon Bajanbaraat, 1380 m, sandige *Caragana*-Steppe mit vielen *Allium*, *Lamium*, blühenden Cruciferen, in höheren Lagen mit blühendem *Thymus* usw., geköschert, 13. 7. 1967.

No. 921. Central aimak: 11 km S vom Paß Zosijn davaa, etwa 90 km S von Ulan-Baator, 1650 m, blumenreiche Gebirgssteppe, geköschert, 15. 7. 1967.

No. 926. Central aimak: Tosgoni ovoo, 5–10 km N von Ulan-Baator, 1500–1700 m, an den Südhängen der Gebirgssteppe, am Nordhang mit einem Birkenwald, geköschert, 19.–20. und 23.–24. 7. 1967.

No. 926a. Same as No. 926, 10 km N von Ulan-Baator, 1700–1900 m, geköschert am Waldrand und auf den Hochgebirgssteppen, 23.–24. 7. 1967.

No. 931. Central aimak: Ulan-Baator, Nucht im Bogdo ul, 12 km SO vom Zentrum, 1500–1600 m, mit sehr üppiger Vegetation bedeckten Talgrundes neben dem Bach, im Talgrund geköschert, 21. 7. 1967.

No. 934. Central aimak: Tosgoni ovoo, 6–10 km N von Ulan-Baator, 1700 m, am Nordhang des Gebirges in einem kleinen Birkenwald und am Waldrand geköschert, die Vegetation ist noch sehr frühzeitig, 4. 6. 1968.

No. 938. Same as No. 934, geköschert im Birkenwald, am Waldrand und auf den Wiesen der Nordhänge von blühendem Gesträuch, von Birken, Weiden und aus Unterholz, 7.–8. 6. 1968.

No. 959. Bulgan aimak: 30 km NNW von Somon Daschinčilen, 1200 m, sehr trockene, öde *Caragana*-Steppe, von der niedrigen, spärlich wachsenden *Caragana* geköschert, 15. 6. 1968.

No. 961. Bulgan aimak: zwischen Somon Chischig-Öndör und Somon Orchon, 23 km NNO von Chischig-Öndör, 1390 m, bewaldetes Hügelland, ausgedehnte Birken- und Nadelholzwälder, an den Waldrändern Gebüsch, im Talgrund nasse Wiesen, am Waldrand und auf der Steppe geköschert, 15. 6. 1968.

No. 967. Bulgan aimak: 7 km NW von Somon Chanžargalant, 1350 m, nach W auslaufendes Tal, steile Berghänge, am Nordhang alter Nadelholzwald, am Südhang steinige Gebirgssteppe mit Gebüsch, der Talgrund mit Waldlichtungen und blühendem Unterholz, geköschert am Waldrand und im Tal, 16. 6. 1968.

No. 973. Bulgan aimak: Namnam ul Gebirge, 23 km NW von Somon Chutag, 1150 m, an den Berghängen junge Nadelholzwälder und Birkenwald, im letzteren mit alleinstehenden, sehr alten Birken und sibirischen Zedern, im Talgrund neben dem Bach Weidengebüsch und ausgedehnte Gebirgssteppe, geköschert, 17. 6. 1968.

No. 985. Chövsgöl aimak: 60 km WNW von der Stadt Mörön, 1800 m, Gebirgsplateau mit Salzsee, kurzrasige Gebirgssteppe, hie und da mit großen Steinblöcken, auf kurzrasigen Steppen geköschert, 19. 6. 1968.

No. 987. Chövsgöl aimak: 84 km W von der Stadt Mörön, etwa 10 km NO vom Fluß Delger mörön, 1650 m, in einer Schlucht mit sehr steilen, steinigen Berghängen, am Südhang von blühender *Caragana* geköschert, 20. 6. 1968.

No. 990. Chövsgöl aimak: 8 km N von Somon Burenchaan, am Fluß Delger mörön, 1450 m, an der rechten Seite des Flusses sehr steile, felsige Berghänge mit *Caragana* und *Amygdalus*, im Talgrund Pappel-Auenwald und nasse Wiesen, am Fluß steinige-kiesige Ufer, geköschert im Talgrund auf den nassen Wiesen und im Pappel-Auenwald, 20. 6. 1968.

No. 991. Same as No. 990, nachts gesammelt bei Lampenlicht, bis 1^h in der Nacht (um 22^h: 17 °C, 1^h: 12 °C, früh morgens: 8 °C) bei windigem Wetter, 20. 6. 1968.

No. 1002. Chövsgöl aimak: zwischen Somon Cecerleg und Somon Bajan-ul, 65 km W von Cecerleg, 1700 m, trockene Gebirgs-steppe, geköschert von Gräsern und von *Caragana*, 22. 6. 1968.

No. 1007. Uvs aimak: Sandgebiet Altan els, 35 km WNW von Somon Tes, 1400 m, von blühender *Caragana* und anderen Leguminosen sowie Gräsern geköschert, 23. 6. 1968.

No. 1010. Uvs aimak: am Fluß Changilcagijn gol, 6 km SW von Somon Baruunturuum, 1350 m, breites Flußbett (derzeit hie und da mit wenig Wasser), Pappel-Auenwald mit ganz trockenen Terrassen und trockenen Berghängen, überall viele *Thymus* und *Artemisia*, die Steppe ist steinig und kurzrasig, im Flußbett vor allem von blühender *Caragana* und von *Iris* geköschert, 24. 6. 1968.

No. 1046. Bajan-Ölgij aimak: rechtes Ufer des Flusses Chovd gol bei der Stadt Ölgij, 1750 m, Terrasse am Flußufer mit Iris, geköschert, 30. 6. 1968.

No. 1050. Bajan-Ölgij aimak: NO-Ecke des Sees Tolbo nuur, 2100 m, geköschert am Seeufer von niedrigen Pflanzen (vor allem *Carex*) an nassen Stellen, 1. 7. 1968.

No. 1054. Bajan-Ölgij aimak: etwa 20 km NNW von der Stadt Ölgij, 2100 m, von *Caragana* geklopft, 2. 7. 1968.

No. 1056. Bajan-Ölgij aimak: im Tal des Flusses Chavcalyn gol, 25 km O von Somon Cagaannuur, 1850 m, mit sehr steilen und felsigen Bergen umgebenes Flußtal, im Talgrund Pappeln, auf den Terrassen blühende *Urtica*, an den Berghängen blühende *Caragana*, geköschert vorwiegend von *Urtica*, 3. 6. 1968.

No. 1069. Uvs aimak: am östlichen Hang des Passes Ulaan davaa, zwischen dem See Örög nuur und der Stadt Ulaangom, 2050 m, Hochgebirgssteppe, von blühenden *Galium, Thermopsis, Artemisia* geköschert, 6. 7. 1968.

No. 1071. Uvs aimak: 2 km O vom Paß Ulaan davaa, zwischen dem See Örög nuur und der Stadt Ulaangom, 1950 m, am nördlichen Berghang neben dem Waldrand von blühendem Gesträuch und von blühendem Unterholz geköschert, 6. 7. 1968.

No. 1082. Uvs aimak: 10 km NW von Somon Naranbulag, 1350 m, Sandhügel auf mit Kiespanzer Bedecktem Boden, auf dem Sand blühende Gräser, der Kiespanzer mit äußerst spärlicher *Caragana*-Vegetation, sonst sehr öde, geköschert, 9. 7. 1968.

No. 1091. Uvs aimak: 3 km NO von Somon Öndörchangaj, Gebirge Chanchöchij ul, 2200 m, alpine Zone, im Talgrund Schnee und Eis, an den Nordhängen Nadelholzwald, an den Waldrändern blühendes Unterholz, geköschert, 11. 7. 1968.

No. 1094. Zavchan aimak: 15 km NW von Somon Songino, 1840 m, geköschert vor allem von blühender *Brassica* und *Artemisia*, 12. 7. 1968.

No. 1100. Zavchan aimak: 45 km WNW von Somon Nömrög, 1850 m, sehr breites Tal mit blühender Steppenvegetation (*Galium, Aster*, Gramineen), geköschert, 13. 7. 1968.

No. 1104. Zavchan aimak: Choit chunch, 26 km ONO vom See Telmen nuur, 2150 m, öde Gebirgssteppe, an den Nordhägen Nadelholzwälder, an den Waldrändern, an Wasserrissen, üppige, blühende Vegetation, geköschert am Waldrand, vor allem von Doldenblütlern, 13. 7. 1968.

No. 1107. Chövsgöl aimak: Alag Mort, 42 km NO vom Paß Chaldzan Sogotyn davaa, am Fluß Tesijn gol, 1900 m, an den Nordhängen Nadelholzwälder, sonst Gebirgssteppe, an den Waldrändern und an Wasserrissen üppige Vegetation und blühende Pflanzen, an den Hängen trockene Steppe, geköschert im Wald und an den Waldrändern, 14. 7. 1968.

No. 1110. Same as No. 1107, am Ufer vom Tesijn gol unter Steinen geeinzelt oder mit einem Schmetterlingsnetz abgestreift, 14. 7. 1968.

No. 1113. Chövsgöl aimak: 3 km W von Somon Burenchaan, 1650 m, Gebirgssteppe, an einer Wasserrise von blühenden Pflanzen geköschert, 16. 7. 1968.

No. 1115. Chövsgöl aimak: 8 km W von Somon Burenchaan, am Fluß Delger mörön, 1450 m, geköschert am Flußufer und an den Berghängen, 16. 7. 1968.

No. 1117. Same as No. 1115, nachts gesammelt bei Lampenlicht bis 2^h in der Nacht (um 22^h: 20 °C, 2^h: 15 °C, früh morgens: 14 °C), um 23^h Nieselregen, später mehrmals stärker geregnet, 16. 7. 1968.

No. 1123. Chövsgöl aimak: N von Somon Chatgal am SW-Ecke des Sees Chövsgöl nuur, 1650 m, am Seeufer Nadelholzwald, stellenweise mit Lichtungen, an den Waldrändern und in Lichtungen blühende Pflanzen, geköschert, 18. 7. 1968.

No. 1126. Chövsgöl aimak: 4 km NW von der Stadt Mörön, 1500 m, südlich gelegene, trockene Gebirgssteppe, an den Wasserrissen mit *Caragana, Artemisia, Galium* usw., geköschert, 19. 7. 1968.

No. 1129a. Chövsgöl aimak: 13 km O von der Stadt Mörön, 1550 m, *Artemisia*-Gebirgssteppe, geköschert, 20. 7. 1968.

No. 1135. Bulgan aimak: Namnan ul Gebirge, 23 km NW von Somon Chutag, 1150 m, an den Berghängen junger Nadelholzwald und Birkenwald, im letzteren mit alleinstehenden, sehr alten Birken und sibirischen Zedern, im Talgrund neben dem Bach Weidengebüsch und ausgedehnte Gebirgssteppe, an den Wasserrissen und an den Waldrändern sehr üppige Vegetation mit Doldenblütlern, geköschert, 21. 7. 1968.

No. 1146. Central aimak: 25 km O von Somon Lun, 1200 m, öde, trockene Gebirgssteppe mit *Stipa, Artemisia, Amygdalus* und *Caragana* auf steinigen Boden, geköschert von blühenden Pflanzen, 25. 7. 1968.

No. 1150. Central aimak: 11 km OSO von Somon Bajanzogt, 1600–1700 m, am Nordhang ausgedehnte Birkenwälder, im Talgrund nasse Wiesen, sonst üppige Steppenvegetation, geköschert, 26. 7. 1968.

CHELONINAE

Ascogaster canifrons WESMAEL, 1835 – Localities: 1 ♂: No. 98 (in PAPP 1967: 205 *A. quadridentata* WESMAEL). 1 ♂: No. 749. 1 ♀ (det. HUDDLESTON 1984): No. 1150.

Ascogaster nachitshevanica ABDINBEKOVA, 1969 – Known sporadic from Azerbaidzhan and Mongolia (HUDDLESTON 1984: 359–360).

Locality – 3 ♀♀ (det. HUDDLESTON 1984, 2 ♀♀ in Budapest and 1 ♀ in London): No. 990.

Ascogaster quadridentata WESMAEL, 1835 – Locality: 1 ♂: No. 514.

Ascogaster rufipes (LATREILLE, 1809) – Localities: 1 ♂: No. 273 (in PAPP 1967: 204 *A. canifrons* WESMAEL). 1 ♂: No. 439 (in PAPP 1971: 66 *A. canifrons* WESMAEL).

Ascogaster varipes WESMAEL, 1835 – Localities: 1 ♂ (det. HUDDLESTON 1984): No. 749. 1 ♂: (det. HUDDLESTON 1984): No. 1104.

Chelonus abductor PAPP, 1971 – Hitherto known only from Mongolia.

Localities – 1 ♀: No.349. 1 ♀: No. 1129a.

Chelonus agilis PAPP, 1971 – So far known only from Mongolia. Previously (more than two decades ago) I did not perceive that the specimens identified by me as *Ch. annulatus* NEES represent actually my species described as new taxon in the same paper with the faunistic data of "Ch. annulatus".

Localities – 1 ♂: No. 349 (in PAPP 1971: 69–70 *Ch. annulatus* NEES). 1 ♂: No. 429 (in PAPP l.c.). 7 ♀♀ + 3 ♂♂: No. 433 (in PAPP l.c.). 1 ♂: No. 444 (in PAPP l.c.).

Chelonus annulatus (NEES, 1816) – Localities: 1 ♀: No. 433 (in PAPP 1971: 70–71 *Ch. dauricus* TELENGA). 1 ♂: No. 693. 2 ♂♂: No. 1056. 2 ♂♂: No. 1094. 1 ♂: No. 1113. 1 ♀: Yellow Gobi, 1 IX 1977, leg. G. MOLNÁR.

Chelonus asiaticus TELENGA, 1941 – Described from Mongolia, widely distributed in the late USSR (TOBIAS 1986: 317). In Mongolia it seems a frequent species.

Localities – 1 ♀: No. 1046. 1 ♀: No. 1050. 2 ♀♀: No. 1056. 1 ♀: No. 1110.

Chelonus bimaculatus SZÉPLIGETI, 1896 – Face rather pubescent thus somewhat similar to that of *Ch. canescens*, the European specimens less pubescent. Antenna with 28–31 antennomeres (28: 1 ♂, 29: 1 ♂, 31: 2 ♂♂). – Distributed in Russia (European part), Ukraine (TOBIAS 1986: 316), Hungary, Yugoslavia and Mongolia.

Localities – 1 ♂: No. 113 (in PAPP 1967: 205 *Ch.* cf. *canescens* WESMAEL). 3 ♂♂: No. 349 (in Papp 1971: 70 *Ch. canescens* WESMAEL). 1 ♂: No. 921. 2 ♂♂: No. 926a. 3 ♂♂: No. 931.

Chelonus canescens WESMAEL, 1835 – The single male specimen reported under this name and also from the locality No. 349 represents *Ch. bimaculatus* SZÉPLIGETI, present rectification; see at this species too. TOBIAS (1986: 311) gives its distribution as follows: Russia (European part, Far East Territory in Siberia), Western Europe.

Locality – 1 ♂: No. 349 (in PAPP 1971: 70 *Ch. bimaculatus* var. *nigriventris* PAPP).

Chelonus capsa Tobias, 1972 – Hitherto known only from Russia (Stavropol region). New to the fauna of Mongolia.

Locality – 1 ♀: No. 1056.

Chelonus caradrinae Kokujev, 1914 – Widely distributed in the late USSR (Tobias 1986: 315), reported from Hungary (Papp 1983: 322, 1987: 322, 1991: 648). New to the fauna of Mongolia.

Localities – 1 ♀: No. 855. 2 ♀♀: No. 915.

Chelonus chrysostigma Tobias, 1972, ♂ new – The species was originally described (Tobias 1972: 603–604) on the basis of the female, the male differs in a few respects from the female as follows:

Male	Female
1. Carapace in dorsal view gradually rounded posteriorly, ventro-apically well incurved.	1. Carapace in dorsal view somewhat acutiform, i.e. posteriorly narrowing (Fig. 20 in Tobias 1972: 605), ventro-apically less incurved.
2. Clypeus with fine and dense punctation.	2. Clypeus almost smooth.
3. Penultimate flagellomere 1.75 times as long as broad.	3. Penultimate flagellomere hardly longer than broad.
4. Antenna with 26 antennomeres.	4. Antenna with 25 antennomeres.

The female holotype of this species is unknown to me, i.e. the differences between the two sexes were established on the basis of its original description. Further material may prove in the future that the two forms represent two distinct species. The single male does not justify the description as new species.

Locality – 1 ♂: No. 1056.

Chelonus contrarius Tobias, 1964 – Antenna with 26–29 antennomeres (26: 5 ♀♀, 27: 4 ♀♀ + 1 ♂, 28: 2 ♂♂, 29: 1 ♀). Hitherto known from Kazakhstan, new to the fauna of Mongolia.

Localities – 6 ♀♀ + 3 ♂♂: No. 1050. 1 ♀: No. 1056. 1 ♀: No. 1123. 1 ♀: No. 1129a.

Chelonus corvulus Marshall, 1885 – Localities: 1 ♂: No. 327. 1 ♂: No. 331. 1 ♂: No. 401. 5 ♀♀: No. 425 (in Papp 1971: 69–70 4 ♀♀: *Ch. annulatus* Nees and 1 ♀: *Ch. carbonator* Marshall). 2 ♀♀: No. 433 (in Papp 1971: 69–70 *Ch. annulatus* Nees). 2 ♀♀ + 1 ♂: No. 444 (in Papp 1971: 69–70 1 ♀ + 1 ♂: *Ch. annulatus* Nees and Papp 1971: 73 1 "♂" = ♀ *Ch. sculpturatus* Szépligeti). 1 ♀: No. 614. 1 ♂: No. 693. 1 ♀: No. 724. 3 ♂♂: No. 855. 1 ♀: No. 921. 1 ♂: No. 985. 1 ♀: No. 1010. 1 ♂: No. 1050. 1 ♂: No. 1056. 1 ♀ + 1 ♂: No. 1115. 1 ♀ + 1 ♂: No. 1123. 1 ♂: No. 1135.

Chelonus dauricus Telenga, 1941 – Localities: 1 ♀: No. 646. 1 ♀: No. 724.

Chelonus inanitus (Linnaeus, 1767) – Localities: 1 ♂: No. 281 (in Papp 1971: 75 *Ch. submuticus* Wesmael). 1 ♂: No. 331 (in Papp l.c.). 16 ♀♀ + 6 ♂♂: No. 724. 2 ♂♂: No. 931. 1 ♂: No. 1010. 1 ♂: No. 1050. 2 ♂♂: No. 1094. 1 ♂: No. 1104. 1 ♂: 1107.

Chelonus jaicus Tobias, 1972 – Recorded from Kazakhstan so far. New to the fauna of Mongolia.

Locality – 1 ♀: No. 1091.

Chelonus kaszabi sp. n.: description see p. 306.

Chelonus mirandus Tobias, 1964, ♂ new – ♂: Antenna with 32 antennomeres. Carapace somewhat longer than mesosoma and with longitudinal rugosity. Tegula yellow. Hind femur apically reddish yellow, hind tibia pale yellow, its distal third brown to blackish. – Hitherto known from Kazakhstan, new to the fauna of Mongolia.

Locality – 1 ♂: No. 826.

Chelonus oculator (Fabricius, 1775) (= *Ch. oculator* Panzer, 1799) – Localities: 1 ♀: No. 614. 1 ♂: No. 632. 1 ♀: No. 637. 1 ♀: No. 644.

Chelonus productus Herrich-Schäffer, 1838 (=*Ch. submuticus* auct. nec Wesmael, 1835) – Previously I reported this species under the name *Ch. submuticus* auct. (Papp 1971: 75) from Mongolia (loc. Nos 281: 1 ♂ and 331: 1 ♂), however, they proved to represent *Ch. inanitus* (Linnaeus) by the reidentification.

Localities – 1 ♂: No. 319 (in Papp 1971: 71 *Ch. pannonicus* Szépligeti). 1 ♀: No. 383 (in Papp l.c.).

Chelonus propodealis Tobias, 1964 – Since its description known only from Kasakhstan (Tobias 1986: 317). New to the fauna of Mongolia.

Localities – 1 ♀: No. 926a. 1 ♀: No. 1129a.

Chelonus sagittatus Papp, 1971 – The original description of this species was based on the female and not on the male sex, it was my fault. Antenna with 25 antennomeres, holotype with 31 antennomeres. Known only from Mongolia.

Locality – 1 ♀: No. 915.

Chelonus scabrator (Fabricius, 1793) – Localities: 1 ♀: No. 730. 1 ♀+1 ♂: No. 732. 1 ♀: No. 921. 2 ♂: No. 1094.

Chelonus smirnovi Telenga, 1953 – Described and up to now known from Russia (Volgograd region). New to the fauna of Mongolia. – Mesonotum (1 ♂: loc. No. 777) exceptionally nearly smooth and glistening; mesonotum usually rugose and shiny (Telenga 1953: 1177).

Localities – 1 ♂: No. 499. 1 ♂: No. 519. 1 ♀: No. 739. 1 ♂: No. 777. 1 ♂: No. 1007. 1 ♀+3 ♂: No. 1056. 1 ♂: No. 1146.

Chelonus striatus Papp, 1971 – Antenna of 1 ♀ (loc. No. 1056) with 27 antennomeres; holotype 20 and 2 ♂ paratypes 25 segmented. Carapace with slightly stronger striation and interspaces more shiny (i.e. with weaker microsculpture) than that of ♀ holotype. Male (from loc. No. 1110) quite similar to the paratypes. – Known only from Mongolia.

Localities – 1 ♀: No. 1056. 1 ♂: No. 1110.

Chelonus subseticornis Tobias, 1971 – Widely distributed in the late USSR (Tobias 1986: 316). New to the fauna of Mongolia.

Localities – 1 ♀: No. 281 (in Papp 1967: 206 *Ch. seticornis* Thomson). 4 ♀♀+1 ♂: No. 331 (in Papp 1971: 73 *Ch. seticornis* Thomson). 2 ♀♀+1 ♂: No. 1107.

Chelonus triquetrus sp. n.: description see p. 309.

Microchelonus agathis Papp, 1971 – Known only from Mongolia.

Localities – 1 ♀: No. 915. 2 ♀♀: No. 1113.

Microchelonus angustiventris Tobias, 1986 – Described recently from the Far East Maritime Territory of Russia (Pogranich rayon). New to the fauna of Mongolia.

Locality – 1 ♀: No. 926.

Microchelonus chalchingoli Tobias, 1989 – Tobias described this species on the basis of four specimens (♀ holotype+3 ♀ paratypes) from three localities of Mongolia.

Localities – 1 ♀ (det. Tobias 1990): No. 319. 1 ♀: No. 1150.

Microchelonus chrysotegula (Tobias, 1964) – Apical fissure of carapace small, distinctly one-third less wide than length of hind basitarsus (Tobias 1986: 333: distinctly wider). – Described and up to now listed from Kazakhstan. New to the fauna of Mongolia.

Locality – 1 ♂ (det. Tobias 1984): No. 637.

Microchelonus contractus (Nees, 1816) – Localities: 1 ♂: No. 514. 7 ♀♀: No. 1056.

Microchelonus elongatus Papp, 1971 – Hitherto known only from Mongolia.

Locality – 1 ♀: No. 1002.

Microchelonus fenestratus (Nees, 1816) – Localities: 2 ♀♀: No. 113 (in Papp 1967: 206 *M. elaephilus* Silvestri). 1 ♀: No. 523. 1 ♀: No. 1123.

Microchelonus fumipennis Tobias, 1986, ♀ new – The species was described recently from Moldavia on the basis of the male sex. Female similar to male, wings more brownish fumous, metasoma 1.6 times as long as broad. New to the fauna of Mongolia.

Locality – 1 ♀: No. 444 (in PAPP 1971: 84 *M. rimatus* SZÉPLIGETI).

Microchelonus hungaricus SZÉPLIGETI, 1908 – A rare species, up to now recorded in Hungary and Azerbaidzhan (TOBIAS 1986: 323). New to the fauna of Mongolia.

Locality – 1 ♂: No. 223 (in PAPP 1967: 206 *M. elaephilus* SILVESTRI).

Microchelonus mirabilis (TOBIAS, 1972) – Described and hitherto known only from Mongolia.

Localities – 1 ♂: No. 926. 5 ♀♀+1 ♂: No. 985.

Microchelonus nitens (REINHARD, 1867) – Body 4–5 (–5.5) mm long thus one of the greatest *Microchelonus* species in the Palaearctic Region. The females from the loc. Nos 1071 and 1100 with posteriorly somewhat acutiform metasoma. Previously recorded by me under the name *Chelonus nitens* (PAPP 1971: 71).

Localities – 7 ♀♀+8 ♂♂: No. 628. 1 ♀+1 ♂: No. 632. 1 ♀: No. 724. 1 ♀: No. 1071. 1 ♂: No. 1094. 1 ♀+2 ♂♂: No. 1100.

Microchelonus parcicornis (HERRICH-SCHÄFFER, 1838) (= *M. rectus* PAPP, 1971) – My female specimen was compared to a female of the Reinhard Coll. (Museum of Berlin), the two specimens are conspecific. The redescription as well as the correct interpretation of this species is needed. Known from Germany, Sweden and Mongolia. My name, *M. rectus*, was synonymized by me recently (PAPP 1990b: 303).

Locality – 1 ♀ (holotype of *M. rectus* PAPP): No. 486.

Microchelonus planicornis TOBIAS, 1989 – Described recently from Mongolia (TOBIAS 1989: 453). Previously (PAPP 1971: 83) I have identified this specimen as *M. parcicornis* HERRICH-SCHÄFFER sensu MARSHALL (1885) and TELENGA (1941). My name was rectified by TOBIAS in 1990.

Locality – 1 ♀ (det. TOBIAS 1990): No. 319.

Microchelonus pusilloides (TOBIAS, 1972) – The species had been described by TOBIAS (1972) from Mongolia on the basis of the single male holotype specimen. My specimens from Mongolia represent the female (7 ♀♀) which seem to be identical with the male (on the basis of the original description). My identification (in 1982) was confirmed by DR. V. I. TOBIAS in 1984.

The two species, *M. pusilloides* (TOBIAS) and *M. pusillus* (SZÉPLIGETI), may be considered as transitional forms between the genera *Microchelonus* SZÉPLIGET and *Chelonus* JURINE. Antenna of both species with 18–19 segments (and not with 16 segments, a generic feature of the genus *Microchelonus*). However, the corporal habitus and other features assign both species to the genus *Microchelonus*. The possible intermediate character of the female antenna was already indicated by TOBIAS (1986: 311, 332), namely he included *M. pusillus* (SZÉPLIGETI) in his key to the species of both genera *Chelonus* and *Microchelonus*.

Known from Mongolia (described from this country) and Turkmenia.

Localities – 1 ♀: No. 819. 2 ♀♀: No. 838. 1 ♀: No. 842. 2 ♀♀: No. 855. 1 ♀: No. 857.

Microchelonus pusillus (SZÉPLIGETI, 1908) – Listed in Hungary and Finland, new to the fauna of Mongolia. The taxon *M. tuberculiventris* TOBIAS, 1986 seems to be identical with *M. pusillus*. Further comments of it see at *M. pusilloides* TOBIAS.

Locality – 1 ♀: No. 504.

Microchelonus retusus (NEES, 1816) – Locality: 1 ♂: No. 908.

Microchelonus risorius (REINHARD, 1867) (? = *Chelonus sulcatus* JURINE, 1806; ? = *Ch. fissus* SZÉPLIGETI, 1900; ? = *M. magnifissus* TOBIAS, 1986) – Reported first from Mongolia (PAPP 1971: 85); TOBIAS (1989) did not include this species in his monograph for the *Microchelonus* species of Mongolia.

Locality – 1 ♂: No. 523.

Microchelonus starki (TELENGA, 1953) – Distributed in Kazakhstan, Russia (European part, Far East Maritime Territory) and Ukraine. New to the fauna of Mongolia.

Locality – 1 ♀: No. 614.

Microchelonus subcontractus (ABDINBEKOVA, 1971) – Hitherto listed in the late USSR, reported recently from Mongolia (TOBIAS 1989: 501). In Mongolia it seems a frequent species.

Localities – 1 ♂: No. 281 (in PAPP 1967: *M. microphthalmus* WESMAEL). 1 ♀ (det. TOBIAS 1990): No. 298 (in PAPP 1971: 86 *M. sulcatus* JURINE). 4 ♀♀+1 ♂ (det. TOBIAS 1990): No. 319 (in PAPP l.c.). 1 ♀ (det. TOBIAS 1990): No. 331 (in PAPP l.c.). 1 ♂: No. 416 (in PAPP 1971: 83 *M. fenestratus* NEES). 1 ♀: No. 657. 1 ♀: No. 732. 1 ♀ (det. TOBIAS 1990): No. 735. 1 ♂ (det. TOBIAS 1990): No. 900. 1 ♀+1 ♂ (det. TOBIAS 1990): No. 921. 1 ♂ (det. TOBIAS 1990): No. 926. 2 ♀♀ (det. TOBIAS 1990): No. 1007. 1 ♀ (det. TOBIAS 1990): No. 1113. 1 ♂: No. 1123. 1 ♀+1 ♂ (det. TOBIAS 1990): No. 1129a. 1 ♀ (det. TOBIAS 1990): No. 1146. 1 ♀+1 ♂ (det. TOBIAS 1990): No. 1150.

Microchelonus zaitzevi (TOBIAS, 1972) – Known only from Mongolia. The female form is very similar to that of *M. subtilistriatus* PAPP, 1971 (temple in dorsal not broadening) and the male form to that of *M. microphthalmus* (WESMAEL, 1838) (?= *Ch. erosus* HERRICH-SCHÄFFER, 1838; ?= *Ch. exilis* MARSHALL, 1885) (carapace somewhat less strongly striate).

Localities – 1 ♂ (det. TOBIAS 1984): No. 377. 1 ♀: No. 429 (in PAPP 1971: 78 *M. contractus* NEES). 1 ♀ (det. TOBIAS 1984): No. 739.

Phanerotoma fracta KOKUJEV, 1903 – Localities: 2 ♂♂ (det. ZETTEL 1988): No. 628. 1 ♀+1 ♂: No. 855. 2 ♀♀+1 ♂: No. 915.

Phanerotoma genalis TOBIAS, 1974 – Locality: 1 ♀ (det. PAPP 1982 and TOBIAS 1983): No. 915.

Phanerotoma katkowi KOKUJEV, 1900* – Localities: 1 ♂: No. 316 (in PAPP 1971: 86–88 holotype of *Ph. excisa* PAPP). 1 ♂: No. 628. 1 ♀+1 ♂: No. 633. 1 ♀: No. 644. 1 ♂: No. 1082. 2 ♀♀: No. 1129a.

Phanerotoma kozlovi SHESTAKOV, 1930 – Locality: 1 ♀ (det. ZETTEL 1989): No. 628.

Phanerotoma minuta KOKUJEV, 1903 – Reported from the late USSR (Kazakhstan, Soviet Middle Asia) and northern China (TOBIAS 1986: 295). New to the fauna of Mongolia.

Localities – 5 ♀♀: No. 680. 1 ♀: No. 857.

Phanerotoma parva KOKUJEV, 1903 – Localities: 7 ♀♀: No. 834. 1 ♂: No. 835. 1 ♀: No. 855. 1 ♀: No. 857. 4 ♀♀: No. 859. 3 ♀♀: No. 882.

Phanerotoma potanini KOKUJEV, 1895 – One of the most frequent *Phanerotoma* species in Mongolia. Known only from Mongolia so far. – As I have indicated (PAPP 1967: 207–208) rugosity of the third tergite either variably or almost hardly weakening posteriorly. The latter case pertains more to the males.

Localities – 1 ♀: No. 494. 1 ♀: No. 742. 1 ♀: No. 800. 2 ♀♀: No. 810. 6 ♀♀: No. 817. 1 ♂: No. 819. 4 ♀♀+2 ♂♂: No. 834. 2 ♂♂: No. 840. 1 ♀+7 ♂♂: No. 869. 10 ♀♀: No. 879. 9 ♀♀: No. 882. 2 ♀♀: No. 885. 32 ♀♀: No. 898. 1 ♀: No. 905. 2 ♀♀+3 ♂♂: No. 915. 12 ♀♀+25 ♂♂: No. 918. 1 ♀: No. 991. 1 ♀: No. 1117.

METEORINAE

Meteorus eadyi HUDDLESTON, 1980 – ♂: Antenna with 30 antennomeres. In dorsal view eye only somewhat longer than temple. ♀: Antenna with 26–27 antennomeres. In dorsal view eye distinctly, i.e. 1.5 times as long as temple. Otherwise not deviating from the European representatives of this species. – Described recently from several European countries (Bul-

* My name, *Ph. excisa* PAPP, is a subjective junior synonym of *Ph. katkowi* KOKUJEV:

Phanerotoma katkowi KOKUJEV, 1900: Trudy russk. entom. Obshch. 34: 30 ♀, type locality: "Districtus Saratowensis", syntype(s) in Sankt Peterburg, Zoological Institute.

Phanerotoma excisa PAPP, 1971: Acta Zool. Hung. **17** (1–2): 86 ♂, type locality: Mongolia, Chentej aimak, Candagam tal, 40 km E from Somon Zargalchaan, 1300 m, holotype in Budapest, Természettudományi Múzeum; **syn. n.**

garia, Federal Republic of Germany, France, Great Britain, Netherlands and Yugoslavia; HUDDLESTON 1980: 29–30). Reported from Armenia and the European part of Russia (TOBIAS 1986: 187), and from Korea (PAPP 1990a: 322). New to the fauna of Mongolia.

Locality – 1 ♂: No. 1010.

Meteorus filator (HALIDAY, 1835) – Locality: 1 ♀: No. 724 (in PAPP 1980: 401 *M. profligator* HALIDAY).

OPIINAE

Biosteres (Biosteres) urbani FISCHER, 1971 – Known only from Mongolia on the basis of its type series (5 ♀♀ + 4 ♂♂).

Locality – 1 ♂: No. 298.

DORYCTINAE

Heterospilus hemipterus (THOMSON, 1892) – My male specimen is identical with the neotype originating from Slovenia (Tolmain) and designated by FISCHER (1960: 47–50) excepting three features:

Mongolian ♂	Slovenian ♂
1. First tergite much wider behind than long medially	1. First tergite less wide behind than long medially.
2. Metasoma stout.	2. Metasoma gracile.
3. Body brownish yellow with rich brown(ish) to black(ish) brown pattern.	3. Body reddish yellow, propodeum and base of first tergite brown(ish).

THOMSON (1892: 1856) remarked on his species that its first cubital cell of male closed ("...cellula 1:a maris undique clausa, ..."), i.e. *cuqu1.* present, which is an inconsistency to the generic feature, namely *cuqu1* absent and at most and exceptionally faintly pigmented. In all other respects *H. hemipterus* THOMSON manifests the features of the genus *Heterospilus* HALIDAY. – A very rare species, hitherto listed from Sweden and Slovenia. New to the fauna of Mongolia.

Locality – 1 ♂: No. 1150.

BRACONINAE

Bracon (Glabrobracon) larvicida WESMAEL, 1838 – Locality: 2 ♂♂: No. 514.

Bracon (Orthobracon) maslovskii TELENGA, 1936 – TOBIAS (1986: 125) placed this name in synonymy with *B. (B.) intercessor* NEES; and the present specimen from Mongolia was identified by him in 1983 with the name *B. maslovskii.* On the basis of the original description (TELENGA 1941: 286 and 401) I consider this taxon as valid species differing from *B. intercessor* in a few features (e.g. strongly rounded temple, sculpture of tergites, less strong body). – The species was described from the Ussuri Region, Far East Maritime Territory of Russia. New to the fauna of Mongolia.

Locality – 1 ♀: No. 967.

Bracon (Glabrobracon) nigriventris WESMAEL, 1838 – Locality: 1 ♂: No. 727.

EXOTHECINAE

Rhysipolis decorator (HALIDAY, 1836) – Head and mesosoma usually black, exceptionally reddish yellow (1 ♀: loc. No. 959 and 1 ♂: loc. No. 1054). Reported from Europe (Belgium, Sweden, the late USSR; TOBIAS 1986: 67). New to the fauna of Mongolia.

Localities – 1 ♂: No. 494. 1 ♂: No. 497. 2 ♂♂: No. 499. 2 ♀♀: No. 508. 1 ♂: No. 514. 1 ♂: No. 519. 1 ♀: No. 926a. 2 ♂♂ (1 ♂ det. BELOKOBYLSKIJ): No. 938. 1 ♀: No. 959. 1 ♀+1 ♂: No. 961. 1 ♂: No. 967. 1 ♂: No. 973. 1 ♂: No. 987. 1 ♂: No. 1054.

