

## Further Notes on Species of Trichodectidae with Descriptions of New Species.\*

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WERNECK (*Mem. do Instit. Oswaldo Cruz*, XXXI, iii, pp. 496-589, 1936) recently reduced the family Trichodectidae to a single genus, but such a procedure is unwarrantable. If one examines casually the figures of species in books it is usually possible to say from what kinds of animals the specimens had been obtained. For instance, one cannot mistake species taken from cats and mongooses, they all show a family likeness, likewise species found on various other groups of animals, and for this reason I consider they should be placed in separate genera. Some time ago I received from Mr. G. B. Thompson three new species of Trichodectidae taken off *Procavia emini* in the Belgian Congo. Two of these species were typical parasites of Procaviidae, but the specimens (a female and a male) of the third species were undoubtedly stragglers; a mere glance at these was sufficient to convince me that they were not parasites of *Procavia*, but a new species of *Trichodectes* parasitic on a species of Canidae, or animal closely related to the Canidae. If one segregates the species of Trichodectidae into different genera, and finds that by doing so the species tell one something about their hosts, then I feel that one is justified in splitting up the family. The same applies not only to the species of Mallophaga parasitic on mammals, but also to those parasitic on birds. The generic characters may not always be very striking, but no one could confuse, let us say, species of *Actornithophilus*, which are parasitic on Charadriiformes, with species of *Heleonomus*, parasites of cranes. It is impossible to lay down any hard and fast rules as to what should be considered generic characters, because what may be a generic character in one family may not be a generic character in another.

For instance, the number and disposition of the spiracles on the abdominal segments are usually, as was first pointed out by Harrison (*Parasit.*, VIII, i, pp. 101-127, t.f. 1-21, 1915), of family or sub-family significance. In the Amblycera there are six pairs of

\* This paper is published posthumously, the uncorrected typescript having been found amongst the effects of the late Mr. Bedford. The writer wishes to express his appreciation to Mr. G. H. E. Hopkins, Entomologist, of Kampala, Uganda, who was responsible for perusing the typescript and making corrections and slight alterations where necessary and without whose help the publication of the paper would have been virtually impossible. (R. du T.)

abdominal spiracles present in all families with the exception of the Trimenoponidae and Gyropidae, the former possessing only five pairs and the latter either five or six pairs. If there are six pairs, they are present on segments ii-vii, except in the Menoponidae and Laemobothriidae which have the spiracles on segments iii-viii. If there are five pairs of spiracles they are present on segments ii-vi. In the Ischnocera there are six pairs of abdominal spiracles present on segments ii-vii in the family Philopteridae, and in the family Trichodectidae they may be absent or vary in number from two to six pairs, the first pair always being present on the second segment. Even in species which are very closely related to one another the number of spiracles will be found to vary, and in one species, *Trichodectes potus* Werneck, there are three pairs of abdominal spiracles in the female, and only two pairs in the male.

Again, the numbers of antennal joints are usually of family significance, but in the Trichodectidae they may not even be of generic significance. In the Amblycera the antennae are always four-jointed, except that in *Menopon gallinae* and probably a few other species they are apparently five-segmented. In the Ischnocera they are five-jointed in all species of Philopteridae, and usually (always in the males) three-jointed in the Trichodectidae, but in females of closely related species parasitic on Procaviidae the antennal joints vary in number from three to five, and in some species the extra segments are only partially developed.

Again, the male genitalia will be found in some genera, e.g. *Pectinopygus*, *Naubates*, *Felicola*, etc., to vary considerably in closely related species, and in other genera, e.g. *Anaticola*, *Ardeicola*, *Procavicola*, *Myrsidea*, *Trinoton*, etc., the male genitalia are very similar in all species included in each genus, and in some genera, e.g. *Anaticola*, *Myrsidea* and *Trinoton* it is doubtful whether the male genitalia are even of specific significance. Moreover, in the genera *Philopterus*, *Menopon* and *Colpocephalum* the male genitalia are usually very similar and of the same type in species which can be grouped together and segregated into separate genera.

Ewing (*Journ. Parasit.*, XXII iii, p. 240, 1936) recently transferred *Trichodectes abnormis* Ewing, reported to have been taken off *Lemur rufus*, Madagascar, to my genus *Suricatoecus*, which I have since been compelled to sink as a synonym of *Felicola*. If, as Ewing considers, *abnormis* is closely related to *cooleyi*, the type of *Suricatoecus*, then there can be no doubt that the type of *abnormis*, a male, was either a straggler from a mongoose, or the host incorrectly recorded.

In the same paper (p. 243) Ewing transferred both *Felicola genetta* (Bedford) = *F. acuticeps* (Neumann) and *F. helogale* Bedford to the genus *Neotrichodectes* Ewing, on the grounds that the abdominal spiracles are absent in both these species, but I have since found spiracles present on abdominal segments ii-v in specimens. I refer to *F. acuticeps* from *Genetta tigrina stuhlmanni*, Uganda, but I cannot detect spiracles in specimens found on *G. tigrina* and *G. felina ludia* in South Africa. Neither of the above species resembles species

of *Neotrichodectes*, which are parasitic on Procyonidae and Mustelinae. He states that I placed them in *Felicola* with some hesitation. This is correct; they are not typical species of *Felicola*, but they are more closely related to species of this genus than to other species, and should not be separated from *Felicola* until more is known about the species parasitic on genet and mongooses.

