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VERSITA

A new species of *Pharyngodon* (Nematoda, Pharyngodonidae) and other helminths in *Cyrtodactylus louisiadensis* (Sauria, Gekkonidae) from Papua New Guinea

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Abstract

Pharyngodon novaeguineae sp. nov. from the large intestines of *Cyrtodactylus louisiadensis* (Sauria, Gekkonidae), from Papua New Guinea is described and illustrated. *Pharyngodon novaeguineae* represents the 36th species assigned to the genus and is separated from its congeners based upon absence of a spicule, egg morphology, and excretory pore position.

Keywords

Pharyngodon novaeguineae, Nematoda, *Cyrtodactylus louisiadensis*, Sauria, Papua New Guinea

Introduction

During a helminthological examination of 4 ring-tailed geckos, *Cyrtodactylus louisiadensis* (de Vis, 1892) from Papua New Guinea, one was found to harbor 119 (28 male, 91 female) nematodes of an undescribed species of *Pharyngodon* Diesing, 1861. *C. louisiadensis* inhabits primary and secondary rainforests of Papua New Guinea, the Solomon Islands, and northeastern Queensland, Australia (Bauer and Henle 1994). To our knowledge, there is one report of helminths from *C. louisiadensis*; Bursey *et al*. (2005a) described the cestode *Gekkotaenia novaeguineaensis* Bursey, Goldberg et Kraus, 2005 and the nematode *Cosmocerca zugi* Bursey, Goldberg et Kraus, 2005 and reported the occurrence of *Aplectana macintoshii* (Stewart, 1914), *Oswaldocruzia bakeri* Moravec et Sey, 1986, *Parapharyngodon maplestonei* Chatterji, 1933 and *Physalopteroides milnensis* Bursey, Goldberg et Kraus, 2005.

The genus *Pharyngodon* was established by Diesing (1861) with *P. spinicauda* (Dujardin, 1845) (originally *Oxyuris spinicauda* Dujardin, 1845 but reclassified by Diesing, 1861) from a lizard *Podarcis muralis* (= *Lacerta muralis)* collected at St. Malo, France, as the type species. Skryabin *et al*. (1960) revised the genus to retain only those species in which males have well-developed caudal alae forming a genital bursa enveloping the 3 pairs of caudal pedunculate papillae. Currently, 35 species are assigned to the genus; however, 4 are known from female specimens only, i.e., *P. boulengerula* Ubelaker, 1965; *P. elongata* Markov et Bogdanov, 1961; *P. sphaerodactyli* Barus et Coy Otero, 1974; and, *P. polypedatis* Yamaguti, 1941 (Binh *et al*. 2007). The purpose of this paper is to describe the 36th species assigned to *Pharyngodon*.

Materials and methods

Four specimens of *Cyrtodactylus louisiadensis* (all females, mean snout-vent length 131 ± 5 mm, range 124–137 mm) were collected by hand on Sudest Island, Milne Bay Province, Papua New Guinea, 21–26 April 2004 by FK, and fixed in neutral buffered 10% formalin. The body cavity was opened by a longitudinal incision and the gastrointestinal tract was removed by cutting across the oesophagus and rectum. The oesophagus, stomach, small intestine, and large intestine of each lizard were examined separately for endoparasites. Nematodes were placed in lactophenol, allowed to clear and examined under a light microscope. Drawings were made with the aid of a microprojector. Measurements are in µm with mean ± SD and range in parenthesis unless otherwise stated. Lizards were deposited in the Bernice P. Bishop Museum (BPBM), Honolulu, Hawaii, as BPBM 19741-19744. Nematodes were deposited in the United States National Parasite

