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ON A NEW FAMILY AND FIVE NEW GENERA OF MALLOPHAGA.

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(With Plates XXVI and XXVII and 3 Text-figures.)

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Introductory.

The present paper comprises descriptions of five new species of Mallophaga, included in five new genera.

One of these genera, *Heteroproctus*, has served to connect up three existing genera, *Ornithobius*, *Akidoproctus*, and *Bothriometopus*, the four forming a compact group for which I have established a new family, Akidoproctidae.

This family is of interest, as it demonstrates the artificiality of the

present classification of the ISCHNOCERA; which is so largely based upon the comparative length and breadth of species, and upon sexual dimorphism of the antennae. Kellogg (1896) has divided the ISCHNOCERA into two families, Trichodectidae and Philopteridae. Mjöberg (1910) has further divided the Philopteridae into four families, Lipeuridae, Eurymetopidae, Goniodidae, and Docophoridae. It will be noted that Kellogg's name Philopteridae has been dropped, unless we assume that Mjöberg intended it to contain the remaining ISCHNOCERAN genera, with which he has not dealt. These are *Nesiotinus* Kellogg, *Ornicholax* Carriker, *Akidoproctus* Piaget, *Giebelia* Kellogg, *Bothriometopus* Taschenberg, *Philoceanus* Kellogg, *Trabeculus* Rudow, *Oncophorus* Piaget = *Rallicola* Johnston and Harrison, and *Kelloggia* Carriker. Neumann has, however, pointed out (1906, p. 58) that *Philopterus* must replace *Docophorus*, so that Kellogg's name must stand for the family including *Philopterus* and *Degeeriella*. It may be noted in passing that Mjöberg's name Eurymetopidae must be replaced by Docophoroididae; as *Docophoroides* Giglioli (1864) has priority over *Eurymetopus* Taschenberg (1882), and is quite validly diagnosed, despite Neumann's assertion (1912, p. 196) to the contrary. Of these genera, not dealt with by Mjöberg, *Ornicholax* and *Kelloggia* fall into the Goniodidae; *Nesiotinus*, which seems to be an immature form, must, if correctly described, form the type genus of a new family Nesiotinidae, with the characters of the genus; *Giebelia*, *Philoceanus*, and *Trabeculus* find place in Waterston's (1914, p. 290) family Giebeliidae; *Rallicola* must be included tentatively in the Philopteridae; while *Akidoproctus* and *Bothriometopus* would, according to the present family diagnoses, fall respectively into the Philopteridae and Lipeuridae. But, as I shall show later, these two genera are closely related, so that a classification which separates them is manifestly absurd.

As a matter of fact, my present investigations, so far as they have gone, have confirmed me in the opinion that the genera themselves need a drastic revision before the family groupings can be satisfactorily arranged. And for this purpose a variety of characters must be called into use, which have hitherto been ignored. I hope, at a future date, to be in a position to undertake this revision. In the meantime, no particular purpose will be served by discussing the present family divisions. But the difficulty that I have mentioned above arises also in the case of the genus *Psittaconirmus*, which I have not placed in a family, as the only family open to receive it is the Lipeuridae, with which I can easily convince myself that it has no immediate affinity.

Sub-order AMBLYCERA.

Family Menoponidae.

Genus *Eomenopon*, nov.

Neumann (1912, p. 353) has founded a sub-genus *Menacanthus* for the reception of certain forms, previously included in *Menopon*, which bear spinous processes on the ventral surface of the head. He thinks (1912, p. 353) "qu'on accueillera avec satisfaction la subdivision que je propose dans le genre *Menopon*." Possibly the satisfaction would have been greater had a less heterogeneous assemblage of forms been included in the sub-genus.

The new genus which I propose also has spines upon the ventral surface of the head. But it need not, on that account, be confused with any of the various members of the sub-genus *Menacanthus*, for the spines are in a different position; nor does its separation depend upon the spines alone, for the frontal margin carries a deep lateral cleft, similar to that found in *Heterodoxus*, which is more pronounced in the young than in the adult. This apparently primitive character will be further discussed below. The genus, which would seem to be characteristic of Australian lorikeets (Loriidae), may be diagnosed as follows:

Menoponidae with the chitinous framework for support of the mandibles continued forwards to the anterior margin of the head, thence curving downwards and backwards to form a pair of stout freely-projecting spinous processes, which reach to the anterior border of the mandibles; with a deep narrow cleft in the side of the forehead, extending to the inner border of the antennary fossa; with winged prothorax, short, but distinct, mesothorax, and metothorax differing from the abdominal segments; and with abdomen of nine distinct segments.

Eomenopon denticulatus, n. sp. Figs. 5, 6, 16.

Head. Parabolic in front, evenly rounded to the temporal angles, with a very slight emargination in front of the eye. Occiput slightly concave. Chitinous supporting structures of unusual form, consisting of two broad straight bars giving articulation to the mouthparts, which run parallel from the anterior margin of the head to where they are met by the forward ventral continuation of the temporal border (the dotted line in Text-fig. 1). At this point each bar divides into two; one branch following the inner margin of the antennary fossa,

and widening to form a prominent dark-brown blotch at the inner end of the frontal cleft; the other passing straight backwards, and round the hind border of the mentum, to meet its fellow of the opposite side, the course being indicated by the inner dotted lines in the Text-figure. Just internal to the postero-lateral angles of the mentum, a pair of short bands run backwards along the borders of the sub-mentum. On the lateral margin of the forehead a slit-like frontal cleft, with chitinous lips, runs inwards. The rounded dorsal swelling, so characteristic of Menoponidae in general, is confined to the area between this cleft and the eye.

The prothorax has narrow elongate wings. The shoulders are squarely rounded, the sides straight and convergent, the postero-lateral angles rounded, and the hind border only slightly convex. A strong interscapular bar runs across the pronotum, joining the scapular bands which bound the raised central region. Another vaguely defined band runs from the shoulder inside the scapular, overlying the clavicular, a structure found also in *Heterodoxus*. *The mesothorax* sends two conical projections under the pronotum, the inner anterior borders of which are strongly chitinous, and continue backwards and inwards as a pair of stout apodemes within the segment. Dorsal to these, a straight bar passes across the full width of the segment, from the outer ends of which pass downwards the bands supporting the acetabular margins for the second legs. This bar has in most Amblycera the form of two strong arches. *The metathorax* is narrow anteriorly, its straight sides diverging rapidly, the postero-lateral angles being acute, and the hind margin straight. *The prosternum* bears a well-defined blotch of characteristic shape, with lateral projections for articulation with the clavicular. It is remarkable for being naked, except for some broad flat denticles towards its posterior margin, which fade away gradually in front, leaving a slight scaly appearance. These denticles, which have suggested the specific name, are much better developed in the young, covering the mentum, sub-mentum, prosternum, and mesosternum; but in the adult they become reduced to a few about the bases of the palps, and those above-mentioned on the prosternum. *The mesosternum* is an oblong plate formed by the fusion of the anterior inter-coxal bands, and carrying three hairs, two in front and one behind. *The metasternum* is a broad plate, covered with hairs. *The coxae* of the first pair have a rectangular anterior prolongation, and acuminate posterior ends, terminating in a stout spinous hair, with strongly arched inner borders.

