PARAMACROCHIRON JAPONICUM N. SP., A CYCLOPOID COPEPOD ASSOCIATED WITH A MEDUSA IN JAPAN[1)]

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With 31 Text-figures

The genus *Paramacrochiron* SEWELL, 1949, as defined by REDDIAH (1968), contains four species: *P. maximum* (THOMPSON and A. SCOTT, 1903) from plankton, *P. ennorense* REDDIAH, 1968, from unidentified medusae, *P. sewelli* REDDIAH, 1968, from the medusa *Lychnorhiza malayensis* STIASNY, and *P. rhizostomae* REDDIAH, 1968, from the medusa *Rhizostoma* sp. To these there should be added *P. pacificum* (C.B. WILSON, 1950) from plankton. Since four members of the genus (including the new species described below) are associates of medusae, it seems probable that this association is true also for *P. maximum* and *P. pacificum*, though as yet these are known only from plankton.

I am indebted to Dr. Takasi TOKIOKA of the Seto Marine Biological Laboratory for the opportunity to examine the specimens of the new species. The study of the material has been aided by a grant (GB–8381X) from the National Science Foundation of the United States.

The figures have been prepared with the aid of a camera lucida. The letter after the explanation of each figure refers to the scale at which it was drawn. The abbreviations used are: A_1= first antenna, A_2= second antenna, MXPD = maxilliped, and P_1= leg 1.

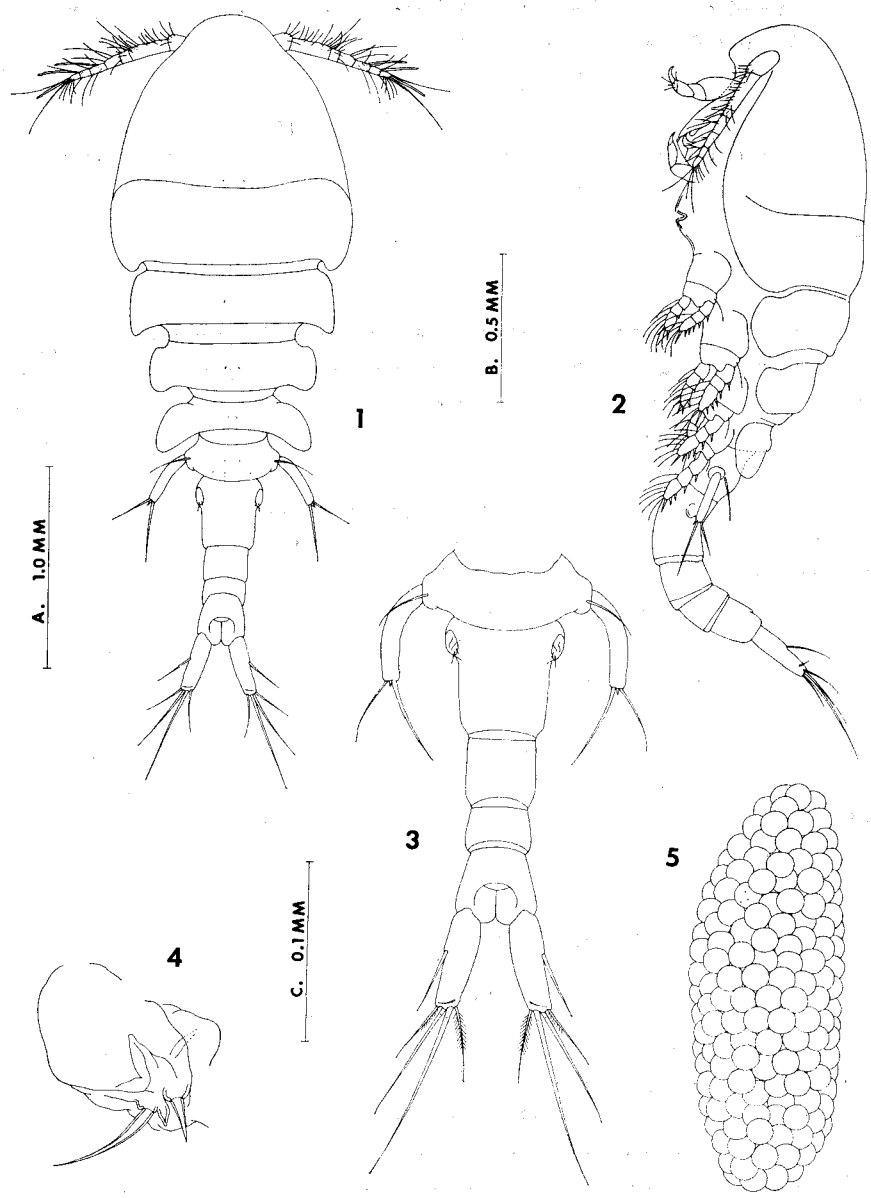
Paramacrochiron japonicum n. sp.

