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BULLETIN OF THE VANDERBILT MARINE MUSEUM
VOLUME VII

Scientific Results of the World Cruises of the yachts
"Ara," 1928-1929, and "Alva," 1931-1932, "Alva"
Mediterranean Cruise, 1933, and "Alva"
South American Cruise, 1935,
William K. Vanderbilt, Commanding

MARINE ALGAE: CHLOROPHYCEAE AND CORALLINACEAE
COELENTERATA: HYDROIDA, LEPTOMEDUSAE, SIPHONOPHORA,
SCYPHOMEDUSAE, ALCYONACEA, PENNATULACEA,
ACTINARIA AND MADREPORARIA
ANNELIDA POLYCHAETA
ECHINODERMATA: ASTEROIDEA, CRINOIDEA, OPHIUROIDEA,
ECHINOIDEA AND HOLOTHUROIDEA
CRUSTACEA: ANOMURA, MACRURA, BRACHYURA, STOMATOPODA
AND CIRRIPIEDIA
MOLLUSCA: CEPHALOPODA, AMPHINEURA, GASTROPODA,
NUDIBRANCHIATA AND PELECYPODA

By LEE BOONE



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THE MARINE ALGAE, COELENTERATA, ANNELIDA
POLYCHAETA, ECHINODERMATA, CRUSTACEA
AND MOLLUSCA OF THE WORLD CRUISES OF THE
YACHTS "ARA," 1928-1929, AND "ALVA," 1931-1932,
"ALVA" MEDITERRANEAN CRUISE, 1933, AND
"ALVA" SOUTH AMERICAN CRUISE, 1935,
WILLIAM K. VANDERBILT, COMMANDING

by

LEE BOONE

This Bulletin, seventh in the scientific series of the Vanderbilt Marine Museum, contains reports on six separate groups of marine organisms, namely, Marine Algae: Chlorophyceae and Corallinaceae; Coelenterata: Hydroida, Leptomedusae, Siphonophora, Scyphomedusae, Alcyonacea, Pennatulacea, Actinaria and Madreporaria; Annelida Polychaeta; Echinodermata: Asteroidea, Crinoidea, Ophuroidea, Echinoidea and Holothuroidea; Crustacea Decapoda: Anomura, Macrura, Brachyura, Stomatopoda and Cirripedia and Mollusca: Cephalopoda, Amphineura, Gastropoda, Nudibranchiata and Pelecypoda collections obtained on four separate expeditions made by Mr. William K. Vanderbilt in his yachts, "Ara" and "Alva." It is the third volume of the scientific series devoted to the Invertebrate collections obtained during the "Alva" World Cruise, 1931-1932, and contains the second report of the "Alva" Echinodermata, the third report on the Crustacea and the first reports on the Coelenterata, Annelida Polychaeta, Mollusca and Marine Algae of this cruise. In "West Made East with the Loss of a Day," a chronicle of the first circumnavigation of the globe under the United States Naval Reserve yacht pennant, July 7, 1931, to March 4, 1932,—An Account of Adventures in Navigation, Diversions, Picturesque Scenes and Every Day Life of Remote Places and the Taking of Specimens for the Vanderbilt Marine Museum, by William K. Vanderbilt in command of the Motor Ship "Alva," Mr. Vanderbilt has presented the narrative of this voyage in an exquisitely illustrated volume which includes maps of the itinerary, also many lovely color plates painted from living specimens by Mr. W. E. Belanske, under Mr. Vanderbilt's

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direction. Volume V of the Bulletin series presented the Crustacea: Stomatopoda and Brachyura, and Volume VI, the Crustacea: Anomura, Macrura, Euphausiacea, Isopoda and Amphipoda and the Echinodermata: Asteroidea and Echinoidea of this "Alva" World Cruise.

