Skrjabinodon piankai sp. n. (Nematoda: Pharyngodonidae) and Other Helminths of Geckos (Sauria: Gekkonidae: Nephrurus spp.) from Australia

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ABSTRACT: Skrjabinodon piankai sp. n. from the large intestine of the Australian gecko Nephrurus laevissimus is described and illustrated. It is also reported from Nephrurus levis and Nephrurus vertebralis. Skrjabinodon piankai differs from 6 other Australian realm species in the number of tail filament spines and egg shape. Other helminths found include Oochoristica piankai, Maxvachonia brygooi, Pharyngodon tiligae, Physaleptoides filicauda, Wanaristrongylus ctenoti, third-stage larvae of Abbreviata sp., third-stage larvae of Physaloptera sp., and Raillietiella scincoides. New host records are established for O. piankai and R. scincoides in N. laevissimus; M. brygooi and P. filicauda in N. levis; and P. tiligae in N. vertebralis.

KEY WORDS: Skrjabinodon piankai sp. n., Pharyngodonidae, helminths, Nephrurus laevissimus, Nephrurus levis, Nephrurus vertebralis, Gekkonidae, Sauria, Australia.

Four species of Skrjabinodon Inglis, 1968, have been reported previously from reptiles of Australia. Parathelandros oedurae Johnston and Mawson, 1947, was originally described from specimens taken from the robust velvet gecko, Oedura robusta Boulenger, 1885, collected in southeast Queensland. Inglis (1968) revised Parathelandros Diesing, 1861, retaining the genus for parasites of Australian amphibians and erecting Skrjabinodon as a new genus for parasites of reptiles; 7 species, including P. oedurae, were placed in the new genus. Skrjabinodon smythi Angel and Mawson, 1968 was described from the marbled gecko, Christinus (=Phyllobatylus) marmoratus (Gray, 1845) collected in South Australia. Skrjabinodon parasmythi Mawson, 1971, from the thick-tailed gecko, Underwoodisaurus mili (Bory de Saint-Vincent, 1825), and Skrjabinodon leristae Mawson, 1971, from a skink, Lerista sp., were described from specimens collected on Flinders Island, South Australia. In addition, 2 species, Skrjabinodon trimorphi Ainsworth, 1990, from the common skink, Leiolopisma nigripalpata Patterson and Daugherly, 1990, and Skrjabinodon poicilandri Ainsworth, 1990 from the common gecko, Hoplodactylus maculatus Boulenger, 1885, have been described from specimens collected in New Zealand (Ainsworth, 1990).

Nephrurus Günther, 1876, is an endemic Australian gecko genus containing arid-adapted species characterized by large heads and short, fat tails that terminate in a small knob (Cogger, 1992). The spinifex knobtail gecko, Nephrurus laevissimus Mertens, 1958, occurs in southeastern Western Australia, northwestern South Australia, and southern parts of the Northern Territory; the smooth knobtail gecko, Nephrurus levis De Vis, 1886, occurs from the central coast of Western Australia to the arid parts of all states except Victoria; Storr's knobtail gecko, Nephrurus vertebralis Storr, 1963, occurs from the lower central interior of Western Australia to South Australia (Cogger, 1992). The ranges of these 3 nocturnal species overlap in Western Australia (Cogger, 1992). However, they are reported to favor different habitats (Pianka, 1972): N. laevissimus is associated with sandridges; N. levis occurs on sandplains vegetated with dense clumps of perennial grasses of Triodia Brown, 1810; and N. vertebralis is associated with shrubs of Acacia Miller, 1754.

There are 4 previous reports of nematodes from N. laevissimus (Jones, 1985, 1987, 1995a, b), 1 report from N. levis (Jones, 1995b), but, to our knowledge, no reports from N. vertebralis. We describe here a new species of Skrjabinodon that was found in the large intestines of N. laevissimus, N. levis, and N. vertebralis from Western Australia and the Northern Territory and list other helminth parasites found in these hosts.
Table 1. Prevalence (%) and mean abundance of helminths of *Nephrurus laevissimus*, *N. levis*, and *N. vertebralis* from Australia.

