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ALLAN HANCOCK MONOGRAPHS
IN MARINE BIOLOGY

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BRACHYURA OF THE
PACIFIC COAST OF AMERICA
BRACHYRHYNCHA: PORTUNIDAE

BY

JOHN S. GARTH

AND

W. STEPHENSON



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BRACHYURA OF THE
PACIFIC COAST OF AMERICA
BRACHYRHYNCA: PORTUNIDAE

by

John S. Garth and W. Stephenson

GENERAL DISCUSSION

Introduction

The portunid crabs are a tropical to sub-temperate group, occurring on the Pacific coast of the Americas from Santa Barbara, California, to Valparaiso, Chile, or from Latitude 33° N to Latitude 33° S. As such their range is coextensive with the area explored by the Hancock Pacific Expeditions conducted by Captain Allan Hancock aboard the *Velero III* and *Velero IV*. It is not surprising, therefore, that these expeditions, operating over a period of three decades, should have amassed by far the most extensive collections of portunids from the western coasts of the Americas. When to these are added the collections of the *Askoy* and the *Zaca*, previously reported (Garth, 1948, 1961), and those of the Scripps Institution of Oceanography and certain unworked collections of the Smithsonian Institution (U. S. National Museum) examined by the visiting author and Miss May Rees in Brisbane, the material available in some species becomes redundant to the point of actually impeding the systematic work by its sheer bulk.

The resident author has long been aware of certain problems presented by the portunids of the eastern Pacific. One of these, the identity of *Portunus acuminatus* (Stimpson) and its relationship to the so-called "*acuminatus-asper-panamensis* group" (Rathbun, 1930, p. 53), was largely resolved by the rediscovery of Stimpson's lost species and the establishment of a neotype (Garth, 1940). The resolution of the *Portunus minimus-pichilinquai* complex in the Gulf of California and its relationship to *P. xantusii* on the north and to *P. affinis* on the south defied conventional taxonomic procedures, although several attempts were

made over the years. It was therefore with considerable relief that these problems were turned over to the visiting author, who solved them through the application of statistical methods not hitherto applied to the group (Stephenson, in MS). While the details of these procedures will appear elsewhere, the results, which extend to the subgeneric level, will be apparent in the revised synonymies below. In addition, the visiting author's familiarity with the Indo-Pacific Portunidae has made it possible to discuss the distinctness of some of the American genera.

Source of Materials

As with earlier reports in this series (Garth, 1958), the collections of the *Velero III* and *Velero IV* have been the principal source of material. These have been richly supplemented with specimens collected by over 75 individuals whose names appear in the Tables of Material Examined. Special mention should be made of collections received from the University of California at Los Angeles, largely the work of B. W. Walker and his students; of collections received from the Scripps Institution of Oceanography, principally from C. L. Hubbs and R. H. Parker; of collections from the California Department of Fish and Game, sent to us by John Fitch; and of collections received from the U. S. National Museum, in part the work of W. L. Schmitt, who accompanied Hancock Expeditions in 1933-34-35 and in 1939.

Acknowledgment

The authors wish to thank the late Captain Allan Hancock, expedition leader and first director of the Allan Hancock Foundation, for the privilege of working on this magnificent collection, and Dr. Leslie A. Chambers, the present director, for providing space and facilities for the study and for defraying the expense of illustrations by Isolda Wisshaupt and Timothy Wyatt. Thanks are due to Dr. Fenner A. Chace, Jr., senior scientist, U. S. National Museum, for the loan of comparative material and for permission to incorporate certain unworked Smithsonian collections originally assigned to Professor Stephenson and Miss May Rees of Brisbane for study and report. We are also indebted to Dr. A. Fleminger of the Scripps Institution of Oceanography for the loan of other material. Participation of the visiting author was made possible by a Senior Foreign Scientist Fellowship Award provided by the National Science Foundation, which also, through a grant to the resident author, met the cost of illustrations by Dr. Ernest R. Tinkham and of bibliographic work by Miss Janet Haig.

SYSTEMATIC DISCUSSION

Method of Treatment

In the account that follows, only species from the shores of the American continent and adjacent islands are considered, with details of past records restricted to these areas. Certain species known from remote islands in the eastern Pacific but having affinities wholly with the western Pacific have been excluded. These include *Nectocarcinus bullatus* Balss, 1924, known only from the type locality, Juan Fernandez Island, and *Thalamita picta* Stimpson, 1858, the Clipperton Island population of which was described as *T. roosevelti* Schmitt, 1939. Also excluded as of doubtful occurrence within the territory considered is *Carcinus maenas* (Linnaeus, 1758), erroneously attributed to Panama by Cano (1889). Included for key and diagnostic purposes, but without detailed records or descriptions, are two Galapagos Islands endemic species indubitably belonging to the American milieu. These are *Portunus angustus* Rathbun, 1898, and *P. stanfordi* Rathbun, 1902, comprehensively treated elsewhere (Garth, 1946). The same single citation is given to cover all Galapagos Islands records of mainland portunid species except *Callinectes arcuatus* Ordway, 1863, the insular occurrence of which was not then known. Free use has been made of specimens of Atlantic species of the genera *Arenaeus*, *Callinectes*, *Cronius*, and *Portunus* for comparative purposes, but an effort has been made to have the diagnosis and description of the Pacific species of these amphi-American genera stand on their own. Generic synonymies are restricted to applications to American species and to first usages in every case. Names applied subgenerically in America, but generically elsewhere, are included.

Historical Review

The classification here employed may be traced to the tribes of H. Milne Edwards (1834), whose Portuniens became the Portunidae of later authors. Because Dana (1852) used the term Portunidae in a restricted sense, assigning to the Platyonichidae genera now recognized as belonging to the portunid subfamilies Carcininae (*i. e.*, *Carcinus* Leach and *Portumnus* Leach) and Macropipinae (*i. e.*, *Platyonichus* Latreille, 1825 = *Ovalipes* Rathbun, and *Polybius* Leach), the present use of the family name may be said to date from Miers (1886), whose subfamilial arrangement was an artificial one that left much to be desired. A more natural grouping of genera was proposed by Alcock (1899),

who recognized four subfamilies: the Carcininae, the Portuninae, the Capryrinae, and the Lupinae. These were subsequently increased to six by Borradaile (1907), who withdrew the Podophthalminae from Alcock's Lupinae and the Catoptrinae in part (*i. e.*, *Caruþa*) from Alcock's Lupinae, which became Borradaile's Thalamitinae, and in part (*i. e.*, *Catoptrus* and *Libistes*) from Alcock's Gonoplacidae (= Goneplacidae). These are the six subfamilies agreed upon by most later authors (Rathbun, 1930; Sakai, 1939; Edmondson, 1954; Stephenson and Campbell, 1960).

The nomenclature of the family has been stabilized by recent decisions of the International Commission on Zoological Nomenclature, the most important of which, in 1956, suppressed *Portunus* Fabricius, 1798, in favor of *Portunus* Weber, 1795. The Portuninae of Alcock therefore became the Macropipinae of Stephenson and Campbell (1960), *Macropipus* Prestandrea, 1833, being the earlier of the two subsequent synonyms of the suppressed *Portunus* Fabricius, *Liocarcinus* Stimpson and Pourtalés, 1870, being the later. As part of the same decision, *Lupa* Leach, 1814, was rejected in favor of *Portunus* Weber, and the correct name for Alcock's Lupinae (= Borradaile's Thalamitinae allowing for withdrawals mentioned) became Portuninae, a development that could not have been foreseen by Alcock. Using the new nomenclature, the west American genera of Portunidae fall into three subfamilies, the Macropipinae, the Portuninae, and the Podophthalminae. One other subfamily, the Carcininae, is represented by *Nectocarcinus* at Juan Fernandez Island (Balss, 1924).

Analogous Atlantic Species

As evidence of the comparatively recent confluence of the western Atlantic and eastern Pacific oceans over the present Isthmus of Panama, there remain in many marine groups species that have as their most nearly related species not another Pacific or Atlantic species, as the case may be, but a species in the opposite ocean, from which they are separated by a land barrier. These are the so-called twin or geminate species, and it would be exceptional were not the Portunidae found to have several such analogous pairs. Most clearly analogous are the Pacific *Callinectes arcuatus* and the Atlantic *C. danae*, and again the Pacific *Arenaeus mexicanus* and the Atlantic *A. cribrarius*, while *Cronius ruber* occurs in both

oceans in undifferentiated form. Within the genus *Portunus*, however, and for reasons not presently apparent, there exists no direct and obvious relationship between a Pacific and an Atlantic species or *vice versa*; in each case the relationship is to a number of forms in the other ocean rather than to a single form. (It may well be that when one or more Atlantic species clusters have been subjected to the penetrating analysis to which the aforementioned "*acuminatus-asper-panamensis*" and "*xantusii-minimus-affinis*" groups have yielded so gratifyingly, these Atlantic-Pacific relationships will sort themselves out.) Meanwhile, the authors feel that the analogous relationship is a revealing one when it can be demonstrated, and when it cannot, have utilized this heading for a general statement on affinities.

Text-Fig. 1a. Explanation of carapace dimensions measured.

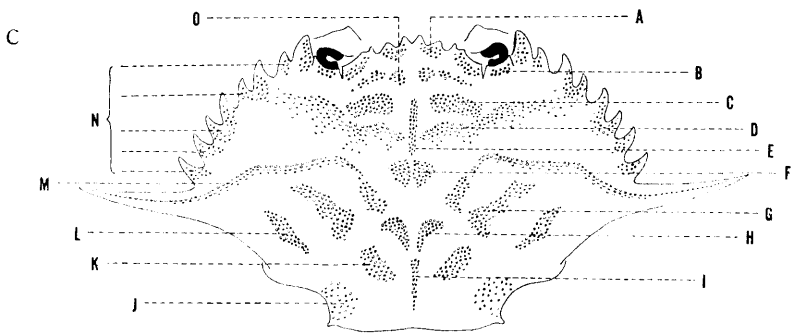
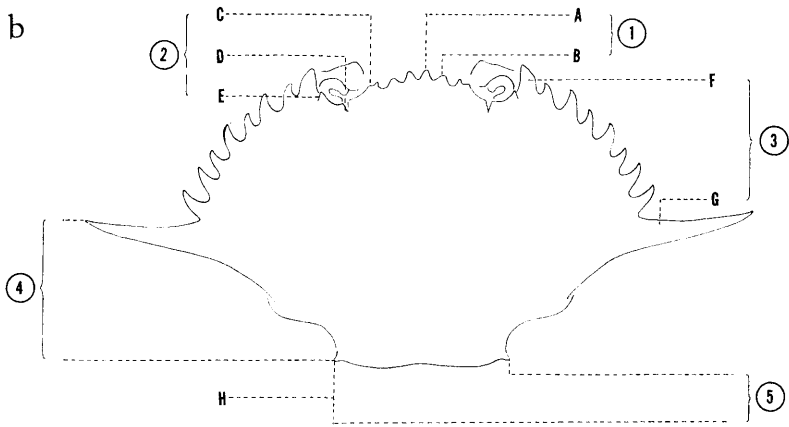
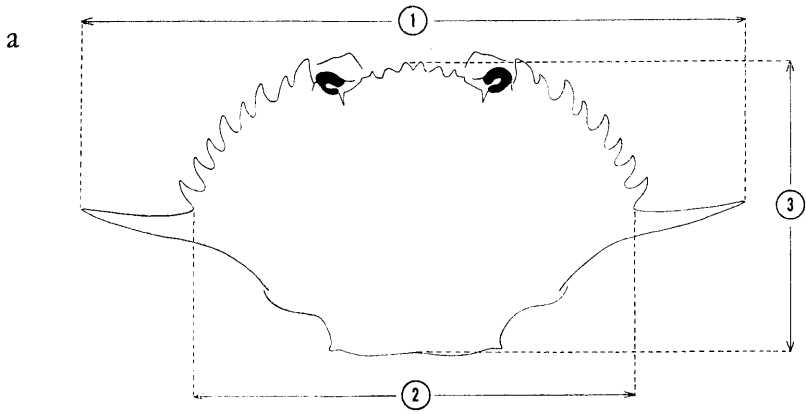
1. Total breadth
2. Breadth less last anterolateral tooth
3. Length

Text-Fig. 1b. Terminology of structures bordering carapace.

1. Front
 - A. Median frontal tooth
 - B. Lateral frontal tooth
2. Orbit
 - C. Inner supraorbital angle
 - D. Inner supraorbital fissure
 - E. Outer supraorbital fissure
3. Anterolateral border
 - F. First anterolateral (exorbital) tooth
 - G. Ninth (last) anterolateral tooth
4. Posterolateral border
 - H. Postlateral angle (here spinous)
5. Posterior border

Text-Fig. 1c. Terminology of raised granular structures of carapace (patches or ridges)

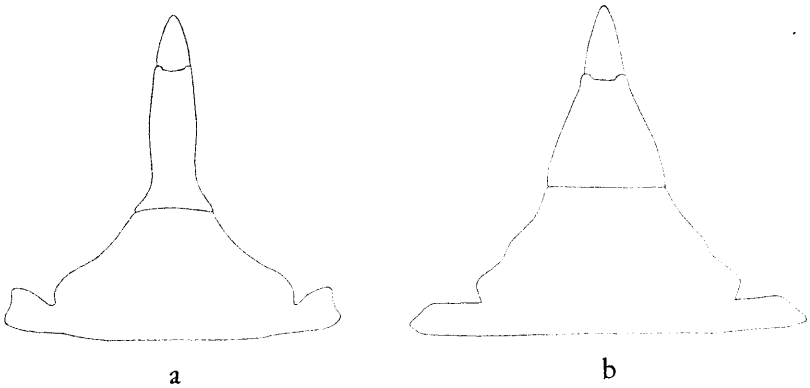
- | | |
|---------------------------|----------------------------|
| A. Frontal | H. Cardiac |
| B. Orbital | I. Median postcardiac |
| C. Protogastric | J. Posterolateral |
| D. Mesogastric | K. Lateral postcardiac |
| E. Central gastric | L. Posterior mesobranchial |
| F. Metagastric | M. Epibranchial |
| G. Anterior mesobranchial | N. Anterolateral |
| O. Post frontal | |



Explanation of Terms

General terminology is standard, but explanations regarding carapace structures appear warranted. These are given in Text Figure 1a-c, modified from *Portunus iridescens*.

Carapace dimensions of all but the largest specimens were measured with dial calipers to the nearest 0.1 mm. Very large specimens were measured in sections with results to the nearest 0.5 mm. Dimensions are expressed as in this example: "13.9 x 35.6(24.1) mm", the numbers indicating length x total breadth (breadth less last anterolateral teeth).



Text-Fig. 2a. "L"-shaped male abdomen (*Callinectes arcuatus*)

Text-Fig. 2b. "Normal" male abdomen (*Portunus xantusii*)

Some abbreviated descriptions are used. Thus the front of *Euphylax* is described as "T"-shaped, while the male abdomen in *Callinectes*, following Rathbun, is described as "L"-shaped. An example, contrasted with a *Portunus* male abdomen, is given in Text Figure 2.

The intramedial area is defined as "that part of the gastric region behind the posterior of the gastric carinae." (Rathbun, 1930, p. 98, footnote)

The use of comparative terms will be apparent by reference to the plates.

Color Notes

Color notes from living specimens are of two kinds: those made by Anker Petersen, former staff artist with the Allan Hancock Foundation, often from a single specimen usually but not always typical of the group, and those made by Jocelyn Crane or W. Stephenson from a series of specimens, and hence more representative of the sampled population. The former are based on Ridgway, "Color Standards and Color Nomenclature" (1912), and are sufficiently explicit to permit amplification of a field sketch into a finished color painting; the latter are intended only to supplement a verbal description prepared from the preserved specimen. Each serves a particular purpose and the reader will determine which is best suited to his needs.

Abbreviations

The names of institutions serving as repositories for type material consulted in the preparation of this study are abbreviated as follows:

- AHF Allan Hancock Foundation, University of Southern California
BMNH British Museum (Natural History)
MCZ Museum of Comparative Zoology, Harvard University
USNM United States National Museum

A more complete listing of institutions will be found in connection with the Tables of Material Examined.

Family *PORTUNIDAE* Miers

Portuniens H. Milne Edwards, 1834, p. 432. A. Milne Edwards, 1860, p. 195; 1861, p. 310.

Portunidae and *Platyonichidae* Dana, 1852, pp. 267, 290.

Portunidae Miers, 1886, p. 169. Alcock, 1899, p. 5. Borradaile, 1907, p. 481. Stephenson and Campbell, 1960, p. 73.

Carapace usually wider than long, depressed or slightly convex, rarely areolated. Front usually broad and cut into teeth. Orbits complete, rostrum lacking, antennules folding obliquely or transversely. Carpus of third maxilliped articulating at or near anteroexternal angle of merus, usually a small lobe on inner angle of endopodite of first maxilliped. Fifth legs usually flattened, especially last two segments. Male openings coxal.

KEYS TO ADULT PORTUNIDS OF WESTERN AMERICA

A. KEY TO SUBFAMILIES AND GENERA

- 1 Eyestalks extremely long, one third or more of carapace breadth (Subfamily Podophthalminae).....*Euphylax* (2 spp.)
- Eyestalks of normal length, much less than one third of carapace breadth..... 2
- 2(1) Carapace narrow; five anterolateral teeth (Subfamily Macropipinae).....*Ovalipes* (1 sp., *O. punctatus*)*
- Carapace broad; nine anterolateral teeth (Subfamily Portuninae)..... 3
- 3(2) Antennal flagellum excluded from orbit by prolongation of basal article; anterolateral teeth alternately large and small*Gronius* (1 sp., *G. ruber*)
- Antennal flagellum not excluded from orbit; anterolateral teeth rarely alternately large and small 4
- 4(3) Palate without longitudinal ridge; supraorbital fissures broadly open and V-shaped*Arenaeus* (1 sp., *A. mexicanus*)
- Palate without longitudinal ridge; supraorbital fissures not broadly open 5
- 5(4) Male abdomen triangular; anteroexternal angle of merus of third maxillipeds not strongly produced laterally.....*Portunus* (9 spp.)
- Male abdomen \perp -shaped (See Text-Fig. 2a); anteroexternal angle of merus of third maxillipeds strongly produced laterally*Callinectes* (3 spp.)

B. KEY TO SPECIES OF *EUPHYLAX*

- 1 Anterolateral borders of carapace with five small teeth or spines; carapace smooth.....*E. dovii*
- Anterolateral borders of carapace with four teeth or spines, three large and one small; carapace with granular lines and elevations*E. robustus*

*The specific name is used without prejudice to studies in progress (Stephenson)

C. KEY TO SPECIES OF *PORTUNUS*

- 1 Posterodistal border of merus of swimming legs without spines or spinules; (postlateral corner of carapace with a spine).....
*P. tuberculatus*
- Posterodistal border of merus of swimming legs with one spine but no spinules 2
- Posterodistal border of merus of swimming legs with spinules but no spine 3
- Posterodistal border of merus of swimming legs with spinules and one spine 5
- Posterodistal border of merus of swimming legs with spinules and two spines*P. brevimanus*
- 2(1) Front with spiniform teeth; ninth anterolateral tooth much longer than seventh*P. stanfordi*
- Front with rounded lobes; ninth anterolateral tooth only slightly longer than seventh*P. angustus*
- 3(1) Spine on inner side of wrist of cheliped of normal length.....
*P. xantusii*
- Spine on inner side of wrist of cheliped very long 4
- 4(3) Postlateral corner of carapace with upturned spine or spiniform tubercle*P. iridescens*
- Postlateral corner of carapace rounded and without a spiniform tubercle*P. guaymasensis*
- 5(1) Cheliped extremely long and thin*P. acuminatus*
- Cheliped not extremely long and thin*P. asper*

D. KEY TO SPECIES OF *CALLINECTES*

- 1 Intramedial area longer than its posterior width; carapace coarsely granular*C. toxotes*
- Intramedial area shorter than its posterior width; carapace not coarsely granular 2
- 2(1) Median frontal teeth rudimentary, less than one-fifth length of laterals; male first pleopods short, reaching only to distal quarter of penultimate segment of abdomen*C. bellicosus*
- Median frontal teeth well developed, about one-half length of laterals; male first pleopods very long, nearly reaching end of penultimate segment of abdomen*C. arcuatus*

Subfamily MACROPIPINAE Stephenson and Campbell

Macropipinae Stephenson and Campbell, 1960, pp. 76, 88.

Carapace not very broad; five anterolateral teeth. Second antenna arising from orbital hiatus, and lying almost in the longitudinal axis of the carapace; flagellum standing inside the orbit. Legs stout and long, last pair typical paddles.

Contains only one west American genus.

Genus OVALIPES Rathbun

Platyonichus Latreille, 1825, p. 151 (type species: *P. ocellatus* (Herbst)).

Not *Platyonichus* Latreille, 1818 (= *Portumnus* Leach, 1814).

Anisopus de Haan, 1833, pp. 3, 12 (type species: *Corystes (Anisopus) punctata* de Haan). Not *Anisopus* Meigen, 1803 (Diptera).

Platyonichus Voigt, 1836, p. 104. Dana, 1851, p. 130. Miers, 1886, p. 201.

Ovalipes Rathbun, 1898, p. 597; 1930, pp. 18, 19 (type species: *O. ocellatus* (Herbst)).

Aeneacancer Ward, 1933, p. 381 (type species: *A. molleri* Ward, 1933).

Diagnosis: Carapace a little broader than long; five subequal teeth on anterolateral margin; three or four teeth on margin of front between orbits. Basal article of antennules advanced and visible dorsally between frontal teeth. Chelipeds elongate. Terminal article of last pair of legs broadly oval, rounded at extremity. Abdomen of male oblong. (Rathbun, 1930)

***Ovalipes punctatus* (de Haan)**

Plate I, Figs. A-D; Plate XII, Fig. A.

Restricted synonymy:

Corystes (Anisopus) punctata de Haan, 1833, p. 13, pl. 2, figs. 1-1d (type locality, Japan); 1835, p. 44.

Corystes (Anisopus) trimaculata de Haan, 1833, p. 13 (type locality, Cape of Good Hope; male lectotype, in Leiden Museum, Crust. D. 19484).

Platyonichus bipustulatus Milne Edwards, 1834, p. 437; Atlas, 1837, pl. 17, figs. 7-10 (type locality, Indian Ocean).

Platyonichus purpureus Dana, 1852, p. 291; Atlas, 1855, pl. 18, figs. 3a, 3b (type locality, Valparaiso).

Ovalipes punctatus Rathbun, 1930, p. 24, pls. 5-8. Garth, 1957, p. 35, synonymy.

Type locality: Japan, P. F. von Siebold, collector.

Type: Male lectotype, in Leiden Museum (Crust. D. 365). Length 38, width 49 mm.

Atlantic analogue: The species occurs in the South Atlantic from Cabo Santa Maria, Uruguay, to Puerto Madryn, Argentina; also in South Africa, Japan, China, Australia, and New Zealand.

Previous records: For western American occurrence, see Garth (1957).

Diagnosis: Four frontal teeth; lateral teeth broad. Abdominal somites free. Carapace with three large color spots; dots not arranged in clusters. A strong tooth on upper margin of orbit. Outer surface of palm very rough. (Rathbun, 1930)

Description: Carapace finely granular all over, granulations slightly coarser anteriorly. Front with median teeth close together, broadly separated from lateral teeth. Anterolateral teeth: first sharp with narrow base. Chelipeds with upper surface, carinae of upper surface, and upper carina of outer surface of hand finely granular; striae on under surface of hands fine, 26-31 in number. First walking leg of male with upper and lower carinae of tricarinate portion of dactyl of equal size and broadly separated. Male abdomen with ultimate segment broad, tip rounded. Male first pleopod gradually tapering to tip.

Material examined: Antofagasta, Chile, 18 m, July 24, 1914, 2 females (K 5244); Caleta Coloso, near Antofagasta, Chile, 1904, 1 male (K 2702); Papudo, Chile, date unknown, 2 males (K 2612); all Hamburg Museum specimens collected by R. Paessler. Lota, Chile, January 16, 1927, 1 male (USNM 61022), collected by W. L. Schmitt. All specimens examined by the senior author only.

Measurements: Large male from Caleta Coloso: length 73, width 98 mm, spines included. Smaller males 14.9 and 20.3 mm, females 27.3 and 28.1 mm, length only. Large male from Lota: length 76.4, width including spines 98.5, without spines 91.7 mm.

Color: In life: 3 red patches (S. Africa, *fide* Barnard, 1950). 3 blue patches (Japan, *fide* Stimpson, 1907). In alcohol: 3 conspicuous red patches.

Remarks: This species, which occurs on the west coast of South America from Independencia Bay, Peru, to Trinidad Channel, Chile, is found in the cooler waters of both hemispheres in the western Pacific, but only in the southern hemisphere in the eastern Pacific and Atlantic oceans. Studies now in progress (Stephenson and Rees) suggest that several closely related species may have been incorrectly synonymized by

Rathbun (1930), whose synonymy has been followed by later workers, including Garth (1957). It seems probable that the Chilean material should be referred to *Ovalipes trimaculatus* (de Haan), but this requires further confirmation.

Subfamily PORTUNINAE Stephenson and Campbell

Thalamitinae Borradaile, 1907, p. 483. Rathbun, 1930, p. 33.

Portuninae Stephenson and Campbell, 1960, p. 106. Not Alcock, 1899, pp. 7, 15 (= *Macropipinae* Stephenson and Campbell).

Carapace typically broad to very broad, 4-9 (in the American species usually 9) anterolateral teeth. Basal article of antenna usually broad, anteroexternal angle sometimes lobulated, flagellum sometimes included in orbit. Legs shorter than chelipeds, last pair typical paddles.

The western American species of this subfamily, all of which possess nine anterolateral teeth, have been placed by all recent authors in four genera: *Arenaesus*, *Callinectes*, *Cronius*, and *Portunus*. Within the genus *Portunus* recent American workers have followed Rathbun (1930) in recognizing two subgenera: *Portunus* and *Achelous*. The present study shows that there are eight closely related species of the genus in western America and one species more distantly related, and further, that within the eight closely related species there are *Portunus* forms and *Achelous* forms and intermediates. The subgenera are not natural groupings, and on this account Stephenson (in MS) has indicated that subgeneric names should not be used. The details of the relationship of the nine species to each other, to eastern American, and to Indo-west Pacific species of the genus will be developed in a later paper.

Although Rathbun (1930) compared *Cronius* with *Portunus*, it is much closer to *Charybdis* de Haan, a genus distributed throughout the Indo-west Pacific area. The geographically closest species are *Charybdis erythrodactyla* (Lamarck) from Hawaii and *Cronius ruber* (Lamarck) from the Galapagos Islands and eastward to West Africa. These two species also resemble each other morphologically, possessing common features discussed under the latter genus and species, since *Charybdis* does not occur within the area here considered.

Although objections have been raised to the continued recognition of *Callinectes* (See Stephenson and Campbell, 1959), further work in progress (Stephenson) suggests that the generic status of *Callinectes* should be retained.

Genus **PORTUNUS** Weber

Portunus Weber, 1795, p. 93; type: *P. pelagicus* (Linnaeus, 1758). Not *Portunus* Leach, 1814, p. 390.

Lupa Leach, 1814, p. 390; type: *P. pelagicus* (Linnaeus, 1758). Not *Lupa* de Haan, 1833, p. 11.

Lupea H. Milne Edwards, 1834, p. 445; type: *P. pelagicus* (Linnaeus, 1758).

Neptunus de Haan, 1833, pp. 3, 7; type: *P. pelagicus* (Linnaeus, 1758).

Achelous de Haan, 1833, pp. 3, 8; type: *P. spinimanus* Latreille, 1819.

Amphitrite de Haan, 1833, pp. 3, 8 (= *Monomia* Gistel, 1848, p. viii); type: *P. gladiator* Fabricius, 1798.

Hellenus A. Milne Edwards, 1879, pp. 210, 221; type: *P. spinicarpus* (Stimpson, 1871).

Description: Carapace transverse, always broader than long, depressed or slightly convex; surface with conspicuous ridges or granular areas. (For terminology, see Text-Fig. 1c). Front relatively short, from one-fifth to one-sixth carapace breadth excluding last tooth. Frontal teeth usually well defined; from 3 to 6 in number, usually 4. Anterolateral borders oblique, arched, longer than posterolateral borders, typically with 9 teeth but some species with as few as 5, the last tooth usually enlarged. Basal antennal article very short, anteroexternal angle produced into a lobule or spine extending into orbit; antennal flagellum not excluded from orbit. Chelipeds equal or subequal; longer, usually much longer, than legs. Anterior border of arm spinous; wrists with both inner and outer spines; palms prismatic, costate; fingers strongly toothed. Fifth legs with all segments flattened; posterior border of propodus with bristles. Male abdomen with third to fifth segments fused; shapes of ultimate and penultimate segments of diagnostic value. (Modified from Stephenson and Campbell, 1959).

This can be amplified, when only western American species are considered, to include features common to the group of eight species mentioned above, *viz*: *Portunus acuminatus*, *P. angustus*, *P. asper*, *P. brevimanus*, *P. guaymasensis* n. sp., *P. iridescens*, *P. stanfordi*, and *P. xantusii*. The divergences from this pattern shown by the ninth species, *P. tuberculatus*, are detailed under its specific description.

Carapace relatively broad, pilose, bearing raised ridges and granular patches but without tubercular elevations, and with the following raised structures recognizable: protogastrics as granular patches; mesogastrics as broad granular ridges; central gastric patch linking mesogastrics to metagastrics; metagastrics typically two short ridges; epibranchials well developed and markedly curved; anterolaterals as granular patches; anterior mesobranchials well developed, sometimes with ridgelike anterior border; posterior mesobranchials as ridges; cardiacs prominent, usually two short, separate ridges; lateral postcardiacs as low granular areas, median postcardiac an inconspicuous granular patch. Front 4-lobed or 4-toothed, inner lobes generally more advanced than outer. Orbital region with inner supraorbital angles partially or completely divided; inner and outer supraorbital sinuses open. Anterolateral borders oblique and arched, longer than posterolateral borders, and always bearing nine teeth, the first tooth usually stouter than the second and the ninth usually distinctly the largest. Third maxilliped hairy; anteroexternal angle of merus, if expanded laterally, only very slightly so. Chelipeds typically robust rather than attenuated, hirsute, under surface granular, the granulations tending toward squamiform arrangement. Posterodistal border of arm with single spine; one spine each on upper and outer surfaces of wrist; a single spine on upper surface of hand, three granular carinae on outer surface. Fifth legs with segments conspicuously flattened; posterior border of propodus with bristles, not spines; posterodistal border of merus bearing spinules and either with or without spines. Male abdomen triangular, moderately elongate; penultimate segment typically with slightly sinuous sides. Male first pleopod moderately long and robust, smoothly curving, without large spines, but with subterminal recurved spinules on outer surface and a few minute hairs (or their follicles) on inner surface.

In the specific descriptions which follow, structures conforming to this pattern are not redescribed. Because most of the differences between male first pleopods are slight and depend on minute details of spinulation, these structures are figured in lieu of verbal description.

Portunus acuminatus (Stimpson)Plate III, Fig. C; Plate VII, Fig. E; Plate IX, Fig. A;
Plate XI, Figs. G, H.*Achelouës acuminatus* Stimpson, 1871, p. 112 (type locality: Panama).*Neptunus acuminatus* A. Milne Edwards, 1879, p. 219.*Neptunus (Amphitrite) acuminatus* Miers, 1886, p. 174.*Portunus (Portunus) acuminatus* Garth, 1940, p. 73, pl. 19; 1948, p. 33; 1961, p. 137. Not Rathbun, 1910, pp. 538, 577, pl. 49, fig. 4 = *P. panamensis* (Stimpson), *fide* Rathbun, 1930, p. 58 = *P. asper* (A. Milne Edwards) (see later). Not Rathbun, 1930, p. 56, pl. 19 = *P. asper* (A. Milne Edwards), *fide* Garth, 1940, p. 75.*Portunus acuminatus* Garth, 1960, p. 116. Stephenson (in MS).

Type: Male holotype, length 0.50, width 1.26 in., originally in the collections of the Smithsonian Institution, no longer extant. Male neotype, AHF No. 391, length 13.0, width 32.2 mm including lateral spine, length of lateral spine 5.8 mm.

Type locality: Panama, Capt. J. M. Dow, collector. Neotype locality: Port Parker, Costa Rica, 5-10 fathoms; *Velero III* Station 936-39.

Atlantic analogue: None. Equally related to four Atlantic species.

Previous records:

Gulf of California. Isabel Island: *Velero III* (Garth, 1940, 1960). Mexico, S of Cape Corrientes. Manzanillo; 17 mi. SE × E of Acapulco; 4 mi. SSW of Maldonado Point; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961).

Nicaragua. Corinto: *Zaca* (Garth, 1961).

Costa Rica. Port Parker: *Velero III* (Garth, 1940; neotype locality).

Port Parker; Port Culebra; Cedro Island, Gulf of Nicoya; 14 mi.

S × E of Judas Point; Golfito, Gulf of Dulce: *Zaca* (Garth, 1961).

Panama. Panama: J. M. Dow (Stimpson, 1871). Bay of Panama: *Velero III* (Garth, 1940). Bahia Honda: *Zaca* (Garth, 1961).

Ecuador. La Libertad: *Velero III* (Garth, 1940). Off Cape Pasado:

Askoy (Garth, 1948).

Diagnosis: Posterodistal border of merus of fifth leg serrated and with a single spine. Chelipeds extremely long and thin. Last anterolateral tooth long to very long. Carapace broad to very broad. A moderately small species.

Description (Adults): Carapace broad to very broad (see *Measurements*), pilose, postlateral corner not spinous. Front with median lobes

rounded, laterals obtusely angled; a deep notch between median lobes. Orbital region with suborbital lobe rounded, not prominent; suborbital fissure open. Anterolateral teeth: first broad and blunt; third, fifth, and seventh larger than second, fourth, and sixth; ninth long, length equivalent to breadth of from 3 to 5 preceding teeth. Chelipeds very elongate, hands long and thin. Anterior border of arm with four spines, distal spine well separated from other three; inner spine of wrist moderately developed, outer well developed; fingers long, thin, sharp, and strongly carinated, with many small teeth. Fifth leg with posterodistal border of merus bearing spinules and a single subterminal spine. Male abdomen with ultimate segment blunt-tipped, about one and one-half times as long as broad, and about three-quarters length of penultimate; penultimate segment slightly broader than long.

Material examined: 247 specimens from 31 stations (See Table 1). From Santa Maria Bay, west coast of Lower California, and off Altata, Gulf of California, Mexico, to La Libertad, Ecuador, in depths of 2-33 (once 30-50) fathoms.

Measurements: Males from 13.9 x 35.6 (24.1) to 4.8 x 7.9 (7.2) mm, females from 10.9 x 23.8 (18.3) to 6.5 x 12.9 (10.0) mm, ovigerous females from 14.4 x 34.8 (24.9) to 8.1 x 16.1 (12.4) mm, young from 3.1 x 4.7 (4.5) mm.

Color: In life: Chestnut mottled with darker [chestnut]. (J. Crane, of Acapulco, Mexico, specimen reported by Garth, 1961) "Plain" and "orange branchial," eggs raspberry. Gastric spot present or absent. (J. Crane, of Manzanillo, Mexico, specimens reported by Garth, 1961)

Carapace white to dark olive brown. Branchial region with orange brown spots (two out of three cases). Cheliped as carapace with red-brown bands or stripes on wrist and hand. Tips of fingers light, yellow to brown. Walking legs brown banded. Ventral surface light. (A. Petersen, of three specimens)

Ecology: Of 19 stations for which bottom type was recorded, 37 per cent were sand, 42 per cent mud, and 21 per cent organic (coralline, nullipore, shell, gorgonian, algae). None were rock. Shell and nullipore were present with sand, with shell and sand, and to a lesser extent with mud.

Breeding: Ovigerous females from February to May.

Portunus angustus Rathbun

Plate XI, Fig. E.

Portunus (Achelous) angustus Rathbun, 1898, p. 594, pl. 44, fig. 2; 1902, p. 282; 1910, p. 578; 1930, p. 70, pl. 32, text-fig. 12. Boone, 1927, p. 181, text-fig. 61. Finnegan, 1931, p. 629. Garth, 1946, p. 419, pl. 71, figs. 3, 4.

Type: Female holotype, USNM No. 21587, length 25.4, width 37.0 mm.

Type locality: Off Hood Island, Galapagos Islands, 20 fathoms, Albatross Station 2812.

Atlantic analogue: No clear single analogue.

Previous records: Galapagos Islands (see Garth, 1946, p. 419).

Diagnosis: Posterodistal border of merus of swimming legs with a single spine but no spinules; frontal teeth rounded; carapace not very broad; ninth anterolateral tooth only slightly longer than seventh; anterolateral teeth alternating between large and distinctly smaller.

Portunus asper (A. Milne Edwards)Plate III, Fig. A; Plate VII, Fig. A; Plate IX, Fig. D;
Plate XI, Fig. A.

Neptunus asper A. Milne Edwards, 1861, p. 325, pl. 30, figs. 3, 3a-c (type locality: shore of Chile).

Acheloüs transversus Stimpson, 1871, p. 111 (type locality: Manzanillo, Mexico).

Acheloüs panamensis Stimpson, 1871, p. 112 (type locality: Panama).
Not Streets and Kingsley, 1877, p. 107 (see under *Remarks* for *Portunus xantusii minimus*).

