A Report on a Collection of Lice (Boopidae: Phthiraptera) on *Petrogale* (Rock Wallabies)

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The collection comprises Phthiraptera belonging to two groups (*octoseriatus* and *ampullatus*) of the genus *Heterodoxus* Le Souëf and Bullen 1902, their distribution being shown on a map. Only the *octoseriatus* is dealt with taxonomically, seven new species being described. Some suggestions are made regarding host relationships based on the distribution of the lice.

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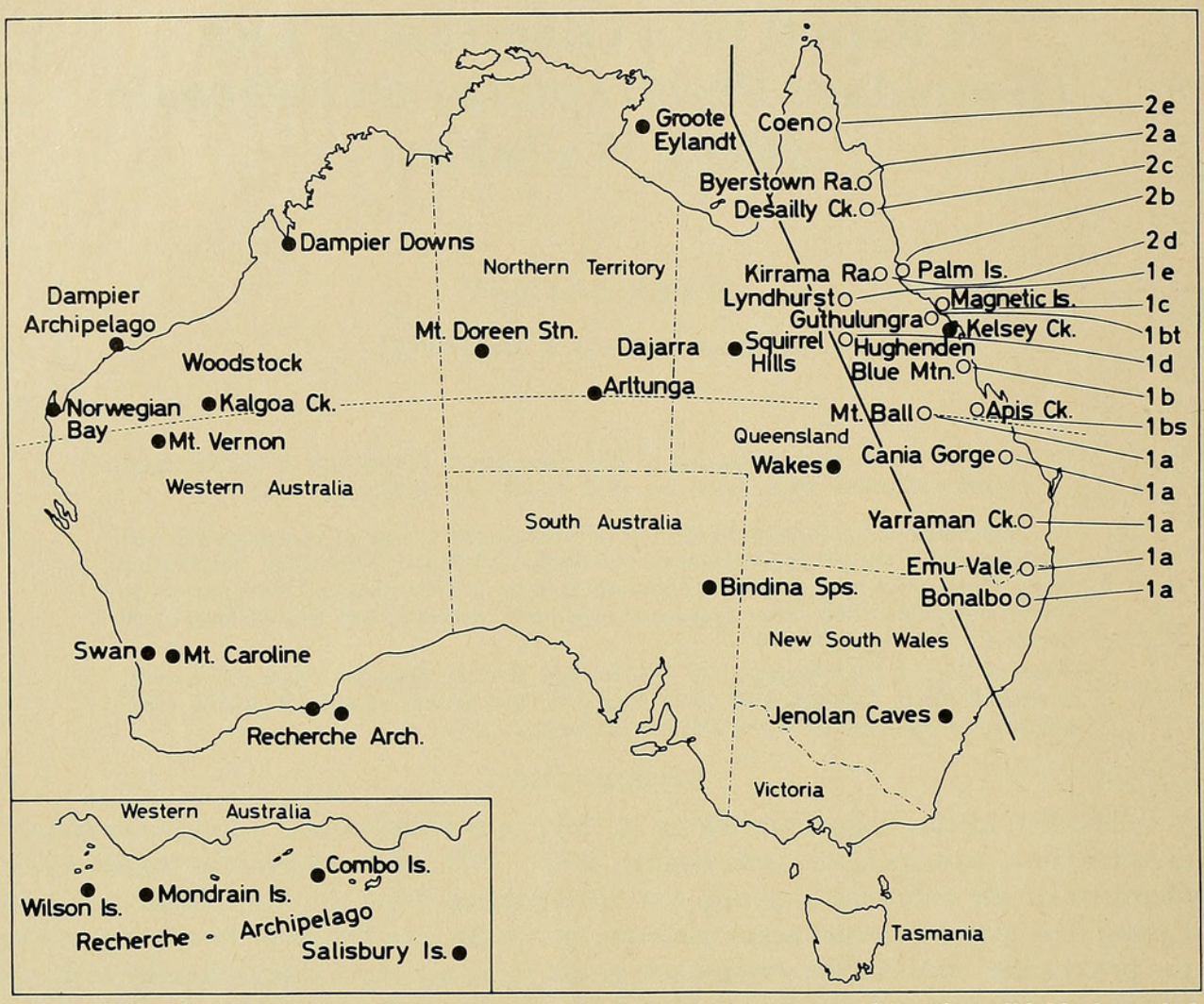
INTRODUCTION

The lice in this collection belong to the genus *Heterodoxus* (family Boopidae) divisible into two groups: *octoseriatus* Kéler 1971 and *ampullatus* Kéler 1971. Members of the *octoseriatus* group are distinguished from the *ampullatus* group in having two lateral macrochaetae with one spiniform seta between them each side of the prosternite, while in the *ampullatus* group there are three macrochaetae with one spiniform seta between the first and second. In the males of the former group the vesica has longitudinal rows of spines or denticles (Figs. 3, 13) while in *ampullatus* the spines and denticles are arranged otherwise.

DISTRIBUTION

In the present collection the members of the *octoseriatus* group are restricted to the eastern subcoastal areas of Australia (Map 1) the furthest west being 143.09 E, host *P. godmani*, 14 km N of Coen, Queensland, this record also being the furthest north (13.50 S): the most southerly record is Gorge Creek, Bonalbo, New South Wales (28.39 S, 152.35 E). There are no records of members of the *ampullatus* group east of the line drawn on Map 1 with the exception of the population parasitic on *Petrogale* n.sp. Maynes (in press) from Kelsey Creek, Queensland (20.26 S, 148.27 E). All specimens of *Heterodoxus* examined from rock wallabies in other areas of Australia belong to the *ampullatus* group.

There is no record in this collection, except from an unconfirmed one (see p. 70) of a host taxon in the same locality being parasitized by more than one taxon of Boopidae, whereas in many groups of birds and mammals the host may not only be parasitized by members of more than one genus, but by members of two species-groups of one genus. The pocket gophers (Geomyidae) of North America may be parasitized by three taxa of *Geomydoecus* (Trichodectidae), sometimes on the same host individual. The pocket gophers, like the rock wallabies, have been divided into many subspecies, 25 in the case of *Pappogeomys castanops* for example, and in which the distribution of the lice seem to throw some light on the gopher relationships (see Hellenthal and Price, 1976, for a full discussion). The hyraxes (Hyracoidea) of



Map 1. Distribution of *Heterodoxus* groups on Rock Wallabies (*Petrogale*). The solid black symbols represent distribution of the *ampullatus* group of *Heterodoxus*; open symbols represent the *octoseriatus* group. The distribution of the taxa of the *octoseriatus* group is also shown as, for example, 1a (see also Table 1).

Africa, in which a number of genera and many species and subspecies have been recognized, tend to be heavily infested with lice. A subspecies of host may be parasitized by up to eight species or subspecies of lice belonging to a number of genera or to different species-groups of the same genus. The number of Hyracoidea taxa and their lice may perhaps be explained by the ancient origin of the host group, it being known at least as early as the Lower Oligocene (Hopkins, 1949: 510, 549) and by the isolation of its populations.

Material

The material comprises 77 tubes of specimens in alcohol collected from 19 taxa of *Petrogale* by Dr Gerald M. Maynes during 1976/77. A small number of specimens in the British Museum (Natural History) and the Australian National Insect Collection were also examined. The taxonomic status of the various forms of the host genus mentioned in this paper is tentative only and is the subject of current research by Dr Maynes and colleagues. The spirit specimens were sorted into two groups by the prosternal chaetotaxy and either mounted on slides after the treatment with KOH, some specimens being stained in Safranin O, or examined in lactophenol. Samples of specimens from all host taxa and localities were prepared by the KOH method, such specimens being used for measurements.

