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Studies on the Free-living Marine Nematodes from Hokkaido, I

By

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(With 4 Text-figures)

As to the present, the free-living marine nematode fauna in Japan has been poorly known, and scarcely about 30 species can be enumerated (Steiner and Höppli, 1926; Tokioka, 1949; Allgen, 1951; Wieser, 1955). This poverty in taxonomic knowledge on Japanese marine nematodes would be one of the most severe problems preventing the advance in the ecological study of the marine benthic communities in Japan. While I have investigated the phytal animals in *Sargassum* community in Hokkaido (Kito, 1975), I have realized the strong necessity to study free-living marine nematodes. In the present paper, as the first report of serial taxonomic works of free-living marine nematodes in Hokkaido, four species, all new to Japan and two of which are new to science, are described.

Specimens were collected from Oshoro on Japan Sea Coast of Hokkaido by means of so-called weed-washing, using a plankton net of the mesh number NXX 13 of Japanese standard (0.094 mm meshes). They were preserved in 70 per cent ethyl alcohol or 5 per cent formaline-seawater solution, and mounted in glycerine or glycerine jelly. All the type specimens are deposited in the Zoological Institute, Faculty of Science, Hokkaido University.

Before going further I am very grateful to Professor Dr. M. Yamada for his guidance and reading the manuscript. Sincere thanks are also due to Dr. S. A. Gerlach, Dr. F. Riemann and Dr. R. M. Warwick for their useful advices and encouragements.

Abbreviations

L = body length; eso = esophagus length; hd = head diameter at the level of cephalic setae; bd = body diameter at the base of esophagus; ad = anal diameter (cloacal diameter); mbd = maximum body diameter; cs = length of cephalic setae, longer+shorter; amp = distance of amphids from anterior (width \times length); nr = distance of nerve ring from anterior; ep = distance of excretory pore from anterior; ea = distance of excretory ampulla from anterior; vg = distance of the posterior end of ventral gland from anterior; t = tail length; spic

= spicule length; gub = gubernaculum length; vd = body diameter at the level of vulva; v = distance of vulva from anterior; **a, b, c, V (%)** = De Man's ratios.

All measurements are in micra.

Family Enoplidae

Enoplus anisospiculus Nelson, Hopper and Webster, 1972

(Fig. 1)

Measurements

Males (2): L=5735.5606, eso=998.898, hd=80.73, bd=140.136, ad=110.110, mbd=162.158, cs=24+17.28+22, amp=37 (9×7)·38 (7×5), nr=394.361, ep=344.307, vg=751.793, t=268.289, spic=264+215.272+197, gub=92.85, a=35.40·35.48, b=5.75·6.24, c=21.40·19.40.

Females (2): L=5732.5677, eso=983.1000, hd=84.91, bd=131.168, vd (mbd)=142.188, ad=92.109, cs=28+21.27+20, amp=34 (9×5)·44(12×7), nr=403.425, ep=329.370, vg=890.894, t=290.311, a=40.37·30.20, b=5.83·5.68, c=19.77·18.25, V=59.5·57.0.

Cuticle apparently smooth but with almost imperceptible fine punctations. Short setae sparsely on the whole body.

Head (Fig. 1-1) covered with thick cephalic capsule, 50-64 μ or 64-70% of head diameter long. Six labial papillae on the lips. Mandibles stout, 37-45 μ or about a half of head diameter long. Cephalic setae arranged into a circle of 6+4, and the length less than 0.4 head diameters. Among cervical setae, four submedian short setae slightly behind the cephalic capsule and two short setae at more posterior area. Amphids pocket-like shape, at anterior side of mandibular base; aperture about 4 μ wide. Pigment spots at about one head diameter long from the anterior end. Esophagus (Fig. 1-2) cylindrical and muscular; nerve ring narrow at about 0.4 esophagus length. Excretory pore opening before nerve ring; excretory ventral gland situated at 75-88% of esophagus length, slightly reflexed. Tail conoid, gradually tapering to spinneret in female (Fig. 1-5) but in male ventral side archwise (Fig. 1-3); respectively, about 3.1 and 2.5 anal diameters long.

