

## Research Note

New Host and Distribution Records of *Cosmocephalus obvelatus* (Creplin, 1825) (Nematoda: Acuariidae), with Morphometric ComparisonsJULIA I. DIAZ,<sup>1</sup> GRACIELA T. NAVONE, AND FLORENCIA CREMONTE

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**ABSTRACT:** This is the first record of *Cosmocephalus obvelatus* (Creplin, 1825) Seurat, 1919 (Nematoda: Acuariidae), from Argentina (Valdés Peninsula, province of Chubut) and from the Magellanic penguin *Spheniscus magellanicus* (Aves: Spheniscidae). The prevalence of this parasite was 31.3% and the mean intensity was 5.4. Despite the wide geographic distribution and the great variety of hosts parasitized by *C. obvelatus* (14 families belonging to 8 orders), there were no significant differences in morphological characteristics and measurements from previous records. Both the wide distribution and the morphometrical stability of *C. obvelatus* may be explained by its ecology and mode of transmission.

**KEY WORDS:** *Cosmocephalus obvelatus*, Acuariidae, Nematoda, *Spheniscus magellanicus*, Spheniscidae, marine birds, Argentina.

*Cosmocephalus obvelatus* (Creplin, 1825) Seurat, 1919, an acuariid nematode with a wide distribution, has been previously reported in Europe, Asia, Africa, New Zealand, and North America (Wong and Anderson, 1982). In South America, there is only 1 record of *C. obvelatus*, described as *Cosmocephalus tanakai* by Rodrigues de Olivera and Vicente (1963) from the black-backed gull *Larus dominicanus* Lichtenstein, 1823, in Brazil. Later, *C. tanakai* was synonymized with *C. obvelatus* by Anderson and Wong (1981). This parasite has a wide range of hosts, having been previously recorded in members of Lariidae, Pelecanidae, Rynchopidae, Sternidae, Anatidae, Podicipedidae, Phalacrocoracidae, Gaviidae, Ardeidae, Stercorariidae, Haematopodidae, Treschiornitidae, and Accipitridae (Baruš and Majudmar, 1975; Borgsteede and Jansen, 1980; Anderson and Wong, 1981;

Tuggle and Schmelting, 1982). Among members of the Spheniscidae, *C. obvelatus* has been cited only from the rockhopper penguin *Eudyptes crestatus* (Miller, 1784) caught in Chile and transferred to the Japanese Zoological Garden (Azuma et al., 1988).

This note reports the first record of *C. obvelatus* in the Magellanic penguin *Spheniscus magellanicus* (Forster, 1781) (Aves: Spheniscidae). It is also the first time that *C. obvelatus* has been found in Argentina. Measurements of the specimens in this study are compared with those given by previous authors. Morphological details seen in the scanning electron microscope (SEM) and dates of prevalence and mean intensity are provided.

At irregular intervals from 1996 to 2000, 16 specimens of *S. magellanicus*, all of which had recently died of unknown but presumably natural causes, were collected along the coasts of the Valdés Peninsula (42°04'–42°53'S, 63°38'–64°30'W), province of Chubut, Argentina. After dissection, the digestive tract was fixed in 10% formalin. Acuariid nematodes were removed from the esophagus and stored in 70% ethanol. The specimens were cleared in lactophenol and studied under the light microscope. Some specimens were dried by the critical point method, examined by SEM (Jeol/SET 100®), and photographed. Voucher specimens were deposited in the Helminthological Collection of the Museo de La Plata (CHMLP), La Plata, Argentina (Accession no. 4811).

The measurements of our specimens and those given by previous authors are listed in Table 1. Morphological details are shown in Figures 1–6. The prevalence was 31.25% and the mean intensity was 5.4. The esophagus was the only site of infection. We observed several de-

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Table 1. Comparative measurements of *Cosmocephalus obvelatus* from different hosts and localities.

