

Three New Species of *Etamphidelus* Andrassy, 1977 (Nemata: Alaimidae) in Southern Chile¹

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Abstract: Three new species of *Etamphidelus* are described from Orange Bay, Hoste Island, Chile. All three are distinguished from previously described species by their numerous longitudinal cuticular ridges. *E. acucephalus* n. sp. is further distinguished by its extremely narrowed anterior body region and posteriorly situated amphids. *E. fueguensis* n. sp. is distinguished from *E. acucephalus* by its anteriorly located amphideal fovea, fewer cuticular ridges, smaller V-an/tail ratio and presence of males. *E. yamani* n. sp. is more similar to *E. fueguensis* n. sp. differing from it by a wider head end, more posteriorly located excretory pore, longer V-an/tail ratio, more numerous cuticular ridges and smaller spermatozoa. *E. puccinelliae* (Lorenzen, 1966) Andrassy, 1977 is transferred to *Paramphidelus puccinelliae* (Lorenzen, 1966) n. comb. The generic diagnosis of *Etamphidelus* is amended, and a key to species is presented.

Key words: taxonomy, morphology, new species, *Etamphidelus*.

During a survey for nematodes at Orange Bay, Hoste Island, in southern Chile, soil samples were taken at three sites about 1 km apart. Full details of those samplings were reported (9). Except for small outcroppings of rocks, the area was essentially blanketed with a continuous thick growth of tundra. Soil taken at the base of the tundra held a high degree of humus content and was well drained but quite moist with fresh water from frequent precipitation.

Several samples held specimens considered to be new species of *Etamphidelus* Andrassy, 1977. These are described below. The collections represent a new distribution record for *Etamphidelus*, so far known only from Japan (1), India (3) and Peru (2).

MATERIALS AND METHODS

Processing techniques: Specimens wet sieved from soil were killed in hot water, preserved, and stored in 4% formaldehyde

for varying periods of time. Later the specimens were transferred to FAA and processed to glycerin.

For SEM studies the glycerin processed specimens were first placed in a mixture of glycerin: alcohol: water, 80:6:4, then brought down in a graded series beginning with 85% glycerin in 30% ethyl alcohol (ETOH) to FAA. The specimens then were brought to absolute ETOH by vapor exchange in a 32 C oven. Specimens then were transferred to a graded series of amyl acetate in absolute ETOH from 30% to absolute amyl acetate. After a 15-60-second sonication in pure amyl acetate they were processed through critical point drying with CO₂, mounted on stubs, and coated with 300 Å of gold layers. An ISI model 3S-130 DS scanning electron microscope was used at 10 kV.

Definitions: Some recently or less commonly used terms and abbreviations are as follows: monovarial = with one ovary; antepudendal = with genital tube anterior to vulva; postpudendal = with genital tube posterior to vulva (7); b.w. = body width; c.b.w. = corresponding body width; c' = tail/anal body width; V' = distance from anterior end to vulva/anterior end to anus; V-an = distance from vulva to anus; neck = distance from anterior end to cardia. Terms referring to body symmetries follow Coomans (4).

All measurements are in micrometers unless otherwise stated.

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SYSTEMATICS

Etamphidelus acucephalus n. sp.
(Figs. 1–3)*Measurements*

Female ($n = 5$) (*type series*): $L = 1.91 \pm 0.13$ (1.77–2.09) mm; $a = 45.8 \pm 6.8$ (37.6–53.5); $b = 3.4 \pm 0.24$ (3.1–3.7); $c = 12.9 \pm 1.53$ (10.9–15.2); $c' = 6.8 \pm 0.70$ (5.9–7.7); $V = 62.3 \pm 4.0$ (57–66); neck = 561 ± 0.05 (510–634) μm ; tail = 148 ± 14 (127–162) μm ; amphid from anterior end = 34.3 ± 3.04 (29.5–38.5) μm ; V-an = 573 ± 80 (467–681) μm .

Holotype (female): $L = 2.09$ mm; $a = 53.5$; $b = 3.5$; $c = 13.2$; $c' = 7.2$; $V = 59.8$; neck = 593 μm ; tail = 158 μm ; amphids from anterior end = 37.0 and 38.5 μm ; V-an = 681 μm .

Description

Body C-shaped, curvature greater in posterior third, tapering toward both ends, especially toward anterior end (Fig. 1H). Cuticle with many longitudinal ridges, transverse striations between the ridges very fine (Fig. 2D). Ridges starting in neck region, increasing to more than 50 at mid-body (Fig. 1K) then diminishing in number toward posterior end, disappearing on tail. Smaller, irregular ridges occur between larger ones (Figs. 1K, 2D). Ridges may have irregular, oblique longitudinal striae, or transverse striae (Fig. 2F). Posterior vulva lip corrugated under SEM (Fig. 2F).

Head very narrow, one-tenth of body width at cardia, truncated with slightly elevated circumoral ring (Figs. 1A–C, 2A), continuous with body contour. Oral opening minute (Fig. 2C). Anterior sensilla consisting of a cirlet of six small inner labial papillae around oral aperture and a cirlet of six outer labial sensory pits from which receptor endings may protrude (Fig. 2B, C); latter 4.0–4.5 μm behind former. Amphidial fovea oval, wide, 4.4–6.1 corresponding body widths behind anterior end; left and right one at different levels, 1.5–6.5 μm apart (Fig. 1A–C). Amphidial aperture narrow, transverse (Fig. 2A). Somatic sensilla few, situated alongside of lat-

eral chord; four usually more prominent than others: first occurring 1.8–2.5 body widths behind nerve ring (Fig. 1D), second 0.6–1.5 body widths behind cardia (Figs. 1J, 2E), third slightly anterior or posterior to vulva, fourth mid-tail (Fig. 1I, L).

Excretory pore not seen. Nerve ring at 54.5–56% of neck length.

Pharynx elongate-pyriform, gradually widening throughout most of length, more so in posterior $\frac{1}{6}$ – $\frac{1}{4}$ th, i.e., 13.6–16% of neck length or 2.4–2.6 times corresponding body width. Five gland nuclei visible: dorsal nucleus (DN) large, situated 30–46 from base of pharynx; first pair of ventro-sublateral nuclei (S_1N) also large, at or near level of DN; second pair of ventro-sublateral nuclei (S_2N) only half the size of other nuclei, situated about halfway between S_1N and base of pharynx (Fig. 1J). Pharyngo-intestinal junction consisting of a conoid projection into pharynx and a broadly flattened valve projecting into intestine, latter may be followed by a conoid intestinal part. Intestine 3–4 cells in circumference, containing brownish granules, vacuoles, and prominent nuclei. Rectum slightly longer than anal body width. An oblique muscle connects proximal dorsal wall of rectum with dorsal body wall (Fig. 1I, L).

