A REVIEW OF THE HOPLOPLEURA HESPEROMYDIS COMPLEX
(ANOPLURA, HOPLOPLEURIDAE)*

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ABSTRACT: The adults of the known species of the Hoplopleura hesperomydis complex are described and illustrated. Three new species: H. difficilis, H. similis, H. cooki and one new subspecies: H. ferrisi emereali are described. H. reithrodontomydis Ferris is resurrected on the basis of immature and adult stages, and the first and second nymphs are described in addition to the description of the adult. The characters of taxonomic importance and the history of the group are discussed. A key to adult stages of the known species of the complex is presented.

The louse species, Hoplopleura ferrisi Cook and Beer, was originally described on the basis of characters found solely in the immature stages by Cook and Beer (1959). The adult stage of H. ferrisi, which was assumed to be identical with that of H. hesperomydis (Osborn) at the time of description, has usually been mistakenly identified as H. hesperomydis.

In the adult stage H. hesperomydis is, however, distinctly differentiated from H. ferrisi by quantitative analysis or discriminant function (Kim, Brown, and Cook, 1965). At the same time a posteriori investigation of the taxonomic characters of the adults revealed some good discriminatory adult characters for H. ferrisi and H. hesperomydis.

Upon studying the problem I have discovered that there are several new taxa in this Hoplopleura hesperomydis complex. All of the species or taxa, except for H. reithrodontomydis ferrisi, will key to H. hesperomydis in Ferris' monograph (1951).

The scientific names of the host species are those of Ellerman (1940-1949), and Hall and Kelson (1959).

The complex is distinguished from all other louse species by the following combination of characters. Antennae clearly 5-segmented. Sternal plate of 2nd abdominal segment and usually of 3rd abdominal segment extended laterally to articulate with corresponding paratergites; these two plates always narrow and transverse. First sternal plate of 3rd abdominal segment also laterally extended to approximate articulate with corresponding paratergites. Blunted setae of first sternal plate of 3rd abdominal segment arranged in two groups of 2 setae. Paratergites of abdominal segments 3 to 6 with posterior margin divided into two apically truncate or slightly emarginate lobes. Paratergites of abdominal segments 4 to 6 with posterior setae either much shorter than the depth of the median emargination or completely lacking. Dorsal and ventral lobes of paratergal plate of abdominal segment 7 apically acute. Paratergites of abdominal segment 8 entirely devoid of any apical processes.

In this paper three new species and one new subspecies of the complex are described with notes on the other species. The adult characters of taxonomic importance are also discussed. H. reithrodontomydis Ferris is resurrected on the basis of immature and adult stages. The complex therefore contains eight species and one subspecies, distinguished on several characters, even though general morphology is very much alike.

HISTORICAL

Since Osborn (1891) first described Hoplopleura hesperomydis, from the white-footed mouse, Peromyscus leucopus (Rafinesque), at Ames, Iowa, this species has been recorded from many other species of hosts. In Ferris' monograph (1921) it was recorded from Peromyscus leucopus (Rafinesque), P. maniculatus (Wagner), P. boylii (Baird), Mus musculus Linn. (= Mus gentus, Tszechou, Kansu, China; Mus wagneri mongolium, Tai-yuan-fu, Shansi, China, fide Ferris, 1951), Onychomys torridus (Conner), O. leucogaster Wied., Hesperomys callosus (Reiniger) (Ferris, 1921; Hopkins, 1949), Oryzomys chaparensis Osgood, and Oryzomys fulvescens (Saussure).

Ferris (1951) described H. reithrodontomydis from Reithrodontomyx spp., and then in 1953 sank this species on the ground that all degrees of intergradations occur in the characters of the apical lobes of the paratergites of the 7th abdominal segment, making a specific distinction untenable.
Since Ferris' monumental work, "The Sucking Lice" (1951), was published, the species of *Hoplopleura* including immature stages have been extensively studied by several workers (Pratt and Lane, 1951; Stojanovich and Pratt, 1961).

Cook and Beer (1959) studied the immature stages of North American species of *Hoplopleura*, and described two new species of the complex, *H. ferrisi* from *Peromyscus boylii* (Baird), *P. nasutus* (J. A. Allen), and *P. prernicus* (Baird), and *H. onychomydis* from *Onychomys torridus* (Coues).

