(continued from p. 384)

appreciably the carapace of the crab. They feed mostly, perhaps exclusively, at the soft articulations on the leech. This leech has no hard jaws or teeth capable of cutting even soft tissue. While we have not tested the acidity of the latter it certainly is not equal to dissolving the anatomy and systematic position of M. hirsuta. He states that although M. hirsuta is sold as Callinectes sapidus in the brackish coastal waters of New Jersey, Chesapeake Bay and North of us (F.S.) has observed at least 500 blue crabs in the brackish waters of Lake Pontchartrain 10 years in various brackish-water habitats on both coasts of Florida, but we have not observed these on any of these crabs. However, Dr. Gordon Ginter, Director, Gulf Coast Research Laboratory, Ocean Springs, Mississippi (personal communication) reports observing a leech early the part of 1938. Meier and Barloun (1953, Wasmann J. Biol. 13: 297-311) record Mysella attached to the prawn, Fenaliomphalus vulgaris Say) and oysters. Leidy (1852, Proc. Acad. Nat. Sci. Philadelphia, 1851-3, p. 243) created the genus Mysobolida for this species. He stated that it was "parasitic upon the common edible crab, Lupa dicantha. Mus. No. 152: p. 99) considers the name Lupa dicantha M. Edw. to be a synonym for the blue crab, Callinectes sapidus Rathbun. Our report of Mysobolida hirsuta Leidy appears to be the first record of the leech in Florida waters. This report therefore extends the southerly geographical distribution of M. hirsuta, mortality of the blue crab.

Acknowledgments are here extended to Dr. J. Percy Moore for his kindness in identifying the leech for us and for his comments on the feeding habits of M. hirsuta. ROBERT F. HUTTON and FRANKLIN J. HANNAK, Florida State Board of Conservation Marine Laboratory. Maritime Bureau, Rayburn Harbor, St. Petersburg, Florida. (Contribution No. 12)

Figure 1. Two specimens of the leech, Mysobolida hirsuta Leidy, attached to the carapace of the blue crab, Callinectes sapidus Rathbun.

(continued on p. 430)

THE IMMATURE STAGES OF THE GENUS HOPLOPLEURA (ANOPLURA: HOPLOPLEURIDAE) IN NORTH AMERICA, WITH DESCRIPTIONS OF TWO NEW SPECIES

EDWIN F. COOK AND JAMES R. BEER

The immature stages of the genus Hoplopleura are but little known. Of the known North American species, only a few have been described or illustrated. Ferris (1921, 1951) illustrated stages of H. acanthopus (Burns) and H. arboricola K. and F., and Pratt and Lane (1951) illustrated stages of H. oenonyx Ferris. In addition to this, a brief description of stage of H. hirsuta Ferris (Ferris, 1921) and H. oenonyx Ferris was made by Pratt and Lane (1951).

In the course of collecting specimens for quantitative studies on louse populations, numerous immature stages have come to hand representing most of the described North American species. All stages of North American species have been collected by us with the exception of H. oenonyx, H. hirsuta and H. oenonyx. Species representing H. oenonyx have been made available to us through the courtesy of Dr. Harry Pratt of the C.D.C. in Atlanta. Skins of Oenonyx palastris and Sigmodon hispidus from which H. hirsuta and H. oenonyx were recovered were made available to us by Dr. Norman Negus of Tulane University.

The adult stages have all been carefully described and illustrated by Ferris (1921, 1951), and also to some extent by Pratt and Lane (1951). Keys to the adult stages are also available in Ferris (1951) and Pratt and Lane (1951). In the present paper, in addition to the key and descriptions of all immature stages, new species are described, 1 of which is readily distinguished in all adult and nymphal stages and another which can be distinguished only in the immature stages. Characters are also considered which will more readily permit the separation of H. arboricola from H. erratica in adult stages.

The several nymphal instars are easily recognized, since in any long series of specimens at least a few nymphs will be found on the point of molting. Succeeding instars are at this time visible within the nymphal skin of the preceding stage. It is apparent in this material that there are 3 nymphal stages.

