FOLIA PARASITOLOGICA 42: 65–68, 1995

Capillaria (*Hepatocapillaria*) *cichlasomae* (Nematoda: Capillariidae) from the liver of the cichlid fish *Cichlasoma urophthalmus* from Yucatan, Mexico

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Key words: *Capillaria cichlasomae*, *Cichlasoma urophthalmus*, liver parasites, nematode, Yucatan, Mexico

Abstract. *Capillaria* (*Hepatocapillaria*) *cichlasomae* sp. n., parasitic in the liver of the cichlid *Cichlasoma urophthalmus* (Günther) from a small freshwater lake ("aguada") Xpoc in Yucatan, Mexico, is described. The parasite is characterized mainly by its small body size (male 1.8 mm, female 4.5 mm), the structure of the stichosome (markedly short stichocytes in one row) and the male (the presence of a pair of small subventral postanal papillae) and female (anus distinctly subterminal) caudal ends, and by the size and structure of the spicule (spicule 0.068–0.085 mm long, with marked transverse grooves on surface) and eggs (size 0.053–0.058 × 0.023 mm, with protruding polar plugs). This is the second known *Capillaria* species from the liver of fish and the first one from the liver of a freshwater fish.

In 1993, during studies on the parasites of fishes in cenotes (= sinkholes) and some other water bodies of the Peninsula of Yucatan, Mexico, numerous specimens of the cichlid *Cichlasoma urophthalmus* (Günther) from a small freshwater lake ("aguada") Xpoc in central Yucatan were found to harbour capillariid eggs in the liver. Subsequent examinations of these fish from the same locality, carried out in 1994, yielded a few adult specimens of this liver nematode and showed a frequent occurrence of the eggs of this parasite in the livers of *C. urophthalmus* of the local population. A detailed study of the nematodes recovered showed that they belonged to a new, hitherto undescribed species of the genus *Capillaria* Zeder, 1800, namely to its subgenus *Hepatocapillaria* Moravec, 1987. The species is described below.

MATERIALS AND METHODS

Fish were collected by angling. They were transported alive to the Laboratory of Parasitology, CINVESTAV – IPN, in Mérida where they were subsequently examined within two days. Fish livers compressed between two glasses were examined under the dessecting microscope. After washing in physiological saline 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 mounted in glycerine-gelatine preparations. All measurements are in millimetres.

RESULTS

Capillaria* (*Hepatocapillaria*) *cichlasomae sp. n. Fig.1

Description: Small, fine nematodes; male smaller than female. Bacillary bands indistinct. Head end rounded, comparatively broad. Mouth aperture small, oval, surrounded by 6 minute cephalic papillae arranged in circlet. Oesophagus relatively short for *Capillaria*. Muscular oesophagus short, slightly expanded posteriorly; nerve ring situated approximately at border of first and second thirds. of length of muscular oesophagus. Stichosome uniform in colour, formed by single row of markedly short stichocytes provided with large nuclei; most stichocytes subdivided into 2–4 transverse annuli. Two medium-sized, wing-like cells present at oesophago-intestinal junction.

Male (2 specimens, holotype and paratype [caudal body fragment]; measurements of paratype in parentheses): Length of body 1.83 (–), maximum width 0.030 (0.035). Length of entire oesophagus 0.980 (54% of body length) (-), of muscular oesophagus 0.138 (–), of stichosome 0.842 (–); number of stichocytes not determined. Distance of nerve ring from anterior extremity 0.050. Spicule well sclerotized, its anterior half (in paratype) or anterior two thirds of its length (in holotype) with numerous marked superficial transversal grooves; proximal end of spicule somewhat expanded; posterior half of spicule nonexpanded in holotype and somewhat expanded in paratype; distal end of spicule obtusely conical to rounded. Length of spicule 0.068 (0.085), its

