

The Great Basin Naturalist

PUBLISHED AT PROVO, UTAH, BY
BRIGHAM YOUNG UNIVERSITY

VOLUME 32

September 30, 1972

No. 3

ON THE RODENT-INFESTING ANOPLURA OF PANAMA

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ABSTRACT.— The species of Anoplura found on indigenous Panamanian rodents belong to the genera *Hoplopleura* (8 species), *Fahrenheitia* (3 species), *Neohaematopinus* (1 species), and *Polyplax* (1 species). As is the case with the Panamanian rodents, the anopluran fauna contains both Nearctic and Neotropical elements. Two new species of *Hoplopleura* are described: *H. scotinomydis* from *Scotinomys xerampelinus*, and *H. mendezi* from *Oryzomys* sp. (probably *O. alfaroi* or *O. albigularis*). A host-parasite list is included.

Panama, the land bridge between North and South America, has an unusually rich fauna whose study is important to an understanding of the movements and distribution of the animals of both continents, as Fairchild (1966) pointed out in his introduction to *Ectoparasites of Panama*. As well as for its intrinsic value, a study of the Panamanian anopluran fauna can be a useful adjunct to the study of movements and relationships of their mammalian hosts.

A preliminary paper on the Anoplura of Panama was published in *Ectoparasites of Panama* (Wenzel and Johnson, 1966). Since 1966, I have had the opportunity to study the numerous specimens collected during the surveys mentioned in the above volume. The present paper is based on those studies. Species discussed by Wenzel and Johnson, for which there is no additional information, are merely enumerated in the "Host-Parasite List," which is based on the present survey as well as on the records of Wenzel and Johnson. Place names and the species names of mammals mentioned herein may be traced in Fairchild and Handley (1966) and Handley (1966), respectively. The species groups of *Hoplopleura* referred to in this paper are discussed by Johnson (in press).

The holotypes and allotypes of new species, and the majority of other specimens are deposited in the collections of the National Museum of Natural History, Smithsonian Institution, Washington, D.C.

Hoplopleura Enderlein

The *hesperomydis* group.

There are two, perhaps three, Panamanian representatives of this group. All the known species occur on mice of the New

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World tribe, Peromyscini. Characters held in common by members of the *hesperomydis* group are given below:

ADULTS.— Head lacking accessory dorsal seta (ADHS of Kim, 1965). All abdominal setae inserted on posterior margins of sternal and tergal plates; paratergal plates III-VI with two truncate apical lobes; plate III with two large apical setae; plates IV-VI with dorsal apical seta small to minute and ventral one longer, though seldom surpassing apices of apical lobes. Females with two apical lobes on plate VII; aberrant males of described species occasionally with ventral lobe missing or vestigial; this lobe always missing in males of a new species described below. Thoracic sternal plate elongate; posterior apex narrowed, usually acute.

NYPHS.— Lacking abdominal spiracles and paratergal or other abdominal plates. First instar with one terminal abdominal seta on each side; second and third instars with one pair plus one single long terminal seta on each side. All instars with accessory dorsal head seta absent; one of dorsolateral head setae often enlarged (outer sutural head setae of Kim, 1965).

Characters that are too variable to assist greatly in species identification within the *hesperomydis* group are as follows: shape of the male genitalia, which depends on position; placement of setae on the lateral postantennal head margins, which depends to some extent on the amount of flattening during mounting; and shape of the apical lobes and length of setae of the paratergal plates. Shape of the thoracic sternal plate and presence or absence of a definite mesal keel on its posterior apex may be good characters for determination of some species. According to the statistical analysis of Kim et al. (1966), relative length and breadth of the thoracic sternal plate and total body length of the male are reasonably good discriminatory characters for males of two species, *ferrisi* Cook and Beer, and *hesperomydis* (Osborn). However, if a male specimen is not completely extended, measurement of body length is useless, and the reproductive state of a female may make a considerable difference in total length. In most cases, as suggested by Cook and Beer (1959) and Kim (1965), nymphs will be necessary for a definitive study of the *hesperomydis* group.

