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ON *PARACALOCARIS SAGAMIENSIS,* A NEW GENUS AND SPECIES FROM JAPAN (DECAPODA: THALASSINIDEA: AXIIDAE)

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Abstract.—A new genus and species of the family Axiidae, *Paracalocaris sagamiensis,* collected from Sagami Bay, Japan, and previously reported as *Calocaris* (*Calocaris*) *granulosa* Grebenyuk, is described. *P. sagamiensis* cannot be placed in either *Calocaris* or *Lophaxius* based on the eye, as it is triangular with dorsally upraised, unpigmented cornea, on the unarmed anterolateral margin of the carapace, and on the 2-segmented pleopod 1, with the distal segment distally trilobed. *Calocaris* (*Calocaris*) *granulosa* is transferred to the new genus, and along with *P. sagamiensis,* placed in the family Axiidae.

From among the material of deep-sea Decapoda Crustacea collected in crab traps by H. Ikeda of Hayama Municipal Museum, Japan, a most interesting axiid specimen was kindly sent to me for study. This specimen, though closely related to *Calocaris* (*Calocaris*) *granulosa* Grebenyuk, from Alaska, differs in various points, and is described as *Paracalocaris sagamiensis* new genus and species. *Calocaris* (*Calocaris*) *granulosa* is transferred to the new genus, and along with *P. sagamiensis,* placed in the family Axiidae.

The following abbreviations are used in this paper; CL, carapace length including rostrum; TL, total length of body; USNM, National Museum of Natural History, Smithsonian Institution, Washington, D.C.; SMF, Forschungsinstitut Senckenberg, Frankfurt am Main, W. Germany.

Family Axiidae Huxley, 1878

Paracalocaris, new genus

Diagnosis.—Hermaphroditic. Carapace with anterolateral margin unarmed; postcervical carina entire. Rostrum elongate, at distinctly lower level than anterior carapace; rostral margins armed. Median carina entire; submedian carina absent; lateral carina extending only short distance posterior to rostrum, armed with one or two spines. Eyestalk not mesially contiguous; cornea unpigmented, upraised or not. Antennal acicle short, situated mesial to dorsodistal spine of segment 2. Maxillipeds 1–3 with exopods and epipods; small podobranch on maxilliped 2; large podobranch on maxilliped 3.

Pereopods lacking exopods; epipods on pereopods 1–4; large podobranch on pereopods 1–3; pleurobranchs absent. Pereopod 1 with chelae subequal; anterior margin of palm armed. Pereopod 2 chelate.

Pleopod 1 2-segmented, distal segment expanded, distally trilobed, with patch of hooks on mesiodistal lobe. Pleopod 2 with endopod lacking distal portion, slender appendix masculina of single article, with appendix interna articulating at its base.

Telson longer than wide, with two dorsal rows of non-articulating spines. Uropodal exopod with transverse suture.

Etymology.—The generic name is derived from the Greek "para," a prefix meaning "near," plus the generic name "*Calocaris.*" Gender: feminine.

Type species.—*Paracalocaris sagamiensis,* new species.

Species included.—*Paracalocaris saga-*

miensis, new species, and *Calocaris* (*Calocaris*) *granulosa* Grebenyuk, 1975.

Remarks.—The present new genus *Paracalocaris* is similar to *Calocaris* Bell, 1853, and *Lophaxius* Kensley, 1989, in being hermaphroditic, and having a post-cervical carina on the carapace; the pleopod 2 with a slender appendix masculina and a free appendix interna (Fig. 5D); and lacking pleurobranchs on thoracic somites 2–4. However, *Paracalocaris* differs in several characters from *Calocaris* and *Lophaxius.* In *Calocaris,* as exemplified by its type species, *C. macandreae* Bell, 1853, the anterolateral margin of the carapace has a spine; the eyes are mesially contiguous; the antennal acicle is reduced; the maxilliped 2 bears a reduced podobranch with a few gill filaments; and pleopod 1 (Fig. 5C) consists of two segments, the distal segment being expanded in the form of a lobe, and with a patch of hooks on small mid-terminal margin. In *Paracalocaris,* the anterolateral margin of the carapace is unarmed; the eyes are not mesially contiguous; the antennal acicle is short; the maxilliped 2 has a large podobranch; and the pleopod 1 is made of two segments, the distal segment being expanded, trilobed, and with patch of hooks on mesial lobe (Fig. 5A). In *Lophaxius* the eyes are not mesially contiguous; the antennal acicle is short; and the maxilliped 2 has a large podobranch (Kensley 1989:962), as in *Paracalocaris.* However, *Lophaxius* differs from *Paracalocaris* and *Calocaris,* in that the anterolateral margin of the carapace has a spine; the pereopod 2 is subchelate; and the pleopod 1 consists of two segments, the distal segment being spatulate with a small mesial patch of hooks (Kensley 1989:962).

