

THE MONONCHIDAE: A FAMILY OF PREDACEOUS NEMATODES

III. GENUS MICONCHUS (ENOPLIDA: MONONCHIDAE)¹

ROLAND H. MULVEY

Abstract

Males and females of two new species, *Miconchus californicus* and *M. hopperi*, are described and illustrated. The male of *M. dadayi* (Micoletzky, 1914) Andrassy, 1958 and of *M. digiturus* (Cobb, 1893) Andrassy, 1958 are described and figured for the first time. The female of *M. fasciatus* (Cobb, 1917) Andrassy, 1958 is illustrated for the first time. Females of *M. studeri* (Steiner, 1914) Andrassy, 1958 and *M. trionchus* (Thorne, 1924) Andrassy, 1958 are redescribed and illustrated. Keys for the males and females are provided.

Introduction

This paper is the third in a series dealing with the taxonomy of the Mononchidae, a family of free-living predatory nematodes inhabiting soil and fresh water. Cobb (8) first erected *Iotonchus* as a subgenus of *Mononchus* Bastian, 1865. Altherr (1), in the first part of his paper, used *Iotonchus* at the generic level but in the systematic part he considered it a subgenus and therefore apparently did not intend to raise *Iotonchus* to generic rank. Pennak (17) was the first to consider *Iotonchus* at generic level. Andrassy (3), who apparently was unaware of this, did the same but placed the forms with subventral teeth in a new genus, *Miconchus*. The present paper deals with the known species in this genus and also establishes two new species.

Materials and Methods

Collecting, preparing slide mounts, and measuring and illustrating nematodes were done as previously described by Mulvey (16).

Taxonomy

GENUS *Miconchus* ANDRASSY, 1958

Diagnosis (after Andrassy (3)).—Mouth cavity oval or broadly barrel-shaped, moderately chitinized; dorsal tooth and two subventral teeth present, all approximately equal in size and directed anteriorly. Teeth poorly developed and situated posterior to the center of the mouth cavity. Lateral organ relatively very small, fissure-like. Female sexual organ usually paired, prevulva; vulva posterior to center of body. Tail generally slender, its posterior section almost cylindrical, more rarely conical. Tail glands and terminal tubes usually present. Large species.

Type species.—*Miconchus digiturus* (Cobb, 1893) Andrassy, 1958.

¹Manuscript received August 21, 1961.

Contribution from the Nematology Section, Entomology Research Institute, Research Branch, Canada Department of Agriculture, Ottawa.

KEY TO SPECIES OF GENUS *Miconchus*

Females

1. Ovary 1.....*digiturus* (Cobb) 2
Ovaries 2..... 2
2. Vulva situated well forward or behind mid-body..... 3
Vulva situated about midway in body..... 4
3. Vulva well forward ($V=35-36\%$), spinneret and caudal glands present...*soutoi* (Carvalho) 4
Vulva well behind mid-body ($V=78\%$), spinneret and caudal glands absent...*exilis* (Cobb)
4. Spinneret present..... 5
Spinneret absent..... 8
5. Teeth basal, body very slender ($a=59.0$).....*schneideri* (Meyl) 6
Teeth suprabasal, body fatter ($a=45$ or less)..... 6
6. Submedian teeth insignificant, body length 6.5-7.0 mm.....*rex* (Cobb) 7
Submedian teeth distinct, body length 4 mm or less..... 7
7. Tail bulky and short ($c=14.3-15.4$), terminus blunt.....*stuederi* (Steiner) 8
Tail rather slender and long ($c=5.2-7.0$), terminus not blunt.....*dadayi* (Micoletzky)
8. Labia striated longitudinally, tail terminus blunt.....*regius* (Cobb) 9
Labia not striated longitudinally, tail terminus acutely rounded..... 9
9. Tail short ($c=15.0-25.0$), teeth situated midway in buccal cavity...*trionchus* (Thorne) 10
Tail longer ($c=13.0$ or less), teeth situated in posterior third of buccal cavity..... 10
10. Teeth very small, eggs 160-190 μ long by 50 μ wide.....*fasciatus* (Cobb) 11
Teeth medium-sized, eggs 130-140 μ long by 50-70 μ wide..... 11
11. Labia set off by deep constriction, tail length 0.34-0.36 mm ($c=9.2-9.7$), buccal cavity elongated.....*hopperi* n. sp. 12
Labia set off by slight constriction, tail length 0.19-0.26 mm ($c=10.9-13.7$), buccal cavity barrel-shaped.....*californicus* n. sp.

KEY TO SPECIES OF GENUS *Miconchus*

Males

1. Spinneret present..... 2
Spinneret absent or inconspicuous..... 5
2. Submedian teeth insignificant, body length 6.6-7.0 mm.....*rex* (Cobb) 3
Submedian teeth distinct, body length less than 4 mm..... 3
3. Tail bulky and short ($c=16$ or less), terminus blunt.....*stuederi* (Steiner) 4
Tail rather slender and long ($c=8.4$ or less), terminus not blunt..... 4
4. Tail relatively long ($c=4.8$), teeth basal...*effilatus* (Schuurmans Stekhoven & Teunissen) 5
Tail relatively shorter ($c=6.7-8.4$), teeth suprabasal.....*dadayi* (Micoletzky)
5. Spinneret inconspicuous, tail terminus digitate.....*digiturus* (Cobb) 6
Spinneret absent, tail terminus not digitate..... 6
6. Tail very short ($c=50.0$).....*exilis* (Cobb) 7
Tail longer ($c=21$ or less)..... 7
7. Labia set off by a deep constriction, tail long ($c=11.7-14.5$).....*hopperi* n. sp. 8
Labia set off by slight constriction, tail shorter ($c=20.7$).....*californicus* n. sp.

Miconchus californicus N. SP.

(Figs. 1-4)

(Six females).— $L=2.81$ mm (2.5-3.2); $a=44.0$ (35.3-50.0); $b=5.5$ (5.2-5.9); $c=12.5$ (10.9-13.7); $V=62\%$ (61-67); buccal cavity = 42-63 \times 26-43 μ ; tail length = .23 mm (.19-.26).

Holotype (female).— $L=3.2$ mm; $a=37.6$; $b=5.3$; $c=12.8$; $V=61\%$; buccal cavity = 58 \times 38 μ ; tail length = .25 mm.

Allotype (male).— $L=3.1$ mm; $a=49.2$; $b=5.3$; $c=20.7$; spicule length = 90 μ ; buccal cavity = 52 \times 33 μ ; tail length = .15 mm; supplements = 15.

Diagnosis.—*Female*: Four young and two gravid mature females were examined. Labial region set off by slight constriction. Amphid aperture obscure. Buccal cavity roomy, walls fairly thick; teeth large, equal-sized, and suprabasal. Tuberculate valve distinct. Intestine distinctly tessellated. Reproductive

organ double, reflexed about a third of its length; a distinct valve located between uterus and oviduct. Spermatheca of all the females containing small tailless sperm. Eggs thin-shelled, 130–140 μ long by 66–70 μ wide. Tail conoid, slightly arcuate with acutely rounded terminus. Spinneret and caudal glands absent. *Male*: Only one male found. Details of labial region and buccal cavity similar to those of female. Testes two, containing many sperm. Supplements projecting above level of cuticle. Tail conoid-arcuate with terminus acutely rounded. Caudal glands and spinneret absent.

