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Porcellanid crabs from the Indo-West Pacific, Part II

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Abstract. This paper discusses 21 species in 8 genera of Porcellanidae (Crustacea, Decapoda, Anomura), chiefly from collections made by Th. Mortensen in the central part of the Indo-West Pacific Region. Three new species are described: *Capilliporcellana wolffi* (type-locality Rayong Bay, Gulf of Siam), *Lissoporcellana pectinata* (type-locality off Roemadan, Kei Islands), and *Lissoporcellana miyakei* (type-locality off Doe Roa, Kei Islands). Several new range extensions are established.

INTRODUCTION

This paper is the third to deal with the Indo-West Pacific Porcellanidae (Crustacea, Decapoda, Anomura) in the collections of the Zoological Museum, University of Copenhagen. The first (Haig, 1964) was concerned with 28 species in the genera *Petrocheles, Petrolisthes, Pachycheles,* and *Polyonyx.* (Three species of the latter genus are now included in genus *Aliaporcellana).* The second (Haig, 1966b) was a report on the porcellanids obtained during the Danish Scientific Investigations in Iran, 1937-38.

Completion of this study, which deals with the species which were not covered in the 1964 paper, has been unavoidably delayed. While it was underway, the late D. S. Johnson was preparing a partial generic revision of the Porcellanidae and the descriptions of some new Indo-West Pacific species, and I had to await publication of that paper (Johnson, 1970) before I could finish parts of the present report. Subsequently, I published another revision in the family (Haig, 1978) which clarified – at least to my own satisfaction – the relationships of a number of species, and cleared the way for the final stages of this study.

The greatest part of the material on which this report is based was the result of the indefatigable collecting activities of Dr. Th. Mortensen (Th. M.). His collections were made in the Gulf of Siam and Singapore (1899 and 1900); in the Philippine Islands (1914); in the East Indian Archipelago during the Danish Expedition to the Kei Islands (1922); during the Java-South Africa Expedition (1929); and in the Red Sea (1937). Additional material was obtained by E. Suenson off China and in the Philippine Islands (between 1882 and 1912), Captain Schönau in the East and South China Seas (between 1889 and 1897), Consul Sv. Gad in Singapore (between 1903 and 1908), the "St. Nordiske Telegrafselskab" in Formosa Strait (1912), C. W. Franck in the Malay Peninsula (1924 and 1937), H. Lemche in India (1951), and T. Wolff in the Fiji Islands (1965). Further collections derive from the Galathea Expedition 1950-52 in the Malay Peninsula, Philippine Islands, New Guinea, and southern Australia, and from the 5th Thai-Danish Expedition in the western Malay Peninsula (1966).

ACKNOWLEDGEMENTS

I want to thank Dr. Torben Wolff for originally making the collection available for study, for providing information and suggestions at various times, and for the translation into English of a note accompanying one lot of specimens. Thanks are also due to Dr. Yukio Nakasone for answering several queries. Mr. Jerry Battagliotti prepared most of the illustrations.

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ACCOUNT OF THE SPECIES

Genus *Porcellana* Lamarck, 1801

As presently restricted, *Porcellana* contains three Indo-West Pacific species. Two of them are represented in the collections of the Copenhagen Museum: *Porcellana persica* was described from the Iranian Gulf and Gulf of Oman (Haig, 1966b: 55) and the second species is recorded below.

Porcellana habei Miyake, 1961

Porcellana habei Miyake, 1961: 240, figs. 3, 4. Haig 1965: 108; 1966b: 58.

Material. Gulf of Siam. 56 m. March 1900. Th.M. 1 juv. Strait of Koh Chang, Gulf of Siam. 6-9 m. 1900. Th.M. 1 ♀ ovig. "Galathea" St. 393. Gulf of Siam, 13°09'N, 100°45'E. 12 m, mud with fine sand. 11 June 1951. 1 ♂. 5th Thai-

Danish Exp. St. 1162. W. Malay Peninsula, 9°45'N, 98°23'E. 12 m, clay with shell and gravel. 6 Mar. 1966. 2 ♀♀ ovig. Singapore. Shore at low tide. 4 June 1903. Consul Sv. Gad. 1 ♂. Kei Exp. St. 68. Java Sea, 5°47'S, 106°14'E. 55 m, stones. 27 July 1922. 1 ♀. Off Java, 8°26'S, 114°29'E. About 70 m, sand. 5 Apr. 1929. Th.M. 1 ♂.

Remarks. The type-specimens from Kyushu, Japan were associated with a hermit crab collected in 30-50 m. A single specimen was found on a sponge taken off Cape Jaubert, Western Australia, in 42 m (Haig, 1965). The material listed above is the first to be reported subsequently.

Genus *Enosteoides* Johnson, 1970

Enosteoides was originally described as a subgenus of *Porcellana* and was later raised to generic rank (Haig, 1978). It includes three species, two of which are represented in the collections of the Copenhagen Museum.

Enosteoides ornatus (Stimpson, 1858)

Porcellana ornata Stimpson, 1858: 229, 242; 1907: 188. Gordon 1931: 529, fig. 1. Miyake 1943: 118, figs. 42, 43.

Porcellana corallicola Haswell, 1882: 759.

Petrolisthes? corallicola? Miers 1884: 271, pl. 29 fig. C.

Porcellana (Enosteoides) corallicola Johnson 1970: 32, fig. 3q, r.

Enosteoides ornatus Haig 1978: 709.

Material. Paumben (= Pamban), India. 2-9 m. April 1889. K. Fristedt. 2 ♂♂, 1 ♀ ovig. 15 miles off Amoy, China. 15-47 m, stones. 1882. E. Suenson. 1 ♀ (juv.). Koh Chang, Gulf of Siam. About 2 m, in coral. 1 Mar. 1900. Th. M. 2 ♂♂ (juv.). Singapore. Shore, low tide. 1906. Consul Sv. Gad. 1 ♂. "Galathea" St. 334. Keppel Harbour, Singapore. Tidal zone, corals. 16 May 1951. 1 ♂, 1 ♀. Kei Exp. St. 71. Java Sea, 5°40'S, 106°8'E. 54 m, sand, stones, sponge. 28 July 1922. 1 ♀ (juv.). Kei Exp. St. 104. Java Sea, 5°52'S, 106°4'E. 38 m, stones, sponge, washings. 4 Aug. 1922. 3 ♂♂, 6 ♀♀ (4 ovig.).

Remarks. Previously, this species was recorded from the west coast of India, Gulf of Mannar, and Mergui Archipelago in the Indian Ocean; southern Japan and Korea south to Singapore; and E. and W. coasts of tropical Australia. It has been collected intertidally under stones and in coral heads, and to depths of 54 m.

Enosteoides melissa (Miyake, 1942)

Porcellana melissa Miyake, 1942: 354, 364, pl. 1 fig. 4, text-figs. 25, 26; 1943: 118, 131, fig. 52. Nakasone & Miyake 1968b: 168, pl. 7 fig. B, text-fig. 2.

Enosteoides melissa Haig 1978: 709.

Material. Off Jolo (Sulu Archipelago), Philippines. About 47 m, sand and coral. 19 Mar. 1914. Th. M. 1♂.

Remarks. The specimen, with a carapace length of only 2.2 mm, agrees closely with the 7.8 mm holotype from the Palau Islands. The type-specimen was found under coral rocks in shallow water.

