

Criconematina (Nematoda: Tylenchida) from the Aleutian Islands

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Abstract: A new genus (*Cerchnotocriconema*) and three new species (*C. psephinum*, *Hemicycliophora amchitkaensis*, and *Paratylenchus amundseni*) are described from Adak and Amchitka Islands in the Aleutian chain. The new genus differs from all other criconematid genera in having irregular, convex sculpturing consisting of small, oval plates on the anterior and posterior regions of each annule, with the mid-annular region minutely punctate or dentate. *H. amchitkaensis* n. sp. resembles *H. similis* Thorne and *H. zuckermani* Brzeski, but has only one head annule, instead of two. *P. amundseni* n. sp., which has a stylet 17–19 μm long, is similar to *P. tateae* Wu & Townshend and *P. labiosus* Anderson & Kimpinski, but differs by the presence of males and the possession of conoid-truncate lip region, functional spermatheca, and long male tail ($c = 8.5\text{--}9.5$). *Seriespinula seymouri* Wu (Mehta & Raski), *Nothocriconema longulum* (Gunhold) De Grisse & Loof, and *Macroposthonia xenoplax* (Raski) De Grisse & Loof are also reported from the islands. **Key words:** ring nematodes, sheath nematodes, pin nematodes, taxonomy, ectoparasites.

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This paper is the second in a series recording and describing plant-parasitic nematode taxa of the Aleutian Islands. The first dealt with Heteroderoidea (3). The plant-parasitic nematode fauna of these remote and largely undeveloped volcanic islands consists mostly of undescribed species (2); thus dispersal and colonization studies must await the assignment of names to species. Siddiqi's (17) concept of Criconematina is followed in this paper.

MATERIALS AND METHODS

Soil samples were mostly of a loamy medium sand (Typic Cryopsamment) and were washed through a sieve (38- μm pore) with water to collect nematodes. Nematodes were extracted from finer soil by use of a centrifugal-flotation method (11). All extracted nematodes were killed and fixed in hot 4% formalin, then processed to glycerin by a rapid method (16). Measurements were

made on specimens mounted in glycerin. In the text and tables, R refers to body annule number; e.g., R_{stylet} is the number of annules from the head end to the stylet knobs. All type material numbered in the text is deposited in the USDA Nematode Collection, Beltsville, Maryland, U.S.A.

SYSTEMATICS

Macroposthonia xenoplax (Raski, 1952)
De Grisse & Loof, 1965

Adak Island specimens: Females (22): $L = 709 \mu\text{m}$ (613–877); $a = 12.3$ (10.2–14.7); $b = 4.8$ (4.2–5.7); $c = 27.0$ (19.0–43.4); $V = 92.8\%$ (90.5–94.6); stylet = 70.9 μm (66.9–74.5). Collected from the rhizosphere of a dunegrass, *Elymus mollis* Trin., at the following sites on Adak Island: Kuluk Bay, July–August 1978; Andrew Bay, 11 August 1979; Clam Lagoon, 22 August 1979.

Amchitka Island specimens: Females (2): $L = 647 \mu\text{m}$ (636–657); $a = 12.8$ (12.4–13.3); $b = 4.4$ (4.0–4.8); $V = 92.2\%$ (91.9–92.5); stylet = 67.5 μm (65.6–69.4). Collected from the rhizosphere of *E. mollis* growing on a beach terrace on Amchitka Island, 8 August 1979.

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These Aleutian specimens are quite similar to those in previous descriptions of *M. xenoplax*, except that they are generally longer (613–817 μm) than the type series (404–620 μm) (14) or the specimens tabulated by De Grisse (8) (404–658 μm).

Nothocriconema longulum (Gunhold, 1953)
De Grisse & Loof, 1965

Adak Island specimens: Females (18): L = 554 μm (448–622); a = 12.2 (9.3–14.6); b = 4.5 (3.7–5.5); c = 12.1 (10.3–16.6); V = 85.5% (82.2–88.2); stylet = 83.5 μm (65.0–88.4); R (annule number) = 84 (70–88). Collected from the rhizosphere of *E. mollis* at Kuluk Bay, Adak Island, Alaska, 22 August 1979.