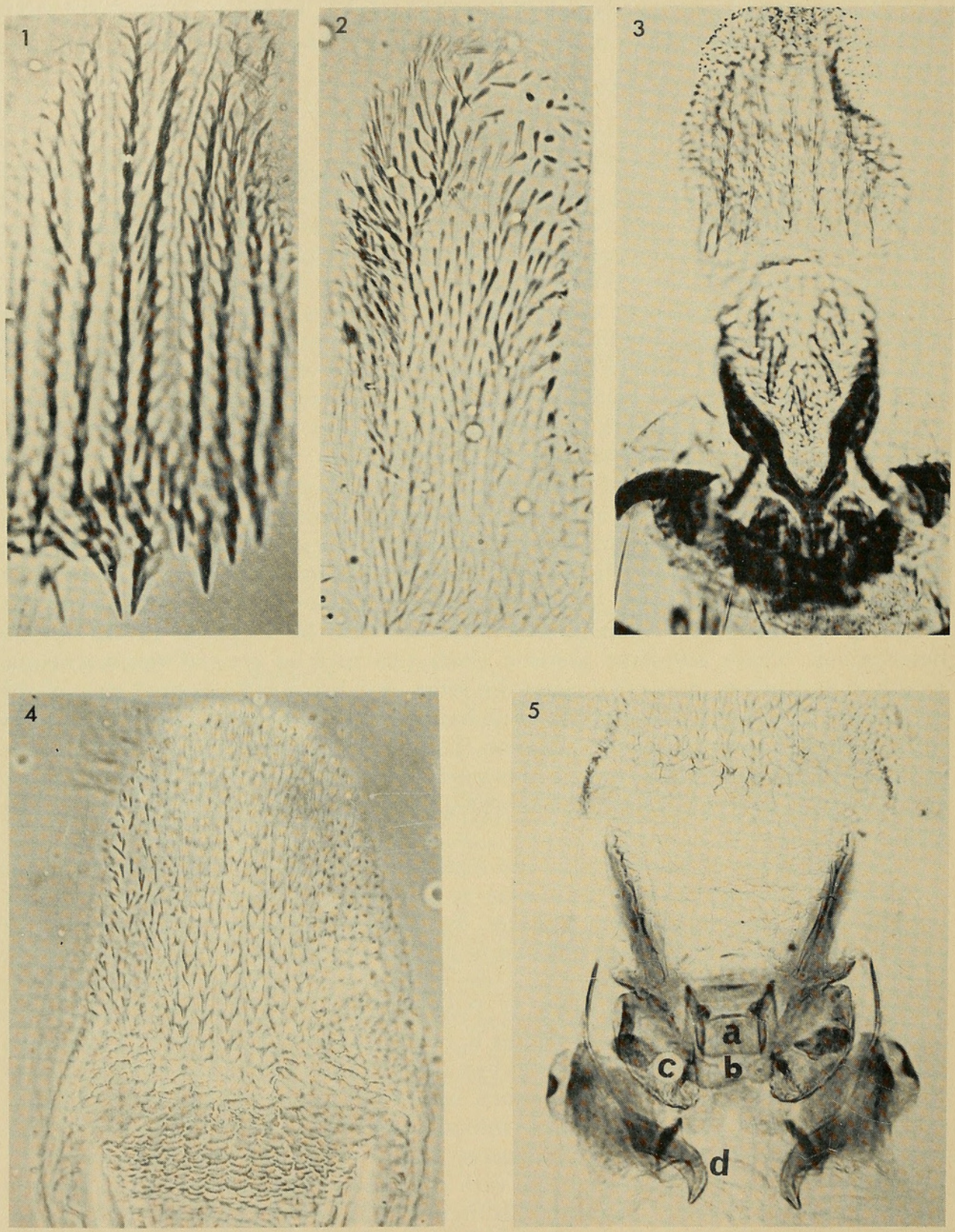
Holotype specimens are deposited in the Australian National Insect Collection; paratypes, when available, in the above collection and in the British Museum (Natural History).

Taxonomy

The species of *Heterodoxus* are similar to each other in the majority of characters and cannot easily be separated into species-groups; for this reason the term group, not species-group, has been used. The present group is separable from all other known species only by the characters of the sac-like part of the copulatory apparatus. This is divided into two areas: the posterior part (that is the part nearest to the main plates of the apparatus) covered with scales (Fig. 4) with or without colourless spines or sometimes thickly covered with spines (Fig. 21); the anterior area has longitudinal rows of spines (Fig. 1) dorsally and finer spines (Fig.2) ventrally. As the two sides of the sac are usually pressed against each other in prepared specimens, the fine spines appear to be intermingled with the stout spines (Fig. 21) and being more numerous, often obscure the latter. *Heterodoxus quadriseriatus* Kéler 1971 from *Setonix brachyurus* (Quoy & Gaimard 1830) has a vesica with similar longitudinal rows of spines and should perhaps be included in this group; however, the sac is not divided into two areas and there are only two rows of large spines set within an elongated area of smaller spines (see Kéler*, fig. 62-63), whereas in the species dealt with below there are four or more such rows. In addition, all the species discussed below have the following characters in common and these will not be repeated in the species descriptions. There are some meristic characters such as general measurements, length of oral spines, mesonotal spiniform setae, number of submarginal setae of the prosternite and length and number of abdominal and vulval setae which show some intra- and perhaps interspecific variation. Longer series and statistical analysis may show significant differences in these characters between populations. However, as the taxa can easily be separated on gross morphological characters it is unnecessary at this stage.

General shape of head, thorax and abdomen as shown in Kéler, figs 56-57, for *octoseriatus*. Arrangement of head setae as in Kéler, fig. 117, for *spiniger*; unlike *ampullatus*, it has temporal seta 3 (Kéler, fig. 124) nearer to the posterior margin of the antennal groove than to the alveolus of 2. Seta 2 is seta 27 of Clay (1969, fig. 2) identified by its close association with the minute seta 26; Kéler's seta 3 is most probably seta 30 of Clay (1969, figs 2, 3). Pronotum with 8 marginal setae each side as follows: 2 short spiniform setae (nearest to head), 1 medium in length, 1 stout and spiniform, 1 minute, 2 long, with a short seta on the outer side of the more central of the two long ones; outer dorsal pronotal seta stout and spiniform, inner minute; posterior pronotal seta present and minute (see Clay, 1971: 528). Prosternite triangular, laterally with 2 macrochaetae and 1 spiniform seta between them; posteriorly without spiniform setae and with a number of submarginal setae. Some or all of these prothoracic characers distinguish this group from *H. ampullatus, pygidialis,* and *mitratus* Kéler and *maai* Emerson. Mesonotum with the usual large wart each side bordered posteriorly by a thickened arc from which arises dorsally a stout spiniform seta and more ventrally a short colourless seta. Mesosternum with indefinite plate with a minute seta each side (see Clay, 1971, fig. 26), thickened ridges of mesosternum with 10-11 setae each side, the most posterior being stout and spiniform. The apparent metanotum, as shown elsewhere (Clay, 1970: 80), is almost certainly the fused metanotum and tergum I, there are therefore two lines of setae

