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**Studies on the Decapod Crustaceans of Micronesia
III. Porcellanidae**

By

Sadayoshi MIYAKE

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(With 1 Plate and 35 Text-figures)

I. Introduction

The present paper comprises systematic and zoogeographic notes of the Porcellanid crabs of Micronesia. The material here dealt with came from the following sources: (1) a large collection containing six known and two new species from Palau and Tokobei Islands made by Mr. Shiro MURAKAMI of the Zoological Laboratory, Kyūsyū Imperial University, Hukuoka, and member of the Palao Tropical Biological Station; (2)*** a collection from Kusaie and Babldáob Islands by Prof. Dr. Teiso ESAKI of the Entomological Laboratory, Kyūsyū Imperial University, Hukuoka, made during his biological expedition to Micronesia; (3) a collection from Palau Islands by Mr. Renji WADA, member of the P. T. B. S.; (4) a small collection from Marshall Islands by the late Mr. Eikiti HORII, made during his biological expedition to Micronesia; (5) a small collection from Palau Islands by Mr. Keizo TAKAHASHI of the Zoological Institute, University of Literature and Science, Tokyo, and member of the P. T. B. S.; (7) a small collection from Palau Islands by Prof. Dr. Hiroshi OHSHIMA of the Zoological Laboratory, Kyūsyū Imperial University, Hukuoka, made during his biological survey of Palau Islands, 1939; and (8) the materials collected by the writer during his sojourn at the Palao Tropical Biological Station from March to August, 1939.

The examination has revealed that these specimens fall in 14 species of six genera as named below.

* Contribution from Palao Tropical Biological Station, No. 46.

** Contributions from the Zoological Laboratory, Kyūsyū Imperial University, No. 155; Papers from the Amakusa Marine Biological Laboratory, No. 84.

*** Results of Professor Teiso ESAKI's Micronesia Expeditions 1936-1939, No. 53.

1. *Petrolisthes asiaticus* (LEACH)
2. *P. moluccensis* (de MAN)
3. *P. fimbriatus* BORRADAILE
4. *P. lamarckii* (LEACH)
- 4 a. *P. lamarckii* var. *rufescens* (HELLER)
5. *P. penicillatus* (HELLER)
6. *Neopetrolisthes ohshimai* MIYAKE
7. *Porcellana armata* DANA
8. *P. suluensis* DANA
9. *P. nitida* HASWELL
10. *P. murakamii* sp. nov.
11. *P. melissa* sp. nov.
12. *Porcellanella triloba* WHITE
13. *Polyonyx biunguiculatus* (DANA)
14. *Pisosoma sculptum* (H. MILNE-EDWARDS)

All of these species are unrecorded from Micronesia and two of them are new to the Science.

I take this opportunity to express my gratitude to those gentlemen who have kindly assisted me in preparing this report. First I wish to thank the Japan Society for the Promotion of Scientific Research for a grant-in-aid and Dr. Shinkishi HATAI, Director of the Palao Tropical Biological Station for all his valuable assistance rendered me throughout my study. I am especially indebted to Prof. Dr. Hiroshi OHSHIMA who has provided me with facilities required for the pursuit of this work, and has kindly looked through the manuscript. I express my hearty thanks also to Prof. Dr. Teiso ESAKI, Messrs. Shiro MURAKAMI, Renji WADA and Keizo TAKAHASI, for placing their materials at my disposal. Acknowledgments are due to Prof. Dr. Tohru UCHIDA of the Zoological Institute, Hokkaido Imperial University, Mr. Tokubei KURODA of the Zoological Institute, Kyoto Imperial University, Mr. Hyôzi AOYAGI of the Zoological Institute, University of Literature and Science, Tokyo and Mr. Ituo KUBO of the Imperial Fisheries Institute, Tokyo, for kindly identifying the gigantic sea-anemone and its cohabitants connected in the present study.

II. Zoogeographical Notes

All the known Micronesian Porcellanids are referable to 15 species, which may be divided from the distributional viewpoint into three groups as follows.

i. Pacific Group (5 species : 33.3 per cent.)

This group is known only from South Pacific Ocean, namely Micronesia, Polynesia, N. and N. E. Australia. The following species belong here.

	<i>Southern limits</i>	<i>Northern limits</i>
1. <i>Petrolisthes fimbriatus</i> .	Rotuma.	Ngáruangel Atoll, Palau Is.
2. <i>Neopetrolisthes ohshimai</i> .	Great Barrier Reef.	Isigaki I., Ryūkyū.
3. <i>Porcellana nitida</i> .	Port Denison, Queensland.	Ngarsmau, Babldáob I.
4. <i>P. murakamii</i> .	Songél a Lise, Palau Is.	Songél a Lise, Palau Is.
5. <i>P. melissa</i> .	Ngadarák Reef, Palau Is.	Ngatmél, Babldáob I.

Among the above species only one, *Neopetrolisthes ohshimai* MIYAKE, is known also from as far north as the Yaéyama-Group, Ryūkyū, and is an exceptional representative in this group.

ii. East Indian Group (4 species : 26.6 per cent.)

This group is distributed in the East Indies and Western Pacific Ocean. The following species belong here.

	<i>Southern limits</i>	<i>Northern limits</i>
1. <i>Petrolisthes moluccensis</i> .	Amboina.	Ngadarák Reef, Palau Is.
2. <i>Porcellana suluensis</i> .	N. W. Australia.	Sulu Sea.
3. <i>P. armata</i> .	Mangsi I., Balabac Passage.	Songél a Lise, Palau Is.
4. <i>Polyonyx biunguiculatus</i> .	Port Denison.	Ngarsmau, Babldáob I.

iii. Indo-Pacific Group (6 species : 40 per cent.)

This group is widely distributed in the Indo-Pacific and Southern Japan, with the centre of distribution chiefly in the vicinity of East Indies. The following species belong here.

	<i>Southern limits</i>	<i>Northern limits</i>
1. <i>Petrolisthes asiaticus</i> .	Mauritius.	Kagosima Bay, Japan.
2. <i>P. lamarckii</i> .	E. Australia.	Akune, Kagosima-Ken, Japan.
3. <i>P. lamarckii</i> var. <i>rufescens</i> .	Tahiti.	Suez.
4. <i>P. penicillatus</i> .	Mauritius.	Isigaki I., Ryūkyū.
5. <i>Porcellanella triloba</i> .	N. Australia.	Rameswarm I., S. E. India.
6. <i>Pisosoma sculptum</i> .	Fiji Is.	Prov. Kii, Japan.

The two groups of East Indian and Indo-Pacific species are evidently referable to the East Indian fauna and form together 66.6 per cent. of the total number of Micronesian species, so that 10 species, or two-thirds of the total number of Micronesian species are recognised to occur in the East Indian region. The remaining five species, or one-third of the total number of Micronesian species, are recognised as endemic inhabitants in the South Pacific Ocean.

III. Systematic

Order Decapoda

Tribe Anomura

Subtribe Galatheidea

Family *Porcellanidae* DANA

Body crab-like. Abdomen bent under and folded against the carapace; tail-fan well developed. First pair of legs chelate, moderately elongate, stout; fifth pair small and elevated, resting on the carapace.

Key to the Micronesian genera of the *Porcellanidae*

- I. First peduncle of antenna short.
 - i) Frontal margin triangular. Cheliped broad, flattened; wrist more or less elongated. Telson 7-lobed.

- a) Carapace rather depressed..... *Petrolisthes*.
 - b) Carapace strongly convex..... *Neopetrolisthes*.
 - ii) Frontal margin truncate, almost straight. Cheliped thick, granulated above; wrist short. Telson 5-lobed *Pisosoma*.
- II. First peduncle of antenna rather large, elongated.
- i) Front prominent, trilobed or dentate. Wrist of cheliped short.
 - a) Carapace not longer than broad *Porcellana*.
 - b) Carapace much longer than broad, with lateral margins almost parallel to each other..... *Porcellanella*.
 - ii) Frontal margin almost straight from above. Carapace broader than long. Wrist remarkably elongated, not toothed *Polyonyx*.

Genus *Petrolisthes* STIMPSON

Carapace depressed, subovate, not broader than long. Front triangular, margin or less undulated, toothed or entire. Epimera (pleural, subbranchial, or lateral portion of carapace) entire. Eyes rather large. First (basal or coxal) peduncle remarkably short, not reaching the upper margin of the carapace. Second or movable peduncle of antenna flattened and more or less cristate. Chelipeds equal or subequal, broad and flattened; wrist or carpus more or less elongated and often provided with teeth on inner margin. Ambulatory legs with the dactyli short and robust, terminating in a single claw.

Type: *Petrolisthes violacea* (GUÉRIN)

The species of *Petrolisthes* are very numerous, inhabiting the tropical and temperate zones in both oceans. According to STIMPSON they are strictly littoral in habitat. They are commonly found in coral reefs between tide-marks in Palau Islands.

The following species are represented in Micronesia.

1. *P. asiaticus* (LEACH)
2. *P. moluccensis* (de MAN)
3. *P. fimbriatus* BORRADAILE
4. *P. lamarckii* (LEACH)

5. *P. lamarckii* var. *rufescens* (HELLER)

6. *P. penicillatus* (HELLER)

Key to the Micronesian species of *Petrolisthes*

- I) With an epibranchial spine.
- i) Chelipeds ciliated with long, fine hairs on the outer margin of palm.
- A) Carapace pubescent sparsely, almost smooth to the naked eye *P. fimbriatus* BORRADAILE.
- B) Carapace covered with velvety tomentum, furnished with tufts of hair especially on hepatic, gastric and branchial regions *P. penicillatus* (HELLER).
- ii) Chelipeds without hair on the outer margin of palm.
- A) With spinules on anterior margins of merus of ambulatory legs.
- a) With one spinule at subdistal end of the said margin *P. asiaticus* (LEACH).
- b) With 3-6 spinules *P. moluccensis* (de MAN).
- B) Without spinule on anterior margin of merus of ambulatory legs *P. lamarckii* (LEACH).
- II) Without an epibranchial spine. Attains a size larger than (I), has a greater average of teeth on anterior margin of wrist of cheliped, but none of the merus of any ambulatory legs...
..... *P. lamarckii* var. *rufescens* (HELLER).

1. *Petrolisthes asiaticus* (LEACH)

Text-figs. 1-2

Pisidia asiatica LEACH, Dict. Sci. Nat., vol. 18, 1820, p. 54—Mauritius
(Type-locality).

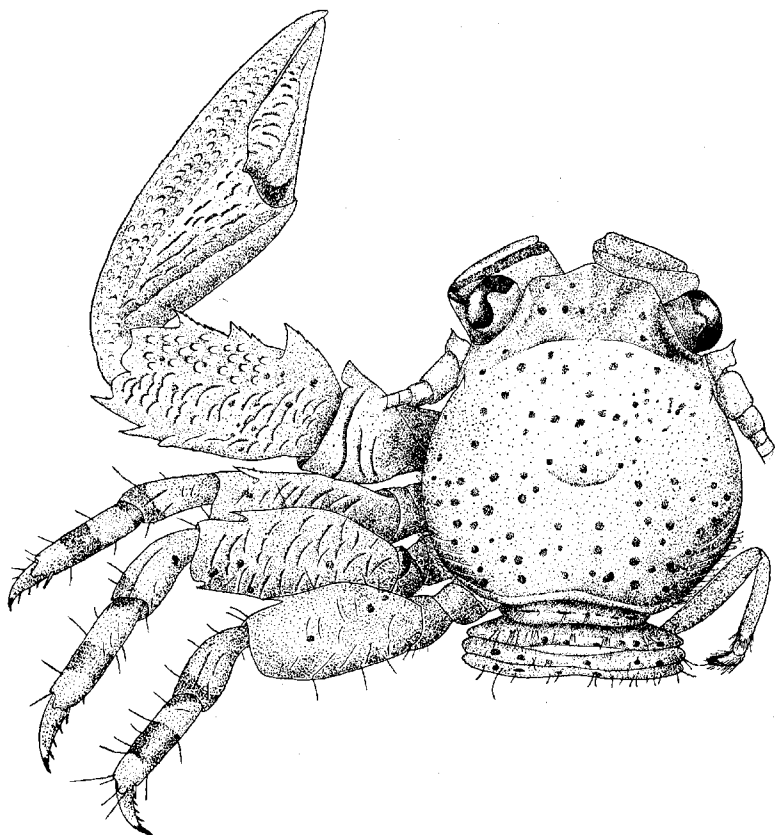
Porcellana asiatica H. MILNE-EDWARDS 1837, p. 252—Mauritius.

..... RICHTERS 1880, p. 159, Pl. 17, fig. 13—Mauritius.

Petrolisthes lamarckii var. *asiaticus* MIERS 1884, p. 269; p. 557—N. Australia.

Petrolisthes asiaticus de MAN 1896, p. 376, Pl. 32, figs. 48 a-b—Atjeh,
North Sumatra.

Petrolisthes lamarchii var. *asiaticus* BORRADAILE 1898, p. 464; p. 466, Pl. 36, fig. 1 b—Ellice Is.; Rotuma Is.

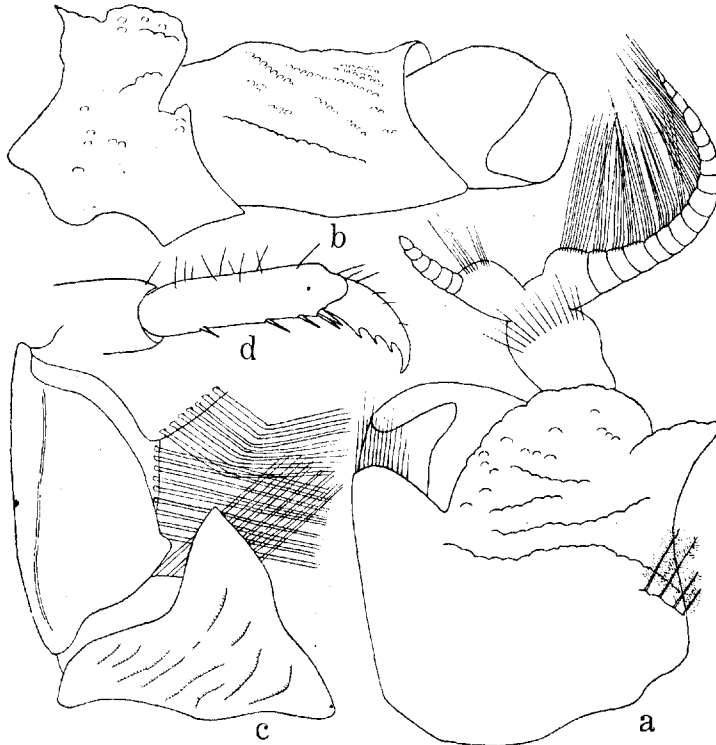


Text-fig. 1. *Petrolisthes asiaticus* (LEACH), male, $\times 9$.

Carapace slightly convex laterally and a little longer than wide. Epibranchial spine prominent and acute. Lateral margins strongly cristate anteriorly; carinae extending to middle of branchial regions.