Female reproductive system monovarial, antepudendal, consisting of reflexed ovary, oviduct, uterus, and anteriorly bent vagina. Ovary reflexed to right or left of oviduct, containing 8–10 oocytes and about 20 oogonia; ovarian sac with more than 20 nuclei, its surface tending to wrinkle when partly empty (Fig. 1E–G). Oviduct joining ovarium dorsolaterally with a narrow portion enlarging to a wide sac, apparently devoid of nuclei or with a single nucleus at its proximal end (Fig. 1E, G). Junction between oviduct and uterus surrounded by about 14 closely packed, more-or-less disc-like uterine cells (Fig. 1G). Rest of uterus a wide sac containing 20–22 scattered nuclei. Vagina oblique; surrounded by specialized muscles (Fig. 3). One muscle running ventrolaterally from body side (either left or right) behind vulva upward and inward to anterior proximal wall of vagina

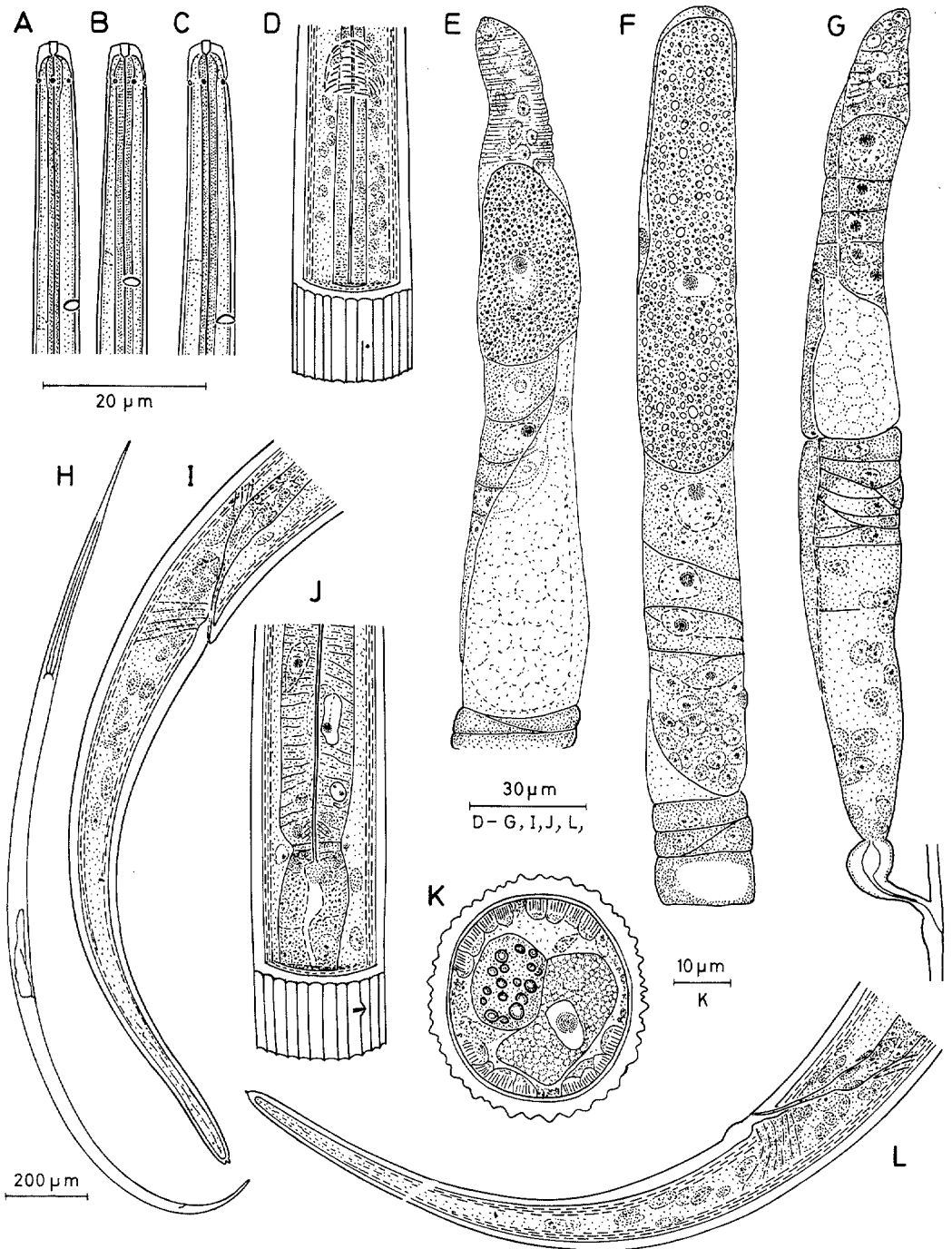


FIG. 1. *Etamphidelus acucephalus* n. sp. A-C) Head ends of three females. D) Part of neck region showing nerve ring and first somatic sensillum. E) Ovary with growing oocyte and oviduct. F) Ovary with fully grown oocyte. G) Entire female reproductive system. H) Female. I) Tail. J) Pharyngo-intestinal junction. K) Cross section at level of ovary. L) Tail.

