Three new species of the sucking louse genus *Hoplopleura* (Phthiraptera: Anoplura: Hoplopleuridae) from rodents (Mammalia: Rodentia: Muridae) in northern Australia

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**Abstract**

Three new species of the rodent louse genus *Hoplopleura* (Anoplura: Hoplopleuridae) are described and illustrated from Australia: *H. melomydis* new species from *Melomys burtoni* (Muridae: Hydromyini, grassland melomys) and *M. capensis* (Muridae: Hydromyini, Cape York melomys) from Queensland; *H. notomydis* new species and *H. setosa* new species from *Notomys alexis* (Muridae: Hydromyini, spinifex hopping mouse) from the Northern Territory. These new louse species are the first lice recorded from each of the three host rodent species.

**Key words:** Phthiraptera, Anoplura, Hoplopleuridae, *Hoplopleura*, lice, new species, Rodentia, Muridae, Australia

**Introduction**

Sucking lice (Anoplura: Hoplopleuridae) are among the most poorly-known ectoparasites of Australian rodents (Rodentia: Muridae). With over 130 described species, the genus *Hoplopleura* is the most speciose among the world Anoplura (Durden & Musser 1994: 18). However, Barker (1996: 240) only listed eight species of *Hoplopleura* recorded from Australia, stating that “Undoubtedly many more species remain to be described from native rodents”. Weaver & Barton (2008) described an additional species of this genus, raising the total to nine and including an identification key to the eight Australian endemic species. Other ectoparasites from Australian rodents, such as fleas, ticks and mesostigmatan mites have been studied in more detail (see, for example, Dunnet & Mardon 1974, Roberts 1970, and Domrow 1987).

As with most parasites, collecting lice from live or dead hosts can be difficult, because lice tend to have highly aggregated distributions in host populations. In this study, I utilised previously collected rodent hosts held in museum collections as voucher specimens, which allowed for a faster examination of specimens from a wider geographical range than could be reached by trapping live hosts. In addition, I examined lice that had been collected as part of ecological and parasitological studies but not identified. These collections included three new species of *Hoplopleura* Enderlein, 1904, which are described and illustrated herein.

**Materials and methods**

I examined lice from two different sources. Some lice had been previously collected during necropsy of rodents, and preserved in 70% ethanol in separate vials for each parasite taxon and host individual, housed at the Australian National Wildlife Collection, CSIRO, Canberra, Australia (ANWC). Other lice were collected from the pelage of voucher specimens of rodents held in 70% ethanol at the Queensland Museum, Brisbane, Australia (QMB). I collected lice from the host pelage using head-louse combs and a modified ‘cocktail shaking’ technique (Henry & McKeever 1971), where rodent voucher specimens were shaken by hand in jars of ethanol, rather than in water and detergent, and the sediment examined for lice.
I prepared the lice for morphological examination using the protocol by Palma (1978) with the following modifications: lice were not stained, they were dehydrated to 70% ethanol, and were mounted on slides in Hoyer’s medium. Slides were dried in an oven at 45°C until cured, and sealed with nail varnish (Ultra3 base coat, Heat Group, Melbourne; main ingredients ethyl acetate and nitrocellulose). I examined the lice using a Zeiss Photomicroscope with differential interference contrast illumination and with a drawing tube attachment. All measurements are in µm unless stated otherwise. All descriptive characters and abbreviations follow that of Kim et al. (1986), with full scientific names given on first mention. Type material was deposited in the Australian National Insect Collection, CSIRO, Canberra, Australia (ANIC), and QMBA, as detailed below.

Results

Taxonomy

Family Hoplopleuridae Ewing, 1929

Genus Hoplopleura Enderlein, 1904

Hoplopleura melomydis Weaver new species

Figs 1–8

Type host. Melomys burtoni (Ramsay, 1887)—grassland melomys (Muridae).

Type locality. Queensland (26°23’S, 153°07’E), Australia.

Other host. Melomys capensis Tate, 1951—Cape York melomys (Muridae).

