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J. Parasitol., 93(2), 2007, pp. 247–251
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HAEMODIPSUS BRACHYLAGI N. SP. (PHTHIRAPTERA: ANOPLURA: POLYPLACIDAE), A NEW SUCKING LOUSE FROM THE PYGMY RABBIT IN NEVADA

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ABSTRACT: The male and female of *Haemodipsis brachylagi* n. sp. (Phthiraptera: Anoplura) are described from specimens collected from a pygmy rabbit, *Brachylagus idahoensis* (Merriam) (Lagomorpha: Leporidae), from Nevada. Morphological features that differentiate the new species from other known species of *Haemodipsus* are elucidated, and an identification key to both sexes of the 3 species now known from this genus in North America is included. Geographical distributions of the other 4 species of *Haemodipsus* known from other parts of the world are highlighted.

Sucking lice (Phthiraptera: Anoplura) are permanent, hematophagous, ectoparasitic insects of placental mammals throughout the world, with about 550 species of Anoplura currently known (Durden and Musser, 1994; Kim, 2006). Until now, the known native and naturalized sucking louse fauna of North America consisted of 76 species assigned to 9 families and 19 genera (Kim et al., 1986). The last species of sucking louse described from North America was *Linognathoides cynomyis* Kim, which parasitizes the black-tailed prairie dog, *Cynomys ludovicianus* (Ord) (Kim, 1986). In the present article, we describe another new species of sucking louse from North America, which brings the total number of native and naturalized sucking lice known from this continent to 77.

The new louse belongs to the polyplacid genus *Haemodipsus* and was collected from the relatively little-studied pygmy rabbit, *Brachylagus idahoensis* (Merriam), in Nevada. The Polyplacidae is the most speciose family within the Anoplura; worldwide, 16 genera and about 200 species are currently assigned to this family (Durden and Musser, 1994), although this information could be subject to taxonomic revision in the future. In North America, 5 genera and 27 species were assigned to the Polyplacidae by Kim et al. (1986). Members of *Haemodipsus* are ectoparasites of rabbits and hares (Lagomorpha: Leporidae) throughout much of the world (North America, Europe, Asia, and Africa) with an introduced species also present in Australia, North America, and elsewhere (Durden and Musser, 1994). Until now, 2 species of *Haemodipsus* were known from North America. These species are the native *H. setoni* Ewing, which parasitizes several species of *Lepus* and at least 2 species of *Sylvilagus* in western North America, and the naturalized (originally introduced) *H. ventricosus* (Denny), which parasitizes the European rabbit, *Oryctolagus cuniculus* (L.), which occurs throughout North America as the laboratory rabbit and in commercial rabbitries.

MATERIALS AND METHODS

The descriptive format followed in this article is that of Durden and Timm (2001), which was based on that of Kim and Ludwig (1978). Names and abbreviations for setae follow those 2 articles and are spelled out in full when first mentioned herein. Louse specimens were stored in 70% ethanol from the field and were later cleared in 10% potassium hydroxide, dehydrated through an ethanol series of increasing concentrations up to 100%, further cleared in xylene, and then slide-mounted in Canada balsam following standard procedures (Kim et al., 1986). Specimens were measured with a calibrated eyepiece graticule fitted into a high-power Olympus BH-2 light microscope. Drawings were prepared with the aid of a Leitz PRADO 500 microprojector.

DESCRIPTION

Haemodipsus brachylagi n. sp.

(Figs. 1–8)

Male (Figs. 1–4): Total body length of holotype, 1.35 mm, mean of series 1.36 mm, range 1.31–1.43 mm (n = 3). Head, thorax, and abdomen moderately sclerotized. Head slightly longer than wide and broadly rounded both anteriorly and laterally; 1–2 apical head setae, 5–6 anterior marginal head setae, 4 ventral preantennal head setae, 1 ventral principal head seta (VPHS), 1 ventral posterior marginal head seta (VPoMHS), 1 dorsal anterior head seta, 2 supra-antennal head setae, 2 sutural head setae (SuHS), 4 dorsal marginal head setae, 1 dorsal principal head seta (DPHS), 1 dorsal accessory head seta (DAcHS), and 1 dorsal posterior central head seta, on each side. VPHS relatively small and situated significantly posterior to antennal insertions, VPoMHS displaced medially, SuHS inserted posterior to principal head suture, and DAcHS displaced anteriorly with respect to insertion of DPHS. Antennae 5-segmented with basal segment much larger than other segments and slightly longer than wide; second antennal segment more elongate than third, fourth, or fifth segments.