First peduncle of antennule bilobed at its anterior margin; upper outer angle strongly projecting outwards (Text-fig. 2 a). Antennal flagellum exceeds cheliped in length. Second peduncle ornamented with granules on the ventral surface, provided with a laminate crest on inner margin. The proximal end of the crest rather acute. Third peduncle ornamented with granulated lines on ventral surface (Text-fig. 2 b). Third maxilliped of ventral side as figured in text-fig. 2 c. Merus slightly produced at the

middle of outer margin; inner laminate lobe much produced, its distal end pointed. Ventral surface of merus ornamented with short transverse lines, furnished with microscopical hairs anteriorly. Carpus furnished with a deep furrow along the outer margin; its inner anterior margin rounded.



Text-fig. 2. *Petrolisthes asiaticus* (LEACH).

a. Ventral view of left antennule $\times 30$, b. Ventral view of basal peduncles of antenna $\times 30$, c. Ventral view of third maxilliped $\times 20$, d. Distal part of ambulatory leg $\times 12$.

Chelipeds unequal. Wrist shorter than carapace in length and usually about twice as long as broad, though sometimes shorter. There is considerable variation in regard to number of teeth of the wrist; as a rule, there are three teeth on each of anterior and posterior margins. Palm much depressed and inner border of both fingers with dense hairs. Anterior half of upper surface of wrist covered with flattened granules which gradually pass into small, transverse, squamiform lines in posterior half;

these granules and lines are bordered with microscopical hairs. Upper surface of palm is covered with similar, flattened granules and lines.

Ambulatory legs somewhat hairy. Anterior margin of merus of first three pairs armed with one spinule on distal part. Posterior margin of merus of first two pairs armed with one spinule near the distal end. Merus of third pair unarmed on posterior margin. Propodi of first three pairs armed with three spinules along the longitudinal axis and two similar spinules at distal ends of their posterior margins. Dactyli of first three pairs short and armed with three spinules on their posterior margins.

Material examined:—

1) Palau Is.:

Ngáruangel Atoll, 1 ♂, Feb. 20, 1938 (collected by Mr. MURAKAMI).

Ngarekobesáng I., 1 ♂, infested with *Sacculina*, Apr. 20, 1939 (MIYAKE).

Malagál I., 1 ♂, 1 ovig. ♀, 1 ♀, Apr. 2, 1939 (MIYAKE).

Ngadarák Reef, 4 ovig. ♀, 1 ♀ May 6, 1939 (MIYAKE).

Ngaiánges I., 1 ♂, 1 ovig. ♀, 1938 (WADA).

..... 2 ♂, 1 ♀, Mar. 7, 1938 (MURAKAMI).

..... 1 ♂, 1 ovig. ♀, Apr. 30, 1939 (WADA et MIYAKE).

Peliliou I.: Ngarageúkl, 4 ovig. ♀, Jan. 20, 1938 (MURAKAMI).

2) Tokobei I., 1 ♂, 1 ♀, Apr. 10, 1938 (MURAKAMI).

3) Kusaie: Malem, 3 ♂, 5 ovig. ♀, 1 ♀, Dec. 20-21, 1937 (ESAKI).

Habitat: Common under coral rocks between tide-marks.

Colour in life: Dorsal face dark green with blackish spots which latter are changed into reddish in alcohol. Ventral face crimson.

2. *Petrolisthes moluccensis* (de MAN)

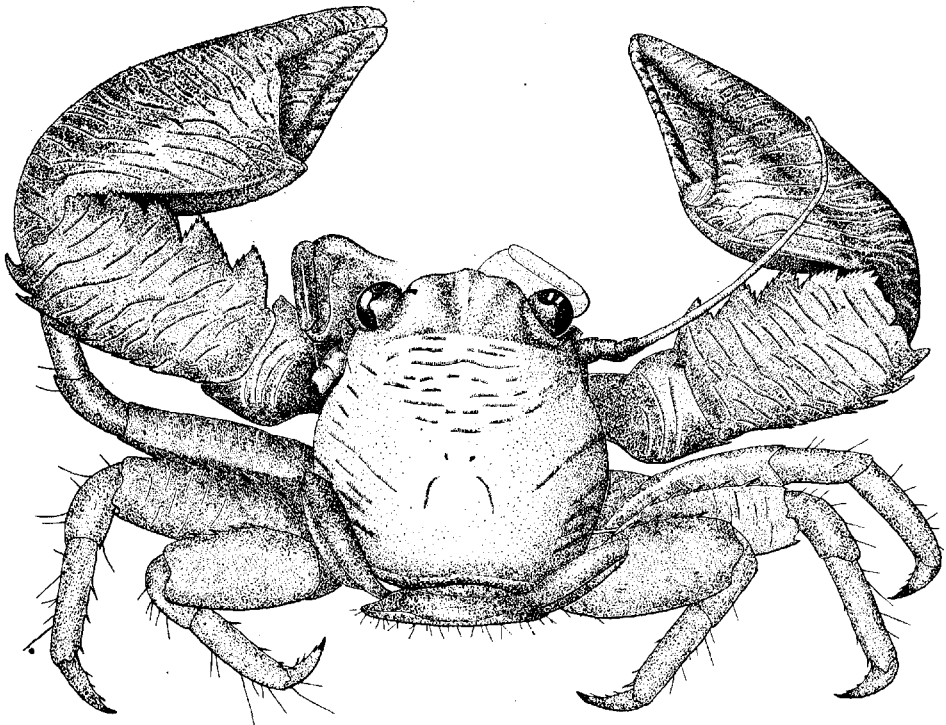
Text-figs. 3-4

Porcellana (*Petrolisthes*) *moluccensis* de MAN 1888 b, p, 411, Pl. 12, fig. 5—
Amboina (Type-locality).

Petrolisthes moluccensis de MAN 1896, p. 378—No new locality.

Carapace a little longer than broad. Front rather short, ornamented with microscopical teeth on the anterior margin. Upper surface almost smooth, but provided with transverse lines on the gastric region, ornamented with microscopical hairs anteriorly. A straight elevated crest

runs transversely, separating front from gastric region. Cervical groove distinct partly on its lateral margins.

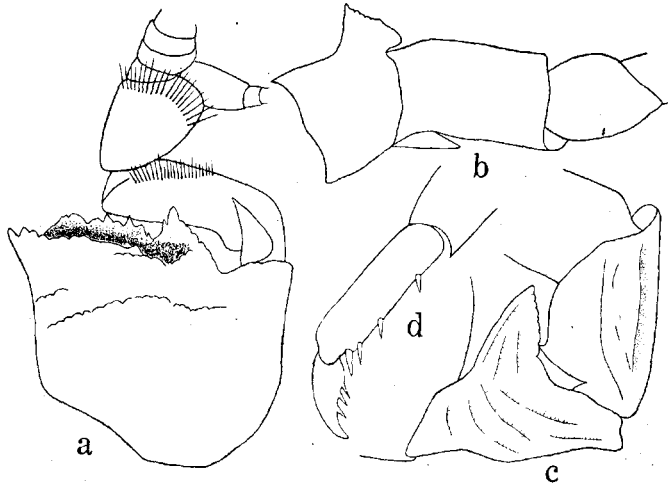


Text-fig. 3. *Petrolisthes moluccensis* (de MAN), male, $\times 10$.

First peduncle of antennule broader than long. The anterior margin is double, and is dentate. Inner angle of upper margin much prolonged anteriorly, separated from the rest of the margin by a notch. Ventral surface ornamented with one or two granulated lines anteriorly (Text-fig. 4 a). Second antennal peduncle provided with a laminate crest. Third and fourth peduncles smooth (Text-fig. 4 b). Merus of third maxilliped provided with a triangular crest inwards, and anterior margin undulated. Ventral surface of merus ornamented with elevated ridges transversely. Carpus, of a normal form; its ventral surface ornamented with a groove along the outer lateral margin besides some longitudinal ridges (Text-fig. 4 c).

Chelipeds subequal, wrist and palm striated with short, transverse lines on upper surface. Arm provided with a blunt tooth at distal end

of anterior margin. Wrist armed with three or four crest-like teeth. Rugose posterior margin armed with acuminate spines; the distal one largest. Inner margin of palm prolonged at its distal end into a rather acute spine.



Text-fig. 4. *Petrolisthes moluccensis* (de MAN).

a. Antennule $\times 40$, b. Basal peduncles of antenna $\times 40$, c. Third maxilliped $\times 25$, d. Distal part of ambulatory leg $\times 12$.

Ambulatory legs with sparse hairs. Meri of first three pairs armed with some spinules on anterior margin. Posterior margin armed with a spinule at the distal end, except the one of the third pair which is unarmed. Propodi armed with five spinules on posterior margin as in *P. asiaticus* (LEACH). Dactyli armed with three spinules.

Material examined: Palau Is.: Ngadarák Reef, 7 ♂, 1 ♀, 1 ovig. ♀, May 11, 1939 (MIYAKE).

Colour in alcohol: Dorsal face of a whitish colour with blue-blackish spots. Ventral face whitish.

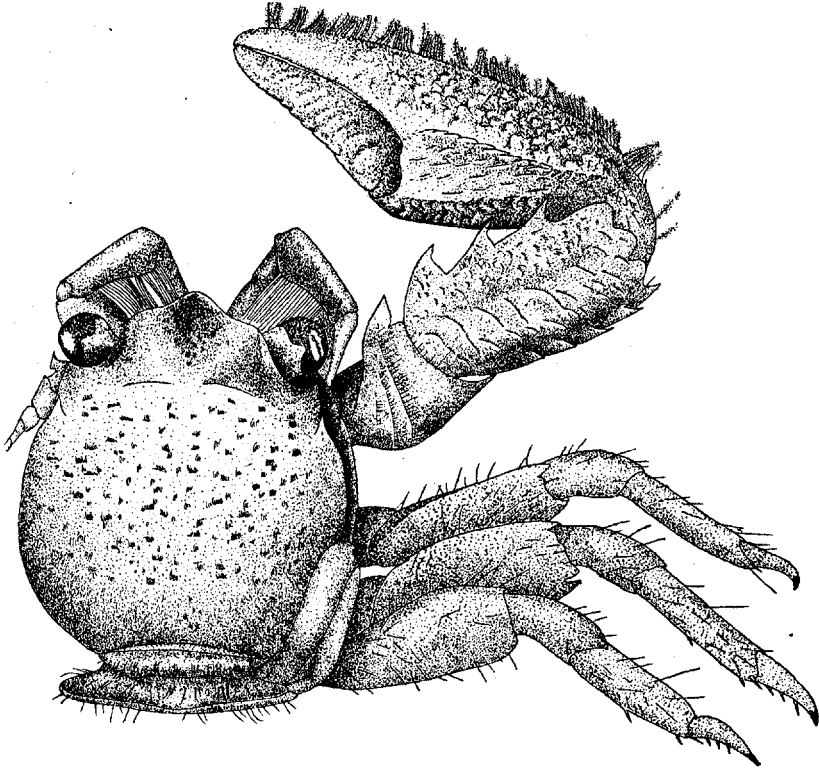
Habitat: Common under negro-heads between tide-marks.

3. *Petrolisthes fimbriatus* BORRADAILE

Text-figs. 5-6

Petrolisthes lamarchii var. *fimbriatus* BORRADAILE 1898, p. 466; p. 467, Pl. 36, fig. 2—Ellice Is.: Funafuti; Rotuma Is. (Type-locality: Funafuti or Rotuma Is.).

Carapace and legs pubescent sparsely. Carapace depressed and longer than broad. Front triangular, with apex rounded. Epibranchial spine acuminate.



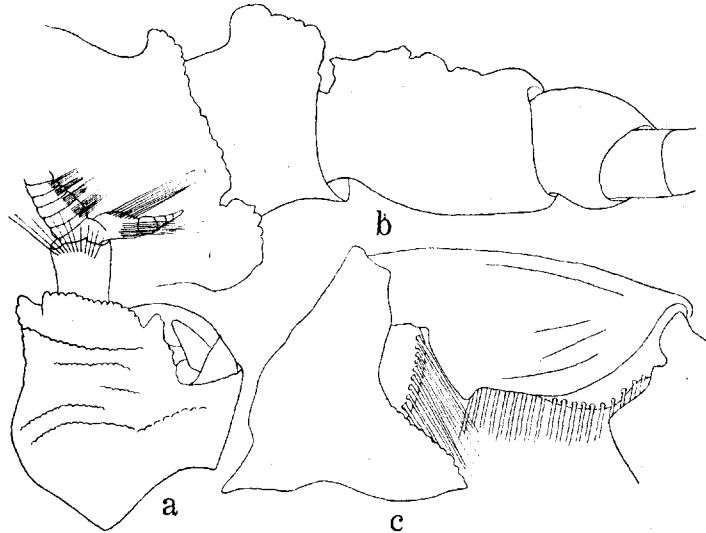
Text-fig. 5. *Petrolisthes fimbriatus* BORRADAILE, male, $\times 10$.

First peduncle of antennule broader than long. Upper outer angle slightly prolonged, anterior margin undulated, with a notch near the proximal end. Dorsal surface ornamented with transverse, granulated lines. The crest of first peduncle of antenna furnished with granules. Second peduncle of antenna ornamented with granules on the anterior margin.

Chelipeds unequal. Wrist armed with three or four teeth on the anterior margin. Rugose posterior border armed with two or three acute teeth distally. The outer margin of palm covered with granules beneath the marginal series of cilia; four or five of them prolonged into spines proximally.

Ambulatory legs a little hairy. Anterior margin of merus ornamented

with hairs as well as the palm of cheliped, but not armed with spine. Posterior margin of meri of first two pairs armed with a tooth at distal end; that of the third pair having the posterior margin unarmed. Propodi



Text-fig. 6. *Petrolisthes fimbriatus* BORRADAILE.
 a. Antennule $\times 25$, b. Antenna $\times 25$, c. Third maxilleped $\times 12$.

of first three pairs armed with one or two spinules along the longitudinal axis of the posterior margin; one on the subdistal end as usual, but the other in the middle of the segment may be present or absent according to individuals. Propodi armed with two similar spinules at distal end of their margin. Dactyli of first three pairs armed with three spinules on the posterior margin.

BORRADAILE described his material as "With or without spines on the anterior margin of the ambulatory legs," but no spine is to be found in our specimens.

Material examined:—

1) Palau Is.:

Ngáruangel Atoll, 1 ♂, Feb. 20, 1938 (MURAKAMI).

Ngadarák Reef, under negro-head, 1 ♂, May 23, 1939 (MIYAKE).

..... 1 ♂, 2 ♀, Jun. 16, 1939 (MIYAKE).

..... 1 ovig. ♀, Jun. 17, 1939 (MIYAKE).

aUgulpelú Reef, under negro-heads, 2 ♂, 1 ovig. ♀, 1 ♀, May 5, 1939 (MIYAKE).

- 2) Kusaie: Malem, 3 ♂, 2 ovig. ♀, Dec. 20, 1937 (ESAKI).
 2 ♂, Dec. 21, 1937 (ESAKI).

Habitat: Common under negro-heads between tide-marks.

Colour in alcohol: Whole body whitish or yellowish. Dorsal face of carapace and chelipeds with red spots. Meri and propodi of ambulatory legs with one transverse stripe or two.

4. *Petrolisthes lamarckii* (LEACH)

Text-figs. 7-8

Pisidia lamarckii LEACH, Dict. Sci. Nat. vol. 18, 1820, p. 54.

not *Porcellana lamarckii* H. MILNE-EDWARDS 1837, p. 251—Bismarck Is.
 (synonym *Petrolisthes hastatus* STIMPSON).