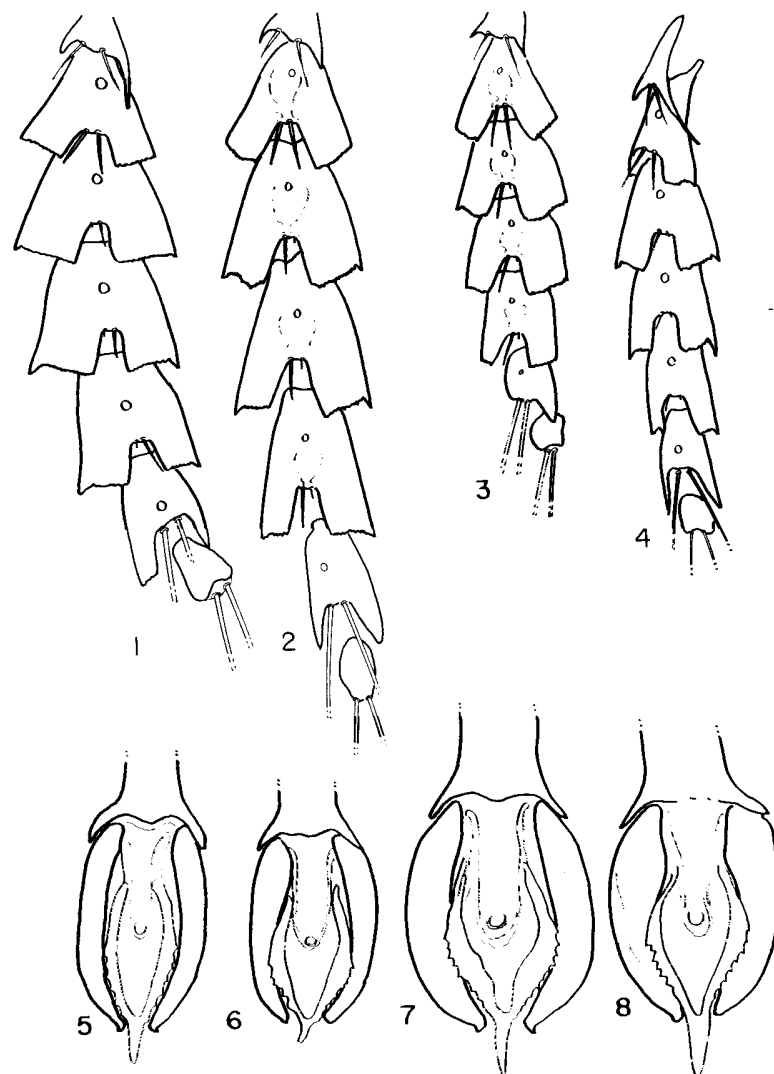
Hoplopleura emphereia Kim

Figs. 1, 7, 10, 14

Hoplopleura ferrisi emphereia Kim, 1965, J. Parasit. 51:882, figs. 37-42.

Hoplopleura hesperomydis: Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 274 (err. det., records from *Peromyscus nudipes*, and probably that from *Reithrodontomys* sp.).

The female holotype, male allotype, 6 male and 20 female paratypes were taken from *Peromyscus nudipes*. El Hato, Province of Chiriqui, Panama, and 1 male and 2 female paratypes from *P. guatemalensis* and *P. mexicanus saxatilis*, Guatemala.



Figs. 1-8. *Hoplopleura hesperomydis*-group: 1, paratergal plates II-VIII, *H. emphereia* Kim, female ex *Peromyscus nudipes*, no. 10247; 2, same, *H. scottinomydis*, n. sp., female paratype ex no. 10245, same, male paratype ex no. 10155; 4, same, *H. hesperomydis* (Osborn), female ex *Peromyscus leucopus*, New Hampshire; 5, aedeagus, *H. hesperomydis* ex *Peromyscus maniculatus*, Washington; 6, same, *H. reithrodontomydis* Ferris (?) ex *Reithrodontomys megalotis*, California; 7, same, *H. emphereia* ex *Peromyscus nudipes*, Chiriqui, Panama; 8, same, *H. scottinomydis*, n. sp., holotype.

PANAMANIAN SPECIMENS.—From *P. nudipes*, 145 males, 248 females, and 1 third instar nymph (female), in 52 collections; most from near or at the type locality. A few specimens were taken in the Province of Bocas del Toro.

COMPARISON OF *emphereia* AND *hesperomydis*.—The adult of *emphereia* differs as follows: thoracic sternal plate broader in proportion to length, slightly bulbous laterally, almost always lacking indication of mesal posteroapical keel (Figs. 12, 14). Usually larger (*hesperomydis*, 8 males and 16 females measured: male, 0.8 to 0.91 mm; female, 1.17 to 1.20 mm; *emphereia*, 20 males and 20 females measured: male, 0.95 to 1.10 mm; female, 1.15 to 1.25 mm). The dorsal apical lobe of paratergal plate VII is always subtruncate, with oblique, sometimes notched, apex (*hesperomydis* with this lobe usually evenly acute apically) (Figs. 1, 4). Aedeagus somewhat larger; often with parameres more convex laterally; pseudopenis more angulate laterally (Figs. 5, 7). Placement of small laterodorsal head setae and relative lengths of apical setae of paratergal plates variable in specimens examined.

STATUS OF THE NAME *emphereia* KIM.—The third-instar nymph from *P. nudipes* is unlike the nymph of *ferrisi* Cook and Beer, thus the name *emphereia* does not pertain to the latter species.

Kim (1965) resurrected the name *reithrodontomydis* Ferris, 1951, on the basis of a study of 8 nymphs collected from *Reithrodontomys* sp. in Chiriqui Province at El Hato, by Tipton. I have seen a female from *Reithrodontomys* sp. with collection data essentially as the nymphs studied by Kim, plus 13 males and 19 females in 14 collections from *Reithrodontomys creper*, and 3 males and 7 females from *R. mexicanus*. Chiriqui, 3 miles (5 km) W Cerro Punta, March, 1962. I did not find consistent differences between adults in the population from *Reithrodontomys* species, and that from *Peromyscus nudipes*. Further, my third instar nymph from *P. nudipes* (Fig. 10) appeared similar to Kim's (1965) drawings of a nymph from *Reithrodontomys* sp. except that the head capsule had been split and the mediodorsal portion, which would have contained the large dorsomedian seta figured by Kim, was missing. Because of the fully developed adult abdomen within, small ventral abdominal setae were not visible. One cannot, without further specimens, state unequivocally that *emphereia* from *P. nudipes* is conspecific with the form from Panamanian *Reithrodontomys* species, but it is highly probable and I make that assumption here.

As a further complication, I have seen a male and female of *Hoplopleura* from *Reithrodontomys megalotis*, California, that are smaller than the Panamanian specimens from *Reithrodontomys* species (male, 0.85 mm; female, 1.08 mm) and the thoracic sternal plate (Fig. 13) and aedeagus (Fig. 6) are more like those of true *hesperomydis* from North American *Peromyscus maniculatus* and *P. leucopus* than those of Panamanian species from *P. nudipes* and *Reithrodontomys* species.