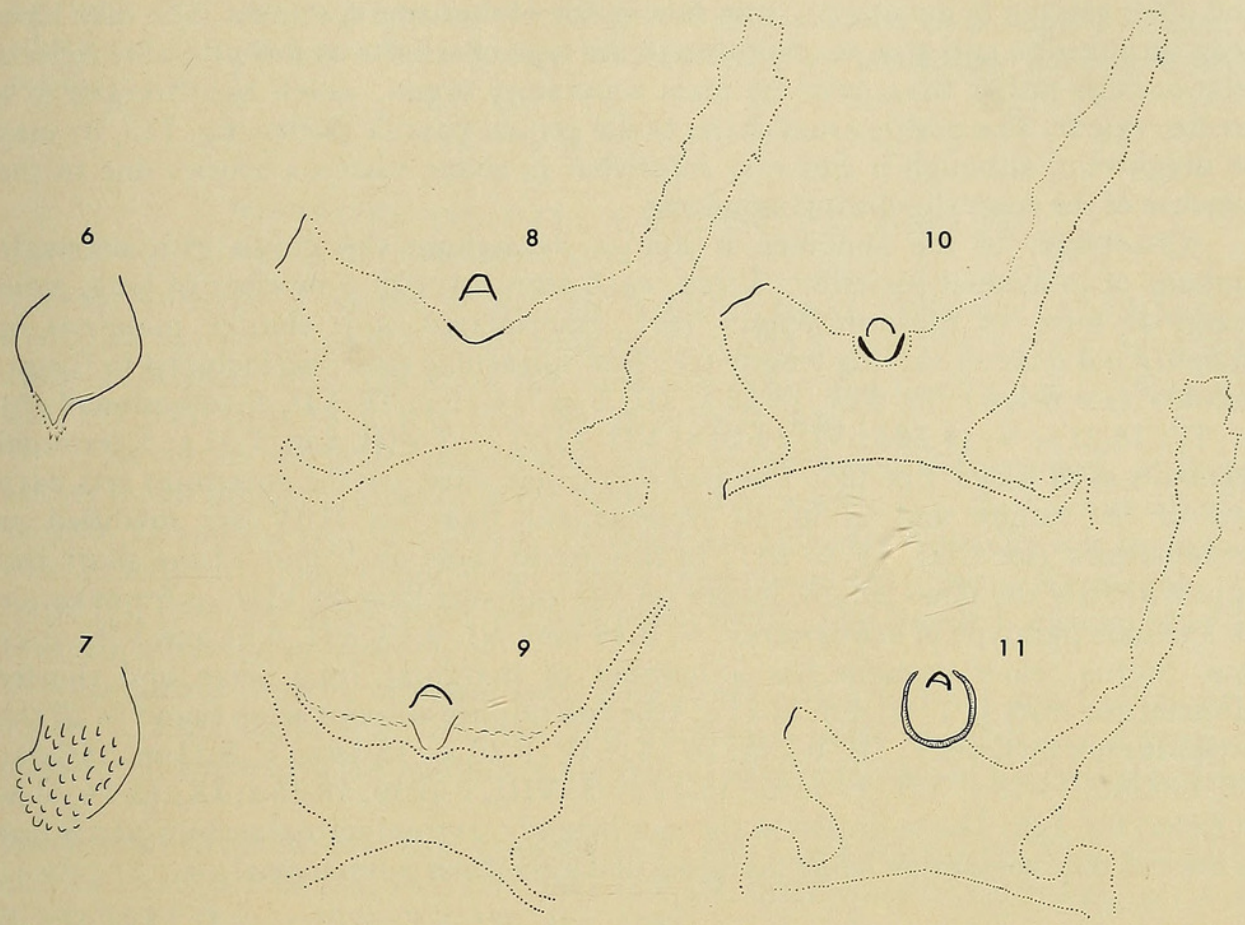
*All mentions of Kéler refer to Kéler, 1971.



Figs 1-5. Heterodoxus spp. 1-2, *H. octoseriatus* from *Petrogale herberti*, armature of vesica sac: 1, dorsal; 2, ventral. 3, *H. orarius* to show the 6 lines of spines and long colourless spines in vesica sac. 4-5, *H. maynesi* sp.n.: 4 vesica sac; 5 central mesosomal sclerites.

Key to lettering on text figures:

a. Anterior median plate (Kéler : 6 = dorsal median plate Kéler, fig. 118).
b. Posterior median plate (Kéler : 6 = ventral median plate Kéler, fig. 118).
c. Inner dorso-lateral plate.
d. Dorso-lateral sclerite (Kéler, fig. 118)
e. Ventro-lateral sclerite.
f. Ventral central bilobed sclerite.



Figs 6-11. Heterodoxus spp. **6-7**, Sclerite c.: **6**, *H. octoseriatus*; **7**, *H. maynesi*. **8-11**, Female genital sclerite and genital papilla: **8**, *H. octoseriatus*; **9**, *H. maynesi;* **10**, *H. lesouefi*; **11**, *H. insulatus*.
[Note: **8-11**, **18-20** same magnification, **6-7** same magnification.]

similar in all the species: the anterior line (metathoracic) comprises two stout spiniform setae on each lateral plate, 3 + 3 marginal setae and 2 + 2 anterior lateral spiniform setae. The posterior line (segment I) comprises a stout spiniform lateral seta each side and 1 + 1 marginal setae with 4-5 minute or short setae each side. The arrangement of these can be seen in Clay (1970, fig. 26). Metasternal plate, which may be the fused metasternal and sternite I, with shape as in *Heterodoxus keleri* Clay, 1971, fig. 8, and normally with 8 setae.

Abdominal tergites IV-V without wide semicircular indentations on each end of the posterior margin and sternite II without finger-like prolongations, the absence of these characters distinguishing this group from *H. longitarsus* (Piaget) and *ancoratus* Kéler. In the female the central part of tergum VIII does not form a separate plate as *H. longitarsus* (Kéler, figs. 120, 125); shape of median plate of tergum IX as in Kéler, fig. 116, Z.

The characters of the male copulatory apparatus of *Heterodoxus* provide the best diagnostic features for the separation of the species, but are probably of little phylogenetic value. As shown above, the characters of the sac-like part of the vesica separate this group from the rest of the genus. Kéler (: 6) gives a general account of the apparatus in the Boopidae and has attempted to name the sclerites, but apart from the dorso-lateral sclerites and the anterior median plate (Kéler: 6 = dorsal median plate, Kéler, fig. 118) it has not been possible to homologize all the sclerites in the following species. In the female the diagnostic characters are found in the form of the internal genital sclerite (Keler, fig. 120, g.s.) of which there are two main types (see p. 73). This sclerite is characteristic for the species, although irregular in outline

and often varying in detail even from side to side of the same specimen. The taxa have been arranged in two groups according to the type of sclerite as this probably reflects relationships rather than does the male copulatory organ, which has diverged to a greater extent. The position and shape of the genital papilla (Kéler, fig. 115, 0) may be diagnostic, although it can vary somewhat in shape within a species due to the pressure of the cover slip during mounting.

