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# ECTOPARASITES OF MARQUESAN RATS\*

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## INTRODUCTION

Several collections of ectoparasites from rats were made in the Marquesas by members of the Pacific Entomological Survey. At the time of this writing the identity of the rats has not been established, and the host must here be recorded merely as a species of *Rattus*. Of the parasites, which include five species, one sucking louse is found commonly on the domestic rats (*R. rattus* and *R. norvegicus*), and another sucking louse has been known from various rats of the Malayan and East African regions; one species of mite occurs on domestic rats throughout the world, another has been known only from the native rat of Hawaii, and a third is here described as new.

## ORDER ACARINA

### FAMILY PARASITIDAE

#### Genus LAELAPS Koch

The genus *Laelaps*, as generally understood, has recently been divided by Ewing<sup>29</sup> into four genera on grounds that do not impress the writer as at all convincing. Neither of the two species here included in *Laelaps* would be so placed if this subdivision were accepted, but the genus is here retained in its usual significance.

#### **Laelaps echidninus** Berlese.

*Echinolaelaps echidninus* (Berlese): Ewing, Manual of External Parasites, p. 11, 1929.

*Laelaps echidninus* Berlese: Trägårdh, Natural History of Juan Fernandez and Easter Island, 3, p. 616, 1931.

Hivaoa: Atuona, from *Rattus* (field no. R 10), Mumford and Adamson. Hatutu [Hatutaa], from *Rattus* (field no. R 13), LeBronnec and Tauraa. "Marquesas," from *Rattus* (field no. R 15), LeBronnec and Tauraa. A widely distributed species on *Rattus rattus* and *R. norvegicus*.

This species has been so frequently recorded and described that it calls

<sup>29</sup> Ewing, H. E., Manual of external parasites, pp. 11, 184-187, Springfield and Baltimore, 1929.

\* Pacific Entomological Survey Publication I, article 12.

for no special treatment here. Apparently it has been the custom to refer all specimens of *Laelaps* having the posterior border of the genito-ventral shield excavated to fit the anterior border of the anal plate to *L. echidninus*. Trägårdh, however, has departed from this practice and described as a new species, *L. pallidus*, such a form found on *Rattus rattus* on Juan Fernandez. The differences indicated as a basis for the species are very slight, and nothing can be done with the Marquesan specimens except to refer them to *L. echidninus*. Ewing has made this species the type of the genus *Echino-laelaps*.

***Laelaps hawaiiensis* Ewing (fig. 35, a-d).**

*Laelaps hawaiiensis* Ewing: B. P. Bishop Mus., Bull. 14, p. 8, fig. 1, a, 1924.

Hivaoa: Atuona, from *Rattus* (field no. R 10), Mumford and Adamson. Hatutu [Hatutaa], from *Rattus* (field no. R 13), LeBronnec and Tauraa. "Marquesas," from *Rattus* (field Nos. R 14, and R 15), LeBronnec and Tauraa. Previously recorded from *Rattus hawaiiensis*, Oahu, Hawaii.

The description given by Ewing is somewhat inadequate, but the identification of the Marquesan specimens with *L. hawaiiensis* seems reasonably secure. In order to bring the knowledge of the species more nearly into harmony with the excellent work of Hirst on other species of the genus the accompanying notes and figures are presented.

The specimens at hand agree quite closely with the size given by Ewing, about 0.6 mm. for the female. The males are scarcely 0.5 mm. in length. The cheliceral fingers of the female (fig. 35, c) are small and weakly toothed and the seta of the fixed finger is stout and bluntly tipped. At the base of the movable finger is a group of small spines, the presence of which has been utilized by Ewing as a part of the basis for his genera *Geneiadolaelaps* and *Macrolaelaps*. But as these spines are present in *L. echidninus*, in which species Ewing has specifically recorded them as absent, and as they are frequently very difficult to see, they should perhaps not be taken too seriously as generic characters. The dorsal plate is marked by the faintest of transverse lines and reticulations, but apparently lacks such areolations as are present in some species and have been regarded by Vitzthum and Trägårdh as important specific characters. About the posterior margin of the plate is a narrow zone of weaker sclerotization of a different texture. The distribution of the dorsal setae is indicated in the accompanying illustration (fig. 35). The ventral plates are marked only by faint transverse lines. The lateral coxal platelet is very small and somewhat elongate. Spiracular peritreme slender, extending forward to above the middle of the first coxa.

