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Myleusnema bicornis gen. et sp. n. (Nematoda: Kathlaniidae), an intestinal parasite of a freshwater serrasalmid fish, *Myleus ternetzi*, from French Guiana

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Abstract. A new nematode, *Myleusnema bicornis* gen. et sp. n., is described from the intestine of a characoid freshwater fish, *Myleus ternetzi* (Norman, 1929) (Cypriniformes: Serrasalmidae), from French Guiana. This cosmocercoid nematode species represents a new genus of the family Kathlaniidae, being characterized mainly by the shape of the body (the cephalic portion is separated from the rest of the body at the level of the nerve ring), structure of the cephalic extremity (presence of three lips and three lamella-like formations demarcating the buccal cavity), absence of an oesophageal pharynx, presence of medium-sized alate spicules (0.694–0.721 mm long), two conspicuous postcloacal horns associated with a gubernaculum, and by the number and distribution of caudal papillae in the male.

During the examination of some freshwater fishes from French Guiana carried out by the second author in 1991, numerous specimens of a previously undescribed nematode species were collected from the intestine of the freshwater characoid fish, *Myleus ternetzi* (Norman, 1929). Since this parasite exhibits a number of unique morphological features, being considerably different from any related form of the family Kathlaniidae, creation of an independent genus *Myleusnema* gen. n. is now proposed to accommodate this species.

MATERIALS AND METHODS

The specimens were fixed and preserved in 70 % ethanol and cleared with glycerine for optical microscopy examination. Drawings were made with the aid of a Zeiss microscope drawing attachment. For examination in SEM, the nematodes were postfixed in 1% OsO_4, dehydrated through an ethanol and an acetone series and then subjected to critical point drying. The specimens were coated with gold and examined with a JSM–6300 scanning electron microscope at an accelerating voltage of 15 kV. All measurements are given in millimetres. Type specimens were deposited (in vials with 70 % ethanol) at Instituto Nacional de Pesquias da Amazônia, Manaus, Brazil; paratypes also at the University of Nebraska State Museum, Lincoln, USA, and at the Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic.

RESULTS

Superfamily Cosmocercoidea Railliet, 1916

Family Kathlaniidae Lane, 1914

Genus ***Myleusnema*** gen. n.

Diagnosis: Kathlaniidae, Kathlaniinae. Body large, with cephalic portion separated from remaining wider portion of body by transverse cuticular fold approximately at level of nerve ring. Mouth aperture triangular, surrounded by three small lips, each associated with a cuticularized lamella-like formation demarcating a poorly developed buccal cavity. Anterior extremity of oesophagus not differentiated into a pharyngeal portion; posterior extremity of oesophagus formed by elongate, expanded isthmus and spherical bulb with valves. Tail conical, relatively short. Male: ventral precloacal sucker present; posterior part of cloacal opening with lobe-like formation armed with two conspicuous horns associated with a gubernaculum; spicules simple, alate and of equal length (similar); numerous paired preanal and postanal papillae present; caudal alae absent. Female: vulva postequatorial; reproductive apparatus prodelphic; eggs numerous, oval, thin-walled, containing moderately developed embryos. Intestinal parasites of Neotropical fishes.

Type- and the only species: *Myleusnema bicornis* sp. n.

Myleusnema bicornis sp. n. Figs. 1–4

Description: Large nematodes. Cuticle with irregular transverse striations. Slightly outlined (poorly developed) lateral alae extending along body. Cephalic end narrow, separated from remaining, broader part of body by transverse cuticular fold at level of nerve ring; body cuticle at region from nerve ring level to posterior end of oesophagus conspicuously thick. Head end rounded, provided with three small lips; dorsal lip bearing two oval-shaped cephalic papillae, each ventrolateral lip with one cephalic papilla and a smaller lateral amphid. Inner base of each lip provided with a cuticularized lamella-like formation protruding anteriorly and demarcating triangular mouth aperture; middle part of each formation widened in apical view, bearing low, narrow ridge at its top; dorsal ridge continuous, uninterrupted, both ventrolateral ridges interrupted at middle. Buccal cavity poorly developed. Anterior extremity of oesophagus not distinctly differentiated into a pharyngeal portion. Oesophagus dark. Oesophageal corpus narrow, elongate, usually S-shaped in larger specimens; posterior extremity of oesophagus differentiated into isthmus and spherical bulb with sclerotized apparatus; isthmus elongate, approximately as long as bulb, conspicuously broader than posterior end of corpus. Anterior end of oesophagus encircled by a ring formation appearing as hollow. Nerve ring encircling oesophageal corpus approximately at level of transverse cuticular fold. Minute deirids situated at level of nerve ring. Excretory pore conspicuous, somewhat anterior to end of oesophageal corpus. Intestine brown, straight, narrow, only its anterior end bulbously inflated. Tail of both sexes short, conical, with terminal spike (posterior end of largest females usually withdrawn). Males usually somewhat smaller than gravid females.

