

Eastern Pacific Expeditions of the New York Zoological Society.  
 Porcellanid Crabs (*Crustacea: Anomura*) from the  
 West Coast of Tropical America

JANET HAIG

Allan Hancock Foundation  
 University of Southern California

(Text-figures 1 & 2)

[This is the forty-seventh of a series of papers dealing with the collections of the Eastern Pacific Expeditions of the New York Zoological Society made under the direction of William Beebe. The present paper is concerned with specimens taken on the Templeton Crocker Expedition (1936) and the Eastern Pacific *Zaca* Expedition (1937-1938). For data on localities, dates, dredges, refer to *Zoologica*, Vol. XXII, No. 2, pp. 33-46, and Vol. XXIII, No. 14, pp. 287-298.]

CONTENTS	PAGE
Introduction .....	57
Ecological Considerations .....	59
Geographical Considerations .....	59
Systematic Considerations .....	60
Restriction of Synonymies .....	60
Systematic Discussion .....	60
Family Porcellanidae .....	60
<i>Petrolisthes agassizii</i> Faxon .....	60
<i>P. edwardsii</i> (Saussure) .....	60
<i>P. glasselli</i> Haig .....	61
<i>P. polymitus</i> Glassell .....	61
<i>P. haigae</i> Chace .....	61
<i>P. armatus</i> (Gibbes) .....	62
<i>P. nobilii</i> Haig .....	62
<i>P. zaca</i> , new species .....	63
<i>P. robsonae</i> Glassell .....	65
<i>P. gracilis</i> Stimpson .....	65
<i>P. tridentatus</i> Stimpson .....	65
<i>P. galapagensis</i> Haig .....	65
<i>P. tonsorius</i> Haig .....	66
<i>P. holotrichus</i> Nobili .....	66
<i>P. platymerus</i> Haig .....	66
<i>P. ortmanni</i> Nobili .....	66

<i>P. lewisi lewisi</i> (Glassell) .....	66
<i>P. lewisi austrinus</i> Haig .....	67
<i>P. hians</i> Nobili .....	67
<i>Neopisosoma mexicanum</i> (Streets) .....	67
<i>Pachycheles chacei</i> Haig .....	68
<i>P. calculosus</i> Haig .....	68
<i>P. crassus</i> (A. Milne Edwards) .....	68
<i>P. biocellatus</i> (Lockington) .....	68
<i>P. vicarius</i> Nobili .....	69
<i>P. spinidactylus</i> Haig .....	69
<i>P. panamensis</i> Faxon .....	69
<i>P. trichotus</i> Haig .....	69
<i>Minyocerus kirki</i> Glassell .....	70
<i>Porcellana cancrisocialis</i> Glassell .....	70
<i>P. paguriconviva</i> Glassell .....	70
<i>Pisidia magdalenensis</i> (Glassell) .....	71
<i>Megalobrachium poeyi</i> (Guérin) .....	71
<i>M. garthi</i> Haig .....	72
<i>M. festai</i> (Nobili) .....	72
<i>M. tuberculipes</i> (Lockington) .....	72
<i>Polyonyx confinis</i> Haig .....	72
Acknowledgments .....	72
Literature Cited .....	73

INTRODUCTION

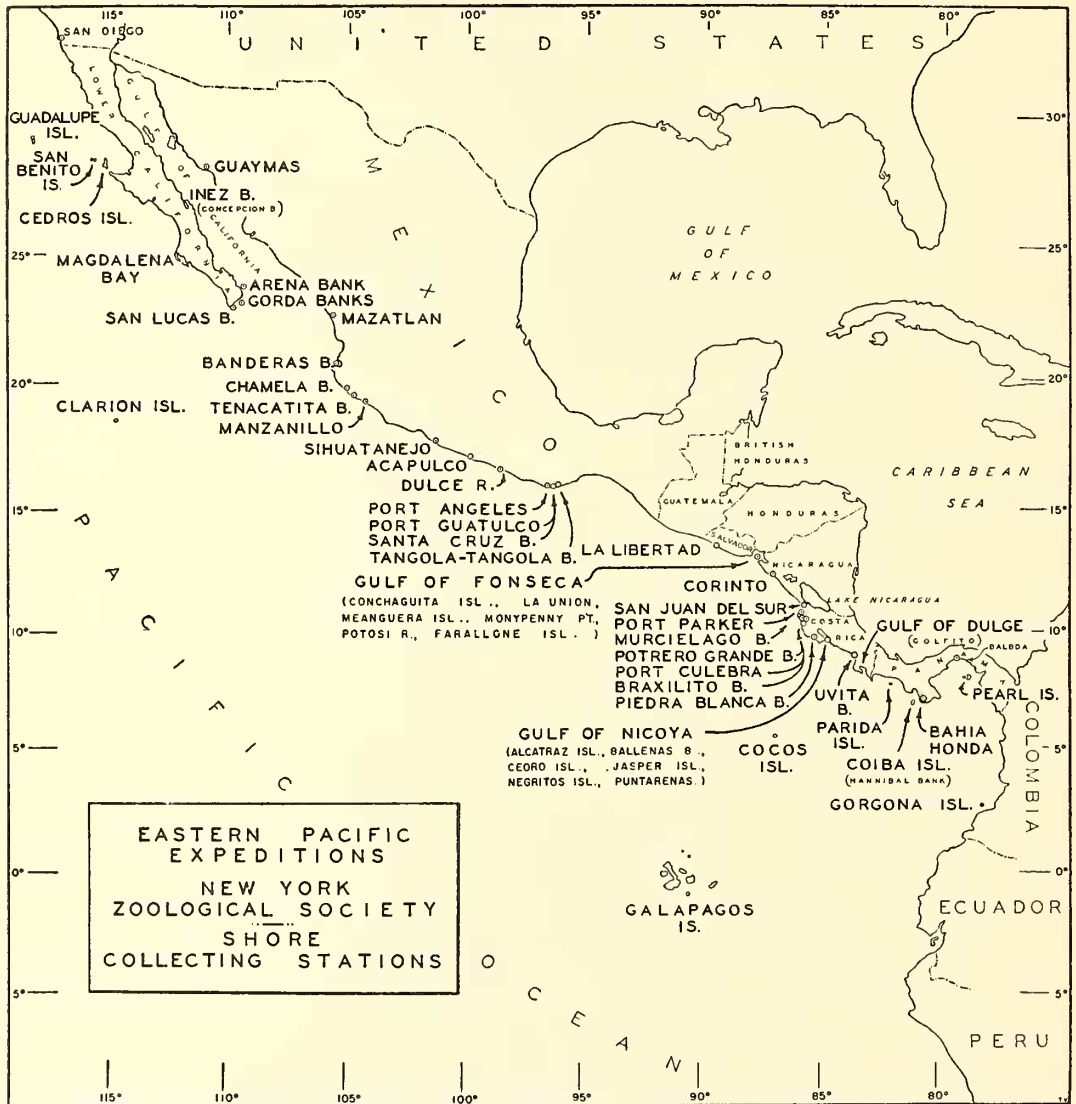
**D**URING a three-year period, 1936 to 1938, two expeditions sponsored by the New York Zoological Society and under the direction of Dr. William Beebe explored the west coast of tropical America aboard the yacht *Zaca*. The first, the Templeton Crocker Expedition (1936), covered the west coast of Baja California, the southern half

of the Gulf of California, and Clarion Island of the Revillagigedo group; the second, the Eastern Pacific *Zaca* Expedition (1937-1938), proceeded along the coast of Mexico and Central and South America as far south as Gorgona Island, Colombia. (See Text-fig. 1.)

The porcellanid crabs from the 1936 Templeton Crocker Expedition (with the exception of those collected at Clarion Island) were the subject of a report by Glassell (1937). While preparing a monograph on the Porcellanidae of the eastern Pacific, I had hoped to examine

material of that family obtained during the expedition of 1937-1938; at that time, however, it was packed away and not accessible for study, except for a few lots, which were examined and subsequently incorporated in the monographic treatment (Haig, 1960) along with specimens collected at Clarion Island during the 1936 expedition.

The bulk of the porcellanids from the Eastern Pacific *Zaca* Expedition (1937-1938) has since become available for examination, and all the Porcellanidae collected during that ex-



TEXT-FIG. 1. Shore collecting stations of the Eastern Pacific Expeditions of the New York Zoological Society. For exact locations of associated dredge stations, refer to *Zoologica*, vol. XXII, no. 2, and vol. XXIII, no. 14.

pedition form the subject matter of the present report. In general, the style of presentation follows that of Garth (1959, 1961, 1966), who reported on part of the brachyuran crabs collected by the expedition, the intertidal brachygnaths having been dealt with earlier by Crane (1947).

The material has been deposited in the American Museum of Natural History; in this report the AMNH catalog number referring to each lot is indicated in parentheses. A few specimens from the group studied before 1960 were donated to the Allan Hancock Foundation, and these are identified (AHF) in the text.

#### ECOLOGICAL CONSIDERATIONS

Porcellanid crabs are usually conspicuous members of the coral community in tropical seas. Most species are not obligate commensals with corals, but may be found in a variety of habitats that offer concealment. Nevertheless certain species are predominantly coral dwellers and have only rarely been found in other situations: in the eastern Pacific these include *Petrolisthes glasselli*, *Petrolisthes polymitus*, *Pachycheles biocellatus*, *Pachycheles vicarius*, and several others. Some species, on the other hand, are generally found under stones in the littoral or have been dredged from various kinds of substrates, but occasionally turn up among crabs and other animals taken from coral heads. *Petrolisthes edwardsii* and *Pisidia magdalenensis* are examples.

