

AUSTRALASIAN ANTARCTIC EXPEDITION

1911-14.

UNDER THE LEADERSHIP OF SIR DOUGLAS MAWSON, O.B.E., B.E., D.Sc., F.R.S.

SCIENTIFIC REPORTS.
SERIES C.—ZOOLOGY AND BOTANY.

Edited by Professor T. Harvey Johnston,
University of Adelaide.

VOL. II. PART 1.

MALLOPHAGA AND SIPHUNCULATA

BY

(THE LATE) PROFESSOR LAUNCELOT HARRISON, B.A., B.Sc.
UNIVERSITY OF SYDNEY.

WITH THREE PLATES AND SEVEN TEXT FIGURES.

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MALLOPHAGA AND SIPHUNCULATA.

By (the late) Professor LAUNCELOT HARRISON, B.A., B.Sc.,

From the Department of Zoology, Sydney University.

(With Plates I-III, and 7 text figures.)

Foreword by Lucy M. Wood.

Owing to the sudden death of Professor Harrison I undertook the preparation and completion of his manuscript on the Mallophagan material of the Australasian Antarctic Expedition for publication. This task has been rendered less difficult because, immediately prior to his death, I had been working with Professor Harrison on the classification of the Mallophaga.

I found much of the matter ready for the final draft and had merely to transcribe the whole of the sections on the Siphunculata, Amblycera, Esthiopterellinae, Giebeliinae and Docophoroidinae. The section relating to the Gonoidinae was complete except for two descriptions, which I have added, viz., *Austrogoniodes hamiltoni* and *A. antarcticus*. The Philopterinae had not been written up, though the species had been determined. I have worked out the group and given a description of the new species *Philopterus antarcticus*. I found that the plates for the final report were complete and ready for publication, but I have drawn all the text figures. I have also added a list of the species dealt with and have put the whole paper together.

It is to be noted that in a recent paper (Ann. Mag. Nat. Hist., July, 1935, pp. 149-150) G. B. Thompson has erected the following new genera, *Epiplecanus*, *Philichthyophaga* and *Epifregata*, having as types *Lipeurus forficulatus*, *L. gyricornis* and *L. gracilicornis* respectively. These new names and the selected types for each are identical with those of Harrison. Harrison died in February, 1928. This report was received from Miss L. M. Wood for publication in June, 1929.—T. H. JOHNSTON, Editor.

INTRODUCTION.

The collection comprises thirty-six species of which nine are new. These species belong to sixteen genera of which four are new. There is included a description of a new species from Stanford University Collection (California).

LIST OF SPECIES OF ANOPLURA.

SUB-ORDER SIPHUNCULATA.

Family ECHINOPHTHIRIIDAE Enderlein.*Sub-family* ANTARCTOPHTHIRINAE.

1. *Antarctophthirus ogmorhini* End. from *Ogmorhinus leptonyx*.
2. *Antarctophthirus mawsoni* n.sp. from *Ommatophoca rossi*.
3. *Antarctophthirus* sp. from *Leptonychotes weddelli*.
4. *Lepidophthirus macrorhini* End. from *Macrorhinus leoninus*.

SUB-ORDER MALLOPHAGA.

SUPER-FAMILY AMBLYCERA Kell.

Family MENOPONIDAE Mjob.*Sub-family* MENOPONINAE.

5. *Menopon* sp. from *Diomedea exulans*.

Sub-family ANCISTRONINAE.

6. *Ancistrona vagelli* Fabr. from *Prion desolatus*.

SUPER-FAMILY ISCHNOCERA Kell.

Family PHILOPTERIDAE Burm.*Sub-family* GONIODINAE.

7. *Austrogoniodes strutheus* Harrison from *Eudyptes sclateri*.
8. *Austrogoniodes waterstoni* Cummings from *Eudyptes sclateri*.
9. *Austrogoniodes mawsoni* n.sp. from *Aptenodytes forsteri*.
10. *Austrogoniodes macquariensis* n.sp. from *Eudyptes schlegeli*.
11. *Austrogoniodes hamiltoni* n.sp. from *Catarrhactes pachyrhynchus*.*
12. *Austrogoniodes antarcticus* n.sp. from *Pygoscelis adeliae*.

* The bird referred to in this report as the Victoria penguin, *Catarrhactes pachyrhynchus*, is the rockhopper, *Eudyptes chrysocome*. The range of the Victoria penguin does not include Macquarie Island.—T. H. JOHNSTON.

Sub-family PHILOPTERINAE.

13. *Philopterus gonothorax* Giebel from *Larus dominicanus*.
14. *Philopterus limosae* D. from a Limicoline bird.
15. *Philopterus melanocephalus* N. from *Sterna* sp.
16. *Philopterus pustulosus* N. from *Megalestris maccormicki*.
17. *Philopterus antarcticus* n.sp. from *Pagodroma nivea*.

Sub-family ESTHIOPTERELLINAE NOM. NOV.

18. *Pseudonirmus charcoti* Neum. from *Pagodroma nivea*.
19. *Pseudonirmus antarcticus* n.sp. from *Thalassoeca antarctica*.
20. *Episbates pederiformis* Duf. from *Diomedea exulans*.
21. *Perineus diomedeeae* O. Fab. from *Diomedea exulans*.
22. *Perineus obscurus* Rud. from *Macronectes giganteus*.
23. *Perineus concinnus* Kell. & Chap. from *Phoebetria fuliginosa*.
24. *Perineus nigrolimbatus* Gieb. from *Priocella glacialisoides*.
25. *Naubates heteroproctus* n.sp. from *Aestrelata lessoni*.
26. *Naubates clypeatus* Gieb. from *Prion desolatus*.
27. *Halipeurus angusticeps* Piaget. from *Priofinus cinereus*.
28. *Pectinopygus (Philichthyophaga) macquariensis* n.sp. from *Phalacrocorax traversi*.

Sub-family GIEBELINAE Waterston.

29. *Trabeculus schillingi* Rud. from *Aestrelata lessoni*.
30. *Giebelia hexakon* Waterston from *Prion* sp.

Sub-family DOCOPHOROIDINAE Mjoberg.

31. *Docophoroides brevis* Duf. from *Diomedea exulans*.
32. *Docophoroides harrisoni* Waterston from *Diomedea melanophrys*.
33. *Docophoroides simplex* Waterston from *Macronectes giganteus*.
34. *Docophoroides hunteri* n.sp. from *Macronectes giganteus*.
35. *Docophoroides ferrisi* n.sp. from *Diomedea nigripes*.

(This species does not belong to the Antarctic Expedition material.)

The collection of Mallophaga brought back by the Expedition is both rich in species and important for the number of novelties which it includes. Dr. Hunter and Dr. McLean, of the Antarctic parties, and Mr. Hamilton at Macquarie Island paid special attention to this group. As a result of their endeavours, no less than five species of the genus *Austrogoniodes*, characteristic of penguins, were obtained. Two of these came from the Antarctic, from the Emperor and Adelie penguins respectively, the remaining three from Macquarie Island, while four of the five proved to be new to science. Consequently the number of known species in the genus *Austrogoniodes* has been increased

from four to eight. Curiously enough, despite the number of penguins examined for parasites, no member of the remarkable and primitive Ischnoceran genus *Nesiotinus*, described by Kellogg (1903), from individuals taken upon *Aptenodytes longirostris* by the German South-Polar Expedition, was seen. It would seem, therefore, that members of this genus do not occur upon Antarctic or Australian Sub-antarctic penguins.

Some years ago I drew attention (1914), to the fact that the group of Mallophaga to which the genus *Austrogoniodes* belongs is confined to fowls, pigeons, tinamous, the anomalous *Opisthocornis*, and the penguins. To a student of Mallophaga such a distribution normally indicates close generic affinity between the host groups. In addition to the positive evidence afforded by the presence of Goniidine parasites on these groups, and upon these groups only, there is also to be considered the negative indication of the absence of the genus *Philopterus*. The latter is the most specialised Ischnoceran genus, and is of almost universal occurrence on birds*, except those mentioned above, the Ratitæ and all Steganopodes save *Phaeton*.

The nature of their parasites, then, drives me to the conclusion that the penguins are more closely related to the admittedly kindred fowls, pigeons, and tinamous than to any other group of birds, unless I am absolutely at fault with regard to the affinities of the *Austrogoniodes*. The accession of four very distinct new species, as well as of a large series of Goniidine forms from fowls, pigeons, tinamous and the hoatzin, led me to re-examine this possibility. While admitting that our knowledge of Mallophaga is insufficient to justify any final opinions on affinities within the group, I am still of the opinion that the genus *Austrogoniodes* is morphologically akin to the genera *Goniodes* and *Goniocotes*, and that this structural resemblance is due to common ancestry. It is, of course, a simple matter to dismiss my considered opinion with a suggestion that the resemblance may be due to convergence. But the advocate of convergence will have a difficult task in choosing from among the parasites of those birds which are at present supposed to be nearest akin to the penguins, any group out of which the genus *Austrogoniodes* may reasonably be considered to have evolved.

The characters of the male genitalia in the four new species of *Austrogoniodes*, which I describe, show remarkable differences. In three of the species, the parameres are more or less bifid at the tips, and the endomeres, though greatly varying in size, are reducible to a common type. But the genitalia of a fourth species, *A. antarcticus*, have scarcely any resemblance to these of the remaining three. It is a curious condition, though common enough in Mallophaga, that while the females are all very similar, and have no special modification of the genital region, the males should show such marked differences.

* The *Philopteri* of Tubinæres and perhaps also of Ralliformes, appear to indicate a comparatively recent invasion.

Of the five known species of the genus *Docophoroides*, characteristic of the albatrosses, examples of three were taken by the expedition, as well as of a fourth species which proved to be new. It seems probable that each species of albatross will be found to have its own species of *Docophoroides*, when a thorough examination has been made. With the exception of the male of *D. murphyi* and female of *D. simplex*, I have had for examination specimens of both sexes of all six species as well as females of a second new species, and so am able to give characters by means of which they may easily be differentiated. The females, to which previous workers have given little attention, proved to be as easily determinable as the males, once suitable diagnostic characters had been found.

The Esthiopterellinae (see below) from Tubinarial hosts put me in a rather embarrassing position, as I have had a careful revision of this particular group, with analytical keys, and descriptions of several new genera, and a considerable number of new species, standing over since I went on active service at the beginning of 1916. I had hoped to have these descriptions in print before the present report was prepared for publication, but this has not been possible. So I have been obliged to describe a number of genera and species in this report without reference to the large comparative series of material which forms the subject matter of my unpublished paper. I have contented myself with short descriptions here, which will be expanded and discussed on comparative lines when the paper on the whole group is published.

The necessity for dealing with a single female Mallophagan collected from the cormorant, *Phalacrocorax traversi*, of Macquarie Island, led me to examine a whole series of Esthiopterelline species found upon Steganopodes. A new genus was obviously necessary for the parasites of cormorants, and as a genus *Pectinopygus* had already been erected by Mjoberg (1910, p. 95) for those members of the group occurring upon gannets, the limits of this genus had to be defined. I find that the species occurring upon cormorants, pelicans, gannets and frigate-birds have a common facies which is quite distinctive, all possessing the same short clypeal region, the same squarish signature, the same type of pleural incassations, and similar male antennæ. Apart from this general similarity, however, the parasites of each family are easily distinguishable from one another; those from the gannets being stout and short; those from the pelicans being very clearly differentiated by the peculiar pleural interlocking hooks found at the posterior end of the abdomen, and used in copulation; those from cormorants being smaller, with slender and delicate male genitalia; while those from frigate-birds (nearest to the last group) are longer, more slender, and more graceful, and have a more elongate clypeus, with the signature almost twice as long as wide. This seems to me a case where sub-genera serve a definite and useful purpose, so I have extended the genus *Pectinopygus* to include all these parasites, with sub-genera for those from gannets, pelicans, cormorants and frigate-birds respectively.

Most curiously, the tropic birds (Phaethonidae), considered from the indications afforded by their Mallophagan parasites, are not Steganopodes at all. No member of the genus *Pectinopygus* occurs upon them, but they possess a type of *Philopterus* with male genitalia of the same character as is possessed by those found upon gulls, terns and Limicolines. The genus *Philopterus* does not occur upon the Sulidae, Pelicanidae, Phalacrocoracidae, and Fregatidae. The smooth texture and brightly coloured markings of the egg-shell of *Phaeton* differ remarkably from the rough, limy, colourless shells of the other Steganopode families, and seem to support the suggestion that the Phaetonidae are not close kindred. It must, however, be admitted that the egg of *Phaeton* is very much *sui generis*, and does not resemble that of any gull, tern or Limicoline with which I am familiar.

ORDER ANOPLURA *Leach.*

SUB-ORDER SIPHUNCULATA *Meinert.*

Family ECHINOPHTHIRIIDAE *Enderlein.*

Sub-family ANTARCTOPHTHIRINAE *Enderlein.*

Genus ANTARCTOPHTHIRUS *Enderlein.*

Antarctophthirus *Enderlein, Zool. Anz., 1904, 136-7.*

Included in the material are specimens of the genotype species, *A. ogmorhini*, a single individual (female) of a new species from the Ross seal, *Ommatophoca rossi*, and a number of larval individuals in the second instar of what may, when adult examples are obtained, prove to be a second new species from the Weddell seal, *Leptonychotes weddelli*.

The key given by Enderlein in his "Monographie der Robbenlause" includes four species, *A. microchir*, *A. trichechi*, *A. ogmorhini*, *A. lobodontis*. Kellogg and Ferris (1915, 49) have added a fifth species, *A. monachus* (which I think might have been referred justifiably to a new genus); and I have here to add a sixth, *A. mawsoni*. I therefore give an amended key to include six species.

Key to species of *Antarctophthirus*.

- A. With hairs occurring upon the mid-dorsal region of thorax and abdomen.
 - B. Hairs comparatively few, only a small number on the anterior abdominal segment *microchir* Trouessart & Neumann.
 - BB. With many hairs in continuous rows, stretching right across the abdomen in the anterior segments *monachus* Kellogg and Ferris.
- AA. Without hairs upon mid-dorsal region.
 - C. Terminal sternite of female without generic pubescence.
 - D. Underside of head with many long hairs posteriorly *trichechi* Boheman.
 - DD. Underside of head with only 3-4 minute hairs posteriorly *mawsoni* Harrison.
 - CC. Terminal sternite of female with genital pubescence.
 - E. Middle of head above with 2-3 hairs *ogmorhini* Enderlein.
 - EE. Middle of head with 7 hairs *lobodontis* Enderlein.

ANTARCTOPHTHIRUS OGMORHINI *Enderlein*.

Echinophthirius setosus Rothschild, Rep. South. Cross Exp., 1902, 224 (not *setosus* Burm. 1834 = *phocae* Luc. 1834).