In a previous paper (*Parasit.* XXIV, pp. 350-364, 1932) I stated that the structure of the respiratory system in the Trichodectidae is not, in the absence of other important characters, of generic significance.

Before placing a species in a new genus one should ask oneself: would it be possible to say from what kind of host the parasite was taken off had the host not been recorded? If it is impossible to answer the question, then one should be justified in placing it in a new genus.

In this paper I have described a new species—*Bovicola dimorpha*, from a goat. This species is closely related to *B. thompsoni* Bedford, described from specimens taken off *Nemorhaedus sumatraensis*, an animal said to be intermediate between the goats and antelopes. Had the hosts of these species not been recorded it would have been impossible for one to have stated that they were parasites of species of Bovidae. For this reason I consider they should be placed in a new genus, but as three genera have already been erected for species of Trichodectidae parasitic on Bovidae, it is best to retain these parasites in the genus *Bovicola* until more is known about the species parasitic on these animals.

Not only have these parasites characters to guide us in splitting them up into genera, but their hosts are also able to help us in this respect as they throw considerable light on their phylogeny. Eventually, when the classification of the Mallophaga is on a sound basis, it will be found that these parasites shed far more light on the phylogeny of their hosts than the hosts do on their parasites, because the hosts have undergone far greater changes than have their parasites.

Dr. Austin Roberts will describe the hosts of two new species of *Procavicola* and a new species of *Dasyonyx* described in this paper, also the hosts of several other species from Procaviidae previously described by the author.

#### Genus TRICHODECTES Nitzsch.

#### TRICHODECTES MUSTELAE (Schrank).

(Figs. 1 and 2).

*Pediculus mustelae* Schrank, *Fauna Boica*, p. 186 (1803).

*Trichodectes dubius* Nitzsch, in Denny, *Mon. Anoplur. Brit.* p. 190, pl. 17, f. 2 (1842). Part.

NOTES ON SPECIES OF TRICHODECTIDAE.

*Trichodectes pusillus* Nitzsch, in Giebel, *Zeit f. ges. Naturw.*, XVIII, p. 88 (1861). Part: Giebel, *Insecta Epizoa*, p. 55 (1874).

*Trichodectes retusus* Piaget, *Les Pédiculines*, p. 387, pl. 31, f. 8 (1880). Part.

The weasel, *Mustela nivalis* L. (= *M. vulgaris*), and the stoat, *Mustela erminea* are parasitised by two distinct species of *Trichodectes*, and both these parasites have been described as the same species by various authors under different names. The result has been considerable confusion, as will be seen from the above synonymy.

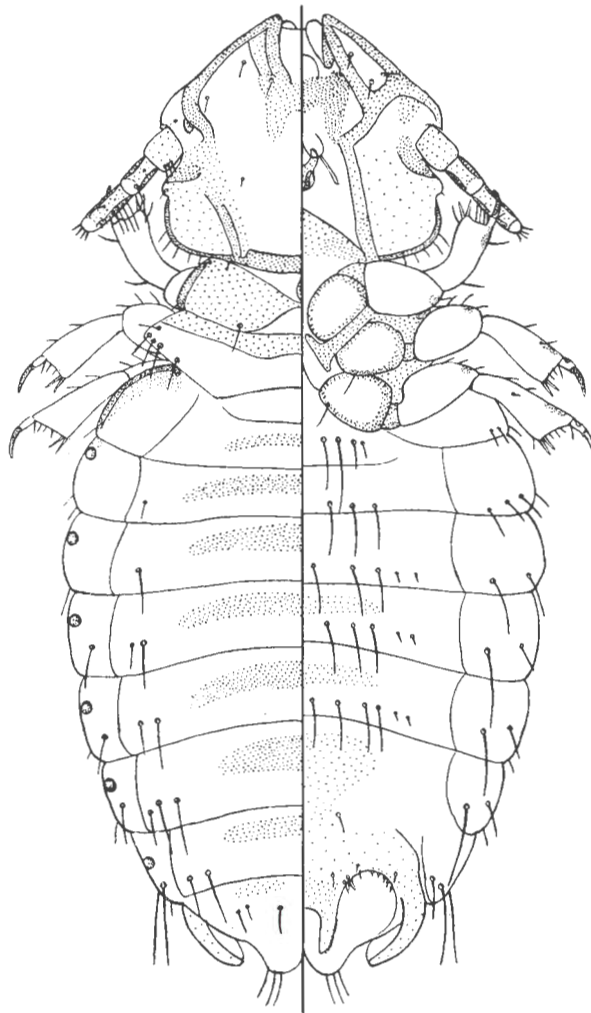


Fig. 1.—*Trichodectes mustelae* (Schrank). ♀

Schrank was the first to describe the parasite from *M. nivalis*, and his name must stand for the species found on this host. Later, Denny described *T. dubius* Nitzsch from both *M. nivalis* and *M. erminea*, and this name must stand for the species found on *M. erminea* as Thompson (*Ann. and Mag. Nat. Hist.* Ser. 10, XIX, p. 76, 1937) designated *M. erminea* as the type-host of *T. dubius*.