<table>
<thead>
<tr>
<th>Helminth</th>
<th><em>Nephrurus laevissimus (N = 36)</em></th>
<th><em>Nephrurus levis (N = 13)</em></th>
<th><em>Nephrurus vertebralis (N = 3)</em></th>
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<tbody>
<tr>
<td></td>
<td>P (%) A ± SD</td>
<td></td>
<td>P (%) A ± SD</td>
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<tr>
<td>Cestoda</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td><em>Oochoristica piankai</em></td>
<td>3‡ 0.14 ± 0.83</td>
<td>—</td>
<td>—</td>
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<tr>
<td>Nematoda</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><em>Maxvachonia brygooi</em></td>
<td>—</td>
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<td>—</td>
</tr>
<tr>
<td><em>Pharyngodon tiliguae</em></td>
<td>17 0.83 ± 2.45</td>
<td>31‡ 16.08 ± 56.47</td>
<td>33‡ 4.00 ± 6.93</td>
</tr>
<tr>
<td><em>Physalopteroides filicauda</em></td>
<td>22† 12.75 ± 29.77</td>
<td>62‡ 53.69 ± 78.69</td>
<td>66‡ 55.33 ± 94.98</td>
</tr>
<tr>
<td><em>Skrjabinodon piankai</em></td>
<td>—</td>
<td>8</td>
<td>0.15 ± 0.56</td>
</tr>
<tr>
<td><em>Wanaristrongylus ctenoti</em></td>
<td>5 0.08 ± 0.37</td>
<td>31 0.85 ± 1.95</td>
<td>—</td>
</tr>
<tr>
<td>Pentastomatida</td>
<td>3 0.03 ± 0.17</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td><em>Raillietiella scincoides</em></td>
<td>5‡ 0.06 ± 0.23</td>
<td>—</td>
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</tr>
</tbody>
</table>

* P = Prevalence (number of hosts infected with a parasite species divided by the number of hosts examined × 100).
† A ± SD = mean abundance (summation of number of individuals of a parasite species per host divided by the number of hosts examined) ± standard deviation.
‡ New host record.

Materials and Methods

Thirty-six *N. laevissimus*, 13 *N. levis*, and 3 *N. vertebralis* from the collections of the Natural History Museum of Los Angeles County (LACM) were examined: *N. laevissimus*, mean snout–vent length (SVL) = 64.6 ± 8.5 mm SD, range 51–80 mm, LACM 57145, 57146, 57156, 57159, 57160, 57162, 57163, 57165, 57170, 57173–57175, 57177, 57180–57182, 57189, 57192, 57193, 57196–57198, 57201, 57204, 57209, 57210, 57213, 57215–57217, 57219, 57220, 57225–57228, collected 34 km west of Lorna Glen homestead, Western Australia (26°14’S, 121°13’E); *N. levis*, SVL = 77.2 ± 10.2 mm SD, range 64–98 mm, LACM 57008, 57009, collected 29 km south of Neale Junction, Western Australia (28°30’S, 125°50’E), LACM 57011–57014, 35 km east of Laverton, Western Australia (28°28’S, 122°50’E), LACM 57018, 57020, 16 km southeast of Renhan’s Well, Northern Territory (21°24’S, 130°53’E), LACM 57026, 57029, 11 km south of The Granite, Northern Territory (20°38’S, 130°25’E), LACM 57032, 57037, 57039, 13 km west of Neale Junction, Western Australia (28°17’S, 125°40’E); *N. vertebralis*, SVL = 81.3 ± 7.6 mm SD, range 73–88 mm, LACM 57047, 6 km east of Stony Point, Western Australia (28°05’S, 124°15’E), LACM 57049, 57051, 14 km northeast of Millrose homestead, Western Australia (26°17’S, 121°00’E). These specimens had been collected between October 1966 and January 1968 for use in an ecological study (Pianka and Pianka, 1976). Because the ecological study included stomach analysis, only small and large intestines remained with the carcasses. Each intestine was searched for helminths using a dissecting microscope. Cestodes were stained with hematoxylin and mounted in balsam for identification; other helminths were identified from the glyceral mounts. Measurements are in mm unless otherwise indicated.

Results

Helminths representing 9 species were found: the cestode *Oochoristica piankai* Bursey, Goldberg, and Woolery, 1996; the nematodes *Maxvachonia brygooi* Mawson, 1972, *Pharyngodon tiliguae* Baylis, 1930, *Physalopteroides filicauda* Jones, 1985, *Skrjabinodon piankai* sp. n. (this paper), *Wanaristrongylus ctenoti* Jones, 1987, *Abbreviata* sp. (third-stage larvae only), *Physaloptera* sp. (third-stage larvae only); and the pentastomid *Raillietiella scincoides* Ali, Riley, and Self, 1984. Prevalence and mean abundance are given in Table 1. Selected specimens were placed in vials of alcohol and deposited in the U.S. National Parasite Collection (USNPC).

