

Geographical distribution. — The type locality of this species is in the Cape Verde Islands. It has been recorded by Balss from Annobon Island. These two localities represent the limits of the known range.

***Petrolisthes armatus* (GIBBES, 1850).**

(Fig. 5, A-E.)

*Porcellana armata* GIBBES, L. R., 1850, p. 190.

*Petrolisthes armatus* STIMPSON, W., 1858, p. 227. — VERRILL, A. E., 1908, p. 434, pl. 27, fig. 3, pl. 28, fig. 4. — BALSS, H., 1916, p. 41.

Source and material.

Collector	Locality	Date	Depth m	Bottom tem- perature °C	Nature	Material
TH. MONOD	Toubacouta, Senegal	6.VII.1939	—	—	—	1 ovig. ♀
J. FOREST	N'Gazobil, Senegal	18.II.1953	Low tide			1 ♀
TH. MONOD	Bubaque, Bijagos Ids., Portuguese Guinea	19.XII.1947	—	—	—	4 ♂, 3 ♀ (2 ovig.)
« SYLVANA » St. 98	11°38'N-15°49'W (channel between Rouban and Bubaque, Bijagos Ids., Portuguese Guinea)	12.IV.1913	25-30	—	Rock, coral	1 ♂
« SYLVANA » St. 100	»	13.IV.1913	Low tide		Rocks	2 ♂
« SYLVANA » St. 93	11°38'N-15°13'W (Bolola River, near Mato Grande, Portuguese Guinea)	9.IV.1913	15-25	—	Rock, pebbles	1 ovig. ♀
SERAND	Pointe Topsail, Tamara, Iles de Los, French Guinea	13.III.1914	—	—	—	2 ovig. ♀
« MERCATOR »	Kassa Id., Iles de Los, French Guinea	24.XI.1935	—	—	—	1 ♂
DYBOWSKI	Conakry, French Guinea	20.XII.1895	—	—	—	1 ♂, 1 ovig ♀
DUFOSSÉ	»	1905	—	—	—	3 ♂ (1 figured)
J. FOREST	»	8.III.1953	Low tide			1 ♂
»	Tombo (Conakry), French Guinea	15.III.1953	»			1 ♂, 4 ♀ (3 ovig.)
—	Conakry, French Guinea	—	—	—	—	5 ♀ (3 ovig.)
DUPORT	Camayenne (near Conakry), French Guinea	1909	—	—	—	1 ♂
J. CADENAT	Aberdeen, Freetown, Sierra Leone	6.III.1948	Low tide			4 ♂, 5 ovig. ♀

Collector	Locality	Date	Depth m	Bottom tem- perature °C	Nature	Material
J. CADENAT and H. BROWN	Kissi Dockyard, Freetown, Sierra Leone	7.III.1948	Low tide		Muddy sand	3 ♂, 3 ♀ (2 ovig.)
J. CADENAT	»	III.1948	—	—	—	2 ♂
»	Pointe de Shenge, Sierra Leone	19.III.1948	—	—	—	12 ♂, 4 ♀ (3 ovig.)
H. BROWN and J. CADENAT	Freetown and Pointe de Shenge Sierra Leone	6-19.III.1948	—	—	—	19 ♂, 10 ovig. ♀
—	Senegal or Gold Coast	—	—	—	—	1 ♂, 2 ♀ (1 ovig.)
R. BASSINDALE	Axim, Gold Coast	13.IV.1949	—	—	—	1 ovig. ♀
»	Tenpobo, Gold Coast	21.XI.1949	Shore		—	1 ♂
»	»	4-6.II.1950	—	—	—	2 ♂, 4 ♀ (1 ovig.)
Expéd. Océanogr. Belge A.S. 98	12°20'S-13°34'E (Baie de Lobito, Angola)	17-20.XII. 1948	12	—	Mud sand	1 ovig. ♀

**Diagnosis.** — Carapace usually slightly longer than wide, bare and faintly rugose dorsally, more prominently so laterally, and armed with an epibranchial spine or tooth. Front depressed, unarmed, and sinuously triangular.

Carpus of chelipeds armed on inner margin with three, rarely four, rather distantly placed acute teeth. Outer margin with one to four, usually two or three, spines in addition to bifid one at distal angle. Chelae bare and convex dorsally without prominent longitudinal ridge running proximally from gape of fingers. Outer margins of chelae spinose and with fringe of hairs in small specimens, nearly entire in large ones. Lower, inner surface of movable finger and, to lesser extent, of fixed finger densely pubescent.

