

Six species of the genus *Colomastix* (Crustacea: Amphipoda: Colomastigidae) from western Japan, with descriptions of two new species

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2新種を含むツツヨコエビ属6種について (甲殻亜門：端脚目)

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抄録：西日本沿岸のカイメン類から、ツツヨコエビ属6種を採集した。これらは、アズマツツヨコエビ *Colomastix azumai* Hirayama and Kikuchi, 1980, ニッポンツツヨコエビ(新称) *C. japonica* Bulycheva, 1955, カマテツツヨコエビ(新称) *C. kapiolani* J.L. Barnard, 1970, イソツツヨコエビ(新種) *C. littoralis* sp. nov., ケアシツツヨコエビ(新称) *C. plumosa* Ledoyer, 1979, およびヒメケアシツツヨコエビ(新種) *C. semiplumosa* sp. nov. である。全種について形態的特徴を記載し、検索表を作成した。これらの各種は、雄の第1・2咬脚, 第1・3尾肢, 尾節板の形態, および第2・3尾肢の剛毛の有無で識別される。

Abstract: Six species of the genus *Colomastix* were collected from sponges in the coastal areas of western Japan. Species collected are *Colomastix azumai* Hirayama and Kikuchi, 1980, *C. japonica* Bulycheva, 1955, *C. kapiolani* J. L. Barnard, 1970, *C. littoralis* sp. nov., *C. plumosa* Ledoyer, 1979, and *C. semiplumosa* sp. nov. Morphological characters of all the species are described and keys to Japanese *Colomastix* species are provided. Each species is distinguishable from one another by the shapes of gnathopods in males, uropods 1 and 3 and telson, and the setation of uropods 2 and 3.

Key Words: Amphipoda; Colomastigidae; *Colomastix*; Japan; new species

Species of the genus *Colomastix* Grube, 1861 inhabit sponges and tunicates in the world (J. L. Barnard and Karaman, 1991), and 37 species have been described so far (LeCroy, 1995). In Japan, only *Colomastix azumai* Hirayama and Kikuchi, 1980 was recorded (Ishimaru, 1994), which was collected from a sponge *Tetilla serica* (= *Craniella serica*) in Shijiki Bay, Nagasaki Prefecture.

During my survey on the amphipod fauna of shallow water in Japan, six *Colomastix* species were collected, and two of them have turned out to be new species. The present paper deals with the descriptions of all the species and provides keys to these *Colomastix* species.

Materials and Methods

The samples treated here were collected from the coastal areas of Wakayama, Osaka and Ehime Prefectures. The collections were carried out by the author, except for the materials from Kushimoto in Wakayama Prefecture collected by Y. Imahara. Hosts of *Colomastix* (sponges and rarely other animals) were collected by snorkeling or SCUBA diving in the subtidal zone and by hand in the intertidal zone. Intact specimens of *Colomastix* species were obtained mainly by breaking the sponges into fragments. Specimens were dissected and their appendages were drawn under a phase-contrast microscope. Body length was measured from the apex of rostrum along the dorsal margin to the distal end of telson. The specimens with penial papillae were determined to be males and the males having fully developed gnathopod 2 were estimated to be mature males. The females with setose oostegites were regarded as mature females. The dissected specimens including the type series are deposited in the Osaka Museum of Natural History (OMNH).

Diagnosis of *Colomastix* Grube, 1861

[modified from J. L. Barnard and Karaman (1991) and LeCroy (1995)]

Body subcylindrical, not heavily sculptured; head large, free. Antennae subequal in length, not geniculate; peduncles thick, flagella reduced; accessory flagellum absent. Mouth parts reduced except for enlarged maxilliped; mandible lacking palp, incisor and lacinia mobilis; maxilla 1, palp uniaarticulate; maxilla 2, plates fused basally; maxilliped, basal segments fused, inner plates reduced, partially or completely fused, outer plate broad, palp 4-articulate, dorsal surfaces of articles 3 and 4 covered with many short setae. Coxae short, broader than long, overlapping. Gnathopod 1 simple, elongate (often vestigial in adult males), apex of propodus bearing brush of elements composed of dactylus and long setae (except for vestigial male gnathopod 1). Gnathopod 2 in males subchelate, propodus large, dactylus strong; gnathopod 2 in females simple or weakly subchelate, carpus and propodus elongate, dactylus slender. Pereopods 3-7 short; coxal gills present on pereopods 2-6; oostegites present on pereopods 2-5 in females. Pleopods, peduncles each with 2 coupling spines, pleopod 3 shortest. Urosomite 1 without lateral pleuron; urosomites 2 and 3 coalesced. Uropods biramous, rami of uropods 1 and 3 variable especially in males. Telson entire.

Type species: *Colomastix pusilla* Grube, 1861 (monotypy).

Descriptions of *Colomastix* Species

Colomastix azumai Hirayama and Kikuchi, 1980

(Japanese name: Azuma-tsutsu-yokoebi)

(Figs. 1-4)

Colomastix azumai Hirayama and Kikuchi, 1980, pp. 133-141, figs. 1-3; Hirayama, 1983, p. 150; Ishimaru, 1994, p. 53.

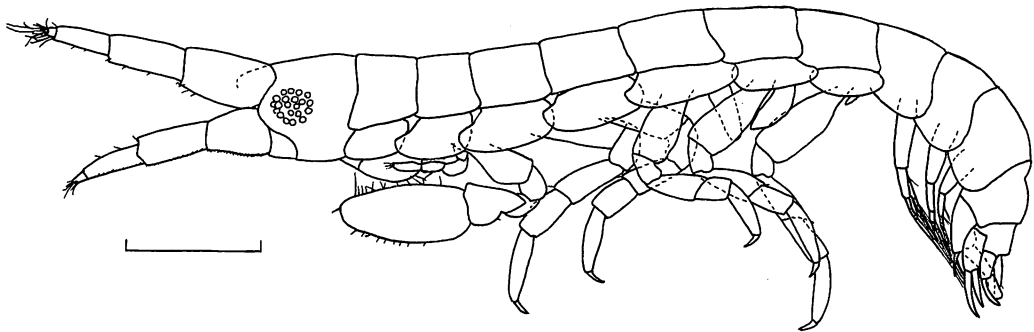


Fig. 1. *Colomastix azumai* Hirayama and Kikuchi. Male "1", 3.5mm: habitus. Scale: 0.5mm.

Material examined. Males "1"- "3" (OMNH-Ar-7025 - 7027), 3.5mm (mature), 3.5mm (immature), 2.6mm (immature), and females "1"- "3" (OMNH-Ar-7028 - 7030), 3.9mm (mature), 3.9mm (immature), 2.5mm (immature), from a sponge *Spirastrella insignis* (18m in depth) off Kamiura in Kushimoto, Wakayama Pref., 28 Nov. 2002; female "4" (OMNH-Ar-7031), 3.7mm (mature), from a sponge *Anthosigmella raromicrosclera* (18m in depth) off Kamiura in Kushimoto, Wakayama Pref., 28 Nov. 2002; male "4" (OMNH-Ar-7032), 2.8mm (immature), from a sponge *Spirastrella insignis* at Oura in Hidaka, Wakayama Pref., 8 Aug. 1987; males "5" and "6" (OMNH-Ar-7033, 7034), 4.0mm (immature), 3.8mm (mature), from a sponge *Spirastrella insignis* (8m in depth) at Hikigawa, Wakayama Pref., 2 Aug. 2003.

Description. *Mature male* [male "1", 3.5mm]. Body (Fig. 1) relatively slender; eyes medium size. Antenna 1 (Figs. 2A, A1): ratio of peduncular articles 1-3 1:0.7:0.5, articles 1 and 2 each with 5 ventral spines and a short lateral plumose seta; flagellum distinctly short, with 3 articles bearing many long setae and several aesthetascs, article 1 thick, produced distolaterally, articles 2 and 3 minute. Antenna 2 (Figs. 2B, B1): lengths of peduncular articles 3-5 almost the same, but gradually shortened, dorsomedial surfaces of articles 3-5 with 1, 4, 4 spines, respectively, dorsodistal corners of articles 4 and 5 each with 2 short plumose setae, ventrolateral margins of articles 3-5 lined with triangular spinules; flagellum short, composed of 3 articles and long setae, article 1 thick, produced dorsodistally, articles 2 and 3 minute.

Mouth parts: maxilliped (Fig. 2C), outer plate reduced, reaching half of palp article 1, inner plates completely fused.

Gnathopod 1 (Figs. 2D, D1) vestigial; coxa roundish triangular, with a few short setae ventrally; basis - propodus heavily wrinkled; distal end of propodus with corniform dactylus and several long setae. Gnathopod 2 (Figs. 2E, E1) enlarged; coxa produced anteriorly; basis greatly broadened distally, with several short setae on anterior margin; merus short, projected mediodistally, posterodistal corner rounded, with a few setae; carpus triangular, posterior and posterodistal margins setose, posteromedial surface with many fine setae and a hollow for receiving projection of merus; propodus massive, 2.3 times as long as carpus, distal half of posterior margin with 2 large projections, anteromedial and posteromedial surfaces setose, proximal half of posteromedial surface covered with many fine setae; dactylus short, robust.

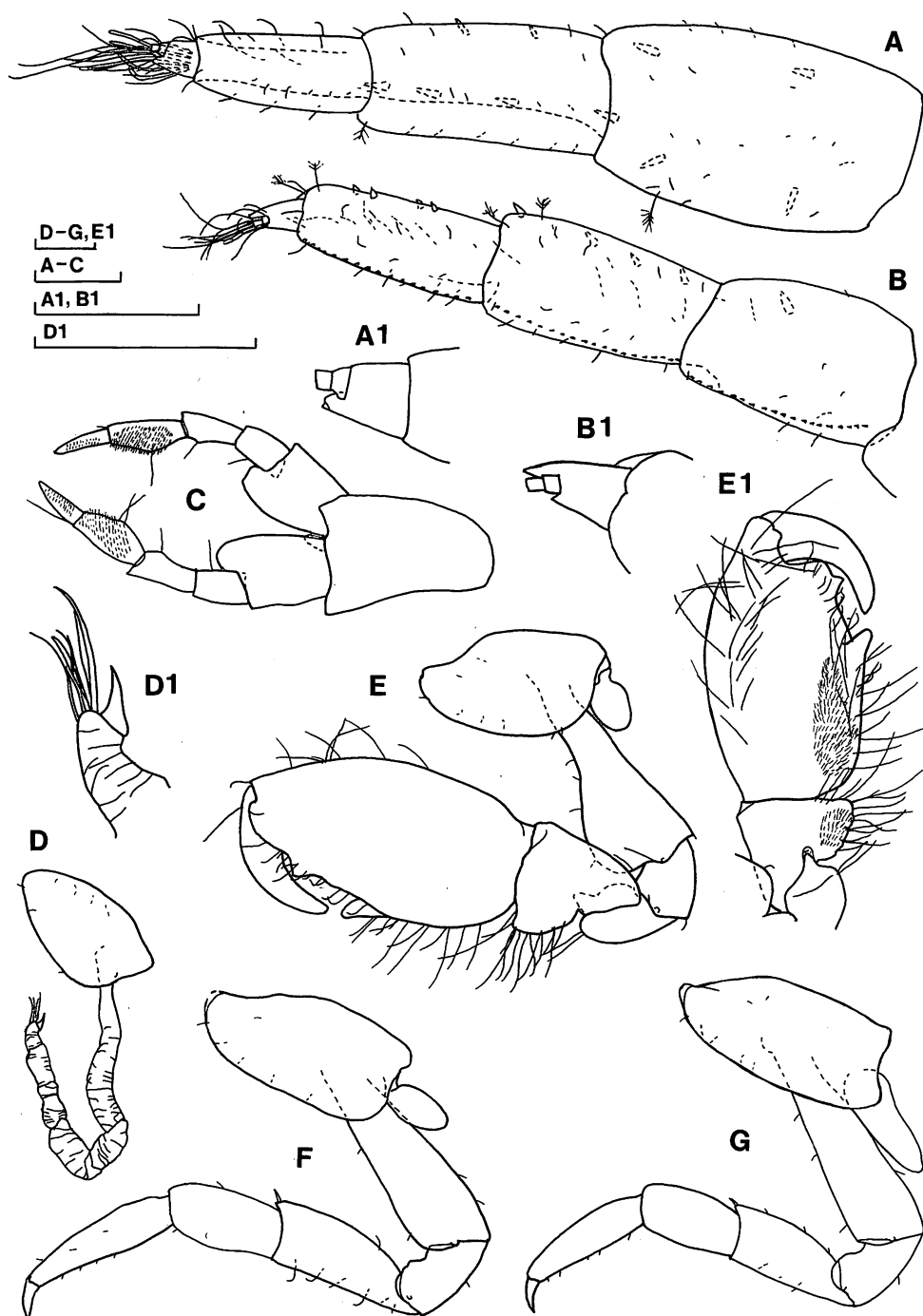


Fig. 2. *Colomastix azumai* Hirayama and Kikuchi. Male "1", 3.5mm: A, antenna 1, dorsal; A1, flagellum of antenna 1 (setae omitted); B, antenna 2, lateral; B1, flagellum of antenna 2 (setae omitted); C, maxilliped, ventral; D, gnathopod 1; D1, tip of gnathopod 1; E, gnathopod 2, lateral; E1, distal part of gnathopod 2, medial; F-G, pereopods 3-4. Scales: 0.1mm.

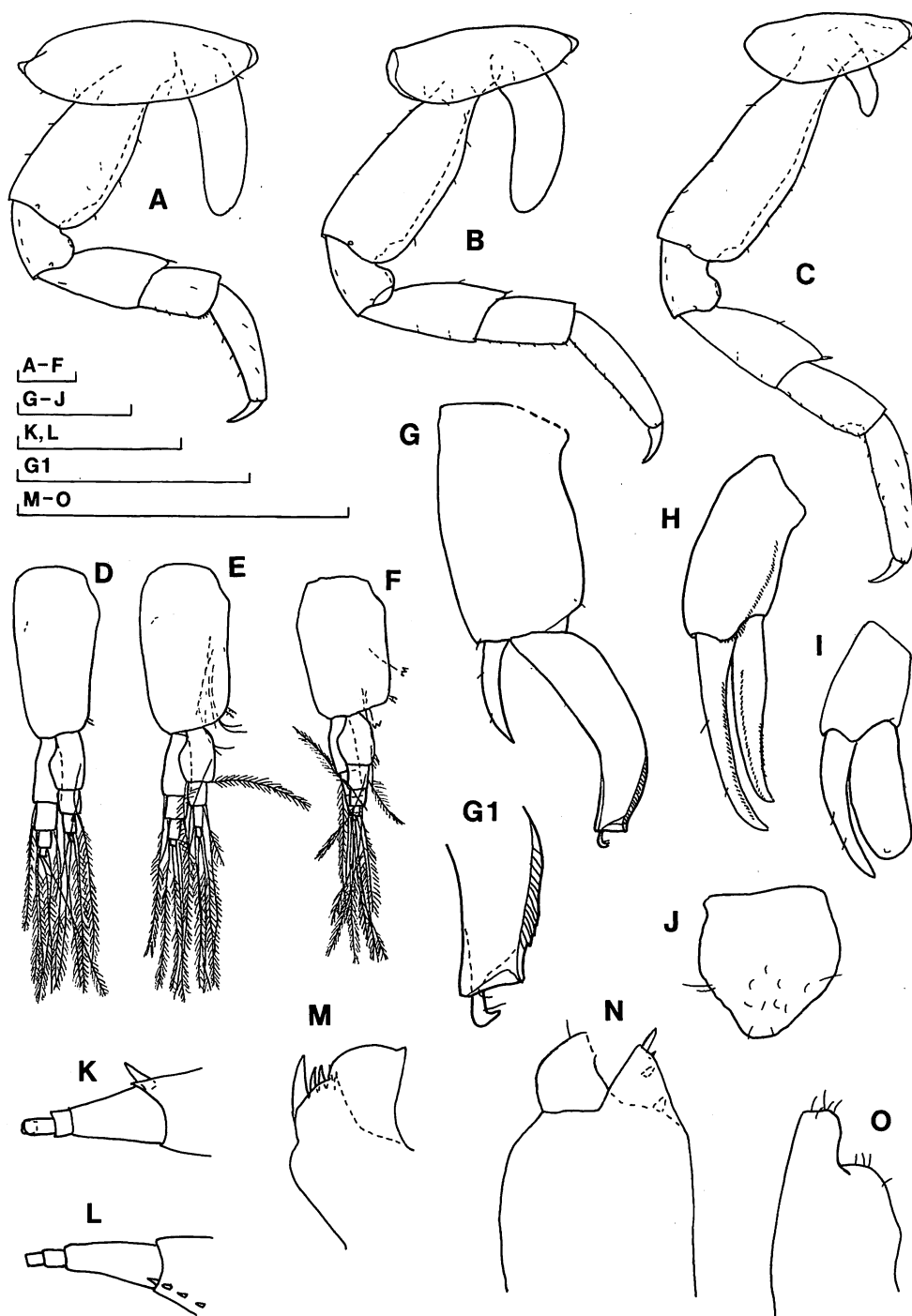


Fig. 3. *Colomastix azumai* Hirayama and Kikuchi. Male "1", 3.5mm: A-B, pereopods 5-6; C, pereopod 7 and penial papilla; D-F, pleopods 1-3; G-I, left uropods 1-3; G1, distal part of uropod 1 inner ramus; J, telson. Male "2", 3.5mm: K, flagellum of antenna 1, medial (setae omitted); L, flagellum of antenna 2, lateral (setae omitted); M, left mandible; N-O, maxillae 1-2. Scales: 0.1mm.

Pereopods: pereopods 3 and 4 (Figs. 2F, G), coxae produced anteriorly, with several short setae ventrally, bases slightly expanded distally, with a few short setae on anterior and posterior margins, anterodistal corners of ischia rounded, meri with a spine on anterodistal corners, posterior margins with 3-6 setae, propodi with 4-5 spinules posteriorly, dactyli short; pereopods 5-7 (Figs. 3A-C), coxa 5 produced anteriorly and posteriorly, coxae 6 and 7 produced posteriorly, bases relatively broad, posterodistal corners of bases and ischia rounded, meri with a spine on posterodistal corners, anterior margins with 1-2 setae, carpi with 3-6 setae anteriorly, propodi with 4-8 spinules anteriorly, dactyli short.

