

## *Thubunaea ctenosauri* sp. n. (Nematoda: Physalopteridae) from the Iguanid Lizard *Ctenosaura pectinata* and Other Lizard Helminths from Mexico

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**ABSTRACT:** *Thubunaea ctenosauri* sp. n. is described from the large intestine of the iguanid lizard *Ctenosaura pectinata* from Aguamilpa, Mexican State of Nayarit. It is characterized mainly by the position of the vulva, number and distribution of caudal papillae, length of spicules (0.066 mm), and size of eggs (0.054–0.060 × 0.039–0.042 mm). Other recorded species of parasitic nematodes are *Skrjabinodon scelopori* from *Phyllodactylus lanei*; *Parapharyngodon alvarengai* from *P. lanei*, *Anolis nebulosus*, and *Sceloporus nelsoni*; and *Atractis scelopori* from *C. pectinata* and *Sceloporus* sp. The findings represent new host records, and *P. alvarengai* is reported from Mexico for the first time.

**KEY WORDS:** nematodes, *Skrjabinodon*, *Parapharyngodon*, *Atractis*, *Thubunaea*, *Anolis nebulosus*, *Ctenosaura pectinata*, *Phyllodactylus lanei*, *Sceloporus nebulosus*, Mexico.

During recent studies on helminth parasites of lizards from the Pacific coast of Nayarit State, central Mexico, several nematode species, including a new species, were collected from 4 endemic species of lizards. One of them was also recorded from a lizard originating from the Mexican State of Veracruz. All findings represent new host records. Species of the nematode genera *Alaeuris* Thapar, 1925 and *Ozolaimus Dujardin*, 1845, forming a part of this material, have already been dealt with in the paper by Moravec et al. (1996). The present paper describes the new species and gives an account of the other nematode species recorded, including 1 new to science.

### Materials and Methods

Most nematodes were collected from the following 4 species of lizards in Aguamilpa (21°05'32"N, 104°46'20"W), Nayarit, Mexico, from August to November 1993: *Phyllodactylus lanei* Smith, 1935 (56 specimens) (Gekkonidae), *Anolis nebulosus* (Wiegmann, 1834) (Polychrotidae) (4), *Ctenosaura pectinata* (Wiegmann, 1834) (Iguanidae) (29), and *Sceloporus nelsoni* Cochran, 1923 (Phrynosomatidae) (10) (all Iguanidae). A specimen of *Sceloporus* sp. originating from Xalapa, Veracruz, accidentally was examined in the same period. The nematodes were washed in physiological saline, fixed and stored in 70% ethanol, and cleared in glycerine. Drawings were made with aid of a Zeiss microscope drawing attachment. One female specimen of *Thubunaea ctenosauri* was transferred to

4% formaldehyde, postfixed in 1% OsO<sub>4</sub>, dehydrated through an ethanol series and acetone, and then subjected to critical-point drying. The specimen was coated with gold and examined with a JSM-6300 scanning electron microscope at an accelerating voltage of 15 kV. All measurements are given in millimeters unless otherwise stated. Types of the new species are deposited in the Institute of Biology, National Autonomous University of Mexico (UNAM), Mexico City; voucher specimens of the remaining species are deposited in the same institute (UNAM) and also in the Institute of Parasitology, Academy of Sciences of the Czech Republic (IPASCR), in České Budějovice. Host specimens are deposited in the herpetological collection of the UNAM.

### Results

#### Physalopteroidea

#### Family Physalopteridae Railliet, 1893

#### *Thubunaea ctenosauri* sp. n.

(Figs. 1A–D, 2)

**DESCRIPTION:** Medium-sized nematodes with almost smooth cuticle. Cephalic end rounded, with 2 rounded, slightly elevated lateral pseudolabia; each pseudolabium provided with a pair of submedian papillae and small lateral amphid. Pseudolabia slightly asymmetrical, one of them somewhat more pronounced than another one. Each pseudolabium equipped with 3 small teeth. Oral opening dorsoventrally elongate. Deirids small, simple, situated approximately at level of nerve ring. Esophagus composed of short "pharynx," anterior muscular portion and posterior, much longer and wider glandular portion. Nerve