These are parasites from *N. laevissimus*: *O. piankai*, USNPC 88189; *P. filicauda*, USNPC 88190; *S. piankai*, USNPC 88191; *Abbreviata* sp. (larva), USNPC 88192; *Physaloptera* sp. (larva), USNPC 88193; *R. scincoides*, USNPC 88194; *N. levis*: *M. brygooi*, USNPC 88195; *P. filicauda*, USNPC 88196; *S. piankai*, USNPC 88197; *W. ctenoti*, USNPC 88198; *Abbreviata* sp. (larva), USNPC 88199. *Nephrurus vertebralis*: *Pharyngodon tiliguae*, USNPC 88200; *S. piankai*, USNPC 88201.

*Skrjabinodon piankai* sp. n.
(Figs. 1–8)

Description

**General**: Oxyurida: Pharyngodonidae Travassos, 1919, *Skrjabinodon* Inglis, 1968. Small,
Figures 1–8. *Skrjabinodon piankai* sp. n. 1. Female, entire, lateral view. 2. Female, en face view. 3. Male, entire, lateral view. 4. Egg, pronuclear stage. 5. Egg, morula stage. 6. Male, posterior end, ventral view. 7. Spicule. 8. Male, posterior end, lateral view.
cylindrical nematodes, extremities tapered in both sexes; moderate sexual dimorphism, males approximately one-third length of females. Cuticle with fine transverse striations along entire body. Mouth surrounded by 3 small lips; prominent lateral amphids just behind lips. Lateral alae present in both sexes. Tail narrowing abruptly behind anus to form filamentous appendage.

**MALE** (based on 10 specimens): Small, white, fusiform nematodes tapering both anteriorly and posteriorly, body usually bent to give comma-shaped appearance. Length 1.27 (1.19–1.40), body length 1.00 (0.97–1.12), tail filament 0.25 (0.22–0.29). Width at level of excretory pore 0.12 (0.10–0.14). Cuticle with striations approximately 3 μm apart. Esophagus excluding bulb 0.216 (0.204–0.242), bulb length 0.049 (0.040–0.054), bulb width 0.052 (0.046–0.057). Nerve ring 0.118 (0.103–0.125) and excretory pore 0.342 (0.306–0.383) from anterior end, respectively. Lateral alae 0.012 (0.010–0.015) wide, beginning midway between lips and nerve ring and ending just anterior to third pair of caudal papillae. Spicules 0.055 (0.051–0.057). Tail filament with 1 (0–2) small spine. Cloaca and associated papillae slightly raised from body surface but not on distinct cone. Caudal alae absent, 3 pairs of sessile papillae, 1 pair precloacal, 1 pair postcloacal, third pair occurring on base of tail filament. Single tubular testis reflexed just posterior to excretory pore.

**FEMALE** (based on 10 gravid specimens): Small, white nematodes tapering anteriorly and posteriorly. Length 3.21 (2.80–3.58), body length 2.55 (2.21–2.86), tail filament 0.66 (0.58–0.71). Width at level of vulva 0.22 (0.18–0.25). Lateral alae 2 μm (2–3 μm) wide, doubled, approximately 50 μm apart at midbody, beginning in a single point at level of nerve ring, ending in a single point just anterior to beginning of tail filament. Cuticle with transverse striations approximately 2 μm wide. Mouth with 3 lips, each lateral lip with 1 small papilla. Esophagus excluding bulb 0.295 (0.285–0.310), bulb length 0.073 (0.068–0.080), bulb width 0.087 (0.080–0.094). Nerve ring 0.125 (0.115–0.145), excretory pore 0.477 (0.410–0.535), and vulva 0.535 (0.485–0.610) from anterior end, respectively. Thick-walled muscular ovjector extending posteriorly 0.40 mm, then continuing as thin-walled vagina 0.18 mm in length before joining 2 uteri, 1 directed anteriorly and the other posteriorly. Ovarian and uterine coils not extending to vulva. In fully gravid females, uterus extending from slightly behind vulva to end of body. Egg barrel shaped, slightly flattened on 1 side, operculum at each end, length 105 μm (100–108 μm), width 34 μm (31–37 μm). Egg surface finely pitted, having a ground-glass appearance. Development to morula stage at deposition. Tail spines 5 (4–7).

