



Co-occurrence of *Pectinospirura argentata* Wehr, 1933, *Skrjabinoclava andersoni* n. sp. and larvae (Nematoda: Acuariidae) in the proventriculus of *Larus dominicanus* Lichtenstein (Aves: Laridae), with notes on their attachment

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Abstract

Pectinospirura argentata Wehr, 1933, *Skrjabinoclava andersoni* n. sp. and acuariid larvae, collected from the proventriculus of the kelp gull *Larus dominicanus* from coastal Buenos Aires, Argentina, are described. This is the first record of the genus *Pectinospirura* Wehr, 1933 from South America and from the kelp gull. The measurements of both sexes are given because there are some differences with previously described specimens of *P. argentata*; the male is smaller with smaller spicules and the female is larger with smaller eggs. *Skrjabinoclava andersoni* n. sp. can be distinguished for all other species in the genus by the morphology of both spicules and by the cuticle which is not inflated anteriorly. This genus is reported for the first time in the kelp gull and from Argentina.

Introduction

Acuarioid nematodes are parasites mainly of birds. They are generally found under the gizzard lining. However, a few live in the proventriculus or oesophagus, where they are frequently found attached (Anderson, 1992). The acuarioids are characterised by complex cephalic structures. The genera *Pectinospirura* Wehr, 1933 and *Skrjabinoclava* Sobolev, 1943 of the Acuariidae are parasites mainly of charadriid and scolopacid shorebirds (Chabaud, 1975).

The aim of this paper is to report and redescribe *Pectinospirura argentata* Wehr, 1933 and to describe a new species of *Skrjabinoclava* and some unidentified larvae from the proventriculus of a juvenile kelp gull *Larus dominicanus*. Moreover, we provide notes on their attachment to the wall of the proventriculus.

Materials and methods

A juvenile kelp gull was found dead at Balneario Orense (38°42'S, 59°47'W), a rocky part of the coast of Argentina. After dissection, the digestive tract was fixed in the field using 10% formalin. In the laboratory,

the nematodes found in the lumen of the proventriculus were removed and preserved in 70% alcohol. Some specimens were mounted in lactophenol and rolled under a coverslip to study various parts of the body from different angles. Drawings were made with the aid of the camera lucida (Olympus, CHB). Measurements are given in micrometres with the range in parentheses, except when otherwise indicated. Other specimens were dried using the critical point method for its study under the Scanning Electron Microscope (Jeol/SET100).

A piece of proventriculus with the attached worms was taken for histological study. It was dehydrated, embedded and sectioned (4–7 µm) following standard histologic procedures. Sections were stained with H & E and photographed.

Pectinospirura argentata Wehr, 1933

Description (Figure 1)

Male (N = 10). Length 5.78 (4.72–6.35) mm. Width at mid-body 252 (221–286). Buccal capsule 224 (195–247) in length. Nerve-ring 261 (219–325), excretory

pore 575 (507–750) and deirids 952 (741–1056) from anterior extremity. Cordons 870 (741–988) in length. Oesophagus 2.98 (2.32–3.33) mm in length. Muscular oesophagus 439 (300–555) and glandular oesophagus 2.55 (2.02–2.89) mm in length. Spicules dissimilar and unequal. Right spicule 159 (130–174) and left spicule 696 (650–780). Distal end of left spicule cup-shaped with dorsal appendage. Tail 250 (177–273) in length. Area rugosa consisting of 4 rows of narrow cuticular ridges, 750 long and beginning at 50 from anterior end of left spicule and ending near first pair of caudal papillae. Caudal extremity slightly curved ventrally, with narrow caudal alae bearing 4 pre-anal and 6 post-anal pairs of pedunculate papillae. One pair of sessile papillae located just ventral to last pair of pedunculate papillae. Phasmids present near tip of tail.

Female (N = 10). Length 6.56 (6.01–7.26) mm. Width at the level of vulva 459 (403–496). Buccal capsule 251 (225–270) in length. Nerve-ring 293 (240–390), excretory pore 627 (520–747) and deirids 955 (702–1,300) from anterior extremity. Cordons 903 (611–1,235) in length. Oesophagus 3.42 (3.05–3.62) mm in length. Muscular oesophagus 458 (330–561) and glandular oesophagus 2.98 (2.60–3.19) mm in length. Vulva in posterior quarter of body, 1.46 (1.33–1.61) mm from tip of tail. Monodelphic. Eggs 37 (33–44) × 21 (18–24), contain larvae. Tail 64 (56–78) in length. Conspicuous phasmids at tip of tail.

