

New genera and species of nematode parasites (Drilonematoidea: Ungellidae) from coelomic cavity of Neotropic acanthodrilids deposited in the Natural History Museum of Geneva, Switzerland

Elena S. IVANOVA¹ & Claude VAUCHER²

¹ Institute of Parasitology, Russian Academy of Science, 33 Leninskii pr., Moscow, 119071, Russia.

² Muséum d'histoire naturelle, case postale 6434, CH-1211 Genève 6, Switzerland.

New genera and species of nematode parasites (Drilonematoidea: Ungellidae) from coelomic cavity of Neotropic acanthodrilids deposited in the Natural History Museum of Geneva, Switzerland. - Two new genera and two new species of nematodes (Ungellidae, Drilonematoidea) parasitic in Neotropic acanthodrilids from the collection of the Natural History Museum of Geneva, Switzerland, are described. *Yagansiella longicollis* gen. n., sp. n. and *Ungella chileana* sp. n. are parasitic in *Yagansia spatulifera*, whereas *Ungella micronychium* sp. n. in *Y. diversicolor* and *Patagoniella capitoporus* gen. n., sp. n. in *Y. papillosa*. *Yagansiella longicollis* gen. n., sp. n. resembles *Ungella* in general morphology but differs by anterior position of ovary top cell and posterior vulva position, characteristic body and caudal fimbriate organs shape. *U. chileana* sp. n. is distinguished by large circular fimbriate organs in tail, female body shape and arrangement of female genital tube and spicule shape. *Ungella micronychium* sp. n. differs by minute cephalic hooks and shape of fimbriate organs and spicules and gubernaculum. *Patagoniella capitoporus* gen. n., sp. n. is distinguished by anteriormost position of excretory pore, anterior vulva position and shape of fimbriate organs and spicules and gubernaculum.

Keywords: Earthworms, nematode parasites - Ungellidae - Drilonematoidea - *Yagansiella longicollis* gen. n., sp. n. - *Ungella chileana* sp. n. - *Ungella micronychium* sp. n. - *Patagoniella capitoporus* gen. n., sp. n. - *Yagansia spatulifera* - *Yagansia diversicolor* - *Yagansia papillosa*.

INTRODUCTION

Earthworm collection deposited in the Natural History Museum of Geneva contains European lumbricids as well as annelids from around the globe. From 1 to 6 specimens of 142 species of earthworms from museum collection were studied on the presence of nematodes (Drilonematoidea, Rhabditida) parasitic in coelomic cavity of earthworms. The bulk of museum collection consists of Neotropic glossoscoleids and acanthodrilids. So far, the only drilonematid parasite had been recorded from these

earthworms. A new genus and the new *Ungella* species from coelomic cavity of *Yagansia spatulifera*, the new *Ungella* species from *Y. diversicolor* and the new genus from *Y. papillosa* all belonged to Ungellidae family are described below.

MATERIAL AND METHODS

Earthworms were stored in ethanol after formaldehyde fixation which found did not affect the nematode morphology. Earthworms were dissected at anterior end and body cavity content was rinsed out and nematode parasites removed. Four specimens of *Yagansia spatulifera*, six ones of *Y. diversicolor* and three of *Y. papillosa* were dissected. Three females and three males of *Yagansiella longicollis* gen. n., sp. n. and a male and a female of *Ungella chileana* sp. n. were obtained from coelomic cavity of single specimen of *Yagansia spatulifera*. Two males of *U. micronychium* sp. n. were recovered from a specimen of *Y. diversicolor* and nine males, five females, three juveniles and fragments of *Patagoniella capitoporum* gen. n., sp. n. from a specimen of *Y. papillosa*. Nematodes were processed into glycerol using slow evaporation technique (Seinhorst, 1959) and mounted on slides. Drawings and measurements were made using "Jenaval" microscope. De Manian indices and absolute measurements are given, where D is maximal diameter (if not indicated), Oes is oesophagus length, Cd is tail length and Ex is distance from base of cephalic hooks to excretory pore. A name "fimbriate organs" was used when describing caudal structures of sensory nature (phasmids?) instead of "suckers" (Ivanova & Hope, 2004).

DESCRIPTIONS

Yagansiella gen. n.

DIAGNOSIS. Rhabditida, Drilonematoidea, Ungellidae. Very long and thin neck region and swollen body. Spacious pseudocoel. Paired blade-like cephalic hooks present. Cuticular ridges situated posteriorly to mouth. Amphids elliptical. Stoma lacking; oesophagus with corpus, isthmus and bulb. Nerve ring situated around isthmus. Excretory pore at isthmus level. Large paired deep transversely oriented fimbriate organs in caudal region with prominent lip-like basal rim. Females monodelphic, prodelphic, spermatheca set-off, distal tip of ovary near oesophageal base, vulva posterior with oblique vagina. Males monorchic; spicules paired and curved; thick gubernaculum with dorso-caudal apophysis and crurae, bursa absent.

TYPE AND ONLY SPECIES. *Yagansiella longicollis* sp. n.

ETYMOLOGY. Generic name refers to annelid host of the species.

Yagansiella longicollis sp. n.

Figs 1-2

MEASUREMENTS. *Holotype female*. L = 1216 μ m; D = 153 μ m; Oes = 213 μ m; Ex = 129 μ m; NR = 105 μ m; Cd = 123 μ m; Ovum = 54 x 27 μ m; V% = 89.44%; a = 7.95; b = 5.71; c = 9.89.

Paratype females (n = 2). L = 1185-1458 μ m; D = 108-140 μ m; Oes = 215 μ m; Ex = 131-135 μ m; NR = 81-90 μ m; Ova = 52-54 x 25-27 μ m; Cd = 112-127 μ m; V% = 90.55-90.81; a = 10.41-10.97; b = 5.51-6.78; c = 10.58-11.48.

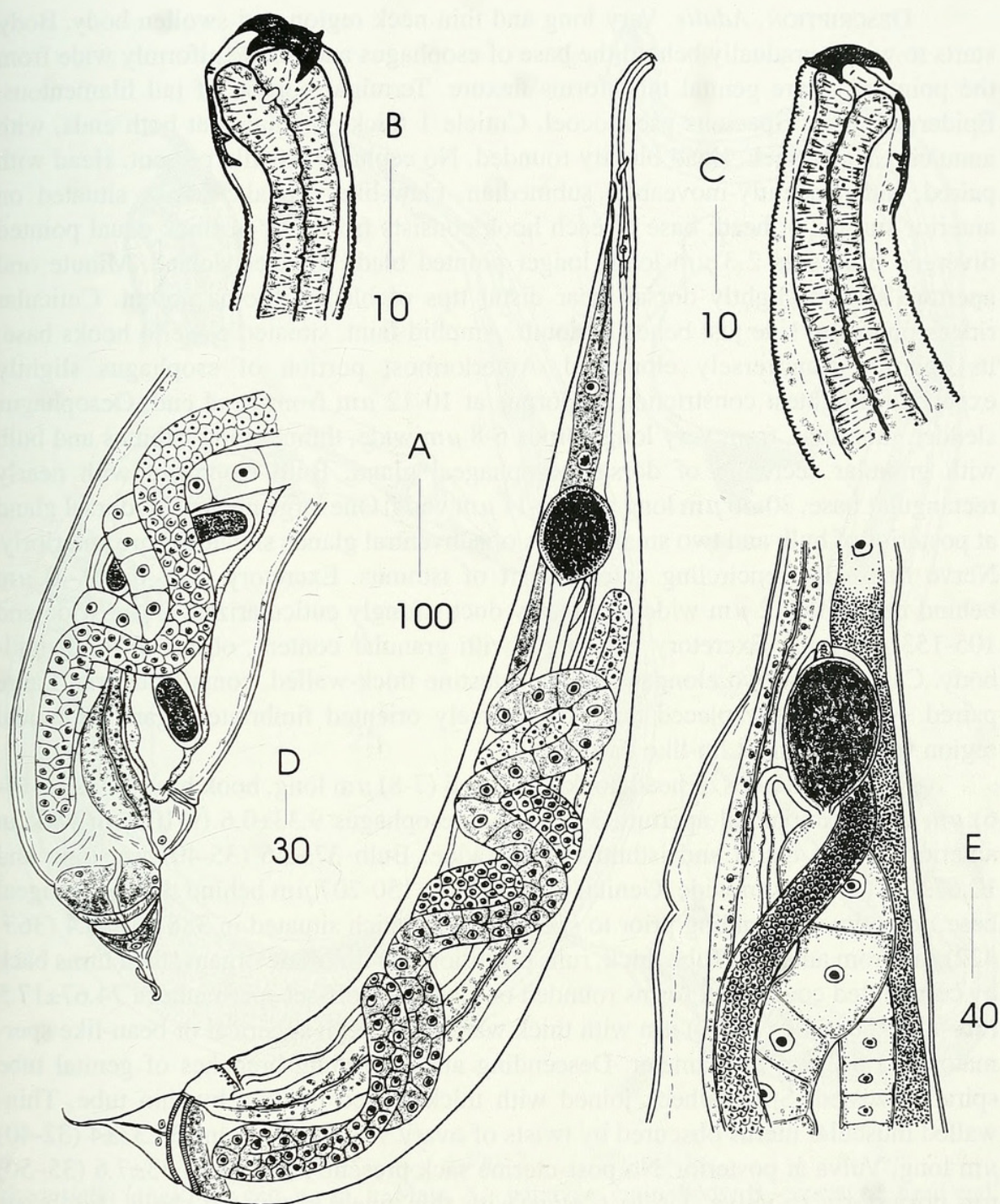


FIG. 1

Yagansiella longicollis gen. n., sp. n. Female. A – paratype, entire body; B – paratype, head end; C – holotype, anterior end; D – holotype, posterior end; E – holotype, spermatheca region. All in lateral position. Scale bars in μm .

