

Mexiconema cichlasomae gen. et sp. (Nematoda: Daniconematidae) from *Cichlasoma* spp. (pisces) from Mexico

F. MORAVEC¹, V. VIDAL² and G. SALGADO MALDONADO²

¹Institute of Parasitology, Czechoslovak Academy of Sciences, Branišovská 31, 370 05 České Budějovice, Czechoslovakia and ²Instituto de Biología, Universidad Nacional Autónoma de México, Apartado postal 70–153, 04510 México, D. F., México

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Abstract. A new nematode genus and species, *Mexiconema cichlasomae* gen. et sp. n., is described from the abdominal cavity, viscera (mesenteries, swimbladder, liver, spleen, kidneys, intestinal lumen, serose cover of intestine) and rarely the skin below the scales of four species of cichlids, *Cichlasoma urophthalmus* (type host), *C. helleri*, *C. motaguense* and *C. pearsei* from the salt water coastal lagoon Celestun (N. Yucatan) (type locality) and several other freshwater, salt water and marine localities from Mexico. This dracunculoid nematode species represents a new genus of the recently established, hitherto monotypic family Daniconematidae. The new genus *Mexiconema* gen. n. is characterized, in contrast to *Daniconema* Moravec et Køie, 1987, mainly by the absence of a pair of large internal, forwardly protruding dorsoventral cephalic papillae, presence of two giant cell nuclei in the glandular section of the oesophagus, caudal processes in both sexes and an unpaired sclerotized copulatory plate in the male; preanal papillae are lacking on the male tail. *Mexiconema cichlasomae* shows certain affinities with members of the families Skrjabillanidae and Guyanemidae.

During recent studies of the parasites of various *Cichlasoma* species in North Yucatan and South Mexico, a previously undescribed nematode species was frequently found in the abdominal cavity and viscera of *Cichlasoma urophthalmus*, less often in *C. helleri*, *C. motaguense* and *C. pearsei*. Since this parasite exhibits unique morphological features, creation of an independent genus is proposed to accommodate this new species.

MATERIALS AND METHODS

The specimens were fixed with hot 70% ethanol, stored in 70% ethanol and cleared with glycerine for light microscopy. Drawings were made with the aid of a camera lucida. For scanning electron microscopy, the nematodes were dehydrated through an ethanol series and amylacetate and then subjected to critical point drying. The specimens were coated with gold and examined with the Tesla BS-300 scanning electron microscope at an accelerating voltage of 15 kV. All measurements are given in millimetres.

RESULTS

Mexiconema cichlasomae gen. et sp. n.

Figs. 1, 2

Description: Fine, thread-like nematodes with almost smooth cuticle. Head end bluntly rounded, dome-shaped in lateral view and somewhat expanded with depressed oral opening region in dorsoventral view; elevated part of cephalic end surrounding oral opening forming two lateral lip-like lobes in some specimens (Fig. 2A) that are absent in others. Eight well developed external paired papillae (2 ventroventral, 2 lateroventral, 2 dorsolateral, 2 dorsodorsal) and pair of lateral amphids present. Oral opening small, oval to somewhat triangular. Buccal capsule absent; muscular oesophagus starting just below oral opening. Oesophagus divided into anterior shorter muscular section and posterior longer glandular section provided with two huge cell nuclei, one approximately at mid-length of glandular oesophagus and one near its posterior end. Posterior end of muscular oesophagus and anterior end of intestine somewhat submerged into glandular oesophagus. Length ratio of muscular and glandular sections of oesophagus being 1:0.93–1.78. Nerve ring encircling muscular oesophagus approximately at its mid-length. Excretory pore situated somewhat behind nerve ring level, deirids not found. Intestine straight. Gravid female approximately 2–3 times as long as male.