This has left *H. hesperomydis* restricted to *P. maniculatus*, *P. leucopus*, *Onychomys leucogaster*, *Hesperomys callinus*, *Oryzomys chapaensis* and *O. fulvescens*.


**ADULT CHARACTERS OF TAXONOMIC IMPORTANCE**

In the taxonomy of *Hoplopleura* several external characters, such as the paratergal plates of the abdominal segments, the number of setae in the sternal plate of the 3rd abdominal segment and the thoracic sternal plate, have been consistently used. Additional characters of taxonomic importance for recognizing species have been found in this study.

**Head**

The setal arrangement of the head of *Hoplopleura* is rather consistent within a given species. The position, length, thickness, and arrangement of the head setae have not been used in the past except for immature stages (Cook and Beer, 1959). However, in this study the head setae are frequently used. For descriptive purposes the following names and abbreviations for the head setae will be used (Fig. 1).

Clypeal setae (CS); Oral setae (OS); Preantennal setae (PAS); Antennal setae (AS); Inner sutural head setae (ISHS); Outer sutural head setae (OSSH); Anterior marginal head setae (AMHS); Middle marginal head setae (MMHS); Posterior marginal head setae (PMHS); Principal dorsal head setae (PDHS); Posterior central head setae (PCHS); Accessory dorsal head setae (ADHS).

**Thorax**

The thoracic sternal plate is a single median plate located between the three pairs of coxae. As shown in Figure 6, the anterior portion of the sternal plate is obvate with a posterior process. The posterior process of the sternal plate is tapered and pointed, rounded, or truncate at the end. The posterior process of the plate is of taxonomic importance.

**Abdomen**

The abdomen consists of nine distinct segments with the 10th segment being membranous, if present. Paratergal plates are present on eight segments and five paratergites of abdominal segments 3 to 7 bear spiracles. The gonopore is borne on the venter of 8th abdominal segment.

The sternal plates of the 2nd, and usually the 1st and 3rd abdominal segments are extended laterally to articulate with the corresponding paratergites. The first sternal plate of the 3rd abdominal segment bears two groups of 2 or 3 enlarged, stout setae.

The paratergal plates or paratergites are distinct, sclerotized plates found at the lateral margin of eight of its abdominal segments. The first paratergite is a small, rodlike sclerite without setae. The second and third paratergites are more or less triangular with a narrow and elongate anterior process (Fig. 2). The posterior part of the paratergite forms two distinctly acute lobes.

The paratergites of abdominal segments 4 to 6 are rectangular with a rather deep median emargination (Figs. 2, 3). The depth of the median emargination varies according to the species. The lateral lobes of the paratergites are formed by this emargination. These lobes are referred to as the dorsal and ventral lobes or, collectively, the lateral paratergal lobes. In many species the lateral paratergal lobes may be secondarily divided into two distinct lobules (Fig. 51). These lobules vary in size in different species.

The paratergal plates generally bear 2 setae, one dorsal and one ventral, on the median posterior margin of the plate (Figs. 2, 3). These are referred to as the paratergal or apical setae. The paratergites of abdominal segments 7 and 8 may or may not possess lateral paratergal lobes, but always have a pair of long setae.

The form of the plates, the size and number of paratergal setae, the size and number of the lateral paratergal lobes are of great taxonomic importance.
H. COOKI SP. NOV.

Figures 1–6. Hoplopleura cooki sp. n. 1. Dorsal view of head (setal arrangement). CS, clypeal setae; OS, oral setae; PAS, preantennal setae; AS, antennal setae; ISHS, inner sutural head setae; OSHS, outer sutural head setae; ACHS, anterior central head setae; MHS, marginal head setae; AMHS, anterior marginal head setae; MMHS, middle marginal head setae; PMHS, posterior marginal head setae; PDHS, posterior dorsal head setae; PCHS, posterior central head setae; ADHS, accessory dorsal head setae. 2. Paratergites of abdominal segments 1–8. 3. Paratergites of third and fourth abdominal segments. 4. Female genitalia. 5. Male genitalia. 6. Thoracic sternal plate, female.
There is some sexual dimorphism in the shape of the plate and the number of setae on the paratergites in some species.

**Male genitalia**

The male genitalia consist of three major parts: a basal apodeme, paramere, and pseudopenis (Fig. 5). The basal apodeme is a long, rodlike sclerite. The length and thickness of the basal apodemes is specifically distinct.

