

First record of *Porrocaecum semiteres* (Zeder, 1800) Baylis, 1920 (Nematoda: Ascaridoidea) from a Superb Starling, *Lamprotornis superbus* Ruppell, 1845 with an overview of the genus *Porrocaecum* recorded from Japanese birds

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Abstract. A young male superb starling, *Lamprotornis superbus* Ruppell, 1845 died suddenly in December 9, 2009 in Saitama Children's Zoo, Saitama Prefecture, Japan. A total of 12 nematode specimens observed in the post mortem were identified as *Porrocaecum semiteres* (Zeder, 1800) Baylis, 1920 by their measurements and morphological characters. This is the second record for *P. semiteres* from Japan. And *L. superbus* is reported as the first host record for *P. semiteres*. Considering that *P. semiteres* requires earthworms as an intermediate host in its life cycle, it is likely that the starling was infected with the nematode by ingestion of earthworms in the cage.

Key words: first host record, intermediate host, *Porrocaecum semiteres*, superb starling

Introduction

The ascaridid nematodes of the genus *Porrocaecum* Railliet and Henry, 1915 have been known from avian hosts belonging to the orders Falconiformes, Strigiformes, Ciconiiformes, Charadriiformes and Passeriformes, and about 40 species have ever been recorded in this genus from all over the world (Barus *et al.*, 1978; Hartwich, 1959; Mozgovoï 1953). There were 6 species of the genus have ever been reported from wild and captive birds in Japan (Asakawa *et al.*, 1991; Kamegai *et al.*, 1957, 1959; Mizuno, 1984;

Nakamura *et al.*, 2003; Teraguchi *et al.*, 2006, 2007; Uchida *et al.*, 1991, 2005; Yamaguti, 1935, 1941; Yoshino *et al.*, 2005, 2009a, 2009b), but there were few reports of the genus from birds belonging to the order Passeriformes in Japan.

Materials and Methods

A young male superb starling, *Lamprotornis superbus* Ruppell, 1845, died suddenly in December 9, 2009 in a captive facility, Saitama Children's Zoo, Saitama Prefecture, Japan. In the post mortem performed at the zoo, nematode specimens were recovered, and were taken to the Wild Animal Medical Center (WAMC) of Rakuno Gakuen University,

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Hokkaido, Japan for the taxonomical examination. Nematode specimens were fixed in 70% ethanol, and cleared in lacto-phenol solution for microscopic observation. Morphological and biometric data were recorded using a camera lucida (OLYMPUS Model BH-2DA). All nematode specimens are preserved in the WAMC and the Meguro Parasitological Museum, Tokyo, Japan, respectively.

Results

A total of 12 nematode individuals obtained from the gizzard and intestine of the starling and identified as *Porrocaecum semiteres* (Zeder, 1800) Baylis, 1920 by the morphological characters according to the criteria of Chabaud (1974), Mozgovoi (1953) and Hartwich (1959). Measurements of the present

specimens were match to the previously reported *P. semiteres* (Barus *et al.*, 1978; Hartwich, 1959). All nematode individuals have following characters; mouth with three lips and interlabia, labial pulp divided anteriorly by a narrow medial incision into two lobes, median lobe extends beyond margin of main pulp, denticles on inner side near upper margin do not reach the level of mediodorsal papillae, interlabia reach 2/3 of lip length, cervical alae present, intestinal cecum as long as ventriculus or may be longer or shorter, ventriculus cylindrical, spicules equal or subequal and gubernaculum absent. Male has 13-15 pairs of precloacal papillae and six pairs of postcloacal papillae. Their morphological characters and measurements were given, but the present female specimens were not having eggs (Fig. 1, Table 1.).

