

Populations of *Plectus acuminatus* Bastian, 1865 and *Panagrolaimus magnivulvatus* n. sp. (Nematoda) from nunatakks in Dronning Maud Land, East Antarctica

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Summary – Populations of *Plectus acuminatus* Bastian, 1865 and *Panagrolaimus magnivulvatus* n. sp. from East Antarctic nunatakks are described from studies by light and scanning electron microscopy. The populations of *Plectus* found are close to *P. acuminatus*, *P. antarcticus* de Man, 1904 and *P. cirratus* Bastian, 1865 and their identity is discussed. Additional information on the morphology of *P. acuminatus* is provided. The new species of *Panagrolaimus* is separated from other species of the genus by the extreme development of the vulval lips, especially the anterior lip. It is further separated from the most closely related species, *P. superbus* Fuchs, 1930, by a larger corpus/isthmus-ratio and a more posterior position of the phasmids in the females, and larger spicules in the males.

Résumé – *Populations de Plectus acuminatus Bastian, 1865 et Panagrolaimus magnivulvatus n. sp.* – Des populations de *Plectus acuminatus* Bastian, 1865 et *Panagrolaimus magnivulvatus* n. sp. provenant des « nunatakks » de la partie est de l'Antarctique sont décrites après étude en microscopie optique et au MEB. Les populations de *Plectus* sont proches de *P. acuminatus*, *P. antarcticus* de Man, 1904 et *P. cirratus* Bastian, 1865, et leur identité est discutée. Des données supplémentaires sur *P. acuminatus* sont fournies. La nouvelle espèce de *Panagrolaimus* se distingue des autres espèces du genre par le très grand développement des lèvres vulvaires, et particulièrement de la lèvre antérieure. Elle se sépare de plus de l'espèce la plus proche, *P. superbus* Fuchs, 1930, par un plus grand rapport corpus/isthme, la position postérieure des phasmides chez la femelle et de plus grands spicules.

Key-words : Antarctica, morphology, nematodes, *Panagrolaimus*, *Plectus*, SEM, taxonomy.

During the Swedish Antarctic Research Expedition (SWEDARP) 1991/92, samples of terrestrial material were taken from several nunatakks* in Dronning Maud Land, East Antarctica. The samples were analyzed for the microfauna groups nematodes, rotifers and tardigrades (Sohlenius *et al.*, 1994). Some samples contained populations of *Plectus acuminatus* Bastian, 1865 and in other samples populations of *Panagrolaimus magnivulvatus* n. sp. were found. These populations are described from studies by light and scanning electron microscopy and their identities are discussed in view of the present taxonomic knowledge of these genera.

Materials and methods

SAMPLING AND EXTRACTION

Samples of soil, mosses and lichens were collected in January and February, 1992 by Dr. Göran Thor from the East Antarctic nunatakks (mountains): Basen (Vestfjella), Fossilryggen (Vestfjella), Haldorsentoppen, Steinnabben, Engenhovet and Wrighthamaren (Sivorgfjella, Heimefrontfjella) in Dronning Maud Land (Fig. 1). A complete review of the sampling sites is given in Sohlenius *et al.* (1994).

Specimens of *Plectus* were found at Basen (sites no. 5, 9 and 14) and specimens of *Panagrolaimus* were found at Basen (site no. 11), Haldorsentoppen (site no. 23) and Steinnabben (sites no. 24, 25 and 26). Accounts of the sites are given below.

The samples were kept deep-frozen (at about -20°C) until extracted by a modified Baermann-method (Sohlenius, 1979). Suspensions of nematodes were killed by heat and fixed in cold TAF. For light microscopy (LM) they were processed to anhydrous glycerine by a slow evaporation method (Hooper, 1970). Preparation of slides were made according to Boström and Gydemo (1983). For scanning electron microscopy (SEM), specimens from cultures on agar plates of *Plectus* (site no. 5) and *Panagrolaimus* (site no. 24) were picked and processed as described in Boström (1989).

Measurements and ratios are generally given as: mean \pm (SE) range or only range.

SITE DESCRIPTIONS

Site 5: Vestfjella, the nunatak Basen, 800 m ENE of the Swedish station Wasa ($73^{\circ} 02' 34''\text{S}$, $13^{\circ} 24' 50''\text{W}$), a gentle slope towards NE, altitude 410 m. Bedrock of basalt, relatively protected area of flow earth with

* Nunatakks : ice-free rocky outcrops.

