

Xiphinema llanosum and *Trophurus vultus*, Two New Plant Nematode Species from Pasture Soils in Colombia

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Abstract: *Xiphinema llanosum* n. sp. and *Trophurus vultus* n. sp. are described and illustrated from grass soils in Llanos Orientales, Colombia. *Xiphinema llanosum* is a bisexual species. The female body length is 2.3–2.7 mm, odontostyle 86–96 µm, and odontophore 58–65 µm long; vulva at 42–47%; anterior ovary is absent; the anterior uterus and oviduct are similar to the posterior branch but slightly reduced; and the tail is dorsally convex-conoid with a blunt hemispherical terminus. Male body length is 2.06–2.96 mm; spicules are 40–44 µm long; and four (rarely three or five) anterior ventromedian supplementary papillae are present. *Trophurus vultus* females are 0.52–0.67 mm long; vulva at 56–60%; stylet is 10.5–13.5 µm long; isthmus is as long as the basal esophageal bulb; the tail is subclavate, 1.6–2.2 times anal body width long; and the terminal cuticle thickness is about one-sixth of the tail length.

Key words: *Andropogon gayanus*, Colombia, new species, pasture grass, taxonomy, *Trachypogon* sp., *Trophurus vultus*, *Xiphinema llanosum*.

During August and September 1985, the first author collected nematodes from experimental plots of introduced pasture species, improved grass, and grass-legume mixed pastures at the Instituto Colombiano Agropecuario-Centro Internacional de Agricultura Tropical (ICA-CIAT) Research Station, Carimagua (Meta) in the Llanos Orientales of Colombia. A native *Trachypogon* dominant savanna grass was also sampled to compare with nematode fauna from introduced grasses. A summary report on these nematodes was prepared by the first author for CIAT (7).

The two species reported here, *Xiphinema llanosum* n. sp. and *Trophurus vultus* n. sp., were localized in their distribution on pasture. The latter species was also identified from samples previously collected from primary forest areas near Araraquera, Amazonas, Colombia.

MATERIALS AND METHODS

Soil samples from rhizospheres of pasture grasses were collected in polythene bags and stored at 4 C. Nematodes were extracted by wet sieving, heat relaxed by pouring hot (about 90 C) water over nematodes held in a very small quantity of tap

water, fixed, and stored in a 3% formaldehyde solution. The fixed nematodes were transferred to warm lactophenol and were left in the same medium over night at room temperature. They were then transferred to warm 75% glycerin and 25% lactophenol solution. After 2 hours, they were transferred to pure dehydrated glycerin then mounted on slides in glycerin. All measurements were taken from glycerin mounted specimens. Spicules were measured along their median lines.

SYSTEMATICS

Xiphinema llanosum n. sp.

(Fig. 1)

Holotype (female in glycerin): L = 2.52 mm; a = 84; b = 6.6; c = 93; c' = 1.2; V = 42.2%¹⁰; odontostyle = 95 µm; odontophore = 65 µm; total stylet = 160 µm; stylet guiding ring 88 µm from anterior end.

Paratypes (10 females): L = 2.3–2.7 (2.5, SD 0.12) mm; a = 72–84 (78, SD 3.44); b = 6.3–7.1 (6.8, SD 0.26); c = 86–114 (100, SD 7.73); c' = 1–1.2 (1.08, SD 0.08); V = 42–47 (44.5, SD 1.6)%; odontostyle = 86–96 (92, SD 3.55) µm; odontophore = 58–65 (62, SD 2.33) µm; total stylet = 144–160 (153, SD 5.58) µm; stylet guiding ring 74–88 (83, SD 5.08) µm from anterior end.