Differential diagnosis.—*M. californicus* differs from *M. hopperi* n. sp., its closest relative, in the extent of labial constriction, shape of the buccal cavity, and position of the teeth. The female tail of this species is much shorter than that of *M. hopperi*.

Habitat.—About the roots of pear tree in orchard and in sand and soil near a bay.

Geographical distribution.—Watsonville and Half Moon Bay, California, U.S.A.

Holotype (female).—Collection No. 319, deposited in the University of California Nematode Collection, Davis, California.

Allotype (male).—Same data as for holotype.

Paratypes (females).—Collection No. 292, deposited in University of California Nematode Collection, Davis, California.

Miconchus dadayi (MICOLETZKY, 1914) ANDRÁSSY, 1958
(Figs. 5–10)

Syn. *Mononchus macrostoma* of Daday, 1910
nec *M. macrostoma* var. *armatus* in Daday, 1897
Miconchus rapax (Cobb, 1917) AndrÁssy, 1958

Californian Specimens

(*Five females*).— $L = 2.6$ mm (2.4–2.9); $a = 42.2$ (33.4–50.8); $b = 4.7$ (4.2–5.1); $c = 6.1$ (5.2–7.0); $V = 62\%$ (58–65); buccal cavity = 43–50 \times 32–37 μ ; tail length = .43 mm (.36–.50).

(*Three males*).— $L = 2.75$ mm (2.7–2.8); $a = 50.6$ (49.0–53.8); $b = 4.6$ (4.4–4.8); $c = 7.3$ (6.7–8.4); spicule length = 79 μ (76–82); buccal cavity = 45–50 \times 30–36 μ ; tail length = .38 mm (.32–.42); supplements = 12–13.

All females examined had well-developed reproductive organs but none contained an egg. Labial region set off by a slight constriction, amphid aperture distinct, its width about one quarter that of the buccal cavity. Teeth small, equal-sized, and suprabasal. Tuberculate valve at junction of esophagus and intestine distinct. Reproductive organs two, reflexed, and with a distinct valve between the uterus and oviduct. Spermatheca of all the females contained sperm. Intestine tessellated. Tail long and slender, containing three caudal glands arranged in tandem and leading to a terminal spinneret.

Male.—This is the first record of a male for this species. Head and tail area similar to those of the female. Testes two, containing many tailless sperm. Accessory pieces bifurcated.

Cobb (9) erected a new species, *Mononchus (Iotonchus) rapax*, which had a body length of 3.7 mm and a buccal cavity 75 μ long and 43 μ wide. I examined

Cobb's original sketches of the head and full tail of this species and found that it differs from *Miconchus dadayi* in size only. Therefore, I have placed it in synonymy with *M. dadayi*. Altherr (2) questionably proposed this synonymy.

Williams (22) described and illustrated an adult male from Mauritius which he identified as the first male recorded for *M. rapax*. However, this specimen fits *M. studeri* more closely than *M. rapax*, and, therefore, I have transferred it to that species.

Cobb (9) erroneously considered *Mononchus macrostoma* var. *armatus* in Daday, 1897 as *M. dadayi* n. nom. by Micoletzky, 1914 (13), while in fact Micoletzky was referring to *M. macrostoma* of Daday, 1910. In the same paper Micoletzky (13) synonymized *M. macrostoma* var. *armatus* with *M. macrostoma* Bastian, 1865. Cobb's mistake was perpetuated until 1935 when Schneider (18) clarified the true identity of *M. dadayi*. Micoletzky (14) in his key of the Mononchidae lists *M. macrostoma* of Daday, 1910 as a synonym of *Mononchus (Iotonchus) dadayi* Micoletzky, 1914. Andrassy (3) examined the type material of Daday and confirmed Micoletzky's listing of 1921. However, Andrassy contended that the new name *M. dadayi* of Micoletzky (13) was intended for *M. macrostoma* var. *armatus* in Daday, 1897 and therefore made the same mistake as Cobb in 1917. Altherr (2), in summarizing the history of *M. dadayi* Micoletzky, 1914, considered it a valid species.

Daday's illustration (10) shows two equal-sized teeth which are suprabasal. The tail of his female is long and slender and contains at least two caudal glands. Female measurements are as follows: $L=2.8$ mm; $a=23.3$; $b=4.0$; $c=3.7$; tail length = .75 mm (approx.). The specimens from California are much thinner and have a shorter tail than that of Daday. However, they conform to Schneider's description (18) very well.

Habitat.—Plant roots, roots of pear tree.

Geographical distribution.—East Africa; French Cameroons; Arlington farm, Virginia, and Placerville, California, U.S.A.

Miconchus digiturus (COBB, 1893) ANDRÁSSY, 1958
(Figs. 11–15)

Venezuelan Specimens

(Two females).— $L=1.70$ mm; $a=21.6, 26.1$; $b=4.0, 5.2$; $c=12.1, 13.1$; $V=71, 78\%$; buccal cavity = 38×27 and $40 \times 28 \mu$; tail length = .13, .14 mm.

(Three males).— $L=1.56$ mm (1.5–1.6); $a=31.9$ (30.6–33.3); $b=4.3$ (4.1–4.4); $c=15.7$ (14.5–17.7); spicule length = 71μ (70–72); buccal cavity = $35\text{--}36 \times 22\text{--}24 \mu$; tail length = .10 mm (.09–.11).

Two females, three males, and seven juveniles were examined. The females conform to Cobb's description (6 and 9) and illustrations very well except that the decrease in body width immediately behind the anus was not as pronounced in the Venezuelan specimens as in those of Cobb.

Buccal cavity of Venezuelan female longer than wide, provided with three equal-sized suprabasal teeth. Amphid aperture wide, about one-third width of buccal cavity. Distinct tuberculate valve at junction of esophagus and intestine. Latter tessellated, containing several captured nematodes. Reproductive organ prodelphic, reflexed about one-quarter its length; posterior

rudimentary branch short. Spermatheca of one female containing many sperm. Vulval lips conspicuously raised above level of the cuticle. Body width decreasing rapidly immediately posterior to level of the vulva. Tail conoid-arcuate, terminating in an inconspicuous spinneret. Caudal glands three, obscure in adult females but distinct in juveniles.

Male.—This is the first record of a male of this species. Details of buccal cavity similar to those of the female. Testes two, containing many sperm. Tail conoid, sharply arcuate, terminating in an inconspicuous spinneret. Accessory pieces bifurcated.

Habitat.—About roots of banana plant (in Fiji), and of papaya, citrus, and rice (in Venezuela).

Geographical distribution.—Fiji; San Felipe and Acarigua, Venezuela.