The abdomen, in shape, appearance, and general arrangement of the chaetotaxy, is very like that of *Heterodoxus*; from which, however, it differs in the terminal segments, and in having the two anterior segments devoid of stigmata, in place of the first only. It is widest at the fourth and fifth segments, and the posterior end is more or less rounded in both sexes. The pleura are clearly marked off, their borders bearing a narrow lateral band, swollen on its inner face at half its length. Wide transverse bands cross each segment. The general shape and disposition of the markings will be apparent from Fig. 16. The last segment of the ♂ is flatly rounded, the tergum with a scattered fringe of a dozen hairs, longer externally; the sternum densely fringed with short hairs. The tergum of the last complete segment of the ♀ has the shape of a truncated cone, with rounded angles and flat hind margin, with about three hairs on each side. Beneath this projects a plate of somewhat similar shape, but narrower; densely fringed with hairs, which are short in the middle, but increase in size outwards, culminating in a dense pencil of about twenty strong hairs on either side. On the ventral side of this plate is a raised area, fringed with hairs and strongly denticulate, which may be part of the plate, but seems to be definitely sutured off from it. Whether these structures together represent the ninth sternum, or whether the posterior part represents a reduced tenth segment, I am unable to say without cutting sections. The genital aperture is covered by a broad transverse flap, carrying a fringe of short hairs, and, inside its margin, a pair of very stout hairs enclosing two short hairs and a patch of denticles. Lying between the seventh and eighth segments, close under the sterna, is a large transversely elongated bean-shaped ring of chitin, which may really be a ring, or may represent the thickened edge of a plate.

The appearance of the ♂ genitalia is shown in Fig. 16. I have not attempted to homologise the parts of this asymmetrical apparatus, the only easily recognisable features of which are the large unequal parameres and a very elongate 'preputial sac,' running through four segments, its wall densely covered with denticles, smaller in front and large behind.

Chaetotaxy of ♀. Head with two short hairs close together in front; two fair-sized hairs, one directed outwards and one backwards, with two or three smaller ones in front of the frontal cleft; internal to these a medium and a small hair overlying the base of the antenna; a few short hairs scattered over the dorsal surface; temporal angle with three long, one medium, and a number of short hairs, with a fringe along its ventral continuation, forming a dense comb-like group under the eye,

but sparser further forward; two minute prickles on hind border of temple, a hair inside the border, and two pairs on the occiput. Prothorax with five short spines on each shoulder; one behind each end of the inter-scapular bar; three spines, a hair, and a spine on each side anteriorly; and a row of ten hairs along the hind margin. Mesothorax with a pair of minute spines, one on each side of the middle line. Metathorax with a group of four spines inside the antero-lateral angle; a row of seven similar spines, projecting backwards, not outwards, on each lateral border; hind border with two hairs and a spine on each side, and a row of twelve hairs between them. Abdomen with a few spines and one to three hairs in each angle; the first segment with a fine hair inside each antero-lateral angle; all segments to the eighth with a row of alternating long and short hairs, the short hairs being in pairs in the median area. On the ventral surface there are two rows of hairs on each segment except the first. On the third and fourth segments the posterior row is broken at each side by a comb-like group of short spines, longer on the third than on the fourth segment.

Chaetotaxy of ♂. Differs only in the terminal segments of the abdomen, the arrangement for which has already been described.

Measurements in millimetres.

	♂		♀	
	Length	Breadth	Length	Breadth
Head.....	0·33	0·64	0·33	0·64
Prothorax	0·27	0·47	0·27	0·49
Mesothorax	0·06	0·40	0·06	0·42
Metathorax	0·26	0·60	0·26	0·62
Abdomen .	1·62	0·86	1·54	0·84
Total length and greatest breadth	2·54	0·86	2·46	0·84

Numerous ♂♂, ♀♀, and ⊙⊙ from the varied lorikeet (*Ptilosclera versicolor*), blue-bellied lorikeet (*Trichoglossus novae-hollandiae*), and leatherhead (*Philemon corniculatus*), from Myall Lakes, New South Wales, April, 1912. Those found on the third host are obviously stragglers.

In Text-figure 1 the heads of *Menopon*, *Eomenopon*, and *Heterodoxus* are placed side by side for comparison. The ventral boundary of the antennary fossa, which is really a ventral continuation of the temple, is indicated by a dotted line. It will be seen that this fossa is most extensive in *Heterodoxus*, where it is floored by a plate with a ventral cleft corresponding to the dorsal cleft. In *Eomenopon* this ventral

flange is reduced, and the cleft has disappeared. The *Colpocephalum* condition can be reached from *Eomenopon* by cutting away that part of the forehead between the frontal cleft and the eye. Species in exactly this condition occur upon the cockatoos. It seems to me that the *Eomenopon* condition may have given origin to two divergent lines, one of which has become *Menopon*, the other *Colpocephalum*; and that possibly, as more forms are carefully examined, a more or less complete

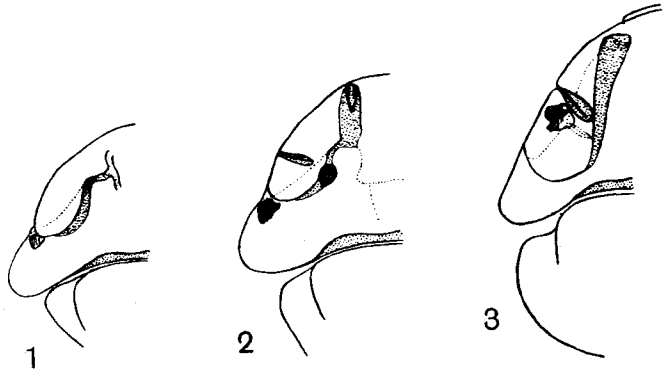

Fig. 1. Outlines of one side of the head of (1) *Menopon* sp., (2) *Eomenopon*, (3) *Heterodoxus*. The dotted line indicates the anterior ventral border of the antennary fossa.

phyletic series may be obtained. The relation of the Menoponidae to the Boopidae still remains an open question. Cumming's genus *Trimenopon* (1913, p. 40) may partly prove to bridge the gap; and, as far as head-structure goes, *Eomenopon* shows a somewhat intermediate condition. But the Boopidae possess some structures not found in any other Mallophaga, and their precise relationship cannot be established in the present state of our knowledge.

Genus *Machaerilaemus*. nov.

Two genera of Menoponidae have already been established chiefly on account of peculiar chitinous structures in the gular region, viz. *Ancistrona* Westwood (1874, p. 197), and *Pseudomenopon* Mjöberg (1910, p. 50), found upon petrels and rails respectively. To these I now add a third, from an Australian grassfinch, which bears a remarkable chitinous plate upon the throat. The genus may be characterised as follows:

Menoponidae with very broad head, more than twice as wide as long, bearing on the throat a large squarish chitinous plate, flanked by

two backwardly directed dagger-like processes, and with a large central sub-circular perforation; with a winged prothorax; meso- and metathorax distinct, sub-equal, and resembling abdominal segments; otherwise like *Menopon*.

Machaerilaemus latifrons, n. sp. Figs. 1–4.

Fig. 1 gives the general form of the ♀, from which the ♂ differs but little except in its smaller size, and in the usual sexual dimorphism of the hind end of the abdomen. The posterior segments of the ♂ are shown in Fig. 3.