Recent records of this species from Zanzibar and Madagascar (Haig, 1966a, as *Porcellana melissa*) should be considered provisional until the material on which they were based can be re-examined. It is possible that it should be referred to the subsequently described, and closely related, species *Enosteoides palauensis* (Nakasone & Miyake, 1968). For the present, *E. melissa* is definitely known only from the Palau and Philippine Islands.

Genus *Capilliporcellana* Haig, 1978

This genus was formed to accommodate a single species, *C. murakamii* (Miyake, 1942). A second member of the genus is now described.

Capilliporcellana wolffi n.sp.

Fig. 1

Holotype. Rayong Bay, Gulf of Siam. 13-19 m, sand, mud, shells. 8 Feb. 1900. Th. M. ♂, 7.3 x 7.3 mm.

Paratypes. 2 specimens from the Philippines, in the collection of the Western Australian Museum; to be discussed in more detail elsewhere.

Description. Carapace as broad as, or slightly broader than, long; dorsal surface non-setose, with regions swollen and defined by deep grooves. Areas not raised include frontal, hepatic, and intestinal regions, and a laminiform crest along lateral margins; these nearly smooth, but raised areas transversely ridged, the ridges especially strong on anterior and posterior branchial regions. Front horizontal, produced beyond eyes, trilobate, each lobe concave dorsally; median lobe broader and more advanced than lateral lobes and, as seen in frontal view, with a long, strongly deflexed tip. Inner orbital margin sharply oblique; outer orbital angle triangular, scarcely produced. Eyes small, partly hidden behind lateral frontal lobes. Epimera densely covered with long plumose setae.

Basal segment of antennule without strong projections anteriorly.

Basal antennal segment broadly in contact with anterior margin of carapace, and produced forward to form broad, triangular lobe, visible in dorsal view. Movable segments slender, unarmed. Flagellum slender, non-setose.

Ischium of outer maxillipeds with outer face rugose and covered with long plumose setae.

Chelipeds large, robust, somewhat unequal in size (left cheliped the larger in

holotype). Merus with dorsal surface very strongly ridged like branchial regions of carapace, or ridges broken up into large, close-set, elongate tubercles; inner margin with strong lobe; inner face and inner ventral margin densely covered with long plumose setae. Carpus nearly twice as long as broad; dorsal surface covered with large, close-set tubercles, these tending to form longitudinal rows; inner margin with 4 or 5 low, triangular teeth; outer margin rather markedly convex, defined by row of tubercles; inner face and outer distal margin heavily setose. Chelae heavy, robust, lying on their outer side and with

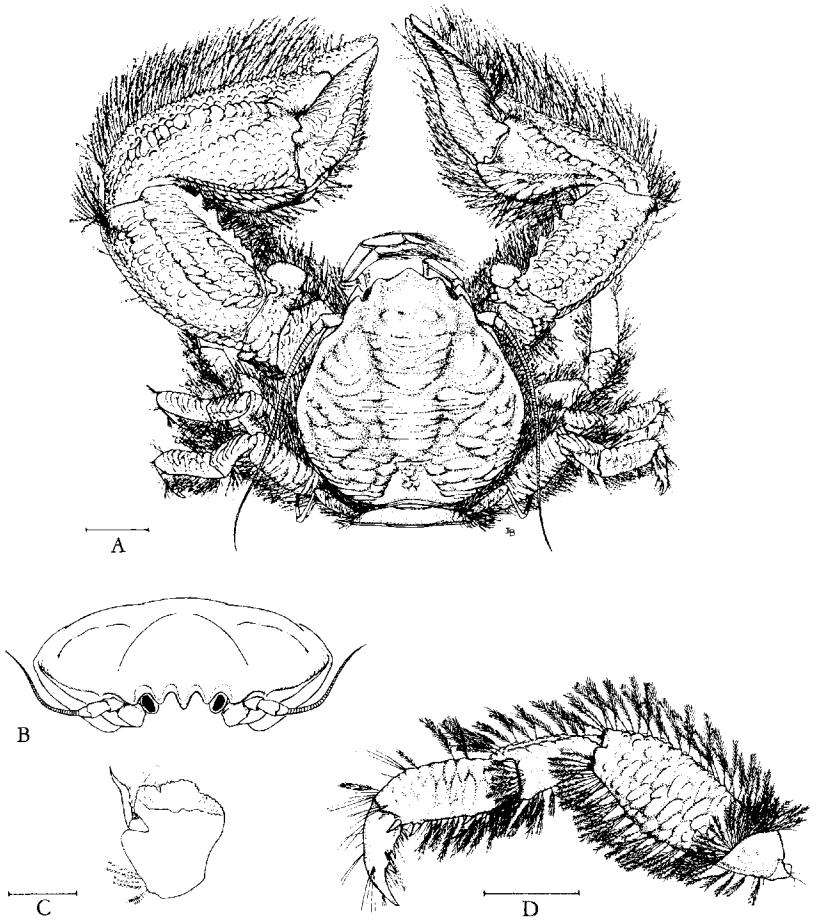

Fig. 1. *Capilliporcellana wolffi*, n. sp. A: holotype. B: holotype, frontal view of carapace. C: paratype from Philippine Islands, left antennule. D: paratype from Philippine Islands, left 3d walking leg. Figs. A, B, D by Jerry Battagliotti. Scales of A, D = 2 mm; of C, 1 mm.

fingers opening vertically or at sharply oblique angle. Dorsal (outer) surface of palm strongly convex, covered with close-set tubercles tending to form longitudinal rows; outer (lower) margin with dense fringe of long plumose setae, fringe continuing length of fixed finger. Fingers curved outwards, slightly gaping but crossed at tips; fixed finger with tubercles like those of palm, dactyl more finely granulate and with broad longitudinal groove; dactyl with large tubercle on cutting edge; gape of fingers densely setose, setation continuing onto ventral surface of palm. Chela of smaller cheliped differs from that of larger cheliped in having dorsal (outer) surface of palm somewhat less convex; and dactyl longer and more curved, with deeper longitudinal groove.

Walking legs rather short and stout. Merus, carpus, and propodus with strong transverse rugae or elongate granules on outer surface, and with fringe of long plumose setae along dorsal and ventral margins. Propodus laterally compressed. Dactyl with a single terminal claw, and with row of movable spinules ventrally.

Telson of abdomen with 7 plates.

Remarks. This species is closely related to *Capilliporcellana murakamii* (Miyake) (Miyake, 1942: 362, pl. 1 fig. 3, text-figs. 23, 24) but may be distinguished from it by the following characters:

1. The carapace of the new species is equally long and broad, or slightly broader than long. In *C. murakamii* the carapace is distinctly longer than broad.

2. The palm of the chelae is swollen and strongly convex in the new species, but flattened in *C. murakamii.*

3. In the new species, the merus, carpus, and propodus of the walking legs are relatively shorter and stouter than are these articles in *C. murakamii.* The merus is distinctly tuberculate, not smooth as in Miyake's species.

Capilliporcellana wolffi is known at present only from the Gulf of Siam and Philippines, in depths of 13 to 51 m on sandy bottoms.

Derivation of name. I am pleased to dedicate this species to Dr. Torben Wolff.

Genus *Raphidopus* Stimpson, 1858

Both members of the genus are represented in the collections of the Copenhagen Museum.

Raphidopus ciliatus Stimpson, 1858

Raphidopus ciliatus Stimpson, 1858: 228, 241; 1907: 185, pl. 22 fig. 5. Miyake 1943: 146, figs. 61, 62. Haig 1966b: 63, fig. 7.