Male (10 specimens; measurements of holotype in parentheses): Length of body 2.98–3.94 (3.45), maximum width 0.041–0.054 (0.054). Length of muscular oesophagus 0.270–0.339 (0.330), its maximum width 0.009–0.015 (0.015); glandular oesophagus 0.465–0.585 (0.585) long, maximum width 0.027–0.036 (0.036). Distance of anterior oesophageal cell nucleus from anterior extremity 0.474–0.612 (0.612), that of posterior nucleus 0.648–0.857 (0.857). Length ratio of muscular and glandular sections of oesophagus 1:1.70–1.78 (1:1.77). Length of posterior part of glandular oesophagus exceeding anterior end of intestine 0.012–0.024 (0.024). Distance of nerve ring and excretory pore 0.141–0.168 (0.162) and 0.150–0.198 (0.198), respectively, from anterior extremity. Anterior end of testis near end of glandular oesophagus. Caudal end straight (not ventrally bent), caudal alae absent. Only four pairs of caudal sessile papillae present, all being located near cloacal opening; their position unstable, usually one or two first pairs adanal and two or three pairs postanal, of which one or two lateral and two or three subventral (Figs. 1G, H, 2D, E); in one specimen all these papillae appeared to be postanal. Preanal papillae absent. Spicules or gubernaculum absent. Unpaired sclerotized copulatory plate present, adhering to anterior wall of common cloacal duct, elongate in lateral view, almost straight, oriented posteriorly; its length being 0.021–0.033 (0.024), maximum width 0.003 (0.003). Tail conical, bluntly ended, with three small spike-like or digital cuticular processes 0.003 (0.003) long at tip.