Diagnosis. The paratergal plates II of Hoplopleura melomydis have a small central seta, in addition to the two large posterior setae, which immediately differentiates it from H. zyzomydis Weaver & Barton, 2008, H. bidentata (Neumann, 1909), H. cornata Kim, 1972, and H. notomydis new species (described below). Hoplopleura melomydis can be differentiated from H. calabyi Johnson, 1960 by the size of the small seta in the middle of paratergal plate II, which is large in H. calabyi and small in H. melomydis. Further, H. melomydis has a sternal plate that is more clavate than the cube-shaped sternal plate of H. calabyi. The setae of paratergal plates IV–VI of H. melomydis are diagnostic, as they comprise one large stout seta and one tiny seta, which differentiates it from H. uromydis Kuhn & Ludwig, 1967, which has setae of more equal lengths on paratergal plates IV–VI. Hoplopleura melomydis can be further differentiated from H. uromydis by the presence of dorsal lateral abdominal setae (DLAS) and ventral lateral abdominal setae (VLAS) on the abdomen, and by having male genitalia with smooth-sided parameres, which are notched in H. uromydis. Both H. gyomydis Kuhn & Ludwig, 1967 and H. irritans Kuhn & Ludwig, 1967 lack a dorsal lobe on paratergal plate VII, which differentiates them from H. melomydis, which has a dorsal lobe on paratergal plate VII. In addition, H. gyomydis only has 8 tergites, and H. irritans lacks tergites on abdominal segments 1 and 2, thus further differentiating these 2 species from H. melomydis. The lack of a dorsal lobe on paratergal plate VII of H. setosa new species (described below) differentiates it from H. melomydis, as does the presence of VLAS on small plates, and the small plates next to tergites. The sexually dimorphic morphology of paratergal plates VII and VIII of H. mastacomymdis Kuhn & Ludwig, 1967 differentiate it from H. melomydis because those of female H. mastacomymdis have dorsal and ventral posterior lobes on paratergal plate VII and a dorsal lobe on paratergal plate VIII. Male H. melomydis can be differentiated from male H. mastacomymdis by having a sternal plate with a longer and more pointed posterior process, no fused posterior sternites and no dorsal preanterior lateral head setae.

with 2 pairs of TeAS, posterior tergite with 3 pairs of TeAS. Tergites of segment 4 and 5 each with 4 pairs of TeAS. Tergite of segment 6 with 5 pairs of TeAS. Segment 7 with 3 pairs of TeAS on tergite and 1 pair of DLAS lateral to tergite. Tergite of segment 8 without setae. Ventrally, no sternite on segment 1. Segment 2 with 1 sternite elongated laterally to articulate with paratergal plate and with 5 pairs sternal abdominal setae (StAS). Segment 3 with large anterior sternite, articulating with paratergal plate and with 5 pairs of StAS, lateral pairs large and stouter than others. Posterior sternite of segment 3 with 4 pairs of StAS. Segment 4 with 3 sternites—anterior and posterior sternites each with 3 pairs of StAS, middle sternite with 4 pairs of StAS. 1 pair of ventral lateral abdominal setae (VLAS) lateral to edge of posterior sternite. Segment 5 with 2 sternites, anterior sternite with 4 pairs of StAS, posterior sternite with 3 pairs of StAS and 1 pair of VLAS. Segment 6 with 2 sternites, each with 3 pairs of StAS. 1 pair of VLAS lateral to posterior sternite. Segment 7 with 1 sternite with 2 pairs of StAS. Genital basal apodeme longer than parameres. Parameres uniformly sclerotized, with pseudopenis biconvex tapering to a point extended beyond apices of the parameres. Paratergal plates present on abdominal segments 1–8. All plates differentially sclerotized. Paratergal plate I small and offset medially. Paratergal plate II with 1 small medial seta, 2 large posterior setae and pointed posterior lobes. Paratergal plate III with 2 large setae and posterior lobes. Paratergal plates IV, V and VI each with 1 large and 1 minute seta and serrated posterior lobes. 5th segment spiracle diameter 24–26 (25). Paratergal plate VII with 2 long setae and pointed posterior lobe on dorsal surface only. Paratergal plate VIII with small spiracle and 2 long setae.

