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## REVISION OF UPOGEBIIDAE (DECAPODA, THALASSINIDEA) IN THE INDO-WEST PACIFIC REGION

Katsushi SAKAI

With 7 Plates and 20 Text-figures

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This work is dedicated to Prof. Jacques FOREST,  
Director of Crustacea-Section of the Muséum  
national d'Histoire naturelle<sup>2</sup> in Paris.  
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## REVISION OF UPOGEBIIDAE (DECAPODA, THALASSINIDEA) IN THE INDO-WEST PACIFIC REGION

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### Introduction

In the present revision, the upogebiid species in the Indo-West Pacific region, comprising 45 species in two subgenera and three genera are studied. Two new genera, one new subgenus and 12 new species are recognized. Synonyms are also updated.

Original intent was to prepare a paper for the section Thalassinidea from Madagascar preserved in the Muséum national d'Histoire naturelle in Paris. In the course of this study, however, the author unexpectedly encountered systematic problems in many aspects. The manuscript was prepared for publication in 1977, however, the publication was delayed through various reasons.

The bulk of the materials from the following institutes and museums has been examined. These are cited as follows.

- AMS= Australian Museum, Sydney.  
BM= British Museum, Natural History, London.  
BMH= Bernice P. Bishop Museum, Honolulu.  
MBCP= Phuket Marine Biological Center, Phuket.  
MNB= Museum für Naturkunde an der Humboldt-Universität zu Berlin.  
MP= Muséum national d'Histoire naturelle, Paris.  
RML= Rijksmuseum van Natuurlijke Historie, Leiden.  
SAMA= South Australian Museum, Adelaide.  
SAMC= South African Museum, Cape Town.  
SMF= Senckenbergisches Museum, Frankfurt am Main.  
UKF= Zoological Institute, University of Kyushu, Fukuoka.  
UMC= University Museum of Zoology, Cambridge, U.K.  
UMK= Universitetets Zoologiske Museum, København.  
USNM= U.S. National Museum, Washington, D.C.  
WAMP= Western Australian Museum, Perth.  
ZMA= Zoologisch Museum, Universiteit van Amsterdam.  
ZMG= Zoologisches Institut und Museum der Universität, Göttingen.  
ZMH= Zoologisches Museum, Hamburg.  
ZSC= Zoological Survey of India, Calcutta.  
ZSM= Zoologische Staatssammlung, München.

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### I. Systematic account on the upogebioid genera.

Various kinds of characters have been compared from the systematical point of view. The morphologies of the mouth parts and the gill-formulae show rather constant characters, however, the dorsal surface of the anterior thoracic region, the cheliped, and the tail-fan are remarkably differentiated so that it is difficult to grip the fundamental value of the development out of those external features. Thinking of the fact that this group of animals inhabits burrows, it seems that the differentiation of the dorsal surface of the anterior thoracic region including the rostrum is a more important character than the shapes of the 1st pereopod and the tail-fan. For this reason, the present author has established a new system for the upogebioid species, by which all the species examined have been divided into three genera, that is, *Upogebia* LEACH 1814, *Wolffogebia* gen. nov. and *Tuerkayogebia* gen. nov.

*Upogebia* LEACH is characterized by the features that the dorsal surface of the anterior thoracic region bears a median furrow. *Wolffogebia* shows characteristically that the dorsal surface of the anterior thoracic region is lacking a median furrow but bears instead a median convexity with hairs around it. *Tuerkayogebia* is a distinct genus of bearing the dorsal surface of the anterior thoracic region occupied only by large tubercles with a glassy surface. It seems probably that three types are caused by different ways of filtration of planktons for their bait.

Up to now the genera *Calliadne* STRAHL 1862, *Gebiopsis* A. MILNE-EDWARDS 1868 and *Gebicula* ALCOCK 1901 have been submitted to the systems of upogebioid species. The genus *Gebiopsis* is defined by the 1st chelate pereopod and the unarmed anterolateral margin of carapace. However, *Gebiopsis* must be regarded as a junior subjective synonym of *Calliadne*, which was applied to species with chelate 1st pereopods.

The genus *Calliadne* STRAHL 1862 was used for species with chelate 1st pereopods. These subdivisions of *Upogebia* s.l. are unsatisfactory, as there are species that show intermediate position in the taxonomically important characters. In the species *U. pseudocheilata* from the Red Sea and *U. assisi* from South Africa, for instance, the 1st pereopod is subchelate so that they were never included into *Calliadne*, however, the denticulations both on the inner distal margin of the carpus of the 1st pereopod and on the anterolateral margin of the carapace are identical with those of most species of *Calliadne*. In some other species the fixed finger is almost as long as the dactylus, which is to be evaluated as an

intergradation.

Out of all these grounds the 1st chelate pereopod cannot be considered as a diagnostic character for defining genera. The genus *Gebicula* ALCOCK was used for species with the 1st pereopod simple and with the telson much shorter than the caudal swimmerets. However, under this condition *Gebicula* must be regarded as a junior subjective synonym of *Upogebia* s.l. as its type species *Gebicula exigua* ALCOCK has turned out to have the character that the 1st pereopod is not simple but subchelate (see p. 83-84).

On the other hand, an undescribed species from Madagascar as well as *Gebicula monochela* SAKAI 1967 from Japan show some features in the shape of the 1st pereopod and the uropod which at first lead to suggestion that they are members of the genus *Gebicula* ALCOCK. After examining the material of ALCOCK's species, its inclusion into a new genus *Wolffogebia* got clear by a median carina on the dorsal surface of the anterior thoracic region, and both the undescribed species and *monochela* SAKAI have to be ranged in a new subgenus *Neogebicula* (see p. 72).

### II. Described species.

45 species including 12 new ones, three genera including two new ones and three subgenera including two new ones are treated in this paper as follows.

1. *Upogebia* (*Upogebia*) *borradailei* sp. nov.  
= *cargadensis* var. BORRADAILE 1910 (partim)
2. *Upogebia* (*U.*) *cargadensis* BORRADAILE 1910  
= *rhadames*, — BARNARD 1947  
= *spongium* SAKAI 1975  
= *longicauda* SAKAI 1975
3. *Upogebia* (*U.*) *savignyi* (STRAHL 1862)  
= sp. SAVIGNY 1817  
= *rhadames* NOBILI 1904
4. *Upogebia* (*U.*) *digitina* SAKAI 1975
5. *Upogebia* (*U.*) *brucei* SAKAI 1975
6. *Upogebia* (*U.*) *tractabilis* HALE 1941
7. *Upogebia* (*U.*) *darwini* (MIERS 1884)  
= *octoceras* NOBILI 1904
8. *Upogebia* (*U.*) *hexaceras* (ORTMANN 1894)
9. *Upogebia* (*U.*) *bowerbanki* (MIERS 1884)  
= *octoceras* var. *australiensis* DE MAN 1927
10. *Upogebia* (*U.*) *amboinensis* DE MAN 1888  
= *ancylodactyla* var. *amboinensis* DE MAN 1928
11. *Upogebia* (*U.*) *ancylodactyla* DE MAN 1905
12. *Upogebia* (*U.*) *fijiensis* sp. nov.  
= *amboinensis*, — SAKAI 1975
13. *Upogebia* (*U.*) *kuekenthali* sp. nov.  
= *intermedia* var. *amboinensis*, — DE MAN 1902 (nec 1888<sup>a</sup>)
14. *Upogebia* (*U.*) *holthuisi* sp. nov.  
= *amboinensis*, — HOLTHUIS 1953
15. *Upogebia* (*U.*) *barbata* (STRAHL 1862)  
= *intermedia* DE MAN 1888 (partim)
16. *Upogebia* (*U.*) *carinicauda* (STIMPSON 1860)  
= *barbata* STRAHL 1862 (partim)

- =*intermedia* DE MAN 1888 (partim)  
 =*carinicauda* var. *gracilipes* DE MAN 1926  
 =*kempi* SANKOLLI 1972
17. *Upogebia* (*U.*) *pseudochelata* TATTERSALL 1921
  18. *Upogebia* (*U.*) *osiridis* NOBILI 1904
  19. *Upogebia* (*U.*) *lenzrichtersi* sp. nov.  
 =sp. LENZ and RICHTERS 1881
  20. *Upogebia* (*U.*) *assisi* BARNARD 1947
  21. *Upogebia* (*U.*) *capensis* (KRAUS 1843)  
 =*africana* ORTMANN 1894
  22. *Upogebia* (*U.*) *subspinosa* (STIMPSON 1860)
  23. *Upogebia* (*U.*) *seychellensis* sp. nov.
  24. *Upogebia* (*U.*) *plantae* sp. nov.
  25. *Upogebia* (*U.*) *ceratophora* DE MAN 1905  
 =? *acanthochela* SAKAI 1967
  26. *Upogebia* (*U.*) *pugnax* DE MAN 1905  
 =sp. aff. *major* BORRADAILE 1904  
 =*fallax* DE MAN 1905
  27. *Upogebia* (*U.*) *hirtifrons* (WHITE 1847)
  28. *Upogebia* (*U.*) *spinifrons* (HASWELL 1882)
  29. *Upogebia* (*U.*) *wuhsienweni* YU 1931
  30. *Upogebia* (*U.*) *shenchiajuui* YU 1931
  31. *Upogebia* (*U.*) *yokoyai* MAKAROV 1938  
 =*affinis* YOKOYA 1930 (nec SAY 1817)
  32. *Upogebia* (*U.*) *imperfecta* sp. nov.  
 =*issaeffi*,—SAKAI 1968
  33. *Upogebia* (*U.*) *issaeffi* (BALSS 1913)
  34. *Upogebia* (*U.*) *major* (DE HAAN 1839)
  35. *Upogebia* (*Acutigebia*) *danai* (MIERS 1876)  
 =*hirtifrons* DANA 1852 (nec WHITE 1847)
  36. *Upogebia* (*A.*) *simsoni* (THOMSON 1893)
  37. *Upogebia* (*A.*) sp.  $\alpha$  DE MAN 1928
  38. *Upogebia* (*A.*) *trypeta* SAKAI 1970
  39. *Upogebia* (*Neogebicula*) *alaini* sp. nov.
  40. *Upogebia* (*N.*) *monochela* SAKAI 1967
  41. *Wolffogebia* *phuketensis* sp. nov.
  42. *Wolffogebia* *obtifrons* sp. nov.
  43. *Wolffogebia* *inermis* sp. nov.
  44. *Wolffogebia* *exigua* (ALCOCK 1901)  
 =*Upogebia* *monoceros* DE MAN 1905
  45. *Tuerkayogebia* *kiiensis* SAKAI 1971

The following seven species are not taken up into the key.

1. *Upogebia* (*Upogebia*) sp. EDMONDSON 1944
- 1944 *Upogebia* (*Upogebia*) sp. EDMONDSON, Occas. Pap. B.P. Bishop Mus. Honolulu. 18(2): 42, text-fig 4.

1946 *Upogebia* sp. — EDMONDSON, Reef and shore Fauna Hawaii, Honolulu.: 261, text-fig 159.

TYPE-LOCALITY.—? Oahu, Hawaii.

MATERIAL EXAMINED.—? Hawaii, Oahu (1♀, BMH 4697-A).

REMARKS.—The present author examined EDMONDSON's female specimen (BMH 4679-A) and identified it as *U. littoralis*. As he suggested, it seems probable that this specimen had artificially been brought from the western coast of America. As a result, so far as the upogebiid fauna in Hawaii is concerned, no species has been known up to now.

## 2. *Upogebia heterocheira* KEMP 1915

1915 *Upogebia* (*Upogebia*) *heterocheira* KEMP, Mem. Indian Mus. 5: 257 (partim), text-figs 22-24, pl. 13 figs. 6-7.

1918 *Upogebia* (*Upogebia*) *heterocheira*, — KEMP, Mem. asiat. Soc. Bengal. 6: 254.

TYPE LOCALITY.—Chilka Lake, India.

REMARKS.—The present author had no access to KEMP's materials. Considering from his description, it seems that his syntypes include at least two species.

## 3. *Upogebia balssi* DE MAN 1927

1927 *Upogebia* (*Upogebia*) *balssi* DE MAN, Capita zool. 2(5): 43, pl. 5 fig. 16 (partim).

TYPE LOCALITY.—Suez.

REMARKS.—This species is based on two specimens, the one collected in Oct. 25 1895 by the Pola Expedition from Suez, which DE MAN (1927: 43) mistook for BALSS' *hirtifrons* (=ZSM 93/1,—*U. pseudochelata* TATTERSALL) from Sherm Sheikh (see p. 38), and the other from the Persian Gulf, which NOBILI (1906: 61) reported as *U. hirtifrons*. However, it seems likely that the specimen from the Persian Gulf differs from the former one from Suez, and is belonging to *U. darwini* (see p. 20).

Otherwise, *Upogebia isodactyla* from the Red Sea (ORTMANN 1891: 55), *U. neglecta* from Port Stephens, E. Australia (DE MAN 1927: 34), *U.* sp.  $\beta$  from Waru-Bay, Ceram (DE MAN 1928: 66), *U. kyushuensis* from western Japan (YOKOYA 1933: 53), and *U. miyakei* from Ishigaki-jima, Ryukyu Retto, Japan (SAKAI 1967: 319) are not discussed in this paper because of inaccessibility of material.

## Key to the Upogebiidae of the Indo-West Pacific region

- 1a. Lateral longitudinal groove of carapace undefinable. Dorsal surface of anterior thoracic region occupied by stout and transparent tubercles. 1st pereopod almost chelate..... *Tuerkayogebia kiiensis* (SAKAI)
- 1b. Lateral longitudinal groove of carapace definable. .... 2
- 2a. Dorsal surface of anterior thoracic region with a median carina. 1st pereopod subchelate. .... 3
- 2b. Dorsal surface of anterior thoracic region with an obscure or conspicuous median furrow. 1st pereopod simple, subchelate or chelate..... 6

- 3a. Hepatic spine present. Anterolateral margin of carapace with 2-4 spines. Rostrum with 1-3 sharp ventral spines. Lateral frontal process of carapace situated behind posterior angle of rostrum. .... *Wolffogebia exigua* (ALCOCK)
- 3b. No hepatic spine present. Anterolateral margin of carapace unarmed. Rostrum also unarmed on ventral surface. .... 4
- 4a. Fixed finger of 1st pereopod smooth on cutting edge. Dorsal surface of anterior thoracic region without denticles. Lateral frontal process of carapace distinctly projected forward. Dorsal surface of anterior thoracic region thickly clothed with fine hairs except its median portion bearing a low, longitudinal carina. .... *W. inermis* sp. nov.
- 4b. Fixed finger of 1st pereopod denticulate on cutting edge. Dorsal surface of anterior thoracic region with denticles. .... 5
- 5a. Rostrum broadly truncated on frontal margin bearing six denticles. Lateral frontal process of carapace slightly projected forward. Dorsal surface of anterior thoracic region elevated in middle portion, laterally implanted with a row of 7-9 hair-tufts, and posterior to 2nd hair-tuft with a single tubercle; lateral longitudinal ridge with a row of tubercles. .... *W. obtifrons* sp. nov.
- 5b. Rostrum semicircular on frontal margin bearing 4-5 denticles. Lateral frontal process of carapace shortly projected forward. Dorsal surface of anterior thoracic region thickly clothed with fine hairs except in its median portion provided with a low longitudinal carina, and laterally with a row of interspaced denticles; lateral longitudinal ridge also with a row of denticles. .... *W. phuketensis* sp. nov.
- 6a. Rostrum obtuse or tapering distally, terminally or subterminally with a denticle. 7
- 6b. Rostrum obtuse at tip, distally provided with at least a pair of denticles except in *spinifrons*. .... 12
- 7a. 1st pereopod simple. Uropod leaf-like. .... 8
- 7b. 1st pereopod subchelate. Uropod broad. .... 9
- 8a. Propodus of 1st pereopod unarmed on ventral margin. Merus of 3rd maxilliped unarmed on inner margin. Anterolateral margin of carapace unarmed. .... *U. (Neogebicula) alaini* sp. nov.
- 8b. Palm of 1st pereopod subterminally with a tooth on ventral margin, forming no chela with dactylus. Merus of 3rd maxilliped with denticles on inner margin. Anterolateral margin of carapace with four denticles. .... *U. (N.) monochela* (SAKAI)
- 9a. Palm of 1st pereopod smooth on ventral margin. Exopod of 3rd maxilliped two-segmented. Fixed finger of 1st pereopod arising at ventrodistal angle of palm; cutting edge denticulate in its proximal part. .... *U. (Acutigebia) trypteta* SAKAI
- 9b. Palm of 1st pereopod provided with denticles on ventral margin. Exopod of 3rd maxilliped three-segmented. .... 10
- 10a. Merus of 3rd maxilliped armed with 10 fine-spinules on inner margin. Fixed finger of 1st pereopod arising at some distance from ventrodistal angle to form a broad gap, upper part of which denticulate. .... *U. (A.)* sp.  $\alpha$  DE MAN 1928
- 10b. Merus of 3rd maxilliped armed with 3-5 spinules on inner margin. .... 11
- 11a. Lateral frontal process of carapace distally divergent. Posterior thoracic region laterally unarmed along cervical groove. Fixed finger of 1st pereopod stoutly arising at some distance from ventrodistal angle of palm to form a broad deep gap. .... *U. (A.) danai* MIERS
- 11b. Lateral frontal process of carapace distally convergent. Posterior thoracic region laterally with some obtuse granules along cervical groove. Fixed finger of 1st pereopod arising at ventrodistal angle of palm, cutting edge denticulate in its proximal part. .... *U. (A.) simsoni* THOMSON
- 12a. 1st pereopod chelate or subchelate. Carpus of 1st pereopod armed with or without a single dorsal spine on inner distal margin. Anterolateral margin of carapace without any spines. .... 13
- 12b. 1st pereopod subchelate. Carpus of 1st pereopod armed with at least two spines on inner distal margin except in *subspinosa*. Anterolateral margin of carapace with 1-6 spines. .... 29
- 13a. Palm of 1st pereopod with a median hair-line on outer surface. .... 14
- 13b. Palm of 1st pereopod bare or with scattered hairs on outer surface. .... 24

*Upogebia*  
*Neogebicula*  
*Acutigebia*

- 14a. 6th abdominal segment denticulate on posterior margin. 1st pereopod chelate...15
- 14b. 6th abdominal segment smooth on posterior margin. 1st pereopod chelate or subchelate. ....17
- 15a. Palm of 1st pereopod longitudinally with two rows of hairs on upper interior surface, the upper one of which distant from dorsal margin. Telson remarkably depressed in middle portion. Dactylus of 1st pereopod provided with a prominent series of teeth on inner median carina.....*U. (Upogebia) bowerbanki* (MIERS)
- 15b. Palm of 1st pereopod longitudinally with two rows of hairs on upper interior surface, the upper one of which closely planced to dorsal margin. Telson slightly depressed in middle portion. ....16
- 16a. Dactylus of 1st pereopod armed with a row of 5-15 granules on inner median carina. Dorsal surface of anterior thoracic region scabrous and hairy as a whole. ....*U. (U.) darwini* (MIERS)
- 16b. Dactylus of 1st pereopod armed with a series of denticles on inner median carina. Dorsal surface of anterior thoracic region scarcely scabrous and hairy in middle portion..... *U. (U.) hexaceras* ORTMANN
- 17a. 1st pereopod subchelate. Dactylus of 1st pereopod transparent at tip.....18
- 17b. 1st pereopod chelate. Dactylus of 1st pereopod not transparent at tip.....19
- 18a. Dorsal surface of anterior thoracic region scabrous. Carpus of 1st pereopod with a rudimentary dorsal spine on inner distal margin. Dactylus armed with two low swellings on cutting edge..... *U. (U.) assisi* BARNARD
- 18b. Dorsal surface of anterior thoracic region less scabrous. Carpus of 1st pereopod devoid of a dorsal spine on inner distal margin. Dactylus with a distinct tooth on cutting edge. .... *U. (U.) pseudochelata* TATTERSALL
- 19a. Linea thalassinica extending to posterior margin of carapace. ....20
- 19b. Linea thalassinica not extending to posterior margin of carapace. ....22
- 20a. Rostrum provided with a pair of subterminal denticles and another pair of proximal ones. Distal segment of antennule long, reaching the level of 1/2 of distal segment of antenna..... *U. (U.) holthuisi* sp. nov.
- 20b. Rostrum only with a pair of subterminal denticles. ....21
- 21a. Dorsal surface of anterior thoracic region transversely with four denticles at level of lateral frontal process. Distal segment of antennule long, reaching the level of 1/2 of distal segment of antenna..... *U. (U.) fijiensis* sp. nov.
- 21b. Dorsal surface of anterior thoracic region transversely with two denticles at level of lateral frontal process. Distal segment of antennule short, reaching the level of the end of penultimate segment of antenna..... *U. (U.) kuekenhali* sp. nov.
- 22a. Telson broader than long, slightly divergent backward on lateral margin. Rostrum with 4-5 subterminal denticles. Distal segment of antennule long, reaching the level of 1/2 of distal segment of antenna.....*U. (U.) barbata* (STRAHL)
- 22b. Telson subsquare in shape, convergent backward on lateral margin. ....23
- 23a. Rostrum with a pair of subterminal denticles. Distal segment of antennule short, reaching the level of distal part of penultimate segment of antenna..... *U. (U.) amboinensis* DE MAN
- 23b. Rostrum with four subterminal denticles. Distal segment of antennule long, reaching the level of proximal part of distal segment of antenna. .... *U. (U.) ancylodactyla* DE MAN
- 24a. 1st pereopod subchelate. Rostrum elongate and with 3-4 lateral denticles. Lateral frontal process produced as a tooth, and distally divergent. Palm of 1st pereopod provided with a broad carina on dorsal margin. Dactylus broad and convex on upper exterior plate..... *U. (U.) osiridis* NOBILI
- 24b. 1st pereopod chelate. Rostrum broadly triangular. Lateral frontal process of carapace shortly projected forward. Palm of 1st pereopod not denticulate on dorsal margin except in *cargadensis*. ....25
- 25a. Palm of 1st pereopod usually denticulate on dorsal margin. Rostrum armed with 6-8 lateral denticles. Telson rectangular, rounded on posterior margin. .... *U. (U.) cargadensis* BORRADAILE
- 25b. Palm of 1st pereopod smooth on dorsal margin.....26
- 26a. Dactylus of 1st pereopod strongly denticulate on inner median carina. Rostrum with four lateral denticles. Telson rectangular, divergent backward on lateral margin, and broadly rounded on posterior one..... *U. (U.) digitina* (SAKAI)
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- 27a. Dactylus of 1st pereopod transparent at tip. Rostrum with five lateral denticles. Telson subsquare, straight on posterior and lateral margin. .... *U. (U.) borradailei* sp. nov.
- 27b. Dactylus of 1st pereopod not transparent at tip. Rostrum with 3-5 lateral denticles. Telson subsquare, convergent in posterior half of lateral margin, and convex on posterior margin. .... *U. (U.) tractabilis* HALE
- 28a. Dorsal surface of anterior thoracic region with obscure median furrow. Rostrum with 5-6 lateral denticles. Carpus of 1st pereopod usually devoid of a dorsal spine on inner distal margin. Telson subsquare, and broadly rounded on posterior margin. .... *U. (U.) savignyi* (STRAHL)
- 28b. Dorsal surface of anterior thoracic region with broad and shallow median furrow. Rostrum with 3-5 lateral denticles. Carpus of 1st pereopod with a rudimentary spine on inner distal margin. Telson almost trapezoid, slightly convex on posterior margin. .... *U. (U.) brucei* (SAKAI)
- 29a. Palm of 1st pereopod longitudinally with three rows of strong spines on inner surface. Lateral frontal process of carapace scarcely projected forward. ....30
- 29b. Palm of 1st pereopod without any spiny rows on inner surface. Lateral frontal process of carapace projected forward except in *pugnax* and *hirtifrons*. ....31
- 30a. Rostrum with 6-7 lateral denticles, and with 2-4 short ventral spines. Antero lateral margin of carapace with 1-3 spines. Carpus of 1st pereopod with three strong dorsal spines on inner distal margin. Palm with a row of 10-15 anteriorly-directed spines on dorsal margin. Upper exterior plate of dactylus bearing a row of granules on its lower margin. .... *U. (U.) plantae* sp. nov.
- 30b. Rostrum with 7-11 lateral denticles. Anterolateral margin of carapace with 1-4 spines. Carpus of 1st pereopod with two strong dorsal spines on inner distal margin. Palm with 8-13 spines on dorsal margin. Upper exterior plate of dactylus smooth on its ventral margin. .... *U. (U.) ceratophora* DE MAN
- 31a. Fixed finger of 1st pereopod horn-like, arising forward at middle part of inner ventral margin of palm. Rostrum with 3-6 lateral denticles and with 3-5 ventral spines. Lateral frontal process of carapace anteriorly projected with 1-5 ventral spines. Palm with 9-10 equidistant spines on dorsal margin, with a median hair-band on outer surface, and characteristically with a transparent longitudinal carina distally on inner surface. .... *U. (U.) wuhsienweni* YU, adult male
- 31b. Fixed finger of 1st pereopod triangular, arising downward at distal part of inner ventral margin of palm. Rostrum with five lateral denticles, but unarmed on ventral margin. Lateral frontal process of carapace shortly projected forward as a tooth. Palm with 5-8 equidistant spines on dorsal margin, medially smooth on outer surface, and distally devoid of a transparent longitudinal carina on inner surface. .... *U. (U.) pugnax* DE MAN
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- 33b. Fixed finger of 1st pereopod in males unarmed on cutting edge, in females armed with 1-2 denticles. Palm with two denticulate carinae on dorsal surface. Dactylus denticulate on cutting edge. ....34
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- 34b. Coxae of pereopods 1-3 with a sharp spine. Carpus of 1st pereopod with a rudimentary dorsal spine on inner distal margin. Meri of pereopods 1-2 with a subterminal spine on dorsal margin. Rostrum with 3-5 lateral denticles. Dorsal surface of anterior thoracic region with a narrow and deep median furrow. .... *U. (U.) subspinosa* (STIMPSON)

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- 37b. Rostrum heart-shaped, bearing 3-6 lateral denticles and 3-5 ventral teeth. Lateral longitudinal ridge of carapace with denticles; lateral frontal process with 1-5 sharp ventral spines. Anterolateral margin of carapace with 3-6 spines. No hepatic spine. Palm of 1st pereopod with a row of 9-11 equidistant teeth on dorsal surface, and with a median hair-line on outer surface except in its distal part bearing a hair-tuft. .... *U. (U.) wushienweni* YU, female
- 38a. Rostrum with three lateral denticles and with two small ventral teeth. Palm of 1st pereopod with a row of denticles on dorsal margin. Carpus with two dorsal spines on inner distal margin. Cutting edge of fixed finger with a distinct outer and a small inner tooth at proximal third. .... *U. (U.) imperfecta* sp. nov.
- 38b. Rostrum with 4-5 lateral denticles and with two ventral ones. Palm of 1st pereopod on dorsal surface with an inner row of spinules except in its distal part and with a narrow outer carina. Carpus with three sharp spines on inner distal margin. Cutting edge of fixed finger of 1st pereopod with five denticles in proximal half, the distal one of which distinct in shape. .... *U. (U.) seychellensis* sp. nov.
- 39a. Lateral frontal process of carapace scarcely projected forward. Rostrum broadened and with 4-5 lateral denticles. Palm of 1st pereopod with a row of 11-12 obtuse equidistant teeth on dorsal margin except in its distal part. Dactylus broadly convex in upper exterior plate. .... *U. (U.) hirtifrons* (WHITE)
- 39b. Lateral frontal process of carapace developed. ....40
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- 42b. Dorsal surface of anterior thoracic region without a transverse furrow, but bearing a median furrow, and posterior to it a narrow median groove. Dactylus of 1st pereopod bearing a row of large flat tubercles in upper exterior plate, and with a row of seven large tubercles and another row of rather strong ones on inner surface. .... *U. (U.) shenchiajuui* YU
- 43a. Inner surface of dactylus of 1st pereopod dorsally with a yellow-transparent carina, and medially with a row of 10-12 oblique ridges. .... *U. (U.) issaefi* (BALSS), male
- 43b. Inner surface of dactylus of 1st pereopod dorsally with a row of transverse ridges, and medially with a row of short, oblique ridges. .... *U. (U.) major* (DE HAAN), female
- 43c. Inner surface of dactylus of 1st pereopod dorsally with a row of granules. ....44
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- 44b. Inner surface of dactylus of 1st pereopod medially with a row of 12 granules .. *U. (U.) issaefi* (BALSS), female

### III. Systematics.

Family Upogebiidae BORRADAILE 1903

1903 *Upogebiinae* BORRADAILE, Ann. Mag. nat. Hist. (7) 12(71): 542.

TYPE GENUS.—*Upogebia* LEACH 1814.

DEFINITION.—Rostrum of a good size. Lateral longitudinal groove of carapace definable except in

*Tuerkayogebia*. 1st pereopod chelate, subchelate or simple, and equal. 2nd pereopod simple and equal. 5th pereopod subchelate. 1st pleopod in males wanting and in females simple. Pleopods 2-5 with broad branches, bearing no appendix interna.

GENERA INCLUDED.—*Upogebia* LEACH 1814, *Wolffogebia* gen. nov. and *Tuerkayogebia* gen. nov.

#### Key to the upogebiid genera of the Indo-West Pacific region

- 1a. Lateral longitudinal groove of carapace definable. .... 2
- 1b. Lateral longitudinal groove of carapace undefinable. Dorsal surface of anterior thoracic region occupied by stout, yellowish transparent tubercles. .... *Tuerkayogebia* gen. nov.
- 2a. Dorsal surface of anterior thoracic region with a median furrow posterior to rostral tip. .... *Upogebia* LEACH
- 2b. Dorsal surface of anterior thoracic region with a median carina. .... *Wolffogebia* gen. nov.

Genus *Upogebia* LEACH 1814

1814 *Upogebia* LEACH, BREWSTER'S Edinburgh Encycl., 7(2): 400.

1862 *Calliadne* STRAHL, Mber. Akad. Wiss. Berlin, 1862: 1064. [Type species by monotypy: *Calliadne savignii* STRAHL 1862.]

1868 *Gebiopsis* A. MILNE-EDWARDS, Nouv. Arch. Mus. Hist. nat. Paris, 4: 64. [Type species by monotypy: *Gebicula nitida* A. MILNE-EDWARDS 1868.]

1901 *Gebicula* ALCOCK, Descript. Catal. ind. deep-sea Crust. Decap.: 201. [Type species by monotypy: *Gebicula exigua* ALCOCK 1901.]

TYPE SPECIES.—*Cancer (Astacus) stellatus* MONTAGUE 1808. [by monotypy]

DEFINITION.—Dorsal surface of anterior thoracic region with a median furrow posterior to rostral tip. Lateral longitudinal groove of carapace definable. Anterolateral margin of carapace with or without spines. 1st pereopod chelate, subchelate or simple.

SUBGENERA INCLUDED.—*Upogebia* (*Upogebia*) LEACH 1814, *Upogebia* (*Acutigebia*) subgen. nov. and *Upogebia* (*Neogebicula*) subgen. nov.

#### Key to the subgenera of the genus *Upogebia*

- 1a. 1st pereopod simple. Upper exterior plate of dactylus of 1st pereopod not differentiated. Uropod slender and leaf-like. Rostrum obtuse at tip, terminally or subterminally provided with a single denticle. Merus of 3rd maxilliped unarmed on inner margin. .... *Upogebia* (*Neogebicula*) subgen. nov.
- 1b. 1st pereopod chelate or subchelate. Upper exterior plate of dactylus of 1st pereopod defined. Uropod broad. .... 2
- 2a. Rostrum tapered at tip, apically bearing a single denticle. Merus of 3rd maxilliped of 1st pereopod with denticles on inner margin. .... *Upogebia* (*Acutigebia*) subgen. nov.
- 2b. Rostrum obtuse at tip, apically bearing a pair of denticles. Merus of 3rd maxilliped devoid of denticles on inner margin. .... *Upogebia* (*Upogebia*) LEACH

Subgenus *Upogebia* (*Upogebia*) LEACH 1814

TYPE SPECIES.—*Upogebia* (*Upogebia*) *stellata* (MONTAGUE 1808).

DEFINITION.—Rostrum obtuse at tip, distally provided with a pair of denticles. Merus of 3rd maxilliped unarmed on inner margin. 1st pereopod chelate or subchelate, upper exterior plate of dactylus definable. Uropod broad.

SPECIES INCLUDED.—*borradailei* sp. nov., *cargadensis*, *savignyi*, *digitina*, *brucei*, *tractabilis*, *darwinii*, *hexaceras*, *bowerbanki*, *amboinensis*, *ancylodactyla*, *fijiensis* sp. nov., *kuekenthali* sp. nov., *holthuisi* sp. nov., *barbata*, *carinicauda*, *pseudochelata*, *osiridis*, *lenzrichtersi* sp. nov., *assisi*, *capensis*, *subspinoso*, *seychellensis*, *plantae* sp. nov., *ceratophora*, *pugnax*, *hirtifrons*, *spinifrons*, *wuhsienweni*, *shenchiajuui*, *yokoyai*, *imperfecta* sp. nov., *issaefi*, *major*.

1. *Upogebia* (*Upogebia*) *borradailei* sp. nov.

Figs. 1a, 2a

1910 *Upogebia* (*Calliadne*) *cargadensis* var. BORRADAILE, Trans. linn. Soc. London, Zool. (2) 13: 263 (nec. pl. 16 fig. 6=*cargadensis* BORRADAILE).

1927 *Upogebia* (*Calliadne*) *cargadensis*, — BORRADAILE In: DE MAN, Capita zool. 2(5): 12, pl. 2 fig. 5.

TYPE LOCALITY.—Cargados Carajos, 55 m deep.

MATERIAL EXAMINED.—Caragados Carajos, 55 m deep (1♂ holotype, 1 ovig ♀ paratype, UMC Sealark Expedition Coll., BORRADAILE 1910: 263 as var. of *cargadensis*).

DIAGNOSIS.—A small-sized species. Rostrum triangular in dorsal view, bearing five stout transparent lateral denticles. Telson roughly square, straight on lateral and posterior margin.



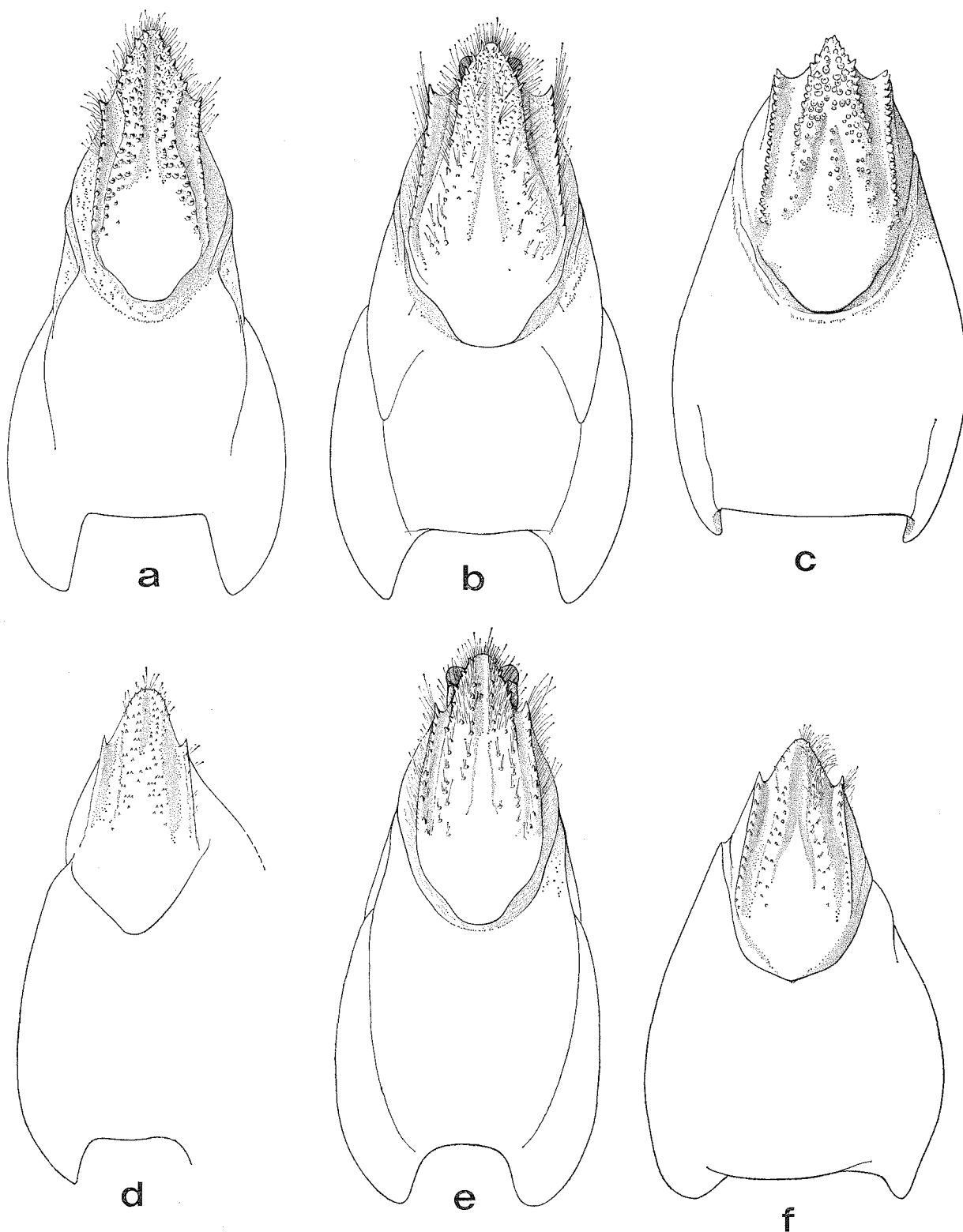


Fig. 1. a. *Upogebia (Upogebia) borradailei* sp. nov., ♂, holotype, UMC Sealark Exped. Coll., carapace. b. *Upogebia (Upogebia) cargadensis*, MP Th, carapace. c. *Upogebia (Upogebia) savignyi*, ovig. ♀, MP Th 48, carapace. d. *Upogebia (Upogebia) digitina*, ovig. ♀, holotype, ZSM 1230/1, carapace. e. *Upogebia (Upogebia) tractabilis*, ♀, syntype, SAMA C-888, carapace. f. *Upogebia (Upogebia) brucei*, ♀, ZSM 1227/1, carapace.

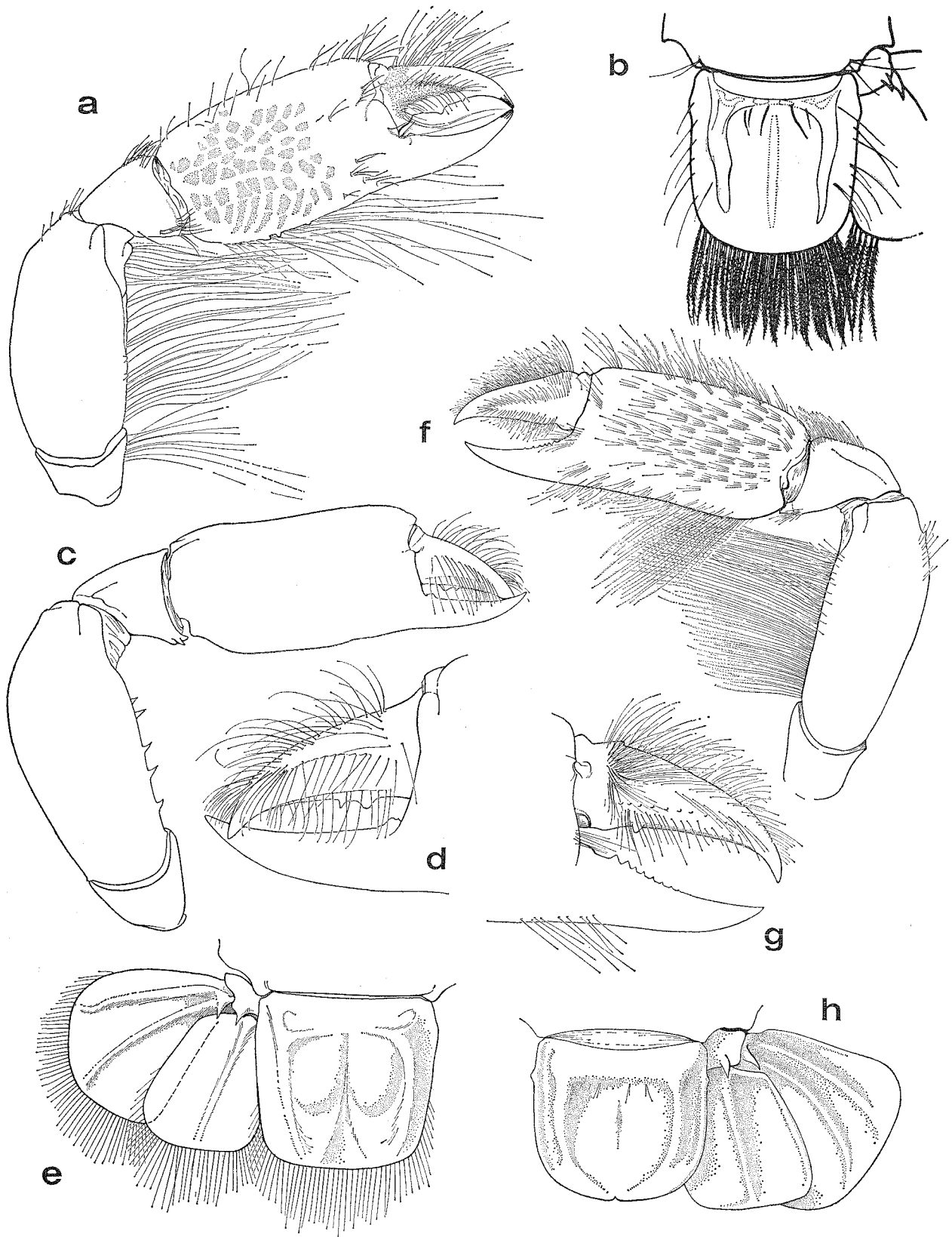


Fig. 2. a. *Upogebia* (*Upogebia*) *borradailei* sp. nov., ♂, holotype, UMC Sealark Exped. Coll., 1st pereopod, outer view. b. *Upogebia* (*Upogebia*) *cargadensis*, MP Th, tail-fan. c. *Upogebia* (*Upogebia*) *tractabilis*, ♂, syntype, SAMA C-888, 1st pereopod, outer view. d. same, chela, inner view. e. same, tail-fan. f. *Upogebia* (*Upogebia*) *savignyi*, ovig. ♀, ZMH 8396, 1st pereopod, outer view. g. same, chela, inner view. h. same, tail-fan.

1st pereopod chelate. Carpus provided with a small dorsal spine on inner distal margin. Palm unarmed on dorsal margin and scattered with hairs on outer surface. Dactylus smooth on inner median carina, and, as well as fixed finger, transparent at tip.

DESCRIPTION.—The rostrum is triangular in dorsal view (Fig. 1a); the dorsal surface is declined distally, and straightly diverges backward with five stout transparent denticles on the lateral margin, and the ventral surface is medially carinate. The dorsal surface of the anterior thoracic region shows a distinct median furrow extending backward to the anterior third of the dorsomedian region, and posterior to it there is no median carina. The dorsomedian region is largely concave in the anterior half of the lateral margin, and is in each half studded with 32(♂)–40(♀) transparent denticles except most of the middle portion posterior to the median furrow. The lateral longitudinal groove is broad and deep in the anterior half, and narrowed in the posterior half. The lateral longitudinal ridge slightly diverges backward, and ornamented with a row of 13 denticles. The antero-lateral margin of carapace is devoid of spines. No linea thalassinica is present posterior to the cervical groove.

The telson is roughly square, straight on the lateral and the posterior margin. The dorsal surface is marked submarginally with a broad lateral longitudinal carina and proximally with a transverse carina which is not distinct but represents a slope line inclined to the middle depression. The median groove is unnoticeable. The uropod shows an oblong endopod which is shorter than the exopod. The exopod bears a small proximal spine. The protopod is armed with a distinct spine.

The eye-stalk is shorter than the rostrum.

The antennular peduncle fails to reach the level of the distal margin of the penultimate segment of the antenna; the third segment is short but slightly longer than the penultimate one. The inferior

flagellum is remarkably longer than the superior one, and the latter is about as long as the peduncle. The scaphocerite is not present.

The 1st pereopod is chelate (Fig. 2a). The merus is provided with a small subterminal spine on the dorsal margin, and in the middle part with 2–3(♂) or 6(♀) small but stout spines on the ventral outer margin. The carpus bears a small dorsal spine on the inner distal margin; the ventral distal spine is small. The palm is convex and scattered with hairs on the outer surface; the dorsal margin is unarmed, the inner dorsal surface is furnished with three rows of hairs, the upper row is scantily hairy and almost merged with the median one, and the ventral outer margin is provided with two tubercles in the proximal half. The fixed finger is smooth on the cutting edge, and transparent at the tip.

The dactylus is about half as long as the palm; the tip is deflected and transparent distally. The outer surface is medially depressed in the proximal two-thirds, the depression is beset with two longitudinal rows of hairs, the upper one of which is a broad band and the lower one is linear. The upper interior surface is provided with two rows of hairs. The interior median carina is thickened in the distal two-thirds. The cutting edge in the male holotype bears a rather distinct tubercle at some distance from the proximal end and two small ones in the middle part, while that in the female paratype bears a series of four denticles in the distal part.

The palm of the 2nd pereopod is long, broadly convex on the dorsal margin and almost straight on the ventral margin.

The eggs are rather a few in number and 0.8 mm in diameter.

REMARKS.—The confusion regarding this new species and *cargadensis* BORRADAILE will be discussed under the latter in some detail. In fact the present species is distinct from *cargadensis* and readily distinguished by the following characters.

<i>borradailei</i> sp. nov.	<i>cargadensis</i> BORRADAILE
Dorsomedian region of carapace devoid of a median carina in posterior part.	Dorsomedian region with a median carina in the posterior fourth.
Telson roughly square, straight on lateral and posterior margin.	Telson oblong, broadly rounded on posterior margin.
Palm of 1st pereopod unarmed on dorsal margin.	Mentioned part spiny in distal half of dorsal margin.
Dactylus and fixed finger of 1st pereopod transparent at tips.	Mentioned parts not transparent at tips.
Fixed finger of 1st pereopod smooth on cutting edge.	Mentioned part minutely denticulate in proximal part of cutting edge.

From the reason mentioned above, the variety of BORRADAILE's species *cargadensis* is recognized as a new species under the name of *borradailei*, and the types are designated as follows:

Holotype.—1♂, 16 mm in total length, from

Cargados Carajos, 55 m deep.

Paratype.—1 ovig. ♀ 16 mm in total length from the same locality.

Disposition.—The University Museum of Zoology, Cambridge.

2. *Upogebia* (*Upogebia*) *cargadensis*

BORRADAILE 1910

Figs. 1b, 2b, Pls. C1-2

- 1910 *Upogebia* (*Calliadne*) *cargadensis* BORRADAILE, Trans. linn. Soc. London, Zool. (2) 13: 263 (partim), pl. 16 fig. 6.
- 1947 *Upogebia rhadames*, — BARNARD, Ann. Mag. nat. Hist. (11) 13: 381.
- 1950 *Upogebia* (*Calliadne*) *rhadames*, — BARNARD, Ann. S. Afr. Mus. 38: 253.
- 1975 *Upogebia* (*Calliadne*) *rhadames*, — SAKAI, Veröff. zool. Staatssamml. München. 18: 23, text-figs. 6-8.
- 1975 *Upogebia* (*Calliadne*) *spongium* SAKAI, Veröff. zool. Staatssamml. München. 18: 29, text-figs. 9-10.
- 1975 *Upogebia* (*Calliadne*) *longicauda* SAKAI, Veröff. zool. Staatssamml. München. 18: 39, text-figs. 14-15.
- Nec.
- 1927 *Upogebia* (*Calliadne*) *cargadensis*, — BORRADAILE In: DE MAN, Capita zool. 2(5): 12, pl. 2 fig. 5 (= *borradailei* sp. nov.)

TYPE LOCALITY.—Kenya, Simoni.

MATERIAL EXAMINED.—Kenya, Mombasa, off Ras Junda, 34.77 m deep, in sponge (1♂, ZSM 1231/1, holotype of *U. longicauda* SAKAI 1975).—, Shimoni, 04°39.1'S, 39°22.3'E, in sponge (1♂ syntype, 1♂, 2♀♀, ZSM 1233/2, determined by SAKAI 1975 as *U. rhadames*).—, Wasin I, 04°40.5'S, 39°20'E, 12.8 m deep, in sponge (2♂♂, 1 ovig. ♀, 1♀, ZSM 1233/1, determined by SAKAI 1975 as *U. rhadames*). Zanzibar (1♀, MNB 17116). Madagascar, off Nossi Bé, 13°27'S, 47°57'E, 21.96 m deep (1♂, ZSM 1232/1, holotype of *spongium* SAKAI 1975).—, Nossi Bé (1 ovig. ♀, MP Th 548).—, in gray sponge (2 juv., USNM 258090).—, near Tany-Kely, 13°38'S, 48°12'E, 28 m deep, in sponge (2♂♂, 2 ovig. ♀♀, 2♀♀, MP Th 549).—, Mitsio (1♀, MP Th 550).—, Mitsio, 25 m deep (1♂, 1 ovig. ♀, 1♀, MP Th 551).—St. Luce, S.E. coast of Madagascar (1♂, 1♀, MP Th 552).—, 25°11.2'S, 47°11.7'E, 85-90 m deep (11♂♂, 7 ovig. ♀♀, 3♀♀, MP, Th 533) South Africa, Natal (1 ovig. ♀, 1♀, SAMC A-6089, determined by BARNARD 1947 as *U. rhadames*).

DIAGNOSIS.—A small-sized species. Rostrum showing a narrow or a broad triangle in dorsal view, provided with 6-8 subacute lateral denticles (Fig. 1b). Lateral longitudinal ridge of carapace with up to 14 denticles. Dorsal surface of anterior thoracic region scabrous; a median furrow distinct, and posterior to it a median carina. No linea thalassinica present. Anterolateral margin of carapace unarmed. Telson nearly oblong, broadly rounded on posterior margin (Fig. 2b).

1st pereopod chelate (Pl C1-2). Merus furnished distally with 1-4 spines on dorsal margin, and with a row of up to 15 distinct, sharp spines on inner ventral margin. Carpus armed with a small dorsal spine on inner distal margin. Palm with about 15 slender, anteriorly-directed spines on dorsal margin, and scattered with hairs on outer surface. Dactylus granulate on inner median carina.

Eggs not many in number and large in size, measuring 1.5 mm in diameter.

REMARKS.—The present author examined two specimens from Cargados Carajos, one male and one ovigerous female still preserved in the University Museum in Cambridge under the name of the present species *cargadensis*. These specimens are clearly different from BORRADAILE's original description but fit very well the material treated by BORRADAILE as probable variety: "In some small specimens, which seem to belong to this species, the upper side of the palm and finger are smooth. These individuals probably represent a variety, for in another specimen of the same size the spines, though fewer than in large individuals, are present" (BORRADAILE 1910: 263). These specimens examined, are only doubtfully included in *cargadensis* by the original author, and treated by him as probable variations, and are therefore to be excluded from the typeseries in accordance to Art 72(b) of the "International Code." In consequence the type-material of this species has to be considered as lost, at least it is not present in the collection of the University Museum of Zoology in Cambridge (GOODHART in litt.), where the GARDINER-collection is kept. Further confusion was caused by a letter, that BORRADAILE wrote to DE MAN, who had asked him for precision of his diagnosis. DE MAN (1927: 12) published that letter in which BORRADAILE altered his diagnosis. Unfortunately that altered diagnosis does exactly fit only the mentioned specimens which BORRADAILE had treated as variation, and which do therefore not belong to the type-series. Apparently BORRADAILE has not examined the typical specimens, which were lost before writing his letter. The present author found supplementary material exactly fitting BORRADAILE's original diagnosis and that the specimens, that BORRADAILE treated as a variety, belong to a distinct species, which is described as new under the name *borradailei* in this paper (see p. 18). Due to this unpleasant situation it seems highly desirable, that BORRADAILE's species is at last fixed definitely by means of the selection of a neotype showing the typical characters. The present author therefore selects the following specimen as neotype of *cargadensis* BORRADAILE:

Neotype.—1♂, 23 mm in total length from Kenya, Shimoni, 04°39.1'S, 39°22.3'E.

Deposition.—Zoologische Staatssammlung in München under Cat. Nr. 1233/2.

The present species is characterized by the features given in the diagnosis and differs from *borradailei* sp. nov. chiefly by the shape and dentation of the chela, the shape and dentation of the rostrum and the dorsomedian region of carapace as well as the shape of the telson (for details see under *borradailei* sp. nov.).

However, all specimens included in the present species show a wide range of variation. Therefore the species described by the present author (1975) as *U. rhadames* from Kenya, *U. spongium* from

Madagascar and *U. longicauda* from Kenya were reexamined and are now treated only as synonym of the present species, because variations are observed as follows:

The presence of sharp, anteriorly-directed spines on dorsal margin of the palm of the 1st pereopod is usually a good character for defining the present species, however they are wanting in small specimens of *spongium* SAKAI measuring 11 mm and *longicauda* SAKAI of 5.6 mm in total length. In some specimens of the species *rhadames* SAKAI\* the dorsal margin of the palm bears a single subterminal spine.

The form of the ventrodistal spine of the carpus of the 1st pereopod is also liable to be variations. This spine is usually distinct and anteriorly-directed as shown in *spongium* and *longicauda*, however it is reduced in a larger male specimen of *rhadames* SAKAI\*.

The ventral inner margin of the merus of the 1st pereopod is typically provided with a row of sharp spines, however in the small specimen of *longicauda* it bears three spines, in the specimens of *spongium* 5-6, in the specimens of *rhadames* SAKAI\* measuring 23 mm these spines are reduced in number.

The dorsal margin of the merus of the 1st pereopod usually bears a single subterminal spine, however, in specimens from Madagascar (MP Th 553) it bears 2-4, and in specimens of *rhadames* SAKAI\* it bears no spine.

The scaphocerite is sometimes present as a pointed spine or a narrow rectangular process, however, it is sometimes wanting.

In all these cases the specimens may definitely be identified to be the present species by the characteristic shapes of rostrum, dorsomedian region and telson.

The specimens from Natal alluded by BARNARD (1947: 381) as *U. rhadames* seem to belong to the present species. The present author examined two specimens of BARNARD's material, an ovigerous female 40 mm long and a female 25 mm long. The smaller one of the two is a little different regarding the characteristic feature of the chela of the present species, because the dorsal margin of the palm of the 1st pereopod bears many distinct granules instead of long, sharp spines, and two rows of hairs on inner dorsal surface are accompanied by denticles. However, those differences are apt to be only individual variations as both specimens show good accordance to *cargadensis* in all other characters.

The present species is closely related to *U. savignyi* in the following points:

The rostrum shows a broad triangle in females, and a narrow one in males. The dorsal surface of the anterior thoracic region is scabrous. No linea thalassinica is present posterior to the cervical groove. The dactylus of 1st pereopod is provided in the proximal part with a small tubercle on the dorsal margin, and in the proximal half with some tubercles on the inner median carina.