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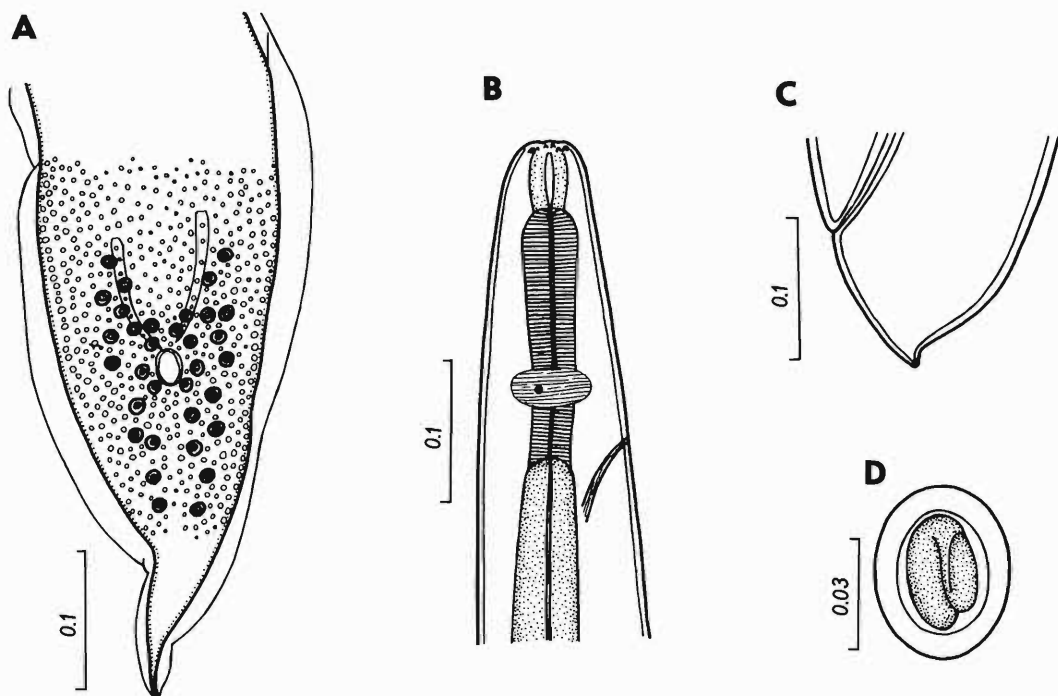


Figure 1. *Thubunaea ctenosauri* sp. n. A. Posterior end of male, ventral view. B. Anterior end of gravid female. C. Female tail. D. Egg.

ring encircling muscular esophagus at its posterior half. Excretory pore near end of muscular esophagus. Tail conical in both sexes.

MALE (1 specimen, holotype): Length of body 8.09, maximum width 0.272. "Pharynx" 0.036 long, length of muscular and glandular parts of esophagus 0.150 and 0.696, respectively. Nerve ring and excretory pore 0.150 and

0.165, respectively, from anterior extremity. Deirids 0.150 from anterior end of body. Tail conical, pointed, 0.258 long. Caudal alae well developed. Numerous preanal (8 pairs), adanal (2 pairs), and postanal (6 and 7) papillae present; altogether, 16 papillae on right side and 17 papillae on left side. Papillae rather similar in appearance, 4 pairs of more lateralmost preanal papillae and 4 pairs of lateralmost postanal papillae appearing to be somewhat pedunculate. Ventral surface with dense cuticular ornamentation (protuberances) extending anteriorly somewhat anterior to anteriormost pair of preanal papillae and posteriorly slightly posterior to last pair of postanal papillae. Spicules equal, slightly sclerotized, 0.066 long.

FEMALE (2 specimens, allotype and paratype; measurements of latter in parentheses): Length of body 27.32 (15.42), maximum width 0.299 (0.299). "Pharynx" 0.039 (0.045) long, length of muscular and glandular parts of esophagus 0.195 (0.198) and 1.11 (1.11), respectively, from anterior extremity; distance of deirids 0.186 (0.222). Tail conical, 0.105 (0.168) long, pointed. Vulva situated 1.84 (1.88) from anterior ex-