Female (n = 10). Figs 5–8. Body length 1241–1426 (1336). Head longer than wide, with 4 ApHS and 4 AnMHs. Dorsally, 2 DPaLHS, 4 SuHS, 8 DMHS, 2 DPHS and 2 DACHS, and ventrally 2 VPVS. Thorax wider than long. DPTS length 108–129 (116). Thoracic sternal plate clavate with stout, rounded anterior process, elongated posterior process. Mesothoracic spiracle diameter 18–29 (24). Abdomen wider than thorax. Dorsally, 18 tergites present. Tergite 1 narrow, with 2 TeAS (1 pair) on posterolateral margin. Tergite 2 broad with 4 TeAS (2 pairs) on posterolateral margin. Tergites 3, 4 and 5 on segment 3, 1 broad with 4 (2 pairs) TeAS, others narrow with 7 (3 pairs and 1) TeAS, and 3 pairs TeAS. Tergites 6, 7 and 8 on segment 4, with 6 TeAS on tergite 6, 7 TeAS on tergite 7, and 5 TeAS on tergite 8. Tergites 9, 10 and 11 on segment 5 with 6 TeAS and 1 DLAS on each side of tergites 9 and 10. Tergites 12, 13 and 14 on segment 6, with 7 TeAS on tergite 11, and 6 TeAS on tergites 12, 13 and 14. Tergite 12 with 1 DLAS on each side. Tergite 15 with 5 TeAS and 1 DLAS on each side, tergite 16 with 5 TeAS on segment 7. Segment 8 with tergite 17 narrow with 4 TeAS, tergite 18 broad with 4 TeAS. Ventrally, no sternite on segment 1. Segment 2 with 1 sternite with 4 pairs of StAS and articulating with paratergal plate II. Segment 3 with 2 sternites. Anterior sternite broad with 3 pairs plus 1 StAS, lateral pair very large and stout. Posterior sternite narrow, with 3 pairs plus 1 StAS. Segments 4–5 each with 3 narrow sternites with 4 pairs of StAS. Segment 5 also with 2 VLAS per side lateral to posterior sternite. Segment 6 with 4 narrow sternites, each with 3 pairs or 3 pairs plus 1 StAS and 3 VLAS per side. Segment 7 with 2 narrow sternites with 3 pairs of StAS on anterior sternite, 4 pairs of StAS on posterior sternite and 1 VLAS per side. Subgenital plate triangular with 4 setae evenly spaced. Gonopods VIII with 3 small setae, gonopod IX with 3 long setae. Genital setae very stout. Paratergal plates as in male, 5th segment spiracle diameter 21.0–28.9 (25.8).

Etymology: The species epithet is a noun in apposition referring to the generic name of the host species, *Melomys*.

Type material. Ex *Melomys burtoni* (Ramsay, 1887): Holotype ♂, QM JM11175, Sunshine Motorway near Noosa-Eumundi Road, Queensland, Australia (26°23'S, 153°07'E), 1 Dec. 1995, unknown collector (QMBA T207311). Paratypes: 1♀, same data as for the holotype (ANIC 19 0000723); 3♀, same data as for the holotype (QMBA T207312–14).

Additional material examined (non-types). Ex *Melomys burtoni* (Ramsay, 1887): 1 slide of nymphs, same data as for the holotype (QMBA T207315); 1♀, QM JM11390, Jenners Rd, near Sarina, Queensland, Australia (21°28'S, 149°09'E), 2 Apr. 1994, unknown collector (QMBA T207316); 1♀, QM JM8869, Cape Tribulation, Queensland, Australia (16°08'S, 145°26'E), Feb. 1989, unknown collector, (QMBA T207317); 2♀, AWCC277/90 & AWCC336/90, East Macliiwraith Range, Queensland, Australia, 9 Aug. 1990, P. Catling & P. Haycock (ANIC 19 000057–58); 1♂, AWCC103/95, “Koolpinya” near Darwin, Northern Territory, Australia, 27 Jul. 1995, P. Haycock (ANIC 19 000059).

