A NEW SYPHACIA SPECIES (NEMATODA: OXYURIDAE) COLLECTED FROM
BUNOMYS SPP. (RODENTIA: MURIDAE) IN CENTRAL SULAWESI, INDONESIA

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ABSTRACT: Syphacia (Syphacia) rifaii sp. n. (Nematoda: Oxyuridae) is described from endemic Bunomys chrysocomus and Bunomys prolatus (Rodentia: Muridae) on Sulawesi Island, Indonesia. The new species is closest morphologically to Syphacia (Syphacia) sulawesiensis, parasitic in Rattus xanthus from Sulawesi Island, by having large vesicular lateral alae in males, but is readily distinguished by having a smaller body, a round cephalic plate in both sexes, the absence of lateral alae in females, a longer relative distance between excretory pore and vulva, and smaller eggs. Syphacia (S.) rifaii is surmised to be a specific parasite of Bunomys spp. and has evolved from a common ancestor with S. (S.) sulawesiensis on Sulawesi Island.

RESULTS

DESCRIPTION

Syphacia (Syphacia) rifaii n. sp.
(Oxyuroidea: Oxyuridae: Syphaciinae)
(Figs. 1–17)

Diagnosis: Small worm. Cuticle with transverse striations. Cephalic vesicle present (Figs. 1–3, 7–12). Esophagus of typical oxyurid form (Figs. 1, 2, 7–9). Cervical alae absent. Deirids not seen. Cephalic plate round; mouth surrounded by 3 weakly elevated lips, 1 dorsal and 2 ventral; 4 cephalic papillae large, arranged almost squarely; amphidial pores with porous patches laterally (Figs. 3, 12–15, 17). Caudal papillae in 3 pairs, 2 pairs near cloaca and 1 posterior pair protruding posterolaterally (Figs. 5, 6). Distance from cephalic end to anterior edges of anterior, middle, and posterior mamelons developed, anterior mamelon 41–53 (46) long, middle mamelon 40–56 (45) long, and posterior mamelon 27–48 (35) long (Figs. 1, 2). Distance from cephalic end to anterior edges of middle, and posterior mamelons 354–423 (386), 396–500 (438), and 467–607 (526), respectively. Spicule thin, needle-shaped, 61–70 (65) long, i.e., 7.9–11.9% (9.8%) of worm length (WL); gubernaculum stout, hook-shaped, 22–27 (25) long; accessory piece of gubernaculum relatively thin, unornamented (Figs. 1, 5, 6). Caudal papillae in 3 pairs, 2 pairs near cloaca and 1 posterior pair protruding posterolaterally (Figs. 5, 6). Tail including short process 35–60 (44) long, i.e. 5.5–8.1% (6.6%) of WL (Figs. 1, 5).

Female (allotype and 13 paratypes): Length 1.40–2.19 (1.82) mm, maximum width 147–244 (182) (Fig. 7). Distance between amphidial pores 16. Lateral alae absent (Figs. 8–11, 13). Total esophagus, including pharynx, corpus, and bulb, 246–277 (262) long: pharynx 12–16 (15) long, corpus 171–206 (189) long and 30–45 (36) wide, bulb 49–68 (59) long by 58–75 (66) wide. Nerve ring 80–108 (99), excretory pore 322–454 (388) from cephalic end. Vulva not protruding, 449–582 (503), i.e., 22–37% (28%) of WL from cephalic end; vagina and ovejector directed posteriorly (Figs. 7–9). Distance between excretory pore and vulva 95–145 (115), i.e., 4.8–8.4% (6.4%) of WL. Eggs oval, asymmetrical, operculated, concave side with wrinkled shell, embryonated in uteri, 68–70 (69) × 23–29 (27) (Fig. 7). Uterus extending anteriorly to the esophageal bulb and ending posteriorly near anus. Tail conical, relatively short, 181–272 (224), i.e., 8.9–15.0% (12.3%) of WL (Fig. 7).

Taxonomic summary

Type host: Bunomys chrysocomus (Hoffmann, 1887) (Yellow-haired hill rat) (Rodentia: Muridae).

Other host: Bunomys prolatus Musser, 1991 (Long-headed hill rat) (Rodentia: Muridae).

Site of infection: Caecum.

Sulawesi is due east of the famous zoogeographical transition area between the Oriental and Australian regions. This island has a unique mammalian fauna that is not only species rich, but also features a very high level of endemism (Musser, 1987). The Sulawesian murine rodents represent about 30% of the total mammalian species and approximately 52% of all the endemic species (Musser and Durden, 2002). Bunomys is one of the endemic rat genera of Sulawesi, of which 7 species are currently recognized (Suyanto et al., 1998). Although Bunomys spp. have been known to harbor specific helminthellid nematodes (Hasegawa and Mangali, 1996), their helminth fauna is still insufficiently known. Recently, we examined the yellow-haired hill rat Bunomys chrysocomus (Hoffmann, 1887) and the long-headed hill rat Bunomys prolatus Musser, 1991 and found nematodes that represent a new species of Syphacia Seurat, 1916 (Oxyuridae: Syphaciinae). The new species is described herein.