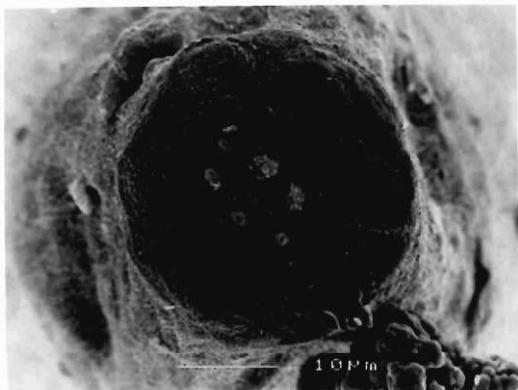


Figure 2. *Thubunaea ctenosauri* sp. n. Scanning electron micrograph of female cephalic end, apical view.

tremity, posterior to esophagus end; vulvar lips not elevated. Vagina pointing backward. Two parallel uteri present. Eggs oval, thick-walled, larvated; size of eggs 0.054–0.060 × 0.039–0.042 (only immature eggs in paratype), egg wall 0.009 (—) thick.

TYPE HOST: *Ctenosaura pectinata* (Wiegmann, 1834).

SITE: Large intestine.

TYPE LOCALITY: Aguamilpa, Nayarit, Mexico (24 August 1993).

PREVALENCE AND INTENSITY: 3% and 8 nematodes.

DEPOSITION OF TYPES: Holotype (♂) and allotype (♀) in the helminthological collection of the UNAM, Mexico City (Coll. No. 2643).

ETYMOLOGY: The specific name of this nematode is derived from the generic name of its type host.

COMMENTS: In contrast to Skryabin and Sobolev (1964), many species originally listed in the genus *Thubunaea* Seurat, 1914, are now considered as members of the related genus *Physalopteroides* Wu and Liu, 1940, on the basis of their asymmetrical oral opening (e.g., Chabaud, 1975; Baker, 1987; Bursey and Goldberg, 1991). Unfortunately, the species of the present genus *Thubunaea* have not been studied by scanning electron microscopy to confirm the symmetry of cephalic structures. Because the asymmetry of the oral opening and pseudolabia of the new species is only slightly developed and the number of teeth is identical on both sides of the oral opening and their size is very similar, we consider it more reasonable to assign this nematode species to *Thubunaea* than to *Physalopteroides*. In our opinion, it will be necessary to reconsider the delimitation of the 2 preceding genera when more exact data on the morphology of individual species are available.

According to Bursey and Goldberg (1991), there are at present 17 species of *Thubunaea*, including the parasites of reptiles. Unfortunately, the descriptions of many species are inadequate and frequently misleading, preventing any detailed comparison. Only 5 *Thubunaea* species are known from the Western Hemisphere (Baker, 1987; Bursey and Goldberg, 1991): *T. parkeri* Baylis, 1926, from *Tropidurus occipitalis* and *Dicrodon calliscelis* from Peru; *T. leiolopismae* Harwood, 1932, from *Scincella lateralis* from Texas, U.S.A.; *T. iguanae* Telford, 1965, from 10 species of lizards (*Callisaurus*, *Cnemidophorus*, *Coleonyx*, *Gambelia*, *Sceloporus*, *Uma*, *Uta*, *Xantusia*) from California, U.S.A., and Mexico; *T. cnemidophorus* Babero and Matthias, 1967, from *Cnemidophorus tigris* from Nevada, U.S.A.; and *T. intestinalis* Bursey and Goldberg, 1991, from *Sceloporus jarrovi* from Arizona, U.S.A.

Of the preceding species, *T. ctenosauri* sp. n. differs from *T. parkeri* mainly in the distinctly more anterior position of the vulva (1.84–1.88 vs. 3–3.5 from anterior extremity, although the body of *T. parkeri* is shorter), more numerous caudal papillae in the male, and geographical distribution. In contrast to *T. ctenosauri* sp. n., the vulva of *T. leiolopismae* is situated anterior to the esophagus end, and it possesses fewer caudal papillae in the male, whereas *T. iguanae* has unequal, conspicuously smaller spicules (0.015/0.013 vs. 0.066) and smaller eggs (0.040 × 0.032 vs. 0.054–0.060 × 0.039–0.042). *Thubunaea cnemidophorus* has smaller eggs (0.038 × 0.023) and no spicules in the male, and *T. intestinalis* has conspicuously larger eggs (0.120 × 0.082), a different shape and length of the female tail, and different distribution of caudal papillae in the male, and its vulva is situated slightly posterior to the nerve ring level (posterior to esophagus in *T. ctenosauri*).