Body elongate, slender, maximum width 29–33 µm. Killed and fixed body straight in esophageal region, then ventrally curved, forming an open C-shape (Fig. 1C). Cuticle

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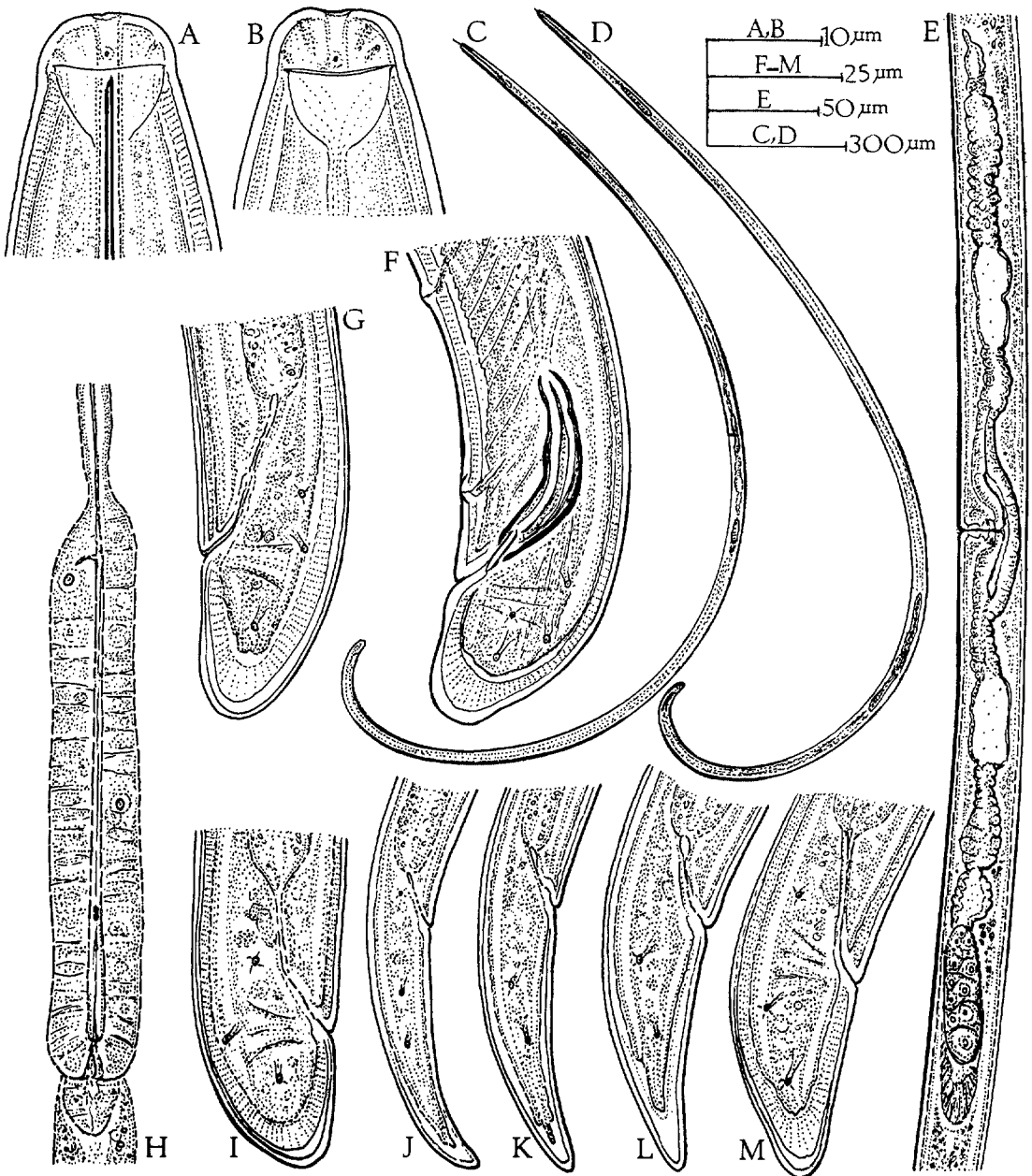


FIG. 1. *Xiphinema llanosum* n. sp. A) Female head region. B) Male head region. C) Female. D) Male. E) Female reproductive region. F) Male tail region. G, I) Female tail regions. H) Female basal region of esophagus. J-M) Juvenile tail regions of J1, J2, J3, and J4, respectively.

superficially smooth, but with fine transverse striae; 2–3 μm thick at midbody; 8–10 μm at tail. Radial striae distinct on tail, located in inner thicker cuticle layer. Lateral body pores in two uneven rows. Dorsal and ventral pores obscure in anterior region. Lateral chords about 0.3 times as wide

as body. Cephalic region hemispherical, offset from body by slight expansion (Fig. 1A). Amphid apertures transverse slits, about four-fifths corresponding body width.

