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THE TAXONOMY OF THE MALLOPHAGAN FAMILY TRICHODECTIDAE, WITH SPECIAL REFERENCE TO THE NEW WORLD FAUNA

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The mallophagan family Trichodectidae includes those members of the suborder Ischnocera in which the tarsi are one-clawed and the antennae in one or both sexes have either a reduced number of segments or the last two segments greatly reduced in size. The members infest mammals exclusively. They are widely distributed over the world, being best represented in Africa and North America, somewhat poorly represented in South America, and absent in Australia except on introduced domesticated animals.

Prior to 1929 this family contained only four genera, with most of the species included in the type genus. Early in that year the present writer broke up this genus into five genera, creating four new ones. Ferris (1929) has expressed doubt as to the value of such genera. Yet it is of interest to note that since that time another worker, G. A. H. Bedford, has established no less than eight new genera in the Trichodectidae, seven of them being derivatives of the same genus *Trichodectes,* and two of them acknowledged synonyms of two of the writer's genera.

For several years Bedford has been studying the African species of Trichodectidae, and in two papers, one on the Trichodectidae of dassies, or rock rabbits (Bedford, 1932*a*) and one on the Trichodectidae of African Carnivora (Bedford, 1932*b*), has given us a good summary of many, if not most, of the known species occurring in the Ethiopian region. His papers contain valuable discussions of the genera and the generic characters in the family.

The object of the present paper is to continue the consideration of these generic characters, particularly from the standpoint of a study of our American forms, and to allocate species to those genera where such allocations have not yet been made. Also, the synonymy of several species has been considered, and three new American species are described.

GENERIC CHARACTERS IN THE FAMILY TRICHODECTIDAE

The generic characters that have been used most in the family Trichodectidae have been employed in other families of biting lice, with the possible exception of the variation in the number or position of the abdominal spiracles. Notwithstanding the fact that these structures show the greatest variation in number to be found in any family of the order Mallophaga, they seldom have been mentioned either in generic or specific descriptions. This is doubtless because they are usually small and poorly pigmented, and hence are not easily seen except in stained specimens. In order to determine to what degree the different generic characters could be used to show natural groupings, the writer charted five of them for all the genera. This chart cannot be presented here, but a short summary of the results follows:

Abdominal Spiracles: In most genera of the Trichodectidae there are six pairs of abdominal spiracles, which are situated in the segments II–VII. In *Geomydoecus* and *Neotrichodectes* there are no abdominal spiracles, while in *Felicola* and *Suricatoecus* there is a reduced number. In those species in which the number of abdominal spiracles has been reduced there is said to be a varying number. However, in all such species represented in the collection of Trichodectidae in the United States National Museum, the writer has found no variation and no vestigial spiracles. In each species in which the number of spiracles is reduced, there are just three pairs, and they are always situated on segments II–IV. Because the spiracles vary so much in number between the genera, and because of the lack of vestigial spiracles, their number is believed to be the most important generic character in the family Trichodectidae. This character happily is in many instances correlated with others. The loss of spiracles is closely correlated with the reduction in sclerotization of the abdominal exoskeleton, with the loss of paratergal plates, and to some extent with the loss of tergal plates.

Antennal Characters: Antennal characters (Fig. 1) are of two kinds, —those confined to one sex and those common to both sexes. Differences between the antennae of the two sexes have always been used as generic characters in the Mallophaga, but as far as possible they should be used only as characters of secondary importance. The writer has found that some difference between the antennae of the two sexes nearly always exists in the Trichodectidae. In nearly all species examined the first segment in the male is larger, even though very slightly, or it is of a different shape than in the female. Also, when the third segment is not enlarged or curved in the male, it nearly always possesses posterior terminal spines that are not found on the antennae of the female. Where there is a difference in the number of antennal segments between the sexes, this fact should always be given in generic descriptions.