When compared to *Thubunaea* species from other continents, *T. ctenosauri* differs in various morphological features, hosts, and geographical distribution. Related species listed in the genus *Physalopteroides* sensu Chabaud (1975) differ from *T. ctenosauri* mainly in a well-pronounced asymmetry of the cephalic structure and in other morphological features.

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## Oxyuroidea

### Family Pharyngodonidae Travassos, 1919

#### *Skrjabinodon scelopori* (Caballero, 1938)

(Fig. 3)

DESCRIPTION: Medium-sized nematodes. Cuticle with fine transverse striations. Lateral alae present. Cephalic end rounded, with 3 small lips; oral papillae indistinct in lateral view. Esophagus almost cylindrical, with well-developed bulb. Nerve ring encircling esophagus at its anterior third in females and at its middle in males. Excretory pore somewhat posterior to end of esophagus. Tail conical, elongate, sharply pointed.

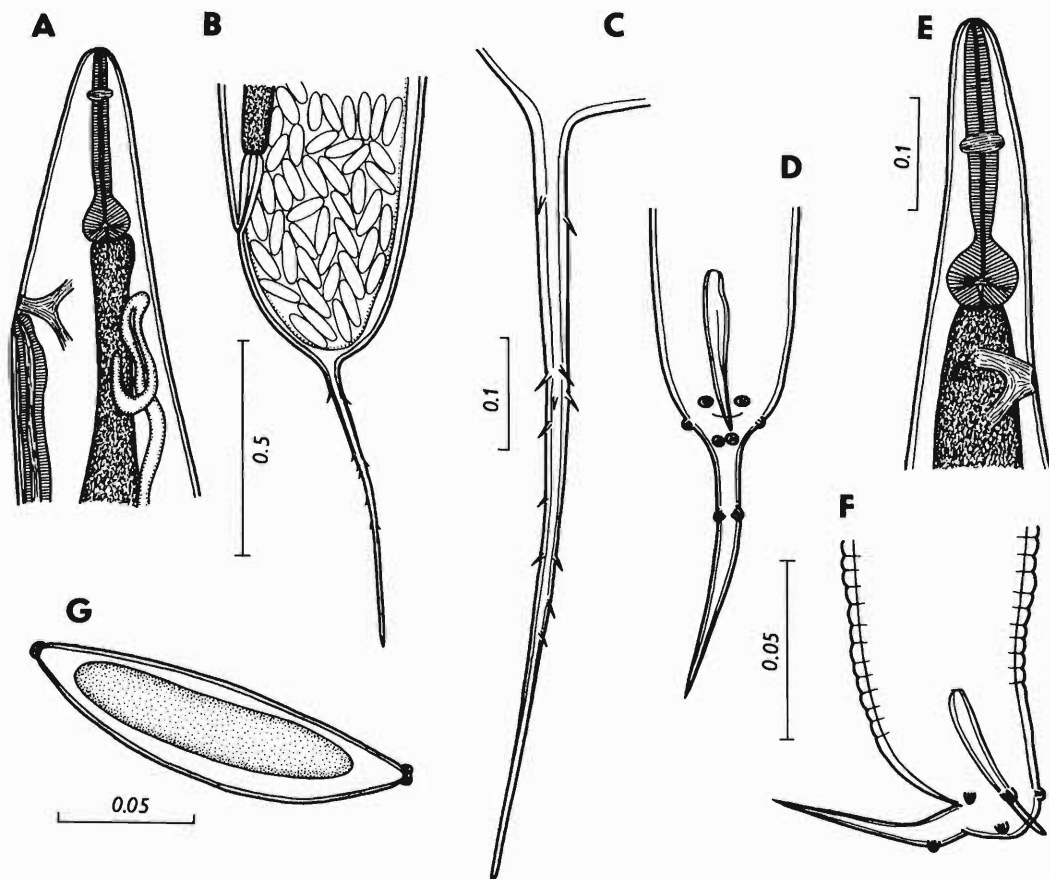


Figure 3. *Skrjabinodon scelopori* (Caballero, 1938). A. Anterior end of gravid female. B. Posterior end of female. C. Caudal appendage of female. D. Caudal end of male, ventral view. E. Anterior end of male. F. Caudal end of male, lateral view.