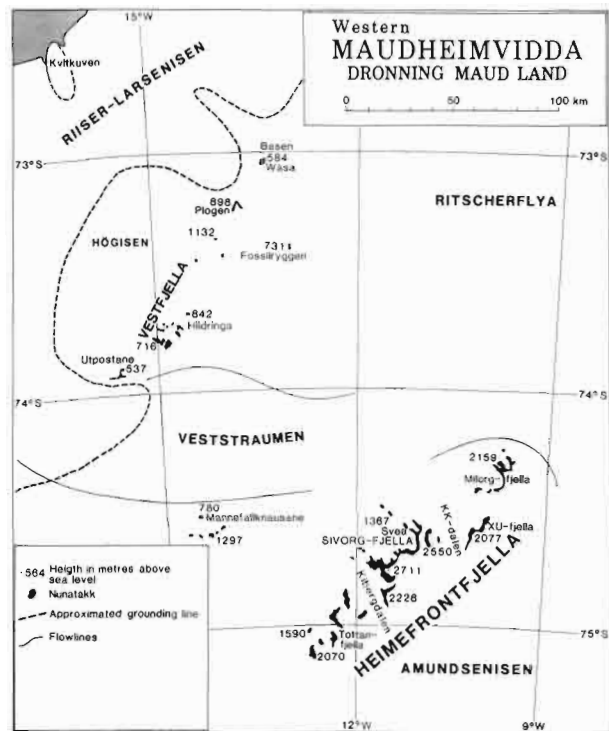


Fig. 1. Map of the sampling area in Dronning Maud Land, East Antarctica.

plentiful tufts of mosses and interspersed individual stands of crustose lichens. Fine sand, humus material, mosses on the surface.

Site 9 : Vestfjella, the nunatakk Basen, 1500 m WNW of the Swedish station Wasa, the lowermost sandstone horizon in the precipice, altitude 250 m. Bedrock of light sandstone, slightly moist sand in protected position, plentiful tufts of mosses and lichens (e.g. *Caloplaca citrina*, *Xanthoria elegans*) in the vicinity. Very dry sand with gravel, brownish thready organic material.

Site 11 : Vestfjella, the nunatakk Basen, 2500 m NNE of the Swedish station Wasa, gentle slope towards E, altitude 520 m. Bedrock of basalt, exposed moist soil with white sediments on the surface of a weakly developed polygon soil. Somewhat grainy, relatively dry sand, some organic material.

Site 14 : Vestfjella, the nunatakk Basen, 1350 m WNW of the Swedish station Wasa, a gentle slope towards WSW, altitude 355–360 m. Bedrock of basalt, a nest of *Pagodroma nivea* (snow petrel) in the vicinity, plentiful tufts of mosses and lichens (e.g. *C. citrina*, *Physcia caesia*, *Umbilicaria aprina*) in the surroundings. Shale gravel, organic very moist material in the surface, mosses.

Site 23 : Sivorgfjella, northern end of the nunatakk Haldorsentoppen, southern slope of the fourth small hill

S of the Swedish station Svea ($74^{\circ} 34' 36''$ S, $11^{\circ} 13' 24''$ W), altitude 1245 m. Bedrock of augen gneiss, exposed tufts of mosses between some rocks, the lichens *Candelariella halletensis* and *Xanthoria candelaria* in the vicinity. Relatively dry organic material, mosses, lichens and algae.

Site 24 : Sivorgfjella, slope of the small nunatakk Steinnabben ($74^{\circ} 33'$, $11^{\circ} 15' W$), altitude 1200–1300 m. Bedrock of metamorphous red granite, exposed tufts of mosses and the lichens *Lecanora expectans* and *Xanthoria candelaria*, several nests of *P. nivea* in the vicinity. Relatively dry organic material, mosses, lichens and mycelia.

Sites 25 & 26 : As site 24. Bedrock of metamorphous red granite, in a mat of the green alga *Prasiola crispata* protected between rocks, close to a nest of *P. nivea*. Relatively moist sand, some organic material, algae.

Plectus acuminatus Bastian, 1865

(Figs 2A, B; 3)

MEASUREMENTS

See Table 1.

DESCRIPTION*

Female : Body arcuate ventrad when killed by heat, with scattered body setae. Head rounded with six lips, not offset from body contour. Six labial papillae close to mouth opening. Four cephalic setae, about $4 \mu\text{m}$ long, directed forward, placed at anterior region of stoma. Amphids circular, diameter $2.5\text{--}3 \mu\text{m}$, corresponding to $1/5\text{--}1/6$ of neck width, located at level of middle part of stoma. Length of stoma $22\text{--}26 \mu\text{m}$, width $3\text{--}4 \mu\text{m}$. Basal bulb $25\text{--}31 \mu\text{m}$ long, $17\text{--}22 \mu\text{m}$ wide; cardia $9\text{--}12 \mu\text{m}$ long. Lateral field with three incisures, extending almost to tail terminus, $5\text{--}8 \mu\text{m}$ wide, covering about one fifth to one seventh of body width (BW). Genital organs didelphic, reflexed, the two ovaries extending two to three times BW anteriorly and posteriorly, respectively. Vulva at middle of body, vulval lips not protruding. Rectum about $0.9\text{--}1.2$ anal body widths (ABW) long. Tail arcuate ventrad with three or four caudal setae on each side.

Male : not found.