Thorax about as long as wide. Thoracic sternal plate (Fig. 2) subtriangular but with broadly rounded posterior angles and moderately rounded anterior angles. Mesothoracic spiracle diameter 0.025 mm. Dorsal principal thoracic seta (DPTS) length 0.22 mm. Tiny mesothoracic seta present between mesothoracic spiracle and DPTS in most (2 of 3) specimens. Legs progressively larger and more robust from anterior to posterior, all legs with subtriangular coxae proximally and acuminate claws terminally, the claws also increasing in size from anterior to posterior.

Abdomen significantly wider than thorax and devoid of tergites and sternites as is characteristic of this genus. Nine rows of relatively long dorsal central abdominal setae (DCAS); row 1 with 4 DCAS, rows 2 and 3 each with 5 DCAS, rows 4–7 each with 6–7 DCAS, row 8 with 5 DCAS, and row 9 with 2 DCAS. Nine rows, or singletons, of dorsal lateral abdominal setae (DLAS) on each side; row 1 with 1 DLAS, rows 2–5 each with 3 DLAS, row 6 with 2 DLAS, and rows 7–9 each with 1 DLAS on each side; setae in DLAS rows 8 and 9 more lateral than DLAS in rows 1–7. Nine rows of ventral central abdominal setae (VCAS); row 1 with 3 VCAS, rows 2–7 each with 6–8 VCAS, and rows 8 and 9 each with 4 VCAS; all VCAS, except those in rows 1 and 9, relatively long. Seven rows of ventral lateral abdominal setae (VLAS); row 1 with 2 VLAS, rows 2–4 each with 3 VLAS, row 5 with 4 VLAS (the 2 medial VLAS being shorter than the 2 lateral VLAS in this row), row 6 with 3 VLAS (the medial 2 VLAS being much shorter than the lateral VLAS in this row), and row 7 with 3–4 VLAS (all small) on each side. Three to 5 small setae situated apically at tip of abdomen. Paratergal plates (Fig. 3) highly reduced as is characteristic of this genus with only 4 tiny plates present: plates I–III subtriangular, plate IV subrectangular, each plate surrounding a spiracle and with 1–2 long paratergal setae (PrS). Two additional spiracles present posteriorly (for a total of 6 abdominal spiracles on each side) and each with 1–2 long PrS.

Received 9 August 2006; revised 22 September 2006; accepted 19 October 2006.

