

The temperate species of the genus *Munida* Leach (Crustacea, Decapoda, Galatheidae) in the east Pacific, with the description of a new species and additional records for tropical-subtropical species

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Abstract

Temperate species of *Munida* occurring in the East Pacific have not been referred to very often in literature since their original description. Five species have been described for the area: *Munida curvipes* BENEDICT, 1902, from southern Chile; *Munida gregaria* (FABRICIUS, 1793), from southern Chile and around the Strait of Magellan to the SW Atlantic; *Munida montemaris* BAHAMONDE & LOPEZ, 1962, from southern Chile; *Munida quadrispina* BENEDICT, 1902, from Sitka, Alaska, to Baja California, Mexico; *Munida subrugosa* (WHITE, 1847), reported in America from Ancud, Chile and around the Strait of Magellan to Montevideo, Uruguay. All five species are redescribed using the type material of *M. curvipes*, *M. montemaris* and *M. quadrispina* and specimens of *M. gregaria* and *M. subrugosa* obtained from their distribution ranges or from museum collections. A new species is described from material collected off the coast of California. Additional records for several species of *Munida* occurring mainly in tropical-subtropical waters of the East Pacific are also included together with an identification key to all species of *Munida* currently known for the East Pacific.

Résumé

Les espèces tempérées du genre *Munida* présentes dans la région du Pacifique Est n'ont pas été citées souvent dans la littérature depuis leur description. Cinq espèces ont été décrites pour cette région: *Munida curvipes* BENEDICT, 1902, de la partie sud du Chili; *Munida gregaria* (FABRICIUS, 1793), au sud du Chili et tout autour du détroit de Magellan jusqu'à l'Atlantique SW; *Munida montemaris* BAHAMONDE & LOPEZ, 1962, au sud du Chili; *Munida quadrispina* BENEDICT, 1902, de Sitka, Alaska, jusqu'en Basse Californie, Mexique; *Munida subrugosa* (WHITE, 1847), connue en Amérique de Ancud, Chili et tout autour du détroit de Magellan jusqu'à Montevideo, Uruguay. Ces cinq espèces sont redécrites grâce à la révision du matériel type de *M. curvipes*, *M. montemaris* et *M. quadrispina* et de spécimens de *M. gregaria* et *M. subrugosa* provenant de leur zone de distribution ou de collections de musées. Un spécimen récolté en face des côtes de la Californie permet de décrire une nouvelle espèce du genre. Des nouveaux registres concernant plusieurs espèces de *Munida* se distribuant principalement dans les eaux tropicales-subtropicales du Pacifique Est sont présentés ainsi qu'une clef d'identification de toutes les espèces de *Munida* reconnues actuellement pour le Pacifique Est.

Introduction

Seventeen species of the galatheid genus *Munida* are currently known from the east Pacific, including the doubtful record of *M. microphthalma* A. MILNE EDWARDS, 1880. Only five of these 17 species have records exclusively in temperate waters of this geographic region while the other 12 species are distributed in tropical/subtropical water of the eastern tropical Pacific, with the exception of *M. mexicana* BENEDICT, 1902, which has been reported along the west coast of Baja California, Mexico, in the warm temperate Californian Province, and *M. hispida* BENEDICT, 1902, which is known as far north as Monterey Bay, California (HENDRICKX, 2000).

The 12 tropical/subtropical species referred to here above include 10 species described between 1880 and 1902 were treated in details by HENDRICKX (2000), who redescribed each species using type material and/or recently collected specimens and added two new species to the east Pacific galatheids fauna. As in the case of tropical/subtropical species, temperate species of *Munida* have not been referred to very often in literature dealing with the east Pacific crustacean fauna since their original description. The five known species are: 1) *Munida curvipes* BENEDICT, 1902, described from southern Chile and known only from the type locality (HAIG, 1955; RETAMAL, 1981); 2) *Munida gregaria* (FABRICIUS, 1793), a common species within its range, known in American waters from southern Chile and around the Strait of Magellan to the SW Atlantic (HAIG, 1955) and the most frequently cited species; 3) *Munida montemaris* BAHAMONDE & LOPEZ, 1962, described from an unique male collected off Valparaiso, Chile, and not reported since; 4) *Munida quadrispina* BENEDICT, 1902, the only temperate species reported in the northern portion of the East Pacific and with a distribution extending from Baja California, Mexico, to Sitka, Alaska (WICKSTEN, 1989; CADIEN, 1997); 5) *Munida subrugosa* (WHITE, 1847), a common species within its range, known in American waters from Ancud, Chile and around the Strait of Magellan to Montevideo, Uruguay (HAIG, 1955; RETAMAL, 1981).

The purpose of this paper is to present the redescription of

temperate species of *Munida* occurring in the East Pacific and that were not included in the previous publication (see HENDRICKX, 2000). During this study, the type material of *M. curvipes*, *M. montemaris* and *M. quadrispina* were examined and are redescribed. Specimens of *M. gregaria*, *M. subrugosa* and *M. quadrispina* obtained from their distribution areas or available in the holdings of the Los Angeles County Museum of Natural History, Los Angeles, California, and of the SCRIPPS Institution of Oceanography Invertebrates Collections, La Jolla, California, were also examined and used for a complete redescription.

In her study dealing with material of decapod crustaceans obtained from off British Columbia, HART (1982) reported *M. quadrispina* as widespread. She indicates that "A careful study of material at hand will probably reveal undescribed species". HART (op. cit.) also reports that large specimens, up to 67 mm length and often taken in fjords, are probably an undescribed species. Among the material reviewed during this study, one large specimen of *Munida* (originally identified as *M. quadrispina*) represents, indeed, an undescribed species and is it probably related to these large *Munida* previously reported by Hart. This new species is described herein. Additionally, some previously unpublished records for species of *Munida* treated by HENDRICKX (2000) and based on material examined during this study are included in an appendix. A key to all species of *Munida* currently known from the East Pacific is included at the end of this contribution.

In the systematic section, a restricted synonymy is provided for *M. gregaria* and *M. subrugosa*. For these two species, all citations included in HAIG (1955), except for the original description, are omitted. For the other species (*M. curvipes*, *M. montemaris*, *M. quadrispina*) all references known to the author have been included in the synonymy. Also included for each species are: a list of material examined, the description, the type locality, the known distribution and depth ranges, and comments on the species taxonomy or distribution.

Terminology used in the species description has been provided in details in HENDRICKX (2000) and is therefore not repeated herein. Abbreviations used in this paper are: CL, carapace length; CLwr, carapace length without rostrum; CW, carapace width; TL, total length; St., sampling station; NS, not sexed; NM, not measured; M, male; F, female; FF, ovigerous female; Col., collector; Id., identifier. Acronyms officially used to designate institutional collections are: EMU-, Estacion Mazatlán UNAM, Mazatlán, Mexico; LACM-, Los Angeles County Museum of Natural History, California; AHF-, Allan Hancock Foundation, Los Angeles, California (holdings transferred to LACM); SIO-, Scripps Institution of Oceanography, La Jolla, California; MNHN-, Museo Nacional de Historia Natural, Chile.

Systematic section

Munida curvipes BENEDICT, 1902 (Fig. 1)

Munida curvipes BENEDICT, 1902: 254, fig. 6.- RICHARDSON, 1904: 86 (as host of *Pseudione paucisecta* RICHARDSON, 1904).- HAIG, 1955: 38.- RETAMAL, 1981: 22.- WICKSTEN, 1989: 315 (listed).- HENDRICKX, 2000: 164 (table 1).- RETAMAL & JARA, 2002: 206 (listed).

