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THE DESCRIPTION OF *RHABDIAS GLOBOCEPHALA* (NEMATODA, RHABDIASIDAE) FROM THE NEW HOST *BUERGERIA POLLICARIS* (AMPHIBIA, RHACOPHORIDAE)

Yu. I. Kuzmin

Schmalhausen Institute of Zoology of NAS of Ukraine, vul. B. Khmel'nits'kogo, 15, Kyiv, 01601 Ukraine
E-mail: rhabdias@voliacable.com

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The Description of *Rhabdias globocephala* (Nematoda, Rhabdiasidae) from the New Host *Buergeria pollicaris* (Amphibia, Rhacophoridae). Kuzmin Yu. I. — Parasitic nematode *Rhabdias globocephala* Kung et Wu, 1945 previously known only from the type host, *Microhyla ornata* from China, is described from a new host, *Buergeria pollicaris* (Werner, 1914). Differentiation of the species from closely related *R. sphaerocephala* Goodey, 1924 is amended based on the shape of anterior cuticular swelling, buccal capsule position, and relative length of oesophagus. The differentiation of *R. globocephala* from 4 sympatric species of the genus: *R. bicornis* Lu, 1934, *R. bufonis* (Schrank, 1788), *R. incerta* Wilkie, 1930 and *R. nipponica* Yamaguti, 1935 is also provided.

Key words: *Rhabdias*, *R. globocephala*, *Buergeria pollicaris*, Rhacophoridae, Microhylidae.

Описание *Rhabdias globocephala* (Nematoda, Rhabdiasidae) от нового хозяина — *Buergeria pollicaris* (Amphibia, Rhacophoridae). Кузьмин Ю. И. — Паразитическая нематода *Rhabdias globocephala* Kung et Wu, 1945, ранее известная только от типового хозяина, *Microhyla ornata* из Китая, описывается по коллекционному материалу от нового хозяина — *Buergeria pollicaris* (Werner, 1914). Дополнена дифференциация вида от морфологически близкого *R. sphaerocephala* Goodey, 1924 на основании различий в форме кутикулярного вздутия на переднем конце тела, положению ротовой капсулы и относительной длине пищевода. Также приводятся отличия *R. globocephala* от четырех симпатрических видов рода — *R. bicornis* Lu, 1934, *R. bufonis* (Schrank, 1788), *R. incerta* Wilkie, 1930 и *R. nipponica* Yamaguti, 1935.

Ключевые слова: *Rhabdias*, *R. globocephala*, *Buergeria pollicaris*, Rhacophoridae, Microhylidae.

Introduction

The nematode genus *Rhabdias* Stiles et Hassall, 1905 is a world-wide distributed group of parasitic nematodes. Most species of the genus inhabit the lungs of amphibians. The species *Rhabdias globocephala* Kung et Wu, 1945 was originally described from *Microhyla ornata* (Dumeril et Bibron) (Amphibia: Microhylidae) from China (Kung, Wu, 1945). The first and only description was fairly detailed, though containing some inaccuracies concerning morphology of the nematode. Moreover, metrical characters were given only for 3 specimens measured and only one illustration, the lateral view of the head end, was presented. *R. globocephala* was differentiated from the European species *R. sphaerocephala* Goodey, 1924 on the basis of differences in oesophagus and tail absolute dimensions.

An unidentified *Rhabdias* sp. collected from *Buergeria pollicaris* (Werner) (Rhacophoridae) in China, that is deposited in the collection of the H. W. Manter Laboratory of Parasitology, University of Nebraska State Museum (HWML), appeared to correspond morphologically to *R. globocephala*. The worms from the examined sample possessed characteristic cuticular swelling on anterior end and the dilation of anterior part of oesophagus. Investigation of the material allowed to revise the description of the species and to amend the differential diagnosis. The results of this investigation are presented herein.

