

## On the Parasites of Fishes from the Antarctic Ocean

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南氷洋産魚類の寄生虫について

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**要旨:** 1971年南極大陸昭和基地沿岸で採集したショウワギス, ウロコギス, ライギョダマシ, ボウズハゲギス, キバゴチの内部寄生虫について調査した結果, 線虫類2種 (*Contracaecum* sp. 幼虫, *Ascarophis nototheniae*), 鉤頭虫1種 (*Echinorhynchus* sp.), 吸虫類2種 (属種共に不明), 条虫幼虫 (plerocercoid) 1種, Copepoda 1種を見出した. ボウズハゲギスからの *Ascarophis nototheniae* の報告は始めてであり (new host record), *Echinorhynchus* は吻における鉤の数と配列から新種と考えられた.

吸虫類, 条虫類, Copepoda は固定が悪かったこと並びに幼虫形態であることから属種の同定は出来なかった.

**Abstract:** In the survey on the parasites of the most common marine fishes from Antarctic Ocean, the authors observed on a new species; two species of Nematoda (larvae of *Contracaecum* sp. and *Ascarophis nototheniae*), two species of Trematoda (A and B), one species of Cestoda (plerocercoid), one species of Acanthocephala (*Echinorhynchus* sp.) and one species of Copepoda. *Trematomus borchgrevinki* is new host of *A. nototheniae*.

In October and November 1971, a member (WATANUKI) of the 12th Japanese Antarctic Research Expedition caught the most common marine fishes, *Trematomus bernacchii* BOULENGER, *T. borchgrevinki* (BOULENGER), *T. hansonii* BOULENGER, *T. sp.* and *Gymnodraco acuticeps* BOULENGER, near the coast of Syowa Station, and forwarded them to KAGEI for investigation of parasites. Helmenths collected from the fishes of the Antarctic Ocean were described by RAILLIET and HENRY (1907), LEIPER and ATKINSON (1914, 1915), JOHNSTON (1937 a, b), JOHNSTON and BEST (1937), JOHNSTON and MAWSON (1945), BYRD (1963), HOLLOWAY (1965) and HOLLOWAY *et al.* (1967),

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Table 1. Survey of parasites in the Antarctic fishes.

Name of fishes	No. exam. fishes	No. positive	Body weight (g)	Total number of worms										
				<i>Contra- caecum</i> sp.	<i>Ascarophis nototheniae</i> M.#F.#T.#			Trema- toda A. B.		Cestoda (Plero- cercoid)	<i>Echinor- hynchus</i> sp. M.#F.#T.#			Cope- poda
<i>Trematomus bernacchii</i> (Syowa-gisu*)	26	12 (46.2)	20-194	23**	2	11	13	1	2	3	3	5	8	6
<i>Trematomus hansonii</i> (Uroko-gisu*)	1	1 (100.0)	40.5	8**						11				
<i>Trematomus</i> sp. (Raigyo- damashi*)	2	0	23-32											
<i>Trematomus borchgrevinkii</i> (Bozu-hage- gisu)	2	2 (100.0)	46-73	28**		1**				2				
<i>Gymnodraco acuticeps</i> (Kiba-gochi*)	1	1 (100.0)	75	76**										

\* : Japanese name; \*\* : larval form; #: M.=Male, F.=Female, T.=Total.

but the present authors have observed a few new species.

The fishes were kept in formalin, and the parasites were collected from their body cavity and digestive organs.

The results of examination are shown in Table 1.

Measurements of the worms given below are based on glycerin-alcohol or gum-chloral toto mounts, the material having been fixed in 10% formalin.

### *Contra-caecum* sp. (Larval Form)

**Diagnosis:** Anisakinae. Small, thick, unshathed and encysted or unencysted larval forms, tapering at both ends, with smooth cuticula; 1.50~19.80 mm in length and 0.07~0.75 mm in width at midpoint. Anterior end with a boring tooth (arrow in Photograph 1) in small worms, and rudimentary three lips in large worms. The interlabia not distinct. Excretory pore opens between the base of subventral lips. Excretory system with a larger and elongate nuclei is trapezoid in form extending to the middle of the body. Nerve ring 0.13~0.51 mm from anterior end; base of anterior muscular portion of esophagus 0.226~1.24 mm from anterior end; length of ventriculus 0.02~0.12 mm. The ventricular appendix (0.149~1.03 mm. VA. in Photograph 2) is longer (1:4.8) than the intestinal caecum (0.033~0.730 mm) in the early stage larvae, but in the older example the intestinal caecum (IC. in Photograph 2) increases

progressively in length (VA: IC=1: 1.1). The anus terminal, the simple conical tail, 0.07~0.31 mm long (Photograph 3). The genital anlagen are not recognizable.