Neptunus xantusii A. Milne Edwards, 1879, p. 213 (part), pl. 39, figs. 4, 4a-c [p. 213 (part), pl. 38, figs. 1-1d and San Diego record are true *Portunus xantusii* (Stimpson)].

Neptunus panamensis A. Milne Edwards, 1879, p. 219.

Neptunus transversus A. Milne Edwards, 1879, p. 220.

Neptunus (Amphitrite) transversus Miers, 1886, p. 174.

Neptunus (Amphitrite) panamensis Miers, 1886, p. 174.

Portunus panamensis Rathbun, 1898, p. 592. Stephenson, 1965, p. 4.

Portunus transversus Rathbun, 1898, p. 592.

Portunus (Portunus) acuminatus Rathbun, 1910, pp. 538, 577, 609,

pl. 49, fig. 4; 1930, p. 56, pl. 19. (Not *Achelous acuminatus* Stimpson).

Portunus (Portunus) panamensis Rathbun, 1910, pp. 577, 609; 1930, p. 58, pl. 20, fig. 1; pl. 22, fig. 3; pls. 23, 24. Finnegan, 1931, p. 626, text-fig. 5. Garth, 1948, p. 34; 1961, p. 138. Buitendijk, 1950, p. 275.

Portunus (Portunus) transversus Rathbun, 1910, pp. 577, 610.

Portunus (Portunus) asper Rathbun, 1930, p. 56, pl. 20, figs. 2, 3; pl. 21; pl. 22, figs. 1, 2. Garth, 1948, p. 33; 1957, p. 36; 1961, p. 138.

Portunus asper Garth, 1960, p. 116. Stephenson (in MS).

Type: Male and 2 female syntypes, Paris Museum. Male syntype, length 22, width 45 mm.

Type locality: Chile, M. Fontaines, collector.

Atlantic analogue: No clear analogue. Apparently equally related to *Portunus spinimanus* Latreille and *P. ordwayi* (Stimpson).

Previous records:

Gulf of California. Canjame, Sonora; Topolobampo, Sinaloa; Macapule, Sinaloa: M. Cardenas (Buitendijk, 1950). Pta. Piaxtla (Garth, 1960). Mazatlan (A. Milne Edwards, 1879).

Mexico, S of Cape Corrientes. Manzanillo: J. Xantus (Stimpson, 1871; A. Milne Edwards, 1879). 17 mi. SE × E of Acapulco; mouth of Dulce River; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961).

El Salvador. Meanguera Island, Gulf of Fonseca: *Zaca* (Garth, 1961). Nicaragua. Corinto: *Zaca* (Garth, 1961, as *P. panamensis*).

Costa Rica. Murcielago Bay; Port Parker; Piedra Blanca Bay; Cedro Island, Gulf of Nicoya; Golfito, Gulf of Dulce: *Zaca* (Garth, 1961). Port Parker; ? Golfito, Gulf of Dulce: *Zaca* (Garth, 1961, as *P. panamensis*).

Panama. Panama: J. M. Dow (Stimpson, 1871; Rathbun, 1930, as *P. panamensis*); A. Agassiz (Rathbun, 1930). Panama Bay: *Albatross* (Rathbun, 1898; Rathbun, 1930); Meek and Hildebrand (Rathbun, 1930). Bahia Honda: *Zaca* (Garth, 1961, as *P. panamensis*). Taboga Island: E. Deichmann (Rathbun, 1930). Perlas Islands: *St. George* (Finnegan, 1931); *Askoy* (Garth, 1948). Piñas Bay; Guayabo Chiquito: *Askoy* (Garth, 1948).

Colombia. Ardita Bay; Octavia Bay; Utria Bay; Cuevita Bay: *Askoy* (Garth, 1948). At sea near Gorgona Island: *Zaca* (Garth, 1961, as *P. panamensis*).

Ecuador. 02° 48' N, 78° 11' W; 01° 07' N, 79° 53' W, off Cape Pasado; 3 mi. W of light on Cape Santa Elena: *Askoy* (Garth, 1948, part as *P. panamensis*).

Peru. Paíta: W. L. Schmitt (Rathbun, 1930). Bay of Sechura, W of Matacaballa; Bay of Sechura between Bayovar and Matacaballa: R. E. Coker (Rathbun, 1910; Rathbun, 1930, as *P. acuminatus*).

Chile. Shore of Chile: M. Fontaines (A. Milne Edwards, 1861).

Diagnosis: Posterodistal border of merus of fifth leg serrated and with single spine. Chelipeds robust. Last anterolateral tooth moderately long to long. Carapace moderately broad to broad. A large species but some individuals maturing when small.

Description (Adults): Carapace moderately broad to broad (see *Measurements*), pilose, postlateral corner not spinous. Front with four rounded to acute lobes, median notch moderately deep. Orbital region with suborbital lobe rounded or acute; suborbital fissure open. Anterolateral teeth: first tooth broad and blunt; third usually larger than second; fifth and seventh larger than fourth and sixth, respectively, in smaller specimens; ninth moderately long to long, equivalent to breadth of 2-4 preceding teeth. Cheliped of normal proportions, hands robust. Anterior border of arm with 4 or 5 spines, distal spine well separated from remainder; spine on posterodistal extremity weakly developed in small specimens. Wrist with inner spine strongly developed, outer moderately so. Fingers robust, strongly carinated. Fifth leg with posterodistal border of merus bearing single spine and spinules. Male abdomen with ultimate segment reasonably sharply tipped, about one and one-half times as long as broad, and about three-fourths length of penultimate; penultimate segment slightly broader than long. Male first pleopod sinusously curved in all but small specimens.

Material examined: 1,121 specimens from 110 stations (See Table 2). From Topolobampo, Gulf of California, Mexico, to Tortuga Bay, Peru, including Socorro Island, Revilla Gigedo Islands, and from shore to 30 fathoms.

Measurements: Males from 41.7 x 94.9 (68.2) to 4.9 x 8.0 (6.8) mm, females from 40.0 x 82.3 (63.7) to 6.1 x 10.0 (8.8) mm, ovigerous females from 40.0 x 82.3 (65.0) to 5.6 x 8.9 (7.8) mm, young from 3.1 x 4.6 (4.1) mm.

Color: In life: Carapace dull fawn to greenish brown, ridges dark brown, two white triangular patches behind posterior mesobranchial ridges in line with their outer edges. Last anterolateral tooth and cheliped spines dark basally with cream or white tip. Outer side of cheliped generally dull white with orange spot on hand near finger articulation and pale purple area on base of movable finger. Inner side of cheliped dull white becoming dull purple or brownish green dorsally, broad purple band on proximal half of movable finger, finger tips brownish purple. Walking legs 1 and 2 with last three segments purple-red, leg 3 with only dactyl this color; all dactyls yellow-tipped. Distal half of fifth dactyl with purple suffusion. [W. Stephenson, of 11 males and 12 females (1 ovigerous) from 50 mi. S of Culiacan, Mexico, R. Lavenberg, collector]

In life: Carapace light cadmium yellow, front bluish white with faint lavender stripes and a cross of purplish spots. Raised portions cadmium orange with a few splotches and dots of bright Vandyke red around them, on postlateral areas, and on teeth. Eyestalk white; eye yellowish green. Chelipeds lighter than carapace, ridges darker; Vandyke red on [spines]. Fingers Vandyke red, fading to yellow on tips. Ambulatory legs redder than chelipeds, overcast with tiny reddish black dots. Ventral side greyish white. (A. Petersen, of a single specimen)

In alcohol: Fingers reddish brown proximally, brown blotch near posterior mesobranchial ridges.

Ecology: Of the 87 stations for which information on bottom type is available, 53 per cent were sand, 26 per cent mud, 12 per cent rock, and 9 per cent organic materials (shell, algae, nullipores). Shell was associated with sand in one out of three stations, mud with sand in one out of six stations. Attracted to surface lights at night.

Breeding: Ovigerous females from January to May.

Notes on atypical specimens: (a) A 12.3 x 26.4(19.9) mm male from Braithwaite Bay, Socorro Island, Mexico, Station 131-34, originally identified as *Portunus (Achelous) brevimanus* (Faxon) but resembling that species only in the bispinous border of the merus of the fifth legs, has been transferred to *P. asper* because of its broad carapace, long last anterolateral teeth, and robust chelipeds. The obscurely bispinous condition of the posterodistal borders of the meri of the fifth legs is due to the enlargement of the first spinule after the normal spine. (b) Two young from Santa Elena Bay, Ecuador, Station 205-34, the larger, a 5.5 x 8.3(7.6) mm male, with intact fifth legs, the right with a single spine plus spinules, the left with spinules only on the border of the

merus; the smaller, doubtfully a male, dismembered. Originally identified as *Portunus (A.) affinis* (Faxon), the carapace breadth and length of last anterolateral spine are indicative of *P. asper*. (c) A 9.4 x 18.5(14.4) mm ovigerous female, also from Station 205-34, with the same slightly aberrant fifth legs as in (a) above, originally identified as *P. (P.) panamensis*, is also referred to *P. asper*.

Notes on the type specimen: Three specimens comprise the type material in the Paris Museum seen by the senior author on May 13, 1964. These bear the label: "*Neptunus asper* (Milne Edwards), Chile, M. Fontaines." Of these the single male is without doubt the type and illustrated specimen, rather than the female illustrated by Rathbun (1930, pl. 21), since its dimensions correspond to those given by A. Milne Edwards (1861, p. 325, pl. 30, fig. 3). The male type differs from the illustration in having the lateral spine longer and more upcurving, the post-orbital spine blunter, extending above the anterolateral arc, the last two anterolateral spines slenderer and more outwardly directed, both anterior gastric and anterior branchial (epibranchial) ridges interrupted, the first postbranchial a thick ridge, not a smooth curve, the inner orbital fissure more open and farther removed from the outer, and the superior distal spine of the manus situated more proximally. In addition the male abdomen is broken exactly as shown in figure 3b, and the meral spine on the fifth pereopod, present on the left side, is absent on the right, possibly broken.

Remarks: The interdigitation of past records of *Portunus asper* and *P. panamensis* supports the synonymy proposed.

***Portunus brevimanus* (Faxon)**

Plate IV, Fig. C; Plate VII, Fig. D; Plate IX, Fig. E;
Plate XI, Fig. F.

Achelous brevimanus Faxon, 1895, p. 23 [under *A. spinimanus* (Latreille)] (type locality: off Cocos Island, Costa Rica, 66 fathoms; *Albatross Station* 3368).

Portunus (Achelous) brevimanus Rathbun, 1910, p. 578 (part: Galapagos records are *P. stanfordi* Rathbun); 1930, p. 68, pls. 29, 30. Garth, 1961, p. 139. Not Glassell, 1934, p. 454 (see *Remarks* below).

Portunus (Achelous) spinimanus Finnegan, 1931, p. 628. (Not *P. spinimanus* Latreille).

Type: Male syntype, USNM No. 20608, length 44.5, width 74 mm; male syntype, MCZ No. 4488.

Type locality: Off Cocos Island, Costa Rica, 66 fathoms, *Albatross* Station 3368.

Atlantic analogue: No clear analogue; apparently equally related to *Portunus ordwayi* (Stimpson) and *P. spinimanus* Latreille.

Previous records:

Mexico. San Benedicto Island, Revilla Gigedo Islands (Rathbun, 1910); A. W. Anthony (Rathbun, 1930). Sulphur Bay and Pyramid Rock, Clarion Island, Revilla Gigedo Islands: *Zaca* (Garth, 1961). Costa Rica: Off Cocos Island: *Albatross* (Faxon, 1895; Rathbun, 1930). Colombia: Gorgona Island: *St. George* (Finnegan, 1931, as *P. spinimanus*).

Diagnosis: Posterodistal border of merus of fifth leg in most cases bispinous. Frontal teeth spiniform. Inner supraorbital lobe clearly divided into two sharp lobes. Last anterolateral tooth short; in adults length *ca.* width of one and one-half preceding teeth. Spine on inner angle of wrist very well developed.

Description (Adult): Carapace moderately broad (see *Measurements*), pilose, posterior corner not spinous. Front with four spiniform, equally spaced teeth; laterals separated by deep U from inner supraorbital lobes. Orbital region with inner supraorbital lobe clearly divided into two sharp lobes, inner lobe longer and sharper; supraorbital border between fissures with dentiform outer termination; suborbital lobe triangular, suborbital fissure open. Anterolateral teeth: first blunt, remainder sharp; fifth and seventh larger than fourth and sixth, respectively; ninth relatively short, length *ca.* width of one and one-half preceding teeth. Third maxilliped with slight lateral expansion of anteroexternal angle. Chelipeds of normal proportions, hand robust. Arm with four or five stout spines, the most distal not particularly separated from the remainder; wrist with very well developed stout inner spine, *ca.* two-fifths length of palm; fingers robust, strongly carinated. Fifth leg with posterodistal border of merus typically with either two large spines or one large and one small spine, followed by spinules or tubercles (see *Remarks*). Male abdomen with ultimate segment sharp-tipped, not quite as long as broad, and about three-fourths length of penultimate; penultimate segment slightly longer than broad in larger males, the reverse in smaller. Male first pleopod relatively straight.

Young specimens: At overall breadths of *ca.* 30 mm, last anterolateral tooth relatively long, equivalent to *ca.* two and one-half preceding teeth; at breadths of *ca.* 10 mm even longer, equivalent to *ca.* three and one-half preceding teeth. In these smallest specimens, frontal teeth rounded lobes, inner supraorbital lobe entire, and even-numbered anterolateral teeth much smaller than odd-numbered.

Material examined: 109 specimens from 24 stations (See Table 3). From Socorro and Clarion islands, Revilla Gigedo Islands, and from Cocos Island, Costa Rica, to a depth of 60 fathoms.

Measurements: Males from 8.6 x 13.5(11.0) to 48.6 x 79.5(69.7) mm, females from 7.2 x 12.1(9.9) to 34.8 x 58.4(49.6) mm, ovigerous female 18.0 x 29.1(24.8) mm, young from 3.7 x 5.5(4.7) mm.

Color: In life: General appearance reddish apricot orange. Numerous white spots scattered over entire surface of carapace, smaller spots and blotches of oxblood red on frontal areas, and a large blotch of oxblood red on superolateral areas. Eyes water green speckled with dark brown. Chelipeds and legs same color as carapace but lighter. Spines on chela white, tipped with deep purple. Fingers light orange at base, fading to white; tips deep reddish purple. Ventral side pale pinkish cinnamon. (A. Petersen, of a specimen from Clarion Island, Mexico)

In life: Frontal portion of carapace oxblood red; posterior area red vermilion, darkest on center. Chelae dark oxblood red with a deep purplish tinge; fingers lightening to a pinkish lavender towards tips; tips very dark brown. Merus a dark vivid red becoming darker and purplish towards white-tipped spines. First two ambulatory legs same color as chelae, tips of dactylus yellow. Third ambulatory leg with merus and carpus bright red; propodus and dactylus red with a bright lavender tinge, tip yellow. Fourth leg with merus and carpus vermilion with stripes of yellow ochre; carpus and paddle bluish lavender bordered with bright vermilion and yellow with a delicate lavender tinge. Eystalks whitish lavender; eye green with a reddish stripe on inside. Ventral side bluish lavender, sternum white. (A. Petersen, of a specimen from Cocos Island, Costa Rica)

In alcohol: Dactylus of walking legs, spines of chelae, and tips of fingers light to dark brown-tipped, with ends lighter. Sometimes with reddish-brown blotches, two on posterolateral portions of carapace, two (faint) on postfrontal portions, one on upper surface of wrist, and one at base of spine on upper surface of hand of cheliped.

Ecology: Shoal water to 60 fathoms. Of the 25 stations with information on bottom type, 52 per cent were sand, 8 per cent were rock, and none were mud. Organic constituents (corallines, nullipores, shell, and algae) accounted for the remaining 40 per cent, and were present more often than not on sand and rock bottoms.

Breeding: A single ovigerous female collected in March.

Remarks: In some specimens the most obvious diagnostic feature, the presence of two spines on the posterodistal border of the merus of the fifth leg, is not exhibited. In two female specimens (Stations 303-34, 924-39) the borders of the right appendages are trispinous, the left normal. In one young specimen (Station 924-39) the right leg has a multi-spinous, the left a bispinous border. Sometimes one of the borders is unispinous.

Although Glassell (1934) synonymized Boone's (1930) *Portunus xantusi* with the present species, her photographed specimens lack the characteristic spine on the inside of the wrist and the characteristic spinulation of the posterodistal border of the fifth merus. Most probably the Gulf of California specimen is *P. xantusii minimus* and the Panama specimen *P. xantusii affinis*.

Finnegan's (1931) *Portunus (Achelous) spinimanus* also belongs to *P. brevimanus*.

Portunus iridescens (Rathbun)

Plate III, Fig. B; Plate VII, Fig. G; Plate IX, Fig. G;
Plate XI, Fig. I.

Neptunus (Hellenus) iridescens Rathbun, 1893, p. 240 (type localities: Gulf of California and Lower California, four localities, *Albatross*).

Portunus (Achelous) iridescens Rathbun, 1930, p. 93, pl. 46, text-fig. 14 (type locality restricted to *Albatross* Station 3017, off Cape Lobos). Crane, 1937, p. 66. Garth, 1961, p. 141.

Portunus (Achelous) spinicarpus Finnegan, 1931, p. 628. (Not *Achelous spinicarpus* Stimpson).

Portunus iridescens Garth, 1960, p. 116.

Type: Female holotype, USNM No. 17445, length 15, width 35 (22) mm.

Type locality: Off Cape Lobos, Gulf of California, 58 fathoms, *Albatross* Station 3017.

Atlantic analogue: *Portunus spinicarpus* (Stimpson, 1871) (equally with *P. guaymasensis*).

Previous records:

- Lower California. Santa Maria Bay (Garth, 1960). Off Santa Margarita Island: *Albatross* Station 3039 (Rathbun, 1893; 1930). Off Cape San Lucas: *Zaca* (Crane, 1937).
- Gulf of California. Off Diggs Point: *Albatross* Station 3033; off Cape Lobos: *Albatross* Station 3017 (Rathbun, 1893; 1930). Inez Area: *Zaca* (Crane, 1937). Santa Inez Bay (Garth, 1960). NW of Guaymas: *Albatross* Station 3011 (Rathbun, 1893; 1930). San Ignacio Bay (Garth, 1960). Off La Paz Bay: *Albatross* Station 2996 (Rathbun, 1930). Arena Bank: *Zaca* (Crane, 1937).
- Costa Rica. 14 mi. S × E of Judas Point: *Zaca* (Garth, 1961).
- Panama. Gulf of Chiriqui: *Zaca* (Garth, 1961).
- Colombia. Gorgona Island: *St. George* (Finnegan, 1931, as *P. spinicarpus*).

Diagnosis: Postlateral corner of carapace elevated as a spinous or right-angled projection. Spine on inner side of wrist enormous, in larger males longer than palm. Posterodistal border of merus of fifth leg bearing spinules but not spines.

Description: Carapace broad (see *Measurements*), pilose; postlateral corner forming a spinous or right-angled projection, sometimes reduced to a tubercle, but always recognizable. Metagastric ridges together forming central patch without ridgelike anterior border. Cardiac elevations short, widely separated, conspicuously raised patches. Front with median lobes projecting distinctly beyond laterals; laterals directed slightly outwards and separated by a deep U from inner supraorbital lobes; all lobes bluntly rounded. Orbital region with inner supraorbital lobe divided into a sharp inner and blunter outer lobe; suborbital lobe broad and blunt, suborbital fissure open. Anterolateral teeth: first blunt, remainder relatively sharp; third and fifth typically larger than fourth; ninth long in adults, equalling breadth of about four preceding teeth. Third maxilliped with anteriorly directed surface of merus broadly flattened and iridescent. Chelipeds long, thin, with enormous spine on inner wrist margin. Arms with four long sharp spines on anterior border, distal spine well separated from remainder; spine on posterodistal extremity well developed. Wrist with outer spine reasonably large, inner spine immense and with continuous row of fine bristles, in larger males extending beyond palm roughly to middle of fingers; in larger females *ca.* three-fourths way along palm, in smaller specimens *ca.* one-half to two-thirds way along palm. Hand long, slightly compressed, carina on inner surface

feebly developed. Fingers short, sharp, compressed, curved. Fifth leg with posterodistal border of merus spinulose; merus relatively short, length *ca.* 1.3 times breadth. Male abdomen with ultimate segment cordiform, about one and one-third times as long as broad, and about two-thirds length of penultimate; penultimate segment slightly broader than long.

Material examined: 146 specimens from 22 stations (See Table 4). From Cape San Lazaro, west coast of Lower California, and off Estero de Tasiota, Sonora, to E of Cabeza Ballena, Gulf of California, Mexico. From Octavia Bay to off Gorgona Island, Colombia. The distribution is discontinuous. From 17-85 fathoms (exceptionally to 150 fathoms).

Measurements: Males from 6.2 x 13.8(9.2) to 24.0 x *ca.* 53.5(36.6) mm, females from 7.4 x 16.8(11.2) to 31.4 x 62.9(46.0) mm, ovigerous females from 18.0 x 39.6(28.8) to 26.6 x 54.6(39.9) mm.

Color: In life: Mottled dark olive yellow, with ridges and marginal teeth densely dotted with ochre red. Eyes yellow brown. Merus of cheliped deep olive buff with light touches of dull orange red; spines ochre tipped. Carpus and long spine pale cadmium yellow, becoming stronger towards tip, which is white. Hand as carpus, but spine ochre red with white tip. Movable finger dull orange yellow on dorsal surface with two white oblong patches, on inner side pale carmine; fixed finger very bright carmine. First three ambulatory legs deep olive buff with light touches of orange yellow; distal portion of dactyls bright carmine. Fourth leg light olive yellow on merus and carpus; propodus mottled orange and pale yellow, margins red and white. Paddle dull orange basally, gradually blending with and becoming dark ochre red distally; a white streak down center of paddle. Ventral surface pale olive buff. (A. Petersen, of a specimen from Espiritu Santo Island, Gulf of California)

In life: Carapace covered by hairs golden brown; uncovered generally pink or pale blue, blue especially on branchial areas. Ridges rust red to red brown. White clear patch behind posterior mesobranchial ridge. Following white-tipped: spine at postlateral angle of carapace, last anterolateral tooth, spines on chelipeds. Fifth leg: propodus with white marginal bar on anterior and again on posterior margin; dactylus with cream or white forming two anterior marginal bars, one central bar, one posterior marginal bar, distal half of dactylus with blood red on margins. Flat anteriorly directed surface of merus of third maxilliped with golden iridescence. (W. Stephenson, based on 4 males and 3 females (3

ovigerous) from Concepcion and San Nicolas bays, Gulf of California, R. Lavenberg, collector)

In alcohol: Distal portion of dactylus of fifth leg sometimes sooty brown.

In formalin: Carapace ridges and distal half of fifth dactyl reddish brown. Chelae mottled red and white.

Ecology: Of the 13 stations for which bottom type is recorded, 7 were mud or sandy mud, 4 were sand, and one each rock and shell. Shell, gravel, or rock were mixed with the mud in most cases.

Breeding: Ovígerous females from December, March, and April.

Remarks: This species closely resembles *Portunus spinicarpus* (Stimpson), an Atlantic species with which it was compared, using specimens loaned for the purpose by the U. S. National Museum (USNM No. 9657, 4 males, 3 females). In both *P. iridescens* and *P. spinicarpus* the length of the inner wrist spine varies, invalidating one of Rathbun's (1930) diagnostic differences, based on relative length of spine to palm. A second main distinction, based on the form of the postlateral corners of the carapace, is at least partially upheld, in that while the corner bears the typical sharp, erect tooth in some specimens of *P. iridescens*, in others it may be reduced to a rounded tubercle, while in *P. spinicarpus* it varies from bearing a tubercle to being completely rounded. Finnegan (1931) correctly stated that the distinction is one of degree; nevertheless, it seems to be a distinction.

The species are probably distinguishable by *Portunus spinicarpus* having sharper frontal teeth, sharper inner supraorbital lobes, less prominent cardiac elevations on the carapace, and by the development of a slight spinulose lobe on the posterodistal border of the fifth merus.

Both species greatly resemble *Portunus guaymasensis*, described below.

***Portunus guaymasensis*, new species**

Plate II, Figs. A-C; Plate XI, Fig. J.

Type: Male holotype, USNM Cat. No. 113053, from 1 mi. W of Guaymas Harbor entrance, Sonora, Gulf of California, Mexico; January 21, 1950, B. W. Walker and party, collectors.

Measurements: Male holotype, length 17.0 mm, width including spines 30.8 mm, without spines 25.0 mm.

Diagnosis: Postlateral corner of carapace rounded, no spine or tubercle present. Spine on inner side of wrist of cheliped enormous. Postero-

distal border of merus of fifth leg bearing spinules but not spines. Frontal lobes bluntly rounded.

Description: Carapace moderately broad (see *Measurements*), pilose, no spine or tubercle at postlateral corner. Mesogastric elevations narrow transverse bands with ridgelike anterior borders. Cardiac ridges also narrow, fairly elongate transverse bands with ridgelike borders, not conspicuously elevated, and almost confluent in midline. Front with median lobes projecting beyond laterals; laterals directed slightly outwards and separated by deep and wide U from inner supraorbital lobes; all lobes bluntly rounded. Orbital region with inner supraorbital lobe incompletely divided into inner and outer lobes, both blunt; suborbital lobe broad and blunt, suborbital fissure open. Anterolateral teeth: first tooth blunt, remaining teeth relatively sharp; third and fifth larger than fourth; ninth tooth long, equalling breadth of three preceding teeth. Third maxilliped with merus neither flattened anteriorly nor iridescent. Chelipeds long, thin, with spine on inner margin of wrist extending to base of finger. Arms with four long sharp spines, the distal well separated from the remainder. Spine on posterodistal extremity well developed. Wrist with outer spine reasonably large, inner spine enormous, extending to finger articulation, and bearing a continuous row of long, fine bristles. Hand long, slightly compressed, carina on inner surface feebly developed. Fingers short, sharp, compressed, and curved. Fifth leg with merus relatively long, length 1.6 times breadth, posterodistal border spinulose. Male abdomen with ultimate segment cordiform, about one and one-third times as long as broad, and about two-thirds length of penultimate; penultimate segment as long as broad, margins sinuous.

Remarks: This species closely resembles both *Portunus spinicarpus* (Stimpson) and *P. iridescens* (Rathbun) in possessing an enormous wrist spine, but differs from the Atlantic *P. spinicarpus* in having blunter frontal teeth, inner supraorbital lobes, and anterolateral teeth, and in lacking a spinulose lobe on the posterodistal border of the fifth merus, and from the Pacific *P. iridescens* in having the elevations of the mesogastric and cardiac portions of the carapace more ridgelike and lacking the conspicuously raised granular cardiac patches. It differs from *P. iridescens* and from some representatives of *P. spinicarpus* in having the postlateral corners of the carapace completely rounded, and from both species in having a relatively short last anterolateral tooth, a relatively long merus of the fifth legs, and in lacking iridescence and a flattened

anterior portion of the merus of the third maxilliped. It appears to be equally related to *P. iridescens* and *P. spinicarpus*.

Because Finnegan (1931) refers to precise cardiac tubercles, her specimens from Gorgona Island, Colombia, reported as *Portunus (Achelous) spinicarpus*, evidently belong to *P. iridescens* rather than to the present species.

Portunus stanfordi Rathbun

Plate XI, Fig. L.

Portunus (Achelous) brevimanus Rathbun, 1898, p. 593; 1910, p. 578 (part: the Galapagos specimens). Boone, 1927, p. 177, text-fig. 59 (labeled *spinimanus*). Not *Achelous brevimanus* Faxon.

Portunus (Achelous) stanfordi Rathbun, 1902, p. 282, pl. 12, fig. 11; 1910, p. 578; 1930, p. 69, pl. 31, text-fig. 11. Boone, 1927, p. 178, text-fig. 60. Garth, 1946, p. 416, pl. 71, fig. 1.

Type: Male holotype, USNM No. 24833, length 13.4 mm, width including spines 23 mm, without spines 17.9 mm.

Type locality: Reef north of Tagus Hill, Tagus Cove, Albemarle Island, Galapagos Islands.

Atlantic analogue: No clear single analogue.

Previous records: Galapagos Islands (See Garth, 1946, p. 416).

Diagnosis: Posterodistal border of merus of swimming legs with a single spine but no spinules; frontal teeth spiniform; carapace not very broad; ninth anterolateral tooth much larger than seventh; antero-lateral teeth alternately larger and smaller but less obviously so than in *Portunus angustus*.

Portunus xantusii (Stimpson)

Stephenson (in MS) has shown that *Portunus pichiliquei* Rathbun merges with *P. minimus* Rathbun on the one hand and with *P. xantusii* (Stimpson) on the other, and that *P. affinis* (Faxon) similarly merges with *P. minimus*. The most that can be done by way of "splitting" is to recognize three subspecies, *xantusii*, *minimus*, and *affinis*, respectively, on morphometric and zoogeographic criteria. These are treated separately with respect to synonymies, records, and material examined, but collectively under *P. x. xantusii* with respect to diagnosis, description, and remarks, in the account that follows.

Portunus xantusii xantusii (Stimpson)

Plate IV, Fig. A; Plate VII, Fig. B; Plate IX, Fig. B;
Plate XI, Fig. B.

Acheloüs xantusii Stimpson, 1860, p. 222 (type locality: Cape San Lucas).

Neptunus xantusii A. Milne Edwards, 1861, Addenda p. 1; 1879, p. 213 (part), pl. 38, figs. 1, 1a-d (not Mazatlan record and pl. 39, figs. 4, 4a-c, which are *Portunus asper*).

Portunus xantusii Rathbun, 1898, p. 593; 1900, p. 140; 1904, p. 179. Holmes, 1900, p. 71. Weymouth, 1910, p. 49, pl. 12, fig. 35. Schmitt, 1921, p. 237, text-fig. 141. Johnson and Snook, 1927, p. 384, text-fig. 339. Ricketts and Calvin, 1939, p. 182, pl. 35, fig. 5. Garth, 1960, p. 110. Stephenson (in MS). Not Taylor, 1912, pp. 191, 211 (incorrect *Albatross* labeling; Puget Sound alleged locality.)

Portunus (Portunus) xantusii Rathbun, 1910, p. 577; 1923, p. 620 (part: the Cape San Lucas, Pichilique Bay, and San Josef Island specimens are *P. x. minimus*); 1926, p. 75; 1930, p. 50, pl. 18. Glassell, 1935, p. 105. Garth, 1961, p. 137.

Portunis [*sic*] *xantusii* Nininger, 1918, p. 36, text-fig. 2.

Portunus (Portunus) xantusi Boone, 1930, p. 163, pl. 56, figs. A, B.

Portunus xantusii xantusii Stephenson, 1965, p. 4.

Type: Five small specimens, syntypes, MCZ No. 1627. The female syntype measured by Stimpson, length 0.54, width 1.05 inches, is believed no longer extant.

Type locality: Cape San Lucas, J. Xantus, collector.

Atlantic analogue: *Portunus gibbesii* (Stimpson, 1859), *fide* Rathbun (1930).

Previous records:

California. Santa Barbara (Glassell, 1935; Garth, 1960). Santa Monica Bay: (Schmitt, 1921); *Anton Dohrn* (Rathbun, 1930). Near Rocky Point, Palos Verdes: U.S.C. (Rathbun, 1930). Point Vicente: U.S.C. (Rathbun, 1930). San Pedro (Holmes, 1900); H. N. Lowe (Rathbun, 1930). San Pedro Bay: U.S.C. (Rathbun, 1930). Wilmington: D. S. Jordan (Rathbun, 1930). Long Beach: *Anton Dohrn* U.S.C. (Rathbun, 1930). Between Long Beach and Seal Beach: U.S.C. (Rathbun, 1930). Anaheim Bay: E. P. Chace (Rathbun, 1930). Newport Bay: U.S.C. (Rathbun, 1930); (Ricketts and Calvin, 1939). Balboa Bay: (Johnson and Snook, 1927). Laguna

- Beach: (Nininger, 1918); W. A. Hilton (Rathbun, 1930). Santa Catalina Island: (Holmes, 1900); *Albatross*; *Anton Dohrn*; W. H. Dall (Rathbun, 1930). San Clemente Island: *Albatross* (Rathbun, 1930). Mission Bay: (Johnson and Snook, 1927). San Diego: (A. Milne Edwards, 1879; Holmes, 1900); *Albatross*; D. S. Jordan; Rosa Smith; San Diego Soc. Nat. Hist. (Rathbun, 1930). San Diego Bay: (Johnson and Snook, 1927); *Albatross* (Rathbun, 1930).
- Lower California. San Benito Islands: *Zaca* (Garth, 1961). Point San Bartolome: *Albatross* (Rathbun, 1923). San Bartolome Bay: *Albatross* (Rathbun, 1930). Abrejos Point: *Albatross* (Rathbun, 1898, 1930). Ballenas Bay: *Albatross* (Rathbun, 1930). Magdalena Bay: *Albatross* (Rathbun, 1898); Hanna and Jordan (Rathbun, 1930). Sail Rock, Entrada Point, and Redondo Point, Magdalena Bay: *Albatross* (Rathbun, 1923). Off Santa Margarita Island: *Albatross* (Rathbun, 1930). Santa Maria Bay: *Albatross* (Rathbun, 1923, 1930). Cape San Lucas: J. Xantus (Stimpson, 1860; Rathbun, 1930).
- Gulf of California. Concepcion Bay: *Albatross* (Rathbun, 1930). Agua Verde Bay: *Albatross* (Rathbun, 1923, 1930).
- Pleistocene Fossil. California. Spanish Bight, San Diego Bay (Rathbun, 1926).

Diagnosis: Posterodistal border of merus of swimming legs with spinules but no spine. Inner spine of wrist of cheliped of normal length. Postlateral corner of carapace rounded. Carapace breadth and length of last anterolateral tooth variable. (See *Description* below).

Description of the species: Carapace varying from fairly narrow in *Portunus xantusii affinis* and *P. x. minimus* to broad in *P. x. xantusii*, pilose, postlateral corner rounded. Front advanced and with four lobes varying from acute to rounded (in *P. x. affinis* front less advanced and lobes more rounded than in others), laterals broader than medians. Orbital region with inner supraorbital angle partially subdivided; supraorbital fissures either open or almost closed. Supraorbital tooth varying from acute and prominent to blunt and rounded; suborbital fissure open. Anterolateral teeth: first tooth blunt, remaining teeth varying from sharply pointed to truncate-tipped; fifth tooth stouter than either fourth or sixth; ninth varying from short (*i. e.*, length equivalent to width of one preceding tooth in *P. x. affinis*) to long or very long (*i. e.*, length equivalent to width of three preceding teeth in *P. x. xantusii*). Third maxilliped with anteroexternal angle of merus not produced laterally,

hirsute. Chelipeds moderately long, robust. Arm with 4-6 spines on anterior border, more in larger specimens; distal spine moderately or distantly separated from remainder; when six spines present, proximal one small. Wrist with inner and outer spines moderately well developed. Fingers short, stout. Fifth leg with posterodistal border of merus with spinules only, these varying from small, sharp spines to blunt, rounded serrations to microscopic spinules; merus somewhat broader in *P. x. affinis*. Male abdomen with ultimate segment triangular, *ca.* one and one-half times as long as broad, tip rounded; penultimate segment about as long as broad.

Material examined: 602 specimens from 116 stations (See Table 5). From E of Gull Island, S of Santa Cruz Island, and from 7.5 mi. SE of Santa Barbara Point, California, to Marquis Point, west coast of Lower California, Mexico; discontinuously from San Ignacio Bay and near Pta. Piaxtla, Sinaloa, Mexico. From shore to 98 fathoms; usually under 50 fathoms.

Measurements: Males from 4.9 x 8.2(6.6) to 35.5 x 70.7(55.8) mm, females from 6.2 x 11.8(8.8) to 36.2 x 73.1(56.8) mm, ovigerous females from 15.2 x 29.8 (22.2) to 31.0 x 55.9(45.1) mm, young from 2.8 x 3.5(3.4) mm.

Color: In life: Exceedingly variable; dullest specimen grayish speckled with black and white, pepper-and-salt fashion. Tips of legs, including chelae, pinkish; ambulatories banded white and brown. Brightest specimen pinkish pepper-and-salt with entire gastric region raspberry red. Others pinkish pepper-and-salt with anterolateral margin and that of front ringed, well inside spines, with black. (J. Crane, of *Portunus xantusii xantusii* from San Benito Islands, Lower California, reported by Garth, 1961)

Ecology: Of the 43 stations for which habitat data are available, *Portunus xantusii xantusii* was dredged from sand bottom at 44 per cent, from mud bottom at 12 per cent, from rock bottom at 9 per cent, and from organic bottom (shell, coralline, eel grass, kelp) at 9 per cent, and was attracted to light at 25 per cent. Algae was an important associate with sand bottom, as was kelp with rock. Attracted to surface lights at night.

Breeding: Ovigerous females from May through September.