Antarctophthirus ogmorhini Enderlein, Zool. Anz., 29, 1906, 662-3, figs. 1-2.

Seven specimens, including both sexes, taken from a dried skin of a sea leopard, *Ogmorhinus leptonyx* Blainville, Macquarie Island, October, 1912, H. Hamilton, P33. These lice of seals have been so well dealt with in Enderlein's "Monographie der Robbenlause" included in the Deutsche Sudpolar-Expedition, Bd. 10, Zoologie, Bd. 2, 1909, that little remains to be said. The specimens from Macquarie Island agree in all points with those described by Enderlein from Victoria Land.

ANTARCTOPHTHIRUS MAWSONI n.sp. Plate I, fig. 1.

A single female, labelled "From Ross Seal, 22-1-14," from *Ommatophoca rossii*, Adelie Land (H5).

Description of Female.—*Head*: rounded in front, the rounded border just protruding beyond the straight line of heavy chitin forming the terminal head skeleton; expanding to base of antenna, then slightly narrowing; expanding once more behind the antenna to its greatest width, the sides being parallel for a distance equal to the basal diameter of the antenna, thence narrowing rather abruptly to the occiput. Occiput marked by a dark band with sinuous front border, hind border being produced posterolaterally into acute short projections, a similar pair of projections occurring one on either side of the mid-line. Antenna with first two articles thick, subequal; terminal three gradually lessening in diameter, and decreasing in length; first article has a narrow dark band, incomplete dorsally, at half its length; second, third and fourth, much wider bands, while the fifth is completely brown, except for the sensory tip. The surface of the head is marked by a pair of light brown circular areas anteriorly, a larger median one between the bases of the antennæ, and a curved band posteriorly.

Thorax: Same width as head anteriorly, indented at first coxal bar (I use this term for the chitinous bands which are continuous from the dorsal to the ventral surface where they give support to the coxal skeleton), thence roundly swollen to narrow slightly at the second coxal bar, thence almost straight to the third bar, where the sides meet the gently curved hind border. Second coxal bars continuous, meeting in the mid-line in a thickened somewhat conical mass, showing a round foramen.

Abdomen of nine segments, widest at 4 and 5, thence abruptly tapering to the small narrow 9 which is indented terminally, so that the abdomen ends in two blunt points.

Legs of usual type, the first pair being smaller, weak, and not strongly coloured, the two posterior pairs stout and darkly coloured.

Chaetotaxy: Under this heading it is advisable to deal separately with the hairs and scales.

Hairs : The head bears dorsally two small flattened hairs in the middle of the anterior clear area, about five on the lateral clear areas behind that, and about a dozen in the occipital clear area, with three stout hairs and a finer one at the temporal angle. The thorax has a scale-like hair in the anterior angles, about six on either side in the mesothoracic region, and three in front and one behind the third coxal bar in the metathoracic region. There are no hairs on the dorsal surface of the abdomen. The ventral surface of the head is very bare, and shows only about a dozen prickles along the middle region and four short spinous hairs posteriorly. There is a pair of hairs on the prosternite, a second pair on the mesosternite, but none at all on the metasternite. The ventral surface of the abdomen is devoid of hairs until the eighth segment is reached. Here a ring of minute prickles in several rows surrounds the vulva, which is in addition flanked by two clumps of bristles, forming a low pubescence not nearly so thick or so long as that in *A. trichechi*. Each lobe of the ninth segment carries two short hairs, situated one behind the other in the middle region.

Scales : The scales are divisible into two quite distinct types, called by Enderlein "schuppen" and "dornen." The first type, for which we may retain the name "scale," resembles a peltate leaf, with a short dark petiole, and a clear transparent colourless lamina. Dorsally these form a complete imbricated covering over the whole thorax and abdomen, but do not occur on the head. Seen in profile, these scales have the appearance of the letter r. In surface view all that is apparent under low power is an optical section of the "petiole," giving the appearance of a peppering with dark spots, which is absent from the articular membranes, so that the segments become marked off one from another by clear lines. On using higher power, it is seen that the dorsal surface is completely concealed by a covering of imbricating laminae. On the ventral surface the covering is not so complete, each scale standing out separately, and having its stalk attached at the anterior margin, not inside the periphery. No scales occur on the head. There are about a dozen on the prothorax, whence they become generally distributed, being absent only from segment 9.

The second type, the "dornen" of Enderlein, is more difficult to deal with, and to name; because of the long graduation of forms which it assumes. It is always distinguishable by the dark brown colour of its lamina, and by the fact that its petiole is many times the diameter of that of the true scales. At one extreme, it consists of this petiole, surmounted by a lamina which is only a little greater in diameter; at the other, the lamina is drawn out into a long baton-shaped structure, ten or more times as long as the diameter of the petiole, while all intermediate stages occur. On the dorsal surface these baton-scales are all of the small type. They form regular lines upon the clear areas between the head blotches, are generally distributed on the prothoracic region, being more numerous at the anterior angles, and are confined to the lateral regions in meso- and metathoracic regions and abdomen, becoming gradually fewer posteriorly. They are much more extensively distributed on the ventral surface. About a dozen small ones appear on the middle region of the head and they extend thickly from the

middle of the prothoracic region down to the eighth abdominal sternite. In the mid-line, they are small, and are arranged roughly in two rows across each segment, but as the rows approach the lateral margins they become more numerous, and the constituent scales become gradually longer, so that each segment in its lateral fourth bears about five rows of long baton-scales.

Male.—Not known.

The female of this species has a close superficial resemblance to that of *A. trichechi* Boheman. It differs, however, in having the abdomen ending in two points; in the absence of numerous long gular hairs, and long genital pubescence; in having the baton-scales of the ventral surface much more numerous, and more definitely arranged; and in the fact that the vulva forms a bay in the hind border of segment 8.

ANTARCTOPHTHIRUS sp.

Fifteen young individuals in what seems like the second instar, taken by Dr. McLean on the Weddell seal (*Leptonychotes weddelli*), Adelie Land, 1913 (H2). It is very probable that these individuals belong to a new species, as their chaetotaxy at this stage has a very distinctive character, but the question will have to wait for solution until adult material is collected.

Genus LEPIDOPHTHIRUS Enderlein.

Lepidophthirus Enderlein, Zool. Anz., 28, 1904, 43.

LEPIDOPHTHIRUS MACRORHINI Enderlein.

Lepidophthirus macrorhini Enderlein, Zool. Anz., 28, 1904, 46-47, figs. 1-5.

Five individuals, male and female, from a young sea-elephant, *Macrorhinus leoninus*, embedded in skin under fore-flippers, Macquarie Island, 6-5-12, H. Hamilton (P.20). One female from under fore-flipper of young sea-elephant, embedded in skin; not common, Macquarie Island, 5-11-12, H. Hamilton (P.32).

This species was originally described by Enderlein from material taken from the same host at Kerguelen.

SUB-ORDER MALLOPHAGA Nitzsch.

SUPER-FAMILY AMBLYCERA Kellogg.

Family MENOPONIDAE Mjoberg.

Sub-family MENOPONINAE Harrison.

Genus MENOPON Nitzsch.

Menopon Nitzsch, in *German's Magazin*, 3, 1818, 299.

MENOPON sp.

A single immature *Menopon* is included among parasites obtained from *Diomedea exulans* on 12th March, 1913 (H.9). A second immature individual is included in material from *Prion vittatus*, Macquarie Island, 20th December, 1912, H. Hamilton (P.35).

I cannot safely refer either of these individuals to a known species, owing to their immature condition.

Sub-family ANCISTRONINAE *Harrison.*

Genus ANCISTRONA *Westwood.*

Ancistrona Westwood, Thesaurus Entomologicus Oxoniensis, 1874, 197.

ANCISTRONA VAGELLI *Fabricius.*

Pediculus vagelli Fabricius, Mant. Ins., 1787, 369.

Ancistrona procellariae Westwood, Thes. Ent. Oxon., 1874, 197, Pl. 37, fig. 4.

Ancistrona gigas Piaget, Tijd. v. Ent., 26, 1883, 152, Pl. 9, fig. 1.

Ancistrona vagelli Harrison, Parasitology, 9, 1916, 63.

A single female, collected at the Australian Museum, Sydney, from a skin of *Prion desolatus* (*Heteroprion desolatus macquariensis*) taken on Macquarie Island by Mr. H. Hamilton.

Pediculus vagelli Fabricius was described by its author from *Procellaria* (= *Fulmarus*) *glacialis*. Fabricius' description is very brief, but the little that can be made of it, and especially the reference to size convince me that it was this cosmopolitan parasite of petrels which he had before him. Certainly the description will not apply to any other parasite of petrels with which I am familiar. I therefore considered myself justified in reducing *procellariae* Westwood, and *gigas* Piaget, to synonyms of *vagelli* Fabricius. I have examined this form from a considerable number of petrel hosts, and there appears to be only a single species.

SUPER-FAMILY ISCHNOCERA *Kellogg.*

Family PHILOPTERIDAE *Burmeister.*

Sub-family GONIODINAE *Mjoberg.*

Genus AUSTROGONIODES *Harrison.*

Austrogoniodes Harrison, Parasitology, 7, 1915, 398.

This genus was established to include three previously described species, *bifasciatus* Piaget from *Spheniscus demersus*, *brevipes* Giebel from *Aptenodytes longirostris*, and *waterstoni* Cummings from *Eudyptula minor*. To these I have added a species *strutheus* from *Eudyptes sclateri*. The collections of the Australasian Antarctic Expedition include two of these species, *A. waterstoni* and *A. strutheus*, and four remarkably handsome and interesting new species, two of which are derived from the Emperor penguin, *Aptenodytes forsteri*, and the Adelle penguin, *Pygoscelis adeliae* respectively.

One of these new species, described below as *A. hamiltoni*, exhibits a definite copulatory appendage on the third antennal article. According to the views of older workers, this character would justify its generic distinction from the remainder. But a glance at the figures and descriptions which follow, will make it obvious that there is no justification for such a step. The sooner the whole category of artificial and arbitrary characters that has been used in the past to distinguish Mallophagan genera and species is described, the better the prospect will be for a satisfactory classification of the group on natural lines.

These parasites of penguins have an easily recognisable facies, the most important features being the strongly rounded temporal region, and the long backwardly directed pointed lobes which pass back on either side of the prothorax.

AUSTROGONIODES STRUTHEUS *Harrison.*

Austrogoniodes struthus Harrison, *Parasitology*, 7, 1915, 399, Pl. 27, fig. 15.

A number of specimens, male, female and young, from a single individual of *Eudyptes sclateri* caught on the beach at The Nuggets, Macquarie Island, 22-1-12, H. Hamilton (P5). Numerous males and females from a partial albino Royal penguin, *E. schlegeli*, The Nuggets, Macquarie Island, 22-1-12, H. Hamilton (P4).

This species, the smallest of the genus, was described originally from specimens taken upon *Eudyptes sclateri*. The specimens taken by Mr. Hamilton upon the same host, and upon the Royal penguin, *E. schlegeli*, at Macquarie Island, agree in all details, except that the female abdomen is a little broader. Mr. G. F. Ferris, of Stanford University, has also sent me a male and female from *Spheniscus mendiculus*, Galapagos Islands, which I cannot separate from those derived from the penguins mentioned above.

AUSTROGONIODES WATERSTONI *Cummings.*

Goniocotes waterstoni Cummings, *Bull. Ent. Soc.*, 1914, 173, fig. 8.

Austrogoniodes waterstoni, Harrison, *Parasitology*, 9, 1916, 85.

A single female taken with *A. struthus* upon *Eudyptes sclateri*, The Nuggets, Macquarie Island, 22-1-12, H. Hamilton (P5).

AUSTROGONIODES MAWSONI n.sp. Plate I, figs. 2 and 3.

One male and one young from the Emperor penguin, *Aptenodytes forsteri* (H.12).

Description of holotype male.—*Head*: Evenly rounded in front of the antennæ, with a strong chitinous anterior border, and strong antennal bands; trabecular angles well chitinised; antenna with first article much swollen, and longer than the rest together, apparently with four articles only. (in the young individual five articles can be

recognised, but the distal three are not completely separated one from another); eyes prominent; temporal region much swollen, with the usual backwardly projecting postero-lateral angles; occiput very sinuous, projecting strongly on prothorax, and heavily chitinous.

Thorax: Prothorax narrow, parallel-sided, and somewhat rounded upon the metathorax; the latter almost twice as wide as the prothorax, with prominent antero-lateral angles, rounded on the abdomen, with a flat posterior border. Legs extremely short and stout, the distal ends of the tibiae armed with very short and stout peg-like spines.

Abdomen: Of eight visible segments, broadly ellipsoidal, widest at segments three and four, rounded posteriorly; lateral bands of tergites fairly widely separate in mid-line, leaving a clear mid-dorsal area; eighth sternite forming a prominent curved plate, with two light areas laterally, above and in front of which is the genital aperture. The pleural incrassations are very complex, but in optical section have the characteristic double-headed appearance indicated in the figure.

Chaetotaxy: The anterior border of the head bears twelve short sensory bristles, the temporal borders three or four, while the postero-lateral angles carry a moderate hair. On the dorsal surface there are half a dozen prickles in front of the mandibles, and four on each temporal lobe. The hind border of the prothorax carries two very short hairs, at about a quarter of the width from each lateral margin. The metathorax carries three hairs at either lateral angle, the anterior longest, with short spines in front of and between them; and with a row of six hairs along the flat median portion of the hind border. The abdominal segments carry four median hairs both dorsally and ventrally. Through an error on the part of the artist this number has been doubled in the figure. Ventrally the hind margins of the pleura bear two hairs anteriorly, increasing to three in the posterior segments, all alternating with short spines. The hind border of the terminal sternal plate bears a row of ten hairs.

Male genitalia: There being but a single male available it was not possible to dissect out the genitalia. Fig. 3 of Plate I indicates the appearance of the apparatus drawn through the body wall, showing a pair of solid parameres ending distally in two points, one directed posteriorly and one inwards at right angles, enclosing a bilobed mesosome.

Female: Not known.

(Measurements in millimetres.)

	Length.	Breadth.
Head ... ..	.504	.554
Prothorax ... ..	.218	.296
Metathorax ... ..	.235	.487
Abdomen	1.042	.874
Total length	2	...
Greatest breadth ... ..	...	.874

Holotype male in the Australian Museum, Sydney.

By its large size, broad temporal lobes, and indistinct demarcation of the antennary articles, this species comes nearest to *A. hamiltoni* (described below), the two together standing somewhat apart from the rest of the genus. But the relationship is not at all close, since the genitalia are of very diverse types, and the pleural incrassations of *A. mawsoni* are much more complex than those of *A. hamiltoni*.

AUSTROGONIODES MACQUARIENSIS n.sp. Pl. I, figs. 4 and 5.