Amchitka Island specimen: Female (1): L = 470 μm ; a = 10.6; b = 4.3; c = 11.2; V = 85.8%; stylet = 79.2 μm ; R = 81. Collected from the rhizosphere of *E. mollis* growing on a beach terrace on Amchitka Island, Alaska, 8 August 1979.

These females appear morphologically identical to those of *Criconemoides quasidemani* Wu, 1965, which was synonymized with *N. longulum* by De Grisse (7).

Cerchnotocriconema, n. gen.

Diagnosis: Criconematidae, Criconematinae. Annules of adult female coarse, covered with irregular plates or pebble-like protuberances on anterior and posterior edges, but without spines or lobes. First annule offset by a narrow second annule. Labial disc rectangular, four submedian pseudolips well-developed, lateral pseudolips less prominent. Vulva closed. Spear long and stout. Annules of third- and fourth-stage juveniles ornamented with prominent, flattened lobes tipped with 3–7 minute denticles; lobes in 12 longitudinal rows at midbody. Lobes of second-stage juvenile arranged in alternating longitudinal rows.

Type species:

Cerchnotocriconema psephinum n. sp.

Relationship: *Cerchnotocriconema* n. gen. is morphologically similar to *Serispinula* (Mehta & Raski, 1971) Khan *et al.*, 1976 in external structure of the lip region and ornamentation of third- and fourth-

stage juveniles. In addition, the annular ornamentation of *Cerchnotocriconema* resembles that of specimens identified as *S. seymouri* (see below), which have weakly developed protuberances or plates on the anterior edges of the annules and a slight but distinct roughening on the posterior edges. However, adult female *Cerchnotocriconema* have highly developed plate-like or pebble-like protuberances on both edges of the annules and lack the finger-like groups of lobes of *Serispinula* spp. Second-stage juveniles of this new genus possess body ornamentation not arranged in longitudinal rows, a character thus far known only in *Hemicriconemoides* Chitwood and Birchfield, 1957 (6,10).

The generic name consists of the Greek word *cerchnotos*—roughened—and the family's type generic name, *Criconema*.

Cerchnotocriconema psephinum, n. sp.
Figs. 1–16; Tables 1, 2

Measurements and ratios for type specimens are given in Table 1, and for post-embryonic juvenile stages in Table 2.

DESCRIPTION: *Female* body stout, tapering anteriorly (Fig. 2), straight or slightly curved when heat-relaxed. Head with two annules, the second much narrower and setting off the first (Fig. 4). Labial region rectangular; submedian pseudolips well developed, more prominent than the lateral pseudolips (Fig. 3). Stylet robust, knobs cupped on anterior surface. Basal bulb scarcely developed, sides parallel (Fig. 5). Excretory pore 2–4 annules posterior to the basal bulb. Female gonad outstretched, often nearly reaching to the esophagus. Spermatheca poorly developed or apparently absent. Vagina straight; vulva closed (Fig. 10), lips rounded and extending posteriorly (Fig. 11). Tail conical-pointed (Figs. 2, 10). Anterior and posterior edges of annules ornamented with oval or angular plates, the middle region of each annule covered with minute projections and/or punctations (Figs. 4, 9–11). Lobes or spines absent except for a few diminutive lobes on the last few tail annules.

Third- and fourth-stage juveniles: Body of third- and fourth-stage juveniles similar in morphology. Lip region similar to that of female (Fig. 7). Annules ornamented

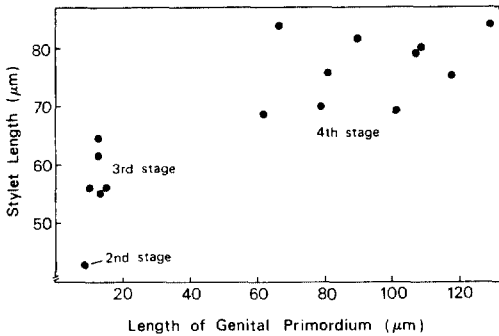


Fig. 1. Segregation of postembryonic juvenile stages of *Cerchnotocriconema psephinum*, n. gen., n. sp., by stylet length and genital primordium length.

with flattened, plate-like spines multi-dentate along their edges (Figs. 6–8, 12); spines arranged in 12 longitudinal rows at midbody. Tail conical, pointed.

