

**Nine Indo-Pacific species of *Upogebia* Leach
(Crustacea: Thalassinidea: Upogebiidae)**

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Nine species of *Upogebia* Leach from the Seychelles Islands, the Philippines, Indonesia and the Gulf of Aden are studied. *U. balmaorum*, *U. laemanu* and *U. gracilis* are all new species and the first two are closely related to each other. The four additional species include *U. baweana* Tirmizi and Kazmi, *U. fallax* de Man, *U. hexaceras* (Ortmann) and *U. miyakei* Sakai, two of which are known only from their holotypes. They are compared here with *U. pugnax* de Man, *U. octoceras* Nobili; all are briefly re-described.

KEYWORDS: *Upogebia*, Thalassinidea, Crustacea, Taxonomy, Indo-Pacific.

Introduction

Two out of the nine species studied in this work, *Upogebia balmaorum* sp. nov., *Upogebia laemanu* sp. nov. were collected in the Seychelles Islands during an ORSTOM Expedition in 1980 and the third, *U. gracilis* sp. nov., was obtained from the Philippines by the MUSORSTOM Expedition in 1976. Four others, captured in Indonesia by the Snellius Expedition (1929–1930) and the National Science Foundation Expedition (1956), are represented by *Upogebia baweana* Tirmizi and Kazmi, 1979, *Upogebia fallax* de Man, 1905, *Upogebia miyakei* Sakai, 1967 and *Upogebia hexaceras* (Ortmann, 1894). They belong to the collections of the Leiden Museum.

The three new species are described and figured. The first two are closely related to each other as well as to *U. brucei* Sakai, 1975 and *U. tractabilis* Hale, 1941, with which they are compared. The four others, although already studied, are little known, and for *Upogebia fallax* de Man, 1905 and *Upogebia miyakei* Sakai, 1967, only the holotypes have so far been reported. Their study has required examination of the type materials of *U. pugnax* de Man, 1905 and *U. octoceras* Nobili, 1904. The opportunity has been taken to figure and briefly redescribe these two species. There has been confusion about the identification and status of certain species and synonymies suggested for them. These aspects are discussed.

The measurements given (in mm) in the descriptions are: the carapace length (cl.) measured from the tip of the rostrum to the posterior border of the carapace and the total length (tl.) measured from the tip of the rostrum to the posterior border of the telson.

Material has been examined from the following collections:

- AM: Australian Museum, Sydney.
 BMNH: British Museum, Natural History, London.
 MNHN: Muséum national d'Histoire naturelle, Paris.
 RMNH: Rijksmuseum van Natuurlijke Historie, Leiden.
 WAM: Western Australian Museum, Perth.
 ZMA: Zoologisch Museum, Universiteit van Amsterdam.

Upogebia balmaorum sp. nov.

(Fig. 1, Fig. 2(a)–(d))

Material examined. ORSTOM 1980, Rêves 2, Seychelles Islands. St. 41, 13.9.1980, 50 m, in a sponge: 4 ovig. ♀, cl. 10–11 mm, tl. 32.5–37.5 mm (MNHN-Th 894 and MNHN-Th 1062 to 1064); 5 ♂, cl. 7–9 mm, tl. 20–26.5 mm (MNHN-Th 894 and MNHN-Th 1064).

Types. HOLOTYPE: ovig. ♀, cl. 11.5 mm, tl. 37.5 mm (MNHN-Th 1062). PARATYPES: ovig. ♀, cl. 10.5 mm, tl. 33.5 mm (MNHN-Th 1063); ovig. ♀, cl. 10 mm, tl. 32.5 mm (MNHN-Th 1064); 2 ♂, cl. 8.5 mm and 9 mm, tl. 25.5 mm and 26.5 mm (MNHN-Th 1064).

Etymology. The species is named for Buu Vinh Bao, Buu Vinh Bau and Buu Suong Mai.

Description. Rostrum (Fig. 1(a)) short and conical, approximately reaching extremity of eyes, lateral margin each with 4 or 5 spiniform tubercles. Rostrum and gastric region with a medio-dorsal groove anteriorly followed by a faint medio-dorsal carina; lateral grooves relatively broad, lateral ridges with 11–13 tubercles. Cervical groove deep, linea thalassinica distinct, terminating midway in the posterior region of carapace. Antero-lateral margin of carapace unarmed (Fig. 1(b)).

Telson (Fig. 1(i)) about 1.25 times as broad as long in females, narrower in males; postero-lateral angles rounded, a very faint inverted U-shaped carina and a fine median groove dorsally.

Arthrobranchs of type C (see Ngoc-Ho, 1981) with two small tubular structures on either side of the rachis.

Antennule (Fig. 2(a)) first peduncular article with a subdistal spine on ventral margin.

Antenna (Fig. 2(b)) third peduncular article with a subdistal spine on ventral margin; scale terminating in a minute spinule.

Mandible (Fig. 2(c)) with small teeth on cutting edge and a larger one posteriorly, mesio-anterior tooth (Fig. 2(c), m.a.t.) minute and spiniform.

First maxilliped (Fig. 2(d)) without epipod; distal part of exopod slightly enlarged and bordered with setae that are longer externally.

Third maxilliped without epipod.

First pereopod (P1) (Figs 1(c), (d)) cheliform. Ischium with two tubercles on lower margin. Merus, about three times as long as broad, armed with 12–16 ventral spines in the holotype and 10–12 in the paratypes. Carpus unarmed. Propodus, over twice as long as broad in females, stouter in males (Fig. 1(f)), with 2–5 denticles on proximal ventral border; fixed finger, as long as dactylus, bearing a row of small round teeth on inner border. Dactylus slightly curved at tip, whole extent of dorsal margin finely denticulate and provided with a fine dorsal groove externally, cutting edge with 10–12 small triangular teeth.

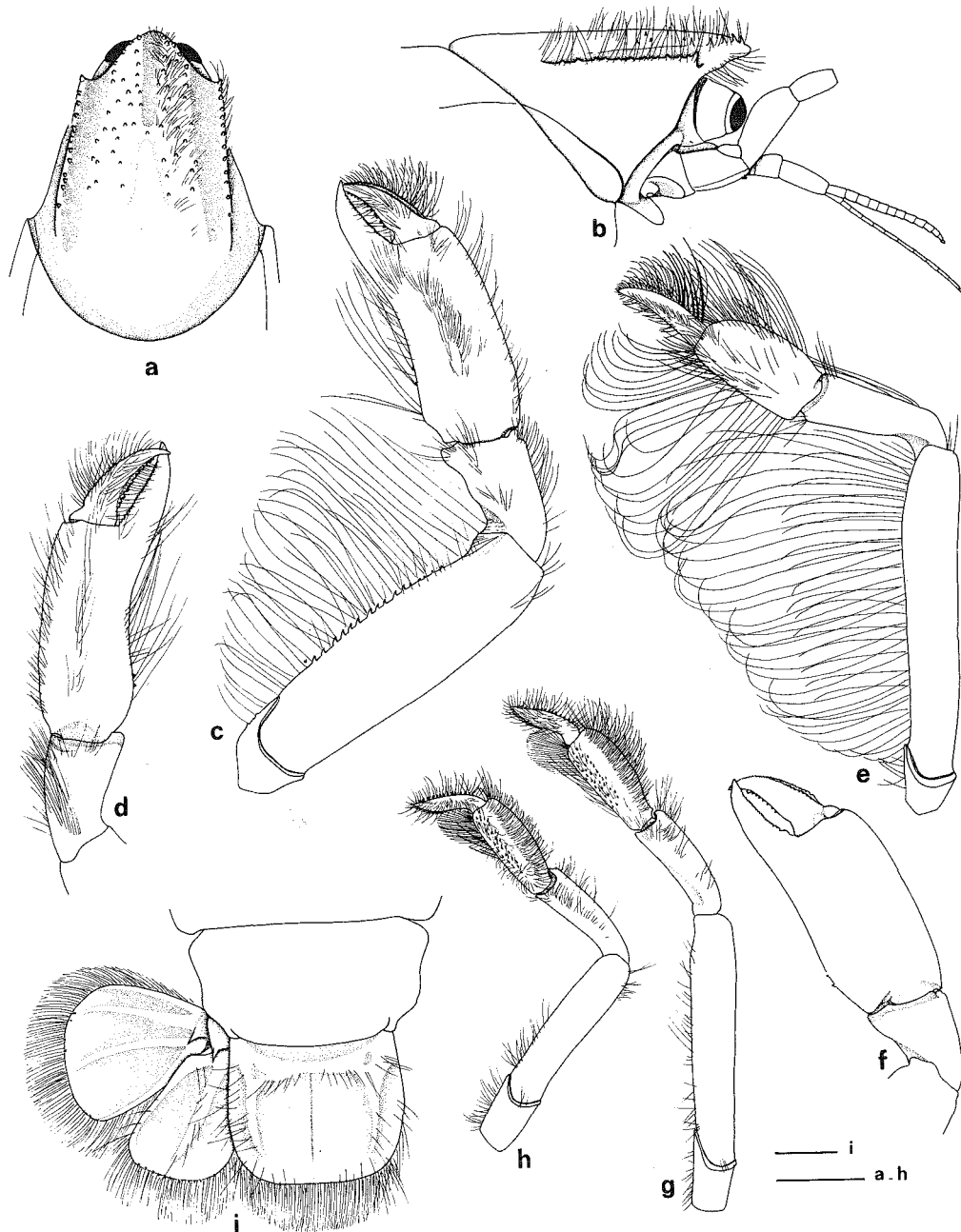


FIG. 1. *U. balmaorum* sp. nov., HOLOTYPE, female (MNHN-Th 1062): (a)–(d) and (i); male PARATYPE (MNHN-Th 1064), lt. 26.5 mm: (f); female PARATYPE (MNHN-Th 1063): (e), (g), (h). (a), (b), anterior part of carapace, dorsal and lateral view; (c), first pereiopod, outer view; (d), distal part of first pereiopod, mesial view; (f), same, outer view; (i), telson and uropod. Scale line: 2 mm.