Rhysipolis mediator (HALIDAY, 1836) (= *Xenarcha major* SZÉPLIGETI, 1896) – Localities: 1 ♂: No. 493. 1 ♂: No. 499. 1 ♀: 514. 4 ♂♂: No. 519. 1 ♀: No. 531. 1 ♂: No. 540. 1 ♀: No. 693. 1 ♀: No. 732. 1 ♂: No. 771. 1 ♂: No. 934. 3 ♂♂: No. 938. 4 ♀♀+1 ♂: No. 959. 1 ♀: No. 967. 1 ♀: No. 987. 2 ♀♀: No. 1115. 1 ♂: No. 1117. 1 ♂: No. 1126.

ROGADINAE

Aleiodes (Neorhogas) dimidiatus (SPINOLA, 1808) – Locality: 1 ♂: Ömnögovi aimak: 85 km N of Dalanzadgad, 105°08'E and 44°10'N, 21 VII 1986, leg. GY. FÁBIÁN, M. HREBLAY, L. PEREGOVITS et G. RONKAY.

Aleiodes (Neorhogas) ferrugiteli SHENEFELT, 1976 – Distributed in Kazakhstan, Turkmenia and Mongolia; reported first from Mongolia (PAPP 1971: 359, 1977: 113). It seems a semidesert- and deserticolous species.

Locality – 1 ♂: Övöchangay aimak: Mts Hangayn nuruu, 2150 m, Harhorin, 102°49'E and 46°12'N, 29–30 VII 1986, leg. GY. FÁBIÁN, M. HREBLAY, L. PEREGOVITS et G. RONKAY.

2. Description of the new species

Chelonus kaszabi sp. n. ♀
(Figs 1–5)

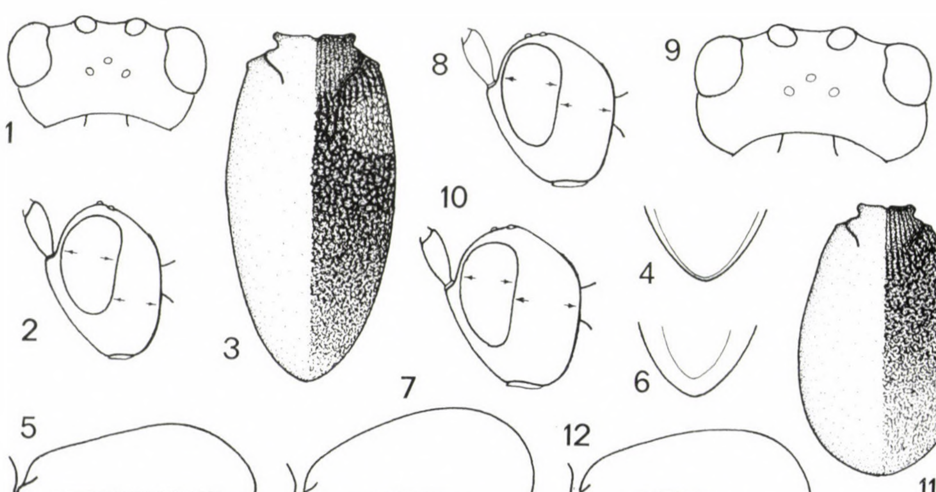
Description of the holotype ♀ – Body 5.5. mm long. Head in dorsal view (Fig. 1) transverse, twice as broad as long, eye twice as long as temple, latter contracted, occiput excavated. Ocelli small, OOL somewhat longer than POL. Cheek 1.5 times as long as basal width of mandible or somewhat less than half as long as height of eye. Temple in lateral view slightly though distinctly broadening ventrally, eye a bit wider than temple behind eye (Fig. 2, see arrows). Clypeus densely punctate, interspaces polished and about as large as punctures. Temple strio-rugose, number of striate elements 8–9. – Antenna as long as head, mesosoma and half carapace, with 30 antennomeres, last eight-nine flagellomeres cubic, ultimate flagellomere blunt.

Mesosoma in lateral view stout, 1.27 times as long as high. Mesonotum shiny and rugulose-uneven, along its lateral margin with striate elements, on its anterior declivous part densely rugulose and dull. Scutellum smooth and shiny with a few very fine punctures. Medio-transverse keel and pair of lateral teeth of propodeum distinct. – Hind femur 3.8 times as long as broad at its middle. Inner (or longer) spur of hind tibia just longer than half basitarsus.

F o r e w i n g shorter than body. Pterostigma 2.5 times as long as wide, issuing radial vein just distally from its middle. Length of radial cell as long as pterostigma; *r2* a bit longer than *r1;* nervulus as long as *d1*.

C a r a p a c e in dorsal view (Fig. 3) twice as long as broad, moderately acute posteriorly; its apico-ventral end not incurved (Fig. 4), i.e. ventral aperture of carapace as long as carapace itself. Carapace in lateral view (Fig. 5) somewhat flattened, one-fourth higher at its posterior third than at its basal third, three times as long as high posteriorly; lower margin of carapace straight. Carapace antero-posteriorly with weakening sculpture (Fig. 3): rugose to rugulose, on its fore half with longitudinal striate elements, dull; its apical declivous part almost smooth, shiny. Ovipositor sheath very short, concealed.

B o d y b l a c k. Middle of mandible, palps and galea reddish with blackish tint. Tegula black. Carapace with a pair of latero-basal yellow spots. Rim of carapace yellowish. Legs black; fore femur entirely and middle femur apically reddish, tibiae 1–2 reddish yellow, hind tibia proximally with a yellow ring. Spurs of tibiae pale. Tarsi black, basitarsi reddish yellow. Wings brownish fumous, pterostigma and veins brown.



Figs 1–5. *Chelonus kaszabi* sp. n.: 1 = head in dorsal view, 2 = head in lateral view, 3 = carapace in dorsal view with indication of its sculpture, 4 = apico-ventral end of carapace, 5 = carapace in lateral view. – Figs 6–8. *Ch. annulatus* (NEES): 6 = apico-ventral end of carapace, 7 = carapace in lateral view, 8 = head in lateral view. – Figs 9–12. *Ch. dauricus* TELENGA: 9 = head in dorsal view, 10 = head in lateral view, 11 = carapace in dorsal view with indication of its sculpture, 12 = carapace in lateral view.

Description of the paratypes (10 ♀♀) – Similar to the holotype. Body 4.5–5 mm long (4.5: 1 ♀, 4.8: 4 ♀♀, 5: 5 ♀♀). Head just to distinctly twice as broad as long. Antenna with 28–30 antennomeres (28: 1 ♀, 29: 2 ♀♀, 30: 3 ♀♀, 3 ♀♀ with damaged antenna). Sculpture of mesonotum similar to that of holotype (4 ♀♀) or somewhat rougher and less shiny (5 ♀♀). Hind femur 3.5–4 times as long as broad at middle (3.5: 1 ♀, 3.6: 1 ♀, 3.9: 2 ♀♀, 4: 4 ♀♀). Carapace in dorsal view clearly twice as long as broad about its middle. Carapace in lateral view one-third to one-seventh higher at its posterior third than at its basal third (one-third: 1 ♀, one-fourth: 5 ♀♀, one-fifth: 2 ♀♀, one-seventh: 1 ♀); 2.85–3.1 times as long as high posteriorly (2.85: 1 ♀, 2.9: 4 ♀♀, 3: 3 ♀♀, 3.1: 1 ♀). Extent of reddish colour of fore and middle femora variable (4 ♀♀). Pair of latero-basal yellow spots of carapace absent (1 ♀), extent of spots (or distance between them) variable (8 ♀♀).

♂ and host unknown.

Type material – Holotype ♀: Mongolia, Chövsgöl aimak, 13 km O von der Stadt Mörön, 1550 m, 20. 7. 1968. leg. Z. KASZAB (No. 1129a). – Paratypes (10 ♀♀): 1 ♀: Mongolia, Uburchangaj aimak, Changaj Gebirge, 2 km S von Somon Schanch, 1690 m, 30. 6. 1964, leg. Z. KASZAB (No. 230) (previously in PAPP 1967: 206 named as *Ch. dauricus* TELENGA). 3 ♀♀: Mongolia, Čojbalsan aimak, 15 km N von Somon Galuut, 850 m, 17. 8. 1965, leg. Z. KASZAB (No. 433) (previously in PAPP 1971: 71 named as *Ch. dauricus* TELENGA). 3 ♀♀: Mongolia, Čojbalsan aimak, 20 km Somon Bajan-uul, 820 m, 18. 8. 1965, leg. Z. KASZAB (No. 444) (previously in PAPP 1971: 71 named as *Ch. dauricus* TELENGA, 1 ♀ + "2 ♂♂"). 1 ♀: Mongolia, Central aimak, Ulan-Baator, Nucht im Bogdo ul, 1500–1600 m, 21. 7. 1967, leg. Z. KASZAB (No. 931). 1 ♀: Mongolia, Uvs aimak, Paß Ulaan davaa, am östlichen Hang, zwischen See Örög nuur und Ulaangom, 1950 m, 6. 7. 1968, leg. Z. KASZAB (No. 1069). 1 ♀: Mongolia, Chövsgöl aimak, 3 km SW von Somon Buren-chaan, 1650 m, 16. 7. 1968, leg. Z. KASZAB (No. 1113).

Holotype (♀) and 8 paratypes (8 ♀♀) are deposited in the Hungarian Natural History Museum, Budapest, Hym. Typ. Nos 7460 (holotype) and 7461–7468 (paratypes). 2 ♀ paratypes (loc. Nos 433 and 444) are deposited in the Zoological Institute, Academy of Sciences, Sankt Peterburg.

Ethymology – The new species is dedicated to its collector, the late DR. ZOLTÁN KASZAB (1915–1986), resolute explorer of the insect fauna of Mongolia and world specialist of the beetles Tenebrionidae and Meloidae.

The new species, *Chelonus kaszabi* sp. n., is related to a few species within the *annulatus* species-group: *Ch. annulatus* (NEES, 1816), *Ch. chrysostigma* TOBIAS, 1972, *Ch. cisdauricus* TOBIAS, 1986 and *Ch. dauricus* TELENGA, 1941; they are distinguished by the following features in a tabular form:

Ch. kaszabi sp. n.	*Ch. annulatus* (NEES)
1. Carapace apico-ventrally not incurved (Fig. 4); in lateral view somewhat flattened, three times as long as high behind (Fig. 5).	1. Carapace apico-ventrally somewhat though distinctly incurved (Fig. 6); in lateral view less flattened, 2.3–2.5 times as long as high behind (Fig. 7).
2. In lateral view temple slightly broadening ventrally (Fig. 2, see arrows); cheek	2. In lateral view temple not broadening ventrally (Fig. 8, see arrows); cheek

nearly twice as long as basal width of mandible.
3. Tegula black; hind femur always black.

somewhat longer than basal width of mandible.
3. Tegula yellow to brownish (at least its fore half always yellow.

Ch. kaszabi sp. n.
1. Temple in dorsal view contracted, eye longer than temple (Fig. 1).
2. Carapace apico-ventrally not incurved (Fig. 4).
3. Antenna with 30 antennomeres.
4. Tegula and pterostigma black.

Ch. chrysostigma TOBIAS
1. Temple in dorsal view rounded, eye as long as temple (cf. Fig. 9).
2. Carapace apico-ventrally somewhat incurved.
3. Antenna with 25 antennomeres.
4. Tegula and pterostigma yellow.

Ch. kaszabi sp. n.
1. Temple in dorsal view contracted (Fig. 1).
2. Pterostigma less wide, 2.5–2.65 times as long as wide.
3. Scutellum smooth and shiny with disperse and very week punctures.
4. Carapace in dorsal view 1.8–2 times as long as broad at its middle (Fig. 3).

Ch. cisdauricus TOBIAS*
1. Temple in dorsal view rounded.
2. Pterostigma wide, twice as long as wide.
3. Scutellum rugose.
4. Carapace in dorsal view 1.6–1.85 times as long as broad.

Ch. kaszabi sp. n.
1. Temple in dorsal view contracted, eye distinctly longer than temple (Fig. 1).
2. Temple in lateral view slightly broadening ventrally, behind eye at most as wide as eye (Fig. 2 see also arrows).
3. Carapace in dorsal view twice as long as broad at its middle, moderately acutiform behind; medially its sculpture rather areolated (Fig. 3).

Ch. dauricus TELENGA
1. Temple in dorsal view rounded, eye somewhat longer than temple (Fig. 9).
2. Temple in lateral view not broadening ventrally and one-fourth wider than eye (Fig. 10 see also arrows).
3. Carapace in dorsal view 1.7–1.75 times as long as broad at its middle, rounded behind; medially its sculpture not areolated (Fig. 11).

Chelonus triquetrus sp. n. ♀
(Figs 13–18)

D e s c r i p t i o n o f t h e h o l o t y p e ♀ – Body 2.8 mm long. H e a d in dorsal view (Fig. 13) transverse, 2.13 times as broad as long, eye distinctly twice as long as temple, latter constricted, occiput excavated. Ocelli small and forming a low triangle, i.e. hind imaginary tangent to fore ocellus touching hind pair of ocelli, OOL somewhat longer than POL. Cheek long, in lateral view three times as long as basal width of mandible or nearly as long as height of eye; in frontal cheek clearly converging, i.e. giving a three-sided outline of head (Fig. 14). Temple in lateral view (Fig. 15) broadening ventrally, eye as wide as temple ventrally (see arrows in Fig. 15). Clypeus with fine subpunctation, interspaces smooth and shiny. Head strio-

* I know this species only on the basis of its original description (TOBIAS 1986: 312).

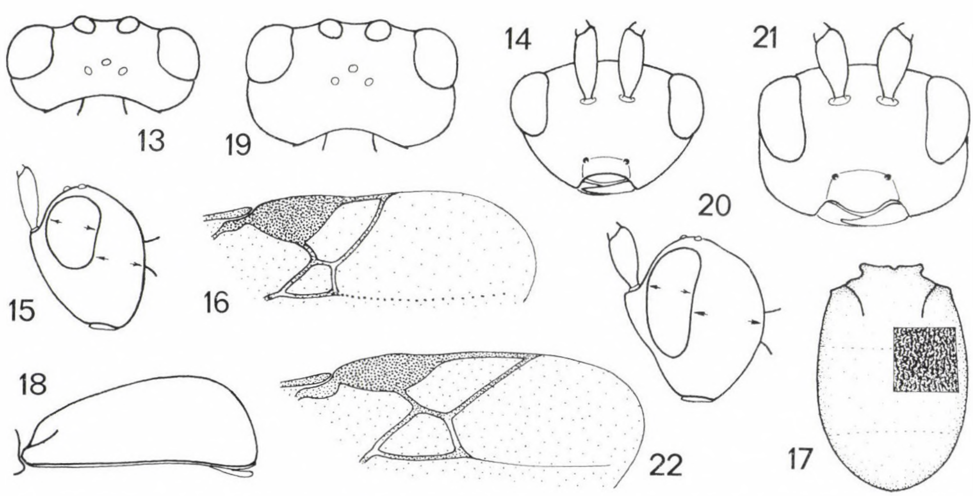
rugulose, subshiny. – Antenna about as long as body, with 18 antennomeres, penultimate flagellomere twice as long as broad.

Mesosoma in lateral view 1.5 times as long as high. Mesonotum rugose, behind densely rugose (before prescutellar furrow). Scutellum with shallow punctation, interspaces shiny and about as long as diameter of punctures. Medio-transverse keel and pair of lateral teeth of propodeum distinct. – Hind femur 4.58 times as long as broad at its middle. Inner (or longer) spur of hind tibia shorter than half basitarsus.

Fore wing shorter than body. Pterostigma (Fig. 16) wide, 1.88 times as long as wide, issuing radial vein just distally from its middle. Radial cell short, length of radial cell along metacarp half as long as pterostigma; *r1* deflacted and somewhat shorter than *r2*. Nervulus longer than *d1*.

Carapace in dorsal view (Fig. 17) 1.59 times as long as broad at its middle, rounded posteriorly; its apico-ventral end not incurved (cf. Fig. 4). Carapace in lateral view high (Fig. 18), just one-third higher at its posterior third than at its basal third; 2.5 times as long as high behind; lower margin of carapace straight. Sutures 1 and 2 hardly distinct. Carapace antero-posteriorly with weakening sculpture: rugose / rugulose to uneven, its hind declivous part uneven to almost smooth and shiny. Ovipositor sheath short.

Body tricoloured. Head and mesosoma black, carapace reddish yellow, legs yellow. Mandible yellow, palpi pale yellow. Scape, pedicel and



Figs 13–18. *Chelonus triquetrus* sp. n.: 13 = head in dorsal view, 14 = head in frontal view, 15 = head in lateral view, 16 = distal part of right fore wing, 17 = carapace in dorsal view with indication of its sculpture, 18 = carapace in lateral view. – Figs 19–22. *Ch. erythrogaster* LUCAS: 19 = head in dorsal view, 20 = head in lateral view, 21 = head in frontal view, 22 = distal part of right fore wing.

first flagellomere yellow, second flagellomere darkening brownish, further flagellomeres brown to dark brown. Tegula yellow. Carapace with brownish tint except its lateral and apical declivous part. Hind coxa rather reddish yellow, basally brownish. Wings hyaline, pterostigma brown, veins opaque brown.

♂ and host unknown.

Type material – Holotype ♀: Mongolia, Südgobi aimak, Tachilga ul, zwischen Zogt-Ovoo und Dalanzadgad, 1550 m, 12 June 1967, leg. Z. KASZAB (No. 792). – Holotype is deposited in the Hungarian Natural History Museum, Budapest, Hym. Typ. No. 7469.

Ethymology – The species name "triquetrus" refers to the three-sided head in frontal view.

The new species, *Chelonus triquetrus* sp. n., runs to *Ch. erythrogaster* LUCAS, 1846 (Southern Europe, North Africa: Algeria), their common features are (1) little number of antennomeres (*Ch. erythrogaster* 17, *Ch. triquetrus* 18), (2) carapace ventro-apically hardly incurved, (3) metasoma, tegula and legs reddish yellow. The two species are distinguished by the following features:

Ch. triquetrus sp. n.	*Ch. erythrogaster* LUCAS
1. Antenna long, as long as body; flagellomeres moderately long, every flagellomere distinctly twice as long as broad.	1. Antenna short, as long as head + mesosoma together; flagellomeres long, first 3–4 flagellomeres four times as long as broad, further ones gradually shortening and attenuating so that penultimate flagellomere twice as long as broad.
2. Temple in dorsal view (Fig. 13) contracted, clearly shorter than eye.	2. Temple in dorsal view (Fig. 19) rounded, nearly as long as eye.
3. Radial cell short (Fig. 16), metacarp half as long as pterostigma.	3. Radial cell long (Fig. 22), metacarp nearly as long as pterostigma.
4. Temple in lateral view broadening ventrally, behind eye temple at most as wide as eye (Fig. 15, see also arrows).	4. Temple in lateral view not broadening ventrally, behind eye temple about one-third wider than eye (Fig. 20, see also arrows).
5. Head in frontal view three-sided, i.e. cheeks ventrally converging (Fig. 14).	5. Head in frontal view four-sided, i.e. cheeks ventrally not converging, rounded as usually (Fig. 21).

Taxonomic remarks – 1. In January 1991 DR. V. I. TOBIAS (Sankt Peterburg) identified the holotype specimen as "Chelonus sp. n. aff. erythrogaster Luc.". His identification considerably promoted the recognition of the new species.

2. The small body size, the quality of the sculpture of the body and the short radial cell indicate that the species in question belongs rather to the genus *Microchelonus*. However, I disregard to classify the new species into this genus considering the number of the antennomeres (18). Certainly this

species also represents a transitional form between the genera *Chelonus* and *Microchelonus* like *Microchelonus pusillus* SZÉPLIGETI, *M. starki* TELENGA etc. which taxonomic position would be verified by the male with apical aperture on its carapace.

REFERENCES

ACHTERBERG, C. VAN (1982): Revisionary notes on Chelonus Jurine and Anomala Von Block (Hymenoptera: Braconidae, Cheloninae). – *Entom. Ber.* **42:** 185–190.

FISCHER, M. (1960): Revision der paläarktischen Arten der Gattung Heterospilus Haliday (Hymenoptera, Braconidae). – *Polskie Pismo Entom.* **30** (4): 33–64.

HUDDLESTON, T. (1980): A revision of the western Palaearctic species of the genus Meteorus (Hymenoptera: Braconidae). – *Bull. Br. Mus. nat. Hist.* (Ent.) **41** (1): 1–58.

HUDDLESTON, T. (1984): The Palaearctic species of Ascogaster (Hymenoptera: Braconidae). – *Bull. Br. Mus. nat. Hist.* (Ent.) **49** (5): 341–392.

PAPP, J. (1967): Ergebnisse der zoologischen Forschungen von Dr. Z. Kaszab in der Mongolei, 101. Braconidae (Hymenoptera) I. – *Acta Zool. Hung.* **13** (1–2): 191–226.

PAPP, J. (1971): Results of the zoological explorations of Dr. Z. Kaszab in Mongolia. Hymenoptera: Braconidae II. – *Acta Zool. Hung.* **17** (1–2): 51–90.

PAPP, J. (1983): A survey of the braconid fauna of the Hortobágy National Park (Hymenoptera, Braconidae), II. – in S. MAHUNKA (ed.): The Fauna of the Hortobágy National Park **2:** 315–337.

PAPP, J. (1987): First survey of the braconid fauna of the Kiskunság National Park, Hungary (Hymenoptera, Braconidae). – in S. MAHUNKA (ed.): The Fauna of the Kiskunság National Park p. 314–334.

PAPP, J. (1990a): Braconidae (Hymenoptera) from Korea, XIII. – *Acta Zool. Hung.* **36** (3–4): 319–330.

PAPP, J. (1990b): A revision of Thomson's Microchelonus species (Hymenoptera: Braconidae, Cheloninae). – *Acta Zool. Hung.* **36** (3–4): 295–317.

PAPP, J. (1991): Second survey of the braconid wasps in the Bátorliget Nature Conservation areas, Hungary (Hymenoptera: Braconidae). – in S. MAHUNKA (ed.): Bátorliget Nature Reserves – after forty years **2:** 639–674.

(TELENGA, N. A.) Теленга, Н. А. (1941): Сем. Braconidae подсем. Braconinae (продолжение) и Sigalphinae. – In: Фауна СССР, Насекомые Перепончатокрылые **5** (3): 1–466.

(TELENGA, N. A.) Теленга, Н. А. (1953). К систематике наездников браконид рода Chelonus Jurine и Chelonella Szépl. (Hymenoptera, Braconidae). – Зоол. Журн. **32** (6): 1175–1177.

(TOBIAS, V. I.) Тобиас, В. И. (1964). Новые виды и род браконид (Hymenoptera, Braconidae) из Казахстана. – *Труды Зоол. Инст.* **34:** 177–234.

(TOBIAS, V. I.) Тобиас, В. И. (1972): Новые виды браконид (Hymenoptera, Braconidae) из Монголии. – *Насек. Монг.* **1:** 585–612.

(TOBIAS, V. I.) Тобиас, В. И. (1986): 27. Отряд Hymenoptera Перепончатокрылые. Семейство Braconidae – Бракониды. – Опред. Насек. Европ. Ч. СССР **III/4:** 1–501.

(TOBIAS, V. I.) Тобиас, В. И. (1989): Наездники рода Microchelonus (Hymenoptera, Braconidae) Монголии. – *Насек. Монг.* **10:** 413–505.

Acta Zoologica Hungarica 38 (3–4), pp. 313–320 (1992)

IMMATURE STAGES OF LEIOMYZA DUDAI SABROSKY, 1956 (DIPTERA, ASTEIIDAE: SIGALOESSINAE)

L. PAPP

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 13th January 1992)

Eggs, larvae (L_2, L_3) and puparium of *Leiomyza dudai* SABROSKY, 1956 are described from Hungary. These are the first known developmental stages in the subfamily Sigaloessinae of Asteiidae. Some comments on the bionomics of the species and a comparison of the immature stages of the two subfamilies are also given. With 18 original figures.

There is rather little known on the immature stages of the acalyptrate dipterous family Asteiidae. HENNIG (1952) published information under "Familie Asteiidae" on two species of *Stenomicra,* which are not asteiids. HARDY & DELPHINADO (1980) published a short description of the puparium of an *Asteia* species, and they gave a good drawing on the egg of *Asteia sabroskyi* HARDY et DELPHINADO, 1980 (Fig. 104c). FERRAR (1987) summarized information on immatures and biology of the cyclorrhaphan dipterous families, incl. Asteiidae but one can see there that no description or drawings of any asteiid larvae had been published previously. Most recently MURPHY (1991) published the first full documentation of an asteiid species, namely of his *Asteia avicenniae.*

Three years ago numerous larvae and other developmental stages of another form of asteiids, *Leiomyza dudai* SABROSKY, 1956, a representative of the other asteiid subfamily Sigaloessinae were collected in a forest in the outskirts of Budapest (the classification of asteiids in two subfamilies seems widely accepted, e.g. PAPP 1984). Below eggs, second and third larval instars and puparium of this species are described and 18 original drawings were made in order to make information more accessible.

In the nomenclature of larval morphology HENNIG'S (1952) and TESKEY'S (1981) terminology is used. When making preparates 10 per cent sodium hydroxide was applied only in order to remove soft particles from cephalopharyngeal skeleton of larvae or to soften puparial shell.

I should like to express my gratitude to DR. AMNON FREIDBERG (Tel Aviv University, Department of Zoology) who facilitated this study and who sent me his drawings on a *Phlebosotera* species prior to their publication in a paper on the asteiid species of Israel.

Leiomyza dudai SABROSKY
(Figs 1–18)

Leiomyza dudai SABROSKY, 1956: 222; PAPP 1972: 316.

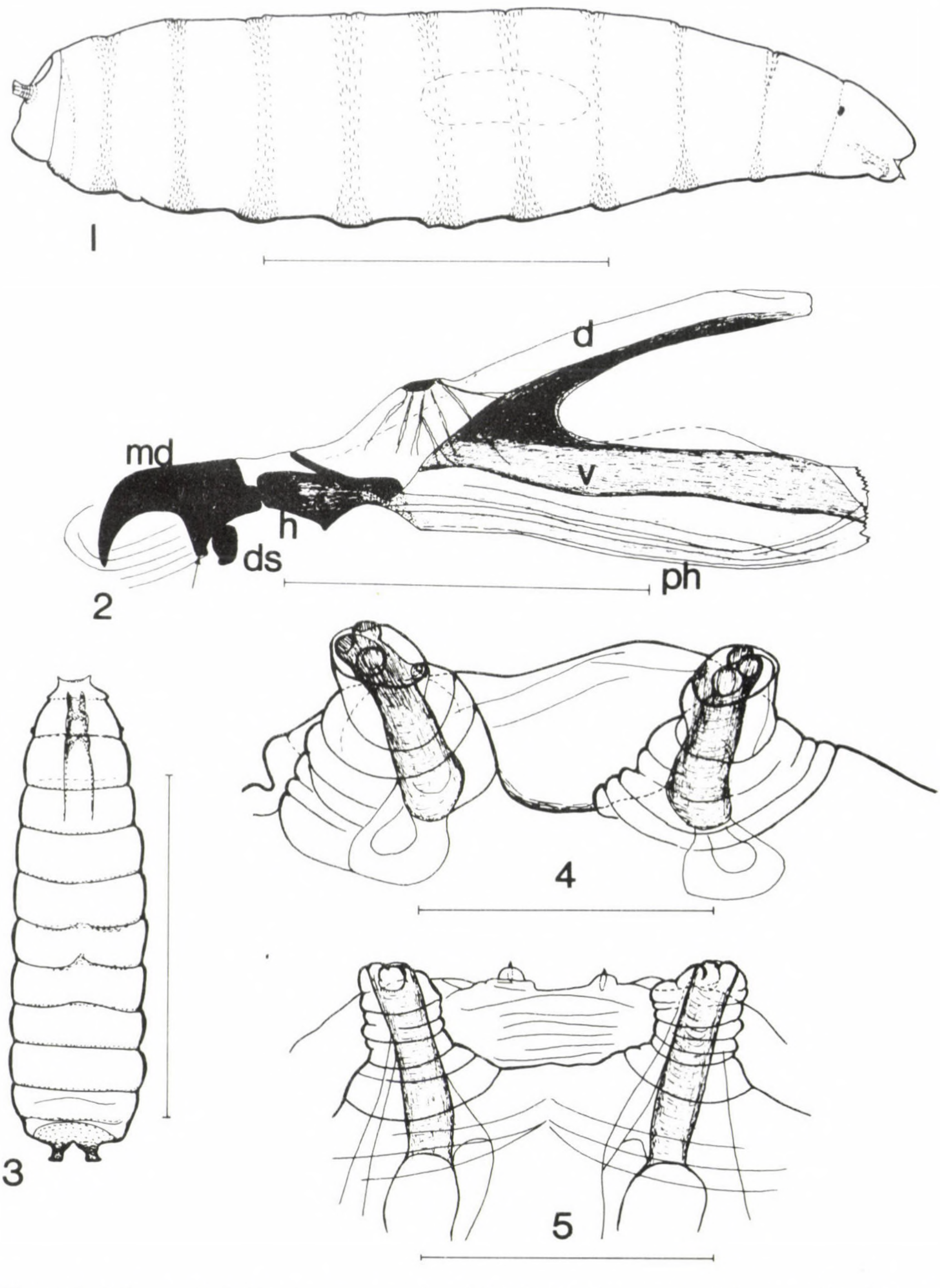
Material studied: ca. 2,000 second and third instar larvae and pupae and several hundred imagos reared from sporophores of *Psathyrella candolleana* grown under an old white poplar tree *(Populus alba)*; locality: Hungary, Budapest, Pestszentlőrinc, Péterhalmi erdő [=forest], 18 August 1989; most of the imagos emerged on the 10th and 11th of September in a laboratory (dark, 22 ± 1°C). In addition, more than 150 imagos were netted over the sporophores in the forest.

Eggs. 0.52–0.60 × 0.14–0.16 mm when laid but swollen in water or on the moist surface of fungus lamellae up to 0.78–0.86 × 0.24–0.26 mm, in this latter state as long as or longer than the gravid female abdomen. White, chorion reticulate, fungal spores glued into the wall make it crispy grey reticulated. It seems general for the asteiids that the eggs are so large: HARDY & DELPHINADO (1980: Fig. 104c) gave 0.5 mm for the eggs of *Asteia sabroskyi* HARDY et DELPHINADO, 1980 (vs. 1.25 mm long puparium), MURPHY (1991) reported 0.40 mm long eggs for *Asteia avicenniae* (vs. wing length of 1.6 mm).

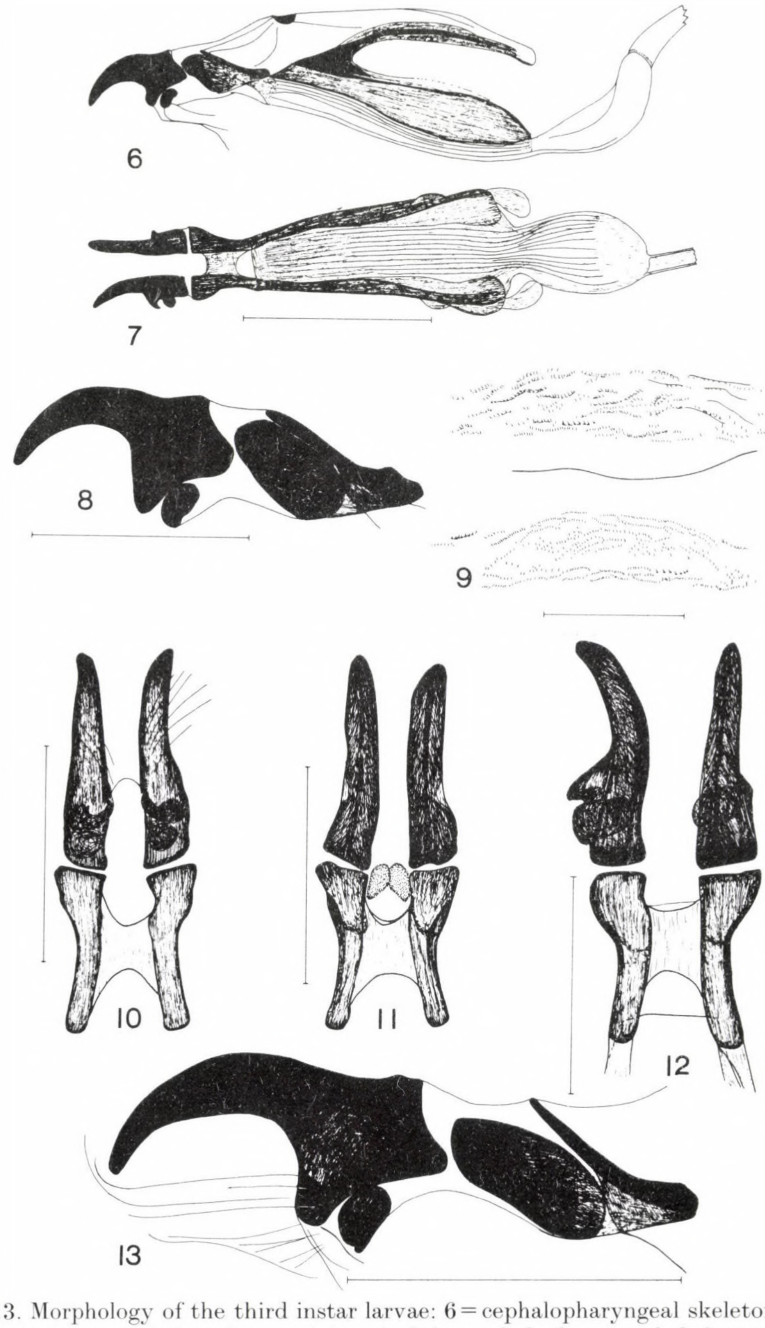
First instar larvae were not found; I think the first larval stage is very short, first molting is possibly in the egg-shell, or simultaneously with hatching. The youngest second instars are not much longer than the egg (swollen).

Second instar larva. Body length 1.2–1.4 mm (longest when molting to L3); distinctly different from L3 not only as regards its size but more dorsoventrally flattened and segment borders are far more definite; otherwise it possesses very few true external characteristics (Fig. 3); cephalopharyngeal skeleton very weakly sclerotized, a long and thin structure of yellow(ish) colour.

Third instar larva. Body length of the full-grown larvae 2.0–2.7 mm; body white or even brilliantly white, cylindrical, no fleshy tubercles/lobes; salivary gland comparatively large (in the 2nd to 3rd (4th) abdominal segment); cephalopharyngeal skeleton of the third instar peculiar: no labial sclerites, i.e. labial sclerite membraneous, not sclerotized (Fig. 11); no parastomal bar, at least – I think – we must not homologize the pair of bars (well sclerotized structures cranially and dorsally to pharynx) with parastomal bar sensu TESKEY 1981, since as far as I can see, these bars of *Leiomyza* are connected with the hypopharynx rather than main part of the cephalopharyngeal skeleton; no abductor/adductor apodemes on mandibles but there are a pair of medially directed teeth on the ventral part of the



Figs 1–5. *Leiomyza dudai* SABROSKY, second and third instar larvae. 1 = full-grown third instar larva laterally, 2 = its cephalopharyngeal skeleton in lateral view (md: mandible, ds: dental sclerite, h: hypopharynx, d: dorsal cornu, v: ventral cornu, ph: pharynx); 3 = second instar larva in dorsal view; 4 = posterior spiracles of the L_3 in a subdorsal view, 5 = same, dorsal view. – Scales: 1.0 mm for Figs 1, 3, 0.2 mm for Fig. 2, 0.1 mm for Figs 4–5.