Ex *Melomys capensis* Tate, 1951: 2♂, 3♀, QM JM17132, Pine River, 5.5 km SW of Betteridge Landing, Andoom, Queensland, Australia (12°30'11"S, 141°45'14"E), 20 Sep. 1993, unknown collector (1♂, 1♀ (one slide), 1♂, 2♀ (3 slides) QMBA T207318–21); 1♂, QM JM17133, Pine River, 5.5 km SW of Betteridge Landing, Andoom, Queensland, Australia (12°29'34"S, 141°45'41"E), 20 Sep. 1993, unknown collector (QMBA T207322).
FIGURES 1–4. *Hoplopleura melomydis* n. sp. male: 1, habitus (dorsal/ventral). 2, paratergal plates. 3, sternal plate. 4, genitalia. Scale bars = 300 µm (Fig. 1); 200 µm (Fig. 2); 100 µm (Figs 3, 4).
FIGURES 5–8. *Hoplopleura melomydis* n. sp. female: 5, habitus (dorsal/ventral). 6, paratergal plates. 7, sternal plate. 8, postero-ventral view. Scale bars = 300 µm (Fig. 5); 200 µm (Fig. 6); 100 µm (Figs 7, 8).
Hoplopleura notomydis Weaver new species
Figs 9–16

Type host. Notomys alexis Thomas, 1922—spinifex hopping mouse (Muridae).

Type locality. Yulara, Northern Territory, Australia.

Diagnosis. The chaetotaxy of the paratergal plates with only 1 seta on paratergal plate IV, and 1 large and 1 tiny seta on each of plates V and VI differentiates Hoplopleura notomydis from all other Australian species. Paratergal plate II of H. notomydis lacks a small central seta, in addition to the two large setae posteriorly, differentiating it from H. uromydis, H. gyomydis, H. mastacomys, H. irritans, H. calabyi, H. melomydis and H. setosa new species (described below). Hoplopleura notomydis can be further differentiated from H. uromydis by having setae on the sternites of a more uniform length, where H. uromydis has alternating short setae on sternites 4–6. Hoplopleura notomydis lacks additional setae adjacent to the tergites, differentiating it from H. gyomydis; and the shape of the posterior process of the sternal plate is also diagnostic, in that H. gyomydis does not have an elongated process on the posterior edge of the plate. Hoplopleura mastacomys has far more setae on the male tergites, and they are uniformly distributed whereas H. notomydis has fewer setae which are clumped in pairs or triplets at the edges of the tergites. Abdominal setae and the shape of the tergites also differentiates H. notomydis from H. irritans, with H. notomydis having broader tergites and fewer extra setae on the abdomen that are not on the tergites compared with H. irritans which has very narrow tergites and numerous setae adjacent to the tergites. Hoplopleura notomydis can be further differentiated from H. calabyi by the size of the seta on paratergal plate II (H. calabyi has a very long seta), by the size and degree of overlap of the paratergal plates, and the number and patterns of clumping of the setae on the tergites, where H. calabyi has more numerous setae that are uniformly distributed. Hoplopleura notomydis can be differentiated from H. melomydis and H. setosa by having broader tergites and sternites, and the lack of additional setae adjacent to the sternites on the ventral surface. Among the lice that do not have a small medial seta on paratergal plate II, H. notomydis can be differentiated from H. zyzomydis by having setae on paratergal plates IV–VI and by having more tergites and sternites in total and by not having serrated internal edges of the parameres of the genitalia of the male; from H. bidentata by having only 1 seta on paratergal plate IV and having pointed posterior lobes on paratergal plate VII; and from H. cornuta by having posterior lobes (dorsal and ventral in females, dorsal only in males) on paratergal plate VII and a sternal plate with a more pointed anterior process.

