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Article/Chapter Title: A new species of Linognathoides (Polyplacidae, Anoplura) from Black tailed prairie dog, *Cynomys ludovicianus* (Ord) (Sciuridae, Rodentia)

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Page(s): Page 354, Page 355, Page 356, Page 357, Page 358, Page 359

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A NEW SPECIES OF *LINOGNATHOIDES*
(POLYPLACIDAE: ANOPLURA) FROM BLACK-TAILED PRAIRIE DOG,
CYNOMYS LUDOVICIANUS (ORD) (SCIURIDAE: RODENTIA)

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Abstract. — *Linognathoides cynomyis* (Polyplacidae: Anoplura), new species, is described from the black-tailed prairie dog, *Cynomys ludovicianus* (Ord), in South Dakota. Adults and three nymphal stages of this species are illustrated and relationships to allied species, *L. laeviusculus* (Grube) and *L. marmotae* (Ferris), are discussed.

Linognathoides species are known from holarctic Marmotini (northern ground squirrels) and Afrotropical Xerini (African ground squirrels). *Linognathoides laeviusculus* (Grube), a polytypic species, is commonly found on many species of *Spermophilus*, whereas *L. marmotae* (Ferris) is a parasite of the North American marmots, *Marmota*. *Cynomys ludovicianus* (Ord), the black-tailed prairie dog, had been reported to harbor *L. marmotae* (Ferris, 1951; Kim and Adler, 1982).

For the first time, large and comprehensive collections of a *Linognathoides* species from *C. ludovicianus* in South Dakota were made by Mr. Glenn E. Kietzmann, Department of Zoology, Iowa State University. This taxon is distinctly different from *L. marmotae* and *L. laeviusculus* and is described as a new species here. Morphological terminology of Kim and Ludwig (1978) is followed for description in this paper.

***Linognathoides cynomyis* Kim, NEW SPECIES**

Neohaematopinus marmotae Ferris (*partim*): Ferris 1951, Mem. Pac. Coast Entomol. Soc. 1: 293 (records from *Cynomys ludovicianus*).

Linognathoides marmotae (*partim*): Kim and Adler, 1982, J. Med. Entomol. 19: 621 (records from *Cynomys ludovicianus*).

