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Pilumnid crabs of the family Xanthidae from the West Pacific. I.  
Twenty-three species of the genus *Pilumnus*, with  
description of four new species

Masatsune TAKEDA and Sadayoshi MIYAKE

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Pilumnid crabs of the family Xanthidae from the West Pacific. I.  
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In the subfamily Pilumninae of the family Xanthidae it is readily known that the genus *Pilumnus* reaches its abundance as to the species and individuals in the whole temperate and tropical oceans. Due to not only the abundance and close resemblance of those species but also little knowledge of each species the systematics of the present genus seem to be rather in a state of disorder.

The first male pleopods are very alike each other and only slightly different at the tips, so that the character seems to be not effectively available for distinguishing each species. Otherwise such characters as the hairiness, convexity, granulation and areolation of the carapace, the shape of the front, and the armatures of the anterolateral borders, subhepatic regions, chelipeds and ambulatory legs may deserve much consideration for discriminating a species from the congeners. Mainly on account of those features Balss (1933) gave each proper genus to many species which were previously referred to the genus *Pilumnus* from the Indo-Pacific regions. According to his excellent monograph and the additional authorities the following species and subspecies are duly referable to the present genus. The species with an asterisk are remarked below, and those with an obelisk are dealt herewith.

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\* Contributions from the Zoological Laboratory, Faculty of Agriculture, Kyushu University, No. 377

- Pilumnus acer* Rathbun, 1923
- P. acutifrons* Rathbun, 1906
- P. alcocki* Borradaile, 1902
- P. australis* Whitelegge, 1900
- P. barbatus* A. Milne Edwards, 1873 †
- P. braueri* Balss, 1933
- P. contrarius* Rathbun, 1923
- P. cristimanus* A. Milne Edwards, 1873 \*
- P. cursor* A. Milne Edwards, 1873 †
- P. danai* Stimpson, 1907 \*
- P. deflexus* A. Milne Edwards, 1867
- P. elatus* A. Milne Edwards, 1873 †
- P. elegans* de Man, 1888 \*
- P. etheridgei* Rathbun, 1923
- P. eudaemoneus* Nobili, 1906 \*
- P. fissifrons* Stimpson, 1858 †
- P. forskali* H. Milne Edwards, 1834
- P. forskali bleekeri* Miers, 1880
- P. forskali caerulescens* A. Milne Edwards, 1873 \*
- P. granti* Montgomery, 1931
- P. haswelli* de Man, 1888
- P. humilis* Miers, 1884
- P. integrifrons* Shen, 1948
- P. kingstoni* (Rathbun, 1923)
- P. kuekenthali* de Man, 1902
- P. laevigatus* (Rathbun, 1911)
- P. lanatus* Latreille, 1825 \*
- P. longicornis* Hilgendorf, 1878 †
- P. longicornis spinosus* Balss, 1933
- P. longipes* A. Milne Edwards, 1873 \*
- P. lumpinus* Bennett, 1964
- P. maccullochi* Montgomery, 1931
- P. maldivensis* Borradaile, 1902
- P. marginatus* Stimpson, 1858 \*
- P. merodontatus* Nobili, 1906
- P. minutus* (de Haan) \*, †
- P. monillifer* Haswell, 1882
- P. neglectus* Balss, 1933
- P. normani* Miers, 1886
- P. novaezealandiae* Filhol, 1885
- P. novaezealandiae spinosus* Filhol, 1885
- P. nuttingi* Rathbun, 1906
- P. oahuensis* Edmondson, 1931

- P. orbitospinis* Rathbun, 1911 †  
*P. parvulus* Nobili, 1906 †  
*P. peroni* H. Milne Edwards, 1834  
*P. planes* Edmondson, 1931  
*P. propinquus* Nobili, 1905  
*P. prunosus* Whitelegge, 1897 †  
*P. pulcher* Miers, 1884 †  
*P. purpureus* A. Milne Edwards, 1873 †  
*P. ransonii* Forest et Guinot, 1961 †  
*P. rotumanus* Borradaile, 1900  
*P. rotundus* Borradaile, 1902  
*P. rufopunctatus* Stimpson, 1858 †  
*P. savigni* Heller, 1861  
*P. scabriusculus* Adams et White, 1848 †  
*P. schellenbergi* Balss, 1933  
*P. semilanatus* Miers, 1884 †  
*P. sinensis* Gordon, 1930  
*P. sodalis* (Alcock, 1898) \*  
*P. spinicarpus* Grant et McCulloch, 1906  
*P. spinulus* Shen, 1932  
*P. striatus* de Man, 1888  
*P. taeniola* Rathbun, 1906 \*  
*P. tahitensis* de Man, 1890 †  
*P. tenellus* Dana, 1852  
*P. tomentosus* Latreille, 1825 †  
*P. tuantaoensis* Shen, 1948  
*P. turgidulus* Rathbun, 1911  
*P. verrucimanus* Klunzinger, 1913 \*  
*P. vespertilio* (Fabricius, 1793) †  
*P. vestitus* Haswell, 1882  
*P. woodwarthi* Rathbun, 1902  
*P. zimmeri* Balss, 1933

*P. cristimanus* A. Milne Edwards was erroneously transferred to the genus *Globopilumnus* of the subfamily Menippinae. This species is very peculiar in the armatures of the anterolateral borders of the carapace and in having characteristic crests on the fingers. Guinot-Dumortier (1959) remarked on this species that it is not included in Menippinae, but in Pilumninae. Though the exact systematic state is still unknown, this species still remains in the present genus with question.

*P. cristipes* Calman is very close to the genus *Lophopilumnus* as pointed in the original description and also by Balss (1933). Miers (1886) remarked on *Pilumnus dilatipes* Adams et White that not only



the palatal ridges are nearly obsolete, but the ambulatory legs are strongly cristated, and that it should probably be constituted the type of a distinct genus, *Lophopilumnus*. *P. cristipes* may perhaps be included in that genus on account of bearing the crested merus of the ambulatory legs and the feebly developed endostomial ridges.

According to Stimpson (1907), *P. vespertilio* of Dana is distinct species resembling somewhat *P. scabriusculus* Adams et White, and designated as *P. danai*. As Dana (1852) reported *P. vespertilio* as *P. mus*, it may be possible that the materials labelled as *P. vespertilio* are distinct from *P. mus*. The question, however, remains unsettled.

In *P. elegans* de Man the anterolateral border of the carapace is armed only with two small spines, and the ambulatory legs are very long. This species is aberrant in the genus and apparently placed in the same group as *P. longipes* A. Milne Edwards and *P. taeniola* Rathbun. They may pass into the subfamily Prionoplacinae of the family Goneplacidae, as suggested by Miers (1886).

In *P. eudaemoneus* Nobili the carapace is not lobulated at all, and its anterolateral border is nearly entire. This species is not true *Pilumnus*, but allied to *P. glaberrimus* Haswell and *P. inermis* Haswell which were transferred to the genus *Ceratoplax* by Rathbun (1923). This species is duly transferred to that genus or allied genera of the family Goneplacidae.

*P. hirsutus* Stimpson seems to be conspecific with *P. minutus* (de Haan) as thought by Sakai (1939). With regard to synonymy it will be dealt with in the present paper.

*P. lanatus* Latreille is little known at present in spite of early known species. Balss (1933) threw doubt on the occurrence of the species and very questionably united with *P. scabriusculus* Adams et White. According to Haswell (1882b), the carapace is little or not all granular and three anterolateral teeth are simple nearly conical teeth terminating in a hard scaly point.

Since the original record of *P. marginatus* Stimpson from the Ryukyu Islands, only a record of the occurrence is from south of Misaki, Sagami Bay (Yokoya, 1933). The materials from the Ryukyu Islands, which are somewhat questionably referred to this species, may perhaps not be true *Pilumnus*, but *Pilumnopeus* mainly on account of the armatures of the anterolateral borders of the carapace. Those material may be dealt with in the later paper.

*Pilumnus* (?) *sodalis* (Alcock) was originally referred to the genus *Liomera* with question, and also afterward reported by Borradaile (1902) under the name *Liomera spinipes*. Odhner (1925) also questionably transferred to the present genus. It is still uncertain whether this species is included in the subfamily Pilumninae or not. If it is included

in Pilumninae, however, this species may be close to *Glabropilumnus* rather than to the present genus for having the unareolated and glabrous carapace. The examination of more material and first male pleopod is very desirable.

*P. verrucimanus* Klunzinger from the Red Sea was characterized by very short diagnosis. According to the short original description, this species is close to *P. laevimanus* which is known as *Glabropilumnus*, and separated from the latter species by having the granulated larger palm of the chelipeds. However, the disposition of hairs, the shape of the front, and the armatures of the anterolateral borders of the carapace seem to be close to those of the genus *Parapilumnus*. This species may be transferred to that genus as *Parapilumnus verrucimanus* (Klunzinger).

The present report is concerned with twenty-three species of the genus *Pilumnus* from Japan and its adjacent waters, the Palau Islands and Australia, which are deposited in the Zoological Laboratory, Kyushu University (ZLKU). Four of those species are described as new to science. They are as follows.

*Pilumnus amamensis* sp. nov.

*P. ikedai* sp. nov.

*P. guinotae* sp. nov.

*P. senahai* sp. nov.

The following provisional key to those species dealt herewith is mainly based on the hairiness on the carapace and the armatures of the carapace and ambulatory legs. The armatures of the ambulatory legs seem to be rather stable with some exceptions.

#### Key to twenty-three species of the genus *Pilumnus*

1. Carapace only with scattered tufts and rows of hairs, greater part of surface being naked ..... 2  
Entire surface of carapace more or less hairy ..... 3
2. Carapace strongly convex, and anterolateral border with granular three teeth..... *semilanatus* Miers  
Carapace evenly convex, and anterolateral border with two thin lobes and a spine..... *barbatus* A. Milne Edwards
3. Carapace only with short close pubescence ..... 4  
Carapace with longish setae or hairs. Even if carapace with short close pubescence, it mixed with long hairs ..... 5
4. Ambulatory legs very long; each merus of first three pairs with three or four spines on upper border and two or three on lower border. Thoracic sternum very wide..... *elatus* A. Milne Edwards

- Ambulatory legs not very long; merus with a terminal granule; carpus and propodus with two or three rows of granules of good size. Thoracic sternum not wide, but usual  
..... *rufopunctatus* Stimpson
5. Fingers of chelipeds bear some characteristic crests on borders and outer surfaces ..... *tahitensis* de Man  
Fingers of chelipeds usual form ..... 6
6. Front strongly declivous, being produced far beyond orbits and cut into two round lobes..... *fissifrons* Stimpson  
Front rather usual form ..... 7
7. Anterolateral border with three or four accessory spinules each between main spines..... *pulcher* Miers  
Anterolateral border without accessory spinules each between main spines or teeth ..... 8
8. Infraorbital angle with a prominent spine, being visible from above.....*orbitospinis* Rathbun  
Infraorbital angle unarmed, or with one or more minute spinules... 9
9. Subhepatic region with a slender spine..... *parvulus* Nobili  
Subhepatic region without a slender spine ..... 10
10. Carapace with dense tubular hairs, showing especially shaggy appearance ..... *vespertilio* (Fabricius)  
Carapace more or less with hairs, those hairs not entirely disguising areolation ..... 11
11. Ambulatory legs unarmed ..... 12  
Ambulatory legs armed ..... 13
12. Anterolateral border with low, spine-tipped teeth  
..... *scabriusculus* Adams et White  
Anterolateral border with curved spines  
..... *purpureus* A. Milne Edwards
13. Each propodus of ambulatory legs with some spines; otherwise each merus with a terminal spine and each carpus with two rows of spinules..... *prunosus* Whitelegge  
Each propodus of ambulatory legs unarmed ..... 14
14. Carapace rather well areolated, those areolae being studded with scattered granules of good size.....*caerulescens* A. Milne Edwards  
Carapace only slightly areolated ..... 15
15. Each carpus of ambulatory legs with a terminal spine ..... 16  
Each carpus of ambulatory legs unarmed ..... 20
16. Carapace slightly convex anteriorly, and flat posteriorly..... 17  
Carapace convex fore and aft as well as laterally..... 18
17. Carapace sparingly covered with simple hairs. Each merus of first three pairs of ambulatory legs with a spine on upper border and with a terminal spine..... *ransoni* Forest et Guinot

- Carapace rather densely and uniformly covered with tufts of plumose and blush-like hairs. Each merus of ambulatory legs only with a small terminal spine..... *senahai* sp. nov.
18. Each merus of ambulatory legs unarmed..... *amamensis* sp. nov.  
Each merus of ambulatory legs armed ..... 19
19. Each merus of ambulatory legs entire on upper border and with a terminal spine..... *minutus* (de Haan)  
Each merus of ambulatory legs with five or six small granules on upper border and with a terminal spine..... *ikedai* sp. nov.
20. Each merus of ambulatory legs only with a terminal spine..... 21  
Each merus of ambulatory legs with two or three spines on upper border and with a terminal spine ..... 22
21. Carapace thickly covered with tufts of short setae or longish hairs ..... *tomentosus* Latreille  
Carapace sparingly covered with tufts of and single hairs ..... *guinotae* sp. nov.
22. Small species. Entire dorsal surface, chelipeds and ambulatory leg with short pubescence or blush-like hairs ..... *cursor* A. Milne Edwards  
Large species. Dorsal surface with longish simple hairs and some tufts of plumose hairs..... *longicornis* Hilgendorf

### Description of species

Genus *Pilumnus* Leach, 1814

*Pilumnus semilanatus* Miers, 1884

(Fig. 1 a-c, Pl. 1, B)

*Pilumnus semilanatus* Miers, 1884, p. 222, pl. 22, fig. B: Queensland, Australia (Prince of Wales Channel, 15 m deep; off Cape Capricorn, 25 m deep; Moreton Bay).—: Grant and McCulloch, 1906, p. 17: Port Curtis, Queensland, 15 m deep.—: McCulloch, 1913, p. 325, fig. 43: Port Denison, Queensland and Port Hedland, Western Australia.—: Rathbun, 1923, p. 114, pl. 24, figs. 1, 2: Queensland (off Bowen, 30 m deep; Lady Elliot I., 30 m deep; Great Sandy Strait; off Port Inskip).—: Rathbun, 1924, p. 19: Cape Jaubert, Western Australia.—: Montgomery, 1931, p. 446: Broome, Western Australia.—: Balss, 1933, p. 27: Onslow, Shark Bay and Holothuria Bank, Western Australia.

*Description*: The carapace is rather strongly convex fore and aft, and provided with rows and tufts of long tubular hairs, those hairs being symmetrically disposed and showing the ragged appearance; there is a row just behind the front, which is continuous to the inner half of the supraorbital border, a tuft each on the gastric region and each

on the anterolateral portion; besides there is a small tuft above each posterior corner, and a still smaller one at each end of the gastro-cardiac suture.

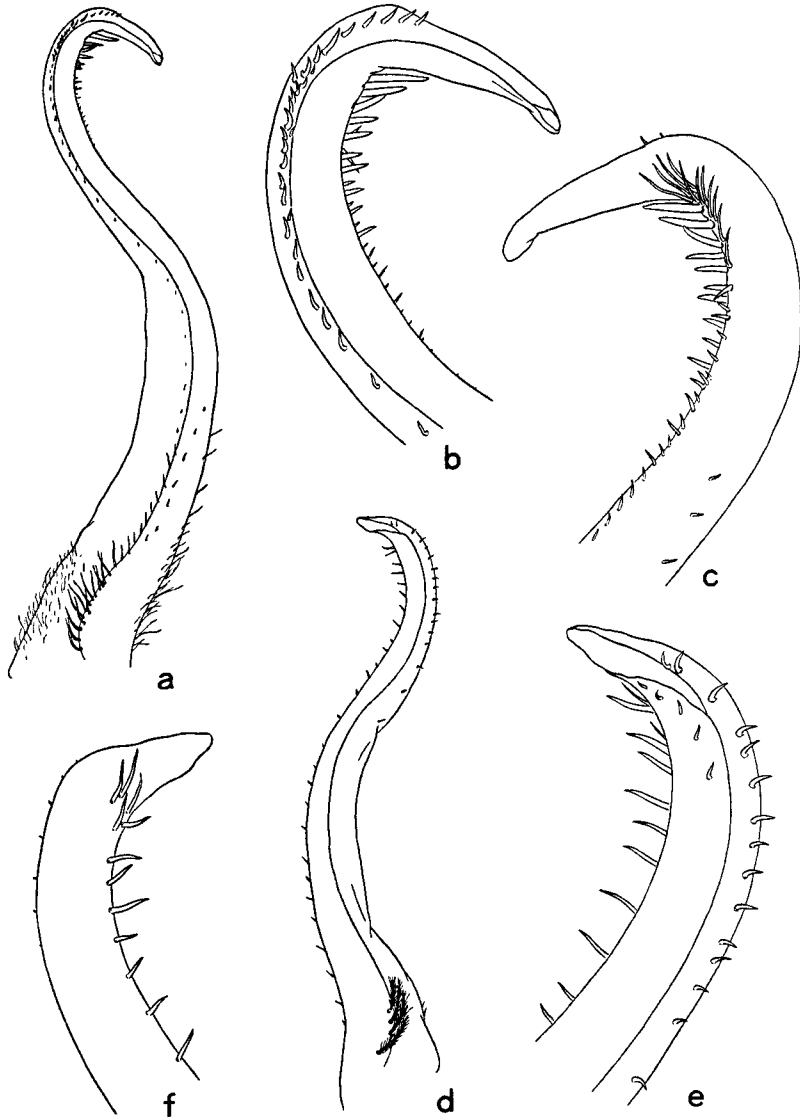


Fig. 1. *Pilumnus semilanatus* Miers. a, Left first pleopod of male, abdominal view,  $\times 18$ ; b, distal portion of the same,  $\times 44$ ; c, the same, sternal view,  $\times 44$ .

*Pilumnus barbatus* A. Milne Edwards. d, Right first pleopod of male, abdominal view,  $\times 44$ ; e, distal portion of the same,  $\times 132$ ; f, the same, sternal, view,  $\times 132$ .

The anterolateral border is armed with three teeth excluding a short granular ridge fused with the external orbital angle; the first is subtruncated and bordered with granules; the second is prominent and capped with some granules; the third is the smallest of the series and concealed under the hairs, being spine-tipped.

The chelipeds are not quite unequal; the upper parts of the carpus and palm are almost bare and armed with granules of good size; the distal half of the larger palm is also bare and spaced with granules, the remainder of the surface being densely covered with ragged hairs.

The ambulatory legs are also densely clothed with same hairs as those on the chelipeds on the upper borders of all the segments and besides on the upper surfaces of the distal three segments.

*Material examined:*

Arafra Sea, 1 ♂, 1 ovig. ♀, 3 ♀♀, ZLKU No. 1437, Apr.-Aug., 1939, S. Wada leg.; Same locality, 1 ♀, ZLKU No. 12360, sent by Dr. T. Habe of the National Science Museum, Tokyo.