COMMENTS

Several species of *Plectus* Bastian, 1865 have been reported from the Antarctic continent and the Subantarctic region, viz. *P. cirratus* Bastian, 1865, *P. parietinus* Bastian, 1865, *P. parvus* Bastian, 1865 (= *P. belgicae* de Man, 1904), *P. antarcticus* de Man, 1904 (= *P. murrayi*

* The specimens from the three sites are similar in size and morphology and the description is thus a combination of all three populations.

Table 1. Measurements in μm and ratios of females of *Plectus acuminatus* from Dronning Maud Land, East Antarctica.

Nunatakk Site no.	Basen 5	Basen 9	Basen 14
n	13	1	4
L	885 \pm 10 (842-968)	859	877 \pm 23 (831-932)
Body diam.	40 \pm 1 (38-43)	39	39 \pm 2 (33-42)
Pharynx	204 \pm 2 (194-216)	195	193 \pm 1.5 (190-197)
Tail	95 \pm 1.5 (87-105)	86	98 \pm 3 (90-103)
V-AT*	3.8 \pm 0.1 (3.5-3.9)	4.2	3.7 \pm 0.1 (3.6-3.8)
a	22 \pm 0.3 (21-25)	22	23 \pm 1 (22-25)
b	4.3 \pm 0.1 (4.1-4.6)	4.4	4.5 \pm 0.1 (4.3-4.7)
c	9.4 \pm 0.1 (9.0-9.9)	10.0	9.0 \pm 0.1 (8.8-9.2)
c'	5.0 \pm 0.1 (4.7-5.5)	4.3	5.2 \pm 0.1 (5.1-5.4)
V	49 \pm 0.2 (48-50)	48	48 \pm 0.6 (46-49)
Height of labial region	3.4-4.3	4.3	3.9-4.3
Head diam.	10.5-11.5	11.0	10.5-11.5
Amphid-ant. end Excret. pore-ant.end	12.5-17.0	15.5	12.5-15.5
Rectum	118-134	116	115-133
Anal body diam.	18-23	22	19-22
Annule width	17-21	20	18-20
	1.2-1.4	1.3	1.2-1.4

* Distance vulva to anus divided by tail length.

Yeates, 1970) and *P. frigophilus* Kirjanova, 1958 (see Maslen, 1979, for a review).

The taxonomy of the genus *Plectus* is quite complex and many species have been described over the years. The most recent revisions of the genus were made by Andr ssy (1985) and Zell (1993). Many species are morphologically very similar and the organisation of the posterior region in males, i.e. spicules, gubernaculum and number of genital supplements, is of great value for diagnoses and identification (e.g. Kito *et al.*, 1991). A major problem is that many populations lack males, which defies identification to species level. In the populations described here no males have been found. Attempts to induce males by culturing of specimens were

not successful although the culturing itself succeeded (B. Sohlenius pers. comm.). Identification of the present specimens was thus based entirely on female characters and by comparison with the most recent revisions and keys.

By applying Andr ssy's (1985) most recent key to these specimens, one arrives at the final dichotomy between *P. acuminatus* and *P. cirratus* (with *P. antarcticus* as synonym). This split is based on the number of male tubular accessory organs and direction of cephalic setae (however, the distinction forward *vs* outward for the latter character does not seem valid according to the descriptions and figures in Andr ssy). However, as males are not present, the specimens must be identified by female characters only. Andr ssy (1984), in an earlier key, separated *P. acuminatus* and *P. cirratus* by *i.a.* body length (0.6-0.9 mm *vs* 0.9-1.5 mm), female *c'*-ratio (4 *vs* 5) and length of stoma (16-23 μm *vs* 20-28 μm). The specimens described here are intermediate between these species in many characters. They are, however, regarded as closer to *P. acuminatus* based on body size and the lip region which is not set-off.

Kito *et al.* (1991) rejected Andr ssy's synonymization (see above) and argued that females of *P. antarcticus* are distinguished from *P. cirratus* females by the not set-off *vs* slightly set-off head, and two or three *vs* three or four caudal setae on each side of the tail. The males are separated by the number of preloacal tubular supplements (a single *vs* none) and presence of gubernaculum (absent *vs* present). Kito *et al.* (1991) furthermore differentiated *P. antarcticus* and *P. acuminatus* females on number of caudal setae, two or three *vs* three or four on each side of the tail. The males are separated by the number of preloacal tubular supplements (a single *vs* two) and presence of gubernaculum (absent *vs* present). The specimens of the present populations have many characters in common with *P. antarcticus sensu* Kito *et al.* (1991). The main separating features seem to be tail length (86-105 *vs* 104-115 μm), *c*-ratio (8.8-10.0 *vs* 7.8-8.8), *c'*-ratio (4.3-5.5 *vs* 5.5-6.8) and, possibly, number of caudal setae (three to four *vs* two to three on each side of the tail).

Zell (1993) applies a phylogenetic approach in his revision and divides the species into groups. By running through Zell's key, the specimens at hand will be identified as belonging to *P. acuminatus* (in the *parietinus*-group). Zell (1993) also synonymizes *P. antarcticus* with *P. cirratus*, which he places in the *aquatilis*-group.