**Host:** *Trematomus bernacchii*, *T. hansonii*, *T. borchgrevinki* and *Gymnodraco acuticeps*.

**Location:** In the outer wall of the intestines, in the intestines, in the mesentery and in the body cavity.

**Locality:** Near the coast of Syowa Station, Antarctic Ocean.

**Discussion:** Infection by the worms was heavier in *Gymnodraco acuticeps* than in *Trematomus bernacchii*, *T. hansonii* and *T. borchgrevinki*. In two groups of *T. bernacchii* examined (20~50 g and 51 g over in total weight), the infection rate was smaller in the younger group (14.2% of 7 checked fishes); the prevalence of infection was higher in the fully grown fishes (33.3% of 18 checked fishes). This may be due to the fact that young fishes have less opportunities to get infected because of their varying feeding pattern.

Among reports on *Contracaecum* larvae from Antarctic fishes (RAILLIET and HENRY, 1907; LEIPER and ATKINSON, 1915; JOHNSTON, 1937 b; JOHNSTON and MAWSON, 1945), there is one by JOHNSTON and MAWSON (1945) who examined the majority of antarctic and subantarctic fishes and recognized five types in the larvae of *Contracaecum*. However, types I~III are believed to represent successive stages of development of one species of *Contracaecum*, because there are no specific differences between these stages. Types IV and V are regarded as merely older forms of stages I~III.

LEIPER and ATKINSON (1915) stated that worms which appeared to be the larvae of *C. osculatum*, were found encysted in the mesentery and under the peritoneal coat of the pyloric processes, as well as in the liver, of *T. bernacchii* from the Ross Sea area.

The larval nematodes examined by the present authors resemble *C. osculatum* which is a parasite in the stomach of seals.

### *Ascarophis nototheniae* JOHNSTON and MAWSON, 1945

**Diagnosis:** Spiruridae, Ascarophidinae. Small filiform worms. Males smaller than females. Anterior end slightly rounded. Lateral margins of dorso-ventrally elongate mouth surrounded by two lobed lips, each containing a spine (JOHNSTON and MAWSON, 1945, designated it as "teeth". Arrow in Photograph 4). Buccal capsule tubular (Photograph 5), thick walled and lined with cuticula; dorsoventrally widened toward mouth but laterally compressed. Esophagus long, divided into a short muscular and a longer glandular posterior portion. Nerve ring situated in region of anterior esophagus. The excretory pore at a little behind the nerve ring. Cuticle transversely striated

except at extreme tips of worm (Photographs 4 to 9).

**Male:** Body 8.35 mm long; 0.10 mm wide at midpoint. Base of anterior muscular portion (M. in Photograph 5) of esophagus, 0.17 mm from anterior end; base of posterior glandular portion (G. in Photograph 6) of esophagus, 3.38 mm from anterior end. Nerve ring (NR. in Photograph 5), 0.22 mm from anterior end. Tail (Photograph 7) bluntly rounded at tip, 97.3  $\mu$  long. Caudal end of male curled ventrally forming one to three turns. Caudal alae narrow. Four pairs of preanal papillae arranged in two sets of sublateral pairs, and five pairs of postanal papillae arranged in single sublateral pairs, more or less equidistant from each other. All papillae pedunculate, except the most posterior pair which is considerably smaller than others and close to end of body. Spicules quite unequal in length (1 : 8.1) and dissimilar in forms (Photograph 7); large spicule, elongated and curved hook-like, measuring 427.5  $\mu$  long, and bearing prominent groove; small spicule, slightly curved, distal end blunt, measuring 53.0  $\mu$  long; gubernaculum absent.

**Female:** Body 12.74~15.54 mm long; 0.09~0.13 mm wide in region of vulva. Base of anterior muscular portion of esophagus, 0.12~0.21 mm from anterior end; base of posterior glandular portion of esophagus, 4.06~4.81 mm from anterior end. Nerve ring 0.18~0.26 mm from anterior end, placed slightly obliquely; excretory pore (arrow in Photograph 5), 0.23~0.35 mm from anterior end. Anus 0.06~0.11 mm from posterior extremity; tail (Photograph 9) short, bluntly rounded at tip terminating in a small conical projection. Vulva (Photograph 8), 8.29~9.14 mm (58.4~65.1%) from anterior end of body, has two slightly prominent lips. Eggs averaging 47.4 (46.4~49.3)  $\mu$  long by 29.2 (28.8~31.3)  $\mu$  with thick transparent shell which is 3.3 (2.7~3.7)  $\mu$  in thickness, embryonic when laid; two polar caps, each with two conspicuous filaments (350  $\mu$  long, Photograph 11), present on embryonated eggs from region of vulva, but without the filaments in the early-stage eggs (Photograph 10).