However, the differences between the present species and *savignyi* are distinct and tabulated as below:

<i>cargadensis</i> BORRADAILE	<i>savignyi</i> STRAHL
Rostrum with 6-8 subacute lateral denticles.	Rostrum with 5-6 subacute lateral denticles.
Median furrow on dorsal surface of anterior thoracic region distinct.	Mentioned part obscure.
Lateral longitudinal groove of carapace deep and narrow in anterior half.	Mentioned groove broad in anterior half.
Lateral longitudinal ridge of carapace roughly denticulate, denticles up to about 14 in number.	Mentioned part finely denticulate, denticles up to 26.
Telson oblong.	Telson subsquare.
Merus of 1st pereopod usually with a single sharp subterminal spine, or sometimes with 2-4 spines on dorsal margin, and with up to 15 sharp stout spines on ventral inner margin.	Mentioned part usually deprived of a subterminal spine, or sometimes with a single small spine on dorsal margin, and usually unarmed, or sometimes with up to 15 small granules on ventral inner margin.
Carpus of 1st pereopod with a small sharp dorsal spine on inner distal margin, and with a sharp anteriorly-directed ventrodistal spine.	Mentioned part usually unarmed on inner distal margin, and with a small obtuse ventrodistal spine.
Palm of 1st pereopod with up to 15 slender, anteriorly-directed spines on dorsal margin, which are sometimes divided into two rows.	Mentioned part without ornamental spines on dorsal margin.
Pereopods 2-5 rather slender.	Pereopods 2-5 rather stout.
Eggs not many in number and large, 1.5 mm in diameter.	Eggs numerous and small, 0.8 mm in diameter.

\*) non *rhadames* NOBILI 1904 (= *savignyi* STRAHL 1862)

3. *Upogebia (Upogebia) savignyi* (STRAHL 1862)

Figs. 1c. 2f-h

- 1817 *Gebia* sp. SAVIGNY, Descr. Egypte Hist. nat. Atlas. pl. 9 figs. 3/2-2'.
- 1862 *Calliadne Savignii* STRAHL, Mb. Akad. Wiss. Berlin. 1861: 1064.
- 1904 *Upogebia (Gebiopsis) rhadames* NOBILI, Bull. Mus. Hist. nat. Paris. 5: 235.
- 1906<sup>a</sup> *Upogebia (Calliadne) Savignyi*, — NOBILI, Ann. Sci. nat. Zool. Paris, 4: 98.
- 1906<sup>a</sup> *Upogebia (Calliadne) rhadames*, — NOBILI, Ann. Sci. nat. Zool. Paris. 4: 100.
- 1927 *Upogebia (Calliadne) savignii*, — DE MAN, Capita zool. 2(5): 5, pl. 1 fig. 1.
- 1927 *Upogebia (Calliadne) rhadames*, — DE MAN, Capita zool. 2(5): 6, pl. 1 fig. 2.

## TYPE LOCALITY.—Suez.

MATERIAL EXAMINED.—Suez (1♂ neotype, 1 ovig. ♀, 1♀, ZMH 8396).—(1♀, ZSM 97/1).—(2♀♀, MNB 17426). Red Sea, Suakim, in sponge (7♀♀, 1 ovig. ♀, 5♀♀, MP Th 45).—(1♀, MP Th 47, syntype of *U. rhadames* NOBILI 1904). Red Sea (1 ovig. ♀, 1♀, SMF 4950).—(1 ovig. ♀, 3♀♀, SMF 4948).—(1♀, SMF 4969).—(1♀, SMF 4968).—(1 juv. SMF 4967).—(1 ovig. ♀, ZMH 8397).—(2 juv. ♀♀, MNB 17426). Gulf of Aden, Djibouti (11♂♂, 4♀♀, MP Th 46, syntypes of *U. rhadames* NOBILI 1904).—(4♂♂, 11 ovig. ♀♀, 4♀♀, MP TH 48, determined by NOBILI 1906<sup>a</sup> as *U. savignyi*). Locality unknown (1 ovig. ♂, SMF 7796).—(1♂, SMF 7797).

DIAGNOSIS:—A small-sized species. Rostrum triangular, bearing 5-6 subacute lateral denticles. Dorsal surface of anterior thoracic region scabrous and obscurely with a median furrow. Lateral longitudinal ridge of carapace extending posteriorly in a straight line with up to 26 denticles, and lateral longitudinal groove conspicuous. Telson subsquare, broadly rounded on posterior margin.

1st pereopod chelate. Merus usually devoid of a subterminal spine on dorsal margin. Carpus usually unarmed on inner distal margin. Palm usually unarmed on dorsal margin and without a hair-line on outer surface. Dactylus in the proximal half with some granules on inner median carina.

DESCRIPTION:—The rostrum shows a broad triangle in females and a narrow one in males, bearing 5-6 subacute lateral denticle (Fig. 1c). The dorsal surface of the anterior thoracic region is scabrous and scantily hairy in its anterior half, bearing an obscure median furrow, and posterior to it no median carina is present. The lateral longitudinal groove of the carapace is broad and shallow. The lateral longitudinal ridge runs posteriorly in a straight line and is armed with up to 26 fine denticles. The antero-lateral margin of the carapace is unarmed. No linea thalassinica is present posterior to the cervical groove.

The telson is subsquare (Fig. 2h), broadly rounded on posterior margin. The dorsal surface is marked

with a U-shaped carina, of which the submarginal longitudinal carina is prominent and the proximal transverse one is interrupted by a median groove extending from the proximal to the distal margin. The endopod is subsquare. The exopod slightly overreaches the endopod, proximally bearing a distinct spine. The protopod is also provided with a distinct spine.

The eye-stalk is stout and sometimes overreaches the rostrum.

The antennular peduncle reaches the distal margin of the penultimate segment of the antenna. The scaphocerite is wanting or present as a narrow rectangular process with or without a small pointed tip.

The 1st pereopod is almost chelate (Fig. 2f). The merus is usually devoid of a subterminal spine on the dorsal margin, but sometimes bears a small one; the ventral inner margin is usually without spines, but sometimes with up to 15 small granules. The carpus bears usually no dorsal spines on inner distal margin, but sometimes 1-2 small obtuse ones; the ventrodiscal spine is small with an obtuse tip, or sometimes wanting. The palm is convex and scattered with hairs on outer surface. The dorsal margin is implanted with a row of scanty hair-tufts. The upper interior surface is provided with two longitudinal rows of hairs. The ventral inner margin bears a row of long hairs, sometimes accompanied with a row of tubercles in its proximal half. The fixed finger is usually armed in the proximal half with 4-11 (average 4-6) denticles distally reducing their size. The dactylus is not distorted and slightly longer than the half of the palm. The dorsal margin bears a small denticle at some distance from the proximal corner. The upper exterior plate is slightly sulcate in the median portion. The lower exterior surface is marked with a V-shaped hair-line in the proximal two-thirds. The upper interior surface (Fig. 2g) is provided with two hair-rows, of which the upper one shows a broad hair-band and the lower one is linear, both are merged with each other in the distal part. The inner median carina is distinct and armed with some granules in the proximal half. The cutting edge is smooth, bearing inside a narrow submarginal furrow with sparse hairs and with a characteristic triangular tooth in the proximal part.

The eggs are many in number and small in size, measuring 0.8 mm in diameter.

REMARKS.—This species *savignyi* was established by STRAHL (1862: 1064) from the figures given by SAVIGNY (1817, Atlas, pl. 9, figs. 3/2-2'). AUDOUIN (1826: 90) described SAVIGNY's species as *U. Stellata* in the text and mentions that "*l'index (est) notablement plus court que le pouce.*" However, it is evident that the character cited above by AUDOUIN does not belong to the specimen figured by SAVIGNY, because SAVIGNY's figures show clearly that the 1st pereopod is not subchelate but chelate. As a result, it seems most likely that AUDOUIN used another

material from Mediterranean for his description and gave the name *Gebia stellata* LEACH for SAVIGNY's figure.

Later STRAHL (1862: 1064) has doubt about AUDOUIN's determination and identified SAVIGNY's species as the species *savignyi*. The present species is surely admitted by STRAHL's description in that 1 "Der Cephalothorax seitlich aber durch gelinde Ausbuchtungen von den hervorspringenden Seitenleisten getrennt wird." 2 "Das erst Fußpaar ist scheerenträgend." 3 "Der Schwanzfächer besteht aus einem breiten zugerandeten Mittelstück."

The species *rhadames* established by NOBILI (1904: 8) from the specimens from Suakim, Djibouti and Massauah is without doubt a synonym of the present species. NOBILI (1904: 8, 1906<sup>a</sup>: 100) mentioned that the species *rhadames* is different from the species *savignyi* 1 "Le rostre est beaucoup plus long, ... (dans Savigni, le dents des bords du rostre ne sont pas plus développées que celles de la surface dorsale)." 2 "Le bord inférieur de la paume est distinctement denticulé." 3 "Le carpe offre inférieurement un tubercule dentiforme bien développé." However, it is difficult to distinguish NOBILI's species from the species *savignyi* by these characters. Concerning the form of the rostrum, the larger females usually show a broad triangular shape. The specimens (MP Th 48) identified by NOBILI (1906<sup>a</sup>: 98) as *U. savignyi* are composed of four small males and four small females, however, all of those specimens show a narrow rostrum and are not different from the syntypes (MP Th 45) of the species *rhadames* in regard to the form of the rostrum. The other distinctions mentioned by NOBILI are not clear and considered to be merely individual variations.

The present species *savignyi* is based on SAVIGNY's figure and its type specimens seem to be lost, so that for convenience the present author has here designated the neotype as follows:

Neotype.—1 ovig. ♀, 32 mm in total length from Suez, Red Sea.

Disposition.—Zoologisches Institut und Zoologisches Museum, Universität Hamburg, Cat. Nr. K 8396.

#### 4. *Upogebia* (*Upogebia*) *digitina* (SAKAI 1975)

Fig. 1d

1975 *Upogebia* (*Calliadne*) *digitina* SAKAI, Veröff. zool. Staatssamml. München, 18: 34, text-figs. 11-13.

TYPE LOCALITY.—Kenya, off Ras Iwatin, 02°28.5'S, 41°04.5'E, 146.40 m deep.

MATERIAL EXAMINED.—Kenya, off Ras Iwatin (1 ovig. ♀ holotype, ZSM 1230/1).

DIAGNOSIS.—A small-sized species. Rostrum triangular, bearing four lateral denticles. Dorsal surface of anterior thoracic region scabrous and with a broad median furrow.

Telson rectangular, slightly divergent backward on lateral margin and broadly rounded on posterior

margin.

1st pereopod chelate. Carpus with a dorsal spine on inner distal margin. Palm unarmed on dorsal margin, and without a hair-line on outer surface. Dactylus proximally furnished with a series of three teeth on cutting edge, and with a prominent series of ten triangular teeth on inner median carina.

DESCRIPTION.—The rostrum shows a broad triangle with a semicircular tip (Fig. 1d), bearing four lateral spines, the proximal one of which is separated from the other three ones. The dorsal surface of the anterior thoracic region is interspersed with denticles down to the posterior two-fifths of the gastric region; the median furrow is broad and shallow. The lateral longitudinal groove is noticeably broad, inclining toward the lateral longitudinal ridge. The lateral longitudinal ridge is represented in the anterior one fourth by a smooth and broad carina, and further posteriorly a slender divergent carina; the lateral frontal process forms a small tooth. The anterolateral margin of the carapace is unarmed. No linea thalassinica is present posterior to the cervical groove.

The telson is rectangular; the dorsal surface is indistinctly marked with a U-shaped carina, and faintly depressed in the middle portion. The exopod of the uropod is proximally armed with a small spine. The protopod bears a sharp spine.

The antennular peduncle overreaches the level of the middle part of the distal segment of the antenna; the distal segment is rather long and about four times as long as the penultimate one. The scaphocerite is absent.

The 1st pereopod is chelate. The merus bears no subterminal spine on the dorsal margin, and is furnished with 5-6 interspaced spines on the ventral outer margin. The carpus is provided with a dorsal spine on the inner distal margin, and with a small but stout ventrodistal spine. The palm is convex and barely scattered with hairs on the outer surface; the inner surface medially bears a spine on the distal margin and three longitudinal rows of hairs in the upper half. The fixed finger is denticulate in the proximal half on the cutting edge. The dactylus proximally bears a swelling on the dorsal margin. The upper exterior plate is lamellar and slightly sulcate longitudinally. The upper interior surface is scattered with bristles and proximally bears 2-4 tubercles. The inner median carina is characterized by a prominent series of ten triangular teeth. The ventral inner surface submarginally bears a large stout tooth at the proximal third. The cutting edge is distally curved and proximally furnished with a series of three stout closely-set teeth.

The 2nd pereopod is simple. The palm is rather long; the dorsal margin is broadly convex, and the ventral one is almost straight.

REMARKS.—The present species is similar to *Upogebia* (*U.*) *bowerbanki* from South-West Australia in that the inner median carina of the dactylus of the

1st pereopod is provided with a prominent series of teeth and the telson is rectangular in dorsal view.

5. *Upogebia (Upogebia) brucei* (SAKAI 1975)

Fig. 1f

1975 *Upogebia (Calliadne) brucei* SAKAI, Veröff. zool. Staatssamml. München. 18: 18, text-figs. 4-5.

TYPE-LOCALITY.—Kenya, South of Washin Is., 04° 43.8'S, 39°24.9'E, 0.9 m deep.

MATERIAL EXAMINED.—Kenya, South of Washin Is. (1♀ holotype, ZSM 1227/1; 1♀ paratype, ZSM 1227/1). Aldabra, 20 m deep (2 ovig. ♀♀, MP Th).

DIAGNOSIS.—A small-sized species. Rostrum triangular and armed with 3-5 lateral denticles. Telson almost trapezoid, slightly convex on posterior margin. 1st pereopod chelate. Carpus with a rudimentary dorsal spine on inner distal margin. Palm unarmed on dorsal margin and without a median hair-line on outer surface. Dactylus with a row of distinct granules on inner median carina.

DESCRIPTION.—The rostrum is broadly triangular with an obtuse tip, bearing 3-5 lateral denticles (Fig. 1f). The dorsal surface of the anterior thoracic region is scabrous and hairy except in its middle portion; the median furrow is broad and shallow, extending backward to the anterior third of the dorsomedian region. The lateral longitudinal groove of the carapace is moderately deep. The lateral longitudinal ridge is provided with 12-14 denticles. The anterolateral margin of the carapace is unarmed. No linea thalassinica is present posterior to the cervical groove.

The telson is trapezoid. The dorsal surface shows a distinct U-shaped carina. and is depressed in the middle portion; the median groove obscurely exists between the proximal and the distal margin. The endopod of the uropod is oblong. The exopod is furnished with a stout proximal tooth. The propod also bears a stout tooth.

The antennular peduncle slightly overreaches the level of the distal margin of the penultimate segment of the antenna; the distal segment is about two times as long as the penultimate one. The scaphocerite is a small triangular lobule with a pointed tip.

The 1st pereopod is chelate. The merus bears no subterminal spine on the dorsal margin, and is provided with 5-11 spinules on the ventral inner margin. The carpus bears a rudimentary dorsal tooth on the inner distal margin, and is provided with a sharp ventrodistal spine. The palm is scattered with hairs on the outer surface, and just beneath the articulation to the dactylus bears a sharp distal spine on the inner surface. The fixed finger is smooth on the cutting edge. The dactylus is apically deflected, and quite unarmed on the dorsal margin. The upper exterior plate is lamellar and faintly carinate in the median line. The lower

exterior surface shows a broad band of long hairs. The upper interior surface is studded with long hairs. The inner median carina is provided with a row of distinct granules. The lower interior surface is submarginally furnished with a row of long hairs and with a small tubercle at the proximal two-fifths.

REMARKS.—Through the present study two female specimens from Aldabra are added to this species. The author (1975: 22) has mentioned before that this species is closely related to the species *hexaceras* (ORTMANN 1894), however it has turned out that this species differs from ORTMANN's one because in the present species no line of hairs on the outer surface of the palm of the 1st pereopod is present. Concerning the rostrum, the median furrow of the dorsal surface of the anterior thoracic region and the inner median carina of the dactylus of the 1st pereopod, the present species is rather related to *savignyi* and *tractabilis*.

6. *Upogebia (Upogebia) tractabilis* (HALE 1941)

Figs. 1e, 2c-e

1941 *Calliadne tractabilis* HALE, Brit. Antarc. res. Exped. (B)4(9): 276, Text-fig. 11.

TYPE-LOCALITY.—South Australia, St. Vincent Gulf, 15 m (8 fms) deep.

MATERIAL EXAMINED.—South Australia, St. Vincent Gulf, 15 m deep (10♂♂, SAMA C-888).—(3 ovig. ♀♀, 2♀♀, SAMA C-888, syntypes of HALE 1941).—(5♂♂, 2♀♀, SAMA C-887). Madagascar, Tuléar, 23°34.2'S, 43°37'E, 175 m deep (1 juv. ♀, MP Th).—, Southern part, 25°11.2'S, 47°14.7'E, 85-90 m deep (3♂♂, 2 ovig. ♀♀, 1♀ fragment, MP Th).—S.W. coast, St. Luce (1♂, 2 ovig. ♀♀, MP Th).

DIAGNOSIS.—A small-sized species. Rostrum broadly triangular, bearing 3-5 lateral denticles. Telson sub-square, convergent in posterior half on lateral margin, and convex on posterior margin. 1st pereopod chelate. Carpus with a small dorsal spine on inner distal margin. Palm unarmed on dorsal margin and with some hairs on outer surface. Dactylus slender, smooth on inner median carina.

DESCRIPTION.—The rostrum in males and females is broadly triangular with an obtuse tip, bearing 3-5 lateral denticles (Fig. 1e). The dorsal surface of the anterior thoracic region is scabrous and hairy, and bears a broad median furrow extending posteriorly to the anterior fourth of the gastric region, and further posteriorly a low median swelling. The lateral margin of the dorsomedian region runs posteriorly in a straight line. The lateral longitudinal groove of the carapace is conspicuous, showing a broadly-concave anterior gap. The lateral longitudinal ridge is provided with 10-14 denticles and scanty hairs, divergent posteriorly in a straight line. The anterolateral margin of the carapace is unarmed.



No linea thalassinica is present.

The telson is subsquare (Fig. 2e); the lateral margin is convergent in the posterior half, and the posterior margin is slightly convex as a whole. The dorsal surface forms a U-shaped carina; the median groove is definable posterior to the transverse part of the U-shaped carina. The endopod of the uropod is narrow and slightly longer than the telson. The exopod is slightly longer than the endopod, and bears a small spine at the base. The protopod bears a triangular proximal spine.

The eye-stalk is stout and armed with a small spine on its inner distal part, extending distally to the level of the end of the rostrum.

The antennular peduncle reaches the level of the distal margin of the penultimate segment of the antenna: the distal segment is rather long and more than twice as long as the penultimate one, and the inferior flagellum is longer than the superior one and about as long as the peduncle. The scaphocerite is present.

The 1st pereopod is chelate (Fig. 2c). The merus bears no subterminal spine on the dorsal margin, and 2-7 spines on the ventral inner margin. The carpus is provided with a small dorsal spine on the inner

distal margin, and with a small ventrodistal spine. The palm is convex and bears some hairs on the outer surface. The inner surface is provided in the upper half with three longitudinal hair-lines of scanty hairs. The fixed finger is smooth on the cutting edge. The dactylus is about half the length of the palm. The upper exterior plate is carinate. The lower exterior surface (Fig. 2d) forms a triangular depression in its proximal two-thirds. The upper interior surface bears two rows of hairs, the upper one of which is a broad band of scanty bristles and the lower one is linear. The inner median carina is smooth. The cutting edge bears 2-4 sharp denticles in the middle part.

The propodus of the 2nd pereopod is short and high; the dorsal margin is incurved distally and the lower one is almost straight. The dactylus is about two-thirds the length of the propodus.

REMARKS.—The present species is closely related to *cargadensis* from the east coast of Africa regarding the features of the dorsal surface of anterior thoracic region and the telson, however the difference between those two species are tabulated as below:

<i>tractabilis</i> HALE	<i>cargadensis</i> BORRADAILE
Rostrum with 3-5 lateral denticles.	Rostrum with 6-8 lateral denticles
Merus of 1st pereopod without a subterminal spines on dorsal margin, and with 2-7 spines on ventral inner margin.	Mentioned part usually with a single subterminal spine on dorsal margin, but sometimes with 2-4, and with up to 15 spines on ventral inner margin.
Carpus of 1st pereopod with a small ventrodistal spine.	Mentioned part with a sharp ventrodistal spine.
Palm of 1st pereopod without ornamented spines on dorsal margin.	Mentioned part with up to 15 spines on dorsal margin.
Fixed finger of 1st pereopod smooth on cutting edge.	Mentioned part minutely denticulate in proximal part on cutting edge.
Dactylus of 1st pereopod medially with 2-4 denticles on cutting edge, and smooth on inner median carina.	Mentioned part smooth on cutting edge, and granulate on inner median carina.
Propodus of 2nd pereopod high.	Mentioned part slender.

## 7. *Upogebia* (*Upogebia*) *darwini* (MIERS 1884)

Figs. 3a, 4a-c, Pls. A1-3, C3

- 1884 *Gebiopsis darwini* MIERS, In: Rep. zool. Coll. Indopac. Ocean Voy. Alert. London. : 281 (partim), pl. 32 fig. A.
- 1904 *Upogebia* (*Gebiopsis*) *octoceras* NOBILI, — Bull. Mus. Hist. nat. Paris. 5: 236.
- 1906 *Upogebia* (*Calliadne*) *hexaceras*, — NOBILI, Bull. sci. France Belg. 40: 60.
- 1906 *Upogebia hirtifrons*, — NOBILI, Bull. sci. France Belg. 40: 61, pl. 4 fig. 13.
- ?1906<sup>a</sup> *Upogebia hirtifrons*, — NOBILI, Ann. Sci. nat. Zool. Paris. 4: 97.
- 1906<sup>a</sup> *Upogebia* (*Calliadne*) *octoceras*, — NOBILI, Ann. Sci. nat. Zool. Paris. 4: 98.
- 1927 *Upogebia* (*Calliadne*) *octoceras*, — DE MAN, Capita

zool. 2(5): 13, pl. 2 fig. 6-6e.

- 1975 *Upogebia* (*Calliadne*) *bowerbankii*, — SAKAI, Veröff. zool. Staatssamml. München. 18: 13, fig. 3.
- 1977 *Upogebia darwini*, — Ho, Jour. Zool. London. 181: 439 (partim), figs. 1-3 (nec. fig. 4).
- Nec.
- 1906<sup>a</sup> *Upogebia* (*Calliadne*) *Darwini*, — NOBILI, Ann. Sci. nat. Zool. Paris. 4: 97 (= *U. barbata*).

TYPE LOCALITY.—Port Darwin, Australia, 22 m (12 fms) deep.

MATERIALS EXAMINED.—Zanzibar, Mazizini (1♂, 1 ovig. ♀, ZSM 1229/1, determined by SAKAI 1975 as *U. (Calliadne) bowerbankii*).—, Reit el Ras, Kibweni (1♂, ZSM 1229/3, determined by SAKAI 1975 as *U. (Calliadne) bowerbankii*). Kenya, Washin Is. (1♀, ZSM 1229/2, determined by SAKAI 1975 as *U. (Cal-*

*liadne bowerbankii*). Off northern Kenya, 2°44.4'S, 40°15.5'E (1♂, 1 ovig. ♀, SMF 7800). Red Sea (1♂, 5 ovig. ♀♀, 1♀, SMF 5070).—, (1♂, ZMH 8399). Aden, Obock & Perim (10♂♂, 4 ovig. ♀♀, 1♀, MP Th 24, syntypes of *U. (Gebiopsis) octoceras*).—, (2 ovig. ♀♀, 2♀♀, MP Th 25, syntypes of *U. (Gebiopsis) octoceras*).—, (1 ovig. ♀, MP Th 26, syntypes of *U. (Gebiopsis) octoceras*).—, (1♂, MP Th 27, syntype of *U. (Gebiopsis) octoceras*). Persian Gulf, West of Oman (1♂, 1♀, MP Th 12, determined by NOBILI 1906 as *U. (Calliadne) hexaceras*).—, Arzanah (1♂, 1♀, MP Th 13).—(1 cheliped, MP Th 14, determined by NOBILI 1906 as *U. (Calliadne) hexaceras*).—, Bancs d'Huitres perlières, 25°10'–24°55'N, 55°10'–54°40'E (2♀♀, MP Th 15, determined by NOBILI 1906 as *U. (Calliadne) hexaceras*).—(1 ovig. ♀, MP Th 16, determined by NOBILI 1906 as *U. hirtifrons*). West of Sumatra, 3°58'N, 90°47'E (2♂♂, 1 ovig. ♀, ZSM 91/1). Off Phuket Is., Thailand, about 40 m deep (1♂, 1♀, BM 1976. 14, determined by Ho 1977 as *U. darwini*). South China Sea (1♂, 1♀, MNB 3395). Philippine (1♂, USNM Albatross 5141).—(1♂, USNM Albatross 617A).—, Bohl (1♂, 1 ovig. ♀, MNB SEMPER's coll.). Bangka Strait, west of Java Sea (1♂, 1♀, MNB 3468). Java Sea, 6°8'S, 108°13'E (3♂♂, 4 ovig. ♀♀, ZSM 91/2). Thursday Is., Torres Strait (1♀, BM 1913.5.19.7). Port Darwin, Australia (1♂ lectotype, BM 82.7; 2♂♂ paralectotype, BM 82.7). Locality unknown (3♂♂, SMF 4933).—(1 ovig. ♀♀, SMF 7744).

DIAGNOSIS.—A middle-sized species. Rostrum semicircular on frontal margin usually bearing 6–8 denticles. Dorsal surface of anterior thoracic region scabrous and hirsute. Lateral longitudinal ridge of carapace with 12–19 denticles. Sixth abdominal somite usually denticulate on posterior margin. Telson rectangular, slightly convex on posterior margin.

1st pereopod chelate. Carpus with a small dorsal spine on inner distal margin. Palm medially provided on outer surface with a longitudinal hair-line in parallel to dorsal margin, and on inner surface with two rows of hairs, the upper one of which closely placed to dorsal margin. Fixed finger denticulate on cutting edge. Dactylus with a row of 5–15 granules on inner median carina.

DESCRIPTION.—The rostrum shows a broad or a narrow triangle with a semicircular frontal margin which bears 4–10 (usually 6–8) equidistant denticles (Fig. 3a, Pl A1–3). The dorsal surface of the anterior thoracic region is scabrous, hirsute, and slightly divergent posteriorly in a straight line on the lateral margin; the median furrow is definable. The lateral longitudinal ridge of the carapace is slightly divergent posteriorly in a straight line, and serrate by a row of 12–19 denticles to a whole extent, the anterior 4–5 ones of which are distinct, posteriorly decreasing in size. The lateral longitudinal groove is conspicuous. The linea thalassinica is definable in the anterior part of the posterior thoracic region.

The 6th abdominal segment is usually denticu-

late on the posterior margin.

The telson is rectangular in adult specimens; the lateral margin straightly runs posteriorly or somewhat converges posteriorly in its posterior three-fourths, and the posterior margin is slightly convex. The dorsal surface forms a distinct U-shaped carina with tubercles; the median groove passes through the transverse part of the U-shaped carina from the anterior to the posterior margin, or sometimes exists only in the depressed middle portion surrounded by the U-shaped carina.

The antennular peduncle shows the distal segment which is rather short, reaching the level of the margin of the penultimate segment of the antenna.

The 1st pereopod is chelate (Fig. 4b, Pl C3). The merus is unarmed on the dorsal margin, and usually bears denticles on the ventral inner margin; this denticulation is represented as a row of small equidistant granules, a row of 10–32 (usually about 20) closely-seriate spinules or extinct. The carpus bears an acute small dorsal spine on the inner distal margin, or unarmed, but sometimes with a few spinules or granules on the dorsal margin, and also bears a small ventrodiscal spine. The palm is convex on the outer surface which is medially provided with a longitudinal hair-line parallel to the dorsal margin, and usually with 1–4 granules or denticles on the distal margin. The inner surface is furnished with an elongated spine near the distal end of the dorsal margin, in the dorsal half with two longitudinal rows of hairs, the upper one of which is near the dorsal margin, and with 1–3 spinules on the distal margin. The ventral margin of the palm is armed with some granules in the proximal half, and distorted with 5–12 granules in the distal half. The fixed finger is strongly or weakly distorted, and denticulate to a whole extent on the cutting edge. The dactylus is proximally provided with some tubercles on the dorsal margin (Fig. 4a), and with a row of 5–15 granules on the inner median carina (Fig. 4c); the cutting edge is smooth, and submarginally provided with an inner proximal tooth.

The eggs are numerous and rather small in size, measuring about 0.5 mm in diameter.

REMARKS.—The present species *darwini* was established by MIERS (1884: 281) on seven specimens from Port Darwin, Australia, including "two or three ovigerous". An indefinite number of specimens from Singapore were only doubtly included, so that they do not belong to the type-series in accordance with Art 72 of the "international code". The present author examined one male and one female with large eggs from Singapore (BM 1882.24) and found that they indeed belong to *ancylodactyla* DE MAN and not to the present species. Concerning the syntypes from Port Darwin, recently Ho (1977: 439) reported that three male- and three female specimens are still preserved in the British Museum, though she does not mention any ovigerous females. The present author examined three male syntypes and

compared them with MIER's description, of which the most important points are 1. *The length of the largest specimens does not exceed 19 mm.* 2. *The wrists (=the carpus of the 1st pereopod) ... having a few minute spinules along their upper margins, ...* 3. *The palm (of the 1st pereopod) ... thinly clothed with hair, which is arranged in distant longitudinal lines* (shown also in his figure A of pl. 32). However these three male-syntypes do not fully agree with MIERS' description in that he describes "*the merus joints (of the 1st pereopod) unarmed*" and figures this feature in his fig. A of pl. 32. Actually in the three male-syntypes examined a denticulation is observable on the ventral margin of the merus as HENDERSON (1893: 432) and HO (1977: 444) have already mentioned regarding the syntype(s). Also the posterior margin of the 6th abdominal segment is said to be unarmed (MIERS 1884: 281), however the present author could discover a row of microscopic spinules on it.

*Upogebia octoceras* NOBILI from Aden, Obock and Perim in the Gulf of Aden seems to be only a synonym of the present species *darwini*. NOBILI (1906<sup>a</sup>: 97, 98) compared the two species *octoceras* and *darwini* with each other and mentioned that; "*Cette espèce (=the species octoceras) est voisine de U. Darwini, dont elle diffère par: 1. Le front pourvu de huit épines recourbées en arrière. 2. Par le mērus des chélipèdes dépourvu de spinules. 3. Par le sixième segment abdominal finement mais distinctement denticulé au long de tout son bord postérieur.*"

However, NOBILI's *darwini* specimens were identified by the present author after examination to be *barbata* STRAHL (for more details under *barbata* p. 35). After it is now known that contrary to MIERS's original description, the syntype of *darwini* bear microscopic spinules on the posterior margin of the 6th abdominal segment as *octoceras* does, a new comparison of both species becomes necessary.

The present author examined the syntypes of *octoceras* and found that there is variation in the number of the distal rostral spines as shown in the following table. Two female syntypes with five distal spines (MP Th 24) and with six distal spines (MP Th 25) of the rostrum have to be excluded from consideration, as they have turned out to belong to *barbata* STRAHL:

Number of spines on frontal margin of rostrum	10	9	8	7	6	5
♂	2	—	4	3	1	—
ovig. ♀	—	2	1	—	3	—
♀	—	—	2	—	1	— (individual number)

(range of body length: 24(♂♂)–46(ovig ♀♀) mm)

In examining more specimens from other localities than the Gulf of Aden, the present author observed that the number of the distal rostral spines are variable in the following way:—Two males (22 & 35 mm long) with eight distal spines and one

ovigerous female (44 mm long) with six from the station 3°58'N, 90°47'E (ZSM 91/1); one male (20 mm long) with seven and one ovigerous female (29 mm long) with eight from Bohol, Philippine (MNB SEMPER's coll.) and one male (38 mm long) and one ovigerous female (35 mm long) with eight from Zanzibar (ZSM 1229/1).

The syntypes of *darwini* from Port Darwin are characterized by four distal rostral spines, so that it seems unlikely at first sight that this species is identical with *octoceras*. In fact, the present author was able to find supplementary specimens with four distal rostral spines from localities other than Port Darwin, however, there is material with four distal rostral spines found together with specimens with more than four distal rostral spines in the same locality:—One male (33 mm long) and one female (37 mm long) from Bangka Straight, Sumatra (MNB 3468); one male (36 mm long) and one female (31 mm long) from South China Sea (MNB 3395); one male (19 mm long) from Philippine (USNM Albatross 5141) and one male (45 mm long) and two ovigerous females (38 & 46 mm long) from Java Sea (ZSM 91/2), all of which have four distal rostral spines, while the specimens from Java Sea (ZSM 91/2) including one male (44 mm long) and one ovigerous female (49 mm long) with five distal rostral spines, one ovigerous female (the abdomen torn off) with eight and one male (46 mm long) with three, though this number results from the undeveloped right posterior spine.

As a result, it is reasonable to say that the number of the distal rostral spine is subject to considerable variations and may not be used for the separation of the two species.

So far as the spinulation on the inner ventral margin of the merus of the 1st pereopod is concerned, it is possible to say that this character is also not constant. The present author got this evidence from the examination of NOBILI's types of *octoceras* and found that most specimens are seemingly unarmed in this body part as the spinules are obscure or microscopic, however some specimens have a clear row of spinules or denticles and one female among them shows a row of distinct acute spinules. In the supplementary specimens from other localities than the Gulf of Aden, the spinulation is observable as follow:—One male from the Philippines (USNM Albatross 5141) and one male from Bohol, Philippines (MNB SEMPER's coll.) with some distinct spines, while the other ovigerous females from Bohol has only a row of minute interspaced granules; three males from Java Sea (ZSM 91/2), one male and one female from South China Sea (MNB 3395), two males and one ovigerous female from the station 3°58'N, 90°47'E (ZSM 91/1) with a row of distinct spines or denticles, while four ovigerous females from Java Sea (ZSM 91/2), one male and one female from Bangka Straight (MNB 3468) have only a row of minute interspaced granules.

As a result it is concluded that the denticulation

or spinulation on the ventral inner margin of the merus of the 1st pereopod is also subject to variation. Therefore both species are to be considered now as synonyms.

To fix the status of both *darwinii* and *octoceras* the following specimens of the type series are now selected as lectotypes:

1. For *U. darwini* MIERS:

Lectotype.—1♂, 20 mm in total length, BM 82.7, from Port Darwin, Australia.

2. For *U. octoceras* NOBILI

Lectotype.—1♂, MP Th 24, from Aden, Obock & Perim.

By this action *U. octoceras* gets a junior subjective synonym of *U. darwini*.

NOBILI (1906: 60-61) mentioned two species *hexaceras* ORTMANN and *hirtifrons* (WHITE) from the Persian Gulf, however, it is most likely that those two records also belong to the present species *darwinii*. The present author examined a series of the specimens identified by NOBILI as *hexaceras* and *hirtifrons*. In NOBILI's specimens recorded as *hexaceras* the longitudinal row of hairs on the outer surface of the palm of the 1st pereopod is clearly parallel to the dorsal and the ventral margin of the same limb, the rostrum is broadly rounded on the frontal margin and bears six distal spines; the dorsal surface of the anterior thoracic region is scabrous; the posterior margin of the 6th abdominal segment is minutely denticulate, though the eggs in the ovigerous female are rather small, measuring about 0.3 mm. NOBILI (1906: 61) mentioned that

"Les mâles ont le rostre comme dans la figure de ORTMANN, c'est-à-dire proportionnellement long...", however the present author could not confirm this point in NOBILI's specimens.

Concerning the ovigerous female recorded as *hirtifrons* by NOBILI from un banc d'Huitres perlières, 25.10'-24°55'N, 55°10'-54°40'E, the present author could not find any specific difference from NOBILI's *hexaceras* except on the left cheliped. NOBILI (1906: 62) mentioned that "*Les pattes de la première paire sont grêles et élancées.*" In fact, the left cheliped is rather long, as NOBILI mentioned. However it is possible to estimate that this left pair might simply be regenerated after autotomy, because the other right cheliped, detached from the body, and still preserved in the same tube is not at all different from the chelipeds of NOBILI's *hexaceras*, though, it is uncertain whether this detached cheliped on the right side belongs to the body of NOBILI's *hirtifrons*.

The present species *darwinii* is very closely related to *hexaceras* ORTMANN and *bowerbanki* MIERS, in that the outer surface of the palm of the 1st pereopod bears a longitudinal row of hairs in the median line, which is parallel to the dorsal margin; the lateral longitudinal ridge of the carapace is entire, slightly divergent posteriorly and denticulate, and the posterior margin of the 6th abdominal segment is usually denticulated. However, the three species *darwinii*, *hexaceras* and *bowerbanki* are clearly different from one another as summarized in the following table.

<i>darwinii</i> MIERS	<i>hexaceras</i> ORTMANN	<i>bowerbanki</i> MIERS
Rostrum with 4-10 frontal denticles.	Rostrum with six frontal denticles.	Rostrum with 8-14 frontal denticles.
Dorsal surface of anterior thoracic region scabrous and hairy as a whole, and with a narrow median furrow.	Mentioned part scabrous and hairy except in middle portion, and with a broad median furrow.	Mentioned part scabrous and hairy as a whole, and with a narrow median furrow.
Lateral longitudinal ridge of carapace with 12-19 denticles.	Mentioned part with 22 denticles.	Mentioned part with 13-23 denticles.
Lateral longitudinal ridge of carapace with 12-19 denticles.	Mentioned part with 22 denticles.	Mentioned part with 13-23 denticles.
Telson slightly depressed in middle portion.	Telson slightly depressed in middle portion.	Telson remarkably depressed in middle portion
Palm of 1st pereopod with two longitudinal rows of hairs on upper interior surface, the upper one of which closely located to dorsal margin.	Mentioned upper row of hairs closely located to dorsal margin.	Mentioned upper row of hairs distant from dorsal margin.
Dactylus of 1st pereopod with a row of 5-15 granules on inner median carina.	Mentioned part with a row of interspaced granules.	Mentioned part with a row of prominent teeth.
Eggs numerous and rather small, measuring 0.5 mm in diameter.	Eggs a few and large, 0.9 mm in diameter.	Eggs a few, and large 0.9 mm in diameter.

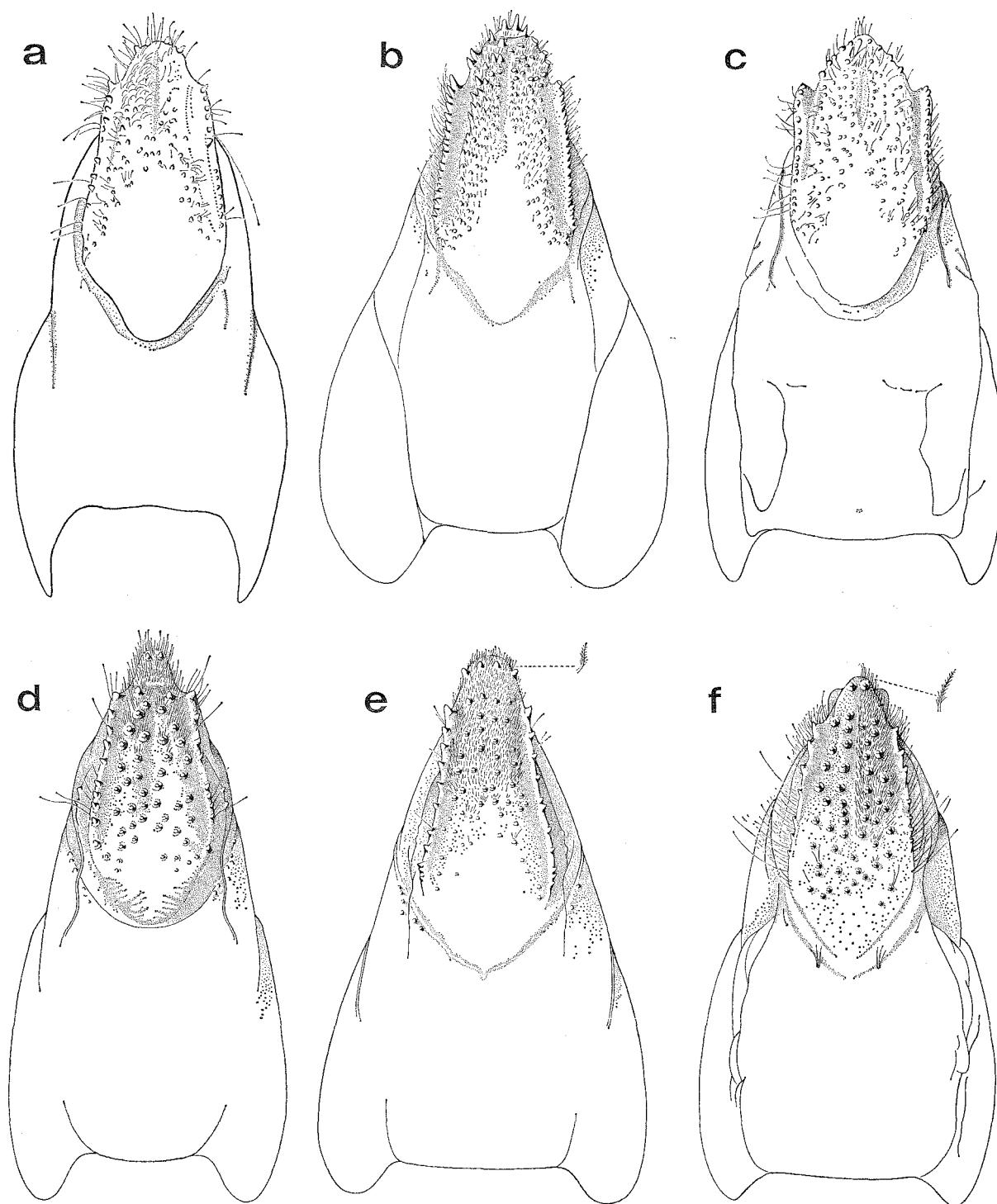


Fig. 3. a. *Upogebia* (*Upogebia*) *darwini*, ♂, lectotype, BM 82.7, carapace. b. *Upogebia* (*Upogebia*) *bowerbanki*, ♂, holotype, BM 1861.97, carapace. c. same, ♀, syntype of *U. australiensis*, AMS 262, carapace. d. *Upogebia* (*Upogebia*) *amboinensis*, ♂, lectotype, ZMG 1370, carapace. e. *Upogebia* (*Upogebia*) *ancylodactyla*, ♂, syntype, ZMA Siboga Coll. 33, carapace. f. *Upogebia* (*Upogebia*) *fijiensis* sp. nov., ♀, holotype, ZSM 597, carapace.

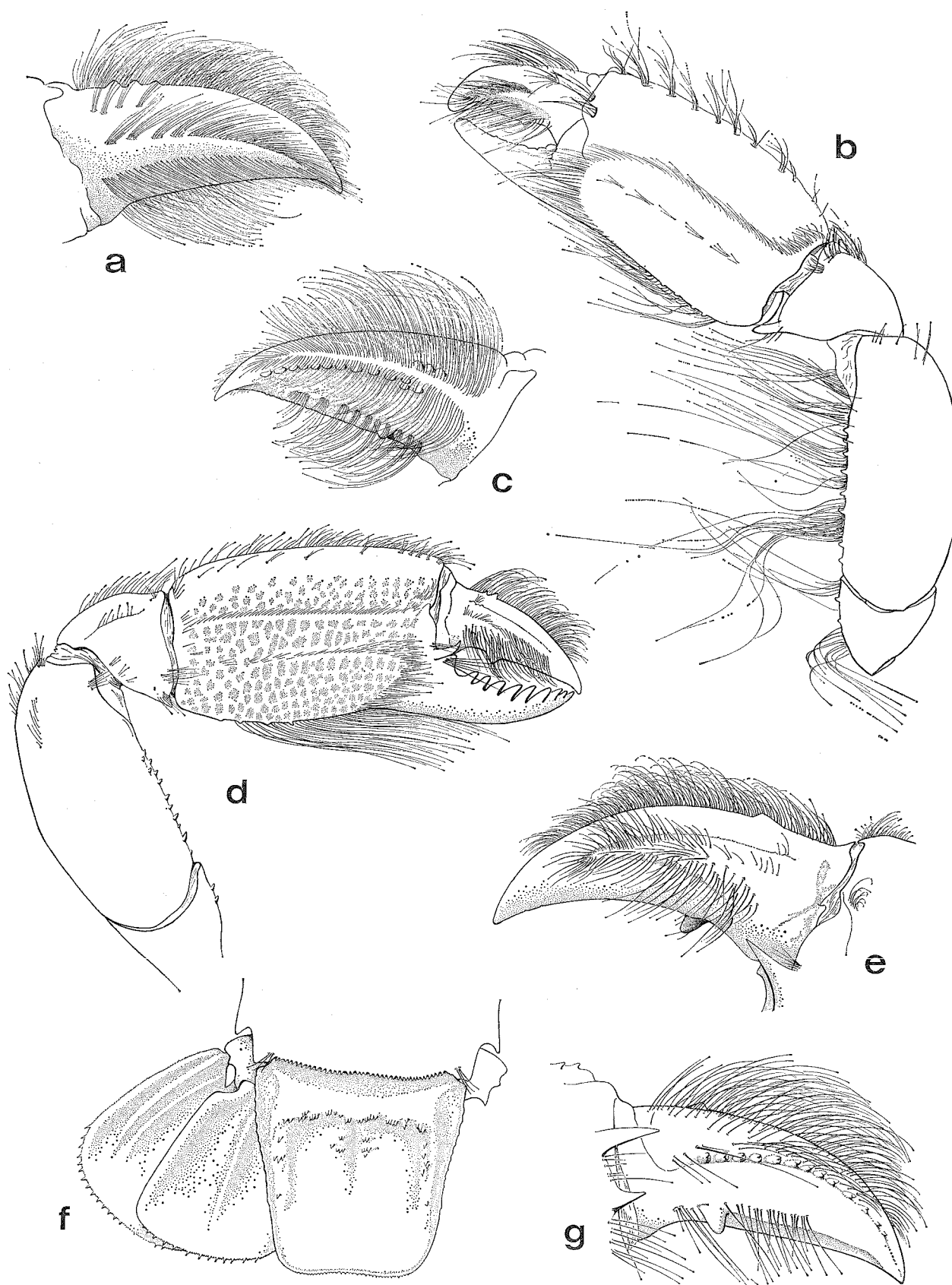


Fig. 4. *Upogebia* (*Upogebia*) *darwini*, ♂, lectotype, BM 82.7, dactylus, outer view. b. same, 1st pereopod, outer view. c. same, dactylus, inner view. d. *Upogebia* (*Upogebia*) *bowerbanki*, ♂, holotype, BM 1861.97, 1st pereopod, outer view. e. same, dactylus, outer view. f. same, tail-fan. g. same, dactylus, inner view.

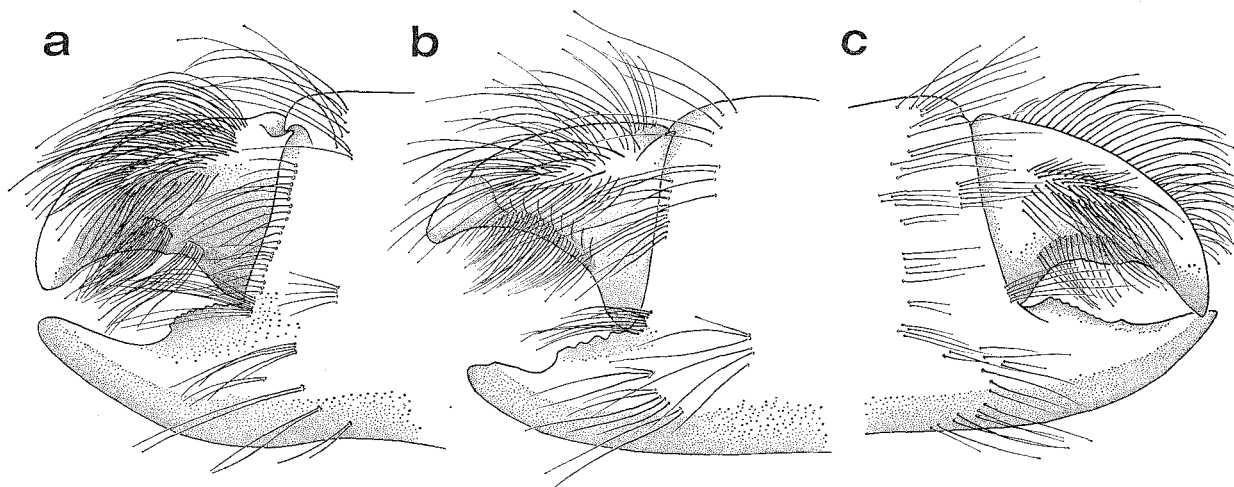


Fig. 5. a. *Upogebia* (*Upogebia*) *amboinensis*, ♂, lectotype, ZMG 1370, chela, inner view. b. *Upogebia* (*Upogebia*) *fijiensis* sp. nov., ovig. ♀, holotype, ZSM 597, chela, inner view. c. *Upogebia* (*Upogebia*) *ancylodactyla*, ♂, syntype, SMA Siboga Coll. 33, chela, inner view.

8. *Upogebia* (*Upogebia*) *hexaceras* (ORTMANN 1894)

Pls. A4, C4

1894 *Gebia* (*Gebiopsis*) *hexaceras* ORTMANN, Denkschr. med.-nat. Ges. Jena. 8: 23, pl. 3 fig. 1.

1928 *Upogebia* (*Calliadne*) *hexaceras*, — DE MAN, Siboga-Expeditie. 39a(6): 81, pl. 8 fig. 11-11f.

Nec.:

1906 *Upogebia* (*Calliadne*) *hexaceras*, — NOBILI, Bull. Sci. France Belg. 40: 60 (= *U. darwini* (MIERS)).

TYPE LOCALITY.—Thursday Island, Torres Strait.

MATERIAL EXAMINED.—South of Salawatti Island, 1°42.5'S, 130°47.5'E, 32 m deep (1 ovig. ♀, ZMA Siboga coll 31). Mermaid Strait, Dampier Archipelago, N. W. Australia (1 ovig. ♀, MNB 4838 Gazelle coll).

DIAGNOSIS.—A middle-sized species. Rostrum semicircular on frontal margin bearing six denticles. Dorsal surface of anterior thoracic region scabrous and hairy except in middle portion. Sixth abdominal somite minutely denticulate on posterior margin. Telson slightly depressed in middle portion.

1st pereopod chelate. Carpus with a small dorsal spine on inner distal margin. Palm medially on outer surface with a longitudinal row of hairs, and on upper inner surface with two rows of hairs, the upper one located close to dorsal margin. Fixed finger denticulate on cutting edge. Dactylus with a series of denticles on inner median carina.

DESCRIPTION.—The rostrum is nearly semicircular on the frontal margin which bears six equidistant denticles (Pl. A4). The dorsal surface of the anterior thoracic region is scabrous and hairy except in the middle portion; the median furrow is broad and shallow, extending posteriorly to the anterior fourth of the dorsomedian region, and further posteriorly a triangular swelling with a few small granules is present. The lateral longitudinal ridge the of carapace is distinctly carinate to a whole extent, slightly

divergent posteriorly and provided with 15-22 denticles (15-16 in a small ovigerous female, 20 mm long from Salawatti Is.; 21-22 in a large ovigerous female, 47 mm long from Mermaid Strait), of which the anterior 7-8 ones are more distinct than the posterior. The lateral longitudinal groove is distinct to a whole extent. The linea thalassinica is present in the anterior part of the posterior thoracic region.

The sixth abdominal segment is provided with a row of fine spinules on the posterior margin.

The telson is variable in shape:—In the female from Mermaid Strait it is evidently broader than long, while in the female from Salawatti Is. slightly broader than long. The lateral margin is convergent backward in the posterior three-fourths, and the posterior margin is slightly convex, though being slightly concave at the middle part. The dorsal surface is slightly depressed in the middle portion delimited by a U-shaped carina bearing spinules; the median groove is deeply concave posterior to the transverse part of the U-shaped carina.

The antennular peduncle reaches the level of the distal margin of the penultimate segment of the antenna. The thinner inferior flagellum of the antennule is slightly longer than the thicker superior one.

The 1st pereopod is chelate (Pl. C4). The merus is unarmed on the dorsal margin, and provided with 16-22 denticles on the ventral inner margin. The carpus bears a small acute dorsal spine on the inner distal margin, a few interspaced denticles on the dorsal margin, and also some denticles in the upper half on the outer distal margin; the ventrodistal spine is small. The palm is convex on the outer surface, bearing a longitudinal row of hairs parallel to the dorsal margin, and 2-3 denticles in the lower half on the distal margin. The dorsal surface is devoid of a subterminal spine. The inner surface is provided with two denticles on the distal margin, and in the upper half with two longitudinal rows of hairs, of which the upper one is thickly brushed

and located close to the dorsal margin; the interspaced part between those two hair-lines is also hairy and scattered with granules. The ventral margin is armed in the proximal half with a row of 4-11 granules, and in the distal half with 5-6 granules, continuing to the ventral margin of the fixed finger. The fixed finger is distinctly distorted, provided with a row of small denticles on the cutting edge. The dactylus is furnished in the proximal part with 1-3 granules on the upper exterior plate, and with a series of denticles on the inner median carina.

The eggs are numerous and large in size, measuring 0.9 mm in diameter.

REMARKS.—The type specimen of the present species *hexaceras* ORTMANN was not accessible to the present author, and its original description is too indistinctive to separate the present species from the closely related species *darwini*.

So far as the form of the rostrum is concerned, ORTMANN (1894: 23) mentioned that "*Unterscheidet sich durch die Bildung der Stirn von sämtlichen übrigen Arten.*", however, the present author has observed the same form of the rostrum in juvenile specimens of *darwini*, so that it may be considered that the character mentioned by ORTMANN is not specific but rather variable.

NOBILI (1906: 60) reported the present species from the Persian Gulf, however, the present author checked his specimens and identified them as *darwini*, because in NOBILI's specimens the dorsal surface of the anterior thoracic region is not smooth medially but tuberculous as a whole. As a result the distribution of the present species is restricted to the region from Salawatti Is. to Mermaid Strait, Dampier Archipelago.

#### 9. *Upogebia* (*Upogebia*) *bowerbankii* (MIERS 1884)

Figs. 3b-c, 4d-g

- 1882 *Gebia hirtifrons*, — HASWELL, Cat. austr. Stalk- and Sessile-eyed Crust. Sydney. : 164 (non *Gebia hirtifrons* WHITE 1847).  
 1884 *Gebiopsis bowerbankii* MIERS, In: Rep. zool. Coll. Indopac. Oce. Voy. Alert, London. : 282.  
 1927 *Upogebia* (*Calliadne*) *bowerbankii*, — DE MAN, Capita zool. 2(5): 9, pl. 1 fig. 4-4f.  
 1927 *Upogebia* (*Calliadne*) *octoceras* var. *australiensis* DE MAN, Capita zool. 2(5): 14, pl. 2 fig. 7-7c.  
 1927 *Upogebia bowerbankii*, — HALE, Crust. South Australia. 1: 85.  
 1941 *Calliadne australiensis*, — HALE, B.A.N.Z. Antarct. Res. Exp. (B)4(9): 273, text-fig. 9.  
 1941 *Calliadne bowerbankii*, — HALE, B.A.N.Z. Antarct. Res. Exp. (B)4(9): 274, text-fig. 10.  
 Nec.  
 1975 *Upogebia* (*Calliadne*) *bowerbankii*, — SAKAI, Veröff. zool. Staatssamml. München, 18: 13 (= *U. darwini* (MIERS, 1884)).