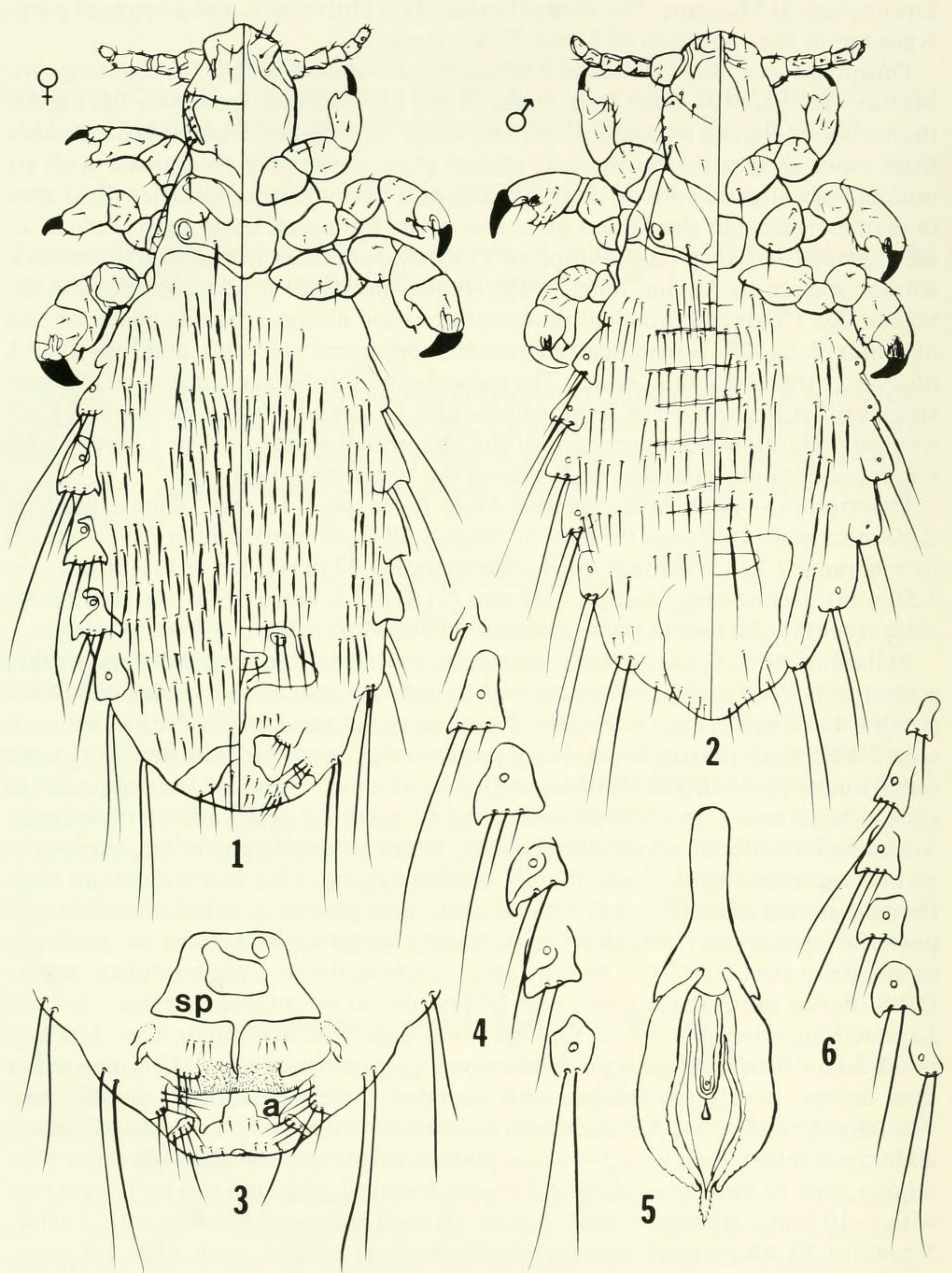
Type data.—♂ holotype, ♀ allotype, 12 ♂, 18 ♀, 14 third-stage nymph, 10 second-stage nymph, and 1 first-stage nymph paratypes from *Cynomys ludovicianus* ♂, Pennington County, Box Elder, South Dakota, June 1983, G. E. Kietzmann. Other paratypes were collected from the same host (10 animals) by G. E. Kietzmann at the same location in 1982: 6 ♂, 26 ♀, 5 third-stage and 2 second-stage nymphs, June 20; 16 ♂, 13 ♀, 6 third-stage, 6 second-stage and 1 first-stage nymphs, June 18; 6 ♂, 34 ♀, and 1 third-stage nymph, June 25; 4 ♂, 1 ♀, 1 second-stage and 1 first-stage nymphs, June 27; 2 ♀, July 24; 2 ♀ and 1 third-stage nymph, August 6. Holotype, allotype, and paratypes are deposited in the collection of The Frost

Entomological Museum, The Pennsylvania State University, and a series of paratypes are in the collection of Glenn E. Kietzmann.

