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Pseudocapillaria yucatanensis sp. n. (Nematoda: Capillariidae) from the bagre *Rhamdia guatemalensis* (Pisces) from cenotes in Yucatan, Mexico

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Abstract. A new nematode species, *Pseudocapillaria yucatanensis* sp. n., is described from the intestine of the freshwater pimelodid catfish *Rhamdia guatemalensis* (Günther) from cenotes (= sinkholes) in Yucatan, Mexico. It differs from other three related species parasitizing freshwater fishes mainly in possessing the spicule with a simple rim of its proximal end and a non-expanded distal end, in the length of the spicule (0.218–0.295 mm), and the size (0.050–0.060 × 0.025–0.030 mm), shape and structure of eggs, and also in the host types and geographical distribution. *Pseudocapillaria yucatanensis* is the first known autochtonous species of *Pseudocapillaria* parasitizing freshwater fishes in Mexico.

During studies on the parasites of fishes in cenotes (= sinkholes) of the Peninsula of Yucatan, Mexico, carried out in 1993 and 1994, capillariid nematodes referable to the genus *Pseudocapillaria* Freitas, 1959 were recovered from the intestine of the bagre, *Rhamdia guatemalensis* (Günther), collected from several localities. A detailed study of their morphology shows that they represent a new, hitherto unknown species which we describe below.

Cenotes or sinkholes are small surface, mostly freshwater bodies connected with subterranean streams, which are typical of the Peninsula of Yucatan; they represent unique ecosystems with characteristic biota.

MATERIALS AND METHODS

The nematodes were fixed in hot 4% formaldehyde and cleared with glycerine for examination. Drawings were made with the aid of either a Zeiss or an Olympus microscope drawing attachment. After examination, the specimens were shortly placed in 4% formaldehyde and then they were transferred to 70% ethanol in which they are stored. All measurements are given in millimetres.

RESULTS

Pseudocapillaria yucatanensis sp. n. Fig. 1

Description: Comparatively small nematodes with smooth cuticle. Anterior end of body narrow, rounded, with indistinct mouth papillae. Two fairly wide lateral bacillary bands present, extending along whole body length. Muscular oesophagus relatively long. Stichosome consisting of single row of stichocytes, mostly subdivided into 6–12 transverse annuli; cell nuclei inconspicuous; alternation of darker and lighter-coloured stichocytes more distinct in larger specimens. Nerve ring encircling muscular oesophagus approximately at border of its first and second thirds. Two distinct wing-like cells present at oesophago-intestinal junction.

Male (5 specimens; measurements of holotype in parentheses): Length of body 1.98–2.87 (2.87), width 0.035–0.040 (0.040). Lateral bacillary bands 0.013–0.020 (0.020) wide. Length of entire oesophagus 1.14–1.69 (1.69), representing 56–65 (59)% of body length. Muscular oesophagus 0.160–0.210 (0.188) long, distance of nerve ring from anterior extremity 0.050–0.065 (0.050). Stichosome 0.977–1.500 (1.500) long, number of stichocytes not determined. Spicule smooth, slender, well sclerotized, 0.218–0.295 (0.218) long; its proximal end somewhat expanded, simple, without folded, lobular rim; distal end rounded. Width of spicule 0.004–0.005 (0.004) at its middle portion. Spicular sheath nonspinous; evaginated sheath long, with uniform width; fully evaginated sheath measuring 0.398–0.475 (0.398) in length and 0.010 (0.010) in width. Seminal vesicle elongate, 0.063–0.213 (0.113) long. Cloacal tube long, spicular canal not distinguished. Posterior end of body rounded, provided with two large, round ventrolateral

lobes, each of them bearing one minute papilla; additional pair of minute, hardly visible papillae appearing to be present anterior to cloacal opening; dorsal cuticular membrane absent. Tail 0.008–0.013 (0.013) long.

