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A New Species of *Hedruris* (Nematoda: Hedruridae) from the Australian Skink *Lampropholis guichenoti* (Reptilia: Scincidae)

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ABSTRACT: We describe a new species of *Hedruris*, *Hedruris wogwogensis* n. sp. (Nematoda), from the skink *Lampropholis guichenoti* in southeastern Australia. This nematode is distinguished from other species of *Hedruris* infecting reptiles principally by the extent of the rows of longitudinal scale-like bosses on the ventral surface of the male tail, which extend anteriorly for more than half the length of the worm. The species also differs in minor respects from other species of *Hedruris*, principally in its small size.

KEY WORDS: Australia, *Arcitalitrus*, *Hedruris*, *Lampropholis*, *Maxvachonia*, *Skrjabinodon*, skink, nematode.

The nematode genus *Hedruris* occurs in fish (Luque et al., 2010), amphibians (Petter, 1971), and reptiles (Burse and Goldberg, 2000), primarily from damp or aquatic environments. Individual species of *Hedruris* are not known to develop in more than one class of vertebrates (Clark, 1978). They possess a number of characteristics that are unique to this genus (Chandler, 1919), the principal of which is a posterior sucker with an eversible hook at the enlarged posterior end of the female, by which the female attaches itself to the host stomach tissues. In an ecological study of the Australian skink *Lampropholis guichenoti*, J.R. found many preserved museum specimens to be infected with gastric nematodes, almost all of which we refer to the genus *Hedruris*. These differ from previously described species in this genus.

MATERIALS AND METHODS

One hundred and eighty-two *Lampropholis guichenoti* skinks were examined as part of an ecological study on habitat fragmentation. Skinks were collected as accidental bycatch in pitfall traps for arthropod collection in the Wog Wog Habitat Fragmental Experiment, NSW, Australia (37°04'30"S, 149°28'00"E; see Margules 1992 for study site description and methods) and are housed at the Australian National Wildlife Collection of the Commonwealth Scientific and Industrial Research Organization (CSIRO), Canberra, Australia. Nematodes and recovered and associated stomach contents were stored in 75% ethanol. Nematodes were cleaned, cleared in chlorolactophenol, and examined using a BA series Olympus microscope. Illustrations were made by the use of a drawing tube. All specimens have been returned to the collection at CSIRO.

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RESULTS

Three species of nematode were recovered. One lizard contained a single female specimen of *Skrjabinodon* sp., in poor condition, and 1 lizard contained 3 female *Maxvachonia chabaudi*. An undescribed species of *Hedruris* occurred in 34/182 lizards (19%), and we describe this new species below.