Development of the Hair-Groove (Ventral Median Groove) of the Head: One character that has not received the proper attention is the development of the hair-groove. Its correlated character, however, the development of the anterior median notch of the clypeus (Fig. 1), has received some attention. In most genera of Trichodectidae the ventral surface of the head along the median line has been incurved to form a groove. This is an adaptation to enable the head of the louse to be applied more effectively to a hair of the host. The development of this groove may be correlated with mandibular changes, so that the mandibles and groove working together make an efficient "hold-fast" organ. In some species of *Bovicola* there is no hair-groove, and in no species of this genus does it appear to be well developed. *Eurytrichodectes* (Fig. 1) has a very poorly developed hair-groove. All species of the family examined by the writer which have a broad, deep, anterior, median clypeal notch also have a well-developed hair-groove.

Eyes: The absence of eyes having been observed in the genus *Geomydoecus* (Fig. 1), it appeared worth while to investigate the eyes of all the genera. In no other genus were they found entirely missing, but in the related genus *Neotrichodectes* they were observed to be frequently poorly developed or vestigial. The same was found to be true of *Eutrichophilus.*

Male Genital Armature: The diagramming of the types of male genital armature has been enlightening. Not only are the types many, but the breaks between them are usually very marked and definite. In addition to the movable parts, in some genera, *Trichodectes* for example, there is developed about the genital opening a genital papilla with sclerotized plates. Also ventrally a definite genital area frequently is indicated by a well-sclerotized plate, the genital plate; or, if a genital plate is absent, this area frequently is inclosed laterally by a pair of genital rods. Finally, there may be developed between the posterior ends of these rods a sclerotized piece, which may be called the "posterior genital sclerite."

The movable genital armature of the members of Trichodectidae (Fig. 2) exhibits two peculiarities. One is the development of a movable articulating sclerite between the base of each paramere and the basal plate. It is best represented in some species of the genus *Bovicola,* and doubtless arises as a detachment of a large, posterolateral tubercle of the basal plate, so evident in the genera *Geomydoecus* and *Tricholipeurus.* For this structure R. E. Snodgrass has suggested the name "arthromere" (Fig. 2). The other peculiarity is to be found in the genus *Eutrichophilus.* In this genus a study of a series of species shows that what at first appear to be the parameres (Fig. 2) are in fact the endomeres. In *Eutrichophilus setosus* these endomeres have the position, shape, and exact appearances of the parameres. Yet by comparison with other spe-

cies it is noted that the true parameres are the small lateral basal processes (Fig. 2), and that the styliform endomeres found in some forms have lost their anterior process, have shifted their position laterally so that they articulate with the distal surface of the arthromere, and have become curved and somewhat clasperlike.

To describe the fundamental types of the male genital armature in Trichodectidae would require many pages, as most genera have a distinctive type. Variations in the size, shape, degree of sclerotization, and pigmentation of the different parts of the male genital armature are the most important diagnostic characters for species.

KEY TO THE GENERA OF TRICHODECTIDAE

1. Abdomen with six pairs of spiracles situated on segments II–VII; paratergal plates usually well developed 2
   Abdomen either with less than six pairs of spiracles or with no spiracles; paratergal plates usually not well developed, and sometimes absent .. 11
2. Clypeus without median notch; hair-groove poorly developed or absent; head and parts of body studded with small setae. On ungulates. *Bovicola* Ewing
   Clypeus nearly always with a median notch; hair-groove usually well developed, always present; head seldom studded with small setae 3
3. Antennae of female 3- to 5-segmented; temporal lobes large, sometimes each with a posterior process. On rock rabbits, or members of the family Procaviidae 4
   Antennae of female 3-segmented, or indistinctly 4-segmented; temporal lobes without posterior processes. Not on members of the family Procaviidae 7
4. Head considerably wider than long; temporal lobes each with a conspicuous posterior daggerlike process; female with trabeculae developed into long, ventral, recurved, hooklike processes ..... *Eurytrichodectes* Stobbe
   Head about as wide as long; temporal lobes either without daggerlike processes or these processes greatly reduced 5
5. Forehead triangular, the lateral margins almost straight; temporal bands present; esophageal sclerite present ..... *Procavicola* Bedford
   Forehead not triangular, lateral margins either inwardly or outwardly curved; temporal bands absent 6
6. Claws of legs II and III spinose-serrate on inner margins; esophageal sclerite absent or rudimentary ..... *Dasyonyx* Bedford
   Claws of legs II and III not spinose-serrate; esophageal sclerite well developed ..... *Procaviphilus* Bedford
7. Forehead more or less trapezoidal; hair-groove very large and wide. On ungulates or porcupines 8
   Forehead not trapezoidal; hair-groove very deep but not so broad 9
8. Third antennal segment of female longer than second and frequently more or less divided into two segments by a transverse suture; spiracles not swollen or bulbous; genital armature of male peculiar in that usual position of parameres is taken by styletlike endomeres (Fig. 2) while parameres are greatly reduced and entirely lateral in position. On American porcupines ..... *Eutrichophilus* Mjöberg
   Third antennal segment of female frequently shorter than second and never divided by a transverse suture; spiracles swollen and bulbous. On deer and antelopes ..... *Tricholipeurus* Bedford

