Sucking lice (Anoplura) from Inner Mongolia with the description of a new species

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Abstract: Sucking lice are small, obligate blood-feeding ectoparasites of mammals, with some species serving as vectors of medically important pathogens, such as those causing trench fever and epidemic typhus. More than 550 species of sucking lice have been described worldwide, of which 23 species have previously been recorded from Inner Mongolia, China. In this study, we describe a new species, *Hoplopleura pseudacanthopus* Wang & Li **sp. nov.**, and report *Eulinognathus cruciformis* Chin, Bai & Qiu, 1995 as a new record from Inner Mongolia. An updated identification key to the sucking lice of Inner Mongolia is provided.

Key words: Hoplopleuridae; Polyplacidae; taxonomy; key

内蒙古吸虱一新种记述（虱目）

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摘要：吸虱是一类哺乳动物体表的小型吸血型寄生虫，部分吸虱种类可以传播流行性斑疹伤寒、战壕热等疾病，是一类重要的媒介生物。目前全世界已记录吸虱超过 550 种，其中 23 种在中国内蒙古地区有所记述。本研究描述了内蒙古 1 新种：拟棘足甲胁虱 *Hoplopleura pseudacanthopus* Wang & Li **sp. nov.**，记录了内蒙古 1 新记录种：十字真颚虱 *Eulinognathus cruciformis* Chin, Bai & Qiu, 1995，同时编制了包含新种和新记录种在内的内蒙古地区吸虱检索表。

关键词：甲胁虱科；多板虱科；分类；检索表

Introduction

Inner Mongolia is one of the largest provincial-level regions in China, with a diverse range of habitats including deserts, grasslands, the Gobi deserts, hills, and forests. This ecological heterogeneity supports a rich community of small mammals, such as rabbits, hamsters, and squirrels (Huang *et al*. 1995), which in turn host a wide diversity of ectoparasites, including sucking lice (Anoplura).

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Sucking lice are small, blood-feeding parasites of mammals and vectors for diseases such as trench fever and epidemic typhus. Globally, over 550 species of sucking lice have been discovered and 98 of them have been recorded in China.

Previous surveys by Chin Ta-Hsiung (Jin Daxiong) documented 23 species of sucking lice in Inner Mongolia, representing 10 genera across five families: Hoplopleuridae Ewing, 1929, Polyplacidae Fahrenholz, 1912, Haematopinidae Enderlein, 1904, Enderleinellidae Ewing, 1929, and Linognathidae Enderlein, 1905 (Chin 1999).

Here, we describe *Hoplopleura pseudacanthopus* Wang & Li **sp. nov.** from *Microtus brandti* and report *Eulinognathus cruciformis* Chin, Bai & Qiu, 1995 as a new record for Inner Mongolia. We also provide an updated identification key incorporating these species, thereby contributing to a more complete understanding of this region's Anoplura fauna.

Material and methods

Rodent hosts were captured in Inner Mongolia using live traps, and ectoparasites were carefully removed with fine combs and preserved in 75% ethanol. Louse specimens were cleared in 0.5% KOH for 1–2 h, dissected to remove internal tissues, and mounted in Hoyer's solution following Anderson (1954). Slides were dried in an oven at 55°C for 1–2 weeks.

Mounted specimens were examined with a Keyence VHX-950F digital microscope and a Zeiss Axio M2 compound microscope. Line drawings were produced using Adobe Illustrator. Morphological terminology follows Kim & Durden (1986) and Durden *et al*. (2020).

Abbreviations used in descriptions: DAnHS — dorsal anterior head setae; ApHS — apical head setae; OrS — oral setae; AnMHS — anterior marginal head setae; VPaHS — ventral preantennal head setae; SHS — sutural head setae; DMHS — dorsal marginal head setae; TeAS — tergal abdominal setae; InStAS — intersternal abdominal setae; InTeAS — intertergal abdominal setae; DLAS — dorsal lateral abdominal setae; DCAS — dorsal central abdominal setae; StAS — sternal abdominal setae; VLAS — ventral lateral abdominal setae.