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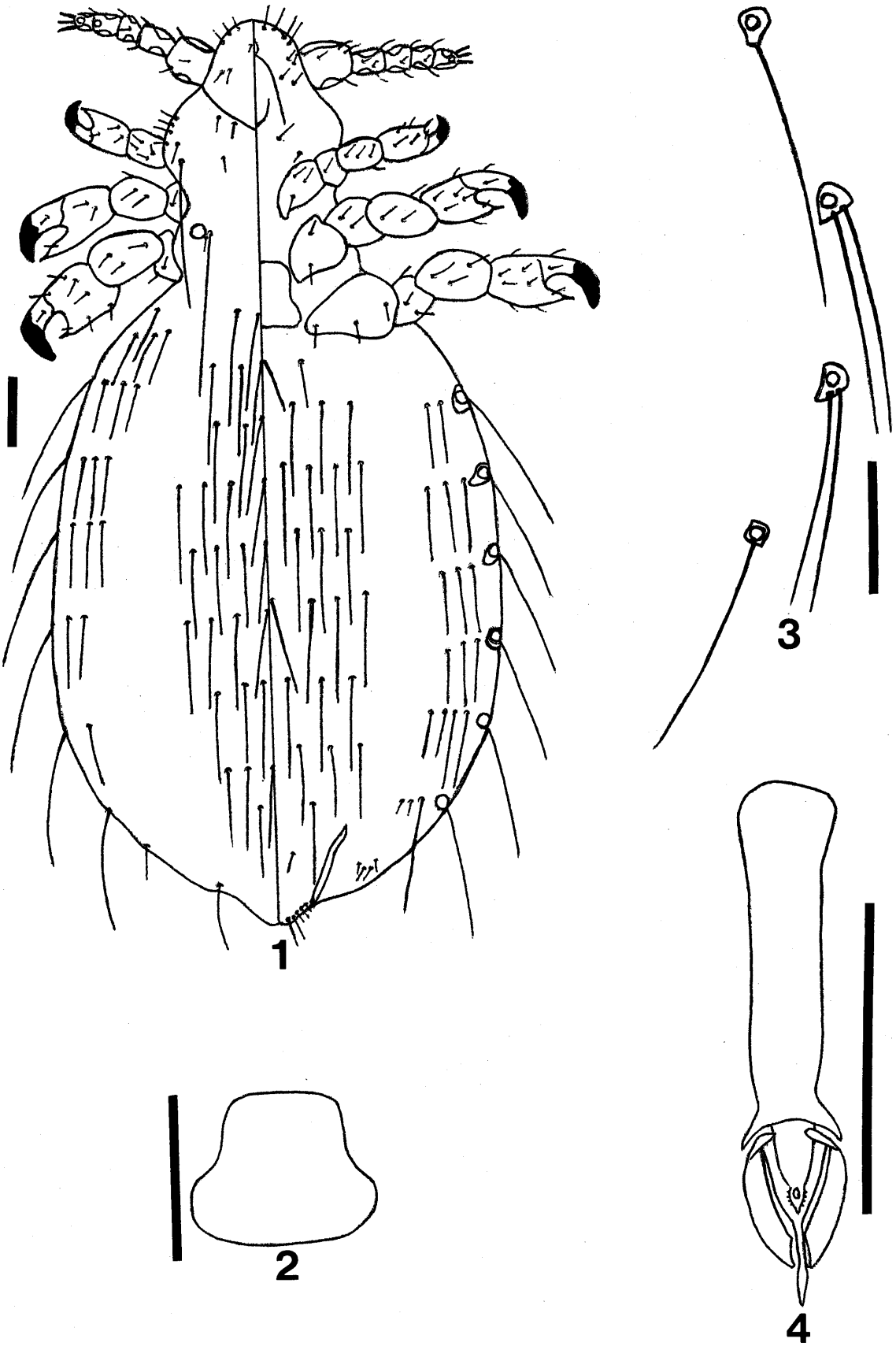
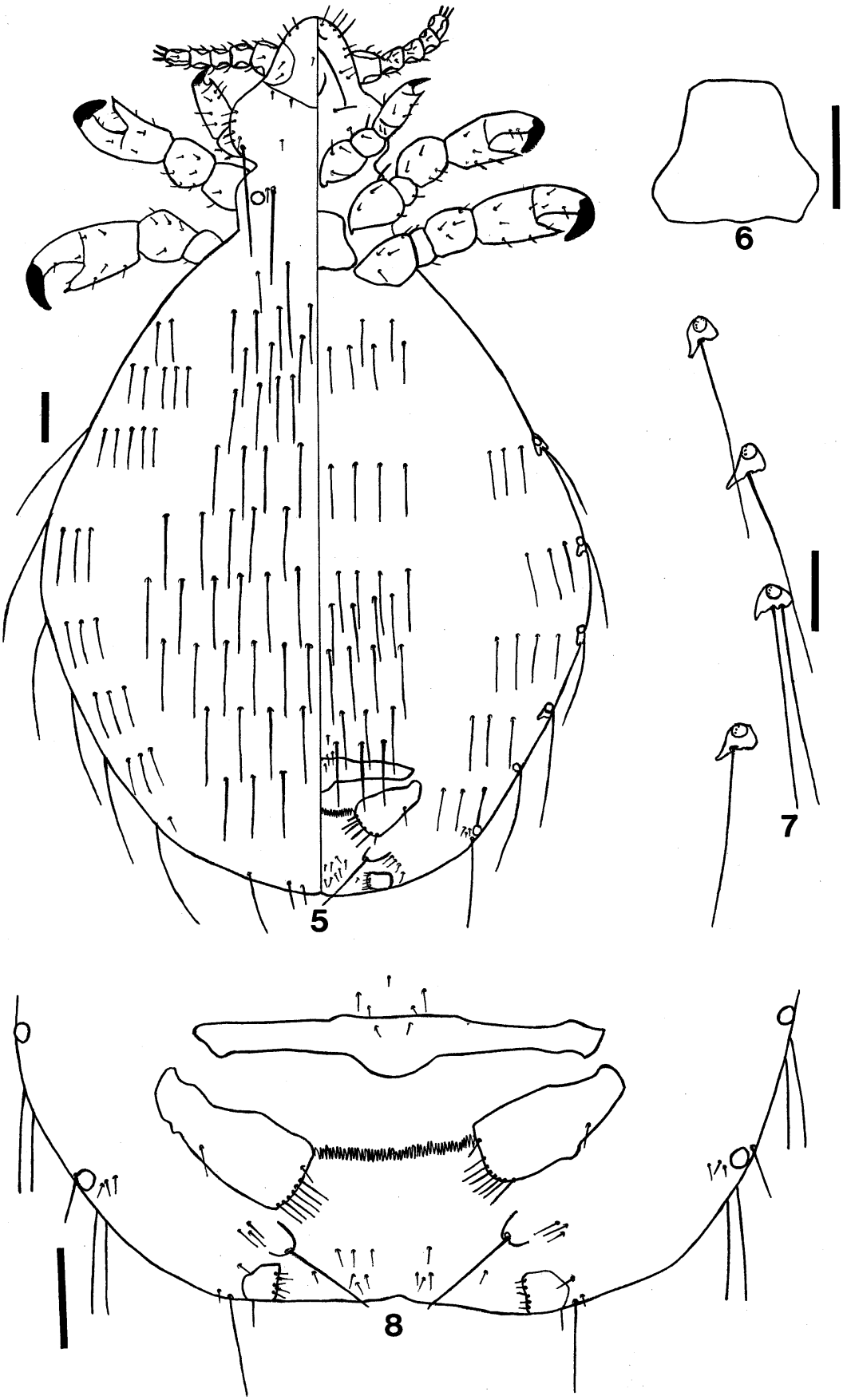