Males (fig. 35) associated with these females and presumably belonging to this species have the cheliceral fingers (fig. 35, *d*) long, slender, and blade-like, and apparently lack the cluster of minute spines at the base of the movable finger. The third coxa alone bears a stout seta, the setae of the other coxae being slender. The dorsal plate is faintly reticulate, and the ventral plate is somewhat more strongly marked with transverse lines.

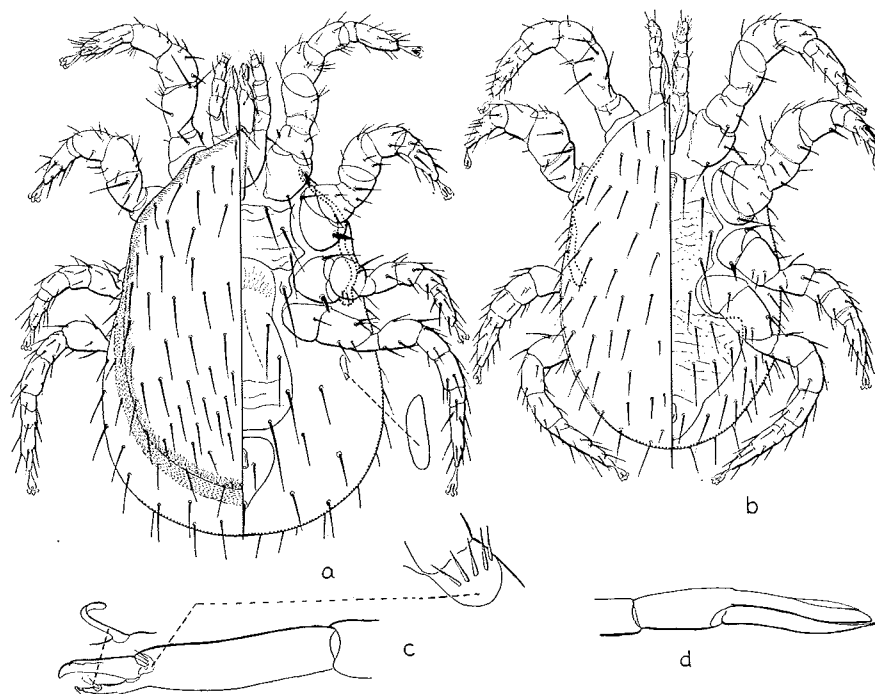


FIGURE 35. *Laelaps hawaiiensis* Ewing: *a*, *b*, male and female; *c*, chelicera of female with details; *d*, chelicera of male.

#### FAMILY LISTROPHORIDAE.

##### Genus LISTROPHOROIDES Hirst

LISTROPHOROIDES Hirst: Zool. Soc. Lond., Proc., p. 999, 1923.

Apparently but a single species, *L. aethiopicus* Hirst, has been referred to this genus. The species here to be dealt with differs from the type rather noticeably in certain respects, but if not referred to *Listrophoroides* it would seem to require a new genus for its reception.

