

Rhabdias kongmongthaensis sp. n. (Nematoda: Rhabdiasidae) from *Polypedates leucomystax* (Amphibia: Anura: Rhacophoridae) in Thailand

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Abstract. *Rhabdias kongmongthaensis* sp. n. is described based on specimens found in the lungs of the tree frog *Polypedates leucomystax* (Gravenhorst) (Amphibia: Rhacophoridae) from Kanchanaburi Province, western Thailand. The new species is similar to two North-American species, *Rhabdias ranae* and *R. americanus*, by presence of two lateral pseudolabia, each with two inner submedian protuberances. *R. kongmongthaensis* differs from both species by relative length and shape of the tail, and by its distribution and host specificity. Presence of lateral pseudolabia distinguishes the new species from the geographically closest *Rhabdias* species as well as from those parasitizing other rhacophorid frogs.

Of about 40 species of the genus *Rhabdias* Stiles et Hassall, 1905, nine were described from anuran amphibians in Southeast Asia. Three of them, *R. bicornis* Lu, 1934, *R. brachylaimus* (Linstow, 1903) and *R. incerta* Wilkie, 1930, are specific parasites of toads (Bufonidae). Three other species, namely *R. montana* Yamaguti, 1954, *R. multiproles* Yuen, 1965 and *R. nipponica* Yamaguti, 1935, were found in frogs belonging to the family Ranidae. *Rhabdias globocephala* Kung et Wu, 1945 was originally described from a microhylid tree frog, *Microhyla ornata*, and later found in a rhacophorid species, *Buergeria pollicaris*, collected in China (Kuzmin 2005). *Rhabdias polypedatis* Yamaguti, 1941 and *R. rhacophori* Yamaguti, 1941 were described from rhacophorid frogs in Japan (Yamaguti 1941).

Polypedates leucomystax (Gravenhorst) is a rather common rhacophorid tree frog widely distributed in South East Asia from eastern India to Sumatra, Philippines and Ryukyus archipelago; it is regarded that the populations in the latter two regions are introduced. In April 2004 we collected *Rhabdias* from lungs of several specimens of *Polypedates leucomystax* in western Thailand. They appeared to be different from all known species of the genus and are described herein as belonging to a new species, *Rhabdias kongmongthaensis* sp. n.

MATERIALS AND METHODS

Thirteen specimens of *Polypedates leucomystax* were collected in the Kong Mong Tha village, Kanchanaburi Province, Thailand and examined for presence of helminths. Four frogs harboured lung nematodes of the genus *Rhabdias*. After recovery from the host lungs, the nematodes were rinsed in saline, heat-killed in saline and stored in 70% ethanol. For morphological examination, nematodes were cleared in glycerin-

phenol mixture. Holotype and paratypes are deposited in the United States National Parasite Collection (USNPC), Beltsville, Maryland. All measurements are in micrometres unless otherwise stated.

RESULTS

Rhabdias kongmongthaensis sp. n. Fig. 1

Description. Measurements are given for holotype followed by mean values and limits for 9 paratypes. Relatively large *Rhabdias* species. Body 10.975 (9.708; 6.475–12.275) mm long and 320 (251; 200–310) wide at level of vulva. Body cuticle inflated. Oral opening narrow, oval, two lateral pseudolabia and four submedian lips present; each lip bearing small papilla on top. Lateral papillae situated on inner surface of pseudolabia. Buccal capsule infundibuliform in lateral view, circular in apical view, 15 (14; 12–15) wide and 12 (12; 10–15) deep; walls of buccal capsule completely surrounded with oesophagus anterior end. Oesophagus club-shaped, comparatively narrow, with mostly muscular anterior part and glandular posterior part. Muscular part slightly dilated at its mid-length. Posterior oesophageal bulb elongate, egg-shaped. Oesophagus length 610 (589; 530–630), or 5.6 (6.3; 5.1–8.8) % of body length. Width of oesophagus anterior end 32 (34; 32–35), width of muscular dilation 45 (44; 40–50), minimum width of glandular part 37 (38; 32–42), width of posterior bulb 67 (66; 57–77). Nerve ring encircling oesophagus posterior to its muscular dilation, at 210 (229; 200–250) from oesophagus anterior end. This distance constitutes 34.4 (39; 34.5–42.1) % of oesophagus length. Intestine wide, thick-walled, its anterior end