FIGURES 1–4. *Haemodipsus brachylagi* n. sp., male. (**1**) Dorsoventral view. (**2**) Thoracic sternal plate. (**3**) Paratergal plates. (**4**) Genitalia. Bars = 0.1 mm.



FIGURES 5–8. *Haemodipsus brachylagi* n. sp., female. (**5**) Dorsoventral view. (**6**) Thoracic sternal plate. (**7**) Paratergal plates. (**8**) Genitalia. Bars = 0.1 mm.

Genitalia (Fig. 4) with basal apodeme about 2.5 times longer than parameres; parameres broadly acuminate posteriorly and curved inward anteriorly (basally); pseudopenis long, extending well beyond apices of parameres, and slightly thickened immediately posterior to parameres. Subgenital plate (shown in Fig. 1), reduced as is characteristic for males of this genus, consisting of a single thickened ridge diverging from posterior to anterior on each side.

Female (Figs. 5–8): Total body length of allotype 1.75 mm, mean of series 1.67 mm, range 1.51–1.80 mm (n = 8). Morphology as in male unless stated otherwise. Thoracic sternal plate (Fig. 6) with posterolateral angles less rounded than in male in most specimens. Abdomen much wider than thorax and wider than in male. Ten rows of relatively long DCAS; row 1 with 4 DCAS (with 2 medial DCAS longer than 2 lateral DCAS in this row), rows 2–5 each with 6–8 DCAS, rows 6–8 each with 8–10 DCAS, row 9 with 8 DCAS, and row 10 with 6 DCAS. Nine rows or singletons of DLAS on each side; row 1 with 2 DLAS; rows 2 and 3 each with 5 DLAS, rows 4–7 each with 3 DLAS, and rows 8–9 each with 1 DLAS on each side. Setae in row 9 short. Four short apical setae situated dorsally near end of abdomen. Eight rows of relatively long VCAS with significant gaps present between rows 2 to 3 and 3 to 4; row 1 with 4 VCAS, rows 2–6 each with 8 VCAS, and rows 7 and 8 each with 6 VCAS. Five rows of VLAS, each row with 3–4 VLAS on each side; 3–4 very small setae posterior to last row of VLAS and adjacent to last spiracle. Paratergal plates (Fig. 7) all subtriangular.