Male (13 specimens; measurements of holotype in parentheses): Length of body 14.28–17.41 (17.41), maximum width 1.09–1.12 (1.12). Anterior narrow cephalic portion of body 0.476–0.490 (0.490) long and 0.204–0.231 (0.231) wide. Length of lips 0.041 (0.041). Length of entire oesophagus 1.809–1.973 (1.973); corpus 1.306–1.482 (1.482) long and 0.122–0.136 (0.136) wide, isthmus 0.218–0.299 (0.218) long and 0.204 to 0.245 (0.245) wide, and bulb measuring 0.218–0.313 × 0.340–0.422 (0.313 × 0.422). Nerve ring and excretory pore 0.480–0.517 (0.517) and 0.979–1.088 (1.088), respectively, from anterior extremity. Posterior end of body ventrally bent. Preanal ventral musculature forming numerous oblique bundles; small, round precloacal ventral sucker present. Ten pairs of subventral caudal papillae present of which 7 pairs being preanal, 1 pair adanal and 2 pairs postanal, situated at posterior half of tail; in addition to subventrals, 2 pairs of lateral papillae present, first at level of last pair of subventral preanals and second slightly posterior to level of subventral adanals. One unpaired papilla present in front of cloacal opening. Special lobe-like process armed with two conspicuous, posteriorly oriented horns protruding out of posterior part of cloacal opening; in addition to horns, this formation bears a pair of minute papillae at its anterior part, a pair of lateral pocket-like depressions at level of horns, and a small transversely elongate median papilla situated posteriorly to horns. Spicules simple, 0.694–0.721 (0.721) long and 0.068–0.072 (0.072) wide, with broad alae; proximal ends of spicules blunt, distal ends nearly pointed. Gubernaculum well sclerotized, 0.138–0.177 (0.177) long, its distal end bifurcate, protruding out of body as cloacal horns mentioned above. Testis very narrow, reaching anteriorly almost to end of oesophagus; conspicuous oval seminal vesicle present. Tail conical, 0.381–0.408 (0.381) long, ending in a small cuticular spike 0.048–0.063 (0.048) long.

Female (17 gravid specimens; measurements of allotype in parentheses): Length of body 16.62–20.13 (16.62), maximum width 1.36–1.54 (1.36). Anterior narrow cephalic portion of body 0.544–0.680 (0.544) long and 0.245–0.258 (0.245) wide. Length of lips 0.041–0.054 (0.041). Length of entire oesophagus 1.96–2.24 (1.96); corpus 1.40–1.70 (1.40) long and 0.136–0.150 (0.150) wide, isthmus 0.245–0.258 (0.245) long and 0.218 to 0.231 (0.231) wide, and bulb measuring 0.299–0.302 (0.299) × 0.381–0.408 (0.408). Nerve ring and excretory pore 0.517–0.639 (0.517) and 1.09–1.31 (1.09), respectively, from anterior extremity. Vulva in posterior half of body, 10.47–13.46 (10.47) from anterior extremity; vulvar lips not elevated. Vagina directed anteriorly. Genital apparatus prodelphic; ovaries parallel, long, forming reflected coils immediately posterior to anterior end of intestine; uterine coils extending anteriorly nearly to anterior end of intestine and posteriorly far posterior to vulva. Eggs oval, thin-walled, size 0.135–0.150 × 0.096–0.105 (0.141–0.150 × 0.099–0.105), containing moderately developed embrya. Tail of smaller females conical, 0.150–0.156 (0.150) long, ending in sharp cuticular spike measuring 0.054 (0.054); tail of largest females blunt, with withdrawn tip.

