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SPECIES OF *CONTRACAECUM* PARASITIZING THE MAGELLANIC PENGUIN *SPHENISCUS MAGELLANICUS* (SPHENISCIDAE) FROM THE ARGENTINEAN COAST

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KEY WORDS

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Spheniscus magellanicus
Contracaeceum spheniscus
Spheniscidae
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Río de la Plata
Contracaecum pelagicum
Interlabial Morphology
Caudal Papillae
Sibling Species

ABSTRACT

Anisakid nematodes have a worldwide distribution and are associated with fishes, birds, and marine mammals from freshwater, brackish, and marine systems. The aims of this work are to report for the first time *Contracaecum mirounga* parasitizing the Magellanic penguin *Spheniscus magellanicus*, to report another *Contracaecum* species in the same host species, and to discuss the validity of *Contracaeceum spheniscus*. Several dead chicks, juveniles, and adults of *S. magellanicus* were collected along the Argentinean coast from 2002 to 2009. Nematodes were removed from digestive tracts and studied using both light and scanning electron microscopy. Nematode prevalences were 2.38% for *C. mirounga* and 12.5% for *Contracaecum* sp. *Contracaecum mirounga* was found in 1 penguin from Península Valdés, Chubut. This species is known as a specific parasite of marine mammals such as Pinnipedia, thereby suggesting that this nematode is not as specific as believed. Another species of *Contracaecum* sp. was found parasitizing 1 penguin from the Río de la Plata coast. It possessed an unusual interlabial morphology and arrangement of male caudal papillae. Despite the low prevalence, the distinct morphological features are convincing and support the presence of a new *Contracaecum* species. However, a formal description is not presented because sufficient male specimens are lacking. Finally, *C. spheniscus* is considered a junior synonym of *Contracaecum pelagicum*. Future molecular studies might be helpful to determine the real diversity of *Contracaecum* species parasitizing *S. magellanicus* considering the number of sibling species recognized among the anisakids.

Anisakid nematodes have a worldwide distribution and are associated with freshwater, brackish, and mainly marine systems. Transmission of species usually involves aquatic invertebrates and fishes as intermediate or paratenic hosts and piscivorous birds and mammals as definitive hosts (e.g., cormorants, pelicans, and seals [Anderson, 2000; Rohde, 2005]). Within Anisakidae, the genus *Contracaecum* Raillet and Henry parasitizes fish-eating birds and marine mammals around the world. Most *Contracaecum* species seem to have little host specificity, e.g., *Contracaecum pelagicum* Johnston & Mawson, 1942, *Contracaecum microcephalum* (Rudolphi, 1809), and *Contracaecum rudolphii* (Hartwich, 1964) exhibit low host specificity and parasitize bird hosts of different orders. However, cases of strict specificity exist such as in the case of *Contracaecum osculatum baicalensis* Moszgovoi and Ryzhykov, 1950 parasitizing only the Baikal seal *Phoca sibirica* Gmelin (Phocidae) (Mattiucci and Nascetti, 2008).

In Argentina, 7 *Contracaecum* species have been reported to date; *C. microcephalum* (Rudolphi, 1809) and *Contracaecum multipapillatum* (von Drasche, 1882) were registered in different species of Ardeidea (Schuurmans Sterkhoven, 1951; Boero et al., 1972; Labriola and Suriano, 1996; Navone et al., 2000). *Contracaecum travassosi* Gutiérrez, 1943 and *Contracaecum chubutensis* Garbin, Diaz, Cremonte and Navone, 2008 were reported from the imperial shag *Phalacrocorax atriceps* Lesson (Phalacrocoracidae) (Gutiérrez, 1943; Garbin et al., 2008). *Contracaecum australe* Garbin, Mattiucci, Paoletti, González-Acuña, and Nascetti, 2011 parasitizes the Neotropical cormorant *Phalacorcorax brasilianus* Gmelin and the red–legged cormorant *Phalacrocorax gaimardi* (Lesson and Garnot) (Garbin et al., 2011, 2014; Biolé et al., 2012).

In the case of the Magellanic penguin *Spheniscus magellanicus* Forster, there are 2 records; *Contracaecum spheniscus* Boero and Led, 1971 was described on the basis of a single juvenile male specimen found in 1 adult penguin from La Plata Zoo, Buenos Aires Province, Argentina (Boero and Led, 1971), and *C. pelagicum* was reported and redescribed from *S. magellanicus*

Figure 1. Sampling sites on the Argentinean coast.

from the Península Valdés coast, Chubut Province and Mar del Plata coast, Buenos Aires Province (Diaz, 2006; Garbin et al., 2007; Diaz et al., 2010). This species also was reported in the black browed albatross *Talassarche melanophris* (Temminck) and in *P. atriceps* from the Chubut coast (Garbin et al., 2007, 2013). Later, Garbin et al. (2013) characterized, using molecular data and morphology, *C. pelagicum* from *S. magellanicus*, and corroborated its transmission by the anchovy *Engraulis anchoita* in the North Patagonian Sea.