Grebenyuk's species, *Calocaris* (*Calocaris*) *granulosa* is also placed in *Paracalocaris.* This species has a small antennal acicle; the eyestalk is flattened, but the cornea is not upraised as *P. sagamiensis*; and pleopod 1 is 2-segmented, the distal segment being distally trilobed (Grebenyuk 1975: figs. 1–5).

Paracalocaris is here treated under the family Axiidae following Sakai & de Saint Laurent (1989:11).

Paracalocaris sagamiensis, new species
Figs. 1–5

Calocaris (*Calocaris*) *granulosus.*—Sakai, 1987:300.

Material examined.—1 ♀, holotype, TL = 81 mm, CL = 31 mm, USNM 231420, off Ohiso, Sagami Bay, Japan, 250–280 m, crab trap, 3 Apr 1984; H. Ikeda, coll.

Diagnosis.—Hermaphroditic. Rostrum styliform, with three marginal spines, margins shortly extending posteriorly onto gastric region; lacking submedian carina, but with post-cervical carina on carapace. Eye triangular with obtuse tip, bearing upraised cornea without pigments. Pereopods 1 subequal, palm with dorsal row of prominent spines; pereopod 3 with propodus elongate, ventrolaterally without transverse rows of spines. Pleurobranchs absent. Pleopod 1 composed of two segments, distal one distally trilobed.

Description.—Hermaphroditic, Rostrum (Fig. 1A, B) styliform, with three marginal spines; tip acute. Carapace compressed, with scattered rounded tubercles; anterolateral margin unarmed. Cervical groove dorsally distinct, ventrolaterally indistinct. Gastric region anteriorly arched to rostrum, lateral carina short, with strong spine, anteriorly continuous with lateral margin of rostrum; submedian carina absent; median carina extending from base of rostrum to posterior margin of carapace, armed with median tubercles.

Eye peduncles (Fig. 1C) small, thick, less than one-fourth length of rostrum, distally triangular with obtuse tip; cornea small, poorly defined, not pigmented, upraised. Antennular peduncle slightly shorter than rostrum; segment 1 as long as segments 2 and 3 combined, its dorsal surface medially concave in proximal half to accommodate eye; dorsolateral flagellum 23 mm long,

