

THE NYMPHAL STAGES OF THREE NORTH AMERICAN SPECIES OF THE GENUS *ENDERLEINELLUS* FAHRENHOLZ

(ANOPLURA: HOPLOPLEURIDAE)¹

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Abstract: The nymphal stages of three North American species of the genus *Enderleinellus* Fahrenholz are described and illustrated. Taxonomic characters which are useful in distinguishing the nymphal stages of the species are also considered.

The nymphal stages of the genus *Enderleinellus* Fahr. are undescribed, although the adult stages have all been carefully described and illustrated by Ferris (1915, 1919, 1951) and Werneck (1947).

In the process of collecting ectoparasite specimens for various purposes using the method of Cook (1954a, b), numerous nymphal stages of the sucking lice have become available in the University of Minnesota Insect Collection. In this paper, the nymphal stages of three North American species of the genus *Enderleinellus*: *E. longiceps* Kellogg & Ferris (1915), *E. marmotae* Ferris (1919) and *E. suturalis* (Osborn, 1891), are described and illustrated [morphological terminologies of Ferris (1951) and Cook & Beer (1959) are followed]. Taxonomic characters useful in separating the nymphal stages of the species are discussed.

NYMPHAL MORPHOLOGY

The three nymphal stages are readily recognized by studying the size of body, the number of principal abdominal setae, and nymphs on the point of molting. Immediately before molting, succeeding instars are usually visible within the nymphal skin of the existing stage.

The clypeofrontal suture is obvious dorsally. The dorsal principal head setae (DPHS) are very small, unlike those in the genus *Hoplopleura*. The ventral principal head setae (VPHS) are distinctive and large in all nymphal stages. The dorsal principal thoracic setae (DPPTS) are comparatively large and are found in all stages (Figs. 1-9). In *E. longiceps* the thoracic sternal plate may be developed in the second and third instars (Figs. 5, 6). However, the thoracic sternal

plate is generally absent in nymphal stages.

Differences between species and nymphal stages are striking in the morphology of the abdomen. In nymph 1, only two pairs of major abdominal setae (MAS) are found, one pair on each side (Figs. 1, 4, 7). In the second nymphal stage there are 4 pairs of major abdominal setae (MAS) and 5-7 or more pairs of central abdominal setae (CAS) on both the dorsal and ventral sides. In *E. marmotae* and *E. suturalis* paratergal plates are evident in 3 or more abdominal segments (Figs. 2, 3, 8, 9). The paratergites of the abdominal segments 3 and 4 may bear 1 or 2 setae (Figs. 2, 3). In nymph 3, there are 6 pairs of major abdominal setae (MAS); anterior—(AMAS), middle—(MMAS), and posterior—(PMAS). The number of central abdominal setae (CAS) is similar to those of nymph 2. However, there are numerous lateral abdominal setae (LAS) on the membrane between the central abdominal setae (CAS) and the paratergal plates. In the anterior half of the abdomen there are 4 or more paratergal plates on each side (Figs. 3, 9). In *E. longiceps* there are 3 or more pairs of spiracles and no evidence of paratergites (Fig. 6).

OS	Oral setae
PHS	Principal head setae
DPHS	Dorsal principal head setae
ADPHS	Anterior dorsal principal head setae
PDPHS	Posterior dorsal principal head setae
DPPTS	Dorsal principal thoracic setae
CAS	Central abdominal setae
DCAS	Dorso-central abdominal setae
VCAS	Ventro-central abdominal setae
LAS	Lateral abdominal setae
DLAS	Dorso-lateral abdominal setae
VLAS	Ventro-lateral abdominal setae
MAS	Major abdominal setae
DMAS	Dorsal major abdominal setae
VMAS	Ventral major abdominal setae
AMAS	Anterior major abdominal setae
MMAS	Middle major abdominal setae
PMAS	Posterior major abdominal setae
ADMAS	Anterior dorsal major abdominal setae
PDMAS	Posterior dorsal major abdominal setae

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PVMAS Posterior ventral major abdominal setae
AcS Accessory setae

DESCRIPTIONS AND DISCUSSION

Enderleinellus longiceps Kellogg and Ferris

TYPE DATA: *Ex* "Gray squirrels", *Sciurus niger* or *S. carolinensis*, Lincoln, Nebraska.