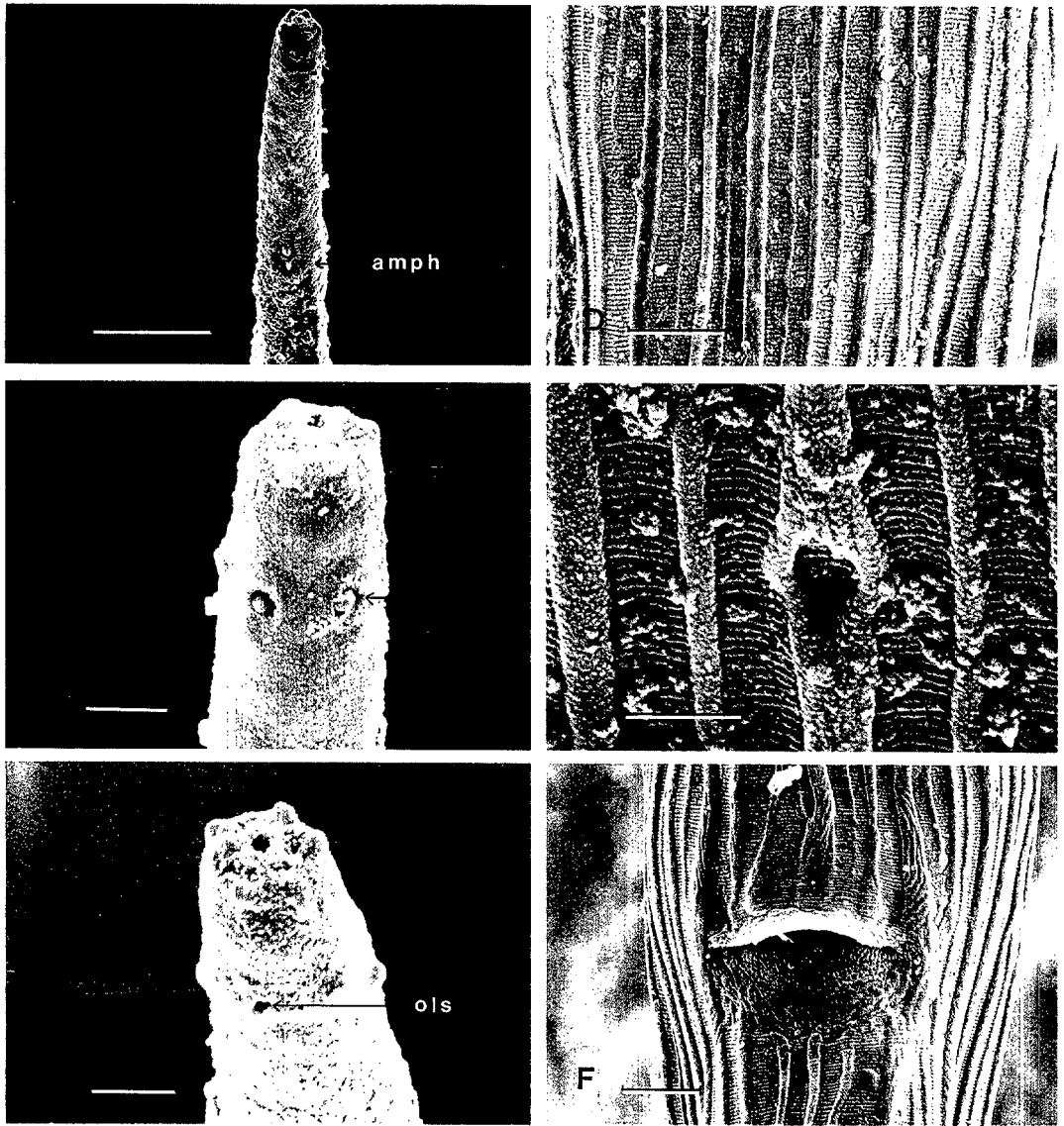


FIG. 2. *Etamphidelus acucephalus* n. sp. female. A) Neck region including amphid (amph). B, C) Head end showing inner labial sensilla (ils) and outer labial sensilla (ols). D) Cuticular detail mid-body. E) Somatic sensillum (body pore). F) Vulva. Bar on A = 10 µm; B, C, E = 2 µm; D, F = 5 µm.

where it turns to opposite body side attaching dorsolaterally as a fan-shaped muscle between dorsal side of lateral chord and the somatic muscles (Fig. 3C, F, I). Another muscle running from ventrolateral body wall (left or right) anterior to vagina downward and inward to posterior proximal wall of vagina where it turns to the opposite body side attaching dorsolaterally (Fig. 3B, E, H). Upon contraction, both muscles constrict the vagina. Two other muscles can

open the vagina; one of these running from anterior wall of vagina to subventral body wall (Fig. 3A, D, G); the other running from posterior wall of vagina to the dorsolateral body wall opposite and (or) behind vulva (Fig. 3D, G). Vulva a transverse slit (Fig. 2F), posterior lip can be pulled backward by fan-shaped muscles attached to ventrolateral or dorsolateral body sides (Fig. 3A, D, G). Vaginal and vulval muscles clearly modified somatic muscles.

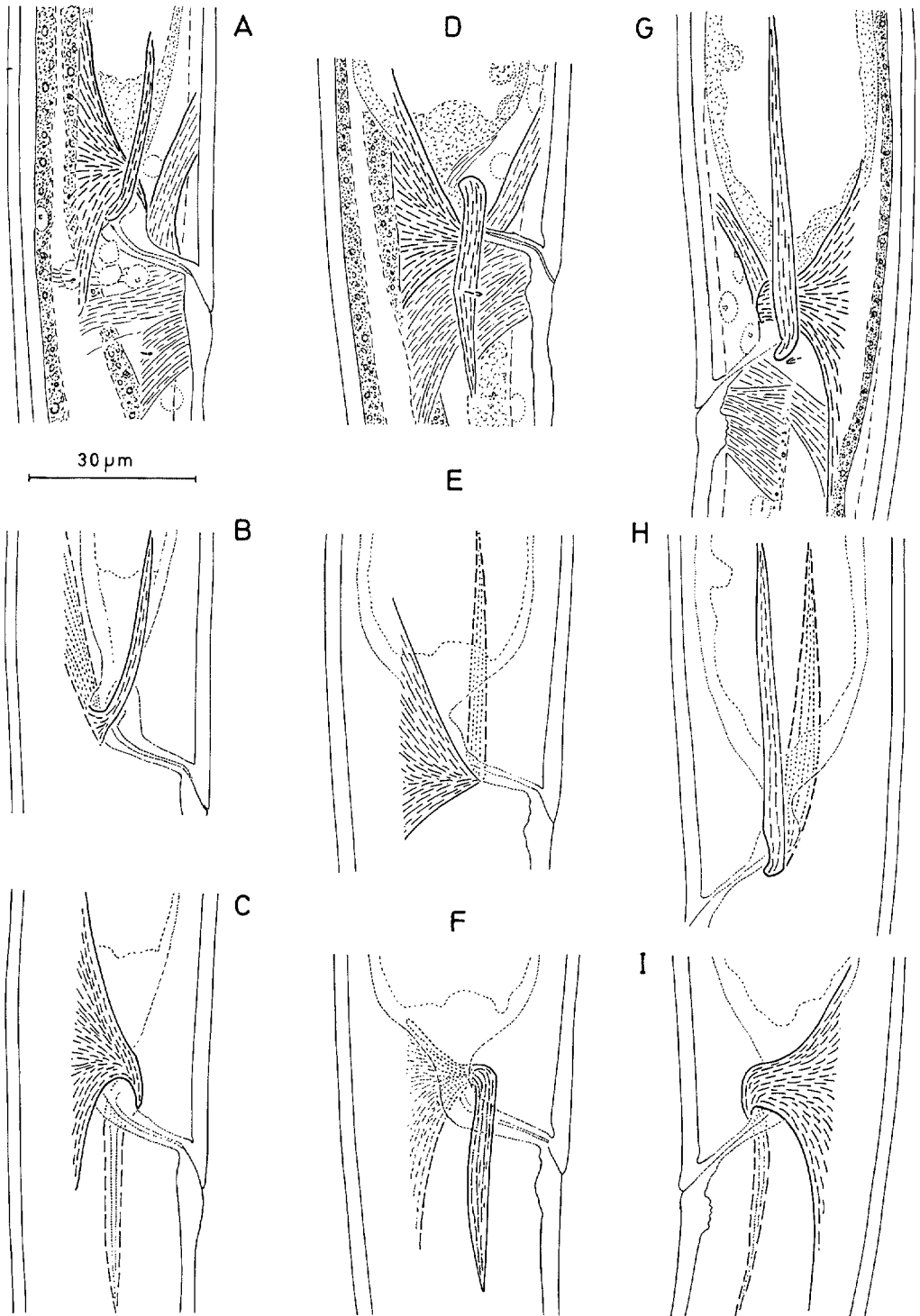


FIG. 3. *Etamphidelus acucephalus* n. sp. Vaginal and vulval musculature. A, D, G) Overview and variation in three females. B, E, H) First set of vaginal constrictors. C, F, I) Second set of vaginal constrictors. A-C, D-F, and G-I from single female each.