Petrolisthes lamarckii BORRADAILE 1898, p. 464; p. 465, Pl. 36, figs. 1, 1 a
 —Ellice Is.: Funafuti; Rotuma.

..... MARCUS 1911, p. 533, text-figs. 14-15; Pl. 26, fig. 3
 —Locality unknown.

..... GORDON 1931, p. 526—Hongkong.

Porcellana dentata H. MILNE-EDWARDS 1837, p. 251—Java: Batavia.

Porcellana (Petrolisthes) dentata de MAN 1888 a, p. 216; 1896, Pl. 32, fig.
 47 b—Mergui Archipelago.

..... de MAN 1888 b, p. 409, Pl. 12, fig. 7—Java.

Petrolisthes dentatus var. de MAN 1896, p. 374, Pl. 32, figs. 47 a, 48 c—
 Atjeh, North Sumatra.

Petrolisthes dentatus HASWELL 1882, p. 146—Port Denison, Queensland.

..... HENDERSON 1893, p. 426—Indian Ocean.

..... RATHBUN 1910, p. 314—Moluccas; Amboina.

Porcellana speciosa DANA 1852, p. 417, Pl. 26, fig. 8—Sulu Sea; Paumotu;
 Wakes Is.

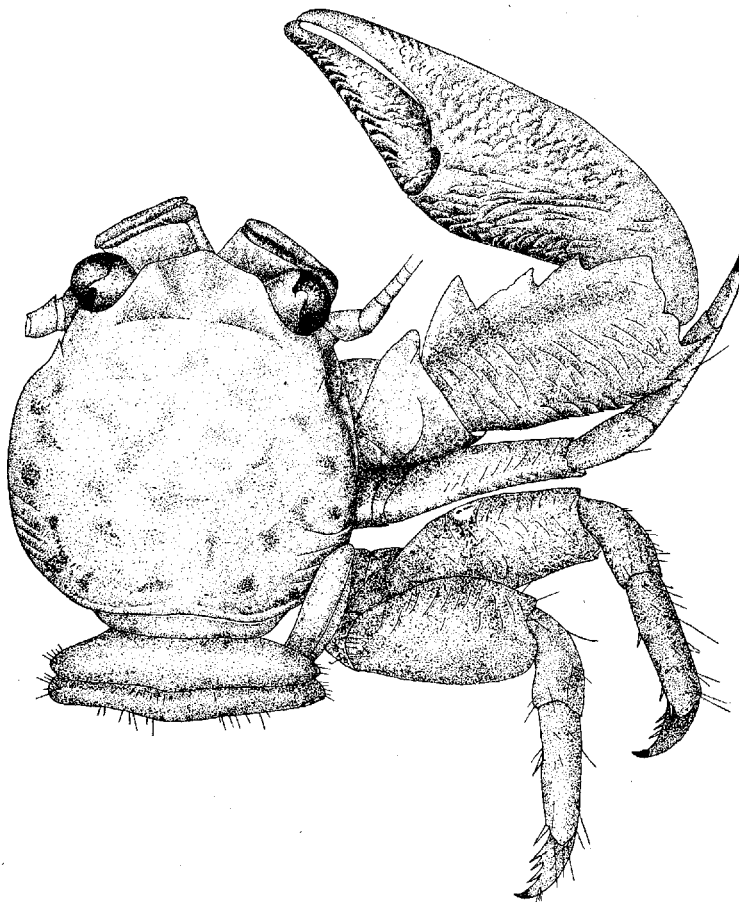
Petrolisthes speciosus STIMPSON 1858, p. 227; p. 241; 1907, p. 182, Pl. 22,
 fig. 2—Kagosima Bay; Amami-Ōsima I.; Bonin Is.

..... ORTMANN 1892, p. 262—South Sea; East Australia.

..... BALSS 1913, p. 30—Bonin Is.

Petrolisthes sp. PARISI 1917, p. 7—Wakes Is.

Porcellana bellis HELLER 1865, p. 76, Pl. 6, fig. 4—Nicobars.



Text-fig. 7. *Petrolisthes lamarchii* (LEACH), male, $\times 7.5$.

Carapace slightly convex and nearly as long as broad. Front triangular, rounded anteriorly separated from gastric region by a slightly elevated transverse crest. The lateral margins of carapace are cristate and terminate anteriorly in the acute epibranchial tooth.

First peduncle of antennule broader than long; upper margin undulated (Text-fig. 8 a). Second peduncle of antenna provided with a laminated crest on the anterior margin. The proximal end of crest is obtuse as in the distal one (Text-fig. 8 b). Merus and carpus of third maxilliped as figured in text-fig. 8 c.

Chelipeds unequal. Wrist measures nearly $\frac{3}{4}$ the length of carapace and is nearly twice as long as broad. Its anterior margin armed with three teeth usually, but in some individuals four or more teeth are found on this margin. Rugose posterior margin armed with three or four acute teeth distally. Upper surface of wrist is much depressed and covered with minute granules, sometimes arranged in very short transverse lines; these granules and lines are bordered with microscopical hairs. Palms covered with similar granules and lines on upper surface. Fingers not hairy along their inner borders.



Text-fig. 8. *Petrolisthes lamarckii* (LEACH).

a. Antennule $\times 33$, b. Antenna $\times 33$, c. Third maxilliped $\times 16$.
d. Distal part of ambulatory leg $\times 16$.

Ambulatory legs a little hairy. Anterior margin of meri unarmed. Posterior margins of meri of first two pairs armed with one tooth at

distal end; those of third pair having the posterior margin unarmed. Propodi of first three pairs armed with two spinules along the longitudinal axis and two similar spinules at distal end of their posterior margins. Dactyli of first three pairs armed with three spinules on their posterior margins (Text-fig. 8 d).

Material examined :—

- 1) Palau Is. :
 Ngáruangel Atoll, 2 ♂, 1 ♀, 1 ovig. ♀, Feb. 20, 1938 (MURAKAMI).
 Babldáob I. : Melekéiok, Reef flat, 1 ovig. ♀, Jul. 19, 1939 (MIYAKE).
 Goréor I. : B-division, Songél a Lise, 1 ♀, Apr. 14, 1939 (MIYAKE).
 Ngadarák Reef, 2 ♂, 4 ovig. ♀, May 23, 1939 (MIYAKE).
 9 ♂, 1 ♀, 7 ovig. ♀, Jun. 1, 1939 (MIYAKE).
- 2) Tokobei I., 1 ♂, 1 ovig. ♀, Apr. 10, 1938 (MURAKAMI).
- 3) Kusaie : Malem, 6 ♂, 2 ♀, 18 ovig. ♀, Dec. 20-21, 1937 (ESAKI).
- 4) Jaluit, 1 ♂, infested with *Bopyrus*, 3 ♀, 3 ovig. ♀, Dec. 1914-Feb. 1915 (HORII).

Habitat : Common under coral rocks between low tide-marks.

Colour in life : Dorsal face dark brown, with dark green or white spots scattered confusely. The latter change into red spots after preservation in alcohol. Ventral face whitish.

4 a. *Petrolisthes lamarckii* var. *rufescens* (HELLER)

Pl. I, fig. 2; Text-figs. 9-10

Porcellana rufescens HELLER 1862, p. 255, Pl. 2, fig. 4; 1865, p. 76—
 Tahiti (Type-locality).

Petrolisthes lamarckii var. *rufescens* BORRADAILE 1898, p. 465; p. 467—
 Funafuti; Rotuma.

Petrolisthes rufescens NOBILI 1906, p. 130—Red Sea.

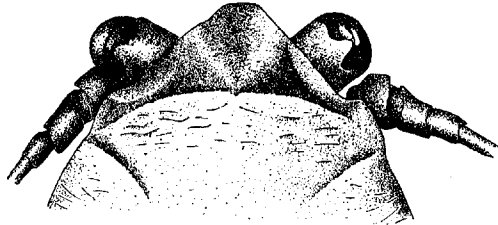
..... NOBILI 1907, p. 377—Polynesia.

..... BALSS 1915, p. 7—Suez.

Petrolisthes dentatus ORTMANN 1892, p. 262—South Sea.

Carapace depressed and quite as long as broad. Upper surface of carapace punctate in the middle and posteriorly, and its anterior half covered with fine granules which gradually pass into transverse striae

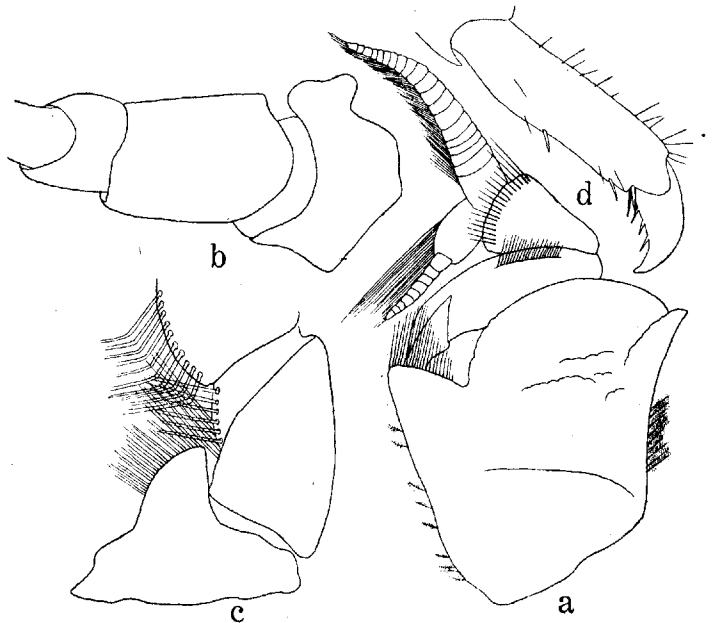
toward the lateral margins. Front triangular, much depressed, concave above. Front is separated from the gastric region by a slightly elevated



Text-fig. 9. Anterior part of *Petrolisthes lamarckii* var. *rufescens* (HELLER), male, $\times 7.5$.

transverse crest, which is interrupted in the middle by median frontal furrow. Epibranchial spine not present.

First peduncle of antennule broader than long. Anterior margin rounded, upper outer angle a little produced. Ventral surface ornamented



Text-fig. 10. *Petrolisthes lamarckii* var. *rufescens* (HELLER).
a. Antennule $\times 25$, b. Antenna $\times 40$, c. Third maxilliped $\times 12$,
d. Distal part of ambulatory leg $\times 12$.

with transverse granulated lines. The structures of antenna and third maxilliped closely resemble those of *P. lamarckii* (Text-fig. 10).

Chelipeds subequal. Wrist armed with five broad teeth as usual on anterior margin, but in some individuals the teeth may decrease to four or even less; the one at the proximal end of this series is the largest. Upper surface of palm slightly convex, covered with flattened granules or squamiform lines. The inner margins of fingers almost smooth; no gap present between them. Ambulatory legs are similar in structure to those of *P. lamarchii*.

Material examined:

- 1) Palau Is.: Ngaiánges I., 2 ovig. ♀, Mar. 7, 1938 (MURAKAMI).
- 2) Kusaie: Málem, 3 ♂, 3 ovig. ♀, 1 ♀, Dec. 20-21, 1937 (ESAKI).
- 3) Jaluit, 2 ♀ (Cat. no. 274), Dec. 1914-Feb. 1915 (HORI).

Habitat: The animal lives in close association with *P. lamarchii* (LEACH).

Coloration: Colour of this species closely resembles *P. lamarchii* (LEACH).



Text-fig. 11. *Petrolisthes penicillatus* (HELLER), male, ×7.5.

5. *Petrolisthes penicillatus* (HELLER)

Text-figs. 11-12

Porcellana penicillata HELLER 1865, p. 79—Nicobar Is. (Type-locality).

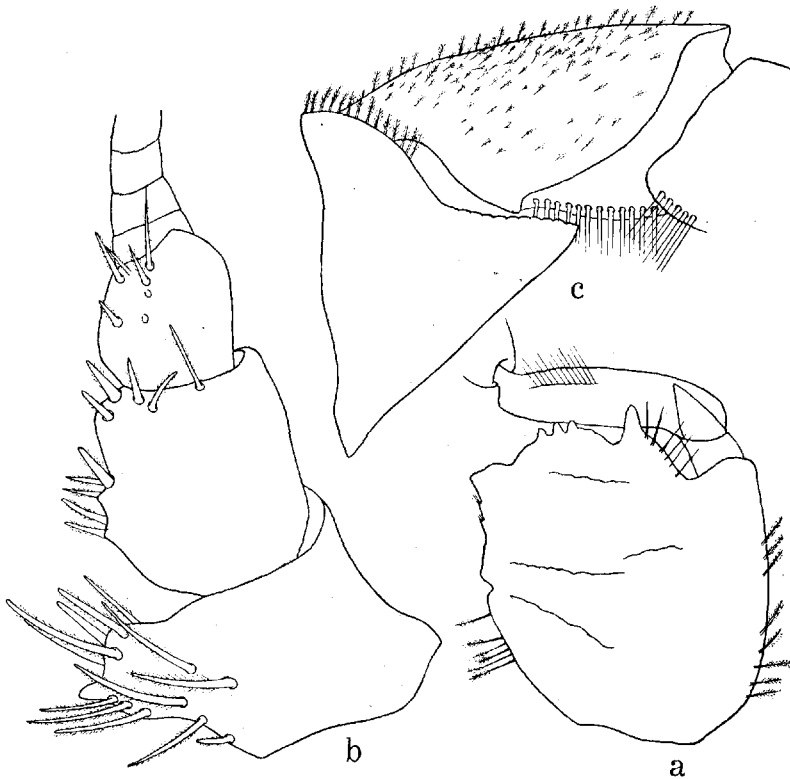
Petrolisthes penicillatus ORTMANN 1897, p. 288—Now new locality.

Porcellana villosa RICHTERS 1880, p. 180, Pl. 17, figs. 11-12—Mauritius.

..... MIERS 1884, p. 559—Amirante Is.

Petrolisthes villosus ORTMANN 1892, p. 264—Fiji Is.

Carapace a little longer than broad, lateral margins rather rounded; slightly convexed, regions well marked, especially hepatic, gastric and branchial regions being more elevated. Dorsal surface covered with velvety tomentum, moreover furnished with tufts of hair on those elevated regions.



Text-fig. 12. *Petrolisthes penicillatus* (HELLER).

a. Antennule $\times 53$, b. Antenna $\times 100$, c. Third maxilliped $\times 33$.

First peduncle of antennule provided with some teeth on the anterior margin (Text-fig. 12 a). Second peduncle of antenna nearly twice as long as broad, provided with a laminated crest, which is furnished with setae. Third peduncle as long as broad, and provided with setae on its inner and anterior margins (Text-fig. 12 b). Merus of third maxilliped longer

than broad, its inner margin rounded. Carpus triangular; its inner margin much produced and angular (Text-fig. 12 c).

Chelipeds and ambulatory legs as well as carapace ornamented with tomentum. Chelipeds unequal. Wrist armed with three or four teeth on its anterior margin, its posterior margin smooth beneath hairs. Palm furnished with long hairs on the outer margin. There are two tubercles on the upper surface of wrist, one being on the longitudinal axis at one-third the length of the joint from its proximal end, the other on the antero-distal end. They are covered with tufts of long hair. Palm furnished with long hairs on the outer margin. No gap present between fingers.