Miconchus effilatus (SCHUURMANS STEKHOVEN & TEUNISSEN, 1938)
ANDRÁSSY, 1958

(*One male*).— $L=1.07$ mm; $a=17.8$; $b=2.97$; $c=4.85$; spicule length = 52μ (approx.); buccal cavity = $50 \times 38 \mu$; tail length = .21 mm; supplements = 10.

Schuurmans Stekhoven and Teunissen (19) erected this species on one male. It is characterized by having a large mouth possessing three small teeth situated well back in the buccal cavity and by the very long tail. Andrassy (3) considered this a valid species and listed *M. dadayi* (in Micoletzky, 1921) as a synonym. I disagree with Andrassy in that I consider *M. dadayi* a valid species.

Habitat.—Forest soil.

Geographical distribution.—Kibga, Parc National Albert, Republic of the Congo.

Miconchus exilis (COBB, 1917) ANDRÁSSY, 1958

(*Female*).— $L=2.0$ mm; $a=43.5$; $b=3.7$; $c=55.6$; $V=78\%$.

(*Male*).— $L=2.0$ mm; $a=45.4$; $b=4.2$; $c=50.0$; supplements = 14.

Cobb (9) did not include illustrations when he erected this species. I examined his original notes and found no sketch of this nematode. Cobb gave an adequate description of both males and females. He remarked that the lip region was distinctly expanded and that the large pyriform pharynx was armed with three subequal teeth whose apices were midway in the pharynx.

Amphids one-fifth head width, lining of esophagus not so prominent as in other mononchs. Colorless pseudobulb at beginning of intestine (probably the tuberculate valve at junction of esophagus and intestine as described by Clark (5)). Posterior sexual branch only two-thirds as long as the anterior. Tail simply conoid.

Male supplements 14 in number, equidistant, and extending forward a distance equal to three tail lengths. Spicula linear. Spinneret and caudal glands absent.

The length of the tail separates this species from *M. trionchus*, its closest relative. The position of the vulva and thinness of the body are also good distinguishing characters.

Habitat.—About the roots of moss.

Geographical distribution.—Moss Vale, New South Wales, Australia.

Miconchus fasciatus (COBB, 1917) ANDRÁSSY, 1958
(Figs. 16-19)

Florida Specimens

(Ten females).— $L=2.3$ mm (2.1-2.4); $a=39.4$ (36.2-41.3); $b=5.8$ (5.5-6.0); $c=9.1$ (7.8-10.4); $V=63\%$ (60-66); buccal cavity = $40-42 \times 24-30 \mu$; tail length = .25 mm (.22-.28).

Cobb (9) described but did not illustrate this species. However, the specimens which I examined from Florida corresponded very closely with Cobb's unpublished illustration of the head area of *M. fasciatus*.

Labia conspicuously set off by a deep constriction. Refractive line mentioned by Cobb (9) distinctive in all specimens. Amphid aperture about one-quarter width of the buccal cavity but obscure in most specimens examined. Teeth very small, equal-sized, and situated in the posterior third of the buccal cavity. Distinct tuberculate valve between esophagus and intestine. Intestine tessellated. Spermatheca of all but one female well supplied with sperm. Reproductive organ double, reflexed, containing long, thin-shelled eggs (160-190 μ long by 50 μ wide). One female contained two eggs. Tail conoid, slightly to strongly ventrally arcuate, with acutely rounded terminus. Spinneret and caudal glands absent.

Male.—Unknown.

Habitat.—About the roots of camphor and pine trees.

Geographical distribution.—Florida (by N. A. Cobb); Gainesville, Florida, collected by B. E. Hopper and R. P. Esser in 1957 and 1961, respectively.

*Miconchus hopperi** N. SP.
(Figs. 20-23)

(Three females).— $L=3.26$ mm (3.2-3.3); $a=50.3$ (45.7-56.8); $b=5.8$ (5.6-6.0); $c=9.3$ (9.1-9.7); $V=62\%$ (61-64); buccal cavity = $57-60 \times 34-36 \mu$; tail length = .35 mm (.34-.36).

(Three males).— $L=2.83$ mm (2.8-2.9); $a=56.0$ (55.7-56.0); $b=5.6$ (5.5-5.7); $c=12.8$ (11.7-14.5); spicule length = 91 μ (90-93); buccal cavity = $52-55 \times 28-32 \mu$; tail length = .223 mm (.20-.24); supplements = 14-15.

Holotype (female).— $L=3.3$ mm; $a=48.5$; $b=5.8$; $c=9.2$; $V=64\%$; buccal cavity = $60 \times 36 \mu$; tail length = .36 mm.

Allotype (male).— $L=2.8$ mm; $a=56.0$; $b=5.7$; $c=12.2$; spicule length = 90 μ ; buccal cavity = $52 \times 28 \mu$; tail length = .23 mm; supplements = 14.

Diagnosis.—*Female*: Three females and three juveniles were examined. Labia set off by deep constriction, double refractive line distinct. Buccal cavity elongated, nearly twice as long as wide, walls thick, teeth fairly large and situated in posterior third of buccal cavity. Amphid aperture one-sixth width of buccal cavity. Distinct tuberculate valve at junction of esophagus and intestine. Latter distinctly tessellated. Reproductive tract double, reflexed about one-quarter, containing a few sperm. Egg thin-shelled (120 μ long by 55 μ wide), distinct valve between oviduct and uterus. Tail conoid, strongly arcuate, terminating in an acutely rounded terminus. Spinneret and tail glands

*In honor of Mr. B. E. Hopper, Nematology Section, Ottawa, Canada.

absent. *Male*: Details of labia and buccal cavity similar to those of the female. Testes two, containing many sperm. Supplements well elevated above level of cuticle. Tail conoid, ventrally arcuate, ending in an acutely rounded terminus. Spinneret and tail glands absent.

Differential diagnosis.—*M. hopperi* differs from *M. fasciatus* in having much larger teeth, in the shape of the buccal cavity, and in tail length.

Habitat.—Material collected by Mr. B. E. Hopper in 1957 from soil near the roots of pine trees.

Geographical distribution.—Gainesville, Florida, U.S.A.

Holotype (female).—Collection No. 2344, deposited in the Canadian National Collection of Nematodes, Ottawa, Canada.

Allotype (male).—Same data as for holotype.

Paratypes (males and females).—Collections 2344 and 2346. Same data as for holotype.

Miconchus regius (COBB, 1917) ANDRÁSSY, 1958

(*Female*).— $L=6.2$ mm; $a=43.5$; $b=5.9$; $c=10.0$; $V=63\%$; buccal cavity = $90 \times 70 \mu$ (approx.); tail length = .62 mm.

Cobb (9) adequately described and illustrated this species. He mentioned that the lips were striated lengthwise and that the amphids were very small; the amphid aperture width was one-eighth that of the buccal cavity. Buccal cavity roomy, walls quite thick, and pharyngeal muscles very strongly developed. Tail finally cylindroid; spinneret and caudal glands absent.