Material. Formosa Strait. 47 m. 23 May 1897. E. Suenson. 1 ♀. Namoa, China. E. Suenson. 1 ♂. 5th Thai-Danish Exp. St. 1164. W. Malay Peninsula, 9° 42'N, 98°21'E. 22 m, sandy clay. 6 Mar. 1966. 4 ♂♂, 5 ♀♀(3 ovig.). Singapore. 4-6 m. 4 Dec. 1899. Th. M. 1 ♀ ovig. Gulf of Siam: Between Koh Mesan and Cape Liant. 9-15 m, sand, stones. 7 Feb. 1900. Th. M. 1 ♂, 1 ♀. 15 miles E. of Koh Chuen. 19 m, shells. 1 Feb. 1900. Th. M. 1 ♀ ovig. Between Koh Chang and Koh Chuen. 28 m, mud. 3 Mar. 1900. Th. M. 1 juv. About 2 km S. of Koh Tulu. 19 m, sand, mud, shells. 9 Feb. 1900. Th. M. 1 ♂, 1 ♀. Koh Kahdat. 7-9 m, sand, stones, coral. 15-18 Feb. 1900. Th. M. 1 ♀. Between Koh Kahdat and Koh Kut. 11 m, sand mixed with mud. 9 Jan. 1900. Th. M. 1 ♂, 1 ♀. N. of Koh Kut. 19 m. 23 Jan. 1900. Th. M. 1 ♂. W. of Koh Kong. 19-28 m. 24 Jan. 1900. Th. M. 2 ♀♀ (1 ovig.). "Galathea" St. 394. 13°13'N, 100°34'E. 20 m, mud with fine sand. 11 June 1951. 1 juv. "Galathea" St. 391. 13°07'N, 100°33'E. 20 m, mud with sand and shells. 11 June 1951. 1 ♀. "Galathea" St. 390. 13° 02'N, 100°33'E. 22 m, muddy sand with shells. 11 June 1951. 4 ♂♂, 3 ♀♀ (1 ovig.), 1 juv. Kei Exp. St. 105. Bantam Bay, Java. 13 m, mud. 5 Aug. 1922. 1 ♀ ovig. Samalona, Makassar (Celebes). About 35 m, muddy sand, shell. 28 June 1922. 1 ♀. St. 11. Off Toeal, Kei Islands. 20 m, sand. 9 Apr. 1922. 1 juv.

Remarks. This species was previously reported from Japan, Korea, Hong Kong, Western Australia, and Queensland. Its occurrence in several intermediate areas is now established. It is an inhabitant of muddy and sandy substrates, littoral to 47 m.

Raphidopus indicus Henderson, 1893

Raphidopus indicus Henderson, 1893: 427, pl. 39 figs. 19-22. Haig 1966b: 62, fig. 6.

Material. Indo-Chinese port. Schmidt. 1 ♀. – Soerabaja (Surabaya), Java. 1870. Andrea. 3 ♀♀.

Remarks. *Raphidopus indicus* has been reported only from the Iranian Gulf and from Madras, India, in 7-50 m. Like *R. ciliatus*, it lives on muddy and sandy substrates.

Genus *Ancylocheles* Haig, 1978

The genus contains a single species.

Ancylocheles gravelei (Sankolli, 1963)

Pachycheles sp. Gravely 1927: 140, pl. 20 fig. 9.
Porcellana gravelei Sankolli, 1963: 280, fig. 1. Haig, 1965: 108.
Ancylocheles gravelei Haig 1978: 711.

Material. Paumben (=Pamban), India. 2-9 m. April 1889. K. Fristedt. 2 ♂♂, 1 ♀ ovig.

Remarks. This species is known only from the west coast of India, Gulf of Mannar, and Australia (Western Australia, Northern Territory, Queensland, and New South Wales). It occurs under stones in the lower intertidal and to a depth of about 16 m.

Genus *Pisidia* Leach, 1820

Pisidia is represented in the Indo-West Pacific by seven species, six of which were found in the collections of the Copenhagen Museum.

Pisidia dehaanii (Krauss, 1843)

Porcellana dehaanii Krauss, 1843: 59, pl. 4 figs. 2, 2a-c. Barnard 1950: 476, fig. 88e-h.
Pisidia dehaanii Haig 1960: 209; 1966b: 53.

Material. Mandapam Camp, India. 5 Oct. 1951. H. Lemche. 11♂♂, 11♀♀ (2 ovig.), 1 juv.

Remarks. This species is an Indian Ocean endemic. It ranges from about 32°S on the east coast of South Africa north to the Iranian Gulf, thence around the Indian subcontinent to the Waltair coast in the Bay of Bengal. It is usually found intertidally, under rocks and among weeds.

Pisidia streptocheles (Stimpson, 1858)

Porcellana streptocheles Stimpson, 1858: 229, 243; 1907: 191, pl. 23 fig. 1. Barnard 1950: 474, fig. 88a-d.
Pisidia streptocheles Haig 1960: 209.

Material (all from South Africa). Simon's Bay, False Bay. 18 Nov. 1863. Hansen and Thalbiter. 7♂♂, 2♀♀ ovig. Java-South Africa Exp.: St. 30. Off Durban, 30°04'15"S, 31°00'30"E. About 94 m, gravel. 27 Aug. 1929. 116 specimens. St. 49. About 10-12 miles W. of Cape Barracouta. 75-79 m, sandy mud. 10 Dec. 1929. 3♂♂. St. 50. About 4 miles S. of Cape Barracouta. 66 m, sandy mud. 13 Dec. 1929. 6♂♂, 2♀♀ ovig. St. 60. False Bay, 2 1/4 miles N. of Cape Point. 56 m, sand. 19 Dec. 1929. 21♂♂, 13♀♀ (9 ovig.), 2 juv. St. 61. False Bay, off Cape Point. 51 m, sand, stones. 19 Dec. 1929. 4♂♂, 1♀ ovig. St. 62. False Bay, off Simonstown breakwater. 41 m, sand. 19 Dec. 1929. 2♀♀ ovig. St. 63. False Bay off Simonstown. 21-30 m, sand, broken shells. 19 Dec. 1929. 21♂♂, 18♀♀ (10 ovig.). St. 66. False Bay, 34°08'S, 18°43'E. 32 m, stones. 19 Dec. 1929. 2♂♂, 1♀ ovig. St. 67. Gordons Bay, False Bay. 15-17 m, hard bottom. 19 Dec. 1929. 2♂♂, 4♀♀ ovig. St. 69. Buffels Bay, False Bay. 56 m, sand. 20 Dec. 1929. 1♂.

Remarks. *P. streptocheles* is confined to the western Indian Ocean. It has most frequently been collected in the warm-temperate area of South Africa,

which extends from the Cape Peninsula on the west to about the mouth of the Kei River on the east (Briggs, 1974: 20, 149). However, it has also been taken near Durban and it is even reported as far north as 24°46'S (Kensley, 1969: 153). The bathymetric range is shallow water to about 100 m.

Pisidia serratifrons (Stimpson, 1858)

Porcellana serratifrons Stimpson, 1858: 229, 242; 1907: 189, pl. 23 fig. 2. Gordon 1931: 526, 530, fig. 6. Miyake 1943: 117, 121, figs. 44, 45.
Porcellana spinulifrons Miers, 1879: 21, 46. Gordon 1931: fig. 4A, B.
Pisidia serratifrons Haig 1960: 209.

