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SUPPLEMENT NUMBER 6

A REVISION OF THE AUSTRALASIAN BOOPIIDAE (INSECTA: PHTHIRAPTERA), WITH NOTES ON THE TRIMENOPONIIDAE

S. von Kéler

31 July 1971
A REVISION OF THE AUSTRALASIAN BOOPIDAE (INSECTA: PTHTHIAPTERA): WITH NOTES ON THE TRIMENOPONIDAE

By the late S. VON KÉLER*
[Manuscript received 21 March 1968; revised manuscript received 23 November 1970]

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Abstract

The louse family Boopidae, parasitic on marsupials in Australia and New Guinea, is revised on the basis of much new material from wild hosts. Important morphological features, particularly the genitalia, and their taxonomic value, are reviewed.

A key is given to the genera of Boopidae and those of the most closely related family, the Trimenoponidae, which occurs on Neotropical marsupials and caviomorph rodents. Seven genera (Boopia, Placogala, Heterodoxus, Paraboopia, Macropodiphila, Paraheterodoxus, Latumaphylax) and 35 species of Boopidae are recognised. Keys are given to the species, and all species are described and figured. Fourteen species are described as new, two in Boopia, seven in Heterodoxus, three in Macropodiphila, and two in Paraheterodoxus.

The majority of boopids are parasites of Macropodidae but a few species are found on members of the families Dasyuridae, Peramelidae, and Vombatidae. One species, Heterodoxus spingifer, has an anomalous host distribution; it is found on domestic and wild Canidae in many parts of the world, but there are occasional records from wallabies.

* Formerly of Berlin.

† Shortly after Dr. von Kéler died, the original manuscript was received for publication in the Australian Journal of Zoology. The Editor-in-Chief is indebted to Mr. M. D. Murray, Division of Animal Health, CSIRO, for accepting responsibility for the re-drafting of the entire manuscript. Also, the valuable contribution of Dr. Theresa Clay, of the British Museum (Natural History), who reconstructed the keys and established the details of types is gratefully acknowledged. Mr. J. H. Calaby kindly clarified problems of host identity.
INTRODUCTION

The Boopidiidae of Australasian marsupials have been treated in many papers, chiefly by S. A. Le Souëf* alone and with H. Bullet, L. Harrison alone and with T. H. Johnston, and recently in an exhaustive and excellently illustrated monograph by F. L. Werneck (1948) reviewing a number of contributions by that author alone and in collaboration with G. B. Thompson.

Dr. Theresa Clay, Department of Entomology, British Museum (Natural History), kindly proposed some years ago that I should determine the Australasian Boopidiidae in the British Museum and the Division of Entomology Museum, Canberra.† The material sent to me has proved to be very extensive and its elaboration grew in course of time to a revision of the whole group.

The bulk of the material before me has been collected by Mr. J. H. Calaby, Division of Wildlife Research, CSIRO, and by Mr. R. Donrow, Queensland Institute of Medical Research, Brisbane. I have also been able to examine type material and specimens determined and published by Werneck and Thompson.

I am grateful to Dr. Clay for the loan of the named material as well as for much information concerning it and for supplying some photocopies of literature not available to me. I am indebted also to Dr. K. C. Emerson for loan of some Boopidiidae from New Guinea. Dr. Clay has included in the manuscript information on Heterodoxus maili, a species not seen by me.

GENERAL REMARKS ON THE BOOPIDIIDAE

The Boopidiidae represent a small group of Malthophaga parasitizing marsupials. In his monograph Werneck (1948) treated 10 genera (four South American and six Australasian) and 27 species (eight South American and nineteen Australasian) of Boopidiidae and Trimenoponidae; all the South American species belong to the Trimenoponidae. To date, no boopid species is known as native in South or Central America. The fifth genus and ninth species of Trimenopodidae was recently described by K. C. Emerson as Chinchillophaga clavata. Fourteen new species are described in the Boopidiidae in the present paper, two in Boopia, seven in Heterodoxus, three in Macropodiphila, and two in Paraheterodoxus. Two species regarded in Werneck’s monograph as probably conspecific but treated provisionally as distinct (B. bettongia and phanerocerata) must be definitely synonymized and two others synonymized by Werneck (B. spinosa and brevispinosa) must be validated, so that the present status of Australasian Boopidiidae amounts to 35 species (see List of Recognized Species).

In the Boopidiidae every genus is in some respects a chapter of evolution, and it is impossible in the present paper to deal with all the characters of interest from the standpoint of comparative morphology. This may be a future task of a younger specialist.

* The correct order of the initials of Le Souëf is A. S., as is found on labelled slides in the British Museum (Natural History). The order was reversed in his publications.
† Now part of the Australian National Insect Collection, Canberra, which for the present is being cared for by the Division of Entomology, CSIRO.
‡ Since this paper was written a sixth genus, Hoploconophila Méndez, 1967, has been described. T. C.
The basal plate shows but little specific or generic variation. It is tongue-shaped in all genera of Boophilidae, more or less narrowed in or before the middle, wider at its posterior, narrower at its anterior end. Its lateral margins are well chitinized and brown colored, while the median portion is colorless, endocuticular, but rather leathern than membranous. The posterior ventral corners of the basal plate are provided with a ventral articulation for the parameres and the dorsal corners with a large dorsal articulation process for the mesosome arch and claspers.

The parameres show but little specific or generic differentiation. Their variable position, due to the state of repose or erection as well as to the technical effects of mounting, rarely admits of their incontestable comparison among different species. The end of each paramere is always provided with an apical sensory seta and sometimes with one or two subapical setae.

The mesosome is membranous, stiffened dorsally by a chitinous mesosome arch and laterally by one pair of mesosome claspers. Both mesosome arch and claspers articulate on the ends of the dorsal articulation process of the basal plate. The mesosome arch retains the same position in rest and erection, but the mesosome claspers at rest are folded within the mesosome (Fig. 122), and their ends may reach far forward to the posterior ends of the lateral sclerites of the vesica.

The vesica is for the most part membranous, clothed with denticles of specifically different shape and density, and with a number of chitinous plates, two median, two to four lateral, and sometimes two accessory lateral ones. The two median plates are movably joined like two covers of a book and retain their connection in repose and erection (Figs. 97 and 122). In this paper they will be referred to as the anterior and the posterior median plates, according to their position in repose. The median plates of the vesica suffer less under the technical effects of mounting than the lateral sclerites, but the lateral sclerites are diagnostically more important than the posterior median plate, because they vary more specifically. While the posterior median plate is nearly constant in all species of a genus, the lateral sclerites differ in every species. More differentiation shows in the anterior median plate, especially its lateral wings, but the latter are often indistinctly outlined except for the anterior handle. All useful details of the plates and sclerites of the vesica have been utilized in the keys to genera and species.

The vesica is in repose invaginated into the posterior end of the mesosome, involving the posterior part of it and folding the posterior halves of the mesosome claspers inside, while the mesosome arch remains still in position (Fig. 122). The mesosome arch and claspers do not show any essential generic or specific differentiation.

The ejaculatory duct (ductus ejaculatorius) opens into the vesica in the middle of its ventral side between this and the basal plate (Fig. 84). Its mouth lies between the anterior and posterior median plates (Figs. 84, 109, 110), the function of which is to hold fast the stalk of the spermatophore and to carry it backwards during evagination of the vesica. The function of the lateral vesical sclerites (Fig. 90) is probably to support the corners of the mouth of the genital chamber (valva), which is stiffened by the posterior projections of the genital sternite. Some distance before its mouth the ejaculatory duct is provided with a large muscular dilatation and its distal part, between this dilatation and the mouth, is provided with a layer of muscle fibres and is folded, so that the distal part comes to the mouth back to front. The purpose of this fold may be understood if we consider that the distal part of the ejaculatory duct is drawn into the vesica during its evagination, the mouth of it coming into the position of insemination together with both the median plates on the ventral side of the evaginated vesica (Fig. 98). In this way the distal part of the ejaculatory duct must be forced inside out during the evagination of the vesica. In the fully evaginated state the end of the spermatophore, or its stalk, held fast by both the median vesical plates, comes out of the mouth of the duct on the ventral side of the vesica (Figs. 109 and 110). In submellar copulation the ventral side of the erected vesica comes into contact with the dorsal wall of the genital chamber and the stalk of the spermatophore can contact the genital papilla of the female. Figure 98 shows an extracted penis with the distal part of the ejaculatory duct hanging out of its opening, probably having been broken during mounting and pressed out.

Some species of Heterodoxus possess one or two pairs of long weakly chitinized spines between the denticulation of the ventral wall of the vesica, turning out in the erected state and directed with their ends anteriorly (Fig. 122). The function of these spines is not quite clear to me. In Heterodoxus alatus there are, indeed, in the dorsal wall of the genital chamber three pairs of longish sclerotizations anterior to the genital papilla, corresponding approximately to the point where the vesical spines must lie during copulation. But in Heterodoxus spiniger there are no such sclerotizations.

In H. macropus there is a small brown sclerite anterior to the genital papilla with a sharply outlined anterior margin. It is, of course, not certain whether or not these structures are correlated with the vesical spines of the males.

On the posterior margin of the vesical anterior median plate is inserted a long and strong tendon, probably belonging to the retractor muscle of the vesica, originating on the anterior end of the basal plate. According to Błaszkowicz (1956) a retractor muscle is inserted on the anterior part of the vesica, but the exact point of insertion has not been ascertained. According to that author the evagination of the vesica is caused by the pressure of blood only. He has, indeed, not studied the genital organs of Boophilidae and has therefore not seen the way of the spermatophore. It seems to me that evagination of the vesica in Boophilidae begins when the spermatophore is pushed into the vesica by means of compression of its anterior end (Fig. 109) within the muscular ampulla of the ejaculatory duct. The pressure of the spermatophore causes the handle of the anterior vesical plate to bend anteriorly and the surrounding part of the vesica wall to form a deep fold; this takes the pressure of blood and thus terminates the process of evagination.

The ventral articulation of the parameres helps to turn the mesosome upwards and to bring the mouth of the invaginated vesica into contact with the vulva. The dorsal basal corners of the parameres are provided with strong lever muscles, which turn the parameres upwards (von Klener, 1960, Fig. 6). As soon as the mouth of the invaginated vesica (i.e. the posterior end of the mesosome) faces the mouth of the genital chamber, the vesica can be fully evaginated and pressed into the genital chamber.

Spermaphores are very often present in the abdomen of males of Boophilidae. They are generally broken into many pieces distributed within the abdomen, but in many cases only their stalk is broken off. Only in two males has the spermatophore been found in the position shown in Figures 109 and 110, with the stalk squeezed between both the median plates of the vesica.
(b) The Female Genital Region

The female genital region of Boopidae occupies the abdominal segments VII–IX or VIII–IX. Segments X–XII constitute the anal region concealed between the gonapophyses of segment IX. It is in most cases difficult to be sure, in whole mounts, of the real form of sternites VII and VIII because they are often not sharply outlined and are, besides, obscured by other translucent sclerites. These sternites, although they may have diagnostic value, can hardly be utilized for practical purposes of determination. In general, it is also not easy to show with certainty the outlines of all other abdominal sternites and tergites except in some favourable mounts not excessively cleared in caustic potash. In Heterodexus longitarsus, for example, sternites VII and VIII are fused together (Fig. 120) and in H. spiniger they are separated (Fig. 119). In some species sternite VII differs in no way from VI, in some others it shows different outlines, as for example in Boopia bairiata (Fig. 105). Sternum VII is counted in the genital region if it shows a different outline from that of VI. Consequently the subgenital plate or hypopygium is sometimes represented by sternum VIII alone and sometimes by the differentiated or fused sterna VII and VIII. This character is certainly of diagnostic value, but can seldom be utilized. Abdominal tergite VII is generally the same as VI in outline and chaetotaxy, but differs in some species. In comparing the chaetotaxy of the pregenital abdominal segments of different species or specimens, it appears, at any rate, advisable to use only segments II–VI or II–VI.

Abdominal sternum VIII is in all genera larger than tergum VIII. It is posteriorly elongated into a broad, rounded, sometimes slightly or deeply emarginated lobe, the subgenital lobe, covering the broad mouth of the genital chamber or vulva. Its posterior margin represents the ventral margin of the genital chamber and is here simply termed “vulva” although this term is not quite correct, because it should refer to the mouth of the genital chamber. It is, in all Boopidae, provided with a marginal row of vulvar setae. The sternite of the subgenital plate usually reaches to the margin of the subgenital lobe, but sometimes it is emarginated, leaving the median part of the vulvar margin membranous and sometimes hardly perceptible. The number, location, distribution, and strength of the vulvar setae are individually variable within limits; nevertheless they furnish, in most cases, reliable diagnostic characters.

The dorsal wall of the genital chamber is represented by sternum IX. Its sternite, the genital sternite, is covered for the most part by the subgenital sternum and lobe; only its posterior corners projecting beyond the vulvar margin are freely visible and reach, in most species, to the sides of the postgenital sternum or to the lateral gonapophyses. The genital sternite is usually more or less deeply emarginate anteriorly forming a sulcus. Within this emargination lies the genital papilla of the spermathecal duct (see below). Behind and usually on both sides of the genital papilla, the genital sternite is provided with a microsculpture of denticles of specific constancy. That this sculpture belongs to the genital and not the subgenital sternites is evident in cases where the subgenital lobe is pushed forward and the sculpture, being free, is perceptible on the posterior part of the genital sternite.

Behind the vulvar margin there is, in all species of Boopidae known to me, a transverse, generally sharply outlined, and more or less distinctly brownish chitinized postgenital sternum, provided on its posterior margin with a row of postgenital setae. It may be partly covered by the subgenital lobe. The length, density, distribution, and character of these postgenital setae are within some limits individually variable; nevertheless they furnish a character of some diagnostic value. On both sides of this sternite, the marginal setae are much stronger and longer than in the middle. The fact that the posterior projections of the genital sternite reach to the sides of the postgenital sternite, or are fused with them, suggests that the postgenital sternum represents the inner gonapophyses of segment IX of Corrodentia fused with the posterior part of this sternite.

On both sides of the postgenital sternum there are, in all Boopidae known to me, sickle-shaped bluntly or sharply pointed appendages known in the literature of Malthiphas as gonapophyses. They probably* represent the outer gonapophyses of segment IX of Corrodentia. The basal ventral side of each gonapophysis is provided with a row of strong setae, which generally cut obliquely the setae of the lateral brushes of the postgenital segment. In some species of Boopia and in Paraheterodexus some of the gonapophysial setae are located on an enlargement of its external margin. In Paraheterodexus calcaratus the innermost gonapophysial seta is developed as a strong spine located on a large lateral projection of the gonapophysis, which is remarkably reduced. In Pz. erinaceus the gonapophysis is reduced to a small appendage, much smaller than its lateral projection, bearing a large and strong spine (Fig. 129). In Boopia the gonapophyses are dorsally fused with the lateral plates of tergum IX which, on the other side, stand in syntetic connection with the narrowly pointed posterior edges of tergite VIII. Pleurite IX is wanting in Boopia or fused as a tergopteleurite.

In Heterodexus and Paraheterodexus the gonapophyses are separated from segment IX by a distinct suture. The dorsal sclerite of the gonapophysis is, in these genera, prolonged toward the posterior angles of the ninth median tegpal plate (see below) sometimes building a syntetic connection with it. In some species of Heterodexus this basal dorsal prolongation of the gonapophyseal sclerite is partly or totally separated from its body by a suture or deep incision (Fig. 119). The gonapophyses end with a more or less strongly developed gonapophysial spur. In Boopia tarasata and B. dubia the gonapophyses are not at all pointed, but rounded at the end and provided with a subapical seta instead of an apical spur.

Tergite IX is divided into three plates, both the lateral plates apparently representing the tergopteleurites and the median plate the rest of the divided tergum. As may be seen from Figure 116, this median plate is in some limits involved in the posterior emargination of tergite VIII in Heterodexus longitarsus, spiniger, wulabati, ancoratus, macropus, and ochotersiaterus. In the remaining species of Heterodexus (ampullatus, *

* Recent investigations of the genital-anal region of the female abdomen of Corrodentia make it more probable that the "gonapophyses" of Boopidae correspond either to paraprostomites or a fusion of them with the outer gonapophyses of these insects. In Corrodentia the paraprostomites articulate dorsally with tegum IX (X and XI being absent). The gonapophyses of Boopidae show this articulation (or fusion). The fact that the posterior arms of tergite IX in Boopidae reach in some species to the sides of the postgenital sternite and in others to the lateral margins of the "gonapophyses" speaks rather for the bivalve nature of the "gonapophyses" of Boopidae. The apical spur of the "gonapophyses" of Boopidae is thus probably homologous with the anal spines of trogonomorph Corrodentia.
calbyi, bicarinatus, alatus, and quadrirerians) the posterior margin of tergite VIII is flatly emarginated and provided with a small, slightly projecting lobe generally limited on both sides by more or less deep and narrow incisions. The median tergal plate of tergite VIII has probably been overlooked by Wernert in his figure of the female of *Heterodoculis longissimis* [Wernert 1936, Fig. 126], because it is present in all specimens of *linguisias* and *spiniger* before me. In *Macropophila* there is neither a lobe nor emargination of the posterior margin of tergite VIII. The intersegmental suture between tergites VIII and IX is very distinct in all species of *Heterodoculis*, *Boopla*, and *Macropophila*. In *Boopla* the ninth median tergal plate is present, the eighth always absent. In all species of *Heterodoculis*, *Boopla*, *Macropophila*, *Phacoecilia*, and *Latumecelum*, the ninth median tergal plate bears on both sides a group of sensilla basiconica, sometimes located on lighter sclerotized lateral wings of this plate. In *Heterodoculis* the syndetic connection of the posterior corners of this plate with the dorsal gonopodial sclerites cannot be understood otherwise than as a secondary feature.

The anal segment is, in all Boopiidae except *Paraheterodoculis*, membranous. Its posterior wall is concave, forming a small anal pocket, into which the rectum opens. Theoretically, the anal pocket represents segment XI + telson. In *Paraheterodoculis* there is a distinctly sclerotized tenth tergite extending between the basal halves of the gonapophyses and separated from them by a narrow colourless suture. The posterior supraanal margin of tergite X extends on both sides into the membranous inner wall of the gonopods and is, in some species of *Heterodoculis*, provided with more or less dense standing sensory ampullae which ascend to the base of the gonopodal spur. The sensory equipment of the supraanal margin undoubtedly possesses a diagnostic value but its fineness and variable location in mounts make this character difficult for practical use. The ventral subanal margin of the anal segment is still perceptible a small distance below the supraanal margin and sometimes anterior to it. It is still provided with a more or less dense row of short sensory setae. It must be added that the supraanal and subanal margins are optical illusions of vertical aspect. Really there are no margins, but perpendicular standing walls of the anal segment. Accordingly the corresponding setae are not to be understood as “marginal” setae but as setae of the supra- and subanal walls.

The genital papilla of the spermathecal duct is present in all species of Boopiidae, but it is not always perceptible. Its shape and size are specifically variable, but its diagnostic value is, in practice, small on account of the difficulty of seeing it and its varying position in different slides. The outlines of the genital papillae of some species are represented in Figure 115. The spermathecal duct in many specimens very distinct, reaches the length of 0.5 mm, and in many specimens is provided with a small pear-shaped dilatation a short distance from the papilla; from this dilatation forward it is twice as thick as behind it, measuring 2 μm.

In the descriptions and keys which follow, "sternites" and "tergites" refer to those of the abdomen unless otherwise stated; "intercalaries" are shorter setae inserted between the longer ones in a row of setae; "discal" setae are those arising towards the middle of a structure, the discal setae of the sternites and tergites being equivalent to the median anterior setae as used by Price and Beer (1963) and others.

**HOST NOMENCLATURE**

In the present paper the term "type host" has been replaced by the neutral term "nominal host." "Types" and "typical" mean something fundamental and unique, like the type species of a genus or type specimen or holotype of a species, while the host named in the original description of a mallophagan species contains absolutely nothing which can be called typical. Very often this host is even erroneous. The word "nominal host" (Nennwirt) implies no prejudice as to the subsequent host records, meaning only that the described mallophagan species was first discovered on that host species. It must be decided from subsequent records whether the nominal host is correct or due to contamination, and whether it is the chief host or an additional natural host of a polyphagous or oligophagous mallophagan species.

**ABBREVIATIONS**

In lists of material examined, the format adopted is initials of determiner, specimens, host (skin number if any), geographical locality, date of collection, full name of collector, museum, accession number, and slide number (in parentheses). The specimens are classified by the host name that is presently accepted. The exact museum location is given for type specimens only.


The abbreviations for museums are ANIC, Australian National Insect Collection, Canberra; BMNH, British Museum (Natural History); ML, Leiden Museum; MZH, Museum of Zoology, Hamburg; UC, California Insect Survey Collection, Division of Entomology, University of California, Berkeley; USNM, United States National Museum, Washington; KCE and GBT, collections of K. C. Emerson and G. B. Thompson respectively.

All measurements have been made in millimetres, and the following abbreviations have been used: HL, head length; HB, head breadth; HH, head index; PC, postocular angle; Pb, prothorax breadth; MB, mesothorax breadth; MtB, metathorax breadth; AB, abdomen breadth; SL, length of head spine; SD, distance of head spine; STh, thickness of head spine; TL, total length.

**KEY TO GENERA OF TRICENOPONIDAE AND BOOPIIDAE**

1. Sprites absent on abdominal segment VIII (6 pairs).................. TRICENOPONIDAE
2. Sprites present on abdominal segment VIII (6 pairs).................. BOOPIIDAE

2(1). Head without dorsal or ventral hooks or processes of the cuticle .................. 3
2(2). With definite prosternal plate with many setae .................. 4

3(1). Maxillary palpus with small 5th basal joint (Fig. 86) .................. Trimenopon
3(2). Maxillary palpus 4-jointed .................. Philadelpheia

4(3). With definite prosternal plate, prosternum without many setae .................. 5
4(4). Without definite prosternal plate, prosternum without many setae .................. 6

5(3). Head nearly twice as long as broad with strongly projecting postnodal lobes; with a pair of large sharply pointed nodal hooks directed posteriorly on ventral side; of temporal lobe bent backwards to form short serrated hook .................. Huxtonia
5(5). Head not as above .................. 6
6(5). Head ventrally with 1 blunt nodal process and 1 longer and sharply pointed maxillary process (Fig. 87D); without process from ventral margin of antennal groove—Cumingia

Head without ventral nodal and maxillary processes but with pointed process from ventral margin of antennal groove (Fig. 87C)—Chinchillophaga

7(1). Postspiracular setae on segments II–IV modified as trichobothria; maxillary palp 4-jointed

Postspiracular setae on segments II–IV unmodified; maxillary palp 2 or 3-jointed

8(7). Spinous process arising near base of each maxillary palp (Fig. 117); spiracles on central tegal plates

Spinous process not arising near base of each maxillary palp; spiracles not on central tegal plates

9(8). Abdominal lateral plates of VII and VIII broad and darkly pigmented (Fig. 7)—Macrophiella

Abdominal lateral plates of VII and VIII not as above—Heterodorus

10(9). Pair of short, stout spiniform palpal setae; segments I–VIII each with pair of stout spiniform setae on tegulae and sternites; abdominal lateral plates partly divided by suture—Paraheterodorus

Without such palpal setae; segments I–VIII without such spiniform setae; lateral plates not so divided

11(10). Head with sinu occipitalis forming dorsal horizontal line across head immediately caudad to occipital (frontal) setae (Fig. 111); plantar pulvillus of tarsal claws with freely projecting point—Phaeogella

Head without sinu occipitalis; plantar pulvillus without projecting point—Boopia

12(7). Maxillary palp 2-jointed; ocular seta on process—Latumcephalium

Maxillary palp 3-jointed; ocular seta not on process—Paraboopia

* This key is partly based on Clay (1970, p. 96). T.C.
† The numbers refer to the primary segments, e.g. in the Boopiidae the apparent first segment is II.

Family TRIMENOPONIDAE

Description

Maxillary palp 4- or 5-jointed, projecting or not beyond margin of head. Mesothorax fused with pro- or metathorax or free; if mesonotum fused with pronotum or free, it has pair of minute setulce, not on elevated warts; if fused with metanotum it bears several normal setulce. If mesothorax fused with pro- or metathorax, mesonotum and 2nd coxae are located beneath posterior half of pronotum or anterior half of metanotum; if free, it has small but separated notum sometimes partly concealed beneath pro- and metanotum, 2nd coxae located between pro- and metathorax. Legs very short and thick, tarsi usually not longer than half tibia, in one species two-thirds of tibia. Abdomen with 5 pairs of spiracles on segments III–VIII, pleurea II–IV without trichobothrial setae.

Hosts

Marsupials and rodents in South and Central America.

Genus TRIMENOPON Cummings

Trimenopa Cummings, 1913a, pp. 39–40.

Description

Head rounded, triangular (Fig. 87E), without hooks or horn-like projections of cuticle, dorsally or ventrally. Maxillary palp with small 5th basal joint (Fig. 86), near margin of head and projecting with 3 joints beyond.

Mesonotum fused with pronotum, posteriorly with recognizable separate sclerotizations. Mesosternum beneath pronotum, separated from prosternum by distinct suture.

Abdominal segment I shorter than II but complete, its pleura concealed beneath sides of metanotum.

Species

T. hipidum (Burmeister, 1838) [syn. Monopen jenningsi Kellogg & Paine, 1910; M. extraneum Gallard, 1934; Trimenopa exhalodora Cummings, 1913; T. roseboomi Emerson, 1940]; d 1.85 mm (Figs. 85, 86, 87E), f 2.05 mm (Fig. 88); from Cavia porcellus (Linnaeus, 1758) [syn. C. cobaya Pallas, 1766; C. cutleri Bennett, 1836; C. anolinae Allen, 1916; C. sperea Erxleben, 1717 [syn. C. azane Lichtenstein 1823], C. fuligida Wagner, 1831 [syn. C. refugeus Lund, 1841]; South America, and from captive guinea-pigs all over the world.

Genus PHILANDESIA Kellogg & Nakayama

Philandesia Kellogg & Nakayama, 1914, pp. 198–9.
Philandria Kellogg, 1914, p. 257.

Description

Head without hooks or horn-like projections of cuticle, dorsally or ventrally. Head with specifically different outlines; in Ph. townsendi (Fig. 87A) and chinchillae (Fig. 87B) as in Boopia; in Ph. messai as in Trimenopa. Maxillary palp 4-jointed, short, projecting beyond margin of head with 2-3 joints.

Mesothorax fused with prothorax. Mesonotum situated between pro- and metanotum; mesosternum beneath posterior half of pronotum, separated from pro- and metanotum.

Male genital organ of uniform type with the mesosomal arch forming a median plate of different outlines, with the mesosomal claspers forming on both sides of it a pair of appendages similar to a second pair of parameres.

Female genitalia more differentiated; in townsendi, a broad postgenital sternum with a comb of strong spines each side with a short row of setae on the rudimentary gonapophyses and with a continuous row of marginal setae on tergite IX; anal segment ribbed longitudinally. In Ph. chinchillae, only a brush of setae both sides of the postgenital sternum and a short row of gonapophysal setae beneath them, the gonapophyses wanting as in townsendi. In Ph. messai, postgenital sternum with 1 postgenital and 1 gonapophysal brush of setae each side and with 3 strong setae medial to these. The
Mesonotum fused with pronotum and concealed beneath it: mesosternum situated totally beneath pronotum but independent from pro- and metasternum, forming a strong sclerotized plate with many strong spines.

First abdominal segment strongly reduced, consisting of a crescent-shaped tergite between the 2nd pleurite and a small sternite between the 3rd coxae. Mesosomal arch-Y-shaped forming a "pseudopenis". Female postgenital sternite with a complete row of strong marginal setae, on the sides very indistinctly separated from the gonapophyses, which seem to be fused with anal sternum and are provided with a row of very strong setae on their external margins (Fig. 89). It is noteworthy that the setae of the gonapophyses and of the postgenital sternum seem to constitute one uninterrupted circular anal corona of setae as in many Menoponidae.