Merus of first walking leg with one to four spines on anterior margin and one spine, rarely two, at posterodistal angle. Merus of second leg with two to five anterior and one, rarely two posterodistal spines. Merus of third leg with one to four anterior spines and none, rarely one, at posterodistal angle.

Males vary in carapace length and width from 3.8 and 3.7 mm. to 11.5 and 11.1 mm. The smallest female is 4.4 mm. long and 4.3 mm. wide; the smallest ovigerous specimen is 4.5 mm. long and 4.4 mm. wide; the largest female, an ovigerous specimen deformed by a parasite in the left branchial chamber, is 11.0 mm. long. In West African specimens of both sexes the relative carapace width appears to increase with age. Young males have an average length-width ratio of about 1.06, whereas the largest males have a ratio of about 1.01. Comparable average ratios in females are about 1.02 and 1.00.

Remarks. — The different superficial appearance of West African specimens of *P. armatus* from typical examples from Florida has led to a detailed study of the extensive series of the species from the western Atlantic and the eastern Pacific in the U. S. National Museum. This study indicates that populations from different localities show considerable variation.

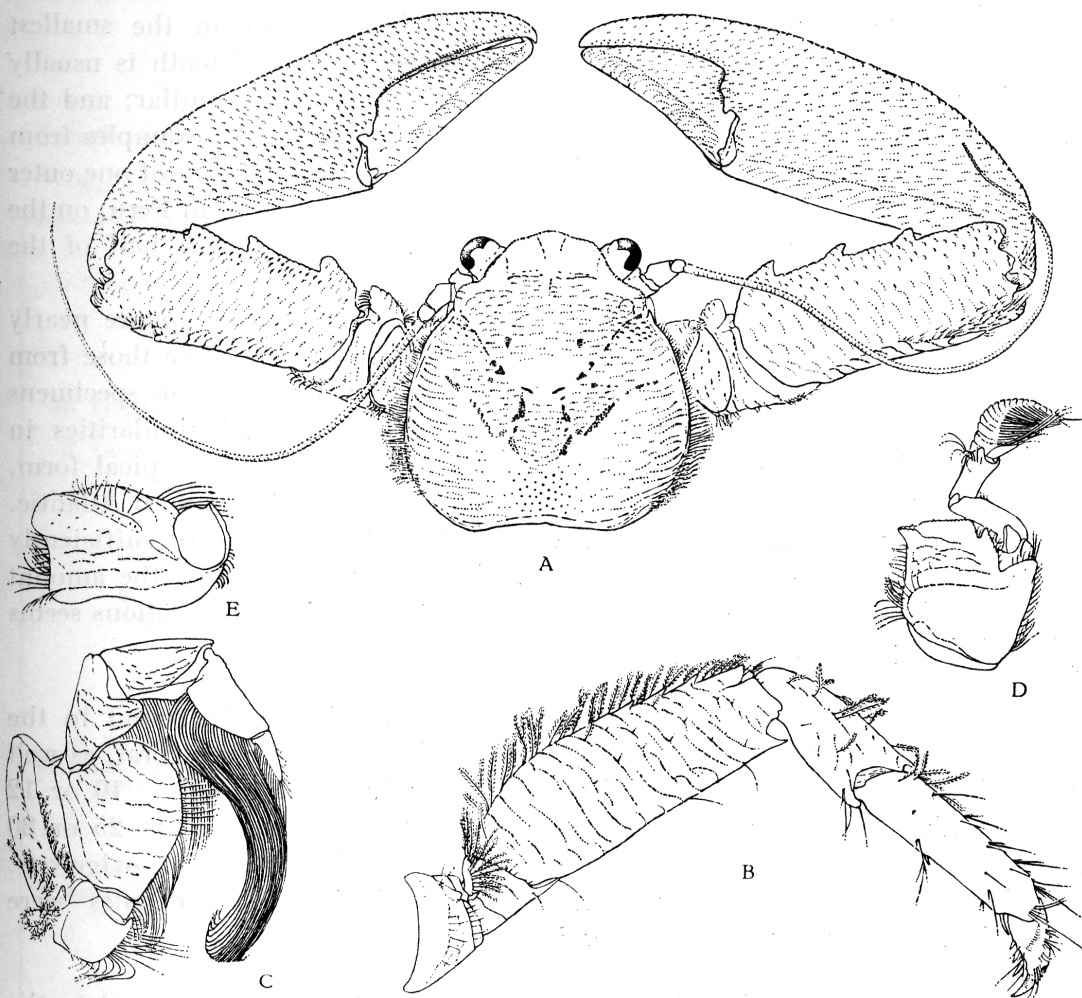


FIG. 5. — *Petrolisthes armatus* (GIBBES, 1850).