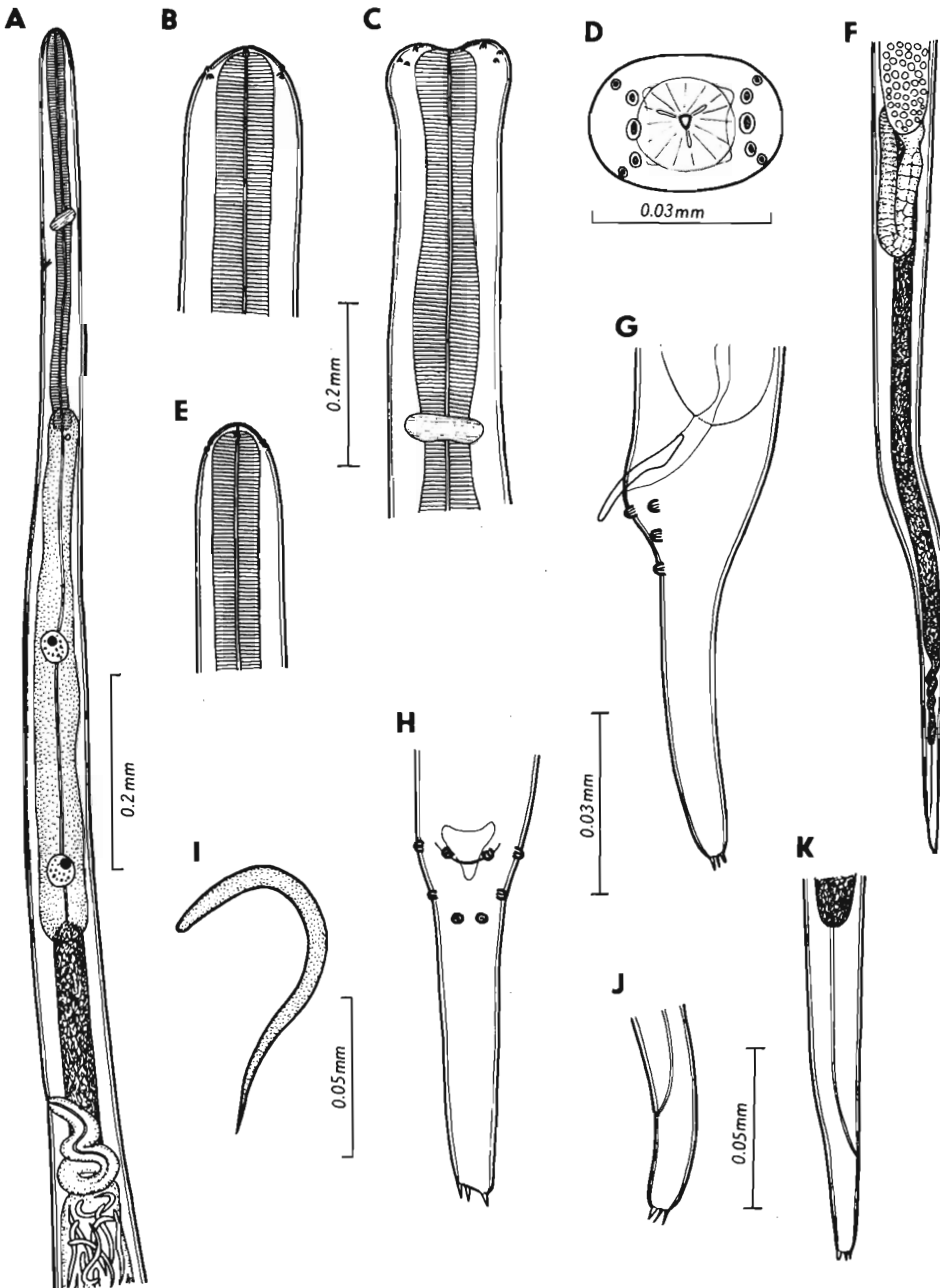


Fig. 1. *Mexiconema cichlasomae* gen. et sp. n. A – anterior end of body of gravid female; B–D – head end of gravid female, lateral, dorsoventral and apical views; E – head end of male, lateral view; F – posterior end of female body; G, H – tail of male, lateral and ventral views; I – shape of larva from female uterus; J – tail of female; K – caudal region of female.