TYPE-LOCALITY.—Fremantle. W. Australia.

MATERIAL EXAMINED.—Cottesloe, Perth, W. Australia (18♂♂, 13 ovig. ♀♀, 9♀♀, WAM 10680-10719). Fremantle, W. Australia (1♂ holotype, BM 1861.97). Sydney, Australia (1♂, 2 ovig. ♀♀, MP HASWELL's coll.). Port Jackson, Australia (1♂, 1 ovig. ♀, 1♀, AMS 262, syntypes of *Gebia hirtifrons*, HASWELL 1882, and also syntypes of *U. (Calliadne)* var. *australiensis* DE MAN 1927).

DIAGNOSIS.—A middle-sized species. Rostrum semi-circular on frontal margin usually bearing 4-7 denticles. Dorsal surface of anterior thoracic region distinctly scabrous and hirsute. Lateral longitudinal ridge of carapace with 13-23 denticles. Sixth abdominal somite minutely denticulate on posterior margin. Telson remarkably depressed in middle portion.

1st pereopod chelate. Carpus with a small acute dorsal spine on inner distal margin. Palm medially provided on outer surface with a longitudinal row of hairs in parallel to the dorsal margin, and on upper interior surface with two rows of hairs, the upper one distant from dorsal margin. Fixed finger evidently denticulate on cutting edge. Dactylus with a prominent series of teeth on inner median carina.

DESCRIPTION.—The rostrum in larger specimens shows a broad triangle with an obtuse tip, bearing 4-7 denticles on the lateral margin (Figs. 3b-c). The dorsal surface of the anterior thoracic region is studded with denticles, provided with a narrow median furrow in the anterior fourth of the gastric region and further posteriorly with a median swelling with granules. The lateral longitudinal ridge of the carapace extends backward in a straight line, bearing a row of 13-23 denticles. The lateral longitudinal groove is remarkable. The linea thalassinica is shortly defined in the posterior thoracic region.

In the small specimens the rostrum shows an elongate triangle with a rounded frontal margin. The denticles on the dorsal surface of the anterior thoracic region are more acute and numerous than in the larger specimens. The linea thalassinica is undefinable.

The sixth abdominal segment is minutely denticulate on the posterior margin.

The telson in larger specimens is subsquare, while in young specimens oblong; the lateral margin is convergent backward, and the posterior one rounded (Fig. 4f). The dorsal surface is marked with a U-shaped carina with small acute spinules; the middle portion is distinctly depressed, and the median groove is present from the proximal to the posterior margin across the transverse part of the U-shaped carina.

The antennular peduncle slightly overreaches the level of the distal margin of the penultimate segment of the antenna. The inferior flagellum of the antennule is up to 1.5 times as long as the superior one.

The 1st pereopod is chelate (Fig. 4d). The merus is unarmed on the dorsal margin, though in



the male holotype it bears a rudimentary subterminal spine. The ventral inner margin is unarmed or armed with some granules or denticles,—in the male holotype six interspaced granules on the left side and 9–10 acute denticles on the right one. The carpus bears a small acute dorsal spine on the inner distal margin. The dorsal margin is provided with a carina bearing a row of small serrate denticles, and the outer distal margin is denticulate in the dorsal half: the ventrodiscal spine is small. The palm in larger or moderate-sized specimens is implanted on the outer surface with a median longitudinal hair-line parallel to the dorsal margin, which in small specimens, however, is faint or almost extinct, and with a single acute spine on the distal margin. The dorsal margin bears an elongate subterminal spine and also a row of hairs in the distal-half. The inner surface in the upper half bears two rows of hairs, the upper one of which is clearly distant from the dorsal margin, and 1–4 acute spines in the upper half of the distal margin. The ventral margin in the proximal half bears a row of granules, and in the distal half distinctly denticulate. The fixed finger is slightly distorted, distinctly provided with large denticles on the cutting edge. The dactylus proximally bears a single tubercle on the dorsal margin of the upper exterior plate (Fig. 4e), and a prominent series of teeth on the inner median carina (Fig. 4g).

The eggs are a few and large in size, measuring 0.9 mm in diameter.

Living within sponges.

REMARKS.—The present species *bowerbanki* was established by MIERS (1884: 282) for a single male specimen, 37 mm long (BM 1861.97) from Fremantle, W. Australia. The present author compared the mentioned holotype to the three syntypes of *octoceras* var. *australiensis* DE MAN from Sydney, a male 35 mm long, one ovigerous female 29 mm and one female 53 mm (AMS 262), and found that the species *bowerbanki* is clearly distinguished from *octoceras* var. *australiensis* in two points, that in *bowerbanki* the linea thalassinica is extinct posterior to the cervical groove, and that the telson is oblong, the lateral margin straightly convergent backward, while in *octoceras* var. *australiensis* the linea thalassinica extends shortly but distinctly posterior to the cervical groove, and the form of the telson is subsquare.

On the other hand, the present author examined a series of 40 specimens from Cotteslow, Perth, W. Australia (WAM 10680–10719) and found that four larger (37, 44, 46 & 47 mm long) among 18 males, one larger (48 mm long) among 13 ovigerous females and one larger (45 mm long) among nine non-ovigerous females show the same character as in *octoceras* var. *australiensis* in regard to the linea thalassinica and the form of the telson, though in one ovigerous female (50 mm long) exceptionally the telson is distinctly broader than long, the lateral margin running backward in a straight line as in *darwini* and *barbata*, on the contrary the other

smaller or young specimens measuring less than 37 mm long show the characteristic features of *bowerbanki*. It is, however, very difficult to separate the larger specimens from the smaller or young ones regarding other characters.

The specimens from Sydney (AMS 262) are different from those from Perth, because there are no distinctions between the larger female (53 mm long) and the smaller ovigerous female (29 mm long) in regard to the linea thalassinica and the form of the telson.

As a result it may be concluded that the specimens from W. Australia show little difference between the larger and the smaller ones, however, the specimens from Sydney all show the same characters as the larger specimens from W. Australia. As no fundamental difference exists between the specimens from W. Australia and Sydney, *octoceras* var. *australiensis* might only be a synonym of *bowerbanki*.

Concerning the shape of the rostrum in *bowerbanki*, MIERS (1884: 282) mentioned that “A male from Fremantle, S.W. Australia, differs (from the species *darwini*) in the form of the rostrum, which is anteriorly deflexed.” and later DE MAN (1927: 15) proved MIERS’ description by his figures (Pl. 1, fig. 4a) as “The upper surface of the rostrum is anteriorly deflexed, appearing curved in a lateral view; below the lateral denticulated margins the rostrum is excavate for the eyes....” However the present author examined the holotype and found that the direction of the rostrum is not natural but artificially caused after the anterior part of the rostrum was broken between the 2nd and 3rd marginal spines, so that it gets sure that the distinctive character pointed by MIERS and DE MAN is incorrect.

#### 10. *Upogebia* (*Upogebia*) *amboinensis* (DE MAN 1888)

Figs. 3d, 5a

1888<sup>a</sup> *Gebiopsis intermedia* var. *amboinensis* DE MAN, Arch. Naturgesch. 53: 462.

1928 *Upogebia* (*Calliadne*) *ancylodactyla* var. *amboinensis*, — DE MAN, Siboga-Expeditie. 39<sub>a</sub>(6): 89.

TYPE-LOCALITY.—Amboina.

MATERIAL EXAMINED.—Amboina (1♂ lectotype; 1♀, 1 ovig. ♀ paralectotypes, ZMG 1370, syntypes of *Gebiopsis intermedia* var. *amboinensis* DE MAN 1888).

DIAGNOSIS.—Rostrum armed with two subterminal denticles. Dorsal surface of anterior thoracic region anteriorly with two denticles at the level of frontal tooth of lateral longitudinal ridge of carapace. Linea thalassinica shortly extending to posterior thoracic region. Sixth abdominal somite smooth on posterior margin. Telson subsquare, lateral margin convergent backward.

Distal segment of antennule short, reaching the level of distal part of penultimate segment of an-

tenna.

1st pereopod chelate. Carpus with a stout dorsal spine on inner distal margin. Palm medially with an oblique hair-line on outer surface. Dactylus with an obscure interior median carina.

DESCRIPTION.—The rostrum shows a narrow triangle with an obtuse tip, bearing two subterminal denticles (Fig. 3d). The dorsal surface of the anterior thoracic region is hirsute and irregularly arranged with four rows of denticles, the two anteriormost ones of which being distinct, and lying at the level of the frontal tooth of the lateral longitudinal ridge of carapace; the median furrow is narrow, extending backward to the anterior third of the gastric region. The lateral longitudinal ridge in the anterior half forms a broad carina with a row of 4-6 denticles, and in the posterior half is concave, slightly divergent posteriorly, and bears a row of 4-9 denticles. The anterolateral margin of the carapace is unarmed. The lateral surface of the anterior thoracic region bears some tubercles. The posterior thoracic region is dorsolaterally provided with tubercles along the cervical groove. The linea thalassinica shortly extends posteriorly in the posterior thoracic region.

The telson is subsquare; the lateral margin is convergent backward in the posterior two-thirds. The U-shaped carina is distinctly raised and furnished with granules as a whole, the lateral longitudinal part of which is broadened, inclined backward. The middle portion surrounded by the U-shaped carina bears an anterior transverse elevation which is medially interrupted by a median groove.

The epistome is pointed at the tip.

The distal segment of the antennule is short, reaching the level of the distal part of the penultimate segment of the antenna.

The 1st pereopod is chelate. The merus is unarmed on both the dorsal and the ventral inner margin. The carpus bears a stout, rather elongate dorsal spine on the inner distal margin; the ventro-distal spine is obtuse. The palm is convex on the outer surface, bearing an oblique row of hairs extending distally to about the middle part of the distal margin. The inner surface is subterminally implanted with a hair-row along the distal margin, which is shortly interrupted in its lower part (Fig. 5a). The fixed finger is distorted; the ventral margin is convex. The cutting edge in the proximal half

is convex and minutely denticulate, and in the distal half is smooth; the tip is incurved. The dactylus is about one-third the length of the whole chela and high in the proximal part. The dorsal margin is strongly declined to a whole extent. The upper interior surface is arranged with hairs along both the upper margin and midline, both of which are distally merged in one. The cutting edge is broadly concave in the middle part. The inner median carina is obscurely developed.

REMARKS.—DE MAN (1888<sup>a</sup>) compared seven specimens of the present species with one of four type specimens of *intermedia* (= *barbata*) and separated the former species from the latter by giving it the rank of a variety. As he mentioned that "...*erscheint die mittlere Schwanzflosse, d. h. das letzte Abdominal-segment, ein wenig länger im Verhältniss zur Breite und also weniger verbreitert als bei dem Original-exemplare (der Art intermedia)...*", the present species is characterized by the form of the telson, which is apparently not broader than long. As far as the form of the chela of the species *amboinensis* is concerned, DE MAN further mentioned that "...*erscheinen die Finger etwas kürzer im Verhältniss zur Grösse des Handgliedes und der bewegliche Finger ist stärker gebogen.*", however, it is sure that those distinctions are not always sufficient for separating the two species, *amboinensis* and *barbata*, because the present author found considerable variations in the form of the chela of *barbata*. Later DE MAN (1928: 89) treated *amboinensis* as a variety of *ancylodactyla* rather than of *intermedia* without giving any fundamental reasons.

The present species is closely related to *ancylodactyla* DE MAN, *barbata* (STRAHL), *fijiensis*, *kueken-thali*, and *holthuisi* nov. spp. in that the outer surface of the palm of the 1st pereopod bears an oblique longitudinal row of hairs, and the lateral longitudinal ridge of the carapace is declined backward in the anterior part and separated by a gap from its posterior part.

In general, the species of the present group are characterized by the fingers of the 1st pereopod being rather short and their tips strongly incurved. The five closely-related species of this group may be, however, distinguished by the characters shown in the following table.

<i>amboinensis</i> DE MAN	<i>ancylodactyla</i> DE MAN	<i>fijiensis</i> sp. nov.
Rostrum with 2 subterminal denticles.	Rostrum with 4 subterminal denticles.	Rostrum with 4 subterminal denticles.
Dorsal surface of anterior thoracic region with 2 anteriormost denticles at level of frontal tooth of lateral longitudinal ridge of carapace.	Mentioned area with 4 anteriormost denticles at more anterior than level of frontal tooth of lateral longitudinal ridge.	Mentioned area with 4 anteriormost denticles at level of frontal tooth of lateral longitudinal ridge.
Linea thalassinica shortly extending to posterior thoracic region.	Mentioned part shortly extending to posterior thoracic region.	Mentioned part distinct, extending to posterior margin of carapace.
Telson subsquare.	Telson subsquare.	Telson subsquare.
Distal segment of antennule short,	Mentioned segment long, reaching	Mentioned segment long, reaching

reaching the level of distal part of penultimate segment of antenna.	the level of proximal part of distal segment of antenna.	the level of 1/2 of distal segment of antenna.
Inner surface of palm of 1st pereopod subterminally with a row of hairs along distal margin, which is interrupted in its lower part.	Mentioned part subterminally with a long upper and a short lower hair-row along distal margin.	Mentioned part subterminal with a long upper and a short lower hair-row along distal margin.
Inner median carina of dactylus of 1st pereopod obscure.	Mentioned part obscure.	Mentioned part with a row of obscure transverse ridges.
Eggs numerous, 0.6 mm in diameter (after DE MAN, 1928: 90).	Eggs a few, 0.9 mm.	Eggs numerous, 0.6 mm.

<i>kuekenthali</i> sp. nov.	<i>holthuisi</i> sp. nov.	<i>barbata</i> (STRAHL)
Rostrum with 2 subterminal denticles.	Rostrum with 2 subterminal and 2 proximal denticles.	Rostrum with 4-5 subterminal denticles.
Dorsal surface of anterior thoracic region with 2 anteriormost denticles at slightly anterior level of frontal tooth of lateral longitudinal ridge.	Mentioned area with 2 anteriormost denticles about at level of frontal tooth of lateral longitudinal ridge.	Mentioned area with 2 anteriormost denticles at level of frontal tooth of lateral longitudinal ridge.
Linea thalassinica distinct, extending to posterior margin of carapace.	Mentioned part distinct, extending to posterior margin of carapace.	Mentioned part shortly extending to posterior thoracic region.
Telson subsquare.	Telson subsquare.	Telson broader than long.
Distal segment of antennule short, reaching level of end of penultimate segment of antenna.	Mentioned segment long, reaching level of 1/2 of distal segment of antenna.	Mentioned segment long, reaching level of 1/2 distal segment of antenna.
Inner surface of palm of 1st pereopod subterminally with a single hair-row along distal margin.	Mentioned part subterminally with a long upper and a short lower hair-row along distal margin.	Mentioned part subterminally with a upper and a lower hair-row along distal margin.
Inner median carina of dactylus of 1st pereopod obscure.	Mentioned part smooth.	Mentioned part distinct.
Unknown.	Eggs rather numerous, 0.4-0.5 mm.	Eggs numerous, 0.6 mm.

11. *Upogebia* (*Upogebia*) *ancylodactyla* DE MAN 1905

Figs. 3e, 5c

- 1905 *Upogebia* (*Gebiopsis*) *ancylodactyla* DE MAN, Tijdschr. ned. dierk. Ver. (2)9: 599.  
 1928 *Upogebia* (*Calliadne*) *ancylodactyla*, — DE MAN, Siboga-Expeditie. 39a(6): 87 (partim), pl. 9 fig. 13, pl. 10 figs. 13i-j (nec. specimen from St. 323).  
 1977 *Upogebia darwini*, — HO, J. zool. London. 181: 439 (partim), figs 4f-i.

TYPE-LOCALITY.—Haingsisi, Samau-Island near Timor (Siboga St. 60).

MATERIAL EXAMINED.—Timor, Samau Island, Haingsisi, Siboga St. 60 (1♂, 1♀, ZMA Siboga coll. 33, syntypes of *Upogebia* (*Gebiopsis*) *ancylodactyla* DE MAN 1905). Singapore (1♂, 1 ovig. ♀, BM 1884.24, paralectotypes of *Gebiopsis darwini* MIERS), (1♂, MNB 12714 MARTENS coll.). Luzon, Philippine (1♂, MNB 1131, paralectotype of *Gebia barbata* STRAHL).

DIAGNOSIS.—Rostrum furnished with four subterminal denticles. Dorsal surface of anterior thoracic region transversely with four denticles lying more anteriorly than lateral frontal process of carapace. Linea thalassinica shortly extending to posterior thoracic region. Sixth abdominal somite smooth on posterior margin. Telson subsquare, convergent

backward on lateral margin.

Distal segment of antennule long, reaching the level of proximal part of distal segment of antenna.

1st pereopod chelate. Carpus with a short stout dorsal spine on inner distal margin. Palm medially with an oblique hair-line on outer surface. Dactylus with an obscure interior median carina.

DESCRIPTION.—A small-sized species. The rostrum shows a narrow triangle with an obtuse tip, bearing four subterminal denticles (Fig. 3e). The dorsal surface of the anterior thoracic region is hirsute and tuberculous; in the female syntype these denticles are arranged in four longitudinal rows, however, in the other specimens examined including the male syntype, irregularly arranged in two to three longitudinal rows, four anteriormost denticles of which are located more anterior than at the level of the frontal process of the lateral longitudinal ridge of the carapace. The lateral longitudinal ridge in the anterior two-fifths is inclined posteriorly, provided with 4-5 denticles, and in the posterior three-fifths bears a row of 6-8 denticles. The anterolateral margin of the carapace is unarmed. The posterior thoracic region is unarmed, however in the syntypes and a female from Singapore (BM 1883.24) dorsolaterally bears minute tubercles along the cervical groove. The linea thalassinica shortly ex-

tends backwards in the posterior thoracic region.

The telson is subsquare, and in the female syntype deformed on the posterior margin. It is typically slightly broader than long; the lateral margin is convergent posteriorly in the posterior two-thirds, and the posterior margin is broadly convex. The U-shaped carina is distinct, the transverse part of which is narrow and granulate, and the lateral longitudinal one is broadened, anteriorly bearing three transverse rows of granules. The middle portion surrounded by the U-shaped carina is broadly depressed and marked with an anterior transverse elevation which is smooth in the male syntype, and granulate in the other specimens examined.

The epistome is truncate at the tip.

The distal segment of the antennule is long, overreaching the level of the distal margin of the penultimate segment of the antenna.

The 1st pereopod is chelate. The merus is unarmed on the dorsal margin, but armed with 6-10 acute interspaced spinules on the ventral inner margin. The carpus bears a short stout dorsal spine on the inner distal margin; the ventrodistal spine is sharp. The palm on the outer surface bears an oblique hair-line extending distally to about the middle part of the distal margin. The inner surface subterminally bears a long upper and a short lower hair-row along the distal margin (Fig. 5c). The fixed finger is distorted; the cutting edge is proximally swelling in a triangular form, the distal edge of which is distally inclined to the midway, bearing minute denticles, while that in the distal half is smooth, incurved at the tip. The dactylus is slightly shorter than one-third the whole length of the chela, high in the proximal part, and strongly deflected at the tip. The cutting edge is broadly concave in the middle part. The inner median carina is obscure.

REMARKS.—The present author examined the two syntypes, a male and a female, and found that this female lacks eggs. DE MAN (1905 & 1928) mentioned that this female bears eggs measuring 0.9 mm in diameter, so that it seems probable that the eggs were lost. The eggs were proved to be few in number and large by the female from Singapore (BM 1882.24).

The present species has a linea thalassinica shortly extending backward to the posterior thoracic region as in *amboinensis* DE MAN, however, it is readily distinguished from the latter, by the fact that the rostrum bears four subterminal denticles; the dorsal surface of the anterior thoracic region bears four anteriormost denticles at the level of the frontal tooth of the lateral longitudinal ridge of the carapace; and the cutting edge of the fixed finger of the 1st pereopod is proximally swelling, while in *amboinensis* the rostrum bears two subterminal denticles; the dorsal surface of the anterior thoracic region is provided with two anteriormost denticles; and the cutting edge of the fixed finger is convex in the proximal half, bearing minute denticles.

The male specimens from Bawean-Island (ZMA Siboga St. 323) was also examined, however this specimen identified by DE MAN (1928: 89) as *ancylo-dactyla* is different from the present species. TIRMIZI will describe this specimen as a new species and will treat it in detail (TIRMIZI in litt.).

## 12. *Upogebia* (*Upogebia*) *fijiensis* sp. nov.

Figs. 3f, 5b.

1975 *Upogebia* (*Calliadne*) *amboinensis*, — SAKAI, Veröff. zool. Staatssamml. München. 18: 9, fig 2 (non *amboinensis* DE MAN 1888).

TYPE-LOCALITY.—Fiji-Islands, Vitti Levu, Sigatoga, 44 m deep.

MATERIAL EXAMINED.—Fiji-Islands, Viti Levu, Sigatoga, 44 mm deep (1 ovig. ♀ holotype, 1 ♂, 1 ♀ paratypes, ZSM 597).

DIAGNOSIS.—Rostrum with two subterminal denticles. Dorsal surface of anterior thoracic region provided with four anteriormost denticles at level of frontal tooth of lateral longitudinal ridge of carapace. Linea thalassinica extending posteriorly to posterior margin of carapace. Sixth abdominal somite smooth on posterior margin. Telson slightly broader than long, lateral margin slightly convergent backward in posterior half.

Distal segment of antennule long, reaching level of 1/2 of distal segment of antenna.

1st pereopod chelate. Carpus with a short stout dorsal spine on inner distal margin. Palm medially with an oblique hair-line on outer surface. Dactylus with a row of obscure transverse ridges on inner median carina.

DESCRIPTION.—The rostrum forms a triangle with an obtuse tip, hirsute and bearing two subterminal denticles (Fig. 3f). The dorsal surface of the anterior thoracic region is also hirsute and arranged with four longitudinal rows of denticles, four anteriormost ones lying at the level of the frontal tooth of the lateral longitudinal ridge of the carapace; the median furrow is definable, extending backward to the midway of the gastric region. The lateral longitudinal ridge is inclined posteriorly, provided with 9-11 denticles decreasing backward in size. The lateral longitudinal groove is remarkable. The anterolateral margin of the carapace is unarmed. The posterior thoracic region is laterally furnished with a few obscure tubercles along the cervical groove. The linea thalassinica extends posteriorly to the posterior margin of the carapace.

The sixth abdominal segment is smooth on the posterior margin.

The telson is subsquare, slightly broader than long; the lateral margin is slightly convergent backward in the posterior half, and the posterior margin is broadly convex. The U-shaped carina is tuberculous. The middle portion surrounded by the

U-shaped carina bears an anterior transverse elevation which is tuberculous, deflected backward at each lateral side, and interrupted midway by a median groove.

The epistome is rounded at the tip.

The distal segment of the antennule is long, reaching the level of the middle part of the distal segment of the antenna.

The 1st pereopod is almost chelate. The merus is unarmed on the dorsal margin, and bears 4-5 (in the female holotype and another small females) or 10 (in the male paratype) small acute spines on the ventral inner margin. The carpus bears a short stout dorsal spine on the inner distal margin; the ventrodistal spine is obtuse. The palm on the outer surface bears an oblique hair-line extending distally about to the middle of the distal margin. The inner surface subterminally bears a long upper and a short lower hair-row along the distal margin (Fig. 5b). The fixed finger is slightly distorted. The cutting edge in the proximal half is convex and provided with four obtuse denticles, and that in the distal half is smooth and concave, and deflected distally at the tip. The dactylus is short, about one-fourth the length of the whole chela, thick and high in the proximal part, and strongly incurved at the tip. The inner median carina is marked with a row of obscure transverse ridges.

REMARKS.—The present species from Fiji Islands was identified by the present author (1975: 9) as *amboinensis*, and a renewed examination of those specimens proved that this form belongs to a new species.

The present species named after the type locality Fiji Islands is closely related to the species *kuekenthali* and *holthuisi* spp. nov. in that the linea thalassinica extends backward to the posterior margin of the carapace. However, it is really distinguished from the latter species in that in the present species the dorsal surface of the anterior thoracic region is provided with four anteriormost denticles at the level of the frontal tooth of the lateral longitudinal ridge of the carapace, and the interior median carina of the dactylus of the 1st pereopod bears a row of obscure transverse ridges, while in the latter species the dorsal surface of the anterior thoracic region is armed with two anteriormost denticles and the interior median carina of the dactylus of the 1st pereopod is unarmed.

Disposition of types is designated as follows:

Holotype.—1 ovig. ♀, 30 mm long from Sigatoga, Viti Levu, Fiji Islands.

Paratypes.—1 ♂, 23 mm long and 1 ♀, 14 mm long from the same locality.

Disposition. — Zoologische Staatssammlung München under Cat. Nr. 597.

### 13. *Upogebia* (*Upogebia*) *kuekenthali* sp. nov.

Figs. 6a, 7a-c.

1902 *Gebiopsis intermedia* var. *amboinensis*, — DE MAN, Abh. Senckenb. naturf. Ges. 25: 759 (non *Gebiopsis intermedia* var. *amboinensis* DE MAN 1888<sup>a</sup>).

TYPE-LOCALITY.—Ternate Island.

MATERIAL EXAMINED.—Ternate (1 ♂ holotype, SMF 4943).

DIAGNOSIS.—Rostrum with two subterminal denticles. Dorsal surface of anterior thoracic region with two anteriormost denticles slightly more anterior than at the level of the frontal tooth of the lateral longitudinal ridge of the carapace. Linea thalassinica extends backward to the posterior margin of the carapace. Sixth abdominal somite smooth on posterior margin. Telson subsquare, lateral margin straightly convergent backward in posterior two-thirds.

Distal segment of antennule short, reaching the level of end of penultimate segment of antenna.

1st pereopod chelate. Carpus with a short stout dorsal spine on inner distal margin. Palm medially with an oblique hair-line on outer surface. Dactylus with an inconspicuous interior median carina.

DESCRIPTION.—The rostrum shows a narrow triangle with an obtuse tip, the dorsal surface of which is hirsute and bears two obtuse subterminal denticles (Fig. 7a). The dorsomedian region in the anterior third is attenuate in breadth, hirsute and provided with five denticles on each lateral margin, two anteriormost denticles are stout and situated slightly more anteriorly than at the level of the frontal tooth of the lateral longitudinal ridge; the median furrow is definable, armed with three denticles on each side, while the region in the posterior two-thirds is sparsely hairy, bearing some denticles distributed down to near the cervical groove, and posterior to the median furrow shows a median carina with some denticles. The lateral longitudinal ridge in the anterior two-fifths is inclined backward, provided with four distinct conical denticles, the anterior one of which is most prominent, defined as the frontal tooth. The lateral longitudinal ridge in the posterior fifth is provided with 7-8 small conical denticles. The anterolateral margin of the carapace is unarmed. The posterior thoracic region dorso-laterally bears some obscure tubercles along the cervical groove. The linea thalassinica extends downward and then backward along the upper border of the branchial region to the posterior margin of the carapace.

The sixth abdominal segment is smooth on the posterior margin.

The telson is subsquare; the lateral margin is straightly convergent backward in the posterior two-thirds, and the posterior margin is slightly convex. The U-shaped carina is distinctly raised and provided with denticles, the transverse part is higher than the lateral longitudinal one.

The epistome is obtuse at the tip.

The distal segment of the antennule is short,

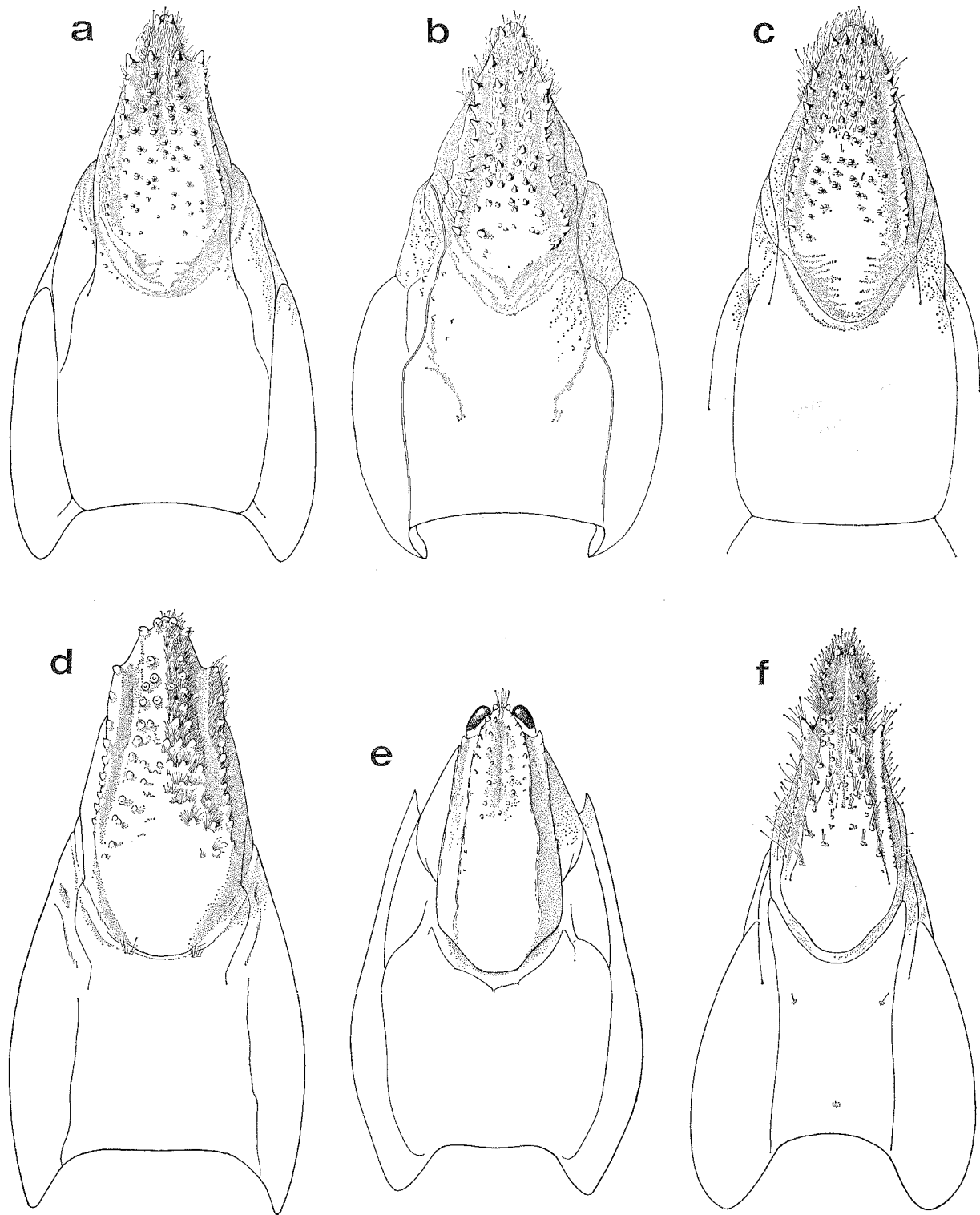


Fig. 6. a. *Upogebia* (*Upogebia*) *kuekenthali* sp. nov., ♂, holotype, SMF 4943, carapace. b. *Upogebia* (*Upogebia*) *holthuisi* sp. nov., ovig. ♀, paratype, USMM 95571, carapace. c. *Upogebia* (*Upogebia*) *barbata*, ♀, lectotype, MNB 1131, carapace. d. *Upogebia* (*Upogebia*) *carinicauda*, MP Th, carapace, dorsal view. e. *Upogebia* (*Upogebia*) *pseudochelata*, ♀, ZSM 93/1, carapace. f. *Upogebia* (*Upogebia*) *osiridis*, ♂, MP Th 29, carapace.

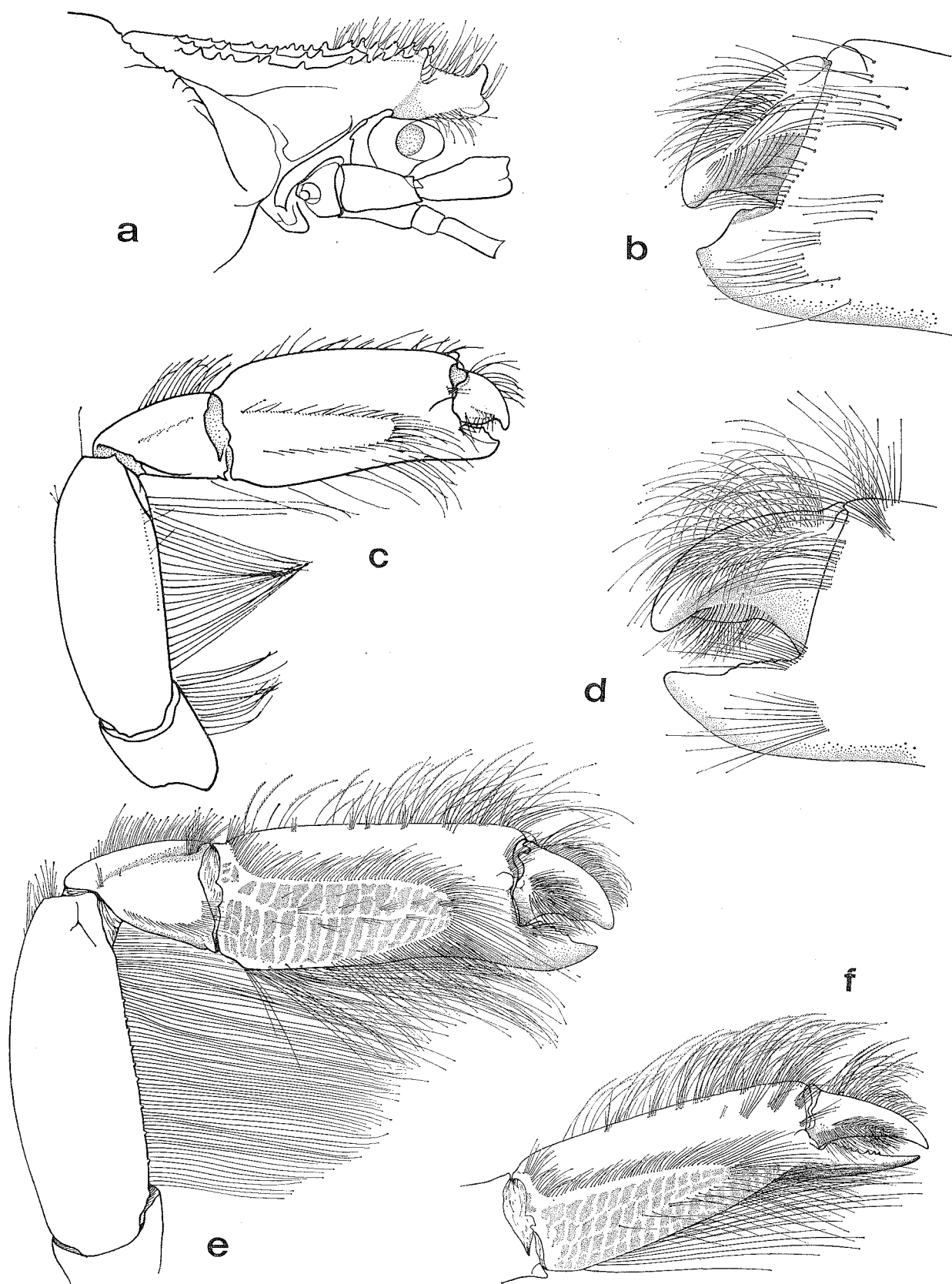


Fig. 7. *Upogebia* (*Upogebia*) *kuekenthali* sp. nov., ♂, holotype, SMF 4943, anterior part of carapace, lateral view. b. same, chela, inner view. c. same, 1st pereopod, outer view. d. *Upogebia* (*Upogebia*) *holthuisi* sp. nov., ♂, paratype, USNM 95571, chela, inner view. e. same, 1st pereopod, outer view. f. same species, ♀, paratype, USNM 95571, chela, outer view.

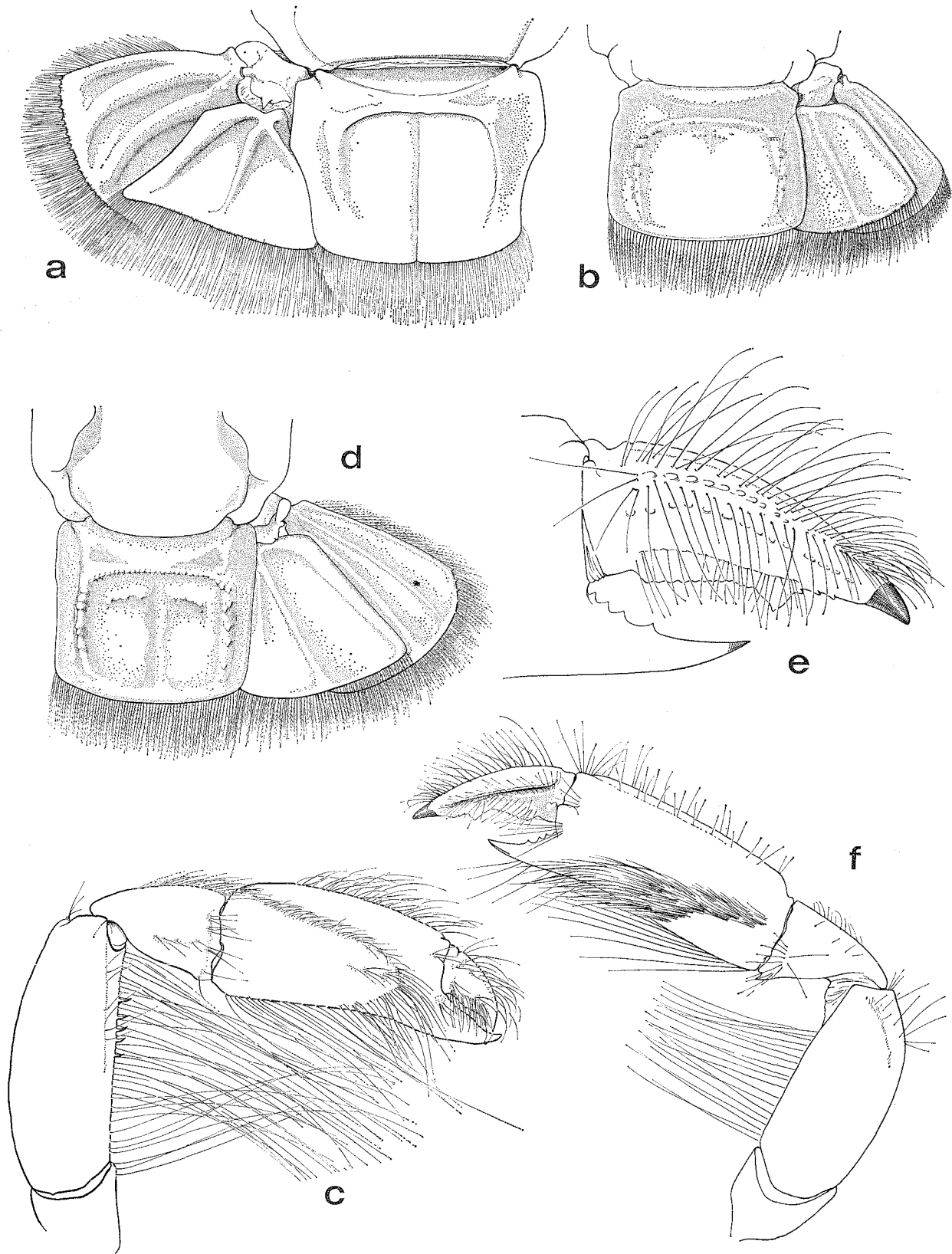


Fig. 8. a. *Upogebia (Upogebia) carinicauda*, ovig. ♀, MP Th 3, tail-fan. b. *Upogebia (Upogebia) barbata*, ♀, lectotype, MNB 1131, tail-fan. c. same, 1st pereopod, outer view. d. *Upogebia (Upogebia) holthuisi* sp. nov., ♂, holotype, USNM 95571, tail-fan. e. *Upogebia (Upogebia) pseudochelata*, ♀, RML STORCK Coll. 11, chela, inner view. f. same, 1st pereopod, outer view.



reaching the level of the distal margin of the penultimate segment of the antenna.

The 1st pereopod is chelate (Fig. 7c). The merus is unarmed on the dorsal and the ventral inner margin. The carpus is armed with a short stout dorsal spine on the inner distal margin; the ventrodistal spine is small. The palm in the male holotype from Ternate is rather stout. The outer surface bears an oblique row of hairs. The inner surface subterminally bears a single hair-row along the distal margin. The fixed finger is short, distorted, and obtuse at the tip. The cutting edge in the proximal part is convex, while in the distal part is noticeably deflected downward at the tip. The dactylus is short, about one-fourth the length of the whole chela, the tip is conical and strongly incurved. The inner median carina is inconspicuously defined.

REMARKS.—The present author compared the original male specimen of the present species from Ternate described by DE MAN (1902, nec. 1888<sup>a</sup>) under the name of *Gebiopsis intermedia* var. *amboinensis* with the three type specimens (DE MAN 1888<sup>a</sup>) and found that the former single male specimen is different from the latter ones in that the linea thalassinica is present throughout the whole posterior thoracic region, while in the latter ones it shortly extends to the anterior part of the posterior thoracic region. The specimen from Ternate is, therefore, treated now as a new species and for it the name *kueken-thali* is proposed in memory of the collector KÜKEN-THAL.

Otherwise, there are only a few minor differences between these two species. In the present species the inner surface of the palm of the 1st pereopod subterminally bears an uninterrupted hair-line along the distal margin, and the cutting edge of the dactylus of the 1st pereopod is scarcely denticulate, while in *amboinensis* the inner surface of the palm subterminally bears an interrupted hair-row, and the cutting edge of the dactylus is minutely denticulate on the proximal convexity.

Disposition of type is designated as follows:

Holotype.—1♂, 21 mm long from Ternate.

Disposition.—Senckenbergisches Museum in Frankfurt am Main under Cat. Nr. 4943.

#### 14. *Upogebia* (*Upogebia*) *holthuisi* sp. nov.

Figs. 6b, 7d-f, 8d.

1953 *Upogebia amboinensis*, — HOLTHUIS, Atoll Res. Bull. Washington. 24: 51 (non *amboinensis* DE MAN 1888)

TYPE-LOCALITY.—Onotoa, Gilbert Islands, about 4 m deep.

MATERIAL EXAMINED.—Onotoa, Gilbert Island, 4 m deep (1♂ holotype, 2♂♂, 2 ovig. ♀♀, 1♀, paratypes, USNM 95571).

DIAGNOSIS.—Rostrum with two subterminal and two

proximal denticles. Dorsal surface of anterior thoracic region irregularly arranged with two rows of denticles, two anteriormost ones about at level of frontal tooth of lateral longitudinal ridge of carapace. Linea thalassinica extends backward to the posterior margin of the carapace. Sixth abdominal somite smooth on posterior margin. Telson subsquare, lateral margin convergent backward in posterior two-thirds.

Distal segment of antennule long, reaching the level of 1/2 of distal segment of antenna.

1st pereopod chelate. Carpus with a short stout dorsal spine on inner distal margin. Palm in males stout, while in females slender, medially bearing an oblique hair-line on outer surface. Dactylus with a smooth interior median carina.

DESCRIPTION.—The rostrum shows a narrow triangle, the dorsal surface is inclined forward, hirsute, and bears two subterminal and two proximal denticles (Fig. 6b). The dorsal surface of the anterior thoracic region is anteriorly narrow, irregularly arranged with two rows of pointed, rather distinct denticles, two anteriormost ones lying about at the level of the frontal tooth of the lateral longitudinal ridge of the carapace; the median furrow is broad. The lateral longitudinal ridge in the anterior two-fifths is inclined posteriorly, provided with four denticles, three anterior ones of which are large and slightly decreasing posteriorly in size, and that in the posterior three-fifths bears a row of 7-8 small sharp denticles. The anterolateral margin of the carapace is unarmed. The posterior thoracic region dorso-laterally bears tubercles along the cervical groove. The linea thalassinica straightly extends backward to the anterior part of the posterior thoracic region.

The sixth abdominal segment is smooth on the posterior margin.

The telson is subsquare (Fig. 8d); the lateral margin is convergent backward in the posterior two-thirds, and the posterior margin is slightly convex. The U-shaped carina is distinctly raised, provided with denticles.

The epistome is obtuse at the tip.

The distal segment of the antennule is rather long, reaching the level of the middle of the distal segment of the antenna.

The 1st pereopod is chelate (Figs. 7d-f). The merus is unarmed on the dorsal margin, and bears a row of 10-13 inconspicuous, equal-sized spinules on the ventral inner margin. The carpus bears a short stout dorsal spine on the inner distal margin; the ventrodistal spine is small. The palm in males is stout (Fig. 7e), in females narrow (Fig. 7f). The outer surface is medially provided with an oblique hair-row. The inner surface subterminally bears a long upper and a short lower hair-row along the distal margin (Fig. 7d). The fixed finger is distorted. In males it is stout in shape, and obtuse at the tip, the cutting edge in the proximal half is convex and provided with minute denticles, and in the distal half is smoothly concave. In females the fixed finger is rather slender, and pointed at the

tip, the cutting edge in the proximal two-thirds is provided with a row of some acute spinules. The dactylus is short and about one-fourth the length of the whole chela. In male it is stout in the proximal part, and deflected at the tip. In females it is slender and pointed at the tip, the cutting edge is smooth and largely concave. The inner median carina is smooth.

The eggs are small and not so many in number, measuring 0.4–0.5 mm in diameter.

REMARKS.—The present species is closely related to the species *kuekenethali* and *fijiensis* spp. nov. in that the linea thalassinica is present throughout the whole length of the posterior thoracic region. In the present species the distal segment of the antennule is rather long, reaching the level of the middle of the distal segment of the antenna, and the inner surface of the palm of the 1st pereopod subterminally bears an interrupted hair line along the distal margin as in *fijiensis* sp. nov., however, in *kuekenethali* the distal segment of the antennule is short as in *amboinensis* DE MAN and the inner surface of the palm subterminally bears an uninterrupted hair-line.

Besides, the present species differs from *fijiensis*, in that the dorsomedian region of the carapace is narrow in the anterior half and then broadened backward in the posterior half, distributing many pointed spinules. The rostrum bears a pair of subterminal teeth and posteriorly another pair of proximal teeth. This arrangement of those teeth hints the species *kuekenethali* sp. nov. and *amboinensis* DE MAN.

Disposition of types is designated as follows:

Holotype.—1 ♂, 27 mm long from Onotoa, Gilbert Island, 4 m deep.

Paratypes.—2 ♂♂, 2 ovig. ♀♀, 1 ♀, 20–27 mm long, from the same locality.

Disposition.—National Museum of Natural History in Washington, under Cat. Nr. 95571.

#### 15. *Upogebia* (*Upogebia*) *barbata* (STRAHL 1862)

Figs. 6c, 8b-c.

1862 *Gebia barbata* STRAHL, Mb. Akad. Wiss. Berlin. 1861: 1062 (partim), figs. 7–9.

1888 *Gebiopsis intermedia* DE MAN, Jour. linn. Soc. Zool. 22: 256 (partim) (nec. pl. 16 figs. 6–8 = *U. carinicauda*).

1906<sup>a</sup> *Upogebia* (*Calliadne*) *Darwini*, — NOBILI, Ann. Sci. nat. Zool. 4: 97.

1928 *Upogebia* (*Calliadne*) *Darwinii*, — DE MAN, Siboga-Expeditie. 39a (6): 84, pl. 8 figs. 12–12b, pl. 9 figs. 12c-f.

TYPE-LOCALITY.—Albay, Luson, Phillippine.

MATERIAL EXAMINED.—Somalia (1 ♂, ZMH 8423). Red Sea (2 ♂♂, 2 ovig. ♀♀, SMF 4944). Aden, Obock & Perim (16 ♂♂, 24 ovig. ♀♀, MP Th 6, determined by NOBILI 1906<sup>a</sup> as *U. (Calliadne) Darwini*).—(1 ♀, MP Th 434, 1 ovig. ♀, MP Th 24, 1 ♀, MP Th 25, determined by NOBILI 1904: 236 as *U. (Calliadne)*

*octoceras*). Perim (2 ♂♂, 2 ovig. ♀♀, MP Th 7, determined by NOBILI 1906<sup>a</sup> as *U. (Calliadne) Darwini*). Djibouti (2 ovig. ♀♀, MNB 15554). Ceylon (1 ♂, 1 ♀, ZMH 8499). Elphinstone Island, Mergui Archipelago (1 ♂, ZMA 102 550, paralectotype of *Gebiopsis intermedia* DE MAN 1888). Malaysia (1 ♂, 1 ovig. ♀, MP Th 436). Philippine, Luson, Albay (1 ♂ paralectotype, 1 ♀ lectotype, MNB 1131).—, Luson, Bohol (1 ovig. ♀, 1 ♀, MNB SEMPER coll).

DIAGNOSIS.—Rostrum with 4–5 subterminal denticles. Dorsal surface of anterior thoracic region interspersed with denticles, two anteriormost denticles of which located at level of frontal tooth of lateral longitudinal ridge of carapace. Linea thalassinica shortly extending posteriorly to posterior thoracic region. Sixth abdominal somite smooth on posterior margin. Telson rectangular, lateral margin slightly divergent backward.

Distal segment of antennule long, reaching level of 1/2 of distal segment of antenna.

1st pereopod chelate. Carpus with a small dorsal spine on inner distal margin. Palm medially with an oblique hair-row on outer surface. Dactylus with a distinct interior median carina.

DESCRIPTION OF LECTOTYPE.—The rostrum shows a triangle with an obtuse tip, the dorsal surface is deflected anteriorly, bearing four subterminal and two proximal denticles (Fig. 6c). The dorsal surface of the anterior thoracic region is hirsute and interspersed with denticles, two anteriormost denticles of which are located about at the level of the lateral longitudinal ridge of the carapace; the median furrow is indistinct. The lateral longitudinal ridge in the anterior half is inclined and divergent backward, provided with 4–5 denticles, and that in the posterior half is interrupted from the anterior part by a small gap, armed with six denticles. The lateral longitudinal groove is narrow, indistinct in the posterior half. The linea thalassinica shortly extends backward in the anterior part of the posterior thoracic region.

The sixth abdominal somite is unarmed on the posterior margin.

The telson is broader than long (Fig. 8b), the posterior margin is slightly convex. The U-shaped carina is remarkably raised and granulate.

The 1st pereopod is chelate (Fig. 8c). The merus is devoid of a subterminal spine on the dorsal margin, and bears five interspaced spines on the ventral margin. The carpus bears a single dorsal spine on the inner distal margin. The palm is medially provided with an oblique hair-row. The ventral margin is convex, distorted distally, and then continued to that of the fixed finger. The fixed finger is unarmed on the cutting edge. The dactylus is strongly incurved distally. The upper exterior plate is slightly sulcate. The lower exterior surface is hairy. The interior median carina is distinct.

REMARKS.—The present species *barbata* STRAHL has been treated as a synonym of *carinicauda* STIMPSON by DE MAN (1928: 60) so that the name *barbata* STRAHL has not been used ever since. The present author has examined the type-series of *barbata* consisting of seven specimens (MNB 1131) and found that those specimens belong to three different species, namely, one male and one female are distinct, while another male belongs to *ancylodactyla* DE MAN, and four ovigerous females to *carinicauda* STIMPSON.

STRAHL's description is based on his heterogenus type-material. His figure, however, most probably refers to the male specimen with the truncate form of the rostrum, caused by artificial damage. There are, however, some differences regarding the dentation of the lateral longitudinal ridge of the carapace between the figure and the mentioned male specimen. This difference may be due to an observation error. One female shows the same major characters as that male specimen.

As parts of the apparently figured male specimen are torn, it seems undesirable to select it as lectotype, in spite of the fact that it was figured. Therefore the following specimen is now selected as lectotype of STRAHL's species.

Lectotype.—1♀, 23 mm long from Albay, Luson, Philippine.

Disposition.—Museum für Naturkunde an der Humboldt-Universität zu Berlin under Cat. Nr. 1131a.

The two type specimens belonging to STRAHL's species proper from Albay, Luson, are rather small in comparison with the material from the Indian region and the Gulf of Aden, however, there are no fundamental differences among them. The present author also examined an ovigerous female 29 mm long from the nearby locality, Bohol, Luson in SEMPER's collection (MNB).

DE MAN's species *intermedia* belongs partly to this species, partly to *carinicauda*. More details about this confusing problem may be found in the latter species.

NOBILI (1906<sup>a</sup>) reported the species *darwini* from the Gulf of Aden. The present author reexamined NOBILI's specimens and confirmed that they are probably identical to *barbata*. However, there are a few differences between the specimens from the Gulf of Aden and those from the Indian region or the Philippine area. Because in the former ones the rostrum bears 4-5 subterminal denticles and the interior median carina of the dactylus of the 1st pereopod is smooth, while in the latter ones the rostrum bears four subterminal denticles and the interior median carina of the dactylus is provided with some denticles (in the specimens from the Indian region). However, the remaining fundamental characters are not at all different in all specimens examined. So NOBILI's specimens may be tentatively identified to the present species.

16. *Upogebia* (*Upogebia*) *carinicauda*  
(STIMPSON 1860)

Figs. 6d, 8d, Pls. A5, C5-6.

b

- 1860 *Gebia carinicauda* STIMPSON, Proc. Acad. nat. Sci. Philad. 1860: 23.
- 1862 *Gebia barbata* STRAHL, Mb. Akad. Wiss. Berlin. 1861: 1062 (partim).
- 1884 *Gebia carinicauda*, — MIERS, In: Rep. zool. Coll. Indopac. Oce. Voy. "Alert": 280.
- 1880 *Gebia carinicauda*, — DE MAN, Jour. linn. Soc. London. 22: 256.
- 1888 *Gebia intermedia* DE MAN, Jour. linn. Soc. London. 22: 256 (partim), pl. 16 figs. 6-8.
- 1891 *Gebia barbata*, — ORTMANN, Zool. Jb. Syst. 6: 54, pl. 1 fig. 8.
- 1893 *Gebiopsis Darwinii*, — HENDERSON, Trans. linn. Soc. London. Zool. 5: 432 (partim).
- 1894 *Gebia barbata*, ORTMANN, Denkschr. med.-nat. Ges. Jena. 8: 22.
- 1926 *Upogebia* (*Upogebia*) *carinicauda* (STIMPSON) var. *gracilipes* DE MAN, Mitt. zool. Mus. Berlin. 12: 343.
- 1928 *Upogebia* (*Upogebia*) *carinicauda*, — DE MAN, Siboga-Expeditie. 39a(6): 60, pl. 3 figs. 6-6c, pl. 4 figs. 6d-h.
- 1972 *Upogebia* (*Upogebia*) *kempi* SANKOLLI, Jour. Bombay nat. Hist. Soc. 68(3): 671, text-figs. 9-10.
- 1977 *Upogebia darwini*, — Ho, Jour. Zool. London. 181: 439 (partim), text-fig. 4.