Two males and two females from the Victoria penguin, *Catarrhactes pachyrhynchus*, and the Royal penguin, *Eudyptes schlegeli*, Macquarie Island; H. Hamilton.

Description of holotype male.—*Head*: Evenly rounded in front of antennæ, with narrow anterior chitinous border, and fairly strong antennal bands; trabecular angles chitinous; antenna with first article swollen, not quite as long as rest together; second article stouter and longer than terminal three, which are not very clearly marked off one from the other; eye somewhat flattened; temporal lobes evenly swollen, scarcely concave in front of postero-lateral angles; occiput sinuous with prominent round occipital blotches.

Thorax: Prothorax narrow, widening posteriorly, with rounded lateral and hind margins; metathorax almost twice as broad, with concave antero-lateral margins, rounded angles and an evenly convex hind border. Legs of usual stout type.

Abdomen: Ovate, widest at segment three, narrowing to an almost acuminate posterior end, of eight visible segments; lateral bands of the tergites not meeting in the mid-line, leaving a median clear area; eighth sternite a curved plate, a little more acutely convex than indicated in figure; pleural incrassations moderately complex, giving a figure in optical section somewhat like a bird's head, as in *A. struthius*.

Chaetotaxy: Half a dozen excessively minute prickles project evenly spaced from the anterior end of the head; similar but slightly larger prickles occur regularly arranged over dorsal surface of the head, as indicated in fig. 4 of Plate I, eight in front of the mandibles, four on either temporal lobe, and two in front of the occiput; three short spines and one somewhat stouter and longer project on the antero-lateral margins of the temporal lobes, while the postero-lateral angles carry two hairs, one just behind the greatest width of the head, and one at the postero-lateral angles. The prothorax has a pair of hairs on the hind border. The metathorax bears postero-laterally on either side a row of five hairs alternating with short spines, and medially a row of ten hairs. The anterior abdominal segments carry a median row of eight hairs, with two special hairs on either side of it. The seventh segment carries four hairs on either side, while the reduced tergite of the eighth segment carries three. The eighth sternite carries twenty-four hairs upon its posterior border. Ventrally, the posterior borders of the pleurites each carry two long hairs and three spines alternating with them.

Male genitalia : The genital apparatus (fig. 5, Plate I), in general, resembles that of *A. mawsoni*, with differences in detail. There is a pair of curved parameres with bifid tips, lying ventral to a mesosome of two triangular lobes; between which projects a tubular "penis," a structure apparently not present in *A. mawsoni*.

Description of allotype female : Generally resembles the male, except in the following points : the antenna is short and simple, of five articles, tapering regularly from the proximal to the distal; the hairs on the hind border of the prothorax are reduced to prickles; the eighth tergite is complete, subtriangular in shape, its anterior margins forming a right angle behind the tergites of the seventh segment, its posterior border convex, and emarginate medially, so that the abdomen ends in two blunt lobes. Ventrally there is a genital pubescence, grading from long hairs laterally to minute prickles medially.

(Measurements in millimetres.)

	Male.		Female.	
	Length.	Breadth.	Length.	Breadth.
Head ... ..	.386	.520	.420	.621
Prothorax ... ..	.110	.201	.117	.285
Metathorax ... ..	.168	.470	.201	.554
Abdomen ... ..	.722	.688	.890	.789
Total length	1.386	...	1.638	...
Greatest breadth ... ..	...	.688	...	.789

Holotype male and allotype female in the Australian Museum, Sydney.

AUSTROGONIODES HAMILTONI n.sp. Pl. I, figs. 8, 9; Pl. II, figs. 1, 2.

Many males and females from the Victoria penguin, *Catarrhactes pachyrhynchus*. The Nuggets, Macquarie Island, 3/3/12, H. Hamilton.

Description of Male.—*Head* flatly rounded in front of antennæ, with narrow chitinous border, antennal bands not strongly marked off. Trabecular angle chitinous, bearing a small spine on anterior face. Antenna with first article very swollen and longer than rest together; second, one-third length of first, bearing two long hairs; third is one-third the length of second bearing a small copulatory appendage; fourth and fifth articles fused. Eye somewhat prominent. Temporal lobes very much swollen, concave in front of antero-lateral angles, strong backwardly projecting postero-lateral angles, occiput sinuous, occipital blotches not very prominent.

Thorax : Prothorax narrow, widening slightly, posterior border rounded on metathorax. Metathorax twice as broad with concave antero-lateral margins, rounded angles and a convex posterior border. Legs short and stout.

Abdomen: Eight visible segments. Broadly ellipsoid, widest at segment 3-4, rounded posteriorly. Lateral bands of tergites fairly widely separated in midline, leaving a clear mid-dorsal area. Eighth sternite forming a curved plate. The pleural incassations not so complex as those of *A. mawsoni* and *A. macquariensis*.

Chaetotaxy: Single prickle on anterior border of each trabecula. Small pegs occur regularly arranged over the dorsal surface of head, four pairs anterior to the mandibles and two rows of four posterior to mandibles. Stout spine between two prickles on the margin of the temporal lobe behind the antero-lateral angle, moderate hair just behind it and a curved spine at the posterior angle. Hind margin of the head is bare.

The prothorax has a pair of long hairs on its postero-lateral angle and a pair of prickles on the dorsal surface. The metathorax bears a spine on the antero-lateral angle. Along the hind border and from the postero-lateral angles are a series of spines and hairs in the following order from the postero-lateral angle spine, hair, spine, hair, spine, row of 24 hairs, spine, hair, spine, hair, spine. Dorsal surface is bare.

The dorsal surface of segments 1-5 of the abdomen carry a hair on the hind border at about one-sixth width from the lateral margin, with a spine lateral and 2-3 spines mesiad, with a row of hairs intermingled with spines in the middle region. Segment 6 has two lateral hairs with a spine between, 2 spines outside and 5 inside, median row being represented by a pair of hairs enclosing a series of spines. Segment 7 bears upwards of 30 hairs along hind border. Behind these is a row of hairs which probably represent the hind margin of segment 8, which is not clearly marked. The tergite of segment 9 is represented by a pair of flaps overhanging the genital aperture. The strongly chitinised sternite of segment 9 bears a row of 22 hairs on its posterior margin. Ventrally the posterior border of the pleurites bears hairs as follows:—1, 3-4 spines; 2, 2 spines, hair, 2 spines, hair, spine; 3, 3 spines, hair, 1 spine, hair, spine; 4, as 3; 5, hair, 2 spines, hair, spine, hair, spine; 6 as 5; 7, clump of 4 hairs with two spines amongst them. Otherwise the ventral surface is bare except for a few scattered hairs in the middle region of the anterior segments.

Male genitalia resemble those of *A. macquariensis*. There is a pair of parameres with marked bifid tips lying ventral to a complex mesosome composed of two triangular lobes each produced at the posterior apex into a long curved process, the point of each process lying between the bifid tip of each paramere. The lobes of the mesosome show chitinous thickenings. The penis is a long tubular structure lying between the lobes of the mesosome. The lateral edges of the basal plate have a characteristic chitinous thickening. When the genitalia are extruded the parameres are thrown back.

Female differs from the male in the following points: Anterior margin of head rounded, antennæ short and simple with articles clearly marked off. Temporal lobes not so prominent. The hairs on the prothorax are absent. The posterior border

of the eighth tergite is emarginate medially so that the posterior end terminates in two blunt lobes. There is a genital pubescence on the ventral surface.

(Measurements in millimetres.)

	Length.	Breadth.
Head ... ..	.420	.672
Prothorax ... ..	.202	.420
Metathorax ... ..	.218	.672
Abdomen	1.309	1.008
Total length	1.915	...
Greatest width ... ..	...	1.008

Holotype male and allotype female in the Australian Museum, Sydney.

AUSTROGONIODES ANTARCTICUS n.sp. Pl. I, figs. 6-7.

One male and two females from the Adelie penguin, *Pygoscelis adeliae*, Adelie Land, 1913 (Dr. McLean).

Description of holotype male.—This species is the smallest of the *Austrogoniodes*.

Head: Anterior margin semi-circular in outline in front of the antenna, with well marked chitinous border, strong antennal bands. Trabecular angles well chitinised. Temporal lobes very pointed at the posterior points, occiput convex, prominent occipital blotches.

Thorax: Prothorax narrow with rounded lateral and hind margins. Metathorax almost twice as broad as thorax, with concave antero-lateral margins, hind border not evenly convex, the posterior margin on abdomen straight.

Abdomen: Eight visible segments, oval in shape, widest at segment 4. Lateral bands of tergites not meeting in the mid-line leaving a narrow clear area. Eighth sternite a curved plate acutely convex. Pleural incassations as in figure, unlike those of *A. macquariensis*, not so darkly coloured.

Chaetotaxy: A few very small prickles project from the anterior margin of the head. There is a series of prickles on the dorsal surface, two rows in front of the mandibles. A spine and two hairs are borne on the lateral margins of the temporal lobes. The prothorax bears no hairs or spines. The lateral angle of the metathorax bears a spine and three long hairs. The posterior margin bears six hairs. Segments one to six of the abdomen each bears a row of five hairs in the middle region of the dorsal surface. The hairs are arranged on the ventral surface as in *A. hamiltoni*.

Male genitalia do not resemble those of any of the other species of the genus. As there is a single male it has not been possible to dissect out the genitalia and the details through the body are obscure. The parameres are short but stout, and each shows an indication of a bifid tip, and a projection at about the middle of its length. The mesosome is quite unlike that of *A. hamiltoni*, each of the lobes showing chitinous thickening along its lateral border and each ending in a short blunt process. There is an indication of a short penis.

Description of female.—The only points in which the female differs from the male is the structure of the last segment. The eighth segment is rounded with a very shallow bay in its posterior border. The genital plate is provided with a series of very short hairs.

(Measurements in millimetres.)

	Male.		Female.	
	Length.	Breadth.	Length.	Breadth.
Head ... ..	.390	.470	.437	.538
Prothorax ... ..	.092	.235	.118	.269
Metathorax ... ..	.168	.370	.202	.420
Abdomen ... ..	.756	.605	.958	.790
Total length	1.280	...	1.579	...
Greatest breadth ... ..	...	.605	...	.790

Types.—Holotype male and allotype female in Australian Museum, Sydney.

Sub-family PHILOPTERINAE *Harrison.*

Genus PHILOPTERUS *Nitzsch.*

Philopterus Nitzsch, *German Magazin*, 3, 1818, 288.

[When preparing this paper I found that there had been no work done in this group beyond the determination of species. There is an indication on one slide of the name for the new species, which I have therefore, called *Philopterus antarcticus*. There are in all five species represented from this genus.—L. M. WOOD.]

PHILOPTERUS GONOTHORAX *Giebel.*

Pediculus lari O. Fabricius, *Faun. Groen.*, 1780, 219, nec Degeer, 1778.

Docophorus lari Denny, *Anoplur. Brit.*, 1842, 84, Pl. 9.

Docophorus gonothorax Giebel, *Zeit. f. ges. Nat.*, 37, 1871, 112.

Docophorus congener Giebel, *Ins. Epiz.*, 1874, 111.

Docophorus breviappendiculatus Piaget, *Pediculines*, 1880, 112.

Docophorus magnus Piaget, *Pediculines*, 1880, 112.

Docophorus larinus Picaglia, *Atti. Soc. Ital. Sci.*, 28, 1885, 1.

Philopterus gonothorax Harrison, *Parasitology*, 9, 1916.

Material comprises a male and two females from *Larus dominicanus*, Macquarie Island, 28/1/12.

PHILOPTERUS LIMOSAE *Denny.*

Docophorus limosae Denny, *Anoplur. Brit.*, 1842, 86, Pl. 4, fig. 2.

Philopterus limosae Harrison, *Parasitology*, 9, 1916, 98.

Material comprises a single male from an undetermined Limicoline, Macquarie Island, 7/11/13, collected by Mr. H. Hamilton.

PHILOPTERUS MELANOCEPHALUS *Nitzsch*.

Docophorus melanocephalus Nitzsch in Burm. Hand., 12, 1838.

Docophorus laricola Nitzsch in Giebel, Zeit. f. ges. Nat., 28, 1866, 363.

Docophorus latocaudatus Rudow, Beitrag, 1869, 12.

Docophorus lobaticeps Giebel, Ins. Epiz., 1874, 109.

Phlopterus melanocephalus Harrison, Parasitology, 9, 1916, 99.

Material comprises four males and two females from *Sterna* sp., Macquarie Island, 26/1/12, collected by Mr. H. Hamilton.

PHILOPTERUS PUSTULOSUS *Nitzsch*.

Docophorus pustulosus Nitzsch, in Giebel, Zeit. f. ges. Nat., 28, 1866, 363.

Docophorus euryrhynchus Giebel, Ins. Epiz., 1874, 112.

Phlopterus pustulosus Harrison, Parasitology, 9, 1916, 103.

Material comprises four males and three females from *Megalestris maccormicki*, Adelie Land, 14/1/13; collected by Dr. Hunter.

PHILOPTERUS ANTARCTICUS *L. M. Wood*, n.sp. Plate II; fig. 3; text fig. 1.

Material comprises one male and one female from *Pagodroma nivea*, Adelie Land, 10/12/13.

Description of male.—*Head* as long as wide, with rounded temporal lobes, hind margin sinuous with rounded projection on the prothorax. Clypeus with clear anterior margin, fairly wide lateral bands darkly coloured, signature narrow in front much wider posteriorly, anterior margin straight, posterior margin rounded with a strongly projecting posterior blunt point. Antennal bands strong and darkly coloured, thickening commencing at the base of the mandible and sweeping out to edge of the head at the base of the trabecula and forward to the clypeal region. Internal to antennal bands are two bent rods arising from the base of the mandibles, each running forward parallel to the antennal bands and curving round the antennal bands and forward to the clypeal bands just near the widest portion of the signature. Trabeculae light coloured reaching to the base of the second article of the antenna. Antennae short; first article stout and fairly long; second narrow and as long as first; third to fifth equal in length and shorter than second. Eye prominent with two curved spines. Narrow marginal band behind the eye. Occipital bands well marked.

Thorax: Prothorax projecting under the occiput with diverging sides and rounded angles, hind margin almost straight. One hair borne on each postero-lateral

angle. Metathorax wider than the prothorax, postero-lateral angles acute, posterior border convex, margins dark colour, bears fifteen pustulated hairs on the posterior margin.

