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A NEW ANISAKID SPECIES PARASITIZING THE IMPERIAL CORMORANT *PHALACROCORAX ATRICEPS* FROM THE NORTH PATAGONIAN COAST, ARGENTINA

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ABSTRACT: The anisakid species *Contracaecum chubutensis* n. sp. was found parasitizing the imperial cormorant *Phalacrocorax atriceps* at 2 different localities, Bahía Bustamante (45°11′S, 66°30′W) and Puerto Madryn (42°47′S, 65°02′W) on the Patagonian coast. Morphometrical analysis and further studies of adult specimens of *C. chubutensis* n. sp. and fourth-stage larvae of *Contracaecum* sp. were done using light and scanning electron microscopy. The possession and disposition of 7 pairs of tail papillae differentiate this new species from *C. osculatum*, *C. radiatum*, *C. plagiaticium*, and *C. mirounga*. Double-sized spicules separate it from *C. variegatum* and *C. pelagicum*. Moreover, the paracloacal papillae disposition and tail shape differentiate this new species from *C. travassosi*. The presence of bifurcated interlabia separate it from *C. ogmorhini* and *C. margolisi*. Three well-marked lip notches, a sharp tail shape, and the of the transversal paracloacal papillae disposition distinguishes *C. chubutensis* n. sp. from *C. magnipapillatum* and *C. septentrionale*. The species here described can be differentiated from *C. caballeroi* by its bifurcated interlabia, longer spicules, and for possessing more precloacal papillae pairs. It can be separated from *C. rudolphii* by a thinner interlabia at the base, deeper lip notches, a sharper tail, the disposition of transversal paracloacal papillae, and greater distance between both papillae of the first subventral distal papillae pair. In addition, fourth-stage larvae recovered from the same host and localities were identified and described as *Contracaecum* sp. Prevalence of adult parasites was 66.7 %, mean intensity was 4.0, and mean abundance was 7.1.

Species of *Contracaecum* Raillet and Henry, 1912 are associated with fresh and brackish water, as well as marine systems; the definitive hosts are piscivorous birds and mammals (Anderson, 2000). Garbin, Navone, et al. (2007) summarized the records of the genus in Argentina and redescribed *Contracaecum pelagicum* Johnston and Mawson, 1942 in *Spheniscus magellanicus* Foster (Sphenisciformes: Spheniscidae) and *Thalassarche melanophris* Temminck (Procellariformes: Diomedeidae) at Península Valdés. *Contracaecum* species parasitizing cormorants on the southwestern Atlantic coast include *C. travassosi* Gutiérrez, 1943, which was described from *Phalacrocorax atriceps* (=*P. albiventer*) Lesson (Pelecaniformes: Phalacrocoracidae) from Península Valdés, Argentinean seacoast, and *C. caballeroi* Bravo Hollis, 1939 in *P. brasilianus* (=*P. olivaceus*) from the Uruguayan coast (Gutiérrez, 1943; Lent and Freitas, 1948). Later, Malacalza et al. (1998) found *Contracaecum* sp. in regurgitated pellets of *P. atriceps* (=*P. albiventer*) from Punta León, Chubut Province, Argentina.

The imperial cormorant *P. atriceps* King (both color morphs ''*atriceps*'' and ''*albiventer*,'' sensu Rasmussen, 1994) is one of several that breed along the southern coast of South America (Punta et al., 1993; Malacalza and Bertellotti, 2001; Punta et al., 2003). It is a relatively abundant seabird on the Argentine coasts and southern islands (Frere et al., 2005), but is distributed throughout the Southern Hemisphere south of 45° latitude, reaching the South African islands and New Zealand (Behn et al., 1955; del Hoyo et al., 1996). Although information on its diet is scarce, fishes and marine invertebrates are thought to be the main prey items (Espitalier-Noel et al., 1987; Gosztongyi and Kuba, 1998).

The aim of the present paper is to describe adults of a new species of *Contracaecum* and fourth-stage larvae of *Contracaecum* sp. parasitizing the imperial cormorant *P. atriceps* from 2 different breeding sites in Chubut Province, Argentina. Morphological details observed using scanning electron microscopy (SEM). In addition, data regarding prevalence, mean intensity, and abundance of infection of adults are provided.

MATERIAL AND METHODS

At irregular intervals from 1999 to 2006, 12 dead imperial cormorants were collected from nesting sites on Bahía Bustamante (n = 10; 45°11′S, 66°30′W) and Puerto Madryn (n = 2; 42°47′S, 65°02′W), Chubut Province, Argentina. All birds, which were in good condition, were dissected and the digestive tracts fixed in 10% formalin. In addition, regurgitated pellets from imperial cormorants from the first locality were collected and fixed in 10% formalin. In the laboratory, viscera and pellets were examined using stereomicroscopy; nematodes were removed and stored in cold 70% ethanol. Twenty adult nematodes (10 males and 10 females) and 10 fourth-stage larvae from Bahía Bustamante, and 8 adults (5 males and 3 females) and 10 fourth-stage larvae from Puerto Madryn, were cleared in lactophenol and examined by light microscopy. Drawings were made with the aid of a drawing tube.