Type host: *Myleus ternetzi* (Norman, 1929) (Characoidei, Serrasalmidae).

Site of infection: Intestine.

Type locality: Takari Tanté Falls, Sinnamary River, French Guiana (28 February 1991).

Deposition of types: Holotype (♂), allotype (♀) and 15 (5 ♂♂ + 10 ♀♀) paratypes in Invertebrate Collection, Instituto Nacional de Pesquisas da Amazônia, Manaus, AM, Brazil; paratypes (4 ♂♂ + 4 ♀♀) in

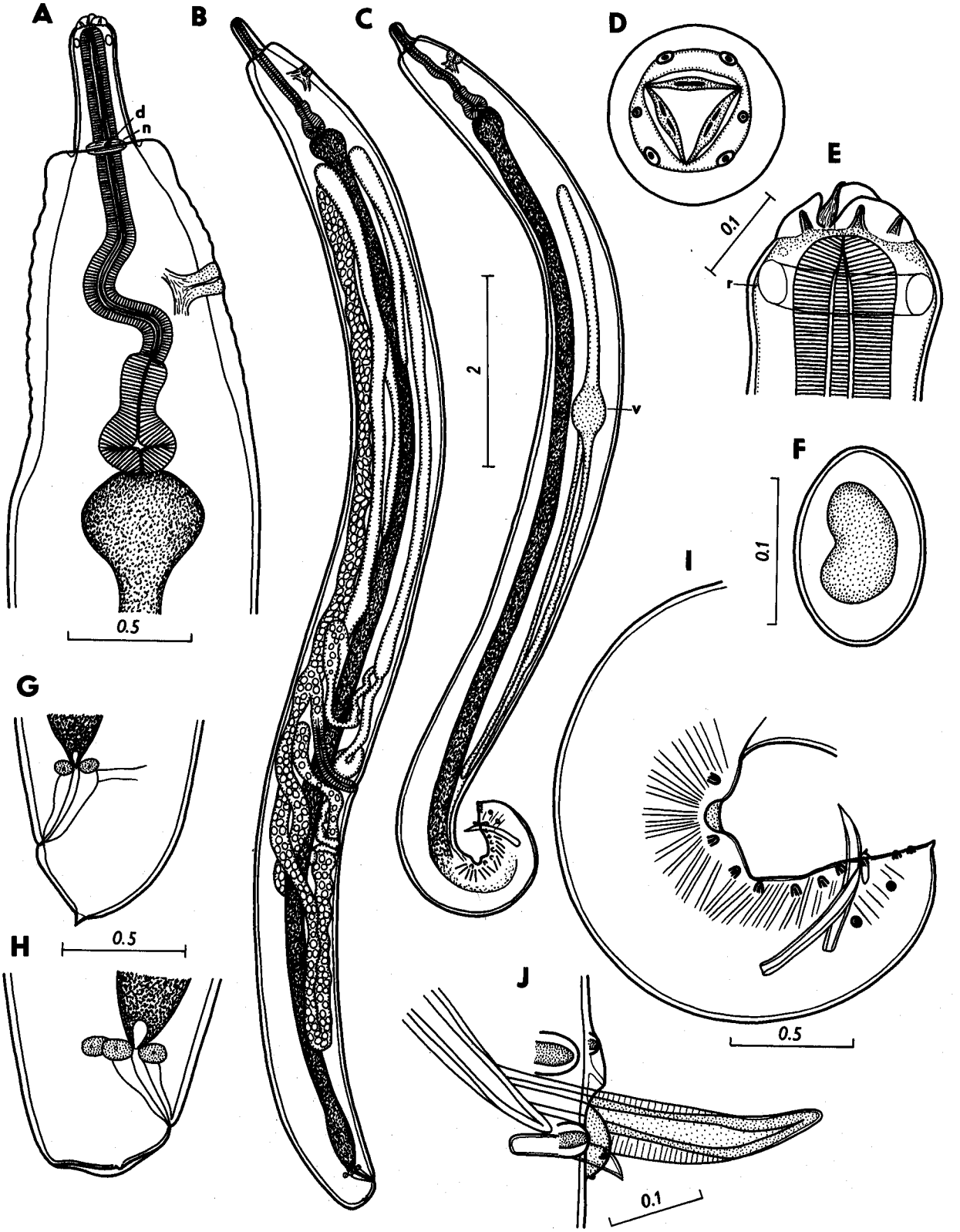

Fig. 1. *Myleusnema bicornis* sp. n. **A** – anterior end of female, lateral view; **B** – female, general view; **C** – male, general view; **D, E** – cephalic end of female, apical and lateral views; **F** – egg; **G** – tail of smaller female; **H** – tail of larger female; **I** – caudal end of male; **J** – region of cloacal opening, lateral view. d = deirid; n = nerve ring; r = hollow ring formation; v = seminal vesicle.