This species may be distinguished by the longitudinally striated lips, and the shape and length of the tail. It is a large species.

Habitat.—About the roots of plants.

Geographical distribution.—Arlington farm, Virginia, U.S.A.

Miconchus rex (COBB, 1904) ANDRÁSSY, 1958

(? *females*).— $L=6.5-7.0$ mm; $a=45.5$; $b=5.0$; $c=5.3$; $V=58\%$; buccal cavity = $82 \times 60 \mu$ (approx.).

(? *males*).— $L=6.5-7.0$ mm; $a=43.5$; $b=5.0$; $c=7.1$; spicule length = 180μ (approx.); supplements = 17.

Cobb (7) described this species from adult males and females and later (9) redescribed and illustrated the head area of the female.

Lips bulky and powerful, pharynx armed with powerful muscles and equipped with a dorsal and two submedian teeth. The teeth are less well developed than in some other species in this genus. Conoid tail tapers more rapidly at first, being nearly cylindroid in the posterior two thirds. Terminus slightly expanded, terminal spinneret armed with two papillae, caudal glands three. Ovaries two, reflexed.

According to Cobb (9) the tail of the male tapers more rapidly at first than that of the female. Supplementary organs 17, prominent, closely approximated, equidistant, occupying a space equal to one and one-half times the length of the tail. Spicula not clearly seen.

This species is distinguished by its size, poorly developed submedian teeth, and very long slender tail.

Habitat.—At depths of from 200 to 1200 ft in Lakes Manapouri and Wakatipu.

Geographical distribution.—New Zealand.

Miconchus schneideri (MEYL, 1955) ANDRÁSSY, 1958

(*One female*).— $L=4.83$ mm; $a=59.0$; $b=4.6$; $c=8.9$; $V=67.9\%$; buccal cavity = $80 \times 52 \mu$; tail length = .60 mm.

Meyl (12) erected this species on a single female. He mentions that the oral cavity is shaped like a barrel with three strong cuticular ridges. His illustration shows three basal teeth, the dorsal one being slightly larger than either of the submedian teeth. The walls of the buccal cavity are thick. Gonads double with short accessories. Tail elongated, spinneret terminal. Meyl (12) considered that Schneider (18) had erred in identifying his specimens as *M. dadayi* Micoletzky, 1914 and, therefore, gave Schneider's specimens a new name, *M. schneideri*. Meyl then placed his female in this species. However, Schneider (18) was correct in his identification and his specimens and Meyl's were different species. Meyl (12) believed that *M. schneideri* was in all respects similar to *M. effilatus* except for the great difference in size.

M. schneideri differs from *M. dadayi* in position of the teeth, in size of buccal cavity, and in tail shape and body width.

Habitat.—Lake bed soil.

Geographical distribution.—Tanganyika Lake, Tanganyika.

Miconchus soutoi (CARVALHO, 1956) ANDRÁSSY, 1958

(*Three females*).— $L=2.3-2.8$ mm; $a=27.6-32.8$; $b=3.1-3.4$; $c=30.1-30.3$; $V=35.2-36.3\%$; buccal cavity = $52 \times 27 \mu$; tail length = .076 mm.

Carvalho (4) erected this species on mature females. Teeth fairly large, equal-sized, dorsal tooth slightly forward of two submedian teeth, apices of teeth midway in buccal cavity. Tail short, conoid, terminus digitate with spinneret and distinct ampulla. Caudal glands three, arranged in tandem.

This species is distinguished by the position of the vulva, and the short tail with its digitate terminus.

Habitat.—Lake bed.

Geographical distribution.—Sao Paulo, Brazil.

Miconchus studeri (STEINER, 1914) ANDRÁSSY, 1958

(Figs. 24-26)

Syn. *Mononchus rapax*, male in Williams, 1958

Californian Specimens

(*Five females*).— $L=2.02$ mm (2.0-2.1); $a=29.3$ (27.7-30.8); $b=4.1$ (3.6-4.4); $c=14.8$ (14.3-15.4); $V=63\%$ (60-66); buccal cavity = $41-43 \times 28-30 \mu$; tail length = .139 mm (.13-.14).

Italian Specimens

(*One female*).— $L=1.6$ mm; $a=27.0$; $b=4.1$; $c=16.2$; $V=65\%$; buccal cavity = $40 \times 30 \mu$; tail length = .10 mm.

(*One male*).— $L=1.8$ mm; $a=32.5$; $b=4.0$; $c=5.1$; spicule length = 100μ ; buccal cavity = $43 \times 29 \mu$; tail length = .12 mm; supplements = 13.

Steiner (20) mentions three powerful basal teeth but his illustrations show that these are comparatively small teeth. Micoletzky (14) illustrates three small suprabasal teeth in the buccal cavity of his specimens. The specimens which I examined from California had three small suprabasal teeth, and posterior to these were two rows each having three very small teeth. Tuberculate valve at junction of esophagus and intestine distinct. There was no sperm in the reproductive tract but otherwise these specimens conformed very well to Steiner's species. The Italian specimens were similar to that described and figured by Steiner (20). Meyl (11) also illustrated and described females of this species from Italy. Williams (22) described and illustrated a male which he identified as *Mononchus rapax*. However, this specimen fits *Miconchus studeri* more closely and, therefore, I have placed it in synonymy with this species.

Habitat.—Under moss (by Steiner), about fern roots (by Meyl), in campus sod (California), and in sugar cane fields (by Williams).

Geographical distribution.—Island of Ufenau in the Zurich Lake, Switzerland; Ischia, Capri; Lower Austria; Mauritius; Berkeley Campus, Berkeley, California, U.S.A.; Italy.

Miconchus trionchus (THORNE, 1924) ANDRÁSSY, 1958
(Figs. 27-32)

Canadian Specimens

(Five females).— $L=3.0$ mm (2.7-3.6); $a=33.6$ (31.0-36.0); $b=4.3$ (3.9-5.1); $c=19.3$ (15.0-24.5); $V=63\%$ (60-64); buccal cavity = $58-70 \times 32-40 \mu$; tail length = .164 mm (.11-.20).

Thorne (21) erected this species on a few females. The young females in the Canadian collection conform very well to Thorne's description and illustrations.

Teeth equal-sized, about midway in the buccal cavity. Walls of buccal cavity thick; amphid aperture about one-sixth width of cavity. Junction of esophagus and buccal cavity much less expanded than that in other species in this genus. Esophageal intestinal valve non-tuberculate. Clark (5) reports that Thorne did not find a tuberculate type valve in his specimens of *M. trionchus*. I examined preserved specimens (5 females and 17 juveniles) and failed to find a tuberculate valve in any of these. I disagree with Clark's view (5) that the tuberculate valve is difficult to find in specimens which have been preserved for several years. I have examined specimens of other species in this genus which have been preserved in glycerine for several years and find the tuberculate valve quite distinct. Micoletzky (15) reported a juvenile of *M. trionchus* from Russia.