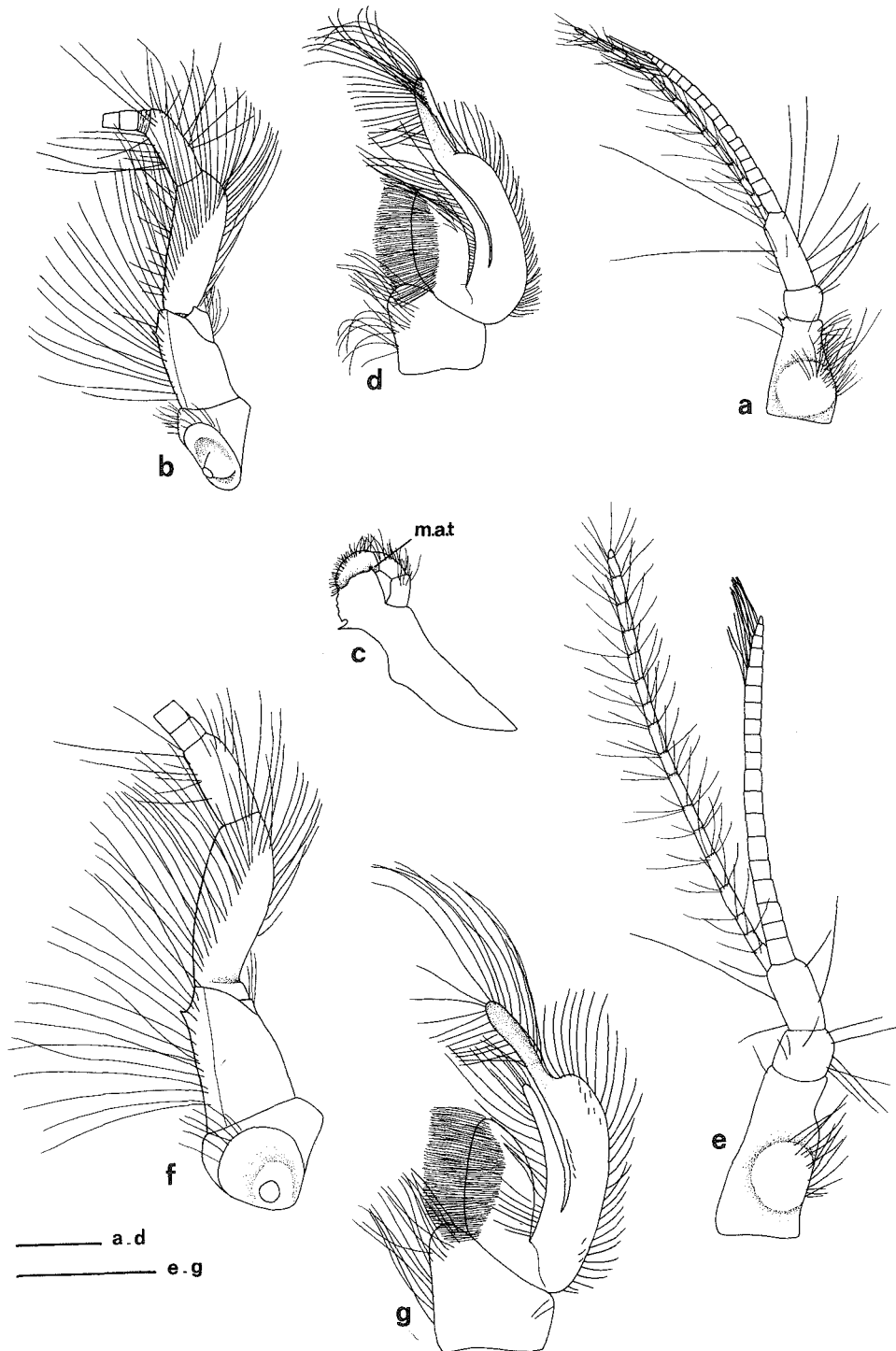


FIG. 2. *U. balmaorum* sp. nov., female PARATYPE (MNHN-Th 1063); (a)–(d); *U. laemanu* sp. nov., female PARATYPE (MNHN-Th 906), lt. 24.5 mm: (e)–(g). (a) and (e), antennule; (b) and (f), antenna; (c), mandible; (d) and (g), first maxilliped. Scale line: 1 mm.

Second pereopod (P2) (Fig. 1 (e)) with a few stiff setae proximally on dorsal margin of dactylus.

Third (P3) (Fig. 1 (g)) and fourth pereopods (P4) (Fig. 1 (h)), propodus with corneous denticles on lower external surface, similar denticles on dorsal margin of dactylus and pectiniform setae ventrally.

The holotype bears eggs of 1–1.2 mm in diameter.

Uropod (Fig. 1 (i)) exopod and endopod rounded, approximately as long as telson, both with fine spinules posteriorly and exopod with a proximal spine; protopod with a spine.

Type locality. Seychelles Islands, 50 m, in a sponge.

Upogebia lacmanu sp. nov.

(Fig. 2 (e)–(g) and Fig. 3)

Material examined. ORSTOM 1980, Rêves 2, Seychelles Islands. St. 5, 4.9.1980, 33 m, fine sand and shells, in a siliceous sponge: 2 ovig. ♀ (PARATYPES); 2♂, one without abdomen (PARATYPES); St. 63, 20.09.1980, 57–61 m, in a sponge: 1♂ (HOLOTYPE), 1 ovig. ♀ (PARATYPE).

Types. Holotype: ♂, cl. 6.5 mm, tl. 17.5 mm (MNHN-Th 895). PARATYPES: 2♂, cl. 6.5 mm, tl. 17 mm and lc. 6 mm (MNHN-Th 906). 3 ovig. ♀, cl. 7.5 mm, tl. 20.5 mm (MNHN-Th 1058); cl. 8.5 mm and 9.5 mm, tl. 24.5 mm and 25.5 mm (MNHN-Th 906).

Etymology. The species is named for Nguyen thi Laetitia and Nguyen trong Emmanuel.

Description. Rostrum (Fig. 3 (a)) triangular in males and about as long as it is wide at base, projecting slightly beyond eyes, lateral margin each with 5–7 small spiniform teeth. Gastric region with lateral grooves relatively wide; lateral ridges bearing 11–13 spiniform tubercles. Antero-lateral border of carapace unarmed (Fig. 3 (b)). Linea thalassinica terminating at level of cervical groove, latter deep and continuous.

In females, the rostrum is slightly shorter than in males, with lateral margins more convex, that is most pronounced in a ♀ paratype of tl. = 20.5 mm (MNHN-Th 1058, Fig. 3 (c)) collected at the same station as the holotype.

Telson (Fig. 3 (g)) about 1.25 times broader than long, postero-lateral angles rounded, posterior margin slightly convex, a faint inverted U-shaped carina and a fine median groove dorsally.

Arthrobranchs of type B, with a single small tubular structure on either side of the rachis.

Antennule (Fig. 2 (e)) peduncle unarmed.

Antenna (Fig. 2 (f)), third article of peduncle with a tiny ventral subterminal spine; scale triangular, very small and bearing a few setae.

Mandible (Fig. 3 (d)) cutting edge with 4–5 rounded teeth and a larger one posteriorly, mesio-anterior tooth minute and spiniform.

First maxilliped (Fig. 2 (g)) without epipod; distal part of exopod slightly enlarged and bordered with setae that are longer exteriorly.

Third maxilliped, lacking epipod.