The parameres are paired elongate sclerites which articulate anteriorly to the posterior end of the basal apodeme. The shape, length and thickness of the paramere are also of taxonomic importance.

The pseudopenis is a Y-shaped sclerite between the parameres. The side of each arm of the pseudopenis is variously serrate. The gonopore lies between the two anterior arms of the pseudopenis.

**Female genitalia**

The principal parts of the female genitalia are: the genital plate, gonopods, and genital lobes.

The genital plate is the sternal plate or abdominal segment 8 and sometimes involves also the venter of segment 7. It is variously shaped and bears several inconsistent setae. The pigmentation of the genital plate usually becomes indistinct in the process of slide preparation so that the plate is difficult to define.

The gonopods are paired, sclerotized, flattened lobes or plates. The gonopods can be identified by the presence of an apical cluster of 3 rather strong setae on each side.

The sternum of abdominal segment 9 bears near each lateral margin a distinct lobe bearing a tuft of setae. These are here called genital lobes. An enlarged seta on the genital lobe is called the genital setae. The genital setae are sometimes flattened and spiniform (Fig. 4).

**LIST OF SPECIES OF THE HESPEROMYDIS GROUP AND THEIR HOSTS**

<table>
<thead>
<tr>
<th>Species</th>
<th>Host</th>
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<tbody>
<tr>
<td>1. H. hesperomydis</td>
<td>Peromyscus leucopus (Rafinesque)</td>
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<td></td>
<td>white-footed mouse, N. Amer.</td>
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<td>P. maniculatus (Wagner) deer mouse, N. Amer.</td>
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<td>P. gossypinus (Le Conte) cotton mouse, N. Amer.</td>
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<td>2. H. difficilis sp. n</td>
<td>P. crinitus (Merriam) canyon mouse, N. Amer.</td>
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<td>3. H. reithrodonomys</td>
<td>Reithrodonomys megavittis (Baird) western harvest mouse, N. Amer.</td>
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<td>6. H. ferrisi emphelicia subsp. n</td>
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<td>7. H. captiosa Johnston</td>
<td>Mus musculus Linn. house mouse, world-wide</td>
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**H. HESPEROMYDIS (OSBORN)**


*Hophpleura hesperomydis* (Osborn), Kellogg and Ferris, 1915, p. 17, textfig. 4-5, pl. 1, fig. 3; pl. 4, fig. 1; pl. 5, fig. 14; Johnson, 1958, p. 41; Cook and Beer, 1959, p. 408-409, figs. 6, 11.

*Hophpleura hesperomydis* (Osborn) (partim), Ferris, 1916a, “Cat Anop.,” p. 156 (not the records from *Peromyscus boylii* and *Mus musculus*); Ferris, 1916a, p. 112 (not the records from *Onychomys* and *Oryzomys*); Ferris, 1921, p. 70-71 (not the records from *Peromyscus boylii*, *Onychomys*, *Mus*, *Oryzomys*, and *Hesperomys*); Hopkins, 1949, p. 470 (not the records from *Oryzomys* and *Hesperomys*); Ferris, 1951, p. 139-137 (not the records from the hosts listed in 1921); Morlan and Hoff, 1957, p. 348-349 (not the records from *Peromyscus boylii*, *P. nasutus*, *Onychomys*, and probably *Microtus*).

**Type data**

Lectotype male; 2 males and 1 female from *Peromyscus leucopus* at Ames, Iowa. The lectotype was designated from a series of 4 syntypes on one slide by Johnson (1958). The type material is deposited in the collection of U. S. National Museum.

*H. hesperomydis* (Osborn) was originally described from 3 males and 1 female found on the white-footed or deer mouse, *Peromyscus leucopus* (Osborn, 1891 called it *Hesperomys leucopus*) at Ames, Iowa. Since Ferris (1916) the species recorded as *H. hesperomydis* from various hosts other than *Peromyscus leucopus* and *P. maniculatus* as probably not *H. hesperomydis* s. str. The specimens from *Oryzomys chaparensis* and *O. flavescens*, South America, reported as *H. hesperomydis* are referred to a new species, *H. similis*, described in this paper. Those from *Hesperomys callinum*, Argentina, are referred to *H. cooki* sp. n.