Pleopods (Figs. 3D-F): peduncles of pleopods 2 and 3 with several long setae; both rami each with 4 articles. Uropods: uropod 1 (Figs. 3G, G1) enlarged, peduncle wide, about 1.8 times as long as width, outer ramus small, lanceolate, about 45% length of peduncle, with 2 short setae ventrally, inner ramus wide and long, slightly shorter than peduncle, curved ventrally, apex with a small hooked projection, distal third of dorsal margin with many minute pleats; uropod 2 (Fig. 3H) medium size, outer ramus slightly longer than peduncle and inner ramus, outer margin of peduncle and outer and inner margins of both rami pectinate; uropod 3 (Fig. 3I) short, peduncle shorter than both rami, outer ramus lanceolate, longer than inner ramus, with 2 setae ventrally, inner ramus longish ovoid, with a tiny semicircular projection near the tip. Telson (Fig. 3J) roundish pentagonal, with several short setae dorsally; dorsal surface flat in lateral view (Fig. 1).

Immature male [male "2", 3.5mm]. Antenna 1 (Fig. 3K): peduncle with 2 spines on ventral margin of article 3; flagellum with 4 articles bearing several long setae and 3 aesthetascs, article 1 elongate, articles 2-4 minute. Antenna 2 (Fig. 3L): flagellum with 3 articles and long setae, article 1 elongate, articles 2 and 3 minute.

Mouth parts: mandible (Fig. 3M) reduced; maxilla 1 (Fig. 3N), outer plate with 4 spines; maxilla 2 (Fig. 3O), distal margins of both plates with several setae; maxilliped, outer plate not reduced, reaching half of palp article 2.

Gnathopod 1 (Figs. 4A, A1) elongate; coxa roundish triangular; basis slender, distal part of anterior margin with a short seta; ischium short, swollen in the middle; merus - propodus slender; distal end of propodus with needle-shaped dactylus and several long setae. Gnathopod 2 (Figs. 4B, B1) smaller than that of male "1"; distal part of basis narrower than that of male "1"; carpus longish triangular; propodus slenderer than that of male "1", 1.4 times as long as carpus, posterior margin without projections; posterolateral surface of propodus with a row of short setae; dactylus ensiform, tip with minute pleats. Gills broader than that of male "1".

Uropods: uropod 1 (Fig. 4C) smaller than that of male "1", peduncle about 1.6 times as long as width, margins pectinate, outer ramus lanceolate, about 80% length of peduncle, with pectinate margins, inner ramus wide, slightly longer than peduncle, apex with a small truncate process, outer margin pectinate; uropod 2 (Fig. 4D) a little longer than uropod 1, outer and inner rami about 1.3 and 1.4 times as long as peduncle, respectively, margins of peduncle and both rami pectinate; uropod 3 (Fig. 4E) short, both rami lanceolate, longer than peduncle, outer ramus longer and narrower than inner ramus, margins of both rami pectinate. Telson (Figs. 4F, F1) slightly narrower than that of male "1" in dorsal view, swollen dorsally in lateral view.

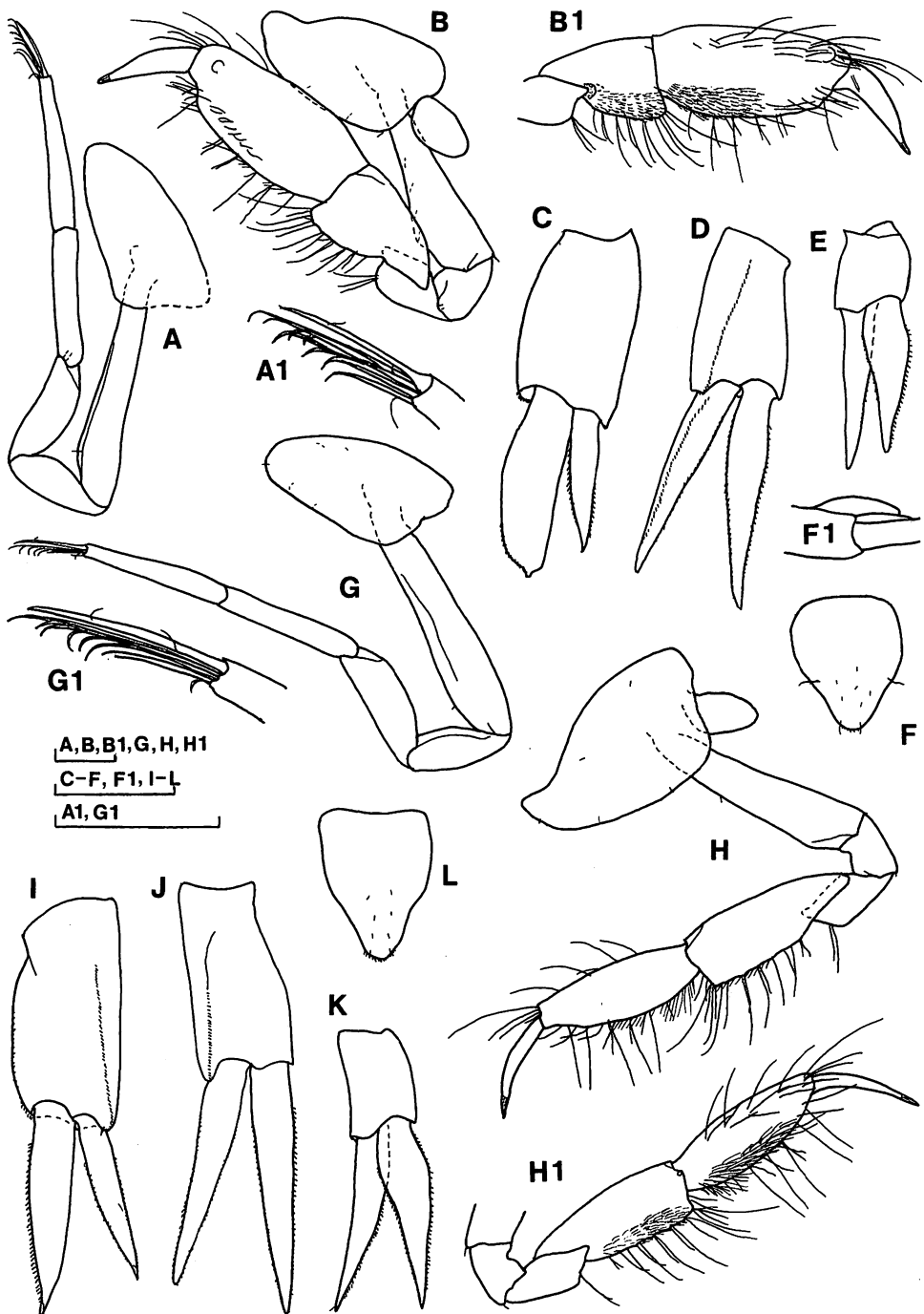


Fig. 4. *Colomastix azumai* Hirayama and Kikuchi. Male "2", 3.5mm: A, gnathopod 1; A1, tip of gnathopod 1; B, gnathopod 2, lateral; B1, distal part of gnathopod 2, medial; C, right uropod 1; D-E, left uropods 2-3; F, telson, dorsal; F1, telson and middle part of uropod 3, lateral. Female "1", 3.9mm: G, gnathopod 1; G1, tip of gnathopod 1; H, gnathopod 2 (oostegite omitted), lateral; H1, distal part of gnathopod 2, medial; I, right uropod 1; J-K, left uropods 2-3; L, telson. Scales: 0.1mm.

Mature female [female "1", 3.9mm]. Gnathopod 2 (Figs. 4H, H1) slender; coxa projected anteriorly; basis narrow; merus lozenge-shaped; carpus and propodus elongate; dactylus narrow, tip with minute pleats.

Uropods: uropod 1 (Fig. 4I), peduncle about 2.1 times as long as width, margins pectinate, both rami lanceolate, with pectinate margins, outer and inner rami about 75% and 90% length of peduncle, respectively, tips of both rami acute. Telson (Fig. 4L) relatively longer than those of males "1" and "2", swollen dorsally like that of male "2".

Remarks. The morphological characters of male "2" and the other immature males in my specimens well agree with original descriptions and figures of *Colomastix azumai* given by Hirayama and Kikuchi (1980). According to the authors, the descriptions were based on female specimens. However, the oval shape of propodus of gnathopod 2 in the figure suggests a high possibility that the holotype of *C. azumai* is not a female but an immature male.

This species has peculiar uropods 1 and 3 in mature males. Any other *Colomastix* species with such uropods have not been recorded. On the other hand, in immature males and mature females, inner rami of uropod 1 are relatively wide and their tips have a small truncate process in immature males and an acute process in mature females. *Colomastix prionotus* Kim and Kim, 1991 from Korea and *C. hamifera* Kossman, 1880 from the Red Sea have such a uropod 1. However, *Colomastix azumai* can be clearly distinguished from *C. prionotus* by the numbers of flagellar articles of antennae (1 and 2 articles in the antennae 1 and 2 of *C. prionotus*, respectively), and from *C. hamifera* by the shape of gnathopod 2 carpus (short and produced posterodistally in *C. hamifera*).

Host. *Spirastrella insignis* Thiele and *Anthosigmella raromicrosclera* (Dickinson); *Craniella serica* (Lebwohl) [Hirayama and Kikuchi, 1980].

Distribution. Kushimoto, Hikigawa and Oura in Wakayama Prefecture; Shishiki Bay in Nagasaki Prefecture (Hirayama and Kikuchi, 1980).

Colomastix japonica Bulycheva, 1955

(New Japanese name: Nippon-tsutsu-yokoebi)

(Figs. 5-9)

Colomastix japonica Bulycheva, 1955, pp. 197-200, fig. 3.

Colomastix lunatio: Kim and Kim, 1987, pp. 9-10, fig. 8; Hirayama, 1990, pp. 21-24, figs. 1-3; (not J. L. Barnard, 1970, pp. 96-100, figs. 51-52).

Material examined. Males "1"- "6" (OMNH-Ar-7035 - 7040), 10.3mm (mature), 9.1mm (mature), 7.9mm (mature), 6.6mm (mature), 4.9mm (immature?), 2.3mm (immature), and females "1"- "5" (OMNH-Ar-7041 - 7045), 8.2mm (mature, ovigerous), 9.1mm (mature), 5.2mm (mature), 4.8mm (immature), 2.6mm (immature), from a sponge *Callyspongia elegans* (3m in depth) at Iwagi Island, Ehime Pref., 3 Aug. 2002; male "7" (OMNH-Ar-7046), 5.9mm (mature), from a sponge *Callyspongia confederata* cast ashore, at Rinkai in Shirahama, Wakayama Pref., 18 Aug. 1992; female "6" (OMNH-Ar-7047), 4.1mm (immature), from a sponge *Haliclona permollis* at Tanigawa in Misaki, Osaka Pref., 4 Aug. 1994; female "7" (OMNH-Ar-7048), 3.9mm (mature), from a sponge

Haliclona permollis (4m in depth) at Oura in Hidaka, Wakayama Pref., 10 Aug. 1998.

Description. *Mature male* [based on male "2", 9.1mm, and male "1", 10.3mm (body and head)]. Body (Fig. 5) robust; eyes small. Head (Fig. 6C) with large interantennal plate projected anteroventrally (Fig. 6D). Antenna 1 (Figs. 6A, A1): ratio of peduncular articles 1-3 1:1.1:0.5, article 1 with several short setae dorsomedially, ventral surfaces of articles 1 and 2 each with a hollow fringed with a row of spines, article 2 with a row of dorsolateral spines and a ventrodistal projection, article 3 with 3 dorsolateral, 2 ventral and a double ventrodistal spines; flagellum distinctly short, with 4 articles, article 1 with a dorsodistal projection and many setae ventrally, articles 2-4 minute. Antenna 2 (Fig. 6B): ratio of peduncular articles 3-5 1:1.3:1, articles 3-5 each with a row of medial spines, article 3 with a dorsoproximal spine and 4 ventral spines, article 4 with many medial setae, many ventral spines and a ventrodistal projection, article 5 with several dorsal and many ventral setae and a small ventrodistal projection; flagellum short, number of articles unknown owing to caespitose setae.

Mouth parts: labrum (Fig. 6E), ventral part covered with thin setae; mandible (Fig. 6F) not reduced; maxilla 1 (Fig. 6G), margin of inner plate setose, outer plate with a small distal projection; maxilla 2 (Fig. 6H), surface covered with many setae; maxilliped (Fig. 6I), outer plate reaching distal margin of palp article 1, inner plates completely fused.

Gnathopod 1 (Figs. 7A, A1) slender; coxa produced anteriorly; basis long, with a seta anterodistally; merus - propodus long; distal end of propodus bearing several long pectinate setae, a few short setae and slender dactylus with spatulate tip. Gnathopod 2 (Figs. 7B, B1) greatly enlarged; coxa lozenge-shaped, with a few setae ventrally; basis broadened distally, anterior margin serrate

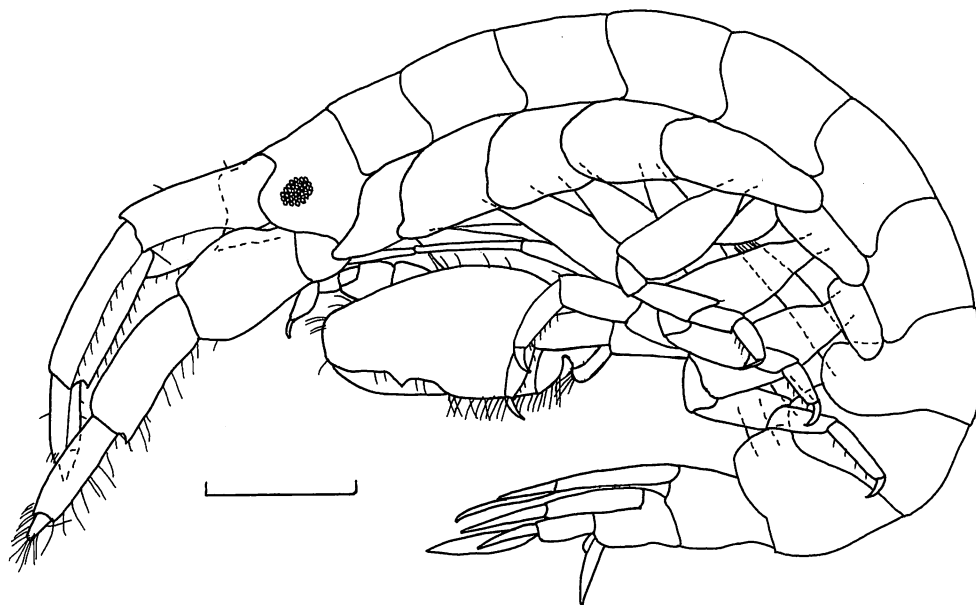


Fig. 5. *Colomastix japonica* Bulycheva. Male "1", 10.3mm: habitus (outer ramus of left uropod 1 shortened owing to regeneration). Scale: 1mm.

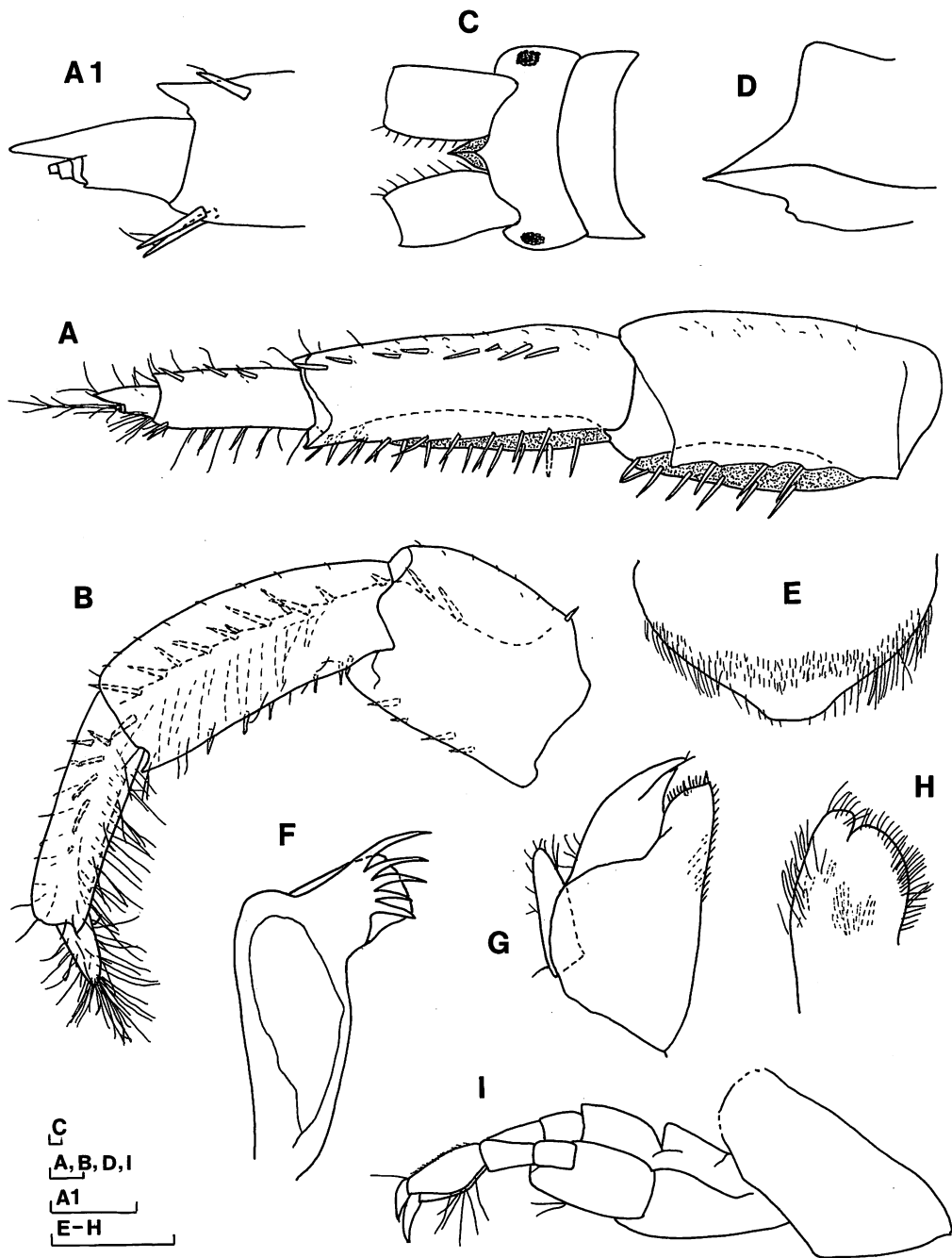


Fig. 6. *Colomastix japonica* Bulycheva. Male "1", 10.3mm: C, head; D, interantennal plate, lateral view. Male "2", 9.1mm: A, antenna 1, lateral; A1, flagellum of antenna 1 (setae omitted); B, antenna 2, lateral; E, labrum; F, right mandible; G-H, maxillae 1-2; I, maxilliped, lateral. Scales: 0.1mm.

and setose, with a notch in distal part; mediodistal corners of ischium and merus rounded and projected, respectively; carpus short, posterior and mediodistal margins setose; propodus massive, ovoid, 2.9 times as long as carpus, posterior, posteromedial and anteromedial surfaces setose, palm with a large triangular projection on distal part and 2 small projections at proximal end; dactylus short, robust, strongly curved, posterior margin with a small projection.