*Measurements* (in mm):

	Largest ♂	Ovig. ♀	Largest ♀
Length of carapce .....	12.9	14.8	15.2
Breadth of carapace.....	16.0	18.3	19.0
Fronto-orbital breadth .....	10.7	12.4	12.7

*Remarks:* The disposition of hairs is peculiar, by which this species is readily distinguished from the congeners. Colour of the present material is entirely faded out and only brownish. According to Montgomery (1931), the granules on the chelipeds are brilliant red, its colouration making the species instantly conspicuous.

*Distribution:* This species is restricted to the Australian waters: Queensland from Moreton Bay northward to Prince of Wales Channel, and Western Australia from Holothuria Bank southward to Shark Bay. The record of occurrence from the Northern Territory has been unknown to date. Unfortunately, at present, the definite localities in the Arafra Sea are not available.

*Pilumnus barbatus* A. Milne Edwards, 1873

(Figs. 1 d f, 2)

*Pilumnus barbatus* A. Milne Edwards, 1873a, p. 243, pl. 9, fig. 7: New Caledonia.

—: Balss, 1938b, p. 57: Sultan Shoal, near Singapore.—: Sakai, 1939, p. 538: No new locality.

*Pilumnus heterodon* Sakai, 1934, p. 307, fig. 19: Nagasaki, Japan.—: 1936, p. 171, fig. 88: No new locality.—: Sankarankutty, 1962, p. 114, figs. 48-50: Car Nicobar.

*Description:* The carapace is transversely oval, smooth and ill-defined, being gently convex fore and aft; the surface is provided with a row of blush-like short and long hairs behind the front and with sparsely disposed tufts of same hairs. The front is produced in the middle and cut into two truncated oblique lobes, each of which bears no lateral lobule and is separated from the supraorbital border by a small incision. The supraorbital border bears two shallow depressions and is fringed with short blush-like hairs. The basal antennal segment fails quite to reach the ventral prolongation of the front; the flagellum is about once and a half as long as the major diameter of the orbit.

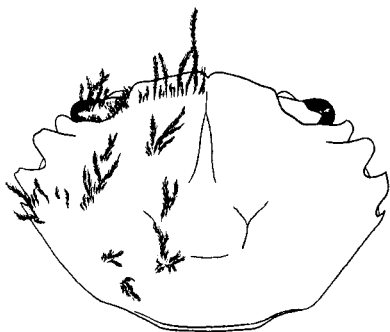


Fig. 2. *Pilumnus barbatus* A. Milne Edwards. Carapace, showing peculiar shape of the anterolateral border and disposition of blush-like hairs,  $\times 10$ .

The anterolateral border is armed with four teeth including the external orbital angle; the first, or the external orbital angle itself, is a prominent thin lobe; the second and third are also very thin lobes and somewhat at higher level, the former being more prominent; the second teeth of both sides are rounded at the tips, while the third tooth of the right side bears a sharp tip anteriorly and that of the left bears two tips anteriorly; the hindermost forms a small sharp spine.

The chelipeds are unequal; the carpus is armed with procurved spines on the outer surface; in the larger chela the outer upper half of the palm is armed with spines and provided with blush-like hairs of unequal length, those spines being arranged mostly in some longitudinal rows; the remainder of the surface is smooth and glossy; the armatures and hairiness of the smaller palm are more accentuated than those of the larger one.

The ambulatory legs are densely clothed with blush-like hairs of various length; the armatures are entirely concealed under those hairs; when those hairs are removed, each merus is armed only with a terminal spine, whereas each carpus with two spines on the upper border, viz. one on the middle and the other as a terminal spine.

*Material examined:*

Ngarmid Passage, Goréor I., Palau Is. ( $134^{\circ} 30' E$ ,  $7^{\circ} 22' N$ ), 1  $\delta$ , ZLKU No. 1397, Apr. 29, 1939, S. Miyake leg.

*Measurements* (in mm):

Length of carapace ..... 3.7

Breadth of carapace including lateral teeth .....	5.3
Breadth of front .....	2.0
Fronto-orbital breadth .....	4.0

*Remarks:* This species is somewhat aberrant in the genus for the disposition of hairs on the carapace, the armatures of the anterolateral borders and for having no frontal lateral lobules. Those features seem to be related to the genus *Parapilumnus*.

In the present material the carapace is entirely smooth and provided with sparse tufts of bluish-like hairs, and the ambulatory legs are armed as mentioned above. Furthermore the second anterolateral tooth is a broad lobe with a sharp tip. According to the original description, the carapace is uniformly covered with short hairs, and the third anterolateral tooth is a sharp spine. As for the armatures of the ambulatory legs those of the present specimen are agreeable with the description of Balss (1938) and Sankarankutty (1962), though in the original description of *P. barbatus* and *P. heterodon* they were not mentioned at all.

*Distribution:* This species has been known from Car Nicobar, New Caledonia (Type locality), near Singapore and Nagasaki, Japan.

### *Pilumnus elatus* A. Milne Edwards, 1873

*Pilumnus elatus* A. Milne Edwards, 1873b, p. 80: Upolu, Samoa Is.—: Balss, 1933, p. 30, fig. 4, pl. 5, figs. 22, 23: No new locality.

*Description:* The carapace is convex anteriorly, very slightly so laterally and posteriorly; the surface is slightly divided into regions by narrow and shallow fullows, and clothed only with thick short setae which arise singly and are uniformly distributed. The front is not produced, and cut into two rounded lobes; its indistinct lateral lobule is separated from the supraorbital angle by a shallow depression.

The anterolateral border is arched, much shorter than the posterolateral and armed with three small spines which are subequal and strongly curved forward. The posterolateral border is long and only slightly inclined.

The chelipeds are unequal in female; the outer surfaces of the segments are thickly covered with short setae like the carapace; in addition, the carpus and palm are rather thickly provided with minute granules; the merus is armed with sharp spines on the upper border, the distal two of those being more prominent; the carpus is also armed with a very sharp stout spine at its inner angle; the palm of the larger chela is swollen proximally, while the smaller one is rather slender; the fingers of the larger chela are as long as the upper border of the larger palm, while the smaller ones are much longer than the upper border of the smaller palm; the immovable finger of the smaller



chela is slightly curved inward and downward; the tips of the fingers are sharply pointed.

The ambulatory legs are very long and covered with short setae and fringed with more longer setae or hairs; the upper surfaces of the propodus and dactylus are provided each with a row of plumose hairs in addition to simple setae or hairs; each merus of the first three pairs is armed with three or four spines on the upper border and with two or three on the lower border, but without a terminal spine; the merus of the last ambulatory leg is unarmed.

*Material examined:*

Near Yonabaru, Okinawa-jima I., Ryukyu Is., 1♀ infested by *Sacculina* sp., ZLKU No. 12063, Jul. 27, 1962, S. Miyake, T. A. Uchida and H. Minei leg.

*Measurements* (in mm):

Length of carapace.....	13.2
Breadth of carapace .....	19.5
Fronto-orbital breadth .....	10.5
Length of first ambulatory leg .....	31.9
"    second    "    .....	39.2
"    third    "    .....	40.8
"    fourth    "    .....	31.2

*Remarks:* Though the present material is slightly damaged, it is agreeable generally with the short original description and excellently with the redescription and photographs of the type specimen given by Balss (1933). In the present material the anterolateral border is armed with three procurved spines, but without accessory spinules between main spines. The wide sternum is peculiar and somewhat atypical in the genus. As Balss (*loc. cit.*) suggested, this species may pass into Pseudorhombilinae [=Carcinoplacinae] of the family Goneplacidae.

*Distribution:* Only a male representative from Upolu (Samoa) has hitherto been known as the type specimen.

*Pilumnus rufopunctatus* Stimpson, 1858

(Fig. 3 a-c, Pl. 1, D)

*Pilumnus rufopunctatus:* Stimpson, 1907, p. 66, pl. 8, fig. 3: Port Jackson, New South Wales, Australia.—: Heller, 1865, p. 23: Sydney, New South Wales.—: Haswell, 1882b, p. 66: Port Jackson, Port Stephens and Griffiths' Point, New South Wales and Western Port, Victoria, Australia.—: Miers, 1884, p. 220: Port Jackson.—: Miers, 1886, p. 160, pl. 14, fig. 5: South Australian coast.—: Rathbun, 1923, p. 115, pl. 24, figs. 3, 4: Spencer Gulf, South Australia.—: Rathbun, 1924, p. 19: Cape Jaubert. Western Australia.

*Description:* The carapace is convex anteriorly, rather well sculptured and thickly covered only with short pubescence in which a good number of procurved sharp granules are embedded; those granules are regularly and symmetrically disposed, viz. one on the anterior portion of each 2M, and two or three on the anterior end of 3M, and six parallel to each anterolateral border. The supraorbital border is armed with four same granules as those on the carapace, two of which are placed at the inner and outer angles. The infraorbital border is also armed with several spinules, its inner angle being prominent and tipped with one or two spinules.

The anterolateral border is armed with three teeth; each tooth is tipped with a same granule as those on the carapace, and is nearly same size, or the hindermost is slightly prominent, each granule being curved forward; the first is placed at some distance from the external orbital angle; one or two granules are placed behind the one at the external orbital angle. The subhepatic region is also armed with a granule of good size.

The chelipeds are quite unequal in both sexes; the carpus is covered with scattered granules and same pubescence as those on the carapace; in the larger chela the outer surface except for the lower distal portion is also covered with pubescence and granules, those granules becoming smaller distally and being irregularly disposed; the armatures of the smaller palm are nearly similar to those of the larger one, but the granules are more accentuated and extended on the entire outer surface.

The ambulatory legs are densely covered with short setae and bordered with longish ones; each merus is armed with a terminal sharp granule; the carpus and propodus are also armed with two or three rows of several elongated sharp granules or spinules each on the upper border.

*Material examined:*

Song Reef, Collaroy, N.S.W., Australia, 1 ♂, ZLKU, No. 1442; Port Jackson, under stone, N.S.W., Australia, 1 ♀, ZLKU No. 1558, sent by late Mr. M. Ward of the Australian Museum.

*Measurements* (in mm):

	♂	♀
Length of carapace .....	11.3	9.6
Breadth of carapace including lateral teeth .....	15.9	14.0
Fronto-orbital breadth.....	9.5	8.4

*Remarks:* Those granules on the carapace are peculiar in shape and said to be blood red in life. Those are "elongated granules"

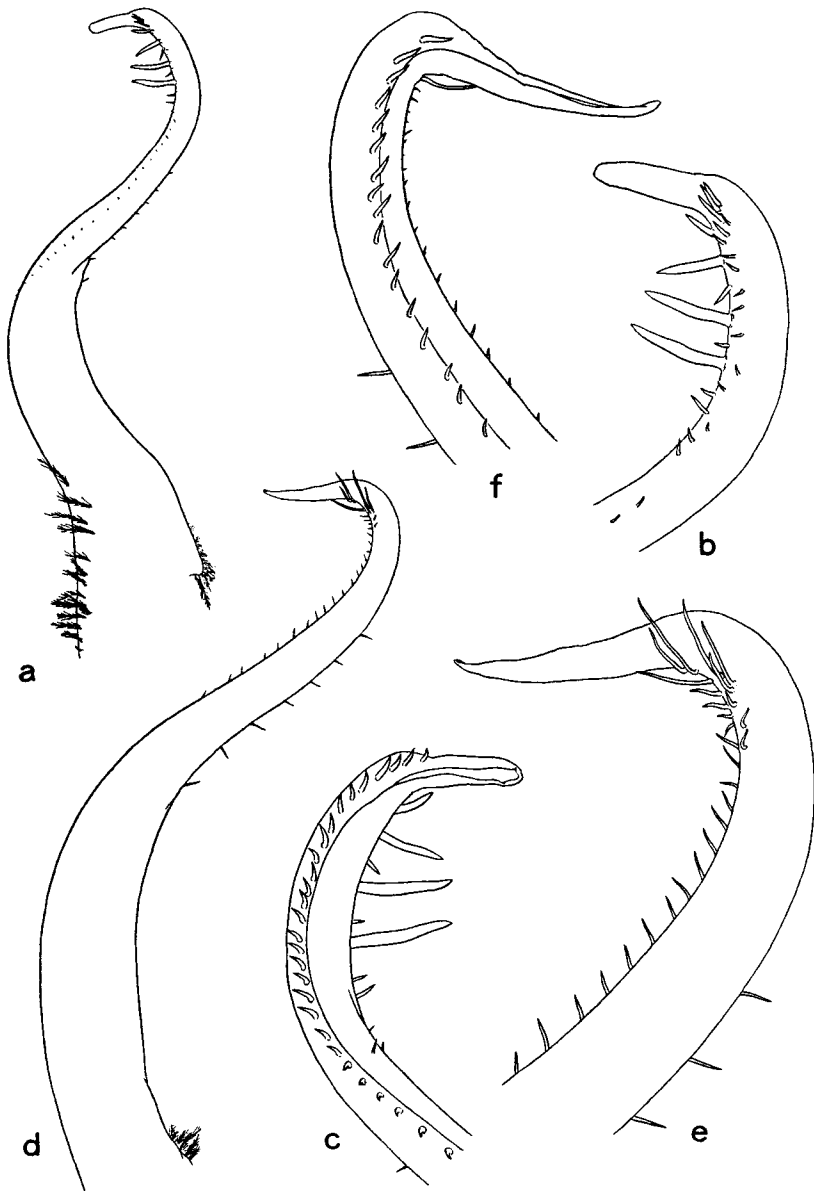


Fig. 3. *Pilumnus rufopunctatus* Stimpson. a, Left first pleopod of male, sternal view,  $\times 18$ ; b, distal portion of the same,  $\times 44$ ; c, the same, abdominal view,  $\times 44$ .

*Pilumnus fissifrons* Stimpson. d, Left first pleopod of male, sternal view,  $\times 36$ ; e, distal portion of the same,  $\times 88$ ; f, the same, abdominal view,  $\times 88$ .

rather than spines or spinules, its shape being most accentuated in the armatures of the ambulatory legs. Those granules on the outer surface of the palm are mostly conical and different from those on the carapace and ambulatory legs.

*Distribution:* This species is mainly known from southern Australia: Port Stephens, New South Wales, southward to Western Port, Victoria, and to South Australian coast. Otherwise, Rathbun (1924) recorded from Cape Jaubert, Western Australia.

### *Pilumnus tahitensis* de Man, 1890

*Pilumnus tahitensis* de Man, 1890, p. 61, pl. 3, fig. 4: Tahiti.—: Ortmann, 1893, p. 437: Tahiti.—: Rathbun, 1907, p. 56: Fakarava, Tuamotu Is.—: Rathbun, 1911, p. 229: Saya de Malha Bank, 52 m deep.—: Balss, 1933, p. 25: Palau Is.; Bougainvill I., Solomon Is.; Mahé I., Seychelles; Madagascar.—: Balss, 1938a, p. 68: Jaluit, Marshall Is.—: Miyake, 1939, p. 218: No new locality.—: Holthuis, 1953, p. 25: Arno Atoll, Marshall Is.—: Forest and Guinot, 1961, p. 129, fig. 125: Raiatea I., Society Is.

#### *Material examined:*

Goréor I., Palau Is., 1 ♀, ZLKU No. 850, May 5, 1939, S. Miyake leg.

#### *Measurements* (in mm):

Length of carapace .....	7.4
Breadth of carapace .....	8.4
Fronto-orbital breadth .....	6.8

*Remarks:* This species is readily distinguished from the congeners of the genus by the armatures of the chelipeds. The movable finger is crested on the upper border and on the outer surface; the immovable finger is also bears two crests, viz. one on the lower border and the other smaller one on the proximal portion of the outer surface; the cutting edges of the fingers are nearly entire, or bears some indistinct traces of incisions. The first male pleopod is represented by Forest and Guinot (1961, fig. 125).

*Distribution:* This species was previously reported from the Palau Islands by Balss (1933), and is widely distributed in both the Indian and the Pacific Oceans; Madagascar, Saya de Malha Bank and Seychelles, and Bougainvill I. (Solomon Is.), Tahiti, Tuamotu and Marshall Is.

### *Pilumnus fissifrons* Stimpson, 1858

(Fig. 3 d-f, Pl. 1, A)

*Pilumnus fissifrons:* Stimpson, 1907, p. 67, pl. 8, fig. 4: Port Jackson, New South

Wales, Australia.—: Heller, 1865, p. 24: Sydney, New South Wales.—: Haswell, 1882b, p. 68, pl. 1, fig. 6: Port Jackson.—: Rathbun, 1923, p. 115, pl. 17, figs. 3, 4: Great Sandy Strait, Queensland, Australia.—: Hale, 1927, p. 312: Kangaroo I., South Australia.—: Balss, 1933, p. 27: Shark Bay and Fremantle, Western Australia.

*Description:* The carapace is convex, and thickly covered with short pubescence and some tufts of long plumose hairs; the surface is slightly areolated anteriorly and bears some granules near the anterolateral borders, the remainder of the surface beneath the pubescence being smooth. The front is strongly declivous and produced far beyond the orbits, and cut into two rounded lobes by a small median sinus; each lobe is deeply excavated laterally and separated from the lateral lobule which is tipped with a granule of good size. The supraorbital border bears two notches beneath the pubescence; the infraorbital border is slightly crenulate and bordered with some sharp granules, its inner angle being strongly produced and acute.

The anterolateral border is armed with three stout teeth of nearly same size, each tooth being covered with pubescence except for a spiniform granule at the tip; otherwise two small granules are disposed at and behind the external orbital angle. The subhepatic region is also pubescent and bears a protuberance which is tipped with a spiniform granule like the anterolateral teeth.

The chelipeds of male are unequal; the entire outer surface of the carpus and outer obliquely-upper surface of the palm are also densely covered with short pubescence like the carapace, and besides with distant and pearly sharp granules of good size which are not concealed by the pubescence; those granules on the palm are somewhat beaded to longitudinal series; the inner surface and the remainder of the outer surface of the palm are quite smooth and glossy.

The ambulatory legs are also thickly covered with same pubescence as that on the carapace; the carpus and propodus are armed each with a row of several pearly sharp granules of good size on the upper border.

*Material examined:*

Sark Island, Port Jackson, N.S.W., Australia, 1 ♂, ZLKU No. 1430, sent by late Mr. M. Ward of the Australian Museum.

*Measurements* (in mm):

Length of carapace .....	8.4
Breadth of carapace including lateral teeth.....	12.2
Fronto-orbital breadth .....	7.8

*Remarks:* This species is most characterized by the peculiar shape of the front and the armatures of the ambulatory legs. The first male

pleopod is also remarkable as represented in Fig. 3d-f, its beak at the tip being considerably longer than those of the members of the genus.

*Distribution*: This species is restricted to Australia: Western Australia from Port Hedland, Cape Jaubert and Shark Bay southward to Fremantle; Kangaroo I. (South Australia); Sydney and Port Jackson (New South Wales); Queensland from Moreton Bay northward to Great Sandy Strait.