A, carapace and chelipeds. — B, right first walking leg. — C, right third maxilliped.

D, right antennule in ventral view. — E, same in anterior view.

Male; Conakry, French Guinea; scale: A,  $\times 3.2$ ; B, C,  $\times 6.6$ ; D,  $\times 9.6$ ; E,  $\times 13.8$ .

The typical form from the Gulf of Mexico coast of the United States is usually characterized by a series of distinct marginal spines on the outer edge of the chelae in all but the largest specimens; by the presence in about 75 per cent of the specimens of three spines on the outer margin of the carpus of the chelipeds, in addition to the double terminal pair; by having the inner tooth on the merus of the chelipeds sharp or acute; and by having the chelipeds little

dissimilar, as indicated by the relative lengths of the movable fingers. This form is fairly constant throughout its range along the Atlantic coast of North, Central, and South America, throughout the West Indies, and at Bermuda, although there seems to be a tendency for the average number of outer spines on the carpus to be slightly less toward the southern end of the range.

Specimens from the Pacific coasts of Mexico and Central and South America are often markedly different from the typical form. Only in the smallest specimens are there marginal spines on the chelae; the meral tooth is usually blunt in all but small specimens; the chelipeds are more dissimilar; and the number of outer spines on the carpus is noticeably reduced. In examples from the west coasts of Mexico and Central America, there is usually at most one outer carpal spine in addition to the bifid terminal one. Specimens from Peru, on the other hand, have from one to three outer carpal spines, nearly half of the specimens examined having three.

In this respect, specimens from the west coast of Africa are more nearly like those from the west coast of South America than they are like those from the western Atlantic. In fact, eastern Atlantic and eastern Pacific specimens are very similar in general appearance. Possibly ecological similarities in these two regions has resulted in similar divergences from the typical form, if indeed it can be assumed that the species originated in the western Atlantic. Although extreme examples of the Pacific and African forms are sufficiently distinct from the typical form to be accorded specific recognition, the amount of variation is such that even subspecific designation of these populations seems unjustified at present.

**Ecology.** — In American waters, *P. armatus* is usually found in the intertidal zone under rocks and stones, in oyster beds, and among coral, as well as on pilings. It is occasionally dredged in depths of as much as 10 or 12 meters. West African specimens were found in depths as great as 25 or 30 meters. Of the 48 females in the present collections, 37 are ovigerous. Ovigerous specimens were taken in every month in which females were collected: February, March, April, and December.

**Geographical distribution.** — *P. armatus* has been found in the eastern Atlantic from Senegal to Lobito, Angola. The record of the species at Gibraltar, based on *Porcellana digitalis* HELLER, 1862, needs verification. The absence of *P. armatus* from the extensive collections made in the vicinity of Dakar and Gorée suggests that Senegal marks the northern limit of its normal range on the West African coast. It could readily be introduced elsewhere on the hulls of ships, however. In the western Atlantic, it is found from the western Florida keys and along the shores of the Gulf of Mexico and Caribbean to Rio de Janeiro, Brazil, as well as throughout the West Indies, the Bahamas, and at Bermuda. It has also been found at Ascension Island. M. RATHBUN (1905) recorded it from near New Haven, Connecticut, but that locality must be viewed with suspicion or as a temporary introduction inasmuch as the species



has apparently not been found elsewhere on the east coast of the United States. In the eastern Pacific, the species is known from the Gulf of California to Peru and in the Galapagos Islands. Although *P. armatus* has been recorded from the Indo-Pacific region, I have seen no specimens assignable to the species from that area. The specimen from the Gulf of Kutch, India, questionably identified as *P. armatus* by Southwell (1909) is certainly distinct.