TYPE-LOCALITY.—Hong Kong.

MATERIAL EXAMINED.—Nossi Bé (3♂♂, 6♀♀, MP Th 542).—(13♂♂, 11♀♀, MP Th 532).—(3♂♂, 1 ovig. ♀, 3♀♀, MP Th 526).—(30♂♂, 39 ovig. ♀♀, 48♀♀, MP Th 536).—(2♂♂, 4♀♀, MP Th 535).—(2♀♀, MP Th 528).—(2 juv., 1 broken juv., MP Th 530).—(7♂♂, 4 ovig. ♀♀, 9♀♀, MP Th 525).—(2♂♂, MP Th 523).—(2♂♂, MP 527).—(1♂, 2 juv., MP Th 531).—(1♂, 1 ovig. ♀, 1♀, MP Th 529).—(1♂, 1♀, MP Th 533).—(1♂, 1 ovig. ♀, 2♀♀, USNM 102362).—(54♂♂, 34 ovig. ♀♀, 84♀♀, 4 broken, USNM 258090). India, Cuffpanade (Bombay) (1♂, RML 16172, paratype of *U. kempi*).—(1♂, RML 29947).—(1♀, RML 29948).—(1♂, RML 29949).—(1 ovig. ♀, RML 29950). Sri Lanka, Bay of Weligama (1 ovig. ♀, SMF 7795). Vietnam, Vung Tàu (=Cap. St. Jacques), Cochinchine, near Saigon (1♂, 1 ovig. ♀, MP Th 3).—(1♂, MP Th 4). Tonkin (1 ovig. ♀, MP Th 2). South China Sea (1 ovig. ♀, MNB 3454). Hong Kong (1 juv. MP Th 534). Philippine, Luson, Albay (4 ovig. ♀♀, MNB 1131, paralectotype of *Gebia barbata* STRAHL). Seba (1♂, 1♀, RML Siboga St. 58, specimens of DE MAN 1928: 60). Amboina (1♂, MNB 3308). Australia, Queensland, Islands of the Torres Strait (1♀, BM 1877.12, probably specimen of MIERS 1884: 280).—, Queensland, Thursday Island (1♀, BM 1881.31, MIERS 1884: 280).—(2♀♀, BM 1882.7, MIERS 1884: 280).—, N.W. of Cape Arnhem, Yirrkala (3♂♂, 2♀♀, USNM 178294). Bahal, Aibakit (2♂♂, 5 ovig. ♀♀, 3♀♀, MNB SEMPER's coll.). New Guinea, Buka, Pitatuki (1♀, MNB 20871, syntype of *U. carinicauda* var. *gracilipes*). New Britain (2♀♀, ZMH 8440). Samoa 2 ovig. ♀♀, SMF 4934).

DIAGNOSIS.—Rostrum usually bearing four subterminal denticles, ventral surface unarmed. Lateral frontal process of carapace defined. Anterolateral margin of carapace armed with a single spine. Telson broader than long, lateral margin largely concave in posterior half, and dorsal surface with a sharply-elevated transverse carina.

1st pereopod subchelate. Carpus with two sharp dorsal spines on inner distal margin. Palm without any longitudinal rows of spines on inner surface, but medially with an oblique hair-row on outer surface. Dactylus with a row of about eight granules on interior median carina.

DESCRIPTION.—The rostrum shows a triangle with a rounded frontal margin, bearing 4-5 distinct interspaced subterminal denticles. The dorsal surface of the anterior thoracic region is hirsute and irregularly arranged with denticles in the anterior half of the dorsomedian region, those denticles extending backward along the lateral margin (Fig. 6d, Pl. A5). The lateral longitudinal ridge of the carapace is provided with 10-13 denticles, the anterior 5-6 ones of which are more distinct than the remaining ones. The anterolateral margin of the carapace bears a single tooth. The linea thalassinica extends backward to the posterior margin of the carapace.

The sixth abdominal somite is smooth on the posterior margin.

The telson is broader than long (Fig. 8a), the lateral margin is largely concave in the posterior half, and the posterior margin is broadly convex. The dorsal surface forms a sharply-elevated transverse carina, from which the median groove extends backward to the posterior margin.

The endopod of the uropod is broad, reaching just the level of the posterior margin of the telson. The exopod overreaches the endopod.

The antennular peduncle reaches the level of the middle part of the distal segment of the antenna. The inferior flagellum is slightly longer than the superior one, and about as long as the terminal and the penultimate segment combined.

The scaphocerite is present.

The 1st pereopod is subchelate (Pl. C5-6). The merus bears a subterminal spine on the dorsal margin, and a row of denticles on the ventral outer margin,—in larger specimens these denticles are distinctly developed in the proximal part, while in smaller ones irregularly arranged. The carpus bears two sharp dorsal spines on the inner distal margin. The inner surface is furnished with a row of about five interspaced spines on the upper distal margin, the ventrodistal spine is sharp. The palm is provided with an oblique row of thick hairs on the outer surface, which is medially inclined to the distal fourth of the ventral margin. The inner surface bears a dorsal spine on the distal margin, and a carina along the ventral margin, which is brimmed with hairs in the proximal half and usually bears a sharp tooth at the base of the carina derived from the ventral margin of the fixed finger. The upper

interior surface is provided with two longitudinal rows of hairs, proximally bearing a distinct spine; the dorsal row is sometimes tuberculate to a whole extent. The fixed finger is distorted and incurved at the tip, overreaching the level of the middle of the dactylus. The cutting edge is denticulate in the proximal two-thirds. The dactylus is slender, and about two-thirds as long as the palm. The upper exterior plate is medially sulcate. The upper interior surface bears an upper broad hair-band and a lower narrow hair-row. The inner median carina is protruded with a row of about eight granules. The cutting edge bears a row of scanty hair-tufts along the inner margin, among which there is a small tooth at the proximal part. The cutting edge is denticulate in the proximal part.

The propodus of the 2nd pereopod is elongated and attenuates distally. The dactylus is three-fifths to half times as long as the palm.

The female specimen 38 mm in body length from Madagascar bears a small number of eggs measuring about 1.5 mm in diameter, while the female 60 mm from Vietnam (MP Th 3) bears numerous eggs measuring 0.4 mm in diameter.

REMARKS.—The type specimen of the present species was unfortunately not accessible to the present author so that the short description of STIMPSON (1860: 91) is the only available source of identification. STIMPSON stated: 1. "*Pedum primi paris manus infra spina versus pollicem instructa*" (=the ventral margin of the palm of the 1st pereopod bears a spine at the basis of the fixed finger). 2. "*Pollex intus subtiliter denticulatus*" (=the cutting edge of the fixed finger is denticulate). 3. "*Abdominis segmentum ultimum carina transversa acuta prope basin ornatum*" (=the dorsal surface of the telson bears a sharply elevated transverse carina near the proximal margin). Through those characters the present species is distinctly characterized and no confusion is possible with the species known up to this time.

As pointed out under the species *barbata* (STRAHL), some syntypes, which are now to be treated as paralectotypes of STRAHL's species belong to the present species. Some subsequent citations of *barbata* as by ORTMANN (1891: 44 and 1894: 22) belong undoubtedly to the present species.

DE MAN's species *Upogebia intermedia* is partly identical with the present species. The confusion about *intermedia* was caused by HENDERSON, who comparing DE MAN's type specimens kept at the British Museum with the types of MIERS' species *darwini* stated the identity of both *intermedia* and *darwini*. He did not realize that DE MAN's original figure (1888 pl. 16, fig. 7) shows the 1st pereopod to be subchelate rather than chelate, which is a good character for the recognition of *carinicauda*, besides the ventral margin of the merus of the 1st pereopod bearing numerous spines (25-30) and the dorsal surface of the telson being distinctly raised in the middle part where the transverse carina is present. Recently HO (1977: 446) reexamined the

type-material kept in London and stated that the single specimen still extant "*seems to be near to Upogebia carinicauda*," but used the name *darwini* for it.

The female syntype kept at the British Museum (BM 86.52) was figured by DE MAN and HO, and is now selected as lectotype of *intermedia* DE MAN, which gets a junior subjective synonym of *carinicauda* by this action. The other syntype, a male specimen (now paralectotype) kept at the Zoologisch Museum, Universiteit van Amsterdam (ZMA 102 550) was examined by the present author and turned out to belong to *barbata* STRAHL. This fact explains also DE MAN's remarks (1928: 84) regarding HENDERSON's treatment of the species, as DE MAN at that time only had on hand the Amsterdam-specimen, formerly in his private collection.

*U. carinicauda* var. *gracilipes* established by DE MAN (1926: 343) for a small female material from Buka Island, Solomon Is. is also the synonym of the present species. He described that "... *durch die schlankere Form der Vorderfüße zu unterscheiden scheint*." However this character is generally observed in the female specimens.

*U. kempfi* described by SANKOLLI (1972: 671) for some specimens from Bombay, India is without doubt belonging to the present species. He picked up several characters different from the species *carinicauda* and mentioned that "... *in kempfi, the upper border (of the propodus) is dentate and the inner surface is armed with 7-10 sharp spines in its lower half*." However in addition to the other characters mentioned by him this distinction is observed in the larger specimens, so that it is defined only as a variation.

This species is similar to *darwini*, *hexaceras*, *bowerbanki*, *savigny* and *digitina* in that the cutting edge of the dactylus of the 1st pereopod in males bears inside a triangular proximal denticle on the hair-line, however, the present species is characterized in that 1. the 1st pereopod is subchelate, 2. the anterolateral margin of the carapace bears a single spine, and 3. the carpus of the 1st pereopod bears two sharp dorsal spines on the inner distal margin.

17. *Upogebia* (*Upogebia*) *pseudochelata*  
TATTERSALL 1921

Figs. 6e, 8e-f.

- 1915 *Upogebia hirtifrons*, — BALSS, Denkschr. Akad. Wiss. Wien, 92(10): 2 (non *hirtifrons* WHITE 1847).  
1921 *Upogebia* (*Upogebia*) *pseudochelata* TATTERSALL, J. linn. Soc. London. 34: 395, pl. 28 figs. 16-22.

TYPE-LOCALITY.—Sudan, Suakin.

MATERIAL EXAMINED.—Red Sea, Egypt, Mersa Sheikh (=Sherm Sheikh) (1♀, ZSM 93/1, determined by BALSS as *U. hirtifrons* (WHITE)). Ethiopia, Eritrea, Sheik Seid (1♀, RML STOCK's coll.).

DIAGNOSIS.—A small-sized species. Rostrum short,

and broadly rounded on frontal margin, bearing three denticles on each lateral margin. Dorsal surface of anterior thoracic region less scabrous as a whole. Lateral frontal process of carapace short, and anterolateral margin unarmed.

1st pereopod subchelate. Carpus devoid of a dorsal spine on inner distal margin. Palm with an oblique row of hairs in proximal half of outer surface. Dactylus translucent at tip, cutting edge bearing a distinct triangular tooth about at distal third.

DESCRIPTION.—The rostrum shows a short triangle with a broadly-rounded frontal margin, the dorsal surface is slightly inclined anteriorly and bears three denticles on each lateral margin (Fig. 6e). The dorsal surface of the anterior thoracic region is broad and less scabrous; the median furrow is broad and laterally brimmed with some denticles. The lateral longitudinal ridge of the carapace is incurved anteriorly, and interspaced with denticles to a whole extent; the frontal tooth is prominent in shape. The lateral longitudinal groove is broad and slightly divergent posteriorly; the anterior gap is narrow. The anterolateral margin of the carapace is unarmed. No linea thalassinica is present in the posterior thoracic region.

The telson is broader than long; the lateral margin is straightly convergent in the posterior two-thirds, and the posterior margin is almost straight. The dorsal surface shows a broad U-shaped carina, the lateral longitudinal part of which is defined only in the anterior half; the middle portion surrounded by the U-shaped carina is slightly depressed, and bears a median groove.

The endopod of the uropod is broadly convex on the posterior margin.

The eye-stalk is stout, failing to reach the level of the rostral tip.

The antennular peduncle fails to reach the level of the distal margin of the terminal segment of the antenna; the 1st segment is minutely pointed at the distal end of the ventral margin, and the terminal segment is about three times as long as the penultimate one. The superior flagellum is distinctly shorter than the inferior one, and about as long as the peduncle.

The scaphocerite of the antenna is pointed at the tip.

The epistome is narrow, and obtuse at the tip.

The 1st pereopod is subchelate (Fig. 8f). The merus is unarmed on both the dorsal and the ventral margin. The carpus bears no dorsal spine on the inner distal margin; the ventrodistal spine is not present. The palm is broadly carinate on the dorsal margin, the inner and the outer margin of which are implanted with scanty hairs. The outer surface is sulcate along the dorsal margin, and bears an oblique row of hairs in the proximal half, which is distally directed downward and then backward about to the midway of the ventral margin. The inner surface bears a row of scanty long hairs

near the dorsal margin. The fixed finger is denticulate in the proximal two-thirds (Fig. 8e). The dactylus is translucent at the tip. The upper exterior plate is broad, slightly convex, and sharply carinate on its ventral margin. The lower exterior surface bears a hair-line along the ventral carina of the upper exterior plate, which is proximally divided into two branches. The cutting edge shows a large triangular tooth at the distal third. The upper interior surface is furnished with two rows of hairs, the intermediate part of which bears a row of tubercles. The interior median carina is also provided with some obscure tubercles.

The 2nd pereopod shows a rather elongated propodus, the ventral margin of which is straight.

REMARKS.—The present female specimen, collected in January 1895 by the Pola Expedition from Mersa Sheikh (=Port of Sheikh) fits exactly the description of *Upogebia pseudocheolata* from Red Sea, though BALSS (1915: 2) identified this specimen as *hirtifrons* (WHITE) from Sherm Sheikh (=Sheikh city). Later DE MAN (1927: 43) confused this material from Mersa Sheikh (=Sherm Sheikh) with the other female collected in Oct. 25. 1895 by the same expedition from Suez and described the latter as a new species under the name *U. balssi* (see p. 88).

Reference to TATTERSAL's description made it clear that the present specimen is to be identical with his new species. He mentioned the following characters: 1. "The rostrum is quite short....In dorsal view it (=the rostrum) is triangular in shape with an obtusely rounded apex." 2. "The first pair of legs are equal in size and subchelate." 3. "The fixed finger bears fine small tubercles on its proximal half." 4. "There is a dense row of shorter hairs on its outer surface (of the palm of the 1st pereopod) besides other scattered hairs."

In addition his figures (TATTERSAL, pl. 28 fig. 18) show that the outer ventral margin of the merus of the 1st pereopod is unarmed, and the cutting edge of the dactylus of the 1st pereopod bears a characteristic triangular tooth.

The present species is rather related to *U. osiridis* in that the upper exterior plate of the dactylus of the 1st pereopod is broad and slightly convex; the ventral margin of the palm of the 1st pereopod bears no spine at the base of the fixed finger; and the anterolateral margin of the carapace is unarmed, however differs from the latter species because in *osiridis* the palm of the 1st pereopod is devoid of a median hair-line on the outer surface; and the rostrum is narrow and elongate. Otherwise, the present species is similar to *U. assisi* from South Africa in that the outer surface of the palm of the 1st pereopod bears a row of hairs in the proximal half, which is inclined distally.

# 18. *Upogebia (Upogebia) osiridis* NOBILI 1904

Figs. 6f, Pl. D1-2.

- 1904 *Upogebia Osiridis* NOBILI, Bull. Mus. Hist. nat. Paris. 5: 235.  
 1906 *Upogebia Osiridis*, — NOBILI, Bull. Sci. France Belg. 40: 62, pl. 4 fig. 14.  
 1906<sup>a</sup> *Upogebia Osiridis*, — NOBILI, Ann. sci. nat. Zool. Paris. 4: 97.  
 1927 *Upogebia (Upogebia) osiridis*, — DE MAN, Capita zool. 2(5): 26, pl. 3 figs. 10-10b.

TYPE-LOCALITY.—Red Sea.

MATERIAL EXAMINED.—Red Sea, Massawa (3 ovig. ♀♀, 1♀, MNB 4208). Red Sea (1♂ lectotype, 1♀ syntype, MP Th 30).—(3 ovig. ♀♀ syntypes, MP Th 31). Gulf of Aden, Aden (12♂♂, 5 ovig. ♀♀, 9♀♀, MP Th 29, specimens of NOBILI 1906).—(1 ovig. ♀, MP Th 32).

DIAGNOSIS.—A small-sized species. Rostrum narrow, elongate, and with 3-4 lateral denticles. Lateral frontal process of carapace distally divergent. Dorsal surface of anterior region rather attenuate; the median furrow broad. Anterolateral margin of carapace unarmed.

1st pereopod subchelate. Carpus with a single dorsal spine on inner distal margin. Palm with a broad carina on dorsal margin; inner surface bearing a denticulate carina along the dorsal sulcation, and lower exterior surface scattered with hair-tufts. Fixed finger devoid of a proximal spine on ventral margin. Upper exterior plate of dactylus characteristically broad and convex on surface.

DESCRIPTION.—The rostrum is narrow and elongate, provided with an obtuse tip; the lateral margin is slightly convex, armed with 3-4 denticles, the anteriormost one of which is more distinct in shape than the following ones, and implanted with thick hairs between those denticles (Fig. 6f). The dorsal surface of the anterior thoracic region is anteriorly attenuate; the median furrow is deep, broad and brimmed with hairs, extending backward from near the rostral tip to the anterior fourth of the dorso-median region, and posterior to this furrow bears a distinct median swelling. The lateral frontal process of the carapace is divergent distally. The lateral longitudinal ridge is divergent posteriorly and denticulate to a whole extent; the 4-5 anterior denticles are more distinct in shape and interspaced than the posterior ones. The lateral longitudinal groove is remarkable. The linea thalassinica extends backward to the posterior margin of the carapace. The anterolateral margin of the carapace is unarmed.

The telson is broader than long; the lateral margin is straightly convergent in the posterior two-thirds, and the posterior margin is almost straight. The dorsal surface shows a low, broad U-shaped carina, the lateral longitudinal part of which reaches near the posterior margin of the telson, and the transverse part is interrupted by a median groove.

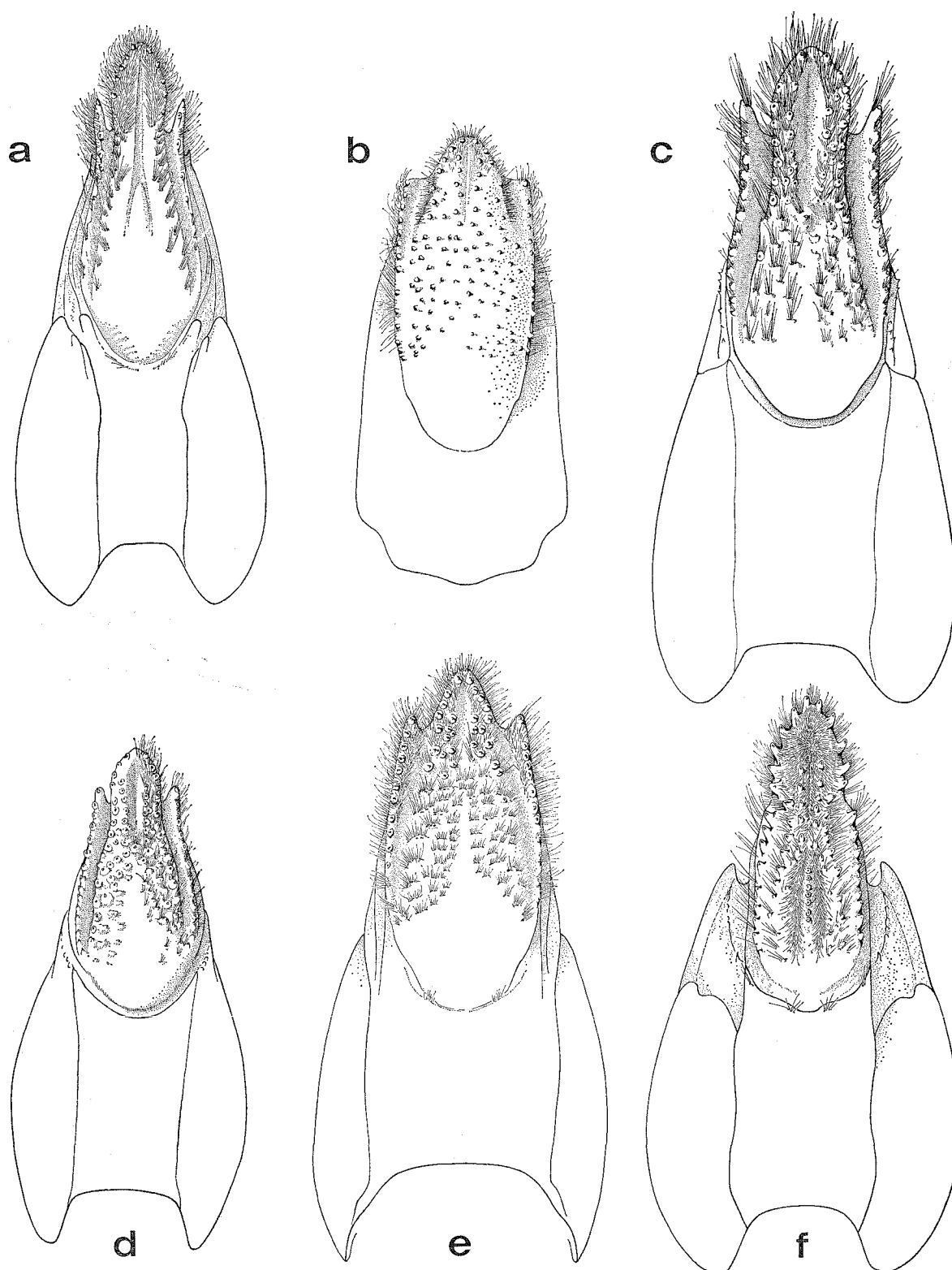


Fig. 9. *Upogebia* (*Upogebia*) *lenzrichtersi* sp. nov., ♂, holotype, SMF 4951, carapace. b. *Upogebia* (*Upogebia*) *assisi*, ovig. ♀, SAMC A-4348, carapace. c. *Upogebia* (*Upogebia*) *capensis*, ♂, neotype, ZMH 29852, carapace. d. *Upogebia* (*Upogebia*) *subspinosa*, ovig. ♀, ZMH 8395, carapace. e. *Upogebia* (*Upogebia*) *seychellensis* sp. nov., ♀, holotype, USNM 276969, carapace. f. *Upogebia* (*Upogebia*) *plantae* sp. nov., ♂, holotype, MP Th, carapace.

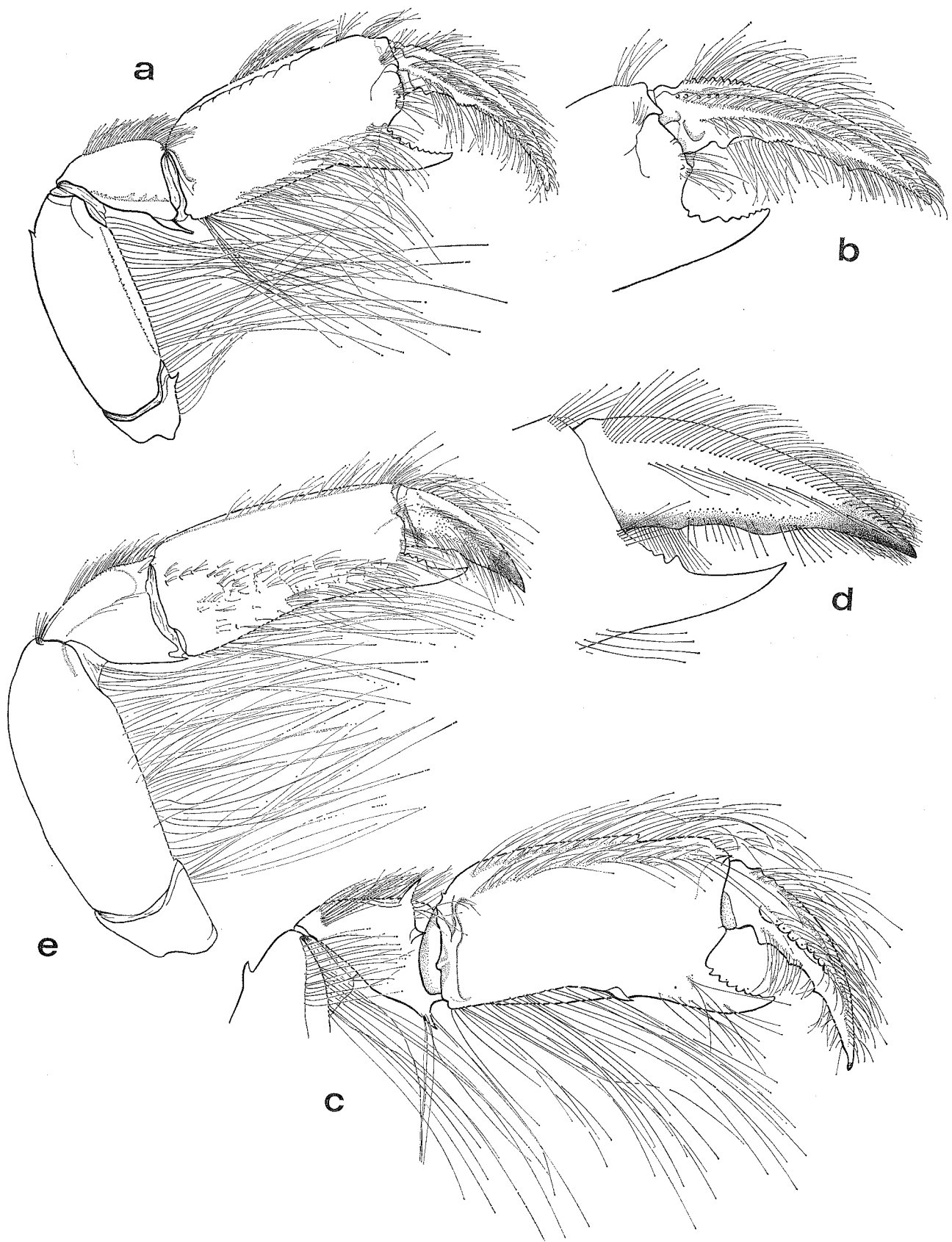


Fig. 10. a. *Upogebia (Upogebia) lenzrichtersi* sp. nov., ♂, holotype, SMF 4951, 1st pereopod, outer view. b. same, chela, outer view. c. same, 1st pereopod, inner view. d. *Upogebia (Upogebia) assisi*, ovig. ♀, holotype, SAMC A-4348, chela, inner view. e. same, 1st pereopod, outer view.



The middle portion delimited by a shallow from the above-mentioned carina is slightly depressed.

The endopod of the uropod is broad, the posterior margin is largely convex and the outer lateral margin is straight.

The antennular peduncle reaches the level of the middle part of the distal segment of the antenna. The 1st segment bears a small distal spine on the ventral margin. The terminal segment is about four times as long as the penultimate one. The flagellae are about as long as the terminal and the penultimate segment combined.

The epistome is truncate at the tip.

The 1st pereopod is subchelate (Pl. D1-2). The merus bears no subterminal spine on the dorsal margin; the ventral surface is minutely denticulate on both the inner and outer margins. The carpus bears only one small dorsal spine on the inner distal margin; the ventrodiscal spine is sharp. The palm forms a broad carina on the dorsal margin. The outer surface is longitudinally sulcate along the dorsal margin, and implanted with a row of sparse hair-tufts. The lower exterior surface is scattered with hair-tufts which is conspicuous especially at the base of the fixed finger. The outer posterior margin shows a carina except in its ventral part. The ventral margin is granulate. The inner surface shows a deep sulcation along the dorsal margin, below which there is a denticulate longitudinal carina posteriorly continuous to the carina derived from the outer posterior margin. Below this carina the inner surface bears a row of long hairs. The lower interior surface is poorly beset with hair-tufts. The inner distal margin bears a stout dorsal tooth. The cutting edge of the fixed finger is proximally armed with 2-4 denticles, detached by a small gap from the ventrodiscal corner of the palm. The dactylus is translucent at the tip. The upper exterior plate is characteristically broad and slightly convex on surface. The lower exterior surface is narrow in breadth, bearing a hair-row below the upper exterior plate, which is proximally divided into three rows. The cutting edge is denticulate to a whole extent. The upper interior surface bears two rows of hairs, the interspace of which forms a carina bearing a row of granules in the proximal half. The inner median carina is also distinctly denticulate; this denticulation is decreased distally. Above this carina there is another row of hairs.

The propodus of the 2nd pereopod is rather slender.

REMARKS.—The present species is rather related to *U. capensis* and *U. subspinosa*, in that the dactylus of the 1st pereopod is denticulate to a whole extent on the cutting edge, and to *U. lenzrichtersi* sp. nov., in that the rostrum is narrow and elongate. In addition, all of these species, *capensis*, *subspinosa*, *lenzrichtersi* and the present species *osiridis* have in common that the cutting edge of the fixed finger of the 1st pereopod is proximally detached by a gap from the ventrodiscal corner of the palm. However,

this species is different because the anterolateral margin of the carapace is unarmed and the carpus of the 1st pereopod bears only one dorsal apical on the inner distal margin as seen in *danai*, *simsoni* and *trypeta*.

Otherwise, the conspicuously broad and convex upper exterior plate of the dactylus of the 1st pereopod hints *U. pseudocheilata* from Red Sea and *U. hirtifrons* from New Zealand.

19. *Upogebia* (*Upogebia*) *lenzrichtersi* sp. nov.

Figs. 9a, 10a-c, Pl. D3-4.

1881 *Gebia* sp. LENZ and RICHTERS, Abh. senckenb. naturf. Ges. 12: 427.

TYPE LOCALITY.—Madagascar, Nossi-Bé.

MATERIAL EXAMINED.—Nossi Bé (2♂♂, 1 ovig. ♀ paratypes, MP Th 520).—(9♂♂, 2 ovig. ♀♀, 9♀♀ paratypes, MP Th 519).—(2 juv. paratypes MP Th 522).—(1♂ holotype, SMF 4951, specimen of *Gebia* sp. LENZ and RICHTERS 1888). Madagascar, Tuléar (1♂ paratype, MP Th 518).—(1 ovig. ♀ paratype, MP Th 521).

DIAGNOSIS.—Rostrum elongate, bearing four lateral denticles. Lateral frontal process of carapace remarkably pronounced anteriorly. Anterolateral margin of carapace with a spine.

1st pereopod subchelate. Carpus with a dorsal and a middle spine on inner distal margin. Palm devoid of a median hair-row on outer surface, dorsal margin defined as a distinct carina in proximal two-thirds, terminated with a spine, and inner ventral margin with a sharp spine at base of fixed finger. Dactylus in males with a distorted triangular crest at proximal third on cutting edge, and in females proximally with a minutely denticulate concavity.

DESCRIPTION.—The rostrum is elongate, and obtuse at the tip; the lateral margin is proximally convergent, hirtuse and armed with four denticles (Fig. 9a). The dorsal surface of the anterior thoracic region is anteriorly attenuate in breadth, laterally provided with 7-8 denticles in the anterior half, and also with tufts of hairs; the median furrow in males is narrow, while in females rather broad, extending backward from the rostral tip to the anterior fourth of the dorsomedian region. Posterior to this median furrow there is a triangular median swelling. The lateral frontal process of the carapace is remarkably stretched out. The lateral longitudinal ridge is provided with tufts of hairs, and also with minute denticles, the anterior 4-5 ones of which are more distinct in shape and widely spaced with one another than the posterior ones. The lateral longitudinal groove is deeply sulcate, the anterior gap is narrow and deep. The anterolateral margin of the carapace is armed with a spine. The linea thalassinica reaches the posterior margin of the carapace.

The telson is slightly broader than long; the

lateral margin is convergent in the posterior two-thirds, and the posterior margin is concave as a whole. The dorsal surface shows a U-shaped carina, the transverse part of which is rather low, while the lateral longitudinal one is broad, extending backward up to the posterior third of the telson. The middle portion delimited by a shallow groove from the U-shaped carina is slightly depressed.

The endopod of the uropod is broad; the inner distal corner is largely rounded, the outer distal one forms an elongate triangle, and the outer proximal one is distinctly defined. The exopod overreaches the endopod.

The antennular peduncle is slightly shorter than the antennal one; the 1st segment is pointed at the distal end of the ventral margin, and the terminal segment is very long, more than four times as long as the penultimate one.

The scaphocerite is not pointed at the tip.

The epistome shows a small spine at the tip.

The 1st pereopod is subchelate (Figs. 10a-c, Pl. D3-4). The merus bears a subterminal tooth on the dorsal margin. The ventral surface is smooth, which in larger males, however, bears a row of indistinct tubercles on its outer margin. The carpus bears two distinct spines on the inner distal margin, the one of which lies at the dorsal corner and the other at the midway. The inner dorsal margin is carinate, which in larger males is somewhat granulate. The ventrodistal spine is sharp. The palm is bare medially on the outer surface. The dorsal margin shows a distinct carina in the proximal two-thirds, which is terminated with a spine; this spine is more distinct in females than in males. The outer surface is fringed with a row of long hairs along the above-mentioned dorsal carina, at some distance from which there is another row of hairs, which is more distinct in females than in males. The inner surface is implanted with a row of long hairs below the dorsal margin, and with a ventral spine at the base of the fixed finger. The fixed finger is short. The cutting edge is denticulate, those denticles decreasing distally. In larger males it is proximally detached by a deep gap from the ventrodistal corner of the palm, while in females directly connected with the palm without a gap. The dactylus is narrow, and transparent at the tip. The upper exterior plate is slightly sulcate, the lower margin of which is carinate to a whole extent, while the upper one is carinate, bearing a row of denticles in its proximal half. The lower exterior surface is furnished with two rows of hairs merging distally into one, the upper one of which is distinct below the upper exterior plate, and with another row of hairs in the distal half just above the cutting edge. The upper interior surface is provided with a broad hair-band along the dorsal margin. The inner median carina in larger males is roughly granulate in the proximal half, while in females smooth to a whole extent. The cutting edge in larger males bears a conical proximal tooth and a low triangular crest in the proximal part, and another 1-2 denticles at the

distal two-thirds; the triangular crest is distorted outward, the proximal slope of which is smooth, while the distal one is armed with a row of horny tipped denticles. The cutting edge in females shows a concavity with minute denticulation near the proximal end.

The propodus of the 2nd pereopod is broad and rather long.

REMARKS.—First this species has been mentioned from Madagascar by LENZ and RICHTERS (1881: 427) as *Gebia* sp. The present author examined their specimen and found that it belongs to a new species. The species name is dedicated to LENZ and RICHTERS:

Disposition of types is designated as follows:

Holotype.—1♂, 32 mm in total length from Madagascar.

Paratypes.—Data as in the description of the material.

Disposition.—Senckenbergisches Museum in Frankfurt am Main (holotype), and Muséum national d'Histoire naturelle in Paris (paratypes).

The present species is closely related to *obtiro* gen. et sp. nov. from N. Australia, in that the cutting edge of the dactylus of the 1st pereopod bears a proximal low convexity, of which the distal slope is minutely denticulate, and the cutting edge of the fixed finger is denticulate to a whole extent. However, those two species are different from each other because in Australian species the rostrum is largely broad on the frontal margin, bearing no median furrow, and the anterolateral margin of the carapace is unarmed.

Concerning the shape of the rostrum and that of the fixed finger of 1st pereopod, the present species is rather related to *osiridis* from the Red Sea and the Gulf of Aden, because in these two species the rostrum is narrow and elongate, the outer surface of the palm of the 1st pereopod is devoid of a median hair-line, and the cutting edge of the fixed finger in males is proximally detached by a deep gap from the ventrodistal corner of the palm.

## 20. *Upogebia* (*Upogebia*) *assisi* BARNARD 1947

Figs. 9b, 10d-e.

1947 *Upogebia assisi* BARNARD, Ann. Mag. nat. Hist. London. (11)13: 381.

1950 *Upogebia assisi*, — BARNARD, Ann. S. afr. Mus. 38: 520, text-figs. 97a-d.

TYPE LOCALITY.—St. Francis Bay, S. Africa.

MATERIAL EXAMINED.—St. Francis Bay, S. Africa (1 ovig. ♀ holotype, SAMC A-4348).

DIAGNOSIS.—Rostrum short and largely rounded on frontal margin, bearing four lateral denticles. Dorsal surface of anterior thoracic region rather scabrous. Lateral frontal process of carapace less prominent. Anterolateral margin of carapace unarmed.

1st pereopod subchelate. Carpus with a rudimentary dorsal spine on inner distal margin. Palm

medially with an oblique hair-line on outer surface. Dactylus translucent at tip, cutting edge with two low swellings.

DESCRIPTION.—A small-sized species measuring 16 mm in total length. The rostrum is short, and broadly rounded on the frontal margin; the lateral margin bears four distinct denticles with an obtuse tip, and the ventral surface is medially carinate (Fig. 9b). The dorsal surface of the anterior thoracic region is rather scabrous exclusive of the posterior part; the median furrow is distinct and brimmed with four denticles on the lateral margin, extending backward from near the rostral tip down to the anterior fifth of the dorsomedian region. The lateral frontal process of the carapace is less prominent, slightly directed outward. The lateral longitudinal ridge is provided with a row of 13-14 denticles to a whole extent. The lateral longitudinal groove forms a wide anterior gap, deeply sulcate in the anterior fourth, and straightly extending posteriorly as a narrow slit in the remaining part. The anterolateral margin of the carapace is unarmed. The linea thalassinica is uncertain due to poor condition of the type.

The telson is subquadrate; the lateral margin is damaged, while the posterior margin is largely convex. The dorsal surface is furnished with a U-shaped carina, the transverse part of which is distinctly accentuated, and the lateral longitudinal one runs backward to the posterior third; the median groove is defined only posterior to the transverse part of the U-shaped carina.

The endopod of the uropod is subsquare, and about as long as the telson; the posterior margin is largely rounded, passing with a rounded outer distal corner into a straight outer lateral margin, and the outer proximal corner is slightly pronounced. The exopod overreaches the endopod.

The antennular peduncle fails to reach the distal margin of the terminal segment of the antenna; the 1st segment bears a slender subterminal spine on the ventral margin, and the terminal segment is about three times as long as the penultimate one.

The scaphocerite of the antenna is distally pointed on the dorsal margin.

The epistome is terminated with a sharp tooth.

The 1st pereopod is subchelate (Fig. 10e). The merus bears a rudimentary subterminal spine on the dorsal surface, and is unarmed on the ventral surface. The carpus bears a rudimentary dorsal spine on the inner distal margin; the ventrodistal spine is small. The palm is indistinctly carinate on the dorsal margin, the outer and the inner edge of which are each implanted with scanty hairs. The outer surface is provided with a median row of long hairs obliquely extending from the middle of the proximal margin to the distal half of the ventral margin. The inner surface is implanted with two rows of scanty long hairs near the dorsal margin, and medially with another row of some hair-tufts. The fixed finger is pointed at the tip, the cutting edge bearing a row of three denticles

in the proximal part, which is reduced in size proximally. The dactylus is terminated in the distal fourth with a translucent apex. The upper exterior plate is obscurely sulcate. The lower exterior surface is ornamented with two rows of hairs merging with each other in the distal half. The upper interior surface is also provided with two rows of hairs, the upper one of which shows a broad hair-band, while the lower one is linear (Fig. 10d). The inner median carina bears five obscure interspaced denticles. The cutting edge is armed with two low swellings in the proximal part.

Only known from the type-locality.

REMARKS.—As BARNARD (1950: 52) mentioned, this species is intermediate between *Upogebia* s. str. and *Calliadne* s. str. of authors because the rostrum which is short and broad, the dorsal surface of the anterior thoracic region rather scabrous, the antero-lateral margin of the carapace without any spine, and the inner distal margin of the carpus of the 1st pereopod bearing only a single spine agree with *Calliadne* s. str. or *Gebiopsis* s. str., while the 1st pereopod subchelate, and the dactylus of the 1st pereopod translucent at the tip fit *Upogebia* s. str.

## 21. *Upogebia (Upogebia) capensis* (KRAUS 1843)

Fig. 9c, Pls. A6, D5-6.

- 1843 *Gebia major* var. *capensis* KRAUS, Südafrik. Crust. : 54.
- 1894 *Gebia africana* ORTMANN, Denkschr. med.-nat. Ges. Jena. 8: 22, pl. 2 fig. 4.
- 1900 *Upogebia capensis*, — STEBBING, Mar. Invest. S. Afr. Cape Town. : 45.
- 1910 ?*Upogebia capensis*, — STEBBING, Ann. S. afr. Mus. 6: 370.
- 1946 *Upogebia africana*, — BARNARD, Ann. Mag. nat. Hist. London. (11)13: 380.
- 1950 *Upogebia africana*, — BARNARD, Ann. S. afr. Mus. 38: 519.

TYPE-LOCALITY.—Table Bay, South Africa.

MATERIAL EXAMINED.—South Africa, Knysna (1 ♂ neotype, 3 ♂♂, ZMH 29852).—(1 ovig. ♀, ZMH 29894).—(1 ovig. ♀, ZMH 29785).—(50 ♂♂, 20 ovig. ♀♀, 33 ♀♀, 3 broken, USNM 105367). South Africa, Langebaan (East Atlantic side) (1 ♂, 2 ♀♀, USNM 105364).—(5 ♂♂, 5 ♀♀, USNM 109651).

DIAGNOSIS.—A middle-sized species. Front of carapace tridentate. Rostrum with 3-5 lateral denticles. Dorsal surface of anterior thoracic region with a narrow and deep median furrow. Anterolateral margin of carapace with a spine.

1st pereopod subchelate. Coxae of pereopods 1-3 unarmed. Meri of pereopods 1-2 usually without a subterminal spine on dorsal margin. Carpus with a dorsal and a middle spine on inner distal margin. Palm with two denticulate carinae on dorsal surface, and devoid of a median hair-row on outer surface. Fixed finger in males unarmed on cutting edge, while in females medially with a denticle.

DESCRIPTION.—The rostrum shows a broad triangle with an obtuse tip, flanked with 3-5 yellow-tipped lateral denticles (Fig. 9c, Pl. A6). The dorsal surface of the anterior thoracic region is relatively constricted anteriorly; the lateral margin is divergent posteriorly; the median furrow is conspicuously broad and glabrous on the bottom. The lateral frontal process of the carapace is distinctly projected outward. The lateral longitudinal ridge bears a row of 12-15 yellow-tipped denticles. The lateral longitudinal groove is remarkable, the anterior gap is deep and widely opened. The posterior thoracic region is laterally flanked with a row of denticles along the cervical groove. The linea thalassinica extends posteriorly to the posterior margin of the carapace. The anterolateral margin of the carapace is armed with a spine.

The telson is broadened, the posterior margin is largely rounded.

The antennular peduncle reaches about the level of the distal margin of the penultimate segment of the antenna.

The 1st pereopod is subchelate (Pl. D5-6). The coxa bears no spine. The merus is usually deficient in a subterminal spine on the dorsal margin, however, the present author observed such a spine in some specimens from Langebaan, facing the Atlantic Ocean (1♀, USNM 10534, 1♂, USNM 109651). The ventral surface is denticulate on both the inner and the outer margins; those denticles on the ventral inner margin are more distinct than those on the ventral outer one. The carpus is distinctly carinate and minutely denticulate on the dorsal surface. The inner surface bears two distal spines, the upper one of which is situated at the dorsal corner and the other is at the middle part. The outer surface is provided with 1-2 granules on the upper distal margin. The ventral outer margin is carinate and terminated by a sharp spine. The palm bears two denticulate carinae on the dorsal surface, both of which are furnished with hairs. The outer surface is implanted with a row of hair-tufts near the dorsal margin, scattered with hairs and granules in the lower half, noticeably denticulate on the ventral margin, and bears a distinct distal spine just beneath the articulation with the dactylus. The inner surface is provided with a row of hairs near the dorsal margin, which in males is overlapped with a row of denticles, while in females not, and with a distinct dorsal spine just above the articulation with the dactylus. The fixed finger is shortly projected. The cutting edge in males is unarmed, proximally detached by a rounded gap from the ventrodistal corner of the palm, while in females bears a small denticle at the midway. The dactylus is slender. The upper exterior plate is rather constricted, the upper margin of which is granulate only in the distal half, while

the lower one is to a whole extent. The inner median carina is smooth. The cutting edge is entirely granulate.

REMARKS.—Since ORTMANN (1894: 22) established *U. africana* using material from Port Elizabeth, the subsequent authors have considered KRAUS' species *capensis* as distinct from *africana*. ORTMANN mentioned that "*Leider ist die G. major var. capensis bei KRAUS viel zu unvollständig beschreiben*", so that it was necessary to review the type specimen(s) of *capensis*. Unfortunately the type specimen(s) seems to be lost (In litt.: Dr. H. JANUS, Staatliches Museum für Naturkunde in Stuttgart), accordingly the only means of revision is restricted to KRAUS' description as follows. KRAUS (1843: 54) pointed out that: 1. "... *ich sie (=capensis) nie von solcher Grösse fand, dass sie (=capensis) diesen Speziesnamen verdient.*", "*Sie (=capensis) hat die Grösse der G. littoralis DESM. (about 30 mm after DESMAREST 1825: 204).*", and "*Länge 2 Zoll 2 linien (about 5.5 mm).*"

KRAUS stressed on the length of the individuals which are not large. In fact, the present author examined here some amount of specimens and found that their length does not exceed 55 mm (neotype, ZMH 29852), and most of them are not as large as the other South-African species, *subspinosa*.

2. "*Häufig in der Tafelbai.*" This fact seems to prove BARNARD's statement about the habitats. BARNARD (1950: 518) mentioned that "*This species (=subspinosa, nor capensis) appears to prefer, as a rule, deeper water than africana (=capensis).*" That means that the present species *capensis* is abundant in shallow water as KRAUS observed in the Table Bay.

3. "*die Furchen hinter dem Schnabel und an den Seiten sind tief, breit und glatt.*" It is possible to say that in the present species the median dorsal furrow and the lateral longitudinal groove of the carapace is broader than in *subspinosa*.

It is evident that the species characterized by the above-mentioned features of KRAUS' description is probably identical with *africana* and different from STIMPSON's species *subspinosa*, so that it may be concluded that *U. africana* is a synonym of *capensis*.

In order to avoid further confusion among *U. capensis*, *africana* and *subspinosa*, the following specimen is now designated as neotype of *Gebia major* var. *capensis* KRAUS 1843:

Neotype.—1, 55 mm in total length from Knysna, South Africa.

Disposition.—Zoologisches Museum in Hamburg.

This specimen shows all typical features referred to in the description and all distinctive characters tabulated below.

<i>capensis</i> KRAUS	<i>subspinosa</i> STIMPSON
Middle-sized species (up to appr. 55 mm in total length).	Rather large-species (largely exceeding 55 mm in total length).
Median furrow on carapace broad and lamellar.	Mentioned furrow narrow and deep.
Antennular peduncle reaching level of distal margin of penultimate segment of antenna.	Antennular peduncle reaching level of distal margin of terminal segment of antenna.
Coxae of pereopods 1-3 unarmed.	Coxae of pereopods 1-3 with a sharp spine on inner side.
Meri of pereopods 1-2 without subterminal spines on dorsal margin.	Meri of pereopods 1-2 with a subterminal spine on dorsal margin.
Inner proximal gap of fixed finger of 1st pereopod in males large.	Mentioned gap moderately opened.
Upper exterior plate of dactylus of 1st pereopod with a denticulate carina in distal half on dorsal margin, while entirely on ventral margin.	Mentioned part with a denticulate carina entirely on both dorsal and ventral margin.
Inner median carina of dactylus of 1st pereopod smooth.	Mentioned carina with denticles in proximal half.

The present species is closely related to *U. subspinosa* in that 1. The dorsal surface of the palm of the 1st pereopod is provided with two denticulate carinae. 2. The outer surface of the palm shows no definite median hair-line. 3. The cutting edge of the fixed finger is detached by a gap from the ventrodistal corner of the palm, and 4. The cutting edge of the dactylus is denticulate to a whole extent.

In *U. major* and *issaeffi* from Japan, the dorsal surface of the palm of the 1st pereopod also bears two rows of denticulate carinae, the inner one of which is, however, not derived from the proper dorsal margin of the palm as in *capensis* and *subspinosa*, but from the hair-line on the inner dorsal surface of the palm.

Otherwise, in *major* and *issaeffi* the outer surface of the palm of the 1st pereopod is implanted with a median hair-line, and the cutting edge of the dactylus is not denticulate entirely but bears a low truncate convexity in the proximal part, so that it is safely said that the two South African species *capensis* and *subspinosa* are very different from the two above-mentioned Japanese species.

## 22. *Upogebia* (*Upogebia*) *subspinosa* (STIMPSON 1860)

Figs. 9d, Pls. B1, E1-2.

- 1860 *Gebia subspinosa* STIMPSON, Proc. Acad. nat. Sci. Philad. 1860: 91.  
 ?1910 *Upogebia subspinosa*, — STEBBING, Ann. S. Afr. Mus. 6: 370.  
 1913<sup>a</sup> *Upogebia capensis*, — BALSS, Denksch. med. naturw. Ges. Jena. 17: 108, text-fig. 8 (non *Gebia major* var. *capensis* KRAUS 1843).  
 1914 *Upogebia capensis*, — LENZ and STRUNCK, Dtsch. Südp. -Exp. 15(7): 291. (non *Gebia major* var. *capensis* KRAUS 1843).  
 1916 *Upogebia capensis*, — BALSS, Beitr. Kenntn. Meeresfauna Westafrika. 2: 34. (non *Gebia major* var. *capensis* KRAUS 1843).

- 1927 *Upogebia* (*Upogebia*) *capensis*, — DE MAN, Capita Zool. 2(5): 32, pl. 3 fig. 1. (non *Gebia major* var. *capensis* KRAUS 1843).  
 1946 *Upogebia capensis*, — BARNARD, Ann. Mag. nat. Hist. London. (11) 13: 380. (non *Gebia major* var. *capensis* KRAUS 1843).  
 1950 *Upogebia capensis*, — BARNARD, Ann. S. Afr. Mus. 38: 515, text-fig. 96. (non *Gebia major* var. *capensis* KRAUS 1843).

TYPE LOCALITY.—Simons Bay, about 15 m deep (8 org.).

MATERIAL EXAMINED.—South-West Africa, Lüderitz Bay (3♂♂, 1 ovig. ♀, 2♀♀, ZMH 8395, determined by BALSS 1916 as *U. capensis*).—(2♂♂, 1 ovig. ♀, 2♀♀, ZSM 87/1, determined by BALSS 1913<sup>a</sup> and by DE MAN 1927 as *U. capensis*).—(28♂♂, 5 ovig. ♀♀, 20♀♀, MNB 16130, specimens of BALSS 1913). South Africa, Simons Bay (2♂♂, 2 broken ♀♀, MNB 17944, determined by LENZ and STRUNCK 1914 as *U. capensis*). Langebaan (1♀, USNM 109651). Port Elithabeth (1 ovig. ♀, 1♀, MNB 8746). Algoa Bay (6♂♂, 5♀♀, MNB 8733).

DIAGNOSIS.—A large-sized species. Front of carapace trilobed. Rostrum with 3-4 lateral denticles. Dorsal surface of anterior thoracic region with a narrow and deep median furrow. Anterolateral margin of carapace with a spine.

1st pereopod subchelate. Coxa, as well as those of 2nd and 3rd pereopods, with a sharp spine at posterior corner of inner distal margin. Merus, as well as that of 2nd pereopod, with a subterminal spine on dorsal margin. Carpus with a dorsal and a middle spine on inner distal margin. Palm with two denticulate carinae on dorsal surface, and devoid of a median hair-line on outer surface. Fixed finger in larger specimens unarmed on cutting edge, while in smaller ones proximally with 1-2 denticles.

DESCRIPTION.—The rostrum shows a broad triangle with an obtuse tip; the lateral margin bearing 3-4

distinct denticles (Fig. 9d, Pl. B1). The dorsal surface of the anterior thoracic region is relatively broad, the lateral margin is divergent posteriorly, and flanked with a row of denticles; the median furrow is narrow and deep. The lateral frontal process of the carapace is projected anteriorly. The lateral longitudinal ridge is provided with a row of 15-16 yellow-tipped denticles. The lateral longitudinal groove is remarkable. The posterior thoracic region is laterally provided with a row of denticles along the cervical groove. The linea thalassinica reaches the posterior margin of the carapace. The anterolateral margin of the carapace is armed with a distinct spine.

The telson is broad; the posterior margin is slightly notched medially, and the lateral margin is concave in the posterior three-fifths.

The antennular peduncle attains nearly to the level of the distal margin of the terminal segment of the antenna.

The 1st pereopod is subchelate (Pl. E1-2). The coxa bears a sharp tooth at the posterior corner of the inner distal margin. The merus is armed with a subterminal spine on the dorsal margin, and provided with a series of small denticles on the inner and the outer ventral margins; some denticles on the inner ventral margin are proximally distinct. The carpus is slightly carinate on the dorsal margin, provided with small denticles in the distal half. The inner distal margin bears two large, sharp spines at both the dorsal corner and the midway. The outer surface is denticulate in the upper half on the distal margin, and bears a smooth carina on the ventral margin. The ventrodistal spine is sharp. The palm bears two denticulate carinae with thick hairs on the dorsal surface. The outer surface bears a row of hair-tufts below the dorsal margin, is scattered with hairs and granules in the lower half, is evidently denticulate on the ventral margin, and is provided with a spine on the distal margin beneath the articulation with the dactylus. The inner surface is furnished with a row of denticles with hairs below the dorsal margin, with a distinct spine on the distal margin, with a distinct spine on the distal margin above the articulation with the dactylus, and with 1-2 spines at the base of the fixed finger. The fixed finger is rather short and stout. The cutting edge in larger specimens is smooth, while in smaller specimens provided with 1-2 small teeth in the proximal half; the gap found in males at the proximal corner of the cutting edge is widely opened and deep. The dactylus is elongate. The upper exterior plate is medially sulcate, the upper and the lower margin of which are provided with granules to a whole extent. The upper interior surface is medially carinate, bearing a row of 5-7 denticles in the proximal half. The cutting edge is entirely denticulate.

In the 2nd and 3rd pereopods the coxa is also armed with a sharp tooth at the posterior corner of the inner distal margin.

REMARKS.—BALSS (1913<sup>a</sup>) synonymized ORTMANN'S

species *africana* with *capensis* and used carelessly the specific name *capensis* for *subspinosa*. Later on BARNARD (1946: 380) suppressed *subspinosa* and used *capensis* and *africana* as the names for the two representatives of *Upogebia* from South Africa.

As the present author made clear in the remarks on *capensis* (see p. 44), *africana* is to be considered as a synonym of *capensis*, and *subspinosa* is a valid species, as STIMPSON (1860: 91) pointed out in his description of *subspinosa* that "*Pedes primi, secundi, tertique paris prope basin spina acuta armati* (=the pereopods 1-3 bear an acute spine near their basis)."

