Sclerostylus n. gen. from Panama and Other Neotropical Species of Leptonchoidea (Dorylaimida)[1]

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Abstract: Leptonchoid species found in soil samples taken in lowland and mid-elevation seasonal forests at four locations in Panama were as follows: *Sclerostylus karri* n. gen., n. sp., *Basirotyleptus saccatus* n. sp., *B. nemoralis, B. acus, B. penetrans, Doryllium neotropicum* n. sp., *D. minor, Tyleptus gymnochilus, Gerthus jamesi, Dorylaimoides micoletzkyi,* and *Tylencholaimellus macrophallus.* The discoveries corroborate our earlier suggestion of a Gondwanian origin for *Tyleptus* and *Basirotyleptus* and provide data for additional biogeographical study. *Key words: Basirotyleptus, Doryllium, Tyleptus, Gerthus, Dorylaimoides, Tylencholaimellus,* nematode taxonomy, Gondwanaland.

We describe below one new genus and three new species in Leptonchoidea from natural areas in Panama and give the first report of occurrence in Central America for additional leptonchoid taxa. Such reports are more than idle curiosities. A coherent theory of historical biogeography for nematodes depends on accurate observations of geographical distribution by persons qualified to provide exact identification. Moreover, accurate reports from natural areas are especially important because these occurrences can indicate which species are native rather than introduced by man.

We found all of the materials in soil collected for us by Dr. James R. Karr and his student, Mr. Douglas Wolf, during July and August 1975. We have been unsuccessful in obtaining additional specimens owing to the relative inaccessibility of the localities. We describe *S. karri* n. gen., n. sp. and *B. saccatus* n. sp. on the basis of the holotype females only, because their occurrence in Panama is of crucial importance to our long range biogeographical studies. After careful assessment of their character states, against a background of knowledge of variability in related species (5), we concluded that they do represent distinct taxa and that the more prudent course was to recognize this fact and describe them.

MATERIALS AND METHODS

A description of the sites sampled in Panama (including dates of sampling) is given in Table 1. All soil samples were taken to our Purdue laboratory where 1000 cc of soil were processed from each sample using a combination of sieves and Baermann funnels; the nematodes were killed, fixed, infiltrated with dehydrated glycerin and mounted on Cobb metal slide mounts by the methods discussed in Ferris et al. (2).

SYSTEMATICS

Genus: *Sclerostylus* n. gen.

Basirotyleptus xiphinemoides Monteiro, 1970 is unique in the genus *Basirotyleptus* in having a distinctive, heavily sclerotized odontostyle and stoma and flanged odontophore. Goseco et al. (5) noted these distinctive features but retained this species in *Basirotyleptus.* The Panama collection contained an additional species with these features. *Sclerostylus* is proposed to accommodate these two species.

Type species: *Sclerostylus karri* n. sp.

Other species: *Sclerostylus xiphinemoides* (Monteiro, 1970) new combination.

Differential diagnosis: Sclerostylus is morphologically very close to *Basirotyleptus*

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Table 1. Description of sites sampled in Panama.*

Site No.	Date	Location	Description of site
1	7/19/75	9°9′35″N by 79°44′ 36″W; near Gamboa on Caribbean slope of Panama Canal Zone	Elevation about 60 m. Moist forest study area (many trees 40 m tall or more), with open undergrowth. Area is structually mature, but not climax, with many trees typical of the early forest stage. Average annual precipitation = 260 cm. Distinct wet and dry seasons, but forest remains green throughout the year.
2	7/26/75	8°50′35″N by 82°35′ 43″W; below Cerro Punto on slopes of Volcan de Chiriqui in western Panama	Elevation 1650 m. Seasonal, mid-elevation forest.
3	7/31/75	9°10′N by 78°48′W; Gorgas Field Station on the Rio Bayano, Altos de Maje Trail, in eastern Panama.	Elevation 70-80 m. Lowland seasonal forest dominated by Cuipo (*Cavanillesia platanifolia*). Sample taken before Bayano Reservoir formed.
4	8/7/75	9°9′17″N by 79°51′ 11″W; on J. Zetek Trail near Big Trees, Barro Colorado Island	Elevation about 500 m. Semi-evergreen seasonal forest. Trees 100-200 years old. Average annual rainfall = 267 cm, with dry season from January through April.