If all the above specimens are of the same species and prove to be the same as the population from *Reithrodontomys chrysopsis* that was originally given the name *reithrodontomydis* Ferris, this name has priority over *emphereia* Kim.

Hoplopleura scotinomydis, n. sp.

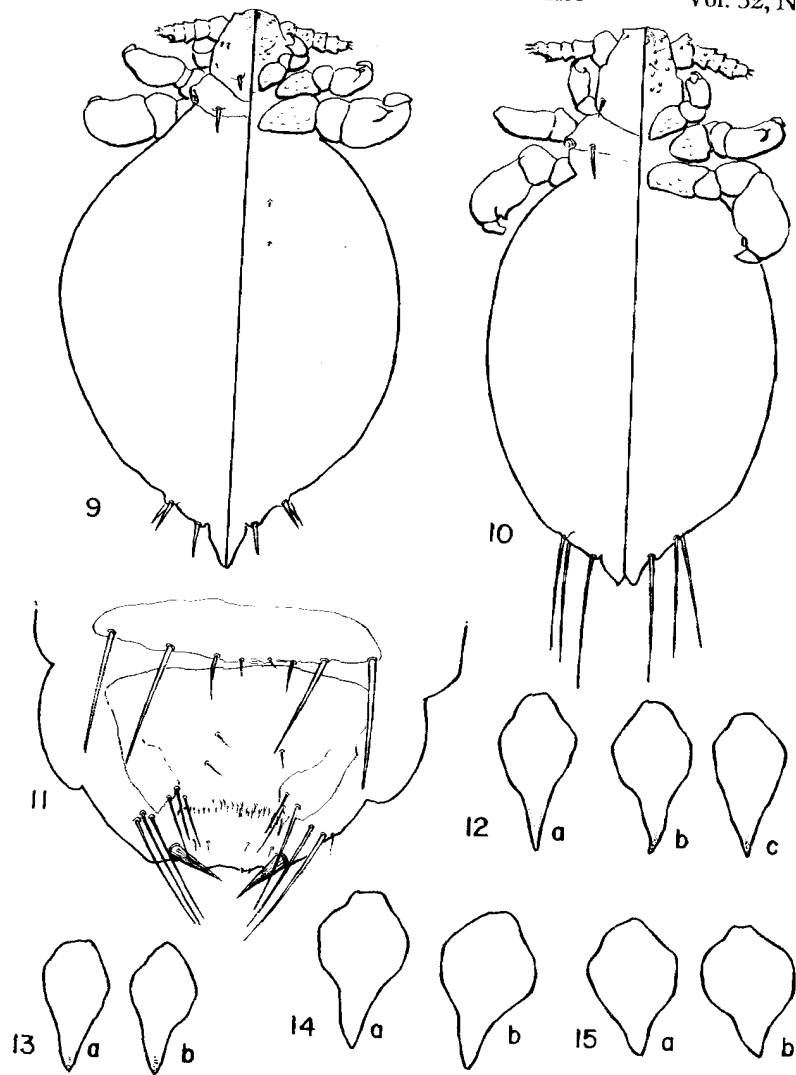
Figs. 2, 3, 8, 9, 11, 15-18

TYPE DATA.—Male holotype, female allotype, 1 male and 2 female paratypes ex *Scotinomys xerampelinus*, Panama: Province of Chiriqui, Boquete Trail, 3 miles (5 km) W Cerro Punta, 7700 ft (2700 m), 9-III-1962, PPMC 10275. Additional paratypes, all from *Scotinomys xerampelinus*, Province of Chiriqui, collected by the Preventive Medicine and Malaria Control Unit, U.S. Army, as follows: 1 female, Martinez Dairy, Cerro Punta, 6800 ft (2400 m), 8-I-1966, no. 6862. A series from Boquete Trail, 3 miles (5 km) W Cerro Punta, 6900 to 7800 ft (2400 to 2700 m), 7-14-III-1962, as follows: 3 males, 7 females, plus 1 third-stage nymph, no. 10155; 1 female, no. 10172; 1 male, 1 female, no. 10238; 4 females, no. 10245; 2 males, no. 10253; 1 male, plus 1 third-stage nymph, no. 10257; 1 female, plus 1 third-stage nymph, no. 10258; 1 female, no. 10260; 2 males, 1 female, no. 10276; 1 female, no. 10277; 1 male, 2 females, no. 10405; 1 male, 2 females, no. 10406; 1 female, no. 10424; 5 males, 5 females, no. 10454; 1 male, no. 10481; 2 females, no. 10492.

DIAGNOSIS.—A member of the *hesperomydis* group. Separable by having apical lobes of paratergal plate II both short, not with ventral greatly prolonged (Fig. 2) and in lacking sword-shaped setae on abdomen. Female further separable by having genital seta rather short and blade-shaped (Fig. 11). Male further separable by having only one apical lobe on paratergal plate VII (Fig. 3) (occasional males of related species also lack the ventroapical lobe of this plate).

LENGTHS.—Male: holotype, 1.0 mm; paratype, 0.95 to 1.10 mm. Female: allotype, 1.45 mm; paratype, 1.30 to 1.45 mm.