Paratype males ($n = 3$). $L = 1093.67 \pm 142.1$ (930–1185) μm ; $D = 83 \pm 25.2$ (60–110) μm ; $Oes = 188.33 \pm 9.5$ (179–198) μm ; $Ex = 118.33 \pm 6.7$ (114–126) μm ; $NR = 99.33 \pm 7.8$ (93–108) μm ; $Cd = 200.67 \pm 8.1$ (195–210) μm ; $Sp\ (arc) = 104.33 \pm 5.5$ (99–110) μm ; $Sp\ (chord) = 67 \pm 5.6$ (62–73) μm ; $Gub = 30.33 \pm 2.1$ (28–32) μm ; $a = 14.32 \pm 5.7$ (8.45–19.75); $b = 5.8 \pm 0.6$ (5.2–6.3); $c = 5.47 \pm 0.9$ (4.43–6.02).

DESCRIPTION. *Adults.* Very long and thin neck region and swollen body. Body starts to widen gradually behind the base of esophagus and turns uniformly wide from the point of where genital tube forms flexure. Terminal portion of tail filamentous. Epidermis thick. Spacious pseudocoel. Cuticle 1 thick, annulated at both ends, with annules $1.5\ \mu\text{m}$ thick. Head bluntly rounded. No cephalic sensilla present. Head with paired, independently-moveable, submedian, claw-like cephalic hooks situated on anterior surface of head; base of each hook consists from pair of thick equal pointed diverged processes $2\text{--}3\ \mu\text{m}$ long; longer pointed blade directed dorsad. Minute oral aperture shifted slightly dorsad near distal tips of blades. Stoma absent. Cuticular ridges on dorsal side just beneath mouth. Amphid faint, situated close to hooks base; its aperture transversely elongated. Anteriormost portion of esophagus slightly expanded. Slightest constriction of corpus at $10\text{--}12\ \mu\text{m}$ from head end. Oesophagus slender, muscular, from very long corpus $6\text{--}8\ \mu\text{m}$ wide, thinner long isthmus and bulb with granular secretion of dorsal oesophageal gland. Bulb elongated with nearly rectangular base, $30\text{--}40\ \mu\text{m}$ long and $10\text{--}11\ \mu\text{m}$ wide. One large nucleus of dorsal gland at posterior of bulb and two smaller ones of subventral glands situated more anteriorly. Nerve ring wide, encircling anterior part of isthmus. Excretory pore in $20\text{--}40\ \mu\text{m}$ behind nerve ring, $2\ \mu\text{m}$ wide. Excretory duct strongly cuticularized, $2\ \mu\text{m}$ wide and $105\text{--}153\ \mu\text{m}$ long. Excretory cell large, with granular content, observed untill mid-body. Cardia from two elongated cells. Intestine thick-walled, contains debris. Large paired symmetrically placed deep transversely oriented fimbriate organs in caudal region with prominent lip-like basal rim.

Females. Blades of head hooks 7.67 ± 0.6 ($7\text{--}8$) μm long, hook base 5.33 ± 1.2 ($4\text{--}6$) μm wide. Amphidial aperture $3 \times 2\ \mu\text{m}$. Oesophagus 9.33 ± 0.6 ($9\text{--}10$) μm wide at anterior, corpus $8\ \mu\text{m}$ and isthmus $6\ \mu\text{m}$ wide. Bulb 37 ± 2.6 ($35\text{--}40$) μm long and 10.67 ± 0.6 ($10\text{--}11$) μm wide. Genital tube starts in $150\text{--}207\ \mu\text{m}$ behind the oesophageal base, sometimes extending prior to spermatheca, which situated in 388.33 ± 30.4 ($363\text{--}422$) μm from anterior. Tube thick, runs posteriorly to fimbriate organs, then turns back by convoluted course and forms rounded or elongated off-set spermatheca 74.67 ± 17.5 ($60\text{--}94$) $\times$ 50 ± 26.5 ($30\text{--}80$) μm with thick walls filled with spherical or bean-like spermatozoa $1.5\text{--}2\ \mu\text{m}$ in diameter. Descending and ascending branches of genital tube spirally twisted. Spermatheca joined with thick-walled oviduct by thin tube. Thin-walled muscular uterus obscured by twists of ovary. Muscular vagina 36.33 ± 4 ($32\text{--}40$) μm long. Vulva at posterior. No post-uterine sack present. Anus in 43.33 ± 7.6 ($35\text{--}50$) μm posteriorly to vulva. Up to 6 eggs with thin finely punctated shells. Fimbriate organs with deep chamber, 39 ± 5.3 ($35\text{--}45$) μm long and 66 ± 5.3 ($60\text{--}70$) μm wide with prominent lip-like muscular rim $5\text{--}7\ \mu\text{m}$ thick. A channel inside tail end runs through fimbriate organs. Terminal portion of tail 50.67 ± 4 ($47\text{--}55$) long and 5.33 ± 0.6 ($5\text{--}6$) μm wide.

Males. Resembles females in body shape but a little shorter and less prominently expanded behind neck region. Amphidial aperture 4.67 ± 1.2 ($4\text{--}6$) $\times$ 2.33 ± 0.6 ($2\text{--}3$) μm . Testis reflexes at 333.67 ± 94.2 ($255\text{--}430$) μm from oesophageal base, flexure curved, 180.67 ± 19.9 ($159\text{--}198$) μm long. Developing spermatocytes in $7\text{--}8$ rows, small, spherical ($2\ \mu\text{m}$ in diameter). Testis very wide, ejaculatory duct muscular, separated from *vas deferens* by constriction. Spermia in *vas deferens* spherical or bean-like,