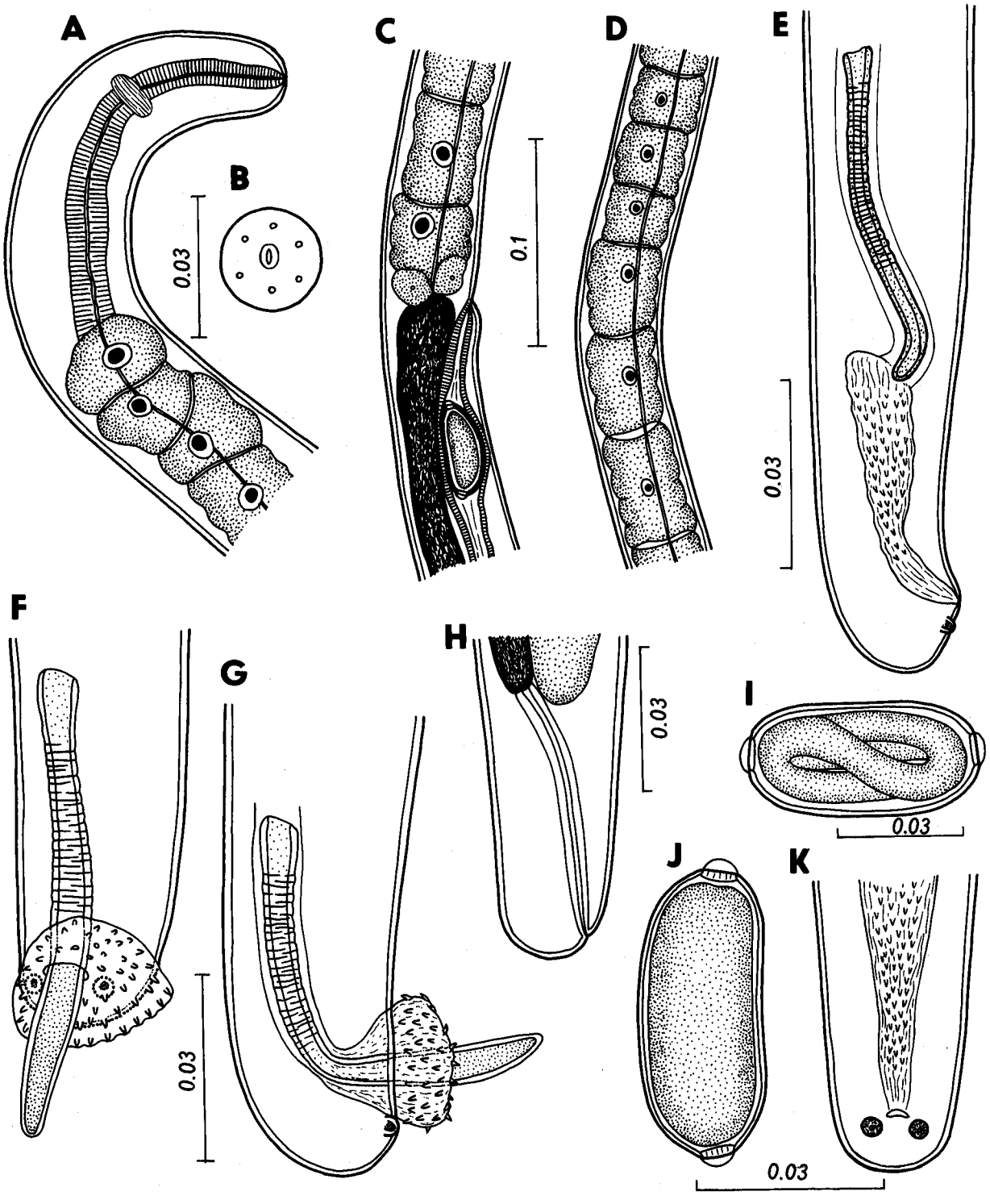

Fig. 1. *Pseudocapillaria yucatanensis* sp. n. **A** – anterior end of female; **B** – female stichosome; **C** – region of vulva; **D** – egg; **E** – posterior end of male; **F** – caudal end of male, lateral view; **G** – egg; **H**– **I** – caudal end of male, ventral views; **J** – caudal end of female; **K** – caudal end of male, lateral view; **L**– **N** – proximal, middle and distal parts of spicule.

lobes, each of them bearing one minute papilla; additional pair of minute, hardly visible papillae appearing to be present anterior to cloacal opening; dorsal cuticular membrane absent. Tail 0.008–0.013 (0.013) long.

