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A REVIEW OF THE OLD WORLD POLYCTENIDAE

(Hemiptera: Cimicoidea)[1]

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Abstract: The family Polyctenidae is here divided into 2 subfamilies. Generalizations on the evolution and host relationships and a supplementary bibliography of the family are presented. For the Old World forms, host records of 228 specimens are analysed and a revised key covering all genera and species is provided. Six species *ex* bats of the genera *Emballonura, Coleura, Hipposideros* and *Tadarida* from Sudan, Ambon, New Guinea, Australia and Solomon Is. are described as new. The total number of the Old World species is thus raised to 14.

The present paper serves as a supplement to monographs of the family Polyctenidae (Hemiptera: Cimicoidea) by Jordan (1912) and Ferris & Usinger (1939). It is divided into five sections: (a) generalization on the host relationship including a critical review of all available host and distribution data of the Old World forms; (b) remarks on the relationships within the family; (c) key to subfamilies, genera and species; and (d) records and descriptions of the species, including a complete list (up to Aug. 1962) of the Old World Polyctenidae in the British Museum which possesses the largest and the most important collection of the family; (e) bibliography of the family supplementary to that (1939) in Ferris and Usinger's monograph. Descriptions of the nymphs of various species will appear in a separate paper.

The material forming the basis of the records and descriptions at the end of the paper came from several sources. A large proportion of it including three of the new species was procured through examination of alcohol-preserved bats at the American Mus. Nat. Hist. and the Rijksmuseum van Natuurlijke Historie at Leiden by myself in 1962 and at the Singapore Nat'l (Raffles) Mus. by the Inst. Med. Res. Malaya (IMR) staff in 1961.

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HOST RELATIONSHIPS IN THE FAMILY

The following is a list of all available host and distribution data of Old World polyctenids.

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1. Partial results of a grant to Bishop Museum from the U. S. National Institutes of Health (AI 01723-07).

2. B. P. Bishop Museum, Honolulu, Hawaii.

Altogether 228 specimens (53 ♂♂, 122 ♀♀, 53 nymphs) are involved [excluding those of *Eoctenes nycteridis* and *Eo. intermedius* noted in Benoit's (1958) and Goidanichi's (1947) papers in which no definite numbers of examined specimens were mentioned]. When compared with the 19 and 17 Old World specimens, respectively, studied by Jordan (1912) and Ferris & Usinger (1939), much has since been added. For computing the frequency rate, the number of specimens forming each record and the total number for each polyctenid species are given. Doubtful and erroneous host records are in square brackets.

Eoctenes coleurae Maa 1♂, 2♀♀, 1 nymph

Coleura gallarum Thomas, Sudan, 4 specim.	Maa 1964

Eoctenes intermedius (Speiser) 13♂♂, 25♀♀, 6 nymphs

Taphozous perforatus E. Geoffr., Egypt, 12 specim.	Speiser 1904; Maa 1961, 1964
T. mauritianus E. Geoffr., Katanga, Congo, 10.	Cooreman 1951
T. sudani Thomas, Congo.	Benoit 1958
T. nudiventris Cretzschmar, Palestine, 2.	Theodor *et al.* 1954
T. kachhensis Dobson, India, 4.	Maa 1964
T. melanopogon Temminck, Malaya, 6.	Maa 1959, 1961
T. cavaticus Hollister, Sumatra, 1.	Ferris 1919
T. sp., Thailand, 1.	Maa 1961
T. sp., N. Queensland, 1.	Maa 1964
"bat", Sudan, 5.	Jordan 1912
"bat", Luzon, Philippines, 1.	Maa 1964
[*Rhinolophus* sp.], Thailand, 1.	Maa 1961
[*Rousettus aegyptiacus* (E. Geoffr.)], Egypt, 1.	Maa 1961

Note: Out of the 44 specimens of *Eo. intermedius* known in different collections, 6 (in 2 lots) are *ex* undetermined bats, 36 *ex Taphozous* spp., and only 1 each *ex Rhinolophus* sp. (originally labeled as *ex* mixture with *Taphozous*) and *Rousettus aegyptiacus*. The last 2 records are to be discarded due to apparent unreliability. *Rhinolophus* spp. are known as hosts of the genus *Adroctenes*, whereas *Rousettus* and other Pteropodidae (Megachiroptera) have never been proven to be true breeding hosts of Polyctenidae.

Eoctenes spasmae (Waterhouse) 27♂♂, 51♀♀, 24 nymphs

Megaderma spasma (Linnaeus), India, 24 specim.	Maa 1964
do., Ceylon, 4.	Ferris *et al.* 1939; Maa 1964
do., Sumatra, 10.	Jordan 1912; Maa 1964
do., Nias I. nr Sumatra, 2.	Speiser 1898
do., Java, 10.	Waterhouse 1879; Maa 1964
do., Karimata Is. nr Borneo, 4.	Ferris 1919; Maa 1964
do., Malaya, 28.	Maa 1959; Maa 1964
do., Thailand, 1.	Maa 1964
do., Luzon, Philippines, 1.	Maa 1961
"large eared bat', N. Borneo, 2.	Maa 1961
"bat", N. Borneo, 3.	Maa 1961
"bat", Thailand, 6.	Maa 1961
[*Megaderma lyra* E. Geoffr.], India, 1.	Maa 1964
[*Nycteris javanica* E. Geoffr.], Thailand, 4.	Maa 1961
[*Cynopterus sphinx* (Vahl)], Travancore, India, 1.	Speiser 1909

[*C. brachyotis* (Mueller)], SW Borneo, 1. Ferris 1919

Note: An analysis of the data listed above reveals that 9 of the 102 specimens of *Eo. spasmae* in collections are *ex* undetermined bats; 84 *ex Megaderma spasma*; 2 (in 1 lot) *ex* "large-eared bat" which probably refers to *M. spasma*; 1 *ex M. lyra* and 4 (in 1 lot) *ex Nycteris javanica*, both of which possibly represent misidentification for *M. spasma* because of superficial similarity.—*M. lyra* and *Nycteris* spp. are known as hosts of *Polyctenes molossus* and *Eo. nycteridis* respectively; 1 each *ex Cynopterus sphinx* (=*marginatus* E. Geoffr.) and *C. brachyotis* both of which most probably resulted from contamination. It appears fairly safe to conclude that *M. spasma* is the only true host and that the records *ex M. lyra*, *Nycteris* and *Cynopterus* are all unreliable and to be discarded.

Eoctenes sinae Maa 1♀
"bat", Kiangsi, China, 1 specim. Maa 1961

Eoctenes ferrisi Maa 2♂♂, 1♀
Emballonura [?] sp., Solomon Is., 1 specim. Maa 1964
Em. raffrayana cor Thomas, Solomon Is., 1. Maa 1964
Em. nigrescens Thomas, Solomon Is., 1. Maa 1964

Eoctenes nycteridis (Horváth) 1♂, 14♀♀, 11 nymphs
Nycteris hispida (Schreber), Tanganyika, 1 specim. Horváth 1910
do., Ruanda. Benoit 1958
N. arge Thomas, Liberia, 5. Ferris 1930
N. grandis Peters, Kivu, Congo, 1. Cooreman 1951
N. macrotis Dobson, Congo, 7. Benoit 1958; Maa 1964
do., Ruanda. Benoit 1958
N. sp., Eritrea, 6. Goidanichi 1947; Maa 1961
"bat", Uganda, 6. Jordan 1912; Maa 1964

Polyctenes molossus Giglioli 2♂♂, 8♀♀, 6 nymphs
Megaderma lyra E. Geoffr., Madras Pres., India, 1 specim. Waterhouse 1879
do., Mysore, India, 11. Maa 1964
"bat", "China", 2. Jordan 1912
[*Molossus* sp.], Fukien, China, 2. Giglioli 1864

Note: The original record of this species as given by Giglioli was Amoy, Fukien, SE China off the "Chinese *Molossus*" collected by R. Swinhoe. The host-bat was later transliterated by Westwood (1874) as *Molossus chinensis* [nom. nud.] and surmised by Speiser (1904) as "einer sudasiatischen Molosside, vielleicht *Nyctinomus cestonii* (Savi) ?". Both authors did not realize that the same bat has already been named and published by Blyth (1861) as *Nyctinomus insignis* (now known as *Tadarida teniotis insignis*), and that there is another Amoy bat described by Andersen & Wroughton (1907) as *Eucheira sinensis* (now know as *Megaderma lyra sinensis*). Since *Tadarida*-bats of the Old World are known as exclusive hosts of the genus *Hypoctenes*, and since *Polyctenes* was found definitely on *M. lyra* more than once, it is most likely that *M. lyra* is the true breeding host of *P. molossus* and that the Amoy record as if *ex* "*Molossus*" or *Tadarida* (which is to be discarded as host) resulted from mixture with or contamination by *M. lyra*.

Adroctenes horvathi Jordan 2♂♂, 13♀♀, 4 nymphs
Rhinolophus eloquens Andersen, Kenya, 5 specim. Ferris *et al.* 1939

do., Equatoria, Sudan, 6. Maa 1964
Rh. lobatus Peters, Kasongo, Congo, 3. Cooreman 1955
Rh. sp., Torit, Sudan, 4. Maa 1964
"bat", Somaliland, 1. Jordan 1912

Adroctenes jordani Maa 3♀♀
Hipposideros sp., NW New Guinea, 3 specim. Maa 1964
[*Myotis* sp.], NW New Guinea, 2. Maa 1964

Note: The *Myotis* sp. (Vespertilionidae) record is apparently incorrect. One of the 3♀♀ of *Adroctenes jordani* was originally labeled as *ex Hipposideros*, whereas the 2 others, as *ex* mixture of *Hipposideros* sp. and *Myotis* sp. No vespertilionid bat has ever been known as a real breeding host of any polyctenid and the genus *Adroctenes* appears to be exclusively found on *Rhinolophus* and *Hipposideros* bats.