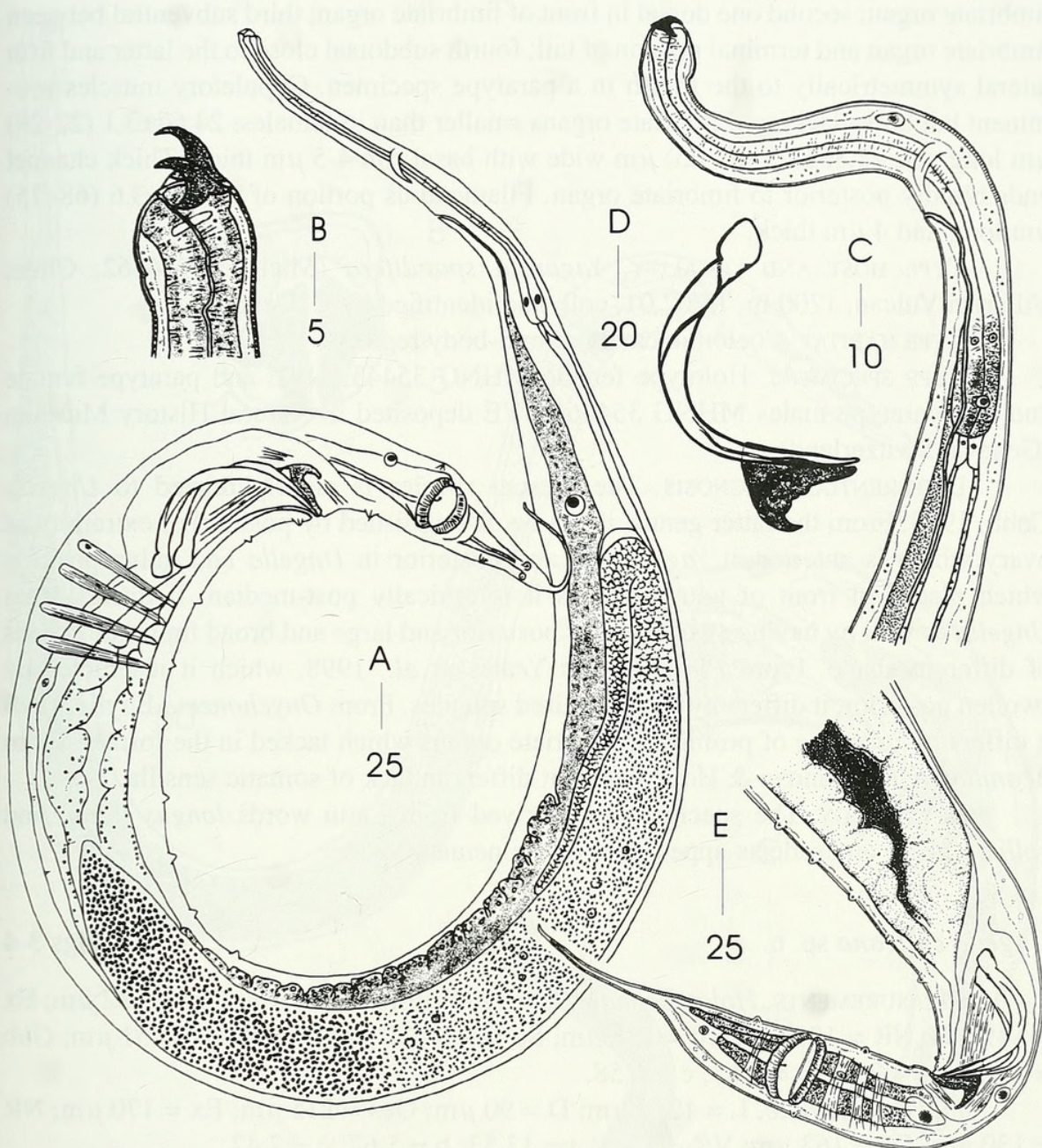


FIG. 2

Yagansiella longicollis gen. n., sp. n. Male. A – paratype, entire body; B – paratype, head end; C – paratype, anterior end; D – paratype, spicules and gubernaculum; E – paratype, tail. All in lateral position. Scale bars in μm .

resemble those from female spermatheca. Very long strongly cuticularized sickle-shaped paired spicules, with elongated manubria 12.33 ± 1.2 (11-13) μm long and 10.33 ± 1.5 (9-12) μm wide. Spicule shafts 5.66 ± 0.6 (5-6) μm wide at mid-length tapering gradually to rounded tips and bearing two front ridges. Gubernaculum massive, dark-brown in colour, with dorso-caudal apophysis 12.33 ± 3.1 (9-15) μm long and crurae as long as gubernaculum body. A slit in gubernaculum body parallel to spicules. Nine pairs of subventral precloacal and four (five) pairs of postcloacal papilli-form sensilla. First pair of postcloacal sensilla subventral, situated between anus and

fimbriate organ; second one dorsal in front of fimbriate organ; third subventral between fimbriate organ and terminal portion of tail; fourth subdorsal close to the latter and fifth lateral symmetrically to the fourth in a paratype specimen. Copulatory muscles prominent but bursa lacking. Fimbriate organs smaller than in females: 24.67 ± 3.1 (22–28) μm long and 22.33 ± 2.3 (21–25) μm wide with basal rim 4–5 μm thick. Thick channel ends blindly posterior to fimbriate organ. Filamentous portion of tail 71 ± 3.6 (68–75) μm long and 4 μm thick.

TYPE HOST AND LOCALITY. *Yagansia spatulifera* (Mich.) AF 4262, Chile, Villarica Vulcan, 1200 m, 14.02.01, coll. and identified by C. Czudi.

TYPE HABITAT. Coelomic cavity at mid-body region.

TYPE SPECIMENS. Holotype female MHNG 35445 INVE and paratype female and two paratype males MHNG 35446 INVE deposited in Natural History Museum (Geneva, Switzerland).

DIFFERENTIAL DIAGNOSIS. The present species is closely related to *Ungella* Cobb, 1928. From the latter genus, it can be distinguished by position of extremity of ovary which is anterior in *Yagansiella* and posterior in *Ungella* and vulva position which places in front of anus whereas it is typically post-median. It differs from *Ungella* as well by having swollen body posterior and large and broad fimbriate organs of different shape. From *Plesiungella* Yeates *et al.*, 1998, which it resembles by swollen posterior, it differs by having paired spicules. From *Onychonema* Baylis, 1943 it differs by presence of prominent fimbriate organs which lacked in the former. From *Acanthungella* (Ivanova & Hope, 2004) it differs in lack of somatic sensilla.

ETYMOLOGY. The species name derived from Latin words *longus* (long) and *collum* (neck) and reflects appearance of the nematodes.

Ungella chileana sp. n.

Figs 3–4

MEASUREMENTS. *Holotype male*. L = 1205 μm ; D = 48 μm ; Oes = 182 μm ; Ex = 149 μm ; NR = 105 μm ; Cd = 183 μm ; Sp (arc) = 70 μm ; Sp (chord) = 51 μm ; Gub = 13 μm ; a = 25.1; b = 6.63; c = 6.58.

Paratype female. L = 1218 μm ; D = 90 μm ; Oes = 215 μm ; Ex = 170 μm ; NR = 130 μm ; Cd = 163 μm ; V% = 64.5; a = 13.53; b = 5.67; c = 7.42.

DESCRIPTION. *Adults*. Anterior of body thin. Terminal portion of tail filamentous. Cuticle 1 μm thick, annulated. Epidermis well-developed. Head truncate, with paired, independently-moveable, submedian cephalic hooks situated on anterior surface of head. Each hook from thick bone head-like base and pointed outwardly-curved blade and directed dorsad. Mouth shifted slightly dorsad near distal tips of blades. Stoma absent. Amphid pocket-like, situated close to hooks base; amphidial aperture transversely elongated. Anteriormost portion of esophagus slightly expanded. No head sensilla visible. Oesophagus straight, slender, from long finely muscular corpus, no distinct isthmus and narrow bulb with 3 nuclei of oesophageal glands. Base of oesophagus not rounded. Nerve ring situated a little farther back from mid-oesophagus. Excretory pore opposite anterior of bulb, 1.5 μm thick. Excretory duct 1.5–2 μm wide 90–100 μm long. Excretory cell with fine granular content visible till mid-body. Cardia prominent from two large oval cells. Intestine thin.

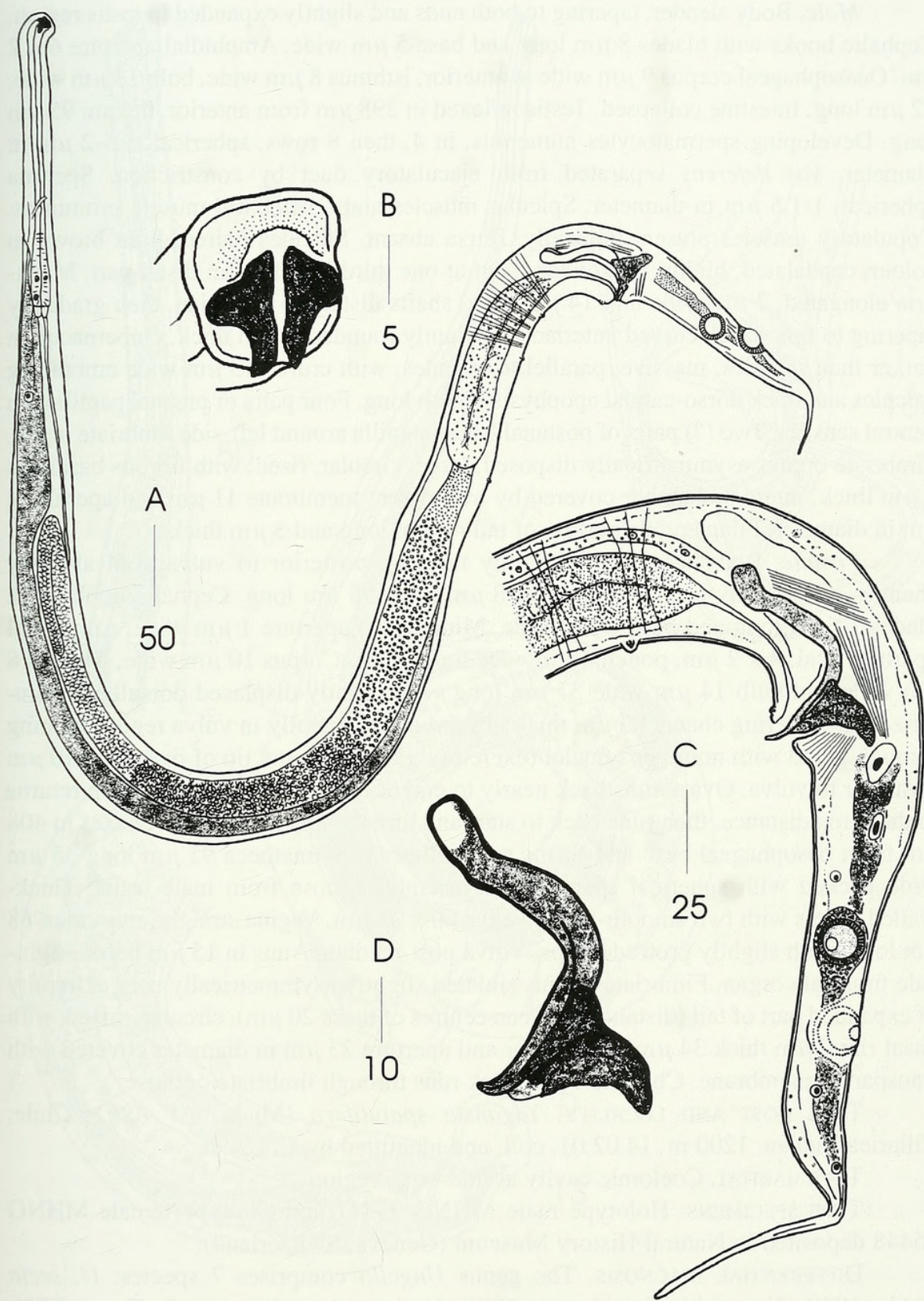


FIG. 3

Ungella chilleana sp. n. Male holotype. A - entire body, lateral view; B - head end, apical view; C - tail, lateral view; D - spicules and gubernaculum, lateral view. Scale bars in μm .