Ambulatory legs furnished with long hairs on both anterior and posterior margins. Posterior margins of meri of first two pairs provided each with a tooth at distal end; those of third pair unarmed. Propodi of first three pairs provided with four spinules on posterior margin as in *P. rufescens* (HELLER). Dactyli of first three pairs armed with three spinules on the posterior margin. Dactyli are short, terminating in a brown horny claw.

Material examined:

Babldáob I.: Melekéiok, Reef flat, 3 ♂, 4 ovig. ♀, 1 ♀, Jul. 19, 1939 (OHSHIMA et MIYAKE).

Ngadarák Reef, under negro-head, 1 ♂, May 23, 1939 (MIYAKE).

Habitat: Common under negro-heads between tide-marks.

Colour in life: Dorsal surface brown, whitish ventrally.

Genus *Neopetrolisthes* MIYAKE

Carapace subovate, longer than broad and strongly convex in both directions. Front broad, much flattened and laminated; margin entire. Eyes small. First peduncle of antennule longer than broad. First peduncle of antenna very short. Second peduncle of antenna more or less cristate. Chelipeds subequal, very short and robust. Wrist very short, being about half as long as carapace. Palm broad and flattened. Ambulatory legs short, robust, and are destitute of spines and hairs.

Type: *Neopetrolisthes ohshimai* MIYAKE

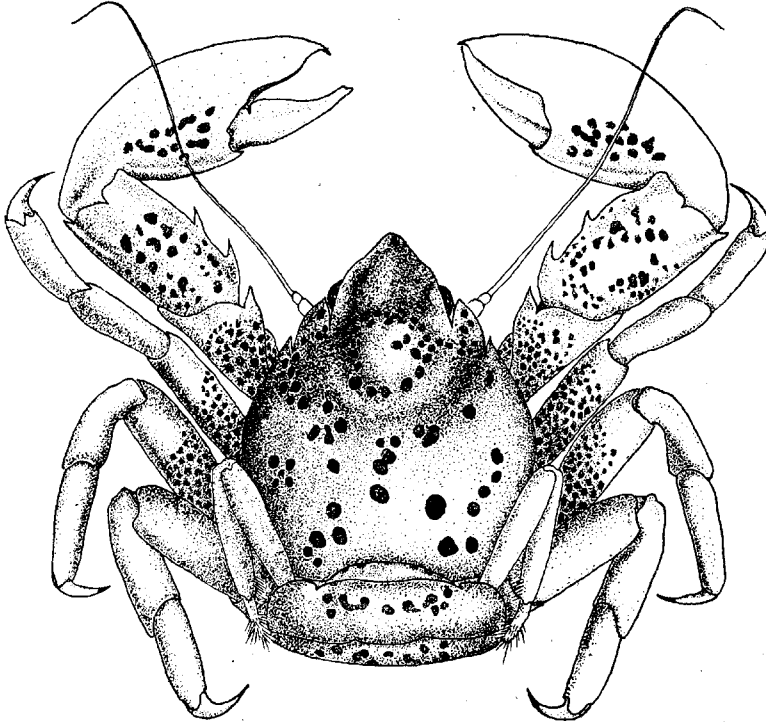
Commensally living in the oral cavity of the gigantic sea-anemone, *Stoichactis kenti*, on coral reefs of Ryūkyū, Palau Islands and Great Barrier Reef.

6. *Neopetrolisthes ohshimai* MIYAKE

Pl. I, fig. 5; Text-figs. 13-14

Neopetrolisthes ohshimai MIYAKE 1937 a, p. 34, text-figs. 1-2—Isigaki I., Yaéyama-Group, Ryūkyū (Type-locality).

..... MIYAKE 1940, p. 47, Pl. 1, fig. 8—Palau Is.



Text-fig. 13. *Neopetrolisthes ohshimai* MIYAKE, female, allotype, $\times 3$.

Carapace subovate, strongly convex in both directions and much longer than broad. Upper surface of carapace smooth, polished and covered with delicate transverse striae on both postero-lateral portions. Front broad and much projecting forwards and downwards. Median lobe of front triangular, with apex rather acute. Frontal lobe markedly flattened,

lamine and convex above. Postocular tooth triangular. Eyes very small, half of which being hardly visible from above. Cervical groove scarcely distinct. Gastric region most elevated. Lateral margins strongly cristate anteriorly; carinae approaching middle of branchial regions. Epimera entire.

First peduncle of antennule longer than broad. The anterior margin undulated, both outer and inner ends much projecting upwards. Surface smooth, covered with reddish round markings (Text-fig. 14 a). Antenna smooth, covered on the surfaces of basal peduncles with markings similar to those just mentioned. First peduncle of antenna very short, not reaching the upper margin of the carapace. Second peduncle rather short and armed with small, triangular crest on the anterior margin. Third peduncle granulated on the anterior margin. Fourth peduncle very short, smooth. The relative lengths of basal peduncles are II : III : IV = 4 : 3 : 2 (Text-fig. 14 b). Merus of third maxilliped longer than broad; inner laminate crest rather broad, antero-inner margin undulated. The surface punctate, covered with delicate transverse striae. Carpus smooth, furnished with a groove along the outer margin on the surface. Its antero-inner angle slightly produced forwards (Text-fig. 14 c).

Chelipeds subequal, smooth on the surface. Wrist remarkably short, of only about half the length of carapace. Anterior margin of wrist armed as usual with three teeth, but the latter may become rudimentary and as few as two or less in number. Palm and fingers depressed and broad. Posterior margin of wrist furnished with a linear submarginal crest. Inner margin of palm prolonged at its distal end into a rather acute spine. Movable finger shorter than palm. No gap present between fingers.

Ambulatory legs smooth and subcylindrical. Propodi bear a spinule at their distal end on posterior margin of ventral side. Dactyli short, terminating in a black horny claw and armed with one or two spinules on the posterior margin (Text-figs. 14 d, e).

Material examined :—

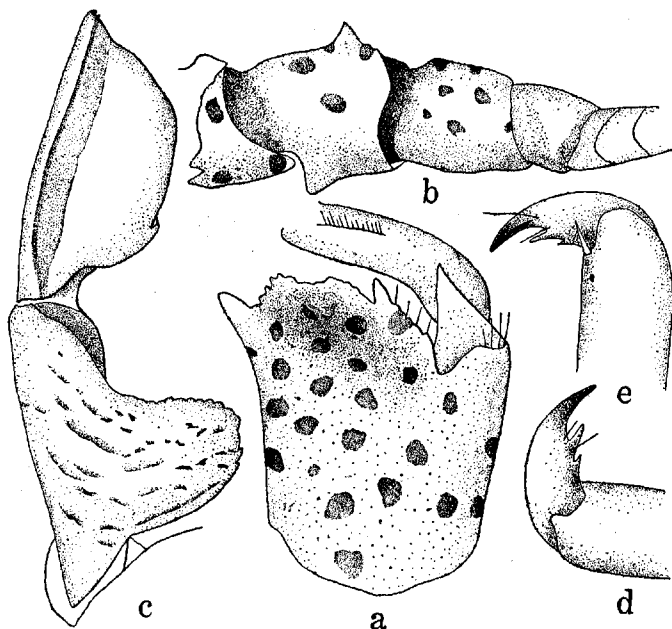
Ngaiánges I., Palau Is., 1 ♂, 1 ♀, found inside *Stoichactis kenti*; 1 ♂, in dead coral at lower tide-mark, Dec. 15, 1937 (WADA).

Ngadarák Reef, 4 ♂, 3 ovig. ♀, 1 ♀, found inside *S. kenti*; 1 ♂, 1 ovig.

♀, found inside *Stoichactis Haddoni*, Jun. 18, 1939 (MIYAKE).

Malagál I., Palau Is., 2 ♂, 1 ovig. ♀, found inside *S. kenti*, May 6, 1939 (MIYAKE).

Colour in life: Body white with reddish round markings on both dorsal and ventral surfaces.



Text-fig. 14. *Neopetrolisthes ohshimai* MIYAKE.

a. Antennule $\times 25$, b. Antenna $\times 25$, c. Third maxilliped $\times 12$, d. Dorsal view of distal part of abulatory leg $\times 12$, e. Ventral view of same $\times 12$.

Habitat: Commonly found residing commensally in the oral cavity of *Stoichactis kenti* (HADDON et SHACKLETON),¹⁾ measuring from 15 to 40 centimetres in diameter, seldom also inside *Stoichactis Haddoni* (SAVILLE-KENT).²⁾ In the host animals, these Porcellanid crabs are associated with a few prawns, *Pericremenes (Ancylocaris) brevicarpalis* (SCHENKEL)³⁾ and pretty fishes, *Actinicola percula* (LACÉPÈDE),⁴⁾ *Amphiprion polymus* (LINNAEUS)⁵⁾ and *Amphiprion frenatus* BREVOORT.⁶⁾ In coral reefs of the type-locality, in

1), 2) According to the kind information from Prof. Dr. Tohru UCHIDA.

3) After consultation with Mr. Ituo KUBO.

4-6) Identified by Mr. Hyôzi AOYACI.

addition to the associates enumerated above, there were found a few snails, *Coralliophila stearnsii* PILSBRY,¹⁾ attached to the outer surface of the body of the anemone. This snail has not yet been found in Palau Islands.

Distribution : Palau Is. ; Ryūkyū Is. ; Great Barrier Reef.

Genus *Porcellana* LAMARCK restricted

Carapace usually convex, as broad as long, sometimes broader, sub-orbicular and depressed above. Front prominent and dentate, the teeth usually well developed. Eyes, of moderate size, the orbits deep. The first peduncle of antenna large, projecting within in the form of a triangular tooth or point, and much produced outwards, far removing the second peduncle from orbit. Second peduncle of antenna cylindrical, not crested. The lengths of second and third peduncles are subequal. Chelipeds variable in form, moderately flattened, wrist rather short, fingers often contorted. Dactyli of ambulatory legs usually rather longer and robust, terminating in a single claw, being sometimes short and armed with a double claw.

Type : *Porcellana platycheles* LAMARCK

The following species occur in Micronesia.

1. *P. armata* DANA
2. *P. suluensis* DANA
3. *P. nitida* HASWELL
4. *P. murakamii* sp. nov.
5. *P. melissa* sp. nov.

Key to the Micronesian species of *Porcellana*

- I) Carapace almost smooth, not areolated above. Eyes rather large. First peduncle of antennule broader than long. Dactyli rather short.
 - i) Anterior margin of wrist armed with acuminate teeth.
 - A) Median lobe of front much deflexed downwards. Dactyli bear two unguicles *P. suluensis* DANA

7) Nom. jap. "Kagome-sangoyadori" identified by Mr. Tokubei KURODA.

- B) Median lobe of front not deflexed and subdivided.
 Dactyli terminated in a single claw and bear four spinules *P. armata* DANA
- ii) Anterior margin of wrist without tooth and provided with an entire laminate crest throughout the margin... *P. nitida* HASWELL
- II) Carapace convex, areolated above. Eyes small. First peduncle of antennule longer than broad. Dactyli rather long.
- i) Carapace without tooth on the lateral margin.....
 *P. murakamii* sp. nov.
- ii) Carapace with two or three teeth on the lateral margin ...
 *P. melissa* sp. nov.

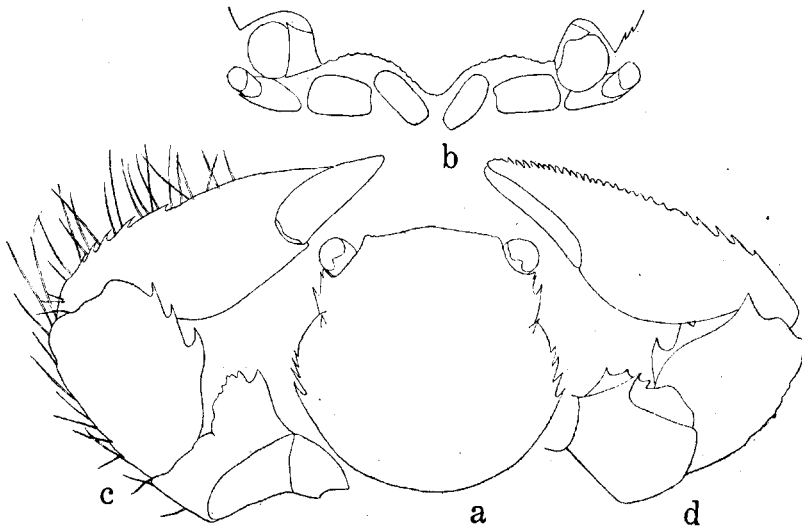
7. *Porcellana suluensis* DANA

Text-figs. 15-16

Porcellana suluensis DANA 1852, p. 414; 1855, Pl. 26, fig. 4—Sulu Sea (Type-locality).

..... RATHBUN 1924, p. 30, Pl. 1, figs. 15-16—N. W. Australia.

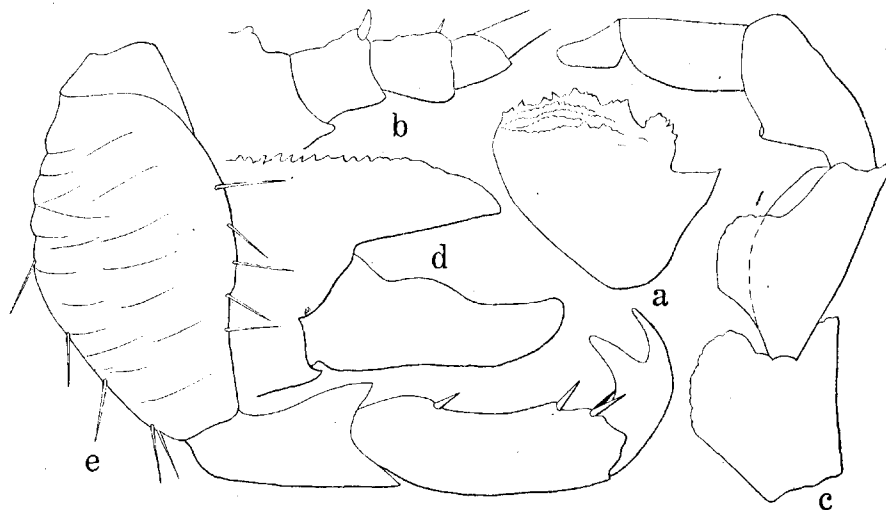
..... GORDON 1935, p. 9, text-fig. 4—Eiland Enoe.



Text-fig. 15. *Porcellana suluensis* DANA, female.

a. Dorsal view of carapace $\times 10$, b. Front of carapace $\times 16$, c. Dorsal view of left cheliped $\times 16$, d. Ventral view of same $\times 16$.

Carapace, chelipeds and ambulatory legs covered with long hairs sparsely. Carapace smooth beneath hairs, rather convex in both directions, being a little broader than long (Text-fig. 15 a). Front so much deflexed downwards that the frontal lobes cannot be seen from above. Median lobe largest, with apex rounded. Lateral lobes form the inner angles of orbits (Text-fig. 15 b). On the lateral margin of carapace there are two spinules behind the outer orbital angle, the anterior one being very small as described by GORDON (1935, p. 9, fig. 4). One spinule occurs on the epibranchial region just above the sinus of the lateral margin. There are four spinules on the lateral margin at the widest portion of carapace. Eyes rather large.