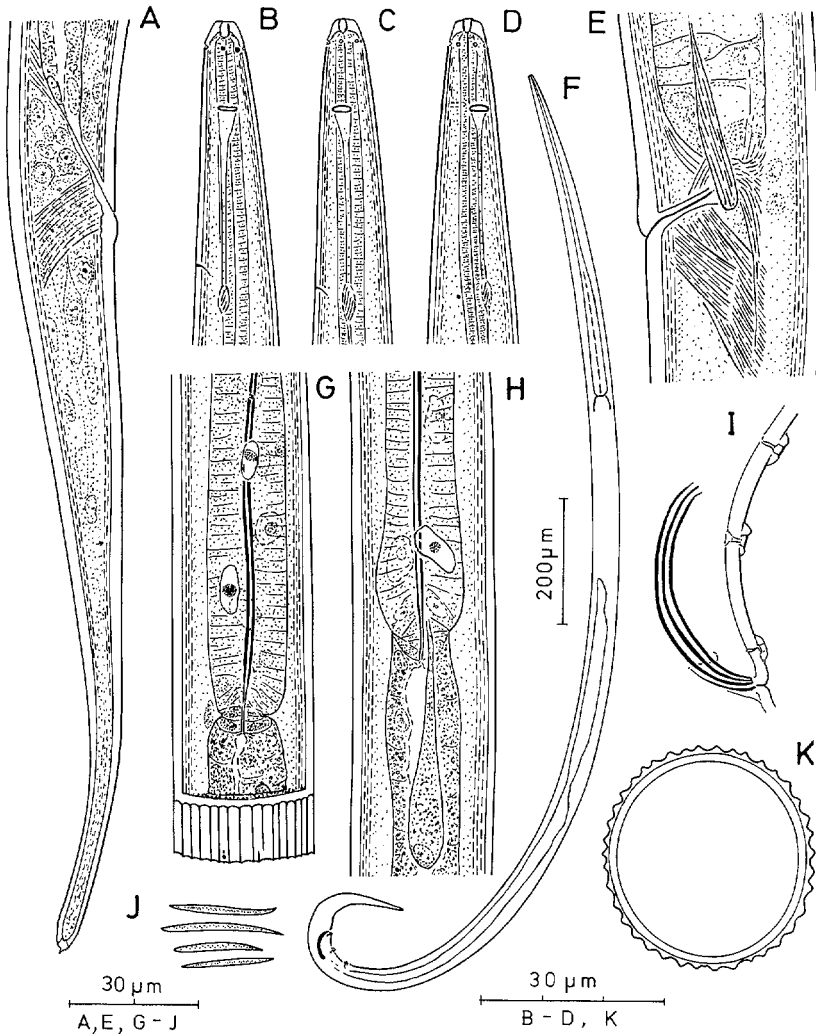


FIG. 4. *Etamphidelus fueguensis* n. sp. A) Female tail. B) Female anterior end. C, D) Male anterior end. E) Vaginal and vulval muscles. F) Male. G) Male pharyngo-intestinal junction. H) Female pharyngo-intestinal junction and ventral gland. I) Spicule and supplements. J) Spermatozoa from vas deferens. K) Male, cross section of mid-body.

Tail ventrally arcuate, tapering regularly toward a conoid tip, with usually one, rarely two, minute projection(s) (Fig. 11, L).

Male: Unknown; mature females did not contain sperm.

Juvenile: Resembling female in every respect except for size and reproductive system.

The specific name is derived from Latin *acu* = needle and *cephalus* = head.

Type locality and habitat: Moist soil beneath deep tundra at Orange Bay, Hoste Island, Chile.

Type specimens: Holotype (female)—col-

lected by D. J. Raski, 19 January 1983; slide number 2233, deposited in University of California Davis Nematode Collection (UCDNC), Davis, California. Paratypes (three females and one juvenile)—same data as holotype, deposited as follows: one female and one juvenile in UCDNC; two females in Nematode Collection, Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

Differential diagnosis: *E. acucephalus* n. sp. can be distinguished from previously described species by its extremely narrowed anterior body region and posteriorly situated amphids.

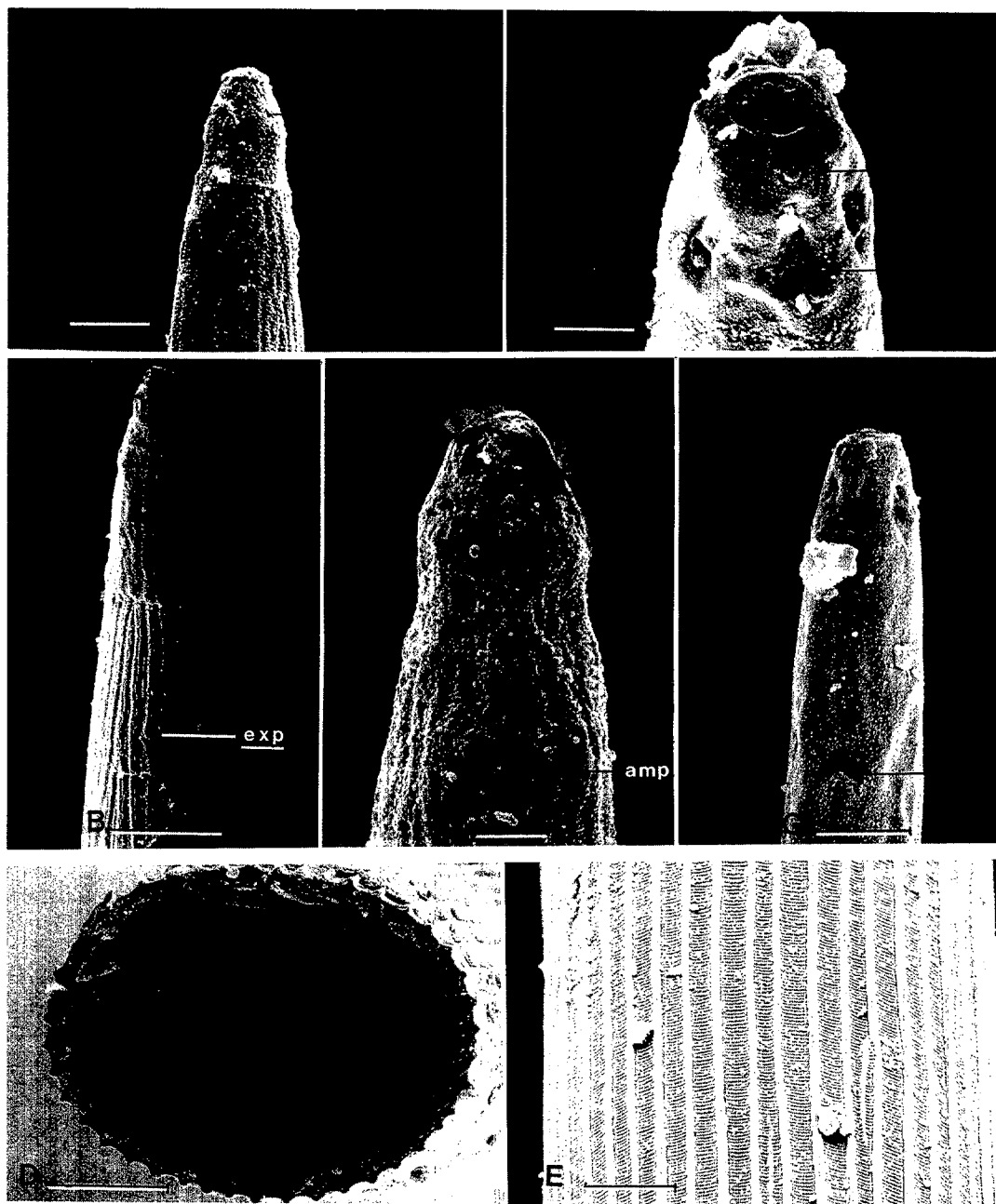


FIG. 5. *Etamphidelus fueguensis* n. sp. female (A–E) and *Paramphidelus* sp. female (F, G). A) Anterior end showing outer labial sensilla (ols). B) Neck region with excretory pore (exp). C) Anterior end with amphid aperture (amp). D) Cross section of mid-body. E) Cuticular details, mid-body. F) Head end showing inner labial sensilla (ils) and outer labial sensilla (ols). G) Anterior end with amphid aperture (amp). Bar on A, E, G = 5 μ m; B, D = 10 μ m; C, F = 2 μ m.