Description. Male (n=4). Figs 9–12. Body length 871.2–877.8 (874.5). Head slightly wider than long, with 4 ApHS and 4 AnMHS. Dorsally, head with 6 DMHS, 4 DPaLHS, 2 DPaHS, 4 SuHS, 2 small DACHS and 2 long DPHS. Ventrally, head with 2 VPaHS and 2 VPHS. Thorax wider than long, with 1 pair of small DMsS and 1 pair of large DPTS, 55.2–60.5 (57.85) long. Mesothoracic spiracle diameter 13.2–21.1 (15.83). Thoracic sternal plate clavate with anterior process. Abdomen wider than thorax. Dorsally, 1 tergite per segment except for segment 3 with 2 tergites and no tergites on segments 9–11. Segment 1 with 1 narrow tergite with scalloped posterior margin and 1 pair small of TeAS. Tergite of segment 2 and anterior tergite of segment 3 each with 2 pairs of postero-lateral TeAS. Tergites of segments 3 (posterior tergite), 4 and 5 each with 4 pairs of TeAS. Tergite of segment 6 with 3 pairs of TeAS evenly spaced. Tergite of segment 7 with 1 pair of TeAS, tergite of segment 8 without setae. Ventrally, segments 2 and 8 each with 1 sternite, segments 3–7 each with 2 sternites. No sternites on segments 1 or 9–11. Sternite of segment 2 with 4 pairs of STAS, articulates with paratergal plate. Anterior sternite of segment 3 large, articulating with paratergal plate and with 2 pairs of very large stout STAS laterally and 1 pair plus 1 single STAS medially. Posterior sternite of segment 3 with 4 pairs of STAS. Sternites of segment 4 with 3 pairs plus 1 STAS on anterior sternite and 4 pairs of STAS on posterior sternite. Sternites of segment 5 with 4 pairs plus 1 STAS on anterior sternite and posterior sternite with 4 pairs of STAS. Sternites of segment 6 with 4 pairs plus 1 STAS on anterior sternite and 3 pairs plus 1 STAS on posterior sternite. Sternites of segment 7 with 4 pairs of STAS and lateral pair of VLAS on small plates for anterior sternite, posterior sternite with 3 pairs plus 1 STAS. Sternite of segment 8 with 1 pair of STAS. Genital basal apodeme slightly longer than parameres. Pseudopenis gently tapered to a point extending beyond apices of parameres. Paratergal plates present on abdominal segments 1–8, plate 1 small and offset medially. All paratergal plates differentially sclerotized. Plates II with 2 large setae and pointed posterior lobes. Paratergal plate III with 2 large setae and serrated posterior lobes. Paratergal plate IV with one large seta and serrated posterior lobes. Paratergal plates V and VI each with 1 large and 1 minute setae and serrated posterior lobes. Paratergal plate VII with 2 large long setae and posterior lobe on dorsal surface only. Paratergal
FIGURES 9–13. Hoplopleura notomydis n. sp. male: 9, habitus (dorsal/ventral). 10, paratergal plates. 11, sternal plate. 12, genitalia. Female: 13, sternal plate. Scale bars = 300 µm (Fig. 9); 200 µm (Fig. 10); 100 µm (Figs 11–13).
FIGURES 14–16. *Hoplopleura notomydis* n. sp. female: 14, habitus (dorsal/ventral). 15, paratergal plates. 16, postero-ventral view. Scale bars = 300 µm (Fig. 14); 200 µm (Fig. 15–16).
plate VIII with 2 large long setae and lacking posterior lobes. Spiracles present on paratgal plates III–VII, with a small spiral on paratgal plate VIII.