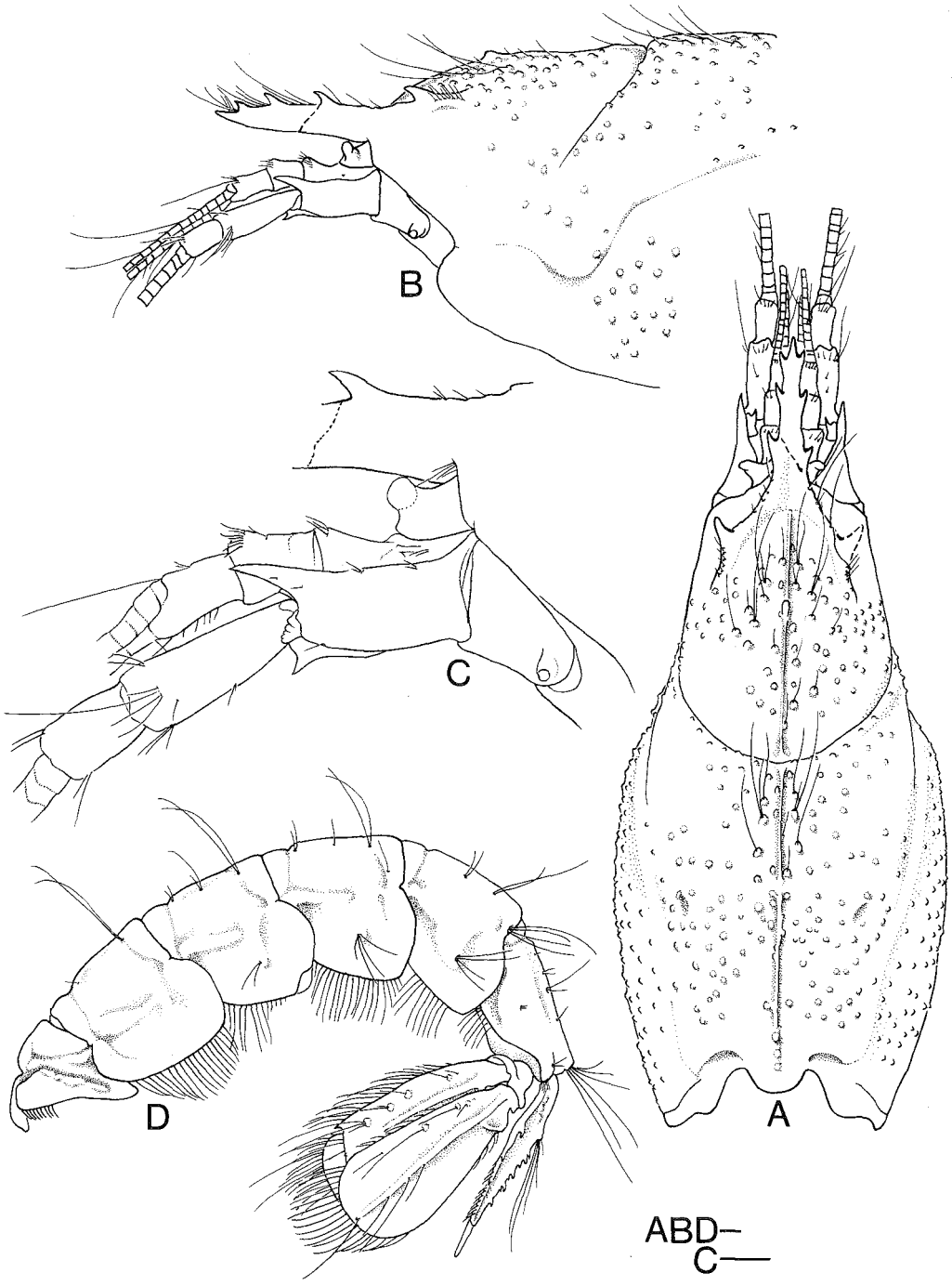

Fig. 1. *Paracalocaris sagamiensis,* new species, ♀, holotype. A, carapace and cephalic appendages, dorsal view; B, anterior carapace, lateral view; C, antennule, antenna, and eyestalk, lateral view; D, abdomen and tail-fan, lateral view. Scales equal 1 mm.

ventromesial flagellum 34 mm long. Antennal peduncle overreaching antennular peduncle by segment 5; segment 1 unarmed; dorsodistal spine of segment 2 well developed, directed anteriorly, extending to about proximal third of segment 4; antennal acicle small, distinctly shorter than, and situated mesial to dorsodistal spine of segment 2; ventrodistal spine of segment 3 short; segment 4 about as long as segment 2, twice length of segment 5, flagellum measuring 63 mm.

Mandible with 3-segmented palp. Maxillular palp (Fig. 2A) 2-segmented, distal segment about as long as proximal one, proximally sinuous with two terminal setae. Maxilla with long posterior flagellum on scaphognathite (Fig. 2B); palp distally tapering, curved mesially. Maxilliped 1 (Fig. 2C) with 2-segmented palp extending to level of distal margin of endite; distal process of exopod consisting of two subequal segments. Maxilliped 2 with proximal segment and flagellum on exopod; epipod leaf-like, with simple rudimentary podobranch and arthrobranch lacking gill-filaments. Maxilliped 3 (Fig. 4D, E) with coxa unarmed; basis with mesial denticle; ischium with denticulate crest on mesial margin widely separated by broad concavity from posterior margin with three well-spaced denticles; merus slightly shorter than ischium, with 3–4 teeth on posterior margin, distal one very distinct, others small; carpus about ¾ length of merus, with ventrodistal spine; propodus about ⅘ length of carpus, dactylus about ⅘ length of propodus.

Pereopods 1 subequal, chelae vertically positioned.

Left, larger cheliped (Fig. 3A) with coxa (not figured) provided with two spines on posteromesial surface, and with seven denticles on lateral margin. Basis (not figured) with obtuse spine on mesial margin. Ischium with three sharp spines on posterior margin. Merus about 2.3 times as long as broad; anterior margin with two sharp subdistal spines and four tubercles; ventral margin with four sharp equidistant spines, and outer surface with sharp distal spine near articulation. Carpus triangular, less than half length of merus, armed with three sharp proximal and two small distal spines on dorsal margin. Chela about 3.5 times as long as carpus; palm about as long as wide, increasing in width distally; anterior margin with four sharp distally directed spines, and obtuse spine proximally; posterior surface with proximally broad but distally narrow carina along entire length of surface, bearing lateral row of six distinct, outwardly directed spines and mesial row of nine denticles on proximal third; lateral and mesial surfaces provided with granules with tuft of setae. Dactyl about 1.3 times as long as palm; cutting edge largely gaping proximally with a broad tooth in midlength, and armed with row of obtuse denticles on distal half; lateral and mesial surfaces medially carinate. Cutting edge of fixed finger largely convex and denticulate.