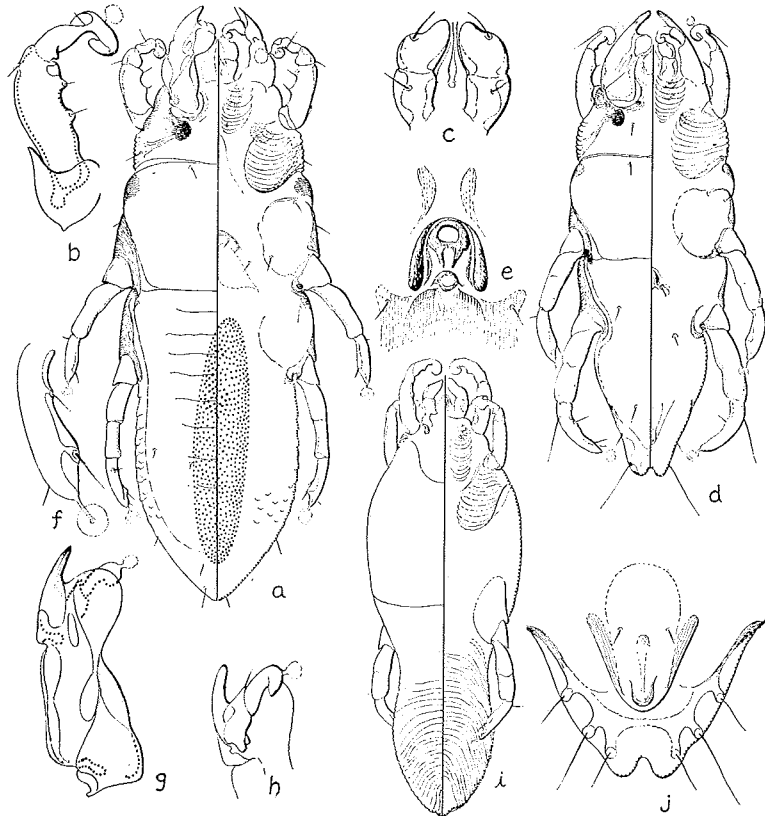
**Listrophoroides expansus**, new species (fig. 36, a-j).

FIGURE 36. *Listrophoroides expansus*, new species: a, female; b, second leg; c, capitulum; d, male; e, genitalic structures of male; f, detail of posterior leg; g, dorsal aspect of first leg; h, ventral aspect of terminal segments of first leg; i, first stage of nymph; j, ventral aspect of abdomen of male.

## Female (fig. 36, a)

Length, 0.4 mm. Body flattened and elongate, slightly sclerotic. Palpi (fig. 36, c) two-segmented, short and stout. First legs (fig. 36, g, h) modified as hair-clasping organs, what is apparently the femur being flattened and expanded and terminating in a conspicuous, acute process on the outer side and a flattened lobe on the inner side, these more or less concealing the very minute terminal segments, the last segment terminating in a hook and bearing a very inconspicuous caruncle. Second legs (fig. 36, b) also somewhat modified, but less strongly so, the apparent femur being long and stout, the succeeding segments small and cylindrical, the apical segment terminating in two lateral anchor-like hooks and bearing a small caruncle. Third and fourth legs but little modified, without claws and with a distinct disc-like caruncle.

Dorsum divided by two transverse furrows, one being just behind the first and one behind the second legs, into three plates. Abdominal tergal plate marked by several transverse furrows; margins of the abdomen slightly serrate. Derm of the ventral side for the most part membranous. The coxae are much flattened and expanded and form a considerable portion of the ventral body wall. Those of the first two legs are marked by very evident transverse ridges and furrows, which in the second legs extend about to the lateral margin of the body. Genital opening a transverse slit bordered anteriorly by a minute crescentic plate and several small setae.

Male (fig. 36, *d*).

Length, 0.34 mm. Closely resembling the female except for the slightly stouter posterior legs and the short conical abdomen. Apex of the abdomen (fig. 36, *j*) slightly bi-lobed and bearing three pairs of small setae, the ventral side with a median, pre-apical papilla. Genital opening between third and fourth coxae, its strongly sclerotic parts having the form shown in fig. 36, *e*.

#### Immature Stages

Apparently four instars, including the adult, are present in the material at hand. The largest immature specimens, which are from 0.37 mm. to 0.4 mm. long and seem certainly to represent the last nymphal stage, differ from the adult female only in lacking the genital structures and in having the abdomen membranous and marked by numerous transverse lines, the legs and thoracic structures being as in the adult. What is apparently the second stage differs from this only in length, being about 0.26 mm. long. What may be assumed to be the first stage, as it is of the same length as eggs contained within the female, is but 0.18 mm. long (fig. 36, *i*). It possesses but three pairs of legs, the first two pairs being alike and resembling the second pair of the other stages. The abdomen is strongly marked with arcuate, transverse lines.