DESCRIPTION.—*Male* (Fig. 16). *Head* (Fig. 17). First antennal segment not particularly enlarged, third segment not modified; post-antennal margins slightly rounded, converging somewhat posteriorly; accessory dorsal seta missing. *Thorax*. Sternal plate (Fig. 15) broad, posterior apex bluntly rounded, short and broad, lacking a mesal keel; plate less than one and one-half times as long as broad. Dorsal mesothoracic seta long. *Abdomen*. All setae long, flexible, none sword-shaped; tergal and sternal plates well developed, all setae confined to their posterior margins; lacking tergal plate and setae on segment 1. Paratergal plates (Fig. 3) II with short acute apical lobes of similar length and two stout setae extending beyond apices of lobes; plates III-VI with equal, scaly, quadrate, apical lobes; plate VII with short triangular dorsal lobe; plate VIII lacking apical



Figs. 9-15. *Hoplopleura hesperomydis*-group: 9, *H. scotinomydis*, n. sp., third-stage nymph ex no. 10155; 10, *H. emphereia* Kim, third-stage nymph ex *Peromyscus nudipes*, Chiriqui, no. 10254. Note that the dorsomedian part of the head is missing; 11, *H. scotinomydis*, n. sp., female genitalia, allotype; 12, thoracic sternal plate, *H. hesperomydis* (Osborn) ex *Peromyscus maniculatus*: a, male, Washington; b, female, Washington; c, female, Utah; 13, same, *H. reithrodontomydis* Ferris (?), California ex *Reithrodontomys megalotis*: a, female; b, male; 14, same, *H. emphereia* Kim, Chiriqui ex *Peromyscus nudipes* no. 6814: a, male; b, female; 15, same, *H. scotinomydis*, n. sp.: a, holotype; b, allotype.

lobes; plate III with two stout apical setae extending about to apices of lobes; IV-VI with small to minute ventral apical seta and stout dorsoapical seta extending almost to apices of lobes. *Aedeagus*. (Fig. 8) with parameres somewhat broadened basally, lateral outlines convex; pseudopenis with elongate apex.

Female (Fig. 18). *Head* and *thorax* as in male. *Abdomen* as in male except for usual sexual dimorphism. Apical setae of paratergal plates (Fig. 2) often relatively shorter than in male; plate VII with two narrow apical lobes, the dorsal one the longer, obliquely truncate; ventral lobe acute. Genital seta shorter than in related species, blade-shaped (Fig. 11).

Nymph (Fig. 9). *Third instar*. *Head*, scaly dorsally, usual ventral tubercles; principal dorsal seta short, stout; other head setae minute. Dorsal mesothoracic seta about same size and shape as principal dorsal head seta. Four minute setae ventrally on abdomen. Terminal setae of abdomen consisting of a pair and single on each side, all these short, stout; anal lobe extended, short, bluntly rounded.

The *travassosi* group.

H. travassosi Werneck and allies are typical parasites of South American rodents. Species of this group are found throughout that continent. The northernmost representatives known are *H. angulata* Ferris, from Panama, and *H. similis* Kim, which is found in Panama and as far north as tropical Mexico.

Hoplopleura angulata Ferris

Hoplopleura angulata Ferris, 1921, Stanford Univ. Publ. Biol. Sci. 2:73, Figs. 40, 41A-C, E; Johnson, in press, Brigham Young Univ., Sci. Bull., Biol. Ser. 17(3), Figs. 58-69.

The type series was from *Rhipidomys venezuelae*, Venezuela. This louse species is common on several species of *Rhipidomys* in Venezuela, and also occurs on species of *Rhipidomys* in Peru, Colombia, and Trinidad.

PANAMANIAN SPECIMENS.—Two males from the rare *Nyctomys sumichrasti*, Province of Chiriqui, Cerro Punta. Occurrence of *angulata* on a mouse other than *Rhipidomys* is a surprising finding considering the rigid host specificity of this species in Venezuela.