Pereopods: pereopods 3 and 4 (Figs. 7C, D), coxae roundish, with a short seta on anteroventral corners, bases slightly expanded distally, with several setae on anterior and posterior margins, meri with a spine on anterodistal corners, anterior and posterior margins with several setae, propodi with 6-7 spinules posteriorly, dactyli short; pereopods 5-7 (Figs. 7E-G), coxae relatively produced posteriorly, bases broad, posterodistal corners rounded, meri with a spine on posterodistal corners, anterior margins with 5-6 setae, carpi with 4-5 setae anteriorly, propodi with 4-6 spinules anteriorly, dactyli short.

Pleopods (Figs. 8A-C): peduncles of pleopods 2 and 3 with several setae; both rami each with 4 articles. Uropods: uropod 1 (Fig. 8D), peduncle and both rami slender, outer ramus about 90% length of peduncle, with 2 short setae ventrally, inner ramus about the same length as peduncle, margins of peduncle and both rami pectinate; uropod 2 (Fig. 8E) slender, about 80% length of uropod 1, outer ramus the same length as peduncle and slightly shorter than inner ramus, outer margin of outer ramus pectinate; uropod 3 (Fig. 8F) about the same length as uropod 2, peduncle shorter than both rami, inner and outer margins pectinate dorsally, both rami lanceolate, outer ramus conspicuously short, about half length of inner ramus, inner margin pectinate, inner ramus long, outer margin serrate. Telson (Fig. 8G) longish triangular, dorsal surface with several short setae, tip with a pair of short setae; proximal fifth thickened ventrally (Fig. 5).

Mature female [female "1", 8.2mm]. Antenna 2 (Fig. 8H), flagellum short, composed of 4 articles and many long setae, article 1 long, produced dorsodistally and ventrodistally, articles 2-4 minute.

Gnathopod 1 (Figs. 8I, I1), basis wider than that of male "2". Gnathopod 2 (Figs. 8J, J1) small; coxa roundish lozenge-shaped, with several setae ventrally; basis slightly broadened distally, anterior margin smooth, with a few short setae; merus projected mediodistally, posterior margin with several short setae, posterodistal corner with long setae; carpus relatively long, posterior and mediodistal margins setose; propodus flat, 1.4 times as long as carpus, posterior, posteromedial and anteromedial surfaces setose, palm indistinct; dactylus very narrow, slightly curved posteriorly, attached to the point of distal tenth of propodus posterior margin.

Telson (Fig. 8N) wider than that of male "2".

Shape variation of gnathopod 2. Males: male "4", 6.6mm (Fig. 9A), notch on anterior margin of basis indistinct, propodus narrower than that of male "2"; male "5", 4.9mm (Fig. 9B), carpus longer and propodus narrower than that of male "4", projections on palm and dactylus smaller than those of male "4"; male "6", 2.3mm (Fig. 9C), basis narrower than that of male "5", anterior margin smooth, carpus longer and propodus narrower than that of male "5", posterior margin of propodus slightly serrate.

Females: female "3", 5.2mm (Fig. 9D), carpus longer than that of female "1", posterior margin

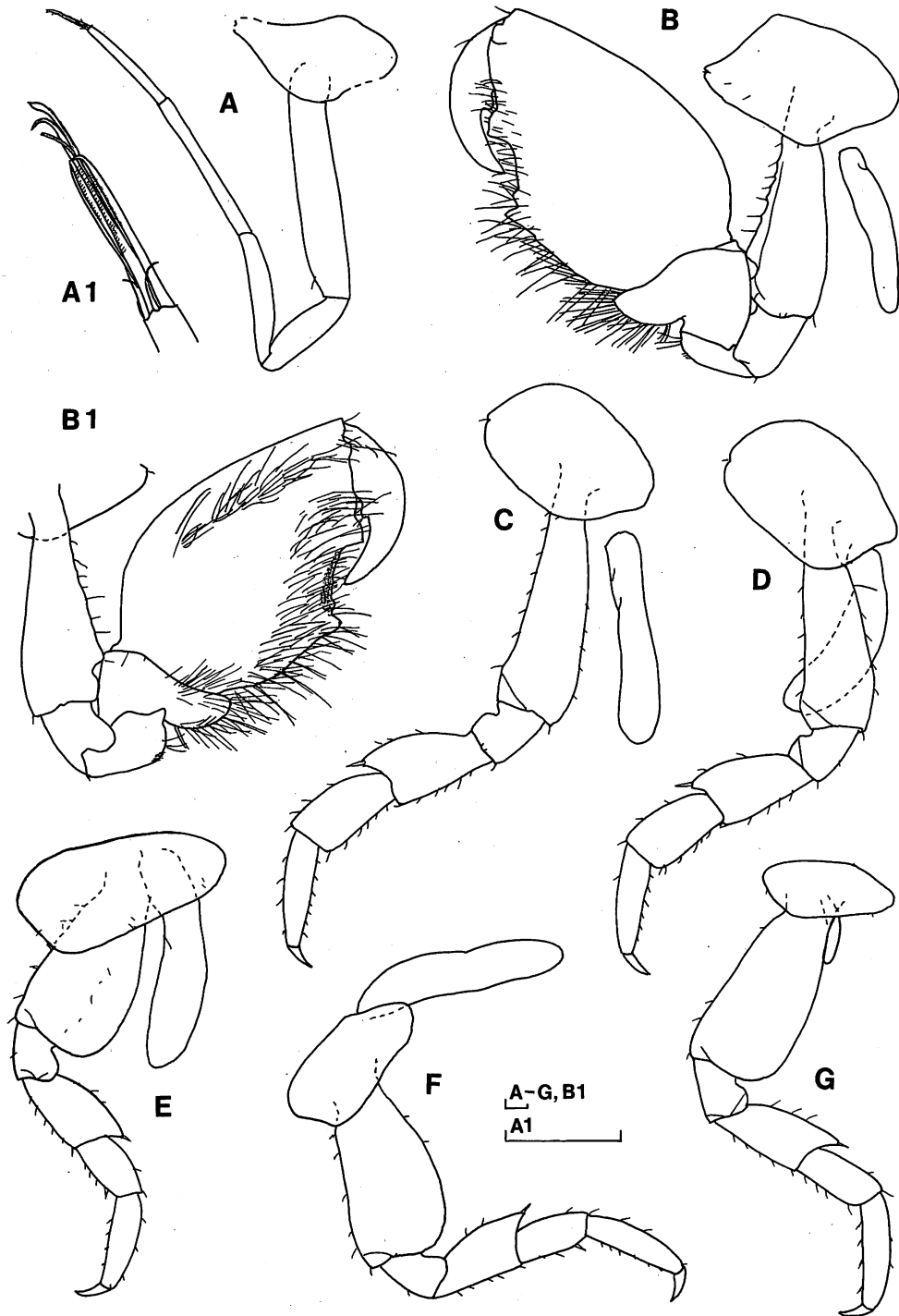


Fig. 7. *Colomastix japonica* Bulycheva. Male "2", 9.1mm: A, gnathopod 1; A1, tip of gnathopod 1; B, gnathopod 2, lateral; B1, gnathopod 2, medial; C-F, pereopods 3-6; G, pereopod 7 and penial papilla. Scales: 0.1mm.

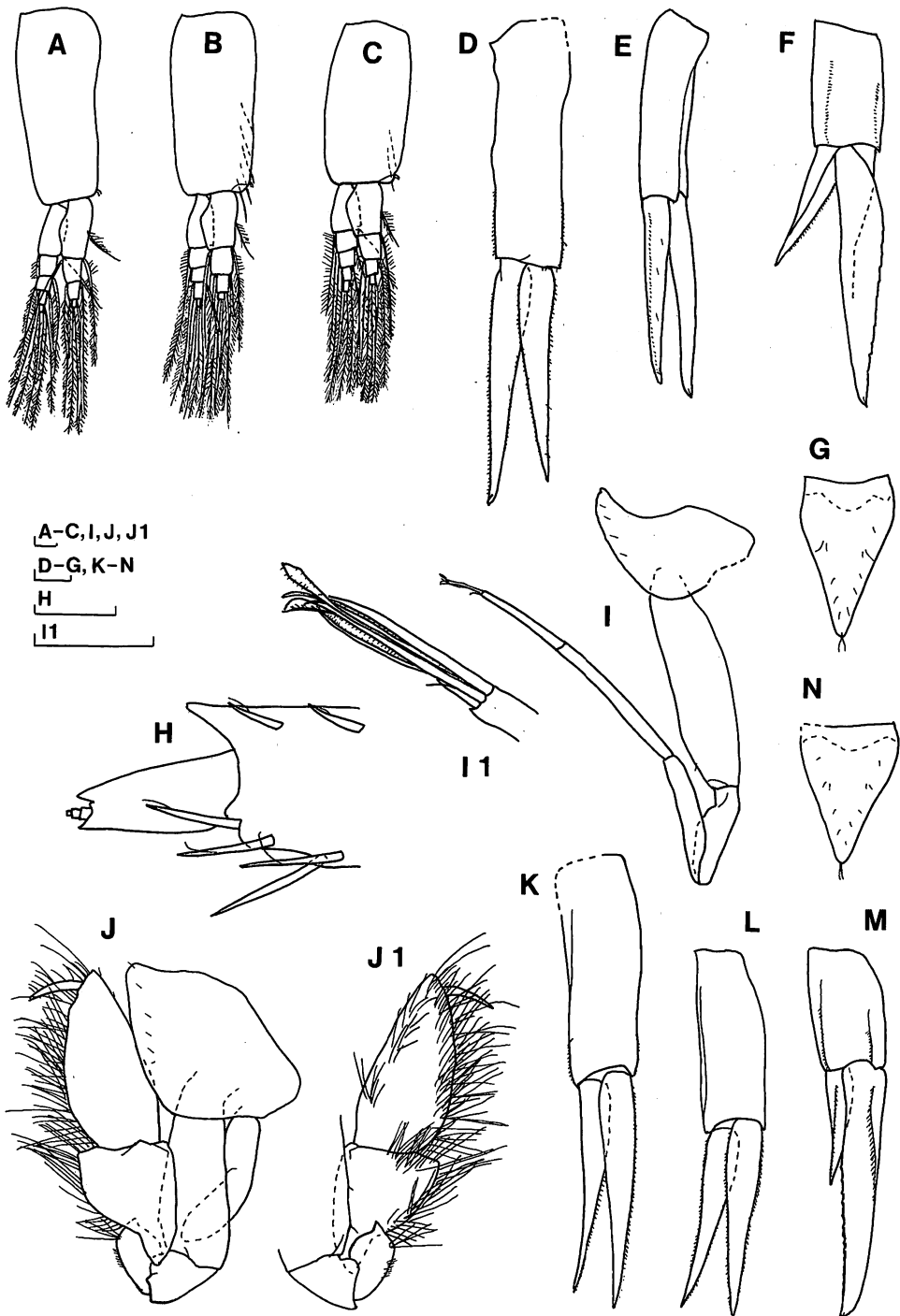


Fig. 8. *Colomastix japonica* Bulycheva. Male "2", 9.1mm: A-C, pleopods 1-3; D, right uropod 1; E-F, left uropods 2-3; G, telson. Female "1", 8.2mm: H, tip of antenna 2 (setae omitted); I, gnathopod 1; I1, tip of gnathopod 1; J, gnathopod 2 (oostegite omitted), lateral; J1, distal part of gnathopod 2, medial; K-M, left uropods 1-3; N, telson. Scales: 0.1mm.

of propodus with a small projection at the point of distal quarter; female "5", 2.6mm (Fig. 9E), basis narrower and carpus longer than that of female "3", posterodistal corner rounded, propodus wider than that of female "3", projection on posterior margin distinct.

Remarks. The present material well agrees with the descriptions and illustrations given by Bulycheva (1955), and is characterized by (1) large and robust body, (2) stout spinous antennae

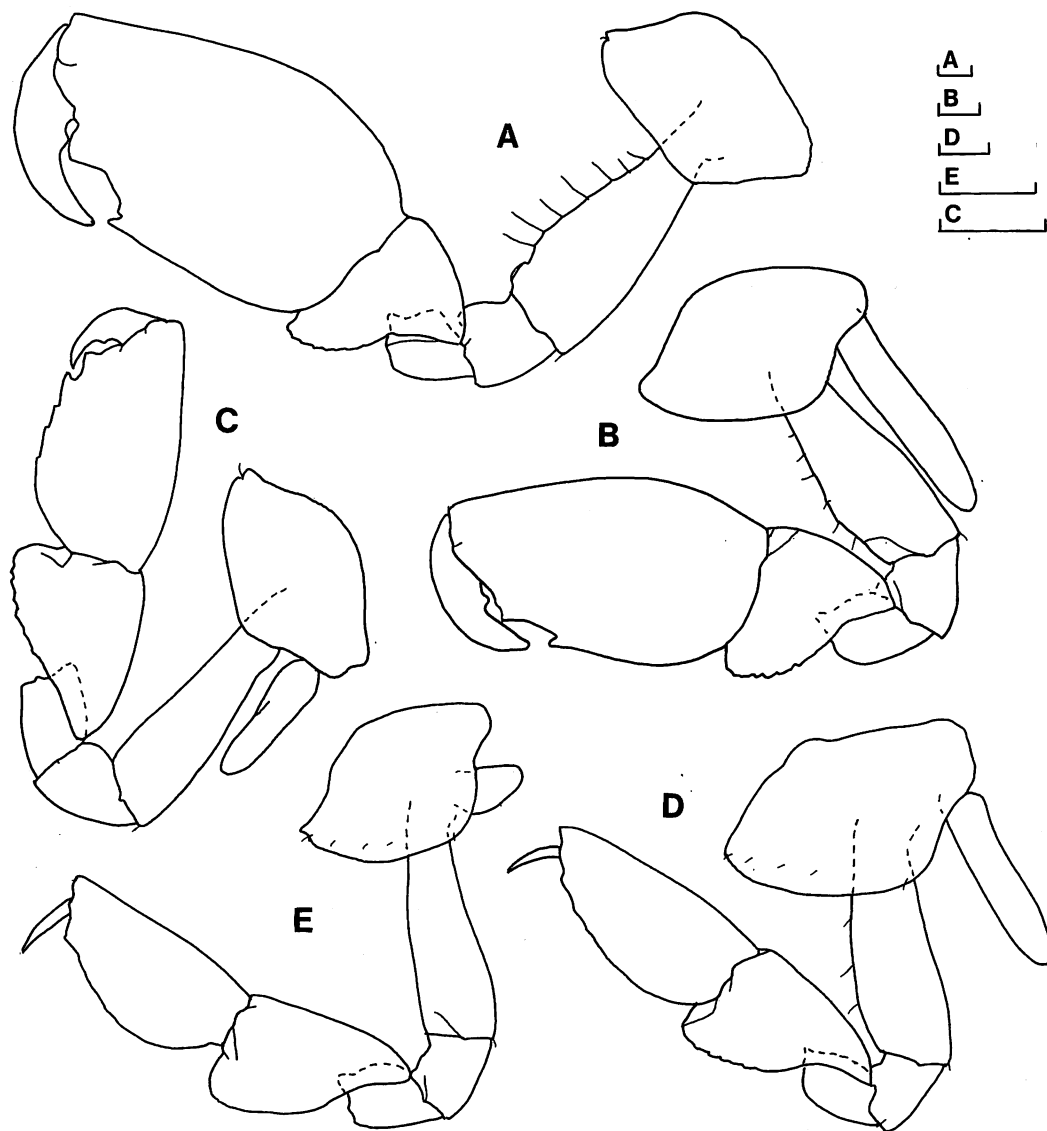


Fig. 9. *Colomastix japonica* Bulycheva. Gnathopods 2 (setae omitted except for on coxae and bases): A, male "4", 6.6mm; B, male "5", 4.9mm; C, male "6", 2.3mm; D, female "3", 5.2mm (oostegite omitted); E, female "5", 2.6mm. Scales: 0.1mm.

without row of spinules, (3) anterodistally produced flagellar article 1 of antenna 1, (4) developed interantennal plate, (5) non-vestigial male gnathopod 1, (6) wide basis of female gnathopod 1, (7) enlarged male gnathopod 2 with serrate anterior margin of basis and 3 projections on posterior margin of propodus, (8) outer ramus slightly shorter than inner ramus in uropod 1, and (9) outer ramus distinctly shorter than inner ramus in uropod 3.

