

First Record of *Cosmocephalus obvelatus* (Acuariidae) in Common Gulls (*Larus canus*) from Gangneung, Korea

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Abstract: A nematode species belonging to the genus *Cosmocephalus* was collected from the stomach of 2 common gulls, *Larus canus*. The common gulls were found dead on the seaside of Gangneung City, the Republic of Korea. The worms were identified and classified by light (LM) and scanning electron microscopy (SEM) on the basis of important taxonomic characters. The nematodes were characterized by a body length 9.1-9.3 mm (males) and 15.5-15.9 mm (females) and cordons recurrent in anterior direction and anastomosing laterally at about the level of anterior quarter of the buccal cavity. The salient bicuspid deirids were located on the posterior to the cordons. Lateral alae were well-developed, extending from the level just posterior of deirids to the level about middle of the body. LM and SEM observations identified the worms as *C. obvelatus*. This is the first reported case of *C. obvelatus* infection in common gulls in Korea.

Key words: *Cosmocephalus obvelatus*, gull, morphology

INTRODUCTION

The gulls have a worldwide cosmopolitan distribution. They breed on every continent, including the margins of Antarctica, and are found in the high Arctic as well. One of the smallest of the "white-headed" gulls, the Mew Gull is common along Pacific Coast beaches in winter, it also occurs in Eurasia, where it is known as the "common gull". The common gull (*Larus canus*) has a wide distribution, breeding throughout temperate and sub-Arctic parts of Eurasia [1]. It is classified as Least Concern (LC) on the IUCN Red List. The common gull is not threatened at present. This species is one of the most abundant marine birds on the Korean East Coast [2].

The classification of Acuariidae depends largely on the pattern of the cordons on the surface of the anterior end of the body [3,4]. Acuariidae is a family of spirurian nematodes. Like all nematodes, Acuariidae have neither a circulatory nor a respiratory system. They include about 40 genera and 300 species, most of which are parasites of birds. The cuticle of the an-

terior part of the body is with 'cordons'-cuticular ridges or grooves- or epaulette-like thickenings. Both sides of the body, cordons may be recurrent to the bottom or may not be. It is to use the cordon when one approaches to the identification of species.

The genus *Cosmocephalus* Molin, 1858 is parasitic in the esophagus or stomach of aquatic birds and uses fish as the intermediate host. The adult worms have circular cord-like thickening known as "cordon", which extends posteriorly from the mouth [5]. Although 13 species of *Cosmocephalus* have been reported, only 7 were considered valid [6]. The nematode *Cosmocephalus obvelatus* Creplin, 1925 has been reported from several species of gulls and other birds. *C. obvelatus* had been reported from all continents except Antarctica in a variety of families of fish-eating birds [7,8]. This nematode has been found in Canada, Brazil, Spain, and New Zealand in species of *Larus* and also in other birds [9,10]. Although a large number of parasitological studies have been carried out in many countries, no reference has yet been made for this helminth in Korea. The aim of the present study is to describe the genus *Cosmocephalus* that was never reported in Korea.

CASE DESCRIPTION

In July 2011, we collected 2 common gulls from the east

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Table 1. Comparisons of the metrical data (in micrometres) of *Cosmocephalus obvelatus* from various hosts and localities

Source	Anderson & Wong [2]	Azuma et al.[3]	Mutafchiev et al. [9]	Present study
Species	<i>C. obvelatus</i>	<i>C. obvelatus</i>	<i>C. obvelatus</i>	<i>C. obvelatus</i>
Host	<i>Larus delawarensis</i>	<i>Eudytes cretatus</i>	<i>Larus argentatus</i>	<i>Larus canus</i>
Locality	Canada	Chile	Bulgaria	Korea
Male	n=10	n=8	n=10	n=2
Body length(mm)	9.9-14.3	9.6-13.0	9.8-11.2	9.1-9.3
Maximum body width	200-350	240-300	255-286	224-246
Cordons, length	-	380-520	322-376	399-407
Cordons, width	-	-	27-32	-
Female	n=10	n=10	n=9	n=3
Body length(mm)	15.8-22.3	11.7-22.8	14.8-18.2	15.5-15.9
Maximum body width	320-500	280-480	402-456	302-342
Cordons, length	-	420-800	452-532	501-548
Cordons, width	-	-	54-77	-
Eggs	-	31-37 x 18-22	35-39 x 20-22(n=20)	36-40 x 19-21(n=20)