Material. East China Sea, 28°38'N, 122°25'E. 60 m. Nov. 1895. Schönau. 1 ♂. Formosa Strait: 25°50'N, 120°04'E to 23°57'N, 118°33'E. 45-66 m. Aug. 1889 and Apr. 1897. Schönau. 6♂♂, 3♀♀ ovig. 15 miles off Amoy. 15-47 m, stones. 1882. E. Suenson. 1♂, 1♀, 1 juv. 23°15'N, 117°40'E. 26 July 1912. Capt. Christiansen. 3♂♂, 3♀♀ovig. 23°08'N, 117°30'E. 44 m. 23 Jan. 1912. E. Suenson. 22♂♂, 26♀♀ (1 ovig.). Formosa Strait, no precise locality. 46 m. 23 May 1897. E. Suenson. 5♂♂, 2♀♀ovig.

Remarks. Gordon (1931) suggested that *Porcellana spinulifrons* might be identical with *P. serratifrons,* and Miyake (1943) synonymized the two species. Johnson (1970: 31) believed these forms to be distinct, but I follow Gordon and Miyake and place Miers' species in synonymy with *Pisidia serratifrons.* The two female syntypes of *Porcellana spinulifrons* in the collections of the British Museum (Natural History) fall within the normal range of variation found in Stimpson's species.

Pisidia serratifrons has a restricted range, being known only from Pei-tai-ho (China), southern Korea and southern Japan, and Formosa Strait south to Hong Kong. With the exception of Pei-tai-ho, which lies in the northwest Pacific cold-temperate region, all these localities are within the area which Briggs (1966, 1974) recognized as supporting a warm-temperate fauna. The bathymetric range is shore to 68 m. Miyake (1943) noted that it has been found among fouling animals and seaweeds on ships' bottoms.

Pisidia gordoni (Johnson, 1970)

Porcellana spinulifrons Gordon 1931: 530, figs. 4C, 5.
Pisidia cf. *spinulifrons* Haig 1966b: 54.
Porcellana (Pisidia) gordoni Johnson, 1970: 29, fig. 3m-p.
Pisidia gordoni Haig 1973: 283.

Material. Paumben (=Pamban), India. 2-9 m. Apr. 1889. K. Fristedt. 1 ♂, 1♀ ovig. Pamban Pass. 5 m. 9 Oct. 1951. H. Lemche. 1♀ovig. Koh Kram, Gulf of Siam. 9 m, coarse sand. 6 Feb. 1900. Th. M. 2♀♀ (1 ovig.). Between

Koh Mesan and Koh Chuen, Gulf of Siam. On and under plants at surface. 5 Feb. 1900. Th. M. 1 juv. Coast of Lem Ngob, Gulf of Siam. 0-2 m, stones and mud. December 1899. Th. M. 1♂, 2♀♀ ovig. 5th Thai-Danish Exp. St. 1165. W. Malay Peninsula, 4°46'N, 98°22'E. 25 m. 6 Mar. 1966. 1♂. "Galathea" St. 325. Strait of Malacca, 4°20'N, 98°54'E. 40 m. 10 May 1951. 5♂♂, 4♀♀ ovig. Singapore. Shore at low tide. 4 June 1903; 1906; 1907. Consul Sv. Gad. 7♂♂, 16♀♀ (15 ovig.), 5 juv. "Galathea" St. 331. 5 miles SE of Singapore. 40 m, clay, corals. 15 May 1951. 1♂, 1♀ ovig. Kei St. 104. Java Sea, 5°52'S, 106°4'E. 38 m, stones, sponge, washings. 4 Aug. 1922. 1♀ ovig.

Remarks. In the Indian Ocean, *Pisidia gordoni* appears to range from Delagoa Bay (Moçambique) north to the Red Sea, Gulf of Aden, and Gulf of Iran, thence along the west coast of the Indian subcontinent to the Gulf of Mannar and Ceylon. It has also been reported from Hong Kong, Singapore, Java, and tropical Australia. The known bathymetric range is littoral to about 72 m.

Pisidia inaequalis (Heller, 1861)

Porcellana inaequalis Heller, 1861: 259, pl. 2 fig. 7.
Pisidia inaequalis Haig 1966b: 54. Lewinsohn 1969: 153, fig. 34.

Material. Ghardaqa, Red Sea. Summer 1937. Th. M. 1♂.

Remarks. *P. inaequalis* has a limited distribution in the Red Sea, Gulf of Aden, and Gulf of Iran. It occurs intertidally and in shallow water on coral reefs.

Pisidia dispar (Stimpson, 1858)

Porcellana dispar Stimpson, 1858: 229, 242; 1907: 190, pl. 23 fig. 3. Miers 1884: 275, pl. 30 fig. C.
Porcellana rostrata Baker, 1905: 260, pl. 35 figs. 1, 1a, b.
Pisidia dispar Haig 1965: 105, 107; 1979: 128, figs. 10, 11. Nakasone & Miyake 1968a: 97, fig. 1.

Material. San Bernardino Strait, Philippines, 12°27'N, 124°3'E. 94-188 m. 3 Aug. 1911. E. Suenson. 1♂. "Galathea" St. 415. Tubajon Bay, Dinagat, Philippines, 10°20'N, 125°32'E. Coral reef in tidal zone. 17-19 July 1951. 1♂. "Galathea" St. 511. Harbour, Port Moresby, New Guinea. 9 m. 2 Oct. 1951. 1♂. "Galathea" St. 564. Great Australian Bight, 36°18'S, 138°29'E. 60 m, sand. 6 Dec. 1951. 1♂, 1♀ ovig. Suva Harbour, Fiji Islands, 18°09'S, 178°24'E. Reef flat, low tide, corals. 17 May 1965. T. Wolff. 1♂.

Remarks. *P. dispar*, a well known species in temperate and tropical Australian waters, has been reported in recent years from Japan, the Ryukyu Islands, the

Moluccas, and New Caledonia. The present material establishes still more extra-Australian records. The known geographic range of the species is extended eastward to the Fiji Islands and its bathymetric range downward from 54 to 188 m. It frequently occurs in the littoral in sheltered situations.

Genus *Lissoporcellana* Haig, 1978

This genus was recently established for the reception of six Indo-West Pacific species. Four of them are represented in the collections of the Copenhagen Museum, as are two new species described herein.

Lissoporcellana quadrilobata (Miers, 1884)
Fig. 2

Porcellana quadrilobata Miers, 1884: 276, pl. 30 fig. D. Haig 1966b: 59.
Porcellana gaekwari Southwell, 1909: 112, figs. 1-3.
Aliaporcellana quadrilobata Nakasone & Miyake 1969: 19, 24, figs. 2, 3.
Lissoporcellana quadrilobata Haig 1978: 712.

Material. Formosa Strait, 25°28'N, 120°29'E. 66 m. Apr. 1897. Schönau. 1♂, 2♀♀ovig., 9 juv. South China Sea, 22°13'N, 115°04'E. 46 m. 19 June 1896. Schönau. 1♂. Off Jolo (Sulu Archipelago), Philippines. About 27-55 m, sand, coral, hydroids. 17, 19, and 21 Mar. 1914. Th. M. About 160 specimens. Between Koh Mesan and Cape Liant, Gulf of Siam. 16 m, shells and sand. 4 Feb. 1900. Th. M. 1♂. Between Koh Mesan and Koh Chuen, Gulf of Siam. 27-46 m, shell, stones. 5 and 6 Feb. 1900. Th. M. 2♂♂, 1♀ ovig. 5th Thai-Danish Exp. St. 1178. W. Malay Peninsula, 8°24'N, 98°12'E. 35 m. 9 Mar. 1966. 1♀ ovig. 5th Thai-Danish Exp. St. 1152. W. Malay Peninsula, 8°06'N, 98°13'E. 36-39 m. 6 Mar. 1966. 2♂♂, 1♀ ovig. Singapore.