*All samples were collected by J. R. Karr and D. Wolf.

but can be differentiated by the flanged odontophore and by the distinct and heavier sclerotization of the odontostyle and stoma. The name, masculine in gender, refers to the distinctive oral armature.

Description: Leptonchidae. Body cylindroid; cuticle and subcuticle with distinct transverse striations. Subcuticle loose and irregular; refractive elements abundant. Lip region offset; labial disc present. Oral opening with thick sclerotization. Stoma long, heavily sclerotized; guiding ring distinct. Odontostyle long, slender, distinct; odontophore conspicuously flanged. Esophagus slender, with short basal bulb. Inner lining of bulb thickened; cardia small, rounded. Vulva transverse; opisthodelphic. Tails of both sexes similar, short and rounded.

Testes two, outstretched. Spicules dorylaimoid; lateral guiding pieces present. Two well-spaced ventromedian supplements and an adanal pair.

Sclerostylus karri n. sp.
(Fig. 1: A-D)

Type: Holotype female on slide labeled 7/19/75 A16 in Purdue Nematode Collection (PNC). Collected from forest soil near Gamboa in the Panama Canal Zone.

Measurements: Holotype female: L = 0.72 mm; a = 34.6; b = 4.8; c = 56.2; V = 48%; width = 20.8 μm; esophagus = 150.4 μm; tail = 12.8 μm; prerectum = 140 μm.

Differential diagnosis: Sclerostylus karri is similar to *S. xiphinemoides* (Monteiro, 1970) but can be distinguished by the shorter anterior uterine branch (less than body width vs. 3.4 body widths long) and by the longer prerectum (140 vs. 64 μm long). The species name is a patronymic honoring James R. Karr.

Holotype female: Body cylindroid, ventrally arcuate. Cuticle and subcuticle transversely striated; radial refractive elements present. Lateral cords obscure; body pores distinct, arranged in two rows. Lip region set off, 9.6 μm wide; papillae distinct. Labial disc present, prominent. Stoma 13 μm long, distinctly sclerotized; guiding ring prominent, thick. Oral opening heavily sclerotized. Spear plus extension about 31 μm long; spear thick, straight; spear extension prominent, flanged. Esophageal bulb pyriform, about 21 μm long, 14% of esophageal