The itinerary of this circumnavigation of the globe, a cruise of 28,182 miles, which began at Northport, Long Island, New York, thence to the "Alva" Base, Fisher Island, Miami, Florida, was via Cuba, and Jamaica, through the Panama Canal to the Perlas Islands, out to the Galapagos, then the Marquesas, Tamotu and Society Archipelagoes, Samoa, Fiji, New Caledonia and Great Palm Island, Australia, then leaving the Pacific, through Torres Straits, to Flores Strait, Sumbawa, Bali, Java, through the Banka and Malacca Straits, Indian Ocean and Arabian Sea to Aden, through the Suez Canal to the Mediterranean Sea, France, Spain, Gibraltar, Morocco, out to the Canaries and Cape Verde Islands, across the Atlantic via Porto Rico, home to Miami. The collections herein discussed were made in the beautiful coral reefs and fascinating tidal zone of the above archipelagoes and localities of the littoral zone of the Indo-Pacific region, that part of the world, oldest in human history, yet still a mystery even to students of science, who have spent their lives in research. The major deep-sea dredgings were made at stations in the Dutch East Indies, off the New Hebrides and off Marquesas Islands, in the Pacific, and off the Canaries, in the Atlantic Ocean and along the continental shelf of the southeastern United States.

The first reports on the same groups of Invertebrates, obtained during the World Cruise of the yacht "Ara," 1928-1929, is also incorporated in the present Bulletin. The journal of this voyage: "Taking One's Own Ship Around the World, a Journal descriptive of scenes and incidents together with observations from the log book recorded on the Voyage Around the World, October 25, 1928, to May 16, 1929, of the yacht "Ara," commanded by the author, has been delightfully told by Mr. Vanderbilt, in an exquisitely illustrated volume, which includes maps of the voyage and numerous color plates of the living specimens, painted by Mr. W. E. Belanske. The "Ara's" route via the Panama Canal traversed some of the most fascinating areas of the Pacific, the Hawaiian, Marshall, Caroline and Philippine Archipelagoes, thence returned home via Cochin China, the Straits Settlements, India, the Suez Canal, Greece, Italy and France, a voyage of 28,738 miles, during which explorations the sea yielded rich harvest of countless rare

and new marine specimens, whose living bodies bear palimpsest of an immemorial past. The principal deep-sea stations made by the "Ara" were in the south China Sea and regions adjacent to the Mindanao coast in Philippine waters. The scientific treasures of this cruise, which are discussed in detail, in the foreword of the respective systematic divisions of the reports, may be summarized by stating that rare species and new ones are of common occurrence, but common species are exceedingly rare.

Material secured by the "Alva" Mediterranean Cruise, 1933, which sailed from the "Alva" Base, Fisher Island, Miami, Florida, via the Bermuda Islands, across the Atlantic to the Mediterranean Sea, making collections at Santander and Almeria, Spain, Naples, and Venice, Italy, and Casa Blanca, Morocco, is also included in this Bulletin.

The "Alva" South American Cruise, 1935, left from her Base, Miami, made important deep-sea stations along the margin of the Pourtales Plateau, securing several hundred valuable specimens, many of which establish second records of Dr. Alexander Agassiz's Echinoderm types, also of Dr. Alphonse Milne Edwards' Crustacean types first collected by the United States Coast Survey steamer "Blake," thence proceeded through the Panama Canal to the Perlas Islands, where valuable specimens of Invertebrates were taken, then swung south, in the path of the Humboldt Current, exploring Ecuadorean, Peruvian and Chilean waters, which investigations yielded countless marine Invertebrate rarities, including the rediscovery of several of "lost" species of Crustacea, established by the Abbé Don Juan Molina, 1782, but so seldom represented in northern museum collections that they have been unrecognized by modern students. Other forgotten species rediscovered by the "Alva" include Anomuran Crustaceans, collected in the Chiloe Archipelago, Chile, first described by M. Guérin de Méneville, in his report on the "Crustacés du Voyage de la Favorite" (1835, also 1838). Brandt's rare Leptoline Medusa, taken only twice since he described it a hundred years ago in the "Mémoires de l'Académie impériale des Sciences de St. Petersbourg" from a station off the northwestern trend of the Humboldt Current, was found lazily drifting in Valparaiso Harbor, Chile, gigantic specimens, their crystalline blue bodies repeating the beauties of Merton's exquisite color-plate. From the muddy bottom of Reloncavi Inlet, Bahia de Cochamo, Chile, Dr. Alexander Agassiz's rare *Brisaster moseleyi*, first dredged by H.M.S. "Chalenger," was taken in abundance by the "Alva."