### *Pilumnus pulcher* Miers, 1884

(Fig. 4 a-c, Pl. 1, C)

*Pilumnus pulcher* Miers, 1884, p. 219, pl. 22, fig. A: Warrior Reef, Albany I. and Thursday I., Torres Strait.—: Miers, 1886, p.161: Torres Strait and off Cape York (10° 30' S, 142° 18' E).—: Calman, 1900, p. 15: Murray I., Torres Strait.—: Rathbun, 1924, p. 19: Cape Jaubert, Western Australia.—: Montgomery, 1931, p. 446, pl. 25, fig. 2: Broome, Western Australia.—: Balss, 1933, p. 26, pl. 6, fig. 31: Holothuria Bank, Western Australia.  
nec *Actumnus pulcher*: Ortmann, 1894, p. 52 (= *Actumnus setifer*, fide Balss, 1933).

*Description*: The carapace is globose and thickly covered with long stiff hairs which arise in tufts around the granules and are uniformly distributed; some shallow interregional fullows are only slightly traceable. The front is declivous, well produced beyond the orbits, and bears a shallow median sinus and subtriangular lateral lobules. The supraorbital border is granulated and bears two indistinct notches, being separated from the lateral lobule of the front.

The anterolateral border is well arched and armed with four main spines including the one at the external orbital angle; those main spines increase in length from the first to the fourth; in addition, three or four spinules are present between the main spines respectively. The posterolateral border is as long as the anterolateral, strongly convergent and concave in the middle.

The chelipeds and ambulatory legs are also densely clothed with stiff long hairs like the carapace; the upper border of the palm is about half as long as its lower border and armed with two prominent spines; the outer surface of the palm is covered with granules which are beaded to longitudinal series and increase in size near the distal portion; the cutting edge of the immovable finger is characteristically four-toothed at the distal two-thirds. The ambulatory legs are stout and unarmed.

#### *Material examined*:

Coral reef, West of Bathurst I., Melville Is., N. Ter., Australia (129° E, 11° 30' S), 1 ♂, 1 ♀ infested by *Sacculina* sp., ZLKU No. 1858, Aug. 1938, S. Wada leg.

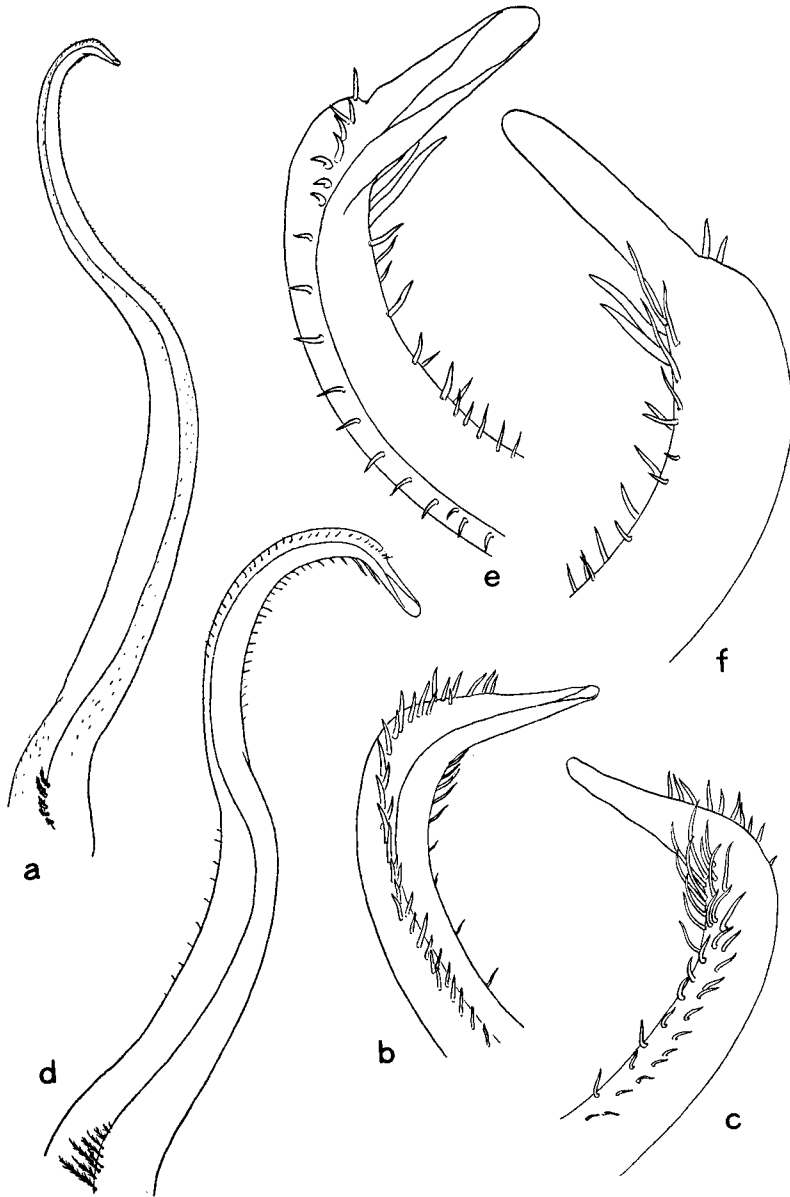


Fig. 4. *Pilumnus pulcher* Miers. a, Left first pleopod of male, abdominal, view,  $\times 9$ ; b, distal portion of the same,  $\times 44$ ; c, the same, sternal view,  $\times 44$ . *Pilumnus orbitospinis* Rathbun. d, Left first pleopod of male, abdominal view,  $\times 26$ ; e, distal portion of the same,  $\times 88$ ; f, the same, abdominal view,  $\times 88$ .

*Measurements* (in mm):

	♂	♀
Length of carapace.....	26.0	15.0
Breadth of carapace excluding lateral spines .....	29.5	16.9
Fronto-orbital breadth .....	17.7	11.3

*Remarks:* This species is readily distinguished from the members of the genus by the globose and hairy carapace and the armatures of the anterolateral borders of the carapace. The first male pleopod is figured in Fig. 4a-c, bearing its very small beak at the tip.

*Distribution:* This species is known from northern Australia: Torres Strait, Queensland, and Western Australia from Holothuria Bank southward to Cape Jaubert. The record of the occurrence from Northern Territory is new.

*Pilumnus orbitospinis* Rathbun, 1911

(Fig. 4 d-f, Pl. 3, B)

*Pilumnus orbitospinis* Rathbun, 1911, p. 229, pl. 16, figs. 14, 15: Salomon Bank, Chagos Archipelago, 100-200 m deep.—: Parisi, 1916, p. 185: 33° 29' N, 135° 50' E. [=Tosa Bay].—: Sakai, 1939, p. 536, pl. 100, fig. 6: Between Ito and Hatsushima, Sagami Bay.—: Sakai, 1965, p. 158, pl. 78, fig. 3: Sagami Bay (Amadaiba Shuragane, 85-100 m deep; south-west of Jogashima, 85 m deep).

*Description:* The carapace is strongly convex fore and aft, slightly so from side to side, and covered with yellow hairs of various length; those hairs are rather stiff, and nearly uniformly and thickly distributed, arising singly; the surface is smooth and ill-defined only with some shallow interregional fullows. The front is not deflexed and is prominent just lateral the deep V-shaped median sinus; each lateral lobule is armed with a granule of good size. The supraorbital border bears two indistinct notches; the infraorbital border is granulated and armed with a prominent slender spine at its inner angle, the long spine being slightly curved dorsally and visible from above.

The anterolateral border is armed with four spines including the one at the external orbital angle; those spines are long and curved slightly forward, gradually increasing in length from the first to the last. The posterolateral border is as long as the anterolateral and strongly convergent. The subhepatic region is unarmed.

The chelipeds are quite unequal; the merus is armed with two long, stout spines near the distal end of the upper border; the carpus is armed with strong spines and is provided with setae or hairs like the carapace; the palm of the larger chela is also armed with sharp spines and hairs on the upper surface, four or five spines on the upper



border being the most prominent; those spines on the larger palm are reduced to sharp granules and disappear near the lower distal portion, those hairs being also diminishing in length; the smaller palm is also provided with sharp spines and hairs on the entire outer surface, those granules being beaded to some longitudinal rows; the hairs and granules are extended to one-third of the upper border of the larger movable finger, and slightly more than half of the smaller one; the fingers of the larger chela are rather short and stout, their cutting edges being provided with a large blunt tooth, while the fingers of the smaller one are more sharply toothed.

The ambulatory legs are slender and covered with hairs like the carapace and chelipeds; the upper distal end of the merus is armed with a sharp terminal spine; otherwise each merus of the first three pairs is usually, but not always, armed with one or two spinules; the other segments are unarmed.

*Material examined:*

Off Tosa-shimizu, Tosa Bay, 150-200 m deep, 1 ♂, ZLKU No. 12067, Nov. 28, 1958, K. Kurohara leg.; Same locality and depth, 1 ♂, 1 ovig. ♀, ZLKU No. 8881, Feb. 1959, K. Kurohara leg.; Off Ashizuri, Tosa Bay, 150 m deep, 1 ♂, 1 ♀, ZLKU No. 8949, Mar. 1959, K. Kurohara leg.; Tosa Bay, 150 m deep, 1 ♂, ZLKU No. 8954, Mar. 1959, K. Kurohara leg.; Tosa Bay, 1 ♀, ZLKU No. 9298, Feb. 19, 1960, S. Nakayama leg.; Tosa Bay, 150-180 m deep, 1 ♂, 1 ♀, ZLKU No. 9739, Apr. 30, 1961, K. Kurohara leg.

*Measurements* (in mm):

	Largest ♂ (No. 9739-1)	Ovig. ♀ (No. 8881-2)	Largest ♀ (No. 9298)
Length of carapace .....	14.0	10.8	10.6
Breadth of carapace excluding lateral spines	17.9	14.2	13.9
Fronto-orbital breadth .....	11.8	9.0	9.2

*Remarks:* This species somewhat resembles *P. minutus* (de Haan) in the armatures of the anterolateral borders of the carapace and chelipeds. In the present species, however, the inner infraorbital angle is armed with a prominent spine, and otherwise each carpus of the ambulatory legs is unarmed.

*Distribution:* This species was originally reported from Salomon Bank, Chagos Archipelago. Though the intervening localities are now unknown, this species is rather commonly dredged up at the Japanese waters from the Sagami Bay and Tosa Bay.

*Pilumnus parvulus* Nobili, 1906

(Pl. 3, A)

*Pilumnus parvulus* Nobili, 1906b, p. 263: Gatavaké and Rikitea, Mangaréva I., Gambier Is.—: Forest and Guinot, 1961, p. 130, fig. 126, pl. 17, fig. 1: No. new locality.

*Description*: The carapace is comparatively wide, vaulted fore and aft, and densely covered with long soft hairs and with minute scant granules near the anterolateral borders, being nearly without regional indication. The front is declivous and cut into two lobes, each lobe being produced most at its middle portion; each small lateral lobule is separated from the front by a deep bight and from the less prominent supraorbital angle by a shallow dorsal depression. The supraorbital border bears two traces of incisions, while the infraorbital border bears a distinct notch near the external orbital angle and bordered with sharp granules. The inner infraorbital angle is cut obliquely and its inner extremity is touched with the proximal portion of the basal antennal segment.

The anterolateral border is armed with four sharp spines including the one at the external orbital angle; those spines are directed forward, the penultimate one being the most prominent. The subhepatic region is armed with a sharp spine. The posterolateral border is considerably longer than the anterolateral and strongly convergent.

Both chelipeds and the right first, third and fourth ambulatory legs are missing. The ambulatory legs are rather stout and covered with long soft hairs similar to but more densely than the carapace; each merus is armed with two or three small spines on the upper border, and with a sharp terminal spine; the carpus is provided with longitudinal fullow near the upper border and armed with a long terminal spine.

*Material examined*:

Ngarekeklau I., Palau Is. (134° 37' 30'' E, 7° 44' 20'' N), 1 ovig. ♀, ZLKU No. 1615, Mar. 14, 1938, S. Murakami leg.

*Measurements* (in mm):

Length of carapace .....	5.6
Breadth of carapace excluding lateral spines .....	8.1
Fronto-orbital breadth .....	6.2

*Remarks*: According to the original description, the outer surface of the larger palm is covered with conical granules and hairs on the upper half, while the entire outer surface of the smaller palm is covered with sharp granules and hairs. This species may be related to *P.*

*bleekeri* Miers on account of having a sharp subhepatic spine. This species is, however, readily separated from the latter species by the smoother carapace and by having a sharp terminal spine on each carpus of the ambulatory legs. The first male pleopod is represented by Forest and Guinot (1961, fig. 126).

*Distribution*: This species has hitherto been known from Mangareva I., Gambier Is., Polynesia.

### *Pilumnus vespertilio* (Fabricius, 1793)

*Pilumnus vespertilio*: A. Milne Edwards, 1873a, p. 242: New Caledonia.—: Hilgendorf, 1878, p. 793: Ibo, Mozambique.—: Richters, 1880, p. 148: Seychelles.—: Miers, 1880, p. 234: Java.—: Miers, 1884, p. 219: Australia (Nickol Bay, Western Australia; Dundas Strait and West I., Northern Territory; Prince of Wales Channel, Thursday I., Sir C. Hardy I., Claremont and Cumberland I., Queensland); Mauritius I.; Seychelles; Timor Laut; Siquijor I., Philippines; New Zealand; Vanua Levu and Bau, Fiji Is.; Upolu, Samoa Is.; New Hebrides Is.;—: Haswell, 1882b, p. 65: Coasts of Australia and Melanesian Islands, without definite localities.—: de Man, 1887, p. 58: Elphinstone I., Mergui Archipelago.—: de Man, 1888, p. 295: Edam I.—: Walker, 1890, p. 110: Singapore.—: Henderson, 1893, p. 365: Rameswaram and Tuticorin, India.—: Ortmann, 1893, p. 438: Red Sea; New Caledonia; Palau Is.; New Guinea.—: Ortmann, 1894, p. 49: Dar es Salaam, Tanganyika.—: Zehntner, 1894, p. 154: Amboina I., Indonesia.—: de Man, 1895, p. 537: West coast of Celebes; Pontianak, Borneo.—: Alcock, 1898, p. 192: Palk Strait; Andamans; Merugui Archipelago.—: Lanchester, 1901, p. 541: Penang I., Malay Peninsula.—: Borradaile, 1902, p. 245: Hululu, Male and Miladumadulu Atolls, Maldives Is.—: Lenz, 1905, p. 356: Zanzibar.—: Nobili, 1906a, p. 274; Djibouti, Massawa and Suez, Red Sea.—: Rathbun, 1906, p. 862: Oahu I., Hawaiian Is.—: Rathbun, 1910, p. 354: Singapore; Koh Chang, and between Koh Mesan and Cape Liant, Gulf of Siam.—: Bouvier, 1915, p. 258: Port Louis, Mauritius I.—: Parisi, 1916, p. 183: Truk, Carolines; Okinawa-jima I.—: Balss, 1922, p. 117: Ishigaki-jima I., Ryukyu Is.—: Balss, 1924, p. 11: Red Sea.—: Gravely, 1927, p. 145, pl. 23, fig. 34: Krusadai I., Gulf of Manaar.—: Balss, 1933, p. 21: Barrow I., Western Australia and Sydney, New South Wales; New Ireland, Bismark Archipelago; Bougainville I., Solomon Is.; Yap and Ponape, Caroline Is.; Satsuma [=Kagoshima], Japan.—: Yokoya, 1933, p. 184: Near Omaë-zaki, Shizuoka Pref., Japan, 77 m deep.—: Gordon, 1934, p. 54: Lam-pasing (Lampong) and Ambon, Indonesia.—: Sakai, 1934, p. 307: Amakusa and Nagasaki, Japan.—: Sakai, 1936, p. 169, fig. 87: No definite locality.—: Sakai, 1939, p. 532, pl. 100, figs. 1, 2: Susaki near Shimoda, Seto Kanayama and Kii Peninsula, Japan, and Okinawa-jima I., Ryukyu Is.—: Miyake, 1939, p. 218: Peliliu I., Ngarekeklaui I. and Goréor I., Palau Is.—: Barnard, 1950, p. 263, fig. 49a-b: Delagoa Bay, Mozambique.—: Sankarankutty, 1962, p. 144: Neill I., Andamans.—: Edmondson, 1962, p. 291, fig. 28b: No new locality.—: Guinot, 1962, p. 2: Zanzibar.—: Guinot, 1964, p. 97: Red Sea.—: Sakai, 1965, pp. 157, 67, pl. 78, fig. 1: Arasaki and Mitohama, Sagami Bay.

*Pilumnus ursulus* Adams and White, 1848, p. 45, pl. 9, fig. 6: Eastern Seas (according to Miers, 1884, it is "Madjica-Sima Group").—: Kluzinger, 1913, p. 263, pl. 2, fig. 7, pl. 7, fig. 3: Red Sea.

*Pilumnus mus* Dana, 1852, p. 240: Tongatabu and Samoa Is.

*Actaea dentata* Edmondson, 1935, p. 29, fig. 9, pl. 1, fig. B; Tongatabu; Viti Levu, Fiji Is.; Oahu I., Hawaiian Is.

*Material examined:*

Ngarmid Passage, Goréor I., Palau Is., (134° 30' E, 7° 22' N), 2 ♂♂, ZLKU No. 12473, May 18, 1939, S. Miyake leg.

Haëmisaki, Iriomote-jima I., Ryukyu Is., 1 ♂, ZLKU No. 10012, Aug. 17, 1962, Y. Ono leg.; Same locality and date, 1 ♀, ZLKU No. 10033, Y. Ono leg.; Uéhara, Iriomote-jima I., 2 ♂♂, ZLKU No. 12439, Jul. 26-30, 1965, S. Shiraishi leg.

Naha, Okinawa-jima I., Ryukyu Is., 1 ♂, ZLKU No. 5258, Nov. 1938, S. Toma leg.

Boma, Tokuno-shima I., Ryukyu Is., 2 ♂♂, 1 ovig.♀, ZLKU No. 12445, Jul. 29, 1966, K. Honda and M. Takeda leg.

Suno, Amami-Oshima I., Ryukyu Is., 2 ♂♂, 2 ovig.♀♀, ZLKU No. 12435, Aug. 5, 1964, K. Baba leg.; Man-ya, Amami-Oshima I., 3 ♂♂, 1 ovig.♀, ZLKU No. 12441, Jul. 22, 1966, K. Honda and M. Takeda leg.

Tomioka, Amakusa, Kumamoto Pref., 1 ♂, ZLKU No. 12480, Sept. 21, 1966, H. Minei leg.

Fukaë, Nagasaki Pref., 1 ♂, ZLKU No. 339, May 22, 1945, T. Senta leg.

To-jima Islet, Shirahama, Wakayama Pref., 3 ♂♂, 1 ♀, ZLKU No. 12448, Jul. 20, 1967, Y. Miya leg.

*Measurements* (in mm):

	♂	Ovig. ♀
	(No. 12439-1)	(No. 1243-3)
Length of carapace.....	24.5	20.4
Breadth of carapace .....	34.1	28.6

*Remarks:* This shaggy crab is most commonly found in the coral reefs of the whole Indo-West-Pacific regions. The first male pleopod is represented by Barnard (1950, fig. 29b). With regard to synonymy *Actaea dentata* Edmondson is quite identical with this species.

*Pilumnus scabriusculus* Adams et White, 1848

(Fig. 10 c d)

*Pilumnus scabriusculus* Adams and White, 1848, p. 44, pl. 9, fig. 5: Eastern Seas.