BARNARD (1950: 518) mentioned concerning the distribution of the two South African species that "*The extension of this west coast species (=subspinosa, non capensis) around the South-West corner of the Cape to Mossel Bay is curious.*" However, the present author examined some specimens clearly belonging to *subspinosa* from Port Elizabeth and the Algoa Bay which localities are situated easter than the Mossel Bay, so that the present species also ranges in the southern region facing the Indian Ocean. The specimens from the southern coast are rather small, the largest one of which taken at port Elizabeth, an ovigerous female, measures only 39 mm in total length (MNB 8746).

### 23. *Upogebia (Upogebia) seychellensis* sp. nov.

Figs. 9e, 12a-b.

TYPE LOCALITY.—Seychelles, south-west of Iloe.

MATERIAL EXAMINED.—Seychelles, south-west of Iloe (1♀ holotype, USNM 276969).

DIAGNOSIS.—A middle-sized species. Front of carapace trilobed. Rostrum with 4-5 lateral denticles, and with two ventral teeth. Lateral frontal process of carapace ventrally unarmed. Anterolateral margin with a spine.

1st pereopod subchelate. Carpus bearing three sharp spines on inner distal margin. Palm with a row of spinules on dorsal margin except in its distal part, outer surface with a narrow ridge along dorsal margin, and medially with a thick-hair row except in its distal part. Cutting edge of fixed finger with five denticles in paroximal half, which are diminishing in size proximally.

DESCRIPTION.—The rostrum is triangular with a rounded frontal margin (Fig. 9e). The dorsal surface is hirsute, provided with 4-5 translucently tipped denticles on the lateral margin. The ventral surface is distally declined with a median carina bearing a small subterminal and a subsequent rudimentary tooth. The dorsal surface of the anterior thoracic region is scabrous, scattered with numerous transverse hair-tufts except its posterior part and in the posterior two-thirds of the median line; the median groove is broad. The lateral frontal process of the carapace is projected anteriorly with an obtuse tip, and unarmed on the ventral surface. The lateral

\* Very common (USNM 175864)

longitudinal ridge is provided with a series of 12 denticles basally provided with a hair-tuft. The lateral longitudinal groove is distinct, divergent posteriorly. The posterior thoracic region laterally bears an obtuse denticle on the cervical groove slightly below the crossing with the linea thalassinica. The linea thalassinica extends backward to the posterior margin of the carapace. The anterolateral margin of the carapace is armed with a triangular tooth.

The telson is broader than long; the lateral margin straightly runs backward, and the posterior one is largely rounded.\* The dorsal surface shows a U-shaped carina, the transverse part of which is narrow, and the lateral longitudinal one is broad and low, extending backward down to the posterior fourth. The middle portion delimited by a broad, shallow sulcation from the U-shaped carina bears a distinct median groove.

The endopod of the uropod is about as long as the telson; the posterior margin is slightly concave in the outer half, passing with a small rounded outer posterior corner into a slightly concaved outer lateral margin. The exopod overreaches the endopod, proximally bearing a small spine. The protopod bears a small spine.

The antennular peduncle is unarmed, reaching about the end of the distal segment of the antenna. The terminal segment is about four times as long as the penultimate one, and about as long as the flagellae.

The 3rd segment of the antenna bears a subterminal spine.

The epistome is terminated in a sharp spine.

The 1st pereopod is subchelate (Fig. 12a). The merus is furnished with a subterminal spine on the dorsal margin. The carpus is provided with some small denticles on dorsal margin. The inner distal margin bears three sharp spines in the dorsal half. The outer surface is armed with four sharp spines on the upper distal margin, and with 1-2 spinules plus one distinct marginal spine on the ventral margin. The ventrodiscal spine is sharp. The palm is not carinate on the dorsal margin, bearing a row of spinules with hairs except in the distal part. The outer surface is ornamented with a distinct narrow ridge with long hairs below the dorsal margin, and medially with a longitudinal row of thick hairs in parallel to the dorsal margin except in the distal part. The lower exterior surface bears another row of long hairs in its median part, which is distally deflected downward to merge with the other row of hairs found on the ventral part. The inner surface is provided with a row of long hairs near the dorsal margin, and with a series of 3-4 denticles on a carina extending distally to the ventral margin of the fixed finger. The fixed finger is pointed. The cutting edge is armed with a series of four obtuse denticles in the proximal half, the distal one of which is distinct, and largely concave in the distal half. The dactylus is terminated by a translucent apex. The upper exterior plate is distinctly carinate

on both the upper and the lower margins. The lower exterior surface is provided with two hair-rows, the upper one of which is broad and densely hairy, while the lower one is lineal. The dorsal surface bears two hair-lines separated by a narrow interspace. The inner dorsal margin bears a hair line in its distal half, which is distally merged with the above-mentioned hair line on the dorsal surface (Fig. 12b). The inner surface medially bears a row of 13-14 small granules plus a smooth distal carina, and proximally a conical tooth along the cutting edge. Below the median row of granules there is a row of some hair-tufts in the proximal half. The cutting edge is granulate in the proximal half, bears a distinct triangular median tooth, and is smooth in the distal half.

REMARKS.—The present species is different from the other South and East African species of *Upogebia* s. str. in that the outer surface of the palm of the 1st pereopod bears a median row of thick hairs except in its distal part, which is parallel to the dorsal margin. In the South and East African species like *U. capensis*, *subspinoso*, *lenzrichtersi* sp. nov. and *osiridis* the outer surface of the palm of the 1st pereopod is deprived of a median hair-line, while in the other species like *U. assisi*, *pseudochelata*, *carinicauda* it bears a median hair-line inclining distally to the ventral margin of the palm. This character hints some species from the West Pacific, like *U. major*, *issaeffi*, *yokoyai*, *imperfecta* sp. nov., *hirtifrons*, *wuhsienweni*, *W. obtifrons* sp. nov. and *T. kiiensis*.

Otherwise, in the present species the inner distal margin of the carpus of the 1st pereopod bears three sharp spines as in *U. plantae* sp. nov. from Madagascar.

Disposition of holotype is designated as follows.

Holotype.—1, about 50 mm in total length from Seychelles, south-west of Iloe.

Disposition.—National Museum of Natural History, Smithsonian Institution in Washington D.C. under the catalogue nr. 276969.

#### 24. *Upogebia* (*Upogebia*) *plantae* sp. nov.

Figs. 9f, 13a-b, Pls. E3, E5.

TYPE LOCALITY.—Madagascar, Nossi Bé, 25 m deep.

MATERIAL EXAMINED.—Madagascar, Nossi Bé, 25 m deep (1♂ holotype, 2♂♂, 3♀♀ paratypes MP Th). Seychelles, off Mahe I., 43 m (85ft) deep (1♂, 1♀, USNM 276969), —, Iloe (1 ovig. ♀, USNM 276969).

DIAGNOSIS.—A small-sized species. Front of carapace simple. Rostrum showing an elongate heart-shape, provided laterally with 6-7 stout denticles, and ventrally with 2-4 sharp spines. Lateral frontal process of carapace scarcely projected forward. Anterolateral margin of carapace with 1-3 spines.

1st pereopod subchelate. Carpus with three



strong dorsal spines on inner distal margin. Palm with a row of 8-11 anteriorly-directed sharp spines on dorsal margin, and with three rows of sharp spines on inner surface. Upper exterior plate of dactylus in males broadly sulcate, dorsal margin of which translucently carinate, and ventral margin with 10-12 granules, and that in females rather flat, dorsal margin of which with 15 minute denticles, and ventral one with 10 granules.

**DESCRIPTION.**—The rostrum shows an elongate heart-shape with an obtuse tip (Fig. 9f). The dorsal surface is clothed with bristles, bearing a row of 6-7 stout denticles and hair-tufts on the lateral margin. The ventral surface is conspicuously carinate medially, provided with usually 2-4 sharp spines. The dorsal surface of the anterior thoracic region is anteriorly constricted in breadth, ornamented with a series of 7-9 denticles and with hair-tufts on the lateral margin; the median furrow is rather narrow, flanked with a row of 6-7 denticles, and extending backward from near the rostral apex down to the midway, and posterior to it a median carina is present, anteriorly bearing 5-6 granules. The lateral frontal process of the carapace is scarcely projected anteriorly, located posterior to the posterior lateral angle of the rostrum. The lateral longitudinal ridge bears a series of 8-9 stout denticles diminishing in size posteriorly. The lateral longitudinal groove is deep. The lateral surface of the anterior thoracic region is provided with a few small spines. The posterior thoracic region laterally bears a small hepatic spine and some other obscure denticles along the cervical groove, and medially a few obscure denticles above the crossing with the linea thalassinica. The linea thalassinica reaches the posterior margin of the carapace. The anterolateral margin of the carapace bears 1-3 spines.

The telson is about as long as broad; the lateral margin is convergent posteriorly in the posterior two-thirds, and the posterior margin is slightly concave as a whole. The dorsal surface shows a U-shaped carina, the transverse part of which is scarcely arising, while the lateral longitudinal one definable as a narrow carina, extending posteriorly to the posterior margin of the telson.

The endopod of the uropod is about as long as the telson; the posterior margin is straight, and the outer lateral margin is largely concave, proximally rounded at the corner. The exopod slightly overreaches the endopod, bearing no spine at the proximal part. The protopod is armed with a triangular spine.

The antennular peduncle reaches the distal margin of the penultimate segment of the antenna. The proximal segment bears a large spine on the ventral margin.

The 3rd segment of the antenna is ornamented with a distinct subterminal spine. The penultimate segment bears 2-3 spines on the ventral margin. The scaphocerite is bidentate.

The epistome in large specimens bears an obtuse

spine at the upper distal corner, while in moderate-sized ones a pointed spine.

The 1st pereopod is subchelate (Pl. E3, E5). The coxa bears a very strongly-curved spine. The merus is provided with a subterminal spine on the dorsal margin, and with a row of 7-14 spines diminishing in size distally on the ventral inner margin. The carpus is furnished with three strong dorsal spines on the inner distal margin, the two spines of which are arising from the innerside, and the other one from the dorsal part. The outer distal margin bears a short spine in its upper half. The dorsal surface is hirsute, bearing 3-5 small teeth on both the outer and the inner margins. The outer lateral surface is also hirsute, forming a smooth thick carina on its ventral margin to a whole extent. The ventrodistal spine is slender. The palm in males is slightly broader than in females. The dorsal margin is provided with a single row of 8-11 anteriorly-directed sharp spines. The outer ventral surface is longitudinally deflected, in the holotype from Nossi Bé, Madagascar, bearing a row of interspaced granules on its ventral margin. The inner surface is furnished with three rows of sharp spines and also with translucent long bristles. The inner ventral margin in males forms an elongate subterminal tooth defined as a fixed finger, detached by a wide opening from a ventrodistal tooth of the palm, and that in females bears two distinct teeth in the distal part, the subterminal one of which is defined as the fixed finger and larger than the terminal one.

**Dactylus in males (Fig. 13a-b):** The dactylus is terminated by a translucent apex. The upper exterior plate is broadly sulcate, the dorsal margin of which forms a thick translucent carina to a whole extent, and the ventral one is interspaced with 10-12 translucently-tipped granules; those granules are distally transformed into short ridges. The lower exterior surface bears two rows of hairs merging with each other in the distal half. The upper interior surface bears a row of hairs below the dorsal margin, and another row of interspaced, rather distinct hair-tufts above the inner median carina. The inner median carina is provided with a row of indistinct granules. The lower interior margin in larger specimens shows a low crest in the distal half, the proximal end of which bears a distinct triangular tooth. In the moderate-sized specimens it also shows a low crest in the distal half, bearing four granules. The cutting edge is almost entire.

**Dactylus in females:** The upper exterior plate is rather flat; the dorsal margin of which is entirely provided with a row of 15 minute denticles, and the ventral one with a row of 10 granules except in the proximal part; those granules on the ventral margin are larger in size than those on the dorsal margin. The inner median carina is indistinctly developed without any granules.

The ovigerous female 30 mm in total length from the Seychelles (USNM 276969) is distinct from the other specimens: The palm of the 1st pereopod bears two rows of anteriorly-directed spines on the



dorsal margin, which are closely arranged to each other, consisting of eight spines on the inner row, and of seven ones on the outer row. The outer surface is scattered with tufts of short hairs, furnished with a conspicuous row of hairs on the dorsal and the ventral margins and the median line.

REMARKS.—The present species closely resembles *U. ceratophora* from the Indopacific region and *U. talismani* from the Atlantic Ocean in that the palm of the 1st pereopod bears three rows of strong spines on the inner surface. However, the present species differs from *ceratophora* in bearing three strong

dorsal spines on the inner distal margin of the carpus of the 1st pereopod.

Disposition of the type series is designated as follows.

Holotype.—1 ♂, 39 mm in total length from Nossi Bé, Madagascar.

Paratype.—2 ♂♂, 3 ♀♀, from the same locality as in the holotype.

Disposition.—Museum nationale d'Histoire naturelle in Paris.

Features in the present species and other two, *ceratophora* and *talismani* are summarized as follows.

<i>plantae</i> sp. nov.	<i>ceratophora</i> DE MAN	<i>talismani</i> BOUVIER
Ventral surface of rostrum medially with 2-4 sharp spines.	Mentioned surface medially with a strong spine, anterior margin of which subdivided into 2-3 spines.	Mentioned surface medially with 3-4 sharp spines.
Dorsal surface of telson depressed in posterior two-thirds, with a median groove.	Mentioned surface depressed in posterior half, with a median groove.	Mentioned surface depressed in posterior two-thirds, with a median groove.
Ventral inner margin of palm in males distally with two strong spines; subterminal spine stronger than terminal one, detached by a wide opening to show a fixed finger.	Mentioned margin distally with three strong spines; terminal spine as large as third one, and defined as a fixed finger.	Mentioned margin distally with two strong spines; terminal spine as large as subterminal one, and defined as a fixed finger.
Upper margin of upper exterior plate of dactylus of 1st pereopod in males with a smooth carina, and in females with a denticulate carina.	Mentioned margin in both males and females denticulate in proximal two-thirds, and them with a smooth carina in distal third.	Mentioned margin in both males and females entirely with a denticulate carina.
Lower margin of upper exterior plate of dactylus of 1st pereopod in males and females granulate.	Mentioned margin in males and females with a smooth narrow carina.	Mentioned margin in males and females with a denticulate carina.
Cutting edge of dactylus of 1st pereopod mostly entire.	Mentioned edge entire.	Mentioned edge with a low convexity in its proximal half.
Inner median carina of dactylus of 1st pereopod granulate in males and smooth in females.	Mentioned carina smooth in both males and females.	Mentioned carina granulate in both males and females.
Inner ventral surface of dactylus of 1st pereopod in males with a low crest along cutting edge in distal half, which bears a triangular tooth near tip.	Mentioned surface ventrally facing to smooth cutting edge.	Mentioned surface with a row of granules along cutting edge in distal half.

25. *Upogebia* (*Upogebia*) *ceratophora* DE MAN 1905

1905 *Upogebia* (*Upogebia*) *ceratophora* DE MAN, Tijdschr. ned. dierk. Vereen. (2)9: 602.

1928 *Upogebia* (*Upogebia*) *ceratophora*, — DE MAN, Siboga-Expeditie, 39a(6): 69, pl. 6 figs. 9-9e.

?1967 *Upogebia* (*Upogebia*) *acanthochela* SAKAI, Res. Crust. Tokyo. 3: 44, pl. 4 fig. 2.

TYPE LOCALITY.—Sumba, Bay of Nangamessi, 36 m deep (Siboga St. 53).

MATERIAL EXAMINED.—Sumba, Bay of Nangamessi, 36 m deep (Siboga St. 53) (1 juvenile syntype, ZMA Siboga coll.). Savu, Anchorage off Seba, 27 m deep (Siboga St. 58) (1 juvenile, probably ♂ syntype, ZMA Siboga coll.). N. W. Australia, Holothuria Bank (1 ♂, 1 ♀, BM).

DIAGNOSIS.—A small-sized species. Rostrum simply projected forward in an elongate triangle, bearing 7-11 lateral denticles and a strong ventral tooth. Lateral frontal process of carapace scarcely protruded forward. Anterolateral margin of carapace with 1-4 spines.

1st pereopod subchelate. Carpus with two sharp spines on inner distal margin. Palm with a spinous row on dorsal margin, and with three rows of strong spines on inner surface. Upper exterior plate of dactylus sulcate, ventral margin of which entirely smooth, while dorsal one denticulate in proximal two-thirds and smoothly carinate in the distal third.

DESCRIPTION.—The rostrum shows an elongate triangle with an obtuse apex. The dorsal surface

is hirsute, provided with a row of 7-11 marginal denticles including 2-3 proximal ones. The ventral surface is medially furnished with a strong triangular tooth, the dorsal or anterior margin of which bears three spines diminishing upward, the uppermost one is rudimentary. The dorsal surface of the anterior thoracic region is anteriorly constricted in breadth, laterally hirsute, and also laterally ornamented with a row of hairs; the median furrow is rather shallowly sulcate, and flanked with a row of 6-8 denticles, extending backward from the middle of the rostrum to the anterior part of the dorsomedian region, and posterior to it a low median carina with a few obscure tubercles is present. The lateral surface of the anterior thoracic region is provided with some spines. The posterior thoracic region bears two spines on the cervical groove above the crossing with the linea thalassinica, and laterally four including a distinct hepatic one. The linea thalassinica reaches the posterior margin of the carapace. The anterolateral margin of the carapace is armed with four spines.

The telson is quadrate; the posterior margin is largely concave in a triangular shape. The dorsal surface is depressed in the posterior half delimited by a slender U-shaped carina; the median groove is undefinable.

The endopod of the uropod shows an elongate triangle, shorter than the telson; the posterior margin is slightly convex, and the anterior lateral margin is almost straight, proximally showing a low triangular corner. The exopod is longer than the endopod.

The antennular peduncle reaches about the level of the distal margin of the penultimate segment of the antenna. The 1st segment bears a strong distal spine on the ventral margin.

The 1st segment of the antenna is armed with a distal spine on the ventral margin, the 2nd with two spines on the dorsal margin, the 3rd with three spines including a strong subterminal one, and the penultimate with 2-3 strong spines on the ventral margin. The scaphocerite is thorn-shaped, bearing a subterminal spine on the ventral margin.

The epistome is triangular with a pointed terminal spine.

The 1st pereopod is subchelate. The coxa bears a sharp spine on the distal margin, otherwise provided with three small spines on the subterminal transverse carina. The merus bears a subterminal spine on the dorsal margin, and entirely a row of 8-9 spines on the narrow ventral surface. The carpus is furnished with two strong dorsal spines on the inner distal margin, the dorsal one is very strong. Following this dorsal spine, the inner dorsal margin is armed with a row of 5 (in the female)-4 (in the male) spines, 1-2 proximal ones of which are less developed. The upper exterior surface is furnished with three long spines, and longitudinally with a row of 7-8 spines just above a median furrow. The outer distal margin bears a few small spines in its dorsal half, and the outer ventral margin a carina

with granules. The ventrodistal spine is rather short.

The chela in the female from *Holothuria* Bank: The palm is entirely ornamented with a row of 12-13 strong spines on the dorsal margin, including a spine at the proximal corner. The outer surface is provided with scattered hairs along the dorsal margin, medially with a row of scanty hair-tufts, longitudinally deflected with a row of tubercles in the lower exterior surface, and with four equidistant granules on the ventral margin. The inner surface is provided with scattered bristles and three rows of strong spines, the upper row of which consists of 8-9 spines, the median of 5-6 and the lower of 6-7, both the median and the ventral ones including a small subterminal spine. In the left cheliped the inner surface additionally bears two strong spines below the dorsal margin. The ventral inner margin is interspaced with three strong spines including the distal one defined as a fixed finger; the distal and the 3rd spines are armed with a distinct spine at their inner proximal part. The fixed finger also bears three small proximal teeth on the cutting edge. The dactylus is terminated by a translucent apex. The upper exterior plate is entirely sulcate, the upper margin of which is provided with a row of 8-10 denticles in the proximal two-thirds, and with a smooth ridge in the distal third, and the lower margin shows a narrow distinct carina without any denticles or granules. The upper interior surface bears two rows of hairs, the upper row of which is rather broad, running along the dorsal margin, and the lower one is medially defined. The inner median carina is obscure. The lower interior surface is smooth, bearing a row of hairs along the cutting edge. The cutting edge is smooth.

The chela in the male from *Holothuria* Bank: The left cheliped is missing. The palm bears a series of 10 strong spines on the dorsal margin, including a spine at the proximal corner. The outer surface is provided with scanty hairs along the dorsal margin, medially in the proximal part, and also on the ventral surface, and is provided with some obscure granules on the ventral margin. The inner surface is arranged with three rows of strong spines; those spines are less in number and shorter than in the female cited above, the dorsal row composed of six spines, the proximal one of which is long, and the others are rather short, the median of six including the subterminal one, and the ventral of five, two distal one of which are small in size. The ventral inner margin is armed with three strong spines including the distal one defined as a fixed finger. The fixed finger bears two small proximal teeth on the cutting edge. The upper exterior plate of the dactylus is sulcate, the upper margin of which is provided with 16 fine denticles in the proximal two-thirds, and with a smooth carina in the distal third. The other characters are almost the same as shown in the female.

REMARKS.—The type specimens brought from Sumba and Savu could be examined by the present author.

Unfortunately both syntypes are juvenile and incomplete in different parts of the body. One syntype from Sumba lacks the chelipeds, while in the other from Savu the rostrum is lost. Out of these reasons it seems undesirable in the moment to select one of them as lectotype, so that both specimens are left in the status of syntypes and are described in some detail as following.

1 juvenile syntype, ca. 10 mm (10.56 mm by DE MAN 1928), from Siboga St. 53, Sumba, 36 m deep (ZMA Siboga coll.).

The rostrum is hirsute on the dorsal surface, bearing a row of seven marginal denticles. The ventral surface is medially carinate with a single strong subterminal tooth. The dorsal surface of the anterior thoracic region bears a median furrow flanked with a row of 7-8 denticles, and posterior to it a short median carina with two rudimentary tubercles. The posterior thoracic region laterally bears a hepatic spine. The anterolateral margin of the carapace is provided with one (in the left)-four (in the right) spines.

The endopod of the uropod is triangular in dorsal view, the anterior lateral margin is slightly concave as a whole, convex around the proximal corner.

The 1st segment of the antennule bears a sharp subterminal spine on the ventral margin.

The 1st segment of the antenna is armed with a rudimentary subterminal spine on the ventral margin the 2nd with a small spine on the dorsal margin only on the left side, the 3rd with a subterminal spine, and the penultimate with one spine on the ventral margin. The scaphocerite is pointed at the tip.

The 1st pereopod is missing except in the coxa. The coxa of the 1st pereopod is provided with a sharp spine on the inner surface, that of the 2nd with 2-3, and that of the 3rd with six small ones.

1 juvenile syntype, ca. 8 mm (8.5 mm by DE MAN 1928), from Siboga St. 58, Savu, up to 27 m deep (ZMA Siboga coll.).

The rostrum is missing. The anterolateral margin of the carapace is unarmed.

The endopod of the uropod shows an oblique narrow fan-shape.

The 1st pereopod in the right side is lost, and that in the left is present, forming a subchela. The merus bears a subterminal spine on the dorsal margin, and a row of five rudimentary interspaced spines on the narrow ventral margin. The carpus bears

two strong dorsal spines on the inner distal margin. Posterior to this spine, the inner dorsal margin is provided with four spines including the rudimentary one at the proximal corner. The upper exterior surface bears three spines, the terminal one of which is long. The palm is armed with a row of eight anteriorly-directed strong spines on the dorsal margin. The outer surface is convex, bearing scanty hairs along the ventral margin. The ventral margin is furnished with some microscopic equidistant granules. The inner surface bears three rows of strong spines, the upper row consisting of three spines, the median of five including a distal distinct one, and the lower of two rudimentary ones. The ventral inner margin is provided with a spine slightly anterior to the midway. The fixed finger is a slender, anteriorly-directed spine, proximally bearing a few minute denticles on the cutting edge. The dactylus is lost at the distal part. The upper exterior plate is deeply sulcate, the upper and the lower margin of which show a distinct smooth carina. The inner surface bears a smooth low carina near the dorsal margin.

The adult specimens from Holothuria Bank, N.W. Australia considered to be the present species are in good accordance with *ceratophora* in the following characters:

1. The lower margin of the upper exterior plate of the dactylus of the 1st pereopod is a smooth, narrow carina.
2. The inner median carina of the dactylus is indistinct and without any tubercles or granules.
3. The ventral margin of the palm of the 1st pereopod bears some equidistant granules.
4. The dorsal surface of the telson is depressed in the posterior half surrounded by a slender U-shaped carina, without a median groove.

In fact, due to the small size of the syntypes some minor characters are different between the present specimens and DE MAN's type series. For example, the present specimens bear much longer and more spines on the carpus and the palm of the 1st pereopod than DE MAN's do, however it is evident that the specimen bearing very long and numerous spines on the chela is a female, and that the male specimen is armed with some reduced spines which are less numerous than in the female.

The minor differences due to individual variation are tabulated below.

Adult specimens from Holothuria Bank	Juvenile specimens from Sumba and Savu
♂ 22 mm in total length and ♀ 30 mm.	Juvenile 10.56 mm from Sumba, and another 8.5 mm from Savu.
Rostrum with three ventral spines.	Rostrum with a single spine (Specimen from Sumba).
1st segment of antenna armed with one distal ventral spine, 2nd with two dorsal ones, 3rd with three, and 4th with 2-3 ventral ones.	1st segment of antenna with a rudimentary ventral spine, 2nd with at least one dorsal one, 3rd with one, and 4th with one ventral one.
Dorsal margin of palm of 1st pereopod with 12-13 (♀) or 10 (♂) strong spines.	Mentioned margin with eight strong spines (specimen from Savu).

Inner surface of palm of 1st pereopod with three rows of strong spines, the upper one consisting of 8-9 (♀) or 6 (♂) spines, the median of 5-6, and the lower of 6-7 (♀) or 5 (♂).

Mentioned surface with three rows of strong spines, the upper row consisting of three, the median of five, and the lower of two rudimentary (specimen from Sumba).

The species *acanthochela* from the Yellow Sea described by the present author in 1967, seems also to be a synonym of the present species, though the author had no access to the type specimens. *acanthochela* has a smooth carina on the lower margin of the upper external plate of the dactylus of the 1st pereopod, and has numerous spines on the inner surface of the palm of the 1st pereopod as in the female specimen from Holothuria Bank, however, there are some differences between them as: 1. In the specimen from the Yellow Sea the upper carina of the upper exterior plate of the dactylus bears only three tubercles in its proximal part, however in the specimen from Holothuria Bank it is denticulate in the proximal two-thirds. 2. In the specimen from the Yellow Sea the rostrum is more elongate than in the specimen from Australia. 3. The location of the depression of the dorsal surface of the telson is also different from each other. Unfortunately a reexamination of the type of *acanthochela* was not possible as mentioned above, so that it remains unclear whether this difference is specific or due to a misdescription. Out of this reason *acanthochela* is identified here only tentatively with the present species. Further investigation will bring more light to this problem.

26. *Upogebia* (*Upogebia*) *pugnax* DE MAN 1905

Fig. 11b, Pls. E4, E6.

- 1904 *Upogebia* sp. aff. *major* BORRADAILE, Fauna & Geogr. Maldive and Laccadive Archipel. 2: 752.  
 1905 *Upogebia* (*Upogebia*) *pugnax* DE MAN, Tijdschr. d. Ned. dierk Vereen, (2)9: 600.  
 1905 *Upogebia* (*Upogebia*) *fallax* DE MAN, Tijdschr. d. Ned. dierk Vereen, (2)9: 601.  
 1928 *Upogebia* (*Upogebia*) *fallax*, — DE MAN, Siboga-Expeditie, 39a(6): 57, pl. 2 fig. 5, pl. 3 figs. 5a-5g.  
 1928 *Upogebia* (*Upogebia*) *pugnax*, — DE MAN, Siboga-Expeditie, 39a(6): 66, pl. 5 figs. 8-8e, pl. 6 fig. 8f.  
 1972 *Upogebia fallax*, — BOZIC and SAINT-LAURENT, Bull. Mus. nation. Hist. nat. Paris. (3e) 29(35): 344.

TYPE LOCALITY.—Soembawa, Sapeh-Bay, 36 m deep (Siboga St. 311).

MATERIAL EXAMINED.—Maldive Is. Mulaku Atoll, 55 m (30 fms) deep (1♂, UMC, only cephalothorax of *U.* sp. aff. *major* BORRADAILE 1904). Indonesia, Samau Island, Haingsisi, 36 m deep (1 juv. ZMA 102 390, holotype of *U. fallax* DE MAN 1905). —, East coast of Sumbawa, Sapeh-Bay, up to 36 m deep (1♀ holotype, ZMA). Japan, Amami-Oshima, Honohoshi, estuary of Sumiyu-river (1♂, UKF 9697). — (1♂, 1♀, UKF 9698). —, Kagoshima-Prefecture, Matsugaura (1♀, UKF 4067). —, Kochi, Urado-Bay (1♂, 1♀, UKF 4357).

DIAGNOSIS.—A small-sized species. Rostrum elongate, simply projected forward, bearing five lateral spines and devoid of ventral spines. Lateral frontal process of carapace defined as a tooth. Anterolateral margin of carapace with a single spine. Telson slightly concave on posterior margin.

1st pereopod subchelate. Carpus with a dorsal and a middle spine on inner distal margin. Palm with a row of 5-8 equidistant spines on dorsal margin, and with a hair line on lower exterior surface. Fixed finger broadly arising downward from ventral distal margin of palm, distal margin of which armed with some thick denticles.

DESCRIPTION.—The rostrum shows an elongate heart-shape with a rounded apex, bearing five lateral denticles (Fig. 11b). The dorsal surface of the anterior thoracic region is anteriorly constricted in breadth, and hirsute; a median furrow is flanked with a row of tubercles, extending backward to the anterior fourth of the dorsomedian region. The lateral frontal process of the carapace is a stout tooth, scarcely projected anteriorly. The lateral longitudinal ridge is armed with a row of 10-12 distinct denticles. The lateral longitudinal groove is noticeable, the anterior gap is narrow. No hepatic spine. The linea thalassinica reaches the posterior margin of the carapace. The anterolateral margin of the carapace bears a single spine.

The telson is broader than long; the lateral margin is concave in the posterior two-thirds, and the posterior margin is slightly concave. The dorsal surface forms a broad U-shaped carina, the lateral longitudinal part extends posteriorly to the posterior fourth of the telson, and the middle portion surrounded by the U-shaped carina is shallowly depressed with a median groove.

The endopod of the uropod shows an elongate triangle, the outer distal angle is rounded. In adult specimens the anterolateral margin is proximally deflected to form a distinct corner, while in young ones that is proximally knobbed. The exopod is always narrow and longer than the endopod.

The antennular peduncle reaches the middle of the terminal segment of the antenna. The proximal segment bears a sharp distal spine on the ventral margin. The terminal segment is long and about four times as long as the penultimate one.

The 2nd segment of the antenna bears a sharp distal spine on the ventral margin. The scaphocerite is pointed at the tip.

The 1st pereopod is subchelate (Pls. E4, E6). The merus is armed with a subterminal tooth on the dorsal margin, and with a row of 8-10 sharp interspaced teeth inside on the ventral margin. The carpus is ornamented with two sharp spines on the inner distal margin, one of which lies at the dorsal

corner and the other at the middle part, and with a medial spine on the dorsal margin. The outer surface bears 1-2 spines on the upper distal margin, and carinate on the ventral margin. The ventrodiscal spine is distinct. The palm is provided with a series of 5-6 anteriorly-directed spines on the dorsal margin. The outer dorsal surface bears a longitudinal low carina near the dorsal margin, and below it a broad and shallow longitudinal furrow with a row of scanty hairs. The outer surface is medially smooth, and bears a row of long hairs in the ventral half, which is distinct in the distal half, merging with another row of long hairs on the ventral margin. The ventral outer margin is arranged with 2-5 irregularly shaped spines in the proximal half, and the ventral inner margin is distinctly concave in the middle part, bearing a sharp spine at the proximal part of the fixed finger. The inner surface is provided with a row of long hairs near the dorsal margin. The fixed finger is broadly developed downward in a triangular form, the frontal margin is broad, and provided with some thick denticles. In young specimens the fixed finger is shortly projected anteriorly. The dactylus is translucent at the tip. The upper exterior surface is medially sulcate, the upper carina is minutely denticulate in the proximal two-thirds, and the lower one is smooth. The lower exterior surface bears two longitudinal rows of long hairs merging into one in the distal

half. The upper interior surface is broad, and provided with two rows of long hairs along the dorsal margin, which are merged with each other in the distal half. The inner median carina is armed with a row of granules except in the distal part. The cutting edge is provided with two small teeth in the middle part.

The palm of the 2nd pereopod is rather long. The dactylus is convex and lanceolate on the upper exterior plate.

REMARKS.—*Upogebia fallax* DE MAN seems to be a juvenile form of the present species. The present author has compared the two type specimens of the species *fallax* and *pugnax*, and found that there are no fundamental differences between those two species, as in the following characters: 1. The shape of the rostrum and the arrangement of the lateral spines. 2. A median furrow on the dorsal surface of the anterior thoracic region. 3. The form of the telson. 4. Distal spines on both the ventral margin of the 1st segment of the antennule and the ventral margin of the 2nd segment of the antenna. 5. The smooth outer median surface of the palm of the 1st pereopod. 6. The sulcate upper exterior plate of the dactylus of the 1st pereopod.

The differences between adult and young specimens may be summarized as follows.

Adult	Young or Juvenile
6th Abdominal segment slightly broader than long.	Mentioned segment longer than broad.
Anterolateral margin of endopod of uropod proximally deflected to form a distinct corner.	Mentioned margin proximally knobbed.
Ventral margin of penultimate segment of antenna without any spines.	Mentioned margin with two spines.
Ventral margin of 2nd segment of antennule only with a terminal spine.	Mentioned margin with a subterminal and a terminal spine.
Palm of 1st pereopod broad.	Palm of 1st pereopod slender.
Dorsal spines of palm of 1st pereopod rather large.	Mentioned spines small.
Fixed finger of 1st pereopod broadly developed downward in a triangular form, anterior margin of which with some thick denticles.	Fixed finger directed anteriorly, bearing a few denticles on cutting edge.
Inner median carina of dactylus of 1st pereopod granulate.	Mentioned carina indistinct.

DE MAN (1905: 601) mentioned in the description of *fallax*: "Telson somewhat less broad than in *Upog. pugnax*, not yet half as long as the 6th (abdominal) somite." and "Exopodite and endopodite of the caudal fan much resembling those of *Upog. pugnax*, but still longer." However, those characters as cited above are considered to be for a juvenile specimen.

The present species is closely related to the species *ceratophora*, *plantae* sp. nov., and *exiqua* in that the rostrum shows an elongate heart-shape, the

dorsal margin of the palm of the 1st pereopod with a row of sharp interspaced spines, the posterior margin of the telson concave, and the endopod of the uropod is oblique on the posterior margin. However, this species is heterospecific among the above-mentioned species, because the anterolateral margin of the carapace bears only one sharp spine, the hepatic spine is not present, and the fixed finger is characteristic in form.

27. *Upogebia (Upogebia) hirtifrons*  
(WHITE 1847)

Figs. 11a, 13c-d, Pls. E7-8.

- 1847 *Gebia hirtifrons* WHITE, Proc. zool. Soc. London. 15: 122.  
 1847<sup>a</sup> *Gebia hirtifrons*, — WHITE, List Crust. Coll. British Mus.: 71 (nomen nudum).  
 1848 *Gebia hirtifrons*, — WHITE, Ann. Mag. nat. Hist. London. (2)1: 225.  
 1874 *Gebia hirtifrons*, — MIERS, Crust. In: Zool. Voy. Erebus & Terror, London.: 4, pl. 3 figs. 5-5a.  
 1907 *Upogebia hirtifrons*, — CHILTON, Trans. Proc. N. Zealand Inst. 39: 457.  
 1927 *Upogebia (Upogebia) hirtifrons*, — DE MAN, Capita zool. 2(5): 45, pl. 5 figs. 17-17b.

TYPE LOCALITY.—South Sea.

MATERIAL EXAMINED.—New Zealand, Manukan (1♂, SMF 4949, specimen of CHILTON, 1907). South Sea (1♀ holotype, BM 44.3).

DIAGNOSIS.—A middle-sized species. Rostrum broadened with a rounded frontal margin, bearing 4-5 lateral denticles. Lateral frontal process of carapace scarcely projected forward. Anterolateral margin of carapace with a single spine.

1st pereopod subchelate. Carpus with two strong teeth on inner distal margin. Palm with a row of 11-12 obtuse, interspaced teeth except in its distal part on dorsal margin, and medially with a row of hair-tufts on outer surface. Upper exterior plate of dactylus broad and convex on surface.

DESCRIPTION.—The rostrum is broadened with a rounded frontal margin, bearing 4 (female holotype)-5 (male, SMF 4949) stout translucently tipped lateral denticles (Fig. 11a). The dorsal surface of the anterior thoracic region is anteriorly constricted in breadth, provided with a median furrow, which is flanked with a row of distinct tubercles convergent posteriorly, extending backward from near the rostral apex to the anterior part of the dorsomedian region. The lateral frontal process of the carapace is scarcely projected forward from the anterior margin of the carapace. The lateral longitudinal ridge bears a row of 11-12 translucently-tipped denticles. The lateral longitudinal groove is noticeable, the frontal gap is narrow and deep, opened outward behind the rostrum. The posterior thoracic region is obscurely denticulate along the cervical groove. The linea thalassinica is shortly defined only at the posterior part of the carapace. The anterolateral margin of the carapace is armed with a spine.

The telson is broader than long; the lateral margin is knobbed at the anterior third, straightly running in the posterior two-thirds, and the posterior margin is largely convex. The dorsal surface shows a U-shaped carina, the lateral longitudinal part of which is slightly broadened, extending posteriorly to the posterior margin of the telson, and the transverse part is smooth and narrow; a median groove is narrow but distinctly defined posterior to the transverse part of the U-shaped carina.

The endopod of the uropod is broader than long, the posterior margin is straight.

The antennular peduncle overreaches the level of the distal margin of the penultimate segment of the antenna, the distal segment is long, and about four times as long as the penultimate one.

The 1st pereopod is subchelate (Pls. E7-8). The merus bears a subterminal spine on the dorsal margin; the ventral outer margin in the female holotype is unarmed, while in the male (SMF 4949) it bears a row of 4-5 interspaced spines in its proximal half. The carpus is armed with three interspaced hair-tufts on the dorsal margin, and with two strong teeth on the inner distal margin, one of which is located at the dorsal corner and the other at the middle part. The outer distal margin bears three short stout teeth in the dorsal half. The ventral outer margin is not carinate but provided with a row of interspaced hair-tufts. The ventrodistal spine is short. The palm is furnished with a row of 11-12 obtuse denticles on the dorsal margin. The upper exterior surface shows a smooth carina near the dorsal margin, the dorsal side of which is armed with a row of interspaced hair-tufts to a whole extent, and also with a row of 4-5 denticles in its distal part, while the ventral one only with a row of interspaced hair-tufts. The outer median surface is longitudinally provided with a row of hair-tufts, the distal one of which lying near the anterior margin is remarkable. The ventral outer margin is beset with long hairs. The upper interior surface is longitudinally furnished with a row of long hairs near the dorsal margin. The inner distal margin is armed with two obtuse spines separated from each other. The ventral distal corner is projected forward to form a fixed finger, which is provided with a distinct tubercle in the proximal part. The dactylus is translucent at the tip (Figs. 13c-d). The upper exterior plate is broad, smooth, and slightly convex on the surface. The lower exterior surface is narrow, and longitudinally beset with two rows of hairs merging into one in the distal half. The upper interior surface is longitudinally provided with two rows of hairs also merging to each other in the distal half. The inner median carina bears a row of 14 (female holotype) or 12 (male, SMF 4949) rounded tubercles, flanked above with a row of hair-tufts. The cutting edge is provided with a low convexity near the proximal corner.

REMARKS.—The original description of this species given by WHITE (1847: 122) is not sufficient, however, the female dried specimen preserved in the British Museum fit what WHITE described in that the specimen is young and its calcification is faint. Therefore, this female specimen has been confirmed as the holotype of the present species. Disposition of the holotype is designated as follows.

Holotype.—1, 31 mm in total length from South Sea.

Disposition.—The British Museum under the catalogue Nr. 44.3 (dried).

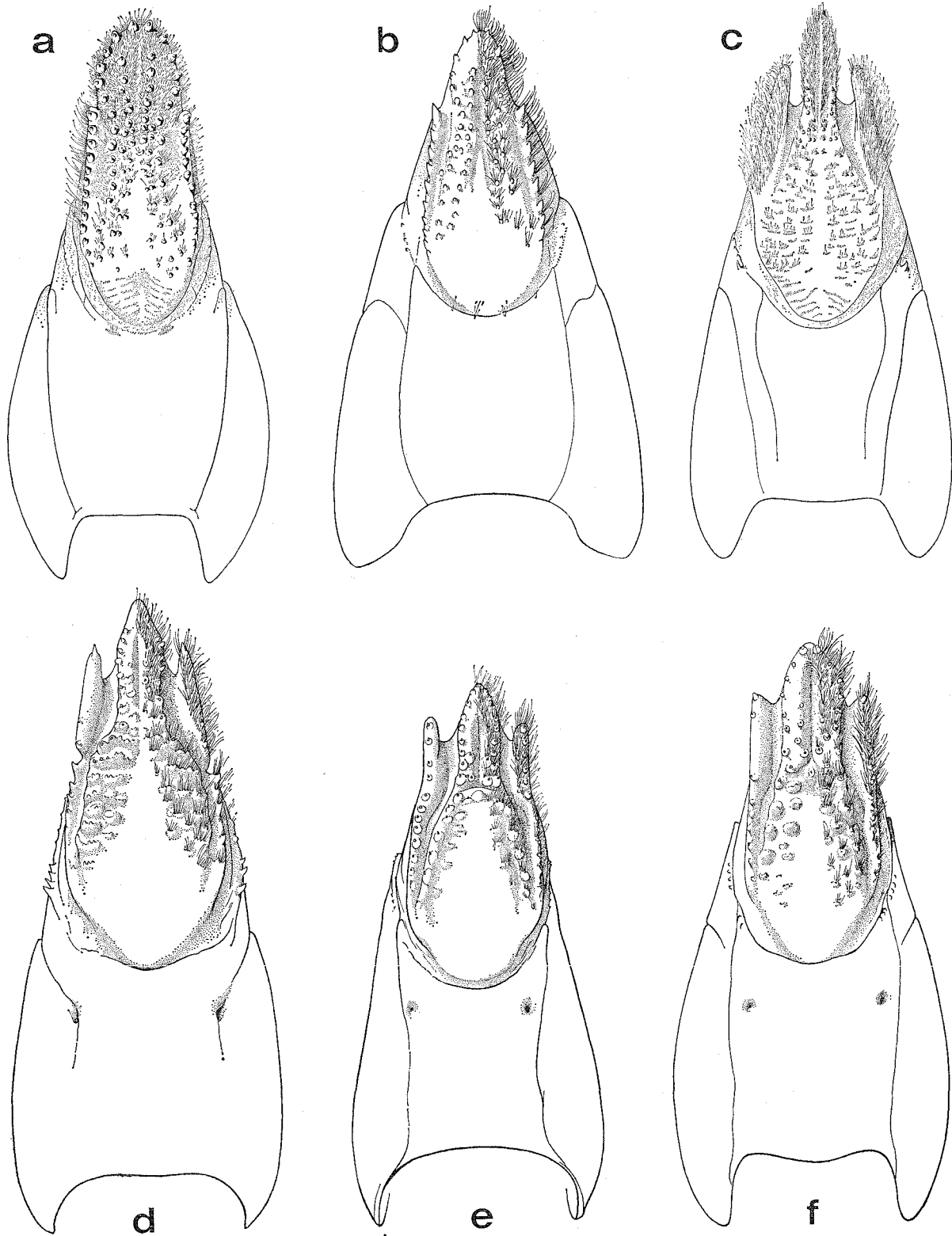


Fig. 11. a. *Upogebia* (*Upogebia*) *hirtifrons*, ♂, SMF 4949, carapace. b. *Upogebia* (*Upogebia*) *pugnax*, ♀, UKF 4767, carapace. c. *Upogebia* (*Upogebia*) *spinifrons*, ♂, MNB 12664, carapace. d. *Upogebia* (*Upogebia*) *wuhsienweni*, ♂, USNM 59072, carapace. e. *Upogebia* (*Upogebia*) *yokoyai*, ♂, UKF 8965, carapace. f. *Upogebia* (*Upogebia*) *imperfecta* sp. nov., ♂, holotype, UKF 9618, carapace.

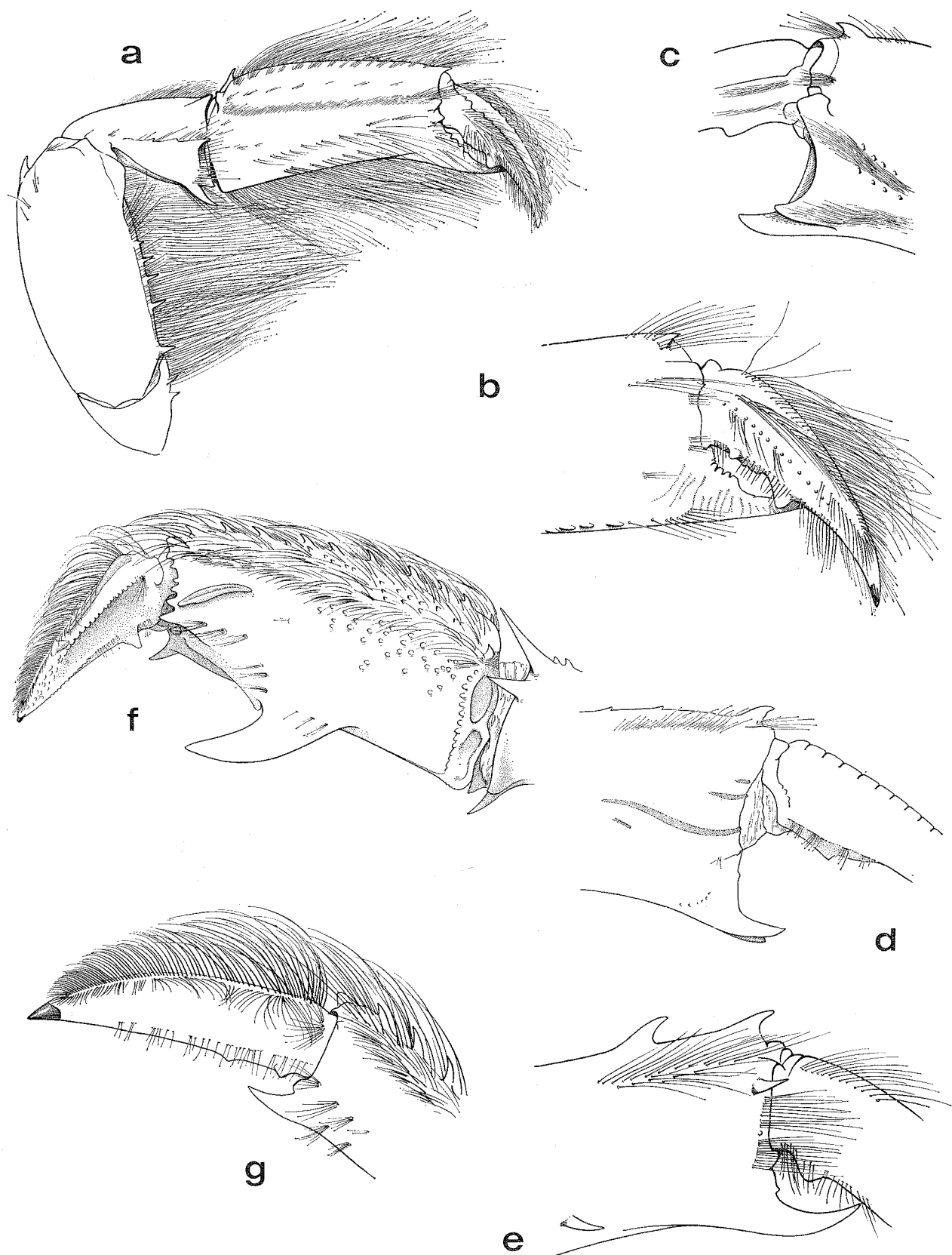


Fig. 12. a. *Upogebia (Upogebia) seychellensis* sp. nov., ♀, holotype, USNM 276969, 1st pereopod, outer view. b. same, chela, inner view. c. *Upogebia (Upogebia) spinifrons*, ♂, MNB 12664, chela, outer view. d. same, chela, inner view. e. same species, ♀, MNB 7491, chela, inner view. f. *Upogebia (Upogebia) wushienweni*, ♂, USNM 59072, chela, inner view. g. same species, ♀, USNM 59071, chela, inner view.



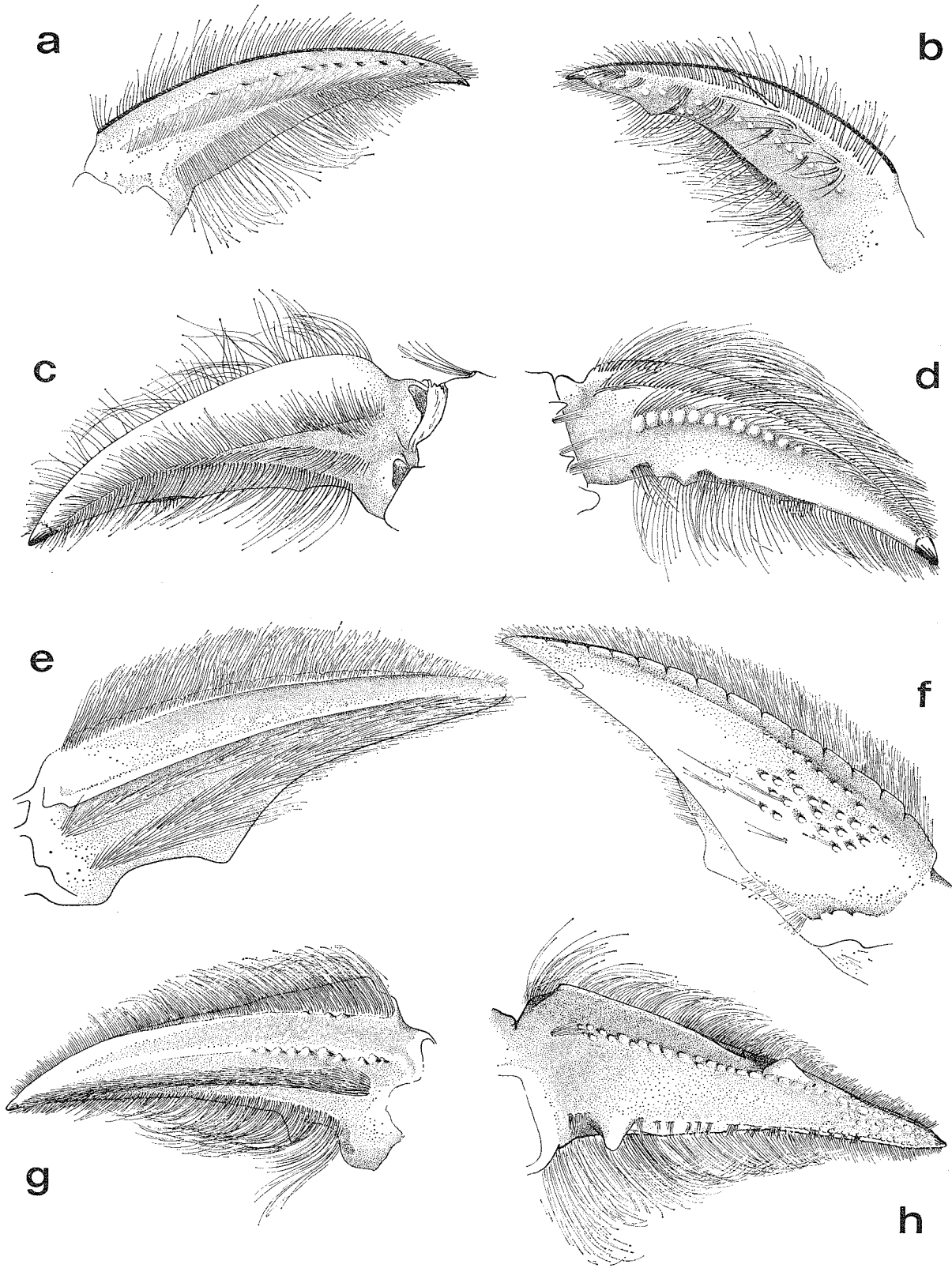


Fig. 13. a. *Upogebia (Upogebia) plantae* sp. nov., ♂, holotype, MP Th, dactylus, outer view. b. same, dactylus, inner view. c. *Upogebia (Upogebia) hirtifrons*, ♂, SMF 4949, dactylus, outer view. d. same, dactylus, inner view. e. *Upogebia (Upogebia) spinifrons*, ♂, MNB 12664, dactylus, outer view. f. same, dactylus, inner view. g. *Upogebia (Upogebia) wushienweni*, ♂, USNM 59072, dactylus, outer view. h. same, dactylus, inner view.

MIERS (1874) gave good figures of the holotype, however, the figure of the telson (pl. 3 fig. 5a) does not show the normal form. It seems likely that MIERS used the dried specimen with a soft crust for his figure. Another specimen preserved in alcohol (SMF 4949) shows that the lateral margin of the telson is straight in the posterior two-thirds, and is not concave in the middle part as MIERS figured it.

CHILTON (1907) gave a description of the present species based on specimens sent to him by SUTER and MACMAHON. The present author had an opportunity to compare one of SUTER's specimens (SMF 4949) with WHITE's type specimen and found that these specimens are without any doubt belonging to the same species and that the telson-character mentioned and figured by MIERS is due to an artefact caused by the drying of the type specimen.

So far as the distribution is concerned, the present species is reported only from New Zealand with certainty, the typical locality "South Sea" being too unclear.

The present species from New Zealand almost agrees with *imperfecta* sp. nov., *issaefi*, and *spinifrons* in that the cutting edge of the dactylus of the 1st pereopod bears a low proximal concavity, that of the fixed finger a distinct tubercle in the proximal part, and the posterior margin of the telson is convex, however, the present species differs from the above-mentioned ones in that the rostrum is broadened, and the frontal gap of the lateral longitudinal groove of the carapace is directed outward just behind the rostrum as in *W. obtifrons* sp. nov. from N. Australia and *W. exigua* from the Andaman Sea.

28. *Upogebia* (*Upogebia*) *spinifrons*  
(HASWELL 1882)

Figs. 11c, 12c-e, 13e-f, Pls. F1, F3.

1882 *Gebia spinifrons* HASWELL, Proc. linn. Soc. N. S. W. 6: 762. (=1882<sup>a</sup> Cat. Stalk- and Sessile-Eyed Crust. Sydney.: 165, pl. 3 fig. 5).

1927 *Upogebia* (*Upogebia*) *spinifrons*, — DE MAN, Capita zool. 2(5): 53, pl. 6 figs. 20-20e.

TYPE-LOCALITY.—Port Stephens, Australia.

MATERIAL EXAMINED.—Gulf of Aden, Aden, Obock and Perim (1♀, MP Th 436, determined by NOBILI 1905 as *Gebiopsis darwini*). S.W. Australia, Port Stephens, 8 fms deep (1♀ holotype, AMS 1544). Malacca (1♀, MNB 7491). Formosa, Takao (1♂, MNB 12664).