Of the 36 species of porcellanids from the Eastern Pacific *Zaca* Expedition, 18, or 50 per cent, were collected from corals. Crane (1947, pp. 88-89) reported that "More than 50 heads of coral, ranging in diameter from six inches to more than two feet, were carefully hammered open and their inhabitants collected." The best locality for this type of collecting, as far as the Porcellanidae were concerned, was Sihuatenajo Bay, where 14 species were recovered from corals in the intertidal zone. Eleven species were collected from intertidal corals at Jasper Island; ten at Uvita Bay; at least nine at Port Parker; and eight at Port Culebra. At Port Guatulco, eight species were found in corals obtained by diving in 1½ fathoms.

Crane (1947, p. 87) enumerated nine habitat zones for the intertidal brachygnathous Brachyura of the 1937-1938 expedition. *Petrolisthes zaca*, described herein, was found living on mud among mangroves; otherwise the coral habitat zone was the only one specified for the Porcellanidae of the expedition. Thirteen species not collected in the latter zone were probably

from "stones near midtide levels," "stones near low-tide levels," or "tidepools."

Dredged species included *Petrolisthes robsonae* and *Polyonyx confinis*, from mud and mangrove leaves in 3 fathoms; and *Porcellana cancrisocialis*, *Porcellana paguriconviva*, and *Pisidia magdalenensis*, chiefly on sand, mud, crushed shell, and rock substrates in 2½ to 30 fathoms.

Among the species collected was an obligate commensal, *Minyocerus kirki*, which lives in association with sea stars and serpent stars. *Porcellana cancrisocialis* and *Porcellana paguriconviva*, free-living over a rather wide bathymetric range, are frequently found with various species of large hermit crabs in their shells; three *P. paguriconviva* from the Eastern Pacific *Zaca* Expedition were associated with a hermit crab of unknown identity.

#### GEOGRAPHICAL CONSIDERATIONS

As a result of the present study, the known range of *Pachycheles crassus* is extended from Balboa, Panama, to Sihuatenajo Bay, Mexico. Smaller northward range extensions include *Petrolisthes tridentatus* from Salinas Bay, Costa Rica, to San Juan del Sur, Nicaragua; and *Pachycheles calculosus* and *Megalobrachium festai* from Acapulco to Sihuatenajo Bay, Mexico. *Petrolisthes robsonae* is reported from La Union, El Salvador, the first precise locality for the species north of Panama although it was recorded earlier from an unspecified area in Mexico. *Petrolisthes galapagensis* is reported from the Gulf of Nicoya, Costa Rica, the first mainland record for the species.

*Petrolisthes lewisi* is recorded from the Gulf of California south to Ecuador, but with a wide gap in its known distribution. Since the two populations in this discontinuous range are recognized as subspecies, it may be assumed that they meet somewhere in the intermediate area, which is now narrowed with the extension of *Petrolisthes lewisi lewisi* southward from Tequepa Bay to Tangola-Tangola Bay, Mexico, and of *P. l. austrinus* northward from Salinas Bay, Costa Rica, to the Gulf of Fonseca.

In the present report, several species are noted for the first time from certain countries visited by the *Zaca*. These records may be listed as follows:

New to Mexico: *Pachycheles crassus*.

New to El Salvador: *Petrolisthes robsonae*.

New to Nicaragua: *Petrolisthes agassizii*, *P. edwardsii*, *P. nobilii*, *P. tridentatus*, *P. tonsorius*, *P. lewisi austrinus*, *Neopisosoma mexicanum*, and *Pachycheles trichotus*.

New to Costa Rica: *Petrolisthes galapagensis*, *Pachycheles chacei*, *Megalobrachium garthi*, and *M. tuberculipes*.

#### SYSTEMATIC CONSIDERATIONS

Two new species, neither of which is yet known from any other source, are represented in the collection of Porcellanidae from the *Zaca* Expedition (1937-1938). One of these, *Polyonyx confinis*, has already been treated (Haig, 1960); the other, *Petrolisthes zaca*, is described in the present report.

Sixty-five eastern Pacific porcellanid species are now recognized as members of the Panamic faunal province, which extends from the head of the Gulf of California to the Gulf of Guayaquil, Ecuador, and includes a number of outlying islands. Of these tropical species, fifteen appear to be restricted to the Gulf of California or to the Cocos and Galapagos Islands, areas not visited by the *Zaca*. The expedition obtained 36 of the remaining 50 species, or 72 per cent of the total.

#### RESTRICTION OF SYNONYMIES

For each species a reference is given to the recent revision of eastern Pacific Porcellanidae (Haig, 1960), which may be consulted for all earlier references. Pertinent works published since 1960 are also cited. Otherwise, the synonymies are restricted to the following references: the work containing the original description of the species; that first citing the name in its present combination; and those containing the original descriptions of its junior synonyms. For *Petrolisthes armatus* and *Megalobrachium poeyi*, species that occur in the Atlantic Ocean as well as the Pacific, junior synonyms with an Atlantic coast type locality are not cited.

#### SYSTEMATIC DISCUSSION

##### Family PORCELLANIDAE

##### *Petrolisthes agassizii* Faxon

*Petrolisthes agassizii* Faxon, 1893, p. 174. Haig, 1960, pp. 24, 32, pl. 20 fig. 4; 1962, p. 174.

*Range*.—From Mazatlan, Gulf of California, to Utria Bay, Colombia. Shore to 5 fathoms.

*Material Examined*.—17 specimens from 4 stations:

##### Mexico

Tangola-Tangola Bay, December 8-13, 1937, intertidal in coral, 1 male (12596).

##### Nicaragua

Corinto, December 28, 1937-January 7, 1938, intertidal, 1 male, 3 females (12597).

##### Costa Rica

Port Parker, January 12-23, 1938, intertidal 1938, 6-2½ fathoms, rocks, 5 males, 6 females (12598).

Port Parker, Station 203, D-10, January 22, 1938, 6-2½ fathoms, rocks, 5 males, 6 females (12598).

*Measurements*.—Males 5.3-6.5 mm., ovigerous females 6.1-8.5 mm.

*Breeding*.—Ovigerous females from Corinto in late December or early January, and from Port Parker in late January.

*Remarks*.—The male specimen collected intertidally at Port Parker was reported by Haig (1960, p. 257).

##### *Petrolisthes edwardsii* (Saussure)

*Porcellana edwardsii* Saussure, 1853, p. 366, pl. 12 fig. 3.

*Petrolisthes edwardsii* Stimpson, 1858, p. 227. Haig, 1960, pp. 24, 33, pl. 21; 1962, p. 175.

*Range*.—From Santa Maria and Magdalena Bays, outer Baja California, and Los Frailes, Gulf of California, to La Plata Island, Ecuador. Isabel, Tres Marias, Revillagigedo, and Galapagos Islands. Shore to 20 fathoms.

*Material Examined*.—53 specimens from 12 stations:

##### Mexico

Chamela Bay, November 17-20, 1937, intertidal, 3 males (12599).

Tenacatita Bay, November 20, 1937, intertidal, 4 males, 5 females, 3 young (12600).

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 2 females, 1 young (12601).

Port Angeles, December 1, 1937, intertidal, 3 males, 2 females (12602).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 1 young male, 2 young females, 2 young (12603).

Tangola-Tangola Bay, December 8-13, 1937, intertidal in coral, 2 males (1 young), 1 female (12604).

##### Nicaragua

Corinto, December 28, 1937-January 7, 1938, intertidal, 2 females (12605).

##### Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 9 males, 4 females (11788).

Port Parker, Station 203, D-10, January 22, 1938, 6-2½ fathoms, rocks, 2 females (12606).

Port Culebra, January 24-31, 1938, intertidal from coral, 1 female (12607).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male (12608).

## Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 3 males (12609).

*Measurements.*—Males 3.8-12.0 mm., nonovigerous females 4.2-8.6 mm., ovigerous females 5.3-10.0 mm.

*Breeding.*—Ovigerous females from Tenacatita and Sihuatenejo Bays in November, from Corinto in late December or early January, and from Port Parker and Port Culebra in January.

*Remarks.*—A specimen from Chamela Bay is parasitized by a bopyrid. The material collected intertidally at Port Parker was recorded by Haig (1960, p. 258).

***Petrolisthes glasselli* Haig**

*Petrolisthes glasselli* Haig, 1957a, p. 33, pl. 8 figs. 1-3; 1960, pp. 24, 39, pl. 20 fig. 2; 1962, p. 176. Chace, 1962, p. 623.

*Range.*—From Cape San Lucas, Gulf of California, to Gorgona Island, Colombia. Isabel, Tres Marias, Revillagigedo, Galapagos, and Clipperton Islands. Shore to 4 fathoms.

*Material Examined.*—284 specimens from 5 stations:

## Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 1 male, 3 females (12610).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 1 male, 1 female (12611).

## Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 97 males, 121 females, 39 young (11786).

Port Culebra, January 24-31, 1938, intertidal in coral, 4 young (12612).

Uvita Bay, March 2-4, 1938, intertidal in coral, 8 males, 9 females (12613).

*Measurements.*—Males 4.1-10.0 mm., nonovigerous females 4.0-7.8 mm., ovigerous females 5.2-9.6 mm.