Giebel described *T. pusillus* Nitzsch from both *M. nivalis* and *M. erminea*, and later Piaget described *T. retusus* from *M. nivalis*, *M. foina*, *M. martes* and *M. erminea*. *T. retusus* Nitzsch was first described by Burmeister (*Handb. der Ent.* II, ii, p. 436, 1838) from *M. foina*. Whether this is a distinct species or not still remains to be proved.

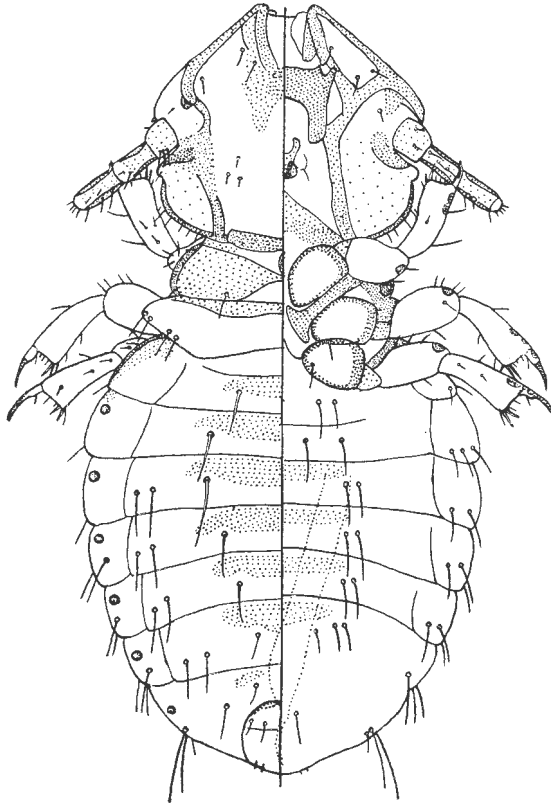


Fig. 2.—*Trichodectes mustelae* (Schrank). ♂.

Specimens have been received from both Colonel R. Meinertzhagen and Mr. G. B. Thompson taken off *Mustela nivalis*, Woolwich, England and unknown locality (probably England).

*T. mustelae* (Schrank) can be distinguished from *T. dubius* Nitzsch as follows:—

In the female of *T. mustelae* (Fig. 1) the setae on the lateral margins of the tergites are shorter and less numerous than in *T.*

*dubius* (Fig. 3); also the chaetotaxy of the sternites is slightly different, and the plate on the apical sternite is pointed and extends further backwards in *T. mustelae* than in *T. dubius*.

The male of *T. mustelae* (Fig. 2) can also be distinguished from the male of *T. dubius* (Fig. 4) by the chaetotaxy and plates on the apical tergites and sternites. In the former species the admedian setae on the tergites are larger and stouter than in *dubius*, and on the sternites the setae are less numerous. The plate on the seventh tergite is smaller than that in *T. dubius*, and *T. dubius* has a well developed genital plate which is absent in *T. mustelae*.

The head and thorax are the same in both species. The male genitalia are very weakly developed, and are therefore of no specific importance.

TRICHODECTES DUBIUS Nitzsch.\*

(Figs. 3 and 4).

*Trichodectes dubius* Nitzsch in Denny, *Mon. Anoplur. Brit.* p. 190, pl. 17, f. 2 (1842). Part.

*Trichodectes pusillus* Nitzsch in Giebel, *Zeit. f. ges. Naturw.*, XVIII, p. 88 (1861). Part; Giebel, *Insecta Epizoa*, p. 55 (1874). Part.

*Trichodectes retusus* Piaget, *Les Pédiculines*, p. 387 (1880). Part.

This species is closely related to the preceding species, and the two have been confused, as has been pointed out under *T. mustelae*. Specimens have been received through the kindness of both Colonel R. Meinertzhagen and Mr. G. B. Thompson taken off *Mustela erminea* in Suffolk, England, and Rosenheim, Bavaria.

TRICHODECTES RETUSUS Nitzsch.

*Trichodectes retusus* Nitzsch, in Burmeister, *Handb. der Ent.* II, ii, 436 (1838); Giebel, *Insecta Epizoa*, p. 55, pl. 3, f. 4 (1874); Piaget, *Les Pédiculines*, p. 387 (1880). Part.

This is a doubtful species as was explained under *T. mustelae*. Giebel's figure is not sufficiently good to enable me to separate it from either *T. mustelae* or *T. dubius*. The type host is *Mustela foina*.

Genus PROCAVICOLA Bedford.

PROCAVICOLA NEUMANNI (Stobbe).

*Trichodectes univirgatus* var. *neumanni* Stobbe, *Ent. Rundschau* XXX, p. 112 (1913).

*Additional record*: Specimens taken off *Heterohyrae Brucei* *Brucei* (Gray). Umi Rocks, on east bank of the Nile in East Madi, Uganda (coll. G. H. E. Hopkins).

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\*This name cannot stand as applying to the parasite of *Mustela erminea*, for *dubius* Nitzsch dates from 1818 as a synonym of *mustelae* Schrank and invalidates *dubius* Denny, 1842. I hope to deal with this matter in a forthcoming publication. (G. H. E. Hopkins.)

