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The Indo-Pacific Pilumnidae V. Three new species of *Pilumnus* Leach, 1815 (Crustacea: Decapoda: Brachyura) from Singapore, Vietnam and Japan

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ABSTRACT: Three new species of closely related pilumnid crabs are described – *Pilumnus murphyi* from Singapore, *Pilumnus serenei* from Vietnam, and *Pilumnus takedai* from Japan. All three belong to the same complex of species as *Pilumnus cursor* A. Milne-Edwards, 1873, but can be separated from each other by small but significant and consistent differences. Diagnoses and descriptions are provided of the new species, and their affinities with related species discussed.

1. INTRODUCTION

Hairy crabs of the '*Pilumnus cursor* A. Milne-Edwards, 1873, complex' are characterised by their carapaces being covered with brush-like hairs, and/or pubescence, presence of strong teeth on the anterolateral margins, long ambulatory legs which have the dorsal margins of the meri of their first three pairs lined with sharp spines, and a very sinuous male first pleopod. On the basis of current literature, the following species can tentatively be referred to this complex:

Pilumnus cursor A. Milne-Edwards, 1873

Pilumnus longicornis Hilgendorf, 1878

Pilumnus andersoni De Man, 1887

Pilumnus spinicarpus Grant & McCulloch, 1906

Pilumnus merodentatus Nobili, 1907

Pilumnus tantulus Rathbun, 1923

Pilumnus neglectus Balss, 1933

Pilumnus balssi Takeda & Miyake, 1972 (= *Pilumnus longicornis spinosus* Balss, 1933)

Pilumnus ransonii Forest & Guinot, 1966.

In his important review of the Indo-Pacific Pilumnidae, Balss (1933) had established a new subspecies, *Pilumnus longicornis spinosus* for numerous specimens from various parts of the Pacific. Filhol (1885), however, had also used that name for *Pilumnus spinosus* from New Zealand, and that name has

precedence over Balss'. Takeda & Miyake (1972) proposed a new name, *P. longicornis balssi* for Balss' subspecies, which is here regarded as a full species.

The systematics of the species in the '*Pilumnus cursor*' complex is very confused, and many of them are very poorly known. Dr Danièle Guinot (Paris Museum) was kind enough to send the author photographs of a dried syntypic female of *P. cursor* contained in the Paris Museum. Comparisons of this specimen with the types of *P. longicornis*, *P. balssi*, *P. tantulus* and *P. neglectus* showed that numerous unidentified specimens, as well as others affiliated with *P. cursor* from Singapore and Vietnam contained in the Zoological Reference Collection (former Raffles Museum collection) of the Department of Zoology, National University of Singapore are actually representatives of two undescribed species belonging to the *P. cursor* complex. These studies also showed that Japanese specimens identified as *P. cursor* by Sakai (1939, 1976) and Takeda & Miyake (1968) should be referred to a new species instead.

In this paper, diagnoses and descriptions are provided of the three new species, and their relationship with the other members of the *P. cursor* complex briefly discussed. A detailed revision of all the species in this complex is currently under preparation. Specimens are deposited in the Zoological Reference Collection (ZRC), Muséum Nationale d'Histoire Naturelle, Paris, France (MNHN), United States National Museum of Natural History, Smithsonian Institution, Washington D.C. (USNM), Australian Museum, Sydney (AM) and the Zoological Laboratory Museum of the Kyushu University, Ryukyu Islands, Japan (ZLKU). The abbreviations G1 and G2 are used for the male first and second pleopods respectively. Measurements are made of the carapace breadth and length respectively. This is the fifth in a series of papers dealing with the taxonomy of Indo-Pacific pilumnids.

2. SYSTEMATIC ACCOUNT

Pilumnus murphyi sp.nov. (Pl. 1, Fig. 1)

Pilumnus cursor Alcock, 1898: 195; Laurie, 1906: 408; Michel, 1964: 29 (not *Pilumnus cursor* A. Milne-Edwards, 1873: 244, Pl. 9, Fig. 4)

Diagnosis. Carapace with thick short, velvet-like pubescence, anterolateral margin with three sharp teeth. Carpus of cheliped with sharp spine on inner angle. Dorsal margin of first three pairs of ambulatory meri with three or less spines. G1 sinuous, tip bent, subterminal portion with thick and thin hairs.

Material examined

Holotype – male (10.9 by 8.0 mm) (ZRC Nr. 1983.10.4.1), Sentosa Reefs, Singapore, 1°14'34"N, 103°49'42"E, leg. P.K.L. Ng, 25.5.1982.

Paratypes – 1 female (10.0 by 6.8 mm) (ZRC Nr. 1983.10.4.2), Sentosa Reefs,

Singapore, 1°14'34"N, 103°49'42"E, leg. P.K.L. Ng, 17.5.1983 – 1 male (AM P34802), Sentosa Reefs, Singapore, 1°14'34"N, 103°49'42"E, leg P.K.L. Ng, 25.5.1982 – 1 female (ovigerous) (AM P34802), west of Pulau Pawai, Singapore, ca. 1°11'17"N, 103°43'34"E, on coral one to two fathoms deep, leg. D.S. Johnson, 30.12.1951 – 1 female (ZRC Nr. 1969.10.27.1), 1 female (USNM Nr. 213919), Pulau Pawai, Singapore, ca. 1°11'17"N, 103°43'34"E, leg. R. Serène, 7.1964 (det. as *Pilumnus elatus* A. Milne-Edwards, 1872) – 1 male, 1 female (MNHN), Raffles Lighthouse, Singapore, 1°09'47"N, 103°44'36"E, leg. A. Monterio, 7.1937 (det. as *Pilumnus* aff. *elatus*).