**MALE** (1 specimen): Length of body 1.96, maximum width 0.136. Length of entire esophagus 0.285; bulb 0.072 long and 0.072 wide. Nerve ring and excretory pore 0.132 and 0.449, respectively, from anterior extremity. Tail elongate, slender, 0.081 long, sharply pointed. One pair of preanal papillae and 3 pairs of postanal papillae present; first postanal pair sublateral and second pair subventral, situated at short distance below cloacal opening; third postanal pair situated approximately at border of first and second thirds of tail. Spicule simple, well sclerotized, 0.057 long.

**FEMALE** (3 specimens): Body of gravid females 3.81–5.73, maximum width 0.381–0.598. Entire esophagus 0.490–0.517 long; bulb 0.105–0.108 long and 0.120–0.129 wide. Nerve ring and excretory pore 0.109–0.120 and 0.571–

0.653, respectively, from anterior extremity. Tail suddenly narrowed at its approximately 2 last thirds, forming needlelike appendage bearing 12–14 cuticular spikes; total length of tail 0.857–1.156, its appendage 0.625–0.775 long. Uterus amphidelphic; anterior ovary not reaching anteriorly to esophagus. Vagina long, muscular, directed posteriorly from vulva; latter situated closely posterior to excretory pore, 0.625–0.721 from anterior end of body. Uterus filled with numerous eggs. Eggs elongate, size 0.162–0.171 × 0.036–0.048, with narrowed ends; each egg pole bearing small, knoblike formation; these polar structures absent from less-developed eggs. Mature eggs nonembryonated.

**HOST:** *Phyllodactylus lanei* Smith, 1935.

**SITE:** Large intestine.

**LOCALITY:** Aguamilpa, Nayarit.

PREVALENCE AND INTENSITY: 30% and 1–48 ( $\bar{x}$  = 10) nematodes per lizard.

DEPOSITION OF VOUCHER SPECIMENS: UNAM (Cat. No. 2644) and IPASCR (Cat. No. N-648).

COMMENTS: Inglis (1968) revised the genus *Parathelandros* Diesing, 1861, and restricted it to accommodate only the species parasitic in Australian frogs; other species were transferred by him to a newly established genus *Skrjabinodon* Inglis, 1968. This has been accepted by many authors (e.g., Petter and Quentin, 1976; Baker, 1987; Ainsworth, 1990). On the other hand, since Inglis's (1968) revision, a number of *Parathelandros* species in lizards outside Australia have been described, with questionable status (Baker, 1987). In this paper, we accept the system of Inglis (1968) and, consequently, the specimens of the present material are listed in the genus *Skrjabinodon*.

By its morphology and measurements, the specimens of the present material are very close to *S. scelopori* (Caballero, 1938), differing from it somewhat in the location of caudal papillae and in the shape of the male spicule and in the location of the vulva in relation to the female excretory pore; polar knoblike formations have not been described on eggs in *S. scelopori*. Because only 1 male was studied, it is highly probable that these differences are within the intraspecific variability of this species and, consequently, we assign the present specimens to *S. scelopori*.

*Skrjabinodon scelopori* is the only species of this genus known from Mexico. It was originally described by Caballero (1938) from the phrynosomatid lizard *Sceloporus torquatus*; later the same species was reported from Mexico by Prado Vera (1971) from *S. grammicus microlepidotus*. *Phyllodactylus lanei* (Gekkonidae) represents a new host record for this nematode.

By the female morphology and egg structure, *S. scelopori* resembles *Spauligodon oxkutzcabiensis* (Chitwood, 1938) described from *Thecadactylus rapicaudus* (Gekkonidae) from Yucatan, Mexico, but the male of the latter species possesses caudal alae.

***Parapharyngodon alvarengai* Freitas, 1957  
(Fig. 4)**

DESCRIPTION (based on specimens from *P. lanei*): Medium-sized nematodes with body tapering to both ends. Cuticle thick, roughly transversely striated. Head end rounded, provided

with 3 minute lips; oral papillae indistinct. Esophagus almost cylindrical, with well-developed posterior bulb. Nerve ring encircling esophagus at its anterior part. Excretory pore situated somewhat posterior to esophagus end.