Remarks: From a distributional analysis it is apparent that while all three forms of *Portunus xantusii* may be found in the southern part of

the Gulf of California, only the *xantusii* form extends north of Magdalena Bay on the west coast of Lower California (and thence to Santa Barbara, California); only the *affinis* form extends south of Tenacatita Bay, Mexico (and thence to Peru); while only the *minus* form extends more than a short distance into the Gulf of California (and thence to Rocky Point at its head). On this basis the three are considered allopatric subspecies, although it is recognized that overlap occurs between *P. x. xantusii* and *P. x. minus* south of Magdalena Bay on the west side of Lower California and at Agua Verde and Concepcion bays on the east side of Lower California; and between *P. x. minus* and *P. x. affinis* south of San Ignacio Bay (Topolobampo) on the Mexican mainland. (See also *Remarks* under these subspecies)

Portunus xantusii minus Rathbun

Plate XI, Fig. C.

?*Amphitrite paucispinis* Lockington, 1877b, p. 107 (type localities: Angeles Bay; Mulege Bay; Magdalena Bay).

Portunus (Achelous) minus Rathbun, 1898, p. 595, pl. 44, fig. 3 (type locality: Gulf of California, southern part, *Albatross* Station 2827); 1924a, p. 374; 1930, p. 76, pl. 36, text-fig. 13. Crane, 1937, p. 67.

Portunus (Portunus) xantusii Rathbun, 1923, p. 620 (part: the Gulf of California specimens, including the type of *P. pichilinquai*).

Portunus (Achelous) pichilinquai Rathbun, 1930, p. 78, pl. 37 (type locality: Pichilinquai Bay, Lower California). Crane, 1937, p. 67.

Portunus minus Steinbeck and Ricketts, 1941, p. 468, pl. 18, fig. 3. Garth, 1960, p. 113.

Portunus pichilinquai Steinbeck and Ricketts, 1941, p. 468. Garth, 1960, p. 113. Stephenson, 1965, p. 4.

Portunus xantusii minus Stephenson, 1965, p. 4.

Type: One male and 3 females, syntypes, USNM No. 21588. Male syntype, length 10.2, width 17.0 (14.1) mm.

Type locality: Gulf of California, 10 fathoms, *Albatross* Station 2827.

Atlantic analogue: None. A Gulf of California endemic form.

Previous records:

Lower California. Magdalena Bay: Fisher and Lockington (Lockington, 1877b); *Albatross* (Rathbun, 1930); *Zaca* (Crane, 1937);

(Garth, 1960). Cape San Lucas: *Albatross* (Rathbun, 1923, 1930). San Lucas Bay: *Zaca* (Crane, 1937; Garth, 1961).

Gulf of California. San Luis Gonzales Bay: *Albatross* (Rathbun, 1930). Mejia Island: F. Baker (Rathbun, 1924a, 1930). Puerto Refugio: (Steinbeck and Ricketts, 1941). Cape Tepoca: (Rathbun, 1930; Garth, 1960). Angeles Bay: (Lockington, 1877b). Tiburon Island: (Garth, 1960). SE of Tiburon Island: *Albatross* (Rathbun, 1930). Off San Pedro Martir Island: *Albatross* (Rathbun, 1930). Port San Carlos: (Steinbeck and Ricketts, 1941). 50 mi. S of Guaymas: *Albatross* (Rathbun, 1930). Inez Area [Santa Inez Bay]: *Zaca* (Crane, 1937). Mulege Bay: (Lockington, 1877b). Concepcion Bay: (Steinbeck and Ricketts, 1941). Ballandra Bay, Carmen Island: F. Baker (Rathbun, 1924a, 1930). San Jose Island: *Albatross* (Rathbun, 1923, 1930); F. Baker (Rathbun, 1924a). Pichilingue Bay: *Albatross* (Rathbun, 1923, 1930); (Garth, 1960). Ceralbo Channel: *Albatross* (Rathbun, 1898, 1930). Arena Bank: *Zaca* (Crane, 1937). Maria Madre Island, Tres Marias Islands: Hanna and Jordan (Rathbun, 1930). Tres Marias Islands (Garth, 1960).

Diagnosis: Intermediate as regards width of carapace and length of last anterolateral teeth between *Portunus xantusii xantusii* and *P. x. affinis*, and overlapping with both morphologically but not geographically.

Description: See species description under *Portunus xantusii xantusii*.

Material examined: 1,402 specimens from 148 stations (See Table 6). Extralimital from E of South Coronado Island. From Magdalena Bay, Lower California, and from Rocky Point, Gulf of California, to Tenacatita Bay, Jalisco, Mexico, and from shore to 55 (exceptionally to 150) fathoms.

Measurements: Males from 7.0 x 12.5(9.6) to 24.9 x 43.2(36.5) mm, females from 7.2 x 11.5(9.9) to 24.1 x 40.0(34.1) mm, ovigerous females from 7.9 x 13.5(10.9) to 19.6 x 34.5(28.0) mm, young from 4.1 x 5.7(5.5) mm.

Color: In life: Arrowhead-shaped patch of pale cream buff on frontal and gastric regions. Other regions with irregular patched effect of cream buff and bright orange cinnamon. Chelae dark vinaceous; spines white-tipped. Fingers rich dark vinaceous proximally with a broad white center band encircling them; tips yellowish white. First three ambulatory legs white or pale gray with two distinct bands of carmine encircling each segment. Eyes dark brownish red. Ventral side white except for light touches of orange red on maxillipeds and pterygostomian region.

(A. Petersen, of a San Lorenzo Channel, Gulf of California, specimen)

Carapace variably mottled in browns, brownish green, and cream, with two dark postorbital areas and two light patches near center of posterolateral borders. White areas: center of first two abdominal segments, on distal portions of most segments of walking legs, and on outsides of chelae. Fingers mostly purple-brown with transverse white bar across middle outside of both fingers. (W. Stephenson, of 3 males and 2 females from off SE end of Tiburon Island and Puerto Escondido, Gulf of California, collected by R. Lavenberg)

Ecology: Of the 130 stations for which habitat information is recorded, 58 per cent were sand, 14 per cent mud, 5 per cent rock or gravel, while 18 per cent were organic bottom (corallines, nullipores, shell, coral). The predominance of sand is further indicated by its frequent presence with mud and rock. Another 5 per cent were attracted to light.

Breeding: Ovigerous females from February to April.

Remarks: A 10.9 x 20.4(16.5) mm ovigerous female from Puerto Escondido, Station 592-36, is a typical *Portunus xantusii minimus* except for the absence of frontal teeth, the front being a continuous sinuous lobe, and of any subdivision of the inner supraorbital angle.

In view of the demonstrated identity of *Portunus panamensis* (Stimpson) with *P. asper* (A. Milne Edwards) and the definition of its range by subsequent collecting as from Topolobampo, Mexico, southward to Peru (or Chile), the synonymy of *Amphitrite paucispinis* Lockington (1877b, p. 107) with *Portunus panamensis*, proposed by Streets and Kingsley (1877, p. 107) with a question mark and followed by subsequent authors, is no longer tenable. It now seems more probable that Lockington's Gulf of California-west coast of Lower California specimens are attributable to *P. xantusii* (Stimpson) as here recognized, for not only are the measurements of his largest female (30 x 54 mm) almost identical with those given for the largest ovigerous female of *P. xantusii* (31 x 55.9 mm), but the localities represented, Angeles, Mulege, and Magdalena bays, fall within the range of *P. x. minimus* as here defined. Finally, although Lockington made no mention of the armature of the merus of the fifth leg, the statement by Streets and Kingsley that "the specimen sent [by Lockington] agrees well with Stimpson's description [of *P. panamensis*] except for having no spine on the meros joint of the posterior feet" provides the essential character with

which to eliminate Lockington's proposed species from the synonymy of *P. panamensis* (= *P. asper*) and to relate it to *P. x. minimus* as the remaining most probable form.

***Portunus xantusii affinis* (Faxon)**

Plate IV, Fig. B; Plate VII, Fig. C; Plate IX, Fig. C;
Plate XI, Fig. D.

Achelous affinis Faxon, 1893, p. 155 (type localities: off Panama and Ecuador); 1895, p. 23, pl. 4, figs. 1, 1a-b (part: not Guaymas, Mexico, specimens).

Portunus (Achelous) affinis Rathbun, 1898, p. 595; 1907, p. 71; 1930, p. 80, pls. 38, 39. Garth, 1961, p. 139; 1965, p. 14.

Portunus affinis Coventry, 1944, p. 538. Garth, 1960, p. 116.

Portunus xantusii affinis Stephenson, 1965, p. 4.

Type: Male syntype, USNM No. 20613, length 22.0, width 36.4 (33.4) mm; 5 males, 4 females, syntypes, MCZ No. 4489.

Type locality: Off Panama, 56 fathoms, *Albatross* Station 3390; and off Ecuador, 52 fathoms, *Albatross* Station 3379.

Atlantic analogue: Not ascertained. However, geographical considerations make this subspecies a more probable analogue of *Portunus ordwayi* (Stimpson, 1860) than the Galapagos Islands endemic, *P. angustus*, as suggested by Rathbun (1930, p. 36).

Previous records:

Lower California. Off Cape San Lucas: *Albatross* (Rathbun, 1930).

Gulf of California. Isabel Island: (Garth, 1960).

Mexico, S of Cape Corrientes. Tenacatita Bay; Manzanillo; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961). Off Acapulco, from stomach of turtle: *Albatross* (Rathbun, 1907, 1930). 250 mi. WSW of Acapulco: G. Vanderbilt Exped. (Coventry, 1944). Vicinity of Clipperton Island, from stomach of yellowfin tuna: *Aggressor* (Garth, 1965).

Costa Rica. Near Cocos Island: *Albatross* (Rathbun, 1930).

Panama. Off Mala Point and NE of Mala Point: *Albatross* (Faxon, 1893, 1895). Panama Bay: *Albatross* (Rathbun, 1898, 1930). Perlas Islands: (Boone, 1930).

Colombia. S of Malpelo Island: *Albatross* (Faxon, 1893). Gorgona Island: *Zaca* (Garth, 1961).

Ecuador. Off Ecuador: *Albatross* (Rathbun, 1930). Galapagos Islands: *Albatross* (Rathbun, 1930).

Also conspicuous in stomach contents of tuna throughout the Central American Pacific (Blunt, 1960; Alverson, 1963).

Diagnosis: As distinguished from *Portunus xantusii xantusii* and, to a lesser degree, from *P. x. minimus*: Carapace fairly narrow; front less advanced, lobes rounder. Ninth anterolateral tooth short, length equal to width of one preceding tooth. Merus of fifth leg somewhat broader. (See also *Remarks* below)

Description: See species description under *Portunus xantusii xantusii*.

Material examined: 1,528 specimens from 60 stations (See Table 7). From off Rio San Lorenzo, Gulf of California, Mexico, to South Bay, Lobos de Afuera Island, Peru, including Clarion Island, Revilla Gigedo Islands, and from shore to 100 fathoms.

Measurements: Males from 7.0 x 11.0(10.2) to 31.6 x ca. 54.0 (50.2) mm, females from 7.5 x 11.8(11.0) to 25.9 x 42.6(40.0) mm, ovigerous females from 12.9 x 20.2(18.7) to 23.0 x 36.8(34.9) mm, young from 2.9 x 3.7(3.5) mm.

Color: In life: Apricot buff, striations brown, chelipeds and ambulatories streaked with violet. A constant white spot in middle of posterolateral margin. (J. Crane, of Tenacatita Bay, Mexico, specimens reported by Garth, 1961)

White spot on gastric region and spot above base of swimming legs on abdomen may be present, absent, or faint. Posterolateral spot, however, constant. (J. Crane, of Manzanillo, Mexico, specimens reported by Garth, 1961)

Ecology: Of the 46 stations for which bottom-type information is available, sand accounted for 41 per cent, mud for 22 per cent, rock for 20 per cent, and organic bottom (coral, nullipores, shell) for 9 per cent. Shell was a frequent concomitant of sand and mud, while gorgonians, nullipores, corallines, and algae were associated with rock. Recoveries from fish stomachs (shark, tuna) accounted for the remaining 7 per cent.

Breeding: Ovigerous females from February to May.

Remarks: *Portunus xantusii affinis* is reasonably distinct from the other subspecies over most of its range. None of the features given in the diagnosis above, however, permits absolute distinction from *P. x. minimus*, and the Isabel Island collections comprise a variable and intermediate population. (See Stephenson, in MS)

Portunus tuberculatus (Stimpson)

Plate III, Fig. D; Plate VII, Fig. F; Plate IX, Fig. F;
Plate XI, Fig. K.

Achelous tuberculatus Stimpson, 1860, p. 223 (type locality: Cape San Lucas).

Neptunus tuberculatus A. Milne Edwards, 1861, Addenda p. 2; 1879, p. 221, pl. 39, figs. 1, 1a-b.

Portunus (Achelous) tuberculatus Rathbun, 1898, p. 596; 1930, p. 90, pl. 44. Finnegan, 1931, p. 629. Crane, 1937, p. 68. Garth, 1946, p. 421, pl. 71, fig. 2; 1948, p. 34; 1961, p. 140; 1965, p. 15.

Portunus tuberculatus Garth, 1960, p. 116.

Type: Male syntype, length 8.5, width 16.5 (12.5) mm, USNM No. 19679 (from British Museum); 8 specimens, syntypes, MCZ No. 1626; 7 specimens, syntypes, BMNH. The female syntype measured by Stimpson, length 0.52, width 1.20 inches, is not known to be one of the above.

Type locality: Cape San Lucas, J. Xantus, collector.

Atlantic analogue: None. Unique among American species; possibly related to the Indo-Pacific *Portunus longispinus* complex.

Previous records:

Lower California. Cape San Lucas: J. Xantus (Stimpson, 1860). San Lucas Bay: *Zaca* (Crane, 1937).

Gulf of California. Los Frailes (Garth, 1960). Isabel Island (Garth, 1960). Maria Madre Island, Tres Marias Islands: Hanna and Jordan (Rathbun, 1930).

Mexico, S of Cape Corrientes. Chamela Bay; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961). Clipperton Island: C. Limbaugh (Garth, 1965).

Costa Rica. Port Parker; Piedra Blanca Bay: *Zaca* (Garth, 1961).

Panama. Panama Bay: *Albatross* (Rathbun, 1898).

Colombia. Gorgona Island: *St. George* (Finnegan, 1931); *Zaca* (Garth, 1961).

Ecuador. Lat. 01° 07' N, Long. 79° 53' W: *Askoy* (Garth, 1948).

Galapagos Islands. (See Garth, 1946).

Diagnosis: Postlateral corner of carapace spinous. Carapace with elevated tubercles. Posterodistal border of merus of fifth leg unarmed apart from microscopic serrations. A small species.

Description (Adults): This species diverges from the common pattern exhibited by the other western American species, and hence a fuller specific description is given. Carapace moderately broad, pilose, bearing raised granular ridges and with conspicuous tubercular elevations. The following areas with large, paired, almost spiniform tubercles: proto-gastric, metagastric, posterior portion of epibranchial, anterior mesobranchial, and cardiac; mesogastric region with a pair of smaller tubercles. Granular ridges following pattern common to western American species (see p. 16). Postlateral corners with sharp, forwardly directed spines. Front with four low rounded lobes, well advanced beyond inner supraorbital angles; median lobes projecting, deeply separated, but with shallower separation from the broad lateral lobes. Orbital region with inner supraorbital lobes entire; two supraorbital sinuses and one suborbital sinus barely open; suborbital lobe bluntly rounded. Anterolateral teeth: first tooth stout and blunt, remaining teeth increasingly sharp; fifth tooth stouter than fourth or sixth; ninth tooth long, especially in larger males (see *Measurements*). Third maxilliped hirsute, anteroexternal angle of merus not produced laterally. Chelipeds elongate, pilose, under surface with squamiform markings. Anterior border of arm with four spines, distal spine well separated from other three; posterodistal border with a single spine sometimes worn to a tubercle. Wrist with both inner and outer spines well developed. Hand with usual carinae and spine on upper surface. Fingers elongate, finely toothed. Fifth leg with posterodistal border of merus apparently smooth; actually bearing microscopic serrations or tubercles. Male abdomen with ultimate segment triangular, tip pointed, *ca.* one and one-third times as long as broad; penultimate segment with markedly sinuous borders. Male first pleopod sharply curved, short, robust, slightly tapering to an acute tip. Recurved spinules present subterminally on all surfaces (upper, lower, inner, outer), upper row extending back to middle of appendage, under row continuing *ca.* one-third way back as microscopic spinules.

Small specimens: Young differing from adults in having lower frontal lobes and much shorter last anterolateral teeth. Carapace ridges recognizable only in posterior half of carapace; tubercular elevations feebly developed. Postlateral corner spines represented only by a ridge-like elevation.

Material examined: 1,122 specimens from 67 stations (See Table 8). From E of Cabeza Ballena, Gulf of California, Mexico, to off Santa Elena Bay, Ecuador, including Socorro Island, Revilla Gigedo Islands.

For Galapagos Islands see Garth (1946, p. 421). From shore to 35 fathoms (once in 19-48 fathoms).

Measurements: Males from 4.7 x 7.4 (6.3) to 13.8 x 32.4 (22.4) mm, females from 5.1 x 9.3 (7.3) to 10.9 x 22.8 (16.9) mm, ovigerous females from 6.6 x 13.1 (10.1) to 13.9 x 28.7 (21.5) mm, young from 4.3 x 6.9 (5.8) mm.

Color: In life: General color light brown marbled with black; base of lateral spines tinged with crimson. Legs barred cream and brown. Underparts white. (J. Crane, of a Chamela Bay, Mexico, specimen reported in Garth, 1961)

Ecology: Of the 64 stations for which bottom-type data are recorded, 40 per cent were sand, 25 per cent mud, 19 per cent rock, and 16 per cent organic materials (nullipores, corallines, corals, shell, and algae). Shell and nullipores were most frequently found with sand, sand and shell with mud, and nullipores and gorgonids with rock.

Breeding: Ovigerous females from January through April.

Remarks: This species appears not at all closely related to the other western American species of the genus and is possibly related to some of the species of the *Portunus longispinus* "complex" recently considered by Stephenson and Rees (in MS), as evidenced by the following common features:

- (a) Small fourth and sixth anterolateral teeth; large ninth tooth.
- (b) Presence of tuberculate elevations on the carapace.
- (c) Markedly sinuous borders of the penultimate segment of the male abdomen.

Genus *CALLINECTES* Stimpson

Callinectes Stimpson, 1860, p. 220; type species: *C. sapidus* Rathbun, 1896, by designation under the plenary powers (Opinion 712). (See *Bull. Zool. Nomencl.*, 21(5): 336, November, 1964).

Diagnosis: Male abdomen narrow and "⊥"-shaped, *i.e.*, with practically parallel-sided, narrow ultimate and penultimate segments arising from a broad basal area (See Text-Fig. 2a). Anteroexternal angle of merus of third maxilliped produced strongly outwards. Wrist of cheliped without inner spine.

Description: Carapace much broader than long, with mesogastric, metagastric, and epibranchial ridges; postlateral angle smoothly rounded. Front usually four-lobed. Orbital region with two supraorbital fissures; a well developed suborbital tooth. Anterolateral teeth: first stouter than those immediately following; ninth sharp, elongate, directed outwards. Third maxilliped with anteroexternal angle of merus produced strongly outwards. Cheliped with three or four spines on anterior margin of arm and a single small spine at posterodistal extremity. Wrist without inner spine, a single outer spine present. Hand swollen, upper surface with usual spine at wrist articulation and with two carinae, the inner ending in a spine, outer surface with three carinae, inner surface usually with a single carina, under surface smooth. Fifth leg with posterodistal border of merus smooth. Male abdomen narrow, "⊥"-shaped. Male first pleopods usually very long, with fine tips. In western American species, outer distal surface with strong, recurved spines; in two out of three such species, inner surface with long, forwardly directed bristles.

Callinectes arcuatus Ordway

Plate V, Fig. A; Plate VIII, Fig. A; Plate X, Fig. A;
Plate XII, Fig. D.

Callinectes arcuatus Ordway, 1863, p. 578 (type locality: Cape San Lucas). A. Milne Edwards, 1879, p. 228 (var. of *C. diacanthus*). Rathbun, 1896, p. 362, pl. 20; pl. 23, fig. 1; pl. 24, fig. 8; pl. 25, fig. 7; pl. 26, fig. 7; pl. 27, fig. 7; 1898, p. 596; 1910, pp. 537, 577; 1923, p. 621; 1930, p. 121, pl. 52, text-figs. 15h, 16h, 17f, 18g. Nobili, 1897, p. 2; 1901, p. 31. Boone, 1929, p. 564, text-fig. 3. Contreras, 1930, p. 233, text-fig. 5. Hildebrand, 1939, p. 23. Garth, 1948, p. 35; 1957, p. 36; 1960, pp. 110, 116; 1961, p. 141. Buitendijk, 1950, p. 275. Holthuis, 1954a, p. 27; 1954b, p. 161. Bott, 1955, p. 56.

Callinectes pleuriticus Ordway, 1863, p. 578 (type locality: Panama). A. Milne Edwards, 1879, p. 228 (var. of *C. diacanthus*).

Callinectes sp. Smith, 1871, p. 91. Lockington, 1877b, p. 107.

Callinectes nitidus A. Milne Edwards, 1879, p. 228, explanation, pl. 41 (var. of *C. diacanthus*) (type locality: Tanesco, shore of Guatemala, borders of the Esteros). Rathbun, 1896, p. 366.

Callinectes dubia Kingsley, 1879, p. 156 (type locality: Gulf of Fonseca, Nicaragua).

?*Neptunus diacanthus* Brocchi, 1875, p. 54, pl. 16, text-figs. 77-79, 82 (pleopod). Cano, 1889, pp. 90, 99, 100, 102, 211. Doflein, 1899, p. 186 (see also Rathbun, 1910, p. 614). Not *Portunus diacantha* Latreille, 1825.

?*Neptunus (Callinectes) diacanthus* Ortmann, 1893, p. 77 (part: the S. Chile specimen). Not *Portunus diacantha* Latreille, 1825.

Type: Male holotype, USNM No. 61833, length 51.4, width 106.5 (87.5) mm.

Type locality: Cape San Lucas, J. Xantus, collector.

Atlantic analogue: *Callinectes danae* Smith, 1869.

Previous records:

California. Anaheim Slough: Lena Higgins (Rathbun, 1930; Garth, 1960).

Lower California. Manuela Lagoon (Garth, 1960). San Bartolome Bay: *Albatross* (Rathbun, 1896). Turtle Bay: A. W. Anthony (Rathbun, 1930). Magdalena Island: Nelson and Goldman (Rathbun, 1930). Cape San Lucas: J. Xantus (Ordway, 1863; A. Milne Edwards, 1879; Rathbun, 1930).

Gulf of California. Horseshoe Bend, Colorado River: *Albatross* (Rathbun, 1896). Guaymas: H. F. Emeric (Rathbun, 1896); (Garth, 1960). Algodones Lagoon: *Albatross* (Rathbun, 1896). Concepcion Bay, mouth of Rio Mulege: *Albatross* (Rathbun, 1896). Bahia de Santa Barbara; Canjeme; Yavaros; Ahome; Topolobampo; Macapule: M. Cardenas (Buitendijk, 1950). Espiritu Santo Island (Garth, 1960). El Mogote, La Paz (Contreras, 1930). Mazatlan: U. S. Bureau of Fisheries (Rathbun, 1930). San Jose del Cabo: *Albatross* (Rathbun, 1923); A. W. Anthony (Rathbun, 1930).

Mexico, S of Cape Corrientes. Manzanillo: M. Cardenas (Buitendijk, 1950). Chamela Bay, North Lagoon; Acapulco Beach: *Zaca* (Garth, 1961). Acapulco: *Hassler* (Rathbun, 1896).

Guatemala. Tanesco on borders of the Esteros: Bocourt (A. Milne Edwards, 1879; Rathbun, 1930).

El Salvador. W of Boca de Rio Lempa near Isla Tasajera, San Vicente; shore near El Cuco, San Miguel: M. Boseman (Holthuis, 1954a). El Triunfo: Hildebrand and Foster (Rathbun, 1930); Peters (Bott, 1955). El Cutaco [Cutuco?]: Hildebrand and Foster (Rathbun, 1930). La Union, Gulf of Fonseca: *Zaca* (Garth, 1961).

- Honduras. Cutuco and Potosi lights, Gulf of Fonseca: *Zaca* (Garth, 1961).
- Nicaragua. Gulf of Fonseca: J. A. McNeil (Smith, 1871; Kingsley, 1879; Rathbun, 1930). Corinto: *Zaca* (Garth, 1961).
- Costa Rica. Port Parker; Port Culebra; Piedra Blanca; Cedro Island, Gulf of Nicoya; Golfito, Gulf of Dulce: *Zaca* (Garth, 1961). Puntarenas: Ørsted (Rathbun, 1930). Rio Punta Mala: H. Pittier (Rathbun, 1930).
- Panama. Bahia Honda: *Zaca* (Garth, 1961). Balboa, Canal Zone: *Zaca* (Garth, 1961); Meek and Hildebrand (Rathbun, 1930); Miraflores Locks, Canal Zone (Hildebrand, 1939). Bella Vista, Panama City: *Zaca* (Garth, 1961). Panama: A. Agassiz (Ordway, 1863); *Vettor Pisani* (Cano, 1889); MCZ (Rathbun, 1896); C. F. Davis; J. Zetek (Rathbun, 1930). Patillo Point; between Patillo Point and Old Panama: W. G. Van Name (Boone, 1929). Off Taboga Island: *Albatross* (Rathbun, 1898). Taboga Island; island at end of breakwater, Panama Bay; Chame Point: Meek and Hildebrand (Rathbun, 1930). Santelmo Bay, Isla del Rey, Perlas Islands: *Askoy* (Garth, 1948). Rio Sabana, Darien: E. Festa (Nobili, 1897).
- Colombia. Tumaco: E. Festa (Nobili, 1897).
- Ecuador. Santa Elena Bay: E. Festa (Nobili, 1901). Salinas: W. L. Schmitt (Rathbun, 1930). Puerto Bolivar: *Zaca* (Garth, 1961).
- Peru. Tumbes: R. E. Coker; Paita, W. L. Schmitt; Pacasmayo: Stolzman (Rathbun, 1930).
- Chile. Chile: Paris Mus. (A. Milne Edwards, 1879). ?South Chile: Pöhl (Ortmann, 1893).

Diagnosis: Carapace moderately finely granular, regions distinct but less so than in *Callinectes toxotes*. Intramedial area shorter than its posterior width. Median frontal teeth triangular, *ca.* one-third length of laterals. Male first pleopods reaching or nearly reaching ultimate segment of abdomen.

Description: Carapace convex, surface moderately finely granular, regions well marked; branchial regions slightly swollen, two distinct areas at inner anterior angles; cardiac region incompletely subdivided by median furrow; intramedial area shorter than its posterior width.

Front with four triangular teeth, medians *ca.* one-third length of laterals; submedian tooth extending well beyond front. Orbital region with inner supraorbital lobes square-cut and with a short ridge; inner supraorbital fissure closed. Suborbital tooth prominent, obtusely angled. Anterolateral teeth all stout; first four blunt, fifth to seventh reasonably sharp, eighth tooth sharp, ninth moderately long, *ca.* two and one-half times length of eighth. Chelipeds with carinae of hand moderately coarsely granular. Male abdomen with border of penultimate segment at most slightly concave, proximal half usually broader than distal; ultimate segment *ca.* one and one-half times as long as broad, *ca.* one-third length of penultimate, borders concave, tip pointed. Male first pleopod very long and thin, reaching or almost reaching ultimate abdominal segment, smoothly curving with elongate, shallow, flared tip bent slightly inwards; inner surface with subterminal row of long, forwardly directed bristles, as many as 12 clearly visible in profile view, becoming shorter and thinner distally and gradually disappearing; outer surface with very short, stout recurved spines beginning proximal to inner row of bristles and continuing to middle of appendage.

Material examined: 256 specimens from 65 stations (See Table 9). From Los Angeles Harbor, California, and Rio Hardy (Rio Colorado), Gulf of California, Mexico, to off Puerto Pizarro, Peru, and from shore to 15 fathoms. Galapagos Islands.

Measurements: Males from 9.0 x 19.1(15.2) to 51.3 x 111.5(89.4) mm, females from 9.6 x 21.0(15.8) to 43.3 x 98.5(74.8) mm, ovigerous females from 22.9 x 51.9 (39.2) to 40.3 x 82.0(68.3) mm, young from 6.9 x 15.4(11.4) mm.

Color: In life: Carapace dull olive gray-green. Chelipeds olive green dorsally, whitish ventrally, washed with bluish-violet and chelae tipped with pale yellow-brown. Legs turquoise washed with olive; hairs straw gold; swimming legs olive green with suggestion of turquoise, paddles washed with black; hairs straw; tubercles at leg joints golden orange; eyes straw with brownish streaks; underparts pure white. (J. Crane, of a male from Port Parker, Costa Rica, reported by Garth, 1961).

In alcohol: Distal third of dactylus of fifth leg sooty black.

Ecology: Of the 13 collections for which habitat is available, over half specify sand or mud bottom, while the remainder give oyster beds, lagoons, estuaries, small channels among mangroves, or seining at mouth

of slough as typical occurrences. Only once did *Callinectes arcuatus* come to light, as contrasted with eight times for *C. bellicosus*.

Breeding: Ovigerous females from months of March, April, July, August, and September.

Remarks: As a result of recent activities of the Galapagos International Scientific Project (GISP), in which Dr. Victor A. Zullo participated, *Callinectes arcuatus* may now be reported from the Galapagos Islands at Academy Bay.

Callinectes bellicosus (Stimpson)

Plate V, Fig. B; Plate VIII, Fig. B; Plate X, Fig. B; Plate XII, Fig. E.

Lupa bellicosa (Sloat, MS) Stimpson, 1859, p. 57 (type locality: Guaymas, Gulf of California). ?Lockington, 1877b, p. 105.

Callinectes bellicosus Ordway, 1863, p. 577. Streets and Kingsley, 1877, p. 107. A. Milne Edwards, 1879, p. 227 (var. of *C. diacanthus*). Rathbun, 1896, p. 365, pl. 22; pl. 24, fig. 10; pl. 25, fig. 8; pl. 26, fig. 8; 1898, p. 596; 1904, p. 180; 1923, p. 621; 1924a, p. 374; 1926, p. 75; 1930, p. 112, pl. 49, text-figs. 15k, 16i, 17g, 20. Holmes, 1900, p. 73. Schmitt, 1921, p. 236, text-fig. 140. Crane, 1937, p. 68. Meredith, 1939, p. 108, figure. Steinbeck and Ricketts, 1941, p. 468, pl. 14, fig. 2. Buitendijk, 1950, p. 275. Garth, 1960, pp. 109, 114, 116. ?Contreras, 1930, pp. 228, 240, text-fig. 11.

Callinectes ochoterenai Contreras, 1930, pp. 227, 229, text-figs. 2, 3A-C (type localities: La Paz and Punta Arena, Guaymas, Gulf of California).

Type: Not extant. Nor are sex or measurements provided by Stimpson.

Type locality: Guaymas, Gulf of California; Capt. C. P. Stone, collector.

Atlantic analogue: No clear Atlantic analogue; related to *Callinectes sapidus acutidens* Rathbun, 1895, and possibly *C. bocourti* A. Milne Edwards, 1879.

Previous records:

California. San Diego: C. R. Orcutt (Rathbun, 1930; Garth, 1960).

Point Loma: Miss Cook (Holmes, 1900).

Lower California. Santo Domingo: C. R. Orcutt (Rathbun, 1930).

Scammon Lagoon (Garth, 1960). San Bartolome Bay: *Albatross*

(Rathbun, 1896). Turtle Bay: A. W. Anthony (Rathbun, 1930). Abreojos Point; Ballenas Bay: *Albatross* (Rathbun, 1923). Magdalena Bay: W. J. Fisher (Lockington, 1877b); *Albatross* (Rathbun, 1896); Hanna and Jordan (Rathbun, 1930). Cape San Lucas (A. Milne Edwards, 1879).

Gulf of California. Shoal Point, Colorado River: *Albatross* (Rathbun, 1896). Pinacate Bay (Ordway, 1863). San Felipe (Garth, 1960). George Bay; San Luis Gonzales Bay: *Albatross* (Rathbun, 1896). Angeles Bay: F. Baker and I. M. Johnston (Rathbun, 1924a); Cal. Acad. Sci. (Rathbun, 1930). Puerto San Carlos (Steinbeck and Ricketts, 1941; Garth, 1960). Guaymas: C. P. Stone (Stimpson, 1859); *Albatross* (Rathbun, 1896); P. J. Jouy (Rathbun, 1930); M. Cardenas (Buitendijk, 1950). Punta Arena, Guaymas (Contreras, 1930). Concepcion Bay: *Albatross* (Rathbun, 1896); (Steinbeck and Ricketts, 1941). Ricason I., Concepcion Bay: *Albatross* (Rathbun, 1923). Off Santa Inez Point: *Zaca* (Crane, 1937). Mulege, at mouth of river: *Albatross* (Rathbun, 1923). Agiabampo (Steinbeck and Ricketts, 1941). Ahome: M. Cardenas (Buitendijk, 1950). Carmen I.: *Albatross* (Rathbun, 1896). Agua Verde Bay: *Albatross* (Rathbun, 1923). Topolobampo: M. Cardenas (Buitendijk, 1950). San Josef [= San José] I.: *Albatross* (Rathbun, 1896). San Gabriel Bay, Espiritu Santo I.: *Velero III* (Meredith, 1939). La Paz: *Albatross*: L. Belding (Rathbun, 1896); (Contreras, 1930); (Steinbeck and Ricketts, 1941); M. Cardenas (Buitendijk, 1950). Pichilique Bay: *Albatross* (Rathbun, 1898).

Pleistocene fossil. California. Signal Hill—Los Cerritos (Rathbun, 1926).

Diagnosis: Carapace finely granular, regions relatively indistinct. Intramedial area shorter than its posterior width. Median frontal teeth rudimentary, laterals spiniform; these with well developed submedian tooth give appearance of a 3-toothed front. Male first pleopods reaching distal quarter of penultimate segment of abdomen.

Description: Carapace smoothly convex and finely granular, granules larger towards anterior and anterolateral borders; branchial regions not swollen; cardiac region not subdivided by median furrow; intramedial area shorter than its posterior width. Front with lateral teeth spiniform in adults, rounded in young, medians rudimentary; submedian tooth extending well beyond front, giving front a 3-toothed appearance. Orbital

region with inner supraorbital lobes bearing a short ridge ending in a tooth; inner supraorbital fissure open. Suborbital tooth prominent, sharp in adults. Anterolateral teeth all sharp; first large, second to eighth increasing in width; ninth relatively short, *ca.* twice length of eighth in adults, longer (*ca.* three and one-half times) in smaller specimens. Chelipeds with carinae of upper and outer surface of hand smooth or finely granular, otherwise separating upper and outer surfaces with large, sharp granules; inner surface with barely recognizable carina. Male abdomen with border of penultimate segment concave, narrowest part near middle; ultimate segment *ca.* one and one-half times as long as broad, *ca.* one-third length of penultimate, borders convex, tip rounded. Male first pleopod long, thin, especially near tip, not quite reaching ultimate segment of abdomen, sinuously curved, and with tip scarcely flaring; inner surface bearing, well back from tip, from four to eight moderately long, forwardly directed bristles; outer surface with recurved spines beginning well forward of bristles of inner surface and continuing about one-third way down appendage.

Material examined: 189 specimens from 57 stations (See Table 10). From San Quintin Bay, west coast of Lower California, and Cholla Bay, Gulf of California, to La Paz Bay, west side, and Santa Barbara Bay, east side, Gulf of California, Mexico, from shore to 10 fathoms.

Measurements: Males from 13.5 x 30.7(22.6) to 80.8 x 154.5 (138.5) mm, females from 10.0 x 22.9(17.8) to 72.2 x *ca.* 140 (122.4) mm, ovigerous females from 57.3 x 108.4(95.1) to 65.5 x 123.0(108.7) mm, young from 6.3 x 14.0 (10.4) mm. Young smaller than this difficult to identify to species.

Color: In life: Carapace mottled greenish yellow to brownish green, sometimes with dark spot on center of orbit and dark green areas roughly outlining epibranchial ridge. Arms generally greenish yellow to greenish brown, wrist articulations purple red. Hand with blotch at level of finger articulation, this blue-green in smaller and purple in larger specimens. Similar internal blotch purple throughout. Inner surface hand and fingers centrally white to pale blue, dorsally purple to red-purple, and ventrally blue to purple-blue. Cheliped colors most vivid in largest male. (W. Stephenson, based on 2 males, 2 females, and 6 young from Las Animas Bay and off SE end of Tiburon Island, Gulf of California, R. Lavenberg, collector).

Ecology: Intertidally to 10 fathoms. Of the 16 instances in which circumstances of capture were recorded, the crabs were swimming at the surface, attracted to light, in 50 per cent. Sand bottom only (no mud) was reported for this species, which was taken also in lagoons and oyster pens.

Breeding: Only one collection (Scammon Lagoon, Lower California, September) contains ovigerous females.

Remarks: Because the median frontal teeth are rudimentary and the submedian tooth is large and on almost the same plane as the lateral teeth, this species could be described as three-toothed. On this basis Contreras (1930) erected a new species, *Callinectes ochoterenai*, here considered a synonym of *C. bellicosus*. The identity of Contreras's *C. bellicosus* is doubtful pending reexamination of his specimens. The proportions of the intramedial area and the carapace granulation shown in his photograph (*op. cit.*, fig. 11) are suggestive of *C. toxotes*, but if so, his record from La Paz, Gulf of California, would be the most northerly so far obtained.