Male. Body slender, tapering to both ends and slightly expanded in testis region. Cephalic hooks with blades $8\ \mu\text{m}$ long and base $5\ \mu\text{m}$ wide. Amphidial aperture $6 \times 2\ \mu\text{m}$. Oesophageal corpus $9\ \mu\text{m}$ wide at anterior, isthmus $8\ \mu\text{m}$ wide, bulb $13\ \mu\text{m}$ wide, $32\ \mu\text{m}$ long. Intestine collapsed. Testis reflexed in $298\ \mu\text{m}$ from anterior, flexure $95\ \mu\text{m}$ long. Developing spermatocytes numerous, in 4, then 8 rows, spherical, $1.5\text{--}2\ \mu\text{m}$ in diameter. *Vas deferens* separated from ejaculatory duct by constriction. Spermia spherical, $1\text{--}1.5\ \mu\text{m}$ in diameter. Spicular muscles and *levator ani* muscle prominent. Copulatory muscles present preanally. Bursa absent. Spicules paired, light brown in colour, cephalated, highly sclerotized, bent at one third length from distal part. Manubria elongated, $7\ \mu\text{m}$ wide and $14\ \mu\text{m}$ long, shafts distally $6\ \mu\text{m}$ wide, then gradually tapering to tips which curved anteriorly and bluntly rounded, $2\ \mu\text{m}$ thick. Gubernaculum darker than spicules, massive, parallel to spicules, with crurae $13\ \mu\text{m}$ wide embracing spicules and thick dorso-caudal apophysis $16\ \mu\text{m}$ long. Four pairs of preanal papilliform ventral sensilla. Two (?) pairs of postanal lateral papilla around left-side fimbriate organ. Fimbriate organs asymmetrically disposed, large, circular, raised, with fibrous basal rim $2\ \mu\text{m}$ thick, internal chamber covered by transparent membrane $11\ \mu\text{m}$ and aperture $4\ \mu\text{m}$ in diameter. Filamentous portion of tail $46\ \mu\text{m}$ long and $3\ \mu\text{m}$ thick.

Female. Body stout, very slightly tapering posterior to vulva. Tail abruptly changes into bluntly rounded terminus $8\ \mu\text{m}$ thick $98\ \mu\text{m}$ long. Cephalic hooks with blades $10\ \mu\text{m}$ long and base $7\ \mu\text{m}$ wide. Minute oral aperture $1\ \mu\text{m}$ wide. Amphidial aperture oval, $4 \times 2\ \mu\text{m}$, pouch $4\ \mu\text{m}$ wide $5\ \mu\text{m}$ long. Corpus $10\ \mu\text{m}$ wide, isthmus $8\ \mu\text{m}$ wide and bulb $14\ \mu\text{m}$ wide $37\ \mu\text{m}$ long very slightly displaced dorsally. Cuticularized meandering channel $5\ \mu\text{m}$ thick observed subventrally in vulva region running through gland with numerous nuclei (excretory gland?). Distal tip of ovary in $110\ \mu\text{m}$ posterior to vulva. Ovary runs back nearly to end of expanded part of tail, then returns to the same distance, then runs back to start and turns to anterior where reflexes in $408\ \mu\text{m}$ from oesophageal base and forms spermatheca. Spermatheca $95\ \mu\text{m}$ long $35\ \mu\text{m}$ wide packed with spherical spermatozoa resembled those from male testis. Thick-walled uterus with two smooth-shelled eggs $60 \times 25\ \mu\text{m}$. Vagina straight, muscular, $38\ \mu\text{m}$ long, with slightly protruded lips. Vulva post-median. Anus in $15\ \mu\text{m}$ before right-side fimbriate organ. Fimbriate organs situated slightly asymmetrically near extremity of expanded part of tail (distance between centres of these $20\ \mu\text{m}$), circular, raised, with basal rim $7\ \mu\text{m}$ thick $34\ \mu\text{m}$ in diameter and aperture $23\ \mu\text{m}$ in diameter covered with transparent membrane. Channel $4\ \mu\text{m}$ thick runs through fimbriate organs.

TYPE HOST AND LOCALITY. *Yagansia spatulifera* (Mich.) AF 4262, Chile, Villarica Vulcan, 1200 m, 14.02.01, coll. and identified by C. Czudi.

TYPE HABITAT. Coelomic cavity at mid-body region.

TYPE SPECIMENS. Holotype male MHNG 35447 and paratype female MHNG 35448 deposited in Natural History Museum (Geneva, Switzerland).

DIFFERENTIAL DIAGNOSIS. The genus *Ungella* comprises 7 species: *U. secta* Cobb, 1928, *U. astrida* Spiridonov, 2001, *U. burmensis* Ivanova & Hope, 2000, *U. ituriensis* Spiridonov, 2001, *U. kivuensis* Spiridonov, 2001, *U. mexicana* Ivanova & Hope, 2000 and *U. sucofera* Timm, 1962.

Ungella chileana sp. n. is characterised by having swollen posterior of females and filamentous portion of tail; not-embedded cephalic hooks with characteristic head

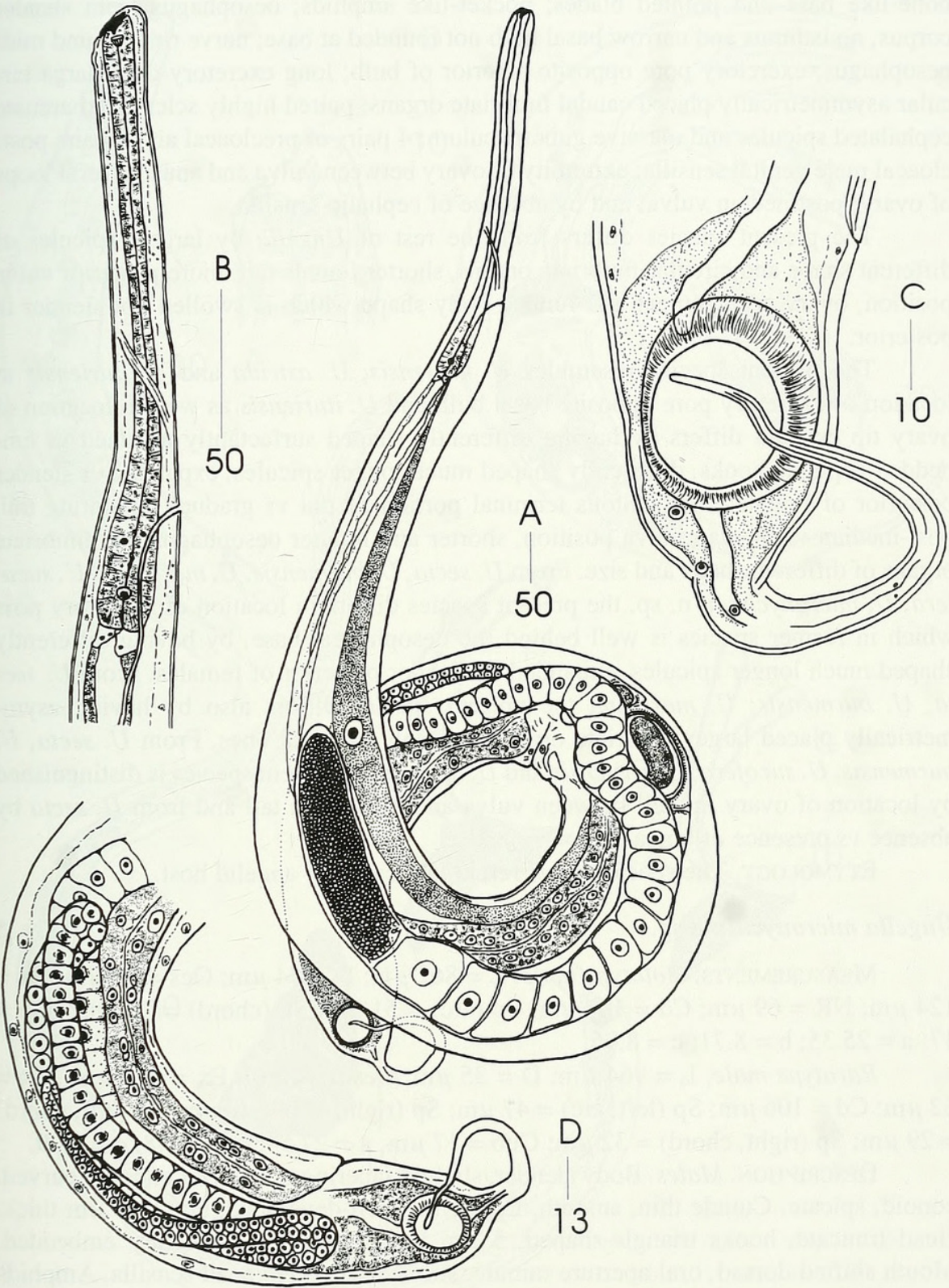


FIG. 4

Ungella chilleana sp. n. Female paratype. A - entire body; B - head end; C - fimbriate organ; D - tail. All in lateral position. Scale bars in μm .

bone-like base and pointed blades; pocket-like amphids; oesophagus from slender corpus, no isthmus and narrow basal bulb not rounded at base; nerve ring around mid-oesophagus; excretory pore opposite anterior of bulb; long excretory duct; large circular asymmetrically placed caudal fimbriate organs; paired highly sclerotised arcuate cephalated spicules and massive gubernaculum; 4 pairs of precloacal and 2 pairs post-cloacal male genital sensilla; extremity of ovary between vulva and anus; several loops of ovary; postmedian vulva; and by absence of cephalic sensilla.