Female (8 specimens; measurements of allotype in parentheses): Body length of gravid female 3.57–6.83 (6.29), maximum width 0.045–0.070 (0.068). Width of lateral bacillary bands 0.015–0.030 (0.025). Length of entire oesophagus 1.73–2.74 (2.63), representing 40–56 (42)% of body length. Muscular oesophagus 0.180–0.278 (0.278) long, stichosome 1.50–2.47 (2.35) long; number of stichocytes 35–44 (40). Distance of nerve ring from anterior extremity 0.063-0.085 (0.078). Vulva 0.003–0.060 (0.060) behind level of oesophagus end, vulvar lips not elevated. Eggs unembryonated, oval, polar plugs distinctly protruding; rarely plugs not protruding. Egg wall two-layered, inner layer hyaline, outer layer thin, with distinct, fine dense net-like sculpture on surface. Size of eggs 0.050–0.060 × 0.025–0.030 (0.058–0.060 × 0.028); thickness of egg wall 0.002–0.003 (0.003); polar plugs 0.004–0.008 (0.005–0.008) long and 0.005–0.008 (0.006) wide, height of protruding part 0.003 (0.003). Eggs arranged in one file at distal part of uterus and in two files in more distant region. Ovary extending posteriad to about mid-length of rectum; rectum 0.040–0.069 (0.058) long. Posterior end of body rounded, anus distinctly subterminal; length of tail 0.009– 0.013 (0.013).

Type host: bagre, *Rhamdia guatemalensis* (Günther), local name "juil de cenote" or "bagre" (fam. Pimelodidae, Siluriformes).

Site of infection: intestine.

Type locality: Xmucuy Cenote (20°33'36" N, 88°59'50" W) (Zona Sotuta), Yucatan, Mexico (holotype, allotype and most paratypes collected on 25 July 1994; other specimens on 26 October 1993 and 25 July 1994).

Other localities: Tixkanka Cenote (21°14'55" N, 88°58'45" W) (Zona Dzilam) (23 May 1994); Ixin-há Cenote (20°37'14" N, 89°06'40" W) (Zona Sotuta) (22 August 1994); Chen-há Cenote (20°41'24" N, 89°52'36" W) (Zona Chochola) (13 September 1994), all Yucatan, Mexico.

Prevalence and intensity: Xmucuy: 16% (in 3 of 19 fishes examined), 1–17 nematodes; Tixkanka: 11% (in 1 of 9), 1 nematode; Ixin-há: 6% (in 5 of 88), 1–23; Chen-há: 25% (in 2 of 8), 2–3.

Deposition of specimens: holotype, allotype and some paratypes in the Institute of Parasitology, Academy of Sciences of the Czech Republic, in České Budějovice (Helm. Coll. No. N – 642); paratypes in Universidad Nacional Autónoma de México, Mexico City.

Etymology: The specific name of this species is derived from the name of the Mexican state of its origin, i.e. Yucatan.

DISCUSSION

According to the system of capillariid nematodes proposed by Moravec (1982), specimens of the present material belong to the genus *Pseudocapillaria* Freitas, 1959, namely to its nominate subgenus *Pseudocapillaria* Freitas, 1959. In his revision of the capillariids from fishes, Moravec (1987) listed six species in this subgenus: *P.* (*P.*) *tomentosa* (Dujardin, 1843) (type species), *P.* (*P.*) *magalhaesi* (Lent et Freitas, 1937), *P.* (*P.*) *microspicula* (Mamaev, Parukhin et Baeva, 1963), *P.* (*P.*) *echenei* (Parukhin, 1967), *P.* (*P.*) *carangi* (Parukhin, 1971) and *P.* (*P.*) *sphyraeni* (Parukhin, 1971). Three additional species of the subgenus *Pseudocapillaria* have been described from fishes since: *P.* (*P.*) *bainae* (Justine et Radujković, 1988) (syn. *P.* (*P.*) *parablennii* Moravec, Orecchia et Paggi, 1988 – see Moravec 1990) from the marine fish *Parablennius gattorugine* from then Yugoslavia and from Italy, *P.* (*P.*) *indica* Moravec, Razia Beevi, Radhakrishnan et Arthur, 1993 from the freshwater fish *Channa gachua* in India, and *P.* (*P.*) *lepidocephali* De et Maity, 1994 from the loach, *Lepidocephalus guntea*, from the Hooghly estuary in India (Moravec et al. 1993, De and Maity 1994).