Abdomen: Nine visible segments widest at fourth and fifth segments, posterior end rounded. Segments 2-7 with strong lateral bands of blackish brown. Posterior

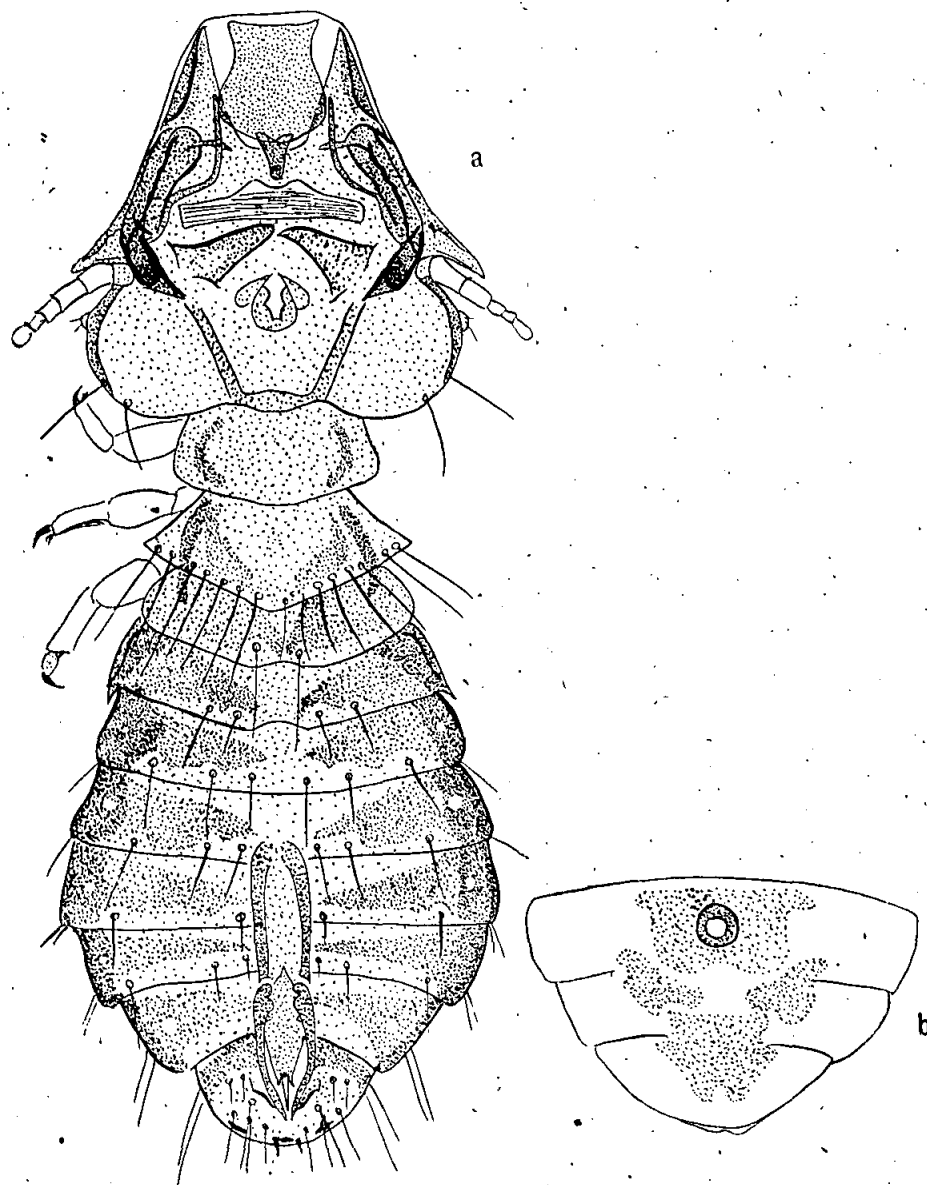


Fig. 1.

Text-fig. 1.—*Philopterus antarcticus* n.sp. a. Dorsal view of male. b. Genital blotch in female.

angles of segment 1 rounded. The chitinous parts of the posterior segment stand out as three blotches, two lateral and one posterior, inside the actual margin. Transverse bands of segment 1 almost meeting mesially, and in segments 2-4 the transverse bands are widely separated. In segments 5-7 the clear area is very narrow.

Chaetotaxy: Two pustulated hairs on the margins of the temporal lobes, two small spines between occipital bands. Hairs on thorax as described. On the dorsal surface of the abdomen the hairs are arranged as follows: On segment 1 are 2 hairs in the middle region; in segment 2 are 4 hairs; on segment 3 are 6 hairs; on segment 4 are 8 hairs; on segment 5 are 6 hairs; on segment 6 are 6 hairs; segment 7 bears none; segment 8 bears 6 hairs; and segment 9 bears 8 hairs and 2 small spines. On the ventral surface segment 1 bears no hairs; segment 2 bears 2 hairs; segment 3 and 4 bear one hair on each lateral margin and two in the middle region; segment 5 bears 2 hairs laterally and 4 in the middle; segment 6 bears 2 hairs laterally and 4 in the middle; segment 7 bears 4 laterally; segment 8 bears 4 laterally; and segment 9 bears 4 on the posterior margin and 2 in the middle region.

Genitalia: Parameres strongly chitinised, long curved rods. At the base each paramere possesses a large condyle which articulates by an anterior head with the basal plate and by a lateral head with the mesosome. The endomerall portion of the mesosome is elongate, ending in two lobes one at each side of the penis (Pl. II, fig. 3).

Description of female: The female differs from the male only in its greater size and in the structure of the posterior end. Two hairs arise from the posterior margin of the tergite of the last segment. Twelve pustulated hairs in three rows on the last sternite. Posterior end not completely rounded but showing an indication of small bay. Genital blotch as in text fig. 1, C.

(Measurements in millimetres.)

	Male.		Female.	
	Length.	Breadth.	Length.	Breadth.
Head	.470	.470	.487	.487
Prothorax	.100	.285	.100	.302
Metathorax	.168	.352	.144	.386
Abdomen	.638	.604	.773	.672
Total length	1.377	...	1.505	...
Greatest width	...	.604	...	.672

Holotype male and allotype female in the Australian Museum, Sydney.

Sub-family ESTHIPTERELLINAE nom. nov.

In my 1916 list, I established the genus *Esthiopterum* to include all those species other than the circumfasciate group containing the type, which had previously been placed in the genus *Lipeurus* (1916, 129), designating *Lipeurus hebraeus* Nitzsch (= *gravis* L.) as type. The genus *Lipeurus* I transferred to the Goniiodinae. Unfortunately, as has been pointed out to me by a correspondent, Mr. E. A. Chapin, I overlooked the fact that I had not admitted the validity of Mjöberg's genus

Pseudonirmus, which I re-establish in the present report. Consequently I included in *Esthiopterum* *Pseudonirmus charcoti* Neumann, Mjöberg's genotype. *Esthiopterum* therefore becomes a synonym of *Pseudonirmus*, and I give the new name *Esthiopterella* to the group of species which I formerly called *Esthiopterum*, with the same genotype, *E. gravis* L. This has necessitated changing the name of the sub-family as above.

This sub-family includes a large number of heterogenous forms, which will ultimately be split up into a very considerable number of groups of generic rank, and these sorted into appropriate higher categories. As far as the Esthiopterellinae of Tubinares are concerned, I have made a careful study of the parasites of almost all the petrels of the world, publication of which has been delayed owing to the war. I had hoped that this paper would be published before I finished the present report. That has proved impossible, so I am obliged to diagnose four of the new genera which are established in the unpublished paper, and two new species. I propose to deal somewhat briefly with these genera and species here, as they will be fully discussed on the basis of large comparative series in the forthcoming paper.

Genus PSEUDONIRMUS Mjöberg.

Pseudonirmus Mjöberg, Arkiv. f. Zool., 6, 1910, 149.

Generic characters: Forms in which the frontal bands are continuous, forming a single band across the head behind the signature; clypeal region short, with definite signature; no internal bands, but modified ventral bands present; male antenna with a slight prolongation of the ventral border of the third article, the two terminal articles being inserted at a small angle dorsally. Genotype, *P. charcoti* (Neumann).

The genotype was described by Neumann (1907, 15) as a *Degeriella*, because of the absence of dimorphism in the antenna. Neumann did not recognise, any more than did Mjöberg, its affinity with the *Lipeurus gurlti* of Taschenberg. Mjöberg erected a new genus for its reception, chiefly as he states, because of the absence of a penis. The genital apparatus is, however, similar to that of the majority of these petrel-infesting species, viz., a simple eversible tube capable of protrusion between a pair of chitinous parameres, so that the only character adduced in Mjöberg's generic definition is no use. The structure of the forepart of the head is quite distinctive, and I add to the two existing species, *gurlti* Taschenberg and *charcoti* Neumann, a third, *antarcticus*, which occupies an intermediate position between the two. The species are found respectively on the three monotypic genera, *Petrella*, *Pagodroma* and *Thalassoeca*.

Key to species of *Pseudonirmus*.

- A Length of head from antenna to frontal bar greater than from antenna to occiput *charcoti* Neumann.
 AA These lengths equal.
 B Clypeus about $\frac{1}{4}$ length of head *antarcticus* n.sp.
 BB Clypeus about $\frac{1}{5}$ length of head *gurlti* Taschenberg.

Types: The holotype male and the allotype female from which this description was originally drawn up were collected by myself from a skin of *Thalassoeca antarctica* in the Museum of Comparative Anatomy, University of Cambridge. They will be deposited in the Australian Museum, Sydney, New South Wales.

(Measurements in millimetres.)

	Male.		Female.	
	Length.	Breadth.	Length.	Breadth.
Head ... ..	.50 (.57)*	.36 (.39)	.62 (.62)	.46 (.47)
Prothorax ... ..	.10 (.11)	.26 (.39)	.12 (.13)	.32 (.34)
Metathorax ... ..	.23 (.26)	.32 (.35)	.24 (.28)	.40 (.42)
Abdomen	1.05 (1.21)	.39 (.40)	1.80 (1.94)	.46 (.57)
Total length	1.88 (2.15)	...	2.77 (3.00)	...
Greatest breadth ... ..	...	.39 (.40)	...	.46 (.57)

* The figures in brackets are measurements of *P. gurti* for comparison.

Genus EPISBATES *nov.*

Generic characters: Form with the general facies of *Pseudonirmus*, but with no clypeus, the frontal bands being continuous round the anterior margin of the head. Genotype, *E. pederiformis* (Dufour).

EPISBATES PEDERIFORMIS *Dufour*. Text fig. 3.

Philoapterus pederiformis Dufour, Ann. Soc. Ent. Fr., 4, 1834, 676, Pl. 21, fig. 4.

Metapleuron laeve Rudow, Zeit. f. ges. Nat., 36, 1870, 140.

Nirmus angulicollis Giebel, Ann. Mag. Nat. Hist., 17, 1876, 388.

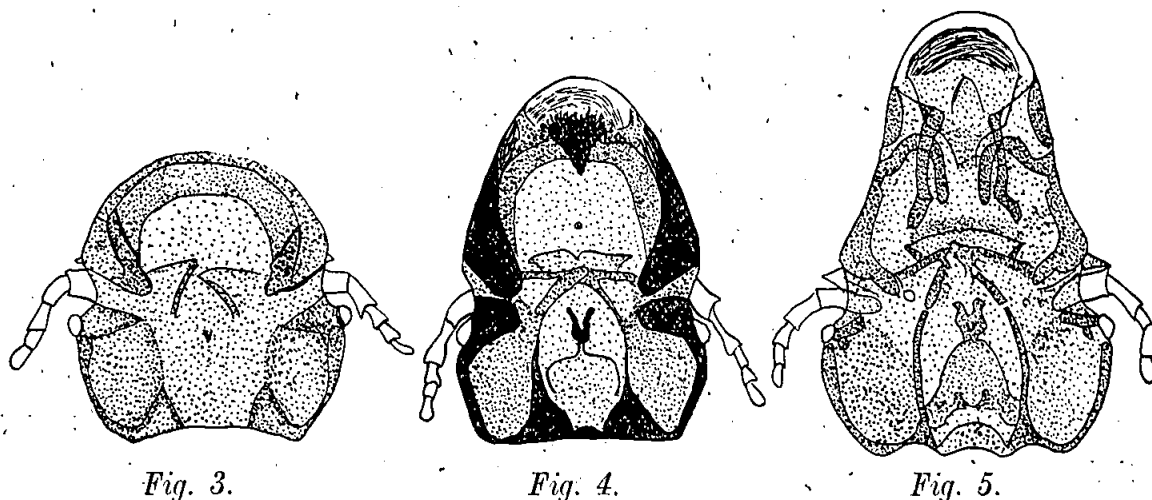
Lipeurus breviceps Piaget, Tijd. v. Ent., 33, 1889, 243, Pl. 9, fig. 6.

Lipeurus macilhennyi Kellogg & Kuwana, Proc. Acad. Nat. Sci. Philad., 1900, 155, Pl. 7, fig. 3.

Esthiopterum pederiforme Harrison, Parasitology, 9, 1916, 139.

A single female from *Diomedea exulans*; 12/3/13. This very distinct form would seem to occur only very sparingly on albatrosses. I have drawn attention to the gradual reduction of the clypeal region in *Pseudonirmus*, and it seems to me that *Episbates* shows the final stage in this reduction, and has been derived from a *Pseudonirmus*-like ancestor. It differs in the complete absence of clypeus, in the squarish expansions of the metathorax between the second and third legs, and in the peculiar granulation or mammillation of the whole cuticle which Dufour has endeavoured to represent in his figure.

This figure is, as a matter of fact, quite adequate for recognition of the species, but has been neglected by subsequent writers. Piaget, indeed, does refer to his description (1880, 333), but considers he is dealing with a larval form of *Docophoroides brevis*. Piaget's usual acumen has failed him here. Giebel (1874, 235) dismisses Dufour's species with a remark that the species was not accessible to him. Each of these writers, on subsequently obtaining examples, described the species as new. Although Rudow's description is too brief to allow of certainty, I believe his *Metapleuron laeve* to be the same insect. Kellogg and Kuwana have described the species from a different host, *Diomedea nigripes*; but Kellogg has subsequently (1914, p. 81) recognised its identity with *Nirmus angulicollis* of Giebel.



Text-fig. 3.—Head of *Episbates pederiformis* Duf. showing generic characters. Text-fig. 4.—Head of *Perineus nigrolimbatus* Gb. showing generic characters. Text-fig. 5.—Head of *Naubates heteroproctus* n.sp. showing generic characters.

Genus PERINEUS nov.

Generic characters.—Forms with strongly contrasted colouring, ranging from white to black, clypeal suture not present; antennal bands usually continuous with clypeal bands; frontal bands not typically developed; internal bands absent, except in *diomedeae*; no definite signature, except in the same species; ocular and occipital blotches large and prominent. Genotype, *Lipeurus nigrolimbatus* Giebel.

This genus is distinguished from the others dealt with by its contrasted colouration, the usual brown giving place to strong black and white, and by a masking of structural details. It is found upon fulmars, albatrosses and skuas. Its occurrence upon the last-mentioned host-group is interesting, as this appears to be a case of acquisition of a true petrel parasite by some ancestral skua in the distant past. The genus has no features in common with any known gull parasites.