Material and methods

Material from HWML, collection N 36 567, was investigated. A sample contained 17 specimens, 15 of which were measured. Material on several related species was used for comparative studies. It included

specimens of *R. sphaerocephala* from *Bufo bufo* (L.) from Eastern Europe, *R. bufonis* (Schrank, 1788) from *Rana arvalis* Nilsson from Eastern Europe, *R. nipponica* Yamaguti, 1935 from *Rana nigromaculata* Hallowell from Ryukyu Archipelago (Japan), *R. incerta* Wilkie, 1930 from *Bufo gargarizans* Cantor from mainland Far East. The material on all above species is deposited in the helminthological collection of the Department of Parasitology, Institute of Zoology of the National Academy of Sciences of Ukraine (Kyiv, Ukraine).

Nematodes preserved in 70% alcohol were clarified in glycerol and studied under the light microscope. In the description of measured characters, mean value is given and followed by limits in parentheses. All measurements are in micrometers unless otherwise indicated.

Results

Description of *R. globocephala* parasitic hermaphrodites from *B. pollicaris* (fig. 1). Body slender, anterior end truncated, posterior end tapered. Body length 4.82 (3.18–6.88) mm, maximum width 175 (125–210). Body cuticle inflated. Cuticle at anterior end forming distinct swelling, abrupt on anterior surface and gradually declining posteriorly (fig. 1, *b*). Oral opening small, round. Circumoral lips small, papillae reduced. Vestibulum funnel-shaped. Buccal capsule cup-like, wide and shallow, 9 (7–10) deep and 14 (12–17) wide. Walls of buccal capsule completely surrounded by anterior end of oesophagus. Oesophagus distinctly divided into three portions: anterior, mostly muscular one, with somewhat dilated posterior half; comparatively narrow middle portion containing ducts of oesophageal glands; and posterior bulb containing large oesophageal gland nuclei. Muscular fibres present along the whole oesophagus, denser in anterior portion and scattered in two posterior ones. Width of oesophagus at anterior end 38 (32–42), width of muscular dilation 46 (40–50), minimum width of middle part 35 (30–40), width of posterior bulb 76 (62–87). Oesophagus length 416 (370–510) or 8.9 (7.4–11.8)% of body length. Nerve ring encircling oesophagus just posterior to its muscular portion, at 148 (125–170) from oesophagus anterior end [35.7 (27.4–40.0)% of oesophagus length]. Excretory pore situated at level of oesophagus midlength. Excretory duct thin and short, almost straight or slightly curved ventrally. Two excretory glands prominent, subventral in position, equal in size, much shorter than oesophagus, their posterior ends situated behind oesophageal-intestinal junction. Two anterior coelomocytes situated ventrally, between oesophagus posterior end and bending part of anterior ovary. Both coelomocytes are usually spherical or ovoid, in some specimens the anterior one is more elongated (fig. 1, *f*). One posterior coelomocyte situated dorsally, behind the level of posterior ovary bending point, between intestine and body walls. Coelomocyte surface rough, contents granulated. Intestine wide. Anterior end of intestine narrower than posterior bulb of oesophagus. Intestinal lumen narrow in anterior part, gradually widening posteriorly. Pre-rectal muscular sphincter obvious. Rectum short, straight, lined with thick cuticle. Genital system amphidelphic, with approximately equal limbs. Vulva (fig. 1, *e*) slit-like, transverse, situated 2.60 (1.86–3.56) mm from anterior end [54.4 (49.6–58.5)% of body length]. Vulva lips reduced. Vagina short, lined with thick cuticle. Uteri joined, tubular, straight, thin-walled. Eggs in uteri arranged in 1 to 3 longitudinal rows, most eggs containing first-stage larvae. Number of eggs 55 (24–95) in a sample studied. Seminal receptacles short, thick-walled. Both limbs of genital system bending contrawards in region of ovaries' distal parts (oocyte growth zones or oviducts). Ovaries almost straight, with proximal ends overlapping level of vulva. Tail conical, tapered, 188 (155–225) long [4.0 (3.0–5.0)% of body length]. Phasmids situated laterally, at about middle of tail length. Post-anal ventral inflation of body wall present in some specimens.

