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Review of Rhabdiasidae (Nematoda) from the Holarctic

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Abstract

The review deals with the species of Rhabdiasidae Railliet, 1915 occurring in the Holarctic. Descriptions of 26 species from the genera *Rhabdias* Stiles et Hassal, 1905 (21 species), *Entomelas* Travassos, 1930 (4 species), and *Kurolonema* Szczerbak et Sharpilo, 1969 (1 species) are presented. Additionally, 5 species of *Rhabdias* are listed as *species inquirenda*, and 4 species are included into the review, since they have been reported close to south-eastern border of Palaearctic (the exact distribution is unknown). Keys to the Holarctic species and diagnoses of the genera are provided. An overview of the information on the biology, morphology and taxonomy of Rhabdiasidae is also presented, as well as the host-parasite list of Holarctic Rhabdiasidae.

Key words: *Rhabdias*, *Entomelas*, *Kurilonema*, *Neoentomelas*, Holarctic, Nearctic, Palaearctic, life cycles, taxonomy, amphibians, reptiles

Introduction

Nematodes of the family Rhabdiasidae Railliet, 1915 are mostly lung-dwelling parasites of amphibians and some reptiles. The group is distributed globally, excluding Antarctica. The family includes more than 90 nominal species belonging to 5–7 genera; most species are assigned to the genus *Rhabdias* Stiles et Hassall, 1905.

One of the distinguishing features of rhabdiasids is the alternation of two generations in their life cycles: hermaphroditic generation with adults inhabiting the host, and gonochoristic generation, soil- or faeces-dwelling. For most rhabdiasid species, however, only adult parasitic stage is described, and thus the species diagnoses are based on morphology of adult hermaphrodites.

Generally, Rhabdiasidae are considered to be morphologically monomorphic group. This makes difficult both the differentiation of species and studies on taxonomy, systematics and phylogeny of the family. However, recent studies involving traditional and novel approaches (electron microscopy, molecular methods) allowed description of new species based on the expanded differentiation. More than 40 species of the family have been described during the last decade, mostly in tropical regions of Central and South America, Africa and South–East Asia. On the other hand, a large part of rhabdiasid species is known from Palaearctic and Nearctic regions, apparently due to the better knowledge on helminths of amphibians and reptiles in Europe, North America and Japanese Islands.

Of about 90 of currently recognised rhabdiasid species, 2 have been already mentioned by Dujardin (1845): *Ascaris nigrovenosa* Rudolphi, 1802 (= *Rhabdias bufonis*, first reported by Schrank 1788 as *Ascaris bufonis*) and *Angiostoma entomelas* Dujardin, 1845 (= *Entomelas entomelas*). In the same century, Schneider (1866) described *Leptodera rubrovenosa* (= *R. rubrovenosa*) and Railliet (1899) reported *Angiostoma fuscovenosa* (= *R. fuscovenosa*) as a separate species. Mecznikov (1865) and Leuckart (1865) first discovered the alternation of generations in the life history of *R. bufonis*.

The information on rhabdiasid nematodes was first systematized in the beginning of the XX century. In 1905 the genus *Rhabdias* Stiles et Hassall, 1905 was erected (Stiles et Hassall 1905), and in 1915 the family Rhabdiasidae Railliet, 1915 was proposed (Railliet 1915). Further cataloguing of rhabdiasid nematodes in Europe, as well as description of new species, was presented in the works of Goodey (1924 b), Semenov (1929), Travassos (1930), Hartwich (1975), Sharpilo (1976). As a result, 10 rhabdiasid species from two genera were estimated for the fauna of Western Palaearctic. Almost each of them has become a subject of more or less extensive morphological and biological studies (Mecznikov 1865; Leuckart 1865; Railliet, 1899; Seurat, 1916; Goodey, 1924 a; Moravec, 1974; Spieler and Schierenberg 1995; Kuzmin 1997; Kuzmin and Miskov 1999; Kuzmin 2000 a; Langford and Janovy 2009).

In Eastern Palaearctic, rhabdiasid nematodes were investigated mainly due to the studies of Yamaguti and his scientific school (Yamaguti 1935, 1941, 1943, 1954), and the first rhabdiasid species from Japanese Islands, *R. tokyoensis* Wilkie, 1930, was described by Wilkie (1930). On the mainland part of Eastern Palaearctic the members of the family were described by Lu (1934), Kung and Wu (1945), Sharpilo (1976), Rausch *et al.* (1984). Works of Hasegawa (1984, 1989 a, b) added to the information on Rhabdiasidae from Japanese Isles. By now, little is known about the life cycles and biology of Rhabdiasidae from Eastern Palaearctic. The free-living stages were described only in *R. agkistrodonis* Sharpilo, 1976, one of 11 species known in this region (Kuzmin 1999).

In Nearctic, the first indigenous rhabdiasid species was described in the beginning of the XX century. That was