Host: *Larus dominicanus* Lichtenstein (kelp gull) (Aves: Laridae).

Locality: Balneario Orense (38°42'S, 59°47'W), coast of Buenos Aires Province, Argentina.

Material: Specimens deposited in the Museo de La Plata, La Plata, Argentina, Helminth. Coll. No. 40,064.

Site: Proventriculus.

Intensity: 106 females and 85 males from one host.

Comments

The general characteristics show a close resemblance to *P. argentata*, which was redescribed by Wong & Anderson (1982), but there are some points of deference. The male described here is smaller (5.78 (4.72–6.35) mm) than that described by Wong & Anderson (1982) [6.9 (6.1–7.6) mm] and the spicules are shorter: right spicule 159 (130–174) [Wong & Anderson: 183 (160–205)]; left spicule: 696 (650–780) [Wong & Anderson: 808 (770–850)]. The female is larger (6.56

(6.01–7.26)) [Wong & Anderson: 6.1 (5.8–6.4) mm] with smaller eggs (37 (33–44)) [Wong & Anderson: 44 (42–49)]. Two pairs of papilla-like structure are visible on the pseudolabia under both LM and SEM (Figure 1a). The deirids consist of two rows of spines, one of large spines and the second of small spines situated just above the first, and are located immediately posterior to the cordons (Figure 1b). The ultrastructure of the cordons indicates that they are formed by superposed layers of longitudinal striations and irregular denticles (Figure 1c).

Skrjabinoclava andersoni n. sp.

Description (Figures 2–3)

General morphology. Acuarioidea, Acuariidae, Acuariinae, *Skrjabinoclava* Sobolev, 1943. Cordons as long as wide, recurrent. Body spines forming expanded arch posterior to cordons and decreasing in size posteriorly. Cuticle not inflated in anterior region.

Male (N = 10). Length 2.62 (2.25–2.97) mm. Width at mid-body 105 (84–117). Buccal capsule 115 (105–123) in length. Nerve ring 127 (114–135), excretory pore 192 (150–270) and deirids 48 (39–57) from anterior extremity. Cordons 39 (30–45) in length and 41 (36–45) in width. Oesophagus 1.08 (1.01–1.14) mm in length. Muscular oesophagus 185 (168–213) and glandular oesophagus 945 (840–1209) in length. Spicules dissimilar and unequal. Right spicule 83 (69–96), in form of scalpel blade; left spicule 381 (360–435), ventrally curved at both ends, surrounded by a transparent cuticle. At end of proximal third left spicule bifurcates into 2 equal parts which re-unite at distal end. Tail 126 (108–168) in length. Area rugosa consisting of maximum of 10 parallel rows of cuticular ridges, irregular in form and size. Caudal extremity slightly curved ventrally, with narrow caudal alae bearing 4 pre-anal and 5 post-anal pairs of pedunculate papillae. One pair of small sessile papillae present mid-ventrally to last pair of papillae.

Female (N = 10). Length 3.47 (2.67–4.03) mm. Width at level of vulva 114 (90–156). Buccal capsule 135 (117–153) in length. Nerve-ring 152 (132–177), excretory pore 192 (150–225) and deirids 81 (78–84) from anterior extremity. Cordons 67 (45–78) in length and 60 (45–75) in width. Oesophagus 1.44 (1.22–1.57) mm in length. Muscular oesophagus 230 (195–276) and glandular oesophagus 1.19 (1.01–1.31) in