From the original description of the single female of *P. acuminatus* by Bastian (1865), the following measurements and ratios can be calculated: length = 833 μm , width = 38 μm , pharynx = 208 μm , tail = 89 μm ; a = 22; b = 4.0; c = 9.4, V = 50. Most of these measurements and ratios for the holotype of the species fall within the ranges of the three populations described here.

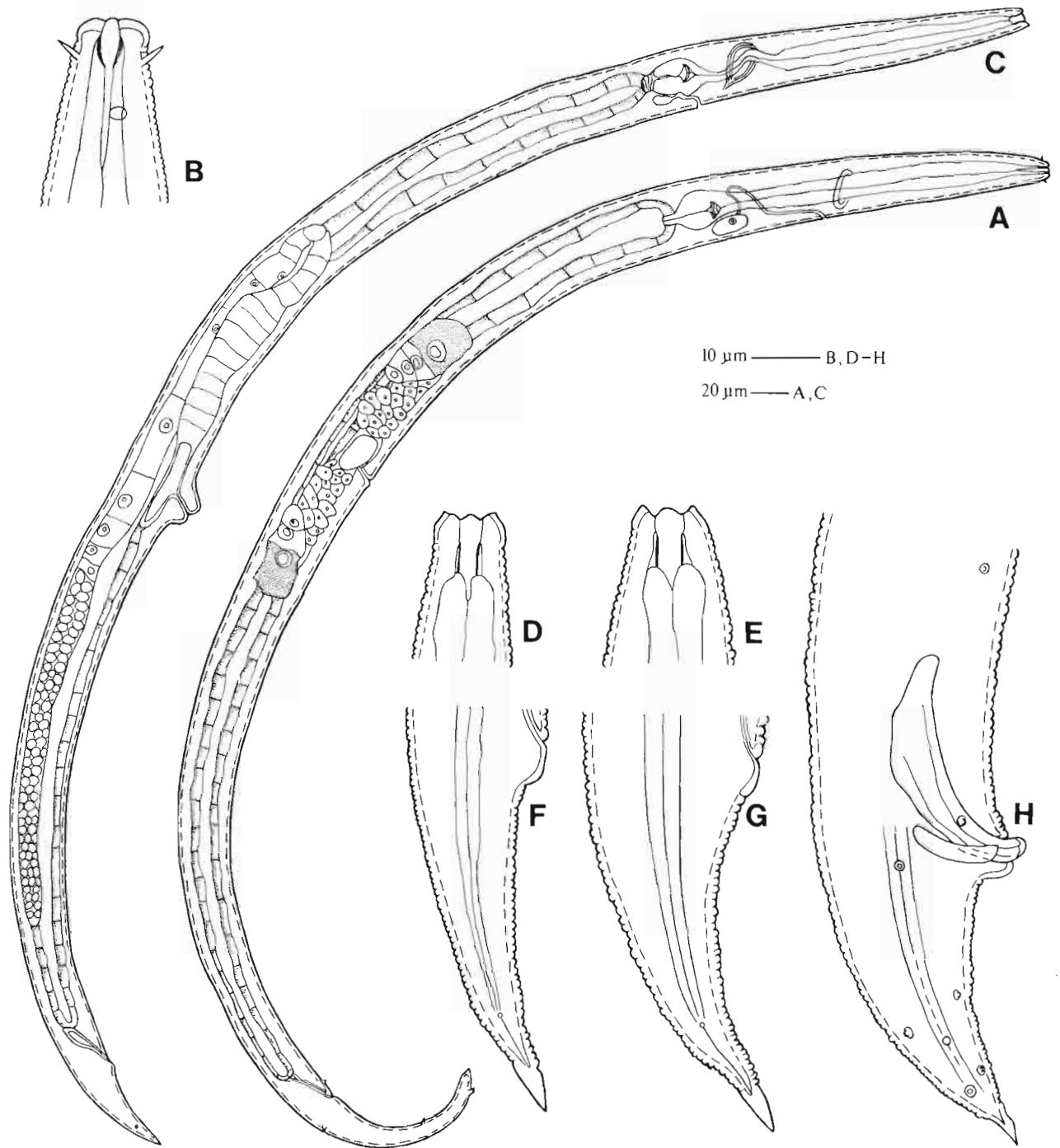


Fig. 2. *Plectus acuminatus* Bastian, 1865; **A**: Female; **B**: Head - *Panagrolaimus magnivulvatus* n. sp. **C**: Holotype female; **D-E**: Head; **F-G**: Female tail; **H**: Male tail.