Some specimens were dried by the critical point method, then observed and photographed using a SEM (JSV 6063 LV; Jeol, Akishma City, Tokyo, Japan). Unless otherwise stated, measurements are given in millimeters; those of paratypes (including holotype and allotype) are expressed by the mean followed by the range in parentheses. Spatial location of papillae was described according to Fagerholm (1990), except for distal papillae, which were identified as subventral and laterodorsal.

Prevalence (P), mean intensity (MI), and mean abundance (A) followed Bush et al. (1997) and were calculated separately for adult and larval infections from Bahia Bustamante. Holotype, allotype, and paratypes specimens were deposited in the Helminthological Collection of Museo de La Plata (CHMLP).

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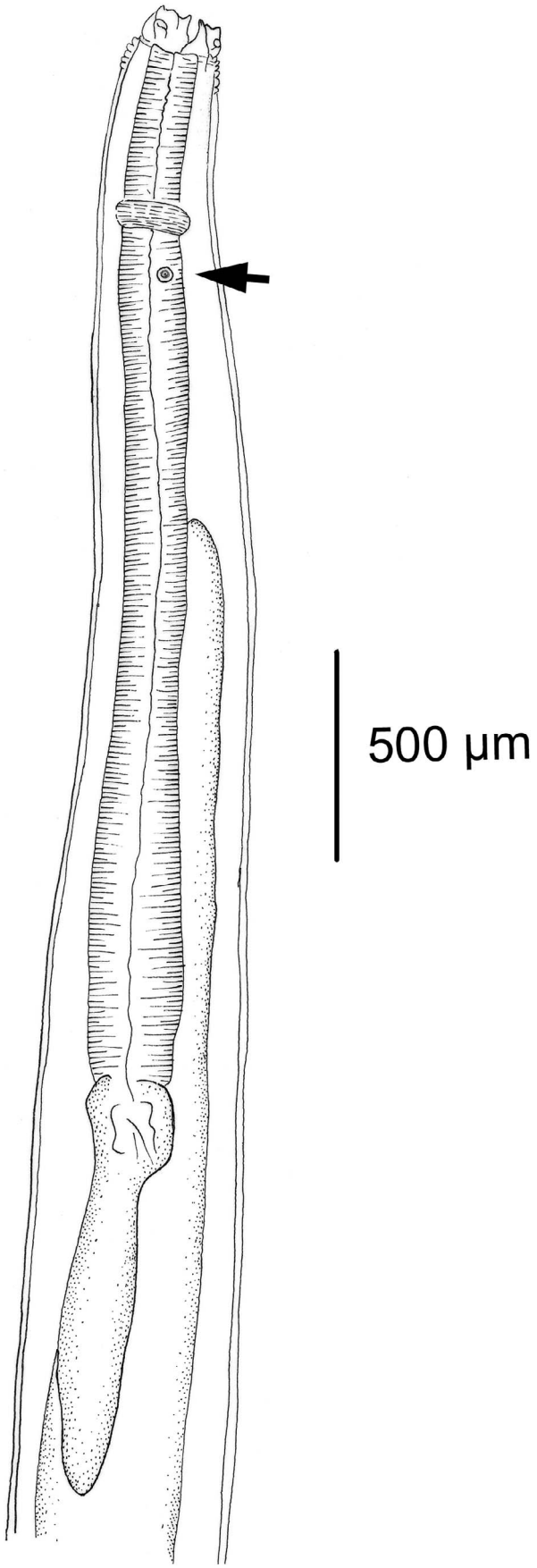

***Contracaecum chubutensis* n. sp.**

(Figs. 1–10; Table I)

Description

General morphology (20 adult specimens from P. atriceps from Bahía Bustamante): Entire body transversally striated (Figs. 2, 3, 6, 7). Conspicuous cephalic collar, with deep concentric anteriorly directed free edges and narrow V-shaped lateral region without striations (Figs. 3–6). Lips with 3 apical notches, central notch deeper and larger than lateral notches (Figs. 3–6); with 2 auricles, each with processes placed obliquely to body's longitudinal axis, with a sensory pit at distal end at level of apical notches (Figs. 3–6, see arrows). Large double lip papillae, 2 on the dorsal lip and 1 on each ventrolateral lip (Figs. 3, 4, 6). Three triangle-shaped bifurcated interlabia shorter than lips (Figs. 2–6). Inconspicuous button-shaped deirids (Figs. 1, 2, see arrows).

Male (holotype): Body length 25.92. Maximum body width 0.83. Distance from anterior end to nerve ring and deirids 0.58 and 0.66, respectively. Esophagus length 3.62; intestinal caecum length 2.41; ventriculus length 0.30; ventricular appendix length 0.80 (Fig. 1). Spicules of equal length reaching almost half of body. Spicules length 10.82 (Fig. 9). Tail length 0.19 (Fig. 10). Caudal extremity conical, bearing 39 pairs of precloacal papillae. Pts zone including 3 pairs of precloacal papillae (Fig. 7). Seven pairs of postcloacal papillae; 2 large paracloacal pairs situated aside cloaca, in transversal position to body axis, 2 subventral pairs, 2 sublateral pairs, and 1 pair of phasmids among latter ones (Figs. 7, 10). Distal spicule tip extended and pointed length of free distal end longer than spicule width (0.057 vs. 0.024). Spicule wings slope distally toward shaft and inserted at different points (Figs. 8, 10) (male paratypes, see Table I).