On the basis of this aforementioned background, the aims of this work are: (1) to report for the first time *Contracaecum mirounga* Nikolskiy, 1974 in 1 *S. magellanicus* adult from Península Valdés, Chubut Province; (2) to report a *Contracaecum* species parasitizing 1 *S. magellanicus* adult from the Río de la Plata coast, Buenos Aires Province; and (3) to discuss the validity of *C. spheniscus*.

MATERIALS AND METHODS

At intervals between May 2002 and May 2009, 139 dead chicks, juveniles, and adults of *S. magellanicus* were collected along the Argentinean coast: 131 from Península Valdés, Chubut Province coast (42°04′–42°53′S, 63°38′–64°30′W), 7 from Buenos Aires Province coast (35°26′S– 57°7′W, 41°02′S– 62°48′W) (Fig. 1). Penguins were dissected and their digestive tracts were fixed in 10% formalin. The proventriculus and esophagus were examined using a stereomicroscope. Nematodes were removed and stored in 70% ethanol. Additionally, authors had access to some nematode specimens extracted from 1 dead *S. magellanicus* from La Plata Zoo, stranded on an unknown site on the Río de la Plata coast, Buenos Aires Province.

Nematodes were cleared in lactophenol and studied with light microscopy (LM) using an Olympus BX51® (Olympus, Tokyo, Japan) microscope. Drawings were made with the aid of a drawing tube. Some specimens were processed for scanning electron microscopy (SEM), dried by the critical point method, and observed using a JEOL/JSMT 6360 LV® scanning electron microscope (JEOL Ltd., Tokyo, Japan). Mean measurements are expressed in millimeters with the range in parentheses. The arrangement of male caudal papillae was described according to the terminology of Fagerholm (1988, 1990, 1991), except that of the distal postcloacal papillae to better differentiate them spatially. Prevalence of infection was calculated for both *Contracaecum* species according to Bush et al. (1997).

DESCRIPTION

Contracaecum mirounga Nikolskiy, 1974

(Figs. 2, 3A–C; Tables I, II)

General description (on the basis of 5 males and 8 females from S. magellanicus observed with SEM and LM): Body entirely transversely striated (Fig. 2A–F). Apical lips with central keel inside shallow notch (see upper black arrow) and 2 auricles bearing tiny terminal sensory tips (Fig. 2A–C). Dorsal lip bearing pair of double labial papillae, 1 pair of subventrals plus single small amphid (Fig. 2A–C). Three triangular entire nonbifurcated interlabia shorter than lips (Fig. 2B, C). Cephalic collar with concentric free edges and a v-shaped lateral region without striations (Figs. 2A–C, 3A). Round and conspicuous deirids (Fig. 2A, lower black arrow). Ventriculus with posterior appendix, intestinal cecum well developed (Fig. 3A).

Male: Conical flat caudal end bearing 68 to 74 precloacal papilla pairs (Figs. 2D, E, 3B). Precloacal transverse striae (PTS) zone comprising 11–12 proximal precloacal papillae (Figs. 2D, E, 3B) arranged in double and even triple rows starting from level of cloaca (Figs. 2D–F, 3B). Five to 6 proximal papillae—adacloacals—situated posterior to cloaca (Figs. 2D–F, 3B). Paracloacal papillae associated with cloaca: 1 double subventral postparacloacal papilla, and median preparacloacal papilla or plaque (Figs. 2D–F, 3B). Four subterminal papillae grouped as 3 subventrals in tandem, and only 1 sublateral (Figs. 4D, F, 3B). One phasmid placed more dorsally next to sublateral papilla on posterior half of the tail (Figs. 2D, F, 3B, see arrows). Both spicules similar in length (Table I). Caudal end with pointed tip (Fig. 3B).

Female: Vulva in anterior half of body, on average of one-third from anterior end. Embryonated eggs almost spherical (Table II). Tail conical pointed tip (Fig. 3C). Papillate phasmids situated sublaterally on tail.

Taxonomic summary

Type host: Mirounga leonina Linnaeus, 1758 (Mammalia, Phocidae).

Other known hosts: Spheniscus magellanicus Foster, 1781 (Aves, Spheniscidae).

Table I. Morphometric data from *Contracaecum mirounga* and *Contracaecum* sp. adult males parasitizing *Spheniscus magellanicus* from Península Valdés, Chubut, and Buenos Aires province coasts, respectively, in contrast to other reports of *Contracaecum* spp. parasitizing the same and related host species.