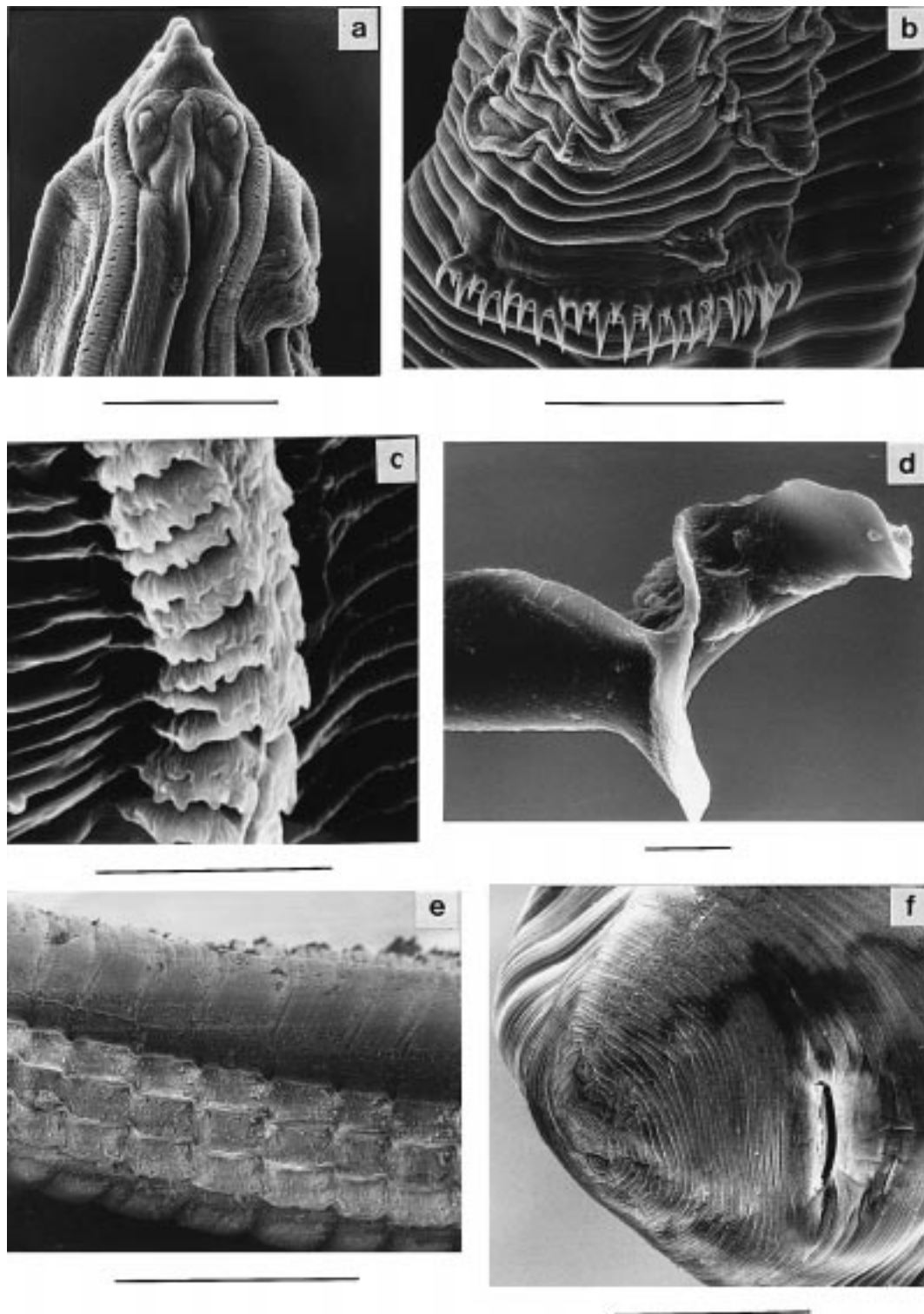


Figure 1. *Pectinospirura argentata*. a. Anterior region of female, lateral view; b. Deirids and distal end of cords; c. Detail of cords; d. Distal end of left spicule, dorso-lateral view; e. Area rugosa of male, ventral view; f. Distal end of female, ventral view, phasmids and anus. Scale-bars: a,f, 50 μm ; b,c,e, 100 μm ; d, 10 μm .