Colomastix japonica Bulycheva, 1955 closely resembles *C. lunario* J. L. Barnard, 1970 from Hawaii in the short outer ramus of uropod 3. However, *Colomastix japonica* is distinguishable from *C. lunario* in the anteriorly serrate basis of male gnathopod 2 (smooth in *C. lunario*) and the rounded anterior margins of coxae 3-5 (pointed in *C. lunario*). Moreover, body sizes of both species are quite different in mature males: 5.0-5.5mm (Bulycheva, 1955) and 5.9-10.3mm (the present study) in *C. japonica*, and 1.9mm in *C. lunario* (J. L. Barnard, 1970). The small specimens of *Colomastix japonica* differs from *C. lunario* in the smaller eyes, the high ratio of carpus to propodus of male gnathopod 2 (Fig. 9C), and the wider bases of pereopods 5-7.

Colomastix lunario was recorded from many localities other than Hawaii: Korea (Kim and Kim, 1987), Fiji (Myers, 1985), New Caledonia (Hirayama, 1990), the Red Sea (Lyons and Myers, 1990), Mauritius (Ledoyer, 1978) and Madagascar (Ledoyer, 1979, 1982). However, the Korean and New Caledonian specimens are entirely different in the body size from the other localities' specimens, i.e. the former is distinctly larger (4.0-10.2mm) than the latter (<2mm in the described papers). In the Korean specimens (Kim and Kim, 1987), although the serration on anterior margin of male gnathopod 2 basis is not recognized in their figure and the authors stated "coxae 1-5 pointed anteriorly", the shapes of male gnathopod 2 and bases of pereopods 5-7, and size of eyes are very similar to the present specimens. In addition, the host sponge (*Callyspongia confoederata*) is common in both species. On the other hand, in the New Caledonian specimens (Hirayama, 1990), all the morphological characters as stated above quite agree with the present specimens. Therefore *Colomastix lunario* from Korea and New Caledonia can be identified as *C. japonica*.

Colomastix laminosa Lyons and Myers, 1990 from the Red Sea also has short outer ramus of uropod 3 as in *C. japonica* and *C. lunario*. However, *C. laminosa* has anteriorly projected coxa 5, shorter uropod 3 and distally rounded telson.

Host. *Callyspongia confoederata* (Ridley), *C. elegans* (Lendenfeld) and *Haliclona permollis* (Bowerbank); *C. confoederata* and *Myxilla setoensis* Tanita [Kim and Kim, 1987]; *Siphonochalina* sp. [Hirayama, 1990].

Distribution. Shirahama and Oura in Wakayama Prefecture, Tanigawa in Osaka Prefecture, Iwagi Island in Ehime Prefecture; Peter the Great Bay in Russia (Bulycheva, 1955); Cheju Island in Korea (Kim and Kim, 1987); Noumea in New Caledonia (Hirayama, 1990).

***Colomastix kapiolani* J. L. Barnard, 1970**

(New Japanese name: Kamate-tsutsu-yokoebi)

(Figs. 10-13)

Colomastix kapiolani J. L. Barnard, 1970, p. 96, fig. 50; J. L. Barnard, 1971, p. 55, figs. 24-25.

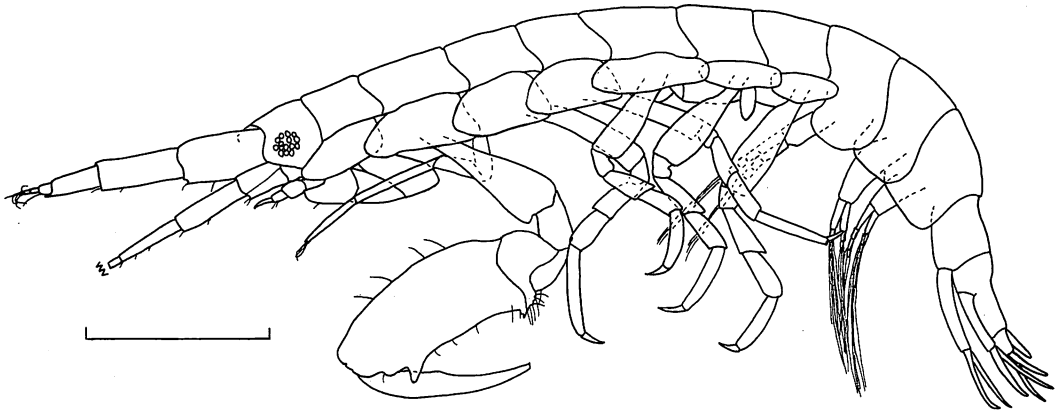


Fig. 10. *Colomastix kapiolani* J. L. Barnard. Male "1", 2.8mm: habitus. Scale: 0.5mm.

Material examined. Males "1" and "2" (OMNH-Ar-7049, 7050), 2.8mm (mature), 2.2mm (immature), from sponges (3m in depth) at Tanigawa in Misaki, Osaka Pref., 29 May 1996; male "3" (OMNH-Ar-7051), 2.2mm (immature), and female "1" (OMNH-Ar-7052), 2.5mm (mature), from a sponge (7m in depth) at Tanigawa in Misaki, Osaka Pref., 18 Mar. 1994; male "4" (OMNH-Ar-7053), 2.6mm (mature), and female "2" (OMNH-Ar-7054), 1.9mm (immature), from a sponge *Strongylophora* sp. (6m in depth) at Hikigawa, Wakayama Pref., 1 Aug. 2003.

Description. *Mature male* [male "1", 2.8mm]. Body (Fig. 10) slender; eyes small. Antenna 1 (Fig. 11A): ratio of peduncular articles 1-3 1:1.1:0.6, articles 1 and 2 each with 5 ventral spines and several short setae, article 3 with a triangular ventral projection; flagellum slender, with 4 articles, articles 1 and 3 each with an aesthetasc and a few setae, article 4 bearing an aesthetasc and many long setae. Antenna 2 (Fig. 11B) slender; ratio of peduncular articles 3-5 1:1.5:1.6, ventral surfaces of articles 3-5 with 2, 3, 2 spines, respectively; most of flagellum lost.

Mouth parts: labrum (Fig. 11C), ventral surface with small tubercles; mandible (Fig. 11D) reduced; maxilla 1 (Fig. 11E), tips of outer plate and palp with 2 and 1 spines, respectively; maxilla 2 (Fig. 11F), distal margins of both plates with several setae; maxilliped (Figs. 11G, G1), outer plate not reduced, inner plates split deeply.

Gnathopod 1 (Figs. 11H, H1) slender; coxa produced anteriorly; basis narrow, with a seta anterodistally; merus relatively wide; carpus and propodus slender; distal end of propodus bearing several long setae, a few short setae and dactylus with spatulate tip. Gnathopod 2 (Fig. 11I) greatly enlarged; coxa trapezoidal; basis broadened distally, with several short setae on anterior margin; merus short, posterodistal corner rounded, posterior surface with a few setae; carpus short, posteroproximal part widely excavated, posterodistal margin serrate, setose, posteromedial surface with many fine setae; propodus large rectangular, length 4.5 and 2.1 times of carpus and width, respectively, posterodistal and posteroproximal corners each with a triangular projection, posteroproximal projection with a small process on distal margin, and with several setae on medial surface, mediolateral surface of propodus with 2 spines, posteromedial surface setose, anteromedial

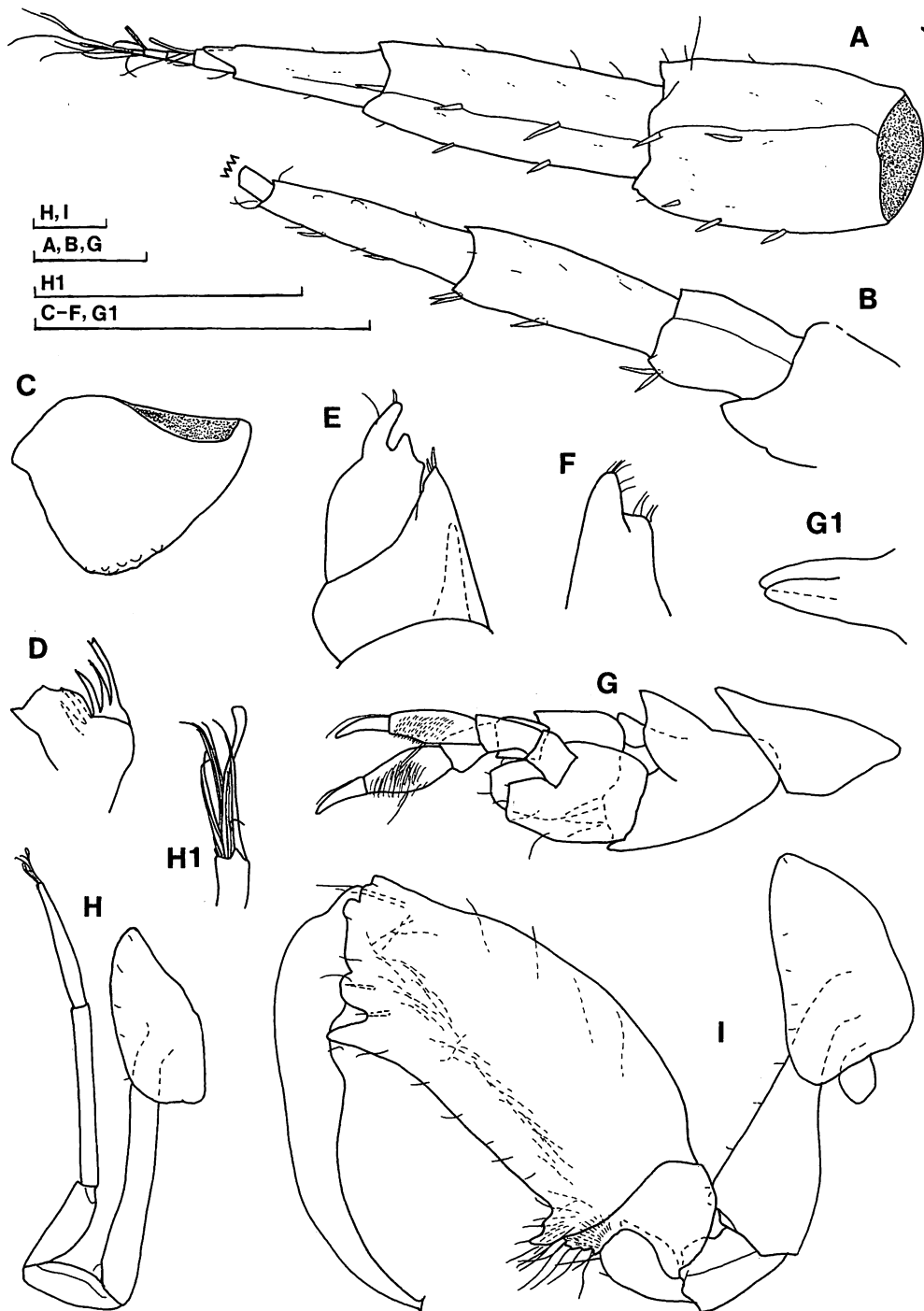


Fig. 11. *Colomastix kapiolani* J. L. Barnard. Male "1", 2.8mm: A, antenna 1, ventral; B, antenna 2, lateral; C, labrum; D, right mandible; E, maxilla 1; F, maxilla 2; G, maxilliped, lateral; G1, inner plates of maxilliped; H, gnathopod 1; H1, tip of gnathopod 1; I, gnathopod 2. Scales: 0.1mm.

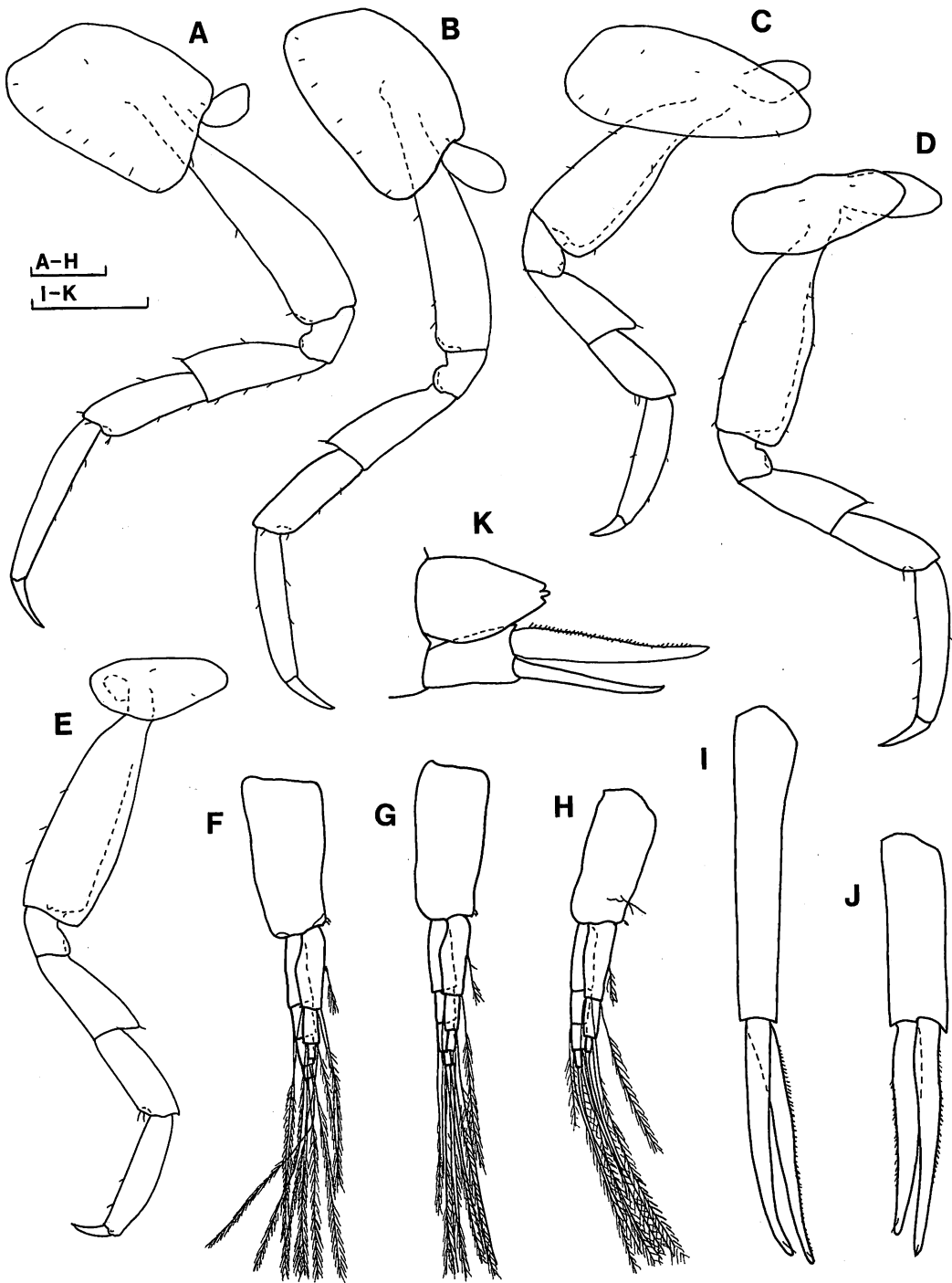


Fig. 12. *Colomastix kapiolani* J. L. Barnard. Male "1", 2.8mm: A-E, pereopods 3-7; F-H, pleopods 1-3; I-J, left uropods 1-2; K, left uropod 3 and telson. Scales: 0.1mm.

surface and posterior margin bearing several setae; dactylus large and long, reaching posteroproximal projection of propodus, slightly curved posteriorly, middle part of posterior margin with a blunt process.

Pereopods: pereopods 3 and 4 (Figs. 12A, B), coxae trapezoidal, ventral surfaces with several short setae, bases slightly expanded distally, with a few setae on anterior margins, anterodistal corners of ischia rounded, meri with a spine on anterodistal corners, carpi with 1-2 short setae on posterodistal corners, propodi slender, with 2-3 spinules posteriorly, dactyli short; pereopods 5-7 (Figs. 12C-E), coxae slightly produced posteriorly, size reduced from coxa 5 to 7, distal three fourths of bases broad, posterodistal corners of ischia rounded, meri with a spine on posterodistal corners, carpi with 1-2 short setae on anterodistal corners, propodi with 1-3 spinules anteriorly, dactyli short.

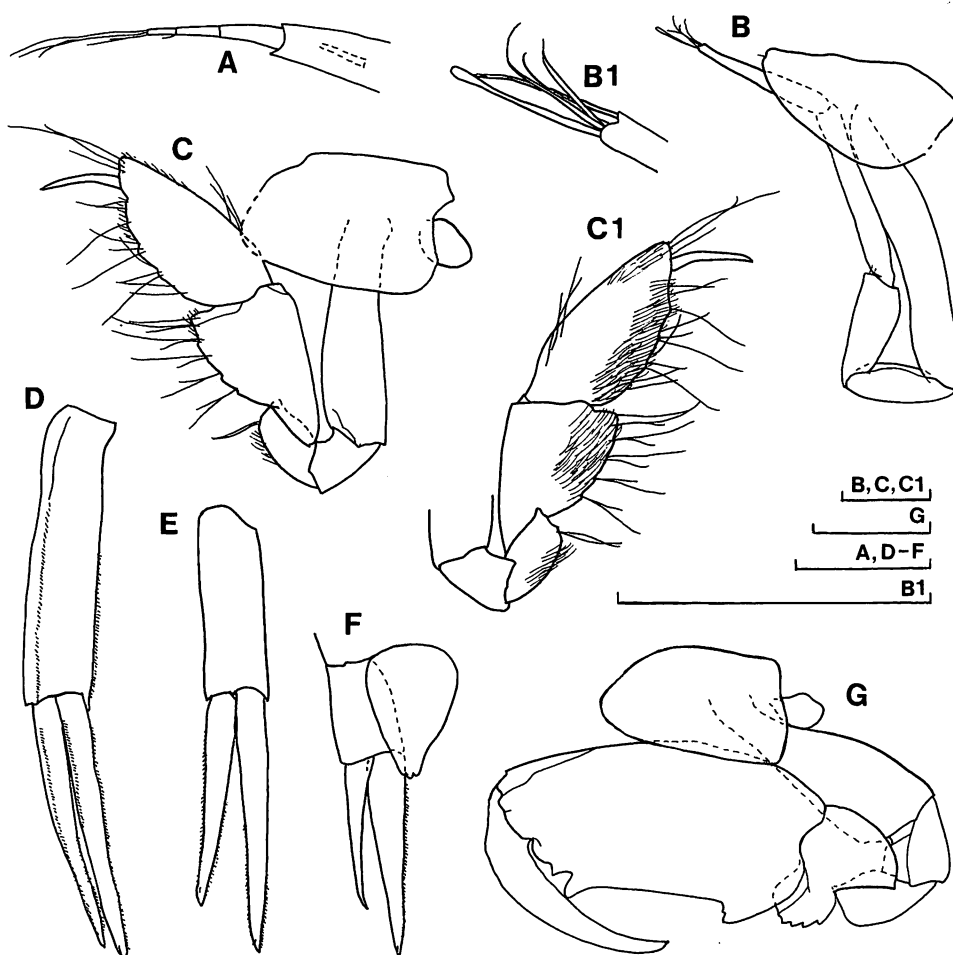


Fig. 13. *Colomastix kapiolani* J. L. Barnard. Female "1", 2.5mm: A, tip of antenna 2; B, gnathopod 1; B1, tip of gnathopod 1; C, gnathopod 2 (oostegite omitted), lateral; C1, distal part of gnathopod 2, medial; D-E, left uropods 1-2; F, left uropod 3 and telson. Male "2", 2.2mm: G, gnathopod 2 (setae omitted). Scales: 0.1mm.