Female (allotype): Body length 29.20. Maximum body width 0.99. Distance from anterior end to nerve ring and deirids 0.54 and 0.63 respectively. Esophagus length 3.12; intestinal caecum length 2.08; ventriculus length 0.25; ventricular appendix length 0.66. Vulva in anterior half of body. Distance from anterior end to vulva 8.72. Tail length 0.40. Embryonated egg (n = 10) diameter 0.069 (0.065–0.074) (female paratypes, see Table I continued).

Taxonomic summary

Type host: Phalacrocorax atriceps King (Aves: Phalacrocoracidae).

Type locality: Bahía Bustamante (45°11′S, 66°30′W), Chubut Province, Argentina.

Other localities: Puerto Madryn (42°47′S, 65°02′W), Chubut Province, Argentina.

Infection site: Stomach.

Prevalence: 60% (6/10) from Bahía Bustamante.

Mean intensity: 4.0.

Mean abundance: 2.67.

Specimens deposited: Holotype (male) (5748 CHMLP), allotype (female) (5749 CHMLP), and 18 paratypes (5750 CHMLP); Helminthological Collection of Museo de La Plata, La Plata, Buenos Aires, Argentina.

Remarks

Contracaecum chubutensis n. sp. can be differentiated from other *Contracaecum* species parasitizing sea mammals that overlap their geographic distribution in the southern Atlantic Ocean with that of Phalacrocoracidae, such as *C. osculatum* (Rudolphi, 1802), *C. radiatum* (Linstow, 1907), *C. ogmorhini* s. s. Johnston and Mawson, 1941, *C. mirounga* Nikolskii, 1974, and *C. margolisi* Mattiucci et al., 2003, by its bifid interlabia (Baylis, 1936; Fagerholm, 1988; Fagerholm et al., 1996; Mattiucci et al., 2003).

From the *Contracaecum* species that parasitize seabirds, *C. variegatum* Rudolphi, 1809 from *Gavia stellata* (Pontoppidan) (Gaviidae), *C. pelagicum* from *Spheniscus magellanicus* Foster (Spheniscidae), *C.*