Species

C. maculata Ferris, 1922; d, 9.1.22 mm; from Lestoros inca (Thomas, 1917) [syn. Camoletes inca Thomas]; Peru.
C. peromydis Ferris, 1922; d, 1.2 mm, 9.1.4 mm (Figs. 83, 87D, 89); from Monodelphis domestica (Wagner, 1842) [syn. Peramys domesticus]; Brazil.
C. intermedia Wernick, 1937; d, 1.25 mm, 9.1.47 mm; from Marmosa incana (Land, 1841) [syn. Marmosa incana paulensis] Tate, 1931]; Brazil.

Genus CHINCHILLOPHAGA Emerson


Description

Head rounded, triangular. Maxillary palp long, projecting with 3 joints beyond the margin of head. Anterior half of the ventral cover of the antennal groove prolonged into a long, sharply pointed tooth directed posteriorly (Fig. 87C). Preocular nodi poorly developed without notch but with a small emargination. Postnodal lobes of head slightly broadened. Mesonotum fused with pronotum, situated between pro- and metanotum; mesosternum between pro- and metasternum.

Species

Ch. clavae Emerson, 1964; d, 1.06 mm, 9.1.55 mm (Fig. 87C); from Dolichotis patagonum (Zimmermann, 1780) in London Zoo; South America.

Genus HOPLOMYOPHILUS* Méndez


Description

"Head without spinelike processes on ventral region; with lateral and posterior margins sinuate; posterior margin with central sinus; with two dorsal, submarginal spiniform setae at the antennal level; cephalic region moderately produced, not limited by distinct suture; eyes absent; maxillary palpi 4-segmented, exposed; antennae 4-

* This genus was described since the manuscript was submitted for publication and has been included to complete the descriptions of the genera of the family Trimenoponidae. The description and details given are those of Méndez, 1967. M.D.M.

Genus HARRISONIA Ferris

Harrisonia Ferris, 1922b, pp. 80–81.
Acanthomenops Harrison, 1922, p. 156.

Description

Head nearly twice as broad as long with strongly projecting postnodal lobes and triangularly projecting temporal lobes, with a pair of large, sharply pointed nodal hooks directed posteriorly on the ventral side of head; end of temporal lobe bent backwards forming a short serrated hook. Maxillary palp projecting with 2 joints beyond margin of head.

Mesonotum fused with metanotum, both nota with some normal alveolar spines or strong setae, no trace of notal suture; mesosternum fused with prosternum, without suture.

First abdominal segment smaller than 2nd, but complete, with small tergite and strong pleurae. Female postgenital sternite very broad with short comb of setae each side. Gonapophyses absent, but 4 strong setae on a projecting lobe each side of postgenital sternite.

Species

H. uncinata Ferris, 1922; d, 9.0.8–0.9 mm; from Hoplonys gymnurus (Thomas, 1897), Proechimys guayanesis (Geoffroy, 1803) [syn. P. vayennensis (Desmarest, 1817), P. micans (Allen, 1899), P. oris Thomas, 1904, P. trinitatis (Allen and Chapman, 1893)], P. semispinosus (Tomes, 1858); South America and Trinidad.

**Genus CUMMINGSIA Ferris

Cummingsia Ferris, 1922b, p. 83.

Description

Head bell-shaped (Fig. 87D), broadly rounded anteriorly, with projecting temporal lobes, their postocular margin closing an angle of about 150° with the ocular margin. Ventral side of head with one strong and blunt nodal thorn and one longer and sharply pointed maxillary thorn, both directed posteriorly. Both sides of labrum with a small tooth on the edges of the clypeus (Fig. 83). Maxillary palp very short, one-fourth longer than broad on base, not reaching to the margin of head.
vulva bears in mazzai a continuous row of 14 setae, in chinchilliae a median group of 6 setae, and in townsendi 14 very short setulae widely scattered, situated not on margin but more anteriorly.

**Species**

- *Ph. townsendi* Kellogg and Nakayama, 1914; d 1.96 mm (Fig. 87A), d 2.07 mm; from *Lagidium pernatum* Meyen, 1833 (syn. *L. inca* (Thomas, 1907)]. *L. vicacea* (Molina, 1782) [syn. *L. pulchra* (Bennett, 1835)]. *Chinchilla lanigera* (Molina, 1782) [syn. *Ch. laniger* (Molina)]; South America.
- *Ph. mazzai* Wernack, 1933; d 1.47 mm, d 1.32 mm; from *Ch. lanigera*, *L. pernatum* [syn. *L. saturatum = L. saturata* (Thomas, 1907)].
- *Ph. chinchilliae* Wernack, 1935; d 1.16 mm, d 1.11 mm (Fig. 87B); from *Ch. lanigera*, *L. pernatum*.

**Genus HARRISONIA Ferris**

*Harrisonia* Ferris, 1922b, pp. 80–81.

**Description**

Head nearly twice as broad as long with strongly projecting postnodal lobes and triangularly projecting temporal lobes, with a pair of large, sharply pointed nodal hooks directed posteriorly on the ventral side of head; end of temporal lobe bent backwards forming a short serrated hook. Maxillary palp projecting with 2 joints beyond margin of head. Mesonotum fused with metanotum, both nota with some normal alveolar spines or strong setae, no trace of notal suture; mesosternum fused with prosternum, without suture.

First abdominal segment smaller than 2nd, but complete, with small tergite and strong pleurae. Female postgenital sternite very broad with short comb of setae each side. Gonapophyses absent, but 4 strong setae on a projecting lobe each side of postgenital sternite.

**Species**

- *H. uncinata* Ferris, 1922; d 0.8–0.9 mm, from *Hoplomys gymnurus* (Thomas, 1897), *Pseudochinmys guayannensis* (Geoffroy, 1803) [syn. *P. cayennensis* (Desmarest, 1817)], *P. micrurus* (Allen, 1899), *P. oris* Thomas, 1904, *P. trinitatis* (Allen and Chapman, 1893)], *P. semispinosus* (Tomes, 1858), South America and Trinidad.

**Genus CUMMINGSIA Ferris**

*Cumingsia* Ferris, 1922b, p. 83.

**Description**

Head bell-shaped (Fig. 87D), broadly rounded anteriorly, with projecting temporal lobes, their postocular margin closing an angle of about 150° with the ocular margin. Ventral side of head with one strong and blunt nodal thor and one longer and sharply pointed maxillary thor, both directed posteriorly. Both sides of labrum with a small tooth on the edges of the clypeus (Fig. 83). Maxillary palp very short, one-fourth longer than broad on base, not reaching to the margin of head.

Mesonotum fused with pronotum and concealed beneath it; mesosternum situated totally beneath pronotum but independent from pro- and metasternum, forming a strong sclerotized plate with many strong spines.

First abdominal segment strongly reduced, consisting of a crescent-shaped tergite between the 2nd pleurae and a small sternite between the 3rd coxae. Mesosomal arch Y-shaped forming a "pseudoapex". Female postgenital sternite with a complete row of strong marginal setae, on the sides very indistinctly separated from the gonapophyses, which seem to be fused with anal sternum and are provided with a row of very strong setae on their external margins (Fig. 89). It is noteworthy that the setae of the gonapophyses and of the postgenital sternum seem to constitute one uninterrupted circular anal corona of setae as in many Menoponidae.

**Species**

- *C. maccalata* Ferris, 1922; d 0.22 mm; from *Lestoros inca* (Thomas, 1917) [syn. *Caenolestes inca* (Thomas)]; Peru.
- *C. pernydys* Ferris, 1922; d 1.2 mm, d 1.4 mm (Figs. 83, 87D, 89); from *Monodelphis domestica* (Wagner, 1842) [syn. *Peramys domesticus*]; Brazil.
- *C. intermedia* Wernack, 1937; d 1.25 mm, d 1.47 mm; from *Marmosa incana* (Lund, 1841) [syn. *Marmosa incana paulensis* Tate, 1931]; Brazil.

**Genus CHINCHILLOPHAGA Emerson**


**Description**

Head rounded, triangular. Maxillary palp long, projecting with 3 joints beyond the margin of head. Anterior half of the ventral cover of the antennal groove prolonged into a long, sharply pointed tooth directed posteriorly (Fig. 87C). Preocular nodi poorly developed without notch but with a small Emination. Postnodal lobes of head slightly broadened.

Mesonotum fused with pronotum, situated between pro- and metanotum; mesosternum between pro- and metathorax.

**Species**

- *Ch. clavata* Emerson, 1964; d 1.06 mm, d 1.55 mm (Fig. 87C); from *Dolichotis patagonum* (Zimmermann, 1780) in London Zoo; South America.

**Genus HOPLOMYOPHILUS* Méndez**


**Description**

Head without spinelike processes on ventral region; with lateral and posterior margins sinuate; posterior margin with central sinus; with two dorsal, submarginal spiniform setae at the antennal level; clypeal region moderately produced, not limited by distinct suture; eyes absent; maxillary palp 4-segmented, exposed; antennae 4.

* This genus was described since the manuscript was submitted for publication and has been included to complete the descriptions of the genera of the family Trimenoponidae. The description and details given are those of Méndez, 1967. M.D.M.
segmented, exposed; not protected ventrally by a flap; anterior fossae deep; temporal lobes slightly prominent, truncate. Prothorax and pterothorax fused, both subquadrate; anterior thoracic stigmas conspicuous; posterior thoracic stigmas reduced; sternal plates fused into a single plate. Legs short, stout, with distinct pulvilli on the 1st tarsal segment of all legs. Abdomen subovate, with 5 pairs of abdominal stigmas; male genitalia of simple type."

**Species**

*H. nativa* Méndez, 1967; d 1.27 mm, 9 1.46 mm; from *Hoplonys gymnurus* (Thomas, 1897); Panama.

**Family BOOPIDAE** Mjöberg


Boopidae Ewing, 1929, p. 96.


Type genus *Boopia* Piaget, 1880.

**Genera**

*Boopia* Piaget, 1880; *Paraboopia* Wenneck & Thompson, 1940; *Phacogalia* Mjöberg, 1919; *Macropophila* Mjöberg, 1919; *Heterodoxus* Le Souef & Bullen, 1902; *Paraheterodoxus* Harrison & Johnston, 1916; *Latumcephalum* Le Souef, 1902.

**Description**

Maxillary palp 2- to 4-jointed. Mesothorax free, usually smaller than pro- or metathorax, well sclerotized, its notum with a pair of spines on elevated warts bordered anteriorly by a sclerotized arc. Mesonotum well sclerotized with spines or setae, situated beneath mesonotum; 2nd coxae always between pro- and metathorax. Pleurae II–IV with or without trichobothrial setae. Abdomen with 6 pairs of spiracles on segments III–VIII.

**Discussion**

Harrison and Johnston (1916) have found as the chief character of the family "the presence of a large accessory sac of unknown function in connection with the male genitalia". Their figure 1 makes it clear that the "accessory sac" represents the spermatophore squeezed with its stalk in the vesica, just as shown in my Figure 109. I do not know whether the Boopidae is the only family of Mallophaga producing spermatophores to inseminate females, but Blagoveshchensky (1956) who has closely investigated the genital organs of 29 genera (64 species) of Amblycera, not including the Boopidae, and 50 genera (141 species) of Ischnocera, did not find spermatophores, but only spermatodones in females of some Ischnocera. I have not found spermatophores or debris of them in Trimenoponidae, but I have so far seen only 12 males of this family. Trimenoponidae do not possess a vesica armed with chitinous plates like the Boopidae, and I must conclude that they do not produce spermatophores. As I have explained in the Introduction, spermatophores and in- and evaginable vesica with claspers chitinous plates belong together functionally. I cannot explain the chitinous structures in the genital organ of males of *Trimenopon hispidum*, having examined only one male of this species, but it is certain that its posterior large parts are homologous with the mesosome arch and claspers of the Boopidae (Fig. 85).

Unlike the Trimenoponidae, the Boopidae, except *Latumcephalum*, have long tarsi. In *Heterodoxus* the tibio-tarsal ratio varies from 0.66 to 0.90 in males and from 0.70 to 1.00 in females. The shortest legs are found in *Heterodoxus amplfantus*, 0.66 in males and 0.70 in females, and the longest in *H. pygidialis* with 0.91 in males and 1.00 in females. In *Bunopia* the tibio-tarsal ratio varies from 0.52 to 0.90 in males and from 0.62 to 0.90 in females. The shortest tarsi are found in *B. biseriata* (0.68 and 0.67), and *grandis* (0.70 and 0.62). *Paraboopia* has relatively long tarsi with ratio 0.75 in males and 0.63 in females. The shortest tarsi are found in both *Phacogalia*; *brevispinosa* has 0.52 in males and 0.63 in females, and *spinosa* 0.65 in males and females. The length of the tarsi and their more or less strongly arched form in Boopidae are very interesting evolutionally, but possess no diagnostic value. As I have already said in the Introduction, the Boopidae are inclined to anchor their hind tarsi in the saddle between the coxae and femora of the hind legs, a condition which has been highly developed in the Gyropidae.

The differentiation of gonapophyses in Boopidae has been mentioned in the Introduction and need only be emphasized here. The male copulatory organ of *Boopia*, *Phacogalia*, *Paraboopia*, and *Latumcephalum* are shown in Figure 90.

**Hosts**

Marupials of Australia and New Guinea. One species, *Heterodoxus spiniger*, is found on Canidae throughout much of the world.

**Genus BOOPIA** Piaget


*Keferula* Eichler, 1940, p. 161.

Type species *Boopia tarsata* Piaget, 1880.

**Species**


**Description**

Boopidae with body length of 1.30–3.14 mm. Head with rounded quadrangular temporal lobes, their postocular angle varying from 110° to 150°. Antennae clavate, 5-jointed, the 4th and 5th joints forming a club. Maxillary palp 4-jointed, situated near the outer margin of the head and with 3 joints projecting beyond it, the last joint provided with 2 sensory rods of unequal length on its hind dorsal side. Ventral side of head without horn-shaped projections or heavy spines. Prothorax with sides bluntly angulated in or slightly anterior to the middle of its length. Chaetotaxy of pronotum rather uniform, consisting of 3 marginal setae, 1 near the anterior angle, and 2 long on the posterior margin and 1 or (in 5 species) 2 discal setae both sides of the pronotum. Before the anterior marginal seta 1, and
behind it 2 more or less strong spines, the 3rd always the strongest, but in some species all 3 setaceous. One minute or short setula behind the marginal spine, wanting in some species. Prostrumen with an elevated sternite of oval, rectangular, or triangular outline, with specifically varying chaetotaxy but apparently without diagnostic reliability due to some individual variability (Figs. 91 and 104).

Mesosternum with 2 large colourless warts bordered anteriorly by a chitinous arc and bearing 1 more or less strong spine. Chaetotaxy of mesosternum practically the same in all species (Figs. 91 and 104).

Metasternum separated from mesosternum by a narrow membranous suture, with very uniform chaetotaxy consisting of 1–2 setae on the posterior margin, and in some species with 1–2 spines on the posterior end of the metapleurca, 1 discal transversal row of 2 setae both sides of the midline, the external being the longest, and 2 short setae anterior to the external discal one, standing one after the other. Metasternum in all species with same shape and chaetotaxy, 2 pairs of setae before and 1 pair behind it (Figs. 91 and 104).

Legs strong and long, tarsi nearly as long as the tibia, the tibio-tarsal ratio of the hind legs varying from 0.52 to 0.90, tibia somewhat shorter than the femur. Second tarsal joint 4–5 times the length of the basal, with smooth or transversely denticulated planta. Claws long and sharp with colourless pulvinus not projecting anteriorly into a point (Figs. 94 and 101).

First segment of abdomen rudimentary, without pleurea, with strongly chitinized tergite and strongly chitinized sternites divided in the middle. Segments II–IX normal and complete, X and XI concealed in the female between the gonopophyses, in male not visible externally. Six abdominal spiracles on pleurites III–VIII, 3 pairs of tri-chothorbaloal haors on pleurites II–IV (Fig. 81). Tergites and sternites II–VI in female or II–VII in male narrow, generally well chitinized, brown, VII and VIII varying specifically.

Male genital organ with vesica of different lengths, more or less densely and strongly denticulated and provided with 2 median plates and 1 pair of lateral sclerites, sometimes with a pair of small additional plates before the lateral sclerites, without long paired spines or accumulation of denticles before the median plates. Vufa of the female with 1 row of marginal setae, which may be characteristic for each species. Gonopophyses rounded with subapical seta or triangular, sharply or bluntly pointed with 1 more or less strong acipular spine and with a row of strong setae near the base, situated in some species partly on a projecting dilatation of its outer margin. Genital papilla generally slender conical, in some species of particular shape.

Hosts

The species of this genus are found on representatives of all families of Australian marsupials from which Boopidiidae have been collected.

**KEY TO THE SPECIES OF BOOPIA**

1. Abdominal sterna III–V (at least) with 1 row of long setae ........................................ 2
2. Abdominal sterna III–V (at least) with shorter setae anterior to the row of long setae (Fig. 81) ........................................ 5

2(1). Prostrumen with anterior macrochaeta only; gonapophysis with submarginal seta on outer marginal plate (Fig. 95) ........................................ 3
3. Prostrumen with at least 1 pair of posterior macrochaetae; gonapophysis with apical seta (Fig. 99) ........................................ 4

3(2). Second joint of hind tarsus with long plantar process, sclerotized on posterior wall (Fig. 94); prostrumen with 2 pairs of macrochaetae (Fig. 101); prostrumen with 1 pair of macrochaetae ........................................ 5
4. Postocular notch present; ocular seta not strongly spiniform ........................................ mlobergi
5. Postocular notch absent; ocular seta strongly spiniform ........................................ bettoni
6. Abdominal terga III–VI (at least) with 1 row of 2–4 long setae ........................................ 6
7. Abdominal terga III–VI with chaetotaxy otherwise ........................................ 7
8. Postocular seta anterior to postocular notch; 2nd frontal setae not strongly spiniform (Fig. 103) ........................................ 9
9. Postocular seta posterior to notch; 2nd frontal setae strongly spiniform ........................................ granulatus
10. Ocular setae not strongly spiniform (Fig. 93) ........................................ 8

9(7). 2nd frontal setae strongly spiniform; prefrontal plate with spiniform setae posteriorly ........................................ biseriata
11. 2nd frontal setae not strongly spiniform; prefrontal plate with macrochaeta only ........................................ doriae
12. Abdominal terga with 2 rows of setae, separated from each other by narrow sclerites ........................................ notatus

**BOOPIA BETTONI** Le Souef

(Figs. 90E, 92)

*Boopida bettoni* Le Souef, 1902, p. 50, fig. 2 (d from *Bettonia rufescens*, Victoria); Werneck and Thompson, 1940, pp. 423–3 (1' "paratype", BMNH); Werneck, 1948, pp. 14–15, figs. 2 and 3, 6, 9 "type" and "paratype", BMNH.

*Boopida phanerocera* Harrison and Johnston, 1916, pp. 348–9, fig. 7 (d, 99, from *Perametes rufescens*, Woolloombooloo, N.S.W.); Thompson, 1939, pp. 604–6 (9, 6 types and 1 header, 92 "type", in GBT coll.); Werneck and Thompson, 1940, pp. 429–32, figs. 78–34 (2d, 59 "otypes", in GBT coll.); 9 from *P. nasuta*, New South Wales; det. T.I.H., 27, Mackay, 27, R. E. Turner, BMNH); Werneck, 1948, pp. 13–14; Hopkins, 1949, pp. 440–2 (from *P. nasuta* and *Thylacis torosa*); Hopkins and Clay, 1952, p. 22 (syn. with *B. bettoni*); von Klee, 1957, figs. 34, 20B, 34C, 34E.

**Types**

Lectotype of *B. bettoni* here designated: 9, in BMNH (Slade No. B.M. 743, 1508/4), from *Bettonia rufescens*, Victoria, 1902–173, with pencil note by Harrison "Typ., L.H., differs from any of mine.”

Paratypotype: 9, in BMNH (Slade No. 1508/5), as data type.


Paratypotype: 59, in BMNH: 19 (Slade No. 1505/3) 49 (Slade Nos. 726–729), as data type.

**Material examined**

*Aepypodius rufescens,* syn. *Bettonia rufescens*; 1d, 19 syntypes now lectotype and paratypotype, Victoria, BMNH (1508/4 and 5) [identical as *B. bettoni*].

* Aepypodius rufescens was once found in northern Victoria but appears to have disappeared from that State over a century ago. It is virtually certain that Le Souef’s host animal was a zoo captive. J.H.C.
Pereneis nauta. - 1♂ lectotype, 1♂ paralecotype, BMNH (1527/8, 1505/32); det. L.H., 1♂, Mackay, Qld., Aug. 1893 (1505/33); 1♂, Mackay, Qld., Aug. 1893 (1505/34); det. 7, 1♀, Queensland, 1930, F. V. Collins (1946/24); det. 7, 1♀, south Queensland, 1930, F. V. Collins (1496/25). [All identified as B. phanerocesta.] 1♂, New South Wales, 1962–67 (1505/33); 9♂, 8♀, 9 nymphs, Hornby, N.S.W., 9.xii.1957, B. McMillan (1512/1–11).


Isodon obovatus. - syn. I. obovata. det. 7, 2♂, 1♀, ympth, Tamborine, F.W.L.W., R. Riek, 27.x.1953, BMNH 1953–331 (1505/88); det. F.W.L.W., 1♂, 1♀, Stoneville, W.A., 441 (1505/89). [All identified as B. phanerocesta.]

**Description**

Ocular seta strongly spiniform, postocular notch wanting; postocular seta just posterior to posterior ommat, not on papilla. Prosternite not rectangular, with 1–2 anterolateral macrochaetae and with 1 pair of posterior discal setae. Stermites III–VII with 8 setae in the row, tergites with 2: 4: 2 setae; tergite VIII sclerotized only in the posterior corners.

**Male.** Second femur with a pair of strong spines near end of trochanter. Median anterior plate of vesica with a short (60 μm) anterior handle varying from slender triangular to rodlike with triangular base (Fig. 92E); lateral sclerites broadly band-shaped with a broader anterior lobe which may in some positions roll itself up, suggesting a pocket-shaped structure; anterior to the lateral sclerites there is a pair of small triangular sclerites each with a sharp tooth.

**Measurements** (in mm) lectotype with range of 21♂ (9♂ from P. nauta, 1⃞ from I. macrourus): H.L. 0.29 (0.26–0.31); H.B. 0.42 (0.40–0.45); H.I. 1.45 (1.38–1.48); Poc 130° (115°–145°); Pb 0.36 (0.34–0.39); Mx 0.36 (0.29–0.36); Mt 0.41 (0.35–0.46); Ab 0.80 (0.70–0.87); T.L. 1.71 (1.57–1.87).

**Female.** Genital sternite similar to that of *miciphorus*, but with broadened anterior cornua and with 4 lateral and 2 ♀ short (30 μm) median setae. Gonapophyses triangular, well sclerotized with external wall coloured brown, internal wall membranous, sharp. Apically with a spur as long as the inner margin and with 4 strong setae along the external margin; the inner margin is provided with a scanty row of hairless sensory ampullae, not reaching to the supraapical margin, which is furnished with a row of short (15 μm) hairs.

**Measurements** (in mm) paramecotype with range of 24♂ (11♂ from P. nauta, 12♂ from I. macrourus, 1♀ from I. obovatus): H.L. 0.30 (0.28–0.33); H.B. 0.42 (0.41–0.47); H.I. 1.38 (1.38–1.58); Poc 134° (112°–132°); Pb 0.37 (0.35–0.41); Mx 0.35 (0.28–0.39); Mt 0.41 (0.38–0.46); Ab 0.87 (0.77–1.00); T.L. 1.74 (1.48–2.00).

**Discussion**

I could not find any diagnostic difference between the type male and the paratype female of *Boopia bettongia* on the one hand and the type male and paratype female of *B. phanerocesta* and males and females collected subsequently off *Pereneis nautula*, *Isodon macrourus*, and *I. obovatus*, on the other. The differences in the outline of the male antenna (see Werncke 1948, p. 15 and fig. 2) have no diagnostic value, being caused by the position of the insect in the mounts and other technical effects. The median posterior plate of the vesica in the type male of *B. bettongia* (see Werncke 1948, p. 15 and fig. 3) agrees exactly with that of all other males before me, but it has in *Boopia* no diagnostic value, showing in all species approximately the same outline. The median piece of the transverse bar of this plate is not lacking in the type male as stated by Werncke; it is always present, but sometimes pale-coloured.

*Boopia bettongia* is the only species of the genus having no postocular notches and no postocular tubercle. The outlines of the thoracic sternites of the type male and the paratype female of *B. bettongia* are somewhat indistinct but are still recognizable enough to allow their identification with those of all other specimens. Some of the variations of these sternites and of their chaetotaxy are shown in Figure 91.

The measurements of *B. bettongia* from *P. nauta* were consistently less than those from *I. macrourus*.

The figures of the whole male of *B. bettongia* and the original description of this species do not admit the identification of the species. According to Le Souef the ocular spine is the only spine on the dorsal surface of the head, but the eighth postnodal seta is in the “type” and “paratype” of *B. phanerocesta* as well as in the “paratypes” of *B. phanerocesta* and all other specimens of the series, a short and thick sharply pointed seta, which may appear as spine-like. In all other species of *Boopia* the eighth postnodal is a normal slender seta. Le Souef gives the total length 1.60 mm (no designation of sex) as 1.60 mm. The male “type” before me is 1.71 mm and the female paratype 1.74 mm long. Werncke and Thompson (1940) did not give measurements of the paratype female they examined.

The description and figure of *B. phanerocesta* Harrison & Johnston are much better. The figure of the whole male is recognizable as this species by the postnodal and ocular spines, which are characteristic of this species. Both the spines are also mentioned in the original description. The difference between the outlines of the prothorax of *B. phanerocesta* and *B. notafusa* is exaggerated. The planta of the second tarsal joint is correctly described as “without a ridge”, but this is also the case in *B. minuta, tarsata, uncinata, and dubia*, while all other species have more or less distinctly serrate plantae. The pair of spines on the median femora in males of *B. phanerocesta* are also present in *B. notafusa, B. uncinata, Paraboopia flavoana*, and both species of *Phacogalia*. The male genital organ is not “of the same general form as in *Boopia notafusa*”, it differs as described. The very characteristic feature mentioned in the original description of *B. phanerocesta* is “that the eye is not bounded posteriorly by a cleft”. As I have mentioned above, *B. bettongia* is the only species of this genus having no postocular cleft. The measurements given by Harrison and Johnston lie nearly exactly within the ranges given. The total length of the male is given as 1.529 mm and that of the female as 1.66 mm, but the breadth of the female mesothorax, given as 0.07 mm, may be a misprint.

Werncke and Thompson (1940) have supplied a detailed description of *B. phanerocesta*, containing some errors and contradictions. The postocular temporal margin is correctly described “sans aucun sillon derrière les yeux” but this character
is not "comme chez grandis et notafusca"; both possess a small but distinct and constant postocular notch as figured by these authors in figures 14 and 22. The chaetotaxy of the head does not "rappelle celle de la dernièr" (notafusca), because notafusca has no spines on the dorsal surface of the head at all, while phanerocerata possesses "deux pas de forts piquants" "au niveau des lobes occipitaux" (eighth and ninth postnodal) "les soies oculaires ... de vrais épines". The ninth postnodal seta is in all specimens before me a normal short seta. The marginal setae of the prothorax "se rapprochant de ceux de tarata par leur nombre et leur distribution" is incorrect; actually these setae are quite different in both species, although individually variable within limits and sometimes slightly different on each side in one and the same specimen. The figures of the prothorax of B. phanerocerata and B. tarata (Werneek and Thompson figs. 30 and 4) illustrate the chaetotaxy of the prothorax correctly, contradicting the text. The male "armature génitale (fig. 33) du typ commun à toute les espèces de la même famille" lacks any diagnostic value. The figure of the male copulatory organ is, in general, correct and shows the specific characters distinctly enough for the identification of the species. The total length of the male is given as 1.74 mm and that of the female as 1.78 mm, both lying within the variation limits of the series before me.