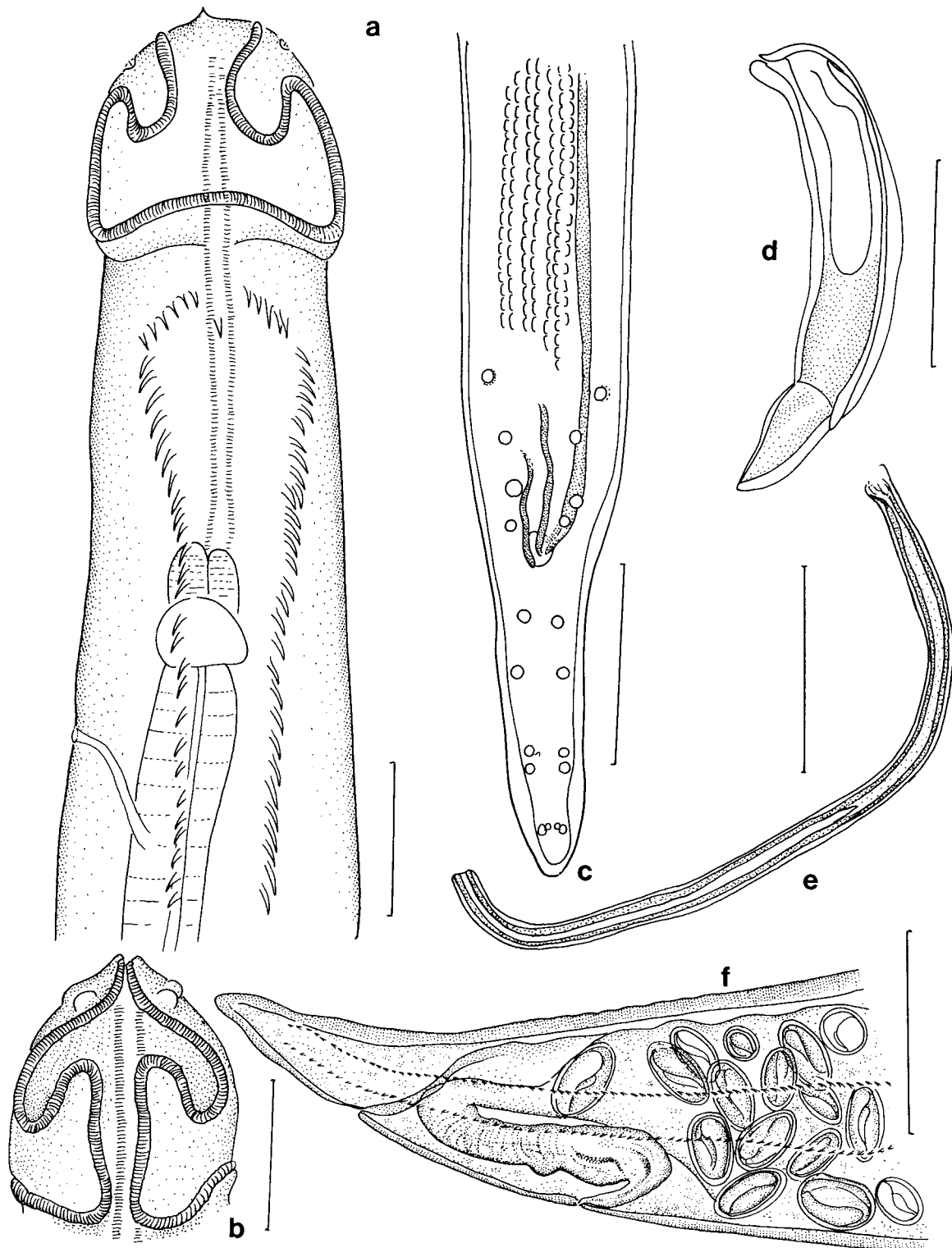


Figure 2. *Skrjabinoclava andersoni* n. sp. a. Anterior region of male, lateral view; b. Anterior region of male, dorsal view; c. Posterior region of male, ventral view, area rugosa and papillae; d. Right spicule, lateral view; e. Left spicule, lateral view; f. Posterior region of female, lateral view, anus, vulva and eggs. Scale-bars: a, 40 μm ; b,c,e,f, 100 μm ; d, 40 μm .