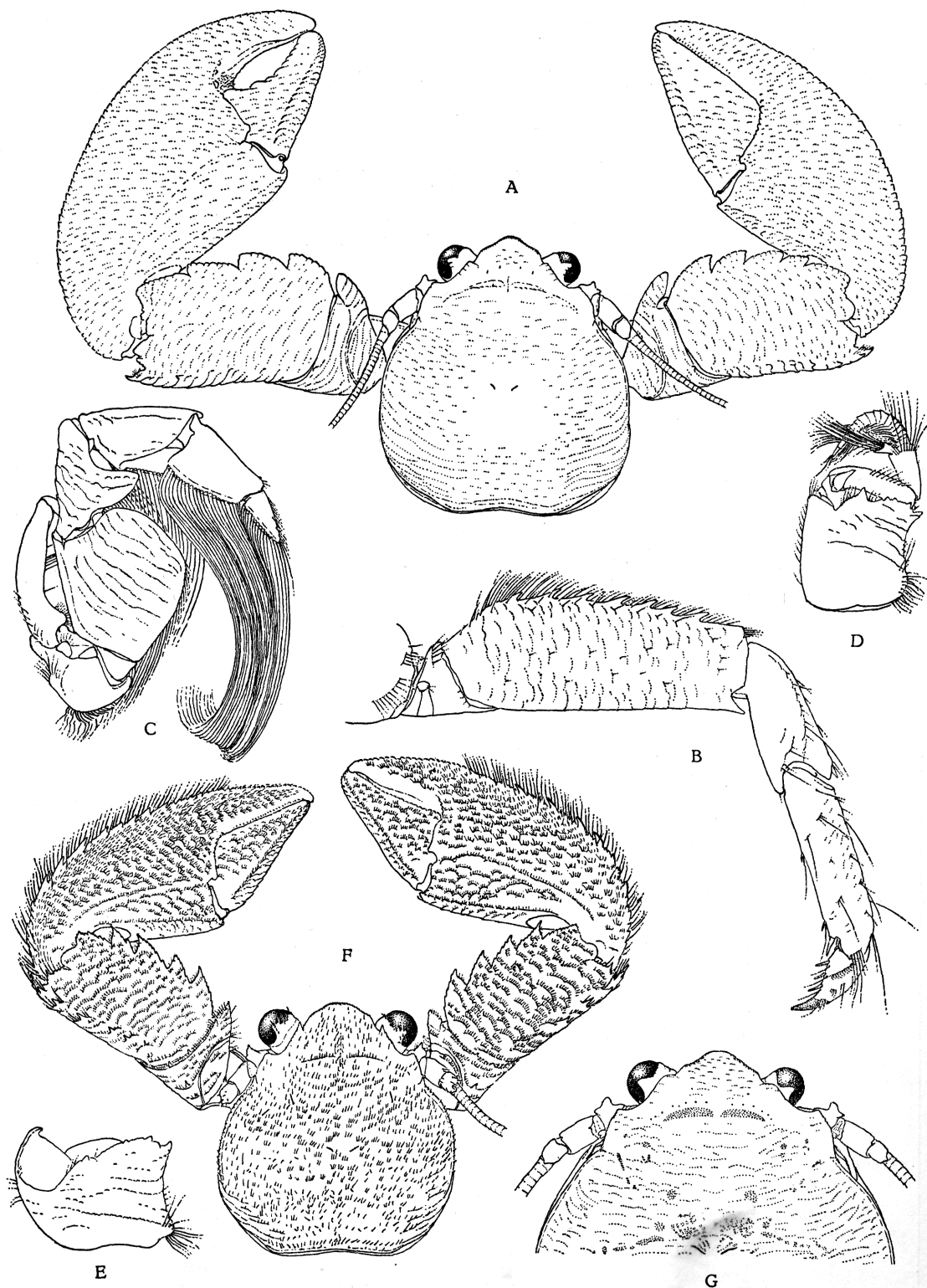
***Petrolisthes monodi* sp. nov.**

(Fig. 6, A-G.)

? *Porcellana speciosa* ? OSORIO, B., 1889, p. 136.