Genitalia (Fig. 8) with laterally extended well sclerotized subgenital plate having subparallel margins except in medial region, and broadly rounded postero-central protuberance; 2 very small setae inserted on subgenital plate anterior to this protuberance, and another 4–6 very small setae inserted immediately anterior to subgenital plate. Gonopods and vulvar fimbriae distinct; gonopods VIII subtriangular, each with 1 short postero-central seta and 6–8 short setae on postero-medial margin; gonopods IX smaller than gonopods VIII and each bearing a stout, relatively long seta; 10–14 tiny setae postero-medial to gonopods IX. Small patch of sclerotized integument on each side posterior to gonopods IX at posterior abdominal margin, each patch with 5–6 tiny setae inserted along posterior margin.

Taxonomic summary

Type host: Brachylagus idahoensis (Merriam) (pygmy rabbit), female, 428 g, total length 261 mm, tail 22 mm, hind foot 62 mm, ear 44 mm, field no. 261-22-62-44, no placental scars noted; R. L. and V. R. Rausch field no. 50651; Burke Museum of Natural History, University of Washington, accession no. 39780 (skin and skeleton).

Type locality: USA, Nevada, Elko County (T34N, R59E, section 27); host found dead on road; 13 March 2003; coll: T. Wasley.

Specimens deposited: Holotype (male), allotype (female), and 3 paratype females deposited in the Department of Entomology, U.S. National Museum of Natural History, Smithsonian Institution, Washington D.C. (accession no. 2041765). Other paratypes are in the collections of the authors (accession no. L-32823 at Georgia Southern University, Statesboro, Georgia).

Etymology: The specific epithet of this new species is derived from the host genus.

Remarks

Perhaps, not surprisingly, *H. brachylagi* n. sp. seems to be morphologically closest to the other native North American louse belonging to this genus, *H. setoni*.

These 2 species of *Haemodipsus*, as well as *H. conformalis* Blagoveshchensky from *Lepus tolai* in central Asia, are the only members of the genus that have a subtriangular thoracic sternal plate. *Haemodipsus conformalis* (known only from the female), apart from its contrasting geographical and host distribution, can be distinguished from both *H. setoni* and *H. brachylagi* by having more numerous abdominal setae and abruptly tapered lateral extensions to the subgenital plate (Blagoveshchensky, 1965).

Males of *H. brachylagi* can be distinguished from males of *H. setoni* in having a much longer basal apodeme (about 2.5 times the length of the parameres); the basal apodeme is about 1.7 times the length of the parameres in *H. setoni*. Also, the parameres are distinctly curved inwards anteriorly (basally) in *H. brachylagi* but not in *H. setoni*. Another difference between the males of these 2 species is the presence of 3 DLAS in each of rows 2–5 and 3 VLAS in each of rows 2–4 in *H. brachylagi* compared with 1 DLAS in each of rows 2–5 and 2 VLAS in each of rows 2–4 in *H. setoni*.

Females of *H. brachylagi* can be distinguished from females of *H. setoni* in having the subgenital plate long and narrow with subparallel margins except in the medial region; in *H. setoni*, this plate is subtriangular with distinctly unparallel margins. Another difference between females of these 2 species is the presence of 5 DLAS in each of rows 2–3 in *H. brachylagi* compared with 3 DLAS in each of these rows in *H. setoni*.

Key to known species of *Haemodipsus* in North America

It is not appropriate to prepare a key to all known species of *Haemodipsus* at the present time because only 1 sex is known for some species—*H. africanus* and *H. conformalis*.