The fresh-water Crustacean fauna of Peru is represented by one species of prawn which is also one of the oldest described Chilean crustacea, the "mason crab," *Cancer cementarius*, described in the Abbé Don Molina's "Natural History of Chile." (1776, anonymously, 1782 signed).

The annotated discussion of the species is presented with reference to their systematic classification. Geographical and bathymetrical distribution of the species is also given. The greater portion of the "Ara" and "Alva" Invertebrates herein discussed are very rare specimens, not at all, or very sparsely represented in any American museum, being hitherto known only from the types or a few specimens variously fifty to a hundred years old or even older, scattered in the museums of Asia, Australia, Oceania, Europe, Africa, South and North America. In addition to these rarities, numerous new species in several groups of Invertebrates were taken by the "Ara" and "Alva" and are deposited in the type series of the Vanderbilt Marine Museum. Concise discussion of the more significant rarities is given in the synopses of the respective systematic divisions of Invertebrates reported.

polished granules, but there is no laminate erect crest or carina along the inner edge of the upper surface of the dactyl of the larger (left) cheliped.

(b) The third left leg has the outer surface of the dactyl longitudinally carinated near the lower margin.

(c) The male has no genital orifices corresponding with those of the female.

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? *Cancer pedunculatus* Herbst, J. F. W., Naturg. Krabben u. Krebse, Bd. III, heft IV, 1804, p. 25, pl. 61, fig. 2.

Pagurus pedunculatus, OLIVER, G. A., Encyl. Meth. Hist. Nat., 1811, t. VIII, p. 647.—OWEN, SIR R., in Beechey, Capt. F. W., Voy. H. M. S. "Blossom," Crustacea, p. 83.—HILGENDORF, F., Monastb. K. Preuss. Akad. Wissench. Berlin, 1878, p. 815.—ORTMANN, A., in Semon, R., Zool. Forschungsr. in Australian u. Malayischen Archip., 1894, vol. V, lief 1, p. 31.

Family: **GALATHEIDAE**

Genus: **MUNIDA** Leach

Munida gregaria (Fabricius)

Plates 106 and 107

MATERIAL EXAMINED: Fifty-three specimens, dredged in 90 fathoms, five miles from Lengua de Vaca Point-Light, Ton Gay Peninsula, Chile, January or February, 1935, by the "Alva."

Seven exceptionally large specimens, from the above-cited locality. Fifty-two specimens, mostly very large specimens, from the identical locality. Twenty-four specimens, of medium and small size, dredged in 9 fathoms, at Port Lagunas, Chile, February 13, 1935. Five specimens, of medium and small size, dredged in Chiquiso Channel, between Chiloe and Cailin Islands, Chiloe Archipelago, Chile, in 7 fathoms.

DISCUSSION: Although this species was previously taken by the "Ara," in 100 fathoms, Punta Arenas, Costa Rica, and described in Volume III, Bulletin of the Vanderbilt Marine Museum, p. 53, plate 12, the present Chilean series is of such exceptional value, both in extent and source, that it is desirable to present the following notes. The description is based on an average large specimen taken in the Ton Gay Peninsula dredgings, supplemented, at the conclusion, by a comparative analysis of a series of sixty-three specimens, showing the percentage of variation existent, especially in the number and arrangement of spines ornamenting the carapace and abdominal somites.