Several unidentified populations of *Plectus* have been reported (Maslen, 1979), but *P. acuminatus* has not previously been recorded from the Antarctica (Andrássy, 1984; Kito *et al.*, 1991). From McMurdo Sound region,

Yeates (1970) described *P. murrayi*, which was later synonymized with *P. antarcticus* by Timm (1971) and the synonymy was accepted by Yeates (1979) and Kito *et al.* (1991). *P. murrayi* was treated as a separate species

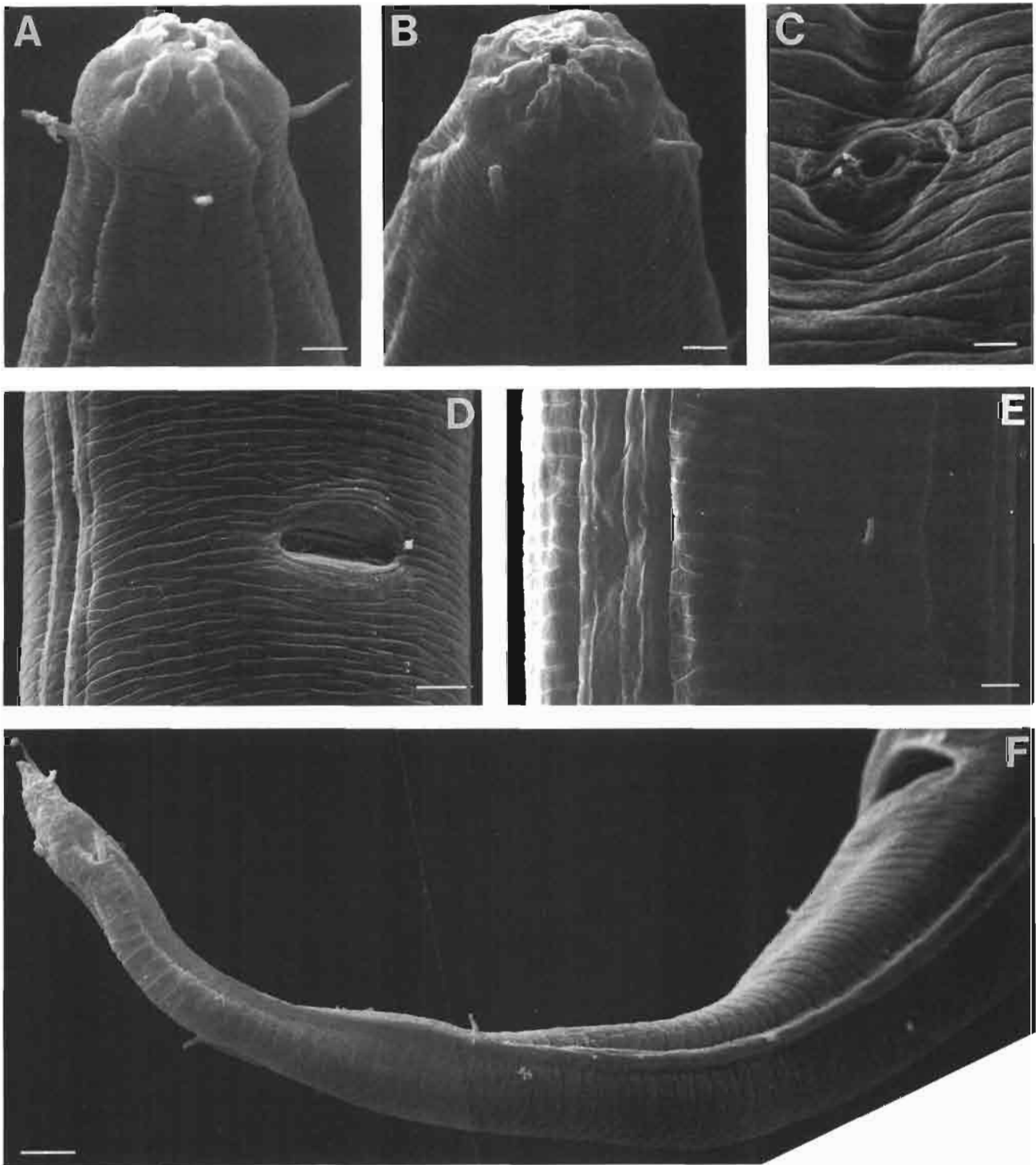


Fig. 3. *Plectus acuminatus* Bastian, 1865; *A*: Head, sublateral view; *B*: Head, slightly tilted ventral view; *C*: Excretory pore; *D*: Vulva; *E*: Lateral field; *F*: Tail (combination of two pictures). (Bar equivalents: *C* = 1 μ m; *A*, *B*, *E* = 2 μ m; *D*, *F* = 4 μ m.)

by Zell (1993), but it was synonymized with *P. acuminatus* by Andr ssy (1985). If the latter synonymization is correct, the species is previously recorded (as *P. murrayi*) from the Antarctica. Recently also a male of *P. acuminatus* was reported by Vinciguerra *et al.* (1991) from the Antarctica.

***Panagrolaimus magnivulvatus* n. sp.**

(Figs 2C-H; 4)

MEASUREMENTS

See Tables 2 and 3.