Characters common to both sexes and showing specific differences are numerous in all species of Boopia. Only the most striking of them may be given here. B. bettongia is the smallest species of the genus, probably not greater than mimita. It is in both sexes distinguished by the chaetotaxy of the head and the pronotum (Fig. 91), the ocular seta being a strong spine, the eighth postnodal seta strong and short; the second frontal a strong and long seta. The sides of the pronotum have three spines, the third the strongest, behind it a fine and short seta elsewhere present only in biseriata, grandis, and uncinata. Similar chaetotaxy of head and prothorax is found only in biseriata and grandis, but the end frontal is short in both these species, not reaching the transverse pronotal bar, while in bettongia it reaches to the level of the third lateral spine. B. grandis and biseriata possess two pairs of pronotal discal setae, bettongia but one, the anterior. The prothorax of B. bettongia can be only confused with that of B. uncinata (Figs. 91 and 104). No other species of Boopia possesses so many discal setae on the pronotum. The median abdominal segments have 2: 4: 2 tergal and eight sternal setae in one row each. Similar distribution of setae is present only in B. mioberi and tarata.

**Hosts**

Aescyphynx rufescens (Gray 1837) has not been confirmed as a host but

Peramelus nasuta Geoffroy has by three collections: 1496/24-5, 1505/35, and 1512/1-11.

Isodon macrourus toonius (Ramsay 1877), recorded by Hopkins (1949), is confirmed as a host for l. macrourus from which new material was collected belonging to this subspecies because of their locality. Isodon oenobas (Shaw 1797) is recorded as a new host by 1505/89.

**Boopia biseriata**, sp. nov.

(Figs. 1-4, 81, 90C, 105)

**Types**


Paratypes: 4d, 4f, in ANIC, BMNH (Slide Nos. 1505/67-71), data as holotype.

**Material examined**

Macropus antilopinus—holotype and 4d, 49, paratypes.


**Description**

Temple rounded with short, stout spine on anterolateral corners. Ocular seta strongly spiniform. Second frontal seta thick spiniform, not reaching pronotal transverse bar. Sides of pronotum with 2 spines, pronotum with 2 long setae near each anterior corner, median pair as long as the lateral, reaching to the inner margin of the anterior coxae; and a pair of medium strong and long sharp spines in the posterior half. Metapleuralum with 2 spines on its posterior end, the external shorter than the internal. Abdominal sternites with 2 rows of setae. Tergites with 2 rows, the anterior with 6 short and posterior with 2: 6: 2 longer and shorter setae.

**Male**—Anterior median plate of vesica with weakly chitinized, long (90 μm) and narrow handle, with a posterior spur; lateral sclerites long, with roundly broadened and nearly touching median marginals (Fig. 90C).

**Measurements** (in mm) 10d including holotype and 4 paratypes, mean and range: HL 0.40 (0.37–0.41); HB 0.52 (0.50–0.54); HL 1.31 (1.24–1.36); Prb 0.48 (0.46–0.49); HB 0.44 (0.39–0.46); Mib 0.53 (0.46–0.61); AB 0.97 (0.94–1.04); TL 2.34 (2.26–2.52).

**Female**—Tergite VIII large, strongly chitinized, with colourless areas around the 8 setae which are arranged in 2 rows. Genital sternite 2-winged, its triangular wings connected by a short bridge not forming a more strongly chitinized lunula; its posterior arms confluent with the lateral sclerites of the postgenital sternum. Genital papilla conical, very fine, colourless, only in few specimens recognizable, 20 by 30 μm. Vulva with a continuous row of 11–15 strong setae, generally the 2nd, rarely the 3rd, on both sides the longest. Postgenital sternum with a row of strong lateral setae situated on warts and with a row of 4 strong but short setae situated on small warts each side of the midline; its sternite narrowly arched in the middle, broadening toward the sides and to the lateral marginal setae, and confluent with the posterior arms of the genital sternite. The posterior margin of the postgenital sternite sends narrow bridges to the alveoli of the lateral and median setae. Gonapophysiae large, strong, bluntly pointed, with apical alveolar seta instead of spur and with a row of short sensilli along their inner margin; about 7 strong gonapophysial setae are situated partly on strong lateral dilatations of the outer margin.

**Measurements** (in mm) 8V including 4 paratypes, mean and range: HL 0.40 (0.35–0.42); HB 0.50 (0.50–0.57); HL 1.37 (1.29–1.62); Prb 0.50 (0.48–0.54); Mib 0.45 (0.41–0.48); MB 0.55 (0.54–0.57); AB 1.09 (1.04–1.13); TL 2.53 (2.24–2.71).

**Discussion**

Boopia biseriata is very similar to B. grandis but the ocular and second frontal spines are shorter and stronger, the latter never reaching to the transverse pronotal bar. The metapleuralum has two spines on its posterior end, the external shorter than the internal; in B. grandis the former is replaced by one fine and short seta. The abdominal tergites have two rows of setae, the anterior with six short and the posterior with 2: 6: 2 longer and stronger ones; the external seta in the median group is not minute as in grandis but strong, half or more the length of the other.
Hosts

The nominal host is *Macropus antilopinus* (Gould, 1842), and *M. robustus* Gould, 1841 (subspecies *M. robustus cervinus* Thomas, 1900) is a second host.

**Boopia doriania**, sp. nov.

Types


Paratypes: 8d, 69, in Bernice P. Bishop Museum (Slide Nos. 1526/0/4, 7, 9–12); 1d, 19, in BMNH (Slide Nos. 1526/0/2); 2d, 29, in KCE coll. (Slide Nos. 1526/0/1, 5); data of all as holotype.

Material examined

*Dendrolagus dorianus*.—holotype, 11c, 99, paratypes; 5 nymphs, same data as holotype.

Description

Close to *B. notatus*. Sides of temporal lobes nearly parallel, without short spine on anterolateral corners, their anterior edges more rounded, the posterior projecting beyond the occipital margin and provided with a nearly membranous, triangular, bluntly pointed lobe, bearing dorsally a short seta. Postocular notch in the form of a narrow slit. Eyes with a strong spine. Ocular setae spiniform. Postocular seta long, reaching slightly beyond the temporal lateral margin.

Second frontal setae normal, reaching beyond pronotal transverse bar to the posterior distal setae of the pronotum.

Pronotum with 1 lateral spine and 3–4 setae before it, with 2 discal setae, the anterior strong, spinous. Prosternite with 2 lateral setae near the anterior corners, with 2 anterior and 2 posterior discal setae; spines absent.

Abdominal segments II–VI in female or II–VII in male with 2 rows of sternal and tergal setae, those of the posterior row long and strong; those of the anterior short and, especially on the sternites, may be scattered to form 2 irregular rows. The external seta in the tergal median posterior row minute.

Male.—Second femora with 2 strong or 1 strong and 1 weak spine near the end of the trochanter. Anterior median plate of vesica with long (200 mm) narrow handle and with a spur on its posterior margin. Lateral sclerites bent anteriorly toward the midline, their ends denticulated on the margin.

Measurements (in mm) 12d, holotype and paratypes, and mean and range: HL 0.39 (0.38–0.41); HB 0.53 (0.52–0.55); HI 1.38 (1.35–1.42); PrB 0.41 (0.39–0.42); MdB 0.38 (0.35–0.41); MB 0.49 (0.46–0.51); AB 1.00 (0.93–1.06); TL 2.23 (2.15–2.33).

Female.—Abdominal tergite VIII frame-shaped, narrowly bordered on the anterior and lateral sides with brown margin, the lateral frames broadened posteriorly. Genital sternite frame-shaped, with slightly arched lunula, its posterior arms touching but not fused with the lateral sclerites of postgenital sternum. Genital papilla colourless, sharply outlined, slender conical, 65 mm long. Vulva with 3–4: 5–10: 3–4 setae, 2nd external the longest and anterior to the row, the median group short, sometimes divided into 2 or 3 groups. Postgenital sternum with strong lateral and 4–7 (generally

6) short median setae. Postgenital sternite strongly arched in the middle, indistinct on the sides, recognizably dilated and reaching to the lateral setae and to the side margins. Gonapophyses triangular, bluntly pointed, with a strong but short apical spur, median margin with a row of short setae and circular hairless sensil, both ascending along the supraanal margin. About 7 strong gonapophyseal setae, 1 or 2 of them situated on a slightly projecting lateral dilatation of the outer basal margin.

Measurements (in mm) 99 paratypes, mean and range: HL 0.39 (0.38–0.41); HB 0.54 (0.54–0.55); HI 1.40 (1.35–1.46); PrB 0.42 (0.41–0.44); MdB 0.40 (0.38–0.42); MB 0.52 (0.49–0.54); AB 1.11 (1.06–1.16); TL 2.40 (2.32–2.54).

Host

The nominal host is *Dendrolagus dorianus* Ramsay, 1883.

**Boopia dubia** Werneck & Thompson

(Figs. 90b, 93–95)


Types

Lectotype here designated: d, in BMNH (Slide No. 718) from *L. latifrons*, Blanchesown, S.A.

Paralecotypes: 10d, 59, in BMNH, ANIC (including Slide Nos. 1505/41–46), data as lectotype.

Material examined


Description

Prosternite rounded rectangular, longer than broad, with 2 pairs of macrochaetae. Abdominal sternites II–VI with 1 row of long setae, 3: 4: 3. Tergites II–V with 1 row of long setae, 4; 4: 4. Second joint of hind tarsus in both sexes with a strong and long plantar process, sclerotized on its posterior wall (Fig. 94).

Male.—Anterior median plate of vesica with a narrow, rod-like, long (90 mm), moderately sclerotized handle, with a short spur on its posterior margin. Lateral sclerites of vesica anteriorly bifurcated with 1 short external and 1 long internal arm, with a large triangular tooth behind the median plates (Fig. 90b).

Measurements (in mm) lectotype and 3 paralecotypes, mean and range: HL 0.47 (0.46–0.49); HB 0.58 (0.56–0.60); HI 1.23 (1.21–1.25); PrB 0.49 (0.47–0.51); MdB 0.44; MB 0.50 (0.49–0.51); AB 1.06 (1.01–1.16); TL 2.8 (2.7–2.9).

* V. hiratus has a limited range in South Australia and no "Swan Beach" can be found within it. It seems likely that the recorded locality name is an error for Swan Reach, a place on the Murray River within the range of *L. latifrons* but outside that of V. hiratus, and that the host was a misidentified *L. latifrons*. J.H.C.
Female. Eighth tergite large, with colourless areas around the setal alveolae, with weakly sclerotized anterior half, and deeply emarginated posteriorly. Supraanal margin with a round projecting papilla in the middle and with 2: 4: 2 short setae. Genital sternite butterfly-shaped with flatly arched lunula. Genital papilla slender, conical, sharply pointed, 20 by 36 μm. Vulva with 4: 5: 2: 4: 2: 4-5 strong setae, the median group equally thick but shorter than the outer groups. Gonapophysis nearly colourless, broadly rounded, with 1 subapical seta on outer margin (Fig. 95). Postgenital sternum with 5 strong lateral setae, large median gap with 2 minute hairs each side near the median lateral seta, which is some distance away from the remaining laterals (Fig. 95).

Measurements (in mm) 29 indicating 2 paratype setae, mean and range: HL 0.47 (0.45–0.49); HB 0.56 (0.53–0.59); HW 1.20 (1.15–1.26); PrB 0.48 (0.46–0.49); MdB 0.42 (0.42–0.44); Mtb 0.49 (0.48–0.52); AB 1.16 (1.09–1.25); TL 2.70 (2.58–2.78).

Discussion

The two long temporal setae are not longer than in tarsata, as stated by Werncke and Thompson, but are of the same length, reaching in both sexes to the middle of the mesothorax (Fig. 93). Their absolute length varies in both species from 0.43 to 0.48 mm. The narrow abdominal tergites are not wanting; in two specimens they are light brown, in others colourless but sharply outlined.

The males and females from the doubtful host, V. hirtatus, do not differ in any way from those from E. latifrons. Their measurable characters are within the limits of the other species, except for the breadth of the male prothorax (0.46 mm).

A very striking character, absent in all other species of Boopia, is the long, strongly chitinized process on the second joint of the posterior tarsi of both sexes (Fig. 94). In B. tarsata this process is represented by a small membranous tubercle (Fig. 101).

Hosts

The nominal host, Lasiorhinus latifrons (Owen, 1845), the hairy-nosed wombat, is confirmed. The next host, Vombatus hirtatus (Perry, 1810), is in doubt.*

**BOOPIA GRANDIS** Piaget

(Figs. 90D, 96–99)

*Booia grandis* Piaget, 1885, pp. 154–5, pl. 16, fig. 8 (♀, from *Macropus rufus*, Zoo, Rotterdam); Thompson, 1937, p. 21 (types 1♂, 1♀, 1 nymph; Werncke and Thompson, 1945), pp. 420–4, figs. 13–20 (1♀, 1 nymph “cotype”; 1♂, 1♀, from *Megalela rufa*.

Zoo, Sydney; 2♂, from *M. rufus*, 2♀, 6♂, nymphs, from *Macropus sp., Broken Hill*, N.S.W., R. N. McNeil.; 2♀, from *M. major*, Coonamble, N.S.W.; 2♂, “cotype” of *B. peregrina*; Werncke, 1948, pp. 10–11.


**Types**

Lectotype here designated.—♀, in Piaget Coll., BMNH (Slide No. 1482), from *Macropus rufus*, Zoo, Rotterdam.

*See footnote, p. 25.

Paratype setae.—♀, in Piaget Coll., BMNH (Slide Nos. 1483, 1484), data as for lectotype.

**Material examined**


**Description**

Ocular setae strong but not spinous. Postocular seta long and posterior to postocular notch, 2nd frontal seta a very strong spine usually reaching to or just beyond the pronotal transverse bar, but may be shorter. Prosternite oval with broadly rounded posterior end, with 1 pair of setae in each anterior corner and with 2 discal spines in the posterior half.

Abdominal sternum and terga with 1 row of discal setae behind the narrow sclerite, the dorsals reaching to the next alveoli, the sternal only to the alveoli of the next anterior discal row of setae, this standing just before the narrow sternite and intercalating half its length with the posterior row. Sterna III–VII each with a scantly anterior row of 1–2 fine setae each side of midline, with 10 in posterior row. Terga with 2 rows of setae, III–VI with 2: 4: 2 long setae.

Male.—Second femora without spines near end of trochanter. Median anterior plate of vesica with a long (120 μm) rod-like, dark brown chitinous handle which in some positions appears slender, leaf-shaped, the lateral wings are anteriorly confluent with a heart-shaped broad plate extending into the handle. Lateral sclerites channel-shaped (Figs. 90D, 96–98).

Measurements (in mm) 185 (mean of 10♂ from *M. eigonatus* and 5♂ from *M. fuliginosus*, range includes 5♂ from *M. rufa*): HL 0.40 (0.39–0.42); HB 0.50 (0.48–0.54); HW 1.24 (1.20–1.28); Poc 140° (124°–153°); PrB 0.41 (0.39–0.45); MdB 0.37 (0.33–0.39); Mtb 0.47 (0.43–0.56); AB 0.94 (0.87–1.13); TL 2.26 (2.09–2.55).

**Female.**—Sternite VIII not exactly definable. Tergite VIII large with broad dark brown border (Fig. 99) except in the middle of the posterior margin. Genital sternite 2-winged with strong and straight lunula, smooth, except for extremely fine denticles on the sides. Its posterior arms very narrow, confluent with the sides of the postgenital sternite. Genital papilla slender conical, sharply pointed, membranous, colourless, with a sclerotized basal ring, 27 by 42 μm. Vulva with a continuous or discontinuous row of 10–13 or 5–6: 6–7 strong marginal setae, the 2nd, rarely the 1st, external the longest. Postgenital sternum posteriorly deeply emarginate with a complete row of marginal setae, the stronger and longer laterals standing in alveolar papillae, divided into 3 sclerites, the median broadly crescent-shaped and the alveolar small, and continuous with the posterior projections of the genital sternite forming narrow bridges to the alveoli of about 7 of the strong marginal setae. Gona-...
long as the gonapophysis itself. Its inner margin with about 2–3 short alveolar setae (Fig. 99) which follow in equal length and are distributed on the supraanal margin, this being also provided with extremely fine sharp denticles. The ventral row of strong setae on the base of the gonapophyses is partly located on a dilatation of its external margin, as in *biseriata*, *notafusca*, *minuta*, and *mboergi*.

Measurements (in mm) 30V (mean of 23V, range 14V) from M. giganteus and 48 from *M. fuliginosus*, range includes 52 from M. rufo; HL 0.42 (0.38–0.45); HB 0.52 (0.49–0.57); HH 1.23 (1.19–1.27); POC 145° (122°–159°); POB 0.44 (0.42–0.48); M1 0.40 (0.36–0.46); M2 0.49 (0.45–0.57); AB 1.07 (0.94–1.25); TL 2.45 (2.03–2.68).

**Discussion**

To the revised description by Werneck and Thompso may be added only that the sensory rods on the end joint of the maxillary palpus are present in all Boopidae and absent in all Trimenoponidae.

*B. grandis* belongs, with its head index 1.20–1.28 in males and 1.19–1.27 in females, to the species with slender heads like *dubiata*, *minuta*, *notafusca*, *taranta*, and *mboergi*. A head with one pair of spines, the 2nd frontals, which never reach the pronotal transverse bar, is one of the exclusive characters of *B. grandis*. The ocular seta is strong but not spinous. The pronotum is as in *biseriata* with two pairs of lateral spines, the posterior much stronger, and with two pairs of lateral discal setae. The metathorax is as in *biseriata* and *uncinata*, with one spine on the posterior upper edges of the metapleuron associated laterally with a short seta, wanting in *uncinata* and replaced by a shorter, weaker spine in *biseriata*.

The tergal setae are in division 2 : 4 : 2 as in *bettongia*, *mboergi*, *taranta*, *uncinata*, and *Placogala spinosa*, as well as in the posterior tergal row of *B. notafusca* and *Panboopia flava*. The sternal setae have a distribution 2 : 2 for the anterior and 10 for the posterior row; this occurs in no other species with a similar distribution of setae, e.g. 2 : 4 and 8 in *notafusca*, 2 : 9 and 8 in *uncinata*, etc. The second tarsal plastron of all legs are serrate with transverse rows of minute (5 μm) spicules as in *biseriata*, *mboergi*, *minuta*, and *notafusca*.

**Hosts**

The nominal host, *Megailea rufo* (Demarest, 1822), has been reconfirmed. *Macropus giganteus* Shaw, 1790, the eastern grey kangaroo, is confirmed as another host, and *M. fuliginosus* (Desmarest, 1817), the western grey kangaroo, is a new host.

**BOOPIA MINUTA Le Souéf**

(Fig. 90G)  
*Boopia minuta* Le Souéf, 1902, p. 51, fig. 3 (G, from *Macropus doralis*); Werneck and Thompson, 1940, p. 428 (1V paratype = *notafusca*); Werneck, 1948, pp. 12–13, fig. 1 (3 and same 1V paratype = *notafusca*).

**Types**

Lectotype here designated: d, in BMNH (Slide No. 1508/3), from *Macropus doralis*, Victoria, 1902.

*M. doralis* is not native to Victoria and the type and only known material of *B. minuta* must have come from a zoo specimen. J.H.C.
longer. The prothorax in *notafusca* has more rounded lateral edges and the lateral setae are different. The setae of the anterior tergal rows on the abdominal segments in *minuta* are nearly intercalating with the posterior row while in *notafusca* they are distinctly separated. The external seta of the posterior median and lateral rows is minute in *notafusca* and much longer in *minuta* (10 µm in *notafusca*, 36 and 70 µm in *minuta*). The sternal rows of the setae are distinctly separated in both species. The setae of the sternal and tergal posterior rows of the female are distinctly spindle-shaped in *minuta* and normal in *notafusca*, although inclining in some specimens here and there to a slight spindle-shaped form. To summarize: both species are, apart from the total length, very similar in monomorphic characters. The differences in dimorphic characters are much more marked. The second femora of males of *notafusca* possess a pair of spines which are wanting in *minuta*. The male genital organ is different in both species. In *B. minuta* the posterior median plate of the vesica is present and distinctly visible although the type is rather strongly cleared with caustic potash, while in all four males of *notafusca* it could not be discovered, although the vesical sclerites are perfectly chitinized. This statement must, in any case, be confirmed with further material, because the absence of the posterior vesical plate is hardly credible. The lateral vesical sclerites are similar in both species, but smaller and weaker in *minuta* and longer and stronger in *notafusca* (Figs. 90G and 90H). The genital papilla and genital sternite are apparently the same in both species, the latter being frame-shaped. The vulva in *minuta* has eight long marginal setae equally spaced, the second external the longest; in *notafusca* the distribution is: 2-4: 1-3: 2-3 setae, the second external is as generally the longest. The postgonosternal sternite in *notafusca* has 9-10 very strong lateral setae standing on warts, in *minuta* has five weaker setae both sides. In *B. notafusca* these lateral setae ascend farther toward the midline, leaving but a small median gap occupied by three strong but short setae separated from each other by the diameter of one alveolus. In *B. minuta* this median gap is much longer, containing a continuous row of eight fine setae equally separated by four to five alveolar diameters. The posterior margin of the postgonal sternum is very flat in *minuta*, but in *notafusca* nearly as deeply emarginated as in *bisterata* (Fig. 105).

**Host**

The nominal host, *Wallabia dorsalis* (Gray, 1837), awaits confirmation.

**BOOPIA MIJOBERGI** Wernick & Thompson

*Bopina miobergi* Wernick & Thompson, 1940, pp. 428–9, fig. 27 (19), 1 nymph, from *Macropus major*, Victoria, A. S. Le Souef = *B. notafusca* from *M. giganteus*, det. L.H. and T.H.J.; Wernick, 1948, p. 13.

**Types**

Lectotype here designated: ♀, in BMNH (Slide No. 712), from *Macropus major*, Victoria, A. S. Le Souef.

Paratypes: 2♀, in BMNH (Slide Nos. 714, 1505/74), data as lectotype.

**Material examined**

*Macropus giganteus*: syn. *M. major*; 1♀ paratype, Victoria, A. S. Le Souef (1505/74).

**Description**

**Male.** Not known.

**Female.** Ocular seta short; postocular notch present, postocular seta on papilla. Prosternite not rectangular with at least 1-2 anterolateral macrochaetae and a pair of posterior discal setae or spines. Abdominal sternites III-VI with 10 setae in a single row, the external being small. Tergites with 2:4:2 setae. Tergite VIII hardly recognizable, apparently similar to that of *tarsata* or *dubia*. Genital sternite rectangularly and narrowly frame-shaped with deeply emarginated anterior margin forming a weak lunula; its posterior arms reaching to the lateral sclerotizations of the gonapophyses.

Genital papilla conical, membranous, 10 by 20 µm. Vulva with 3:2:3 marginal setae, both median minute (4-6 µm), the innermost in the lateral groups very long (330 and 360 µm), the rest much shorter (80-100 µm). Vulva with 3:2:3 setae, the 2nd lateral the longest, both the median minute (6 µm). Postgonal sternum with about 6 lateral stronger setae reaching to the end of the gonapophyseal spur and with a row of 5:5 minute setae (10 µm) each side of the midline.

**Measurement** (in mm): TL 1.57.

**Discussion**

The only type female before me, being one of the three females of the type series, belongs to the group of four species with one sternal and one tergal row of abdominal setae, including *miobergi*, *tarsata*, *dubia*, and *bettongia*. The only character dealt with in the original description of *B. miobergi* is the presence of but one row of setae on the abdominal sterna and terga. The genital sternite is narrowly frame-shaped as in *bettongia*, *minuta*, *notafusca*, and *bisterata*. The chaetotaxy of the postgonal sternum resembles those of *unicriniata*, *minuta*, and *bettongia*.

It is impossible to decide, without having seen the original specimens, whether those determined by Harrison and Johnston as *notafusca* off *Macropus giganteus* (major) and *M. bicolor* (*aulobatus*) belong to *miobergi* or not. I will return to this question in dealing with *B. notafusca*.

**Host**

The nominal host, *Macropus giganteus* Shaw, 1790, awaits confirmation.

**BOOPIA NOTAFUSCA** Le Souef

(Fig. 90F)

*Bopina notafusca* Le Souef, 1902, p. 50, fig. 1 (♂ from *Macropus aulobatus*); Harrison and Johnston, 1916, pp. 347-8, figs. 5 and 6 (♂ type, ♂♂, ♂♂, from *M. aulobatus* and *M. giganteus*, Victoria, A. S. Le Souef); Thompson, 1939, p. 606 (♂, 9 types, in G.B.T. coll.); Wernick and Thompson, 1940, pp. 424-8, figs. 21-26 ("coptypes" ♂♂, ♂♂, 3 nymphs; det. L.H., ♀♀, from *Opshofter robustus*, Belltrees, N.S.W.; L. Harrison; ♂♂, ♀♀, nymphs, from "wallaby", Dargo, Vic., 15.vi.1911, Bruno Deck); Wernick, 1948, pp. 11–12.

*Keberiella notafusca*, Eichler, 1940, p. 161.

**Types**

Paralctotypes: 2♀, in BMNH (1514/6, 7), data as lectotype.

Material examined
Wallabia bicolor.—Lectotype and 1♂ paralctotype (1514/6): 1 nymph, data as lectotype (1514/4).
Macropus robustus.—syn. Orycteropus robustus: 3♀, Belltrees, N.S.W., L. Harrison (1505/83).

Antechinus flavipes*—det. F.L.W., 1♀, Aug. 1911, A. S. Le Souef, BMNH 1962–677 (1508/1) (identified as Hierodorus brevipinnosus).

Description
Temple rectangular, without short stout spine on anterolateral corner, posterior edge without triangular membranous lobe. Ocular seta not spiniform; posterior edge of temple without triangular membranous lobe. Second frontal seta strong, reaching just beyond pronotal transverse bar. Prosternite as in biuraeta but the anterior median pair of setae much shorter, reaching only to the alveoli of the prosternal spines, which are weak and rather setaceous; pronotum without marginal spines. Abdominal sterna and terga III–VI with 2 rows of setae, 1 anterior and 1 posterior to the narrow sclerite.

Male.—Anterior median plate of vesica (Fig. 90/f) with very indistinct, slender, conical handle broadened at base and about 40 μm long, without spur on its posterior margin. Lateral scierites bipartite, the inner lobe narrower than the outer, their bluntly pointed ends both posteriorly directed.

Measurements (in mm): TL 1.80–1.94.

Female.—Tergite VIII large, rectangular, with colourless round areas around the setae, sometimes united around the posterior row of setae, rarely also around the anterior ones and in this case similar to that of B. grandis. Genital sternite frame-shaped with long, dark brown, slightly arched lunula, its posterior arm set with the lateral sclerotization of the postgenital sternum. Genital papilla distinct, although very fine, slender conical, with broadened base, 15 by 15 μm, very slightly sclerotized, sharply outlined. Vulva with 2–4:1–3:2–3 marginal setae, the lateral strong, the median much shorter and fatter, the 2nd lateral the longest. Postgenital sternum with long row of strong lateral setae reaching to end of the gonapophylar spur and with 3:3 short but strong setae both sides of the midline. Postgenital sternite tripartite, the median part broad crescent-shaped, the lateral reduced to small plates with finger-like projections to the wars of the lateral setae. Gonapophyses slender triangular, sharply pointed, with a long apical spur of about half the length of the gonapophyses; median margin with a row of about 8–10 short (8 μm) alveolar sensory setae in the supraanal margin; about 5 gonapophylar setae on strong lateral projections of outer basal margin.

Measurements (in mm): TL 1.64–2.12.