Text-fig. 16. *Porcellana suluensis* DANA, female.

a. First peduncle of antennule $\times 40$, b. Antenna $\times 40$, c. Third maxilliped $\times 40$, d. Fingers of left cheliped $\times 25$, e. Second ambulatory leg of left side $\times 35$.

First peduncle of antennule broader than long, lobe-like, ventral surface smooth; upper surface furnished with a few granulated ridges running transversely as is the case in members of *Pisosoma* (Text-fig. 16 a). First peduncle of antenna rather large. Succeeding peduncles smooth, cylindrical. Second and third peduncles furnished with a spinule on upper distal end. The relative lengths of basal peduncles are II:III:IV = 10:10:7 (Text-fig. 16 b). Third maxilliped smooth on ventral surface.

Merus longer than broad; the laminate crest broad with undulated margin (Text-fig. 16 c).

Chelipeds short and stout. Arm broader than long, a laminate crest produced strongly at inner distal angle, its margin being provided with a few teeth. Wrist longer than broad, with three teeth on inner margin. Outer and upper surfaces of wrist furnished with long hairs sparsely. Palm twisted into a vertical plane. Its lower margin denticulated closely, while on the proximal end there are five or six spinules beneath the pubescence (Text-figs. 15 c-d, 16 d).

Meri of ambulatory legs transversely striated above. Propodi armed with two spinules along the longitudinal axis and with two similar spinules at the distal end of the posterior margin. Dactyli very short, with one stout unguicle besides the principal one as seen in members of *Polyonyx* (Text-fig. 16 e).

Material examined:—Ngadarák Reef, 1 ♀, May 21, 1939 (MIYAKE).

Colour in alcohol: Whole body whitish.

Habitat: Found on *Acropora* sp. on the reef flat.

8. *Porcellana armata* DANA

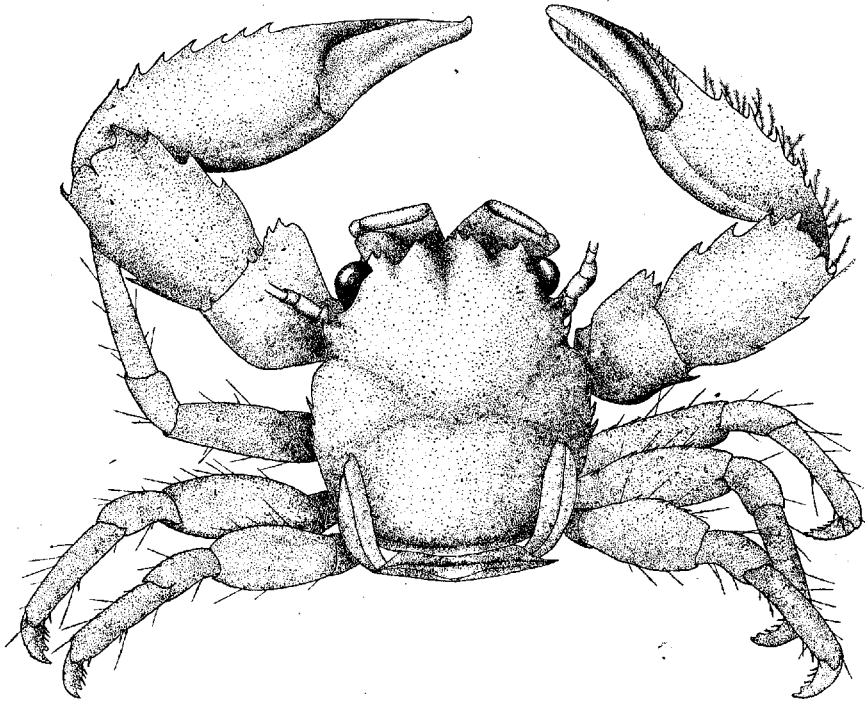
Text-figs. 17-19

Porcellana armata DANA 1852, p. 426; 1855, Pl. 26, fig. 14 (named *Porcellana spinuligera* in the Plate)—Mangsi I., Balabac Passage, North Borneo (Type-locality).

The following illustration and short description of this common inhabitant in Songél a Lise are given, because DANA's description was based on much damaged specimen, and the species is still insufficiently known. Moreover the form presents some variations, which will be worthy of putting on record. The rich materials at my disposal have enabled me to study the slight variations which are revealed by the frontal margins and number of teeth on the lateral margins of the carapace.

Carapace slightly longer than broad, a little convex, smooth, not at all areolated. Cervical groove distinct. Front as a rule trilobed, median lobe broad, and frontal margins variable in form. The median lobe much produced forwards and usually divided into four teeth; two of them on

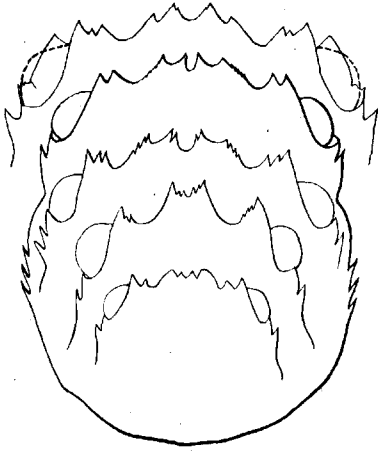
the inner side are small, separated by a U-shaped sinus, while the remaining lateral ones are broader than the inner teeth. Lateral lobes usually divided into two teeth. Lateral margin usually furnished with



Text-fig. 17. *Porcellana armata* DANA, male, $\times 7.5$.

five minute teeth. Anterior margins of frontal lobes sometimes subdivided irregularly into a few or many minute teeth as in text-fig. 18. Farther back an acuminate tooth produced behind the post-ocular angle, sometimes two or three teeth may occur there. Lateral margin of carapace usually armed with three teeth, frequently with two, but rarely with only one tooth, or as many as four teeth.

First peduncle of antennule broader than long, surface smooth. The crest-like ridges, where the anterior plate and ventral or dorsal plates meet, more or less undulated; ridges slightly produced upwards on both inner and outer angles (Text-fig. 19 a). First peduncle of antenna much produced forwards. Succeeding peduncles cylindrical, smooth. Their relative lengths are II:III:IV=7:7:4 (Text-fig. 19 b). Merus of third maxilliped longer than broad, ornamented with transverse striae on the



Text-fig. 18. *Porcellana armata* DANA.
Variation of frontal armour $\times 12$.

ventral surface. Carpus rather long, ornamented with one longitudinal groove running along the outer margin (Text-fig. 19 c).

Chelipeds unequal, smooth. Arm broader than long, upper distal end much produced, and armed with two or three teeth. Wrist longer than broad, armed with four teeth on anterior margin, including upper distal tooth, also with three teeth on posterior margin. Palms twisted into a vertical plane in both hands. Palm of larger

hand armed with six or seven minute teeth arranged in a longitudinal line on outer margin, while the smaller hand has five teeth. The larger hand of cheliped furnished with a tuft of short hair at the base of fingers on inner surface. Fingers of smaller cheliped furnished with long hairs thickly along both inner margins. Immobile finger armed with an obtuse tooth at the middle of inner margin. Movable finger armed with a similar tooth proximally. Immobile finger of smaller cheliped with a pair of unguicles at distal end and provided with microscopical tubercles (about 20 in number) along the submarginal line of outer surface.

Ambulatory legs smooth, with sparse hairs. Meri armed with two or three spinules on the anterior margin. Propodi armed with four spinules on posterior margin, two of them at the distal end in pair, one just in front of them, and the other before the middle of the segment. Dactyli armed with two unguicles at the distal end, of which the proximal one is very small. Besides them there are three spinules on posterior margins.

Material examined:—

Goréor I., Palau Is.:

Madalái, 11 ♂, 2 ♀, May 3, 1939 (MIYAKE).

Songél a Lise: A-division, 18 ♂, 21 ovig. ♀, 15 ♀, 1936 (TAKAHASI).

B-division, 52 ♂, 4 ovig. ♀, 37 ♀, 1936 (TAKAHASI).

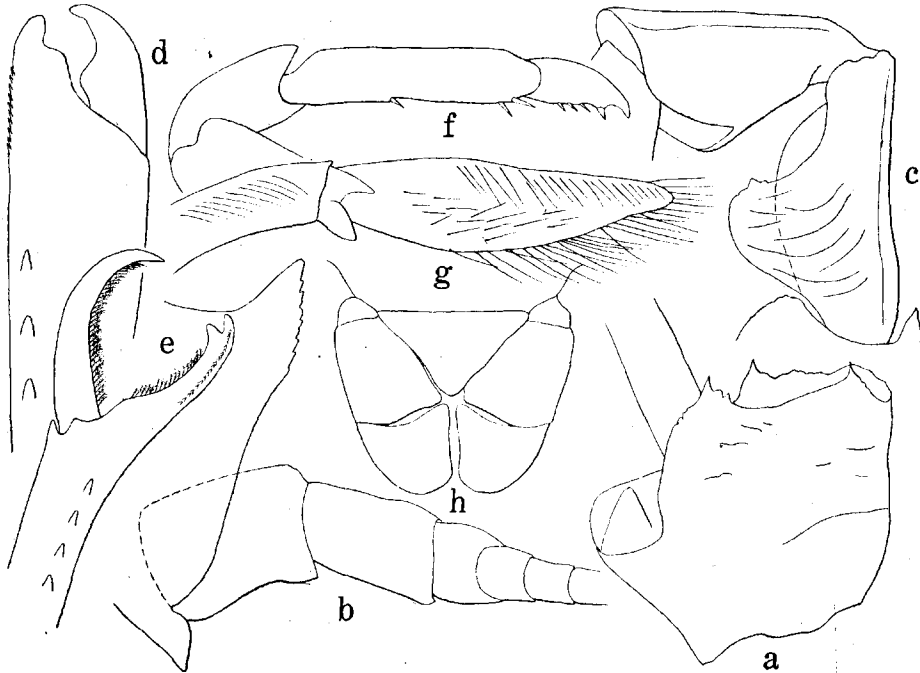
..... 14 ovig. ♀, 4 ♀, May 7, 1938 (MURAKAMI).

..... 18 ♂, 23 ovig. ♀, 12 ♀, in living corals,
Apr. 19, 1939 (MIYAKE).

Ngadarák Reef, 15 ♂, 12 ♀, on *Acropora* sp., Jun. 18, 1939 (MIYAKE).

Colour in alcohol: Dorsal surface light orange, whitish ventrally.

Habitat: Found commonly on living corals in Songél a Lise.



Text-fig. 19. *Porcellana armata* DANA, male.

a. Antennule $\times 40$, b. Antenna $\times 40$, c. Third maxilliped $\times 25$, d. Outer side of larger chela $\times 7.5$, e. Smaller chela $\times 12$, f. Second ambulatory leg $\times 18$, g. Abdominal appendage $\times 75$, h. Telson $\times 20$.

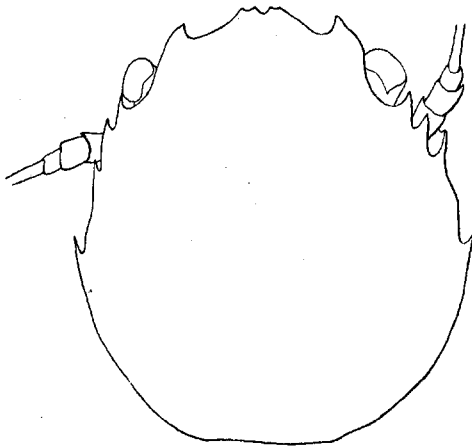
9. *Porcellana nitida* HASWELL

Text-figs. 20-22

Porcellana nitida HASWELL 1882, p. 148—Port Denison, Queensland (Type-locality).

Only one specimen of our collection appears to belong to *Porcellana nitida* HASWELL; figures of this species are given here.

Carapace a little longer than broad, smooth, glabrous and not areolated above. Front trilobed, median lobe broader than lateral ones and slightly produced with apex dentate, lateral lobes directed inwards, its apex being

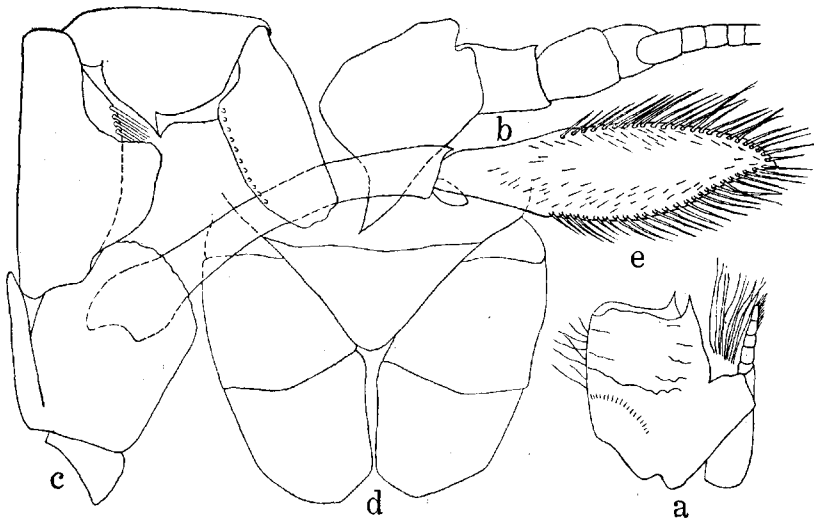


Text-fig. 20. *Porcellana nitida* HASWELL.
Outline of carapace of male $\times 10$.

pointed; lateral margins of front smooth. Two acute teeth behind the orbit, lower orbital angle with three teeth, of which the outermost one is largest. There is an acuminate tooth at the lateral margin of carapace.

First peduncle of antennule broader than long. Inner angles of both anterior crests projecting upwards. Ventral surface ornamented with transverse striae (Text-fig. 21 a).

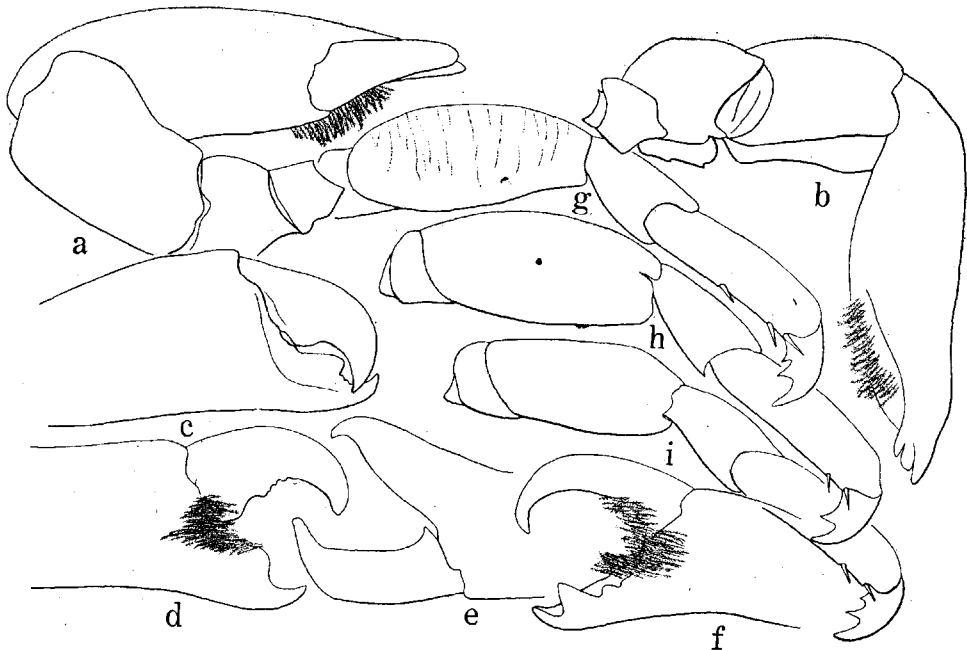
First peduncle of antenna very long. Succeeding peduncles smooth, cylindrical. Their relative lengths are II : III : IV = 2 : 2 : 1 (Text-fig. 21 b). Third maxilliped quite smooth on the ventral surface, merus very long, its laminate crest rather broad. Carpus rather broad (Text-fig. 21 c).