Hoplopleura similis Kim

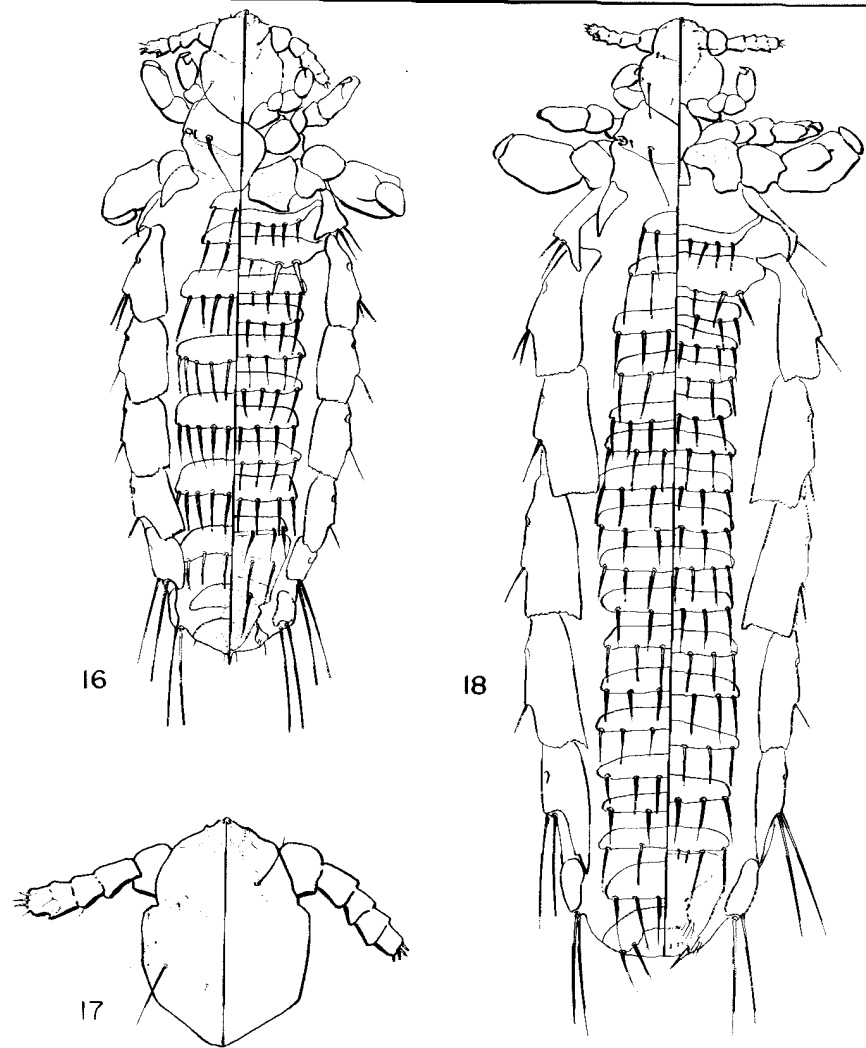
Figs. 19-21

Hoplopleura similis Kim, 1965, J. Parasit. 51:884, Figs. 47-53.

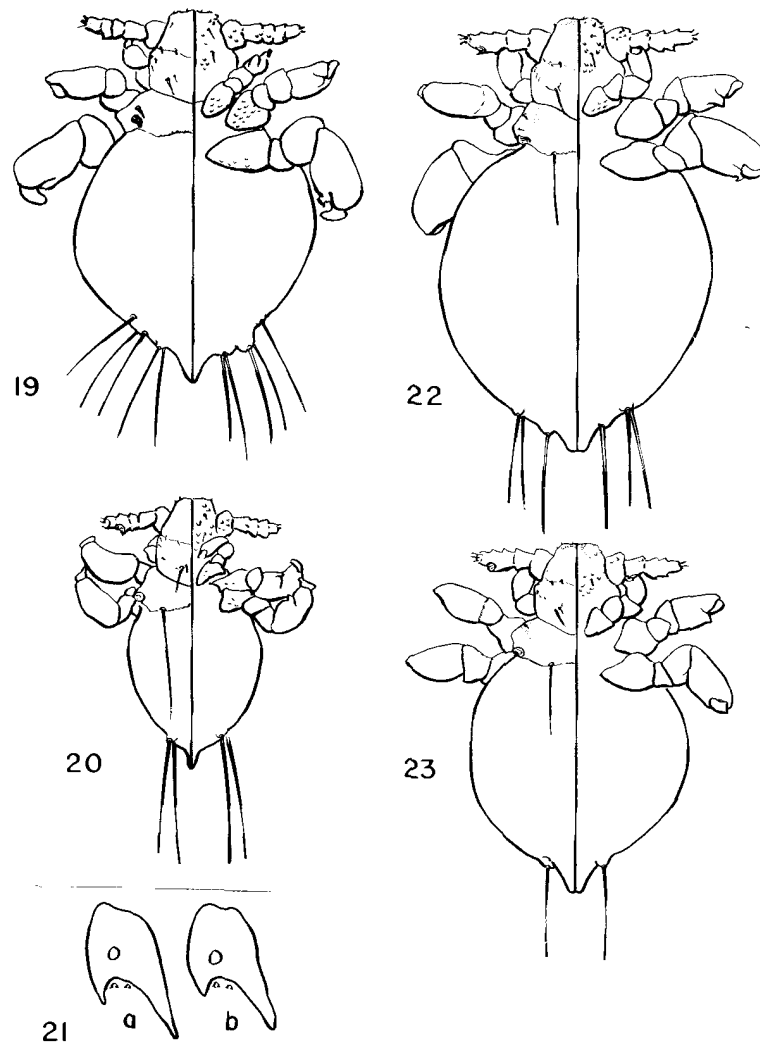
The female holotype and a series of female paratypes were from *Oryzomys fulvescens*, Veracruz, Mexico. The male allotype was from Bolivian *Oryzomys chaparensis*.

PANAMANIAN SPECIMENS.—From *Oryzomys fulvescens*: 1 female, Province of Bocas del Toro, Rancho Mojica, 500 ft (1700 m), 8-IX-

1961, no. PMMC 8017; 1 female, Province of Chiriqui, Boquete Trail, 3 miles (5 km) W Cerro Punta, 7750 ft (2700 m), 10-III-1962, no. PMMC 10314; 4 nymphs (first and third instar), Province of Chiriqui, 3 miles (5 km), W Cerro Punta, 7800 ft (2700 m), 7-III-1962, no. PMMC 10177.



Figs. 16-18. *Hoplopleura scotinomydis*, n. sp.: 16, holotype; 17, head, holotype; 18, allotype.



Figs. 19-23. *Hoplopleura* species: 19, *H. similis* Kim, third-stage nymph; 20, same, first-stage nymph; 21, same, paratergal plate VII, female: a, ex no. 8017; b, ex no. 10314; 22, *H. mendezi*, n. sp., third-stage nymph; 23, same, second-stage nymph.

The Panamanian females are like the holotype except the ventral apical lobe of paratergal plate VII is very short (Fig. 21). The nymph has not been described previously. It is very like that

of *travassosi* except the dorsal head setae are less thornlike. The third instar lacks the dorsal mesothoracic seta. If the seta is missing, not broken off, this is a major difference between *travassosi* and *similis*.