It is evident that the North American species of the genus are separable into 3 groups. Those nymphs found on chipmunks and tree squirrels (H. arboricola, H. erratica, and H. sciuri) have 5 pairs of minute abdominal spiracles. Those found on cricetid rodents have no such spiracles visible in any immature stages. The 1 species found on the flying squirrel (H. trivittata) lacks abdominal spiracles as a nymph, but has the anal lobes apically setose in all stages, a condition not evident in the other 2 groups. The lice of chipmunks and tree squirrels also have conspicuous dorsal and ventral abdominal setae in addition to the marginal

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setae in the 2nd and 3rd instars. These are not present at all or are minute in the early stages of the other 2 groups.

Two complexes requiring further investigation have been revealed here. One of 2 new species herein described is from this complex. These new species are very different in the material we have had available from various spe- large enough nor from enough Enatamis species. New species here are not species heretofore described. It will be considered further in the description of H. arboricola, justified on the basis of the limited data of North American fauna, for examination of im- matures of other species should clarify the relationships in this group.

All North American species of the genus Hoplopleura can be recognized in the 3 nymphal stages by the presence of small unpigmented spines variously distributed on the ventral surface of the head capsule, the first antennal segment, and the coxae.

Descriptions of immatures that accompany the following key are diagrammatic.

KEY TO THE NYMPHES OF HOPLOPLEURA OF NORTH AMERICA

1. With 2 or more major posterior abdominal setae
   2. With no major posterior abdominal setae

2a. With only 1 pair of minute, ventral abdominal setae; with seta group X (Fig. 15)
   1st instar, *E. niyamensis*

2b. With several pairs of minute, ventral abdominal setae
   2nd instar, *E. niyamensis*

3. With 2 only major posterior abdominal setae
   3rd instar, *E. niyamensis*

4. Abdomen with a double row of 6 sclerotized plates dorsally (Fig. 25)
   2nd instar, *E. niyamensis*

5a. Abdominal spiracles absent
   2nd instar, *E. niyamensis*

5b. Abdominal spiracles present (Figs. 13 and 14; Figs. 7, 8, 15, 24; Figs. 9, 30, 31)
   2nd instar, *E. niyamensis*

6a. Abdomen with 4 or more pairs of dorsal setae near middle of posterior portion (Figs. 13, 14)
   2nd instar, *E. niyamensis*

6b. Abdomen with no more than a pair of dorsal setae near middle of posterior portion (Fig. 13)
   2nd instar, *E. niyamensis*

7a. Abdomen with 9 or more pairs of dorsal setae near middle of posterior portion (Fig. 14)
   2nd instar, *E. niyamensis*

7b. Abdomen with 1 or less pairs of dorsal setae near middle of posterior portion (Fig. 11)
   2nd instar, *E. niyamensis*

8a. With paratergal sclerites (Figs. 8, 26; Figs. 12, 13)
   2nd instar, *E. niyamensis*

8b. Without paratergal sclerites
   2nd instar, *E. niyamensis*

9a. From *Eutamias* (Fig. 23)
   2nd instar, *E. niyamensis*

9b. From *Tamias* (Fig. 30)
   2nd instar, *E. niyamensis*

10a. Paratergal lobes without setae; from *Tamias* (Fig. 30)
    2nd instar, *E. niyamensis*

10b. Paratergal lobes with setae; from *Eutamias* (Fig. 31)
    2nd instar, *E. niyamensis*

11a. From *Eutamias* (Fig. 14)
    2nd instar, *E. niyamensis*

11b. From *Tamias* (Fig. 14)
    2nd instar, *E. niyamensis*

12a. With 4 major setae at posterior end of abdomen (Fig. 12)
    1st instar, *E. niyamensis*

12b. With 12 major setae at posterior end of abdomen (Fig. 13)
    1st instar, *E. niyamensis*

13a. One pair of anterior abdominal setae (Fig. 24)
    3rd instar, *E. niyamensis*

13b. Two pairs of anterior abdominal setae (Fig. 22)
    3rd instar, *E. niyamensis*