Adroctenes magnus Maa 1♂
Hipposideros diadema (E. Geoffr.), N. Queensland, 1 specim. Maa 1964

Hypoctenes petiolatus Maa 1♀, 1 nymph
Tadarida beccarii (Peters), Ambon, 2 specim. Maa 1964

Hypoctenes quadratus Maa 2♂♂, 1♀
Tadarida sp. (? *australis* Gray), NW New Guinea, 3 specim. Maa 1964

Hypoctenes clarus Jord. 2♂♂, 1♀
Tadarida thersites (Thomas), Cameroons, 2 specim. Jordan 1922
T. limbata (Peters), Congo, 1. Benoit 1958

Hypoctenes faini Benoit 1♀
Tadarida fulminans (Thomas), Ruanda, 1 specim. Benoit 1958

As exemplified above, the reliability of the host data on specimen-labels can and should be evaluated by checking the frequency rate of a given host-species and by considering the host specificity of related parasite-species. The discarding of the records enclosed in square brackets in the above list would only increase the clarity of the host-parasite relationship rather than obscure or spoil the true picture. Of the 228 specimens listed, only 3 were labeled as *ex* Megachiroptera (1 each *ex Rousettus aegyptiacus*, *Cynopterus sphinx* and *C. brachyotis*). And there is only 1 odd record each that one same host-species (*Megaderma lyra*)[3] harboring 2 different though closely allied parasite-genera and that one same host-genus (*Nycteris*) being host of 2 remotely related parasite-genera. These discrepancies are all quite apparent and have rooted from mislabeling of specimens, misidentification of host-bat or contamination of field material. Since the Polyctenidae are wingless and viviparous, stragglers, if any, are very rare in the family under natural conditions.

Table 1 is a summarization of the host relationship of the Polyctenidae including New World forms but not unreliable records. The families and genera of bats in the Table are arranged according to the sequence of order outlined by Simpson (1945) in his classification of mammals. Of the 16 Microchiropterous families recognized by that authority, only 6 and 1 respectively are known as hosts of Polyctenidae in the Old and New Worlds; and

3. In the New World, *Molossus cerastes* Thomas has been recorded as hosts of *Hesperoctenes cartus* Jord., *H. fumarius* Wwd. and *H. impressus* Horv. while *Eumops perotis* Wied, as hosts of *H. eumops* Ferr. & Using. and *H. giganteus* Ronderos. These odd records are not to be unreservedly accepted before some exact knowledge can be gained regarding the ecology as well as the ranges of distribution and variation in both the hosts and parasites involved.

of the the 25 genera (for those 6 families) recognized by the same authority, only 9 were heretofore known as hosts of Polyctenidae. Insofar as the host relationship is concerned, those 6 bat families fall into 3 categories: (a) occurring only in the Old World and serving as host—Nycteridiidae, Megadermatidae, Rhinolophidae, Hipposideridae; (b) occurring in both the Old and New Worlds but serving as host only in the Old World—Emballonuridae; (c) occurring and serving as host in both the Old and New Worlds—Molossidae. No bat-family endemic to the New World has reliable records of harboring any polyctenids. By implying the general pattern and tendency, the families Rhinopomatidae (Mediterranean to Malaysian Subregions) and Myzopodidae (Madagascar) and the 11 genera of Megadermatidae, Hipposideridae and Molossidae not listed in Table 1 may prove to be true hosts too. But the remaining families and genera are almost certainly not. The Vespertilionidae are nearly world-wide but chiefly distributed in temperate zones, whereas the Mystacinidae are confined to New Zealand in the southern temperate zone. These 2 families are not or hardly within the reach of the Polyctenidae which are tropical and subtropical in distribution. The Noctilionidae, Phyllostomatidae, Desmodontidae, Natalidae, Furipteridae and Thyropteridae are confined to the Neotropical Region. None of them is likely the true host of polyctenids unless the Neotropical polyctenid-fauna proves to be composed of more than the single genus *Hesperoctenes*.

Two of the bat-genera listed in Table 1, *Megaderma* and *Tadarida*, are each definitely known as hosts of 2 closely allied polyctenid genera. In *Megaderma*, actually 2 well defined subgenera are involved, which are considered by some authorities to be both of genus-rank because of differences in the shape of nose-leaf and in the width of skull. On the other hand, *Tadarida* sensu Simpson has a nearly worldwide range and is now generally divided into half a dozen or more subgenera (which are in part recognized by some mammalogists as distinct genera) such as *Austronomus*, *Chaerephon*, *Micronomus*, *Mops* and *Tadarida* s. s.[4] The Old World polyctenids *ex* these 5 subgenera are hardly separable from one another but all belong to a genus not known in the New World. Furthermore, if the host relationship is analysed at the suprageneric level, we can immediately notice that the Rhinolophoidea are partly parasitized by Polycteninae (*Eoctenes*, *Polyctenes*) and partly by Hesperocteninae (*Adroctenes*) whereas the Emballonuroidea and Vespertilionoidea are each by a single subfamily of polyctenids. It is quite beyond the scope of this paper to go into the systematics of bats, but our present knowledge of polyctenid fauna seems suggestive of the advisability to reconsider the superfamilial criteria as well as the status of the subgenera of *Megaderma* and *Tadarida*.

It is quite evident, as shown in Table 1, that closely related bats harbor closely related polyctenids and that the general evolutionary trends of the hosts and parasites are closely parallel to each other. The Nycteridiidae have so far no fossil records; the Emballonuridae, Megadermatidae, Rhinolophidae and Hipposideridae are known from the Upper Eocene or Lower Oligocene; but the Molossidae, from Upper Oligocene (cf. Simpson, *l. c.*). Therefore, the family Molossidae which is generally placed at or near the top of the family-tree of the Chiroptera, appears to be the youngest in geological age among the 6 bat-families known to be harboring polyctenids. The family Polyctenidae has no fossil records, but in

4. To these subgenera, the Old World host species *australis*, *limbata*, *beccarii*, *thersites* and *fulminans* respectively belong. The type species of the genus *Tadarida* Rafinesque 1814 is *teniotis* Rafin. of the Palaearctic Region.

structural and other features, it apparently shows a progressively increasing degree of specialization from the genus *Eoctenes* to *Hesperoctenes*. Obviously *Hesperoctenes* is also younger in geological age than any other polyctenid genus.

The ecology of the host-bats is so little known at present that hardly anything can be generalized. It appears that most of the recorded hosts form very small colonies and roost in shallow caves and tree holes, and that the size of the host colony probably more or less effects the population density of the parasite.

In short, major points of the host relationship of the family are: 1) The hosts all belong to 6 families of Microchiroptera, 2) each species of polyctenids has a definite host range, 3) 1 species of bat harbors only 1 species of polyctenid, 4) closely related host-species harbor closely related parasites, 5) the parallelism of the host-parasite evolution is evident.

Table 1. Summary of host relationship of Polyctenidae

Microchiroptera		Polyctenidae
Emballonuroidea		
2. Emballonuridae	*Emballonura*	*Eoct. ferrisi*
	Coleura	*Eoct. coleurae*
	Taphozous	*Eoct. intermedius*
(1. Rhinopomatidae and 3. Noctilionidae are not yet known as hosts of Polyctenidae)		
Rhinolophoidea		
4. Nycteridae	*Nycteris*	*Eoct. nycteridis*
5. Megadermatidae	*Megaderma* s. s.	*Eoct. spasmae*
	M. (*Lyroderma*)	*Polyct. molossus*
6. Rhinolophidae	*Rhinolophus*	*Adroct. horvathi*
7. Hipposideridae	*Hipposideros*	*Adroct. jordani, magnus*
Phyllostomatoidea		
(9. Desmodontidae are not yet known as hosts of Polyctenidae; in 8. Phyllostomatidae, the genera *Artibeus, Glossophaga* and *Phyllostomus* have been very doubtfully recorded—each with 1 single record—as hosts of *Hesp.* sp., *Hesp. parvulus* and *Hesp. fumarius* respectively).		
Vespertilionoidea		
16. Molossidae	*Tadarida*, Oriental	*Hyp. petiolatus, quadratus*
	Tadarida, Ethiopian	*Hyp. clarus, faini*
	Tadarida, Neotropical	*Hesp. cartus, hermsi, setosus*
	Molossus (*Promops*)	*Hesp. abalosi*
	M. (*Eumops*)	*Hesp. angustatus, eumops, giganteus*
	Molossus s. s.	*Hesp. fumarius, limai, longiceps, vicinus*
(10. Natalidae, 11. Furipteridae, 12. Thyropteridae, 13. Myzopodidae, 14. Vespertilionidae and 15. Mystacinidae are not yet definitely recorded as hosts of Polyctenidae).		

RELATIONSHIPS WITHIN THE FAMILY

The interrelationship of the 5 polyctenid genera has already been discussed by Jordan (1922) and Ferris & Usinger (1939). The 2 major subdivisions of the family recognized by them are here termed subfamilies. To show the progressively increasing degree of specialization from the most generalized to the most specialized forms, some selected characters are compared in Table 2. Not included are unique generic characters such as the abdominal

Table 2. Comparison of polyctenid genera

	prosternal process present	genal comb extensive	pronotal comb strong	apical antennal segments modified	antennal segment 1 with anterior comb	occipital comb strong	legs 2-3 long, slender
Eoctenes spasmae group	×	×	×	×	(×)	×	×
Eo. nycteridis group	×	—	×	×	(×)	×	(×)
Polyctenes	×	×	×	(×)	(×)	×	×
Adroctenes jordani group	×	—	×	×	×	×	—
A. horvathi group	—	×	×	×	(×)	×	—
Hypoctenes	—	—	(×)	(×)	(×)	(×)	×
Hesperoctenes	—	—	—	—	—	(×)	×

sternal comb in *Hypoctenes*, and most of the subfamilial characters such as the dorsal comb on antennal segment 2.

