THE CHARACTERS AND PROBABLE HISTORY OF THE HAWAIIAN RAT

BY

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ECTOPARASITES OF SOME POLYNESIAN AND MALAYSIAN RATS OF THE GENUS RATTUS

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Among the various lots of material sent to the United States National Museum in 1920 by the Bernice P. Bishop Museum for examination and study were several of ectoparasites from rats. These were collected from three localities as follows: Popoia Islet, Hawaii; Rosa Island, Samoa; and Fanning Island. In order properly to determine these parasites it became necessary for the writer to study those of related species of Rattus occurring on other islands of the Pacific. In doing so he soon sensed a problem in distribution and island species formation of considerable magnitude,—a problem the solution of which would require many years. This problem of the distribution of the ectoparasites, however, rests largely on the distribution of the parasite hosts. The distribution of the host species, fortunately, has already received attention. (See p. 3.)

The genus Rattus is a very ancient one, and the representatives found on the larger islands of Malaysia are for the most part supposed to be descendants of ancestral types which inhabited this region before these islands were separated from the continental mainland. The rats found on many of the smaller islands of the Pacific, including those found in Hawaii, were probably introduced by the native Polynesians when they colonized these islands. The species of the *concolor* group of the genus Rattus, according to Mr. Gerrit S. Miller, Jr., are very closely related but most of them are based on definite, non-intergrading characters.

The parasites obtained belong to five different species, two of them mites and three sucking lice.

One of the mite species obtained, *Laelaps echidninus* Berlese, is a cosmopolitan form that has been reported from many parts of the world on different rat species. This is the mite that transmits a fatal protozoan disease among domesticated white rats—a disease that is of little consequence among wild rats. This mite was taken from the following:

Rattus sp., Rosa Island, Samoa (Bernice P. Bishop Museum).

Rattus crassus ♂ (U. S. N. M. 145482), Pulo Lamukotan, Borneo.

The other mite taken belongs to the same genus as *echidninus,* but is a much smaller species which is not closely related. This mite was taken from the following hosts:

Rattus sp., Rosa Island, Samoa (Bernice P. Bishop Museum).

Rattus hawaiiensis, Popoia Islet, Hawaii (Bernice P. Bishop Museum). It is described as follows:

Laelaps hawaiiensis New species. (See fig. 7.)

A medium-sized, light brown species. Chelicerae when extended reaching beyond the palpi, chelae unequal and poorly chitinized. Body about two-thirds as broad as long and sparsely clothed with rather long spines. Sternal plate broader than long, anterior margin about straight, posterior margin broadly and evenly concave; anterior sternal spines situated directly on the anterior margin of sternal plate, middle sternal spines situated outside of lines drawn from anterior to posterior spines, posterior sternal spines situated inside of both posterior and lateral margins of sternal plate; all sternal spines subequal. Ventral abdominal plate broader than anal plate and equal to the sternum in width. It is truncate behind and bears four pairs of lateral, marginal, subequal spines. Anal plate subtriangular with almost equal sides; anal opening longer than broad and situated about two-thirds its greatest diameter from the anterior margin of anal plate; paired anal setae smaller than median anal seta and situated at the level of the posterior margin of the anus; median anal seta situated at the tip of anal plate. Legs short and stout; first and second pairs of equal stoutness, but first pair slightly longer than second; third and fourth pairs of legs equally stout but the fourth pair the longer. Length, 0.59 mm.; width, 0.36 mm.

Type host and type locality: *Rattus hawaiiensis,* Popoia Islet, Oahu island, Hawaii.

Type material: several specimens, Bernice P. Bishop Museum.

The description is based on female specimens in the type lot. A male found in this lot has the chelicerae like those of the genus Liponyssus and may not belong to this species.

The three species of sucking lice found, to which should be added one previously reported by Ferris from Lankavi Island, Malay Straits, are as follows:

Polyplax n. sp.

Hoplopleura, two n. sp.