Males

1A. Thoracic sternal plate subrectangular, about 3 times as wide as long; parameres with wide posterior opening; pseudopenis barely extending beyond apices of parameres; up to 5 DLAS and VLAS per row on each side on abdomen; on introduced domestic/laboratory rabbit, *Oryctolagus cuniculus* . . . . . *H. ventricosus*

1B. Thoracic sternal plate subtriangular, about as wide as long; parameres with narrow posterior opening; pseudopenis extending well beyond apices of parameres; no more than 4 DLAS or VLAS per row on each side of abdomen; on native North American leporids 2

2A (1B). 3 DLAS in each of rows 2–5 and 3 VLAS in each of rows 2–4; basal apodeme more than twice the length (about 2.5×) of the parameres, parameres curved inward anteriorly (basally), on *Brachylagus idahoensis* . . . . . *H. brachylagi*

2B (1B). 1 DLAS in each of rows 2–5 and 2 VLAS in each or rows 2–4; basal apodeme less than twice the length of the parameres (about 1.7×), parameres not curved inward anteriorly (basally), mainly on *Lepus* spp., occasionally on *Sylvilagus* spp., mainly in western and central North America . . . . . *H. setoni*

Females

1A. Thoracic sternal plate subrectangular, about 3× as wide as long; 4 DLAS in each of rows 3–6 and 4 VLAS in all rows; posteromedian extension of subgenital plate reaching to vulvar fimbriae; on introduced domestic/laboratory rabbit, *Oryctolagus cuniculus* . . . . . *H. ventricosus*

1B. Thoracic sternal plate subtriangular, about as wide as long; 1, 2, 3 or 5 DLAS (never 4) in each of rows 3–6 and 3 VLAS in all rows (except row 3 of *H. brachylagi*, which can have 4); posteromedian extension of subgenital plate not reaching to vulvar fimbriae; on native North American leporids . . 2

2A (1B). 5 DLAS in each of rows 2–3; subgenital plate long and narrow with subparallel margins except in medial region; on *Brachylagus idahoensis* . . . . . *H. brachylagi*

2B (1B). 3 DLAS in each of rows 2–3; subgenital plate subtriangular with distinctly unparallel margins; on *Lepus* spp. and occasionally on *Sylvilagus* spp., mainly in western and central North America . . . . . *H. setoni*

DISCUSSION

The pygmy rabbit is an increasingly rare sagebrush (*Artemisia tridentata*)-associated mammal that is confined to parts of California, Idaho, Oregon, Montana, Nevada, and Utah, with an additional small, disjunct, endangered population in Washington (Green and Flinders, 1980; Duszynski et al., 2005; Hoffmann and Smith, 2005). Because of the general reduction in population density and range of this rabbit, its associated sucking louse as described herein, is also probably rare. Hopefully,

the host-specific parasites of this unique host can be conserved in concert with any host conservation efforts (Durden and Keirans, 1996), so that these parasites are not lost forever as may be the case with some of the parasites of the black-footed ferret, *Mustela nigripes* (Audubon and Bachman) (Gompper and Williams, 1998). *Haemodipsus brachylagi* is not the only parasite that seems to be host-specific to the pygmy rabbit; for example, the protozoan *Eimeria brachylagia* Duszynski, Harrenstien, Couch and Garner, was recently described from this host (Duszynski et al., 2005).

The sucking louse genus *Haemodipsus* is now known to include 7 described species. Despite the small number of recognized species, as a group, representatives of this genus are widely distributed geographically, with *H. africanus* Bedford occurring in southern Africa (although it is known from a single female specimen, which cannot currently be located in any museums, and is presumed to be lost), *H. brachylagi* n. sp. in western North America, *H. conformalis* Blagoveshchensky in central Asia, *H. leporis* Blagoveshchensky in Eurasia, *H. lyriocephalus* (Burmeister) in Eurasia, *H. setoni* in North America, and *H. ventricosus* in Europe (Durden and Musser, 1994). Furthermore, some of these louse species have definitely, or apparently, been introduced into other biogeographical regions. For example, *H. ventricosus* is the louse of the domestic (European/laboratory) rabbit, and, with its host, it has been introduced around the world, so that it is now virtually cosmopolitan (Kim et al., 1986; Durden and Musser, 1994). Also, *H. lyriocephalus* has been introduced into New Zealand with its European hare hosts (Tenquist and Charleston, 1981), and it is also present on scrub hares, *Lepus saxatilis* Cuvier, in South Africa where it seems to be part of the native fauna (Louw et al. 1993). *Haemodipsus setoni* has similarly been reported from native leporids in Eurasia and South Africa where it may be an introduced species (Louw et al., 1993; Durden and Musser, 1994). Further detailed examinations of native leporids for ectoparasites in various parts of the world will probably yield a few more undescribed species of *Haemodipsus* as well as range extensions for introduced species.