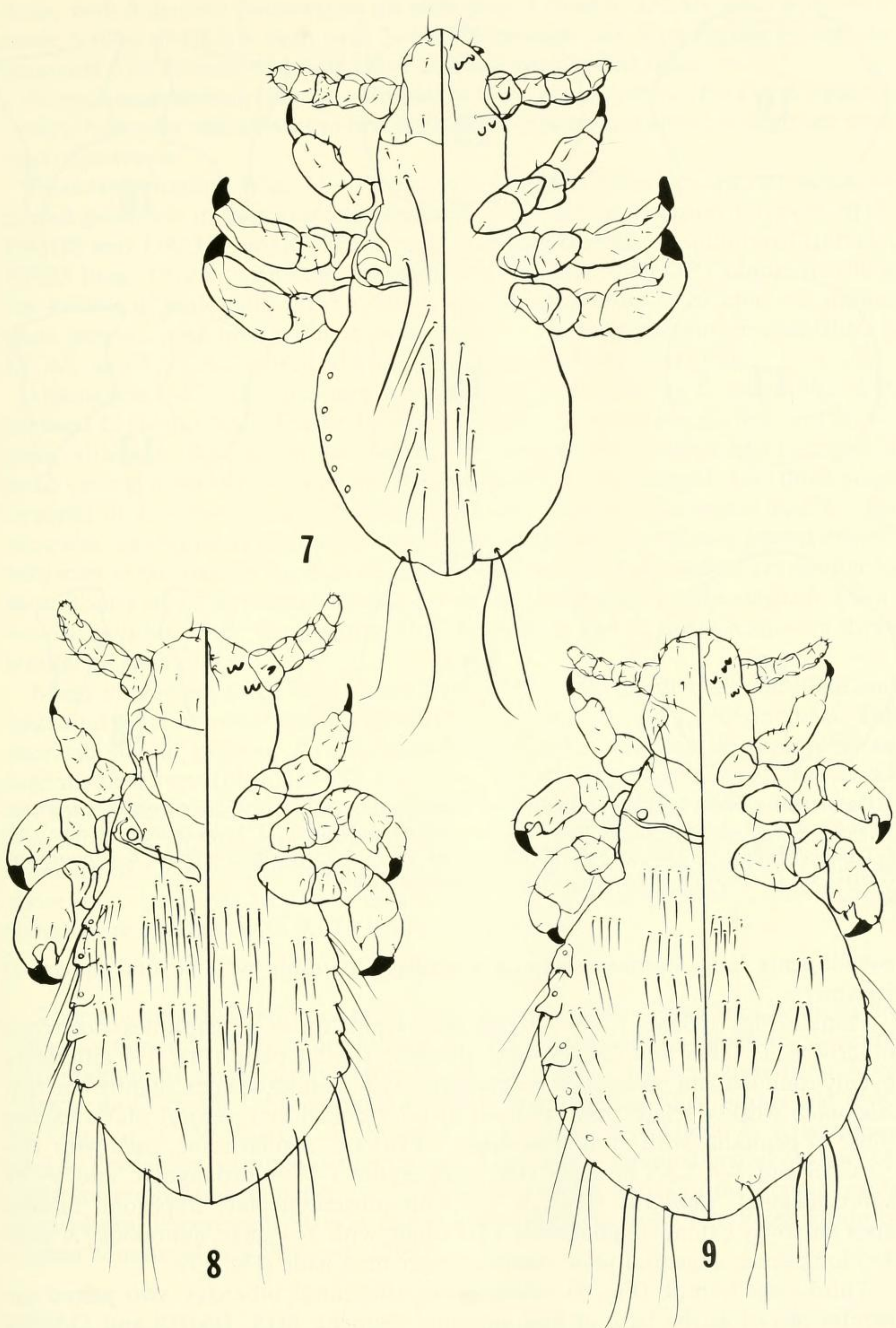
Diagnosis.—Closely related to *Linognathoides marmotae* and *L. laeviusculus*. Males of *L. cynomyis* differ from those of two most similar species by having the thoracic sternal plate rounded posteriorly (Figs. 13–15), and females are separable from other species by the thoracic sternal plate posteriorly emarginate with its middle apex slightly convex (Figs. 10–12), and mesothoracic spiracles (0.33 mm in diameter) smaller than those of *L. marmotae* but much larger than those of *L. laeviusculus*. The first-stage nymph of *L. cynomyis* differs from those of its most similar species by having long DPHS (dorsal principal head setae) passing far beyond DPTS (dorsal principal thoracic setae) and almost reaching posterior end of thorax, long DPTS reaching 3rd and 4th abdominal spiracles, and long DCAS (dorsal central abdominal setae). The second- and third-stage nymphs of this new species differ from those of *L. marmotae* and *L. laeviusculus* by having 7–8 CAS (central abdominal setae) on each of the abdominal segments 4 to 7, and 3 LAS (lateral abdominal setae) on each side of the segments 4 to 6.