Differentiation. Adult hermaphrodites of *R. globocephala* Kung et Wu, 1945 most closely resemble those of *R. sphaerocephala* Goodey, 1924 in the possession of anterior swelling of cuticle. In the latter species, however, this swelling is spherical in

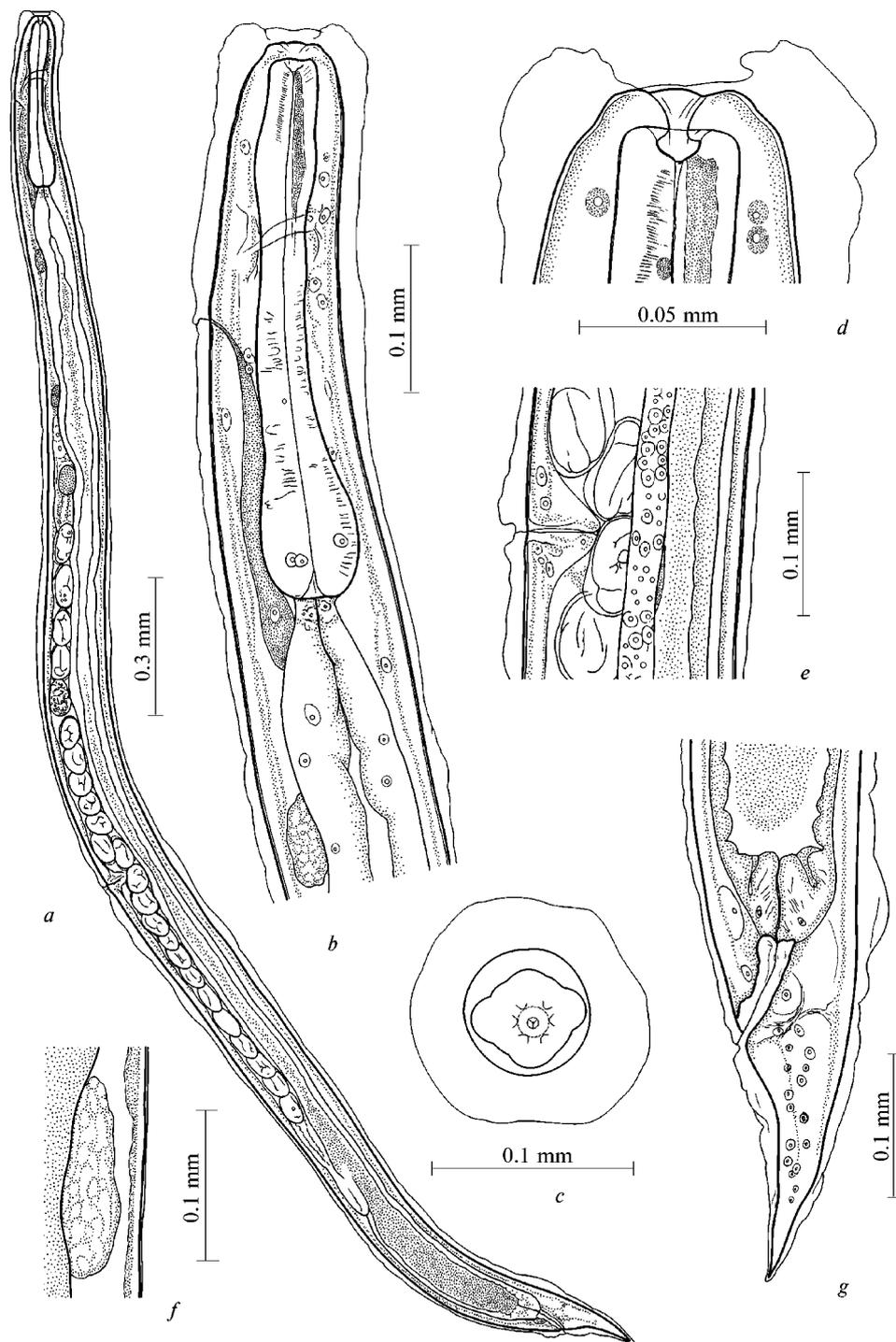


Fig. 1. *Rhabdias globocephala*, parasitic hermaphrodite from *Buergeria pollicaris*: a – general view; b – anterior end, lateral view; c – head end, apical view; d – head end, lateral view; e – region of vulva, lateral view; f – anterior coelomocyte; g – tail, lateral view.