Etamphidelus fueguensis n. sp.
(Figs. 4–6)

Measurements

Holotype (female): L = 1.72 mm; a = 39.9; b = 3.7; c = 10.3; c' = 7.3; V = 65.3; neck =

462 μ m; tail = 167 μ m; amphids from anterior end = 13.5, 14.0 μ m; V-an = 428 μ m (mature female).

Paratype (female): L = 1.38 mm; a = 39.4; b = 3.0; c = 12.6; c' = 4.8; V = 70.5; neck = 454 μ m; tail = 110 μ m; amphids from an-

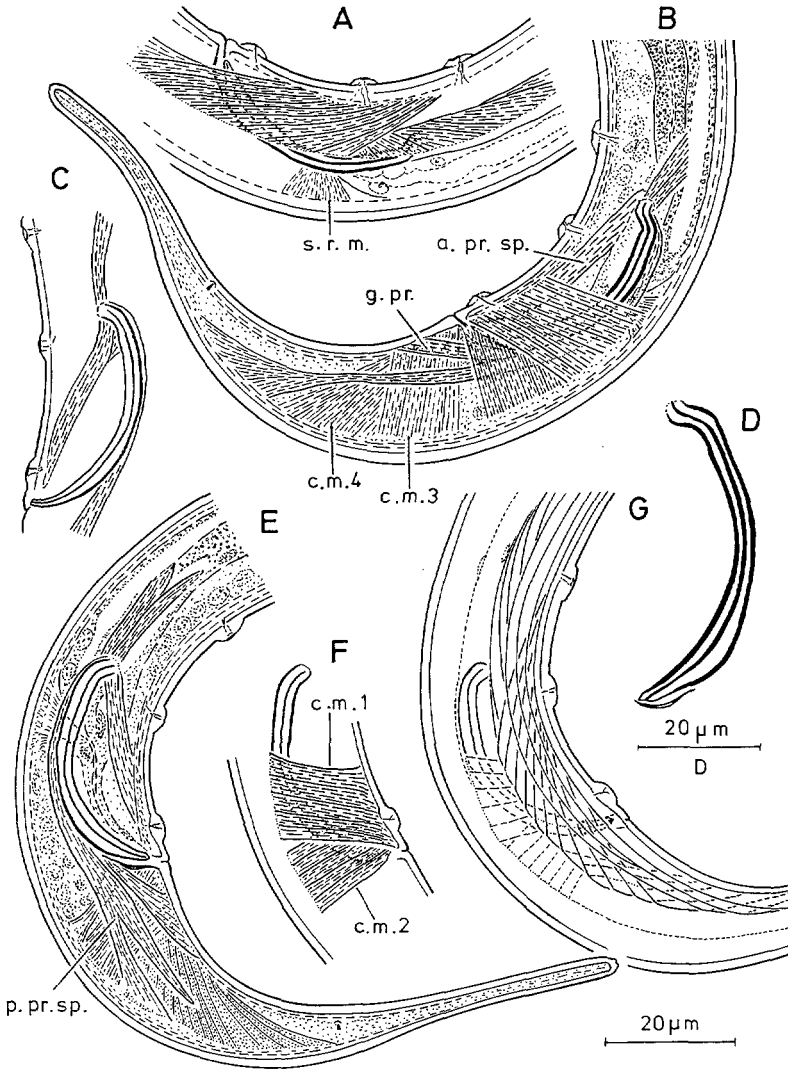


FIG. 6. *Etamphidelus fueguensis* n. sp. male. A) Ventral somatic musculature in spicular region and somato-rectal muscles. B) Tail of same specimen showing spicular, gubernacular, and copulatory muscles. C) Spicule with retractor and protractor muscles. D) Left spicule and gubernaculum. E-G) Tail region showing (from inward to outward) spicular, gubernacular, and caudal copulatory muscles (E); preanal copulatory muscles (F), and ventral somatic muscles (G). a.pr.sp. = anterior protractor spiculi; c.m. = copulatory muscles (1, 2 = preanal; 3, 4 = caudal); p.pr.sp. = posterior protractor spiculi; s.r.m. = somato-rectal muscle.

terior end = 14.5 μm ; V-an = 297 μm (young female).

Paratype (males, $n = 4$): L = 1.61 ± 0.11 (1.47–1.72) mm; a = 50.0 ± 2.25 (46.7–51.9); b = 3.5 ± 0.28 (3.2–3.8); c = 12.0 ± 0.33 (11.6–12.4); c' = 4.48 ± 0.33 (4.1–4.9); neck = 468 ± 44 (420–524) μm ; tail = 135 ± 12 (118–145) μm ; amphids from anterior end = 13.7 ± 1.3 (11.5–14.5) μm ; T = 46.4 ± 4.3 (41.4–49.2).

Description

Female: Body ventrally arcuate to almost straight upon fixation; tapering toward both ends, especially the posterior. Cuticle with many (> 40) longitudinal ridges, transverse striae between ridges fine (Fig. 5E).