Descriptions of taxonomic characters and identification key structures are based on prior literature (Burmeister 1838–1846; Enderlein 1904–1906; Fahrenholz 1912, 1916; Ferris 1921, 1933, 1951; Ewing 1929; Johnson 1957, 1960; Blagoveshtchensky 1965; Kim & Ludwig 1978; Kim & Durden 1986; Durden 1991, 1994; Chin 1992, 1994, 1999; Chin *et al*. 1995; Durden *et al*. 2019, 2020; Sun *et al*. 2022).

Key to the species of Anoplura from Inner Mongolia

1. Head with prominent ocular point; lateral lobes of paratergal plates attached to abdomen; parasites of ungulates (Haematopinidae) ····· 5
-. Head without prominent ocular point, or only slightly raised; lateral lobes of paratergal plates detached from abdomen ····· 2
2. Forelegs subequal to midlegs (Enderleinellidae) ····· 7
-. Forelegs smaller than midlegs and hindlegs; midlegs smaller than or almost equal to hindlegs ····· 3
3. Abdomen without paratergal plates; fore coxae widely spaced (Linognathidae) ····· 8
-. Abdomen with distinct paratergal plates; fore coxae close together ····· 4

4. Sternite of abdominal segment II extending laterally; hindlegs strongest; paratergal plates well developed, lateral lobes covering basal part of next paratergal plate (Hoplopleuridae) ····· 10
-. Sternite of abdominal segment II not extending laterally; midlegs almost equal to hindlegs; lateral lobes of paratergal plates small; parasites of rodents, rabbits, hares and insectivores (Polyplacidae) ····· 15
5. Head length almost equal to or slightly longer than width; anterior process of thoracic sternal plate with central protrusion ····· *Haematopinus eurysternus* Nitzsch
-. Head length distinctly longer than width; anterior process of thoracic sternal plate without central protrusion6
6. Thoracic sternal plate wider than long; female gonopods slender, terminal part curved outward into hook-like shape; on domestic pig ····· *Haematopinus suis* Linnaeus
-. Thoracic sternal plate longer than wide; gonopods triangular, with pointed anterior margin; on donkey ····· ····· *Haematopinus asini* Linnaeus
7. Sternite of abdominal segment II extending laterally to paratergal plates; paratergites II and IV without setae ····· *Enderleinellus suturallis* Osborn
-. Sternite of abdominal segment II rounded or elongate, not extending laterally; paratergites present on segments II–V; paratergal plate on segment II with 1 seta, on segments III–V with 2 setae ····· ····· *Enderleinellus tamiopsis* Chin
8. Preantennal region conical; in females, inner angle of posterior margin hook-shaped; subgenital plate elongate, spoon-shaped with slender posterior part; on cattle (*Bos taurus*) ····· *Linognathus vituli* Linnaeus
-. Preantennal region short; subgenital plate not as above ····· 9
9. Postantennal process distinctly convex; lateral margin of head without elongate setae; genital plate large, longer than gonopods; on goat and sheep ····· *Linognathus africanus* Kellogg & Paine
-. Postantennal process not convex; lateral margin of head with one elongate seta; genital plate absent or small ····· *Linognathus stenopsis* Burmeister
10. Paratergal plate VII with two lateral lobes ····· 11
-. Paratergal plate VII without lateral lobes ····· 12
11. Setae on paratergal plates IV–VI short, not reaching half length of lateral lobes; on house mouse (*Mus musculus*) ····· *Hoplopleura captiosa* Johnson
-. Setae on paratergal plates IV–VI reaching posterior margin of lateral lobes; on hamster ····· ····· *Hoplopleura cricetuli* Ferris
12. Thoracic sternal plate rocket-shaped, posterior process elongate ····· 13
-. Thoracic sternal plate hexagonal, posterior process not elongate; on gerbil ·· *Hoplopleura meridionidis* Ferris
13. Setae on paratergal plates longer than lateral lobes; lateral lobes on segment III: one truncate, one spiniform ····· 14
-. Setae on paratergal plates shorter than lateral lobes; lateral lobes on segment III truncate ····· ····· *Hoplopleura edentula* Fahrenholz
14. Thorax with two DPTS; lateral lobes on segments IV–VI with deep posterior emargination; on field mouse ····· *Hoplopleura acanthopus* Burmeister
-. Thorax with three DPTS; lateral lobes on segments IV–VI without deep posterior emargination; on field mouse ····· *Hoplopleura pseudacanthopus* **sp. nov.**
15. Paratergal plates absent or vestigial on abdomen ····· 16
-. Paratergal plates present on abdomen ····· 17
16. Postantennal process slightly curved; thoracic sternal plate longer than wide, oval-shaped ····· ····· *Haemodipsus lyriocephalus* Burmeiste
-. Postantennal process acute; thoracic sternal plate hexagonal ····· *Haemodipsus leporis* Blagoveshtchensky
17. Antennae and head with hook-like spines ····· 18