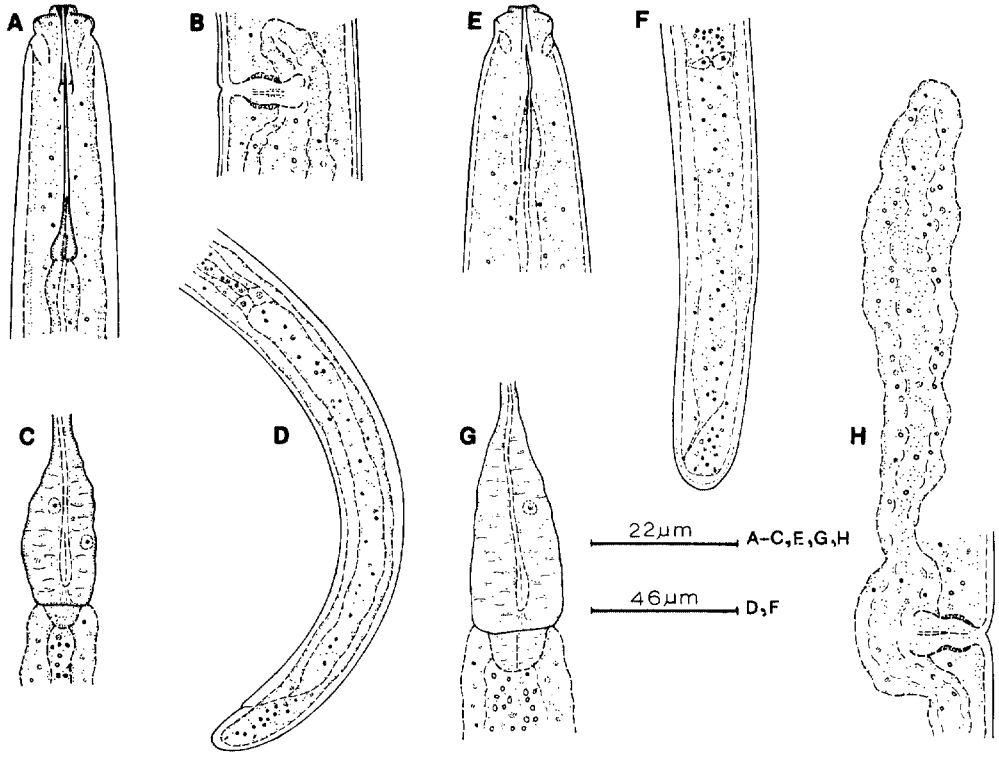

Fig. 1. A-D) *Sclerostylus karri* n.gen., n.sp. A) Head. B) Vulval region. C) Esophageal bulb. D) Female posterior portion. E-H) *Basirotyleptus saccatus* n.sp. E) Head. F) Female posterior portion. G) Esophageal bulb. H) Vulval region.

length; inner cuticular lining thick. Cardia rounded, 4 µm long. Vulva transverse; vagina about 11.2 µm long. Anterior gonad reduced to short branch less than one body width long. Posterior gonad normal, 13% of body length, reflexed 70%. Intestine-prerectum junction surrounded by three distinct cells, prerectum about 11 anal body widths long. Tail bluntly rounded, about as long as anal body width. Caudal papillae present.

Male not known and female did not contain spermatozoa.

Distribution and habitat: This species has been collected only from the type locality in Panama.

The Genus *Basirotyleptus*

Ferris et al. (3) showed evidence that the genus *Basirotyleptus* probably evolved on the Gondwanaland supercontinent (although at the time we made this suggestion only one species had been reported from South America and none from Central America). We predicted that species of *Basirotyleptus* would be found in Central America, which we suggested was the route of species of *Basirotyleptus* to North America. The Panama soil samples discussed herein contained four *Basirotyleptus* species, the most species of any leptonchoid genus. One of these (from eastern Panama) proved to be a new species, which is described below. It is most similar to *B. modestus* Husain and Khan, 1968, known only from India. Males were found for the first time for *B. nemoralis* Siddiqi, 1977 (previously known only from India) and are described below. Measurements for Panama specimens are also given for *B. acus* Goseco, Ferris and Ferris, 1975 (previously known only from North America) and for *B. penetrans* Thorne, 1964 (previously known only from Puerto Rico).

Basirotyleptus saccatus n. sp. (Fig. 1: E-H)

Type: Holotype female with dimensions listed, on slide 7/31/75 A7 in PNC. Collected from forest soil near Altos de Maje,

Gorgas Field Station in eastern Panama.

Measurements: Holotype female: L = 0.85 mm; a = 28.5; b = 5.9; c = 88.5; V = 44.7%; width = 29.8 μm; esophagus = 144 μm; tail = 9.6 μm; prerectum = 94.4 μm.

Differential diagnosis: Basirotyleptus saccatus can be distinguished from *B. modestus* Husain and Khan, 1968 by the larger size (0.85 vs. 0.46–0.54 mm), by the longer anterior uterine branch (2.7 vs. 1.5 anal body widths long) and by the shorter tail (c = 88.5 vs. 42–56.2). The name is from the Greek sacc = sac and refers to the anterior uterine branch.