I recognise nine species, four of which were represented in the collections of the Australasian Antarctic Expedition.

PERINEUS DIOMEDEAE *Fabricius*.

Pediculus diomedae Fabricius, Syst. Ent., 1775, 808.

Phlopterus diomedae Dufour, Ann. Soc. Ent. Fr., 4, 1834, 669, Pl. 21, fig. 1/2.

Lipeurus diomedae, Giglioli, Quart. Jour. Micr. Sci., 4, 1864, 19, Pl. I, fig. 1/2.

Lipeurus ferox Giebel, Zeit. f. ges. Nat., 29, 1867, 195.

Lipeurus ferox Kellogg, New Mallophaga, 1896, 127, Pl. 9, figs. 1-2.

Lipeurus densus Kellogg, New Mallophaga, 1, 1896, 114; Pl. 7, figs. 1-2.

Esthiopterum diomedae Harrison, Parasitology, 9, 1916, 133.

Two immature individuals taken on *Diomedea exulans*, 12/3/13. I have seen only a limited number of individuals of this giant parasite from three species of albatross. When better material is examined, there may prove to be more than one species. In this connection it should be noted that the first host record for *diomedae* is *D. exulans*; for *ferox*, *T. melanophrys*; and for *densus*, *D. albatrus*. *P. densus* Kellogg is based upon immature specimens.

PERINEUS OBSCURUS *Rudow*.

Lipeurus obscurus Rudow, Zeit. f. ges. Nat., 36, 1870, 125.

Lipeurus melanocnemis Giebel, Ins. Epizoa, 1874, 233.

Lipeurus gaini Neumann, Deux. Exp. Ant. Fr., 1913, 192, figs. 4/5.

Esthiopterum obscurum Harrison, Parasitology, 9, 1916, 139.

One male from *Macronectes giganteus*, Adelie Land, 1913, Dr. McLean.

One male and one female from the same host, Adelie Land, 15/12/12.

I have followed Taschenberg (1882), who had access to Rudow's types, in accepting *melanocnemis* Giebel as synonymous with *obscurus* Rudow. There can be no doubt that *gaini* Neumann is identical with the former. The species has not been recorded from any host other than *Macronectes giganteus*.

PERINEUS CONCINNUS *Kellogg and Chapman*.

Lipeurus concinnus Kellogg and Chapman, New Mallophaga, 3, 1899, 97, Pl. 7, fig. 2.

Esthiopterum concinnum Harrison, Parasitology, 9, 1916, 132.

One male and one immature male from the sooty albatross, *Phoebastria fuliginosa*, Macquarie Island, 5/11/12, H. Hamilton.

This species which would appear to be generally distributed on albatrosses, much resembles the better known *P. nigrolimbatus*, characteristic of fulmars. As Kellogg (loc. cit) has pointed out, it is a dark, slender form, and I find in this species an

excellent diagnostic character in the female antenna, which, in this species, is long enough to reach to the occiput or beyond, while in *nigrolimbatus* it is appreciably shorter. It was first recorded from *Diomedea albatrus* from California, and I have other specimens from *Thalassogeron melanophrys* and *T. bulleri*.

PERINEUS NIGROLIMBATUS *Giebel*. Text fig. 4.

Lipeurus bilineatus Stephens, Syst. Cat., 2, 1829, 333, nom.nud.

Lipeurus nigrolimbatus Giebel, Insecta Epizoa, 1874, 233.

Lipeurus mutabilis Piaget, Les Pediculines, 1880, 324, Pl. 27, fig. 1.

Lipeurus celei Kellogg, New Mallophaga, 1, 1896, 117, Pl. 7, figs. 5-6.

Lipeurus varius Kellogg, New Mallophaga, 1, 1896, 116, Pl. 7, figs. 3-4.

Esthiopterum nigrolimbatum Harrison, Parasitology, 9, 1916, 101.

Eight females in an unnumbered lot from *Priocella glacialis*, Stillwell Island, J. G. Hunter. Numerous males and females from an unnumbered lot from the same host, Adelie Land, 39/12/13.

This cosmopolitan parasite of fulmars is somewhat variable, but I cannot find good grounds for dividing it into more than one species. Kellogg (1914, 85) has pointed out certain differences between the northern and southern forms, the latter having a flatter clypeal front, darker colour, and slightly longer antennæ than the former. *P. varius* of Kellogg is the immature form of the author's *P. celer*, and has page priority, should the question of reinstating the species arise.

GENUS NAUBATES *nov.* Text fig. 5.

Generic characters.—This genus is erected to contain a group of six species, the members of which have usually been referred to *Lipeurus fuliginosus* of Taschenberg. They comprise stout dark forms, with well developed antennal anterior, and internal bands on the head, and having a main diagnostic feature, very strong ventral bands which give the head pattern a characteristic appearance. Genotype, *Naubates heteroproctus* n.sp.

NAUBATES HETEROPROCTUS *n.sp.* Plate 2, figs. 4, 5, 6, 7.

One female and one young from *Aestrelata lessoni*, Macquarie Island, 8/5/13, H. Hamilton.

This species is well enough characterised by the somewhat foot-shaped endings to the ventral bands, by the extraordinary asymmetry of the last segment of the male abdomen, and by the short and narrow segments eight and nine, following upon the broad anterior segments in the female abdomen. I propose to defer complete description until I deal with the genus as a whole.

NAUBATES CLYPEATUS (*Giebel*).

Lipeurus clypeatus Giebel, Ins. Epizoa, 1874, 136.

Lipeurus prioni Enderlein, Deutsch. Sud-polar Exp., 10, 1909, 454.

Esthiopterum clypeatus Harrison, Parasitology, 9, 1916, 132.

One male and one young collected at the Australian Museum from a skin of *Prion desolatus* taken at Macquarie Island by Mr. H. Hamilton.

This species was described by Giebel from specimens obtained from the blue petrel, *Halobaena caerulea*. I have examined specimens from this host, and can detect no specific difference between them and individuals taken upon prions.

Genus HALIPEURUS *nov.*

Generic characters.—Long and slender forms; signature and clypeal bands distinct; clypeal suture prominent; internal bands continued back to mandibles; metathoracic angle, from within outwards, with a row of three hairs in a triangular light coloured area, then a short hair, than a longer-hair; end of abdomen rounded in male, sometimes slightly bifid; narrow and two-pointed in female. Genotype, *H. euryphallus* Harrison, from *Aestrelata* spp.

This genus has been erected to include fourteen species of the type usually referred to *diversus* Kellogg or *angusticeps* Piaget.

HALIPEURUS ANGSTICEPS *Piaget*.

Lipeurus angusticeps Piaget, Pediculines, 1880, 306, Pl. 25, fig. 4.

Esthiopterum angusticeps Harrison, Parasitology, 9, 1916, 130.

A single female collected at the Australian Museum from a skin of *Prionus cinereus* taken at Macquarie Island by Mr. H. Hamilton.

Genus PECTINOPYGUS *Mjöberg*.

Pectinopygus Mjöberg, Arkiv. f. Zool., 6, 1910, 95.

Mjöberg erected this genus to contain the species *Docophorus bassanae* of Denny, of which *Lipeurus pullatus* Nitzsch is a synonym, and which occurs upon the European gannet, *Sula bassana*. The character which suggested the name, and upon which Mjöberg mainly relied for his generic distinction, is the presence of a pair of comb-like structures upon the lateral pieces of the male genital armature. This character is found in forms from *S. bassana* (Mjöberg, loc. cit.), *S. capensis* (Cummings, 1916, 691) and *S. serrata* in my own collection; but, as pointed out by Waterston (1914, 312), it does not appear in the genitalia of forms from certain other gannets, which are assuredly congeneric. Hence the pectinate genitalia have no generic significance.

The inclusion in the material collected by the Australasian Antarctic Expedition of a single parasite from *Phalacrocorax traversi* of Macquarie Island, led me to examine closely such cormorant parasites as I possessed, some eight species in all, and to decide that a genus must be erected to contain them. On extending my study to the other Steganopode families, I find that the Esthiopterellinae parasites of cormorants, frigate-birds, pelicans and gannets present an easily recognisable common facies, and must be treated together.

I propose therefore to retain Mjöberg's name, *Pectinopygus* for the whole group, extending the diagnosis; and to divide it into four sub-genera to contain the easily separable forms found upon Sulidae, Pelicanidae, Phalacrocoracidae and Fregatidae respectively. The genus does not occur upon Phaetonidae.

Generic characters.—Esthiopterellinae of elongate form, with the female markedly more robust than the male; clypeate, the clypeal region being very short in proportion to the length of the head, with, usually, a squarish signature; antennal anterior and internal bands heavy; antennæ dimorphic; female abdomen with characteristic genital pubescence; a transverse row of short hairs in front, and lateral rows of long sweeping hairs at the sides of the genital aperture. Characteristic of the genus are the structures, which I call sheathed hairs, occurring on the terminal segment of the abdomen in one or both sexes. Genotype, *Pectinopygus bassanae* O. Fabricius.

PECTINOPYGUS s.str.

Robust forms, darkly coloured, with two small postero-lateral backwardly directed projections from the square signature; third article of male antenna carrying a projecting toothed ridge, somewhat resembling a shark's tooth; male with transverse bands of first four segments divided medially; termination of abdomen in male two-pointed dorsally, the cleft between completely dividing the tergites of the ninth segment, and partially those of the eighth; ventrally the ninth sternite projects as a more or less arrow-headed point between and beyond the dorsal points; three or four sheathed hairs on either side on the ventral surface of the dorsal points; termination of abdomen in female slightly emarginate dorsally, definitely two-pointed ventrally, each of the points bearing three or four sheathed hairs on its ventral surface. Male genitalia complex on Suldia. Genotype, *Pectinopygus (Pectinopygus) bassanae* O. Fabricius, from *Sula bassana*.

Included species.—*annulatus* Piaget from *Sula fiber*; *helleri* Kellogg and Kuwana from *S. piscatrix*; *potens* Kellogg and Kuwana from *S. piscatrix*; *pullatus* Nitzsch = *bassanae* from *S. bassana*; *staphylinoides* Denny = *bassanae* from *S. bassana*; *bassanae* O. Fabricius from *S. bassana*.

EPIPELECANUS sub-genus n.

Elongate forms, darkly coloured, with small postero-lateral projections from the signature, directed outwards; signature with strongly convex hind border; first article of male antenna with a slightly bifid, wholly chitinous appendage at half its length, third article with a long, recurved hook-like appendage; male with transverse bands of first seven abdominal segments divided medially, female, first eight; male with pleura of eighth segment produced backwards into blunt, slightly curved processes, and those of ninth segment bearing curved chitinous hooks projecting forwards; no sheathed hairs, but a number of small thick conical spines on either side of fairly deep emarginat emargination of hind border; female with hind end slightly emarginated dorsally, two-pointed ventrally, with a pair of short sheathed hairs on either side ventrally. Male genitalia complex. On Pelecanidae. Type of sub-genus, *Pectinopygus* (*Epipelecanus*) *forficulatus* Nitzsch, from *Pelecanus onocrotalus*.

Included species.—*bifasciatus* Piaget from *Pelecanus crispus*; *forficulatus* Nitzsch, from *P. onocrotalus*.

PHILICHTHYOPHAGA sub-genus n.

Smaller forms, darkly coloured, without projections from the signature; third article of male antenna usually with a slight prolongation of pre-axial border; abdomen of male with transverse bands of anterior segments usually divided medially (one in some species to three in others); with a peculiar chaetotaxy on ventral surface of last two segments, varying with species; and without sheathed hairs, though a few pustules show slightly raised rims. Abdomen of female with transverse bands separated medially through first eight segments; with tergite of ninth segment ending flatly, and bearing two pairs of sensory hairs with rimmed portules, and with sternite of the same segment also ending flat, cleft by a deep narrow median incision, with a pair of sheathed hairs on either side. Male genitalia usually simple; on Phalacrocoracidae. Type of sub-genus, *Pectinopygus* (*Philichthyophaga*) *gyricornis* Denny, from *Phalacrocorax carbo*.

Included species.—*acutifrons* Rudow from *Phalacrocorax capensis*; *afer* Kellogg from *P. africanus*; *brevicornis* Denny from *P. cristatus*; *brevisignatus* Piaget from *P. javanicus*; *confusus* Bagnall and Hall from *P. sulcirostris*; *depressus* Rudow from *P. vigua*; *dispar* Piaget from *P. sulcirostris*; *fanalloni* Kellogg from *P. penicillatus*; *gyrocercus* Nitzsch from *P. vigua*; *gyricornis* Denny from *P. carbo*; *longicornis* Piaget from *P. carbo*; *macquariensis* n.sp. from *P. traversi*; *setosus* Piaget from *P. sulcirostris*; *subsetosus* Piaget from *P. melanotus*; *toxocercus* Nitzsch from *P. carbo*. [NOTE.—I have not, at this stage, attempted to settle any question of synonymy arising out of the above list.]

PECTINOPYGUS (PHILICHTHYOPHAGA) MACQUARIENSIS *n.sp.* Text fig. 6.

A single female holotype, collected from the Macquarie Island cormorant, *Phalacrocorax traversi*, by Mr. H. Hamilton on 10th July, 1912.

Description of female.—*Head*: Broader than long; clypeal region extremely short, being less than one-third the length of the preantennal portion of the head;

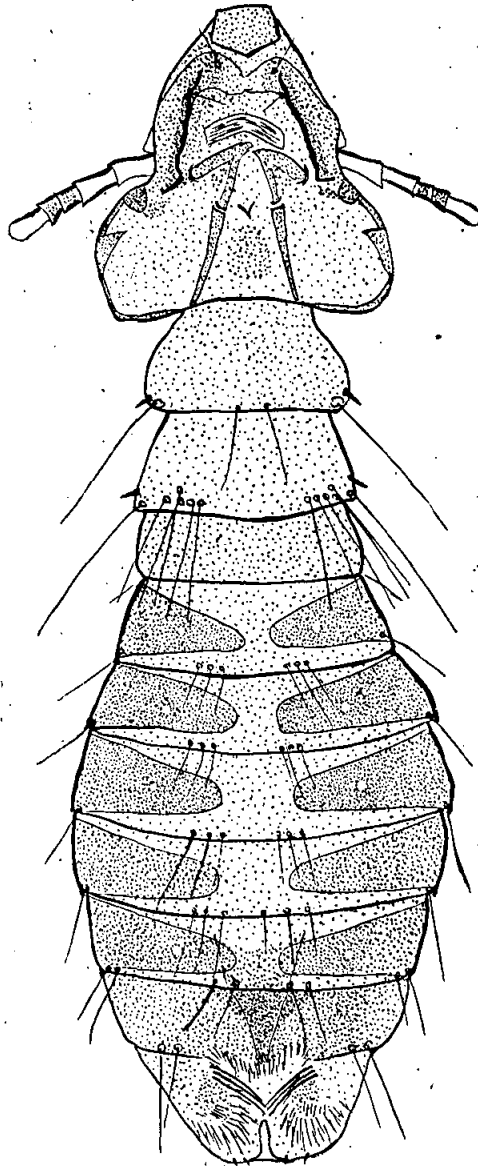


Fig. 6.