First pereopod (Figs 3 (e), (f)) cheliform. Merus about twice as long as wide, bearing 5–9 ventral spines, smaller ones anteriorly. Carpus with a ventro-distal spine, one or two dorso-distal spines on external surface and another one mesially. Propodus nearly twice as long as broad, with 5 or 6 ventral tubercles; cutting edge of fixed finger

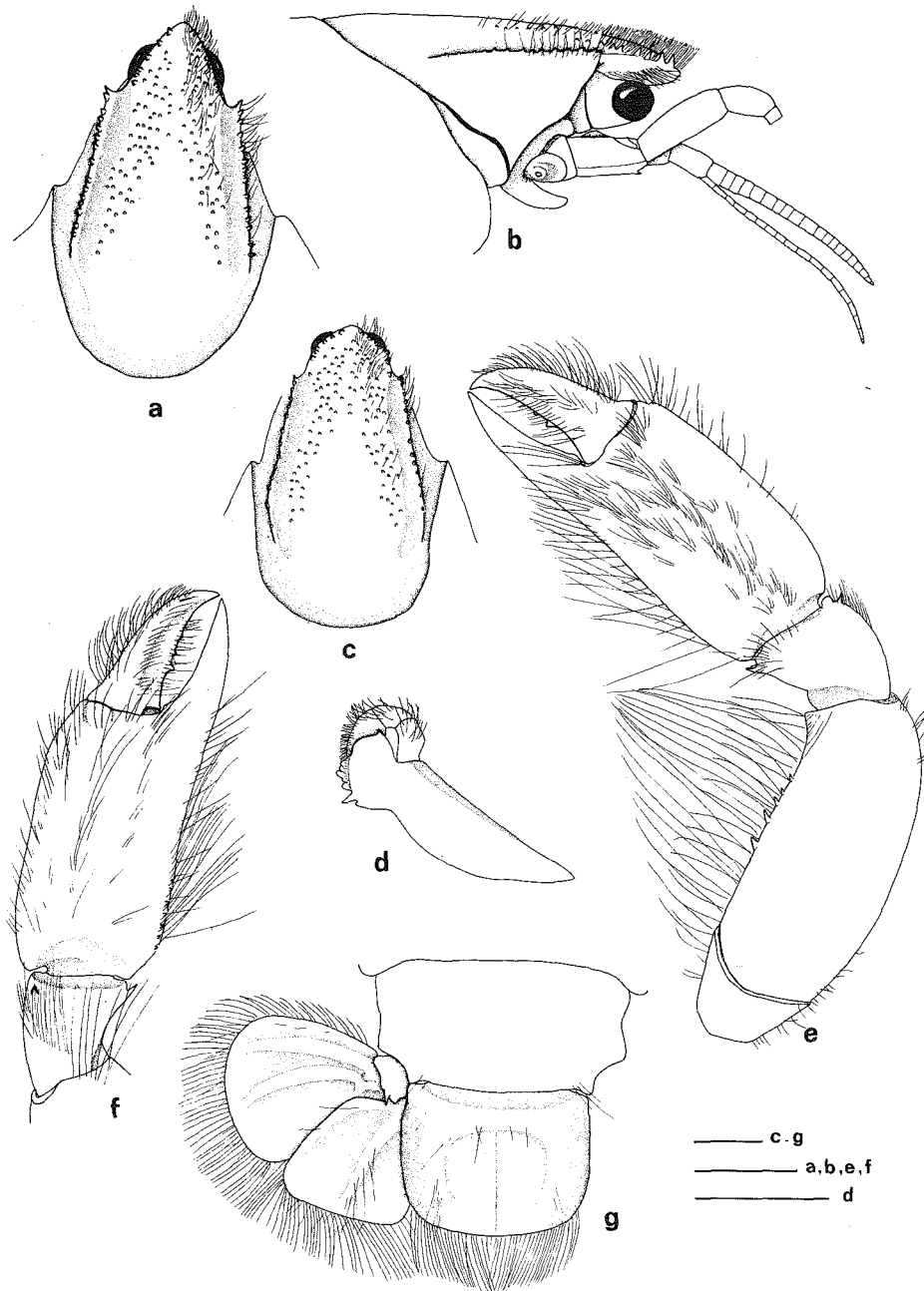


FIG. 3. *U. laemanu* sp. nov., HOLOTYPE, male (MNHN-Th 895): (a), (b), (e)–(g); female PARATYPE (MNHN-Th 1058): (c), (d). (a), (c) and (b): anterior part of carapace, dorsal and lateral view; (d), mandible; (e), first pereopod, outer view; (f), distal part of first pereopod, mesial view; (g), telson and uropod. Scale line: 1 mm.

Table 1. Differentiating characters between *Upogebia balmaorum* sp. nov. *Upogebia laemanu* sp. nov. and *Upogebia tractabilis* Hale.

	<i>U. balmaorum</i>	<i>U. laemanu</i>	<i>U. tractabilis</i>
Median groove on rostrum	present	absent	present
Teeth on lateral margin of rostrum	4-5	5-7	4-5
Ventral spine on 1st article of antennular peduncle	1, small	absent	1, large
First pereiopod			
*Ventral meral spines	12-16	5-9	2-7
Ventral carpal spine	absent	1	1
Dorsal carpal spine	absent	1-2	1
Cutting edge of fixed finger	with rounded teeth to whole extent	1 rounded tooth proximally	smooth
*Triangular teeth on cutting edge of dactylus	10-12	2-5	2-4
Dorsal margin of dactylus	denticulate to whole extent	smooth	a few tubercles
Telson	broader than long	broader than long	quadrate
Proximal spine on exopod of uropod	present	absent	present

smooth, except for a small proximal rounded tooth. Dactylus slightly curved at tip, with 2-5 triangular teeth on cutting edge.

In female paratypes, the first pereiopod is a little more slender than in the males and the rounded proximal tooth on the cutting edge of the fixed finger is larger.

The female paratype of tl. = 20.5 mm bears eggs of 0.8-0.9 mm in diameter.

Uropod (Fig. 3 (g)) exopod rounded, about as long as telson, endopod trapezoid, a little shorter, protopod with a small spine.

Type locality. Seychelles Islands, 33-61 m, in a sponge.

Remarks. *U. balmaorum*, *U. laemanu* spp. nov. from Seychelles, *U. brucei* Sakai from Kenya and *U. tractabilis* Hale from South Australia (Hale, 1941) and Madagascar (Sakai, 1982) are similar to one another in the shape of the rostrum and the shape and spinulation of the first pereiopod that bears ventral spines on the merus and ventral spinules or denticles on the propodus. *U. brucei*, nevertheless, differs from the others in the shape of the telson and also in having a large mesio-anterior tooth on the mandible, but no teeth or denticles on both fixed finger and dactylus of the first pereiopod. Characters differentiating *U. balmaorum*, *U. laemanu* and *U. tractabilis* are listed in Table 1, those marked with an * are subject to some variation.

Upogebia baweana Tirmizi and Kazmi, 1979

(Fig. 4)

Upogebia baweana Tirmizi and Kazmi, 1979: 108, fig. 2.

Upogebia (Upogebia) baweana Sakai, 1984: 157, fig. 3.

Material examined. Snellius Expedition, 3-7 May 1930, Haroekoe, Ind. Archipel (Indonesia), shore and reef collections: 2 ovig. ♀, cl. 5 mm and 5.5 mm, tl. 14 mm and 15 mm (RMHN-D 37843).

Description. Rostrum (Fig. 4(a)) a little longer than eye peduncle and slightly downturned, bearing 4 dorsal spines. Few setae and rounded tubercles on gastric