Anterior end narrow, truncate, continuous with body contour. Anterior sensilla

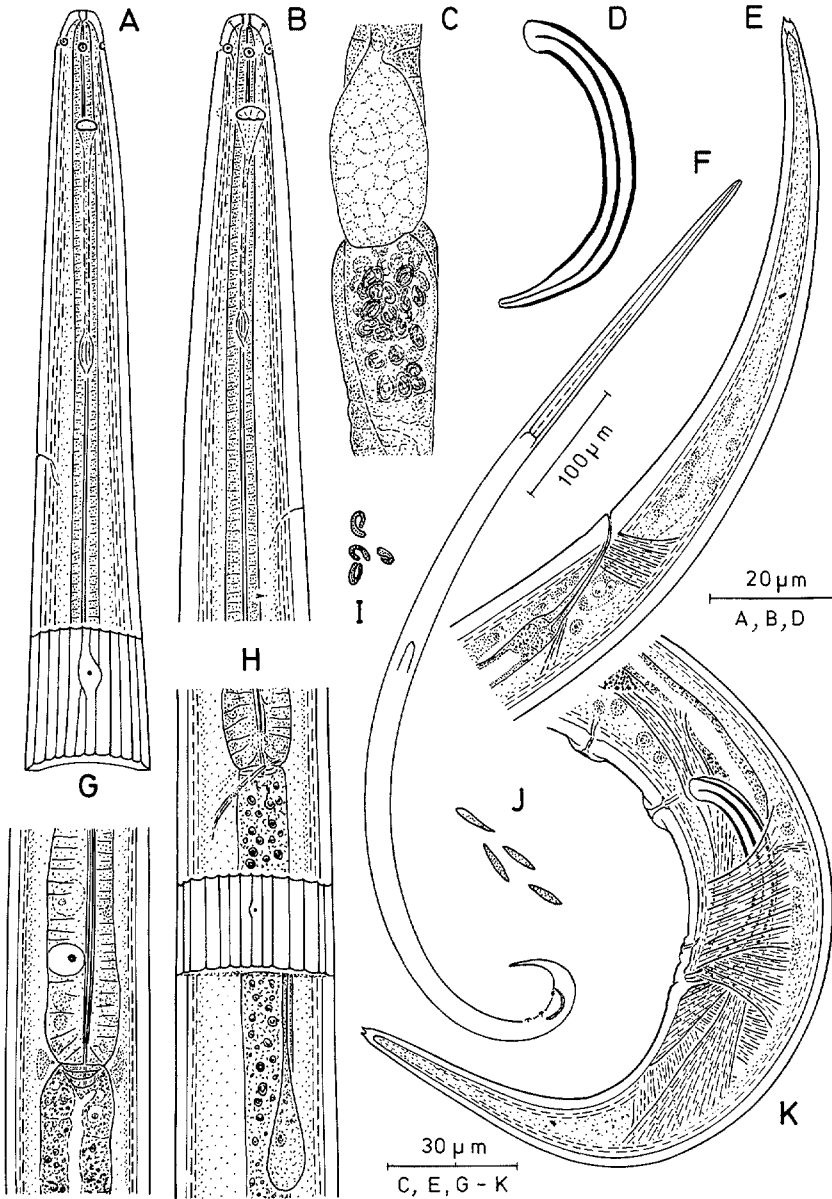


FIG. 7. *Etamphidelus yamani* n. sp. A) Male anterior end. B) Female anterior end. C) Oviduct and proximal part of uterus with coiled sperm (spermatheca). D) Left spicule. E) Female tail. F) Male. G) Male pharyngo-intestinal junction. H) Female pharyngo-intestinal junction and ventral gland. I) Coiled spermatozoa from spermatheca. J) Spermatozoa from vas deferens. K) Male tail.

consisting of a cirlet of six very faint inner labial papillae and a cirlet of six prominent outer labial sensory pits; latter four behind former (Fig. 4B). Anterior end $\frac{1}{7}$ – $\frac{1}{5}$ th as wide as body at cardia, about $\frac{1}{5}$ – $\frac{1}{6}$ th as wide at level of sensory pits. Amphidial fovea narrow, oval, occupying one-third of corresponding body width; 1.6–1.7 cor-

responding body widths behind anterior end; left and right one at same level; fusus 29–31 μm behind fovea (Fig. 4B). Somatic sensilla obscure except one opposite vulva on ventral side of lateral chord and one on tail (Fig. 4A).

Excretory pore 39.5 μm behind anterior end, i.e., 6.3 times body width at outer la-

bial sensilla or 11.5% of neck length. Ventral gland ending about 1.7 body widths behind cardia, shifted to left side of body (Fig. 4H). Nerve ring at 49% of neck length.

Pharynx elongate; gradually widening but more so in posterior fifth. Three prominent gland nuclei (one dorsal and two ventrosublateral) near base of pharynx, at about the same or different levels (Fig. 4H). Pharyngo-intestinal junction as described above for *E. acucephalus* n. sp. Rectum about 1.3 anal body widths long; proximally connected to dorsal body wall by somato-rectal muscle (Fig. 4A).

Female reproductive system monovarial and antepudendal, ovary reflexed right or left of oviduct, joining oviduct dorsolaterally; oviduct with wide sac-like portion containing a single nucleus at junction with narrow part; uterus with 26–28 nuclei. Proximal part of uterus serving as spermatheca; spermatozoa coiled, enclosed in vacuole-like structures. Vagina oblique, surrounded by specialized muscles (Fig. 4E) as described for *E. acucephalus* n. sp. Vulva a transverse slit, provided with fan-shaped dilator muscles as described for *E. acucephalus* n. sp.

Tail variable in length, almost straight, tapering regularly to conoid tip, with or without a projection; anal depressor prominent (Fig. 4A).

Male: Body ventrally arcuate to almost straight except for strongly curved caudal region (Fig. 4F). Cuticle with many longitudinal ridges, starting on anterior neck (Fig. 5B), reaching 45 by mid-body (Figs. 4K, 5D), then diminishing in number toward posterior end, disappearing on tail.

Anterior end truncate (Figs. 4C, D, 5A, C), $\frac{1}{8}$ – $\frac{1}{10}$ as wide as body at cardia, $\frac{1}{5}$ – $\frac{1}{6}$ as wide at level of outer labial sensilla. Amphidial fovea oval, occupying $\frac{1}{3}$ – $\frac{2}{5}$ of corresponding body width, 13.5 (11.5–14.5) μm or 1.65 (1.5–1.7) corresponding body widths behind anterior end; left and right at same level; fusus 31.0 (29.0–32.5) μm behind fovea (Fig. 4C, D). Amphidial aperture slit-like (Fig. 5C). Somatic sensilla obscure except for caudal one (Fig. 6B, E).

Excretory pore 44.7 (43.5–46.0) μm be-

hind anterior end, i.e., 7–8 times body width at anterior sensory pits or 10.3% (9.1–10.8) of neck (Figs. 4C, D, 5B). Nerve ring at 50.6% (49.5–51.4) of neck.

Three prominent gland nuclei present near base of pharynx, one (dorsal or one of ventrosublaterals) anterior to other two (Fig. 4G). Intestine with three cells in circumference. Rectum short, joining vas deferens opposite proximal parts of spicule; provided with a dorsal somato-rectal muscle (Fig. 6B, E).

Monorchic; testis with elongate spermatozoa, latter 20–28 μm long (but difficult to measure because of twisting); vas deferens long, with several glandular compartments. Spicules slender, 54.5 (51–62) μm along the arc, with median piece (Fig. 6D); musculature a bifid retractor, an anterior (ventral) protractor and a posterior (dorsal) protractor (Fig. 6B, C, E). Retractor attaching alongside lateral chord; anterior protractor attaching to anterior cloacal lip, posterior protractor attaching dorsolaterally in tail region. Posterior distal cloacal wall somewhat thickened, forming a weakly developed gubernaculum, with a protractor running from its proximal end toward subventral body wall of tail (Fig. 6B, E). Several sets of specialized muscles present in caudal region of tail (from outside to inside and for one body side only, see Fig. 6A, B, E–G): 1) oblique somatic muscles consisting of ventrolateral somatic muscles bordering lateral chord in region just anterior to most anterior supplement until opposite median supplement, and running anterio-laterally to posterioro-ventrolaterally (Fig. 6A, G); 2) oblique somatic muscles along ventral margin of lateral chord in region from second supplement to about half body width behind cloacal opening, running anteriorly to subventral body wall in region of supplements (Fig. 6A, G); 3) oblique somatic muscles running from ventral margin of lateral chord posteriorly to subventral body wall in first half of tail (Fig. 6G); 4) set of oblique dorso-ventral muscles running from dorsal margin of lateral chord posteriorly to subventral body wall in precloacal region (Fig. 6B, F—

c.m. 1); 5) set of dorsoventral muscles behind previous one, running from dorsal margin of lateral chord to wall of cloaca (ventral parts partly covered by previous set) (Fig. 6B, F—c.m. 2); 6) postcloacal set of dorsoventral muscles running from dorsal margin of lateral chord to subventral body wall and posterior cloacal lip (partly covered by previous set, by posterior spicule protractor, and by gubernacular protractor) (Fig. 6B—c.m. 3, E); 7) oblique dorsoventral muscles running from dorsal margin of lateral field in tail anteriorly to subventral body wall behind cloaca (partly covered by spicular and gubernacular protractors as well as by the previous set; probably equivalent to anal depressor muscles in female) (Fig. 6B—c.m. 4, E). During copulation muscle sets 1–3, upon contraction, probably curling caudal region of male around female body, while muscle sets 4–6 upon contraction flattening ventral body surface of male to fit better onto female's body.