(figs. 1–31)

Type material.– 7♀♀, 6♂♂ from one medusa, *Thysanostoma thysanura* HAECKEL, Sirahama, Wakayama-ken, Japan, 19 November 1969. Collected by T. TOKIOKA and S. NISHIMURA. Holotype ♀, allotype, and 6 paratypes (3♀♀, 3♂♂) deposited in the United States National Museum, Washington; 4 paratypes (1♀, 2♂♂) in the Seto Marine Biological Laboratory; and the remaining paratypes (dissected) in the collection of the author.

Female.– The body (figs. 1 and 2) is moderately slender. The length (not

1) Contributions from the Seto Marine Biological Laboratory, No. 529.



Figs. 1–5. *Paramacrochiron japonicum* n. sp., female. 1, dorsal (A); 2, lateral (A); 3, urosome, dorsal (B); 4, area of attachment of egg sac, dorsal (C); 5, egg sac, ventral (B).

including the setae on the caudal rami) is 3.28 mm (3.17–3.49 mm) and the greatest width 1.18 mm (1.09–1.25 mm), based on five specimens in lactic acid. The ratio of the length to the width of the prosome is 1.74:1. The segment of leg 1 is separated dorsally from the head by a weak transverse furrow. The epimeral areas of the pedigerous segments are expanded and shaped variously as in figure 1. The ratio of the length of the prosome to that of the urosome is 1.59:1.

The segment of leg 5 (fig. 3) is $250 \times 528\ \mu$. Between this segment and the genital segment there is no ventral intersegmental sclerite. The genital segment in dorsal view is 412 μ long, 385 μ in greatest width anteriorly at the small rounded lateral expansions, and 280 μ wide near the middle. The areas of attachment of the egg sacs are located dorsolaterally on the anterior expansions. Each area (fig. 4) bears two naked setae 62 μ and 21 μ with a pointed process between them. The three postgenital segments are $222 \times 260\ \mu$, $155 \times 240\ \mu$, and $253 \times 275\ \mu$ from anterior to posterior. The posteroventral margin of the anal segment bears on both sides a row of small spinules.

The caudal ramus (fig. 6) is moderately elongated, $345 \times 110\ \mu$ in greatest dimensions, or 3.14:1. The outer lateral seta is 250 μ and minutely barbed. The dorsal seta is 70 μ and naked. The outermost terminal seta is 250 μ with inner hairs proximally and barbed distally. The innermost terminal seta is 290 μ, plumose proximally and barbed distally. The two median terminal setae are 473 μ (outer) and 640 μ (inner), both finely barbed.

The dorsal surface of the body bears only a few minute hairs (sensilla) as shown in figure 1.