Callinectes toxotes Ordway

Plate V, Fig. C; Plate VIII, Fig. C; Plate X, Fig. C;
Plate XII, Fig. F.

?*Callinectes diacanthus* Stimpson, 1860, p. 220. Not *Portunus diacanthus* Latreille, 1825, p. 190.

Callinectes toxotes Ordway, 1863, p. 576 (type locality: Cape San Lucas). A. Milne Edwards, 1879, p. 227 (var. of *C. diacanthus*). Rathbun, 1896, p. 363, pl. 21; pl. 24, fig. 9; pl. 25, fig. 9; pl. 26, fig. 9; pl. 27, fig. 8; 1910, pp. 536, 577, pl. 55; 1930, p. 127, pl. 54, text-figs. 15i, 16g, 17i, 18h. Contreras, 1930, p. 237, text-fig. 8. Garth, 1948, p. 35; 1957, p. 37; 1961, p. 142. Holthuis, 1954a, p. 27; 1954b, p. 161. Bott, 1955, p. 56.

?*Lupa dicantha* Lockington, 1877b, p. 106. Not *Portunus diacanthus* Latreille, 1825.

Callinectes robustus A. Milne Edwards, 1879, p. 227 (var. of *C. diacanthus*) (type locality: Colombia).

?*Callinectes bellicosus* Contreras, 1930, pp. 228, 240, text-fig. 11. Not *Lupa bellicosa* Stimpson, 1859, p. 57.

Type: Male syntype, USNM No. 2413, length 89, width 189(158) mm; 2 males, syntypes, MCZ No. 5182; male syntype, MCZ No. 5183.

Type locality: Cape San Lucas, J. Xantus, collector.

Atlantic analogue: No clear analogue. Related to *Callinectes bocourti* A. Milne Edwards, 1879, and *C. sapidus acutidens* Rathbun, 1895.

Previous records:

Lower California. Cape San Lucas: J. Xantus (Ordway, 1863).

Mexico, S of Cape Corrientes. Acapulco: *Hassler* (Rathbun, 1896); (Contreras, 1930).

El Salvador. Barra Ciega, Acajutla: Felton; La Libertad: Zilch (Bott, 1955). La Paz, Herradura: G. Kruseman (Holthuis, 1954a). La Union: Peters, Schuster (Bott, 1955).

Costa Rica. Boca Jesus Maria: J. F. Tristan; San Domingo, Gulf of Dulce: H. Pittier (Rathbun, 1930). Piedra Blanca; Golfito, Gulf of Dulce: *Zaca* (Garth, 1961).

Panama. Corozal; Chame Point; Rio Chorrera: Meek and Hildebrand (Rathbun, 1930).

Colombia, Tumaco: *Askoy* (Garth, 1948). Not precisely located: Andre (A. Milne Edwards, 1879).

Ecuador. Guayaquil: J. Orton (Rathbun, 1896). Salada, Guayaquil; purchased in Guayaquil market; Punta Salinas: W. L. Schmitt (Rathbun, 1930).

Peru. Mouth of Rio Tumbes: R. E. Coker (Rathbun, 1910).

Chile. Juan Fernandez Island: W. L. Schmitt (Rathbun, 1930).

Diagnosis: Carapace coarsely granular, markedly convex, regions distinct. Intramedial area longer than its posterior width. Frontal teeth rounded, medians about half length of laterals. Male first pleopods nearly reaching end of ultimate segment of abdomen.

Description: Carapace markedly convex, coarsely granular, with well marked regions. Branchial regions swollen, two distinct lobes at inner anterior angles. Cardiac region with two distinct lobes separated by median furrow. Intramedial area longer than its posterior width. Front four-lobed, lobes rounded, medians about half length and half breadth of laterals; submedian tooth not prominent. Orbital region with inner supraorbital lobes low and smoothly rounded; inner supraorbital fissure almost closed. Suborbital tooth prominent and obtusely rounded. Antero-lateral teeth: first stout and blunt, second to fourth rounded and blunt,

fifth to eighth increasing in length and sharpness; ninth long, *ca.* thrice length of eighth in adults, *ca.* two and one-half times in young. Chelipeds with carinae of upper and outer surface of hand fairly coarsely granular; inner surface with finely granular carina. Male abdomen with border of penultimate segment concave, narrowest part near proximal end; ultimate segment *ca.* twice as long as broad, *ca.* half length of penultimate, tip rounded. Male first pleopod long and thin, especially near tip, reaching middle of ultimate segment of abdomen, sinuously curved, tip not flaring visibly. Inner surface bare subterminally but usually with 3-6 hairs or bristles near middle of appendage; outer surface with short recurved spines extending to middle of appendage; upper surface with sparsely arranged short hairs, sometimes restricted to subterminal area, sometimes extending half way down appendage.

Material examined: 17 specimens from 11 stations (See Table 11). From 11 miles NW of Corinto, Nicaragua, to San Francisco Bay, Ecuador, 0-15 fathoms.

Measurements: Males from 12.4 x 22.3(20.2) to 88.8 x 188(154) mm; females from 23.9 x 44.4(39.0) to 68.2 x 144.9(115.0) mm; ovigerous females 66.9 x 142.8(114.2) mm.

Ecology: Shore to 15 fathoms, including "fresh" and brackish water.

Breeding: The single ovigerous female is from the month of January.

Remarks: See under *Callinectes bellicosus*.

Genus ARENAEUS Dana

Arenaeus Dana, 1851, p. 130; type species: *A. cribrarius* (Lamarck, 1818).

Euctenota Gerstaecker, 1856, p. 131; type species: *E. mexicana* Gerstaecker, 1856.

Diagnosis: Close to *Callinectes*. Palate smooth, without longitudinal ridge; two supraorbital fissures broadly open and V-shaped; suborbital fissure so broadly open as to be barely recognizable; nine anterolateral teeth, the first eight long and broad, the ninth long; first abdominal segment in both sexes with spiniform margins.

Description: Carapace broad, microscopically granular; regional boundaries, apart from cervical grooves, indistinct. Mesogastric ridges

present but not conspicuous. Postlateral angle smoothly rounded. Front either 2- or 4-toothed. Orbital region with inner supraorbital angle entire; supraorbital fissures broad and deep, intervening region forming a square tooth; border of median to inner fissure forming another dentiform process. Suborbital border transverse, becoming narrow near first anterolateral tooth, suborbital fissure barely recognizable; orbit widely open. Suborbital region densely hirsute. Anterolateral teeth: first five long, broad and blunt; sixth to ninth increasingly sharp; ninth tooth elongate, directed outwards. Third maxilliped with anteroexternal angle of merus not produced laterally. Chelipeds subequal, smooth, with swollen, carinated palm. Arm with three spines on anterior border, distal spine longest and stoutest and situated well back from wrist articulation; tubercles but no spines on posterior border. Wrist with usual inner spine and three tubercles or spines on anteroexternal border. Hand short, stout, swollen, carinated; upper surface with two carinae, innermost ending in a spine; outer surface with three carinae, lowest continuing along immovable finger; under surface smooth or microscopically granular; spine at wrist articulation curved, well developed; immovable finger projecting beyond movable finger as a sharp, upwardly curved tooth. Walking legs moderately long; inner side of carpus, propodus, and dactylus fringed with hairs; posterodistal border of merus of fifth leg smooth. Male abdomen elongate, ultimate segment cordiform in smaller specimens but with concave borders and attenuated tip in larger specimens; distal half of penultimate segment almost parallel-sided. Male first pleopods very elongate and slender, in large specimens extending well beyond midpoint of ultimate abdominal segment. [Based upon features common to the type species from the Atlantic, *Arenaeus cribrarius* (Lamarck), and the Pacific species, *A. mexicanus* (Gerstaecker)]

***Arenaeus mexicanus* (Gerstaecker)**

Plate V, Fig. D; Plate VIII, Fig. D; Plate X, Fig. D;
Plate XII, Fig. B.

Euctenota mexicana Gerstaecker, 1856, p. 131, pl. 5, figs. 3, 4 (type locality: Mexico).

Arenaeus bidens Smith, 1871, p. 90 (type locality: Corinto, Nicaragua).
Lockington, 1877b, p. 107.

Neptunus mexicanus A. Milne Edwards, 1879, p. 212, pl. 42, figs. 3, 3a-e.

Neptunus (Neptunus) mexicanus Miers, 1886, p. 172.

Neptunus cribrarius Cano, 1889, pp. 90, 102, 213. Not *Portunus cribrarius* Lamarck, 1818.

Arenaeus mexicanus Faxon, 1895, p. 22. Rathbun, 1910, pp. 537, 577, pl. 37, fig. 2; 1923, p. 620; 1930, p. 137, pl. 58, fig. 1; pl. 61. Schmitt, 1939, p. 9. Garth, 1948, p. 35; 1960, pp. 114, 116; 1961, p. 142. Holthuis, 1954a, p. 28; 1954b, p. 161.

Type: Male holotype, length 33, width 74 mm, in Berlin Museum (No. 301).

Type locality: Mexico; collector unknown, *vide* H. E. Gruner.

Atlantic analogue: *Arenaeus cribrarius* (Lamarck, 1818).

Previous records:

Lower California. Santa Maria Bay (Garth, 1960). Magdalena Bay: San Diego Soc. Nat. Hist. (Rathbun, 1930). Cape San Lucas: Presidential Cruise (Schmitt, 1939). San Lucas Bay: *Zaca* (Garth, 1961).

Gulf of California. Tepoca Bay (Garth, 1960). Puerto Escondido (Garth, 1960). Carmen Island: *Albatross* (Rathbun, 1930).

Mexico, S of Cape Corrientes. Chamela Bay, lagoon shore and Passavera Island; Acapulco beach; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961).

El Salvador. Near El Cuco, San Miguel: Boeseman (Holthuis, 1954a).

Nicaragua. Corinto: J. A. McNeil (Smith, 1871; Rathbun, 1930). Corinto; San Juan del Sur: *Zaca* (Garth, 1961).

Costa Rica. Cocos Island: *Albatross* (Faxon, 1895; Rathbun, 1930). Potrero Grande Bay; Murcielago Bay; Piedra Blanca Bay; Cedro Island and Ballenas Bay, Gulf of Nicoya; Uvita Bay: *Zaca* (Garth, 1961).

Panama. Gulf of Panama: *Vettor Pisani* (Cano, 1889). Taboga Island: Meek and Hildebrand (Rathbun, 1930). Isla Parida, Gulf of Chiriqui; Bahia Honda; Pacheca Island, Pearl Islands: *Zaca* (Garth, 1961).

Colombia. Cueva Bay: *Askoy* (Garth, 1948). Gorgona Island: *Zaca* (Garth, 1961).

Ecuador. Lat. 01° 07' N, Long. 79° 53' W; La Plata Island: *Askoy* (Garth, 1948).

Peru. Ancon: R. E. Coker (Rathbun, 1910). Salaverry: W. L. Schmitt (Rathbun, 1930). Immediately S of Callao: Mrs. Sherman P. Haight (Garth, 1961).

Diagnosis: The two species of the genus, *Arenaeus cribrarius* and *A. mexicanus*, resemble each other so closely that diagnosis and description are combined.

Description: Carapace with regions relatively distinct, inner branchial lobe discernible; metagastric ridge often not recognizable, center of metagastric area with small tubercle in adults. Front with two rounded teeth. Orbital region with inner supraorbital lobes angled rather than rounded; tooth between two supraorbital fissures long and narrow. Anterolateral teeth: sixth to eighth relatively elongate. Cheliped with outer spine or tubercle of wrist relatively small. Male abdomen with distal margins of penultimate segment conspicuously rounded; ultimate segment with markedly attenuated tip. Male first pleopod with very long, thin tip bearing a spoon-shaped flare. No subterminal armature on inner or outer surfaces, but a regular row of bristles on center of under surface.

Material examined: 470 specimens from 52 stations (See Table 12). From Marquis Point, west coast of Lower California, and Point Piactla, Gulf of California, Mexico, to Paracas Peninsula, Peru, and from shore to 50 fathoms.

Measurements: Males from 5.7 x 12.2(10.2) to 35.6 x 82.0 (61.8) mm, females from 7.9 x 17.2(12.7) to 28.3 x 62.5(48.7) mm, ovigerous females 25.1 x ca. 60(43.4) and 25.5 x 58.2(42.5) mm, young from 4.2 x 7.2(5.9) mm.

Color: In life: Ground color of carapace light cress green becoming lighter and with brownish tinge on branchial regions. Entire carapace almost covered with numerous pale cinnamon pink spots. Anterolateral teeth bluish with white tips. Ambulatory legs pale grayish blue violet, bordered with blue and pale olive green; paddles of fifth leg citron yellow. Ventral surface light cream, almost white. (A. Petersen, of a specimen from Chacahua Bay, Mexico)

All mottled, gray and black, spotted with white. Underside of legs and carapace, except abdomen, speckled with black. Chelipeds and legs grayish spotted with black. Two conspicuous black spots on carapace, one on each side of mid-gastric region. (J. Crane, of San Lucas Bay specimens reported by Garth, 1961)

Olive-tinged pepper-and-salt with bright white spot in middle of posterior gastric region and another on intestinal region. (J. Crane, of Chamela Bay, Mexico, specimens reported by Garth, 1961)

In alcohol: Light marks on carapace larger and less numerous than in *Arenaeus cribrarius*. Young with single dark patch in each anterior mesobranchial area.

Ecology: Shore to 22 fathoms usually; once to 50 fathoms. Attracted to sub-surface light. Of the 29 stations for which bottom type was specified, 55 per cent were sand, 27.5 per cent mud, 6.5 per cent rock, and 10.5 per cent organic matter. Such organic constituents as shell, nullipores, and seaweed were frequent concomitants of sand and mud.

Breeding: Only two ovigerous females in the months of March and May.

Remarks: A large male from Gulf of Dulce, Costa Rica (Station 939-39) has an additional anterolateral tooth near the base of the normal ninth tooth.

Genus **CRONIUS** Stimpson

Cronius Stimpson, 1860, p. 225; type species: *C. ruber* (Lamarck, 1818).

Charybdella Rathbun, 1897, p. 166 (for *Cronius*, preoccupied under rule then valid).

Diagnosis: Differing from all other western American portunids in having large anterolateral teeth alternating with very distinctly smaller teeth in the adult; carapace not very broad.

Description: Carapace relatively narrow, hirsute, bearing granular ridges; of these mesogastrics, metagastrics, and epibranchials conspicuous. A broad gap between metagastrics and epibranchials. Front four-lobed or four-toothed, separated by a deep fissure from inner supra-orbital angles. Orbital region with two fissures in supraorbital border, one fissure in suborbital. Anterolateral teeth nine, with first, third, fifth, seventh, and ninth large and second, fourth, sixth, and eighth distinctly smaller than their nearest neighbors. Chelipeds robust, hirsute, spinous, with six obvious, granular carinae. Under surface with squami-form markings. Anterior border of arm with three or four large spines. Upper carinae of inner surface of hand unrecognizable, or barely so. Male abdomen with ultimate segment triangular. Male first pleopod

smoothly curving, without flared subterminal membrane. (Based upon a comparison of an extensive series of *Cronius ruber*, with two collections only of *C. tumidulus*, and upon the literature.)

A discussion of the distinctness of *Cronius* from *Charybdis* de Haan, 1833, will be found following a comparison of the most closely related species of each, *Cronius ruber* and *Charybdis erythroductyla*. (See *Remarks* under *Cronius ruber*.)

Cronius ruber (Lamarck)

Plate IV, Fig. D; Plate VIII, Fig. E; Plate X, Fig. E;
Plate XII, Fig. C.

Portunus ruber Lamarck, 1818, p. 260 (type locality: Brazil).

Lupea rubra H. Milne Edwards, 1834, p. 454.

Cronius ruber Stimpson, 1860, p. 225. A. Milne Edwards, 1879, p. 232. Miers, 1886, p. 188. Nobili, 1897, p. 2; 1901, p. 32. Rathbun, 1923, p. 621; 1924b, p. 159; 1930, p. 139, pls. 62, 63. Boone, 1927, p. 182, text-fig. 62. Finnegan, 1931, p. 630. Sivertsen, 1933, p. 13. Schmitt, 1933, p. 17 (figured). Glassell, 1934, p. 454. Meredith, 1939, p. 108 (figured). Garth, 1946, p. 422, pl. 72, figs. 3, 4; 1948, p. 36; 1960, p. 116; 1961, p. 143; 1965, p. 15. Holthuis, 1954a, p. 28, text-fig. 10; 1954b, p. 161. Guinot-Dumortier, 1959, p. 514, text-fig. 15 (pleopod).

Achelous ruber A. Milne Edwards, 1861, p. 345, pl. 33, figs. 1, 1a-b.

Goniosoma millerii A. Milne Edwards, 1869, p. 54, pl. 18, figs. 1-3 (type locality: Cape St. Vincent, Cape Verde Islands).

Amphitrite edwardsii Lockington, 1877a, p. 43 (type locality: Mazatlan); 1877b, p. 106.

Cronius milleri A. Milne Edwards, 1879, p. 232.

Cronius edwardsii A. Milne Edwards, 1879, p. 232. Rathbun, 1910, p. 578.

Cronius edwardsi Bouvier, 1895, p. 8.

Charybdella rubra Rathbun, 1900, p. 139.

Charybdella edwardsii Rathbun, 1910, p. 611.

Type: Not located, *vide* Rathbun (1930).

Type locality: Brazil.

Atlantic analogue: The species itself occurs on both the American and African sides of the Atlantic Ocean. A second species, *Cronius tumidulus* (Stimpson, 1871), is found in the western Atlantic only.

Previous records (from western America only):

Lower California. Cedros Island (Garth, 1960). Point San Bartolome: *Albatross* (Rathbun, 1923). Lower California: L. Diguët (Bouvier, 1895).

Gulf of California. Guaymas (Garth, 1960). Mazatlan: H. Edwards (Lockington, 1877a, 1877b). Maria Madre Island, Tres Marias Islands: Hanna and Jordan: Sec. Agr. y Fomento (Rathbun, 1930).

Mexico, S of Cape Corrientes. Chamela Bay; Manzanillo; Port Guatulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961). Acapulco: MCZ (Rathbun, 1930). Clipperton Island: C. Limbaugh (Garth, 1965).

El Salvador. San Salvador: J. M. Dow (Rathbun, 1930). Near El Cuco, San Miguel: Boeseman (Holthuis, 1954a).

Honduras. Cutuco and Potosi lights, Gulf of Fonseca: *Zaca* (Garth, 1961).

Costa Rica. Port Parker, Arriba Rocks; Port Culebra; Piedra Blanca: *Zaca* (Garth, 1961). Punta Arenas: P. Biolley (Rathbun, 1930).

Panama. Bahía Honda: *Zaca* (Garth, 1961). Panama: Sternbergh (Stimpson, 1860); J. M. Dow (Rathbun, 1930). Panama City: J. Zetek; Meek and Hildebrand (Rathbun, 1930). Darien: E. Festa (Nobili, 1897). Naos Island: G. M. Gray (Rathbun, 1930). Isla Saboga, Perlas Islands; Guayabo Chiquito: *Askoy* (Garth, 1948).

Colombia. Gorgona Island: *St. George* (Finnegan, 1931). Gorgona and Gorgonilla islands: *Zaca* (Garth, 1961).

Ecuador. Lat. 01° 07' N, Long. 79° 53' W; La Plata Island: *Askoy* (Garth, 1948). Santa Elena Bay: E. Festa (Nobili, 1901). Salinas: W. L. Schmitt (Rathbun, 1930). Galapagos Islands (see Garth, 1946, p. 422).

Peru. Paita: W. L. Schmitt (Rathbun, 1930).

Diagnosis: Outer surface of wrist with three spines. Posterior border of merus of fifth leg with a stout spine. Inner supraorbital angle clearly subdivided, inner process spinous.

Description: (Generic features not repeated). Carapace moderately narrow. Mesogastric ridges biarcuate; cardiac ridges and single mesobranchial ridge at most faintly recognizable. Front with teeth sharp in adults, medians broader than laterals. Orbital region with inner supra-orbital angle conspicuously divided into sharp inner and broader outer process; main suborbital tooth stout and projecting; a dentiform process just lateral to suborbital fissure. Basal antennal article bearing a sharp spine. Anterolateral teeth: all smaller (even numbered) teeth approximately same size and all teeth long and sharp. Third maxilliped bearing coarse matted hairs; anteroexternal angle of merus produced slightly laterally. Chelipeds with anterior border of arm bearing a small distal spine. Posterodistal border with small spine, sometimes worn to a tubercle. Outer surface of wrist with three usual spines. Hand relatively long; of four spines on upper surface, one at wrist articulation, two on inner carina, one on outer carina; outer carina of upper surface strongly developed. Fingers elongate and sharp. Fifth legs with posterior border of merus bearing a strong spine and posterior border of propodus microscopically serrated. Male abdomen relatively broad; penultimate segment about two-thirds as long as broad, and with smoothly curving margins; ultimate segment about as long as broad. Male first pleopod robust, bearing abundant stout, recurving spines, not spinules, extending well down appendage; inner surface with a few subterminal hairs.

For purposes of comparison, the following situation obtains with *Cronius tumidulus* (Stimpson): Carapace narrower; mesogastric ridges almost straight; cardiac ridges distinct; two distant mesobranchial ridges. Front rounded, laterals broader than medians. Orbital region barely and obscurely divided; main suborbital tooth rounded. Basal antennal article bearing a rounded tubercle. Anterolateral teeth: second tooth relatively large, followed by fourth, with sixth and eighth teeth distinctly small; first and second teeth stout and relatively blunt. Third maxilliped bearing fine hairs; anteroexternal angle of merus not produced laterally. Cheliped with outer surface of wrist bearing a single spine. Hand with two spines on upper surface, one at wrist articulation and one on inner carina. Fingers short and blunt. Fifth legs with posterior border of merus without a spine but spinulose; posterior border of propodus smooth. Male abdomen narrower, penultimate segment as long as broad and with sinuous margins; ultimate segment one and one-half times as long as broad.

Young specimens: Inner projections of supraorbital lobes merging into lobes generally, frontal lobes rounded. Fourth, sixth, and eighth anterolateral teeth reduced to rudiments, second tooth subsidiary projection of first. Carapace narrow (see *Measurements*.)

Material examined: 177 specimens from 48 stations (See Table 13). From South Bay, Cedros Island, west coast of Lower California, and from S shore, Tiburon Island, Gulf of California, Mexico, to 9.5 miles SW of Zorritos Light, Peru. For Galapagos Islands records see Garth (1946, p. 422). From shore to 35 fathoms.

Measurements: Males from 10.0 x 14.1 (12.9) to 53.6 x 79.3 (72.3) mm, females from 9.1 x 13.5 (11.9) to 34.0 x 53.3 (49.6) mm, ovigerous females from 17.6 x ca. 28 (ca. 24.5) to 34.2 x 54.8 (48.3) mm, young from 4.4 x 6.1 (5.6) mm.

Color: In life: Dark purplish-black; pile dark buff; ridges and carapace and legs dark purplish-red and purplish-blue. Same color on abdominal crests. Swimmerets rusty orange. Chelae dark purple. Under side white with buffy pile, except carpus, manus, and dactylus of legs, which are like upper parts of same. Eggs buffy orange. (J. Crane, of Gulf of Fonseca female reported by Garth, 1961)

In alcohol: Dull reddish orange with dark near and light on tips of all spines. Fingers of chelipeds dark purple with white tips.

Ecology: Of the 25 collections for which information on bottom type is available, 28 per cent were sand, 24 per cent rock, and 32 per cent organic bottom (coralline algae, nullipores, gorgonians, and shell). Of these, shell and nullipores were often present with sand, gorgonians and nullipores with rock. Mud bottom and shingle beach accounted for 8 per cent each of the remainder.

Breeding: Ovigerous females in February and March.

Remarks: In view of the close relationship that exists between *Cronius* and *Charybdis* de Haan, as mentioned under the subfamily Portuninae, and particularly between *Cronius ruber* and *Charybdis erythro-dactyla* Lamarck) (see Leene, 1938, p. 135, fig. 77) as the geographically most proximate species, the former found in the Galapagos Islands, the latter in Hawaii, an enumeration of the similarities and differences of these two species is deemed in order. The following are their common features:

Carapace hexagonal, only moderately broad, fairly convex, and bearing the following ridges: mesogastrics, metagastrics, and epibranchials (plus others different in the two species); postlateral corner smoothly rounded. Front four-toothed (considering process lateral to the four teeth as inner subdivision of inner supraorbital angle), teeth of approximately equal size, deeply separated from inner supraorbital angles. Orbital region with inner supraorbital angles clearly subdivided into a narrower, sharper inner lobe and a broader, blunter outer lobe; two supraorbital fissures, and a deep suborbital fissure with a distinct lateral tooth; main suborbital tooth well developed. Anterolateral teeth: first five teeth alternately large and small. Third maxillipeds with a slight production of the anteroexternal angle of the merus. Chelipeds massive; anterior border of arm with massive spines; wrist with inner spine strong and three spines or spinules on outer surface; hand with six distinct costae, inner costa of upper surface bearing two stout spines. Fifth leg with posterior border of merus bearing a stout spine; posterior border of propodus minutely serrated. Male abdomen with ultimate segment triangular, tip rounded.

The following are their differences (those marked with an asterisk apply to some species of *Charybdis* other than *C. erythrodactyla* also):

Carapace with protogastric ridge replaced in *Cronius ruber* with diffusely granular areas; a broad gap between metagastric and epibranchial ridges; faint cardiac and (single) mesobranchial ridges sometimes detectable*. Basal antennal article bearing spine, not touching front, therefore not excluding flagellum from orbit*. Anterolateral teeth nine, not seven; in the young, five recognizable. Chelipeds with all main carinae of hand strongly granular, not smooth; under surface of hand with squamiform markings; four spines, not five, on upper surface of hand*. Male abdomen with penultimate segment with gradually converging sides, not with proximal half nearly parallel-sided. Male first pleopod smoothly curved, not sinuous, and lacking subterminal tip.

Of the above differences, the only feature that would serve for generic separation of *Cronius* from *Charybdis* is the number of anterolateral teeth in the adult. As indicated by Stephenson and Campbell (1959), the genus *Charybdis* occupies a critical position in evolutionary development from portunids possessing five anterolateral teeth (e. g., *Thalamita*) to those with nine (e. g., *Portunus*). *Cronius* has advanced from *Charybdis*, with 6 or 7 teeth, by the addition of further antero-

lateral teeth to a total of nine, the late evolutionary development of these additional teeth indicated by their smaller size and absence in young specimens. While to give this single feature (number of anterolateral teeth in the adult) transcendence over the numerous similarities shown by *Cronius* to *Charybdis* may appear illogical, the retention of *Cronius* as a genus serves to emphasize the evolutionary progression to the situation in *Portunus*, many American species of which show a comparable, but much less well marked, alternation in size of anterolateral teeth. Furthermore, it avoids upsetting existing synonymies and conforms to the distributional picture.

Subfamily PODOPHTHALMINAE Borradaile

Podophthalminae Borradaile, 1907, p. 483. Stephenson and Campbell, 1960, p. 115.

Eye stalks very long, orbits occupying whole anterior border of carapace except for narrow front. Anterolateral teeth few. Basal article of antenna short, flagellum included in orbit. Last legs paddle-shaped.

The discoveries of *Euphylax robustus* A. Milne Edwards, 1874, and of *Podophthalmus nacreous* Alcock, 1899, apparently narrow the gap between the eastern Pacific *Euphylax* Stimpson, 1860, and the Indo-west Pacific *Podophthalmus* Lamarck, 1801, previously known from one species each. The following features separate the genera: (Cf. Stimpson, 1860, p. 226)

In *Euphylax* the widest portion of the carapace lies near the middle and between the last anterolateral teeth; in *Podophthalmus* it lies near the front and between the first anterolateral teeth.

In *Euphylax* the eyestalks are shorter, not extending to the tips of the less projecting first anterolateral teeth; in *Podophthalmus* the eyestalks are extremely long, extending to the tips of the projecting first anterolateral teeth.

The male first pleopods may offer a further point of separation. The pleopods of the two species of *Euphylax* are very similar (see below). The pleopods of *Podophthalmus nacreous* have not been described or figured, but those of *P. vigil* (Fabricius, 1798) differ remarkably from *Euphylax* in being longer, having a more elongate tip, and lacking the stout, erect, subterminal bristles (see Stephenson and Campbell, 1960).

Only one genus of the subfamily occurs in the New World and it is restricted to the west coast of the Americas and offshore islands.

Genus **EUPHYLAX** Stimpson

Euphyllax Stimpson, 1860, p. 225; type species: *E. dovii* Stimpson, 1860.

Description: Adult (length $> ca.$ 5 mm): Carapace relatively long and roughly ovoid, widest portion near middle, generally smooth and polished, but with pitting in postorbital region and on margins of gastric region; anterolateral and posterolateral margins curving inwards; posterior margin about half width of anterior. Cardiac and branchial regions swollen. Front narrow, T-shaped, with median notch; epistomial projection extending beyond front. Orbital region enormously broad, distance between outsides of corneas over two thirds of carapace breadth; upper border of orbit beaded. Suborbital region forming a flattened shelf. Anterolateral teeth: four or five teeth or lobes; first stoutest, last most protruding. Third maxilliped with anteroexternal angle broadly produced laterally. Chelipeds long, hands strongly compressed. Fingers with well spaced large teeth, each with a smaller tooth on each side; movable finger with a dorsal carina. Walking legs elongate; merus of fifth leg with well developed subterminal spine on posterior margin; propodus with posterodistal extremity broadly enlarged, trapezoidal; dactylus very broad and flattened. Male abdomen broadly triangular, tip of ultimate segment rounded, penultimate segment with convex sides. Male first pleopod short, stout, tapering abruptly near tip, extreme tip turned inwards. Basal lobes with long, bipinnate hairs. Inner surface with subterminal microscopic spinules, increasing in size proximally, followed by a long irregular row of stout, erect spines, 6-12 in number, becoming more distantly spaced and smaller proximally and ending near middle of appendage. Outer surface with densely spaced row of stout, slightly backwardly directed spines; row commencing as spinules, increasing to spines, then becoming shorter and more sparsely arranged to terminate about one-third way down appendage.

Young (length $< ca.$ 5 mm) differing from adults as follows: Carapace with anterolateral margins inclined forwards or outwards, rather than inwards, and with well marked, elevated granular areas separated by smoother areas with sparser granulation, the most obvious of these being the mesogastric, a broad, transverse area with margins turning forward to fuse with the protogastrics; the epibranchials, broad and curving backward at cervical grooves; the cardiacs, two marked elevations; and the branchials, smoothly swollen. Front with stem of T broad. Eye-stalks much thicker. Epistomial projection not visible from above. Orbi-

tal region with distance between outsides of corneas greater than 90 per cent of carapace breadth. Suborbital shelf not recognizable. Chelipeds with surfaces finely granular; long, erect, inwardly directed bristles on inner side of palm, immovable, and movable fingers.

Color: In alcohol tending to nacreous. Upper surface of chelipeds orange or red-orange.

There is no doubt of the specific distinctness of the two species, *Euphylax dovii* and *E. robustus*, as Coventry (1944, p. 540) has noticed in contradiction to Rathbun's (1930, p. 148) comment on *E. robustus*: "Perhaps conspecific with *E. dovii*. Its peculiarities may be due to its greater size." The question is rather, whether two species so different from one another should be placed in the same genus. *E. dovii* is unique among portunids in having flattened paddles on its last four pairs of thoracic appendages, showing convergence with the oxystomatous *Matuta* Fabricius, 1798, family Calappidae. However, in view of the numerous similarities between the two species, and particularly their remarkably similar male first pleopods, they are best retained in one genus.

Euphylax dovii Stimpson

Plate VI, Figs. A, B; Plate VIII, Fig. F; Plate X, Figs. F, G; Plate XII, Fig. G; Text-Fig. 3a.

Euphylax dovii Stimpson, 1860, p. 226, pl. 5, figs. 5, 5a (type locality: W coast of Central America). A. Milne Edwards, 1861, Addenda p. 2; 1879, p. 204, pl. 38, figs. 2, 2a-d. Rathbun, 1907, p. 72; 1910, p. 578; 1930, p. 147, pl. 65. Boone, 1929, p. 564, text-fig. 2; 1930, p. 190, pl. 65. Coventry, 1944, p. 539. Garth, 1946, p. 423, pl. 72, figs. 1, 2; 1948, p. 36, pl. 5, fig. 2; 1957, p. 38; 1961, p. 144. Buitendijk, 1950, p. 276.

Euphylax dowi Garth, 1957, p. 38.

Type: Female holotype, length 1.8, width 2.8 in.; originally in the collections of the Smithsonian Institution, no longer extant.

Type locality: Western coast of Central America, Capt. J. M. Dow, collector. (It was the resident author's desire to clarify the role of Capt. Dow in this connection, rather than a *lapsus calami*, that prompted his 1957 citation of the species as *dowi*, a change that cannot be condoned under the present rules of nomenclature.)

Atlantic analogue: None. The genus does not occur in the Atlantic.

Previous records:

Mexico. Bahia de Manzanillo, Colima (Buitendijk, 1950).

Costa Rica. Wafer Bay, Cocos Island: *Ara* (Boone, 1930).

Panama. Bahia Honda; Hannibal Bank; 22 mi. ESE of Jicarón I.: *Zaca* (Garth, 1961). Off Gulf of Panama: *Albatross* (Rathbun, 1907). Panama: H. A. Ward (Rathbun, 1930). Pacheca I., Pearl Is.: Mrs. S. P. Haight (Boone, 1929). Montuosa Islet: *Albatross* (Rathbun, 1930).

Colombia. Off Cape Corrientes: George Vanderbilt Exped. (Coventry, 1944). Vicinity of Malpelo I.: *Askoy* (Garth, 1948).

Ecuador. Galapagos Is. (See Garth, 1946).

Peru. Paita (Rathbun, 1910), *Hassler* (Rathbun, 1930).

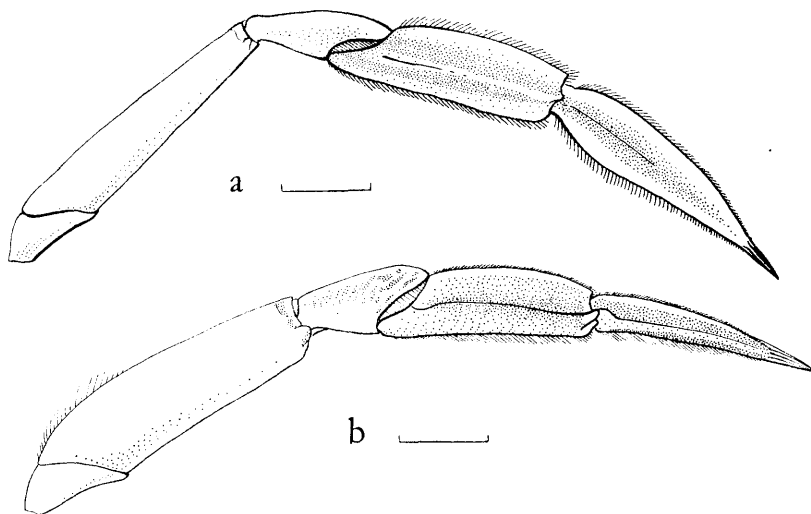
Chile. Talcahuano (Rathbun, 1930).

Also conspicuous in stomach contents of tuna throughout the Central American Pacific, up to 120 miles offshore (Juhl, 1955; Alverson, 1963).

Diagnosis: (Adults): Distance between eyes *ca.* 70 per cent of carapace width. Propodus and dactylus of walking legs flattened. Chelipeds long and slender.

Description (Adults): Carapace relatively broad (see *Measurements*), highly polished, anterolateral margins markedly curved. No mesogastric or epibranchial granular lines, but an indistinct oblique patch of low rounded granules on each side of cardiac region. Posterolateral margins finely beaded; a microscopically beaded ridge a little distance forward of posterior margin. Anterolateral and posterolateral margins with fringing hairs extending to pterygostomial region. Front with stem of T relatively broad. Epistomial projection sharp, extending far forwards. Orbital region with distance between outside tips of eyes *ca.* 70 per cent of carapace breadth; upper border finely beaded. Suborbital sinus medial to cornea feebly developed, a second sinus in line with end of cornea barely recognizable; suborbital shelf smooth. Anterolateral teeth small, varying in number from two to five, with first and last best developed, followed by third, second, and fourth. Positions of teeth, when not present, indefinitely marked by blunt lobes. Chelipeds thin, very elongate. Arm with anterior margin with three to six distantly spaced small spines or tubercles; upper anterodistal and lower distal

extremities without spines. Wrist with well developed spine on inner margin, outer spine small or reduced to a tubercle. Upper surface with a single carina, not ending in a tubercle. Hand very elongate, compressed, and sinuously curved; upper surface of palm with two carinae bearing sharp spinules, innermost carina obscure proximally and ending in a small spine; outer surface with three carinae, upper and lower bearing



Text-Fig. 3a. Walking leg of *Euphylax dovii* Stimpson.

Text-Fig. 3b. Walking leg of *Euphylax robustus* A. Milne Edwards.