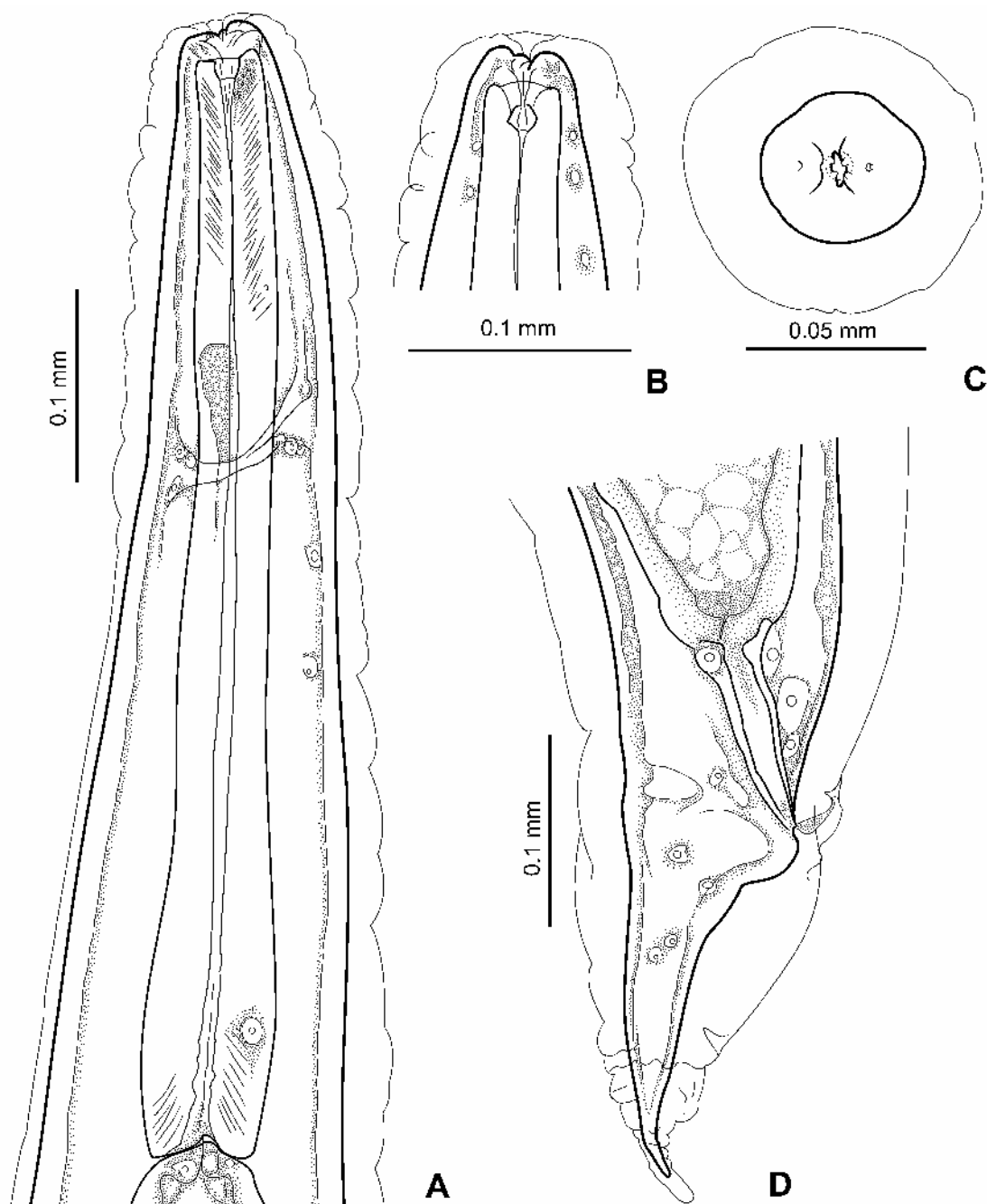


Fig. 1. *Rhabdias kongmongthaensis* sp. n. **A** – anterior end, lateral view; **B** – head end, dorsal view; **C** – head end, apical view; **D** – tail, lateral view.

narrower than posterior bulb of oesophagus. Posterior part of intestine comparatively thin-walled, with wide lumen filled with black contents. Rectum short, narrow, with sclerotized walls.