	Species					
	Contracaecum turgidum	*Contracaecum mirounga*	*Contracaecum mirounga*	*Contracaecum spheniscus*	*Contracaecum pelagicum*	*Contracaecum* sp.
References	Chapin (1927)	Nikolskiy (1974)	Present study	Boero and Led (1970)	Garbin et al. (2007)	Present study
Type host	*Monachus schauinslandi*	*Mirounga leonina*	*Spheniscus magellanicus*	*Spheniscus magellanicus*	*Spheniscus magellanicus*	*Spheniscus magellanicus*
Locality	Laysan Island, Hawaii	Balleny Islands, Antarctica	Península Valdés, Chubut, Argentina	Buenos Aires coast, Argentina	Península Valdés, Chubut, Argentina	Buenos Aires coast, Argentina
N	Not specified	10	5	1	10	1
Body length (mm)	45.00	17.30 (12.00–28.70)	17.32 (15.6–18.6)	28.8	17.56 (11.00–25.08)	25.92
Maximum body width (mm)	1.8	0.70 (0.57–1.30)	0.63 (0.58–0.67)	0.72	0.67 (0.56–0.96)	0.83
Nerve ring DAE* (mm)	—	0.21 (0.29–0.33)	0.39 (0.35–0.43)	0.55	0.46 (0.36–0.51)	0.58
Deirids DAE* (mm)	—	—	0.53 (0.41–0.58)	—	0.65 (0.57–0.73)	0.66
Esophagus length (mm)	6.3	2.31 (2.01–4.75)	2.55 (2.48–2.64)	3.24	2.78 (1.90–3.97)	3.62
Intestinal cecum length (mm)	3.44	1.26 (0.92–2.85)	1.56 (1.44–1.68)	2.45	1.97 (1.56–2.68)	2.41
Ventriculus length (mm)	—	0.15 (0.08–0.25)	0.21 (0.16–0.26)	—	0.22 (0.16–0.26)	0.3
Ventricular appendix length (mm)	2.10	0.68 (0.65)	0.59 (0.46–0.69)	1.22	0.74 (0.63–0.83)	0.8
Spicule length (mm)						
(+)	12.00	8.93 (6.38–11.09)	8.97 (8.12–10.71)	4.5	4.10 (3.07–5.07)	10.82
(−)	11.8	—	8.60 (5.89–10.59)	4.32	—	—
Tail length (mm)	0.39	0.22 (0.18–0.33)	0.20 (0.19–0.23)	—	0.18 (0.11–0.29)	0.19
Precloacal papilla pairs	—	60–70	68–74	—	25–31	35
Double paracloacal papilla pairs	1	1	1	1	1	1
Adacloacal papilla pairs	10	4	5–6	—	—	2
Subventral papilla pairs	2	2	2	2	2	3
Sublateral papilla pairs	2	2	2	2	2	2
Medial papilla or plaque	—	—	1	—	—	—
Phasmid pairs	1	1	1	—	1	1

* DAE, distance from anterior end.

