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Janet Haig  
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Pacific, Part I

INVERTEBRATE  
ZOOLOGY  
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81.

PORCELLANID CRABS FROM THE INDO-WEST PACIFIC, PART 1\*)

By JANET HAIG

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**Introduction.**

This paper is the second of a series of reports dealing with the Porcellanidae (Crustacea Anomura) in the collections of the Zoological Museum, University of Copenhagen. The first (HAIG, 1962) treated the western Atlantic and eastern Pacific members of the family. The present report deals with 28 Indo-West Pacific species in four genera, *Petrocheles*, *Petrolisthes*, *Pachycheles*, and *Polyonyx*, and a third will be concerned with the remaining Indo-West Pacific species in the Copenhagen Museum collections.

This is undoubtedly one of the finest collections of Porcellanidae ever assembled from the Indo-West Pacific area; it is particularly strong in specimens from the Philippine Islands, Gulf of Siam, and East Indian Archipelago. By far the greatest part of the material is the result of the collecting efforts of Dr. TH. MORTENSEN on three expeditions: the expedition to Siam, 1899-1900; the expedition to the eastern and western Pacific, 1913-1916; and the Kei Islands Expedition, 1922. A brief general account of the Siamese expedition has been published (MORTENSEN, 1902), and there is a more detailed account, with station data, of the Kei Islands Expedition (MORTENSEN, 1923).

Smaller amounts of Indo-West Pacific material derive from Dr. MORTENSEN'S Java-South Africa Expedition, 1929-1930; from incidental shore and shallow-water stations of the "Dana" Expedition, 1928-1930, and the "Galathea" Expedition, 1950-1952; from dredgings made by the vessels "Shanghai", and "Monsunen"; and from collectors K. FRISTEDT,

\*) Allan Hancock Foundation Contribution No. 258.

Consul SV. GAD, P. HEEGAARD, H. LEMCHE, H. MORTENSEN, REGNARD, SCHINAU, E. SUENSON, H. SUTER, and "Store Nordiske Telegraf-Selskab".

References listed under each species are not intended to be complete. In each case I have cited a reference to the original description of the species and of its synonyms, and to the paper first using the name in its currently accepted combination; I have also included references to works which give good illustrations or are particularly useful in the study of the species in question.

### Acknowledgements.

I am most grateful to those persons and institutions who have assisted in the preparation of this report: TORBEN WOLFF, Zoological Museum, Copenhagen, for the opportunity to study the collections; ISABELLA GORDON, British Museum (Natural History), JACQUES FOREST, Natural History Museum, Paris, and F. A. MCNEILL, Australian Museum, for providing photographs and sketches and examining type material in their care; GERHARD PRETZMANN, Natural History Museum, Vienna, and KARL LANG and CHARLOTTE HOLMQUIST, Swedish State Museum of Natural History, Stockholm, for the loan of type specimens; L. B. HOLTTHUIS, Museum of Natural History, Leiden, for assistance with nomenclatural problems; and the administration of the Allan Hancock Foundation for the use of laboratory space and equipment. My heartiest thanks to all of them.

### Account of the Species.

Genus *Petrocheles* Miers, 1876.

MIERS created *Petrocheles* (as a subgenus of *Petrolisthes*) to accommodate two species, *P. spinosus* and *P. australiensis*. He designated neither species as type and, so far as I am aware, no such designation has ever been made. Accordingly, *Petrolisthes (Petrocheles) spinosus* MIERS is hereby selected as the type of genus *Petrocheles*.

One of the two species was collected by Dr. MORTENSEN.

#### *Petrocheles spinosus* (Miers).

*Petrolisthes (Petrocheles) spinosus* MIERS, 1876a, p. 222 (New Zealand); 1876b, p. 61, pl. 1, fig. 5.

*Petrocheles spinosus*, THOMSON, 1899, p. 191. BENNETT, 1932, p. 479, pl. 60, fig. 5.

Material: Slipper Island, New Zealand. Shore at low tide. Dec. 20, 1914. TH. MORTENSEN. 1♀  
Off New Plymouth, New Zealand. 8 fathoms. Hard bottom. Jan. 12, 1915. TH. MORTENSEN. 1♂.

Remarks: *Petrocheles spinosus* is a New Zealand endemic. It has been reported from depths as great as 46 fathoms, and is occasionally taken intertidally. A complete description of the species was given by BENNETT (1932).

Genus *Petrolisthes* Stimpson, 1858.

Approximately 30 species of *Petrolisthes* occur in the Indo-West Pacific area; of this number, 16 are represented in the Copenhagen Museum collections.

*Petrolisthes militaris* (Heller).

Fig. 1.

*Porcellana annulipes* WHITE, 1847, p. 63 (*nomen nudum*; Corregidor, Philippine Islands).

*Porcellana militaris* HELLER, 1862, p. 523 (Nicobars).

*Petrolisthes annulipes*, MIERS, 1884, pp. 270, 558, pl. 29, fig. B.

*Petrolisthes militaris*, ORTMANN, 1892, pp. 259, 265. LAURIE, 1926, p. 142. MIYAKE, 1943, pp. 54, 56, text-figs. 1-2.

Material: Tsugaru Strait, Japan. December, 1893. E. SUENSON. 1♂, 2♀♀.

Japan, 33°10'N, 129°18'E. 40 fathoms. Sept. 7, 1897. E. SUENSON. 1♂.

Nagasaki, Japan. With *Geryonia*. 1893. E. SUENSON. 1♂.

East China Sea, 26°30'N, 121°10'E. 42 fathoms. Mar. 14, 1896. SCHINAU. 1♂, 1♀.

East China Sea, 26°10'N, 121°00'E. 44 fathoms. Aug. 5, 1912. Capt. CHRISTIANSEN, "St. Nordiske Telegrafskab". 3♀♀ ovig.

Formosa Strait, 23°34'42"N, 119°49'04"E. 60 fathoms, from cable. Corals, barnacles. Aug. 26, 1929. "St. Nordiske Telegrafskab". 2♂♂, 5♀♀ ovig.

Formosa Strait, 23°08'N, 117°30'E. 24 fathoms. Jan. 23, 1912. E. SUENSON. 1♂.

Namoa Island, China. E. SUENSON. 5♂♂, 2♀♀ ovig.

South China Sea, 20°42'N, 113°26'E. 45 fathoms. "Shanghai". 2♀♀ (1 ovig.).

East Asia. 1893. E. SUENSON. 1♀ ovig.

East Asia. From cable. "St. Nordiske Telegrafskab". 7♂♂, 3♀♀ (2 ovig.).

San Bernardino Strait, Philippine Islands, 12°27'N, 124°03'E. 50-100 fathoms. Aug. 3, 1911. E. SUENSON. 2♂♂, 2♀♀ (1 ovig.), 4 juv.

Off Jolo (Sulu Archipelago), Philippine Islands. About 25 fathoms. Sand and coral. Mar. 19, 1914. TH. MORTENSEN. 1♂.

Kei Islands Expedition. St. 82. Sunda Strait, 6°38'S, 105°21'E. 35 meters. Sandy mud. July 30, 1922. 2♀♀ (1 ovig.).

Kei Islands Expedition. St. 67. Java Sea, 5°48'S, 106°12'E. 38 meters. Sand. July 27, 1922. 1♂.

Kei Islands Expedition. St. 72. Java Sea, 5°41'S, 105°57'E. 35 meters. Stones, sponges. July 28, 1922. 2♀♀ ovig.

Kei Islands Expedition. St. 104. Java Sea, 5°52'S, 106°04'E. 38 meters. Stones, sponges. Aug. 4, 1922. 1♂, 2♀♀ ovig., 1 juv.

Kei Islands Expedition. Amboina Bay, Amboina. About 50 fathoms. Stones, sand. Feb. 22, 1922. 1♂.

Kei Islands Expedition. Off Neira, Banda. 13 meters. Sand, diver. June 12, 1922. 1♂.

Kei Islands Expedition. St. 30. Between Doe Roa and Kei Doelah (Kei Islands). About 40 meters. Sand, shells. Apr. 18, 1922. 2♂♂, 4♀♀ (3 ovig.).  
 "Dana" Expedition 1928-30. St. 3667, off Queensland, Australia, 21°38.5'S, 150°15.5'E. 17 meters. Mar. 12, 1929. 1♂.

Remarks: *Petrolisthes militaris* is distributed throughout the Indian Ocean (Seychelles; Caragados; Chagos; southern India and Ceylon; Nicobars); from Tsugaru Strait, Japan, southward through the Japan and China Seas, and in the Philippine Islands; and in the East Indian Archipelago and northern Australia. The northernmost record has been Tanega-Shima, Japan (YOKOYA, 1933). Thus the Tsugaru Strait locality listed above is a considerable extension of range northward and, further-

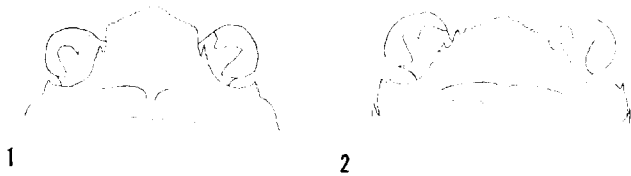


Fig. 1. *Petrolisthes militaris* (Heller). Anterior portion of carapace,  $\times 5$ .  
 Fig. 2. *Petrolisthes scabriculus* (Dana). Anterior portion of carapace,  $\times 5$ .

more, establishes the known northern limit of the species at the southern boundary of the Japanese temperate fauna (EKMAN, 1953, p. 22).

The species has been reported from coral reefs and from dredge hauls, the greatest recorded depth being 102 metres or about 56 fathoms (YOKOYA, 1933). The bathymetric range is extended to 100 fathoms on the basis of the Copenhagen Museum collections.

### ***Petrolisthes scabriculus* (Dana).**

Fig. 2.

*Porcellana scabricula* Dana, 1852, p. 424 (Sulu Sea); 1855, pl. 26, fig. 13.

*Petrolisthes scabriculus*, STIMPSON, 1858, p. 227. LAURIE, 1926, p. 143.

Material: "Galathea" Expedition 1950-52. St. 439, 23 kilometres north of Cebu, Philippine Islands. 1-2 meters. Corals. Aug. 12, 1951. 1♂.

North of Jolo (Sulu Archipelago), Philippine Islands. About 20 fathoms. Lithothamnion. Mar. 17, 1914. TH. MORTENSEN. 1♀ ovig.

Off Jolo. About 12 fathoms. Sand, coral. Mar. 17, 1914. TH. MORTENSEN. 1♀.

Off Jolo. About 25 fathoms. Sand, coral. Mar. 19, 1914. TH. MORTENSEN. 5♂♂, 5♀♀ (2 ovig.).