14a. No small setae on posterior abdominal plate (Fig. 12)
    3rd instar, *E. niyamensis*

14b. With 4 small setae on posterior abdominal plate (Fig. 13)
    3rd instar, *E. niyamensis*

15a. With 8 small setae on posterior abdominal plate (Fig. 28)
    3rd instar, *E. niyamensis*

15b. With 12 small setae on posterior abdominal plate (Fig. 14)
    3rd instar, *E. niyamensis*

16a. With 2 pairs of small lateral setae on thoracic tergum in addition to principal seta of thorax (Fig. 12)
    1st instar, *E. niyamensis*

16b. With 1 pair of small lateral setae on thoracic tergum in addition to principal seta of thorax (Fig. 12)
    1st instar, *E. niyamensis*
adjacent small seta, ventral base of. Last abdominal segment not prolonged posteriorly. Cuticle of abdomen appears scaled, of a light brown color. Four major abdominal setae: 2 pairs of minute setae on ventral side of abdomen, 2 pairs of principal setae on thorax in addition to two principal setae. Dorsal principal setae smaller, each of setae in process of moltting into nymph 2. The largest species in the group, the sizes cited here may be too small since only 7 third instars were measured.

**Nymph 1:** (Fig. 8) Total length 0.66-0.75 mm. Similar to nymph 2 of H. herpetomys, extremely long, slender anal segment. This species differs from H. herpetomys in having a number of abdominal setae in having no dorsal setae before the anal segment present, cuticle of abdomen appearing scaly, light brown in color. Abdomen with intercalary setae on either side of anal opening.

**Nymph 2:** (Fig. 17) Total length 0.35-0.55 mm. Similar to nymph 2 of H. herpetomys, thus, cuticle not visible from any other species in the genus. Six major abdominal setae.

**Nymph 3:** (Essentially identical to nymph 2. Total length 0.66-0.75 mm. August 5, 1957, collected by James R. Beer and Robert Schwall. Paratypes: 10 males, 12 Peromyscus maniculatus, 12 small setae on thorax and 17 fourth instars, 4 males, 6 females, 17 first instars, and 8 second instars, from 3 Peromyscus maniculatus. Types: Holotype, Paratypes: Holotype and Paratypes in the University of Minnesota collection.

This species is most remarkable in that it can only be identified in the immature stages by examining the specimens from P. maniculatus in Minnesota. May well be that a careful analysis of the parasite populations of the various species of the genus will reveal even more new species. (See further comments under H. herpetomys.)

**DESCRIPTION OF THE EARLY STAGES OF KNOWN NORTH AMERICAN SPECIES.**

*H. herpetomys* | *H. prattii* | *H. laceyi* | *H. campbelli* | *H. prattiae* | *H. laceyi* | *H. campbelli* | *H. prattiae* | *H. laceyi* | *H. campbelli* | *H. prattiae*
---|---|---|---|---|---|---|---|---|---|---

**COOK AND BEER—NEW SPECIES OF HOPLOPLEURA (CANTOPLURA)**

**Nymph 1:** (Fig. 6) Total length 0.30-0.37 mm. Anterior principal head setae larger than posterior. Principal thoracic setae somewhat longer than running minute setae except for those adjacent to major ventral abdominal setae. 4 scaly; Anal segment not protruded posteriorly. Nymph 2: (Fig. 16) Total length 0.34-0.47 mm. Anterior principal and posterior head setae and principal thoracic setae of same size. Anal segment not protruded posteriorly; no of major abdominal setae: 6 minor abdominal setae present. Nymph 3: (Fig. 20) Total length 0.60-0.79 mm. Otherwise identical with nymph 2. From Booth Island, Minnesota. From Peromyscus manfullatus, Baskett Lake.
Hoplolopha kirtropi Ferris