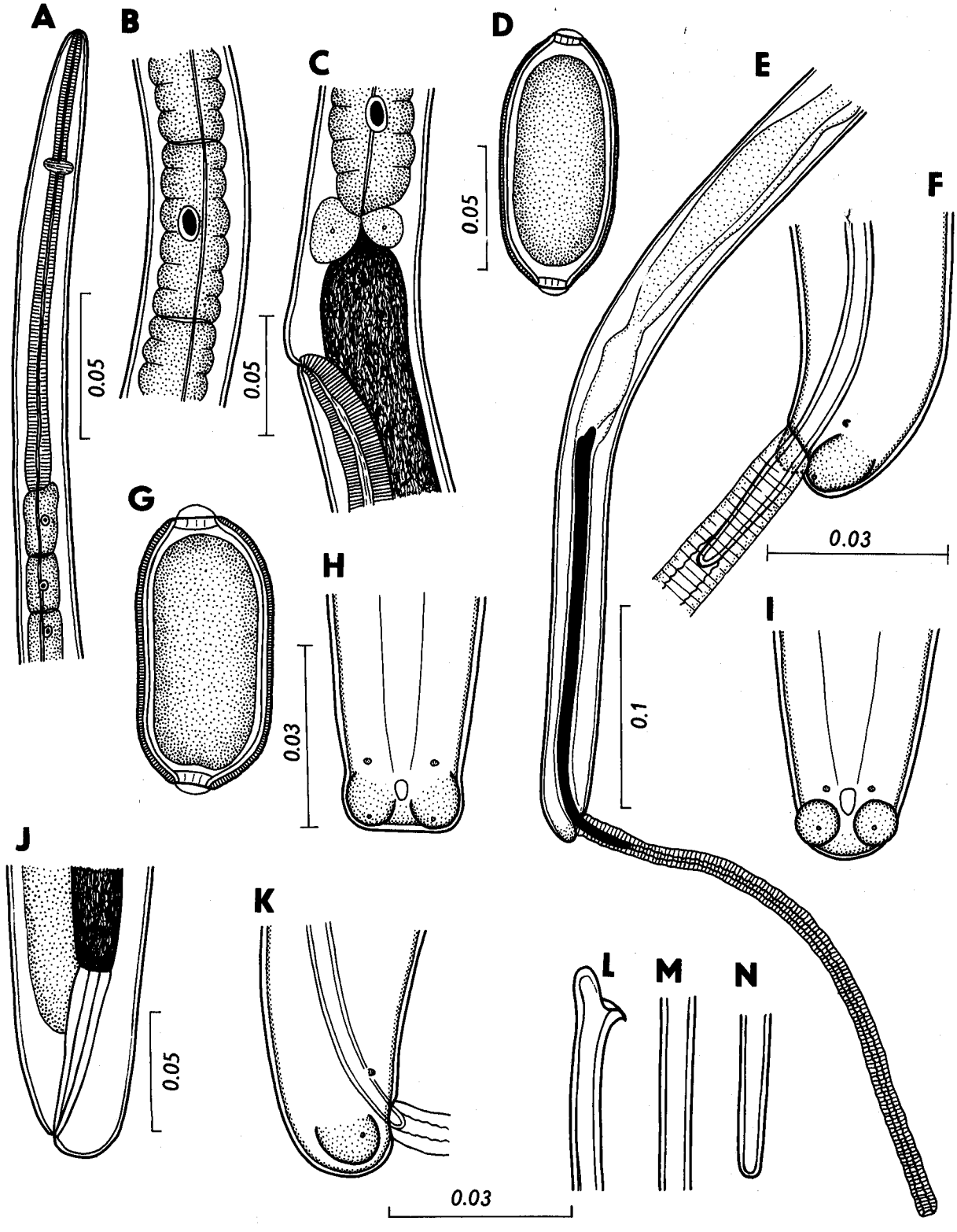

Fig. 1. *Capillaria* (*Hepatocapillaria*) *cichlasomae* sp. n. **A** – anterior end of female; **B** – cephalic end, apical view; **C** – region of vulva; **D** – middle part of female stichosome; **E** – posterior end of male; **F–G** – caudal end of male with everted spicular sheath; **H** – caudal end of female; **I** – larvated egg from host's liver; **J** – mature egg from female uteus; **K** – caudal end of male, ventral view.

width 0.003 (0.004). Evaginated spicular sheath funnel-shaped, short and broad (length 0.015, width 0.028 in paratype), its surface covered by small spines. Caudal end rounded, bearing one pair of small, inconspicuous subventral postanal papillae. Cloacal opening subterminal, length of tail 0.008 (0.013).