*Breeding.*—Ovigerous females from Sihuatenejo Bay in November, from Port Guatulco in December, from Port Parker in January, and from Uvita Bay in March.

*Remarks.*—This species, which has rarely been found except in association with corals, is the only eastern Pacific *Petrolisthes* with two epi-branchial spines on either side of the carapace.

The specimens from Port Parker were previously reported by Haig (1960, p. 262).

***Petrolisthes polymitus* Glassell**

*Petrolisthes polymitus* Glassell, 1937, p. 81, pl. 1

fig. 1. Haig, 1960, pp. 25, 41, pl. 22 fig. 1; 1962, p. 176.

*Range.*—From Espiritu Santo Island, Gulf of California, to La Libertad, Ecuador. Tres Marias and Galapagos Islands. Shore to 4 fathoms.

*Material Examined.*—13 specimens from 4 stations:

## Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 1 female (12614).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 2 males, 5 females (12615).

## Costa Rica

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 2 males, 1 female (12616).

Uvita Bay, March 2-4, 1938, intertidal in coral, 1 male, 1 female (12617).

*Measurements.*—Males 4.0-5.0 mm., nonovigerous female 4.8 mm., ovigerous females 3.3-4.9 mm.

*Breeding.*—Ovigerous females from Sihuatenejo Bay in November, from Port Guatulco in December, from Jasper Island in February, and from Uvita Bay in March.

*Remarks.*—This species was originally described from a single specimen collected in the Gulf of California during the 1936 Templeton Crocker Expedition. It was taken over a wide geographical area during various cruises of *Velero III* and *Velero IV*.

***Petrolisthes haigae* Chace**

*Petrolisthes marginatus*, Haig, 1960, pp. 25, 47, pl. 20 fig. 1. Not *P. marginatus* Stimpson.

*Petrolisthes* sp., Haig, 1962, p. 177.

*Petrolisthes haigae* Chace, 1962, p. 620, text-fig. 1.

*Range.*—From Guaymas Bay, Gulf of California, to Santa Elena Bay, Ecuador. Isabel, Tres Marias, Revillagigedo, Galapagos, and Clipperton Islands. Shore to about 10 fathoms (exceptionally to 22 fathoms).

*Material Examined.*—525 specimens from 10 stations:

## Mexico

Tenacatita Bay, November 20, 1937, intertidal, 1 female (12618).

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 14 males, 26 females (12619).

Acapulco, November 25-29, 1937, intertidal, 2 males, 7 females (12620).

Port Guatulco, Station 195, D-14, December 6, 1937, 4 fathoms, coral, 1 male (12621); D-

15, December 6, 1937, diving in 1½ fathoms, coral, 21 males, 35 females, 1 young (12622).

#### Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 110 males, 146 females (11780).

Port Parker, Station 203, D-9, January 22, 1938, 1½-4 fathoms, coral, 2 males, 1 young (12623).

Port Culebra, January 24-31, 1938, intertidal in coral, 90 specimens (12624).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 18 males, 13 females (12625).

Uvita Bay, March 2-4, 1938, intertidal in coral, 16 males, 17 females (12626).

#### Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 1 male, 3 females (12627).

*Measurements.*—Males 2.6-9.5 mm., nonovigerous females 2.4-7.4 mm., ovigerous females 3.5-9.2 mm.

*Breeding.*—Ovigerous females from Tenacatita Bay, Sihuatenajo Bay, and Acapulco in November, from Port Guatulco in December, from Port Parker and Port Culebra in January, from Jasper Island in February, and from Uvita Bay and Bahia Honda in March.

*Remarks.*—This species occurs abundantly throughout its range. Chace (1962) showed that it is distinct from *Petrolisthes marginatus* Stimpson, a closely related west Atlantic form.

The specimens collected intertidally at Port Parker were reported by Haig (1960, p. 267) as *Petrolisthes marginatus* Stimpson.

#### *Petrolisthes armatus* (Gibbes)

*Porcellana armata* Gibbes, 1850, p. 190.

*Petrolisthes armatus*, Stimpson, 1858, p. 227.

Haig, 1960, pp. 25, 50, pl. 19 fig. 2; 1962, p. 178.

*Range.*—From Puerto Peñasco and San Felipe, Gulf of California, to Independencia Bay, Peru. Galapagos Islands. Shore to 10 fathoms. Also occurs in western and eastern Atlantic.

*Material Examined.*—32 specimens from 5 stations:

#### Nicaragua

Near Potosi River, Gulf of Fonseca, December 23-25, 1937, intertidal, 5 males, 7 females (12628).

#### Costa Rica

Port Parker, January 12-23, 1938, intertidal, 6 males, 7 females (12629).

Port Culebra, January 24-31, 1938, intertidal, 3 males (12630).

Cedro Island, Gulf of Nicoya, February 12-13 or 21-22, 1938, intertidal, 1 male, 1 female (12631).

#### Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 1 male, 1 young female (12632).

*Measurements.*—Males 2.6-11.7 mm., nonovigerous females 3.9-5.5 mm., ovigerous females 4.5-7.3 mm.

*Breeding.*—Ovigerous females from Gulf of Fonseca in December, from Port Parker in January, and from Cedro Island in February.

#### *Petrolisthes nobilii* Haig

*Petrolisthes nobilii* Haig, 1960, pp. 25, 55, pl. 1, pl. 18 fig. 3.

*Range.*—From Cabeza Ballena, Gulf of California, to Santa Elena Bay, Ecuador. Isabel Island. Intertidal zone.

*Material Examined.*—16 specimens from 7 stations:

#### Mexico

Sihuatenajo Bay, November 24, 1937, intertidal under stones, 1 male (12633).

Port Angeles, December 1, 1937, intertidal, 1 female (12634).

Tangola-Tangola Bay, December 8-13, 1937, intertidal, 2 males, 2 females (12635).

#### Nicaragua

Corinto, December 28, 1937-January 7, 1938, intertidal, 1 male, 1 female (12636).

San Juan del Sur, January 9-12, 1938, intertidal, 2 males, 2 females (12637).

#### Costa Rica

Ballenas Bay, Gulf of Nicoya, February 25-26, 1938, intertidal, 1 female (12638).

#### Colombia

Gorgonilla Island, March 30, 1938, intertidal under rocks, 1 male, 1 female (12639).

*Measurements.*—Males 6.7-10.4 mm., nonovigerous female 4.3 mm., ovigerous females 5.6-10.4 mm.

*Breeding.*—Ovigerous females from Port Angeles and Tangola-Tangola Bay in December, from Corinto in late December or early January, from San Juan del Sur in January, from Ballenas Bay in February, and from Gorgonilla Island in March.

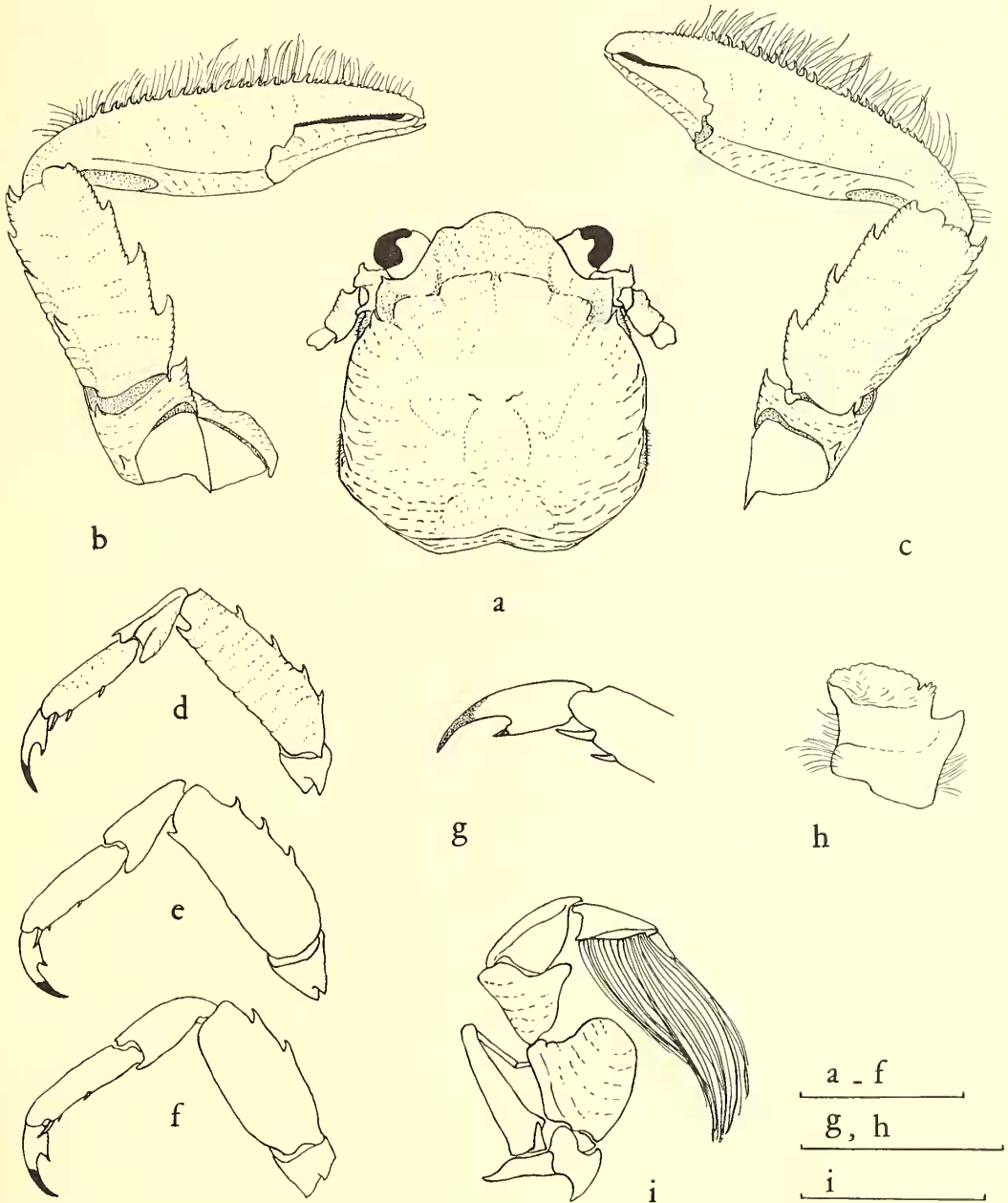
***Petrolisthes zacae*, new species**

(Text-fig. 2)

*Types*.—Female holotype, AMNH Cat. No. 12640, from Ballenas Bay, Gulf of Nicoya, Costa Rica, February 25 or 26, 1938, intertidal in mangrove mud. One male and one female, paratypes, AMNH Cat. No. 12641, same data as holotype.