Off Jolo. 20-30 fathoms. Sand, coral. Mar. 19, 1914. TH. MORTENSEN. 3♂♂, 4♀♀ (3 ovig.).

Off Jolo. 20 fathoms. Diver. Mar. 21, 1914. TH. MORTENSEN. 1♀.

Off Jolo. 50 meters. Mar. 26, 1914. TH. MORTENSEN. 1♀.

Kei Islands Expedition. Off Neira, Banda. About 15 meters. Sand, diver; washed from gorgonids. June 9, 1922. 1♂, 1♀ ovig.

Kei Islands Expedition. St. 30. Between Doe Roa and Kei Doelah (Kei Islands). About 40 meters. Sand, shells. Apr. 18, 1922. 1♂, 1♀ ovig.

Remarks: *Petrolisthes scabriculus* and *P. militaris* have in common the following characters: carapace transversely rugose; a supraorbital spine, two epibranchials, and a few marginal midbranchial spinules; anterior margin of carpus of chelipeds with 4 or 5 teeth, and posterior margin with a row of spines; manus long and narrow, with a distinct longitudinal crest on dorsal surface; merus of walking legs spined on anterior margins. Several authors have suggested that the two forms are synonymous, but LAURIE (1926) presented good evidence that they are specifically distinct. On the basis of the rather extensive material available to me, I agree entirely with LAURIE and am able to add the following observations.

The form of the front is quite different in the two species. In *P. militaris* (fig. 1) the front is narrow, its margin minutely denticulate or crenulate, and the distinct inner orbital angle is not marked by a spinule. In *P. scabriculus* (fig. 2) the front is broader, its margin more distinctly denticulate than in *P. militaris*, and the inner orbital angle is marked by a distinct spinule.

The arrangement of spines on the posterior margin of the carpus seems to be nearly always constant (confined to the distal half of the margin in *militaris*, extending its entire length in *scabriculus*).

The midbranchial spinules tend to be smaller in *P. militaris* than in *P. scabriculus*. But the actual number of these spinules is somewhat variable, dependent to some extent on the size of the specimen.

In *P. militaris* the manus is transversely rugose to the inside of the longitudinal crest, and granular to the outside. In *P. scabriculus* it is granular (usually) on both sides of the crest.

The presence or absence of a fringe of hair on the outer surface of the manus is not a constant character, although the fringe tends to be longer and thicker in *scabriculus* and is apparently always present in that species, whereas it may be either present or absent in *militaris*.

On the basis of the present material and such published records as can be definitely identified with this species, *P. scabriculus* occurs in the Philippine Islands and the eastern part of the East Indian Archipelago. It has been collected in shallow water and to a depth of about 30 fathoms.

*Petrolisthes boscii* (Audouin).

SAVIGNY, 1809, pl. 7, fig. 2 (published without name or description).

*Porcellana boscii* AUDOUIN, 1826, p. 89 (Red Sea).

*Petrolisthes boscii*, STIMPSON, 1858, p. 227.

Material: Oyster Island, off Karachi (Pakistan). Shore; rock pool, under stones. Sept. 15, 1951. H. LEMCHE. 1♀, 4 juv.

Koh Chang, Gulf of Siam. In coral, about 1 fathom. Mar. 1, 1900. TH. MORTENSEN. 2 juv.

Remarks: *Petrolisthes boscii* is known from a number of localities in the northern Indian Ocean, and particularly the Red Sea; it is also reported from Western Australia and from Japan. It is an intertidal species.

*Petrolisthes hastatus* Stimpson.

*Petrolisthes hastatus* STIMPSON, 1858, pp. 228, 241 (Ousima and Kikaisima Islands, Ryukyus); 1907, p. 184, pl. 22, fig. 4. BAAL, 1937, pp. 56, 70, 84. MIYAKE, 1943, pp. 54, 62, text-figs. 5-6.

*Porcellana inermis* HELLER, 1862, p. 524 (Nicobars); 1865, p. 76, pl. 6, fig. 5.

*Petrolisthes inermis*, DE MAN, 1902, p. 691, pl. 23, fig. 36.

*Petrolisthes* n. sp.?, DE MAN, 1902, p. 692, pl. 23, fig. 37.

Material: "Galathea" Expedition 1950-52. St. 321, anchorage, Galathea Bay, Great Nicobar (Nicobar Islands), May 7, 1951. 2♀♀.

Koh Chang, Gulf of Siam. Rocky shore, low tide. January, 1900. TH. MORTENSEN. 1♂, 2♀♀ ovig.

Kei Islands Expedition. Elat, Nochoe-Joet Island (Kei Islands). Shore. Apr. 28, 1922. 1♂.

"Dana" Expedition 1928-30. St. 3619, small island off Noumea Harbor, New Caledonia. 0-0.5 meters. Dec. 5, 1928. 6♂♂, 6♀♀ (5 ovig.).

New Caledonia. June 16, 1934. "Mensunen". 1♂, 2♀♀ (1 ovig.).

Remarks: In certain characters, *Petrolisthes hastatus* shows considerable intraspecific variation. The carpus of the cheliped varies in its length-width ratio, being proportionately longer in larger specimens. Individuals differ in the form and development of the teeth on the anterior carpal margin; usually there are three low, wide-set teeth, but sometimes traces of additional teeth may be present between them, and at other times only two are developed. The hairs in the gape of the fingers are sometimes short and sometimes developed into a long tuft. The anterior margin of the merus of the first pair of walking legs may have a single spine or as many as six, or such spines may be altogether lacking; I have seen specimens in which the merus on one side is armed with one or two spines, while that on the other side is unarmed. Variation in these characters sometimes occurs among individuals from the same locality.

I have seen three syntypes (1 ♂, 2 ♀♀ ovig.) of *Porcellana inermis* HELLER, collected in the Nicobar Islands by the "Novara" Expedition of 1857-59. These exhibit all the variations in the characters mentioned above, and can certainly be referred to *Petrolisthes hastatus*, as already suggested by earlier writers. The form called *Petrolisthes* n. sp.? by DE MAN (1902) also seems to fall within the normal variation of *P. hastatus*.

Parasitism by rhizocephalans is reported by DE MAN (1902) and BAAL (1937); the latter author listed *Lernaeodiscus okadaï*, *Septodiscus flabellum*, and *Triangulus cornutus*.

*Petrolisthes hastatus* occurs in the northeastern part of the Indian Ocean; and in the western part of the Pacific Ocean, from about 30° N southward to the East Indian Archipelago and thence eastward to Samoa. It is an intertidal species.

#### ? *Petrolisthes hastatus*.

Material: Koh Chang, Gulf of Siam. Shore under stones at low water. Jan. 12, 1900.

TIL. MORTENSEN. 3 juv.

Koh Chang. About 1 fathom, in coral. Mar. 1, 1900. TIL. MORTENSEN. 1 juv.

Remarks: The above specimens resemble *Petrolisthes hastatus*, but are too small to identify with certainty.

#### *Petrolisthes*, sp.

Material: Puerto Galero (Mindoro), Philippine Islands. Shore. Feb. 4, 1914.

TIL. MORTENSEN. 2 ♀♀ ovig.

Zamboanga (Mindanao), Philippine Islands. Rocky shore. Feb. 25, 1914. TIL. MORTENSEN. 3 ♂♂, 2 ♀♀ ovig.

Remarks: The material listed above resembles *Petrolisthes hastatus* in certain features and *P. asiaticus* in others, and possibly belongs to an undescribed species. I hesitate to describe it at this time, preferring to wait until more specimens become available for examination.

#### *Petrolisthes asiaticus* (Leach).

*Pisidia asiatica* LEACH, 1820, p. 54 (Mauritius).

*Petrolisthes asiaticus*, STIMPSON, 1858, p. 227. DE MAN, 1896, p. 376; 1898, pl. 32, figs. 48a-b; 1902, p. 694. MIYAKE, 1942, p. 334, text-figs. 1-2; 1943, p. 95, text-fig. 27.

*Petrolisthes leporinoides* ORTMANN, 1892, pp. 259, 263 (South Seas).

*Petrolisthes lamarcki* var. *asiaticus*, BORRADAILE, 1898, p. 464, pl. 36, fig. 1(?), 1b (not all synonymy).

*Petrolisthes yaeyamensis* MIYAKE, 1937b, p. 157, text-fig. (Ryukyu Islands).



Material: ? Puerto Galero (Mindoro), Philippine Islands. TH. MORTENSEN. 1 ♀ (juv.). "Galathea". Expedition 1950 52. St. 415, Tubajon Bay, Dinagat, Philippine Islands, 10 20' N, 125°32' E. Coral reef in tidal zone. July 17-19, 1951. 1 ♂.

Koh Chang, Gulf of Siam. About 1 fathom, in coral. Mar. 1, 1900. TH. MORTENSEN. 2 ♂♂, 6 ♀♀ (4 ovig.).

Koh Kahdat, Gulf of Siam. 1 fathom, coral and coral blocks. January-February, 1900. TH. MORTENSEN. 2 ♂♂, 2 ♀♀ (1 ovig.).

Apia, Upalu, Samoa. Apr. 23, 1934. "Monsunen". 6 ♂♂, 2 ♀♀ (1 ovig.).

Remarks: There has been much controversy and confusion regarding both the status and the nomenclature of this species and the following one. The types and a great deal of additional material need to be examined, but in the meantime I follow MIYAKE's (1942 and 1943) definition of the two forms.

*Petrolisthes asiaticus* seems to be widely distributed in both the Indian and Pacific Oceans. Because of early confusion among several species, it will be necessary to re-examine material on which several records were based before the geographical limits of the species can be precisely defined. It is a littoral form.

### *Petrolisthes lamarckii* (Leach).

*Pisidia lamarckii* LEACH, 1820, p. 54 (no locality).

*Porcellana dentata* H. MILNE EDWARDS, 1837, p. 251 (Java).

?*Porcellana pulchripes* WHITE, 1847, p. 129 (*nomen nudum*; Madgica-Sima Group).

*Porcellana speciosa* Dana, 1852, p. 417 (Kingsmills, Wake Island, Mangsi Islands, Tuamotus); 1855, p. 26, fig. 8.

*Petrolisthes lamarckii*, STIMPSON, 1858, p. 227. MIYAKE, 1942, pp. 334, 342, text-figs. 7 8; 1943, pp. 56, 98, text-fig. 29.

*Porcellana bellis* HELLER, 1865, p. 76, pl. 6, fig. 4 (Nicobars).

*Porcellana* (*Petrolisthes*) *dentata*, DE MAN, 1888a, p. 216.

*Petrolisthes lamarcki*, ORTMANN, 1894, pp. 25, 26 (not all synonymy). BORRADAILE, 1898, p. 464, pl. 36, fig. 1a.