Three medioventral supplements present: posteriormost close to cloacal opening, median opposite proximal end of retracted spicules, anteriormost about 21–27 μm before median one, or at 7–10, 40–47, and 67–70 μm , respectively, from cloacal opening. Tail as in female, but more curved (Fig. 6B, E).

The specific name is derived from "Tierra del Fuego" to which the type locality belongs.

Type locality and habitat: Moist soil beneath deep tundra at Orange Bay, Hoste Island, Chile.

Type specimens: Holotype (female)—collected by D. J. Raski, 19 January 1983; slide number 2266, deposited in UCDNC, Davis, California. Paratypes (one female and three males)—same data as holotype, deposited as follows: two males in UCDNC; one female and one male in the Nematode Collection, Instituut voor Dierkunde, Rijksuniversiteit Gent, Belgium.

Differential diagnosis: *E. fueguensis* n. sp. resembles *E. acucephalus* n. sp. in possessing longitudinal cuticular ridges but differs in the following characters: more anteriorly

located amphidial fovea (1.6–1.7 c.b.w. vs. 4.4–6.0 c.b.w. behind anterior end); fewer cuticular ridges in mid-body (± 45 vs. > 50); smaller ratio V-an/tail (± 2.6 vs. ± 3.8); and presence of males.

Etamphidelus yamani n. sp.

(Fig. 7)

Measurements

Holotype (female): L = 1.88 mm; a = 41.7; b = 3.9; c = 14.1; c' = 5.5; V = 63.2; neck = 483 μm ; tail = 133 μm ; amphid from anterior end = 16 μm ; V-an = 559 μm .

Paratype (male): L = 1.68 mm; a = 52.6; b = 3.5; c = 15.4; c' = 3.4; neck = 476 μm ; tail = 109 μm ; amphid from anterior end = 19 μm .

Description

Female: Body C-shaped upon fixation; tapering toward both ends. Cuticle with large number of longitudinal ridges, starting in neck region, more than 50 in mid-body region, then diminishing in number toward posterior end, disappearing on tail. Since a study with SEM was not possible, we have no information about transverse striae.

Head narrow, truncate, contour slightly rounded; continuous with body contour. Anterior sensilla consisting of a circlet of six very faint inner labial papillae and a circlet of six very prominent outer labial sensory pits; latter 4.5 μm behind former (Fig. 7B). Anterior end one-fifth as wide as body at cardia and one-fourth as wide (as body at cardia) at level of outer labial sensilla. Amphidial fovea wide, oval, occupying about half of corresponding body width, 1.4 corresponding body widths behind anterior end, left and right one at same level; fusus 36 μm behind fovea (Fig. 7B). Somatic sensilla eight: first 0.7 body width behind level of excretory pore, second slightly before halfway between excretory pore and nerve ring (Fig. 7B), third slightly more than a body width behind cardia (Fig. 7H), fourth halfway between ventral gland and ovary, fifth opposite multiplication zone of ovary, sixth just in front of vulva,

seventh ca. 45% of V-an distance, eighth about halfway on tail; the eighth being in middle of lateral chord; the first, second, and sixth along ventral side of lateral chord; others along dorsal side of lateral chord.

Excretory pore at 81 μm behind anterior end, i.e., 9.3 times body width at outer labial sensilla, or 16.3% of neck (Fig. 7B). Ventral gland ending about 2.5 body widths behind cardia, shifted to right of body (Fig. 7H). Nerve ring at 53% of neck.

Pharynx elongate, gradually widening, slightly distorted posteriorly. Gland nuclei obscure, less than a body width anterior to cardia. Pharyngo-intestinal junction consisting of a conoid projection into pharynx and a flattened valve projecting into intestine. Rectum 1.2 anal body widths long, proximally connected to dorsal body wall by an oblique, somato-rectal muscle.

Female reproductive system monovarial, antepudendal, ovary reflexed to left of oviduct and ventrally from intestine, ovarian sac with about 14 nuclei, ovary joined laterally by oviduct; uterus with about 40 nuclei. Proximal part of uterus functioning as a spermatheca; spermatozoa coiled, enclosed in vacuole-like structures (Fig. 7C, I). Vagina oblique, surrounded by specialized muscles like *E. acucephalus* n. sp. Vulva a transverse slit, provided with fan-shaped dilator muscles like *E. acucephalus* n. sp.

Tail ventrally arcuate, tapering regularly to a conoid tip with two projections; anal depressor prominent (Fig. 7E).

Male: Similar to female, except for following: head more truncate-conoid (Fig. 7A), almost one-eighth as wide as body at cardia and one-fourth as wide at level of outer labial sensilla. Fovea occupying only a third of corresponding body width; 1.8 corresponding body widths behind anterior end; fusus 38 μm behind fovea (Fig. 7A). Somatic sensilla seven: first slightly more than two body widths behind excretory pore (Fig. 7A); second 1.5 body widths anterior to nerve ring; third 1.3 body widths behind cardia; fourth opposite testis; fifth opposite anterior part of vas deferens; sixth opposite median part of vas deferens; seventh halfway on tail; first and second in middle, third and seventh along

ventral side, and others along dorsal side of lateral chord. Three big pharyngeal gland nuclei present at base of pharynx, situated at different levels. Excretory pore 73.5 μm behind anterior end, i.e., nine times the body width at outer labial sensilla or at 16.5% of neck (Fig. 7A). Nerve ring at 51% of neck.

Monorchic; testis with spermatozoa 10–11 μm long (Fig. 7J), leading to a long vas deferens with several glandular compartments and joining rectum between proximal parts of retracted spicules. Spicules 65 μm long along the arc, ventrally curved, with median piece (Fig. 7D). Each spicule with bifid retractor, and with anterior and posterior retractor. Gubernaculum obscure, apparently present because of well-developed gubernacular protractor. Specialized caudal muscle system as in *E. fueguensis* n. sp. Three medioventral supplements present: posteriormost close to cloacal opening, median opposite proximal end of retracted spicules, anteriormost 20 μm before median, or at 10, 52, and 73 μm , respectively, from cloacal opening. Tail as in female, but more curved (Fig. 7K).

The species is named after the nearly extinct Yamani tribe of original inhabitants of the southernmost part of Chile.

Type locality and habitat: Moist soil beneath deep tundra at Orange Bay, Hoste Island, Chile.

Type specimens: Holotype (female)—collected by D. J. Raski, 19 January 1983; slide number 2234, deposited in UCDNC, Davis, California. Paratype (male)—same data and same collection as holotype.