—: Miers, 1886, p. 155: Samboangan, Philippines.—: Balss, 1933, p. 24: Sulu Sea; Upolu, Samoa Is.; Timor; Palau Is.; Damma I.—: Balss, 1938b, p. 56: Sultan Shoal, near Singapore.—: ? Sakai, 1939, p. 533, pl. 100, fig. 5:

Shimoda, Sagami Bay, and Tosa Bay.

*Pilumnus forskalii*: de Man, 1888, p. 295, pl. 12, fig. 1: Pulo Edam, Java.

*Pilumnus sluiteri* de Man, 1892, p. 283, pl. 1, fig. 2 (not read): Enkhuizen I., Java.

—: Ortmann, 1893, p. 438: Definite locality not available.—: Lanchester,

1901, p. 541: Penang I., Malay Peninsula.—: Lenz, 1905, p. 356: Aldabra I.

—: Ward, 1932, p. 252: North West I., Queensland, Australia.

*Material examined*:

Gadaraku Reef, Palau Is. (134° 28' 30" E, 7° 17' 30" N), 1 ♂ ZLKU No. 1738, Apr. 21, 1939, S. Miyake leg.; Songél a Lise, Goréor I., Palau Is., 1 ♂, 1 ♀, ZLKU No. 2191, May 1, 1939, S. Miyake leg.

Kabira, Ishigaki-jima I., Ryukyu Is., 1 ♂, ZLKU No. 1557, Feb. 26, 1939, H. Ohshima and S. Miyake leg.

*Measurements* (in mm):

	Largest ♂ (No. 2271-1)	Largest ♀ (No. 2271-7)
Length of carapace.....	24.0	17.6
Breadth of carapace .....	31.7	23.0

*Remarks*: This species is most closely related to *P. tomentosus* Latreille for having nearly uniformly disposed tufts of hairs on the carapace, and in the armatures of the carapace and chelipeds. In the latter species, however, the armatures of the anterolateral borders of the carapace are more accentuated, and each merus of the first three pairs of the ambulatory legs is usually armed with a minute terminal spinule. The photograph given by Sakai (1939, pl. 100, fig. 5) is not somewhat agreeable with that description, and seems to be more close to *P. caeruleascens* A. Milne Edwards on account of the areolation and rather scant longish hairs on the carapace.

*Distribution*: This species is widely distributed to the tropical Indo-West-Pacific regions from Aldabra eastward to Samoa, southward to Queensland, Australia and northward to Japan.

*Pilumnus purpureus* A. Milne Edwards, 1873

(Fig. 5 a-c, Pl. 2, B)

*Pilumnus purpureus* A. Milne Edwards, 1873a, p. 246, pl. 10, fig. 5: New Caledonia.

*Description*: The carapace is convex fore and aft, thickly covered with short and long stiff hairs which arise singly; the surface is slightly sculptured and sparsely granulated; those granules become larger and sharper near the anterolateral borders. The front is produced in the middle and bears a narrow deep median sinus, being fringed with several long stiff hairs just near the median sinus; each lateral lobule

is small but sharp, and separated from the supraorbital angle by a deep incision. The supraorbital border is setose, spinose laterally, and bears two possible traces of notches, while the infraorbital border is also fringed with setae and spinules, and bears a notch near the external orbital angle; the inner infraorbital angle is not produced but rounded. The inner angle of the basal antennal segment is just touched with the ventral prolongation of the front, its outer angle being raised nearly to the level of the inner infraorbital angle; the second and third antennal segments bear some long stiff hairs each on the outer side.

The anterolateral border is provided with four spines including the one at the external orbital angle; those spines are rather stout, curved forward and increase in size from the first to the fourth; the second is provided with an accessory spinule behind and below the main spine, the accessory one being as prominent as the subhepatic spinule. The subhepatic region is minutely granulated, one of which is prominent and visible from above but slightly smaller than the spine at the external orbital angle. The posterolateral border is strongly convergent after some distance from the last anterolateral spine, its dorsal surface being concave for the reception of the last ambulatory leg.

The chelipeds are distinctly unequal in both sexes; the carpus is provided with short setae mixed with longish ones and with sharp granules on the outer surface, its inner angle being not prominent; the larger palm is also provided with short setae mixed with longish ones and with two kinds of sharp granules in size on the upper and outer proximal surfaces, the larger granules of them being beaded to some longitudinal series; the remainder of the surface, about lower one-third, is smooth and glossy; the smaller palm is nearly like the larger one, but the entire outer surface is covered with granules and hairs; the fingers are clearly toothed on the cutting edges, being toothed more sharply in the smaller ones; each movable finger is considerably longer than the upper border of the palm; the immovable fingers of both chelae are slightly curved downward; the tips of the fingers are curved each other downward and upward, being crossed.

The ambulatory legs are rather long, unarmed and thickly covered with setae or hairs. In spirit the carapace is brick red or blackish brown, and the hairs are yellow.

*Material examined:*

Gushichan, Okinawa-jima I., Ryukyu Is., 1 ♀, ZLKU No. 12232, Jul. 3, 1962, S. Miyake, T. A. Uchida and H. Minei leg.

Suno, Amami-Oshima I., Ryukyu Is., 1 ovig.♀, ZLKU No. 12226, Aug. 6, 1964, K. Baba leg.; Sani, Amami-Oshima I., 3 ♂♂, 2 ♀♀, ZLKU No. 12227, Aug. 15-17, 1966, K. Honda and M. Takeda leg.; Yo, Kasari, Amami-Oshima I., 3 ♂♂, 1 ovig.♀, ZLKU No. 12233, Apr. 26, 1967, T.

Saisho et al. leg.; Kasari-zaki, Amami-Oshima I., 2 ♂♂, 1 ♀, ZLKU No. 12361, Aug. 7, 1967, S. Aoki and M. Takeda leg.

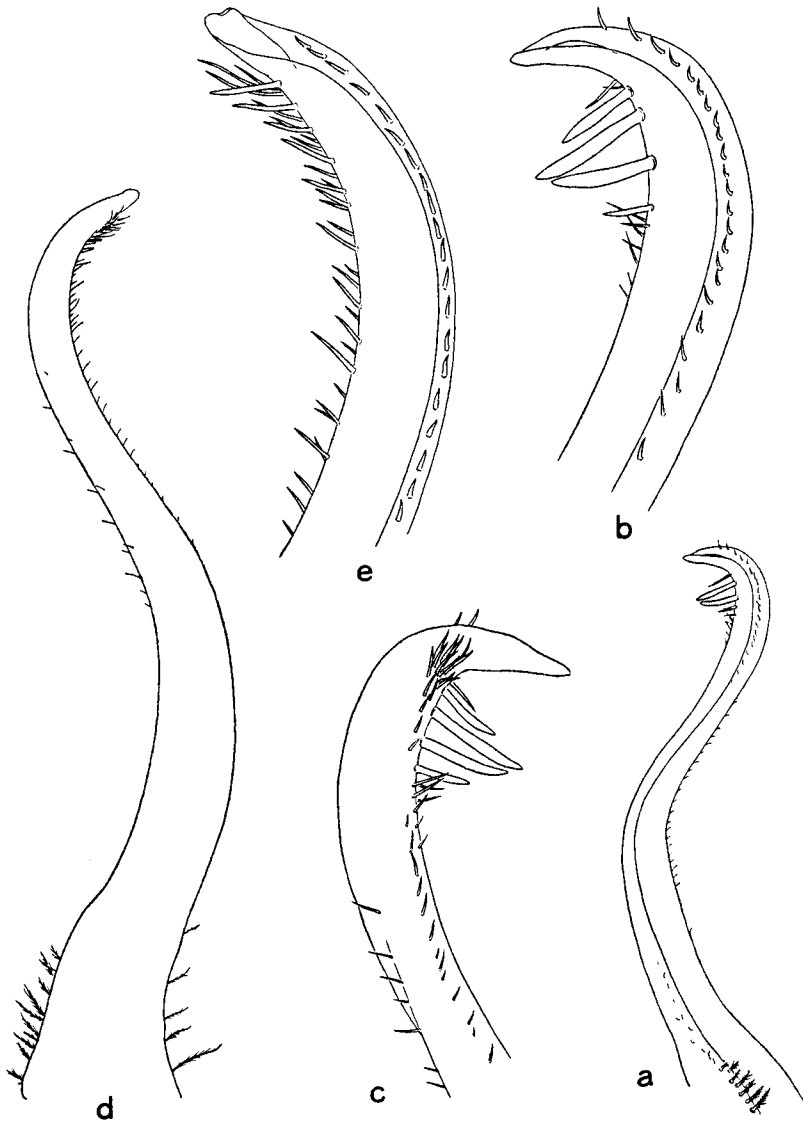


Fig. 5. *Pilumnus purpureus* A. Milne Edwards. a, Right first pleopod, abdominal view,  $\times 18$ ; b, distal portion of the same,  $\times 44$ ; c, the same, sternal view,  $\times 44$ .

*Pilumnus prunosus* Whitelegge. d, Right first pleopod, sternal view,  $\times 36$ ; e, distal portion of the same, abdominal view,  $\times 88$ .

*Measurements* (in mm):

	Largest ♂ (No. 12227-1)	Smallest ovig. ♀ (No. 12226)	Largest ♀ (No. 12227-4)
Length of carapace.....	10.5	5.8	8.7
Breadth of carapace .....	13.7	7.9	11.9

*Remarks:* The present materials from the Ryukyu Islands are referred to this species with slight hesitation, for the original description is insufficient to reidentify this species and the figure is by no means good representation. The present materials may be close to *P. deflexus* A. Milne Edwards from Australia which is also little known from the imperfect original description and is not figured. The present material may be, however, distinguished from the latter species by the armatures of the carapace and larger cheliped. On the other hand, though the general aspect of the carapace is somewhat like that of *P. prunosus* Whitelegge, the present materials are most readily separated from the species by the armatures of the ambulatory legs.

The original author described as, "Quelques tubercules pointus (environ 7) existent sur la partie antérieure de la région branchiale; la région hépétique en porte un et la région gastrique quelques-uns, mais beaucoup plus petits." The hairiness and armatures of the carapace as well as the colour are generally agreeable with the description, even if the granulation of the dorsal surface is variable in some degree. In the smaller specimens the dorsal surface is rather smooth, and the granules on the carapace are much smaller than those of the larger specimens. If the present identification is correct, it seems to be curious that the record of the species has not been known since the original record from New Caledonia. The present materials referred to this species are rather commonly found in the coral flat reefs of the Ryukyu Islands.

*Pilumnus prunosus* Whitelegge, 1897

(Figs. 5 d-e, 6, pl. 2, A)

*Pilumnus prunosus* Whitelegge, 1897, p. 133, pl. 6, fig. 1: Funafuti, Ellice Is.

*Description:* The carapace is strongly convex antero-posteriorly and covered with short setae mixed with long fine hairs, those setae mostly arising singly except for some long ones; the surface is nearly smooth and ill-defined. The front is declivous and slightly produced in the middle, bearing a rather wide median sinus; each lateral lobule is low and indistinct, being separated from the supraorbital angle by a shallow dorsal depression. The supraorbital border is spinose laterally



and bears two deep notches. The infraorbital border is granulated and bears a deep notch just inner the external orbital angle; four or five granules near and at the inner infraorbital angle are prominent and spiniform. The basal antennal segment is about twice as long as broad and contact with the ventral prolongation of the front; the second segment is as long as, but much stouter than the third. The external orbital angle is armed with a spine and accessory spinules on both sides and occasionally also behind the main spine.

The anterolateral border is armed with three stout spines; those spines increase in size from the first to the third, being slightly curved forward at the tips and fringed with setae at the broad bases. The subhepatic region is covered with sparse short setae, but without any granule or spinule. The posterolateral border is slightly longer than the anterolateral, nearly straight and rather strongly convergent.

The chelipeds are subequal in both sexes; the entire outer surfaces of the carpus and palm are armed with sharp granules or spinules, being interspaced with short setae mixed with long soft hairs; the inner angle of the carpus is armed with a stout spine which is curved upward; those granules on the outer surface of the palm are distinctly beaded to several longitudinal rows; the fingers are sharply and regularly toothed on the cutting edges; the immovable finger is curved downward and inward, and provided with six teeth, three or four of them at the middle being more prominent; the pigments of the fingers are extended back near to the proximal portion of the fingers.



Fig. 6. *Pilumnus prunosus* Whitelegge. Right chela, outer view,  $\times 12$ .

The ambulatory legs are densely covered with long flexible hairs; each merus is entire on the upper border, and minutely granulated on the lower border, being armed with a small terminal spine; each carpus is armed with two rows of spines, of which the upper row is composed of five or six spines, the distal spine of them being as a terminal one; the second row is situated on the upper surfade near the upper border and composed of four or five spiniform granules; the propodus is also armed with some spiniform granules in a line with the second row of the carpus.

*Colour*: In the present material the carapace is purplish dark brown, and the chelipeds and ambulatory legs

are light brown. The fingers are mainly reddish brown, and blackish brown along the cutting edges. Colour in life is said as follows. The carapace is plum coloured, the cardiac region and posterior margin being reddish brown. The spiniform granules on the chelipeds are orange-coloured. The ambulatory legs and undersurface of the body are similar to but greyer than the carapace. The pigments of the fingers are reddish brown.

*Material examined:*

Songél a Lise, Goréor I., Palau Is., (134° 30' E, 7° 21' N), 1 ♂, 1 ovig. ♀, ZLKU No. 1652, Mar. 28, 1938, S. Murakami leg.

*Measurements* (in mm):

	♂	Ovig. ♀
Length of carapace .....	8.1	8.6
Breadth of carapace excluding lateral spines.....	11.0	12.1
Fronto-orbital breadth .....	8.3	8.9

*Remarks:* The present material may be referable to this species from Funafuti, Ellice Islands, but show some slight differences. In the present material the anterolateral border is slightly longer than the posterolateral, the supraorbital border is rather distinctly spinulose, the subhepatic region is unarmed at all, and finally the chelipeds are nearly equal in both sexes. According to the original description, the anterolateral border is longer than the posterolateral, the supraorbital border is smooth, the subhepatic region is occupied by three or four small rounded granules, and the chelipeds are unequal. Furthermore in the present material it is not accurate to note that the first and second anterolateral spines are compressed.

The hairiness and armatures of the chelipeds and ambulatory legs are, however, excellently agreeable with the original description. Especially the armatures of the ambulatory legs are peculiar in the genus, and somewhat resemble those of *P. etheridgei* Rathbun from Australia. In the latter species each merus bears no terminal spine, and in addition, the armatures of the anterolateral border and subhepatic region are very different from those of the present species.

The first male pleopod bears less prominent beak at the tip as figured in Fig. 5d-e. In the male abdomen the terminal segment, as the original author accentuated, does not extend beyond the articular nodules of the first segments of the chelipeds, though the character seems to be not properly available for separating the members of the genus into groups.

*Pilumnus caerulescens* A. Milne Edwards, 1873

(Fig. 7, Pl. 2, D)

*Pilumnus caerulescens* A. Milne Edwards, 1873a, p. 242, pl. 9, fig. 3: New Caledonia. —: Zehntner, 1894, p. 153: Amboina.—: Alcock, 1898, p. 196: Andamans. —: Rathbun, 1910, p. 355, pl. 1, fig. 15: Koh Kahdat, Gulf of Siam.—: Rathbun, 1914, p. 660: Monte Bello Is., Western Australia.—: McNeill, 1926, p. 315: North West I., Queensland, Australia.—: Ward, 1932, p. 253: North West I. and Heron I., Queensland.

*Pilumnus forskalii caerulescens*: Balss, 1933, p. 14: Banda Sea; Friedrich Wilhelms Port, New Guinea; Matuka, Fiji Is.; Turtle I. (19° 54' S, 118° 54' E).—: Balss, 1938a, p. 67: Nauru, Gilbert Is.; Aranuka, Apamama, Beru, Nukunoo, Tapitoea and Tamana, Marshall Is.; Ebon, Ellice Is.—: Miyake, 1939, p. 218: No new locality.—: Holthuis, 1953, p. 25: Onotoa, Gilbert Is.

*Description*: The carapace is rather strongly convex fore and aft, and distinctly divided into regions, those areolae being convex and studded with scattered granules of good size; around each granule a tuft of some rather stiff setae or hairs arise, one or two hairs of each tuft being long, but not entirely disguising the areolation. The front is slightly produced, and cut into two rounded lobes, each lobe bearing a small triangular lateral lobule. The supraorbital border is minutely granulated, setose and bears two small notches, of which the lateral one is indistinct. The inner infraorbital angle is slightly produced and cut obliquely, so that a inclined V-shaped notch is formed between this angle and the basal antennal segment. The inner angle of the basal antennal segment is just touched with the ventral prolongation of the front.

The anterolateral border is armed with four teeth including the external orbital angle; those four teeth are tipped each with a spiniform granule or spinule; the first, or the external orbital angle itself, is as prominent as the second. The subhepatic region is also armed with a protuberance or stout tooth which is tipped with a granule and bears some accessory granules, being visible from above. The posterolateral border is much longer than the anterolateral and moderately convergent.

The chelipeds are unequal in both sexes; the merus is concealed under the carapace; the carpus is armed with scattered conical granules of good size fringed and interspaced with short and long setae or hairs on the outer surface, and armed with a stout spine-tipped tooth at its inner angle; the armatures of the outer surface of the larger palm is nearly like those of the carpus, those granules being distinctly beaded to some longitudinal series; the outer lower surface is smooth and glossy; the hairs and granules on the smaller palm are more accentuated.

The ambulatory legs are comparatively stout and rather densely

covered with short and long hairs mixed with very sparse plumose ones; each merus of the first three pairs is armed with a small terminal granule rather than a spine; each carpus usually bears a very small terminal granule.