Text-fig. 6.—*Pectinopygus (Philichthyophaga) macquariensis n.sp. ♀* Diagram of whole animal to show specific characters.

signature transversely oblong, that is, broader than long ($\cdot 097$ by $\cdot 069$), slightly wider posteriorly, anterior border slightly, posterior more markedly convex; occiput flat, slightly re-entrant; anterior bands ending at mid-line, hardly prolonged into definite

internal bands. Trabecula small, and scarcely projecting; antenna with first article stout, equal in length with second, which is more slender; third and fourth short, subequal, coloured more heavily than the rest; terminal article not quite as long as the second.

Thorax: Prothorax short and wide, almost three times as wide as long, with an uncoloured median line, and a long pustulated hair with a small spine in front, at the rounded postero-lateral angles. Metathorax the same width as the head, almost three times as wide as long, with a spine and a long pustulated hair at the square angle, and a group of four or five closely apposed pustulated hairs, not in one line, just inside the angle; slightly convex on abdomen.

Abdomen: Short and broad, the breadth exceeding half the length; widening to greatest breadth at third and fourth segments, thence narrowing gradually to the ninth, which ends posteriorly with a flatly emarginate border, bearing a narrow median cleft. Transverse bands narrow oblong, more so than in any other species known to me, that of the fifth segment measuring $.084 \times .272$ mm., those of either side not meeting, but leaving a clear median space $.128$ mm. in width. The genital flap is rounded, and produced backwards, and is flanked by a pair of narrow gonapophyses, each of which carries a pair of strong hairs, differing from those forming the genital pubescence by their darker colour and more robust form. The ninth sternite bears a pair of small sheathed hairs terminal on either side of the median incision ventrally.

Chaetotaxy: In addition to the hairs mentioned above, the abdomen bears dorsally three hairs in the clear middle area on the hind margins of segments 1-6 and two on segments 7-8; while ventrally, apart from the genital pubescence on segments 7-9, 6 bears a row of four hairs on either side of the genital plate, and the anterior segments a row of about six hairs on their hind margins.

(Measurements in millimetres.)

	Length.	Breadth.
Head ... ..	.438	.454
Prothorax ... ..	.140	.373
Metathorax ... ..	.176	.454
Abdomen	1.060	.672
Total length	1.814	...
Greatest breadth ... ..	...	.672

The propriety of describing a species as new, with but a single female on which to base description, is certainly open to question. I could not, however, short of discarding the specimen altogether, see my way to any other course. Neumann (1913; 192) has referred a parasite of *Phalacrocorax vigua*, taken in the Straits of Magellan, to *P. faralloni* Kellogg, which was taken upon *Phalacrocorax penicillatus* in California, despite the fact that two species, *depressus* Rudow and *gyrocerus* Nitzsch have been

described from the former host. I could not be satisfied to refer this female to a known form in that way. I have *Philichthyophaga* from nine different species of *Phalacrocorax*, each of which carries a distinct parasite. The species described above differs from all of these, and its host, *Phalacrocorax traversi*, has such an isolated habitat, that the parasite is unlikely to occur in common upon another cormorant host. The question might have been settled easily, were the brief descriptions of certain species by Rudow and Giebel of any use for critical work. Unfortunately, however, until their types are re-examined, or further material obtained from the hosts of the types, it is not possible to visualise the forms which they described without figuring.

The holotype female will be placed in the Australian Museum, Sydney.

EPIFREGATA sub-genus n.

Elegant long slender forms of a clear honey colour, with darker markings; clypeus more elongate, the signature being twice as long as wide, wider anteriorly, and drawn out posteriorly into a rounded angle; male antenna long and slender, with a slight enlargement of the pre-axial border of the third article; male abdomen with segment 3 shorter than the rest and tergite narrowed to less than half the length of segment; and with ninth segment ending in two conical protuberances separated by a v-shaped cleft; ventral surface of eighth segment bearing a row of inwardly directed hairs on the pleuron of each side; and two groups of small bristles, some with raised pustular rims, internal to these. Female not seen, but according to Piaget's figure (1880, Pl. 25, fig. 6), the abdomen is flatly emarginate dorsally, with a straight hind border with median cleft ventrally. Female genitalia simple; on Fregatidae. Type of sub-genus, *Pectinopygus* (*Epifregata*) *gracilicornis* Piaget from *Fregata ariel*.

Included species: *crenulatus* Giebel from *Fregata aquila*; *gracilicornis* Piaget from *Fregata ariel*.

This sub-genus shows remarkable structural affinities with the Esthiopterelline forms from Tubinares, especially with species of the genus *Halipeurus* described in this report. There can be no doubt that the genus *Pectinopygus* finds its nearest allies in the parasites of Tubinares, as might be expected from the generally accepted affinities of the host-groups.

Sub-family GIEBELIINAE Waterson.

Genus TRABECULUS Rudow.

Trabeculus Rudow, Zeit. f. ges. Nat., 27, 1866, 466.

Oncophorus Rudow, Zeit. f. ges. Nat., 35, 1870, 475.

Mackayia Waterston, Scottish Naturalist, 1912, 251.

Cecalymenus Enderlein, Zool. Anz., 49, 1917, 242.

Trabeculus Harrison, Parasitology, 9, 1916, 144.

This genus has a somewhat obscure history. Four years after its establishment (the genotype being *Trabeculus schillingi* from *Aestrelata mollis*), its author, without offering any reason, changed the name to *Oncophorus*, and the name *Trabeculus* disappeared from the literature of Mallophaga. In 1885, Piaget (*Les Pediculines*, Supplement, 35) claimed *Oncophorus* as his own, Taschenberg having previously removed *O. schillingi* to his newly established genus *Eurymetopus* (*Docophoroides* Giglioli), after examination of Rudow's type. The genus *Oncophorus*, in the hands of Piaget, came to include a number of species from rails and hornbills, which were far removed from the pètel parasite for which the genus was originally founded. Johnston and myself (1911), accepting Taschenberg's judgment that *Oncophorus schillingi* was congeneric with *Docophoroides brevis*, reduced *Trabeculus* to the state of a synonym of *Docophoroides*.

Dr. Waterston created a genus *Mackayia* (1912, p. 251) for the reception of a *Giebelia*-like species from *Puffinus anglorum*; and later (*l.c.*, p. 258) described a second species *Mackayia heteracanthus* from *Macronectes giganteus* from South Africa. He consulted me in 1915 about this particular species, further material having come to hand from *Aestrelata mollis*, and we agreed that *Mackayia heteracanthus* was the lost *Trabeculus schillingi* of Rudow.

Dr. Enderlein, presumably owing to isolation from British literature on account of the war, was unaware of Waterston's description, and of my subsequent clearing up of the matter, and has made *Trabeculus schillingi* the type of a new genus and species *Cecalymenus aestrelatae*. Enderlein's material was obtained from individuals of *Aestrelata mollis* taken at Tristan d'Acunha in November, 1901.

TRABECULUS SCHILLINGI Rudow.

Trabeculus schillingi Rudow, Zeit. f. ges. Nat., 27, 1866, 467.

Oncophorus schillingi Rudow, Zeit. f. ges. Nat., 35, 1870, 475.

Eurymetopus schillingi Taschenberg, Nova Acta, Halle, 44, 1882, 185.

Mackayia heteracanthus Waterston, Scott. Nat., 1912, 258.

Cecalymenus aestrelatae Enderlein, Zool. Anz., 49, 1917, 242.

Trabeculus schillingi Harrison, Parasitology, 9, 1916, 144.

Material comprises one female and one young from a specimen of *Aestrelata lessoni* collected at Macquarie Island by Mr. H. Hamilton on 8th May, 1913.

Genus GIEBELIA Kellogg.

GIEBELIA HEXAKON Waterston.

Giebelia hexakon Waterston, Ann. African Mus., 10, 1914, 291.

Material comprises one female and one young collected from the head and neck of *Prion* sp., ?*vittatus*, Macquarie Island, by Mr. H. Hamilton. There is a discrepancy in the date of collection. The label in the bottle gives this date as 18th November, 1912; while the card label states 20th December, 1912.

Sub-family DOCOPHOROIDINAE Mjöberg.*Genus* DOCOPHOROIDES Giglioli.

Docophoroides Giglioli, Q.J.M.S., 4, 1864, 21.

Eurymetopus Taschenberg, Nova Acta, Halle, 44, 1882, 182, nec Schönherr, 1840.

Taschenbergius Neumann, Bull. Soc. Zool. France, 20, 1906, 59, nec Schmiedeknecht, 1888.

Taschenbergiella Neumann, Deux. Exp. Antarct. France, 1913, 196.

Giglioli (1864, 21) gave no diagrams of his genus, pointing out that he had borrowed the name from a manuscript work by Denny on exotic Anoplura, which was shortly to be published. Denny's work never appeared and, in consequence, Neumann has claimed (1913, 196) that Giglioli's generic name is a *nomen nudum*. This position is quite untenable, as was pointed out by Johnston and myself (1911), since Giglioli has given his genus reference to Dufour's species, *Phlopterus brevis*, which is sufficiently well described and figured to be recognisable with certainty. The genus being monotypic, it must stand, the characters being those of the type species.

Until comparatively recently all specimens of *Docophoroides* collected from Tubinarian hosts were referred to a single species *D. brevis* Dufour, usually under the incorrect name of *Eurymetopus taurus* Nitzsch, in which both generic and specific names are synonyms. The credit for indicating that more than one species was involved is due to Waterston (1914, 299-305), who not only described a second species, *D. simplex*, but pointed out that the form figured by Kellogg (1896, Pl. 11, figs. 3-6) as *D. brevis* did not belong to that species. In this opinion Kellogg concurred (1914, 87-89), named the species *D. pacificus*, and described a further new species, *D. murphyi*. Finally Waterston (1917, 99) added a fifth species, *D. harrisoni*.

The Mawson collections include examples of *D. brevis*, *D. harrisoni* and *D. simplex*, and of a new species which I name *D. hunteri*, in compliment to Dr. J. G. Hunter, biologist with the Southern parties. Through the kindness of Mr. G. F. Ferris, of Stanford University, I have received on loan mounted specimens of *D. pacificus* and *D. murphyi* and of a new species which I describe here, although it does not belong to the Mawson collections, and name it in his honour *D. ferrisi*. I have before me specimens of both sexes of seven species, except for the males of *D. murphyi* and *D. ferrisi*, and the female of *D. simplex*. An examination of this series shows that the different species are very distinct, and that both sexes provide satisfactory characters for their specific distinction. The differences in size are constant: In the male, the antenna and genitalia offer the best characters; in the female, the genital plate and the markings anterior to it on the ventral surface of the abdomen. The shape of the signature is important, and holds equally for both sexes.

Kellogg has implied a zoogeographical distribution for species of the genus, but this implication is not justified. As I say below, I do not think that *D. simplex* has yet been taken upon its true host, but each of the other species is found upon a distinct albatross, and their distribution is simply a matter of the distribution of their hosts. It seems probable that there will prove to be a much greater number of species in the genus as parasites of other albatrosses come to be critically examined. The hosts of the existing species are as follows:—

Host.	Parasite.
<i>Diomedea exulans</i>	<i>Docophoroides brevis</i> .
<i>Thalassarche melanophrys</i>	<i>D. harrisoni</i> .
<i>Thalassogeron chlororhynchus</i>	<i>D. murphyi</i> .
<i>Diomedea nigripes</i>	<i>D. ferrisi</i> .
<i>Diomedea albatrus</i>	<i>D. pacificus</i> .
<i>Macronectes giganteus</i>	<i>D. hunteri</i> .

It is possible that the real host of *D. simplex* may prove to be *Phoebetria fuliginosa*. The only other albatross not accounted for which is found in both Cape and Australian seas is *Thalassogeron culminatus*, and I have from this a single mutilated female *Docophoroides* resembling *D. brevis* and nothing at all like *D. simplex*.

Key to the species of *Docophoroides* based on males.

- A. Signature broader than long.
 - B. Large form: male genitalia with anchor shaped termination *brevis* Duf.
 - BB. Small form: male genitalia without terminal expansion *harrisoni* Wat.
- AA. Signature longer than broad.
 - C. Second article about or more than twice as long as the first.
 - D. Second article of antenna longer than rest together *murphyi* Kell.
 - DD. Second article of antenna shorter than rest together *pacificus* Kell.
 - CC. Second article of antenna much less than twice as long as the first.
 - E. Antenna quite simple: first to second article as 3:4 *simplex* Wat.
 - EE. Antenna with distal end of article 3 swollen and terminal articles inserted at slight angle; first to second article as 4:5 *hunteri* Harr.

Key to the species of *Docophoroides* based on females.

- A. Signature broader than long.
 - B. Large form: immediately in front of genital plate a continuous band, not two separate blotches *brevis* Duf.
 - BB. Small form: two transversely elongated blotches, and not a band in front of genital plate *harrisoni* Wat.
- AA. Signature longer than broad.
 - C. Larger forms greater than 3.5 mm.
 - D. About 4 mm.: anterior portion of genital plate with light median area *hunteri* Harr.
 - DD. About 4.5 mm.: no median light area *ferrisi* Harr.
 - CC. Smaller forms, smaller than 3.5 mm.
 - E. Blotches in front of genital plate elongate ellipsoid not acuminate at outer ends *murphyi* Kell.
 - EE. Blotches sub-triangular, pointed at outer ends *pacificus* Kel.

Comparative measurements of species of *Docophoroides*.

	Length.					Breadth.				
	Head.	Prthor.	Mesthor.	Abdomen.	Total.	Head.	Prthor.	Mesthor.	Abdomen.	
	<i>Male.</i>									
<i>D. brevis</i> ...	1.263	.474	.684	2.263	4.421	1.474	.947	1.294	1.663	
<i>D. harrisoni</i> ...	.895	.368	.474	1.579	3.105	1.053	.632	.842	1.230
<i>D. murphyi</i> ...	...	...	...	...	...	...	...	...	...
<i>D. pacificus</i> ...	.947	.316	.474	1.737	3.316	1.026	.642	.895	1.231
<i>D. simplex</i> ...	1.000	.274	.378	1.474	3.000	.973	.632	.796	1.158	
<i>D. hunteri</i> ...	1.053	.368	.474	2.053	3.789	1.119	.709	.902	1.368	
<i>D. ferrisi</i> ...	...	...	...	...	...	...	...	...	...
	<i>Female.</i>									
<i>D. brevis</i> ...	1.294	.478	.696	2.421	4.947	1.632	1.105	1.579	2.158	
<i>D. harrisoni</i> ...	.964	.366	.474	1.684	3.316	1.053	.709	1.026	1.421
<i>D. murphyi</i> ...	.895	.336	.420	1.599	3.158	.947	.632	.790	1.263
<i>D. pacificus</i> ...	1.056	.368	.506	1.895	3.474	1.073	.684	.895	1.526	
<i>D. simplex</i> ...	...	...	...	...	...	...	...	...	...
<i>D. hunteri</i> ...	1.105	.374	.579	2.263	4.102	1.105	.737	.980	1.684	
<i>D. ferrisi</i> ...	1.263	.474	.658	2.411	4.579	1.368	.947	1.263	1.789	

DOCOPHOROIDES BREVIS *Dufour*. Plate III, fig. 6a.