Second-stage juvenile: Head region rounded, not distinctly offset (Fig. 14). Body ornamented with blunt spines arranged in alternating longitudinal rows and minutely dentate on their edges (Figs. 13–16). Tail short-conical, pointed.

No males seen.

TYPES, TYPE HOST, AND LOCALITY: Holotype female (T-344t) collected from rhizosphere of *Geranium erianthum* DC. at Finger Bay, Adak Island, Alaska, 28 August 1979; paratype females and juveniles (T-2865p–T-2869p) collected at the same locality and date from the rhizospheres of *G. erianthum*, *Anemone narcissifolia villosissima* (DC.) Hult., *Carex macrochaeta*

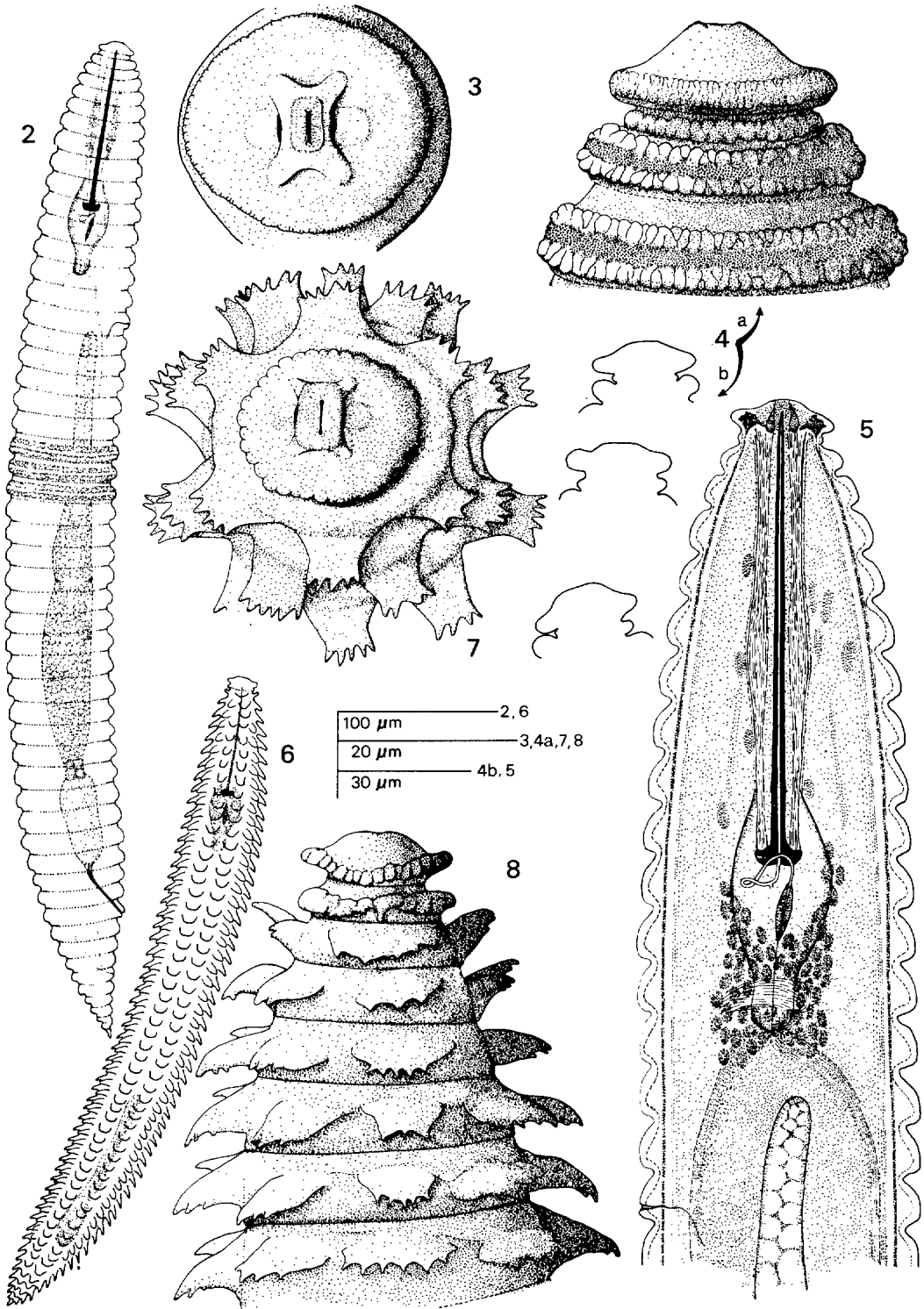
C. A. Mey., *Lupinus nootkatensis* Donn, and *Plantago macrocarpa* Cham. & Schlet. Additional specimens collected at the 420-m level of Mt. Moffett, Adak Island, 25 August 1979, from the rhizosphere of *Elymus mollis* Trin.