MATERIAL EXAMINED

Type, "Albatross" St. 2788, 11 Feb 1888, 1 M (CL 13.2 mm) (USNM 20533). The label in the type jar provides the following data (see comments): Off Port Otway, Patagonia, "Albatross" Station 2788, 1050 fathoms (1890 m) (no date provided) (USNM 20533).

DESCRIPTION

Carapace with distinct transverse striae, very setose; secondary striae reduced in branchial regions. Cervical groove well marked. Pterygostomian flap narrow, not inflated. Two pairs of epigastric spines, the anterior pair the strongest and more closely set than the posterior pair which are smaller. A small parahepatic spine. A pair of small anterobranchial spines, the anteriormost very small. Frontal margin transversally oblique. Lateral margin (right) slightly convex. Rostrum of type broken, narrow at base. Supraocular spines short, slightly diverging, overreaching anterior margin of cornea. Anterolateral spines sharp, shorter than supraocular spines and not reaching the level of the sinus between rostrum and supraocular spines. Anterior branchial margin armed with 3 long, sharp spines, the anterior slightly longer; posterior branchial margin armed with 2 slightly curved spines; 6 spines on lateral margins of entire carapace (excluding anterolateral). Sternal plastron (sternites 3-7) wider than long; third thoracic sternite projected anteriorly; fourth sternite very narrow anteriorly, its length less than 1/2 its width; surface of sternite 4-7 punctate; sternites 5 to 7 with transverse ridges obtuse, strongly granulated. Second abdominal segment with three pairs of strong, sharp dorsal spines, two lateral pairs and one central, the later stronger. Third and fourth abdominal segments without spines. Eyes small, their cornea diameter about equal to length of supraocular spines and less than 1/3 the distance between the base of anterolateral spines. Distal spines of antennular basal segment subequal, the distolateral slightly longer; two lateral spines (inner damaged), the outer spine the same length as the distomesial spine, the inner spine apparently much longer (projected). First (basal) segment of antennal peduncle with a sharp distomesial spine reaching end of second segment; second segment with sharp distolateral and distomesial spines, the later reaching about midlength of third segment; a sharp, short distal spine on lateral margin of third and fourth segments. Ischium and merus of third maxilliped of about same length; ischium with a distoventral spine; merus with two strong spines on flexor margin; extensor margin unarmed. Chelipeds and walking legs squamous. Chelipeds strong, wide, about twice as long as carapace (including rostrum), with rows of strong spines on all joints; spines particularly

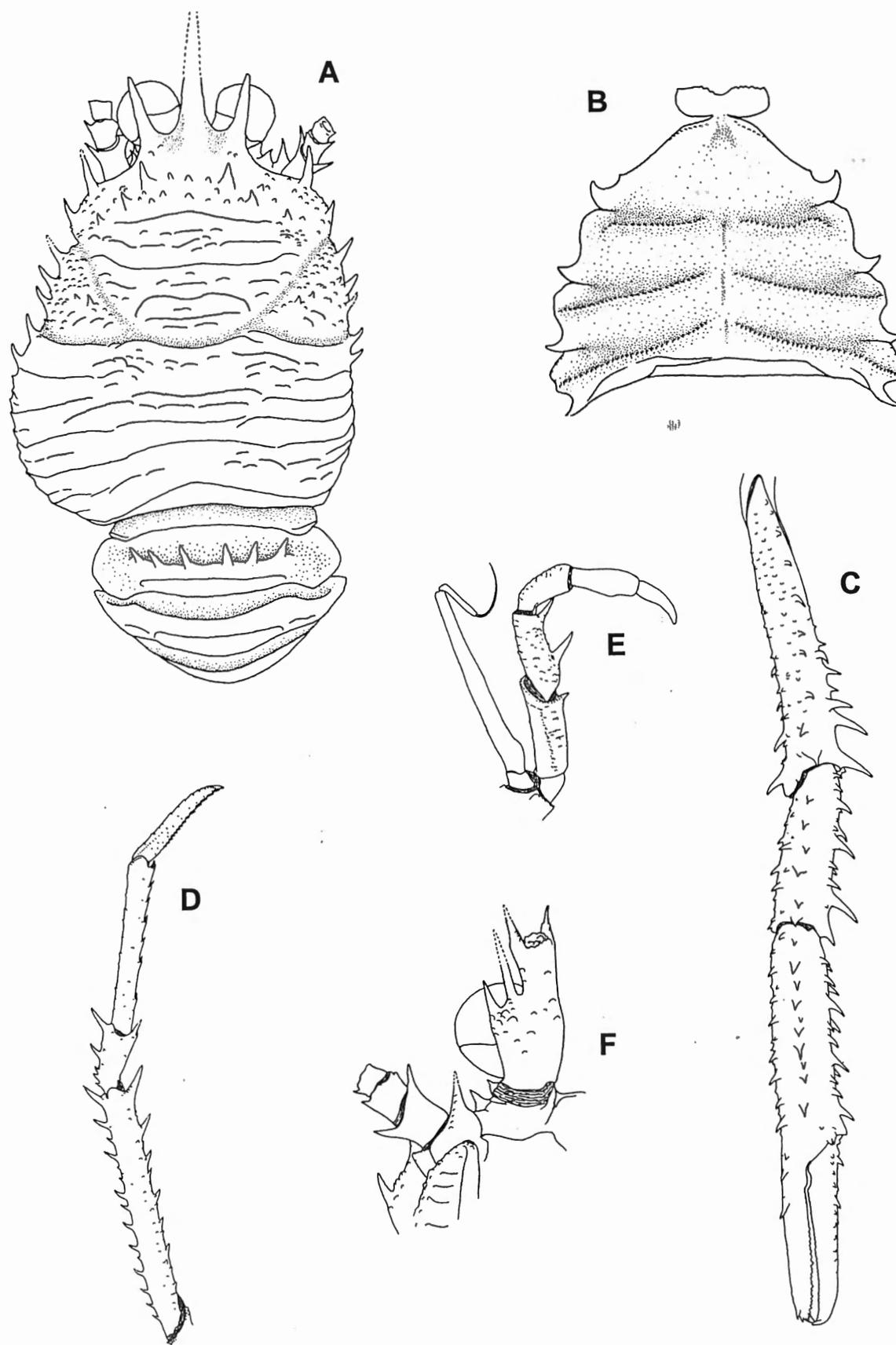


Fig. 1. *Munida curvipes* BENEDICT, 1902. Male, holotype (CL 13.2 mm) (USNM-20533). A. Carapace and abdomen, dorsal view. B. Sternal plastron. C. Right cheliped, dorsal view. D. Right second pereiopod, lateral view. E. Right third maxilliped, lateral view. F. Ventral view of cephalic region, showing antennular and antennal peduncles.

strong on distal half of merus and upper margin of carpus; merus with one row of strong, sharp spines dividing into two rows in distal third, two ventral parallel rows of medium to small spines, and one row of spines on each lateral side; carpus stout, longer than 1/2 merus length, about same length as dactylus: fingers shorter than propodus (palm); manus with an outer row of spines in addition to dorsal and ventral rows; fingers with spines on proximal part. Pereiopods very slender. Second pereopod with strong spines along the upper edge of merus and carpus; lower edge of merus with less numerous, medium to small size spines, except the most distal one which are longer; carpus without ventral spines, except for one sharp distal spine; propodus about 3/4 merus length, without dorsal spines and with movable spinules on the ventral margin; dactylus about 2/3 propodus length, flexor margin spinulated.