Habitat.—Moss, moist soil, forest soil, and near the roots of pine trees.

Geographical distribution.—City creek, Utah, U.S.A.; Volga district, Kama, U.S.S.R.; Ottawa area, Ontario, Waterton Lakes, Alberta, and Kootenay forest region, British Columbia, Canada.

Acknowledgments

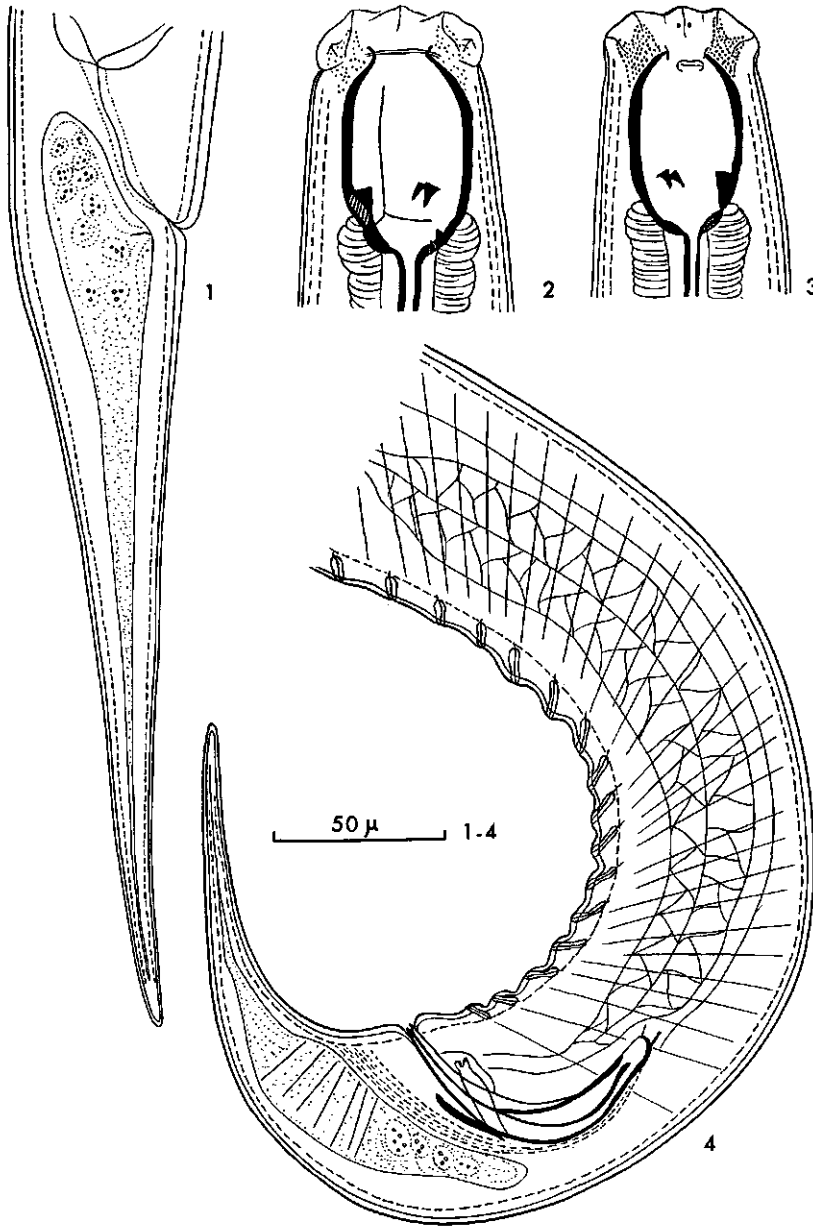
The author is indebted to Dr. M. W. Allen, Professor of Nematology, University of California, California, for the use of the Californian collection, upon which most of this paper is based, and to the Nematology Section, U.S. Depart-

ment of Agriculture, Beltsville, Maryland, for permission to examine and study Dr. N. A. Cobb's original work on the Mononchidae. Grateful thanks also to Dr. A. D. Baker, Chairman, Nematology Section, Entomology Research Institute, Research Branch, Ottawa, and to Dr. M. W. Allen and Dr. A. C. Tarjan, University of Florida, for corrections and criticisms of the manuscript.