**Female** (n=3) Figs 13–16. Body length 1122–1135.2 (1129). Head about as wide as long, with 4 ApHS and 4 AnMHS. Dorsally, head with 8 DMHS, 4 SuHS, 2 small DAcHS and 2 long DPHS. Ventrally, head with 2 VPHS. Thorax wider than long, with 1 pair of large DPTS, 60.5–68.4 (64) long. Mesothoracic spiral diameter 13.2–15.8 (14). Thoracic sternal plate clavate with anterior process. Abdomen wider than thorax. Dorsally, 3 tergites per segment except for segments 1 and 3 with 1 tergite, and segments 2 and 8 each with 2 tergites. Segment 1 with 1 pair of small TeAS set posterolaterally. Segment 2 with 2 pairs TeAS posterolaterally. Segment 3 tergite with 3 pairs of TeAS posterolaterally. Segment 4 with anterior and medial tergites with 3 pairs of TeAS and posterior tergite with 4 pairs of TeAS. Segment 5 with 3 tergites each with 3 pairs of TeAS. Segment 6 with anterior and medial tergites each with 3 pairs of TeAS and posterior tergite with 2 pairs of TeAS. Segment 7 with anterior and medial tergites each with 3 pairs of TeAS and posterior tergite with 2 pairs of TeAS. Segment 8 anterior tergite with 2 pairs of TeAS and posterior tergite with 1 pair of TeAS. Ventrally, no sternite on segment 1. Segment 2 with 1 sternite articulating with paratgal plate II. Segments 3–7 each with 3 sternites. Anterior sternite of segment 3 with 4 pairs of StAS, posterior sternite with 2 pairs of large stout StAS on sclerotized projection of posterolateral edge of sternite. Medial sternite of segment 3 with 2 pairs of StAS, posterior sternite with 4 pairs of StAS. Stermites of segments 4 and 5 with same chaetotaxy: middle sternite with 3 pairs of StAS and anterior and posterior sternites each with 4 pairs of StAS. Segment 6 with 1 pair of VLAS on small plates positioned lateral to sternite with 4 pairs of StAS. Medial and posterior sternites of segment 6 each with 4 pairs of StAS. Segment 7 with 1 pair of VLAS on small plates positioned lateral to anterior and medial sternites. Anterior sternite with 4 pairs of StAS, medial sternite with 3 pairs of StAS, posterior sternite with 4 pairs of StAS varying in size. Subgenital plate broadly triangular with serrated apex and 4 small setae scattered irregularly but all consistent in size. Gonopods VIII with 3 small setae, gonopods IX with larger setae. Long and stout genital setae. Paratgal plates present on abdominal segments 1–8, plate I small and offset medially. All paratgal plates differentially sclerotized. Plate II with 2 large setae and pointed posterior lobes. Paratgal plate III with 2 large setae and serrated posterior lobes. Paratgal plate IV with one large seta and serrated posterior lobes. Paratgal plates V and VI each with 1 large and 1 minute setae and serrated posterior lobes. Paratgal plate VII with 2 large long setae and posterior lobe on dorsal surface only. Paratgal plate VIII with 2 long setae and lacking posterior lobes. Spiracles present on paratgal plates III–VII, with a small spiral on paratgal plate VIII.