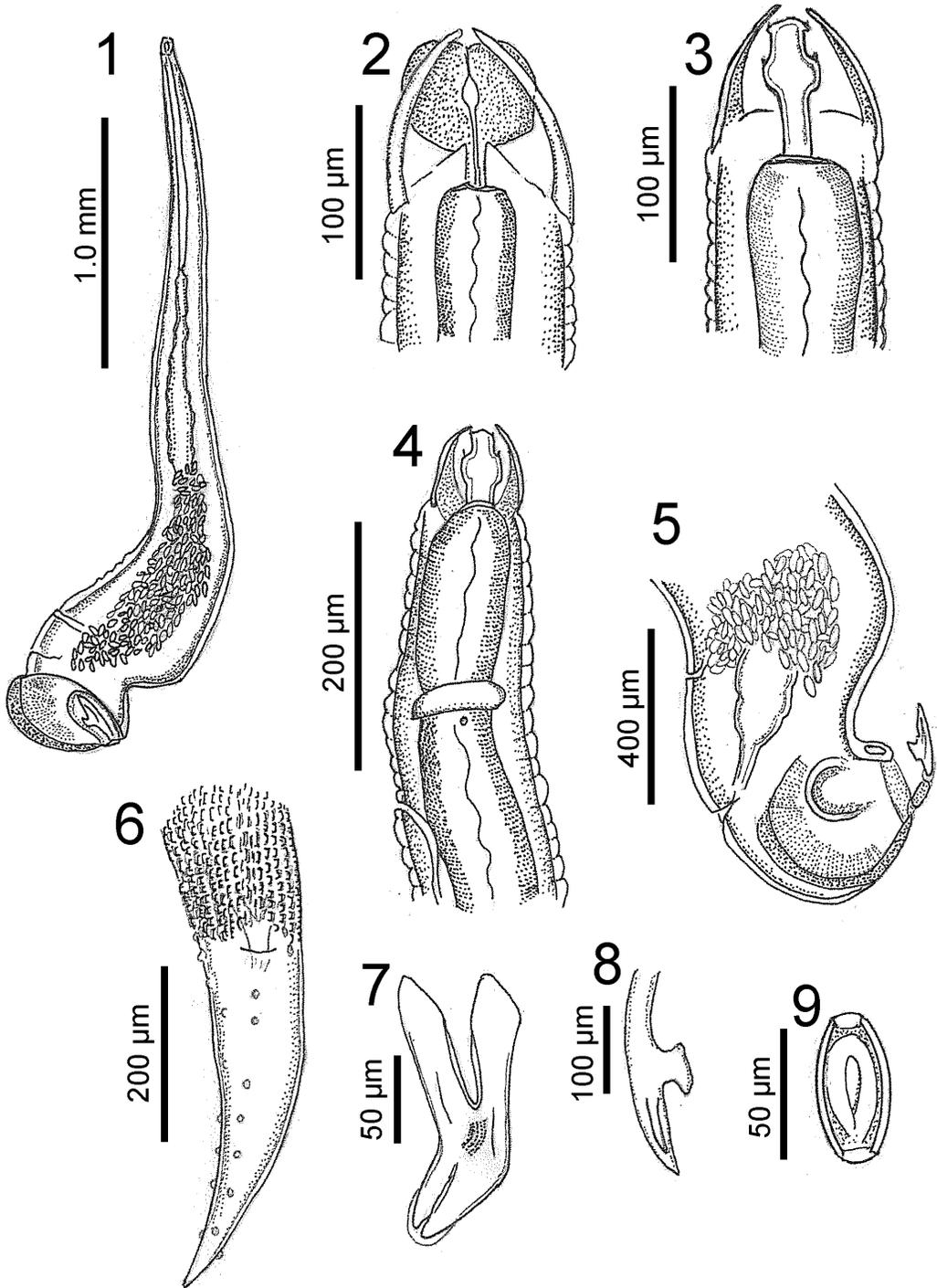
Habronematoidea
Hedruridae Railliet, 1916
***Hedruris* Nitzsch, 1821**
***Hedruris wogwogensis* n. sp.**

Diagnosis

With characters of the genus. Small nematodes, both sexes < 5.0 mm. Males with ca. 25 regular rows of small rectangular bosses or scales on ventral surface extending anteriorly from anus to more than half the length of the worm. Copulatory spicules curved ventrally about midlength, separate anteriorly, fused midlength, posterior end with membranous covering. Females markedly widened toward the posterior end, with large posterior ventral pouch in which stout hook is invaginated. Eggs simple, without lateral protuberances.

Description (Figs. 1–9; Table 1)

Two lateral pseudolabia and 2 median lips at anterior end of worm. Lateral pseudolabia thick, attached to body wall by stout narrow pedicle, with single small peg-like anteriorly directed papillae on dorsal and ventral margin and an amphid centrally. Dorsal and ventral lips triangular in outline, curved medially to partly enclose pseudolabia, and attached to body of



Figures 1–9. *Hedruris wogwogensis* n. sp. 1. Mature female nematode, lateral view, with terminal spine invaginated. 2. Anterior end, dorso-ventral view. 3. Anterior end, lateral view. 4. Anterior end, showing nerve ring, doreids, and excretory pore. 5. Female tail, lateral, with spine everted. 6. Male tail, ventro-lateral view. 7. Male copulatory spicule, ventral view. 8. Spine at posterior end of female. 9. Egg.