DESCRIPTION.—*Nymph.* Abdomen of both first and third instar faintly reticulate; thoracic cuticle and anterior ventral abdominal cuticle spiculate. *First instar* (Fig. 20) with one pair of long terminal abdominal setae on each side; anal lobe somewhat extended; head with usual tubercles ventrally, principal dorsal head seta well developed, its accessory seta short, stout. Other dorsal setae of head small, not thornlike. Dorsal mesothoracic seta very long. *Third instar* (Fig. 19). Head much as in first instar but principal dorsal seta relatively shorter. Dorsal mesothoracic seta apparently not present. Two pairs and a single terminal abdominal seta on each side.

The *quadridentata* group.

As is true of the *travassosi* group, species of *Hoplopleura* related to *quadridentata* (Neumann) are typically Neotropical. However, distribution of known species of the group is generally more northern. In South America true *quadridentata*-group species apparently do not occur south of the tropical regions, while to the north one species, *oryzomydis* Pratt and Lane, is common on rice rats (*Oryzomys palustris*) in the southern United States. In Panama there are three representatives of the *quadridentata* group, one of them new.

Hoplopleura nesoryzomydis Ferris

Hoplopleura nesoryzomydis Ferris, 1921, Stanford Univ. Publ., Biol. Sci. 2:90, Fig. 53A; Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 275.

PANAMANIAN SPECIMENS.— From *Zygodontomys microtinus*, 9 males, 11 females, 2 nymphs, taken in 13 collections, Canal Zone and Azuero Peninsula. Also present in 2 collections from *Oryzomys capito talamancae*, Canal Zone (4 males, 3 females, 15 nymphs) and Cerro Punta, Chiriqui (1 female, 1 nymph).

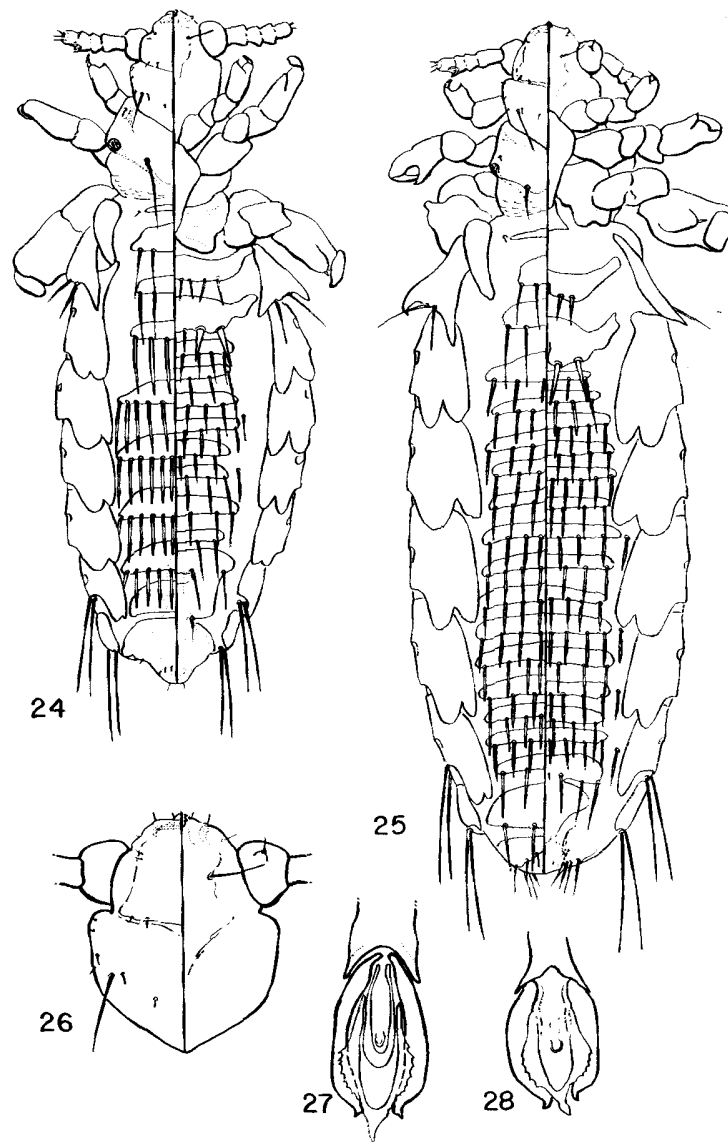
Hoplopleura oryzomydis Pratt and Lane

Figs. 27, 31-34

Hoplopleura oryzomydis Pratt and Lane, 1951, J. Parasit. 37:141, Figs. 1-3, 5; Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 275. Johnson, in press, Brigham Young Univ. Sci. Bull., Biol. Ser. 17(3), Figs. 129-137.

The type series of *oryzomydis* was taken from *Oryzomys palustris*, Florida and South Carolina. Venezuelan specimens from *Nectomys squamipes* are similar to the North American form (Johnson, in press).

PANAMANIAN SPECIMENS.— One pair from *Oryzomys caliginosus*, El Valle; 1 pair from *Oryzomys capito*, Province of Darien, Santa Fe, no. OICS 2286.



Figs. 24-28. *Hoplopleura quadridentata*-group: 24, *H. mendezi*, n. sp., holotype; 25, same, female. Composite drawing of the allotype and paratype; 26, same, head, holotype; 27, *H. oryzomydis* Pratt & Lane, aedeagus, ex *Oryzomys capito*, Darien, Panama; 28, *H. mendezi*, aedeagus, holotype.