Description.—Total body lengths: Male holotype 1.45 mm, female allotype 2.00 mm; male 1.42 mm (\bar{x}) ($n = 5$, range 1.38–1.47 mm); female 1.97 mm (\bar{x}) ($n = 6$, range 1.86–2.08 mm); third-stage nymph 1.32 mm (\bar{x}) ($n = 11$, range 1.25–1.50 mm); second-stage nymph 1.02 mm (\bar{x}) ($n = 12$, range 0.90–1.14 mm); first-stage nymph 0.79 mm (\bar{x}) ($n = 2$, range 0.69–0.90 mm).

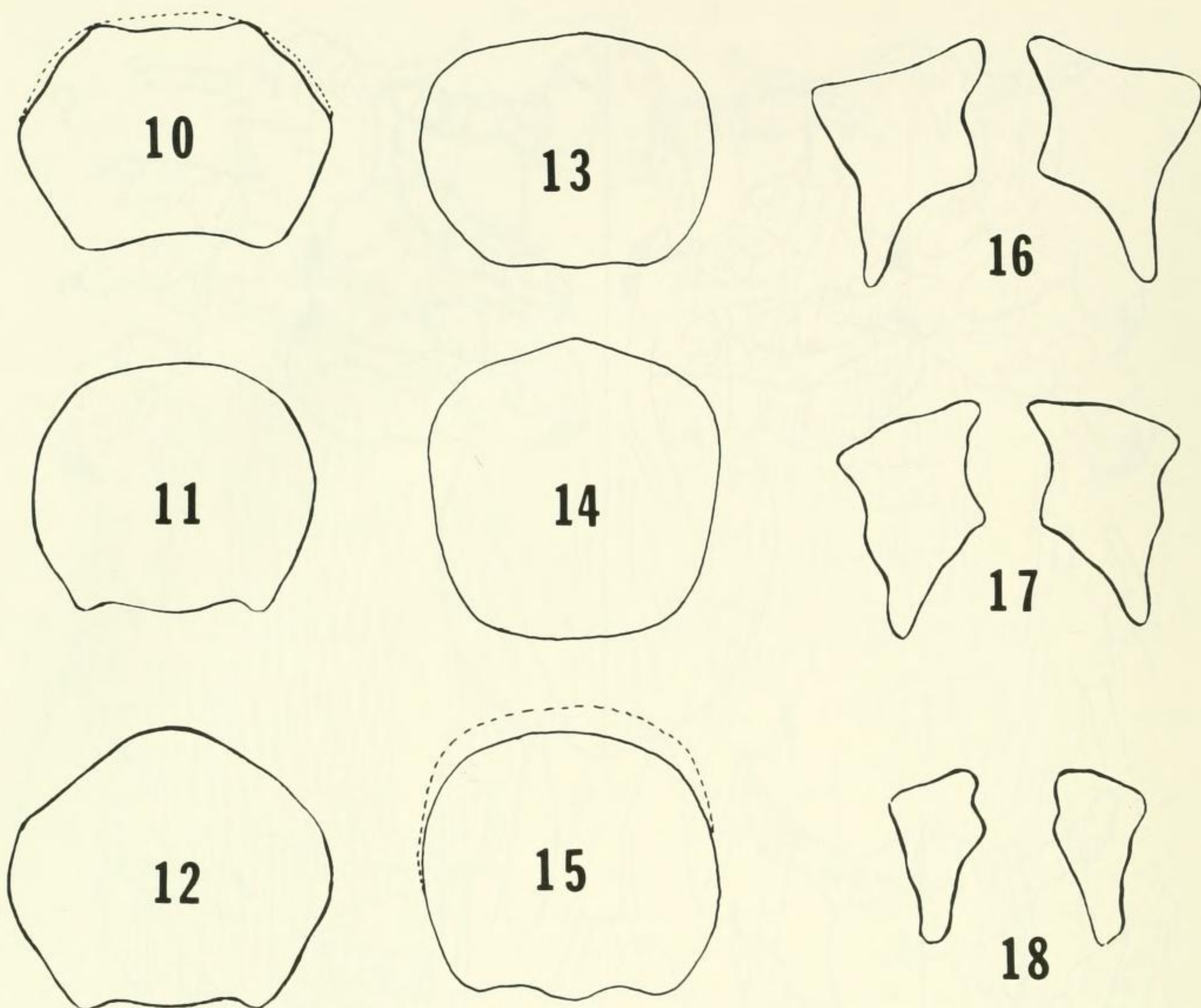
Male (Figs. 2, 5, 6, 14).—Head and thorax well sclerotized but abdomen weakly sclerotized. *Head* slightly longer than wide, anterior apex broadly rounded; 2 SHS (sutural head setae) and 4 DMHS (dorsal marginal head setae) distinct on each side; DPHS long, passing beyond thoracic spiracle; DAChS (dorsal accessory head setae) longer than DMHS (dorsal marginal head setae); DPoCHS (dorsal posterior central head setae) and VPHS (ventral principal head setae) distinct; antennae 5-segmented, without sexual dimorphism, with the basal segment larger than the second segment, slightly wider than or as wide as long. *Thorax* broader than long; thoracic sternal plate (Fig. 14) with anterior apex slightly angularly rounded and posterior apex evenly rounded; mesothoracic spiracle (0.033 mm in diameter) moderate in size; DPTS (0.139 mm) long, reaching the second abdominal tergite; DPtS (dorsal prothoracic setae) and DMsS (dorsal mesothoracic setae) distinct. *Legs* with subtriangular coxae; forelegs small, each with acuminate claw; hindlegs much larger than midlegs, each with strong, pointed tarsal claw. *Abdomen* wider than thorax, poorly sclerotized, with one thin plate per segment dorsally and ventrally; 8 rows of DCAS, each