Undoubtedly the genera *Hesperoctenes* and *Eoctenes* represent the 2 extremes in the phylogeny of the family. Chiefly on the basis of the absence of dorsal combs and the unmodified apical antennal segments, the former genus has been regarded by earlier authors as the most generalized. However, the species of *Hesperoctenes* are exceedingly closely related to one another and are all confined to bats of the family Molossidae (*cf.* discussions under "host relationships") whereas those of *Eoctenes* have during the long past strongly diversified in several directions and are parasitic on Emballonuridae, Nycterididdae as well as Megadermatidae. These suggest that the former rather than the latter genus is younger in geological age. On the other hand, the flattening and longitudinal excavating of antennal segment 2 to closely fit, when in repose, the lateral margin of head, the presence of a dorsal comb on the same segment, the short series of peg-like modified setae underneath tarsi 2 and 3, and (in antepenultimate nymphal instar) the ventral comb on antennal segment 1, all found in *Hesperoctenes* but not *Eoctenes*, appear to be specialized rather than generalized characters. The various combs on the body of polyctenids evidently have appeared and disappeared more than once in the evolutionary history of the family. They serve as a quite conspicuous and convenient character but their real phylogenetic significance is not to be over-emphasized. In *Hesperoctenes*, furthermore, the losing or weakening of dorsal combs on occipital, pronotal and mesonotal margins is compensated by the presence of the dorsal comb on the antennal segment 2 whereas the losing of the ventral comb on antennal segment 1 and the shortening of the genal comb, by the presence of stout spines on the anterior prosternal and ventral metapleural areas. Of course the unmodified apical antennal segments and the nearly symmetrical tarsal claws in *Hesperoctenes* are generalized characters. But similarly, the former character has been compensated by the strong modification of segments 1 and 2, and the latter, by the presence of peg-like modified setae termed by Jordan (1912) as tarsal comb. By considering repeatedly the relative significance of the various characters involved, I became in favor of the view that *Hesperoctenes* is more specialized than *Eoctenes*. Meanwhile, the reversing of the sequence of order set by earlier authors would only bring the system in conformity to the theory of parallelism

in host-parasite evolutionary pattern.

In addition to the compensation of one character by another, there are evidences of disharmonious development in related forms. This provides additional support for the view of repeated appearance and disappearance of certain characters in the evolutionary history of the family. The anterior comb on the venter of antennal segment 1 is well developed only in *Adroctenes jordani* group, poorly so in *A. horvathi* group and in *Polyctenes* and *Eoctenes*, and hardly traceable in *Hypoctenes* and *Hesperoctenes*. The apical comb on the same segment is transverse and moderately developed in *Eoctenes*, oblique and strongly developed in *Polyctenes*, arcuate and moderately developed in *Adroctenes*, represented by a longitudinal series of short setae in *Hypoctenes* and entirely absent in *Hesperoctenes*. The comb on antennal segment 2 is strongest in *Hypoctenes*, moderately strong in *Hesperoctenes* and *Adroctenes* but entirely absent in *Polyctenes* and *Eoctenes*. The hypostomal comb is similar, strongest in *Hypoctenes*, moderately strong in *Adroctenes*, replaced by short strong hypostomal setae in *Polyctenes* and *Eoctenes*, and by strong prosternal spines in *Hesperoctenes*. Also in *Hypoctenes* is the strong modification of antennal segments 3 and 4 and the presence of a comb on abdominal sternite 2, the former is but slightly developed in *Adroctenes* while the latter is unknown to any other genus. The occipital comb is represented by a series of short setae in *Hesperoctenes*, poorly developed in *Hypoctenes*, moderately strong in *Polyctenes* (where it is weaker than pronotal comb) and strong in *Adroctenes* and *Eoctenes*. The genal comb is extensive and nearly reaching hind angle of head in *Polyctenes* and *Adroctenes* and in *Eoctenes spasmae* group, but not so in *Hypoctenes* and *Hesperoctenes* and in *Eo. nycteridis* group. The pronotal comb is entirely absent in *Hesperoctenes*, hardly recognizable in *Hypoctenes*, moderately strong in *Eoctenes nycteridis* group and in *Adroctenes*, and strong in most species of *Eo. spasmae* group and in *Polyctenes*. The mesonotal comb is unique for *Eoctenes*.

The parallelism of the host-parasite evolution in Polyctenidae is so obvious that not only the general evolutionary trend at genus-level of the bats closely corresponds with that of the polyctenids but also the interspecific affinities of the hosts and of the parasites are more or less parallel, although geographical isolation also plays a rather important role. I believe that when more host and distribution data are available, a still clearer picture of their relationship will eventually appear.

Key to subfamilies, genera and species of Old World Polyctenidae

1. Antennal segment 2 dorsally with a longitudinal, more or less arcuate comb on an expanded horizontal plate of posterior margin; tarsi 2 and 3 beneath near apex with 3–5 peg-like modified setae; claws of these tarsi with very small basal projection. Subfamily Hesperocteninae..... 2
   Antennal segment 2 cylindrical, without dorsal comb or expanded plate; tarsi 2 and 3 without peg-like modified setae beneath; claws (at least outer ones) of these tarsi with very distinct basal projection. Subfamily Polycteninae..... 9

2 (1). Legs 2 and 3 short and robust, femur 3 not reaching level of abdominal apex; occipital and pronotal combs both well developed, teeth of occipital comb not smaller than those of antennal comb. Genus *Adroctenes*..... 3
   Legs 2 and 3 long and slender, femur 3 attaining at least level of abdominal apex; occipital and pronotal combs both not or hardly developed, teeth of

occipital comb when present, hardly longer or more robust than neighboring ordinary setae 5

3 (2). Anterior basal comb on venter of antennal segment 1 hardly developed, its teeth less than 1/2 as long as those of discal comb of same segment; pronotal comb almost covering entire hind pronotal margin; prosternum posteriorly pointed, not produced into long intercoxal process. Ethiopian species ..... **Adroctenes horvathi**

Anterior basal comb on venter of antennal segment 1 well developed, its teeth as long as those of discal comb; pronotal comb covering only about 1/2 of hind pronotal margin; prosternum posteriorly produced into long broadly truncate intercoxal process. Oriental species 4

4 (3). Pronotum widest near anterior end, posterolaterally with 5 pairs of long marginal bristles at sides of pronotal comb; antennal segment 1 about as long as wide, 3 much longer than 4, 2 dorsally with 14-toothed comb; body 4.6 mm long ..... **Adr. magnus**

Pronotum widest at midlength, posterolaterally with 3 pairs of long marginal bristles; antennal segment 1 distinctly longer than wide, 3 subequal in length to 4, 2 dorsally with 10-toothed comb; body 3.0–3.4 mm long..... **Adr. jordani**

5 (2). Abdominal venter with a distinct comb at base; teeth of genal comb short, not projecting laterally beyond side of head; prosternum without stout spines on anterior margin. Genus *Hypoctenes*..... 6

[Abdominal venter without comb; teeth of genal comb long, extending well beyond sides of head; prosternum with 10–20 stout spines arranged arcuately on anterior margin either in a continuous or medially interrupted series. Confined to New World Molossidae ..... Genus **Hesperoctenes**]

6 (5). Antennal segment 1 hardly longer than 2, *ca.* 31 : 29 or 25 : 26; posterolateral margin of prosternum at most with very small patch of fine setae, never with stout spines. Ethiopian species 7

Antennal segment 1 distinctly longer than 2, *ca.* 30 : 22 or 26 : 20; posterolateral margin of prosternum with a short series of short stout spines which are as robust as those on anterior margin of femur 1. Oriental species..... 8

7 (6). Venter of gena with about 15 blunt spines which are not shorter than teeth of genal comb and are arranged somewhat regularly in a single series along lateral margin at anterolateral angle; antennal segments 2 and 3 subequal in length, *ca.* 11 : 12 in ♀; posterolateral margin of prosternum with small patch of fine setae ..... **Hyp. faini**

Venter of gena with about 7–10 blunt spines which are distinctly shorter than teeth of genal comb and are arranged irregularly at and near anterolateral angle; antennal segment 2 much shorter than 3, *ca.* 29 : 37 in ♀ and 26 : 36 in ♂..... **Hyp. clarus**

8 (6). Laterotergites 5 to 8 strongly petiolate; abdominal sternal comb composed of about 41 teeth ..... **Hyp. petiolatus**

Laterotergites 5 to 8 quadrate; abdominal sternal comb composed of about 28–33 teeth..... **Hyp. quadratus**

9 (1). Mesonotal lobe without comb; antenna long, extending beyond level of hind margin of head; posterolateral angle of head scarcely produced, rounded,

distinctly drawn away from anterolateral angle of pronotum. Genus *Polyctenes* ..... **Polyctenes molossus**

Mesonotal lobe with well developed comb; antenna short, not reaching level of hind margin of head; posterolateral angle of head acutely produced and touching anterolateral angle of pronotum. Genus *Eoctenes* 10

10 (9). Intercoxal process of prosternum tongue-like, with apex broad and slightly or distinctly emarginate; genal comb far from reaching posterolateral angle of head; pronotum distinctly transverse..... 11