Odontostyle 86–96 (92) μm long, furcate at base. Odontophore 58–64 (62) μm long,

basal flanges well developed. Stylet guiding ring usually 83–88 μm from anterior end. Esophagus 340–385 (364) μm long; anterior part slender, with a minute sclerotized triangular mucro 50–88 μm posterior to odontophore; enlarged posterior part cylindrical, 94–102 μm long, 14–17 μm wide. Esophageal-intestinal valve large, rounded.

Vulva a transverse slit. Vagina at right angles to body axis, about one-half body width long. Reproductive organs didelphic, amphidelphic (Fig. 1E). Anterior branch slightly reduced; ovary absent; one or two anterior cells may represent rudimentary ovary; uterus normal, often with sperm; uterus-oviduct sphincter present. Posterior branch well developed, ovary normal, Z-organ and uterine spines absent. Egg in uterus 260 \times 25 μm .

Pre-rectum 390–450 μm long, 12–15 times maximum body width. Tail dorsally convex-conoid, 24–27 μm long, 1.0–1.2 times anal body width; terminus bluntly rounded, hemispherical to slightly cylindrical (Fig. 1G, I).

Paratypes (eight males): L = 2.06–2.96 (2.57, SD 0.24) mm; a = 76–109 (92, SD 8.87); b = 5.7–7.7 (6.9, SD 0.6); c = 90–112 (103, SD 6.48); c' = 0.95–1.0 (0.98, SD 0.02); T = 36–46 (42, SD 3.69)%; odontostyle = 88–97 (93, SD 2.39) μm ; odontophore = 60–65 (62, SD 2.1) μm ; total stylet = 148–160 (155, SD 3.27) μm ; stylet guiding ring 82–89 (86, SD 1.52) μm from anterior end; spicules = 40–44 (42, SD 1.36) μm .

Males similar to females in structure of cuticle, cephalic region and stylet. Posterior body more ventrally curved than female. Maximum body width 26–28 μm . Esophagus 340–375 (360) μm long; enlarged posterior part 86–93 μm long, 15–17 μm wide. Testes paired, one outstretched, one reflexed. Spicules thick, with a strong median piece, 40–44 (42) μm long; lateral guiding pieces cylindrical, 10–12 (11) μm long (Fig. 1F). Tail 22–27 μm long, terminus broadly obtuse, three or four pairs of caudal papillae. One preanal pair of papillae, 13–18 μm anterior to cloacal aper-

ture. Usually four ventromedian supplementary papillae, located 47–61 μm , 60–90 μm , 94–118 μm , and 124–146 μm anterior to cloacal aperture; exceptions: one male with three and one with five.

Paratypes (four first-stage juveniles): L = 0.83–0.88 (0.847, SD 0.02) mm; a = 42–49 (45, SD 2.59); b = 3.3–3.9 (3.5, SD 0.26), c = 18–19 (18.4, SD 0.42); c' = 3.8–4.4 (4.2, SD 0.28); odontostyle = 49–51 (50, SD 0.7) μm ; odontophore = 37–39 (38, SD 0.7) μm ; total stylet = 86–89 (88, SD 1.22) μm ; guiding ring 37–40 (39, SD 1.22) μm from anterior end; replacement odontostyle = 55–60 (57, SD 1.87) μm .

Paratypes (one second-stage juvenile): L = 1.08 mm; a = 54; b = 4.3; c = 22; c' = 3.4; odontostyle = 59 μm ; odontophore = 43 μm ; total stylet = 102 μm ; stylet guiding ring 49 μm from anterior end; replacement odontostyle = 71 μm .

Paratypes (six third-stage juveniles): L = 1.26–1.56 (1.4, SD 0.1) mm; a = 58–61 (59.6, SD 1.34); b = 4.2–5.6 (5, SD 0.47); c = 29–35 (31, SD 0.2); c' = 2.5–2.9 (2.7, SD 0.15); odontostyle = 68–72 (70, SD 1.68) μm ; odontophore = 47–53 (49, SD 2.12) μm ; total stylet = 116–125 (119.3, SD 2.8) μm ; stylet guiding ring 57–64 (60, SD 2.91) μm from anterior end; replacement odontostyle = 79–83 (81, SD 1.41) μm .