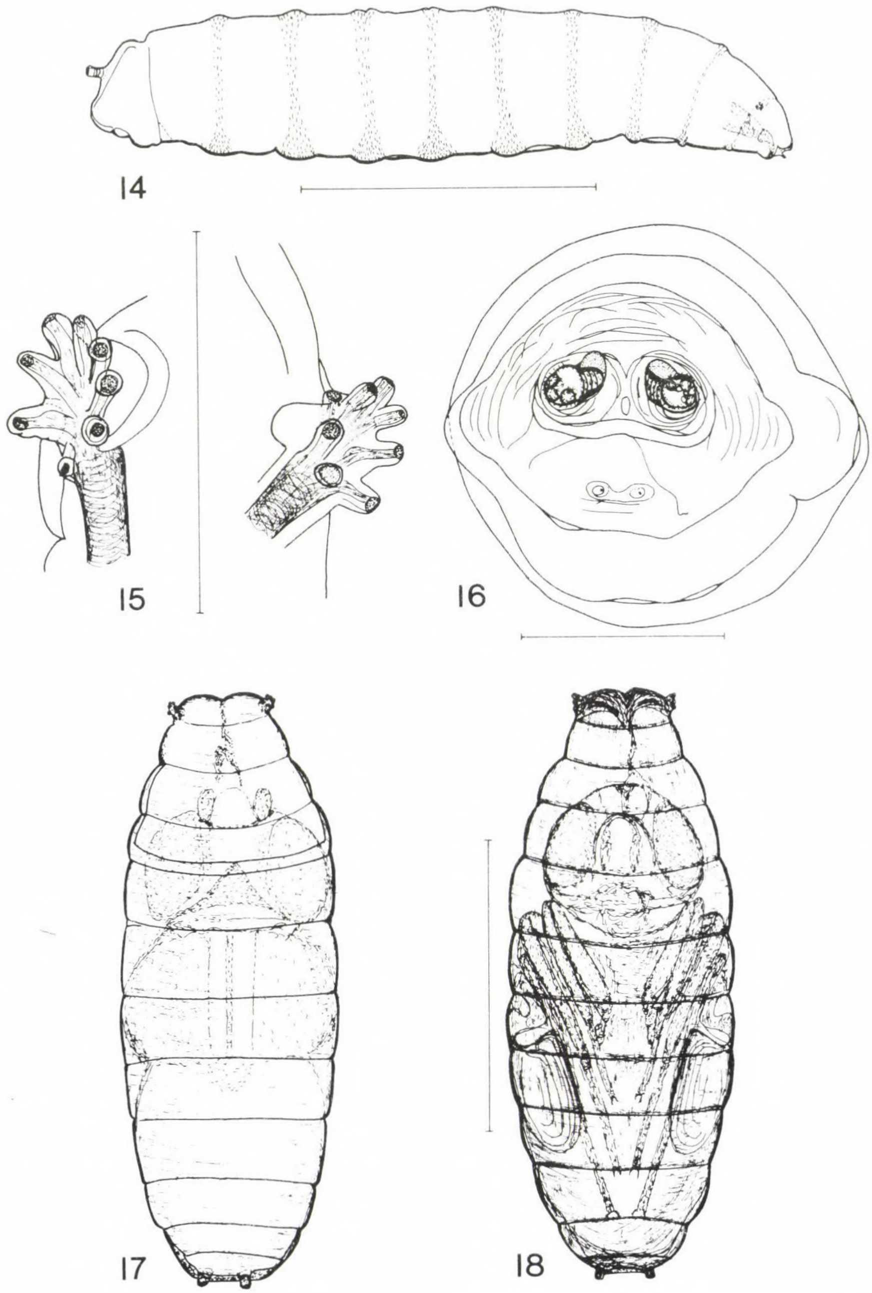


Figs 6–13. Morphology of the third instar larvae: 6 = cephalopharyngeal skeleton in lateral view, 7 = same, ventral view, 8 = cranial part of the cephalopharyngeal skeleton in a higher magnification with slightly divergent mandibles, 9 = creeping setulae on the 6th and 7th abdominal segment, ventrally, 10 = cranial part of the cephalopharyngeal skeleton in ventral view, 11 = same, dorsal view, 12 = same, dorsal view of another larva in situ with somewhat distorted mandibles, 13 = same, full lateral view. – Scales: 0.2 mm for Figs 6–7 and 9, 0.1 mm for Figs 8, 10–12 and 13.

mandibles (signed with an arrow in Fig. 2); dental sclerite small but compact; hypopharynx of an intricate structure; dorsal and ventral cornu extremely weakly sclerotized, they are actually yellow but darkened in the "black-and-white" figures here; pharynx comparatively large, consequently pharyngeal filter more voluminous than in other dipterous families, enlarged also by a weakly sclerotized emargination of the oesophagus (Figs 6–7, seen also in Fig. 3: M, N of MURPHY 1991). Anterior spiracles with 7 + 1 bulbs each (Fig. 15), posterior spiracles on short dorso-caudally directed semicylindrical processes, each with 3 round openings (medially with remains of the spiracles of the second instar, "ecdysial scar" of TESKEY), this cylinder sclerotized on the puparium only and includes a short and wide cylindrical tube and more cranially a spiracular synus ("air chamber"). All body segments with creeping welts (except for first thoracic), creeping welts with unarranged small spinules (Fig. 9).

Puparium. Ochreous yellow to light brown. Shorter than a full-grown larva, 1.82 to 2.1 mm (Figs 17–18). HARDY et DELPHINADO (1980) published a short description of the puparium of *Asteia sabroskyi* HARDY et DELPHINADO, 1980 in five lines without drawings. The puparium of *Phlebosotera* is very similar to *Leiomyza* (Figs 17–18, A. FREIDBERG pers. comm.). The puparium of *Asteia avicenniae* MURPHY, 1991 lacks any peculiar outer characteristics (even more barrel-shaped).

Biology. PAPP (1972) reported its rearings from 35 species of Agaricales fungi from Hungary including *Psathyrella candolleana* and *P. spadiceo-grisea*. Our present observations can be summarized as follows. The eggs are laid between the lamellae of Agaricales fungi, however, some larvae were found feeding in(inside) the stalks. The pairs meet on the dorsal surface of pileus, their copulation is preceded by a long period of "mating dance" of the male: it moves its wings up and down (cf. FREIDBERG 1984). The copulation is normally very long: half an hour or even longer. Pairs in copula were found in my rearing jar of 0.3 liter (i.e. the free space was less than 0.2 liter) one day after their emergence, i.e. without any feeding prior to mating. This means that it would be easy to culture this species in the laboratory on fresh mushrooms. The ripening of eggs in female is much different from that of the muscoid flies: in one occasion only 2 to 4 eggs are laid but egg-laying is more or less continuous in the whole life; the number of eggs laid during a life-time is still unknown to me. The eggs are enormously big compared to the size of imagos or of pupae (see above; otherwise it seems general that the asteiid eggs are rather large compared to the imago body length). PAPP (1972) reported on 292 *Leiomyza* specimens (*L. dudai* and *L. laevigata*) from 42 positive fungus samples, i.e. the mean of the number of specimens per sample is only 6.95. The larvae of *Phlebosotera* sp. were reared from under



Figs 14–18. Third instar larva and puparium: 14 = another third instar larva in lateral view, 15 = anterior spiracles of the L3, the left one in dorsal view, the right one laterally; 16 = posterior spiracles as seen on a pupal shell, caudal view (scales: 1.0 mm, 0.1 mm and 0.2 mm), 17 = puparium with a fly ready to emerge, dorsal view, 18 = same, ventral view. – Scales: 1.0 mm for Figs 14, 17–18, 0.1 mm for Fig. 15, 0.2 mm for Fig. 16.

pine bark. The larvae of *Asteia avicenniae* MURPHY, 1991 were reared from flower buds of *Avicennia officinalis* L.; the larvae of other *Asteia* species seem saprophagous: *A. sabroskyi* was reared from rotting bark and stems of *Pisonia*, *Charpentiera* and *Urera*, and from seed pods of *Hibiscadelphus* (HARDY & DELPHINADO 1980), *A. montgomeryi* HARDY, 1980 was reared from rotting stems of *Erythrina sandwichensis*.

Discussion. GRIFFITHS (1972) put the family Asteiidae in the superfamily Opomyzoidea together with Clusiidae, Odiniidae, Agromyzidae, Anthomyzidae, Aulacigastridae, Periscelididae, (Stenomicridae, Xenasteiidae), Milichiidae, Australimyzidae, Carnidae, Braulidae, Fergusoninidae, Teratomyzidae. The characteristics of the larval cephalopharyngeal skeleton enable us to separate them from the other known larvae of this group.

The characteristics (only some of them are synapomorphies) of the asteiid larvae can be summarized as follows: semicylindrical (i.e. anterior part conical) or slightly S-shaped, white, without any conspicuous outer features; segments with creeping welts except for the first thoracic (Sigaloessinae) or first two thoracic segments (Asteiinae); pharynx long and deep and extended caudally, i.e. also a weakly sclerotized emargination of oesophagus with ventral chambers for filtering; dorsally to the posterior edge of hypopharynx there is a sclerotized button for insertion of muscles (Figs 2, 6, cf. Fig. 3M of MURPHY 1991); dorsal and ventral cornu very weakly sclerotized; dental sclerite present (Sigaloessinae) or absent (Asteiinae); mandibles long and arcuately curved; labial sclerite hardly if at all sclerotized; hypopharynx of an intricate structure [actually I am unable to decide at any respect based on MURPHY's drawings]; anterior spiracles with 4 to 8 bulbs; posterior spiracles with 3 pairs of round (or even bulbous) openings, posterior spiracles on short cylindrical processes, inside the last segment there is a pair of air chambers joining the posterior spiracles through cylindrical, weakly sclerotized tubes (Figs 4–5).

REFERENCES

FERRAR, P. (1987): A guide to the breeding habits and immature stages of Diptera Cyclorrhapha. E. J. Brill, Leiden, I: 1–478, II: i–iv + 479–907.

FREIDBERG, A. (1984): The mating behavior or Asteia elegantula with biological notes on some other Asteiidae (Diptera). – *Entomol. Gener.* **9** (4): 217–224.

GRIFFITHS, G. C. D. (1972): The phylogenetic classification of Diptera Cyclorrhapha, with special reference to the structure of the male postabdomen. The Hague, Junk ed., Series Entom. **8:** 1–340.

HARDY, D. E. & DELPHINADO, M. D. (1980): Insects of Hawaii, Volume 13, Diptera: Cyclorrhapha III. Univ. Press of Hawaii, Honolulu, VI + 451 pp., Asteiidae, p. 229–251, spec. p. 244–247.

HENNIG, W. (1952): Die Larvenformen der Dipteren. Eine Übersicht über die bisher bekannten Jugendstadien der zweiflügeligen Insekten, Berlin, **3:** I–VII + 1–628.

MURPHY, D. H. (1991): A new species of Asteia Meigen and its immature stages (Insecta: Diptera, Asteiidae) from flowers of Avicennia in Singapore. – *Raffles Bull. Zool.* **39:** in print.

PAPP, L. (1972): Systematical and ecological investigations on fly pests of fungi in Hungary. II. Sphaeroceridae and Asteiidae (Diptera). – *Annls hist.-nat. Mus. natn. hung.* **64:** 315–317.

PAPP, L. (1984): Family Asteiidae. – In: SOÓS, Á. & PAPP, L. (eds): Catalogue of Palaearctic Diptera. **10:** 63–66.

SABROSKY, C. W. (1956): Additions to the knowledge of the Old World Asteiidae (Diptera). – *Revue fr. Ent.* **23** (4): 216–243.

TESKEY, H. J. (1981): Morphology and terminology – Larvae. – In: MCALPINE, J. F. et al. (eds): Manual of Nearctic Diptera, Vol. 1: 65–88.

Acta Zoologica Hungarica 38 (3–4), pp. 321–344 (1992)

TAXONOMY OF THE PALAEOTROPICAL GENUS *ACHAETOTHORAX* HEDICKE (DIPTERA, SPHAEROCERIDAE)

L. PAPP & A. L. NORRBOM

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

Systematic Entomology Laboratory, USDA, ARS, PSI, c/o National Museum of Natural History, NHB 168, Washington, D. C. 20560, U. S. A.

(Received 30th November 1991)

Achaetothorax HEDICKE, previously a subgenus of *Copromyza* FALLÉN, is elevated to the rank of genus in the tribe Copromyzini. The name *Femoromyza* RICHARDS is synonymized with it, and the genus is reported from the Oriental Region for the first time. Eight Afrotropical and one Oriental species are recognized: *abyssinicus* (DUDA), comb. n., *straeleninus* (RICHARDS), comb. n., and *rhinocerotis* (RICHARDS), comb. n., *acrostichalis* sp. n. (Zaire), *crypticus* sp. n. (Zaire, Tanzania, Uganda), *flavipes* sp. n. (Uganda, Zaire), *malayensis* sp. n. (Malaysia), *trochanteratus* sp. n. (Zaire) and *vojnitsi* sp. n. (Kenya, Zaire). Some phylogenetic relationships of *Achaetothorax* are discussed, and a key and illustrations to permit their identification are provided. With 48 original figures.

Achaetothorax HEDICKE, 1923 is a palaeotropical genus of small, black, shiny sphaerocerids of the tribe Copromyzini (Copromyzinae). Specimens are rare in collections, and only a few institutions possess any specimens at all. Thus the species of *Achaetothorax* appear to be uncommon compared with related genera such as *Norrbomia* PAPP, *Gymnometopina* HEDICKE, or *Metaborborus* VANSCHUYTBROECK. Their life habits are almost unknown; the only specimens we examined with life history label data were all collected on the dung of large mammals.

Previous workers (e.g. RICHARDS 1980) treated *Achaetothorax* as a subgenus of *Copromyza* FALLÉN, but we recognize it as a genus because of its apparent sister group relationship with *Norrbomia* (MARSHALL & NORRBOM, in prep.). We consider *Femoromyza* RICHARDS, 1939 a subjective junior synonym of *Achaetothorax* because their type species are closely related and belong to the same species group. Only three Afrotropical species previously were known, but we describe an additional five species from the Afrotropical Region and one from Malaysia, which is the first record of the genus from the Oriental Region.

MATERIALS AND METHODS

We follow the morphological terminology of McAlpine (1981) and Norrbom & Kim (1985), but some synonymous terms also are given in parentheses. For examined specimens, label data which seem to be important for any future retrieval are reported. Data not given on labels are put in brackets, and hand writing in quotation marks. Data on different labels are separated by a hyphen. In the case of types some comments on the state of preservation are added.

We examined 130 specimens, including the primary types of all three nominal species described hitherto. Material was kindly loaned by the following institutions and individuals: American Museum of Natural History, New York (AMNH), David Grimaldi; Biosystematic Research Institute, Jeff Cumming, for Canadian National Collection, Ottawa (CNC); Natural History Museum (former British Museum (Natural History)) (BMNH), Brian R. Pitkin; California Academy of Sciences (CAS), Paul H. Arnaud, Jr.; Institut Royal des Sciences Naturelles de Belgique (IRSN), P. Grootaert; Muséum National d'Histoire Naturelle, Paris (MNHN), Loïc Matile; Musée Royal de l'Afrique Centrale (MRAC), Eliane De Coninck. The acronym HNHM is for the Zoological Department, Hungarian Natural History Museum, Budapest, and USNM represents the National Museum of Natural History, Smithsonian Institution, Washington, D. C.

Genus **Achaetothorax** Hedicke, stat. n.

Gymnothorax Duda, 1923: 59, as subgenus of *Borborus* Meigen; type species: *Borborus (Gymnothorax) abyssinica* Duda, 1923: 103 (by monotypy). Preoccupied by *Gymnothorax* Bloch, 1795: 83.

Achaetothorax Hedicke, 1923: 431, as nom. n. for *Gymnothorax* Duda, 1923; type species: *Borborus abyssinica* Duda, 1923 (automatic).

Borborus (Achaetothorax): Vanschuytbroeck 1948: 31, 1950a: 14, 1950b: 5, 1951: 8, 1959a: 36, 1959b: 56.

Copromyza (Achaetothorax): Richards 1938: 403, 1980: 616; Hackman 1965: 488, 1969: 206.

Femoromyza Richards, 1939: 71, as subgenus of *Copromyza* Fallén; **syn. n.** Type species: *Copromyza (Femoromyza) rhinocerotis* Richards, 1939: 72 (by original designation).

Diagnosis: Small (1.80 to 3.15 mm), redbrown to black, shiny copromyzine flies; head and thorax almost completely without microtrichia (except narrowly on posterior and posterolateral margins of scutum); arista bare; genal seta absent, postoculars in single row; 2–3 distinct postpronotal and 2+2 dorsocentral setae; katepisternal seta absent; katatergite produced, with nippleshaped process; femora swollen, hind femur with anteroventral and posteroventral rows of spinelike setae and subapical spinulae; hind tibia without dorsal preapical seta, without anteroventral seta at distal third, and without ventroapical spur; trochanter of male with small ventroapical spinulae.

Description – Head: longer than high, eyes small, consequently genae broad, head bristles characterized by the large pro- and inclinate inner vertical seta, outer verticals moderately to greatly reduced and proclinate, postocular setae in single row, ocellars outside triangle defined by ocelli, short to very short (at most 1.5 times as long as pedicel bristle), 2 small fronto-orbital pairs, interfrontals very short (3–4 pairs), genal bristle absent, arista bare and at least as long as head.

Thorax: prothorax small or well developed and collarlike; mesonotum flat or at least flatter than in *Norrbomia;* microtrichia restricted to laterotergite and extreme lateral postsutural margin of scutum; katatergite produced, with nippleshaped process; 1 lateral (reclinate) and 1–2 medial (inclinate) postpronotal setae (also often with additional medial setulae), 2 notopleural setae (reclinate), acrostichal setulae absent except prescutellar pair (except in *acrostichalis* which has paired submedial row; prescutellar pair is more lateral than this row), 2+2 dorsocentral pairs (anterior one shorter and inclinate), 1–2 presutural intra-alar setulae (also 1 postsutural and usually several additional presutural setulae in *acrostichalis*), 1 presutural and 1 postsutural supra-alar seta, and 1 postalar seta; katepisternal (sternopleural) seta absent.

Legs: trochanters yellow; at least hind femur and fore tibia, and usually all femora and tibiae mostly brown, except basally and apically (all entirely yellow in *flavipes*); femora swollen, hind femur with anteroventral and posteroventral rows of spinelike setae and subapical spinulae; hind tibia without ventroapical spur, without dorsal preapical seta, and without anteroventral seta on distal third; male fore basitarsus ventroapically with small hooklike process, and male hind trochanter with ventroapical cluster of spinulae.

Wings: hyaline, unshaded; length subequal to body, very strong basal costal bristle present, *CuA1* extension distinct, ca. 1/4 as long as crossvein *dm–cu*.

Abdomen: sternites very broad, sternite 4 more than 2/3 width of tergite 4 (except in females of *malayensis*), tergites shiny, with microtrichial patterns greatly reduced.

Male genitalia: epandrium (genital arch) with well developed lateral cleft; hypandrium with apodeme well developed, arms free from epandrium; interparameral sclerite weak; postphallic sclerite absent; surstylus (gonostylus) separate from epandrium, usually with large dark spinelike process (not modified seta, lacking any striations at high magnification) (small in *flavipes*, absent in *vojnitsi*); paramere (postgonite) broad and flat, with ventroapical lobe; cercus large, fused with other cercus medially and with ventral projection of epandrium dorsally (e.g. Figs 20, 30).

Female genitalia: postabdomen telescoped; 6th and 7th segments with pair of long and narrow tergal and sternal sclerites; 2 globular spermathecae with short sclerotized neck, small basal apodeme, and large apical apodeme with membranous apex.

PHYLOGENETIC RELATIONSHIPS

Achaetothorax appears to be the sister group of *Norrbomia* PAPP. The relationships of these two genera will be discussed in a paper in preparation by MARSHALL and NORRBOM.

Achaetothorax is a well defined monophyletic group. Synapomorphies for the included species are: 1) arista bare (occurs independently in *Metaborborus pilifer* (VANSCHUYTBROECK)); 2) microtrichose areas of cuticle greatly reduced (similar reduction occurs convergently in *Gymnometopina* and some species of *Metaborborus*); 3) katatergite produced, with nipplelike process (a similar process occurs in some genera of Sphaerocerinae); 4) male hind trochanter with ventroapical spinulae; 5) femora swollen, and hind femur with anteroventral and posteroventral spinelike setae and spinulae; 6) hind tibia without ventroapical spur and dorsal preapical seta (also lost independently in *Lotophila* LIOY); 7) hind tibia without anteroventral seta at distal third (lost independently in various other taxa of Copromyzini); 8) 1–2 pairs of inclinate medial postpronotal setae; 9) 2 + 2 dorsocentral setae (anterior one inclinate); 10) acrostichal setae absent except prescutellar pair (this assumes that the presence of 2 rows in *acrostichalis* is due to reversal).

The hypothesized phylogenetic relationships of the species of *Achaetothorax* were to be represented by a cladogram in this paper. However, just after it was submitted, the junior author found four more new species in the MRAC and IRSN materials (det. P. VANSCHUYTBROECK). Moreover it was discovered that the specimens had called *abyssinicus* comprise two very similar species: the other one is described below as *crypticus* sp. n. (this is why illustrations for *crypticus* are on the last table). Descriptions of the other new species will be given and the species relationships will be analyzed in a future paper. It is to be remarked here that there is a problem with the polarity of the absence/presence of acrostichal microchaetae. The only known species, *A. acrostichalis*, which possesses acrostichals, seems closer to the *abyssinicus* + *straeleninus* subgroups in several other respects (character states, incl. the male genital ones) than subgroup of *flavipes* + *vojnitsi*. Rather the latter group seems a sister-group of all the other Afrotropical species. This incongruence can be solved if we hypothesize that though the absence of acrostichals is a component of the groundplan of *Achaetothorax* the code of this feature was not lost in the genom of the species but enveloped and expressed again in *A. acrostichalis*.

KEY TO THE SPECIES OF *ACHAETOTHORAX*

1 Two rows of acrostichal setae present (at least anterior to transverse suture). Prothorax well developed, collarlike. Male surstylus (gonostylus) long and slender, without long bristles, its black mediocaudal process extremely broad (Fig. 17) **A. acrostichalis** sp. n.

– Acrostichal setae absent except prescutellar pair. Prothorax variable in size 2

2 Hind femur with dorsal and anteroventral setae and mid femur with anteroventral and posteroventral setae longer than width of femur. Ocellar bristles normal, 1.5 times as long as pedicel bristle. Outer vertical bristle normal, at least 0.75 times length of inner vertical bristle 3

– Hind and mid femoral setae shorter than width of femur. Ocellar bristles short, usually not longer than pedicel bristle (slightly longer in *trochanteratus*). Outer vertical bristle short, at most half as long as inner vertical bristle 5

3 Legs entirely yellow (at most yellowish brown). Setae on hind tibia not longer (usually shorter) than width of tibia. Male sternite 5 caudally with a small medial emargination (Fig. 39). Ventral process of paramere (postgonite) longer than half of maximal width of paramere (Fig. 37) **A. flavipes,** sp. n.

– Femora and tibiae mostly redbrown or dark brown. Anterodorsal and posterodorsal setae on hind tibia longer than width of tibia 4

4 Female sternites 3 and 4 normally sclerotized, broad, sternite 4 at least 0.80 times as wide as tergite 4. Male sternite 5 caudally with quadrate medial extension (Fig. 43). Ventral process of paramere (postgonite) short, less than 1/4 maximal width of paramere (Fig. 42) **A. vojnitsi** sp. n.

– Female sternites 3 and 4 weakly sclerotized, relatively narrow, sternite 4 less than 0.55 times as wide as tergite 4. Male unknown **A. malayensis** sp. n.

5 Fore tarsomeres 2–5 yellow. Prothorax well developed, collarlike. Female sternite 4 not bipartite 6

– Fore tarsus usually entirely dark brown, tarsomeres 4–5 occassionally yellowish. Prothorax small. Female sternite 4 bipartite 7

6 Prescutellar acrostichal seta ca. half as long as posterior dorsocentral bristle. Male hind trochanter with large conical ventroapical lobe. Male sternite 5 (Fig. 28) posterior margin with quadrate medial lobe. Male fore basitarsus with dorsal setae half as long as tarsomere 2. Male cercus (Fig. 26) long and slender. Surstylus (gonostylus) caudally with 2 apically merged processes (Figs 26, 30, 32). Comparatively large species, 2.67 to 2.91 mm **A. trochanteratus** sp. n.

– Prescutellar acrostichal seta minute. Male hind trochanter without apical lobe. Male sternite 5 (Fig. 18) posterior margin without medial lobe. Male fore basitarsus with dorsal setae longer than tarsomere 2. Male cercus (Fig. 17) short and broad. Surstylus (gonostylus) caudally with single blunt spinelike process (Fig. 17). Small species, 2.00 to 2.41 mm **A. straeleninus** (Richards)

7 Male sternite 5 (Fig. 5) with largest, medial pair of setae in row on medial lobe closely approximated. Surstylus (gonostylus) (Fig. 6) with spinelike mediocaudal process slender. Male cercus (Fig. 6) bilobed apically 8

– Male sternite 5 (Fig. 7) with largest, medial pair of setae in medial apical row well separated. Surstylus (gonostylus) (Figs 8, 14) with spinelike mediocaudal process broad. Male cercus (Figs 8, 14) simple **A. rhinocerotis** (Richards)

8 Male cercus, in posterior view (Fig. 6), with medial apical lobe slightly projected; basal part of posterior side of cercus not concave on medial half. Surstylus, in posterior view, with basal lobe pronounced **A. abyssinicus** (Duda)

– Male cercus, in posterior view (Figs 46, 47), with medial apical lobe more projected; basal part of posterior side of cercus concave on medial half. Surstylus, in posterior view, with basal lobe weak **A. crypticus** sp. n.

Achaetothorax abyssinicus (DUDA, 1923) comb. n.
(Figs 1–4, 5–6, 11–13)

Borborus (Gymnothorax) abyssinica DUDA, 1923: 103. – *Borborus (Achaetothorax) abyssinica:* HEDICKE 1923: 431. – *Copromyza (Achaetothorax) abyssinica:* RICHARDS 1980: 616. (not) *Borborus (Achaetothorax) abyssinica:* Vanschuytbroeck 1948: 31, 1950a: 14, 1950b: 5, 1951: 8, 1959a: 36 (misidentifications of *crypticus, straeleninus, flavipes,* possibly other species). – (probably not) *Copromyza (Achaetothorax) abyssinica:* HACKMAN 1965: 488.

Material examined: Syntype female (HNHM), 1) Abyssinia KOVÁCS – 2) Marako, 1912. III. – 3) [DUDA's handwriting] "nitidissima m ♀ det. O. DUDA".

Other than type: ETHIOPIA: 2 males 2 females (AMNH, USNM): Addis Abbaba, Abyssinia, VIII. 5. or VIII. 31. 1920 – F/4951a or 4962c; 3 males 5 females (CAS, HNHM) Shashemawe, 8. VII. 1973, V. O. DeMasi; 5 males 2 females (HNHM), Addis Abeba, Akaki River, 29. IX. or 13. XI. 1980, DEMETER; 1 male 1 female (HNHM), ibid., Lake Langano, 12. X.; 1 male (HNHM), ibid., Addis Abeba, 16. IX.

Measurements (syntype): body length 2.08 mm, wings 2.10 × 0.74 mm; body length of other specimens 1.85 to 2.62 mm.

Ocellar and outer vertical bristles short. Prothorax small. Prescutellar acrostichal seta medium, more than half as long as posterior dc. Fore tarsus entirely dark brown. Male fore metatarsus with dorsal setae slightly longer than tarsomere 2. Hind femur with spinelike setae on apical 4/5 anteroventrally, on apical 1/2 posteroventrally.

Male abdomen: sternite 5 (Fig. 5) posterior margin with medial lobe, row of setae on lobe with closely appoximated medial setae longest. Cercus bilobed, in posterior view (Fig. 6), with posteromedial lobe slightly projected; posterior side of basal part not concave on medial half, its medial margin straight; in lateral view (Fig. 13), anteriorly with subapical concave area, apex acute. Surstylus, in posterior view (Fig. 6), with basal lobe produced; spinelike mediocaudal process slender. Paramere (postgonite) (Fig. 11) with ventral lobe short and acute. Distiphallus (Fig. 12) bulbous apically, with one pair of dark sclerotized lateral plates and 2 pairs of ventral lobes, subapical lobes lanceolate.

Female abdomen: sternites broad, sternites 3–4 ca. 0.90 times as wide as corresponding tergites; sternite 4 (Fig. 1) bipartite, medial edges weakly sclerotized. Sternite 5 trapezoidal, width/length 1.8. Sternite 8 bipartite, enlarged dorsally, parts not fused and extended over bases of cerci, rather strongly dorsally curved; tergite 8 long but not wide, weakly sclerotized medially (Fig. 2). Epiproct medium sized with pair of moderately long setae (Fig. 2). Hypoproct subquadrate, weakly sclerotized. Cercus with slight lateral bulge medially and with 2 pairs of long and several pairs of short setae.

Remarks – We have not examined specimens of *abyssinicus* from outside of Ethiopia; presumably, HACKMAN's record from South Africa, and all of VANSCHUYTBROECK's records from Zaire of this species are erroneous, although we have not examined HACKMAN's or all of VANSCHUYTBROECK's material.

DUDA's description was based on one male and one female syntype from the HMNH, labelled with "Abyssinia KOVÁCS, Marako 1912 III". The male specimen appears to have been lost when the Sphaeroceridae collection was loaned to the late DR. M. P. ARADI prior to 1969. After the return of the collection, during revision of the undetermined and unsorted part, the probable female syntype was located. It has labels matching the type data given by DUDA. Although it also has a label in his handwriting with "nitidissima m ♀ det. O. DUDA", which is a MS name, we believe that it is a syntype of *abyssinicus*. Unfortunately the correct usage of the name abyssinicus cannot be determined with certainty from this syntype, because we have not discovered any female characters to distinguish the species we assume to be abyssinicus from related species. We doubt that the syntype is *crypticus* based on distributional data, but because *rhinocerotis* is also known from Ethiopia, we cannot be certain that it is not that species.

Achaetothorax acrostichalis sp. n.
(Figs 17–19, 22–23)

Holotype male (CAS), ZAIRE: Epulu, 950 m, 2. X. 1957, E. S. Ross et R. E. LEECH. – Paratypes: 2 males 2 females (CAS, HNHM, USNM), same data as holotype. 3 males (BMNH, USNM), UGANDA: Ruwenzori Range, Namwamba Valley, 10100 ft., XII. 1934–I. 1935, T. H. E. JACKSON, B. M. E. Afr. Exp., B. M. 1935–203.

Measurements (holotype): body length 2.18 mm, wings 2.03×0.71 mm; body length of paratype specimens 2.15 to 2.30 mm.

Ocellar bristles normal, 1.5 times as long as pedicel bristle. Outer vertical bristle 1/2 to 4/5 length of inner vertical bristle. Prothorax well developed, collarlike. Acrostichal setae in 2 (1 pair) submedial rows (present at least anterior to transverse suture); prescutellar seta 1/2 to 2/3 as long as posterior *dc*. Fore tarsus entirely yellowish, or metatarsus often brownish, at least basally. Male fore metatarsus with dorsal setae shorter than length of tarsomere 2. Hind femur with spinelike setae on apical 3/5 anteroventrally, on apical 1/3 to 1/2 posteroventrally.

Male abdomen: Sternite 5 (Fig. 18) similar in shape to *straeleninus*, somewhat trapezoidal (especially in normal position, with medial part projected), posterior margin with weak medial concavity, on each edge of latter, cluster of small setae at extreme margin. Cercus, in posterior view (Fig. 17), short and broad, in lateral view, apex broadly rounded and posteriorly projected. Surstylus (Fig. 17) long and slender, without long bristles; spinelike mediocaudal process broad, at least basally. Paramere (Fig. 23) with long slender ventroapical lobe. Distiphallus, in lateral view (Fig. 22), constricted medially.

Female abdomen: Sternites 2–5 normally sclerotized, very broad, each more than 0.90 times as wide as corresponding tergite.

Achaetothorax crypticus sp. n.
(Figs 44–48)

Holotype male (IRSN), ZAIRE: Kivu, Parc Nat. Albert, Nyamuronge Riv., near Mugando, 21. IV. 1945, G. F. DE WITTE, 19. – Paratypes: RWANDA: 3 males (USNM, MRAC), Lake N'Gando, pied Volc. Karisimbi, 2400 m, 9. III. 1935, G. F. DE WITTE, 1241, 1242 or 1247. TANZANIA: 1 male (IRSN), Ngorongoro, Rest Camp, 2400–2500 m, 6–19. VI. 1957, Mission Zoolog. I. R. S. A. C. en Afrique orientale (P. BASILEWSKY et N. LELEUP). UGANDA: 1 male (BMNH), Ruwenzori Range, Fort Portal, 5000 ft., XII–1934–I. 1935, F. W. EDWARDS, B. M. E. Afr. Exp., B. M. 1935–203. ZAIRE: 1 male (USNM), Lukula, 19–24. VII. 1948, P. VANSCHUYTBROECK; 19 males 15 females (IRSN, HNHM, USNM), same data as holotype; 2 males (MRAC, USNM), Kivu, Parc Nat. Albert, Burunga, Mokoto, 2000 m, 9–24. III. 1934, G. F. DE WITTE, 313; 16 males, 9 females (MRAC, USNM): Kivu, Parc Nat. Albert, Mt. Sesero, near Bitashimwa, 2000 m, Bambous 1–3. VIII. 1934, G. F. DE WITTE, 505 or 514. – Other specimens examined: MOZAMBIQUE: 1 female (MNHN), Lourenço Marqués, 3. VIII. 1929, P. LESNE, "bouses".

Measurements (holotype): body length 2.79 mm, wings 2.33 mm; body length of other specimens 2.20–3.15 mm.

Ocellar and outer vertical bristles short. Prothorax small. Prescutellar acrostichal seta medium, more than half as long as posterior dc. Fore tarsus entirely dark brown. Male fore metatarsus with dorsal setae longer than tarsomere 2. Hind femur with spinelike setae on apical 1/2 to 2/3 anteroventrally, on apical 2/5 to 1/2 posteroventrally.

Male abdomen: Sternite 5 (Figs 44–45) posterior margin with weak medial lobe, row of setae on lobe with closely approximated medial setae longest. Cercus bilobed, in posterior view (Figs 46–47), with posteromedial lobe longer than in *abyssinicus;* posterior side of basal part concave on medial half, medial margin of medial lobe curved dorsolaterally across cercus; in lateral view (Fig. 48), anteriorly with deep subapical concave area, apex slightly acute. Surstylus, in posterior view (Figs 46–47), with basal lobe weak; spinelike mediocaudal process slender. Paramere with ventral lobe short and acute. Distiphallus similar to *rhinocerotis* and *abyssinicus*.

Female abdomen: sternites broad, sternites 3–4 more than 0.85 times as wide as corresponding tergites; sternite 4 bipartite.

Remarks – The female from Mozambique is tentatively identified.

Achaetothorax flavipes sp. n.
(Figs 34–38)

Holotype male (MRAC): ZAIRE: Kivu, Parc Nat. Albert, S. Lake Edward, Tshambi (975 m), 11. II. 1936, L. LIPPENS, – P. VANSCHUYTBROECK det., 1958, *Gymnometopina clunicrus* DUDA. – Paratypes: ZAIRE: 2 males 1 female (MRAC, USNM, HNHM), same as holotype; 1 male (MRAC), Kivu, Parc Nat. Albert, S Lake Edward, Kitembo (925 m), 4. IV. 1936, L. LIPPENS; 1 female (IRSN), W. Ruwenzori, Kalonge, 1932, VAN HOOF; 1 male (CAS), Epulu, 950 m., 2. X. 1957 – E. S. ROSS et R. E. LEECH. UGANDA: 3 males (BMNH, USNM, HNHM), Ruwenzori Range, Namwamba Valley, 10, 100 ft., XII. 1934–I. 1935, T. H. E. JACKSON, B. M. E. Afr. Exp., B. M. 1935–203; 1 male (BMNH), Ruwenzori Range, Kilembe, 4, 500 ft., XII. 1934–I. 1935, F. W. EDWARDS, B. M. E. Afr. Exp., B. M. 1935–203.

Measurements (holotype): 2.23 mm, wings 2.08 × 0.74 mm; body length of paratypes 2.18 to 2.69 mm.

Ocellar bristle normal, 1.5 times as long as pedicel bristle. Outer vertical bristle 0.75 times as long to subequal to inner vertical bristle. Prothorax small. Prescutellar acrostichal seta well developed. Legs, including femora, tibiae, and all of fore tarsus yellow to very light brown, concolorous. Male fore metatarsus with dorsal setae no longer than length of tarsomere 2. Hind femur with spinelike setae on apical 3/4 to 4/5 anteroventrally (extended basally to or almost to point opposite apex of tibia), on apical 2/5 to 1/2 posteroventrally.