Table 1. Measurements of *Hedruris wogwogensis* n. sp. (length in mm, all other measurements in μm).

	Holotype	Male paratype (3)	Allotype	Female paratypes (7)
Length	4.78	4.00–5.10	4.70	3.1–4.7
Maximum width	120	140	480	400–510
Esophagus length	960	937–487	1080	660–920
Esophagus width	72	60–68	76	64–84
Nerve ring*	180	140	220	180–240
Excretory pore*	244	240–310	377	240–320
Dereid*	220	192–244	230	190–240
Tail	320	320–400	–	–
Spicule	172	140–180	–	–
Spine length	–	–	220	210–220
Eggs	–	–	67 \times 30	70 \times 30–56 \times 28
Ventral scales on male tail†	52.3%	55%–65%	–	–

* Distance from anterior end.

† Distance from posterior end.

worm by stout pedicle. Cuticle with pronounced deep transverse striations, especially in anterior portion. Buccal capsule short, leading to esophagus, flat anterior surface of which is cuticularized. Esophagus not visibly divided into muscular and glandular portions. Nerve ring surrounds esophagus near anterior end, and dereids at the same level. Excretory pore a short distance posterior to dereids.

Male: Thin and of uniform width, tapering to a fine pointed tail. Curved ventrally, none in tight coils. Ventral surface of worm lined with 20–25 regular rows of longitudinally arranged rectangular bosses, extending anteriorly from immediately anterior to anus to slightly more than half length of worm. Tail with six pairs of papillae arranged on low subventral ridge, and 1 pair adanal, 1 pair immediately pre-anal, and 1 pair of small papillae on dorsolateral surface of tail. Copulatory spicules twisted longitudinally, well sclerotized, widely separated anteriorly, curved ventrally about midlength, becoming fused about midlength and separated again distally. Tips blunt, apposed, with fine membranous covering, just protruding from anal aperture in all specimens. Accessory piece not evident.

Female: Approximately same length as males, width gradually increasing posteriorly so that posterior end 3–4 times width of that at esophago-intestinal junction. Posterior end rounded, curved dorsally, with voluminous cuticular bursa. Rim of bursa thick posteriorly, diminishing anteriorly, from which radiate very fine parallel lines on its internal surface. A large well-sclerotized eversible hook, with a stout peg on concave surface, articulates with the posterior rim of this bursa, and invaginates into a sac within the bursa. Anus and vulva on convex ventral surface of tail. Eggs elongate, without lateral swellings, thick smooth shells, operculate at both ends, embryonated.

Taxonomic summary

Type host: *Lampropholis guichenoti* (Duméril and Bibron, 1839).

Type locality: Wog Wog Habitat Fragmentation Experiment, NSW, Australia (37°04'30"S, 149°28'00"E).

Collection dates: January 1988, January 1989, April 1989, April 1990, February 1991, May 1991, October 1991, February 1992, May 1992, Oct 1992, February 1993, April 1993, October 1993, February 1994, April 1994, February 1995, April 1995, October 1995, February 1996, April 1996, April 1997.

Site of infection: Stomach.

Prevalence and intensity: Prevalence 34/182 skinks examined (19%). Intensity range 1–14 (mean, 5.3).

Specimens deposited: Specimens deposited in the Australian National Wildlife Collection, Canberra, N5576–N5611.

Specimens examined: 140 male and female adults (some incomplete).

Etymology: *wogwogensis* from the collection sites of infected lizards in the Wog Wog Habitat Fragmentation Experiment, New South Wales, Australia.