Chaetotaxy of the abdomen is similar throughout the group with a certain amount of individual variation. Terga, each segment with a number of long, stout marginal setae of uniform length (m), interspersed with shorter marginal or submarginal setae of varying length (s); post-spiracular setae not included in the m. number (see below). II, 4 m. 13-16 s; III, 6 m. 14-19 s; IV-VII, 6 (occasionally 5) m; IV, 18-23 s; V, 14-20 s; VI, 13-21 s; VII, 13-21 s; ♂ VIII, 6 m. 7-11 s; ♀ terminal segments as in Kéler, fig. 125. The post-spiracular setae are the outermost seta each end of the tergite and as in all *Heterodoxus* those on II-IV are modified as trichobothria (see Clay, 1970: 83); in this group those on V and VI are short and approximately the same length, longer on VII and very long on VIII, as for example on a female paratype of *octoseriatus*: V, 0.19 mm. VI, 0.19. VII, 0.31 and VIII, 0.41 mm. Sterna, each segment has a number of marginal (m.) setae and shorter submarginal ones (s.). II, 4 m. 6-11 s. (the two minute anterior setae found in all the Boopidae not included); III, 6-7 m. 10.14 s; IV, 8-10 m. 12-16 s; V, 9-11 m. 13-16 s; VI, 10-15m. 13-19 s; VII, 12-15 m. 15-19 s; ♂, VIII, 6-10 m. 12-15 s; IX, 13-14; ♀ as in Kéler, fig. 125. The variation in the numbers of marginal sternal setae is partly due to the end ones sometimes being marginal and sometimes submarginal.

Species Description.

The first five species, although mostly differing distinctly in the characters of the male copulatory organ, are similar in the characters of the female genital region (type I) and for this reason have been grouped together.

Heterodoxus octoseriatus Kéler (Figs 1, 2, 6, 8, 13; Map 1, 1a)

Heterodoxus octoseriatus Kéler, 1971, *Aust. J. Zool. (Suppl.)* 6: 60.

Type-host: *Petrogale penicillata* (Griffith, Smith & Pidgeon 1827)

Specimens examined: Holotypes and paratypes as listed in Kéler: 60-61 from Bonalbo, N.S.W. In the present collection from *P. penicillata*, QUEENSLAND:- 2♂, 10♀, Emu Vale (28.14 S, 152.15 E) (15/16.v.1976, RW* 10-11). From *P. herberti* Thomas:- 9♂, 5♀, Yarraman Creek (26.47 S, 152.01 E), (23.v.1976, RW 15-16); 3♂, 3♀ Cania Gorge (24.38 S, 150.58 E) (29/31.v.1976 RW 25-27); 1♀ Mt. Ball (23.20 S, 147.39 E) (6.vi.1976, RW 35).

The diagnostic characters not clearly shown in Kéler's figures are the form of sclerite c (Fig. 6), the presence of the ventro-lateral sclerite (e) (Fig. 13) and the length of the proximal spines in the vesica sac (Fig. 1). These characters, together with the form of the female genital sclerite (Fig. 8) distinguish it from *maynesi* which amongst the species described here it resembles most closely. The group of spicules on the ventral wall of the genital chamber in both species is bilobed anteriorly.

In addition to the specimens of *octoseriatus* from Mt. Ball, there is a single male (RW 31, 5.vi.1976), belonging to the *ampullatus* group and probably conspecific with the taxon found on *P. purpureicollis* (Squirrel Hills, Qld, 21.47 S, 140.46 E, 15.vi.1976 RW 37). As this is the only case in the collection of more than one taxon on

* All the material with RW numbers was collected by G. M. Maynes.

the same host species in the same locality and as it is based on a single specimen of which the date and number are near the Squirrel Hills specimens, the record needs confirmation.

Heterodoxus maynesi sp. n. (Figs 4-5, 7, 9; Map 1, 1b).

Type-host: *Petrogale inornata* Gould 1842.

Types: Holotype ♂ in the Australian National Insect Collection, CSIRO, from *Petrogale inornata,* QUEENSLAND: Blue Mtn. (21.33 S, 148.57 E) (19.ix.1976, RW 152). Paratypes: 10♂, 15♀ from the same host taxon and locality (18.ix.1976, RW 146, 147, 148. 19.ix.1976, RW 152, 153. 20.ix.1976, RW 155).

This species resembles *octoseriatus* most closely, being distinguished, as shown above, by the apparent absence of the ventro-lateral sclerite (e), the form of sclerite c (Figs 5, 7) and the type of spines in the vesica sac (Fig. 4). Although it is not always clear exactly how many longitudinal rows of these spines are present, *maynesi* has five to six full rows compared to the eight of *octoseriatus*. The female is distinguished by the form of genital sclerite (Fig. 9).

Specimens from *P. inornata* from Apis Creek (Map 1, 1.bs) and Guthalungra (Map 1, 1.bt) differ from *maynesi* and from each other in small but apparently constant differences in the position of the genital papilla relative to the genital sclerite.

Specimens examined: 8♂, 19♀, QUEENSLAND: Apis Creek Station (22.59 S, 149.34 E) (23/24.ix.1976, RW 158, 164, 166, 167). 1♂, 2♀, QUEENSLAND: Guthalungra (19.56 S, 147.50 E) (8/9.ix.1976, RW 136, 137, 138).

Heterodoxus insulatus sp. n. (Figs 11-12, 14-15; Map 1, 1c)

Type-host: *Petrogale inornata* Gould 1842.

Types: Holotype ♂ in the Australian National Insect Collection, CSIRO, Canberra, from *P. inornata,* QUEENSLAND: Magnetic Island (12.xi.1966, J. H. Calaby). Paratypes: 2♂, 4♀ from the same host individual as the holotype.

The male is distinguished by the lower part of the vesica sac having a patch of short broadly-based colourless spines as well as flattened scales (Fig. 14); the spines in the six longitudinal rows are elongate, but mostly hidden by the thick covering of the ventral spicules; other characters as shown in Figs 14-15. The genital sclerite of the female (Figs 11-12) is of the *octoseriatus* type but quite distinct; the ventral patch of spicules in the genital chamber dense and rounded or flattened anteriorly. Although this species is parasitic on the same host species as *maynesi*, it shows marked differences in both the male copulatory organ and the female genital sclerite.

Heterodoxus lesouefi sp. n. (Figs 10, 21; Map 1, 1d)

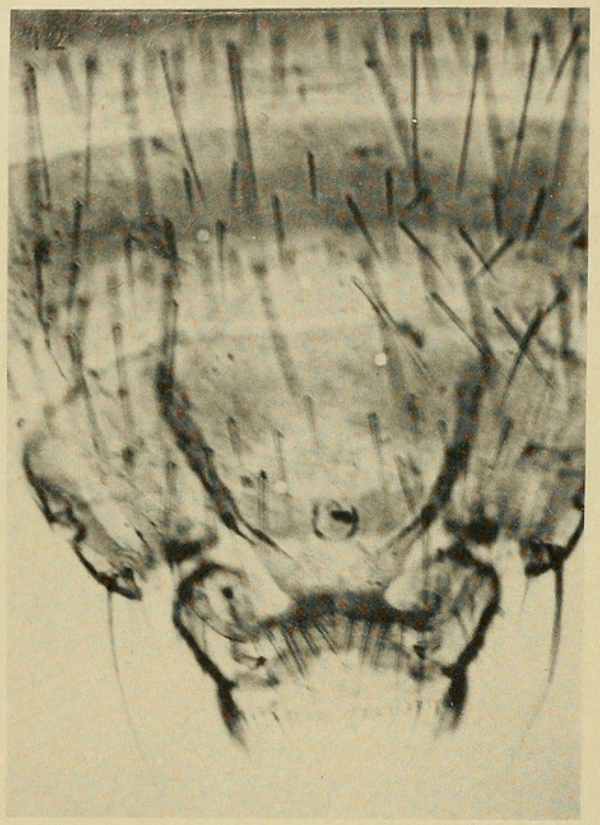
Type-host: *Petrogale puella* Thomas 1926.