Text-fig. 21. *Porcellana nitida* HASWELL.

a. First peduncle of antennule $\times 25$, b. Antenna of right side $\times 25$,
c. Third maxilliped of right side $\times 25$, d. Telson $\times 25$, e. Abdominal
appendage of male $\times 40$.

Chelipeds unequal, left one being larger, smooth without denticulated margins. Arm two-thirds as broad as long, provided with a laminate crest on inner (anterior) margin, its distal end much produced. Wrist three-fifths as long as broad and provided with a laminate entire crest on inner margin. The length of palm a little larger than twice of breadth. Lower surface of palm slightly produced, ornamented with a tuft of hair at the base of fingers. Immovable finger armed with an obtuse tooth proximally. Immovable finger armed with two teeth at the subdistal end of inner margin, distal one of which is large and stout. Movable finger unarmed on inner margin.



Text-fig. 22. *Porcellana nitida* HASWELL.

- a. Dorsal view of left cheliped $\times 7.5$, b. Ventral view of right cheliped $\times 7.5$, d. Inner side of same $\times 7.5$, e. Outer side of right chela $\times 7.5$, f. Inner side of same $\times 7.5$, g. First ambulatory leg $\times 12$, h. Second leg $\times 12$, i. Third leg $\times 12$.

Ambulatory legs smooth, glabrous, of a moderate length. First three pairs of ambulatory legs of left side missing. Meri unarmed, a little longer than twice of breadth, and ornamented with transverse striae on upper surface. Carpi unarmed, two-thirds as long as broad. Dactyli 3.6

times as broad as long, armed with three or four spinules on posterior margin, of which the two at distal end being in pair, another one just in front of them, and the remaining one at the middle of the segment. The last mentioned spinule is absent from the second and third pairs. Dactylus short, bearing three unguicles which increase in size distally.

Telson of abdomen seven-lobed, the central segment being very small.

Material examined:—Babldáob I.: Off Ngarsmau, 28 m deep, 1 ♂, Jul. 14, 1939 (OHSHIMA et MIYAKE).

Habitat: Attached to a soft coral.

Colour in life: Whole body of a light red colour.

10. *Porcellana murakamii* sp. nov.

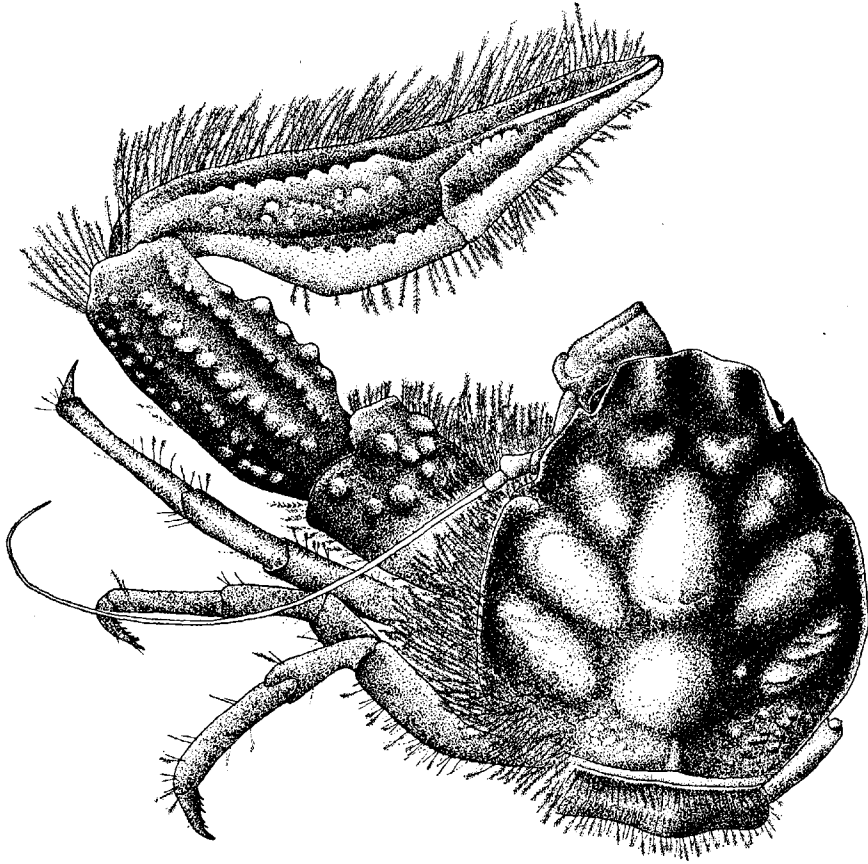
Pl. I, fig. 3; Text-figs. 23-24

Carapace longer than broad, subovate, rather convex, dorsal surface strongly areolated. Lateral margins entire, not dentate, expanded with a reflexed laminiform crest and separated from branchial regions by a deep groove. Front with a small median triangular lobe with apex concave strongly; frontal margin almost smooth, not serrated or denticulated.

First peduncle of antennule broader than long, anterior margin more or less undulated, projecting two or three lobes of irregular forms. Ventral surface smooth (Text-fig. 24 a). First peduncle of antenna large, triangular, much produced beyond the upper margin of the carapace. Succeeding peduncles cylindrical, of which the third one projects upwards on the upper distal end as in the genus *Petrolisthes*. The relative lengths of basal peduncles are II:III:IV=6:7:5 (Text-fig. 24 b). Third maxilliped smooth on the ventral surface. The crest of merus much projecting inwards with rounded margins. The upper inner angle much curved in a convexed line (Text-fig. 24 c).

Chelipeds unequal, the right one being larger in holotype; sculptured above with ridges, and somewhat irregularly tuberculated. Wrist oblong, quadrate, three longitudinal granulated ridges on its surface, and the anterior margin tuberculated, posterior margin straight. Palm broad and flat, with a rather prominent median ridge and an acute, denticulated,

ciliated outer margin. Inner margins not dentate, with a little gap between fingers.

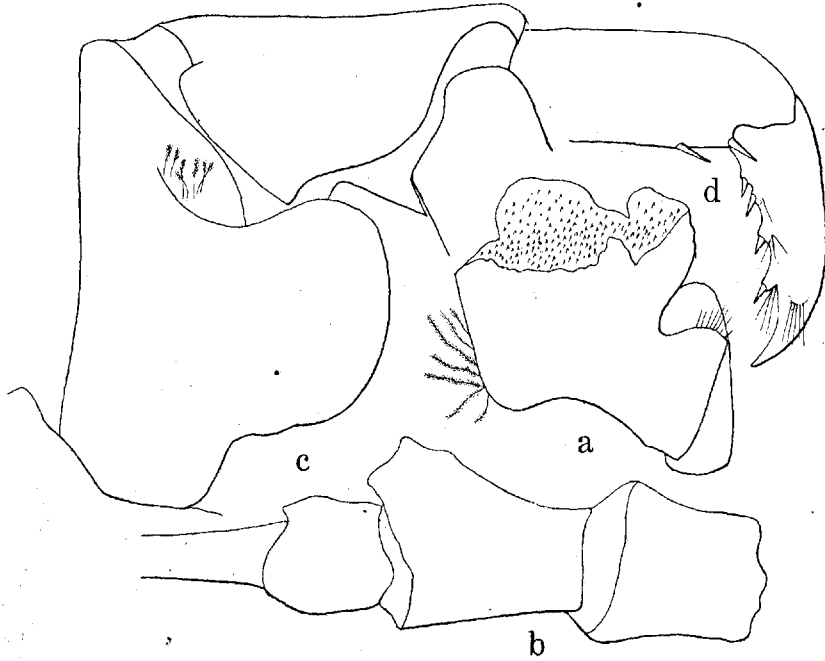


Text-fig. 23. *Porcellana murakamii* sp. nov. male, holotype, $\times 10$.

Ambulatory legs rather slender, cylindrical, somewhat hairy. Meri smooth, unarmed. Propodi as a rule furnished with three spinules on the posterior margin; two of them on the distal end in pair, the other in front of them along the longitudinal axis. Dactyli rather long, usually furnished with four spinules along the posterior margin (Text-fig. 24 d).

This species is closely allied to *Porcellana pulchra* STIMPSON in regard to the absence of teeth from the lateral margin of the carapace, but differs from the latter in many characters, *e. g.* in the shape of front, in the areolation of upper surface of the carapace, in the structures of

chelipeds and ambulatory legs, &c. *Porcellana ornata* STIMPSON is doubtless a distinct species.



Text-fig. 24. *Porcellana murakamii* sp. nov.

a. Antennule $\times 33$, b. Antenna $\times 53$, c. Third maxilliped $\times 33$,
d. Distal part of ambulatory leg $\times 33$.

Type: Holotype, ♂, from Songél a Lise, Goréor I., Palau Is., May 2, 1938, collected by Mr. Shiro MURAKAMI. Type deposited in the Zoological Laboratory, Kyūsyū Imperial University, Hukuoka.

Habitat: Found in the coral reef near low tide-mark in the type-locality.

Dimensions:

Length of carapace 6.3 mm.

Breadth of carapace..... 5.5 mm.

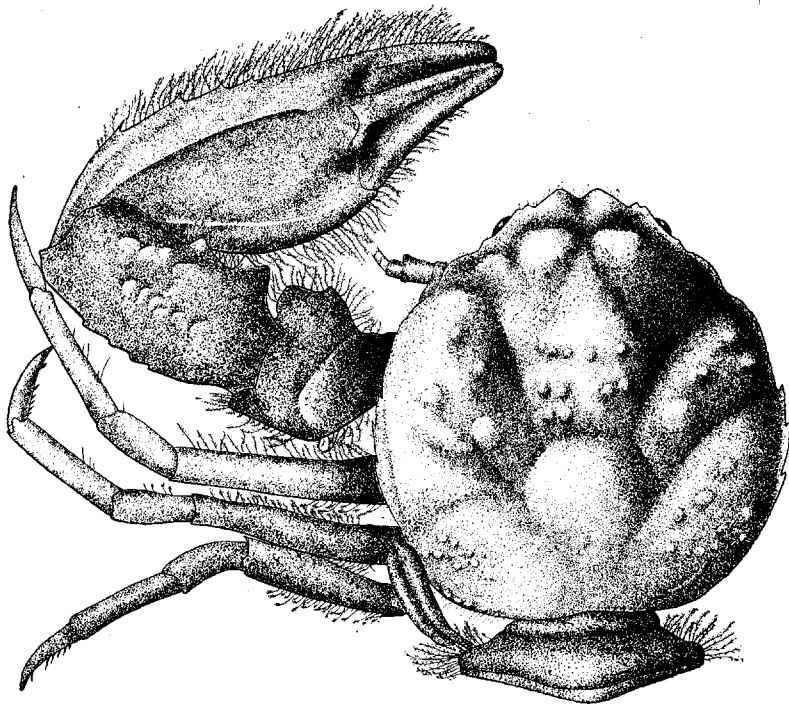
Colour in alcohol: Whole body whitish.

11. *Porcellana melissa* sp. nov.

Pl. I, fig. 4; Text-figs. 25-27

Carapace subovate, as long as broad in holotype, but a little longer than broad in cotypes. Upper surface areolated, protogastric, mesogastric,

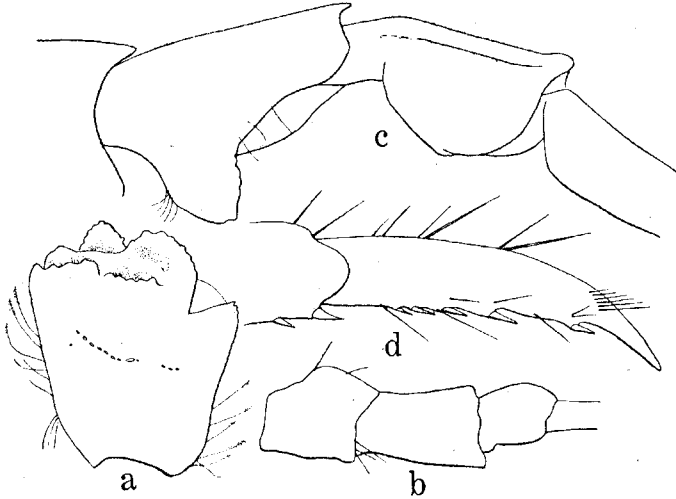
urogastric and branchial regions distinct. Urogastric and branchial regions covered with granules above. Front distinctly separated from supraorbital lobes by a notch. Median lobe of the front much deflexed downwards, forming a V-shaped notch between lateral lobes when seen from above. Frontal margins almost smooth, but separated microscopically. Lateral margins of carapace furnished with two or three teeth at the middle; three in holotype. Orbit deep; eyes small.



Text-fig. 25. *Porcellana melissa* sp. nov., female, holotype, $\times 7.5$.

First peduncle of antennule longer than broad. Upper surface furnished with two or three crest-like ridges and ornamented with granules in holotype (Text-fig. 26 a), but cotypes lack such ridges on the upper surface (Text-fig. 27 a). Ventral surface smooth. First peduncle of antenna large, its triangular teeth much produced under the eyes. Succeeding peduncles cylindrical, smooth in holotype (Text-fig. 26 b), but more or less granulated in cotypes (Text-fig. 27 b). In cotypes ventral surface of carpus granulated besides having a longitudinal line (Text-figs.

26 c, 27 c). Their relative lengths are II:III:IV=4:5:3 (Text-fig. 26 b). Merus of third maxilliped longer than broad, smooth on the ventral surface. Laminate crest of merus on inner margin rather small, its anterior margin more or less undulated. Carpus also longer than broad.



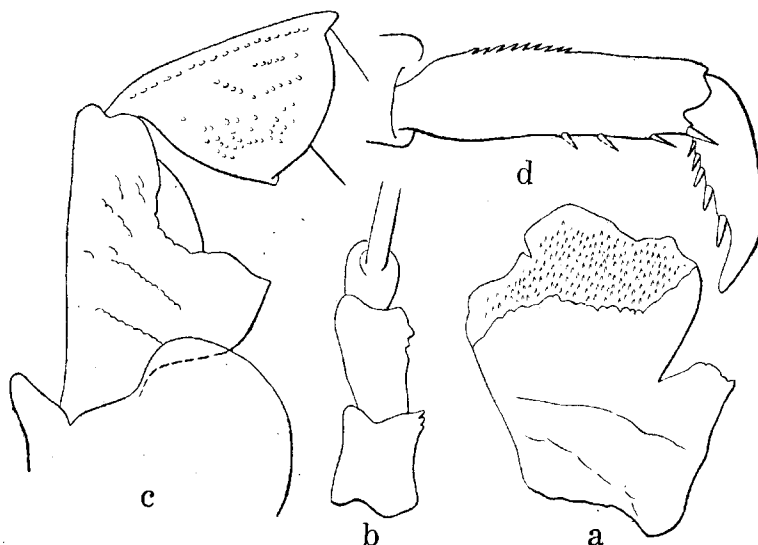
Text-fig. 26. *Porcellana melissa* sp. nov., female, holotype, $\times 25$.

a. First peduncle of antennule, b. Antenna, c. Third maxilliped, d. Dactylus of ambulatory leg.