*Measurements*.—Female holotype, length 8.6 mm., width 7.8 mm. Male paratype, length 5.0 mm. Ovigerous female paratype, length 7.8 mm.

*Diagnosis*.—Carapace finely rugose; no supraocular spine; a single epibranchial spine; front broad, with three shallow lobes. Carpus of chelipeds about two and a half times as long as wide, inner margin with three narrow, wide-set



TEXT-FIG. 2. *Petrolisthes zacae*. Holotype: a, carapace; b and c, chelipeds; d, e, and f, left walking legs 1, 2, and 3, respectively; g, dactyl of left first walking leg. Paratype: h, basal segment of right antennule; i, right third maxilliped. (Scale a-f = 4 mm.; g, h = 2 mm.; i = 3 mm.)

teeth, outer margin with four similar teeth; chela long and slender, its outer margin spinulate. Merus of walking legs with a few spines on upper margin; dactyl with a single movable spinule on lower margin.

*Description.*—Carapace finely rugose, especially along lateral and posterolateral margins; dorsal surface flat, regions not strongly indicated except for hepatics, which lie at a level below that of rest of carapace, and protogastric lobes. Front broad, flat or very faintly concave, with three shallow, rounded lobes, median one broader and more produced than laterals. No supraocular spine. Orbits shallow, strongly oblique; outer orbital angle subrectangular and sometimes produced into a minute spinule. A well-developed epibranchial spine. No hairs on dorsal surface of carapace; lateral portion with very short hairs.

a series of long, slender, rather evenly spaced spinules, more than 20 in number in the holotype, not developed on the proximal fourth of the palm nor on the outer margin of the pollex. Fingers smooth on dorsal surface, curved and crossing at tips; outer margin of dactyl with a ridge, produced into a sharp spinule at point where the finger curves sharply inward and crosses under pollex. A short, thick pubescence on lower inner side of fingers, on dactyl extending more than halfway to tip. Outer margin of chela with a fringe of very fine hairs, not obscuring row of spinules.

Walking legs transversely rugose, and with a few very fine, scattered hairs on margins. Merus with a posterodistal spine on legs 1 and 2, none on leg 3; anterior margin with a few spines (well-developed in female specimens, weakly developed in the small male), as follows in Table I:

TABLE I  
SPINULATION OF WALKING LEGS

<i>Legs</i>	Holotype ♀ 8.6 mm.	Paratype ♀ 7.8 mm.	Paratype ♂ 5.0 mm.
Leg 1 (left)	4	3	2
Leg 1 (right)	3	3	2
Leg 2 (left)	3	3	2
Leg 2 (right)	3	(leg missing)	(leg missing)
Leg 3 (left)	2	(leg missing)	(leg missing)
Leg 3 (right)	2	(leg missing)	2

First movable segment of antenna with a strongly projecting, rounded, spine-tipped lamellar lobe; second granular, slightly produced at proximal end of anterior margin; third smooth; flagellum without hairs. Outer maxilliped and antennule as shown in Text-figure 2.

Chelipeds subequal. Merus lightly rugose; armed on inner margin with a strong pointed tooth; two spines on dorsal surface near outer margin, one at distal and the other near proximal end of segment. Carpus nearly two and a half times as long as wide; dorsal surface nearly smooth, evenly convex; armed on inner margin with three low, narrow, wide-set teeth (the most distal one not developed in the small male paratype), their edges finely crenulate; outer margin with four similar teeth, the most distal one bifid and placed at outer distal angle, the proximal two placed slightly on dorsal surface. Chela long and slender, smooth, evenly convex; outer margin crenulate, some of the crenulations in the form of short, close-set spinules; on dorsal surface just to the inside of the crenulated margin,

Carpus with anterodistal spine well developed on leg 1, obsolescent or absent on legs 2 and 3. Propodus long and slender; two movable spinules on lower margin in addition to the usual posterodistal pair. Dactyl long and slender; a "thumblike" projection about halfway along lower margin, tipped with a movable corneous spinule; lower margin otherwise unarmed. (The spinule and the corneous fixed claw are paler in color than indicated in Text-fig. 2 d-f.)

*Remarks.*—*Petrolisthes zacae* is allied to a small group of species, including *P. armatus* (Gibbes), *P. nobilii* Haig, and *P. robsonae* Glassell, in which the carapace is not transversely striate; there are low, wide-set teeth on the inner margin of the carpus of the cheliped; and the anterior margin of the merus of the walking legs is armed with only a few spines. It differs from all of them by a combination of several characters, and particularly by the form of the dactyl of the walking legs. As far as I am aware, the structure of the dactyl in this species is unique among porcellanids of genus *Petrolisthes*. Assuming



that the types were collected in a situation typical for the species, it is probably an adaptation for living in mud.

***Petrolisthes robsonae* Glassell**

*Petrolisthes robsonae* Glassell, 1945, p. 227, text-fig. 3. Haig, 1960, pp. 25, 57, pl. 18 fig. 2.

*Range*.—Mexico (specific locality not known) to Guayaquil, Ecuador.

*Material Examined*.—La Union, Gulf of Fonseca, El Salvador, Station 199, D-21, December 27, 1937, 3 fathoms, mud, mangrove leaves, 2 males, 1 female (12642).

*Measurements*.—Males 6.5 and 7.0 mm., non-ovigerous female 5.3 mm.

*Remarks*.—An unusual characteristic of this species is its ability to withstand great changes in salinity (Haig, 1960, pp. 58-59). It has been collected at both ends of the Panama Canal, its occurrence on the Atlantic side of the Isthmus of Panama probably being due to an accidental introduction. It is also reported from Bellavista, Panama City; Guayaquil, Ecuador; and an unspecified locality in Mexico. With the discovery of specimens among the material collected by the *Zaca* during the 1937-1938 expedition, La Union becomes the northernmost precise locality known for the species.

***Petrolisthes gracilis* Stimpson**

*Petrolisthes gracilis* Stimpson, 1858, p. 227 (*nomen nudum*); 1859, p. 74. Haig, 1960, pp. 28, 79, pl. 27 fig. 2.

*Range*.—From Santa Maria Bay, Baja California, and Punta Peñasco and San Felipe, Gulf of California, to Tangola-Tangola Bay, Mexico. Tres Marias Islands. Shore; rarely to 25 fathoms.

*Material Examined*.—6 specimens from 3 stations:

Mexico

Sihuatenejo Bay, November 24, 1937, intertidal under stones, 1 male, 2 females (12643).

Port Guatulco, December 2-7, 1937, intertidal, 1 male (12644).

Tangola-Tangola Bay, December 8-13, 1937, intertidal, 2 males (12645).

*Measurements*.—Males 2.6-3.9 mm., ovigerous females 2.7 and 4.3 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay in November.

*Remarks*.—Except for a single specimen collected at Tangola-Tangola Bay by the *Velero III*, *Petrolisthes gracilis* has not been known south of the Gulf of California. I suggested (Haig, 1960, p. 81) that the Tangola-Tangola Bay

record might be erroneous. However, the specimens taken by the *Zaca* confirm the presence of the species in southern Mexico.

***Petrolisthes tridentatus* Stimpson**

*Petrolisthes tridentatus* Stimpson, 1858, p. 227 (*nomen nudum*); 1859, p. 75, pl. 1 fig. 4. Haig, 1960, pp. 29, 81, pl. 25 fig. 4.

*Range*.—From Salinas Bay, Costa Rica, to Puna Island, Ecuador. Intertidal. Also occurs in western Atlantic.

*Material Examined*.—18 specimens from 5 stations:

Nicaragua

San Juan del Sur, January 9-12, 1938, intertidal, 1 male, 3 females (12646).

Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 3 males, 2 females (11834).

Cedro Island, Gulf of Nicoya, February 12-13 or 21-22, 1938, intertidal, 3 males (12647).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal, 2 males, 3 females (12648).

Ballenas Bay, Gulf of Nicoya, February 25-26, 1938, intertidal, 1 female (12649).

*Measurements*.—Males 3.9-6.1 mm., nonovigerous females 3.8 and 4.0 mm., ovigerous females 3.6-4.5 mm.