Right, smaller cheliped (Fig. 3B), similar to, but less wide and more denticulate than left. Coxa and basis as in larger cheliped. Ischium armed with five sharp spines on posterior margin. Merus smaller than that of larger cheliped, about 2.3 times as long as broad; anterior margin armed with two sharp subterminal spines, posterior margin with row of nine sharp spines, and lateral surface with sharp distal spine near articulation. Carpus less than half length of merus; anterior margin with four spines, middle two the largest. Chela more than three times as long as carpus; palm less wide than that of left cheliped, with six sharp spines directed anteriorly; posterior surface showing distinct carina as in larger cheliped, carina triangular on proximal third, laterally with nine distinct tubercles or spines, and mesially with 12 tubercles, becoming narrow in distal ⅔; lateral and mesial surfaces furnished with granules, each having tuft of setae. Dactyl about 1.3 times as long as palm;

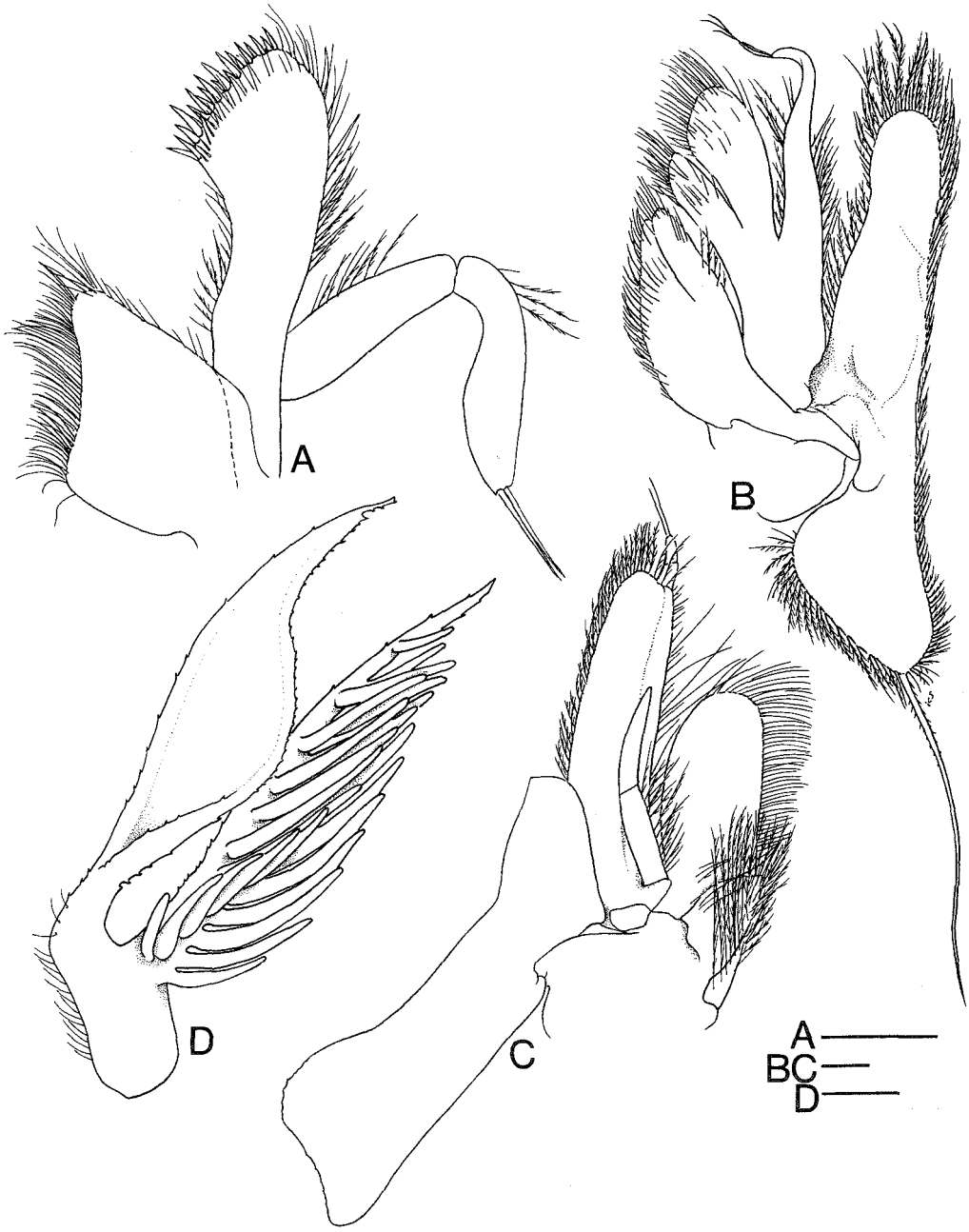

Fig. 2. *Paracalocaris sagamiensis,* new species, ♀, holotype. A, maxillule, external face; B, maxilla, external face; C, 1st maxilliped, internal face; D, epipod and podobranch of 2nd pereopod. Scales equal 1 mm.

cutting edge largely gaping proximally, with broad tooth at about midlength, concave with row of denticles on distal half. Fixed finger similar to that of larger cheliped.

Pereopod 2 with coxa having proximal spine on each posteromesial and anteromesial surfaces, and with group of seven denticles proximally on lateral margin. Basis