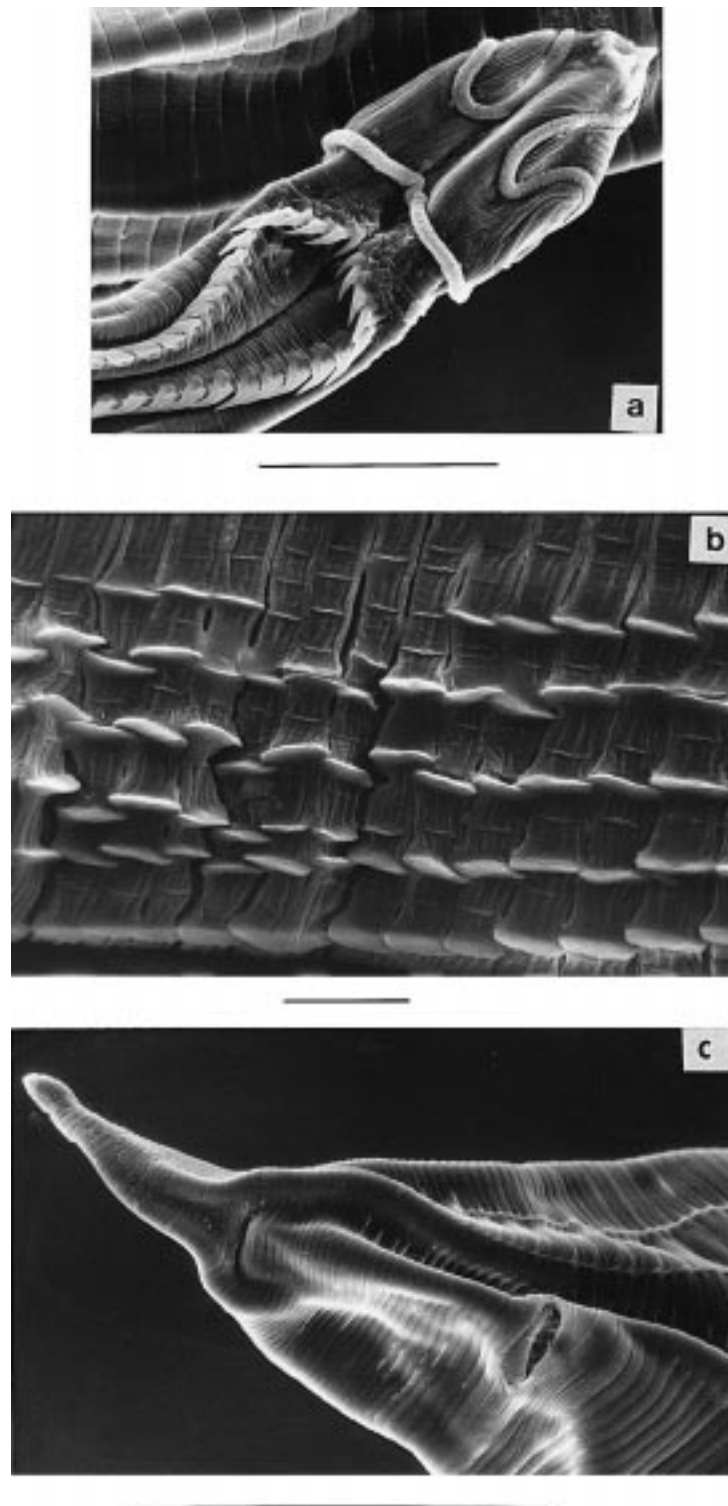


Figure 3. *Skrjabinoclava andersoni* n. sp. a. Anterior end of female, lateral view, deirids and cords; b. Area rugosa of male, ventral view; c. Distal end of female, vulva and anus. Scale-bars: a, 50 μm ; b, 10 μm ; c, 100 μm .