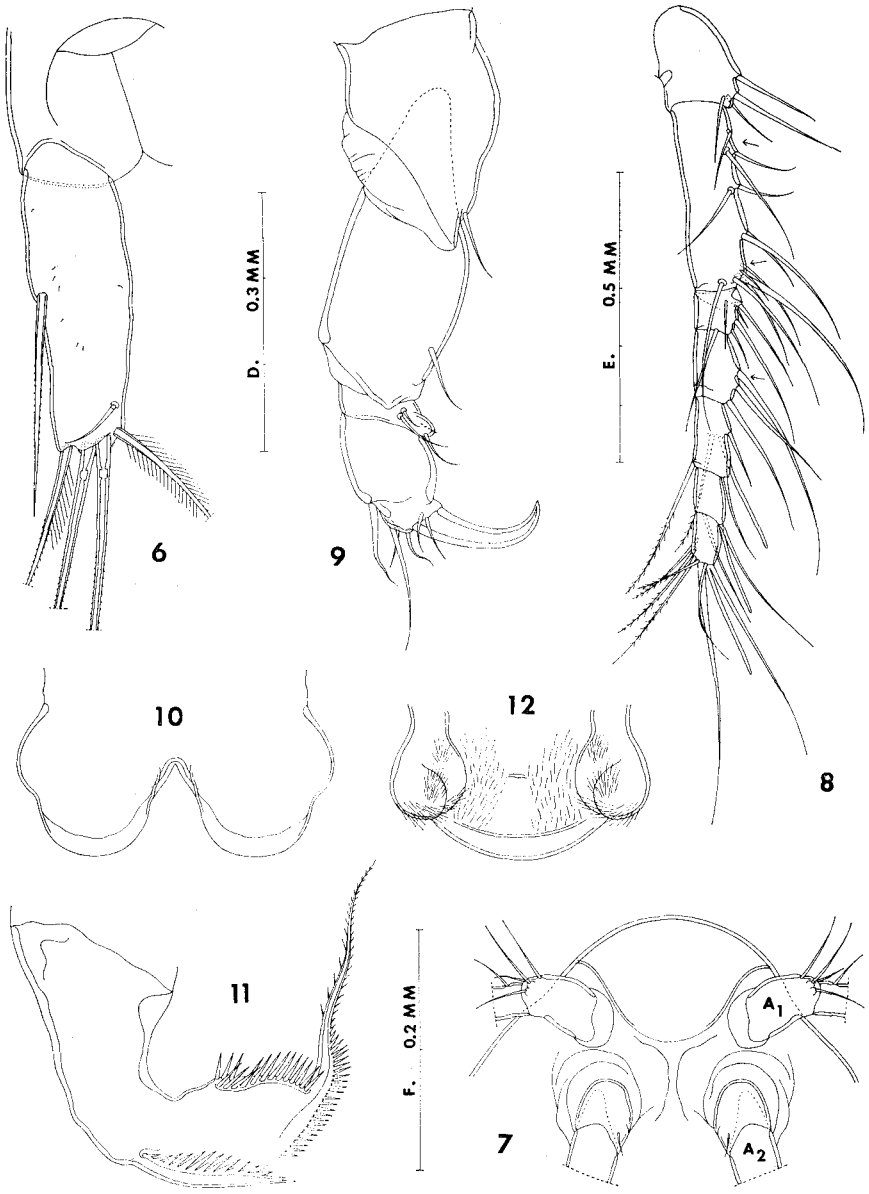
The egg sac (fig. 5) is elongated, $1250 \times 480\ \mu$, with a ratio of about 2.6:1, extending a little beyond caudal ramus. It contains many eggs, about 80 μ in diameter.

The rostrum (fig. 7) is broadly rounded posteroventrally.

The first antenna (fig. 8) is 640 μ long and 7–segmented. The lengths of the segments (measured along their posterior non-setiferous margins) are: 44 (130 μ along the anterior margin), 196, 52, 78, 80, 52, and 52 μ respectively. The formula for the armature is: 4, 13, 6, 3, 4+1 aesthete, 2+1 aesthete, and 7+1 aesthete.

The second antenna (fig. 9) is robust and 4–segmented. Each of the first two segments bears a single seta. The third segment bears three setae, one arising on a prominence which has a row of minute spinules. The fourth segment is 101 μ along its outer edge, 57 μ along its inner edge, and 68 μ wide; it bears terminally a claw 102 μ along its axis and five setae. All the setae are naked.