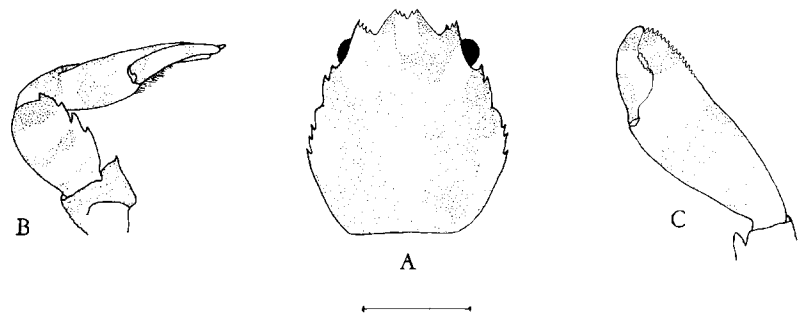

Fig. 2. *Lissoporcellana quadrilobata* (Miers). St. 1178, 5th Thai-Danish Expedition, W. Malay Peninsula. A: carapace. B: left cheliped in normal position. C: right chela, straight dorsal view. Scale = 3 mm.

Shore at low tide. 12 Dec. 1906. Consul Sv. Gad. 1♂. "Galathea" St. 360. Singapore Island, 300 m W. of Sultan Shoal lighthouse. 25 m, muddy sand. 31 May 1951. 1 ♂, 1 ♀ ovig. Kei Exp. St. 74. Sunda Strait, 6°03'S, 105°54'E. 30 m, sand, shells. 29 July 1922. 2 ♀♀ ovig. St. 72. Java Sea, 5°41'S, 105° 57'E. 35 m, stones. 28 July 1922. 1 ♀ ovig. St. 90. Java Sea. 5°55'S, 105° 30'E. 36 m, hard bottom. 1 Aug. 1922. 1 ♂. Off Samalona, Makassar. About 35 m, muddy sand, shells. 28 June 1922. 1♂, 2♀♀ ovig. Amboina Bay, Amboina. About 13-128 m, stones, sand. 22 and 28 Feb. 1922. 3♂♂, 8♀♀ (6 ovig.). Off Kombir, Lonthor Island, Banda. About 70-90 m, sand. 6 June 1922. 1♂. St. 15. S. of Doe Roa (Kei Islands). 5-20 m, sand. 10 Apr. 1922. 1♂, 4♀♀ (3 ovig.). St. 21. Kei Islands, 5°50'S, 132°47'E. 50-70 m, hard bottom. 14 Apr. 1922. 1♂. St. 31. Doe Roa Basin (Kei Islands). About 50 m, sand. 18 Apr. 1922. 2♂♂, 6♀♀ (5 ovig.). St. 37. Doe Roa Strait. About 40 m, sand. 23 Apr. 1922. 3♂♂.

Remarks. Twelve specimens of this species, together with a specimen of *L. streptochiroides* (Johnson), were collected at 25°28'N, 120°29'E with an octocoral which was found attached to a cable. Dr. Torben Wolff kindly provided the translation of a note, in the handwriting of H. J. Hansen, which was in the container with the crabs: " Schönau writes that they [the porcellanids] were found in the crown of a large octocoral . . . and had the same colour, viz. watery pale white like this, and since all crabs [otherwise] have a dark colour these are evidently specimens having continuously made the coral their home and received this colour by adaptation."

By way of contrast, a specimen of *L. quadrilobata* from St. 1178 of the 5th Thai-Danish Exp. was observed to have a distinct color pattern on the carapace and chelipeds (see fig. 2). There was no pattern on the walking legs and abdomen. The colors, after the crab had been preserved in alcohol for about two years, were brownish-yellow and white.

This species ranges from the east coast of Africa and throughout the Indian Ocean to the Malay Peninsula, thence north to the East China Sea at 27°30'N and east to Queensland, Australia. It is now reported to a depth of about 128 m, most frequently on sandy substrates, and there are several records of its occurrence with Alcyonaria.

Lissoporcellana streptochiroides (Johnson, 1970)

Porcellana (Porcellana) streptochira De Man 1888: 419, pl. 18 fig. 6.
Porcellana (Pisidia) streptochiroides Johnson, 1970: 26, fig. 3j-l.
Lissoporcellana streptochiroides Haig 1978: 712.

Material. East China Sea, 26°42'N, 121°19'E. 79 m. 3 June 1894. Schönau. 1♂. Formosa Strait, 25°28'N, 120°29'E to 23°57'N, 118°33'E. 51-

66 m. 29 Mar. 1896 and Apr. 1897. Schönau. 1♂, 4♀♀ (2 ovig.), 2 juv. Formosa Strait, 23°15'N, 117°40'E. 26 July 1912. Capt. Christiansen. 2♂♂, 2♀♀ ovig. Formosa Strait, 23°08'N, 117°30'E. 44 m. 23 Jan. 1912. E. Suenson. 70 specimens. Formosa Strait, no precise locality. 46 and 64 m. 23 May 1897. E. Suenson. 3♂♂, 1♀ ovig. 8 miles from Hong Kong, 22°12'N, 114°15'E. 26 m. 16 Nov. 1911. E. Suenson. 1♂. Off Hong Kong, 22°10'N, 114°30'E. 31 and 37 m. 1882. E. Suenson. 2♂♂, 5♀♀ (4 ovig.). Off Hong Kong, 21°30'N, 113°08'E. 37 m. 6 Apr. 1890. Schönau. 3♂♂, 2♀♀ ovig. Off Jolo (Sulu Archipelago), Philippines. About 27-55 m, sand and coral and among hydroids. 17, 19, and 21 Mar. 1914. Th. M. 5♂♂, 9♀♀ (7 ovig.). Singapore. Shore, low tide. 1 Sept. 1908. Consul Sv. Gad. 1♀ ovig. Kei Expedition: St. 103. Sunda Strait, 6°05'S, 105°42'E. 52 m, shell. 4 Aug. 1922. 1 juv. St. 68. Java Sea, 5°47'S, 106°14'E. 55 m, stones, sponge. 27 July 1922. 1 juv. St. 116. Java Sea, 5°57'S, 106°34'E. 22 m, sand. 7 Aug. 1922. 1♀. Amboina Bay, Amboina. 13-128 m, stones, sand. 22 and 28 Feb. and 2 Mar. 1922. 5♂♂, 8♀♀ (5 ovig.). St. 11. Off Toeal (Kei Islands). 20 m, sand. 9 Apr. 1922. About 220 specimens. St. 19. Off Toeal. About 20 m, sand. 14, 18, and 19 Apr. and 12 May 1922. 15♂♂, 10♀♀ (7 ovig.). St. 38. NE of Doe Roa (Kei Islands). About 35 m, sand. 24 Apr. 1922. 1♂, 1♀. St. 14. S. of Doe Roa. About 40 m, sand. 10 Apr. 1922. 2♂♂, 3♀♀ (2 ovig.).