Pleopods (Figs. 11F-H): peduncle of pleopod 3 with a few setae; outer and inner rami with 4 and 3 articles, respectively. Uropods: uropod 1 (Fig. 12I) elongate, peduncle slender, outer ramus long, about 75% length of peduncle, inner ramus slightly longer than outer ramus, inner margin pectinate, both rami each with a short seta near the tips; uropod 2 (Fig. 12J) medium size, three fourths length of uropod 1, outer ramus 1.2 times as long as peduncle, inner ramus slightly longer than outer ramus, both rami each with a terminal short seta, margins of both rami pectinate; uropod 3 (Fig. 12K) short, 0.7 times as long as uropod 2, peduncle shorter than both rami, inner ramus about four thirds as long as outer ramus, inner margin of inner ramus pectinate. Telson (Fig. 12J) roundish triangular, distal end trilobate.

Immature male [male "2", 2.2mm]. Gnathopod 2 (Fig. 13G): propodus relatively shorter than that of male "1", about 3.2 times as long as carpus, posteroproximal projection shifted to the distal direction; dactylus shorter, strongly curved posteriorly.

Mature female [female "1", 2.5mm]. Antenna 2 flagellum slender, with 3 articles (Fig. 13A). Gnathopod 2 (Figs. 13C, C1) relatively small; coxa trapezoidal; basis narrow, straight; merus with many fine setae on posteromedial surface, posterodistal corner with a pair of long setae; carpus longish triangular, posterior margin bearing long setae, posteromedial surface with many fine setae; propodus 1.2 times as long as carpus, posterior margin and proximal part of anteromedial surface setose, posteromedial surface and distal part of anteromedial surface covered with many fine setae; dactylus narrow, slightly curved posteriorly.

Remarks. The present material has (1) deeply split inner plates of maxilliped, (2) very elongate propodus and dactylus of male gnathopod 2, (3) inner ramus about four thirds as long as outer ramus in uropod 3, and (4) apically trilobate telson. These and the other characters well agree with the descriptions and figures of *Colomastix kapiolani* J. L. Barnard, 1970 from Hawaii. However, there are some differences between the present and the Hawaiian specimens. In Barnard's figures, distal part of the basis of male gnathopod 1 swollen anteriorly, and the posterodistal projection on propodus of male gnathopod 2 located a little proximally. In addition, the adult size of Hawaiian male is smaller than that of the present males (1.3mm in the former and 2.5-2.8mm in the latter). Nevertheless, I think these differences as intraspecific variation because the unique characters as stated above are combined in both populations.

Colomastix subcastellata Hurley, 1954 from New Zealand closely resembles *C. kapiolani* in the deeply split inner plates of maxilliped, the shape of male gnathopod 2, and the apically trilobate telson. However, the former differs from the latter in the location of posteroproximal projection on propodus of male gnathopod 2 and the dentation of lateral margins of telson. Although *Colomastix fissilingua* Schellenberg, 1926 from Antarctic-austral area (K. H. Barnard, 1932; Holman and Watling, 1983) and *C. magnirama* Hurley, 1954 from New Zealand have deeply split inner plates of maxilliped and apically trilobate telson as in the present species, male gnathopods 2 of both these species are dissimilar to that of *C. kapiolani*. *Colomastix fissilingua* has 2-articulate flagellum of antenna 1 and *C. magnirama* has distinctly shorter outer ramus of uropod 3.

Host. *Strongylophora* sp. and unidentified sponges; *Pocillopora* sp. (J. L. Barnard, 1970).

Distribution. Hikigawa in Wakayama Prefecture, Tanigawa in Osaka Prefecture; Oahu Island

in Hawaii (J. L. Barnard, 1970).

***Colomastix littoralis* sp. nov.**

(New Japanese name: Iso-tsutsu-yokoebi)

(Figs. 14-18)

Material examined. Holotype: male (OMNH-Ar-7055), 3.5mm (mature), from a sponge *Halichondria okadai* (intertidal) at Nagasaki coast in Misaki, Osaka Pref. (34° 20'N, 135° 09'E), 17 May 1992. Allotype: female (OMNH-Ar-7056), 3.4mm (mature), the same data as the holotype. Paratypes: 3 males, 3.0mm (mature; OMNH-Ar-7057), 2.5mm (mature; OMNH-Ar-7058), 2.0mm (immature; OMNH-Ar-7059), and 1 ovigerous female, 3.5mm (OMNH-Ar-7060), the same data as the holotype; 4 males, 3.4mm (mature; OMNH-Ar-7061), 3.2mm (mature; OMNH-Ar-7062), 2.5mm (mature; OMNH-Ar-7063) and 2.2mm (immature; OMNH-Ar-7064), from a sponge *Halichondria okadai* (intertidal) at Toyokunizaki coast in Misaki, Osaka Pref., 7 Oct. 2002; 1 female 3.9mm (mature; OMNH-Ar-7065), from a sponge *Halichondria okadai* (intertidal) at Ebisuzaki coast in Wakayama City, 4 Apr. 1999.

Description. *Mature male* (holotype, 3.5mm). Body (Fig. 14) relatively stout; eyes large. Antenna 1 (Figs. 15A, A1): ratio of peduncular articles 1-3 1:0.8:0.5, articles 1-3 with 4, 4, 1 ventral spines, respectively, article 3 with a short dorsodistal spine, articles 2 and 3 each with several dorsal and ventral short setae; flagellum short, with 3 articles, article 1 long and articles 2 and 3 minute, bearing 5 aesthetascs and many long setae. Antenna 2 (Figs. 15B, B1): ratio of peduncular articles 3-5 1:1.2:0.9, medial surfaces of articles 3-5 with 1, 3, 4 spines, respectively, ventrolateral edges of articles 3-5 lined with triangular spinules; flagellum short, with 3 articles, article 1 long and articles 2 and 3 minute, ventrodistal corner of article 1 projected, tip of flagellum bearing many long setae.

Mouth parts: maxilliped (Fig.15C), outer plate reduced, not reaching half of palp article 1, inner

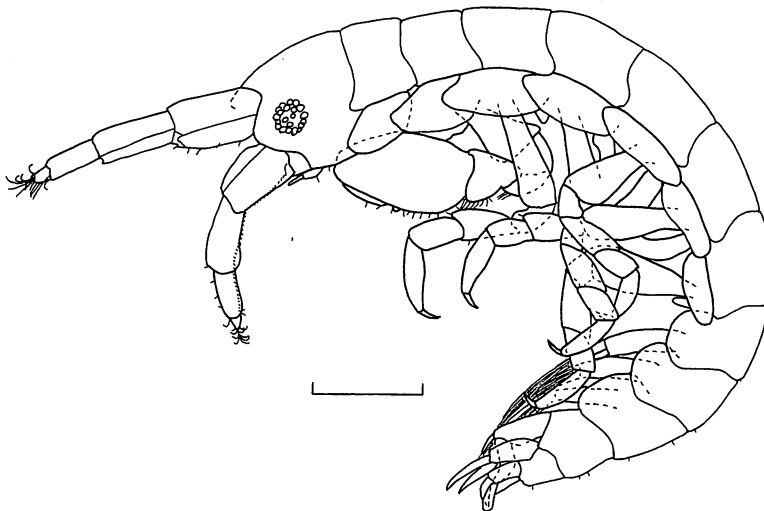


Fig. 14. *Colomastix littoralis* sp. nov. Male (holotype), 3.5mm: habitus. Scale: 0.5mm.

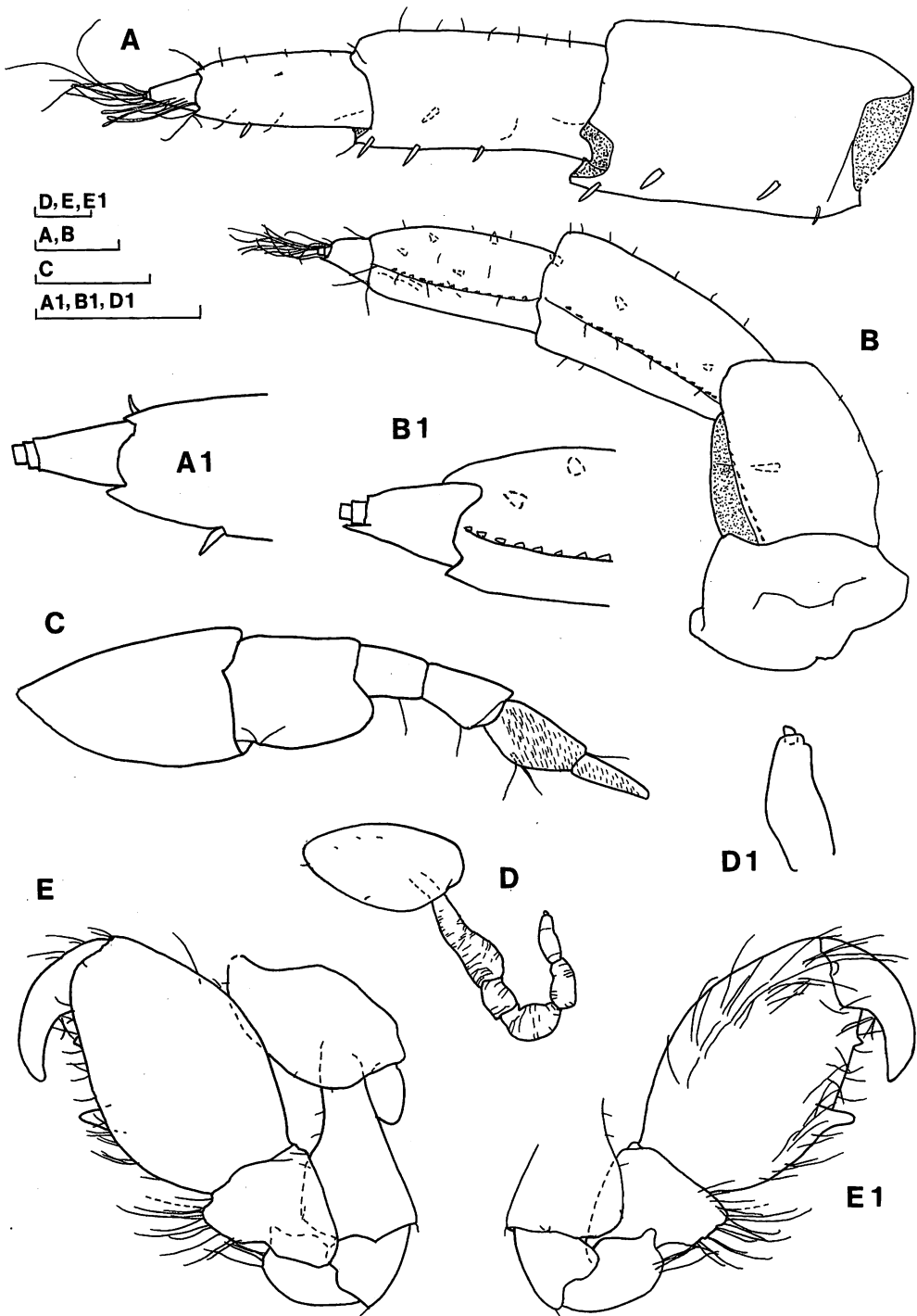


Fig. 15. *Colomastix littoralis* sp. nov. Male (holotype), 3.5mm: A, antenna 1, lateral; A1, tip of antenna 1 (setae omitted); B, antenna 2, ventrolateral; B1, tip of antenna 2 (setae omitted); C, maxilliped, lateral; D, gnathopod 1; D1, tip of gnathopod 1; E, gnathopod 2, lateral; E1, distal part of gnathopod 2, medial. Scales: 0.1mm.

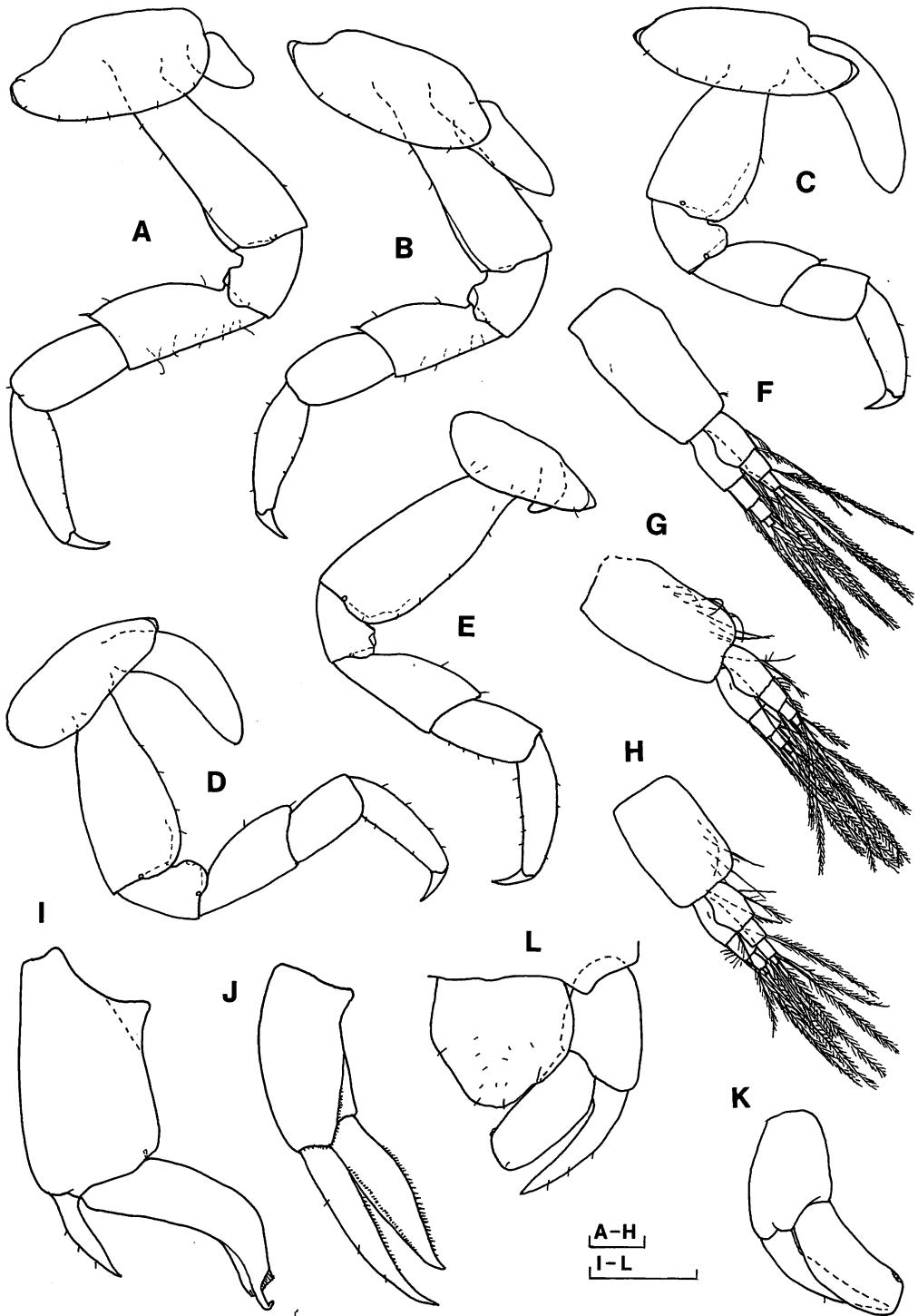


Fig. 16. *Colomastix littoralis* sp. nov. Male (holotype), 3.5mm: A-D, pereopods 3-6; E, pereopod 7 and penial papilla; F-H, pleopods 1-3; I-K, left uropods 1-3; L, telson and right uropod 3. Scales: 0.1mm.

plates completely fused; other parts unknown.

Gnathopod 1 (Figs. 15D, D1) vestigial; coxa roundish triangular, with a few short setae ventrally; basis - propodus heavily wrinkled, without setae; distal end of propodus with conspicuously reduced dactylus. Gnathopod 2 (Figs. 15E, E1) enlarged; coxa produced anteriorly; basis greatly broadened distally, with several short setae on anterior margin; merus short, projected mediodistally, posterodistal corner rounded, with a few setae; carpus triangular, posterior and posterodistal margins setose; propodus massive, about twice as long as carpus, posterior margin with a large projection in the middle and a small projection distally, anteromedial and posteromedial surfaces setose; dactylus short, robust, strongly curved posteriorly.