The labrum (fig. 10) has two broad lobes with hyaline margins. The mandible (fig. 11) bears on its convex margin a spiniform scale with spinules followed by a row of slender spinules, and on its concave margin beyond the indentation a row of about 13 strong spinules plus another row of 3–4 such spinules; the lash is long and barbed. The paragnath (fig. 12) is a small hairy lobe. The first maxilla (fig. 13) bears four elements, three of them finely barbed. The second maxilla (fig. 14) has



Figs. 6–12. *Paramacrochiron japonicum* n. sp., female. 6, caudal ramus, dorsal (D); 7, rostrum, ventral (E); 8, first antenna, with arrows indicating the positions of aesthetes added in the male, dorsal (D); 9, second antenna, posterior (F); 10, labrum, ventral (F); 11, mandible, posterior (C); 12, paragnaths and postoral area, ventral (F).

an unarmed first segment. The second segment has a small setule proximally near its outer margin, a naked seta on its posterior surface, and an inner distal spine bearing two rows of spinules; the lash is long and spinulose. The maxilliped (fig. 15) is 3-segmented. The first segment is elongated and unarmed; the second is shorter with two setae, one of them finely barbed; and the third bears a spinulose element and a naked seta and terminates in an attenuated tip with spinules along one edge.

The ventral area between the maxillipeds and the first pair of legs (fig. 16) is slightly protuberant. A sclerotized line connects the bases of the maxillipeds.

Legs 1–4 (figs. 17, 18, 19 and 20) have 3-segmented rami, except for the endopod of leg 4 which consists of a single long segment. The formula for the armature is as follows (the Roman numerals representing spines, the Arabic numerals setae):

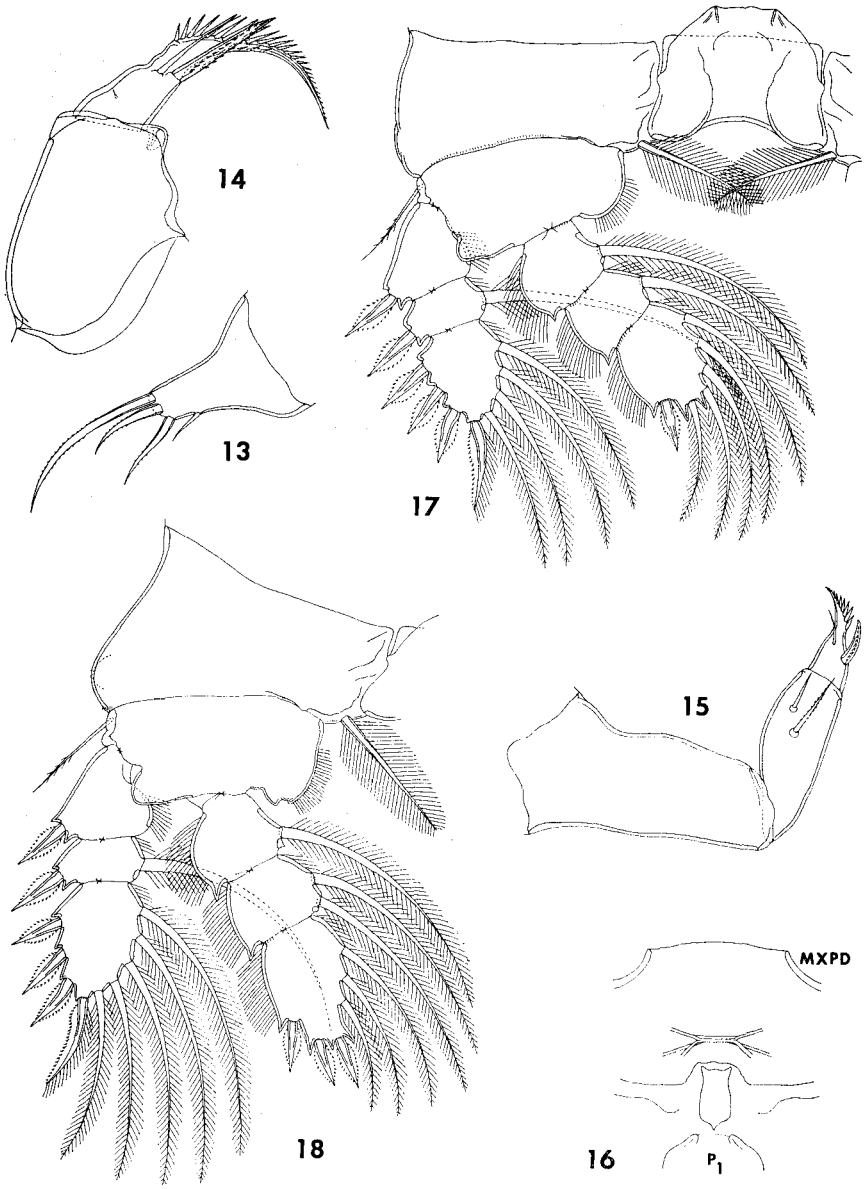
P_1	coxa	0–1	basis	1–0	exp	I–0; I–1; III, I, 4
					enp	0–1; 0–1; I, 5
P_2	coxa	0–1	basis	1–0	exp	I–0; I–1; III, I, 5
					enp	0–1; 0–2; I, II, 3
P_3	coxa	0–1	basis	1–0	exp	I–0; I–1; III, I, 5
					enp	0–1; 0–2; I, II, 2
P_4	coxa	0–1	basis	1–0	exp	I–0; I–1; II, I, 5
					enp	II