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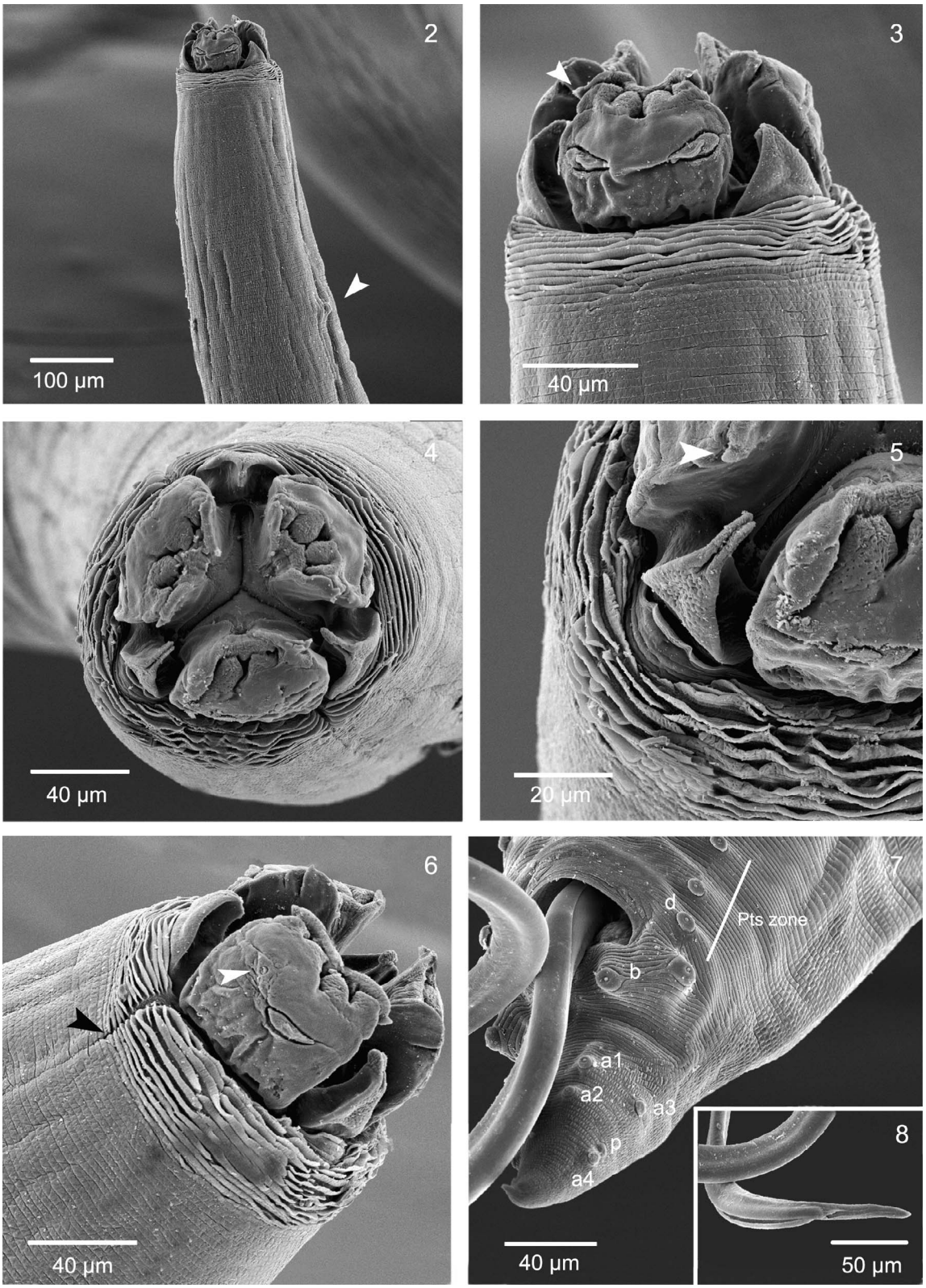
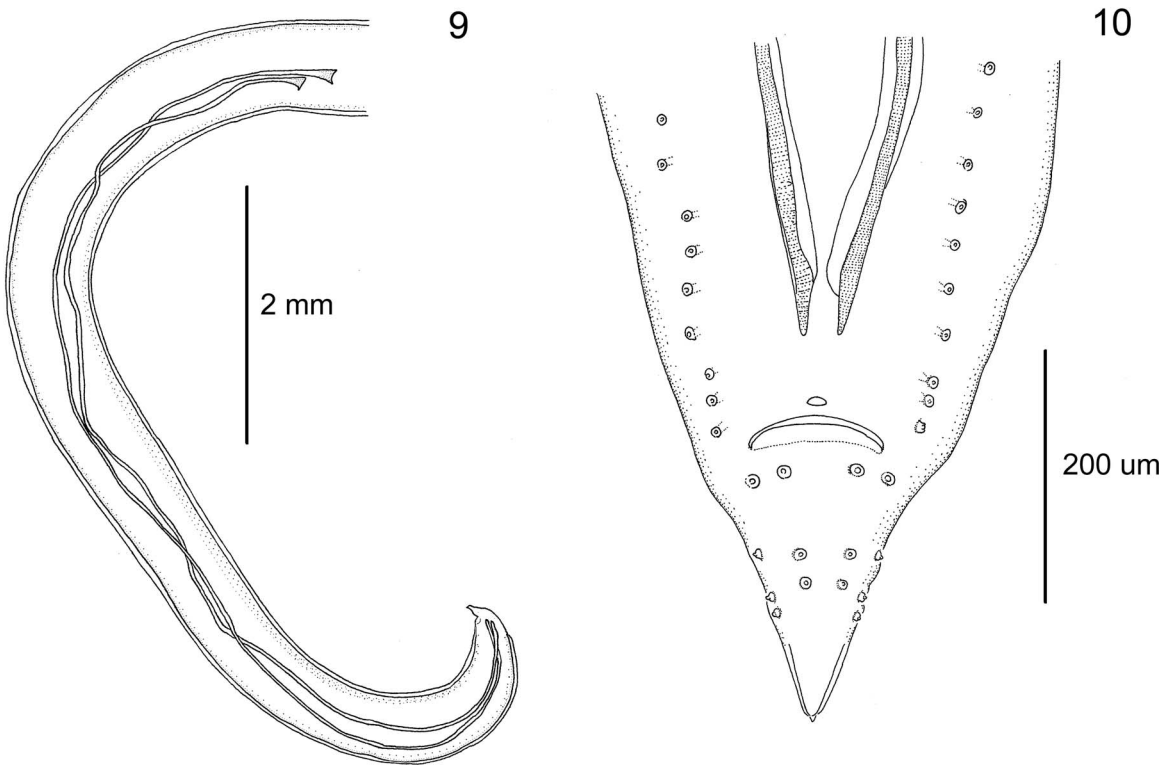
FIGURE 1. *Contracaecum chubutensis* n. sp. from *P. atriceps* from the Chubut province coast. Anterior end, lateroventral view, nerve ring, esophagus, intestinal caecum, ventriculus, ventricular appendix, and deirid (arrow).



FIGURES 2–8. *Contracaecum chubutensis* n. sp. from *P. atriceps* from the Chubut province coast. (**2**) Anterior end details, deirid (arrow); (**3**) anterior end, laterodorsal view, cephalic collar, dorsal lip, interlabia, cephalic lip papillae, lip auricle tip (arrow); (**4**) anterior end, apical view, lips, bifid interlabia, cephalic lip papillae, auricles, and lip notches; (**5**) interlabium details, lip notches, lip auricle tip (arrow), and excretory pore; (**6**) anterior end, laterodorsal view, ventrolateral lip, double cephalic lip papilla, amphid (white arrow) cephalic collar, and V-shaped lateral region without striations (black arrow); (**7**) posterior male end, postcloacal papillae distribution: distal subventral papillae [a1–a2], distal sublateral papillae [a3–a4], post paracloacal papilla pair [b], proximal precloacal papillae [d], phasmid [p]; (8) distal spicule end, lateroventral view.