Remarks. The species was previously reported only from Singapore, Java, Flores, and Queensland; its known range is now extended northward to 26°42'N. The bathymetric range is shore to 128 m.

Lissoporcellana spinuligera (Dana, 1853)

Porcellana armata Dana, 1852: 426. Miyake 1942: 354, 356, figs. 17-19; 1943: 117, 127, fig. 48. (Name preoccupied.)

Porcellana spinuligera Dana, 1853: 1593; 1855: pl. 26 fig. 14.

Porcellana latifrons Stimpson, 1858: 229, 243; 1907: 190, pl. 23 fig. 4.

Pisidia spinuligera Haig 1965: 105; 1979: 128, fig. 12. Nakasone & Miyake 1968a: 101, fig. 2.

Lissoporcellana spinuligera Haig 1978: 712.

Material. Puerto Galero (Mindoro), Philippines. About 9 m. 3 Feb. 1914. Th. M. 1♂. Kaladis Point (Mindanao), Philippines. On mole. 11 Mar. 1914. Th. M. 1♂. Off Jolo (Sulu Archipelago), Philippines. About 23-94 m, sand, coral, Lithothamnion. 17, 19, 21, and 26 Mar. 1914. Th. M. 32♂♂, 21♀♀ (16 ovig.), 2 juv. Koh Chang, Gulf of Siam. About 2 m, coral. 1 Mar. 1900. Th. M. 5♂♂, 1♀. Koh Kahdat, Gulf of Siam. About 2 m, coral. Jan.-Feb. 1900. Th. M. 2♂♂, 1♀ ovig., 1 juv. Singapore. Shore, low tide. 4 June 1903. Consul Sv. Gad. 1♀ ovig. Onrust off Djakarta, Java. Corals. April 1929. Th. M. 1♂. Kei Expedition: Off Neira, Banda. About 20 m, from sponges.

10 June 1922. 2♂♂. Toeal, Kei Islands. 0-2 m, among hydroids and alcyonarians and from coral. 20, 21, 25, and 26 Mar. 1922. 16♂♂, 15♀♀ (13 ovig.). Vatek opposite Toeal. 0-2 m, rocky shore. 23 Mar. 1922. 1♀ ovig.

Remarks. This species is known to occur in the Ryukyu Islands, Hong Kong, the Malay Peninsula, Philippine Islands, Palau Islands, East Indian Archipelago, and Western Australia. The known bathymetric range is shore to 94 m, but it occurs most commonly on coral reefs in 24 m or less.

Lissoporcellana pectinata n. sp.
Fig. 3

Holotype. St. 43, Kei Exp. Off Roemadan, Kei Islands, 5°30'S, 132°45'E. About 35 m, with a large antipatharian from bottom of sand and coral. 27 Apr. 1922. ♀ (ovig.), 5.0 x 4.0 mm.

Paratypes. 9♂♂ (3 juv.), 19♀♀ (14 ovig., 1 juv.), collected with holotype.

Description. Carapace about 1 1/4 times as long as broad, strongly convex laterally; dorsal surface nearly smooth, with regions scarcely indicated. Front broad, horizontal, produced well beyond eyes, trilobate; median lobe broader than lateral lobes, concave dorsally, its margin cut into 4 strong teeth, space between the 2 median teeth forming deep notch; median lobe separated by deep, U-shaped indentations from narrow lateral lobes, latter each cut into 2 strong teeth distally. Inner orbital margin sharply oblique; outer orbital angle produced into strong spine. Hepatic margin with strong spine or tooth; 1 or 2 minute epibranchial spinules sometimes present; posterior branchial margin with 3 (occasionally 4) well developed spines.

Basal segment of antennule with 3 spinules anteriorly.

Basal antennal segment broadly in contact with anterior margin of carapace; first and second movable segments each with well developed anterodistal spinule; third unarmed; flagellum long and slender, with very short setae.

Chelipeds devoid of setae and covered with small, flattened granules, appearing nearly smooth; one slightly larger than the other. Merus with strong lobe on inner margin, edges of lobe crenulate and bearing well developed tooth; outer and distal margins unarmed; ventral surface with strong spine at inner distal angle. Carpus with 4 to 6 well developed teeth on inner dorsal margin, these varying in size; outer margin unarmed; a single strong spine on distal half of inner ventral margin. Chelae narrow, elongate, lying on their flattened outer side and with fingers opening vertically or at sharply oblique angle. Outer dorsal (lower) margin of palm with sharp crest, crenulate toward its distal end; just to inside of this margin, proximal half of palm with row of 3 to 6 spines; inner (upper) margin of palm with sharp, unarmed crest. Fingers incurved and

crossed near tips, tips not notched; outer (upper) margin of dactyl with smooth crest continuing upper marginal crest of palm; outer (lower) margin of fixed finger with crenulate crest continuing lower marginal crest of palm; gape of fingers densely setose.

Walking legs long and slender, with long, scattered setae. Merus with dorsal margin unarmed; ventrodistal angle subrectangular. Carpus with dorsodistal spine, this more strongly developed on first pair of legs. Ventral margin of propodus with row of long, slender, subequally spaced, movable spinules, usually 8 or 9 in row, the most distal spinule paired. Ventral margin of dactyl with row of 6 well developed, broadly triangular teeth, the tooth adjacent to

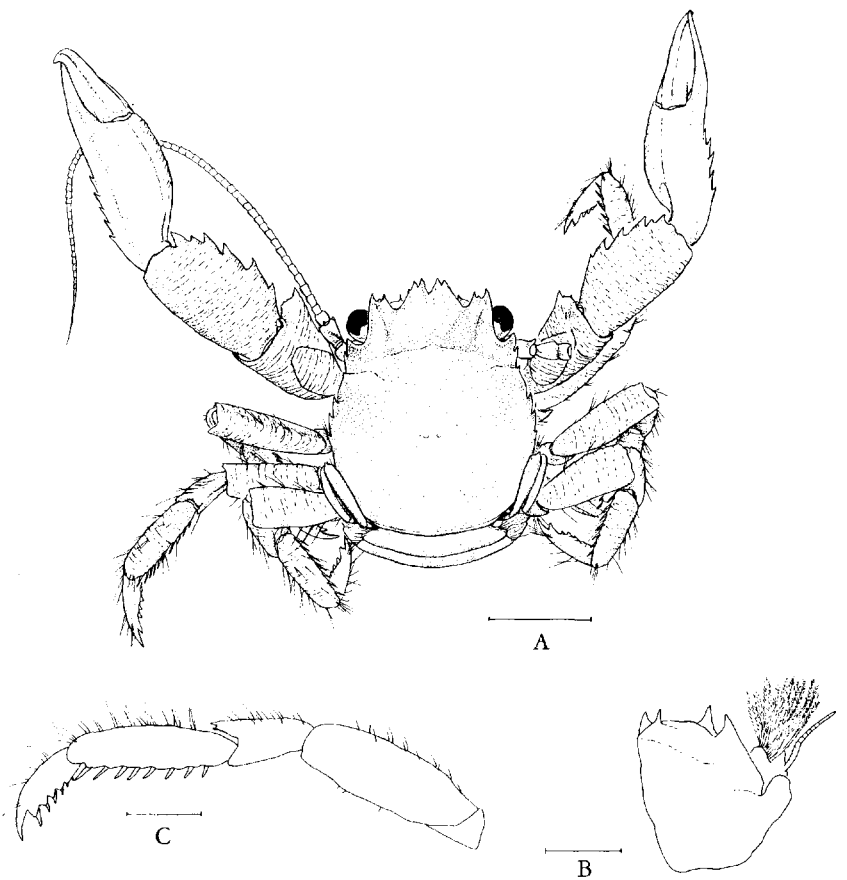

Fig. 3. *Lissoporcellana pectinata,* n. sp. A: holotype. B: paratype, right antennule. C: specimen from Australia, left walking leg. Fig. A by Jerry Battagliotti. Scale of A = 2 mm; of B, 0.5 mm; of C, 1 mm.

terminal claw largest, others decreasing in size toward proximal end of article; a slender, movable spinule arising from base at proximal side of each tooth, these spinules shorter than those on ventral margin of propodus.