Holotype female: Body cylindroid, straight. Cuticle finely striated; subcuticle coarsely striated. Refractive elements present. Lateral cords obscure; body pores present but indistinct. Lip region set off by constriction, 8 μm wide, lips and papillae distinct. Labial disc surrounds oral opening. Stoma sclerotized, goblet-shaped, 5.6 μm long. Amphids cup-shaped, about 5 μm wide. Spear slender (but not needle-like), short, 9.6 μm long, slightly arcuate; spear extension sclerotized, slightly arcuate, 11.2 μm long. Esophagus slender tube expanding to muscular, pyriform basal bulb. Esophageal bulb 30 μm long, occupying about 21% of esophageal length, inner lining thick. Cardia rounded, 5 μm long. Vulva transverse; vagina distinct, 11 μm long. Anterior gonad reduced to uterine branch, about 2.7 body widths long; posterior gonad normal, 24% of body length, reflexed 56%. Prerectum distinct, 5.3 anal body widths long, intestine-prerectum junction guarded by 3 distinct cells. Tail rounded, short, about 10 μm long. Caudal papillae present.

Basirotyleptus nemoralis Siddiqi, 1970
(Fig. 2: E-M)

Measurements: Females (7): L = 0.47 mm ± 0.03 (0.44–0.54); a = 27.2 ± 1.5 (25.3–29.3); b = 4.4 ± 0.16 (4.1–4.8); c = 66.26 ± 12.2 (55.6–84.3); V = 41.5% ± 2.7 (38–44.6); G1 = 17.6% ± 1.7 (15–18.7); G2 = 2.2% ± 0.4 (2–3); width = 17.6 μm