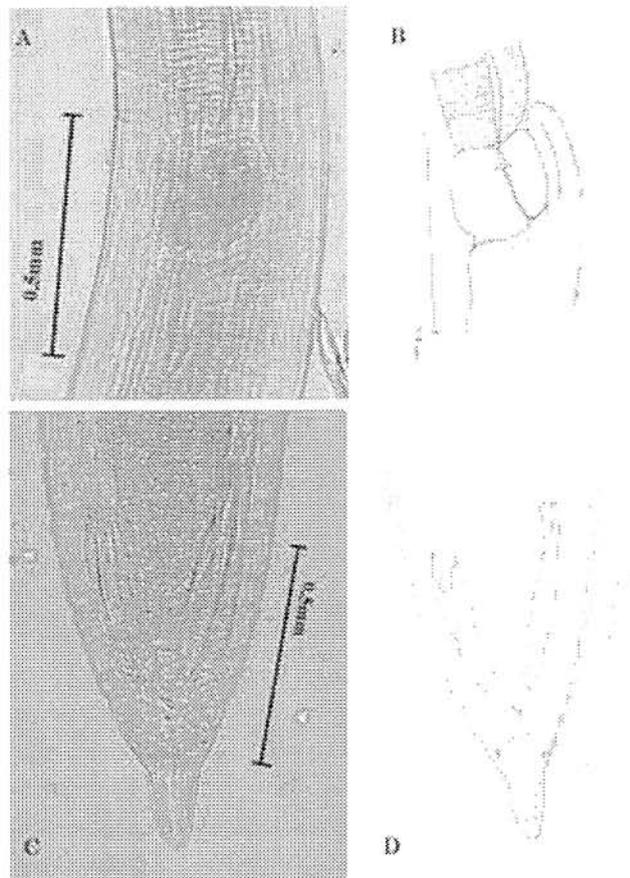


Fig. 1. *Porrocaecum semiteres* obtained from the superb starling
Ventriculus and intestinal cecum (A, B), caudal extremity and spicules of male (C, D)

Table 1. Measurements of *Porrocaecum semiteres* (mm)

	Male (n=6)	Female (immature) (n=4)
Body length	21.40 - 28.61 (25.26)*	30.08 - 38.03 (35.29)
Body width	0.54 - 0.76 (0.68)	0.73 - 0.91 (0.84)
Length of esophagus	1.61 - 1.93 (1.78)	1.76 - 2.09 (1.93)
Length of ventriculus	0.23 - 0.36 (0.27)	0.27 - 0.35 (0.30)
Length of intestinal cecum	0.31 - 0.38 (0.35)	0.38 - 0.49 (0.43)
Spicules	0.52 - 0.64 (0.57)	-
Vulva situated from anterior end	-	12.31 - 15.43 (14.55)
Cloaca from tail end	0.22 - 0.26 (0.24)	-
Anus from tail end	-	0.47 - 0.66 (0.60)

* average

Discussion

P. semiteres have previously been reported from Charadriiformes (mainly Laridae and Stercorariidae) and Passeriformes (Sturnidae and Corvidae) birds living in Europe, Asia and Canada region (Barus *et al.*, 1978; Hartwich, 1959; Mozgovi, 1953). There were several species belonging to the genus *Porrocaecum* recorded from wild birds in Japan: *P. angusticolle* (Molin, 1860) Baylis & Daubney, 1920 from *Milvus migrans* (Boddaert, 1783), *Circus spilonotus* Kaup, 1847, *Spilornis cheela perplexus* Swann, 1922, *Egretta intermedia* (Wagler, 1829), *E. garzetta* (Linnaeus, 1766) and *Butorides striatus* (Linnaeus, 1758); *P. crassum* (Deslongchamps, 1824) Railliet & Henry, 1909 from *Otus scops japonicus* Temminck & Schlegel, 1844; *P. ensicaudatum* (Zeder, 1800) Baylis, 1920 from *Zoothera dauma* (Latham, 1790); *P. phalacrocaracis* Yamaguti, 1941 from *Phalacrocorax capillatus* (Temminck & Schlegel, 1850); *P. reticulatum* (Linstow, 1899) Baylis & Daubney, 1922 from *Ardea cinerea* Linnaeus, 1758, *E. intermedia*, *Nycticorax nycticorax* (Linnaeus, 1758) and *Gorsakius goisagi* (Temminck, 1835); *P. semiteres* from *Scolopax rusticola* Linnaeus, 1758; *P. spirale* (Rudolphi, 1795) Baylis, 1920 from *Strix uralensis* Pallas, 1771; *P. wui* Hsu, 1933 from *Corvus corone* Linnaeus, 1758; *Porrocaecum* sp.