DESCRIPTION *

Female: Body arcuate ventrad, almost C-shaped, when relaxed by heat. Cuticle annulated, annules about 1 μm wide at midbody. Lateral field with three incisures to phasmid, one incisure extending to tail terminus; 5-8 μm wide at midbody, occupying one fourth to one sixth of BW. Anterior end with six lips in all populations. Subventral and subdorsal lips bear one anterior and one posterior papillae, lateral lips bear one anterior papilla and a round amphid at the base. Stoma length 9-11 μm , 11-13 μm in specimens from site 26. Cheilostom weakly sclerotized, 2-3 μm long and about 4 μm wide; prostom strongly sclerotized, 4-6 μm long and about 3 μm wide, 3.5-4 μm wide in specimens from site 26; rest of stoma funnel-shaped, not sclerotized. Basal bulb with valves, 25-31 μm long and 18-23 μm wide; 31-34 μm long and 19-27 μm wide in the site 26 specimens. Hemizonid at level from middle part of isthmus to anterior portion of bulb. Deirid at level from middle part of isthmus to middle part of bulb. Reproductive system panagrolaimid, monodelphic, prodelfic, reflexed anteriorly. Postvulval portion of ovary straight, very long in specimens from site 26. Vulval lips conspicuously protruding; anterior lip very massive and projecting about 10 μm from body contour; what may be small papillae appear on its surface in the SEM. Tail conoid with a pointed terminus.

Male: General morphology similar to female and the description is thus restricted to a few characters. Body posture arcuate ventrad especially in the posterior region. Lateral field with three incisures extending almost to tail terminus; 5-7 μm wide at midbody, 8 μm wide in site 26 males; occupying one fifth to one seventh of BW. Basal bulb 22-28 μm long and 17-22 μm wide; 27-30 μm long and 18-23 μm wide in males from site

26. Testis generally reflexed anteriorly, occasionally with several flexures or straight. Tail conoid with pointed terminus. Genital papillae: one or two pairs of preanal papillae, one pair of adanal papillae, two pairs of caudal lateral papillae, two or three pairs of caudal subventral papillae and one or two pairs of caudal subdorsal papillae. Spicules panagrolaimid, arcuate ventrad, cephalated, massive.

TYPE LOCALITY

Organic soil material (mosses, lichens and mycelia) at the nunatak Steinnabben (Sivorgfjella, Heimfrontfjella), Dronning Maud Land, East Antarctica.

OTHER LOCALITIES

The nunatak Haldorsentoppen (Sivorgfjella, Heimfrontfjella) and Basen (Vestfjella), Dronning Maud Land, East Antarctica.

TYPE SPECIMENS

Holotype female, sixteen female and eight male paratypes (access no. 4589) at Swedish Museum of Natural History, Department of Invertebrate Zoology, Box 50007, 10405 Stockholm, Sweden; three female and two male paratypes deposited at Rijksuniversiteit Gent, Instituut voor Dierkunde, K. L. Ledeganckstraat 35, 9000 Gent, Belgium; two female and five male paratypes deposited at Mus m National d'Histoire Naturelle, Laboratoire de Biologie Parasitaire, Protistologie, Helminthologie, 61, rue Buffon, 75005 Paris, France.

DIAGNOSIS AND RELATIONSHIPS

P. magnivulvatus n. sp. is distinguished from other species of the genus by the extreme development of the vulval lips, especially the anterior lip, in the female.

P. magnivulvatus n. sp. is close to *P. rigidus* (Schneider, 1866) Thorne, 1937, *P. subelongatus* (Cobb, 1914) Thorne, 1937 and *P. superbus* Fuchs, 1930. *P. magnivulvatus* n. sp. has six separate lips and thus distinguished from *P. rigidus*, which has the six lips arranged into three pairs and from *P. subelongatus*, which has the six lips amalgamated into three. The new species agrees with *P. superbus* in having six distinctly separated lips. The females of *P. magnivulvatus* n. sp. differ from females of *P. superbus* in the larger corpus/isthmus-ratio (2.8-3.7 *vs* 2.0-2.7) and a more posterior position of the phasmids (63-70% *vs* 57-65% of tail length); the males differ in the length of the spicules (33-45 *vs* 29-33 μm).

COMMENTS

Another Antarctic endemic species of *Panagrolaimus*, *P. davidi*, was described from McMurdo Sound Region, Victoria Land by Timm (1971). *P. davidi* was contrasted with *P. subelongatus* and separated from it by the conspicuous dorsal metastomatal tooth in the former. Other populations of *Panagrolaimus* have also been

* The specimens from the sites 23, 24 and 25 are similar in size and morphology, whereas the single female from site 11 is smaller and those from site 26 are much larger. The larger specimens from site 26 is probably related to a better nutritional status, which is also indicated by the development of the ovaries and presence of intra-uterine eggs. In the description, specimens from sites 23-25 are combined, but the other two are mostly described separately.