Discussion
The suggestion of Wernec and Thompson that the specimens published by Harrison and Johnston (1916) as Boopia notafusca by Harrison and Johnston (1916) as Boopia notafusca may in part (the specimens off Macropus giganteus) have been misidentified and are probably B. mjoberghi cannot definitely be considered without the original specimens. But both figures of B. nota- fusca published by Harrison and Johnston are explicitly said in the text to have been made from the type male, and the text contains nothing which could refer to B. mjoberghi. This does not exclude the possibility that specimens of Macropus giganteus were considered in the original description. The fact that the drawing of the whole male shows but one row of setae on the abdominal tergites, while notafusca has two rows distinctly separated, is due to the loss of most of the abdominal setae from the type male, so that two rows of setae can only be recognized by the very indistinct alveoli. Wernec and Thompson very probably had some other species among their material, as they write “sur quelques especimens les poils des deux series sont tres rapproches, format presque une rangee unique”. This cannot occur in B. notafusca, because in this species the two transversal rows of setae are separated by the narrow sclerite. Figure 24 in Wernec and Thompson, which shows both transversal rows of setae before the narrow tergite, is incorrect.

Figure 5 of Harrison and Johnston, of the head and thorax of the type male of B. notafusca, agrees perfectly with the male type before me on slide 1514/5. The head and the segments of the thorax are extended exactly as in the figure and the metanotum shows the short transversal bar, just behind the pair of discal setae, representing a rudimentary metanotal sclerite, characteristic for B. notafusca and present in all males and females before me. There is no doubt that the male on slide 1514/5 is the type of B. notafusca.

Host
The nominal host, Wallabia bicolor (Desmarest, 1804), is confirmed. Macropus giganteus and M. robustus have not been confirmed as hosts nor has Antechinus flavipes. The latter record was probably due to contamination.

BOOPA TARSATA Piaget
(Figs. 904, 100–102)

Boopia tarsata Piaget, 1880, pp. 599–600, pl. 50, fig. 1 (♀, from Phacolomus fossor); Cummings, 1916, pp. 269–71, fig. 9 (22 specimens from Phacolomus mitchelli, Zoo, London); Thompson, 1937, p. 23 (♂, ♀, eggs on slide in Piaget Coll. BMNH); Wernec and Thompson, 1940, pp. 415–18, figs. 1–8 (♂♂, ♀♀, from Vombatus urinatus, Zoo, Melbourne and Sydney; 55, 99, from V. hirus, from Tasmania*, in Zoo, London; 1♀, from Wallabia bicolor, Victoria, Le Souef); Wernec, 1948, pp. 8–9; von Kéter, 1957, figs. 2 and 34.

Boopia longitarsata Piaget, 1980, pl. 50, explanation to fig. 1.

Types
Lectotype here designated: 1♀, in Piaget Collection, BMNH (Slide No. 1485), from Phacolomus fossor.

Paralctotype: 1♀, in BMNH (Slide No. 1485), data as lectotype.

Material examined

* If from Tasmania this host must have been V. urinatus and not hirus. J.H.C.

Description
Prosternite rounded rectangular, longer than broad with 1 pair of anterior macrochaetae. Abdominal sternites III-V with 1 row of 10 discal setae; tergites with 1 row of setae, 2 : 4 : 2. Second joint of hind tarsus with small membranous plantar process without sclerotization (Fig. 101).

Male.—Anterior median plate of vesca with a broad, tongue-shaped long (100 µm) handle and with a small spur on its posterior margin. Lateral sclerites forming triangular lobes with rounded posterior ends and converging anterior arms (Fig. 904).

Measurements (in mm) 15♂ (8♂ from V. histatus, 7♂ from V. urinus) mean and range:
HL 0.48 (0.46–0.51); HB 0.56 (0.54–0.61); HH 1.16 (1.12–1.24); PRb 0.46 (0.44–0.49); M1b 0.55 (0.48–0.59); AB 1.14 (1.02–1.20); TL 2.77 (2.59–3.14).

Female.—Abdominal tergite VIII similar to that of dhubia but with the colourless areas around the alveoli running into a large colourless exuviae of the anterior half of the tergite. Supraanal margin without median papilla and with 3 : 3 longer (40–60 µm) setae.

Genital sternite bipartite composed of two longitudinal club-shaped sclerites reaching with their narrow posterior ends to the lateral margins of the postgenital sternite. Genital papilla slender conical, bluntly pointed, 30 by 40 µm. Vulva with 4–6 : 1 : 3 : 2–4 strong setae, the 2nd external the longest. Gonapophysis nearly colourless, broadly rounded, with 1 subapical seta on outer margin. Postgenital sternum with about 6 strong lateral setae, large median gap with 3 minute setae each side near the median lateral which is some distance away from the remaining lateral (Fig. 102).

Measurements (in mm) 1♂ (9♂ from V. histatus, 8♂ from V. urinus) mean and range:
HL 0.50 (0.47–0.52); HB 0.57 (0.55–0.62); HH 1.17 (1.13–1.23); PRb 0.49 (0.45–0.52); M1b 0.56 (0.51–0.58); AB 1.24 (1.17–1.38); TL 2.97 (2.67–3.21).

Discussion
B. tarata is the largest species of the genus, the males being 2.6–3.1 mm and the females 2.9–3.2 mm. It is in general aspect, and especially in the outline of the head, similar to grunalis, from which it may easily be distinguished by the lighter brown coloured apex of the female and the eighth tergite, which is broadly chitinized on lateral and posterior margins and appears as deeply excavated anteriorly. It may only be added that the second tarsus in B. tarata is not 2.5 times longer than the first as Piaget writes. The lengths of the tarsi 1 : 2 : 3 are 0.550 : 0.630 : 0.745 mm and the ratios are 1 : 1.15 : 1.35.

Hosts
The nominal host, Vombatus ursinus (Shaw, 1800), and V. histatus (Peery, 1810) are confirmed as hosts. The record from Wallabia bicolor, which Hopkins (1949) considers may be due to contamination, requires confirmation.

BOOPIA UNICINATA Harrison & Johnston
(Figs. 907, 103, 104)

Boopia uncinata Harrison & Johnston, 1916, pp. 319–50, fig. 8 (♀, from Dasynurus maculatus, Sydney); Thompson, 1939, p. 604, fig. (♀, ♀, from Dasynurus geoffroii, Forest Grove and Serpentine, W.A., 1906); Wernerck and Thompson, 1940, pp. 433–6, figs. 35–40 (♂, ♀, 1 nymph, from "Dasynurus quoll", Sydney); 6d, 5♀, including 2 allotopy, from Dasynurus geoffroii, Forest Grove, W.A.; Wernerck, 1940, pp. 15–16 (additional 3♂, 3♀, from Dasynurus hallucatus, Townsville, Qld., F. H. Taylor, Stanford University); 2♂ from Paremeles maculos, Townsville, Qld., F. H. Taylor, Stanford University).

Type♂

Material examined

Description
Ocular seta a stout spine; postocular seta short, anterior to postocular notch (Fig. 103). Second frontal seta a long strong bristle reaching to at least middle of pronotum. Prosternite semi-elliptical with narrowly rounded posterior end, with 2 or 3 macrochaetae near the anterior corners, the external one being stronger, with 1 or 2 pairs of short discal setae in the anterior and with 3–4 strong spines in the posterior half.


*Identity of host doubtful (see Appendix 1). J.H.C.
†These specimens are now in UC. M.D.M.
‡Note on types. According to the original description this was described from 1 female, 1 nymph from Dasynurus maculatus, Sydney. Thompson (1939, p. 606) designated as type a female from Dasynurus quoll, Sydney. 7.vii.1910. In the British Museum (Natural History) there are two slides, with a female and a nymph, with this data, marked types by G.B.T. However, in addition there are two slides with a male and a female and the same data although Harrison states that he had only the female and nymph. The slide with the female has the word "Lectotype" written across the label.

Unfortunately all the Harrison and Johnston and Le Souef material mentioned in Thompson (1939) has had the original labels removed and new labels attached; they do not in this case agree with the host data given in the original description.

It is apparent, however, from Thompson (1939, p. 604) that Dasynurus quoll is this author's interpretation of Dasynurus maculatus of the original description. We can conjecture that perhaps Harrison and Johnston obtained further material from the original host individual after their paper had gone to press. The female designated as type by Thompson (1939) must presumably be taken as the lectotype; the other female marked as lectotype having no standing. A male taken from a different host, D. geoffroii, was referred to as "allotopy" by Wernerck and Thompson (1940, p. 433). T.C.
Male—Second femora with a pair of strong spines near the end of the trochanter. Anterior median plate of vesica with short (30 µm) light greyish brown coloured, slender conical handle, without spur on its posterior margin (Fig. 90F).

Measurements (in mm) 10F from D. hallucatus, mean and range: HL 0.28 (0.27–0.30); HB 0.40 (0.39–0.42); HI 1.42 (1.34–1.47); PrB 0.34 (0.33–0.36); MBl 0.30 (0.29–0.32); MBl 0.36 (0.35–0.39); ABl 0.72 (0.70–0.80); TL 1.71 (1.64–1.91). The measurements of 2d (1505/25, 2d) from D. geoffroii were in the same range except for PrB 0.37. The sole measurements of 1d (1505/30) from "D. quoyi" were HL 0.26; HB 0.38; HI 1.44.

Female—Genital sternite rectangular, frame-shaped, broadened in the anterior corners, with an arched narrow lumina. Genital papilla very fine, slender conical, with bluntly pointed tip, 30 by 40 µm. Vulva with 1 anteriorly remote lateral seta (discal in position) and with 2-3 short rows of setae with distribution 1: 2-4: 1-3: 1 or 0-1: 1-4: 1-2: 2-3: 0-1, the 1st, 2nd, or 3rd external the longest. Postgenital sternum with a row of weak marginal setae, the 5 lateral long, the 5:5 median short. Gonapophyses with 1 short and weak apical spur, with 3 strong setae on its basal inner surface and with a threefold row of very densely standing circular sensory ampullae without setae.

Measurements (in mm) 10F from D. hallucatus, mean and range: HL 0.29 (0.27–0.30); HB 0.41 (0.39–0.42); HI 1.43 (1.37–1.50); PrB 0.35 (0.33–0.38); MBl 0.30 (0.26–0.33); MBl 0.38 (0.35–0.41); ABl 0.78 (0.73–0.87); TL 1.75 (1.65–1.85). Those of 2D (1505/25, 2d) from D. geoffroii were in the same range except for HB 0.43 (1505/26). Only ABl 0.90 and TL 1.99 of 19 from "D. quoyi" were outside the range.

Discussion

Although no authenticated specimens have been seen from the nominal host, it is assumed that the series of specimens from "Dasyurus quoyi," D. geoffroii, and D. hallucatus belong to the species urcinus; these specimens are very uniform and differ only in individually variable details.

Hosts

The original labels were removed from the slide, it is probable that the host of the species examined by Werneke and Thompson, given as "D. quoyi," was D. maculatus of Harrison and Johnston.

New material from D. geoffroii has not been seen but Dasyurus hallucatus Gould, 1842 has been confirmed as a host. Hopkins (1948) considers the record from Isodon macrourus (syn. Perameles macrura) to be due to contamination but this host record is possible.

Genus PARABOOPIA Werneke & Thompson

Paraboeopia Werneke & Thompson, 1940, p. 441; Werneke, 1948, p. 18.

Type species Paraboeopia flavo Werneke & Thompson, 1940.

Description

Head without strong dilations of margin; ocular setae never on a projecting wart. Head as in Booplia but with a spine-bearing wart on the anterior edges of the temporal lobes. Maxillary palp 3-jointed, with 2 joints reaching beyond the margin of head. Mesonotum smaller than metanotum, with 1 pair of large colourless warts bearing 1 strong spine, 1 small seta behind it and usually 1 minute setula near the margin of the alveolus of spine. Abdomen without trichobothrial hairs.

Discussion

The genus has been founded on the maxillary palpi, which are three-jointed in contrast to all other Boopidae, and on the absence of the trichobothrial setae on abdominal pleurae II–IV, which are present in all Boopidae except Paraboeopia and Latamceophalus. In all other somatic and sexual details the single species of the genus is a typical Booplia of the group with two tegal and two sternal rows of abdominal setae. The male genital organ is poorly preserved in the only paratype specimen before me but is distinct enough to show that it is nearest to that of Booplia notafusca. The genital chaetotaxy of the vulva is similar to that of Booplia mjobergi, that of the postgenital sternum similar to that of Booplia notafusca. The narrow abdominal tergites II–VII are well recognizable but the sclerites of the apical segments of the female are not visible. The genital papilla is very distinct, sharply outlined, slender conical, 15 by 30 µm; its apex is somewhat indistinct but seems to be blunt.

PARABOOPIA FLAVA Werneke & Thompson

(Figs. 90F, 106)

Paraboeopia flavo Werneke & Thompson, 1940, pp. 441–2, figs. 48–53 (3d, 5v, from Osphranta robustus, Scone, N.S.W.; 1d from O. robustus, Beltrees, N.S.W., L. Harrison); Werneke, 1948, pp. 18–19.

Types

Lectotype here designated: 1d, in BMNH (Slide No. 730), from Osphranta robustus Gould, Scone, N.S.W., 18.vii.1925.

Paralecotypes: 1d, 29, in BMNH 1962–677 (Slide Nos. 1505/81, 82, 733), data as lectotype.

Material examined

Macropus robustus.—syn. Osphranta robustus: 1d, 19 syntypes now paralecotypes (1505/81, 82).

Discussion

For some additional characters of the male, supplementing the very good original description of P. flavo, see Figures 90F and 106.

Host

The nominal host, Macropus robustus Gould, 1841, has not been confirmed.

Genus PHACOGALIA Mjoberg


Type species Phacogalia brevispina Harrison & Johnston, 1916.

Species

Ph. brevispinosa Harrison & Johnston, spinosa Harrison & Johnston.
Description

Head without horn-shaped projection posterior to base of maxillary palp, and without strong dilatations of margin; preocular and ocular lobes not prominent, without notch; sides of head nearly straight, diverging posteriorly, postocular temporal margin forming at most an angle of 160° with the ocular margin; temporal lobes with one rounded edge, the posterior; eyes not prominent. Ocular seta not on a projecting wart. Ventral side of head without spines behind the posterior tentorial pits, with or without a pair of such spines before the posterior tentorial pits. Maxillary palp 4-jointed with 3 joints reaching beyond the margin of head.

Pronotum usually slightly narrower than head, with broadly rounded sides, rarely slightly angulated posteriorly. Mesonotum smaller than metanotum, with 1 pair of large colourless warts bearing 1 strong spine, 1 small seta behind it, and usually 1 minute setula near the margin of the alveolus of spine.

Abdominal spiracles on pleurites. Abdomen with trichobothrial hairs on pleura II–IV (as in Fig. 81).

Discussion

Harrison and Johnston, in describing Heterodoxus brevispinosus, wrote: "we include it for the present time within the genus Heterodoxus, but its characters lie in some respects intermediate between that genus and Boopia, and it may later form the type of a distinct genus"; and further "head almost twice as wide as long, roughly hemispherical in shape, with temporal lobes showing a slight truncation with two rounded angles, a condition intermediate between Heterodoxus and Boopia". The two spines on the ventral side of the head "have been mainly instrumental in inducing us to include the species in the genus Heterodoxus ......." The authors noted that the two spines "are not situated at the base of the palps as in the latter genus, but on the chitinous framework which supports the palps, at the level of the eyes". The prothorax is described as "almost as wide as the head, somewhat angulated", but in the specimens before it is rounded, as in Heterodoxus, without any trace of an angle. This character is, indeed, not essential for the genus, because in Ph. spinosa, in contrast to brevispinosus, is more like Boopia than Heterodoxus, the sides of the prothorax are angulated as in Heterodoxus alatus, the only species of this genus with angulated prothorax, this angulation being quite different from all species of Boopia.

Boopia spinosa and Heterodoxus brevispinosus differ in appearance so far from Boopia on the one side and Heterodoxus on the other, and stand in some characters so near together, that they cannot be placed either in Boopia or in Heterodoxus. An additional character common to both species, and found in no species of Boopia or Heterodoxus, is a sharp transverse margin just behind the frontal setae. This is no artificial product of pressure of the cover glass, as one is inclined to think at the first glance, but presents the sharp dorsal margin of the vertico-occipital gliding sinus for the anterior part of the pronotum. This gliding sinus is also present in most species of Heterodoxus, but here it is shallow and its dorsal margin is situated so far back that it escapes observation. In Boopia this sinus is still flatter and without a sharp dorsal margin at all. In both species of Phacogalia sinus occipitalis runs on both sides into the membranous areas of the temporal lobes, reaching their margins. The temporal lobes appear therefore bifurcate, with sclerotized anterior and posterior angles and with a colourless membranous median area. Some Boopia species show a slight inclination to this membranization of the median part of the temporal lobes, but in no species is this character so striking as in Phacogalia.

The keen observation of Harrison and Johnston revealed one more character of Phacogalia brevispinosus, neglected by subsequent authors and present also in Ph. spinosa. Harrison and Johnston found in both sexes on the inner face of the claws "a peculiar empedial modification, consisting of a transparent membranous expansion of the general shape of the claw itself, extending almost to the apex of the claw and projecting ventrally from it". This structure is perfectly clear in both species of Phacogalia and represents the plantar pulvinus, not the empedium, and, in contrast to the empedium, is not free but fused for the most part with the planta of the claw. A pulvinus is present in all Boopidiaceae (Figs. 94 and 101), gradually confluent with the sclerotized cuticle of the claws, while in both species of Phacogalia it forms an anteriorly projecting membranous point simulating a second subsapical point of the claw itself, so that the end of the claw appears as asymmetrically split.

The spines on the ventral side of the head, present in Ph. brevispinosus but absent in Ph. spinosa, do not constitute a generic character. They are not homologous with either the maxillary hooks of Heterodoxus or the alveolar spines of Paraheterodoxus, although similar to the latter. The spines in Phacogalia brevispinosus are situated on the "framework supporting the palps", anterior to the posterior tentorial pits; in Paraheterodoxus they are situated on the anterior ends of the ventrally prolonged occipital sutures just behind the posterior tentorial pits.

I am, indeed, not absolutely convinced of the independent position of Phacogalia based on the characters discussed above. The two species pose an evolutionary problem rather than a diagnostic problem, and the chief motive for putting them both in a distinct genus was to prevent this interesting evolutionary problem, which may be solved by subsequent investigations, from being concealed in a "convenient" diagnostic hiding-place.

KEY TO THE SPECIES OF PHACOGLAIA

1. Head ventrally without pair of stout spiniform setae (Fig. 107) ........................................ brevispinosus
   Head ventrally without pair of stout spiniform setae (Fig. 111) ........................................ spinosa

PHACOGLAIA BREVISPINOSA Harrison & Johnston

(Figs. 90K, 107–110)

Phacogalia brevispinosus, Mjöberg, 1919 (from Phacogala sp.). Thompson, 1939, p. 604
(Ⅳ, from Antechinus flavipes, *Zoo, Sydney, Aug. 1911, A. S. Le Souëf, in GBIT coll.).

Type

The single female type has not been located and is apparently lost. A neotype has therefore been designated.


* See discussion on host identity in Appendix I.
setae is weakly developed, the 4–6 laterals and 2 : 2 small median setae are similar to those of Boopla bettongia. No difference in the female genital chaetotaxy has been found between the populations of different hosts. The gonopophyses are just as in Boopla, triangular, sharply pointed, with a short apical spur and dense accumulation of circular hairless sensilla on their inner margin. The gonopophyses

| MEASUREMENTS OF MALE AND FEMALE PHACOGALIUM BREVISPINOSA FROM ANTECHINUS SPP. |
|-----------------------------------------------|-----------------------------------------------|
| All values given in millimetres. When there are two specimens, measurements of both are given; when there are more than two, the mean is given with the range in parentheses. |

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<tr>
<td>MB</td>
<td>0.31 (0.28–0.34)</td>
<td>0.30, 0.36</td>
<td>–</td>
<td>0.33, 0.33</td>
</tr>
<tr>
<td>MB</td>
<td>0.41 (0.38–0.45)</td>
<td>0.41, 0.44</td>
<td>–</td>
<td>0.44, 0.44</td>
</tr>
<tr>
<td>AB</td>
<td>0.70 (0.64–0.77)</td>
<td>0.70, 0.72</td>
<td>–</td>
<td>0.75, 0.75</td>
</tr>
<tr>
<td>TL</td>
<td>1.21 (1.14–1.65)</td>
<td>1.53, 1.51</td>
<td>1.38, 1.45</td>
<td>1.55, 1.67</td>
</tr>
</tbody>
</table>

* This must be a mixed series containing chiefly specimens from A. stuartii, and possibly A. godmani or A. flavipes. See Appendix 1, 3.H.C.
† Slide numbers of females 1505/18, 20.
‡ Slide numbers of males and females 1505/8, 9.
§ Slide numbers 1505/16, 17.

are provided with only 2–3 long and strong lateral setae, but no projecting edge of their external margin is present, as is also the case in some species of Boopla. The genital sternite is very indistinct, frame-shaped, not rectangular as in some Boopla but more circular, its posterior prolongations ending freely near the lateral border of the postgenital sternite. The abdominal sternites have two rows of setae, the posterior with 10, the externals of which are short weak spines, and the anterior with 10–13 short spiny setae; the tergites have but one row of 3 : 4 : 3 strong setae.

**Hosts**

The nominal host, Antechinus flavipes (Waterhouse), has not been confirmed. Antechinus stuartii Macleay, 1841, A. bellus (Thomas, 1904), A. minimus (Geoffroy, 1803), and A. swainsoni (Waterhouse, 1840) are new hosts.
PHACOGALIA SPINOSA Harrison & Johnston

(Figs. 90f., 111)

Boopla spinoa Harrison & Johnston, 1916, pp. 350–2, fig. 9 (d, 9, from Macropus rutilans, Victoria, A. S. Le Souef); Thompson, 1939, p. 604 (d, 9 types, in GBT coll.); Werneck and Thompson, 1940, pp. 436–9, figs. 42–47 (d, 9 types, in GBT coll.); Werneck, 1948, pp. 16–18 (d, 9 types; d, 9, from Antechinus penicillata Shaw, no locality, BMNH; 1d, 9; nympha and eggs, from A. tapoeta, New South Wales, leg Werneck from skin No. 8500 in USNM. Syn. Heterodoxus brevispinosa Harrison & Johnston).

Types

Lectotype: d, in BMNH (Slide No. 734), det. G.B.T., from Macropus rutilans [labelled as Wallabia bicolor], Victoria, A. S. Le Souef [identified as Boopla spinoa].

Paratype: 9, in BMNH (Slide No. 735), data as lectotype.

Material examined

Phacogale tapoeta, F.E.W., 2d, 39, 1 nymph, Western Australia, 35–145362, 1949–62.

Ex. 2736 (1496/1, 1505/4) [identified as Boopla spinoa]. 6d, 4v, 7 nymphs, Buxton, Vic., 1.iii.1962, R. M. Warrenke (1503/3, 1513/1–5).

Description and discussion

Phacogala spinoa is very well described and illustrated by Harrison and Johnston and subsequently by Werneck and Thompson, who revised the types. Werneck (1948) has, in a long but unconvincing argument, given his reasons for considering Ph. spinoa and brevispinosa identical, but without having seen the last-named species. The spins on the underside of the head of brevispinosa are no product of the imagination of Harrison and Johnston but exist in all specimens and in both sexes before me. These spins are wanting in Ph. spinoa. The “simplex zones expressadas que não se destacam de superfície do tegumento visíveis unicamente em boas preparações” indicated “em linha postilhada” in figure 43 (Werneck and Thompson 1940) are, in all Boopla species, more or less distinctly visible and represent the posterior ends of the hypostomal rim or, perhaps, the rudiments of maxillary cardines, which normally articulate in insects on the posterior end of the hypostomal rim just anteriorly to the posterior tentorial pits (Fig. 111).

Male genital armature very distinct from that of Ph. brevispinosa (Fig. 90L). Vulva with a continuous ring of 8–10 marginal setae, the 2nd external the longest, as in Boopla, generally divided by a small median gap into groups of 4: 4, 5: 5 or asymmetrically 4: 5, 5: 4, or 4: 6 setae. Genital sternite in 1 female (1505/3) distinct, bipartite, consisting of 2 arched rims not connected anteriorly with one another. Their posterior ends run freely out near the lateral margins of the postgenital sternite. Postgenital marginal setae as in brevispinosa. Postgenital sternite in the above-mentioned female distinct, narrowly bowl-like, reaching from one side of the postgenital sternum to the other. Gonopophyses triangular, with a short apical spur, 2–3 strong setae on the inner wall, but not on a projection of the external margin, and with an accumulation of circular hairless sensilla along their inner margin.

Abdominal sternites with 1 posterior row of 12 strong setae, both the externals being shorter, and with 1 anterior row of 5–6 short setae, tergites with 1 row of 2: 4: 2 strong spinous setae.

Measurements (in mm) 8 males, mean and range: HL 0.27 (0.26–0.28); HB 0.41 (0.41–0.42); HI 1.65 (1.50–1.87); PRb 0.38 (0.36–0.40); MDb 0.30 (0.29–0.32); MDb 0.39 (0.36–0.44); TL 1.62 (1.60–1.71).

Measurements (in mm) 7 females, mean and range: HL 0.27 (0.26–0.29); HB 0.42 (0.41–0.44); HI 1.53 (1.43–1.66); PRb 0.40 (0.38–0.40); MDb 0.31 (0.25–0.33); MDb 0.40 (0.36–0.44); TL 1.66 (1.52–1.78).

Hosts

Phacogale tapoeta (Meyer, 1793) is confirmed as a host. Specimens have not been seen from the nominal host, Wallabia bicolor (Desmarest, 1804) syn. M. rutilans.

Genus MACROPOPHILA Mjöberg

Macrophophila Mjöberg 1919, p. 95; Werneck and Thompson, 1940, p. 444 (syn. Heterodoxus).

Type species Macrophophila forcipata Mjöberg, 1919.

Species

M. bicrusata, sp. nov., brevicrusata, sp. nov., clayae, sp. nov., forcipata Mjöberg.

Description

Head with a strong horn-shaped posteriorly-directed projection posterior to base of each maxillary palp, but without strong dilatations of margin. Preocular and ocular lobes not prominent, without notch; sides of head nearly straight, diverging posteriorly, postocular temporal margin forming at most an angle of 160° with the ocular margin; temporal lobes with but one rounded edge, the posterior, eyes not prominent. Maxillary palp 4-jointed with 3 joints reaching beyond the margin of head. Ocular seta not on a projecting wart. Third temporal seta nearer to the 2nd than to the posterior margin of the antennal groove or in equal distance.

Pronotum usually slightly narrower than head, with broadly rounded sides. Prosternite with 3 lateral macrochaetae, with 2 spines between the 1st and the 2nd, and with 2: 1.65 (1.50–1.87) and 2–6 posterior discal spines (Fig. 112). Mesonotum smaller than metasternum, with 1 pair of large colourless warts bearing 1 strong spine, 1 small seta behind it and usually 1 minute setula near the margin of the alveolus of spine. Posterior margin of metasternum between the long seta and the posterior metapleural spine with 1–3 short spines and 2–3 very fine short setulae (Fig. 114).

Abdominal spiracles on tergites. Abdominal pleurae VII and VIII in both sexes thickened, brown coloured, VIII rounded and projecting posteriorly, trichobothrial hairs on II–IV (as in Fig. 81). Stermites with 1 marginal and 1 regular discal row of setae, tergites II–VII with 1 marginal seta, the tergal marginal rows with short intercalaries.

Dorsolateral sclerites of vesica hooked anteriorly towards the midline. Postgenital sternum of female with an oval, colourless area in the middle of its posterior margin, containing a group of 6–11 sensilla (Fig. 113).