9. Forehead triangular, sides about straight 10
Forehead not triangular, male provided with a dorsal genital papilla; parameres free; endomeres poorly developed and somewhat platelike. *Trichodectes* Nitzsch

10. Clypeus with a deep V-shaped median notch (Fig. 1), which is deeper than wide; genital plate present in male and with a large, bilobed, posterior sclerite. On certain ungulates of families Antelopidae and Bovidae. *Damalinia* Mjöberg
Clypeus with a small, shallow median notch; head as broad as long. On aardwolf ..... *Protelicola* Bedford

11. Abdomen with 3 pairs of spiracles situated on segments II–IV* 12
Abdomen without spiracles; paratergal plates reduced in numbers or absent 13

12. Forehead triangular (Fig. 1), median notch present. Occurring in all continents ..... *Felicola* Ewing
Forehead not triangular, without median notch. Occurring only in Africa ..... *Suricatoecus* Bedford

13. Abdominal segments I–III with paratergal plates; eyes absent; first antennal segment of male (Fig. 1) and second of female usually with an appendage; internal sac of male genitalia with hooklike denticles, endomeral plate not bifurcate distally; thoracic spiracles ventrolateral, not visible from above. On rodents of the family Geomyidae. *Geomydoecus* Ewing
All abdominal segments including I–III without, or at most with vestigial, paratergal plates; eyes present but usually degenerate; first antennal segment of male as well as second of female without appendage; endomeral plate ending in a pair of daggerlike processes distally, which serve as guides for the pseudopenis ..... *Neotrichodectes* Ewing

The Genus *Eutrichophilus* Mjöberg (1910), *sensu stricto*

The genus *Eutrichophilus* Mjöberg (1910) originally included species from deer and porcupines. In 1929 Bedford established his genus *Tricholipeurus* for certain species found on antelopes. The deer-infesting species of *Eutrichophilus* should be transferred to *Tricholipeurus*.

The genus *Eutrichophilus* includes the following previously described species, all of which have been previously assigned to it:

Eutrichophilus cercolabes Mjöberg from *Cercolabes prehensilis*.
Eutrichophilus coëndu Stobbe from *Coëndou mexicanus*.
Eutrichophilus cordiceps Mjöberg from *Cercolabes prehensilis*.
Eutrichophilus mexicanus (Rudow) from *Cercolabes mexicanus*.
Eutrichophilus minor Mjöberg from *Cercolabes prehensilis*.
Eutrichophilus setosus (Giebel) from *Erethizon dorsatum*.

These six species come from just half that many type hosts (the generic name *Cercolabes* in this type host list is only a synonym of *Coëndou*), one from northern North America, one from Mexico, and one from South America.

* According to some authors there may be four pairs of spiracles on the abdomen, but the writer has never observed that number on any specimen he has examined.

In the several collections located in Washington there are seven distinct, though rather closely related, species of *Eutrichophilus* which represent specimens taken in various localities scattered from Alaska to Paraguay. Three of these are new, two being here described. The other new species, represented only by two broken females, is not described.

Eutrichophilus lobatus, New Species. (Fig. 2.)