Male. Testes paired, opposed and outstretched; 63% of body length. Spicules (Fig. 1-4) asymmetrical, right 2.5 and left 1.9 anal diameters long; proximally like a knob and with 6-9 semicircular plates on the ventral curved surface, distal 0.2 length pointed. Gubernaculum proximally tended to cover the spicules, more cuticularized. Preanal supplement large trumpet-shaped at 2.6-2.8 anal diameters before the cloaca, 108.116 μ . Preanal setae densely present between anus and preanal supplement, 41 μ at maximum length. Postanal setae two and stout, 8-16 μ .

Female. Ovaries paired, equal, opposed and reflexed at about 0.2 body length before and after the vulva. Vulva just behind the middle of the body. No eggs observed in uterus.

Remarks. The present material is easily identifiable with *Enoplus anisospiculus* from the structure of spicules in male. Most characters of the present specimens are very similar to the original description and figures by Nelson et al. (1972), though amphids situate more anteriorly and the tail length is somewhat elongated in the present material.

Material studied. Three males and two females. 1 ♂ (26-IX-1975, Kito leg.): Oshoro, among algae in the *Sargassum* region. 2 ♂♂ and 2 ♀♀ (27-X-1975, Kito leg.): Oshoro, on *Laminaria* holdfasts.

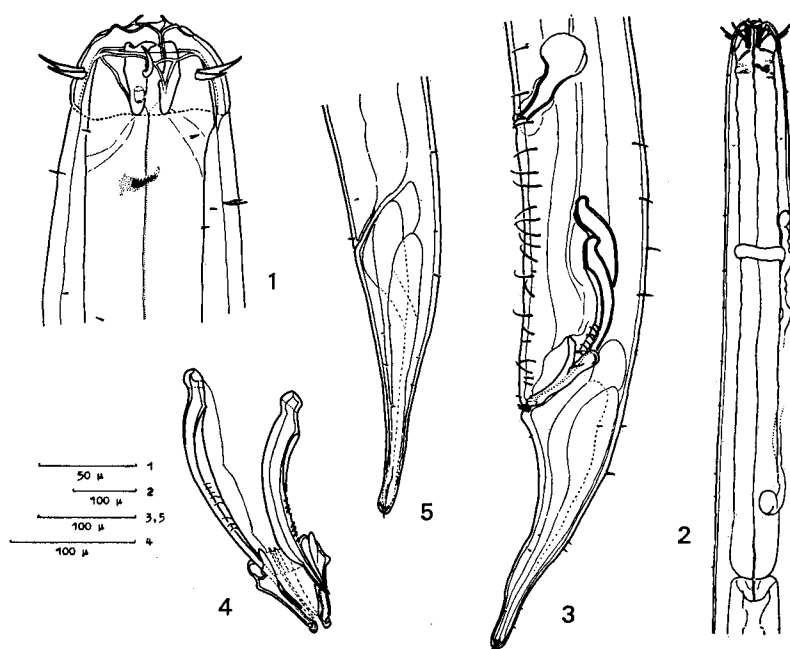


Fig. 1. *Enoplus anisospiculus* Nelson, Hopper and Webster, 1972
1. male head; 2. anterior end; 3. posterior end; 4. spicules and gubernaculum, ventral view; 5. posterior end of female.

Family Cyatholaimidae

Acanthonchus (Seuratiella) tridentatus n. sp.

(Fig. 2)

Measurements

Holotype ♂: L=1194, eso=150, hd=19, bd=41, mbd=46, cs=5+4, amp=11 (8×7), nr=87, ep=26, vg=263, t=103, spic=39, gub=36, a=25.96, b=7.96, c=11.59.

Allotype ♀: L=1153, eso=151, hd=21, bd=41, ad=35, vd(mbd)=49, cs=5+4, amp=14 (6×5), nr=87, ep=28, vg=254, t=111, v=584, a=23.53, b=7.64, c=10.39, V=50.7.