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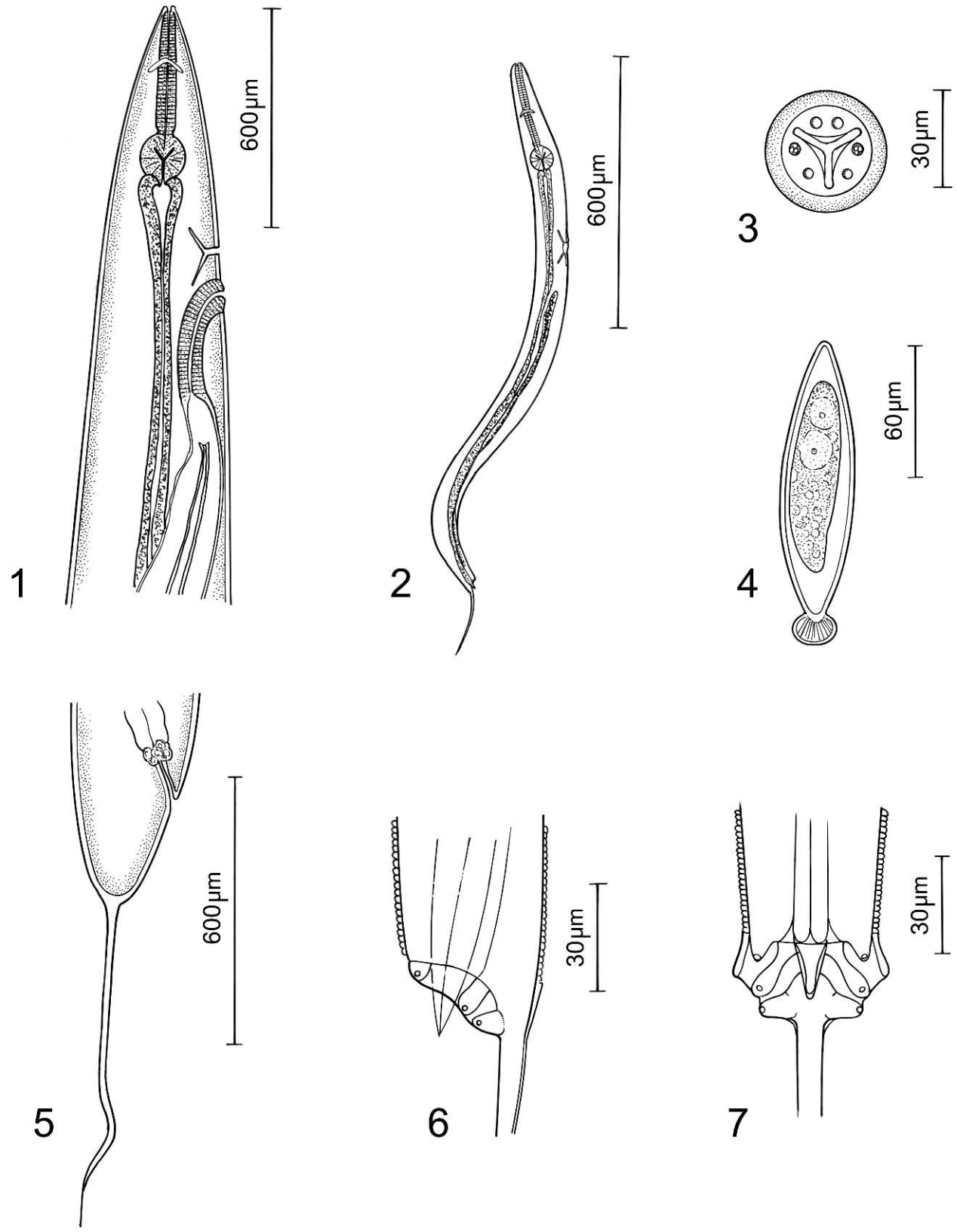

Figs 1–7. *Pharyngodon novaeguineae* sp. nov.: **1.** Female, anterior end, lateral view. **2.** Male, entire, lateral view. **3.** Female, en face view. **4.** Egg. **5.** Female, posterior end, lateral view. **6.** Male, posterior end, lateral view. **7.** Male, posterior end, ventral view

Collection (USNPC), Beltsville, Maryland, USA and the Bishop Museum.

Results

One hundred eighty eight endoparasites were found. Of these, 119 (28 males and 91 females) represented an undescribed species of *Pharyngodon*; also present were specimens of *Maxvachonia adamsoni* Moravec et Sey, 1990, *Oswaldocruzia bakeri*, third stage larvae of *Abbreviata* sp. and a nymph of *Kiricephalus* sp. (Table I). Description of the new species follows.