The inner coxal seta of legs 1–3 is plumose, but in leg 4 this seta is finely barbed. The inner margin of the basis in all four legs is haired. The third segment of the endopod of leg 1 is 107 μ long (without the spinous processes) and its spine is 57 μ. The third segment of the endopod of leg 2 is 138 μ, and the three spines from outer to inner are 60, 50 and 62 μ. The third segment of the endopod of leg 3 is 150 μ, and the three spines from outer to inner are 69, 60, and 82 μ. The exopod of leg 4 is 340 μ including the spinous processes. The endopod of leg 4 is narrow proximally and broadened distally, with both sides slightly irregular and ornamented with hairs. Its greatest dimensions (including the two terminal spiniform processes) are 290×81 μ. The two terminal elements are 159 μ (outer) and 195 μ (inner), both with barbules. Across the end of the segment near their insertions there are minute spinules.

Leg 5 (figs. 21 and 22) has an elongated, unornamented, somewhat bowed free segment, 286 μ in length not including the terminal spiniform process (308 μ including this process) and 68 μ wide, the ratio being about 4.0:1. The exact contour of the segment may vary somewhat depending on the orientation in which it is viewed. The two terminal elements are 240 μ and 213 μ, both with a few barbules along their midregions. The adjacent seta on the body is 220 μ and naked.

Leg 6 is represented by the two setae and process near the area of attachment of each egg sac (see fig. 4).

Male.– The body (fig. 23) resembles in general form that of the female. The length (without the ramal setae) is 2.69 mm (2.59–2.82 mm) and the greatest width



Figs. 13–18. *Paramacrochiron japonicum* n. sp., female. 13, first maxilla, anterior (C); 14, second maxilla, posterior (F); 15, maxilliped, antero-inner (F); 16, area between maxillipeds and first pair of legs, ventral (E); 17, leg 1 and intercoxal plate, anterior (D); 18, leg 2, anterior (D).

0.81 mm (0.77–0.90 mm), based on five specimens in lactic acid. The ratio of the length to the width of the prosome is 1.88:1. The ratio of the length of the prosome to that of the urosome is 1.24:1.