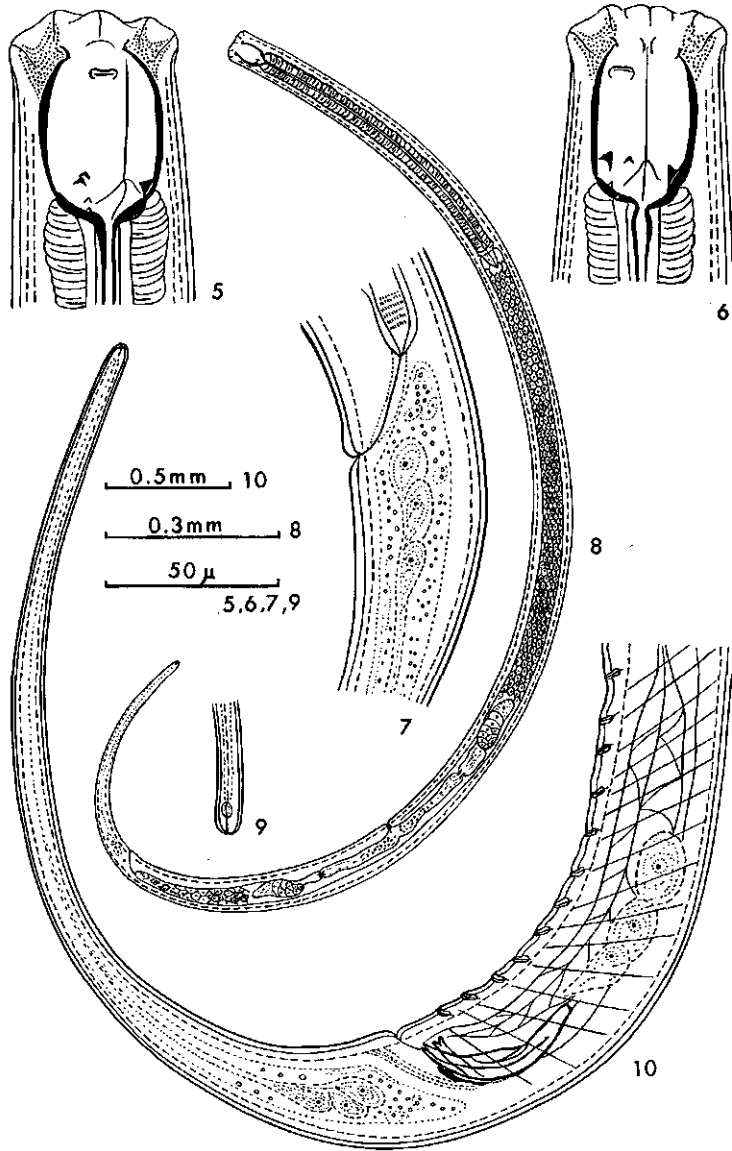
References

1. ALTHERR, E. Les nématodes du Parc national Suisse. *Ergebn. wiss. Unters. schweiz. Nat. Parks*, **3**, 1-46 (1930).
2. ALTHERR, E. Results from the Danish Expedition to the French Cameroons (1949-1950) XXVIII. Nématodes limnicoles. *Bull. de l'J. F.A.N. Sér. A*, **22**, 770-787 (1960).
3. ANDRÁSSY, I. Ueber das System der Mononchiden (Mononchidae Chitwood, 1937; Nematoda). *Ann. Hist.-Nat. Musei Hung.* **50**, 151-171 (1958).
4. CARVALHO, J. C. DE. *Mononchus soutoi* sp. n. (Nematoda, Mononchidae). *Rev. brasil. biol.* **16**, 133-134 (1956).
5. CLARK, W. C. The oesophageal-intestinal junction in the Mononchidae (Enoplida, Nematoda). *Nematologica*, **5**, 178-183 (1960).
6. COBB, N. A. Nematodes, mostly Australian and Fijian. *Macleay Mem. Vol. Proc. Linnean Soc. N. S. Wales*, 252-308 (1893).
7. COBB, N. A. Free-living and fresh-water New Zealand nematodes. *In Proc. Cambridge Phil. Soc. London*, **12**, 363-374 (1904).
8. COBB, N. A. Notes on new genera and species of nematodes. 4. Subdivisions of *Mononchus*. *J. Parasitol.* **2**, 195-196 (1916).
9. COBB, N. A. The Mononchs (*Mononchus* Bastian, 1866). A genus of free-living predatory nematodes. *Soil Sci.* **3**, 431-486 (1917).
10. DADAY, E. Untersuchungen über die Süßwasser-Mikrofauna Deutsch-Ost-Afrikas. *Zoologica*, **59**, 44-54 (1910).
11. MEYL, A. H. Die bisher in Italien gefundenen freilebenden Erd und Süßwasser-Nematoden. *Arch. zool. ital. Torino*, **39**, 161-264 (1954).
12. MEYL, A. H. Nematoden aus dem Psammon des Tanganyika-Sees. *Zool. Anz. Leipzig*, **155**, 135-138 (1955).
13. MICOLETZKY, H. Freilebende Süßwasser-Nematoden der Ost-Alpen mit besonderer Berücksichtigung des Lunzer Seengebietes. *Zool. Jahrb. Jena, Abt. Syst.* **36**, 331-546 (1914).
14. MICOLETZKY, H. Die freilebenden Erd-Nematoden. *Arch. Naturgeschichte Abt. A*, **87**, 1-650 (1922).
15. MICOLETZKY, H. Neue und seltene freilebende Nematoden aus dem Wolgagebiet (Kama). *Zool. Anz. Leipzig*, **73**, 113-123 (1927).
16. MULVEY, R. H. The Mononchidae: A family of predaceous nematodes. I. Genus *Mylonchulus* (Enoplida: Mononchidae). *Can. J. Zool.* **39**, 665-696 (1961).
17. PENNAK, R. W. P. Fresh water invertebrates of the United States. Ronald Press Co., New York. 1953.
18. SCHNEIDER, W. Freilebende Nematoden. (Voyage de Ch. Alluaud et P. A. Chappuis en Afrique Occidentale Française, Dec. 1930-Avril 1931). *Arch. Hydrobiol.* **28**, 1-20 (1935).
19. SCHUURMANS STEKHOVEN, J. H. and TEUNISSEN, R. J. H. Nématodes libres terrestres. Exploration du Parc National Albert, Mission G. F. de Witte (1933-35). *Fasc. 22*, 1-220 (1938).
20. STEINER, G. Freilebende Nematoden aus der Schweiz. 1. Teil einer vorläufigen Mitteilung. *Arch. Hydrobiol. Planktonk.* **9**, 259-276 (1914).
21. THORNE, G. Utah nematodes of the genus *Mononchus*. *Trans. Am. Microscop. Soc.* **43**, 157-171 (1924).
22. WILLIAMS, J. R. Studies on nematode soil fauna of sugar cane fields in Mauritius. I. The genus *Mononchus* (Trilobidae, Enoplida). *Mauritius Sugar Ind. Res. Inst. Occ. Paper No. 1*, 1-13 (1958).

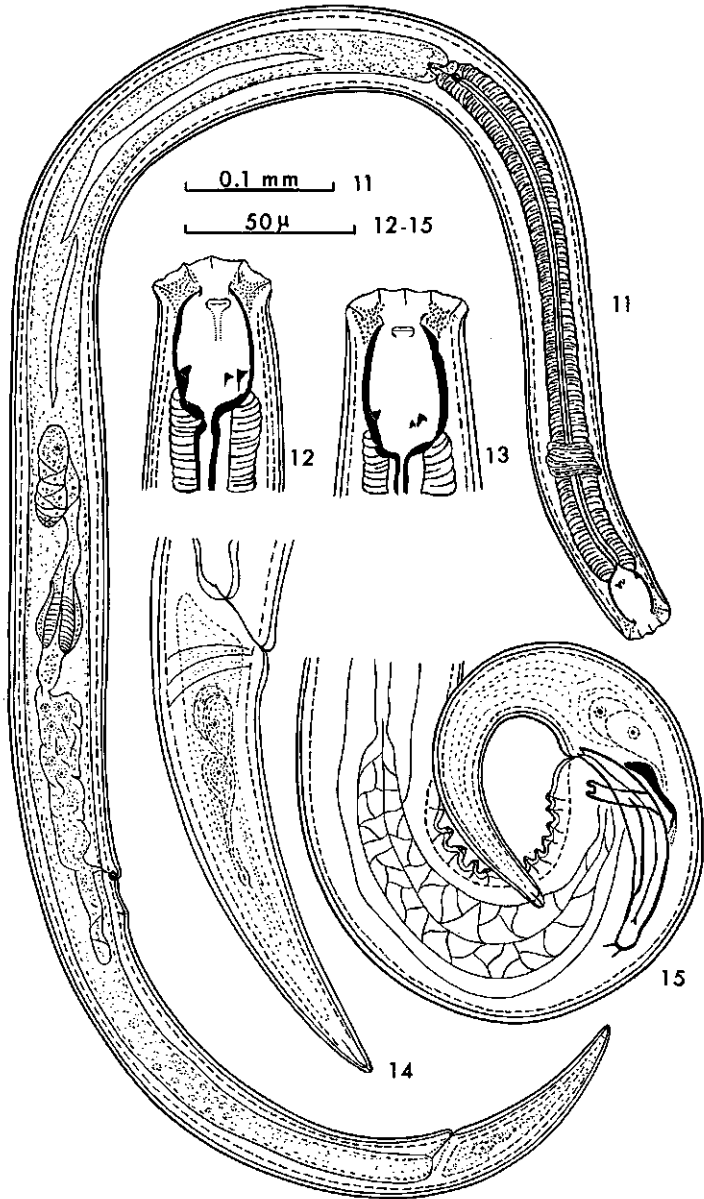
NOTE: Figs. 1-32 follow.