Morphological differences among the populations: paratergal plates of Panamanian specimens scalier than those of types. Thoracic sternal plate (Fig. 31) somewhat broader than in U.S. specimens; more like that of Venezuelan series. Aedeagus (Fig. 27) similar to types. Abdominal tergal and sternal plates narrower than in Venezuelan and U.S. specimens, approaching obsolescence. Penultimate tergal plate of female smaller than in U.S. specimens, but like them in having two rather than three or four apical setae (compare Figs. 32-34).

Hoplopleura mendezi, n. sp.

Figs. 22-26, 28-30

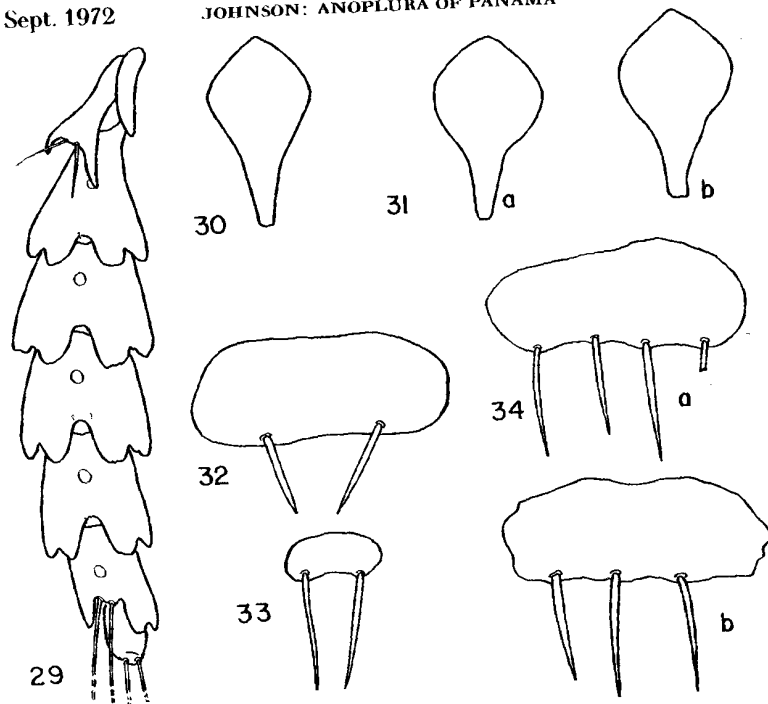
TYPE DATA.— Male holotype, female allotype, 2 male paratypes from *Oryzomys* sp., Province of Chiriqui, Bambito, El Hato, 15-I-1961, Keenan and Wislocki collectors, RML 40451. One female paratype as above but Chiriqui Viejo, Casa Shannon, 17-I-1961, Wislocki collector, RML 40450. Also examined: 2 males, 1 female, 3 nymphs (second and third instar), lacking data but possibly RML no. 40445.

According to Handley (1966) the type host could be either *Oryzomys alfaroi*, which is rare, or *Oryzomys albigularis*. Both these species are found at the type locality. A third species, *Oryzomys fulvescens*, occasionally occurs at high elevations like the type locality, in this area of Panama, but as it carries *Hoplopleura similis* Kim, there is less likelihood that it is the type host of *mendezii*.

DIAGNOSIS.— A member of the *quadridentata* group. Adult separable by lacking long setae on paratergal plate III. Nymph differs (from others known) by having antennal segments 3 to 5 incompletely separated; and further from *nesoryzomydis* by having the small dorsolateral head setae minute.

LENGTHS.— Male: holotype, 1.0 mm; paratypes 0.95 to 1.05 mm. Female: 1.3 mm.

DESCRIPTION.— *Male* (Fig. 24). *Head* (Fig. 26). Postantennal angles well developed; antennae unmodified, first segment not particularly enlarged; accessory dorsal seta present. *Thorax*. Sternal plate (Fig. 30) elongate, squared apically. Dorsal mesothoracic seta long. *Abdomen*. Tergal and sternal plates arranged as usual; segment 1 with indistinct tergal plate and one minute seta to either side of the plate. Typical abdominal plates well developed, their posteroapical setae long, straight, slightly sword-shaped, some setae off plates dorsally and ventrally. Paratergal plates (Fig. 29, female) III-VI each with two deeply subdivided, rounded apical lobes; VII with truncate, divided dorsal lobe and lacking ventral lobe; VIII lacking apical lobes. Plate II with two long apical setae; plates III-VI with apical setae missing, extremely minute, or minute and removed from plate margin. *Aedeagus* (Fig. 28) with para-



Figs. 29-33. *Hoplopleura quadridentata*-group: 29, *H. mendezi*, n. sp., paratergal plates, female paratype; 30, same, thoracic sternal plate, allotype; 31, *H. oryzoimydis* Pratt & Lane, thoracic sternal plate, ex *Oryzomys capito*, Darien, Panama: a, male; b, female; 32, *H. oryzoimydis*, penultimate abdominal tergal plate, female, paratype; 33, same, ex *O. capito*, Darien; 34, same, ex *Nectomys squamipes*, Venezuela.

meres not noticeably convex laterally, pseudopenis flared and serrate laterally.

Female (Fig. 25). *Head, thorax and abdomen* as in male except for usual sexual dimorphism. Paratergal plate VII with long rounded-acute ventral apical lobe and truncate, apically divided dorsal lobe. Genital seta long, not blade-shaped.

