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THE TAXONOMY OF THE ANOPLURAN GENUS  
PEDICULUS LINNAEUS.

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In his revision of the American lice of the genus *Pediculus* (Ewing, 1926) the writer pointed out that those species occurring on American monkeys were distinct from those found on man. In fact he created for them a new subgenus, *Parapediculus*, and gave distinguishing characters for it. Since that time many specimens have been taken from American monkeys, through the cooperation of the National Zoological Park. A study of this additional material confirms the findings of the writer in his paper of 1926. It should be stated, however, that in one species observed (apparently an undescribed form) the lateral lobes of the pleural plates are very poorly developed and are present only on pleural plates IV and V.

Last year (1932) material from chimpanzees at the London Zoological Gardens was received. The first lot contained only three specimens, but the characters of these were so striking that a third subgenus was erected (Ewing, 1932) for the species they represented. This subgenus, *Paenipediculus*, was much farther removed from the typical subgenus than *Parapediculus*. The receipt of additional material of the type of *Paenipediculus*, *P. simiae*, and in particular the eggs and first nymphs included in the lot, have enabled the writer to elaborate somewhat on the characters of the subgenus *Paenipediculus*. Since the species of *Pediculus* from New World monkeys constitute a subgenus, the question may be asked: Do those from Old World apes constitute a subgenus?

The present writer is not in a good position to answer this question, as he has seen specimens of only one of the four species involved. However, a review of the literature indicates that only one of these three other species, *Pediculus schäffi* Fahrenholz (see Fahrenholz, 1915), belongs to *Paenipediculus*. This conclusion is reached notwithstanding the claims of Nuttall (1919). He stated, "We have recently encountered this louse

[*P. schäffi*] in the Denny Collection at Oxford . . ." and concluded as follows regarding it: "Judging from the author's figures and measurements he must have indeed examined very few specimens. The only indications he gives that may point to a new species are, (a), the presence of a blunt spur basally on coxa II in ♀ and larva, (b) the very prominent lateral protrusion of the last abdominal segments in a ♀, (c) the more tapering basal end of the egg; his further 'specific' characters may be dismissed as without significance." Nuttall finished his discussion of *Pediculus schäffi* with this statement: "On the evidence at hand, *P. schäffi* must be regarded provisionally as a race of *P. humanus*." It should be stated, however, that there are characters mentioned by Fahrenholz and others that are apparent in the figures he gives which clearly indicate that *Pediculus schäffi* belongs to *Paenipediculus*. As a matter of fact, only one of the six characters given in the original diagnosis of *Paenipediculus* is discussed by Nuttall.

The other two ape-infesting species of *Pediculus* are *P. assimilis* Fahrenholz and *P. friedenthali* Fahrenholz. According to the descriptions and figures given by Fahrenholz these species do not belong to *Paenipediculus*. Could they have been stragglers on their hosts, gibbons, from some other primates? In order to answer this point the writer has searched several scores of study skins representing several species of gibbons without finding as much as a single egg or louse specimen. It would appear to some that this would indicate either that gibbons were not the natural hosts of these species or that they were rare in nature. The writer would hesitate, however, to draw such conclusions.

When the writer described the type of *Paenipediculus*, *P. simiae*, there was little assurance that it actually had the chimpanzee as a natural host. In order to learn more about the conditions of the host previous to the taking of the lice, inquiry was made of Dr. B. V. Wigglesworth, the sender of the first lot of material, to get any data he could supply. He not only obtained such information but forwarded to me the additional material (already mentioned), which was collected by Colonel A. E. Hamerton at the London Zoological Gardens, together with the following note from Colonel Hamerton, who collected the first lot of material:

"The first lice I sent to you were taken from a chimpanzee 'Andrew' that was brought to England from West Africa (Gold Coast) early in the year and was deposited in the 'Zoo' here last July. The lice were found on it a few days after arrival—and they have spread to 2 other chimpanzees that shared its den for a time. I send to you herewith some living and dead specimens from the 'Chimps' that were infected from 'Andrew.' I have not been able to find them on any other primates—though I have not searched all the representatives of this order in our collection. I am unable to say that the chimpanzee is the natural host of the louse. The 2 gorillas will not permit any one to handle them so it is not possible to say whether they harbor *Phthirus gorillae*, but they show no signs of lousiness."

Thus the indications are that the host from which the type of *Paenipediculus* was taken was infested in nature, and that the louse described did in fact belong to the chimpanzee.

Other facts, also, have been brought to bear on the host problem which show conclusively that the louse described is in fact a chimpanzee louse. They are here given:

Several years ago the writer collected eggs from chimpanzee skins in the United States National Museum. He even obtained the fully formed first nymphs from some of these eggs, but because of the lack of more mature individuals, and because little was known at that time in regard to the history of the host individuals from which the eggs were taken, no description of them was made. After publishing the description of *Paenipediculus simiae* the writer began to wonder if these eggs could possibly be those of the described species, but could come to no conclusion, as no eggs of *Paenipediculus simiae* were available for comparison.