*Petrolisthes dentatus*, DE MAN, 1896, p. 374; 1898, pl. 32, figs. 47a, b, 48c.

*Petrolisthes lamarcki* var. *rufescens*, BORRADAILE, 1898, p. 465. MIYAKE, 1942, pp. 334, 345, pl. 1, fig. 2, text-figs. 9-10; 1943, pp. 56, 100, text-fig. 30.

*Petrolisthes obtusifrons* MIYAKE, 1937a, p. 155, text-fig. (Ryukyu Islands).

Material: Polana Beach, Lourenço Marques, Mozambique. Sand beach at low tide. Sept. 3, 1929. TH. MORTENSEN. 2 ♂♂.

Cannonier's Point, Mauritius. October, 1929. TH. MORTENSEN. 3 ♂♂, 1 ♀ ovig.

Puerto Galero (Mindoro), Philippine Islands. Shore, coral reef. Feb. 2, 1914. TH. MORTENSEN. 1 ♂, 1 ♀.

Kei Islands Expedition, Lebesi, Sunda Strait. Shore, under stones at low tide. July 31, 1922. 1 ♂.

New Hebrides. July 10, 1934. "Monsunen". 1 ♀ ovig.

New Hebrides. July 15, 1934. "Monsunen". 1♂, 1♀.  
 Apia, Upalu, Samoa. Apr. 23, 1934. "Monsunen". 2♂♂, 2♀♀ ovig.  
 Takarua, Tuamotu Islands. Mar. 16, 1934. "Monsunen". 1♀ ovig.

Remarks: All the described forms listed above should probably be included in the synonymy of *Petrolisthes lamarckii*, but several species considered synonyms by BORRADAILE (1898) have to be excluded. The species has been redescribed several times because it is somewhat variable in a number of characters. The character that has caused the most confusion is the presence or absence of an epibranchial spine. BORRADAILE included *Petrolisthes rufescens* (HELLER) in the synonymy of *P. lamarckii*, and designated individuals without an epibranchial spine as *P. lamarckii* var. *rufescens*; in this he was followed by MIYAKE (1942, 1943). However, *Petrolisthes rufescens* (HELLER) is a distinct and valid form (see Remarks in the account of that species).

BAAL (1937) reported specimens parasitized by rhizocephalans, *Lernaediscus okadai*, *Septodiscus flabellum*, and *Triangulus cornutus*.

*Petrolisthes lamarckii* ranges throughout the entire Indo-West Pacific, where it is the most abundant littoral porcellanid.

### ***Petrolisthes rufescens* (Heller).**

*Porcellana rufescens* HELLER, 1861a, p. 24 (Red Sea); 1861b, p. 255, pl. 2, fig. 4.  
*Petrolisthes rufescens*, PAULSON, 1875a, p. 32, pl. 1, fig. 8; 1875b, p. 88. NOBILI, 1906a, p. 66 (part); 1906b, pp. 129, 130 (part).  
*Porcellana (Petrolisthes) rufescens*, HILGENDORF, 1878, p. 825, pl. 2, fig. 7.  
*Petrolisthes armatus?*, SOUTHWELL, 1909, p. 119, fig. 10 of pl. Not *P. armatus* (GIBBES).

Material: "Galathea" Expedition 1950-52. St. 221, Diego-Suarez, Madagascar. Shore, rocks. Mar. 2, 1951. 4♀♀ ovig.  
 "Galathea" Expedition 1950-52. St. 321, Galathea Bay, Great Nicobar (Nicobar Islands). Shore, sand and corals. May 6, 1951. 1♀ ovig.

Remarks: *Petrolisthes rufescens* is closely related to *P. lamarckii* (LEACH), and has often been considered synonymous with it; but after examining a number of specimens I believe that *P. rufescens* is sufficiently distinct to be considered a valid species, at least for the present. I hope to discuss the relationships of the two forms in another paper. One character which distinguishes *P. rufescens* from *P. lamarckii* is the absence in the former species of strong teeth along the posterior margin of the carpus of the cheliped; instead there is a ridge which is unarmed or at the most bears one or two feebly developed denticles. HILGENDORF (1878) and SOUTHWELL (1909) give good illustrations of the species.

I have examined four syntypes (2♂♂, 2♀♀) of *Porcellana rufescens*

HELLER, collected by FRAUENFELD in the Red Sea in 1855 and deposited in the Natural History Museum, Vienna. At the request of Dr. GERHARD PRETZMANN, I hereby select one of these specimens as lectotype: it is a male with the carapace measuring 6.4 mm long and 6.3 mm wide.

*Petrolisthes rufescens* is a littoral species, and probably an Indian Ocean endemic. Most, and probably all, records from the Pacific are based on specimens of *Petrolisthes lamarckii* without an epibranchial spine. Verified localities for *P. rufescens* include Zanzibar, Mozambique, Red Sea, Persian Gulf, and Gulf of Cutch.

***Petrolisthes novaezelandiae* Filhol.**

*Petrolisthes novae-zelandiae* FILHOL, 1885, p. 408 (Cook Strait and Stewart Island, New Zealand); pl. 48, figs. 4-5 (*novae zelandiae*).

*Petrolisthes stewarti* FILHOL, 1885, p. 410 (Stewart Island, New Zealand); pl. 48, figs. 1-3, 6.

*Petrolisthes novae-zealandiae*, BENNETT, 1932, p. 476, pl. 60, figs. 3-4.

Material: All the following localities are in New Zealand:

North Channel, Kawau Island, Hauraki Gulf. 10 fathoms. Hard bottom. Dec. 29, 1914. TH. MORTENSEN. 2♂♂, 3♀♀ (2 ovig.), 1 juv.

"Dana" Expedition 1928-30. St. 3633, Hauraki Gulf, 36° 31' S, 174° 57' E. 48 meters. Jan. 2, 1929. 1♀ ovig.

"Dana" Expedition 1928-30. St. 3632, Auckland. 5-20 meters. Dec. 1928. 1♂.

"Galathea" Expedition 1950-52. St. 642, Auckland Harbour. Old bucket with epifauna. Jan. 28, 1952. 1♀.

"Galathea" Expedition 1950-52. St. 647, between Crusoe Island and Motuihi, off Auckland. 30 meters. Feb. 3, 1952. 5♂♂, 5♀♀ (4 ovig.).

"Galathea" Expedition 1950-52. St. 648, between Rangitoto Island and Devonport. 10 meters. Shell, gravel. Feb. 8, 1952. 2♂♂.

"Galathea" Expedition 1950-52. St. 666, lighthouse, northwest point of Rangitoto, off Auckland. 10-20 meters. Feb. 27, 1952. 4♂♂, 1♀ ovig.

Wellington Harbour. 5-10 fathoms. Hard bottom. Feb. 16, 1915. TH. MORTENSEN. 1♂, 1♀ ovig.

Queen Charlotte Sound. 3-10 fathoms. Hard bottom. Jan. 19-20, 1915. TH. MORTENSEN. 190 specimens.

Lyttelton Harbour. 1-5 fathoms. Mud. August, 1897. H. SUTER. 2♂♂.

Akaroa Harbour. 6 fathoms. Mud. 1897. H. SUTER. 3♀♀ (1 ovig.).

"Galathea" Expedition 1950-52. St. 597, Portobello, Otago Harbour, 10 miles east of Dunedin. Shore, rocks. Jan. 9, 1952. 1♀ ovig.

Remarks: The species is a New Zealand endemic. It has been reported from the littoral and in depths to 40 fathoms.

***Petrolisthes teres* Melin.**

*Petrolisthes inermis* HASWELL, 1882, p. 757 (Port Denison, Australia). MIYAKE, 1943, pp. 55, 80, text-figs. 16-17.

*Petrolisthes teres* MELIN, 1939, p. 104 (new name for *P. inermis* HASWELL, 1882).

Material: Coast of Lem Ngob, Gulf of Siam, 0-1 fathom. Stones and mud. Dec., 1899. TH. MORTENSEN. 11 ♂♂, 8 ♀♀ (4 ovig.).  
 Koh Chang, Gulf of Siam. Rocky shore at low tide. January, 1900. TH. MORTENSEN. 7 ♂♂, 5 ♀♀ (3 ovig.), 3 juv.  
 Koh Chang. Shore at low tide, under stones. Jan. 12, 1900. TH. MORTENSEN. 1 ♂, 2 ♀♀ ovig.  
 Koh Chang. About 1 fathom, in coral. Mar. 1, 1900. TH. MORTENSEN. 1 ♂, 1 ♀ ovig.  
 Bay at south end of Koh Chang. Shore, among large oysters. Mar. 14, 1900. TH. MORTENSEN. 1 ♀ ovig.  
 Gulf of Siam, 1900. TH. MORTENSEN. 17 juv.

Remarks: HASWELL (1882) described this species under the name *Petrolisthes inermis*. The name is a junior secondary homonym of *Porcellana inermis* HELLER, 1862, which is a *Petrolisthes* (= *Petr. hastatus* STIMPSON), and therefore invalid according to the revised International Code of Zoological Nomenclature, which states: "A species-group name that is a junior secondary homonym must be rejected by any zoologist who believes that the two species-group taxa in question are congeneric" (Article 59(b), p. 57). MELIN (1939) properly rejected the name *Petrolisthes inermis* HASWELL, introducing *Petr. teres* as a replacement for it; and MELIN's name must be used for the species in question.

However, MELIN was in error in identifying his Bonin (Ogasawara) Islands material with this species. MELIN's specimens belong to another, apparently unnamed form, which is not represented in the present collection and will be discussed elsewhere.

With the Bonin Islands record eliminated, the species is reported only from a number of Australian localities. On the basis of the MORTENSEN collections, its range can now be extended to the Gulf of Siam. I have compared Dr. MORTENSEN's material with specimens from Australia and with photographs of two syntypes of *Petrolisthes inermis* HASWELL from Port Denison, Queensland (Australian Museum Reg. No. P. 3891).

*Petrolisthes teres* is an intertidal species.

### ***Petrolisthes japonicus* (de Haan).**

*Porcellana japonica* DE HAAN, 1849, p. 199, pl. 50, fig. 5 (Japan).

*Petrolisthes japonicus*, STIMPSON, 1858, pp. 227, 211; 1907, p. 181. MIYAKE, 1943, pp. 55, 72, text-figs. 11-13.

Material: Misaki, Japan. Shore, under stones. Apr. 28, 1914. TH. MORTENSEN. 8 ♀♀.