TYPE LOCALITY

Label in jar: Off Port Otway, Patagonia. Original "Albatross" data: Chonos Archipelago, West of Darwin Bay (45°35'00" S, 75°55'00" W), South Pacific Ocean, Chile, 11 Feb 1888.

DISTRIBUTION RANGE

Known only from the type locality.

DEPTH RANGE

Known only from 1050 fathoms (c. 1890 m).

COMMENTS

The type material illustrated here and labeled USNM 20533, is infested by a bopyrid parasite and presents a strongly swollen left branchial cavity (Fig. 1, A). According to BENEDICT (1902: 256), only one specimen of this species was available at the moment it was described. The illustration of the type material presented by BENEDICT (1902: Fig. 6), however, does not feature this peculiar swelling of the branchial cavity. The only specimen reported by BENEDICT (loc. cit.) is the type, cat. 20533, USNM, and there seems to be no possibility of a confusion with additional material. Position and size of spines on external margin of right chelae, on dorsal side of carapace and the broken rostrum illustrated by BENEDICT, perfectly match with the specimen obtained from the Smithsonian Institution and illustrated herein. The size of the specimen examined (CLwr 13.2 mm) is also very close to the size of the specimen figured by BENEDICT (estimated at CLwr 13.0 mm from the illustration). In the view that there is no other specimen of *M. curvipes* on the records other than the type, one must admit that the swelling was simply omitted in BENEDICT's illustration for esthetic considerations. Posterior to BENEDICT description in 1902, *M. curvipes* has only been cited five times in the literature, including the reference to the type material by RICHARDSON (1904: 86, description of a bopyrid parasite in the branchial chamber). The type material of *M. curvipes* at the Smithsonian was re-examined by M. SCHOTTE who confirmed that the inflated left branchial chamber is empty.

The older and most complete reference to *M. curvipes* is by HAIG (1955: 38) who treated Chilean species of *Munida* quite extensively; unfortunately, she did not examine the type material at that time and it seems nobody did after 1955 till today. HAIG (loc. cit.) gives as type locality the "Albatross" St. 2788, which is correct, indicating that this locality corresponds to "... off Archipiélago de los Chonos, Chile ..." [sic], which is in contradiction with the label in the type jar and the locality reported by BENEDICT (1902: 256). This confusion prompted HENDRIKX (2000: table 1) to report two localities for *M. curvipes*. A search of the original station data by Rose GULLEDGE at the Smithsonian indicates that "Albatross" Station 2788 indeed corresponds to the Chonos Archipelago (but some of the entries for "Albatross" Station 2788 in the Smithsonian data base do have off Port Otway, Patagonia, Chile, as a locality).

Munida gregaria (FABRICIUS, 1793) (Figs. 2, 3)

Galathea gregaria FABRICIUS, 1793: 473.

Munida gregaria.- HAIG, 1955: 36-37 (complete synonymy), fig. 9.- RETAMAL, 1973: 12, fig. 11-13; 1974: 12; 1981: 22, fig. 92.- BAHAMONDE, 1986: fig. 3. (distribution).- HENDRIKX, 2000: 164 (table 1).- BOSCHI, 2000: 97 (listed).- RETAMAL & JARA, 2002: 206 (listed).

MATERIAL EXAMINED

S of Punta Arenas, Magellan Strait, Chile, St. M 115 (53°11'5 N, 70°55' W), Lund University Chile Expedition, 04 May 1949, 1 M (CLwr 27.0 mm, rostrum broken) and 2 F (CLwr 23.2 and 24.4 mm), shore (tidal belt) (Id. J. HAIG) (LACM, ex-AHF; no registration number). Punta Arenas, Magellan Strait, Chile, 26 Mar 1966, 1 M (CL 23.5 mm) and 1 F (CL 21.0 mm), shore (Col. MCGINNIS and party) (Id. J. HAIG) (LACM, ex-AHF, Acc. No 1975-3B). Punta Arenas, Magellan Strait, Chile, 20 Nov 1963, 1 M (CL 28.1 mm), stranded at low tide, beach (Col. J. BOYD, USARP) (Id. J. HAIG) (LACM, ex-AHF, Acc. No 1975-3A). Between Ushuaia, Argentina, and Puerto Williams, Chile, St. 457, 06 Feb 1963, 3 M (CL 15.0-22.8 mm), 14 F (CL 12.6-22.8 mm) and 4 additional specimens (NS, NM), from engine room strainer (Id. J. HAIG) (LACM, ex-AHF, Acc. No 1975-3C). Off Buenos Aires, 39°12.5' S, 55°40' W, Argentina, 22 Dec 1969, 2 M (CLwr 18.2 and 19.5 mm) and 3 F (CLwr 16.8-22.2 mm), 300 m (EMU-5404).

DESCRIPTION

Carapace strongly convex transversally, with distinct setose transverse striae; secondary striae present, mostly interrupted. One pair of epigastric spines behind the supraocular spines, and 1-2 pair of unobvious lateral spinules (occasionally wanting). A group of spinules generally present on hepatic region, and a few spinules scattered on epigastric region. No arterobranchial spines, but 1-2 unobvious spinules sometimes visible under magnification. Frontal margins almost straight. Lateral margins slightly convex in posterior half. Rostrum short, stout, subtriangular, finely serrated dorsally and laterally; rostrum width measured at level