Male: Forehead triangular; median notch small, crescentic. Antennae very large and reaching backward beyond posterior margin of prothorax; first segment about as long as II and III together, broadest at its base and with axis slightly curved; second segment much shorter than third, slightly swollen on inside and with

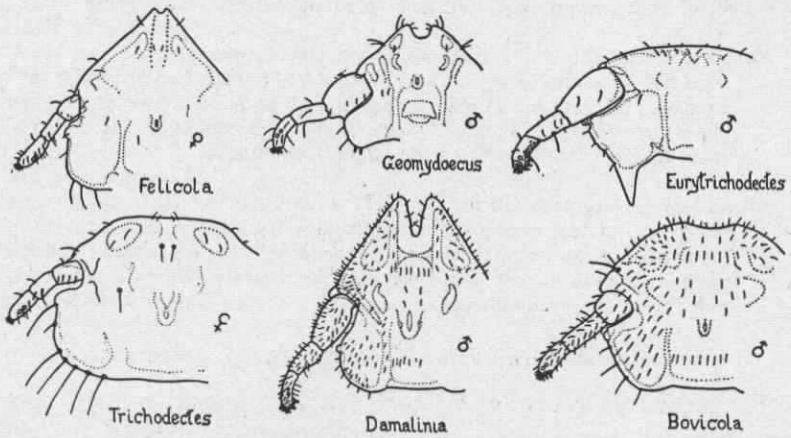

FIG. 1. Heads of the type species of six genera of Trichodectidae (not equally enlarged): *Felicola subrostrata* (Nitzsch), *Geomydoecus geomydis* (Osborn), *Eurytrichodectes paradoxus* Stobbe, *Trichodectes canis* (Degeer), *Damalinia crenelata* (Piaget), *Bovicola caprae* (Gurlt). All views dorsal.

outer margin longer than inner; third segment strongly curved, its terminal spines approximate and each but slightly longer than wide at base. Segment VIII of abdomen distinct from IX and formed into two broadly rounded distal lobes below, each bearing a tuft of long setae; segment IX about two-thirds as broad as VIII, and also bilobed distally. Genital armature (Fig. 2) with broad basal plate, lateral margins of which become much thickened toward distal end for articulation with endomeres and parameres; endomeres separate, stout, slightly curved distally but not hooked, each articulating at its base with inside of projecting thickened lateral margin of basal plate and inside of paramere; parameres short plates, apparently fusing with reduced arthromeres.

Length, 1.79 mm.; width, 0.73 mm.

Female: Head smaller than in male, and forehead not nearly as broad. Segments VIII and IX of abdomen much smaller than in the male and only slightly bilobed. So-called gonapophyses (hair-claspers) simple, curved, well sclerotized, situated laterally to segment VIII.

Length, 1.65 mm.; width, 0.69 mm.

Type host.—*Coendou pruinosus.*

Type locality.—"South America."

Type slide.—U.S.N.M. No. 50060.

Described from one male and one female which were part of a lot consisting of a male, female, and three nymphs taken from the skin of type host (U.S.N.M. 172985) coming from "South America." This species is near *coëndu* Stobbe, but has a broader head, the last two segments of the abdomen differently shaped, and a different genital armature.

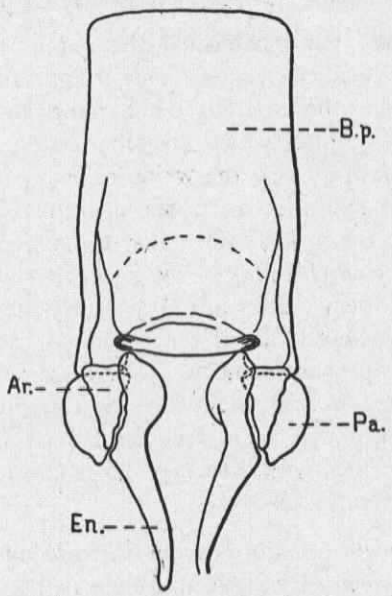

FIG. 2. Ventral view of genital armature of male of *Eutrichophilus lobatus*, new species. *Ar.*, arthromere; *B.p.*, basal plate; *En.*, endomere; *Pa.*, paramere.