Male abdomen: Sternite 5 (Fig. 38) posterior margin with slight, but distinct, medial concavity. Cercus, in posterior view (Fig. 34), broad, tapering at midlength, apex rounded, in lateral view (Fig. 35) acute, apex hooklike. Surstylus (Figs 34, 35) bilobed, anterior lobe with posteriorly projecting, knoblike process, posterior lobe apically with small, dark process; in posterior view, with well-developed basal lobe. Paramere (postgonite) with ventral lobe slender and longer than 1/2 of maximal width of paramere (Fig. 37). Distiphallus (Fig. 36) with unpaired, weak, slender, medioapical lobe.

Female abdomen: Sternites 2–5 normally sclerotized, broad; sternite 3 0.67 times as wide as tergite 3; sternite 4 0.75 times as wide as tergite 4.

Achaetothorax malayensis sp. n.

Holotype: female (USNM): MALAYSIA: Selangor, Kuala Lumpur, IMR Grazing Grd., light, VII. 1958, R. TRAUB. – Paratype: 1 female (USNM): MALAYSIA: Kuala Lumpur, IMR Lab., light trap, I. 1959, R. TRAUB.

Ocellar bristle normal, 1.5 times as long as pedicel bristle. Outer vertical bristle 0.75 times as long to subequal to inner vertical bristle. Prothorax small. Prescutellar acrostichal seta 1/2 length of posterior dc. Femora and tibiae redbrown, except basally and apically. Fore tarsus, including metatarsus, entirely yellow. Mid femur with long anteroventral setae. Hind femur with long dorsal and anteroventral setae. Hind tibia with antero- and posterodorsal setae slightly longer than width of tibia. Hind femur with spinelike setae on apical 2/3 to 7/10 anteroventrally (extended basally almost to point opposite apex of tibia), on apical 2/5 posteroventrally.

Female abdomen: Sternites relatively narrow; sternite 3 0.44 times as wide as tergite 3, sternite 4 0.52 times as wide as tergite 4. Sternites 3 and 4 weakly sclerotized. 8th sternites do not overlap cerci, only slightly dorsally curved. Cerci with small, subbasal lateral bump. Spermathecae with large apical and smaller basal apodemes, and with moderately long neck. Epiproct with 1 pair of large setae and smaller medial pair.

Remarks – During study of Lund University expedition material in 1980, the senior author examined one specimen with the following data: SRI LANKA: Lund University Ceylon Expedition 1962, BRINCK–ANDERSSON–CEDERHOLM, W. Prov., Yakkala, 18 mls NE Colombo, 15–31. I. 62. Loc. 11 – paddy fields – Ditches. This specimen was without genitalia (it is probably a male), and because of its deficiency it was sent back without identification. Unfortunately, probably due to lack of determination labels, it was not found again in the collection of the Zoological Museum when requested for the present study (R. DANIELSSON, pers. comm.). It may be a specimen of *malayensis* or another species. Its existence is mentioned here only to indicate that *Achaetothorax* is present in Sri Lanka.

Achaetothorax rhinocerotis (RICHARDS) comb. n.
(Figs 7–10, 14–16)

Copromyza (Femoromyza) rhinocerotis RICHARDS 1939: 72; 1980: 617.

Material examined – Holotype male (BMNH): [glued on a triangular card, below a card with hind tarsi glued; right fore leg and left mid tarsi lost] 1) [SOUTH AFRICA:] Zululand, Umfolosi Riv., June 1922, H. H. Curson; 2) "From dung of Rhino"; 3) Pres. by Imp. Bur. Ent. Brit. Mus., 1922–464; 4) [rounded, red margined] Type; 5) [22.5 × 13 mm with RICHARDS' handwriting] "Copromyza rhinocerotis ♂ Type". – Paratypes male and female (BMNH): same data as holotype (female is *A. vojnitsi* or *A. flavipes*).

Other than types: ETHIOPIA: 1 male (AMNH), Djibuti to Addis Abbaba Rail Road, Abyssinia, 14–17. IX. 1920 – F/4966. KENYA: 3 males (HNHM), N. Kenya, Marsabit, on elephant dung, No. 208 – Hung. Sci. Africa Exp. "Teleki", 18. 3. 1988, leg. A. VOJNITS. TANZANIA: 1 male (CAS), 13 mi. S. of Babati, 1550 m, 18. XI. 1957, E. S. ROSS et R. E. LEECH. ZAIRE: 1 male (USNM), Kivu, Rutshuru, 1285 m, 20–21. XII. 1933, G. F. DE WITTE, 131; 1 male (MRAC), Kivu, Parc Nat. Albert, N'Goma, 17–19. IV. 1935, H. DAMAS. ZIMBABWE: 1 female (BMNH), Shangani, De Beer's Ranch, V. 1932, A. MACKIE.

Measurements (holotype): Body 1.88 mm, wings (curved, not precisely measured) ca. 1.54 × 0.61 mm. Hind femur 0.76 mm long, 0.233 mm at widest, ratio 3.26.

Ocellar and outer vertical bristles small. Prothorax small. Prescutellar acrostichal seta medium length, ca. half as long as posterior dc. Fore tarsus entirely brown, or sometimes with tarsomeres 4–5 yellowish. Male fore metatarsus with dorsal setae as long as or slightly shorter than tarsomere 2. Hind femur with spinelike setae on apical 3/4 to 4/5 anteroventrally (extended almost to point opposite apex of tibia), on apical 1/2 posteroventrally.

Male abdomen: sternite 5 (Fig. 7) posterior margin with weak medial concavity; apical row of setae with medial pair longest but well separated. Cercus not bilobed, in posterior view (Figs 8, 14), relatively short and broad, narrowed subapically to broad rounded apex; in lateral view, anteriorly with subapical concave area, apex acute. Surstylus with spinelike mediocaudal process broad. Paramere (Fig. 9) with ventral lobe short and acute. Distiphallus (Fig. 10) similar to *abyssinicus*.

Female abdomen: sternites broad, sternites 3–4 more than 0.85 times as wide as corresponding tergites: sternite 4 bipartite.

Achaetothorax straeleninus (RICHARDS) comb. n.
(Figs 20–21, 24–25)

Borborus (Achaetothorax) straeleni VANSCHUYTBROECK, 1959b: 57 (preoccupied by *B. straeleni* VANSCHUYTBROECK 1948, now in *Dudaia*).

Copromyza (Achaetothorax) straelenina RICHARDS, 1980: 616 (nom. n. for *B. straeleni* VANSCHUYTBROECK, 1959).

Material examined – Holotype male (MRAC) [double mounted on polyporus block; hind legs (except coxae), right fore tarsomeres 2–5, and left mid tarsomere 5 lost, right arista and head bristles broken, some thoracic bristles including apical scutellars lost] 1) ♂; 2) [red] HOLOTYPUS; 3) Congo belge, P.[arc] N.[ational] G.[aramba], Miss. H. DE SAEGER, 2901; 4) COLL. MUS. CONGO (ex coll. I. P. N. C. B); 5) P. VANSCHUYTBROECK det. 1959, Achaetothorax straeleni n. sp.; 6) P. VANSCHUYTBROECK det., 195 "Achaetothorax straeleni nsp ♂".

Other than types: UGANDA: 2 males 1 female (BMNH, HNHM), UGANDA: Ruwenzori Range, Namwamba Valley, 10100 ft., XII. 1934–I. 1935, T. H. E. JACKSON, B. M. E. Afr. Exp., B. M. 1935–203. ZAIRE: 6 males 4 females (CAS, USNM, HNHM), Haut-Zaire, Epulu, 950 m, 2. X. 1957, E. S. ROSS et R. E. LEECH; 1 male 5 females (MRAC, USNM, HNHM), Haut Zaire, Parc Nat. Garamba, II/id/9, 31. X. 1951 or Mpaza/9, 23. I. 1952, H. DE SAEGER, 2709 or 3076.

Measurements (holotype): Body length 2.13 mm, wings 1.77 × 0.67 mm, arista 0.655 mm, second costal section 0.767 mm, third section 0.37 mm, ratio 2.07. Terminal section of vein M 0.62 mm, ta–tp 0.525

mm, ratio 1.18, tp 0.09 mm long, terminal section of vein Cu ca. 0.09 mm. Body length of largest females is 2.65 mm.

Ocellar and outer vertical bristles short. Prothorax well developed, collarlike. Prescutellar acrostichal seta minute. Male hind trochanter without large ventroapical process. Male fore basitarsus with dorsal setae longer than tarsomere 2. Fore basitarsus dark brown, tarsomeres 2–5 yellow. Hind femur with spinelike setae on apical 1/2 anteroventrally, on apical 2/5 to 1/2 posteroventrally.

Male abdomen: Sternite 5 (Fig. 21) somewhat trapezoidal (especially in normal position, with medial part projected), posterior margin with weak medial concavity, on each edge of latter, cluster of small setae at extreme margin. Cercus, in posterior view (Fig. 20), short and broad, in lateral view, apex broadly rounded. Surstylus with very long bristles. Paramere (Fig. 24) ventral lobe concave on ventral margin. Distiphallus, in lateral view (Fig. 25), constricted medially.

Female abdomen: Sternites very broad, sternites 3–4 more than 0.90 times as wide as corresponding tergites; sternites 2–4 usually evenly sclerotized, sternite 5 weak medially. Sternite 5 slightly trapezoidal, width/length 2.09. 8th sternites do not overlap cerci, only slightly dorsally curved apically, cerci with strong subbasal ventral bulge. Epiproct with 1 pair of large setae only. Spermathecae with moderately long neck.

Achaetothorax trochanteratus sp. n.
(Figs 26–29, 30–33)

Holotype male (CAS), ZAIRE: Epulu, 950 m, 2. X. 1957, E. S. Ross et R. E. Leech. – Paratypes: 1 male 4 females (CAS, USNM, HNHM), same data as holotype. 2 females (HNHM): P.[eoples] R.[epublic] Congo, No. 679, Lefinie reservation, 13. I. 1964., J. Balogh et A. Zicsi.

Measurements (holotype): body length 2.56 mm, wings 2.33 × 0.78 mm; body length of paratype specimens 2.30 to 2.80 mm.

Ocellar bristle medium length, slightly longer than pedicel bristle. Outer vertical bristle less than half as long as inner vertical bristle. Prothorax well developed, collarlike. Prescutellar acrostichal seta ca. half as long as posterior dc. Legs with typical dark areas relatively light brown, especially fore and mid femora and mid tibia. Fore metatarsus brown, at least on basal half, tarsomeres 2–5 yellow. Male fore basitarsus with dorsal setae short, only half as long as tarsomere 2. Male hind trochanter with large ventroapical concial process. Hind femur with spinelike setae on apical 1/2 anteroventrally, on apical 1/3 to 2/5 posteroventrally.

Male abdomen: Sternite 5 (Fig. 28) posterior margin with large quadrate medial lobe within larger concavity. Cercus, in posterior view (Fig. 26), very long and narrow, in lateral view (Fig. 30), apex acute. Surstylus caudally with 2 apically merged spinelike processes (Figs 26, 30, 32). Paramere (Fig. 31) with a long slender ventral lobe.

Female abdomen: Sternites 2–5 normally sclerotized (tergites 3–5 or all tergites weakly sclerotized in 3 of 4 females paratypes, but these probably teneral), very broad, each more than 0.90 times as wide as corresponding tergite.

Achaetothorax vojnitsi sp. n.
(Figs 39–43)

Holotype male (HNHM), N. KENYA: Marsabit, on elephant dung, No. 208 – Hung. Sci. Africa Exp. "Teleki", 18. III. 1988, A. Vojnits. – Paratypes: 2 males 1 female (HNHM, USNM): same as holotype. ZAIRE: 4 males 1 female (IRSN, USNM), Haut Zaire, Parc Nat. Garamba, 8. II. 1950, 22. V. 1951 or 31. X. 1951, H. De Saeger, 202, 1778, or 2709; 3 males 2 females (MRAC, USNM), Kivu, Parc Nat. Albert, S Lake Edward, Kitembo, 4. IV. 1936, L. Lippens; 1 male 4 females (MRAC, HNHM), Kivu, Parc Nat. Albert, Tshambi, 11. II. 1936, L. Lippens; 1 male 1 female (MRAC); 1 male 1 female (USNM), Kivu, Parc Nat. Albert, Bugazia, 920 m, 21. V. 1935, H. Damas, A162; 1 female (MRAC), Kivu, Parc Nat. Albert, Nayakibumba, near Kikere, 2250 m, 5. VII. 1934, G. F. De Witte, 474; 1 male (USNM), Shaba, Parc Nat. Upemba, Kanonga, 700 m, 17–22. II. 1949, G. F. De Witte, 2354a.

Measurements (holotype): body length 2.18 mm, wings 2.05×0.72 mm; body length of paratypes 2.18 to 2.56 mm.

Ocellar bristles normal, 1.5 times as long as pedicel bristle. Outer vertical bristle 0.75 times as long to subequal to inner vertical bristle. Prothorax small. Prescutellar acrostichal seta well developed. Fore tarsus color variable, usually concolorous brown, but lighter than tibia, sometimes more yellowish or metatarsus slightly darker than other tarsomeres. Male fore metatarsus with dorsal setae no longer than length of tarsomere 2. Hind femur spinose on apical 3/4 to 5/6 anteroventrally (spines extending basally to point opposite apex of tibia), on apical 2/5 posteroventrally.

Male abdomen: Sternite 5 (Fig. 43) posterior margin with quadrate medial lobe; lobe without row of setae. Cercus, in posterior view (Fig. 39), broad, tapering beyond midlength, apex rounded, in lateral view (Fig. 38) acute, apex hooklike. Surstylus (Figs 38, 39) bilobed, anterior lobe with posteriorly projected, knoblike process, posterior lobe apically without dark process; in posterior view, without basal lobe. Paramere (postgonite) (Fig. 42) with ventral lobe short, less than 1/4 of maximal width of paramere (Fig. 42). Distiphallus without slender medioapical lobe.

Female abdomen: Sternite setulae relatively long. Sternites 2–5 normally sclerotized; sternite 3 0.75–0.80 times as wide as tergite 3; sternite 4 0.80–0.90 times as wide as tergite 4.

REFERENCES

BLOCH, M.-E. (1795): Naturgeschichte der ausländische Fische. Berlin. spec. **9:** 83.

DUDA, O. (1923): Revision der altweltlichen Arten der Gattung Borborus (Cypsela) Meigen (Dipteren). – *Arch. Naturgesch.* **89**A (4): 35–112.

HACKMAN, W. (1965): Diptera (Brachycera): Sphaeroceridae (Borboridae). – South African Animal Life. Results of the Lund University Expedition in 1950–1951 **11:** 485–503.

HACKMAN, W. (1969): A review of the zoogeography and classification of the Sphaeroceridae (Borboridae, Diptera). – *Not. entomol.* **49:** 193–210.

HEDICKE, H. (1923): Nomina nova IV. – *Dt. ent. Z.* 1923: 431.

MCALPINE, J. F. (1981): Morphology and terminology – adults. In: MCALPINE, J. F. et al. (eds): Manual of Nearctic Diptera, BRI, Ottawa, **1:** 9–63.

NORRBOM, A. L. & KIM, K. C. (1985): Systematics of Crumomyia Macquart and Alloborborus Duda (Diptera: Sphaeroceridae). – *Syst. Ent.* **10:** 167–225.

NORRBOM, A. L. & KIM, K. C. (1987): Taxonomy and phylogenetic relationships of the Afrotropical genus Gymnometopina Hedicke (Diptera: Sphaeroceridae). – *Revue Zool. afr.* **101:** 479–505.

PAPP, L. (1988): A review of the Afrotropical species of Norrbomia gen. n. (Diptera: Sphaeroceridae, Copromyzini). – *Acta zool. hung.* **34** (4): 393–408.

RICHARDS, O. W. (1938): Diptera Sphaeroceridae (Borboridae, Cypselidae). – *Mission Scientifique de l'Omo (Zool.)* **4** (40): 381–405.

RICHARDS, O. W. (1939): Some African Sphaeroceridae (Borboridae) in the collection of the British Museum (Diptera). – *Proc. R. ent. Soc. Lond.* (B) **8:** 68–73.

RICHARDS, O. W. (1980): 57. Family Sphaeroceridae. – In: CROSSKEY, R. W. (ed.): *Catalogue of the Diptera of the Afrotropical Region*, British Museum (Natural History), London, p. 614–626.

VANSCHUYTBROECK, P. (1948): Sphaerocerinae (Diptera Acalyptratae). – *Explor. Parc natn. Albert Miss. G. F. de Witte* **52:** 1–43.

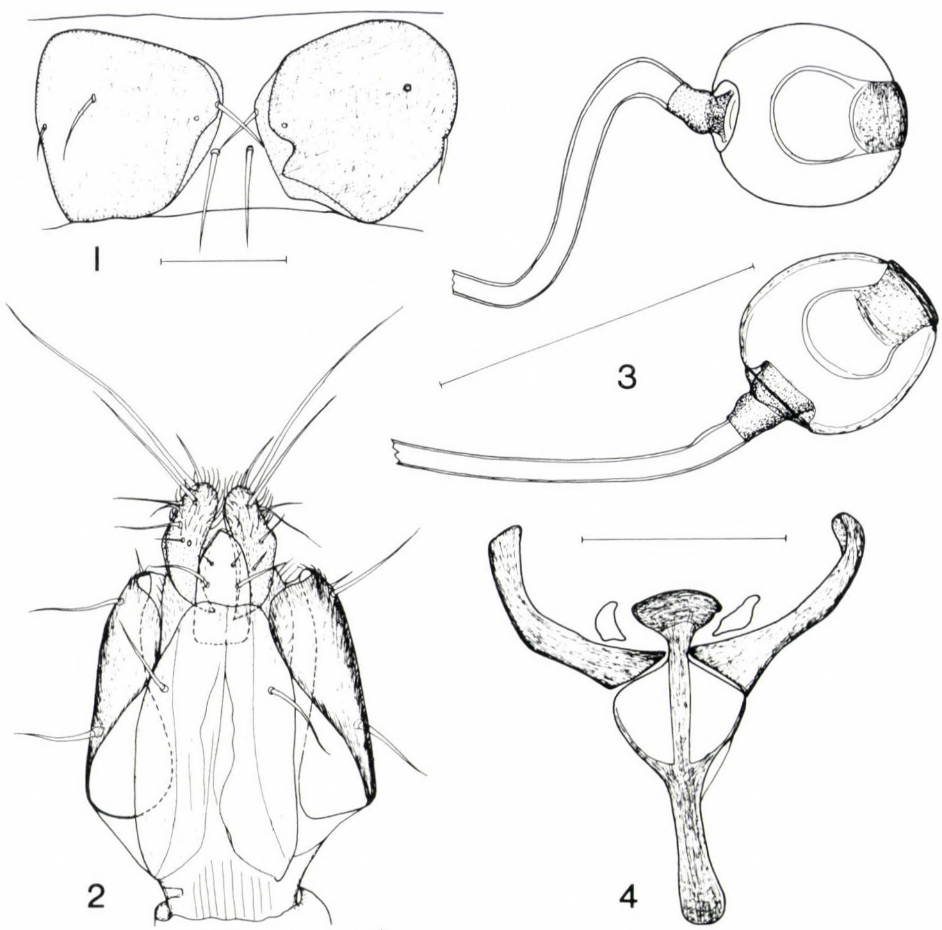
VANSCHUYTBROECK, P. (1950a): Diptères Sphaeroceridae du Musée du Congo belge. – *Ann. Mus. Congo belg.* (Zool.) **5:** 1–46.

VANSCHUYTBROECK, P. (1950b): Contribution à l'étude des Sphaeroceridae africains (Diptera Acalyptratae) (1ère note). – *Bull. Inst. roy. Sci. natr. Belg.* **26** (25): 1–19.

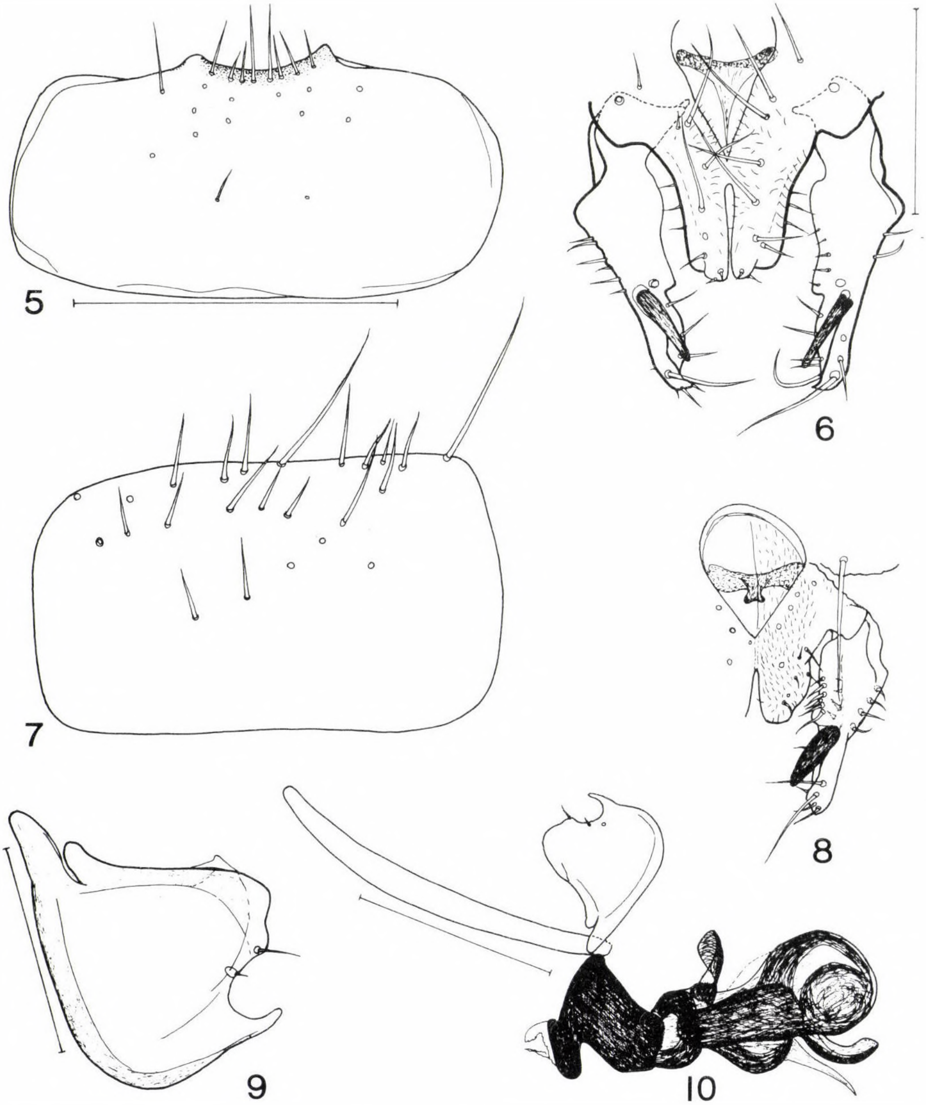
VANSCHUYTBROECK, P. (1951): Contribution à l'étude des Sphaeroceridae africains (Diptera Acalyptratae) (2ème note). – *Bull. Inst. roy. Sci. natr. Belg.* **27** (33): 1–16.

VANSCHUYTBROECK, P. (1959a): Sphaeroceridae (Diptera Acalyptratae). – *Explor. Parc natn. l'Upemba Miss. G. F. de Witte* **57** (3): 15–62.

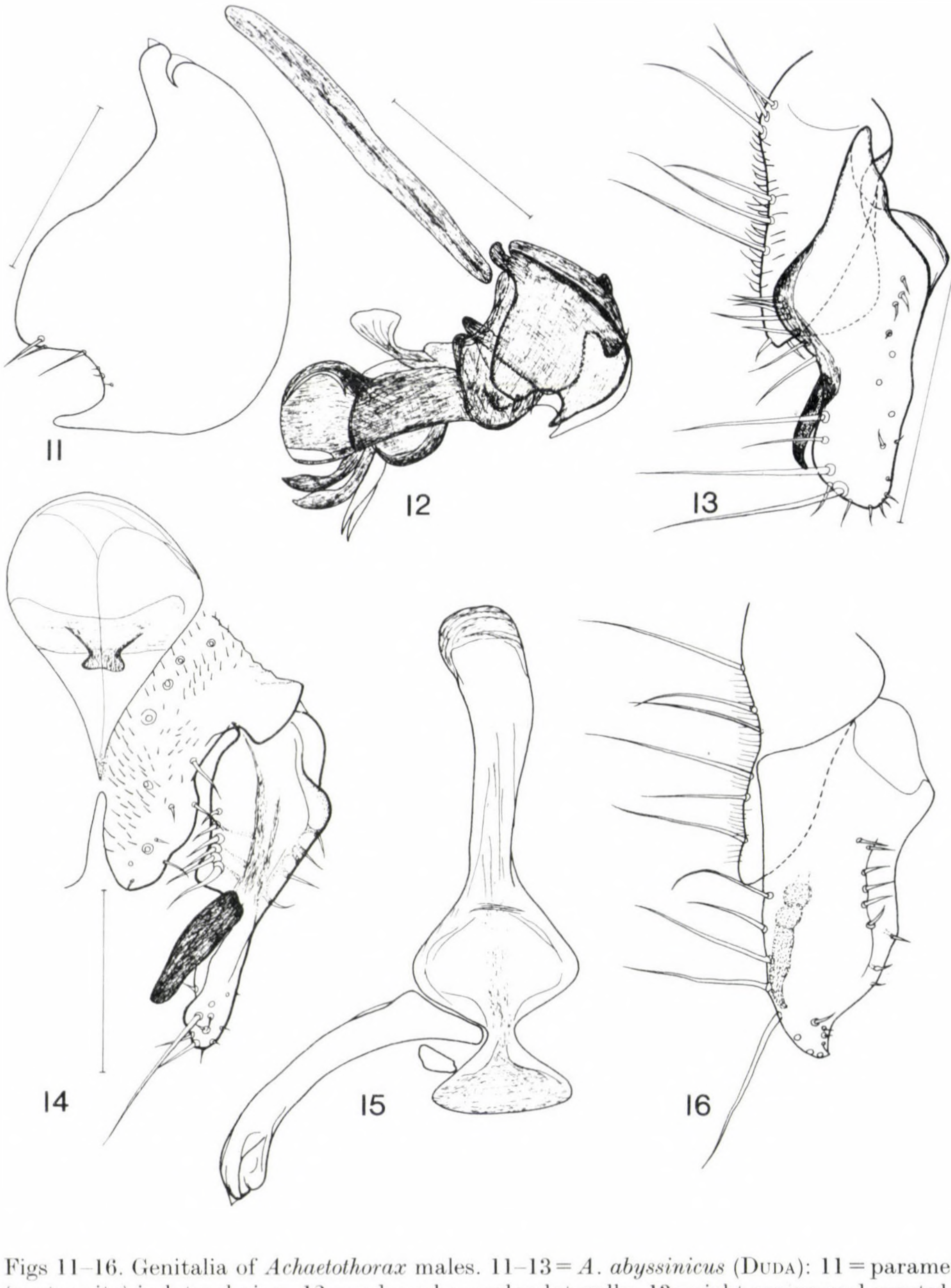
VANSCHUYTBROECK, P. (1959b): Sphaerocerinae, Limosinae, Ceropterinae (Diptera Ephydroidea). – *Explor. Parc natn. Garamba Miss. H. de Saeger* **17** (2): 15–85.



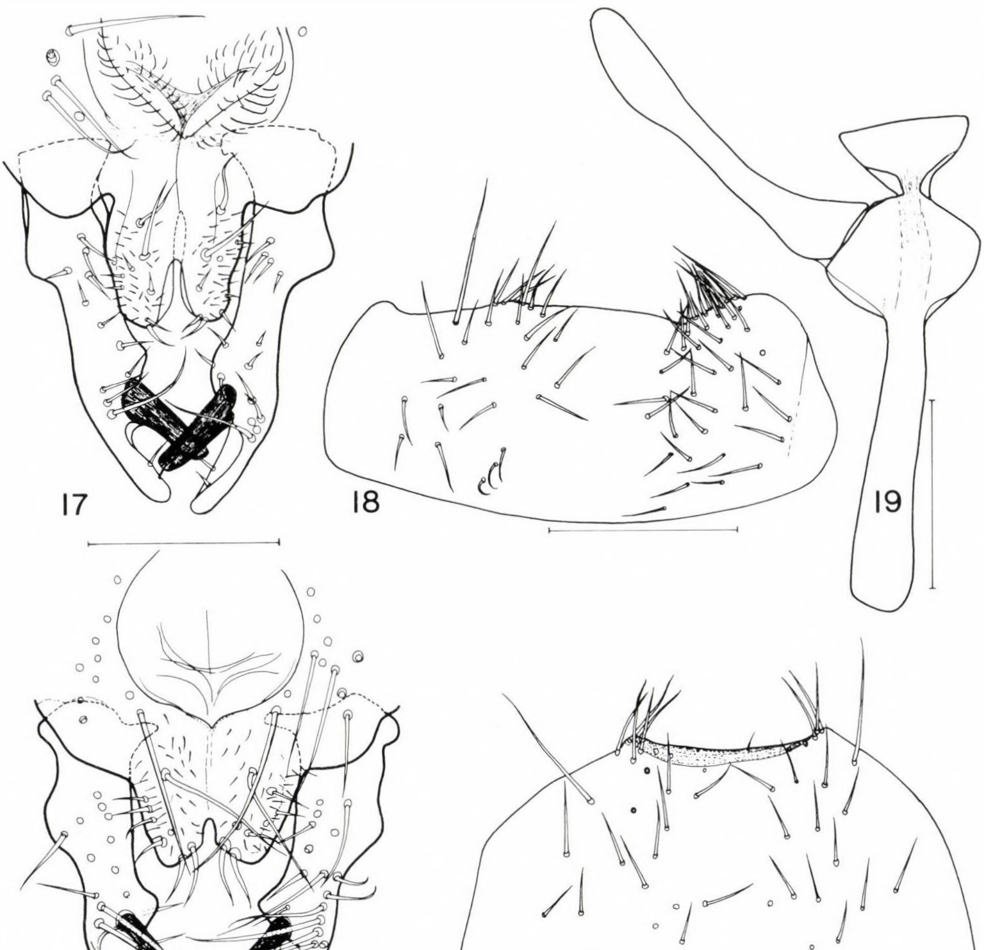
Figs 1–4. *Achaetothorax abyssinicus* (DUDA). 1 = female 4th sternite ventrally, 2 = female terminalia (8th tergite and sternite, epiproct and cerci) dorsally, 3 = spermathecae, 4 = male hypandrium with postgonite joining plates, dorsally (scales: 0.2 mm for Figs 1, 2, 4, 0.1 mm for Fig. 3).



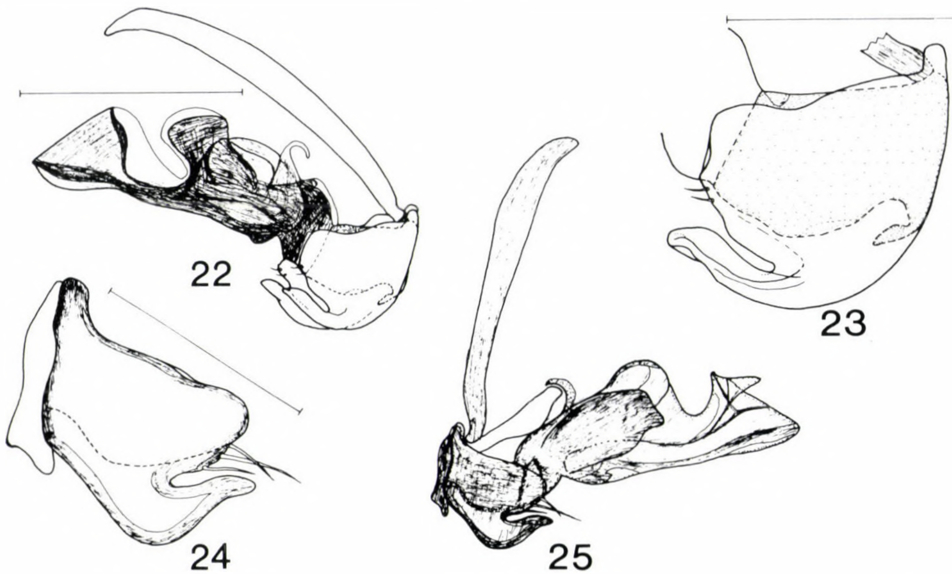
Figs 5–10. Genitalia of *Achaetothorax* males. 5–6 = *A. abyssinicus* (DUDA): 5 = sternite 5, ventral view, 6 = cerci and surstyli in caudal view; 7–10 = *A. rhinocerotis* (RICHARDS): 7 = sternite 5, ventral view, 8 = right cercus and surstylus caudally, 9 = paramere (postgonite) in lateral view, 10 = aedeagal complex laterally (scales: 0.5 mm for Figs 5, 7, 0.2 mm for Figs 6, 8, 10, 0.1 mm for Fig. 9).



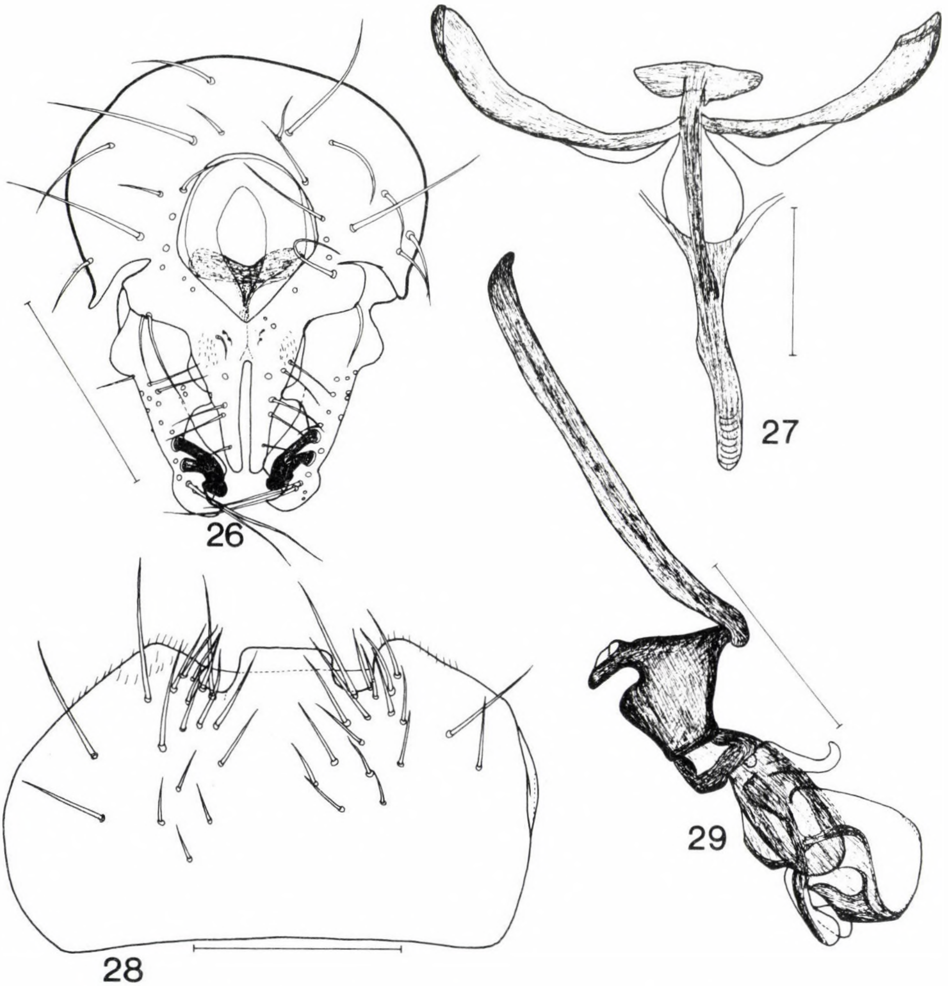
Figs 11–16. Genitalia of *Achaetothorax* males. 11–13 = *A. abyssinicus* (DUDA): 11 = paramere (postgonite) in lateral view, 12 = aedeagal complex laterally, 13 = right cercus and surstylus in lateral view; 14–16 = *A. rhinocerotis* (RICHARDS): 14 = right cercus and surstylus in caudal view, 15 = hypandrium with paramere joining plate, 16 = right cercus and surstylus in lateral view (scales: 0.1 mm for Figs 11, 14–16, 0.2 mm for Figs 12, 13).