Paratypes ♂♂(4): L=833-1350, eso=106-161, hd=14-18, bd=28-43, ad=28-42, mbd=33-48, cs=2-4+2-3, amp=8-13 (5-8×5-8), nr=59-91, ep=20-30, vg=182-296, t=73-123, spic=34-40, gub=26-37, a=25.24-28.13, b=7.86-8.39, c=10.98-11.71.

Paratypes ♀♀(4): L=810-1358, eso=111-166, hd=13-19, bd=28-44, ad=25-40, vd(mbd)=33-58, cs=3-7+2-4, amp=5-13 (5-6×4-6), nr=62-95, ep=19-25, vg=158-314, t=78-122, v=415-659, a=23.21-26.12, b=7.30-8.18, c=10.02-11.48, V=48.0-51.2.

Body (Fig. 2-1, 5) slender, curved ventrally; anterior blunt and posterior gradually tapering. Cuticle striated with transverse rows of minute punctations; anterior and posterior differentiation. Short setae and pores distributed.

Head (Fig. 2-2) truncated and labial papillae indistinct. Cephalic setae 6+4 and cervical setae short. Buccal cavity shallow, 6-10 μ , supported by cuticular rods; dorsal tooth very weak. Esophagus slender and cylindrical; surrounded by nerve ring just behind the middle of esophagus. Amphids spiral, 3-3 $\frac{1}{3}$ turning at a short distance from anterior and 21-33% of corresponding diameter in width. Ocelli not observed. Excretory pore at anterior 1.3-1.7 head diameters long; ventral gland at 168-189% of esophagus from anterior, followed by a small cell. Tail (Fig. 2-3, 6) conical to blunt point with the spinneret, 2.4-2.9 anal diameters long in male and 2.9-3.5 in female; three caudal glands present.

Male. Testes paired and opposed, 58-61% of body length from anterior to cloaca. Spicules (Fig. 2-4) slightly curved, swelling at the middle part and distally narrowed, 1.0-1.4 anal diameters long. Gubernaculum heavily cuticularized and complicated at dilated distal part, 0.8-0.9 spicule length; distal ends, 9 μ wide, bearing a circle or two rows of small pointed processes and typical three large ones. Six preanal supplements present and the anteriormost one larger and more cuticularized than any posterior ones, especially posterior two tubuli very small, about 3 μ ; each length of anterior four, 26-31, 13-17, 11-16 and 8-13 μ ; distance between the anteriormost and second, the second and third, the third and fourth, the fourth and cloaca, respectively, 2.1-2.9, 1.4-1.8, 1.0-1.2 and 0.6-0.7 anal diameters long and posterior two tubuli just in front of cloaca. Two postanal setae somewhat stout, 6-8 μ long.

Female. Ovaries paired, opposed and reflexed; the anterior 14-15 and the posterior 14-16% of the body length. Vulva at about the middle of the body. Eggs 25-44×41-60 μ in size, one in each uterus.

Remarks. In the two subgenera, *Acanthonchus* Cobb 1920 and *Seuratiella* Ditlevsen 1921, of the genus *Acanthonchus* Cobb 1920, only a species of the former subgenus *A. (A.) setoi* Wieser, 1955, has been hitherto known in Japan. From the presence of a weak dorsal tooth of the present new species, although any ocelli