Male holotype description. Carapace quadrilateral, uniformly covered with thick; short, velvet-like pubescence, brush-like hairs absent, surfaces smooth when denuded, with only scattered small granules, regions indistinct. Postorbital lobes relatively prominent. Front and supraorbital margins with thin, translucent rim. Front truncate, bilobed with deep median cleft. Lateral lobule well-developed. Supra- and infraorbital margins lined with small granules, former with distinct notch. Anterolateral margin with three sharp, forward pointing teeth. External orbital angle acute, small. Subhepatic region with several small granules. Posterolateral margin smooth. Exposed ventral surfaces covered with short, thick pubescence. Endostomial ridges strong, reaching anteriorly and posteriorly. Sternal surfaces slightly pubescent, smooth.

Chelipeds unequal, right larger. Upper oblique surface of palm and entire surface of the left covered with similar pubescence as carapace. Pubescence not extending beyond base of fingers which are pigmented black. Palm covered with small granules when pubescent regions denuded. Glabrous regions completely smooth. Fingers of right cheliped shorter than palm. Dactylus with one longitudinal groove, cutting edge with five teeth. Pollex with one longitudinal groove, proximal part of cutting edge with three prominent teeth, distal with three low denticles. Fingers of left cheliped nearly as long as palm. Dactylus with two longitudinal ridges, cutting edge with five broad teeth. Pollex with one longitudinal groove, cutting edge with five teeth. Carpus with a sharp shipe on inner dorsal angle, surfaces covered with similar pubescence as on carapace.

Ambulatory legs long, covered with velvet-like pubescence and scattered brush-like hairs. Third leg longest. Last leg without spines or granules. Merus of each of first three pairs with two spines on dorsal margin. Tips of all dactyli sharp, smooth, glabrous, beige-coloured.

Abdomen triangular, 7-segmented, all segments free, articulating. Tip of last segment rounded, slightly longer than penultimate. G1 sinuous, tip distinctly bent downwards, subterminal portion with numerous thick and thin long hairs. G2 short, with terminal flagellum.

Paratypes. One of the paratype females (ZRC Nr. 1983.10.4.2) has only one spine (not two) on the dorsal margin of the merus of the third ambulatory leg but agrees with the holotype male in all other non-sexual characters. In both chelipeds, the carpus has a blunt tooth instead of a sharp spine at its inner dorsal