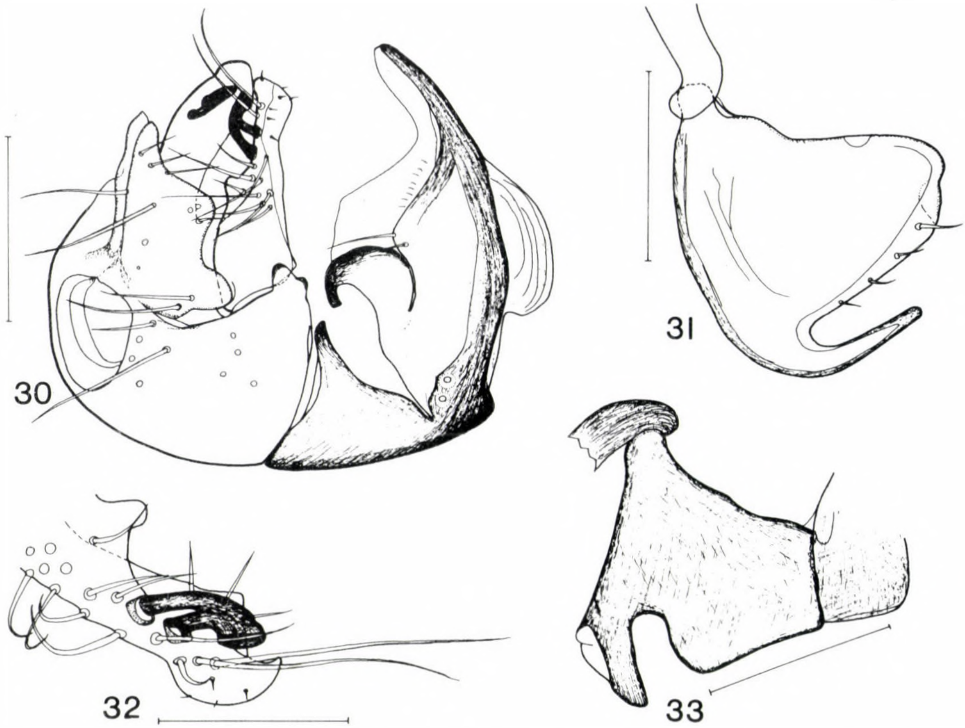
Figs 17–21. Genitalia of *Achaetothorax* males. 17–19 = *A. acrostichalis* sp. n.: 17 = cerci and surstyli in caudal view, 18 = sternite 5 in ventral view, 19 = hypandrium; 20–21 = *A. straeleninus* (RICHARDS): 20 = cerci and surstyli in caudal view, 21 = sternite 5 ventrally (scales: 0.1 mm for Figs 17, 19, 20, 0.2 mm for Figs 18, 21).



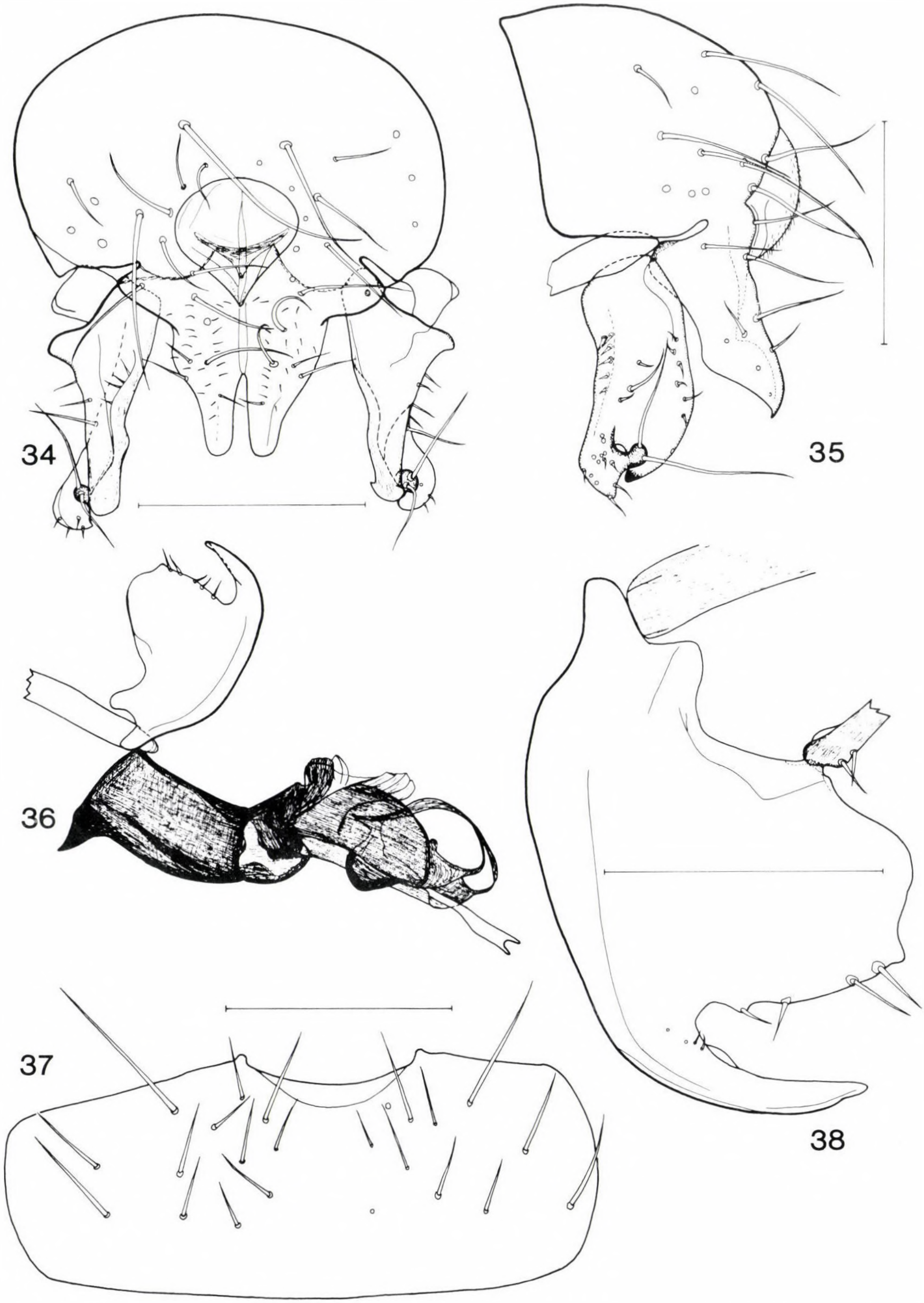
Figs 22–25. Genitalia of *Achaetothorax* males. 22–23 = *A. acrostichalis* sp. n.: 22 = aedeagal complex laterally, 23 = paramere (postgonite) laterally; 24–25 = *A. straeleninus* (RICHARDS): 24 = paramere (postgonite) in lateral view, 25 = aedeagal complex with a part of hypandrial arm laterally (scales: 0.2 mm for Figs 22, 25, 0.1 mm for Figs 23–24).



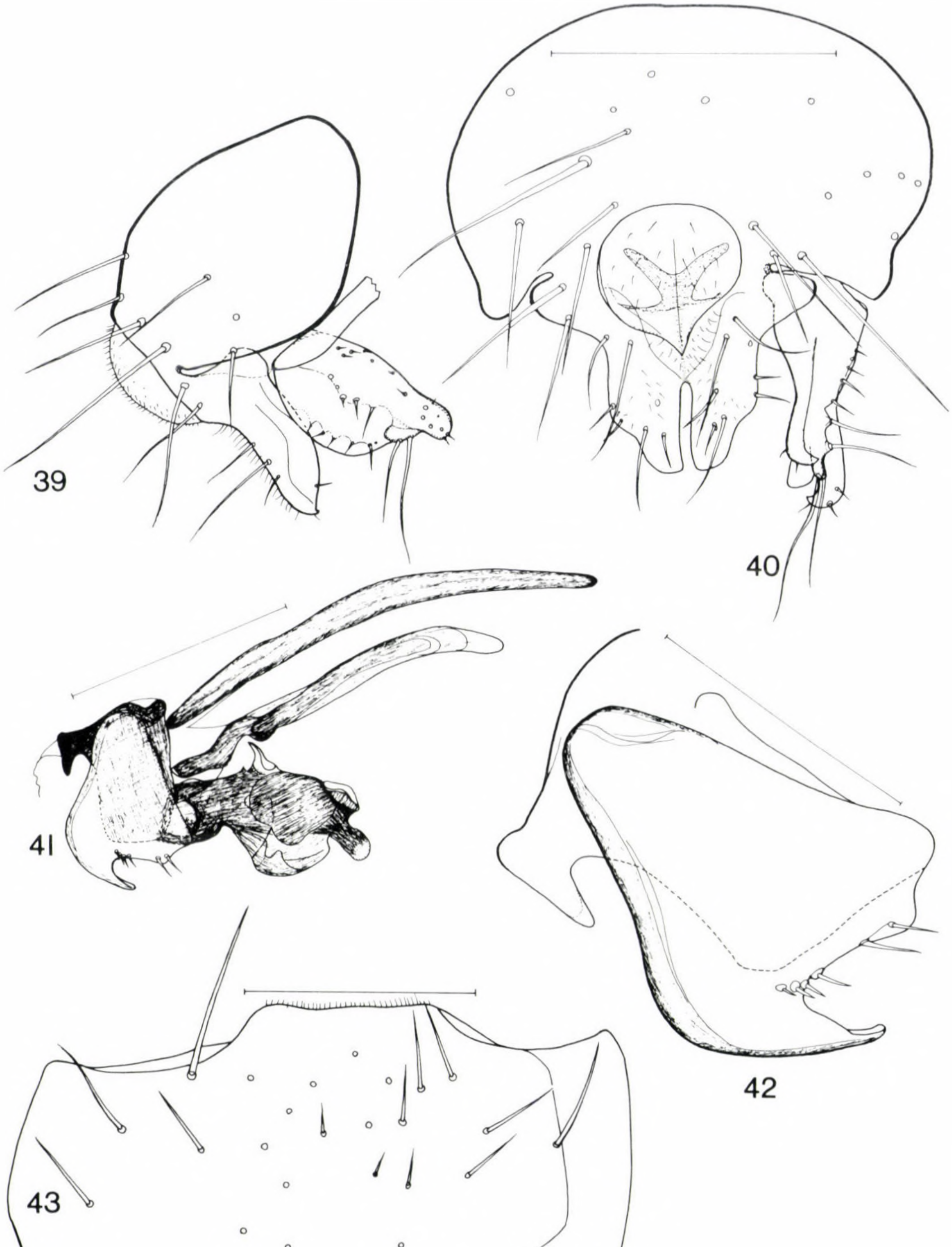
Figs 26–29. Genitalia of *Achaetothorax trochanteratus* sp. n., paratype male. 26 = epandrium, cerci and surstyli in caudal view, 27 = hypandrium dorsally, 28 = sternite 5 in ventral view, 29 = aedeagus and aedeagal apodeme laterally (scales: 0.2 mm for Figs 26, 28–29, 0.1 mm for Fig. 27).



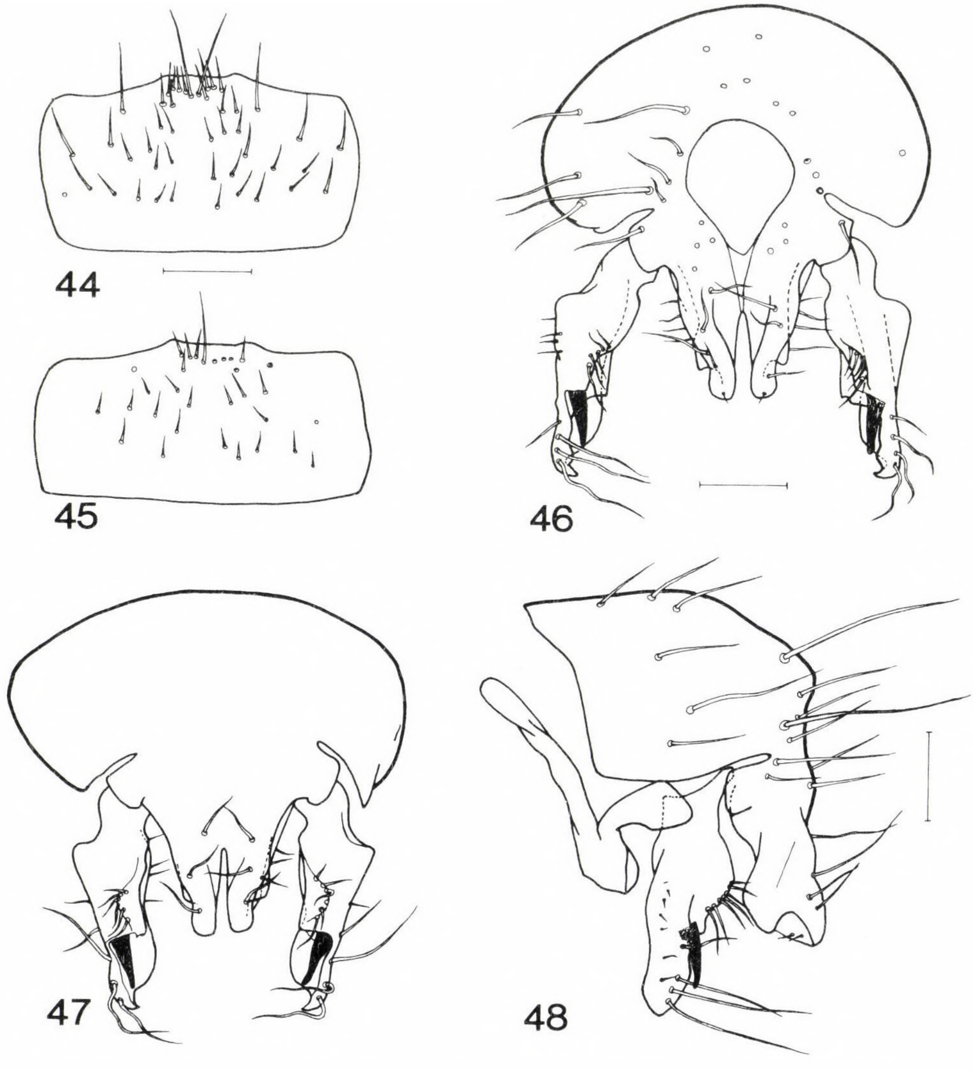
Figs 30–33. Genitalia of *Achaetothorax trochanteratus* sp. n., paratype male. 30 = sternite 6 and 7, epandrium, cerci and surstyli in a subventral-sublateral view, 31 = paramere in lateral view, 32 = apical part of surstylus in caudal view, 33 = basiphallus laterally (scales: 0.2 mm for Fig. 30, 0.1 mm for Figs 31–33).



Figs 34–38. Genitalia of *Achaetothorax flavipes* sp. n., paratype male. 34–35 = epandrium, cerci and surstyli in caudal view, 35 = epandrium, left cercus and surstylus in lateral view, 36 = aedeagus and right paramere laterally, 37 = right paramere in higher magnification, 38 = sternite 5 in ventral view (scales: 0.2 mm for Figs 34–36, 38, 0.1 mm for Fig. 37).



Figs 39–43. Genitalia of *Achaetothorax vojnitsi* sp. n., paratype male. 39 = epandrium, right cercus and surstylus in lateral view, 40 = epandrium, cerci and right surstylus in caudal view, 41 = aedeagal complex with hypandrium laterally, 42 = right paramere with basiphallus laterally, 43 = sternite 5 in ventral view (scales: 0.2 mm for Figs 39–41, 43, 0.1 mm for Fig. 42).



Figs 44–48. Genitalia of *Achaetothorax crypticus* sp. n., paratype males. 44–45 = sternite 5 in ventral view, 46–47 = epandrium, cerci and surstyli in caudal (posterior) view, 48 = left cercus and surstylus in lateral view (44, 46, 48 = Burunga, 45, 47 = Mt. Sesero males) (scales: 0.2 mm for Figs 44–45, 0.1 mm for Figs 46–47 and for Fig. 48).

Acta Zoologica Hungarica 38 (3–4), pp. 345–358 (1992)

TAXONOMIC STUDIES ON THE PALAEARCTIC CUCULLIAE, PART V. THE STIGMATOPHORA-GROUP (LEPIDOPTERA, NOCTUIDAE)

G. RONKAY & L. RONKAY

H–1137 Budapest, Szent István körút 4, Hungary

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 15th November 1991)

The genus *Shargacucullia* G. RONKAY et L. RONKAY and the *S. stigmatophora*-group are characterized, and a new species, *Shargacucullia naumanni* sp. n., (Afghan and Tadjik Pamir, Tien Shan) is described. With 1 phototable and 22 figures, original.

Introduction – The genus *Cucullia* SCHRANK, 1802 (s. l.) has few main lines of evolution which results in large groups of species. These groups are characterizable by both external and genital features and their separation is usually easy. As a result of the recent investigations, it was pointed out that these groups belong to two phylogenetically divergent lineages differing in some principal morphological (and life history) features, consequently the members of these lineages cannot be considered as congeneric units. The taxonomic interpretation of the tribe Cuculliini is given in the 6th Volume of the series "Noctuidae Europeae" (G. RONKAY & L. RONKAY 1992) in which a new genus – *Shargacucullia* – is described for the so-called "yellow Cuculliae". As this group is characterized in details in the work mentioned above, only a short discussion of the genus is given here.

Shargacucullia G. RONKAY et L. RONKAY, 1992

Type species: *Cucullia lychnitis* RAMBUR, 1833

This evolutionary line is generally homogeneous in external appearance: ground colour of fore wing ochreous-brownish or pale greyish with two more or less conspicuous darker grey or brownish stripes on costal and inner margins, lower part of postmedial line with two whitish/whitish-ochreous lunules, outer margin crenulate. The synapomorphies in the male genitalia are as follows: the ductus ejaculatorius continues from the terminal part of the large diverticulum, the presence of a short, tubular diverticulum at middle of the large sac and the sclerotized, rugulose, ribbon-like field on the large diverticulum of the vesica; the coremata are usually absent (except in the *mediogrisea*-group).

In the female genitalia the ductus bursae is heavily sclerotized, flattened, the ostium bursae is strong, V- or U-shaped, without dorsal ligula, the ductus seminalis originates from the apex bursae. The larvae – the majority of the descriptions includes also them – feed on Scrophulariaceae (a single datum for *S. verbasci* to feed on *Buddleia* is known), and, with the exception of *S. prenanthis* BOISDUVAL, 1840, they are of a similar type in colouration and dark markings.

Two of the characteristic features of this group is of special interest from the phylogenetic point of view, namely the position of the ductus ejaculatorius in the male and the ductus seminalis in the female (which very probably had a correlative evolution). The direct continuation of the large, recurved sac of the vesica in ductus ejaculatorius and the origin of ductus seminalis from apex bursae are typical for the genera *Shargacucullia*, *Calocucullia* and the South and Central American "*Cucullia*" and *Opsigalea* Hampson, 1906 species, since all the species of *Cucullia* s. str. have the ductus ejaculatorius originated laterally from the large sac being far from its apex and the ductus seminalis springs from the fundus of bursa copulatrix. These features are nearly unique in the trifine Noctuidae tribes but not unprecedented. The short, tubular diverticulum of *Shargacucullia* and *Calocucullia* can be considered as homologous with the ductus ejaculatorius of *Cucullia* s. str. while the ductus seminalis appears in the proximal situation in some species of *Oncocnemis* LEDERER, 1853, where the originally bilobate bursa transformed into a single one with the reduction of corpus bursae. This was the probable course of development in case of *Cucullia* s. str., too.

In our opinion only the species characterizable by the latter features can be considered as a homogeneous unit and to be treated as the genus *Cucullia* (type species *C. umbratica* LINNAEUS, 1758). The other taxa, regarded as *Cucullia*, are the descendants of a more or less heterogeneous "pool" of ancient taxa and form some few genera which are closely related but not congeneric with *Cucullia* (according to POOLE 1989, p. 296: "...but the species described by KÖHLER in the genus *Cucullia*, none of the ones I am familiar with is a *Cucullia*. Apparently the genus *Cucullia* does not occur in South America.").

The genus *Shargacucullia* contains some groups of species, representing the different paths in the phylogeny of the line. The *mediogrisea*-group can be characterized by the most ancient features: costal dark streak of forewing less conspicuous, cucullus falcate and less distinct from other parts of valva, corona usually extremely long, harpe slender and often long, pointed, carina without teeth but with a small, eversible, sclerotized bar, abdominal coremata present, ostium bursae U-shaped without rounded terminal lobes, ovipositor and gonapophyses strong. This group contains four species, discussed and figures in the second part of this series (G. RONKAY & L. RONKAY 1987).

The species *Shargacucullia eugrapha* BOURSIN, 1941, shows some special convergences with the taxa of the *dracunculi*-group, like the shorter, arcuate cucullus with a rounded edge on the ventral margin, the shorter corona and the similar costal processus and harpe. On the other hand, none of the synapomorphies of *Cucullia* s. str. can be found in the *mediogrisea*-group, and, beside this sole case, no other transitional form between *Shargacucullia* and *Cucullia* s. str. is known.

The differences between the *stigmatophora*- and the *scrophulariae*-groups are, as compared with the *mediogrisea*-group, significantly smaller; these differences are given in the following chapter.

An other specialized side-arm of development is represented by a sole species. *S. verbasci* LINNAEUS where the cucullus and corona reduced and the distal part of valva is tapering and the clavi are large, flattened and rounded plates.

The last small group of the line had evolved very probably independently from the *scrophulariae*-group within the western part of the area of the latter. This group – the *prenanthis*-group – is very distinct from its relatives and can be easily separated from them by both imaginal and larval characters. The autapomorphies of this group – lack of the corona, specially modified distal part of valva, well developed, sclerotized pulvillus, strong single cornutus of carina, heavily sclerotized, wide posterior part of ostium bursae, huge cervix bursae connected with corpus bursae by a narrow, membranous tube and also some larval and life history features – are unique within the genus.

CHARACTERIZATION OF THE *STIGMATOPHORA*-GROUP

The members of the species-groups belonging to the genus *Shargacucullia* have a characteristic external appearance, while the genitalia of both males and females dislay the same respective groundplan. These morphological characters had evolved along different paths and in the more recent *scrophulariae*-group the specific differences have become extremely slight or overlapping.

The species of the *stigmatophora*-group are apparently more conservative as there are well-discernible specific differences in the genitalia of both sexes, and, as with the external features, the genitalia preserved numerous ancient character states of the genus *Shargacucullia*. The important common features of the group members are as follows:

- ground colour of wings generally dark, brownish, hind wing entirely dark brown even in case of males;
- transverse lines and cellular lunule(s) present on wings, especially on underside;
- harpe originating close to ventral margin of valva and directed towards cucullus and not to costal margin;
- valvae moderately long, cucullus short and less acute;
- vesica with two short, nearly equal cornuti;
- carina with a large ventral tooth;
- ostium bursae slender, less sclerotized;
- ductus bursae wide, heavily sclerotized.

DISTRIBUTION

The members of the *stigmatophora* and *mediogrisea* groups have the most easternly distribution of the *Shargacucullia* of the Inner Asian-Himalayan area. Their ranges almost entirely overlap, but related species in the two evolutionary lines are – by the known data – not sympatric, with the exception of *naumanni* and *notodontina* in NE Afghanistan. The members of these species groups occur sympatrically with the more derived taxa of the *Shargacucullia* in Chinese Turkestan and Afghanistan.

The species belonging to the *mediogrisea*-group seem connected to the montane forest zone; the species of the *stigmatophora*-group evolved into xeromontane elements, inhabiting stream valleys at higher elevations. The distribution pattern of the three species of the *stigmatophora*-group is rather common with those of numerous xeromontane genera or species-groups. The first part of the species belonging to these groups occur in the Tien Shan chain in Chinese and Soviet Turkestan, sometimes also in Kashgar and SW Mongolia, the second part in the Pamir and the Hissar Mts. (Badakhshan, Darwaz and rarily in some parts of the Tien Shan) while the third one on Kashmir (Ladakh, Nepal); their ranges are allopatric and isolated by the main chain of the Tien Shan and Karakorum and the valley of the Amu Darya. The only peculiar fact in the distribution of the *stigmatophora*-group is the appearance of *notodontina* in the Mts. Paghman, very close to the southernmost known locality of *naumanni*.

The two species living in the Himalaya range – *stigmatophora* and *mediogrisea* – inhabit also the subtropical and tropical forest zones, and the latter is the only *"Cucullia"* species known from the true Oriental territory. It was surprisingly found in Thailand, Province Chiang Mai, by the expedition of the Zoological Museum, Copenhagen in 1984, and in Viet Nam, NW from Sai Gon (Ho Chi Minh City), by the expedition of the Hungarian Natural History Museum in 1988.

KEY TO SPECIES BASED ON EXTERNAL FEATURES

1. Lunules of forewing postmedial line strong and white, forewing wide with dark central area suffused with brown **S. stigmatophora** HAMPSON
– Lunules of forewing postmedial line smaller and more ochreous, central area of fore wing lighter 2
2. Forewing more elongate with more acute apex, ground colour of fore wing nearly unicolorous and shiny: lunules of postmedial line relatively large **S. notodontina** BOURSIN
– Forewing shorter and less acute, ground colour of forewing more mosaic-like and not shiny, lunules of postmedial line small, obsolescent **S. naumanni** sp. n.

KEY TO SPECIES BASED ON MALE GENITALIA

1. Harpe shorter and thicker with more rounded apex, diverticula bearing the cornuti nearly equally long (Figs 7–10, 15–20) **S. naumanni** sp. n.
– Harpe longer and more or less acute, one of the two diverticula bearing the cornuti about two times as long as the other (Figs 11–14, 21–22) 2
2. Harpe shorter and fairly acute, valvae strongly constricted in distal third (Figs 13–14) **S. stigmatophora** HAMPSON
– Harpe longer and slightly acute, valvae without strong constriction (Figs 11–12) **S. notodontina** BOURSIN

KEY TO SPECIES BASED ON FEMALE GENITALIA

1. Bursa copulatrix with a strongly sclerotized zone at ductus bursae **S. stigmatophora** HAMPSON
– Bursa copulatrix hyaline or with some gelatinous traces 2
2. Ductus bursae significantly longer with nearly parallel margins (Figs 23–24) **S. naumanni** sp. n.
– Ductus bursae shorter with strongly tapering proximal part (Fig. 25) **S. notodontina** BOURSIN

SYSTEMATICS*

Shargacucullia stigmatophora HAMPSON, 1894 (Figs 1–2, 13–14, 22–24)

Type material examined: Holotype ♀ (by the colour slides of the specimen), "Murree., 92–98, Harford Coll. 1887", "19", (underside) "Cucullia stigmatifera [sic!] Hmpsn., type ♀" (BMNH).

Additional material examined: Kashmir: Goolmarg, 11 and 16. VI. 1967, leg. TOPÁL, 2 ♀ (HNHM); Lihenwan, 12–23. VI. 1979, leg. PLANTE, 1 ♂ (Plante). Slides Nos 2670 (♂), 2588, 3184 (♀) RONKAY.

The description of the species is satisfactorily given by HAMPSON (1906), the characterization of the genitalia of both sexes is given below.

Male genitalia (Figs 13–14, 22): Uncus slender, hooked, tegumen high, fultura inferior a rounded plate, vinculum long, V-shaped. Valvae elongate, narrow, constricted at distal third. Sacculus less sclerotized, clavus a very small, hairy protuberance. Harpe elongate, acute, conical cucullus short, corona well developed. Aedeagus cylindrical, carina with a large distal tooth and some smaller teeth laterad. Vesica everted forward, consists of three diverticula: two shorter, bearing the two fine, bulbed cornuti – the ventral one about two times longer than the other one – and a larger, reclinate sac with a rugulose, sclerotized ribbon on its dorsal surface.

Female genitalia (Figs 23–24): Ovipositor short, gonapophyses short and slender. Ostium bursae U-shaped, ductus bursae strongly sclerotized, wide and flattened, its anterior part twisted and finely granulose. Apex bursae slightly, distal third of bursa copulatrix strongly, gelatinous/sclerotized; lateral emergence usually well developed. Corpus bursae a large, hyaline sac.

Diagnosis – The species is easy recognizable by its characteristic dark coloration of wings, especially the intensive dark brown suffusion of forewings and the conspicuous, white lunule of postmedial line. The main specific feature of the male genitalia is the distally constricted valva. In the female genitalia the gelatinous crests and the lateral emergence of the posterior part of bursa copulatrix at ductus bursae are the strongest within the species-group.

*Abbreviations:
British Museum (Natural History), London (BMNH)
Hungarian Natural History Museum, Budapest (HNHM)
Zoological Museum, Humboldt University, Berlin (ZMHU)

Shargacucullia notodontina BOURSIN, 1934
(Figs 3, 11–12, 21, 25)

Type material examined: paratype ♂ Kuldja (ZMHU), paratype ♀ Karagai Tau (ZMHU).

Additional material examined: Afghanistan: Paghman Mts, 30 km NW Kabul, 2200 m, 29. VI.–8. VII. 1963, leg. KASY et VARTIAN (VARTIAN). Slides Nos 2586 (♂), 2587, 2764 (♀) RONKAY.

The external morphology of the species is given by BOURSIN (1934) in details, the genital features are given below.

Male genitalia (Figs 11–12, 21): Uncus long and slender, hooked, tegumen narrow, fultura inferior a quadrangular plate, vinculum V-shaped. Valvae elongate, sacculus narrow, clavus a small, rounded protuberance. Harpe long, conical, slightly acute, cucullus short, pointed, corona well-developed. Aedeagus cylindrical, carina with a large distal and sone small, lateral teeth. Vesica everted forward, consists of three diverticula; two bear fine, bulbed cornuti, the ventral one very long and slender; third diverticulum a large and reclinate sac with a sclerotized ribbon on dorsal surface.

Female genitalia (Fig. 25): Ovipositor and gonapophyses short, ostium bursae U-shaped. Ductus bursae long, heavily sclerotized, flattened, posterior part strongly dilated and folded, anterior part narrow and rugulose. Apex and corpus bursae hyaline.

Diagnosis – Closely allied to *S. naumanni* sp. n. but separable by its more unicolorous and shiny forewings, longer harpe and ventral diverticulum in the male, and proximally more tapering, usually shorter ductus bursae in the female, genitalia.

Shargacucullia naumanni sp. n.
(Figs 4–10, 15–20, 26–28)

Type material: Holotype ♂, "NE Afghanistan, Prov. Badakhshan, (Darwaz), vic. Khwáhan, Kotal-e-Komkhas, N-Seite, 3200 m, 12. 7. 72, leg. BRADE et NAUMANN, No. 327", slide No. 2605 RONKAY (NAUMANN). – Paratypes: Afghanistan: Prov. Badakhshan (Darwaz), vic. Khwáhan, Pari Kham, 2500 m, 26. 7. 1972, BRADE et NAUMANN, 1 ♀ (HNHM); Prov. Badakhshan, 3000 m, 15 km NE Baharak, Kotal-e-Zardeu, 30. 6. 1971, EBERT et NAUMANN, 1 ♂ (NAUMANN); Prov. Kadaghan, 69° E, 35° 40′ N, 2100 m, Salang Pass, N slope, 13. VI. 1971, VARTIAN, 1 ♀ (VARTIAN). USSR: Tadzhikistan, Pamir, Chorog, 1 ♂, 1 ♀ (coll. BEHOUNEK, Deisenhofen); a series of males and females, USSR, Kirghizsky chain, alpinists' camp in the Ala-Archa valley, 2050–2100 m, 3–7. 07. 1980, 15. 07. 1986, leg. A. NEKRASOV (coll. NEKRASOV, Moscow and HNHM). Slides Nos 189 NEKRASOV; 2380, 3100, 4056 RONKAY (males), 2604, 2765, 3106, 4057 RONKAY (females).

Description – Alar expanse 39–44 mm (holotype: 40 mm), length of fore wing 17–20,5 mm (holotype: 17 mm). Head and thorax light ochreous-brown, frons and collar striolate with dark red-brown, basal line of collar black. Fore wing with characteristic shape, relatively short and wide, apex less pointed. Ground colour of fore wing light ochreous-brown, irrorated with darker brownish scales. Antemedial line double, strongly waved, costal part of it obsolete. Orbicular and reniform stigmata nearly entirely deleted, encircled with only some black spots, their filling usually slightly lighter than ground colour. Postmedial line double, sinuous, upper part of it obsolescent, becoming sharper below cell. Lunules of postmedial line small and less conspicuous, ochreous. Subterminal line less defined, marginal area with some darker brownish lines on and between veins, terminal line whitish. Dark stripe of inner margin reddish-brown, becoming wider from postmedial line to tornus. Cilia dark brown, finely spotted with whitish-ochreous. Hind wing brown, marginal area darker. Cellular lunule pale but visible, transverse line a diffuse, darker stripe, veins covered with dark brown. Terminal line brown, cilia whitish-ochreous with a scattered, brown outer line. Underside of forewing unicolorous, fumous brown, costal margin slightly darker. Shadow of postmedial line visible, cilia brown, spotted with ocherous. Underside of hind wing brownish-white, transverse line and cellular lunule conspicuous, brown, marginal area suffused with darker brown.

The colouration of the specimens from the Tien Shan and the Tadjik Pamir (Chorog) is a bit darker and the wing pattern is sharper and the wingspan of the specimens from Chorog is larger.

Male genitalia (Figs 7–10, 15–20): Uncus slender and hooked, tegumen high, fultura inferior deltoidal, vinculum V-shaped. Valvae elongate, sacculus narrow, clavus a rounded protuberance. Harpe short and a bit flattened, apex of it more or less rounded. Aedeagus cylindrical, carina with a larger ventral and some smaller lateral teeth. Vesica everted forward, consists of three diverticula; two, bearing short and relatively thick cornuti, are nearly equally long, third diverticulum a large and tubular, reclinate sac, with a sclerotized ribbon on its dorsal surface.

Female genitalia (Figs 26–28): Ovipositor short, gonapophyses short and gracile. Ostium bursae U-shaped, narrow. Ductus bursae heavily sclerotized, long and flattened, posterior part wide, anterior part with parallel margins. Apex and corpus bursae less gelatinous, emergence small and flattened.

Diagnosis – The new species is similar to *S. notodontina* but distinguishable from it by external and genital features as follows: *S. naumanni* has shorter and wider forewing with less pointed apex. The ground colour is less unicolorous and not shiny, with more mosaic-like inner field of forewing; the lunules of postmedial line are less conspicuous.

The differences in the genital characteristics are also spectacular, greater than in other groups of the yellow Cuculliae. The harpe of *S. naumanni* is shorter than that of *S. notodontina*, the ventral diverticulum is shorter and the cornuti are thicker than those of *notodontina*. In the female genitalia the ductus bursae of *naumanni* have nearly parallel anterior margins and is usually longer than in the related taxa.

The third species of the group, *stigmatophora*, differs externally strongly from the species pair discussed above, the main differences are listed in the identification keys.

The new species is known from the Afghan and Soviet Pamir and the C Tien Shan range, the area of it is contiguous with that of *notodontina*.

* * *

Acknowledgements – We would like to express our thanks to MRS. E. VARTIAN (Vienna) and DR. Z. F. KLYUCHKO (Kiev), PROF. H.-J. HANNEMANN and DR. W. MEY (Berlin), PROF. C. NAUMANN (Bonn), J. PLANTE (Martigny), A. V. NEKRASOV (Moscow), MR. G. BEHOUNEK (Deisenhofen), PROF. Z. VARGA (Debrecen) and DR. L. GOZMÁNY (Budapest) for their kind help. Our special thanks to DR. I. J. KITCHING (London) for his useful advices and the correction of the English text.

We are grateful to DR. M. HONEY (London) and MR. L. PEREGOVITS (Budapest) for making the colour slides of the holotype of *stigmatophora*.

REFERENCES

BOURSIN, C. (1934): Contributions à l'étude des Noctuidae Trifidae. XII. Description de quatre nouvelles Cucullia, avec quelques notes sur trois espèces paléarctiques. – *Revue fr. Ent.* **1:** 142–153.

BOURSIN, C. (1941): Die Cucullia-Arten aus Dr. H. Hönes China-Ausbeuten während der Jahre 1931 bis 1938. Beiträge zur Kenntnis der Agrotidae-Trifinae, XXX. – *Dt. ent. Z. Iris* **55:** 28–84.

HAMPSON, G. F. (1894): Fauna of British India, incl. Ceylon and Burma. Vol. II. – London, pp. 1–239.

HAMPSON, G. F. (1906): Catalogue of the Lepidoptera Phalaenae in the British Museum, VI. – London, British Museum.