Chelipeds subequal, left one being slightly larger. Arm smooth, very short, furnished with an obtuse tooth on the upper distal angle. Wrist quadrate, oblong; its breadth a little more than half the length and its length slightly larger than half the length or breadth of carapace. Upper surface ornamented with two longitudinal granulated ridges. Wrist of holotype armed with two obtuse teeth proximally on the anterior margin; proximal one rather broad, subdivided; in cotypes it is armed with two minute acuminate teeth as in *Porcellana ornata*. Posterior margin of wrist denticulated. Palm broad, flat, smooth on upper surface. Median ridge on the upper surface rather prominent and straight. Outer margin armed with many minute teeth beneath the feather-like hairs; three or four teeth on proximal ends somewhat larger. There is no gap between fingers.

Ambulatory legs rather slender, meri ornamented with short hairs closely. Propodi usually armed with three spinules on the posterior

margin; two of them stand at the distal end in pair, the other in front of them. Dactyli rather long, armed with five spinules which increase in size distally.



Text-fig. 27. *Porcellana melissa* sp. nov., cotype, ovig. female.

a. First peduncle of antennule $\times 53$, b. Antenna $\times 53$, c. Third maxilliped $\times 53$, d. Distal part of ambulatory leg $\times 33$.

This species is closely allied to *Porcellana ornata* STIMPSON, but may be distinguished from it at first sight by the characters of carapace, antennules, more slender chelipeds and ambulatory legs.

Types: Holotype, ♀, from off Ngatmél, Babldáob I., Mar. 14, 1938, collected by Mr. Shiro MURAKAMI. Cotypes, 2 ovig. ♀, 1 juv.; Ngadarák Reef, May 23, 1939, collected by the writer. Types deposited in the Zoological Laboratory, Kyūsyū Imperial University, Hukuoka.

Habitat: Commonly found under coral rocks at low tide-mark in the type-locality.

Dimensions (in mm):

	Holotype (♀)	Cotypes (ovig. ♀ ♀)	
Length of carapace	7.8	4.0	3.5
Breadth of carapace.....	7.8	3.7	3.0

Colour in alcohol: Holotype whitish, cotypes light reddish white.

Genus *Porcellanella* WHITE

Carapace oblong, very much longer than broad, with lateral margins almost parallel. Upper surface of carapace smooth, polished, with peculiar coloured markings, not areolate even in anterior regions. Eyes small. Front prominent, composed of three flattened horizontal teeth. First peduncle of antennule longer than broad. First peduncle of antenna elongated as in *Porcellana*. Chelipeds smooth, unarmed, with wrist short and palm strongly elongated. Ambulatory legs with merus robust and dactylus short, compressed and multiunguiculate.

Type: *Porcellanella triloba* WHITE

Members of the genus are known as commensal inhabitants. They are commonly found hiding themselves between the leaves of *Pennatula*. The distribution of the genus extends from Japan, China Sea, Indian Sea farther eastwards as far as N. E. Australia, in waters of moderate depth.

12. *Porcellanella triloba* WHITE

Text-figs. 28-29

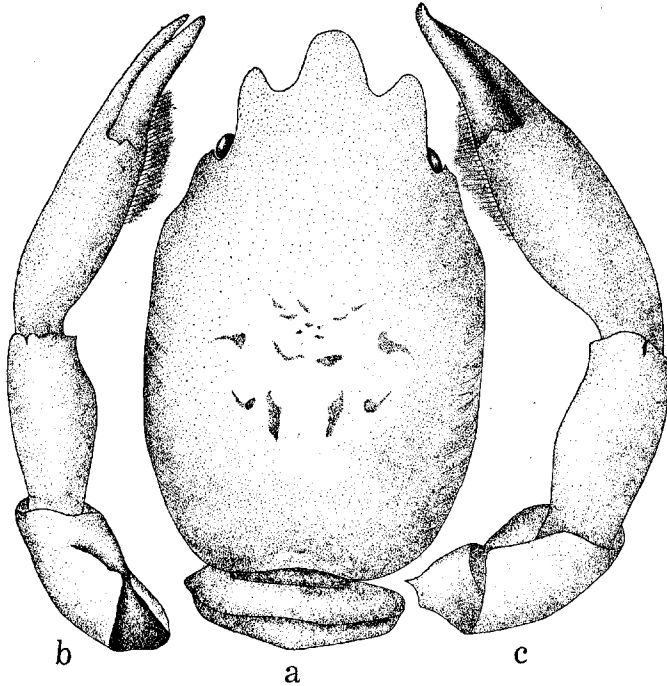
Porcellanella triloba WHITE, Macgillivray's voyage of H. M. S. "Rattlesnake," vol. 2, 1852, Appendix, p. 394, Pl. 5, fig. 2—North Australia (Type-locality).

..... HASWELL 1882, p. 149—Cape Capricorn, Australia.
 HENDERSON 1893, p. 429—Rameswaram I., S. E. India.
 ? ZEHNTNER 1894, p. 188, Pl. 8, fig. 17—Amboina.

Carapace elongated, much longer than broad, the proportion of length to breadth being 1.5:1. Lateral margins of carapace parallel to each other. Upper surface quite smooth, glabrous, with minutely striated lines running laterally. Front horizontal, tridentate; median tooth much larger with apex rounded and more projecting than the lateral ones (Text-fig. 28 a). Epimera obliquely striated.

First peduncle of antennule rather long, with dentate anterior crest and furnished sparsely with long hairs on ventral surface (Text-fig. 29 a). First peduncle of antenna elongated. Succeeding peduncles smooth, cylindrical and unarmed. Their relative lengths are II:III:IV=10:9:6

(Text-fig. 29 b). Third maxilliped ornamented with transverse striae on ventral surface (Text-fig. 29 c).



Text-fig. 28. *Porcellanella triloba* WHITE, male, $\times 7.5$.
a. Outline of carapace, b. Left cheliped, c. Right cheliped.

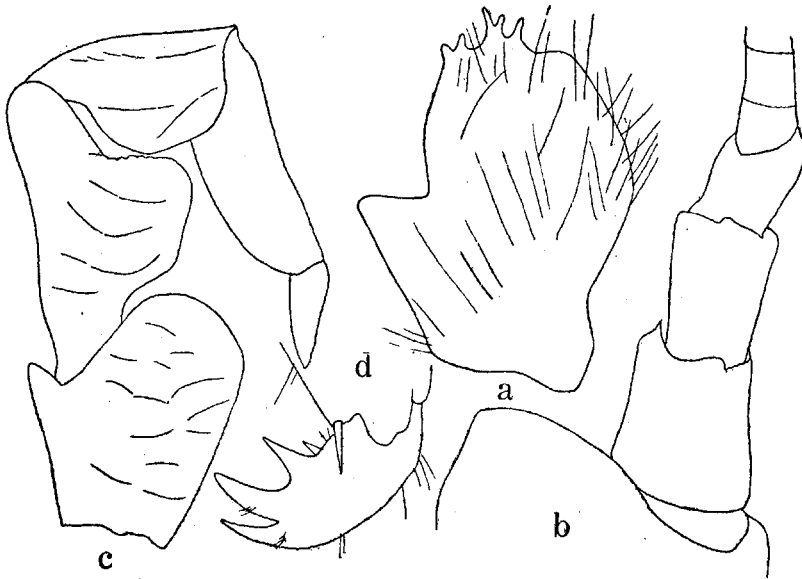
Chelipeds unequal, the right one being larger in both sexes in our collection. Surface smooth, glabrous like the carapace. Arm and wrist nearly twice as broad as long. Anterior (inner) angle of ischium and arm not produced. Inner margin of wrist slightly produced, presenting a convexed curve. Palm longer than twice the breadth, contracted at the proximal end, and ornamented with a tuft of hair at the base of fingers (Text-figs. 28 b-c).

Ambulatory legs short, robust, smooth. Propodi armed with one spine at the distal end. Dactyli armed with four sharp unguicles on inner margin, the proximal one being the smallest among them (Text-fig. 29 d).

Material examined:—Palau Is.: Off Malagál I., 1 ♂, 1 ovig. ♀, from *Pteroeides* sp., May 1938 (WADA).

Colour in life: According to Mr. Renji WADA, markings of male are greyish brown, of female reddish brown in colour. Eggs light green.

Habitat: Commonly found attached to leaves of *Pteroeides* sp.



Text-fig. 29. *Porcellanella triloba* WHITE.

a. First peduncle of antennule $\times 33$, b. Antenna $\times 53$, c. Third maxilliped $\times 20$, d. Dactylus of ambulatory leg $\times 27$.

Genus *Polyonyx* STIMPSON

Carapace suborbicular, broader than long, convex and smooth. Lateral margins strongly convex. Front rather narrow, much deflexed downwards, with an almost straight margin. First peduncle of antennule not toothed, but flattened or truncate at the anterior margin. First peduncle of antenna very broad, elongated and smooth. Chelipeds subequal, smooth, polished. Wrist very large, usually without teeth, but with a sharp entire internal crest. Palm with or without feather-like hairs. Fingers of smaller cheliped sometimes twisted into a vertical plane. Dactyli of ambulatory legs furnished with two or more unguicles.

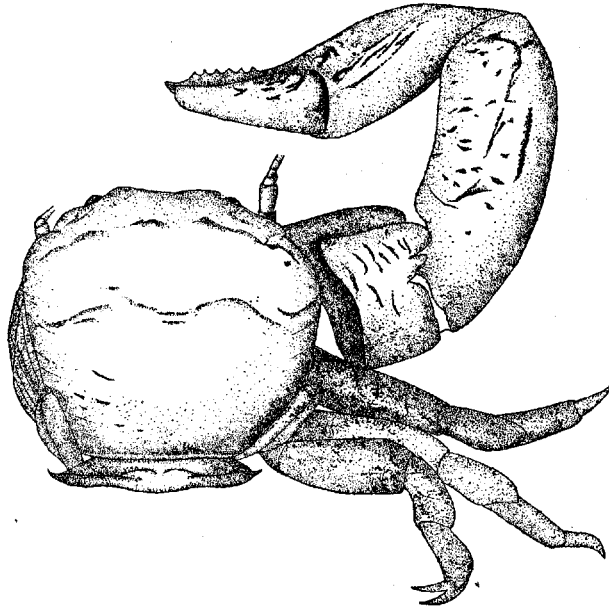
Type: *Polyonyx macrocheles* (GIBBS)

Members of the genus is known to live commensally in the tubes of Annelid worms, sometimes free-living. It is widely distributed from the

east coasts of North America, Australia, China Sea, Southern Japan, Malay Archipelago, Indian Ocean and farther westwards as far as the Red Sea. Only one species, *Polyonyx biunguiculatus* (DANA) is known from the Palau Islands.

13. *Polyonyx biunguiculatus* (DANA)

Pl. I, fig. 1; Text-figs. 30-32



Text-fig. 30. *Polyonyx biunguiculatus* (DANA), male, $\times 7.5$.

Porcellana biunguiculata DANA 1852, p. 411; 1855, Pl. 26, fig. 1—Locality unknown.

..... HASWELL 1882, p. 147—Off Port Denison, Queensland.

Polyonyx biunguiculatus GORDON 1935, p. 10, figs. 5 b, d—Eiland Enoe.

Homonyms:

Polyonyx biunguiculatus MIERS 1884, p. 273 (synonym *Polyonyx actifrons* de MAN).

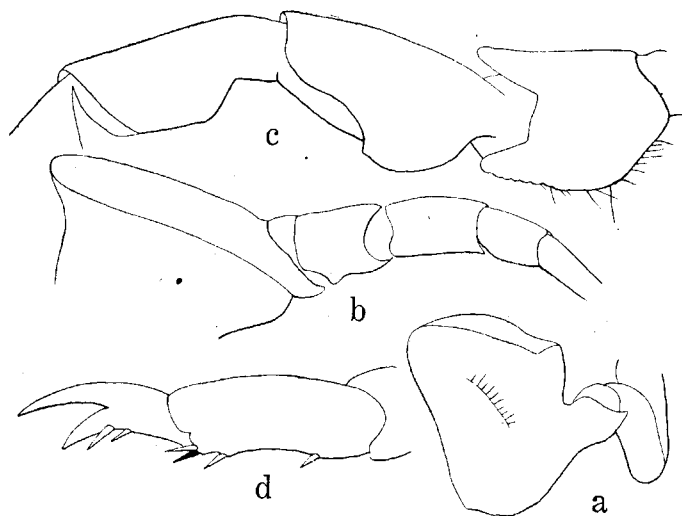
Porcellana (*Polyonyx*) *biunguiculata* de MAN 1887, p. 421 (synonym *P. actifrons* de MAN).

Polyonyx biunguiculatus LAURIE 1926, p. 146 (synonym *P. actifrons* de MAN?).

Polyonyx biunguiculatus ORTMANN 1894, p. 30 (synonym *Polyonyx obesulus* WHITE).

Carapace broader than long, the proportion of length to breadth being 7:8. The upper surface strongly convex longitudinally. Regions faintly indicated, smooth, glabrous to the naked eyes, except near the lateral portions, where transverse lines are found under a microscope. Frontal margin rather broad, measuring 5/11 of the breadth of carapace. Median lobe much deflexed. Outer orbital angles obtuse.

First peduncle antennule lobe-like, not dentate, with anterior margin entire. Ventral surface smooth, glabrous (Text-fig. 31 a). First peduncle of antenna very broad, elongated and smooth. Succeeding peduncles smooth, not cristate, cylindrical. The relative lengths of basal peduncles are II:III:IV=1.7:2:1 (Text-fig. 31 b). Third maxilliped quite smooth, glabrous on ventral surface. Each segment very long. Crest of merus slightly produced inwards (Text-fig. 31 c).



Text-fig. 31. *Polyonyx biunguiculatus* (DANA), male.

a. First peduncle of antennule $\times 40$, b. Antenna $\times 40$, c. Third maxilliped $\times 40$, d. Distal part of ambulatory leg $\times 25$.

Chelipeds unequal. Upper surface smooth, glabrous. Arm broader than long, convex transversely. Upper surface ornamented with transverse lines. Wrist longer than broad; crest of inner margin not produced. Upper surface of wrist smooth, though minutely punctate. Palm of cheliped longer than broad. The outer surface uneven, but smooth,

glabrous. Fingers more or less curved outwards, ornamented with microscopical tuft of hair on proximal end of ventral side. Larger cheliped usually with smooth outer margins of both movable and immovable fingers, but sometimes furnished with minute teeth. Immobile finger of larger hand bears a large tubercle on inner margin. Movable finger furnished with small teeth on the proximal end of inner margin. There is a small gap between fingers. Immobile finger of the smaller cheliped furnished with small teeth on both outer and inner margins. Movable finger also furnished with small teeth on inner margin. There is no gap between fingers (Text-fig. 32).