Drawings by Isolda Wisshaupt. Scales = 5 mm.

sharp spinules or tubercles, central smooth; tubercles on lower carina extending halfway along immovable finger. Under surface with numerous fine spinules; inner surface with well developed central carina bearing sharp spinules; occasionally a small isolated tubercle distal to center of palm, well above carina. Immobile finger same length as movable finger; teeth on fingers sharp. Walking legs with propodus and dactylus flattened, paddlelike, fringed with bristles, and resembling typical por-

tunid fifth legs (see Text-Fig. 3a). Male abdomen with length/breadth ratio of ultimate segment *ca.* 0.75: 1.05; penultimate length/breadth ratio *ca.* 0.50: 0.75. (Data from 20 larger males; ultimate segment ratio may increase with increasing size of specimens.) Male first pleopod indistinguishable from that of *Euphylax robustus* (see generic description).

Young differing from adults in the following particulars, in addition to those noted at the generic level: Carapace of small specimens with anterolateral borders directed forward, giving a *Thalamita*-like appearance. Chelipeds short, robust, only slightly sinuous. Arm with three spines; additional spinules and fringe of long, erect bristles on anterior border. Walking legs with propodus and dactylus less flattened than in adults. (Based upon a single, sizable collection of soft specimens).

Young of *Euphylax dovii* differ from young of *E. robustus* as follows: Carapace with mesogastric arc not elevated; carapace shape as in paragraph above. Chelipeds with fringe of long, erect, inwardly directed bristles and three spines and spinules on anterior border of arm. Hairs on palm and fingers well developed, those on movable finger extending to upper surface; fingers slender. Walking legs with propodus and dactylus more flattened; fifth leg with propodus more trapezoidal in shape.

Material examined: 131 specimens from 9 stations (See Table 14). From Costa Rica to Gulf of Guayaquil, Peru, including Cocos and Malpelo islands.

Measurements: Males from 21.9 x 35.8(35.3) to 52.8 x *ca.* 86.5(*ca.* 85.5) mm, females from 22.6 x 36.5(35.9) to 25.9 x 41.8(40.9) mm, young from 5.1 x 6.8 (6.5) mm; no ovigerous females present.

Color: In life: Carapace and merus of all legs deep purple; other segments of legs wine red. Underside of carapace, meri of legs, and maxillipeds blue; sternum white; abdomen brownish; undersides of rest of ambulatories wine red. (J. Crane, of specimens from Panama reported by Garth, 1961) In alcohol: Upper surface of cheliped "pure" orange, carapace dull orange, inner and outer surfaces of hand distinctly nacreous.

Ecology: Intertidally to 30-35 fathoms. Attracted to surface lights at night.

Euphylax robustus A. Milne Edwards

Plate VI, Figs. C, D; Plate VIII, Fig. G; Plate X, Fig. H;
Plate XII, Fig. H; Text-Fig. 3b.

Euphylax robustus A. Milne Edwards, 1874, p. 249 (type locality: near Mazatlan, Mexico); 1879, p. 205, pl. 37. Rathbun, 1930, p. 148, pls. 66, 67. Coventry, 1944, p. 540. Garth, 1948, p. 37; 1960, p. 116; 1961, p. 145. Buitendijk, 1950, p. 276.

Type: Female holotype, length 56, width 90 mm, in Paris Museum.

Type locality: Near Mazatlan, Mexico, collector unknown, *vide* J. Forest.

Atlantic analogue: None. The genus does not occur in the Atlantic.

Previous records:

Gulf of California. Near Mazatlan (A. Milne Edwards, 1874). Isabel Island: George Vanderbilt Exped. (Coventry, 1944). Yavaros, Sonora; Bahia de Santa Barbara, Sonora; Macapule, Sinaloa: M. Cardenas (Buitendijk, 1950).

Mexico, S of Cape Corrientes. 17 mi. SE × E of Acapulco; Tangola-Tangola Bay: *Zaca* (Garth, 1961).

Costa Rica. Port Culebra: *Zaca* (Garth, 1961).

Panama. Parida Island, Gulf of Chiriqui; Bahia Honda: *Zaca* (Garth, 1961). Piñas Bay; Guayabo Chiquito: *Askoy* (Garth, 1948).

Colombia. Ardita Bay; Octavia Bay: *Askoy* (Garth, 1948). At sea near Gorgona Island: *Zaca* (Garth, 1961).

Diagnosis (Adults): Distance between eyes over 80 per cent of carapace width. Propodus and dactylus of walking legs of typical portunid shape, not flattened. Chelipeds robust.

Description (Adults): Carapace relatively long (see *Measurements*), surface dull, rather than polished, anterolateral margins slightly curved. Granular lines marking usual positions of mesogastric and epibranchial ridges; branchial areas with distinct granulation, cardiac areas faintly granular. Posterolateral margins obviously beaded; forward of posterior margin, a finely beaded ridge. Anterolateral and posterolateral margins, also pterygostomian region, without hairs. Front with stem of T relatively narrow. Epistomial projection rounded, not extending far forward. Orbital region with distance between outside tips of eyes over 80 per cent of carapace breadth. Upper border of orbit coarsely beaded or serrated; supraorbital sinuses (two on each side) well developed. Suborbital shelf coarsely granular. Anterolateral teeth four, sharp, first con-

spicuously large, second smallest. Chelipeds robust, relatively short, and spinous. Arms with three very well developed spines on anterior margin, one on upper anterodistal extremity, and a small one on lower distal extremity. Wrist with very well developed spines on inner and outer sides; upper surface with indistinct upper carina and distinct lower carina ending in a tubercle. Hand compressed, very deep, palm swollen; spine at wrist articulation stout and sharp; upper surface with two carinae each bearing widely spaced sharp tubercles, inner carina ending in a stout spine; outer surface with three carinae, all with distantly spaced, sharp tubercles on palm, lower carina extending smoothly and increasingly obscurely along immovable finger; under surface with sparse, rounded tubercles; inner surface with ill developed central carina bearing a few rounded tubercles and ending in a tubercle; a single well developed, isolated spine distal to center of palm and well above carina. Immovable finger longer than movable; fingers with stout, rounded teeth. Walking legs with propodus and dactylus stout and elongate, *i. e.*, of normal portunid form, dactylus with long cornified tip (see Text-Fig. 3b). Male abdomen with length/breadth ratio of ultimate segment *ca.* 0.88: 0.95; of penultimate segment *ca.* 0.5: 0.75 (Data from 6 larger males; ratio of penultimate segment may decrease with increasing size of specimens.) Male first pleopods similar to those of the preceding *Euphyllax doyii* (See generic description).

Young differing from adults in the following particulars, in addition to those expressed at the generic level: Carapace in smallest young with anterolateral borders directed almost straight forward. In specimens *ca.* 10-15 mm broad, both anterolateral and posterolateral margins converging posteriorly, specimens resembling *Podophthalmus nacreous* Alcock, 1899. Orbital region with suborbital shelf smooth. Cheliped with two spines on anterior margin of arm; hand not deep and compressed; no sign of isolated spine on upper surface of palm. Walking legs with propodus and dactylus slightly flattened.

The young of *Euphyllax robustus* differ from those of *E. doyii* as follows: Carapace shape as in paragraph above: granular elevation in meta-gastric region better developed. First of anterolateral teeth outstandingly the largest. Chelipeds with fewer bristles, fingers less compressed; two spines on anterior border of arm. Walking legs with propodus and dactylus less flattened; fifth leg with propodus ovoid.

Material examined: 42 specimens from 19 stations (See Table 15). From S of Boca del Rio Mayo, Gulf of California, Mexico, to Payta, Peru. 10-33 fathoms.

Measurements: Males from 8.2 x 12.6(——) to 51.8 x 87.3(81.2) mm, females from 5.8 x 9.1(——) to 61.3 x 97.6(91.8) mm, young from 4.1 x 5.6(5.4) mm; no ovigerous females present.

Color: In life: Carapace and legs above gray blue-green. Chelipeds gray blue-green except olive brown manus and dactylus. Ridges and dactyls tinged with pink. Tubercles on chelipeds white. Eyestalks bright violet. Swimmerets pale horn. Abdomen barred with violet and white. Legs barred with violet and white below. Eggs pale salmon. (J. Crane, as reported by Garth, 1961)

In alcohol: Upper surface of cheliped red orange, under side of hands faintly nacreous. Carapace blue or lilac on yellow ground, posterior half sometimes nacreous.

Ecology: From 10 to 33 fathoms. Mud bottom in 7 out of 10 instances, frequently mixed with sand. Encountered once on floating sargassum; attracted once to light.

APPENDIX I

The Vermilion Sea Expedition

The results of the reconnaissance study of the zoogeography and ecology of benthic invertebrates in the Gulf of California and on the continental slope off west Mexico carried out during the years 1958-1963 by Robert H. Parker, and for which the resident author provided the portunid identifications (see Parker, 1964), appeared too late to be fully integrated into the text. Furthermore, its treatment as a systematic paper would have required the entry into the synonymies of a double set of names, those supplied by the identifier, which appear correctly in the Systematic List of Species (*op. cit.*, p. 163), and those used in the Supplemental Lists of Invertebrate Species from various Gulf of California Environments (*ibid.*, p. 166, ff.), of which there appear variant spellings. Accordingly, it was decided to treat this useful work separately, and to distinguish between its systematic and ecological portions.

The records that follow appear more fully in the Tables of Material Examined since the specimens collected were used in this study. They will not be found among Previous Records for the species concerned, however, except as extracted from Garth (1960), who included an Addendum concerning Vermilion Sea Expedition findings in a Baja California symposium paper reviewing brachyuran distribution in the Gulf of California-west coast of Baja California region as then known.

Systematic List (Parker, 1964, p. 163)

- Portunus (Achelous) affinis* (Faxon), Sta. Nos. 87, 97, 158.
Portunus (Achelous) iridescens (Rathbun), Sta. Nos. 50, 164.
Portunus (Achelous) minimus Rathbun, Sta. No. 190.
Portunus (Achelous) pichilinquai Rathbun, Sta. Nos. 185, 186, 191, 207, 212.
Portunus (Portunus) acuminatus Stimpson, Sta. Nos. 87, 95, 97, 98, 150, 157, 158, 159.
Portunus (Portunus) asper (A. Milne Edwards), Sta. Nos. 98, 148, 149, 157.
Portunus (Portunus) xantusii (Stimpson), Sta. No. 222.
Callinectes bellicosus Stimpson, Sta. No. 173.
Euphylax robustus A. Milne Edwards, Sta. Nos. 95, 97, 150, 158.
For a List of Stations see Parker (1964, p. 143 ff.)

Ecological List

Northern Gulf of California, sand bottom, 27-65 m (Parker, 1964, p. 170) :

Portunus iridescens, *P. minimus*, *P. pichilinquai*

Southern Gulf of California, sand bottom, 27-65 m (*ibid.*, p. 171) :

Portunus acuminatus, *P. affinis*, *Euphylax robustus*

Southern Gulf of California, clay bottom 27-65 m (*ibid.*, p. 172) :

Portunus acuminatus, *P. affinis*, *P. asper*, *Euphylax robustus*

Southern Gulf of California, clay bottom, 66-120 m (*ibid.*, p. 173) :

Portunus iridescens

Southern Gulf of California, silty clay, 36-75 m (*ibid.*, p. 71) :

Portunus acuminatus (see also text-fig. 23b for distribution in the Gulf)

———Gulf of California, sand and sand-mud, 11-26 m (*ibid.*, p. 58) :

Portunus pichilinquai (see also p. 53 for assemblage)

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Tables of Material Examined

Localities are listed in geographical order from north to south, according to the plan in previous reports (Garth, 1958). Latitudes and longitudes of Hancock Foundation stations up to and including 1502-42 are given in Fraser (1943); precise positions for subsequent stations have not yet been published but are available on request.

Depths are given in fathoms except where otherwise stated.

Stations occupied by the Hancock Foundation's research vessels *Velero III* (1932-1941) and *Velero IV* (1948-present day) are consecutively numbered, the number in each case followed by a hyphen and two digits denoting the year of collecting. This material was collected for and is deposited in the Allan Hancock Foundation.

In all cases where specimens were not taken at a Hancock Foundation station, the collector and/or institution of origin is given in the "Remarks" column. Material not expressly stated as belonging to another institution will be found in the collections of the Allan Hancock Foundation.

Institutions providing specimen material are indicated by the following abbreviations:

AMNH	American Museum of Natural History
CF&G	California Department of Fish and Game
GISP	Galapagos International Scientific Project
IATTC	Inter American Tropical Tuna Commission
SIO	Scripps Institution of Oceanography
UCLA	University of California at Los Angeles
USFWS	United States Fish and Wildlife Service
USNM	United States National Museum

The following descriptive abbreviations referring to specimens are used:

ov	ovigerous
frag	fragmented or damaged

plp pleopod

yg young, unsexable juveniles

Comments in parentheses refer to the item immediately preceding; thus "1 ♂ (frag)" means one fragmented male, while "1 ♂. frag" means one male and additional fragments.

The initials JSG and WS are those of the resident and visiting authors, respectively; the initials MJR are those of the late Mary J. Rathbun of the USNM, to whom portunids of early Hancock expeditions were referred.

TABLE 1
Portunus acuminatus (Stimpson)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California (W side)					
Santa Maria Bay 0.5 mi. SE of Hughes Point	5-18	Apr. 4, 1949	1787-49	1 ♀	
Gulf of California (E side)					
Off Altata	18-20	Mar. 16, 1960	P-150-60	4 ♂, 1 ♀	Parker & Dockins, SIO
Off Río San Lorenzo	27-31	May 10, 1959	VS-BII-25	1 ♂, 1 ♀	Parker, Rowland & Keith, SIO (Parker Sta. 87)
Off Punta Piaxtla	24-26	May 13, 1959	VS-BII-33	11 ♂, 4 ♀ (1 ov) 1 frag.	Parker, Rowland & Keith, SIO (Parker Sta. 95)
Off Boca Tecapán	25-31	Mar. 11-12, 1960	P-159-60	2 ♂ (1 frag.)	D. Dockins, SIO
NW of Isabel Island	29-33	Mar. 10-11, 1960	P-158-60	7 ♂, 8 ♀, 8 yg	D. Dockins, SIO
Isabel Island	10-25	Mar. 5, 1934	277-34	20 ♂, 21 ♀ (2 ov)	D. Dockins, SIO
Isabel Island	10-18	Apr. 2, 1937	745-37	3 ♀ (2 ov)	D. Dockins, SIO
Isabel Island	10-18	Apr. 2, 1937	747-37	12 ♂, 17 ♀ (5 ov) 2 yes, 1 frag.	D. Dockins, SIO
Isabel Island	10-15	Mar. 8, 1938	870-38	4 ♂	
Isabel Island	15-25	Mar. 9, 1939	974-39	21 ♂, 33 ♀ (21 ov)	Color note, ♂ D. Dockins, SIO
SE of Isabel Island	7-12	Mar. 8-9, 1960	P-157-60	3 ♂, 12 ♀ (5 ov)	Parker, Rowland & Keith, SIO (Parker Sta. 97)
Off San Blas	30	May 18, 1959	VS-BII-39	3 ♂, 2 ♀ (1 ov)	Parker & Rowland, SIO (Parker Sta. 98)
Off San Blas	26	May 18, 1959	VS-BII-40	2 ♀ (1 ov)	
Southern Mexico					
Chacahua Bay	4-12	Mar. 23, 1939	927-39	1 ♂	

Tangola-Tangola and Santa Cruz bays	15-20	Feb. 28, 1934	259-34	1 ♂, 1 ♀	
Guatemala San José Light	23	Mar. 23, 1939	931-39	1 ov ♀	
Costa Rica					
Salinas Bay	8	Feb. 11, 1935	476-35	1 ♂	
Salinas Bay	6	Feb. 11, 1935	481-35	2 ♂	
Port Parker	5	Feb. 9, 1935	468-35	2 ♂, 1 ov ♀	
Port Parker	30	Feb. 9, 1935	472-35	1 ♀, 1 chela	
Port Parker	5-10	Mar. 25, 1939	936-39	3 ♂, 4 ♀ (1 ov)	♂ neotype, AHF 391, pleopod; illustration
Playa Blanca	15	Feb. 8, 1935	461-35	3 ♂, 1 ♀, 4 yg, 1 frag.	
Puerto Culebra	10	Feb. 24, 1934	253-34	4 ♂, 3 ♀ (1 ov)	
Off S. Viradores Islands	10	Feb. 25, 1934	257-34	frags.	
Panama					
Secas Islands	25	Feb. 22, 1934	250-34	1 ov ♀	
Secas Islands	12	Feb. 5, 1935	448-35	1 ♂, 1 yg	
Secas Islands	5-20	Feb. 6, 1935	458-35	2 ♂	
Secas Islands	30-50	Mar. 1, 1938	863-38	1 ♀	
Colombia					
Octavia Bay	2	Jan. 28, 1935	434-35	1 ♂	
Ecuador					
La Libertad	15-33	Jan. 20, 1933	15-33	1 yg, seen by JSG	Id. MJR as <i>panamensis</i>

TABLE 2

Portunus asper (A. Milne Edwards)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Gulf of California, E side					
Topolobampo		Feb. 1958	W58-46	1 ov ♀	W. Baldwin, UCLA
50 mi. S of Culiacán, 11 mi. offshore	20-21	Apr. 2, 1964	64 A2-8	11 ♂, 12 ♀ (1 ov)	R. Lavenberg, <i>Alaska</i> ; beam trawl. Color notes, WS.
Off Robelar	9-10	Mar. 16, 1960	P-148-60	3 yg	R. H. Parker, SIO
Off Robelar	5-6	Mar. 16, 1960	P-149-60	1 ♂	R. H. Parker, SIO
Near Point Piaxtla	6-8	Apr. 1, 1937	744-37	2 ♂, 1 ♀	
Off Point Piaxtla	24-26	May 13, 1959	VS-BII-33	1 ♀ (frag.)	Parker & Rowland, SIO (Parker Sta. 95)
Mazatlán	8	Jan. 15, 1963	—	1 ♂, 3 ♀ (1 ov)	John O. Burch
3-4 mi. S of Mazatlán	—	Oct. 29, 1961	—	1 ♀	Bruce Campbell & Donald Shasky, <i>Camaroneira 17</i>
SE of Isabel Island	7-12	Mar. 8-9, 1960	P-157-60	4 ♂, 4 ♀	D. Dockins, SIO
1-3 mi. N of Ensenada	—	Jan. 22, 1958	W58-3	3 ♂	Rosenblatt & Baldwin, UCLA
Chacala					
Off San Blas	26	May 18, 1959	VS-BII-40	2 ♀	Parker & Rowland, SIO (Parker Sta. 98)
Revilla Gigedo Islands					
Socorro Island					
Braithwaite Bay	shallow water	Jan. 3, 1934	131-34	1 ♂	See Remarks
Southern Mexico					
Tenacatita Bay	shore	Mar. 17, 1933	121-33	1 ♂	
Tenacatita Bay	4-10	Mar. 18, 1933	122-33	1 ♀ ov	
Tenacatita Bay	5	Feb. 15, 1935	485-35	1 ♂, 1 yg	

Tenacatita Bay	2-8	May 8, 1939	964-39	3 ♂, 28 yg	L. Berner (returned to SIO)
Tenacatita Bay	8-15	May 8, 1939	965-39	1 ♀, 5 yg	
N of White Friars Rocks, Petatlán Bay	20-25	May 7, 1939	963-39	1 ♂, 1 ♀	
Acapulco Harbor	—	June 15, 1952	SIO H52-40	1 ♂	
Chacahua Bay	5-10	Jan. 9, 1938	765-38	2 ♂, 3 yg	
Chacahua Bay	10-15	Mar. 20, 1939	927-39	1 ♂, 18 yg	
Tangola-Tangola and Santa Cruz bays	15-20	Feb. 28, 1934	259-34	1 ♂, 40 yg	
Guatemala					
Off San José Point	7-11	Jan. 11, 1938	770-38	2 ♂, 2 ♀, 8 yg	
Near San José Light	2-5	Mar. 23, 1939	929-39	2 ♂, 3 yg	
Off San José Light	12-13	Mar. 23, 1939	930-39	2 ♂, 3 ♀, 2 yg	
Off San José Light	23	Mar. 23, 1939	931-39	1 ♀, 8 yg	
Costa Rica					
Salinas Bay	20	Feb. 11, 1935	475-35	2 ♂, 5 ♀	W. L. Schmitt (returned to USNM)
Salinas Bay	8	Feb. 11, 1935	476-35	1 ♂	
Salinas Bay	2	Feb. 11, 1935	477-35	1 yg	
Salinas Bay	1.5	Feb. 11, 1935	478-35	1 ♀, 1 yg	
Salinas Bay	12	Feb. 11, 1935	480-35	3 ♂, 1 ov ♀	
Salinas Bay	6	Feb. 11, 1935	481-35	10 ♂, 3 ♀, 3 yg	
Port Parker	5	Feb. 9, 1935	468-35	26 ♂, 18 ♀ (2 ov)	
Port Parker	10	Feb. 9, 1935	469-35	4 ♂, 4 ♀, 2 yg	
Port Parker	5	Feb. 9, 1935	470-35	6 ♂, 2 ♀	
Port Parker	10	Feb. 9, 1935	471-35	1 ♀	
Port Parker	30	Feb. 9, 1935	472-35	2 ♂, 2 yg	
Port Parker	3-8	Mar. 24, 1939	934-39	5 ♂, 1 ♀	
Port Parker	5-10	Mar. 25, 1939	936-39	6 ♂, 1 ♀	
Playa Blanca	3-5	Feb. 8, 1935	460-35	2 ♂	

Portunus asper (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Playa Blanca	25	Feb. 8, 1935	463-35	1, 2 yg, 1 frag.	
Playa Blanca	shore	Feb. 8, 1935	465-35	62 specimens (incl. 3 ov ♀)	
Puerto Culebra	2-4	Mar. 13, 1933	116-33	1 ♂, 1 ♀	W. L. Schmitt (returned to USNM) Seining at mouth of slough
Puerto Culebra	—	Mar. 13, 1933	117-33	2 ♂, 2 ♀	
Puerto Culebra	10	Feb. 24, 1934	253-34	3 ♂, 4 ♀ (1 ov)	
Puerto Culebra	3-10	Feb. 24, 1934	254-34	8 ♂, 10 ♀ (5 ov)	
Puerto Culebra	3-10	Feb. 24, 1934	254-34	1 yg	W. L. Schmitt (returned to USNM)
Puerto Culebra	10	Feb. 25, 1934	257-34	1 ♀ (frag.)	W. L. Schmitt (returned to USNM)
S of Puerto Culebra					
Cocos Bay	2	Mar. 13, 1933	116-33	11 ♂, 8 ♀ (2 ov) 1 frag.	
Gulf of Dulce	10-22	Mar. 26, 1939	939-39	5 ♂, 2 ♀	W. L. Schmitt (returned to USNM)
Panama					
Gulf of Panama	to 15	Sept. 1958	—	3 ♂, 8 ♀	Reese, Baldwin & Wintersteen, UCLA
Secas Islands	25	Feb. 22, 1934	250-34	1 ♂	
Secas Islands	shore	Feb. 4, 1935	446b-35	1 ov ♀	
Secas Islands	12	Feb. 5, 1935	448-35	1 ♂, 7 ♀ (2 ov), 6 yg	
Secas Islands	14	Feb. 5, 1935	450-35	4 ♂	
Secas Islands	12	Feb. 5, 1935	451-35	10 ♂, 6 ♀, 5 yg	
Secas Islands	12	Feb. 6, 1935	456-35	5 ♂, 1 ♀, 7 yg	
Secas Islands	5-20	Feb. 6, 1935	458-35	10 ♂, 9 ♀	
Secas Islands	3	Mar. 2, 1938	865-38	2 ov ♀	
Bahía Honda	shore	Jan. 10, 1933	5-33	1 yg	

Bahía Honda	5-8	Mar. 9, 1933	113-33	2 yg	James Morehouse, <i>Challenger</i> , C F&G T. H. Bullock (returned to USNM) E. Robson; dredged (returned to USNM)
Bahía Honda	15-20	Feb. 22, 1934	249-34	7 ♂, 4 ♀, 2 yg	
7.5 mi. SWXS of Chame Point	3	Mar. 10, 1937	—	1 ♂	
Panama Bay			W53-273	1 ♂	
Panama (City?)		Dec. 1936	—	1 ♀	
Taboga Island	2-5	May 2, 1939	959-39	9 ♂, 18 ♀ (2 ov) 2 yg	
Taboga Island	2-5	May 2, 1939	960-39	2 ♂, 5 ♀, 2 yg	
Pearl Islands Isla del Rey			W53-285	1 ♀	T. H. Bullock (returned to USNM)
Piñas Bay	25	Jan. 29, 1935	438-35	8 ♂, 1 ♀	
Piñas Bay	20	Jan. 29, 1935	439-35	1 ♀, 7 yg	
Piñas Bay	15	Jan. 29, 1935	440-35	1 yg	Id. MJR as <i>P. stanfordi</i>
Off Panama			—	1 ♂, 1 ♀	J. Seapin, <i>Rutilie B.</i> in bait net, C F&G
8°29'30" N, 78°30'15" W	2	Feb. 16, 1938			
Colombia					<i>Askoy Exped., AMNH</i>
Ardita Bay	7	Mar. 6, 1941	<i>Askoy 31,</i> sample 81	1 ♀	
Octavia Bay	2	Jan. 28, 1935	434-35	2 yg	
Off Port Utría	15-20	Feb. 14, 1934	235-34	1 ♀	
Off Port Utría	20	Feb. 15, 1934	238-34	1 ♂, 1 ♀	
Off Port Utría	20	Jan. 25, 1935	423-35	1 ♂ (frag.)	
Port Utría	shore	Feb. 15, 1934	239-34	1 ♂ (frag.)	
Port Utría	10	Jan. 24, 1935	417-35	1 ♂, 2 ♀	
Port Utría	15-30	Feb. 25, 1938	856-38	4 ♂, 6 ♀, 5 yg	

Portunus asper (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks	
Port Utría	15-30	Feb. 25, 1938	856-38	1 ♀	Comp. w. USNM No. 22024	
Off Cape Corrientes	10	Feb. 13, 1934	231-34	5 ♂, 1 ♀, 11 yg		
N of Gorgona Island	10-20	Feb. 24, 1938	851-38	1 ♂, 2 ♀		
N of Gorgona Island	20	Feb. 12, 1934	221-34	1 yg		
Off Gorgona Island	8-10	Feb. 12, 1934	225-34	1 ♀		
Gorgona Island	shore	Jan. 22, 1935	405-35	2 yg		
Off Monkey Point	20	Jan. 22, 1935	407-35	1 ♂		
Between Gorgona and Gorgonilla islands	—	Feb. 12, 1934	228-34	14 ♂, 12 ♀ (3 ov) ca. 110 yg		
Ecuador						
Off Cape San Francisco	2	Feb. 11, 1934	214-34	1 ♂, 1 ♀		♂ illustrated <i>Askey</i> , by dipnet, AMNH ♂ pleopod Id. MJR, confirmed JSG, orig. 1 misidentified = <i>P. tuberculatus</i>
Off Cape San Francisco	15	Feb. 23, 1938	850-38	1 ♂, 2 yg		
San Francisco Bay	2	Feb. 11, 1934	215-34	1 ♂, 2 ♀ (1 ov), 1 yg		
San Francisco Bay	20	Feb. 11, 1934	216-34	3 ♂, 1 ♀		
02°48' N, 78°11' W	surface	Apr. 24, 1941	<i>Askey</i> 91	1 ♂, 1 ♀		
Manta	1	Jan. 19, 1935	402-35	2 ♂ (1 frag.), 2 yg		
Off La Plata Island	10	Jan. 22, 1933	23-33	4 yg (2 frag.)		
Off La Plata Island	7-10	Feb. 10, 1934	213-34	2 ♂, 6 yg		
Salango Island	12	Jan. 18, 1935	396-35	1 ♂		
Salango Island	3	Jan. 18, 1935	397-35	46 ♂, 45 ♀ (7 ov) 10 yg		
Salango Island	3	Jan. 18, 1935	398-35	1 ♂, 1 ♀	Light at anchorage Unusual specimens, see Remarks	
Salango Island	8	Jan. 18, 1935	399-35	48 ♂, 45 ♀, 11 yg		
Off La Libertad	—	Jan. 17, 1933	8-33	1 ♂		
Off La Libertad	3-5	Jan. 18, 1933	9-33	2 yg, 1 frag.		
Off La Libertad	8-12	Feb. 8, 1934	205-34	6 yg (1 ♂)		

Off Santa Elena Bay	8-10	Feb. 9, 1934	209-34	23 ♂, 11 ♀ (3 ov) 23 yg, 1 frag.	M. J. Lobell (returned to USNM) Color notes, 1 ♂
Santa Elena Bay	7-8	Feb. 9, 1934	208-34	1 (frag.)	
Santa Elena Bay, near S shore	5-7	Feb. 9, 1934	210-34	1 ♂, 1 ♀, 1 yg	
Peru					
5°34' S, 80°52' W	—	May 16, 1941	U-02305	2 ♂, 1 ♀	
Sechura Bay	9.5	Feb. 15, 1938	845-38	126 specimens (incl. 4 ov ♀)	
Sechura Bay	6	Feb. 15, 1938	846-38	1 yg	M. J. Lobell, otter trawl (returned to USNM)
Sechura Bay	—	May 19, 1941	U-02419	1 ♂, 2 ♀ (1 ov)	
Off Lobos de Afuera Island	25-30	Feb. 14, 1938	843-38	1 ♀	
Tortuga Bay	—	May 23, 1941	U-02323	1 ♂	M. J. Lobell, dredge (returned to USNM)

TABLE 3

Portunus brevipanus (Faxon)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Revilla Gigedo Islands					
Socorro Island					
Braithwaite Bay	14-18	Jan. 3, 1934	129-34	3 yg	
Braithwaite Bay	20	Jan. 4, 1934	133-34	1 ♂, 1 ♀, 7 yg	
Braithwaite Bay	10-20	Mar. 18, 1939	922-39	1 ♂, 1 yg	
Off Braithwaite Bay	17-46	Mar. 18, 1939	924-39	1 ♀, 9 yg	
Off Cape Rule	4-10	June 8, 1934	291-34	1 yg (frag.)	
SE of Cape Rule	20	June 8, 1934	293-34	1 ♀, 1 yg	
W of Cape Rule	41-46	Mar. 18, 1939	926-39	3 ♂, 1 ♀, 1 yg	

Portunus asper (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Clarion Island					
Sulphur Bay	25	Jan. 5, 1934	135-34	1 ♂, 3 yg	
Sulphur Bay	32	Jan. 5, 1934	136-34	1 ♂, 1 ♀	
Sulphur Bay	50-30	Jan. 5, 1934	138-34	1 ♀, 1 yg	
Off Sulphur Bay	35	June 11, 1934	299-34	3 yg	
Sulphur Bay	55	June 11, 1934	301-34	1 ♂, 1 ♀, 2 yg	Comp. w. USNM No. 20696
Sulphur Bay	30	June 11, 1934	303-34	1 ♀	
Sulphur Bay	20	June 11, 1934	304-34	1 ♂, 1 ♀	
Sulphur Bay	15	June 11, 1934	305-34	1 ♀	
Sulphur Bay	5	Mar. 16, 1939	915-39	2 yg	Color notes
Sulphur Bay	28-45	Mar. 16, 1939	917-39	5 ♂, 4 ♀, 6 yg	
Off Sulphur Bay	45-60	Mar. 16, 1939	918-39	1 ov ♀	
Off Sulphur Bay	25-26	Mar. 17, 1939	919-39	1 ♂, 2 ♀, 1 yg, 1 frag.	
Off Sulphur Bay	31-56	Mar. 17, 1939	921-39	6 ♂, 6 ♀, 7 yg	♂ pleopod
Cocos Island					
Off Nuez Island	31-50	Jan. 13, 1938	772-38	1 frag.	Color notes; ♂ illustr.
Off Nuez Island	31-50	Jan. 13, 1938	773-38	6 ♂, 2 ♀, 2 frag. 2 yg	
Off Nuez Island	30-50	Jan. 14, 1938	779-38	1 ♂, 1 ♀	♀ with left lateral frontal lobe bilobed
Chatham Bay	40-46	Jan. 14, 1938	780-38	1 ♂	

TABLE 4

Portunus iridescens (Rathbun)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California, W side Cape San Lazaro	36-40	received May 18, 1959		1 ♂	C. Limbaugh (returned to USNM)

Santa María Bay 2 mi. SW of Hughes Point Marquis Point	19-22 50	May 5, 1950 Dec. 4, 1962	1973-50 SIO 62	1 ♀ 32 ♂, 31 ♀ (1 ov)	USFWS, trawl (returned to SIO)
Gulf of California Off Estero de Tasiota, Sonora	35-41	Mar. 21, 1960	P-164-60	2 ♂, 1 ♀	R. Parker, SIO ♂ illustrated
About 1 mi. W of Guaymas harbor entrance, Sonora	—	Jan. 21, 1950		1 ♂	B. W. Walker & party (returned to USNM)
Concepción Bay	55-85	Apr. 12, 1964	64A2-40	3 ♂, 3 ov ♀	R. Lavenberg, <i>Alaska</i> ; otter trawl. Color notes, WS
San Nicolas Bay	35-55	Apr. 12, 1964	64A2-42	1 ♂, 1 ♀	R. Lavenberg, <i>Alaska</i> ; otter trawl. Color notes, WS
San Ignacio Bay, Sinaloa Off San Ignacio Farallon	30-50 50-65	Mar. 31, 1937 Apr. 1, 1959	742-37 VSS-33	1 ov ♀ 15 ♂, 14 ♀ (1 ov) 2 frag.	R. Parker, SIO (Parker Sta. 50)
E of San Francisco Island NE of Espiritu Santo I	47 52-69	Mar. 8, 1937 Feb. 15, 1940	650-37 1113-40	6 ♂, 1 ♀ 2 ♂, 1 ♀	Color notes
5 mi. SE of Santa Inez Point Espiritu Santo Island	50	Apr. 10, 1964	64A2-31	1 ♂, 3 ♀ (2 ov)	R. Lavenberg, <i>Alaska</i>
Off Ballenas Bay	48	Mar. 8, 1937	644-37	1 ♂, 2 ♀, 1 YG	
San Gabriel Bay	24	Mar. 6, 1937	632-37	1 YG	
Off Gorda Point	51-55	Feb. 16, 1940	1116-40	4 ♂, 2 ♀	
Off Gorda Point	17-25	Feb. 16, 1940	1117-40	1 ♂	
E of Cabeza Ballena	25	Mar. 3, 1937	620-37	1 ♂, 1 YG	
Colombia					♂ pleopod
Octavia Bay	75	Jan. 27, 1935	430-35	1 ♂, 1 YG	
Port Utria	20	Mar. 15, 1934	238-34	1 ♂	
Off Port Utria	35	Jan. 25, 1935	422-35	1 ♂, 3 ♀	
N of Gorgona Island	10-20	Feb. 24, 1938	851-38	1 YG	
Off Gorgona Island	150	Feb. 2, 1934	220-34	1 ♀	

TABLE 5
Portunus xantusii xantusii (Stimpson)

Locality	Fms.	Date	Station	Number & Sex	Remarks
California					
Santa Barbara Islands					
S of Santa Cruz Island	6-10	Oct. 31, 1940	1197-40	7 ♂, 4 ♀, 3 yg	
E of Gull Island					
San Nicolas Island					
Dutch Harbor	20	Dec. 12, 1940	1219-40	1 ♀, 1 yg	
Santa Catalina Island					
E of Johnsons Cove			H51-235	2 ♂, 3 ov ♀	Flechtsig & Newman, <i>Orca</i> , seine, 100 ft. (returned to USNM) Gary Brusca, <i>Velero II</i> , surface light at night J. Savage & class, <i>Velero IV</i> Night light
Catalina Harbor	8	Nov. 14, 1963	—	1 ♀	
Long Point	—	Apr. 25-26, 1958	—	1 ♂	
White Cove	—	July 8, 1953	2366-53	2 ♂	
San Clemente Island					
Off Wilson Cove	14-16	Feb. 22, 1941	1238-41	1 ♂, 1 ♀	
Pyramid Cove	10	Nov. 25, 1939	1024-39	6 ♂, 1 ♀, 6 yg 1 frag.	
7.5 mi. SE of Santa Barbara Point	34	Nov. 8, 1961	61A-8-54	1 ♂	M/V <i>Alaska</i> , blanket net; C F&G
1.5 mi. SE of Point Mugu	26-30	Mar. 23, 1941	1275-41	1 ♂	
9.2 mi. W of Point Dume	98	May 14, 1959	6234-59	1 ♀	
Santa Monica Bay	20	May 1, 1958	—	1 ♂	J. Baxter, <i>Proowler</i> , C F&G Rim Fay, UCLA
Zuma Beach	5	Dec. 1958	—	1 ♀	
Off Redondo Beach	13-22	May 6, 1940	1138-40	2 ♂	
Off Redondo Beach	10-20	May 6, 1940	1140-40	1 ♂, 1 ♀	
Redondo, toward pier	28	July 29, 1916	T-169	1 ov ♀, frag.	
Redondo Beach	—	July 24, 1938	B 3857	1 ♂, 1 ♀	<i>Anton Dohrn</i> , Acc. 489
Portuguese Bend	shore	Feb. 13, 1942	1446-42	2 ♂	J. Q. & T. A. Burch