Discussion

I have decided to exclude Macrophophila with its four known species from the genus Heterodoxus. Macrophophila differs much more and constantly, in a number of characters, from all other species of Heterodoxus than Dendrolagis Mjöberg, which I
have, in contrast to previous authors, synonymized with *Heterodoxus*. The four species of *Macropophilia* differ from *Heterodoxus* in the following characters: (1) Enlarged and posteriorly prominent pleurae VII and VIII; (2) Third temporal seta situated near alveolus of second (shown in *Heterodoxus* only in *H. ampullatus*); (3) Two spines on the lateral margins of prosternite between the first and second macrochaetae, which do not occur in any species of *Heterodoxus*; (4) One to three strong spines on the posterior margin of the metanotum between the median macrochaeta and the metapleural spine; (5) A small, median, colourless semicircular area on the posterior margin of the wholly chitinized postgenital sternum of female, provided with a group of small setae, this area being absent in all *Heterodoxus*; (6) Lateral sclerites of the vesica hooked anteriorly medial, which does not occur in any species of *Heterodoxus*; (7) Gonapophysyes elongated, much longer and more slender than in *Heterodoxus*.

Mjöberg has based his genus on the following characters: (1) Gemmal notches deeper; (2) Spines behind maxillary palpi smaller; (3) Mesothorax much reduced, with four strong spines between the coxae; (4) Metathorax with posterior angles produced into an obtuse process carrying a very long hair; (5) Abdomen with regular rows of 30-40 fine flattened chitinous setae and six longitudinal rows of much longer hairs; (6) Last segment in female ending in two forceps-like, sharply pointed movable processes; (7) Lateral sclerites of, especially, the preceding segment very strongly developed, dark brown, well set off and protruding backwards in both sexes. Of the above characters it must be noted that the gemmal notches are not deeper. The spines behind the maxillary palpi are smaller, their length varying in *Macropophilia* (3 species) between 72 and 100 μm and in *Heterodoxus* between 87 and 174 μm. This character does not, therefore, possess any diagnostic value. The mesosternite has, in all species of *Heterodoxus* except *salabati*, four spines on the posterior end; this character has consequently no diagnostic value. The posterior angles of the metathorax, i.e. the metapleurae, are, in intact specimens, not prolonged posteriorly but they suffer readily under the pressure of the cover glass, shifting more posteriorly. The setae on the abdominal segments are not flattened. The "movable processes" on the apex of the female abdomen are the gonapophysyes. Pleurites VII and VIII are really enlarged and prolonged posteriorly, and this is the chief characteristic of *Macropophilia* absent in all *Heterodoxus*.

KEY TO THE SPECIES OF *MACROPHOLOGA*

1. Long marginal setae of sternites II-VI not regularly interspersed with shorter setae .... clavata
   Long marginal setae of sternites II-VI regularly interspersed with shorter setae .... 2
2(1). Females ................................................................. 3
2(2). Males .................................................................................................. 5
3(2). Sternite VIII with 18 setae ................................................... forcipata
   Sternite VIII with 14 or less setae .................................................. 4
4(3). Anterior margin of genital sclerite deeply concave with lunula ...................... biarcuata
   Anterior margin of genital plate flatly concave without lunula .................. brevicaudata
5(2). Anterior hooks of dorsal lateral plates of vesica with ear-like appendages on outer margin; ends of parameres straight (Fig. 11) ................................................ brevicaudata
   Anterior hooks of dorsal lateral plates of vesica without ear-like appendages; ends of parameres bent inwards (Fig. 12) ................................................ brevicaudata

MACROPHOLOGA BIARCUATA, sp. nov.

(Figs. 9-11, 13, 112C, 112D, 114, 115B, 116F)

*Heterodoxus forcipatus*, Wernke, 1948, p. 24, fig. 6 (19, from *Thylagale thetis*, Mt. Tamborine, Qld.)

Types
Paratypes: 2♂, 1♀, in BMNH, ANIC. 1♂, 1♀, data as for holotype (1496/47-50), 1♀, from *T. thetis*, Mt. Tamborine, Qld. (1505/50); 1♂, 1♀, from *T. thetis* (CM 79), Mt. Tamborine, Qld., 7.viii.1960, J. H. Calaby (1496/44-46).

Material examined
*Thylagale thetis*—Holotype and 2♂, 1♀ paratypes; 2 nymphs (CM 79), Mt. Tamborine, Qld., 7.viii.1960, J. H. Calaby (1496/43).

*T. stigmaticata*—♀, Tooloom Scrubs, N.S.W., 17.i.1962, J. H. Calaby (1496/43).

Description
Prosternite with 2-3 anterior and 1♂-3 apical discal spines. Marginal rows of sternal setae on abdominal segments II-VI with short intercalary setae.

Male.—Dorsal lateral plates of vesica with a pointed ear-like appendage on the outer margin of their anterior hook. Ends of parameres straight.

Measurements (mm) 35 holotype and 2 paratypes, mean and range: HL 0.39 (0.38–0.39); HB 0.60 (0.58–0.61); PH 0.54 (0.52–0.56); PH 0.57 (0.57–0.58); MM 0.42 (0.39–0.44); MB 0.58 (0.55–0.59); AB 0.83 (0.82–0.84); SL 0.10; SD 0.22 (0.21–0.23); STm 0.02; TL 2.68 (2.57–2.76).

Female.—Anterior margin of genital sternite in female deeply concave with a weak but distinct lunula. Vulva with 6-9 marginal setae each side of the midline, its posterior margin flatly concave. Genital papilla as in clavata, sp. nov. (Fig. 115).

Measurements (mm) 14♀, including 13 paratypes, mean and range: HL 0.39 (0.36–0.42); HB 0.50 (0.50–0.62); HD 1.49 (1.39–1.63); PH 0.56 (0.54–0.58); MM 0.40 (0.36–0.44); MB 0.57 (0.54–0.59); AB 0.84 (0.81–0.87); SL 0.09 (0.09–0.10); SD 0.20 (0.15–0.25); STm 0.02; TL 2.76 (2.71–2.87).

Discussion
*M. biarcuata* is very similar to *clavata*, on average smaller, differing in genital characters of male and female, and in the posterior ventral row of marginal setae having short intercalary setae.

Hosts
The nominal host is *Thylagale thetis* (Lesson, 1827); *T. stigmaticata* Gould, 1860 is also recorded as a host.

MACROPHOLOGA BREVIARCUATA, sp. nov.

(Figs. 14-16, 112E, 112F, 115C, 116F)

Wernke, 1941, p. 47 (1♂, 1♀, from *Thylagale stigmaticata*).
Types

Holotype: ♂, in ANIC (Slide No. 1497/3), from Thylagale stigmatica willoxi, 19.ii.1960, Mt. Lindesay, N.S.W., J. H. Calaby.
Paratypes: 1♀, with holotype in ANIC (Slide No. 1497/2); 1♂, 1♀, from Thylagale stigmatica, 4 miles SW. of Atherton, Qld., 30.x.1963, K. Keith, in BMNH (Slide No. 1505/49).

Material examined

Thylagale stigmatica.—Holotype and paratypes.

Description

Pronotum with 2–3 anterior and 1(♂)?–3 apical discal spines. Marginal rows of sternal setae on abdominal segments II–VI with short intercalary setae.

Male.—Dorsal lateral plates of vesica without appendage on their hooked anterior ends. Ends of parameres bent inwardly.

Measurements (mm) 2♂, holotype (1497/2) followed by paratype 1505/9): HL 0.41, 0.39; HB 0.61, 0.61; HI 1.50, 1.56; Ptb 0.55, 0.57; Mtb 0.41, 0.41; Mtb 0.54, 0.52; AB 0.80, 0.75; SL 0.19, 0.09; SD 0.24, 0.24; Sth 0.02, 0.02; TL 2.58, 2.58.

Female.—Anterior margin of genital plate in female flatter concave, without lumina. Vulva with 5–7 marginal setae each side of the midline, its posterior margin more deeply excavated but not as deep as in clayae. Genital papilla slightly greater than in breviarcuta and forciapatia (Fig. 115).

Measurements (mm) 2♀, paratypes (1497/2, 1505/9): HL 0.39, 0.41; HB 0.61, 0.59; HI 1.56, 1.46; Ptb 0.55, 0.55; Mtb 0.41, 0.41; Mtb 0.57, 0.54; AB 0.86, 0.80; SL 0.09, 0.09; SD 0.23, 0.24; Sth 0.02, 0.02; TL 2.76, 2.76.

Discussion

M. breviarcuta is very similar to clayae and bizarcuta, probably a little smaller than the latter, differing from it only in the sexual characters of both males and females, and from clayae by the presence of short intercalary setae in the marginal rows of pregenital abdominal sternae.

Host

The nominal host is Thylagale stigmatica Gould, 1860.

MACROPUSPHILA CLAYAE, sp. nov.

(Figs. 5–8, 112A, 112B, 113, 115A, 116A–116D)


Types

Holotype: ♂, in ANIC (Slide No. 1496/40) from Thylagale billardi, Maydena, Tas., 23.xii.1958, B. C. Mollison [identified as H. forciapatia].
Paratypes: 1♂, 1♀, in BMNH, ANIC. 1♂, 1♀, data as holotype, 1959–667 (1496/40); 1♂, 1♀, from T. billardi, Maydena, Tas., 31.i.1960, T. Andersen (1505/54); det. F.L.W., 1♂, 2♀, from Macropus billardi, Furneaux Is., Tas., R. N. Atkinson, 1913–450 (1505/51–53) [all identified as H. forciapatia]. 1♂, 1♀, from T. billardi, Maydena, Tas., 25–27.viii.1960, B. C. Mollison (1518/4–6); 3♂, 3♀, from T. billardi, Flinders I., Furneaux Group, Tas., 10.xii.1960, D. L. McIntosh (1518/1–3).

Material examined

Thylagale billardi.—holotype and 10♂, 12♀ paratypes. Syn. Macropus billardi: 1♂, 1♀ paratypes.

Description

Prosternite with 4–6 anterior and 3–6 apical discal spines. Marginal rows of sternal setae on abdominal segments II–VI without short intercalary setae.

Male.—Anterior hooks of dorsal lateral plates of vesica prolonged into denticulated plates projecting anteriorly and posteriorly (Fig. 7).

Measurements (mm) 12♂, holotype and paratype, mean and range: HL 0.42 (0.39–0.42); HB 0.62 (0.59–0.64); HI 1.47 (1.43–1.53); PB 0.60 (0.58–0.61); Mtb 0.44 (0.42–0.45); Mtb 0.58 (0.55–0.60); AB 0.80 (0.77–0.83); TL 2.88 (2.60–3.02).

Female.—Vulvar margin deeply concave with 4–5 setae of equal strength and 3–4 small and weak intercalary setae both sides of the median emargination. Genital sternite anteriorly flatter concave, without lumina. Genital papilla very fine, conical (Fig. 115).

Measurements (mm) 13♀, paratypes, mean and range: HL 0.43 (0.42–0.45); HB 0.63 (0.58–0.66); HI 1.46 (1.40–1.52); PB 0.61 (0.52–0.65); Mtb 0.44 (0.41–0.46); Mtb 0.59 (0.57–0.62); AB 0.89 (0.80–0.94); TL 3.02 (2.76–3.23).

Discussion

The description and especially the figures of this species published by Wernec (1948) under M. forciapatia are sufficient for identification with the specimens of the type series before me. Figures 7 (male), 10 (female apex, ventral), and 12 (male genitalia) in Wernec’s paper represent clayae, sp. nov.; figure 6 (female) is that of M. bizarcuta off Thylagale inaeulis, but figures 8 (head of female), 9 (female apex, dorsal), and 11 (male apex, dorsal) are not identifiable with certainty.

Host

The only host known at present is Thylagale billardi (Desmarest, 1822).

MACROPUSPHILA FORCIAPATIA Möjberg

(Figs. 78–80)

Macropus forciapatia Möjberg, 1919, p. 95 (♂, ♀, from Macropus cosseni).

Type

Apparently missing from Möjberg collection in Naturhistoriska Riksmuseet, Stockholm.

Material examined

Thylagale stigmatica.—syn. Macropus cosseni: 9 within last nymph, from skin in Stockholm Museum collected by E. Möjberg. Cedar Creek, Qld., 29.xii.1913, C. Moreby, Naturhistoriska Riksmuseet, Stockholm.
Description

Prosternite with 2-3 anterior and 1(?)–3 apical discal spines. Marginal rows of sternal setae on abdominal segments II–VI with short intercalary setae.

Male.—According to original description with the "apical ventral segment rounded, with 6 very long stiff hairs".

Measurement (mm) TL 2.3 (after Mjöberg).

Female.—Vulva with 3 long stout setae each end and 1 + 2 finer setae.

Measurement (mm) TL 2.45 (after Mjöberg).

Discussion

The original description is insufficient to ensure the identification of the species. Mjöberg's statement that the males have "six long stiff hairs" on the rounded "apical ventral segment" and "the next last ventral segment in female deeply excised in the middle of the hind arm and armed with eight exceedingly long, stiff chinious hairs, four on each side" together with his generic characters of Macrophila in which the "last segment in females ending in two forceps-like sharply pointed movable processes" and "the lateral sclerites of especially the preceding segment very strongly developed, dark brown, well set off and protruding backwards in both sexes" makes only the genus recognizable.

I have before me a female within the last nymph, which Mr. C. Moreby of the British Museum (Natural History) was successful in finding on the skin of Macropus coxeni, the only specimen of this kangaroo collected by Mjöberg (1916), and sent through kind cooperation of Dr. H. Stenram of the Zoological Institute, University of Lund, and Dr. C. Edelstam of the Naturhistoriska Riksmuseet, Stockholm, to Dr. Theresa Clay. This female is specifically not identifiable with the original description. Only two non-diagnostic facts, firstly that the specimen before me differs specifically from the three other species of this genus, and secondly that it comes from the only original skin of Macropus coxeni which supplied the type series, make it nearly sure that this specimen is conspecific with the type series of M. forcipata Mjöberg. This specimen cannot be designated as neotype, because we cannot exclude the possibility that Macropus coxeni may be the host of one or two other species of Macrophila.

The last nymph before me, 2.48 mm long, is in very good condition, with clearly visible, fully sclerotized, brown cheloathy of the female, very easily distinguished from the chaetothy of the nymph, which, where the setae are lost, is clearly recognizable by the alveoli. All the generic characters mentioned above in the discussion of the genus, except the position of the third temporal seta, could have been based on this specimen. The outline of the whole body of the nymph is in good condition, except that the thorax is somewhat distorted in breadth. The outline of the head is like that of M. bicurcata, sp. nov., and slightly different from that of the other two species, but not having studied the outlines of heads of boopid nymphs, I am not able to say how far these coincide with the outlines of the imago. The ocular seta of the female (that of the nymph is lost on each side) is minute, as in all other species of the genus. The gonapophyses are clearly visible with one thin and sharp apical spur 50 μm long, and 8 strong setae directed medially. The prosternite is distorted in breadth (5μ), consequently not triangular, with three strong anterior
discal and one small posterior apical spine in the female. The anterior corners have one long seta each side in female and nymph. The lateral margins have two strong spines on both sides in female and nymph (generic character), and one short spine on both sides, laterally of the latter, in the nymph only. Curiously enough, the posterior pair of the long setae are represented by only one seta in the nymph. The genital papilla is distinct, bluntly conical, 20 by 20 μm. The spermathecal duct is perceptible for about 100 μm of its length. The maxillary hooks of the female are 80 μm long, and those of the nymph 70 μm long. Head 0.348 mm long. 0.609 mm broad. Head index 1.75.

Host

The only record of this species is the original, from the nominal host Thylogale stigmatita Gould, 1860, syn. Macropus coxeni.

Genus HETERODOXUS Le Souef & Bullen


Dendrolagus Mjöberg, 1919, p. 94; Thompson, 1939, p. 606; Werneck and Thompson, 1940, pp. 449–1.

Type species Heterodoxus macropus Le Souef & Bullen, 1902.

Species

H. alatus, sp. nov., ampullatus, sp. nov., ancuratus, sp. nov., calabyi, sp. nov., longitarus Piaget, maai Emerson, macropus Le Souef & Bullen, mitratus, sp. nov., octoceratus, sp. nov., pygidialis Mjöberg, quadriferatius, sp. nov., spiniger Enderlein, wallabii Pimmey.

Description

Head with a strong horn-shaped posteriorly-directed projection posterior to base of each mandibular palp, without strong dilatations of margin. Precocular and ocular lobes not prominent, without notch; sides of head nearly straight, diverging posteriorly, postocular temporal margin forming at most an angle of 160° with the ocular margin; temporal lobes with but one rounded edge, the posterior, eyes not prominent. Ocular seta not on a projecting wart. Third temporal seta located nearer to the posterior margin of the antennal groove than to the 2nd temporal, except in H. ampullatus. Maxillary palp 4-jointed with 3 joints reaching beyond the margin of head.

Promeson usually slightly narrower than head, with broadly rounded sides, rarely slightly angulated posteriorly. Prosternite with 1 or 2 lateral macrochaetae, with or without 1 lateral spine. Apical discal spines wanting except in H. mitratus and maai. Posterior margin of metanotum without spines, with some small setulae only. Mesonotum smaller than metanotum, with 1 pair of large colourless warts bearing 1 strong spine, 1 small seta behind it, and usually 1 minute setula near the margin of the alveolus of spine.

Abdominal spiracles on tegrites. Abdomen with trichobothrial hairs on pleurae II–IV (as in Fig. 81). Pleurae VII–VIII neither thickened nor projecting posteriorly. Stermites II–VI with one marginal row of setae without intercalaries except in
H. amputatus, and with 1 or 2 more or less regular dorsal rows of setae. Tergites II–VI with 1 marginal row of setae and either with intercalaries or with more or less remote, but not intercalating, rather irregular rows of shorter setae.

Dorsolateral sclerites of vesica not hooked anteriorly towards the midline. Postgenital sternum in female without oval colourless sensory area, except in H. macropus.

Discussion

The presence of one pair of cuticular spines behind the maxillary palpi, the absence of the postocular marginaliums, and the acutely rounded temporal lobes as characters distinguishing Heterodoxus from Boopis have been noted by Harrison and Johnston (1916). My inclusion of Dendrologia psyllidus in Heterodoxus does not influence the above diagnosis, the emargination of the lateral margins of head in this species being so shallow that it does not change the general outline of the head.

Mjöberg's statement that the temporal lobes of the head of Dendrologia are "well set off as in the genus Boopis" is much exaggerated.

Other important characters of the genus Heterodoxus are that it never possesses a handle on the anterior margin of the anterior median vesical plate, that the vesical posterior median plate is never lyrate, and that the gonapophyses are never fused with the ninth abdominal segment and never bear a projecting dilatation on their external margin. The last character occurs also in some species of Boopis.

KEY TO SPECIES OF HETERO DOXUS

1. Prosternite quadrangular, corners rounded with 1 normal seta on the anteriorlateral and 1 spineon the posterolateral corner, without other lateral setae........................................... psyllidus

   Prosternite triangular, laterally with 2–3 macrochaetae each side and 1 spiniform seta posterior to the 1st macrochaeta (Fig. 1238) .................................................................................................................................................. amputatus

   Prosternite with 3 lateral macrochaetae and 1 spiniform seta between the 1st and 2nd macrochaeta (Fig. 1238) .................................................................................................................................................. amputatus

   Prosternite with 2 lateral macrochaetae and 1 spiniform seta between them (Fig. 1248). 3

   Prosternite posteriorly with spiniform setae (Fig. 1248). 4

   Prosternite posteriorly without spiniform setae ................................................................................................................................................................................................. 5

4. Male vesica strongly sclerotized, rigid, bottle-shaped with rounded anterior end, membranous posteriorly, uniformly denticulated all over (Fig. 54). Female genital papilla small, conical, rounded anteriorly (Fig. 1152); vesica 4–5 central ones shorter ........................................................................................................................................... mitratus

   Male vesica not as above; with patch of spines comprising 2 groups of 6–7 vertical rows of short stout overlapping spines separated by area of thorny-like spines (Figs. 74, 76). Female genital papilla elongate (Fig. 1155); vesica with 4 long stout setae each side and 8 short fine setae in central emargination (Fig. 77) .................................................................................................................................................. maasi

5. Posterior margin of tergites IV–VI at least with a wide semicircular indentation each side (Fig. 22), sternite II with finger-like prolongations extending to base of marginal setae ......................................................... 6

   Tergites without such indentations; sternite II without such prolongations .............................................................................................................................................................. 7

6. Dorsolateral vesical sclerites each prolonged anteriorly as a broad plate; vesica with semi- circular thickening (Fig. 23). Female postgenital sternum with 4 median setae posterior to and distinct from marginal row (Fig. 120) .......................................................................................................................................... longitarsus

   Male genitalia not as above; vesica anteriorly with anchor-shaped sclerite. Setae of female postgenital sternum not as above ............................................................................................................................................... ancesetus

7. Males ...................................................................................................................................................... 8

   Females .................................................................................................................................................. 14

8. Vesica with 2–4 long (over 46 μm) spines arranged in pairs ................................................................................................................................................................................... spiniger

   Vesica without spines or with shorter more numerous ones ................................................................................................................. 9

9. Vesica without longitudinal rows of denticiles (Fig. 118) ........................................................................................................................................................................................... spiniger

   Vesica with longitudinal rows of denticiles .................................................................................................................................................. 10

10. Vesica with about 10 longitudinal rows of denticiles, their bases confluent, forming parallel ribs between the pairs of long spines; a large oval brush of strong dense spines between the posterior pair of spines and the median plate (Fig. 50) ........................................................................................................................................... macropus

   Vesica with 5 rows of short denticiles, their bases not confluent; behind the posterior pair of spines a large oval area of dense scales denticulated on their margins (Fig. 122). 11

11. Vesica anterior to the plates with longitudinal rows of long spines ............................................................................................................................................................... 12

   Vesica anterior to the plates without longitudinal rows of long spines .................................................................................................................................................. 13

12. Vesica anterior to the plates with less than 5 longitudinal rows of stout spines within an oval more finely denticulated area (Fig. 62) .......................................................................................................................................... quadridentatus

   Vesica anterior to the plates with over 6 longitudinal rows of stout spines within a long brush of fine denticiles (Fig. 58) .................................................................................................................................................. octodentatus

13. Vesica with 2 large conical brushes of dense strong spines lying just anterior to dorso- lateral sclerites (Figs. 27, 28) .................................................................................................................................................. ubalbari

   Vesica without such brushes. Dorsolateral sclerites of genitalia paddle-shaped (Fig. 45) .................................................................................................................................................. calybdy

14. Genital papilla strongly sclerotized and situated within horseshoe-shaped sclerite (Fig. 1152) .................................................................................................................................................. macropus

   Genital papilla not as above ............................................................................................................................................................................................... 15

15. (14). Genital papilla wider or as wide as long (antero-posterolateral) .................................................................................................................................................. 16

   Genital papilla longer (antero-posterolateral) than wide .............................................................................................................................................................. 17

16. (15). Genital papilla broadly rounded anteriorly (Fig. 1158) .................................................................................................................................................. spiniger

   Genital papilla conical (Fig. 1150) .............................................................................................................................................................. octodentatus

17. (15). Genital papilla pointed anteriorly ............................................................................................................................................................................................. 18

   Genital papilla rounded posteriorly ................................................................................................................................................................. 19

18. (17). Vulva with 4–8 strong marginal setae each side of median group of 1–4 shorter ones .................................................................................................................................................. calybdy

   Vulva with continuous row of 20–23 strong marginal setae .................................................................................................................................................. 19

19. (18). Genital papilla bordered anteriorly by semicircular dark brown sclerite (Fig. 1158); vulva with continuous row of 16 strong marginal setae ........................................................................................................................................... ubalbari

   Genital papilla not bordered anteriorly by semicircular sclerite; vulva with 4–5 strong marginal setae each side of midline .................................................................................................................................................. quadridentatus

HETERODOXUS ALATUS, sp. nov.

(Figs. 30–33, 115X, 1167, 121, 122)

Types


Material examined

Thylgoide brujini. – syn. T. brujini brujini: holotype and 2d, 29 paratypes.

Description

Temple behind eye straight. Third temporal seta near posterior margin of antennal groove (Fig. 117). Prothorax distinctly narrower than head. Prosternite triangular with 2 lateral macrochaetae and 1 spine between them, without apical (posterior) spines. Marginal rows of setae on sternites II–VI without intercalaries.
Male. Vesica with patch of spines comprising two groups of 6–7 vertical rows of short stout overlapping spines separated by an area of thorn-like spines (Figs. 74 and 76).

Female. Genital papilla elongated (Fig. 115F), surrounded by horseshoe-shaped area lightly pigmented posteriorly. Vulvar margin with 4 long stout setae each side and 8 short fine setae in central emargination (1IV).

Measurements (in mm) male and female, after Emerson (1962): TL 3.47, 3.45.

Host

The nominal host is Dorocopulus veternum (Lesson, 1827).

HETERODOXUS MACROPS (Le Souef & Bullen) (Figs. 48–51, 115L, 116V)


Heterodoxus longitarsus, Harrison and Johnston, 1916, pp. 352–3, fig. 11 (from Macropus giganteus and M. stigmaticus); Werneck, 1941, p. 47 (1D, 1V, from Thylogale stigmaticus, Queensland, 1D, from M. agilis, Queensland).

Types

Lectotype here designated: 1D, in USNM, from “black wallaby”?, Victoria, Le Souef (remounted by E. W. Stafford, original label not preserved).

Parallectotypes: 1D, 2F, in USNM, data as lectotype.

Material examined

Macroopus giganteus. 2D, 2F, Townsville, Qld., 1929, G. Dennes, BMNH (1496/65, 1497/9–11).

Thylogale stigmaticus. 1D, 1V, Queensland, A. S. Le Souef (1505/47, 48).


Description

Templesthe eye straight, 3rd temporal seta near margin of antennal groove (Fig. 117). Prothorax distinctly narrower than head. Prosternite triangular with 2 lateral macrochaetae and 1 spine between them, without spiniform setae posteriorly. Marginal rows of setae on sternites II–IV without intercalaries.

Male. Vesica with about 10 longitudinal rows of dendrites between the pairs of long spines, their bases confluent forming parallel ribs; a large oval brush of strong dense spines between the posterior pair of spines and the median plate.

Measurements (in mm) 75 including holotype and paratype, mean and range: HL 0.44 (0.42–0.47); HH 0.64 (0.53–0.65); HB 1.46 (1.38–1.50); Prh 0.55 (0.53–0.57); Mr 0.43 (0.35–0.45); MB 0.56 (0.54–0.57); AB 0.98 (0.94–1.02); STL 0.15 (0.15–0.16); SD 0.27 (0.26–0.28); STR 0.03 (0.02–0.04); TL 2.77 (2.61–2.90).

Female. Genital papilla strongly sclerotized, conical and rounded at tip, and situated within a strongly sclerotized, horseshoe-shaped sclerite (Fig. 115L). Mouth of spermathecal duct opening apically on papilla. Vulvar margin straight, membranous in the median third and with 3–10 setae each side of the midline; subgenital sclerite deeply emarginate. Genital sternite flatly emarginate anteriorly, without humula. Post-genital sternite with a continuous row of marginal setae, about 12 of the median ones flanked each side by a long strong seta, nearly twice as long as the innermost of the lateral series. Just dorsal to the median series are 4 stronger supplementary setae with larger circular alveoli.

Measurements (in mm) 12Y including 2 paratypes, mean and range: HL 0.44 (0.43–0.46); HB 0.65 (0.60–0.68); HB 1.45 (1.36–1.56); Prh 0.56 (0.53–0.60); Mr 0.45 (0.41–0.48); MB 0.57 (0.49–0.61); AB 1.05 (1.00–1.12); STL 0.15 (0.14–0.16); SD 0.27 (0.25–0.28); STR 0.03 (0.03–0.04); TL 2.82 (2.67–3.03).

Discussion

H. macropus is similar to alatus, sp. nov., not only in having two pairs of vesical spines but also in the chaetotaxy of the abdominal segments, which is quite different from that of spiniger. The females of macropus are easily recognizable by their peculiar genital papilla.

Hosts

The hosts are Macropus giganteus Shaw, 1790, Wallabia agilis (Gould, 1842), and Thylogale stigmaticus Gould, 1860. The nominal host, the “black wallaby”, Wallabia bicolor (Desharnes, 1804) has not been confirmed.

The specimens from Thylogale stigmaticus bear double red-bordered labels on the backs of both slides and are probably those seen by Werneck (1941). Those from Wallabia agilis were collected in 1963 and represent a confirmation of the record of Werneck (1941). The specimens from Macropus giganteus were collected in 1929 and cannot be those seen by Harrison and Johnston (1916).