DIAGNOSIS.—A middle-sized species. Front of carapace trilobed. Rostrum elongate, hirsute, without any lateral denticles, and with 2-5 compressed ventral teeth. Lateral frontal process of carapace also elongate, hirsute, with a subterminal denticle on dorsal surface, and with 1-2 ventral teeth. Dorsal

surface of anterior thoracic region anteriorly tuberculous and posteriorly with transverse rows of hairs. Hepatic spine present. Anterolateral margin of carapace with three sharp spines. Telson convex on posterior margin.

1st pereopod subchelate. Carpus with two spines on inner distal margin. Palm in males with a row of 4-5 equidistant teeth plus a distinct terminal tooth on dorsal margin, and in females with a row of 6-8 sharp teeth; inner surface in males characteristically with two translucent longitudinal ridges distally.

DESCRIPTION.—The rostrum is narrowly projected with an obtuse apex (Fig. 11c). The dorsal surface is hirsute, and devoid of denticles, while the ventral one is keeled with 2-5 sharp compressed teeth. The dorsal surface of the anterior thoracic region is anteriorly constricted in breadth, scarcely hairy but tuberculous, and posteriorly broadened, scattered with transverse rows of hairs; the median furrow is distinctly definable, extending from near the rostral apex to the anterior part of the dorsomedian region. The lateral frontal process of the carapace is narrowly projected anteriorly, separated by a distinct incision from the rostrum, bears a subterminal denticle on the dorsal surface and 1-2 ventral teeth; the outer lateral margin is longitudinally projected outward. The lateral longitudinal groove is deep, divergent posteriorly in the posterior half. The lateral surface of the anterior thoracic region is provided with some denticles. The posterior thoracic region is flanked with a row of spinules along the cervical groove. The hepatic spine is distinct. The linea thalassinica is subdivided into some branches in the middle part, extending backward to the posterior margin of the carapace. The anterolateral margin of the carapace bears three sharp spines gradually increasing in size dorsally.

The telson is broader than long; the lateral margin is convergent backward in the posterior two-thirds, and the posterior margin is broadly convex. The dorsal surface is medially depressed, marked by a U-shaped carina, the transverse part of which is furnished with scanty hairs, and the lateral longitudinal part is represented as a broad crest in the anterior two-thirds; the median groove is distinct posterior to the transverse part of the U-shaped carina.

The endopod of the uropod is slightly shorter than the telson; the posterior margin is broad, slightly concave in the outer half, and the outer lateral margin is largely concave, bearing a remarkable knob at the proximal corner. The exopod is much longer than the endopod.

The antennular peduncle distinctly overreaches the level of the distal margin of the penultimate segment of the antenna. The proximal segment bears a small ventrodistal spine. The terminal segment is about three times as long as the penultimate one. The superior flagellum is shorter than the inferior one, and about as long as the peduncle.

The third segment of the antenna bears a distinct subterminal spine. The scaphocerite is rounded at the tip.

The epistome is subdivided into two strong spines at the tip.

The 1st pereopod is subchelate (Pls. F1, F3). The merus bears 1-2 subterminal spines on the dorsal margin, and is provided with 5-11 interspaced spines on the ventral outer margin, which are stronger and more numerous in females than in males. The carpus bears two spines on the inner distal margin, one of which lies at the dorsal corner, and the other beneath the dorsal one. The inner dorsal margin is ornamented with 1-3 spines. The outer distal margin is provided with a few spines in females, while with a few granules in males. The palm and the dactylus are characteristic by both sexes.

In males: The palm is oblong in outer view. The dorsal margin is scarcely carinate, bearing a row of 4-5 low teeth plus a distinct terminal tooth. The exterior surface bears a row of soft hairs near the dorsal margin, is medially furnished with a row of soft hairs, and also medially with some tubercles in the anterior half. The lower exterior surface is longitudinally deflected inside with a row of hairs. The inner surface is longitudinally provided with a row of soft thick hairs near the dorsal margin, and characteristically with two translucent longitudinal ridges in the distal part (Fig. 12d). The cutting edge of the fixed finger is largely deflected downward at the base, bearing a large blunt outer tooth near the proximal part (Fig. 12c). The dactylus is obtuse and not translucent at the tip (Figs. 13e-f). The upper exterior plate is slightly sulcate to a whole extent, the upper and the lower margin are conspicuously carinate in the proximal part. Along the dorsal margin of the upper exterior plate there is a thick hair-band, the proximal half of which is facing to the outer surface, while the distal half to the inner surface due to a torsion. The lower exterior surface bears two rows of hairs merging in each other in the distal half, leaving a small interspace with a row of some granules in the proximal half. The inner surface is provided with a row of distinct square-shaped granules on the dorsal margin, and medially scattered with granules in the proximal half. The cutting edge bears a low broad tooth near the proximal corner.

In females: The palm is slender. The dorsal margin is ornamented with a row of 6-8 sharp distinct spines. The outer surface longitudinally bears a row of hairs in the middle line, in parallel to which the lower exterior surface is beset with another row of hairs. The ventral margin is provided with a small inner spine about at the middle part. The inner surface is longitudinally armed with a row of hairs along the dorsal margin (Fig. 12e). The fixed finger is shortly projected anteriorly, and unarmed on the cutting edge. The upper exterior plate of the dactylus is sulcate, the lower margin distinctly carinate. Along the dorsal margin of the upper exterior plate there is a hair-band as in males.

The lower exterior surface is provided with two rows of hairs merging in each other in the distal half. The inner surface is smooth on the dorsal margin. Just below the dorsal margin the inner surface bears a row of hairs. The cutting edge is armed with a small triangular tooth near the proximal corner.

In the 2nd pereopod the merus bears 1 (in males)-4 (in females) subterminal spines on the dorsal margin, and 5-6 (in males) small or 7-9 (in females) sharp spines on the ventral margin, the proximal end anteriorly projected beyond the ischium, bearing 2-4 sharp spines. The propodus is high, slightly constricted distally.

REMARKS.—This species is characterized by the following points, that is, the rostrum is elongate, and the ventral surface of the rostrum, the antero-lateral margin of the carapace and the dorsal margin of the palm are respectively provided with spines, so that the present species is similar to *W. exigua* *U. wuhsienweni*, *U. ceratophora* and *U. plantae* sp. nov. However, this species is more closely related to *U. wuhsienweni* from Formosa than the others, because in both species the exopod of the 3rd maxilliped consists of 2-3 segments, the lateral frontal process of the carapace is armed with sharp ventral teeth, and the posterior margin of the telson is convex. Especially in the males the inner surface of the palm of the 1st pereopod bears a translucent longitudinal ridge in the distal part.

## 29. *Upogebia* (*Upogebia*) *wuhsienweni* YU 1931 \*

Figs. 11d, 11f-g, 13g-h, Pls. G1-2.

- 1931 *Upogebia Wuhsienweni* YU, Bull. Fan mem. Inst. Biol. 2(6): 89, Text-fig. 2.  
 1934 *Upogebia major*, — TAKAHASHI, Hakubutsugaku-Zasshi (=Miscellaneous Reports of Natural Science), 32(51): 20, text-figs. 1-4.  
 1935 *Upogebia wuhsienweni*, — LIU, Economic shrimps North China, Peking. : 68, pl. 24 figs. 7-12.

TYPE LOCALITY.—Chiao-Chou Bay, North-China.

MATERIAL EXAMINED.—China, Yen-t'ai (=Chefoo) (1♂, 1♀, MP Th). —, Guantao near Foochow (1♀, USNM 83534). —, Hsia-men (=Amoi) (1♂, 2♀♀, USNM 83534). Formosa, Taichu, Ohkoshoh (1♀, USNM 59070). — (1♀, USNM 59073). —, Taichu, Daito-Prov. (1♀, USNM 59071). —, Tainan (1♂, USNM 59072).

DIAGNOSIS.—A middle-sized species. Front of carapace trilobed. Rostrum showing an elongate heart-shape with 3-6 lateral denticles, and with 3-5 ventral teeth. Lateral frontal process of carapace anteriorly projected with 1-5 ventral spines. No hepatic spine. Linea thalassinica present only in anterior thoracic region. Anterolateral margin of carapace with 3-6 spines.

1st pereopod subchelate. Carpus with two

\* USNM material examined Dec 89: ventral rostral spines are small, slender, rounded  
 & lateral rostral lobes. Ventral rostral spines are small serrations, different from

dorsal spines on inner distal margin. Palm with a row of 9-11 equidistant teeth on dorsal surface; outer surface medially with a hair-line or -band plus a distinct hair-tuft near distal margin, and inner surface in males with a translucent longitudinal ridge in distal fourth. Fixed finger in males strongly arising from middle of ventral inner margin, while that in females at ventrodistal angle of palm.

**DESCRIPTION.**—A large genital opening in males and females lies in the coxa of the 3rd pereopod, so that the sexuality is not to be decided by its position. For convenience' sake, the state of the 1st abdominal pleopod is used for sexual determination.

The front of the carapace is trilobed. The rostrum shows a short heart-shape with a rounded tip (fig. 11d), while that in the larger male from southern Formosa (USNM 59070) an elongate one. The dorsal surface is hirsute, and bears a row of 3-6 translucently-tipped lateral denticles. The ventral surface is medially carinate with 3-5 small teeth. The dorsal surface of the anterior thoracic region is scabrous, studded with hair-tufts, constricted in breadth in the anterior third (in males) or in the anterior half (in females), provided with 3-6 translucently-tipped lateral denticles, and broadened in the posterior two-thirds (in males) or in the posterior half (in females); the median furrow extends backward from near the rostral tip to the base, or that in the larger male from southern Formosa to the anterior fourth of the dorsomedian region. The lateral frontal process of the carapace is anteriorly projected with 1-5 sharp ventral spines. The lateral longitudinal ridge in males shows a thick carina in the anterior half, which is hirsute and provided with two spines including a sharp distal one, and posterior to it a narrow carina in the posterior half, which is provided with a row of some denticles, while that in females is entire, provided with a row of eight translucently tipped denticles. The lateral longitudinal groove is broad in the anterior half. The lateral surface of the anterior thoracic region is armed with some denticles. The posterior thoracic region is laterally denticulate along the cervical groove. No hepatic spine is present. The linea thalassinica is definable only in the anterior thoracic region. The anterolateral margin of the carapace bears 3-6 sharp spines.

The telson is broader than long, the lateral margin is concave in the posterior half, and the posterior margin is largely convex. The dorsal surface is slightly depressed in the middle portion, in which the median groove is almost undefinable.

The endopod of the uropod is about as long as the telson, the posterior margin is slightly concave, and the outer lateral margin is conspicuously (in males) or slightly (in females) projected outward at the posterior corner, and is distinctly knobbed at the proximal one. The exopod overreaches the endopod, proximally armed with an indistinct tooth. The protopod bears also a sharp tooth.

The antennular peduncle is unarmed, failing to

reach the distal margin of the terminal segment of the antenna. The terminal segment is about four times as long as the penultimate one.

The 3rd segment of the antenna bears a small subterminal spine. The scaphocerite is leaf-like with a truncate tip.

1st pereopod in males (Pls. G1-2): The basis bears a truncate tooth at the ventroproximal part. The merus is armed with a subterminal spine on the dorsal margin, and with a row of 7-10 spines on the ventral outer margin. The carpus bears two strong dorsal spines on the inner distal margin. The dorsal margin, the outer distal margin in the upper half, and the ventral outer margin are respectively denticulate. The ventrodistal spine is strong. The palm is broadened on the dorsal surface, hirsute, and medially provided with a row of 9-10 short interspaced teeth to a whole extent. The outer surface shows a faint sulcus along the dorsal margin, below it longitudinally two rows of hair-tufts, and is medially provided with a distinct soft hair-band in the proximal two-thirds, and anterior to it with a distinct subterminal hair-tuft. The lower external surface is longitudinally deflected outward, armed with a row of granules and also with soft hairs along the ventral margin. The outer distal margin bears a spine just below the articulation. The upper interior margin is ornamented with a smooth crest in the distal part, and also with a row of small granules in the remaining part. Along the dorsal margin the inner surface bears a broad, shallow sulcus with soft hairs, and below it is studded with granules in the proximal three-fourths, and also armed with a translucent longitudinal carina in the distal fourth (Fig. 12f), which is inclining distally. The inner distal margin bears 4-5 interspaced denticles, the ventral one of which is rather long in size. The fixed finger is strongly arising from the middle part of the ventral inner margin. The dactylus shows an yellow translucent apex (figs. 13g-h). The upper exterior plate forms a narrow longitudinal median furrow, the dorsal and the ventral margins of which in the larger male from southern Formosa are provided with granules in the proximal part. Above the upper exterior plate there is a row of hairs. The lower exterior surface bears two rows of soft hairs merging in each other in the distal half, between which a tuberculous carina lies in the proximal half. The inner dorsal margin is yellow-translucently carinate in the proximal two-thirds, declining distally and terminated with a triangular translucent tooth. Above the inner dorsal margin a row of hairs is located. The inner median surface is concave, and bears a row of small granules near the dorsal margin. The cutting edge bears a distinct inner tooth near the proximal end.

Smaller individuals in males: The longitudinal ridge of the carapace is armed with a row of seven denticles in the anterior half. The basis of the 1st pereopod bears a sharp spine on the ventral proximal surface as in females. The fixed finger is arising from the ventrodistal corner of the palm. The

inner dorsal margin of the dactylus shows a carina in the proximal two-thirds, which is not provided with a distal tooth.

1st pereopod in females: The basis bears a strong spine in the ventral proximal part. The carpus is less spinous than in males. The palm is distally constricted in breadth. The dorsal margin is hairy, and provided with a row of 9-11 short teeth. The upper exterior surface is sulcate near the dorsal margin, and below it bears a low carina, the dorsal and the ventral margin of which are implanted with hair-tufts. The outer median surface is beset with a hair-line in the proximal three-fourths, and anterior to it with a distinct subterminal hair-tuft. The lower exterior surface is roundly deflected, longitudinally bearing a row of hairs. The outer distal margin is armed with a small spine just below the articulation. The inner surface is roughly implanted with long hairs along the dorsal margin. The inner median surface is scattered with some hair-tufts, but bears no distal ridge as in males. The fixed finger (Fig. 12g) is arising from the ventrodistal corner of the palm. The cutting edge bears an obscure proximal tubercle. The dactylus is translucent at its apex. The upper exterior plate is medially sulcate. Above the upper exterior plate there are two rows of hairs entirely merging in each other. The lower exterior surface bears two rows of hairs merging in each other in the distal half, and between them a carina in the proximal part. The inner dorsal margin shows a smooth broad swelling except in the proximal part, above which a hair-line is situated. The inner median surface is furnished with a distinct hair-tuft near the proximal end. The cutting edge bears two small teeth in the proximal half.

The 1st pleopod is lacking in males, while two-segmented in females.

REMARKS.—The present specimens examined are identified with the species *wuhsienweni* from China by following characters mentioned by YU (1931: 89). 1. Lower surface of rostrum with 2 (♂) or 3 (♀) small sharp spines. 2. Lower surface of lateral frontal lobe (=the lateral frontal process of carapace) with 2 small spines, followed by 6 unequal-sized spines on lower margin (=the anterolateral margin) of carapace. 3. Upper border (of the palm of the 1st pereopod) bearing a spine at its distal end and 8 (♀) equidistant ones in two thirds of its length or 10 (♂) in nearly its whole length.

Concerning numbers and arrangement of spines on the dorsal margin of the palm of the 1st pereopod in males, it seems that Yu's specimens show some individual variations, that is, in the present specimens the dorsal margin of the palm in both males and females is usually armed with short but strong spines to a whole extent.

Later LIU (1955: 68) described this species and figured it in detail. He noticed the sexual dimorphism in some characters, and pointed out that: 1. The inner surface of the palm of the 1st pereopod

medially bears a slightly decurved carina in the distal part only in males. 2. The ventral outer surface of the palm of the 1st pereopod is provided with a row of spinules along the ventral margin (=not showing a true ventral margin but a deflected surface) only in males. 3. The inner dorsal margin of the dactylus of the 1st pereopod forms a carina which is terminated by a rounded process only in males.

Those characters mentioned above are very useful to identify the present species, however, YU did not describe them in his original text.

### 30. *Upogebia* (*Upogebia*) *shenchiajuui* YU 1931

1931 *Upogebia Shenchiajuui* YU, Bull. Fan memor. Inst. Biol. 2(6): 85, text-fig. 1.

TYPE-LOCALITY.—Chiao-Chou Bay, northern China.

REMARKS.—So far as this species is concerned, the material is not accessible to the author in this revision, however, the species *shenchiajuui* is seemingly very characteristic from the other species as YU (1931: 85) mentioned: 1. Anterior part of upper surface of gastric region with a row of tubercles on each side of a narrow median longitudinal groove which is continuous with median longitudinal groove of rostrum.... 2. its outer surface (of the dactylus of the 1st pereopod) bearing a row of flattened tubercles (on the ventral margin of the upper exterior plate).

However, it seems likely that the species *shenchiajuui* is related with the species *yokoyai* from Japan and its southern islands in that: 1. The merus of the 1st pereopod bears seven outer spines on the ventral margin. 2. The cutting edge of the dactylus bears two large blunt teeth in its proximal part, and is denticulate in the rest part. 3. Arrangement of granules on the inner surface of the dactylus is similar to *yokoyai*.

### 31. *Upogebia* (*Upogebia*) *yokoyai* MAKAROV 1938

Figs. 11e, 15a-b, Pls. B2, F2.

1930 *Gebia affinis* YOKOYA, Sci. Rep. Tohoku Univ. Biol. 5: 544, text-fig. 5 (primary homonym of *Gebia affinis* SAY 1817).

1938 *Upogebia* (*Upogebia*) *yokoyai* MAKAROV, Crust. In: Fauna U.S.S.R. 10(3): 57, text-fig. 18.

1978 *Upogebia* (*Upogebia*) *yokoyai*, — SAKAI, Jour. Seika Women's Jr. Coll. 1: 47, text-figs. 1E-F.

TYPE LOCALITY.—Japan, Mutsu Bay, Asadokoro.

MATERIAL EXAMINED.—Japan, Hiroshima, estuary of Ohta-river (1♂, UKF 8965). —, Nagasaki Prefecture, off Shimabara (1♂, 1♀, UKF 3650). —, Amami-Oshima, Honohoshi, at the estuary of Sumiyoriver (1♂, UKF 9700). —, Ryukyu-Archipelago, Iriomote I. (3♂♂, SMF 7801).

DIAGNOSIS.—A middle-sized species. Front of carapace trilobed. Rostrum triangular with an obtuse apex ornamented with a denticle, bearing 3-4 lateral denticles. Dorsal surface of anterior thoracic region with a transverse furrow at anterior fourth of dorsomedian region. Anterolateral margin of carapace with 1-2 spines.

1st pereopod subchelate. Palm in males broadened on dorsal margin, furnished with a stout, anteriorly directed distal spine and a small upward-directed proximal one, and that in females bearing a smooth carina on dorsal margin, provided with a small dorsally directed proximal spine. Dactylus sulcate on upper exterior plate, inner surface medially carinate with tubercles, and cutting edge proximally with two large teeth, otherwise denticulate.

DESCRIPTION.—The rostrum shows a triangle with an obtuse apex ornamented with a denticle, bearing 3-4 lateral denticles (Fig. 11e, Pl. B2). The ventral surface is slightly convex. The dorsal surface of the anterior thoracic region in the anterior fourth is constricted in breadth, and that in the posterior three-fourths is broadened, laterally armed with denticles; the median furrow is broad, shallow, extending from near the rostral tip to a distinct transverse furrow located at the anterior fourth of the dorsomedian region. The lateral frontal process of the carapace is shortly projected anteriorly. The lateral longitudinal ridge in the anterior third is slightly convergent posteriorly, thick, hirsute, and provided with 4-6 denticles, and that in the posterior two-thirds is slightly divergent posteriorly, narrow, and armed with some denticles. The lateral longitudinal groove is deep, divergent backward. The posterior thoracic region is laterally denticulate along the cervical groove. The linea thalassinica extends down to near the posterior margin of the carapace. The anterolateral margin of the carapace is furnished with 1-2 spines.

The telson is slightly broader than long, the posterior margin is notched at the midway. The dorsal surface is marked with a U-shaped carina, the transverse part of which is obscure, roundly curved at its outer angle; the median groove is slightly definable only posterior to the transverse part of the U-shaped carina.

The endopod of the uropod is shorter than the telson, the posterior margin is straight and continuous with a rounded outer posterior corner to the outer lateral margin which is slightly concave. The exopod is as long as the endopod, proximally bearing a spine. The protopod is also armed with a spine.

The epistome is bispinous.

The antennular peduncle overreaches the level of the distal margin of the penultimate segment of the antenna.

The 3rd segment of the antenna bears a subterminal ventral spine. The scaphocerite is leaf-like.

The exopod of the 3rd maxilliped bears no distal flagellum.

The 1st pereopod is subchelate, showing sexual dimorphism in several parts.

1st pereopod in males (Pl. F2): The merus bears a rudimentary subterminal spine on the dorsal margin, and a row of 4-6 interspaced teeth in the proximal half on the ventral outer margin. The carpus is provided with two spines on the inner distal margin, one of which is situated at the dorsal corner and the other at the middle. The inner dorsal margin is carinate with denticles. The ventrodistal spine is stout. The palm is broadened on the dorsal margin, the inner margin of which is denticulate, provided with a stout anteriorly directed tooth at the distal end and also with a small sharp dorsally directed one at the proximal end. The upper exterior surface is broadly sulcate along the dorsal margin, and below it longitudinally bears a low smooth carina, the upper and the lower margin of which are flanked with hairs. The outer median surface is obliquely beset with a row of interspaced short hair-tufts, which is distally declined downward near the distal margin. The inner surface bears a row of long hairs near the dorsal margin. The distal margin is armed with a short stout tooth beneath the articulation. Beneath this spine the fixed finger is arising from the ventrodistal angle of the palm, which is stout and entire on the cutting edge. The dactylus is yellow and translucent at the tip (Fig. 15a-b). The upper exterior plate is medially sulcate, the dorsal margin of which forms a smooth carina, and the ventral one shows a smooth carina in its distal half and a tuberculous one in its proximal half. The lower exterior surface is beset with two rows of hairs merging with each other in the distal half. Above the upper exterior plate there are two rows of hairs merging with each other in the distal half, between them irregularly arranged with some distinct granules in the proximal half. The inner dorsal margin is carinate with 4-8 interspaced granules. The upper interior surface is longitudinally provided with five tufts of long hairs. The inner median surface is carinate with irregularly-arranged granules, 1-3 proximal ones of which are more distinct than the others. The cutting edge bears two large obtuse teeth in the proximal part, otherwise it is denticulate.

1st pereopod in females: The merus bears a sharp subterminal spine on the dorsal margin. The carpus is ridged on the inner dorsal margin. The palm is rather slender than in males. The dorsal margin shows a low smooth carina, bearing only a small dorsal tooth at the proximal end. The fixed finger is rather slender and anteriorly projected, bearing a small proximal tooth on the cutting edge. The upper exterior plate of the dactylus is slightly sulcate, the dorsal margin of which is scarcely carinate, but the ventral margin is provided with a row of interspaced granules. The inner dorsal margin is more granulate than in males. The inner median surface bears no granules. The cutting edge is furnished with 1-2 large obtuse teeth in the proximal part, otherwise it is roughly denticulate in

the remaining part.

REMARKS.—The present species was firstly described as new by YOKOYA (1930: 544) under the name of *G. affinis*, however, later MAKAROV (1938: 57) pointed out that YOKOYA's name is a homonym of *Gebia affinis* SAY 1817 and established the new name *yokoyai* for the species. The author has not examined the type specimens of YOKOYA as his description and figure are satisfying and the specimens examined are without doubt identical with YOKOYA's species as: 1. "In these carinae the medial one (=the dorsal margin of the palm of the 1st pereopod)...is guarded with strong tooth on each of the proximal and the distal ends of the carina" (YOKOYA 1930: 546). 2. "The anterior prolongation of the propodus of the plex (=fixed finger) is armed with a strong triangular tooth at the base of the inner margin" (YOKOYA l.c.). 3. "The dactylus or the movable finger is provided with three rows of tubercles" (YOKOYA l.c.).

So far as the sexual dimorphism of the 1st pereopod is concerned, YOKOYA did not notice it, however, the above-mentioned characters and the figure of the 1st pereopod of YOKOYA (1930: 545, text-fig. 5d) are right only for males and distinctly different in some features from the other Japanese species *major* and *issaefi*.

### 32. *Upogebia (Upogebia) imperfecta* sp. nov.

Figs. 11f, 15c-d, Pls. B3, F4, F6.

1968 *Upogebia (Upogebia) issaeffi*, — SAKAI, Jour. Seika Women's Jr. Coll. 1: 47 (partim), text fig. 1D.

TYPE LOCALITY.—Yellow Sea, 36°02'N, 121°56'E, 50 m deep.

MATERIAL EXAMINED.—Yellow Sea, 35°02'N, 121°56'E, 50 m deep (1♂ holotype, UKF 9618, determined by SAKAI as *U. issaeffi*).

DIAGNOSIS.—A large-sized species. Front of carapace trilobed. Rostrum broadly triangular, and with three lateral denticles and two small ventral teeth. Anterolateral margin of carapace with a single spine.

1st pereopod subchelate. Carpus with two spines on inner distal margin. Palm medially with a hair-line on outer surface. Fixed finger with a distinct outer and a small inner tooth on cutting edge. Inner surface of dactylus translucently carinate on its dorsal margin, and below it with two rows of granules.

DESCRIPTION.—The rostrum shows a broad triangle with a rounded apex, bearing three translucent lateral denticles (Fig. 11f, Pl. 3B). The ventral surface is obscurely carinate with two small teeth, the proximal one of which is rudimentary. The dorsal surface of the anterior thoracic region is longitudinally provided with four rows of denticles, constricted in breadth in the anterior two-fifths, and broadened in the posterior three-fifths; the median furrow is

broad, extending from near the rostral tip to the anterior fourth of the gastric region, and posterior to it there is a denticle. The lateral frontal process of the carapace is projected anteriorly. The lateral longitudinal ridge is rather straight on its outer margin armed with a row of 10 denticles including a distinct distal one, the anterior half of which is broad and hirsute, while the posterior half is narrow and sparsely hairy. The lateral longitudinal groove in the anterior half is broad and deep, while in the posterior half is narrow and divergent backward. The lateral surface of the anterior thoracic region is unarmed. The posterior thoracic region is laterally provided with minute denticles. The linea thalassinica is indistinctly defined in the anterior half of the posterior thoracic region. The anterolateral margin of the carapace bears a stout tooth.

The antennular peduncle reaches the middle of the distal segment of the antenna. The proximal segment bears a subterminal spinule. The terminal segment is about four times as long as the penultimate one.

The 3rd segment of the antenna is furnished with a distinct subterminal spine. The scaphocerite is leaf-like.

The epistome is bidentate.

The 1st pereopod is subchelate (Pls. F4, F6). The coxa bears a minute spine. The merus is ornamented with a subterminal spine on the dorsal margin, with a row of distinct teeth on the ventral inner margin and a row of small denticles in the distal half on the ventral outer margin. The carpus bears two strong teeth on the inner distal margin. The inner dorsal, the outer dorsal and the ventral outer margins are respectively armed with distinct denticles. The ventrodistal tooth is rather small. The palm is distinctly denticulate on the dorsal margin, the subterminal denticle of which is well developed in size. The outer median surface is longitudinally provided with a row of hair-tufts distally deflected downward. The ventral outer surface is scattered with some denticles and long hairs. The outer distal margin bears a stout tooth beneath the articulation with the dactylus. The ventral margin is armed with three distinct denticles in the proximal part, and distally with a tooth at the base of the fixed finger. The inner surface is longitudinally furnished with a row of denticles and long hairs near the dorsal margin. The inner distal margin bears a spine beneath the dorsal corner. The fixed finger bears a stout outer and a rudimentary inner tooth at the proximal third on the cutting edge. The dactylus is yellow and translucent at the apex (Figs. 15c-d). The upper exterior plate is rather narrow, the dorsal margin of which is slightly carinate, bearing a row of eight interspaced denticles in its distal half, and the ventral margin is also carinate, bearing nine granules in its proximal half. The lower exterior surface is provided with two rows of hairs merging with each other in the distal half, and between them with a row of six granules in the proximal half. Above the upper exterior plate there are two rows of hairs



merging with each other in the distal half. The inner surface is yellow-translucently carinate on the dorsal margin, proximally bearing two truncate teeth also with a translucent tip, and below it provided with a row of 13 distinct rounded granules. The inner surface is medially furnished with another row of 11 large granules obliquely running distally from the dorsal proximal corner. Between these granulous rows there is a row of five hair-tufts. The cutting edge bears a low truncate tooth in the proximal half, otherwise it is smooth.

The abdomen and the tail-fan are absent.

REMARKS.—The present species is closely related to the species *issaeffi* in that. 1. The characters of the carapace. 2. The fixed finger of the 1st pereopod bears a distinct outer and a small inner tooth on the cutting edge. 3. In males the inner surface of the dactylus is yellow-translucently carinate on the dorsal margin, and below it bears a row of tubercles. However, the present species is readily distinguished from *issaeffi* as tabulated below.

<i>imperfecta</i> sp. nov. (♂)	<i>issaeffi</i> (BALSS) (♂)
Larger species.	Middle-sized species.
Rostrum with two small interspaced teeth on ventral margin.	Mentioned part unarmed.
Coxa of 2nd pereopod with a large spine.	Mentioned part with a small spine.
Dorsal margin of palm of 1st pereopod denticulate to a whole extent.	Mentioned part smoothly carinate except in proximal and distal parts where is denticulate.
Upper exterior plate of dactylus of 1st pereopod narrow, dorsal margin of which with eight small granules.	Mentioned part broad, dorsal margin of which with a row of fine short transverse ridges.
Inner surface of dactylus of 1st pereopod medially with a row of 11 large rounded granules.	Mentioned part medially with a row of 11 oblique ridges.

Unfortunately the morphology of the abdomen and the tail-fan as well as those of the female specimens are unknown, however this species is seemingly characteristic so that the type is designated as follows:

Holotype.—1♂, 27 mm in carapace length from Yellow Sea.

Disposition.—Zoological Laboratory, Kyushu University under the Catalogue Nr. 9618.

### 33. *Upogebia* (*Upogebia*) *issaeffi* (BALSS 1913)

Figs. 14a, 15e-f, Pls. B4, F5, F7.

- 1913 *Gebia* (*Upogebia*) *issaeffi* BALSS, Zool. Anz. 42: 239.  
 1914 *Gebia* (*Upogebia*) *Issaeffi*, — BALSS, Abh. Bayer. Akad. Wiss. math.-phys. Kl. Suppl. 2(10): 89, text-figs. 48-49.  
 1927 *Upogebia* (*Upogebia*) *issaeffi*, — DE MAN, Capita zool. 2(5): 27.  
 1938 *Upogebia* (*Upogebia*) *issaeffi*, — MAKAROV, Crust. In: Fauna U.S.S.R. 10(3): 59, text-figs. 19-20.  
 1939 *Upogebia issaeffi*, — YOKOYA, Sci. Rep. Tohoku Univ. Biol. 14: 278.  
 1968 *Upogebia* (*Upogebia*) *issaeffi*, — SAKAI, Jour. Seika Women's jr. Coll. 1: 47 (partim) (nec. text-fig. 10 = *U. imperfecta* sp. nov.).

TYPE LOCALITY.—Vladivostock.

MATERIAL EXAMINED.—Vladivostock (1♂ syntype, ZSM 94/1). — (2♂♂ syntypes, ZSM 94/2). Japan, Mie Prefecture, Sugashima I. (2♂♂, 2♀♀, 2 juv. USNM 105734). —, Hyogo Prefecture, Uchiyama-river (1♀, UKF 3367).

DIAGNOSIS.—A middle-sized species. Front of carapace trilobed. Rostrum triangular with three lateral denticles. Anterolateral margin of carapace with a single spine.

1st pereopod subchelate. Dactylus proximally with a truncate tooth on cutting edge, and otherwise smooth.

In males: Palm smoothly carinate on dorsal margin except in distal and proximal part being denticulate; inner surface with a row of denticles below dorsal margin. Upper exterior plate of dactylus broadly sulcate, upper margin of which with a row of many fine transverse ridges and ventral one with a row of 10 distinct granules in proximal two-thirds; inner surface prominently carinate on dorsal margin and below it with a row of large granules, and medially with a row of 10-12 distinct oblique ridges.

In females: Palm denticulate on dorsal margin; inner surface also denticulate along dorsal margin. Upper exterior plate of dactylus narrow, bearing a granulate crest on dorsal and ventral margins; inner surface dorsally provided with a row of granules, and medially with a row of 12 granules.

DESCRIPTION.—The rostrum shows a triangle with an obtuse apex (Fig. 14a, Pl. B4); the dorsal surface is hirsute and bears three yellow-translucent lateral denticles, and the ventral surface is obscurely carinate medially. The dorsal surface of the anterior thoracic region is laterally ornamented with a row of yellow translucent denticles and hair-tufts, anteriorly constricted in breadth, and then broadened backward; the median furrow is broadly extending backward from near the rostral tip to the anterior



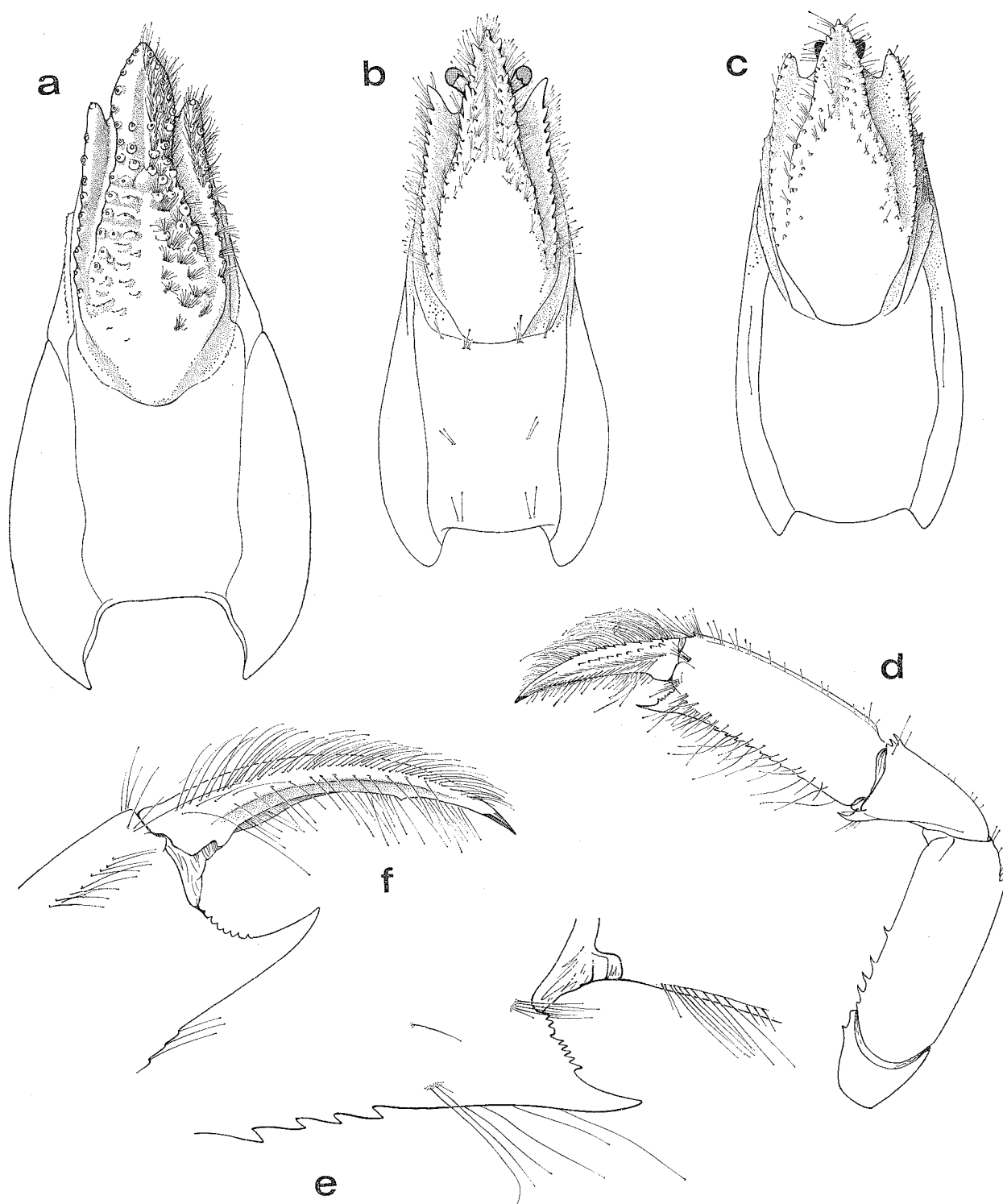


Fig. 14. a. *Upogebia* (*Upogebia*) *issaeffi*, ♀, UKF 3367, carapace. b. *Upogebia* (*Acutigebia*) *danai*, MP Th, carapace. c. *Upogebia* (*Acutigebia*) *simsoni*, ovig. ♀, MNB 13487, carapace. d. same, 1st pereopod, outer view. e. same, chela, inner view. f. *Upogebia* (*Acutigebia*)  $\alpha$  DE MAN 1928, juv., type specimen, ZMA Siboga Coll., chela, inner view.

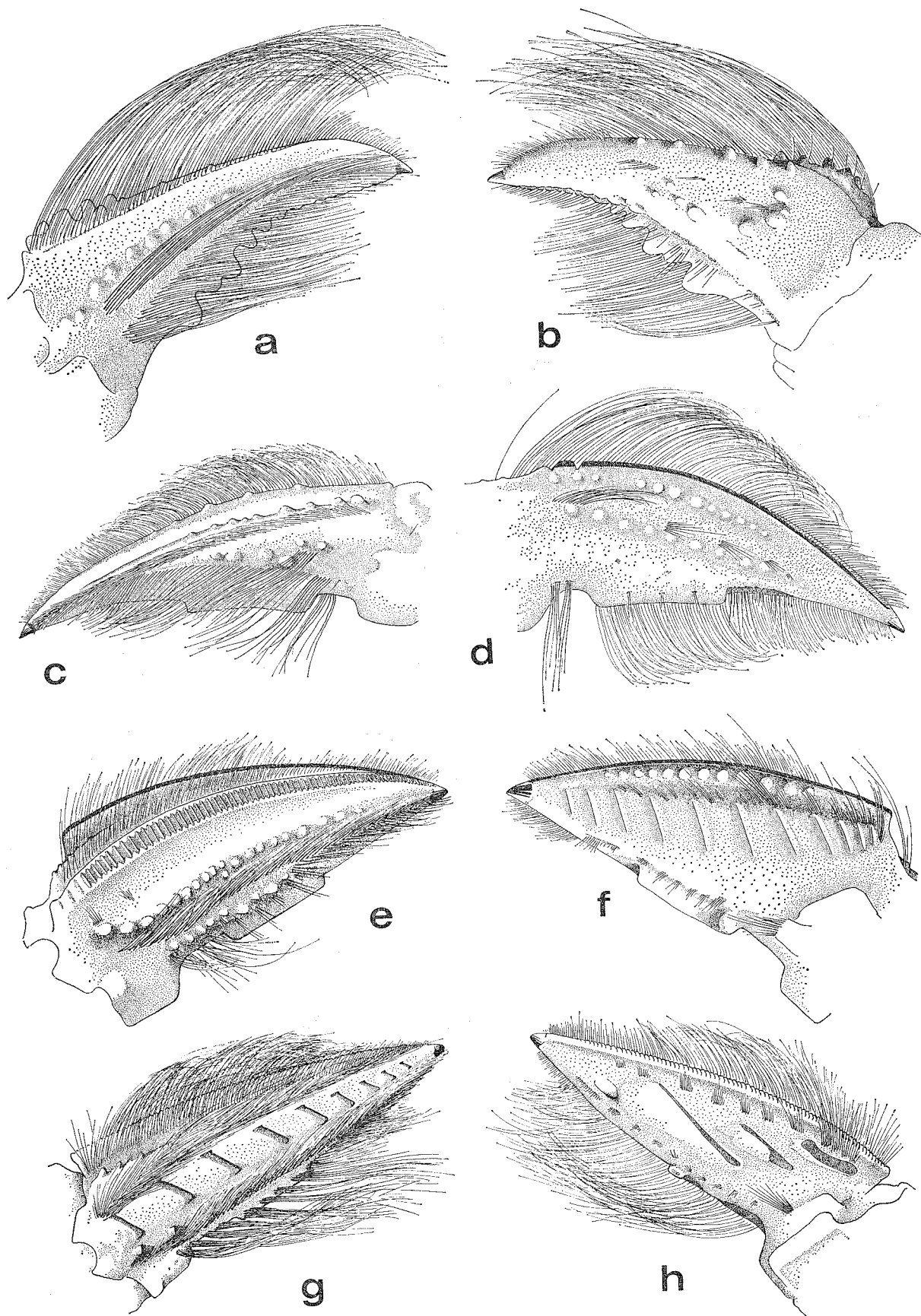


Fig. 15. a. *Upogebia* (*Upogebia*) *yokoyai*, ♂, UKF 8965, dactylus, outer view. b. same, dactylus, inner view. c. *Upogebia* (*Upogebia*) *imperfecta*, sp. nov., ♂, UKF 9618, dactylus, outer view. d. same, dactylus, inner view. e. *Upogebia* (*Upogebia*) *issaeffi*, ♂, syntype, ZSM 94/2, dactylus, outer view. f. same, dactylus, inner view. g. *Upogebia* (*Upogebia*) *major*, ♂, MP Th 20, dactylus, outer view. h. same, dactylus, inner view.

fourth of the gastric region, and posterior to it there is a median carina. The lateral frontal process of the carapace is projected anteriorly. The lateral longitudinal ridge in the anterior part is broadened and hirsute, while in the posterior part it is narrow, bearing about 11 yellow translucent denticles, the terminal one of which is distinct. The lateral longitudinal groove is deep in the anterior part, then divergent posteriorly. The lateral surface of the anterior thoracic region is armed with some spinules. The posterior thoracic region is laterally provided with granules. The linea thalassinica is defined in the anterior half of the posterior thoracic region. The anterolateral margin of the carapace is armed with a spine.

The telson is broader than long; the posterior margin is largely convex. The dorsal surface shows a U-shaped carina, the lateral longitudinal part of which is broadly extending backward to the posterior margin of the telson, and the transverse part is slightly definable with interspaced hair-tufts; the middle depression delimited by a deep lateral groove from the U-shaped carina bears a median groove posterior to the transverse part of the U-shaped carina.

The endopod of the uropod reaches the posterior margin of the telson, the posterior margin is almost straight, incurved at the outer angle, and the outer lateral margin is slightly concave to a whole extent. The exopod overreaches the posterior margin of the endopod, proximally bearing a spine. The protopod is provided with a bispinous process.

The antennular peduncle reaches the level of the middle part of the terminal segment of the antenna. The distal segment is about three times as long as the penultimate one.

The scaphocerite is leaf-like.

The epistome is bispinous.

The 1st pereopod is subchelate. The merus and the carpus are very similar to those in *U. major*, however the spines or teeth in the present species are less numerous and less sharp.

In males (Pls. F5, F7): The palm shows a smooth carina on the dorsal margin, which is denticulate in the distal and the proximal part, bearing a distinct subterminal tooth. The outer median surface has a U-shaped hair-line in the distal part, which is distally close to the above-mentioned median hair-line, and ventrally bears a few denticles. The outer distal margin is armed with a sharp subterminal spine just below the articulation with the dactylus. The inner surface is longitudinally furnished with a row of denticles and long hairs below the dorsal margin. The inner distal margin bears a spine beneath the dorsal corner. The ventral surface bears no tooth at the base of the fixed finger. The fixed finger is medially provided with a distinct outer and an obtuse inner tooth on the cutting edge. The dactylus is terminated by a yellow translucent apex (Figs. 15e-f). The upper exterior plate is broad, and deeply sulcate, the dorsal margin of which is provided with a row of short yellow translucent transverse ridges

to a whole extent, while the ventral margin with 10 rounded granules in the proximal two-thirds. The lower exterior surface bears two rows of hairs merging with each other in the distal half, and between them a row of rounded tubercles in the proximal half. Above the upper exterior plate there is a longitudinal sulcation with a hair-band. The inner dorsal margin is yellow-translucently carinate except in the proximal part which is armed with a row of rounded granules. The upper interior surface is ornamented with a row of distinct rounded granules, and below it with a row of long hairs. The inner median surface is longitudinally armed with a row of 10-12 oblique ridges. The cutting edge bears a truncate tooth in the proximal part, the distal and the proximal corner of which are each granulate.

In females: The palm is narrower than in males. The dorsal margin is denticulate to a whole extent. The ventral inner margin is medially provided with a small spine at the base of the fixed finger. The other characters are almost the same as in males. The upper exterior plate of the dactylus is narrow, the dorsal margin of which is carinate with granules to a whole extent, which are arranged with more interspace and are sharper in proximal half than in the distal one, and the ventral one is also carinate, bearing granules only in the proximal half. The lower exterior surface bears two rows of hairs merging with each other in the distal half, and between them a granulate carina in the proximal half. Above the upper exterior plate there is a longitudinal sulcation with a hair-band. The inner surface is provided with a row of 10-11 granules along the dorsal margin to a whole extent, which is diminished distally, and below it medially with a row of 12 granules extending distally from the upper proximal corner.

REMARKS.—The syntypes of BALSS (1913: 239), three male-specimens, was examined. The original description of the male given by BALSS is clear and characteristic as he mentioned: 1. "er (der Dactylus der P/1) oben eine Reihe von nebeneinander gestellten Leistchen (Stimmeleiste?) trägt." 2. "Auf der Innenfläche (der Dactylus der P/1) stehen ebenfalls zehn große in einer Reihe gestellte Leistchen."

Later MAKAROV (1938: 59) gave a redescription, in which the sexual dimorphism in the dactylus was revealed.

Concerning the relationship to other species of the genus the present species is often stated to be similar to *major*, however, it seems likely that *issaeffi* is more closely related to the species *imperfecta* sp. nov. from the Yellow Sea (see p. 64).

#### 34. *Upogebia* (*Upogebia*) *major* (DE HAAN 1839)

Figs. 15g-h, Pls. B5, G3-4.

- 1839 *Gebia major* DE HAAN, Crust. In: Fauna Japonica, Batavia. pl. 35 fig. 7.  
1849 *Gebia major*, — DE HAAN, Crust. In: Fauna japonica, Batavia.: 165.

- 1879 *Gebia major*, — MIERS, Proc. zool. Soc. London. 1879: 21, 52.
- 1891 *Gebia major*, — ORTMANN, Zool. Jb. Syst. 6: 54, pl. 1 figs. 7a-b.
- 1913 *Gebia major*, — BALSS, Denkschr. med.-naturw. Ges. Jena. 17: text-fig. 7.
- 1914 *Gebia major*, — BALSS, Abh. bayer. Akad. Wiss. math.-phys. Kl. Suppl. 2(10): 90.
- 1917 *Upogebia (Upogebia) major*, — PARISI, Atti Soc. ital. Sci. nat. 56: 23.
- 1927 *Gebia major*, — NAKAZAWA, Anomura. In: Eiguro de Japanaj Bestoj, Tokyo. : 1037, Text-fig. 1997.
- 1927 *Upogebia (Upogebia) major*, — DE MAN, Capita zool. 2(5): 47, pl. 6 fig. 18.
- 1930 *Gebia major*, — YOKOYA, Sci. Rep. Tohoku Univ. Biol. 5: 543, fig. 4.
- 1936 *Upogebia major*, — MIYAZAKI, Bull. Japan. Soc. sci. Fish. 5(1/6): 317.
- 1938 *Upogebia major*, — ISHIKAWA, Study fish baits, Fukuoka.
- 1938 *Upogebia (Upogebia) major*, — MAKAROV, Crust. In: Fauna U.S.S.R. 10(3): 54, text-figs. 16-17 (English text).
- 1941 *Upogebia major*, — URITA, Bull. biogeogr. Soc. Japan. 12: 39.
- 1947 *Upogebia major*, — KUBO & NAKAZAWA, Macrura. In: Illust. Encycl. Fauna Japan, Tokyo. : 755, text-fig. 2176.
- 1955 *Upogebia major*, — LIU, Economic shrimps North China, Pekin. : 66, pl. 24 figs. 1-6.
- 1958 *Upogebia major*, — KAMITA, Sci. Rep. Shimane Univ. 8: 59, text-fig. 45.
- 1958 *Upogebia major*, — UTINOMI, Anomura. In: Colour Illust. Sea Shore Anim. Japan, Osaka. : 63, pl. 32 fig. 1.
- 1961 *Upogebia (Upogebia) major*, — MIYAKE, Fauna & Flora Amakusa, Crust. : 9.
- 1962 *Upogebia major*, — MIYAKE, SAKAI & NISHIKAWA, Rec. Oceanog. Wks. Japan. Spec. No. 6: 124.
- 1967 *Upogebia major*, — OHSHIMA, Chikyu-kagaku (= Earth Science), Sapporo. 21: 11.
- 1968 *Upogebia (Upogebia) major*, — SAKAI, Jour. Seika Women's jr. Coll. 1: 45, text-figs. 1A-C.
- non:
- 1934 *Upogebia major*, — TAKAHASHI, Hakubutugaku-Zasshi, Tokyo. 32(51): 20 (= *U. wushienweni*).

TYPE LOCALITY.—Japan.

MATERIAL EXAMINED.—Vladivostock (1♀, USNM 72383, determined by MAKAROV). Japan, Yokohama (2♂♂, 3 ovig. ♀♀, 1♀, MP Th 20). — Shizuoka Prefecture, Atami (1♂, USNM 18879). Japan (1♀, USNM 28501).

DIAGNOSIS.—A large-sized species. Front of carapace trilobed. Rostrum triangular with 3-4 yellow translucent lateral denticles. Anterolateral margin of carapace with a single spine.

1st pereopod subchelate. Palm provided with two denticulate carinae on dorsal surface. Dactylus proximally with a large truncate tooth on cutting edge, and otherwise smooth. In males: Upper exterior plate of dactylus medially prominent with a row of 9-11 translucent oblique ridges, ventral margin of which is smoothly carinate; inner surface dorsally carinate with a row of translucent fine granules, and medially with three large oblique ridges. In

females: Upper exterior plate of dactylus dorsally with a row of short transverse ridges, and ventrally carinate with a row of granules; inner surface dorsally carinate with a row of short transverse ridges, and medially prominent with a row of short oblique ridges.

DESCRIPTION.—The rostrum shows a broad triangle with an obtuse apex, is hirsute, and bears 3-4 distinct yellow translucent lateral denticles (Pl. B5). The dorsal surface is slightly constricted in breadth in the anterior fourth, and broadened in the posterior three-fourths; the median furrow is broad, shallow, and laterally flanked with a series of distinct yellow translucent denticles, extending backward from near the rostral tip to an obscure transverse furrow at the anterior fourth of the dorsomedian region. The lateral frontal process of the carapace is projected anteriorly. The lateral longitudinal ridge bears a row of yellow translucent denticles, is slightly broadened, hirsute in the anterior half, and narrow, less hairy in the posterior half. The lateral longitudinal groove is deep, straight in the anterior part, and shallow, divergent backward in the posterior three-fourths. The lateral surface of the anterior thoracic region is studded with spinules. The posterior thoracic region is provided with a row of spinules along the cervical groove in the lateral part of the dorsal surface and the lateral surface. The linea thalassinica reaches the posterior margin of the carapace. The anterolateral margin of the carapace bears a single spine.

The telson is broader than long; the posterior margin is broadly convex. The dorsal surface shows a U-shaped carina, the transverse part of which is provided with some hair-tufts, and posterior to it a median groove.

The endopod of the uropod is about as long as the telson; the posterior margin is slightly concave in its outer half, and the outer lateral margin is largely concave. The exopod is slightly longer than the endopod, proximally bearing a spine. The protopod bears two spines.

The antennular peduncle fails to reach the middle of the terminal segment of the antenna.

The 3rd segment of the antenna bears a subterminal spine. The scaphocerite is leaf-like, provided with a small spine.

The 1st pereopod is subchelate (Pls. G3-4). The merus bears a subterminal spine plus 1-2 ones on the dorsal margin, and provided with a row of small spines on the ventral outer margin, and with a row of stout ones on the ventral inner margin. The carpus bears two strong spines on the inner distal margin. The dorsal margin, the outer distal margin in the upper half, and the ventral outer carina are respectively provided with a row of spines. The ventrodistal spine is sharp. The palm in males is broader than in females. The dorsal margin is carinate with denticles to a whole extent, bearing a distinct subterminal spine. In parallel to it the inner dorsal margin is also carinate with denticles. The

upper exterior surface is slightly sulcate medially. The median outer surface bears a hair-line in the proximal half to the proximal two-thirds, which is deflected distally. The lower exterior surface is scabrous with long hairs. The outer distal margin bears a stout tooth beneath the articulation with the dactylus. The ventral surface distally forms an inner longitudinal swelling with denticles, which is continuous to the ventral margin of the fixed finger. The fixed finger is rather short; the cutting edge bears a few denticles in the proximal part, and the ventral margin is smooth.

The dactylus in males (Figs. 15g-h): The tip is translucent. The upper exterior plate is provided with a row of 9-11 yellow translucent oblique ridges, the ventral margin of which is distinctly carinate. Above the upper exterior plate there are two hair-lines merging to each other in the distal half, and between them a denticulate carina in the proximal part. The inner dorsal margin is distinctly carinate with a row of fine translucent granules to a whole extent. The inner surface bears a row of interspaced hair-tufts below the dorsal margin, and medially bears three large oblique ridges, diminishing proximally. The cutting edge bears a broad truncate tooth in the proximal part, and otherwise it is smooth.

The dactylus in females: The upper exterior plate is longitudinally sulcate, the dorsal margin of which is distinctly carinate with a row of short yellow translucent transverse ridges to a whole extent, and the ventral margin is also distinctly carinate with a row of yellow translucent granules. The inner dorsal margin is also distinctly carinate with a row of short transverse ridges to a whole extent. The inner surface is longitudinally provided with a distinct carina with a row of short, oblique ridges in the midline. The other characters are almost the same as in males.

REMARKS.—The original figure given by DE HAAN (1839, pl. 35 fig. 7) is very characteristic for the present species because his figure shows that the upper exterior plate of the dactylus of the 1st pereopod bears a row of large oblique ridges, and the inner surface a row of three large oblique ridges. However, this character is only found in males, so that it is sure that DE HAAN's figure was taken from a male specimen, though he showed it as a female in the legend.

This species agrees with *issaeffi*, *imperfecta* (males), *spinifrons* (males), and *hirtifrons* (males) in that the cutting edge of the dactylus of the 1st pereopod bears a low truncate tooth in the proximal part, and also with *issaeffi* in that the dorsal margin of the palm bears two rows of denticulate carinae, and the inner surface of the dactylus in males bears a row of long oblique ridges medially. However, the present species is different from other species in that the upper exterior plate of dactylus in males forms a row of oblique ridges, and in females bears a carina with a row of transverse ridges on the

dorsal margin and a carina with a row of granules on the ventral one.