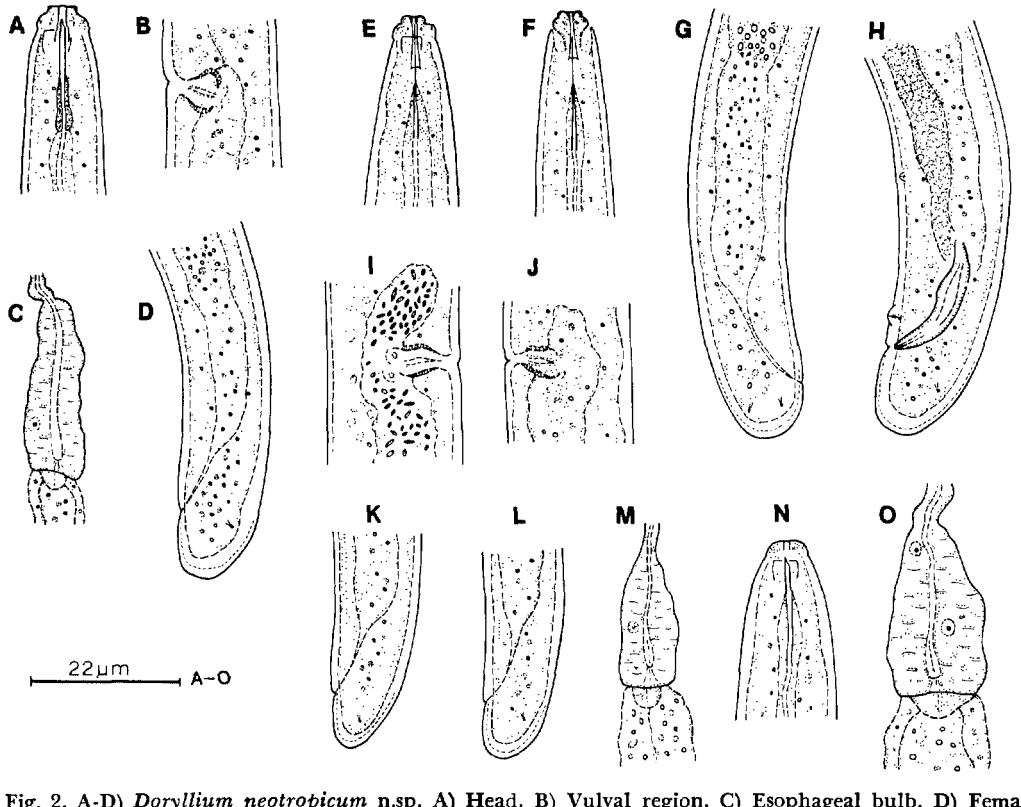

Fig. 2. A-D) *Doryllium neotropicum* n.sp. A) Head. B) Vulval region. C) Esophageal bulb. D) Female posterior portion. E-M) *Basirotyleptus nemoralis*. E,F) Head. G) Female posterior portion. H) Male posterior portion. I,J) Vulval region. K,L) Female tail. M) Esophageal bulb. N,O) *Tyleptus gymnochilus*. N) Head. O) Esophageal bulb.

± 1.1 (16–19.2); esophagus = 108 μm ± 2.8 (104–112); tail = 7.2 μm ± 0.9 (6.4–8); prerectum = 42.8 μm ± 7.3 (32–48).

Males (2): L = 0.55, 0.58 mm; a = 28.9, 30.2; b = 4.7, 5.3; c = 69.3, 51.7; T = 45, 44.8%; width = 19.2, 19.2 μm; esophagus = 116.8, 108.8 μm; tail = 8, 11.2 μm; spicule = 21, 19.2 μm.

Male: First report of male. Similar to female in general morphology. Body cylindroid, ventrally arcuate in posterior half. Cuticle and subcuticle distinctly striated. Refractive elements obscure. Lateral pores distinct. Lip region set off, 5.6 μm wide; labial disc present. Stoma sclerotized, funnel-shaped, 9.6 μm long, oral opening distinctly sclerotized. Amphids stirrup-shaped, about 3 μm wide. Spear thin, typical of genus, 8 μm long; spear extension distinct, 11.2 μm long, thickened at posterior end. Esophageal bulb pyriform, 19 μm long, posterior inner lining thick; cardia 4 μm long. Testes two, outstretched; sperms cylindroid to oval-shaped, 2–3 μm long. Spicules slightly arcuate; lateral guiding pieces present. Adanal pair of supplements present. Copulatory musculature obscure. Caudal papillae present.

Discussion: This species was originally described from India and is distinctive in the genus in the absence of refractive elements in the cuticle. We noted variation in tail shape, from round to bluntly conoid. Collected from forest soil near Gamboa, Panama Canal Zone. Specimens on PNC slides 7/19/75 A3, 7/19/75 A8, 7/19/75 A9, and 7/19/75 A11.

Basirotyleptus acus Goseco, Ferris and Ferris, 1975

Measurements: Females (3); L = 0.44 mm (0.40–0.51); a = 22 (17.8–26.5); b = 4.4 (4–5.2); c = 44.1 (43–45.5); V = 32.2% (31.9–33); G1 = 0%; G2 = 22.9% (18.8–25); width = 20.2 μm (19.2–22.4); esophagus = 98.5 μm (97.6–99); tail = 10.1 μm (9.6–11.2); prerectum = 45.3 μm (40–56); spear plus extension = 19.9 μm (19.2–20.8).

Comments: We observed variation in the esophagus-vulva distance (2–4 body widths) among these specimens. This is the first report of *B. acus* outside the USA, where it was originally described. Specimens on PNC slides 7/19/75 A5, 7/19/75 A21, and 7/19/75 A22, collected from forest soil near Gamboa in the Panama Canal Zone.