Paratypes (four fourth-stage juveniles): L = 1.88–1.99 (1.92, SD 0.04) mm; a = 67–76 (71, SD 3.24); b = 5.6–5.8 (5.7, SD 0.1); c = 55–58 (56.5, SD 1); c' = 1.5–1.7 (1.6, SD 0.08); odontostyle = 77–85 (82, SD 3) μm ; odontophore = 56–60 (58, SD 1.41) μm ; total stylet = 135–145 (140, SD 3.8) μm ; stylet guiding ring 74–77 (75, SD 1.22) μm from anterior end; replacement odontostyle = 88–93 (90, SD 2.12) μm .

First-stage to fourth-stage juveniles can be distinguished by body length, tail shape, and length of functional stylet and replacement odontostyle. First-stage and second-stage juvenile tails are regularly tapered, with a 5–7- μm -thick terminal hyaline region. Third-stage and fourth-stage tails are dorsally convex-conoid, with a 9–12- μm -thick terminal hyaline region (Fig. 1J–M).

Type host and locality

Collected from the rhizosphere of grasses and *Trachypogon* sp. which was the dominant native savanna grass in Carimagua (Meta), Llanos Orientales, Colombia.

Type specimens

Deposited in the CIP Nematode Collection, CAB International Institute of Parasitology, St. Albans, England. Holotype (female) on slide T145/27/1. Paratypes (10 females, 8 males, and 15 juveniles) on slides T145/27/2 to T145/27/16.

Diagnosis

The distinctive female reproductive organs of *Xiphinema llanosum* n. sp. are composed of two well-developed uteri that lack Z-organs and spines and two uterus-oviduct sphincters, but without an anterior ovary. *Xiphinema llanosum* can be distinguished from *Xiphinema* species having this type of female reproductive organs by body, stylet, and spicule lengths; the position of the vulva; and the tail shape in adults and juveniles.

Relationships

Xiphinema llanosum is close to *X. surinamense* Loof & Maas, 1972 and *X. fluminense* Huang, Uesugi & Raski, 1987. Females of *X. llanosum* have similar reproductive organs to those of *X. surinamense* but differ by the shorter odontostyle, 121–133 μm long in *X. surinamense* females from Surinam and 101–125 μm in females from Brazil (5,6); and the tail shape is convex-conoid (tail of *X. surinamense* is hemispherical). Males differ by the shorter spicules, 63–76 μm long in *X. surinamense* from Surinam and 48–61 μm in the Brazilian specimens (5,6). Males of *X. llanosum* have 3–5 ventromedian supplementary papillae, *X. surinamense* males from Surinam had one supplement (5), and Brazilian specimens varied between two and four (6). Juveniles of *X. llanosum* have more tapering tails with higher c' ratio than *X. surinamense* from Brazil (in *X. surinamense* $c' = 2.3\text{--}3.0, 1.7\text{--}1.9, 1.5\text{--}1.6,$ and $1.0\text{--}1.1$ in J1, J2, J3, and J4, respectively) (6).

The new species differs from *X. fluminense* by the shorter body, longer odontophore, absence of the anterior ovary, and shorter spicules (in *X. fluminense* $L = 3.4\text{--}3.5$ mm; female odontophore length 42–59 μm and male 39–41 μm ; and spicules 50–55 μm long). The J4 tail of *X. fluminense* is shorter compared to anal body width and more rounded than the J4 of *X. llanosum* (2).

Trophurus vultus n. sp.

(Fig. 2)

Holotype (female in glycerin): $L = 0.57$ mm; $a = 34.5$; $b = 5.8$; $c = 20$; $c' = 2.1$; $V = 25.57\%$; stylet = 13 μm .

Paratypes (20 females): $L = 0.52\text{--}0.67$ (0.57, SD 0.025) mm; $a = 27\text{--}36$ (32, SD 2.46); $b = 5.0\text{--}5.8$ (5.3, SD 0.32); $c = 20\text{--}26$ (22.5, SD 2.21); $c' = 1.6\text{--}2.2$ (1.8, SD 0.16); $V = 56\text{--}60$ (57.7, SD 1.19)%; stylet = 10.5–13.5 (12, SD 0.85) μm .