Subgenus *Upogebia* (*Acutigebia*) subgen. nov.

TYPE SPECIES.—*Upogebia* (*Acutigebia*) *danai* MIERS 1876.

DEFINITION.—Rostrum tapering at tip, provided with an apical denticle. Merus of 3rd maxilliped ornamented with denticles on inner margin. 1st pereopod subchelate, upper exterior plate of dactylus definable. Uropod broad.

OTHER SPECIES INCLUDED.—*simsoni*, sp.  $\alpha$  DE MAN 1928, and *trypeta*.

### 35. *Upogebia* (*Acutigebia*) *danai* (MIERS 1876)

Fig. 14b, Pl. G5.

- 1852 *Gebia hirtifrons* DANA, U.S. explor. Exped. 13: 511 (non *Gebia hirtifrons* WHITE 1847).
- 1855 *Gebia hirtifrons*, — DANA, U.S. explor. Exped. Atlas. Crust.: pl. 32 figs. 2a-f.
- 1876 *Gebia Danai* MIERS, Ann. Mag. nat. Hist. London. (4)17: 223.
- 1876<sup>a</sup> *Gebia danai*, — MIERS, Cat. stalk-sessile-eyed Crust. New Zealand, London. : 70 (identical with MIERS 1876).
- 1886 *Gebia hirtifrons*, — FILHOL, Rec. Vénus. (Zool.) 3(2): 428.
- 1907 *Upogebia danai*, — CHILTON, Trans. Proc. N. Zealand Inst. 39: 460.
- 1911 *Upogebia danai*, — CHILTON, Trans. Proc. N. Zealand Inst. 43: 552.
- 1927 *Upogebia* (*Upogebia*) *danai*, — DE MAN, Capita zool. 2(5): 22, pl. 3 figs. 9-9d.

TYPE LOCALITY.—New Zealand, Bay of Islands.

MATERIAL EXAMINED.—New Zealand, Kaikoura Peninsula (4♂♂, 2♀♀, MP Th 212). —, Cook Strait (1♂, MP Th 17, specimen of FILHOL 1886). —, Hauraki Gulf (1♂, SMF 4947, specimen of CHILTON 1907).

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum tapered distally with an apical denticle. Lateral frontal process of carapace divergent distally. Merus of 3rd maxilliped with 4-5 spinules on inner margin, exopod three-segmented. 1st pereopod subchelate. Palm ventrally armed with a series of anteriorly-directed teeth. Fixed finger stoutly arising at some distance from ventro-distal angle of palm to form a broad deep gap, upper margin of which is denticulate, while one ventral one is smooth. Upper exterior plate of dactylus dorsally denticulate and ventrally sparsely tuberculate. Cutting edge medially with a distinct tooth. Tail-fan and pleopods thickly beset with marginal hairs.

DESCRIPTION.—The rostrum is tapered distally with an apical spine (Fig. 14b). The dorsal surface of

the anterior thoracic region including that of the rostrum is brimmed with a row of distinct outward-directed denticles, the median furrow extends from the top of the rostrum to the anterior fourth, flanked with a row of scanty hair-tufts, and especially in males, with indistinct granules. The lateral frontal process of the carapace is strongly projected outward. The lateral longitudinal ridge is provided with a row of 12-15 outward-directed denticles to a whole extent. The lateral longitudinal groove is broadly sulcate with a deeply concave frontal gap. The linea thalassinica reaches the posterior margin of the carapace, and is shortly interrupted posterior to the cervical groove. The anterolateral margin of the carapace is unarmed.

The telson is broader than long; the lateral margin is convergent backward in the posterior two-thirds, and the posterior margin is almost straight. The dorsal surface is convex with a transverse carina at the proximal third, which is concave medially with some hairs, laterally extending to each outer proximal corner of the telson.

The endopod of the uropod is longer than the telson; the posterior margin is largely convex with interspaced spinules, largely rounded at the inner distal corner, and the outer lateral margin is smooth and straight. The exopod is about as long as the endopod, the posterior margin is armed with interspaced spinules.

The antennular peduncle is about as long as the antennal one. The 1st segment bears a small terminal spine on the ventral margin, and the terminal one is elongate and longer than the antennular flagellum.

The 3rd segment of the antenna bears a subterminal spine on the ventral margin. The scaphocerite is biramous at the tip.

The epistome is compressed, and bears a few spinules on its rounded tip.

In the 3rd maxilliped the merus bears 4-5 sharp spines on the inner margin. The exopod is three-segmented, the distal two segments are each short and slender.

The 1st pereopod is subchelate (Pl. G5). The merus bears a subterminal spine on the dorsal margin, the ventral outer margin is proximally provided with some distinct denticles, and otherwise with a row of small denticles. The carpus bears a dorsal spine on the inner distal margin. The outer distal

margin in the dorsal half bears a small tooth. The ventrodistal spine is sharp. The palm is smooth on the outer median surface. The dorsal margin is carinate to a whole extent, furnished with scanty hairs along both the inner and the outer margin. The lower exterior surface is beset with hair-tufts, and longitudinally serrate by a series of anteriorly-directed teeth posterior to the fixed finger. The fixed finger is stoutly arising at some distance from the ventrodistal corner of the palm to form a broad gap, the dorsal margin of which is denticulate, while the ventral one smooth. The inner surface is provided with two rows of hairs near the dorsal margin. The dactylus is translucent at the tip. The upper exterior plate is medially sulcate, the upper margin of which is provided with interspaced spinules in the proximal two-thirds, and the lower one bears some obscure tubercles. The lower exterior surface bears two rows of long hairs merging with each other in the distal half, the upper one of which is more distinct than the lower one. The upper interior surface also bears two rows of hairs, and armed with a broad carina between them. The inner median carina is scarcely present. The cutting edge bears a distinct tooth slightly distal to the midway.

In the 2nd pereopod the propodus is high, the dorsal margin is deflected downward in the distal half.

REMARKS.—The present species has been mentioned under the name of *Gebia hirtifrons* WHITE by DANA (1852: 511). Later MIERS (1876: 223) pointed out that DANA's species differs from WHITE's and introduced the name *danai* for the specimen described by DANA. In fact, DANA's species is very different and distinct from WHITE's one as DANA described: 1. "Flagella of inner antennae a little shorter than the last joint of base," 2. "On lower margin (of the pal mop of the 1st pereopod), small denticulations," 3. "Lower finger (=fixed finger of the 1st pereopod) slender and somewhat incurved." In addition the figures in DANA's Atlas published in 1855 show that the present species is clearly different from *hirtifrons*.

The present species from New Zealand is closely related to *simsoni*, sp.  $\alpha$  DE MAN 1928, and *trypeta*, however, all of those species are clearly different from one another as shown in the following table.

<i>danai</i> MIERS	<i>simpsoni</i> THOMSON
Lateral frontal process of carapace divergent distally.	Mentioned process convergent distally.
Posterior thoracic region laterally smooth along cervical groove.	Mentioned region laterally with some obtuse granules along cervical groove.
Linea thalassinica shortly interrupted posterior to cervical groove.	Mentioned part shortly interrupted posterior to cervical groove.
Tail-fan thickly beset with marginal plumose hairs.	Tail-fan simply with marginal plumose hairs.
Exopod of 3rd maxilliped three-segmented.	Mentioned part three-segmented.

Merus of 3rd maxilliped with 2-4 spinules on inner margin.

Palm of 1st pereopod with a series of sharp, flat, forward-directed teeth on ventral margin.

Fixed finger of 1st pereopod stoutly arising at some distance from ventrodistal angle of palm to form a broad gap, dorsal margin of which denticulate, while cutting edge smooth.

Upper exterior plate of dactylus of 1st pereopod denticulate on dorsal margin, and obscurely denticulate on ventral one.

Cutting edge of dactylus of 1st pereopod in males and females with a distinct middle triangular tooth.

Mentioned part with four distinct spinules and some rudimentary ones on inner margin.

Mentioned part with 8-9 small triangular teeth on ventral margin.

Mentioned part arising at ventrodistal angle of palm, cutting edge proximally denticulate.

Mentioned part sharply denticulate on both upper and ventral margins.

Mentioned part in females smooth.

*trybeta* SAKAI

sp.  $\alpha$  DE MAN 1928

Lateral frontal process of carapace convergent distally.

Posterior thoracic region laterally smooth along cervical groove.

Linea thalassinica defined in posterior half of posterior thoracic region.

Tail-fan simply with marginal plumose hairs.

Exopod of 3rd maxilliped two-segmented.

Merus of 3rd maxilliped with 4-5 spinules on inner margin.

Palm of 1st pereopod smooth on ventral margin.

Fixed finger of 1st pereopod arising from ventrodistal corner of palm, cutting edge proximally denticulate.

Upper exterior plate of dactylus of 1st pereopod denticulate in proximal half on dorsal margin, while smooth on ventral margin.

Cutting edge of dactylus of 1st pereopod in males with a triangular tooth, while in females smooth.

Mentioned process divergent distally.

Mentioned region laterally with obscure granules along cervical groove.

Mentioned part undefinable.

Tail-fan simply with marginal plumose hairs.

Mentioned part three-segmented.

Mentioned part with 10 spinules on inner margin.

Mentioned part with four triangular denticles on ventral margin.

Mentioned part arising at some distance from ventrodistal angle of palm to form a broad gap, dorsal margin of which denticulate.

Mentioned part denticulate in proximal half on dorsal margin, while smooth on ventral margin.

Mentioned part with a low triangular tooth.

36. *Upogebia (Acutigebia) simsoni* (THOMSON 1893)

Figs. 14c-e

1893 *Gebia simsoni* THOMSON, Pap. Proc. R. Soc. Tasmania. 1892: 49, pl. 1 figs. 3-5.

1902 *Upogebia simsoni*, — FULTON & GRANT, Proc. R. Soc. Victoria. (2)14: 61, pl. 5 figs. 5-6.

?1926 *Upogebia simsoni*, — MCNEILL, Austr. Zoologist. 4: 305.

?1927 *Upogebia simsoni*, — HALE, Crust. S. Austr. Adelaide. 1: 85.

?1930 *Upogebia simsoni*, — MCNEILL & WARD, Rec. Austr. Mus. 17: 362.

TYPE LOCALITY.—East coast of Tasmania.

MATERIAL EXAMINED.—Australia, Victoria, Port Phillip Bay (1 ovig. ♀, MNB 13487). —, Victoria, Western Port (1 ♂, BM 1906.11.13.7-8).

DIAGNOSIS.—A small-sized species. Front of cara-

pace trilobed. Rostrum triangular with an apical spine. Lateral frontal process of carapace convergent distally. Merus of 3rd maxilliped with four distinct spinules and some other rudimentary ones on inner margin, exopod three-segmented. 1st pereopod subchelate. Palm ventrally provided with a series of 8-9 anteriorly-directed denticles. Fixed finger arising from ventrodistal angle of palm, cutting edge proximally denticulate. Upper exterior plate of dactylus denticulate on both dorsal and ventral margins, cutting edge in females smooth.

REMARKS.—THOMSON's original description and his figures (1893: 491, pl. 1 figs. 3-5) are unsatisfactory to distinguish the present species from other related ones, especially *danai* from New Zealand. Later on FULTON and GRANT (1902: 61) compared the Victorian specimens with the holotype and mentioned details in their description.

The present author examined one ovigerous female from Port Phillip Bay, Victoria and identified

it as the present species, because it fits what FULTON and GRANT mentioned in that 1. "*Below this (=the lateral portion of the cervical groove) on the hepatic region there is a diagonal line of 3-4 small tubercles.*" 2. "*The lower margin (of the palm of the 1st pereopod) is armed posteriorly with a series of small, flat, forwardly projecting teeth. . . .*" 3. "*Its lower distal extremity (of the palm) extended into a strong, short, rudimentary inferior finger, which is toothed on its upper margin for its posterior half.*" 4. "*The mobile finger (of the 1st pereopod). . . ., with the upper edges strongly denticulate.*"

37. *Upogebia (Acutigebia)* sp.  $\alpha$  DE MAN 1928

Figs. 14f.

1928 *Upogebia (Upogebia)* sp.  $\alpha$  DE MAN, Siboga-Expeditie, 39a(6) : 52, pl. 1 fig. 4, pl. 2 figs. 4a-4f.

MATERIAL EXAMINED.—Indonesia, West coast of Gebé Island, Fau-anchorage and laguen, 31 m deep (1 juv. holotype, ZMA Siboga coll.).

REMARKS.—The present species based on only one single juvenile specimen from Gebé Island is probably identical with *simsoni* from the south and the west coasts of Australia in that the posterior thoracic region is laterally marked with minute denticles along the cervical groove. However they are clearly different from each other because in this species the upper exterior plate of the dactylus of the 1st pereopod (Fig. 14f) is smooth on both the dorsal and the ventral margins like *trybeta*, the merus of the 3rd maxilliped is armed with a row of 10 fine denticles on the inner margin, and the anterior frontal process of the carapace is directed forward.

38. *Upogebia (Acutigebia) trybeta* SAKAI 1970

1970 *Upogebia trybeta* SAKAI, Publ. Seto mar. biol. Lab. 18: 49, text-figs. 1, 2A-B.

TYPE-LOCALITY.—Japan, Amami-Oshima, Maya.

MATERIAL EXAMINED.—Japan Amami-Oshima, Maya (1♀ holotype, SMF 7802, 2♂♂, 3 ovig. ♀♀ paratypes, SMF 7798, 1♂, 1 ovig. ♀ paratype MP Th 443).

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum triangular, with an apical spine, provided with 4-5 lateral denticles. Lateral frontal process of carapace convergent distally. Merus of 3rd maxilliped with four teeth on inner margin, exopod two-segmented. 1st pereopod subchelate. Palm ventrally unarmed. Fixed finger arising from ventrodistal angle of palm, cutting edge proximally denticulate. Upper exterior plate of dactylus dorsally denticulate in proximal half, and ventrally smooth, and cutting edge in males medially

with a triangular tooth, in females smooth.

REMARKS.—The present species is closely related to *simsoni* in that the anterior frontal process of the carapace is slightly convergent distally, the merus of the 3rd maxilliped is provided with 4-5 interspaced spines on the inner margin, the fixed finger is arising from the ventrodistal angle of the palm, and its cutting edge is denticulate in the proximal part. However, the present species is clearly different from *simsoni* in that the palm of the 1st pereopod is not armed but smooth on the ventral margin, and the upper exterior plate of the dactylus is denticulate in the proximal half on the dorsal margin, and smooth on the ventral margin. The habitat is also characteristic as the type-series was brought by the present author from inside of living coral.

Subgenus *Upogebia (Neogebicula)* subgen. nov.

TYPE SPECIES.—*Upogebia (Neogebicula) alaini* sp. nov.

DEFINITION.—Rostrum obtuse on frontal margin, apically bearing a denticle. Merus of 3rd maxilliped unarmed on inner margin. 1st pereopod simple. Upper exterior plate of dactylus not differentiated. Uropod slender and leaf-like.

OTHER SPECIES INCLUDED.—*Upogebia (Neogebicula) monochela* (SAKAI 1967).

39. *Upogebia (Neogebicula) alaini* sp. nov.

Figs. 16a-f.

TYPE LOCALITY.—Nossi Bé, Madagascar, 130°20'S, 48°10'E, 50 m deep.

MATERIAL EXAMINED.—Madagascar, W Nossi Bé, 130°20'S, 48°10'E, 50 m deep (1 ovig. ♀ holotype, MP Th 478). — (1♀ paratype, MP Th). —, Banck de Pracel, 42 m deep (1 ovig. ♀ MP Th 483). —, W Ile Metsio, 120°50'S, 48°30'E, 40-48 m deep (Abdomen and telson of male specimen, MP Th 481). — (3♀♀, MP Th 480). — (Fragment of abdomen, MP Th 482).

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum rounded at frontal margin bearing a subterminal denticle and three lateral ones. Lateral frontal process of carapace shortly projecting forward with a pointed tip. Posterior thoracic region laterally denticulate along cervical groove. Anterolateral margin of carapace unarmed. Ischium and merus of 3rd maxilliped unarmed on inner margin, and exopod simple. 1st pereopod simple. Merus with a row of spinicles on ventral margin. Carpus with a terminal spine on dorsal margin. Palm unarmed on ventral margin. Upper exterior plate of dactylus not differentiated but with bristles, and dorsal margin with a series of spinicles in distal part. Uropod leaf-like.



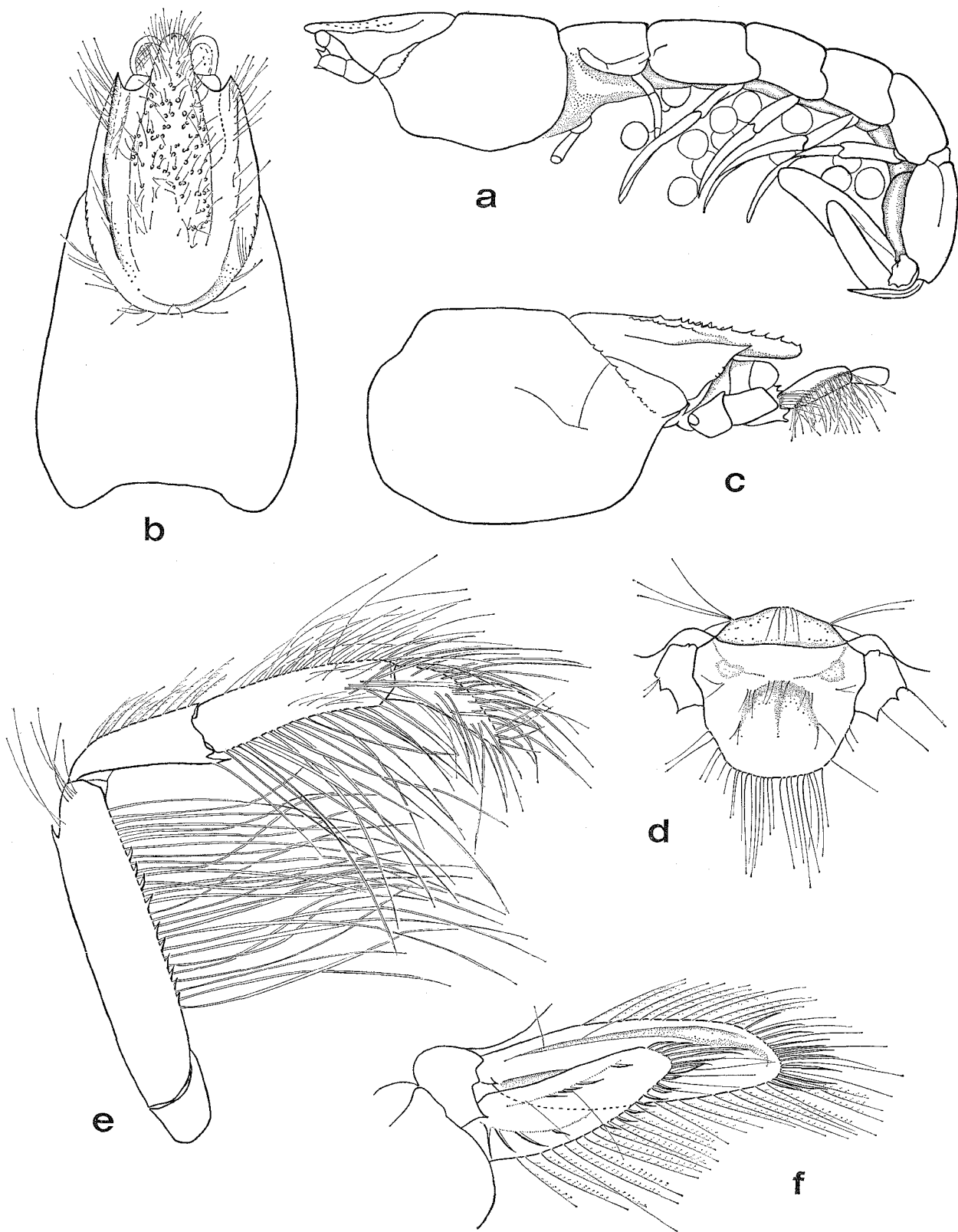


Fig. 16. a. *Upogebia* (*Neogebicula*) *alaini* sp. nov., ovig. ♀, holotype, MP Th 478, body, lateral view. b. same carapace, dorsal view. c. same, carapace, lateral view. d. same, telson. e. same, 1st pereopod, outer view. f. same, uropod.

DESCRIPTION.—The rostrum is slightly constricted distally in breadth, and clearly longer than broad; the dorsal surface is sparsely hairy, bearing a subterminal denticles and 2-3 lateral ones (Figs. 16a-c). The dorsal surface of the anterior thoracic region is elevated, and scabrous, provided with a row of about 10 lateral denticles. The lateral frontal process of the carapace is sharply pointed at the tip, incurved distally on the outer lateral margin. The lateral frontal ridge is provided with sparse hairs and tubercles. The lateral longitudinal groove is broad. The cervical groove lies at the posterior two-fifths of the carapace, laterally bearing about nine spinules along its posterior margin. No linea thalassinica is present in the posterior thoracic region. The anterolateral margin of the carapace is unarmed.

The epistome is rounded, brimmed with bristles.

The eye-stalk is robust, and slightly shorter than the rostrum.

The antennular peduncle overreaches the rostrum by its distal segment. The proximal segment is armed with eight spinules on outer distal margin, the ventral one of which is small, while the dorsal one is strong. The distal segment is about as long as the proximal one. The antennal peduncle reaches the rostrum at the level of the proximal third of the penultimate segment. The scaphocerite is biramous.

The mandible bears a three-segmented palp. The cutting edge is irregularly denticulate, bearing a stout tooth near the ventrodistal corner, and the distal margin is armed with a stout tooth at the outer angle.

The 1st maxilla is similar to that in the species of *Upogebia* s. str.; the 2nd segment of the palp is sickle-shaped.

The 2nd maxilla bears a palp broadened at the distal part; the distal endite of the endopod bears a shallow slit between the proximal and the distal segment.

The 1st maxilliped is provided with a palp which is elongate and swollen at the distal part.

The 2nd maxilliped bears a small simple exopod without a flagellum.

The 3rd maxilliped is also provided with a small simple exopod without a flagellum. The endopod is densely fringed with hairs along the inner margin.

The 1st pereopod (Fig. 16e) is simple and sym-

metrical. The merus bears a subterminal spine on the dorsal margin, and a row of about 10 tiny interspaced spinules on the ventral margin. The carpus bears a sharp terminal spine on the dorsal margin, and also a sharp subterminal one on the ventral margin. The propodus is elongate and about 1.4 times as long as the carpus, bearing no fixed finger at the ventrodistal angle. The dactylus is 0.7 times as long as the propodus and about three times as long as broad; the tip is pointed. The upper exterior plate is only implanted with bristles. The dorsal margin bears a series of spinicles in the distal part, and the cutting edge is provided with bristles.

The 2nd pereopod is simple. The carpus is armed with a sharp subterminal tooth on the dorsal margin, and also with a terminal one on the ventral margin. The merus bears a sharp subterminal tooth on the dorsal margin, and a row of about 13 tiny interspaced spinicles on the ventral margin.

The 3rd and the 4th pereopod are simple, while the 5th one is subchelate.

The 1st pleopod in females consists of three-segments, the distal two segments of which are slender. This limb is absent in males. The 2nd to 5th pleopods are leaf-like, the endopods of which are small.

The 6th abdominal segment is slightly longer than the 2nd, and 1.6 times as long as the telson.

The telson (Fig. 16d) is broader than long, the dorsal surface is broad in the proximal third, slightly constricted in the middle part, and further constricted in the posterior third, marked with a weak transverse carina with scanty hairs about at the proximal third, and posterior to it slightly concave in the middle portion which shows no median groove.

The endopod of the uropod is leaf-like, and as long as the telson (Fig. 16f). The exopod is also leaf-like, and about 2.4 times as long as the telson, the distal margin is obliquely truncate.

The eggs are relatively few in number, measuring 0.4 mm in diameter.

REMARKS.—This species is closely related to the Japanese species *Gebicula monochela* SAKAI 1967 in the features of the uropod, the dactylus of the 1st pereopod, and others, however, it is readily distinguished from Japanese species as shown in the following table:

<i>alaini</i> sp. nov.	<i>monochela</i> SAKAI
Rostrum clearly longer than broad.	Rostrum about as long as broad.
Lateral frontal process of carapace distally incurved on outer lateral margin.	Mentioned part divergent distally.
Epistome rounded without any teeth.	Epistome terminated with a single tooth.
Ischium and merus of 3rd maxilliped not denticulate on inner margin.	Mentioned parts with some teeth on inner margin.
Carpus of 1st pereopod with a single spine on inner distal margin.	Mentioned part with two dorsal spines on inner distal margin.

Palm of 1st pereopod bearing no fixed finger at ventrodistal angle of palm.

Palm with a small subterminal spine on ventral margin, which is not developed as a fixed finger.

As a result, the type-series is designated as follows:

Holotype.—1 ovig. ♀, 9.8 mm in body length, from Nossi Bé, Madagascar, 103°29'S, 48°10'E, 50 m deep, MP Th 478.

Paratype.—1 ♀, data as in holotype, MP Th 479.

Disposition.—Muséum national d'Histoire naturelle in Paris.

40. *Upogebia (Neogebicula) monochela* (SAKAI 1967)

1967 *Gebicula monochela* SAKAI, Publ. Seto mar. biol. Lab. 15: 322, text-fig. 2, pl. 11B.

TYPE-LOCALITY.—Japan, Kumamoto Prefecture, Amakusa, off Tomioka, Uze 38 m deep.

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum triangular, bearing four lateral denticles. Lateral frontal process of carapace divergent distally. Posterior thoracic region with 6–7 denticles along cervical groove. Anterolateral margin of carapace with four spines. Ischium of 3rd maxilliped with six spinules on inner margin, and merus with four, exopod simple. 1st pereopod simple. Merus with a row of distinct spinules on ventral margin. Carpus with a single dorsal spine on inner distal margin. Palm subterminally with a single tooth on ventral margin, not forming a cheliped with dactylus. Uropod leaf-like.

REMARKS.—No additional specimen has been reported up to now. The present author alluded in 1967 that this species is closely related with *Upogebia (Upogebia) fallax* DE MAN, however, this latter species is determined as a synonym of *U. (Upogebia) pugnax* in this paper.

Genus *Wolffogebia* gen. nov.

TYPE SPECIES.—*Wolffogebia phuketensis* sp. nov.

DEFINITION.—Dorsal surface of anterior region with a median carina. Lateral frontal process of carapace developed. Lateral longitudinal groove definable. Anterolateral margin of carapace armed or unarmed. 1st pereopod subchelate.

OTHER SPECIES INCLUDED.—*obtifrons* sp. nov., *inermis* sp. nov., and *exigua* (ALCOCK 1901).

41. *Wolffogebia phuketensis* sp. nov.

Figs. 17a, 18c–d, 20b.

1976 *Upogebia* sp. FRITH, Res. Bull. Phuket marine biol. Cent. 10: 18.

TYPE LOCALITY.—Phuket, Thailand.

MATERIAL EXAMINED.—Phuket, Thailand (1 ♂ holotype, 1 ovig. ♀ paratype, UMK Q21B-74.10.9). — (1 ♂ paratype, UMK Q64B-74.11.27). — (1 ♂ paratype, UKM Q114B-74.11.20). — (1 ♂, 1 ♀ paratypes, MBCP Q28B-74.11.9, specimens of FRITH 1976). — (1 ♂ paratype, MBCP Q59B-74.11.26, specimen of FRITH 1976).

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum semicircular on frontal margin bearing 4–5 denticles. Lateral frontal process of carapace shortly projected forward with an obtuse tip. Dorsal surface of anterior thoracic region hirsute except in median portion which bears a low median longitudinal carina, and laterally provided with a row of denticles. Lateral longitudinal ridge also with a row of denticles. Anterolateral margin of carapace unarmed. Telson convex on posterior margin. Exopod of 3rd maxilliped simple, without flagellum. 1st pereopod subchelate. Carpus with two strong dorsal spines on inner distal margin. Palm medially with an oblique hair-line on outer surface. Fixed finger with a series of 5–6 denticles on cutting edge. Upper exterior plate of dactylus in males lanceolate, with a median sulcation, upper interior surface submarginally with a row of seven rounded granules, and inner median surface with a row of some small granules in proximal half, and with a carina in distal half.

DESCRIPTION.—The rostrum is broad, with a semicircular frontal margin closely beset with 4–5 translucent denticles (Figs. 17a, 18c). The ventral surface is medially carinate. The dorsal surface of the anterior thoracic region is hirsute except in the median portion, anteriorly constricted in breadth posterior to the rostrum, and then broadened backward, laterally bearing a row of 10–12 translucent denticles; a low, anteriorly-tapered median carina is present posterior to the rostrum. The lateral frontal process of the carapace is shortly projected with an obtuse tip. The lateral longitudinal ridge is broadened in the anterior two-thirds, hirsute, and provided with a row of 10–12 translucent denticles, while it is narrow in the posterior third, and sparsely with three denticles. The lateral longitudinal groove is narrow and deep, slightly divergent posteriorly. No hepatic spine is present. The linea thalassinica is undefinable in the posterior thoracic region. The anterolateral margin of the carapace is unarmed.

The telson is broader than long (Fig. 18d); the posterior margin is largely convex, and the lateral margin is largely concave in the posterior two-thirds. The dorsal surface is distinctly marked with a U-shaped carina in the anterior half, the transverse part of which is distinct with some hairs, and also with a median groove posterior to the transverse

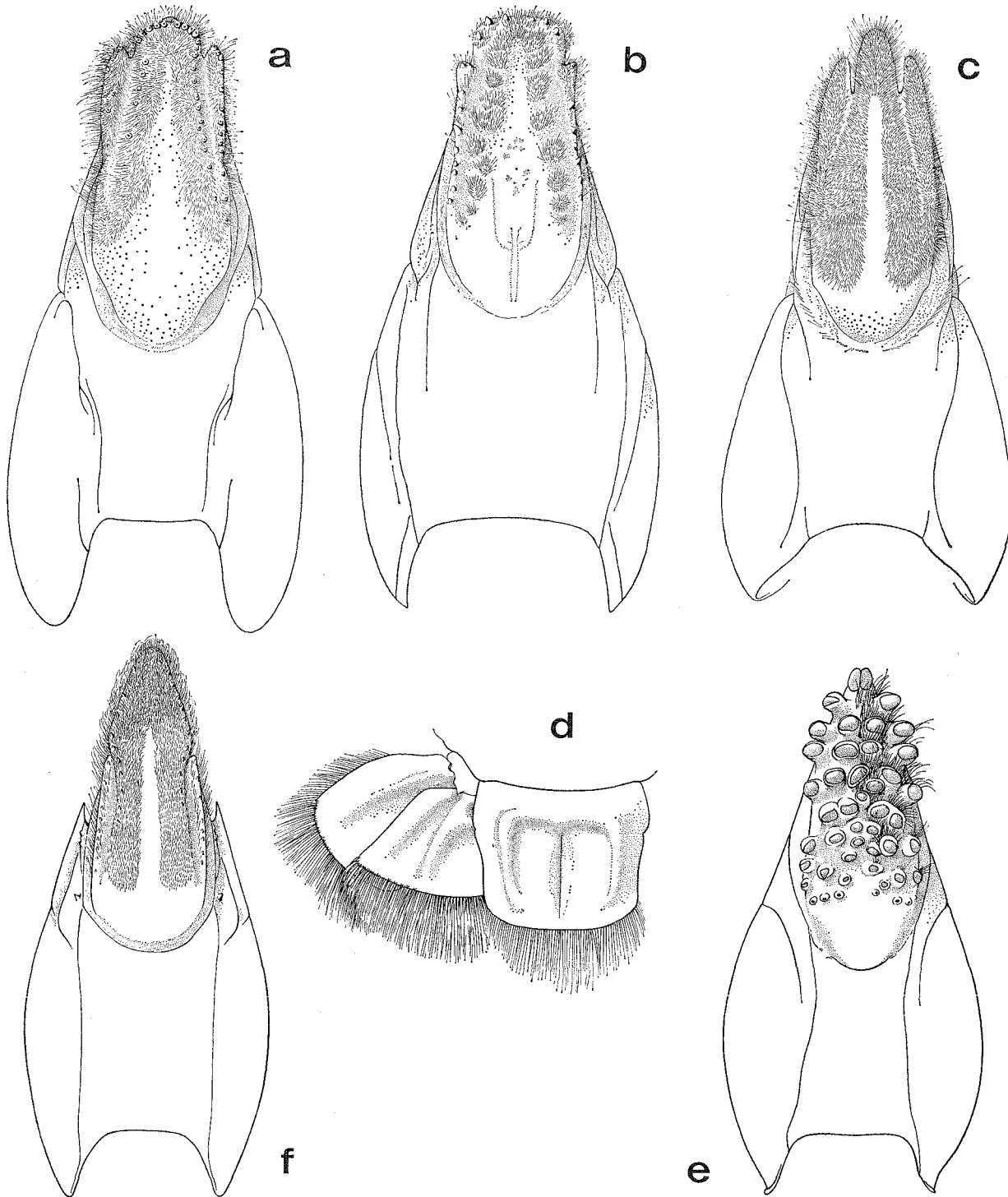


Fig. 17. a. *Wolffogebia phuketensis* sp. nov., ♂, holotype, UMK Q218 74, carapace. b. *Wolffogebia obtifrons* sp. nov., ovig. ♀, holotype, ZMH Aust. Exped. Coll., carapace. c. *Wolffogebia inermis* sp. nov., ♂, holotype, ZMA, carapace. d. *Tuerkayogebia kiiensis*, ♀, holotype, MP Th 441, tail-fan. e. same, carapace. f. *Wolffogebia exigua*, ♂, ZSI 23557, carapace.

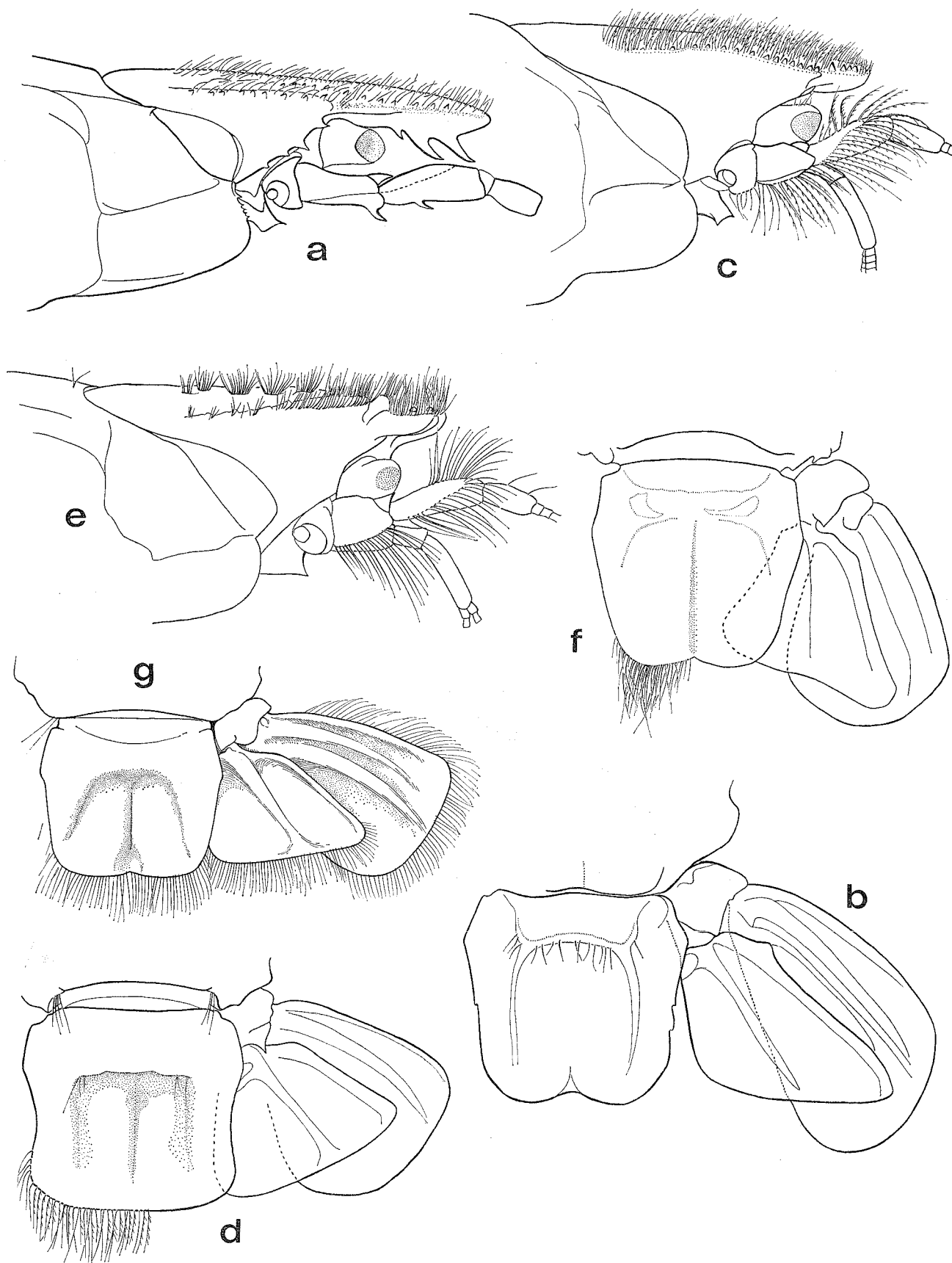


Fig. 18. *Wolffogebia exigua*, ♂, ZSI 23557, anterior part of carapace, lateral view. b. same, tailfan. c. *Wolffogebia phuketensis* sp. nov., ♂, holotype, UMK Q218 74.10.9., anterior part of carapace, lateral view. d. same, tail-fan. e. *Wolffogebia obtifrons* sp. nov., ovig. ♀, holotype, ZMH Aust. Exped. Coll., anterior part of carapace, lateral view. f. same, tail-fan. g. *Wolffogebia inermis* sp. nov., ♂, holotype, ZMA, tail fan.

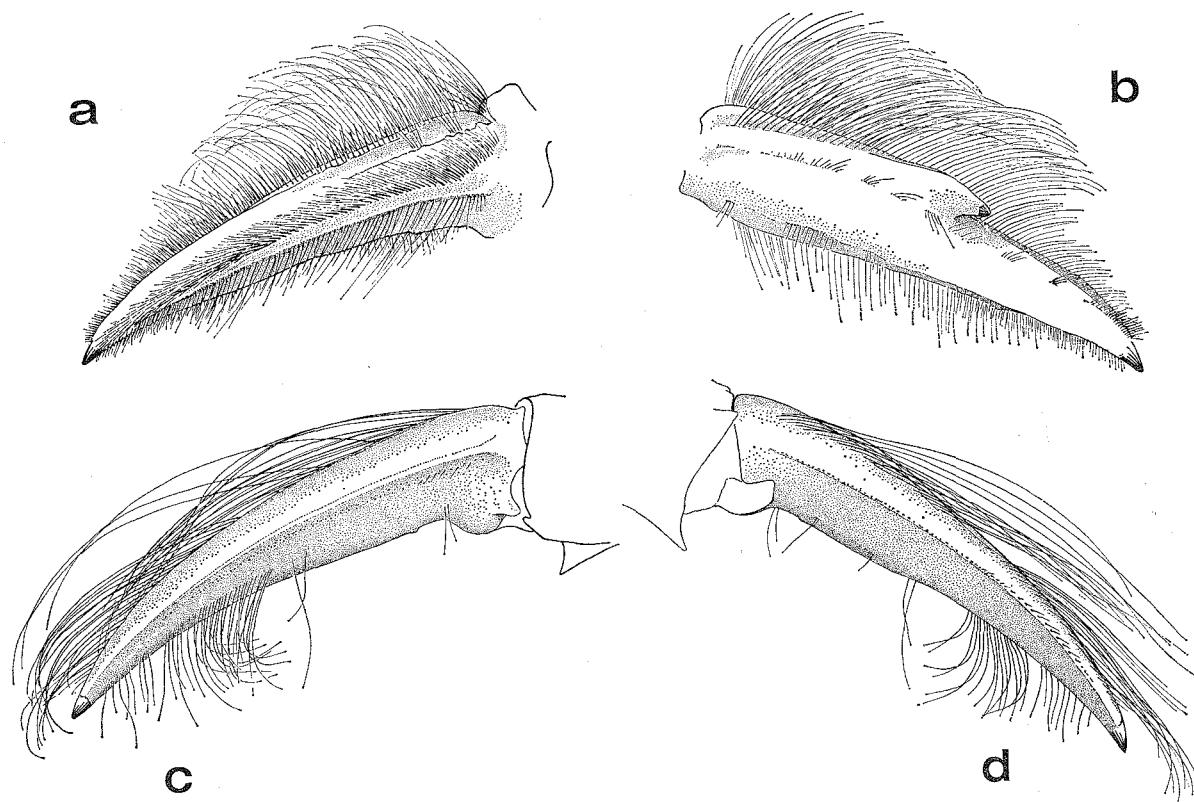


Fig. 19. a. *Wolffogebia inermis* sp. nov., ♂, holotype, ZMA, dactylus, outer view. b. same, dactylus, inner view. c. *Wolffogebia exigua*, ♂, ZSI 23557, dactylus, outer view. d. same, dactylus, inner view.

part of the U-shaped carina.

The endopod of the uropod is about as long as the telson, the posterior margin is slightly convex as a whole, and the outer lateral margin is rather straight. The exopod is longer than the endopod. The protopod bears a triangular tooth.

The antennular peduncle overreaches the distal margin of the penultimate segment of the antenna, the terminal segment is about three times as long as the penultimate one.

The 3rd maxilliped has a simple exopod without a flagellum.

The 1st pereopod is subchelate (Fig. 20b). The merus bears a subterminal spine on the dorsal margin, and is unarmed on the ventral margin. The carpus is armed with two strong dorsal spines; the ventrodistal spine is definable. The palm in males is rather broad, while that in females slender. The dorsal margin is rounded in transverse view, longitudinally bearing a row of interspaced scanty hair-tufts. The upper exterior surface bears a row of hair-tufts in the distal half. The median exterior surface is furnished with a row of hairs, which is deflected distally. The lower exterior surface in both sexes is scattered with long hairs in the distal part, and subterminally bears a hair tuft. The upper interior surface is longitudinally provided with a row of long hairs near the dorsal margin. The fixed finger is pointed at the tip; the cutting edge is armed with a series of 5-6 small triangular teeth except in its distal part. The dactylus is terminated

with a translucent apex. The upper exterior plate is lanceolate with a median sulcation. The lower exterior surface is provided with two rows of hairs separated by a smooth interspace, the upper row of which is broad, while the lower one is lineal. Above the upper exterior plate the outer surface bears a hair-band. The upper interior surface is submarginally armed with a series of seven rounded granules in the proximal half, and below it with a narrow slit exhibiting a row of six hair-tufts in its proximal half. The inner median line is only provided with a row of a few small granules in the proximal half, and with a carina in the distal half. The upper interior surface in females is submarginally unarmed. The cutting edge is ornamented with a distinct proximal and an indistinct middle tubercle.

REMARKS.—The present new species is rather related to *obtifrons* sp. nov. from N. Australia as mentioned in the remarks to the latter. However, this species is very characteristic in that the exopod of the 3rd maxilliped shows a simple segment without a flagellum as in *U. yokoyai* from Japan.

The type-series is designated as follows:

Holotype.—1♂, 39 mm in total length, from Phuket, Thailand. UMK Q21B-74.10.9.

Paratypes.—As mentioned in the list of material examined.

Disposition.—Universitetets Zoologiske Museum in Kobenhavn, and Phuket Marine Biological Center in Phuket.

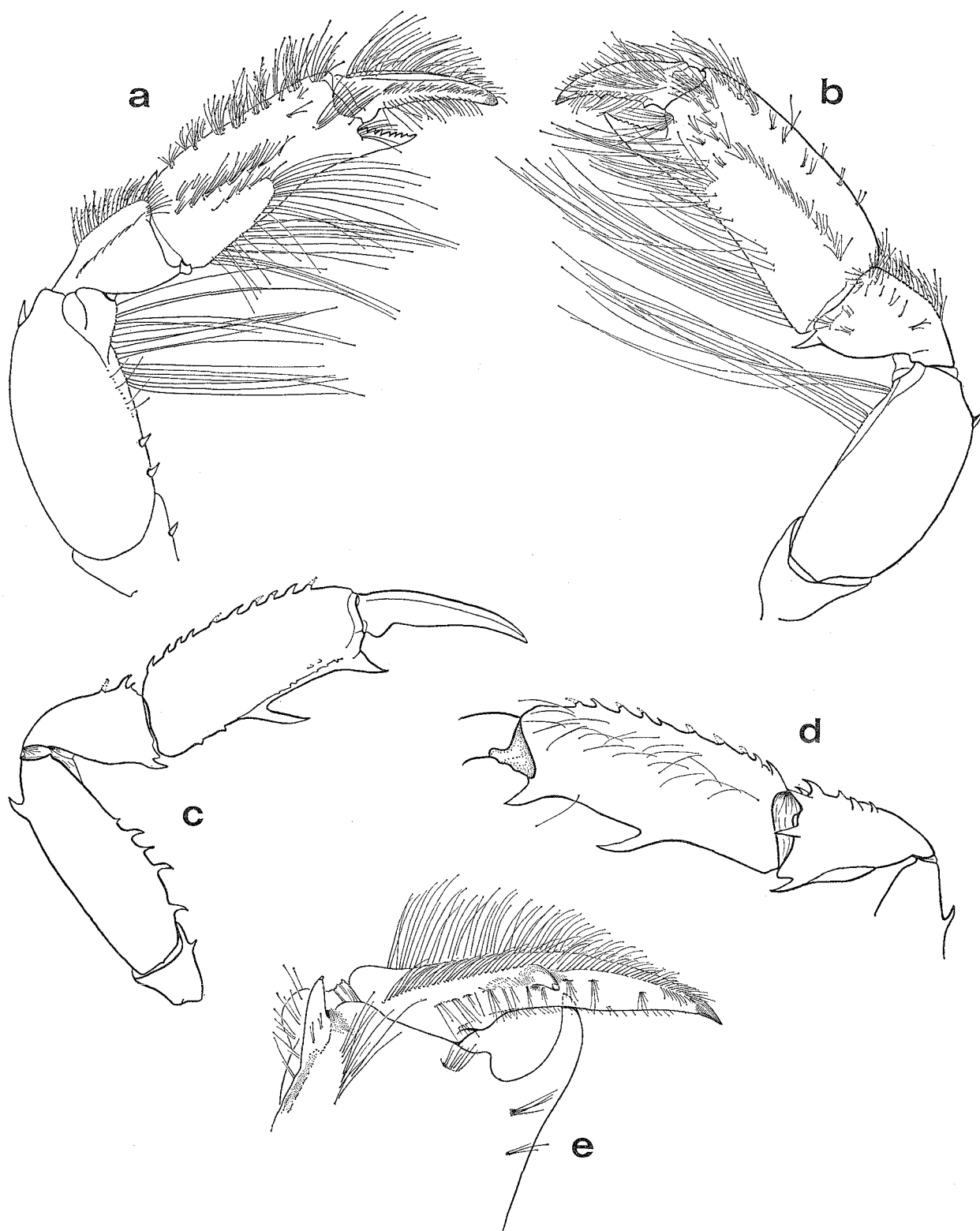


Fig. 20. a. *Wolffogebia obtifrons* sp. nov., ovig. ♀, holotype, ZMH Aust. Exped. Coll., 1st pereopod, outer view. b. *Wolffogebia phuketensis* sp. nov., ♂, holotype, UMK Q218 74.10.9, 1st pereopod, outer view. c. *Wolffogebia exigua*, ♂, ZSC 23557, 1st pereopod, outer view. d. same, 1st pereopod, inner view. e. *Wolffogebia inermis* sp. nov., ♂, holotype, ZMA Aust. Exped. Coll., tail-fan.

42. *Wolffogebia obtifrons* sp. nov.

Figs. 17, 18e-f, 20a.

TYPE LOCALITY.—Port Hedland, N. W. Australia.

MATERIAL EXAMINED.—Port Hedland, N. W. Australia (1♀ holotype, ZMH Australian Exped. 1975-76, Nr. 30).

DIAGNOSIS.—A small-sized species. Rostrum broadly truncate on frontal margin bearing six equidistant denticles. Lateral frontal process of carapace slightly projected forward. Dorsal surface of anterior thoracic region medially elevated with a median carina, lateral margin implanted with a row of 7-9 hair-tufts, and posterior to 2nd hair-tuft with a tubercle. No hepatic spine. Anterolateral margin of carapace unarmed. Telson convergent to midway on posterior margin. 3rd maxilliped bearing a two-segmented exopod. 1st pereopod subchelate. Carpus with two dorsal spines on inner distal margin and next to it another spine on outer distal margin. Dorsal margin of palm proximally with a row of four short spines, and outer surface medially with a row of hair-tufts in proximal two-thirds. Fixed finger denticulate on cutting edge to its whole extent. Dactylus proximally with a low convexity on cutting edge, inner surface dorsally smooth, and with a median row of seven granules in proximal half.

DESCRIPTION.—The rostrum is broadly truncate on the frontal margin hairy and provided with six equidistant denticles (Figs 17b, 18e). The ventral surface shows a median carina longitudinally delimited by a shallow sulcation on both sides. The dorsal surface of the anterior thoracic region is medially elevated in a median carina, the lateral margin is implanted with a row of 7-9 distinct hair-tufts, and posterior to the last hair-tuft with a denticle. The lateral frontal process of the carapace is slightly projecting forward, showing an obtuse tip. The lateral longitudinal ridge is provided with a row of 8-9 denticles as a whole, and anteriorly with three hair-tufts, the anterior one of which is elongated. The lateral longitudinal groove is directed outward at the anterior gap posterior to the posterolateral angle of the rostrum, and is divergent posteriorly as a whole. No hepatic spine is present. The linea thalassinica is obscurely defined, extending backward up to near to the posterior margin of the posterior thoracic region. The anterolateral margin of the carapace is unarmed.

The telson is rather rectangular (Fig. 18f); the lateral margin is posteriorly convergent in the posterior two-thirds, and the posterior one is concave. The dorsal surface forms a U-shaped carina, the transverse part of which is undefinable in the middle part, and the lateral longitudinal one shortly extends backward to the middle of the telson, a median groove is noticeable posterior to the transverse part of the U-shaped carina.

The endopod of the uropod reaches the level of the posterior margin of the telson, the posterior

margin is slightly concave. The exopod overreaches the endopod.

The eye-stalk is short.

The antennular peduncle overreaches the level of the distal margin of the penultimate segment of the antenna. The flagella are short; the inferior one is slightly longer than the superior, and about as long as the distal and the penultimate segment combined.

The 3rd maxilliped shows a two-segmented exopod.

The 1st pereopod is subchelate (Fig. 20a). The merus is armed with a sharp subterminal spine on the dorsal margin, and proximally with 2-3 stout triangular spines on the ventral margin. The carpus bears two sharp dorsal spines on the inner distal margin, and next to it another dorsal spine on the outer distal margin; the ventrodistal spine is not present. The palm is slender. The dorsal margin is rounded in transverse view, and longitudinally bears a row of interspaced hair-tufts to its whole extent and four interspaced teeth in its proximal half. The upper exterior surface is furnished with a row of distinct interspaced hair-tufts along the dorsal margin. The median exterior surface bears a row of hair-tufts in the proximal two-thirds. In parallel to it the lower exterior surface bears another row of hair-tufts, which is deflected downward at the middle part, and then merged in a row of hair-tufts found on the ventral margin. The outer distal margin bears a distinct hair-tuft at the middle and the ventral part. The inner surface is furnished with a hair-line along the dorsal margin. The inner ventral margin is provided with a sharp spine about at the distal third. The fixed finger is short, the cutting edge is armed with eight denticles to a whole extent. The dactylus is translucent at the tip. The upper exterior plate is medially sulcate, and distally tapering. The lower exterior surface bears two rows of hairs. Above the upper exterior plate there is a hairy band. The upper interior surface is smooth on the dorsal margin, and below it bears a row of hair-tufts. The inner median surface is definable with a row of seven tubercles in the proximal half. The cutting edge is proximally provided with a low truncate tooth, from the distal margin of which a row of denticles extends further distally at a short distance up to about the middle.

REMARKS.—The present new species from N. Australia is rather related to *W. phuketensis* sp. nov. from Phuket in that the dorsal surface of the anterior thoracic region bears an anteriorly-tapering median carina posterior to the frontal margin of the rostrum instead of a median furrow, the anterolateral margin of the carapace is unarmed, and the cutting edge of the fixed finger of the 1st pereopod is denticulate throughout its length.

Concerning the form of the cutting edge of the dactylus, this species fits *lenzrichtersi* sp. nov. from Madagascar, because in both species it is provided with a low truncate tooth, the distal part of which



is minutely denticulate. However, the present species is very characteristic in that the rostrum is broadly truncate on the frontal margin, and the dorsal surface of the anterior thoracic region is laterally provided with a row of distinct hair-tufts.

The type specimen of females is designated as follows:

Holotype.—1 ovig. ♀, 37 mm in total length, collected from Port Hedland, N.W. Australia.

Disposition.—Zoologisches Museum in Hamburg.

#### 43. *Wolffogebia inermis* sp. nov.

Figs. 17c, 18g, 19a-b, Pl. G6.

TYPE LOCALITY.—Java, Mocara Tangerang (W. Jakarta).

MATERIAL EXAMINED.—Java, Mocara Tangerang (1 ♂ holotype, ZMA).

DIAGNOSIS.—A small-sized species. Front of carapace trilobed. Rostrum elongate with rounded frontal margin, hirsute, and unarmed. Lateral frontal process of carapace broadly projecting forward. Dorsal surface of anterior thoracic region unarmed, hirsute except in its median longitudinal portion, and with a low median carina. Lateral longitudinal ridge also hirsute and unarmed. No hepatic spine. Anterolateral margin of carapace unarmed. 1st pereopod subchelate. Carpus with two dorsal spines on inner distal margin. Palm dorsally with a distinct ridge distally terminated by an anteriorly-directed tooth, outer surface medially with a row of scanty hairs. Fixed finger arising at some distance from ventrodistal angle of palm to form a wide gap, cutting edge unarmed. Upper exterior plate of dactylus sulcate, and inner dorsal margin slightly carinate, medially furnished with a distinct anteriorly-directed tooth.

DESCRIPTION.—The rostrum is elongate with a rounded apex, hirsute, unarmed, and inclined distally (Fig. 17c). The ventral surface is distinctly carinate on the median line. The dorsal surface of the anterior thoracic region is also hirsute except in the median longitudinal portion, unarmed, and bears a narrow carina extending from near the rostral tip to the posterior fourth of the gastric region. The lateral frontal process of the carapace is broadly projected anteriorly, hirsute, and extends anteriorly to the level of the middle of the rostrum. The lateral longitudinal ridge is also hirsute, and unarmed, the lateral margin is longitudinally protruding outward from the lateral surface of the anterior thoracic region. The lateral longitudinal groove is narrow. No hepatic spine is present. The linea thalassinica is definable only in the anterior part of the posterior thoracic region. The anterolateral margin of the carapace is unarmed.

The telson is subsquare and slightly broader than long (Fig. 18g); the lateral margin is conver-

gent backward in the posterior two-thirds, and the posterior margin is medially notched. The dorsal surface shows an obscure U-shaped carina in the anterior half; the median groove is remarkable behind the transverse part of the U-shaped carina.