Telson of abdomen with 7 plates.

Remarks. *L. pectinata* appears to be allied to *L. spinuligera* (Dana) and *L. furcillata* (Haig). All three species have a row of strong denticulations along the anterior margin of the rostrum, formed by indentations of the three frontal lobes. *L. pectinata* differs from the two related forms in lacking a row of spines on the outer margin of the carpus of the chelipeds, and from these and all other members of genus *Lissoporcellana* in the form of the armature on the ventral margin of the propodus and dactyl of the walking legs.

In addition to the type material from the Kei Islands, I have seen a few individuals of this species from Australia.

Derivation of name. From Latin "pectinatus", having the form of a comb, in reference to the structure of the ventral row of spinules on the propodus of the walking legs.

Lissoporcellana furcillata (Haig, 1965)

Porcellana furcillata Haig, 1965: 108, 110, fig. 2. Zann 1977: 10 (colored fig.), 11.
Lissoporcellana furcillata Haig 1978: 712.

Material (all from the Kei Exp.). Off Neira, Banda. About 20 m, sand, diver. 1 June 1922. 1♂, 5♀♀ (4 ovig.). Banda. About 20 m, washed from sponge. 10 June 1922. 1♂. St. 40. N. of Doe Roa, Kei Islands. 25 m, sand. 25 Apr. 1922. 2♂♂, 4♀♀ ovig. St. 18. Doe Roa Strait. About 40 m, sand, corals. 12 Apr. 1922. 1♂. Toeal, Kei Islands. About 2 m, from sponge. 21 Mar. 1922. 1♀ ovig. St. 19. Off Toeal. 20 m, sand. 12 May 1922. 4♂♂, 2♀♀ ovig.

Remarks. Zann (1977) figured a specimen from the Great Barrier Reef, which was found living at the base of an orange-pink gorgonian coral. In the colored illustration the ground color of the porcellanid is a matching orange-pink, and there are characteristic purple markings on the carapace and chelipeds.

This species was previously known only from Western Australia and Queensland, in 9 to 46 m.

Lissoporcellana miyakei n. sp.

Fig. 4

Porcellana nitida Miyake 1942: 359, figs. 20-22; 1943: 117, 129, fig. 50.
Not *Porcellana nitida* Haswell = *Lissoporcellana nitida.*

Holotype. St. 15, Kei Exp. S. of Doe Roa, Kei Islands. 5-20 m, sand. 10 Apr. 1922. ♂, 6.4 x 5.9 mm.

The following specimens are paratypes: 1♂, 1♀ ovig., collected with holotype. Off Jolo (Sulu Archipelago), Philippines. 47 m, sand and coral. 19 Mar. 1914. Th. M. 1♂, 1♀ ovig. Additional paratypic material from the Philippines is in the collections of the Smithsonian Institution.

Description. Carapace a little longer than broad, strongly convex laterally;

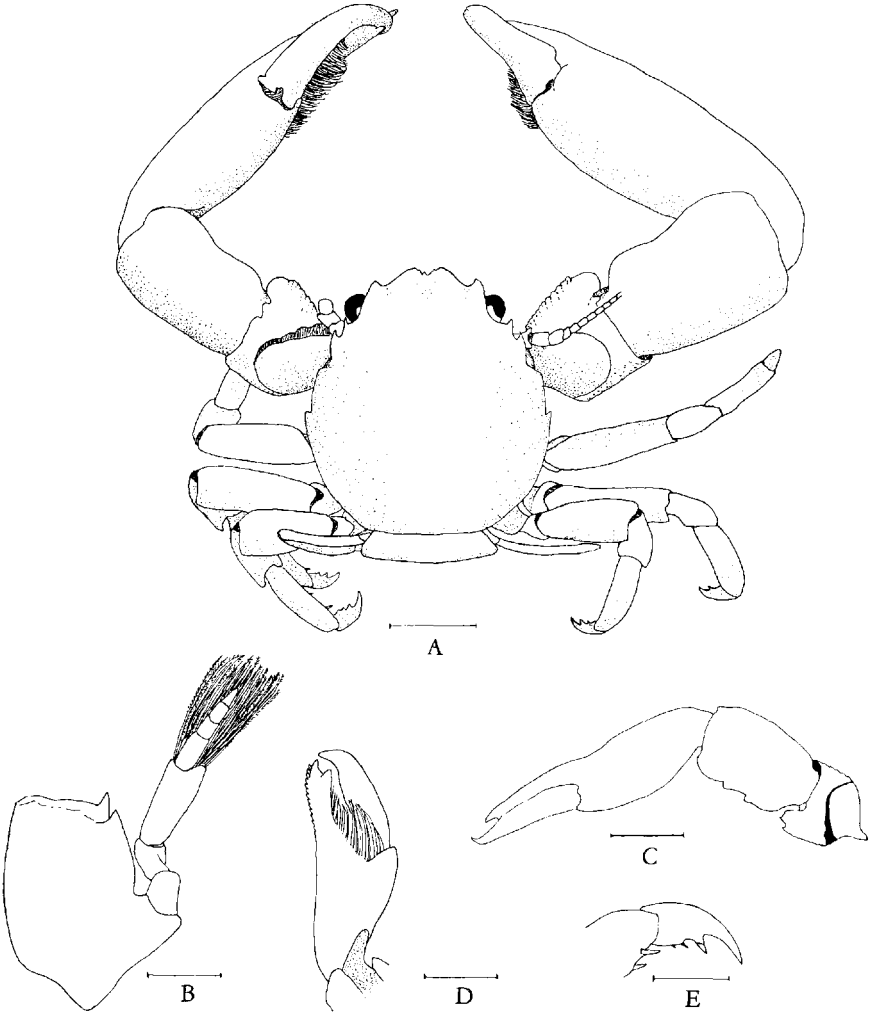

Fig. 4. *Lissoporcellana miyakei*, n. sp. A: holotype. B: paratype from Philippine Islands, right antennule. C: specimen from Western Australia, smaller cheliped. D: paratype from Philippine Islands, smaller chela in ventral view. E: specimen from Queensland, dactyl of walking leg. Scales of A, C, D = 2 mm; of B, E, 0.5 mm.

dorsal surface nearly smooth, with regions scarcely indicated. Front broad, horizontal, produced well beyond eyes, trilobate; median lobe much broader than lateral lobes, its margin medially notched so that it appears bilobate, the notch shallow and minutely denticulate; median lobe separated by U-shaped indentations from lateral lobes, latter pointed at tip; frontal margin, except for median notch, smooth and unarmed. Inner orbital margin sharply oblique and shallowly concave; outer orbital angle produced into strong spine. Hepatic margin with strong spine; epibranchial area very finely crenulate; posterior branchial margin with a single well developed tooth.

Basal segment of antennule with 2 teeth anteriorly.