Ambulatory legs smooth, not hairy. Meri and carpi unarmed. Propodi usually furnished with four spinules on the posterior margin; two of these spinules stand on the distal end in pair, remaining two along the longitudinal axis, namely one on the distal end, the other at about one-third the length of the joint before proximal ends. The last-mentioned spinule is sometimes absent or there are two spinules instead of it even in one individual. Dactyli armed with two unguicles, in addition to which there are two spinules in front of them.

Material examined :—

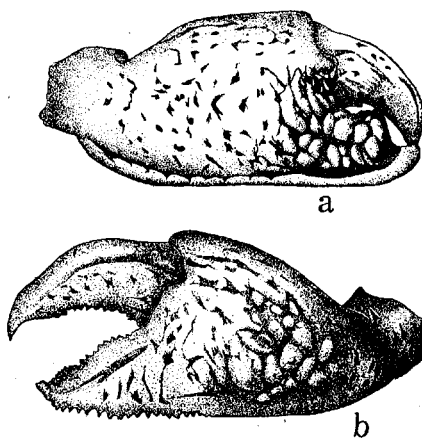
Babldáob I. :

Off Ngarsmau, sandy bottom, 1 ovig. ♀, Feb. 21, 1938 (ESAKI et MURAKAMI); 2 ovig. ♀, 3 ♀, Jul. 14, 1939 (OHSHIMA et MIYAKE).

Off the entrance of the Ngät pang Bay, 1 ♀, Feb. 21, 1938 (ESAKI et MURAKAMI).

Goréor I. :

Ngarekamâis, 1 ovig. ♀, May 26, 1938 (MURAKAMI).



Text-fig. 32. *Polyonyx biunguiculatus* (DANA).
a. Outer face of larger chela $\times 7.5$,
b. Outer face of smaller chela $\times 12$.

Songél a Lise, I-islet—II-islet, 2 ♂, 1 ovig. ♀, May 30, 1938 (MURAKAMI); XXIII-islet, J-division, 2 ♂, 1 ovig. ♀, 1 ♀, Mar. 24, 1938 (MURAKAMI).

aUgulpelú Reef, 1 ovig. ♀, May 3, 1938 (MURAKAMI).

Colour in life: Dorsal surface light orange-yellow, ventral whitish.

Habitat: Found on sandy or muddy bottoms 20–50 m deep. In palau Islands probably free-living.

Genus *Pisosoma* STIMPSON

Carapace subovate, convex, not longer than broad. Median lobe of front so deflexed downwards that front forms an almost straight truncate margin. Eyes of moderate size. Antenna with small first peduncle. Second peduncle of antenna more or less cristate anteriorly as in *Petrolisthes*. Third peduncle rather large, cylindrical. Chelipeds short, thick, granulated above. Ambulatory legs normal in form. Telson five-lobed, its central segment being small.

Type: *Pisosoma sculptum* (H. MILNE-EDWARDS)

This species inhabits under rocks of coral reefs between tide-marks. Members of the genus are distributed in the Southern Japan, Ryūkyū, Philippines, Indian Ocean, East Africa, Malay Archipelago, N. and N. E. Australia and Polynesia.

14. *Pisosoma sculptum* (H. MILNE-EDWARDS)

Text-figs. 33–35.

Porcellana sculpta H. MILNE-EDWARDS 1837, p. 253—Batavia, Java (Type-locality).

? *Porcellana sculpta* DANA 1852, p. 412; 1855, Pl. 26, fig. 2—Sulu Sea; Fiji Is.

Porcellana (Pisosoma) sculpta de MAN 1888 b, p. 413—Java.

not *Porcellana (Pisosoma) sculpta* de MAN 1888 a, p. 218—Mergui Archipelago—synonym *Pisosoma pisum* (H. MILNE-EDWARDS).

Pisosoma sculptum ORTMANN 1892, p. 265—Amami-Ōsima.

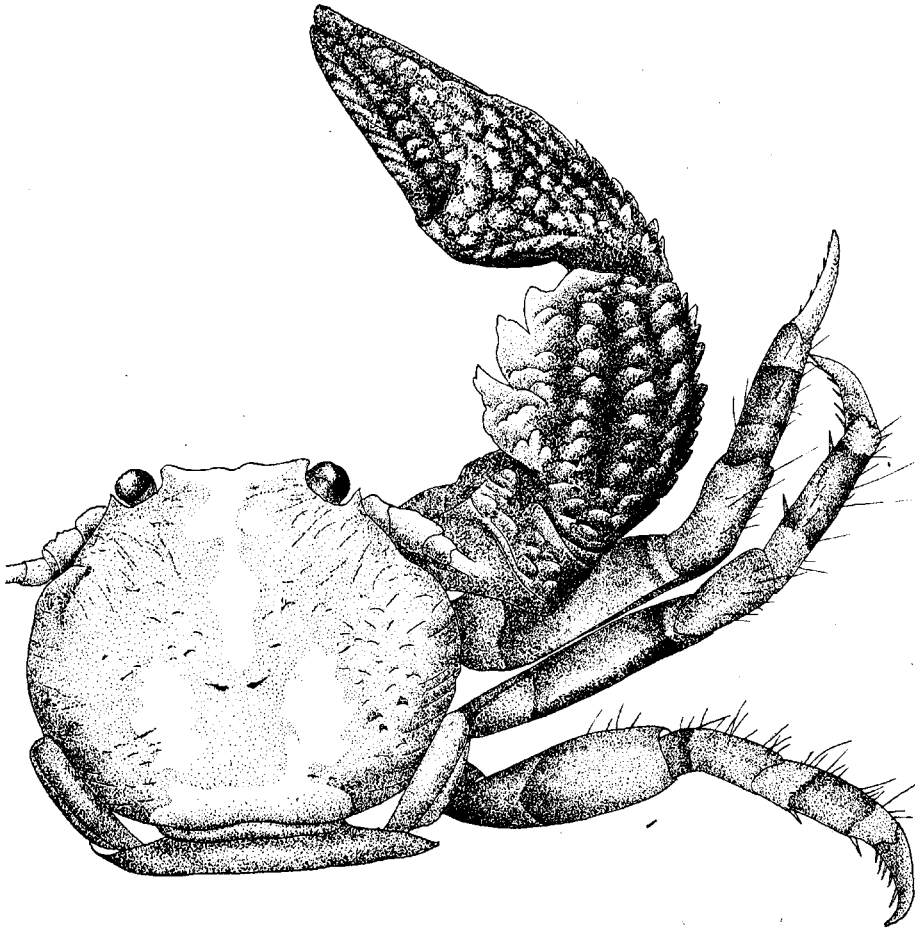
Pisosoma sculptum de MAN 1896, p. 378—Atjeh, North Sumatra.

Pisosoma sculptum MIYAKE 1937 d, p. 217—Prov. Kii, Japan.

Pachycheles sculptus ORTMANN 1894, p. 29—Dar-es-Salaam, E. Africa.

Pachycheles sculptus ORTMANN 1897, p. 294—No new record.

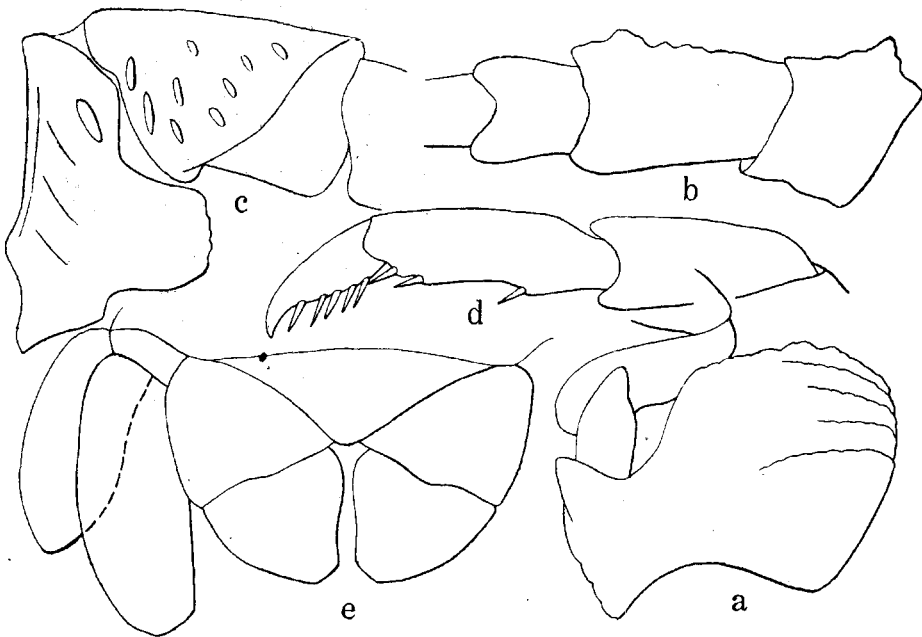
Pachycheles (Pisosoma) sculptus BALSS 1913, p. 32—No new locality.



Text-fig. 33. *Pisosoma sculptum* (H. MILNE-EDWARDS), male, $\times 16$.

Carapace slightly broader than long, smooth, though sparsely punctate above. Anterior half of lateral margins cristate, but the posterior half rounded and covered with some elevated oblique lines. Frontal margin a little longer than one-third the breadth of carapace; median lobe short, much deflexed downwards, forming a straight, truncate margin. Outer orbital angle acute.

First peduncle of antennule broader than long. Ventral surface a little convex anteriorly, ornamented with four lines which are margined with microscopical hairs on upper and outer portions (Text-fig. 24 a). First peduncle of antenna small, very short. Second peduncle rather short, projecting into a crest-like tooth on upper margin. Third peduncle more or less covered with granules on anterior margin. Fourth peduncle short and smooth. The relative lengths of them are II:III:IV=12:19:10 (Text-fig. 34 b). Third maxilliped uneven on the ventral surface. Merus ornamented with transverse striae margined with microscopical hairs. The laminate crest of merus much produced inwards; its inner margin undulated. Carpus cristate on ventral surface (Text-fig. 34 c).



Text-fig. 34. *Pisosoma sculptum* (H. MILNE-EDWARDS).

a. First peduncle of antennule $\times 52$, b. Antenna $\times 53$, c. Third maxilliped $\times 33$, d. Distal part of ambulatory leg $\times 16$.

Chelipeds subequal. Wrist a little longer than broad, usually armed with three acuminate teeth which are subdivided and sometimes represented by crest-like teeth. Upper surface furnished with squamiform crests, which are much elevated, smooth and glabrous, in some individuals there

are three or four longitudinal grooves between the crests on upper surface mentioned above. Ornamentation of palm same as in wrist; four or five longitudinal grooves between squamiform crests. There is no gap between fingers.

Ambulatory legs somewhat hairy. Meri unarmed. Propodi armed with four spinules; two of them stand along longitudinal axis and the other two at distal end in pair. Dactyli armed with five spinules on inner margin increasing in length distally. Dactyli bear a groove on distal portion of outer margin. Last segment of abdomen broader than long, with five lobes (Text-fig. 34 d).

Material examined:—Ngadarák Reef, Palau Is., 2 ♂, 4 ovig. ♀, 4 ♀, May 23; Jun. 16-17, 1939 (MIYAKE).

Habitat: Common under negro-heads in Ngadarák Reef.

Colour in life: Dorsal surface of cheliped and carapace red; the middle portion of carapace with white longitudinal stripes. Ventral surface whitish. Ambulatory legs white with a red stripe on both segments of meri and propodi.



Text-fig. 35. *Pisosoma sculptum* (H. MILNE-EDWARDS), Another ornamentation of cheliped, showing crest-like teeth of wrist $\times 12$.

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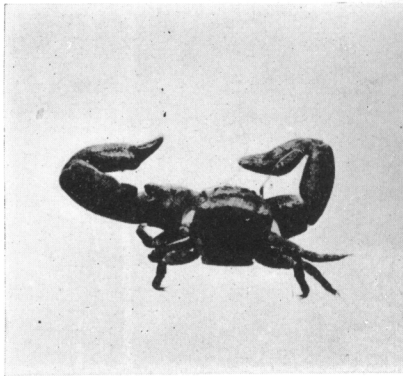
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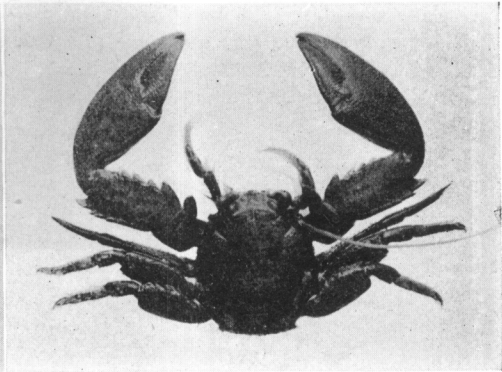
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Explanation of Plate I

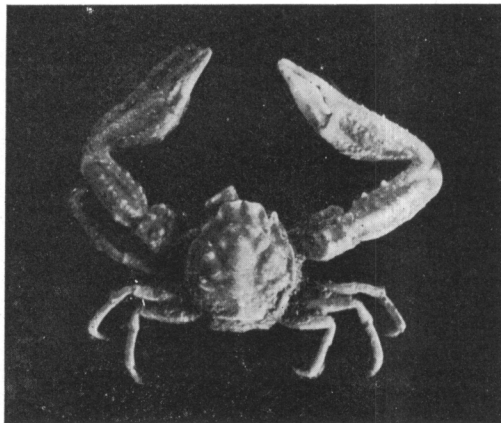
- Fig. 1. *Polyonyx biunguiculatus* (DANA), ♂, ca. ×1.5.
- Fig. 2. *Petrolisthes rufescens* (HELLER), ♂, ca. ×1.5.
- Fig. 3. *Porcellana murakamii* sp. nov., ♂, holotype, ca. ×2.5.
- Fig. 4. *Porcellana melissa* sp. nov., ♀, holotype, ca. ×1.8.
- Fig. 5. *Neopetrolisthes ohshimai* MIYAKE, ♂, ca. ×1.5.



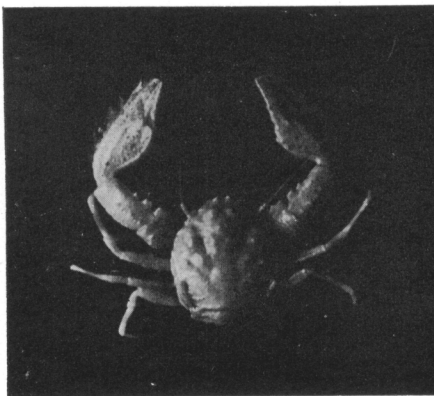
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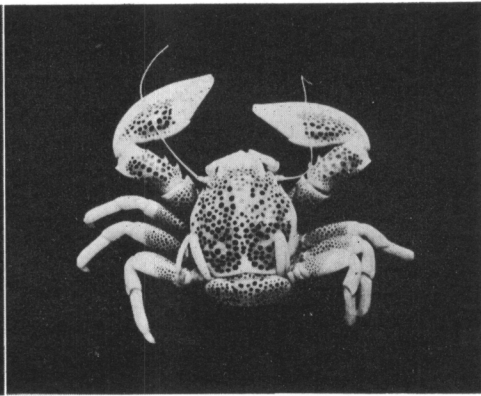
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