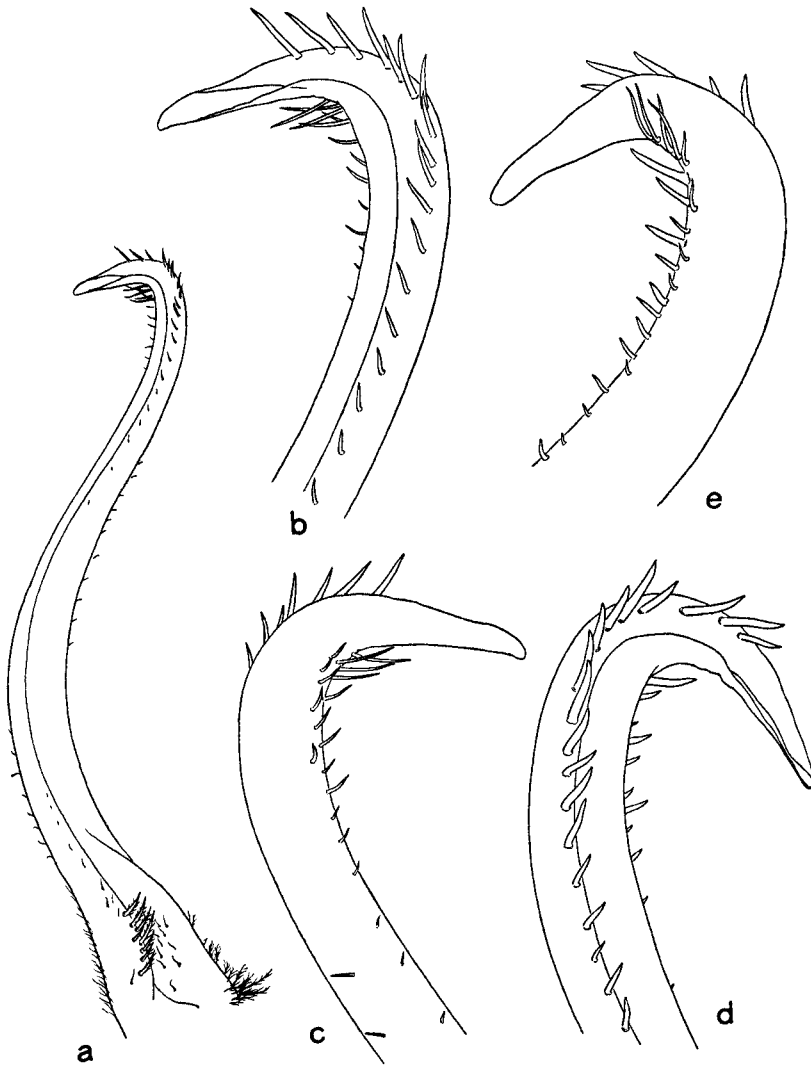


Fig. 7. *Pilumnus caeruleus* A. Milne Edwards. a, Right first pleopod of male from Ryukyu Is., abdominal view,  $\times 36$ ; b, distal portion of the same,  $\times 88$ ; c, the same, sternal view,  $\times 88$ ; d, distal portion of left first pleopod of male from Palau Is., abdominal view,  $\times 88$ ; e, the same, sternal view,  $\times 88$ .

*Material examined:*

Songél a Lise, Goréor I., Palau Is. (134° 30' E, 7° 21' N), 1 ♂, 2 ovig. ♀♀, ZLKU No. 2188, May 1, 1939, S. Miyake leg.; Same locality, 4 ♂♂, 1 ovig. ♀, 5 ♀♀, ZLKU No. 1747, May 19, 1939, S. Miyake leg.

Nagusuku, Okinawa-jima I., Ryukyu Is., 1 ♂, ZLKU No. 12160, Jun. 30, 1962, S. Miyake, T. A. Uchida and H. Minei leg.

Man-ya, Amami-Oshima I., Ryukyu Is., 1 ♂, ZLKU No. 12162, Jul. 22, 1966, K. Honda and M. Takeda leg.; Sani, Amami-Oshima I., 2 ♀♀, ZLKU No. 12367, Aug. 15, 1966, K. Honda and M. Takeda leg.; Yo, Kasari, Amami-Oshima I., 2 ovig. ♀♀, ZLKU No. 12452, Aug. 9, 1967, S. Aoki and M. Takeda leg.

*Measurements* (in mm):

	Largest ♂ (No. 1747-1)	Smallest ovig. ♀ (No. 1747-6)	Largest ♀ (No. 2188-3)
Length of carapace.....	8.2	4.8	7.9
Breadth of carapace .....	11.5	6.7	11.3
Fronto-orbital breadth.....	8.4	4.9	8.4

*Remarks:* The deep interregional fullows and the long hairs of each tuft around the granules on the carapace and chelipeds may be enable one to distinguish this species from the congeners. The hairiness is, however, variable to some extent. Those tufts of hairs on the carapace are typically rather sparse. Otherwise in some material from the Ryukyu Islands the hairs are slightly stout, being provided with very short, thick secondary hairs.

*Distribution:* This species has been known from the Andamans, Amboina, Gulf of Siam, Monte Bello Is., New Caledonia (Type locality), New Guinea, Fiji, Ellice, Gilbert and Marshall Is.

*Pilumnus ransoni* Forest et Guinot 1961

(Fig. 12 a c, Pl. 3, C)

*Pilumnus ransoni* Forest et Guinot, 1961, p. 130, figs. 123, 124, 127, pl. 4, figs. 1, 2, pl. 17, fig. 2: Tahiti.

*Description:* The carapace is only slightly convex anteriorly, thinly covered with short setae mixed with scant longish ones, those setae being never in tufts but arising singly; the regions are very faintly indicated and nearly smooth except just near the anterolateral borders. The front is slightly produced in the middle and cut into two truncated oblique lobes by a median small V-shaped sinus, each lateral lobule being indistinct. The supraorbital border is minutely granulated laterally

and bears two small notches, while the infraorbital border is armed with six or seven spinules and bears a deep notch near the external orbital angle; the inner infraorbital angle is not so produced but rounded. The inner angle of the basal antennal segment is just touched with the ventral prolongation of the front; its outer angle is raised near to the level of the inner infraorbital angle.

The anterolateral border is armed with three spines excluding the acute external orbital angle; those spines are strongly curved forward and subequal, or the hindermost is slightly smaller than the precedings. The subhepatic region is armed with some sharp granules and spinules; some of them are visible from above between the external orbital angle and the first anterolateral spine; a sharp spinule otherwise is also visible between the first and second anterolateral spines. The posterolateral border is much longer than the anterolateral and only slightly inclined.

The larger cheliped is heavy; the carpus is studded with scattered granules of good size interspaced with short and long hairs, its inner angle being armed with a worn out stout spine and besides with a small supplementary one below the main spine; the palm slightly tapers and is provided with conical granules on the upper and outer proximal surfaces, the remainder of the surface being smooth and glossy; the fingers are stout and bluntly toothed on the cutting edges; the smaller cheliped is missing.

The ambulatory legs are long and rather densely covered with short and long setae or hairs mainly along the borders; the second and third pairs are subequal in length; each merus of the first three pairs is armed with a spine on the upper border; in addition, each merus as well as the last one is armed with a small terminal spine; each carpus also bears a terminal spine.

The penultimate segment of the male abdomen is slightly concave laterally. The first male pleopod is strongly curved and bears a long beak and scant setae on its subterminal portion.

*Material examined:*

Ishigaki-jima I., Ryukyu Is., 1 ♂, ZLKU No. 1764, Apr. 3, 1938, C. Senaha leg.

*Measurements* (in mm):

Length of carapace .....	7.0
Breadth of carapace including lateral spines .....	9.4
Fronto-orbital breadth .....	6.6

*Remarks:* The present material is safely referable to this species. The only slight difference is the front, viz. in the present specimen

the front is obliquely truncated, though in the original one it is said to be slightly rounded. The subhepatic spinules otherwise seem to be more accentuated than those of the original one. The general shape of the first male pleopod is well agreeable with and only slightly different at the beak from the original figure.

*Distribution*: This species was originally reported from Tahiti.

*Pilumnus senahai* sp. nov.

(Pl. 4, A, B)

*Diagnosis*: Carapace rather wide, slightly convex anteriorly and nearly without regional indication. Dorsal surface, chelipeds and ambulatory legs covered with plumose and blush-like hairs, those on carapace being disposed in small tufts and rows. Anterolateral border with three spine-tipped teeth; first two spines at tips curved forward, while third one directed forward. Subhepatic region with a granulated low prominence. Posterolateral border only slightly inclined. Ambulatory legs long. Each merus and carpus with a terminal spinule.

*Description of holotype*: The carapace is rather wide, slightly convex anteriorly and bears no regional indication; the dorsal surface is entirely and rather uniformly covered with small tufts and rows of short plumose hairs; in those tufts near the front and anterolateral borders, one or two hairs of each tuft are very long and blush-like; behind the front there is a row of two kinds of hairs, viz. one is slightly shorter and plumose, being symmetrically provided with longish secondary hairs at the whole length and the other is much longer and blush-like, being provided with secondary hairs at the distal half; the entire surface is nearly smooth except for the small pits and the minute scant granules near the anterolateral borders, at and around which the tufts of hairs arise. The front is subtruncated and bears a median small notch, being fringed with longish hairs just near the median notch; the lateral lobules are low and indistinct. The supraorbital border is also fringed with plumose and blush-like hairs, minutely granulated laterally and bears two shallow indistinct notches. The external orbital angle is not produced. The infraorbital border is setose, very minutely granulated and bears a rather deep notch just near the external orbital angle; the inner angle is not so produced and cut obliquely, so that its inner extremity is touched with the proximal portion of the basal antennal segment. The inner angle of the basal antennal segment is just touched with the short ventral prolongation of the front; the antennal flagellum is about twice as long as the major diameter of the orbit and is not provided with secondary hairs.

The anterolateral border is armed with three spine-tipped teeth;

those three teeth are nearly equal; the first two spines at the tips are curved forward, while the hindermost is directed obliquely-forward. The subhepatic region bears a granulated low prominence. The posterolateral border is longer than the anterolateral, nearly straight and weakly convergent.

The chelipeds are only slightly unequal, the left one being larger; the entire outer surface of the carpus and palm are thickly covered with blush-like hairs of various length; the inner angle of the carpus is armed with a small spine; the outer surfaces of the carpus and palm are covered with granules, those on the palm being disposed in longitudinal series; the hairs on the palm arise mainly around the granules; the cutting edges of all the fingers are only slightly and irregularly toothed on the whole length; each immovable finger of both chelae bears a deepish longitudinal fullow on the outer surface near the proximal end.

The ambulatory legs are very long and densely furnished with plumose and blush-like hairs of various length; the long hairs on the distal three segments are provided with very short secondary hairs, while the other hairs are provided with longish secondary ones; each merus and carpus of all the ambulatory legs are armed with a small terminal spine.

*Description of paratypes:* In both females the hairiness of the carapace, chelipeds and ambulatory legs is very alike the holotype. The armatures of the anterolateral borders, subhepatic regions and chelipeds are also like the holotype. In the smaller female the lateral one of two shallow notches on the supraorbital border is somewhat indistinct. In the larger female each merus and carpus of the ambulatory legs are armed with small but distinct spines like the other specimen; otherwise each merus of the left second and right third ambulatory legs bears a minute granule on the upper border, and the merus of the right first ambulatory leg is slightly roughened on the upper border.

*Holotype:* Ovig. ♀, ZLKU No. 1766, Flat reef, Maézato, Ishigaki-jima I., Ryukyu Is., Apr. 3, 1938, C. Senaha leg.

*Paratypes:* 1 ♀, ZLKU No. 1967, data as for the holotype; 1 ♀, ZLKU No. 1746, Maézato, Ishigaki-jima I., May 21, 1940, S. Miyake and K. Kawahara leg.

*Measurements* (in mm):

	Holotype	Paratypes	
	Ovig. ♀ (No. 1766)	♀ (No. 1767)	♀ (No. 1746)
Length of carapace.....	5.5	5.1	5.4
Breadth of carapace .....	7.6	7.2	7.6
Fronto-orbital breadth .....	5.8	5.4	5.8



*Remarks:* This species is apparently belonged to the same group as *P. cursor* A. Milne Edwards, *P. neglectus* Balss and *P. ransoni* Forest et Guinot. In the present species the plumose and blush-like hairs are characteristic, and may be somewhat like those of *Planopilumnus penicillatus* (Gordon), in which the anterolateral teeth are quadridentate.

In *P. cursor* the carapace, chelipeds and ambulatory legs are also covered with short and long blush-like hairs, but those on the carapace are not disposed in tufts or rows. Moreover in both sexes the larger palm is always smooth and grossy on the outer surface. Each merus of the first three pairs of the ambulatory legs is armed with two or three spines on the upper border and with a terminal spine, but each carpus is unarmed.

In *P. neglectus* the small crest on the proximal portion of the lower border of the immovable finger is the most characteristic. In the present species the outer proximal surface of the immovable finger is impressed with a longitudinal deepish groove.

In *P. ransoni* the hairs on the carapace, chelipeds and ambulatory legs are rather sparse and simple. Each merus of the first three pairs of the ambulatory legs is armed with a spine on the upper border and with a terminal one, and each carpus bears also a terminal spine. The present species is separated from that species by the characteristic hairs and having no distinct spine on the upper border of each merus of the ambulatory legs.

*Pilumnus amamensis* sp. nov.

(Figs. 8, 9 a-c, Pl. 2, C)

*Diagnosis:* Carapace convex fore and aft, slightly divided into regions by narrow, shallow fullows and studded with spiniform granules of good size, those granules being fringed with some setae or hairs. Anterolateral border with four stout spines including one at external orbital angle. Those spines increase in size from first to fourth tooth, third one being most strongly directed forward. Subhepatic region with one or two granules. Chelipeds heavy and quite unequal. Larger palm very swollen and its immovable finger short and stout. Each merus of ambulatory legs unarmed, while each carpus with a terminal spine.

*Description of holotype:* The carapace is strongly convex fore and aft, slightly so from side to side, and rather thickly covered with short setae mixed with longish ones; the surface is only slightly divided into regions by narrow, shallow interregional fullows and studded with scattered spiniform granules of good size, those granules or spinules becoming larger and sharper near the anterolateral borders; the setae

or hairs are rather short and stiff, arising mainly in tufts around those granules or spinules, otherwise a few arising singly. The front is slightly produced and cut into two rounded lobes by a V-shaped sinus, each lobe bearing a small but sharp lateral lobule. The supraorbital border is minutely granulated and bears two traces of notches, while the infraorbital border is armed with several spinules and bears a indistinct notch near the external orbital angle; the inner infraorbital angle is only slightly produced. The inner angle of the basal antennal segment is hardly reached the ventral prolongation of the front, its outer angle being raised nearly to the inner infraorbital angle; the second segment is short and stout, and the third is a little longer than the second, being provided each with one or two longish setae on the outer angles.

The anterolateral border is armed with four stout spines including the one at the external orbital angle, those spines increasing in size from the first to the fourth; each spine is straight and directed forward, the third being more strongly directed forward. The subhepatic region is minutely granulated, one or two of which are slightly prominent. The posterolateral border is strongly convergent, its dorsal surface being shallowly concave for the reception of the last ambulatory leg.

The chelipeds are short, heavy and quite unequal, the right one being larger; the merus is entirely concealed under the carapace; the carpus is armed with sharp spines interspaced with short and long hairs on its outer surface; the armatures of the smaller carpus are nearly like the larger one; the larger palm is very swollen and armed with spines on the outer surface, those spines somewhat being beaded to some longitudinal rows and diminishing in size near its lower surface; the smaller palm is not swollen; the armatures of the smaller palm are nearly like those of the larger one, but the spines are very accentuated, four spines on the upper border being the most prominent; the fingers of the larger chela are exceedingly short, stout and bear two molar-like teeth on each cutting edge, while those of the smaller one are sharply toothed.

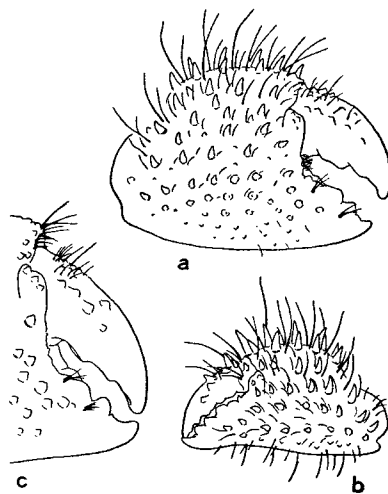


Fig. 8. *Pilumnus amamensis* sp. nov.  
a, b, Chelae of holotype,  $\times 6$ ; c, right chela of paratype, ovig. ♀,  $\times 6$ .

The ambulatory legs are smooth and rather densely covered with

short and long hairs; the merus is unarmed, while the carpus bears a terminal spine.

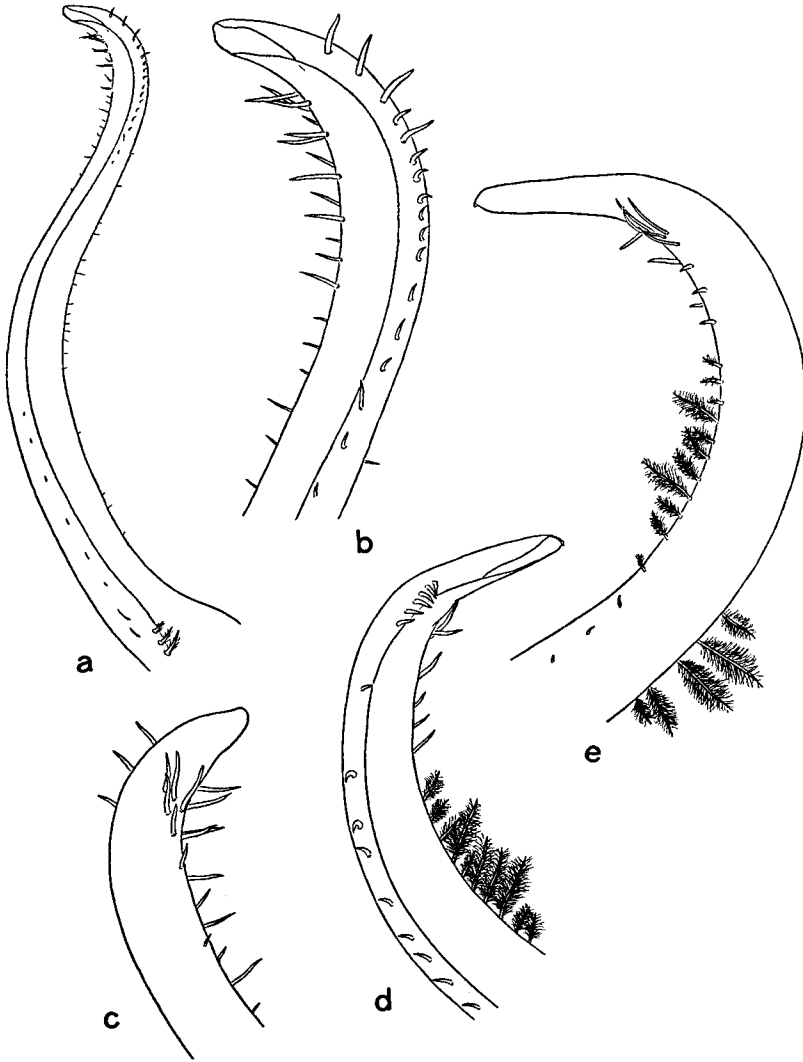


Fig. 9. *Pilumnus amamensis* sp. nov. a, Right first pleopod of male, abdominal view,  $\times 36$ ; b, distal portion of the same,  $\times 88$ ; c, the same, sternal view,  $\times 88$ .

*Pilumnus minutus* (de Haan). d, Distal portion of left first pleopod of male, abdominal view,  $\times 88$ ; e, the same, sternal view,  $\times 88$ .

*Description of paratypes:* In the larger female and the male the larger chelipeds are missing, but the armatures of the smaller chelipeds

and ambulatory legs are quite like those of the holotype. In the smaller female and the ovigerous female each larger palm is also very swollen, the fingers being short and stout like that of the holotype. In the male the granules on the carapace appear to be somewhat smaller. The terminal segment of the male abdomen is somewhat narrow, and about once and a half as long as the penultimate one. Though the first male pleopod seems to be well developed, its beak at the tip is rather short as figured in Fig. 9a-c.