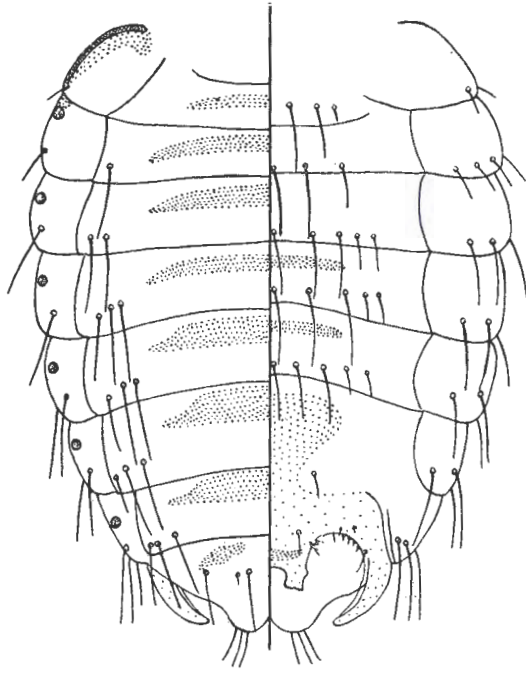


Fig. 3.—*Trichodectes dubius*, Nitzsch. ♀.

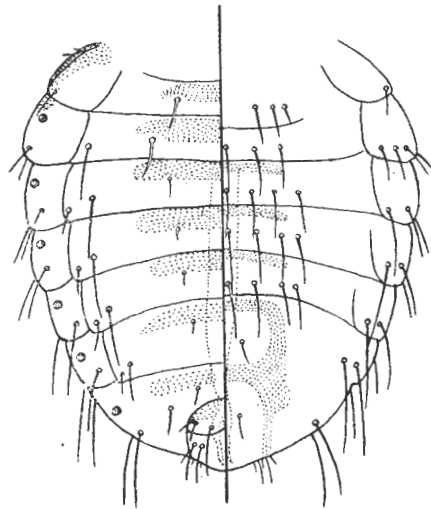


Fig. 4.—*Trichodectes dubius*, Nitzsch. ♂.

*PROCAVICOLA LOPESI* sp. nov.

(Figs. 5 and 6).

Males and females taken off *Procavia lopesi* Thos. and Wrough., Umi Rocks, on east bank of the Nile in East Madi, Uganda (coll. G. H. E. Hopkins). *Holotype* a male.

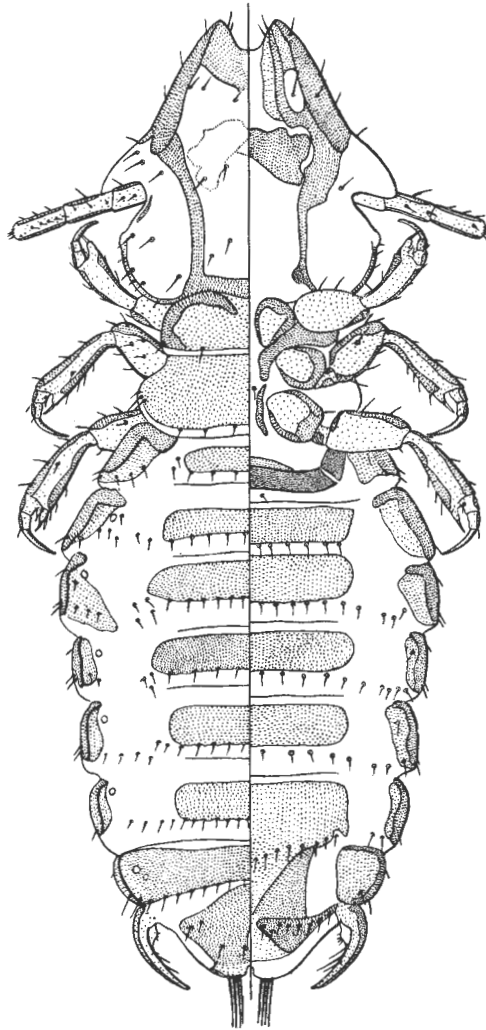


Fig. 5.—*Procavicola lopesi* sp. nov. ♀.

This species belongs to the *sternatus* group and can be distinguished by the head being narrower in proportion to its length, especially in the male, than in the other species; also by the male genitalia and the shape of the plates on the apical sternites of the female (Fig. 5). Male genitalia with the basal plate long and slender, constricted in the middle; parameres very short; endomeres very long and slender; no spines on preputial sac.



The male closely resembles *P. pretoriensis* Bedford in having the abdomen pointed posteriorly and the transverse plate on tergite vii is interrupted in the middle; paratergal plates vi and vii are very weakly developed, whereas in the male of *P. pretoriensis* they are well developed.

*Male*: Length, 1.36 mm.; head,  $0.4 \times 0.33$  mm.

*Female*: Length, 1.64 mm.; head,  $0.47 \times 0.43$  mm.

*PROCAVICOLA FURCA* sp. nov.

(Fig. 7).

Males taken off *Procapia* sp., Kastol Nek, Transvaal, 25th January, 1925 (Transvaal Museum No. 1324).

This species belongs to the *sternatus* group and can be distinguished by the male genitalia. The basal plate is broadcast in the middle and very narrow posteriorly; anteriorly it is forked. The only other known species having the basal plate forked in front is *P. mokeetsi* nov. sp.; the parameres are very short, and the endomeres are united anteriorly; in all other known species they are separated; above each endomere is a very small sclerite; preputial sac without spines. Paratergal plates on segments i-vi well developed; tergite vii with a transverse plate which is shorter than in *P. neumanni*.