Fortunately, however, in this second lot of material sent from the London Zoological Gardens there were some eggs. These were mounted and studied. They proved to be identical with those I had taken previously from chimpanzee skins.

An investigation as to the source of the egg material obtained from the study skins at the National Museum shows that four of the five lots taken came each from the skin of a different individual chimpanzee killed in nature,<sup>1</sup> and one came from a young chimpanzee that had been kept in captivity for about a year in Africa. Thus we have the desired proof that *Paenipediculus simiae* has the chimpanzee as a natural host.

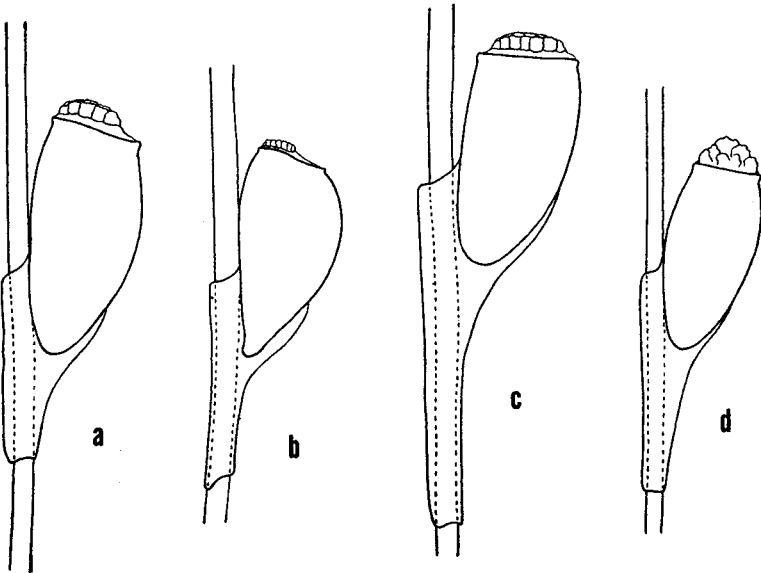


FIG. 1.—Eggs of two man-infesting and two ape-infesting louse species, all drawn to the same scale; a, *Pediculus humanus*; b, *Pediculus* (*Paenipediculus*) *simiae*; c, *Phthirus gorillae*; d, *Phthirus pubis*.

<sup>1</sup>This information was obtained from the records of the collector of the chimpanzee skins, C. R. Aschemeier. Mr. Aschemeier, who is a taxidermist in the United States National Museum, also was interviewed.

*Paenipediculus* was described as a subgenus of *Pediculus* and should be regarded as such. However, an examination of further material representing eggs, first nymphs, other nymphs, and several females necessitates a revision of the generic diagnosis. In the original description of the subgenus it was stated that the first three pairs of pleural plates were absent. However, by clearing a female specimen of the second lot of material with potassium hydroxide and staining in acid fuchsin it was found that each of these pleural plates was represented by a ring of chitin. These vestigial pleural plates do not show up in unstained specimens, as the chitin has little or no natural pigment.

An examination of the legs of the first nymphs shows that the first tarsal claws are long, sharp, and slender; while the second and third tarsal claws are stout and have their tips rounded (Fig. 2, c). This marked difference in the tarsal claws suggests a condition found in the first nymphs of *Phthirus* (Fig. 2, a and b) and possibly indicates a phylogenetic relationship between the Pediculidae and Phthiridae.

In order to show more clearly the differences between the first nymphal instars of some related primate-infesting lice a key is here given to the two species occurring on man, the one species known from the gorilla, and the type of *Paenipediculus* from the chimpanzee.

1. Tarsi and tarsal claws of all the legs of the same size and shape.....  
*Pediculus humanus* Linnaeus.  
Tarsi of anterior legs more slender than the others, tarsal claws of anterior legs much more slender and much sharper than the tarsal claws of the other legs.....2
2. Tarsal claws II and III rounded at their tips, simple, without teeth.....*Paenipediculus simiae* Ewing.  
Tarsal claws II and III pointed at their tips, and provided with teeth.....3
3. Tarsal claw I longer than II and III, with vestigial teeth; tarsal claws II and III very short, but slightly longer than broad and with teeth poorly formed; spine on tibial thumbs II and III stout, conspicuous, and more than one-third as long as claws II and III.....*Phthirus gorillae* Ewing.  
Tarsal claw I not longer than II and III, provided with distinct teeth; tarsal claws II and III slender, over three times as long as broad and each provided with large, tuberclelike teeth; spine on tibial thumbs II and III very short and inconspicuous.....*Phthirus pubis* (Linnaeus.).