*Breeding*.—Ovigerous females from San Juan del Sur and Port Parker in January, and from Gulf of Nicoya in February.

*Remarks*.—One of the specimens from Port Parker was reported by Haig (1960, p. 287). The range of the species is now extended slightly northward from Salinas Bay to San Juan del Sur.

***Petrolisthes galapagensis* Haig**

*Petrolisthes galapagensis* Haig, 1960, pp. 28, 84, pl. 2, pl. 25 fig. 2.

*Range*.—Galapagos Islands. Shore to 2½ fathoms.

*Material Examined*.—Jasper Island, Gulf of Nicoya, Costa Rica, February 22-25, 1938, intertidal, 4 males, 5 females (12650).

*Measurements*.—Males 4.2-6.3 mm., nonovigerous females 5.0-5.5 mm.

*Remarks*.—The above record is the first for the species outside the Galapagos Archipelago. In the Galapagos it frequently occurs with its close relative *Petrolisthes tonsorius* Haig, and the two species were encountered together at Jasper Island as well. They are best distinguished by the form of the cheliped: in *P. galapagensis* the margins of the carpus are subparallel, while

in *P. tonsorius* the inner carpal margin is produced into a strong lobe.

***Petrolisthes tonsorius* Haig**

*Petrolisthes tonsorius* Haig, 1960, pp. 28, 85, pl. 3, pl. 26 fig. 1.

*Range*.—From Cape San Lucas, Gulf of California, to Santa Elena Point, Ecuador. Revilagigedo, Cocos, and Galapagos Islands. Shore to 10 fathoms.

*Material Examined*.—36 specimens from 6 stations:

Mexico

Sihuatenejo Bay, November 24, 1937, intertidal under stones, 1 female (12651).

Port Angeles, December 1, 1937, intertidal, 2 males (12652).

Tangola-Tangola Bay, December 8-13, 1937, intertidal, 4 males, 8 females, 2 young (12653).

Nicaragua

Corinto, December 28, 1937-January 7, 1938, intertidal, 1 male (12654).

San Juan del Sur, January 9-12, 1938, intertidal, 1 female (12655).

Costa Rica

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal, 12 males, 5 females (12656).

*Measurements*.—Males 4.1-9.3 mm., nonovigerous females 3.8-6.2 mm., ovigerous females 3.6-8.3 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay in November, from Tangola-Tangola Bay in December, and from Gulf of Nicoya in February.

***Petrolisthes holotrichus* Nobili**

*Petrolisthes holotrichus* Nobili, 1901, p. 14. Haig, 1960, pp. 29, 102, pl. 29 fig. 4.

*Range*.—From Salinas Bay, Costa Rica, to La Libertad, Ecuador. Intertidal.

*Material Examined*.—4 specimens from 2 stations:

Costa Rica

Ballenas Bay, Gulf of Nicoya, February 25-26, 1938, intertidal, 1 female (12657).

Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 3 females (12658).

*Measurements*.—Nonovigerous female 2.9 mm., ovigerous females 3.8-5.0 mm.

*Breeding*.—Ovigerous females from Gulf of Nicoya in February and from Bahia Honda in March.

***Petrolisthes platymerus* Haig**

*Petrolisthes platymerus* Haig, 1960, pp. 29, 108, pl. 4, pl. 29 fig. 3.

*Range*.—Known only from Port Parker, Costa Rica, and Taboguilla Island, Panama. Intertidal.

*Material Examined*.—Ballenas Bay, Gulf of Nicoya, Costa Rica, February 25-26, 1938, intertidal, 1 male (12659).

*Measurements*.—Male 4.5 mm.

*Remarks*.—This species was previously known from only 14 specimens collected at two localities. It may have been overlooked by most collectors because of its small size. The largest individual on record is the 5.2 mm. holotype, while egg-bearing females range from 3.5-4.9 mm.

***Petrolisthes ortmanni* Nobili**

*Petrolisthes ortmanni* Nobili, 1901, p. 16. Haig, 1960, pp. 27, 112, pl. 23 fig. 3.

*Range*.—From Puerto San Carlos, Gulf of California, to Lobos de Afuera Islands, Peru. Tres Marias Islands and Cocos Island. Shore to 3½ fathoms.

*Material Examined*.—57 specimens from 7 stations:

Mexico

Tenacatita Bay, November 20, 1937, intertidal, 1 male (12660).

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 2 males, 4 females (12661).

Port Guatulco, December 2-7, 1937, intertidal, 1 female (12662).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 10 males, 8 females (12663).

Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 11 males, 13 females (11831).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 3 males, 3 females (12664).

Uvita Bay, March 2-4, 1938, intertidal in coral, 1 male (12665).

*Measurements*.—Males 2.6-5.6 mm., nonovigerous females 3.2-4.7 mm., ovigerous females 3.6-6.6 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay in November, from Port Guatulco in December, from Port Parker in January, and from Gulf of Nicoya in February.

*Remarks*.—The specimens from Port Parker were reported earlier by Haig (1960, p. 303).

***Petrolisthes lewisi lewisi* (Glassell)**

*Pisosoma lewisi* Glassell, 1936, p. 287.

*Petrolisthes lewisi* Haig, 1957b, p. 7 (not new records nor all of synonymy).

*Petrolisthes lewisi lewisi*, Haig, 1960, pp. 27, 113, pl. 23 fig. 1.

*Range*.—From Carmen Island, Gulf of California, to Tequepa Bay, Mexico. Isabel and Tres Marias Islands. Shore to 3 fathoms.

*Material Examined*.—11 specimens from 3 stations:

*Mexico*

Sihuatenejo Bay, November 24, 1937, intertidal under stones, 3 females (12666).

Port Guatulco, December 2-7, 1937, intertidal, 2 males, 1 female (12667).

Tangola-Tangola Bay, December 8-13, 1937, intertidal, 4 males, 1 female (12668).

*Measurements*.—Males 5.0-5.8 mm., nonovigerous females 3.0 and 5.8 mm., ovigerous females 4.3-5.4 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay in November and from Tangola-Tangola Bay in December.

*Remarks*.—The known range of *Petrolisthes l. lewisi* is now extended southeastward from Tequepa Bay to Tangola-Tangola Bay.

***Petrolisthes lewisi austrinus* Haig**

*Petrolisthes lewisi austrinus* Haig, 1960, pp. 27, 115, pl. 5, pl. 23 fig. 2.

*Range*.—From Salinas Bay, Costa Rica, to Santa Elena Point, Ecuador. Intertidal.

*Material Examined*.—5 specimens from 2 stations:

Nicaragua

Near Potosi River, Gulf of Fonseca, December 23-25, 1937, intertidal, 1 male (12669).

Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 1 male, 3 females (12670).

*Measurements*.—Males 4.5 and 5.5 mm., nonovigerous females 2.6 and 4.7 mm., ovigerous female 3.3 mm.

*Breeding*.—Ovigerous female from Bahia Honda in March.

*Remarks*.—The known range of subspecies *austrinus* is extended northwestward from Salinas Bay to Gulf of Fonseca. The area of contact of the two subspecies of *Petrolisthes lewisi*, which has yet to be determined, lies somewhere between the latter locality and Tangola-Tangola Bay.

***Petrolisthes hians* Nobili**

*Petrolisthes hians* Nobili, 1901, p. 17. Haig, 1960, pp. 26, 121, pl. 22 fig. 3.

*Pisosoma flagraciliata* Glassell, 1937, p. 82, pl. 1 fig. 2.

*Range*.—From Santa Maria Bay, outer Baja California, and Guaymas, Gulf of California, to Santa Elena Bay, Ecuador. Isabel, Tres Marias, and Revillagigedo Islands. Shore to 4 fathoms (exceptionally to 18 fathoms).

*Material Examined*.—137 specimens from 8 stations:

Mexico

Tenacatita Bay, November 20, 1937, intertidal, 1 male (12671).

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 40 males, 44 females (12672).

Acapulco, November 25-29, 1937, intertidal, 5 males, 4 females (12673).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 4 males, 2 females (12674).

Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 7 males, 3 females (11835).

Port Culebra, January 24-31, 1938, intertidal in coral, 4 males, 6 females (12675).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male (12676).

Uvita Bay, March 2-4, 1938, intertidal in coral, 8 males, 8 females (12677).

*Measurements*.—Males 1.6-5.3 mm., nonovigerous females 2.0-3.9 mm., ovigerous females 1.9-5.1 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay and Acapulco in November, from Port Guatulco in December, from Port Parker and Port Culebra in January, and from Uvita Bay in March.

*Remarks*.—Two ovigerous females from Sihuatenejo Bay were parasitized by a bopyrid. The specimens from Port Parker were previously reported by Haig (1960, p. 309).

*Pisosoma flagraciliata*, a synonym of *Petrolisthes hians*, was based on material collected in the Gulf of California during the 1936 Templeton Crocker Expedition.

***Neopisosoma mexicanum* (Streets)**

*Pachycheles mexicanus* Streets, 1871, p. 225, pl. 2 fig. 1.

*Neopisosoma mexicanum*, Haig, 1960, pp. 124, 127, pl. 30 fig. 2.

*Range*.—From Mazatlan, Gulf of California, to Santa Elena Point, Ecuador. Galapagos Islands. Shore to 10 fathoms.