The present species differs from the rest of *Ungella* by largest spicules of different shape and circular fimbriate organs, shorter female tail, more posterior vulva position, ovary arrangement and female body shape which is swollen not slender in posterior.

The present species resembles *U. kivuensis*, *U. astrida* and *U. ituriensis* in location of excretory pore opposite basal bulb and *U. ituriensis* as well in location of ovary tip cell but differs by having differently shaped surfactantly attached vs embedded cephalic hooks, differently shaped much longer spicules, expanded vs slender posterior of females, filamentous terminal portion of tail vs gradually pointing tail, post-median vs median vulva position, shorter and thinner oesophagus and fimbriate organs of different shape and size. From *U. secta*, *U. burmensis*, *U. mexicana*, *U. sucofera*, *U. micronychium* n. sp. the present species differs in location of excretory pore which in former species is well behind the oesophageal base, by having differently shaped much longer spicules, expanded vs slender posterior of females. From *U. secta*, *U. burmensis*, *U. mexicana* the present species differs also by having asymmetrically placed larger fimbriate organs vs small elliptical ones. From *U. secta*, *U. burmensis*, *U. sucofera*, *U. kivuensis* and *U. astrida* the present species is distinguished by location of ovary tip cell between vulva and anus vs in tail and from *U. secta* by absence vs presence of bursa.

ETYMOLOGY. The species name refers to locality of annelid host.

Ungella micronychium sp. n.

Fig. 5

MEASUREMENTS. *Holotype male*. L = 862 μ m; D = 34 μ m; Oes = 99 μ m; Ex = 124 μ m; NR = 69 μ m; Cd = 107 μ m; Sp (arc) = 51 μ m; Sp (chord) = 43 μ m; Gub = 17; a = 25.35; b = 8.71; c = 8.06.

Paratype male. L = 964 μ m; D = 35 μ m; Oes = 92 μ m; Ex = 124 μ m; NR = 62 μ m; Cd = 106 μ m; Sp (left, arc) = 47 μ m; Sp (right, arc) = 40 μ m; Sp (left, chord) = 29 μ m; Sp (right, chord) = 32 μ m; Gub = 17 μ m; a = 27.54; b = 10.48; c = 9.09.

DESCRIPTION. *Males*. Body slender, slightly tapering to anterior end, tail curved, conoid, spicate. Cuticle thin, smooth. Epidermis well-developed, up to 10 μ m thick. Head truncate, hooks triangle-shaped, 5 μ m long 2 μ m thick, slightly embedded. Mouth shifted dorsad, oral aperture minute, stoma absent. No head sensilla. Amphids with oval apertures 3-5 x 1.5 μ m and pouch 5 x 4 μ m. Oesophagus from corpus 43-48 μ m long and 6-7 μ m wide at mid-length, with basal widening as wide as bulb, isthmus 5 μ m wide 23-30 μ m long and bulb 9-12 μ m and 17-21 μ m long. Bulb piriform with granular secretion of dorsal oesophageal gland. Nerve ring encircles anterior of isthmus. Excretory pore in 25 posterior to oesophageal bulb, 1 μ m wide, disposed on hillock 1.5 μ m high. Excretory duct thin, 20-22 μ m long, leads to excretory cell

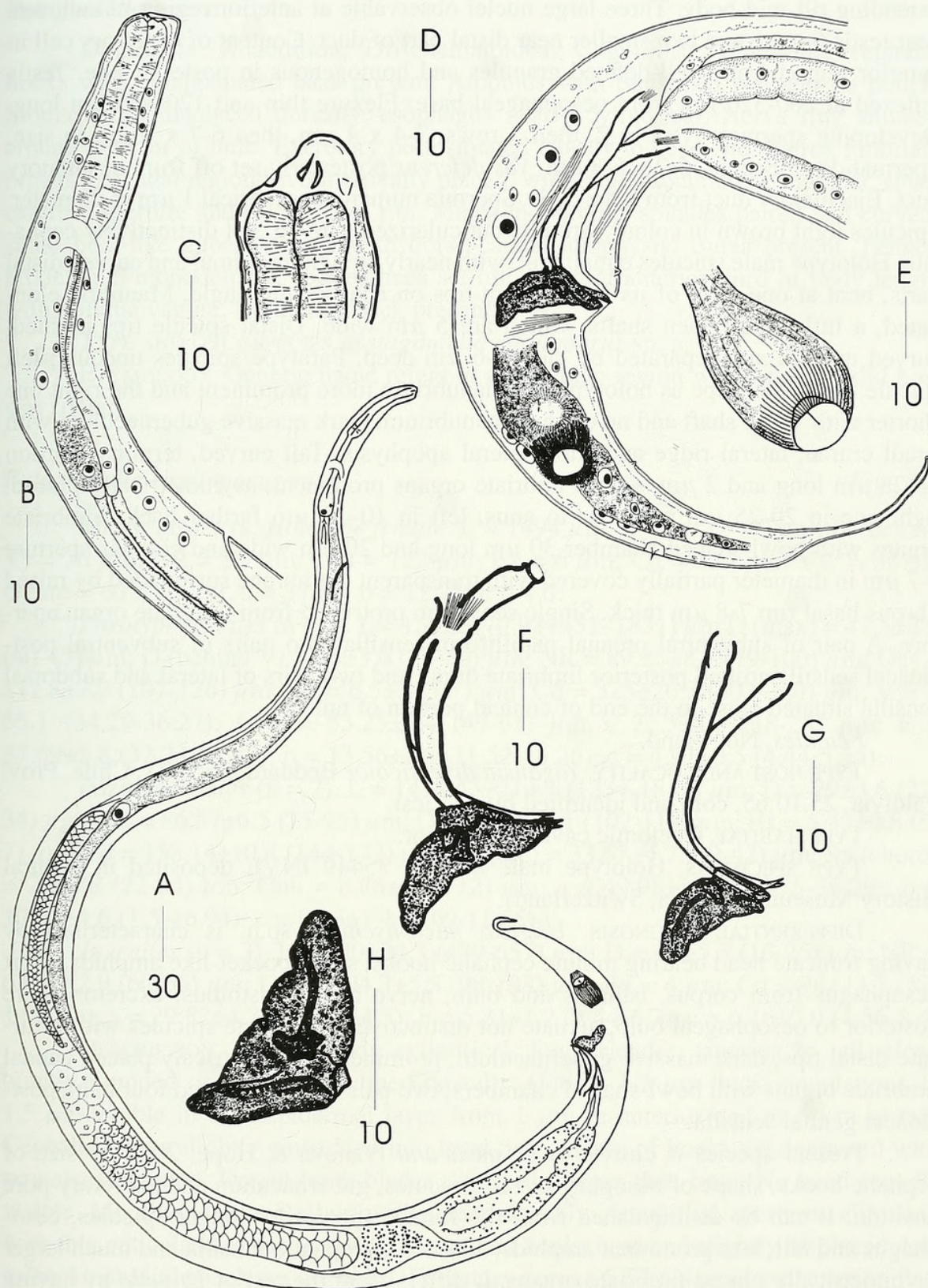


FIG. 5

Ungella micronychium sp. n. Male. A - paratype, entire body, lateral view; B - holotype, anterior end, lateral view; C - paratype, head end, subdorsal view; D - holotype, tail, lateral view; E - fimbriate organ, lateral view; F - paratype, spicules and gubernaculum, lateral view; G - holotype, spicules and gubernaculum, lateral view; H - holotype, gubernaculum, lateral view. Scale bars in μm .