Nymph 1: (Fig. 4) Total body length 0.34 mm. ADPHS represented by the inner one of a pair of small setae located anterior to clypeofrontal suture; two distinct setae located posterior to clypeofrontal suture; PDPHS minute; VPHS located posterior to base of antennae minute. No thoracic sternal plate; DPTS as large as ADPHS. Abdomen with 4 MAS and a minute AcS located posterior to each MAS; a minute seta located posterior to DPTS; a single minute seta located mesad of each DMAS. Cuticle scaly in appearance. Anal segment slightly prolonged.

Nymph 2: (Fig. 5) Total body length 0.40–0.42 mm. ADPHS represented by the inner one of a pair of minute setae located anterior to clypeofrontal suture; PDPHS located between 2 minute setae small. Thoracic sternal plate well developed and more or less rectangular; DPTS large. Abdomen with 8 MAS; a minute AcS located dorsally, posterior to base of PMAS; 7 DCAS and 7 VCAS irregularly arranged. Cuticle scaly in appearance. Anal segment slightly prolonged.

Nymph 3: (Fig. 6) Total body length 0.48–0.52 mm. Head, thorax and setal armature similar to nymph 2. Thoracic sternal plate well developed and slightly produced anteriorly. Abdomen with 3 pairs of MAS on each side; 7 DCAS and 7 VCAS arranged in more or less straight line; a pair of small setae located mesad of base of PMAS and posterior to 7th DCAS and 7th VCAS; 3 pairs of spiracles located anterior to AMAS; no paratergal plates; no evidence of

segmentation. Anal segment slightly produced. Cuticle somewhat scaly in appearance.

SPECIMENS EXAMINED: *Ex Sciurus carolinensis*, Princeton, Minnesota, 26. X. 1957, L. Abrahamson, 5 second instars and 8 third instars; no other locality and collector data, 1958, 1 first instar and 3 second instars.

Enderleinellus marmotae Ferris

TYPE DATA: *Ex Marmota monax*, Grafton, North Dakota (*vide* Wilson, 1963).

Nymph 1: (Fig. 1) Total body length 0.40–0.50 mm. Head with anteriorly truncated, obovate, dorsal sclerotized plate. Oral setae (OS) long; ADPHS represented by the inner one of a pair of small setae located anterior to clypeofrontal suture; PDPHS small; VPHS long and large. No thoracic sternal plate; DPTS small, but as large as DPHS. Abdomen with 4 MAS; Cuticle scaly in appearance. Anal segment slightly prolonged.

Nymph 2: (Fig. 2) Total body length 0.64–0.72 mm. DPHS minute; VPHS strong and large. DPTS larger than DPHS and slightly smaller than or as large as VPHS. Abdomen with 4 pairs of MAS; paratergites on 4 abdominal segments; 5 pairs of CAS. Paratergite on abdominal segment 3 with a single short seta; paratergite on abdominal segment 4 with a pair of long setae; paratergite on abdominal segment 5 very small or vestigial. Five DCAS and 5 VCAS arranged more or less in straight line; a rather strong seta located mesad of base of PDMAS and a small seta also located posterior to PDMAS; a weak but long seta located mesad of PVMAS. Cuticle scaly in appearance.

Nymph 3: (Fig. 3) Total body length 0.72–0.83 mm. DPHS minute; head with 14 other minute setae; VPH large; center of head with 2 rather large setae located anterior to antenna; DPTS as large as VPHS.