Inside at Point Fermin	shore	Nov. 30, 1940	1217-40	1 ♂	<i>Anton Dohrn</i> , Acc. 540
Off Point Fermin	—	Nov. 8, 1922	—	1 ♀	
Off San Pedro Breakwater	14	July 23, 1940	1165-40	2 ov ♀	S. J. Holmes (returned to USNM)
San Pedro Harbor		Dec. 25-27, 1895		2 ♀, 1 unsexed	
San Pedro		June 29, 1897	R. 202	1 ♂, 1 ♀	S. J. Holmes (returned to USNM)
San Pedro		May 27, 1901	V, haul 2	1 ♀	<i>Albatross</i> Exped.
San Pedro		May 28, 1901	VII	1 ♀	<i>Albatross</i> Exped.
San Pedro		June 11, 1901	XVI, haul 2	5 ov ♀	(returned to USNM)
Between Long Beach and Seal Beach	5	Nov. 4, 1922	D-44	2 ♂, 1 ♀, 1 yg	(returned to USNM)
2 mi. off Belmont Pier	7-10	July 23, 1940	1161-40	1 ♂	<i>Anton Dohrn</i> , Acc. 534
W shore Anaheim Landing	shore	Feb. 12, 1942	1445-42	1 ♀	
Anaheim (Landing or Slough?)		Jan. 9, 1916	—	3 ♂	Mudflats; Acc. 625
Anaheim Slough	—	—	—	1 ♂, 2 ov ♀	Lena Higgins
Off Huntington Beach	8-15	Apr. 20, 1940	1126-40	1 ♀	
Off Huntington Beach	4-20	Apr. 20, 1940	1127-40	5 ♂, 7 ♀	
Along Huntington Beach	5-10	Feb. 16, 1941	1233-41	5 ♂, 2 ♀	
3.5 mi. off Huntington Beach	18-19	Feb. 16, 1941	1234-41	1 ♂, 1 ♀	
Off Newport Inlet, ocean side	6-18	June 25, 1942	1453-42	1 ♀, 1 frag.	
Newport Bay	—	Nov. 28, 1914	D-I-39	3 ♂, 1 frag.	<i>Anton Dohrn</i> , Acc. 320
Newport Bay, Back Bay at Kerckhoff Lab.	—	July 1959	—	2 ♀	L. Hughes
Newport Bay at Balboa N side of bar, main channel	shore	Dec. 15, 1914	—	1 ♂	Higgins, Hobbs & Burnight
Newport Bay					
S of Lido Isle	3	Feb. 1, 1942	1444-42	2 ♂	
Newport Harbor					
Corona del Mar	shore	Dec. 18, 1941	1440-41	1 frag.	
Corona del Mar	shore	Dec. 17, 1941	1441-41	1 ♂	

Portunus xantusii xantusii (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Newport Bay					
Corona del Mar side	shore	July 18, 1952	2131-52	1 ♂, 1 ♀	
Laguna Beach	54-57	Apr. 21, 1940	1131-40	1 ♂	
Off Abalone Point	shore	Aug. 20, 1933	—	1 ♂	Illustrated
Oceanside					
San Diego	—	1929	—	3 ♂, 3 ♀ (1 ov)	
Mission Bay	9-13	Feb. 23, 1941	1243-41	1 ♂	
2.75 mi. off Point Loma					
San Diego					
Zuniga Shoals	shore	Mar. 3, 1904	—	2 ♂, 1 ♀	<i>Albatross</i> Exped. (returned to USNM)
San Diego Bay anchorage	6-7	Feb. 23, 1941	1242-41	2 ♂, 3 ♀, 1 yg	
San Diego	—	Feb. 26, 1950	—	1 ♂, 1 ♀	Mitchell & Roche
San Diego					
Shelter I. fishing pier	3	Nov. 18, 1957	—	3 ♂, 2 ♀	F. Ziesenhenné, hoop net. ♂ pleopod
Lower California, W side					
W end of Cortez Bank	45	Aug. 26, 1949	1880-49	4 ♂, 2 ♀, 2 yg	
Off Tijuana River	16.5	Mar. 8, 1960	P-222-60	1 ♂	R. Rosenblatt, SIO (returned to SIO)
Tijuana River	25 ft.	July 19, 1958		1 ♀	J. C. Quast, dive (returned to SIO)
Papatote Bay	35 ft.	Aug. 10, 1959	SIO 59-307	2 ov ♀	C. L. Hubbs, dipnet (returned to SIO)
Punta Banda	0	Feb. 2, 1951	SIO H51-19	2 ♂	
San Quintin Bay	12	Feb. 15, 1936	489-36	1 ♂, 1 ♀	
San Quintin Bay	25	Feb. 15, 1936	490-36	1 ♂, 1 ♀, 1 yg	
Rosario Bay	10-15	Feb. 15, 1936	491-36	3 ♂	
Rosario Bay	15	Feb. 28, 1937	610-37	1 ♂, 1 ♀, 1 yg	
Guadalupe Island					
Melpomene Cove	—	Dec. 17, 1949	1913-49	3 ♂, 1 ♀	Surface at night
Melpomene Cove	50-51	Dec. 19, 1949	1920-49	1 ♂	

Melpomene Cove	10			1 ♂	C. Limbaugh, dive (returned to SIO)
S end Melpomene Cove W of South Bluff between inner islet and main island	—	Dec. 7, 1946	H46-144	2 yg	C. L. Hubbs
Between Melpomene Cove and inner island	—	Dec. 7, 1946	H46-145	1 yg	C. L. Hubbs
Blanca Bay	5-15	Dec. 18, 1949	1914-49	1 ♂, 1 ♀, 1 yg	K. S. Norris, trynet (returned to SIO) C. L. Bevington & J. Radovitch, <i>Yellowfin</i> ; C F&G
Blanca Bay	8-12	Apr. 15, 1951	2018-51	2 ♂, 1 ♀	
Playa María Bay	6-8	Apr. 15, 1951	2019-51	1 ♂, 1 ♀	
	35 ft.	Sept. 1, 1952	SIO H52-165	2 ♂, 3 ♀ (1 ov)	
Santa Rosalia Bay	4	Sept. 6, 1953		1 ov ♀	
San Benito Islands Between S ends of E and W islands	35	Sept. 19, 1939	1009-39	3 yg	
Cedros Island	10-15	Mar. 10, 1934	287-34	12 ♂, 10 ♀	At gangway light Kenyon-Williams Exped. J. Knudsen & D. Gorsline J. Soule & W. Emerson, night dipnetting
South Bay	—	Feb. 26, 1941	—	7 ♂, 4 ♀	
S of Cedros Island	3	Apr. 27, 1946	M 9 A	1 ♂, 1 frag.	
Scammon Lagoon	4.5-9	Sept. 14, 1953	KG-6	1 ♂	
Scammon Lagoon	5-9	Sept. 14, 1953	KG-5	1 ♂	
Head of Scammon Lagoon	surface	Mar. 21, 1956	—	1 ♂	
4 mi. N of Dewey Channel	24-25	Feb. 27, 1941	1261-41	1 ♂	
Dewey Channel off San Eugenio Point (Punta Eugenia)	21-26	Feb. 27, 1941	1260-41	6 ♂, 1 yg	
3.75 mi. NNW of San Eu- genio Point (Punta Eugenia)	20	Mar. 5, 1949	1702-49	1 ♂, 1 ♀, 3 yg	
Port San Bartolomé Anchorage	5	Oct. 31, 1951	2065-51	1 ♂	At light
Turtle Bay	1-4	Mar. 6, 1949	1707-49	1 ♂, 2 ♀, 2 yg	S. A. Glassell
Off Cape Tortolo Turtle Bay	5-8	Jan. 19, 1938	—	13 ♂, 6 ♀, 2 yg	

Portunus xantusii xantusii (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Turtle Bay	—	Mar. 6, 1949	1708-49	2 ♂, 4 ♀	Surface at night
Turtle Bay	—	Apr. 9, 1952	S-52-33	1 ♂, 1 ♀	D. Ganssle, night light (returned to USNM)
Turtle Bay	35 ft.	Mar. 21, 1959	6187-59	1 ♀	Dipnet at surface
Turtle Bay	—	Apr. 17, 1952	SIO H-36	2 ♂, 5 ♀	(returned to SIO)
Off Thurloe Head	30	Mar. 9, 1934	285-34	1 ♂	
Asunción Island	—	Feb. 23, 1932	—	1 ♂, 2 ♀	
Asunción Bay	—	July 8, 1958	58 C2-5	1 ov ♀	C F & G
Abreojos Lagoon	—	—	—	—	
Off Whale Island	3.5 m	Feb. 11, 1950	—	2 ♂, 3 ♀, 2 yg	M. W. Johnson
San Ignacio Lagoon	—	Feb. 11, 1950	H50-65, 67, 69, 70	1 ♀, 4 yg	C. L. Hubbs, M. W. Johnson & A. A. Allanson
San Ignacio Lagoon	3.25-3.75 m	Feb. 11, 1950	H50-71	1 ♂, 1 ♀	C. L. Hubbs, M. W. Johnson & A. A. Allanson
N Whale Island	—	—	—	—	
San Juanico Bay	16	Mar. 2, 1937	616-37	1 yg	
San Juanico Bay	24	Mar. 2, 1937	617-37	1 ♂, 13 yg	
Santa María Bay	5-25	Mar. 21, 1933	126-33	5 ♂, 5 ♀, 15 yg	
Santa María Bay	18-25	Jan. 19, 1940	1031-40	20 ♂, 6 ♀, 20 yg 1 frag.	
Santa María Bay	5	Apr. 3, 1949	1786-49	1 ♀	
Santa María Bay	5	Jan. 9, 1955	—	1 ♂	Night light, UCLA
Santa María Bay	—	Jan. 14, 1955	K-105	6 ♂, 4 ♀, 3 yg	J. W. Knudsen, night light
Off Hughes Point	10	Mar. 7, 1934	279-34	3 ♂, 7 ♀	
Off Hughes Point	30-40	Mar. 7, 1934	280-34	2 ♀, 1 yg	
Off Hughes Point	30	Mar. 7, 1934	281-34	35 yg	
3.6 mi. ENE of Hughes Point	—	Aug. 11, 1956	55 Y6-2	1 ♂, 2 ov ♀	J. Schmidtke, M/V <i>Yellowfin</i> , C F & G
2.7 mi. ENE of Hughes Point	11	May 5, 1950	1974-50	4 ♂, 6 ♀	

0.5 mi. SE of Hughes Point	5-18	Apr. 5, 1949	1787-49	19♂, 15♀, 21 yg	
Magdalena Bay	13	Mar. 8, 1949	1715-49	1♂, 1♀, 3 yg	
5 mi. NE of Entrada Point	—	May 2, 1950	1962-50	1 ov ♀	Surface at night
Entrada Point	13-15	May 3, 1950	1971-50	8♂, 16♀ (6 ov)	
3.3 mi. from Belcher Point	8-12	May 3, 1950	1972-50	4♂, 2♀	
6.2 mi. from Belcher Point	18	Mar. 9, 1949	1721-49	2♂	
1 mi. N of Redondo Point	13	Mar. 9, 1949	1718-49	1♂, 1♀	Surface at night
Marcy Channel	15	Feb. 16, 1936	493-36	1♂, 1♀, 2 yg	
Off Point Tosco		Dec. 4, 1962	SIO 62	1♀	USFWS, trawl (returned to SIO)
Marquis Point					
Gulf of California					
San Ignacio Bay, Sinaloa	3-5	Mar. 31, 1937	740-37	14♂, 10 yg 5 frags.	
Near Point Piaxtla, Sinaloa	6-8	Apr. 1, 1937	744-37	1♀	

TABLE 6

Portunus xantusii minimus Rathbun

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California, W side					
4.75 mi. E of South Coronado Island	14	Mar. 11, 1938	871-38	1♂	Extralimital
Magdalena Bay	10-15	July 18, 1938	3-38	1♂	W. L. Schmitt (returned to USNM)

Portunus xantusii minimus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Gulf of California					
Off Rocky Point, Sonora	11	Feb. 2, 1940	1072-40	1 ♂	
Cholla Bay, Sonora		Feb. 2, 1949		2 ♀	T. H. Bullock (returned to USNM)
Off Georges Island	10	Mar. 25, 1937	722-37	2 ♂, 1 yg	
Inside Georges Island	11.5-13	Feb. 3, 1940	1075-40	2 ♂, 9 ♀ (3 ov) 1 yg	
Off Consag Rock	10-25	Mar. 24, 1937	719-37	1 ♂, frag.	
10 mi. SE of San Felipe	10	Feb. 1949		5 ♂, 1 ♀	T. H. Bullock; shrimp trawler (returned to USNM)
N of Cabo Tepoca, Sonora	31-36.5	Mar. 30-31, 1960	P-212-60	1 ♂, 5 ♀ (2 ov)	
Tepoca Bay, Sonora	11-13	Feb. 4, 1940	1078-40	10 ♂, 21 ♀ (1 ov) 4 yg	
Off San Luis Island	10	Mar. 23, 1937	717-37	6 ♂, 4 ♀	
N of Lobos Point, Sonora	25	Mar. 26, 1937	726-37	2 ♂, 2 ♀	
Gonzaga Bay					
Off Willard Point	2-3	Mar. 23, 1937	716-37	2 ♂, 4 ♀, 3 yg	
Off Willard Point	surface	Jan. 29, 1940	1060-40	1 ♂, 2 ♀	
Between Angel de la Guarda & Mejia islands	6-11	Jan. 28, 1940	1056-40	7 ♂, 8 ♀ (1 ov), 8 yg	
E of Angel de la Guarda I.	40	Mar. 6, 1936	549-36	1 ♂, 1 ♀	
E of Angel de la Guarda I.	8-10	Mar. 6, 1936	551-36	1 ♂, 4 ♀ (2 ov)	
E of Angel de la Guarda I.	10	Mar. 8, 1936	554-36	9 ♂, 13 ♀ (1 ov)	
Angel de la Guarda Island					
Puerto Refugio	20	Mar. 20, 1937	704-37	1 ♂, 1 ♀	
Puerto Refugio	8-10	Mar. 20, 1937	706-37	9 ♂, 9 ♀ (3 ov) 2 yg	
Puerto Refugio	60	Mar. 21, 1937	708-37	1 ov ♀	
Puerto Refugio	40	Mar. 21, 1937	711-37	4 ♂, 1 ov ♀	
Puerto Refugio	11-22	Jan. 26, 1940	1048-40	1 ♂, 9 ♀ (2 ov)	

Puerto Refugio	2	Jan. 27, 1940	1050-40	1 ♂	
Puerto Refugio	21	Jan. 27, 1940	1051-40	2 ♂, 15 ♀, 7 yg	
Puerto Refugio	6	Jan. 27, 1940	1052-40	2 ♂, 3 ♀, 8 yg	
Off Puerto Refugio	51-56	Jan. 29, 1940	1057-40	1 ♀, 1 frag.	
Between Isla Partida and Angel de la Guarda I.	20	Mar. 8, 1936	555-36	1 ♂	
Angeles Channel	30	Mar. 19, 1937	699-37	1 ♂, 1 ♀	
Angeles Bay, on spit	1	Mar. 3, 1936	539-36	1 ♂	
Angeles Bay	18	Mar. 20, 1937	702-37	2 ♂, 8 ♀ (2 ov) 1 yg	
S of Isla Partida	20	Mar. 9, 1936	558-36	2 ♂, 1 ov ♀	
S of Isla Partida	45	Mar. 9, 1936	559-36	1 ♂, 1 ♀	
N end Tiburon Island	surface	Mar. 29, 1960	P-207-60	2 ♂, 2 ♀	
E of Tiburon Island	12	Mar. 11, 1936	569-36	1 ♂	
E of Tiburon Island	12	Mar. 11, 1936	570-36	2 ♂	
E of Tiburon Island	5	Mar. 11, 1936	571-36	3 ♂, 2 ♀	
S end of Tiburon Island	4	Mar. 11, 1936	567-36	13 ♂, 22 ♀ (5 ov) frags.	♂ pleopod
Off S end Tiburon Island	40-55	Mar. 10, 1936	563-36	1 ♂, 1 ♀, 1 yg	
Off SE end Tiburon Island, .5-2 mi. offshore	13-14	Apr. 5, 1964	64 A2-15	2 ♂, 2 ♀ (1 ov)	R. Lavenberg, Alaska; surface midwater trawl; color notes, WS
S of Tiburon Island	20	Mar. 11, 1936	566-36	2 ♀ (1 frag.)	
S of Tiburon Island	7	Mar. 28, 1937	731-37	3 ♂, 4 ♀, 11 yg	
S of Tiburon Island	12	Mar. 28, 1937	732-37	2 ♂, 6 ♀, 14 yg	
S of Tiburon Island	2-16	Jan. 25, 1940	1044-40	2 ♂, 2 ♀, 2 yg	
E of San Esteban Island	20-70	Mar. 10, 1936	562-36	1 ♂, 3 ♀ (1 ov) 1 yg	
Off Punta Kino, Sonora	14-18	Mar. 25, 1960	P-191-60	3 ♂, 3 ♀ (1 ov)	R. H. Parker, SIO
Off San Francisco Bay	10-20	Mar. 1, 1936	530-36	1 ♂, 6 ♀, 2 yg	
San Francisco Bay	20	Mar. 2, 1936	532-36	6 ♂, 4 ♀, 1 frag.	
Off Punta Baja, Sonora	6.5	Mar. 25, 1960	P-190-60	1 ov ♀	R. H. Parker, SIO
SW of Punta Baja, Sonora	17.5	Mar. 25, 1960	P-185-60	4 ♀ (3 ov)	R. H. Parker, SIO
SW of Punta Baja, Sonora	36	Mar. 25, 1960	P-186-60	1 ov ♀	R. H. Parker, SIO
Puerto San Carlos & vicinity, Sonora	1-10	Mar. 24, 1949	1765-49	2 ♂, 1 ♀	

Portunus xantusii minimus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Ensenada de San Francisco, Sonora	15-18	Feb. 7, 1940	1087-40	1 yg	
Ensenada de San Francisco, Sonora	2-6	Feb. 7, 1940	1088-40	8 ♂	
Guaymas Bay, Sonora	3	Jan. 22, 1940	1038-40	1 ♂	
Guaymas, Sonora	surface	Mar. 22, 1949	1761-49	4 ♂, 2 ov ♀	Light at anchorage
Inner Harbor	surface	Mar. 23, 1949	1763-49	5 ♂, 5 ♀ (2 ov)	At night
Inner Harbor	low tide	Mar. 23, 1946	9	1 ♂	A. Sorenson (returned)
Guaymas, Sonora	6-10	Jan. 23, 1940	1039-40	4 ♂, 4 yg	
Outside Guaymas Bay, Sonora	surface	Feb. 6, 1940	1086-40	4 ♂, 5 ♀	Light at anchorage
Off Guaymas Harbor, Sonora					
S of Tortuga Island	18	Mar. 17, 1937	692-37	3 ♂, 7 ♀ (3 ov)	
E of San Marcos Island	18	Mar. 14, 1936	579-36	1 ♂, 1 ov ♀	
San Marcos Island	20	Mar. 14, 1936	582-36	2 ♂	
SE of San Marcos Island	12	Mar. 14, 1936	580-36	1 ♀	
SE of San Marcos Island	25	Mar. 14, 1936	583-36	1 ov ♀	
Off Concepción Bay	3	Mar. 15, 1937	681-37	2 ♂, 1 yg	
Off Concepción Bay	12	Mar. 15, 1937	683-37	2 ♂, 1 ♀	
Concepción Bay	shore	Mar. 14, 1936	584-36	4 ♂, 15 ♀ (7 ov) 1 frag.	
Concepción Bay	surface	Mar. 14, 1936	587-36	3 ♂, 1 ♀	Electric light
Concepción Bay	10	Mar. 15, 1936	589-36	1 ♂	
Concepción Bay	12	Mar. 16, 1937	686-37	2 ♂	
Concepción Bay	5	Mar. 16, 1937	687-37	5 ♂, 4 ♀, 4 yg 2 frag.	
Concepción Bay	12	Mar. 16, 1937	688-37	1 ♂, 1 ♀	
Concepción Bay	surface	Mar. 26, 1949	1770-49	2 ♀	Anchorage at light
Coyote Bay	2-3	Mar. 14, 1936	585-36	8 ♂, 3 ♀	
Coyote Bay					
W of Bargo Island	3-7	Mar. 27, 1949	1771-49	6 ♂, 7 ♀ (2 ov)	

Off Ildefonso Island	50	Mar. 15, 1937	677-37	4 ♂, 3 ♀ (2 ov)
Off Pulpito Point	14	Mar. 14, 1937	674-37	5 ♂, 14 ♀ (6 ov) 5 yg
Off Pulpito Point	55	Mar. 15, 1937	675-37	8 ♂, 8 ♀ (1 ov)
S of Mangles Anchorage	3-5	Feb. 28, 1936	526-36	28 ♂, 10 ♀ (2 ov) 1 frag.
W of Coronados Island	3-10	Feb. 28, 1936	525-36	5 ♂, 1 ♀, 2 yg
Carmen Island	20	Mar. 14, 1937	673-37	8 ♂, 4 ♀ (1 ov) 3 yg
Salinas Bay	11-15	Apr. 6, 1939	<i>Stranger</i> 32	2 ♂, 2 ♀
Salinas Bay	7	Mar. 20, 1949	1755-49	10 ♂, 8 ♀, 2 yg
1 mi. WSW of Perico Point	7-11	Mar. 21, 1949	1759-49	1 ov ♀
1 mi. WSW of Perico Point	7-11	Mar. 21, 1949	2189 mud	1 ♂
San Francisco Bay	25	Mar. 20, 1949	1754-59	1 ♂, 1 ♀
Puerto Escondido	24	Mar. 16, 1936	592-36	1 ov ♀
Puerto Escondido	10-15	Mar. 16, 1936	594-36	3 ♂, 1 ♀
Puerto Escondido	26	Mar. 16, 1936	595-36	3 ♂, 1 ♀
Puerto Escondido	20	Mar. 16, 1936	596-36	3 ♂, 3 ♀
Puerto Escondido	10	Mar. 16, 1936	597-36	3 ♀ (1 ov)
Puerto Escondido	60	Mar. 12, 1937	667-37	1 ♀
Puerto Escondido	8-15	Feb. 10, 1940	1093-40	1 ♀, 1 yg
Puerto Escondido	18-21	Feb. 11, 1940	1096-40	1 ♂
Puerto Escondido	14-18	Feb. 11, 1940	1097-40	1 ♂, 1 yg
Puerto Escondido, inner lagoon	shore	Apr. 14, 1964	64A2-48	1 ♂
Agua Verde Bay	5-10	Feb. 27, 1936	520-36	4 ♂, 3 ♀, 2 yg
Agua Verde Bay		Feb. 27, 1936	521-36	6 ♂, 1 ov ♀
Agua Verde Bay	10	Mar. 10, 1937	655-37	4 ♂, 6 ♀
Agua Verde Bay	8	Mar. 11, 1937	662-37	5 ♂, 2 ♀ (1 ov) 78 yg
Agua Verde Bay	15	Mar. 11, 1937	663-37	1 ♂
Agua Verde Bay	20	Feb. 12, 1940	1102-40	1 yg
N of San Francisco Island	22	Mar. 8, 1937	647-37	1 ♂, 1 ♀
N of San Francisco Island	60	Mar. 8, 1937	648-37	1 ♂, 5 ♀
E of San Francisco Island	shore	Feb. 24, 1936	515-36	1 ♂

M/S *Stranger*

Mud sample

R. Lavenberg, *Alaska*;
color notes, WS

Reef

Portunus xantusii minimus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
E of San Francisco Island	125-150	Feb. 25, 1936	516-36	3 ♂, 6 ♀ (1 ov)	
E of San Francisco Island	15	Feb. 25, 1936	517-36	3 ♂, 1 ♀	
E of San Francisco Island	47	Mar. 9, 1937	650-37	6 ♂, 9 ♀ (2 ov)	
San Francisco Island	shallow	Mar. 9, 1937	653-37	1 ♀	Coral
Off San Francisco Island	30	Feb. 24, 1936	513-36	10 ♂, 19 ♀ (3 ov)	
S of San Francisco Island	15	Feb. 24, 1936	514-36	64 specimens (incl. 2 ov ♀)	
3 mi. SW of San Francisco I.	43-44	Feb. 13, 1940	1106-40	1 ♂, 2 ♀, 2 yg	
Espiritu Santo Island					
Off Ballenas Bay	25	Mar. 8, 1937	642-37	5 ♂, 8 ♀ (2 ov) 1 yg	
Off San Gabriel Bay	29-35	Feb. 13, 1940	1107-40	1 ♀	
San Gabriel Bay	1-4	Feb. 22, 1936	506-36	3 ♂, 2 ♀	
San Gabriel Bay	24	Mar. 6, 1937	632-37	1 ♀	
San Gabriel Bay	shallow	Mar. 6, 1937	634-37	1 ♀	
San Gabriel Bay	surface	Mar. 29, 1949	1779-49	8 ♂, 1 ♀	At light
San Lorenzo Channel	5-15	Feb. 19, 1936	498-36	4 ♂, 2 ♀	
San Lorenzo Channel	14	Mar. 21, 1936	606-36	1 ♂, 2 ♀ (1 ov)	
San Lorenzo Channel	24	Mar. 21, 1936	607-36	7 ♂, 1 ♀, 3 yg	
San Lorenzo Channel	3-5	Mar. 7, 1937	639-37	15 ♂, 9 ♀ (1 ov) 5 yg	
San Lorenzo Channel	6-13	Feb. 14, 1940	1111-40	9 ♂, 7 ♀, 4 yg	♂ color note 441
San Lorenzo Channel	13	Mar. 15, 1949	1738-49	1 ♂, 2 ♀	
La Paz	shore	Jan. 28, 1955	K-137	1 ♀	J. W. Knudsen; rocky beach
La Paz Bay					
Pichilingue Harbor	3	Feb. 21, 1936	504-36	4 ♂, 9 yg	
Off Prieta Point Light	5	Feb. 21, 1936	503-36	1 ♂, 1 ov ♀	
Off Prieta Point Light anchorage		Mar. 5, 1937	630-37	1 ♀	Electric light
Ensenada de los Muertos	5	Mar. 5, 1937	627-37	23 ♂, 10 ♀, 19 yg	
Ensenada de los Muertos	10-12	Mar. 5, 1937	628-37	1 ♂, 24 yg	
Off Robelar, Sinaloa	5-6	Mar. 16, 1960	P-149-60	1 yg	R. H. Parker, SIO

Locality	Fms.	Date	Station	Number & Sex	Remarks
Los Frailes, offshore		Mar. 23, 1957		1 ♂	
Off Los Frailes	5-15	Apr. 4, 1937	751-37	110 specimens (incl. 1 ov ♀)	W. L. Klawe, night light (returned to USNM)
Fraile Bay	8-10	Feb. 18, 1936	497-36	4 ♂, 2 ♀, 14 yg	
Fraile Bay	10	Mar. 13, 1949	1735-49	2 ♂, 3 ♀	
Off Gorda Point	51-55	Feb. 16, 1940	1116-40	1 ♂	
Off Gorda Point	17-25	Feb. 16, 1940	1117-40	19 ♂, 19 ♀ (4 ov) 1 frag.	
Gorda Point		ca. May 15, 1956		1 ♂	W. L. Klawe (returned to USNM)
Inner Gorda Point	59-78	Feb. 17, 1940	1118-40	1 ♂	
N of Cabeza Ballena	10-15	Feb. 8, 1936	495-36	1 yg (frag.)	
1.25 mi. SW of Cabeza Ballena	20	Mar. 11, 1949	1725-49	5 ♂, 3 ♀	
1.25 mi. SW of Cabeza Ballena	30	Mar. 11, 1949	1726-49	1 ♂, 6 ♀	
1.75 mi. NE of Cape San Lucas	10	Mar. 11, 1949	1724-49	17 ♂, 33 ♀ (13 ov)	
1.5 mi. NE of Cape San Lucas	10	Mar. 11, 1949	1723-49	2 ♂, 3 ♀ (2 ov)	
Nr. Point Piaxtla, Sinaloa	6-8	Apr. 1, 1937	744-37	3 ♂	
Isabel Island	10-18	Apr. 2, 1937	745-37	1 ov ♀	
Off Isabel Island Southern Mexico	10-25	Mar. 5, 1934	277-34	21 ♂, 4 ♀ (1 ov)	
Tenacatita Bay	10	Mar. 4, 1934	271-34	1 ♂	
Tenacatita Bay	5	Feb. 15, 1935	485-35	1 ♂ (frag.)	

TABLE 7

Portunus xantusii affinis (Faxon)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Gulf of California, E side Off Rio San Lorenzo	27-31	May 10, 1959	VS-BII-25	1 ♂	Parker, Rowland, Keith, SIO (Parker Sta. 87)

Portunus xantusii affinis (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
5-7 mi. SW of Mazatlán	60-100	Oct. 31, 1961		2 ♀	Bruce Campbell, Donald Shasky, <i>Rio Duero</i> , C F & G D. Dockins, SIO
NW of Isabel Island	29-33	Mar. 10-11, 1960	P-158-60	1 ♂, 2 ♀	
Off Isabel Island	15-25	May 9, 1939	974-39	3 ♂, 4 ♀	
Tres Marias Islands					
Cleopha Island	20-41	Feb. 8, 1954	2602-54	8 ♂, 9 ♀ (2 ov)	♂ illustrated
2.5 mi. SW of SE Pt.	30	May 18, 1959	VS-BII-39	1 ov ♀	Parker, Rowland, Keith, SIO (Parker Sta. 97)
Off San Blas					
Revilla Gigedo Islands					
Clarion Island	—	Mar. 28, 1954	5482-11	9 ♂, 5 ♀	L. Pinkas, C F & G, from stomach of Gambuso shark, <i>Carcharinus azureus</i>
Southern Mexico					
Tenacatita Bay	25	Mar. 4, 1934	272-34	1 yg	Comp. w. USNM No. 20613
Petatlán Bay					
S of White Friars	25	Mar. 2, 1934	264-34	12 ♂, 12 ♀ (1 ov) 2 yg	
W of Morro de Petatlán	25	Mar. 3, 1934	267-34	4 ♂ (1 frag.), 12 ♀ (2 ov)	
W of Tequepa Bay	near surface	Apr. 16, 1961		2 ♂, 1 yg	IATTC (returned to SIO)
Acapulco Harbor		June 15, 1952	SIO H52-40	1 ♂	L. Berner (returned to SIO)
Chacahua Bay	40-50	Jan. 9, 1938	767-38	6 ♂, 5 ♀	
Chacahua Bay	5-10	Jan. 9, 1938	765-38	1 ♂, 72 yg, 1 cast cuticle	
Chacahua Bay	10-15	Mar. 20, 1939	927-39	4 ♂, 24 yg	
Tangola-Tangola and Santa Cruz bays	15-20	Feb. 28, 1934	259-34	11 ♂, 9 ♀ (1 ov) 57 yg	
15°30' N, 97°05' W	—	Mar. 8, 1959		1 ♀	J Seapin, <i>Ruthie B.</i> , C F & G

Guatemala	570-620	Nov. 18, 1958	TO-58-2	1 ♂	Wisner & Parker, SIO
Off Guatemala					
El Salvador	1306	Mar. 6, 1958		2 ♂, 1 ♀	J. Seapin, <i>Ruthie B.</i> , C F & G, from stomach of Porpoise tuna UCLA; from stomach of tuna caught on hand line
13°27' N, 91°44' W		Jan. 19, 1955		1 ♂, 1 ♀	Tom Jow, UCLA; dipnet under light
12°35.2' N, 89°55' W	over 1000	Mar. 18, 1957	57-C-1	1 ♀	
69 mi. from Acajutla					
Costa Rica					
Port Parker	10	Feb. 9, 1935	469-35	1 ♂, 2 ♀	
Playa Blanca	2-3	Feb. 8, 1935	459-35	1 yg	
Playa Blanca	3-5	Feb. 8, 1935	460-35	3 yg	Very small. ?Ident.
Playa Blanca	15	Feb. 8, 1935	461-35	4 ♂, 3 ♀, 11 yg	
				5 v. small yg	
Puerto Culebra	10	Feb. 24, 1934	253-34	1 ♂	
S of Mala Point	shore	Feb. 24, 1934	256-34	7 yg	
Off S Viradores Islands	10	Feb. 25, 1934	257-34	1 yg	
Near S Viradores Islands	shoal	Feb. 25, 1934	258-34	6 yg	<i>Pocillopora</i> coral
10°31' N, 86°12' W		Mar. 27, 1954		1 ♂	D. Ganssle, M/V <i>Saratoga</i> , UCLA
Gulf of Dulce	10-22	Mar. 26, 1939	939-39	11 ♂, 8 ♀, 18 yg	
Panama					
Secas Islands	25	Feb. 22, 1934	250-34	1 ♀	
Secas Islands	shoal	Feb. 22, 1934	252-34	1 yg (frag.)	<i>Pocillopora</i> coral. Id. MJR as <i>P. angustus</i> Id. MJR as <i>P. angustus</i>
Secas Islands	12	Feb. 5, 1935	448-35	2 yg	
Secas Islands	12	Feb. 5, 1935	448-35	13 yg	
Secas Islands	12	Feb. 5, 1935	451-35	1 yg	
Secas Islands	12	Feb. 6, 1935	456-35	11 yg	
Secas Islands	12	Feb. 6, 1935	457-35	1 yg	
Secas Islands	25-26	Mar. 27, 1939	945-39	996 specimens, mostly small	Id. MJR as <i>P. angustus</i>

Portunus xantusii affinis (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
10 mi. W of Secas Islands	30	Mar. 27, 1939	944-39	3 ♂, 2 ♀	
Off Jicarita Island	24	Feb. 20, 1934	240-34	1 ♂, 1 ♀	
Jicarita Island	30	Feb. 20, 1934	242-34	6 ♂, 24 ♀ (18 ov)	
Off Bahia Honda	30-50	Mar. 1, 1938	863-38	2 ♂, 1 ♀	♂ pleopod
Bahia Honda	15-20	Feb. 22, 1934	249-34	5 ♂, 17 yg	
Off Pacora Island	15-25	Feb. 21, 1934	245-34	2 yg	
Off Medidor Island	30-35	Mar. 28, 1939	948-39	1 yg	
Off S point of bay	25-30	Feb. 22, 1934	248-34	1 ♂	
Colombia					
Off Octavia Rocks	45	Jan. 27, 1935	431-35	1 ♀	
Port Utría	20	Feb. 14, 1934	234-34	1 ♀	
Off Port Utría	15-20	Feb. 14, 1934	235-34	2 ♂, 1 ♀, 5 yg	
				1 carapace	
Off Port Utría	20	Feb. 15, 1934	238-34	2 ♂, 4 ♀ (3 ov)	
				1 frag.	
Off Cape Corrientes	10	Feb. 13, 1934	231-34	12 yg	
Off Gorgona Island	shore	Feb. 12, 1934	218-34	3 yg	
Off Gorgona Island	20	Feb. 12, 1934	221-34	1 ♀, 15 yg	
Off Gorgona Island	5-6	Feb. 12, 1934	227-34	1 yg	
Between Gorgona and Gorgonilla islands	—	Feb. 12, 1934	228-34	7 yg	
Ecuador					
San Francisco Bay	2	Feb. 11, 1934	215-34	1 yg	Specimen not found
Off La Plata Island	7-10	Feb. 10, 1934	213-34	1 ♂, 1 yg	
Peru					
Gulf of Guayaquil	—	Apr. 20, 1954	—	2 ♂, 1 ♀	J. Fitch, <i>Stella Maris</i> , C F & G
Lobos de Afuera Island, S Bay	14-16	Jan. 17, 1935	395-35	1 ♂	
09°05' S, 79°57' W	14	Apr. 21, 1959	59-C-22	1 ♀	M/V <i>Constitution</i> , UCLA

TABLE 8
Portunus tuberculatus (Stimpson)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Gulf of California					
Off Los Frailes	5-15	Apr. 4, 1937	751-37	3 ♂, 7 ♀ (2 ov), 6 yg	
E of Cabeza Ballena	25	Mar. 3, 1937	620-37	1 ♂, 4 ♀ (3 ov), 4 yg	♂ pleopod
1.25 mi. SW of Cabeza Ballena	20	Mar. 11, 1949	1725-49	1 ♂, 3 ♀ (1 ov)	
1.25 mi. SW of Cabeza Ballena	30	Mar. 11, 1949	1726-49	1 ♂	♂ pleopod
1.75 mi. NE of Cape San Lucas	10	Mar. 11, 1949	1724-49	8 ♂, 9 ♀ (6 ov)	
Off Isabel Island	10-25	Mar. 5, 1934	277-34	52 specimens (6 ov ♀)	
Isabel Island	10-18	Apr. 2, 1937	745-37	4 ♂, 12 ♀ (1 ov), 2 yg	
Isabel Island	10-18	Apr. 2, 1937	747-37	10 ♂, 4 ♀	
Isabel Island	10-15	Mar. 8, 1938	870-38	10 ♂, 6 ♀ (2 ov)	♂ illustrated
Revilla Gigedo Islands					
Socorro Island					
Braithwaite Bay	shore	Jan. 2, 1934	128-34	1 ♂	
Braithwaite Bay	10-18	Jan. 3, 1934	129-34	2 ♂, 1 ov ♀	
Braithwaite Bay	shoal	Jan. 3, 1934	131-34	2 ♂, 1 ov ♀, 5 yg	
Braithwaite Bay	20	Jan. 4, 1934	133-34	1 ♀	
Southern Mexico					
Tenacatita Bay	25-35	Mar. 4, 1934	275-34	1 ov ♀, 5 yg	
W of Islets off Navidad Head					
Petatlan Bay	5-10	Mar. 3, 1934	265-34	1 yg, 9 ♀ (1 ov)	
N of White Friars	25	Mar. 3, 1934	268-34	16 ♂, 9 ♀ (1 ov) 1 frag., 3 yg	
E of White Friars	5-10	Mar. 3, 1934	269-34	7 ♂, 5 ♀ (1 ov), 5 yg	
S of White Friars	25	Mar. 2, 1934	264-34	1 ♂	
Chacahua Bay	5-10	Jan. 9, 1938	765-38	22 ♂, 2 ♀, 8 yg	