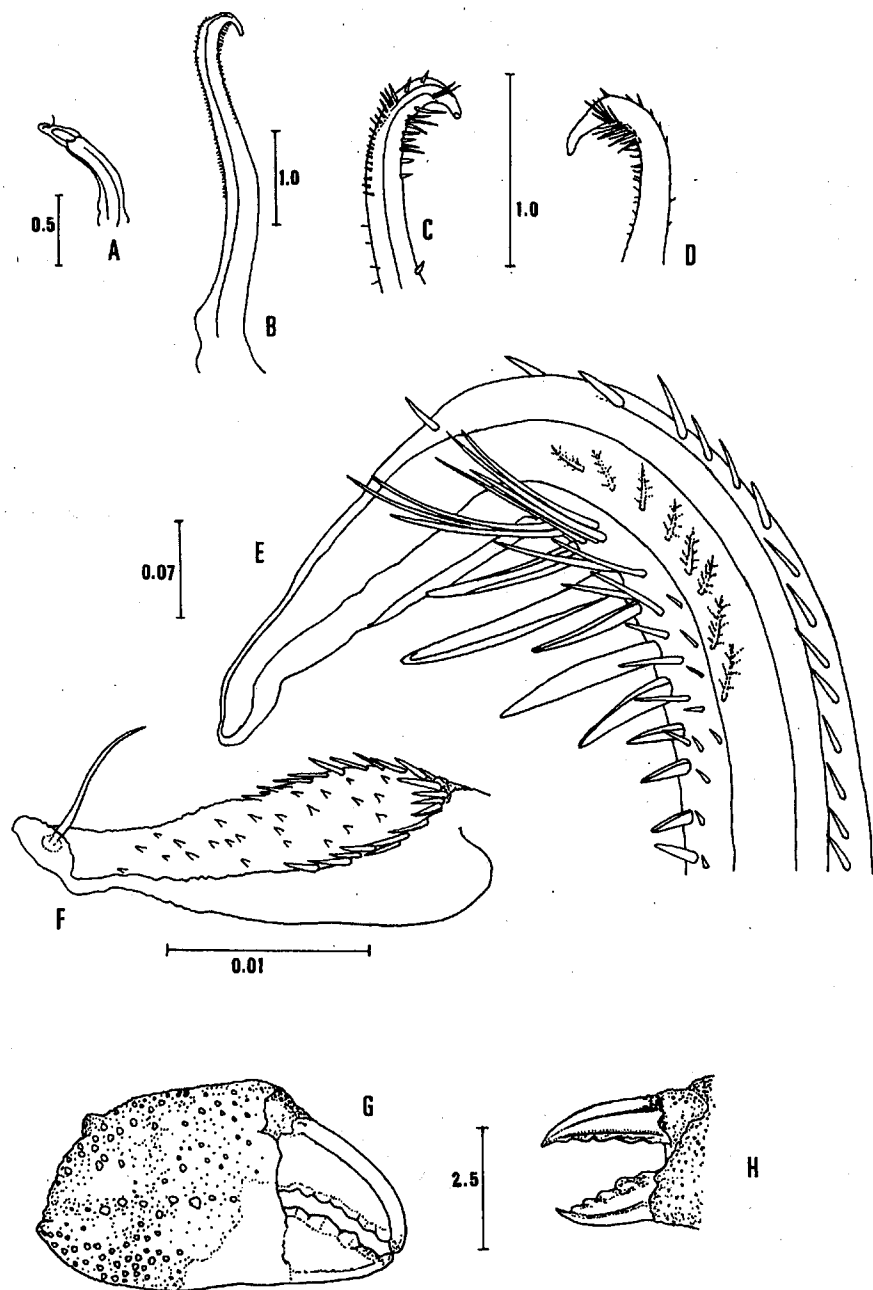


Figure 1. *Pilumnus murphyi* sp. nov. Holotype male, 10.9 by 8.0 mm, ZRC Nr. 1983.10.4.1. A, F, Left G2; B, C, D, E, Left G1; G, Right cheliped; H, Left cheliped (scale in mm).

angle. In some of the paratypes, there are scattered brush-like hairs on the carapace. In the other paratypes, the anterolateral teeth are less well-developed, being lower, more lobe-like and not distinctly forward pointing. In other features, however, especially in the form of the G1 and G2, they agree extremely well with the holotype.

Etymology. *Pilumnus murphyi* is named in honour of Associate Professor Dennis H. Murphy of the Department of Zoology, National University of Singapore, whose guidance and encouragement over the years is deeply appreciated.

Remarks. This species can be differentiated from other species in the *Pilumnus cursor* complex by its possession of a distinct carpal spine in the chelipeds, fewer spines on each merus of the first three pairs of ambulatory legs, scarcity or even complete absence of brush-like hairs on the carapace, and the structure of its G1. *Pilumnus murphyi* is closest to *P. spinicarpus* Grant & McCulloch, 1906, but their hair pattern on their carapaces is very different. The original authors of *P. spinicarpus* described only the frontal regions as having the scattered brush-like hairs whilst the posterior regions are covered with a short, velvet-like pubescence. This has been confirmed through examination of material of *P. spinicarpus* from Australia sent to the author through the kind offices of the Australian Museum. *Pilumnus murphyi*, however, is uniformly covered with a short and dense velvet-like pubescence, with only scattered or no brush-like hairs. Its chelipeds are also covered with a similar kind of pubescence and completely lacks the long brush-like hairs present in the other species. The palm of *P. spinicarpus* is much longer than that of *P. murphyi*, with most of the surface being smooth. The teeth on the cutting edges of the chelipeds are broad and blunt in *P. spinicarpus* (Fig. 4E, F) but less strongly built and more blade-like in *P. murphyi* (Fig. 1G-H). The two fingers of *P. murphyi* each have a longitudinal ridge which is absent in *P. spinicarpus*.

Their G1s are similar in shape but that of *P. spinicarpus* is distinctly stouter, with the tip curving gently downwards and the subterminal portion having only thin hairs (Fig. 4A, B, D). The G1 of *P. murphyi*, on the other hand, is more slender, with the tip distinctly bent downwards and the subterminal portion having both thick and thin hairs (Fig. 1B-E).

Grant & McCulloch (1906), in describing *P. spinicarpus*, distinguished it from *P. cursor* by the presence of sharp meral spines on the legs and carpal spine on the chelipeds of *P. spinicarpus*. Both these characters are also present in *P. murphyi* but they appear to be rather variable. The carpal spine of a paratype specimen of *P. murphyi* (ZRC Nr. 1983.10.4.2) is reduced to a blunt tooth and the meral spines also vary between one and two. Takeda & Miyake (1968) noted that for their '*P. cursor*' (here referred to *P. takedai* sp.nov.), the meral spines vary between one and three and may even occasionally be absent. The terminal spine may also be absent in some specimens. The density of the brush-like hairs also varies slightly; the holotype male of *P. murphyi* has none on the carapace