**Diagnosis**

Total body length: female about 1.15 mm, male about 0.77 mm. Related to *H. difficilis* sp. n. *H. ferrisi* Cook and Beer, *H. rettrodontomydias* Pera and *H. onychomydis* Cook and Beer. Very near to *H. difficilis*. Female separable from *difficilis* having dorsal paratergal setae of abdominal segments 3 to 8 short, but not minute. Male differ
from Reithrodontomydis by having both paratergal seta
of 2nd and 3rd abdominal segments similar in size and parame
of uniform thickness. Separable from Hesperomydis in having MMHS placed closer to PPHS and lateral paratergal lobes of 4th and 5th abdominal segments with acute lateral lobules. Separable from onychomydis in having thoracic sternal plate with posterior process pointed, paratergal setae of abdominal segments 4 to 6 shorter than the depth of median emargination, and parame
t of uniform thickness. The genitalic setae of females are not spiniform. The posterior process of the thoracic sternal plate is less acute.

New records

From Peromyscus californicus californicus (Gamm
CALIFORNIA: San Diego, 16 Nov. 1952, E. D. Brown, 2
P. crinitus, 19 November 1952, by J. P. Newey. Paratypes: 6 males and 5 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crini


Comments

There are specimens recovered from Mus, Zapus, Perognathus, and ? Peromyscus nasutus. They are either stragglers or contaminants.

2. Hoplopleura difficilis sp. n.  
(Figs. 14-18)  

Type data

Holotype female and allotype male (on one slide) from Peromyscus crinitus (Merriam), Tooele Co., Utah, 20 March 1953, collected by E. A. Shippee. Paratypes: 6 males and 5 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 March to 13 April 1953, collected by E. A. Shippee; 2 females from P. crinitus, Tooele Co., Utah, 20 M

Diagnosis

Close to H. hesperomydis (Osborn), H. reithrodontomydis Ferry and H. onychomydis Cook and Beer. Females separable from hesperomydis in having dorsal paratergal setae of abdominal segments 4 to 6 minute, and differing from reithrodontomydis and onychomydis by having thoracic sternal plate with posterior process bluntly pointed. Males separable from hesperomydis and reithrodontomydis in having dorsal paratergal setae of 2nd and 3rd abdominal segments shorter than ventral setae, and differing from hesperomydis, reithrodontomydis and onychomydis by having paramere apically thickened.

Description
Female: Total body length about 1.20 mm. Head (Fig. 15) broad behind antennae. MHS not arranged in straight line; MMHS close to PDHS. Antennae 5-segmented; scape much wider than long and as long as pedicel. Thorax: sternal plate with posterior process bluntly pointed as in Figure 17. Legs as in other member of genus. Abdomen: sternal plate of 2nd segment with 2 groups of 4 setae extending laterally and articulating with paratergal plate. Anterior sternal plate of 3rd segment articulated laterally with corresponding paratergal plate, bearing the usual 2 groups of 2 enlarged setae. Ventral paratergal process of 2nd segment elongated and acute, bearing paratergal setae similar in size (Fig. 14). Paratergal setae of 3rd segment longer than depth of median emargination and similar in size. Dorsal paratergal setae of segments 4 to 6 minute. Lateral paratergal lobes of 7th segment distinct and pointed. Paratergite of 8th segment without lateral lobe. Seventh and 8th segments with pair of long paratergal setae. Last tergite with 2 setae on each side. Genitalia as in Figure 16; genital setae unspecialized.

Male: Total body length about 0.97 mm. Head, thorax, and legs as in female. Abdomen as in female with usual sexual differences. Genitalia as in Fig. 18; paramere more or less thickened apically.

3. Hoplopleura reithrodontomydis Ferris
(Figs. 19-26)

Hoplopleura hesperomydis (Osborn), Ferris, 1953, p. 52.

Type data
Dr. Robert L. Langston of the University of California, Berkeley, kindly sent me 14 slides containing 8 males and 23 females of Hoplopleura reithrodontomydis Ferris. Of 14 slides 3 from Reithrodontomydis dorealis Merriam, R. antelais, and R. chrysopsis Merriam bear Ferris' handwritten label "Hoplopleura reithrodontomydis n. sp., holotype." One slide containing 1 male and 1 female specimens from R. chrysopsis bear "holotype" on the label in addition to "holotype." In other 11 slides bear Ferris' handwritten label "Hoplopleura reithrodontomydis n. sp." From 1 syntype I here designate the lectotype. Lectotype female from Reithrodontomydis dorealis Merriam.
Todos Santos, Guatemala, Ferris Collection 925 (USNM 70617). Paratypes: 8 males and 22 females from R. dorsalis; 4 males and 9 females from R. australis; 1 male and 5 females from R. chrysopsida, Ajusco near Mexico City, Mexico, Ferris Collection 923. The type specimens are deposited in the collection of the University of California at Berkeley, except for 2 paratypes on one slide which is in the University of Minnesota Entomology Collection.

