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 Haplopleura (8 species), Euhodotonea (3 species), Neohodotonea (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 Haplopleura are described: H. scutinomyzidae from Scutinomyzidae zelaznyi, and H. mendisi from Oryzomys sp. (possibly O. affinis or O. albipulicaris). 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 Haplopleura 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.

Haplopleura Enderlein

The hopenomydis 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 setae (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.

**Nymphs.**—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 emphoria Kim_

Figs. 1, 7, 10, 14.


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

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

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 *empherica* and *hesperomydis*.—The adult of *empherica* differs as follows: thoracic sternal plate broader in proportion to length, slightly bulbous laterally, almost always lacking indication of mesal posteroparal 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; *empherica*, 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 truncate, with oblique, sometimes notched, apex (*hesperomydis*; with this lobe usually evenly acute apically) (Figs. 1, 4). Aesopagus somewhat larger, often with papules more convex laterally, pseudopenes 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 *empherica* Kim.—The third instar nymph from *P. nudipes* is unlike the nymph of *ferrii* Cook and Beer, thus the name *empherica* does not pertain to the latter species.

Kim (1965) resurrected the name *riehthodontomys* Ferris, 1951, on the basis of a study of 8 nymphs collected from *Rieethovenomys* sp. in Chiriquí Province at El Hato, by Tipton. I have seen a female from *Rieethovenomys* sp. with collection data essentially as the nymphs studied by Kim, plus 13 males and 19 females in 14 collections from *Rieethovenomys creper*, and 3 males and 7 females from *R. meitziani*, Chiriquí, 3 males (5 km) W Cerro Punta, March, 1962. I did not find consistent differences between adults in the population from *Rieethovenomys* species, and that from *Peryomus meiurus*. Further, my third instar nymph from *P. nudipes* (Fig. 10) appeared similar to Kim's (1965) drawings of a nymph from *Rieethovenomys* sp. except that the head capsule had been split and the mediadorsal 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 *empherica* from *P. nudipes* is conspecific with the form from Panamanian *Rieethovenomys* 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 *Rieethovenomys megalotes*, California, that are smaller than the Panamanian specimens from *Rieethovenomys* species (male, 0.85 mm; female, 1.08 mm) and the third instar plate (Fig. 13) and aesopagus (Fig. 6) are more like those of true *hesperomydis* from North American *Peryomus maniculatus* and *P. leucopus* than those of Panamanian species from *P. nudipes* and *Rieethovenomys* species.

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

*Hoplopleura scotomysis*, n. sp.

*Type data.*—Male holotype, female allotype, 1 male and 2 female paratypes ex *Scotomysis wrighti* crampelinus, Panama: Province of Chiriquí, Boquete Trail, 3 miles (5 km) W Cerro Punta, 7700 ft (2700 m), 9-III-1962, PMMC 10275. Additional paratypes, all from *Scotomysis crampelinus*, Province of Chiriquí, collected by the Preventive Medicine and Malaria Control Unit, U.S. Army, as follows: 1 female, Martinez Dairy, Cerro Punta, 6800 ft (2400 m), 8-1-1966, no. 9662; 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, no. 10275; 4 males, no. 10345; 2 males, no. 1035; 1 male, plus 1 third-stage nymph, no. 10257; 1 female, plus 1 third-stage nymph, no. 10259; 1 female, no. 10261; 2 males, no. 10274; plus 1 male, no. 10276; 1 female, no. 10277; 1 male, no. 10278; 1 male, no. 10463; 1 male, no. 10464; 1 male, no. 10465; 2 females, no. 10462; 5 males, no. 1046; 1 male, no. 10481; 2 females, no. 10492.

Diagnosis.—A member of the *hesperomydis* group. Sepalable 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. 1). 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 antenntal segment not particularly elongated, 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 medial keel; plate less than one and one half times as long as broad. Dorsal meso- thoracic 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 lobe 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
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 setae 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 travassoi group.

H. travassoi Werncke 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

The type series was from Rhipidomyus venezuelae, Venezuela. This host species is common on several species of Rhipidomyus in Venezuela, and also occurs on species of Rhipidomyus 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 Rhipidomyus is a surprising finding considering the rigid host specificity of this species in Venezuela.