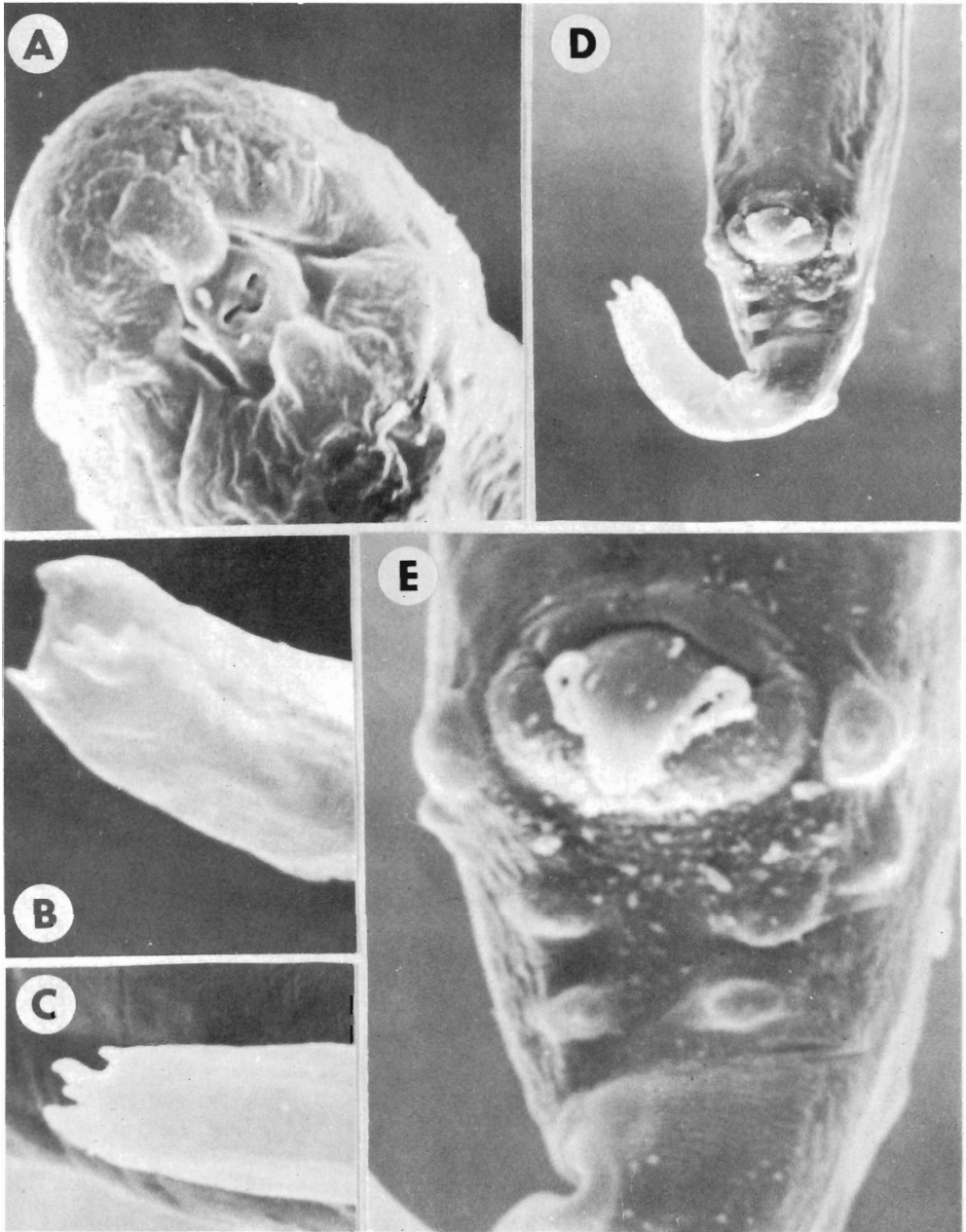


Fig. 2. Scanning electron micrographs of *Mexiconema cichlasomae* gen. et sp. n. A – head end of female with lateral lip-like lobes, apical view ($\times 2\,460$); B – tail tip of female with distinct caudal processes ($\times 4\,720$); C – same, different position ($\times 2\,810$); D – tail of male, ventral view ($\times 1\,260$); E – cloacal opening region showing distribution of caudal papillae and protruding distal end of copulatory plate ($\times 4\,200$).

Female: (10 specimens; measurements of allotype in parentheses): Length of body of gravid female (with larvae) 5.25–14.13 (10.04), maximum width 0.068–0.136 (0.109). (Length of nongravid female 4.53, its width 0.054.) Length of muscular oesophagus 0.282–0.480 (0.393), its maximum width 0.015–0.024 (0.024); glandular oesophagus 0.450–0.615 (0.615) long, maximum width 0.036–0.060 (0.051). Distance of anterior oesophageal cell nucleus from anterior extremity 0.456–0.694 (0.694), that of posterior nucleus 0.636–0.938 (0.938). Length ratio of muscular and glandular sections of oesophagus 1:0.93–1.60 (1:1.56). Length of posterior part of glandular oesophagus exceeding anterior end of intestine 0.021–0.045 (0.021). Distance of nerve ring and excretory pore 0.120–0.240 (0.216) and 0.201–0.294 (0.270), respectively, from anterior extremity. Anus functional. Tail conical, bluntly ended, with three small cuticular processes 0.003 (0.003) long at tip; one of these processes being dorsal and two subventral; subventral processes may be forked (Figs. 2B, C). Monodelphic. Single ovary reflected, situated anteriorly to rectum. Uterus very long, occupying major part of nematode body. It is straight, containing eggs, developing embryos and fully formed larvae in sequence from the posterior to the anterior end. Vulva well developed, functional, situated 0.72–1.24 (1.21) from anterior end of body, usually somewhat posterior to end of oesophagus (distance of vulva from oesophagus end 0–0.272 (0.204)); vulvar lips not elevated. Vagina directed posteriorly, being represented by short, coiled tube. Fully formed larvae in uterus slender, with sharply pointed tail; length of larvae about 0.180 (0.180), width 0.005–0.006 (0.005).