HETERODOXUS MITRATUS, sp. nov. (Figs. 52–55, 115L, 116V, 124)

Types

Holotype: d, in BMNH (Slide No. 1497/19), from Dorocopus vanheurni, 13.xii.1940, Mt. Mura, east Papua, Shaw Mayer, 968.

Paratypes: 1D, 4F, in BMNH (Slide Nos. 1497/18, 19), data as for holotype.

Material examined

Dorocopus vanheurni. Holotype and 1D, 4F paratypes.

* Hopkins (1946, p. 176) has discussed fully the action of various authors in relation to macroopus. He concluded that Paine’s redescription (1912, p. 361) of macroopus from syntypes (2D, 2F) sent to Paine by Le Souef, and including for the first time the name of the host, should be regarded as a restriction of the species. Hopkins (1946, p. 177), therefore, formally restricted the name macroopus to the species represented by these syntypes from the black wallaby. Through the kindness of Dr. K. C. Emerson it has been possible to examine two males and two females now in the U.S. National Museum which are almost certainly those described by Paine and from which a lectotype has been designated. These prove to be the species described here. Wallabia bicolor has not been confirmed as the true host, but other specimens of H. macroopus have been taken from W. agilis. Plowman (1940, p. 21) thought that two males in the Le Souef collection from the black wallaby were those seen by Paine, presumably believing that they had been returned; he found that they were conspecific with his new species wallabia. Hopkins, misled by this statement, considered wallabia to be a synonym of macroopus. It now seems most unlikely that these two males were seen by Paine, the four specimens belonging to another species having been found in the United States. T.C.
Male.—Vesica with 5 rows of short denticles between the 2 pairs of long spines, their bases not confluent (Fig. 122); behind the posterior pair of spines, a large oval area of dense scales denticulated on their margins.

Measurements (in mm) 3d, holotype and paratypes, mean and range: HL 0.45; HB 0.67; HI 1.26; PrB 0.54 (0.51–0.54); MB 0.45 (0.38–0.44); MB 0.51 (0.48–0.52); AB 0.93 (0.87–0.97); SL 0.17 (0.16–0.17); SD 0.25 (0.20–0.25); STH 0.03; TL 2.80 (2.61–2.80). In the male 1503/4–1 the head is remarkably deformed, and the measurements of HL, HB, HI are not included.

Female.—Genital papilla bordered anteriorly by semicircular dark brown sclerotized ring (Fig. 115). Vulvar margin straight, membranous in its median third, with a continuous row of 16 (19) strong marginal setae; the subgenital sternite flatly emarginated posteriorly, genital sternite anteriorly deeply emarginate, the emargination bordered both sides by a clear fine line. Genital papilla short, conical, with rounded tip, well sclerotized. Postgenital marginal row of setae as in macropus, but with about 20 short median setae between the pair of strong ones.

Measurements (in mm) 39 paratype: SL 0.15; SD 0.16; STH 0.03; TL 2.55. The female is damaged and not measurable in all details.

Discussion
This species is a typical Heterodoxus, approaching macropus, with one dorsal row of abdominal setae intercalated by short ones, and with one sternal marginal row without intercalaries and two discal rows, the posterior more regular and dense, the anterior more scattered and irregular. The genitalla, especially the male copulatory organ, are similar to those of macropus and spiniger, with two pairs of long vesical spines, but with a very different armature of vesical plates.

Host
The nominal host is Thylogale bruni (Schreber, 1778).

HETERODOXUS AMPULLATUS, sp. nov. (Figs. 34–38, 115G, 116P, 123)

Types
Holotype: ♂, in ANIC (Slide No. 1512/43), from Petrogale penicillata, 20.ii.1964, Jenolan, N.S.W., J. Bishop.
Paratypes: 39, in ANIC, BMNH (Slide Nos. 1512/43, 44), data as holotype.

Material examined
Petrogale penicillata: holotype and paratypes.

Description
Temple behind eye straight. Third temporal seta near 2nd (Fig. 123). Prosternite triangular with 3 lateral macrochaetae and 1 spine between 1st and 2nd (Fig. 123). Marginal rows of setae on sternites with intercalaries. Tergites II–VI with marginal row of setae only with intercalaries; sternites with 1 marginal and 1 discal row.

Male.—Dorsoscutal vesical sclerites bent anteriorly at right angles towards midline and connected by the transverse base of a densely scaled area of the vesica, this area with an arched transverse row of darker, larger, contiguous brown scales.

Measurements (in mm) ♂, holotype: HL 0.46; HB 0.70; HI 1.50; PrB 0.64; MB 0.51; MB 0.67; AB 0.97; SL 0.10; SD 0.30; STH 0.02; TL 2.99.

Female.—Vulvar margin with 5–6 strong setae each side of the deep emargination; 4–5 short setae in the middle. Genital papilla (Fig. 115G) well sclerotized, situated within round colourless area bordered posteriorly by the semicircular lunula; genital sternite deeply emarginate anteriorly.

Measurements (in mm) 39 paratypes, mean and range: HL 0.46; HB 0.66 (0.65–0.67); HI 1.43 (1.40–1.44); PrB 0.63 (0.62–0.64); MB 0.50 (0.48–0.49); MB 0.67 (0.64–0.70); AB 0.98 (0.94–1.02); SL 0.11 (0.10–0.12); SD 0.29 (0.29–0.30); STH 0.02 (0.02–0.03); TL 2.97 (2.91–3.03).

Discussion
This species differs in two characters from all other species of Heterodoxus. The third temporal seta is situated, as in Macropophilia, nearer to the second temporal than to the posterior margin of the antennal groove, and the posterior margin of the metanotum has four strong setae, two each side of the midline, with 6–7 minute setulae.

Host
The nominal host is Petrogale penicillata (Griffith, Smith, and Pidgeon, 1827).

HETERODOXUS ANCORATUS, sp. nov. (Figs. 39–42, 115J, 116S)

Types
Holotype: ♂, in ANIC (Slide No. 1497/6), from Protemnodon parryi (CM. 36), 23.iv.1960, Mt. Lindsay, foothills, Qld., J. H. Calaby.
Paratypes: 11♂, 6♀, in BMNH, ANIC; 45, 46♀, data as for holotype (1496/57, 58; 1979/6, 7); 6♂, 29, from P. parryi, Mt. Lindsay foothills, Qld., 23.iv.1960, J. H. Calaby (1513/21–24); 1♂, from P. parryi (CM 56), Beaudesert, Qld., 2.x.1960, J. H. Calaby (1497/8).

Material examined
Wallabia parryi.—syn. Protemnodon parryi: holotype and 11♂, 69 paratypes.

Description
Temple behind eyes straight, 3rd temporal seta near posterior margin of antennal groove (Fig. 117). Prothorax distinctly narrower than head. Prosternite triangular, with 2 lateral macrochaetae and 1 spiniform seta between them, without apical (posterior) spines. Marginal rows of setae on sternites II–VI without intercalaries. Sternite II with finger-like prolongations extending to base of marginal setae.

Male.—Posterior margin of tergites IV–VI, at least, with a wide semicircular indentation each side. Vesica without long spines, and without longitudinal rows of long spines anterior to plates. Dorsoscutal sclerites of vesica with posterior ends knobbed, anteriorly bent towards the middle and prolonged into 2 parallel ledges joined at their ends to a long slender, triangular, finely granulated plate with a chitinized point and an anchor-shaped tip (probably representing the cup-shaped chitinization of the anterior end of the vesica).
Measurements (in mm) 12d, holotype and paratypes, mean and range: HL 0.45 (0.41–0.46); HB 0.62 (0.60–0.65); HL 1.40 (1.37–1.45); Prb 0.55 (0.54–0.57); Mdb 0.45 (0.41–0.46); Mdb 0.54 (0.49–0.58); AB 0.96 (0.91–0.98); SL 0.15 (0.15–0.16); SD 0.25; STb 0.03 (0.02–0.03); TL 2.89 (2.68–2.94).

**Female.** Vulvar margin slightly excavated and finely granulated with a continuous row of 17–20 strong setae; margin of subgenital sclerite excavated; genital sternite deeply excavated anteriorly, with well-scleritized, slightly arched lunula. Genital papilla very fine, hardly visible, conical with rounded tip and with apical opening of spermathecal duct. Postgenital marginal row of setae as in alatur, but with about 15 medium setae.

Measurements (in mm) 5V paratypes, mean and range: HL 0.46 (0.45–0.47); HB 0.63 (0.62–0.65); HL 1.39 (1.37–1.42); Prb 0.56 (0.55–0.57); Mdb 0.46 (0.45–0.46); Mdb 0.56 (0.54–0.58); AB 1.01 (0.98–1.04); SL 0.15 (0.14–0.15); SD 0.26; STb 0.03 (0.02–0.03); TL 2.84 (2.76–2.94).

**Discussion**

This species is distinguished in both sexes by the second (first visible) abdominal sternite, in which four short finger-like projections extend from each to the posterior margin of each of the four marginal setae.

**Host**

The nominal host is *Wallabia parryi* (Bennett, 1835).

**HETERODOXUS CALABYI, sp. nov.**

(Figs. 43–47, 115F, 116Q)

1 Heterodoxus longitarius, Harrison and Johnston, 1916, p. 354 (from Macropus rufogriseus, Victoria; M. dorsalis, New South Wales); Werncke, 1941, p. 47 (from Wallabia bicolor, Victoria).

**Types**

Holotype: c, in ANIC (Slide No. 1496/56), from *Protemnodon dorsalis*, Gorge Creek, Bentaibo, N.S.W., 20.ii.1960, J. H. Calaby.

Paratypes: 16d, 17V, in ANIC, BMNH, all from *P. dorsalis*. 7d, 9V, data as holotype (Slide Nos. 1509/9–11, 1496/55, 56, 1513/8–11): 2d, 2V, Mt. Lindsay foothills, Qld., 24.ii.1960, J. H. Calaby (1513/12–13); 4d, 3V (from CM 73, 74, 86), Logan Village, Qld., 5–11.v.1960, J. H. Calaby (1518/7–9); 1V, Toorooloom Scrub, N.S.W., 25.ii.1962, J. H. Calaby (1518/10); 3d, 2V, Vinegar Hill, nr. Legume, N.S.W., 17.ii.1962, J. H. Calaby (1500/1–1–4).

**Material examined**


**Description**

Temple behind eye straight. Prothorax distinctly narrower than head. Prosternite triangular with 2 lateral macrochaetae and 1 spiniform seta between them (Fig. 124F), without apical (posterior) spines.

**Male.**—Vesica without 2–4 long spines anterior to the plates, without longitudinal rows of long spines, without large brushes of dense strong spines lying just anterior to the dorsolateral sclerites which are paddle-shaped and converge gently anteriorly. Long setae of marginal row of tergites II–VI with definite intercalaries.

Measurements (in mm) 16d including holotype, mean and range: HL 0.43 (0.41–0.47); HB 0.64 (0.62–0.67); HL 1.48 (1.42–1.53); Prb 0.56 (0.54–0.58); Mdb 0.46 (0.44–0.48); Mdb 0.58 (0.56–0.61); AB 0.99 (0.94–1.02); SL 0.13 (0.13–0.15); SD 0.27 (0.24–0.28); STb 0.02 (0.02–0.03); TL 2.87 (2.77–3.03). The measurements of specimen 1505/61 from *W. bicolor* are within the range except HB 0.59; Mdb 0.41; TL 0.52.

**Female.** Genital papilla bottle-shaped with a pencil-like apex (Fig. 115/F). Vulva with almost straight, finely granulated margin with 4–8 strong marginal setae each side of the medial group of 1–4 short ones; genital sclerite flatly emarginate anteriorly, with a round colourless area around the genital papilla and with a strong semilunar lunula; mouth of the spermathecal duct subapical. A short median row of 7–12 (21V) weak, short postgenital marginal setae, bounded each end by 1 stronger and longer seta separated from the lateral row by a gap.

Measurements (in mm) 185, mean and range: HL 0.44 (0.43–0.46); HB 0.65 (0.62–0.70); HL 1.48 (1.40–1.65); Prb 0.56 (0.48–0.59); Mdb 0.47 (0.45–0.49); Mdb 0.59 (0.57–0.61); AB 1.01 (0.97–1.08); SL 0.14 (0.13–1.15); SD 0.28 (0.25–0.29); STb 0.03; TL 2.96 (2.83–3.09).

**Discussion**

*H. calaby* is very similar to *macropus* but on average larger, the abdominal dorsal rows of setae less regular, and the setae less numerous. The male genital organ is quite distinctive, without analogy among the currently known species. The genital papilla of the female is also to some degree atypical, slender conical indeed, but in its apical third tubulous and with a short and bluntly conical tapering end; the duct is widened to its mouth, which is situated slightly subapically.

**Hosts**

The nominal host is *Wallabia dorsalis* (Gray, 1837); *W. eugeni* (Desmares, 1817) is another host. The specimens described by Harrison and Johnston (1916) off *Wallabia dorsalis* were not among the present material.

The host record of *W. bicolor* (Desmares, 1804) requires confirmation. The male and two females on Slide No. 1496/70 are probably those seen and described by Harrison and Johnston as *Heterodoxus longitarius*, and the male and female from *Wallabia bicolor*, Victoria (Slides Nos. 1505/61, 62), are probably those described by Werncke (1941) as *H. longitarius*.

**HETERODOXUS LONGITARIUS** (Piaget)

(Figs. 21–24, 115D, 116E, 116F, 120)

*Menopon longitarius* Piaget, 1880, pp. 594–6, pl. 41, fig. 7 (d, 9, from Halmaturus giganteus, Zoo, Rotterdam).

*Menopon (Menacanthus) longitarius* Neumann, 1912, pp. 359–60, 367, fig. 5 (d, 45, from kangaroo, Jardin des Plantes, Paris; 1d, 1V, from wallaby, Hylop). *Heterodoxus longitarius*, Johnston and Harrison, 1912, p. 13 (types of *H. macropus* conspecific); Cummings, 1913, p. 44 (types of *H. macropus* in BMNH conspecific with description; specimens from wallaby, north Queensland; from *Corone australis*, Victoria);
Neumann, 1913, p. 634 (syn. H. spiniger, macropus, armiferus); Harrison and Johnston, 1916, pp. 353–4, figs. 10–11 (specimen from Macropus thetis, New South Wales; M. wallabiae, Victoria; M. rufociliis, Flinders Is., Tas.; M. hennetti, Zoo, Melbourne; M. doralis, M. robustus, M. giganteus, M. wilcoxi, New South Wales; M. stigmaticus, Queensland; syn. H. spiniger, macropus, armiferus); Thompson 1937, p. 25 (Piaget types, 5d, 39, 3 nymphs, in BMNH); Thompson 1939, p. 139 (Piaget types, 29, in LM); Plomley, 1940, p. 19 (not syn. spiniger, wallabiae); Werner, 1941, pp. 47–55, fig. 2 (1d, 1V types, 1V, from Petrogale penicillata, New South Wales; 1V, from Thylagale stigmaticus, Queensland; 1V, from Macropus agilis, Queensland; 2d, 2V, from Wallabia bicolor, Victoria; 1V, from wallaby, Western Australia); Werner 1948, pp. 20–21 (syn. H. spiniger); Clay 1949, p. 836 (Piaget types, 3d, 39, 3 nymphs in BMNH, 2V, in LM); Hopkins, 1949, pp. 441–2 (hosts - Thylagale stigmaticus, Proteomnodon agilis, P. doralis, P. rufogrisea, Macropus robustus, M. rufus, M. major).

Types

Lectotype: d, in Piaget Collection, BMNH (Slide No. 426b), from Macropus (= Halmaturus) giganteus, Zoo, Rotterdam.

Paralleloctyes: 5d, 39, in Piaget Collection, in BMNH (Slide Nos. 425, 426a, 427), 25, in LM, data as lectotype.

Material examined


Description

Temples behind eyes straight. Third temporal setae near posterior margin of antennal groove (Fig. 117). Prosternite distinctly narrower than head. Prosternite triangular with 2 lateral macrochaetae and 1 spine between them, without apical (posterior) spines. Sternite II with finger-like prolongations extending to base of marginal setae. Marginal rows of setae on sternites II–VI without intercalaries. Posterior margin of tergites IV–VI, at least, with a wide semicircular indentation on each side (Figs. 22, 120). Long setae of marginal row of tergites II–VI without intercalaries, discal row of shorter setae lies just anterior, but its setae never actuallyinterspersed with the marginal ones.

Male.—Vesica without pairs of long spines, or longitudinal rows of long spines anterior to the plates. Dorsolateral vesical sclerites each prolonged anteriorly to a broad chitinose plate.

Measurements (in mm) 12d, mean and range: HL 0.47 (0.45–0.49); HL 0.68 (0.64–0.70); HL 1.47 (1.40–1.60); PBH 0.59 (0.55–0.61); PBH 0.49 (0.46–0.52); PBH 0.61 (0.59–0.67); AB 11.0 (10.4–11.18); SL 0.16 (0.15–0.17); SD 0.23 (0.23–0.28); SBH 0.03 (0.02–0.03); TL 3.04 (2.89–3.19).

Female.—Vulva straight, densely and roughly granulated with a continuous row of 18–25 long and strong setae; genital papilla conical, as long as broad, apex blunt, with mouth of spermaticheal duct apical; genital sternite with 4 parallel arms, the outer pair longer than inner and a straight, horizontal, strongly sclerotized lunula; postgenital sternum with 4 median setae just behind marginal row (Fig. 120).

Measurements (in mm) 11V, mean and range: HL 0.46 (0.44–0.48); HL 0.69 (0.65–0.71); HB 1.49 (1.46–1.54); PB 0.59 (0.57–0.61); PBH 0.48 (0.44–0.52); PBH 0.61 (0.57–0.64); AB 1.11 (1.02–1.17); SL 0.16 (0.15–0.17); SD 0.27 (0.27–0.28); SBH 0.03; TL 3.01 (2.73–3.16).

Discussion

After a long period of confusion of H. longitarsus with other described or undescribed species, male specimens of this species have been clearly defined by Werner (1941) who has published excellent figures of the male genitalia of H. spiniger (Enderlein) and H. longitarsus (Piaget). The present investigation shows that both sexes of all species of Heterodoxus are perfectly distinguishable. Some of the material previously ascribed to this species is now considered to be Macropophila baircata, sp. nov., or breviarcata, sp. nov., Heterodoxus macropus, or H. octometerus, sp. nov.

Hosts

The nominal host, Macropus giganteus Shau, has been subsequently recorded by Harrison and Johnston, but these specimens have probably been misidentified, the male copulatory organ in their figure 11 being that of wallabiae and not longitarsus. Most other records of Harrison and Johnston are due to misidentification. The same applies to records of Werner. Three records of Macropus rufus recorded by Hopkins (1949) are probably independent, but lack data. Most of the host species recorded for Heterodoxus longitarsus are hosts of new species described in the present paper. The nominal host therefore has not been confirmed.

Wallabia rufogrisea (Desmarest, 1817) is a host.

HETERODOXUS MAAL* Emerton

(Figs. 74–77, 115F)


Types

Holotype: d, in Bernice P. Bishop Museum, Honolulu (Bishop 6588), from Dorocopsis veterem (Lesson, 1836) (American Museum of Natural History No. 193156), Eramboe, West Irian, 2.xi.1960, T. C. Maa.

Paratypes: 9, with holotype; 1d, in Bernice P. Bishop Museum, data as holotype; 1d, 1V, in KCE coll., data as holotype.

Material examined

Dorocopsis veterem: holotype and 9 paratype (Bishop 6588).

Description

Temples behind eye straight, 3rd temporal setae near posterior margin of antennal groove. Prosternite as broad or nearly as broad as head (0.710–0.746–0.725–0.760 mm). Prosternite triangular, with 2 lateral macrochaetae and 1 spiniform seta each side, 4–6 spiniform setae posteriorly. Marginal rows of setae on sternites II–VI without intercalaries. Sternites V–VI with two rows of discal setae.

*This description, with the accompanying figures, has been prepared by Dr. Theresa Clay. Dr. Nixon Wilson of the Bernice P. Bishop Museum, Honolulu, kindly made the holotype and paratype available for examination.
Temple behind eye straight. Third temporal setae near posterior margin of antennal groove (Fig. 117). Prothorax as broad or nearly as broad as head (0.710–0.746: 0.725–0.760). Proteronitriger triangular, with 2 lateral macrochaetae and 1 spine between them; posteriorly 4–6 spiniform setae (Fig. 124B). Sterites V–VI with 2 rows of discal setae.

**Male.** Vesica strongly sclerotized, rigid, bottle-shaped with rounded anterior end, membranous posteriorly, uniformly denticle-furred all over.

**Measurements** (in mm) z6, holotype followed by paratype: HL 0.49, 0.52; HB 0.73, 0.73; H 1.51, 1.39; PL 0.72, 0.71; Mb 0.52, 0.57; MB 0.65, 0.70; AM 1.02, 0.99; SDL 0.14, 0.12; SD 0.29, 0.26; STS 0.02, 0.02; TL 3.25, 3.26.

**Female.** Genital papilla small, conical, rounded anteriorly (Fig. 115). Vulvar setae all stout, 12–13 in 3 groups, the 4–5 central ones shorter. Gonapophyses long and straight, their apical spur nearly as long as the gonapophyses themselves. Genital sternite deeply excavated anteriorly with slightly sclerotized oval or rectangular lunula behind the genital papilla; small tubercle with pigmented matrix present each side dorsal to the subgenital lobe.

**Measurements** (in mm) 49, paratypes, mean and range: HL 0.51 (0.51–0.52); HB 0.75 (0.74–0.76); H 1.47 (1.44–1.49); PL 0.74 (0.71–0.75); Mb 0.54; MB 0.69 (0.68–0.70); AM 1.07 (1.03–1.13); SL 0.13 (0.12–0.13); SD 0.29 (0.28–0.30); STS 0.03 (0.02–0.03); TL 3.39 (3.31–3.54).

**Discussion.**

*H. mitratus* is of the general type of *Heterodoxus*, but with 4–6 spines on the posterior end of the prothorax, as in *Macropophila forcipata*. This species is nearest to *H. maculatus* Emerson in its chaetotaxy and in the breadth of the head, which is equal to the breadth of the prothorax while in all other *Heterodoxus* species known to me the prothorax is always distinctly narrower than the head. The antennal grooves in *H. mitratus*, as in all other *Heterodoxus* before me, are ventrally open, i.e. their ventral lobes do not reach to the margin of the head and consequently the antennal clubs are freely visible in the ventral aspect. The genital characters of male and female *mitratus* Emerson cannot be judged exactly from the original description, but the vesical plates seem to be quite different. In *mitratus* the prothorax is not rounded as in all other *Heterodoxus* species, but slightly angulated posteriorly.

**Host.**

The nominal host is *Dorocupsus vanheurni* (Thomas, 1922).

**HETERODOXUS OCTOSERIATUS**, sp. nov.

(Figs. 56–59, 115O, 116Y, 116Z, 125)

**Petrogalea pygidialis** Mjoberg, 1919, p. 94 (from *Dendrolagus lumholtzi*, Malanda and Cedar Creek, Qld.).

**Types.**

Holotype: d, in ANIC (Slide No. 1496/4), from *Petrogalea pygidialis*, s.viii.1960, Gorge Creek, Bonalbo, N.S.W., J. H. Calaby.

* See page 57.
Male.—Dorsolateral vesical sclerites joined anteriorly forming a lyriform figure.

**Measurements** (in mm) 56 including holotype, mean and range: HL 0.41 (0.40–0.41); HB 0.56 (0.56–0.57); HI 1.37 (1.34–1.40); PI 0.47 (0.46–0.48); MI 0.41 (0.41–0.42); MIH 0.03; TL 2.45 (2.42–2.49).

**Female**.—Genital papilla broadly bell-shaped (Fig. 115V). Tergites and sternites each with a marginal and discal row of setae, without intercalaries; vulvar margin slightly concave with 3 long and 2–3 short setae each side of midline, gonapophysis spur as long as gonapophysis itself.

**Measurements** (in mm) 46, mean and range: HL 0.41; HB 0.57 (0.56–0.58); HI 1.38; SL 0.13; SD 0.23 (0.22–0.23); STH 0.05; TL 2.46 (2.41–2.54).

**Discussion**

I do not find any generic difference between *Dendrolagia pygidialis* Mjöberg and all the species of *Heterodoxus* before me. The head is typical of *Heterodoxus*, having no similarity at all to *Boopla*. The postocular margins of the temples are slightly concave and not so straight as in *Heterodoxus*, but this is only difference and does not change the typical triangular outline of the *Heterodoxus* head. The third temporal seta is typical in position for all *Heterodoxus*, before and somewhat median to the second. The male genital organ is, of course, different from all other *Heterodoxus*, but it is of the same general type with two median plates, the anterior quite similar to that of other *Heterodoxus* species, the posterior somewhat different; and a pair of lateral sclerites or chitin bands, complicated as in all *Heterodoxus*, anteriorly generic rank, is the female genital papilla, which is not slender but broadly and slightly conical, being at its base broader than long, rather well sclerotized (Fig. 115). Much more "atypical" is the genital papilla of *Heterodoxus macrorus*. The gonapophyses of *H. pygidialis* are slender triangular, provided with a long and strong apical spine as *H. pygidialis* are slender triangular, provided with a long and strong apical spine as *H. pygidialis* of *H. nitrus*, while all other species of *Heterodoxus* possess broadly triangular gonapophyses with a short or very short apical spine. In *pygidialis*, as in all other *Heterodoxus* species, they have no lateral lobe bearing the strong basal setae and are dorsally not fused with the ninth tergopleurite. The abdominal chaetotaxy is similar to that of *H. saulabati*, *longitarsus*, or *spiniger*, with both marginal rows without intercalaries and with tergal and sternal discal setae irregularly scattered in two rows. The prothorax lateral discal spine of *Heterodoxus* species is, indeed, replaced by a strong seta. It may be added that the form of the anterior coxae just before the trochanter is blunter than in other species of *Heterodoxus*.

**Host**

The nominal host, *Dendrolagus lamboeltzi* Collett, 1884, is confirmed.

**HETERODOXUS QUADRISERIATUS** sp. nov.

(Figs. 60–64, 115M, 116F–116X)

**Types**

Holotype: ♂, in ANIC (Slide No. 1496/72), from *Setonix brachyrhynchos*, Bald I., W.A., 1954, G. B. Sharman.

Paratypes: 7♂, 6♀, in BMNH, ANIC. 19 (Slide No. 1496/72), data as holotype; 1♂, 1♀ (Slide No. 1505/91), 25, 19 (Slide Nos. 1497/14, 15), from *Setonix brachyrhynchos*, 71, 1955, Rottnest I., W.A., G. M. Dunnet; 46, 39, 1337 (Slide Nos. 1496/73–76), from *Setonix brachyrhynchos*, Rottnest I., W.A.

**Material Examined**

*Setonix brachyrhynchos*—holotype and 7♂, 6♀ paratypes.

**Description**

Templese behind eyes straight, 3rd temporal seta near posterior margin of antennal groove (Fig. 117). Prosternite triangular, with 2 lateral macrochaetae and 1 spine between them, without spiniform setae posteriorly. Abdominal terga II–VI with 1, the marginal, row of strong setae and with short intercalaries. Sterna with 1 marginal row of strong setae without intercalaries and with 1 discal row of short setae not intercalating with the posterior row.

Male.—Veisica with 4 longitudinal rows of long spines within an oval, more finely denticulated area anterior to the plates.

**Measurements** (in mm) 56, holotype and paratypes, mean and range: HL 0.37 (0.34–0.39); HB 0.54 (0.52–0.59); HI 1.49 (1.43–1.56); PI 0.49 (0.46–0.52); MI 0.39 (0.38–0.41); MIH 0.49 (0.47–0.54); AB 0.76 (0.72–0.80); SL 0.13 (0.10–0.11); SD 0.23 (0.21–0.24); STH 0.02; TL 2.48 (2.23–2.55).