*Male*: Length, 1.19 mm.; head,  $0.37 \times 0.36$  mm.

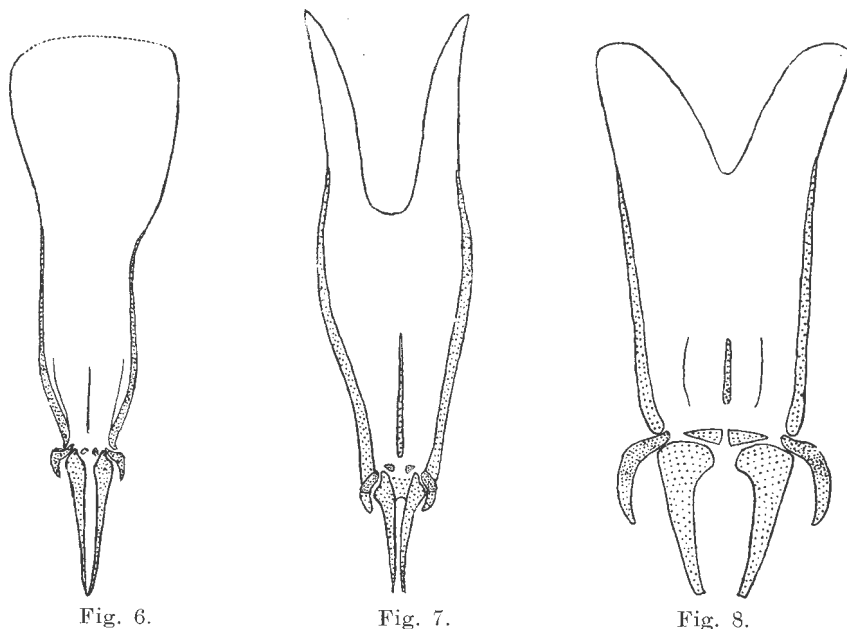


Fig. 6.

Fig. 7.

Fig. 8.

Fig. 6.—*Procavicola lopesi* sp. nov. ♂ genitalia.

Fig. 7.—*Procavicola furca* sp. nov. ♂ genitalia.

Fig. 8.—*Procavicola mokeetsi* sp. nov. ♂ genitalia.

PROCAVICOLA MOKEETSI sp. nov.

(Fig. 8).

Males and females taken off *Procavia* sp., Mokeetsi, N.E. Transvaal, 22nd February, 1922 (Transvaal Museum No. 3275). *Holotype* a male.

This species also belongs to the *sternatus* group, and can be easily distinguished by the male genitalia. The basal plate is broad and sub-parallel, except in front where it broadens slightly and is forked; the parameres are long and curved, and the endomeres are broad anteriorly and blunt at their apices; above each is a small transverse sclerite; preputial sac beset with minute spines and a few larger ones. *P. neumanni* (Stobbe) and *P. emarginata* (Bedford) are the only other species known belonging to the *sternatus* group that possess both minute and larger spines on the preputial sac. Male with paratergal plates on segments i-viii well developed and tergite vii with a short transverse plate. The plates on the apical sternites of the female are similar to those of *P. lopesi*.

*Male*: Length, 1.65 mm.; head, 0.45 × 0.43 mm.

*Female*: Length, 1.68 mm.; head, 0.49 × 0.49 mm.

Genus DASYONYX Bedford.

DASYONYX MINOR sp. nov.

(Fig. 9).

Two females taken off *Procavia* sp., Kastol Nek, Transvaal, 25th January, 1925 (Transvaal Museum No. 1324).

This species belongs to the *validusa* group, and is closely related to *D. oculus* Bedford, *D. ovalis* Bedford and *D. windhuki* Bedford. From *D. ovalis* it can be distinguished by the shape of the sclerites on the forehead and the plates on the apical sternites; from *D. oculus* by the sclerites on the forehead, and from *D. windhuki* by its small size and plate on sternite vii, which is similar to the female of *D. waterbergensis* Bedford. The antennae are four-jointed. In the female of *D. windhuki* the third segment is partly divided near its apex, making a rudimentary fifth segment, and in *D. ovalis* this segment is slightly more developed, but hardly sufficiently so that the antennae can be said to be five jointed.

*Female*: Length, 0.82 mm.; head, 0.2 × 0.24 mm.

DASYONYX VALIDUS Bedford.

*Dasyonyx validus* Bedford, *Proc. Zool. Soc. Lond.*, p. 721 (1932).

*Additional record*: Specimens taken off *Heterohyrax brucei* (Gray), Umi Rocks on east bank of the Nile in East Madi, Uganda (coll. G. H. E. Hopkins).

DASYONYX NAIROBIENSIS Bedford.

*Dasyonyx nairobiensis* Bedford, *Onderstepoort Jour. Vet. Sci. and Anim. Indust.*, VII, i, p. 38, f. 8-9 (1936).

*Additional record:* Specimens taken off *Procavia lopesi* Thos. and Wrough., Umi Rocks on east bank of the Nile in East Madi, Uganda (coll. G. H. E. Hopkins).