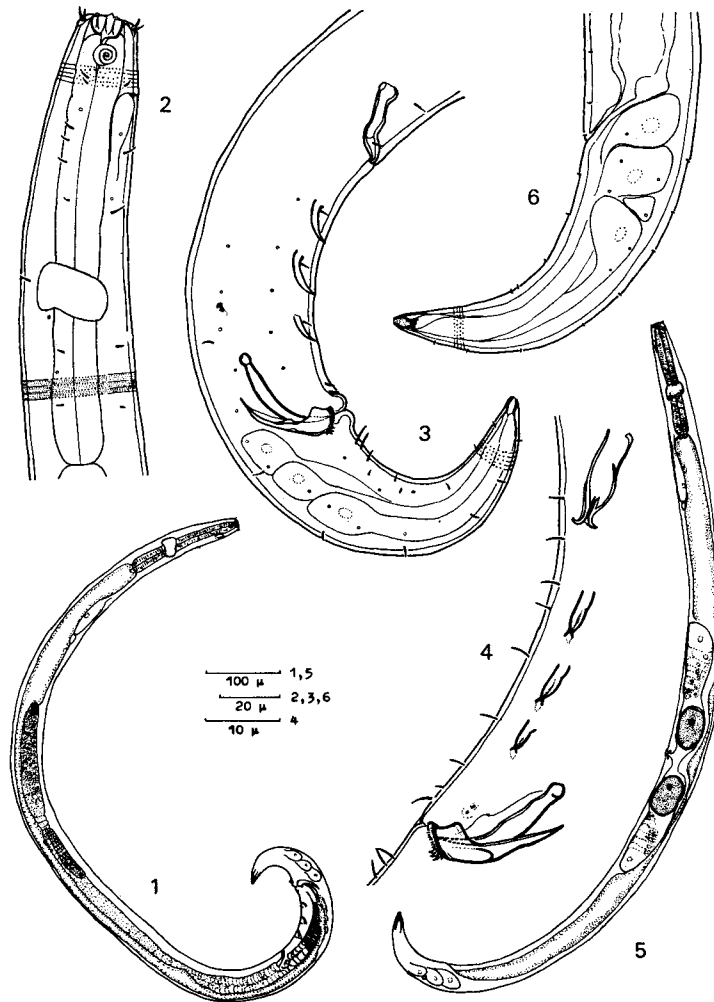


Fig. 2. *Acanthonchus (Seuratiella) tridentatus* n. sp.

1. male; 2. anterior end; 3. posterior end; 4. spicules, gubernaculum and preanal supplements of another male; 5. female; 6. posterior end.

are not observed (disappearance with the result of preservation?), it is apparent that the new species belongs to the subgenus *Seuratiella*. This species resembles *A. (A.) duplicatus* Wieser, 1959, *A. (S.) rostratus* Wieser, 1959 and *A. (S.) pugionatus* Vitiello, 1970 in the presence of six preanal supplements, though it is apparently distinguishable from the latter by the structure of gubernaculum bearing the typical three large pointed denticles at the distal end.

Material studied. Six males and five females. Holotype ♂ and allotype ♀ (11-VIII-1975), paratypes; 1♂ (9-IX-1975), 3♂♂ and 3♀♀ (26-IX-1975): Oshoro, on *Sargassum* in the subtidal zone (Kito leg.). Paratypes 1♂ and 1♀ (11 VIII-1975): Oshoro, on *Dictyopteris divaricata* in the *Sargassum* region (Kito leg.).

Family Draconematidae

Draconema japonicum n. sp.

(Fig. 3)

Measurements

Holotype ♂: L=1332, eso=129, hd=21, bd=40, ad=30, mbd=66, cs=9, amp=9 (11×15), t=124, spic=82, gub=23, a=20.18, b=10.33, c=10.74.

Allotype ♀: L=1317, eso=130, hd=26, bd=37, ad=20, vd(mbd)=90, cs=9, amp=9 (11×12), t=88, v=726, a=14.63, b=10.13, c=14.97, V=55.1.

Paratypes ♂♂(4): L=906-1378, eso=107-130, hd=17-24, bd=29-35, ad=27-33, mbd=58-66, cs=5-9, amp=8-14 (10-11×13-17), t=102-131, spic=73-78, gub=20-23, a=15.62-21.18, b=8.39-10.60, c=8.88-11.02.

Paratypes ♀♀(4): L=1246-1619, eso=123-149, hd=21-25, bd=35-44, vd(mbd)=91-110, cs=8-10, amp=6-9 (10-11×12-13), t=89-103, v=698-915, a=12.34-14.72, b=9.30-11.01, c=14.00-15.72, V=55.3-56.5.