DISCUSSION: The genital primordium of third-stage juveniles is scarcely more developed than that of the second stage. The length of the primordium, when plotted against stylet length, clearly separates the juvenile stages (Fig. 1). Other characters, such as body length, annule number (R), and stylet length alone do not give sharp distinctions among these life stages (Table 2).

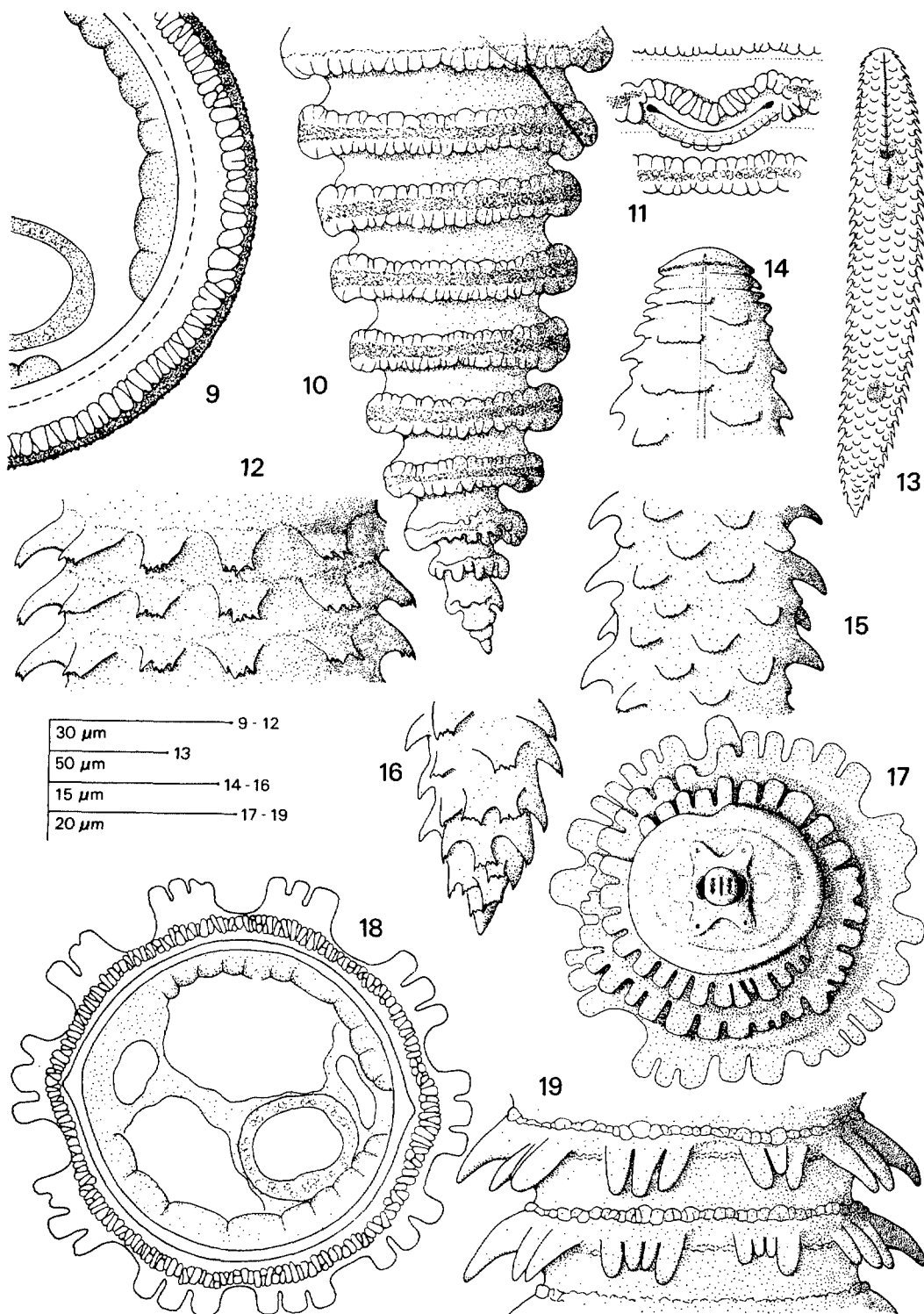
In *C. psephinum*, the number of body annules tends to decrease as the nematode matures: second-stage juvenile, R = 66; third-stage, 56–63; fourth-stage, 54–60; female, 51–60 (Tables 1, 2). A similar decline exists for *Seriespinula venusta* (Mehta and Raski, 1971) Khan et al., 1976 (13): 91–97; (87–91; 82–91; 76–90, second, third, fourth, female, respectively). Knobloch (12) reported annule number in *Criconema octangulare* (Cobb, 1914) Taylor, 1936 (= *Ogma octangulare* [Cobb, 1914] Schuurmans-Stekhoven & Teunissen, 1938) as fairly constant from second to fourth stage, but females averaged fewer annules (75; 74; 73–75; 67–75). The close similarity in annule number trends between *C. psephinum* and a species of *Seriespinula* is a further indication of the relatively close relationship between the two genera.