Diagnosis

Very close to H. hesperomydis (Osborn), H. difficilis sp. n. and H. onychomydis Cook and Beer. Separable from onychomydis in having thoracic sternal plate with posterior process pointed and paratergal setae of abdominal segments 4 to 6 shorter than the depth of median emargination. Females differing from hesperomydis and difficilis by having thoracic sternal plate with posterior process acute. Further separable from hesperomydis and difficilis in having paratergite of 8th abdominal segment more or less rectangular in shape and dorsal paratergal setae of abdominal segments 4 to 6 minute. In the males reithrodontomydis differs from difficilis in having paramere of uniform thickness. This species is best identified in immature stages.

Description

Female: Total body length about 1.13 mm. Head (Fig. 21) and thorax very similar to those of difficilis and hesperomydis except posterior process of thoracic sternal plate acute or elongated and acute as in Figure 20. Legs as in other member of the genus. Abdomen: sternal plate of 2nd segment and anterior sternal plate of 3rd segment as in other member of the genus. Paratergal setae of 3rd segment longer than the depth of median emargination (Fig. 19). Dorsal paratergal setae of segments 4 to 6 minute. Paratergite of 7th segment with distinct lateral lobes on each side bearing a pair of long paratergal setae. Paratergite of 8th segment without lateral lobes and paratergite of 9th segment in shape. Last tergite with 2 setae on each side. Genitalia as in Fig. 22; genital setae unmodified.

Male: Total body length about 0.80 mm. Head, legs, and abdomen as in female with usual sexual differences. Posterior process of thoracic sternal plate bluntly pointed. Genitalia as in Fig. 24; paramere of uniform thickness, lateral arms of pseudopenis with 2 prominent and 2 to 3 minute teeth.

Nymph 1 (Fig. 25): Total body length about 0.35 mm. Similar to nymph 1 of H. ferrisi and H. onychomydis. It differs from ferrisi in having abdominal segments with acute lateral lobules, and also separable from onychomydis in having paratergite lobes of 4th and 5th segments with acute lateral lobules, and also separable from reithrodontomydis, difficilis, and hesperomydis in having posterior process of thorax sternal plate blunt or even truncate, at least as long or longer than the depth of median emargination. Male further separable from difficilis, ko-

Hoplopleura and reithrodontomydis by having basally thickened paramere.

Specimens examined
Holotype, allotype and paratypes including 13 females, 11 males, 7 third nymphs, 15 second nymphs, and 23 first nymphs. Data for the type specimens are as in "Type data." Two collections: Ex Onychomys torridus pulchra, Elliot, California; Victorville, no other data, 1 female; Ex O. leucogaster arctipes Rhoads, Colorado; Colorado Springs, no other data, 2 males.

**5. Hoplopleura ferrisi ferrisi Cook and Beer**
(Figs. 31-36)

*Hoplopleura ferrisi* Cook and Beer, 1959, J. Parasit. 41: 408, figs. 8, 18.

*Hoplopleura hesperomydis* (Osborn) (partim), Ferris, 1916b, p. 195 (err. det., the records from *Peromyscus boylii*); Ferris, 1921, p. 70 (the records from *P. boylii*); Hopkins, 1949, p. 471 (the records from *P. boylii*); Ferris, 1951, p. 136-137 (the records from *P. boylii*); Moran and Hoff, 1957, p. 348-349 (err. det., two records from *P. boylii*); and *P. nasutus nasutus* (Allen).

Type data
Holotype: 1st instar nymph from *Peromyscus boylii* (Baird), Portal, Arizona, 5 August 1957, collected by James R. Beer and Robert Schwab. Paratypes: 6 males, 13 females, 13 first instars, 33 second instars, 3 third instars, collected from the same host specimen. Other paratypes are from *Peromyscus nasutus* (Allen), *P. eremicus* (Baird). Types in the University of Minnesota Entomology Collection.