FIGURES 9, 10. *Contracaecum chubutensis* n. sp. from *P. atriceps* from the Chubut province coast. (**9**) Posterior male extremity, whole spicules; (**10**) Posterior male extremity, distal spicule end, cloaca, precloacal papillae, postcloacal papillae.

eudyptulae Johnston and Mawson, 1944 from *Eudyptula minor* (Forster) (Spheniscidae), and *C. plagiaticium* Lent and Freitas, 1948 from *Nycticorax nycticorax naevius* (Bodd.) (Ardeidae) are similar to this new species in having bifurcated interlabia (Johnston and Mawson, 1944; Fagerholm et al., 1996). However, *C. variegatum* possesses a longer interlabium, thinner at base with a more conspicuous furrow, more than a double number of precloacal papillae, shorter spicules (4.40–4.86 vs. 5.88–12.60), and, therefore, larger body-to-spicule length ratio (4.00–6.50 vs. 2.18–3.13) (Fagerholm et al., 1996). *Contracaecum pelagicum* can be differentiated from *C. chubutensis* n. sp. mainly for their shallower lip notches, rounded lips, prominent auricle and lip papillae, shorter spicules (3.07–5.07 vs. 5.88–12.60), and greater body-to-spicule length ratio (3.40–5.10 vs. 2.18–3.13) (Garbin, Navone, et al., 2007). *Contracaecum eudyptulae* has shorter intestinal caecum, fewer precloacal and postcloacal papillae pairs (12 and 6, respectively), and an oblique paracloacal papillae disposition (Johnston and Mawson, 1944). *Contracaecum plagiaticium* has shorter spicules (2.32–3.49 vs. 5.88–12.60), greater body-to-spicule length ratio (4.80–5.40 vs. 2.18–3.13), and 8 postcloacal papillae pairs (1 more subventral papillae pair) (Lent and Freitas, 1948). *Contracaecum magnipapillatum* (=*C. magnicollare* Johnston and Mawson, 1941) from *Anous minutus* Chapin (Laridae) and *C. septentrionale* Kreis, 1955 from *P. aristotelis* (Linnaeus) (Phalacrocoracidae) share some morphological features with the new species such the number and spatial distribution pattern of postcloacal papillae. However, they differ from each other for the absence of bifurcated interlabia (Johnston and Mawson, 1941; Gutierrez, 1943; Kreis, 1955; Hartwich, 1964; Fagerholm et al., 1996).

Among *Contracaecum* species parasitizing species of Phalacrocoracidae from the southestern South American coast, *C. travassosi* from *P. atriceps* (= *P. albiventer*) can be differentiated from *C. chubutensis* n. sp. by its blunt tail shape with a constriction at the proximal subventral papillae level, paracloacal papillae disposition oblique 45° to the body longitudinal axis, and shallow lip notches (Gutierrez, 1943). *Contracaecum caballeroi*, from the Neotropic cormorant *P. brasilianus*, can be distinguished from the new species by its lack of bifurcated interlabia, much shorter spicules (0.90–1.09 vs. 5.88–12.60), and larger body-to-spicule length ratio (24.74–26.98 vs. 2.18–3.13) (Lent and Freitas, 1948). *Contracaecum rudolphii* Hartwich, 1964 s.l. from *P. carbo* is the most similar species to *C. chubutensis* n. sp. However, it can be distinguished from the new species by its rounded lips with more exaggerated papillae, blunt tail shape with a constriction at the proximal subventral papillae level, oblique and closer paracloacal papillae disposition, first distal subventral papillae pair more separate each other (42–50 μm vs. 37 μm), and shorter and blunter free distal spicule end (≈30 μm vs. 58 μm) (Hartwich, 1964; Barus et al., 2000; Abollo et al., 2001; Amato et al., 2006).

***Contracaecum* sp.**

(Figs. 11–14; Table II)

Description

Fourth-stage larvae (L4) (10 specimens from Bahía Bustamante): Cuticle transversally striated, specially marked at anterior extremity and forming a developed cephalic collar (Figs. 12, 13). Oral opening with 3 well-developed lips with conspicuous winglike processes on their anterior corners (Figs. 12, 13). Dorsal lip bearing 2 internal papillae and 2 small cephalic papillae (Fig. 12). Each ventrolateral lip possesses a single internal papilla (Fig. 12). Excretory pore opening right beneath the ventrolateral lips (Fig. 12, see arrow). Deirids nonconspicuous, located just posterior to the nerve ring (Fig. 11, see arrow). Ventriculus small and subspherical. Intestinal caecum dorsal to esophagus, longer than ventricular appendix (Fig. 11). Conical striated tail (Fig. 14).

Taxonomic summary

Infection sites: Esophagus and stomach.
Prevalence: 80% (8/10).
Mean intensity: 8.5.
Abundance: 7.1.
Specimens deposited: Paratypes (5751 CHMLP); Helminthological Collection of Museo de La Plata, La Plata, Buenos Aires, Argentina.