-. Antennae and head without hook-like spines ····· 22
18. Ventral side of head with hook-like spines; thoracic sternal plate pentagonal ····· 19
-. Ventral side of head without hook-like spines; thoracic sternal plate not pentagonal; on five-toed jerboa ····· *Eulinognathus cardiocranius* Chin
19. Head with 4–6 pairs of hook-like spines ventrally; antennae with 1–2 spines ····· 20
-. Head with 1–2 pairs of hook-like spines ventrally ····· 21
20. Head with six pairs of hook-like spines ventrally; antennae with one spine each on segment I; thoracic sternal plate quadrate, with anterior and posterior processes; on five-toed jerboa ····· *Eulinognathus allactagae* Johnson
-. Head with four pairs of hook-like spines ventrally; antennae with one spine each on segment I; thoracic sternal plate cruciform; on five-toed jerboa ····· *Eulinognathus cruciformis* Chin, Bai & Qiu
21. Thoracic sternal plate ginkgo-leaf-shaped, wider than long; on long-eared jerboa ····· *Eulinognathus euchoreutae* Cais
-. Thoracic sternal plate irregular quadrilateral or hexagonal, length equal to width; on three-toed jerboa ····· *Eulinognathus dipodis* Blagoveshtchensky
22. Paratergal plate II divided into two sclerites connected medially by membrane ····· 23
-. Paratergal plate II not divided into two sclerites ····· 24
23. Setae on paratergal plates IV–VI unequal (one short, one long); thoracic sternal plate subtriangular, anterior process with one pointed projection medially; on red-backed vole and field mouse ····· *Polyplax borealis* Ferris
-. Setae on paratergal plates IV–VI almost equal; anterior margin of thoracic sternal plate straight; posterior process ligulate; on hamster ····· *Polyplax qiuae* Chin
24. Fore tarsi distinctly forked; paratergal plates present on segments II–VI, with 2–3 setae; on ground squirrel ····· *Linognathoides laeviusculus* Grube
-. Fore tarsi not forked; paratergal plates present on segments II–VI, with 2–4 (occasionally five) setae; on marmot ····· *Linognathoides palaearctus* Olsoufiev

Taxonomy

Family Hoplopleuridae Ewing, 1929

Genus *Hoplopleura* Enderlein, 1904

***Hoplopleura pseudacanthopus* Wang & Li sp. nov.** (Figs 1, 2)

Female (based on two specimens) (Fig. 1). Body length 1.15 mm. Head longer than wide; preantennal region short. Antennae five-segmented; segment I robust, wider than long; segment II elongate. ApHS four, AnMHS six, VPHS two, VpaHS two, SHS four, DMHS four on each side.

Thorax. Width nearly equal to length; three DPTS present, with one on one side and two on the other; DMsS two (Fig. 2B). Thoracic sternal plate with rounded anterior margin and a blunt, truncate posterior process (Fig. 2A).

Abdomen. Wider than thorax. Dorsal view (Fig. 1A). Segments I–II each with one tergite; tergite I with two pairs of TeAS, tergite II with three pairs. Segment III with two tergites and 1–2 pairs of DLAS; anterior tergite with three pairs of TeAS; posterior tergite narrow, with 6–7 TeAS. Segment IV with three tergites: anterior tergite with six TeAS and two DLAS; middle tergite with six TeAS and two DLAS; posterior tergite with seven TeAS and two DLAS. Segment V

with three tergites: anterior tergite with seven TeAS and two DLAS; middle and posterior tergites each with eight TeAS and two DLAS. Segment VI with two tergites separated by a row of nine InTeAS; anterior tergite with 10 TeAS and one DLAS; posterior with six TeAS and one DLAS. Segment VII lacking tergite but bearing three rows of DCAS: row 1 with nine DCAS, row 2 with four DCAS and three DLAS, row 3 with five DCAS. Segment VIII with one tergite and six TeAS.