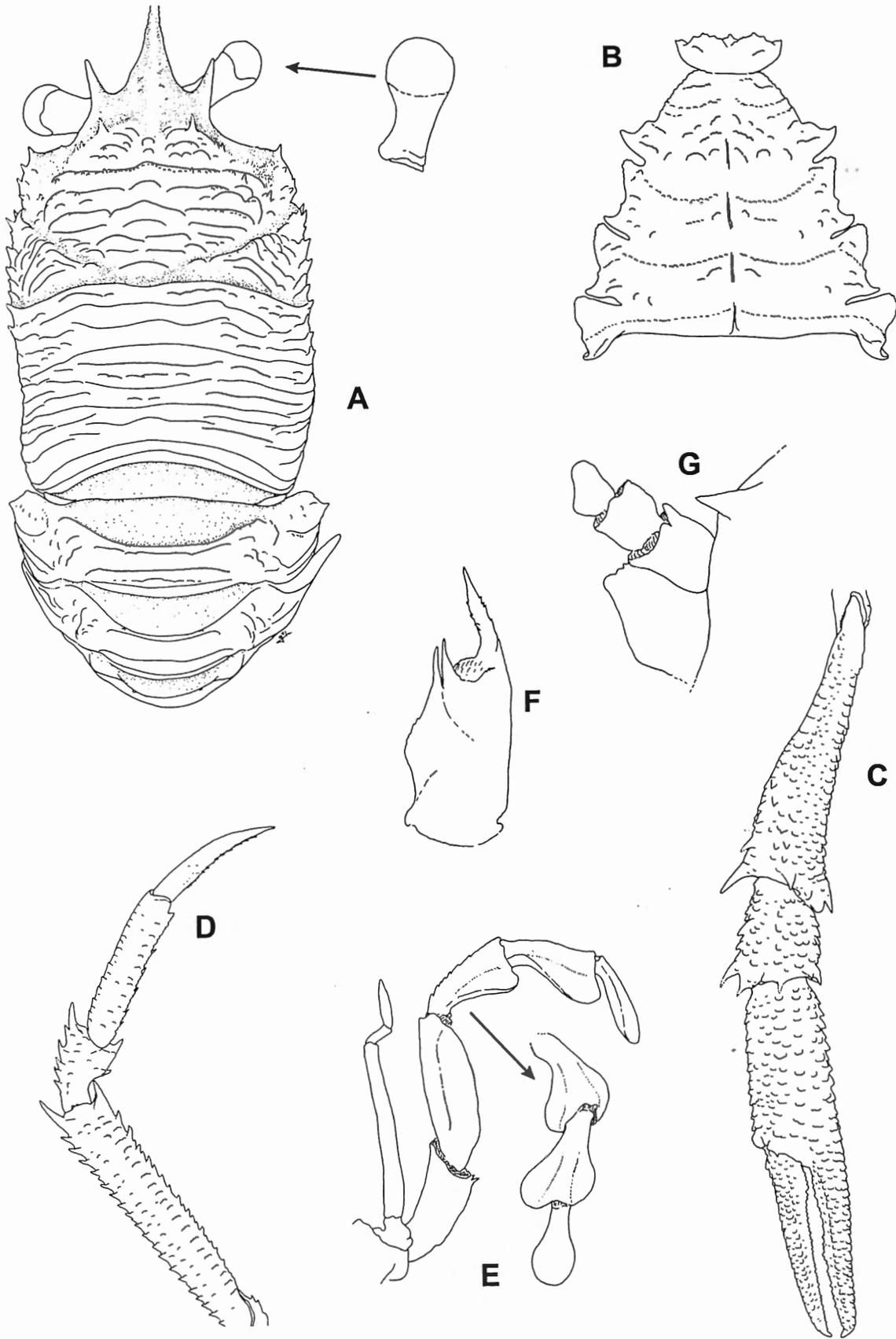


Fig. 2. *Munida gregaria* (FABRICIUS, 1793). Female, S of Punta Arenas (CL 29.4 mm) (LACM). A. Carapace and abdomen, dorsal view. B. Sternal plastron. C. Left cheliped, dorsal view. D. Right second pereiopod, lateral view. E. Right third maxilliped, lateral view, and frontal view of last three segments. F. Right basal antennular segment, ventral view. G. Dorsal view of right antennal peduncle.

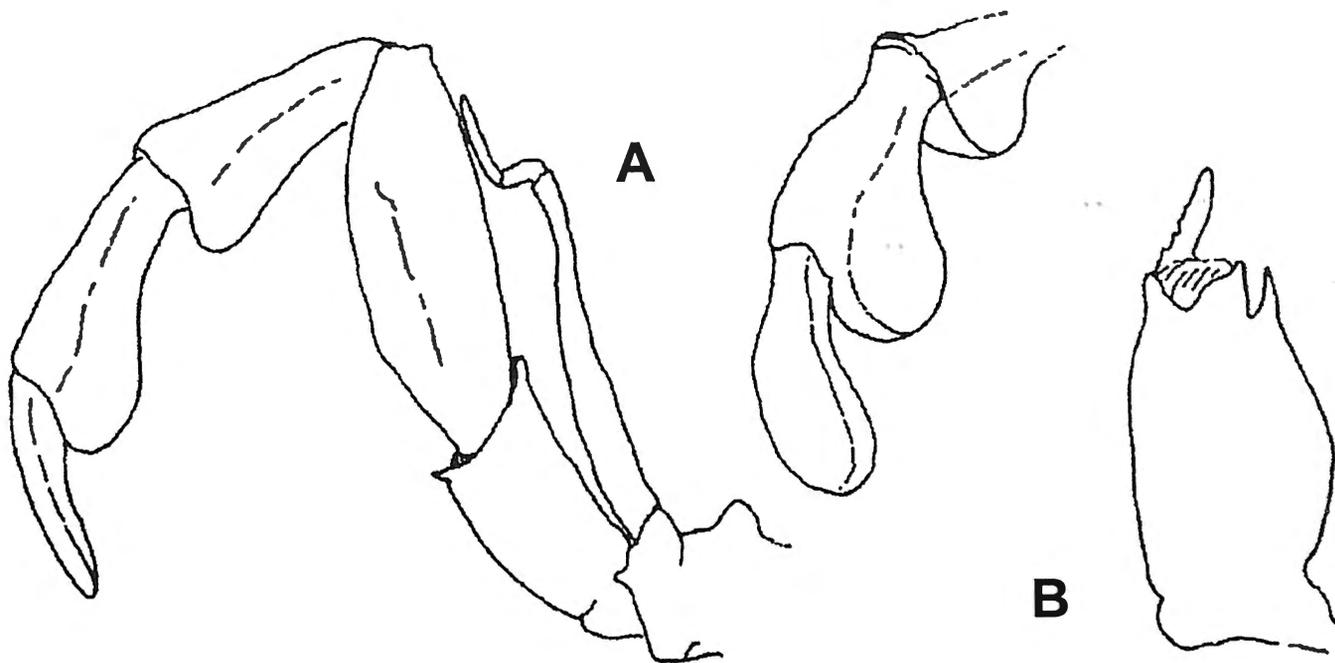


Fig. 3. *Munida gregaria* (FABRICIUS, 1793). Female, off Buenos Aires (CLwr 16.8 mm) (EMU-5404). A. Left third maxilliped, lateral view, and frontal view of last two segments. B. Right basal antennular segment, ventral view.

of sinus between rostrum and supraocular spines longer than $2/3$ rostrum length. Supraocular spines short, stout, slightly diverging, about half or less than half length of rostrum, not overreaching anterior margin of cornea (eyes extended); anterolateral spines small, much shorter than supraocular spines and not reaching the level of the sinus between rostrum and supraocular spines; 2-3 spinules behind anterolateral spines, on hepatic margin. Anterior branchial margins armed with 5-6 short spines; posterior branchial margin armed with 2-3 short spines; about 7-9 spines on lateral margins of entire carapace (excluding anterolateral).

Sternal plastron (sternites 3-7) almost as wide as long. Sternite 3 inserted into sternite 4, anterior margin spinulose, laterally acute; sternite 4 wide anteriorly, its length slightly more than $1/2$ its width; surface of sternites 4-6 squamose, particularly sternite 4; sternites 5 to 7 with transverse ridges obtuse, granulated. Second abdominal segment with two pairs of very short, sharp dorsal spines on anterior ridge, the inner pair stronger, the outer pair or both pairs sometimes obsolete or reduced to blunt tubercles. Third and fourth abdominal segments with a pair of small spines similar in size to inner pair of second abdominal segment and occasionally obsolete. Eyes small, cornea diameter shorter than $1/2$ length of rostrum (projected) and less than $1/4$ the distance between the base of anterolateral spines; ocular peduncle long, about twice as long as cornea diameter. Distal spines of antennular basal segment unequal, the distomesial much longer and laterally spinulated; one lateral spine (outer lateral spine obsolete), of about same length as distolateral spine. First (basal) segment of antennal peduncle spineless, its inner side forming a produced, slightly crenulated extension; second segment with a short, outer distal blunt spine; third segment un-

armed. Flexor margin of merus of third maxilliped unarmed; extensor margin unarmed; carpus and propodus strongly produced laterally (frontal view); dactylus wide, distally compressed.