Heat relaxed body ventrally arcuate to C shaped, sometimes irregularly curved. Maximum width 16–22 (18) μm . Cuticle distinctly annulated, transverse striae ca. 1 μm wide at midbody. Lateral fields with three striae, four incisures, striae nonareolated, incisures equidistant, field about one-third body width, slightly expanded at vulva and phasmid regions (Fig. 2I, K). Deirids absent. Phasmids pore-like, at midtail or slightly posterior.

Cephalic region conoid-rounded, elevated, smooth. Framework sclerotization of medium strength, outer margins extend posteriorly six or seven body annuli, inner margins form bulbar stylet guide which extends posteriorly three or four body annuli (Fig. 2A, B). Stylet slender; conus about as long as shaft; knobs small, rounded, sloping posteriorly, 1.4–2.1 μm across. Dorsal esophageal gland orifice 2.8–3.8 μm posterior to stylet knobs. Median esophageal bulb oval, about one-half as wide as corresponding body width; valve plates distinct; distance from anterior end of body to valve plates 60–65 (63) μm , equal to, or more than, distance from plates to posterior end of gland lobe. Isthmus about as long as basal bulb. Basal bulb saccate; dor-

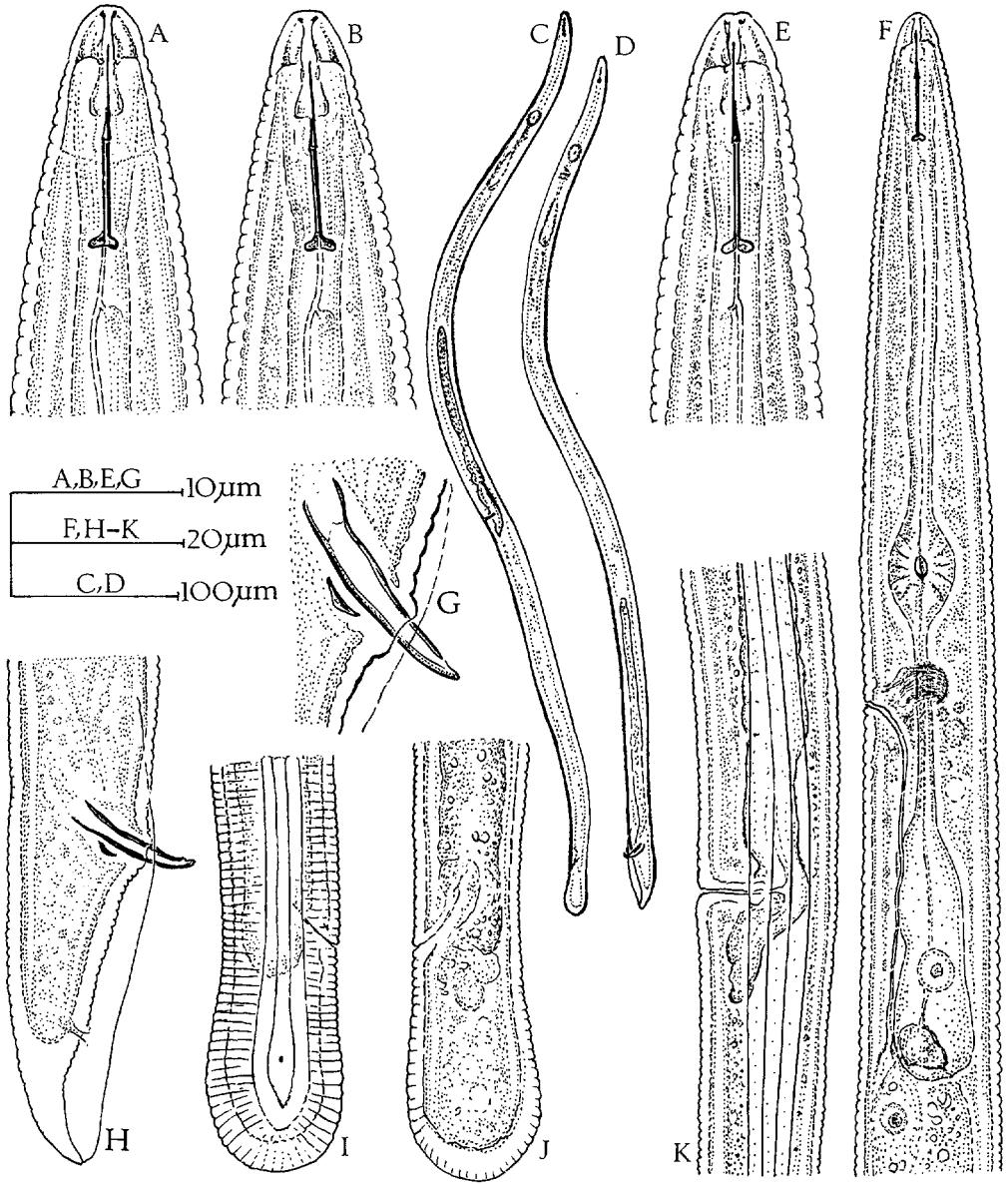


FIG. 2. *Trophurus vultus* n. sp. A, B) Female head regions. C) Female. D) Male. E) Male head region. F) Female esophageal region. G) Male spicular region. H) Male tail region. I, J) Female tail regions. K) Female vulval region.

sal gland forms short lobe (6–8 μm) over dorsal and lateral sides of esophageal-intestinal junction (Fig. 2F). Excretory duct distinct; pore 62–82 (75) μm from anterior end, 8–14 μm posterior to median bulb; renette cell large, just posterior to esophageal-intestinal junction (Fig. 2F). Hemizonid obscure, at same level as excretory pore, at level or just posterior to nerve ring.

Vulva sub-postmedian, not protruding, epiptygma absent. Vagina at right angles to body axis, extends one-half to two-thirds into body. Post-uterine sac three-fourths vulva body width. Reproductive system anterior branch well developed, short. Spermatheca rounded, axial. Ovary with single row of oocytes. Intestine overlaps rectum, extends slightly into tail cavity. Tail clavate