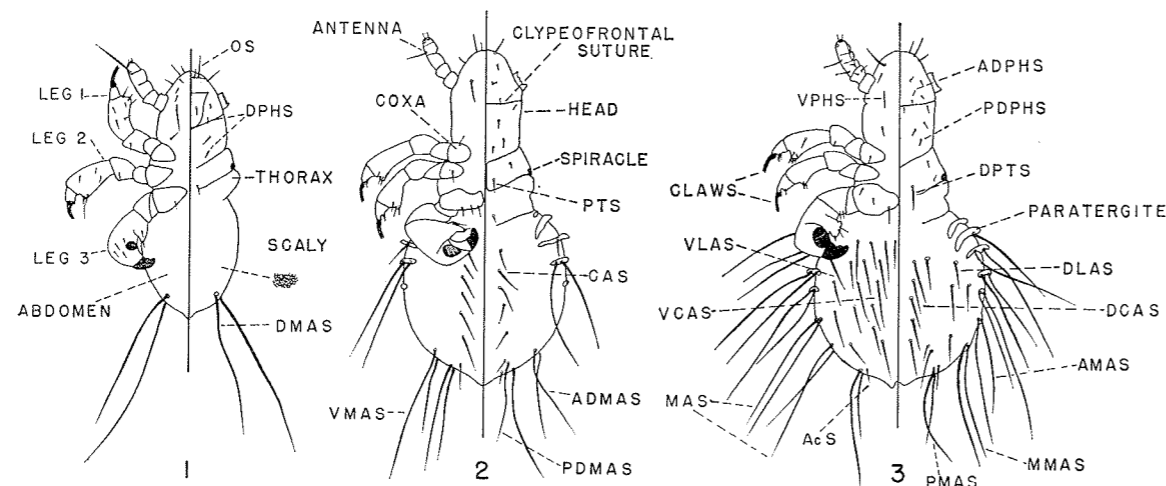


Fig. 1-3. *Enderleinellus marmotae* Ferris. 1, Nymph 1; 2, Nymph 2; 3, Nymph 3.
(See p. 327 for explanation of terms.)

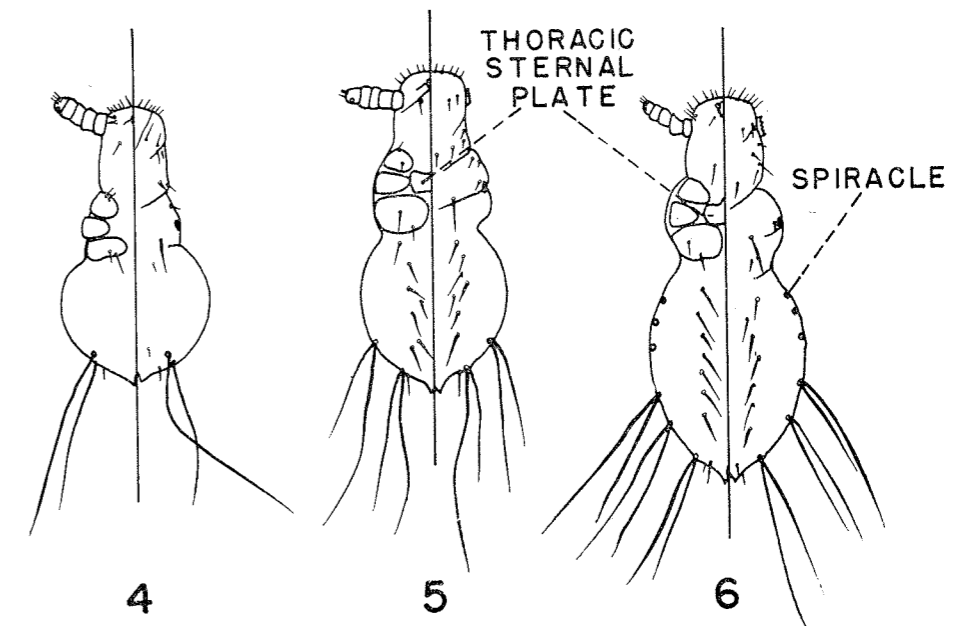


Fig. 4-6. *Enderleinellus longiceps* Kellogg & Ferris. 4, Nymph 1; 5, Nymph 2; 6, Nymph 3.