Body (Fig. 3-1,5) characteristic for *Draconema* in general; swelling anterior part like a head, cylindrical long trunk and tail ending in a conical tip. The width at anterior part greater than in the middle part of the body in male and the swelling near the vulva in female wider than anterior swelling in width. Cuticle annulated but anterior end and the tip of the tail smooth; especially anterior 8-12 annules coarse and the others fine; these annules generally circled but some of them irregular and incomplete; cuticle thickened at the coarse annule zone. On the surface of the body numerous setae basically arranged in 8 longitudinal rows, two at each lateral side, two dorsal and two ventral; ventral rows of setae shorter than the other rows of setae at the middle part of body. Long and short setae densely distributed at anterior swelling, maximum 68 μ , furthermore, many thread-like setae scattered (visible in a higher magnification). Each kind of characteristic tubular setae arranged on the dorsal side of the head and the ventral preanal part.

Head (Fig. 3-2) smooth cuticle; the length nearly the same as the following coarse annule part. Mouth opening surrounded by six low lips, each bearing a short labial seta and two chitinous ribs. Buccal cavity narrow and tooth absent. Cephalic setae circled but indistinct in number because of overlap by other outer cervical setae. Amphids at posterior half of the head, shaped as the end of a shephred's clock; surrounded by five or six setae. On the dorsal surface between both amphids 12 stout tubular setae arranged in two transverse rows, six pairs before and after; bending ventrally and enlarged at the base, 18-32 μ long; setae

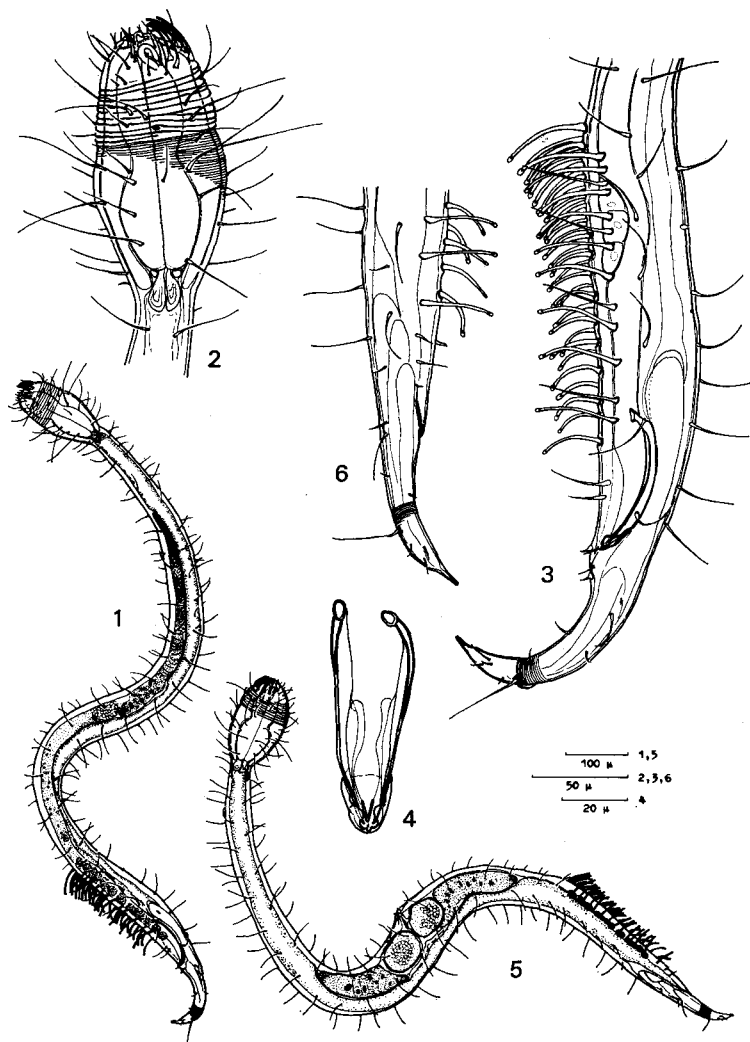


Fig. 3. *Draconema japonicum* n. sp. 1. male; 2. anterior end; 3. posterior end; 4. spicules and gubernaculum of another male, ventral view; 5. female; 6. posterior end.