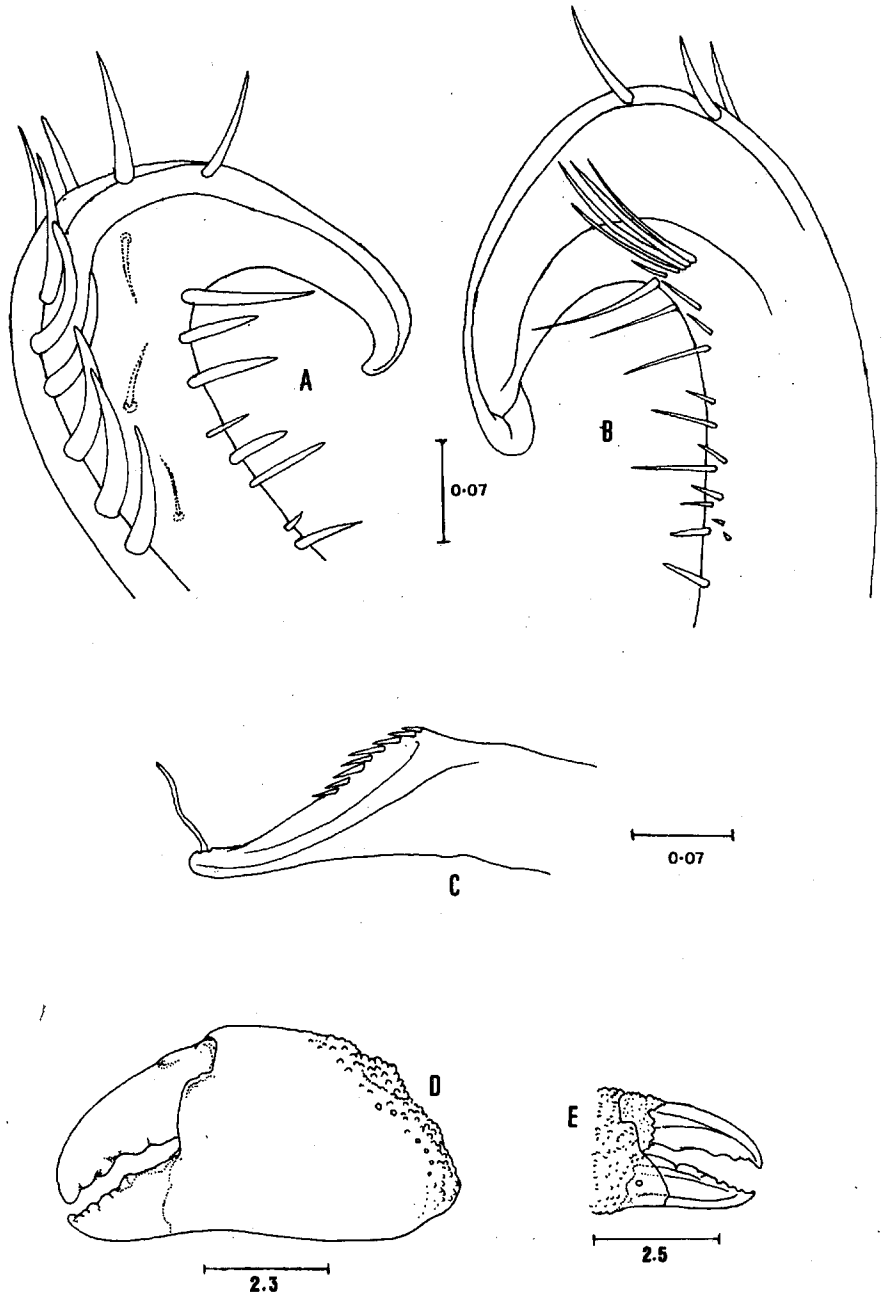


Figure 2. *Pilumnus serenei* sp. nov. Holotype male, 8.4 by 8.6 mm, ZRC Nr. 1983.11.8.1. A, B, Left G1; C, Left G2; D, Left cheliped, E, Right cheliped (scale in mm).

but they are present in scattered tufts on some of the paratypes.

The G1 of *P. takedai* (fide Takeda & Miyake 1968) (Fig. 3A-C) is significantly different from that of *P. murphyi*, with its tip more sharply tapered, strongly curving downwards and without any long subterminal hairs. The outer surfaces of the palms of the larger cheliped in *P. cursor* (fide A. Milne-Edwards, 1873) and *P. takedai* (Fig. 3D, E) are covered with numerous conical or spiniferous granules whilst in *P. murphyi*, smaller, lower and more rounded granules are present instead. The cutting teeth on the pollex in *P. murphyi* also appears to be more blade-like.

Pilumnus murphyi may also be confused with *P. neglectus*, but the chelipeds of *P. neglectus* are unusual in being distinctly bent in the proximal part of the pollex and strengthened by a thick ventral ridge, with the basal parts wrinkled (Balss 1933). These structures are absent in *P. murphyi*. The differences between *P. murphyi* and *P. serenei* sp.nov. will be discussed later under the latter species.

Specimens identified as '*P. cursor*' by Alcock (1898), Laurie (1906) and Michel (1964) are at present tentatively referred to *P. murphyi* pending their examination. The descriptions provided by these authors of their specimens, however, indicate that they are more likely to be conspecific with *P. murphyi* than with *P. cursor* as here defined.

Pilumnus murphyi is founded in coral reefs, usually in or under coralline rocks in the intertidal region and adjacent shallow waters. It appears to prefer only slightly disturbed coralline areas with relatively sandy substrates, and has yet to be found in silty areas. It is brown on all its dorsal aspects when alive.