**Source and material.**

Collector	Locality	Date	Depth m	Bottom tem- perature °C	Nature	Material
G. VIEILLARD	Dakar, Senegal	20.VIII.1939	—	—	—	3 ♂
J. CADENAT	Gorée, Senegal	26.III.1946	—	—	—	5 ♂, 1 ♀, 1 fragment
»	»	30.III.1946	—	—	—	1 ♀
»	»	23.IX.1947	—	—	—	1 young ♂
»	»	6.I.1948	From stomach of <i>Puntazzo puntazzo</i> (CETTI)			1 ♂ holotype (figured)
»	»	V-VI.1948	—	—	—	1 ovig. ♀
»	»	15.II.1950	Beach			1 young ♂
E. POSTEL « GERARD TRÉCA » St. 34	9°40'N-14°21'W (near Conakry, French Guinea)	3.II.1953	25	—	Sandy mud with sponges and gorgonians	1 ovig. ♀
A. CREMOUX « GERARD TRÉCA » St. 28	9°16'N-13°42'W (near Conakry, French Guinea)	27.I.1953	20	—	Gray sandy mud with sponges and gorgonians	1 ovig. ♀
J. FOREST « GERARD TRÉCA » St. 48	9°13'N-14°21'W (near Conakry, French Guinea)	17.III.1953	40	—	Rocks with barnacles, gorgonians, and pearl oysters	1 ovig. ♀
J. FOREST « GERARD TRÉCA » St. 39	Boulbinet, French Guinea	8.III.1953	3-5	—	Mud and laterite	1 ♂
J. FOREST « GERARD TRÉCA » St. 40	9°N-13°50'W (French Guinea- Sierra Leone border)	9.III.1953	30	—	Shell sand with sponges and hydroids	2 young ♂, 4 ♀ (3 young, 1 ovig.), 1 juv.
—	Senegal or French Guinea	—	—	—	—	1 young ♂, 2 young ♀

FIG. 6. — *Petrolisthes monodi* sp. nov.

A, carapace and chelipeds of male holotype from Gorée, Senegal. — B, right first walking leg of same. — C, right third maxilliped of same. — D, left antennule of same in ventral view. — E, same in anterior view. — F, carapace and chelipeds of young female from Senegal. — G, anterior part of carapace of large male from Gorée, Senegal.

Scale: A, G,  $\times 3.2$ ; B,  $\times 5.8$ ; C,  $\times 6$ ; D,  $\times 9.3$ ; E,  $\times 13.8$ ; F,  $\times 6.3$ .

**Types.** — The holotype and a few paratypes are deposited in the Muséum National d'Histoire Naturelle at Paris. Most of the paratypes are in the Institut Français d'Afrique Noire at Dakar; a few are in the U.S. National Museum at Washington.

**Diagnosis.** — Carapace slightly longer than wide except in very large specimens. Surface bare and faintly rugose in adult specimens, sparsely covered with short setae in small individuals. A sharp epibranchial spine which becomes obsolescent in very large specimens. Supra-ocular spine absent in adults but prominent in immature specimens. Front prominent, sinuously triangular, and crenulate or denticulate on margins. Lateral wall of carapace entire and provided with several prominent longitudinal carinae.

Chelipeds slightly unequal, dissimilar. Merus rugose dorsally; inner lobe blunt in mature specimens, sharp in immature ones; a single sharp spine ventrally. Carpus faintly rugose and bare in adult specimens, distinctly rugose and setose in young; inner margin with three or four, rarely five, broad, denticulate teeth, which are blunt in mature specimens, tipped with a sharp spine in immature ones; outer margin strongly rugose and armed, in addition to terminal pair of spines, with two, one, or no spines in adults and three to five in immature specimens. Chela nearly smooth and bare in adults, distinctly rugose and setose in young; outer margin denticulate and without fringe in mature individuals, strongly dentate and fringed with long hairs in small specimens. Fingers of major chela gaping, those of minor one meeting throughout their length and pubescent on inner, lower margins.

Merus of first walking leg armed with five to nine strong spines and fringe of hairs on anterior margin and with one or two spines at posterodistal angle. Merus of second leg with five to ten anterior and one, rarely two, posterodistal spines. Merus of third leg with five to seven anterior spines and none at posterodistal angle.

The carapace of the male holotype is 12.6 mm. long and 12.2 mm. wide. The largest male paratype has the carapace 17.0 mm. long and wide. One damaged carapace measures 19.0 mm in length. The smallest male is 3.2 mm. long and 2.8 mm. wide; the abdominal appendages of this specimen are not fully developed. The largest female is 14.9 mm. long and 15.5 mm. wide, and the smallest, 3.6 mm. long and 3.3 mm. wide. Ovigerous specimens vary from 6.6 to 10.1 mm. in length and from 6.4 to 10.5 mm. in width. The single juvenile is 2.5 mm. long and 2.2 mm. wide.