Hosts: *Cichlasoma urophthalmus* (type host), *C. helleri*, *C. motaguense* and *C. pearsei* (all Cichlidae). Localization: abdominal cavity and viscera (mesenteries, swimbladder, liver, spleen, kidneys, intestinal lumen, serous membrane covering intestine), rarely skin beneath scales.

Type locality: coastal lagoon Celestun (mostly salt water), North Yucatan (20°45'–20°58' N, 90°15'–90°25' W), Mexico.

Other localities (all in Yucatan peninsula, Mexico): coastal lagoon Chelem (Yucatan); El Vapor (a freshwater lagoon continuous to Terminos lagoon) and nearby localities Palizada and Sta. Gertrudis, El Cayo (a salt water locality inside Terminos lagoon) and Pargos, and the river Rio Champoton (all Campeche); Rio Lagartos (coastal lagoon) and Noh Bek (lake) (both Quintana Roo). El Vapor (as well as Palizada and Sta. Gertrudis), Rio Lagartos and Noh Bek are truly freshwater localities, all the remaining sites are salt water or marine localities.

Prevalence: *M. cichlasomae* occurred in *Cichlasoma urophthalmus* at a prevalence of 3.3–50.0% (43.0% in type locality); it was always a rare parasite of other three *Cichlasoma* species.

Deposition of types: holotype (♂), allotype (♀) and majority of paratypes deposited in the helminthological collection of Instituto de Biología, Universidad Nacional Autónoma de México (Helm. Coll. Nos. 186–3–holotype and allotype and 186–4–paratypes); 2 paratypes (♂ + ♀) in the Institute of Parasitology, Czechoslovak Academy of Sciences (Helm. Coll. No. N–573) in České Budějovice, Czechoslovakia.

Etymology: The specific name refers to the generic name of host fishes.

Genus *Mexiconema* gen. n.

Diagnosis: Dracunculoidea, Daniconematidae. Body thread-like, head end bluntly rounded, provided with eight external paired papillae and a pair of lateral

amphids. Oral opening small, oval to triangular. Buccal capsule absent. Oesophagus divided into anterior short muscular section and posterior, longer glandular section with two large cell nuclei. Nerve ring encircling muscular oesophagus approximately at its mid-length, excretory pore slightly posterior to nerve ring level. Tail of both sexes conical, with three minute processes at tip. Caudal alae in male absent; four pairs of sessile postanal and adanal papillae present. Female with functional anus. Major part of female body filled with uterus containing larvae. Vulva situated near posterior end of oesophagus, vagina short. Single ovary in posterior part of body.

Type- and the only species: *Mexiconema cichlasomae* sp. n.

DISCUSSION

The general morphology of *Mexiconema cichlasomae* gen. et sp. n. shows that this nematode species belongs to the superfamily Dracunculoidea Cameron, 1934 in the conception of Chabaud (1975) and can be assigned to the recently established family Daniconematidae according to the key to families of the Dracunculoidea provided by Moravec and Køie (1987). Some features of *Mexiconema* gen. n. do not agree with the original diagnosis of Daniconematidae (the absence of a pair of prominent internal labial papillae and the presence of a sclerotized copulatory plate in male), but these may be taken for the differences between genera of the same family. For example, the related family Skrjabillanidae comprises genera with the copulatory plate present in the male (*Skrjabillanus*, *Molnaria*) and those in which this plate is absent (*Sinoichthyonema*). We therefore propose to modify the diagnosis of Daniconematidae as follows:

“Dracunculoidea. Body thread-like. Head end with eight external paired papillae. Buccal capsule absent. Oesophagus divided into short anterior muscular and long posterior glandular portions. Tail of male without caudal alae, provided with several pairs of papillae. Spicules absent. Vulva situated in anterior part of body. Monodelphic. Parasites of fishes. Type genus: *Daniconema* Moravec et Køie, 1987.”