Haplolopha kirtropi Ferris. Nymph 1: (Fig. 10.) Total length 0.41-0.55 mm. Anterior principal head setae represented by stout, immediately anterior to the clypeofrontal suture. Principal thoracic setae are longer than posterior principal head margin of head. Thoracic principal setae are brownish. Four major abdominal setae on ventral surface of abdomen, not attaining middle of body, no abdominal segmentation. Nymph 2: (Fig. 21.) Total length 0.49-0.67 mm. Head and thorax similar to those of nymph 1. A pair of minute setae on ventral side of abdomen near hind coxal bases. Nymph 3: (Fig. 28.) Total length 0.74-1.14 mm. Nymphs 3 and 4 together in last instar. No head and thorax similar to those of nymph 1. A pair of minute setae on ventral side of abdomen near hind coxal bases. Nymph 4: (Fig. 22.) Total length 0.81-0.93 mm. Head and thorax very similar to those of nymph 1. A pair of minute setae on ventral side of abdomen near hind coxal bases. No evidence of abdominal segmentation. Nymph 5: (Fig. 23.) Total length 0.83-0.84 mm. Head and thorax similar to those of nymph 1. A pair of minute setae on ventral side of abdomen near hind coxal bases.

Comments: Probably reared on Sitotroga spp.

Hoplolopha tripartita Kellogg and Ferris

Hoplolopha tripartita Kellogg and Ferris. Nymph 1: (Fig. 12.) Total length 0.27-0.32 mm. Anterior principal head setae quite minute dorsally. Principal thoracic setae about 1/3 times as long as posterior principal head setae. No evidence of abdominal segmentation. Nymph 2: (Fig. 20.) Total length 0.36-0.44 mm. Head and thorax very similar to those of nymph 1. A pair of minute setae on ventral side of abdomen near hind coxal bases. Nymph 3: (Fig. 23.) Total length 0.38-0.39 mm. A pair of minute setae on ventral side of abdomen near hind coxal bases. Nymph 4: (Fig. 22.) Total length 0.49-0.67 mm. A pair of minute setae on ventral side of abdomen near hind coxal bases. Nymph 5: (Fig. 23.) Total length 0.63-0.66 mm. A pair of minute setae on ventral side of abdomen near hind coxal bases.

Comments: This species is apparently restricted to the genus Glanisius.

Hoplolopha arboricola Kellogg and Ferris

Hoplolopha arboricola Kellogg and Ferris. Nymph 1: (Fig. 13.) Total length 0.38-0.35 mm. Anterior principal head setae large, 1.5 times as long as posterior principal head setae. Thoracic principal setae are brownish. Posterior half of dorsal side of abdomen with 2 pairs of minute setae on ventral side of abdomen near hind coxal bases. A pair of minute setae on ventral side of abdomen near hind coxal bases. A pair of minute setae on ventral side of abdomen near hind coxal bases.

Comments: This species is restricted to B. kirtropi in the west. It must be reanalyzed in the east nations. Records of this species from both countries are not accurately identified.
Nymph 3: (Fig. 29.) Total length 0.66-0.91 mm. Head and thorax like nymph 2. Anterior abdominal setal row with 6 setae rather than 2; posterior ventral major abdominal setae each with 2 minute setae medially of base. Several small setae at abdominal apex dorsally and ventrally as in the figure. Five pairs of spiracles. Cuticle pigmented and appearing scaled.

Specimens examined: 4 first instars, 12 second instars and 12 third instars from Scirpus carolinensis, Princeton, Minnesota; 2 second instars and 1 third instar from Scirpus sphenops, Carlos Avery Game Refuge, Minnesota, July 29, 1958.

Comments: This species is probably to be found on all North American Scirpus. The record from S. sphenops is apparently new.

*Hoplopleura onychomydis* Ferris

*Nymph 1: (Fig. 5.) Total length, 0.46-0.57 mm. Anterior principal head setae represented by the inner of a small pair located anterior to the clypeofrontal suture. Posterior principal absent, but not especially long, barely attaining posterior head margin. A small seta medially of posterior principal. Principal thoracic setae about 1/2 times as long as posterior principal head setae. A minute pair of setae on ventral of abdomen near posterior coxae; another small pair on ventral near posterior end of abdomen. Only 2 major abdominal setae. Dorsal side of abdomen with a row of 6 pairs of sclerites.