**Remarks.** — This species varies considerably with growth but it seems to differ from all previously described species. OSORIO (1889) probably confused it with the Indo-Pacific *P. speciosus* (DANA). That species apparently differs most noticeably in having the meri of the walking legs unarmed. *P. acanthophorus* (H. MILNE-EDWARDS and LUCAS) from the west coast of South America is red, spotted with yellow, rather than yellow, spotted with red, as in the present species; adult specimens of *P. acanthophorus* also have a pronounced supra-ocular spine and the inner projection of the merus of the cheliped spine-tipped,

as well as the carpus armed internally with six teeth and externally with seven, in addition to the terminal pair. *P. dentatus* (H. MILNE-EDWARDS) from the Indo-Pacific has the meri of the walking legs unarmed, or at most with one or two inconspicuous spines, and no pubescence on the lower surfaces of the fingers. *P. moluccensis* (DE MAN) from Amboina has the last two segments of the walking legs dark reddish violet with white spots; it also lacks pubescence on the fingers and has no prominent posterodistal tooth on the merus of the first two pairs of walking legs. *P. obtusifrons* MIYAKE from Japan is a small species with a light blue carapace and ivory legs; it has no gape between the fingers of the major chela and apparently has the meri of the walking legs unarmed anteriorly. *P. rufescens* (HELLER) from the Indo-Pacific is a small species which lacks an epibranchial spine and which probably has the outer margin of the carpus of the chelipeds and the anterior margins of the meri of the walking legs unarmed; it also lacks pubescence on the fingers of the minor chela. *P. amoenus* (GUÉRIN) from the West Indies and the Galapagos Islands is also a small species with a spinose front, supra-ocular spines, and five to seven outer carpal spines. Finally, *P. marginatus* STIMPSON from the West Indies and Ecuador has a broader front, more numerous outer carpal spines, the outer margin of the fixed finger nearly straight, and no spines on the anterior margins of the meri of the walking legs.

It is a pleasure to name this species for Dr. THÉODORE MONOD, Director of the Institut Français d'Afrique Noire, whose studies have added so much to our knowledge of the carcinological fauna of West Africa and who fostered my interest in the porcellanids of this region by furnishing a considerable part of the collections on which the present study is based.

**Ecology.** — *P. monodi* has been taken in shallow water and in depths of at least 40 meters. Ovigerous females were found in all months in which females were taken: January, February, March, and May or June.

**Geographical distribution.** — The type series came from the area between Dakar, Senegal, and Sierra Leone. If the specimens tentatively identified as *Porcellana speciosa* by OSORIO belong to this species, the known range is extended to São Tomé Island. The specimen from Durban, South Africa, identified by STEBBING (1918) as *Petrolisthes speciosus* and subsequently assigned to *P. lamarckii* (LEACH) by BARNARD (1950), is certainly not *P. monodi*.

Genus PORCELLANA LAMARCK, 1801.

#### KEY TO THE WEST AFRICAN SPECIES OF *PORCELLANA* <sup>(1)</sup>.

1. Dorsal surface of carapace and chelipeds largely concealed by pubescence; outer margins of chelae with dense fringe of long setae ..... 2

<sup>(1)</sup> The species from Loanda, Angola, briefly dignosed by B. OSORIO, (1887) under the name *Porcellana mattsosi* is omitted from this key. Additional specimens must be obtained before even the true generic status of this species can be determined.



- Pubescence not so dense as to conceal most of surface of carapace and chelipeds; fringe on chelae sparse or lacking ..... 3
- 2. One to three outstanding spines on outer margin of carpus of major cheliped, in addition to terminal spine ..... *P. platycheles platycheles*.
- No spines on outer margin of carpus of major cheliped proximad to terminal spine ..... *P. platycheles africana*.
- 3. Front nearly entire, lobes indistinctly separated; eyestalk with inner distal spine or sharp tubercle ..... 4
- Frontal lobes distinctly separated; eyestalks unarmed ..... 5
- 4. Frontal and lateral margins of carapace and margins of carpus of chelipeds spinose ..... *P. caparti*.
- Frontal and lateral margins of carapace and margins of carpus of chelipeds finely tuberculate ..... *P. elegans*.
- 5. Chelipeds slender; inner margin of carpus with two teeth or lobes ... *P. longicornis*.
- Chelipeds robust; inner margin of carpus nearly straight, irregularly spinose ..... *P. foresti*.