Portunus tuberculatus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Chacahua Bay	10-15	Mar. 20, 1939	927-39	10 ♂, 3 ♀, 17 yg	
	15-20	Feb. 28, 1934	259-34	6 ♂, 5 ♀ (2 ov), 3 yg	
Tangola-Tangola and Santa Cruz bays					
Guatemala					
Off San José Light	23	Mar. 23, 1939	931-39	1 yg	
Costa Rica					
Salinas Bay	2	Feb. 11, 1935	477-35	1 ♀	
Salinas Bay	1.5	Feb. 11, 1935	478-35	1 ♂, 1 ♀	
Salinas Bay	6	Feb. 11, 1935	481-35	1 ♂, 2 ♀	
Puerto Culebra	10	Feb. 24, 1934	253-34	1 ♂, 1 ov ♀, 1 frag.	
Puerto Culebra	3-10	Feb. 24, 1934	254-34	1 ♂, 1 ♀, 1 yg	
Off S Viradores Islands	10	Feb. 25, 1934	257-34	25 ♂, 25 ♀ (8 ov) ca. 50 frags.	
Near S Viradores Islands	shoal	Feb. 25, 1934	258-34	1 ♂	Coral
Gulf of Dulce	10-22	Mar. 26, 1939	939-39	22 ♂, 11 ♀ (2 ov), 15 yg	
Gulf of Dulce	19-48	Mar. 26, 1939	941-39	14 ♂, 24 ♀ (5 ov), 3 yg	
Panama					
Secas Islands	15	Feb. 22, 1934	251-34	5 ♂, 6 ♀ (1 ov), 1 yg	
Secas Islands	25	Feb. 5, 1935	449-35	1 ♂	
Secas Islands	14	Feb. 5, 1935	450-35	2 ♂, 1 ♀	
Secas Islands	12	Feb. 6, 1935	456-35	1 ♀, 1 yg	
Secas Islands	5-20	Feb. 6, 1935	458-35	1 ♂, 2 ♀, 1 yg	
Secas Islands	3	Mar. 2, 1938	865-38	12 ♂, 8 ♀ (3 ov) 5 yg, 1 frag.	
Bahia Honda	15-20	Feb. 22, 1934	249-34	12 ♂, 15 ♀ (5 ov)	
Off Pacora Island	15-25	Feb. 21, 1934	245-34	2 ♂, 2 ♀	
Off S point of bay	25-30	Feb. 22, 1934	248-34	1 ov ♀	
Piñas Bay	25	Jan. 29, 1935	438-35	2 ♂	
Piñas Bay	30-35	Jan. 29, 1935	442-35	1 yg	

Colombia									
Port Utría	20	Feb. 14, 1934	234-34	6 ♂, 7 ♀, 5 yg					
Off Port Utría	15-20	Feb. 14, 1934	235-34	1 ♀					
Port Utría	10	Jan. 24, 1935	417-35	2 ♂, 4 ♀ (1 ov), 1 yg					
Off Port Utría	20	Jan. 25, 1935	423-35	10 ♂, 13 ♀ (2 ov) 1 frag.					
Port Utría	12	Jan. 25, 1935	425-35	1 ♂, 2 ♀, 2 yg					
Port Utría	15-30	Feb. 25, 1938	856-38	8 ♂, 14 ♀, 5 yg					
Off Cape Corrientes	10	Feb. 13, 1934	231-34	5 yg					
N of Gorgona Island	10-20	Feb. 24, 1938	851-38	2 ♂, 4 yg					
Gorgona Island									
Off North Point	20	Jan. 22, 1935	409-35	1 ♂, 1 ov ♀, 1 yg					
Off Monkey Point	22	Jan. 22, 1935	406-35	1 ♂					
Off Monkey Point	20	Jan. 22, 1935	407-35	5 ♂, 2 ♀, 4 yg					
Off Gorgona Island	20	Feb. 12, 1934	221-34	113 specimens (no ov ♀)					
Off Gorgona Island	35	Feb. 12, 1934	223-34	85 specimens (no ov ♀)					
Off Gorgona Island	10	Feb. 12, 1934	224-34	6 ♂, 2 ♀, 12 yg					
Off Gorgona Island	8-10	Feb. 12, 1934	225-34	10 ♂, 9 ♀ (4 ov)					
Off Gorgona Island	20	Feb. 12, 1934	226-34	2 ♂, 10 ♀					
Off Gorgona Island	5-6	Feb. 12, 1934	227-34	1 ♂, 2 ♀					
Between Gorgona and Gorgonilla islands	15	Feb. 12, 1934	228-34	128 specimens (no ov ♀)					
Ecuador									
Off Cape San Francisco	2	Feb. 11, 1934	214-34	1 ♂, 1 ♀, 2 yg					
Off Cape San Francisco	15	Feb. 23, 1938	850-38	4 ♂, 2 ♀ (1 ov), 1 yg					
Off La Plata Island	10	Jan. 22, 1933	23-33	1 ♂, 1 yg					Yg with <i>P. panamensis</i> in coll. ident. MJR
Off La Plata Island	7-10	Feb. 10, 1934	213-34	18 ♂, 9 ♀ (4 ov), 1 yg					
Salango Island	3	Jan. 18, 1935	398-35	1 ♂, 1 ♀					
Salango Island	8	Jan. 18, 1935	399-35	1 ♀, 1 yg					
Off Santa Elena Bay	8-10	Feb. 9, 1934	209-34	1 ♂, 1 ♀, 1 yg					

TABLE 9
Callinectes arcuatus Ordway

Locality	Fms.	Date	Station	Number & Sex	Remarks
California Los Angeles Harbor Testing Lab. Dock, Slip No. 1		Aug. 15, 1960		1 ♂	C. Wakeman, Los Angeles Harbor Dept.
Lower California Manuela Lagoon	salt marsh beach seine	Sept. 17, 1953	KG-12	1 ♂, 1 ♀	J. Knudsen & D. Gorsline
Santa María Lagoon		Aug. 5, 1953		1 ♀	Radovitch, Bennington & Colliyer, C. F. & G.
Santa María Bay		Aug. 26, 1960	SIO 60-367	1 ♀	F. H. Berry, bag seine (returned to SIO)
Santa María Bay	0-5 ft	Dec. 9, 1962	SIO 62-737	3 ♂, 3 ♀	D. Dockins, USFWS, dipnet (returned to SIO)
Magdalena Bay	0	Nov. 27, 1961	SIO 62-101	1 ♂, 1 ♀	F. H. Berry, beach seine (returned to SIO)
Almejas Bay	0	Aug. 23, 1960	SIO 60-374	1 ♀	F. H. Berry, dipnet (returned to SIO)
Gulf of California Río Hardy (Río Colorado)		Aug. 17, 1956		1 ♂	J. P. E. Morrison (returned to USNM)
Between San Felipe and mouth of Colorado River		Apr. 6-9, 1947	H47-53	2 ♂, 2 ♀ (1 ov)	C. L. Hubbs
San Felipe Bay, reef and 1-2 mi. N		Apr. 12, 13, 1954	2623-54	1 ♂, 1 ♀	
San Felipe, oyster beds		Dec. 1948		1 ♀	
San Felipe, S beach		Dec. 1948		1 ♀	
San Felipe, first sand beach S of town, opposite airport		Nov. 24, 1950	W50-189	1 ♂	O. C. Joseph & party

San Felipe, beach 1 mi. S of town	Jan. 5, 1955	W55-30	1 ♂	R. Whitney & C. Keller, 50' seine; UCLA
Puertecitos Puerto Libertad, Sonora .5 mi. S of hotel	Feb. 14-16, 1961		1 ♀	J. Q. Burch
San Carlos Bay, Sonora	Feb. 7, 1950	W50-64	1 yg ♂	B. W. Walker & party (returned to USNM)
San Carlos Bay, Sonora	Feb. 3, 1952	W52-33	1 yg (frag.)	A. D. Flechsig & M. Newman (returned to USNM)
San Carlos Bay, Sonora	May 1954		1 ♂	C. Limbaugh (returned to USNM)
Puerto San Carlos, Sonora	Feb. 2, 1958	ESR-1	5 ♂, 1 ♀, 1 yg	E. S. Reese, UCLA
Ensenada Bocoohibampo, Guaymas, Sonora	Feb. 8, 1940	1091-40	6 ♂, 1 ♀	♂ illustrated
Off Boca del Río Yaqui, Sonora	May 17, 1946	1515-46	2 ♂	
Estero 2 mi. W of Yavarros, Sonora	May 18, 1957	W58-233	1 ♂	UCLA party
San Ignacio Bay, Sinaloa	Feb. 9, 1952	W52-47	8 ♂, 6 ♀, 10 yg	B. W. Walker & party (returned to USNM)
Espiritu Santo Island Cove S of Ballenas Bay	Mar. 31, 1937	740-37	1 ♂, 1 yg	
San Gabriel Bay	Feb. 22, 1936	511-36	1 ♀	
Off Robelar, Sinaloa	Mar. 8, 1937	645-37	2 ♂	
Astillero at Mazatlán	Mar. 16, 1960	P-149-60	1 yg	B. W. Walker & party Rosenblatt, Munz, et al., UCLA
Río Santiago at La Boca de la Asadero, Nayarit	Jan. 29, 1951	W58-18	1 ♂, 1 ♀	J. Fitch & W. Baldwin, UCLA
Estero at San Blas, Nayarit	Jan. 31, 1958	W58-14	1 ♂	R. Rosenblatt & F. Munz, UCLA
Estero at San Blas, Nayarit	Jan. 30, 1958	W58-15	4 ♂, 2 ♀, 5 yg	F. H. Berry & party, seine (returned to SIO)
Banderas Bay	Aug. 19, 1961	6108B-39	3 ♂, 4 ♀ (2 ov)	
Southern Mexico Tenacatita Bay	May 8, 1939	965-39	1 ♀	

Callinectes arcuatus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Acapulco Harbor	—	Sept. 1946	1547-46	1 ♂, 3 ♀ (1 ov)	C. L. Hubbs (H46-229)
Wharf to Playa Honda, Santa Lucia Bay	shore	Mar. 20, 1939	928-39	4 ♂, 1 ov ♀	♂ pleopod
Chachahua Bay	1-3	May 4, 1939	962-39	1 ♂, 1 ♀	
Nicaragua	shore	Feb. 10, 1935	474-35	2 ♂, 3 ♀ (one soft)	Larger ♂ with 9th antero- lateral tooth malformed
11 mi. NW of Corinto	shore	Feb. 9, 1935	473-35	1 ♀	
Costa Rica	shoal	Feb. 10, 1935	—	2 ♀	Seining
Salinas Bay	—	Mar. 13, 1933	117-33	1 ♂ (frag.)	
Parker Bay	shore	Feb. 24, 1934	256-34	1 ♀ (frag.)	
Parker Bay	—	July 17, 1961	L-7	1 ♂	Oren F. Lackey
Port Culebra, at mouth of slough	shore	Mar. 10, 1933	111-33	14 ♂, 12 ♀ (1 ov)	Ov ♀ with 7 anterolateral teeth on left
Port Culebra	—	Mar. 28, 1939	947-39	1 ♂	W. L. Klawe, bait net (returned to USNM)
S of Mala Point	shore	Apr. 2, 1957	57-C-3	1 ♀	L. R. C., bait net, UCLA
Caldera	—	June 25, 1957	SIO H-52-193	1 ov ♀	E. W. Kates, <i>Retowin</i> , bait net (returned to SIO)
Panama	1-2	July 22, 1952		1 ♂, 3 ♀	E. Reese, W. Baldwin & J. Wintersteen, UCLA
Bahia Honda	shore	Sept. 1958		3 ♂, 3 yg	E. Robson (returned to USNM)
Bahia Honda	to 15	Mar. 26, 1939		2 ♂, 1 ♀, 1 yg (frag.)	E. Deichmann (returned to USNM)
Rio Anton		July 1924			
Off mouth of Río Anton					
Punta Chame					
Gulf of Panama					
Venado					
Entrance to Panama Canal, Pacific side					

Off Panama City 08°57'30" N, 79°33'50" W	50 ft	Feb. 23, 1958	1 ♂, 1 ♀	J. Seapin, <i>Ruthie B.</i> , night light, C F & G
Panama (City?)		Feb.-May, 1947	1 ♂	<i>Retouza</i> (returned to SIO)
Panama (City?)		Apr. 31, 1937	1 ♂, 2 ♀, 3 yg	E. Robson (returned to USNM)
Bella Vista		Mar. 11, 1937	1 ♂, 2 ♀ (1 soft), 2 yg	E. Robson (returned to USNM)
Panama Viejo		Nov. 28, 1959	1 ♂, 3 ♀	F. Berry (returned to SIO)
Otoque Island		Jan. 30, 1937	1 ♂	E. Robson (returned to USNM)
Pearl Islands Contadora Island		Apr. 14, 1939	4 ♂	E. Robson (returned to USNM)
Panama Bay 8°44' N, 78°49' W	1.5	July 23, 1953	1 ♂	W. McFarland, <i>San Hilarito</i> , encircling net (returned to USNM)
Ecuador San Francisco Bay	2	Feb. 11, 1934	1 ♀	
W of Manta	shore	Jan. 20, 1935	1 ♂	
S of Santa Elena Point	shore	Jan. 18, 1933	1 ♂, 1 ♀	
Peru Gulf of Guayaquil Off Puerto Pizarro		May 11, 1941	2 ♂	M. J. Lobell, USFWS (returned to USNM)
Galapagos Islands Santa Cruz Island		Feb. 12, 1964	1 ♂	Victor A. Zullo, GISP
S Channel, campsite		Feb. 14, 1964	1 yg ♀	Victor A. Zullo, GISP; C. Angemeyra [Anger- meyer?], collector
Unknown localities ?			1 ♂, 57 yg	No data (returned to USNM)

TABLE 10
Callinectes bellicosus (Stimpson)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California San Quintin		Nov. 5, 1960		1 ♂	C. L. Hubbs & party (returned to SIO)
Manuela Lagoon		Mar. 1, 1937	614-37	2 ♂, 2 ♀	
Scammon Lagoon	2 ft	Sept. 14, 1953	KG-10	6 ♀ (4 ov)	J. Knudsen & D. Gorsline
San Ignacio Lagoon	shore	Feb. 8, 1950		1 ♂	M. W. Johnson, SIO
N Whale Island	4 ft	Aug. 23, 1950	SIO 60-364	2	F. H. Berry, bay seine (returned to SIO)
Magdalena Bay		Nov. 28, 1961	SIO 61-11 B-15	2 ♂, 2 ♀, 1 yg	USFWS (returned to SIO)
Magdalena Bay		Aug. 23, 1960	SIO 60-374	1 ♀	F. H. Berry, dipnet (returned to SIO)
Almejas Bay	0				
Gulf of California					
Cholla Bay, Sonora		May 28, 1961		2 ♀, seen by JSG	Don Allen (returned)
SW Cholla Bay, near Punta Peñasco, Sonora	shore	Apr. 14, 1965		1 ♂, 1 ♀	G. Bakus & party
San Felipe Bay	shore	? 1951	W51-64	1 yg	B. W. Walker, UCLA
San Felipe	shore	Dec. 1948	—	1 ♂	B. C. Walton, USC
San Felipe	shore	Dec. 1948	—	1 ♀	B. C. Walton, USC; oyster beds
San Felipe	shore	June 6, 1951	SIO 51-208	1 ♂	F. Wylie (returned to SIO)
San Felipe Bay	shore	Apr. 12, 13, 1954	2623-54	1 ♂	
San Felipe, first sand beach S of town	shore	Nov. 24, 1950	W50-189	1 ♂, 1 ♀	O. C. Joseph & party

1 mi. S of San Felipe	shore	Feb. 24-25, 1955		1 ♂, 2 ♀, 2 yg	R. H. Linsley
1 mi. S of San Felipe	shore	Jan. 5, 1955	W55-30	1 ♂	R. Whitney & C. Keller, UCLA, 50' seine
Puertecitos		Feb. 14-16, 1961		1 ♀	J. O. Burch
15 mi. S of San Felipe	shore	Nov. 25, 1950		1 ♂, 1 ♀, 2 yg	A. O. Flechsig & party
Off San Luis Island	10	Mar. 23, 1937	717-37	1 ♂	
San Luis Gonzaga Bay	—	Jan. 30, 1959	W59-9	2 ♂	
Las Animas Bay	shore	Apr. 8, 1964	64A2-23	1 ♂, 1 ♀	W. Baldwin, J. Wintersteen & H. Kelly, UCLA
Los Angeles Bay	2	Apr. 21, 1962	SIO 62-217	1 ♀	R. Lavenberg, <i>Alaska</i> , mating pair. Color notes, WS
Los Angeles Bay		Apr. 23, 1962	SIO 62-223	2 ♂ (yg)	Seine (returned to SIO) C. L. Hubbs & party (returned to SIO)
Off SE end Tiburón Island	5	Apr. 5, 1964	64A2-14	3 ♀ (yg), 3 yg	R. Lavenberg, <i>Alaska</i> , blanket net. Color notes, WS
SE of Punta Baja, Sonora	surface	Mar. 22, 1960	P-173-60	2 ♂	Parker & Eddy, SIO, dipnetted
San Carlos Bay, Sonora		Feb. 2, 1958	ESR-1	5 ♂, 4 ♀, 1 yg	E. S. Reese, UCLA
Puerto San Carlos, Sonora	shore	Feb. 8, 1940	1091-40	2 ♂	
Ensenada de San Francisco, Sonora	shore	Mar. 31, 1937	739-37	1 ♀	
Ensenada de San Francisco, Sonora	shore	May 17, 1946	1516-46	2 ♀	E. Y. Dawson & F. E. Durham
Off Guaymas Harbor, Sonora	surface	Feb. 6, 1940	1086-40	1 ♀, 2 yg	Light at anchorage
Guaymas Harbor, Sonora		Apr. 12, 1957		1 ♂, 1 ♀	Dip net (returned to SIO)
Guaymas, inner harbor	—	Mar. 22, 1949	1761-49	10 ♂, 6 ♀, 5 yg	Surface at night
Guaymas, inner harbor	—	Mar. 23, 1949	1762-49	4 ♂, 5 ♀, 2 yg	Otter trawl
Guaymas, inner harbor		Mar. 23, 1949	1763-49	1 ♂, 1 ♀, 6 yg	Surface at light
Guaymas, Sonora		Mar. 22, 1939		1 yg	M. W. Johnson (returned to SIO)
Guaymas, Sonora		Feb. 13, 1953		1 ♂, 1 ♀	Mangrove swamps (returned to USNM)
Guaymas, Sonora		Mar. 27, 1959	SIO VS-22	2 yg	Vermilion Sea Exped. (returned to SIO)

Callinectes bellicosus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Mulegé	0	Nov. 20, 1963	SIO 6311-25	2 ♂, 2 ♀	A. Fleminger, dipnet (returned to SIO) Electric light at anchorage
Concepción Bay	—	Mar. 15, 1937	685-37	1 ♂, 2 ♀	
Concepción Bay	5	Mar. 16, 1937	687-37	2 yg	
Concepción Bay	—	Mar. 28, 1940		2 ♂	E. F. Ricketts, electric light at night (returned to USNM) Surface at night
Concepción Bay, anchorage	—	Mar. 26, 1949	1770-49	1 ♀	
Coyote Bay	—	Mar. 27, 1949	1771-49	1 yg	
W of Bargo Island	3	Jan. 21, 1955	K-116	1 yg	J. W. Knudsen
Puerto Escondido	shore	Jan. 22, 1955	K-121	1 ♂, 1 ♀	J. W. Knudsen
Puerto Escondido, N Bay	shore	Apr. 14, 1964	64A2-48	1 ♂, 1 ♀	R. Lavenberg, Alaska, from crab holes.
Puerto Escondido, inner lagoon	shore			1 ♂, 1 ♀	Color notes, WS
Santa Barbara Bay, Sonora	—	Mar. 2, 1962	62A1-11	1 ♀	C F & G
Agua Verde Bay	shore	Feb. 13, 1940	1103-40	3 ♂, 2 ♀, 1 yg	
Espíritu Santo Island	—	Feb. 16, 1932		1 ♂	
Espíritu Santo Island	—	Feb. 18, 1932	20-32	1 ♂, 1 ♀	♂ pleopod
Espíritu Santo Island	—	Mar. 20, 1936	605-36	5 ♂, 4 ♀	In lagoon
San Gabriel Bay	shore	Mar. 6, 1937	634-37	5 ♂, 2 ♀	
San Gabriel Bay	shore	Mar. 8, 1937	645-37	5 ♂, 6 ♀	In lagoon; ♂ illustrated
San Gabriel Bay	shore	Mar. 14, 1949	1736-49	2 ♂, 3 ♀	
San Gabriel Bay	shore	Mar. 29, 1949	1779-49	1 ♂, 1 ♀	Surface at light
La Paz Bay	—	Mar. 5, 1937	630-37	3 ♂, 2 ♀	Electric light, anchorage
Off Punta Prieta Light	—	Mar. 5, 1937	630-37	1 ♀	Comp. w. USNM ♀ 15439 by JSG

TABLE 11
Callinectes toxotes Ordway

Locality	Fms.	Date	Station	Number & Sex	Remarks
Nicaragua 11 mi. NW of Corinto	1-3	May 4, 1939	962-39	1 ♀, 3 yg	
Costa Rica Port Culebra, along slough Caldera	shore —	Mar. 12, 1933 July 17, 1961	115-33 L-7	3 ♂ 1 ♀	Damaged Oren F. Lackey
Gulf of Nicoya		Jan. 1952		2 carapaces (1 broken)	S. E. Erdman (returned to USNM)
Panama Gulf of Panama	to 15	Sept. 1958		1 ♂, 1 ♀	E. S. Rees, W. Baldwin & J. Wintersteen, UCLA; ♂ pleopod; illustrated
Green Island (= Isla Verde?)		Jan. 8, 1939		1 ov ♀	E. Robson (returned to USNM)
Río Marina, brackish lagoon		Apr. 30, 1944	R 2506	1 ♀	J. P. E. Morrison (returned to USNM)
Río Mata Puerco, at bridge		May 15, 1944	R 2549	1 ♂	J. P. E. Morrison (returned to USNM)
Vicinity of Panama City from stream below survey camp		Feb. 18, 1944	R. 2645	1 ♂, soft shell	J. P. E. Morrison, caught in trap (returned to USNM)
Colombia Tumaco		Apr. 19, 1941	Askoy 88 sample 344	1 ♂	Askoy Exped., AMNH; bought in fish market
Ecuador San Francisco Bay		Feb. 23, 1938	849-38	1 ♂	Freshwater stream

TABLE 12

Arenaeus mexicanus (Gerstaecker)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California, W side Marquis Point	0	Dec. 4, 1962	SIO 62-705	1 ♀	F. H. Berry, seine (returned to SIO)
Gulf of California Near Point Piaxtla Mazatlán	6-8	Apr. 1, 1937 Feb. 11, 1953	744-37 12-A	3 yg 1 ♀	T. H. Bullock (returned to USNM)
	8	Jan. 15, 1963 Jan. 22, 1958	— W58-3	1 ♀ 1 ♂	J. O. Burch Rosenblatt & Baldwin, UCLA
Mazatlán 1-3 mi. N of Ensenada Chacala	shore	Jan. 25, 1958 Aug. 19, 1961	— SIO 6108B-39	1 ♂, 9 yg 1 ♂, 1 ♀	B. Walker & party, UCLA F. H. Berry, beach seine (returned to SIO)
Banderas Bay	36	June 28, 1962	—	1 ♂, 1 yg ♂	S. Kato, night light (returned to SIO)
Off Black Rock, Cape Corrientes	5-10	Jan. 7, 1938	763-38	5 ♂, 1 ♀, 6 yg	
Southern Mexico Tenacatita Bay Tenacatita Bay Tenacatita Bay Tenacatita Bay Tenacatita Bay Tenacatita Bay Tenacatita Bay Tenacatita Bay Petatlán Bay	shore	Jan. 3, 1933	2-33	carapace only	
	shore	Mar. 17, 1933	121-33	6 ♂	
	10	Mar. 4, 1934	271-34	2 ♂, 1 ♀	
	6	Feb. 15, 1935	483-35	1 ♀	
	8	Feb. 15, 1935	484-35	3 ♂, 1 ♀	
	5	Feb. 15, 1935	485-35	2 ♀	
	2-8	May 8, 1939	964-39	1 ♂, 1 yg	
	8-15	May 8, 1939	965-39	1 ♂, 1 ♀, 2 yg	
	5-10	Mar. 3, 1934	265-34	163 specimens (no ov ♀)	

Acapulco Harbor Santa Lucia Bay, from wharf to Playa Honda	Sept. 1, 1946	1 ♀	C. L. Hubbs (H46-229)
Chacahua Bay	Jan. 9, 1938	131 specimens (no ov ♀)	
Chacahua Bay	Jan. 9, 1938	1 yg	
Chacahua Bay	Mar. 20, 1939	4 ♂, 31 yg, 2 unsexable	
Tangola-Tangola and Santa Cruz bays	Feb. 28, 1934	3 yg	
Nicaragua 11 mi. NW of Corinto	May 4, 1939	7 ♂, 1 ♀, 3 yg	
Costa Rica			
Port Parker	Mar. 25, 1939	3 ♂, 4 ♀ (1 ov)	Seine haul; ♂ pleopod
Puerto Culebra	Feb. 24, 1934	1 ♂	
Gulf of Dulce	Mar. 26, 1939	3 ♀, 1 yg	
Panama			
Bahia Honda	Mar. 9, 1933	2 ♂	
Pearl Islands			
N side Pedro Gonzales Island	Mar. 11, 1944	1 ♀ (frag.)	J. P. E. Morrison (returned to USNM)
Isla del Rey		2 ♂, 1 ♀	T. H. Bullock (returned to USNM)
San José Island	May 17, 1944	1 yg (frag.)	J. P. E. Morrison (returned to USNM)
San José Island	May 26, 1944	1 ov ♀	J. P. E. Morrison (returned to USNM)
San José Island	May 26, 1944	2 ♀	J. P. E. Morrison (returned to USNM)
San José Island	May 26, 1944	2 ♂, 2 ♀	J. P. E. Morrison (returned to USNM)
San José Island Playa Grande	Aug. 2, 1944	1 ♂	Wetmore & Morrison (returned to USNM)

Arenaeus mexicanus (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Colombia					
Octavia Bay	2	Jan. 28, 1935	434-35	1 ♀	Abdomen asymmetrical
Port Utria	—	Feb. 14, 1934	—	1 ♀	
Off Cape Corrientes	10	Feb. 13, 1934	231-34	8 yg, frag.	
Ecuador					
Off Cape San Francisco	2	Feb. 11, 1934	214-34	2 yg	Comp. w. USNM 71849 by JSG
Off Cape San Francisco	15	Feb. 23, 1938	850-38	1 ♂, 1 ♀, 1 yg	
San Francisco Bay	2	Feb. 11, 1934	215-34	1 ♂, 2 ♀, 1 yg	
Manta Bay	1	Jan. 19, 1935	401-35	1 ♂	
W. of Manta Bay	shore	Jan. 20, 1935	403-35	1 ♂, 1 ♀	
Salango Island	2-3	Jan. 18, 1935	398-35	1 ♂	
Salango Island	8	Jan. 18, 1935	399-35	1 ♂	
Santa Elena Bay					
Off La Libertad	3-5	Jan. 18, 1933	9-33	1 ♂	
Off La Libertad	10	Jan. 20, 1933	15-33	1 ♀	
Off La Libertad	8-12	Feb. 8, 1934	205-34	1 ♂, 2 ♀, 1 yg	
Off La Libertad	—	Feb. 8, 1934	206-34	2 yg	On floating seaweed
Peru					
Sechura Bay					M. J. Lobell, otter trawl (returned to USNM) M. J. Lobell, seine (returned to USNM) M. J. Lobell, seine (returned to USNM) M. J. Lobell, submarine light & dipnet (returned to USNM)
Nonora Bay, 5°52' S, 81°07' W		May 23, 1941	U-02419	1 ♂, 3 ♀	
Chilca Bay, 12°29'30" S, 76°48' W	beach	Apr. 16, 1941	U-02340	2 ♂	
Chilca Bay, 12°29.5' S, 76°48' W	beach	Mar. 17, 1941	U-02354	1 ♂	
S part of Paracian Peninsula (= Peninsula Paracas), 13°56' S, 76°21' W		June 24, 1941	U-02292	2 ♀	

TABLE 13
Cronius ruber (Lamarck)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Lower California, W side South Bay, Cedros Island Magdalena Bay	shore	Apr. 10, 1934	288-34	2 ♂	♂ illustrated
4.75 mi. N of Entrada Point Marcy Channel	18 13	Mar. 8, 1949 Mar. 9, 1949	1716-49 1718-49	1 ♀ 1 ♀	
Gulf of California S shore Tiburón Island Turner's Island, S of Tiburón Island	shore shore	Jan. 25, 1940 Jan. 24, 1940	1045-40 1042-40	19 ♂, 16 ♀ 1 ♂	
Ensenada de San Francisco, Sonora	shore	May 18, 1946	1517-46	1 ♀	E. Y. Dawson & F. E. Durham
Guaymas, Sonora Astillero at Mazatlán, Sinaloa	shore	Jan. 23, 1940 Jan. 29, 1951	1041-40	7 ♂, 6 ♀ 1 ♂	B. Walker & party
Off Isabel Island Isabel Island Isabel Island Isabel Island Off Isabel Island Tres Marias Islands	10-25 10-18 10-18 10-15 15-25	Mar. 5, 1934 Apr. 2, 1937 Apr. 2, 1937 Apr. 8, 1938 May 9, 1939	277-34 745-37 747-37 870-38 974-39	1 ♂, 12 yg 1 ♂, 2 ♀, 1 yg 10 yg 2 ♂, 9 yg 1 ♀	
María Magdalena Island María Magdalena Island María Cleofa Island	13 3-5	May 9, 1939 May 9, 1939 Mar. 18, 1956	970-39 971-39 KW-17	1 (frag.) 1 ♀, 2 yg 1 yg	J. W. Knudsen, coral
Southern Mexico Tenacatita Bay W of Islets off Navidad Head	25-35	Mar. 4, 1934	275-34	1 ♂, 7 yg	

Cronius ruber (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Petatan Bay	25	Mar. 2, 1934	264-34	1 ♂, 1 ♀, 4 yg	
S of White Friars Tangola-Tangola and Santa Cruz bays	15-20	Feb. 28, 1934	259-34	2 ♀	
Chacahua Bay	5-10	Jan. 9, 1938	765-38	3 yg	
Costa Rica Playa Blanca		July 17, 1963	L-212	1 ♂	Oren F. Lackey
Panama					
Secas Islands	shoal	Feb. 22, 1934	252-34	1 ov ♀	
Secas Islands	14	Feb. 5, 1935	450-35	1 ov ♀, 4 yg	
Secas Islands	shore	Feb. 5, 1935	454-35	1 ♂, 2 ♀ (1 ov)	
Secas Islands	3	Apr. 2, 1938	865-38	6 yg	
Bahia Honda					
Off Pacora Island	15-25	Feb. 21, 1934	245-34	1 frag.	
Off S point of bay	25-30	Feb. 22, 1934	248-34	1 yg	
Venado		Mar. 26, 1939		1 ♀	E. Robson (returned to USNM)
Collins Beach		Mar. 5, 1939		4 ♂, 4 ♀ (3 ov)	E. Robson (returned to USNM)
Panama City Bella Vista	shore	Feb. 2, 1935 1936-37	445-35	1 ♂ 2 ♂, 1 ♀	E. Robson (returned to USNM)
Bella Vista		Mar. 6, 1937		1 ♀	E. Robson (returned to USNM)
Bella Vista		Jan. 22, 1939		1 ♂	E. Robson (returned to USNM)
San Francisco Bay San Francisco	shore	Feb. 28, 1938 Apr. 1, 1939	860-38	6 yg 4 ♂	E. Robson (returned to USNM)

E. Robson
(returned to USNM)
E. Robson
(returned to USNM)

1 yg
1 yg

Apr. 14, 1938
Apr. 15, 1938

Pearl Islands
Isla Contadora
Isla Contadora

Colombia

Gorgona Island
Off Monkey Point
Off Gorgona Island

22
8-10

Jan. 22, 1935
Feb. 12, 1934

406-35
225-34

1 yg
1 yg

Ecuador

Off Cape San Francisco

15
shore

Feb. 23, 1938

850-38

1 yg

Manta Bay

shore

Jan. 19, 1935

400-35

1 ♂

2 ♂ (one soft)

W of Manta

shore

Jan. 20, 1935

403-35

1 yg

23-33

Off La Plata Island

10

Jan. 20, 1933

23-33

1 yg

213-34

Off La Libertad

10

Jan. 20, 1933

15-33

1 ♂

Santa Elena Bay

2-7

Jan. 20, 1933

14-33

1 ♂

Off La Playa

shore

Jan. 18, 1933

10-33

2 ♂

S of Santa Elena Point

Peru

9.5 mi. SW of Zorritos Light

shore

Feb. 16, 1938

847-38

2 ♀

TABLE 14

Euphyllax doevii Stimpson

Locality	Fms.	Date	Station	Number & Sex	Remarks
Costa Rica 10°33' N, 86°42' W		Jan. 28, 1958		1 ♂	W. Childs, night light, C F & G
Cocos Island Wafer Bay	surface	Mar. 3, 1933	107-33	17 ♂, 16 ♀	

Euphyllax doevii (cont.)

Locality	Fms.	Date	Station	Number & Sex	Remarks
Panama Bahia Honda Panama Bay	30-35	Mar. 28, 1939 1937	948-39	1 ♂	Movable finger of chela only E. Robson (returned to USNM)
Panama Bay			W53-273	2 ♀	T. H. Bullock (returned to USNM)
114 mi. 230°T from Mariato Point	—	Mar. 24, 1959	59C1-11	83 yg, 47 megalopa	<i>Constitution</i> , UCLA. Larval ident. uncertain. Yg. illustrated
Colombia Off Malpelo Island	surface	Mar. 26, 1941	<i>Askoy</i> 55	2 ♂, 2 ♀	<i>Askoy</i> Exped., AMNH, by dipnet
Peru Gulf of Guayaquil		Apr. 20, 1954		5 ♂	<i>Stella Maris</i> , C F & G. ♂ illustrated
480 mi W of Galapagos Islands, 0°11'30" N, 100°28' W		Oct. 17, 1955	55S5-18	2 ♂	C. Blunt, from stomach of 1123 mm lancet fish; <i>Schofield</i> , C F & G

TABLE 15

Euphyllax robustus A. Milne Edwards

Locality	Fms.	Date	Station	Number & Sex	Remarks
Gulf of California Santa Barbara Bay S of Boca del Río Mayo		Jan. 25, 1950	W50-42	2 ♂ (frag.)	A. O. Flechsig (returned to USNM)

Euphyllax robustus (cont.)