Hivaoa: Atuona, many specimens, male, female, and immature, from *Rattus* (field no. R 10), Mumford and Adamson. Holotype a female.

*Listrophoroides aethiopicus* Hirst was described from the male only. It differs from *L. expansus* conspicuously in the form of the first legs, which are not flattened as in the new species, the two first pairs apparently resembling more nearly the second legs of *L. expansus*. Also in the genotype the coxae of the third legs appear to be provided with strong spurs.

#### Order ANOPLURA

##### Genus HOPLOPLEURA Enderlein

**Hoplopleura oenomydis** Ferris (figs. 37, *a-i*; 38, *a-k*; 39, *a-e*).

*Hoplopleura oenomydis* Ferris, Contributions toward a monograph of the sucking lice: Stanford Univ. Pub., Biol. Sci., 2, pp. 82-84, figs. 47-48, 1921.

*Hoplopleura pacifica* Ewing, B. P. Bishop Mus., Bull. 14, pp. 9-11, fig. 1, *b, c*, 1924.

Hivaoa: Atuona, from *Rattus* (field no. R 10), Mumford and Adamson. Eiao, from *Rattus* (field no. R 12), Adamson. "Marquesas," from *Rattus*

(field nos. R 14, R 15), LeBronnec and Tauraa. In addition, specimens from *Rattus rattus diardi*, Federated Malay States, and from *Rattus norvegicus*, Townsville, Australia, are at hand, and specimens from "Mus sp.," Sumatra, received from the British Museum (Natural History) for identification some years ago and since returned to that institution are to be referred to the same species. Previously recorded by Ferris from *Oenomys hypoxanthus bacchante* (type host), *Dasymys incomptus helukus*, and *Thamnomys surdaster polionopus*, British East Africa; *Limnomys mearnsi* and *Rattus calcis*, Philippine Islands.

The problem of the identity of the species of *Hoplopleura* from Marquesan rats is one of considerable interest, but from the writer's point of view it is by no means as complex as Ewing has indicated. Ewing has described a new species, *Hoplopleura pacifica*, from specimens taken from the Hawaiian rat, *Rattus hawaiiensis*, and has indicated his intention of describing another species which has apparently not actually been named, based upon specimens from *Rattus calcis* in the Philippine Islands. It may be noted that the specimens at hand from *Rattus calcis* are from the same individual animal as those recorded by Ewing, being a part of material taken by the writer from a skin in the United States National Museum and returned to that institution.

It is possible that the question of the name to be applied to a louse from an obscure mammal in an insignificant archipelago is not one that is worthy of extended discussion, for the matter might well be dismissed by the unadorned statement that all the specimens recorded represent the same species. However, the question of distribution is of some interest, and of even more interest is the problem of the methods which should be applied in the systematic work by which alone the question of distribution can be approached. It is largely as a contribution toward the development of such methods in the study of the ectoparasites that the following discussion is presented.

It is the writer's contention that—as far as can be determined by the contemplation of preserved material only—only a single species is involved, and that the conclusions derived by Ewing were neither based upon the examination of adequate material, nor did they include allowance for normal variation or involve comparison of his specimens with the species to which they should properly have been compared.

*Hoplopleura oenomydis* Ferris is one of a group of species that may be regarded as centering about *H. affinis* (Burmeister) and that includes such species as *H. apomydis* Ferris, *H. chrotomydis* Ferris, and *H. malaysiana* Ferris. It is distinguishable from these other species chiefly by the form of the paratergites (pleurites) of the abdomen, the broad dorsal and ventral lobes of the third plate, as well as of the fourth and fifth, the narrow



and acute ventral lobe of the sixth, the absence of an acute and prolonged dorsal lobe in the seventh, the pair of moderately long median setae on the second and third plates, and the minute ventral median seta on the fourth to sixth. The species is thus well enough defined as an entity and is clearly recognizable.