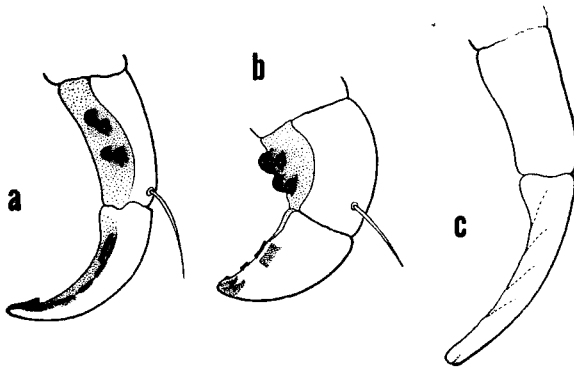


FIG. 2.—Tarsus III, from below, of first nymphal instar of three primate-infesting lice; a, *Phthirus pubis*; b, *Phthirus gorillae*; c, *Pediculus* (*Paenipediculus*) *simiae*. All drawings equally enlarged.

The characters of the eggs (Fig. 1) and of the first nymphs of *Pediculus* certainly have a subgeneric significance. This is particularly true of *Paenipediculus*. If we insert them in a key to the subgenera of *Pediculus* along with the adult characters we get the following:

#### KEY TO THE SUBGENERA OF PEDICULUS.

1. Egg oval, or but very slightly pointed at the base, its greatest length more than twice its greatest diameter. First tarsi and first tarsal claws of first nymph the same as the other tarsi and tarsal claws. Adult females with first pair of legs similar to the others; first three pairs of pleural plates well developed; body clothed with setae.....2
- Egg with base cone shaped, tapering, and middle part inflated, its greatest length about twice its greatest diameter. First tarsi and first tarsal claws of first nymph more slender than the others. Adult females with first pair of legs more slender than the others; first three pairs of pleural plates greatly reduced, being represented by small chitinous rings; body practically naked.....*Paenipediculus* Ewing.
2. Egg frequently somewhat tapering and curved at the base toward attached hair, cement cup with a long extension on hair which may exceed the length of the egg itself. Adults with characters as follows: Some of pleural plates provided with lateral lobes; body setae rather inconspicuous, setiform, and nearly all of them arranged in transverse rows; thoracic spiracles not conspicuous; chitinous parts heavily pigmented. Living on American monkeys.....*Parapediculus* Ewing.
- Egg oval or suboval and seldom curved at the base toward attached hair, about two and a half times as long as broad, cement cup

with short extension on hair which seldom exceeds one-half the length of the egg itself. Adults with characters as follows: None of pleural plates with lateral lobes; body setae conspicuous, frequently peglike, seldom over one-half of them arranged in transverse rows; thoracic spiracles large, conspicuous; chitinous parts frequently poorly pigmented. Living on man and gibbons.....*Pediculus* Linnaeus.

The different varieties of *Pediculus humanus* Linnaeus and apparently the two species described by Fahrenholz from gibbons belong to the typical subgenus. All of the American monkey-infesting species are included in *Parapediculus*, while the two lice reported from the chimpanzee belong to *Paenipediculus*. The louse of the gorilla is not a *Pediculus*. The characters of the nymph (first nymph) are typical of *Phthirus*. The valid species and varieties of *Pediculus*, together with their type hosts, are here given.

#### A LIST OF THE KNOWN SPECIES AND VARIETIES OF PEDICULUS.

##### SUBGENUS PEDICULUS LINNAEUS.

- P. humanus humanus* Linnaeus, from white race of man.
- P. humanus corporis* Degeer, from white race of man.
- P. humanus nigritarum* Fabricius, from black race of man.
- P. humanus americanus* Ewing, from red race of man.
- P. humanus angustus* Fahrenholz, from yellow race of man.
- P. assimilis* Fahrenholz, from gibbon, *Hylobates syndactylus*.
- P. friedenthali* Fahrenholz, from gibbon, *Hylobates mülleri*.

##### SUBGENUS PARAPEDICULUS EWING.

- P. lobatus* Fahrenholz, from Schlegel's spider monkey, *Ateles pan.*
- P. atelophilus* Ewing, from grey spider monkey, *Ateles geoffroyi*.
- P. consobrinus* Piaget, from a spider monkey, *Ateles paniscus*.
- P. chapini* Ewing, from a spider monkey, *Ateles ater*.

##### SUBGENUS PAENIPEDICULUS EWING.

- P. schäffi* Fahrenholz, from chimpanzee, *Pan troglodytes*.
- P. simiae* Ewing, from chimpanzee, *Pan* sp.

A long list of synonyms might here be added, but it is not intended to go into the matter of synonymy in this paper. Nuttall (1919) has given a list of synonyms. It should be stated, however, that a more careful study of some of these so-called synonyms may show that they represent good races or subspecies. By all odds the most important taxonomic character in *Pediculus* is the shape of the pleural plates. These have not been critically studied in some of the Old World species. The position and size of the spiracles is another important character that has attracted but little attention from workers in the past.

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