Eutrichophilus australis, New Species

Female: Forehead trapezoidal, with a very broad and very shallow anterior median notch. Hair-groove broad and deep, about a third as broad as head. First segment of antenna slightly swollen, about as long as second; second shorter than third; third slightly clavate and bearing the two subequal sense organs on its posterior margin near the apex, each being at a distance equal to about its diameter from the other. Eyes with conspicuous, strongly rounded corneas. Temporal lobes somewhat angulate behind. Thoracic spiracles well developed but concealed from above by the projecting pronotum. Abdomen with sides subparallel; spiracles small, subequal; sixth abdominal segment without, seventh with, lateral tufts of long setae; paratergal plates of eighth abdominal segment very large, freely projecting, cupped and each bearing on its ventral margin a fringe of evenly spaced setae. These paratergal plates doubtless function as gonapophyses. They are movably hinged to the paratergal plates of the seventh segment.

Length, 2.26 mm.; width, 0.74 mm.

Type host.—Coendou villosum.

Type locality.—Sapucay, Paraguay.

Type slide.—U.S.N.M. No. 50061.

Described from two females, taken from skins of type host, collected at type locality. They constitute a part of two lots with data as follows: One female from skin U.S.N.M. No. 115121 and one female and three

nymphs from skin U.S.N.M. No. 115123. This species comes next to *cercolabes* Mjöberg, but differs from Mjöberg's species in having the forehead trapezoidal instead of subtriangular, a much broader hair-groove, and the sides of the abdomen subparallel.

The Genus *Suricatoecus* Bedford (1932)

Bedford (1932*b*) has established the genus *Suricatoecus* for an African species of *Trichodectes* (*T. cooleyi* Bedford) found on a mongoose. In this species the forehead is not triangular; yet there are three pairs of abdominal spirales, which are situated on segments II to IV. Into this genus should go also the writer's *Trichodectes abnormis,* collected from a lemur taken from the east coast of Madagascar. In the original description the writer stated that the abdominal spiracles were missing. By a very careful play of the light through the microscope he has now discovered them. They are very poorly sclerotized and without pigment, but it is believed that if the specimen had been stained they would have shown up conspicuously. These spiracles are on segments II to IV, as in *Suricatoecus.* Since only a single male specimen of *abnormis* was taken, it may be a straggler from some carnivore. The two species of this genus, with their type hosts, are here listed, *abnormis* being transferred from *Trichodectes.*

Suricatoecus cooleyi (Bedford) from *Suricata suricatta hamiltoni.*
Trichodectes abnormis Ewing from *Lemur rufus.*

The Genus *Geomydoecus* Ewing (1929)

This genus is the most modified, from the generalized type of the family, of all the contained genera. The species are blind (Fig. 1), without abdominal spiracles, without tergites, and usually with only the first three pairs of paratergal plates, and some of these may be much reduced. These degenerative changes, however, have been matched by the development of specialized structures. The antennae, for example, are modified more than in any other genus, usually having one or two processes (Fig. 1) in both sexes and strongly adapted for clasping in the male. The male genital armature is very complicated and highly modified, but is exceeded in this respect by those of *Neotrichodectes* and American species of *Tricholipeurus.* The described species of *Geomydoecus* and their type hosts follow:

Trichodectes californicus Chapman (1897) from *Perognathus* sp.
Trichodectes expansus Dugès (1902) from *Geomys* sp.
Geomydoecus geomydis (Osborn) (1891) from *Geomys bursarius.*
Trichodectes scleritus McGregor (1917) from "gopher."
Trichodectes thomomyus McGregor (1917) from *Thomomys* sp.

All species in this list, except the type species, *geomydis,* are here allocated to *Geomydoecus* for the first time, and all but one (probably a straggler) come from that rather aberrant rodent family Geomyidae. A new species is described as follows:

Geomydoecus texanus, New Species

Male: Like male of *geomydis* (Osborn) (Fig. 1) except that first antennal segment has outer margin less arched and is without process, and last antennal segment less curved.

Length, 1.48 mm.; width, 0.75 mm.

Female: Like female of *geomydis* (Osborn) except that anterior median notch is deeper and lateral margins of forehead are more emarginate.

Length, 1.26 mm.; width, 0.68 mm.

Type host.—Geomys personatus fallax.

Type locality.—Corpus Christi Bay, Flour Bluff, Tex.

Type slide (holotype, the male).—U.S.N.M. No. 50062.