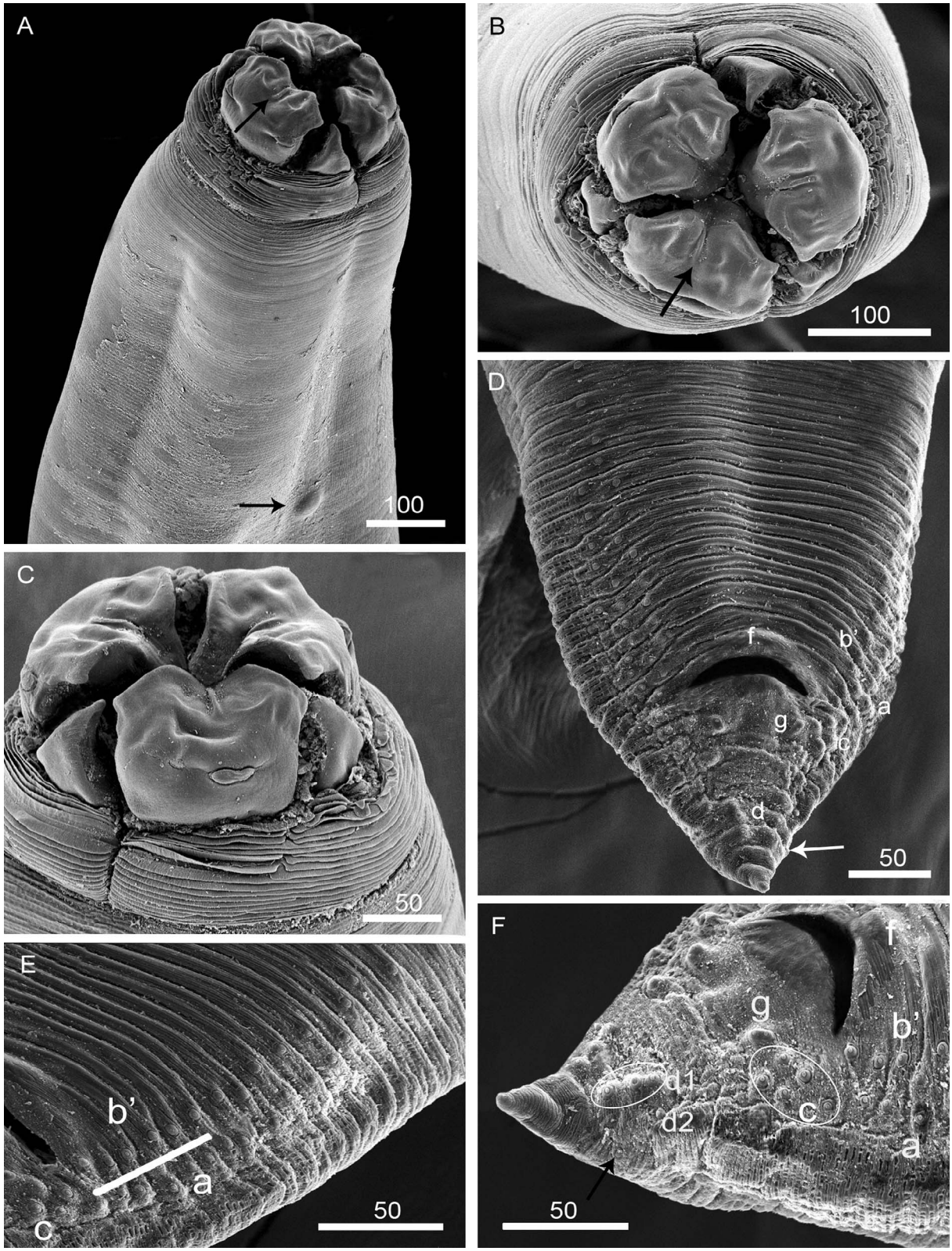

Figure 2. Scanning electron micrographs of *Contracaecum mirounga* Nikolskiy, 1974 parasitizing *Spheniscus magellanicus* from Península Valdés coast, Chubut Province. (**A**) Anterior end, lateral view; note dorsal lip, auricles with sensory tips, central keel on shallow notch (upper black arrow), labial papillae, entire interlabia, cephalic collar, deirids (lower black arrow). (**B**) Anterior end, subdorsal view; note lips, auricles with sensorial tips, central keel on shallow notch (black arrow), labial papillae, interlabia. (**C**) Anterior end, lateral view; note lateroventral lip, labial papilla, amphid, interlabia, cephalic collar with a v-shaped lateral region. (**D**) Male posterior end, subventral view; note post- and precloacal papillae, phasmid (white

Type locality: Balleny Islands, Antarctica (66°55′S, 163°45′W).

Other localities: Península Valdés, Chubut Province, Argentina (42°04′–42°53′S, 63°38′–64°30′W).

Site of infection: Proventriculus.

Prevalence: 2.38% (1 of 42 adult penguins examined).

Specimens deposited: Helminthological Collection of Museo de La Plata (MLP-He 7464), Buenos Aires, Argentina.

Remarks

The present specimens found in a single *S. magellanicus* adult from Península Valdés were identified as *C. mirounga* on the basis of the morphometric analysis and arrangement of male caudal papillae. However, no significant differences were observed when comparing the present specimens with those described in the original description of Nikolskiy (1974).

Contracaecum mirounga is very similar to *Contracaecum turgidum* Chapin, 1927. However, both males and females of *C. mirounga* are significantly smaller than *C. turgidum* (Tables I, II) (Chapin, 1927). Additionally, *C. mirounga* males differ from *C. turgidum* by having smaller spicules: 8.93 (6.38–11.09) vs. 12.00 mm, and a lower number of adacloacal papillae (5–6 vs. 10). Besides, proximal precloacal papillae on the PTS zone are more crowded in *C. mirounga*, being arranged in double or even triple columns (Fig. 2D–F; Table I) (Chapin, 1927; Fagerholm, 1988). On the other hand, *C. turgidum* parasitizes phocids such as the endemic Hawaiian monk seal *Monachus schauinslandi* Matschie (Chapin, 1927; Fagerholm et al., 1988).

Contracaecum sp.

(Figs. 3D–F, 4; Tables I, II)

Description (on the basis of 1 male and 3 females from 1 S. magellanicus observed with SEM and LM): Body entirely transversely striated (Fig. 4A–D). Lips without notches, with 2 prominent lobed auricles and well-remarkable sensory tips (Fig. 4A, B). Conspicuous labial papillae, 2 on dorsal lip, 1 on each ventrolateral lip with 1 small amphid (Fig. 4A, B). Three entire and well-developed interlabia with a biconcave apex (Fig. 4A, B, see black arrows). Well-developed, thick, and conspicuous cephalic collar with about 20 deep concentric free edges, and a v-shaped lateral region without striations (Figs. 3D, 4A, B). Round and conspicuous deirids. Ventricle with a regular appendix, intestinal cecum well developed (Fig. 3D).

Male: Conical caudal end bearing 35 pairs of conspicuous precloacal papillae, slightly raised, mammiform (Figs. 3E, 4C, D). PTS zone comprising 4 proximal pairs of precloacal papillae (Figs. 3E, 4D). Two proximal postcloacal papillae—adacloacal—located below the level of the cloacal commissures (Figs. 3E, 4D). Paracloacal papillae associated with cloaca: 1 double pair of postparacloacal papillae located just below lower cloacal commissures (Figs. 3E, 4D, F). Paracloacal median papilla or plaque not seen. Five pairs of subterminal papillae grouped as 3 subventral, and 2 sublateral ones. One phasmid placed more ventrally between these latter 2 papillae (Figs. 3E, 4D, F). Both spicules similar in length reaching almost half of body (Table I). Sharply pointed spicule tip with very short free distal end (23 μm) (Fig. 4C, E). Conical caudal end with a sharply pointed tip (Fig. 4C, E).