Remarks

In most specimens examined the esophagus of the nematode was partly compressed longitudinally. This feature and the deep transverse cuticular striations suggest that many specimens were contracted, presumably resulting from their preservation, and thus the true lengths may be more than stated. The species of *Hedruris* described herein differs from all other species in a number of characteristics, principally size, morphology of eggs, number of caudal tubercles in males, and

the extent of the rectangular bosses on the ventral surface of the male. Six species have been described from reptiles. In Australia, *Hedruris longispicula* from the skink *Lygosoma challengerii* has a long and apparently simple spicule, almost as long as the tail, and the bosses on the male tail extend for most of the distance of the coils, though the distance is not stated (Thomas, 1959). *Hedruris saltuarii* from the Australian leaf-tailed gecko, *Saltuarius moritzi*, and *Hedruris pendula* from turtles in North America are both more than 20 mm in length; in the former there are 12–15 rows of bosses, and they extend anteriorly for 2.5 mm (ca. 15% of length of worm; Jones, 2013), and in the latter the flattened rectangular bosses on the ventral surface of the male tail extend as far as the beginning of the caudal coils and are in rows of 14–16 (Baker, 1986). *Hedruris miyakoensis* from the skink *Scincella boettgeri* in the Ryuku Archipelago, Japan, is also larger (ca. 9 mm), and the rows of rectangular bosses on the male tail extend as far as the first coils and the eggs are smaller (Hasegawa, 1989). The males of *Hedruris hanleyae* from the gecko *Hemidactylus garnotti* in the Cook Islands are only slightly larger but possess only 9–10 rows of rectangular bosses on the male tail, extending approximately 1.0 mm anteriorly (Burse and Goldberg, 2000). *Hedruris minuta* from the skink *Leiopisma smithi* in New Zealand is the closest in size but bears more tubercles on the male tail, and the lines of bosses on the ventral surface of the male tail extend for only about one third of the length of the worm (Andrews, 1974). A single species (female only) has been recorded from an amphibian, *Hyla jervisensis*, in Australia (Johnston and Mawson, 1941). Thus in the species described herein, there are more rows of rectangular scales, and they extend further anteriorly than in other species for which these features are adequately described. Most descriptions state that the posterior part of the male is in about 3 tight coils (as was the case in *H. saltuarii* [Jones, 2013]), whereas males in this species were in semicircular or circular coils, never in tight spirals. This may be an artifact of preservation.

Life cycles are known for 3 species of *Hedruris*; *Hedruris androphora*, from the newt *Triturus vulgaris* in France, became adult in the body cavity of the isopod crustacean, *Asellus aquaticus* (Petter, 1971); *Hedruris ijimai*, from the frog *Rana ornatovenstris* in Japan, develop in *Asellus hilgendorfi* (Hasegawa and Otsuru, 1979); and *Hedruris spinigera* in the amphipod *Paracorphium excavatum* (Luque et al., 2010). No life cycles are known from species of *Hedruris* that mature in reptiles. However, the terrestrial amphipod *Arcitalitrus sylvaticus* is abundant in Eucalypt forests of the Wog Wog Habitat Fragmentation Experiment

(Margules et al., 1994) and could conceivably be an intermediate host for *H. wogwogensis*.

Lampropholis guichenoti occurs in southeastern Australia, inhabiting wet and dry sclerophyll forests and moister woodlands and is common in suburban gardens (Cogger, 2014). No specimens of *Hedruris* have been recorded from the sympatric swamp-inhabiting skink *Lissolepis coventryi* (Jones and Watharow, 2010). Goldberg and Bursey (2012), in a review of helminths of Australian lizards, did not record *Hedruris*, or any other species of nematode, from *L. guichenoti*, nor have species of *Hedruris* been recorded in any species of skink or gecko from arid Australia (Jones, 1995). Further studies are needed to examine this nematode's life cycle and to determine whether it occurs in other species of skink.