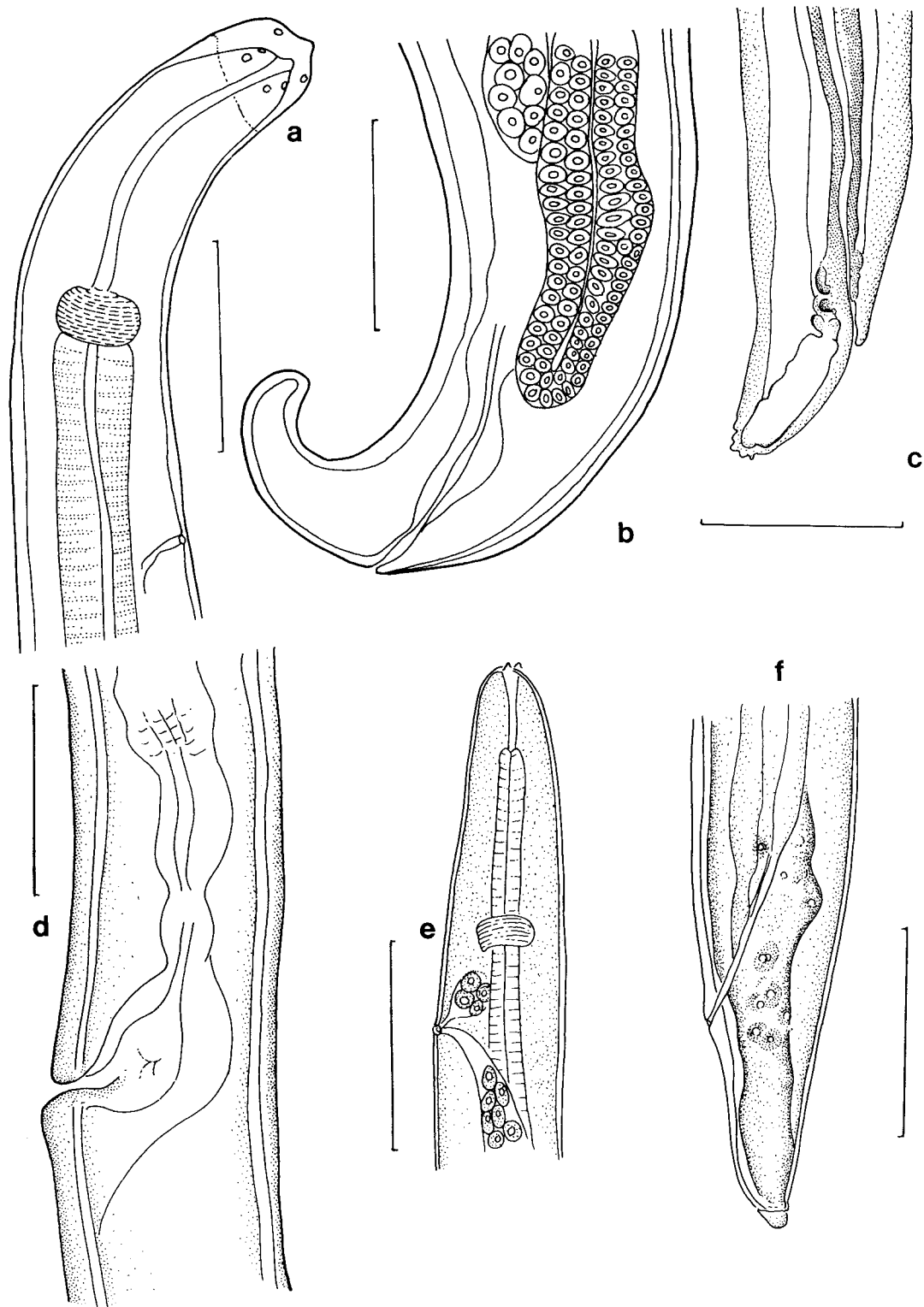


Figure 4. Acuariid larvae. a. Fourth-stage larva, female; anterior region, lateral view, with third-stage moult; b. Fourth-stage larva, female; posterior region, lateral view, with third-stage moult; c. Fourth-stage larva, male; posterior region, lateral view; d. Fourth-stage larva, female; vagina vera and vagina uterina, lateral view; e. Third-stage larva; anterior region, lateral view, f. Third-stage larva; posterior region, lateral view. *Scale-bars:* 100 μm .