Intercoxal process of prosternum triangular, acute or subacute; genal comb virtually reaching posterolateral angle of head; pronotum about as long as wide..... 12

11 (10). Mesonotum subequal in length to pronotum, widest before midlength; abdominal tergites each with more than 1 setal row..... **Eo. nycteridis**

Mesonotum about 3/4 as long as pronotum, widest at midlength; abdominal tergites each with only 1 setal row..... **Eo. ferrisi**

12 (10). Mesonotum nearly 1/2 as long as wide, and markedly shorter than pronotum; abdominal tergites 7 and 8 at most each with 1 medially interrupted row of long curved bristles, no complete bristle-row..... 13

Mesonotum not or hardly shorter than wide, but subequal in length to pronotum; abdominal tergites 7–8 each with a complete row of long curved bristles..... 14

13 (12). Teeth of pronotal comb only about 1/2 as long as those of occipital comb; intercoxal process of prosternum shorter and blunter as in fig. 1; abdominal tergite 7 in ♀ with 5 pairs of long bristles..... **Eo. coleurae**

Teeth of pronotal and occipital combs subequal in length; intercoxal process of prosternum longer and acuter, not as in fig. 1; abdominal tergite 7 in ♀ with only 2 pairs of long bristles..... **Eo. intermedius**

14 (12). Long curved bristles on abdominal tergites 6–8 (♀) or 7–8 (♂) about as long as tergites themselves; those near antero- and posterolateral corners of pronotum about 2× as long as antennal segment 2; anterior margin of labrum evenly rounded..... **Eo. spasmae**

Long curved bristles on abdominal tergites 7–8 (♀) only about 1/2 as long as tergites themselves; those near antero- and posterolateral corners of pronotum hardly longer than antennal segment 2; anterior margin of labrum subangulate at side..... **Eo. sinae**

Subfamily Polyctenidae

Antennal segment 1 ventrally with oblique or transverse comb of 5–6 large teeth; segment 2 cylindrical, without comb. Pronotum usually scarcely transverse and roundly narrowed anteriorly; metasternum small. Legs 2 and 3 always long and slender; coxae 3 approximate; tarsi 2 and 3 without peg-like modified setae beneath; either outer or both outer and inner claws of tarsi 2 and 3 with large basal projection. Parasitic on Emballonuridae, Nycteridiidae and Megadermatidae; Old World.

Genus **Eoctenes** Kirkaldy 1906

This genus may be subdivided into 2 species-groups, as follows:

(a) *spasmae*-group. Genal comb virtually reaching hind angle of head. Proboscis 4-segmented. Pronotum about as long as wide; teeth of pronotal comb (except in *Eo. coleurae*) about as long as those of occipital comb; intercoxal process of prosternum long-triangular, with acute or subacute apex. Mesonotum with only ordinary short recumbent setae, no long erect bristles. Legs long and slender. Parasitic on Emballonuridae and Megadermatidae. Species included: *coleurae*, *intermedius*, *spasmae*, *sinae*.

(b) *nycteridis*-group. Genal comb far from reaching hind angle of head. Proboscis 3- or 4-segmented. Pronotum distinctly shorter than wide; teeth of pronotal comb only 1/2 as long as those of occipital comb; intercoxal process of prosternum tongue-like, with broadly truncate or slightly or distinctly emarginate apex. Mesonotum with a number of long erect bristles in addition to ordinary short recumbent setae. Legs shorter and more robust in proportion. Parasitic on Emballonuridae and Nycteridiidae. Species included: *nycteridis*, *ferrisi*.

Eoctenes coleurae Maa, n. sp. Figs. 1, 3B.

SUDAN: Holotype ♀ (AMNH), Jebelein, *ex* alcohol-preserved bat *Coleura gallarum nilosa* (#82246–82260, 83392–83404), 25. I. 1927, H. E. Anthony (Taylor Sudan Exped.). Allotype ♂, paratypes 1♀, 1 nymph, same data. Holotype and 1♀ paratype in Amer. Mus. Nat. Hist.; allotype and 1 paratype nymph in Bishop Mus.

♀. Body (on slide) 2.7 mm long. Head, measured along median line from occipital margin to labral apex, hardly shorter than (28 : 31) wide along occipital margin. Labrum and head proper with similar setae as in *Eo. ferrisi* but anterior angle ventrally with 3–4 small blunt modified setae and hypostomal region with fewer and smaller setae. Genal comb almost reaching hind angle of head. Proboscis 4-segmented, segment 4 more slender than and subequal in length to 3, hardly longer than 2. Antenna as in *Eo. ferrisi*. Pronotum 1/6 wider than long, virtually parallel-sided, anteriorly with 3 pairs and posterolaterally with 1 pair of long curved bristles, lateral and posterior marginal area uniformly covered with recumbent setae, discal area extensively bare; posterior margin not sinuate at middle; teeth of pronotal comb only about 1/2 as long as those of occipital comb. Mesonotum slightly wider than pronotum (39 : 36) and when not including area overlapped by pronotum, just 2× as wide as long, posterolateral area uniformly setose, elsewhere bare, no long bristles; posterior margin of mesonotal lobe gently curved. Prosternum evenly, rather longly setose, its intercoxal process short, triangular, apically subacute. Mesosternum rather uniformly adorned with short setae, anteriorly with 2 pairs of rather long erect ones. Metasternum small, posteriorly setose. Abdominal tergite 2 with 1 row of short setae, 3–5 each with 2 rows, 6 with 3 rows, 7 and 8 respectively with 5 and 3 pairs of long submedian bristles in addition to 2 rows of short setae; abdominal sternites with similar but sparser setae than in *Eo. intermedius*; laterotergites smaller in proportion than in *intermedius*.

♂. Body (on slide) 2.1mm long. Similar but abdominal tergites without long bristles.

This species is closely allied to *Eo. intermedius* parasitizing *Taphozous* bats but can easily be distinguished from the latter species by the shorter teeth of pronotal comb, shorter and

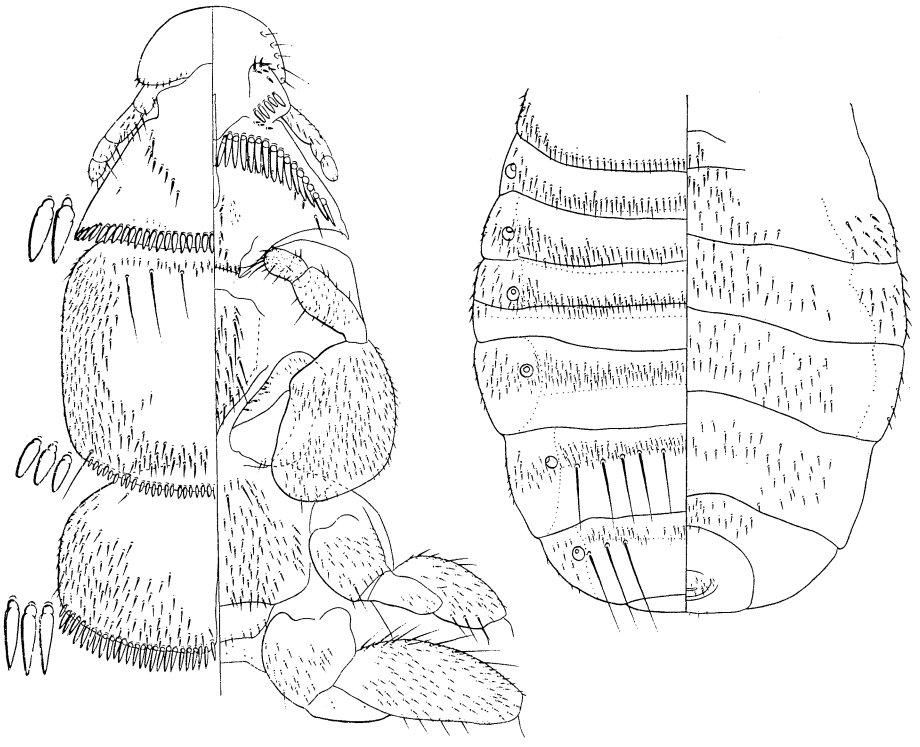

Fig. 1. *Eoctenes coleurae* Maa, holotype ♀. Dorsal and ventral views.

blunter prosternal process and in ♀, also by the more numerous long bristles on abdominal tergites 7 and 8.

Eoctenes intermedius (Speiser) 1904

SUDAN: 1♂, 1♀ (BMNH 1913-257, types of *Eo. eknomius* Kell. & Paine, on same slide), Khartoum, IX. 1909, J. H. King; 1♂ (BMNH), same data, but det. Jordan as *intermedius*.

EGYPT: 2 ♀♀ (CAS), Sultan Hassan Mosque, *ex Taphozous perforatus*, III. 1952, H. Hoogstraal.

INDIA: 2 ♀♀ (both with unborn nymphs), 2 nymphs (BMNH 1923-615 *ex* coll. N. C. Rothschild), Vizaynagar, Bellary, S. India, *ex T. kachhensis*, VII. 1912, G. S. Shortridge.

PHILIPPINE IS.: 1♀, Montalban, Rizal Prov., Luzon, *ex* bat (BBM 908-924), II. 1962, L. & S. Quate.

AUSTRALIA: 1♀, Cowie Bay Cave nr Cooktown, Cape York Penin., N. Queensland, *ex* alcohol-preserved bat *Taphozous* sp. (AMNH 156946–156958), VI. 1950, J. Roberts.

Eoctenes spasmae (Waterhouse) 1879

CEYLON: 1♀ (BMNH 1923-615 *ex* coll. N. C. Rothschild), Ceylon, *ex M. spasma*; 2 nymphs (BMNH 1923-615 *ex* coll. Rothschild), Peradeniya, *ex M. spasma*, J. C. F. Fryer.