Chelipeds and walking legs squamous. Chelipeds strong, wide, more than twice as long as carapace (including rostrum) in male and less than twice as long in females; palm and fingers of chelae compressed, fingers slightly gaping; merus about equal to carapace length, almost three times as long as carpus and twice as long as palm; palm about twice as long as high and shorter than fingers. Merus proximally triangular and distally squarish in cross section, armed with two rows of spines on dorsal face, spines sharp in distal third, reduced to blunt tubercles in proximal two thirds; four large, sharp distal spines. Carpus with four rows of spines or blunt tubercles ending in 1-2 sharp, strong distal spines. Palm with a row of spiny or obtuse tubercles on ventral and dorsal margins; movable finger with one blunt spine near its base; fingers laterally compressed, distally crossing and ending in a sharp point. Pereiopods squamous compressed, particularly pereiopods 2-3. Second pereiopod about $1\ 1/2$ times carapace length (including rostrum); merus about $2/3$ carapace length (including rostrum), about 3 times as long as carpus and slightly less than twice as long as propodus; dactylus about $4/5$ propodus length. Second pereiopod with a row of blunt spines along the superior edge of merus and carpus, ending in a much longer, sharp distal spine; inferior edge of merus with a similar row of spines, less marked in proximal fourth; carpus with one ventral spine and one sharp distal spine; propodus without dorsal spines and with movable spinules on ventral margin, flexor margin of dactylus spinulated.

TYPE LOCALITY

South Atlantic, 37°30' S (HAIG, 1955).

DISTRIBUTION RANGE

From Ancud to Strait of Magellan, Chile (HENDRICKX, 2000), with records in Calbuco, Ancud, Chiquiso Channel (between Chiloe and Cailin Islands), Port Lagunas, Dixon Cove, Canal Molinas (?), Smith Channel, Punta Arenas, Paso Brecknock, and Strait of Magellan (HAIG, 1955). Also in the SW Atlantic. Probably in New Zealand (HAIG, 1955), but this record might correspond to another species.

DEPTH RANGE AND HABITAT

Shore to 50-60 m. Youngs are pelagic, adults are benthic. Sand, mud and in tidal belt among kelp, stones and on sand (HAIG, 1955).

Munida macrobrachia sp. nov.
(Figs. 4, 5 C, D)

TYPE MATERIAL

Holotype, off Point Vicente (10.4 miles offshore, 76° transect), Los Angeles County, California, St. 24480, R.V. "Velerio IV", 9 Mar 1976, one male (CL 40.6 mm; CLwr 30.5; TL 68.5 mm), 540-612 m (300-340 fathoms), rock dredge (LACM CR 1976-349.1, ex-AHF 616-2 (id. M.K. WICKSTEN, *M. quadrispina*)).

ADDITIONAL MATERIAL

ENE of Avalon, Sta. Catalina Island, California, 12 Aug 1950, 3 M (CLwr 14.6; CL 22.8 mm) and 1 F (CLwr 15.0-15.7 mm; CL 21.8-22.7 mm) (LACM, ex-AHF, no catalog number). Pyramide Head, San Clemente Island, California, St. 11581-67, 25 Jul 1967, 7 M (CLwr 13.7-18.2 mm; CL 19.6-25.7 mm) and 2 F (CLwr 13.7-14.8 mm; CL 19.6-22.5 mm) (LACM, ex-AHF, no catalog number).

DESCRIPTION

Carapace little convex anteriorly and latero-posteriorly, almost flat in its central part, all main striae strongly raised; secondary striae interrupted. Gastric region slightly elevated. Cervical groove deep; cardiac region very narrow, surrounded by a deep groove. Pterygostomian flap long and deep, laterally inflated and partially visible in dorsal view (lateral to branchial region), its anterior part projecting forwards almost to the level of the supraocular spine (lateral view), its spinose anterodorsal part also visible dorsally, next to hepatic region. Two pairs of epigastric spines, the strongest pair beyond the base of the supraorbital spines, the other small; one small hepatic spine; one parahepatic and one anterior branchial spine on each side, both strong to medium in size. Frontal margin almost transversal. Lateral margin almost straight in its anterior 2/3, slightly convex in its poste-

rior third; carapace widest at about 3/4 of its length. Rostrum spiniform, sharp, less than 1/2 length of remaining carapace, slightly serrated dorsally and laterally. Supraocular spines sharp, almost parallel, a little longer than 1/4 rostrum length and reaching anterior margin of corneas. Anterolateral spine sharp, shorter than supraocular spine, not reaching to the level of sinus between rostrum and supraocular spines. Anterior branchial margin with 3 spines (third very small), posterior branchial margin with 4-6 spines or spinules; a total of 7-9 spines or spinules on the entire lateral margin of carapace (excluding anterolateral). Sternal plastron (sternites 3-7) slightly longer than wide. Sternite 3 projected anteriorly; sternite 4 narrow anteriorly, its length more than 1/2 its width. Sternites 4-6 with some short, obsolete striae. Transverse ridges between fifth, sixth and seventh sternites slightly raised, with a few minute granules. Abdominal tergites unarmed. Eyes small, cornea diameter less than 1/4 the distance between bases of anterolateral spines. Distal spines of antennular basal segment unequal, the distomesial much longer than distolateral; two lateral spines, the inner one long, slender, sharp, not overreaching distal spine, the outer one very short. First (basal) segment of antennal peduncle with distomesial spine very long, overreaching the end of the antennal peduncle and reaching to the anterior level of supraocular spines; second segment with one strong distolateral spine, reaching about midlength of third segment, and an unobscured, sharp distomesial spine; third segment with one short, sharp distomesial spine. Ischium and merus of third maxilliped of about same length; ischium with a distoventral spinulated spine; merus bearing two strong, sharp spines on flexor margin and four sharp spinules in the space between these two spines. Extensor margin unarmed, except for a sharp distal spine. Chelipeds of male subequal, squamous, with rows of irregularly set mostly blunt spines and tubercles. Left cheliped almost 3 times as long as carapace; merus about 1/3 longer than carapace length, 3.5 times as long as carpus and 1.5 times as long as palm; fingers shorter than palm. Merus armed with four rows of spines; spines sharper and longer dorsally. Carpus with irregularly set tubercles and obtuse spines, longer and stronger dorsally and on the outer face. Outer face of palm with three rows of blunt spines; two additional rows of similar spines on dorsal margin. Fingers with numerous flattened tubercles and blunt spines, distally curving, ending in a blunt tooth; a strong blunt tooth near base of dactylus; cutting edge with small teeth, larger proximally; finger slightly gapping proximally, dactylus with two stronger proximal teeth projecting in the gap. Pereiopods slender, flattened; outer face and part of inner face covered with flattened tubercles, some tipped with a blunt spine. Second pereopod slightly more than twice carapace length. Merus slightly shorter than carapace, c. 4 times as long as carpus, c. 1.5 times as long as propodus, c. 8 times as long as high; propodus twice as long as dactylus. Merus with one row of 13-15 blunt, cylindrical spines on dorsal border, spines slightly longer distally, and a long, curved distal spine; ventral margin with one long, sharp distal spine followed by a row of about 5 strong spines. Carpus with 4-5 dorsal blunt spines, the largest close to distal angle, and with a strong ventrodorsal spine. Propodus with 7 movable ventral spines. Dactylus slightly convex proximally, slightly curving