MALE (1 specimen): Length of body 2.83, maximum width 0.340. Annuli on cuticle 0.015–0.030 long. Lateral alae well developed, extending from level of esophagus end posteriorly to some distance anterior to cloacal opening. Length of entire esophagus 0.476; bulb 0.102 long and 0.114 wide. Nerve ring and excretory pore 0.150 and 0.615 from anterior extremity. Spicule weakly sclerotized, 0.096 long, with sharply pointed distal tip. Tail 0.102 long, suddenly narrowed slightly posterior to cloacal opening, forming caudal appendage. Three pairs of cloacal papillae present: 1 pair of subventral preanal papillae, 1 pair of sublateral postanal papillae situated near posterior lip of cloaca, and 1 pair of subventral papillae at midlength of tail; papillae of first postanal pair larger than others.

FEMALE (2 specimens): Length of body 6.91–8.16, maximum width 0.775–0.884. Lateral alae absent. Entire esophagus 1.29–1.40; bulb 0.190–0.218 long and 0.231–0.245 wide. Nerve ring and excretory pore 0.245–0.286 and 1.50–1.56, respectively, from anterior extremity. Vulva somewhat preequatorial, 2.86–3.02 from anterior end of body. Uterus containing numerous nonembryonated eggs of oval shape, size 0.078–0.087 × 0.042–0.045, with subterminal operculum near 1 pole. Genital apparatus didelphic and prodelphic; ovaries long, their anterior ends forming prominent coils around base of esophagus. Tail short, conical, ending in sharp cuticular spike; length of tail 0.517–0.585.

HOSTS: *Phyllodactylus lanei* Smith, 1935, *Anolis nebulosus* (Wiegmann, 1834), and *Sceloporus nebulosus* Cochran, 1923.

SITE: Large intestine.

LOCALITY: Aguamilpa, Nayarit.

PREVALENCE AND INTENSITY: *P. lanei*: 29% and 1–10 ( $\bar{x}$  = 3) nematodes; *A. nebulosus*: 2% and 2 (2) nematodes; *S. nelsoni*: 30% and 1–22 (11) nematodes.

DEPOSITION OF VOUCHER SPECIMENS: UNAM and (Cat. No. 2644) and IPASCR (Cat. No. 649).

COMMENTS: Although *Parapharyngodon* Chatterji, 1933, is considered by some authors (e.g., Petter and Quentin, 1976; Vicente et al., 1993) a synonym of *Thelandros* Wedl, 1862, in