from *Accipiter gentilis* (Linnaeus, 1758), *A. nisus* (Linnaeus, 1758), *Buteo lagopus*, (Pontoppidan, 1768), *Spizaetus nipalensis* (Hodgson, 1836) and *E. intermedia* (Asakawa *et al.*, 1991; Kamegai *et al.*, 1957, 1959; Mizuno, 1984; Nakamura *et al.*, 2003; Teraguchi *et al.*, 2006, 2007; Uchida *et al.*, 1991, 2005; Yamaguti, 1935, 1941; Yoshino *et al.*, 2005, 2009a, b). The present case is the second record of *P. semiteres* from Japan.

From *L. superbus*, this study reports a nematode belonging to the genus *Porrocaecum* for the first time. In other words, this is the first host record for *P. semiteres*. Except for *P. semiteres*, two helminths, namely, one nematode (*Geopetitia aspiculata* Webster, 1971) and one cestode (*Choanotaenia abassinae* Joyeux, Baer and Martin, 1936), have previously been reported from wild and captive *L. superbus* (French *et al.*, 1994; Joyeux *et al.*, 1936).

The superb starling originally distributed in Middle part of Africa (Ethiopia, Kenya, Somalia, Sudan, Tanzania and Uganda) and they feed various invertebrates and plants on ground (Zimmerman *et al.*, 1999). It is known that the genus *Porrocaecum* use earthworms as intermediate host (*Lumbricus rubellus* Hoffmeister, 1843 and *Eisenia foetida* (Savigny, 1826) reported as intermediate host of *P. semiteres* in Europe) (Anderson, 2000; Barus *et al.*, 1978). Thus, the present case might be the result of the

ingestion of intermediate host (maybe earthworms) having the infective larvae of the nematode in their cage. The pathogenicity of *P. semiteres* was not well known, but in the present case, some of the nematodes parasitized under gastric mucosa and the other blocked intestine. These observations should attract attention to the possibility that the nematode *P. semiteres* causes epizootic infections among intermediate hosts (earthworms) and severe pathogenicity in final hosts, especially in zoos.