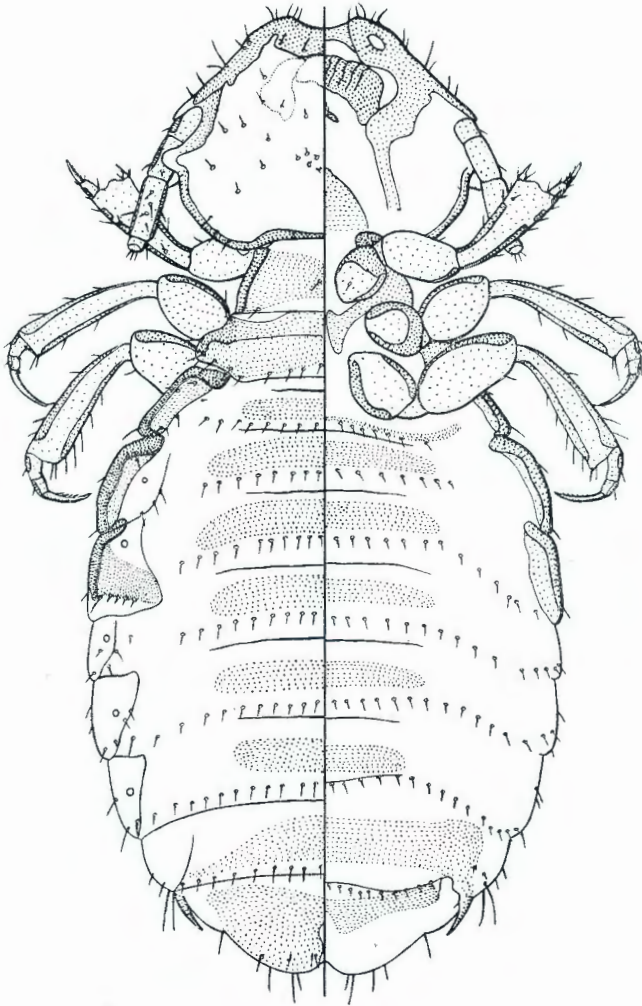


Fig. 9.—*Dasynoyx minor* sp. nov. ♀.

Genus PROCAVIPHILUS Bedford.

PROCAVIPHILUS GRANULOIDES sp. nov.

(Fig. 10).

Males and females taken off *Heterohyrax brucei brucei* (Gray), Umi Rocks on east bank of the Nile in East Madi, Uganda (coll. G. H. E. Hopkins). *Holotype* a male.

This species is closely related to *P. ferrisi* Bedford (= *P. serraticus* Ferris, 1930, *nec* Hill, 1922) and *P. robertsi* (Bedford), both of which were recorded taken off species of *Heterohyrax*. It appears to be intermediate between these species and *P. granulatus* (Ferris) recorded from species of *Dendrohyrax*. From *P. granulatus* the female can be distinguished by the head, which is symmetrical, and the margin of the vulva is not toothed. From *P. ferrisi* and *P. robertsi* both sexes can be distinguished by the granulations, which are more distinct on the head and also present on the abdomen. The temples of the females resemble those of *P. ferrisi*, and project backwards more than they do in *P. robertsi*, and the plate on the apical

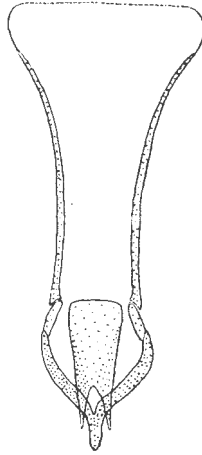


Fig. 10.—*Procaviophilus granuloides* sp. nov. ♂ genitalia.

sternites of the female is also similar to that of *P. ferrisi*, and is quite distinct from the plates on the apical sternites of *P. robertsi*. In the male the plate on tergite viii is divided in the middle as in *P. robertsi*, whereas in *P. ferrisi* it is entire. The male genitalia are very similar to those of *P. ferrisi*, there being slight differences in the pseudo-penis and endomeres. In *P. robertsi* the basal plate is much longer and also narrower, the arms of the pseudo-penis are differently shaped at their bases, and the endomeres are also different. In all these species there are minute spines on the preputial sac.

*Male*: Length, 1.27–1.33 mm.; head, 0.31 × 0.28 mm.

*Female*: Length 1.38 mm.; head 0.35 × 0.31 mm.

#### GENUS BOVICOLA Ewing.

##### BOVICOLA DIMORPHA sp. nov.

(Figs. 11, 12 and 13).

One female, the holotype, was kindly forwarded by Mr. Gordon Thompson taken off a goat at Hangchow, China, 25th May, 1934; also two males and one female sent by Dr. C. Y. Liu taken off a wild

goat in the same locality in 1933. The holotype will be deposited in the British Museum collection, and the allotype will be returned to Dr. Liu.