The head is extremely broad in proportion to its length, being more than twice as wide as long, and affording the greatest width of the insect. The forepart is flatly rounded, the sides of the forehead being much swollen and abruptly rounded, and roofing the antennary fossa. The floor of this is formed by a forward continuation of the temple, which meets the inturned forehead at a point just behind the articulation of the palps; floor and roof being fused along their hind margins from this point to just in front of the eye, and enclosing a deep pocket in which the two terminal segments of the antenna can be completely hidden. The lens of the eye is fairly prominent, filling the angle between forehead and temple, its outline being continued dorsally towards the temporal angle. It carries a short spine. The pigment spot is roughly square. The temporal angles are acutely rounded, and the occiput flatly sinuous. On the ventral side (Fig. 2) the most remarkable feature is the plate upon the throat, the shape of which may be seen from the figure. The lateral spinous processes project freely, but the median part of the plate passes backwards under the anterior border of the prosternum. Six or seven hairs arise from the plate on each side. The terminal joint of the palps is the longest, and they show a fine annulation, giving a serrate outline in optical section, that I do not remember to have seen before in the group. The antennae are of the usual type.

The prothorax is winged, with an interscapular bar not quite reaching the scapulars (the intervening space being occupied by a small spine), and crossed by a median longitudinal crease for insertion of the dorsal prothoracic muscles. The claviculars are thick, and pass downwards, backwards, and inwards to fuse with the lateral angles of the prosternum. The *mesothorax* and *metathorax* are alike, and resemble abdominal segments. The thoracic sterna are shown in Fig. 2. The *coxae* of the

first pair are elongate, closely apposed at their hinder ends, and diverging forwards and outwards, the trochanters arising from their ventral faces a little nearer the anterior end. The coxae of the remaining two pairs are palette-shaped, with a notch on the inner margin. The *trochanters* are small and triangular: the *femurs* stout and strongly arched; the *tibiae* narrow proximally, and swollen distally, those of the third pair conspicuously long. The first joint of the *tarsus* (Fig. 4) is short, and bears a large flap-like appendage on the inner side. Mjöberg (1910, p. 213) refers to this structure as an onychium; but, whatever the precise meaning of this much abused term may be, it surely cannot be applied to a structure that has no connection at all with the grasping apparatus of the foot. The second joint of the tarsus is long, and bears on its inner face at about two-thirds of its length a small finger-like process, which collapses in balsam mounts. The flexing apparatus of the claws consists of a cross-striated triangular plate, the apex of which is connected with the flexor tendon, while from the base a ligamentous sheet passes to the claws. Each of the basal angles bears a hair.

The abdomen broadens very slightly, being widest at the fourth and fifth segments in the ♀, and at the fourth in the ♂, which tapers more rapidly posteriorly to the rounded ninth segment. The whole abdomen is yellowish brown, the pleura and a broad transverse band in each segment being darker brown. The last segment of the ♀ is rectangular dorsally, the vulva being broadly rounded on the ventral side, and the borders of both being densely fringed with short hairs.

Only one ♂ was available, and in it the genitalia are but lightly chitinised, so that it may not be quite mature. The general form of the apparatus will be clear from an examination of Fig. 3.

The chaetotaxy presents no features worthy of particular remark, and its general distribution is given in the various figures. The forehead shows five hairs and a prickle; the temporal angle three hairs and a spine, between which and the mid-line are a hair and a spine set in a common pustule, and a short hair. The prothorax has two spines, a long hair, and a spine on each side, and a series of eight hairs along the hind border. The mesothorax is distinguished from the metathorax and abdominal segments by the possession of a row of short spines on each lateral border. Meso- and meta-thorax, and the first seven abdominal segments, each have two to three hairs at the angles, and a row of ten along the hind margin. On the ventral surface of the head there are a pair of hairs in front of the gular plate, about six hairs on each

side of it, and four short hairs on the margin of the antennary fossa. The prosternum bears a group of about fifteen short spines. The first coxa has two spines anteriorly, and a group of hairs posteriorly. Meso- and metasternum each have a closely clustered group of hairs, and the second and third coxae have spinous anterior borders, and a cluster of hairs. The pleura of the abdomen bear on their ventral hind margin a row of a few spines; and each abdominal sternum carries two rows of hairs.

Measurements in millimetres.

	♂		♀	
	Length	Breadth	Length	Breadth
Head	0·22	0·49	0·22	·57
Prothorax	0·14	0·32	0·15	·37
Mesothorax	0·07	0·36	0·07	·45
Metathorax	0·07	0·40	0·07	·47
Abdomen	0·57	0·47	0·72	·54
Total length and greatest breadth	1·07	0·49	1·23	·57

One ♂, possibly not quite mature, and seventeen ♀♀, from the Gouldian grassfinch (*Poephila gouldiae*), no locality given, N. C. Rothschild collection. The host is found in northern Australia, but is a popular aviary bird. The material belongs to the Entomological Museum of the University of Cambridge; and was handed me for description by Mr Hugh Scott, M.A., Curator in Entomology.

The affinities of the species are obscure. I know of no form with a gular plate of like character, or in any intermediate condition.

Sub-order Ischnocera.

Family Akidoproctidae, nov.

Mjöberg (1910, p. 96) has already foreshadowed the erection of a family to include the genera *Ornithobius* Denny and *Akidoproctus* Piaget. With these must certainly be included *Bothriometopus* Taschenberg. I have received from Mr G. F. Hill, Government Entomologist at Port Darwin, Northern Territory of Australia, a number of examples of a form from the pied goose (*Anseranas semipalmata*), for which I propose below a new genus *Heteroproctus*. This form links up to such a remarkable degree the three genera mentioned above, that I have no hesitation in establishing a family for the reception of the group of genera.

The family, for which I have taken the genus *Akidoproctus* as type (as taking the older *Ornithobius* of Denny might lead to confusion, the generic name *Ornithobia* having been used in Diptera) may be briefly diagnosed as: *Lipeurus*-like forms, large and elongate, without signate clypeus; with a notch of varying depth in the front margin of the head; with large antennae, alike or dimorphic, in front of the middle of the head; without trabeculae, or prominent trabecular angles; with swollen temples; with prothoracic stigmata prominent at the postero-lateral angle of the prothorax; and with long legs.

Some characters based on more minute detail might be added, but I have no material of *Bothriometopus*, and am unable to say, from available descriptions, whether it agrees in certain features common to the other genera. It is remarkable that, in spite of the compactness of the group, characters which are usually considered of generic importance are very unevenly distributed. The notch in front of the head is uniform in *Akidoproctus*, *Heteroproctus*, and *Bothriometopus*, but is very different in *Ornithobius*. The antennae are alike in *Akidoproctus*; almost alike to dimorphic in *Ornithobius*; markedly dimorphic in *Heteroproctus* and *Bothriometopus*. The last segments of the abdomen are conical in *Akidoproctus*, and in *Ornithobius* to a less degree; but in *Bothriometopus* the end of the abdomen is definitely two-pointed. In *Heteroproctus* the abdomen of the ♀ is pointed, while that of the ♂ ends in two broadly rounded lobes. The oesophageal sclerite is present in three genera, but totally absent in *Ornithobius*. The very remarkable spinous genital plate of the ♀ *Heteroproctus* (Fig. 8) also occurs in *Ornithobius* and *Akidoproctus*. The subsidiary transverse bands on the posterior abdominal segments of the ♂ *Heteroproctus* are found also in *Bothriometopus*.