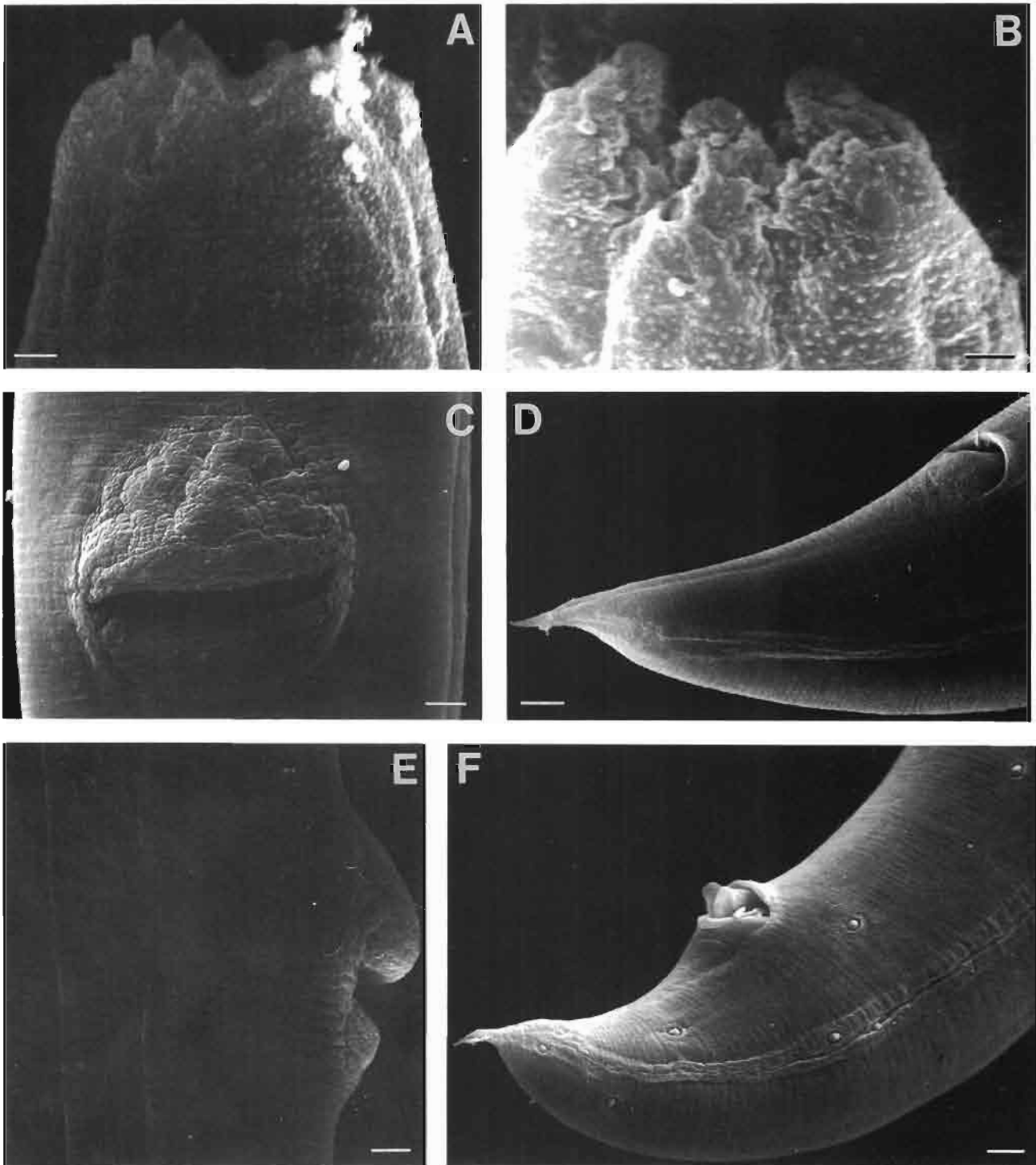


Fig. 4. *Panagrolaimus magnivulvatus* n. sp. *A* : Head, sublateral view; *B* : Head, slightly tilted sublateral view; *C* : Vulva, ventral view; *D* : Female tail; *E* : Vulva, lateral view; *F* : Male tail. (Bar equivalents : *A*, *B* = 1 μ m; *C*-*F* = 4 μ m.)

Table 2. Measurements in μm and ratios of holotype and paratype females of *Panagrolaimus magnivulvatus* n. sp. from Dronning Maud Land, East Antarctica.