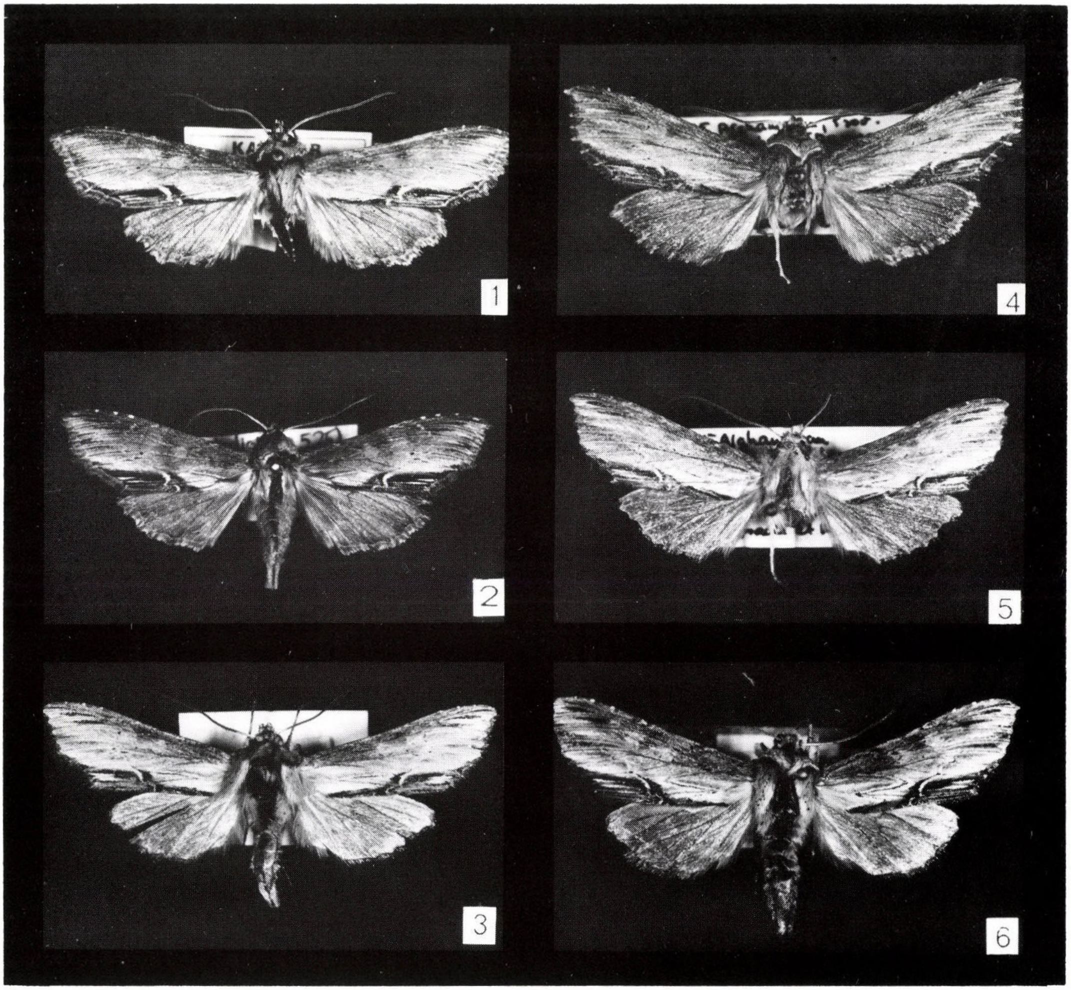
POOLE, R. W. (1989): Noctuidae. in: HEPPNER, J. B.: Lepidopterorum Catalogus (New Series, Fasc. 118). – Brill, Flora & Fauna publications.

RONKAY, L. & RONKAY, G. (1986): Taxonomic studies on the Palaearctic Cuculliae. Part. I. Description of four new species. – *Acta Zool. Hung.* **32:** 351–360.

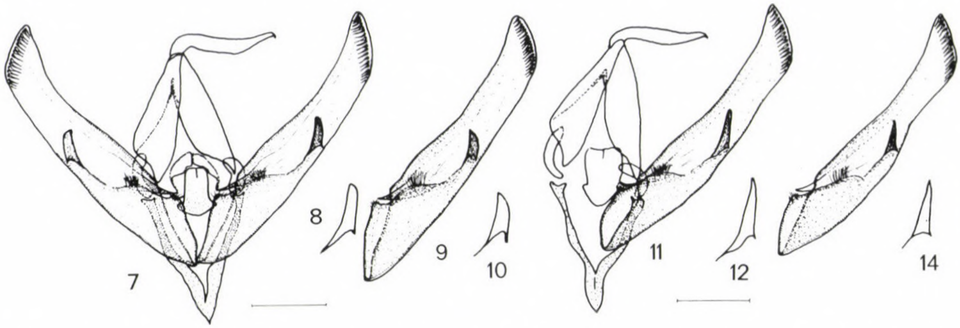
RONKAY, L. & RONKAY, G. (1987): Taxonomic studies on the Palaearctic Cuculliae. Part II. (Lepidoptera, Noctuidae). – *Acta Zool. Hung.* **33:** 463–484.

RONKAY, L. & RONKAY, G. (1988): Taxonomic studies on the Palaearctic Cuculliae (Lepidoptera, Noctuidae). Part IV. – *Annls hist.-nat. Mus. natn. hung.* **80:** 91–101.

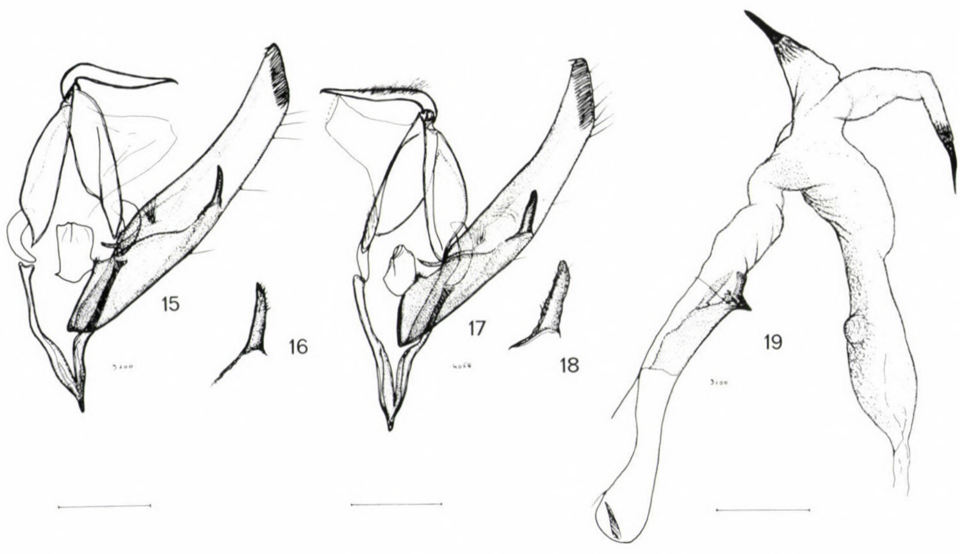
RONKAY, L. & RONKAY, G. (1992): Cuculliinae. – In: Noctuidae Europaeae, Volume 6, Entomological Press, Sorø, (in press).



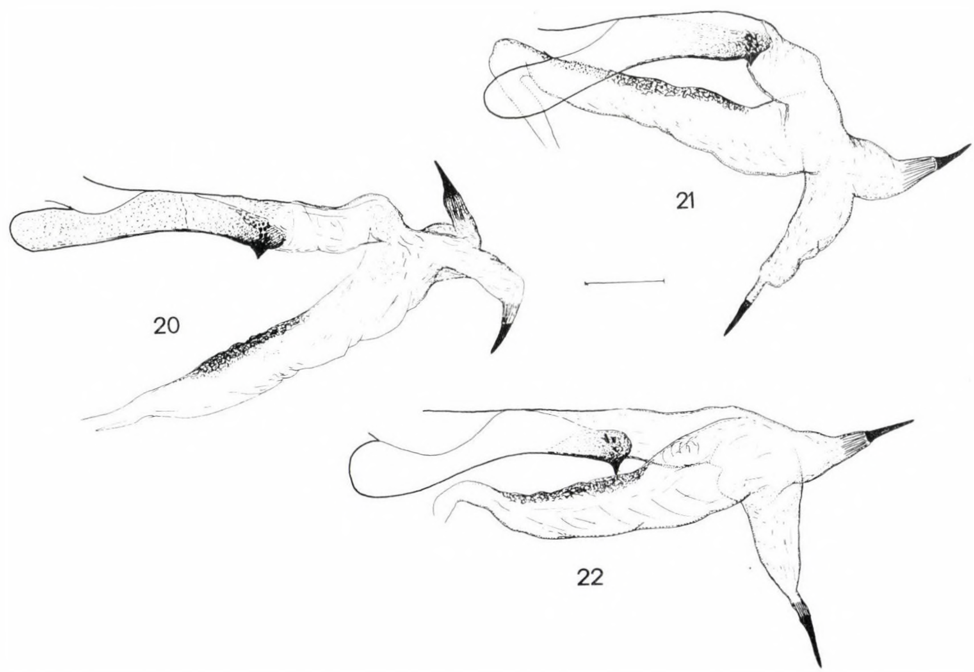
Figs 1–6. *Shargacucullia* spp. 1 = *S. stigmatophora*, ♂, Kashmir, 2 = *S. stigmatophora*, ♀, Kashmir (HNHM), 3 = *S. notodontina*, ♀, Afghanistan (VARTIAN). 4 = *S. naumanni*, ♂, holotype, Afghanistan (Naumann). 5 = *S. naumanni*, ♂, paratype, Afghanistan (HNHM). 6 = *S. naumanni*, ♀, paratype, Afghanistan (VARTIAN).



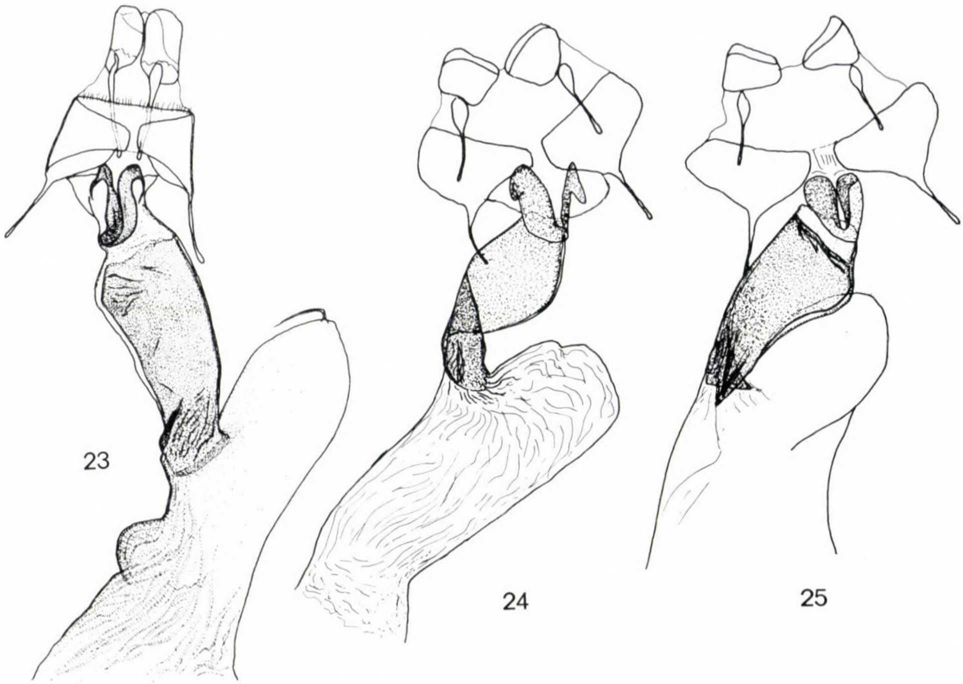
Figs 7–14. *Shargacucullia* spp., male genitalia, aedeagi removed. 7–10 = *S. naumanni* (7–8 = = holotype, Afghanistan, slide 2605 Ronkay; 9–10 = *S. naumanni*, paratype, Afghanistan, slide 2380 Ronkay). 11–12 = *S. notodontina*, paratype, Kuldja, slide 2586 Ronkay. 13–14 = *S. stigmatophora*, Kashmir, slide 2670 Ronkay.



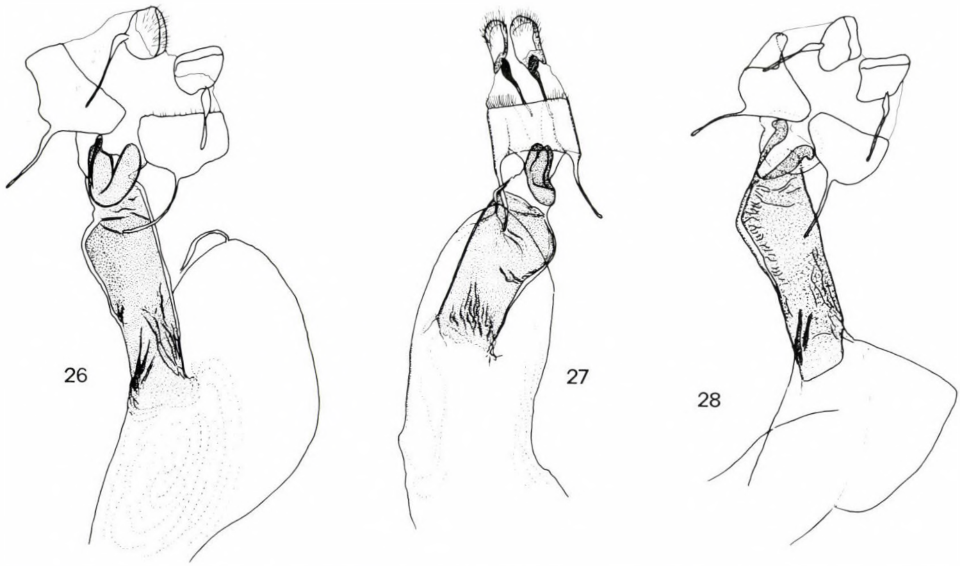
Figs 15–19. *Shargacucullia naumanni* sp. n. 15–16, 19 = paratype, Pamir, Chorog, slide 3100 Ronkay; 17–18 = paratype, Ala-Archa, slide 4056 Ronkay.



Figs 20–22. *Shargacucullia* spp., aedeagi: 20 = *S. naumanni*, holotype, Afghanistan, slide 2605 RONKAY; 21 = *S. notodontina*, paratype, Kuldja, slide 2586 RONKAY; 22 = *S. stigmatophora*, Kashmir, slide 2670 RONKAY.



Figs 23–25. *Shargacucullia* spp., female genitalia, proximal part of bursa copulatrix removed; 23–24 = *S. stigmatophora* (23 = Kashmir, slide 3184 RONKAY, 24 = Kashmir, slide 2588 RONKAY); 25 = *S. notodontina*, paratype, Karagai Tau, slide 2587 RONKAY.



Figs 26–28. *Shargacucullia naumanni* sp. n., female genitalia, proximal part of bursa copulatrix removed: 26 = paratype, Pamir, Chorog, slide 3106 RONKAY, 27 = paratype, Ala-Archa, slide 4057 RONKAY, 28 = paratype, Afghanistan, slide 2604 RONKAY.

Acta Zoologica Hungarica 38 (3–4), pp. 359–371 (1992)

FEMALE INTERNAL GENITALIA OF THE CONIOPTERYX SPECIES OF CENTRAL EUROPE (NEUROPTERA, CONIOPTERYGIDAE)

GY. SZIRÁKI

Zoological Department, Hungarian Natural History Museum, H-1088 Budapest, Baross utca 13, Hungary

(Received 16th December 1991)

Female internal genitalia of the 12 Central-European *Coniopteryx* species were studied. Bursa copulatrix, spermatheca and the female accessory gland are described and figured. The investigated characteristics confirm the validity of the three subgenera which live in this territory, and which were separated from each other on the basis of the male genitalia. With 38 original figures.

Bursa copulatrix and spermatheca of some coniopterygid species was examined already sixty years ago (TJEDER 1931), but later the female internal genitalia of this neuropterous family were described only sporadically (TJEDER 1964, MEINANDER 1972, ASPÖCK et al. 1980). Recently an identification key was prepared for the Hungarian *Coniopteryx* species (SZIRÁKI 1992b). Present investigations are initial steps of the scheduled studies for clearing up systematically the structure of female internal genitalia of Coniopterygidae, and of some other neuropterous families. It is expected that, finally, the results will afford possibilities for solution of phylogenetic problems of Neuropteroidea.

The investigated coniopterygid material was collected mainly in Hungary, but the specimens of *C. drammonti* in Spain. (Within Central Europe the latter species was reported only from a single locality of Austria (HÖLZEL et al. 1980).) In the case of *C. pygmaea* and *C. lentiae* – in addition to the Hungarian female specimens – I have examined material from the Soviet Far East and from Spain, respectively.

For studying of the taxonomically important structures of female internal genitalia, the abdomen, together with the last tergal segment, was boiled in 10% potassium hydroxide solution, and after a rinse stained by safranine. The potassium hydroxide treatment destroyed the mesodermal cells, which form the ovaries and the lateral oviductus and left the ectodermal cells, which form the vagina, accessory gland, bursa copulatrix, spermatheca, spermathecal gland and median oviduct (UNZICKER 1968). The gut content was removed as far as it was possible. The possibility of joining of the undescribed female coniopterygids to the corresponding males is discussed in an other paper (SZIRÁKI 1992a).

GENERAL CONSTRUCTION OF FEMALE INTERNAL GENITALIA OF THE GENUS *CONIOPTERYX*

In the investigated genus the female internal genitalia have the following construction (Fig. 1). Vagina is an elongated, weakly sclerotized chamber. Accessory gland and bursa copulatrix open into the vagina dorsally, while median oviduct proximally. Distal part of vagina may be turned out, and in this case pores of accessory gland and bursa copulatryx open caudally (Fig. 3). Bursa copulatrix is a well separated structure in the subgenera *Coniopteryx* s. str. and *Holoconiopteryx* with strongly chitinized, wrinkled wall, while in the subgenus *Metaconiopteryx* bursa copulatrix and spermatheca are fused and have moderately chitinized walls (e.g. Fig. 27). In the subgenera *Coniopteryx* s. str. and *Holoconiopteryx* the spermatheca is bladder-like, while in *Metaconiopteryx* (e.g. Fig. 26) it is a very elongated, in lateral view "sausage-like" structure. All of the examined spermatheces have a rather thin "appendage". On the basis of its shape and position, this organ shows obvious homology with the structures, which are regarded to be spermathecal gland in Trichoptera (UNZICKER 1968), Lepidoptera (NAUMANN 1988), or in some other insect orders (MATSUDA 1976). This structure in the neuropterous family Chrysopidae (and presumptively in Hemerobiidae) is regarded as spermathecal duct or "fertilization duct" (ductus seminalis) (PRINCIPI 1977, ADAMS & PENNY 1985, MONSERRAT 1990), while in Osmylidae (TJEDER 1957) or in Mantispidae (POIVRE 1981) as a gland. In my opinion this structure is a spermathecal gland. In a female of *C. esbenpeterseni,* which was collected in copula, a dense subtance is visible at the pore of this organ, while the other parts of the spermatheca seem to be empty. Moreover, the distal part of the "appendage" in this case is swollen (see Fig. 32). At least in the case of subgenus *Metaconiopteryx* the proximal end of the spermathecal gland is fixed to the median oviduct by a membrane. Usually a well chitinized blotch (or ring) is situated at the distal end of this gland. This structure was mentioned first time by TJEDER (1931).

Accessory gland has caudally a rather thin duct, a more or less widened subcaudal part (gland reservoir) and proximally a long, often irregularly curved and looped tube. The median oviduct is usually slightly or moderately chitinized and tubular organ.

CHARACTERISTIC FEATURES OF FEMALE INTERNAL GENITALIA

Subgenus *Coniopteryx* s.str.

Coniopteryx (Coniopteryx) aspoecki Kis, 1967
(Figs 1–4)

Bursa copulatrix is triangular in lateral- and in ventral view as well. Its wall is definitely wrinkled, well chitinized. Spermatheca rather long, oval, its proximal half hairy. Spermathecal gland normally developed, the chitinized blotch dark, strong. Reservoir and tube of the accessory gland wide. Median oviduct moderately chitinized.

Coniopteryx (Coniopteryx) borealis Tjeder, 1930
(Figs 5–7)

Bursa copulatrix high and short, its wall definitely wrinkled. Spermatheca moderately long, its surface coarsely granular. Spermathecal gland thin, with a strong distal knob. Reservoir and tube of accessory gland moderately wide, tube is relatively short. Median oviduct slightly chitinized.

Coniopteryx (Coniopteryx) parthenia Navas et Marcet, 1910
(Figs 8–10)

Bursa copulatrix is funnel-like in lateral- and in dorsal views as well. Its wall is definitely wrinkled. Spermatheca spherical, around the opening of spermathecal gland hairy and slightly crinkly. Spermathecal gland short, proximally very thin, distally rather wide. Reservoir of accessory gland moderately wide, tube – before the reservoir – strongly widened, otherwise thin and long. Median oviduct well chitinized.

Coniopteryx (Coniopteryx) pygmaea Enderlein, 1906
(Figs 11–13)

Bursa copulatrix is rounded, its wall definitely wrinkled. Spermatheca moderately long, oval. Its surface wrinkled and slightly granulous. Spermathecal gland and blotch normally developed. Reservoir of accessory gland narrow, tube thin, long. Median oviduct moderately chitinized.

Coniopteryx (Coniopteryx) tineiformis CURTIS, 1834
(Figs 14–16)

Bursa copulatrix high and short, its wall definitely wrinkled. Spermatheca in lateral view oval, around the well chitinized blotch slightly granulous. Spermathecal gland rather short. Reservoir of accessory gland little, tube moderately wide and long. Its proximal end may be branched. Median oviduct moderately chitinized.

Subgenus *Holoconiopteryx*

Coniopteryx (Holoconiopteryx) drammonti ROUSSET, 1964
(Figs 17–19)

Bursa copulatrix wrinkled, in ventral view with a black-pigmented inner part and with a short proximal apodeme. Spermatheca bean-like, spermathecal gland well developed with a large distal knob. Spermathecal blotch moderately chitinized. Accessory gland moderately long and strongly wrinkled. Median oviduct moderately chitinized.

Coniopteryx (Holoconiopteryx) haematica MCLACHLAN, 1868
(Figs 20–22)

Bursa copulatrix elongated with a black inner part and with a long proximal apodeme above the duct of spermatheca. Within the dark part of bursa copulatrix there is a light spot in ventral view. Spermatheca elongated, with slightly wrinkled proximal part. Spermathecal gland small, blotch moderately chitinized. Accessory gland thin and moderately long. Median oviduct slightly chitinized.

Coniopteryx (Holoconiopteryx) renate H. ASPÖCK et U. ASPÖCK, 1964
(Figs 23–25)

Bursa copulatrix in ventral view rounded with a large black inner part and with a light spot inside of it. Spermatheca large, elongated and slightly granulous, spermathecal gland normal with a well developed distal knob. Reservoir of accessory gland moderately wide, tube thin and long. Median oviduct moderately chitinized.

Subgenus *Metaconiopteryx*

Coniopteryx (Metaconiopteryx) arcuata KIS, 1965
(Figs 26–28)

Bursa copulatrix moderately chitinized and only slightly separated from spermatheca. Spermatheca elongated, curved. Its distal part slightly wider than the proximal. Spermathecal gland well developed, blotch normal. Reservoir of accessory gland moderately wide, tube rather short, with wide distal part before the reservoir. Median oviduct moderately chitinized.

Coniopteryx (Metaconiopteryx) esbenpeterseni TJEDER, 1930
(Figs 29–32)

Bursa copulatrix moderately chitinized and entirely fused with spermatheca. Spermatheca long, with diagonal and transversal thickenings. Its distal part – in ventral aspect – very wide. Spermathecal gland well developed with strong distal part. Spermathecal blotch strongly chitinized. Reservoir of accessory gland moderately wide, tube moderately long. Median oviduct slightly chitinized.

Coniopteryx (Metaconiopteryx) lentiae H. ASPÖCK et U. ASPÖCK, 1964
(Figs 33–35)

Bursa copulatrix moderately chitinized, narrow and almost entirely fused with spermatheca. Spermatheca very long and turns back proximally with a very sharp – often angular – turning. Spermathecal gland rather short, blotch – compared with width of spermatheca – very large. Accessory gland thin and long. Median oviduct slightly chitinized.

Coniopteryx (Metaconiopteryx) tjederi KIMMINS, 1934
(Figs 36–38)

Bursa copulatrix moderately chitinized and slightly separated from spermatheca. Spermatheca irregularly winding and extremely long. Spermathecal gland well developed, blotch protruding. Reservoir of accessory gland moderately wide, tube moderately long. Median oviduct slightly chitinized.

SYSTEMATICAL REMARKS

The investigated characteristics of female internal genitalia confirm the validity of the three Central European *Coniopteryx* subgenera, which were separated from each other on the basis of their male genitalia (KIS et al. 1970, MEINANDER 1972). Subgenera *Coniopteryx* CURTIS and *Holoconiopteryx* MEINANDER are rather close to each other. They have strongly chitinized, more or less wrinkled bursa copulatrix and a bladder-like, well separated spermatheca. These two subgenera are distinguishable on the basis of absence (in *Coniopteryx* s.str.) or presence (in *Holoconiopteryx*) of black pigmentation in bursa copulatrix. At the same time, *Metaconiopteryx* KIS, NAGLER et MANDRU is a quite separated subgenus as regards its male and female genitalia as well. In the latter the bursa copulatrix is only moderately chitinized, and fused with the conspicuously elongated spermatheca.

* * *

Acknowledgement – I would like to express my thanks to DR. VICTOR MONSERRAT (Madrid) for the coniopterygid material from Spain.

REFERENCES

ADAMS, P. A. & PENNY, N. D. (1985): Neuroptera of the Amazon basin. Part 11a. Introduction and Chrysopini. – *Acta Amazonica* **15:** 413–479.

ASPÖCK, H., ASPÖCK, U. & HÖLZEL, H. (1980): Die Neuropteren Europas. Eine zusammenfassende Darstellung der Systematik, Ökologie und Chorologie der Neuropteroidea (Megaloptera, Raphidioptera, Planipennia) Europas 1–2. – Goecke et Evers, Krefeld, pp. 495 et 355.

HÖLZEL, H., ASPÖCK, H. & ASPÖCK, U. (1980): Neuropteroidea. – *Catalogus Faunae Austriae* **17:** 1–26.

KIS, B., NAGLER, C. & MANDRU, C. (1970): Insecta, Neuroptera (Planipennia). – *Fauna Republici Socialiste Romania*, Insecta **8:** 1–343.

MATSUDA, R. (1976): Morphology and evolution of the insect abdomen. – Pergamon Press, Oxford, pp. 534.

MEINANDER, M. (1972): A revision of the family Coniopterygidae (Planipennia). – *Acta Zool. Fennica* **136:** 1–357.

MONSERRAT, V. (1990): Systematic studies on Hemerobiidae (Insecta: Neuroptera). – In: MANSELL, M. W. & ASPÖCK, H. (eds): *Advances in neuropterology. Proceedings of the Third International Symposium on Neuropterology*, Berg en Dal, Pretoria: 67–88.

NAUMANN, C. M. (1988): The internal female genitalia of some Zygaenidae (Insecta, Lepidoptera): their morphology and remarks on their phylogenetic significance. – *Syst. Entomol.* **13:** 85–99.

POIVRE, C. (1981): Morphologie comparative et systématique de mantispides d'Afrique et d'Europe (Neuroptera, planipennia) (theses). – Université de Nancy, pp. 256.

PRINCIPI, M. M. (1977): Contributi allo studio dei Neurotteri italiani, XXI. La morphologia addominale ed il suo valore per la discriminazione generica nell'ambito delle Chrysopinae. – *Boll. Ist. Entomol. Univ. Bologna* **31:** 325–360.

SZIRÁKI, GY. (1992a): A possibility for identification of female coniopterygids (Neuroptera). – *Proceedings of Fourth European Congress of Entomology* (in press).

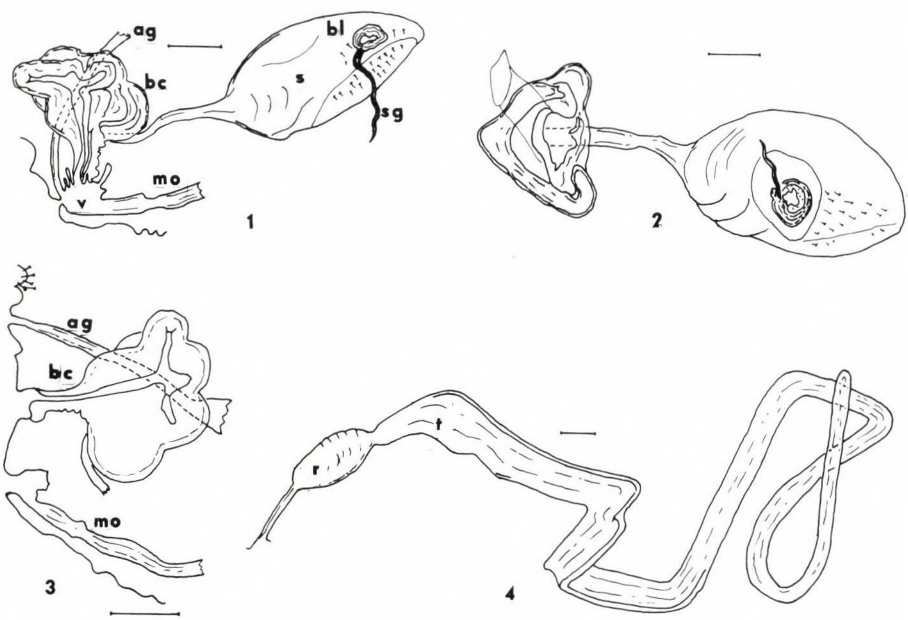
SZIRÁKI, GY. (1922b): Coniopterygidae of Hungary with a key to the identification of Coniopteryx Curtis females (Insecta: Neuroptera: Coniopterygidae). – *Proceedings of Fourth International Symposium on Neuropterology* (Bagnères-de-Luchon), Toulouse, pp. 359–366.

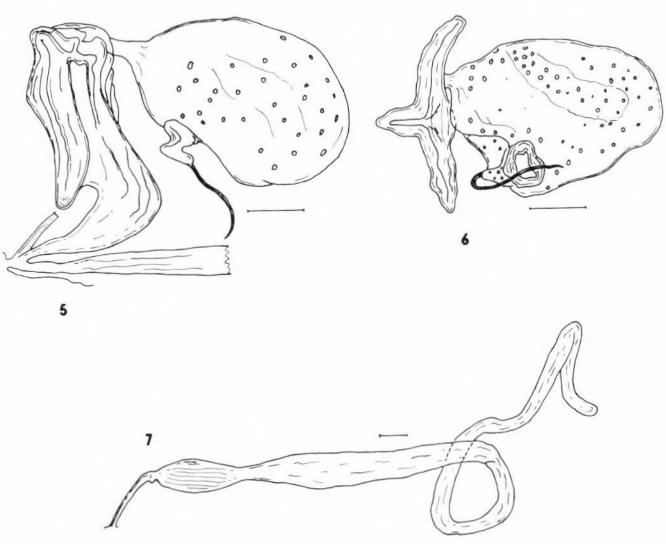
TJEDER, B. (1931): A revision of the North-European species of the genus Coniopteryx Curt. (s.str.) based upon a study of the male and female genitalia. – *Arkiv för Zoologi* (A) **23:** 1–32.

TJEDER, B. (1957): The lace-wings of Southern – Africa. I. Introduction and families Coniopterygidae, Sysiridae, and Osmylidae. – In: HANSTRÖM, B., BRINCK, P. et RUDEBECK, G. (Eds) *South African Animal Life 4. Swedish Nat. Sci. Res. Council,* Stockholm, pp. 93–188.

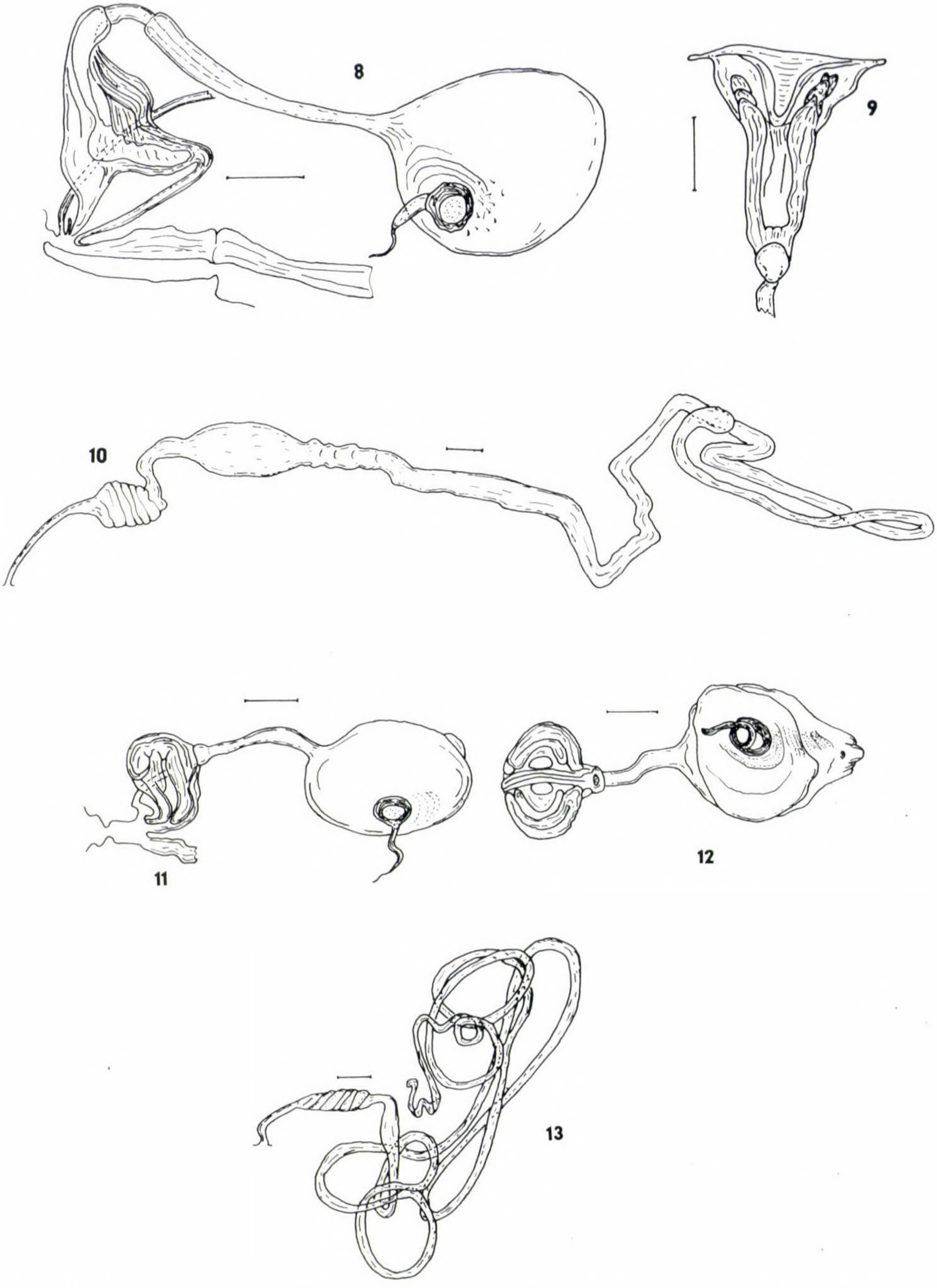
TJEDER, B. (1964): The female of Coniopteryx tullgreni Tj. (Neuroptera, Coniopterygidae). – *Opusc. Entomol.* **29:** 1–2.

UNZICKER, J. D. (1968): The comparative morphology and evolution of the internal female reproductive system of Trichoptera. – *Illinois Biol. Monographs* **40:** 1–72.



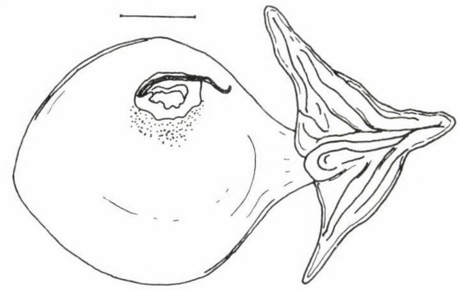


Figs 1–4. Female internal genitalia of *Conioperyx aspoecki,* internal genitalia, lateral view (1), bursa copulatrix and spermatheca, ventral view (2), openings of accessory gland and bursa copulatrix in "turned out" position of distal part of vagina, lateral view (3), accessory gland, lateral view (4), ag = accessory gland, bc = bursa copulatrix, bl = blotch of spermatheca, mo = median oviduct, r = reservoir of accessory gland, s = spermatheca, sg = spermathecal gland, t = tube of accessory gland, v = vagina, the stopped lines represent 0.03 mm. Figs 5–7. Female internal genitalia of *Coniopteryx borealis,* internal genitalia, lateral view (5), bursa copulatrix and spermatheca, ventral view (6), accessory gland, lateral view (7), the stopped lines represent 0.03 mm.