Basirotyleptus penetrans (Thorne, 1964) Siddiqi, 1969

Measurements: Females (3): L = 0.66 mm (0.65–0.68); a = 28.2 (23–31.7); b = 4.8 (4.6–5.0); c = 78.5 (71.5–82.5); V = 53.1% (52.2–54); G1 = 9.4% (8.4–10); G2 = 17.2% (17–17.8); width = 23.8 μm (20.8–28.2); esophagus = 138 μm (136–140.8); tail = 8.5 μm (8–9.6); prerectum = 58.6 μm (56–64); spear plus extension = 25 μm (24–25.6).

Comments: These specimens are very similar to those described from Puerto Rico (5,9). This is the first report of this species outside of Puerto Rico. Specimens on PNC slides 7/19/75 A1, 7/19/75 A7, and 7/19/75 A12, collected from forest soil near Gamboa in the Panama Canal Zone.

The Genus *Doryllium*

Two species of *Doryllium* were found, both from site 1 (Table 1) near Gamboa on the Caribbean slope of the Panama Canal Zone. One of them proved to be a new species and is described below. The second species was *D. minor* Jairajpuri, 1963, described originally from North India.

Doryllium neotropicum n. sp. (Fig. 2: A-D)

Type: Holotype female on slide 7/19/75 A7 in PNC. Collected from forest soil near Gamboa in the Canal Zone.

Paratypes: Females (2) on slides 7/19/75 A16 and 7/19/75 A26 in PNC.

Measurements: Holotype female: L = 0.62 mm; a = 38.7; b = 3.9; c = 77.5; V = 37.6%; width = 16 μm; esophagus = 156.8 μm; tail = 8 μm; prerectum = 51 μm.

Paratype female: L = 0.76 mm; a = 39.6; b = 4; c = 79.1; V = 36%; width = 19.2 μm; esophagus = 188.2 μm; tail = 9.6 μm; prerectum = 43.2 μm.

Differential diagnosis: Doryllium neotropicum can be distinguished from *D. minor* Jairajpuri, 1963 by the more robust and differently shaped spear and spear extension, the absence of the anterior uterine branch, and the differently shaped labial disc.

Holotype female: Body cylindroid, slender, ventrally arcuate. Cuticle and subcuticle with distinct transverse striations. Lateral cords 4.8 μm wide; body pores distinct, arranged in two rows. Lip region offset, 6.4 μm wide; prominent labial disc present. Amphids stirrup-shaped, 3.2 μm wide; stoma 5 μm long, walls obscure; guiding ring distinct. Spear robust, 9.6 μm long, aperture distinct; spear extension prominent, 8 μm long, flanged. Nerve ring about 41% along esophagus. Esophagus slender, suddenly expanding to set off, cylindroid basal bulb, about 41.6 μm long; lumen distinctly sclerotized. Cardia rounded, small, 2 μm long. Vulva transverse; vagina distinct, extending halfway across body width. Anterior gonad absent; posterior gonad normal, 17% of body length, reflexed 83%. Prerectum distinct, about 4 anal body widths long. Tail rounded, slightly more than one-half anal body width long; caudal papillae present.

Male not known, and female did not contain spermatozoa.

Doryllium minor Jairajpuri, 1963

Measurements: Females (2): L = 0.49, 0.48 mm; a = 27.8, 30; b = 4, 3.8; c = 27.8, 30; V = 37.7, 39.5%; G1 = 3.2, 2%; G2 = 22, 23%; width = 17.6, 16 μm; esophagus = 121.6, 124.8 μm; prerectum = 48, 31.4 μm; spear plus extension = 12.8 μm.

Comments: The specimens from Panama are very similar to those collected in north-central USA (6). Specimens on PNC slides 7/19/75 A25 and 7/19/75 A26, collected from forest soil near Gamboa in the Panama Canal Zone.