Remarks: BOSCHMA (1935, p. 152) reported specimens parasitized by rhizocephalans, *Lernaeodiscus cornutus* and *L. okadaei*. BAAL (1937, p. 70) reported material parasitized by another rhizocephalan, *Septodiscus flabellum*. It is possible, however, that the specimens were misidentified in

the latter case (Aroe Islands, Moluccas) and the same may be true of certain other records for *Petrolisthes japonicus*, e.g. DE MAN, 1888a, p. 215 (Merqui Archipelago) and DE MAN, 1896, p. 373 (Borneo and Malacca), which may well represent further extra-Australian records of *Petrolisthes teres* MELIN. On the whole, *P. japonicus* seems to be confined to Japan and adjacent islands, where it occurs intertidally.

***Petrolisthes elongatus*** (H. Milne Edwards).

*Porcellana elongata* H. MILNE EDWARDS, 1837, p. 251 (New Zealand).

*Petrolisthes elongatus*, STIMPSON, 1858, p. 227. BENNETT, 1932, p. 473, pl. 60, figs. 1-2.

Material: All the following localities are in New Zealand:

New Zealand. Aug. 18, 1906. H. MORTENSEN. 1 ♂.

Bay of Islands. Shore, under stones. Jan. 1, 1915. TH. MORTENSEN. 1 ♂ (juv.).

Kaipara. Shore; sand, stones. Jan. 8, 1915. TH. MORTENSEN. 1 ♀.

Kaipara. Shore. Jan. 9, 1915. TH. MORTENSEN. 1 ♂, 4 ♀♀ (2 ovig.).

"Dana" Expedition 1928-30. St. 3632, Auckland. 5 20 meters. December, 1928. 1 ♂, 3 ♀♀ ovig.

Pouai Island off Auckland. Shore, under stones. Dec. 24, 1914. TH. MORTENSEN. 12 ♂♂, 1 ♀ ovig., 5 juv.

Rangitoto Island off Auckland. Shore, under stones. Dec. 27, 1914. TH. MORTENSEN. 2 ♂♂.

"Galathea" Expedition 1950-52. St. 643, Manukau Harbour, 37°05'S, 174°45'E. Tidal flat, mud. Jan. 29, 1952. 1 ♂, 3 ♀♀ (2 ovig.).

Slipper Island. Shore at low tide. Dec. 20, 1914. TH. MORTENSEN. 1 ♂, 2 ♀♀ (1 ovig.).

Mahia Peninsula. Shore, under stones at low tide. Dec. 18, 1914. TH. MORTENSEN. 1 ♂, 2 ♀♀.

Cape Kidnappers. September, 1909. H. MORTENSEN. 3 juv.

Wellington. Aug. 8, 1938. P. HEEGAARD. 1 ♂, 1 ♀.

"Galathea" Expedition 1950-52. St. 579, Wellington Harbour. Wharf piles. Dec. 27, 1951. 1 ♂, 1 ♀ ovig.

Akaroa Harbour. Shore, under stones. Dec. 14, 1914. TH. MORTENSEN. 14 ♂♂, 7 ♀♀ (5 ovig.), 2 juv.

"Galathea" Expedition 1950-52. St. 597, Portobello, Otago Harbour, 10 miles east of Dunedin. Shore, rocks. Jan. 9, 1952. 85 ♂♂, 61 ♀♀ (50 ovig.).

Paterson Inlet, Stewart Island. Shore. Nov. 18, 1914. TH. MORTENSEN. 19 ♂♂, 13 ♀♀ (12 ovig.).

Remarks: In common with several other porcellanids inhabiting colder waters, this species grows to considerably larger size than do most tropical members of the family. The largest male collected at "Galathea" St. 597 measured 21.2 mm in carapace length and 19.3 mm in breadth; the largest ovigerous female from the same station was 18.4 mm long.

*Petrolisthes elongatus* is confined to New Zealand, except for Tasmania, where it is said to be common, and some indefinite records from "coast

of Australia". It occurs intertidally and in shallow water. Specimens were taken at "Dana" St. 3632 in 5-20 meters, along with one example of *P. novaezelandiae* FILHOL.

***Petrolisthes ornatus*** Paulson.

*Petrolisthes ornatus* PAULSON, 1875a, p. 32, pl. 1, fig. 10 (*nomen nudum*); 1875b, p. 86, pl. 11, fig. 3 (Red Sea).

*Porcellana (Petrolisthes) mossambica* HILGENDORF, 1878, p. 825, pl. 2, figs. 6, 6a (Mozambique).

*Porcellana tuberculosa*, SOUTHWELL, 1909, p. 114, fig. 4 of pl. Not *Petrolisthes tuberculosa* (H. MILNE EDWARDS).

Material: "Galathea" Expedition 1950-52. St. 221, Diego-Suarez, Madagascar. Shore, under stones. Mar. 2, 1951. 1♀ ovig.

Remarks: *Petrolisthes ornatus* is an intertidal species, apparently restricted to the western portion of the Indian Ocean; it is recorded from Zanzibar, Mozambique, Red Sea, and Gulf of Kutch. The "Galathea" specimen is the first to be reported from Madagascar.

***Petrolisthes indicus*** de Man.

*Petrolisthes indicus* DE MAN, 1893, p. 293, pl. 7, figs. 3, 3a (Flores). MIYAKE, 1943, p. 55, 69, text-figs. 9-10.

*Petrolisthes securiger* MELIN, 1939, p. 109, text-figs. 67-68 (Ogasawara Islands).

Material: Zamboanga, Philippine Islands. Rocky shore. Feb. 25, 1914. TH. MORTENSEN. 1♀ ovig.

Kei Islands Expedition. Amboina. Shore at low tide. February, 1922. 1♀ ovig.

Remarks: This species was previously reported only from the Bonin (Ogasawara) Islands; Taiwan; and Flores in the East Indian Archipelago. It is an intertidal form.

***Petrolisthes tomentosus*** (Dana).

*Porcellana tomentosa* Dana, 1852, p. 420 (Tuamotu Islands); 1855, pl. 26, fig. 10.

*Petrolisthes tomentosus*, STIMPSON, 1858, p. 227. MIYAKE, 1943, pp. 55, 85, text-figs. 19-21.

*Petrolisthes pubescens* STIMPSON, 1858, pp. 228, 241 (Ousima Island, Ryukyu Islands); 1907, p. 183, pl. 22, fig. 3.

Material: New Caledonia. June 19, 1934. "Monsunen". 12♂♂, 8♀♀.

Remarks: *Petrolisthes tomentosus* has been reported from Mauritius, Red Sea, southern Japan, Ryukyu Islands, Taiwan, Queensland, New Caledonia, and Tuamotu Islands. It is an intertidal species.

***Petrolisthes penicillatus*** (Heller).

*Porcellana penicillata* HELLER, 1862, p. 523 (Nicobars).

*Porcellana villosa* RICHTERS, 1880, p. 160, pl. 17, figs. 11-12 (Mauritius).

*Petrolisthes penicillatus*, ORTMANN, 1897, pp. 287, 288. MIYAKE, 1942, p. 347, text-figs. 11-12; 1943, pp. 55, 83, text-fig. 18.

Material: Mauritius. REGNARD. 2♂♂, 1♀ ovig.

Remarks: *Petrolisthes penicillatus* has been reported from the Amirantes Islands, Mauritius, Madagascar, and the Nicobar Islands in the Indian Ocean, and from the Ryukyu, Palao, and Fiji Islands in the Pacific Ocean. It is an intertidal species.

***Petrolisthes***, species indeterminable.

Koh Chang, Gulf of Siam. Shore, low tide, under stones. Jan. 14, 1900. TH. MORTENSEN. 1 juv.

Kei Islands Expedition. Banda. About 20 meters. Diver; washed from sponge. June 10, 1922. 1 juv.

Kei Islands Expedition. Kei Islands or Banda. Sediment from a pail. 1922. 1 juv.

Genus ***Pachycheles*** Stimpson, 1858.

*Pachycheles* is represented by about 10 species in the Indo-West Pacific area. Three of these species are present in the Copenhagen Museum collection.

***Pachycheles sculptus*** (H. Milne Edwards).

*Porcellana sculpta* H. MILNE EDWARDS, 1837, p. 253 (Java).

*Porcellana pisum* H. MILNE EDWARDS, 1837, p. 254 (China).

*Porcellana pulchella* HASWELL, 1882, p. 758 (Holborn Island and Port Mølle, Australia).

*Pachycheles pulchellus*, MIERS, 1884, p. 273, pl. 30, fig. A.

*Pachycheles sculptus*, ORTMANN, 1894, p. 29.

*Pachycheles sculptus* var. *pisum*, BORRADDAILE, 1900, p. 423.

*Pisosoma pisum*, MIYAKE, 1943, pp. 110, 112, text-figs. 38-39.

Material: San Bernardino Strait, Philippine Islands, 12°27'N, 124°03'E. 50-100 fathoms. Aug. 3, 1911. E. SUENSON. 1 ♀.

Off Jolo (Sulu Archipelago), Philippine Islands. 20-30 fathoms. Sand and coral. Mar. 19, 1914. TH. MORTENSEN. 9♂♂, 5♀♀ (3 ovig.).

Koh Chang, Gulf of Siam. About 1 fathom. Coral. Mar. 1, 1900. TH. MORTENSEN. 3♂♂, 5♀♀ (2 ovig.).

Koh Kahdat, Gulf of Siam. About 1 fathom. Coral. January-February, 1900. TH. MORTENSEN. 5♂♂, 3♀♀ (1 ovig.).

Singapore. Shore, low tide. 1907. Consul SV. GAD. 1♂, 2♀♀ ovig.

Singapore. Shore, low tide. Oct. 23, 1910. Consul SV. GAD. 1♀ ovig.

- Onrust off Djakarta, Java. Corals. April, 1929. TH. MORTENSEN. 1 ♀ ovig.  
 Kei Islands Expedition. St. 14. South of Doe Roa (Kei Islands). About 40 meters.  
 Sand. Apr. 10, 1922. 2 ♂♂.  
 Kei Islands Expedition. St. 11. Off Toعال (Kei Islands). 20 meters. Sand. Apr. 9,  
 1922. 1 ♂.  
 Kei Islands Expedition. St. 19. Off Toعال. 20 meters. Sand. Apr. 14, 1922. 1 ♀.

Remarks: This species is characterized by the smooth, strongly convex carapace; the frontal margin, which is transverse in dorsal view and without a tuft of hairs; the presence of long, non-plumose hairs on the walking legs; five plates in the telson of the abdomen; and the absence of pleopods in males. While it shows great stability in all these characters, it is highly variable in the structure of the chelipeds, which may be smooth or extremely tuberculate. As a result there has been a great deal of confusion, with the smooth and tuberculate varieties considered by many writers to be separate species; while, at the same time, the variety with tuberculate chelipeds has been confused with certain closely related but distinct Indo-West Pacific species.