Female: Tail conical with blunt tip. Wide cloacal opening. Papillate phasmids situated sublaterally on tail (Fig. 3F). Vulva in anterior half of body. Embryonated eggs almost spherical (Table II).

Taxonomic summary

Type host: Spheniscus magellanicus Foster, 1781 (Aves, Spheniscidae).

Type locality: Unknown site on the Rio de la Plata coast, Buenos Aires Province, Argentina (35°26′S–57°7′W to 41°02′S–62°48′W).

Site of infection: Proventriculus.

Prevalence of infection: 12.5% (1 of 8 penguins examined from the Buenos Aires coast).

Specimens deposited: Helminthological Collection of Museo de La Plata (MLP-He 7465), Buenos Aires, Argentina.

Remarks

In certain aspects of their morphology, the present specimens are very different from the other observed *Contracaecum* species and this morph does not appear to have been described previously. None of the described *Contracaecum* species shows the unusual interlabia with a biconcave apex (Fig. 4A, B, see black arrows). Usually, *Contracaecum* interlabia are either entire or bifid. Another peculiar feature is the conspicuous, thick, and robust cephalic collar not seen in other *Contracaecum* spp., particularly those numerous concentric deep free edges (Figs. 3D, 4A, B). The pattern (distribution) of male postcloacal papillae studied here is unique since it is not shared by any other known *Contracaecum* species. The arrangement of caudal papillae in *Contracaecum* spp. falls within 4 different morphotypes: *C. osculatum* type, *C. mirounga*/*turgidum* type, *C. radiatum* type, and *C. ogmorhini* type (Fagerholm, 1988). The 3 first types are commonly found in *Contracaecum* spp. parasitizing pinnipeds. The latter type is typical of piscivorous birds and consists of 1 double pair of postparacloacal papillae, 2 distal subventral pairs, 2 distal sublateral pairs, and 1 pair of phasmids such as in *C. ogmorhini* (Fagerholm, 1988). However, the specimen studied here does not match any of the 4 morphotypes discussed by Fagerholm (1988). It looks like the *C. mirounga*/*turgidum* type due to the presence of 3 distal subventral papilla pairs but the proximal precloacal caudal papillae and the adacloacal ones are less numerous (Fagerholm, 1988). Neither does the papilla arrangement match that of the *C. ogmorhini* type since it exhibits a greater number of papillae such as 1 extra subventral one and 2 adacloacal ones (Fagerholm, 1988).

When comparing present specimens with other *Contracaecum* species parasitizing *S. magellanicus*, some morphometric characters overlap those of the following species: *C. pelagicum* and *C. spheniscus* (Boero and Led, 1971; Portes-Santos, 1984; Garbin et al., 2007) (see Tables I, II). Nevertheless, present specimens

←
arrow). (**E**) Male posterior end, sublateral view. (**F**) Male posterior distal end, subventral view; note phasmid (black arrow) (**a**, precloacal transverse striae (PTS) zone; **b′**, proximal precloacal caudal papillae; **c**, adacloacal papillae; **d**, distal caudal papillae; **d1**, subventral papillae; **d2**, sublateral papilla; **f**, median papilla or plaque; **g**, double postparacloacal papillae.)

Table II. Morphometric data from *Contracaecum mirounga* and *Contracaecum* sp. adult females parasitizing *Spheniscus magellanicus* from Península Valdés, Chubut, and Buenos Aires province coasts, respectively, in contrast to other reports of *Contracaecum* spp. parasitizing the same and other host species.