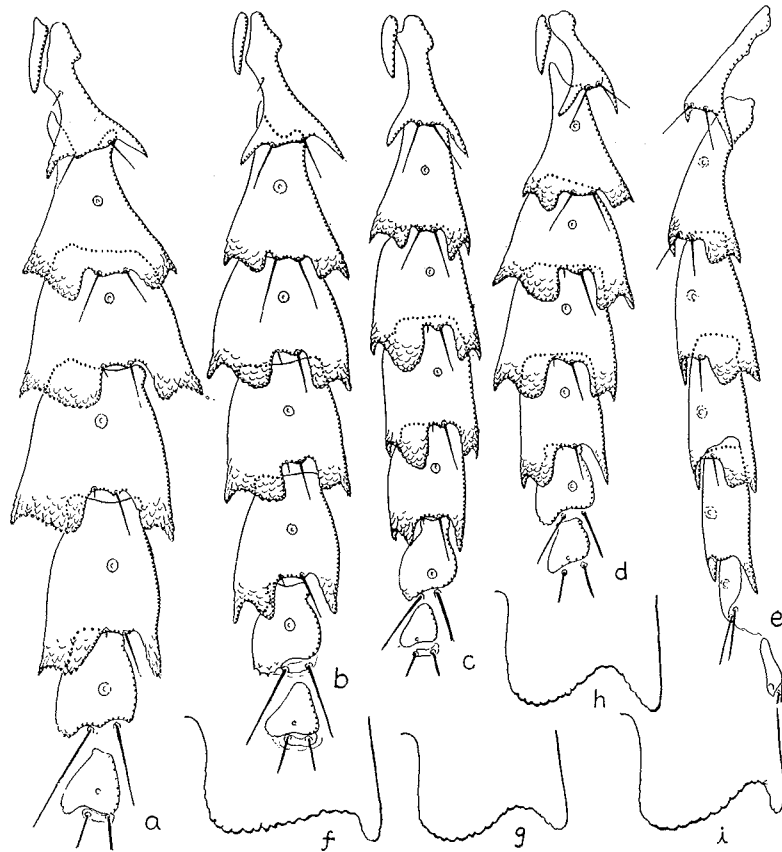


FIGURE 37. *Hoplopleura oenomydis* Ferris. Paratergal plates of females: *a*, from paratype, from *Oenomys hypoxanthus*; *b*, from *Rattus* species, Marquesas; *c*, from *Rattus diardi*, Malay Peninsula; *d*, from *Rattus calcis*, Philippine Islands; *e*, from *Rattus norvegicus*, Townsville, Australia. Posterior margin of dorsal lobe of fifth plate; *f*, of paratype; *g*, *h*, *i*, from Marquesan specimens, showing variation.

The specimens at hand, which are here assigned to *H. oenomydis*, may be compared critically and most easily on the basis of three sets of structures, the paratergal plates, the sternal plate of the thorax, and the genitalia of the male. It is in these structures that bases for specific separation are most commonly to be found in this group.

In attempting a critical comparison of the paratergal plates of a series of closely related forms, difficulty is at once encountered in securing specimens that are directly comparable. The plates should be dissected from the body and flattened out, but the same degree of flattening cannot always be secured, and allowance must be made for this factor. Differences due to it may be detected in figure 37, *a-e*. There exist, however, in the specimens at hand, certain real differences. There is evidently a considerable difference in size, specimens from *Rattus calcis* having these plates noticeably smaller than do specimens from the type host. But as indicated in the figures, the intergradation in size of a series of the plates makes a specific separation on this basis entirely impracticable, even though such differences may be genetically fixed. In actual structure the only apparent differences are to be found in the depth of the secondary lobing of the posterior margin of the plates, but here again (fig. 37, *f-i*) variation and intergradation make the use of such a character impracticable.

Differences are to be found in the form and size of the thoracic sternal plate, but again it is evident that these differences are variable and intergrading, plates from Marquesan specimens (fig. 38, *e, f*) practically duplicating the type form (fig. 38, *a, b*), even though the normal form in the Marquesan specimens (fig. 38, *d*) is more rounded.