I have examined a large number of specimens of *Pachycheles sculptus*, and have observed all gradations between the extremes in the form of the cheliped. The chela may be completely smooth or somewhat pitted; it may show incipient smooth ridges, or have four smooth, well-developed, narrow, longitudinal ridges; each of these ridges may have a series of slightly oblique grooves across it, so that the chela appears to have four longitudinal rows of close-set tubercles. The wide interspaces between these rows may be smooth, pitted, or with small, wide-set tubercles. The carpus may be completely smooth, or have low, somewhat overlapping tubercles; or it may have irregular rows of strong, squamate tubercles, some of them transversely elongate. Both chelipeds may be similar in the degree of tuberculation, or the minor chela may be more strongly ridged and tuberculate than the major. The presence of low, smooth ridges on the chela and the completely smooth condition seem to occur more commonly in larger specimens, while the strongly tuberculate chelae are much more often encountered in small individuals; furthermore, a more completely smooth and strongly convex carapace seems to accompany smoother chelae and greater size. It would be most interesting to study these animals in life, to determine whether individuals become increasingly smooth with each successive moult.

*Porcellana pisum* H. MILNE EDWARDS was described from material with smooth chelipeds; the name *pisum* has been applied by most subsequent writers to the smooth form, with *Porcellana pulchella* HASWELL



(described from specimens with smooth ridges on the chela) generally considered a synonym of it. H. MILNE EDWARDS also described *Porcellana sculpta*, a species with tuberculate chelipeds. In view of the fact that there are several very closely related *Pachycheles* species with tuberculate chelipeds, which are distinguished by characters not mentioned in H. MILNE EDWARDS' description, it was necessary to find out to which of these species the type of *Porcellana sculpta* belongs. Dr. J. FOREST of the Paris Museum kindly supplied me with information on and photographs of the type of *Porcellana sculpta*, from which it is evident that H. MILNE EDWARDS was dealing with an example of the tuberculate variety of the present species.

H. MILNE EDWARDS, therefore, described simultaneously two species, *Porcellana pisum* and *P. sculpta*, which prove to be synonymous. The correct name to be applied to the species depends upon the first author to consider the two as synonyms. After going through all the literature dealing with these names, I find that the first reviser was BORRADAILE (1900), who discussed the variations in the cheliped and called the species *Pachycheles sculptus*, making *pisum* a variety of it. Thus *Pachycheles sculptus* is the name that must be used for the species.

There are two other Indo-West Pacific *Pachycheles* species which agree with *P. sculptus* in having a broad, truncate frontal margin; a similar arrangement of teeth on the anterior margin of the carpus of the cheliped; non-plumose hairs on the walking legs; a five-plated telson; and absence of pleopods in the male. They differ from H. MILNE EDWARDS' species in having rugosities on the anterior portion of the carapace, and a different arrangement of the tuberculations on the chelipeds; in *P. sculptus* the anterior regions of the carapace are smooth and, when the chelae are tuberculate, the tubercles tend to be arranged in longitudinal rows with wide interspaces between these rows. These two species have both appeared in the literature as *sculptus*: one of them was discussed by GRANT and McCULLOCH (1906, p. 40, pl. 2, fig. 1, as *Pachycheles sculptus*) and the other by MIYAKE (1942, p. 374, text-figs. 33-35, and 1943, p. 110, text-fig. 37, as *Pisosoma sculptum*). Neither of these species is included in the present collection and they will not be discussed further here, but it should be pointed out that both of them are without names.

*Pachycheles sculptus* appears to be rather widely distributed in the western and central Pacific, in the littoral and in depths to about 50 fathoms. A few records from the easternmost portion of the Indian Ocean have been confirmed; but most Indian Ocean records are probably based on *Pachycheles natalensis* (KRAUSS), which will be discussed below.

***Pachycheles natalensis*** (Krauss).

*Porcellana natalensis* KRAUSS, 1843, p. 58, pl. 4, figs. 1, 1a c (Natal, South Africa).

*Pachycheles natalensis*, STIMPSON, 1858, p. 228. BARNARD, 1950, p. 472, text-fig. 87.

*Pisosoma natalensis*, PAULSON, 1875b, p. 88, pl. 11, fig. 5.

*Pisosoma sculpta*, GRAVELY, 1927, p. 140, pl. 20, fig. 8.

Material: Paumben (– Pamban), India. 15 fathoms. April, 1889. K. FRISTEDT.

1♂, 2♀♀ ovig.

Remarks: *Pachycheles natalensis* has occasionally been confused with *P. sculptus*, but the two species are quite unlike in several respects. *P. natalensis*, which was illustrated by KRAUSS (1843), PAULSON (1875b), GRAVELY (1927), and BARNARD (1950), may be distinguished at once by the frontal margin which is narrow, rounded-triangular, and somewhat projecting in dorsal view, instead of broad and transverse as in *P. sculptus*; the anterior regions of the carapace, which are roughened instead of smooth; the chelae with broad, longitudinal, granular swellings defined by deep grooves, very different in appearance from the chelae of *P. sculptus*; and the presence of a pair of pleopods in males. Some specimens of *P. natalensis* (including those reported above) have a long, thick tuft of fine hairs on the lower surface of the major chela, at the base of the fingers, while in other individuals such a tuft is completely absent.

Specimens from the Persian Gulf and Red Sea reported by NOBILI (1906a, p. 67, and 1906b, p. 136) as *Pachycheles sculptus* are certainly *P. natalensis*, for NOBILI mentions the tuft of hairs at the base of the fingers. A specimen from Dar-es-Salaam reported by ORTMANN (1894, p. 29) as *P. sculptus* was said to agree perfectly with KRAUSS' description and illustration, so it was presumably *P. natalensis* also. Certain other specimens from the Indian Ocean referred to *P. sculptus* should be re-examined in order to determine their status.

*Pachycheles natalensis* is apparently an Indian Ocean endemic. It ranges along the eastern coast of Africa to nearly as far south as Durban, and occurs in the Red Sea and Persian Gulf and as far east as the Gulf of Manaar off southern India. It has been dredged in shallow water.

***Pachycheles pisoides*** (Heller).

*Porcellana pisoides* HELLER, 1865, p. 73, pl. 6, fig. 3 (Nicobars).

*Pachycheles lifuensis* BORRADAILE, 1900, p. 424 (Lifu, Loyalty Islands).

*Pachycheles pisoides*, EDMONDSON, 1925, p. 19.

*Pachycheles fronto* MELIN, 1939, p. 114, text-figs. 69-71 (Bonin Islands).

Material: Honolulu, Hawaiian Islands. Coral. May 1, 1915. TH. MORTENSEN. 2♂♂,

3♀♀ ovig.

Remarks: *Pachycheles pisoides* can be distinguished from other Indo-West Pacific members of the genus by the following combination of characters: carapace, chelipeds, and walking legs covered with non-plumose hairs; telson of the abdomen with five segments; and a pair of pleopods present in males. The hair structure, number of segments (five or seven) in the telson, and presence or absence of male pleopods are now recognized to be of taxonomic importance in *Pachycheles*, but these characters were seldom mentioned in earlier descriptions. Therefore it was necessary to check on them in the types of *Porcellana pisoides* HELLER, *Pachycheles lifuensis* BORRADAILE, and *Pachycheles fronto* MELIN, species which seemed to be otherwise identical. I was able to borrow a female type of *Porcellana pisoides* from the Vienna Museum, and a female type of *Pachycheles fronto* from the Stockholm Museum, and to compare them with male specimens from close to their respective type localities. Dr. ISABELLA GORDON confirmed the presence of the characters mentioned above in the two syntypes of *Pachycheles lifuensis* in the Cambridge Museum. There can be little doubt that all these nominal forms belong to a single species.

*Pachycheles pisoides* has a wide distribution in the Indian and western Pacific Oceans; published records and material I have seen are all from island groups. It is a littoral species and is frequently found associated with corals.

#### Genus *Polyonyx* Stimpson, 1858.

The Indo-West Pacific *Polyonyx* species were recently reviewed by JOHNSON (1958), who recognized 14 species from that area. Eight species are represented in the Copenhagen Museum collection.

#### *Polyonyx pygmaeus* (de Man).

*Porcellana pygmaea* DE MAN, 1902, p. 698, pl. 23, figs. 38, 38a-c (Ternate).

*Polyonyx pygmaeus*, NOBILI, 1906a, p. 74. LAURIE, 1926, p. 153. JOHNSON, 1958, pp. 98, 100.

Material: Between Koh Mesan and Cape Liant, Gulf of Siam. 5-8 fathoms. Sand, stones. Feb. 7, 1900. TH. MORTENSEN. 1 juv.

West of Koh Kut, Gulf of Siam. About 15 fathoms. Mud. Mar. 4, 1900. TH. MORTENSEN. 2 juv.

Kei Islands Expedition. St. 67. Java Sea, 5°48'S, 106°12'E. 38 meters. Sand. July 27, 1922. 3 juv.

Kei Islands Expedition. St. 104. Java Sea, 5°52'S, 106°04'E. 38 meters. Stones, sponge washings. Aug. 4, 1922. 1 juv.

Kei Islands Expedition. Amboina, on harbor mole. About 1 meter. Feb. 28, 1922. 1 juv.

Kei Islands Expedition. Off Neira, Banda. About 15 meters. Sand, diver. June 9, 1922. 1♀ ovig.

Kei Islands Expedition. Banda. About 15 meters. Sand; washed from *Acanthogorgia*. June 15, 1922. 1♀, 2 juv.

Remarks: Most of the material was extremely small and difficult to study; the largest of the juveniles was only 1.3 mm in length, while the ovigerous female from Neira had a length of 2.8 mm and breadth of 3.4 mm. The ovigerous female holotype measured  $2.3 \times 2.5$  mm, and LAURIE's male specimen  $2.75 \times 2.75$  mm.

The species was previously known from only three specimens, one each from the Persian Gulf, Cargados Carajos, and Ternate. The present material agrees well with the accounts of DE MAN and LAURIE. The bathymetric range is shallow water to 30 fathoms.

***Polyonyx suluensis*** (Dana), n. comb.

Fig. 3.

*Porcellana suluensis* DANA, 1852, p. 414 (Sulu Sea); 1855, pl. 26, fig. 4. RATHBUN, 1924, p. 30, pl. 1, figs. 15-16. GORDON, 1935, p. 9, text-fig. 4. MIYAKE, 1942, p. 354, text-figs. 15-16; 1943, pp. 117, 128, text-fig. 49.

*Polyonyx denticulatus* PAULSON, 1875a, p. 32, pl. 11, fig. 11 (*nomen nudum*); 1875b, p. 89, pl. 11, fig. 6 (Red Sea). NOBILI, 1906b, pp. 136, 138. LAURIE, 1926, p. 151. JOHNSON, 1958, pp. 98, 100, text-fig. 1.