**Female**.—Second sternite without finger-like projections. Vulvar margin emarginate, finely granulate, more strongly so at the sides, with small (lateral) and 4 (medial) strong setae each side of midline. Genital sternite anteriorly butterfly-shaped, posteriorly deeply emarginate with indistinct, light brown lunula. Postgenital sclerite as in *anconarius*, but without the supplementary setae.

**Measurements** (in mm) 65 paratypes, mean and range: HL 0.38 (0.37–0.41); HB 0.56 (0.54–0.60); HI 1.47 (1.42–1.50); PI 0.51 (0.49–0.54); MI 0.40 (0.39–0.41); MIH 0.52 (0.49–0.57); AB 0.85 (0.83–0.87); SL 0.10; SD 0.22 (0.19–0.23); STH 0.02 (0.02–0.03); TL 2.60 (2.49–2.77).

**Host**

The nominal host is *Setonix brachyrhynchos* (Quoy and Gaimard, 1830).

**HETERODOXUS SPINNERI** (Enderlein)

(Figs. 17–20, 82, 84, 115E, 116F–116X)

*Menopon spingari* Enderlein, 1909, pp. 80–1, pl. 8, figs. 4 and 5 of V, from house dog of A. D. B. de Menezes, Calcutta, India.

*Menopon (Menacanthus) spingari* Neumann, 1912, pp. 364–5, 367.

*Heterodoxus spingeri* Enderlein, 1909, pp. 19–20, pl. 3, 6, from house dog of A. D. B. de Menezes, Calcutta, India.

*Menopon (Menacanthus) spingeri* Neumann, 1912, pp. 364–5, 367.

*Heterodoxus spiniger* Enderlein, 1909, pp. 19–20, pl. 3, 6, from house dog of A. D. B. de Menezes, Calcutta, India.

*Menopon (Menacanthus) spiniger* Neumann, 1912, pp. 364–5, 367.


*Menacanthus spiniger* Enderlein, 1912, p. 213.

*Menopon (Menacanthus) spiniger* Neumann, 1912, pp. 364–5, 367.

*Heterodoxus spiniger* Enderlein, 1909, pp. 19–20, pl. 3, 6, from house dog of A. D. B. de Menezes, Calcutta, India.

*Menopon (Menacanthus) spiniger* Neumann, 1912, pp. 364–5, 367.
Dr. Theresa Clay has kindly called my attention to the fact that the specimen from *Wallabia agilis* in Figure 118 shows but one pair of vesical spines, while in my original key to the species (now amended) two pairs are mentioned. * In fact, both the males examined from *W. agilis* possess but one pair of these spines and seven males examined from *Dactylaspis buecha* possess either two pairs or in addition have one smaller fifth spine in one of the rows. Not having found any other differences between the males and females of the two populations, I am convinced that the number of vesical teeth is in some degree individually variable and that both the populations are conspecific.

### Table 2

**MEASUREMENTS OF MALE AND FEMALE HETERODOXUS SPINNER**

<table>
<thead>
<tr>
<th>Measure</th>
<th>Canis familiaris (Paraguay)</th>
<th>Canis familiaris (Ceylon)</th>
<th>Canis adustus (Ireland)</th>
<th>Canis adustus (Israel)</th>
<th>Wallabia agilis (Paraguay)</th>
<th>Wallabia agilis (Ireland)</th>
</tr>
</thead>
<tbody>
<tr>
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<tr>
<td><strong>Males</strong></td>
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<tr>
<td>HL</td>
<td>0.43 (0.42–0.44)</td>
<td>0.39 (0.29–0.46)</td>
<td>0.45 (0.45–0.46)</td>
<td>0.43 (0.43–0.44)</td>
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</tr>
<tr>
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<td>0.62 (0.60–0.65)</td>
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<tr>
<td>HL</td>
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<td>1.48 (1.45–1.53)</td>
<td>1.49 (1.49–1.53)</td>
<td>1.47 (1.45–1.49)</td>
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<tr>
<td>PB</td>
<td>0.54 (0.51–0.57)</td>
<td>0.52 (0.52–0.55)</td>
<td>0.51 (0.51–0.55)</td>
<td>0.52 (0.50–0.55)</td>
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<tr>
<td>MB</td>
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<td>0.42 (0.40–0.45)</td>
<td>0.43 (0.40–0.45)</td>
<td>0.44 (0.42–0.45)</td>
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<tr>
<td>TL</td>
<td>0.96 (0.91–1.00)</td>
<td>0.93 (0.90–0.99)</td>
<td>0.97 (0.97–0.99)</td>
<td>0.95 (0.93–0.97)</td>
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<tr>
<td>SD</td>
<td>0.25 (0.24–0.26)</td>
<td>0.24 (0.23–0.25)</td>
<td>0.26 (0.26–0.27)</td>
<td>0.27 (0.26–0.28)</td>
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<tr>
<td>SB</td>
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<td>0.03 (0.02–0.04)</td>
<td>0.03 (0.03–0.04)</td>
<td>0.03 (0.03–0.04)</td>
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<tr>
<td>TL</td>
<td>2.75 (2.64–2.83)</td>
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<td>2.87 (2.79–2.88)</td>
<td>2.70 (2.63–2.73)</td>
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<td><strong>Females</strong></td>
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<tr>
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<tr>
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<td>0.65 (0.64–0.66)</td>
<td>0.66 (0.65–0.67)</td>
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<tr>
<td>HL</td>
<td>1.48 (1.46–1.53)</td>
<td>1.49 (1.49–1.50)</td>
<td>1.50 (1.50–1.51)</td>
<td>1.49 (1.47–1.50)</td>
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<tr>
<td>PB</td>
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<td>0.58 (0.57–0.60)</td>
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<td>0.58 (0.57–0.59)</td>
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<tr>
<td>MB</td>
<td>0.46 (0.44–0.48)</td>
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<td>0.52 (0.50–0.54)</td>
<td>0.51 (0.49–0.51)</td>
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<tr>
<td>TL</td>
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<td>0.62 (0.59–0.63)</td>
<td>0.63 (0.59–0.66)</td>
<td>0.55 (0.53–0.57)</td>
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<tr>
<td>SD</td>
<td>1.09 (1.03–1.13)</td>
<td>1.13 (1.09–1.20)</td>
<td>1.16 (1.12–1.21)</td>
<td>1.16 (1.12–1.23)</td>
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</tr>
<tr>
<td>SB</td>
<td>0.14 (0.12–0.15)</td>
<td>0.17 (0.15–0.17)</td>
<td>0.18 (0.16–0.18)</td>
<td>0.17 (0.15–0.16)</td>
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<tr>
<td>TL</td>
<td>0.28 (0.23–0.30)</td>
<td>0.32 (0.28–0.32)</td>
<td>0.32 (0.28–0.32)</td>
<td>0.32 (0.28–0.32)</td>
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</tbody>
</table>

* All values given in millimetres. When there are two specimens, measurements of both are given; when there are more than two, the mean is given with the range in parentheses.
Cuon alpinus (Pallas, 1811), syn. C. javanicus (Desmarest, 1820) (Eichler 1953); Felis geoffroyi D’Orbigny and Gervais, 1844, Oncifelis satinaurus (Thomas, 1902) (Werneck 1936); Wallabia bicolor (Plomley 1940); man (Plomley, 1940); Corvus coronoides Vigors and Horsfield, 1827, syn. Corone australis Gould, 1865 (Cummings 1912). Only Canis aureus and C. adustus of the additional hosts have been confirmed. The record from Wallabia agilis makes probable the occurrence of H. spiniger on Australian marsupials. It is uncertain whether the specimens off Corvus coronoides and man belong to spiniger or longitarsus.

**HETERODOXUS UALABATI Plomley**
(Figs. 25–29, 115F, 116Q)


**Types**
Lectotype here designated: 6, in SPHTM (Slide No. NB/P/1), det. N.J.B.P., from *Wallabia bicolor* Desmarest, Victoria.

Paratypics: 5L, in SPHTM (Slide Nos. NB/P/2–5), 1L, 3D as lectotype; det. N.J.B.P., 2D, from *Wallabia bicolor*, Zoo, Sydney, 10.v.1927, det. N.J.B.P., 2D, from "black wallaby", Victoria, A. S. Le Souëf.

**Material examined**

**Description**
Temple behind eye straight. Third temporal setae near posterior margin of antennal groove.
Prothorax distinctly narrower than head. Prosternum triangular with 2 lateral macrochaetae with 1 spine between them, without apical (posterior) spines.
Marginal rows of setae on sternites II–VI without intercalary. Long setae of marginal row of tergites II–VI without intercalaries, discal row of shorter setae lies just anterior, but its setae never intercrossed with the marginal ones.
Males.—Vesica without 2–4 long spines or longitudinal rows of long spines anterior to the plates; 2 large conical brushes of dense strong spines lie just anterior to dorso-lateral sclerites.

**Measurement** (in mm): TL 2.9–3.5.

**Female**.—Genital papilla much longer than broad, slender conical, apex sharply pointed (Fig. 115). Mouth of spermathecal duct subapical. Vulvar margin broadly emarginate, densely but finely granulated, with a continuous row of 20–23 strong setae; postgonial sternum with 4 median setae just behind marginal row.

**Measurement** (in mm): TL 3.1–3.4.

*Measurements of lectotype (in mm): HL 0.44; HB 0.70; PrB 0.64; MbB 0.50; MiB 0.61; AB 1.09; SL 0.16; SD 0.18; STB 0.04; TL 3.00; M.D.M.

**Discussion**
The interpretation of this species is discussed under *H. macropus* (p. 59).

**Host**
*Wallabia bicolor* (Desmarest, 1804) is confirmed as host.

**Genus PARAHETERODOXUS Harrison & Johnston**


**Type species** Paraheterodoxus insignis Harrison & Johnston, 1916.

**Species**
*Pa. calcaratus*, sp. nov., *erinaeus*, sp. nov., *insignis* Harrison & Johnston.

**Description**
Head without horn-shaped projection posterior to base of maxillary palp, without strong dilatations of margin. Prococull and ocular lobes not prominent, without notch; sides of head nearly straight, diverging posteriorly, postocular temporal margin forming at most an angle of 160° with the ocular margin; temporal lobes with but one rounded edge, the posterior; eyes not prominent. Ocular setae never on a projecting wart. Head on ventral side with a pair of strong alveolar spines behind the posterior tentorial pits. Maxillary palp 4-jointed with 3 joints reaching beyond the margin of head.

Prothorax usually slightly narrower than head, with broadly rounded sides, rarely slightly angulated posteriorly. Mesonotum smaller than metanotum, with 1 pair of large colourless warts bearing 1 strong spine, 1 small seta behind it and usually 1 minute seta near the margin of the alveolus of spine. Abdominal spiracles on pleurites, trichobothrial hairs on pleurae II–IV (as in Fig. 81).

**Discussion**
This genus is, like *Placogalus*, transitional between *Boopia* and *Heterodoxus*. The head outline of *insignis* and *erinaeus*, sp. nov., is more like that of *Heterodoxus* than that of *calcaratus*, sp. nov., which is similar to *Placogalus*. The prothorax in all three species is more like that of *Boopia*. The distribution of the temporal setae is not like that of *Boopia* or *Heterodoxus*, the third not arising before the second but before the first or in the middle before the first and second. The eyes are slightly prominent in *insignis* and *calcaratus*, not at all so in *erinaeus*. The margin of the pronotum has two short strong spines anterior to the external macrochaeta. The chaetotaxy of the abdomen differs from all *Boopia* and *Heterodoxus* in possessing one pair of lateral sternal and tergal spines. The anterior coxae are toothed just before the trochanter as in *Heterodoxus* and *Macropophila*. The maxillary horn-shaped protuberance present in all *Heterodoxus* and *Macropophila* is wanting. Post-tertoral alveolar spines are placed on dilatations of the anterior ends of the occipital rims, being strong in *insignis* and *calcaratus*, weak and small in *erinaeus*. The occipital macrochaeta of the ventral side of the head is placed close to the spine in *insignis* and *calcaratus*, and is more posterior in *erinaeus*. The membranous papilla between the anterior coxae, flanked both sides by a minute seta, is more like that in *Boopia*. (I have not mentioned this papilla, which seems to be present in all *Boopiidae*, in the Introduction.)
The posterior median plate of the vesica is as in Boopia, lyrate and not, as in Heterodoxus, bilobed or quadrangular. The gonapophyses are like those in Boopia, provided with a projecting lateral lobe for the large basal setae. They are fused with the ninth pleurite as in Boopia, and not separated from it and articulated as in Heterodoxus. In Pa. erinaceus the gonapophyses are greatly reduced and their lateral lobes greatly enlarged (Fig. 129).

**KEY TO SPECIES OF PARAEHETERODOXUS**

1. Gula with pair of posteriorly diverging sclerites, each with a small spiniform seta in the middle and a long seta on the posterior end .............................................. erinaceus 
   Gula with pair of roundish papillae, posteriorly each with a strong spiniform seta on the inner sclerotized end and a long seta on the outer membranous part (Fig. 126) .............................................. 2

2. Lateral wings of anterior median vesical plate each prolonged anteriorly as a narrow chitinous plate ending in a triangular tooth reaching nearly to anterior end of vesica; vesica cylindrical (Fig. 127). Setae of lateral projection of female gonapophyses not very strong and similar in form ................................................................................................. insignis 
   Lateral wings of anterior median vesical plate united to form a short plate which projects anteriorly as a short blunt or long slender style; vesica oval. Lateral projection of female gonapophyses with 1 strong apical seta and about 4 shorter and finer ones ...... calcarius

**PARAEHETERODOXUS CALCARIUS, sp. nov.**

(Figs. 73, 128)

*Paraeheterodoxus insignis*, Wernecke and Thompson, 1940, p. 446 (2♀, 1 nymph, from Wallabia bicolor, Gippsland, Vic., June 1898, A. S. Le Souef).

**Types**


Paratypes: 19, in ANIC (Slide No. 1496/2), data as holotype; 1♀, 19, in BMNH (Slide No. 1496/3), data as holotype.

**Material examined**

*Bettongia penicillata*—♂ holotype and 1♀, 2♀ paratypes.

*Wallabia bicolor*—det. F.L.W. and G.B.T., 2♀, 1 nymph, Gippsland, Vic., June 1898, A. S. Le Souef, BMNH, 1962–677 (1505/63, 1512/21, 22) [identified as *H. insignis*].

**Description**

Similar to *P. insignis* but the postocular temporal margins are not, or hardly visibly, concave. The chaetotaxy of the body without remarkable differences.

**Male**—The wings of the anterior vesical median plates united anteriorly and produced into a short, bluntly rounded style in one male and a long and slender one in the other. The posterior margin of the anterior median plate with a short tooth as in most Boopia. The lateral sclerites of vesica long, with a blunt tooth-shaped edge in their middle of their margin, similar to that of *Boopia bettongia*.

**Measurements (in mm)**

*Paraeheterodoxus insignis* [1♀, 1♂]: 
- **Head**
  - HL: 0.40, 0.40
  - HB: 0.68, 0.70
  - HI: 1.72, 1.75
  - PrH: 0.59, 0.62
  - MdB: 0.48, 0.52
  - MdB: 0.70, 0.70
  - TL: 2.76, 2.77

*Paraeheterodoxus calcarius* [2♀, 1♂]:
- **Head**
  - HL: 0.42, 0.40
  - HB: 0.65, 0.67
  - HI: 1.55, 1.70
  - PrH: 0.59, 0.59
  - MdB: 0.46, 0.45
  - MdB: 0.67, 0.62
  - TL: 2.90, 2.83

**Hosts**

The nominal host is *Bettongia penicillata* Gray, 1837. *Wallabia bicolor* (Desmarest, 1804) awaits confirmation as a host.

**PARAEHETERODOXUS ERINACEUS, sp. nov.**

(Fig. 129)

**Types**

Holotype: ♂, in ANIC (Slide No. 1496/80), from Potorous tridactylus, Sandfly, Tas., 8.v.1962, B. C. Mollison.

Paratypes: 2♂, 2♀, in ANIC, BMNH (1496/80–83), data as holotype.

**Material examined**

*Potorous tridactylus*—holotype and 2♂, 2♀ paratypes; 5 nymphs, data as holotype (1496/79).

**Description**

Head nearly as in *Heterodoxus*, but more flatly rounded anteriorly and with slightly convex postocular temporal margins. Gula with a pair of posteriorly diverging sclerites beginning on the tentorial pits, each with a small spine in the middle and with a long seta on its posterior end. Prosternal plate heart-shaped or oval. Second abdominal segment reduced, shorter than in *Pa. insignis* or *calcarius*. Chaetotaxy of abdomen as in both the other species, with 1 spine both sides of sternites and tergites and with 2 rows of setae on sterna and terga, these being less numerous and more widely separated and not intercalated with shorter setae.

**Male**—Lateral wings of the anterior median vesical plate united as a heart-shaped brown plate tapering anteriorly; posterior margin without tooth. Posterior median plate as in *Boopia*, lyrate. Lateral plates weakly developed, sharply pointed posteriorly, with a toothlike projection in the middle of their internal margins. Vesica oval, broadly bordered with minute spines, nearly smooth in the middle.

**Measurements (in mm)**

*Paraeheterodoxus calcarius* [3♂, 3♀]:
- **Head**
  - HL: 0.39 (0.37–0.42)
  - HB: 0.64 (0.64–0.65)
  - HI: 1.64 (1.52–1.72)
  - PrH: 0.61 (0.59–0.63)
  - MdB: 0.48 (0.46–0.49)
  - MdB: 0.55 (0.51–0.62)
  - AB: 0.94 (0.93–0.96)
  - TL: 2.74 (2.67–2.86)

**Female**—Vulva with 4:1:4 or 4:1:2:4 setae, the median strong but much shorter. Genital sclerite in both females examined indistinct, its posterior projections long and narrow, connected with the sides of the postgenital sternite. Postgenital sternite narrow, arched, both sides enlarged with finger-like projections to the arolii of the lateral marginal setae. The postgenital marginal row of setae con...
tinnuous, with about 9-10 longer and stronger laterals and about 26 short and weak median setae. Gonapophyses reduced to short, strongly chitinized papillae provided with a strong but short apical spur. The lateral lobes of gonapophyses very strongly developed, much greater than the gonapophyses themselves, provided with 6–7 very strong, thick, long, brown spines. Genital papilla triangular, broad at base, colourless, and not always apparent.

**Measurements** (in mm) 27 (1496/80 and 81): HL 0.42, 0.41; HB 0.68, 0.70; HI 1.62, 1.71; FvB 0.67, 0.67; MvB 0.54, 0.51; MvB 0.65, 0.58; AB 1.13, 1.10; TL 3.29, 3.16.

**Host**

The nominal host is *Potorous tridactylus* (Kerr, 1792).

**PARAHETERODUS INSIGNIS** Harrison & Johnston

(Figs. 69–72, 126, 127)

**Paraheterodux insignis** Harrison & Johnston, 1916, pp. 357–9, figs. 1, 13, 14 (cf. V, from *Aecypprynus rufescens*, New South Wales and Queensland); Thompson, 1939, p. 606 (V type, from A. rufescens, Zoo, Sydney, L. Harrison, in GBT coll.); Wernick and Thompson, 1940, pp. 445–7, figs. 54–56 (15 V type, in GBT coll.; 17 V, in GBT coll.; 197, 1 nymph, from *Wallabia bicolor*, Gipsland, Vic., June 1898, A. S. Le Souef); Wernick 1948, pp. 26–8 (addition V paratype, UC); Hopkins, 1949, p. 442 (4 records from A. rufescens).

**Types**

Lectotype: 17, in BMNH (Slide No. 736), det. G.B.T., from *Aecypprynus rufescens*, Zoo, Sydney, L. Harrison. Paralectotype: 10, in UC, data as lectotype.

**Material examined**


**Description**

Prosternal plate triangular with rounded anterior angles and straight lateral margins.

**Male.**—Lateral wings of the anterior median vesicle plate each prolonged anteriorly into a long and narrow chitinized plate ending with a triangular tooth reaching nearly to the anterior end of the vesica. Vesica rounded cylindrical with flattened anterior margin, broadly bordered with finely denticulated area. Lateral plates nearly as broad as long, excavated on their posterior margin, forming 1 stronger median and 1 weaker outer tooth.

**Measurements** (in mm) 4d (1496/77, 78; 1497/16, 17), mean and range: HL 0.46 (0.45–0.46); HB 0.73 (0.72–0.74); HI 1.59 (1.57–1.61); FvB 0.66 (0.65–0.68); MvB 0.51 (0.49–0.53); MvB 0.66 (0.65–0.68); TL 3.03 (2.97–3.06).

**Female.**—Vulva with 2:4:2:2, 2:5:2, or 2:6:3 strong setae, the lateral groups being longer than the median. Gonapophyses broadly triangular and provided with a very thin and long apical spur, the 5 basal setae are situated on a strong external lobe. Postgenital sternite flabby emarginate, with a continuous row of marginal setae, the 7–8 lateral longer and stronger, about 10 of the median ones shorter and weaker. Genital sternite H-shaped with a long and straight brown lamella, its posterior ends reaching to the external margin of the gonapophyseal lobe. Genital papilla slender conical, bluntly pointed, with the mouth of the spermathecal duct just anterior to the middle of its length.

**Measurements** (in mm) 3v (1496/77, 78; 1497/17), mean and range: HL 0.47 (0.46–0.48); HB 0.75 (0.72–0.78); HI 1.53 (1.40–1.64); FvB 0.69 (0.65–0.71); MvB 0.54 (0.52–0.55); MvB 0.71 (0.68–0.73); TL 3.17 (2.94–3.25).

**Discussion**

The size and features of the head, the female gonapophyses, the slender conical genital papilla, and some other characters of this species are nearly typical of *Heterodoxus*, but its genital organ is more like that of *Boopia*. The strong alveolar spines on the ventral side of the head are neither homologous with the maxillary hooks of *Heterodoxus*, as has been correctly pointed out by Wernick (1948), nor with the alveolar spines of *Phacoglia*. The postocular margin of the temples is slightly concave, as in *H. pygidaulis*; the prothorax is bluntly angulated before the middle, as in *Boopia*; the front coxa has a strong tooth before the trochanter, as in *Macropophila*. This tooth is much stronger than in *Heterodoxus*, except *H. calabyi* in which it is absent. The prosternum is triangular, as in most *Heterodoxus*, but its chaetotaxy is quite different from that in *Heterodoxus* or *Boopia*. The chaetotaxy of the mesonotum is as in *Boopia* and *Heterodoxus*, with one pair of alveolar spines situated on large warts; that of the metanotum is quite like that of *Heterodoxus*. The chaetotaxy of abdominal tergum I is again characteristic, being similar to that of the following five abdominal terga in the female and six in the male; these terga bear one strong spine each side of the marginal row of setae. This pair of spines is also present on the abdominal sterna, sternum I in the male bearing two spines each side. The chaetotaxy of sternum and terga is similar, being one marginal and one discal row of densely standing setae, the marginal rows interspersed with many shorter ones. The second femora of males have one pair of strong spines behind the middle of their length. This pair of spines is absent in all *Heterodoxus* and *Macropophila* and present in *Boopia betongia*, *B. natufusca*, *B. uncinata*, *Paraboopia flavus*, *Phacoglia spinosa*, and *Ph. brevipinosa*, but in all these species it is situated just behind the end of the trochanter.

**Host**

The nominal host, *Aecypprynus rufescens* (Gray, 1837), is confirmed. The specimens from *Wallabia bicolor* (determined by Wernick and Thompson, 1940) are considered to be *Pa. calcarius*, sp. nov.

**Genus LATUMCEPHALUM** Le Souef

**Latumcephalum** Le Souef, 1902, p. 51; Wernick and Thompson, 1940, pp. 448–9; Wernick, 1948, p. 28.

**Latumcephalum** Tillyard, 1926 (emendation with consent of Le Souef but unjustified).

**Type species** Latumcephalum macropus Le Souef, 1902.

**Species**

Description

Head nearly twice as broad as long with large pointed postnodal lobes, large eye lobes, and pointed temporal lobes; ocular setae situated on a very large chitinous wart. Maxillary palp 2-jointed, 2nd joint clavate, reaching beyond margin of head. Mesonotum and metanotum equal in size, separated by a distinct suture; mesonotum with 1 pair of conical sclerotized warts each bearing a weak spine and a small seta medially to it.

Abdomen without trichobothrial hairs.

Discussion

The peculiar shape of the head of this genus, with its broadened postnodal, ocular, and temporal lobes and large tubercles bearing the ocular setae, is less interesting than the formation of the legs, which do not have "l’aspect général commun a tous les mallophages des marnipiaux australiens" (Werneck and Thompson 1940), but, on the contrary, are more similar to those of ischnoceren Mallophaga. Their tarsi not only have "les derniers segments ..... beaucoup plus courte" but the basal joint is also quite different from that of other Boopiidae, being cylindrical and having the exultralula reduced to a small tubercle bearing two setae. The second joint is a little longer than the basal and is provided on its plato with two long, membranous, sharply pointed, colourless hair-like projections similar to those which I have found (1928, fig. 49) on the plantae of the second tarsal joint in some Trichodectidae. Besides, the cibarium is provided with a strongly chitinized, brown, narrow clothes-peg-like larynx, very similar to that of many Menoponidae. The genital characters of male and female are of the same type as in Boopia. The two-jointed maxillary palpus and the absence of trichobothrial setae on the abdominal segments H-V bring this genus into proximity with Pareboopia flavus.

KEY TO THE SPECIES OF LATUMCEPHALUM

1. Area between procutal and postocutal slit triangular and bluntly pointed ............. lesouefi
   Area between procutal and postocutal slit large and rectangular (Fig. 130) ............... macroclus

LATUMCEPHALUM LESOUEFFI Harrison & Johnston

(Figs. 90M, 132-135)

Latumcephalus lesouefi Harrison & Johnston, 1916, pp. 343-4, figs. 2 and 3 (l, nymphal V, from Macropus ulabasatus, Victoria, A. S. Le Souef); Thompson, 1939, p. 607 (lV type, 2 nymphs, from W. bicolor, Victoria, 1902, A. S. Le Souef, in GBT coll.); Werneck and Thompson, 1940, pp. 452-4, figs. 61-66 (1V, 2 nymph types, in GBT coll.; 1V, from W. bicolor, in GBT coll.; dd, 99, nymphs, from W. bicolor from New South Wales, Zoo, London, A. E. Hamerton).

Type

Lectotype here designated.—c in BMNH (Slide No. BM. 741), det. G.B.T., from Wallabia bicolor, Victoria, A. S. Le Souef.

Material examined


Description and Discussion

In addition to the diagnostic details used in the key to species of Latumcephalus and to the characters considered by Werneck and Thompson in text and figures, the following remarks may be made on this species. Lunula of the genital sternite arches exactly as in L. macroclus. Genital papilla longer (30 μm) and more slender, and 10 μm diameter at its base. Vulva as in L. macroclus with 2:7:2 or 2:6:2 setae, 2nd external the longest as in all species of Boopia, median group shorter and weaker, 1st external short, but nearly as long as the median setae. Subanal margin with 6 short alveolar spicules. Inner margin of gonapophyses and supraanal margin with 13 short alveolar spicules both sides of the midline. The copulatory organ very similar to that of macroclus, but the details cannot be compared as they cannot all be seen in the single specimen of macroclus. Posterior median plate of the vesica of L. lesouefi similar to that of Boopia, but its anterior arms fused with one another (Figs. 133 and 134).

Measurements (in mm) (11V, mean and range): HL 0.26 (0.25-0.28); HB 0.46 (0.44-0.47); HI 1.71 (1.6-1.83); PB 0.26 (0.25-0.28); MB 0.28 (0.26-0.29); AB 0.54 (0.52-0.55); TL 1.34 (1.25-1.36). Those of 3 females fell within the male range except HB 0.46 (0.44-0.49) and AB 0.57.

Host

The nominal host, Wallabia bicolor (Desmarest, 1804), is confirmed.