Table 1. Measurements and ratios for *Cerchnotocriconema psephinum*, n. gen., n. sp.

	Holotype female	Paratype females			
		N	Mean	Range	SD
Length (μm)	672	21	644	588–735	41.7
Stylet length (μm)	105	21	102	94–108	3.85
Stylet base width (μm)	10.0	21	10.1	8.2–10.9	0.77
a	10.7	21	9.5	8.0–11.0	0.85
b	4.4	20	4.5	3.9–5.3	0.36
c	23.2	19	18.0	14.7–23.4	2.43
V(%)	87.0	21	87.7	86.1–88.8	0.72
Gonad as % of body length	47.6	21	59.2	42.0–76.1	8.48
R _{total}	58	21	54.7	51–60	2.39
R _{esophagus}	14	20	13.5	11–15	1.00
R _{excretory pore}	18	17	16.8	15–18	1.01
R _{post-vulva}	10	21	10.1	9–11	0.83
R _{post-anus}	6	19	6.0	5–7	0.60



Figs. 2-8. *Cerchmotocriconema psephinum* n. gen., n. sp. 2) Female, entire. 3) Females, *en face* views. 4) Females, head region and outlines of head regions. 5) Female, anterior region. 6) Fourth-stage juvenile, entire. 7) Fourth-stage juvenile, *en face* view. 8) Fourth-stage juvenile, head region.



Figs. 9-19. *Cerchnotocriconema psepthinum* n. gen., n. sp. 9) Female, mid-body cross-section. 10) Female, lateral view of posterior region. 11) Female, ventral view of vulva. 12) Fourth-stage juvenile, mid-body region. 13) Second-stage juvenile, entire. 14) Second-stage juvenile, anterior region. 15) Second-stage juvenile, mid-body region. 16) Second-stage juvenile, posterior region. *Seriespinula seymouri* (Wu) Khan, Chawla, & Saha. 17) Female, *en face* view. 18) Female, mid-body cross-section. 19) Female, mid-body region.

Table 2. Measurements and ratios for juvenile *Cerchnotocriconema psephinum*, n. gen., n. sp.

	2nd stage (n = 1)	3rd stage (n = 5)		4th stage (n = 10)	
		Mean	Range	Mean	Range
Length (μm)	196	278	263 - 296	419	337 - 485
Stylet length (μm)	43.0	58.6	55 - 65	76.7	69 - 84
a	10.6	8.9	8.5- 9.5	9.2	8.4- 10.9
b	2.6	3.0	2.9- 3.2	3.5	3.1- 4.0
R	66	59	56 - 63	56	54 - 60
Length of genital primordium (μm)	7.8	13.0	10 - 15	94.3	62 - 129

The specific name is derived from the Greek word *psephinos*—pebbly—referring to the ornamentation of the annules.