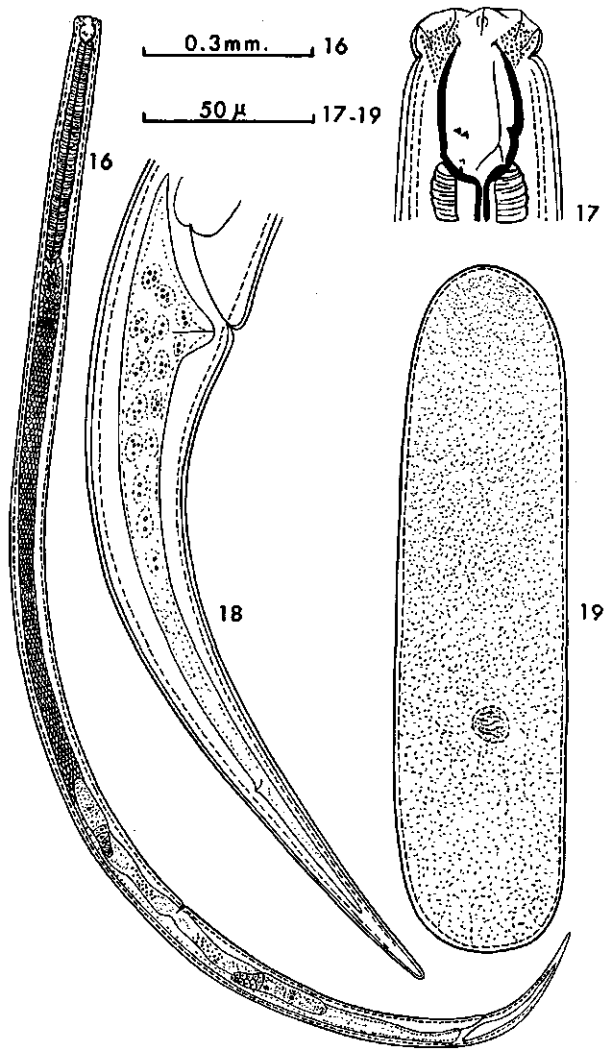
FIGS. 1-4. *Miconchus californicus* n. sp. 1. Female tail. 2. Female head. 3. Male head. 4. Male tail.



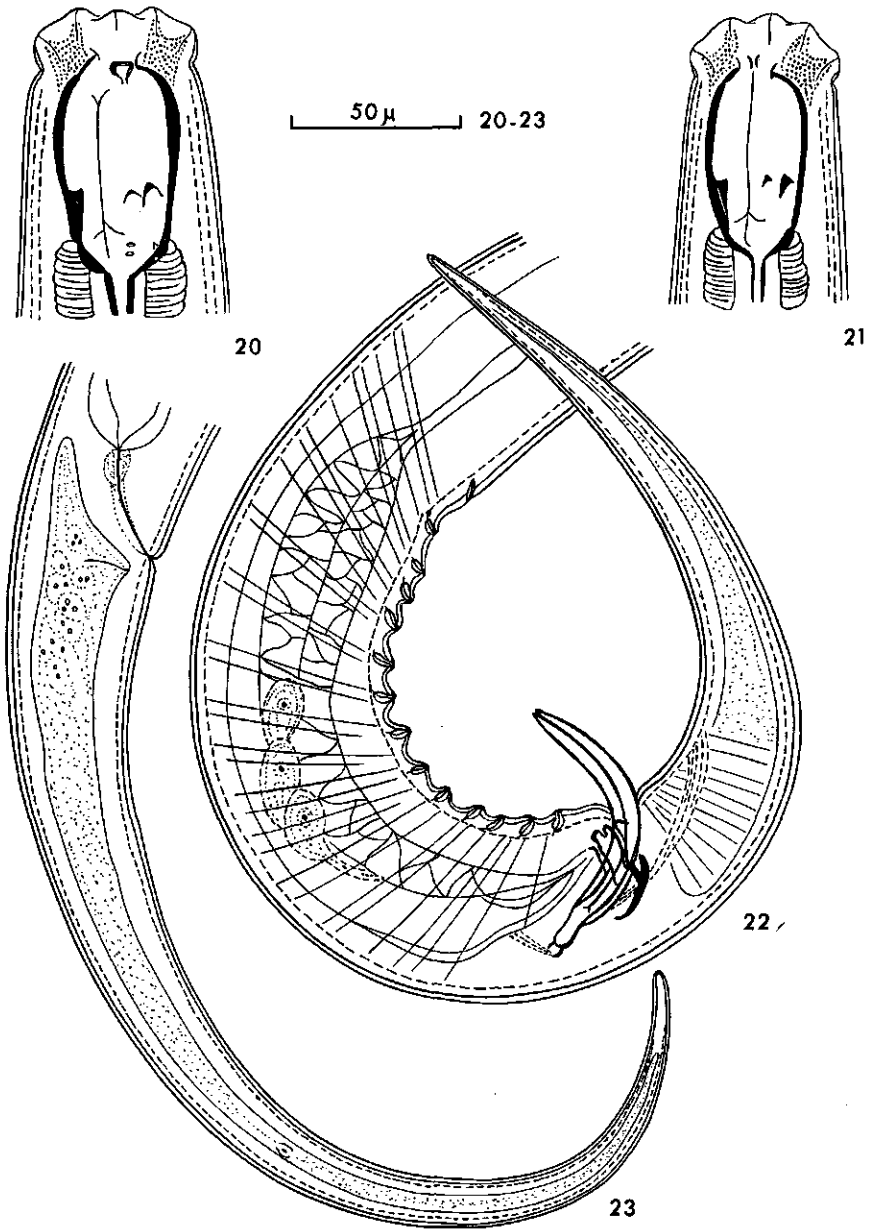
FIGS. 5-10. *Miconchus dadayi*. 5. Female head. 6. Male head. 7. Female tail showing caudal glands. 8. Female head. 9. Female tail terminus. 10. Male tail and supplements.