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LITERATURE CITED

- Andrews, J. R. H. 1974. A new species of *Hedruris* (Nematoda: Spirurida) from the skink *Leiopisma smithi*. *New Zealand Journal of Zoology* 1:329–332.
- Baker, M. R. 1986. Revision of *Hedruris* Nitzsch (Nematoda: Habronematoidea) from aquatic vertebrates in North America. *Canadian Journal of Zoology* 64:1567–1572.
- Burse, C. R., and S. R. Goldberg. 2000. *Hedruris hanleyi* n. sp (Nematoda: Hedruridae) from *Hemidactylus garnottii* (Sauria: Gekkonidae) from the Cook Islands, Oceania. *Journal of Parasitology* 86:556–559.
- Chandler, A. C. 1919. On a species of *Hedruris* occurring commonly in the western newt, *Notophthalmus torosus*. *Journal of Parasitology* 5:116–122.
- Clark, W. C. 1978. Head morphology and prehensile adaptations in *Hedruris spinigera* (Nematoda: Spirurida). *New Zealand Journal of Zoology* 5:497–501.
- Cogger, H. 2014. *Reptiles and Amphibians of Australia*, 7th ed. CSIRO Publishing, Collingwood, Victoria, Australia.
- Goldberg, S. R., and C. R. Bursey. 2012. Intestinal helminths in nine species of endemic Australian lizards, *Lophognathus longirostris* (Agamidae), *Heteronotia binoei* and *Lucasium stenodactylum* (Gekkonidae), *Ctenotus grandis*, *Ctenotus helena*, *Cyclodomorphus branchialis*, *Egernia depressa*, *Eremiascincus richardsonii*, *Morethia butleri*, and *Morethia lineoocellata* (Skinkidae), with a review of Australia lizard helminths. *Comparative Parasitology* 79: 247–268.
- Hasegawa, H. 1989. *Neoentomelas asatoi* gen et sp. n (Nematoda: Rhabdiasidae) and *Hedruris miyakoensis* sp. n. (Nematoda: Hedruridae) from skins of the

- Ryukyu Archipelago, Japan. Proceedings of the Helminthological Society of Washington 56:145–150.
- Hasegawa, H., and M. Otsuru.** 1979. Life history of an amphibian nematode, *Hedruris ijimai* Morishita, 1926 (Heduridae). Japanese Journal of Parasitology 28:89–97.
- Johnston, T. H., and P. M. Mawson.** 1941. Some nematodes from Kangaroo Island, South Australia. Records of the South Australian Museum 7:45–148.
- Jones, H. I.** 1995. Gastric nematode communities in lizards from the Great Victoria Desert, and an hypothesis for their evolution. Australian Journal of Zoology 43:141–164.
- Jones, H. I.** 2013. Gastrointestinal nematodes from three species of leaf-tailed geckos (Reptilia: *Saltuarius* spp), with descriptions of new species of *Skrjabinodon* (Oxyuroidea: Pharyngodonidae) and *Hedruris* (Habronematoidea: Heduridae). Comparative Parasitology 80:47–59.
- Jones, H. I., and S. Watharow.** 2010. Gastrointestinal helminths in two allopatric sibling species of swamp skink, *Lissolepis coventryi* and *Lissolepis luctuosus* (Reptilia: Skinkidae) from Southeastern and Southwestern Australia, with descriptions of three new species of nematode. Comparative Parasitology 71:37–51.
- Luque, J. L., F. M. Vieira, K. Herrmann, T. M. King, R. Poulin, and C. Lagrue.** 2010. New evidence on a cold case: trophic transmission, distribution and host-specificity in *Hedruris spinigera* (Nematoda: Heduridae). Folia Parasitologica 57:223–231.
- Margules, C. R.,** 1992. The Wog Wog Habitat Fragmentation Experiment. Environmental Conservation 19:316–325.
- Margules, C. R., G. A. Milkovits, and G. T. Smith.** 1994. Contrasting effects of habitat fragmentation on the scorpion *Cercophonius squama* and an amphipod. Ecology 75:2033–2042.
- Petter, A.-J.** 1971. Redescription d'*Hedruris androphora* Nitzsch, 1821 (Nematoda: Heduridae) et étude de son développement chez l'hôte intermédiaire. Annales de Parasitologie 46:479–495.
- Thomas, P. M.** 1959. Some nematode parasites from Australian hosts. Transactions of the Royal Society of South Australia 82:151–162.