Basal antennal segment broadly in contact with anterior margin of carapace; first movable segment with well developed anterodistal spinule; second smooth or obscurely denticulate along anterior margin; third unarmed; flagellum non-setose.

Chelipeds nearly smooth, devoid of setae; one a little larger than the other. Merus with strong lobe on inner margin, this lobe with edges crenulate and surface finely rugose; outer and distal margins of merus unarmed; ventral surface with spine at inner distal angle. Carpus with inner dorsal margin unarmed (or, rarely, with 2 small, wide-set teeth and a few crenulations), broadened distally to form rounded lobe; outer margin unarmed; inner ventral margin unarmed. Chelae narrow, elongate, lying on their outer side and with fingers opening vertically or at sharply oblique angle. Outer dorsal (lower) margin of palm with unarmed crest continuing onto fixed finger, where it becomes crenulate. Fingers incurved and crossed near tips; larger chela with broad, crenulate-edged lobe on cutting edge of each finger; smaller chela with well developed tooth on ventral side of fixed finger near distal end, this tooth together with distal end of finger forming a bifurcation in which tip of dactyl rests. Gape of fingers densely setose.

Walking legs long and slender, with long, scattered setae. Merus with dorsal margin unarmed; ventrodistal angle subrectangular. Carpus unarmed. Ventral margin of propodus with 3 or 4 movable spinules, including the usual distal pair. Ventral margin of dactyl with strong, fixed, corneous-tipped spine adjacent to terminal claw, and with 2 or 3 small movable spinules, these progressively smaller proximally, the most proximal one minute.

Telson of abdomen with 7 plates.

Remarks. Miyake (1942: 359) reported *Porcellana nitida* Haswell, 1882 (now *Lissoporcellana nitida*) from the Palau Islands. From his description and the accompanying illustration it is evident that his specimen does not belong to Haswell's species, which has no notch on the median frontal lobe nor any armature on the posterior branchial margin of the carapace. Nakasone and Miyake (1969: 24, 26) pointed out this misidentification, and expressed the opinion

that the Palau specimen belongs to *Aliaporcellana quadrilobata* (Miers) (=*Lissoporcellana quadrilobata*). However, this individual, and the specimens that I have examined, appear sufficiently distinct to justify their inclusion in a new species.

Lissoporcellana miyakei resembles *L. quadrilobata* in a number of characters, including the structure of the dactyl of the walking legs; but it differs consistently from the latter species in having a less elongate carapace with a single spine on the posterior branchial margin. The rostrum is much less produced than in *L. quadrilobata* and less deeply cleft, with its margins unarmed except for fine crenulations in the median notch.

The new species is closely related to *L. nakasonei* (Miyake) (*Porcellana nakasonei* nom. nov. in Nakasone, 1978: 28). *L. nakasonei,* which was originally described as *Porcellana maculata* (Miyake, 1957: 75, figs. 1-3), has no bifurcation on the fixed finger of the chelipeds, the gape of the fingers is devoid of setae, and there is no strong, fixed spine on the dactyl of the walking legs adjacent to the terminal claw. I am indebted to Dr. Y. Nakasone for confirmation of the first two characters.

I have examined material of *L. miyakei* from the Philippine Islands, Kei Islands, and the west and east coasts of Australia; as noted above, it was recorded (Miyake, 1942, as *Porcellana nitida* Haswell) from the Palau Islands. The species is known to occur at depths of 5-122 m, on sand and coral substrates and in association with soft corals and gorgonians.

Derivation of name. For Dr. Sadayoshi Miyake, because he first called attention to this species and because of his many contributions to knowledge of the Porcellanidae of the Indo-West Pacific.

Genus *Porcellanella* White, 1852

Both members of the genus are represented in this collection.

Porcellanella triloba White, 1852

Porcellanella triloba White, 1852: 394, pl. 5 figs. 2, 2a. Sankarankutty 1962: 96, figs. 1-12. Johnson 1964: 100. Haig 1966b: 59.

Porcellanella picta Stimpson, 1858: 229, 243; 1907: 193, pl. 22 fig. 6. Miyake 1943: 133, 134, figs. 54, 55. Johnson 1964: 98, fig. 1.

Material. 10 km NW of Koh si Chang, Gulf of Siam. About 18 m, mud. 1 Mar. 1900. Th. M. 1♀ ovig. W. of Koh Kut, Gulf of Siam. About 28 m, mud. 4 Mar. 1900. Th. M. 2 juv. Teluk Merbau, Malay Peninsula. Shore. 1924 and 3 Sept. 1937. C. W. Franck. 2♂♂, 2♀♀ ovig. 5th Thai-Danish Exp. W. Malay Peninsula. 23 Jan. 1966. From trawl-refuse. 1♂. Kei Exp. St. 119. Java Sea, 6°0'S, 106°50'E. 22 m, mud. 7 Aug. 1922. 1♂, 1♀ ovig. Soerabaja (Surabaya) Java. 7.5 m. 1870. Andrea. 1♀ ovig., 3 juv. Kei Exp.

Amboina. 2 m, sand, coral. 14 Feb. 1922. 1♂, 1♀ ovig. Kei Exp. Amboina Bay, Amboina. 13-18 m, sand. 28 Feb. 1922. 1♀ ovig.

Remarks. In reporting on *Porcellanella* from the Iranian Gulf (Haig, 1966b: 59-61), I noted that those specimens showed a mixture of the characters used by Johnson (1964) to separate *P. triloba* White and *P. picta* Stimpson. I concluded, as had Sankarankutty (1962) earlier, that the two species are probably synonymous. The material treated in the present paper is all *"picta"*-like in the form of the frontal lobes, but some specimens have features which Johnson considered to be characteristic of *P. triloba.* Except for the structure of the frontal lobes, I am still unable to find any characters by which the two forms can be consistently separated.

P. triloba ranges from the east coast of Africa across the Indian Ocean and through the East Indian Archipelago, thence south to the east and west coasts of tropical Australia and north to the southern part of Japan. It was erroneously reported from the Falkland Islands by Henderson (1888: 112), probably through a mistake in labelling. The species has been collected intertidally and to depths of about 72 m, frequently living on Pennatulacea.

Porcellanella haigae Sankarankutty, 1963

Porcellanella triloba Miyake 1942: 368, figs. 28, 29; 133, 134, fig. 53.

Porcellanella haigae Sankarankutty, 1963: 273, fig. 1a-e. Nakasone & Miyake 1972: 142, fig. 3.

Material. Jolo (Sulu Archipelago), Philippines. 38-56 m, sand and coral. 19 Mar. 1914. Th. M. 1 juv.

Remarks. Miyake (1942) recorded *Porcellanella triloba* White from the Palau Islands, later (1943) comparing it with *P. picta* Stimpson. It was partly on the basis of these papers that Johnson (1964) believed *P. picta* to be distinct from *P. triloba.* However, as Sankarankutty (1962: 100) pointed out, Miyake's Palauan material does not belong to *P. triloba*; it is a different species which was subsequently described (Sankarankutty, 1963) as *P. haigae*. It has strongly produced frontal lobes as do some individuals of *P. triloba,* but differs from that species in lacking a well developed, triangular lobe on the merus of the chelipeds.

P. haigae was previously known only from the Gulf of Mannar, from Shizuoka prefecture, Japan, and from the Palau Islands, in 18-60 m. All these records indicate that the porcellanids were found on Pennatulacea (*Pteroeides* and *Cavernularia*).

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