Nunatakk Site	Basen 11	Haldorsentoppen 23	Steinnabben 24	Steinnabben 24	Steinnabben 25	Steinnabben 26
n	1	4	Holotype	7	6	4
L	683	788 \pm 19 (761-844)	887	818 \pm 16 (776-904)	807 \pm 19 (750-868)	1131 + 22 (1082-1187)
Body diam.	34	37 \pm 1 (35-39)	35	36 \pm 1 (33-39)	36 \pm 1 (33-39)	52 \pm 1 (49-56)
Pharynx	179	180 \pm 4 (172-193)	190	183 \pm 3 (174-195)	186 \pm 4 (176-204)	207 \pm 3 (200-214)
Tail	37	50 \pm 1 (49-52)	52	51 \pm 1 (48-54)	47 \pm 1 (41-51)	53 \pm 2 (47-58)
V-A/T*	6.0	5.1 \pm 0.1 (4.9-5.3)	5.8	5.2 \pm 0.1 (4.8-5.6)	5.6 \pm 0.1 (5.1-6.0)	7.6 \pm 0.2 (7.2-8.1)
a	20	21.5 \pm 0.3 (21-22)	25	23 \pm 0.4 (22-25)	23 \pm 0.6 (21-25)	21.5 \pm 1 (19-23)
b	3.8	4.4 \pm 0.1 (4.3-4.6)	4.7	4.5 \pm 0.1 (4.3-4.6)	4.4 \pm 0.1 (4.0-4.7)	5.5 \pm 0.1 (5.3-5.8)
c	18	16	17	16 \pm 0.3 (15-17)	17 \pm 0.5 (16-19)	22 \pm 1 (20-23)
c'	2.1	2.6 \pm 0.1 (2.4-2.9)	2.4	2.7 \pm 0.1 (2.4-3.1)	2.5 \pm 0.1 (2.4-2.7)	2.1 \pm 0.1 (1.9-2.3)
V	63	62 \pm 0.4 (61-63)	60	62 \pm 0.3 (61-63)	62 \pm 0.2 (62-63)	60 \pm 0.6 (59-62)
Corpus/isthmus	3.1	3.0-3.3	3.3	3.2-3.7	2.8-3.0	3.0-3.3
Excret. pore-ant. end	134	148-165	167	144-172	129-151	167-177
PUB	not seen	17-23	23	14-19	19	not seen
PUB/body diam.	not seen	0.5-0.6	0.7	0.4-0.6	0.6	not seen
Phasmid %	not seen	69-70	66	63-67	66-70	65-70
Rectum/anal body diam.	—	1.0-1.2	1.2	1.0-1.4	1.2-1.3	1.1-1.2

* Distance vulva to anus divided by tail length.

found in the Antarctic region, but they were not identified to species (Maslen, 1979, 1981). Species of *Panagrolaimus* are not always well defined and the identity of many species is confused. *P. davidi* Timm, 1971 is diagnosed by its prominent dorsal metastomatal tooth, which has not been found in any of the specimens described here.

The most recent revision of *Panagrolaimus* was made by Andrassy (1984) and later Williams (1987) attempted to use scanning electron microscopy in the taxonomy of the genus. A combination of the information in Andrassy and Williams and the findings by Boström (1989) led to the conclusions presented in the section on

diagnosis and relationships above.

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Table 3. Measurements in μm and ratios of paratype males of *Panagrolaimus magnivulvatus* n. sp. from Dronning Maud Land, East Antarctica.

Nunatakk Site	Haldorsentoppen 23	Steinnabben 24	Steinnabben 25	Steinnabben 26
n	3	5	6	4
L	828 \pm 33 (793-893)	785 \pm 19 (737-821)	877 \pm 26 (791-934)	1198 \pm 37 (1127-1275)
Body diam.	35 \pm 3 (30-40)	30 \pm 1 (28-32)	35 \pm 1 (34-39)	44 \pm 2 (41-48)
Pharynx	180 \pm 1 (179-181)	179 \pm 2 (174-184)	196 \pm 6 (176-207)	206 \pm 5 (197-216)
Tail	46 \pm 1 (44-47)	46 \pm 1 (42-48)	45 \pm 1 (42-47)	57 \pm 2 (54-61)
Spicules	36 \pm 2 (33-39)	36 \pm 1 (34-39)	36 \pm 1 (35-38)	41 \pm 1 (39-45)
Gubernaculum	12	12 \pm 1 (10-13)	14 \pm 0.5 (13-16)	16 \pm 0.3 (16-17)
a	24 \pm 2 (20-26)	26 \pm 0.4 (25-27)	25 \pm 1 (23-27)	27 \pm 0.5 (26-28)
b	4.6 \pm 0.2 (4.4-4.9)	4.4 \pm 0.1 (4.2-4.6)	4.5 \pm 0.1 (4.2-4.7)	5.8 \pm 0.1 (5.6-5.9)
c	18 \pm 0.6 (17-19)	17 \pm 0.7 (15-19)	20 \pm 0.4 (19-21)	21
c'	1.8 \pm 0.1 (1.7-1.9)	2.0 \pm 0.1 (1.8-2.3)	1.7 \pm 0.1 (1.6-1.8)	1.8 \pm 0.1 (1.7-1.9)
T	62 \pm 3 (56-66)	60 \pm 1 (57-63)	65 \pm 1 (61-69)	71 \pm 2 (66-75)
Corpus/isthmus	2.8-3.0	2.6-3.3	2.4-2.8	2.8-3.2
Excret. pore-ant. end	154-157	149-161	147-164	169-191
Phasmid %	70-77	68-71	77-78	78
Cloaca/anal body diam.	1.2-1.3	1.2-1.6	1.4	1.2-1.6

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