Pilumnus serenei sp.nov. (Pl. 2, Fig. 2)

Diagnosis. Carapace covered with thick, short, velvet-like pubescence especially on posterior regions, with frontal regions having numerous long, brush-like hairs. Anterolateral margin with three sharp, forward pointing teeth. Carpus of chelipeds with strong spine on inner dorsal angle. Dorsal margins of meri of first three pairs of ambulatory legs with one spine. G1 sinuous, tip bent downwards, subterminal portion with numerous thin hairs.

Material examined

Holotype – male (8.4 by 7.6 mm) (ZRC Nr. 1983.11.8.1), Nhathrang Bay, Vietnam, leg. R. Serène, 13.8.1964.

Paratypes – 1 female (ovigerous) (7.5 by 5.6 mm) (ZRC Nr. 1983.11.8.2), same data as holotype – 1 male, 1 female (ovigerous) (AM P34803), 1 male, 1 female (ovigerous) (MNHN), 1 male, 1 female (ovigerous) (USNM Nr. 213920), 4 male, 4 female (2 ovigerous) (ZRC Nr. 1983.11.8.3-8), same data as holotype.

Male holotype description. Carapace quadrilateral, covered with short, thick, velvet-like pubescence which is denser on posterior regions. Long brush-like hairs scattered all over carapace, being more numerous on frontal regions.

Regions indistinct, front and supraorbital margins with translucent rim. Front truncate with distinct median cleft, lateral lobule distinct. Anterolateral margin with three sharp, forward pointing teeth, the last being smallest. External orbital angle extended to short spine. Subhepatic region covered with very small granules. Endostomial ridges distinct, anterior and posterior portions well-developed. Sternal surfaces smooth, covered with short pubescence.

Chelipeds unequal, left larger. Upper one-third of outer surface of palm of left cheliped covered with very short dense pubescence, the lower two-thirds being glabrous. Outer surface of right cheliped uniformly covered with pubescence. Short stiff hairs interspersed among the short pubescence in both chelipeds. Pubescence not extending beyond base of fingers, which are pigmented black. Pubescent parts of cheliped covered with small, low granules, those on the right cheliped being larger. Fingers of left cheliped shorter than palm, without longitudinal grooves or ridges, cutting edge of dactylus with four broad, blunt teeth, pollex with six, the proximal being largest. Fingers of right cheliped nearly as long as palm, dactylus with one longitudinal ridge, cutting edge with two distal denticles and two broad, blunt proximal teeth, pollex with two broad, blunt proximal teeth and three distal denticles. Carpus with distinct, sharp spine on inner dorsal angle.

Ambulatory legs long, covered with stiff, brush-like hairs. Third leg longest. Merus of first three pairs with one median spine on dorsal margin, merus of last leg smooth, without spines or granules. Tips of dactylus of all legs beige-coloured, sharply tapered, smooth, glabrous.

Abdomen 7-segmented, all segments free, articulating. Tip of last segment rounded, slightly longer than penultimate. G1 sinous, tip distinctly bent downwards, subterminal portion with numerous long, thin hairs. G2 short, with terminal flagellum.

Paratypes. The other paratypes agree with the holotype in almost all significant non-sexual aspects.

Etymology. The present species is named in honour of the late Dr Raoul Serène, whose decades of work in this area have greatly contributed to our knowledge of the Indo-West Pacific Brachyura.

Remarks. *Pilumnus serenei* sp.nov. can be separated from the other members of the *Pilumnus cursor* complex in having more brush-like hairs on the carapace and legs, with those on the carapace concentrated more on the frontal regions, the short pubescence being denser on the posterior regions; its smaller size, being only two-thirds the size of *P. murphyi* sp.nov. and *P. spinicarpus*; having each of the meri of the first three pairs of ambulatory legs with only one median spine on the dorsal margin; and the tip of its G1 being more strongly bent downwards and hook-like.

The hair pattern on the carapace and legs of *P. serenei* is similar to that described for *P. takedai* sp.nov. (identified as *P. cursor*) by Takeda & Miyake (1968), but the chelipeds and G1s of the two species are distinctly different. The

outer surface of the palm in *P. takedai* is covered with conical granules whereas in *P. serenei*, it is mostly smooth. The G1 tip in *P. serenei* is also more distinctly bent inwards and the subterminal regions are lined with numerous stiff, thin hairs (Fig. 2A, B). The G1 tip in *P. takedai* is only very gently bent, and lacks the stiff subterminal hairs (Fig. 3). The arrangement of the brush-like hairs and pubescence on the carapace of *P. serenei* is similar to that of *P. spinicarpus*, but in *P. serenei*, the brush-like hairs are more abundant. Their G1s are also different, with that of *P. spinicarpus* much stouter and the G1 tip less distinctly bent (Fig. 4A, B, D). These differences cannot be attributed to age of size since the specimens of *P. spinicarpus* examined and the types of *P. takedai* are all larger than known specimens of *P. serenei*, despite the fact that the G1s of *P. serenei* are the most strongly hooked.

Pilumnus serenei also bears a resemblance to *P. murphyi* but the two species can easily be separated by the hair pattern and composition on the carapace. In *P. murphyi*, the carapace is covered uniformly with a dense, short, velvet-like pubescence with the brush-like hairs either absent or scarce. The larger cheliped of *P. serenei* is also relatively smoother and more glabrous than that of *P. murphyi*, with the teeth and denticles on the cutting edges of the fingers blunt and not blade-like as in *P. murphyi*. Also, unlike *P. serenei*, *P. murphyi* has a longitudinal ridge on each of its fingers, while the fingers of *P. serenei* are smoother.