Some *Haemodipsus* spp. lice might be enzootic vectors of zoonotic pathogens such as *Francisella tularensis*, the bacterium that causes tularemia (''rabbit fever''). Moreover, *F. tularensis* has been isolated from *H. ventricosus*, which is a confirmed laboratory vector of this pathogen (Shaughnessy, 1963; Durden, 2002).

ACKNOWLEDGMENTS

We thank Tony Wasley (Nevada Division of Wildlife) for collecting and forwarding specimens, David Furth (U.S. National Museum of Natural History, Smithsonian Institution) for depositing type specimens and supplying an accession number, and the Office of Research Services and Sponsored Programs at Georgia Southern University for partial publication funds.

LITERATURE CITED

BLAGOVESHCHENSKY, D. I. 1965. New species of sucking lice (Siphunculata) that are parasites of rodents. Communication I. Entomological Review **44:** 85–91.

DURDEN. L. A. 2002. Lice (Phthiraptera). *In* Medical and veterinary entomology, G. Mullen and L. Durden (eds.). Academic Press, San Diego, California, p. 45–65.

———, AND J. E. KEIRANS. 1996. Host–parasite coextinction and the plight of tick conservation. American Entomologist **42:** 87–91.

———, AND G. G. MUSSER. 1994. The sucking lice (Insecta, Anoplura) of the world: A taxonomic checklist with records of mammalian hosts and geographical distributions. Bulletin of the American Museum of Natural History **218:** 1–90.

———, AND R. M. TIMM. 2001. *Hoplopleura janzeni* n. sp. (Phthiraptera: Anoplura), a new sucking louse from a Central American swimming mouse. Journal of Parasitology **87:** 1409–1413.

DUSZYNSKI, D. W., L. HARRENSTIEN, L. COUCH, AND M. M. GARNER. 2005. A pathogenic new species of *Eimeria* from the pygmy rabbit, *Brachylagus idahoensis*, in Washington and Oregon, with description of the sporulated oocysts and intestinal endogenous stages. Journal of Parasitology **91:** 618–623.

GOMPPER, M. E., AND E. S. WILLIAMS. 1998. Parasite conservation and the black-footed ferret recovery program. Conservation Biology **12:** 730–732.

GREEN, J. S., AND J. T. FLINDERS. 1980. *Brachylagus idahoensis*. Mammalian Species **125:** 1–4.

HOFFMANN, R. S., AND A. T. SMITH. 2005. Order Lagomorpha. *In* Mammal species of the world: A taxonomic and geographic reference, volume 1, 3rd edition, D. E. Wilson and D. M. Reeder (eds.). Johns Hopkins University Press, Baltimore, Maryland, p. 185–211.

KIM, K. C. 1986. A new species of *Linognathoides* (Polyplacidae: Anoplura) from black-tailed prairie dog, *Cynomys ludovicianus* (Ord) (Sciuridae: Rodentia). Proceedings of the Entomological Society of Washington **88:** 354–359.

———. 2006. Blood-sucking lice (Anoplura) of small mammals: True parasites. *In* Micromammals and macroparasites: From evolutionary ecology to management, S. Morand, B. R. Krasnov, and R. Poulin (eds.). Springer, Tokyo, Japan, p. 141–160.

———, AND H. W. LUDWIG. 1978. The family classification of the Anoplura. Systematic Entomology **3:** 249–284.

———, H. D. PRATT, AND C. J. STOJANOVICH. 1986. The sucking lice of North America: An illustrated manual for identification. The Pennsylvania State University Press, University Park, Pennsylvania, 241 p.

LOUW, J. P., I. G. HORAK, AND L. E. O. BRAACK. 1993. Fleas and lice on scrub hares (*Lepus saxatilis*) in South Africa. Onderstepoort Journal of Veterinary Research **60:** 95–101.

SHAUGHNESSY, H. J. 1963. Tularemia. *In* Diseases transmitted from animals to man, 5th ed., T. G. Hull (ed.). Charles C. Thomas, Springfield, Illinois, p. 588–604.

TENQUIST, J. D., AND W. J. G. CHARLESTON. 1981. An annotated checklist of ectoparasites of terrestrial mammals in New Zealand. Journal of the Royal Society of New Zealand **11:** 257–285.