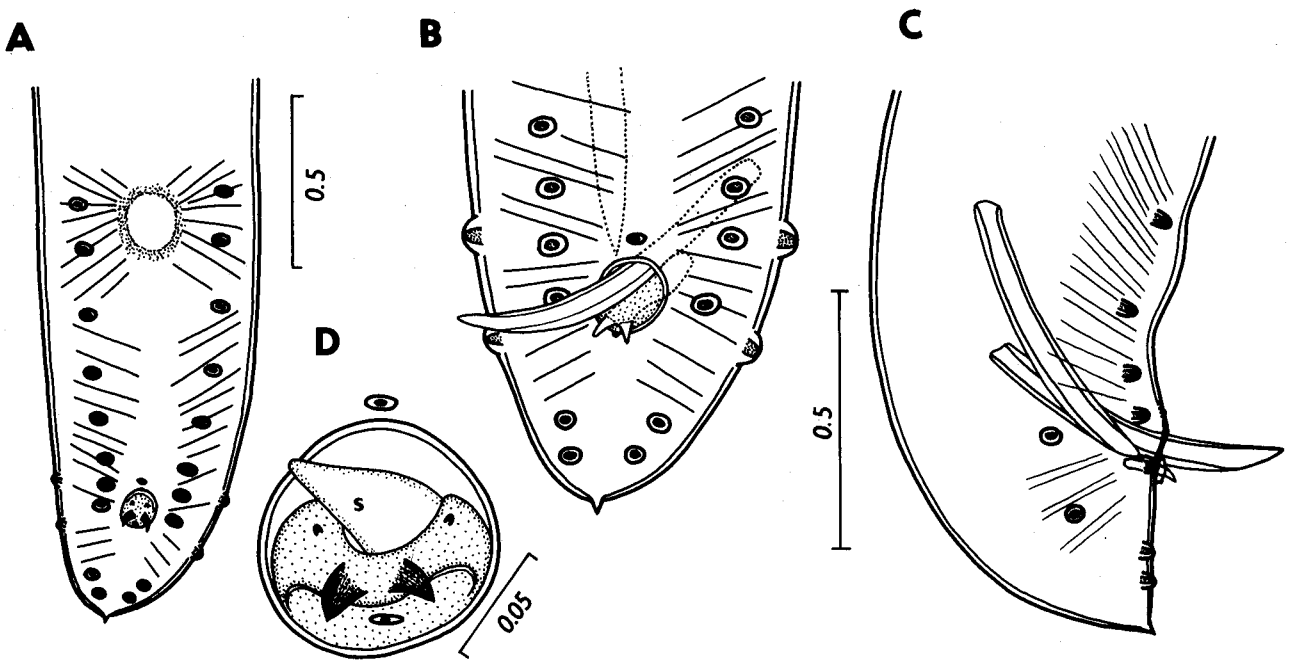

Fig. 2. *Myleusnema bicornis* sp. n., male. **A** – posterior end of body, ventral view; **B, C** – caudal end, ventral and lateral views; **D** – region of cloacal opening. s = spicule.

Helminth Collection, University of Nebraska State Museum, Harold W. Manter Laboratory, Lincoln, Nebraska, U.S.A., and in Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice, Czech Republic (3 ♂♂ + 3 ♀♀; Cat. No. N – 657).

Etymology: The generic name of this nematode consists of Greek terms *Myleus* (= a generic name of the fish host) and *nema* (= nematode), whereas the specific name *bicornis* (= with two horns) relates to a characteristic morphological feature of males (presence of the postcloacal lobe-like formation with two horns) of this species.