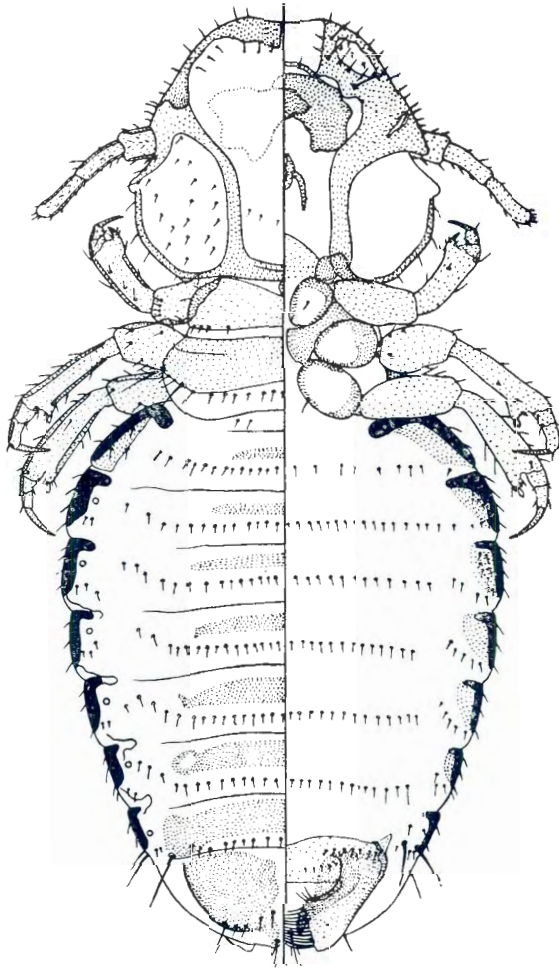


Fig. 11.—*Bovicola dimorpha* sp. nov. ♀.

*Female* (fig. 11); total length, 2.38 mm.; head, 0.66 × 0.75 mm.

Forehead with the anterior margin almost straight; marginal band divided by a narrow pale line in the middle and serrated posteriorly in front. Temples with very small processes on the posterior margins as in *B. thompsoni*. Antennae with the second and third segments sub-equal, slightly longer and narrower than the basal joint.

Abdomen with pale brown plates; tergites i-vii each with a median transverse plate and a single row of short setae; on the apical tergite there is a plate with five setae on each side; sternites also with a row of short setae, but transverse plates are apparently absent except on the apical segment; paratergal plates well developed.

*Male* (figs. 12, 13): Total length, 2.01–2.29 mm.; head, 0.57 × 0.71 mm.

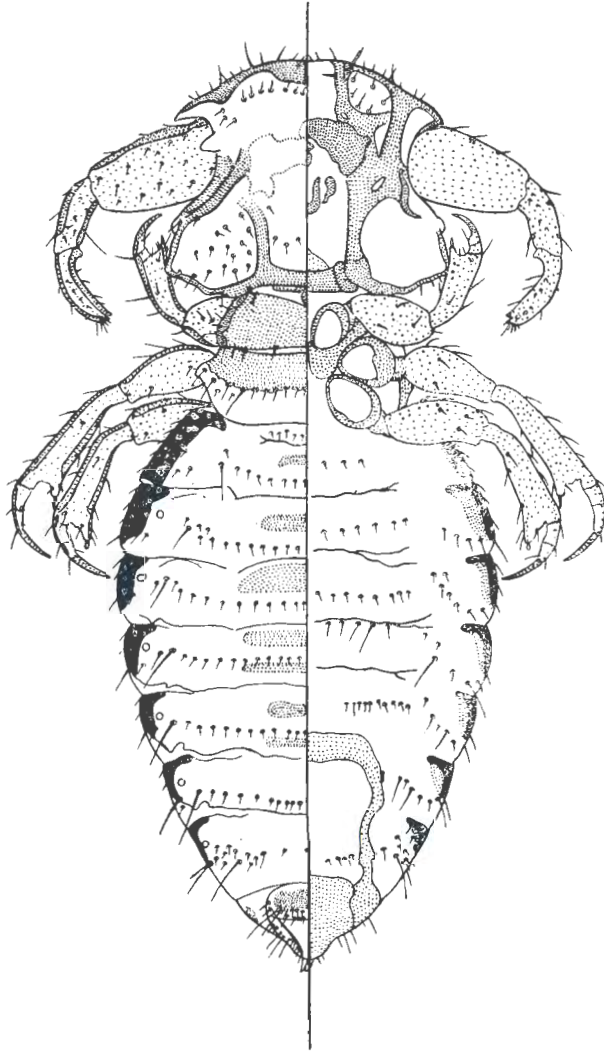


Fig. 12.—*Bovicola dimorpha* sp. nov. ♂.

The head is very different to that of the female, the forehead is much shorter, and the temples project laterally, terminating in a small process; similar processes are also present on the posterior

margins of the temples as in the female. Antennae with the first segment dilated, the third segment is elongated, being slightly longer than the second, with a small process on its inner margin at the base and two spines at the apex.

Abdomen with pale brown plates; tergites i-iii each with a single, narrow, short transverse plate; tergites iv-v each with two transverse plates; tergites vi-vii with a row of setae only; tergite viii with a small median plate and a batch of short setae beneath it; tergite i with two rows of short setae; the remainder, except the last, each with a single row of short setae. There appear to be no plates on the sternites except the genital plate, which is well developed; each sternite with a single row of setae.

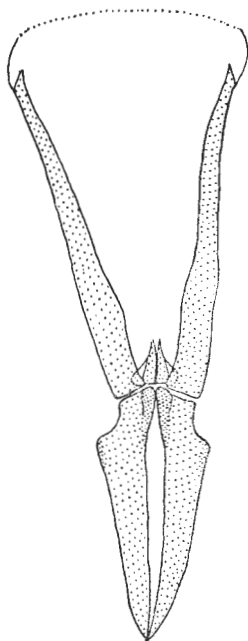


Fig. 13.—*Bovicola dimorpha* sp. nov. ♂ genitalia.