shaped, 22–28 (26) μm long; terminus hemispherical, crenate (Fig. 2I, J). Terminus cuticle 4.0–5.2 (4.3) μm thick, thickness about one-sixth tail length. Ventral tail annuli 24–32 (27).

Paratypes (four males): L = 0.48–0.53 (0.51, SD 0.018) mm; a = 31–39 (35, SD 2.91); b = 4.7–5.3 (5.1, SD 0.39); c = 14–17 (15.4, SD 1); c' = 2.7–2.9 (2.8, SD 0.08); T = 14–24 (19, SD 3.57)%; stylet = 11–13 (12, SD 0.07) μm ; spicules = 13–15 (14, SD 0.07) μm ; gubernaculum = 3–4 (3.5, SD 0.35) μm .

Similar to female. Esophagus 92–100 μm long. Excretory pore 68–72 μm from anterior end. Esophageal gland lobe 6–7 μm long, lateral to esophageal-intestinal junction. Testis short, outstretched; spermatozoa small, rounded. Bursa extends to tail tip, smooth or slightly crenate. Tail 29–34 μm long, terminal hyaline portion 12–17 μm long. Spicules robust, slightly arcuate, with ventral subterminal aperture (Fig. 2G). Gubernaculum short, trough shaped. Phasmids slightly posterior to midtail, extend into bursa (Fig. 2H).

Type host and locality

Collected from the rhizosphere of grass, *Andropogon gayanus* Kunth, at Carimagua (Meta), Llanos Orientales, Colombia.

Type specimens

Deposited in the CIP Nematode Collection, CAB International Institute of Parasitology, St. Albans, England. Holotype (female) on slide T40/2/1. Paratypes (20 females, 4 males) on slides T40/2/2 to T40/2/9.

Diagnosis

Trophurus vultus n. sp. is recognized by its isthmus being about as long as the basal esophageal bulb, the dorsal esophageal gland extending over the esophageal-intestinal junction, and the cuticle on the female tail tip being only slightly thickened, about one-sixth of the tail length.

Relationships

Trophurus vultus n. sp. comes close to *Trophurus minnesotensis* (Caveness, 1958) Caveness, 1959; *T. sculptus* Loof, 1956 (4); and *T. similis* Khan & Nanjappa, 1971 (3); but differs by a shorter body length and the diagnostic characters as listed here.

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