Рис. 1. *Rhabdias globocephala* из *Buergeria pollicaris*: a – общий вид; b – передний конец, латерально; c – головной конец, апикально; d – головной конец, латерально; e – область вульвы, латерально; f – передний целомоцит; g – хвост, латерально.

lateral view and distinctly separated from the remaining body cuticle (Goodey, 1924; Kuzmin, 1997), whereas it gradually declines posteriorly in *R. globocephala*. In *R. globocephala*, the buccal capsule walls are completely surrounded by oesophagus; in *R. sphaerocephala* the anterior part of buccal capsule walls is free from oesophageal tissues. In *R. globocephala*, the anterior end of intestine is much narrower than posterior bulb of oesophagus (fig. 1, b); in *R. sphaerocephala* the anterior part of intestine is wider than oesophageal bulb (Goodey, 1924, fig. 2; Kuzmin, 1997). *R. globocephala* specimens from the material examined were smaller and possessed less numerous eggs than *R. sphaerocephala*. The both species are separated geographically.

Four other species of the genus *Rhabdias* were found in anuran amphibians from mainland East Asia: *R. bicornis*, *R. bufonis*, *R. incerta* and *R. nipponica* (Lu, 1934; Kung, Wu, 1945; Hsu, 1960; Wang et al., 1992). *R. incerta* possesses the characteristic dilation of muscular part of oesophagus, similar to that in *R. globocephala*. The species, however, is much larger than *R. globocephala* and the buccal capsule walls in *R. incerta* are not surrounded by anterior end of oesophagus. *R. globocephala* may be distinguished from both *R. bufonis* and *R. nipponica* by presence of dilation of oesophagus muscular portion, anterior cuticular inflation and by more anterior position of nerve ring in relation to oesophagus anterior end. This distance measured 40.2–50.8% and 30.7–50.0% of oesophagus length in *R. bufonis* and *R. nipponica*, correspondingly. *R. globocephala* differs from *R. bicornis* by presence of six circumoral lips versus two lateral pseudolabia described in the latter species (Lu, 1934).