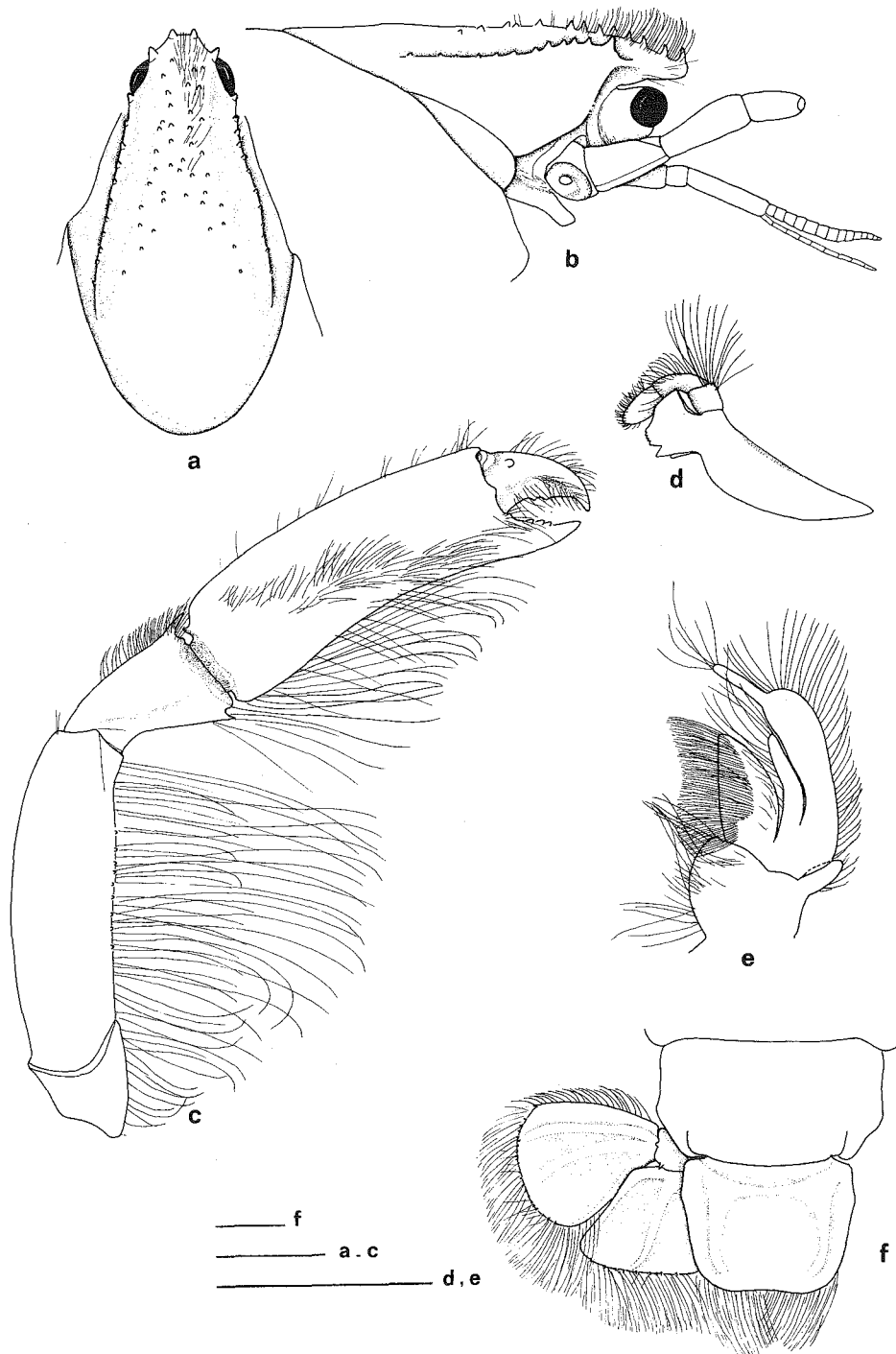


FIG. 4. *U. baweana* Tirmizi and Kazmi (RMNH-D 37843): female, tl. 15 mm: (a)–(c) and (f); female, tl. 14 mm: (d) and (e). (a), (b), anterior part of carapace, dorsal and lateral view; (c), first pereopod, outer view; (d), mandible; (e), first maxilliped; (f), telson and uropod. Scale line: 1 mm.

region; lateral grooves shallow and wide, lateral ridges with 11–12 teeth, posterior ones very small. Antero-lateral margin of carapace unarmed or with 1–2 minute denticles (Fig. 4(b)). Linea thalassinica weakly marked and terminating at level of cervical groove.

Telson (Fig. 4(f)) about 1.4 times broader than long, a faint inverted U-shaped carina on dorsal surface.

Mandible (Fig. 4(d)) without mesio-anterior tooth.

First maxilliped (Fig. 4(e)) bearing a small epipodial lobe.

Third maxilliped, without epipod.

Arthrobranchs of type C, with two tubular structures on either side of the rachis.

First pereopod (Fig. 4(c)) slender. Merus with eight minute ventral tubercles in one specimen (tl. 15 mm), unarmed in the other. A ventro-distal and a larger dorso-distal spine on carpus. Propodus unarmed; fixed finger slightly shorter than dactylus, bearing 3–4 teeth on cutting edge. Dactylus with curved tip and two low triangular teeth on ventral margin.

Uropod (Fig. 4(f)) approximately as long as telson and having spinules on posterior margin; protopod with two spiniform tubercles.

Remarks. The presence of ventral tubercles on the cheliped merus in one specimen studied can be considered as a variation, otherwise this material agrees with the holotype of the species as described by Tirmizi and Kazmi.

The most similar species is *U. darwini* (Miers, 1884) from which *U. baweana* differs in having: (1) a rostrum slightly downturned; (2) lateral grooves of the gastric region distinctly wider, lateral ridges with fewer and smaller teeth; (3) pereopod 1 with no ventral meral spines, fixed finger shorter than dactylus, the latter having no rounded proximal tooth on inner surface.

Apart from these characters, it can also be noted that, unlike *U. darwini* (see Ngoc-Ho, 1981), *U. baweana* has an epipod on the first maxilliped and arthrobranchs of type C.

Upogebia miyakei Sakai, 1967

(Fig. 5(a), (b))

Upogebia miyakei Sakai, 1967: 319, fig. 1. Ngoc-Ho, 1977: 313; 1979: 319, fig. 1A.

Material examined. Snellius Expedition, 3–7 May 1930 Haroekoe, Indian Archipel (Indonesia): 2 ovig. ♀: cl. 5.5 mm and 6 mm, tl. 18 mm and 19 mm (RMNH-D 37845).

Remarks. *U. miyakei* Sakai was once thought to be identical to *U. lincolni* Ngoc-Ho, 1977 (see Ngoc-Ho, 1977: 313). The two species are very similar indeed in the shape and spinulation of the rostrum, in the shape of the telson and uropods (Fig. 5(b)) but the present species differs from *U. lincolni* in having, in females, a more slender first pereopod with the propodus nearly three times as long as broad and bearing 2–4 large spines on the mesio-dorsal margin (Fig. 5(a)).

Males are unknown.

Upogebia fallax de Man, 1905

(Fig. 5(c), (d))

Upogebia (Upogebia) fallax de Man, 1905: 601. de Man, 1928: 57, figs 5(a)–(g).

Upogebia fallax. Bozic and de Saint Laurent, 1972: 344.

Upogebia (Upogebia) fallax. Sakai, 1982: 53 (in part, HOLOTYPE of *U. fallax* only, ZMA 102 390) (nec *U. pugnax* de Man).

Upogebia (Upogebia) pugnax. Sakai, 1984: 161 (nec *Upogebia pugnax* de Man).

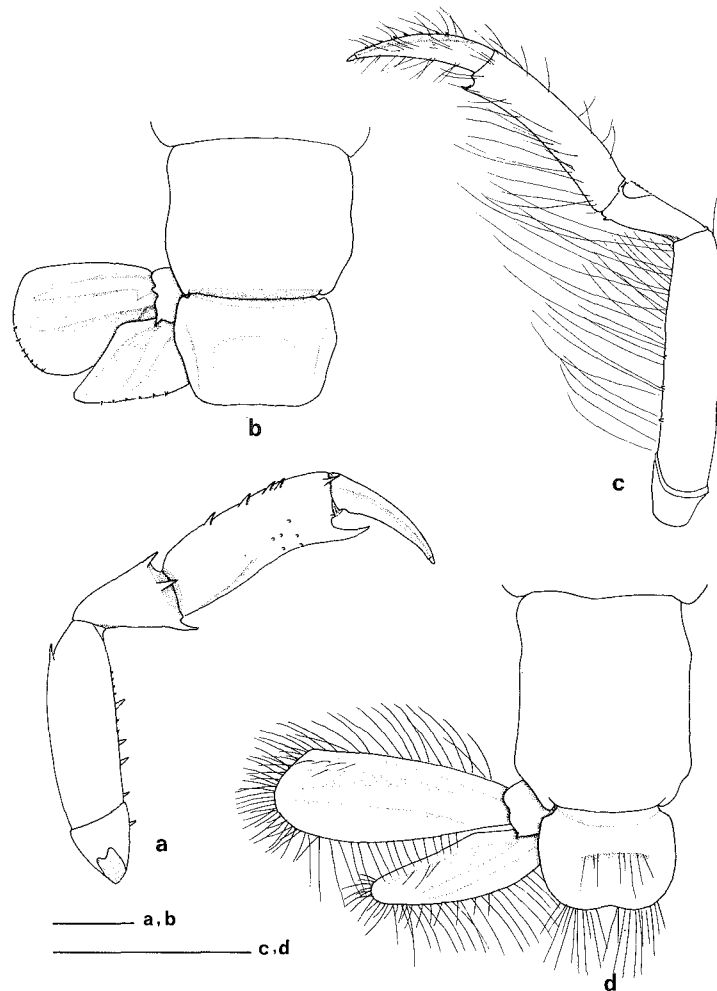


FIG. 5. *U. miyakei* Sakai (RMNH-D37845) female, tl. 19 mm: (a), (b); *U. fallax* de Man (RMNH 31757) male, tl. 7 mm: (c), (d). (a), first pereiopod, mesial view; (b) and (d), telson and uropod; (c), first pereiopod, outer view. Scale line: 1 mm.

Material examined. Snellius Expedition, 16.6.1930: St. 295a, off Miangas, Indonesia, 5°25'N–126°36'E, surface plankton: 1♂ juv., cl. 2.5 mm, tl. 7 mm (RMNH 31757, assigned to *U. pugnax* de Man by Sakai, 1984), specimen much damaged, broken into two pieces; tip of rostrum lost, left P1 and both P5 present.