Material as follows: Male, female, and three nymphs from type host and type locality, July 22, 1929, by Francis Harper; two females and three nymphs from type host and type locality, July 23, 1929, by Francis Harper; two males, two females, and two nymphs, from *Geomys personatus,* Kinney County, Tex., August 8, 1929, by Francis Harper. This is the only species in the genus in which the antennae of the male have no processes while those of the female do.

Much care should be taken in studying the antennae in species of *Geomydoecus.* If they are not in their usual position, the processes do not show up readily. These structures may always be detected, however, by focusing up and down with the microscope, varying the light intensity at the same time.

In the several collections located in Washington there are about two dozen lots of specimens which doubtless would be regarded by some workers as belonging to Osborn's *geomydis.* Those specimens coming from California, of which there are thirteen lots, show a consistent difference from those of *geomydis* found on its type host, *Geomys bursarius,* in the shape of the first segment of the antennae of the male. In the males from California the posterior process is distinctly thumblike and conspicuous, while the antennal segment itself is but slightly swollen about the base of the process. In the males from *Geomys bursarius* the posterior process is low, not thumblike, and inconspicuous, while the segment iself is expanded about the base of the process. For these reasons the writer believes that Chapman's species is distinct notwithstanding the fact that it has long been regarded as a synonym of *geomydis.*

There are three lots of *Geomydoecus* from the State of Washington at the U. S. National Museum, one from *Thomomys fuscus,* one from *Thomomys douglasi,* and the other representing a single straggler, from a meadow mouse, which agree fairly well with McGregor's type of

thomomyus. In this species the male genital armature is distinctive in that the pseudopenis is absent and the endomeral plate extends far back of the parameral arch.

Dugès' *expansus* was described (Dugès, 1902) as a variety of *geomydis,* differing from the type form, according to its author, in having a broader abdomen, tridentate mandibles, and spines on the posterior lobes of the head of the male. In the U. S. National Museum collection there are four large nymphs which apparently belong to Dugès' *expansus.* An examination of these and of many specimens of *geomydis* shows that two of the differential characters given by Dugès do not hold, since in Osborn's *geomydis* the mandibles, particularly the right one, are tridentate and the temporal lobes (posterior lobes of the head) of the male bear spines (two on each lobe).

Dugès' *expansus,* however, not only is a distinct species but differs from all the others in the great width of its head, which is twice as wide as long. Also, it is decidedly larger than any of the other species.

An examination of the types of McGregor's *scleritus* shows that this species is extremely near Osborn's *geomydis* and may possibly be reduced to either a variety or a synonym of that species. Until the male is found, however, it is best to retain *scleritus* in its present status. The only consistent difference that the writer has found between it and *geomydis* is in the shape of the trabeculae; yet there is some variation in this character. It remains to be seen whether this is correlated with either host or geographical distribution.

The Genus *Neotrichodectes* Ewing (1929)

Neotrichodectes shares with *Geomydoecus* the loss of abdominal sclerites (in some species all of them being gone) and of all the abdominal spiracles. It differs from that genus in possessing eyes, in always having antennae without processes, and in having an endomeral plate (in the male genital armature) that ends in a pair of daggerlike projections distally which serves as guides for the pseudopenis. *Neotrichodectes* and *Geomydoecus* make a natural group in the Trichodectidae. The first-named genus connects this group with the American species of *Trichol*ipeurus on the one hand—the two groups of species have the same type of male genital armature—and with *Felicola* on the other. The connection with *Felicola* is shown through the mongoose-infesting species, *Neotrichodectes helogale,* and the genet-infesting species, *Neotrichodectes genetta.* The first-named species was described under the generic name of *Felicola* and the second under that of *Trichodectes.* Both these species have been recently placed with some hesitation (Bedford, 1932*b*) in *Felicola.* Possibly they should be put into a genus of their own. The following species are here allocated to *Neotrichodectes,* only the type having been previously included:

Trichodectes castoris Osborn from "beaver."
Trichodectes gastrodes Cummings from *Choloepus didactylus.*
Trichodectes genetta Bedford from *Genetta felina ludia.*
Felicola helogale Bedford from *Helogale parvula brunnula.*
Trichodectes interrupto-fasciatus Kellogg and Ferris from *Taxidea taxus* and a "skunk."
Neotrichodectes mephitidis (Packard) from *Mephitis* sp.
Trichodectes mephitidis Osborn from *Spilogale interrupta* and *Mephitis mephitica.*
Trichodectes minutus Paine from *Putorus noveboracensis.*
Trichodectes nasuatis Osborn from *Nasua narica.*
Trichodectes pallidus Paiget from *Nasua fusca.*
Trichodectes thoracicus Osborn from *Bassaris astuta.*

Questionably included are:

Trichodectes barbarae Neumann from *Galictis barbara.*
Trichodectes exilis Nitzsch from *Lutra vulgaris.*
Trichodectes mustelae Schrank from *Mustela vulgaris.*

Synonyms are:

Trichodectes monticolus McGregor = *Trichodectes mephitidis* Osborn, not Packard.
Trichodectes dubius Nitzsch = *Trichodectes mustelae* Schrank.
Trichodectes pusillus Nitzsch = *Trichodectes mustelae* Schrank.

Osborn's *mephitidis,* which is a secondary homonym, may be only a synonym of Packard's *mephitidis.* The latter is not a bird louse at all, as has been assumed by Kellogg and Ferris (1915), but a true trichodectid, as Packard's figure and description clearly show.

These same authors, quite without justification, have placed Paine's *Trichodectes minutus,* which was based on specimens collected by the writer from a weasel in Illinois, as a synonym of Osborn's *mephitidis.* The common louse of the weasel in the eastern part of the United States differs from *mephitidis* in size, in the shape of the temporal lobes and of the first segment of the male antennae, and in other minor points. However, their identification of the California *Trichodectes* on skunks as Osborn's *mephitidis* appears correct, since the types of McGregor's *monticolus,* taken from a California skunk, appear to be no other than *mephitidis.*

The writer has had three specimens of Osborn's type material of *Trichodectes castoris* remounted, one of them being stained. An examination of these specimens shows that the species is a typical *Neotrichodectes,* having no abdominal sclerites, no abdominal spiracles, and

degenerate eyes. It is closely related to *mephitidis* Osborn and *minutus* Paine, differing from the former in having but a slight indication of an anterior median notch to the clypeus and in the shape of the first antennal segment of the male, and from the latter in the shape of the trabeculae and the temporal lobes, which are somewhat angulate behind as in *mephitidis* Osborn. Since this species is typical of those infesting carnivores, its occurrence on a rodent might be suspected of being due to straggling. On several occasions ectoparasites have been sent to the writer from beavers but never a specimen of biting louse.

An examination of seven cotypes of Osborn's *thoracicus* shows that it is closely related to *minutus,* having the temporal lobes devoid of posterior angles, but that it differs from *minutus* in having a deeper anterior median notch, shorter setae in the dorsal row on the first antennal segment of the male, and a much smaller, posterior, marginal, temporal seta which is definitely dorsal in position.

Cummings' *gastrodes,* based on five specimens in poor condition ("the specimens had been attacked by a species of mite"), comes in *Neotrichodectes,* having the genital armature and other characters typical of the genus. Its occurrence on an edentate may have been due to straggling. American edentates are remarkably free from ectoparasites. The writer knows of no well-established case of louse infestation on them, notwithstanding the existence of certain records, which probably apply to stragglers.

The Genus *Trichodectes* Nitzsch (1818), *sensu stricto*

The various recent generic subtractions from *Trichodectes* leave it with eighteen good, or apparently good, species. Fourteen of these come from carnivores and four from monkeys. One of the carnivore-infesting species is found on bears. The present writer has not had the opportunity to examine any of the monkey-infesting species. The bear-infesting species, *Trichodectes pinguis* Nitzsch, has the same type of movable genital armature as the type species of *Trichodectes, T. canis* Degeer, but the paratergal plates do not appear to be typical of this genus.