The genitalia of the males (fig. 38, *i-k*), while varying in size and minute details, show no differences that are at all significant and that are outside of the range of variation normally to be expected, that are, in fact, even as great as may be found between opposite halves of the same specimen.

In the distribution of the body setae nothing significant can be detected. In the form of the head there are slight variations, but these are not greater than might readily be caused by differences in preparation. The head of the type female, as noted in the original description, is rather noticeably slender, but this apparent difference is not maintained in the male and in specimens from other African hosts, and is closely approached by individual specimens from other sources.

It may very well be that in a species distributed over such a wide geographical area and on different hosts analysis by genetical methods would reveal fixed differences, but until such an analysis has been made there is nothing to be gained by recognizing more than one species in the material at hand. Specimens from the Hawaiian rat are not available, but Ewing's description and figure, together with circumstantial evidence, are sufficient to indicate that it comes within this series.

It may be concluded, then, that in all probability *Hoplopleura oenomydis* is one of those species which are capable of rather ready, even though



erratic, transfer from one host species to another. Its occurrence upon *Rattus norvegicus*, of which it is certainly not a normal parasite, would indicate as much. It may be suspected that it was originally a parasite of some species of *Rattus* in the Malayan region and that it has spread from that center.

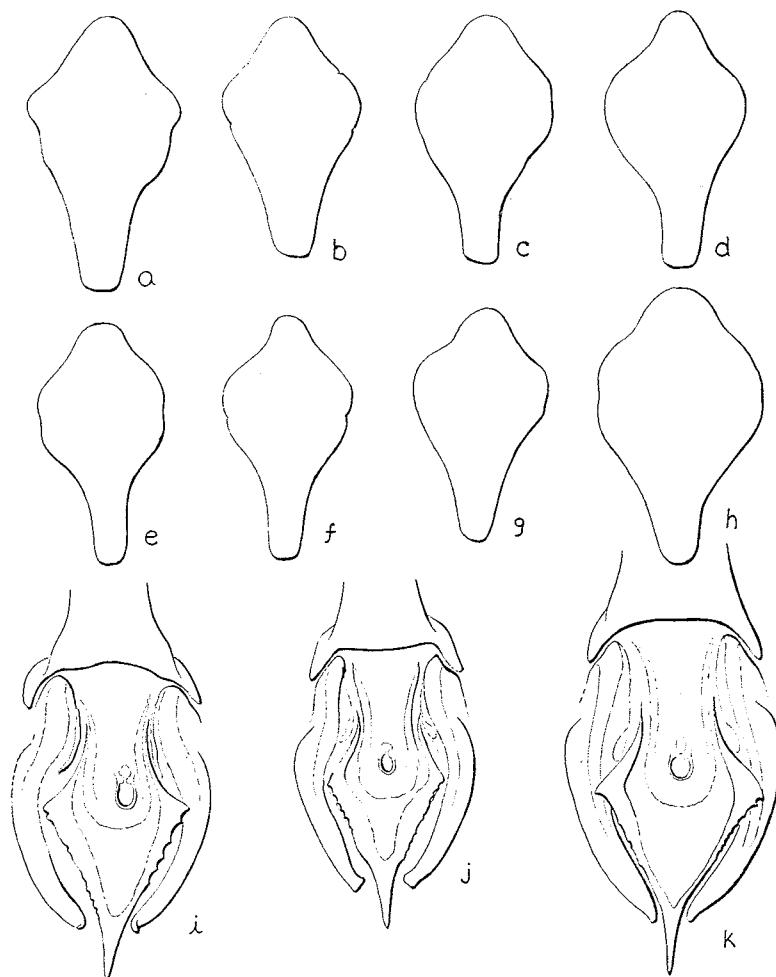


FIGURE 38. *Hoplopleura oenomydis* Ferris. Sternal plates of thorax: a, from the type female; b, from the allotype male; c, from specimen from *Rattus diardi*; d, e, from female from the Marquesas; f, from male from the Marquesas; g, from female from *Rattus calcis*; h, from female from *Rattus norvegicus*, Australia. Genitalia of male: i, from allotype; j, from specimen from the Marquesas; k, from specimen from *Rattus norvegicus*, Australia.