DISCUSSION

The nematode family Kathlaniidae includes the parasites of fishes, amphibians and reptiles. According to Chabaud (1978), it is difficult to delimit the Kathlaniidae because the family is intermediate between the Cosmocercidae and certain Seuratoidea (Quimperiidae, Schneidernematidae). We follow here the system of the latter author who includes in the Kathlaniidae those Cosmocercoidea in which the oesophageal isthmus is expanded into a bulb and in which the ventral musculature of the male tail is specialized to form oblique bundles which lead ultimately to a more or less completely formed preanal sucker.

The morphology of the present material corresponds well to the diagnosis of the Kathlaniidae and there is no doubt that they belong to this family. The closest genera appear to be *Falcaustra* Lane, 1914, *Spectatus* Travassos, 1923 and *Chabaudinema* Díaz-Ungría, 1968, all having representatives parasitizing freshwater fishes. However, in contrast to them, *Myleusnema* exhibits some morphological features by which it substantially differs not only from the three above mentioned genera but also from all other cosmocercoid genera, appearing to be quite unique among nematode parasites of vertebrates. It concerns mainly the unusual shape of the body and the presence of the special postcloacal formation armed with two conspicuous horns in the male.

The body of *Myleusnema* with the unusually separated, narrow cephalic portion reminds one, at the first glance, of the body of an acanthocephalan with the extruded proboscis; the separation of the cephalic end seems to be a constant feature in *M. bicornis* and was found in all fixed specimens of this species including a juvenile female. Nevertheless, observations on fresh nematodes indicate that they have some ability to extend or retract their cephalic portion.

A peculiar feature of *Myleusnema bicornis* is the presence of two postcloacal horns associated with the gubernaculum in the male. Such horns are absent from all other kathlaniid species, although the distal tip of the gubernaculum may be bifurcated in some species parasitizing turtles, for example in *Kathlania leptura* (Rudolphi, 1819) or *Falcaustra ararath* (Massino, 1924) (see Skryabin et al. 1964).

Only two species of the family Kathlaniidae, belonging to the genera *Spectatus* and *Chabaudinema*, have so far been reported from South American freshwater fishes: *Spectatus spectatus* Travassos, 1923 from the characid fishes *Piaractus brachypomus* and *Salminus maxillosus* and the catfish *Pseudoplatystoma* sp. from Brazil and Paraguay (Travassos 1923, 1955, Travassos