Description. Remaining part of rostrum slightly overreaching the eyes and bearing three small teeth on each lateral margin. Lateral ridges of gastric region with 10–11 small teeth, antero-lateral border of carapace with a spinule.

Sixth abdominal segment (Fig. 5(d)) much longer than broad, nearly one and a half times longer than second segment and over twice as long as telson.

Telson (Fig. 5(d)) approximately one and a half times broader than long with rounded postero-lateral angles, curving regularly into posterior border that is concave medially.

First article of antennular peduncle with a subdistal spine on ventral margin.

Third article of antennal peduncle with a subdistal spine on ventral margin.

Third maxilliped with a small epipodial lobe.

First pereiopod (Fig. 5(c)) merus with three proximal tubercles on ventral margin.

Carpus with a ventro-distal spine; disto-dorsal margin damaged, all spines there (if any) are lost. Propodus slender, unarmed except for a mesio-dorsal tubercle; fixed finger subterminal, short, with 2–3 denticles on cutting edge. Dactylus, over half as long as the propodus and tapered to corneous slender tip; small corneous denticles dorsally.

Male genital openings on coxae of fifth pereiopods.

Uropods (Fig. 5(d)) both exopod and endopod long and slender, exopod over twice as long as telson; protopod with a small spine.

Remarks. In spite of its smaller size, a slightly broader telson with no median spinule on posterior border and a less spinose first pereiopod, the present material agrees with the description and figures of the holotype of *U. fallax* de Man (de Man, 1928).

Sakai (1982) synonymized this species with *U. pugnax* de Man and considered its holotype (tl. 12 mm) as a juvenile form of the latter (holotype of tl. 18.5 mm). As de Man (1928) pointed out, these two species are indeed closely related in the morphology of their rostrum and their first pereiopod but differ from each other by their uropods and their sixth abdominal segment. The exopod of the uropods as well as the sixth abdominal segment are over twice the length of the telson in *U. fallax* and hardly 1.5 times this length in *U. pugnax*; the shape of the uropod endopod is also different in the two species.

Examination of the present specimen (tl. 7 mm) seems to confirm de Man's view. It can be noted that there is hardly any difference, and especially no shortening, between its sixth abdominal segment and uropods (Fig. 5(d)) when compared with the HOLOTYPE of *U. fallax* (tl. 12 mm; de Man, 1928, Fig. 5(e)). Therefore, it seems unlikely that, when reaching the size of 18.5 mm, specimens of this species could have the same telson and uropod proportions as the HOLOTYPE of *U. pugnax* which is depicted in Fig. 7(e)).

Insufficient material of both *U. fallax* and *U. pugnax* is available to fully confirm this view; nevertheless, at present, it is probably wiser, as de Man (1928) suggested, to maintain them as separate species.

Upogebia gracilis sp. nov.

(Fig. 6)

Material examined. MUSORSTOM Expedition 1976, Philippines. St. 14, 190 m: 1♂ (HOLOTYPE), both P1, left P2–P4 and right P5 present.

Type. HOLOTYPE: ♂, cl. 5 mm, tl. 13 mm (MNHN-Th 787).

Etymology. The species is named for its slender body and appendages.

Description. Rostrum (Fig. 6(a)) unarmed, triangular, projecting far beyond eyes, with a spiniform pointed tip slightly curving upwards (Fig. 6(b)), lateral border a little convex and a relatively wide and deep median groove dorsally. Gastric region with few tubercles alongside shallow lateral grooves; lateral ridges faintly marked, bearing 7–8 small tubercles. Antero-lateral border of carapace with 3–4 spinules (Fig. 6(b)). Cervical groove deep, bearing a small spine on either side, near section with linea thalassinica, the latter continuing to posterior margin of carapace.

Sixth abdominal segment (Fig. 6(h)) about 1.3 times as long as telson.

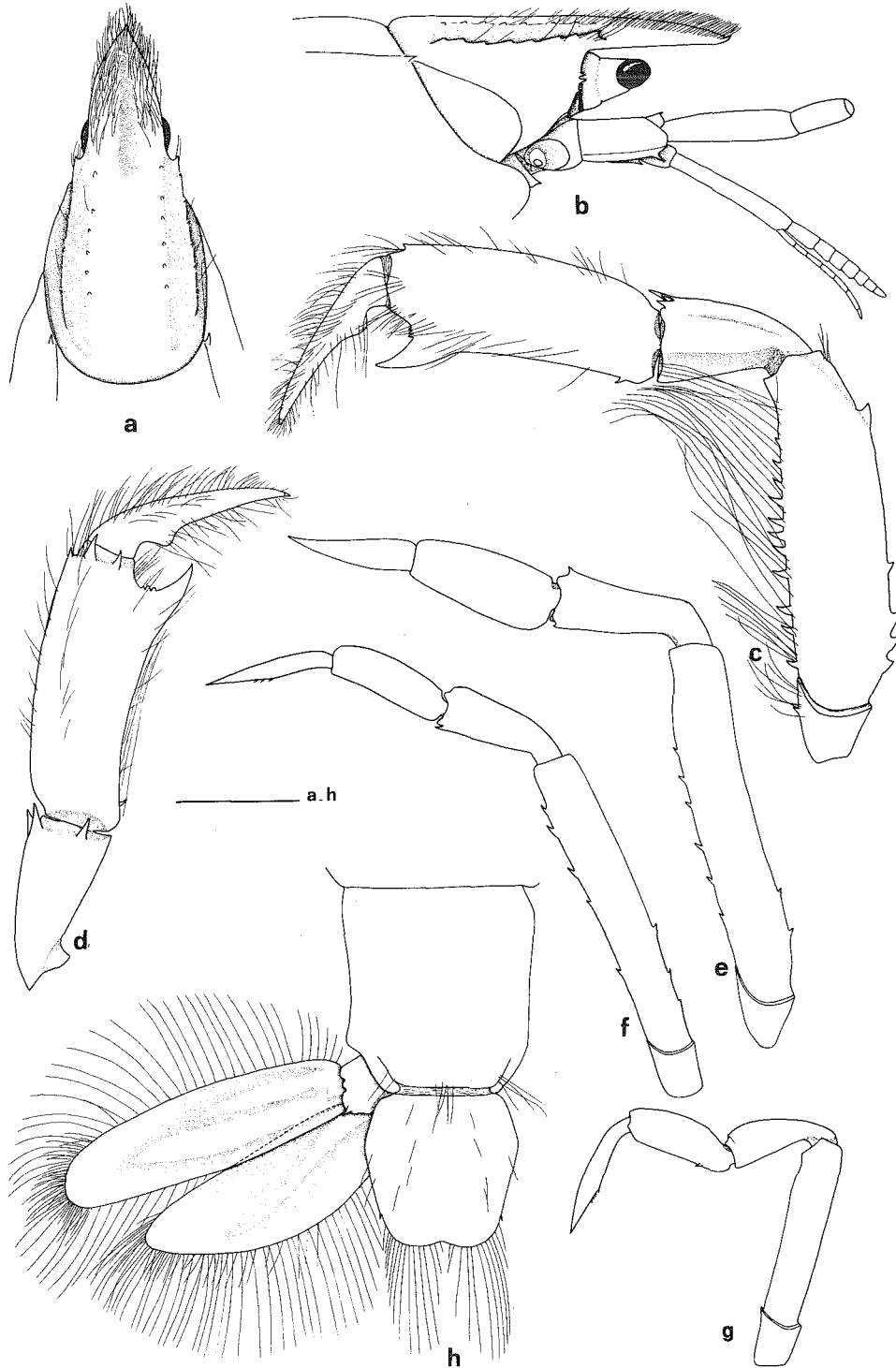


FIG. 6. *U. gracilis* sp. nov., HOLOTYPE, male (MNHN-Th 787). (a), (b), anterior part of carapace, dorsal and lateral view; (c), first pereopod, outer view; (d), distal part of first pereopod, mesial view; (e), (f), (g), second, third and fourth pereopod; (h), telson and uropod. Scale line: 1 mm.

Telson (Fig. 6(h)) approximately as long as broad, lateral border convex, each with a subdistal spinule; postero-lateral angles rounded, posterior border concave medially.

Arthrobranches of type B, with a small tubular structures on either side of the rachis.

Antennule (Fig. 6(b)) first peduncular article with a ventro-distal spine.

Antenna (Fig. 6(b)) third peduncular article bearing a subdistal spine on ventral margin; scale terminating in a spinule.

Mandible without a mesio-anterior tooth.

First maxilliped without epipod, third maxilliped with a small one.