Differential diagnosis: *E. yamani* n. sp. resembles *E. acucephalus* n. sp. and *E. fueguensis* n. sp. in possessing a large number of longitudinal cuticular ridges. It differs from the former in more anterior position of amphidial fovea (1.4 c.b.w. behind anterior end vs. 4.4–6.0), wider head end ($\frac{1}{4}$ – $\frac{1}{5}$ of b.w. at cardia vs. $\frac{1}{10}$), less attenuated anterior body region, and presence of males. It differs from *E. fueguensis* n. sp. in wider head end ($\frac{1}{4}$ – $\frac{1}{5}$ of b.w. at cardia vs. $\frac{1}{7}$ – $\frac{1}{10}$), larger anterior sensilla, more posteriorly located excretory pore (± 9 b.w. at sensory pits behind anterior end vs. \pm

7), longer V-an/tail ratio (± 4.2 vs. ± 2.6), larger number of cuticular ridges (> 50 vs. ± 45), and smaller spermatozoa ($10-11$ vs. $> 20 \mu\text{m}$).

Etamphidelus Andr ssy, 1977

Diagnosis (emended): Alaimidae. Body slender, ventrally arcuate to almost straight; tapering toward both extremities, especially toward anterior end. Cuticle transverse striae (by SEM only) extremely fine, with or without longitudinal ridges. Head end truncate, flattened or rounded anteriorly, continuous with body contour. Anterior sensilla comprising a cirlet of six minute inner labial papillae (by SEM only) and a cirlet of six prominent outer labial sensory pits. Amphids prominent, fovea oval, aperture narrow slit-like to oval, situated at some distance behind sensory pits, connected with fusus through a long amphidial duct. Pharynx elongate, gradually widening, more so in posterior part. Female reproductive system monovarial, antepudendal or postpudendal, ovary reflexed to left or right of short oviduct; proximal part of uterus functioning as spermatheca in gonochoristic species. Vagina and vulva with complex musculature, vagina narrow, anteriorly or posteriorly oblique; vulva a transverse slit. Postvulvar sac (antepudendal females) or prevulvar sac (postpudendal females) absent. Tail usually ventrally curved, tapering to a rounded tip without or with one or two small projections, or with a dorsally bent, sharply pointed tip. Male monorchic; reproductive system with long glandular vas deferens. Spicules ventrally arcuate, with median piece. Two to three medioventral supplements present. Caudal copulatory musculature very complex.

Type species: *E. japonicus* Andr ssy, 1977.

Other species: *E. manipuriensis* Choudhary & Jairajpuri, 1983; *E. neotropicus* Andr ssy, 1986; *E. acucephalus* n. sp.; *E. fueguensis* n. sp.; *E. yamani* n. sp.

Remarks: 1) Andr ssy (1) assigned *Amphidelus puccinelliae* Lorenzen, 1966 to his genus *Etamphidelus* on the basis of the large amphids and spicules with median piece. The species was differentiated from the

type species by its poorly developed anterior sensilla, a larger (85% of c.b.w.) and more anteriorly situated amphid, shorter expanded part of the pharynx, thinner spicules, more (= 5) pre-anal supplements, hook-like tail, and monovarial postpudendal female gonads (5,6). *A. puccinelliae* is at least on four points at variance with Andr ssy's diagnosis of *Etamphidelus*: the development of the anterior sensilla, the position of the amphids, the postpudendal female gonad, and the number of supplements. A study of the type material and additional specimens identified by S. Lorenzen showed that *A. puccinelliae* best fits the genus *Paramphidelus* Andr ssy, 1977 because of body size, head shape, thin-walled vagina with backward curve, pharynx length, single postvulvar reproductive branch, and relatively broad spicules with median piece. The large amphidial fovea depicted by Lorenzen (5: Abb.9b) is an artifact as already presumed by that author. The oval structure is no longer in the position shown by Lorenzen (5) but more oblique with regard to the longitudinal axis. Other specimens have normally sized oval amphidial apertures. These are rather anterior for the genus *Paramphidelus* (2 or 3 lip region widths at level of sensory pits behind anterior end), but this is also true for *P. monohystera* (Heyns, 1962) and *P. palustris* Andr ssy, 1977. Hence we propose *Paramphidelus puccinelliae* (Lorenzen, 1966) n. comb.

2) Under the light microscope the amphids of *Etamphidelus* species appear as a more-or-less wide oval. SEM pictures reveal that this shape is mainly due to the fovea and that the actual aperture can also be slit-like (Figs. 2A, 5C). Comparison with *Paramphidelus* (Fig. 5F, G) shows a comparable distribution of anterior sensilla, but a wider amphidial aperture, although the latter could be more a specific than a generic difference.

Key to the Species of *Etamphidelus*

- 1a. Cuticle marked with numerous (= > 40 in mid-body) longitudinal ridges 2

- b. Cuticle without longitudinal ridges 4
- 2a. Anterior end needle-like, amphidial fovea more than 4 c.b.w. behind anterior end *E. acucephalus* n. sp.
- b. Anterior end less attenuated, amphidial fovea less than 2 c.b.w. behind anterior end 3
- 3a. Cuticular ridges ± 45 in mid-body; body width at cardia 7–10 times head width; excretory pore 6–8 head widths behind anterior end; V-an/tail ratio 2.5–2.7 *E. fueguensis* n. sp.
- b. Cuticular ridges > 50 in mid-body; body width at cardia 4–5 times head width; excretory pore nine head widths behind anterior end; V-an/tail ratio 4.2 *E. yamani* n. sp.
- 4a. Female with postpudendal reproductive system *E. neotropicus* Andr ssy, 1986
- b. Female with antepudendal reproductive system 5
- 5a. Female tail as long as male tail ($c = 9\text{--}10$ [♀], 10.8 [♂]; $c' = 8\text{--}10$); male with two supplements; spicules $15 \mu\text{m}$ *E. japonicus* Andr ssy, 1977
- b. Female tail longer than male tail ($c = 5\text{--}6$ [♀], $8\text{--}9$ [♂]; $c' = 21\text{--}27$ [♀], $8\text{--}10$ [♂]; male with three supplements; spicules $11\text{--}12 \mu\text{m}$ *E. manipuriensis* Choudhary & Jairajpuri, 1983

DISCUSSION

The complex musculature of vagina and vulva resembles that described for *Alaimus* (8), except as it relates to the anterior (*Alaimus*) rather than the posterior reproductive branch (*Etamphidelus*). The copulatory musculature of male *Etamphidelus* is more complex than in male *Alaimus* (8); this may be correlated with the longer spicules in *Etamphidelus* males.

The fact that the long spermatozoa are coiled and enclosed in vacuoles in the female uterus is new and as yet unexplained. It is at variance with what was observed in *Alaimus* (8) or in gonochoristic *Paramphidelus* species observed by the authors.

The finding of three closely related species of a presumably rare genus at the same locality invites speculation as to the origin of these species. Two species are gonochoristic, and one seems to reproduce parthenogenetically. The two gonochoristic species are so similar they could be considered sibling species; the parthenogenetic one has probably developed from an ancestor of the other two species through a further elongation and narrowing of the anterior end. The latter process is not uncommon in nematodes and often results, as here, in a posterior shift of the amphids. As yet it is difficult to assess what habitat conditions favor the relative abundance of these alaimid nematodes in the locality sampled. Little is known about their bionomics, except that they do feed on blue-green algae (8).

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