**Taxonomic summary**

**TYPE HOST:** *Nephrurus laevisimus* Mertens, 1958.

**ADDITIONAL HOSTS:** *Nephrurus levis* De Vis, 1886; *N. vertebralis* Storr, 1963.

**TYPE LOCALITY:** 34 km west of Lorna Glen homestead, Western Australia (26°14'S, 121°13'E).

**SITE OF INFECTION:** Large intestine.

**TYPE SPECIMENS:** Holotype, male, U.S. National Parasite Collection no. 88186; allotype, female, no. 88187; paratypes (9 males, 9 females), no. 88188.

**ETYMOLOGY:** The specific epithet honors Eric R. Pianka, Denton A. Cooley Centennial Professor of Zoology, University of Texas at Austin, for his pioneering studies on the ecology of Australian lizards.

**Remarks**

*Skrjabinodon piankai* is the seventh species of *Skrjabinodon* to be reported from the Australian biogeographical realm; 5 from Australia and 2 from New Zealand. These species are separated on the basis of tail spines and egg shape. *Skrjabinodon oedurae* and *S. poicilandri* possess 3 caudal body spines that the other 5 species lack. Females of *S. oedurae* have 19 tail filament spines; females of *S. poicilandri* have 36–44. *Skrjabinodon leristae*, *S. parasmythi*, *S. smythi*, and *S. trimorphi* have spindled-shaped eggs; the eggs of *S. piankai* are barrel-shaped. Eggs of *S. parasmythi* and *S. smythi* have plugs at each end, those of *S. leristae* and *S. trimorphi* do not. Tail filament spines of female *S. parasmythi* are slender and pointed, those of female *S. smythi* are digitiform. Males of *S. parasmythi* have a well-developed spicle, males of *S. smythi* lack a spicle. Females of *S. leristae* have doubled lateral alae; females of *S. trimorphi* have single lateral alae.

**Discussion**

Other species of helminths found in this study are listed in Table 1. Previously reported hel-
minths of *N. laevissimus* include *P. filicauda*, *Wanaristrongylus papangawurpae* Jones, 1987, and cysts containing larvae of physalopterids; from *N. levis*, *W. ctenoti* and physalopterid larvae (Jones, 1985, 1987, 1995a, b).

*Oochoristica piankai* was first described from specimens taken from the small intestine of the thorny devil, *Moloch horridus* Gray, 1841, collected by E. R. Pianka in Western Australia (Bursey et al., 1996). *Nephrurus laevissimus* is the second host for this parasite to be reported. *Maxvachonia brygooi* was first described from the agamid genus *Amphibolurus* Wagler, 1830, by Mawson (1972); *N. levis* is a new host record for *M. brygooi* and represents the 10th lizard species to harbor this helminth. *Pharyngodon tiliquae* was first described from the skin *Tiliqua scincoides* (White, ex Shaw, 1790) by Baylis (1930); *N. vertebralis* is a new host record for *P. tiliquae* and represents the 10th lizard species to harbor this helminth. *Physalopteroides filicauda* was described from specimens taken from the stomach of a *N. laevissimus* collected by E. R. Pianka in Western Australia (Jones, 1985). It has been found in at least 38 species of Australian lizards. *Wanaristrongylus papangawurpae* and *W. ctenoti* were also described from specimens taken from the stomachs of *N. laevissimus* and *N. levis*, respectively, collected by E. R. Pianka in Western Australia (Jones, 1987). *Wanaristrongylus papangawurpae* has been found in 8 species of Australian lizards and *W. ctenoti* in 12 species (Jones, 1988, 1995a). *Raillietiella scincoides* was originally described from *T. scincoides* by Ali et al. (1984); *N. laevissimus* is the second reported host. Larvae of *Abbreviata* sp. and *Physaloptera* sp. are commonly reported in Australian reptiles (Jones, 1995a). Larvae of *Abbreviata* sp. have submedian teeth on each pseudolabium; such teeth are absent in larvae of *Physaloptera* sp.

It should be noted that the material examined by Jones (1995a, b) and our material were from the same collection of lizards by E. R. Pianka; the stomachs had been deposited in the Western Australia Museum and the carcasses in LACM. Further examination of Australian lizards will be necessary before the number of hosts for *S. piankai* can be known.

Acknowledgments

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**Literature Cited**