Philopterus brevis Dufour, Ann. Soc. Ent. Fr., 4, 1834, 676, Pl. 21, fig. 3.

Docophorus thoracicus Nitzsch in Giebel, Zeit. f. ges. Nat., 18, 1861, 316 (juv.).

Docophorus brevis Giglioli, Q.J.M.S., 4, 1864, 21.

Lipeurus taurus Nitzsch in Giebel, Zeit. f. ges. Nat., 28, 1866, 385.

Docophorus tonsus Rudow Beitrag, 1869, 13 (juv.).

Docophorus dentatus Giebel, Ann. Mag. Nat. Hist., 17, 1876, 388 (juv.).

Eurymetopus taurus Taschenberg, Nova Acta, Halle, 44, 1882, 182.

Taschenbergius brevis Neumann, Brit. Antarct. Exp., 2, 1911, 22.

Taschenbergiella brevis Neumann, Deux. Exp. Antarct. Franc., 1913, 195.

Docophoroides brevis Harrison, Parsitology, 9, 1916, 144.

Material comprises two females, two males, and two young from *Diomedea exulans* (young bird) collected 12/3/13, no locality being given on the label; and about thirty individuals, male and female and young from the same host on the same day, again without locality. It is not clear from the labels whether this second lot came from the same individual host as the first.

This is the largest species of the genus, and is found on *Diomedea exulans* and its races. The species, recorded by Kellogg (1896, 135) as *Eurymetopus taurus*, has since, as is mentioned above, been described as *D. pacificus*. Piaget has also described and figured a species as *Lipeurus taurus* (1880, 332) which certainly cannot be referred to

the species now under discussion. I conclude from Piaget's description and figure that he had before him the species subsequently described by Waterston as *D. harrisoni* (see below).

I have included in the synonymy given above the names *Docophorus thoracicus* Nitzsch, *D. tonsus* Rudow, and *D. dentatus* Giebel, all of which, I think, refer to immature forms of *D. brevis*.

DOCOPHOROIDES HARRISONI Waterston. Plate III, figs. 6f, 1.

Docophoroides harrisoni Waterston, Entom. Month. Mag., 3, 3, 1917, 99.

Lipeurus taurus Piaget, Les Pédiculines, 1880, 332, Pl. 31, fig. 3, nec Nitzsch.

Material comprises 9 individuals, male and female, taken from neck of *Diomedea melanophrys* captured near Hobart.

This species agrees with *D. brevis* in having a very short broad signature, but is easily distinguished by its much smaller size. The male differs markedly from all other species (excluding *D. murphyi*, the genitalia of which have not been described) in the fact that the genitalia are without the anchor shaped termination common to the rest, the "penis" tapering to a point. The male antenna is also characteristic. The second article is long, though not quite twice as long as the first; while the third article is longer than the first, a very unusual condition, the proportions being 6 : 11 : 7. Piaget (*l.c.*) figures a male which agrees precisely as to signature and antenna. He does not describe the genitalia, but I infer from his gibe at Dufour's description and figure (which are reasonably good) that there was no terminal enlargement in the form he examined. It is therefore fairly certain that he had to do with the species now under discussion, although he gives the host from which his material was obtained as *Diomedea exulans*. Waterston (*l.c.*) has figured the male genitalia, but is in error in stating that the ventral "splints" at the distal end of the basal plate are absent. They are present, though somewhat reduced.

DOCOPHOROIDES SIMPLEX Waterston. Plate 3, fig. 6 (b).

Eurymetopus simplex Waterston, Ann. S. African Mus., 10, 1914, 303.

Docophoroides simplex Harrison, Parasitology, 9, 1916, 145.

Material comprises a single male from an individual of *Macronectes giganteus* collected in Adelie Land, 1913, by Dr. McLean.

Waterston's description was based on a number of specimens taken from *Diomedea melanophrys* in the Cape seas, I suspect that neither of these is the true host of the parasite. *Docophoroides harrisoni* was described by Waterston as occurring on *D. melanophrys* in South African waters, and I have several records of it from the same host in the South

Pacific, so that this would appear to be the normal association. *Docophoroides hunteri*, described below as new, occurs upon *Macronectes giganteus* both from Adelie Land and Macquarie Island, and also would seem to be the normal association. It is unlikely that two species of *Docophoroides* will occur on a single host, except as stragglers, which are of frequent occurrence among the Tubinares, so it would seem that the real host of *D. simplex* is still to seek, and may prove to be *Phoebetria fuliginosa*.

DOCOPHOROIDES HUNTERI *n.sp.* Plate III, fig. 3, 4, 5, 6c.

Material comprises numerous males and females and young from two individuals of *Macronectes giganteus*; the first collected by Mr. H. Hamilton on 12th July, 1912, no locality being indicated, but certainly at Macquarie Island; the second collected in Adelie Land on December 15, 1912.

Description of male.—*Head*: Breadth and length equal. Clypeus straight in front, squarish, widening slightly posteriorly. Signature long, emarginate in front and at sides, with a long acuminate point directed backwards; just more than two-thirds as broad as long. Trabeculæ long, with rounded ends not quite reaching the distal border of the first antennary article. Antenna with first article stout, four-fifths as long as second, which is narrower, paler and very slightly expanded at its distal extremity; third article inserted at a slight angle, three-fourths as long as first, dark coloured proximally, and expanded distally; fourth and fifth short, together equal to the first, also dark in colour; whole antenna very short compared with that of other species, measuring only 0.52 mm. Rest of head of usual type, except that the posterior temporal angle is not "hooked" as in *D. brevis*. Occiput sinuous.

Thorax: Prothorax of usual type, with pronotum divided by a median light line, and with a very small hair at the posterior angle. Metathorax also divided medially, produced backwards as a prominent angle on the abdomen, and with postero-lateral angle produced very slightly backwards. A row of six hairs at this angle, three on hind and three on lateral border.

Abdomen: Elongate, about a third longer than broad, widest at 4th segment. Segment 1 dark coloured, the transverse bands not meeting in the midline. Segments 2-5 similar, with transverse bands continuous, but very narrow across the middle region, where the band runs close to the anterior border of the segment, leaving in front a clear area, and behind it an obscure infuscate band, in which is set the row of pustulated hairs. In segment 6 the transverse band is much wider and wider again in 7. Segment 8 is entirely dark dorsally, and is not sharply marked off from the clearer brown 9, which bears a median notched emargination, in the cleft of which the "penis" just protrudes. The sternite of segment 9 projects beyond the tergite, both laterally and posteriorly, is rounded at the sides and broadly but slightly emarginate behind.

Genitalia: (Plate III, fig. 4) most resemble those of *D. pacificus* as figured by Snodgrass (in Kellogg), but the basal plate is longer in proportion to the distal portion, its ventral splints are not so prominent, and the angle which precedes the neck of the terminal anchor-shaped process is more square.

Chaetotaxy: The temporal angle bears a small number of hairs in two rows. The hairs of the thorax have been mentioned above. Segment 1 of the abdomen bears a pair of hairs on the median clear area, and a row of ten along the hind border, and in the following segments as far as seven the same arrangement holds, except that the median pair comes to lie just in front of the transverse row. Segment 8 bears a couple of hairs inside the lateral angle. Segment 9 carries a row of eight hairs on either side in front of the hind border, and three small hairs on either side of the terminal prominences. Laterally there is a group of three or four hairs at each angle. The prominent sternite of segment 9 carries a large number of hairs in several rows.

Description of female: Differs from the male in its larger size, darker colour, and by the white centre to the abdomen, due to the transverse bands being separated in the mid-line. The head is generally like that of the male, except for the antennæ. The first article is stout, cylindrical; the second is slightly longer but only half the diameter, somewhat pedunculate in form, being much distended distally; third, fourth and fifth shorter, and darker in colour, the fourth being actually the shortest.

Thorax similar to that of male. Abdomen with transverse bands of segment 1 almost meeting posteriorly, enclosing a clear white area anteriorly, in which is a pair of hairs; 2 somewhat similar, but the bands do not approach so closely posteriorly and the white space between is goblet-shaped, widest anteriorly. In the next four segments the transverse bands are well separated; in 7 the whole segment is brown, as also in 8. The abdomen ends in a small emargination, leading into a short superficial groove, which divides the terminal segment into two lobes. Chaetotaxy of first six abdominal segments resembles that of male. Seventh carries eight pustulated hairs on its hind border, three lateral on either side close to the angle and two median. A number of short hairs show on the terminal segment, most of which project from the ventral side of it. The ventral abdominal markings are characteristic, and their form may be noted in the figure.

This well marked species is distinguished particularly by its greater length in proportion to breadth, by the extremely short antennæ of the male and by the median light area in the anterior portion of the genital plate of the female. For measurements see comparative table above.

DOCOPHOROIDES FERRISI *n.sp.* Text fig. 7.

Material.—A slide containing two females and one young, received on loan from the Stanford University collection, and label reading: "721f.—*Eurymetopus taurus*—*Diomedea nigripes*."

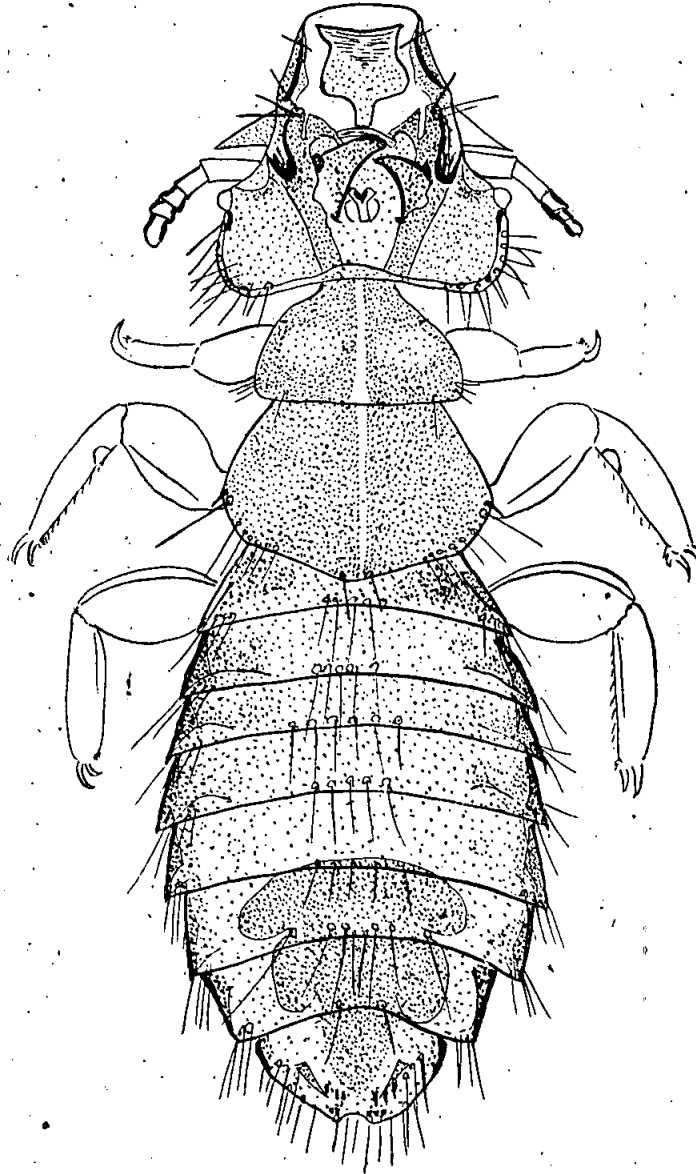


Fig. 7.

Text-fig. 7.—*Docophoroides ferrisi* n.sp. Female.

Description of female.—*Head*: Broader than long (1.368/1.263). Clypeus wide in front, with almost square angles, slightly emarginate sides, widening somewhat towards the base of the trabeculæ. Signature of the shape of a liqueur glass, very slightly emarginate in front, narrowing posteriorly, then widening to its greatest width opposite the clypeal suture; the stem being a narrow backwardly directed point which

reaches almost to the mandibles. It measures 0.42 in length, by 0.27 on the front margin and 0.34 at its greatest width. The antennal bands are extremely broad and prominent, measuring 0.1 mm. in width. The temples are broadly rounded, and form flat angles with the almost straight, slightly concave, occiput at points straight behind the eyes. They bear two rows of long hairs.

Thorax: Prothorax of usual type, with a minute spine in the anterior angles, three short hairs in the posterior angle, with a longer hair a little inside on the hind border. Metathorax swells out boldly to a point mid-way between second and third legs; thence sweeps inwards to form a prominent backwardly-projecting point behind the level of the hind border, which forms an obtuse angle on the abdomen at about half the length of the first segment. A row of seven hairs and a prickle across the angle, the prickle and the first hair in front of the median lateral angle.

Abdomen: Three-fourths as broad as long, widest at fourth and fifth segment. Transverse bands broad, and almost meeting in the mid-line in the first six segments, giving a unicolourous appearance. Segment 7 and conjoint 8 and 9, entirely brown. Genital plate and abdominal markings differ from those figured for *D. hunteri* in the following particulars: In accordance with the larger size of the species the genital plate is about a fifth wider, the separation of the anterior from the posterior portion is a little more deeply incised, there are only three pustulated hairs on each side in place of four, and there is no median lighter area running through the anterior portion; the lateral lobes of the posterior portion project further laterally, but are not produced backwards so far; the small triangular blotches are narrower, only one-third the width at the base of those of *D. hunteri* the blotches in front of the plate are not so transversely elongated.

Chaetotaxy: In addition to the hairs already mentioned, there is a row of about ten hairs on the hind border of the first six segments of the abdomen; apparently only a pair on segment 6, and a pair median and three lateral on each side in 7, 8 and 9 shows dorsally only a group of three hairs a little behind the anterior angles, with a small prickle internal to them, and a row of four very minute sensory prickles on either side across the bases of the conical processes in which the abdomen ends. Ventrally there is a row of twelve hairs, decreasing in size as they pass inwards till they become mere prickles, running from just inside the anterior angle to the mid-line at half the length of the conjoint segment, while a second line of about twelve hairs runs just inside the lateral border.