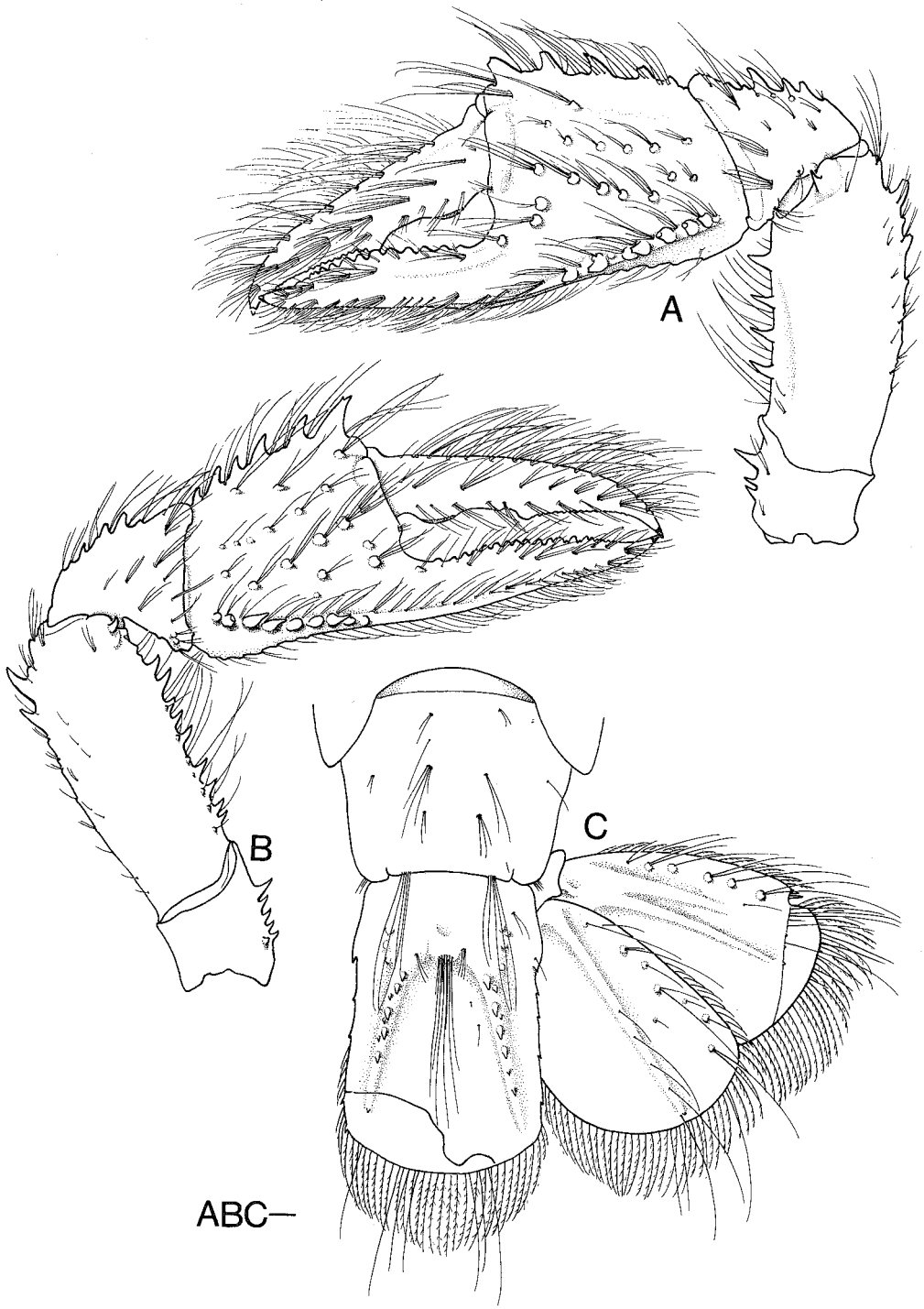

Fig. 3. *Paracalocaris sagamiensis,* new species, ♀, holotype. A, 1st larger pereopod, left side; B, 1st smaller pereopod, right side; C, tail-fan, dorsal view. Scales equal 1 mm.

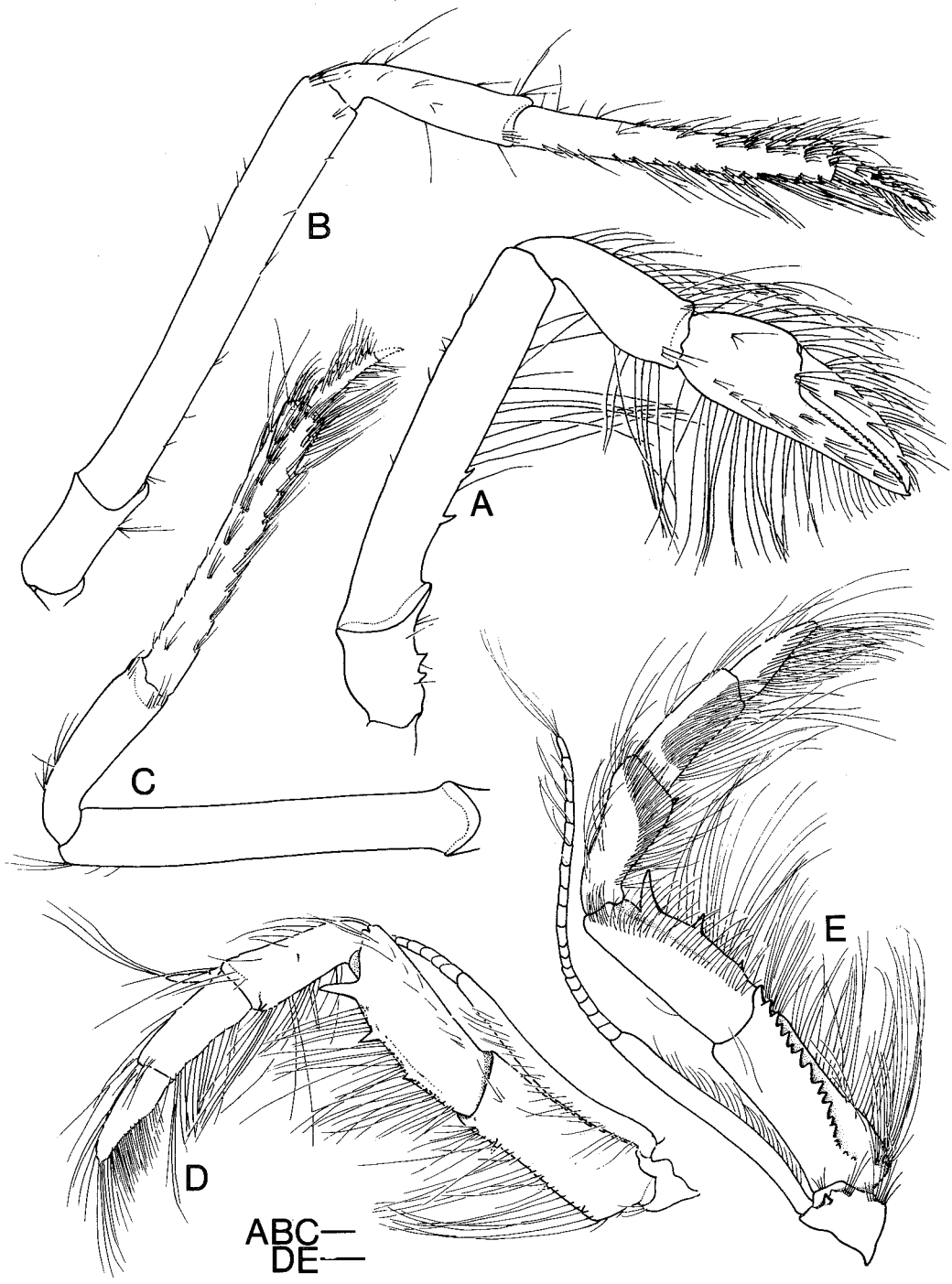

Fig. 4. *Paracalocaris sagamiensis,* new species, ♀, holotype. A, 2nd pereopod, right side; B, 3rd pereopod, right side; C, 4th pereopod, right side; D, 3rd maxilliped, interior face; E, 3rd maxilliped, mesial view. Scales equal 1 mm.