First pereiopod (Fig. 6(c),(d)) subcheliform. Ischium with a spinule on lower margin. Merus over three times as long as broad, bearing large spines: 3–4 proximal and one subdistal on dorsal margin, 10–11 on ventral margin. Carpus with a fine longitudinal groove on outer surface and three dorso-distal spines: two external and a larger mesial; another distal spine on lower half of mesial surface. Propodus nearly three times as long as broad and slightly dilated near base of fixed finger, bearing a small ventro-proximal, a small dorso-subdistal and two large mesio-subdistal spines, the latter near the articulation with the dactylus; fixed finger measuring approximately one-fourth length of dactylus, with 3–4 small rounded proximal teeth on cutting edge. Dactylus with corneous pointed tip, ventral border bearing a large round proximal tooth.

Second pereiopod (Fig. 6(e)) with two dorso-proximal and six ventral spines on merus. Carpus with a ventro-distal and two dorso-subdistal spines.

Third pereiopod (Fig. 6(f)) with three dorso-proximal and five ventral spines on merus; one ventro-distal spine on carpus; dactylus with a few denticles on lower margin.

Fourth pereiopod (Fig. 6(g)) with a proximal spinule on ventral border of propodus and a few denticles on same border of dactylus.

Table 2. Distinguishing characters between *U. gracilis* sp. nov., *U. fallax* de Man and *U. contigua* Bozic and de Saint Laurent.

	<i>U. gracilis</i>	<i>U. fallax</i>	<i>U. contigua</i>
Rostrum			
Tip	pointed	rounded	rounded
Lateral dorsal border	unarmed	with subacute spines	with small tubercles
First pereiopod			
Merus			
Proximal dorsal spines	3–4	absent	absent
Propodus			
Dilation nr base of fix. fing.	present	absent	absent
Dorsal spines	1 subterminal	6–7	1 subterminal
Mesio-subdistal spines	2	absent	absent
Dactylus			
Large ventral tooth	present	absent	absent
Telson			
Spine on lateral margin	present	absent	absent
Posterior margin	concave	concave	straight
Median spine on post. margin	absent	present	absent

Uropod (Fig. 6(h)) both exopod and endopod long and slender, exopod nearly twice as long as telson, posterior margin rounded; protopod with a small spine.

Remarks. The long rostrum and sixth abdominal segment and the long and slender uropods place *U. gracilis* close to *U. fallax* de Man, 1905 from Indonesia (holotype of 12.5 mm in tl.) and *U. contigua* Bozic and de Saint Laurent, 1972 from the Gulf of Guinea (holotype of 21 mm in tl.). The present material, nevertheless, differs from *U. fallax* and *U. contigua* in many respects and the main distinguishing characters are listed in Table 2.

Upogebia pugnax de Man, 1905

(Fig. 7)

Upogebia (Upogebia) pugnax de Man, 1905: 600. de Man, 1928: 66, fig. 8–8(e), 8(f); Sakai, 1982: 52 (in part, nec. fig. 11(b), Pls. E4, E6); 1987: 302 (nec. *U. pugnax* de Man). nec. *U. pugnax*. Sakai, 1984: 161 (= *U. fallax* de Man).

Material examined. Siboga Expedition, St. 311: 1♂, HOLOTYPE (ZMA-De 103. 243), cl. 6.6 mm, tl. 18.5 mm, broken into three pieces, right eye missing; right P1, merus of right P2 and both P5 present.

Description. Given in detail by de Man (1928), a few characters are here added:

Mandible (Fig. 7(b)) with a large mesio-anterior tooth.

First maxilliped without epipod, third maxilliped with a small one.

Arthrobranchs of type B: one small tubular structure on either side of the rachis.

First pereopod (Fig. 7(c), (d)) dactylus with corneous tip, a fine longitudinal dorsal groove on outer surface and a median row of proximal tubercles on mesial surface.

Merus of second pereopod with a dorso-distal and three ventro-proximal spines.

Coxal spines present on pereopods 1–3, those of pereopod 1 largest.

Rudimentary female openings are visible (with difficulty and after staining of the specimen) on coxae of the third pereopods; male genital apertures on coxae of the fifth.

First pleopods (P11) absent.

Sixth abdominal segment (Fig. 7(e)) about 1.3 times as long as telson, lateral borders unarmed.

Uropods (Fig. 7(e)) exopod approximately 1.5 times as long as telson, protopod with a spine.

Remarks. There seems to be little doubt that de Man (1928) made a mistake in the sex identification of the present material. This is not a female but a male having small, but distinct, genital openings on the coxae of the fifth pereopods and no P11. The latter are probably not lost, as de Man presumed (1928), but absent; there is no trace of them on the first abdominal segment, the sternites of which are undamaged. Males possessing rudimentary oviducal openings on the coxae of the third pereopods (false hermaphrodites) are not uncommon in *Upogebia*, and these openings are, moreover, hardly visible in the holotype of *U. pugnax*. The slight feminization of the latter could have been induced by a *Sacculina*, apparent on the third abdominal segment.

As the holotype of *U. pugnax* is a male, all specimens assigned to *U. pugnax* by Sakai (1982, 1987), of which the *female* resembles the holotype and of which the *male* shows a strong sexual dimorphism in the morphology of the first pereopods, are likely to belong to a new species.

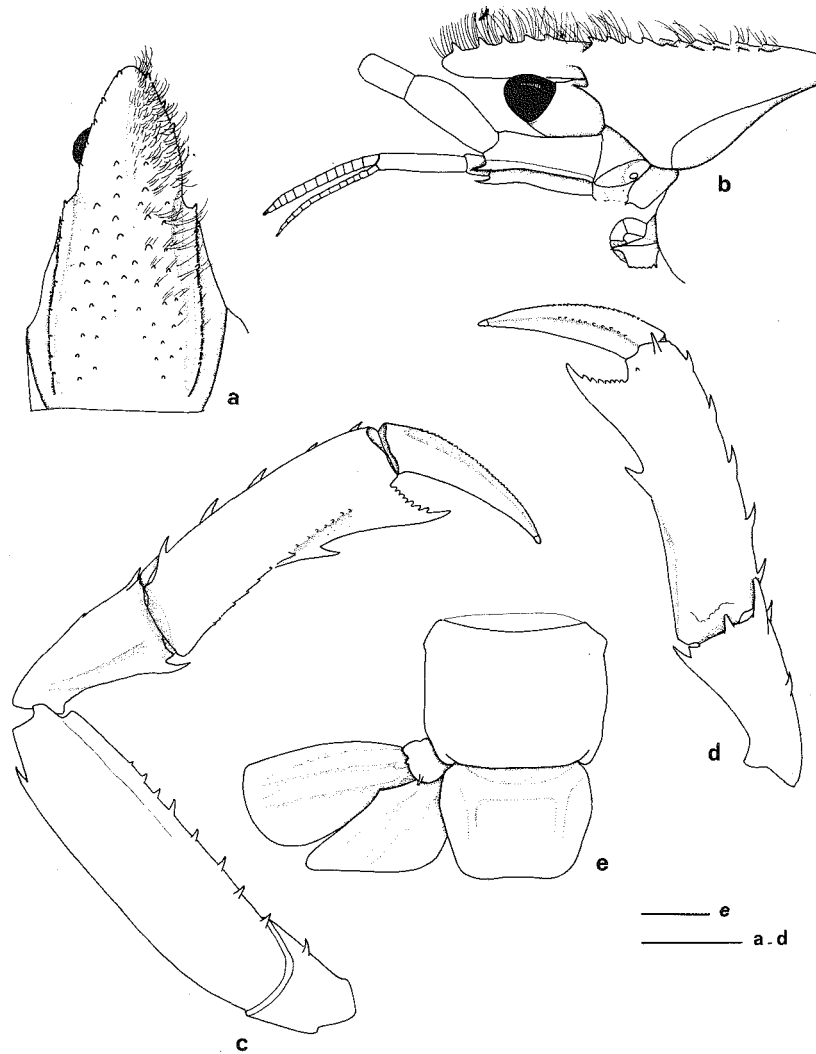


FIG. 7. *U. pugnax* de Man, HOLOTYPE, male (ZMA-De 103. 243). (a), (b), anterior part of carapace, dorsal and lateral view; (c), first pereopod, outer view; (d), distal part of first pereopod, mesial view; (e), telson and uropod. Scale line: 1 mm.

***Upogebia hexaceras* (Ortmann, 1894)**

(Fig. 8)

Gebia (*Gebiopsis*) *hexaceras* Ortmann, 1894: 23, pl. 3, fig. 1.

Upogebia (*Calliadne*) *hexaceras*. de Man, 1928: 81, pl. 8, fig. 11–11(f).

Upogebia (*Upogebia*) *hexaceras*. Sakai, 1982: 23.

nec: *Upogebia* (*Calliadne*) *hexaceras*. Nobili, 1906b: 60 (= *U. octoceras* Nobili).

Upogebia (*Calliadne*) *hexaceras*. Poore and Griffin, 1979: 299 [= *U. darwini* (Miers)] (cf. Sakai, 1982: p. 105).