The endopod of the uropod is broad, and slightly shorter than the telson, the posterior and the outer lateral margins are straight. The exopod overreaches the endopod, and proximally bears a small spine. The protopod bears no spine.

The antennular peduncle reaches the level of the distal margin of the penultimate segment of the antenna. The terminal segment is long, and about four times as long as the penultimate one. The antennular flagella are about as long as the terminal and the penultimate segment combined.

No scaphocerite is present.

The epistome is sharply pointed.

The 1st pereopod is subchelate (Pl. G6). The cheliped in the right side is absent in the specimen examined. The merus bears a sharp subterminal spine on the dorsal margin, and proximally a sharply-pointed spine on the ventral margin. The carpus is armed with two sharp spines on the inner distal margin, one of which lies at the dorsal corner, and the other at the midway. The ventrodistal spine is long and sharp. The palm is rather broad. The dorsal margin shows a carina to a whole extent, which is distally terminated with a stout tooth, and scantily hairy along the inner margin. The outer surface is convex and bears a longitudinal row of scanty short hairs in the middle line. The lower exterior surface is furnished with a row of hairs. The outer distal margin is provided with a tuft of hairs both at the midway and near the ventral corner. The upper interior surface is longitudinally armed with a row of long hairs below the dorsal margin. The fixed finger is arising at some distance from the ventrodistal angle of the palm to form a wide gap, the cutting edge is smooth. The dactylus (Figs. 19a-b, 20e) is translucent at its tip. The upper exterior plate is elongate and medially sulcate. Above its exterior plate there are two rows of hairs, and between them a smooth median interspace. The lower exterior surface is also longitudinally provided with two rows of hairs, the dorsal one of which is broad, the ventral one lineal, and with a smooth distinct carina between them. The inner dorsal margin is slightly carinate, and medially bears a stout anteriorly-directed tooth, and just below the dorsal margin bears a row of hair-pits. The cutting edge is nearly smooth.

REMARKS.—The present species is similar with *U. heterocheira* KEMP (1915: 257) from the Chilka Lake in that the dorsal surface of the anterior thoracic region is covered with fine hairs, and without any trace of granules or tubercles. However, the present species is different from it as shown in the following table.

<i>inermis</i> sp. nov.	<i>heterocheira</i> KEMP
No hepatic spine.	Hepatic spine stout.
No scaphocerite.	Scaphocerite consisting of a single tooth with a broad base.
2nd antennal segment unarmed at ventrodistal angle.	Mentioned part bearing a large spine at ventrodistal angle.
Dorsal margin of palm of 1st pereopod terminated with a stout tooth.	Mentioned part with 2-4 spines.
Cutting edge of fixed finger unarmed.	Mentioned part proximally with a large blunt spine.
Dorsal margin of dactylus medially with a stout tooth.	Mentioned part smooth.

Type specimen is designated as follows:

Holotype.—1♂, 34 mm in total length from Java, Mocara Tangerang.

Disposition.—Zoologisch Museum, Universiteit van Amsterdam.

#### 44. *Wolffogebia exigua* (ALCOCK 1901)

Figs. 17f, 18a-b, 19c-d, 20c-d.

- 1901 *Gebicula exigua* ALCOCK, Descr. Catal. Indian deep-sea Crust. Investigator: 202, pl. 2 fig. 4.  
 1905 *Upogebia (Upogebia) monoceros* DE MAN, Tijdschr. d. ned. dierk. Vereen. (2)9: 603.  
 1928 *Upogebia (Upogebia) monoceros*, — DE MAN, Siboga-Expeditie 39a(6): 75, pl. 6 fig. 10, pl. 7 figs. 10a-d.

TYPE LOCALITY.—Andaman Sea, 485 m (365 fms) deep.

MATERIAL EXAMINED.—Burma, off Irawady Delta, ca. 37 m (20 fms) deep (1♂, ZSI 2355/7, coll. by Marine Survey-Ship "Investigator", Sta. 60). — Java, Anchorage off Djangkar, 9 m deep (1 ovig. ♀, ZMA, holotype of *U. monoceros* DE MAN).

DIAGNOSIS.—Front of carapace simple. Rostrum of a triangular shape with an obtuse tip, bearing 5-6 equidistant lateral denticles and 1-3 ventral spines. Dorsal surface of anterior thoracic region hirsute except in its median portion, and with a row of lateral denticles. Lateral frontal process of carapace scarcely projecting forward, lying behind posterolateral angle of rostrum. Lateral longitudinal ridge with a row of equidistant denticles. Hepatic spine distinct. Anterolateral margin of carapace with 2-4 spines. 1st pereopod subchelate. Carpus with two upper spines on inner distal margin. Palm dorsally with a row of 9-10 anteriorly-directed teeth, outer surface medially with scattered transverse rows of short hairs, and inner ventral margin medially with a strong tooth. Fixed finger arising at ventrodistal angle of palm, cutting edge unarmed.

DESCRIPTION.—The rostrum is broadly triangular with an obtuse apex (Figs. 17f, 18a). The dorsal surface is hirsute, and bears a row of 5-7 interspaced lateral denticles, the anterior one of which is situated

at some distance from the rostral apex. The ventral surface bears a remarkable carina with 1-3 strong teeth; in the male specimen from Irawady Delta the two anterior ones are stouter than the proximal one. The dorsal surface of the anterior thoracic region is constricted in breadth posterior to the rostrum, hirsute except in the median longitudinal portion which is slightly convex, and laterally bears a row of indistinct denticles. The lateral frontal process of the carapace is scarcely projecting anteriorly, lying behind the posterolateral angle of the rostrum. The lateral longitudinal ridge is also hirsute, and longitudinally provided with a row of 8-9 interspaced denticles. The lateral longitudinal groove is narrow and moderately deep. The hepatic spine is distinct. The linea thalassinica extends posteriorly to the posterior margin of the carapace. The anterolateral margin of the carapace bears 2-4 interspaced spines diminishing in size downward.

The 2nd abdominal segment in females is rather long, similar to that of Callianassid species, while that in males is short like other Upogebiids, and the pleura is roundly protruded backward on the posterior margin.

The telson is slightly broader than long (Fig. 18b), the lateral margin is straightly convergent in the posterior two-thirds, in males bearing denticles in the middle line, in females unarmed. The posterior margin is largely concave as a whole. The dorsal surface shows a distinct U-shaped carina, the lateral longitudinal part of which extends to the posterior margin of the telson; the middle portion surrounded by the U-shaped carina is remarkably depressed without a median groove.

The endopod of the uropod shows an oblique fan-shape; the posterior margin is slightly convex, and the outer lateral margin bears a knob at the proximal angle. The exopod slightly overreaches the endopod. The protopod bears a small spine on the posterior margin.

The epistome is pointed at the tip.

The antennular peduncle reaches the level of the distal margin of the penultimate segment of the antenna. The proximal segment bears a sharp distal spine on the ventral margin. The distal segment is about three times as long as the penultimate one. The flagella are subequal and about as long as the

peduncle.

The 3rd segment of the antenna bears a subterminal spine. The penultimate segment proximally bears a sharp ventral spine. The scaphocerite in males is monospinous, in females bifurcate.

The 1st pereopod is subchelate (Figs. 20c-b). The merus is provided with a sharp subterminal spine on the dorsal margin, and with 4-5 interspaced spines on the ventral margin, 2-4 proximal spines of which are more distinct and sharp than the distal ones, and directed backward at the tip. The carpus bears two sharp upper spines on the inner distal margin. The inner dorsal margin bears two interspaced spines posterior to the distal spine mentioned above. The outer distal margin bears two spines in the upper part, and behind those another spine. The ventrodistal spine is sharp. The palm is provided with a row of 9-10 anteriorly directed prominent spines. The outer surface is medially scattered with transverse rows of short hairs. The ventral outer surface in males is longitudinally deflected outward with a row of about 10 small interspaced tubercles, while that in females is deflected without a row of tubercles. The ventral inner margin is armed with a distinct tooth at the middle part. The upper interior surface bears a row of scanty long hairs near the dorsal margin. The fixed finger shows a sharp tooth at the ventrodistal corner of the palm, the cutting edge is smooth. The dactylus is translucent at its tip (Figs. 19c-d). The upper exterior plate is narrow and shallowly sulcate in its whole extent. The inner dorsal margin is smooth, and provided with a hair-band. The inner surface is medially carinate, and bearing a row of hair-pits.

In the 2nd pereopod the propodus is rather high, the dorsal margin is convex in the middle part, and the ventral one is straight.

REMARKS.—It seems not likely that *U. monoceros* DE MAN 1905 is a synonym of the present species. Unfortunately the type specimen of the species *exigua* was not accessible to the author, as it was rather fragile, so that it could not be sent (in litt: K. K. TIWARI). However, a male specimen collected off Irawady Delta, Burma, Andaman Sea at about 37 m deep (20 fms) as well as the holotype of *U. monoceros*, a female, have been examined and it is sure that those two specimens are not only belonging to the same species but also to *exigua*, because ALCOCK stated that 1. "Behind which spine (=the anterior part of the lateral longitudinal ridge of the carapace) a line of tiny spinules runs towards the cervical suture." 2. "The anterior borders (=the anterolateral margins) of the carapace... is armed with 3-4 spines," 3. "and there is a (hepatic) spine." 4. "The telson is short and quadrate." 5. "The propodite (of the 1st pereopod), which is subcylindrical." In addition the figure given by ALCOCK (pl. 2 fig. 4) for his species

is also available as follows. 6. The epistome is pointed. 7. The merus of the 1st pereopod bears a row of five spines, 8. and bears two subterminal spines on the dorsal margin. 9. The carpus bears three spines on the dorsal margin. 10. The palm bears a row of six teeth on the dorsal margin, 11. and bears a large subterminal spine on the ventral margin. Among those characters mentioned above the number of spines on the dorsal margins of the merus and of the palm is not always identical with that of the present specimens, however, this difference could be safely considered as an individual variation.

In spite of those agreements some important differences seem to be observed comparing the present specimens of both sexes with ALCOCK's description. ALCOCK mentioned "the 1st pair of thoracic legs... strictly monodactylous," and through this shape of the 1st pereopods the genus *Gebicula* is established by him. However, one should be careful in observing the form of the 1st pereopods as it presents different aspects according to the directions of view. The author observed those two specimens and found that the lower exterior surface of the palm is deflected outward with a row of denticles and hairs, so that this deflected border is liable to be mistaken for the ventral margin of the palm and it may be concluded that the 1st pereopod is simple as defined by ALCOCK. In fact ALCOCK showed a stout tooth at the subterminal position of the ventral margin in his figure, so there is no doubt that the subterminal tooth on the ventral margin of the palm described by ALCOCK is the fixed finger.

Concerning the uropod and telson, ALCOCK stated: "The telson is much shorter than the caudal swimmerets (=uropods) and the caudal swimmerets broadly foliaceous." Later BORRADAILE (1903: 543) wrote that, "the last limb (=uropod) in *Gebicula* seems to be of a more primitive shape than that of *Upogebia*." DE MAN (1928: 20) mentioned in his key: "Uropods in *Gebicula* longer than telson." Apart from ALCOCK's definition, the definitions given by BORRADAILE and DE MAN are apt to be available, however, the original description differs much from those subsequent ones, as ALCOCK described the uropod as broadly foliaceous. In fact it is not rare that species with broadly foliaceous uropod being longer than the telson are found among the members of *Upogebia*.

In conclusion it seems most unlikely that the genus *Gebicula* is valid. ALCOCK's species obviously belongs to the genus *Upogebia*, and is merely a senior synonym of *Upogebia monoceros* DE MAN.

Excluding the inaccuracies in ALCOCK's description concerning the shape of the 1st pereopod and the uropod mentioned above, there are some additional differences between the present material and ALCOCK's description, which are tabulated below:

♀, 15 mm in total length, from Andamen Sea 485 m deep, after ALCOCK 1901.

♂, 19 mm in total length from Burma 37 m deep;  
♀, 16 mm from Java 9 m deep, holotype of *U. monoceros*

Ventral margin of rostrum unarmed.

Cervical groove laterally with tiny spinules.

Antennular and antennal peduncles of nearly equal length.

Proximal and terminal segments of antenna each with a terminal spine on ventral margin.

No scaphocerite.

Mentioned margin with 1-3 spines.

Mentioned part unarmed.

Antennular peduncle shorter than antennal one by its terminal segment.

Mentioned segments each without a terminal spine on ventral margin.

Scaphocerite in males monospinous, and in females bispinous.

Presence or absence of the ventral teeth of the rostrum has been considered as an important character by DE MAN, who used it in his key (DE MAN 1928: 39). However, at least as far as this species is concerned, the number of the ventral spines of the rostrum seems to be subject to individual variation.

The present table shows rather clearly that also the denticulation on the antennal segments and the cervical groove, the relation of length between the antennal and antennular peduncles, and absence of the scaphocerite in ALCOCK's specimen are indefinite. These inaccordances may be due to mistakes of ALCOCK.

It seems likely that the present species is clearly related to *U. ceratophora* from Indonesia in that the posterior margin of the telson is concave, the endopod of the uropod is obliquely positioned, the spinulations on the ventral margin of the rostrum, on the anterolateral margin of the carapace, and on the dorsal margin of the palm of the 1st pereopod, and a pair of hepatic spines are present. However, this species shows a rather heterospecific character because the dorsal surface of the anterior thoracic region bears no median furrow but a median convexity like *W. phuketensis*, *inermis*, and *obtifrons* gen. et spp. novs.

#### Genus *Tuerkayogebia* gen. nov.

DEFINITION.—Dorsal surface of anterior thoracic region provided only by stout, yellow-translucent tubercles. Lateral frontal process of carapace and lateral longitudinal groove undefinable. Anterolateral margin of carapace unarmed. 1st pereopod chelate.

TYPE SPECIES.—*Tuerkayogebia kiiensis* (SAKAI 1971). Only the type species is known.

#### 45. *Tuerkayogebia kiiensis* (SAKAI 1971),

Figs. 17d-e.

1971 *Upogebia* (*Calliadne*) *kiiensis* SAKAI, Publ. Seto mar. biol. Lab. 19: 243, text-figs. 1-2.

1972 *Upogebia* (*Calliadne*) *kiiensis*, — SAKAI, Nanki biol. Soc. 14: 1, text-fig. 1.

TYPE LOCALITY.—Japan, Wakayama-Pref., Shirahama, 20 m deep.

MATERIAL EXAMINED.—Japan, Wakayama-Pref., Shirahama, 20 m deep (1♀ holotype, MP Th 441).

DIAGNOSIS.—A small-sized species measuring 23 mm in total length. Front of carapace simple (Fig. 17e). Rostrum with two apical and four lateral tubercles. Dorsal surface of anterior thoracic region provided only with stout, yellow-translucent tubercles. Lateral frontal process of carapace and lateral longitudinal groove undefinable. Anterolateral margin of carapace unarmed. Telson (Fig. 17d) about 4/5 as long as broad, lateral margin with a low truncate process in the proximal 2/5, and posterior margin almost straight. 3rd maxilliped with a three-segmented exopod. 1st pereopod almost chelate. Carpus with three upper teeth on inner distal margin. Palm with an oblique row of hairs on outer surface. Dactylus overreaching fixed finger by distal 1/6 of length, dorsal surface with a smooth broad carina, cutting edge with crest bearing 6-7 denticles, and inner surface with a row of nine tubercles.

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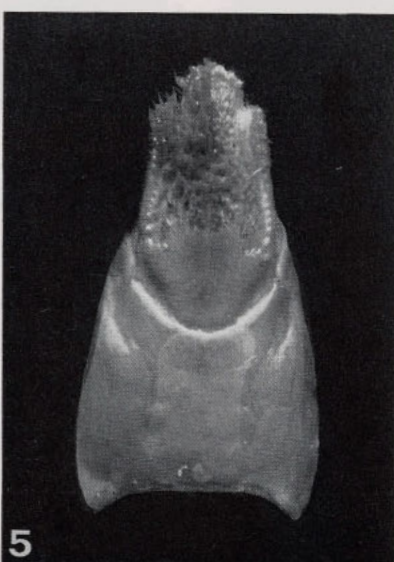
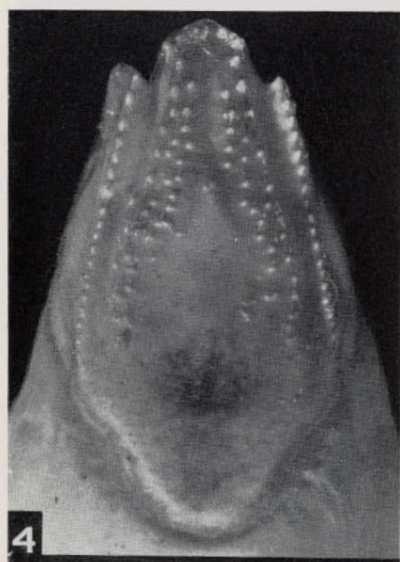
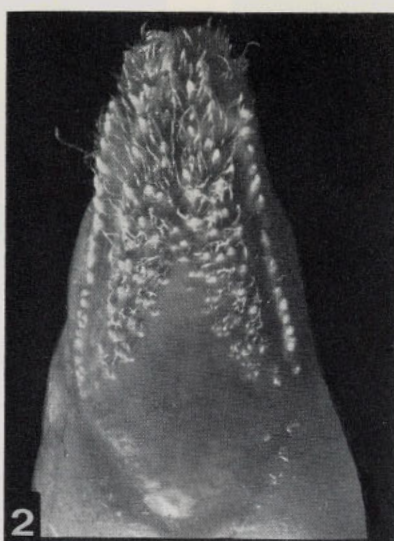
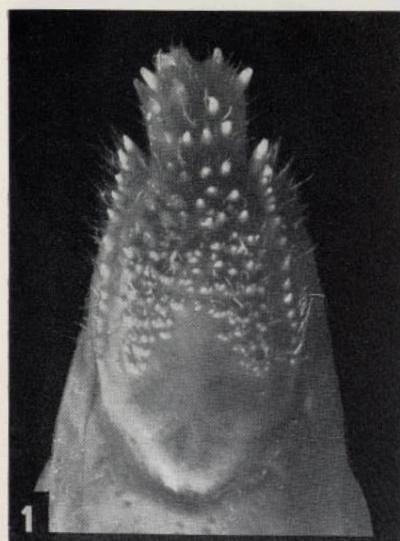
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## Explanations of Plates

**Explanation of plate A**

1. *Upogebia* (*Upogebia*) *darwini*, ZSM 91/2. 2. same, ZSM 91/2. 3. same, ZSM 91/2. 4. *Upogebia* (*Upogebia*) *hexaceras*, ovig. ♀, MNB 4838. 5. *Upogebia* (*Upogebia*) *carinicauda*, ovig. ♀, MP Th 3. 6. *Upogebia* (*Upogenia*) *capensis*, ♂, neotype, ZMH 29852.



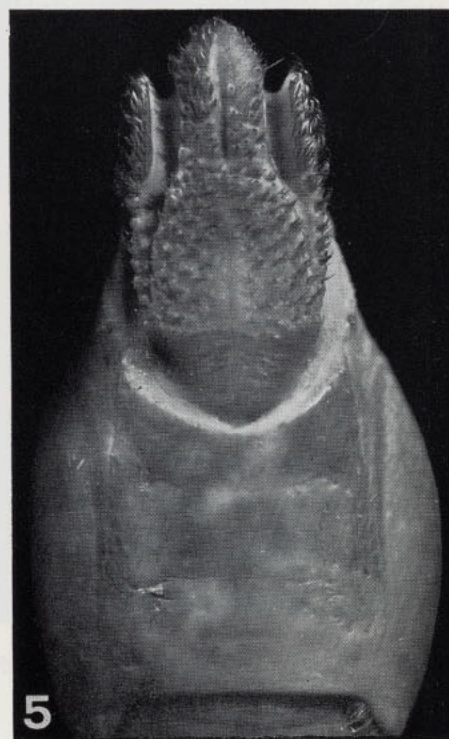
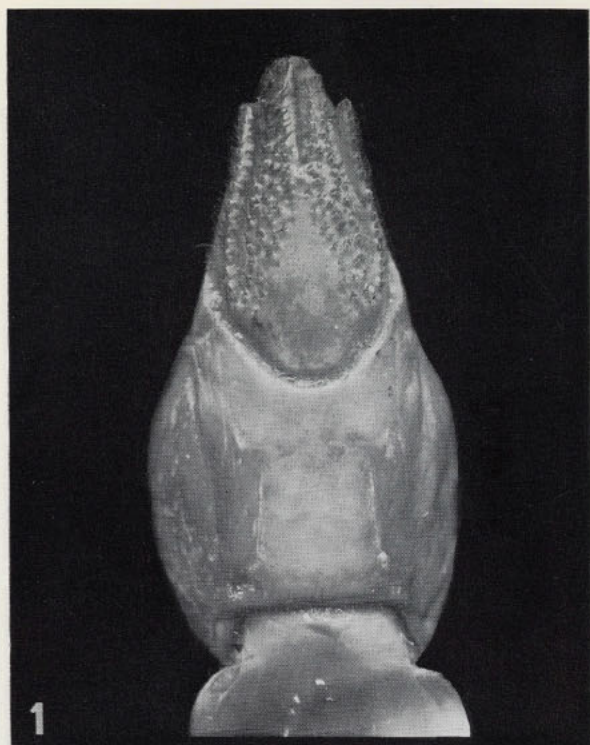


K. SAKAI: Revision of Upogebiidae

**Explanation of plate B**

1. *Upogebia* (*Upogebia*) *subspinos*a, oving. ♀, ZMH 8395. 2. *Upogeiba* (*Upogebia*) *yokoyai*, ♂, UKF 8965.
3. *Upogebia* (*Upogebia*) *imperfecta* sp. nov., ♂, holotype, UKF 9618. 4. *Upogebia* (*Upogebia*) *issaeffi*, ♂, syntype, ZSM 94/2. 5. *Upogebia* (*Upogebia*) *major*, ♀, USNM 72383.



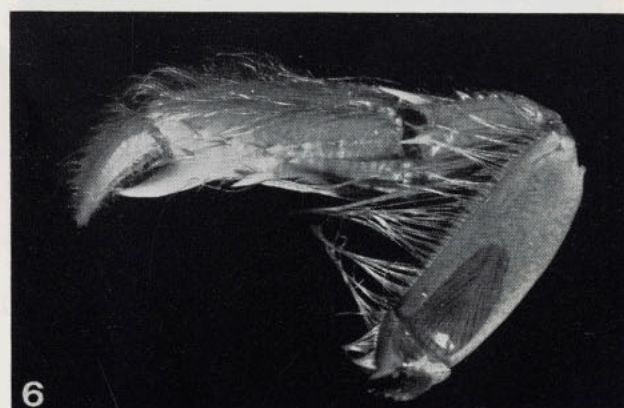
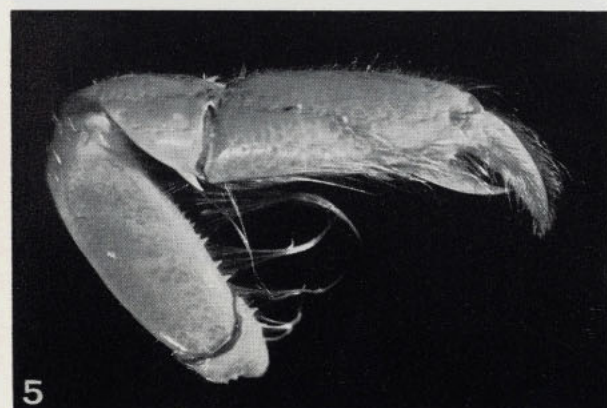
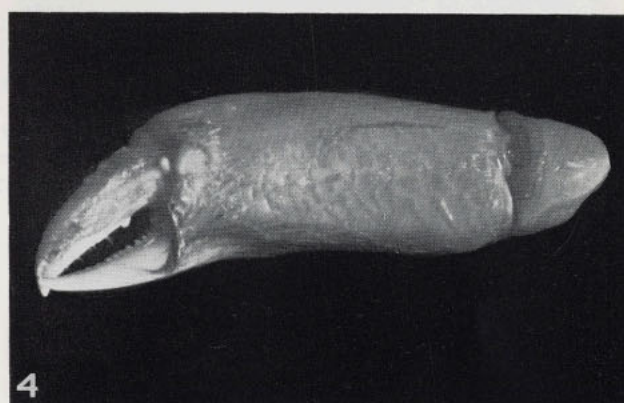
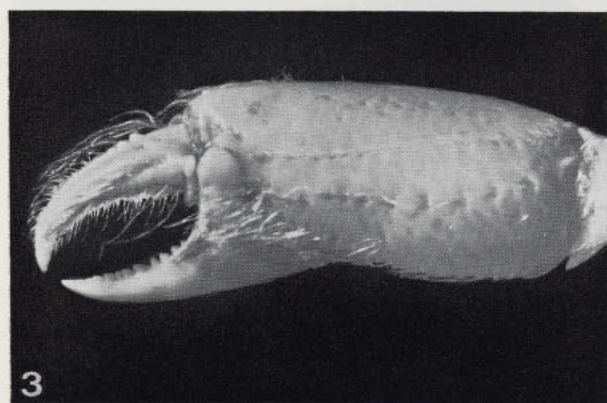
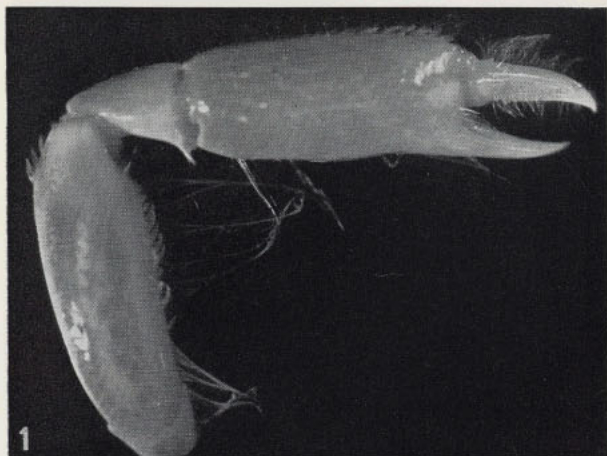


K. SAKAI: Revision of Upogebiidae

**Explanation of plate C**

1. *Upogebia (Upogebia) cargadensis*, ovig. ♀, MP Th 553, 1st pereopod, outer view. 2. same, inner view.
3. *Upogebia (Upogebia) darwini*, ZSM 91/2, 1st pereopod, outer view. 4. *Upogebia (Upogebia) hexaceras*, ovig. ♀, MNB 4838, 1st pereopod, outer view. 5. *Upogebia (Upogebia) carinicauda*, ovig. ♀, MP Th 3, 1st pereopod, outer view. 6. same, inner view.

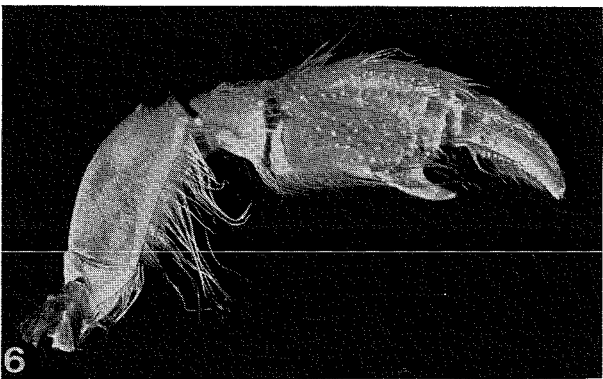
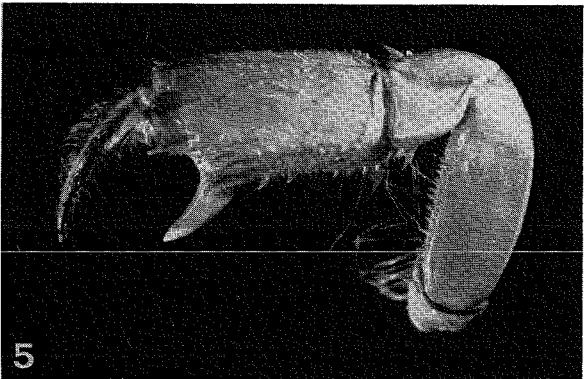
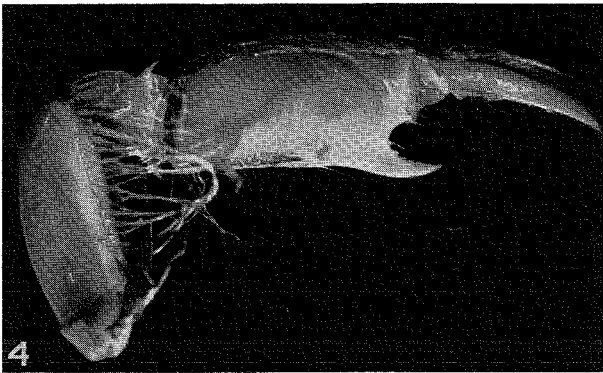
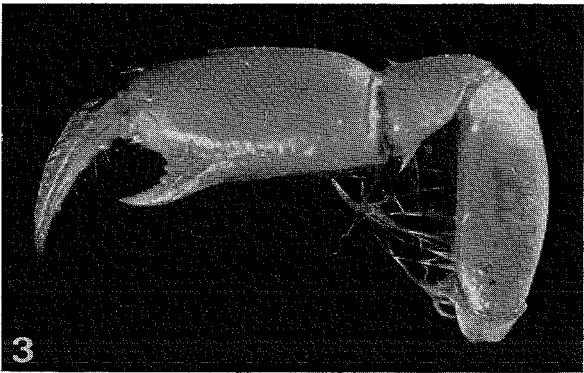
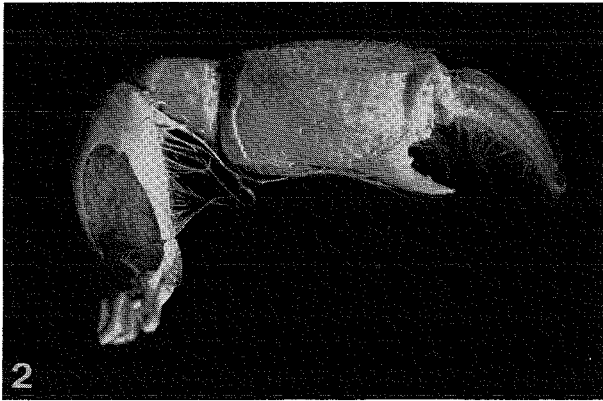
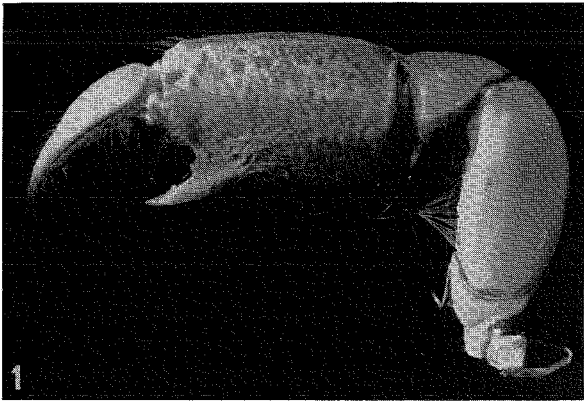




K. SAKAI: Revision of Upogebiidae

**Explanation of plate D**

1. *Upogebia* (*Upogebia*) *osiridis*, ♂, MP Th 29, 1st pereopod, outer view. 2. same, inner view. 3. *Upogebia* (*Upogebia*) *lenzrichtersi* sp. nov., ♂, paratypes, 1st pereopod, outer view. 4. same, inner view. 5. *Upogebia* (*Upogebia*) *capensis*, ♂, neotype, ZMH 29852, 1st pereopod, outer view. 6. same, inner view.

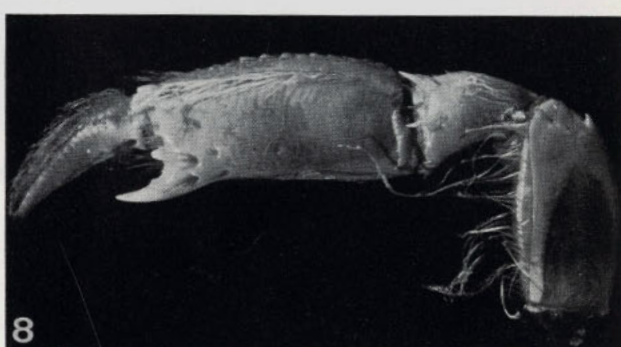
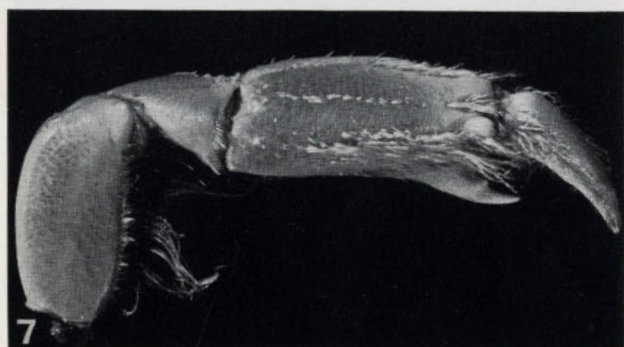
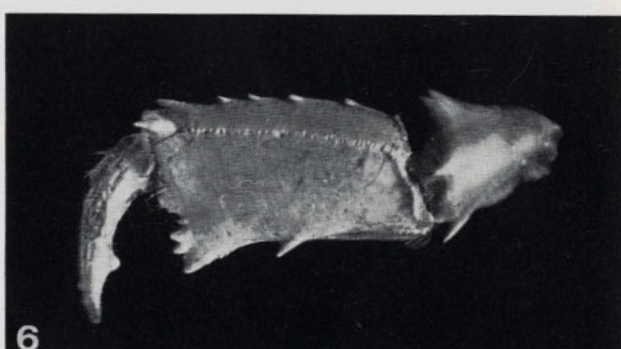
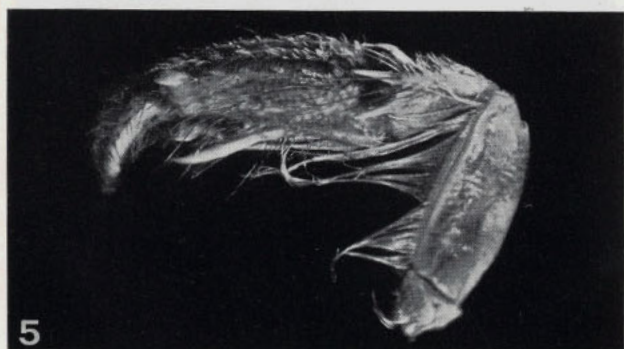
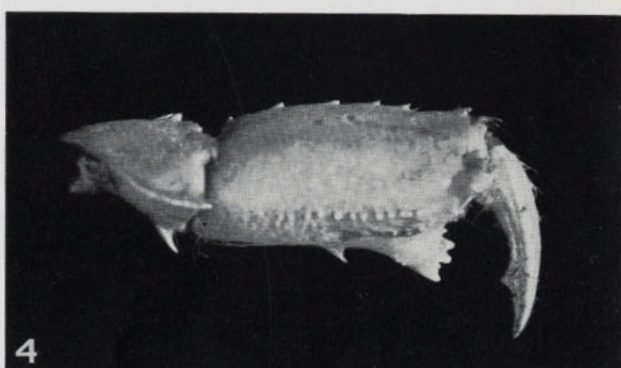
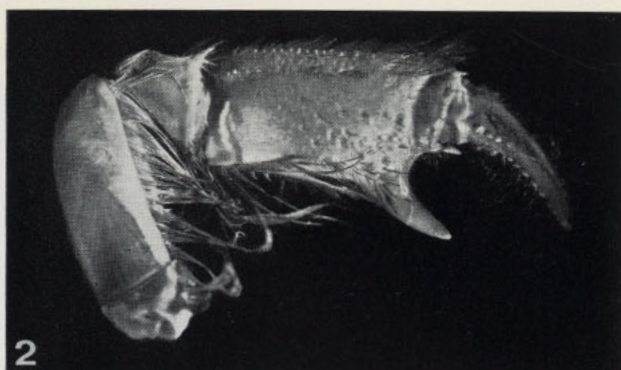
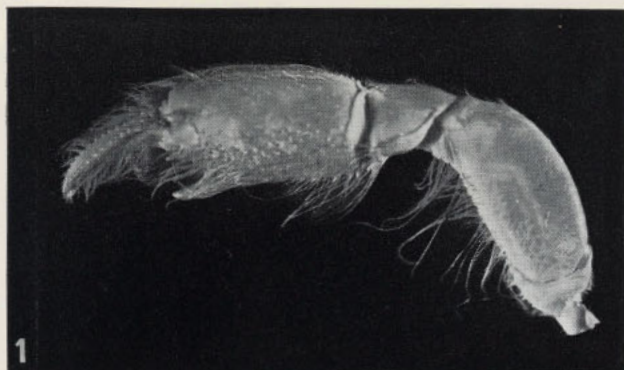


K. SAKAI: Revision of Upogebiidae

**Explanation of plate E**

1. *Upogebia (Upogebia) subspinosa*, ovig. ♀, ZMH 8395, 1st pereopod, outer view. 2. same, inner view. 3. *Upogebia (Upogebia) plantae* sp. nov., MP Th. 1st pereopod, outer view. 4. *Upogebia (Upogebia) pugnax*, ♂, UKF 4357, 1st pereopod, view. 5. *Upogebia (Upogebia) plantae* sp. nov. MP Th, 1st pereopod, inner view. 6. *Upogebia (Upogebia) pugnax*, ♂, UKF 4357, 1st pereopod, inner view. 7. *Upogebia (Upogebia) hirtifrons*, ♂, SMF 4949, 1st pereopod, outer view. 8. same, inner view.



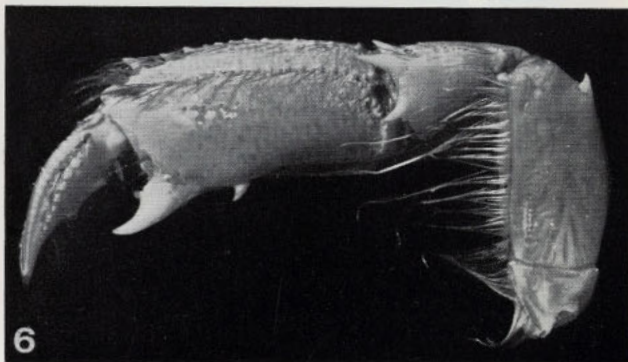
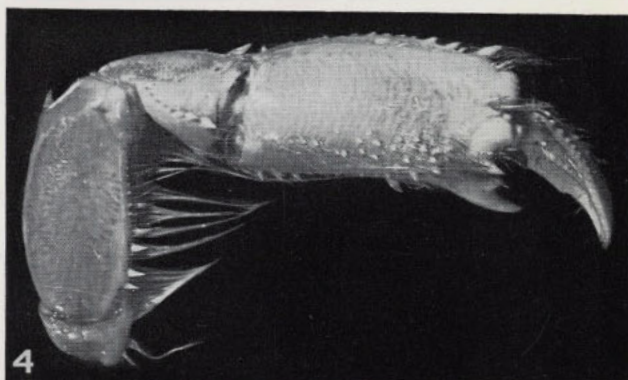
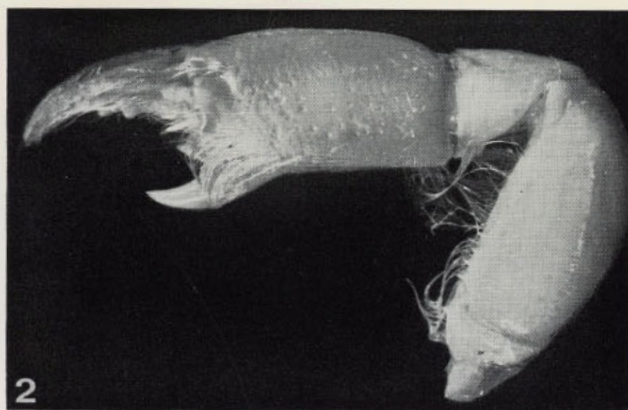
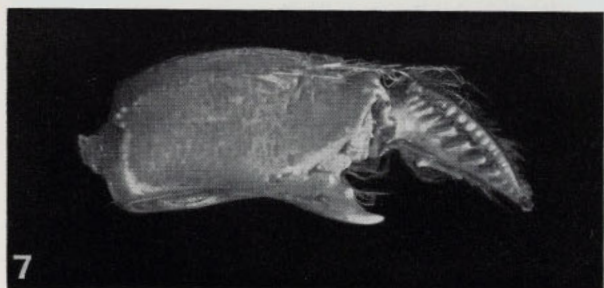
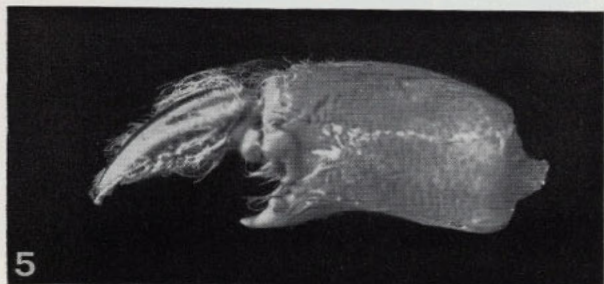
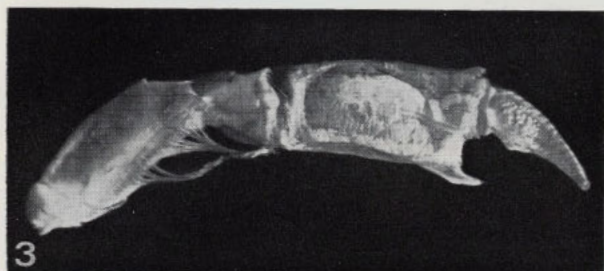
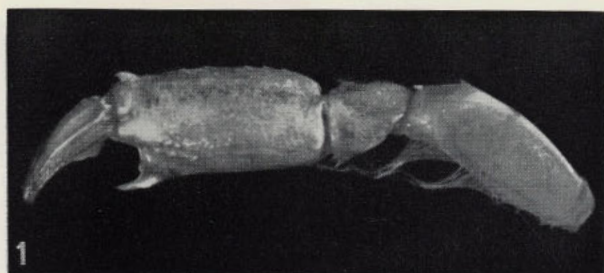


K. SAKAI: Revision of Upogebiidae

#### Explanation of plate F

1. *Upogebia* (*Upogebia*) *spinifrons*, ♂, MNB 12664, 1st pereopod, outer view.
2. *Upogebia* (*Upogebia*) *yokoyai*, ♂, UKE 8965, 1st pereopod, outer view.
3. *Upogebia* (*Upogebia*) *spinifrons*, ♂, MNB 12664, 1st pereopod, inner view.
4. *Upogebia* (*Upogebia*) *imperfecta* sp. nov., ♂, holotype, UKF 9618, 1st pereopod, outer view.
5. *Upogebia* (*Upogebia*) *issaeffi*, ♂, syntype, ZSM 94/2, 1st pereopod, outer view.
6. *Upogebia* (*Upogebia*) *imperfecta* sp. nov., ♂, holotype, UKF 9618, 1st pereopod, inner view.
7. *Upogebia* (*Upogebia*) *issaeffi*, ♂, syntype, ZSM 94/2, 1st pereopod, inner view.



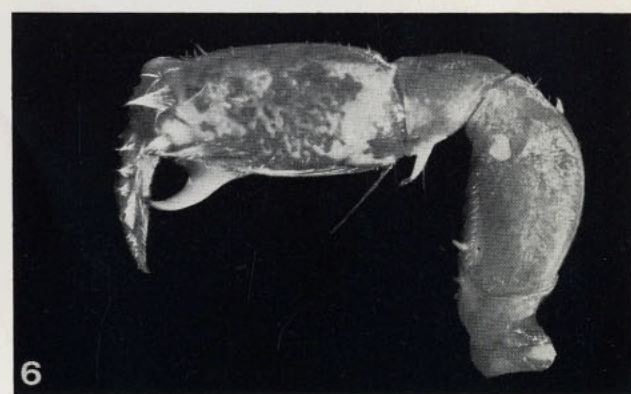
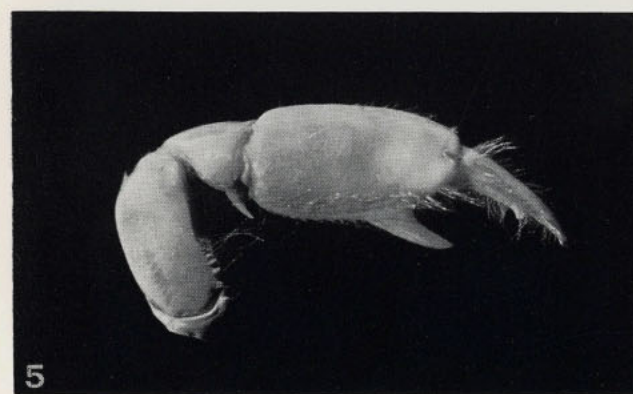
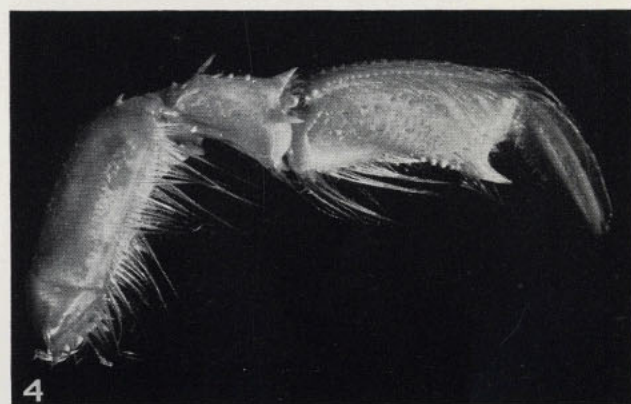
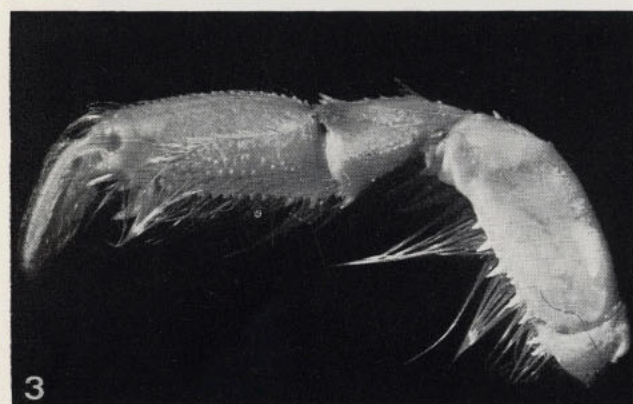
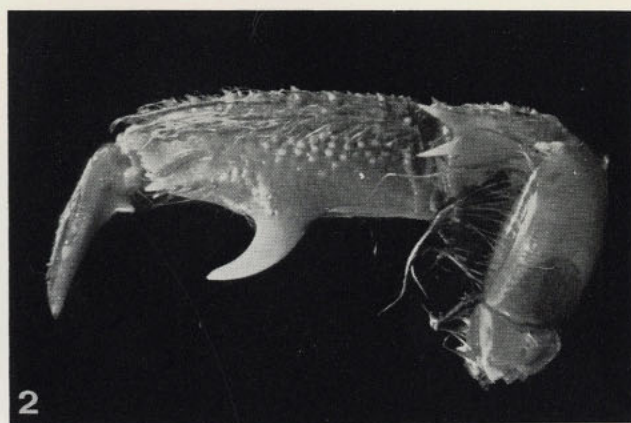
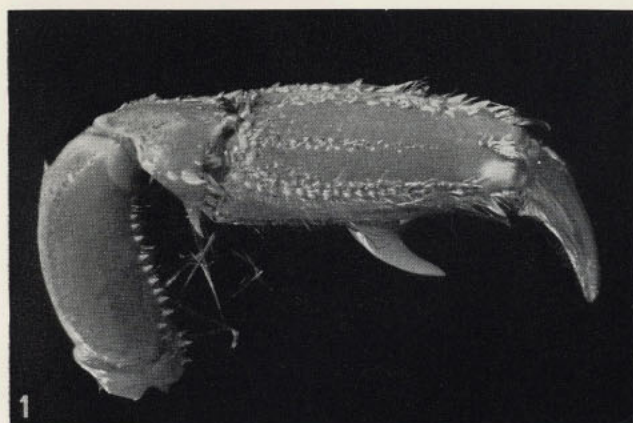


K. SAKAI: Revision of Upogebiidae

**Explanation of plate G**

1. *Upogebia* (*Upogebia*) *wukshienweni*, ♂, USNM 59072, 1st pereopod, outer view. 2. same, inner view. 3. *Upogebia* (*Upogebia*) *major*, ♀, USNM 72383, 1st pereopod, outer view. 4. same, inner view. 5. *Upogebia* (*Acutigebia*) *danai*, ♂, MP Th 212, 1st pereopod, outer view. 6. *Wolffogebia inermis* sp. nov., ♂, holotype, ZMA, 1st pereopod, inner. view.





K. SAKAI: Revision of Upogebiidae

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*Upogebia* (*Upogebia*) ..... 3, 6-8, 47, 59-61.

## ADDENDUM

Since the manuscript for the present revision was terminated in 1977 and its publication was delayed for different causes, some papers on Upogebiids appeared including descriptions of new species and/or taxonomic discussions. Most of those specimens could not be examined by the present author, however, for convenience sake some remarks on that papers are given here. It is hoped, that herewith the present paper will keep its monographic character.

*Upogebia lincolni* Ho 1977

This species will key out near *U. pugnax* and *U. wuhsienweni* using the key of the present paper. It is, however, readily distinguishable from the former by the shape of the fixed finger of the cheliped and from the latter by the much feebler dentition of the anterolateral borders. A much more evident difference from both species is the extremely well developed transverse carina of the telson, which is similar to *carinicauda*.

*Upogebia quddusia* TIRMIZI & GHANI 1978

This species from Pakistan will most probably key out as *U. barbata* in the key to species published in the present paper. It is evidently near to this species but there are some differences indicating, that *quddusia* is distinct from *barbata*. The most obvious feature seems to be the median furrow in the posterior half of the telson (TIRMIZI & GHANI 1978: fig. 1D, but not mentioned in the text), which *barbata* lacks. Also there seem to be some differences in the cheliped. Only a direct comparison of the type series with *barbata*-specimens could help to identify the real relations of both species.

*Upogebia ancylodactyla* DE MAN 1905

TIRMIZI & KAZMI (1979: 106) selected a lectotype for the present species.

*Upogebia baweana* TIRMIZI & KAZMI 1979

This name is introduced by the authors for the specimen of the "Siboga"-station 323, which DE MAN (1928: 87) included in his *ancylodactyla* (see also present paper p. 28). *U. baweana* will key out as *U. assisi* using the present key, but is easily differentiated from that species by the sharp subfrontal teeth.

*Upogebia amboinensis* (DE MAN 1888)

TIRMIZI & KAZMI (1979: 110) have unfortunately designated the Amsterdam specimen (formerly in DE MAN's private collection) as lectotype of this species in spite of the fact, that BROCK's collection is kept in the Göttingen-Museum (W-Germany). Herewith the lectotype designation on p. 25 of the present paper is invalid and all the Göttingen-specimens are paralectotypes. Judging from the figures and description of the authors, the lectotype seems to belong to the same species as the paralectotypes, how-

ever, as the species in question is a member of a difficult group of species, which are very similar to each other, the question needs careful reexamination by comparison of the whole type series.

*Upogebia acutispina* DE SAINT LAURENT & HO 1979

The present author examined two holotype and one paratype specimens of this species when working on the present revision (see pp. 49, 51). He then came to the opinion, that the specimens from Holothuria-Bank (NW-Australia) were adults of *U. ceratophora* DE MAN 1905 of which he examined the juvenile syntypes. Seeing the characters used by the authors for separating *acutispina* from this latter species (ventral spinulation of rostrum, spinulation of first pereopods, shape and armature of telson) and with the experience of age-variable characters in *Upogebia*, he is still believing, that both species are synonymous and that *acutispina* is simply an adult of *ceratophora*. Of course, this question can only be solved finally with more material of different size classes from both typical localities.

*Upogebia ceratophora* DE MAN 1905

DE SAINT LAURENT & HO (1979: 64) designated a lectotype for this species (the syntype of station 53 of the Siboga-Expedition), which also is described and discussed in the present paper (see pp. 49-52).

*Upogebia australiensis* DE MAN 1927

In the present paper this species is treated as a possible synonym of *U. bowerbanki*. POORE & GRIFFIN (1979: 287) have, on the basis of a more abundant material, separated *australiensis* from the latter, which is probably more adequate.

*Upogebia darwini* (MIERS 1884)

The figure and description in the present paper will help to fix the status of this species in future, as there is some confusion presently. The specimen figured by POORE & GRIFFIN (1979: Fig. 46) evidently does not belong to this species, as it has a subchelate first Pereiopod and also otherwise differs from the types from Port Darwin. It most probably belongs to *U. carinicauda* (STIMPSON 1860).

*Upogebia dromana* POORE & GRIFFIN 1979

As already pointed out by POORE & GRIFFIN (1979: 295) this species is near to *U. hirtifrons* and will key out as that species in the present key. The main difference between both species is the double carinated telson in *dromana*.

*Upogebia giralia* POORE & GRIFFIN 1979

From the description and figures of POORE & GRIFFIN it is evident, that this species is identical with *Wolffogebia obtifrons* described in the present paper, so that this species has to be called *Wolffogebia giralia* (POORE & GRIFFIN 1979) now.



*Upogebia hexaceras* (ORTMANN 1894)

As mentioned in this paper (p. 24) only a reexamination of the poorly described type specimen will give security concerning the identity of the species and its distinction of *U. darwini*. In all cases the specimen described and figured by POORE & GRIFFIN (1979: 300, fig. 50) most probably belongs to *U. darwini*.

*Upogebia neglecta* DE MAN 1927

This species is not treated in the present paper, because the author had no access to the type. POORE & GRIFFIN (1979: 301) give figures and a description of the type specimen. Presently it cannot be brought into connection with any species.

All other species described by POORE & GRIFFIN (1979) are used in the same sense as they are in the present paper.

## Additional Literature

- HO, N.N. 1977. *Upogebia lincolni* sp. nov. (Decapoda, Thalassinidea, Upogebiidae) from Java, Indonesia. *Crustaceana*, **33**(3): 309-313, text-figs. 1-3.
- POORE, G.C.B. & GRIFFIN, D.J.G. 1979: The Thalassinidea (Crustacea: Decapoda) of Australia. *Rec. austral. Mus.*, **32**(6): 217-321, text-figs. 1-56.
- SAINT LAURENT, M. DE & HO, N. N. 1979. Description de deux espèces nouvelles du genre *Upogebia* LEACH, 1814 (Decapoda, Upogebiidae). *Crustaceana*, **37**(1): 57-70, text-figs. 1-40.
- TIRMIZI, N.M. & GHANI, N. 1978. *Upogebia quddusia* n. sp. from Pakistan (Decapoda, Thalassinidea). *Crustaceana*, **35**(2): 134-138, text-figs. 1-2.
- TIRMIZI, N.M. & KAZMI, Q.B. 1979. Results of the Study of the Type Material of some Species of *Upogebia* (Decapoda, Thalassinidea). *Crustaceana*, **Suppl. 5**: 105-114, text-figs. 1-3.