*Colour*: In formalin the carapace, each carpus of the chelipeds and the ambulatory legs are light brown mottled with reddish irregular bands and spots, the reddish colour being somewhat banded on the ambulatory legs. Each palm of both chelae is more or less purplish. The pigments of the fingers are pale blackish brown, being darker along the cutting edges with white tips and teeth.

*Holotype*: ♀, ZLKU No. 12221, Sani, Amami-Oshima I., Ryukyu Is., Aug. 15, 1966, K. Honda and M. Takeda leg.

*Paratypes*: 1 ♂, ZLKU, No. 12222, data as for the holotype; 2 ♀♀, ZLKU No. 12223, Yo, Kasari, Amami-Oshima I., Apr. 26, 1967, T. Saisho et al. leg.; 1 ovig. ♀, ZLKU No. 12366, Yo, Kasari, Amami-Oshima I., Aug. 6, 1967, S. Aoki and M. Takeda leg.

*Measurements* (in mm):

	Holotype		Paratypes		
	♀	♂	♀	♀	Ovig. ♀
Length of carapace .....	6.0	5.0	9.3	6.3	7.8
Breadth of carapace					
excluding lateral spines.....	7.7	6.5	12.2	8.0	10.3
Fronto-orbital breadth .....	6.0	5.1	9.2	6.2	7.8

*Remarks*: The general aspect of the carapace somewhat resembles *P. sinensis* Gordon. But in the present material the anterolateral spines bear no expanded bases, the larger palm is much swollen and the terminal segment of the male abdomen is not so strongly pointed.

On the other hand, this species is somewhat close to *P. purpureus* A. Milne Edwards to which the material from the Ryukyu Islands are referred in the present paper. The conical granules on the carapace, the spines on the anterolateral borders of the carapace and chelipeds are, however, more accentuated, and each carpus of the ambulatory legs is armed with a terminal spine. The first male pleopod of the latter species bears two stout setae near the tip. Finally the shape of the larger palm is quite different type.

Otherwise this species may be placed near to *P. minutus* (de Haan)

and *P. savigni* Heller, but readily distinguished from the latter by the shape of the larger palm and the armatures of the ambulatory legs.

*Pilumnus minutus* (de Haan, 1835)

(Fig. 9 d-e)

*Cancer (Pilumnus) minutus* de Haan, 1835, p. 50, pl. 3, fig. 2: Japan.

*Pilumnus minutus*: A. Milne Edwards, 1873, p. 250: New Caledonia.—: Parisi, 1916, p. 183: Sagami Bay.—: Sakai, 1934, p. 307: Nagasaki, Japan.—: Sakai, 1936, p. 170, pl. 51, fig. 2: No definite locality.—: Sakai, 1939, p. 535, fig. 53, pl. 66, fig. 2, pl. 100, fig. 9: Coast of Iwate Pref., Tateyama Bay and Ise Bay, Japan.—: Miyake, 1961, p. 173: Ariake Sea, Japan.—: Sakai, 1965, p. 158, pl. 79, fig. 2: Sagami Bay (off Kameki Reef and Mosaki, 30-50 m deep; Arasaki, 5-10 m deep; Mitohama, 15-35 m deep).

*Pilumnus hirsutus*: Stimpson, 1907, p. 69, pl. 9, fig. 1: Northern China Sea; east coast of Amami-Oshima I., Ryukyu Is., 55 m deep; Bonin Is.—: Miers, 1879, p. 31: Corean Strait, 20-70 m deep.—: Haswell, 1882b, p. 69: Off Holborn I., Australia, 35 m deep.—: Ortmann, 1893, p. 437: Kagoshima, Japan.—: Alcock, 1898, p. 197: Andamans; Mergui Archipelago; Malacca Strait.—: Rathbun, 1902, p. 129: Male Lagoon, Maldive Is., 55 m deep.—: Nobili, 1906a, p. 278: Red Sea.—: Rathbun, 1910, p. 355: Gulf of Siam, 2-55 m deep.—: Rathbun, 1911, p. 229: Providence Is., 50-140 m deep; Amirate Is., 35-80 m deep.—: Klunzinger 1913, p. 261: No new locality.—: Balss, 1922, p. 117: Japan (between Ito and Hatsushima, Boshu, 150 m deep, Zushi, 130 m deep, near Misaki, 20-30 m deep, Sagami Bay; Tomo, Bingo [=Hiroshima Pref.]; Nagasaki).—: Rathbun, 1923, p. 122, pl. 28: Off Bowen, 35-55 m deep, off Double Island Point, 55 m deep, Queensland, Australia.—: Yokoya, 1933, p. 184: Japan (near Inubo-zaki, 18 m deep; between Shiwoya-zaki and Inubo-zaki, 48 m deep; near Tanabe, Wakayama Pref., 190 m deep; south of Ashizuri-zaki, 256 m deep; west of Tanegashima I., 203 m deep; north of Tanegashima I., 102 m deep; east of Tanegashima I., 219 m deep; Bungo Strait, 210 m deep; west of Ashizuri-zaki, 276 m deep; south of Ashizuri-zaki, 179 m deep; north-west of Goto Is., 155 m deep; between Mihogaseki and Oki I., 37 m deep).—: Balss, 1933, p. 20: Hakodate and Tsugaru Strait, Japan; Formosa Strait; Maccasfield Bank; Gulf of Siam; Singapore; Philippines; Amboina; near Treal and near Doe Roa, Kei Is.; Trincomalee, Ceylon.—: Chopra and Das, 1937, p. 407, fig. 11: Mergui Archipelago.—: Stephensen, 1945, p. 146, fig. 36D-F: Off Bahrein, 23-33 m deep, Persian Gulf.—: Barnard, 1950, p. 263, fig. 49d-g: False Bay, off East London, off Port Shepstone, 0-140 m deep, and Durban, South Africa.—: Sankarankutty, 1962, p. 144: Port Blair, Andamans.

*Pilumnus minutus* (?) var. *hirsutus*: Miers, 1886, p. 154: Kôbe, Japan, 90 m deep.

*Pilumnus minutus hirsutus*: Lanchester, 1900, p. 743: Singapore.

*Pilumnus habererianus* Doflein, 1902, p. 629, pl. 5, fig. 6: Sagami Bay.—: Parisi, 1916, p. 185: Tokyo Bay.

*Material examined*:

Akaiwa, Tomioka, Amakusa, Kumamoto Pref., 1 ♂, ZLKU No. 3904,

Mar. 1954, S. Miyake leg.; Same locality, 6 ♂♂, 7 ovig. ♀♀, 5 ♀♀, ZLKU No. 8496, Jul.-Aug. 1957, S. Miyake leg.; Off Uze, Amakusa, 40 m deep, shelly sand, 33 ♂♂, 20 ovig. ♀♀, 13 ♀♀, ZLKU No. 12068, Jun. 21, 1966, T. Kikuchi and Y. Miya leg.; Tomioka, Amakusa, 5 ♂♂, 3 ovig. ♀♀, 5 ♀♀, ZLKU No. 12147, Sept. 21, 1966, H. Minei leg.; Off Uze, Tomioka, Amakusa, ca. 40 m deep, 30 ♂♂, 17 ovig. ♀♀, 20 ♀♀, ZLKU No. 12369, May 29, 1967, T. Fujino leg.; Same locality, ca. 50 m deep, 4 ♂♂, 5 ovig. ♀♀, ZLKU No. 12426, May 30, 1967, T. Fujino leg.

Sasebo, Nagasaki Pref., 1 ♀, from bottom on ship, ZLKU No. 3975, Aug. 10, 1938, S. Miyake leg.

Near Orono-shima Islet, Fukuoka Pref., 45 m deep, 2 ♂♂, 2 ovig. ♀♀, 1 ♀, ZLKU No. 484, Jul. 21, 1954, Shikanoshima Aquarium leg.; Okino-shima Islet, Fukuoka Pref., 60 m deep, 1 ♂, ZLKU No. 11980, May 18, 1967, K. Baba, Y. Miya and T. Fujino leg.; Munakata-Oshima I., Fukuoka Pref., 1 ♂, ZLKU No. 8925, Sept. 1957, Y. Motomatsu leg.; Off Munakata-Oshima I., 10 m deep, 11 ♂♂, 8 ovig. ♀♀, 7 ♀♀, ZLKU No. 12012, May 19, 1967, K. Baba, Y. Miya and T. Fujino leg.

Iyo Strait, Ehime Pref., 1 ovig. ♀, 2 ♀♀, ZLKU No. 1974, Aug. 1953, S. Yagi leg.

Sakanotsu, Tottori Pref., 1 ♀, ZLKU No. 3911, Sept. 28, 1949, T. Kishida leg.

*Measurements* (in mm):

	Largest ♂ (No. 12068-1)	Smallest ovig. ♀, (No. 8496-13)	Largest ♀ (No. 3975)
Length of carapace.....	8.4	3.2	8.5
Breadth of carapace .....	11.5	4.5	12.0

*Remarks:* This species is by far the most abundant *Pilumnus* in the Japanese waters. There are some variations in the armatures of the carapace, chelipeds and ambulatory legs. The external orbital angle is armed with a spinule and usually provided with an accessory spinule behind it. In the extreme case each one of the accessory spinules of the first and second teeth is nearly as long as the main spine, those material to which the specific name *habererianus* was given. The subhepatic region is usually only minutely granulated, those granules of the larger material being slightly prominent but not visible from above for the accessory spinule of the external orbital angle. Each merus of the ambulatory legs is usually unarmed, but in some material from Amakusa each merus of the first three pairs is armed with some minute granules on the upper border and with a terminal spiniform granule, and sometimes the merus of the last also bears a very small terminal granule. A terminal spine of each carpus is always prominent.

*P. hirsutus* Stimpson was united with this species by Parisi (1916), but separated by Balss (1922, 1933), and then thought as a synonym by Sakai (1939, 1965). Many external characters are common in both species, and none of the specific differences seems to be shown externally. The first male pleopod is represented by Chopra and Das (1937, fig. 11), Stephensen (1945, fig. 36F) and Barnard (1950, fig. 49g) as that of "*P. hirsutus*," and by Sakai (1939, fig. 53a) as that of "*P. minutus*." Here it is again figured in Fig. 9d-e, and is proved to be the same type as the figure given by Chopra and Das (*loc. cit.*), bearing bluish-like hairs near the distal part.

*Distribution*: This species spreads over the Indo-West-Pacific regions from South Africa and the Red Sea, and across the tropical Indian Ocean to New Caledonia, southward to Australia and northward to Japan. In Japan this species is found on the entire coast of the mainland northward to Hakodate, Tsugaru Strait.

*Pilumnus ikedai* sp. nov.

(Pl. 4, C, D)

*Diagnosis*: Carapace convex, smooth and ill-defined. Surface thinly covered with fine short hairs mixed with longish tufts of plumose hairs. Each frontal lobe bordered with sharp granules. Anterolateral border with three spine-tipped teeth excluding a spiniform granule at external orbital angle. First tooth with two or three accessory spinules. Subhepatic region granulated. Ambulatory legs with five or six indistinct small granules on upper border of each merus. Otherwise each merus and carpus with a terminal spine.

*Description of holotype*: The carapace is convex fore and aft, smooth and ill-defined; the surface is thinly covered with fine short hairs mixed with scant longish ones and with some tufts of plumose hairs. The front is declivous and cut into two rounded lobes, each lobe being fringed with spiniform granules and bearing a more prominent lateral spinule. The supraorbital border is minutely spinulated and nearly entire or bears two shallow depressions. The infraorbital border is also spinulated, the inner five or six of those spinules being more prominent. The inner angle of the basal antennal segment is just touched with the ventral prolongation of the front, its outer angle being raised slightly higher than the inner infraorbital angle; the second and third antennal segments are nearly equal in length, but the former is much stouter.

The anterolateral border is armed with three spine-tipped teeth; the external orbital angle is spine-tipped and provided with one or two accessory spinules behind the main spine; the first is also provided

with two or three accessory spinules; the following two are nearly equal and bears no accessory spinules, each spine being curved forward at the tip. The subhepatic region is minutely granulated. The posterolateral border is longer than the anterolateral and moderately inclined.

The chelipeds are distinctly unequal, the right one being larger; the merus is short, stout and armed with the terminal and subterminal spines on the upper border; the carpus of the larger cheliped is thickly covered with conical granules interspaced with rather scant setae on the outer surface, its inner angle being armed with a sharp conical granule of good size; the smaller carpus is armed with sharper conical granules and denser setae than in the larger one; the palm of the larger chela is heavy and armed with granules like the larger carpus on the upper surface and the outer proximal portion, the remainder of the surface being glossy; the smaller palm is provided with sharp granules of good size and with setae or longish hairs except for the inner surface, those granules or spinules on the outer surface being distinctly beaded to some longitudinal rows; the fingers of the larger chela are heavy; the cutting edge of the movable finger is bluntly toothed, the inner two teeth being molar-like, and the cutting edge of the immovable one is provided with a larger tooth in the middle and some smaller ones on both sides of the main tooth; the smaller chela is sharply toothed on the cutting edges.

The ambulatory legs are thinly covered with setae or simple longish hairs mixed with scant plumose ones; each merus of the first three pairs bears five or six small granules on the upper border, of which two or three are slightly prominent; the upper border of the last merus is nearly entire; in addition, each merus including the last is armed with a terminal spine; each carpus also bears a terminal spine.

*Holotype*: Ovig. ♀, ZLKU No. 12225, off Ototo-jima I., Bonin Is., Jul. 6-7, 1938, H. Ikeda leg.

*Measurements* (in mm):

Length of carapace .....	5.9
Breadth of carapace including lateral teeth .....	8.5
Fronto-orbital breadth .....	6.0

*Remarks*: The ornamentation of the dorsal surface and the armatures of the anterolateral borders of the carapace may be close to *P. laevigatus* (Rathbun) from Amirante and north-west Australia, and to *P. zimmeri* Balss from Zanzibar, the general aspects of both species being similar each other.

In *P. laevigatus* the armatures of the ambulatory legs were not



mentioned in the original description. Guinot (1964) reported from Aldabra and showed that each carpus and propodus of the ambulatory legs are armed with numbers of sharp granules or spinules. In the present material each merus of the first three pairs of the ambulatory legs bears five or six small granules, and each merus including the last and each carpus are armed with a terminal spine. The other difference is the shape of the front. In the present material the front is bordered with spiniform granules, and bears small but sharp lateral spinules, while in the latter species the front is only slightly granulated laterally and bears no distinct lateral lobule. Furthermore in the latter species the fingers of the smaller chela are said to be a little hollowed out within the tips.

In *P. zimmeri* each merus, carpus and propodus of the ambulatory legs are said to bear nine to ten spinules on the upper border, being the most different from the armatures of the present species.

On the other hand this species seems to have some resemblance to *P. spinulus* Shen in the general aspect of the carapace bearing the denticulated front. In the latter species, however, the carapace is more densely covered with short stiff hairs, and each carpus of the ambulatory legs is said to be unarmed.

### *Pilumnus tomentosus* Latreille, 1825

(Fig. 10 a-b)

- Pilumnus terrae-reginae* Haswell, 1882a, p. 752: Port Molle, Australia.—: 1882b, p. 68, pl. 1, fig. 1: No new locality.—: Grant and McCulloch, 1906, p. 15, pl. 1, fig. 1: Mast Head I. and Port Curtis, Queensland, Australia.
- Pilumnus tomentosus* (?): Miers, 1886, p. 160, pl. 14, fig. 4: Australia (off East Moncoeur I., Bass Strait, 70 m deep; Port Phillip, Victoria, 70 m deep).
- Pilumnus major* Ortmann, 1893, p. 439: Tokyo Bay.—: Yokoya, 1933, p. 185: Sagami Bay, 90 m deep.
- Pilumnus tomentosus*: Whitelegge, 1900, p. 149: Off the coasts of New South Wales, Australia.—: Rathbun, 1923, p. 119, pl. 27, figs. 1, 2: Shoalhaven Bight, New South Wales, 30–80 m deep; Victoria, Australia (off Gabo I., 170–270 m deep; south-east of Cape Everard to south Gabo I., 160–270 m deep; south of Diana's Peak to south of Mt. Cann, 125–145 m deep; south of Mt. Cann, 100–180 m deep; east of Bass Strait, 125–145 m deep; east of Flinders I., Bass Strait, 360–540 m deep); South Australia (Marsden Point, Kangaroo I., 30 m deep; Spencer Gulf, 30–35 m deep; off Cape Jervis, 30 m deep; Great Australian Bight, 145–215 m deep).—: Hale, 1927, p. 312: Kangaroo I.—: Balss, 1933 p. 23, pl. 3, figs. 14, 15: Sydney, Diasaster Bay, 70 m deep, and Port Phillip, New South Wales; 38° 15' S, 180° 43' E, 125–215 m deep, Victoria; Bass Strait; near Albany, Western Australia; Timor; Cebu I., Mactan I. and Guimaras I., Philippines; Maccasfield Bank; Japan; Upolu, Samoa Is.—: Sakai, 1936, p. 171, pl. 51, fig. 1: No definite locality.—: Sakai, 1939, p. 532, pl. 64, fig. 1: Fukuura, Ajiro

and Shimoda, Sagami Bay.— : Sakai, 1965, p. 157, pl. 78, fig. 2: Mosaki, 10-15 m deep and Mitohama, 10-15 m deep, Sagami Bay.

*Material examined:*

Shibushi Bay, Kagoshima Pref., 1 ♀, ZLKU No. 12064, Sept. 1963, O. Omine leg.

Tomioka, Amakusa, Kumamoto Pref., 1 ♂, ZLKU No. 2225, Jul. 7, 1936, S. Miyake leg.; Tsuji-shima Islet, Amakusa, 1 ♀, ZLKU No. 12065, Ayr. 26, 1967, A. Taki leg.

Tosa-shimizu, Kochi Pref., 5 m deep, 2 ♀♀, ZLKU No. 9581, Oct. 24, 1960, K. Kurohara leg.

Susaki, near Shimoda, Sagami Bay, 1 ♀, by gill net for spiny-lobster fishing, ZLKU No. 9409, S. Kosuge leg.

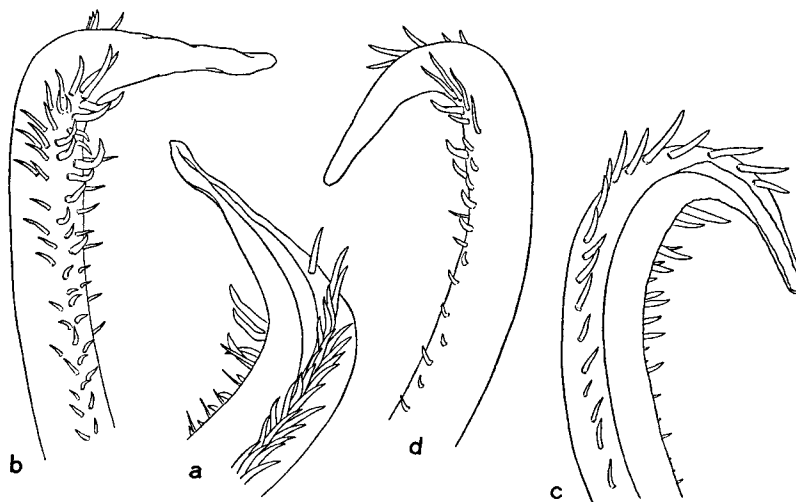


Fig. 10. *Pilumnus tomentosus* Latreille. a, Distal portion of right first pleopod of male, abdominal view,  $\times 33$ ; b, the same, sternal view,  $\times 33$ .