Abdomen with 5 pairs of DCAS, 5 DLAS on each side; 6 pairs of MAS; paratergites on 5 abdominal segments; DCAS arranged in straight line; a large, strong seta laterad to first DCAS; 1 long and 1 short, weak seta posterior to last DCAS; 1 seta laterad of base of PDMAS; paratergite of abdominal segment 2 with 1 long seta; paratergites of abdominal segments 3–5 with a pair of long paratergal setae; VCAS overlaps with VLAS; 10 or more VLAS between VCAS and paratergites; 2 setae as large as VCAS mesad of VCAS, 1 mesad to first VCAS and the 1 mesad to last VCAS; a weak seta mesad of base of PVMAS. Anal segment slightly produced. Cuticle scaly in appearance.

SPECIMENS EXAMINED: *Ex Marmota monax*, Carlos Avery, Anoka Co., Minnesota, 18. X. 1962, J. R. Beer, 38 first instars, 60 second instars, 50 third instars.

Enderleinellus suturalis (Osborn)

TYPE DATA: *Ex Citellus franklini*, Ames, Iowa. *E. suturalis* was first described from *Citellus franklini* and *C. tridecemlineatus*. Ferris (1919) suggested that *C. franklini* might be considered as the type host. In 1951, however, Ferris stated that *C. tridecemlineatus* has been designated by Kellogg & Ferris as the type host. There is no indication of such type designation by Kellogg & Ferris (1915). *C. franklini* should be considered to be the type host of *E. suturalis*.

Nymph 1: (Fig. 7) Total body length 0.30–0.35 mm. DPHS and DPTS minute; head, thorax, and abdomen similar to those of *E. marmotae*: abdomen with 2 pairs of MAS; a minute seta located on base of VMAS. Cuticle scaly in appearance.

Nymph 2: (Fig. 8) Total body length 0.46–0.57 mm. DPHS and DPTS minute; VPHS large. Abdomen with 3–4 paratergites; 4 pairs of MAS; 5 pairs of CAS. Paratergite of abdominal segment 3 with a pair of long setae; paratergite of abdominal segment 4 small or vestigial; DCAS irregularly arranged; a minute but distinctive AcS on base of PMAS; VCAS arranged more or less in straight line. Cuticle somewhat scaly in appearance.

Nymph 3: (Fig. 9) Total body length 0.53–0.62 mm. Head and thorax identical to those of nymph 2. Abdomen with 4 paratergites, 6 pairs of MAS, 5 pairs of CAS and numerous LAS. Paratergites of abdominal segments 2 and 3 with a pair of long setae; 9 or more DLAS located between DCAS and paratergites; DCAS arranged more or less in straight line; PMAS with a weak AcS; a strong seta located anterior to PVMAS; VCAS overlaps with 9 or more VLAS. Abdominal setae more or less truncate. Cuticle somewhat scaly in appearance.

SPECIMENS EXAMINED: *Ex Citellus harrisi*, Portal, Arizona, 27. VII.—16. VIII. 1957, James R. Beer, 4 first instars, 95 second instars and 66 third instars; *Ex Citellus franklini*, Delto, Manitoba, Canada, 4. VIII. 1961, Dave Olson, 4 second instars and 7 third instars; Minnesota: Fairmont, Martin Co., 27. V. 1962, E. G. Parks, 66 first, 55 second and 49 third instars; Itasca State Park, 21. VI.—27. VII. 1962, Ke Chung Kim, 8 first, 66 second and 114 third instars; *Ex Citellus tridecemlineatus*, Fairmont, Martin Co., Minnesota, 27. IV. 1962, E. G. Parks, 3 second and 6 third instars; Itasca State Park, 21. VI.—27. VII.