Diagnosis
Total body length: female about 1.06 mm; male about 0.90 mm. Related to *H. ferrisi emphereia* subsp. n., *H. onychomysis* Cook and Beer, *H. boyliiica ferris*, *H. hesperomydis* (Osborn) and *H. difficilis* sp. n. Females separable from *ferrisi emphereia* in having thoracic sternal plate with posterior process gradually acute and paratergite of 8th abdominal segment more or less symmetrical, and males also separable from *ferrisi emphereia* in having paramere gradually tapering posteriorly. It differs from *onychomysis*, *reithrodontomydis*, *hesperomydis*, and *difficilis* by having paramere posteriorly abruptly tapering.

Specimens examined

Comment
This species was originally described on the basis of characters found solely in the immature stages. A quantitative analysis or discriminant function of the adult stages reveals that the population of *H. hesperomydis* from *Peromyscus lanatus* and *P. maniculatus* can be, however, distinctly discriminated from that of *H. ferrisi* found on the *P. boylii*, *P. nasutus* and *P. eremicus*.

**6. Hoplopleura ferrisi emphereia subsp. n.**
(Figs. 37-42)

Type data
Holotype: a female from *Peromyscus nudipes* (Allen), Panama; Chiriqui, El Hato, Lava Flow, 5,000 ft, 14 Jan. 1951, collected by Tipton. Allootype: male, data same as holotype. Holotype and allotype are on one slide. Paratypes: Ex *P. nudipes*, Panama; Chiriqui, El Hato, Lava Flow, 5,000 ft, 7-9 Jan. 1951, 5 males and 7 females, collected by Tipton, Chiriqui, El Volcan, 12 Jan. 1951, 1 male and 1 female, by Tipton, Chiriqui, Martiniz Dairy, 6,800 ft, Cerro Punta, 7-8 Jan. 1961, 2 males and 12 females, by Tipton; Ex *P. guadalamensis* Merriam, Guatemala: Dept. Jalapa, 5 miles E Mataquessintia, Laoslidoa, 21 March 1951, 1 female, collected by L. de la Torre; Ex *P. mexicanus saxatilis* Merriam, Guatemala: Dept. Santa Rosa, Finca El Progresso, 23 July 1961, 1 male, collected by L. de la Torre. Type host: *P. nudipes* (Allen). Type locality: Chiriqui, El Hato, Panama.

Diagnosis
Very closely related to *H. ferrisi ferrisi* Cook and Beer. Female differs from *ferrisi* by having thoracic sternal plate with posterior process abruptly pointed, and males further separable in having paramere posteriorly abruptly tapering.

Description
Female: Total body length about 1.27 mm. Head (Fig. 39); MHS arranged in more or less straight line. Antennae 5-segmented; scape wider than long and as long as pedicel. Thorax: sternal plate with posterior process abruptly pointed as in Figure 38. Legs as in other member of genus. Abdomen: sternal plate of second segment with 2 groups of 4 setae extending laterally and articulating with paratergal plate. Anterior sternal plate of 3rd segment articulating with corresponding paratergal plate, bearing 2 groups of 2 enlarged setae. Ventral paratergal lobe of 2nd segment long and acute. Paratergal setae of 2nd and 3rd segments longer than depth of median emargination. Dorsal paratergal setae of segments 4 to 6 minute. Paratergites of 7th and 8th segments as in Figure 37. Genitalia as in Figure 40.

Male: Total body length about 0.91 mm. Head, legs, and abdomen as in female with usual sexual differences. Thorax: posterior process of sternal plate more or less rounded, but not pointed. Genitalia as in Figure 42; paramere basally thickened and posteriorly abruptly tapering.

Comments
This species is very similar to ferrisi in general morphology, but distinctly different in male genitalia and female thoracic sternal plate. This species may well be treated as a distinct species, when we know more about the biology of the species and host.