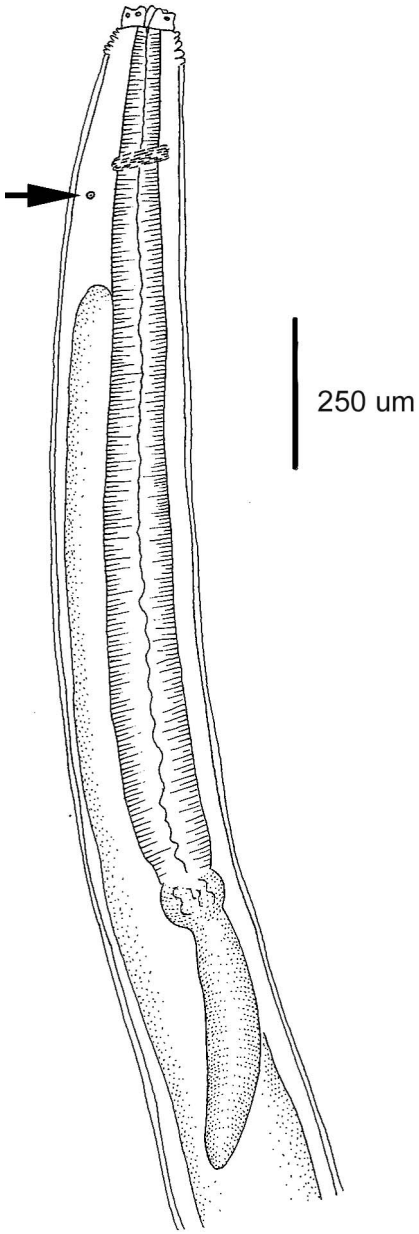


FIGURE 11. *Contracaecum* sp. from *P. atriceps* from the Chubut province coast. Fourth-stage larvae (L4): anterior end, esophagus, intestinal caecum, ventriculus, ventricular appendix, and deirid (arrow).

Remarks

The presence of an intestinal caecum and ventricular appendix and the position of the excretory pore right beneath the ventrolateral lips allow the inclusion of these larvae as a species of *Contracaecum*. The lips are well developed, but interlabia are lacking, which usually characterizes fourth-stage larvae (Berland, 1989; Fagerholm, 1990; Fagerholm et al., 1996). To date, there are few descriptions of *Contracaecum* spp. fourth-stage larvae in birds. *Contracaecum magnipapillatum* fourth-stage larvae found by Fagerholm et al. (1996) in *Anous minutus* possess large winglike expanded auricles. Fourth-stage larvae of *C. rudolphii* from *P. carbo* (Linnaeus) have an interlabium, a feature not usually present in this larval stage (Barus et al., 2000); perhaps these specimens might belong to immature adult specimens (Garbin, Navone, et al., 2007). *Contracaecum osculatum* fourth-stage larvae do not have auricle expansions, which differentiate them from larval specimens described in this work. The present fourth-stage larvae seem to be similar to those described by Garbin, Navone, et al. (2007) from *S. magellanicus*. They agree with almost all of the morphometrical features except the ventricular appendix length and ventriculus plus ventricular appendix length, greater in the former, and the excretory gland distance to the anterior end, greater in the latter. According to the similarities among larvae of this genus, it is impossible to assign present specimens to a given species without experimental infections or molecular genetic analysis.

DISCUSSION

Differences mentioned above allow for the separation of *C. chubutensis* n. sp. from *C. rudolphii*, *C. travasossi*, and *C. caballeroi*, which are the closest related species. Thus, differences such as the postcloacal spatial papillae distribution, tail shape, mouth, and spicules are strong enough to discriminate these species from *C. chubutensis* n. sp.

There are several studies dealing with the diet of *P. atriceps* diet along the Chubut coast. *Engraulis anchoita* and nototheniid fishes constitute some of the most frequent *P. atriceps*' prey items, whereas *Odontesthes* spp., *Merluccius hubbsi*, and *Eleginops maclovinus* are consumed in smaller quantities (Punta et al., 1993; Malacalza et al., 1994; Punta et al., 2003; Gosztonyi and Kuba, 1998). Some of these fish species were analyzed for parasites in the same locality, e.g., *M. hubbsi*, *E. anchoita*, and *Odontesthes* spp., and *Contracaecum* third-stage larvae were found (Sardella and Timi, 1996; Timi et al., 2001; Sardella and Timi, 2004; Garbin, Navone et al., 2007; C. Carballo, unpubl. obs.). However, studies based on collections and inspection of these nototheniid prey items at the foraging area and prospection for the endoparasite could confirm the *C. chubutensis* n. sp. transmission.

Molecular genetic studies of nematodes, such as those carried out by Nascetti et al. (1993) and Mattiucci et al. (1997) on the *Anisakis simplex* complex, and other authors on *Contracaecum* spp. (Mattiucci et al., 2002, 2003; Li et al., 2005; Mattiucci et al., 2007) would help to establish the specific relationship between third-stage larvae of *Contracaecum* species found in prey of *P. atriceps*, and those of fourth-stage larval *Contracaecum* and adults found in the digestive tract of this bird and other host species studied in the same area, i.e., *S. magellanicus*, *P. brasilianus*, and *T. melanophris*.