Nymph. Second and third instar similar except for size and the fact that third instar (Fig. 22) has a pair plus a single terminal abdominal seta on each side while the second instar (Fig. 23) has only one terminal seta on each side. Anal segment slightly prolonged. Principal dorsal head seta well developed, its accessory seta short but not minute; other dorsal setae small to minute. Thorax with long mesothoracic seta; abdomen spiculate, lacking plates or spiracles.

This species is named for my friend and colleague Eustorgio Méndez, Gorgas Memorial Laboratory, Panama, in recognition of

his contributions to the taxonomy of the Mallophaga and Siphonaptera of South and Central America.

Fahrenholzia Kellogg and Ferris

Fahrenholzia ferrisi Werneck

Fahrenholzia ferrisi Werneck, 1952, Rev. Bras. Biol. 12:73, Fig. 7; Johnson, 1962, Ann. Ent. Soc. Amer. 55:417, Figs. 10-13, 30, 37.

Fahrenholzia fairchildi: Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 275 (*lapsus*, specimens from *Heteromys desmarestianus*, Cerro Punta).

The type series was from *Heteromys goldmani*, Veracruz, Mexico. This species also occurs on *Heteromys* sp., Guatemala.

PANAMANIAN SPECIMENS.—From *Heteromys desmarestianus*, 20 collections (43 males, 57 females, 39 nymphs). Seventeen collections were from Province of Chiriqui, near Cerro Punta; two from Boquete; one from Cerro Campana. Also examined: one nymph, probably this species, from *H. desmarestianus*, Piña, Canal Zone.

It seems evident that *F. ferrisi* is the normal anopluran parasite of *Heteromys desmarestianus* in Panama. See further comment below.

Fahrenholzia fairchildi Johnson

Fahrenholzia fairchildi Johnson, 1962, Ann. Ent. Soc. Amer. 55:419, Figs. 18-21, 32, 39. Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 275.

The type series was supposedly from *Heteromys desmarestianus*, Santa Fe, Panama. Paratypes were from *Liomys adpersus*, Fort Kobbe and Summit Road, Canal Zone. These were all collected in 1955-57. In the 1961-63 surveys, this species was taken only from *Liomys adpersus*. There were 34 collections, including 29 males, 44 females, and 67 nymphs, Azuero Peninsula, Los Santos Province, and a collection of 1 male and 2 nymphs from Juan Mina, Canal Zone. The collection data of the type collection probably were erroneous, since *fairchildi* was found consistently on *Liomys* in the present series, while *Heteromys desmarestianus* carried only *F. ferrisi*. Thus the normal host of *fairchildi* is *Liomys adpersus*. Through a *lapsus*, specimens of *ferrisi* from *H. desmarestianus*, Cerro Punta, were reported as *fairchildi* by Wenzel and Johnson (1966).

Polyplax Enderlein

Polyplax auricularis Kellogg and Ferris

Polyplax auricularis Kellogg and Ferris, 1915, Stanford Univ. Publ., Univ. Ser., p. 13, Fig. 4; pl. 4, Fig. 8. Ferris, 1921, Stanford Univ. Publ., Biol. Sci. 2:206.

The type series was from *Peromyscus maniculatus*, California. This species is also found on other species of *Peromyscus* and from *Onychomys* sp. in North America. It has been reported from *Reithrodontomys mexicanus* and *Neotomodon* sp., Mexico.

PANAMANIAN SPECIMENS.—From *Reithrodontomys creper*, Province of Chiriqui, near Cerro Punta, 15 males, 19 females, 7 nymphs, in 10 collections. *P. auricularis* often occurred together with *Hoplopleura emphereia* Kim.

Panamanian specimens do not differ consistently from North American individuals taken from species of *Peromyscus*, *Neotoma*, and *Onychomys*. This aberrant species is the southernmost representative of the genus *Polyplax* in the New World. Although its northern populations apparently have a broad host range, in Panama—doubtless at the southernmost point of its range—*auricularis* is associated only with *Reithrodontomys creper*.

HOST-PARASITE LIST

Order Rodentia

Family Sciuridae

Sciurus granatensis

Enderleinellus sp. (*longiceps* group)
Neohaematopinus semifasciatus F., s. lat.
Neohaematopinus semifasciatus F., s. lat.

Sciurus variegatoides

Family Heteromyidae

Liomys adpersus

Heteromys desmarestianus

Fahrenholzia fairchildi J.
Fahrenholzia ferrisi W.
Fahrenholzia hertigi J.

Family Cricetidae

Oryzomys sp.

Oryzomys caliginosus

Oryzomys capito

Hoplopleura mendezi, n. sp.
Hoplopleura oryzomydis P. & L.
Hoplopleura oryzomydis P. & L.
Hoplopleura nesoryzomydis F.
Hoplopleura similis K.
Hoplopleura angulata F.
Hoplopleura emphereia K.
Polyplax auricularis K. & F.
Hoplopleura emphereia K.
Hoplopleura emphereia K.
Hoplopleura nesoryzomydis F.
Hoplopleura scotinomydis, n. sp.
Hoplopleura hirsuta F.

Oryzomys fulvescens

Nyctomys sumichrasti

Reithrodontomys creper

Reithrodontomys mexicanus

Peromyscus nudipes

Zygodontomys microtinus

Scotinomys xerampelinus

Sigmodon hispidus

Family Muridae

Rattus rattus

Polyplax spinulosa (B.)

Family Echimyidae

Hoplomys gymnurus

Hoplopleura audax F.

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