*Polyonyx hexagonalis* ZEHNTNER, 1894, p. 187, pl. 8, figs. 18, 18a (Amboina).

*Pisidia suluensis*. HAIG, 1960, p. 209.

Material: Off west side Kyushyu Island, Japan. 32°42'54"N, 129°44'20"E. 31 fathoms. Rock and sand. Aug. 31, 1931. "St. Nordiske Telegrafskab". 1♂.

Formosa Strait, 23°08'N, 117°30'E. 24 fathoms. Jan. 23, 1912. E. SUENSON. 6♂♂, 4♀♀.

8 miles from Hongkong, 22°12'N, 114°15'E. 14 fathoms. Nov. 16, 1911. E. SUENSON. 1♀.

? Puerto Galero (Mindoro), Philippine Islands. TH. MORTENSEN. 1♂.

San Bernardino Strait, Philippine Islands, 12°27'N, 124°03'E. 50-100 fathoms. Aug. 3, 1911. E. SUENSON. 1♂, 3♀♀ ovig.

Kaladis Point (Mindanao), Philippine Islands. On mole. Mar. 11, 1914. TH. MORTENSEN. 1♀ ovig.

Jolo (Sulu Archipelago), Philippine Islands. 12 fathoms. Sand, coral. Mar. 17, 1914. TH. MORTENSEN. 1♂.

Off Jolo. About 20 fathoms. Coral bottom. Mar. 17, 1914. TH. MORTENSEN. 1♀ ovig., 1 juv.

Off Jolo. About 15 fathoms. Diver. Mar. 19, 1914. TH. MORTENSEN. 2♀♀ ovig.

Off Jolo. 20-30 fathoms. Sand, coral. Mar. 19, 1914. TH. MORTENSEN. 5♂♂, 5♀♀, 1 juv.

Gulf of Siam. 30 fathoms. March, 1900. TH. MORTENSEN. 2♂♂.

15 km west of Koh Kut, Gulf of Siam. 30 fathoms. Jan. 28, 1900. TH. MORTENSEN. 1♂.

Singapore. Shore at low tide. 1906. Consul Sv. GAD. 1♂, 1♀ ovig.

Singapore. 1907. Consul Sv. GAD. 1♂, 3♀♀ (2 ovig.).

"Galathea" Expedition 1950-52. St. 346, 1½ miles east of Tanjong Rhu, Singapore. 14 meters. Sand and mud. May 25, 1951. 1♀ ovig.

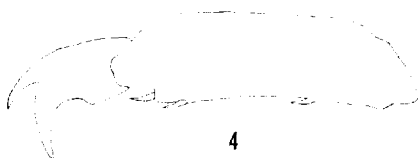
## From the Kei Islands Expedition:

- St. 76, Sunda Strait, 6°08'S, 105°44'E. 29 meters. Mud. July 29, 1922. 1 ♀ ovig.
- St. 78, Sunda Strait, 6°25'S, 105°41'E. 30 meters. July 29, 1922. 1 ♀.
- St. 68, Java Sea, 5°47'S, 106°14'E. 55 meters. Stones, sponge. July 27, 1922. 5 ♂♂ (2 ovig.), 1 juv.
- St. 71, Java Sea, 5°40'S, 106°08'E. 54 meters. Sand, stones, sponge. July 28, 1922. 4 ♂♂, 4 ♀♀ ovig., 1 juv.
- St. 104, Java Sea, 5°52'S, 106°04'E. 38 meters. Stones, sponge, washings. Aug. 4, 1922. 5 ♂♂, 3 ♀♀ ovig., 2 juv.
- St. 107, Java Sea, 5°47'S, 106°07'E. 49 meters. Hard bottom. Aug. 5, 1922. 4 ♂♂ (1 ovig.), 2 juv.
- West of Samalona, Makassar (Celebes). About 35 meters. Muddy sand, shell. June 28, 1922. 8 ♂♂, 9 ♀♀ (7 ovig.), 6 juv.
- Taka Bako, Makassar. About 25 meters. Sandy mud, shell. June 27, 1922. 1 ♀.
- Taka Bako. About 35 meters. Mud, sand, shell. June 29, 1922. 5 ♂♂, 7 ♀♀ (6 ovig.).
- Amboina. Shore at low tide. February, 1922. 1 ♀.
- Amboina Bay. About 70 fathoms. Feb. 21, 1922. 2 ♂♂, 2 ♀♀ ovig.
- Amboina Bay. About 50-70 fathoms. Stones, sand. Feb. 22, 1922. 15 ♂♂, 17 ♀♀ (8 ovig.).
- Amboina Bay. About 60 fathoms. Green sand. Feb. 22, 1922. 1 ♂, 1 juv.
- Amboina Bay. 7-10 fathoms. Sand. Feb. 28, 1922. 4 ♂♂, 5 ♀♀ ovig.
- Amboina Bay. 25-50 fathoms. Stones, sand. Mar. 2, 1922. 5 ♂♂, 6 ♀♀ (5 ovig.).
- Amboina Bay. About 50 fathoms. Stones, sand. Mar. 3, 1922. 5 ♂♂, 3 ♀♀ (2 ovig.), 2 juv.
- Banda. 20 meters. June, 1922. 1 ♀ ovig.
- Banda. About 20 meters. Sand, diver; washed from sponge. June 10, 1922. 3 ♂♂, 4 ♀♀ (2 ovig.).
- Off Neira, Banda. About 20 meters. Sand, diver. June 1, 1922. 1 ♀ ovig.
- Off Neira. About 10 meters. Sand, diver. June 5, 1922. 1 ♂, 1 ♀ ovig.
- Off Neira. About 15 meters. Sand, diver; washed from gorgonids. June 9, 1922. 1 ♂, 2 ♀♀ (1 ovig.).
- Off Neira. About 15 meters. Sand, diver. June 9, 1922. 2 ♂♂, 1 ♀.
- Off Neira. About 20 meters. Sand, diver. June 10, 1922. 2 ♂♂, 2 ♀♀.
- Toeal (Kei Islands). 0-1 fathom. Mar. 20 (21), 1922. 1 ♂, 1 ♀ ovig.
- Off Toeal. About 2 meters. Rocky shore. Mar. 23, 1922. 1 ♀ ovig.
- Off Toeal. 1-2 meters. From coral block. Mar. 25, 1922. 1 ♂, 2 ♀♀ ovig.
- Toeal. About 2 meters. Coral. Mar. 26, 1922. 2 ♂♂.
- St. 11, off Toeal. 20 meters. Sand. Apr. 9, 1922. 22 ♂♂, 21 ♀♀ (14 ovig.), 2 juv.
- St. 19, off Toeal. About 20 meters. Sand. Apr. 14, 1922, 1 ♂; Apr. 18, 2 ♂♂, 3 ♀♀ (2 ovig.), 1 juv.; Apr. 19, 32 ♂♂, 38 ♀♀ (15 ovig.); Apr. 22, 2 ♀♀ (1 ovig.); May 12, 7 ♂♂, 2 ♀♀ ovig.
- St. 14, south of Doe Roa (Kei Islands). About 40 meters. Sand. Apr. 10, 1922. 18 ♂♂, 17 ♀♀ (10 ovig.).
- St. 20, Doe Roa Basin. About 50 meters. Sand, shells. Apr. 14, 1922. 4 ♂♂, 2 ♀♀, 1 juv.
- St. 31, Doe Roa Basin. About 50 meters. Sand. Apr. 18, 1922. 1 ♀.
- St. 21, Kei Islands, 5°30'S, 132°47'E. 50-70 meters. Hard bottom. Apr. 14, 1922. 2 ♀♀ ovig.
- St. 30, between Doe Roa and Kei Doelah. About 40 meters. Sand, shells. Apr. 18, 1922. 3 ♂♂, 3 ♀♀ (1 ovig.).
- St. 38, northeast of Doe Roa. About 35 meters. Sand. Apr. 24, 1922. 3 ♂♂, 3 ♀♀ (1 ovig.).
- Kei Islands or Banda. Sediment from a pail. 1922. 1 ♀.

Remarks: *Polyonyx denticulatus* PAULSON may be easily recognized from the original description and illustration, and the careful descriptions of NOBILI (1906), LAURIE (1926), and JOHNSON (1958). LAURIE showed that *Polyonyx hexagonalis* ZEHNTNER is a synonym. However, no author to my knowledge has identified *Polyonyx denticulatus* with *Porcellana suluensis* DANA. The latter species was rather briefly described by DANA from a specimen of 1.4 lines (about 3 mm) which he believed to be a juvenile, but which may well have been adult. DANA's account and accompanying illustration were not entirely satisfactory, but the species



3



4

Fig. 3. *Polyonyx suluensis* (Dana). Propodus and dactyl of left walking leg,  $\times 18$ .  
Fig. 4. *Polyonyx telestophilus* Johnson. Propodus and dactyl of left walking leg,  $\times 25$ .

is distinctive enough so that RATHBUN (1924), GORDON (1935), and MIYAKE (1942, 1943) were able to refer material to it; none of them, however, took into account the various treatments of *Polyonyx denticulatus* PAULSON. It is quite evident, from a comparison of all the descriptions and illustrations noted in the synonymy above, that each author has dealt with the same species. DANA's name must be used for the animal, in the combination *Polyonyx suluensis* (DANA).<sup>1)</sup>

Both LAURIE and JOHNSON have suggested that the population of the species may be grouped into distinct geographical races, characterized by the degree of convexity of the lateral carapace margins. Since the very long series at my disposal is derived entirely from the western Pacific Ocean, and chiefly from the East Indian Archipelago, no more evidence is brought to bear on this point; but within the present series I found specimens with the lateral carapace margins parallel and others with the margins extremely convex, and various gradations between the two extremes. The lateral margins tend to be more nearly parallel in males than in

<sup>1)</sup> It should be pointed out that I was in error in suggesting (HAIG, 1960, p. 209) that *Porcellana suluensis* should be referred to genus *Pisidia*.

females, and I am inclined to believe that this may be a more important consideration than geographical distribution.

LAURIE mentioned a specimen from Cargados Carajos parasitized by a rhizocephalan.

*Polyonyx suluensis*, under its various synonyms, has been reported in depths to about 40 fathoms in the Red Sea, Seychelles, Saya de Malha Bank, Cargados Carajos, and south of Cape Jaubert, Western Australia (Indian Ocean); and Singapore, Sulu Sea, Palau Islands, Eiland Enoc, and Amboina (western Pacific). On the basis of the Copenhagen Museum collections, the geographic range is extended northward to Kyushyu Island, Japan, and the bathymetric range downward to 100 fathoms.

***Polyonyx telestophilus* Johnson.**

Fig. 4.

*Polyonyx telestophilus* JOHNSON, 1958, pp. 98, 103 (Johore Shoals, Singapore).