Nothing is known about the ecology of this species, although it is probably a coral reef pilumnid like *P. spinicarpus* and *P. murphyi*.

Pilumnus takedai sp.nov. (Fig. 3)

Pilumnus cursor Sakai, 1939: 537, Fig. 54; 1976: 488, Text-fig. 261b; Takeda & Miyake, 1968: 49, Fig. 13a-c

(not *Pilumnus cursor* A. Milne-Edwards, 1873: 244, Pl. 9, Fig. 4)

Diagnosis. Carapace covered with thick, short pubescence, frontal regions with numerous brush-like hairs. Frontal margin convex, anterolateral margin with three sharp, spine-tipped teeth. Surfaces of upper oblique half of palm of larger cheliped covered with rows of conical granules. Tip of G1 strongly hooked.

Material examined

Holotype – male (9.3 by 7.0 mm) (ZLKU Nr. 1676-1), Shika, Ishigaki-Jima island, Ryukyu Islands, Japan, leg. C. Senaha, 5.1937.

Paratype – 1 female (9.0 by 6.1 mm) (ZLKU Nr. 1676-2), same data as holotype.

Etymology. The author takes great pleasure in naming this new species after Dr Masatsune Takeda of the Tokyo National Museum.

Remarks. Specimens referred to *P. cursor* by Sakai (1939, 1976) and Takeda & Miyake (1968) almost certainly do not belong to that species. Examination of

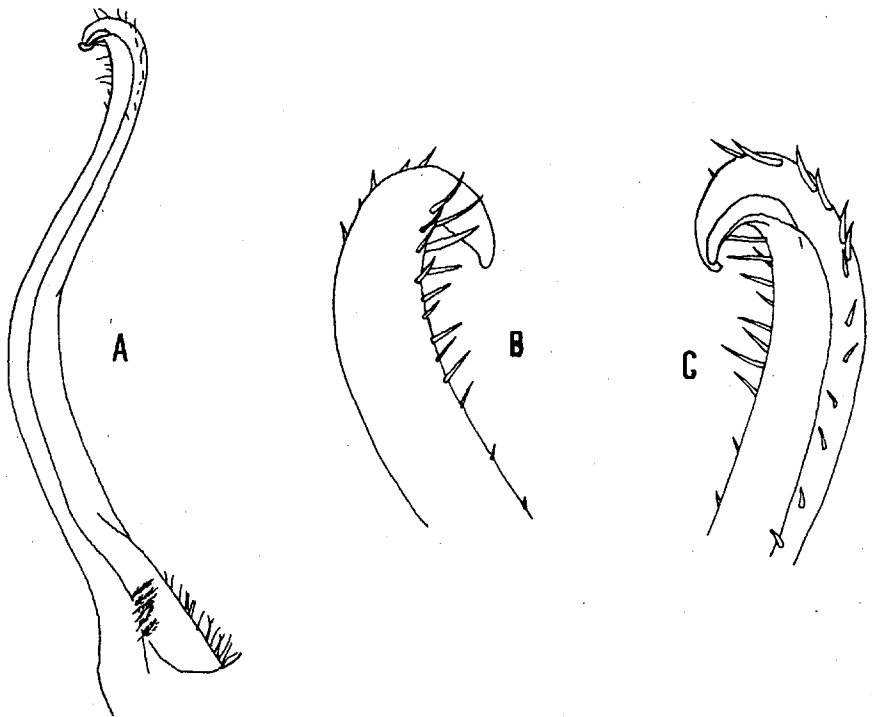


Figure 3. *Pilumnus takedai* sp.nov. A-C, Left G1 (after Takeda & Miyake 1968).

a pair of Takeda & Miyake's specimens show that they differ from *P. cursor* as here defined in having the anterolateral margins cut into spine tipped teeth (not strong spines), the carapace smooth except near the anterolateral margins (not uniformly granular), the frontal margins convex (not truncate) and the lower oblique half of the palm of the larger cheliped smooth (not covered with conical granules). The species has already been well-described by Takeda & Miyake (1968) and there is no further need to do so again here.

Pilumnus takedai also resembles *P. murphyi* sp.nov. and *P. serenei* sp.nov., but may be separated by its more strongly granular palm, hair pattern and structure of its G1.