INDIA: 1 nymph (BMNH 1923-615 *ex* coll. Rothschild), Oyayanagar, Bellary, *ex M. lyra*; 1♀ (BMNH), Ratnagiri, S of Bombay, *ex M. spasma*, XI. 1899, K. R. Kirtekar; 8♂♂, 9♀♀ (incl. 1 unborn nymph), 6 nymphs (BMNH 1923-615 *ex* coll. Rothschild), Sirsi, Kanara, *ex M. spasma*, IV. 1912, N. B. Kinnear.

THAILAND: 1♂ (IMR 23282), Bangnara, *ex* alcohol-preserved bat *Megaderma spasma medium* (#6327), IX. 1918.

MALAYA: 1♀, 1 nymph (IMR 21533), Selangor, Bt. Lagong, *ex M. spasma* (R 55472), II. 1959, R. Traub.

SUMATRA: 2♂♂, 1♀, 2 nymphs (probably of 2nd postnatal instar) (LDN), Pulu Babi (2°, 7'N., 96°, 40'E.), no host records, IV. 1913, E. Jacobson; 1♂, 2♀♀ (LDN), same data but *ex* alcohol-preserved bat *Megaderma spasma* (#6327 & #1734); 1♂, 1♀ (BMNH 1890-47), "Sumatra, *ex M. lyra*", no further details.

JAVA: 1♀, 1 nymph (LDN), Moera Antjol, *ex* alcohol-preserved bat *M. spasma* (#1607), II–III. 1903, E. Jacobson; 2♀♀ (LDN), Gede, Tjibodas, *ex* alcohol-preserved bat *M. spasma* (#1616), VII. 1909, H. W. v. d. Weele; 1♂, 1♀ (IMR 23289), Tjibodas, *ex* alcohol-preserved bat *M. spasma trifolium* (#19000), 1916; 1♀ (IMR 23290), no locality but probably from Java, *ex* alcohol-preserved bat *M. spasma trifolium* (#6337); 1 nymph (2nd postnatal instar) (BMNH 1830-62, type), underside of slide with author's handwritten label "*Polyctenes spasmae* (Type) C. Waterh. Java"; 1 nymph (of same instar as type) (BMNH, no register number), with Waterhouse's label "*Polyctenes spasmae* C. Waterh. Java", apparently a paratype but not indicated so; 1 nymph (3rd postnatal instar) (BMNH 1890-47), Java, *ex Megaderma spasma*; 1♂ (BMNH 1923-615 *ex* coll. Rothschild), Willis Mt, 750 m, *ex M. spasma*, coll. Baron V. Hugel.

KARIMATA IS.: 1 nymph (IMR 23283), *ex* alcohol-preserved bat *M. spasma carimatae* (#149), 1904.

In Waterhouse's type, the antennal segment 1 ventrally with 2 and 3 teeth respectively at apical and anterior margins; pronotum almost parallel-sided; pronotal and mesonotal combs absent; abdominal segments each with a pair of lateral bristles. Relative measurements (scale 35 units=1 mm): length of head 32 units, pronotum 30, mesonotum incl. part overlapped by pronotum 20, metanotum (area exposed behind mesonotum) 6, abdomen 45; total length of body 127; width of labrum 16, occiput 28, pronotum 34, mesonotum 31, metanotum 24.

Eoctenes sinae Maa 1961

Known only from the unique type specimen *ex* an undetermined bat.

Eoctenes ferrisi Maa, n. sp. Figs. 2, 3A.

SOLOMON IS.: Holotype ♂ (BISHOP 3649), Pusisama, ca. 5 m, Vella Lavella I., *ex Emballonura* sp. (BBM 23232), 27. XI. 1963, P. Temple. Allotype ♀, Malangona, ca. 10 m, Choiseul I., *ex E. raffrayana cor* (BBM 23613), 6.III.1964, Temple; paratype ♂, Pelele, ca. 10 m, Kolombangara I., *ex Emballonura nigrescens* (BBM 23503), 10. II. 1964, Temple. Type series in Bishop Mus.

♂. Body (on slide) 2.8 mm long. Head, measured along median line from occipital margin to labral apex much shorter than (28 : 38) wide along occipital margin. Labrum

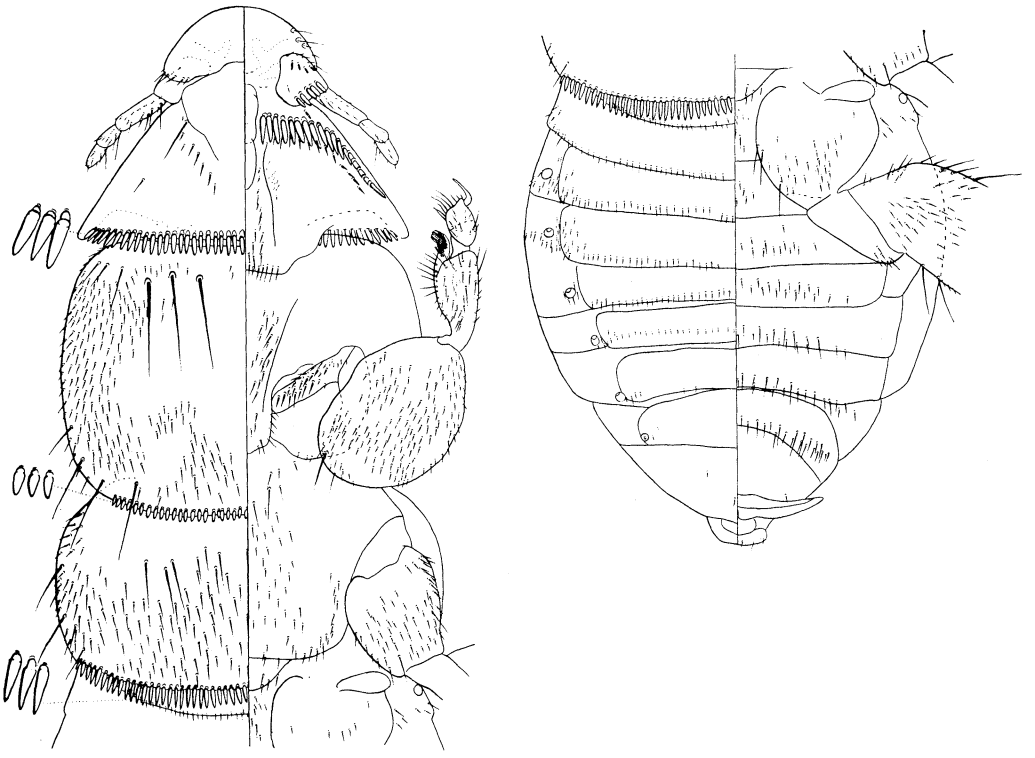

Fig. 2. *Eoctenes ferrisi* Maa, holotype ♂. Dorsal and ventral views.

with some small setae on lateral margin ventrally, and some on posterior margin dorsally; head proper dorsally with an isolated seta near hind angle and a series of setae of varied length lined subparallel to genal suture, ventrally with an isolated seta at anterior angle and a series of erect setae lined subparallel to genal comb; hypostomal region anteriorly with smaller and posteriorly with larger erect setae forming a pair of longitudinal series at sides of rostral groove and 2–3 transverse series on posterior margin; a pair of small patches of fine setae situated laterally to rostral groove. Genal comb far from reaching hind angle of head. Proboscis 4-segmented, segments 2 and 3 not quite clearly articulated, their combined length slightly greater than 4. Antenna rather typical for the genus but comb underneath segment 1 composed of only 5 teeth. Pronotum 1/4 wider than long, widest near midlength, anteriorly with 3 pairs of longer and another 3 pairs of shorter erect bristles, posterolaterally with few pairs of similar bristles; lateral marginal area rather uniformly covered with short recumbent setae, posterior marginal area unevenly setose; discal area bare; posterior margin slightly concavely curved at middle; teeth of pronotal comb only about 1/2 as long as those of occipital comb. Mesonotum 3/4 as long as pronotum; anterior 1/2 largely bare, with several pairs of moderately long erect bristles; posterior 1/2 uniformly covered with recumbent setae; posterolateral angle with long bristles; posterior margin of mesonotal lobe very gently curved. Prosternum anteriorly unevenly setose, its intercoxal process long, almost parallel-sided, apically blunt. Mesosternum uniformly covered with