Material: Koh Chuen, Gulf of Siam, 30 fathoms, Shell, February, 1900. TH. MORTENSEN, 1♀ ovig., 2 juv.

Gulf of Siam, 30 fathoms, March, 1900. TH. MORTENSEN, 2♀♀ ovig.

Kei Islands Expedition, Amboina Bay, Amboina. About 50 fathoms. Stones, sand. Mar. 3, 1922. 1♂, 1♀ ovig.

Remarks: As noted by JOHNSON, the only species with which *Polyonyx telestophilus* could be confused is *P. suluensis* (DANA). The two may be readily distinguished by the form of the dactyl of the walking legs (figs. 3, 4); the distinctive shape of the dactyl in *P. telestophilus* could be seen in the two minute juvenile specimens from Koh Chuen. JOHNSON stated that *P. telestophilus* differs from *P. suluensis* in the following characters, among others: lateral margins of carapace straight and parallel in region of lateral spines; armature of the carpus of the chelipeds (JOHNSON, 1958, text-figs. 1A and 2B); and the presence of very sparse hair or none on the chela of the minor cheliped. I found these characters to occur occasionally in specimens of *P. suluensis* as well, although in the majority of cases the distinctions just mentioned are valid.

JOHNSON found *P. telestophilus* to be strictly commensal with alcyonarian corals of genus *Telesto*. Unfortunately I cannot confirm this observation for, if the specimens collected by Dr. MORTENSEN were associated with *Telesto*, no notation of the fact was made.

JOHNSON's largest specimens were 3.75 mm in carapace length. Measurements of the Copenhagen Museum specimens are as follows: male, 3.3 mm

long by 3.4 mm wide; ovigerous females, 3.3 mm by 3.5 mm to 4.6 mm by 5.7 mm.

The types were collected around Singapore in 10–22 fathoms. The present material, taken in 30–50 fathoms, extends the range of the species northward to the Gulf of Siam and southward to Amboina.

***Polyonyx biunguiculatus*** (Dana).

*Porcellana biunguiculata* DANA, 1852, p. 411 (no type locality); 1855, pl. 26, figs. 1a–d. *Polyonyx biunguiculatus*, STIMPSON, 1858, p. 229 (“Mari Orientali”). GORDON, 1935, p. 10, text-figs. 5b, d. MIYAKE, 1942, p. 371, pl. 1, fig. 1, text-figs. 30–32. JOHNSON, 1958, pp. 100, 105, text-fig. 3.

Material: Formosa Strait, 25°28'N, 120°29'E. 36 fathoms. April, 1897. SCHINAU. 1 ♂ (juv.).

Puerto Galera (Mindoro), Philippine Islands. About 5 fathoms. Feb. 3, 1914. TH. MORTENSEN. 1 ♂.

6 miles north-northeast of Sacol (Mindanao), Philippine Islands. 35 fathoms. Coral bottom. Mar. 6, 1914. TH. MORTENSEN. 1 ♀.

Off Jolo (Sulu Archipelago), Philippine Islands. 20–30 fathoms. Sand and coral. Mar. 19, 1914. TH. MORTENSEN. 6 ♂♂, 3 ♀♀ ovig.

Off Jolo. About 25 fathoms. Sand and coral. Mar. 20, 1914. TH. MORTENSEN. 1 ♀.

North side of Koh Mesan, Gulf of Siam. 10–15 fathoms. Feb. 5, 1900. TH. MORTENSEN. 1 ♂, 1 juv.

Between Koh Mesan and Koh Chuen, Gulf of Siam. 30 fathoms. Stones. Feb. 5, 1900. TH. MORTENSEN. 1 ♀.

Between Koh Mesan and Koh Chuen. 15 fathoms. Stones. Feb. 6, 1900. TH. MORTENSEN. 1 ♂, 2 ♀♀ (1 ovig.).

15 miles east of Koh Chuen. 10 fathoms. Shells. Feb. 1, 1900. TH. MORTENSEN. 1 ♀ ovig.

Gulf of Siam. 30 fathoms. March, 1900. TH. MORTENSEN. 1 ♂, 1 ♀ ovig., 2 juv.

Singapore. Shore at low tide. Dec. 12, 1906. Consul Sv. GAD. 1 ♀ ovig.

Singapore. Shore at low tide. 1906. Consul Sv. GAD. 1 ♂.

Singapore. Shore at low tide. 1907. Consul Sv. GAD. 1 ♀.

“Galathea” Expedition 1950–52. St. 334, Keppel Harbour, Singapore. Tidal zone. corals. May 16, 1951. 1 ♂, 1 ♀ ovig.

“Galathea” Expedition 1950–52. St. 330, 5 miles southeast of Singapore. 40 meters. Sand, corals. May 15, 1951. 1 ♂, 1 ♀ ovig., 2 juv.

Kei Islands Expedition. St. 67. Java Sea, 5°48'S, 106°12'E. 38 meters. Sand. July 27, 1922. 2 ♂♂, 1 ♀ ovig.

Kei Islands Expedition. St. 71. Java Sea, 5°40'S, 106°08'E. 54 meters. Sand, stones, sponge. July 28, 1922. 1 ♀ ovig.

Kei Islands Expedition. St. 111. Java Sea, 5°25'S, 106°03'E. 22 meters. Sandy mud. Aug. 6, 1922. 1 ♂.

Java Sea, 5°45'05"S, 112°19'56"E. 35 fathoms. Mud. Dec. 10, 1935. “St. Nordiske”. 1 ♂.

Kei Islands Expedition. Amboina, on harbor mole. About 1 meter. Feb. 28, 1922. 1 ♀ ovig.

Kei Islands Expedition. Saparoera Bay, Saparoera. 10–15 fathoms. Muddy sand. Mar. 9, 1922. 1 ♀ ovig.



- Kei Islands Expedition. Banda. About 15 meters. Sand; washed from *Acanthogorgia*. June 15, 1922. 1 juv.
- Kei Islands Expedition. Off Neira, Banda. About 25 meters. Sand, diver. June 14, 1922. 1 ♀ ovig.
- Kei Islands Expedition. St. 16. Kei Islands, 5°32'20"S, 132°37'E. 50 meters. Sand, Lithothamnion. Apr. 12, 1922. 1 ♀ ovig.
- Kei Islands Expedition. St. 20. Doc Roa Basin (Kei Islands). About 50 meters. Sand, shells. Apr. 14, 1922. 1 ♂ (juv.).
- Kei Islands Expedition. Vatek opposite Toeal (Kei Islands). About 1-2 meters. Rocky shore. Mar. 27, 1922. 1 ♂.
- "Dana" Expedition 1928-30. St. 3760, Manokuari, Netherlands New Guinea. July 16, 1929. 1 ♂.

Remarks: This species and its two close relatives, *Polyonyx obesulus* and *P. triunguiculatus*, were confused by many authors. GORDON (1935) showed that *P. biunguiculatus* and *P. obesulus* may be easily distinguished, and JOHNSON (1958) defined all three species more precisely. In the light of their findings, material on which some of the early records were based should be re-examined.

The large Copenhagen Museum series of *Polyonyx biunguiculatus* shows all the characters discussed by JOHNSON. According to both GORDON and JOHNSON, *P. biunguiculatus* and *P. obesulus* are easily distinguished by the form of the front, but I found that this difference is not always very clear-cut. The most striking difference between the two species is in the form of the dactyl of the walking legs. I observed one character which has not previously been mentioned in the literature: pleopods are completely lacking in males of *P. biunguiculatus*, just as in many species of *Pachycheles*.

*Polyonyx biunguiculatus* occurs in the Indian Ocean and the western-most part of the Pacific Ocean, including the East Indian Archipelago. In the Pacific the most northern locality on record is Palao Islands (MIYAKE, 1942). Thus the Formosa Strait record, above, represents a substantial northern extension of range for the species. It has occasionally been collected in the littoral at low tide, but is more frequently dredged in depths to about 35 fathoms.

### ***Polyonyx obesulus* Miers.**

*Porcellana obesula* WHITE, 1847, p. 130 (*nomen nudum*; Madgica-Sima Islands).

*Polyonyx obesulus*, MIERS, 1884, p. 272, pl. 29, fig. D. GORDON, 1935, p. 11, text-figs.

5a, c. JOHNSON, 1958, pp. 99, 108, text-fig. 4.

? *Porcellana (Polyonyx) tuberculosa* DE MAN, 1888b, p. 424, pl. 19, fig. 1 (Amboina).

Material: Paumben (= Pamban), India. 1-5 fathoms. April, 1889. K. FRISTEDT.

3 ♂♂, 2 ♀♀ ovig.

- Trincomali, Ceylon. 2-6 fathoms. March, 1889. K. FRISTEDT. 1♂, 2♀♀.  
 ? Puerto Galera (Mindoro), Philippine Islands. TH. MORTENSEN. 1♂.  
 Off Jolo (Sulu Archipelago), Philippine Islands. 20-30 fathoms. Sand and coral.  
 Mar. 19, 1914. TH. MORTENSEN. 3♂♂, 1♀ ovig.  
 20 miles east-southeast of Koh Samit, Gulf of Siam. 13-14 fathoms. Sand, mud, shell.  
 Feb. 2, 1900. TH. MORTENSEN. 1♂, 1♀.  
 Koh Kahdat, Gulf of Siam. 5-8 fathoms. Sandy mud. Feb. 16 or Mar. 4, 1900.  
 TH. MORTENSEN. 1♀ ovig.  
 Off north end Koh Kut, Gulf of Siam. 10 fathoms. Jan. 27, 1900. TH. MORTENSEN.  
 2 juv.  
 Singapore. Shore at low tide. June 15, 1905. Consul Sv. GAD. 1♂.  
 Singapore. Shore at low tide. 1907. Consul Sv. GAD. 2♀♀ ovig.
- From the Kei Islands Expedition:
- St. 95, Lampong Bay, Sumatra, 5°44'S, 105°20'E. 25 meters. Mud. Aug. 1, 1922. 1♂.  
 St. 67, Java Sea, 5°48'S, 106°12'E. 38 meters. Sand. July 27, 1922. 3♂♂, 2♀♀.  
 St. 68, Java Sea, 5°47'S, 106°14'E. 55 meters. Stones. July 27, 1922. 1♂.  
 St. 71, Java Sea, 5°40'S, 106°08'E. 54 meters. Sand, stones, sponge. July 28, 1922.  
 2♂♂, 1♀.  
 St. 72, Java Sea, 5°41'S, 105°57'E. 35 meters. Stones, sponges. July 28, 1922. 1♂.  
 St. 107, Java Sea, 5°47'S, 106°07'E. 49 meters. Hard bottom. Aug. 5, 1922. 1 juv.  
 St. 108, Java Sea, 5°44'S, 105°56'E. 54 meters. Sponges. Aug. 5, 1922. 1 juv.  
 St. 111, Java Sea, 5°28'S, 106°03'E. 22 meters. Sandy mud. Aug. 6, 1922. 1♀ ovig.  
 Off Samalona, Makassar (Celebes). About 35 meters. Muddy sand, shells. June 28,  
 1922. 1♂, 2♀♀ (1 ovig.).  
 Taka Bako, Makassar. About 35 meters. Mud, sand, shell. June 29, 1922. 3♂♂, 1 juv.  
 Amboina Bay, Amboina. About 50 fathoms. Stones, sand. Feb. 22, 1922. 1♂.  
 Amboina Bay. About 70 fathoms. Stones, sand. Feb. 22, 1922. 3 juv.  
 Banda. 20 meters. June, 1922. 1♂, 1♀, 1 juv.  
 Banda. About 20 meters. Sand, diver. June 8, 1922. 1♂, 2♀♀ ovig.  
 Banda. About 15 meters. Sand; washed from *Acanthogorgia*. June 15, 1922. 1♂.  
 Off Goenoeng Api, Banda. About 10 meters. Sand, coral; diver. June 2, 1922. 1♂, 1♀.  
 Off Neira, Banda. About 10 meters. Sand, diver. June 5, 1922. 11♂♂, 8♀♀ ovig.  
 Off Neira. About 15 meters. Sand, diver. June 9, 1922. 2♂♂, 1♀ ovig.  
 Off Neira. 13 meters. Sand, diver. June 12, 1922. 2♀♀ ovig.  
 St. 20, Doe Roa Basin (Kei Islands). About 50 meters. Sand, shells. Apr. 14, 1922.  
 1♂, 1 juv.  
 Off Toeal (Kei Islands). 1-2 meters. Sand; from coral block. Mar. 25, 1922. 1♀ ovig.  
 Kei Islands or Banda. Sediment from a pail. 1922. 1 juv.