**Host:** *T. bernacchii* and *T. borchgrevinki*.

**Location:** In the stomach.

**Locality:** Near the coast of Syowa Station, Antarctic Ocean.

**Discussion:** The authors have assigned the species to the genus *Ascarophis* BOULENGER, 1871, on account of the characters of the anterior end. By YAMAGUTI's description (1961) a generic diagnosis of genus *Ascarophis* is the eggs with two polar plugs (caps), each plug having two long and conspicuous filaments.

Although many species of genus *Ascarophis* have been recognized in the fishes from the antarctic and subantarctic regions by JOHNSTON and MAWSON (1943, 1945),

HOLLOWAY *et al.* (1967) reported that other species except *A. nototheniae* were inadequately known and were synonymized by re-examining the previously reported *Ascarophis* species from these regions.

The structural characteristics of the present specimens are closely related to those of *A. nototheniae*.

This species is readily distinguished from *A. australis* and *A. upenerichthys* previously described from subantarctic waters, in the lengths of the spicules, the position of the vulva, the size of egg and the number of postanal papillae.

Although JOHNSTON and MAWSON (1945) found that *A. nototheniae* occurs very widely in the stomach of 26 species of antarctic and subantarctic fishes, HOLLOWAY *et al.* (1967) reported that the rate of infection in *T. bernacchii* was slight as in the present examination (infection rate 26.9%; 1.9 worms per animal). *A. nototheniae* infection was negative in *T. hansonii* and positive in *T. borchgrevinkii* (new host record).

### *Echinorhynchus* sp.

**Diagnosis:** Echinorhynchidae; Acanthocephala.

**Male:** 5.02~5.22 mm long and 0.90 mm wide when compressed (Photograph 12). All specimens have completely retracted proboscis. The trunk has no spine. The proboscis receptacle is double-walled. The two retractors arising from the posterior end of the proboscis receptacle are attached to the body wall at the level of the anterior testis. The lemnisci, short, reaching about one-third the length of the proboscis receptacle. The oval to elliptical testes overlap each other, one is 0.60~0.78×0.32~0.48 mm and the other is 0.44~0.68×0.26~0.48 mm, for about one-fourth the length, situated constantly in the middle part of the trunk, and in contact with the proboscis receptacle anteriorly and the cement glands posteriorly. The six ovoid cement glands, 0.28~0.42 mm long and 0.25~0.37 mm wide, are slightly overlapping each other. The genital pore is terminal.

**Female:** 6.06~6.61 mm long, 1.04~1.18 mm wide when compressed (Photograph 13). All specimens are strongly curved. The cylindrical proboscis (Photograph 14), 1.00×0.30 mm, has 18 longitudinal rows of about 15 very long sharp hooks (length 28.4  $\mu$  at the base line; 49.6 (48.4~51.3)  $\mu$  at the 3rd line; 58.5 (57.3~59.4)  $\mu$  in the middle part. Photographs 14 and 15). There is a very short neck. The proboscis receptacle is 1.12~1.32×0.26~0.34 mm. The genital pore opens terminally. The female contained eggs of peculiar form. The delicate outer egg shell is 103.5 (96.3~114.5)  $\mu$ ×23.3 (21.1~25.5)  $\mu$ , the middle with conspicuous polar propagations and

the elliptical inner embryo (Photograph 16).

Further details of the anatomy of the parasite were obscured by the mass of eggs.

**Host:** *T. bernacchii*.

**Location:** In the intestines.

**Locality:** Near the coast of Syowa Station, Antarctic Ocean.

**Discussion:** From the morphological arrangement of the cement glands, testes etc., it is certain that this worm belongs to genus *Echinorhynchus*. Although intestinal Acanthocephala of the genus *Echinorhynchus* have been recognized in *T. bernacchii* by LEIPER and ATKINSON (1914; *E. campbelli*, *E. rennicki* and *E. debenhami*) and by HOLLOWAY (1965; *Echinorhynchus* sp.), the present specimens differ from those species in the body size and the number and arrangement of proboscis-hooks.

The present specimens resemble *E. zanclorhynchi* which was found in the fish from Macquarie Island and reported by JOHNSTON and BEST (1937), but they differ from this species in the number and arrangement of proboscis-hooks.

### Other Parasites

Other parasites (3 Trematoda, 16 plerocercoids of Cestoda and 6 Copepoda) were also observed as shown in Table 1, but they were not specifically identified because of their poor state of fixation or being in the larval stage. LEIPER and ATKINSON (1915) and JOHNSTON (1937) referred to the presence of plerocercoids under the mucosa of pyloric processes of such fishes as *T. bernacchii*, *T. hansonii* and *Notothenia corriceps*. BYRD (1963) described Trematodes from the Antarctic fishes.

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