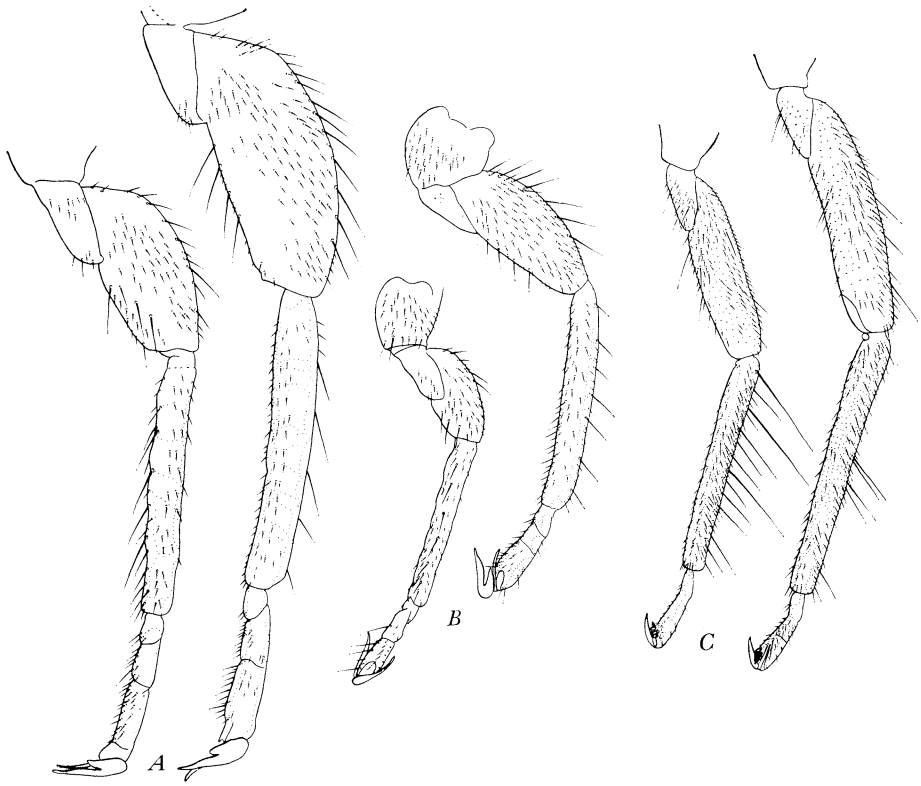

Fig. 3. Mid and hind legs. A, *Eoctenes ferrisi* Maa; B, *Eo. coleurae* Maa; C, *Hypoctenes petiolatus* Maa; not drawn to same scale.

recumbent setae, anteriorly with about 3 pairs and posteriorly with 1 pair of erect setae. Metasternum very small, posteriorly setose. Abdominal tergites each with 1 setal row; sternites usually each with 2 setal rows; basal laterotergites large and well defined, progressively decreasing in size and in distinctiveness on approaching abdominal apex; no long bristles.

♀. Body (in alcohol) 3.0 mm long. Similar. Abdominal tergites 6 and 7 each with 2 pairs of submedian erect bristles arranged in line with recumbent setae.

Among described forms of the genus, the closest relative of this new species appears to be *Eo. nycteridis*. Since the 2 species are geographically widely isolated and their host bats belong to different families, many differentiating characters are expected to exist. Besides those mentioned in the key, the body size, the vestiture at hypostomal region, mesonotum and venter of thorax and abdomen, as well as the relative length and thickness of legs are also dissimilar.

The discovery of this new species is of much interest, particularly because it is quite distinct from *Eo. coleurae* and *Eo. intermedius*, both known as parasites of emballonurid bats and because the genus *Emballonura* is widely distributed in the Old World but has here-

tofore not yet been recorded as host of any polyctenid.

Eoctenes nycteridis (Horváth) 1910

UGANDA: 4 ♀♀ (incl. 1 unborn nymph), 1 nymph, (BMNH 1909-183), Moffat Rd., Entebbe, E. Degan; 1 ♀ (BMNH), Baruma I., 1948, G. R. Barnley.

CONGO: 1 ♀, 6 nymphs (LDN), Landana, Upper Congo, *ex* alcohol-preserved bat *Nycteris macrotis* (#376), 1890, M. Petitaine.

Genus **Polyctenes** Giglioli 1864

Polyctenes molossus Giglioli 1864

CHINA: 1 ♀, 1 nymph (BMNH 1890-97), "China, off bat" (no further detail).

INDIA: 1 ♀ (BMNH 1879-49, type of *lyrae* Waterh., right hind leg on a separate slide), underside of slide with Waterhouse's label "*Polyctenes lyrae* C. Waterh. Type", India, no further data; 1 ♂, 6 ♀♀, 4 nymphs (3 of them killed at moment of moulting, thus with double sets of exoskeleton and ctenidia) (BMNH), Kolar, Mysore, *ex Megaderma lyra*, IX. 1912, N. B. Kinnear.

Subfamily Hesperocteninae Maa, n. subfam.

Antennal segment 1 ventrally either with scattered spines or with 1 or 2 arcuate combs each of 10–11 moderately large teeth; segment 2 with dorsal surface more or less ampliate posteriorly, and with 1 arcuate comb; posterior surface longitudinally concave below dorsal ampliation. Pronotum strongly transverse, nearly parallel-sided; metasternum large, strongly transverse. Legs 2 and 3 either long and slender or short and robust; coxae 3 widely separated; tarsi 2 and 3 beneath near apex with peg-like modified setae; claws of tarsi 2 and 3 with vestigial basal projection. Parasitic on Rhinolophidae, Hipposideridae and Molossidae; Old and New Worlds.

Genus **Adroctenes** Jordan 1912

Members of this genus fall into 2 clear-cut groups which are differentiated not only in structural characters but also host and geographical ranges.

(a) *horvathi*-group. Body practically uniformly covered with dense short setae, with setose area much more extensive than bare area. Labrum with lateral marginal setae strongly modified into peg-like and spine-like ones. Hypostomal comb poorly developed. Antennal segment 1 ventrally with only 1 disco-transversal comb. Pronotum widest near midlength, its posterior submarginal bristle-row not interrupted at middle; pronotal comb covering almost entire posterior pronotal margin; prosternum subtriangular, posteriorly not produced into intercoxal process. Ethiopian Region. Parasitic on Rhinolophidae.

(b) *jordani*-group. Body not uniformly covered with setae; setose area less extensive than bare area. Labrum with ordinary, unmodified lateral marginal setae. Hypostomal comb well developed. Antennal segment 1 ventrally with 2 well defined combs, 1 anterobasal and another disco-transversal. Pronotum widest near anterior end, with posterior submarginal bristle-row broadly interrupted at middle; pronotal comb only covering about 1/2

of posterior pronotal margin; prosternum posteriorly produced into a large, apically truncate intercoxal process. Oriental Region. Parasitic on Hipposideridae. Besides *jordani*, *magnus* also belongs here.

For the inclusion of *jordani*-group or the 2 new species described below, the generic diagnosis given by Jordan (1912) will have to be revised, particularly the passage "clipeo ad latera spinis crassis loco setarum instructo; ...prosterno...sine processu intercoxali." The discovery of the same species-group also greatly extends the geographical range of the genus.

Adroctenes horvathi Jordan 1912

SOMALILAND: 1♀ (Type, BMNH 1913-257), Upper Shoika, Brit. Somaliland, *ex* "bat", XI.1909, A. E. Drake-Brockman.

SUDAN: 5 ♀♀ (incl. 1 unborn nymph), 1 nymph (3rd postnatal instar) (BMNH 1931-219) Katire Matonga, Equatoria Prov., *ex Rhinolophus eloquens*, coll. J. S. Owens; 3 ♀♀ (incl. 1 unborn nymph), 1 nymph (1st postnatal instar) (BMNH 1955-594), Nagichot, 160 km E of Torit, S. Sudan, *ex Rhinolophus* sp., 2. IX. 1951, E. T. M. Reid.

Adroctenes jordani Maa, n. sp. Figs. 4, 6B.

NW NEW GUINEA: Holotype ♀ (BISHOP 3650), Vogelkop Penin., Manokwari, *ex*

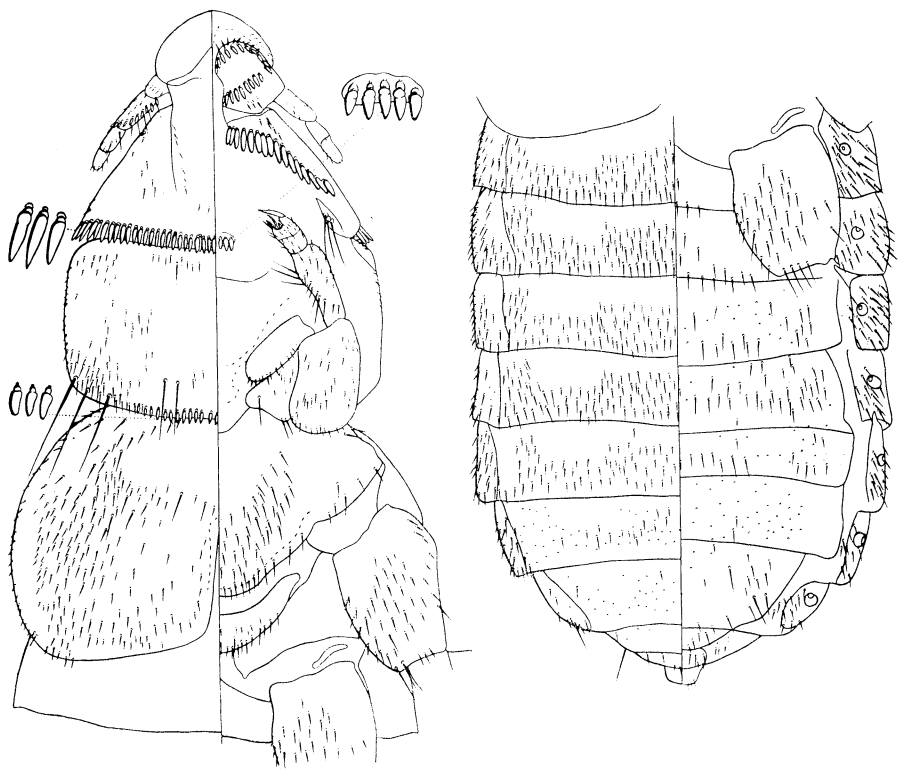

Fig. 4. *Adroctenes jordani* Maa, holotype ♀. Dorsal and ventral views.

Hipposideros sp. (BBM 883–887), 2. II. 1962, L. & S. Quate. Paratypes 2 ♀♀, same data but *ex* mixture of *Hipposideros* sp. and *Myotis* sp. (BBM 883–889). Type series in Bishop Mus. Obviously *Myotis* is not the true breeding host, see discussion under host relationship of the family.