Pereopods: pereopods 3 and 4 (Figs. 16A, B), coxae trapezoidal, produced anteriorly, ventral surfaces with several short setae, bases slightly expanded distally, with a few short setae on anterior margins, distal ends of ischia a little produced, meri with a spine on anterodistal corners, and with several setae on posteromedial margins, propodi narrowed distally, posterior margins minutely serrate, dactyli short; pereopods 5-7 (Figs. 16C-E), coxae produced posteriorly, size reduced from coxa 5 to 7, bases slightly expanded distally, posterior margins with a few short setae, posterodistal corners of ischia rounded, meri with a spine on posterodistal corners, propodi minutely serrate on anterior margins, with several short setae, dactyli short.

Pleopods (Figs. 16F-H): peduncles of pleopods 2 and 3 each with several long setae; both rami each with 4 articles. Uropods: uropod 1 (Fig. 16I) enlarged, peduncle expanded, about 1.9 times as long as width, dorsodistal corner with a short spine, outer ramus small, lanceolate, about 45% length of peduncle, with 3 short setae ventrally, inner ramus wide and long, shorter than peduncle, curved ventrally, distal end with many minute pleats and a small hooked projection; uropod 2 (Fig. 16J) medium size, outer ramus slightly longer than peduncle and inner ramus, outer margin of peduncle and outer and inner margins of both rami pectinate, ventral margin of outer ramus with a few short setae; uropod 3 (Figs. 16K, L) short, peduncle shorter than both rami, outer ramus lanceolate, slightly longer than inner ramus, with a few setae ventrolaterally, inner ramus wide, distal margin rounded, mediodistal corner with lined minute tubercles. Telson (Fig. 16L) roundish pentagonal, dorsal surface with several short setae.

Mature female (allotype, 3.4mm). Mouth parts: labrum (Fig. 17A), middle part of ventral surface produced, without setae; mandible (Fig. 17B) reduced; maxilla 1 (Fig. 17C), outer plate with 3 spines, palp with 2 thick setae; maxilla 2 (Fig. 17D), margins of both plates setose; maxilliped (Fig. 17E), outer plate not reduced, inner plates completely fused.

Gnathopod 1 (Figs. 17F, F1) elongate; coxa longish triangular; basis almost straight, middle part of anterior margin with a seta; ischium short, with a seta posterodistally; merus - propodus slender; distal end of propodus with needle-shaped dactylus and many long setae. Gnathopod 2 (Figs. 17G, G1, G2) slender; coxa projected anteriorly; basis narrow, slightly widened distally, anterior margin with several short setae; merus lozenge-shaped, posterodistal corner rounded, with a few setae; carpus and propodus relatively long, posterior margins setose, posteromedial surfaces with many fine setae, anteromedial surface of propodus setose; dactylus narrow, tip with minute pleats.

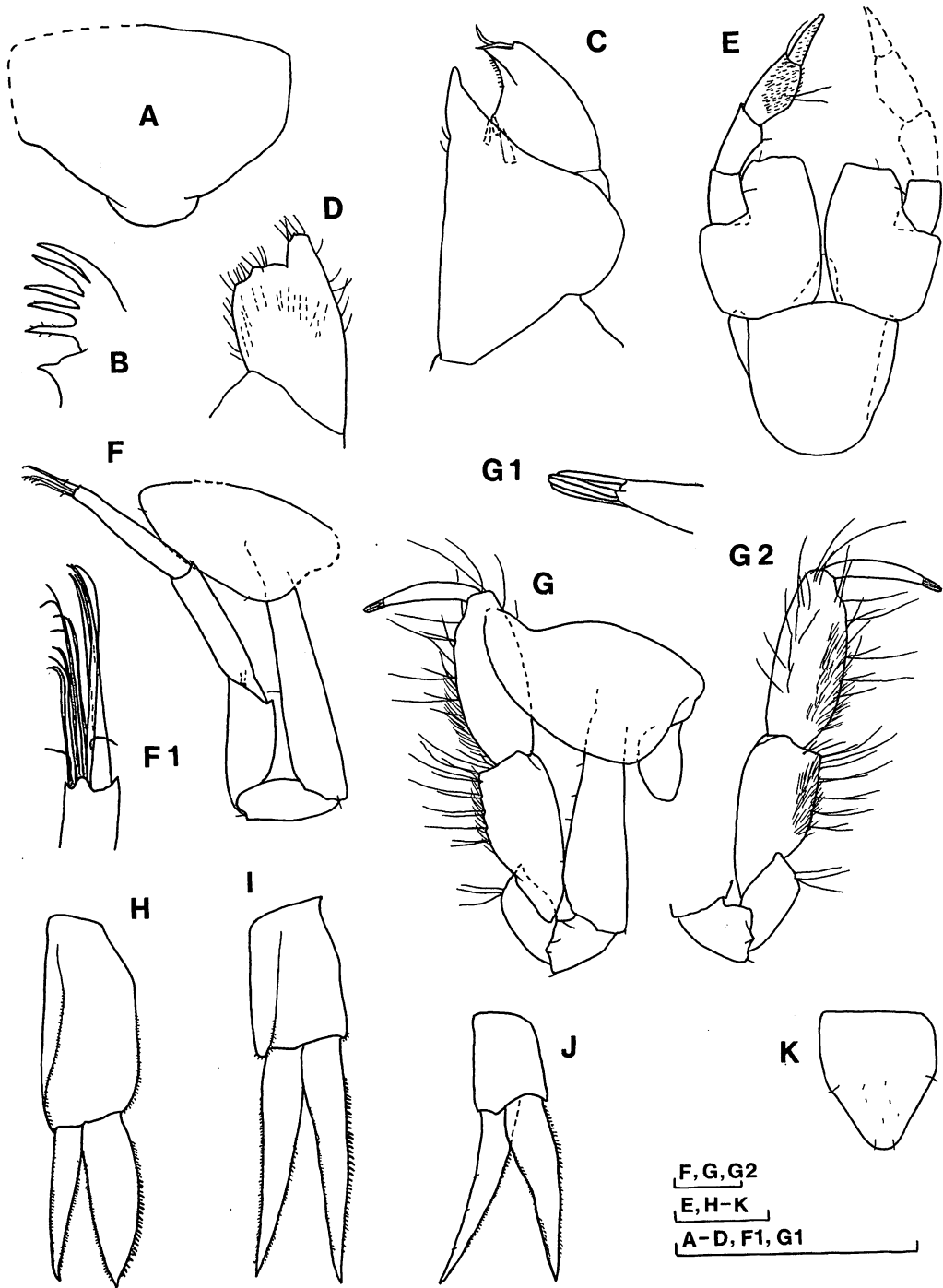


Fig. 17. *Colomastix littoralis* sp. nov. Female (allotype), 3.4mm: A, labrum; B, right mandible; C, maxilla 1; D, maxilla 2; E, maxilliped, ventral; F, gnathopod 1; F1, tip of gnathopod 1; G, gnathopod 2 (oostegite omitted), lateral; G1, tip of dactylus; G2, distal part of gnathopod 2, medial; H-J, left uropods 1-3; K, telson. Scales: 0.1mm.

Uropods: uropod 1 (Fig. 17H) relatively smaller than that of the holotype, peduncle about 2.2 times as long as width, margins pectinate, outer ramus lanceolate, about 70% length of peduncle, with pectinate margins, inner ramus wide, about 75% length of peduncle, apex with a small acute process, margins pectinate; uropod 2 (Fig. 17I) a little longer than uropod 1, outer and inner rami about 1.7 and 1.8 times as long as peduncle, respectively, margins of peduncle and both rami pectinate; uropod 3 (Fig. 17J) short, both rami lanceolate, longer than peduncle, outer ramus longer and narrower than inner ramus, outer margin of outer ramus with a few short setae, margins of inner ramus pectinate. Telson (Fig. 17K) slenderer than that of the holotype.

Immature male (paratype "8", 2.2mm). Gnathopod 1 (Figs. 18A, A1) almost the same as that of the allotype. Gnathopod 2 (Fig. 18B): basis swollen anterodistally, propodus broader, others like the allotype.

Uropods and telson (Figs. 18D-G) almost the same as those of the allotype, but ratio of peduncle to rami in uropod 1 higher, apex of uropod 1 inner ramus with a small truncate process.

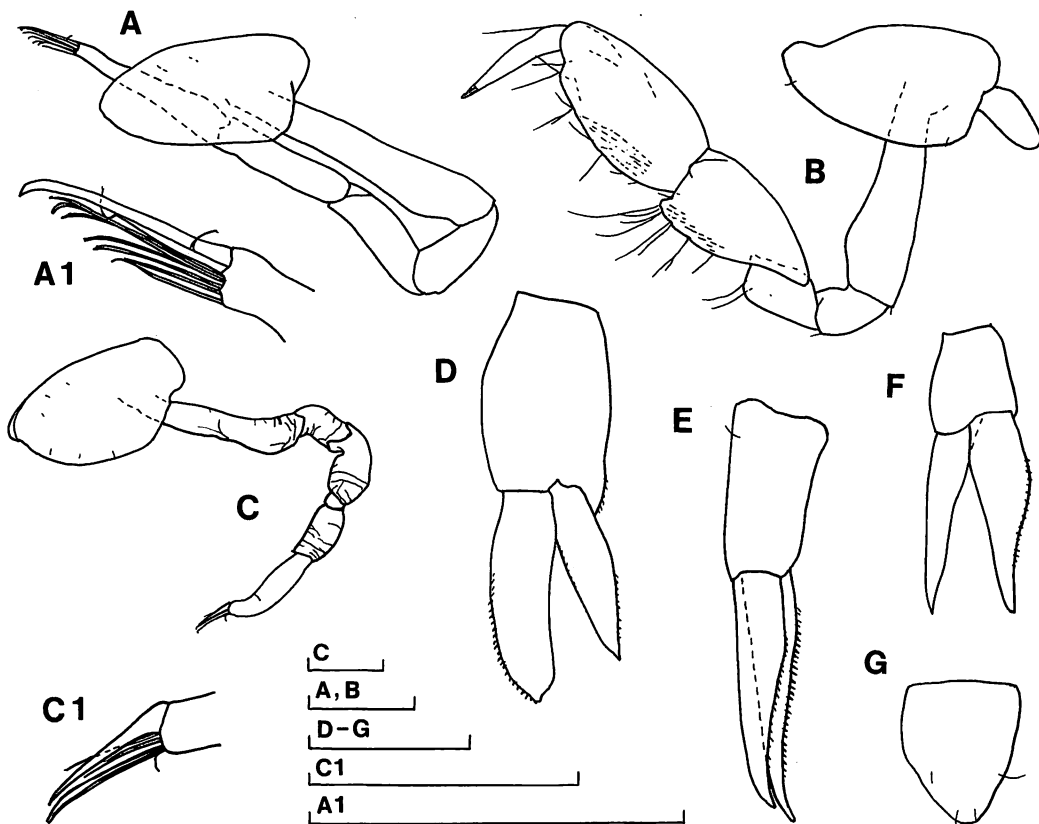


Fig. 18. *Colomastix littoralis* sp. nov. Male (paratype "8"), 2.2mm: A, gnathopod 1; A1, tip of gnathopod 1; B, gnathopod 2; D, right uropod 1; E-F, left uropods 2-3; G, telson. Male (paratype "5"), 3.4mm: C, gnathopod 1; C1, tip of gnathopod 1. Scales: 0.1mm.

Variation. Gnathopod 1 of paratype "5" (mature male, 3.4mm; Figs. 18C, C1): tip of propodus with spinelike dactylus and several setae.

Etymology. Referring to the habitat of this new species.

Remarks. Mature males of *Colomastix littoralis* sp. nov. have (1) vestigial gnathopod 1, (2) stout gnathopod 2 with 2 projections on propodus, (3) distinctly short outer ramus of uropod 1, (4) strongly curved inner ramus of uropod 1 with a small hooked projection, and (5) apically rounded inner ramus of uropod 3, and immature males have inner ramus of uropod 1 with a small truncate process. In the species of *Colomastix* described, only one species, *C. azumai*, shares all of these characters with the present species. However, *Colomastix littoralis* differs from *C. azumai* in the presence of lined minute tubercles on mediiodistal corner and the absence of tiny semicircular projection near the tip on outer ramus of uropod 3 in adult males. The immature males and mature females of *C. littoralis* can be separated from *C. azumai* by the telson (flat in the former and swollen in the latter). In addition, the sizes of mature and immature males are also different in both species, viz. mature: 2.5-3.5mm, immature: 2.0-2.2mm in *C. littoralis*; mature: 3.5-3.8mm, immature: 2.6-4.0mm in *C. azumai*, at least in the present locality.

Host. *Halichondria okadai* (Kadota).

Distribution. From Ebisuzaki coast in Wakayama Prefecture to Nagasaki coast in Osaka Prefecture.

Colomastix plumosa Ledoyer, 1979

(New Japanese name: Keashi-tsutsu-yokoebi)

(Figs. 19-22)

Colomastix plumosa Ledoyer, 1979, p. 26, fig. 8(I); Ledoyer, 1982, p. 158, fig. 55; Lyons and Myers, 1990, pp. 1220-1221, fig. 18.

?*Colomastix pusilla*: Nayar, 1967, pp. 145-146, fig. 7; (not Grube, 1861, p. 137).

Material examined. Males "1" and "2" (OMNH-Ar-7066, 7067), 2.1mm (immature), 1.9mm (immature), from a sponge *Spirastrella insignis* (3m in depth) at Oura in Hidaka, Wakayama Pref., 8 Aug. 1998; male "3" (OMNH-Ar-7068), 1.5mm (immature), and females "1" and "2" (OMNH-Ar-7069, 7071), 1.3mm (immature), 1.2mm (immature), from a sponge *Clatharia (Clatharia) fasciculata* (3m in depth) at Hikigawa, Wakayama Pref., 2 Aug. 2003.

Description. *Immature male* [based on male "1", 2.1mm, male "2", 1.9mm (maxillae and uropod 2), and male "3", 1.5mm (mandible)]. Body (Fig. 19) relatively slender; eyes small. Antenna 1 (Fig. 20A): ratio of peduncular articles 1-3 1:0.7:0.5, article 1 with 3 ventrodiscal and 2 medial spines, article 2 with 2 ventrodiscal and a medial spines, dorsodistal corner projected, article 3 with a dorsodistal spine; flagellum short, with 4 articles, article 1 long, article 4 minute, article 1 with several aesthetascs, articles 2-4 bearing several long setae. Antenna 2 (Fig. 20B): ratio of peduncular articles 3-5 1:1:0.8, dorsal surfaces of articles 3-5 with 1, 2, 1 spines, respectively, ventrolateral margins of articles 3-5 lined with triangular spinules; flagellum short, composed of 3 articles, article 3 with many long setae.

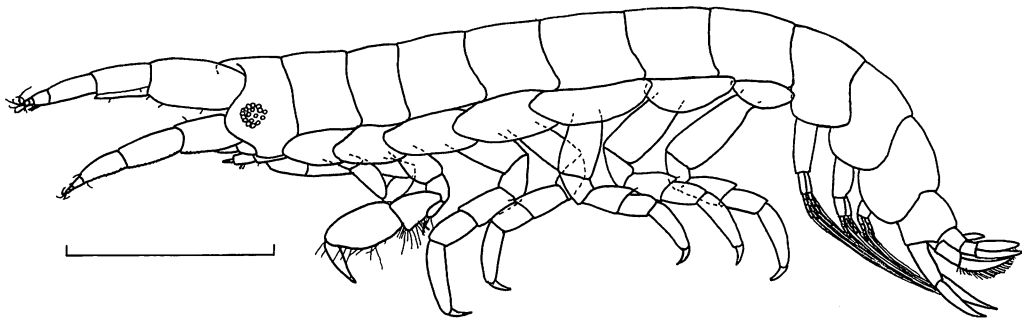


Fig. 19. *Colomastix plumosa* Ledoyer. Male "1", 2.1mm: habitus. Scale: 0.5mm.

Mouth parts: mandible (Fig. 20C) reduced; maxilla 1 (Fig. 20D), tip of palp with 2 setae; maxilla 2 (Fig. 20E), distal margins of both plates with several setae; maxilliped (Fig. 20F), outer plate not reduced, inner plates completely fused.

Gnathopod 1 (Figs. 20G, G1) slender; coxa roundish triangular; basis narrow, without setae; merus relatively wide; propodus slender, distal end with several long setae and swordlike dactylus. Gnathopod 2 (Figs. 20H, H1) not enlarged; coxa produced anteriorly; basis slightly broadened distally, with a short seta on anterior margin; merus short, posterodistal corner rounded, with a few setae, anterodistal corner produced; carpus short, posterior and posterodistal margins setose; propodus large, length 1.6 times of carpus, without projections, posterior and posterodistal margins bearing sparse setae, posteromedial surface with many fine setae; dactylus almost straight, tip with pleat structure.

Pereopods: pereopods 3 and 4 (Figs. 20I, J), coxa 3 produced anteriorly, coxa 4 produced anteriorly and posteriorly, ventral surfaces of both coxae each with a few short setae, bases slightly expanded distally, with a few setae on anterior margins, meri with a spine on anterodistal corners, carpi with a short seta on anterodistal corners, propodi slender, without setae, dactyli short, unguiform; pereopods 5-7 (Figs. 21A-C), coxae longish oval, size reduced from coxa 5 to 7, bases relatively wide, posterodistal corners rounded, both margins bearing a few short setae, posterodistal corners of ischia rounded, meri with a short spine on posterodistal corners, carpi with a short seta on posterodistal corners, propodi without setae, dactyli short, unguiform.

Pleopods (Figs. 21D-F): peduncle of pleopod 2 with a few setae; both rami each with 4 articles. Uropods: uropod 1 (Fig. 21G) relatively stout, outer ramus short, almost the same length as peduncle, inner ramus wide, length about 1.2 times of outer ramus, outer and inner margins of peduncle and both rami pectinate; uropod 2 (Figs. 21H, K) small, three fourths length of uropod 1, peduncle distinctly short, outer ramus 2.0-2.6 times as long as peduncle, curved dorsally, inner ramus lanceolate, length about 0.8 times of outer ramus, ventral surfaces of both rami strongly setose; uropod 3 (Fig. 21I) short, peduncle about 0.4 times as long as both rami, outer ramus straight, without setae, inner ramus wide, slightly shorter than inner ramus, heavily setose ventromedially. Telson (Fig. 21J) longish triangular, distal margin with 4 short setae.