extending till mid-body. Three large nuclei observable at anterior region of cell: one near testis flexure and two smaller near distal part of duct. Content of excretory cell in anterior region from well-defined granules and homogenous in posterior one. Testis reflexed at 260-320 μm from oesophageal base. Flexure thin and 120-135 μm long. Developing spermatocytes in 2, then 3 rows, 3-4 x 4 μm , then 6-7 x 7 μm in size. Spermatids amoeboid, 5-7 x 6-8 μm . *Vas deferens* posteriorly set off from ejaculatory duct. Ejaculatory duct from large cells. Spermia numerous, spherical 1 μm in diameter. Spicules light brown in colour, strongly cuticularized, curved, not distinctively cephalate. Holotype male spicules equal, thin, with nearly straight proximal and curved distal parts, bent at one third of its length from tips on nearly right angle. Manubria elongated, a little wider than shafts, which are 5 μm wide. Distal spicule tips pointed, curved upward and separated by cleft 5-6 μm deep. Paratype spicules unequal; left spicule the same shape as holotype but manubrium more prominent and the right one shorter with wider shaft and no distinct manubrium. Dark massive gubernaculum with small crurae, lateral ridge and short lateral apophysis. Tail curved, terminal portion 24-28 μm long and 2 μm wide. Fimbriate organs prominent, asymmetrically placed, right one in 20-25 μm posterior to anus, left in 10-12 μm farther back. Fimbriate organs with bowl-shaped chamber 30 μm long and 20 μm wide and circular aperture 6-7 μm in diameter partially covered with transparent membrane surrounded by raised fibrous basal rim 7-8 μm thick. Single sensillum protruded from fimbriate organ aperture. A pair of subventral preanal papilliform sensilla, two pairs of subventral post-cloacal sensilla around posterior fimbriate organ and two pairs of lateral and subdorsal sensilla situated close to the end of conical portion of tail.

Females. Not found.

TYPE HOST AND LOCALITY. *Yagansia diversicolor* Beddard, 965.171, Chile, Prov. Valdivia, 25.10.65, coll. and identified by A. Zicsi.

TYPE HABITAT. Coelomic cavity at anterior.

TYPE SPECIMENS. Holotype male MHNG 35449 INVE deposited in Natural History Museum (Geneva, Switzerland).

DIFFERENTIAL DIAGNOSIS. *Ungella micronychium* sp.n. is characterised by having truncate head bearing minute cephalic hooks, small pocket-like amphids, short oesophagus from corpus, isthmus and bulb, nerve ring on isthmus, excretory pore posterior to oesophageal bulb, arcuate not distinctively cephalate spicules with bifurcate distal tips, dark massive gubernaculum, prominent asymmetrically placed caudal fimbriate organs with bowl-shaped chambers, two pairs precloacal and four pairs post-cloacal genital sensilla.

Present species is closest to *U. mexicana* Ivanova & Hope, 2000 by size of cephalic hooks, shape of oesophagus, tail, spicules, gubernaculum and excretory pore position. It can be distinguished from the former species by longer spicules, oesophagus and tail, less prominent amphids, absence of cephalic sensilla and much larger asymmetrically placed fimbriate organs. It differs from the rest of *Ungella* by having minute cephalic hooks, different shape of fimbriate organs in tail and spicules and gubernaculum.

ETYMOLOGY. The species name derived from Greek words «mikros» (small) and «onychium» (claw or talon) and reflects the size of cephalic hooks. It is a noun in apposition.

Patagoniella gen. n.

DIAGNOSIS. Rhabditida, Drilonematoidea, Ungellidae. Blade-like cephalic hooks with amalgamated base present. Amphids with thickened rim and no pouch. Stoma short; displaced dorsally, esophagus nearly cylindrical. Nerve ring situated around anterior of bulb. Excretory pore situated closely to head end. Paired fimbriate organs in caudal region asymmetrically placed, with large subcuticular chamber, small external aperture and thick, basal rim. Males monorchic; spicules paired and curved; small boat-like gubernaculum with dorso-caudal apophysis. Bursa present. Female prodelphic, monodelphic, spermatheca set off; vulva at anterior third of body length with oblique vagina. No uterine sack present.

TYPE AND ONLY SPECIES. *Patagoniella capitoporus* sp. n.

ETYMOLOGY. Generic name refers to geographic region where the annelid host was found.

Patagoniella capitoporus sp. n.

Figs 6-7

MEASUREMENTS. *Holotype female*. L = 1494 μm ; D (max) = 40 μm ; D (behind V) = 26 μm ; NR = 95 μm ; Oes = 122 μm ; Ex = 6 μm ; Cd = 325 μm ; V% = 36.81; Ovum = 60 x 26 μm , a = 37.35; b = 12.25; c = 4.6.

Paratype females (n = 4). L = 1592 $\pm$ 170.9 (1451–1831) μm ; D (max) = 42.5 $\pm$ 2.9 (40–45) μm ; D (behind V) = 25 $\pm$ 3.6 (22–30) μm ; NR = 89.25 $\pm$ 8.7 (79–100) μm ; Oes = 117.8 $\pm$ 7.9 (107–126) μm ; Ex = 6.5 $\pm$ 1 (5–7) μm ; Cd = 325 $\pm$ 26.3 (302–360) μm ; V% = 35.1 (34.29–36.27); Ova = 53.25 $\pm$ 5.4 (49–61) μm x 22.5 $\pm$ 3.3 (18–25) μm ; a = 37.69 $\pm$ 5.8 (32.24–45.78); b = 13.56 $\pm$ 1.5 (11.52–15.26); c = 4.91 $\pm$ 0.5 (4.44–5.55).

Paratype males (n = 7). L = 1424.43 $\pm$ 214.1 (1234–1813) μm ; D = 29 $\pm$ 3.6 (22–34) μm ; NR = 86.57 $\pm$ 6.5 (75–95) μm ; Oes = 112 $\pm$ 6.1 (102–119) μm ; Ex = 5.57 $\pm$ 0.8 (5–7) μm ; Cd = 158.14 $\pm$ 10.4 (144–172) μm ; Sp (arc) = 33.57 $\pm$ 4.7 (29–42) μm ; Sp (chord) = 27 $\pm$ 3.8 (22–34) μm ; Gub = 8.86 $\pm$ 2 (6–12) μm ; a = 49.98 $\pm$ 10.6 (64.75–36.29); b = 10.94 $\pm$ 4.6 (1.5–16.94); c = 9.03 $\pm$ 1.4 (7.69–11.55).

Juveniles (n = 3). L = 550 $\pm$ 94.3 (479–657) μm ; D = 19 $\pm$ 5.3 (15–25) μm ; NR = 63.33 $\pm$ 2.9 (60–65) μm ; Oes = 104.3 $\pm$ 5.5 (98–108) μm ; Ex = 4 μm ; Cd = 98 $\pm$ 43.7 (57–144) μm ; a = 29.57 $\pm$ 4.2 (26.28–34.3); b = 5.31 $\pm$ 1.2 (4.44–6.7); c = 6.16 $\pm$ 2.0 (4.56–8.4).

DESCRIPTION. *Adults*. Body cylindrical, long, slender, tapering to tail. Head bluntly rounded or truncate, inclined dorsally. Cuticle 1–2 μm thick, annulations 1–1.5 μm visible in tail. Epidermal layer from 1 μm in anterior end to 5 μm in tail. Cephalic hooks slightly embedded into head tissue. Base of hooks amalgamated with processes inclined. Dorsal hook blades diverged, longer than base. No head sensilla visible. Mouth and stoma slightly displaced dorsally. Amphidial apertures elliptical, with thin cuticularized rim, situated just behind hooks base and slightly displaced dorsally. Amphidial pouch not observed. Excretory pore in 5.57–6.4 μm from anterior, flattened in dorso-ventral direction. Excretory duct 1.14–1.2 μm wide, proceeds up to 35.8–41.43 μm , then narrowing to less than 1 μm wide and runs until after oesophagus. Excretory cell large, with granular content and huge nucleus. Oesophagus muscular, slender, nearly cylindrical, with slightest expansion at posterior bulb. Isthmus less than 1 μm thinner than corpus and about 1.5–2 μm than bulb. Three nuclei of oesophageal