with 8–11 setae; 7 rows of DLAS (dorsal lateral abdominal setae), each with 2–4 setae; abdominal sternites weaker, narrower than tergites, one or two rows of VCAS (ventral central abdominal setae), each row with 6–10 setae, segment 1 with 2 setae on each side, and 8th row with 4 setae; 5 rows of VLAS (ventral lateral abdominal setae) present, each with 4–5 setae. Paratergites (Fig. 6) present on segments 2 to 7: plate I with one short and one long apical setae; plates II and III each with one long, one intermediate, and one short setae; plates IV and V each with dorsal seta long and ventral seta shorter; plate VI with 2 long setae; dorsal angles of paratergites II–IV slightly produced into points; paratergites II–VI each with spiracles. *Genitalia* (Fig. 5) with distinct subgenital plate; basal apodeme narrow anteriorly; parameres apically narrow;



Figs. 1-6. *Linognathoides cynomyis* Kim, n. sp. 1, Female. 2, Male. 3, Female genitalia: a, adgenital plate; sp, subgenital plate. 4, Female paratergites. 5, Male genitalia. 6, Male paratergites.



Figs. 7-9. *Linognathoides cynomyis* Kim, new species. 7, First-stage nymph. 8, Second-stage nymph. 9, Third-stage nymph.



Figs. 10-15. Thoracic sternal plates. 10-12, Females. 13-15, Males. 10, *Linognathoides laeviusculus* (Grube). 11, *L. cynomyis* Kim, n. sp. 12, *L. marmotae* (Ferris). 13, *L. laeviusculus* (Grube). 14, *L. cynomyis* Kim, n. sp. 15, *L. marmotae* (Ferris). Figs. 16-18. Female adgenital plate. 16, *L. marmotae* (Ferris). 17, *L. cynomyis* Kim, n. sp. 18, *L. laeviusculus* (Grube).

pseudopenis long, narrow, serrated laterally, extending well beyond apices of parameres.