Host*	Cram (1927)	Khalil (1931)	Rodrigues de Oliveira and Vicena (1963)		Anderson and Wong (1981)		Bowie (1981)	Azuma et al. (1988)	This report
			Rao (1951)	Larvis sp.	Larvis sp.	<i>Larvis delawarensis</i>	<i>Larvis dominicanus</i>	<i>Eudynes crestatus</i>	
Locality	Several	Pelicanus sp.	Larvis sp.	Larvis sp.	<i>Larvis delawarensis</i>	<i>Larvis dominicanus</i>	New Zealand	Chile	<i>Spheniscus magellanicus</i>
Female	Europe	Egypt	Canada	Brazil	Canada	Canada			Argentina
<i>n</i>	—	1 immature	—	10	10	—	4	19	10
Total length (mm)	9.7-20	5.7	37122	12.5	19.4 (15.8-22.3)	—	10.85 (7.6-17.5)	11.7-22.8	16 (13.5-22.12)
Maximum width (µm)	300-380	—	200-400	277	393 (320-500)	—	270 (130-440)	280-480	425 (296-627)
Buccal capsule (µm)	—	—	—	363	615 (570-730)	—	—	480-760	566 (525-637)
Nerve ring (µm)	—	—	—	—	684 (640-770)	—	398 (378-421)	440-840	646 (585-780)
Deirids (µm)	490	—	—	—	685 (610-790)	—	458 (368-647)	450-900	687 (611-793)
Excretory pore (µm)	—	—	—	—	813 (705-940)	—	—	37118	777 (650-962)
Muscular esophagus (mm)	—	—	—	0.77	1.3 (1.2-1.5)	—	—	0.80-1.56	0.98 (0.72-1.2)
Glandular esophagus (mm)	—	—	—	3.43	4.7 (4.1-5.1)	—	3.37 (2.83-3.5)	2.32-5.24	4.04 (3.16-4.98)
Total esophagus (µm)	—	680	—	4.2	6.0 (5.2-6.6)	—	—	3.12-6.80	5.07 (3.95-6.19)
Postdeirids	—	—	—	—	End of lateral alae	—	End of lateral alae	—	8.4
Vulva (from anterior end) (mm)	5.5	Midbody	Midbody	6.2	8.4 (7.4-10.4)	—	44.5% of body length	4.3-13.6	7.6 (6.27-9.23)
Vagina vera (µm)	—	—	—	—	Long	—	—	—	85 (45-150)
Vagina uterina (µm)	—	—	—	—	Short	—	—	—	173 (120-240)
Egg length (µm)	36	—	35-37	36	43 (40-45)	—	39 (36-42)	34-37	36 (33-40)
Egg width (µm)	20	—	17-18	19	25	—	21 (19-23)	18-22	20 (18-21)
Tail (µm)	230	180	—	175	301 (220-380)	—	—	200-300	248 (182-373)
Male	—	—	—	—	—	—	—	—	—
<i>n</i>	—	2	—	2	10	—	10	8	9
Total length (mm)	5.7-12.2	7.6	37085	9.5-12	12.4 (9.9-14.3)	—	10.89 (8.97-12)	9.6-13	9.47 (8.08-10.4)
Maximum width (µm)	240-255	—	150-270	250-280	279 (200-350)	—	275 (230-390)	240-300	272 (195-390)
Buccal capsule (µm)	—	—	—	369	418 (380-510)	—	—	440-500	415 (360-481)
Nerve ring (µm)	—	—	—	462	474 (420-530)	—	—	460-580	460 (390-552)
Deirids (µm)	430	—	—	399	450 (350-540)	—	469 (442-493)	440-600	491 (369-671)
Excretory pore (µm)	—	—	—	532-630	583 (500-680)	—	550 (531-578)	520-720	589 (474-820)
Muscular esophagus (mm)	—	—	—	0.98-1.32	1.1 (1.0-1.3)	—	—	0.8-1.08	0.82 (0.68-1.06)
Glandular esophagus (mm)	—	—	—	2.85-4.61	4.0 (3.6-4.3)	—	—	2.76-4.08	3.24 (2.52-3.99)
Total esophagus (µm)	—	930	—	3.83-5.93	5.1 (4.6-5.4)	—	5.29 (4.91-5.79)	3.56-5.16	4.05 (3.30-5.05)
Postdeirids	—	—	—	—	End of lateral alae	—	60.1% of body length	—	6.1