Immature female [based on female "1", 1.3mm, and female "2", 1.2mm (uropods and telson)]. Gnathopod 1 (Figs. 22A, A1): coxa slenderer than that of male "1"; tip of dactylus spatulate.

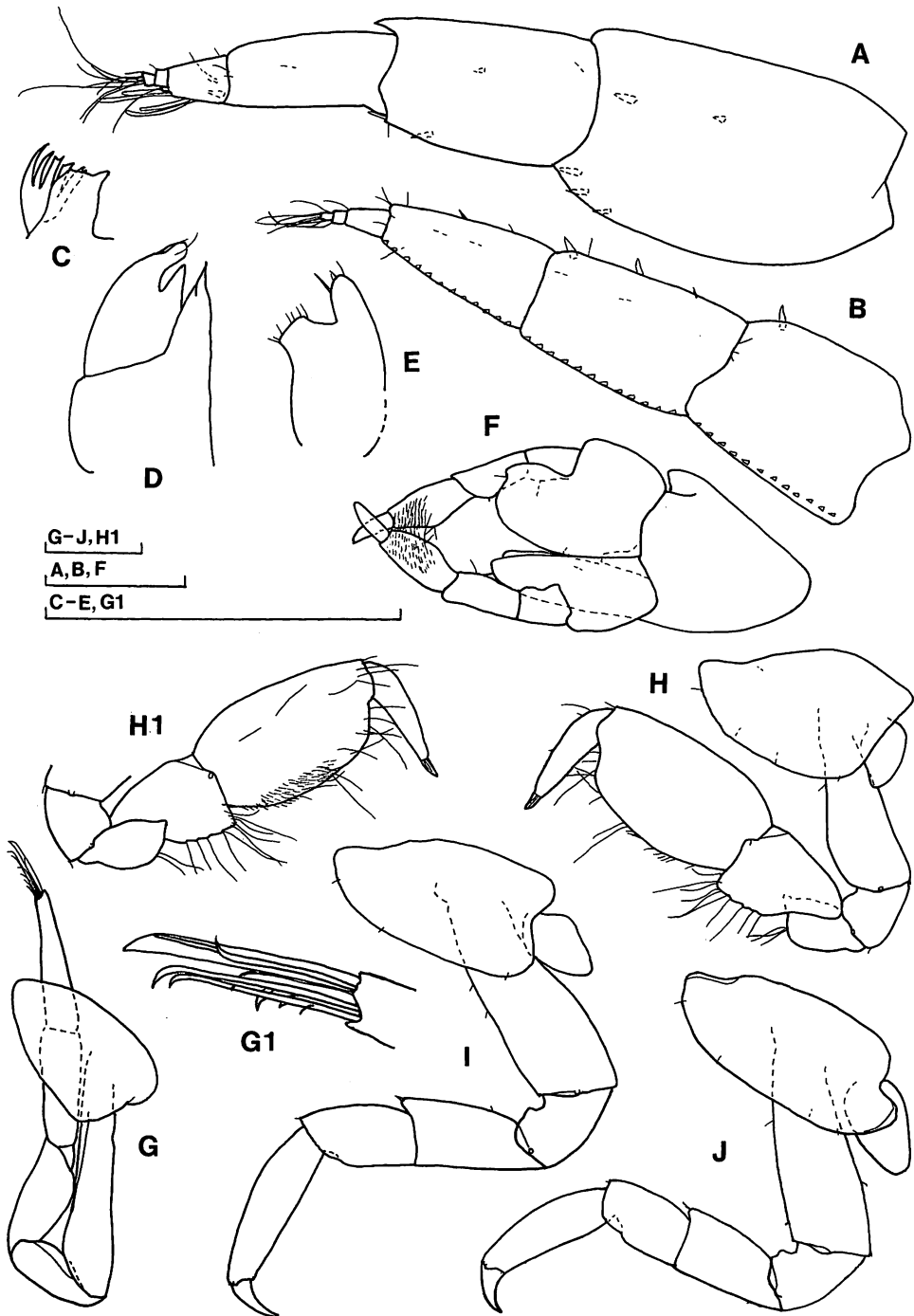


Fig. 20. *Colomastix plumosa* Ledoyer. Male "1", 2.1mm: A, antenna 1, lateral; B, antenna 2, lateral; F, maxilliped, ventral; G, gnathopod 1; G1, tip of gnathopod 1; H, gnathopod 2, lateral; H1, distal part of gnathopod 2, medial; I-J, pereopods 3-4. Male "2", 1.9mm: D, maxilla 1; E, maxilla 2. Male "3", 1.5mm: C, left mandible. Scales: 0.1mm.

Gnathopod 2 (Fig. 22B): coxa roundish trapezoidal, projected anteriorly; basis narrow, straight; carpus long, posterodistal margin bearing several long setae, posteromedial surface with many fine setae; propodus slender, slightly shorter than carpus, posterior margin with several normal setae and many medial fine setae; dactylus almost straight, tip with minute pleats.

Uropods (Figs. 22C-G): inner ramus of uropod 1 slenderer than that of male "1"; outer ramus of uropod 2 not curved.

Remarks. In spite of their immaturity, all the specimens can be identified as *Colomastix plumosa* Ledoyer, 1979 from Madagascar (Ledoyer, 1979, 1982) and the Red Sea (Lyons and Myers, 1990) by the heavily setose rami of uropod 2 and inner ramus of uropod 3. *Colomastix pusilla*

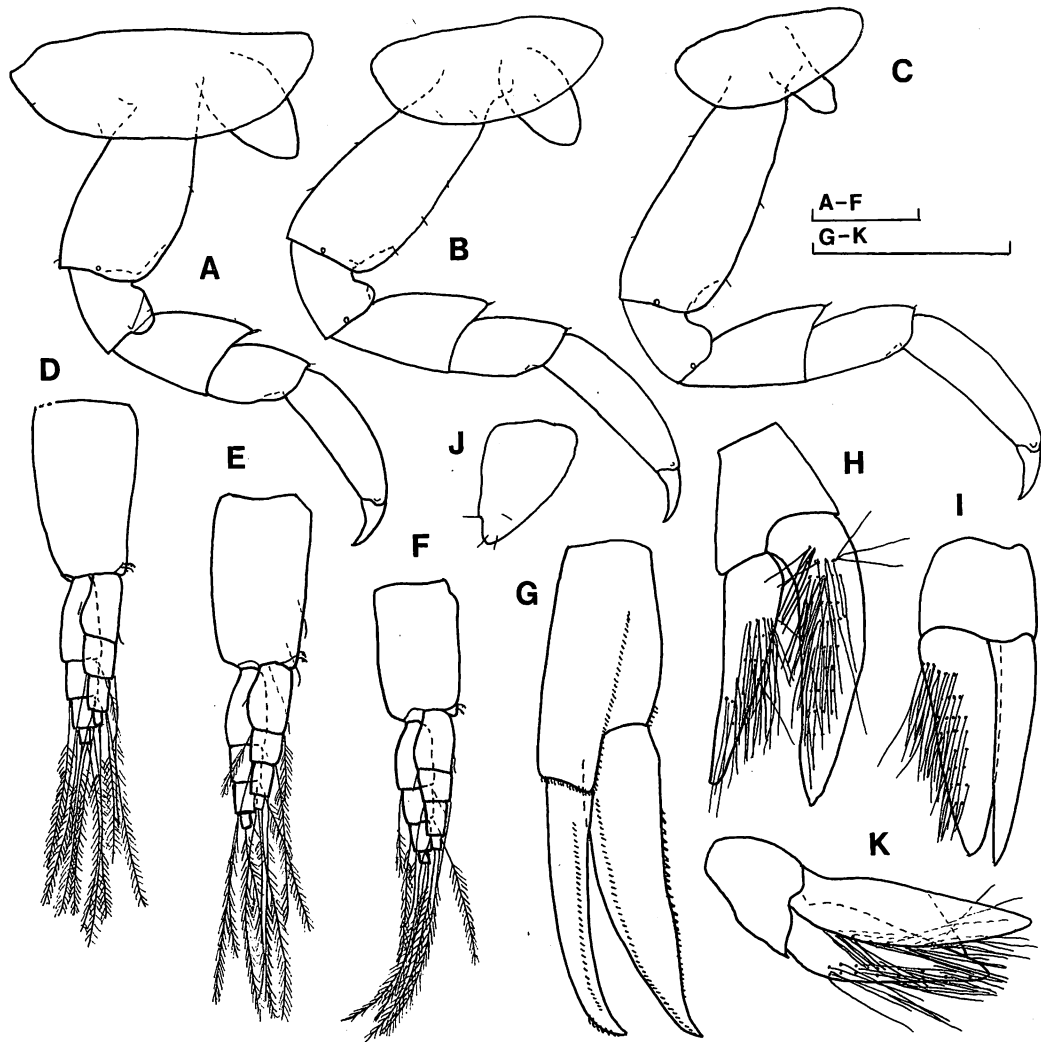


Fig. 21. *Colomastix plumosa* Ledoyer. Male "1", 2.1mm: A-B, pereopods 5-6; C, pereopod 7 and penial papilla; D-F, pleopods 1-3; G, left uropod 1, lateral; H, left uropod 2, ventral; I, left uropod 3, ventral; J, telson. Male "2", 1.9mm: K, left uropod 2, ventrolateral. Scales: 0.1mm.

recorded from India by Nayar (1967) has similar setose uropod 3. Considering the location of India, his specimen may possibly be identified with *C. plumosa*, although he described only antennae, gnathopods and uropods 1 and 3.

Colomastix bousfieldi LeCroy, 1995, *C. falcirama* LeCroy, 1995, and *C. heardi* LeCroy, 1995 from the Gulf of Mexico also have setose inner ramus of uropod 3. However, in these species, the setation of uropod 3 occurs in only females and their uropod 2 are not setose in both sexes.

Host. *Spirastrella insignis* Thiele and *Clatharia (Clatharia) fasciculata* (Wilson).

Distribution. Hikigawa and Oura in Wakayama Prefecture; Madagascar (Ledoyer, 1979, 1982), the Red Sea (Lyons and Myers, 1990), ?India (Nayar, 1967).

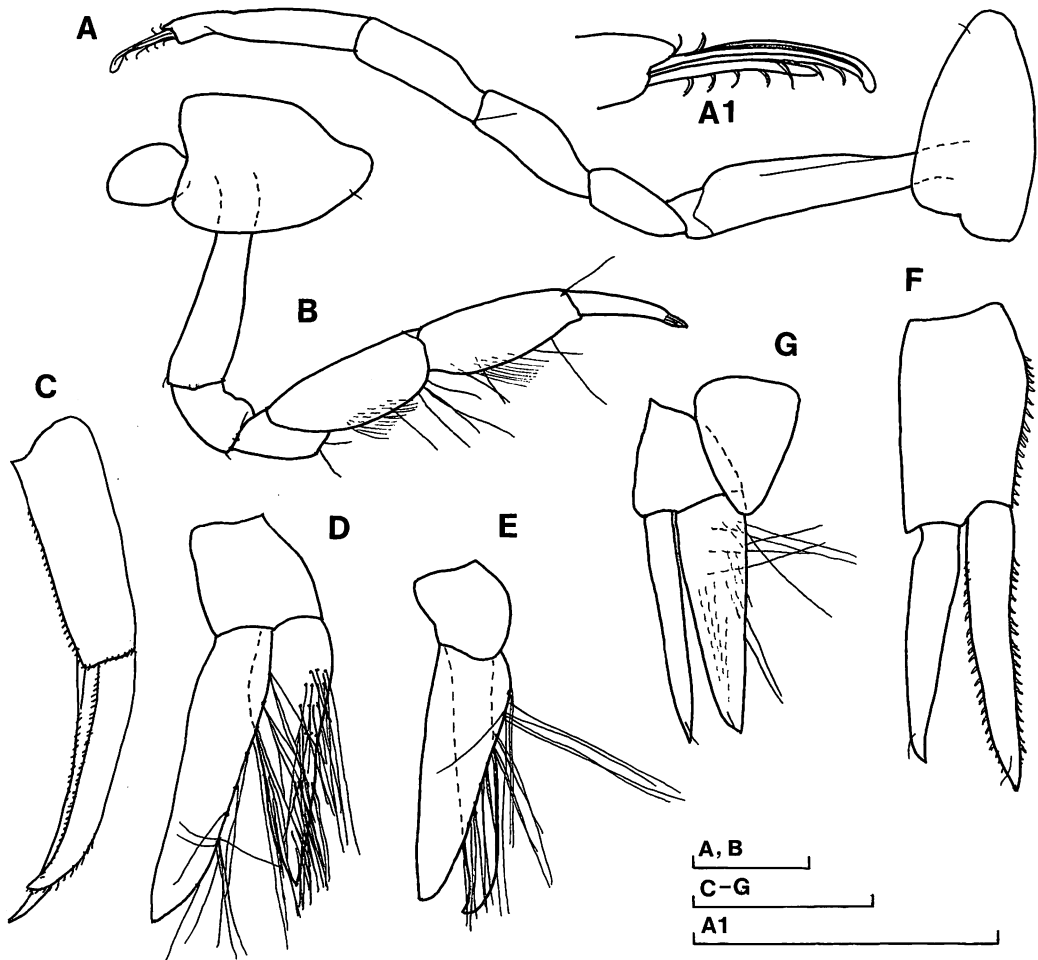


Fig. 22. *Colomastix plumosa* Ledoyer. Female "1", 1.3mm: A, gnathopod 1; A1, tip of gnathopod 1, medial; B, right gnathopod 2; C, right uropod 1, lateral; D, right uropod 2, ventrolateral; E, left uropod 3, medial. Female "2", 1.2mm: F, left uropod 1, dorsal; G, left uropod 3 and telson, dorsal. Scales: 0.05mm.

Colomastix semiplumosa sp. nov.

(New Japanese name: Hime-keashi-tsutsu-yokoebi)

(Figs. 23-25)

Material examined. Holotype: female (OMNH-Ar-7072), 1.8mm (mature), from a sponge ?*Rhabdastrella* sp. (18m in depth) off Kamiura in Kushimoto, Wakayama Pref. (33° 28'N, 135° 46'E), 28 Nov. 2002.

Description. *Mature female* (holotype, 1.8mm). Body (Fig. 23) slender; eyes large. Antenna 1 (Fig. 24A): ratio of peduncular articles 1-3 1:0.6:0.5, article 1 with 2 ventral and a medial spines, articles 2 and 3 with 2 and 1 ventral spines, respectively; flagellum with 4 articles, article 1 long, article 4 minute, article 3 with many long setae. Antenna 2 (Fig. 24B): ratio of peduncular articles 3-5 1:0.9:0.7, dorsomedial surfaces of articles 3-5 with 1, 2, 1 spines, respectively, ventrolateral margins of articles 3-5 lined with triangular spinules; flagellum short, composed of 4 articles, articles 3 and 4 each with several long setae.

Mouth parts: maxilla 1 (Fig. 24C), tip of palp without setae; maxilla 2 (Fig. 24D), distal margins of both plates with several setae; maxilliped (Fig. 24E), outer plate not reduced, inner plates completely fused.

Gnathopod 1 (Figs. 24F, F1) slender; coxa oval; basis narrow, without setae; merus relatively wide; propodus slender, distal end with several long and short setae and spatulate dactylus. Gnathopod 2 (Figs. 24G, G1) not enlarged; coxa produced anteriorly; basis slightly broadened distally; merus short, posterodistal corner with a few setae, anterodistal corner produced, posterior margin with many fine setae; carpus long, posterior margin setose, posteromedial surface with many fine setae; propodus slender, length 0.9 times of carpus, posterior and anterodistal margins bearing sparse setae, posteromedial surface with many fine setae; dactylus narrow, slightly curved posteriorly, tip with pleat structure.

Pereopods: pereopods 3 and 4 (Figs. 24H, I), coxa 3 produced anteriorly, coxa 4 produced anteriorly and posteriorly, bases slightly expanded distally, with a few setae on anterior and posterior margins, meri with a spine on anterodistal corners, propodi slender, with 2 short spinules

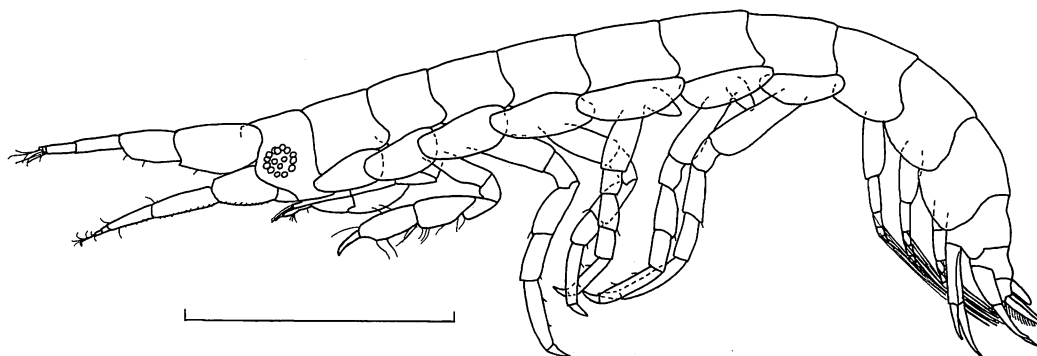


Fig. 23. *Colomastix semiplumosa* sp. nov. Female (holotype), 1.8mm: habitus. Scale: 0.5mm.