The following key will serve to differentiate the genera of the family:

A.	Anterior emargination crescentic	*Ornithobius*
AA.	Anterior emargination oblong.	
B.	Antennae alike in the sexes	*Akidoproctus*
BB.	Antennae differing in the sexes.	
C.	End of abdomen bilobed in both sexes	*Bothriometopus*
CC.	Abdomen bilobed in ♂, conical in ♀	*Heteroproctus*

Genus *Heteroproctus*, nov.

Akidoproctidae of more than average size (3–4 mm.), and elongate form. Head with deep squarish emargination in front; trabecular angle rounded, and with a ridge running parallel to its lateral border dorsally, giving a double outline; antenna of ♂ with an appendage on the third segment. Prothorax with prominent stigmata at postero-lateral angles; metathorax wider than the head, widest posteriorly. Abdomen of nine segments, the eighth of which is obviously of a double nature; parallel-sided, tapering rapidly from the seventh segment to an acuminate point in the ♀, but only gradually in the ♂ to the much wider bilobed ninth segment; bands differing in the sexes. ♂ genitalia with large parameres with bluntly rounded apices, the remainder of the apparatus being plate-like.

Heteroproctus hilli, n. sp. Figs. 8–11.

Reference to the figures of ♂ and ♀ will make clear the general form. The ♂ is smaller than the ♀, and the sexes differ in the form of the antennae, of the posterior end of the abdomen, and of the abdominal markings. The two latter differences affect the chaetotaxy.

The head is narrow in front, where it ends in two rounded forcipate lobes, separated by the emargination, which is wider posteriorly, and extends about half way to a line joining the antennae; the lateral margins of the forehead concave, widening to the trabecular angle, which is bluntly rounded, and has the double character alluded to above; behind this angle the head is distinctly constricted; the eye is not prominent, the pigment fleck being small and roughly triangular; from the eye the temples swell out evenly, the greatest width being a little in front of half the distance from eyes to occiput; width at temporal angles about that at eyes, angles rounded; occiput sinuous, with a median and two lateral concavities, separated by two slight convexities. Antenna of ♂ large, first article as long as second and third together, cylindrical, narrower proximally; second article two-thirds first, narrower; third article shorter, truncated, with an appendage; fourth and fifth sub-equal, diverging almost at right angles; the terminal three articles distinctly darker than the basal two. Antenna of ♀ with first article shorter, thicker, and lighter in colour than second; terminal three forming a decreasing series, all darker in colour than second; final two forming an angle with remainder. Sensory grooves elongate, one on each of the two terminal articles, on the posterior border, that of the

fourth article placed distally at three-quarters of the length, that of the fifth a little proximal of half the length. In colour, a little more than a third of the head on either side is dark translucent brown, leaving a median area yellowish white except for the narrow chitinous hind border of the emargination, a curved chitinous piece in front of the mandibles, which may represent a labrum, the mandibles themselves, the oesophageal sclerite, and a faint elongated triangular plate on the ventral surface, for which I would propose the term *gular plate* in place of Kellogg's *occipital signature*. The heavier markings of the head consist of two fine blackish bands running from the posterior mandibular articulation to the occiput, just in front of which they send inwards slight projections, and continuous round the temporal margins to the eyes; and of two short bands which, commencing just behind and outside the anterior mandibular articulation, diverge outwards to the margins of the forehead in front of the trabecular angles, sending internal branches round the inner margins of the dark chitin of the forehead, which run forward to support the forcipate lobes. Just before these latter reach the level of the hind border of the emargination, they exhibit a sharp curl outwards and inwards again, which is too small to appear in the figures, but which is obviously the homologue of the much more prominent structure of the same nature found in *Ornithobius*.

The occipital apodeme apparatus is a little complex, and comprises a black crescentic piece supporting the median convexity of the occiput, which has the appearance of being poised upon a black triangular projection of the prothorax, while a pair of apodemes of the usual convergent type project backwards into the prothorax.

The prothorax is alike in the sexes, rectangular, with the anterior angles truncated, the posterior square, with projecting, crater-like stigmata, and the hind margin slightly convex. It is dark brown, with a light median space, the lateral margins being blackish brown. The *metathorax* is almost twice as wide as the prothorax, with forward projecting antero-lateral angles, swollen sides, widest posteriorly, with truncated postero-lateral angles, and a hind margin somewhat convex on the abdomen. It also is divided by a median uncoloured line, which does not quite reach the hind border in the ♀; and is darker at the antero-lateral angles and along the lateral margins. Between the metathorax and the first abdominal segment appears an angular projection, which is part of the endo-sternal apparatus in connection with the acetabulum of the third coxa.

The abdomen of the ♂ is composed of nine apparent segments, of which the eighth shows very obviously that it is composed of two fused segments. It is parallel-sided to the fifth segment, whence it tapers slightly, the convergence becoming emphasised from the distal half of the double eighth segment. The arrangement of the chitinous markings will be best understood by reference to Fig. 10. The light spots found anteriorly on the second to the seventh segments of the ♀ only appear on the second and third segments of the ♂. There is an uncoloured median space through the first three segments. The third segment has a subsidiary transverse band, divided into two isolated blotches by this space, behind each of which is a small dark bar on the hind margin of the tergum. The transverse and subsidiary bands of the next three segments are entire, the subsidiary bands showing, however, a median anterior notch. The posterior border of the subsidiary band of the sixth segment is indented on either side for the pustule of a hair. Similar small bars, somewhat lighter in colour, are present on the hind margin of these three segments, those of the sixth segment being shorter than the rest. The transverse band of the seventh segment is entire, its posterior margin being indented by four pustules on either side. The eighth segment is more or less parallel-sided to a third of its length, where a group of pustulate hairs is situate upon the margin; after which the sides converge rapidly. A lighter coloured area extends across the segment between the two groups of pustulated hairs. The postero-lateral angles are produced slightly backwards. The terminal segment is composed of two dark rounded lobes, separated by a very narrow uncoloured line.

The abdomen of the ♀ has its sides sub-parallel to the seventh segment, the last two tapering abruptly. The first segment resembles that of the ♂. The next six are alike in character, each bearing two squarish lateral blotches, separated by a wide median space, occupied by a third rectangular blotch, lighter in colour and softer in outline. Towards each antero-lateral angle is a small light-coloured spot, a perforation in the heavy chitin of the pleura, from the hind border of which an irregular dark band runs towards the stigma. The eighth segment is almost uniformly coloured, but shows indications of median longitudinal and transverse division. The ninth segment forms a dark equilateral triangle, bisected by a narrow uncoloured line.

The ♂ genitalia have large parameres, which lie with their ends crossed in the position of retraction, the tips being broadly rounded. The basal plate is very weakly chitinised, only the distal part of its

lateral margins being at all prominent. The form of the apparatus is indicated in Fig. 9. The genital plate of the ♀, as shown in Fig. 8, is shaped like an arrow-head with broken tip, each barb being set with a row of about twelve stout spines.