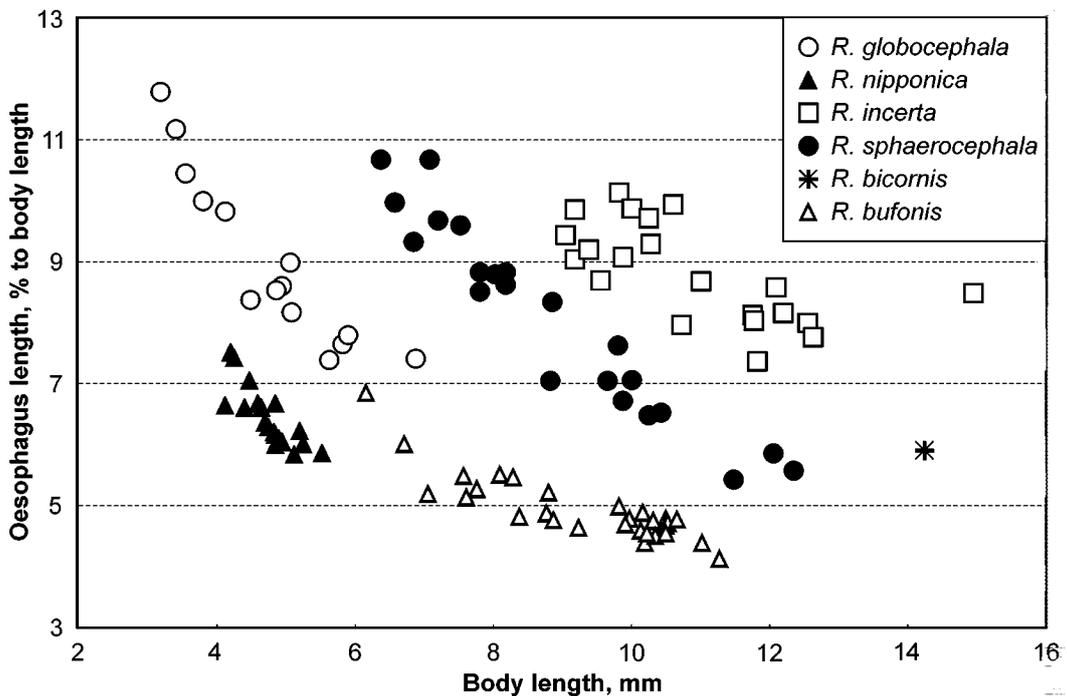


Fig. 2. Relationship of the oesophagus relative length (in% to body length) to total length in *R. globocephala* and sympatric *Rhabdias* species. Data for *R. bicornis* were calculated as mean value from measurements given in original description by Lu (1934).

Рис. 2. Зависимость относительной длины пищевода (в% длины тела) от длины тела у *R. globocephala* и симпатрических видов *Rhabdias*. Данные по *R. bicornis* (среднее значение) даны по оригинальному описанию Lu (1934).

Additional morphometric comparison of the species was performed using the approach proposed by Baker (1978) for sympatric North American *Rhabdias* spp. The scatterplot (fig. 2) shows the relationship between oesophagus relative length (in% of body length) and body length. It is seen from the plot that by this relationship *R. globocephala* is similar to *R. bufonis* and differs from all other species.

Discussion

Species of the genus *Rhabdias* are considered to demonstrate the high degree of host specificity, for about a half out of about 40 nominal *Rhabdias* species were reported each from a single host species. The additional investigation of some species, however, can yield information on new hosts, not always belonging to the same taxon as the type host. *R. globocephala* was originally described from the microhylid frog *Microhyla ornata* and now is found in the material from the rhacophorid frog *Buergeria pollicaris*. Thus, it is not a specific parasite either of the type host, or of microhylid amphibians. On the other hand, no species from the genus *Rhabdias* has been found in hosts belonging to different orders (Kuzmin et al., 2003).

The differentiation of *Rhabdias* spp. is often fairly complicated due to the morphological uniformity of species and absence of males in parasitic generation (Chu, 1936; Baker, 1978). The differentiation of *R. globocephala* in original description was primarily based on the anterior swelling of body cuticle. However, the outer layer of cuticle in *Rhabdias* spp. is quite fragile and can be occasionally damaged in fixed nematodes. Thus, the additional characters are often necessary for adequate species differentiation. Some qualitative characters useful for differentiation can be observed in the shape of oesophagus. The dilation of oesophagus muscular part distinguishes *R. sphaerocephala*, *R. incerta* and *R. globocephala* from other *Rhabdias* spp. found in Eurasian anurans. The measurements of oesophagus width at separate levels of its length are necessary for accurate estimation of the dilation presence.

Morphometric comparison of closely related *Rhabdias* spp. is quite complicated and often senseless because of high individual variability of characters, especially those related to body size (body length and width, size of oesophagus, tail, position of vulva). The relative metric characters could give more information for species differentiation, particularly when they are compared with the total length of worms (Baker, 1978). In general case, the relative length of oesophagus decreases gradually in relation to body length increasing, due to the allometric growth of nematodes (Baker, 1978). The graphical comparison of oesophagus relative length with body length helps to separate some species of the genus even if the limits of absolute and relative length of oesophagus overlap, as it is seen from the plot (fig. 2) for *R. globocephala* and *R. sphaerocephala*.

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