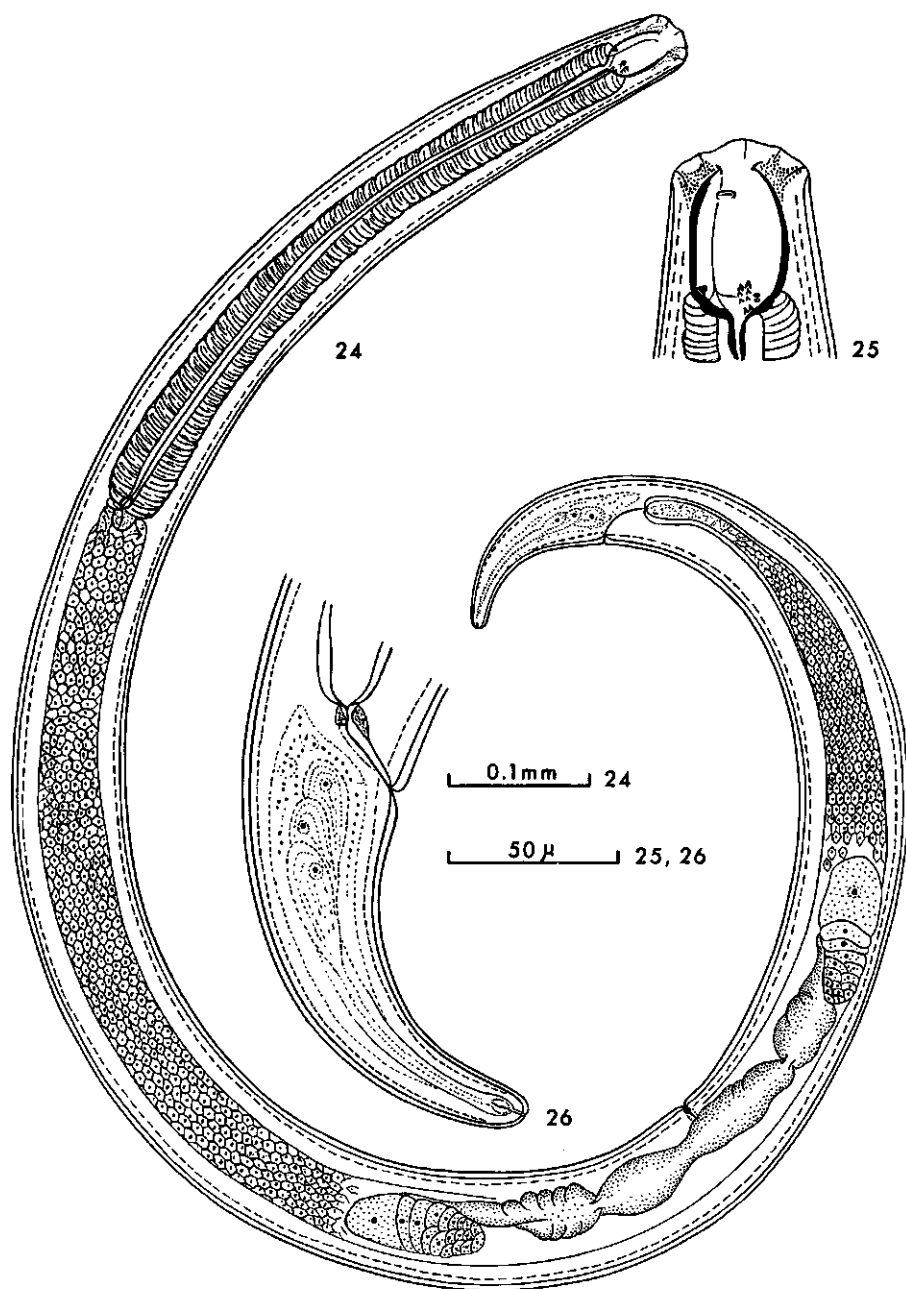
FIGS. 11-15. *Miconchus digiturus*. 11. Female. 12. Male head. 13. Female head. 14. Female tail. 15. Male tail and supplements.



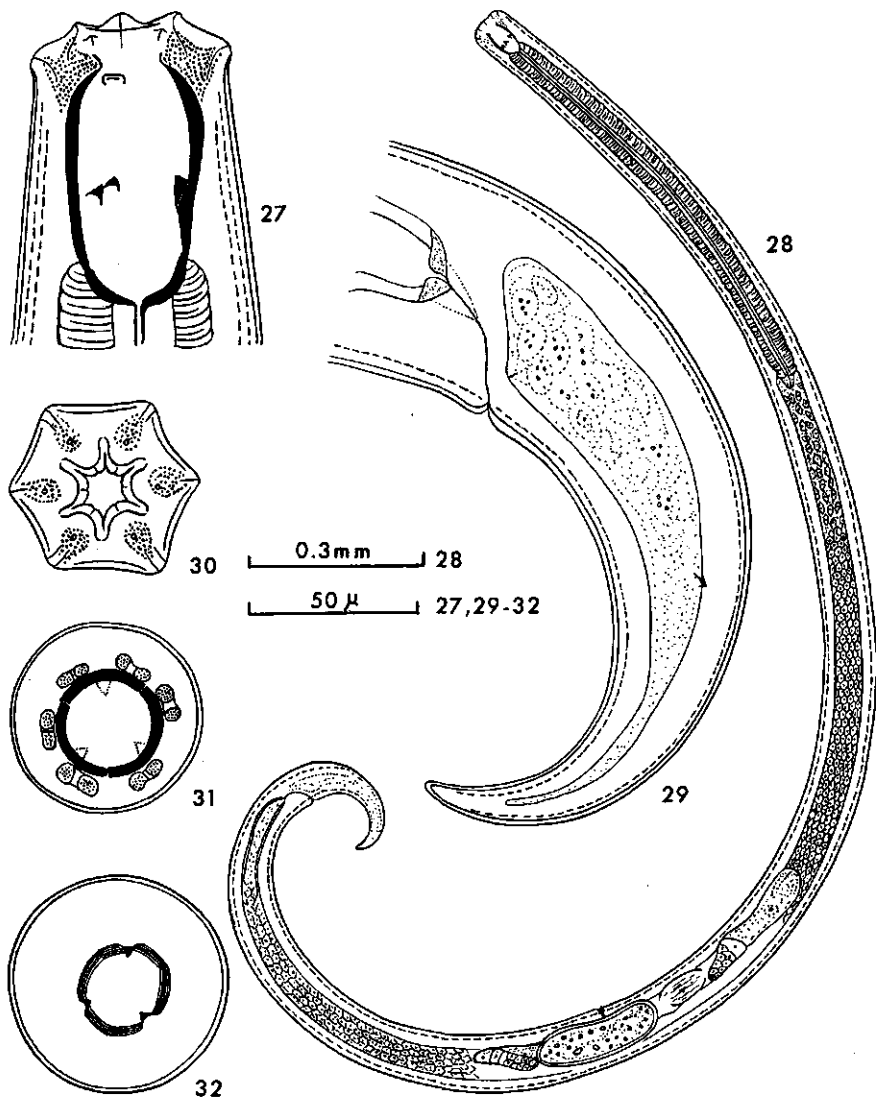
FIGS. 16-19. *Miconchus fasciatus*. 16. Female. 17. Female head. 18. Female tail. 19. Egg.



FIGS. 20-23. *Miconchus hopperi* n. sp. 20. Female head. 21. Male head. 22. Male tail and supplements. 23. Female tail.



FIGS. 24-26. *Miconchus studeri*. 24. Female. 25. Female head. 26. Female tail.



FIGS. 27-32. *Miconchus trionchus*. 27. Female head. 28. Female. 29. Female tail. 30. *En face* view of head at level of the labia. 31. *En face* view of head showing muscles and walls of buccal cavity. 32. *En face* view of head at level of the three teeth.