Off Alkata	18-20	Mar. 16, 1960	P-150-60	1 ♂, 1 ♀	Parker & Dockins, SIO
Off Punta Piaxtla	24-26	May 13, 1959	VS-BII-33	2 ♂	Parker, Keith & Rowland, SIO (Parker Sta. 95)
NW of Isabel Island	29-33	Mar. 10-11, 1960	P-158-60	1 ♂	D. Dockins, SIO
Off San Blas	30	May 18, 1959	VS-BII-39	1 ♂, 1 ♀	Parker, Keith & Rowland, SIO (Parker Sta. 97)
Costa Rica	10	Feb. 9, 1935	471-35	1 yg	
Port Parker					
Panama	to 15	Sept. 1958		2 ♂, 4 ♀	E. S. Reese, W. Baldwin & J. Wintersteen, UCLA.
Gulf of Panama					♂ illustrated T. H. Bullock (returned to USNM)
Panama Bay			W53-273	1 ♀	
Panama (City?)	—	Jan. 11, 1933	—	1 yg	
Piñas Bay	25	Jan. 29, 1935	438-35	1 yg	
Piñas Bay	20	Jan. 29, 1935	439-35	2 yg	
Piñas Bay	15	Jan. 29, 1935	440-35	1 yg	
Colombia	35	Jan. 25, 1935	420-35	1 yg	Yg. illustrated
Off Port Utria	10	Feb. 13, 1934	231-34	1 yg	
Off Cape Corrientes	12	Feb. 12, 1934	228-34	14 yg	
Between Gorgona and Gorgonilla islands					
Ecuador	20	Feb. 11, 1934	216-34	1 yg	
San Francisco Bay					
Santa Elena Bay					
Off La Libertad	surface	Jan. 20, 1933	17-33	1 yg (? ♀)	Electric light at anchorage On floating <i>Sargassum</i>
Off La Libertad		Feb. 8, 1934	206-34	1 yg	
Peru	—	May 13, 1912	—	1 ♂ (seen by JG)	R. Paessler (returned to Hamburg Museum)
Payta					

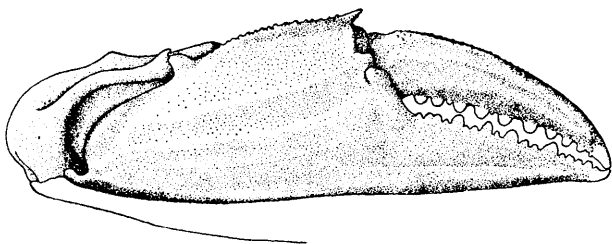
PLATE I

Macropipinae

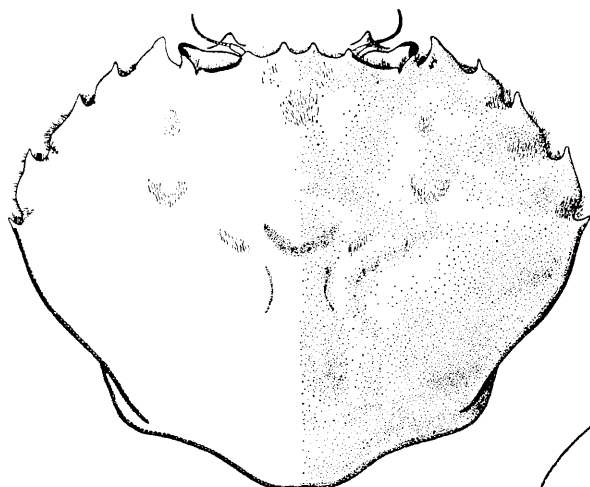
Ovalipes punctatus (de Haan), Lota, Chile, January 16, 1927
(USNM No. 61022)


- A. Carapace, dorsal view.
- B. Right cheliped, outer view.
- C. Right cheliped, transverse section of inferior surface of propodus at widest part, showing granulation and ridges.
- D. Male abdomen, straightened. (For male first pleopod of another specimen, see Plate XII, Fig. A)

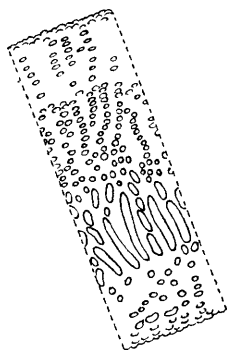
Drawings by Timothy Wyatt. Scales = 10 mm.



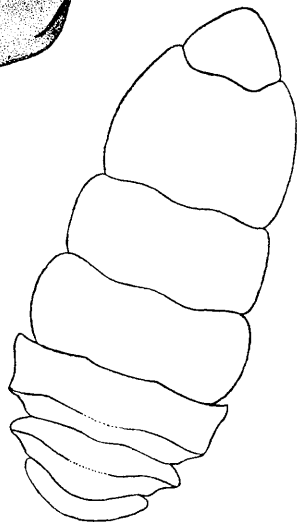
B 



A 



C 



D 

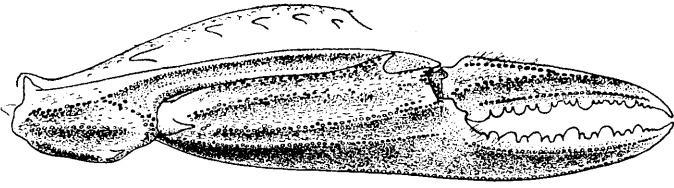
PLATE II


Portuninae

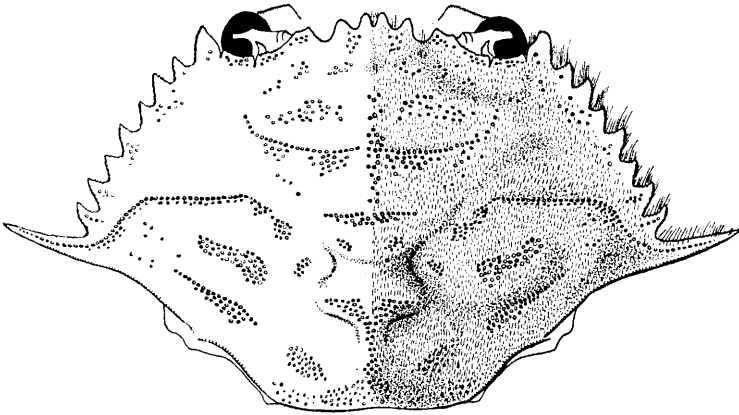
Portunus guaymasensis, n. sp., male holotype
(USNM No. 113053)


- A. Right cheliped, outer view.
- B. Carapace, dorsal view.
- C. Abdomen. (For male first pleopod see Plate XI, Fig. F)

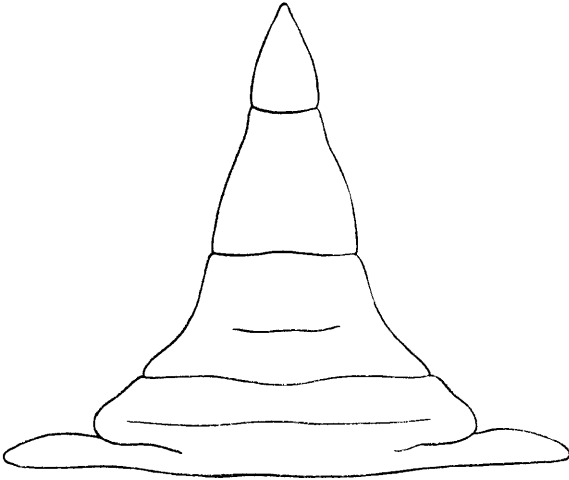
Drawn by Isolda Wisshaupt; inked by Timothy Wyatt.
Scales of A and B = 10 mm; of C = 5 mm.



A 



B 



C 

PLATE III

Portuninae

Carapaces of *Portunus* species

- A. *Portunus asper* A. Milne Edwards, *Velero III* Sta. 215-34.
- B. *Portunus iridescens* (Rathbun), SIO Sta. P-164-60.
- C. *Portunus acuminatus* (Stimpson), neotype (AHF No. 391),
Velero III Sta. 936-39.
- D. *Portunus tuberculatus* (Stimpson), *Velero III* Sta. 870-38.

Drawings by Isolda Wisshaupt. Scales = 10 mm.

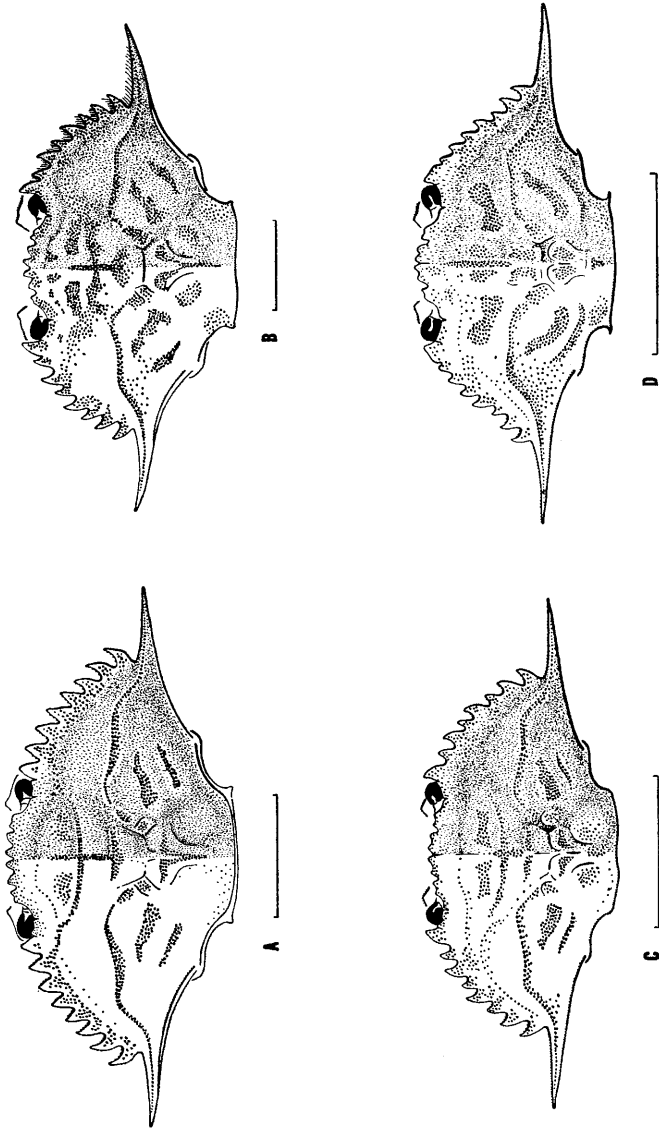


PLATE IV

Portuninae

Carapaces of *Portunus* and *Cronius* species

- A. *Portunus xantusii xantusii* (Stimpson), Oceanside, California, August 20, 1933.
- B. *Portunus xantusii affinis* (Faxon), *Velero IV* Sta. 2602-54.
- C. *Portunus brevimanus* (Faxon), *Velero III* Sta. 773-38.
- D. *Cronius ruber* (Lamarck), *Velero III* Sta. 288-34.

Drawings by Isolda Wisshaupt. Scales = 10 mm.

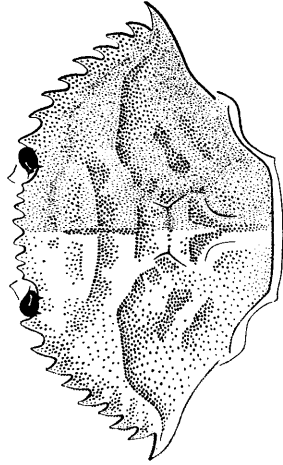
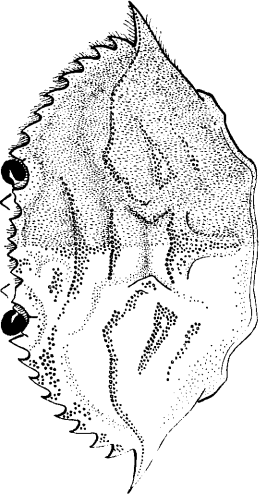
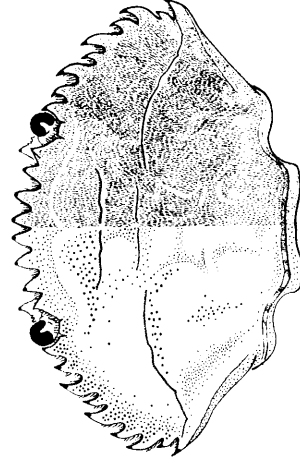


PLATE V

Portuninae

Carapaces of *Callinectes* and *Arenaeus* species

- A. *Callinectes arcuatus* Ordway, *Velero III* Sta. 1091-40.
- B. *Callinectes bellicosus* (Stimpson), *Velero III* Sta. 645-37.
- C. *Callinectes toxotes* Ordway, Gulf of Panama, September, 1958.
- D. *Arenaeus mexicanus* (Gerstaecker), *Askoy* Sta. 80 (La Plata Island, Ecuador).

Drawings by Isolda Wisshaupt. Scales = 10 mm.

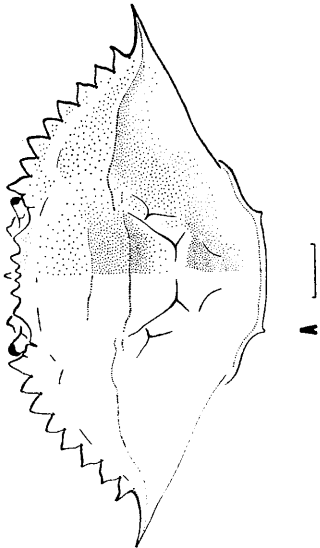
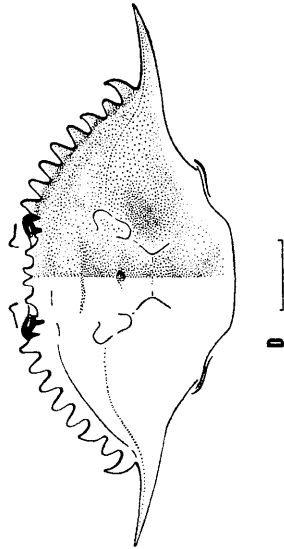


PLATE VI

Podophthalminae

Carapaces of *Euphylax* species

- A. *Euphylax dovii* Stimpson, adult, Gulf of Guayaquil, Peru, April 20, 1954.
- B. *Euphylax dovii* Stimpson, young, M/V *Constitution* Coll. No. 11, off Panama, March 24, 1959.
- C. *Euphylax robustus* A. Milne Edwards, adult, Gulf of Panama, September, 1958.
- D. *Euphylax robustus* A. Milne Edwards, young, *Velero III* Sta. 420-35.

Drawings by Isolda Wisshaupt. Scale = 10 mm.

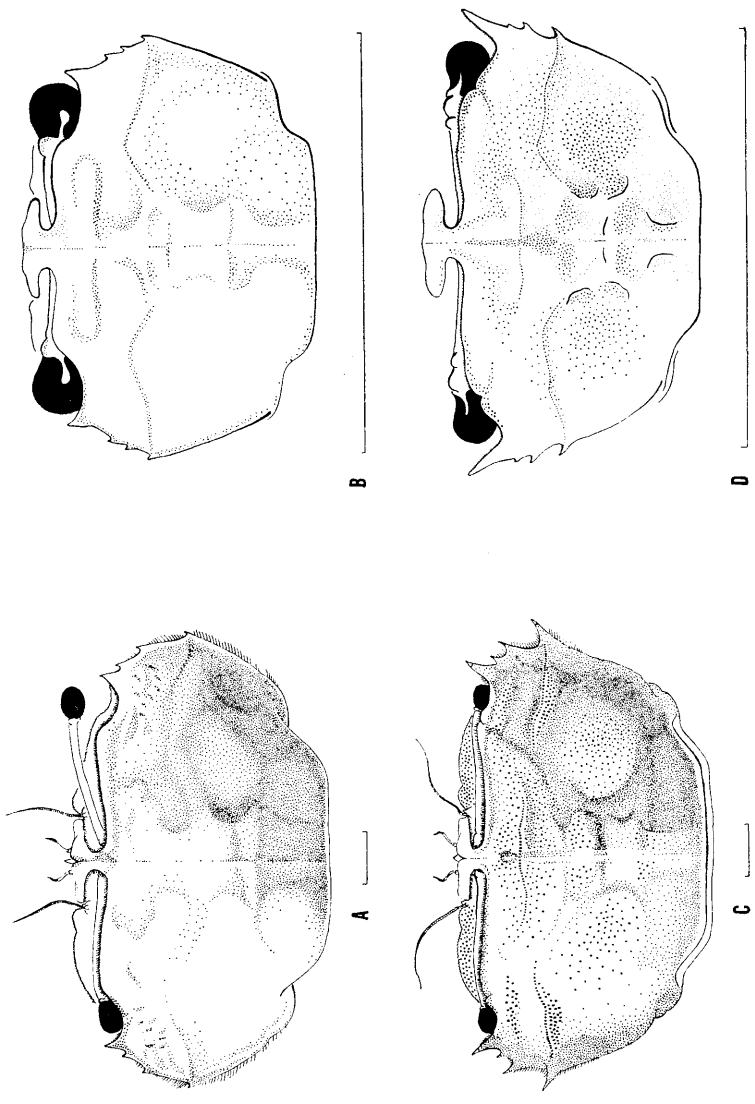


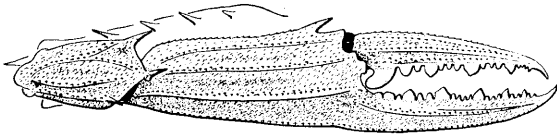
PLATE VII

Portuninae

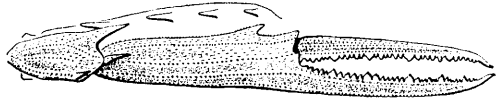
Right chelipeds of *Portunus* species, outer view

- A. *Portunus asper* A. Milne Edwards, *Velero III* Sta. 215-34.
- B. *Portunus xantusii xantusii* (Stimpson), Oceanside, California, August 20, 1933.
- C. *Portunus xantusii affinis* (Faxon), *Velero IV* Sta. 2602-54.
- D. *Portunus brevimanus* (Faxon), *Velero III* Sta. 773-38.
- E. *Portunus acuminatus* (Stimpson), neotype (AHF No. 391), *Velero III* Sta. 936-39.
- F. *Portunus tuberculatus* (Stimpson), *Velero III* Sta. 870-38.
- G. *Portunus iridescens* (Rathbun), SIO Sta. P-164-60.

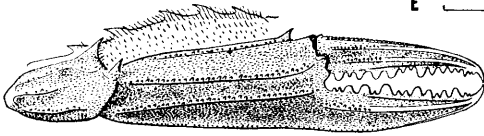
Drawings by Isolda Wisshaupt. Scales = 10 mm.



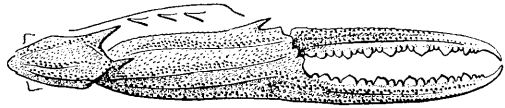
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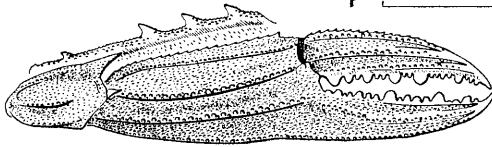
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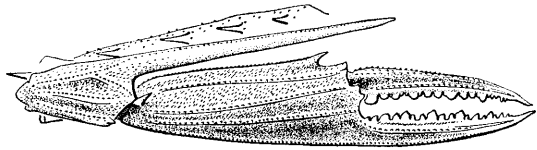
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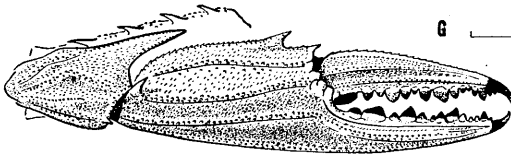
F _____



C _____



G _____



D _____

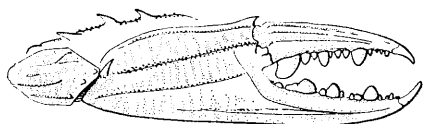
PLATE VIII

Portuninae and Podophthalminae

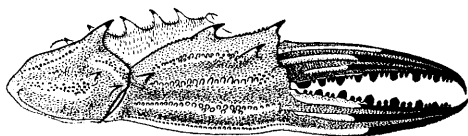
Right chelipeds of *Callinectes*, *Arenaeus*, *Cronius*, and *Euphylax*
species, outer view

- A. *Callinectes arcuatus* Ordway, *Velero III* Sta. 1091-40.
- B. *Callinectes bellicosus* (Stimpson), *Velero III* Sta. 645-37.
- C. *Callinectes toxotes* Ordway, Gulf of Panama, September, 1958.
- D. *Arenaeus mexicanus* (Gerstaecker), *Askoy* Sta. 80 (La Plata Island, Ecuador).
- E. *Cronius ruber* (Lamarck), *Velero III* Sta. 288-34.
- F. *Euphylax dowii* Stimpson, Gulf of Guayaquil, Peru, April 20, 1954.
- G. *Euphylax robustus* A. Milne Edwards, Gulf of Panama, September, 1958.

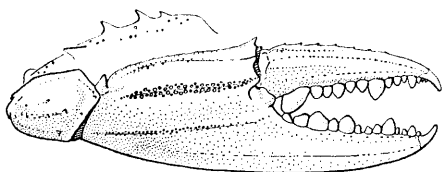
Drawings by Isolda Wisshaupt. Scales = 10 mm



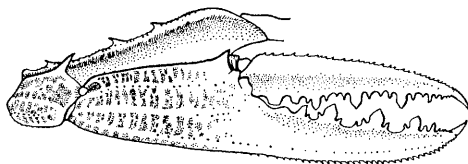
A ———



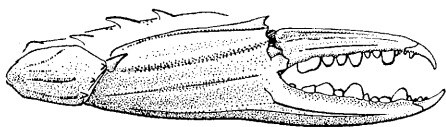
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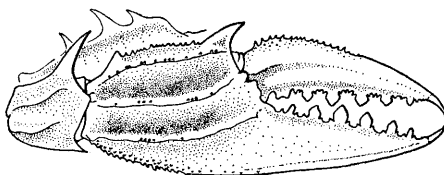
B ———



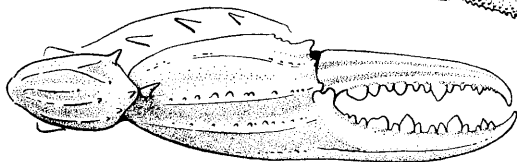
F ———



C ———



G ———



D ———

PLATE IX

Portuninae

Male abdomens of *Portunus* species

- A. *Portunus acuminatus* (Stimpson), neotype (AHF No. 391),
Velero III Sta. 936-39.
- B. *Portunus xantusii xantusii* (Stimpson), Oceanside, California,
August 20, 1933.
- C. *Portunus xantusii affinis* (Faxon), *Velero IV* Sta. 2602-54.
- D. *Portunus asper* A. Milne Edwards, *Velero III* Sta. 215-34.
- E. *Portunus brevimanus* (Faxon), *Velero III* Sta. 773-38.
- F. *Portunus tuberculatus* (Stimpson), *Velero III* Sta. 870-38.
- G. *Portunus iridescens* (Rathbun), SIO Sta. P-164-60.

Drawings by Isolda Wisshaupt. Scales of *P. acuminatus*
and *P. tuberculatus* = 5 mm; others = 10 mm.

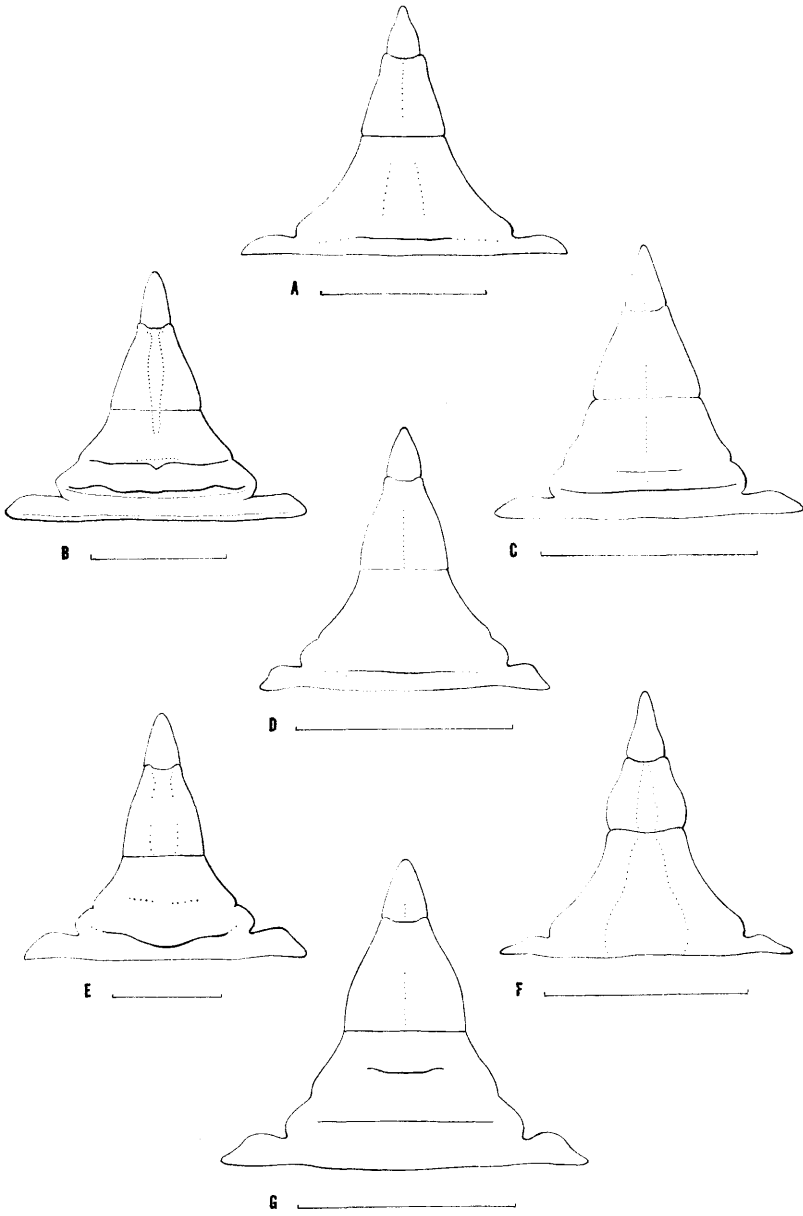


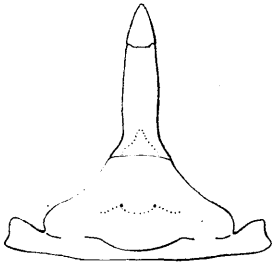
PLATE X

Portuninae and Podophthalminae

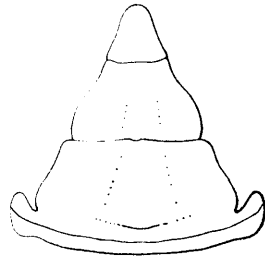
Male abdomens of *Callinectes*, *Arenaeus*, *Cronius*, and *Euphylax* species

- A. *Callinectes arcuatus* Ordway, *Velero III* Sta. 1091-40.
- B. *Callinectes bellicosus* (Stimpson), *Velero III* Sta. 645-37.
- C. *Callinectes toxotes* Ordway, Gulf of Panama, September, 1958.
- D. *Arenaeus mexicanus* (Gerstaecker), *Askoy* Sta. 80 (La Plata Island, Ecuador).
- E. *Cronius ruber* (Lamarck), *Velero III* Sta. 288-34.
- F. *Euphylax dovii* Stimpson, Gulf of Guayaquil, Peru, April 20, 1954.
- G. *Euphylax dovii* Stimpson, Gulf of Guayaquil, Peru, April 20, 1954, another specimen.
- H. *Euphylax robustus* A. Milne Edwards, Gulf of Panama, September, 1958.

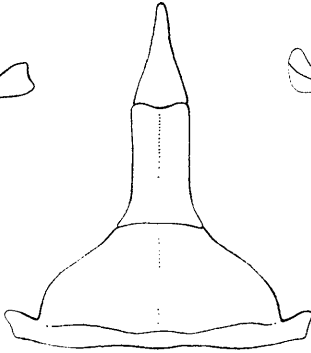
Drawings by Isolda Wisshaupt. Scales = 10 mm.



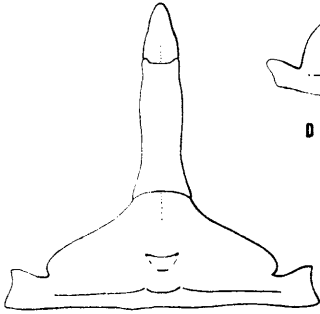
A ———



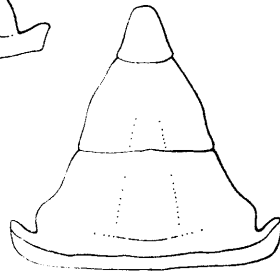
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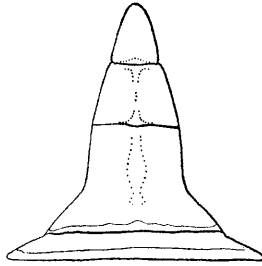
D ———



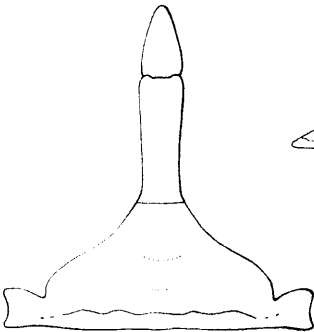
B ———



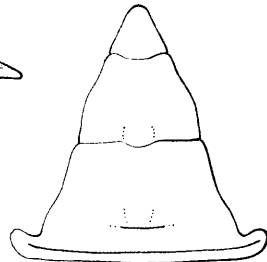
G ———



E ———



C ———



H ———

PLATE XI

Portuninae

Male first pleopods of *Portunus* species

- A. *Portunus asper* A. Milne Edwards, *Velero III* Sta. 402-35.
- B. *Portunus xantusii xantusii* (Stimpson), San Diego, California, November 18, 1957.
- C. *Portunus xantusii minimus* Rathbun, *Velero III* Sta. 567-36.
- D. *Portunus xantusii affinis* (Faxon), *Velero III* Sta. 242-34.
- E. *Portunus angustus* Rathbun, *Velero III* Sta. 177-34 (Galapagos Islands).
- F. *Portunus brevimanus* (Faxon), *Velero III* Sta. 921-39.
- G. *Portunus acuminatus* (Stimpson), neotype (AHF No. 391), *Velero III* Sta. 936-39, entire pleopod.
- H. *Portunus acuminatus* (Stimpson), neotype (AHF No. 391), *Velero III* Sta. 936-39.
- I. *Portunus iridescens* (Rathbun), *Velero III* Sta. 238-34.
- J. *Portunus guaymasensis*, n. sp., holotype (USNM No. 113053).
- K. *Portunus tuberculatus* (Stimpson), *Velero III* Sta. 620-37.
- L. *Portunus stanfordi* Rathbun, *Velero III* Sta. 195-34 (Galapagos Islands).

Drawings by Ernest R. Tinkham. Scales = 1.0 mm.

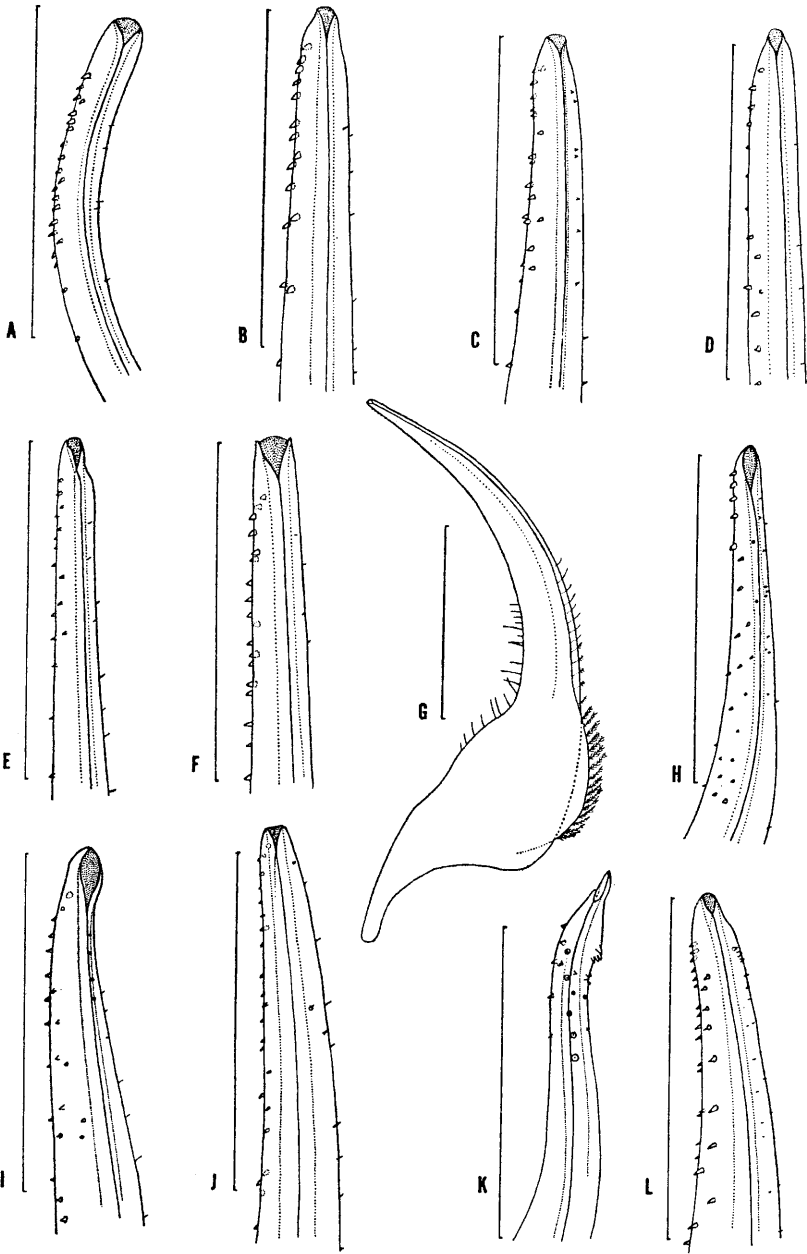
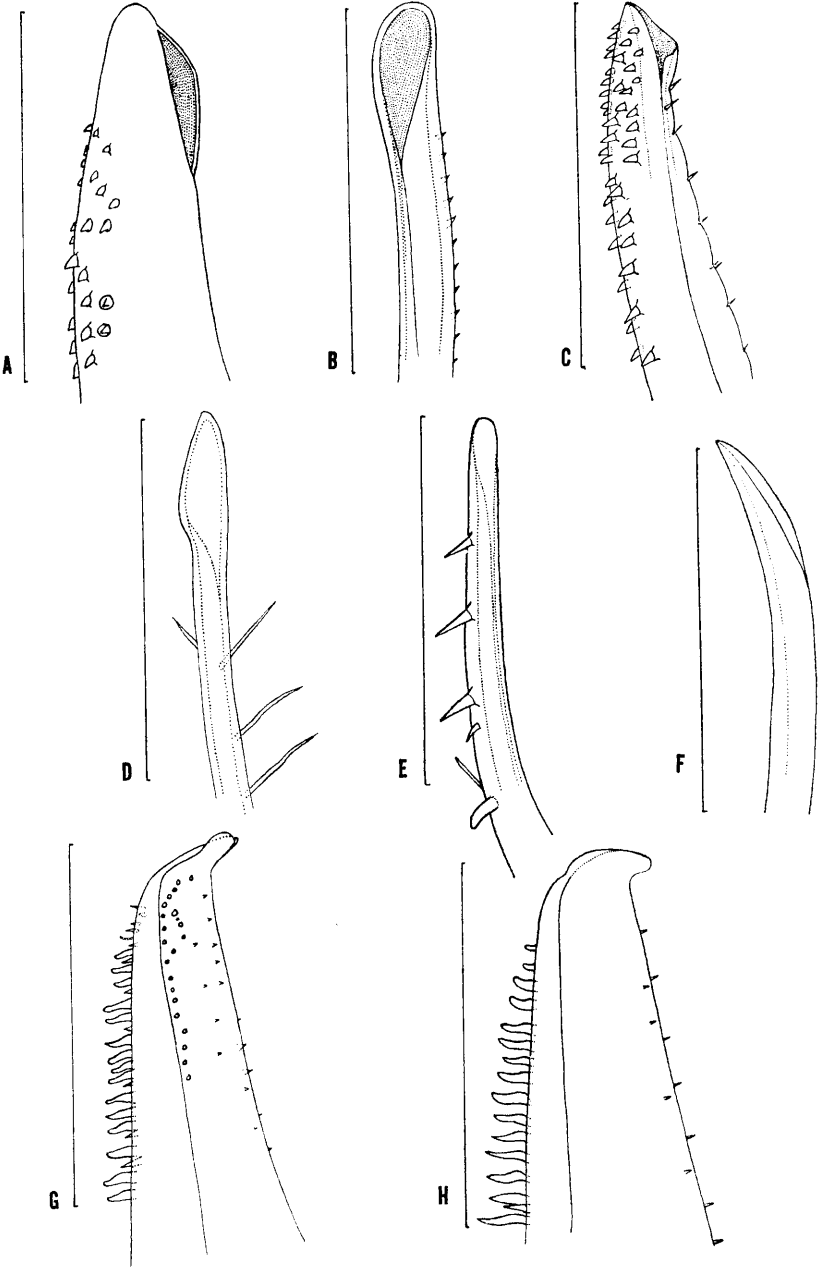


PLATE XII

Macropipinae, Portuninae, and Podophthalminae
Male first pleopods of *Ovalipes*, *Arenaeus*, *Cronius*, *Callinectes*,
and *Euphylax* species

- A. *Ovalipes punctatus* (de Haan), Caleta Coloso, near Antofagasta, Chile, 1904 (Hamburg Mus. K 2702).
- B. *Arenaeus mexicanus* (Gerstaecker), *Velero III* Sta. 938-39.
- C. *Cronius ruber* (Lamarck), *Velero III* Sta. 313-35 (Galapagos Islands).
- D. *Callinectes arcuatus* Ordway, *Velero III* Sta. 928-39.
- E. *Callinectes bellicosus* (Stimpson), *Velero III* Sta. 20-32.
- F. *Callinectes toxotes* Ordway, Gulf of Panama, September, 1958.
- G. *Euphylax dowii* Stimpson, *Stella Maris*, Gulf of Guayaquil, Peru, April 20, 1954.
- H. *Euphylax robustus* A. Milne Edwards, Payta, Peru, May 13, 1912 (Hamburg Mus. K 2735).

Drawings by Ernest R. Tinkham. Scales = 1.0 mm.



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(Numbers in bold face refer to plates)

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