***Pharyngodon novaeguineae* sp. nov.** (Figs 1–7)

Oxyuroidea Railliet, 1916
Pharyngodonidae Travassos, 1919
Pharyngodon Diesing, 1861

General: Males with caudal alae that envelop the 3 pairs of caudal papillae; females with vulva in anterior half of body. Sexual dimorphism evident, males shorter and thinner than females. Mouth bounded by 3 lips; dorsal lip with 2 papillae, each sublateral lip with 1 papilla and 1 amphid. Oesophagus composed of anterior cylindrical corpus, short isthmus and posterior valved bulb. Tail in both sexes forming flexible terminal process.

Male (holotype and 9 paratypes): Small, cylindrical nematodes, distinctly truncated posterior end. Cuticle with transverse annulations approximately 6 apart and longitudinal striations at 2 intervals. Length excluding tail filament 1.16 ± 0.06 mm (1.07–1.25 mm), width at excretory pore 76 ± 9 (61–88). Lateral alae approximately 6 in width extending from level of nerve ring to base of caudal alae. Buccal cavity 8 ± 2 (6–11). Oesophageal corpus 159 ± 11 (146–176) in length, isthmus 9 ± 3 (6–13) in length, bulb 47 ± 3 (40–52) long, 42 ± 3 (37–46) wide. Nerve ring 109 ± 5 (104–116) and excretory pore 402 ± 20 (370–434) from anterior end. Three pairs of caudal papillae; precloacal pair situated on slightly inflated portion of caudal end, adcloacal pair posteriorly directed, and postcloacal pair enclosed by caudal alae. Prominent V-shaped cloacal lips. Spicule absent. Body terminates in flexible, smooth, filiform process, 165 ± 9 (153–183) in length.

Female (allotype and 9 paratypes): Cylindrical nematodes, cuticle with transverse annulations approximately 10 apart (most apparent anteriorly) and faint longitudinal striations at 2 intervals; posteriorly, transverse striations at 2 intervals become apparent giving, depending upon microscope focus, a cross-hatched appearance. Lateral alae absent. Length excluding tail filament 3.18 ± 0.20 mm (2.88–3.46 mm), width a level of vulva 276 ± 19 (242–306), body cylindrical, tapering sharply posterior to anus to form flexible, smooth, process 631 ± 33 (587–687) in length. Buccal cavity 8 ± 3 (6–12). Oesophagus consisting of corpus 276 ± 33 (250–356) in length, isthmus 14 ± 2 (11–18) in length, bulb 89 ± 3 (85–92) long, 99 ± 4 (92–104) wide. Nerve ring 117 ± 6 (110–128), excretory pore 524 ± 27 (485–574), and vulva 598 ± 29 (561–650) from anterior end. Anus 204 ± 16 (179–230) anterior of base of tail spike. Vulva slitlike, anterior lip coronoid (beak-like). Thick-walled ovijector, approximately 215 in length, and thin-walled vagina, approximately 120 in length, joining 2 uteri that extend posteriorly and when filled with eggs reach posterior end of body cavity. In non-gravid individuals, posterior ovary at midbody, anterior ovary parallel to vagina. Egg, spindleform, one end pointed and unadorned, one end truncate with blade-like adornment, slightly flattened on one side, 127 ± 3 (122–131) by 34 ± 2 (31–37); thin, smooth shell. Eggs not larvated when released.

Taxonomic summary

Type host: *Cyrtodactylus louisiadensis* (de Vis, 1892); symbiotype, BPBM 19741, collected 21 April 2004.

Type locality: Along Gesirava River, 11.49179°S, 153.41261°E, 127 m elevation, Sudest Island, Milne Bay Province, Papua New Guinea.

Site of infection: Large intestine.

Type specimens: Holotype male USNPC 100342; allotype female USNPC 100343; paratypes USNPC 100344; voucher specimens USNPC 100345, BPBM H250.

Etymology: The new species is named for the country of collection, New Guinea.