Other Genera

Tyleptus gymnochilus Loof, 1964 (described from Venezuela) was found at sites 1 and 4 (Table 1). *Gerthus jamesi* Goseco, Ferris and Ferris, 1976 (described from Florida, USA) was found at sites 2, 3, and 4 (Table 1). One species each of *Dorylaimoides* and *Tylencholaimellus* were found in Panama. *Dorylaimoides micoletzkyi* (deMan, 1921) Thorne and Swanger, 1936 (found in sites 1 and 4, Table 1) is a cosmopolitan species. *Tylencholaimellus macrophallus* Thorne, 1964 (found in sites 1, 3, and 4, Table 1) is otherwise known only from Puerto Rico.

Tyleptus gymnochilus Loof, 1964
(Fig. 2: N,O)

Measurements: Females (2): L = 0.62, 0.66 mm; a = 27.6, 30.2; b = 4.1, 4.7; c = 65, 82.5; V = 37, 38.8%; G1 = 5.1, 6%; G2 = 16.6, 22%; width = 20.8, 22.4 μm; esophagus = 131.2, 153.6 μm; tail = 8, 9.6 μm; prerectum = 35.2, 36 μm; spear plus extension = 16, 14.4 μm.

Males (2): L = 0.63, 0.67 mm; a = 33, 32.2; b = 4.3, 4.4; c = 56, 52.3; T = 56, 59%; width = 19.2, 20.8 μm; esophagus = 147.2, 147.2 μm; tail = 11.2, 12.8 μm; spicule = 19.2, 19.5 μm.

Comments: With the exception of their slightly smaller size and distinct thickening of the inner lining of the esophageal bulb, these specimens agree very well with the original description and that of Goseco et al. (5). Distinctness and clarity of the inner thickening of the esophageal bulb probably vary according to fixation. The amphid apertures did not appear sinuous, as suggested in Goseco et al. (5). We now feel that *T. gymnochilus* is a *Tyleptus* species which exhibits a derived loss of projecting inner liplets. Females (3) and males (2) on PNC slides 7/19/75 A7, 7/19/75 A23, 7/19/75 A27, and 8/7/75 A5.

Gerthus jamesi Goseco,
Ferris and Ferris, 1975

Measurements: Females (4): L = 0.45 mm (0.38–0.50); a = 24 (21.6–26.1); b = 3.3 (2.9–3.8); c = 45.6 (39.5–47.9); V = 44% (45–48); G1 = 0%; G2 = 5.2% (3.6–6.0); width = 18.8 μm (17.6–22.4); esophagus = 136.6 μm (124.8–147); tail = 9.9 μm (9.6–11.2); prerectum = 38.9 μm (32–48).

Comments: The specimens are remarkably similar to our specimens from Florida (6). Of the many specimens recovered, none were males. We found no males in Florida either. This species is well distributed in Panama as discussed above. Specimens on PNC slides 7/26/75 A1; 7/26/75 A2; 7/31/75 A1; 8/7/75 A1; 8/7/75 A3; 8/7/75 A4; 8/7/75 A6; and 8/7/75 A8.

Dorylaimoides micoletzkyi (deMan, 1921)
Thorne and Swanger, 1936

Measurements: Female: L = 1.01 mm; a = 78.9; b = 5.5; c = 14.3; V = 42%; G1 = 11%; G2 = 11%; width = 12.8 μm; esophagus = 182.4 μm; tail = 70.4 μm; prerectum = 134 μm.

Males (3): L = 1.1 mm (1.09–1.15); a = 77.2 (75.6–79.8); b = 5.8 (5.5–6.2); c = 16.5 (16.2–17.1); T = 59.6% (58–61); width = 14.4 μm (14.4–14.4); esophagus = 188 μm (185.6–195); tail = 67.2 μm (67.2–67.2); spicule = 33.3 μm (32–34).

Comments: Although this is the first report from Central America, this species has been collected throughout the world and is considered to be one of the most widespread *Dorylaimoides* species (7). Specimens on PNC slides 7/19/75 A4; 7/19/75 A6; and 8/7/75 A1.