***Porcellana platycheles platycheles* (PENNANT, 1777).**

(Fig. 7, H-I.)

*Cancer Platy-cheles* PENNANT, T., 1777, p. 6, pl. 6, fig. 12.

*Porcellana platycheles* HELLER, C., 1863, p. 316. — NICOL, E. A. T., 1932, p. 88. — BOUVIER, E.-L., 1940, p. 178, figs. 35 (3-4), 130, pl. 5, fig. 7.

**Source and material.**

Collector	Locality	Date	Depth m	Bottom tem- perature °C	Nature	Material
L. GARRETA	Las Palmas, Canary Islands	1911	—	—	—	1 ♂, 1 ♀

**Diagnosis.** — Carapace and legs covered with pubescence which largely conceals the surface and becomes a prominent fringe along outer margins of chelae. Carapace usually longer than wide, feebly convex, and armed with a series of marginal spines on hepatic and anterior branchial regions. Front divided into three deeply separated, subtriangular, entire lobes, the median one the largest.

Chelipeds slightly unequal and dissimilar. Merus armed ventrally with one or more sharp spines. Carpus with a proximal spinose lobe on internal margin and one to three distinct spines in addition to terminal one on external margin. Chelae not grossly tuberculate dorsally beneath pubescence.

The male in the collection has the carapace 8.4 mm. long and 8.1 mm. wide; the carapace of the female is 7.1 mm. long and wide..

**Ecology.** — This species frequents muddy shores where it is usually found clinging to the under sides of rocks in the intertidal zone. The biology of the species at Plymouth, England, has been described by NICOL (1932).



Geographical distribution. — The typical subspecies ranges from the Shetland and Orkney Islands, the coasts of Ireland, and along the European and Mediterranean shores as far as Port Said. The Canary Islands seem to mark the southern limit of the typical form.

***Porcellana platycheles africana* subsp. nov.**

(Fig. 7, A-G.)

? *Porcellana platycheles* MONOD, T., 1933, p. 477 [22].

Source and material.

Collector	Locality	Date	Depth m	Bottom tem- perature °C	Nature	Material
« MERCATOR »	24°13'N-15°44'W (Bahia de Caballo, Rio de Oro)	2.XI.1935	—	—	—	23 ♂, 13 ♀ (7 ovig.) (1 ♂ figured)
»	Villa Cisneros, Rio de Oro	3.XI.1935	22	—	—	1 ♂
»	Port Etienne, Mauritania	5.XI.1935	—	—	—	1 ♂, 3 ♀ (1 ovig.)
I. MARCHE-	Pointe de Cansado, Mauritania	27.VII.1953	Low tide			3 ♂, 3 ♀ (1 ovig.)
MARCHAD	»	VII.1953	—	—	—	8 ♂, 4 ♀ (2 ovig.)
GRUVEL	Atlantic coast of the Sahara	1908	—	—	—	2 ♂
IFAN-Gorée	Dakar, Senegal	—	—	—	—	1 ♂
R. SOURIE	Anse Bernard, Dakar, Senegal	14.VI.1946	—	—	—	2 ♂, 7 ♀ (4 ovig.)
»	»	19.VI.1947	—	—	—	1 ♂, 1 ♀
TH. MONOD	»	30.XI.1947	—	—	—	2 ♂, 1 ♀
« MERCATOR »	Baie de Dakar, Senegal	13.XI.1935	—	—	—	1 ♂
IFAN-Gorée	Wreck of the « PERSÉE », between Cap Manuel and Gorée, Senegal	4.V.1953	15	—	—	4 ♂, 6 ovig. ♀
I. MARCHE-	»	6.V.1953	15	—	—	3 ♂, 9 ♀ (7 ovig.)
MARCHAD	»	7.V.1953	15	—	—	19 ♂, 36 ♀ (26 ovig.)
»	»	29.V.1953	15	—	—	1 ♂, 1 ovig. ♀
»	»	—	9	—	—	7 ♂, 9 ♀ (3 ovig.)
TH. MONOD	Gorée, Senegal	26.III.1946	—	—	—	2 ♂
J. CADENAT	»	27.III.1946	—	—	—	4 ♂, 1 ♀ (1 ♂ is holotype- figured)