Remarks

Species of *Pharyngodon* are separated on the presence or absence of a spicule, the morphology of the caudal alae, the shape of the egg, the presence or absence of spines on the tail filament of adults, and distribution patterns (see Table I in Bursey and Goldberg 1996). One additional species, *P. oceani-*

Table I. Site of infection, number of helminths, prevalence, mean intensity, range of infection and USNPC and BPBM accession numbers for voucher specimens of 5 helminth species in *Cyrtodactylus louisiadensis* from Papua New Guinea

Helminth species	Site of infection	No.	Prevalence	Mean intensity ± SD	Range	Accession no. USNPC	Accession no. BPBM
Maxvachonia adamsoni	large intestine	8	1/4 (25%)	8	–	100346	H248
Oswaldocruzia bakeri	stomach	4	1/4 (25%)	4	–	100347	H249
Pharyngodon novaeguineae sp. nov.	large intestine	119	1/4 (25%)	119	–	100345	H250
Abbreviata sp. (cysts)	stomach wall	56	4/4 (100%)	14 ± 14	1–32	100348	H251
Kiricephalus sp. (nymph)	body cavity	1	1/4 (25%)	1	–	100349	–

cus Bursey et Goldberg, 1999, should be added to the list of species: male, spicule absent, tail filament longer than bursa; female, tail subulate with 5–7 spines, bottle-shaped egg (Bursey and Goldberg 1999).

Four species of *Pharyngodon*, i.e., *P. frenatusi* Gupta, 1959, *P. intermicauda* Baylis, 1923, *P. kuntzi* Gupta, 1959, and *P. neyrae* Calvente, 1948, have been described as lacking a spicule and having eggs with pointed ends. Eggs of *P. intermicauda* and *P. kuntzi* have adornments at both ends; *P. frenatusi* and *P. novaeguineae* have adornment at one end; and eggs of *P. neyrae* lack polar adornments. *P. frenatusi* and *P. novaeguineae* are separated on the basis of excretory pore position; in *P. frenatusi* the excretory pore lies at the level of the oesophageal bulb while in *P. novaeguineae* the excretory pore is well behind the oesophageal bulb.

Discussion

Maxvachonia adamsoni and *Kiricephalus* sp. (nymph) represent new host records for *Cyrtodactylus louisiadensis*. *Maxvachonia adamsoni* was originally described by Moravec and Sey (1990) from specimens taken from the intestine of *Litoria infrafrenata* Günther (Hylidae) collected at Moi Biri Bay, Baiawa, Papua New Guinea. It has been reported from *Sphenomorphus jobiensis* (Meyer) collected in Milne Bay Province, Papua New Guinea (Bursey *et al*. 2005b). Adults of *Kiricephalus pattoni* inhabit the lung and respiratory passageways of numerous Indian, Southeast Asian, and Australian snakes (Riley and Self 1980), adults of *Kiricephalus tortus* are known only from the snake *Boiga irregularis* from New Guinea (Shipley 1898), however nymphs assigned to *Kiricephalus* have been reported from a number of amphibians and reptiles (see Bursey and Goldberg 2004 for list).

Oswaldocruzia bakeri was originally described by Moravec and Sey (1986) from *Callulops stictogaster* and *C. wilhelmana* collected at Orumba, Eastern Highlands Province, Papua New Guinea. It was reported in *Callulops humicola* collected in Papua New Guinea (Moravec 1990), *Platylantis pelewensis* collected on Belau (Bursey and Goldberg 2004), and *Cyrtodactylus louisiadensis* and *Sphenomorphus jobiensis* also collected in Papua New Guinea (Bursey *et al*. 2005a, b). Third-stage larvae of *Abbreviata* sp. are widely distributed in Australia and have been reported from agamid, gekkonid, scincid, and varanid lizards as well as several species of snakes (Jones 1995). Because these larvae are found in cysts, it is most likely that *C. louisiadensis* serves as a paratenic host.

A revised list of endoparasites of *C. louisiadensis* would be as follows: definitive host of (cestode) *Gekkotaenia novaeguineaensis*; (nematode) *Aplectana macintoshii*, *Cosmocerca zugi*, *Oswaldocruzia bakeri*, *Parapharyngodon maplestonei*, *Pharyngodon novaeguineae*, *Physalopteroides milnensis*; paratenic host of (nematode) *Abbreviata* sp.; (pentastome) *Kiricephalus* sp.

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