Tylencholaimellus macrophallus Thorne, 1964

Measurements: Female: L = 1.22 mm; a = 27.2; b = 7.2; c = 42.3; V = 41%; G1 = 3% ; G2 = 17%; width = 44.8 μm; esophagus = 169.6 μm; tail = 28.8 μm; prerectum = 54.4 μm; spear plus extension = 28.2 μm.

Male: L = 0.87 mm; a = 24.8; b = 5.5; c = 45.5; T = 39%; width = 35.2 μm; esophagus = 160 μm; tail = 19.2 μm; spear plus extension = 22.4 μm; spicule = 42 μm.

Comments: This species, previously known only from Puerto Rico, differs from other *Tylencholaimellus* species in the very long, slender male spicules. The specimens fit the description well, except that the female is slightly larger than the holotype female. Male (1), female (1), and juveniles (2) on PNC slides 7/19/75 A24; 7/31/75 A11; 7/31/75 A7; and 8/7/75 A6.

DISCUSSION

Consideration of known distributions of nematode species, together with cladistic evolutionary analyses, enable us to predict discoveries of taxa. The known distribution of species of *Tyleptus* and *Basirotyleptus* suggests a Gondwanian origin, with probable entry into North America via Central America (3,4), and we predicted the occurrence of species of these genera in Central America.

Rosen (8) combined current geophysical models of Caribbean and Central American history and vicariance biogeographic models to show that present distributions across a broad spectrum of biota can be comprehended by assuming that the components of an original simple Central American pattern of the late Mesozoic were synchronously pulled apart along an east-west axis and then later reformed along a north-south axis on the new Panamanian isthmus. He suggested several important theoretical consequences of this model which include the prediction that Costa Rica and Panama will be found to contain a mixture of new southern elements with closest relatives in South America, and new and old northern elements with closest relatives in nuclear Central America and Mexico.

Leptonchoid taxa from Panama are listed in Table 2, together with notations concerning prior discoveries of the same taxa (or closely related taxa) in other parts of the world. We have indicated (1,3,4) that the genera *Tyleptus* and *Basirotyleptus sensu lato* are Gondwanian (southern land mass) taxa. *Tyleptus gymnochilus* and *Sclerostylus xiphinemoides* are both known from South America, and we found *T. gymnochilus* in Puerto Rico as well. *Basirotyleptus nemoralis* and *B. modestus* (close to *B. saccatus*) are known only from India, for which we have shown Gondwanian affinities in nematode taxa (3). We predict that *B. nemoralis* and *B. saccatus* will also be discovered in South America. If Rosen's (8) model is correct, it is likely that *B. acus* (known also from eastern USA) and *B. penetrans* (known otherwise only from Puerto Rico) will be discovered in northern Central America or Mexico. We have insufficient information at the present time to make predictions regarding the other genera of Table 2, although most of them are probably not of Gondwanian origin as are *Tyleptus* and *Basirotyleptus* (3 and unpublished data, our laboratory).

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Table 2. Known geographic occurrence in Panama of leptonchoid species, plus known distribution elsewhere of the same (or similar) species.

Species	Canal Zone	Western Panama	Eastern Panama	Barro Colorado	Elsewhere
Tylencholaimellus macrophallus	X		X	X	Puerto Rico
Doryllium minor	X				India, USA (Indiana)
Doryllium neotropicum	X				(close to *D. minor*, India)
Gerthus jamesi		X	X	X	USA (Florida)
Dorylaimoides micoletzkyi	X			X	Europe, Asia, USA, Pakistan
Tyleptus gymnochilus	X			X	Venezuela, Puerto Rico
Sclerostylus karri	X				(close to *S. xiphinemoides*, Brazil)
Basirotyleptus saccatus			X		(close to *B. modestus*, India)
B. nemoralis	X				India
B. acus	X				USA (eastern)
B. penetrans	X				Puerto Rico

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