Hermaphrodites. Genital system amphidelphic, typical of *Rhabdias*. Vulva post-equatorial. Distance from anterior end to vulva 5.700 (5.187; 3.675–6.375) mm, or 51.9 (54.4; 51.6–57.0) % of body length. Uteri filled with numerous eggs, most eggs containing larvae.

Tail comparatively short, conical, tail tip covered with cuticular swelling. Tail length 200 (217; 180–250) or 1.8 (2.3; 1.9–3.1) % of body length.

Type host: Stripe (house, jar) tree frog, *Polypedates leucomystax* (Gravenhorst, 1829).

Type locality: Kong Mong Tha, Kanchanaburi Province, Thailand (15°10'N, 98°32'E).

Site of infection: Lungs.

Prevalence and intensity: 4 out of 13 (30.8%) tree frogs were infected with 1–4 (mean 2.7) nematodes.

Type series: Holotype, USNPC 96376; 9 paratypes, USNPC 96377.

Etymology: Species name is given after the Kong Mong Tha village in Thailand, the type locality of the species.

Remarks. *Rhabdias kongmongthaensis* is morphologically most similar to *Rhabdias ranae* Walton, 1929, a parasite of North American frogs, and *R. americanus* Baker, 1978, a parasite of North American toads. The three species share common features of the head end morphology, namely the presence of two lateral pseudolabia and four submedian lips or “protuberances” (terminology of Baker 1978) surrounding the oval oral aperture. *Rhabdias kongmongthaensis* differs from *R. ranae* in a more elongate body and a relatively shorter tail; the tail comprises 3.7–5.4% of body length in the latter species (Kuzmin et al. 2003). *Rhabdias kongmongthaensis* has a cuticular swelling that reaches the tip of tail. This swelling is absent in *R. ranae*. In *R. americanus*, the nerve ring is situated closer to the anterior end of oesophagus than in *R. kongmongthaensis*. The two species also differ in shape of the tail, which is narrower and more elongate in *R. americanus* (Kuzmin et al. 2003). We also consider important the substantial geographical isolation and different host groups of *R. kongmongthaensis* versus *R. americanus* and *R. ranae*.

Rhabdias kongmongthaensis is geographically close to *R. brachylaimus* (Linstow, 1903), *R. globocephala* Kung et Wu, 1945, *R. nipponica* Yamaguti, 1935 and *R. multiproles* Yuen, 1965, all found in mainland South East Asia. However, lateral pseudolabia or similar structures on the head end have not been described for any of these species. In *R. brachylaimus*, the oral opening is surrounded by “three lips which protrude abruptly at the head end” (Yuen 1965, p. 276); in *R. multiproles*, six poorly developed lips are present (Yuen 1965); no lips were reported in *R. nipponica* (Yamaguti 1935). In *R. globocephala*, the round oral opening is surrounded by six small lips (Kung and Wu 1945, Kuzmin 2005). Additionally, *R. kongmongthaensis* differs from *R. globocephala* by less pronounced swelling of the muscular oesophagus (Kuzmin 2005).

Two species of the genus *Rhabdias* have been described from the rhacophorid frogs from Japan, namely *R. polypedatis* Yamaguti, 1941 and *R. rhacophori* Yamaguti, 1941. It was stated in the first descriptions that lips or pseudolabia were lacking in both of them (Yamaguti 1941). Both *R. polypedatis* and *R. rhacophori* were recently synonymised with *R. nipponica* Yamaguti, 1935 by Goldberg and Bursey (2002). We do not comment on the synonymisation here, however, it is obvious that *R. kongmongthaensis* clearly differs from *R. polypedatis*, *R. rhacophori* and *R. nipponica* in the structure of the head end.

DISCUSSION

Differentiation among species belonging to the genus *Rhabdias* Stiles et Hassall, 1905 is often complicated due to their high morphological uniformity (Chu 1936, Baker 1978). A few species may be easily distinguished from others by the presence of unique and distinct morphological characters, such as the shape of the cuticular swelling on the anterior end, presence of two pseudolabia at the anterior end or reduction of the rectum (Goodey 1924, Lu 1934, Kung and Wu 1945, Baker 1978, Kuzmin 2000, 2003). Morphology of the anterior end of *Rhabdias* species, in some instances, yields some characters appropriate for the species diagnostics. Baker (1978) was the first to propose division of *Rhabdias* species into three groups based on the morphology of their head end: species without lips, species with six lips and species with two lateral pseudolabia. *Rhabdias kongmongthaensis* belongs to the third group, since lateral inflations of the body wall on its head end are very similar to the lateral pseudolabia described by Baker (1978) in *R. americanus* and *R. ranae*.