Immature stages are at hand in the Marquesan material and among the specimens from *Rattus diardi*, and eggs are present in the Marquesan material. The immature specimens from different sources agree exactly, a further support for the contention that this is all one species, since the immature forms—as far as known—in this genus appear to differ as sharply as do the adults. The first instar is represented only by an embryo in an egg, and of it nothing can be said except that the abdomen bears a single very long seta at each side near the apex. This seta is not present in more mature nymphs. On the basis of size, two other stages appear to be present; these are similar in structure, the larger being definitely the last nymphal stage

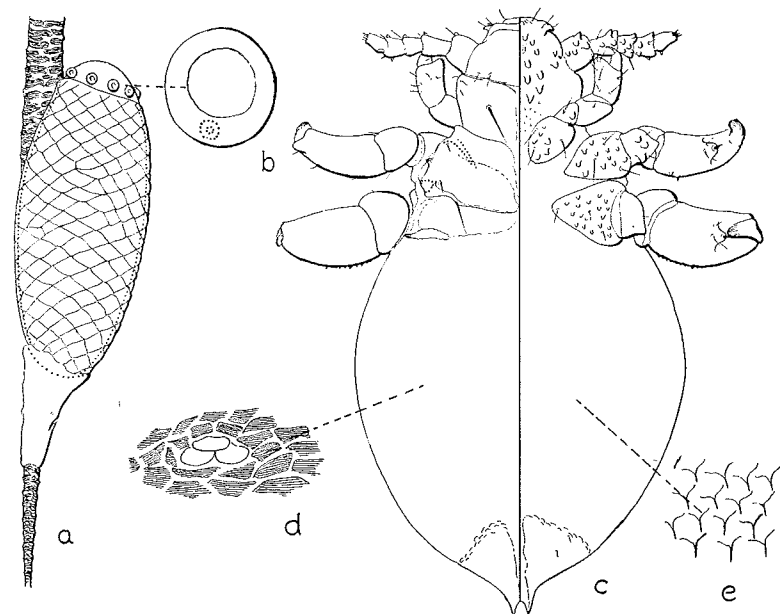


FIGURE 39. *Hoplopleura oenomydis* Ferris: a, egg; b, detail of egg; c, last stage of nymph; d, ornamentation of derm of dorsum; e, ornamentation of derm of venter.

(fig. 39, c). The coxae and the ventral side of the head are beset with numerous small tubercles; the derm of the abdomen is somewhat sclerotic, the sclerotization of the dorsum and the lateral regions of the venter being laid down in a mosaic of minute plates (fig. 39, d). The median region of the venter is thickly beset with minute points (fig. 39, e). The apex of the abdomen is more heavily sclerotic, the mosaic merging into a single plate. Abdominal spiracles can not be detected and none but perhaps the most minute of setae are present.

Little information exists as to the eggs of the sucking lice. Eggs, which

may be assumed to belong to *H. oenomydis*, are at hand. The length of the egg capsule itself is approximately 0.52 mm. The egg (fig. 39, a) is marked by scale-like reticulations. The operculum bears seven or eight tubercles (fig. 39, b), which appear to open into the egg by a minute pore and to the outside by a larger pore.

#### Genus POLYPLAX Enderlein

##### *Polyplax spinulosa* (Burmeister).

*Polyplax spinulosa* (Burmeister): Ferris, Stanford Univ. Pub., Biol. Sci., 2, pp. 187-191, fig. 119, 1923.

Hivaoa: Atuona, from *Rattus* (field no. R 10), 1 male, 1 female, Mumford and Adamson. Recorded previously as a normal parasite of the domestic rats, *Rattus rattus* and *R. norvegicus*, wherever they occur; also recorded from *Rattus calcis*, Philippine Islands, *Rattus stridens*, Malay Peninsula, and from other genera and species of Murine and Microtine rodents.

This species is well enough known to need no further treatment. The Marquesan specimens are entirely typical.