The chaetotaxy of the head agrees very remarkably with that of *Ornithobius fuscus*. There are a number of short hairs on the forehead, two more on each side in the ♂ than in the ♀; a short hair in the eye; five on the temple, of which the second is a little, and the fourth considerably, longer than the rest; and one short prickle on the hind margin close to the angle. The prothorax carries a pair of hairs on the posterior margin, close to the stigmata. The metathorax has two lateral hairs in front of the posterior angle, and three, set in a single large pustule, inside the hind margin close to the angle. In the ♂ abdomen, each segment save the last has a short backwardly directed spinous hair at the posterior angle; the anterior segments have, in addition, one or two softer hairs; the sixth segment has two pustulated hairs partly inserted into the subsidiary transverse band; the seventh segment has four pustulated hairs on either side; the eighth segment a long and a short hair on either side; the ninth segment, three short hairs. Ventrally, there is a group of about eight hairs in the middle of the first sternum, a median pair on the second to the fifth, flanked by minute prickles, two pairs of prickles only on the sixth, and a group of about a dozen short hairs on the latter half of the eighth. The genital opening is ventral, the posterior margin of the sternum being notched in the middle, and bearing an evenly spaced fringe of about a dozen short hairs. In the ♀ the anterior segments are much as in the ♂. The seventh has two long hairs on the lateral border, in front of the angle, and three pustulated hairs on either side on the hind margin. The eighth has a long hair and a prickle at a third of its length laterally, and three pairs projecting from the ventral surface. The ninth has a short lateral prickle.

Measurements in millimetres.

	♂		♀	
	Length	Breadth	Length	Breadth
Head	0·91	0·58	0·87	0·59
Prothorax	0·35	0·42	0·35	0·42
Metathorax	0·35	0·67	0·40	0·71
Abdomen	1·97	0·64	2·42	0·71
Total length and greatest breadth	3·58	0·67	4·04	0·71

Seven ♂♂, 4 ♀♀, and 6 ⊙⊙, from the pied goose (*Anseranas semipalmata*), Koolpinyah, Northern Territory of Australia, July, 1913, G. F. Hill.

It is somewhat significant that this parasite, coming from a host with the generic name of *Anseranas*, should link up in so marked a fashion the genus *Akidoproctus* found on ducks with the genus *Ornithobius* found on geese and swans. Still more important is the fact that it connects with these genera the previously somewhat isolated *Bothriometopus* from *Palamedea*, and thus points to a confirmation of the anserine affinities of the Palamedeidae.

Family Goniodidae.

Genus *Austrogoniodes*, nov.

The Mallophaga of the above family hitherto described from penguins are three in number, viz., *Goniocotes bifasciatus* Piaget (1885, p. 47) from *Spheniscus demersus*, *G. waterstoni* Cummings (1914, p. 173) from *Eudyptula minor*, and *Goniodes brevipes* Giebel (1878, p. 254) from *Aptenodytes longirostris*. I propose to describe presently a new species from *Eudyptes sclateri*, and I have in hand half a dozen other species, which will be described in the zoological results of the Australasian Antarctic Expedition. I find that these species form a compact group, with certain easily recognisable features in common, for which I now propose generic rank.

The characters upon which I base the genus are not of striking morphological significance, but they are sufficient to render the species included recognisable at a glance. The chief is the head-shape, the temples being greatly swollen, and produced far back alongside the prothorax. The anterior temporal 'angle' is never really angular. In most species it is only a broadly rounded swelling, though in one or two it becomes obtusely rounded, and more or less angular. The posterior temporal angle is produced backwards into an acute point, reaching to at least half the length of the prothorax, and continued by a stiff spine back on to the metathorax. The result is a head-shape which, however much it may vary in detail among the members of the genus, differs from that of any other Goniodidae. The second character is the shortness of the legs, particularly of the tibiae, which are, in some species, as broad as long, and which are always armed with heavy conical processes, not well enough chitinised to be called spines. Apart from these, it may be noted that the ♂ abdomen always ends in a

rounded heavily chitinous plate, to which is attached a great part of the strong musculature controlling the copulatory apparatus; that the end of the ♀ abdomen is broader, and lightly to deeply notched in the middle; that the metathorax comes far back on to the abdomen; and that its postero-lateral margins are usually continued beyond the sutural line of the hind margin, in a way that will appear later in the figures. The antennae are in some species alike, in others widely dimorphic; and show, in general, a tendency to reduction of the number of articles by fusion, so that, in some species, only three are present in the adult. In two species the ♂ antenna bears an appendage.

These antennal differences, which have been used in the past to separate genera, I am now forced to consider, of little importance. It was first pointed out to me by Mr J. D. Waterston that copulatory appendages on the antennae have arisen quite independently in several groups. My own observations have amply confirmed this view, so I make no attempt to split the present group on antennal differences. This will also explain why I have, in compounding the generic name, used *Goniodes* instead of *Goniocotes*. It may be possible to establish the latter genus on other grounds, but it is not justifiable to separate it from *Goniodes* on antennae alone. As type of *Austrogoniodes* I designate *Goniocotes waterstoni* Cummings.

Austrogoniodes strutheus, n. sp. Fig. 15.

The head is obtusely rounded in front, and not flatly so, as in most Goniodidae. The side of the forehead is continued ventral to the antenna into a prominent trabecular angle, which reaches almost to the end of the first antennal article. The eye is slightly prominent, with a minute conical spine, and without a pigment spot, though all the remaining species have pigmented eyes. Behind the eye, the temple swells out broadly to a greatest width a little in front of half its length; then sweeps inwards and backwards, with a concave outline, to form an acuminate process at the side of the prothorax, reaching to more than half its length, and continued by a stout spinous hair which reaches to the metathoracic angle. The occiput is flatly convex on the prothorax, then curves outwards and backwards to form the inner margin of the acuminate process. The markings of the head are conspicuous (Text-fig. 2, 1). Two large triangular black blotches occur on the occiput, one in front of each lateral angle of the prothorax. Each of these is continued externally as a narrow brown band reaching the base of the temporal spine; internally as a narrow band along the median occipital

margin; and anteriorly as a broad ill-defined brown band reaching to the posterior mandibular articulation, and then spreading broadly to embrace the eye and the base of the antennal band. The latter is deep brown, begins external to the anterior mandibular articulation, runs to the frontal margin in front of the antenna, and turns along the anterior border of the head to meet that of the other side, becoming narrower as it goes forward, except for a short length in the middle of the front which is biconvex, and affords one means of distinguishing this species from most of its congeners. From between the antenna and the eye a

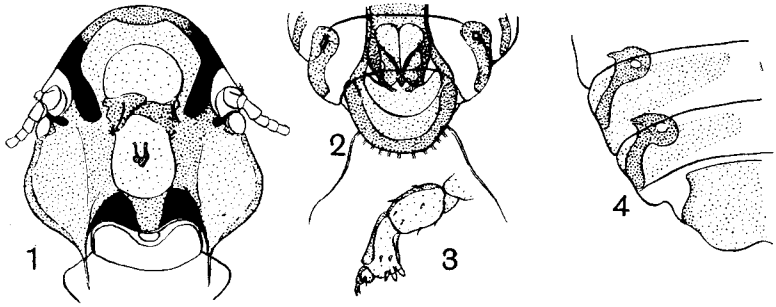

Fig. 2. *Austrogoniodes strutheus*: (1) head of ♂; (2) last segments of abdomen, ♂; (3) third left leg; (4) last segments of abdomen, ♀, showing the bird-like pleura.

short band runs inwards, not quite meeting the base of the antennal band. From behind the eye a very narrow band edges the temporal margin to the base of the spine. The antennae are alike in the sexes, the first article being a trifle more swollen in the ♂. The basal article is longest; the second narrower and shorter; the third and fourth subequal, and shorter still; the fifth shortest. The sinus is large and semicircular, roofed dorsally by a transparent membrane, and partly covered ventrally by the trabecular angle, and a slight forward projection of the posterior angle.