	Species					
	Contracaecum turgidum	*Contracaecum mirounga*	*Contracaecum mirounga*	*Contracaecum spheniscus*	*Contracaecum pelagicum*	*Contracaecum* sp.
References	Chapin (1927)	Nikolskiy (1974)	Present study	Boero and Led (1970)	Garbin et al. (2007)	Present study
Type host	*Monachus schauinslandi*	*Mirounga leonina*	*Spheniscus magellanicus*	*Spheniscus magellanicus*	*Spheniscus magellanicus*	*Spheniscus magellanicus*
Locality	Laysan Island, Hawaii	Balleny Islands, Antarctica	Península Valdés, Chubut, Argentina	Buenos Aires coast, Argentina	Península Valdés, Chubut, Argentina	Buenos Aires coast, Argentina
N	Not specified	4	8	—	10	3
Body length (mm)	62.00	22.22 (19.5–26.8)	24.17 (17.56–33.05)	—	35.33 (32.60–39.20)	32.55 (29.20–35.10)
Maximum body width (mm)	2.8	0.65 (0.5–1.4)	0.94 (0.52–1.48)	—	0.82 (0.79–0.85)	1.09 (0.99–1.20)
Nerve ring DAE* (mm)		0.26 (0.2–0.3)	0.55 (0.48–0.65)	—	0.57 (0.51–0.61)	0.58 (0.54–0.61)
Deirids DAE* (mm)		0.37 (0.35–0.4)	0.72 (0.62–0.90)	—	0.64 (0.58–0.71)	0.65 (0.63–0.68)
Esophagus length (mm)	6.00	2.91 (2.9–4.9)	3.03 (2.81–3.32)	—	3.74 (3.22–4.60)	3.30 (3.12–3.64)
Intestinal cecum length (mm)	6.3	1.97 (2.0–2.65)	2.38 (2.10–2.74)	—	2.73 (2.28–3.20)	2.14 (2.08–2.36)
Ventriculus length (mm)	3.44	0.16 (0.2–0.25)	0.22 (0.17–0.26)	—	0.21 (0.16–0.26)	0.25 (0.23–0.28)
Ventricular appendix length (mm)	—	0.84 (0.6–0.84)	0.72 (0.65–0.82)	—	0.86 (0.79–0.91)	0.69 (0.66–0.72)
Vulva DAE* (mm)	2.10	7.14 (5.25–9.0)	6.94 (5.28–9.23)	—	9.75 (8.20–11.90)	8.87 (8.72–9.07)
Tail length (mm)	0.8	0.3 (0.3–0.35)	0.41 (0.30–0.63)	—	0.36 (0.31–0.43)	0.46 (0.40–0.52)
Embryonated egg length (mm)	0.06–0.54	—	0.06 (0.057–0.064)	—	0.064 (0.062–0.066)	0.069 (0.068–0.070)

* DAE, distance from anterior end.

exhibit marked differences in their interlabial morphology and distribution of male caudal papillae compared with *Contracaecum* species mentioned above.

DISCUSSION

Previous studies have reported only specimens of *C. pelagicum* from this host and it is the most common worm in this bird species (Portes-Santos, 1984; Garbin et al., 2007; Diaz et al., 2010; Novo Borges et al., 2014). On the other hand, *C. pelagicum* exhibits low host specificity since it can parasitize different bird orders (Silva et al., 2005; Garbin et al., 2007, 2013; Garbin, 2009). Our study adds to the host–parasite associations of *Contracaecum* spp. and documents the presence of other *Contracaecum* spp. in Magellan's penguins.

Contracaecum mirounga differs from the other multipapillate congeners parasitizing pinnipeds (e.g., *C. osculatum*, *C. turgidum*, and *C. radiatum*), highlighting the relevance of the caudal papilla pattern in the taxonomy of the genus *Contracaecum* (Fagerholm et al., 1988). The report of *C. mirounga* parasitizing only 1 penguin from Península Valdés in the present study is noteworthy. However, it would not be rare considering that *S. magellanicus* overlaps the same foraging area and prey items (e.g., the squids *Loligo* spp. and *Illex* spp.) of the elephant seal, *M. leonina,* and the South American fur seal *Arctocephalus australis* (Zimmermann), habitual hosts of *C. mirounga* (Mattiucci et al., 2003, 2008b; Lewis et al., 2006; Campagna et al., 2007). Therefore, either this nematode species parasitizes penguins with low prevalence and can utilize it as an adequate definitive host, or this constitutes an accidental infection in penguins. The presence of mature nematodes suggests that *S. magellanicus* constitutes a suitable definitive host and that the nematode is not as specific as previous studies would indicate.

The finding of a previously undescribed morphotype, *Contracaecum* sp., in only 1 penguin from the Buenos Aires provincial coast is noteworthy because errant *S. magellanicus* penguins are usually found on this coast; some penguins die or are taken to aquariums or zoos (García-Borboroglu and Boersma, 2015). The parasitized penguin could have acquired this rare parasite by ingesting an uncommon prey item during migration to and from the southern coast of Brazil in the winter. Another, more feasible, hypothesis is that the penguin could have ingested an unusual prey item infected with *Contracaecum* sp. larvae by feeding at the zoo. New findings and morphological studies on a larger number of specimens can test this hypothesis. The morphological features described above are convincing and would support the description of a new species according to the unusual arrangement of male caudal papillae and interlabial shape never seen in other known *Contracaecum* species. However, sufficient specimens weren't available to justify a formal description. If this were possible, a new and fifth *Contracaecum* morphotype might be proposed that bears 4 proximal precloacal caudal papilla pairs comprised by the PTS zone, 2 proximal postcloacal papilla pairs adacloacal, 1 double postparacloacal pair, 3 distal subventral pairs, 2 sublateral pairs, and 1 phasmid pair.

Finally, according to the morphometric features of the unique *C. spheniscus* specimen described and drawn by Boero and Led (1971), which was not deposited in any reference collection, we believe that it belongs to a juvenile male of *C. pelagicum* (Table I).