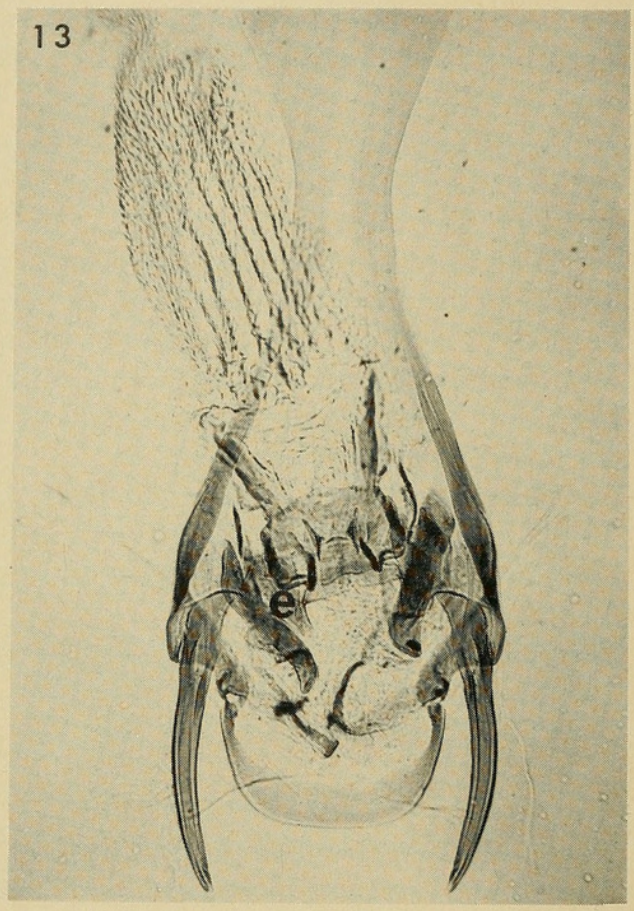
Types: Holotype ♂ in the Australian National Insect Collection, CSIRO, Canberra, from *P. puella,* QUEENSLAND: 16 km S of Lyndhurst (19.20 S., 144.20 E.) (13.vii.1976. RW 90). Paratypes: 1♂, 1♀ from the same host individual as the holotype.

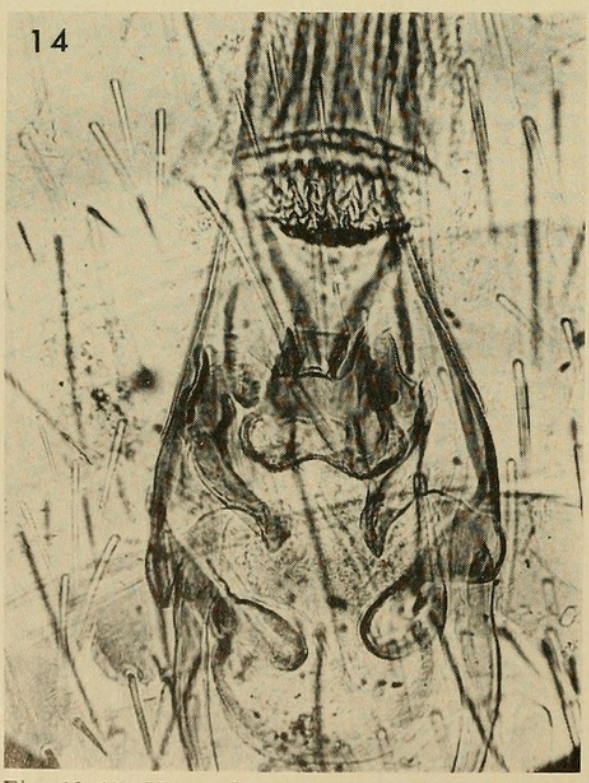
Other specimens examined: 3♂, 5♀ from *P. puella,* QUEENSLAND: 42 km N.E. Hughenden (20.25 S., 144.30E) (18.xi.1977, RW 291, 293).

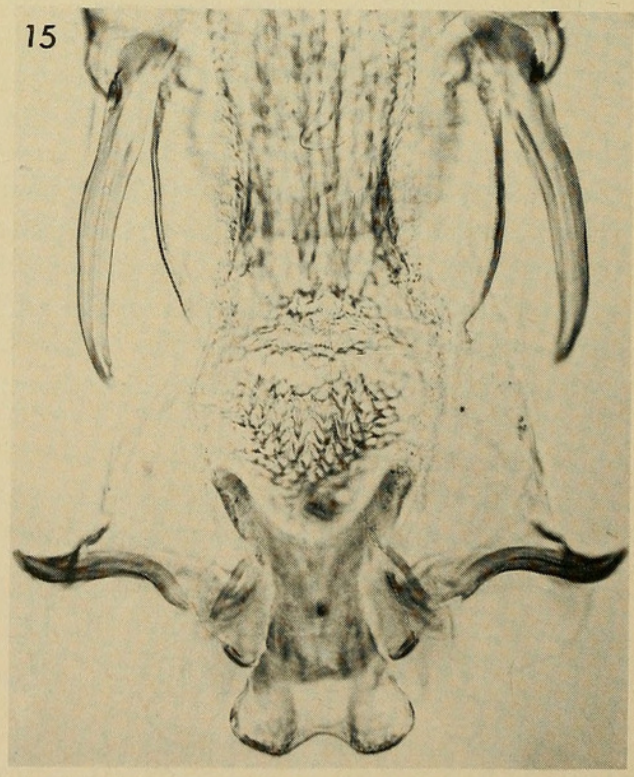
In spite of the unique characters of the male organ, this species has been placed

near *octoseriatus* on the characters of the female genital region (Fig. 10). The male has 8 longitudinal rows of spines in the vesica and the lower part of the vesica sac is covered by colourless spines; the central plates are also diagnostic (Fig. 21). The group of spicules on the ventral wall of the genital chamber is bilobed anteriorly.









Figs 12-15. Heterodoxus spp. 12, *H. insulatus*: ♀ genital region. 13-15, Male copulatory organ: 13, *H. octoseriatus* from *Petrogale herberti*; 14-15, *H. insulatus*.

Heterodoxus harrisoni sp. n. (Figs 16-18; Map 1, 1e)

Type-host: *Petrogale puella* Thomas 1926.