Remarks: In very young examples there may be a few minute spinules on the lateral margins of the carapace and on the anterior margin of the merus and carpus of the chelipeds; but such specimens can be readily identified by the characteristic form of the dactyl of the walking legs.

In the Copenhagen Museum collection there is an equivalent number of lots of *Polyonyx obesulus* and of *P. biunguiculatus* from the general area of the Philippines, Gulf of Siam, and East Indian Archipelago (29 lots

of the first species, 26 of the second); but the two forms were collected together in only seven cases.

The type locality of *Polyonyx obesulus* was "Madgica-Sima groupe" (WHITE, 1847). JOHNSON (1958) places this locality in the South China Sea. However, the only equivalent geographical term I have found is Majicoshima, a group of islands located in the southern part of the Ryukyu Archipelago and now known as the Sakishima Islands. If this is indeed the area from which the type material originated, the range of *P. obesulus* extends considerably farther north than has been recognized. MIYAKE (1943) did not include the species in his account of the porcellanids of Nippon and adjacent waters.

The general range of *Polyonyx obesulus* is Indian Ocean and western part of the Pacific Ocean, including the East Indian Archipelago and northern and eastern Australia. The bathymetric range is shore to about 70 fathoms.

### ***Polyonyx triunguiculatus* Zehntner.**

*Polyonyx triunguiculatus* ZEHNTNER, 1894, p. 185 (Amboina). JOHNSON, 1958, pp. 99, 110.

*Polyonyx acutifrons* DE MAN, 1896, p. 384 (Atjeh, Sumatra); 1898, pl. 32, figs. 49, 49a-d.

*Polyonyx biunguiculatus*, LAURIE, 1926, p. 146. Not *A. biunguiculatus* (DANA).

Material: Java-South Africa Expedition. St. 44. Between Gunner's Quoin and Flat Island, north of Mauritius. 25 fathoms. Corals. Oct. 15, 1929. TH. MORTENSEN on "Maurice". 7♂♂, 4♀♀ ovig.

Java-South Africa Expedition. St. 45. Between Gunner's Quoin and Flat Island, north of Mauritius. About 30 fathoms. Sand and corals. Oct. 16, 1929. TH. MORTENSEN on "Maurice". 1♂, 1♀ ovig.

Remarks: This species is reported from the Indian Ocean at the following localities: Red Sea, Zanzibar, Seychelles, Amirantes, Providence Island, Cargados, Chagos Archipelago, and Ceylon. The above material is the first to be reported from Mauritius. The species is also known from Amboina, Sumatra, and Singapore. It has occasionally been collected in the littoral zone, and has been dredged in depths as great as 78 fathoms.

### ***Polyonyx hendersoni* Southwell.**

*Polyonyx hendersoni* SOUTHWELL, 1909, p. 117, figs. 6-9 of pl. (south of Adams Bridge, Ceylon). GRAVELY, 1927, p. 141, pl. 20, fig. 11. JOHNSON, 1958, pp. 98, 112.

Material: Paumben (= Pambani), India. 4-5 fathoms. April, 1889. K. FRISTEDT. 2♂♂, 6♀♀ ovig.

Remarks: The present specimens agree well with the published descriptions and illustrations. The males measure 6.2 by 7.4 mm and 6.5 by 7.1 mm in carapace length and width; the ovigerous females, 3.3 by 3.9 mm to 6.8 by 7.9 mm.

*Polyonyx hendersoni* is known only from the area around southern India and Ceylon, where it has been collected to a depth of 8.5 fathoms.

### ***Polyonyx pedalis* Nobili.**

*Polyonyx pedalis* NOBILI, 1905, p. 397 (Djibouti, Red Sea); 1906b, pp. 136, 137, pl. 8, fig. 3. JOHNSON, 1958, pp. 99, 116.

Material: Kei Islands Expedition. St. 20. Doe Roa Basin (Kei Islands). About 50 meters. Sand, shells. Apr. 14, 1922. 1♂, 1♀ (both juv.).

Kei Islands Expedition. St. 30. Between Doe Roa and Kei Doelah (Kei Islands). About 40 meters. Sand, shells. Apr. 18, 1922. 1♂ (juv.).

Remarks: *Polyonyx pedalis* is the only member of the "sinensis group" (JOHNSON, 1958, p. 97) of Indo-West Pacific *Polyonyx* species represented in the Copenhagen Museum collections. The discovery that the species occurs in the Kei Islands is of great interest, for it was previously known only from two individuals taken at Djibouti in the Red Sea.

The shape of the carapace, with narrow, produced front, is distinctive; so are the walking legs, which are denticulate along the posterior margin of the merus and have movable spinules along the entire length of the posterior margin of the propodus. These characters show clearly in the present specimens, one of which is only 2.3 mm in length and 2.4 mm in width and the other two 2.5 by 2.6 mm. I could find no sign of pleopods in the males; since they are juveniles, it is impossible to tell whether the pleopods are not developed or whether they are normally lacking in this species as in *Polyonyx biunguiculatus*.

The species is now known from the Red Sea and the Kei Islands, to a depth of about 50 meters. Most of the *Polyonyx* species of JOHNSON's "sinensis group" are commensals, but as far as *P. pedalis* is concerned there is no evidence of commensalism. It may be that the species normally lives commensally and is only occasionally free-living; this would account for the fact that it has so seldom been collected.

### **A Note on Specimens Parasitized by Rhizocephala.**

During the study of the species treated in this paper I encountered several specimens with a rhizocephalan parasite attached to the abdomen and observed that, in most cases, the presence of the parasite was accom-

panied by external modifications involving the development of both male and female pleopods in the same individual, or the failure of any pleopods to develop. There are numerous references in the literature to the parasitism of Porcellanidae by Rhizocephala but, as far as I am aware, none of these mention accompanying external modifications.

HARTNOLL (1960) discussed several reported cases of hermaphroditism in normally dioecious decapods, expressed in the presence of both male and female pleopods and genital pores, broadening of the male abdomen, and presence of gonads of both sexes in a single individual. (None of the references mentioned by HARTNOLL refer to Porcellanidae.) In the parasitized porcellanids of the present collection, the only striking external modification is the occurrence of both male and female pleopods or their complete absence. In a few cases the male abdomens are slightly broadened, approaching the normal condition in females, but in porcellanids the variation in this character is not very great. In no case, in the specimens I examined, was there more than one pair of genital pores in any individual. I did not dissect the specimens in order to examine the condition of the gonads.

The following brief notes were made on the parasitized specimens:

*Petrolisthes militaris* (HELLER). "Dana" St. 3667, off Queensland, Australia; 17 meters; Mar. 12, 1929. A male, with well-developed ♂ plps on abdominal segment 2; also fairly well-developed ♀ plps on segments 3, 4, and 5. This hermaphroditic condition was presumably caused by a parasite, but the latter is not attached to the specimen or in the container with it.

*Petrolisthes scabriculus* (DANA). Jolo, Philippine Islands; 25 fathoms; Mar. 19, 1914; TH. MORTENSEN. Three specimens, out of 10 in this lot. Male with ♂ plp developed only on right side of segment 2, reduced to a vestige on left side; rudimentary ♀ plps developed on segments 3, 4, and 5. Female without a trace of plps on any segments. Female normal, externally unmodified, with well-developed plps on segments 3, 4, and 5.

*Petrolisthes teres* MELIN. Koh Chang, Gulf of Siam; shore at low tide; January, 1900; TH. MORTENSEN. Three specimens, out of 15 in this lot. Two males, both with well-developed ♂ plps on segment 2, and with fairly well-developed ♀ plps on segments 3, 4, and 5. Female normal, externally unmodified, with well-developed plps on segments 3, 4, and 5.

*Polyonyx suluensis* (DANA). Jolo, Philippine Islands; 12 fathoms; Mar. 17, 1914; TH. MORTENSEN. A female, without a trace of plps on any segments.

*Polyonyx suluensis*. Jolo, Philippine Islands; 20-30 fathoms; Mar. 19, 1914; TH. MORTENSEN. A female, out of 6 specimens in this lot; ♀ plps on segments 3, 4, and 5 developed, but smaller than normal.

*Polyonyx suluensis*. Kei Islands Expedition. St. 19. Off Toeal, Kei Islands; 20 meters; May 12, 1922. A male, out of 9 specimens in this lot; without a trace of plps on any segments.

*Polyonyx suluensis*. Kei Islands Expedition. St. 38. Northeast of Doe Roa, Kei Islands; about 35 meters; Apr. 24, 1922. A male, out of 6 specimens in this lot; without a trace of plps on any segments.

*Polyonyx suluensis*. Kei Islands Expedition. St. 68. Off Java; 55 meters; July 27, 1922. Two females, out of 6 specimens in this lot; both normal, externally unmodified, with well-developed plps on segments 3, 4, and 5.

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