♀. Body (on slide) 3.0–3.4 mm long, 1.1 mm wide. Head, measured along median line from occipital margin to labral apex, shorter than (20 : 23) wide along occipital margin. Labrum longer and narrower in proportion than in *A. horvathi*. Genal suture almost straight; genal comb with 15–16 teeth, posteriorly almost reaching lateral margin of head; hypostomal comb composed of 5–7 apically pointed teeth. Antennal segment 1 longer than wide; 2 dorsally with an arcuate comb of 10 pointed teeth; 3 subequal in length to 4. Pronotum almost 2× as wide as long, hardly wider than head, widest at midlength, posterolaterally with 3 and 2 pairs of bristles at sides of and before pronotal comb respectively; pronotal comb composed of 26–31 teeth; prosternum virtually bare except a few setae on hind margin which is gently curved. Mesonotum widest behind midlength; hind margin of mesonotal lobe practically straight, distinctly oblique. Legs more slender in proportion and coxae 2 and 3 less setose than in *A. magnus*. Other characters similars to those in *magnus*. ♂ unknown.

Adroctenes magnus Maa, n. sp. Figs. 5, 6A.

AUSTRALIA: Holotype ♂ (AMNH), Gordon Mine, Iron Range, Cape York Penin., Queensland, *ex* alcohol-preserved bat *Hipposideros diadema reginae* (#154884), 13. VI. 1948, G. H. H. Tate & H. M. Van Deusen. Holotype in Amer. Mus. Nat. Hist.

♂. Body (on slide) 4.6 mm long, 1.6 mm wide. Head, measured along median line from occipital margin to labral apex, shorter than (28 : 35) wide along occipital margin. Labrum anteriorly more strongly curved than in *A. horvathi*, posterolaterally subtruncate, ventrally depressed at hind part to form receptor for antennal segment 1; lateral marginal setae normal, not modified into stout spines. Dorsal surface of head proper almost bare; ventral surface anterolaterally with small patch of setae and posterolaterally with oblique series of bristles. Genal suture gently curved; occipital comb with apically pointed teeth of which those at middle are distinctly shorter than at sides; genal comb with about 20 blunt teeth; teeth of these 2 combs of similar length, more than 2× as long as those of pronotal comb; hypostomal comb composed of 8 blunt teeth which are 2/3 as long as those of genal comb. Antenna short, apically far from reaching level of posterolateral angle of head; segment 1 about as long as wide, ventrally with 2 bluntly-toothed combs, 1 anterobasal and 1 discal, teeth of anterobasal comb about as long as but wider than those of discal comb; segment 2 shorter than 1, hardly shorter than 3+4, dorsally with 1 arcuate comb of 14 pointed teeth, ventrally without longitudinal series of obtuse spines; segment 3 much longer than 4. Pronotum 2× as wide as long, slightly wider than head, widest near anterior angle where it strongly decurves and forms a flap to hold foreleg in position when in repose; surface of pronotum with scattered setae, posterolaterally with 5 pairs of marginal bristles which are medially widely interrupted by pronotal comb, and do not form a continuous transverse submarginal bristle-row; 1 or 2 submedian bristles lying slightly before pronotal comb; pronotal comb covering only about 1/2 of posterior pronotal margin and composed of 27 teeth. Prosternum with scattered strong setae, its intercoxal process strongly produced, posteriorly broadly truncate and sparsely fringed with setae. Mesonotum much wider and

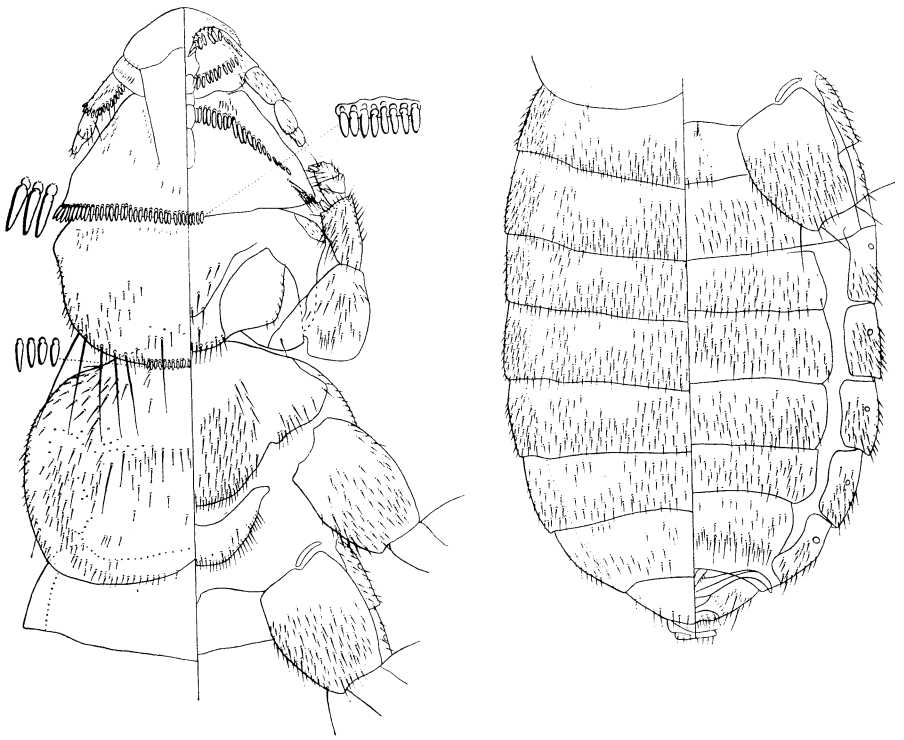

Fig. 5. *Adroctenes magnus* Maa, holotype ♂. Dorsal and ventral views.

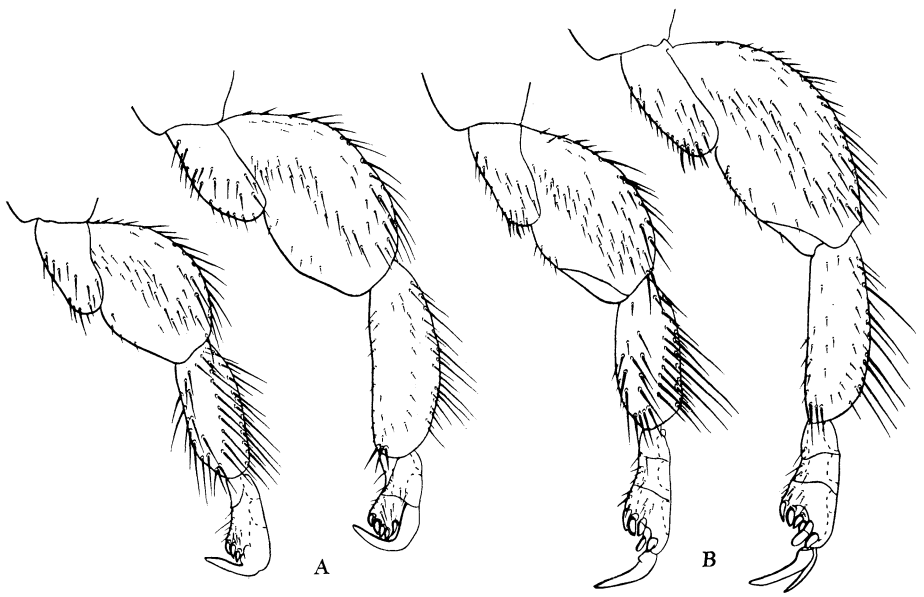

Fig. 6. Mid and hind legs. A, *Adroctenes magnus* Maa; B, *Adr. jordani* Maa; not drawn to same scale.

slightly more setose than pronotum, widest at midlength; hind margin of mesonotal lobe gently curved, scarcely oblique. Mesosternum anteriorly deeply angularly incised at middle, posteriorly broadly rounded. Metasternum strongly produced anterolaterally, setose near posterolateral margin, elsewhere almost bare. Abdominal setae not evenly distributed but of uniform length and robustness; laterotergites all subquadrate; paramere quite strongly curved in S-shape. Legs distinctly shorter and more robust than in *A. horvathi*. ♀ unknown.

As suggested by its name, this species can immediately be recognized from its congeners by the outstandingly large body size. In structure, it is quite closely allied to the preceding species but they can be separated at ease by using couplet 4 of the key.

Genus **Hypoctenes** Jordan 1922

Notwithstanding the discovery of the 2 new species in the Oriental Region greatly extending the geographical range of the genus, the diagnosis given by Jordan remains sound and adequate. The species of the genus are so closely related to one another that the subdividing into species-group is unnecessary.

Hypoctenes petiolatus Maa, n. sp. Figs. 3C, 7.

AMBON (Amboina): Holotype ♀ (LDN), *ex* alcohol-preserved bat *Tadarida "australis"* from a tall tree, 20. X. 1922, F. Kopstein. Holotype in Leiden Mus. According to Laurie & Hill's (1954) List of land mammals of New Guinea, etc., the only *Tadarida* known from Ambon is *T. beccarii beccarii* (Peters) whereas *T. australis* (Gray) is confined to New Guinea and Australia.