MATERIALS AND METHODS

Bunomys chrysocomus were captured using small cage traps, 28 × 12 × 12 cm, in Donggala, Central Sulawesi. The rats were killed using ether alcohol and then necropsied in the laboratory. The viscera were removed and opened with scissors. Contents of the each portion of the alimentary canal were rinsed separately in physiological saline. Scrapings taken from each portion of the alimentary canal were also examined for nematodes. The worms were then fixed and stored in 70% ethanol. Later, the worms were examined using a compound Olympus BH series microscope (Olympus Company, Tokyo, Japan), equipped with a drawing tube, and a JEOL JSM5310LV scanning electron microscope (SEM) (JEOL Company, Tokyo, Japan). For light microscopy, the specimens were cleared in glycerol-alcohol solution by evaporation. Measurements were made with an ocular micrometer. For SEM, the specimens were fixed in glutaraldehyde, dehydrated through an ethanol series, freeze-dried using a Labconco Model 79480 (Labconco Co., Kansas City, Missouri), and coated with gold at 5–8 mA for 5 min using an ion coater Eiko IB-2 (Eiko Co., Tokyo, Japan). Measurements (range, followed by mean in parentheses) are given in micrometers unless otherwise stated. Pinworms collected from the caecum of a long-headed hill rat, Bunomys prolatus, in Lore Lindu, Central Sulawesi in 2001, by Dr. Ibnu Maryanto, were also examined by light microscopy. Specimens are deposited in the Museum Zoologicum Bogoriense (MZB), Indonesia, and the National Science Museum, Tokyo (NSMT), Japan.

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The new species belongs to Syphacia by having 3 mamelons in males, a non-protruding vulva, and eggs with small operculum at one end (Petter and Quentin, 1976). It is assigned to the subgenus Syphacia according to the round cephalic plate, less-developed lips, and the absence of cervical alae and developed deirids (Hugot, 1988). There are about 30 species in the subgenus, although some species have not been adequately described. Presence of large vesicular lateral alae in males is an exceptional character for the subgenus, being shared only by Syphacia (Syphacia) sulawesiensis Hasegawa and Tarore, 1996, a parasite in Rattus xanthurus (Gray, 1867) in northern Sulawesi, Indonesia (Hasegawa and Tarore, 1996). However, S. (S.) sulawesiensis differs from S. (S.) rifaii by having a much larger body (males 1.65–1.91 mm long; females 3.87–5.14 mm long), laterally-elongated cephalic plate in both sexes, moderately developed lateral alae in females, a shorter distance between excretory pore and vulva (corresponding to 2.3–3.8% of worm length), and larger eggs (77–86 × 24–29 μm) with coarsely pitted shells (Hasegawa and Tarore, 1996).

In addition to the vesicular lateral alae in males, S. (S.) rifaii is easily distinguished from other representatives of the subgenus known from Indo-Australian regions by having a round cephalic plate, i.e., Syphacia (Syphacia) abertoni Weaver and Smales, 2006, Syphacia (Syphacia) brevicaudata Weaver and Smales, 2008, Syphacia (Syphacia) darwini Hugot and Quentin, 1985, Syphacia (Syphacia) longicaudata Smales, 2001, and Syphacia (Syphacia) obvelata (Rudolphi, 1802), Syphacia (Syphacia) ohtoarum Hasegawa, 1991, and Syphacia (Syphacia) pseudomyos Weaver and Smales, 2008 possess a laterally-elongated cephalic plate (Quentin, 1971; Hugot and Quentin, 1985; Hasegawa, 1991; Smales, 2001; Weaver and Smales, 2006, 2008), while Syphacia (Syphacia) australasiensis Smales, 2004, Syphacia (Syphacia) millardi Hugot, 2005, and Syphacia (Syphacia) muris (Yamaguti, 1935) possess a quadrangular cephalic plate (Quentin, 1971; Smales, 2004; Hugot, 2005).

**DISCUSSION**

Syphacia species generally have a co-evolutionary relationship with their hosts, with each Syphacia species often showing specificity with the host genus (see Hugot, 1988). Recovery of S. (S.) rifaii from 2 Bunomys species suggests that this pinworm is host genus-specific. It is of special interest that the new species and S. (S.) sulawesiensis, which was collected from an endemic rat, R. xanthurus, of Sulawesi, share a common characteristic, i.e., the large vesicular lateral alae in males. *Bunomys* spp. and native *Rattus* spp., including *R. xanthurus*, on Sulawesi are considered as new endemics; their relatives are distributed on the Sunda shelf (Musser, 1981, 1987; Musser and Newcomb, 1983). Presumably, both *Syphacia* species are derived from a common ancestor who was introduced by the ancestor of the rat that colonized Sulawesi and subsequently speciated on this island.

Beyond Wallace’s line, *Syphacia* has extended its distribution to Sulawesi and Sahul, where both old endemic and new endemic murids harbor specific species (Hugot and Quentin, 1985; Smales, 2001, 2004; Weaver and Smales, 2006, 2008). Some of the Australian species, such as S. (S.) australasiensis, have a square cephalic plate while others have oval, laterally elongated cephalic plates, suggesting the occurrence of plural lineages. Further helminthological survey on Sulawesi rats, especially on old
endemic rats such as species of *Crunomys*, *Echinothrix*, *Tateomys*, and *Melanoconus* may reveal more specific *Syphacia* spp. Hopefully, the employment of DNA sequence analysis will reveal evolutionary relationships among the *Syphacia* species from Indonesia to Australia (cf. Okamoto et al., 2007).

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**LITERATURE CITED**