The segment of leg 5 (fig. 24) is 104×303 μ. There is no ventral intersegmental sclerite. The genital segment is 440×445 μ. The four postgenital segments are 135×180 μ, 127×172 μ, 97×164 μ, and 146×170 μ from anterior to posterior.

The caudal ramus resembles that of the female, but is smaller, 234×81 μ, the ratio being 2.89:1.

The rostrum resembles that of the female.

The first antenna is like that of the female, but three aesthetes are added (see fig. 8), so that the formula is: 4, 13+2 aesthetes, 6, 3+1 aesthete, 4+1 aesthete, 2+1 aesthete, and 7+1 aesthete. The second antenna (fig. 25) resembles that of the female, but the dimensions of the fourth segment and the claw are slightly different. The outer side of this segment is 99 μ, the inner side 62 μ, the width 57 μ, and the claw 112 μ.

The labrum, mandible, paragnath, first maxilla, and second maxilla are like those in the female. The maxilliped (fig. 26) is 4–segmented (assuming that the proximal part of the claw before the slight indication of division represents a fourth segment). The first segment has a small inner distal spiniform process. The second segment bears two naked setae and a row of spinules. The small third segment is unarmed. The claw is 350 μ along its axis with proximally two very unequal setae and a few surficial rugosities.

Legs 1–4 have the same segmentation and formula for the armature as in the female. The third segment of the endopod of leg 1 is 81 μ long (without the spiniform processes) and its spine is 66 μ. The third segment of the endopod of leg 2 is 109 μ, and the three spines from outer to inner are 70, 70, and 75 μ. The third segment of the endopod of leg 3 is 104 μ, and the three spines from outer to inner are 72, 86, and 104 μ. In leg 4 (fig. 27) the exopod is 245 μ long (including the spiniform process). The endopod is much shorter than in the female, 122 μ without the processes (140 μ including the processes) $\times 47$ μ. The two terminal elements are 140 μ (outer) and 195 μ (inner), both with barbules as in the female. On the outer margin of the right endopod of the single male dissected there is a minute thornlike process; the left endopod of this male (fig. 28) lacks such a process.

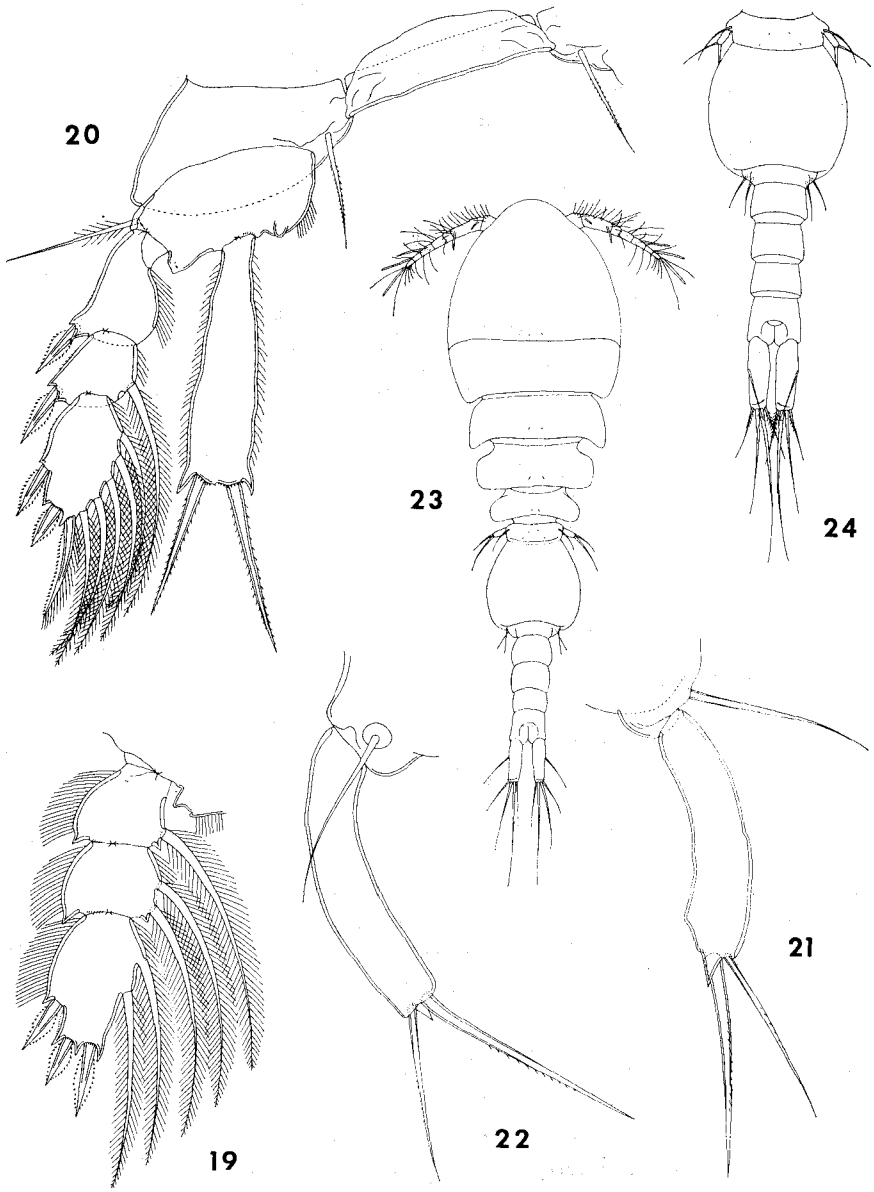
Leg 5 (fig. 29) has a small subrectangular unornamented free segment 63×26 μ.