**Etymology.** The species epithet is a noun in apposition referring to generic name of the host species, Notomys.


*Hoplopleura setosa* Weaver new species

Figs 17–24

**Type host.** Notomys alexis Thomas, 1922—spinifex hopping mouse (Muridae).

**Type locality.** Yulara, Northern Territory, Australia.

**Diagnosis.** The bristly appearance of *Hoplopleura setosa* is unlike that of any other Australian species of *Hoplopleura*. While it lacks the characteristic large setae on the sternite of segment 2, the sternite itself does articulate with the corresponding paratgal plate, and the hind legs are larger than the other legs, thus placing *H. setosa* in the Hoplopleuridae, and in the genus *Hoplopleura*. The combination of the small seta on paratgal plate 2, one large seta on paratgal plates IV–VI, the sexual dimorphism of the posterior lobe on paratgal plate VII, and the shape of sternite 2 in not having a pair of extremely large stout setae at each end of the plate differentiates this species from other species of *Hoplopleura* in Australia. Further differentiating features of *H. setosa* are the overall chatotaxy of sternites and tergites with up to 12 setae per plate, extra small plates with VLAS on the ventral surface, and the splitting of tergites to form small lateral plates with paired setae on the dorsal surface. *Hoplopleura setosa* can be further differentiated from *H. zyzomydis*, *H. bidentata*, *H. cornata* and *H. notomydis* in having a small seta on paratgal plate II. It can be further differentiated from *H. gyomydis*, *H. uromydis*, *H. mastacomydis*, *H. irritans*, *H. calabyi* and *H. melomydis* by having only one large seta on each of paratgal plates IV–VI.
FIGURES 21–24. *Hoplopleura setosa* n. sp. female: 21, habitus (dorsal/ventral). 22, paratergal plates. 23, sternal plate; 24, postero-ventral view. Scale bars = 200 \(\mu\)m (Figs 21–22); 100 \(\mu\)m (Figs 23–24).
Description. Male (n=1). Figs 17–20. Body length 799. Head about as long as wide, with 4 ApHS and 6 AnMHs. Dorsally with 8 DPaLHS, 2 DPaHS, 4 SuHS, 6 DMHS, 2 DAcHS and 2 large DPHS. Ventrally with 2 VPaHS, 8 OrS and 2 VPPhS. Thorax wider than long, with 1 pair of dorsal prothoracic setae (DPTS), 1 pair of small dorsal mesothoracic setae (DmsS) and 1 pair of large DPTS, 82 long. Mesothoracic spiracle diameter 16 wide, sternal plate rounded with anterior and posterior processes. Abdomen wider than thorax. Dorsally, with 1 tergite per segment except for segment 2 with 2 tergites. All TeAs long, overlapping following tergites. Tergite of segment 1 with 1 pair of TeAS laterally. Anterior tergite of segment 2 narrow with 2 pairs of TeAS, posterior tergite wider than anterior tergite, with 4 pairs of TeAS. Tergite of segment 3 with 6 pairs of TeAS. Tergite of segments 4 and 5 with 5 pairs of TeAS, tergite of segment 6 with 4 pairs of TeAs plus 1. Tergite of segment 7 with 3 pairs of TeAS, no TeAS on tergite of segment 8. Ventrally, no sternite on segment 1. Sternite of segment 2 with 5 pairs of StAS. Segment 3 with 2 sternites. Anterior sternite of segment 3 with 3 pairs of StAS, posterior sternite of segment 4 with 4 pairs StAS, with additional VLAS on small plate positioned laterally to sternite. Segment 4 with 2 sternites, each sternite with 4 pairs of StAS, and with additional VLAS on small plate positioned laterally to sternite. Segment 5 with 2 sternites, each sternite with 3 pairs of StAS plus 1, and with additional VLAS on small plate positioned laterally to sternite. Segment 6 with 2 sternites, anterior sternite with 3 pairs of StAS plus 1, posterior sternite with 4 pairs of StAS. Sternite of segment 7 with 3 pairs of StAS plus 1. Sternite of segment 8 with 2 pairs of StAS. Genital basal apodeme approximately the same length as parameres. Parameres broadly curved and lightly sclerotized. Pseudopenis narrow and extends beyond apices of parameres. Paratergal plates lightly sclerotized. Paratergal plate I offset mediadorsally. Paratergal plate II with 2 long posterior setae and one small medial seta. Paratergal plate III with dorsal and ventral posterior lobes and 1 pair setae. Paratergal plates IV–VI all with dorsal and ventral pointed posterior lobes and one fairly long seta. Paratergal plate VII with a pointed dorsal posterior lobe and 1 pair of long setae. Paratergal plate VIII without lobes and with a pair of setae. Spiracles present on paratergal plates III–VII with smaller spiracle on paratergal plate VIII.