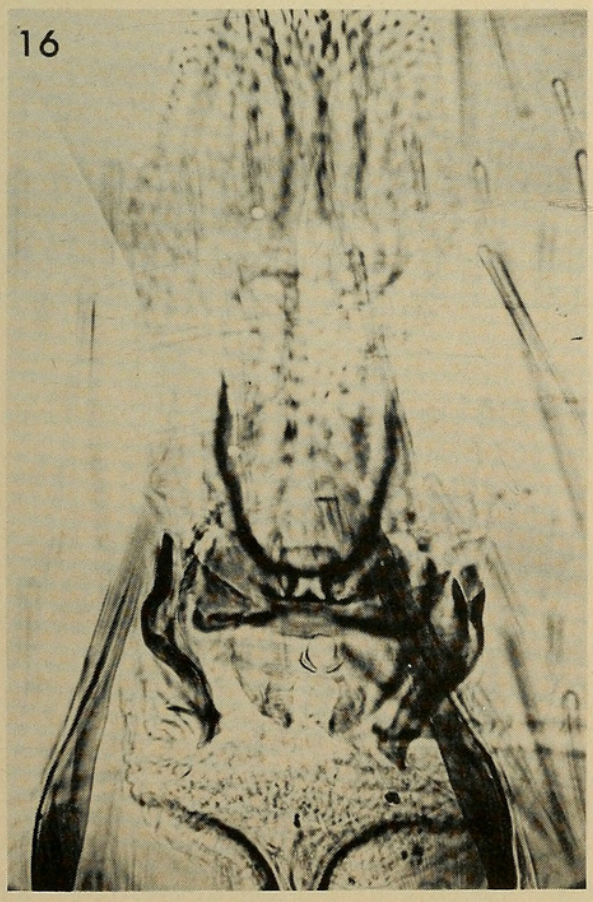
Types: Holotype ♂ in the Australian National Insect Collection, CSIRO, Canberra, from *P. puella,* QUEENSLAND: Black Rock, Lyndhurst Station (19.12 S, 144.22 E) (12.vii.1976, RW 85). Paratypes: 1♂, 4♀ from the same host individual as holotype.

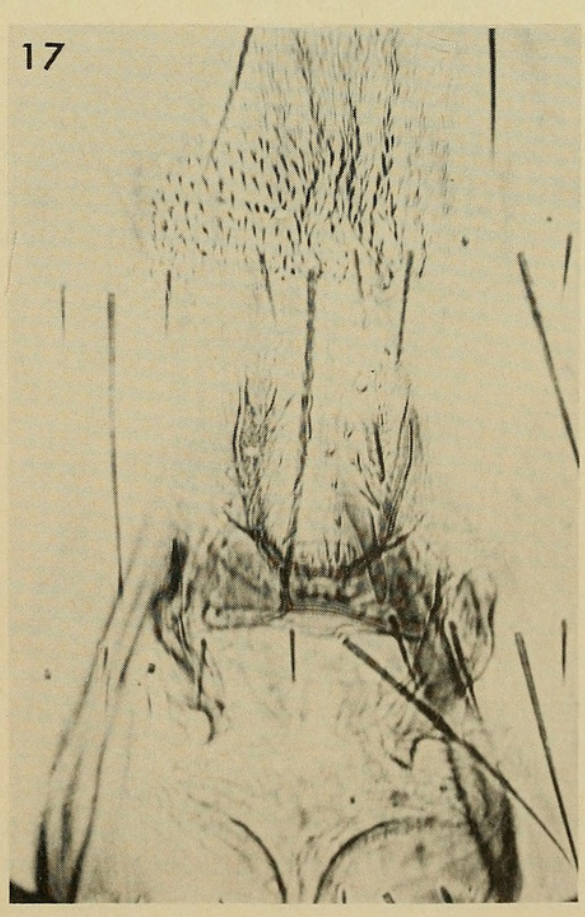
The male organ of this species is quite unlike that of any other species in the form of the spines in the lower part of the vesica sac, the shape of the dorso-lateral sclerites and the central plates of the mesosome (Figs 16-17). The female genital sclerite, although distinctive (Fig. 18) is nearer the *octoseriatus* type and the patch of spicules in the genital chamber is bilobed as in that species. The genital papilla is also distinctive being fez-like in shape.

The following five taxa, two of which are represented by females only, are recognized in the female by the form of the genital sclerite (type II). This does not have the pair of elongate arms as in type I, but has stouter shorter arms with accessory thickening anterior to the papilla (Fig. 19). The three males resemble each other in the presence of sclerite f (Figs 25-27) and the central pointed structure may also be homologous in the three species. The female specimens listed below with type II sclerite cannot yet be named:

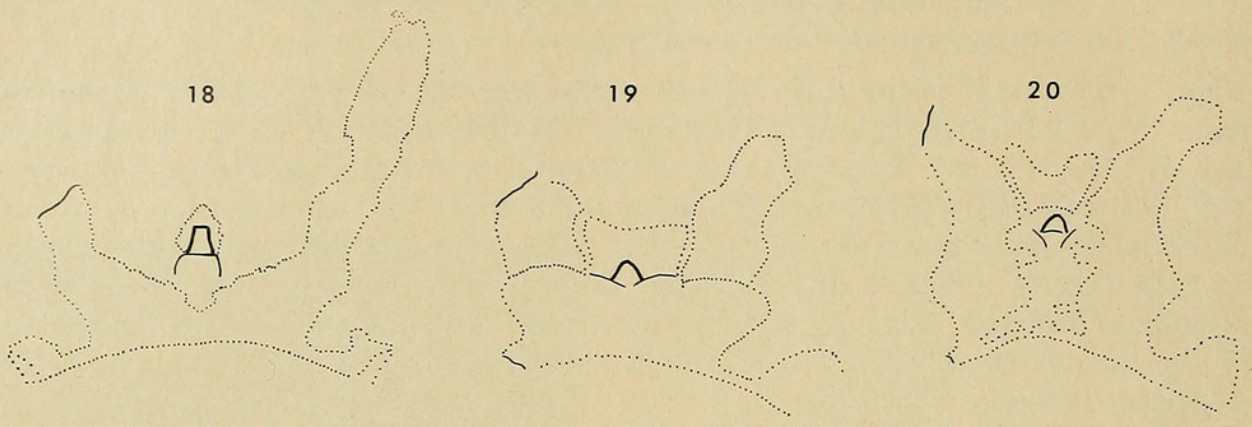
1♀ from *P. godmani* Thomas, 1923, QUEENSLAND: Desailly Creek (16.24 S, 144.57 E. Map 1, 2c) (21.viii.76. RW 103).

3♀ from *P. penicillata* ssp. nov. QUEENSLAND: Kirrama Range (18.06 S, 145.41 E. Map 1, 2d) (26/27.viii.1976. RW 113, 115).





Figs 16-17. Heterodoxus harrisoni, male copulatory organ.



Figs 18-20. Heterodoxus spp. Female genital sclerite and genital papilla: **18**, *H. harrisoni;* **19**, *H. orarius;* **20**, *H. insularis.*

Heterodoxus orarius sp. n. (Figs 3, 19, 23, 25; Map 1, 2a)

Type-host: *Petrogale godmani* Thomas, 1923.

Types: Holotype ♂ in Australian National Insect Collection, CSIRO, Canberra, from *Petrogale godmani*, QUEENSLAND: Byerstown Range, 13 km S. of Lakeland (15.57 S., 144.50 E.) (30.vii.1976, RW 94). Paratypes: 12♂, 3♀ from the same host taxon and locality as the holotype (30.vii.1976, RW 94, 95; 31.vii.1976, RW 97).

This and the following species resemble each other and differ from other known species in the presence of a stout sclerotized point in the male copulatory apparatus of the kind shown in Fig. 23, and of long colourless spines in the lower part of the vesica sac (Figs 3, 23). *H. orarius* is distinguished from *H. insularis* in having the sclerites of the apparatus larger and in the difference in shape of sclerite f (Fig. 25). The sclerotization of the female genital sclerite also differs in the two species (Fig. 19).