*Nymph 2: (Fig. 15.) Total length, 0.66-0.71 mm. Head and thorax like those of nymph 1, except 2 pairs of marginal thoracic setae rather than 1 pair. Abdomen without major setae. A longitudinal row of pairs of minute setae on ventral side of abdomen; 3 pairs of minute setae at apex ventrally, 1 pair at apex dorsally.

*Nymph 3: (Fig. 25.) Total length, 0.66-0.96 mm. Practically identical with nymph 2, except for a single pair of small setae dorsally and ventrally near posterior end of abdomen (labeled "X").

Specimens examined: 3 first instars, 4 second instars, and 3 third instars from "Rats" Atlanta, Ga. (no other data); 10 first instars, 10 second instars, 9 third instars, from Rattus, Atlanta, Ga., December, 1946.

**SUMMARY**

The nympha stages of the known North American species of the genus *Hoplopleura* are described and illustrated. Two new species are described, *H. ferrisi* and *H. onychomydis*. The former can only be recognized in the immature stages. Characters that distinguish *H. arboricola* K. and F. and *H. erratica* (Osb.) in both immature and adult stages are discussed. Keys to all immature stages are presented.

**LITERATURE CITED**


**EXPLANATION OF PLATES**

Figures 1-4. *Hoplopleura onychomydis*, n. sp.

Figures 5-14. First instars of *Hoplopleura* spp.


THE HAEMAPHYSALIS TICKS (ACARINA: IXODIDAE) OF BIRDS.

1. H. ORNITHOPHILA N. SP. FROM BURMA AND THAILAND*

HARRY HOOGSTRAAL AND GLENN M. KOHLS

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Owing to ever increasing evidence concerning the role of birds and their parasites in the spread of viruses pathogenic to man and domestic animals, we have been making a special study of ticks that feed on birds. The present report is the first in a series dealing with Haemaphysalis ticks from birds. We are grateful to the authorities of the Harvard University Museum of Comparative Zoology for allowing us to study material in their collection.

Haemaphysalis ornithophila n. sp.
(Figures 1 to 12)

Holotype. Male, from Pitta ochreata ochreata (Hume, 1871) (Burmese Rufous-tailed Pitta), deposited in the Museum of Comparative Zoology, Harvard University.

Paratypes. Two males with data as above, 1 in Museum of Comparative Zoology and 1 in Hoogstraal collection. One male (RML 22947) from Galla galas galas (Linnaeus, 1758) (Red Jungle Fowl) Mykytyn, Burma 13 May 1945, G. E. Davis, United States of America Typhus Commission, legit.; deposited in Rocky Mountain Laboratory.

DESCRIPTION

MALE. Holotype, overall length, 2.1 mm, width 1.3 mm. Thailand paratypes 2.1 mm by 1.4 mm and 2.3 mm by 1.3 mm; Burma paratypes 2.0 mm by 1.4 mm. Body widest immediately behind scutum to scapulae; posterior margin broadly rounded. Color yellowish brown.

Capitulum. Basis capituli rectangular, lateral margins parallel or only very slightly diverging anteriorly, posterior margin straight; corona gradually tapering to an acute apex, approxi-
mately 3/4 as long as basis capituli. Palpi broadly salient basally, basal margins straight and slightly pointed; without sensilla; segment 3 approximately 4/5 as long as segment 2 and ventrally bearing a long thin, sharply pointed spur reaching almost to end of length of segment 2. In medio margin of palp fairly lateral margins slightly convex, apex bluntly rounded; a slight cornu present; denticles 4/4 in segment 1. Scutum. Lateral grooves deep and broad, extending from level of middle of c.s. II and including 1 testa on each side. Cervical grooves deep, wide, and straight anteriorly, extending as shallow, narrow, broadly diverging grooves reaching approximately the same level as the anterior termination of lateral grooves. Frenulae clearly marked, numbering 11, elongate. Punctations quite numerous, fairly large, uniform, and deep, mostly noncontiguous; uniformly distributed over scapulae and scutal surface except for a band across anterior third; a few small punctations on testa and on lateral margins.

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