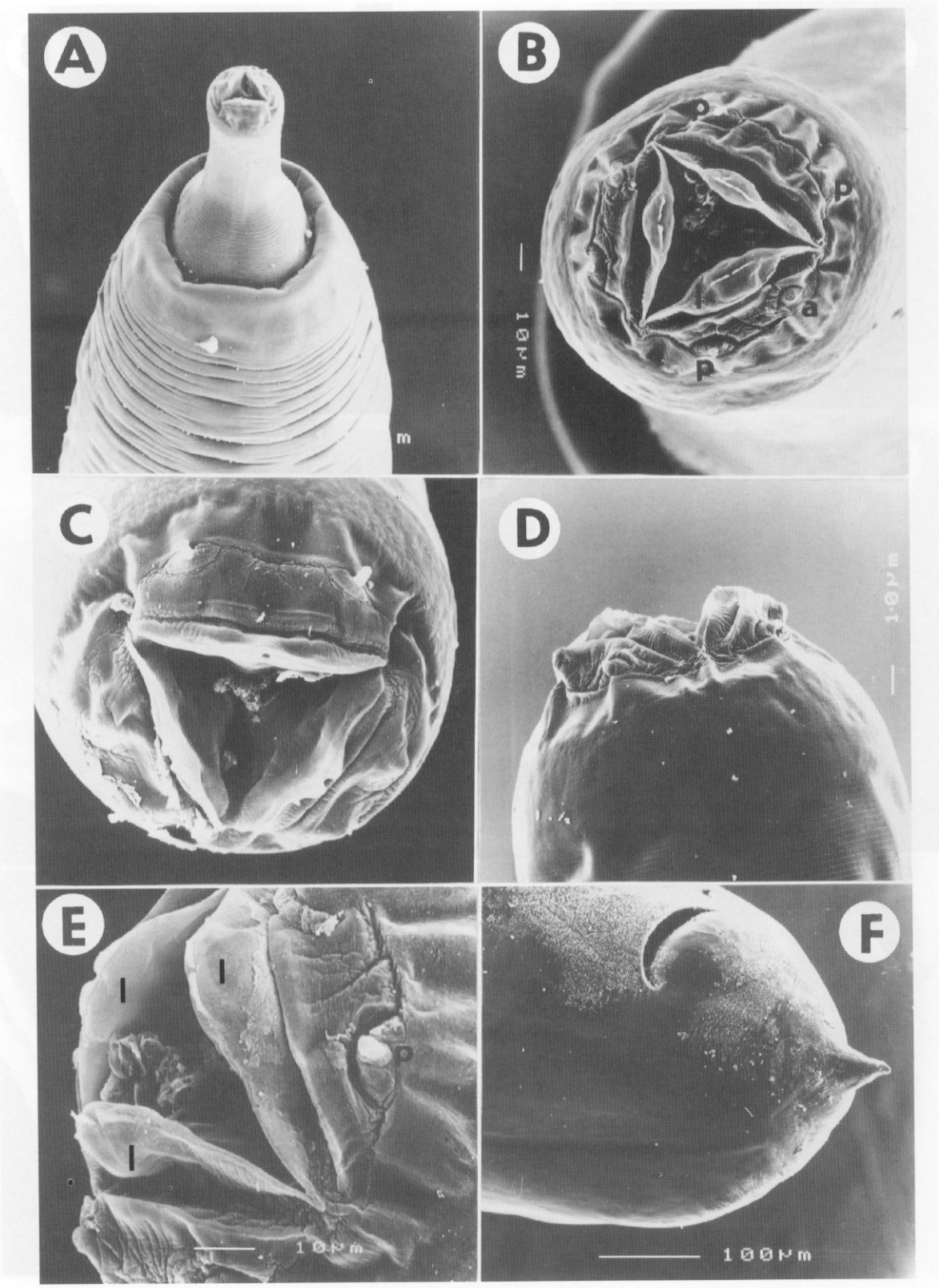

Fig. 3. *Myleusnema bicornis* sp. n., SEM micrographs. **A** – anterior end of female body, dorsal view; **B** – cephalic end, apical view; **C** – same, subapical view; **D** – the same, ventral view; **E** – mouth aperture surrounded by three lamella-like formations, subventral view; **F** – tail of female, ventrolateral view. a = amphid; l = lamella-like formation; p = cephalic papilla.