TECHNICAL DESCRIPTION: Carapace subrectangular, produced anteriorly to a slender acuminate rostral spine, which is subequal in length to the precervical portion of the carapace and is very compressed laterally, with the lateral margin finely carinate and the dorsal margin crested and denticulate, this crest originating as a non-denticulate carina extending briefly on the carapace, continuing forward on the rostrum, bearing six or seven compressed, forward and upward-directed teeth which normally increase in size from proximal to subdistal, this tooth being situated about two-thirds of the length of the rostrum, at the apex of the crest, beyond which the dorsal margin of the rostrum is concavely deflected to the apex. The inferior rostral margin usually, but not always, bears one strong obliquely downward and forward directed tooth, approximately opposite or slightly in advance of the large subdistal tooth of the dorsal series, this inferior spine being slightly in advance of the eye. There are a pair of short acuminate preorbital spines, one on either side adjacent to the base of the rostrum, another pair of subequal or sometimes slightly shorter spines occur, one each above the base of the antennae. The precervical portion of the carapace bears anteriorly about five unbroken transverse carinae and immedi-

ately posterior to these four similar carinae but which are interrupted by the deep cervical groove. On the postcervical region (counted in the median line) there are normally twelve transverse carinae, slightly interrupted by the cardio-intestinal grooves in the center and separated from the sides, by the lateral line, from similar carinae which are a continuation of the dorsal carinae. Each of these carinae is a finely beaded line, margined anteriorly by short, fine silky cilia. The first of the precervical carinae bear the above-described preorbital and antennal spines. The second carina bears in line with the preorbital a submedian pair of spines, and on either side of these variously 2, 3, or 4 spinules, which on young specimens are very small, sometimes obsolete. The third carina bears a submedian pair of spinules, sometimes with also a median spinule and usually another pair of spinules, one each just above the hepatic sulcus. There are also about four, sometimes five, spinules, along the anterolateral margin of the precervical carapace and another spine on the first postcervical carina near the margin. There is nearly always a single spinule, larger than the average, situated in the median lateral area, above and slightly posterior to the cervical groove. There are also usually six, sometimes only four, spinules, three each submedian along the inner portion of the first postcervical carina and a single submarginal spinule. There normally are no more spines or spinules on the dorsad of the carapace, but the first postmarginal carina of the sidewall is continuously spinulose with ten to twelve spinules; posterior to the last of these and just below the sulcus there are three or four spinules, one each on the third, fourth and fifth carinae, while above these yet on the sidewall are about six larger spines, the first of which is just below the lateral line and in continuation of the marginal spines of the dorsad series of the carapace; then there are four lateral spines occurring one each on alternate carinae, the fourth spine being in line with the second postcervical carina; behind this fourth spine and more dorsad are two more spinules, each on alternate carinae, the sixth one being subdorsad, almost in line with the first spinule of this series.

The anterior margins of the first, second and third abdominal somites are each spinulose, there being four spines each on the anterior margin of the first or most anterior carina of each

somite. On the very large specimens there are usually only two spines here on the first somite, these forming a well-separated, submedian pair, there being two pairs each on the anterior margin of the first carinae of the second and third somites, the outer pair of spines of each being approximately in line with the pair of the first somite and the inner pair submedian, between these.

The first abdominal somite has a flat carina posteriorly ciliate on the anterior margin which fits beneath the carapace and is followed in the median area by a smooth, glossy area which bears a single, submedian, transverse row of ten to twelve low granules, each of which is fringed with posterior-directed fine cilia; the posterior half of this somite is marked by four close-spaced, elevated, transverse, flat carinae, each being fringed on the anterior margin by fine cilia; the first carina bearing also on the anterior margin a well-separated submedian pair of forward-directed spines; these carinae are slightly interrupted and curved on the lateral portions, conforming to the contour of the epimeral region. The epimera are narrowed to a subacute rounded carinate margin and have the anterior margin bent upward, rimlike.

The second somite is about as long in the median line as the first, but with the epimera narrowed to an acuminate, triangulate tooth; this somite is similarly smooth anteriorly and transversely carinate on the posterior, but bears four submedian spinules on the anterior margin of the first carina, the outer pair being approximately in line with those of the first somite; the inner pair being subequally spaced between the outer pair.