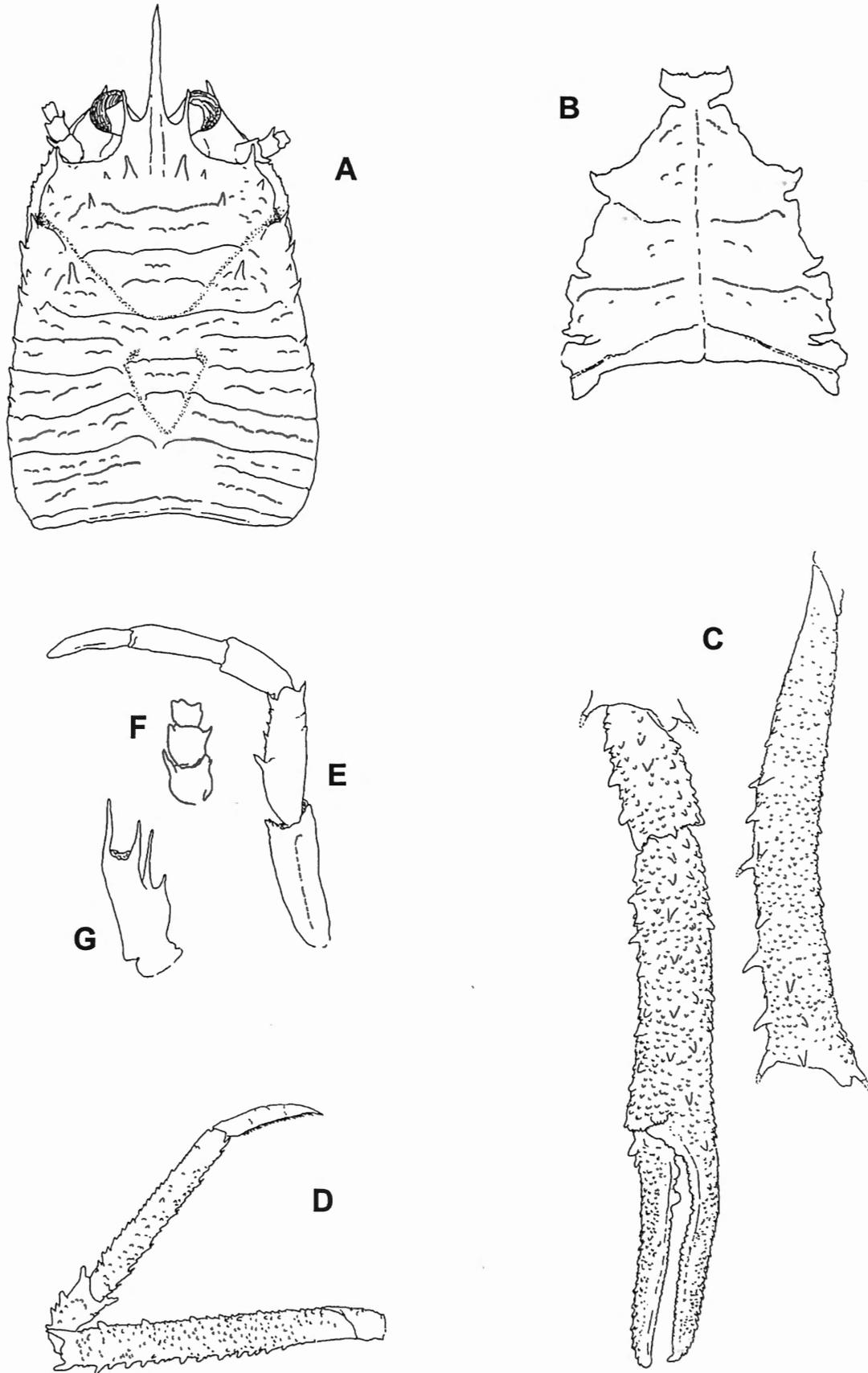


Fig. 4. *Munida macrobrachia* sp. nov. Male, holotype (CL 40.6 mm) (LACM). A. Carapace, dorsal view. B. Sternal plastron. C. Left cheliped, dorsal view. D. Right second pereiopod, lateral view. E. Left third maxilliped, lateral view. F. Dorsal view of left antennal peduncle. G. Left basal antennular segment, ventral view.