Of these nine species, *P. bainae, P. carangi, P. echenei, P. magalhaesi, P. microspicula* and *P. sphyraeni* represent a group of marine, mostly inadequately described species parasitic in fishes of the order Perciformes and they can easily be distinguished from the new species morphologically. Of them, in contrast to the new species, *P. bainae, P. carangi, P. echenei* and *P. microspicula* have a considerably shorter spicule (not exceeding 0.14 mm), *P. magalhaesi* has markedly larger eggs (0.090–0.093 × 0.021–0.039 mm), and *P. sphyraeni* has a much longer body (males 14–15 mm and females 18–25 mm) (for a key to species of *Pseudocapillaria* see Moravec 1987).

The three remaining species can be distinguished as follows:

P. tomentosa is known mainly from various freshwater cypriniform fishes of the Holarctic and it differs from the new species mainly in possessing a folded, lobular (vs. simple) rim of the anterior end of spicule, larger eggs (0.066–0.076 × 0.030–0.039 mm) with non-protruding (vs. protruding) polar plugs and larger body (males 4–7 mm, females 7–12 mm) (Moravec 1987).

P. indica from the snakehead, *Channa gachua* (Channidae, Perciformes) from India differs principally in having distinctly smaller (0.036–0.048 × 0.024–0.027 mm) eggs with non-protruding (vs. protruding) polar plugs and rough (vs. fine) superficial sculpture, and larger body size of females (15 mm) (Moravec et al. 1993).

P. lepidocephali from the loach, *Lepidocephalus guntea*, from India can be differentiated by distinctly broader eggs (width of eggs 0.036–0.040 mm) with

non-protruding (vs. protruding) polar plugs and by a distinctly expanded (vs. non-expanded) distal end of the spicule, which is shorter (0.104–0.161 mm) in the Indian species (De and Maity 1994).

Moreover, in none of the three named species was a pair of minute preanal papillae (present in *P. yucatanensis*) reported in the male. All these species are of a different zoogeographical origin (*P. tomentosa* is a Holarctic species and both *P. indica* and *P. lepidocephali* are Oriental species), but *P. tomentosa* has recently been reported also from the culture of introduced carp, *Cyprinus carpio*, from Mexico. Since *P. tomentosa* is a common parasite of pond-reared carps in Europe (Moravec 1987, 1994), it is highly probable that it was introduced into Mexico along with the introduction of its host fish. The new *Pseudocapillaria* species from *R. guatemalensis* is undoubtedly indigenous to Yucatan.

Rhamdia guatemalensis is a typical fish of cenotes (sinkholes) in central Yucatan and it may well be that, similarly to some other helminth patasites of this fish (e.g. *Rhabdochona kidderi*), *Pseudocapillaria yucatanensis* is an endemic species of this region. Although it seems to be widespread in the cenotes of Yucatan, the results of this study indicate that its occurrence in *R. guatemalensis* is not frequent, this being apparently associated with local ecological conditions in cenotes (sinkholes).

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REFERENCES

DE N. C., MAITY R. N. 1994: On a new species of *Pseudocapillaria* (Nematoda: Trichuroidea), *P. lepidocephali*, from the estuarine fish *Lepidocephalus* (*Lepidocephalichthys*) *guntea* (Hamilton). Syst. Parasitol. 27: 207–211.

MORAVEC F. 1982: Proposal of a new systematic arrangement of nematodes of the family Capillariidae. Folia Parasitol. 29: 119–132.

MORAVEC F. 1987: Revision of Capillariid Nematodes (subfamily Capillariinae) Parasitic in Fishes. Studie ČSAV, No. 3, Academia, Prague, 141 pp.

MORAVEC F. 1990: Synopsis of type specimens deposited in the helminthological collection of the Institute of Parasitology, Czechoslovak Academy of Sciences, in České Budějovice. III. Nematoda. Folia Parasitol. 37: 367–383.

MORAVEC F. 1994: Parasitic Nematodes of Freshwater Fishes of Europe. Academia and Kluwer Acad. Publishers, Prague and Dordrecht, 480 pp.

MORAVEC F., RAZIA BEEVI M., RADHAKRISHNAN S., ARTHUR J. R. 1993: *Pseudocapillaria indica* sp. n. (Nematoda: Capillariidae) from the snakehead, *Channa gachua* (Hamilton) (Pisces), from southern India. Folia Parasitol. 40: 35–38.

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