The third somite forms the hinder margin of the dorsal portion of the abdomen and is about as long as the second, but with the smooth anterior portion smaller and the elevated transversely carinate portion longer; the first of the four carinae bear anteriorly four spinules in line with those of the preceding somite. The epimera are narrowed to an acuminate triangle.

The fourth somite is as long medially as the third, deflected, with the entire surface paved by four transverse flat carinae, each posteriorly finely ciliate; these carinae being interrupted and forming an elegant design on the epimera which are triangulate but less narrowed than those of the preceding somite.

The fifth somite is a trifle longer than the fourth one, with the epimera reduced, subacuminate; the posterior margin truncate above the base of the telson and concave on either side above

the uropoda, the entire surface being elegantly sculptured by flat, transverse, posteriorly ciliated carinae, which are interrupted and curved, following the contour of the somite. This pattern is continued on the uropod peduncle and proximal portion of the telson, their distal portions being paved with smaller, curved, posteriorly convex and ciliated squamae. The telson is one and a third times as long as the pretelsonic somite, with the distal margin widely rounded, fringed with long, silky setae. The two lateral lines that cut the telson are oblique. The uropod peduncle has a small spine at the inner distal angle; the blades are truncate distally, with the inner distal angle widely rounded, the usually exposed outer dorsad portions of each blade paved with squamae as on the telson.

The chelipeds are equal, 130 millimeters long on specimens having the carapace plus the rostrum 55 millimeters long. These chelipeds have the merus 50 millimeters long on the outer margin, triquetral, with the upper-inner margin serrate with coarse spines, a second submedian series of smaller spines on the upper surface, the three upper distal angles spinose; the carpus is 16 millimeters long, similarly triquetral and spinose on the inner-upper marginal and distal angle; the propodus and dactyl are 62 millimeters long, the palm being 34 millimeters long and 12 millimeters wide, distally, and the fingers 28 millimeters long. The palm is moderately dilated distally and bears a submedian longitudinal carina composed of erect, spinose squamae; both lateral margins of the palm and dactyli are similarly margined. The upper and outer surfaces of the merus, carpus, propodus and dactyli are almost continuously paved with these distally acute or spinose squamae, semiconcealed beneath a dense pilosity on the merus, carpus and propodus which is nearly absent on the dactyli, except along the bases of the cutting edges, the dactylar surfaces being continuously paved with these asperities which are subequal in size or a little larger than the teeth along the cutting edge. The apices of the dactyli are each incurved acuminate teeth.

The first, second and third pairs of ambulatories are similar and decrease in length in the order named, the first pair having the dactyli reaching to the base of the propodi of the chelipeds and the second and third pairs each decreasing in length by about the length of their respective dactyli. Each ambulatory has the

inner lateral and distal margins of the merus and carpus spinose; the propodi, which are about twice the length of the related carpal joints, are spinose along the upper lateral margin with the entire surfaces paved with these sharp squamae as are also the surfaces of the merus and carpus which are more thickly pilose than are the propodi. The dactyli are one-half as long as the related propodi, curved, laterally compressed, acuminate, with a dual series of long, brown setae along the upper margin.

The antennal flagella are about as long as the propodi.

The large eyes are reniform, set on short stalks and protected beneath by the several strong spines arising from the bases of both the antennae and antennulae.

The external maxillipeds have the second or subdistal article of the palp produced on the outer lateral margin into a moderately convex process which bears distally a long tuft of setae.