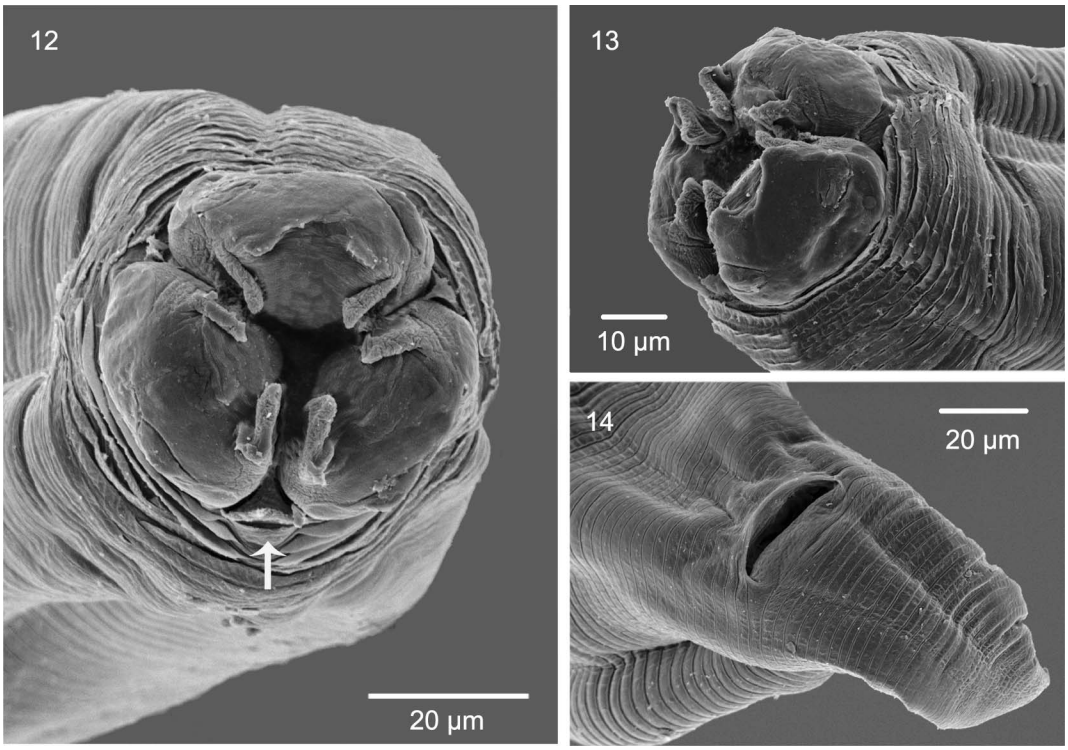
Mean intensity and abundance of infection by *Contracaecum* spp. from different *Phalacrocorax* spp. in the region are higher in comparison to those from the present work (Torres et al., 2000; Amato et al., 2006). Low mean intensity and abundance values of infection could be related to both the regurgitation habit of this bird and to the low mean intensity and prevalence of *Contracaecum* larvae in the prey items consumed by *Phalacrocorax atriceps*. In this sense Malacalza et al. (1994) suggested that the regurgitation of *P. atriceps* (=*P. albiventer*) would be a depuration mechanism since high nematode intensities were found in regurgitated pellets. In adittion, Garbin, Diaz, et al. (2007) observed low mean intensity (2.81) and abundance (1.47) of *Contracaecum* spp. third-stage larvae parasitizing *E. anchoita* from the Chubut province sea coast.

Future molecular studies could be carried out to confirm the validity of *C. chubutensis* n. sp., considering that most of the nominal species of anisakid nematodes now comprise several sibling species that cannot be recognised by only morphological analysis (Mattiucci et al., 2002; Li et al., 2005; D'Amelio et al., 2007; Mattiucci et al., 2008).

TABLE I. Morphometrical data of *Contracaecum chubutensis* n. sp. adults from *P. atriceps* at 2 different Argentinean coastal sites.