The prothorax is more or less rectangular, its antero-lateral angles rounded, its hind border convex on the metathorax. The pronotum bears an hour-glass-shaped transverse band, darker postero-laterally, and more deeply emarginate in front; the space thus left being filled by a small oval blotch. (This last has, in Giebel's figure of *Goniodes brevipes* (1878, pl. XIV., fig. 19), been included within the occipital border.) The *metathorax* is as broad as the head immediately in front of the eyes. The postero-lateral borders are carried back on to the abdomen as far as the anterior border of the second segment; the hind margin being

straight, and anterior to their terminations. It carries a dark band along the antero-lateral border, and otherwise is uniformly coloured, except that it is slightly lighter along the postero-lateral borders, and that the coloration stops short of the hind margin. The *legs* are short, thick, and heavily chitinised, the tibia bearing distally four stout conical processes, two of them pedunculated.

The abdomen is of eight apparent segments, widest at the second and third, thence tapering slightly to the seventh, which is followed in the ♀ by the broadly rounded, slightly emarginated, eighth; while in the ♂ that segment is heavily chitinous, and semicircular. The details of the transverse bands and pleural markings are shown in Fig. 15. The pleural bands, particularly in the ♀ and towards the posterior end (Text-fig. 2. 4), bear a ridiculous resemblance to a row of bird's heads, poised upon long necks, which has suggested the specific name.

The genital plate of the ♀ is a flap hinged laterally, concave in the middle, and fringed with short hairs, which increase in size on either side, culminating in a row of a dozen stout curved hairs. The ♂ genitalia, shown in Text-fig. 2. 2, are complex, and differ considerably from those of *A. waterstoni* and other members of the genus.

Chaetotaxy of ♀: the forehead shows eight extremely small evenly spaced spines; similar spines are scattered over the surface of the head; two similar spines between antenna and greatest width, at which point a similar spine and a longer stouter one occur, followed by another short spine round the 'angle.' Prothorax with a pair of small spines anteriorly; and a short hair on the hind margin towards each postero-lateral angle. Metathorax with a very short spine in front of, one at, and three, alternating with hairs, behind the angle; two hairs at the angle, two on the postero-lateral margin, and six along the hind border, with a pair posterior to them. Legs strongly beset with short spines, in addition to the spinous processes mentioned above. Each anterior abdominal segment with a row of about six hairs in the median area, flanked by a pair of minute spines on a line with the inner ends of the pleural bands; first segment with a couple of minute spines at the angle, remainder with 2–3 hairs in addition; eighth segment with three hairs on either side, and a pair of spines on the hind border. On the ventral side, the sternal region is free from hairs, except for a couple on the hind border of the metasternum; but each abdominal segment bears a row of fine hairs.

Chaetotaxy of ♂: differs in having a fair-sized hair in place of the spine just behind the greatest width of the temple; in having a row of

five hairs anteriorly on either side of the bilobed tergum of the eighth segment; and in having a row of about twelve channelled hairs round the much-produced sternum of the same segment, which forms the end of the abdomen.

Measurements in millimetres.

	♂		♀	
	Length	Breadth	Length	Breadth
Head to middle of occiput	·38	·47	·40	·54
Head to line of posterior angles	·50	—	·48	—
Prothorax	·10	·22	·13	·23
Metathorax	·14	·34	·15	·39
Abdomen from line of anterior angles	·62	·45	·89	·71
Total length and greatest breadth	1·16	·47	1·51	·71

Numerous ♂♂ and ♀♀ from *Eudyptes sclateri*, N. C. Rothschild collection, no locality given. Probably from one of the southern islands of New Zealand. Given me for description by Mr Hugh Scott, M.A., Curator in Entomology.

This species would appear to be closest to *A. bifasciatus* of Piaget, from which it differs in its smaller size; in the chaetotaxy of the abdomen; in the concave vulva; and in the hind end of the ♂ abdomen, the heavy chitinous border of which is produced much further forwards and inwards. It is easily distinguished from *A. brevipes* Giebel and *A. waterstoni* Cummings by the antenna, apart from other differences.

Family ————————?

Genus *Psittaconirmus*, nov.

This genus is established for the reception of a parasite of Australian lorikeets, which shows, in conjunction with a general nirmoid form, considerable sexual dimorphism, involving the antennae, and a peculiar forcipate clypeal front.

According to the present criteria of classification, this genus should be included in the Lipeuridae. But I have good reasons for believing that it would be quite wrongly placed. To begin with, it is indubitably closely related to other forms from Australian parrots, which must at present be placed in the genus *Degeeriella*. And secondly, its own structure is, apart from the antennae, that of *Degeeriella* and not *Lipeurus*. In the form of the head, and particularly in the structure of the occipital apodemes and the prothoracic skeleton, it agrees with a

group within the genus *Degeeriella* which characterises parrots and hawks. Piaget (1880, p. 300) has certainly included some of these parrot infesting forms in the genus *Lipeurus*; but, in the case of *L. circumfasciatus*, the tubercle on the third article of the ♂ antenna, which is presumably his justification for the position in which he places the insect, is a sense organ, and not a clasping appendage. Pending a revision of the classification, I prefer to hold over any more precise statement as to the position of *Psittaconirmus*. The genus may be diagnosed as follows:

ISCHNOCERA of smallish size (less than 2 mm.) with elongate nirmoid form; head circumfasciate, without signate clypeus, broken in front by an oval emargination, across which the points of the frontal margin overlap; with definite weak trabeculae; third article of ♂ antenna with an appendage; transverse bands of abdomen continuous in the ♂, interrupted in the ♀; hind end of abdomen rounded in the ♂, bifid in the ♀. On Australian Loriidae.

Psittaconirmus australis, n. sp. Figs. 7, 12–14.

Head broad in front, sides of the forehead diverging slightly to the trabeculae, divergence continuing to a greatest width a little in front of the occiput; temporal angles broadly rounded; occiput with a slight convexity. In front is a small oval emargination, closed anteriorly by the acute overlapping tips of the frontal margin. Trabeculae weak, acute, as long as the first antennal article of the ♀. Antennae differing in the sexes; ♂ with first article as long as the distal four together, narrower proximally; second article a third of first; third shorter, with an appendage; fourth shorter than fifth; ♀ filiform, first article shorter and broader than second; third and fourth shorter and sub-equal; fifth longer. Antennal bands, starting from an enlargement at the base of the antenna, run outwards and then forwards round the margin of the head, gradually reducing in thickness to end in the overlapping acuminate points. Internal bands run forwards from the anterior mandibular articulation, turning inwards, then forwards again, to end in rounded enlargements on either side behind the emargination; the latter bound behind by a curved chitinous band. Temporal bands are continuous from eye round occiput; occipital bands hardly exist. The oesophageal sclerite is well marked. The eye is fairly prominent, with a hair and an elongated pigment spot.