Female (2 specimens, allotype and paratype [body fragment]; measurements of paratype in parentheses): Body length of gravid specimen 4.54 (length of body fragment of paratype 1.55), maximum width 0.050 (0.060). Length of entire oesophagus 2.00 (44% of body length), of muscular oesophagus 0.195, of stichosome 1.81; stichocytes 38 in number. Distance of nerve ring from anterior end 0.075. Vulva situated at level of oesophago-intestinal junction in allotype (0.098 posterior to oesophagus end in paratype), vulvar lips not elevated. Eggs oval, thin-walled, arranged in one file in uterus; size of eggs including polar plugs 0.053-0.058 × 0.023 (0.055-0.060 × 0.025-0.028). Egg wall 0.002 thick, two-layered; outer layer conspicuously thin, with smooth surface; polar plugs distinctly protruding; length of polar plug 0.004, its width 0.009. Contents of mature egg uncleaved. Rectum short hyaline tube; ovary reaching posteriorly slightly behind end of intestine. Anus subterminal; tail rounded, 0.008 long.

Eggs from host's liver: Length 0.057–0.060, width 0.027. Polar plugs somewhat protruding; length of polar plug 0.003, width 0.009. Egg wall conspicuously thin (width 0.002), hyaline, with smooth surface. Egg contains fully formed, coiled larva; width of larval body 0.008.

Type host: cichlid, *Cichlasoma urophthalmus* (Günter), local name "majorra del sureste" (fam. Cichlidae, Perciformes).

Site of infection: liver.

Type locality: a small freshwater lake ("aguada") Xpoc (20°35' 12" N, 89°19'00"W), Yucatan, Mexico.

Dates of collection: holotype, allotype and male paratype collected on 4 July 1994, female paratype on 4 October 1994; eggs found in liver of fish examined on 15 September 1993, and 4 July and 4 October 1994.

Prevalence: 3% (in 2 out of 65 fishes examined); intensity: 1 and 10 nematodes.

Deposition of specimens: Institute of Parasitology, Academy of Sciences of the Czech Republic, České Budějovice, Helm. Coll. No. N – 641; paratypes in Universidad Nacional Autónoma de México, Mexico City.

Etymology: The specific name of this species is derived from the generic name of its type host.

DISCUSSION

According to the system of capillariids proposed by Moravec (1982), the new species from *C. urophthalmus* belongs to the genus *Capillaria* Zeder, 1800 (*sensu stricto*). In his later revision of capillariid nematodes from fishes, the same author (Moravec 1987) proposed for the four distinct morphological groups of fish capillariiids new subgenera: *Procapillaria*, *Neocapillaria*, *Capillaroides* and *Hepatocapillaria*. The last named subgenus is characterized by short stichocytes, the rounded male tail with a pair of minute subventral papillae, the well sclerotized spicule, the absence of the vulvar appendage, the uncleaved contents of eggs in uterus and by the localization of these parasites in the host's liver; there is no doubt that the nematodes of the present material belong to this subgenus.

To date the subgenus *Hepatocapillaria* Moravec, 1987 has been monotypic, with the only species *Capillaria* (*Hepatocapillaria*) *cyprinodonticola* Huffman et Bullock, 1973 described from the liver of marine and brackish-water fishes of the families Cyprinodontidae (*Cyprinodon variegatus*, *Floridichthys carpio*, *Fundulus grandis*) and Poeciliidae (*Poecilia latipinna*) from southern Florida (mangrove swamp in Marathon, the Florida Keys) from the USA (Huffman and Bullock 1973). *C. cyprinodonticola* was tentatively assigned to the genus *Schulmanela* Ivashkin, 1964 by Moravec (1982) in his review of capillariids; however, after a re-examination of the type specimens he (Moravec 1987) redescribed this species and established it as the type species of the newly erected subgenus *Capillaria* (*Hepatocapillaria*).