	C. rudolphii Hartwich, 1964	*C. caballeroi* Bravo Hollis, 1939	*C. travassosi* Gutiérrez, 1943	*C. chubutensis* n. sp.	*C. chubutensis* n. sp.
References	Hartwich (1964), Barus (2000), Abollo (2001)	Gutiérrez (1948)	Gutiérrez (1943)	Present paper	Present paper
Type host	*P. carbo, Phalacrocorax* spp.	*Anhinga anhinga*	*P. atriceps*	*P. atriceps*	*P. atriceps*
Other hosts	Phalacrocoracidae, Charadriformes, Ciconiformes	*P. brasilianus*	—	—	—
Localities	Cosmopolitan	México, Uruguay	Chubut Province, Argentina	Bahía Bustamante, Chubut Province, Argentina	Puerto Madryn, Chubut Province, Argentina
Males (n)	39	3	no data	10	5
Body length	12.10–33.90	24.29–26.97	16.10–25.40	25.06 (14.32–38.58)	19.39 (11.60–28.51)
Maximum body width	0.24–0.95	0.53–0.64	0.70–1.10	0.77 (0.43–0.98)	0.65 (0.58–0.74)
Nerve ring (dae)	—	0.43–0.45	0.45–0.64	0.52 (0.36–0.60)	0.47 (0.33–0.55)
Deirids (dae)	—	0.44–0.48	—	0.64 (0.46–0.84)	0.57 (0.43–0.66)
Esophagus length	2.03–4.26	3.18–3.48	2.80–4.10	3.39 (2.32–4.50)	2.83 (2.08–3.93)
Intestinal caecum length	1.53–3.68	2.71–3.01	1.90–3.20	2.25 (1.50–2.76)	2.17 (1.58–3.04)
Ventriculus length	—	0.10–0.10	—	0.23 (0.13–0.30)	0.18 (0.15–0.21)
Ventricular appendix length	—	0.51–0.61	0.74–1.30	0.67 (0.46–0.80)	0.64 (0.48–0.75)
Spicule length	4.05–9.98	0.90–1.09	7.70–11.10	9.95 (6.40–12.60)	8.43 (5.34–10.35)
Tail length	0.14–0.24	0.13–0.15	0.19–0.26	0.20 (0.17–0.26)	0.20 (0.15–0.25)
PrPP	27–43	40	26–30	35–43	35–36
BL/MBW	52.3 (29.4–98.1)	42.14–45.83†	23.00–23.09†	33.19 (27.68–39.32)	29.76 (19.97–46.66)
BL/EL	8.0 (5.25–10.8)	7.64–7.75†	5.75–6.19†	7.33 (6.15–9.27)	6.74 (4.87–7.54)
BL/TL	131.8 (74.1–197.2)	179.80–186.84†	84.74–97.69†	124 (83.74–214.32)	94.5 (72.34–113.13)
EL/ICL	1.3 (1.11–1.54)	1.16–1.17†	1.28–1.49†	1.52 (1.44–1.63)	1.30 (1.26–1.36)
EL/VAL	3.25 (1.82–4.25)	5.70–6.23†	3.15–3.78†	4.90 (3.49–6.02)	4.78 (4.20–5.20)
BL/SL	3.86 (2.06–5.69)	24.74–26.99†	2.09–2.28†	2.58 (2.18–3.14)	2.51 (2.24–2.75)
Females (n)	36	—	No data	10	2
Body length	10.10–57.60	—	22.7–31.5	29.60 (21.98–35.33)	17.97 (15.30–20.64)
Maximum body width	0.29–1.51	—	1.10–1.50	0.90 (0.61–1.27)	0.75 (0.61–0.89)
Nerve ring (dae)	—	—	0.59–0.73	0.56 (0.48–0.62)	0.63 (0.52–0.74)
Deirids (dae)	—	—	—	0.69 (0.58–0.80)	0.66 (0.55–0.76)
Esophagus length	1.62–5.48	—	3.50–4.80	3.05 (1.19–4.28)	2.74 (2.36–3.12)
Intestinal caecum length	1.28–4.12	—	2.70–4.20	1.91 (1.08–2.93)	1.88 (1.60–2.16)
Ventriculus length	—	—	0.89–1.60	0.24 (0.16–0.26)	0.18 (0.16–0.21)
Ventricular appendix length	—	—	—	0.74 (0.66–0.94)	0.63 (0.58–0.68)
Vulva (dae)	5.12–17.7	—	18.60–21.00	9.57 (8.32–11.56)	7.63 (6.54–8.72)
Tail length	0.19–0.63	—	0.43–0.54	0.41 (0.30–0.65)	0.36 (0.30–0.41)
Embrionated egg	0.059–0.073	—	0.068	0.070 (0.06–0.07)	0.068

* dae = distance from anterior end; PrPP = Precloacal papillae pairs; BL/MBW = Body length/Maximum body width ratio; BL/EL = Body length/Esophagus length ratio; BL/TL = Body length/Tail length ratio; EL/ICL = Esophagus length/Intestinal caecum length ratio; EL/VAL = Esophagus length/Ventricular appendix length ratio; BL/SL = Body length/spicule length ratio.
† = ratios calculate with maximum and minimum values.



FIGURES 12–14. *Contracaecum* sp. from *P. atriceps* from the Chubut province coast. Fourth-stage larvae (L4): (**12**) anterior end, apical view, lips with wing-like processes, internal and cephalic lip papillae, excretory pore (arrow), cephalic collar; (**13**) anterior end, laterodorsal view, lips with wing-like processes, internal and cephalic dorsal lip papillae, cephalic collar; (**14**) posterior extremity, anus, and striations.

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TABLE II. Morphometrical data of *Contracaecum* sp. fourth-stage larvae in *P. atriceps* at two different Argentine coastal sites. Means are followed by the standard deviation.

	Contracaecum sp.	*Contracaecum* sp.
References	Present	Present
Type host	*P. atriceps*	*P. atriceps*
Locality	Bahía Bustamente, Chubut Province, Argentina	Puerto Madryn, Chubut Province, Argentina
Individuals (*n*)	10	10
Body length	5.67 ± 2.05 (3.22–7.88)	7.23 ± 1.28 (5.72–9.14)
Maximum body width	0.24 ± 0.08 (0.13–0.36)	0.25 ± 0.04 (0.18–0.32)
Anterior end to nerve ring	0.24 ± 0.05 (0.15–0.29)	0.28 ± 0.05 (0.21–0.36)
Deirids (dae)	0.30 ± 0.11 (0.17–0.40)	0.39 ± 0.11 (0.24–0.56)
Esophagus length	1.14 ± 0.44 (0.51–1.72)	1.17 ± 0.16 (0.93–1.43)
Intestinal caecum length	0.74 ± 0.35 (0.26–1.24)	0.69 ± 0.12 (0.56–0.90)
Ventricular appendix length	0.48 ± 0.11 (0.36–0.60)	0.45 ± 0.14 (0.40–0.52)
Ventriculus + ventricular appendix length	0.50 ± 0.14 (0.28–0.70)	0.55 ± 0.09 (0.45–0.70)
Excretory gland (dpe)	2.31 ± 0.22 (2.16–2.56)	2.57 ± 0.28 (2.35–2.98)

* dae = distance from anterior end; dpe = distance from posterior end.

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