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Literature Cited

- Anderson, R. C., 2000. *Nematode parasites of vertebrates. Their development and transmission 2nd Ed.* 650pp. CABI Publishing, Wallingford, Oxon, UK.
- Asakawa, M., Okada, H., Tsubura, Y. & Kurosawa, T., 1991. Parasitic helminths from a Japanese Scops Owl, *Otus scops japonicus*. *Wildl. Rep.*, **13**: 8-14 (in Japanese with English summary).
- Barus, V., Sergejeva, T. P., Sonin, M. D. & Ryzhikov, K. M., 1978. *Helminths of fish eating birds of the palaearctic region. I. Nematoda*. Publishing House of the Czechoslovak Academy of Sciences, Prague.
- Chabaud, A. G., 1974. *Keys to the genera of the order Ascaridida. CIH Keys to the Nematode Parasites of Vertebrates. No.2.*, 116pp., CAB, Furham, UK.
- French, R. A., Todo, K. S., Meehan, T. P. & Zachary, J. F., 1994. Parasitology and pathogenesis of *Geopetitia aspiculata* (Nematoda: Spirurida) in zebra finches (*Taeniopygia guttata*): experimental infection and new host records. *J. Zoo Wildl. Med.*, **25**: 403-422.
- Hartwich, G., 1959. Revision der vigelparasitischen nematoden mitteleuropas. I. Die gattung *Porrocaecum* Railliet et Henry, 1912 (Ascaridoidea). *Mit. Zool. Mus. Berlin*, **40**: 107-147.
- Joyeux, C. E., Baer, J. G. & Martin, R. 1936. Sur quelques cestodes de la Somalie-Nord. *Bull. Soc. Pathol. Exotique*, **29**: 82-96.
- Kamegai, S., Nonobe, H. & Suzuki, T., 1957. On the parasites of wild animals and birds in Kanto area. *Jpn. J. Parasitol.*, **6**: 318 (in Japanese).
- Kamegai, S., Nonobe, H., Suzuki, T. & Machida, M., 1959. On the parasites of wild animals and birds in Kanto area (2). *Jpn. J. Parasitol.*, **8**: 98 (in Japanese).
- Mizuno, F., 1984. Studies on the parasite fauna of the Eastern Carrion Crow, *Corvus corone orientalis* Eversman, and the Japanese Jungle Crow, *Corvus macrorhynchos japonensis* Bonaparte. *Jpn. J. Vet. Res.*, **32**: 105.
- Mozgovoi, A. A., 1953. [*Ascaridata of animals and man and the disease caused by them. Essentials of Nematodology Vol. 2 (part 2).*] Nauka, Moscow (in Russian).
- Nakamura, S., Yoshino, T., Chiba, A., Sato, J. & Asakawa, M., 2003. The parasitic helminths from avian species in Niigata Pref., Japan. *Jpn. J. Ornithol.*, **52**: 116-118 (in Japanese with English summary).
- Teraguchi, T., Yokohata, Y., Tsubota, T., Itani, M., Sudo, A. & Yada, S., 2006. Parasitic nematodes obtained from three species of wild birds in Chubu District, Japan. Proc. Int. Symp. 12th Ann. Meet. Jpn. Soc. Zoo Wildl. Med. & 21th Cent. COE Progr. Gifu Univ., September 2006. pp. 171. Gifu Univ., Gifu.
- Teraguchi, T., Yokohata, Y. & Yada, S., 2007. Seven species of parasitic helminthes obtained from four species of wild birds in Ishikawa Prefecture. Proc. 13th Ann. Meet. Jpn. Soc. Zoo Wildl. Med., September 2007. pp. 86. Iwate Univ., Iwate (in Japanese).
- Uchida, A., Uchida, K., Itagaki, H. & Kamegai, S., 1991. Check list of helminth parasites of Japanese birds. *Jpn. J. Parasitol.*, **40**: 7-85.

- Uchida, A., Uchida, K., Kawakami, Y., Nagatomo, M., Shen, M. H. & Ooi, H. K., 2005. A helminthological survey of parasites in the waterfowl of Kanagawa Prefecture, Japan. *Jpn. Vet. Med. Assoc.*, **58**: 127-131 (in Japanese with English summary).
- Yamaguti, S., 1935. Studies on helminth fauna of Japan. Part 12. Avian nematodes I. *Jpn. J. Zool.*, **6**: 403-434.
- Yamaguti, S., 1941. Studies on helminth fauna of Japan. Part 36. Avian nematodes II. *Jpn. J. Zool.*, **9**: 441-480.
- Yoshino, T., Shingaki, T., Yanai, T., Fukushi, H., Kinjo, T., Saito, K., Watanabe, Y., Kurosawa, N., Osa, Y. & Asakawa, M., 2005. External and internal parasites obtained from some endangered raptor species in Japan. Proc. 11th Ann. Meet. Jpn. Soc. Zoo Wildl. Med., September 2005. pp.89. Obihiro Univ., Obihiro (in Japanese).
- Yoshino, T., Nakamura, S., Endoh, D., Onuma, M., Osa, Y., Teraoka, H., Kuwana, T. & Asakawa, M., 2009a. A helminthological survey of four families of waterfowl (Ardeidae, Rallidae, Scolopacidae, Phalaropodidae) from Hokkaido, Japan. *J. Yamashina Inst. Ornithol.*, **41**: 42-54.
- Yoshino, T., Shingaki, T., Onuma, M., Kinjo, T., Yanai, T., Fukushi, H., Kuwana, T. & Asakawa, M., 2009b. Parasitic helminths and arthropods of the Crested Serpent Eagle *Spilornis cheela perplexus* Swann, 1922 from the Yaeyama. *J. Yamashina Inst. Ornithol.*, **41**: 55-60.
- Zimmerman, D. A., Turner, D. A. & Pearson, D. J., 1999. *Birds of Kenya and Northern Tanzania, Field Guide Edition*. 576pp. Princeton University Press, Princeton.

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