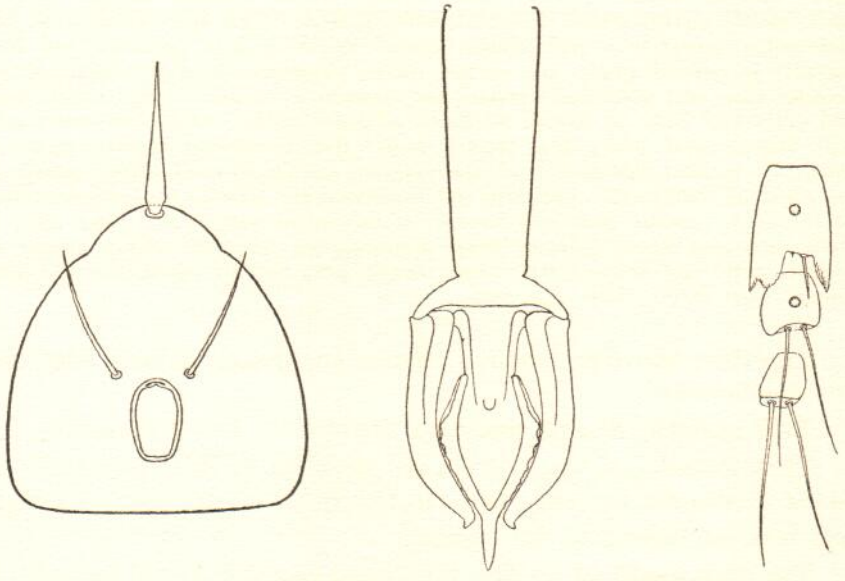
Hoplopleura malaysiana Ferris.

Rats, not only of the genus Rattus but of other genera, are commonly parasitized by two groups of sucking lice represented by the comprehensive genera Polyplax and Hoplopleura. Both of these genera are very large and their species are found on Murid hosts from nearly all parts of the world. The single Polyplax species taken was obtained from a skin of *Rattus surdus* collected in West Sumatra, and now in the United States National Museum.

Of the Hoplopleura species, *H. malaysiana* Ferris had been described by Ferris (1921) from *Rattus vociferans lancavensis* taken at Lankavi

Island, Malay Straits. A paratype of this species, which was taken from a skin in the United States National Museum, has been examined by the writer. It is a rather unusual species in that it lacks the lateral lobes and large divergent spines on the articulating sternal plate of the third abdominal segment. Only a single record exists for this species.

One of the other species of Hoplopleura was obtained only from *Rattus chalcis* (U. S. N. M. 145778) collected at Baguio, Luzon, Philip-



a *b* *c*

FIGURE 1.—*a*, Anal plate of *Laelaps hawaiiensis*, new species; *b*, dorsal view of genital armature of male of *Hoplopleura pacifica*, new species; *c*, dorsal view of last three pleural plates of left side of abdomen of female of *Holopleura pacifica*, new species.

pine Islands. This species is related to the very cosmopolitan *H. affinis* (Burm.). It will be described in a more comprehensive paper to be published by the United States National Museum.

The remaining speceis of Hoplopleura, also new, was found on several Rattus species. It is described as follows:

Hoplopleura pacifica New species. (See fig. 1.)

Female.—First segment of antenna as broad as long; second segment enlarged distally, considerably longer than first segment and much longer than broad. Large dorsal seta of head about as long as head is wide and just inside of this large

pair of setae is a minute pair, each member of which is situated slightly less than its length directly inward from the large seta. Typical pleural plates of abdomen large, longer than broad and with large posterior lobes flanking deep squarish emargination. Each of posterior lobes of typical pleural plates with concave posterior emargination and serrate edges; outer corners of lobes acute, inner rounded. Dorsal seta of each typical pleural plate, very minute; ventral seta conspicuous, about as long as the posterior lobes themeslves. Pleural plate I over half as long as II; II with subequal, slightly curved posterior lobes and with setae considerably exceeding lobes; III similar to typical pleural plates, but narrower and with shallower posterior squarish emargination and with both setae longer than posterior