*Material Examined*.—Corinto, Nicaragua, De-

ember 28, 1937-January 7, 1938, intertidal, 1 female (12678).

*Measurements.*—Ovigerous female 4.4 mm.

*Remarks.*—*Neopisosoma dohenyi* Haig, which occupies much the same area as *N. mexicanum* and has been collected with it at Mazatlan and Acapulco, was not taken during the *Zaca* expedition.

#### ***Pachycheles chacei* Haig**

*Pachycheles chacei* Haig, 1956, pp. 7, 9, pl. 1; 1960, pp. 134, 135, pl. 31 fig. 3.

*Range.*—From San José, Guatemala, to Santa Elena Bay, Ecuador. 1-4 fathoms. Also Atlantic coast of Panama and Colombia.

*Material Examined.*—23 specimens from 2 stations:

##### Costa Rica

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male, 2 females (12679).

Uvita Bay, March 2-4, 1938, intertidal in coral, 9 males, 11 females (12680).

*Measurements.*—Males 2.4-4.7 mm., ovigerous females 2.7-5.2 mm.

*Breeding.*—Ovigerous females from Gulf of Nicoya in February and from Uvita Bay in March.

*Remarks.*—The Costa Rican specimens collected by the *Zaca* bridge a considerable gap in the known distribution of the species, which has not been reported previously from the area between Acajutla, El Salvador, and Isla Verde, Panama.

#### ***Pachycheles calculosus* Haig**

*Pachycheles calculosus* Haig, 1960, pp. 135, 136, pl. 10, pl. 31 fig. 4.

*Range.*—From Acapulco, Mexico, to La Libertad, Ecuador. Shore to 4 fathoms.

*Material Examined.*—Sihuatenejo Bay, Mexico, November 24, 1937, intertidal in coral, 2 males (12681).

*Measurements.*—Males 4.5 and 4.7 mm.

*Remarks.*—The range of this species is now extended northwestward from Acapulco to Sihuatenejo Bay.

#### ***Pachycheles crassus* (A. Milne Edwards)**

*Porcellana (Pachycheles) crassa* A. Milne Edwards, 1869, p. 128, pl. 26 fig. 12.

*Pachycheles crassus*, Haig, 1957b, p. 5; 1960, pp. 134, 141, pl. 31 fig. 1, text-fig. 4.

*Range.*—From Balboa, Panama, to Gorgona Island, Colombia. Shore to 4 fathoms.

*Material Examined.*—Sihuatenejo Bay, Mexico, November 24, 1937, intertidal in coral, 2 males, 1 female (12682).

*Measurements.*—Males 3.9 mm. long, 4.8 mm. wide and 4.8 mm. long, 6.3 mm. wide, ovigerous female 5.6 mm. long, 7.9 mm. wide.

*Remarks.*—*Pachycheles crassus* was previously known from only nine specimens collected at five localities. The *Zaca* material shows the marked broadening of the carapace, particularly in females, that is characteristic of the species.

The known range is now considerably extended northwestward, from Balboa to Sihuatenejo Bay.

#### ***Pachycheles biocellatus* (Lockington)**

*Petrolisthes (Pisosoma) biocellatus* Lockington, 1878, pp. 396, 403.

*Petrolisthes (Pisosoma) gibbiscarpus* Lockington, 1878, pp. 396, 402.

*Pisosoma aphrodita* Boone, 1932, p. 53, text-figs. 17-18.

*Pachycheles biocellatus*, Glassell, 1937, p. 84. Haig, 1960, pp. 134, 144, pl. 32 fig. 1. Chace, 1962, p. 619.

*Range.*—From Espiritu Santo Island, Gulf of California, to La Plata Island, Ecuador. Isabel, Tres Marias, Revillagigedo, Clipperton, and Galapagos Islands. Shore to 13 fathoms.

*Material Examined.*—112 specimens from 7 stations:

##### Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 22 males, 18 females (12683).

Acapulco, November 25-29, 1937, intertidal, 1 male, 1 female (12684).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 1 male, 1 female (12685).

##### Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 16 males, 11 females, 5 young (11830).

Port Culebra, January 24-31, 1938, intertidal in coral, 14 males, 16 females (12686).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male, 3 females (12687).

Uvita Bay, March 2-4, 1938, intertidal in coral, 1 male, 1 female (12688).

*Measurements.*—Males 2.6-7.0 mm., nonovigerous females 3.0-5.5 mm., ovigerous females 2.8-7.9 mm.

*Breeding.*—Ovigerous females from Sihuatenejo Bay.

ejo Bay and Acapulco in November, from Port Guatulco in December, from Port Parker and Port Culebra in January, from Gulf of Nicoya in February, and from Uvita Bay in March.

*Remarks.*—The specimens from Port Parker were recorded earlier by Haig (1960, p. 315). The species was collected in the Gulf of California during the 1936 Templeton Crocker Expedition.

***Pachycheles vicarius* Nobili**

*Pachycheles vicarius* Nobili, 1901, p. 19. Haig, 1960, pp. 134, 147, pl. 32 fig. 2.

*Range.*—From Acajutla, El Salvador, to Santa Elena Bay, Ecuador. Shore to 4 fathoms.

*Material Examined.*—43 specimens from 5 stations:

Costa Rica

Port Parker, January 12-23, 1938, intertidal (in coral?), 7 males, 10 females, 1 young (11832); 1 male, 1 female (AHF).

Port Culebra, January 24-31, 1938, intertidal in coral, 3 males, 3 females (12689).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male, 1 female (12690).

Uvita Bay, March 2-4, 1938, intertidal in coral, 9 males, 5 females (12691).

Panama

Bahia Honda, March 13-19, 1938, intertidal, from *Pocillopora* coral, 1 male (12692).

*Measurements.*—Males 2.8-6.4 mm., nonovigerous females 3.2-5.2 mm., ovigerous females 3.8-6.2 mm.

*Breeding.*—Ovigerous females from Port Parker and Port Culebra in January, from Gulf of Nicoya in February, and from Uvita Bay in March.

*Remarks.*—The Port Parker specimens were recorded and one of them illustrated by Haig (1960, p. 317, pl. 32 fig. 2).

***Pachycheles spinidactylus* Haig**

*Pachycheles spinidactylus* Haig, 1957a, p. 31, pl. 7 figs. 1-4; 1960, pp. 134, 153, pl. 33 fig. 2.

*Range.*—From Santa Maria Bay, outer Baja California, and Cape San Lucas, Gulf of California, to Port Utria, Colombia. Isabel Island. Shore to 4 fathoms.

*Material Examined.*—16 specimens from 3 stations:

Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 6 males, 7 females (12693).

Costa Rica

Port Culebra, January 24-31, 1938, intertidal in coral, 1 female (12694).

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 male, 1 female (12695).

*Measurements.*—Males 4.9-7.9 mm., ovigerous females 3.5-8.4 mm.

*Breeding.*—Ovigerous females from Sihuatenejo Bay in November, from Port Culebra in January, and from Gulf of Nicoya in February.

***Pachycheles panamensis* Faxon**

*Pachycheles panamensis* Faxon, 1893, p. 175. Haig, 1960, pp. 134, 155, pl. 33 fig. 1; 1962, p. 182.

*Pachycheles sonorensis* Glassell, 1936, p. 291.

*Range.*—From Tiburon Island, Gulf of California, to Santa Elena Bay, Ecuador. Isabel Island. Shore to 4 fathoms.

*Material Examined.*—58 specimens from 4 stations:

Mexico

Tenacatita Bay, November 20, 1937, intertidal, 1 male, 1 female (12696).

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 25 males, 27 females, 2 young (12697).

Port Guatulco, Station 195, D-14, December 6, 1937, 4 fathoms, coral, 1 young female (12698).

Costa Rica

Uvita Bay, March 2-4, 1938, intertidal in coral, 1 female (12699).

*Measurements.*—Males 3.2-8.0 mm., nonovigerous female 9 mm., ovigerous females 3.6-9.1 mm.

*Breeding.*—Ovigerous females from Tenacatita and Sihuatenejo Bays in November and from Uvita Bay in March.

*Remarks.*—Material of this species was collected in the Gulf of California during the 1936 Templeton Crocker Expedition and reported by Glassell (1937) as *Pachycheles sonorensis*.

***Pachycheles trichotus* Haig**

*Pachycheles trichotus* Haig, 1960, pp. 134, 157, pl. 12, pl. 32 fig. 3.

*Range.*—Known only from Acajutla, El Salvador, and Isla Verde, Panama. Probably intertidal.

*Material Examined.*—Corinto, Nicaragua, December 28, 1937-January 7, 1938, intertidal, 1 male (12700).

*Measurements*.—Male 3.8 mm. long, 4.1 mm. wide.

*Remarks*.—The single specimen collected by the *Zaca* agrees very closely with the only specimens previously known, the male holotype from Isla Verde, Panama, and two ovigerous females from Acajutla, El Salvador. The Corinto male is smaller than the three types, which are nearly identical in size:

Male holotype: 4.7 mm. long, 5.4 mm. wide.

Ovigerous female paratype: 4.7 mm. long, 5.3 mm. wide.

Ovigerous female paratype: 4.8 mm. long, 5.3 mm. wide.

#### *Minyocerus kirki* Glassell

*Minyocerus kirki* Glassell, 1938, p. 430, pl. 31.

Haig, 1960, p. 193, pl. 37 fig. 1, text-fig. 8; 1962, p. 185.