Material examined. National Science Foundation Expedition, 10 February 1956: Kaipoeer Village, Geelvink Bay, Irian Jaya (Indonesia), 0.75 m–1.2 m, black silt and

sand: 1♂, cl. 7 mm, tl. 18.5 mm, both P1 and right P3, P5 present (RMNH-D 37844). Siboga Exped. St. 164, Indonesia: 1 ovig. ♀, tl. 20 mm, (ZMA-De 103. 244) (identified as *U. hexaceras* by de Man, 1928). Mission J. Bonnier and Ch. Perez 1901 (Persian Gulf), St. 49: 1♂, 1 ovig. ♀, tl. 24.5 mm and 26.5 mm (MNHN-Th 12); St. 54: 1♂, 1 ovig. ♀, tl. 20.5 mm and 22.5 mm (MNHN-Th 13); St. 53: 1 ovig. ♀, tl. 21 mm (MNHN-Th 14); St. 47: 1 ovig. ♀, tl. 24 mm (MNHN-Th 15) (assigned to *U. hexaceras* by Nobili, 1906b).

Description. Rostrum (Fig. 8(a)) rounded distally and projecting beyond eyes, bearing 9 dorsal teeth. A fine medio-dorsal groove anteriorly on rostrum and gastric

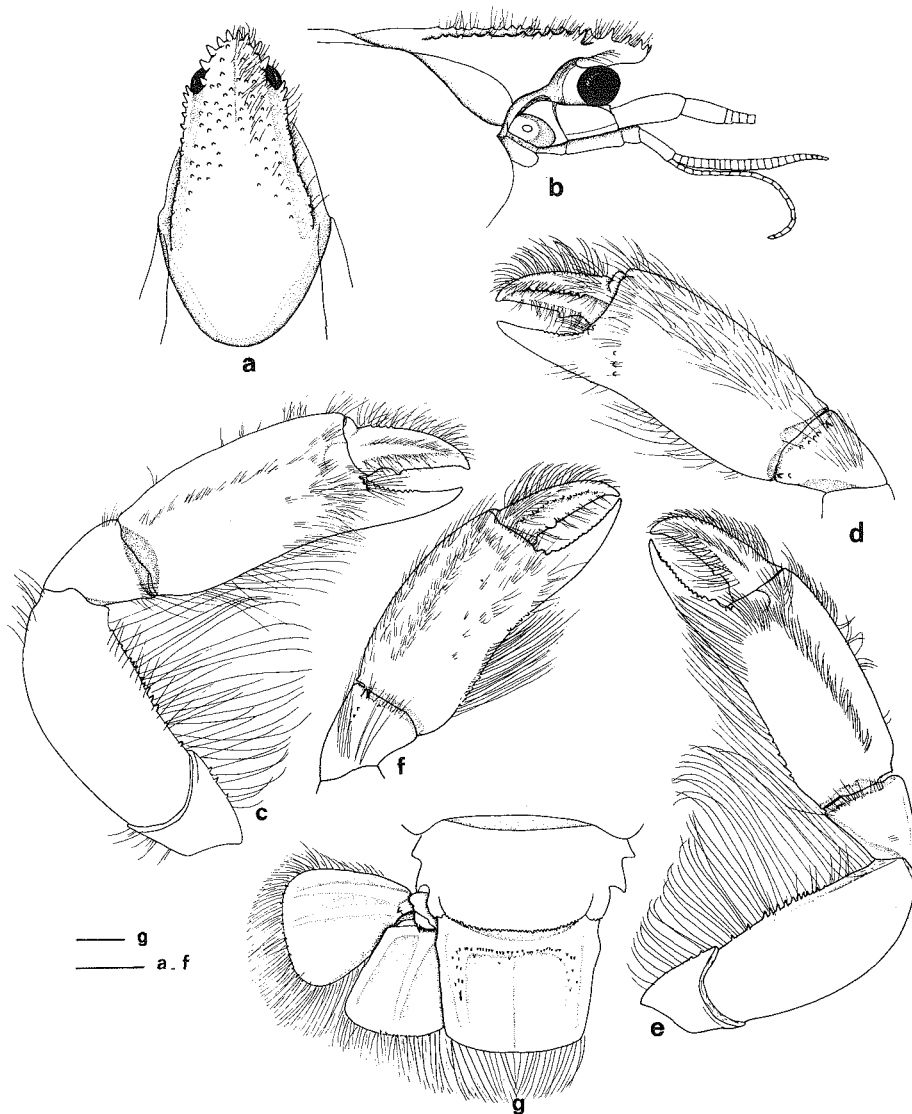


Fig. 8. *U. hexaceras* (Ortmann), male (RMNH-D 37844): (a)–(d) and (g), female (ZMA-De 103, 244): (e), (f). (a), (b), anterior part of carapace, dorsal and lateral view; (c) and (e), first pereiopod, outer view; (d) and (f), distal part of first pereiopod, mesial view; (g), telson and uropod. Scale line: 1 mm.

region; lateral grooves moderately broad; lateral ridges with 13–14 teeth and tubercles. Linea thalassinica distinct, terminating in the posterior region of the carapace shortly beyond the cervical groove. Antero-lateral border of carapace unarmed (Fig. 8(b)).

Sixth abdominal segment (Fig. 8(g)) about twice as broad as long, lateral margins each with two expansions one of which pointed, whole posterior margin denticulated.

Telson (Fig. 8(g)) subquadrate, posterior border slightly convex, a fine medio-dorsal groove and a spinulated inverted U-shaped carina dorsally.

Antennule and antenna (Fig. 8(b)), peduncle unarmed, scale of antenna terminating in a minute spinule.

Mandible, without a mesio-anterior tooth.

First and third maxillipeds lacking epipod.

Arthrobranchs of type B, with one small tubular structure on either side of the rachis.

First pereopod (Fig. 8(c), (d)) Ischium with 3 spinules. Merus with 13–14 spines on ventral margin, the distal ones small. Mesial surface of carpus bearing a dorsal spinule followed by 3–4 tubercles and 2 ventral tubercles, the distal one spiniform. Outer surface of propodus with 2 median distal tubercles near the angle between dactylus and fixed finger; two tubercles similarly located on mesial surface, together with a few others, placed more ventrally near base of fixed finger; fixed finger, as long as dactylus, bearing 9 spiniform denticles on cutting edge. Dactylus with slightly curved tip, 4 denticles dorsally and a proximal triangular tooth on cutting edge; mesial surface with a median row of 8–9 tubercles.

Uropod (Fig. 8(g)) approximately as long as telson, both rami carrying fine spinules on distal margin, exopod with an extra proximal spine; protopod also with a spine.

Remarks. It has not been possible to obtain the holotype of *U. hexaceras* for study; instead, an ovigerous female from the Siboga Expedition, st. 164, identified by de Man in comparison with the type (de Man, 1928, p. 81) has been examined and the first pereopod figured (Fig. 8(e), (f)). The present specimen from Irian Jaya agrees with the material of the Siboga and with the description of *U. hexaceras* by Sakai (1982) in the shape and armature of the sixth abdominal segment, of the telson and uropods as well as the first pereopods; it differs by its long rostrum, projecting beyond the eyes and a higher number of rostral spines.

In the shape of spinulation of its rostrum, it resembles closely *U. octoceras* Nobili from the Red Sea, the lectotype of which is depicted in Fig. 8, but can be separated from the latter by at least five features: (1) a longer rostrum; (2) cheliped merus armed with spines and spinules; (3) cheliped propodus devoid of a large mesio-distal spine near the articulation with the dactylus; (4) fixed finger with spiniform denticles on cutting edge; (5) telson subquadrate.

The length of the rostrum and the higher number of rostral spines are here considered as a individual or sexual variation and the present material is tentatively assigned to *U. hexaceras*.

U. hexaceras (Ortmann), *U. octoceras* Nobili and *U. darwini* (Miers) are actually very close to one another; their differentiating characters are given below, under *octoceras*. Confusions about the identification of these species are frequent: the material assigned by Poore and Griffin (1979) to *U. hexaceras* is placed by Sakai (1982) with *U. darwini*; similarly, the material from the Persian Gulf, although having no mesio-distal spine on the propodus of the first pereopod and identified by Nobili (1906b) as *U. hexaceras*, is likely to belong to *U. octoceras*.

Upogebia octoceras Nobili, 1904

(Fig. 9)

Upogebia (Gebiopsis) octoceras Nobili, 1904: 236. Nobili, 1906a: 98.*Upogebia (Calliadne) hexaceras*. Nobili, 1906b: 60 [nec *U. hexaceras* (Ortmann)].*Upogebia (Calliadne) octoceras*. de Man, 1927: 13, fig. 6-6(e).*Upogebia darwini*. Sakai, 1982: 19 [(in part: type material of *U. octoceras* Nobili (MNHN-Th 24, 25, 26, 27)] (nec *U. darwini* (Miers)].