Heterodoxus insularis sp. n. (Figs 20, 24, 26, Map 1, 2b)

Type-host: *Petrogale assimilis* Ramsay 1877.

Types: Holotype ♂ in Australian National Insect Collection, CSIRO, Canberra, from *Petrogale assimilis,* QUEENSLAND: Munday Bay, Great Palm Is. (18.45 S., 146.37 E.) (1.ix.76, RW 125). Paratypes: 12♂, 26♀ from the same host taxon and locality (1.ix.1976, RW 125; 5.ix.1976, RW 129) and from the same host taxon from Onion Bay, Great Palm Is. (3.ix.1976, RW 127).

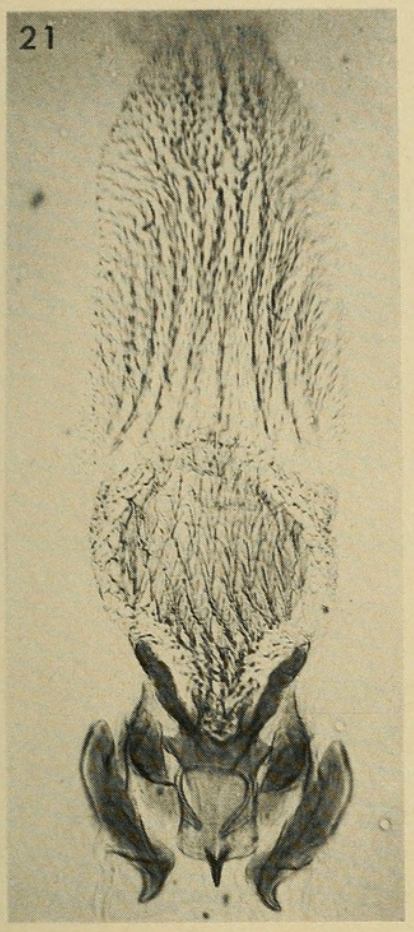
This species resembles most closely *H. orarius*, differing as shown above in the size of the sclerotized point and the shape of sclerite f in the male copulatory apparatus (Fig. 26) and in the sclerotization of the female genital sclerite (Fig. 20).

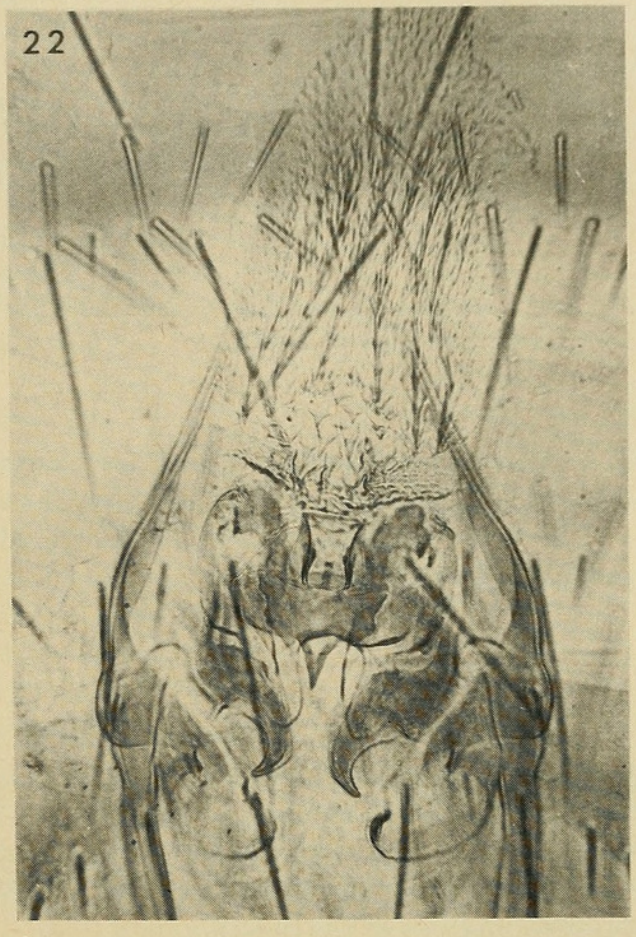
Heterodoxus murrayi sp. n. (Figs 22, 27; Map 1, 2e).

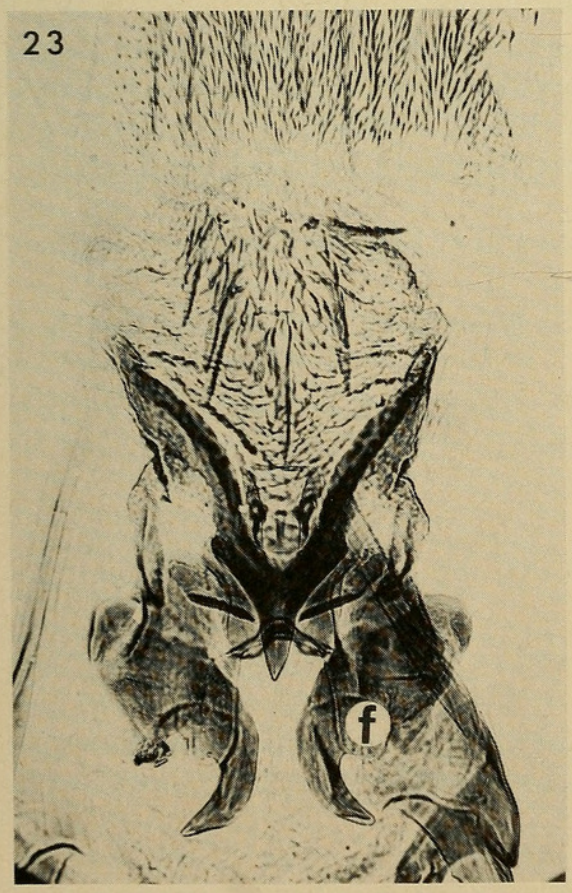
Type-host: *Petrogale godmani* Thomas 1923.

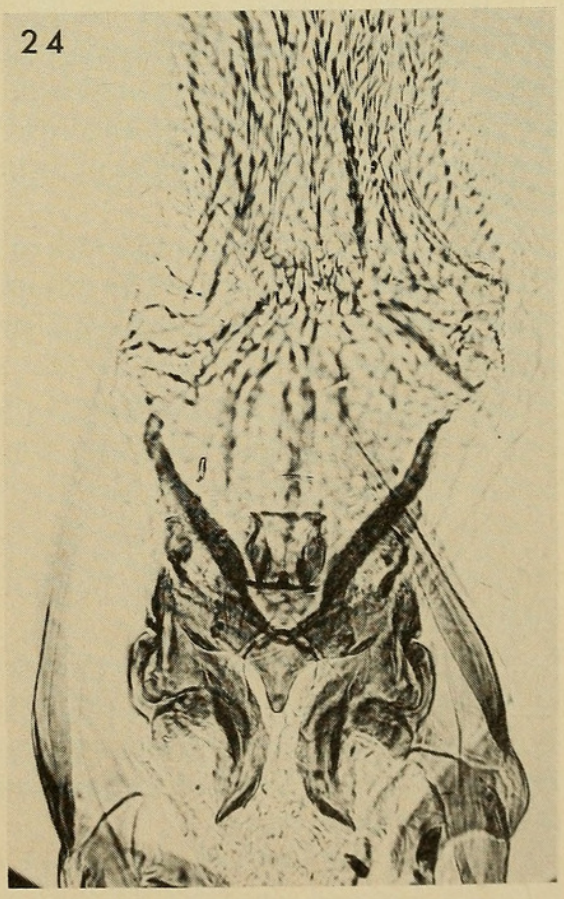
Types: Holotype ♂ in the Australian National Insect Collection, CSIRO, Canberra, from *P. godmani,* QUEENSLAND: 14 km N. of Coen (13.50 S., 143.09 E.) (5.viii.1976, RW 100).