Seriespinula seymouri (Wu, 1965)

Khan, Chawla & Saha, 1976

Figs. 17-19

Females (7): L = 476 μm (426-522); a = 11.1 (10.5-11.3); b = 4.8 (4.4-5.2); c = 13.9 (12.1-16.0); V = 85.8% (82.2-91.9); stylet = 59.3 μm (55.8-63.1); R = 62 (60-64). Collected from the rhizosphere of *Arnica unalaschcensis* Less. (Asteraceae), at the Finger Bay dump area, Adak Island, Alaska, 26 August 1980.

The submedian pseudolips of examined specimens seemed much more prominent than the lateral pseudolips when viewed with an interference microscope (Fig. 17). Ebsary (9) presented a SEM photograph of *S. seymouri* in which the submedian pseudolips appear slightly larger than the lateral ones. The body annules of the Aleutian *S. seymouri* bear, besides finger-like projections or lobes, plate-like protuberances on the anterior edge and slight but noticeable roughening on the posterior edge (Figs. 18, 19) similar to the ornamentation of the new genus and species described above. This character, which apparently has not been observed by previous authors (9,13,18), may indicate a close relationship between *Seriespinula* spp. and the new genus, *Cerchnotocriconema*.

Hemicycliophora amchitkaensis, n. sp.

Figs. 20-27; Table 3

Measurements and ratios for type specimens are presented in Table 3.

DESCRIPTION: *Female* sheath loosely

appressed to body. Annules rounded on body, more or less flattened on sheath. Lateral field indicated by breaks or anastomoses (Fig. 25); annule surface with very faint longitudinal wrinkling. Amphid apertures prominent; lips not clearly defined (Fig. 21). Head region rounded, with one annule; labial disc protuberant (Fig. 23). Stylet knobs mostly rounded, sloping posteriorly (Fig. 24). Excretory pore usually two annules behind hemizonid (Fig. 22). Gonad outstretched, spermatheca poorly developed and without sperm (Fig. 20). Vulval lips protuberant but not markedly elongated (Fig. 26); body narrowed immediately behind vulva. Tail basically conical, curving more dorsally; tail tip slightly offset, narrowly rounded (Fig. 27).

Male not seen.

TYPES, TYPE HOST, AND LOCALITY: Holotype female (T-345t) and paratype females (T-2870p) collected from rhizosphere of *Elymus mollis* Trin. growing on a beach terrace, Amchitka Island, Alaska, 30 August 1978.

DIAGNOSIS: In a recent review of *Hemicycliophora* by Brzeski and Ivanova (5), *H. amchitkaensis* n. sp. will be identified as *H. similis* Thorne, 1955 or *H. zuckermani* Brzeski, 1963. However, *H. similis* and *H. zuckermani* have two head annules rather than one. The labial disc of *H. amchitkaensis* is flattened in outline, but that of *H. similis* is rounded. *H. zuckermani* is much shorter than *H. amchitkaensis* (670-1,000 μm [4] vs. 1,145-1,365 μm) and the esophagus is comparatively shorter (b = 4.4-5.8 vs. 5.9-6.8).

The specific name refers to Amchitka Island, the type locality of *H. amchitkaensis*.

Table 3. Measurements and ratios for *Hemicycliophora amchitkaensis*, n. sp.

	Holotype female	Paratype females (n = 5)	
		Mean	Range
Length (μm)	1,365	1,269	1,145 - 1,355
Stylet length (μm)	95.8	91.9	89.8 - 93.3
a	28.7	27.5	25.2 - 29.3
b	6.6	6.3	5.9 - 6.8
c	9.2	9.1*	8.3 - 9.9
V(%)	83.9	85.7	82.9 - 89.9
Gonad as % of body length	55.3	50.5	32.2 - 68.6
VL/VB	5.4	5.0	4.5 - 5.6
Excretory pore to head (μm)	229	217	202 - 239
R _{total}	285	284	275 - 295
R _{stylet}	22	23	21 - 24
R _{excretory pore}	49	51	47 - 54
R _{vulva}	229	227	216 - 236
R _{vulva to anus}	17	20*	19 - 21

*Tail measurable only on two specimens.

Paratylenchus amundseni, n. sp.
Figs. 28-36; Table 4

Measurements and ratios of type specimens are given in Table 4.