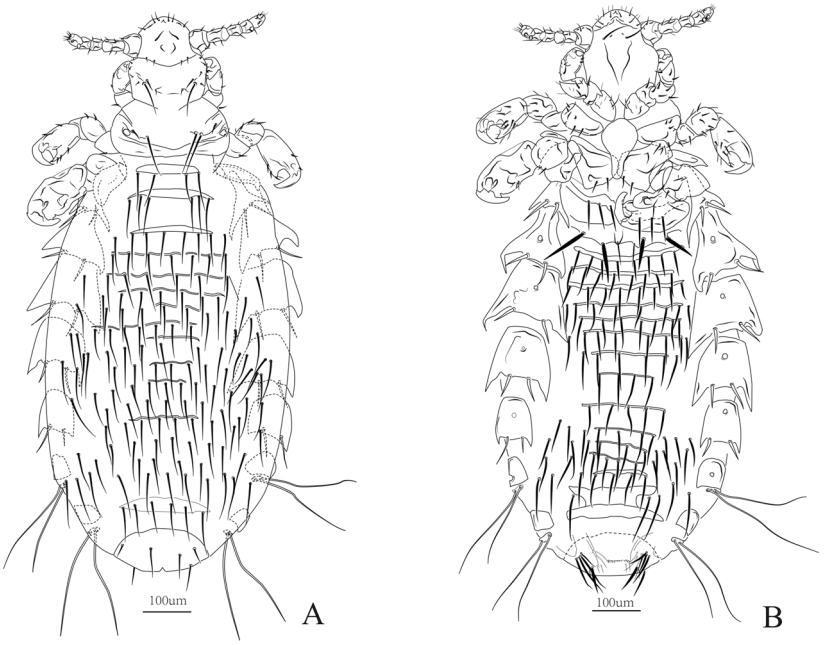

Figure 1. *Hoplopleura pseudacanthopus* **sp. nov.** Female. A. Dorsal view. B. Ventral view.

Ventral view (Fig. 1B). Segment II with one sternite and three pairs of StAS. Segment III with three sternites: anterior sternite broad, and with 7–8 StAS (2–3 thin seta inserted medially, 5 stout ones located laterally); middle and posterior sternites each with four pairs of StAS. Segment IV with three sternites: anterior sternite with 7–8 StAS; middle one with six StAS and one VLAS; posterior one with seven StAS. Segment V with three sternites: anterior one with six StAS and one VLAS; middle one with four StAS and one VLAS; posterior one with four StAS. Segment VI with two sternites: anterior one with five StAS; posterior one with four TeAS and three VLAS. Segment VII with three sternites: anterior one with three StAS and three VLAS; middle one with four StAS and two VLAS; posterior one slightly broader, with four StAS and five VLAS. Segment VIII sclerotized, bearing three setae near genital region.

Paratergal plates (Fig. 2D). present on segments I–VIII. Plate I small, blade-like; plates II–VIII each with two setae on posterior margin. Setae on plates II–VI equal to or slightly longer than lateral lobes; setae on plates VII–VIII stouter. Lateral lobes of plates II and IV–VI acute; plate III lobes truncate.

Genitalia (Fig. 2C). Subgenital plate strongly sclerotized; anterior subgenital plate with four pairs of setae (two medial pairs minute). Gonopod VIII with three slender terminal setae. Gonopod IX with one stout terminal seta and 3–4 medial setae on each side. Genital plate ventrally with four slender setae; genital setae nearly equal in length to gonopodal setae.

Male. Unknown.

Host. *Microtus brandti* Radde, 1861.