Prothorax short and much narrower than the head; narrower in front, with dark lateral borders and a median uncoloured space. *Metathorax*

narrow in front, widening rapidly posteriorly, with hind angles rounded, and margin slightly convex; with dark lateral bands, thickening at the antero-lateral angles. *Legs* elongate.

Abdomen of ♂ with sub-parallel sides anteriorly, tapering gradually from the fifth segment to the rounded ninth. Pleura of first to sixth segments of strong translucent brown, continued forwards and inwards into the segment in front, and with a median inwardly directed rounded enlargement; of segments seven and eight narrower; all eight segments with a broad light-coloured transverse band. Terminal segment rounded, with tergum only faintly chitinous. Abdomen of ♀ broader, widening evenly to the fourth segment, whence it tapers gradually to the bifid ninth. Pleura as in the ♂; but the transverse bands of the first seven segments have a broad median interruption. The hind border of the eighth segment is the shape of an inverted V; and its transverse band seems to be continuous. The ninth segment has the form of two narrow triangular lobes, each fringed with a dense pencil of hairs projecting from the ventral side.

.The material at my disposal has not been sufficiently well preserved to allow of a satisfactory description of the genitalia. In the ♂, the apparatus is complex. The basal plate reaches forward to the anterior border of the fifth segment, and its lateral margins become heavily chitinised as it passes backwards. The parameres are straight, with their tips (Fig. 7) truncated, and bearing a longish hair. But the median part of the apparatus is not in fit condition for description.

Chaetotaxy of ♀. Forehead with five extremely fine small hairs, the fifth just in front of the trabecula; a spine in the eye, and three along the lateral temporal margin; a fairly long hair at the angle; two spines between this and the prothorax on the hind margin, and a pair of spines inside the occipital border. Prothorax with a pair of short hairs on the hind margin. Metathoracic angle with, from without inwards, a spine, a hair, a row of three pustulated hairs, followed by a second similar row. Abdomen with one or two hairs at the angle, and a pair of hairs on the hind border, of each of the first seven segments. Segments five to seven have an additional pair of hairs laterally on the hind border. Eighth segment with four hairs; ninth terminated on either side by a brush of hairs. The ♂ differs only at the posterior end of the abdomen, where the square flap of the eighth segment, covering the genital opening, carries a row of ten short hairs, and the ninth segment has six or seven scattered hairs on each side.

Measurements in millimetres.

	♂		♀	
	Length	Breadth	Length	Breadth
Head	0·39	0·27	0·42	0·32
Prothorax	0·10	0·20	0·10	0·22
Metathorax .	0·17	0·32	0·18	0·37
Abdomen	0·69	0·35	1·03	0·50
Total length and greatest breadth	1·35	0·35	1·73	0·50

One ♂ and three ♀♀ from the purple-crowned lorikeet (*Glossopsittacus porphyrocephalus*), Bow River, Western Australia, 30 October 1912, S. W. Jackson.

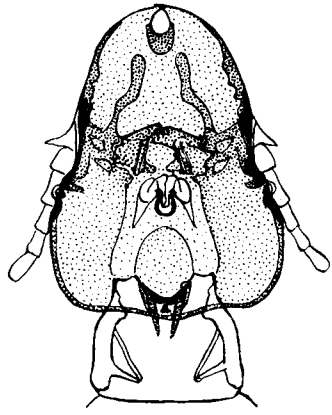

Fig. 3. Head and prothorax of *Psittaconirmus* ♀.

Two ♀♀, one of which is immature, from the blue-bellied lorikeet (*Trichoglossus novae-hollandiae*), Myall River, New South Wales, I provisionally assign to this species. These show some differences, which may be real, or may be due to the marked difference in the state of preservation. I figure the adult ♀ (Fig. 14), as well as the head, and the occipital apodemes (Text-fig. 3). The main differences lie in the darker coloration of the pleura and all lateral bands; the better defined transverse bands of the abdomen, with stigmata prominent in light-coloured areas; the inner row on the metathoracic border containing two, not three, hairs; and the pencils of hairs on the ventral surface of the ninth segment being so short as not to project beyond the borders of the segment. The measurements of this ♀ are also slightly larger, as the following table shows:

Measurements in millimetres.

	♀	
	Length	Breadth
Head	0·44	0·35
Prothorax	0·11	0·23
Metathorax	0·20	0·39
Abdomen	1·11	0·47
Total length and greatest breadth	1·86	0·47

The species dealt with in this paper have all been described from ovigerous females, and males with the genitalia chitinised. All figures have been drawn with the aid of a *camera lucida*. The types will be deposited in the Australian Museum, Sydney, New South Wales; and, as far as the material available allows, co-types will be placed in the British Museum, and in the Entomological Museum of the University of Cambridge.

LIST OF HOSTS WITH PARASITES.

EUDYPTES SCLATERI	*Austrogoniodes strutheus.*
ANSERANAS SEMIPALMATA	*Heteroproctus hilli.*
TRICHOGLOSSUS NOVAE-HOLLANDIAE	*Eomenopon denticulatus.*
	Psittaconirmus australis.
GLOSSOPSITTACUS PORPHYROCEPHALUS	*Psittaconirmus australis.*
PTILOSCLERA VERSICOLOR	*Eomenopon denticulatus.*
PHILEMON CORNICULATUS	*Eomenopon denticulatus.*
POEPHILA MIRABILIS	*Machaerilaemus latifrons.*