Genitalia with the basal plate gradually narrowing posteriorly; parameres well developed; preputial sac with minute to medium-sized spines.

In this species the sexes are dimorphic. It is closely related to *B. thompsoni* Bedford, described from females only, taken off *Nemorrhædus sumatraensis*, an animal considered to be intermediate between the goats and antelopes. From *B. thompsoni* the female can be distinguished by its larger size, the shape of the forehead, which is concave in front in *B. thompsoni*; also by the transverse plates on the sixth and seventh tergites, the plates on the apical sternite, and the gonopophyses.

Genus EUTRICHOPHILUS Mjöberg.

EUTRICHOPHILUS MAXIMUS sp. nov.

Female taken off *Coendu rothschildi* Thos., Gamboa, Canal Zone, 15th May, 1932 (coll. L. H. Dunn).

*Female* (Fig. 14): Total length, 2.8 mm.; head, 0.75 (median line), 0.84 (to temples)  $\times$  0.89 mm.

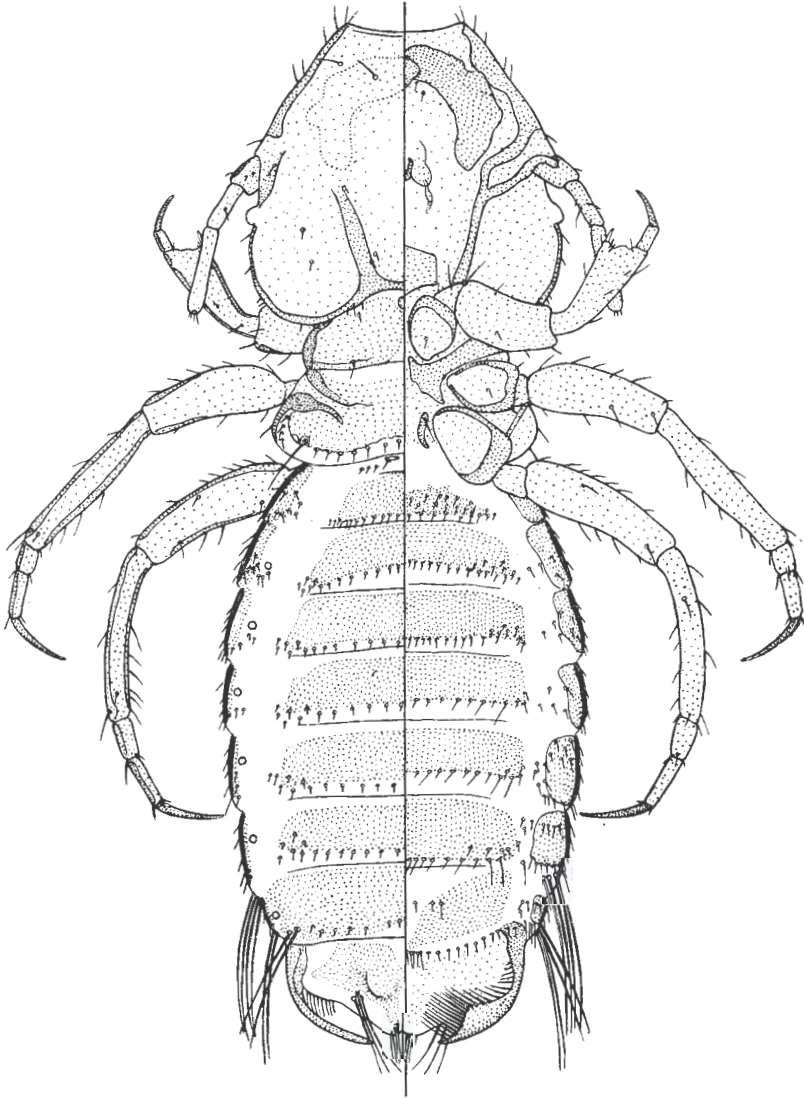


Fig. 14.—*Eutrichophilus maximus* sp. nov. ♀.



Forehead broad in front with the anterior margin slightly concave; temporal bands well developed, and similar bands also present on venter. Antennae three-jointed, the first segment the shortest, the third about twice as long as the second. Mandibles well developed, situated well forward.

Mid and hind legs very long and slender.

Abdomen elongate-oval; tergites i-vii and sternites i-vi each with a pale brown transverse plate and a row of setae, the plate on sternite i sparsely clothed with setae, and on tergite vii there are two long setae on each side near the latero-posterior angles; sternite vii with an indistinct plate on each side and three long setae at the latero-posterior angles; on the apical tergite and sternite the plates are interrupted in the middle, the latter by a narrow line. Gonopophyses as shown in Fig. 14. Paratergal plates well developed. Spiracles present on prothorax and tergites ii-vii.

The female can be easily distinguished from the other known species by its large size, the shape of the forehead, which is broader in front than in other species, the mid and hind legs being exceptionally long and slender, the apical tergites and sternites, and also by the gonopophyses. It is closest to *E. cercolabes* Mjöberg, recorded from *Cercolabes prehensilis* and *Cocndu villosus* in Brazil.