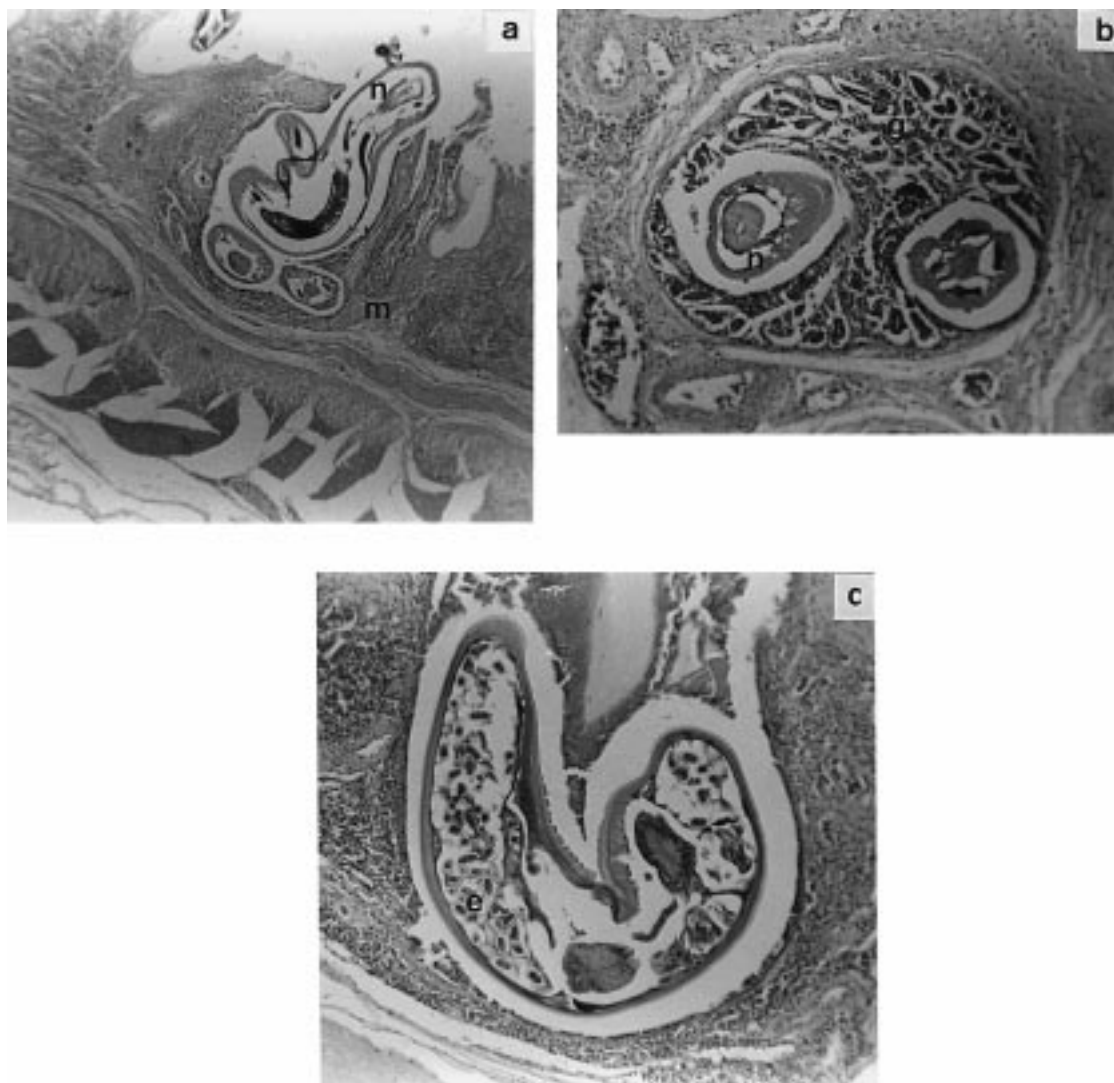


Figure 5. Photomicrographs of histological sections of nematodes attached to the mucosa of the proventriculus of *Larus dominicanus*: a. Longitudinal and cross-sections of anterior region ($\times 40$); b. Cross-section of proventricular gland, with nematode at level of muscular oesophagus ($\times 100$); c. Longitudinal section of gravid female ($\times 100$). Abbreviations: e, eggs; g, acinous mucous gland; m, mucosa; n, nematode.

length. Vulva in posterior quarter of body, 204 (171–240) from tip of tail. Monodelphic. Vagina surrounded by thick muscle fibres, distinctly divided into vagina vera and vagina uterina. Eggs 35 (33–39) \times 20 (18–21), contain larvae. Anus 90 (75–114) from tip of tail.

Type-host: *Larus dominicanus* Lichtenstein (kelp gull) (Aves: Laridae).

Type-locality: Balneario Orense (38°42'S, 59°47'W), coast of Buenos Aires Province, Argentina.

Type-material: Holotype (male), allotype (female) and paratypes (one male and one female) are deposited in

the Museo de La Plata, La Plata, Argentina, Helminth. Coll. No. 40,065/1, 40,065/2 and 40,065/3.

Site: Proventriculus.

Intensity: 33 females and 31 males in one host.

Etymology: This species is named for Prof. Roy C. Anderson, Department of Zoology, University of Guelph, Ontario, Canada.

Comments

The cordons of *Skrjabinoclava andersoni* n. sp. are similar to those *S. tupacincái* Freitas, Vicente & Ibañez, 1970, *S. inornatae* Wong & Anderson, 1987,

S. wilsoniae Wong & Anderson, 1987 and *S. bartlettiae* Wong & Anderson, 1988 (see Wong & Anderson, 1987; 1988). *S. andersoni* n. sp. can be distinguished from *S. tupacincal* and *S. wilsoniae* in that the right spicule is shaped like a scalpel blade and the left spicule is bifurcate. Moreover, the new species can be distinguished from the latter because the spines of the body decrease in size posteriorly. From *S. inornatae* the new species can be distinguished mainly by the structure of the distal end of the left spicule and the morphology of the right spicule. Moreover, *S. andersoni* n. sp. can be distinguished from all other species by the morphology of both spicules and by the cuticle not being inflated anteriorly.

Acuariid larvae

Description

Fourth-stage larva, male (N = 2) (Figure 4c)

Cordons and deirids absent. Length 5.28, 5.45 mm. Width at mid-body 117, 78. Buccal capsule 33, 30 in length. Nerve-ring 96, 105 and excretory pore 162, 183 from anterior extremity. Oesophagus 1.74, 1.94 mm in length. Muscular oesophagus 750, 870 and glandular oesophagus 0.99, 1.07 mm in length. Tail 63, 69 in length. Moulting of third-stage larva present.