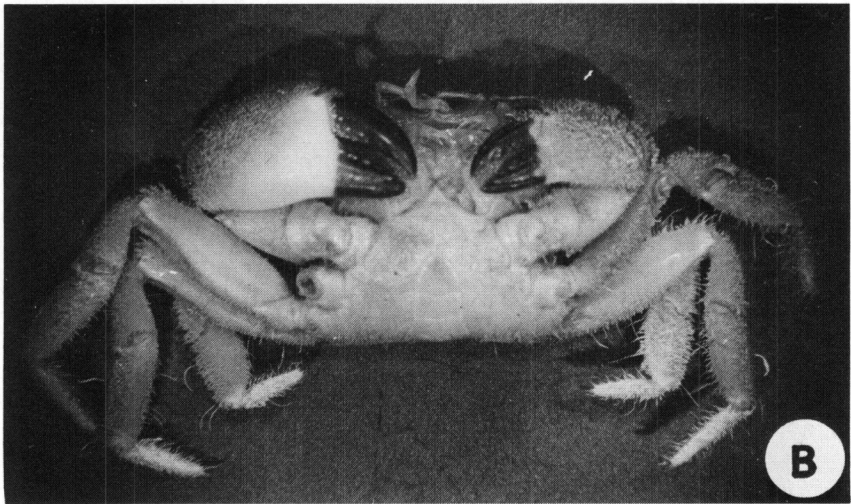
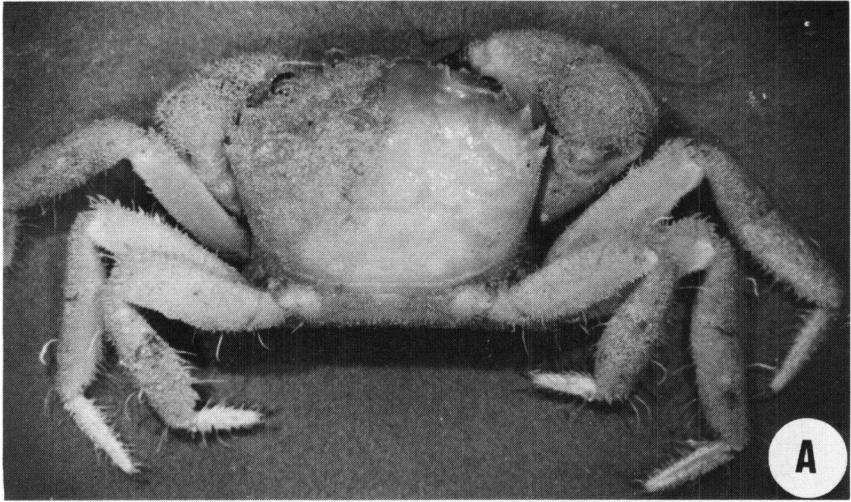


Plate 1. *Pilumnus murphyi* sp.nov. Holotype male, 10.9 by 8.0 mm, ZRC Nr. 1983.10.4.1 (right half of carapace denuded).

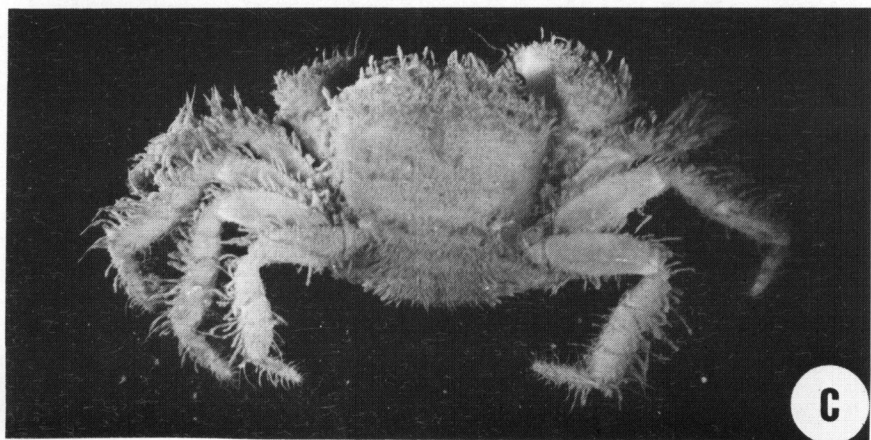
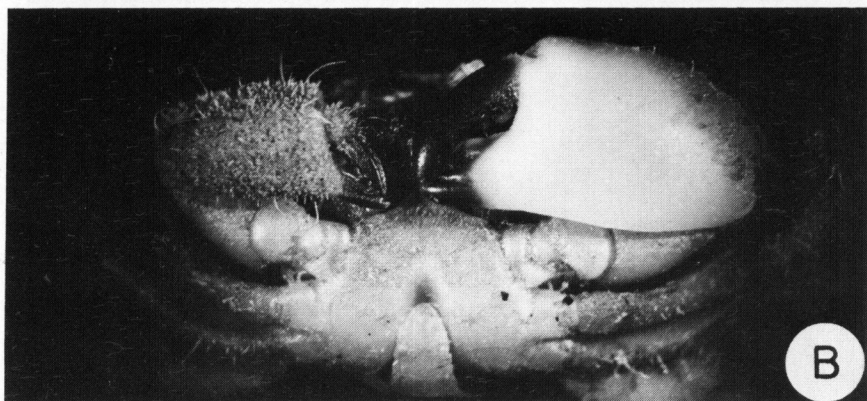
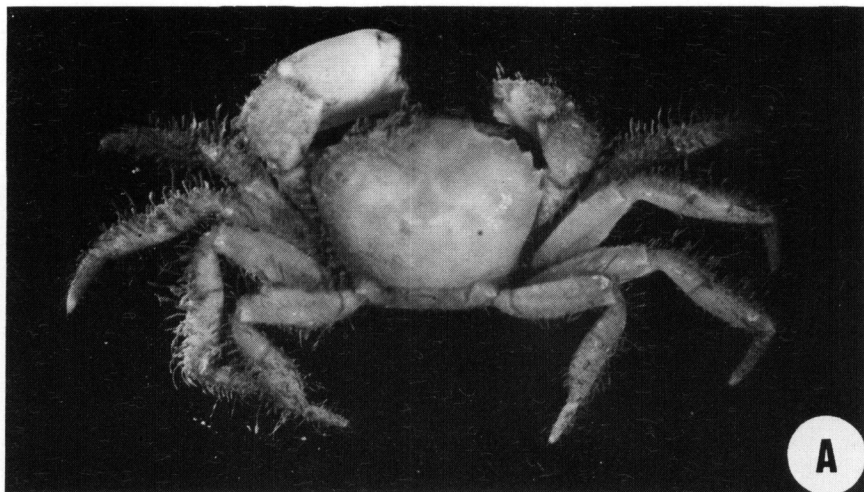