Although the morphology of *Capillaria cichlasomae* sp. n. is very similar to that of *C. cyprinodonticola*, it differs distinctly from the latter in possessing a clearly subterminal anus in the female (terminal in *C. cyprinodonticola*), a somewhat shorter spicule (0.068–0.085 mm vs. 0.099–0.102 mm) and a different shape and structure of eggs (in contrast to *C. cyprinodonticola*, the eggs of *C. cichlasomae* are narrower, with distinctly protruding polar plugs). Both species also differ in their host types (Atheriniformes vs. Perciformes), habitat (freshwater vs. marine or brackish-water), and geographical distribution (Florida vs. Yucatan).

To date there are known only three species of capillariids (*Schulmanela petruschewskii*, *Capillaria cyprinodonticola* and *C. cichlasomae*) parasitic in the liver of fishes. *Schulmanela petruschewskii* (Shulman, 1948), differing from *C. cichlasomae* mainly in a well developed caudal bursa in the male, is a widespread parasite of many freshwater fish species of the orders Salmoniformes, Cypriniformes and Perciformes in Europe and Trans-Caucasia (Moravec 1987, 1994), where heavy infections of this pathogenic parasite are often found in pond-reared carp (*Cyprinus carpio*) and rainbow trout (*Oncorhynchus mykiss*) (e.g. Ghittino 1961, Georgescu et al. 1983). *S. petruschewskii* has recently been reported also from the cultured, introduced tilapia (*Oreochromis aureus*) from Cuba (Prieto et al. 1993),

but the actual appurtenance to this species should be verified.

Although the population of *Cichlasoma urophthalmus* in lake Xpoc is highly infested with this parasite, most infected fishes harbour only the parasite's larvated eggs in their liver. In these cases the eggs are mostly encapsulated, usually each capsule containing a few eggs, and some eggs are occasionally found dead, destroyed by tissue reaction; this indicates on a long-lasting presence of the eggs in the liver. On the other hand, the nematodes themselves are much less frequently found. For example, an examination of the sample of 25 *C. urophthalmus* (body length 7–19 cm) taken in October 1994 showed that 24 fish specimens (prevalence 96%) harboured *C. cichlasomae* eggs in the liver, but only one (prevalence 4%) contained a nematode. A similar relation between the occurrence of the parasite's eggs and the parasites themselves was observed in another histozoic trichuroid, *Huffmanela huffmani* Moravec, 1987, a swimbladder parasite of sunfishes (*Lepomis* spp.) in Texas (Huffman and Moravec 1988). Fishes infected with *C. cichlasomae* eggs usually contain huge numbers of these eggs in the liver.

Little is known about the biology of *Capillaria cichlasomae* but, similarly as *Schulmanela petruschewskii* in Europe, this pathogenic parasite may represent a certain danger to the aquaculture of local species of *Cichlasoma* and probably also of the related, introduced tilapia species (*Oreochromis* spp.). In view of the existing plans to utilize some natural small water bodies in Yucatan for ecoturism and to adapt some of them for establishing cultures of tilapia in the near future, this parasite deserves further study.

Acknowledgements. The authors' thanks are due to the fellow-workers of the Laboratory of Parasitology and Histopathology, CINVESTAV-IPN in Mérida, namely to J.Vargas Vázquez, C. Vivas Rodríguez, R. Síma Alvarez, J. Güemez Ricalde and G. Arjona Torres, for their assistance in collecting and examining fish. Thanks are also due to Mrs. I. Husáková, Institute of Parasitology in České Budějovice, Czech Republic, for her technical assistance in preparing the drawings and in obtaining the necessary literature. This work was supported by the grant from the Comisión Nacional para el Uso y Conocimiento de la Biodiversidad (CONABIO), Mexico, no. PO99.

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Raceived 21 November 1994

Accepted 23 February 1995