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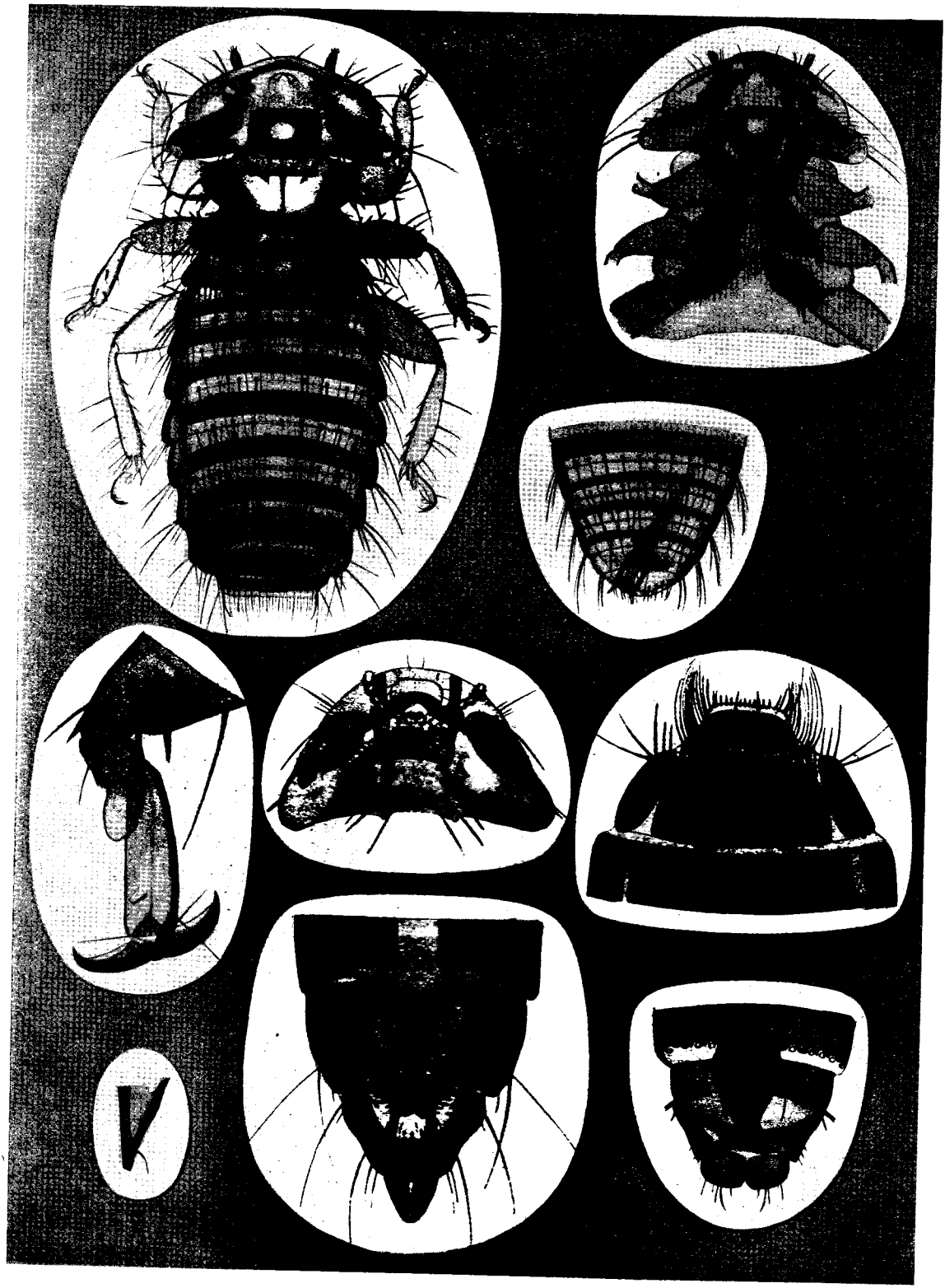
DESCRIPTION OF PLATES XXVI AND XXVII.

PLATE XXVI.

Fig. 1. *Machaerilaemus latifrons*, ♀.
Fig. 2. „ „ ventral surface of head and thorax.
Fig. 3. „ „ last segments of ♂.
Fig. 4. „ „ third tarsus.
Fig. 5. *Eomenopon denticulatus*, ventral surface of head.
Fig. 6. „ „ abdomen of ♀, ventral.
Fig. 7. *Psittaconirmus australis*, tip of right paramere, ♂.
Fig. 8. *Heteroproctus hilli*, end of abdomen, ♀.
Fig. 9. „ „ end of abdomen, ♂.

PLATE XXVII.

Fig. 10. ***Heteroproctus hilli***, ♂.
Fig. 11. „ „ ♀.
Fig. 12. *Psittaconirmus australis*, ♀.
Fig. 13. „ „ ♂.
Fig. 14. „ „ ? ♀.
Fig. 15. *Austrogoniodes strutheus*, ♀.
Fig. 16. *Eomenopon denticulatus*, ♂.



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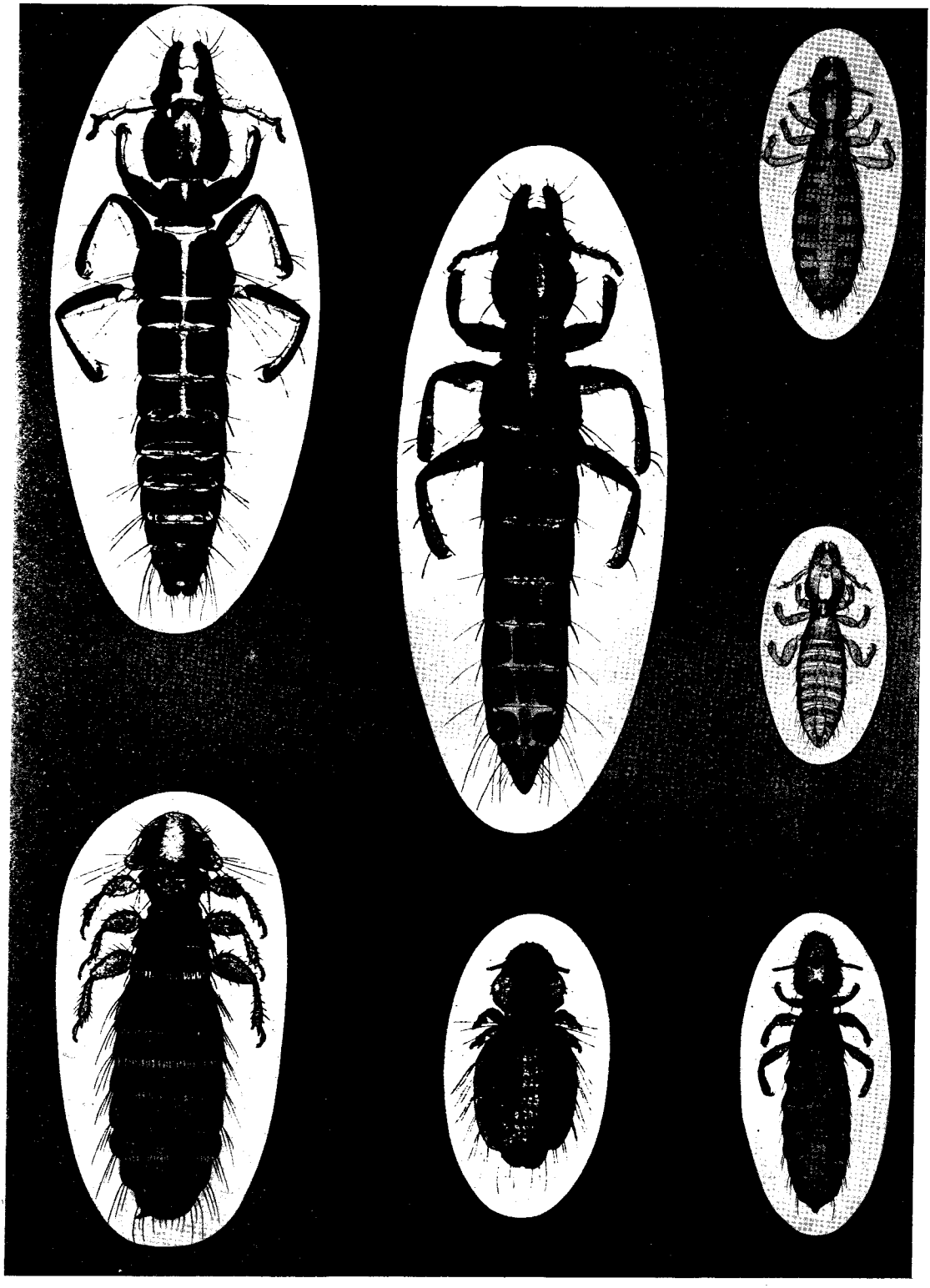

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