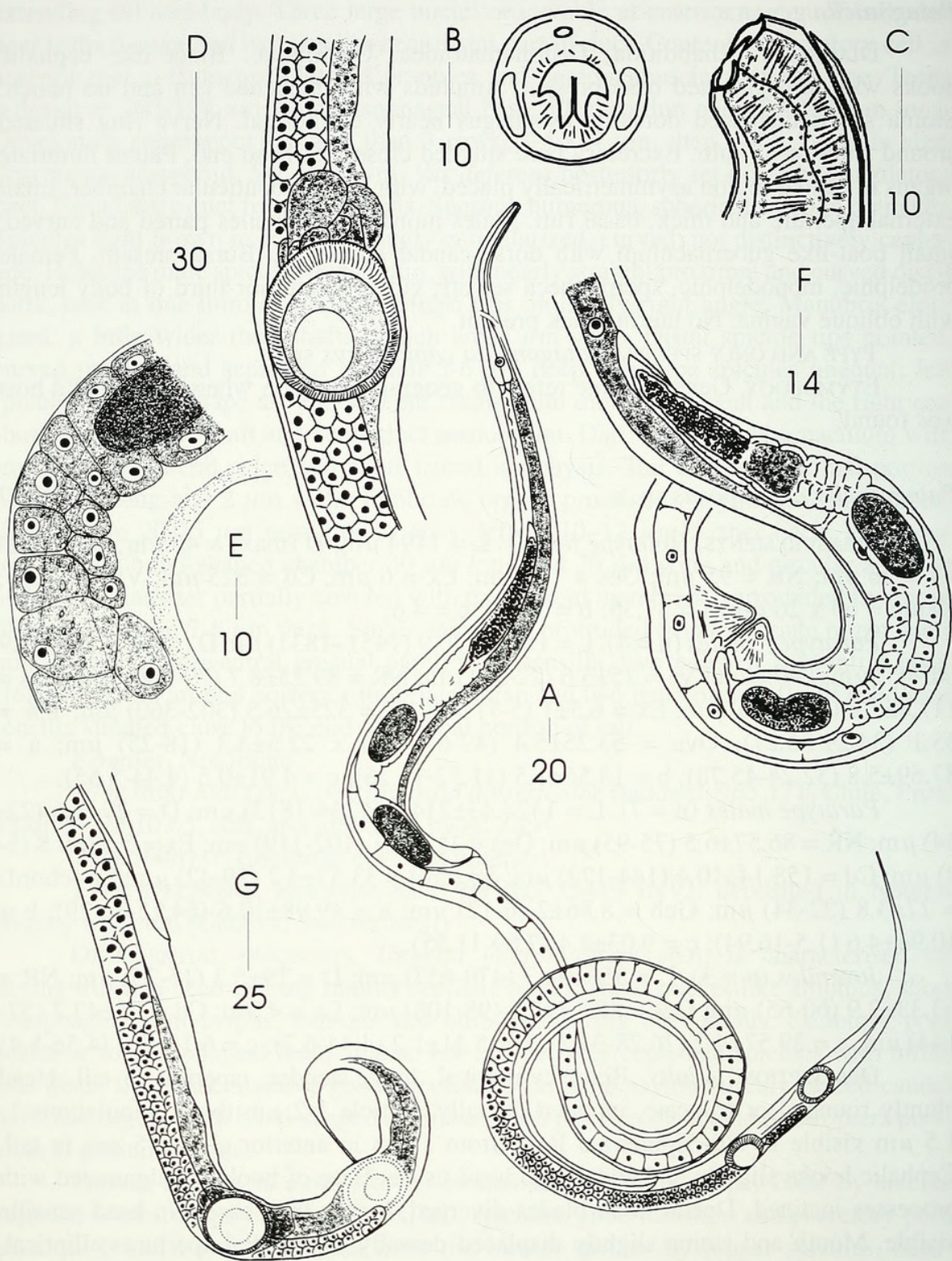


FIG. 6

Patagoniella capitoporus gen. n., sp. n. Female. A – holotype, entire body, lateral view; B – paratype, head end, apical view; C – paratype, head end, lateral view; D – paratype, fimbriate organ, lateral view; E – paratype, part of oviduct, lateral view; F – paratype, spermatheca, oviduct and uterus, lateral view; G – paratype, tail, lateral view. Scale bars in μm .

glands in posterior of bulb. Nerve ring wide, encircling anterior of bulb. Cardia large. Intestine collapsed, with walls composed from large cells and cuticularized lining. Pair of asymmetrical fimbriate organs in tail.

Females. Body tapered dramatically just behind vulva. Lateral chord 6-9 (7.4 ± 1.1) μm wide at mid-body. Hook blades 4-6 (5.4 ± 0.9) μm long, hook base 3-4 (3.6 ± 0.5) μm long. Stoma 5-6 (5.4 ± 0.5) μm long and 1-2 (1.8 ± 0.4) μm wide. Amphids 5-4 (4.4 ± 0.5) x 2 (2 ± 0) μm , situated close to hook base. Excretory pore in 5-7 (6.4 ± 0.9) μm from head end. Nerve ring about 10 μm thick. Anterior of corpus 8-10 (9.2 ± 0.8) μm wide, corpus 8-9 (8.6 ± 0.5) μm wide, isthmus 6-8 (7 ± 1) μm wide, bulb 27-35 (29.6 ± 3.2) μm long and 10-11 (10.4 ± 0.5) μm wide. Genital tube starts in tail, runs on dorsal side and reflexed in 174-272 (229 ± 40.4) μm from anterior, where forms long narrow set-off spermatheca 63-134 (91.4 ± 26.2) μm long and 12-17 (14.6 ± 1.9) μm wide filled with oval or spherical spermatozoa 1.5-4 x 2-4 μm in size. Oviduct from large cells, about 80-152 μm long. Single mature smooth-shelled egg 49-61 (54.6 ± 5.6) x 18-26 (23.2 ± 3.3) μm in uterus. Spermatozoa in uterus as in spermatheca. Egg shell 1 μm thick. Vulva at the level of one-third length of the body. Lips protruded. Vagina muscular, obliquely inclined, 15-18 (17 ± 1.2) μm long. No post-uterine suck present. Tail long, conical, initially as wide as before anus, then gradually pointing and ends in conoid portion 23-34 (28.8 ± 4.1) μm long and 2-3 (2.6 ± 0.5) μm wide. Fimbriate organs wider than tail diameter, cause slight swelling of tail. First fimbriate organ situated in 80-95 (87.2 ± 7) μm behind anus, the next one in 35-52 (43.8 ± 7.1) μm farther back. Fimbriate organs slightly raised, longitudinally oval, with fibrous basal rim 29-36 (31 ± 2.8) x 17-24 (19.6 ± 2.7) μm , fringed internally with thin rim and deep chamber 17-24 (20.8 ± 2.8) x 12-16 (14.2 ± 1.6) μm , half-covered from surface by transparent membrane. In several specimens circular membrane aperture 13-14 μm in diameter observed. Bottom of organ chamber covered by fibers. Posterior fimbriate organ slightly smaller in several specimens.

Males. Body length, anterior end, oesophagus and excretory system as in females with cephalic hooks little smaller in size than in females (blades 4.71 ± 0.5 (3-40) μm ; base 3.43 ± 0.8 (2-4) μm). Amphids 4-7 (4.86 ± 1.1) x 1-2 (1.71 ± 0.8) μm . Lateral chord 4.71 ± 0.5 (4-5) μm . Cuticularized spot 1 μm in size situated opposite excretory pore on dorsal side observed in several specimens. Testis reflexed at 271.71 ± 31.2 (220-310) μm from anterior, testis flexure 177.57 ± 46.2 (124-250) μm long. Developing spermatocytes hexagonal, arranged in 2, then 3 rows, 4 x 4, then 7 x 7; immature sperm in testis with irregular outlines arranged in no rows, 4-7 in diameter, spermatids in *vas deferens* spherical, numerous, about 1-1.5 in diameter. Constriction between *vas deferens* and ejaculatory duct, spermatids in ejaculatory duct 2.5-3.5 in diameter. Tail conical with short filamentous terminal portion 15-22 (18.29 ± 2.6) μm long. Spicules not distinctively cephalate, sickle-shaped, with manubria 2.86 ± 0.4 (2-3) x 2.71 ± 0.5 (2-3) μm blades 2.14 ± 0.4 (2-3) μm wide at mid-length and pointed distal tips. Gubernaculum minute, boat-shaped, with proximal hook 3.14 ± 2.6 (15-22) μm long bent posteriad. Long thin ribbed bursa present. Four-five pairs of postanal sub-ventral sensilla. First one in 12-25 posteriorly to anus, next one in 11-13 farther back and situated more laterally, third in front of anterior fimbriate organ, fourth between fimbriate organs, last one just behind posterior fimbriate organ. Each sensillum with