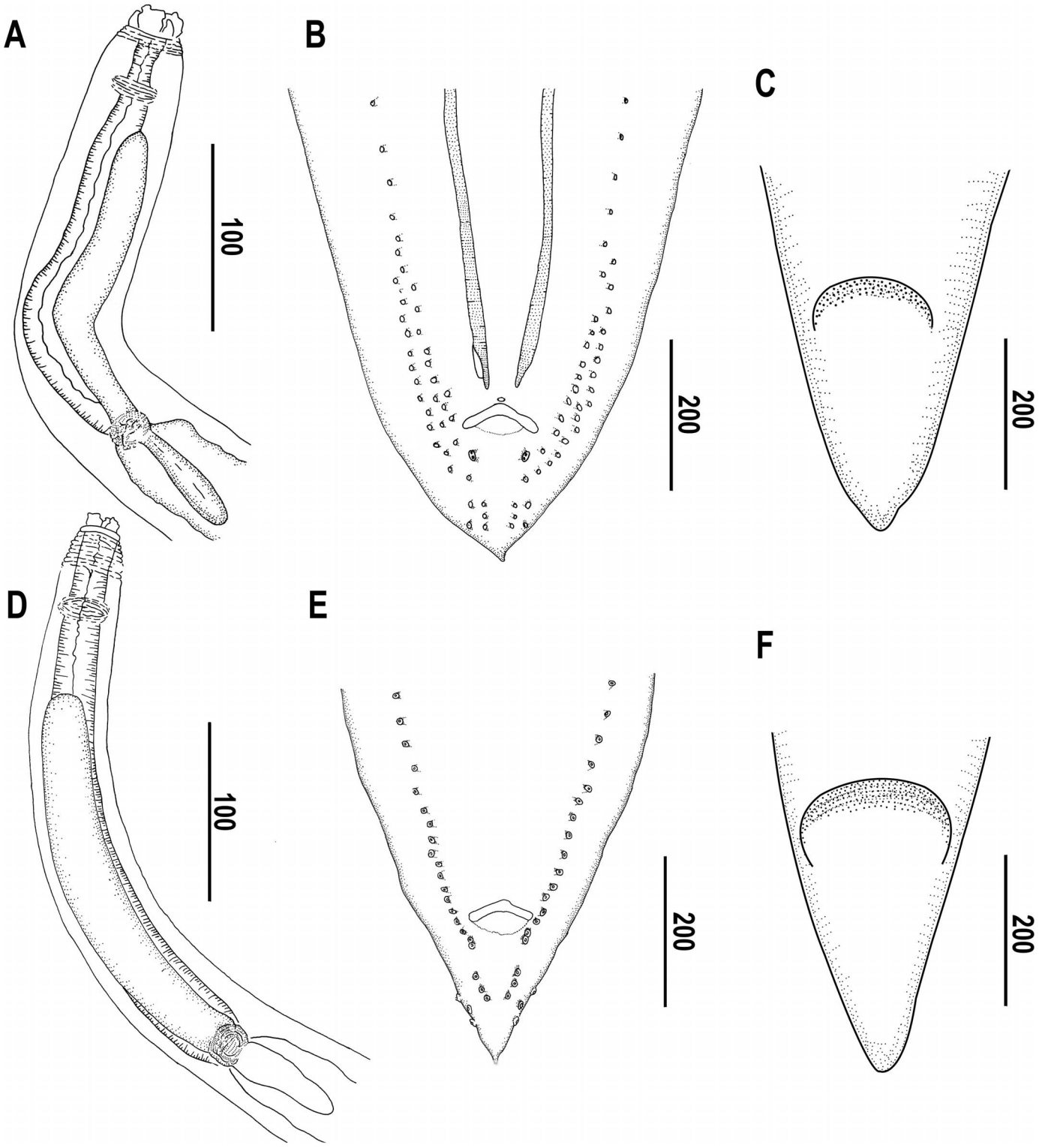

Figure 3. (**A–C**) Drawings of *Contracaecum mirounga* Nikolskiy, 1974 parasitizing *Spheniscus magellanicus* from Península Valdés coast, Chubut Province. (**A**) Anterior end, lateral view; note lips, cephalic collar, nerve ring, esophagus, intestinal cecum, ventriculus, ventricular appendix. (**B**) Posterior male end; note pre- and postcloacal papilla distribution, spicules, cloaca. (**C**) Posterior female end; note cloaca. (**D–F**) Drawings of *Contracaecum* sp. parasitizing *Spheniscus magellanicus* from the Buenos Aires Province coast. (**D**) Anterior end, lateral view; note lips, cephalic collar, nerve ring, esophagus, intestinal cecum, ventriculus, ventricular appendix. (**E**) Posterior male end; note pre- and postcloacal papilla distribution, cloaca. (**F**) Posterior female end; note cloaca.