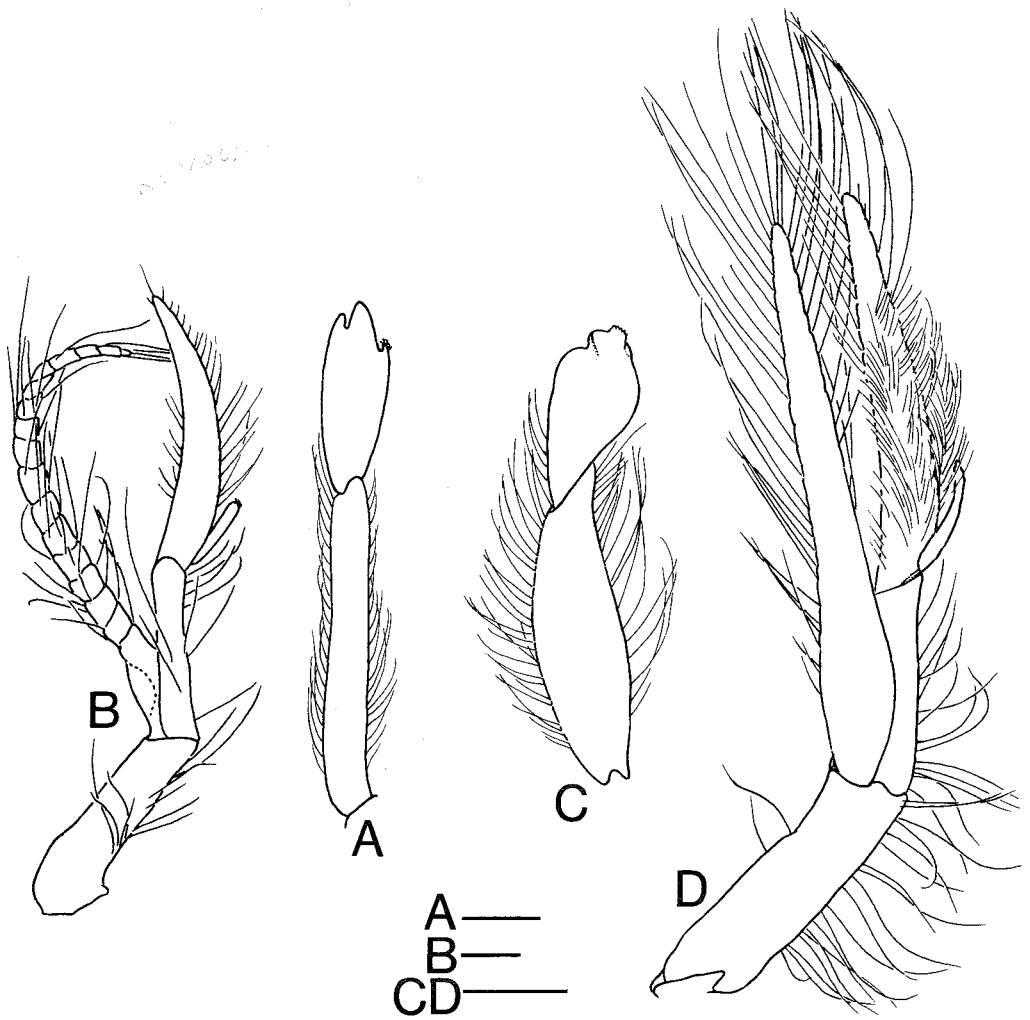

Fig. 5. A, B, *Paracalocaris sagamiensis,* new species, ♀, holotype: A, 1st left pleopod, anterior view; B, 2nd right pleopod, mesial view. C, D, *Calocaris macandreae* Bell, ♀, SMF 12810, from North Sea (58°10.2′N, 05°32′6E–58°11.7′N, 05°29.9′E, 98 m): C, 1st left pleopod, anterior view; D, 2nd pleopod, anterior view. Scales equal 1 mm.