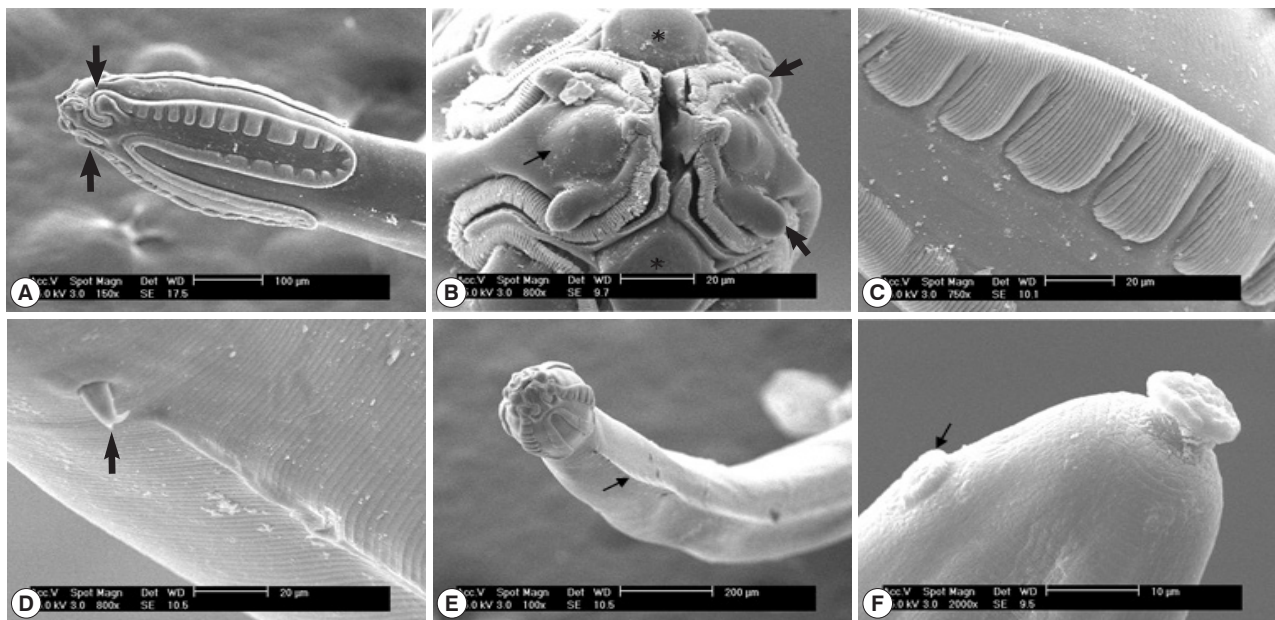


Fig. 1. SEM micrographs of *Cosmocephalus obvelatus* (Creplin) from *Larus canus*. (A) Anterior end, female, lateral view; note recurrent cordon (arrows). (B) Anterior end, female, apical view; note cephalic papillae (arrow heads), amphid (arrow), cuticular swellings dorsally and ventrally at the base of the pseudolabia (asterisks). (C) Cuticular plates, detail from the middle part of the descending arm of a cordon. (D) Bifurcated deirid and lateral alae (arrow). (E) Anterior end, lateral view; note lateral alae (arrow). (F) Posterior end, female, note nipple-like projection and phasmid (arrow).

coast of Gangneung City, Korea. The gulls were found dead and were stored at -4°C until examination for gastrointestinal helminths by dissection. The viscera were examined for parasites under a stereomicroscope. The nematodes were recovered from the gizzard of common gulls. Specimens were collected, rinsed in 0.85% saline, fixed with 10% formalin and studied using light microscopy (LM). For scanning electron microscopy (SEM), the worms were washed with 0.1 M phosphate buffer pH 7.4 (PB) and fixed with 2.5% glutaraldehyde in PB at 4°C for

4 hr. After washing with PB, they were post-fixed with 1% osmium tetroxide at 4°C for 4 hr. The specimens were dehydrated in a graded ethyl alcohol series, dried by CO_2 critical point drier, coated with osmium tetroxide, and examined by a scanning electron microscope (Hitachi, S-4800, Tokyo, Japan) at 15 kV.

Measurements of this medium-sized acuariids are shown in Table 1. Two pseudolabia were observed at lateral side of the mouth with each bearing a pair of large cephalic papillae and 1 inconspicuous amphid (Fig. 1B). Cordons arose dorsally