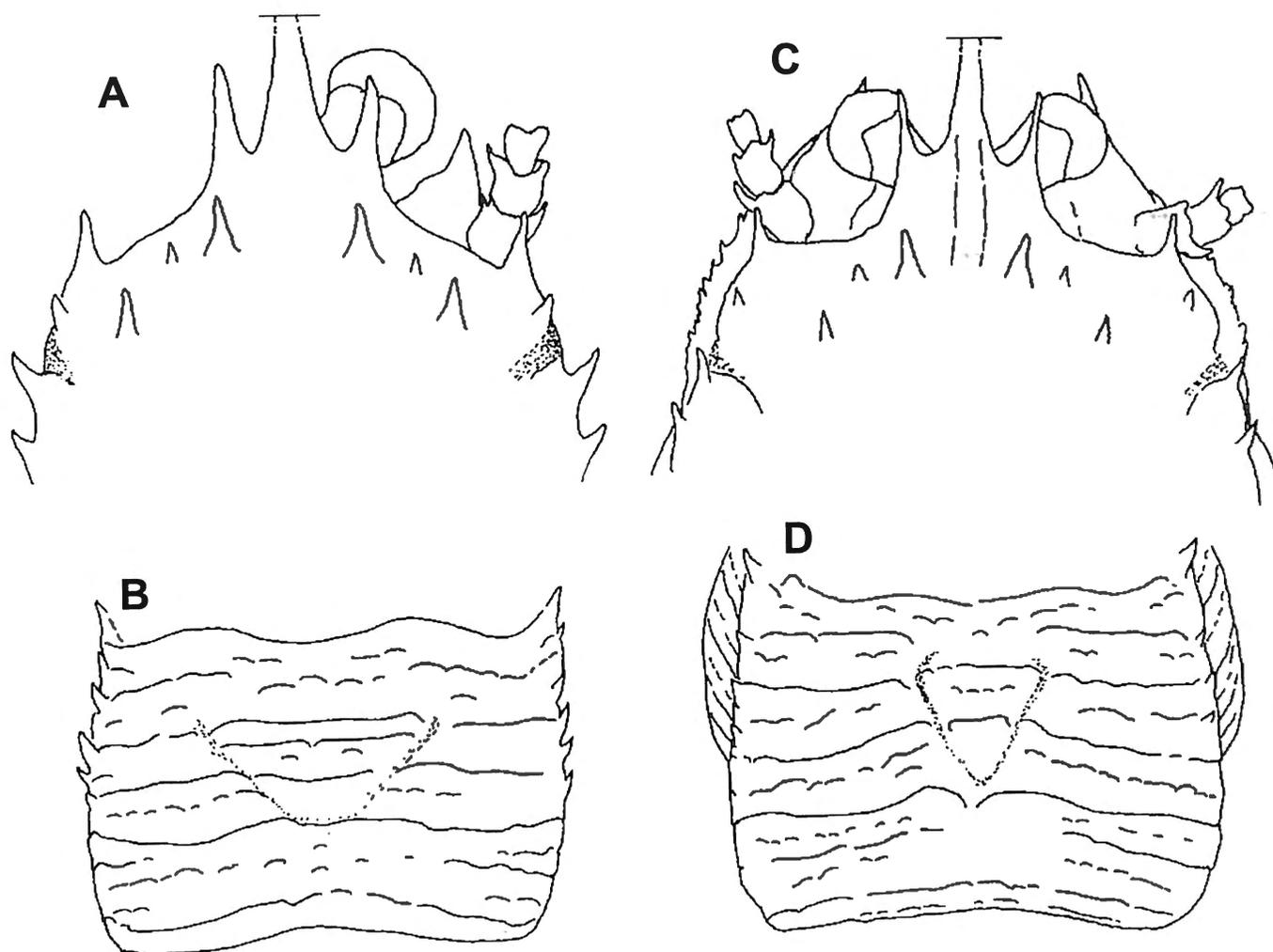


Fig. 5. Frontal (A, C) and posterior portions (B, D) of carapace of two species of *Munida* of about the same CL. A, B. *M. quadrispina* BENEDICT, 1902 (male, CLwr 24.5 mm, Petersburg, Alaska) (LACM-A375). C, D. *M. macrobrachia* sp. nov. (male, holotype, CLwr 30.5 mm) (LACM).

distally; tip dark coloured; c. 25 movable spinules along flexor margin.

ETYMOLOGY

The name of the species refer to the chelipeds of the male holotype, which are very long and strong.

DISTRIBUTION RANGE

Known only from three localities off Southern California, USA (off Point Vicente, Sta. Catalina Island, San Clemente Island).

DEPTH RANGE

The holotype is from 540-612 m.

COMMENTS

The only adult specimen available was compared to specimens of species of *Munida* recorded for the region. The large

size and the general shape of *M. macrobrachia* (i.e., small eyes, branchial regions laterally inflated, carapace dorsally depressed and orbital margin almost straight), make it readily distinct from the other species known in the area. Furthermore, the absence of dorsal spines on first two abdominal tergites differentiate the new species from all *Munida* known from the region that bears spines on at least the second abdominal tergite (*M. bapensis* HENDRICKX, 2000, *M. curvipes*, *M. gracilipes* FAXON, 1893, *M. hispida* BENEDICT, 1902, *M. microphthalma* A. MILNE EDWARDS, 1880, *M. montemaris* BAHAMONDE & LÓPEZ, 1962, *M. obesa* FAXON, 1893, *M. perlata* BENEDICT, 1902, *M. propinqua* FAXON, 1893, *M. subrugosa*, and *M. tenella* BENEDICT, 1902). *Munida williamsi* HENDRICKX, 2000 features a pair of dorsal spines on the second abdominal tergite, but these are often diminute or wanting. Compared to *M. macrobrachia*, *M. williamsi* has a much longer rostrum, very slender chelipeds with an outer palm devoid of spines or tubercles, and a distinct spination on the basal segment of antennulae. Among species without spines on abdominal tergites, *M. debilis* BENEDICT, 1902 and *M. refulgens* FAXON, 1893 feature long,

slender chelipeds, very short supraocular spines which are set closely to the rostrum, and sternite three is not separated from sternite four by a neck-like projection (not projected anteriorly). Other species can be distinguished from *M. macrobrachia* by the following characteristics: *Munida mexicana* BENEDICT, 1902 is a small species, with large eyes, fingers of chelae very slender and much longer than palm, tuberculate ridges on the sternal plate and three strong spines on flexor margin of merus of third maxilliped; *Munida gregaria* presents a typically short, subtriangular rostrum, and a very distinct flattened, keel-like projection on all free joints of third maxilliped. *Munida quadrispina*, with which the specimen was originally identified, features strongly convex carapace and lateral margins, a much wider gastric region, the pterygostomial flap is not inflated and is proportionally much shorter and narrower than in *M. macrobrachia*, the chelipeds are much shorter and armed with sharp, long spines, and the eyes are proportionally much larger.

The additional material reported herein probably corresponds to immature stages of *M. macrobrachia* and was therefore not considered as part of the type material. Among other features, these specimens share the depressed carapace, the narrow gastric region, the slender chelipeds with blunt or subcylindrical spines, and the inflated pterygostomial flap of *M. macrobrachia*. The orbital margin, however, is not transversal and is rather oblique, a characteristic shared with *M. quadrispina*. The laterally inflated pterygostomial flap, also observed in *Munida obesa* and in *M. refulgens*, is rather typical of *Pleuroncodes*. But species of *Pleuroncodes* feature flattened chelipeds and walking legs, and a different carapace shape.

Munida montemaris BAHAMONDE & LOPEZ, 1962
(Fig. 6)

Munida montemaris BAHAMONDE & LOPEZ, 1962: 85-91.- HENDRIKX, 2000: 164 (table 1).- BOSCHI, 2000: 97 (listed).

MATERIAL EXAMINED

Holotype, off Punta Angeles, Valparaiso, Chile, "Pescador", 1962 (exact date not available), 1 M (CW 16 mm; CLwr approx. 22.5 mm), 400 m (coll. I. BARRERA) (MNHN-10079). The unique male specimen known to date had not been illustrated previously. Figures presented herein were obtained through the courtesy of the Museo Nacional de Historia Natural, Chile.

DESCRIPTION

Carapace with distinct complete transverse striae, little setose; secondary striae almost absent. A series of eight epigastric spines, the middle pair very small, a much stronger lateral pair situated at base of supraocular spines, and two pairs of smaller spines set obliquely backwards, one on each side of the largest pair; space between the largest pair similar to length of spines. A small but distinct parahepatic spine. A pair of small anterobranchial spines and one postcervical spine on each side of carapace, these spines of similar size.

Frontal margin slightly transverse. Rostrum long, sharp, contained about 2.5 times in carapace length, without lateral spines but finely serrated on lateral margins. Supraocular spines slightly diverging, overreaching anterior margin of cornea. Anterolateral spines sharp, much shorter than supraocular spines and not reaching the level of the sinus between rostrum and supraocular spines. Anterior branchial margins armed with 3 spines, posterior branchial margins armed with 2 short spines; 6 spines on lateral margins of entire carapace (excluding anterolateral). Sternal plastron (sternites 3-7) as long as wide, sternite 3 projected forwards, with curving, sharp lateral edges; sternite 4 moderately narrow anteriorly, its length about 1/2 its width; sternites without striae; transversal ridges between sternites 5-7 finely granulated. Second abdominal segment with four pairs of strong, sharp dorsal spines. Third and fourth abdominal segments without spines. Eyes large, their diameter about half the length of rostrum (projected) and about 1/3 the distance between anterolateral spines. Distal spines of antennular basal segment very unequal, the distolateral much longer and sharper; two lateral spines, the inner spine the largest and almost reaching tip of distolateral spine, the outer spine sharp, shorter, reaching about 1/2 length of the inner lateral spine. First (basal) segment of antennal peduncle with sharp distomesial spine. Merus of third maxilliped with two strong and one short spines on flexor margin; extensor margin unarmed; ischium slender and long, about 1 1/2 times as long as merus and with a distal spine on both sides, the outer the longest. Chelipeds and walking legs squamous. Chelipeds strong, wide, about twice as long as carapace (including rostrum), with rows of strong spines on all segments; spines particularly strong on distal half of merus which bears about 7 outer spines, about 12 larger upper spines and several large distal spines; merus shorter than carapace length; carpus stout, slightly longer than 1/2 merus length, shorter than palm, with 2 rows of spines on outer margin, 4 rows on upper margin and 5 rows on lower margin, spines weaker than on merus; fingers and palm of about same length; manus with two outer row of spines (6 and 8 spines) in addition to dorsal and ventral rows, ventral row extending to tip of fixed finger. Pereiopods relatively slender, compressed, with spines on both upper and lower margins. Second pereopod with small spines along the superior edge of merus and propodus; inferior edge of merus with slightly stronger spines; carpus without ventral spines, except for one sharp distal spine; propodus about 2/3 merus length; dactylus about 2/3 propodus length, flexor margin spinulated.