Fourth-stage larva, female (N = 1) (Figure 4a, b, d)

Cordons and deirids absent. Length 5.07 mm. Width at the midbody 104. Buccal capsule 144 in length. Nerve-ring 162 and excretory pore 260 from anterior extremity. Oesophagus 1.86 mm in length. Muscular oesophagus 520 and glandular oesophagus 1.34 mm in length. Vulva 1.64 mm from tip of tail. Vagina distinctly divided into vagina vera and vagina uterina. Anus 117 from tip of tail. Moulting of third-stage larva present.

Third-stage larva (N = 4) (Figure 4e, f)

Cordons and deirids absent. Length 5.85 (5.12–6.67) mm. Width at mid-body 102 (96–105). Buccal capsule 34 (30–39) in length. Nerve-ring 109 (96–120) and excretory pore 162 (159–165) from anterior extremity. Oesophagus 1.67 (1.58–1.76) mm in length. Muscular oesophagus 728 (645–939) and glandular oesophagus 1.09 (0.94–1.33) mm in length. Tail 84 (75–90) in length.

Attachment (Figure 5)

The majority of the worms were found attached by their anterior end to the mucosa with the remainder of the body free in the lumen. It was a little difficult to remove the nematodes free and undamaged from their site of infestation. The worms were embedded in the host tissues up to a depth of about the middle of the body, some of them being coiled. The histological sections show that some of them were located in the acinous mucous glands.

Discussion

There are three species of the genus *Pectinospirura* Wehr, 1933. The type-species, *P. argentata*, was described from specimens found in *Larus argentatus* in the United States (Wehr, 1933). Later, it was found in *L. delawarensis* from Canada by Wong & Anderson (1982). These authors redescribed the type-species and, made *P. sobolevi* Turemuratov, 1965, which was found in *L. argentatus*, a synonym of *P. argentata*. The other two species are *P. multidentata* and *P. tringae*, both from scolopacids in Russia and China, respectively. Wong & Anderson (1982) suggested that these may be synonymous. Mawson (1969) recorded *P. argentata* from *Hydroprogne caspia* (Charadiidae) in South Australia; she found only two female specimens. *P. argentata*, as described here, is the first record of *Pectinospirura* in South America and from the kelp gull *L. dominicanus*.

Shorebirds are hosts of 23 of the 30 known species of *Skrjabinoclava*. Eighteen species occur in the Scolopacidae and five in the Charadiidae (Anderson & Wong, 1992). There are only two records of the genus from the South American Atlantic coast: *S. tupacincal* Freitas, Vicente & Ibañez, 1970 and *S. thapari* Freitas, 1953 (Freitas, 1953; Vicente et al., 1983). On the other hand, on the South American Pacific coast the following species have been reported in shorebirds: *S. tupacincal*, *S. bakeri* Wong & Anderson, 1987, *S. inornatae* and *S. hartwichi* Wong & Anderson, 1987 (see Freitas et al., 1970; Wong & Anderson, 1987, 1990). To date, the only *Skrjabinoclava* reported in a gull is *S. inornatae* from *Larus delawarensis* in North America, which is mainly a parasite of willets (Wong & Anderson, 1987). Fiddler crabs serve as intermediate hosts of *S. inornatae* in coastal areas of the Gulf of Mexico as well as on the Central and South American Pacific coast (Wong et al., 1989). *S. andersoni* n. sp. is

the first record of the genus in Argentina and from the kelp gull *L. dominicanus*.

Because the larvae described here have no cordons, it is difficult to assign them to a genus. The appearance of cordons appears to be variable, depending on the species. Cordons are sometimes present on the third-stage larva, but in most species studied they first appear during the development of the fourth-stage larva in the definitive host (Anderson, 1992). The presence of third-stage larvae would indicate that the infestation was very recent. The absence of cordons in the fourth-stage larvae and the presence of the cuticle of the third-stage would indicate that the moult was very recent. The larval body size resembles *Pectinospirura argentata*, but the other measurements do not agree with that species. Moreover, the third-stage larvae described above are larger than the fourth-stage. Consequently, it would appear that the larvae belong to another acuarioid nematode. More information is required on the nematodes of shorebirds in Argentina in order to understand their development and transmission.

The attachment of acuarioid nematodes to the oesophageal and proventricular mucosa was studied by Bartlett (1991), who described a gelatinous cap-like structure called a *pileus* around the anterior end of the worms. This author found the nematodes embedded in host tissues to the depth of the posterior extent of the cuticular cordons on the external surface of the anterior end. In the present study the worms were found embedded to a depth of about the middle of the body and a *pileus* was not observed.

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