*Pilumnus scabriusculus* Adams et White. c, Distal portion of left first pleopod of male, abdominal view,  $\times 66$ ; d, the same, sternal view,  $\times 66$ .

*Measurements* (in mm):

	♂	♀	♀	♀
	(No. 2225)	(No. 9409)	(No. 9581-1)	(No. 12064)
Length of carapace .....	32.0	28.4	27.4	32.7
Breadth of carapace .....	43.4	38.3	37.2	43.6

*Remarks:* In the Japanese material the anterolateral border of the carapace is armed with three stout teeth, each being always subtruncated

at the outer border and the tip being capped with a small spine. The armatures are exactly agreeable with the description of *P. major* Ortmann, but seem to be different from the figures given by Rathbun (1923, pl. 27, figs. 1, 2) and Balss (1933, pl. 3, figs. 14, 15), and also from that of *P. terraereginae* Haswell given by Grant and McCulloch (1906, pl. 1, fig. 1). The armatures of the present material are very close to those of *P. scabriusculus* Adams et White, being not so strongly produced as in the typical *P. tomentosus*. Balss (1933) examined many material from various localities including a male from Japan and remarked on a Japanese specimen as, "Das *P. major* Ortmann mit unserer Art identisch ist, geht aus der Beschreibung deutlich hervor; das grosse Exemplar aus Japan hatte ich zuerst mit Ortmann's Art identifiziert und habe später seine Identität mit den anderen Formen festgestellt."

The armatures of the chelipeds and ambulatory legs are well agreeable with the description of Rathbun (1923). The ambulatory legs are rather broad and stout. Each merus of the first three pairs has a terminal spinule on the upper border and an angulated subterminal tooth. The last merus is entire on the upper border and rather strongly produced near the upper distal end.

*Distribution*: This species is rather commonly found in the shallow waters from the Tokyo Bay to Kyushu. The overseas localities are south-east coasts of Australia, Samoa, Timor and Philippines.

*Pilumnus guinotae* sp. nov.

(Fig. 11, 12 d-f, Pl. 3, D)

*Diagnosis*: Carapace convex, ill-defined and sparsely covered with short and long hairs around minute granules. Each frontal lobe obliquely truncated and more produced laterally. Anterolateral border with three spine-tipped teeth excluding granule-tipped external orbital angle. Each spine curved forward and subequal or third tooth only slightly smaller. Subhepatic region granulated, one of them being good size and visible from above. Each merus of first three pairs of ambulatory legs with a very small terminal spinule. First male pleopod with two or three stout setae on its subterminal portion.

*Description of holotype*: The carapace is rather strongly convex fore and aft, only slightly so transversely, and sparsely covered with short and longish hairs around the granules or pits; the regions are ill-defined. The front is produced, declivous and cut into two lobes by a deep V-shaped median sinus, each lobe truncated obliquely and more produced laterally; each small but distinct lateral lobule is separated

from the frontal lobe by a deep bight, and from the supraorbital border by a rather shallow incision. The supraorbital border is minutely granulated and fringed with setae, bearing two shallow notches. The infraorbital border is setose and bears a notch near the external orbital angle and several distinct granules; the inner infraorbital angle is slightly produced, its inner side being cut obliquely and touched with the middle portion of the basal antennal segment. The inner angle of the basal antennal segment is just touched with the ventral prolongation of the front; the second segment is as long and stout as the third; the antennal flagellum bears no secondary hairs, and once and a half as long as the major diameter of the orbit.

The anterolateral border is provided with three spine-tipped teeth excluding the external orbital angle which is tipped with a small granule and with two accessory granules behind it; those spines at the tips are curved forward and subequal or the hindermost is only slightly smaller than the precedings. The subhepatic region is granulated, one or two of which are good size and visible from above.

The chelipeds are distinctly unequal, the left one being larger; the carpus is studded with granules of good size fringed and interspaced with short setae mixed with scant long hairs; besides the segment is armed with a stout spine at its inner angle and with some supplementary granules below the main spine; the palm of the larger chela is heavy and thickly covered with granules of good size on the upper and outer surfaces, each granule being rather sparsely fringed with short and long hairs; the palm of the smaller chela is more densely covered with hairs and sharper granules on the entire outer surface; the cutting edges of the larger fingers bear molar-like teeth, while those of the smaller fingers are much sharper; the pigments of the fingers are extended back nearly to the proximal portion.

The ambulatory legs are comparatively stout and rather sparsely bordered with short and long hairs; each merus of the first three pairs is armed with a very small terminal spine; the other segments are

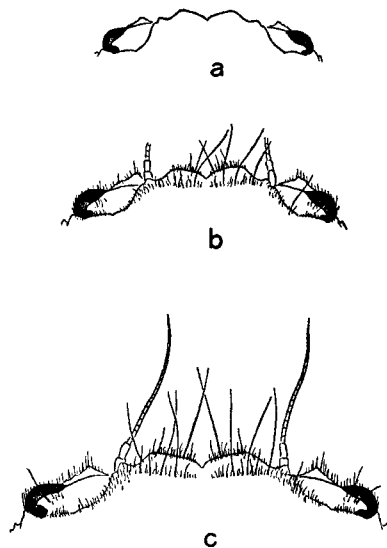


Fig. 11. *Pilumnus guinotae* sp. nov.  
Frontal portion, showing peculiar shape of the front. a, b, paratypes,  $\times 5$ ; c, holotype,  $\times 5$ .

unarmed. The first pleopod bears two or three very stout setae on its subterminal portion.

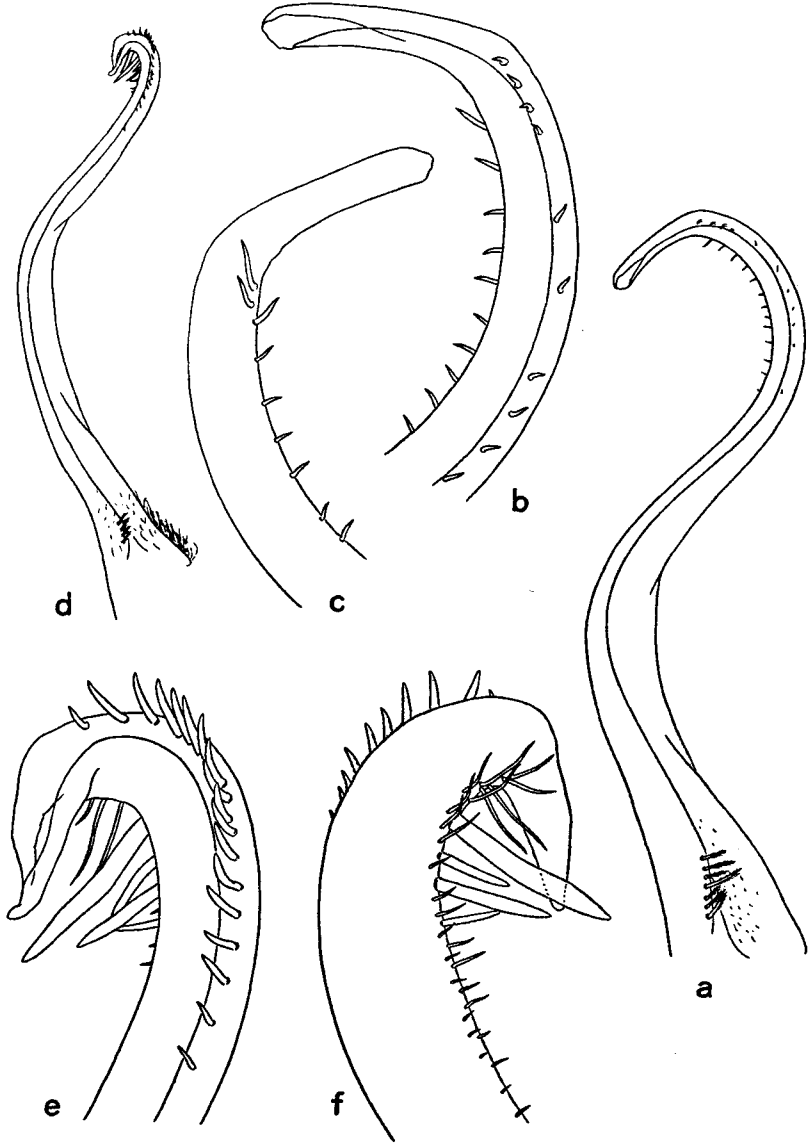


Fig. 12. *Pilumnus ransoni* Forest et Guinot. a, Right first pleopod of male, abdominal view,  $\times 36$ ; b, distal portion of the same,  $\times 88$ ; c, the same, sternal view,  $\times 88$ .

*Pilumnus guinotae* sp. nov., holotype. d, Right first pleopod, abdominal view,  $\times 18$ ; e, distal portion of the same,  $\times 88$ ; f, the same, sternal view,  $\times 88$ .

*Description of paratypes:* In the ovigerous female and rather small male the ornamentation and armatures of the carapace, chelipeds and ambulatory legs, especially the characteristic shape of the front and armature of each merus of the ambulatory legs, are quite like those of the holotype. The first male pleopod bears also two stout setae on its subterminal portion.

*Holotype:* ♂, ZLKU No. 1793, Ngarmid Passage, Goréor I., Palau Is. (134° 30' E, 7° 22' N), Jun. 29, 1939, S. Miyake leg.

*Paratypes:* 1 ♂, 1 ovig. ♀, ZLKU No. 1658, Ngadarák Reef, Palau Is. (134° 28' 30" E, 7° 17' 30" N), Apr. 21, 1939, S. Miyake leg.

*Measurements* (in mm):

	Holotype		Paratypes
	♂	♂	ovig. ♀
Length of carapace .....	8.0	4.9	6.1
Breadth of carapace .....	10.7	6.6	8.2
Fronto-orbital breadth .....	8.2	5.0	6.2

*Remarks:* The present species seems to be related to *P. maccullochi* Montgomery from Broome, Western Australia, in the general aspect of the carapace which is covered with scant hairs, and in the armatures of the anterolateral borders of the carapace. In *P. maccullochi*, however, the ambulatory legs are unarmed, and the greater part of the larger palm is smooth and naked. In this species the shape of the front is characteristic, and may be the same type as that of *P. parvulus* Nobili which is very different from the present species in having a slender subhepatic spine.

### *Pilumnus cursor* A. Milne Edwards, 1873

(Fig. 13 a-c)

*Pilumnus cursor* A. Milne Edwards, 1873a, p. 244, pl. 9, fig. 4: New Caledonia: Upolu, Samoa Is.—: Miers, 1884, p. 223: Port Denison, Queensland, Australia.—: Calman, 1900, p. 15 (part, *fide* Grant and McCulloch, 1906): Murray I., Torres Strait.—: Rathbun, 1907, p. 55: Funafuti, Ellice Is.—: Bouvier, 1915, p. 258: Grand Port, Mauritius I.—: Edmondson, 1925, p. 42: Wake I.—: Balss, 1938a, p. 68: Tamana and Aranuka, Gilbert Is.—: Miyake, 1939, p. 218: No new locality.—: Sakai, 1939, p. 537, fig. 54: Northern Diato-jima I.—: Holthuis, 1953, p. 25: Saipan, Marianas.

nec *Pilumnus cursor*: Haswell, 1882b, p. 67; Alcock, 1898, p. 195; Calman, 1900, p. 15 (part). (= *P. spinicarpus* Grant et McCulloch, *fide* Grant and McCulloch, 1906, and Montgomery, 1931)

nec *Pilumnus cursor*: de Man, 1888, p. 299; 1902, p. 630. (= *P. neglectus* Balss, *fide* Balss, 1933)

*Description:* The carapace is only slightly convex anteriorly and covered with rather dense short pubescence of blush-like hairs and scattered long ones, some of the long hairs being disposed in rows and tufts; beneath the pubescence the surface is only slightly divided into regions and provided with minute granules near the anterolateral borders. The front is somewhat produced, slightly rounded and bears a rather wide, deep median sinus; the triangular lateral lobule is distinctly separated from the frontal lobe and the supraorbital angle. The supraorbital border is minutely granulated and bears two shallow but distinct notches, while the infraorbital border bears a deep notch laterally and armed with several sharp granules, its inner angle being moderately prominent. The inner angle of the basal antennal segment is barely reached the ventral prolongation of the front; the antennal flagellum is about twice as long as the major diameter of the orbit and provided with scant longish hairs.

The anterolateral border is armed with three spine-tipped teeth; the external orbital angle is not spine-tipped, but acute; those three teeth are nearly equal size, or the middle one is slightly prominent than the others. The subhepatic region is granulated. The posterolateral border is nearly straight, much longer than the anterolateral and only slightly convergent. The posterior border is slightly concave in the middle.

The chelipeds are unequal in both sexes; the entire outer surfaces of the carpus and smaller palm are covered with close-set pubescence mixed with longish ones; the outer obliquely-upper surface of the larger palm is also covered with pubescence, the remainder of the surface being quite smooth and glossy; beneath the pubescence those surfaces are provided with small conical granules and spiniform ones; those granules on the palm are beaded to some longitudinal series; the inner angle of the carpus is armed with a rather prominent spine-tipped tooth.

The ambulatory legs are very long and densely covered with blush-like hairs of various length; each merus of the first three pairs is armed usually with one to three spines on the upper border and with a very small terminal spine; the other segments are unarmed.

*Colour in life:* Those pubescences and longish blush-like hairs are greyish or greyish brown. The proper surfaces of the carapace, chelipeds and ambulatory legs are brownish. The distal portion of the larger palm is white and the fingers are black. A patch including a middle part of the infraorbital border near the subhepatic and pterygostomial regions is reddish pink, the colour being faded soon after it is preserved in formalin or spirit.

*Material examined:*

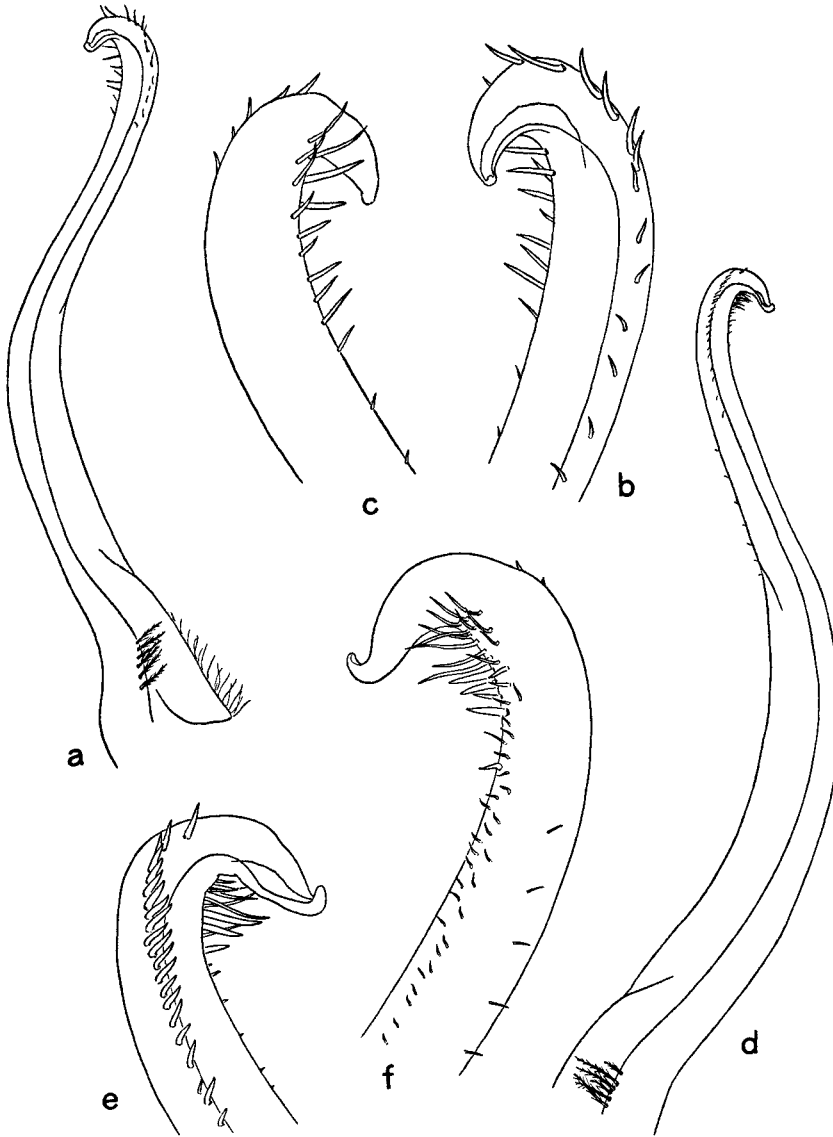


Fig. 13. *Pilumnus cursor* A. Milne Edwards. a, Right first pleopod of male, abdominal view,  $\times 36$ ; b, distal portion of the same,  $\times 88$ ; c, the same, sternal view,  $\times 88$ .

*Pilumnus longicornis* Hilgendorf. d, Left first pleopod of male, abdominal view,  $\times 18$ ; e, distal portion of the same,  $\times 44$ ; f, the same, sternal view,  $\times 44$ .



Ngarmid Passage, Goréor I., Palau Is., (134° 30' E, 7° 22' N), 10 ♂♂, 12 ovig. ♀♀, ZLKU No. 1396, Apr. 29, 1939, S. Miyake leg.

Suwo, Formosa, 1 ♂, 1 ovig. ♀, ZLKU No. 1776, Nov. 4, 1932, H. Ohshima leg.

Shika, Ishigaki-jima I., Ryukyu Is., 1 ♂, 1 ovig. ♀, ZLKU No. 1676, May 1937, C. Senaha leg.; Maézato, Ishigaki-jima I., 1 ♀, ZLKU No. 1629 May 5, 1938, M. Masaki leg.; Same locality, 1 ♂, 1 ♀, ZLKU No. 1744, May 21, 1940, S. Miyake and K. Kawahara leg.; Same locality, 1 ♂, 1 ovig. ♀, ZLKU No. 1790, May 23, 1940, S. Miyake and K. Kawahara leg.; Miyara-wan, Ishigaki-jima I., 1 ♀, ZLKU No. 12454, Mar. 1959, H. Minei leg.

Kamiyama-jima Islet, Okinawa-jima I., Ryukyu Is., 1 ♂, 1 ovig. ♀, ZLKU No. 12455, Jul. 1, 1962, S. Miyake, T. A. Uchida and H. Minei leg.

Man-ya, Amami-Oshima I., Ryukyu Is., 1 ♂, 2 ♀♀, ZLKU No. 12457, Jul. 21, 1966, K. Honda and M. Takeda leg.; Sani, Amami-Oshima I., 3 ♂♂, 2 ovig. ♀♀, 3 ♀♀, ZLKU No. 12460, Aug. 15-18, 1966, K. Honda and M. Takeda leg.; Kyonoura, Amami-Oshima I., 1 ♂, ZLKU No. 12468, Aug. 3, 1967, S. Aoki and M. Takeda leg.; Yo, Kasari, Amami-Oshima I., 2 ♂♂, 2 ovig. ♀♀, 3 ♀♀, ZLKU No. 12469, Aug. 5-6, S. Aoki and M. Takeda leg.