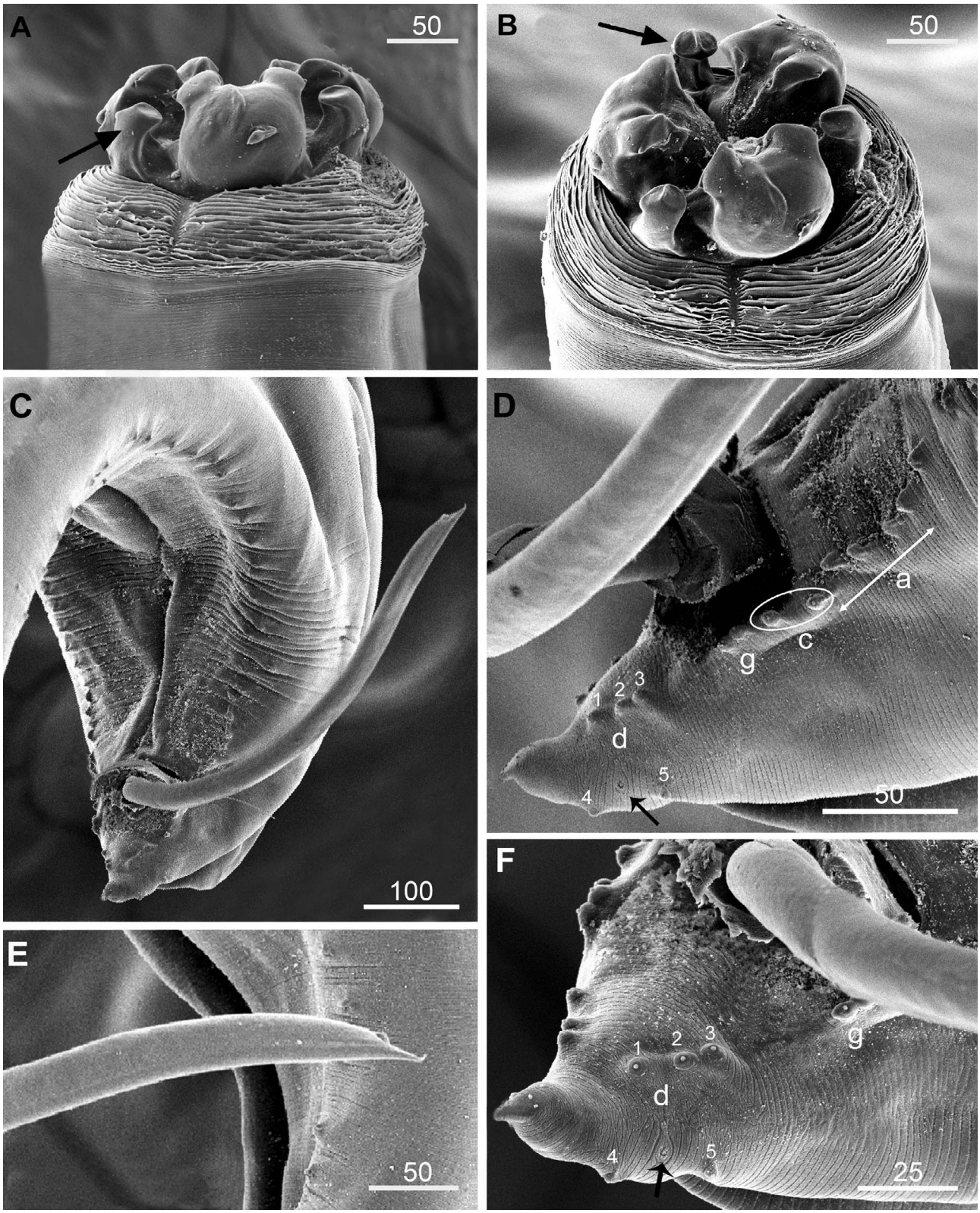

Figure 4. Scanning electron micrographs of *Contracaecum* sp. parasitizing *Spheniscus magellanicus* from the Buenos Aires Province coast. (**A**) Anterior end, lateral view; note lateroventral lip, lobed auricles with sensory tips, labial papilla, interlabium with a biconcave apex (black arrow), cephalic collar with a v-shaped lateral region. (**B**) Anterior end, laterodorsal view; note lateroventral lip, lobed auricles with sensory tips, labial papilla, interlabium with a biconcave apex (black arrow), cephalic collar with a v-shaped lateral region. (**C**) Male posterior end, note spicule, post- and precloacal papillae, cloaca. (**D**) Male posterior end. (**E**) Detailed distal spicule end. (**F**) Male posterior distal end (**a**, precloacal transverse striae zone with proximal precloacal caudal papillae; **c**, adacloacal papillae; **d**, subterminal papillae, subventrals [1, 2, 3], sublaterals [4, 5], phasmids [black arrow]; **g**, double postparacloacal papilla.)

For this reason, we propose *C. spheniscus* as a junior synonym of *C. pelagicum*.

In the future, molecular studies could be helpful to determine the real diversity of *Contracecum* species parasitizing *S. magellanicus*, taking into account the large number of sibling species currently recognized among the Anisakidae.

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