*Range*.—From Punta Peñasco and San Felipe, Gulf of California, to Realejo, Nicaragua. Shore to 13 fathoms.

*Material Examined*.—72 specimens from 3 stations:

##### El Salvador

Cutuco, Gulf of Fonseca, December 21, 1937, 1 male, 3 females (AHF).

La Union, Gulf of Fonseca, Station 199, D-7 to D-16, December 27, 1937, 5-6 fathoms, 12 males, 12 females, 24 young (AHF).

##### Nicaragua

Monypenny Point, Gulf of Fonseca, Station 199, D-5 and D-6, December 24, 1937, 4-7 fathoms, 9 males, 11 females (AHF).

*Measurements*.—Males 2.9-3.8 mm., nonovigerous females 3.5-3.7 mm., ovigerous females 3.1-5.5 mm.

*Breeding*.—Ovigerous females from all three localities in the Gulf of Fonseca.

*Remarks*.—All the material listed above was reported by Haig (1960, p. 334) and is in the collections of the Allan Hancock Foundation.

Specimens of *Minyocerus kirki* have been reported living as commensals with sea stars, *Luidia columbia* (Gray) and *Luidia phragma* H. L. Clark. Of specimens collected by the *Zaca*, those from Cutuco were "around mouth of sea star" and those from La Union and Monypenny Point "on serpent stars and sea stars." As I have already noted (Haig, 1960, pp. 195 and 196), the sea star was probably *Luidia foliolata* Grube and the serpent star either *Amphipholis platydisca* Nielsen, *Ophiothrix spiculata* Lecomte, or *Ophiolepis grisea* H. L. Clark.

#### *Porcellana cancrisocialis* Glassell

*Porcellana cancrisocialis* Glassell, 1936, p. 292.

Haig, 1960, pp. 198, 200, pl. 38 fig. 2, text-fig. 9(2); 1962, p. 187.

*Range*.—From Santa Maria Bay and Point Tosco, outer Baja California, and Punta Peñasco, Gulf of California, to Santa Elena Bay, Ecuador. Isabel Island. Shore to 54 fathoms.

*Material Examined*.—14 specimens from 5 stations:

##### Mexico

Tenacatita Bay, Station 183, D-2, November 21, 1937, 30 fathoms, muddy sand, 1 male, 1 female (12701).

17 miles southeast by east of Acapulco, Station 189, D-1, November 29, 1937, 20 fathoms, sandy mud, algae, 2 males, 1 female, 1 young (12702).

Port Guatulco, Station 195, D-11, December 6, 1937, 5 fathoms, gray sand, crushed shell, 1 male (12703).

##### Costa Rica

Port Parker, Station 203, D-2, January 20, 1938, 10 fathoms, shelly sand, algae, 2 females (12704).

Port Culebra, Station 206, D-1, January 30, 1938, 14 fathoms, sandy mud, 2 males, 3 females (12705).

*Measurements*.—Males 3.7-6.9 mm., nonovigerous females 3.7 and 4.1 mm., ovigerous females 4.5-8.6 mm.

*Breeding*.—Ovigerous females from Acapulco in November and from Port Parker and Port Culebra in January.

*Remarks*.—Specimens of this species have frequently been found living in association with hermit crabs, but there is no evidence that this was the case as far as the *Zaca* material is concerned. The species was collected in the Gulf of California by the 1936 Templeton Crocker Expedition (Glassell, 1937).

#### *Porcellana paguriconviva* Glassell

*Porcellana paguriconviva* Glassell, 1936, p. 293.

Haig, 1960, pp. 198, 203, pl. 38 fig. 1, text-fig. 9(3); 1962, p. 185.

*Range*.—From Magdalena Bay, outer Baja California, and Punta Peñasco, Gulf of California, to Taboga and Taboguilla Islands, Panama. Shore to 50 fathoms.

*Material Examined*.—9 specimens from 4 stations:

##### Mexico

Port Guatulco, Station 195, D-2, December 4, 1937, 3 fathoms, sand, 1 male, 1 female (12706).

## Costa Rica

Port Parker, Station 203, D-2, January 20, 1938, 10 fathoms, shelly sand, algae, 1 female (12707); D-13, January 22, 1938, 7-9 fathoms, shells, algae, 1 male (12708).

Port Culebra, January 24-31, 1938, intertidal, 2 males, 1 female (12709).

## Panama

Bahia Honda, Station 222, D-2, March 18, 1938, 4-8 fathoms, rocks, dead coral, 1 male, 1 young female (12710).

*Measurements.*—Males 3.2-8.1 mm., nonovigerous female 3.0 mm., ovigerous females 7.3-8.2 mm.

*Breeding.*—Ovigerous females from Port Guatulco in December and from Port Parker and Port Culebra in January.

*Remarks.*—According to an accompanying note, the specimens from Port Culebra were found "on body of giant hermit inside shell." The "giant hermit" may have been *Petrochirus californiensis* Bouvier, a large species with which the types of *Porcellana paguriconviva* were associated. However, the identity of the hermit crab cannot be confirmed at this time because the pagurids from the 1937-1938 *Zaca* Expedition have not been located, according to Jocelyn Crane.

*Porcellana paguriconviva* was collected in the Gulf of California by the 1936 Templeton Crocker Expedition (Glassell, 1937).

***Pisidia magdalenensis*** (Glassell)

*Porcellana magdalenensis* Glassell, 1936, p. 295.  
*Pisidia magdalenensis*, Haig, 1960, p. 209, pl. 38 fig. 4, text-fig. 10; 1962, p. 187.

*Range.*—From Santa Maria Bay, outer Baja California, and Petatlan Bay, Mexico, to Santa Elena Bay, Ecuador. Shore to 25 fathoms.

*Material Examined.*—87 specimens from 8 stations:

## Mexico

Port Guatulco, Station 195, D-2, December 4, 1937, 3 fathoms, sand, 1 male, 2 females (12711); D-11, December 6, 1937, 5 fathoms, gray sand, crushed shell, 1 male (12712); D-16, December 7, 1937, 10 fathoms, sand, 1 male (AHF).

## Nicaragua

Corinto, Station 200, D-1, December 29, 1937, 6½ fathoms, mangrove leaves, 1 female (12713); D-6, December 29, 1937, 2½ fathoms, mangrove leaves, 4 males, 1 female (12714); D-14, January 5, 1938, 3 fathoms, mangrove leaves, 1 male, 1 female (AHF); D-

27 to D-30, January 7, 1938, 3 fathoms, 18 males, 23 females (12715).

## Costa Rica

Port Parker, Station 203, D-2, January 20, 1938, 10 fathoms, shelly sand, algae, 4 males, 1 female (12716); D-4, January 22, 1938, 7 fathoms, gravel, algae, 1 female (AHF); D-7, January 22, 1938, 9-5 fathoms, shells, algae, 2 males, 2 females (12717); D-13, January 22, 1938, 7-9 fathoms, shells, algae, 2 males, 3 females (12718).

Port Culebra, January 24-31, intertidal in coral, 2 males (12719).

Port Culebra, Station 206, D-1, January 30, 1938, 14 fathoms, sandy mud, 1 female (12720).

Cedro Island, Gulf of Nicoya, Station 213, D-7 and D-9, February 13, 1938, 4-6 fathoms, mud, sand, crushed shell, 4 males, 5 females (12721).

Golfito, Gulf of Dulce, Station 218, D-5, March 9, 1938, 6 fathoms, mangrove leaves, mud, shells, 1 male, 3 females (12722).

## Panama

Bahia Honda, Station 222, D-2, March 18, 1938, 4-8 fathoms, rocks, dead coral, 1 male, 1 female (12723).

*Measurements.*—Males 2.5-4.4 mm., nonovigerous females 2.2-3.0 mm., ovigerous females 2.2-4.0 mm.

*Breeding.*—Ovigerous females from Port Guatulco in December, from Corinto in late December and early January, from Port Parker and Port Culebra in January, from Gulf of Nicoya in February, and from Gulf of Dulce and Bahia Honda in March.

*Remarks.*—A portion of the material from Port Guatulco, Corinto, and Port Parker was reported earlier by Haig (1960, pp. 338, 339).

***Megalobrachium poeyi*** (Guérin)

*Porcellana poeyi* Guérin, 1855, pl. 2 fig. 4.  
*Megalobrachium poeyi*, Benedict, 1901, p. 136, pl. 3 fig. 8. Haig, 1960, pp. 213, 214, pl. 16 fig. 4, pl. 39 fig. 1; 1962, p. 188.

*Range.*—From Salinas Bay, Costa Rica, to San Francisco near Panama City, Panama. Shore to 25 fathoms. Also occurs in western Atlantic.

*Material Examined.*—3 specimens from 2 stations:

## Costa Rica

Cedro Island, Gulf of Nicoya, February 12-13 or 21-22, 1938, intertidal, 1 male (12724).

## Panama

Bahia Honda, March 13-19, 1938, low tide under stones, 1 male, 1 female (12725).

*Measurements*.—Males 3.5 and 3.7 mm., nonovigerous female 5.9 mm.

*Remarks*.—Although widely distributed in the Caribbean area, this species appears to be confined to Costa Rica and Panama on the Pacific coast, where only 13 specimens are reported, including the three cited above.

**Megalobrachium garthi** Haig

*Megalobrachium garthi* Haig, 1957a, p. 39, pl. 10 figs. 1-5; 1960, pp. 213, 220, pl. 16 fig. 7, pl. 39 fig. 4.