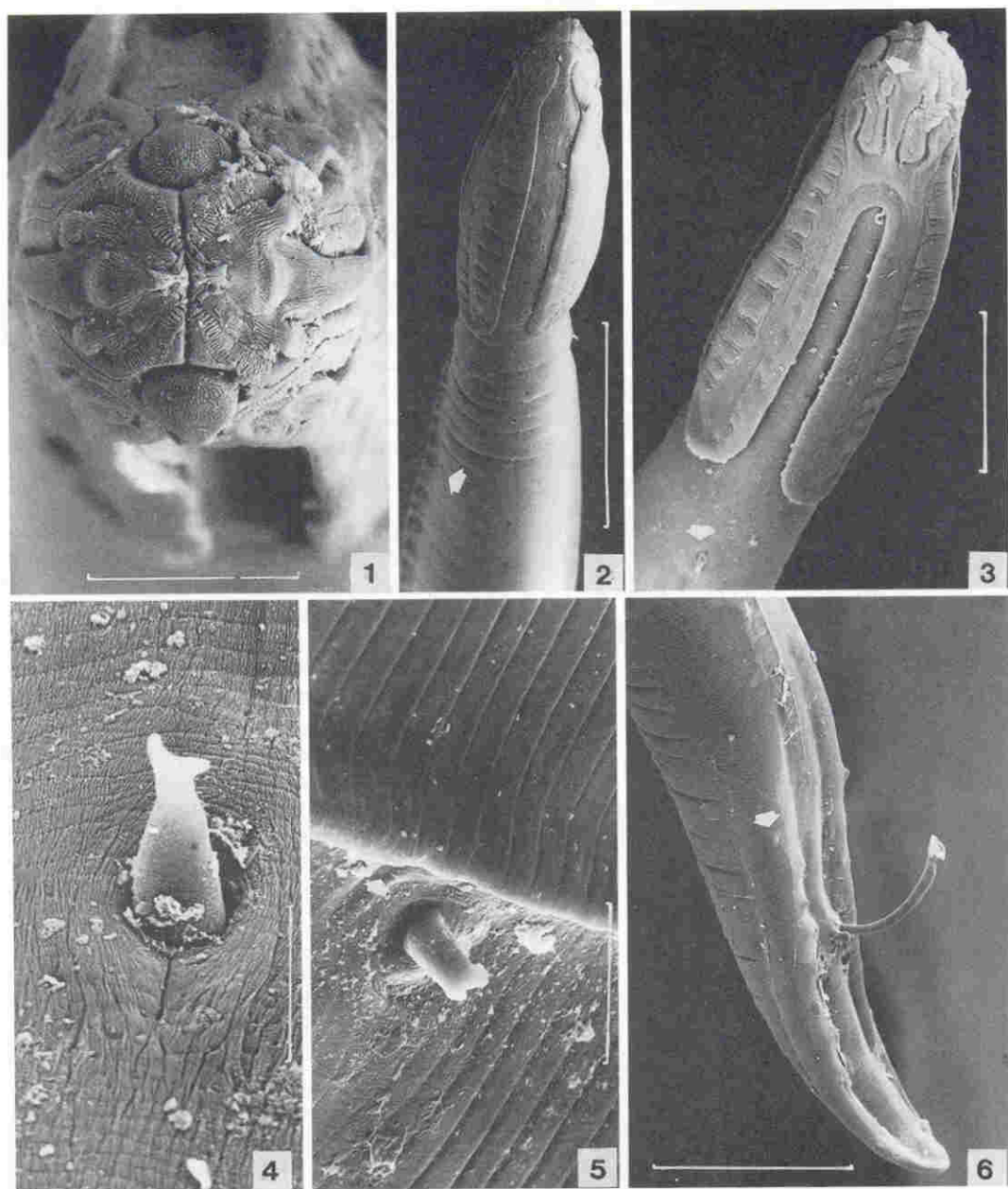
Table 1. Continued.

	Cram (1927)	Khalil (1931)	Rao (1951)	Rodrigues de Oliveira and Vicente (1963)	Anderson and Wong (1981)	Bowie (1981)	Azuma et al. (1988)	This report
Right spicule ( $\mu\text{m}$ )	130-155	160	140-150	—	195 (180-220)	145 (129-161)	160-180	162 (127-212)
Left spicule ( $\mu\text{m}$ )	420-540	540	480-540	—	633 (590-700)	542 (537-568)	560-640	526 (474-575)
Tail ( $\mu\text{m}$ )	420	270	—	415	450 (400-500)	—	380-440	316 (285-373)
Preloacal papillae (no.)	4	4	4	4	4	4	4	4
Postloacal papillae (no.)	5-6	5	5	5	5	5	5	5

\* Hosts: *Acritis* spp., *Alca* spp., *Cotornichates pachyrhynchus* Viillot, 1816, *Larus* spp., *Mergus serrator* Linnaeus, 1758, *Puffinus* sp., *Sterna* spp., and *Totanus* spp.

tails under the SEM. Each cordon is long, recurrent, laterally anastomosing, and runs along the margin of membranous plates that extend posteriorly. The cordons have 2 inflexions at the level of the anterior end (Figs. 1-3). The descending and ascending arms are scalloped on the inner edges. The membranous plate shows both transverse and longitudinal markings (Figs. 1-3). The deirids are bicuspid (Fig. 4). Postdeirids are located asymmetrically near the end of the lateral alae; they have 2 tips (Fig. 5). At the posterior end of the male, the proximal pair of preloacal papillae lies outside the line of distribution of the other preloacal papillae (Fig. 6). In addition, we observed under the optical microscope that the vagina vera is shorter than the vagina uterina (85  $\mu\text{m}$  and 173  $\mu\text{m}$ , respectively).