*Measurements* (in mm):

	♂ (No. 1676-1)	Ovig ♀ (No. 12455-2)
Length of carapace.....	7.0	6.5
Breadth of carapace including lateral spines	9.3	8.7

*Remarks:* The present material from the Palau and Ryukyu Islands are referred to this species for having the less convex subquadrate carapace, the pubescences on the carapace, chelipeds and ambulatory legs, the small spine-tipped anterolateral teeth and the long ambulatory legs. As many previous authors had been pointed, the original description is too short to reidentify the present species and the figure represented is diagrammatic. The original author described as, "La carapace est subquadrilatée, peu bombée, légèrement granuleuse et revêtue d'une courte pubescence." Those pubescences or the soft, short blush-like hairs seem to be the most remarkable feature for this species. The armatures of the anterolateral borders of the carapace seem to be rather constant, being armed with three procurved spine-tipped teeth. In almost all the specimens the larger palm is provided with hairs and granules on the obliquely-upper surface, the remainder of the surface being devoid of them and grossy. In some male specimens, however, only the upper and outer proximal parts of the larger palm are provided

with them. The spininess of each merus of the ambulatory legs is somewhat variable. The upper border is usually armed with one to three spines and with a small terminal one, but occasionally entire and bears no terminal spine. Those armatures of the ambulatory legs are agreeable with the description given by Balss (1938a). Otherwise the records of occurrences cited above are somewhat questionable. Haswell (1882) recorded this species from Port Mill, Australia, but his species was turned to *P. spinicarpus* Grant et McCulloch which is said to be most closely allied to this species. According to Montgomery (1931) Alcock's *P. cursor* is not the present but that species. De Man's materials are also turned to *P. neglectus* Balss.

*Distribution:* This species was originally recorded from Upolu and New Caledonia, and may be rather widely distributed both in the Indian and Pacific Oceans, westward to Mauritius, southward to Queensland, Australia and northward to Wake I. and Ryukyu Is.

### *Pilumnus longicornis* Hilgendorf, 1878

(Fig. 13 d-f)

*Pilumnus longicornis* Hilgendorf, 1878, p. 794, pl. 1, figs. 8, 9: Inhambane, Mozambique.—: Alcock, 1898, p. 193: Makran and Karachi, Pakistan; Bombay, India; Nicobar Is; Malacca Strait.—: Calman, 1900, p. 16: Murray I., Torres Strait.—: de Man, 1902, p. 635: Ternate I., Indonesia.—: Nobili, 1906c, p. 135: N. E. of Arzana I., Persian Gulf.—: Rathbun, 1910, p. 355: Gulf of Siam, 9-55 m deep.—: Rathbun, 1911, p. 228: Diego Garcia I., Chagos Archipelago, 25 m deep; Cargados Carajos I. near Mauritius I., 50-55 m deep; Saya de Malha Bank, 55-100 m deep; Amirante Is., 35-45 m deep; Seychelles, 60 m deep.—: de Man, 1914, p. 336: Madagascar.—: Balss, 1933, p. 15: Dar es Salaam, Tanganyika; Nossy Faly and Ankufy, Madagascar; Makasar, Celebes; Java Sea; Singapore; Cape York, Queensland, and Onslow and Shark Bay, Western Australia; Hauraki Gulf, New Zealand.—: Chopra and Das, 1937, p. 406, pl. 6, fig. 3: Mergui Archipelago.—: Sakai, 1939, p. 533, pl. 100, fig. 3: Shimoda, coast of Wakayama Pref. and Tosa Bay, Japan; Okinawa-jima I., Ryukyu Is.—: Stephensen, 1945, p. 144, fig. 36A: Persian Gulf, 5-50 m deep.—: Barnard, 1947, p. 365; No definite locality.—: Barnard, 1950, p. 265, fig. 49c: Durban, South Africa; Delagoa Bay, Mozambique; Mauritius I.—: Edmondson, 1962, p. 294, fig. 29a: Pearl Harbour, Oahu I., Hawaiian Is.—: Guinot, 1964, p. 94: Persian Gulf.—: Sakai, 1965, pp. 158, 68, pl. 78, fig. 4: Off Kameki Reef, 50 m deep, and south-west of Jogashima, 85 m deep, Sagami Bay.

*Pilumnus andersoni* de Man, 1887, p. 59, pl. 3, figs. 5, 6: Elphinstone I. and King I., Mergui Archipelago.—: de Man, 1895, p. 552: Atjeh, Indonesia.—: Alcock, 1898, p. 194: Mergui Archipelago; Ceylon; Karachi; Gaspar Strait, Indonesia.—: Rathbun, 1906, p. 863: Laysan I., Hawaiian Is.—: Rathbun, 1907, p. 55: Funafuti, Ellice Is.; Ponape, Caroline Is.—: Rathbun, 1910, p. 355: Gulf of Siam, 20-55 m deep.—: Rathbun, 1911, p. 228: Carajos I., 55 m deep; Seychelles, 60 m deep; Saya de Malha Bank, 85-100 m deep; Amirante Is., 45-60 m

deep.—: Miyake, 1939, p. 218: No new locality.  
*Pilumnus tantulus* Rathbun, 1923, p. 116, pl. 25: Platypus Bay, 10-15 m deep and off Pine Peak, 45 m deep, Queensland, Australia.

*Material examined:*

Off Sone, Munakata-Oshima Islet, Fukuoka Pref., 1 ovig. ♀, ZLKU No. 9231, Jul. 27, 1959, Y. Motomatsu leg.

Mitohama, near Misaki, Sagami Bay, 1 ♂, by gill net for spiny-lobster fishing, ZLKU No. 12066, Aug. 1964, M. Takeda leg.

*Measurements* (in mm):

	♂	Ovig. ♀
Length of carapace .....	20.8	14.3
Breadth of carapace including lateral teeth .....	27.5	20.5
Fronto-orbital breadth.....	17.0	13.2

*Remarks:* In the present material the anterolateral border of the carapace is armed with three stout, spine-tipped teeth in addition to the acute external orbital angle. The first is the smallest of the series, and the following two are subequal. Each merus of the ambulatory legs is armed with two or three spines on the upper border and with a small terminal one. The male specimen from the Sagami Bay is equipped with numbers of the acorn barnacles and tube-inhabitant nereids. As many previous authors pointed, the size and the armatures of the anterolateral borders of the carapace and ambulatory legs are very variable. The material from the Sagami Bay reported by Sakai (1965) are said that the anterolateral teeth are distinct spines, of which the third is very small.

*Distribution:* This species is widely distributed from east Africa through the Indian Ocean to Australia, New Zealand, central Pacific and Japan.

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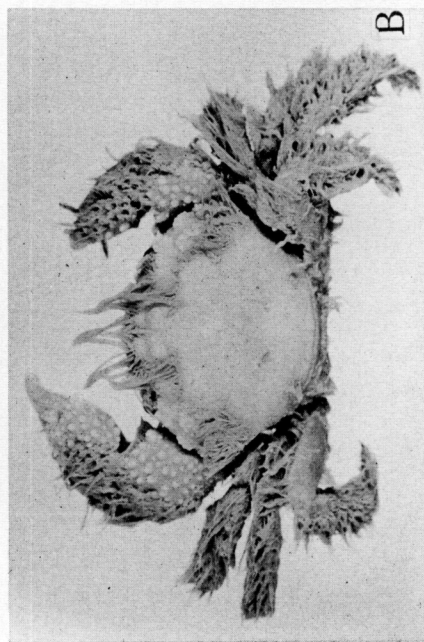
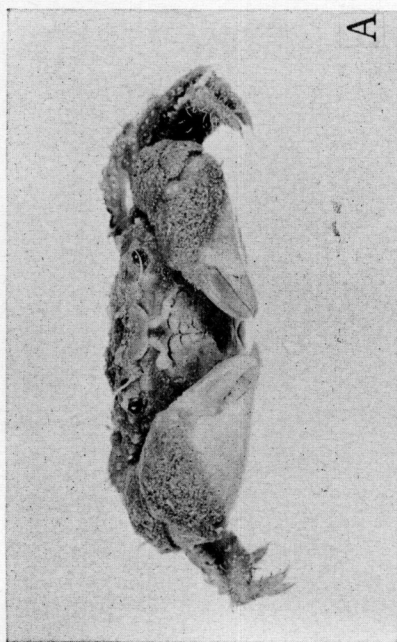
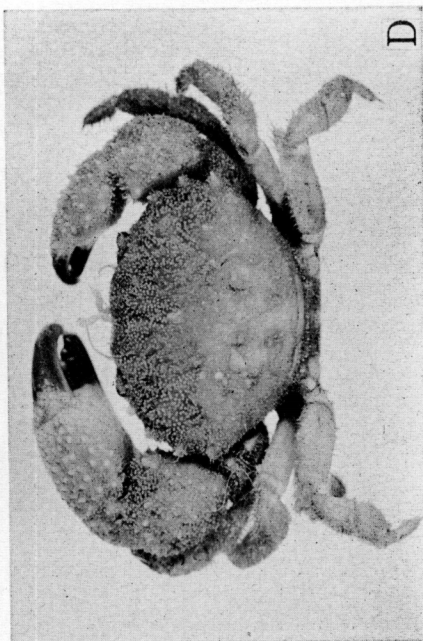
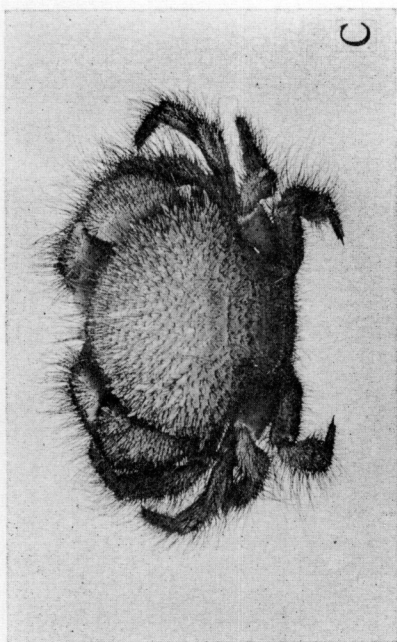
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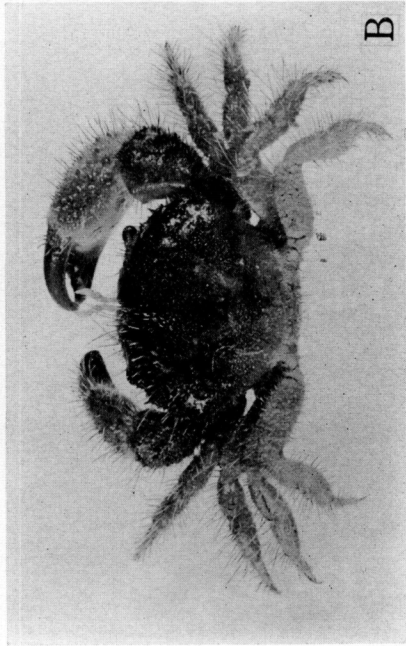
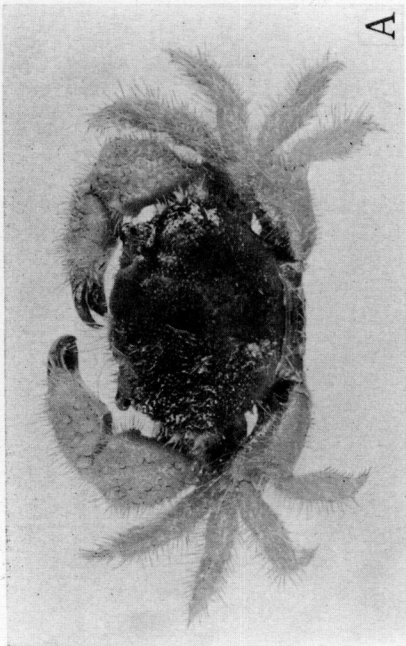
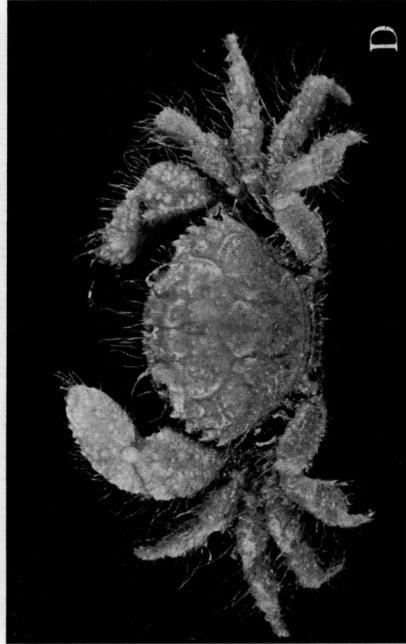
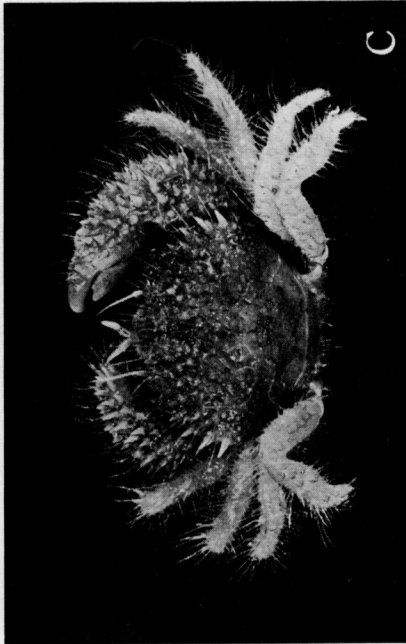
### Explanation of Plate 1.

- Fig. A. *Pilumnus fissifrons* Stimpson; ♂ (8.4×12.2 mm) from Australia.
- Fig. B. *Pilumnus semilanatus* Miers; ♂ (12.9×16.0 mm) from Australia.
- Fig. C. *Pilumnus pulcher* Miers; ♂ (26.0×29.5 mm) from Australia.
- Fig. D. *Pilumnus rufopunctatus* Stimpson; ♂ (11.3×15.9 mm) from Australia.



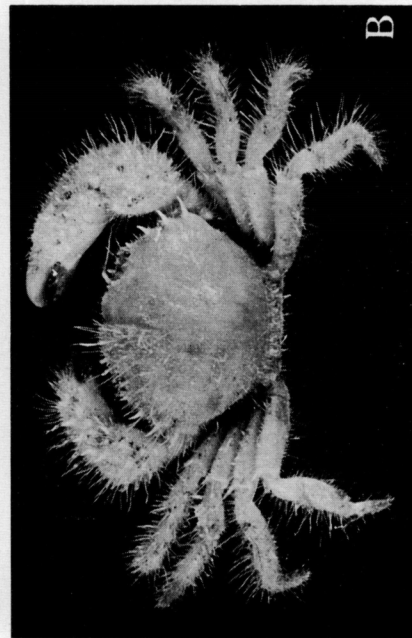
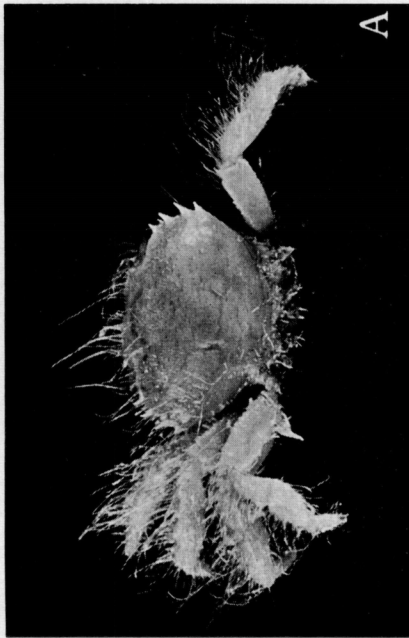
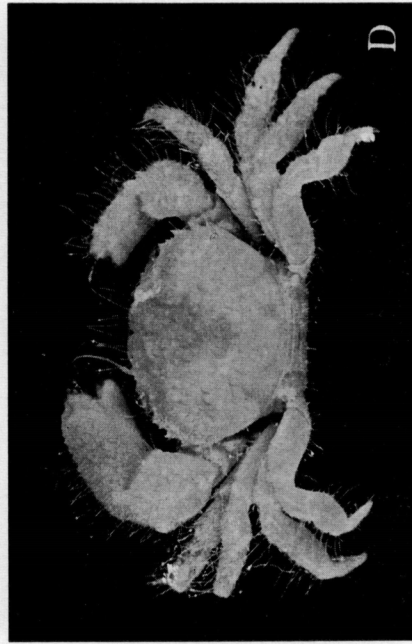
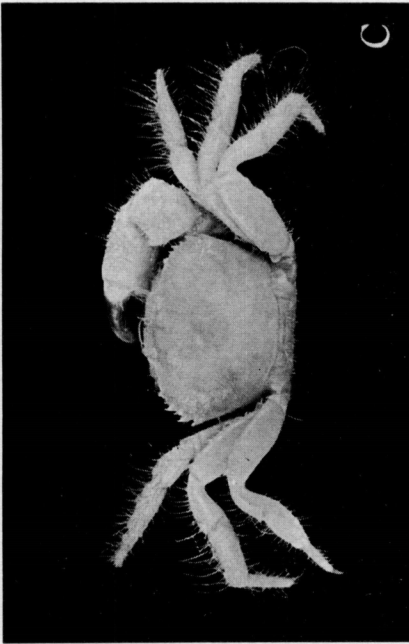
### Explanation of Plate 2.

- Fig. A. *Pilumnus prunosus* Whitelegge; ♂ (8.1×11.0 mm) from Palau Is.  
Fig. B. *Pilumnus purpureus* A. Milne Edwards; ♂ (10.5×13.7 mm) from Ryukyu Is.  
Fig. C. *Pilumnus amamensis* sp. nov.; Holotype, ♂ (6.7×7.7 mm) from Ryukyu Is.  
Fig. D. *Pilumnus caeruleus* A. Milne Edwards; ♂ (8.1×11.3 mm) from Palau Is.



### Explanation of Plate 3.

- Fig. A. *Pilumnus parvulus* Nobili; Ovig. ♀ (5.6×8.1 mm) from Palau Is.  
Fig. B. *Pilumnus orbitospinis* Rathbun; ♂ (14.0×17.9 mm) from Tosa Bay, Japan.  
Fig. C. *Pilumnus ransoni* Forest et Guinot; ♂ (7.0×9.4 mm) from Ryukyu Is.  
Fig. D. *Pilumnus guinotae* sp. nov.; Holotype, ♂ (8.0×10.7 mm) from Palau Is.



## Explanation of Plate 4.

Figs. A, B. *Pilumnus senahai* sp. nov.; Holotype, ♀ (5.5×7.6 mm) from Ryukyu Is.

Figs. C, D. *Pilumnus ikedai* sp. nov.; Holotype, ovig. ♀ (5.9×8.5 mm) from Bonin Is.