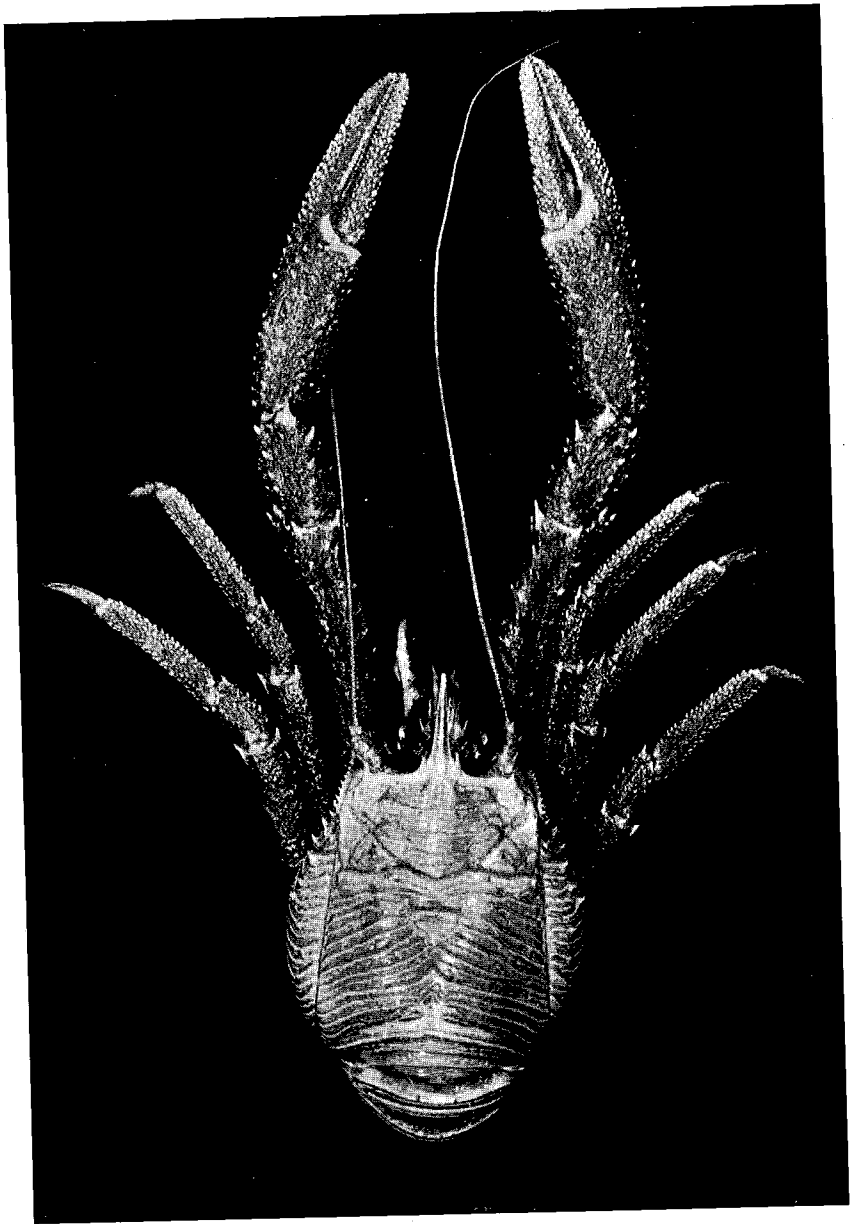
Sixty-three specimens which form an excellent series of growth stages of the species, from post-larval forms to very large old adults, were examined.

Forty-five of these, of various ages, are typical in the number and arrangement of spines on the first three abdominal somites. On the remainder the variation existent in the number of spines occurring on the first, second and third abdominal somites is as follows: the Roman numerals represent the somites I, II and III, the Arabic numerals the number of spines present, the sequence of these numerals represents the somite on which they occur. Large specimens: I, 12; II, 4; III, 4; I, 6; II, 6, III, 6; I, 4; II, 6; III, 6; I, 8; II, 8; III, 6; I, 4; II, 6; III, 4; I, 4; II, 4; III, 4.