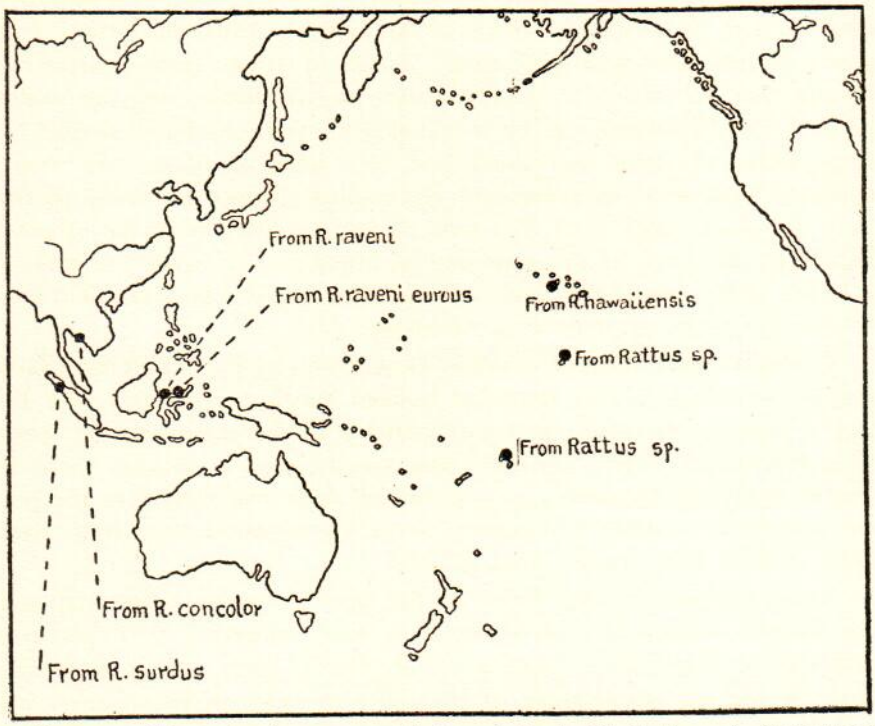


FIGURE 2.—Map showing geographical and host distribution of *Hoplopleura pacifica,* new species. Large dots indicate locality records.

lobes and subequal; V-VI, typical; VII without ventral posterior lobe and with only a slight development of dorsal posterior lobe, plate about as long as broad with centrally placed, large spiracular opening and with two long, subequal setae about twice as long as the plate itself; VIII smaller than VII and without a vestige of either posterior lobe, longer than broad, without spiracular opening and with two long, subequal setae, slightly exceeding those of VII in length. Sternum with long posterior extension, the sides of which are divergent. Length, 1.20 mm.; width, 0.45 mm.

Male.—Basal plate of genital armature very long and with sides almost parallel; at the distal end the basal plate expands into a broad Y. Parameres stout, long, curved and each ending in a stumpy, outwardly curved hook. Dilator with endo-

meres articulating proximally with bases of parameres, and with teleomeres united distally and continued as a spine-like pseudopenis. Outer margin of teleomeres irregularly serrate. Length of male, 0.87 mm.; width, 0.38 mm.

Type host and type locality: *Rattus hawaiiensis,* Hawaiian islands.

Type material: a slide of specimens, Bernice P. Bishop Museum.

Description based on type material consisting of seven females and five males.

The distribution of *Hoplopleura pacifica,* new species, is indicated in figure 2. It was found to occur on at least six different forms of the genus Rattus and possibly seven. Some of these hosts, particularly *R. concolor, R. raveni, R. raveni eurous* and *R. hawaiiensis* are said to be very closely related, yet by mammalogists are considered distinct. A large series of louse individuals and lots were obtained. At first it appeared that some of these lots represented distinct varieties, particularly did those taken from *R. raveni* appear to differ from the others in regard to the detail of the male genital armature. However, a study of a larger series from other hosts showed that these differences fell easily within the range of individual variation.

The occurrence then of a single louse form on these different Rattus species over such a wide range of isolated localities illustrates well Kellogg's principle in regard to the occurrence of the same parasite species on different and widely separated host species, that is, in such cases the species should be considered as one handed down unchanged to the present specifically distinct host species from the ancestral type from which these distinct host species were evolved.

As an explanatory hypothesis for the lack of specific differentiation of the parasite species in such cases, it is here suggested, with particular reference to *Hoplopleura pacifica* and its Rattus hosts, that a great similarity in the fur environment of the different host species, coupled with a remarkable stability of the germ plasm in the particular strain of parasites involved, have been chiefly responsible for the conditions obtaining.