Hoplopleura similis Kim

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

Panamanian specimens.—From Oryzomyinae 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), 16-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 xeromelica, 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. mendezii, 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 thorinike. 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.** Abdomens of both first and third instar faintly reticulate; thoracic cuticle and anterior ventral abdominal cuticle spicate. **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 thorinike. 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 neoryzomydis** Ferris

*Hoplopleura neoryzomydis* Ferris, 1921, Stanford Univ. Publ., Biol. Sci. 2:90, Fig. 53A; Wenzel and Johnson, 1966, Ectoparasites of Panama, p. 276.

**Panamanian specimens.**—From *Zygodontomyus microtius*, 9 males, 11 females, 2 nymphs, taken in 13 collections, Canal Zone and Azuero Peninsula. Also present in 2 collections from *Oryzomys capitatus 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


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

**Panamanian specimens.**—One pair from *Oryzomys caliginosus*, El Valle; 1 pair from *Oryzomys capitatus*. Province of Darien, Santa Fe, no. OICS 2286.
Morphological differences among the populations: paratergal plates of Panamanian specimens smaller 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 mendezii_, n. sp.

_Figs. 22, 26, 28-30_

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

According to Handley (1966) the type host could be either _Oryzomys alfaroi_, which is rare, or _Oryzomys albicolor_. 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 _quadridens_ group. Adult separable by lacking long setae on paratergal plate III. Nymph differs (from others known) by having antennal segments 5 to 5 incompletely separated; and further from _Neoryzomys_ by having the small dorsolateral head seta 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 setae present. Thorax. Sternal plate (Fig. 30) elongate, squared apically. Dorsal mesothoracic seta long. Abdomen. Tergal and sternal plates arranged as usual; segment I 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-

Fig. 29-33. _Hoplopleura quadridens_ group: 29, _H. mendezii_, n. sp., paratergal plate, female paratype; 30, same, thoracic sternal plate, allotype; 31, _H. o. prattiae_, thoracic sternal plate, ex _O. capito_, Darian; 32, _H. o. kooneni_, penultimate abdominal tergal plate, female, paratype; 33, same, ex _O. capito_, Darian; 34, same, ex _Neoryzomys_ squamipes, Venezuela.

_numbers 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 lobe short but not minute; other dorsal setae small to minute. Thorax with long mesothoracic setae; abdomen with saddle, lacking plates or spinules.

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 frrisi Wernick**

Fahrenholzia frrisi Wernick, 1952, Rev. Bras. Biol. 12:73, Fig. 7; Johnson, 1962, Ann. Ent. Soc. Amer. 55:417, Figs. 10.43, 30. 37.


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

**Panamanian specimens.**—From Heteromys demarestianus, 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. demarestianus, Piña, Canal Zone.

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

**Fahrenholzia fairchildi Johnson**


The type series was supposedly from Heteromys demarestianus, Santa Fe, Panama. Paratypes were from Loniomys adspersus, 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 Loniomys adspersus. 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 Loniomys in the present series, while Heteromys demarestianus carried only F. ferrisi. Thus the normal host of fairchildi is Loniomys adspersus. Through a lapus, specimens of ferrisi from H. demarestianus, Cerro Punta, were reported as fairchildi by Wenzel and Johnson (1966).

**Polyplax Enderlein**

Polyplax auricularis kellogg and Ferris


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 Reithrodonotomys mexicanus and Neotomodon sp., Mexico.

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Panamanian specimens.—From Reithrodonotomys creper, Province of Chiriqui, near Cerro Punta, 15 males, 19 females, 7 nymphs, in 10 collections. P. auricularis often occurred together with Holopleura 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 Reithrodonotomys creper.

**Host-Parasite List**

**Order Rodentia**

**Family Scurridae**

Scurus granaticus

Scurus variegatoides

**Family Heteromysidae**

Liomyctes adspersus

Heteromys demarestianus

**Family Gribitidae**

Oryzomys sp.

Oryzomys caliginosus

Oryzomys capito

Oryzomys julceens

Nyctomys sumichrasti

Reithrodonotomys creper

Reithrodonotomys mexicanus

Peromyscus nudipes

Zapus donaymeyanus microstomus

Scotoynomyx terrestris

Sigmodon hudsonius

**Family Muridae**

Rattus rattus

**Family Echimyidae**

Hoplomys binyanus

**Literature Cited**