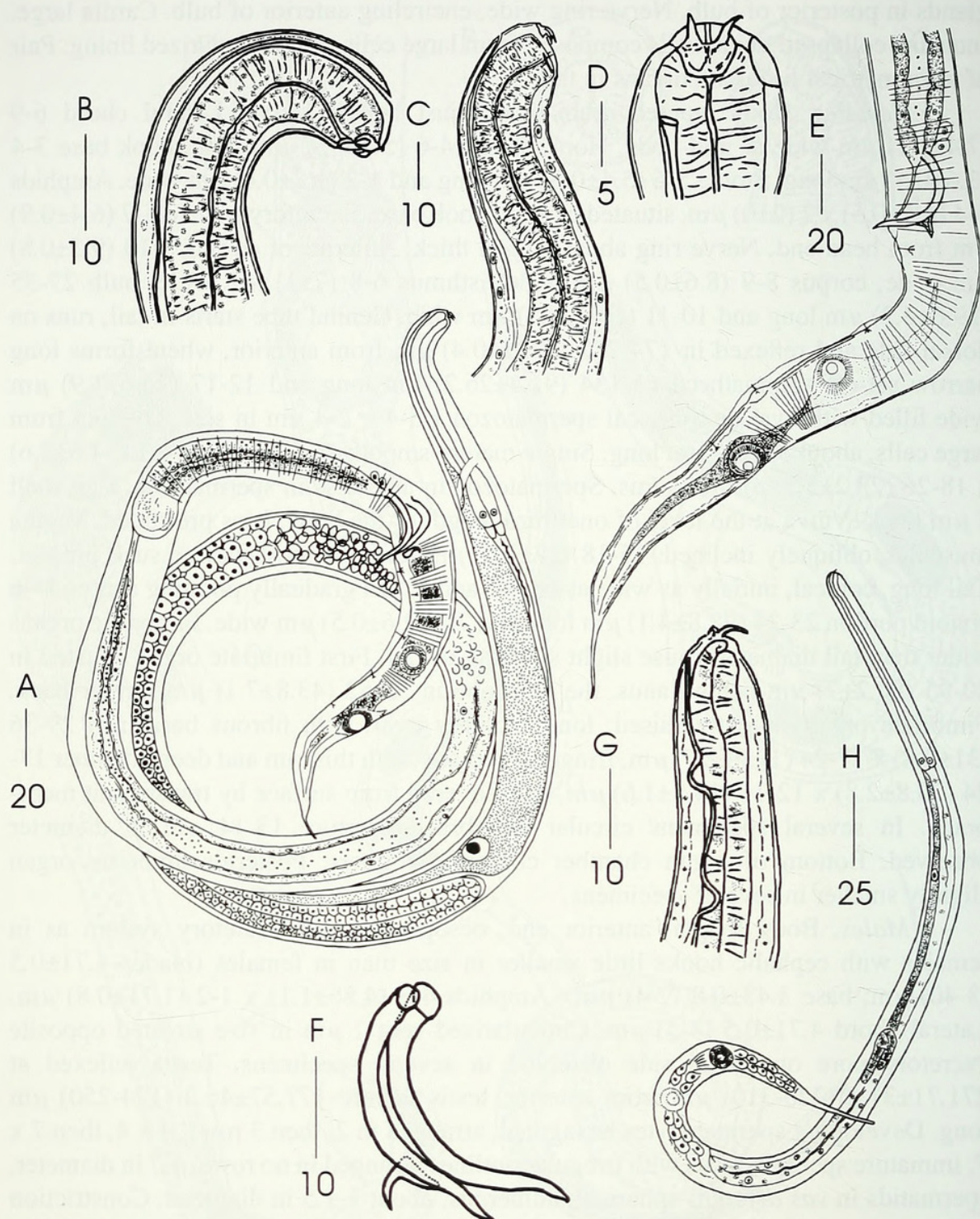


FIG. 7

Patagoniella capitoporus gen. n., sp. n. Male and juvenile. A – paratype male, entire body, lateral view; B, C – anterior end, paratype male, lateral view; D – head, paratype male, ventral view; E – male tail, lateral view; F – spicules and gubernaculum, lateral view; G – juvenile anterior end, lateral view; H – entire juvenile, lateral view. Scale bars in μm .

prominent base 1.5 high and fine bristle 4-10 high. Fimbriate organs the same in structure as in females but smaller in size, first one situated in 46.43 ± 7.2 (36-60) μm posterior to anus and second one in 18 ± 7.9 (7-31) μm farther back. First fimbriate

organ with basal rim 17 ± 2.8 (15-23) $\times$ 12.71 ± 2.5 (10-17) μm , nearly spherical internal chamber 8.57 ± 1.1 (8-11) $\times$ 8.14 ± 1.5 (6-11) μm ; second one with rim 14 ± 2.2 (11-18) $\times$ 11.20 ± 1.4 (10-14) μm and chamber 7.86 ± 0.4 (7-8) $\times$ 7.43 ± 1.1 (5-8) μm . Circular aperture in membrane covered the organ 3-5 μm in diameter.

Juveniles. Slender body, anterior end rounded, tail conical with filamentous terminal portion 15 ± 6.6 (9-22) μm long. Cephalic hooks thin with blades 3.33 ± 0.6 (3-4) μm and base 1.33 ± 0.6 (1-2) μm long. Amphids not observable. Excretory pore and duct 1 μm or less wide, duct visible until after oesophagus base. Oesophagus with corpus 5 μm and isthmus 4 μm and basal bulb 8 ± 1 (7-9) μm wide. Cardia and intestine well-developed. Genital primordium in 231 ± 18.2 (210-242) μm from anterior, reflexed, 98.3 ± 53.9 (60-160) μm long. Fimbriate organs circular, first situated in 14.67 ± 6.7 (9-22) μm from anus and second one in 13.33 ± 5 (8-18) μm . Both fimbriate organs with basal rim 8.67 ± 1.5 (7-10) μm in diameter and chamber 5 ± 1 (4-6) μm in diameter. Aperture in covering membrane not observable.

TYPE HOST AND LOCALITY. *Yagansia papillosa* AF 653, Chile, prov. Bahia Pond, Patagonic forest, 6.10.89, collected and identified by Mr Covarubias.

TYPE HABITAT. Coelomic cavity.

TYPE SPECIMENS. Holotype female MHNG 35450 INVE, three paratype females and seven paratype males MHNG 35451 INVE and two juveniles MHNG 35452 INVE deposited in Natural History Museum (Geneva, Switzerland).

DIFFERENTIAL DIAGNOSIS. The species resembles most members of *Ungella* Cobb, 1928 in general morphology but differs from all of them in having of excretory pore closely to anterior end and more anterior position of vulva (at one third body length vs median or post-median position). From *Plesiungella* Yeates *et al.*, 1998, it differs by presence of paired spicules of different shape and slender posterior of females. From *Onychonema* Baylis, 1943, it can be distinguished by presence of fimbriate organs. From *Acanthungella* (Ivanova & Hope, 2004), it differs by absence of somatic sensillae along the body.

ETYMOLOGY. Species name derived from Latin words *caput* (head) and *porus* (pore) and reflects the anteriormost position of excretory pore. It is a noun in apposition.

KEY TO GENERA OF UGELLIDAE WITH SPICULAR APPARATUS

- 1 Somatic sensilla present *Acanthungella* Ivanova & Hope, 2004
- Somatic sensilla absent 2
- 2 Single spicule *Plesiungella* Yeates, Spiridonov & Blakemore, 1998
- Paired spicules 3
- 3 Caudal fimbriate organs («suckers») absent *Onychonema* Baylis, 1943
- Caudal fimbriate organs present 4
- 4 Excretory pore near head end *Patagoniella* gen. n.
- Excretory pore at the level of mid-oesophagus or well behind the oesophageal base 5
- 5 Extremity of ovary behind vulva which is median or post-equatorial
..... *Ungella* Cobb, 1928
- Extremity of ovary behind oesophageal base, vulva in front of anus
..... *Yagansiella* gen. n.

TAXONOMICAL REMARKS

Drilonematid fauna of Neotropic acanthodrilids is the less (if at all) studied amongst all Drilonematoidea. Till now only *Ungella mexicana* was described from *Howascolex* sp. from Mexico. Two new *Ungella* species and two new genera were described above. Both *Ungella* species demonstrate similarity in shape of oesophagus, spicules and gubernaculum and presence of prominent fimbriate organs. From type species *U. secta* Cobb, 1928 they differ by structure of cephalic hooks attached to head surface whereas in *U. secta* they have deeply embedded shafts. Excretory pore position seems to be variable in the genus and takes place or opposite nerve ring (*U. kivuensis* Spiridonov, 2001, *U. astrida* Spiridonov, 2001, *U. ituriensis* Spiridonov, 2001, *U. chileana* sp. n.) either behind oesophageal bulb (*U. secta*, *U. burmensis* Ivanova et Hope, 2000, *U. mexicana*, *U. sucofera* Timm, 1962, *U. micronychium* sp. n.) whereas nerve ring position on isthmus is constant. Oesophagus shape, presence of few (or more often single) thin-shelled eggs and median/post-median vulva position and structure of excretory system is as well constant. Typically, ovary is leading straight to anterior end though in *U. chileana* it makes some loops at posterior. Short post-uterine sack present (*U. kivuensis*, *U. astrida*, *U. ituriensis*, *U. sucofera*) or absent. For male reproductive system, morphologically distinct *vas deferens* and ejaculatory duct, spherical small-sized immature sperm, curved paired spicules, sometimes bifurcated (*U. mexicana*, *U. micronychium*) are characteristic. Bursa present (*U. secta*) or absent (the rest of species). Fimbriate organs vary greatly in shape, size and position.

Yagansiella longicollis gen. n., sp. n. possess some unusual features. Cuticular ridges on its anterior end reminds of cephalic armature of Homungellidae though these not joined with hooks which is single in the latter. Anterior placement of female gonoduct extremity in *Yagansiella* is unusual among drilonematids, as well as anteriormost position of excretory pore in *Patagoniella*. Appearance of *Yagansiella longicollis* resembles in some way of oxyurids inhabiting earthworm gut – for instance, *Postervulva danieli* Spiridonov, Ivanova, 1998 – in body shape, prominent annulation, spacious pseudocoel, muscular vagina though the present species undoubtedly belongs to Ungellidae.

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