of the posterior rows longer than the anterior setae and arranged almost at the boundary of the coarse annules. Esophagus 0.1 body length, with almost equal two bulbs or slightly the posterior bulb developed in both length and width. Width at the level of posterior bulb as long as the greatest body width in male. Between the cuticle and esophagus a mass of glandular cells occurring, their secretion and

nerves observed, their structures indistinct. Excretory organ and nerve ring not observed. Caudia well developed; the constriction at the level of the caudia appeared like a neck, half the maximum width of anterior swelling. Intestine of a general shape and straightforward. Tail (Fig. 3-3, 6) gradually tapering to a conical smooth tip end, 3.7-4.1 anal diameters long in male and 3.8-4.3 in female; smooth at one-third tail length, with a pair of long and short seta occurring dorsally, near the boundary of annules, and three or four setae in the middle of lateral side. Anterior caudal gland before the anus.

Male. Testis single and outstretched; started at about 0.26 body length from anterior end. Spicules (Fig. 3-4) arcuate with a proximal knob and pointed distal end, 2.3-2.8 anal diameters long. Gubernaculum short, less than one-third spicule length; distal one-third dilated around the spicule end from outside, distal inner part fused. Preanal tubular setae four rows, two ventro-lateral and two ventral; distance between the anteriormost seta and the cloaca, the posterior one and the cloaca, 6.1-8.0, 1.6-2.2 anal diameters long, respectively; inner rows 17-18 compound setae, 23-48 μ and outer rows 9 compound and 4 simple setae, 37-49 μ regularly arranged; their length decreased from anterior to posterior setae; the shape of compound seta similar to that of *Draconema cephalatum* Cobb, 1913. Between the last tubular seta and the cloaca, another two setae present and two short stout setae swelling at each base and two usual setae present on both cloacal sides.

Female. Ovaries paired, equal, opposed and reflexed at 0.13-0.21 total length before and after the vulva. Vulva behind the middle of the body; cuticle around the vulva developed and two short setae in both side. Egg covered with sheath, 65-67 \times 51-53 μ , one each uterus.

Remarks. The present new species resembles *Draconema cephalatum* Cobb, 1913 in the general feature of the body. It, however, differs from the latter species, mainly in the number of the anterior coarse annules, the shape of the gubernaculum dilated half around the distal spicule end from the outside (the present species is entirely discernible from all the congeneric species so far known in this structure), the proportion of the gubernaculum length to the spicule length, the number and the arrangement of the preanal tubular setae, and the smooth tail end with the lateral short setae.

An immature specimen under the name *Chaetosoma* sp. was reported in the Tanabe Bay, Japan by Tokioka in 1949, but his specimen is probably not identical with the present species.

Material studied. Six males and five females. Holotype ♂ (27-X-1975), allotype ♀ (26-IX-1975) and paratypes; 2♂♂ and 2♀♀ (26-IX-1975), 1♂ and 1♀ (27-X-1975): Oshoro, on *Laminaria* holdfasts (Kito leg.). Paratypes 2♂♂ and 1♀ (26-IX-1975): Oshoro, among algae in the *Sargassum* region (Kito leg.).

Family Axonolaimidae

Araeolaimus elegans De Man, 1888

(Fig. 4)

Measurements

Males (5): L=581-870, eso=96-137, hd=5-6, bd=13-21, ad=16-22, mbd=17-26, cs=2-4, amp=7-8 (3-5×4-6), nr=58-81, ep=17-23, ea=23-32, vg=160-235, t=54-81, spic=26-28, a=32.67-42.39, b=5.87-6.94, c=10.74-11.56.

Females (5): L=691-1114, eso=101-146, hd=5-6, bd=16-22, vd=18-26, ad=13-18, mbd=22-27, cs=3-4, amp=6-11 (3-4×4-5), nr=63-91, ep=-, ea=24-31, vg=166-251, t=62-99, v=350-412, a=28.28-42.04, b=6.49-7.63, c=10.59-11.71, V=49.8-51.8.

Body slender, short and cylindrical; cuticle finely striated and with short setae sparsely arranged, in cervical region and male tail in a particular way.