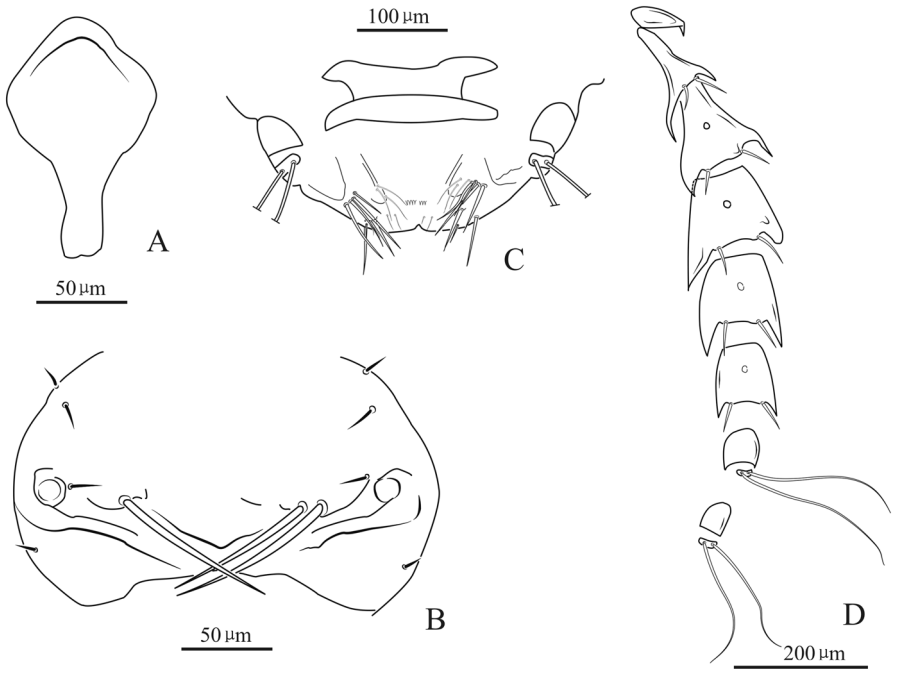

Figure 2. *Hoplopleura pseudacanthopus* **sp. nov.** Female. A. Thoracic sternal plate; B. DPTS on thorax; C. Genitalia; D. Paratergal plates.

Holotype. ♀, **China**, Inner Mongolia, Xilingol League, 25-V-2022, slide no. N225 8-2; **Paratype.** 1♀, same data as holotype, slide no. N225 5-3.

Etymology. This species epithet is derived from Greek “pseudo-” (“false, deceptive”) and refers to its resemblance to *Hoplopleura acanthopus* Burmeister, 1839.

Diagnosis. This new species is characterized by a short preantennal region; three DPTS on the dorsal thorax (one on one side, two on the other); four to five stout setae on sternite III; paratergal plates present on abdominal segments I–VIII; abdomen with 13 tergites and 15 sternites.

Remarks. *Hoplopleura pseudacanthopus* **sp. nov.** closely resembles *H. acanthopus* in the shape of the thoracic sternal plate and lateral lobes of paratergal plates III–V, but differs in: (1) sternite III bearing five stout setae (vs. two stout setae per side in *H. acanthopus*); (2) thorax with three DPTS (vs. one on each side in *H. acanthopus*); and (3) genital setae subequal in length to gonopodal setae (vs. longer in *H. acanthopus*).

Family Polyplacidae Fahrenholz, 1912

Genus *Eulinognathus* Cummings, 1916

***Eulinognathus cruciformis* Chin, Bai & Qiu, 1995**, new record for Inner Mongolia

Specimen examined. 1♀, **China**, Inner Mongolia, Xilingol League, 06-IX-2022, slide no. W129 6-1.

Host. *Allactaga sibirica* (five-toed jerboa), *Meriones unguiculatus* (Mongolian gerbil).

Diagnosis. Antennae 5-segmented; segment I bearing one strong spine, tip surpassing margin of segment I. DPTS equal in size to DPHS. Thoracic sternal plate cruciform, anterior and posterior margins extended; posterior extension reaching hind coxal margin. Abdomen lacking tergites and sternites. Paratergal plates present on segments II–VI, each with one long and one short seta; plates VII–VIII with two long subequal setae.

Remarks. This species was originally described from Ningxia, China, on *Allactaga sibirica* (Chin *et al*. 1995; Chin 1999). However, Chin (1999) questioned the accuracy of the host record and suggested possible alternative hosts. Our study confirms that *E. cruciformis* also parasitizes *Meriones unguiculatus* and documents this species as a new record for Inner Mongolia.

Distribution. China (Ningxia, Inner Mongolia); Mongolia (Krištofík 1999).

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