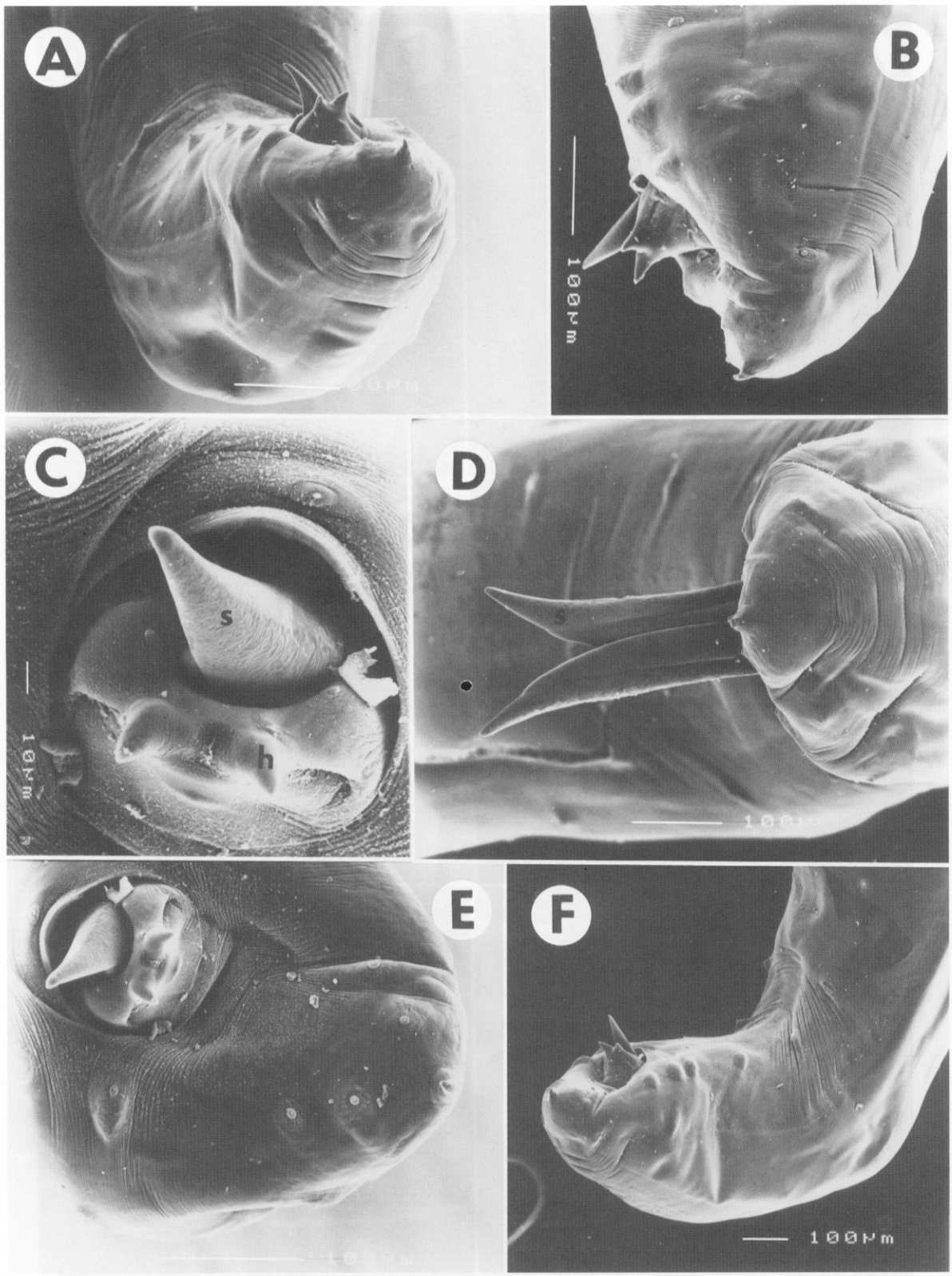

Fig. 4. *Myleusnema bicornis* sp. n., SEM micrographs of caudal end of male. **A, B** – tail, subapical and lateral views; **C** – region of cloacal opening, ventral view; **D** – subdorsal view of tail; **E** – tail, ventral view; **F** – posterior end of body, lateral view. h = postcloacal horn; s = spicule.

et al. 1928, Masi Pallarés 1990) and *Chabaudinema americana* Díaz-Ungría, 1968 from *Colossoma macropomus* from Venezuela (Díaz-Ungría 1968, Masi Pallarés 1990). Although both species resemble *Myleusnema bicornis* in some features, there are marked differences between them as can be seen from the following key.

KEY TO GENERA OF THE KATHLANIIDAE OCCURRING IN FISHES (MODIFIED FROM CHABAUD 1978)

1 Cephalic extremity complex with three main lips separated from each other by subsidiary lobes. Oesophastome with unequal teeth. Spicules and gubernaculum complex .... *Kathlania* Lane, 1914

– Cephalic extremity simple with three or six lips . . 2

2 Pharyngeal part of oesophagus simple or armed with three small teeth 3

– Pharyngeal part of oesophagus armed with complex cuticularized formations 5

3 Anterior extremity of oesophagus simple, not differentiated into a pharyngeal portion 4

– Anterior extremity of oesophagus differentiated into pharyngeal portion. Three or six well developed lips present. Oesophageal isthmus generally spherical ..... *Falcaustra* Lane, 1915

4 Cephalic extremity with three lips. Cephalic portion narrow, separated at nerve ring level by marked transverse fold of cuticle. Oesophageal isthmus expanded. Conspicuous postcloacal lobe-like formation armed with two horns present .... *Myleusnema* gen. n.

– Cephalic extremity with six lips. Cephalic portion not separated from rest of body. Oesophageal isthmus not expanded. Postcloacal lobe-like formation with horns absent ..... *Spectatus* Travassos, 1923

5 Pharyngeal part of oesophagus with anterior cuticularized ring. Parasites of Neotropical fish .... *Chabaudinema* Díaz-Ungría, 1968

– Pharyngeal part of oesophagus with three large anteriorly directed tricuspid teeth. Parasites of Australian ceratodiform fish .... *Amblyonema* Linstow, 1898

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