Female (Figs. 1, 3, 4, 11, 17).—Head, thorax, and legs as in male unless described otherwise. DAchS and DMsS long; thoracic sternal plate (Fig. 11) anteriorly evenly rounded and posteriorly emarginate, with its middle apex slightly convex. *Abdomen* weakly sclerotized, without distinct dorsal and ventral plates except those of genitalia, with numerous setae; 13 rows of regular setae, each with 10-12 CAS and 3-4 LAS on each side; paratergites I-IV subtriangular, and V-VI subrectangular. *Genitalia* (Figs. 3, 17) with subgenital plate trapezoid, middle apex narrowly extended; gonopods VIII small, with 3-4 setae; gonopods IX with 4-5 long setae; adgenital plate slightly longer than wide (Fig. 17).

Third-stage nymph (Fig. 9).—*Head* with 10 ventral tubercles, two paired tubercles placed at the base of first antennal segment; SHS, DMHS and DAchS distinct; DPHS long, reaching mesothoracic spiracles; DPHS and DAchS placed on lateral convexity; VPHS long, reaching the middle part of first antennal segment. *Thorax* without sternal plate; DPtS and DMsS distinct; DPtS short, barely reaching first row of DCAS. *Legs* similar to those of adults. *Abdomen* membra-

nous, with 5 distinct paratergites on each side; 8 rows of DCAS, each with 6–10 setae; 6 rows of DLAS, each with 2–4 setae on each side. Paratergites present on segments 3 to 6, each with one short and one long apical setae.

Second-stage nymph (Fig. 8).—Similar to third-stage nymph. *Head* with 2 paired ventral tubercles placed next to first antennal segment; first antennal segment with ventral tubercle.

First-stage nymph (Fig. 7).—*Head* with 4 ventral tubercles, paired tubercles placed posterior to first antennal segment which bears a ventral tubercle; SHS, DMHS and DAChS small; DPHS long, reaching beyond mesothoracic spiracle; VPHS long. *Thorax* with large mesothoracic spiracle, with DPTS long, reaching the middle of abdomen; DPtS distinct but DMsS minute or lacking; no sternal plate present. *Abdomen* without paratergites; 5 spiracles present on each side, 8 DCAS, and 7 VCAS; paired MAS (marginal abdominal setae) long.

Discussion.—*L. cynomyis* new species is most similar to *L. marmotae* and perhaps *L. laeviusculus*. The first-stage nymphs of all three species are very much alike, although there are minor differences, such as the location and number of head ventral tubercles and size of DPHS and DPTS. The second- and third-stage nymphs of *L. cynomyis* are distinctly different from *L. marmotae* and *L. laeviusculus*, having more abdominal setae, such as DCAS, DLAS, and paired ventral tubercles at the base of the first antennal segment; these characters are similar to those found in *L. pectinifer* (Neumann) which is parasitic on the African *Atlantoxerus gotulus*, while the nymphs of *L. marmotae* and *L. laeviusculus* are more similar to each other.

Many characters of *L. cynomyis* adults such as the thoracic sternal plate and adgenital plate are intermediate between *L. marmotae* and *L. laeviusculus*. The thoracic sternal plate of *L. cynomyis* for both male and female represents an intermediate type (Figs. 10–15). Similarly, the adgenital plates of *L. marmotae* are subtrapezoid and of *L. laeviusculus* are oblong-triangular, whereas those of *L. cynomyis* are slightly elongated subtrapezoid (Figs. 16–18). The mesothoracic spiracles of *L. marmotae* females are large, 0.056 mm (\bar{x}) in diameter, whereas those of *L. cynomyis* are 0.033 mm in diameter; the spiracles of *L. laeviusculus* females are smallest with 0.013 (\bar{x}) mm in diameter.

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