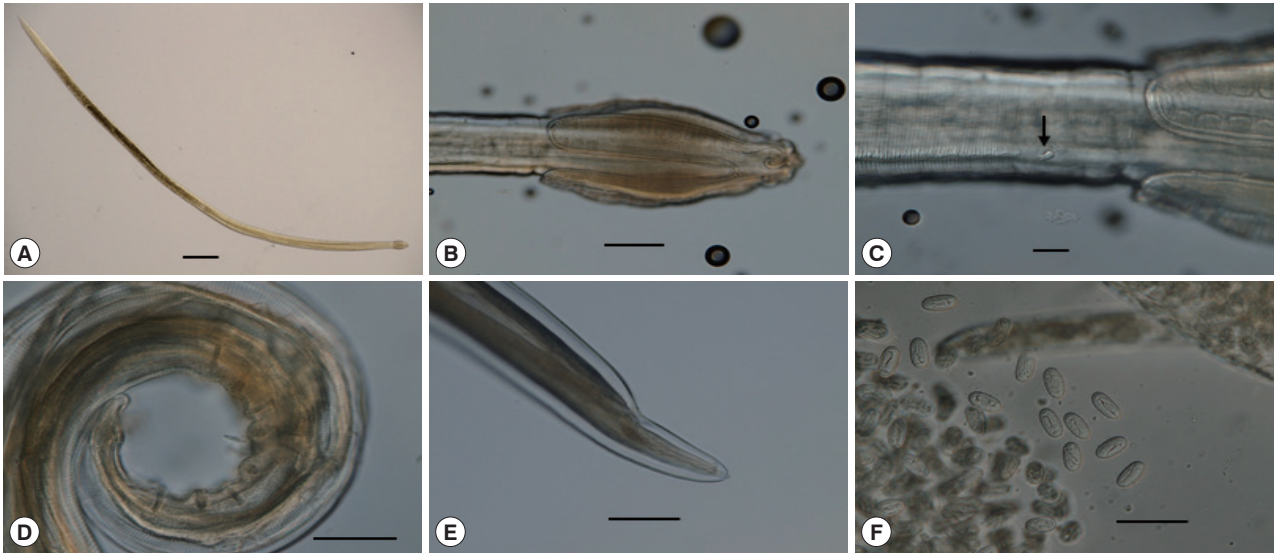


Fig. 2. *Cosmocephalus obvelatus* (Creplin) from *Larus canus*, light microscopic views. (A) Whole sample, female. Scale bar = 1,000 µm. (B) Anterior end, female, lateral view. Scale bar = 200 µm (C) Bifurcated deirids, note lateral alae. Scale bar = 50 µm. (D) Posterior end, male. Nine caudal papillae. Scale bar = 100 µm. (E) Posterior end, female. Scale bar = 200 µm. (F) Embryonated eggs in uterus. Scale bar = 50 µm.

and ventrally between pseudolabia (Figs. 1A, B, 2B), extending posteriorly in longitudinal direction and anastomosing laterally at about the level of the anterior quarter of the buccal cavity (Fig. 1B). Each cordon consists of a single row of cuticular plates (Fig. 1A, C). The salient bicuspid deirids were located on the posterior to cordons (Figs. 1D, 2C). Lateral alae well-developed, extending from level just posterior of deirids to level about the middle of the body (Fig. 1D, E).

Prominent phasmids situated subventrally near tip of tail (Fig. 1F). Male: Body length 9.1-9.30 mm. Maximum body width 224-246 µm. Tail 398 µm long. Cordons 399-407 µm long. Caudal extremity of male with caudal alae bear 4 pairs of preanal and 5 pairs of postanal pedunculate papillae with almost equal distance between them (Fig. 2D). Female: Body length 15.5-15.9 mm. Maximum body width 302-342 µm (Fig. 2A). Cordons extend to 501-546 µm from anterior end (Table 1). Caudal extremity of female tapered and round. Knob-like projection at tip of tail (Fig. 2E). Uterus packed with embryonated thick-shelled eggs (Fig. 2F).

DISCUSSION

C. obvelatus has been described several times using LM and SEM [3,5,6,11,12]. Although 11 species of *Cosmocephalus* have been reported [13], Anderson and Wong [7] redescribed *C. obvelatus* (Creplin, 1825) and believed that it as well as *C. im-*

perialis Morishita, 1930, *C. capellae* Yamaguti, 1935, and *C. jaenschi* Johnston & Mawson, 1941 were the only valid species. They considered *C. diesingi*, *C. faridi*, *C. firlottei*, and *C. firlottei* as junior synonyms of *C. obvelatus*. This concept was followed by Smogorzhevskya [14] and Diaz et al. [11]. Mutafchiev et al. [6] recently revised the genus *Cosmocephalus* thoroughly. They reported that *C. faridi* should be considered valid. Its unique character among congeners is the highly-elongate loop of the cordon, reaching up to 1/3 of the cordon length. In addition, they reported *C. podicipis* and *C. pelecani*. According to them, the genus *Cosmocephalus* consisted of 7 valid species currently. They proposed keys for identification of the species of the genus *Cosmocephalus*.

In general, the morphology and size of all *Cosmocephalus* species are quite different [6]. The main characters used to distinguish between them are the size of the body length, the presence of lateral alae, the shape of deirids, and the cordon length. Nevertheless, Diaz et al. [12] reported this species seems to exhibit great morphological stability, indicating a wide adaptability to different hosts and localities.

In the present study, most of the measurements of male and female *C. obvelatus*, except for a few variations, are within the ranges so far published [5-7]. Male worms were smaller than in other reports in their maximum body length (Table 1). Although little difference is found in measurements of the body length among specimens, the specimens studied here

closely coincided with the description by Azuma et al. [5], Diaz et al. [11], and Mutafchiev et al. [6]. On the basis of the SEM observations, the morphological characters of our specimens fully confirmed the characteristics of *C. obvelatus* presented by Mutafchiev et al. [6]. Consequently, we concluded that the present specimens are identified as *C. obvelatus*. In Korea, the genus *Cosmocephalus* had not been recorded from any wild birds. This is the first report of the species in common gulls in Korea.

CONFLICT OF INTEREST

We have no conflict of interest related to this work.

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