This species is placed here with *orarius* and *insularis*, although the female is unknown and the male shows considerable differences in the copulatory organ. However, it has sclerite f (Fig. 27) and a central pointed sclerite (Fig 22) as in the other species, but this may not be homologous. There are six longitudinal rows of spines and a small number of colourless spines in the lower part of the vesica sac (Fig.

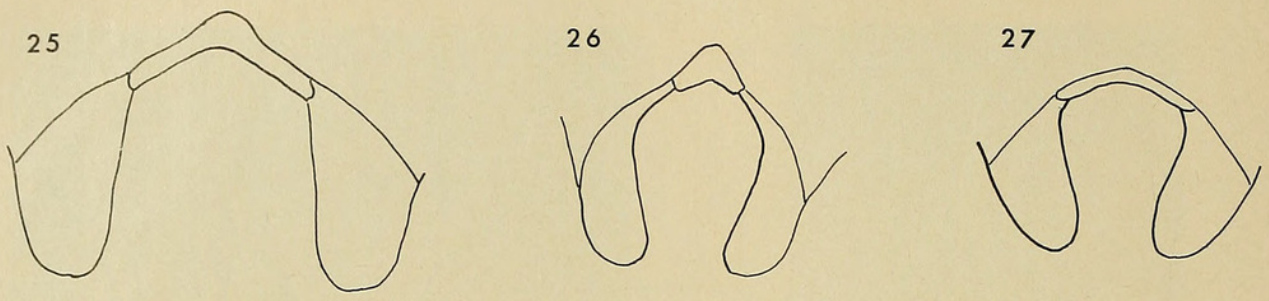








Figs 21-24. Heterodoxus spp. Male copulatory organ: **21**, *H. lesouefi*; **22**, *H. murrayi*; **23**, *H. orarius*; **24**, *H. insularis*. [Note: **23** and **24** same magnification.]



Figs 25-27. Heterodoxus spp. Sclerite f (see Fig. 21): **25**, *H. orarius;* **26**, *H. insularis;* **27**, *H. murrayi.* [Note: All to same magnification.]

22). As other taxa parasitic on *P. godmani* have type II female sclerite, it is probable that the female of this species will have the same.

This species is named for Mr M. D. Murray in gratitude for his assistance in the publication of this paper.

Host-Parasite Relationships

Throughout the Phthiraptera it is usual to find a group of related hosts parasitized by related species of lice, so it is of interest to consider whether the lice of the rock wallabies throw any light on the relationships of their hosts. However, any deductions of host-parasite relationships within the *ampullatus* group must wait for further material, especially from the Northern Territory populations, and for a more detailed analysis of the possible taxa.

In the *octoseriatus* group the following points may be of interest:

1. As all the east coast *Petrogale,* with the exception of the new species from Kelsey Creek, are parasitized by members of the *octoseriatus* group, it seems likely that they are all derivatives from one ancestral stock. Further, it is possible that the hosts are divisible into two groups, those parasitized by *Heterodoxus* 1a-1e on one hand, and 2a-2e (Map 1) on the other.
2. The similarity of the populations of *P. inornata* and *P. penicillata* sens. str. suggests that the hosts of these should be grouped together.
3. Material from *P. inornata* from four localities is available, each locality having a separate taxa.
4. The differences between the parasites from *P. puella* south of Lyndhurst (20.25 S and 19.20 S) and those from Black Rock, Lyndhurst (19.12 S), (*H. lesouefi* and *H. harrisoni*), suggests that two host taxa may be involved.
5. The differences between the species from *P. godmani* from Byerstone Range (*H. orarius*) and from Coen (*H. murrayi*) suggests that the hosts may be taxonomically separable.
6. The similarity between *Heterodoxus orarius* and *H. insularis* suggests that the host of the latter (*P. assimilis* from Palm Is.) may have been derived from *P. godmani.*
7. As the females from the new taxon of *P. penicillata* from Kirrama Range belong to the group of taxa found on *godmani* and *assimilis* it is possible that the new host taxon is related to these hosts.

Within the *octoseriatus* group the taxa are similar in most of the external features, but are separable by the characters of the male copulatory apparatus and those of the female genital region. The differences in these features are presumably due to isolation of the populations and not to adaptive changes to their environment.

TABLE 1

Heterodoxus taxa	*Petrogale* taxa	Localities	Host collection No. (RW series)
	penicillata	Gorge Creek, Bonalbo, N.S.W.	Types*
octoseriatus	(Griffiths *et al.* 1827)	Emu Vale, Qld	10, 11
Kéler,		Yarraman Creek, Qld	15, 16
1a†	*herberti*	Cania Gorge, Qld	25, 27
	Thomas 1926	Mt Ball, Qld	35
maynesi n.sp.	*inornata*	Blue Mtn, Qld	146, 147, 148
1b	Gould 1842		152, 153, 155
1bs	*inornata*	Apis Creek, Qld	158, 164, 166, 167
1bt	*inornata*	Guthalungra, Qld	136-138
insulatus n.sp.	*inornata*	Magnetic Is., Qld	ANIC, BM(NH)
1c			
lesouefi n.sp.	*puella*	16 km S. of Lyndhurst, Qld	90
1d	Thomas 1926	42 km N.E. of Hughenden, Qld	291, 293
harrisoni n.sp.	*puella*	Black Rock, Lyndhurst, Qld	85
1e			
orarius n.sp.	*godmani*	Byerstown Range, Qld	94, 95, 97
2a	Thomas 1923		
insularis n.sp.	*assimilis*	Palm Is., Qld	125, 127, 129
2b	Ramsay 1877		
taxon nov.	*godmani*	Desailly Creek, Qld	103
2c			
murrayi n.sp.	*godmani*	14 km N.E. of Coen, Qld	100
2e			
taxon nov.	taxon nov.	Kirrama Range, Qld	113, 115
2d			

* Types of *H. octoseriatus*.
ANIC. Australian National Insect Collection. BM(NH). British Museum (Natural History) Collection.
† See Map 1.

It is possible that the cases cited above under 3-5 may represent small isolated populations which have diverged in these characters on isolated populations of hosts which themselves have not become taxonomically separable. It cannot necessarily be assumed where the male copulatory apparatus of two taxa is similar that they have been separated for a shorter time than those in which the apparatus appears very different. Further, adjacent hosts with the same or similar parasites do not necessarily denote relationship between the hosts. Factors which may have confused the original host-parasite distribution such as secondary infestation, extinction of one of a sympatric pair and others are discussed in Clay, 1957. The relationships between the host taxa, suggested here, can only be hypothetical, these must of course be based on mammalian characters, not on those of the insect parasites. However, knowledge of louse-host associations in this and other mammal and bird groups, does suggest that such information may throw light on host relationships.

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