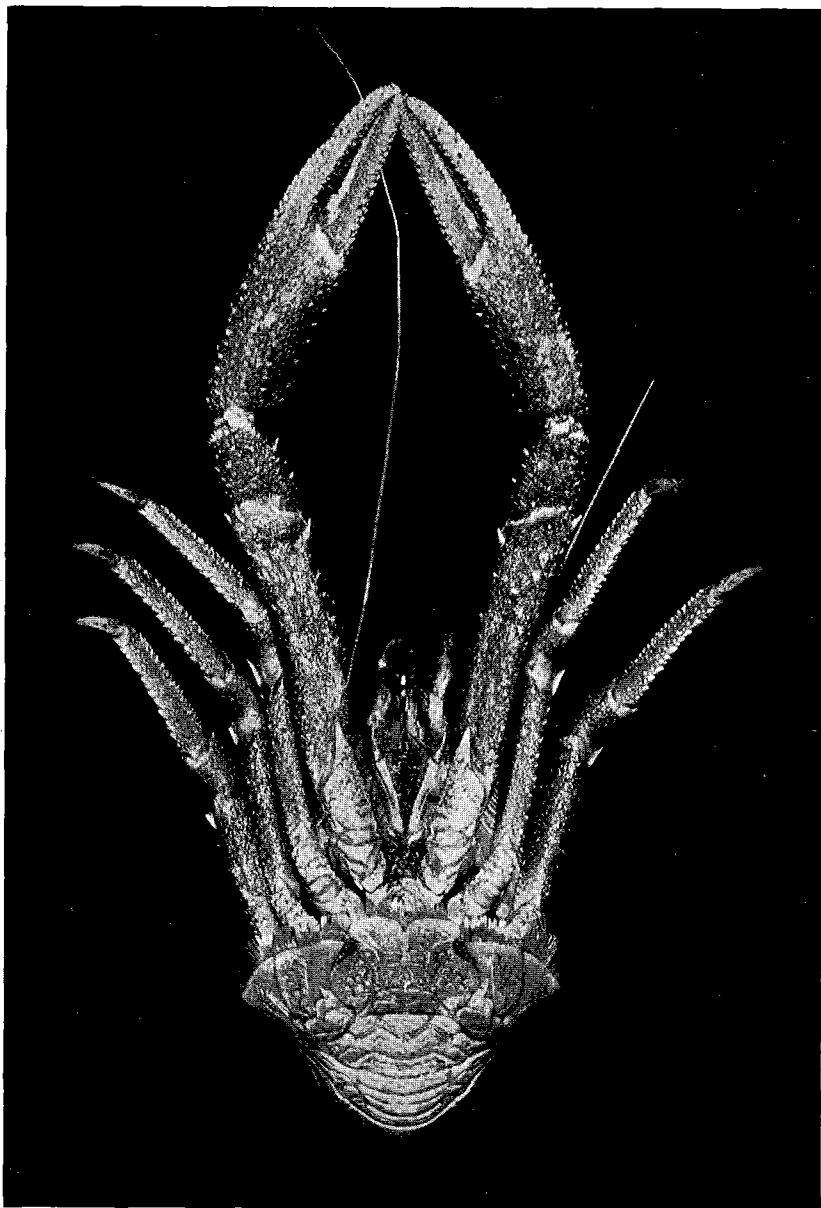
Medium size specimens: I, 3; II, 5; III, 5; I, 2; II, 5; III, 4; I, 2; II, 4; III, 3; I, 2; II, 4; III, 5; I, 2; II, 5; III, 4.

Quite small specimens, with carapace 20 millimeters long; I, 2; II, 2; III, 2; I, 0; II, 2; III, 4; yet smaller specimens, with transverse carinae less impressed and nearly devoid of spines everywhere: specimen with carapace 16.5 millimeters long, I, 0; II, 0; III, 0; specimen with carapace 14 millimeters long: I, 0; II, 0; III, 0; specimen with carapace 12 millimeters long: I, 0; II, 0; III, 0; specimen with carapace 10 millimeters long: I, 0; II, 0; III, 0.

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Munida gregaria (Fabricius), $\times 1$, from Lengua de Vaca Point Light,
Ton Gay Peninsula, Chile.



Munida gregaria (Fabricius), $\times 1$, from Lengua de Vaca Point Light,
Ton Gray Peninsula, Chile.