In the United States there are two species of *Trichodectes* that infest dogs. One of these is the type species, *Trichodectes canis* Degeer, and the other is *Trichodectes floridanus* McGregor (1917). *Trichodectes floridanus* differs from *T. canis* in having a more pronounced anterior median emargination to the clypeus, much larger dorsal tubercles on the head and a thorax with postero-lateral angles to its posterior border. The following specimens of *Trichodectes canis* have been examined and identified: Two males and 1 female from dog, R. W. Wells, Starkeville, N. Y., June 16, 1921 (Bishopp No. 10203); 5 females from dog, Washington, D. C.; 1 female from dog, West Milton, Ohio, June 5, 1933; 2

females from dog, F. C. Bishopp, Fillmore, Ind., September 15, 1930 (Bishopp No. 14727); 5 males, 9 females and 1 nymph, from coyote, S. G. Jewett, Coos County, Ore., December, 1923; 1 male and 2 females from dog, E. B. Marshall, Charlotte, N. C., September 22, 1931 (Bishopp No. 18071); 2 females and 2 nymphs from dog, Y. Hsu, Soochow, China, 1929.

In addition to the types of *Trichodectes floridanus,* a single lot of specimens of this species was examined. Data for the latter follow: Two females from dog, F. Y. S. Moore, McAlester, Okla., 1929.

Two specimens of *Trichodectes canis* taken from a coyote are so close to those taken from dogs that it does not seem advisable to describe them as representing a new variety. They do not show, however, any suggestion of a median anterior clypeal notch, while some of the specimens from dogs show a very slight median anterior emargination. The specimens taken from a dog at Charlotte, N. C., are somewhat intermediate between *canis* and *floridanus,* but nearer the former.

The Genus *Bovicola* Ewing (1929)

The genus *Bovicola* was established in 1929 by the writer for bovine-infesting species of *Trichodectes.* It should be enlarged, temporarily at least, to include all those ungulate-infesting members of the family Trichodectidae remaining in the type genus *Trichodectes* that show closer affinities to this genus than to any of the other more recenty established ones. The three species found on hosts of the family Camelidae, the four on members of the family Equidae, and the one on a species of Suidae apparently are more closely related to the genus *Bovicola* than to *Trichodectes.* Because of the lack of material the writer has not had an opportunity to go into the synonymy of the species of this genus.

That the species of *Bovicola* are related to the rather unusually shaped species of *Damalinia* is shown by their chaetotaxy. In both these genera (Fig. 1) the head is studded with small setae and there is a transverse discal row of setae on the clypeus and also on the epicranium.

The Other Genera of Trichodectidae

There remain eight genera of the Trichodectidae that have not been given any special consideration in this paper. Six of them, *Eurytrichodectes, Procavicola, Dasyonyx, Procaviphilus, Damalinia,* and *Trichodectes,* are African and have been given adequate treatment by Bedford, particularly in his two recent papers (Bedford, 1932*a,* and 1932*b*). The other two, *Tricholipeurus* and *Felicola,* are almost world-wide in their distribution. The former has been dealt with by Bradford (1929) and the latter by the same author (1932*b*).

Literature Cited

Bedford, G. A. H. 1929.—Anoplura (Siphunculata and Mallophaga) from South African Hosts. 15th Ann. Rept. Dir. Vet. Services, Union So. Africa, Dept. Agr., 501–549.

1932*a*.—Trichodectidae (Mallophaga) Parasitic on Procaviidae. Proc. Zool. Soc. Lond., 709–730.

1932*b*.—Trichodectidae (Mallophaga) Found on African Carnivora. Parasitology, 24: 350–364.

Dugès, A. 1902.—*Trichodectes geomydis* Osborn var. *expansus*, Alf. Dug. Mem. Soc. Cient. "Antonio Alzate," 18: 185–195.

Ewing, H. E. 1929.—A Manual of External Parasites, 225 pp. Springfield, Ill.

Ferris, G. F. 1929.—[Review of "A Manual of External Parasites," by H. E. Ewing (1929]. Ent. News, 40: 337–341.

Kellogg, V. L., and Ferris, G. F. 1915.—The Anoplura and Mallophaga of North American Mammals. Stanford Univ., 74 pp.

McGregor, E. A. 1917.—Six New Species of Mallophaga from North American Mammals. Ann. Ent. Soc. Amer., 10: 167–175.

Mjöberg, E. 1910.—Studien über Mallophagen und Anopluren. Ark. f. Zool., 6, N:o 13: 1–296.