♀. Body (on slide) 3.9 mm long, 1.3 mm wide, with setae closely similar to those in *H. clarus*. Labrum slightly shorter and wider in proportion than in *clarus*, surrounded (except at middle section of anterior margin) by marginal setae of varied length. Occipital comb represented by a row of incipient teeth which are not or hardly longer and more robust than neighboring ordinary setae; middle section of occipital margin produced posteriorly. Genal suture short, straight; genal comb composed of about 30 rather small and blunt teeth, its posterior end almost reaching lateral carina of gena; a small patch of blunt spines and of short setae, respectively, situated anterolaterally and posteriorly to genal comb. Proboscis with segments 2, 3 and 4 subequal in length to one another. Hypostomal area finely, irregularly setose; hypostomal comb composed of 18 slender pointed teeth which are distinctly longer than those of antennal comb and about 2× as long as those of abdominal sternal comb. Antenna almost reaching level of midlength of lateral pronotal margin; segment 1 longer than wide, with postero-interior corner angulated and postero-exterior area strongly excavated; segments 2 and 3 posteriorly longitudinally concave, each near base with a large dorsal plate bearing long bristles along posterior margin; segment 2 distinctly shorter than 1 and than 3, its dorsal comb composed of about 20 pointed teeth slightly shorter than those of hypostomal comb. Pronotum slightly widened posteriorly, with setae similarly arranged as in *H. clarus*; prosternum subtriangular, posteriorly not extending inbetween coxae 1, its posterolateral margin with a series of pointed spines as robust as those on anterior margin of femur 1. Mesonotum uniformly setose except anterior margin, without long bristles; mesosternum anteriorly roundly sinuate. Abdominal sternite 2 with about 4 irregular rows

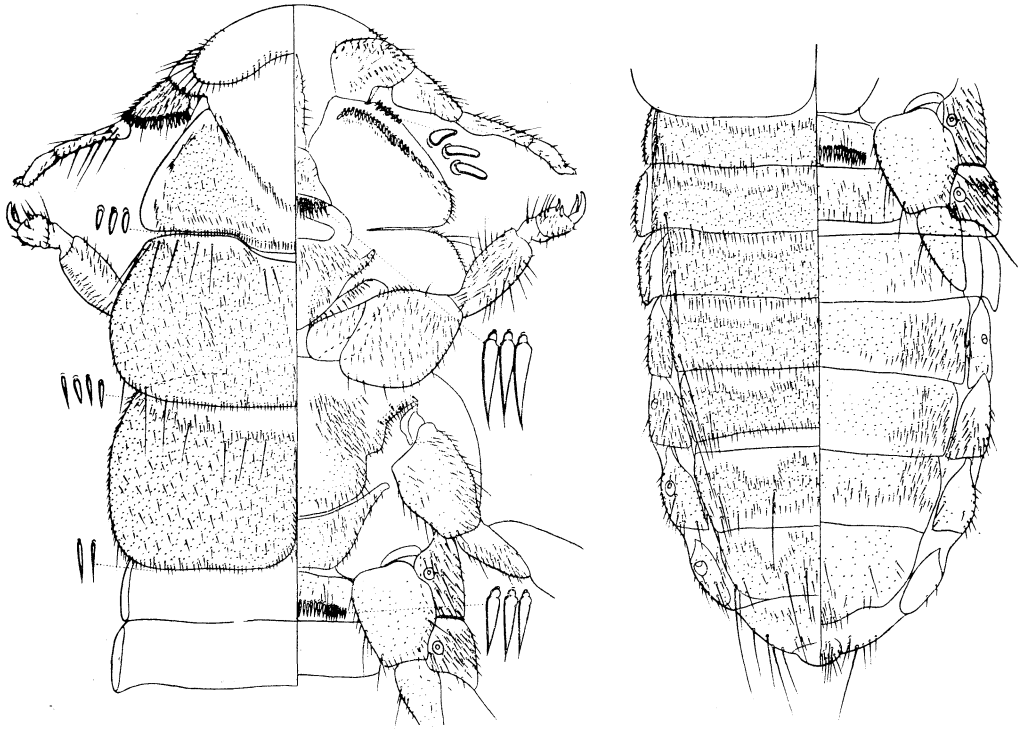

Fig. 7. *Hypoctenes petiolatus* Maa, holotype ♀. Dorsal and ventral views; but note the abdominal segments 6 to 8 were wrongly drawn as if each with 2 sets (1 dorsal and 1 ventral) of laterotergites. Actually there is 1 set which is partly dorsal and partly ventral.

of fine setae before its comb which is composed of 41 slender pointed teeth; laterotergites 4 to 8 distinctly petiolate at base. ♂ unknown.

Besides the ♀ adult described above, 1 nymph is tentatively referred here. The latter was found by me at the bottom of a jar containing 5 alcoholic specimens of *Tadarida plicatus*, 2 undetermined vespertilionids and 2 undetermined pteropods *ex* coll. Broers in the Leiden Mus. Those bats are presumed to have been collected somewhere in Indonesia.

Hypoctenes quadratus Maa, n. sp. Fig. 8.

NE NEW GUINEA: Holotype ♂ (BISHOP 3651), Sepik Distr., Bainyik Agric. Exp. Sta. nr Maprik, *ex Tadarida* sp. (*?australis*) (TMP 1664–1671) in tree hole, 4. I. 1960, T. C. Maa. Allotype ♀ and paratype ♂, same data. Type series in poor condition.

♂. Body (on slide) 1.1–1.2 mm wide. Labrum shorter and broader in proportion than that in *H. petiolatus*. Genal comb composed of about 28–30 teeth. Hypostomal comb with 16–18 teeth which are hardly longer than those of antennal comb and less than 2× as long as those of abdominal sternal comb. Antennal segment 1 ventrally with some fine setae; dorsal comb on segment 2 composed of about 24 long slender and pointed teeth. Comb on abdominal sternite 2 composed of 28–33 teeth; laterotergites all quadrate. Paramere api-

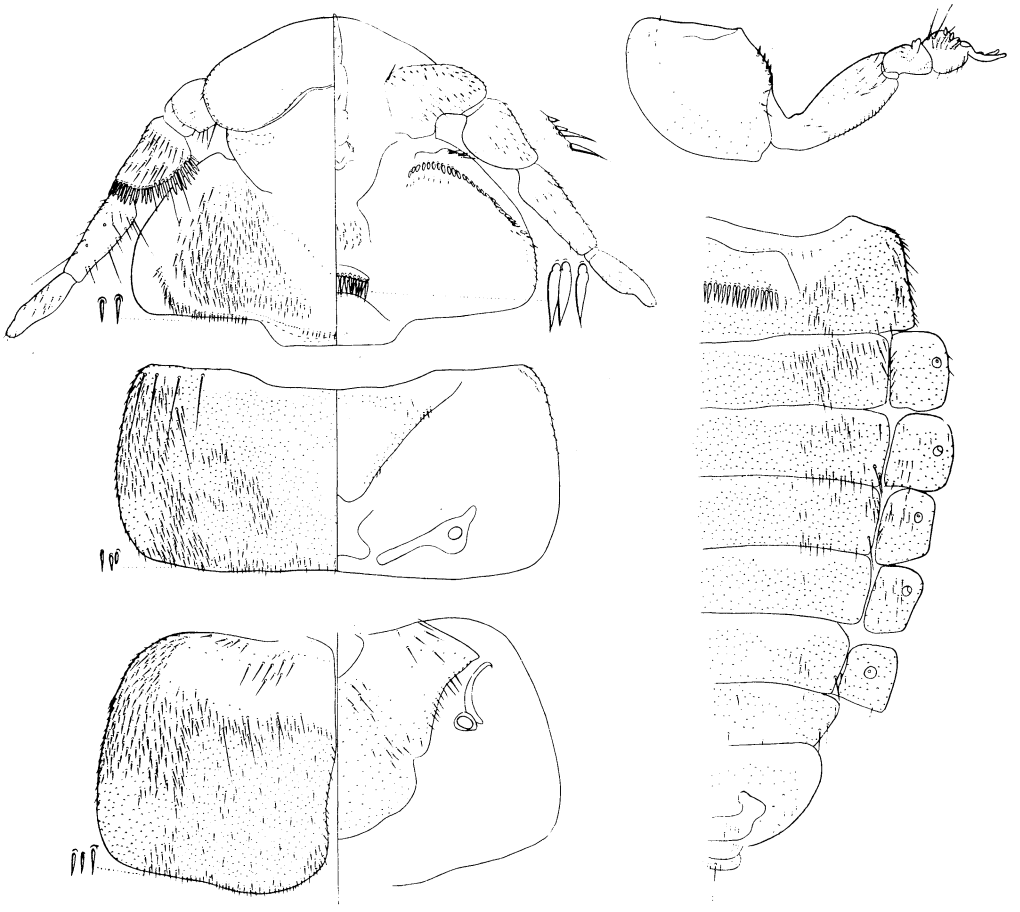

Fig. 8. *Hypoctenes quadratus* Maa. Head, prothorax, mesothorax, fore leg (in dorsal and ventral views) and abdomen (ventral view), partially reconstructed from damaged type series.

cally strongly curved. Other characters similar to those in *H. petiolatus*.

♀. Similar, slightly larger; 1.3 mm wide.

This and the preceding species are so closely related to each other that at first glance, they were presumed to be conspecific. The criterion of their separation is the shape of laterotergites. The type series of *quadratus* has been seriously damaged as a result of using wrong chemicals and the accompanying figures were partly reconstructed from disintegrated parts of the 3 specimens.

Hypoctenes clarus Jordan 1922

CAMEROONS: 1♂ (BMNH 1933-548, type), Efulen, *ex Mops* [*Tadarida*] *thersites*, G. L. Bates, with Jordan's label "*Hypoctenes* n. g. *clarus* n. sp. 1922. Type. Jordan. Ectoparasites I. p. 200–208, textfig. 195–198"; 1♀ (BMNH) same data as type, registered as paratype.

Hypoctenes faini Benoit 1958

This species is based upon a single ♀ specimen and is known to me only by description.

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