Material examined. Aden, Obock and Perim. LECTOTYPE (selected by Sakai, 1982): ♂, cl. 11.5 mm, tl. 34 mm (MNHN-Th 24). PARALECTOTYPES: 9♂, 5♀ (4 ovig.): cl. 7.5–13 mm, tl. 21–37.5 mm (MNHN-Th 1176); 4♀ (one much damaged, 2 ovig.): cl. 10–11 mm, tl. 30–36 mm (MNHN-Th 25); 1♀ (dried): cl. 10.5 mm (MNHN-Th 26); 1♂ (dried): cl. 9.5 mm (MNHN-Th 27).

U. darwini (Miers). Phuket, Thailand: 1♂, 1♀, tl. 24 mm and 31 mm (BMNH 1976: 14); Port Darwin, Australia: 1♂, 1♀: tl. 38 mm and 38.5 mm (AM-P 6823); Cottesloe, W. Australia: 1♀, tl. 39.5 mm (WAM 10573); Dampier Archipel., W. Australia: 1♂, tl. 20.5 mm (WAM 12175).

Description. Rostrum (Fig. 9(a)) rounded distally, about as long or slightly longer than eye peduncle, bearing 6–10 dorsal teeth. Gastric region with a slight median longitudinal groove; lateral ridges with 13–15 teeth. Antero-lateral border of carapace unarmed (Fig. 9(b)); linea thalassinica terminating midway in posterior region of carapace.

Sixth abdominal segment (Fig. 9(h)) with whole posterior margin distinctly denticulated.

Telson (Fig. 9(h)) about 1.5 times broader than long, posterior margin nearly straight; a denticulated inverted U-shaped carina dorsally.

Antennule (Fig. 9(c)) and antenna (Fig. 9(d)) peduncles unarmed.

Mandible without mesio-anterior tooth.

First and third maxilliped without epipod.

Arthrobranchs of type A, with one large structure on either side of the rachis.

First pereopod (Figs 9(e), (f), (g)). Ischium with a small tubercle on ventral margin. Merus unarmed or bearing minute granules on ventral outer margin. Carpus with a dorsal tubercle on mesio-distal border and another one below it. Propodus with 1–2 sharp mesio-distal spines near the articulation of the dactylus and sometimes with a dorso-distal spine; fixed finger with 8–9 relatively large rounded teeth on proximal two-thirds of inner margin. Dactylus with slightly curved tip, two rounded proximal tubercles on outer dorsal margin, a large triangular tooth on ventral margin and a median longitudinal row of small denticles on mesial surface.

Uropod (Fig. 9(h)) exopod with a small proximal spine, about as long as telson, endopod slightly shorter, both bearing fine spinules on distal margin; protopod with a small spine.

Remarks. Nobili (1904) considered *U. octoceras* and *U. darwini* (Miers) as being related but distinct while Sakai (1982) thought they were conspecific. Re-examination of the present type material of *U. octoceras* confirms Nobili's view. *U. octoceras* and *U. darwini* are indeed similar in the shape of their telson and the denticulation of the telson carina, in the morphology of their cheliped and in the ornamentation of their dactylus. Furthermore, some variability is apparent in *U. darwini* and some material of this species may have five rostral spines or microscopic denticles on the posterior margin of the sixth abdominal segment (see Poore and Griffin 1979; Sakai, 1982) and may be confused with *U. octoceras*. Nevertheless, the two species still differ from each other in

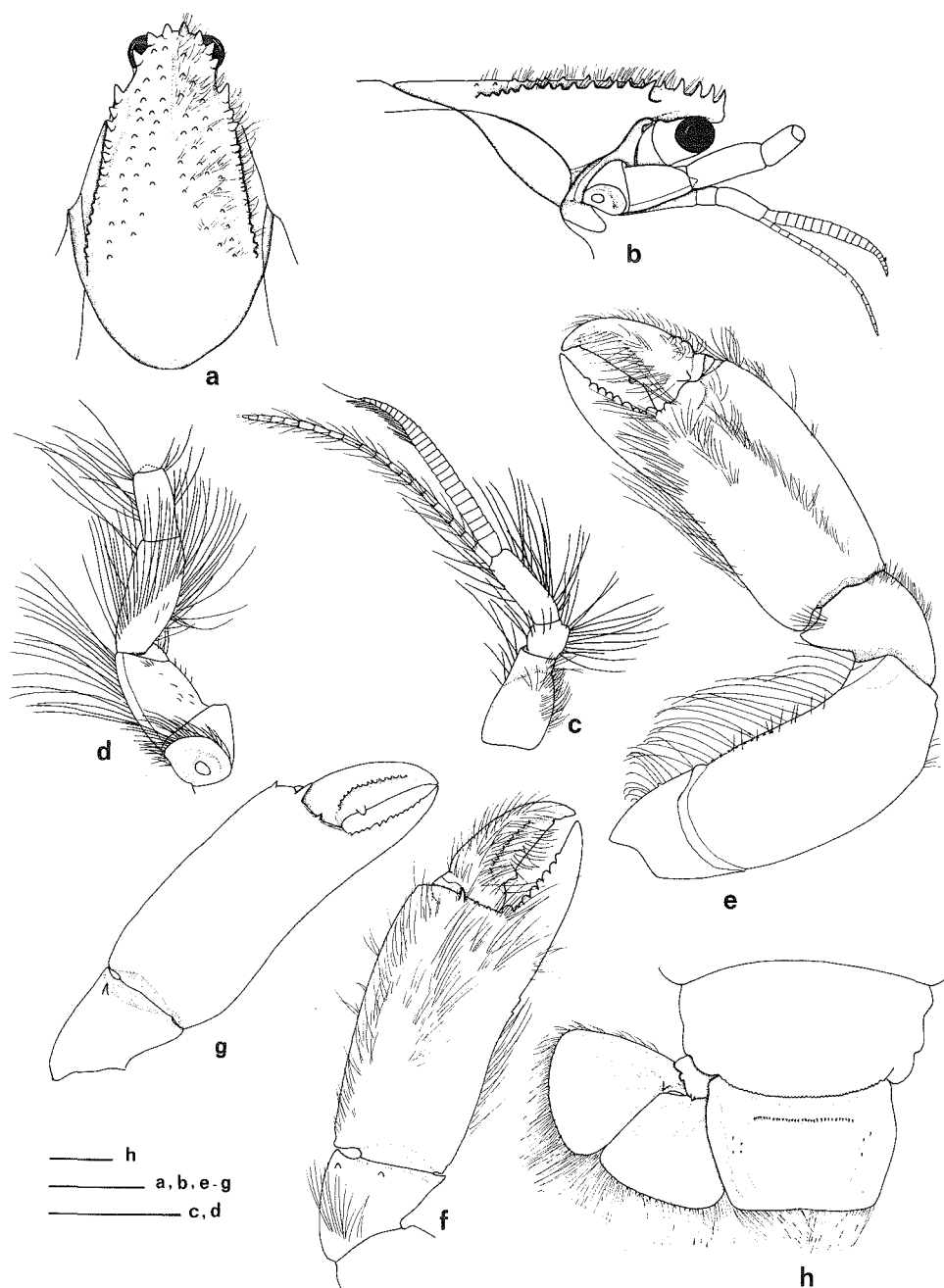


FIG. 9. *U. octoceras* Nobili, LECTOTYPE, male (MNHN-Th 24): (a), (b), (e), (f), (h); female PARALECTOTYPES, (MNHN-Th 1176), tl. 37.5 mm: (c), (d); (MNHN-Th 25), tl. 32 mm: (g). (a), (b), anterior part of carapace, dorsal and lateral view; (c), antennule; (d) antenna; (e), first pereiopod, outer view; (f) and (g), distal part of first pereiopod, mesial view; (h), telson and uropod. Scale line: 2 mm.

Table 3. Differentiating characters between *U. darwini* (Miers), *U. hexaceras* (Ortmann) and *U. octoceras* Nobili.

	<i>U. darwini</i>	<i>U. hexaceras</i>	<i>U. octoceras</i>
Rostral spines	4, rarely 5	6-9	6-10
6th abdom. segment			
Lat. pointed expansions	absent	present	absent
Posterior border	smooth or finely denticulated	distinctly denticulated	distinctly denticulated
Telson	broader than long	subquadrate	broader than long
Cheliped			
Ventral border of merus	with spinules	with spines or spinules	unarmed or with granules
Mes.-dist. spine on propod.	absent	absent	usually present
Teeth on fixed finger	small, spiniform	small, spiniform	large, rounded

many respects, and the following characters in *U. octoceras*, adapted from those mentioned by Nobili (1904), enables it to be distinguished from *U. darwini*: (1) 6-10 rostral spines; (2) ventral border of cheliped merus unarmed or with small granules; (3) posterior border of sixth abdominal segment distinctly denticulated; (4) usually, a mesio-distal spine on cheliped propodus near articulation with the dactylus; (5) cutting edge of fixed finger with relatively large and rounded teeth.

On the other hand, *U. octoceras* resembles *U. hexaceras* in the shape and spinulation of its rostrum and in the shape of the first pereopod. The main differentiating features between *U. darwini* (Miers), *U. hexaceras* (Ortmann) and *U. octoceras* Nobili are listed in Table 3.

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