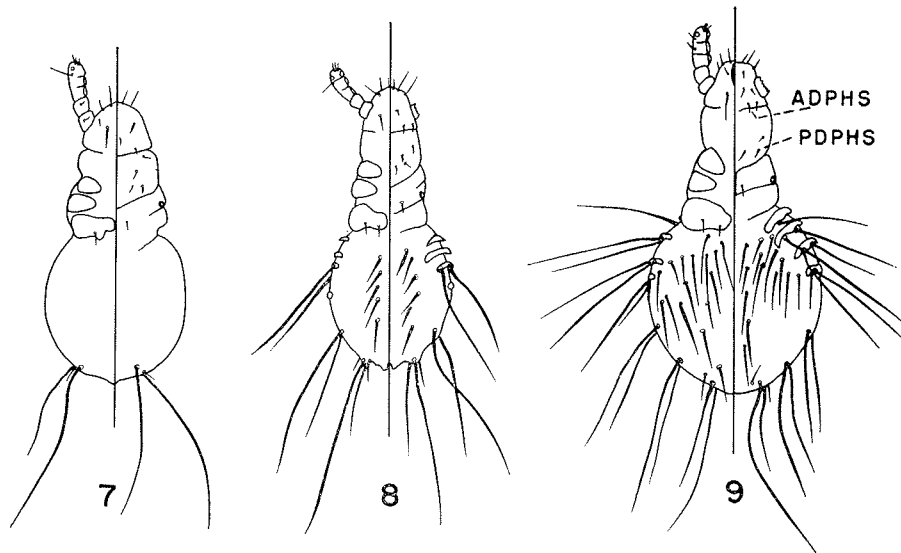


Fig. 7-9. *Enderleinellus suturalis* (Osborn) 7, Nymph 1; 8, Nymph 2; 9, Nymph 3.

1962, Ke Chung Kim, 20 first, 35 second and 45 third instars; Dunseth, Rolette Co., North Dakota, 6. V. 1961, J. R. Beer, 1 first, 6 second and 10 third instars.

Comments. Kim, Brown & Cook (1963) studied the adult populations of *E. suturalis* from the three host species, *Citellus franklini*, *C. tridecemlineatus* and *C. harrisi*. Louse populations from these host species are distinctly discriminated. Differences among nymphs of *E. suturalis* from the three host species seem to exist, but are not distinct enough to be useful in discriminating three taxa. A more extensive study of the nymphal stages of the genus *Enderleinellus* may suggest that differences among the three taxa are more subspecific than specific.

REFERENCES

- Cook, E. F.** 1954a. A modification of Hopkins' technique for collecting ectoparasites from mammal skins. *Ent. News* **65**: 35-37.
- 1954b. A technique for preventing post mortem ectoparasite contamination. *J. Mammal.* **35**: 266-67.
- Cook, E. F. & J. R. Beer.** 1959. The immature stages of the genus *Hoplopleura* (Anoplura: Hoplopleuridae) in North America, with descriptions of two new species. *J. Parasit.* **45** (4): 405-16.
- Ferris, G. F.** 1919. Contributions toward a monograph of the sucking lice. Part 1. *Leland Stanford Jr. Univ. Publ., Univ. Ser.* **2** (1): 5-51.
1951. The sucking lice. *Mem. Pacif. Cst. Ent. Soc.* **1**: 1-320.
- Kellogg, V. L. & G. F. Ferris.** 1915. The Anoplura and Mallophaga of North American Mammals. *Leland Stanford Jr. Univ. Publ., Univ. Ser.* (no vol. no.), 74 p., 8 plates.
- Kim, K. C., B. W. Brown, Jr., & E. F. Cook.** 1963. A quantitative taxonomic study of the *Enderleinellus suturalis* complex (Anoplura: Hoplopleuridae). *Syst. Zool.* **12** (3): 134-48.
- Osborn, H.** 1891. The Pediculi and Mallophaga affecting man and lower animals. U.S. Dept. Agric., Div. Ent., Bull. 7, 29 p.
- Werneck, F.** 1947. Notas sobre o genero *Enderleinellus* (Anoplura). *Mem. Inst. Oswaldo Cruz* **45**: 281-305, illus.
- Wilson, N.** 1963. Correction in the type locality of *Enderleinellus marmotae* Ferris (Anoplura: Hoplopleuridae). *Proc. Ent. Soc. Wash.* **65** (1): 67.