Although we examined for helminths only four amphibian species (*Polypedates leucomystax* plus one species of ranid frogs and two toad species) from the type locality of *R. kongmongthaensis*, we suggest that the new species is a specific parasite of tree frogs. More and more data, including those obtained using DNA sequences (our unpublished data), provide evidence that the host specificity of most *Rhabdias* is narrower than traditionally suggested. For instance, *R. ranae*, previously thought to have a wide host range and distributed almost all over North America, has been recently demonstrated to represent at least four different species (*R. ranae*, *R. ambystomae*, *R. joaquinensis* and *R. bakeri*) that are either specific to different host groups (salamanders, wood frogs, leopard frogs) or differ in their geographic distribution (Kuzmin et al. 2001, 2003, Tkach et al., in press). We anticipate that the rich amphibian fauna of Thailand and other regions in South East Asia harbours numerous species of Rhabdiasidae that still await their discovery.

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REFERENCES

- BAKER M.R. 1978: Morphology and taxonomy of *Rhabdias* spp. (Nematoda: Rhabdiasidae) from reptiles and amphibians of southern Ontario. *Can. J. Zool.* 56: 2127–2141.
- CHU T. 1936: A review of the status of the reptilian nematodes of the genus *Rhabdias* with a description of *Rhabdias fuscovenosa* var. *catanensis* (Rizzo, 1902) new rank. *J. Parasitol.* 22: 130–139.
- GOLDBERG S.R., BURSEY C.R. 2002: Helminths of 10 species of anurans from Honshu Island, Japan. *Comp. Parasitol.* 69: 162–176.
- GOODEY T. 1924: Two new species of the nematode genus *Rhabdias*. *J. Helminthol.* 2: 203–208.
- KUNG C.C., WU H.W. 1945: Parasitic nematodes of amphibians from Pehpei Szechwan, China. *Sinensia* 16: 73–83.
- KUZMIN Yu.I. 2000: Morphology of parasitic and free-living adults of *Rhabdias rubrovenosa* (Nematoda: Rhabdiasidae). *Vestn. Zool.* 34 (1/2): 109–114.
- KUZMIN Y. 2003: *Rhabdias japalurae* sp. nov. (Nematoda, Rhabdiasidae) from the japalures (Reptilia, Agamidae) and some notes on other *Rhabdias* spp. from lizards. *Acta Parasitol.* 48: 6–11.
- KUZMIN Yu.I. 2005: The description of *Rhabdias globcephala* Kung et Wu, 1945 (Nematoda: Rhabdiasidae) from the new host *Buergeria pollicaris* (Werner, 1914) (Amphibia: Rhacophoridae). *Vestn. Zool.* 39 (4): 9–14.
- KUZMIN Y., TKACH V.V., SNYDER S.D. 2001: *Rhabdias ambystomae* sp. n. (Nematoda: Rhabdiasidae) from the North American spotted salamander *Ambystoma maculatum* (Amphibia: Ambystomatidae). *Comp. Parasitol.* 68: 228–235.
- KUZMIN Y., TKACH V.V., SNYDER S.D. 2003: The nematode genus *Rhabdias* (Nematoda: Rhabdiasidae) from amphibians and reptiles of the Nearctic. *Comp. Parasitol.* 70: 101–114.
- LU S.C. 1934: On *Rhabdias*, a genus of parasitic nematoda of Nanking. *Sinensia* 5: 164–172.
- TKACH V.V., KUZMIN Y., PULIS E.E.: A new species of *Rhabdias* from lungs of the wood frog, *Rana sylvatica*, in North America: the last sibling of *Rhabdias ranae*? *J. Parasitol.* (In press.)
- YAMAGUTI S. 1935: Studies on the helminth fauna of Japan. Pt. 10. Amphibian nematodes. *Jpn. J. Zool.* 6: 393–402.
- YAMAGUTI S. 1941: Studies on the helminth fauna of Japan. Pt. 34. Amphibian nematodes, II. *Jpn. J. Zool.* 9: 397–408.
- YUEN P.H. 1965: Some studies on the taxonomy and development of some rhabdiasoid and cosmocercoid nematodes from Malayan amphibians. *Zool. Anz.* 174: 275–298.

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