Plate 2. *Pilumnus serenei* sp.nov. A, B, Holotype male, 8.4 by 7.6 mm, ZRC Nr. 1983.11.8.1 (carapace denuded). C, Paratype female, 7.5 by 5.6 mm, ZRC Nr. 1983.11.8.2 (carapace undenuded).

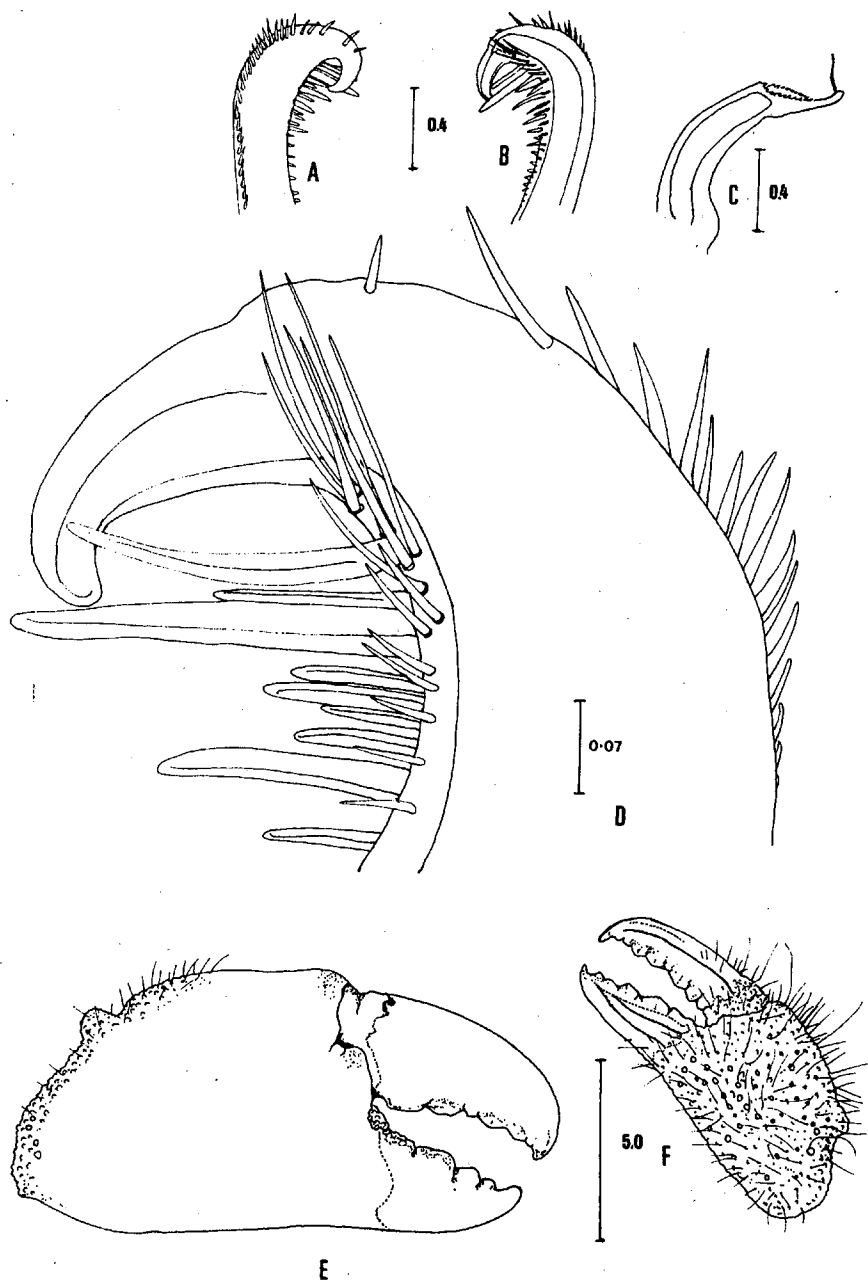


Figure 4. *Pilumnus spinicarpus* Grant & McCulloch, 1906. Male, 16.1 by 12.5 mm, AM P7009, Middle Island, Port Denison, Queensland, Australia, under dead coral refuse at low tide, leg. E.H. Rainford, 2.1924. A, B, D, left G1; C, left G2; E, Right cheliped; F, Left cheliped (scale in mm).

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