*Range*.—From Turner Island, Gulf of California, to Port Utria, Colombia. Tres Marias Islands. Shore to 4 fathoms.

*Material Examined*.—8 specimens from 4 stations:

## Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 3 males, 1 female (12726).

Port Guatulco, Station 195, D-15, December 6, 1937, diving in 1½ fathoms, coral, 2 males (12727).

## Costa Rica

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 1 female (12728).

Uvita Bay, March 2-4, 1938, intertidal in coral, 1 female (12729).

*Measurements*.—Males 3.9-6.0 mm., nonovigerous female 2.8 mm., ovigerous females 5.0 and 5.1 mm.

*Breeding*.—Ovigerous females from Sihuatenejo Bay in November and from Gulf of Nicoya in February.

*Remarks*.—The specimens from Costa Rica are the first to be reported from the wide geographical area between Tangola-Tangola Bay, Mexico, and Secas Islands, Panama.

**Megalobrachium festai** (Nobili)

*Porcellanides festae* Nobili, 1901, p. 21.

*Megalobrachium festai*, Haig, 1960, pp. 213, 226, pl. 16 fig. 10, pl. 40 fig. 3.

*Range*.—From Acapulco, Mexico, to Santa Elena Bay, Ecuador. Shore to 4 fathoms.

*Material Examined*.—Sihuatenejo Bay, Mexico, November 24, 1937, intertidal in coral, 4 males, 4 females (12730).

*Measurements*.—Males 2.0-3.8 mm., nonovigerous females 3.5-4.3 mm., ovigerous female 2.2 mm.

*Remarks*.—Until now only 49 specimens of

*Megalobrachium festai* have been recorded, 41 of which were taken from sponges dredged off Acapulco by the *Velero IV*. Material was collected at three localities in Mexico and one each in El Salvador and Ecuador.

The known range of the species is now extended northwestward from Acapulco to Sihuatenejo Bay.

**Megalobrachium tuberculipes** (Lockington)

*Pachycheles tuberculipes* Lockington, 1878, pp. 396, 404.

*Megalobrachium tuberculipes*, Haig, 1960, pp. 213, 227, pl. 16 fig. 11, pl. 40 fig. 4.

*Range*.—From Punta Peñasco and San Felipe, Gulf of California, to Santa Elena Bay, Ecuador. Shore to 10 fathoms.

*Material Examined*.—4 specimens from 2 stations:

## Mexico

Sihuatenejo Bay, November 24, 1937, intertidal in coral, 1 male (12731).

## Costa Rica

Jasper Island, Gulf of Nicoya, February 22-25, 1938, intertidal in coral, 3 males (12732).

*Measurements*.—Males 2.6-3.0 mm.

*Remarks*.—This species seems to be best adapted for concealment in sponges. The specimens collected at Gulf of Nicoya by the *Zaca* Expedition are the first to be recorded between Acapulco, Mexico, and Pearl Islands, Panama.

**Polyonyx confinis** Haig

*Polyonyx confinis* Haig, 1960, pp. 233, 234, pl. 17, text-fig. 12(3).

*Range*.—Known only from Corinto, Nicaragua.

*Material Examined*.—Corinto, Nicaragua, Station 200, D-14, January 5, 1938, 3 fathoms, mangrove leaves, male holotype (AHF 3817), 1 female paratype (AHF).

*Measurements*.—Male holotype 2.7 mm. long and 3.6 mm. wide, ovigerous female paratype 2.4 mm. long and 3.6 mm. wide.

*Remarks*.—This species, which is known only from the two types collected by the *Zaca*, was described by Haig (1960). Both types are housed in the Allan Hancock Foundation.

## ACKNOWLEDGMENTS

I wish to express my thanks to Jocelyn Crane, Department of Tropical Research, New York Zoological Society, for making the porcellanids from this expedition available for study; and to Dr. Dorothy E. Bliss and Dr. Arnold Ross, Department of Living Invertebrates, The Amer-



ican Museum of Natural History, who arranged for the shipping of the collection to the Allan Hancock Foundation and provided catalog numbers and other information.

## LITERATURE CITED

- BENEDICT, J. E.  
1901. The anomuran collections made by the *Fish Hawk* expedition to Porto Rico. Bull. U. S. Fish Comm., Pt. 2, 20:131-148, pls. 3-6.
- BOONE, LEE  
1932. The littoral crustacean fauna of the Galapagos Islands. Part II. Anomura. Zoologica 14:1-62, text-figs. 1-19.
- CHACE, F. A., JR.  
1962. The non-brachyuran decapod crustaceans of Clipperton Island. Proc. U. S. Natl. Mus. 113:605-635, text-figs. 1-7.
- CRANE, JOCELYN  
1947. Eastern Pacific expeditions of the New York Zoological Society. XXXVIII. Intertidal brachygnathous crabs from the west coast of tropical America with special reference to ecology. Zoologica 32:69-95, text-figs. 1-3.
- FAXON, W.  
1893. Reports on the dredging operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California . . . by the U.S. Fish Commission steamer *Albatross*, during 1891 . . . VI. Preliminary descriptions of new species of Crustacea. Bull. Mus. Compar. Zool. Harvard 24:149-220.
- GARTH, J. S.  
1959. Eastern Pacific expeditions of the New York Zoological Society. XLIV. Non-intertidal brachygnathous crabs from the west coast of tropical America. Part 1: Brachygnatha Oxyrhyncha. Zoologica 44:105-126, pl. 1, text-figs. 1-2.  
1961. Eastern Pacific expeditions of the New York Zoological Society. XLV. Non-intertidal brachygnathous crabs from the west coast of tropical America. Part 2: Brachygnatha Brachyrhyncha. Zoologica 46:133-159, pl. 1, text-figs. 1-2.  
1966. Eastern Pacific expeditions of the New York Zoological Society. XLVI. Oxystomatous and allied crabs from the west coast of tropical America. Zoologica 51:1-16, text-figs. 1-2.
- GIBBES, L. R.  
1850. On the carcinological collections of the United States, and an enumeration of species contained in them, with notes on the most remarkable, and descriptions of new species. Proc. Amer. Assoc. Adv. Sci. 3:167-201.
- GLASSELL, S. A.  
1936. New porcellanids and pinnotherids from tropical North American waters. Trans. San Diego Soc. Nat. Hist. 8:277-304, pl. 21.  
1937. The Templeton Crocker Expedition. IV. Porcellanid crabs from the Gulf of California. Zoologica 22:79-88, pl. 1.  
1938. New and obscure decapod Crustacea from the west American coasts. Trans. San Diego Soc. Nat. Hist. 8:411-454, pls. 27-36.  
1945. Four new species of North American crabs of the genus *Petrolisthes*. Jour. Wash. Acad. Sci. 35:223-229, text-figs. 1-4.
- GUÉRIN-MÉNEVILLE, F. E.  
1855. *In* R. de la Sagra, Historia física, política y natural de la isla de Cuba. Vol. 8, Atlas de Zoología. Crustáceos, Aragnides e Insectos. Paris. Pls. 1-20.
- HAIG, JANET  
1956. The Galatheidea (Crustacea Anomura) of the Allan Hancock Atlantic Expedition with a review of the Porcellanidae of the western north Atlantic. Allan Hancock Atl. Exped. Rpt. 8:1-44, pl. 1.  
1957a. Four new porcellanid crabs from the eastern Pacific. Bull. South. Calif. Acad. Sci. 56:31-41, pls. 7-10.  
1957b. The porcellanid crabs of the *Askoy* expedition to the Panama Bight. Amer. Mus. Novitates (1865):1-17.  
1960. The Porcellanidae (Crustacea Anomura) of the eastern Pacific. Allan Hancock Pac. Exped. 24:1-440, pls. 1-41, text-figs. 1-12.  
1962. Papers from Dr. Th. Mortensen's Pacific expedition 1914-1916. LXXIX. Porcellanid crabs from eastern and western America. Vidensk. Medd. fra Dansk Naturh. Foren., 124:171-192, text-figs. 1-5.
- LOCKINGTON, W. N.  
1878. Remarks upon the Porcellanidea of the west coast of North America. Ann. and Mag. Nat. Hist. Ser. 5, 2:394-406.
- MILNE EDWARDS, A.  
1869. *In* A. G. L. de Folin and L. Périer, Les fonds de la mer. Étude internationale sur les particularités nouvelles des régions sous-marines 1:128-130, pl. 26. Paris.
- NOBILI, G.  
1901. Viaggio del Dr. Enrico Festa nella repubblica dell'Equador e regioni vicine. Decapodi e stomatopodi. Bol. Mus. Zool. Anat. Comp. Univ. Torino 16 (415):1-58.

## SAUSSURE, H. DE

1853. Description de quelques crustacés nouveaux de la côte occidentale du Mexique. *Rev. et Mag. de Zool.* Ser. 2, 5:354-368, pls. 12-13.

## STIMPSON, W.

1858. *Prodromus descriptionis animalium vertebratorum . . . Pars VII. Crustacea*

*Anomura.* *Proc. Acad. Nat. Sci. Phila.* 10:225-252.

1859. Notes on North American Crustacea, no. 1. *Ann. Lyceum Nat. Hist. New York* 7:49-93, pl. 1.

## STREETS, T. H.

1871. Descriptions of five new species of Crustacea from Mexico. *Proc. Acad. Nat. Sci. Phila.* 23:225-227, pl. 2.