LATUMCEPHALUM MACROCLUS Le Souef

(Figs. 130 and 131)

Latumcephalus macroclus Le Souef, 1902, p. 51, fig. 4 (from "skin of wallabies"); Harrison and Johnston, 1916, pp. 340-345, figs. 2 and 3 (2V types from Macropus dorcia, Zoo, Melbourne, A. S. Le Souef); Thompson, 1939, p. 607 (2V paratypes, from Wallabia dorcia, Victoria, 1902, A. S. Le Souef, in GBT coll.); Werneck and Thompson, 1940, pp. 449-51, figs. 57-60 (1V, 2V types, GBT, 2V, from Wallabia bicolor, Victoria, A. S. Le Souef, in GBT coll.). Werneck, 1948, pp. 28-9.

Types

Lectotype here designated.—c, in BMNH (Slide No. BM. 737, 1518/13), det. G.B.T., from Wallabia dorcia, Zoo, Melbourne, 1902, A. S. Le Souef. Paralactotypes: 3V, in BMNH (Slide Nos. 738, 739, 740), data as lectotype.

Material examined


Description

Male.—Second femora are provided with only 1 strong spine near the end of the trochanter. Vesical plates similar to those of Boopia, the anterior median plate provided with a long and strongly chitinized handle. The posterior median plate in the single male not perceptible, the lateral sclerites short, posteriorly channel-shaped as in some species of Boopia.

Female.—Gonapophyses (Fig. 131) provided with a very thin and long apical spur and with 8 long and strong setae, 4 of them situated on the alveolar tubercles
of the outer margin, the others ascending on the base to the sides of the postgenital sternum, the last 2 or 3 situated just beneath its lateral margin. Genital sternite in female 1505/65 distinct, frame-shaped, with broadened anterior angles as in Boopla bettonia and some others, and with a distinct, slightly arched lunula. Its long and narrow posterior arms connected with the anterior edges of the more strongly chitinized sides of the postgenital sternum. Median margin of the gonopophyses and the supra-anal margin with a continuous row of short alveolar setae. Subanal margin with a row of hairless setae. Genital papilla slender conical, colourless; the spermathecal duct as in many Boopla very long, distinctly perceptible for a length of 0.5 mm, without forming a dilatation on this stretch. Vulva with 2: 7: 2 setae, the 1st external very short, 2nd very long, median group short but 2.5 times as long as the first external. Postgenital marginal row of setae discontinuous with 6: 5: 6 strong setae, all standing on small papillae. Subanal margin with 2: 2 short alveolar spiculae. Inner margin of gonopophyses and supra-anal margin with a row of 10-11 short alveolar spiculae both sides of the midline.

Measurements (in mm) δ (1518/13) followed by Ψ (1505/65): HL 0.22, 0.24; HB 0.41, 0.42; HL 3.1, 1.76; PrB 0.22, 0.23; MdB 0.20, 0.19; MdB 0.23, 0.23; AL 0.49, 0.47; TL 1.27, 1.27.

Hosts

The nominal host, "skin of wallabies", was restricted by Harrison and Johnston (1916) to Wallabia doralis (Gray, 1837). W. doralis and W. bicolor have not been confirmed as hosts in recent collections.

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ANNEX I
By J. H. Calaby

NOTE ON THE NAMES OF AUSTRALASIAN MARSUPIAL HOSTS

In the literature of the systematics of parasites there are many problems of host identity. Perhaps most of these arise from misidentifications of hosts by collectors or their advisors, and the failure to preserve specimens of hosts. In the absence of specimens, advances in host taxonomy make it impossible to be certain of the identities of some nominal hosts.

As Dr. von Keller's paper is the first comprehensive review of an important group of parasites of Australian marsupials it is thought that a listing of host names and synonyms and a discussion of the doubtful hosts might be useful to parasitologists.

List of Hosts and Synonyms

There is no modern formal checklist of the Australian mammals, the most recent being that of Iredale and Troughton (1934). The authors of that work have a generally narrower view of generic limits than is accepted by the majority of present-day workers; and considerable systematic and nomenclatural research has taken place since it was published, resulting in a rearrangement of some forms, alterations to names, and additions to the fauna. Between 1935 and 1952 Tate published revisions of various groups of marsupials and improved the position somewhat, but some of his innovations are not accepted by other workers. Haltenorth's (1958) revision of the Marsupialia appears to be largely a personal interpretation of the literature and is little or no improvement on Tate's studies. Laurie and Hill (1954) have published a checklist of the mammals of New Guinea.

Species of marsupials from which Boopidae have been identified are given in the following list. The senior synonyms are the names most commonly used by present-day students of Australian mammals, and take account of recent systematic revisions and decisions of the International Commission for Zoological Nomenclature. They are followed by names for marsupials recorded in the literature by students of Mallophaga. Studies are in progress towards a new checklist of Australian mammals and will lead to further rearrangements. Of the species in the present list, the two wombatts, Vombatus ursinus and V. hibernus, are no more than subspecifically distinct, and all of the wallabies except W. bicolor, listed here in Wallabia, should perhaps be best placed in the genus Macropus for reasons given by Calaby (1966).

Family DASYURIDAE

Name of Marsupial

Antechinus flavipes (Waterhouse, 1838) Phascogalea flavipes
Antechinus stuarti Macleay, 1841
Antechinus bellus (Thomas, 1904)

Synonym

Antechinus flavipes (Waterhouse, 1838) Phascogalea flavipes
Antechinus stuarti Macleay, 1841
Antechinus bellus (Thomas, 1904)
Antechinus minimus (Geoffroy, 1803)
Antechinus swainsoni (Waterhouse, 1840)
Phascologale tapoatafa (Meyer, 1793)
Dasyurus maculatus (Kerr, 1792)
Dasyurus viverrinus (Shaw, 1800)
Dasyurus geoffroii Gould, 1841
Dasyurus hallucatus Gould, 1842

Antechinus tapoatafa
Antechinus penicillata (Shaw, 1800)
Dasyurus maculatus
Dasyurus quoll (Zimmermann, 1777)
Dasyurus geoffroii forris Thomas, 1906†
Dasyurus geoffroii
Dasyurus geoffroii forris
Satamellas hallucatus

Family PERAMELIDAE

Perameles nasuta Geoffroy, 1804
Isoodon obesulus (Shaw, 1797)
Isoodon macrorurus (Gould, 1842)

Isoodon obesulus
Perameles macrorurus
Thylacis macrorurus
I. macrorurus torosus (Ramsay, 1877)‡
Thylacis torosus

Family VOMBATIDAE

Vombatus ursinus (Shaw, 1800)
Vombatus hirsutus (Perry, 1810)

Phascolomys fossor (Desmarest, 1804)
Phascolomys hirsutus
Phascolomys (Vombatus) hirsutus
Phascolomys michelli Owen, 1838

Lasiocynus latifrons (Owen, 1845)

Family MACROPOIDAE

Bettongia penicillata Gray, 1837
Aepyprymnus rufescens (Gray, 1837)
Potorous tridactylus (Kerr, 1792)
Dorcopsis victoriae (Lesson, 1827)
Dorcopsis variegata (Thomson, 1822)
Dendrolagus dorrius (Ramsay, 1883)
Dendrolagus halmaherae Collett, 1884
Thylacoleo thetis (Lesson, 1827)

Macropus rufus
Macropus giganteus Shaw, 1790
Macropus eugenii (Desmarest, 1817)
Macropus robustus Gould, 1841
Macropus antiopusinus (Gould, 1842)
Macropus megaliurus (Desmarest, 1822)
Macropus fuliginosus (Desmarest, 1817)

Macropus rufus
Macropus giganteus
Macropus eugenii
Macropus robustus
Macropus antiopusinus
Macropus megaliurus
Macropus fuliginosus

Nominal Host of Boopit auncinita

Harrison and Johnston (1916) list the nominal host of Boopit auncinita unequivocally as “a ‘tiger cat’, Dasyurus maculatus”. The first author to list the species following the original description was Thompson (1939) who, without explanation, recorded the nominal host as Dasyurus quoll, an entirely different

* Name currently recognized in a subspecific sense.
† Because of locality, all specimens of lice collected from D. geoffroii are from this subspecies.
‡ Because of locality, all specimens of lice collected from I. macrorurus are from this subspecies.
species commonly known as the eastern native cat. He presumably confused the name of the nominal host, *Dasyurus maculatus* (*Viverra maculata* Kerr, 1792), with *Didelphis maculata* Kerr, 1792, a junior synonym of “*Dasyurus quoll*". (The specific name *quoll* Zimmermann, 1777, has been ruled as unavailable by the International Commission for Zoological Nomenclature [Bull. zool. Nomencl. 4, 547 (1950)]. The valid name of the eastern native cat is *Dasyurus viverrinus* (Shaw, 1800).) All subsequent authors have followed Thompson and listed the nominal host of *B. uncinata* erroneously as "*Dasyurus quoll*".

Thompson stated that Harrison and Johnston's type material was in his care and that he had "remounted and labelled it all." The specimens of *B. uncinata* from Sydney (1 male, 2 females, 1 nymph) listed by Werneke and Thompson (1940) and labelled as from "*Dasyurus quoll*", may have originally stood under the name *Dasyurus maculatus*, but the original labels are lost. These specimens are unlikely to be type material as Harrison and Johnston in their original description saw only one female and one nymph. Thus there is no unequivocal record of *B. uncinata* from "*Dasyurus quoll*".

**Nominal Host of Phacogalia brevispinosa**

*Phacogalia brevispinosa* was described from a specimen taken from "a pouch mouse, *Phascologale flavipes (= Antechinus flavipes)*, at the Sydney Zoological Gardens". Wakefield and Warneke (1967) have shown that two species of *Antechinus, flavipes* and *stuartii*, have long been confused under the name *flavipes*. *A. stuartii* has been placed in subjective synonymy under *flavipes* for the past century. Only *A. stuartii* occurs in the coastal region of New South Wales and it is common around Sydney. It is probable that the animal from which the type of *Phacogalia brevispinosa* was collected was captured in the Sydney area and was a specimen of *A. stuartii*.

Von Keler records *P. brevispinosa* from two specimens of "*Phascologale flavipes*" from Palmerston, Qld. In north Queensland there are three species of *Antechinus* which have been considered forms of *A. flavipes* and all of which may well be known to Von Keler. It is now known that one of these, *A. godmani* (Thomas, 1923), is a full species, and another, *A. s. adamsi* (Thomas, 1923) is a subspecies of *stuartii*. The remaining form is true *flavipes* (Wakefield and Warneke 1967). Only one form, listed as *A. f. godmani*, has been recorded actually at Palmerston, by Harrison (1962). Harrison and his team from the Innisfail Field Station of the Queensland Institute of Medical Research labeled their specimens with serial numbers prefixed by "N.P.", and as one of the Palmerston series of *P. brevispinosa* from "*P. flavipes*" carries Harrison's number, it seems certain that the lice were taken from host specimens he recorded as *A. f. godmani*. As the full complexity of the systematic situation in *Antechinus* in north Queensland was not realized at the time of Harrison's work and as he gives few descriptive details of his specimens it cannot be considered certain that they are *godmani*.

It thus appears that there are no unequivocal collections of *Phacogalia brevispinosa* from its recorded nominal host, *Antechinus flavipes*.

**APPENDIX II**

By M. D. MURRAY and J. H. CALABY

**THE HOST RELATIONS OF THE BOOPIDAE**

Thirty-five species of Boopidae have now been described from the Australasian marsupials and it is possible for the first time to review their host relationships critically. The collections upon which von Keler's study is based fall clearly into two categories; the early collections made before 1960, from which the 20 species described previously were obtained, and the recent and extensive ones. The majority of the former were made from captive animals with some confusion of identity of the host, whereas the latter are field collections by persons competent in the modern concepts of identification of these mammals. These field collections have revealed clearly the danger of collecting ectoparasites from captive animals in zoological gardens. Of the 20 species of lice described from early collections, the types of 13 are known or can be presumed to have been collected from animals in zoological gardens, and only five of these hosts have been confirmed even though many collections have been made from the supposed hosts.

It is customary in zoological gardens and parks, particularly in Australia, to have an enclosure in which several species of kangaroos feed and sleep together, so it is easy to understand how many of the collections made by Le Souef may have confused the issue, particularly with regard to the louse fauna of *Nullibid bicoilor*. Von Keler was well aware of this problem and wisely refers to the host of the type material as the nominal host, allowing the true hosts to be determined as more collections are made. However, the confusion will be perpetuated unless the problem is discussed and emphasized.

It seems advisable when discussing host relationships of Boopidae to question all those collections from captive animals. Table 3 is a host-parasite list, arranged by family of host and genera of Boopidae. Records which have been confirmed or have been collected reliably are given in italics, and those in need of confirmation, with a question mark. Records which appear to be due to contamination and which should be ignored are given in parentheses. The most striking feature is that no lice have been recorded from the Notoryctidae (marsupial mole), Phascolarctidae (koala), Phalangeridae (possums), Petauridae (gliders), Burramyidae (pigny possums), and Tarsipedidae (honey possum). In the case of the Notoryctidae and perhaps also the Burramyidae and Tarsipedidae, insufficient specimens have been examined for lice, and no valid conclusions can be drawn. However considerable numbers of koalas and several species of possums in both the Phalangeridae and Petauridae have been searched for lice, and it is very probable that the members of these families do not harbour these parasites.

*Phacogalia* species appear to be lice of small dasyurids whereas *Boopia uncinata* is the louse of the large dasyurids. Other species of *Boopia* are found on all of the other groups of Australasian marsupials from which lice have been collected: *B. betongia* is the louse of typical bandicoots (Peramelidae); *B. tarata* that of the two closely related species of common wombats, *Vombatus ursinus* and *V. ursinus*, whereas *B. dubia* is the louse of the hairy-nosed wombat, *Lasiorhinus latifrons*. *Boopia* appear to be the typical lice of the large kangaroos, although one is found on the swamp
wallaby, *W. bicolor*, and another on a tree kangaroo, *Dendrolagus morio*, of New Guinea. Thus species of *Boopia* occur on members of all the families Dasyuridae, Peramelidae, Vombatidae, and Macropodidae.

A distinct grouping may be seen of the lice found on Macropodidae. The genus *Parheterodoxus* is confined to the rat-kangaroos (*Potoroinae*); the large kangaroos (red, eastern and western grey, euro, and antilopine) are infested by species of *Boopia* whereas the large and some of the smaller wallabies are infested by species of *Heterodoxus*; the genus *Macropophila* is confined to the small wallabies of the genus *Thylogale*. It is noteworthy that the remaining genera, *Parabooipa* and *Latumcephalum*, both of which have affinities with *Boopia*, infest those kangaroos which are parasitized by species of *Boopia*.

*H. spiniger* has now been definitely found on a marsupial, *W. agilis* (see p. 64), so it is highly probable that this louse did transfer from a macropodid host to dogs, perhaps via the dingo, and was transported around the world on domestic dogs.

Thus the extensive recent collections have considerably clarified the host relationships of lice of Australasian marsupials, and a definable pattern is emerging. However, it is equally clear that the need for collection to be continued remains, so as to confirm and clarify an emerging relationship before some of the hosts become extinct.

Clay (1970) casts doubt on the commonly held view that the Boopiidae are primary parasites of Australian marsupials, and suggests that infestation of these animals was comparatively late and arose from an avian monopodid ancestor. This might have become established on an ancestral phalangeroid stock [Order Diprotodonta of Kirsch (1968)] and diversified on that group, the parasites now found on the other groups of marsupials being due to secondary infestations. A consideration of the known distribution of members of the Boopiidae among their marsupial hosts, including their absence from the possum families, leads us to go further and suggest that the ancestral boopiids became established in the first place on the family Macropodidae. Typical members of this family were in existence in the Miocene and probably Oligocene, and by the Pliocene the family had radiated widely (Stirton, Tedford, and Woodburne 1968). This seems to be early enough to allow sufficient time to escape for the Boopiidae to reach its present diversity which, as pointed out by Clay, is not very great. There may be evidence that something peculiar about the arboreal possum-like marsupials that has discouraged an association of lice with them, but in the absence of any knowledge of the biology of these lice we can make no suggestions on this point. We agree also with Clay that the Boopiidae and Trimenoponidae are not closely related and almost certainly had different origins.

### Table 3

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<tr>
<th>Host Relations of Boopiidae of Marsupials</th>
<th>Genus and Species of Boopiidae</th>
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- *Host requires confirmation.*

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<th>Family</th>
<th>Genus</th>
<th>Species</th>
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<td><em>bicolor</em></td>
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<td><em>Phalangeria</em></td>
<td><em>torquata</em></td>
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- *Notes:*
  - *brevirostris* (short-robbed)
  - *brevirostris* (broad-nosed)
  - *Ignita* (ignite)
  - *Encantagia* (encantagia)

- *Comparative species:*
  - *Beringia* (beringia)
  - *Lophopera* (lophopera)
  - *Diprurus* (diprurus)

- *Comparative host:*
  - *Diprurus* (diprurus)

- *Comparative notes:*
  - *Diprurus* (diprurus)
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Figure 1-4. Rework: 1. brevicauda, 2. furcipata, 3. and 4. terminal abdominal segments of female and male.
Figs. 5-8.—Macropophila clayne: 5, male; 6, female; 7, male genitalia; 8, terminal abdominal segments of female.

Figs. 9-13.—Macropophila spp. 9-11, M. biacuara: 9, male; 10, female; 11, male genitalia. 12, M. breviacuara, genitalia of male holotype. 13, M. biacuara, terminal abdominal segments of female.
Figs. 14–16.—Macrophila brevicauda: 14, male; 15, female; 16, terminal abdominal segments of female.

Figs. 17–20.—Heterodoxus spiniger: 17, male; 18, female; 19 and 20, terminal abdominal segments of male and female respectively.
Figs. 21-24. *Heterodoxus longiventris*: 21, male; 22, female; 23, male genitalia; 24, terminal abdominal segments of female.

Figs. 25-29. *Heterodoxus audax*: 25, male; 26, female; 27, male genitalia; 28, male genitalia—sac extended; 29, terminal abdominal segments of female.
Figs. 30-33. — Heterodoxus alatus: 30, male; 31, female; 32, male genitalia; 33, terminal abdominal segments of female.

Figs. 34-38. — Heterodoxus ampullatus: 34, male; 35, female; 36, male genitalia; 37, part of vesica of male genitalia; 38, terminal abdominal segments of female.
Figs. 39-42.—*Heterodoxus ancoratus*: 39, male; 40, female; 41, male genitalia; 42, terminal abdominal segments of female.

Figs. 43-47.—*Heterodoxus calabri*: 43, male; 44, female; 45, male genitalia; 46 and 47, dorsal and ventral view, respectively, of terminal abdominal segments of female.
Figs. 48-51. *Heterodoxus macrops*: 48, male; 49, female; 50, male genitalia; 51, terminal abdominal segments of female.

Figs. 52-55. *Heterodoxus mitsunus*: 52, male; 53, female; 54, male genitalia; 55, terminal abdominal segments of female.
Figs. 56-59. *Heterodoxus ortneriatus*: 56, male; 57, female; 58, male genitalia; 59, terminal abdominal segments of female.

Figs. 60-64. *Heterodoxus quadrirerius*: 60, male; 61, female; 62 and 63, male genitalia; 64, terminal abdominal segments of female.
Figs. 65-68.—*Heterodaxus pygidalis*: 65, male; 66, female; 67 and 68, terminal abdominal segments of male and female respectively.

Figs. 69-72.—*Para* *heterodaxus insignis*: 69, male; 70, female; 71, male genitalia; 72, terminal abdominal segments of female.
Fig. 73.—*Paraheterodoxus calcaratus*, terminal abdominal segments of male (*A*) and female (*B*).

Figs. 74-77.—*Heterodoxus maai*: 74 and 75, male genitalia; 76, male genitalia showing part of vesica; 77, terminal abdominal segments of female.
Figs. 78–80.—Macrocephila forcipata: 78, female; 79, head and thorax of female; 80, terminal abdominal segments of female.

Fig. 81.—Booplia bicraniata, female (1503/71).

Fig. 82.—Lateral aspect of head and thorax of Heterodactylus spiniger male (1521/7).

Fig. 83.—Preantennal region, ventral, of Cumminga peramphis female (1505/1).
Fig. 84.—Male genitalia of *Heterodosis spiniger* (1523/11). *mes. arc.*, mesosome arch; *par.*, paramere; *art. proc.*, articular process of basal plate; *mes.cl.*, mesosome clasp; *vl.scl.*, ventrolateral sclerite; *d.l.scl.*, dorsolateral sclerite; *v.m.pl.*, ventral median plate; *d.m.pl.*, dorsal median plate; *ej.d.*, ejaculatory duct; *ven.t.*, venicular teeth; *musc.amp.*, muscular ampulla of ejaculatory duct; *bas.pl.*, basal plate.

Figs. 85 and 86.—*Trimenopon hispidum* (1523/1): 85, male genitalia; 86, maxillary palp.

Fig. 87.—Lateral region of head of: A, *Philandresia townsendi* male (1523/5); B, *Philandresia chichillae* female (1505/6); C, *Chinchillepha pavonaria* female (1525/2); D, *Camingisana peramydis* female (1505/1); E, *Trimenopon hispidum* male (1523/1).

Figs. 88 and 89.—Female end of abdomen of *Trimenopon hispidum* (1523/1) and *Camingisana peramydis* (1505/2) respectively.
Fig. 90.—Sclerites of vesica, free-hand sketches: A, Boopis tarsata (1505/36); B, B. dubia (1496/23); C, B. bicornuta (1505/07); D, B. grandis (1512/34, 1509/3); E, B. bettongia (1496/27) [E', 1496/28, 34; E", 1512/3]; F, B. succinata (1505/27); G, B. minutula (1508/3, type); H, B. minuta (1512/25); I, Paraboopis flavus (1505/81); K, Phacogala brevigarious (1496/13, 10); L, Phacogala spinosa (1513/2); M, Latanophalum lenaei (1496/51).

Fig. 91.—Thoracic sternites of one male and four females of Boopis bettongia: A, female (1508/3); B, male (1508/4); C, female (1512/3); D, female (1512/5); E, female (1496/25).

Fig. 92.—End of abdomen of Boopis bettongia female (1496/34).
Figs. 93-95. *Boopis dubia*. 93, male (1496/38); α, ocular seta; p, postocular seta; f, second frontal seta; 94, hind tarsus (1496/23); 95, end of abdomen, female, of 1496/39 (left) and 1505/41 (right).

Figs. 96-99. *Boopis grandis*. 96, male genitalia, ventral aspect (1512/34); 97, 98, erect phallus, dorsal and ventral aspect respectively; 99, end of abdomen of female (1512/34).
Figs. 100-102.—Boopia tarsata: 100, female head, dorsal (1496/18); 101, male left hind tarsus (1496/22); 102, end of abdomen of female (1512/18).

Fig. 103.—Male head and prothorax of Boopia uncinata (1505/24):
A, dorsal; B, ventral.

Fig. 104.—Thoracic sternites of Boopia uncinata: A-D and H, females off Dasyurus hallucatus; E, female off Dasyurus geoffroyi; F, G, I, males off D. hallucatus; J, male off D. geoffroyi fortis. Slide identification numbers as follows: A, 1505/29; B, 1505/28; C, 1522/1; D, 1505/26; E, 1505/25; F, 1496/16; G, 1522/2; H, 1522/3; I, 1522/3; J, 1496/17.

Fig. 105.—End of abdomen of Boopia biseriata female: 1496/67 (left); 1505/67 (right).

Fig. 106.—Head and prothorax of Paraboopia flavo male (1505/81): A, dorsal; B, ventral.
Figs. 107–110. *Phacogala brevipinosa*. 107, dorsal (A) and ventral (B) view of head and prothorax; 108, male genitalia; 109, 110, phallic with spermatophore, ventral and dorsal aspects respectively.

Fig. 111. *Phacogala spinosa*. A, female head and prothorax, dorsal (1513/1); B, male head and prothorax, ventral (1513/1).
Fig. 112.—Prosternites of *Macropophila clayae* (A, B), *M. bicarnea* (C, D), *M. brevitarsa* (E, F). Slide identification numbers are as follows: A, 1496/42; B, 1505/54; C, 1496/44; D, 1496/48; E, 1497/2; F, 1505/49.

Fig. 113.—End of abdomen of female *M. clayae* (1496/42).

Fig. 114.—Thoracic region of *M. bicarnea* (1496/49).

Fig. 115.—Genital papillae of species of *Macropophila* and *Heterodoxa*:

- A, *M. clayae*;
- B, *M. bicarnea*;
- C, *M. brevitarsa*;
- D, *H. longitarsus*;
- E, *H. spiniger*;
- F, *H. ualabati*;
- G, *H. amplatus*;
- H, *H. calabyi*;
- I, *H. nitrus*;
- J, *H. ancoratus*;
- K, *H. alatus*;
- L, *H. macropus*;
- M, *H. quadrilaterus*;
- N, *H. pygidiulus*;
- O, *H. octosieratus*;
- P, *H. maui*. 
Fig. 116.—Ninth median tergal plates of females of Macropodilus and Heterodoxus species. A-D, M. clayae (1496/40, 1496/42, 1505/59, 1518/5 respectively); E, M. biarcuata (1496/50); F, M. brevicauda (1505/49); G, H. C. longitarsus (1496/60, 1496/61 respectively); I, K-N, H. spinius (1518/12, 1518/3, 1518/11, 1518/1, 1518/4 respectively); O, H. salabati (1497/51); P, H. ampullatus (1518/43); Q, H. calabris (1496/55); R, H. mirus (1497/18.1); S, H. amorus (1496/57); T, H. alatus (1503/41); U, H. macropus (1505/55); V-X, H. quadrispinosus (1496/72, 1496/75, 1505/91); Y, Z, H. octoverratus (1496/4.2, 1496/4.1).

Fig. 117.—Male head and prothorax of Heterodoxus spiniger (1514/1): A, dorsal; B, ventral.

Fig. 118.—Male genitalia of H. spiniger (1518/12) from Wallabia agilis. Explanation of lettering as in Figure 84.

Fig. 119.—End of abdomen of female H. spiniger (1518/12) from W. agilis.
Fig. 120.—End of abdomen of female *Heterodoxus longipalpus*, left dorsal, right ventral. Slide identification numbers 1497/3 and 1496/62 respectively. viii, ix, tergites; p, genital papilla (internal); g.p., gonapophysis; s.m.a., supraanal margin and ampullae; g.s., genital sclerite (internal); z.g.l., subgenital lobe; l, lunula; p.g.s., postgenital sternum; p.g.s., postgenital setae; s.m.s., subanal margin and setae; v, vulva.

Fig. 121.—Male head and prothorax of *Heterodoxus alatus* (1503/3-2): A, dorsal; B, ventral.

Fig. 122.—Male genitalia of *H. alatus*: A, 1503/3-2; B, 1503/4-1.

Fig. 123.—Male head and prothorax, dorsal and ventral views, of *Heterodoxus ampullatus* (1512/43).

Fig. 124.—Male head and prothorax, dorsal and ventral views, of *H. mirratus* (1497/19). 1, 2, 3, temporal setae.
Fig. 125.—End of abdomen of female *Heterodoxus octoseriatus* (1496/4).

Figs. 126, 127.—Female head (1496/77) and male genitalia (1497/16) of *Parahterodoxus insignis* respectively.

Fig. 128.—End of abdomen of female *Parahterodoxus calcaratus* (1496/3).

Fig. 129.—End of abdomen of female *P. erinaceus* (1496/80).
Figs. 130 and 131.—Female head and prothorax, dorsal and ventral views, and end of abdomen of female *Laturncephalum macropus* respectively (both 1505/65).

Figs. 132-135.—*Laturncephalum lesueufi*: 132, hind tarsus (1509/20); 133, dorsal aspect of male genitalia (1496/51); 134, ventral aspect of male genitalia (1496/52); 135, end of abdomen of female.
Recognized Genera, Species, and Synonyms of Trimenoponidae and Boopidiidae

Valid names in italics, synonyms in roman type

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<td>tarsata Piaget</td>
</tr>
<tr>
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