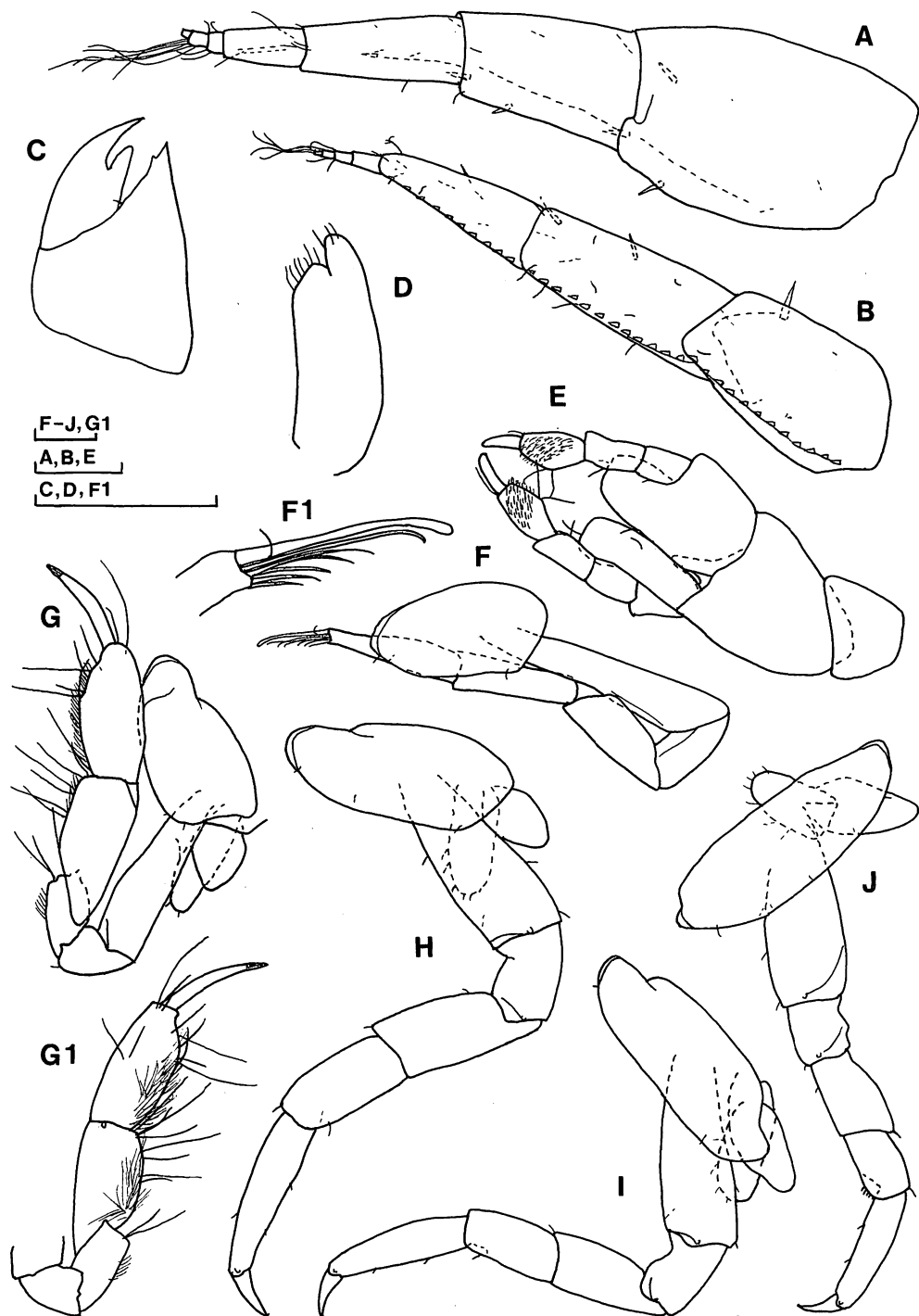


Fig. 24. *Colomastix semiplumosa* sp. nov. Female (holotype), 1.8mm: A, antenna 1, lateral; B, antenna 2, lateral; C, maxilla 1; D, maxilla 2; E, maxilliped, ventral; F, gnathopod 1; F1, tip of gnathopod 1; G, gnathopod 2, lateral; G1, distal part of gnathopod 2, medial; H-J, pereopods 3-5. Scales: 0.05mm.

on anterior margins, dactyli short; pereopods 5-7 (Figs. 24J, 25A, B), coxae longish oval, size reduced from coxa 5 to 7, bases relatively wide, posterodistal corners rounded, anterior margins bearing a few short setae, meri with a short spine on posterodistal corners, carpi with a short seta on posterodistal corners, propodi slender, with 2 spinules, dactyli short. Oostegites (Figs. 24G-J) not fully mature, distal margins with several short setae.

Pleopods (Figs. 25C-E), both rami each with 4 articles. Uropods: uropod 1 (Fig. 25F), outer ramus short, about 65% length of peduncle, inner ramus long, length about 1.5 times of outer ramus, outer and inner margins of peduncle and both rami pectinate; uropod 2 (Fig. 25G) ordinary, about 80% length of uropod 1, outer ramus 1.3 times as long as peduncle, inner ramus slightly longer than outer ramus, outer and inner margins of peduncle and both rami pectinate, tips of both rami each with a short seta; uropod 3 (Fig. 25H, I) short, peduncle about half length of outer ramus, outer ramus narrow, without setae, inner ramus wide, slightly shorter than inner ramus, heavily setose ventrally. Telson (Fig. 24J) longish trapezoidal, margin with 4 short setae.

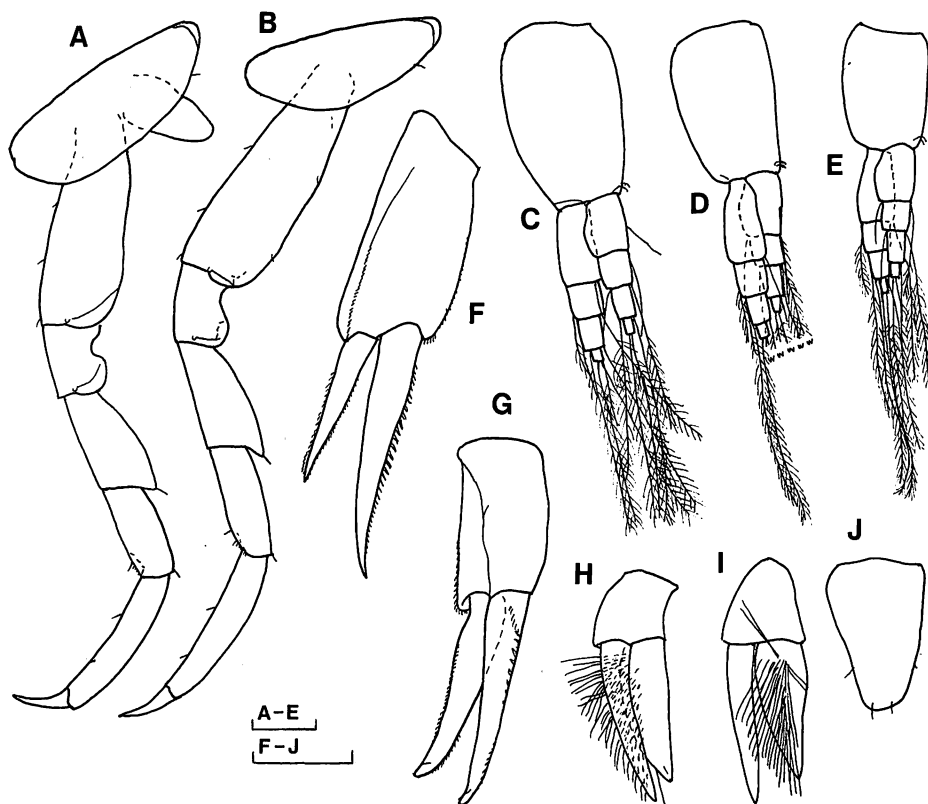


Fig. 25. *Colomastix semiplumosa* sp. nov. Female (holotype), 1.8mm: A-B, pereopods 6-7; C-E, pleopods 1-3; F, left uropod 1, dorsal; G, left uropod 2, medial; H, left uropod 3, dorsal; I, right uropod 3, ventral; J, telson. Scales: 0.05mm.

Etymology. Referring to the affinity of the setation of uropods with *Colomastix plumosa*.

Remarks. This new species has short outer ramus of uropod 1, ordinary uropod 2, and ventrally setose inner ramus of uropod 3. These characters are shared with *Colomastix bousfieldi*, *C. falcirama* and *C. heardi* from the Gulf of Mexico (LeCroy, 1995). However, *Colomastix semiplumosa* sp. nov. can be distinguished from the latter three species in the slender flagella of antennae and the presence of the pleat structure on dactylus of gnathopod 2. In addition, *C. semiplumosa* attains maturity in the smaller size (1.8mm). *Colomastix plumosa* resembles this new species in having setose uropod 3, but both rami of uropod 2 are also setose in *C. plumosa*.

Host. ?*Rhabdastrella* sp.

Distribution. Kushimoto in Wakayama Prefecture.

Keys to Japanese *Colomastix* Species

Keys to mature males, immature males and females of Japanese *Colomastix* species are provided, while mature males of *Colomastix plumosa* and *C. semiplumosa*, and immature males of *C. semiplumosa* are unknown.

1. Key to mature males

1. Gnathopod 1 vestigial; uropod 1 inner ramus curved.....2
 Gnathopod 1 not vestigial; uropod 1 inner ramus straight.....3
2. Uropod 3 outer ramus with a tiny semicircular projection near the tip, body size medium (3.5-3.8mm).....*Colomastix azumai* Hirayama and Kikuchi, 1980 (p. 2)
 Uropod 3 outer ramus with lined minute tubercles on mediiodistal corner, body size small (2.5-3.5 mm).....*Colomastix littoralis* sp. nov. (p. 21)
3. Gnathopod 2, propodus massive, ovoid, dactylus short; body size large (5.2-10.3 mm).....
 *Colomastix japonica* Bulycheva, 1955 (p. 8)
 Gnathopod 2, propodus large rectangular, dactylus elongate; body size small (2.6-2.8 mm)
 *Colomastix kapiolani* J. L. Barnard, 1970 (p. 15)

2. Key to immature males

1. Uropods 2 and 3 setose ventrally.....*Colomastix plumosa* Ledoyer, 1979 (p. 27)
 Uropods 2 and 3 not setose.....2
2. Uropod 3 outer ramus shorter than half length of inner ramus.....
 *Colomastix japonica* Bulycheva, 1955 (p. 8)
 Uropod 3 outer ramus longer than half length of inner ramus.....3
3. Uropod 1 both rami slender; uropod 3 outer ramus about three fourths as long as inner ramus; telson trilobate.....*Colomastix kapiolani* J. L. Barnard, 1970 (p. 15)
 Uropod 1 inner ramus wide, apex with a small truncate process; uropod 3 outer ramus slightly longer than inner ramus; distal margin of telson smooth.....4
4. Telson swollen dorsally in lateral view.....
 *Colomastix azumai* Hirayama and Kikuchi, 1980 (p. 2)

Telson flat in lateral view *Colomastix littoralis* sp. nov. (p. 21)

3. Key to females

- 1. Uropods 2 and 3 setose ventrally *Colomastix plumosa* Ledoyer, 1979 (p. 27)
 - Only uropod 3 setose ventrally *Colomastix semiplumosa* sp. nov. (p. 32)
 - Uropods 2 and 3 not setose 2
- 2. Uropod 3 outer ramus shorter than half length of inner ramus
 - *Colomastix japonica* Bulycheva, 1955 (p. 8)
 - Uropod 3 outer ramus longer than half length of inner ramus 3
- 3. Uropod 1 both rami slender; uropod 3 outer ramus about three fourths as long as inner ramus; telson trilobate *Colomastix kapiolani* J. L. Barnard, 1970 (p. 15)
 - Uropod 1 inner ramus relatively wide, apex with a small acute process; uropod 3 outer ramus slightly longer than inner ramus; distal margin of telson smooth 4
- 4. Telson swollen dorsally in lateral view
 - *Colomastix azumai* Hirayama and Kikuchi, 1980 (p. 2)
 - Telson flat in lateral view *Colomastix littoralis* sp. nov. (p. 21)

Discussion

Colomastix species dwell mainly in sponges (LeCroy, 1995). Table 1 shows the occurrence of *Colomastix* species in the examined sponges. I described six species of *Colomastix* which had been collected from 10 species of sponges in Wakayama, Osaka and Ehime Prefectures. Besides these species, I also examined 6 sponge species, *Scypha ciliata* (Fabricius), *Halichondria japonica*

Table 1. Occurrence of *Colomastix* species in the examined sponges.

Family and species names of examined sponges	<i>Colomastix</i> species					
	<i>C. azumai</i>	<i>C. japonica</i>	<i>C. kapiolani</i>	<i>C. littoralis</i>	<i>C. plumosa</i>	<i>C. semiplumosa</i>
Family Heterocoelidae						
<i>Scypha ciliata</i>	—	—	—	—	—	—
Family Ancorinidae						
? <i>Rhabdastrella</i> sp.	—	—	—	—	—	○
Family Spirastrellidae						
<i>Anthosigmella raromicrosclera</i>	○	—	—	—	—	—
<i>Spirastrella insignis</i>	○	—	—	—	○	—
Family Agelasidae						
<i>Agelas</i> sp.1	—	—	—	—	—	—
<i>Agelas</i> sp.2	—	—	—	—	—	—
Family Halichondriidae						
<i>Halichondria japonica</i>	—	—	—	—	—	—
<i>H. okadai</i>	—	—	—	○	—	—
<i>H. panicea</i>	—	—	—	—	—	—
Family Microcionidae						
<i>Clatharia (Clatharia) fasciculata</i>	—	—	—	—	○	—
Family Callyspongiidae						
<i>Callyspongia confederata</i>	—	○	—	—	—	—
<i>C. elegans</i>	—	○	—	—	—	—
Family Chalinidae						
<i>Haliclona permollis</i>	—	○	—	—	—	—
<i>Haliclona</i> sp.	—	—	—	—	—	—
Family Petrosiidae						
<i>Strongylophora</i> sp.	—	—	○	—	—	—
family unknown						
unidentified sponges	—	—	○	—	—	—

○: present, —: absent.

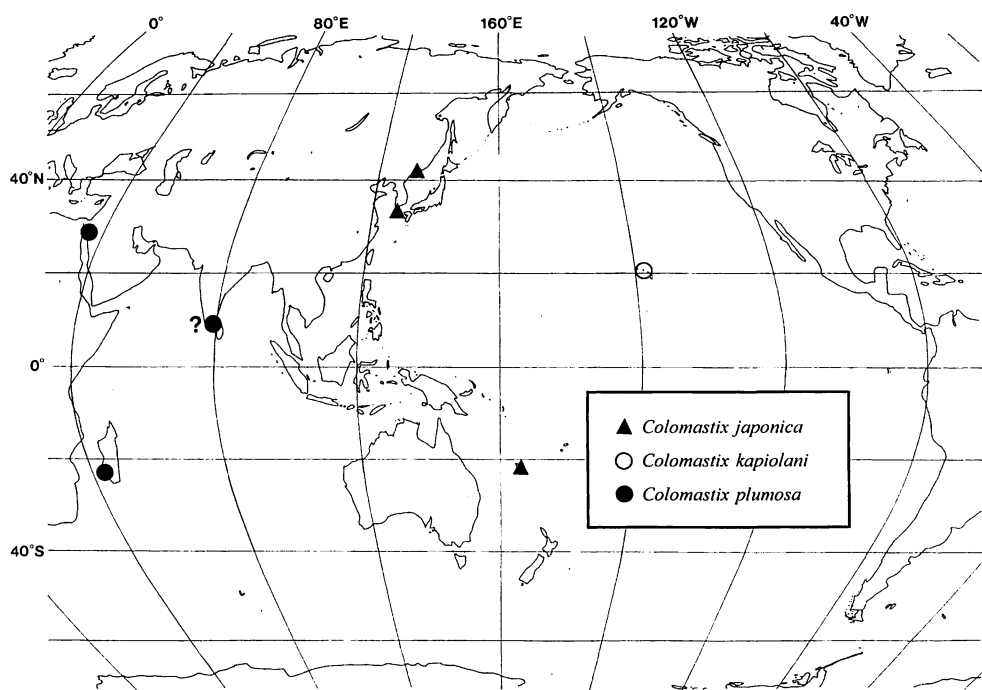


Fig. 26. World distributions of three *Colomastix* species occurred in Japan.

(Kadota), *H. panicea* (Pallas), and *Haliclona* sp. in Misaki, Osaka Prefecture, and *Agelas* sp. 1 and *A.* sp. 2 in Kushimoto, Wakayama Prefecture; however, *Colomastix* species was not collected from these sponges. Each *Colomastix* species occurred in 1-3 species of sponge (average: 1.8; Table 1), while each *Colomastix* species in the Gulf of Mexico was associated with 1-20 species of sponges (average: 4.9) (LeCroy, 1995). This fact suggests that host specificity is comparatively high in Japanese *Colomastix* species. In Japan, there are 538 known species of marine sponges (Ogawa et al., 1993; Ogawa, 1997, 1999, 2001, 2002, 2003), and I have examined only a smaller part of the sponge species. Moreover, *Colomastix* species are associated also with tunicates and corals (LeCroy, 1995). If the other sponges, tunicates and corals are investigated, more *Colomastix* species are expected to be discovered. Species numbers of *Colomastix* are relatively rich in the eastern Gulf of Mexico (11 species; LeCroy, 1995) and Madagascar (8 species; Ledoyer, 1982). Since six *Colomastix* species were collected in spite of small number of the examined sponge species, I think that species diversity of *Colomastix* is also high in Japan just like *Aoroides* (Ariyama, 2004).

Three of six *Colomastix* species described in the present paper are widely distributed in the Indo Pacific region (Fig. 26). Although I have no means to explain the distributions, Myers (1993) stated that the long distance dispersal of amphipods took place only through rafting, and J. L. Barnard (1976) wrote that inquilinous associates of ascidians and sponges could be transported in their hosts attached to rafting materials. If the dispersal of *Colomastix* was performed in recent years, transportation by ship-fouling is inferred, because *Paracerceis sculpta*, an isopod breeding in sponges, has been introduced into many localities in the world (Hewitt and Campbell, 2001; Ariyama and Otani, 2004).

Ackowleggments

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