7. Hoplopleura captiosa Johnson
(Figs. 43-46)


Hoplopleura hesperomydis (Osborn) (partim), Ferris, 1916a, "Cat. Anop.," p. 155 (records from Mus musculus, Calif., USA); Ferris, 1916a, p. 112 (err. det., records from Mus musculus); Ferris, 1921, p. 70-72 (err. det., records from Mus musculus in Russian Turkestan, Virginia, USA, and China); Blagoveschtchensky, 1937, p. 44 (err. det., Mus musculus, southern Kazakhstan; fide Johnson, 1960); Hopkins, 1949, p. 482 (records from Mus musculus); Blagoveschtchensky, 1950, p. 85 (err. det., from Mus musculus, Tadzhikistan; fide Johnson, 1960); Hopkins, 1951, p. 136-137 (records from Mus musculus); Sosnina, 1951, p. 365 (err. det., from Mus musculus, Tadzhikistan; fide Johnson, 1960); Sosnina, 1954, p. 107 (err. det., from Mus musculus, Tadzhikistan; fide Johnson, 1960).

Hoplopleura acanthopus (Burmeister), O'Mahoney, 1944, p. 60 (err. det., from Mus musculus, Cairo, Egypt; fide Johnson, 1960); O'Mahoney, 1945, p. 231 (err. det., from Mus musculus, South Altai Mountain, Russia; fide Johnson, 1960).

Hoplopleura intermedia Kellogg and Ferris, Kaneko, 1955, p. 109, figs. 4, 5 (err. det., from Suncus murinus and Mus caroli; fide Johnson, 1960).

Hoplopleura musculi Wegner, 1961, p. 155-164, figs. 1, 2, 3 (new synonymy).

Type data
Holotype female, allotype male, 4 males and 19 female paratypes from Mus musculus Linn., Egypt: Western Desert Governorate, Royal Shooting Club, 3 miles N of Faiyum, 4 Jan. 1954, collected by Hoogstraal. Other paratypes from Thos sp., Mus sp., Mus musculus sp. Egypt, Mus caroli color, Thailand, M. musculus, Russian Turkestan, Mus bacterianus, Ryukyu, Japan, Mus caroli, Ryukyu, Japan, M. musculus, California, USA. Holotype and allotype deposited in the collections of U. S. National Museum, type no. 64466.

Diagnosis
Total body length: Female, 1.2 to 1.35 mm, male 0.85 to 0.95 mm. Related to H. similis sp. n., H. cooki sp. n., and H. hesperomydis (Osborn). Separable in both male and female from hesperomydis in having sternal plates and parameral setae; thoracic sternal plate with posterior process rounded and 3rd abdominal segment with 2 paratergal setae on each side.

Specimens examined
Ex Mus musculus, CHINA: Chou, Kansu, 1 male and 1 female (Ferris’ collection); Tai-Yuan-Fu, Shanxi, 1 male and 1 female (Ferris’ collection); EGYPT: West Desert Gov., Royal Shooting Club, 3 miles N of Faiyum, 4 Jan. 1954, by H. Hoogstraal, 1 female paratype; UNITED STATES: Virginia, Falls Church, 2 females, 1915, collected by E. A. Chapin (Ferris’ collection); USSR: Dharan, Russian Turkestan, 3 males and 3 females (Ferris’ collection).

Comments

8. Hoplopleura similis sp. n.
(Figs. 47-53)

Hoplopleura hesperomydis (Osborn) (partim), Ferris, 1921, p. 70-72 (err. det., records from Oryzomys fulvescens and O. chaparensis); Hopkins, 1949, p. 469 (records from O. fulvescens and O. chaparensis); Ferris, 1951, p. 136-137 (the records from O. fulvescens and O. chaparensis).

Type data
Holotype: female from Oryzomys fulvescens Saussure, Vera Cruz, Orizaba, Mexico, no other data, Ferris’ collection 951 (USNM 59259). Allotype: male from Oryzomys chaparensis Os good, Todos Santos, Bolivia, no other data, Ferris’ collection 1021 (USNM not listed). Paratypes: 7 females from O. fulvescens, Vera Cruz, Orizaba, Mexico; 2 females from O. chaparensis, Todos Santos, Bolivia. The type specimens are deposited in the collections of the University of California at Berkeley, California except 2 female paratypes (one slide) which are kept in the University of Minnesota Entomology Collection. Type host: Oryzomys fulvescens Saussure. Type locality: Vera Cruz, Orizaba, Mexico.
**Diagnosis**

Closely allied to *H. cooki* sp. n. and *H. captiosa* Johnson. It differs in both male and female from *cooki* by having abdominal segment 8 without distinct lateral paratergal lobe, thoracic sternal plate with posterior process gradually tapering and acute, abdominal segment 3 with a single paratergal seta placed near ventral angle of median emargination and PMHS placed in parallel with PDHS. Sepia from *captiosa* in having abdomen with no setae on membrane, thoracic sternal plate with posterior process pointed, 3rd abdominal segment with a single paratergal seta on each side, and also variable in female from *captiosa* by having spiniform genital setae.