Head (Fig. 4-1) narrowed and mouth opening anteriorly, lips and labial papillae indistinct. Buccal cavity narrow and distinct, about one head diameter long. Four cephalic setae at anterior 0.5 head diameters length. Amphids sausage-shaped, at short distance behind the buccal cavity, 1.0-1.8 head diameter from anterior end and about 38% of corresponding body diameter in width. Ocelli at 4.3-5.2 head diameters long from anterior. Esophagus slender and with the median bulvar swelling at about one-third of esophagus. Nerve ring wide and at 61% of the esophagus from anterior end. Excretory pore opening between amphids and ocelli; but more or less indistinct; ampulla near the ocelli and ventral gland cell large, at 168% of esophagus from anterior. Cervical setae short, and scattered as a few separate positions (at both sides of amphids, between amphids and ocelli, near anterior and posterior ends of mid-swelling of esophagus, and between mid-swelling and nerve ring). Tail (Fig. 4-2,3) gradually tapering to a blunt tip and with caudal glands and spinneret; male tail 3.4-3.7 anal diameters long and in female 4.1-5.5.

Male. Testes doubling and the posterior short and reflexed; the length from anterior end of testis to the cloaca, 57% of body length. Spicules relatively long, 1.2-1.8 anal diameters and sharply bent. Gubernaculum with apophysis of 8-10 μ or 0.3-0.4 spicule length but indistinct. Postanal setae arranged in a few rows on the ventral surface of tail but their number not identical with each other.

Female. Vulva opening at middle of the body. Ovaries paired, almost equal, opposed and reflexed at about 0.2 body length to anterior and posterior from vulva.

Remarks. The present specimens examined well agree with the original description and figures of *Araeolaimus elegans* by De Man (1888) based upon the specimens from the North Sea, though some minor differences are noticed in the detailed structures. Among them, such characteristics as the shorter cephalic setae (less than 4 μ) and the somewhat larger proportion of the copulatory apparatus found in the present specimens have not so far been reported. The

arrangement of cervical setae somewhat resembles the Chilean specimens reported by Wieser (1956) rather than those by De Man, and the excretory pore is more posteriorly located as in *Coinonema punctatum* Cobb, 1920 from Florida, synonymized with *Araeolaimus elegans* by Gerlach (1953), according to the Bremerhaven Checklist of Aquatic Nematodes (Gerlach and Riemann, 1973).

Material studied. Five males and five females. 1 ♂ and 1 ♀ (9-IX-1975), 4 ♂♂ and 4 ♀♀ (26-IX-1975): Oshoro, on *Sargassum* in the subtidal zone (Kito leg.).

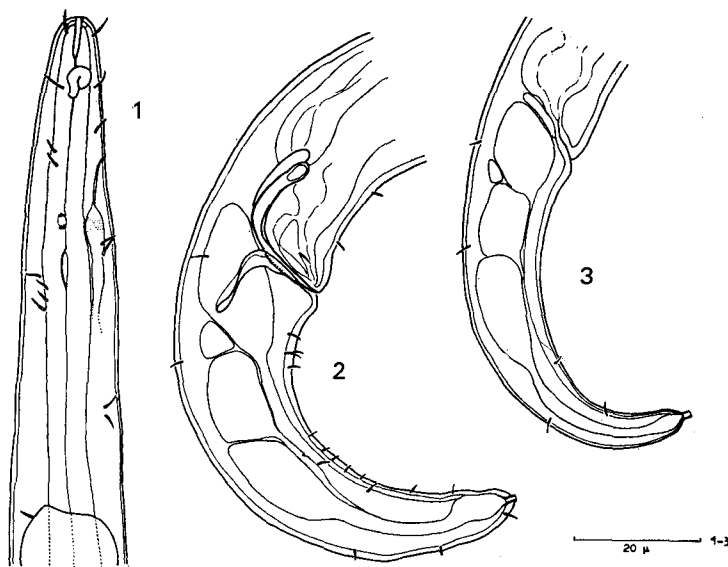


Fig. 4. *Araeolaimus elegans* De Man, 1888. 1. anterior end of male; 2. posterior end; 3. posterior end of female.

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