In spite of the numerous records of *C. obvelatus* worldwide, few authors have given complete measurements, usually doing so only while describing the nematode as a new species. However, it is useful to give measurements when reporting a new host and/or locality, if only for comparative purposes. General morphology and measurements of our specimens agree with those presented by Cram (1927), Khalil (1931), Rao (1951), Rodrigues de Oliveira and Vicente (1963), Anderson and Wong (1981), Bowie (1981), and Azuma et al. (1988) (Table 1) with the exception of the esophagus as reported by Khalil (1931), who considered esophagus length to be only that of the muscular portion. Other discrepancies arise with the vagina vera and vagina uterina lengths. Anderson and Wong (1981) observed a long vagina vera and a short vagina uterina, without giving measurements, and Lafuente et al. (1999) agreed with them. We also observed a terminal papilla on the female tail, as previously mentioned by Rodrigues de Oliveira and Vicente (1963), Bowie (1981), Azuma et al. (1988), and Anderson and Wong (1981). Postdeirids were mentioned only by Anderson and Wong (1981), and Bowie (1981). Possibly because they are difficult structures to see, we assume that the postdeirids were present in the other cases. Despite the wide geographical distribution and the great variety of hosts parasitized by *C. obvelatus* (14 families belonging to 8 orders), there are no significant variations among populations in morphological characteristics and measurements. In contrast, in another acuariid species, *Synhimantus* (*Synhimantus*) *la-*



Figures 1–6. *Cosmocephalus obvelatus* from *Spheniscus magellanicus*. 1. Apical view. 2. Anterior extremity showing lateral alae (arrow), dorsal view. 3. Anterior extremity showing cephalic papillae (arrow), inflexions of chordons and deirid (arrow), lateral view. 4. Detail of deirid. 5. Detail of postdeirid located near end of lateral alae (arrow). 6. Posterior extremity of male with left spicule protruded and showing papillae arrangement with proximal pair of precloacal papillae lying out of line of distribution (arrow), latero-ventral view. Scale bars: 1 = 50  $\mu\text{m}$ , 2 = 500  $\mu\text{m}$ , 3 = 100  $\mu\text{m}$ , 4 = 10  $\mu\text{m}$ , 5 = 20  $\mu\text{m}$ , and 6 = 200  $\mu\text{m}$ .

*ticeps* (Rudolphi, 1819), which also is cosmopolitan but has a narrower range of hosts, Etchegoin et al. (2000) found differences in measurements among specimens from different localities.

The shape of the cordons, the morphology and size of the cervical papillae, and the location in the definitive host (habitats) seem to be of fundamental importance when establishing relationships in the acuariid group (Baruš and Majudmar, 1975). The cordons of *Cosmocephalus* have a complex structure and are relatively wide. *Cosmocephalus obvelatus* is always located in the esophagus of the host. The genera *Synhimantus* and *Cosmocephalus* are closely related; they have similar cordons and cervical papillae, but members of the former genus live under the cuticle of the gizzard. Etchegoin et al. (2000) reported morphometric differences that they considered as intraspecific variations in specimens from different hosts and localities. However, we observed that *C. obvelatus* varies little, even in different hosts and localities. This morphometrical stability may indicate that *Cosmocephalus* is better adapted to different hosts and diverse localities because all hosts have similar environmental and feeding habits (eating fish). The intermediate hosts of *C. obvelatus* are amphipods, and it uses fish as paratenic hosts (Anderson, 1992). These characteristics may play an important role in the cosmopolitan distribution of *C. obvelatus*. Moreover, the distributions of many species of fish-eating birds overlap in their breeding and/or wintering grounds.

The intensity of infection recorded here is similar to the intensities found by Keppner (1973) from the California gull *Larus californicus* Lawrence, 1854 (Lariidae) (prevalence [P] = 23.5% and mean intensity [I] = 4.25), by Courtney and Forrester (1974) from the brown pelican *Pelecanus occidentalis* Linnaeus, 1776 (Pelecanidae), in North America (P = 40% and I = 4), and by Lafuente et al. (1999) from Audouin's gull *Larus audouinii* Payraudeau, 1826 (Lariidae), in the Mediterranean Sea (P = 82.76% and I = 5.08). This intensity is higher than that given by Threlfall (1968) from the black-backed gull *Larus marinus* Linnaeus, 1758 (Lariidae), in Newfoundland (P = 9.39% and I = 1).