Leg 6 (fig. 30) consists of a posteroventral flap on the genital segment bearing two naked setae 166 μ and 138 μ and a spiniform process.

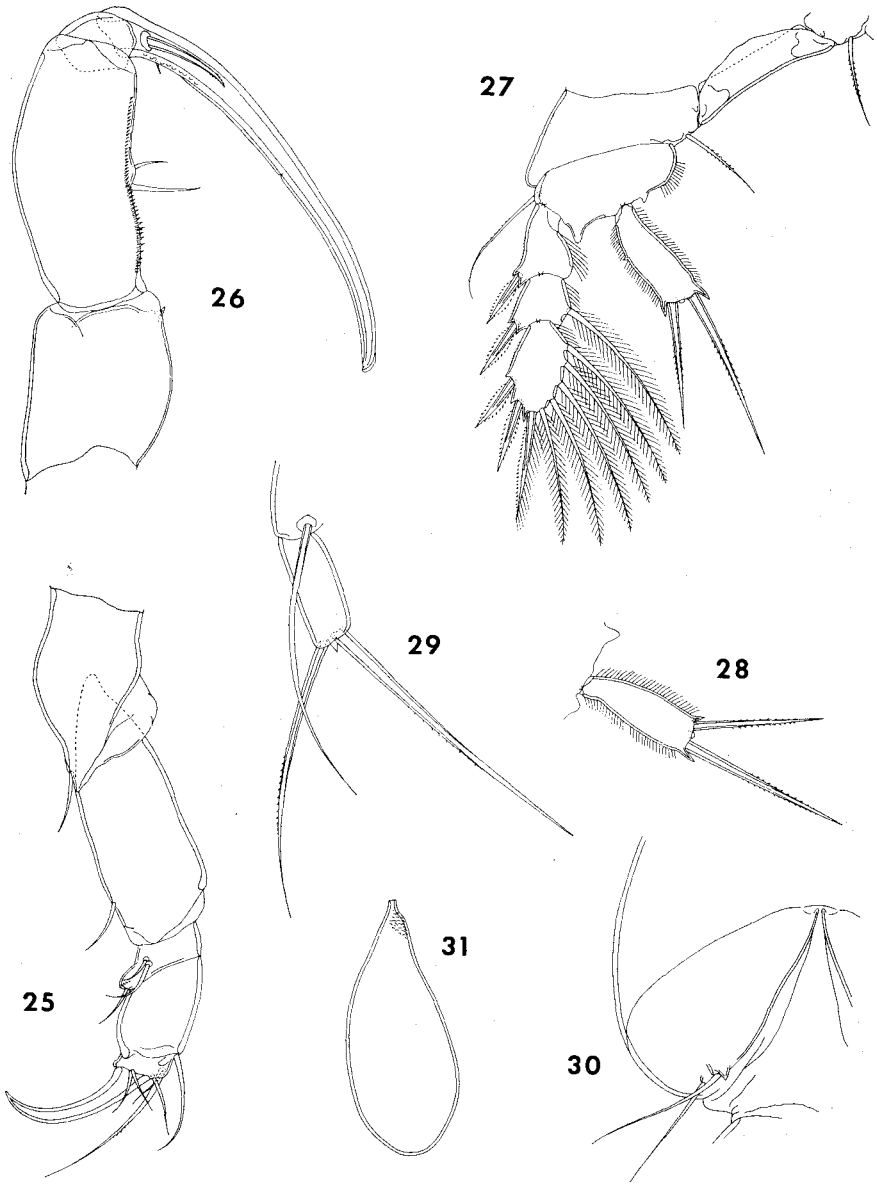
The spermatophore (fig. 31) is 395×176 μ, not including the neck. (Five spermatophores were attached to one side of the genital segment in one female.)