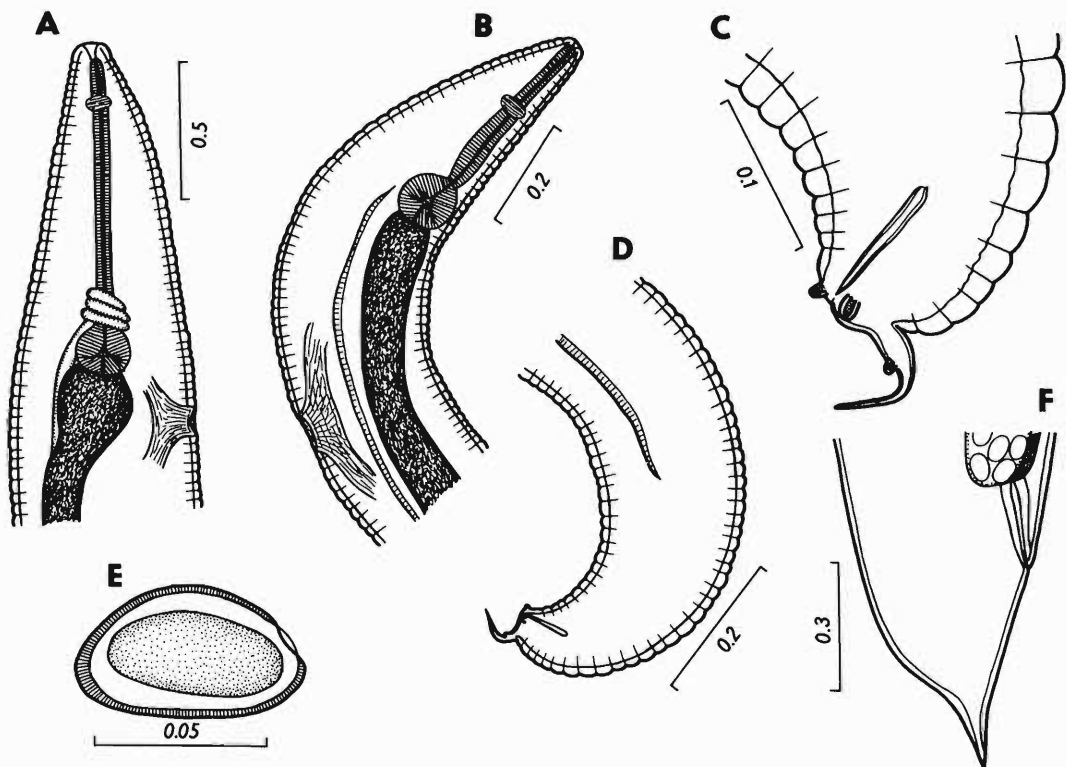


Figure 4. *Parapharyngodon alvarengai* Freitas, 1957. A. Anterior end of gravid female. B. Anterior end of male. C. Caudal end of male. D. Posterior end of male. E. Egg. F. Posterior end of female.

this paper we follow Adamson (1981) and Baker (1987), taking the former as an independent genus. Accordingly, the present specimens are listed in *Parapharyngodon*.

The genus *Parapharyngodon* comprises many species parasitizing lizards and amphibians (Baker, 1987). By their morphology and measurements, the present specimens appear identical to *P. alvarengai* Freitas, 1957, described originally from *Mabuya maculata* from Brazil and later reported from Brazil also from *Ameiva ameiva* (Freitas, 1957; Vicente et al., 1993). Although a few *Parapharyngodon* species have been reported from North and Central America (Baker, 1987), this is the first record of *P. alvarengai* from Mexico.

#### Cosmocercoidea

#### Family Atractidae Railliet, 1917

#### *Atractis scelopori* (Gedoelst, 1919)

(Fig. 5)

DESCRIPTION (based on specimens from *Sceloporus* sp.): Small, whitish nematodes with

smooth cuticle. Cephalic end rounded, with 6 small lips; 4 prominent oral papillae present. Esophagus with well-developed corpus, isthmus and bulb provided with sclerotized apparatus. Nerve ring encircling anterior end of isthmus; excretory pore at level of bulb. Tail conical, with rounded tip.

MALE (2 specimens): Length of body 2.48–2.52, maximum width 0.150–0.163. Length of esophageal corpus 0.246–0.249, maximum width 0.039; isthmus 0.090–0.093 long and 0.027–0.033 wide; bulb 0.081–0.084 long and 0.075–0.078 wide. Nerve ring and excretory pore 0.258–0.264 and 0.321–0.342, respectively, from anterior extremity. Testis not reaching anterior end of esophagus. Spicules unequal; right spicule 0.174–0.192 long, left spicule 0.105–0.108 long. Length of small, slightly sclerotized gubernaculum 0.063–0.066. Three pairs of subventral preanal papillae present. Postanal papillae: 4 pairs, of which first pair lateral, second and fourth subventral and third dorsolateral; last 2 pairs almost at same level. Tail 0.108–0.111 long.