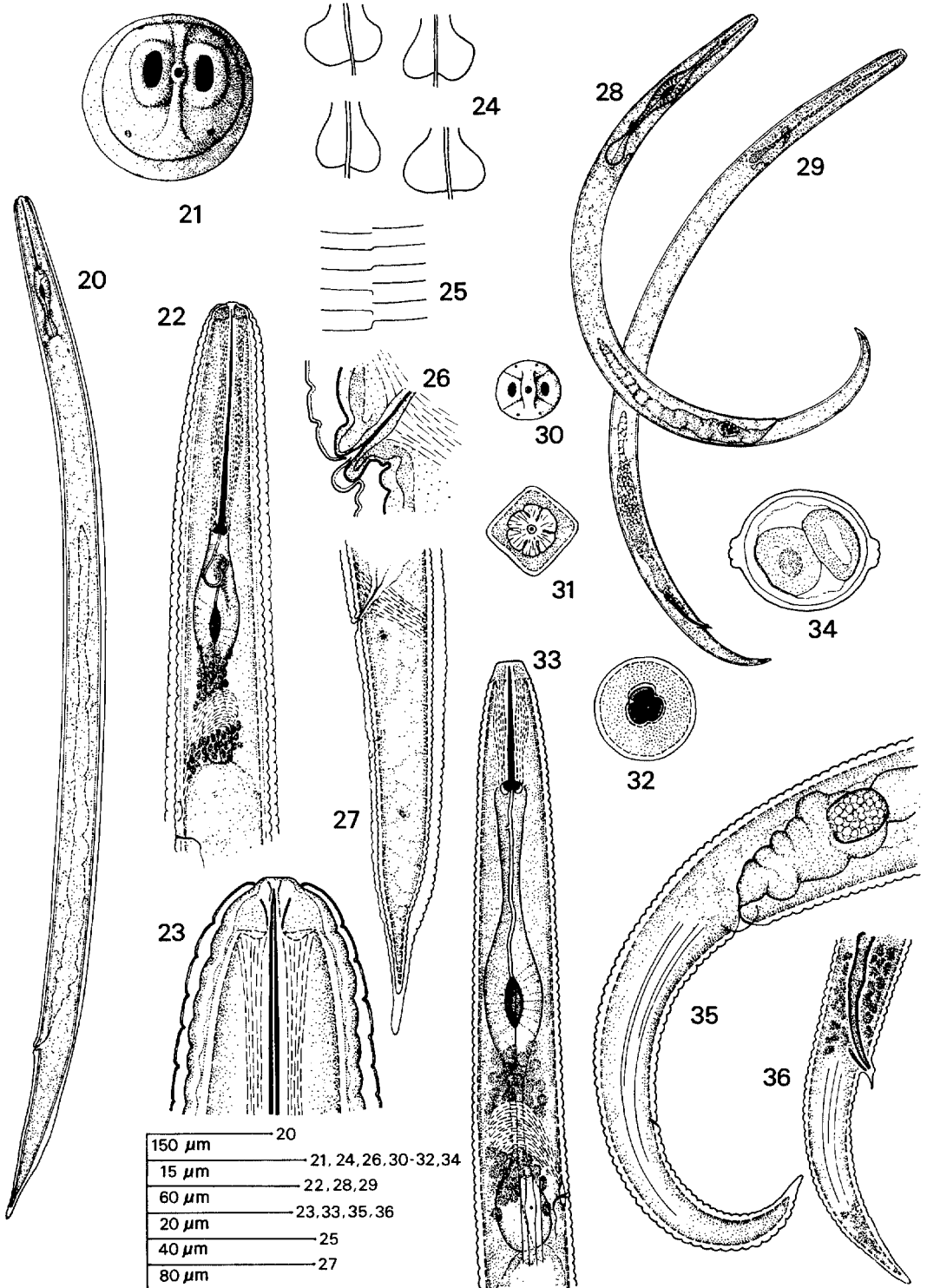
DESCRIPTION: *Female* assuming a slightly curving to C-shape when heat-relaxed (Fig. 28). Head conoid-truncate, smooth, continuous with body contour; lips not protuberant (Fig. 33). Anterior surface of head broadly oval (Fig. 30); body square in cross-section at mid-stylet level, and round at stylet knob level (Figs. 31, 32). Stylet slender, knobs rounded and consisting of two distinct regions: the knobs proper, and thinner, rounded posterior extensions visible both laterally (Fig. 33) and