Etymology.— The new species is named for the country in whose waters the specimens were found.

Remarks.— Information on many details of external anatomy is lacking in existing



Figs. 19–24. *Paramacrochiron japonicum* n. sp. Female. 19, endopod of leg 3, anterior (D); 20, leg 4 and intercoxal plate, anterior (D); 21, leg 5, ventral (D); 22, leg 5, dorsal (D). Male. 23, dorsal (A); 24, urosome, dorsal (B).



Figs. 25–31. *Paramacrochiron japonicum* n. sp., male. 25, second antenna, posterior (F); 26, maxilliped, inner (F); 27, leg 4 and intercoxal plate, anterior (D); 28, endopod of opposite leg 4, anterior (D); 29, leg 5, dorsal (C); 30, leg 6, ventral (D); 31, spermatophore, attached to female, dorsal (E).

descriptions and figures of the five species in *Paramacrochiron*. This is especially true in the case of the males. The differentiation of *P. japonicum* from known species is here based primarily on certain features of the females (unless otherwise noted).

In *P. ennorense* the body length is shorter than in the new species (2.89 mm, range 2.83–3.17 mm); the egg sacs reach only a little beyond the second postgenital segment; and the free segment of leg 5 is 4.5:1, with the two elements unarmed.

In *P. maximum*, though the body length is near that of *P. japonicum*, the egg sac is short, not reaching to the end of the first postgenital segment; the endopod of leg 4 has an outer marginal notch and bears two plumose elements; the genital segment lacks anterior rounded lateral expansions; and in the male the genital segment has nearly parallel sides.

In *P. pacificum* the body length is approximately that of *P. japonicum*, but the second segment of the second antenna has a short outer process; the fourth endopod is 3:1 and its two terminal elements are plumose; the outer spines on the fourth exopod are aciculate rather than with serrated fringes; and the two elements on the free segment of leg 5 are plumose.

In *P. rhizostomae* the body length is shorter than in the new species (2.8 mm); the free segment of leg 5 is a little longer than the genital segment (in REDDIAH's figure 6A); and the terminal process of the maxilliped is bent at a right angle.

In *P. sewelli* the body length is shorter than in the new species (2.41 mm, range 2.06–2.67 mm); and the second segment of the first antenna has a prominent outer protuberance.

Although THOMPSON and A. SCOTT (1903) in *P. maximum* and REDDIAH (1968) in *P. ennorense* suggested that the terminal armature of leg 5 consists of two long elements and a short spine, it is probable that the spine is in reality a spiniform process as in other species of the genus. Thus the terminal armature may be considered to be composed of two long elements only.

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