Boero and Led (1970) described a new species, *Cosmocephalus argentinensis*, from 1 female specimen found in a Magellanic penguin

in the Zoological Garden in La Plata, Argentina. We consider this acuariid as a species inquirendae because the description is very poor and no type materials (which were never deposited in a museum collection) are available for our examination.

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#### Literature Cited

- Anderson, R. C. 1992. Nematode Parasites of Vertebrates. Their Development and Transmission. CAB International, Wallingford, Oxon, U.K. 578 pp.
- , and P. L. Wong. 1981. Redescription of *Cosmocephalus obvelatus* (Creplin, 1825) (Nematoda: Acuarioidea) from *Larus delawarensis* Ord (Lariidae). Canadian Journal of Zoology 59:1897–1902.
- Azuma, H., M. Okamoto, M. Ohbayashi, Y. Nishine, and T. Mukai. 1988. *Cosmocephalus obvelatus* (Creplin 1825) (Nematoda: Acuariidae) collected from esophagus of rockhopper penguin, *Eudyptes crestatus*. Japanese Journal of Veterinary Research 36:73–77.
- Baruš, V., and G. Majudmar. 1975. Scanning microscopic studies on the cordon structures of Acuariid genera (Nematoda: Acuariidae). Folia Parasitologica 22:125–131.
- Boero, J. J., and J. E. Led. 1970. El parasitismo de La Fauna Autóctona. VI. Los parásitos de la avifauna argentina I. Actas de las 5ª Jornadas de Veterinaria, Facultad de Ciencias Veterinarias, Universidad Nacional de La Plata: 65–71.
- Borgsteede, F. H. M., and J. Jansen. 1980. Spirurata in wild birds in The Netherlands. Tropical and Geographic Medicine 32:91–92.
- Bowie, J. Y. 1981. Redescription of *Cosmocephalus tanakai* Rodriguez and Vicente (Nematoda-Acuariidae) a parasite of the southern black-backed gull in New Zealand. New Zealand Journal of Zoology 8:249–253.
- Courtney, C. H., and D. J. Forrester. 1974. Helminth parasites of the brown pelican in Florida and Louisiana. Proceedings of the Helminthological Society of Washington 41:89–93.
- Cram, E. B. 1927. Bird parasites of the suborders Strongylata, Ascaridata and Spirurata. Bulletin of the United States National Museum 140:1–465.
- Etchegoin, J. A., F. Cremonte, and G. T. Navone. 2000. *Synhimantus* (*Synhimantus*) *laticeps* (Rudolphi, 1819) Railliet, Henry et Sisoff, 1912 (Nematoda, Acuariidae) parasitic in *Tyto alba*

(Gmelin) (Aves, Tytonidae) in Argentina. *Acta Parasitologica* 45:99-106.

**Keppner, E. J.** 1973. Some parasites of California gull, *Larus californicus* Lawrence, in Wyoming. *Transactions of the American Microscopical Society* 92:288-291.

**Khalil, M. B.** 1931. On two new species of nematodes from *Pelecanus onocrotalus*. *Annals of Tropical Medicine and Parasitology* 25:455-460.

**Lafuente, M., V. Roca, and E. Carbonell.** 1999. Cestodos y nematodos de la gaviota de Audouin, *Larus audouinii* Payraudeau, 1826 (Aves: Laridae) en las Islas Chafarinas (Mediterráneo sudoccidental). *Boletín de la Real Sociedad Española de Historia Natural (Sec. Biol.)* 95:13-20.

**Rao, N.** 1951. *Cosmocephalus firlottei* n. sp. (family

Acuariidae) from the sea gull *Larus argentatus*. *Canadian Journal of Zoology* 25:173-177.

**Rodrigues de Olivera, H., and J. J. Vicente.** 1963. Nova espécie do gênero *Cosmocephalus* Molin, 1858 (Nematoda, Spiruroidea). *Revista Brasileira de Biologia* 23:389-392.

**Threlfall, W.** 1968. The helminth parasites of three species of gulls in Newfoundland. *Canadian Journal of Zoology* 46:827-830.

**Tuggle, B. N., and S. K. Schmeling.** 1982. Parasites of the bald eagle (*Haliaeetus leucocephalus*) of North America. *Journal of Wildlife Diseases* 18:501-506.

**Wong, P. L., and R. C. Anderson.** 1982. The transmission and development of *Cosmocephalus obvelatus* (Nematoda: Acuarioidea) of gulls (Laridae). *Canadian Journal of Zoology* 60:1426-1440.