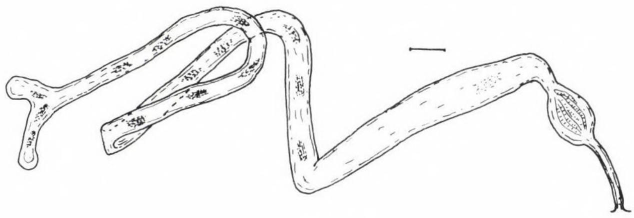
Figs 8–10. Female internal genitalia of *Coniopteryx parthenia*, internal genitalia, lateral view (8), bursa copulatrix, dorsal view (9), accessory gland, lateral view (10), the stopped lines represent 0.03 mm. Figs 11–13. Female internal genitala of *Coniopteryx pygmaea*, internal genitalia, lateral view (11), bursa copulatrix and spermatheca, ventral view (12), accessory gland, lateral view (13), the stopped lines represent 0.03 mm.

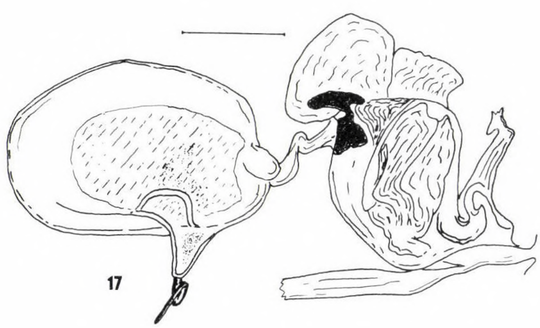
14



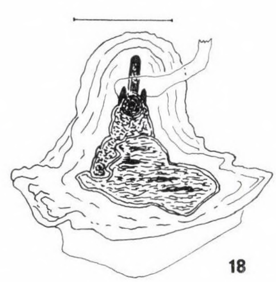
15

16



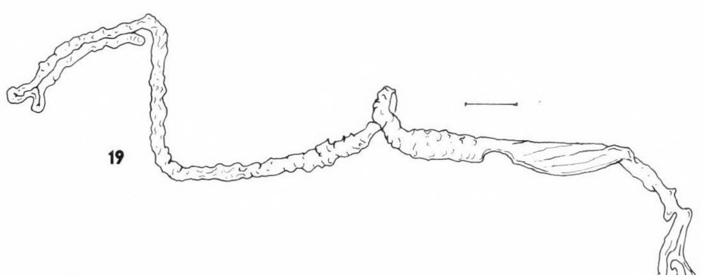


17

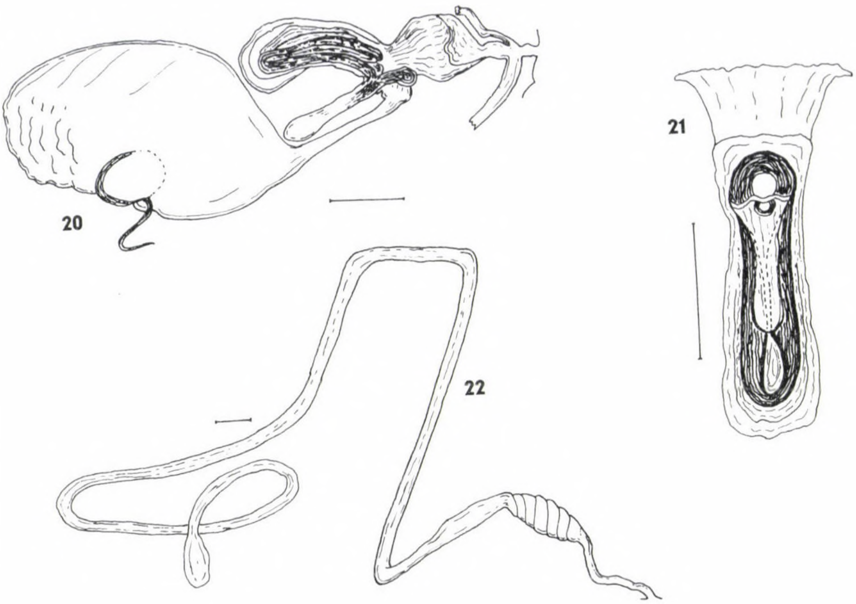


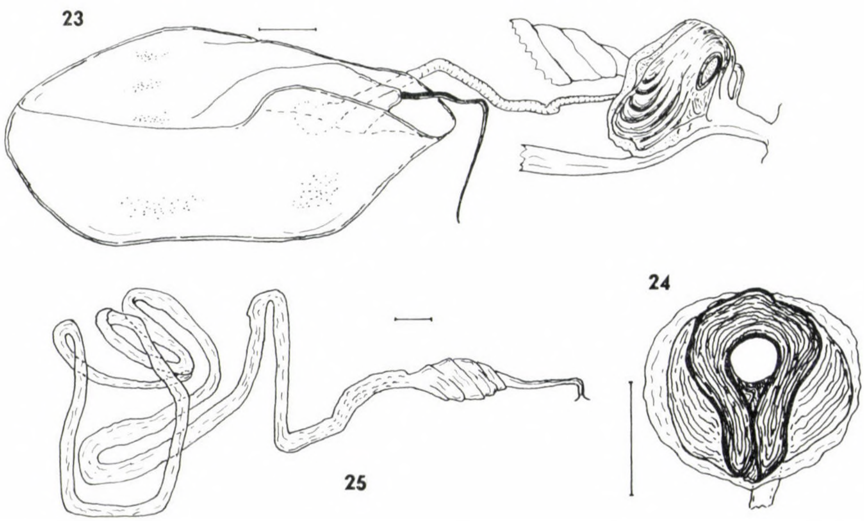
18

19

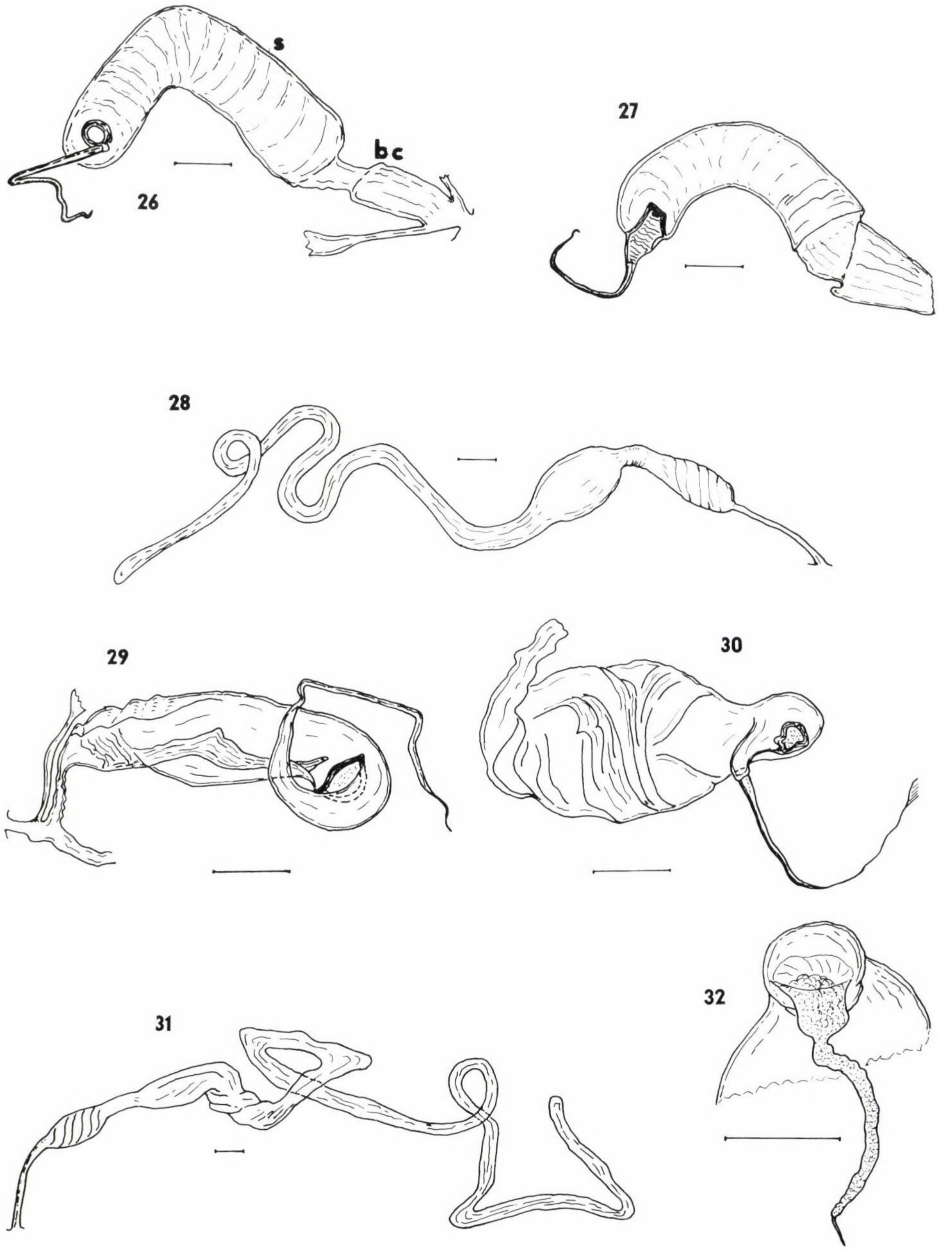


Figs 14–16. Female internal genitalia of *Coniopteryx tineiformis*, internal genitalia, lateral view (14), bursa copulatrix and spermatheca, ventral view (15), accessory gland, lateral view (16), the stopped lines represent 0.03 mm. Figs 17–19. Female internal genitalia of *Coniopteryx drammonti*, internal genitalia, lateral view (17), bursa copulatrix, ventral view (18), accessory gland, lateral view (19), the stopped lines represent 0.03 mm.

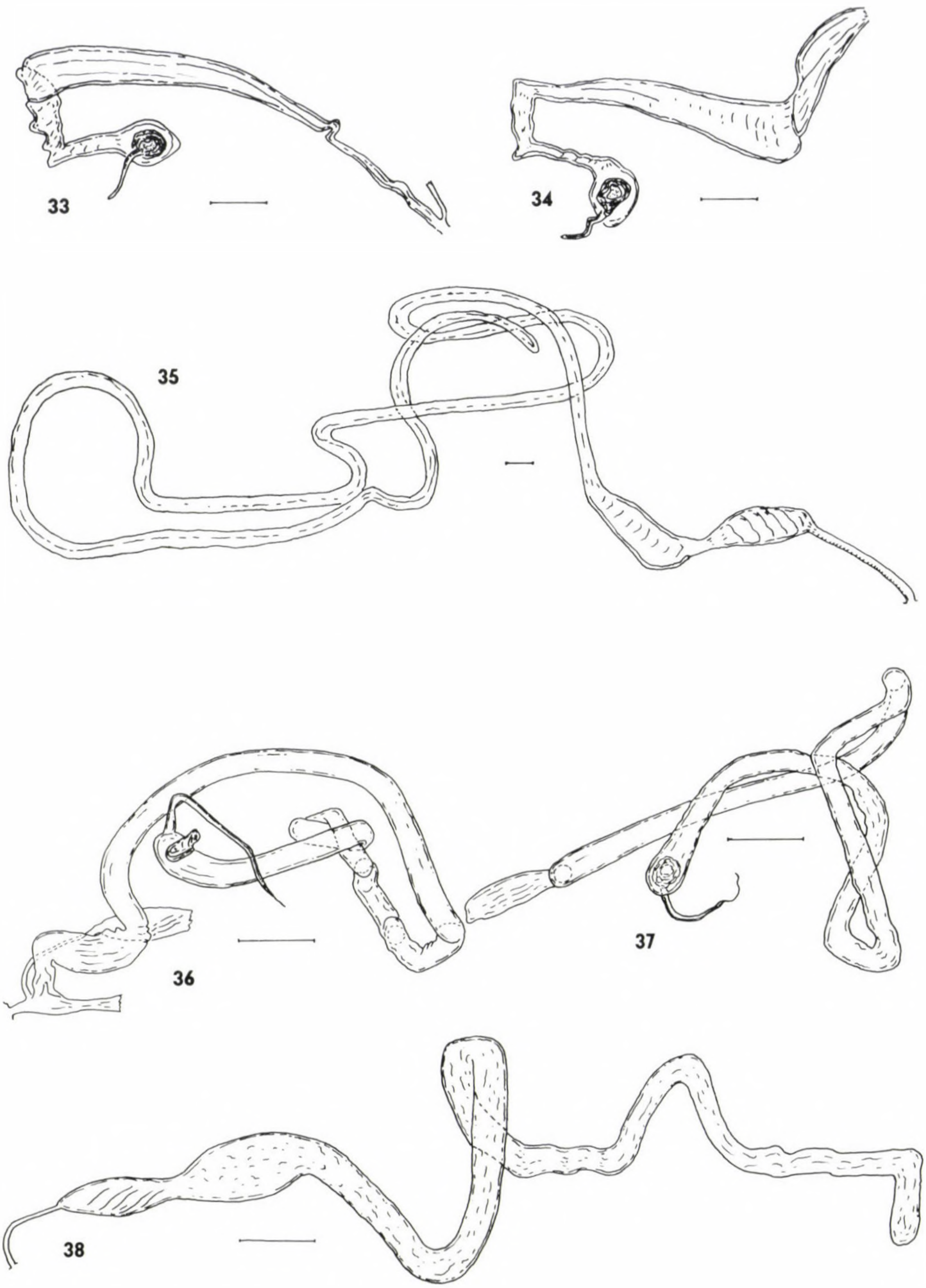




Figs 20–22. Female internal genitalia of *Coniopteryx haematica*, internal genitalia, lateral view (20), bursa copulatrix, ventral view (21), accessory gland, lateral view (22), the stopped lines represent 0.02 mm. Figs 23–25. Female internal genitalia of *Coniopteryx renate*, internal genitalia, lateral view (23), bursa copulatrix, ventral view (24), accessory gland, lateral view (25), the stopped lines represent 0.03 mm.



Figs 26–28. Female internal genitalia of *Coniopteryx arcuata*, internal genitalia, lateral view (26), bursa copulatrix and spermatheca, ventral view (27), accessory gland, lateral view (28), bc = bursa copulatrix, s = spermatheca, the stopped lines represent 0.03 mm. Figs 29–32. Female internal genitalia of *Coniopteryx esbenpeterseni*, internal genitalia, lateral view (29), bursa copulatrix and spermatheca, ventral view (30), accessory gland, lateral view (31), spermathecal gland from a specimen collected in copula, ventral view (32), the stopped lines represent 0.03 mm.



Figs 33–38. Female internal genitalia of *Coniopteryx lentiae,* bursa copulatrix and spermatheca, lateral view (33), ditto, ventral view (34), accessory gland, lateral view (35), the stopped lines represent 0.03 mm. Figs 36–38. Female internal genitalia of *Coniopteryx tjederi*, internal genitalia, lateral view (36), bursa copulatrix and spermatheca, ventral view (37), accessory gland, lateral view (38), the stopped lines represent 0.06 mm

Acta Zoologica Hungarica 38 (3–4), pp. 373–376 (1992)

COPROPHILUS (ZONOPTILUS) FAUVELI SP. N. FROM AZERBAIDZHAN (COLEOPTERA, STAPHYLINIDAE: OXYTELINAE)

L. TÓTH

Zoological Department, Hungarian Natural History Museum,
H-1088 Budapest, Baross utca 13, Hungary

(Received 5th December 1991)

Description of *Coprophilus (Zonoptilus) fauveli* sp. n. from Azerbaidzhan, comparison of two related species and identification key to the species-group are given. With 3 original figures.

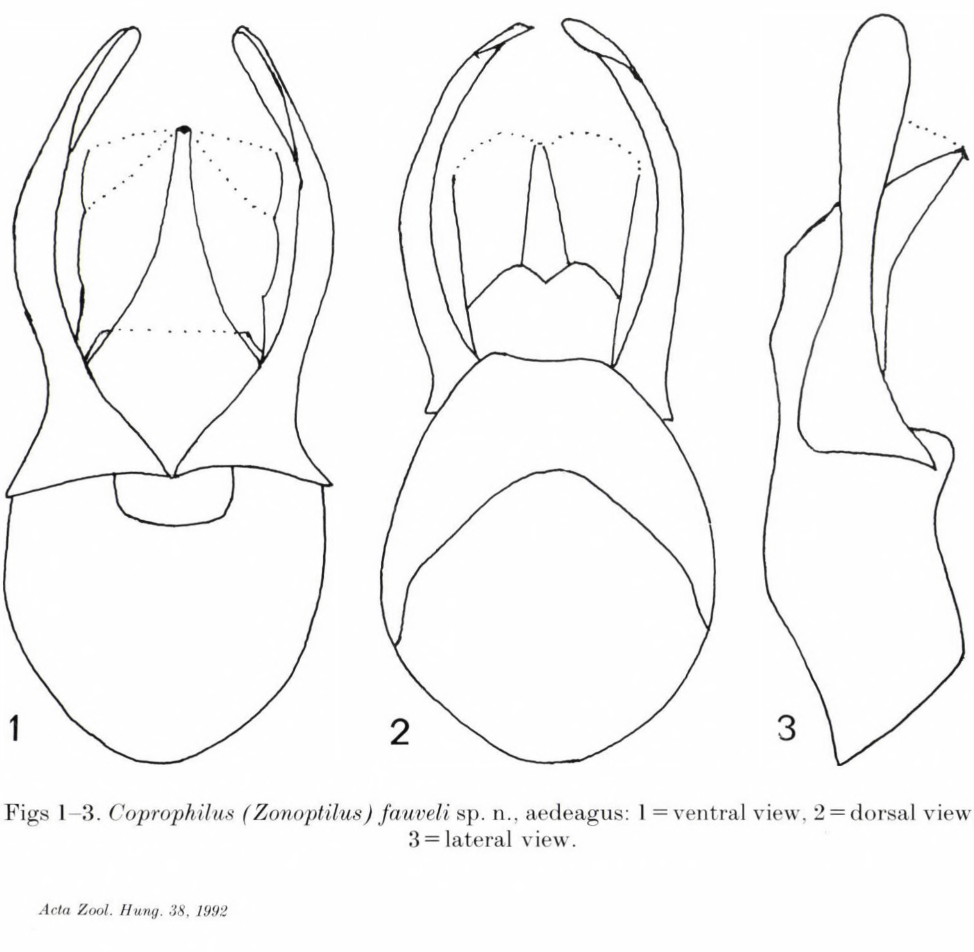
During the examination of the *Coprophilus* specimens of the FAUVEL's Collection I could find the type-series of *Coprophilus (Zonoptilus) pentatoma* FAUVEL, 1897. In the original description of this species FAUVEL enumerated some specimens as anonym varietas of his new species. I have established that the type-series contains three different species: *Coprophilus (Zonoptilus) pentatoma* FAUVEL, 1897, *C. (Z.) drugmandi* TÓTH, 1990 and finally *C. (Z.) fauveli* sp. n.

Coprophilus (Zonoptilus) fauveli sp. n.
(Figs 1–3)

Male – Body moderately slender. Head black with reddish-yellow margin of clypeus and reddish tubercules of front, pronotum dark reddish-brown, with reddish translucid fore margin, elytra light yellowish-brown with large, elusive common triangular blackish mark, antennae, palpi and legs (except the brownish fore part of femora) light reddish-yellow.

Head broader than long 40 : 25, compound eyes large, moderately prominent, behind on vertex with deep, transversal furrow with scattered puncturation. Clypeus shining, smooth, covered by some small punctures, tubercules above the insertion of antennae prominent, smooth and shining surface of front and vertex rather shining on the middle and with only traces of microsculpture laterally, at internal side of tubercules 1 round impression with dense coriaceous microsculpture. – Antenna rather stout 1st segment large, 2nd and 3rd reversed obconical, 3rd a little longer than 2nd, 4–6th equal in length and breadth, 7–10th transversal 11th about 1.5 times longer than broad, pointed obtusely, the 7–11th larger than the former ones, with fine but dense pubescence and some larger setae, separated as a 5 segmented loose club.

Pronotum longer than broad 56 : 50, broader than the head 56 : 40, broadest in one-quarter of its length, anterior edge slightly curved, anterior angles rounded, retracted posteriorly on male, sides narrowed in nearly straight line posteriorly to the obtuse-angulated posterior angles, basal edge curved, marginated. Disc moderately arched, surface shining, with scattered puncture, interspaces broader than the diameter of punctures, smooth and shining, without visible microsculpture, with 2 short, longitudinally oblonged impressions near base on either side of the middle. – Elytra as long as broad (together) 62 : 62, broader than the prothorax 62 : 50, a little widened backwards 55 : 62, humeral angles feebly produced anteriorly, postero-external angles rounded, apical edge slightly run inwards to the nearly rectangular sutural angles. Disc moderately arched, between humeral knob and sutural margin 5, under humeral knob



Figs 1–3. *Coprophilus (Zonoptilus) fauveli* sp. n., aedeagus: 1 = ventral view, 2 = dorsal view, 3 = lateral view.

the 6th punctato-striae produced backwards, confluent with irregular punctures before apex, surface of interspaces smooth and shining, the blackish-brown elusive triangular common mark extending from basal margin and scutellum nearly to the sutural angles. Surface of epipleura shining with coriaceous ground-sculpture.

Abdomen slender, a little widened backwards to the 5th (visible) tergite and after becoming narrow apically, surface of tergites rather shining in spite of fine microsculpture in among scattered punctures, posterior margin reddish translucid.

Aedeagus: Figs 1–3. – Length: 3.5–4.2 mm.

Female corresponding to the male in general, different only in size: a little smaller and slender, but the anterior angles of the pronotum not retracted backwards.

The new species is named in honour of A. FAUVEL, the famous specialist of this group.

Holotype ♂ is labeled: 1. "Bakou" (Azerbaidzhan) handwriting on quadrangular white label, 2. Holotypus ♂ Coprophilus Zonoptilus fauveli sp. n. det. DR. L. TÓTH 1990. on red framed quadrangular white label. – Allotype ♀ is labeled: 1. Bakou handwriting on quadrangular white label. 2. Allotypus ♀ Coprophilus Zonoptilus fauveli sp. n. det. DR. L. TÓTH 1990 on red framed white label. – Paratype ♀ is labeled: 1. Bakou handwriting on quadrangular white label, 2. Paratypus ♀ Coprophilus Zonoptilus fauveli sp. n. det. DR. L. TÓTH 1990 on red framed white label.

The types are deposited in the collection of the Institut Royal des Sciences Naturelles de Belgique, Bruxelles.

The new species is similar to *Coprophilus (Zonoptilus) pentatoma* FAUVEL and *C. (Z.) drugmandi* TÓTH, supposing they are close relatives. The distinctive features among the three species are:

pentatoma FAUVEL ♂	*drugmandi* TÓTH ♂	*fauveli* sp. n. ♂
clypeus: smooth and shining, with only few punctures; frons: with punctures, interspaces smooth and shining antenna brown 9–10th segments as long as broad, 11th segment twice longer than broad.	clypeus: opaque, covered with fine coriaceous microsculpture; frons: with punctures, interspaces smooth and shining on the middle, but with fine coriaceous microsculpture on sides; antenna yellow, 9–10 segments broader than long, 11th twice longer than broad.	clypeus: smooth and shining, with only few punctures; frons with punctures, interspaces smooth and shining, antenna: yellow, 7–10th segments broader than long, 11th segment less than twice longer than broad.
pronotum: as long as broad 28 : 28; interspaces as broad as the diameter of the punctures, with fine scattered punctures, coriaceous microsculpture only locally; 2 very small fovea near base on either side of the middle.	pronotum: longer than broad 30 : 26; interspaces as broad as the diameter of the punctures, with fine scattered punctures, coriaceous microsculpture only locally, 2 very small fovea near base on either side of the middle.	pronotum: longer than broad 28 : 25; interspaces broader than the diameter of the punctures, without visible microsculpture, shining, 2 short, longitudinal impressions near base on either side of the middle.

elytra (together): less broader than long 31 : 34 dark reddish-brown.	elytra (together): a little broader than long 33 : 32 yellowish-brown with triangular blackish mark on base.	elytra (together): as broad as long 31 : 31 yellowish-brown with elusive triangular, blackish mark on base.
abdomen: shining, disc of tergites smooth and shining on the middle.	abdomen: nearly opaque, tergites covered with fine, but dense coriaceous microsculpture among punctures visible only on the 6th tergite.	abdomen: shining, tergites covered with fine coriaceous microsculpture among punctures, visible all of tergites, posterior edge shining on the middle.
length: 3.2 mm.	length: 4.5 mm.	length: 3.5–4.2 mm.
distribution: Turkestan	distribution: Dobrudja	distribution: Azerbaidzhan

I think it is necessary to give an identification key to the 6 known species of the species-group with 5 segmented antennal club. The key based of BERNHAUER's (1908), FAUVEL's (1897), REITTER's (1894a, 1894b), TÓTH's (1991) studies, considers only the external features.

1 (4) Elytra unicolour, without marks
2 (3) Elytra dark reddish-brown, nearly black **pentatoma** FAUVEL
3 (2) Elytra reddish-yellow **solskyi** BERNHAUER
4 (1) Elytra multicolour, with marks
5 (8) Elytra dark, brownish-black with light coloured, yellowish marks
6 (7) Penultimate segment of antenna transverse **bimaculatus** LUZE
7 (6) Penultimate segment of antenna as broad as long **longicornis** BERNHAUER
8 (5) Elytra yellowish-brown with common brownish-black mark
9 (10) Clypeus opaque. Abdomen opaque, visible puncturation only on 6th tergite **drugmandi** TÓTH
10 (9) Clypeus shining. Abdomen shining (in spite of coriaceous microsculpture) punctures visible on all tergites **fauveli** sp. n.

* * *

I am indebted to DR. D. DRUGMAND (Institut Royal des Sciences Naturelles de Belgique, Bruxelles) who lent me types important in this investigation.

REFERENCES

BERNHAUER, M. (1908): Beiträge zur Kenntnis der paläarktischen Staphyliniden Fauna. – *Münch. kol. Zeitschr.* **3** (3): 320–335.

FAUVEL, A. (1897): Tableau des espèces paléarctiques du genre Coprophilus Latr. – *Revue d'Ent. Caen* **16:** 226–229.

REITTER, E. (1894a): Ueber die bekannten Arten der Coleopteren-Gattung Zonoptilus Motsch. – *Wien. ent. Ztg.* **13** (6): 177–178.

REITTER, E. (1894b): Neue Revision der Coleopteren-Gattung Zonoptilus Motsch. – *Wien. ent. Ztg.* **13** (9): 291–292.

TÓTH, L. (1991): New data to the knowledge of the palearctic Coprophilus Latreille, 1829 species (Coleoptera, Staphylinidae) – *Annls hist.-nat. Mus. natn. hung.* **83:** in press.

Acta Zoologica Hungarica 38 (3–4), pp. 377–391 (1992)

CONTRIBUTIONS TO THE EUPITHECIA FAUNA OF SOUTH AMERICA (LEPIDOPTERA, GEOMETRIDAE)

A. M. Vojnits

Zoological Department, Hungarian Natural History Museum, H–1088 Budapest, Baross utca 13, Hungary

(Received 2nd October 1991)

Three new species from Argentina are described: *Eupithecia arenosissima* sp. n., *Eupithecia illepidus* sp. n. and *Eupithecia norquinco* sp. n. The species complex of *Eupithecia frequens* Butler, 1822, is discussed. 49 original photos on 8 plates.

Introduction. – Our present knowledge concerning the very rich South American Lepidoptera fauna is rather poor. This is especially the case with some groups causing identification problems, like the tribe Eupitheciini. Rindge (1987) pointed out that there are large intervals in the literature after the descriptions at the beginning of this century, because several decades passed by until a new paper was published again dealing with South American Heterocera. Truly modern descriptions (not revisions) can only be found in the periodicals beginning with the 50es.

Accordingly it were rather hasty to attempt deep zoogeographic or phylogenetic interpretations. Yet I wish to state again, that the aedeagus and the vesica of the species from the Southern part of South America are rather uniform. In other words: these structures, otherwise very variable in the Old World, display but a meagre phylogenetic plasticity.

Eupithecia frequens Butler, 1822

Trans. Ent. Soc. London: 404.

Diagnosis. – Antennae and palpi nearly agree with the description given by Rindge (1987), except one male with palpi resembling those of *Eupithecia arenosissima* sp. n. Average alar expanse of forewings of males 8 mm, extreme values 7 and 8.5 mm (based on 5 specimens), those of females 9 mm, extreme values 8 and 10 mm (based on 15 specimens). Forewings and hindwings broad, forewings with slightly attenuate apex. Forewings ground colour greyish brown with rufous median field, transverse lines grey or yellowish grey. Discal dots rounded, black. Hindwings ground colour grey with darker transverse lines, discal dots grey. Fringes striated grey and fuscous or grey and lighter grey (Plate 1, Figs 1 – 2). Underside with brownish grey ground colour, hindwings whitish grey with well marked transverse lines and discal dots.

Male genitalia. – Valves short, broad, slightly broken. Sacculus well developed (Plate 3, Fig. 1). Uncus laterally flattened, biapical, dorsal slightly longer than ventral. Clavulus medium long with medium long setae. Ampullae four times longer basally with some short and long bristles (Plate 3, Fig. 2). Aedeagus slightly club-shaped, 6–7 times longer than its diameter in middle. Vesica divided into sharply separated lobes with the very characteristic large cymbiform and small semicircular sclerotized formations (Plate 3, Figs 3–4).

Sternite VIII. – Sternite angulately incised, tergite approximately 4 times longer wide, attenuate posteriorad, cleft into two narrow arms (Plate 3, Fig. 5).

Female genitalia. – Bursa copulatrix ovoid (lemon-shaped) padded with numerous minute spines. Ductus bursae largely as wide as long. Ductus seminalis arising at 1/3 length from bursa. A wide, sclerotized and slightly concave band extending between ductus bursae and ductus seminalis (Plate 3, Figs 6–7). Anterior and posterior apophyses medium sized long, papillae anales triangular (Plate 3, Fig. 8).

The female genitalia are rather varying. Sometimes bursa copulatrix with a long cervical process and ductus seminalis arising further from the ductus bursae. In other cases the bursa copulatrix is pear-shaped. The regular global shape is also a typical form, and then the ductus seminalis becomes inflexed backwards. The shape of the bursa copulatrix could be rather elongate, at other times elongated pyriform, the cervical process very long and heavily sclerotized, the ductus seminalis arising closer to the basal portion than to the ductus bursae. In some cases the sclerotized band is very wide.

Biology – First stages and foodplant unkown. Flying period October and November.

Material examined. – 5 males and 15 females from the following localities: Argentina, El Bolson, Prov. Rio Negro; Arroyo Negro, Cerro Piltriquitron, Pampa Azcona, leg. Gy. Topál. Specimens are deposited in the Lepidoptera collection of the Hungarian Natural History Museum, Budapest.

Remarks. – According to the large series examined the shape of the bursa copulatrix is rather variable. If only a few specimens were available, ones which differ considerably from each other, they could easily be supposed to represent distinct species. The structure of the male genitalia bears also some important characters as well as the shape of sternite VIII, but these can hardly be interpreted correctly at the present state of investigations. Goingly the work of RINDGE (1987) and the varying series I assign the question arises: perhaps it would be necessary to revise the taxa belonging in the frequens-complex. For my part I place the specimens taken in Argentina only temporarily to *Eupithecia frequens*.

Slides – Nos 19078, 19083, 19118, 19138, 19139 (males); 19055, 19078, 19095, 19096, 19099, 19102, 19108, 19111, 19128, 19134, 19135, 19136, 19140, 19145, 19147, 19148 (females), gen. prep. A. VOJNITS.

NEW TAXA FROM ARGENTINA

Eupithecia arenosissima sp. n.

Derivation of specific name: arenosissimus = the most arenarious

Specific differences. – The new taxon shows some similarities with *Eupithecia malchoensis* RINDGE, 1987, but the valva and sternite VIII differ.

Diagnosis. – Male palpi dark brown 0.7–0.8 times diameter of eyes. Female palpi yellowish brown 0.9 times diameter of eyes. Male antennae strongly jointed, segments dentiform, distinct, cilia not reaching half diameter of joints. Female antennae thick and shortly ciliate. Length of forewings in males 8–10 mm, average 8.5 mm (based on 23 specimens); in females 8–10.5 mm, average 9 mm (based on 31 specimens). Forewings pronouncedly attenuate, termen arched and longer than dorsum, apex pointed. Hindwings short. Forewings ground colour sandy greyish brown, median field yellowish or slightly rufous, apex and marginal area grey, transverse lines pale, postmedian wide but submarginal narrow and whitish, discal dots longish and black. Hindwings ground colour pale brownish yellow with pale transverse lines and longish discal dots. Fringes brown or yellowish brown (Plate 1, Figs 3–4). Undersides bright yellowish brown with pale brown pattern.

Male genitalia. – Valves expanded and from their middle tapering (Plate 4, Fig. 1). Uncus biapical, pince-shaped. Clavulus long. Ampullae 3 times longer than wide with some short setae (Plate 4, Fig. 2). Aedeagus cylindric and stout, only 3–3.5 times longer than its diameter. Vesica resembling a cerebral hemisphere with a large cymbiform and a small curved sclerotized formation (Plate 4, Figs 3–4).

Sternite VIII. – Sternite basally incised, attenuating posteriorad to one third length, then two-third tapering into two arms. Sternite nearly 3 times longer than wide (Plate 4, Fig. 5).

Female genitalia. – Bursa copulatrix ovoid, membraneous. Ductus bursae sclerotized, either wider or narrower than long. Ductus seminalis arising at 2/5 length of bursa. Bursa copulatrix with varying numbers of spines in median and basal portions, basal part with 10–40 smaller spines arranged in one curved group medially with 2–5 larger and thicker spines (Plate 5, Fig. 1), occasionally also the larger spines appearing in two groups numbering 12–14. In other cases there are 20–24 larger and some few smaller spines in one group and only 1–2 smaller ones wholly isolated (Plate 5, Figs 3–6). Papillae anales rice-shaped, anterior and posterior apophyses medium large and thick (Plate 5, Fig. 2).

Biology. – First stages and foodplant unknown. Flying period September and October.

Distribution. – Prov. Rio Negro, Argentina. Locus typicus: Pampa Azcona.

Holotype male: "Argentina, El Bolson", "Prov. Rio Negro), Pampa Azcona", "24. IX. 1961., Gy. Topál", "Eupithecia gen. prep. No. 15072 male, det. A. Vojnits". – Paratypes: 22 males and 31 females, El Bolson, Prov. Rio Negro, Arrayo Negro, Cerro Piltriquitron, Pampa Azcona, September–October, leg. Gy. Topál. – Holotype and paratypes are deposited in the Hungarian Natural History Museum, Budapest.

Remarks. – The female genitalia are remarkably variable, indeed to such a degree that without a large series it would have been difficult to interpret it as a single taxon.

Slides – Nos 19050, 19057, 19059, 19065, 19071, 19072, 19076, 19080, 19090, 19097, 19098, 19100, 19109, 19115, 19119, 19120, 19124, 19126, 19129, 19151, 19152, 19153, 19154 (males); 19054, 19056, 19058, 19062, 19067, 19068, 19069, 19070, 19073, 19074, 19075, 19077, 19079, 19082, 19085, 19087, 19088, 19089, 19091, 19092, 19105, 19121, 19125, 19137, 19142, 19144, 19146, 19155 (females), gen. prep. A. Vojnits.

Eupithecia illepidus sp. n.

(Derivation of specific name: illepidus = clumsy)

Specific differences. – The taxon is superficially resembling *Eupithecia hastaria* Warren, 1900, but the structure of the genitalia is entirely different.