Mexiconema gen. n. differs from *Daniconema*, the only other genus of Daniconematidae, mainly in the absence of two prominent, lobe-like inner cephalic papillae, in having the glandular part of the oesophagus provided with two large cell nuclei, and in the presence of three caudal processes in both sexes. Moreover, *Mexiconema* is noted for the presence of the sclerotized copulatory plate and the absence of preanal papillae in males and for the location of the vulva near the posterior end of the glandular oesophagus in females (in contrast, the copulatory plate is absent and preanal papillae are present in *Daniconema* males and the vulva of congeneric females is near the anterior end of the glandular oesophagus).

Moravec and Køie (1987) mention that, of the presently existing families of Dracunculoidea, Daniconematidae appears to be the most closely related to the family Skrjabillanidae, which includes tissue parasites of palaeartic freshwater fishes. They remark that *Daniconema anguillae*, then the only species of Danicone-

matidae, is noted for many features characteristic of the family Skrjabillanidae (e.g., structure of the oesophagus, character of the female reproductive apparatus, absence of spicules, etc.), but differs from members of this family in such features as is the absence of the buccal capsule, number, shape and distribution of caudal papillae in the male and absence of the male caudal alae, which form a kind of bursa in skrjabillanid males. The morphology of *Mexiconema cichlasomae* gen. et sp. n. gives further evidence of close relationships between these two families. This concerns mainly the presence of the sclerotized copulatory plate in the male; similar to *Mexiconema*, this organ is also present in the skrjabillanid genera *Skrjabillanus* Shigin et Shigina, 1958 and *Molnaria* Moravec, 1968, but is absent from all other families and genera of dracunculoids. The presence of three small caudal processes in both sexes of *Mexiconema cichlasomae* is also typical of the females of the skrjabillanid genera *Skrjabillanus* and *Molnaria*.

The family Daniconematidae also shows affinities with Guyanemidae (see Moravec and Køie 1987), until recently a monotypic family including several *Guyanema* species from South-American freshwater fishes. Adamson and Roth (1990) described a new genus and species, *Pseudodelphis oligocotti*, from the peritoneal cavity of tidepool sculpin *Oligocottus maculosus* from coastal British Columbia in Canada, which they assigned to the family Guyanemidae. The general morphology of this species is more similar to members of the family Daniconematidae than to *Guyanema* spp. However, *P. oligocotti* possesses two spicules in the male in contrast to Daniconematidae species in which the spicules are absent, being substituted by an unpaired sclerotized copulatory plate in *Mexiconema cichlasomae*. Since the spicules of *P. oligocotti* are short and were illustrated only in lateral view, appearing similar to a copulatory plate, we reexamined the paratype specimens of *P. oligocotti* deposited in the U.S. National Parasite Collection (USNM Helm. Coll. No. 81005) and confirmed the presence of two spicules in this species. In addition to the absence of spicules and presence of the copulatory plate, *M. cichlasomae* differs from *P. oligocotti* in other features, especially the structure of the oesophagus (e.g., presence of two large cell nuclei), the number and distribution of caudal papillae in the male and the presence of caudal processes in both sexes.

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REFERENCES

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- ADAMSON M. L., ROTH M. 1990: Prevalence and intensity of *Pseudodelphis oligocotti* n. gen., n. sp. (Dracunculoidea; Guyanemidae) in the tidepool sculpin, *Oligocottus maculosus* (Scorpaeniformes; Cottidae). J. Parasitol. 76: 509-514.

CHABAUD A. G. 1975: Keys to genera of the order Spirurida. Part 1. Camallanoidea, Dracunculoidea, Gnathostomatoidea, Physalopteroidea, Rictularoidea and Thelazioidea. CIH Keys to the nematode parasites of vertebrates

3. Commonwealth Agricult. Bureaux, Farnham Royal, Bucks, 27 pp.
MORAVEC F., KØIE M. 1987: *Daniconema anguillae* gen. et sp. n., a new nematode of a new family Daniconematidae fam. n. parasitic in European eels. Folia Parasitol. 34: 335-340.

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