unarmed, ischium (Fig. 4A) with two posterior spines. Merus about four times length of ischium, with two posterior spines on proximal half. Carpus about half length of merus, unarmed. Chela about 1.5 times as long as carpus; cutting edges of dactylus and fixed finger armed with fine distally directed spines. Pereopod 3 with coxa having genital pore, and with proximal spine on anteromesial surface of left side, but unarmed on right side, and with group of five denticles proximally on lateral margin. Basis unarmed. Ischium (Fig. 4B) slender, unarmed. Merus about four times as long as ischium, unarmed. Carpus about ⅔ length of merus. Propodus about twice as long as carpus, ventrolaterally with row of tufts of setae. Pereopod 4 with coxa having two spines on anteromesial margin. Basis and ischium unarmed. Merus (Fig. 4C) elongate, distinctly

Table 1.—Branchial formula of *Paracalocaris sagamiensis,* new species (r = rudimentary, having no gill-filaments).

	Maxillipeds			Pereopods				
	1	2	3	1	2	3	4	5
Epipods	1	1	1	1	1	1	1	—
Podobranchs	—	r	1	1	1	1	—	—
Arthrobranchs	—	r	2	2	2	2	2	—
Pleurobranchs	—	—	—	—	—	—	—	—

shorter than that of pereopod 3. Carpus about half length of merus. Propodus more than 1.5 times as long as merus, ventrolaterally with row of tufts of setae. Pereopod 5 with coxa having genital pore, unarmed. Gill filaments simple and small in number (Fig. 2D).

Abdomen (Fig. 1D) unarmed; length ratio of abdominal somites 1–6 to abdominal somite 2 as follows: 0.7; 1; 1; 1.1; 1.1; 1.2. Pleuron 1 narrow, ventral margin obtuse, pleura 2–5 broad, ventrally truncate. Pleopod 1 (Fig. 5A) 2-segmented; distal segment about half length of proximal one, distally trilobed, middle lobe larger than lateral ones. Pleopod 2–5 (Fig. 5B) narrow, and biramous; endopod 2-segmented with free appendix interna, distal segment sickle-shaped, and about 1.5 times as long as proximal segment; exopod multiarticulate.

Telson (Fig. 3C) about 1.6 times as long as broad, about 1.3 times as long as abdominal somite 6, not quite reaching level of posterior margin of uropodal endopod; lateral margin slightly convex proximally with spine at anterior third, and with four well-spaced denticles on posterior ⅔; posterior margin semicircular, unarmed; dorsal surface with transverse tuft of setae at about anterior third, and diagonal row of 8–9 denticles on each side extending posteriorly near posterolateral angle. Uropodal exopod broad; lateral margin largely convex; dorsal surface with smooth outer and inner ribs, and row of few tubercles each having setae directed parallel to lateral margin; distal transverse suture with few denticles. Uropodal endopod broad; outer margin unarmed; dorsal surface with smooth mid-rib, and few tubercles on outer half.

Remarks.—The present new species from Sagami Bay is similar to *Paracalocaris granulosa* (Grebenyuk, 1975) from Alaska, in being hermaphroditic, having short antennal acicles, the post-cervical carina on the carapace, and the shape of the tail fan and 1st pereopod, but differs in other details.

In *P. sagamiensis,* the rostrum is styliform with three marginal spines; the eye is less than one-fourth the length of the rostrum, and the cornea is upraised to form a rounded, dorsolateral protrusion; the antennular peduncle is slightly shorter than the rostrum, and its proximal segment is unarmed; the abdominal somite 6 is longitudinally furnished with two rows of 4–5 tufts of setae; the telson is slightly shorter than the uropod, armed with an anterior spine and four denticles on the lateral margin, and with a semicircular posterior margin; and the uropodal exopod is unarmed on the lateral margin. In pereopod 1, the ischium is provided with three (larger cheliped) or seven (smaller cheliped) spines on the posterior margin, the merus with four (larger cheliped) or nine (smaller cheliped) spines on the posterior margin, and the palm with 5–6 spines on the anterior margin.

In *P. granulosa,* the rostrum is an elongate triangle with one marginal spine; the eye is elongate and one-third the length of the rostrum, with the cornea not upraised; the antennular peduncle overreaches the rostrum by the distal half of the terminal segment,

the proximal segment is armed with three denticles; the abdominal segment 6 is dorsally provided with two rows of six tufts of setae (Grebenyuk 1975: fig. 1–8); the telson is slightly longer than the uropod, armed with three denticles on the lateral margin, and is slightly concave on the posterior margin; and, the uropodal exopod is armed with three spines on the outer margin. In pereopod 1 the ischium is furnished with two spines on the posterior margin, the merus with seven spines on the posterior margin, and the palm with a row of four spines on the anterior margin (Grebenyuk 1975:299).

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