Diagnosis. – Male palpi brown, dark brown, 0.6 times diameter of eyes. Female palpi brown and yellow, 0.7 times diameter of eyes. Male antennae thickly ciliate on both sides, cilia as diameter of antennae. Female antennae thickly ciliate, cilia short. Length of forewings in males 8–11 mm, average 9 mm (based on 18 specimens). Length of forewings in females 8–10.5 mm, average 9 mm (based on 9 specimens). Forewings elongate an isosceles triangle. Apex attenuate. Hindwings elongate. Forewings ground colour greyish brown with characteristic dark spots at apex and at tornus. Transverse lines obsolete, discal dots rounded, well marked and black. Fringes striated brown and greyish brown (Plate 2, Figs 1–2). Undersides ground colour glossy brownish grey, darker on forewings, lighter on hindwings, pattern pale.

Male genitalia. – Valves moderately elongate, dorsally straight, ventrally broken at middle, apex widely rounded (Plate 6, Fig. 1). Uncus elongate, biapical, laterally less flattened. Clavulus long with medium long spines. Ampullae 6–7 times longer than base with some short spines (Plate 6, Fig. 2). Aedeagus cylindrical, 5 times longer than its diameter. Vesica lobulate with a large cymbiform and a small C-shaped sclerotized formation (Plate 6, Figs 3–4).

Sternite VIII. – Basally slightly sinuous, tapering backwards, twice as long or slightly longer than its wide. Sides slightly concave and incised terminally (Plate 6, Fig. 5).

Female genitalia. – Bursa copulatrix membranous, pointed at origin of ductus seminalis, concave on opposite side. More or less curved and larger spines in two groups at concave side in anterior part of bursa; with 12–18 spines in each group. Ductus bursae sclerotized, considerably longer than wide. Ductus seminalis arising from median part of bursa (Plate 7, Fig. 1). Variability is rather considerable as to the shape of the bursa, and the situation, number and size of the spines (Plate 7, Figs 3–9). Length and width of anterior and posterior apophyses medium, papillae anales ovoid (Plate 7, Fig. 2).

Biology. – First stages and foodplant unknown.

Distribution – Argentina, Prov. Rio Negro; locus typicus: El Bolson, Pampa Azcona.

Holotype male: "Argentina, El Bolson", "(Prov. Rio Negro), Pampá Azcona", "10. IX. 1961. leg. TOPÁL", "Eupithecia gen. prep. No. 19093 male, det. A. VOJNITS. – Paratypes: 17 males and 7 females, El Bolson, Prov. Rio Negro, Arroyo Negro, Pampá Azcona, Cerro Piltriquitron, September–October, leg. GY. TOPÁL. – Holotype and paratypes are deposited in the Hungarian Natural History Museum, Budapest.

Remarks. – FLETCHER (1953) described a taxon from Argentina as a subspecies of *hastaria* WARREN, distributed in Bolivia and Brasil. This subspecies *nebulata* differs from the nominate subspecies *hastaria* by its unicoloured fumose grey ground colour except the slight rufous brown suffusion on a part of the veins. According to the figures of *hastaria* published by FLETCHER, *illepidus* resembles *hastaria* in the apical and tornal spots and in the shape of the forewing, but the structure of the genitalia is entirely different. By the genitalia, *hastaria* belongs to the *sybilla*-complex. Among the *Eupithecia* species of Chile (RINDGE 1987) there is merely a single taxon, namely *Eupithecia spurcata* WARREN, 1904, which has two groups of robust spines in the bursa copulatrix and thereby resembling the new species – but otherwise the two taxa considerably differ.

Slides – Nos 19051, 19053, 19066, 19081, 19093, 19094, 10101, 19103, 19110, 19112, 19117, 19122, 19123, 19127, 19130, 19132, 19150 (males); 19061, 19086, 19107, 19131, 19133, 19141, 19143, 19149 (females), gen. prep. A. VOJNITS.

Eupithecia norquinco sp. n.

Derivation of specific name: a noun is apposition taken from the type locality

Specific differences. – According to the structure of the genitalia the taxon is closely related with *Eupithecia sibylla* BUTLER, 1882, but it has considerably more attenuate forewings with a rufous postdiscal area and the flight periods of the two taxa also differ.

Diagnosis. – Male palpi light brown and yellow, 1.1 times diameter of eyes. Female palpi brown and yellowish brown, 1.2 times diameter of eyes. Male antennae with surprisingly short cilia. Female antennae very short. Antennae thickly ciliate in both sexes. Length of forewings in males 7.5 and 8 mm (only two specimens available). Length of forewings in females 7.5, 8 and 9.5 (only three specimens available). Forewings elongate, an isosceles triangle. Dorsum and termen a gently curved arch, apex attenuate. Hindwings expanded. Forewings ground colour brownish grey, larger part of veins covered with darker grey scales. Transverse lines pale, discal dots small and black. Hindwings ground colour light grey with greyish transverse lines. Fringes brown on forewings, grey on hindwings (Plate 2, Figs 3–4). Underside ground colour brownish grey with grey pattern.

Male genitalia. – Valves robust with a straight dorsum and broken ventrum forming largely an isosceles triangle. Sacculus spiniform (Plate 8, Fig. 1). Uncus long, laterally flattened, biapical with longer dorsal than ventral. Clavulus long with medium sized setae. Ampullae bulky, 3 times longer than basally wide bearing some short and a few longer spines (Plate 8, Fig. 2). Aedeagus cylindrical with parallel sides. Vesica oviform with curled margin, a large cymbliform and a small C-shaped sclerotized formation (Plate 8, Figs 3–4).

Sternite VIII – Sternite basally sinuous, twice longer than its wide, tapering posteriorad, terminally excised 1/3 length with gently curved arms (Plate 8, Fig. 5).

Female genitalia – Bursa copulatrix elongate, more or less ovoid, pointed at origin of ductus seminalis, sclerotized and long, 4 times longer than its diameter. Ductus seminalis originating at middle length of bursa copulatrix, or slightly closer to basal portion. A long sclerotized strip extending between ductus bursae and ductus seminalis for about 50 percent of their distance. Bursa with numerous small chitinous spines arranged in a semicircle, convex towards ductus seminalis (Plate 8, Fig. 6). Anterior and posterior apophyses large and bulky, papillae anales rather large (Plate 8, Fig. 7). The shape of the bursa copulatrix and the arrangement of the spines are varying, partly owing also to the state of imbedding in the slide (Plate 8, Fig. 8).

Biology – First stages and foodplant unknown.

Distribution – Argentina, Prov. Rio Negro; locus typicus: Norquinco.

Holotype male: "Argentina, Norquinco Prov. Rio Negro", "17. II. 1961 (lámpa), GY. TOPÁL", "Eupithecia gen. prep. No. 19115 male, det. A. VOJNITS", "Eupithecia sibylla BTLR., det. A. VOJNITS" – Paratypes: 2 males and 2 females, Argentina, Prov. Rio Negro, El Bolson, Norquinco, leg. GY. TOPÁL. – Holotype and paratypes are deposited in the Hungarian Natural History Museum, Budapest.

Remarks – The new species is undoubtedly very close to *Eupithecia sybilla* BUTLER, so much so that at first I have determined the specimens taken from Argentina under discussion as *sybilla*. However, the shape and pattern of the wings are discernibly different. Some characteristics in the structures of the genitalia also differ. The considerable similarities of the two taxa speak for their close relationship.

RINDGE (1987) synonymized the taxa *Eupithecia (Tephroclystia) praelongata* WARREN, 1900 and *Eupithecia davisi* VOJNITS, 1985, under *Eupithecia sybilla* BUTLER. *Eupithecia hastaria* WARREN (1906) could also be placed in this complex on the basis of the configuration of the genitalia. I am not convinced by RINDGE's (1987) argumentation namely that: "the condition of the left forewing is excellent, which makes a positive identification possible, without any question" – yet the abdomen of the holotype is missing and thus the examination of the genitalia is impossible. It seems that the genital structure of the South American species complexes of *Eupithecia* are rather uniform, while the genital configuration of a single taxon can be very varying within certain limits. If one takes into consideration also the fact that the vesica was not studied in most of the cases, it becomes evident that further investigations are necessary.

Slides – Nos 19049, 19113 (males); 19052, 19114, 19115 (females), gen. prep. A. VOJNITS.

* * *

Acknowledgements – I would like to express my sincere thanks to MR. F. H. RINDGE (New York) and MR. D. R. DAVIS (Washington) for their kind help. I am also indebted to the Alexander von Humboldt Foundation (Bonn–Godesberg) and the OTKA Foundation of the Hungarian Academy of Sciences (Budapest) for supporting my research.

REFERENCES

FLETCHER, D. S. (1953): Some new species of Geometridae from Argentina and Chile – *Acta Zool. Lilloana* **13:** 367–380.

RINDGE, F. H. (1987): The Eupithecia (Lepidoptera, Geometridae) of Chile – *Bull. Am. Mus. Nat. Hist.* **186** (3): 269–363.

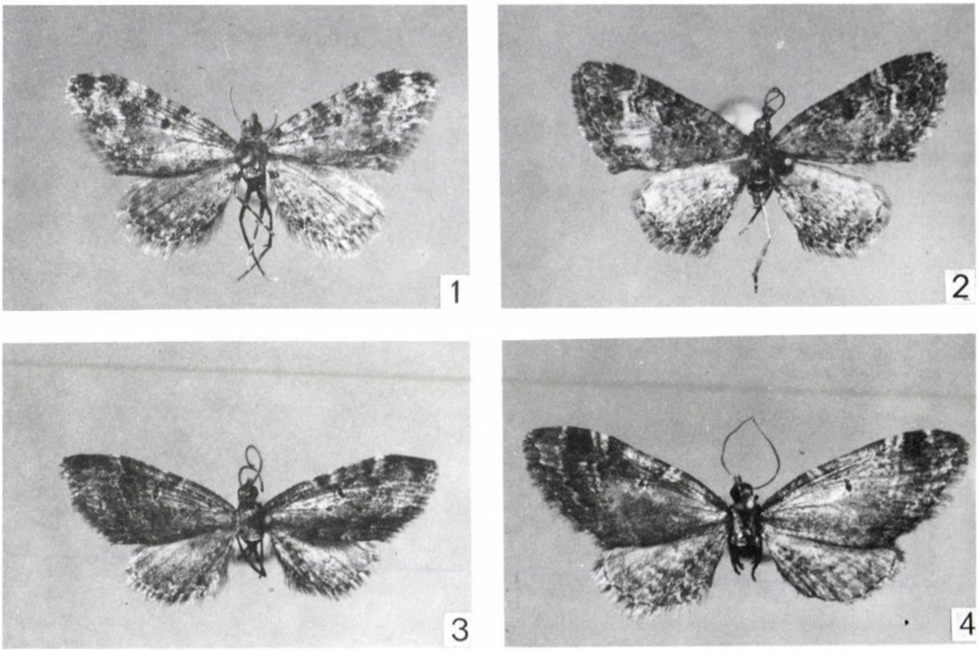


Plate 1, Fig. 1 = *Eupithecia frequens* BUTLER, male; Fig. 2 = *E. frequens* BUTLER, female; Fig. 3 = *E. arenosissima* sp. n., male; Fig. 4 = *E. arenosissima* sp. n., female.

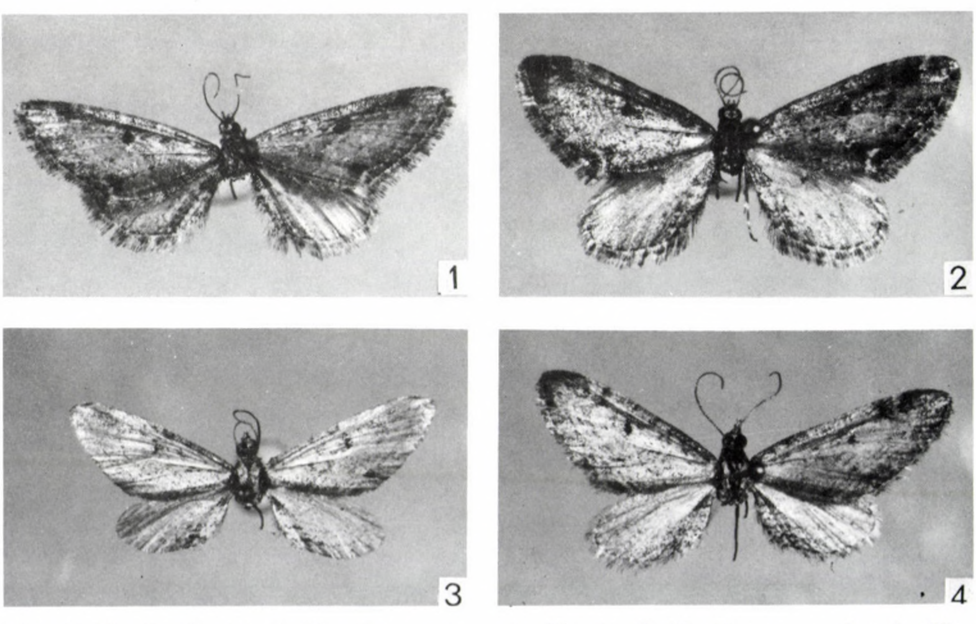


Plate 2, Fig. 1 = *Eupithecia illepidus* sp. n., male; Fig. 2 = *E. illepidus* sp. n., female; Fig. 3 = *E. norquinco* sp. n., male; Fig. 4 = *E. norquinco* sp. n., female.

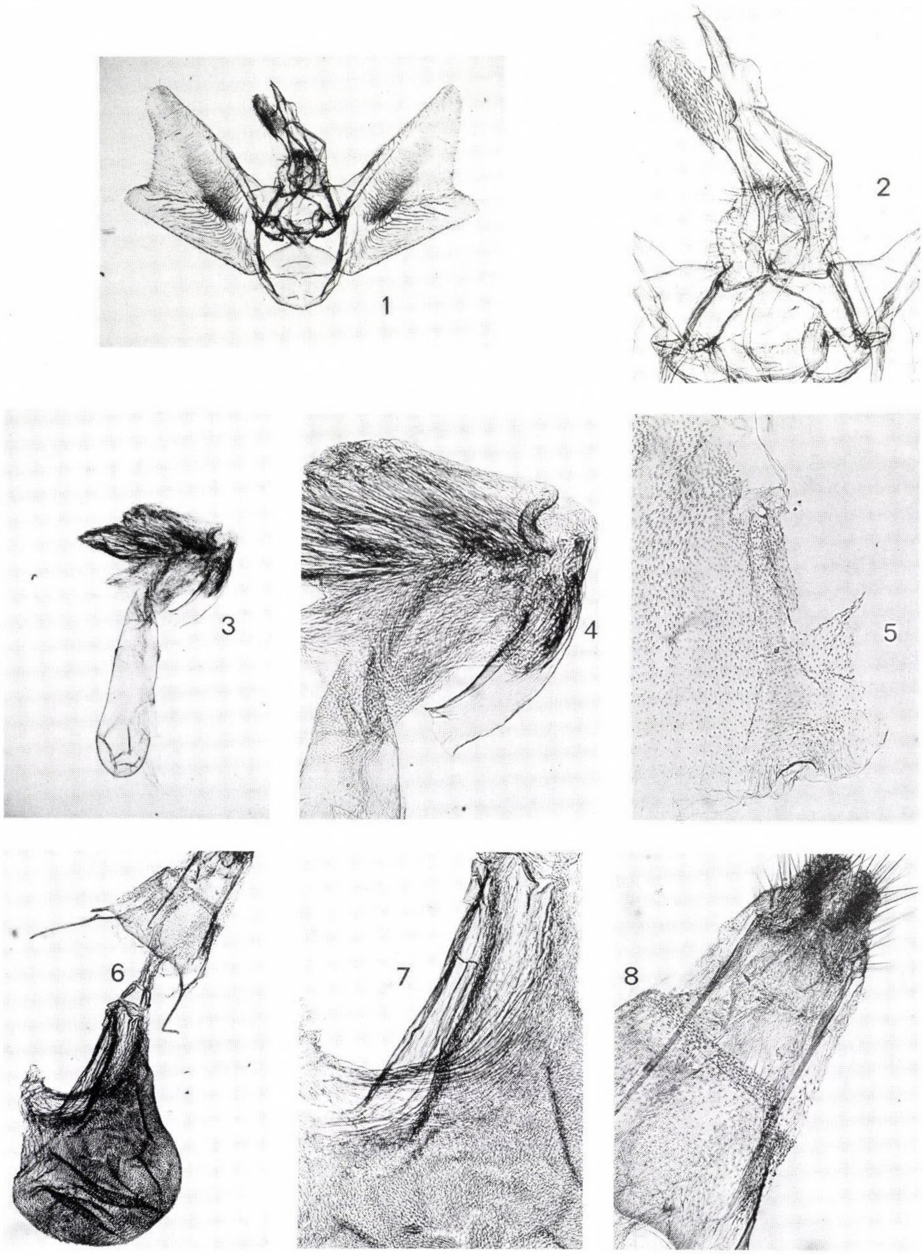


Plate 3, Figs 1–2 = male genitalia; Figs 3–4 = aedoeagus; Fig. 5 = sternite VIII; Fig. 6 = female genitalia; Fig. 7 = bursa copulatrix and Fig. 8 = apophyses and papillae anales of *Eupithecia frequens* BUTLER.

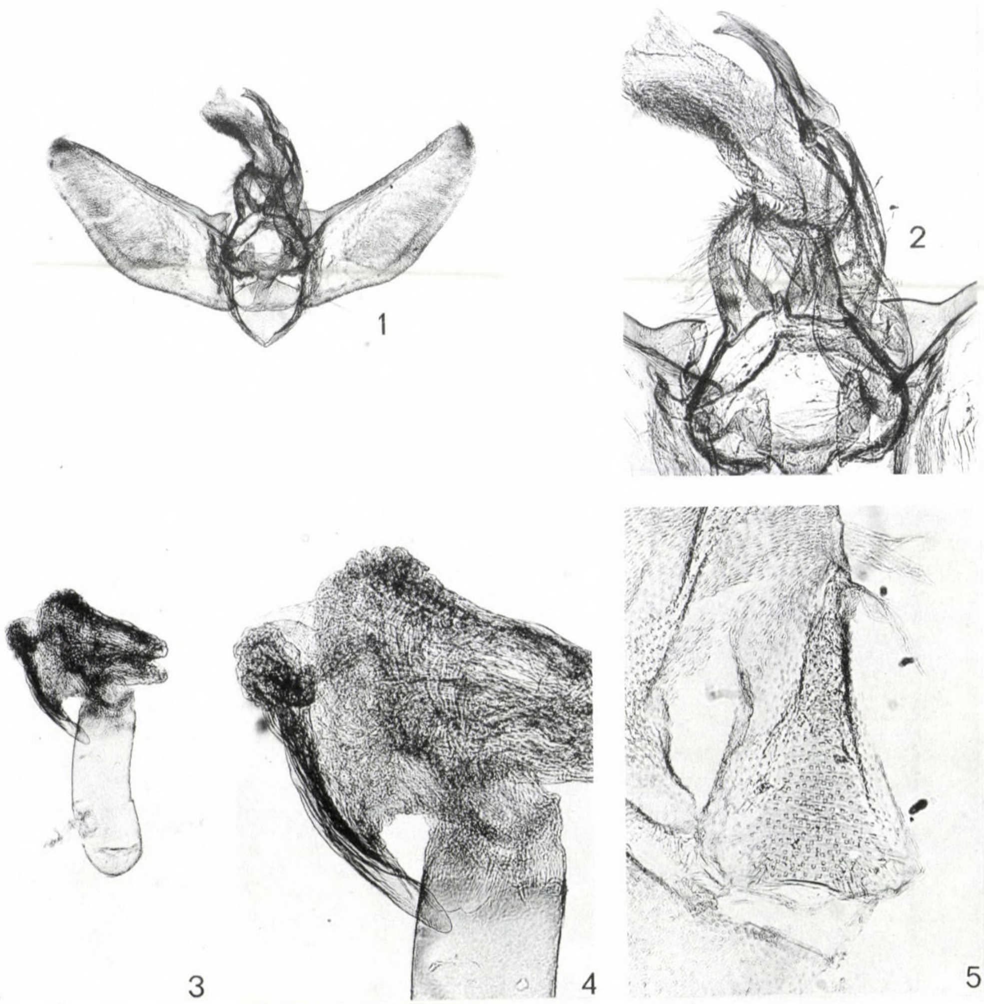


Plate 4, Figs 1–2 = male genitalia; Figs 3–4 = aedoeagus and Fig. 5 = sternite VIII of *Eupithecia arenosissima* sp. n.

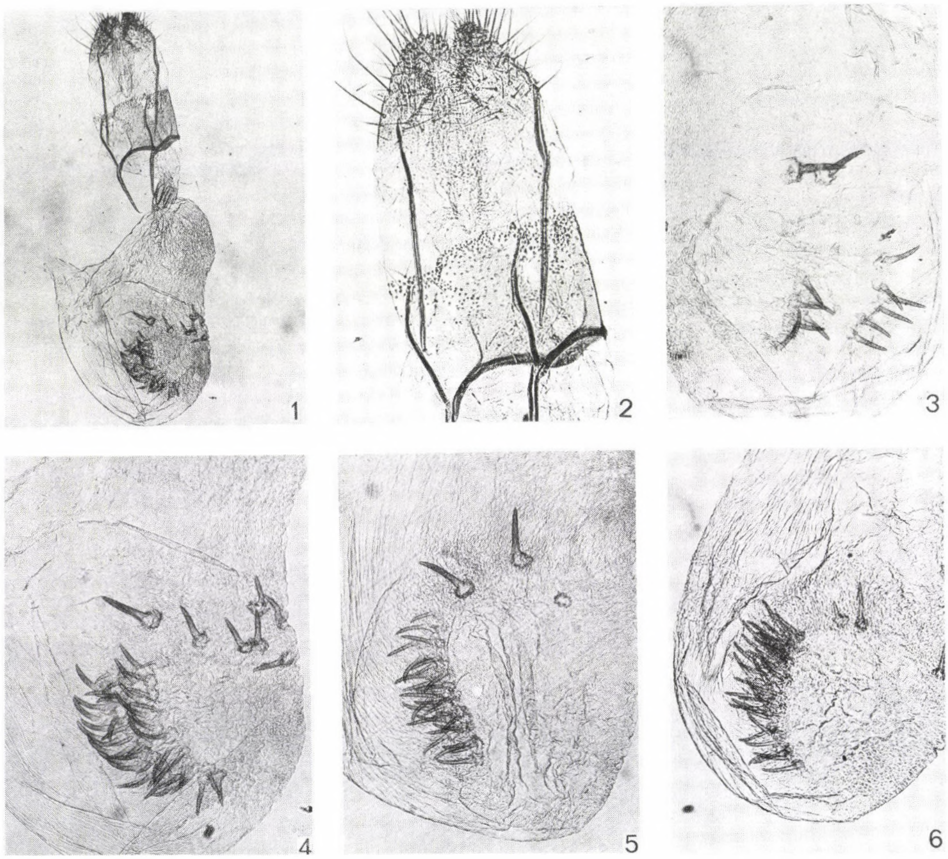


Plate 5, Fig. 1 = female genitalia; Fig. 2 = apophyses and papillae anales and Figs 3–6 = bursa copulatrix of *Eupithecia arenosissima* sp. n.

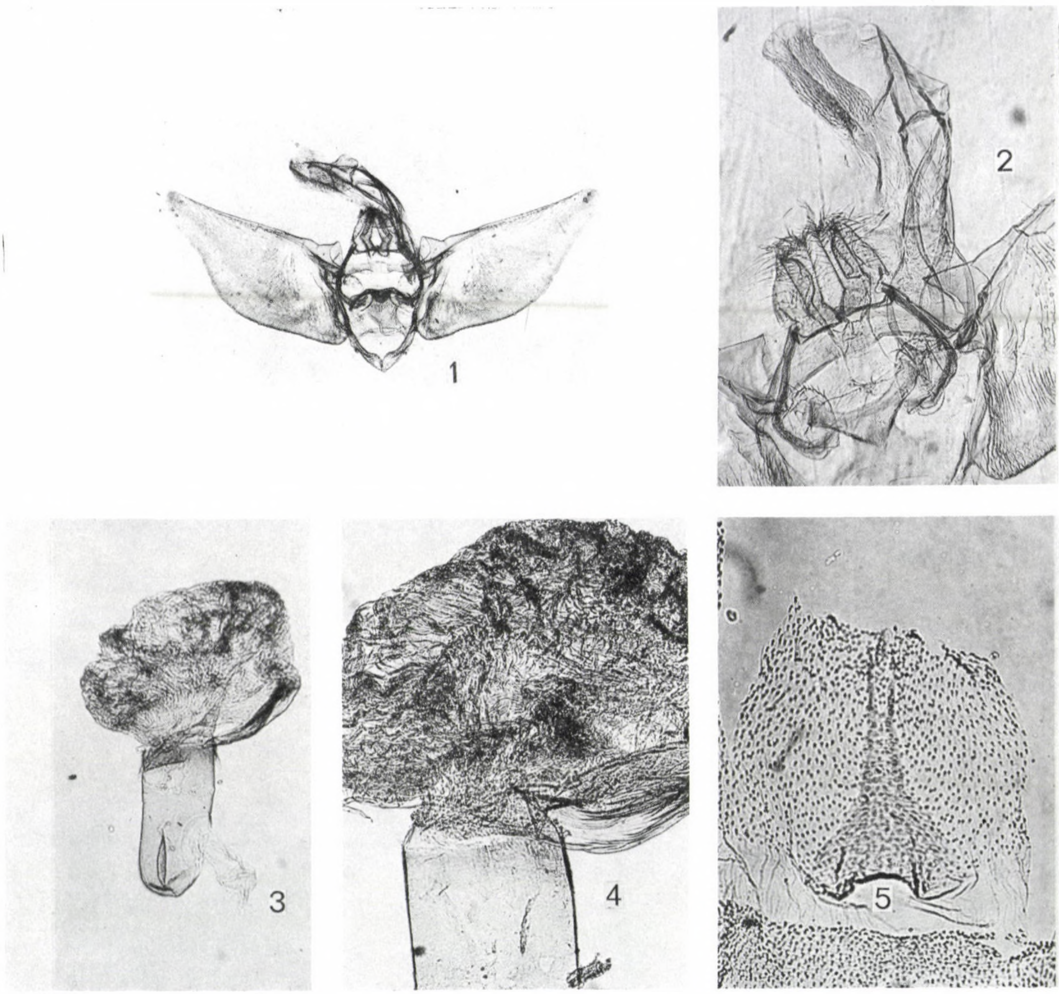


Plate 6, Figs 1–2 = male genitalia; Figs 3–4 = aedoeagus and Fig. 5 = sternite VIII of *Eupithecia illepidus* sp. n.

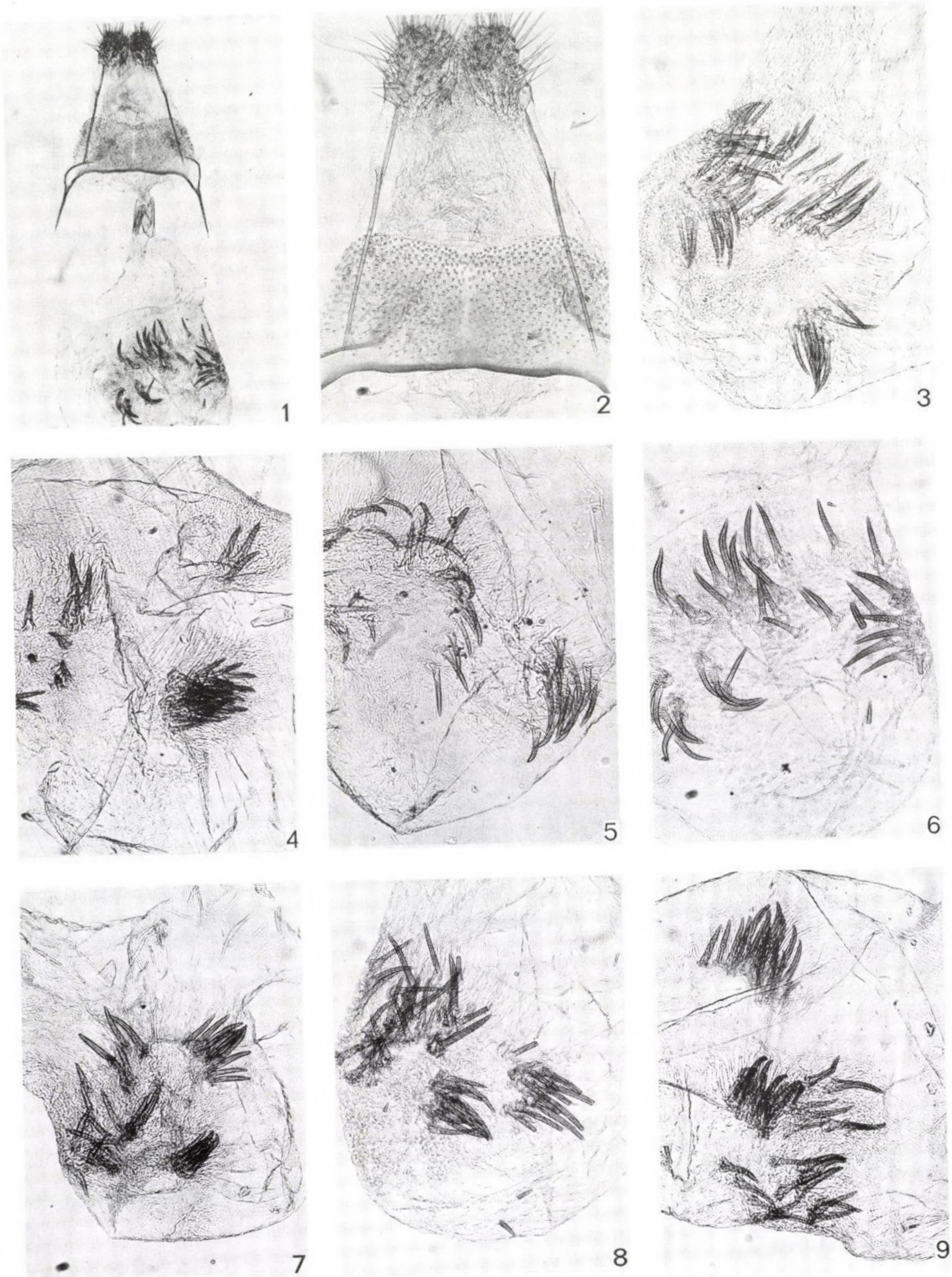


Plate 7, Fig. 1 = female genitalia; Fig. 2 = apophyses and papillae anales and Figs 3–9 = bursa copulatrix of *Eupithecia illepidus* sp. n.

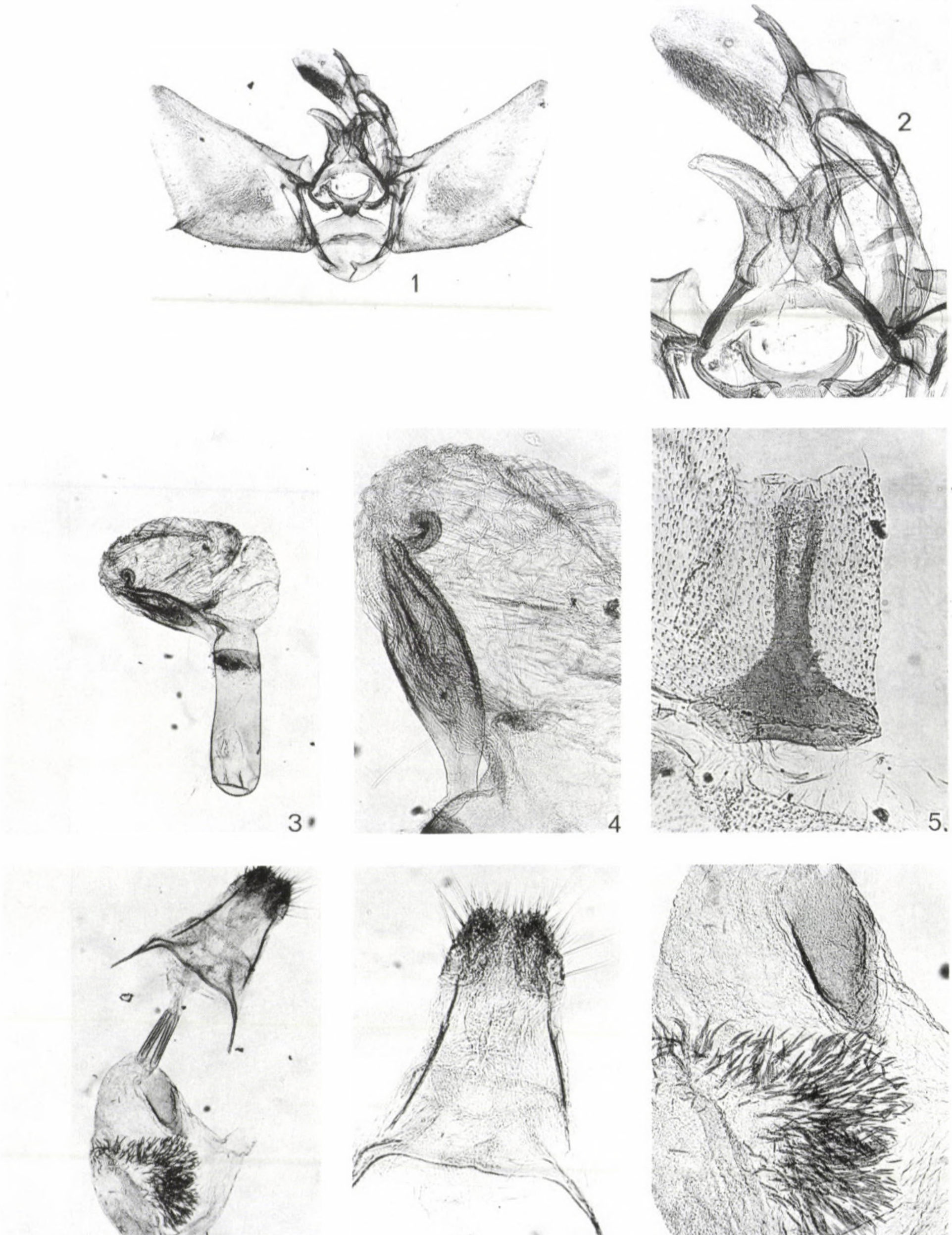


Plate 8, Figs 1–2 = male genitalia; Figs 3–4 = aedoeagus; Fig. 5 = sternite VIII; Fig. 6 = female genitalia; Fig. 7 = apophyses and papillae anales and Fig. 8 = bursa copulatrix of *Eupithecia norquinco* sp. n.

PRINTED IN HUNGARY

Akadémiai Kiadó és Nyomda Vállalat, Budapest

NOTES TO CONTRIBUTORS

I. PAPERS will be considered for publication in *Acta Zoologica* only if they have not previously been published or submitted for publication elsewhere. They may be written in English, French or German.

Papers should be submitted to

Dr. J. PAPP
Zoological Department
Hungarian Natural History Museum
H-1088 Budapest, Baross utca 13, Hungary

Papers may be either articles with abstracts or short communications. Both should be as concise as possible, articles in general not exceeding 25 typed pages, short communications 8 typed pages.

II. MANUSCRIPTS

1. Papers should be submitted in *two copies*.
2. The text of papers must be of high stylistic standard, requiring minor corrections only.
3. Manuscripts should be typed double spaced on good quality paper, with generous margins.
4. The name of the author(s) and of the institutes where the work was carried out should appear on first page of the manuscript.
5. *References* should be listed at the end of the paper in the following form:

BELLO, A. & GERAERT, E. (1972): Redescription of eight species belonging to the superfamily Tylenchoidea (Nematoda). — Nematologica 18: 190—200.

For books, please give the initials and family name of the author(s), title of the book, name of publisher, place and year of publication.

Reference to the literature in the text should be made using the name and date system.

6. *Captions* to illustrations should be listed on a separate sheet, not inserted in the text.

III. ILLUSTRATIONS AND TABLES

1. Each paper should be accompanied by two sets of illustrations one of which must be ready for the blockmaker. The other set attached to the second copy of the manuscript may be rough drawing in pencil or photocopies.
2. Illustrations must not be inserted in the text.
3. All illustrations should be identified in blue pencil by the author's name, abbreviated title of the paper and figure number.
4. Tables should be typed on separate pages and have captions describing their content. Clear wording of column heads is advisable. Tables should be numbered in Roman numerals (I, II, etc.).

IV. RETURN OF MATERIAL

Owing to high postage costs, the Editorial Office cannot undertake to return *all* material not accepted for any reason for publication. Of papers to be revised (for not being in conformity with the above Notes or for other reasons) only *one* copy will be returned. Material rejected for lack of space or on account of the referees' opinion will not be returned to authors outside Europe.

CONTENTS