from above (Fig. 32). Excretory pore, hemizonid, and deirids all in region of basal bulb (Fig. 33), the excretory duct passing through the hemizonid. Gonad outstretched; spermatheca round or oval and filled with sperm (Fig. 35); post-uterine sac absent. Vulval flaps well developed. Tail slender-conoid, evenly tapering to non-annulated, finely rounded tail tip (Fig. 35). Lateral field with four incisures at midbody.

Males curved when heat-relaxed (Fig. 29). Lip region rounded-truncate. Stylet absent, elements of esophagus barely discernible. Excretory pore near posterior end of esophagus. Testis outstretched. Spicules curved slightly; gubernaculum linear; anal

Table 4. Measurements and ratios for *Paratylenchus amundseni*, n. sp.

	Holotype female	Allotype male	Paratype females (n = 16)			Paratype male
			Mean	Range	SD	
Length (μm)	347	346	352	316 - 373	14.3	312
a	23.3	33.1	22.6	19.4 - 25.4	1.54	29.9
b	3.9	3.5	4.0	3.6 - 4.6	0.22	3.3
c	10.1	9.3	10.9	9.0 - 13.5	1.40	9.5
Stylet length (μm)	18.8		18.1	16.9 - 18.8	0.52	
Stylet knobs to dorsal gland orifice (μm)	4.1		4.3	3.3 - 5.0	0.52	
Excretory pore to head (μm)	74.5	73.0	74.3	65.6 - 79.0	3.87	71.5
V(%)	79.8		78.3	76.1 - 80.4	1.41	
Gonad as % of body length	49.9	31.0	38.2	23.9 - 50.3	8.38	28.7
Spicule length (μm)		20.0				17.8
Gubernaculum length (μm)		3.7				3.3



Figs. 20–36. *Hemicycliophora amchitkaensis* n. sp. 20) Female, entire. 21) Female, *en face* view. 22) Female, anterior region. 23) Female, head region. 24) Female, stylet knobs. 25) Female, lateral field. 26) Female, vulva. 27) Female, posterior region. *Paratylenchus amundseni* n. sp. 28) Female, entire. 29) Male, entire. 30) Female, *en face* view. 31) Female, cross-section posterior to cephalic region. 32) Female, cross-section at stylet knobs. 33) Female, anterior region. 34) Female, midbody cross-section. 35) Female, posterior region. 36) Male, posterior region.

sheath with prominent, curving projection on posterior edge (Fig. 36). Tail slender, conoid, tapering to a finely rounded tip. Lateral field probably with four incisures (three on tail), the inner ones exceedingly faint.

Fourth-stage juvenile completely lacking a stylet.

TYPES, TYPE HOST, and LOCALITY: Holotype female (T-346t), allotype male (T-347t), and paratype females and male (T-2871p-T-2876p) collected from rhizosphere of *Elymus mollis* Trin. at Shagak Bay, Adak Island, Alaska, 29 August 1978.

DIAGNOSIS: *Paratylenchus amundseni* n. sp. is very similar in morphometric characters to *P. tateae* Wu & Townshend, 1973 and *P. labiosus* Anderson & Kimpinski, 1977. However, both of the latter species have protuberant submedian lips, whereas *P. amundseni* has a conoid-truncate head. In addition, the spermatheca of *P. tateae* is poorly developed or absent (1,19), whereas in *P. amundseni* it is well-developed and filled with sperm. The male of *P. amundseni* has a relatively longer tail ($c = 9.3-9.5$) than that of *P. labiosus* ($c = 11-13$). In Raski's key (15) *P. amundseni* will be identified as *P. halophilus* Wouts, 1966, but *P. halophilus* has a much longer stylet (26-30 μm vs. 17-19 μm), a normally digitate tail in both sexes, and a much shorter male tail ($c = 12-17$ vs. 9.3-9.5).

This species is named for Dr. Clifford Amundsen, University of Tennessee Ecology Program, whose studies of the Aleutian flora led to the collection of this and many other nematode species.

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