**Description**

**Female:** Total body length about 1.25 mm. Head (Fig. 48) with MHS in straight line and PDHS near PDHD; PMHS placed in parallel with PDHS. Antennae 5-segmented; scape wider than long and as long as pedicel. Thorax: sternal plate with posterior process gradually tapering and acute as in Figure 49. Legs as in other member of the genus. Abdomen: sternal plate of 2nd segment with 2 groups of 4 setae extending laterally and articulating with paratergal plate; anterior sternum of 3rd segment articulate with corresponding paratergal plate bearing 2 groups of 2 enlarged setae. Paratergit of the 3rd segment with 1 paratergal seta and each paratergal lobe divided into 2 distinct lobes (Fig. 47). Paratergite of segment 4 to 6 distinct but dorsal paratergal setae very small. Paratergite of 7th segment with distinctly pointed lateral lobes, bearing 2 long setae. Paratergite of 8th segment symmetrical with 2 long setae. Last tergite with 3 long setae on each side. Genitalia (Fig. 50): genital setae flat, spiniform.

**Male:** Total body length about 0.86 mm. Head, legs, and abdomen as in female with usual sex differences. Thorax: sternal plate with posterior process not acute as in Figure 52. Genitalia as in Figure 53: paramere of uniform thickness.

**Comments**

This species has been mistakenly identified as *hesperomydis*.
9. *Hoplopleura cooki* sp. n.  
(Figs. 1–6)

*Hoplopleura hesperomys* (Osburn) (partim),  
Ferris, 1921, p. 70–72 (err. det., records from *Hesperomys callous = Eligmodontia callous*);  
Hopkins, 1949, p. 472 (records from *Hesperomys callous*); Ferris 1951, p. 136–137  
(records from *Hesperomys callous*).

**Type data**

Holotype female, allotype male, 2 male and 2  
female paratypes from *Hesperomys callous*,  
ARGENTINA, Joya, no other data, Ferris' Collection  
942 (USNM 94164). Type host: *Hesperomys callous*  
(Rengger). Type locality: Joya, Argentina.  
Holotype, allotype, and 2 paratypes de-  
posited in the collections of the University  
of California at Berkeley, California. One male and  
1 female paratypes (on one slide) are kept in the  
University of Minnesota Entomology Collection.

**Diagnosis**

Closely related to *H. similis* sp. n. Separable in both  
male and female from similis in having 8th  
abdominal segment with distinct dorsal paratergal  
lobe acute, thoracic sternal plate with posterior  
process abruptly pointed, single paratargal seta of  
3rd abdominal segment placed on middle of median  
emargination and PMHS placed anterior to PDHS.

**Description**

Female: Total body length about 1.27 mm.  
Head (Fig. 1): PMHS placed anterior to PDHS;  
ADHS close to PDHS. Antenna 5-segmented  
scape wider than long and as long as pedicel.  
Thorax: sternal plate with posterior process rather  
short and abruptly pointed as in Figure 6. Legs  
as in other member of the genus. Abdomen: sternal  
plates of 2nd and 3rd segments as other member  
of the genus. Ventral paratergal lobe of 2nd seg-  
ment acute. Dorsal paratergal setae of 2nd segment  
longer than ventral one. Paratergite of 3rd segment  
with a single paratergal seta placed on the middle  
of anterior edge of median emargination. Para-  
tergal lateral lobes of segments 4 to 6 more or less  
truncate. Dorsal paratergal setae of segments 4 to  
6 minute. Paratergal lateral lobes of 7th segment  
distinct and pointed. Paratergites of 7th and 8th  
segments with 2 long setae. Paratergite of 8th  
segment asymmetrical and with a distinct dorsal  
paratergal lobe acute (Figs. 2, 3). Last tergite  
with 3 setae on each side. Genitalia (Fig. 4):  
genital seta flat spiniform.

Male: Total body length about 0.98 mm. Head,  
thorax, legs, and abdomen as in female with usual  
sex differences. Genitalia as in Figure 6: para-  
terescences evenly thickened.

**Comments**

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