Female (n=4) Figs 21–24. Body length 1069–1142 (1110). Head slightly longer than wide, with 2 ApHS and 4 AnMHs. Dorsally with 8 DPaLHS, 2 DPaHS, 4 SuHS, 6 DMHS, 2 DAcHS and 2 large DPHS. Ventrally with 2 VPaHS, 8 OrS and 2 VPPhS. Thorax wider than long, with 1 pair dorsal prothoracic setae (DPTS), 1 pair of DmsS and 1 pair of large DPTS, 68–95 (84) long. Mesothoracic spiracle diameter 13–18 (16) wide, sternal plate rounded with anterior and posterior processes. Abdomen wider than thorax. Dorsally, with 3 tergites per segment except for segment 1 with 1 tergite and segments 2, 3 and 4 with 2 tergites each. Tergite of segment 1 with 1 pair of long TeAS. Anterior tergite of segment 2 small with 2 pairs of TeAS, and posterior tergite more elongate with 4 pairs of TeAS. Anterior tergite of segment 3 with 6 pairs of TeAS, posterior tergite with 4 pairs of TeAS. Segment 4 with anterior tergite split laterally to form one central plate flanked by smaller plate on each side (here called ‘auxiliary tergites’). Main tergite with 3 pairs of TeAS, auxiliary tergites with 1 pair of TeAS each. Posterior tergite of segment 4 with 3 pairs of TeAS. Segments 5, 6 and 7 each with 3 tergites arranged with a middle tergite split laterally to form small plates. Anterior tergites with 5 pairs TeAS, middle tergite medial plate with 3 pairs of TeAS, middle tergite auxiliary plates with 1 pair of TeAS, posterior plate with 6 pairs of TeAS on segments 5 and 6, with 5 pairs of TeAS on segment 7. Segment 8 with 3 tergites, anterior tergite with 4 pairs of TeAS, middle tergite with 3 pairs of TeAS and posterior tergite with notch on lateral edge, with 2 pairs of small setae anteriorly and 3 pairs posteriorly. Ventrally, no sternite on segment 1. Segment 2 with 1 sternite with 4 pairs of StAS. Segments 3–7 with 3 sternites. Anterior sternite of segment 3 large and articulating with paratergite, with 5 pairs of StAS, lateral pair of setae larger than medial ones. Middle and posterior sternites narrower than anterior one, with 6 and 5 pairs of StAS respectively. Each sternite of segment 4 with 5 pairs of StAS and 1 additional VLAS on small plate lateral to sternites. Each middle sternite of segments 5 and 6 with 6 pairs of StAS, each anterior and posterior sternite of segments 5 and 6 with 5 pairs of StAS, and each sternite of both segments with 1 additional VLAS on small plate lateral to sternites. Segment 7 with 3 sternites, anterior and posterior sternites with 5 pairs of StAS and 1 additional VLAS on small plate lateral to sternites, and middle sternite with 4 pairs of StAS. Segment 8 with 1 sternite with 2 pairs of StAS. Subgenital plate broadly triangular constricted laterally and 2 pairs small setae set irregularly. Gonopods VII and IX very large. Gonopod VIII with 3 stout setae and gonopod IX with 3 small setae and 1 large genital seta. Paratergal plates lightly sclerotized. Paratergal plate I offset mediadorsally. Paratergal plate II with 2 setae posteriorly and one small medial seta. Paratergal plate III with dorsal and ventral posterior lobes and 1 pair setae. Paratergal plates IV–VI all with dorsal and ventral pointed posterior lobes and one seta. Paratergal plates VII and VIII without lobes and with pair of setae. Spiracles present on paratergal plates III–VII with smaller spiracle on paratergal plate VIII.
**Etymology.** The species epithet (from Latin, *setosus* = hairy, bristly) is an adjective in the nominative singular referring to the abundance of setae on the specimens.

**Type material.** Ex *Notomys alexis*: Holotype ♂, AWC 101/96, Yulara, Northern Territory, Australia, 24 Aug. 1996, K. Masters & P. Haycock (ANIC 19 000067). Paratypes: 2♀, same data as for the holotype (ANIC 19 000068–69).

**Additional material examined (non-types).** 2♀, AWC AR424, same location and collector as for the holotype, 1 Jul. 1996 (ANIC 19 000070–71).

**Discussion**

The three new species of rodent lice described in this paper are the first lice known from their host species: *Melomys burtoni*, *Melomys capensis* and *Notomys alexis*, and bring the total number of species of *Hoplopleura* in Australia to 12. The chronology of descriptions of Australian *Hoplopleura* has been sporadic, with the first endemic species described by Neumann in 1909 (*H. bidentata*), followed by a period of dormancy, then a flurry of activity from Johnson (1960), Kuhn & Ludwig (1967) and Kim (1972). This was again followed by another period of dormancy, before Weaver & Barton (2008) described the latest species. This uneven sequence of descriptions perhaps highlights the lack of research into ectoparasites of Australian rodents, particularly for those of little concern for conservation. The reason for the lack of research is unknown but may be related to a range of factors, of which the most important is a lack of taxonomic capacity for working on sucking lice in Australia. Another factor is the relative abundance of host species without conservation concern are often not the focus of research. On the other hand, species of high conservation concern may not be allowed to be sampled destructively, thus limiting opportunities to collect lice. In addition to these problems, lice are difficult to collect from live hosts, and can be difficult to collect as part of a necropsy, as they are small and often easily missed when examining the pelage. Considering these factors, I have demonstrated here that there are effective methods by which ectoparasite samples can be collected from museum voucher specimens of small mammals, thereby eliminating the need for destructive field sampling of hosts. These methods can be used to better understand parasite faunal communities of rodent species (and other small mammals), and can also generate novel information and additional benefit for existing museum collection data. Future research on Australian Hoplopleuridae will include comprehensive systematic and phylogenetic analyses, with particular interest in *H. setosa*, as its morphology is unique among species of the genus *Hoplopleura*.

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**References**


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