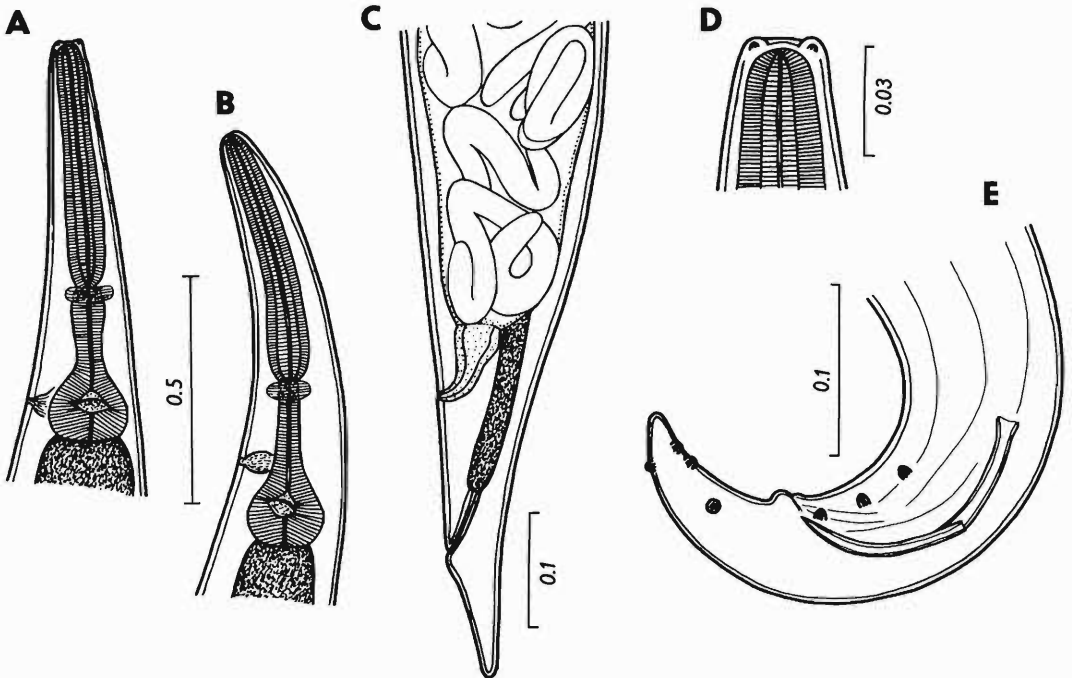


Figure 5. *Atractis scelopori* (Gedoelst, 1919). A. Anterior end of gravid female. B. Anterior end of male. C. Posterior end of female. D. Cephalic end of gravid female, lateral view. E. Posterior end of male.

FEMALE (4 specimens): Length of gravid specimens 2.16–2.41, maximum width 0.218. Length of esophageal corpus 0.240–0.279, maximum width 0.036; isthmus 0.090–0.105 long and 0.030–0.033 wide; bulb 0.075–0.081 long and 0.078–0.084 wide. Nerve ring and excretory pore 0.252–0.303 and 0.318–0.384, respectively, from anterior extremity. Ovary situated anteriorly; uterus containing developing larvae, its distal part with a few already fully formed larvae. Vagina short. Vulva situated somewhat in front of anal opening (at distance of 0.156–0.165). Tail 0.126–0.150 long.

HOST: *Ctenosaura pectinata* (Wiegmann), *Sceloporus* sp.

SITE: Large intestine.

LOCALITIES: Aguamilpa, Nayarit (*C. pectinata*) and Xalapa, Veracruz (*Sceloporus* sp.).

PREVALENCE AND INTENSITY: *C. pectinata*: 52% and 8–12,721 ( $\bar{x}$  = 2,906) nematodes; *Sceloporus* sp.: 6 nematodes in a single host examined.

DEPOSITION OF VOUCHER SPECIMENS: UNAM (Cat. No. 2646) and IPASCR (Cat. No. N-650).

COMMENTS: According to Baker (1987), the genus *Atractis* Dujardin, 1845 (syn. *Cyrtoso-*

*mum* Gedoelst, 1919; *Pseudatractis* Yamaguti, 1961), includes many species parasitic in turtles and lizards.

Of the 5 species known from North and Central American lizards, the specimens of the present material are closest to *A. scelopori* (Gedoelst, 1919) and, therefore, are considered to belong to this species. In contrast to existing descriptions of *A. scelopori* (e.g., Bravo Hollis, 1942; Coy Otero, 1970), the males of the present material have 4 (instead of 3) pairs of postanal papillae, but there is a considerable variation in the number of caudal papillae in individual *Atractis* species, which renders this character useless for separating species (Gambino and Hynemann, 1960; Bowie and Franz, 1974). *Atractis scelopori* can be distinguished from *A. opeatura* Leidy, 1891, by considerably shorter spicules and from *A. longicaudatum* (Brenes and Bravo Hollis, 1960) and *A. mega* (Bowie and Franz, 1974) by a markedly shorter female tail (Bowie and Franz, 1974); the features (oral papillae) used by Bowie and Franz (1974) to distinguish *A. scelopori* and *A. penneri* (Gambino, 1957) seem to be questionable.

*Atractis scelopori* has been reported from

many species of iguanid lizards of different genera (the type host is *Sceloporus undulatus*) from North and Central America (U.S.A., Mexico, Panama, Nicaragua, Cuba) (see Baker, 1987). In Mexico, it was previously found in *Ctenosaura acanthura* by Bravo Hollis (1942) and in *C. hemilopha* by Gambino (1957).

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