Male: Not known.

This species comes next in size to *D. brevis*, but differs from it in the much greater length of the clypeal region, and the corresponding long signature. The form of the genital plate is totally different, that of *D. brevis* being drawn out laterally, so that the anterior portion is very wide and short, and is almost entirely cut off from the posterior

portion by very deep incisions. The main feature of *D. brevis*, however, is that the first pair of blotches in front of the plate have run together to form a continuous band, a condition I have not seen in any other species.

The holotype female, being the property of the Entomological Department, Stanford University, California, will be returned there in due course, and will thus be separated from the types of other new species described in this paper.

NOTE BY THE EDITOR.

R. A. Falla's Report on the Birds of the Australasian Antarctic Expedition, 1911-14, and of the British, Australian, and New Zealand Antarctic Research Expedition, 1929-31 (Rep. Brit. Austr. N.Z. Ant. Res. Exp., Ser. B., vol. 2, 1937), permits the correction of some of the names given to bird hosts in Harrison's paper. The Macquarie Island bird referred to as the Victoria penguin, *Catarrhactes pachyrhynchus*, is the rockhopper, *Eudyptes chrysocome*—host for *Austrogoniodes hamiltoni*. The sooty albatross of Macquarie Island is not *Phoebetria fuliginosa*, but *P. palpebrata*—host for *Perineus concinnus*. *Sterna* sp. from the same island is *S. vittata macquariensis* Falla—host for *Philopterus melanocephalus*. The "undetermined Limicoline," host of *Philopterus limosae*, Macquarie Island, is *Calidris canutus*. The bird identified as *Prion ? vittatus* (host of *Giebelia hexakon*) is *Pachyptila desolata*, which is also the host for *Naubates clypeatus*. The locality, "Adelie Land," in the present report is not the French territory, but King George V. Land.

—T. HARVEY JOHNSTON.

PLATE I.

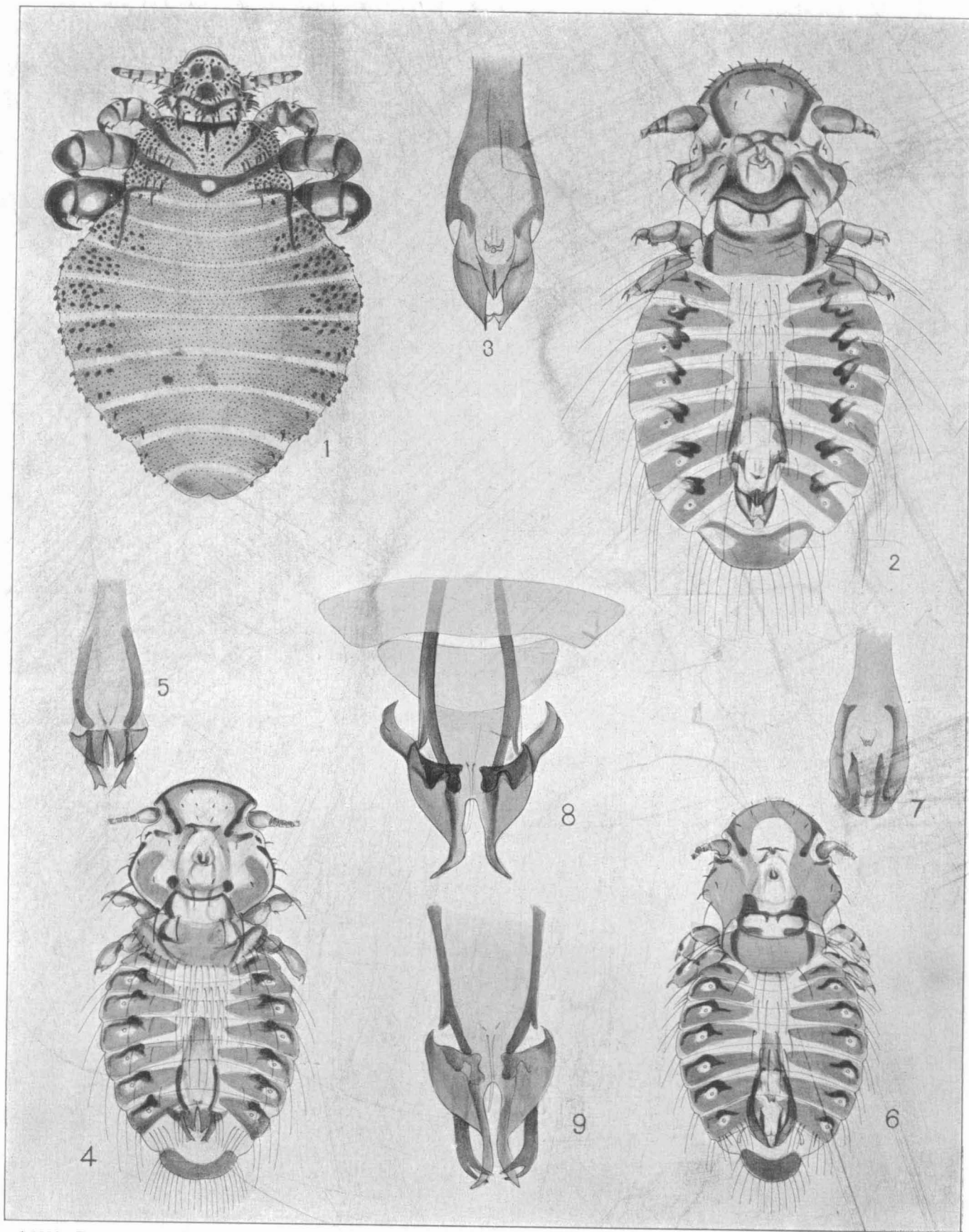
- Fig. 1. *Antarctophthirus mawsoni* ♀.
 2. *Austrogoniodes mawsoni* ♂.
 3. *Austrogonioides mawsoni* ♂ genitalia.
 4. *Austrogoniodes macquariensis* ♂.
 5. *Austrogoniodes macquariensis* ♂ genitalia.
 6. *Austrogoniodes antarcticus* ♂.
 7. *Austrogoniodes antarcticus* ♂ genitalia.
 8. *Austrogoniodes hamiltoni* ♂ genitalia in position of extrusion.
 9. *Austrogoniodes hamiltoni* ♂ genitalia withdrawn.

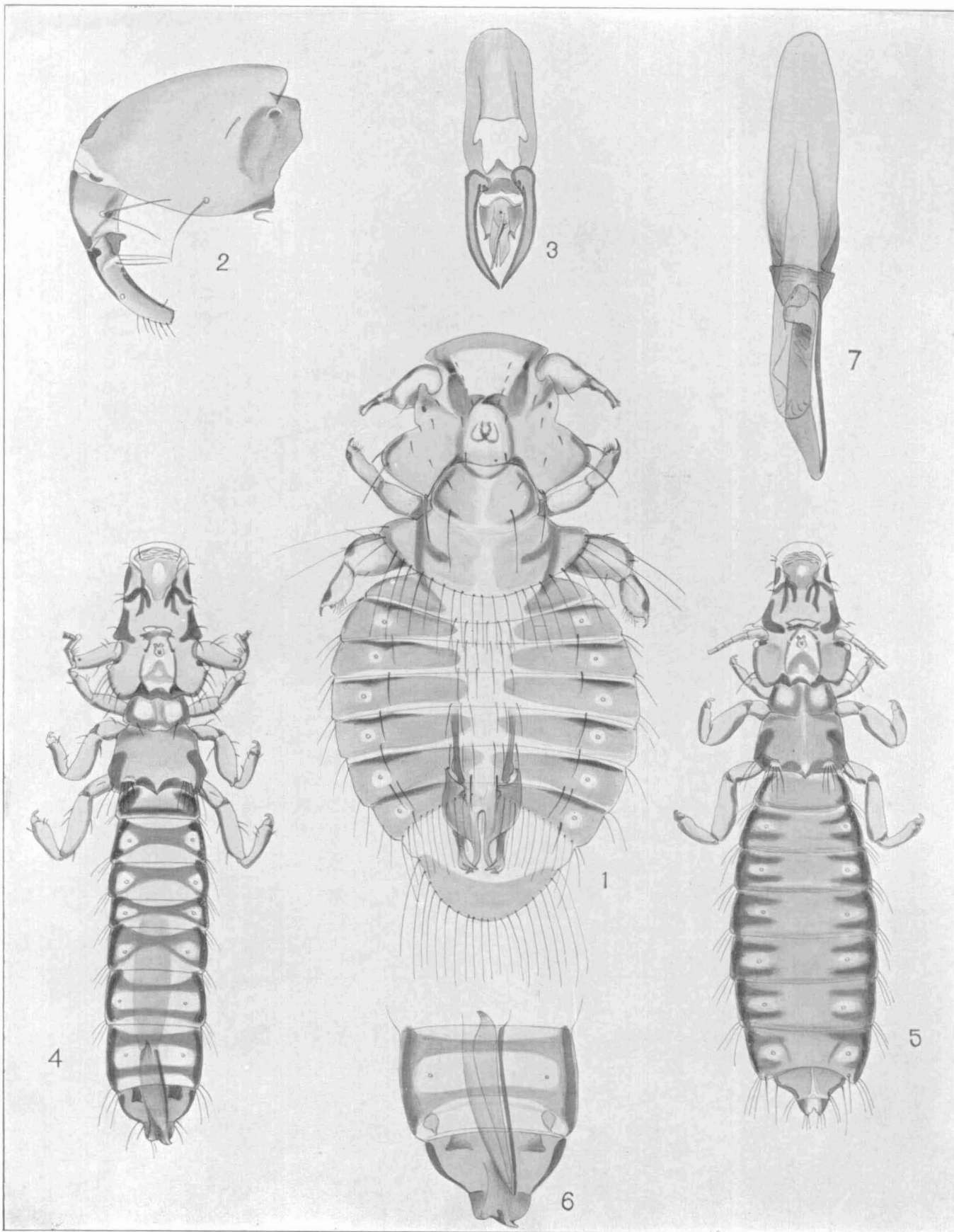
PLATE II.

- Fig. 1. *Austrogoniodes hamiltoni* ♂.
 2. *Austrogoniodes hamiltoni* antenna ♂.
 3. *Phlopterus antarcticus* ♂ genitalia.
 4. *Naubates heteroproctus* ♂.
 5. *Naubates heteroproctus* ♀.
 6. *Naubates heteroproctus* terminal ♂.
 7. *Naubates heteroproctus* ♂ genitalia.

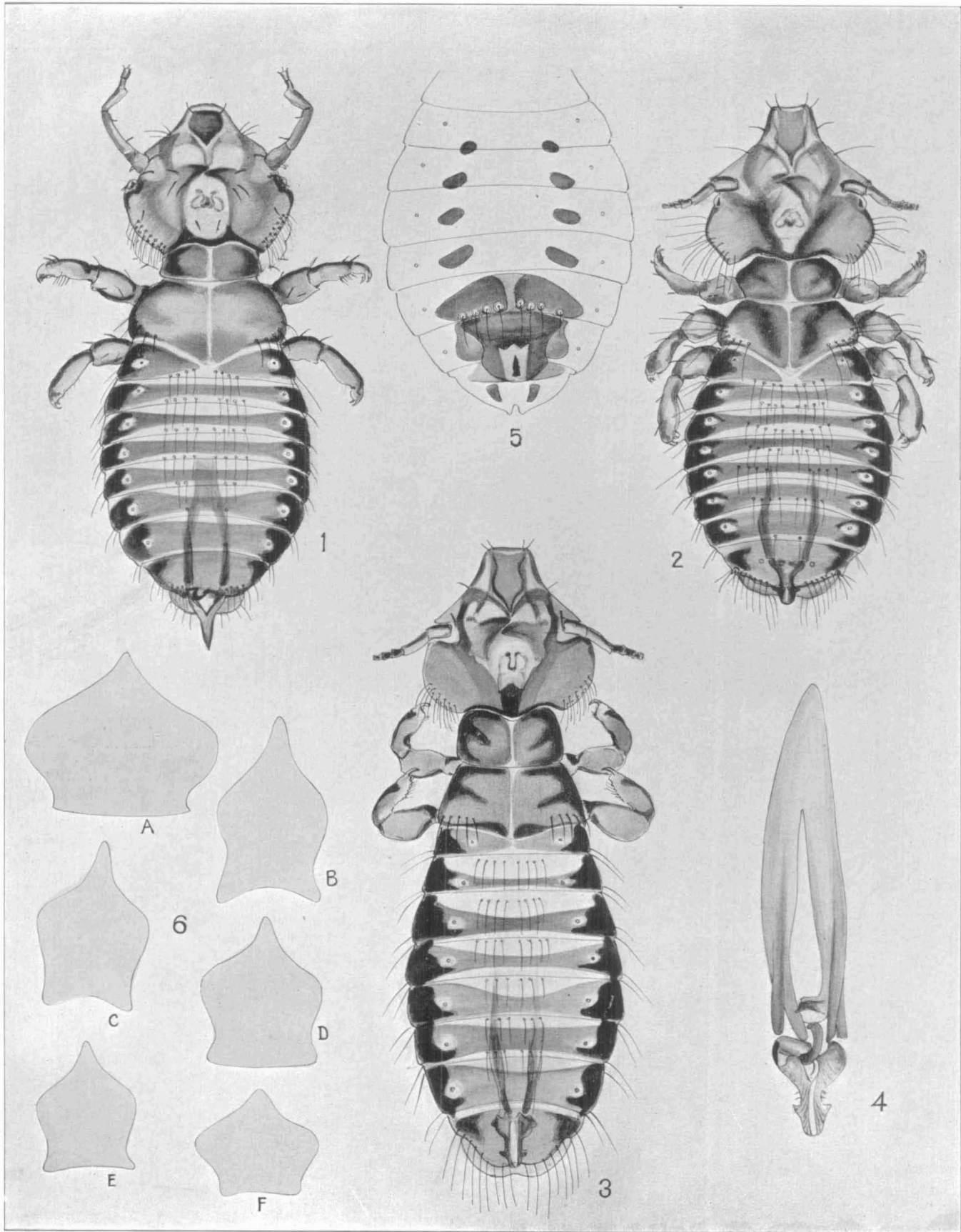
PLATE III.

- Fig. 1. *Docophoroides harrisoni* ♂.
 2. *Docophoroides simplex* ♂.
 3. *Docophoroides hunteri* ♂.
 4. *Docophoroides hunteri* ♂ genitalia.
 5. *Docophoroides hunteri* ♀ underside.
 6. Signatures of (a) *D. brevis* ♂, (b) *D. simplex* ♂, (c) *D. hunteri* ♂,
 (d) *D. pacificus* ♂, (e) *D. murphyi* ♀, (f) *D. harrisoni* ♂.





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