TYPE LOCALITY

Off Punta Angeles, seven miles off Valparaiso (33°01' S, 71°39' W), Chile.

DISTRIBUTION RANGE

Known only from the type locality.

DEPTH RANGE

Captured at 400 m depth.

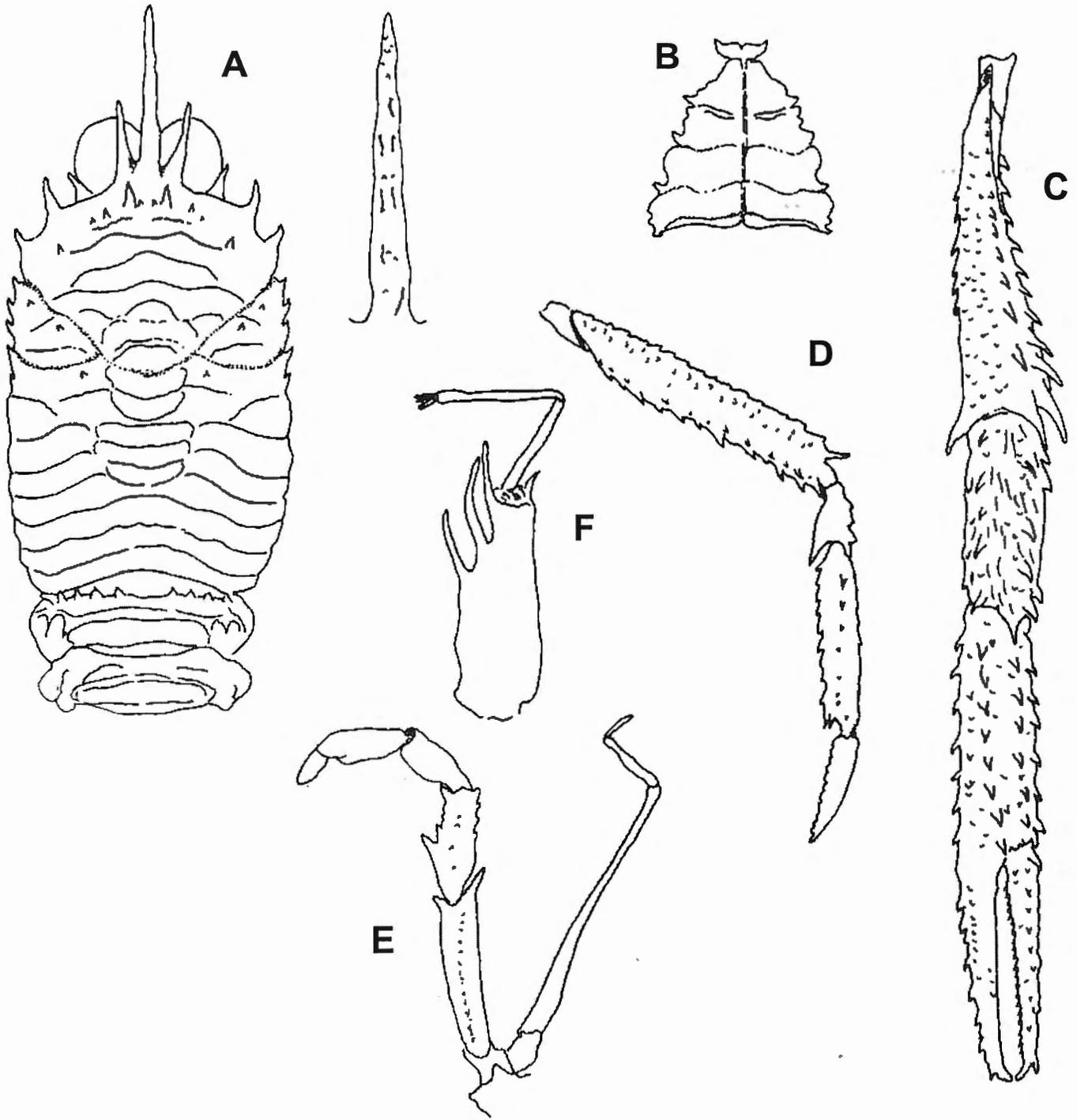


Fig. 6. *Munida montemaris* BAHAMONDE & LOPEZ, 1962. Male, holotype (CLwr 22.5 mm) (MNHN-10079). A. Carapace and anterior part of abdomen, dorsal view. B. Sternal plastron. C. Right cheliped, dorsal view. D. Right second pereiopod, lateral view. E. Left third maxilliped, lateral view. F. Right basal antennular segment, ventral view.

COMMENTS

Original of illustrations made at the Museo Nacional de Historia Natural were lost in the mail. Figures presented herein were reproduced from a copy sent by fax and are not of perfect quality. No illustration of the antennal peduncle is available and the original description reports the presence of a spine on first segment only.

According to BAHAMONDE & LOPEZ (1962: 89), the type

material of *M. montemaris* is closely related to *M. curvipes* from which it differs by a higher number of dorsal spines on the second abdominal segment (8 vs. 6 in *M. curvipes*) and by the shape of the dactylus of pereiopods 2-5 (straight in *M. montemaris*; curved in *M. curvipes*). These characteristics alone would, in my opinion, not be sufficient to justify the conservation of *M. montemaris* as a valid species. In particular, intraspecific variation of number of dorsal spines on abdominal segments is often observed among specimens of

Munida. The comparison of the type material of *M. curvipes* (Fig. 1) with the illustration of *M. montemaris* (Fig. 6), however, indicates that 1) second pereopod is more slender and lateral spines on merus are much longer in *M. curvipes*, 2) sternum is wider in *M. curvipes*, 3) spines on branchial margin are much stronger in *M. curvipes*, 4) ischium of third maxilliped is much longer than merus in *M. montemaris* and of about the same length in *M. curvipes*. In addition to this, eyes are proportionally larger and supraocular spines are less diverging in *M. montemaris*. Although some of these characteristics may vary among specimens of the same species, on the basis of these observations *M. montemaris* is maintained as a valid species.

Munida montemaris is not cited by WICKSTEN (1989) in her list of offshore decapod crustaceans of the eastern Pacific Ocean.

Munida quadrispina BENEDICT, 1902
(Figs. 5A, B, 7, 8, 9)

Munida quadrispina BENEDICT, 1902: 269-270, fig. 17.- RATHBUN, 1904: 14 (listed), 166.- SCHMITT, 1921: 165-166, fig. 105.- HART, 1982: 168, fig. 66.- WICKSTEN, 1989: 315 (listed).- CADIEN, 1997: 1, 3, textfig.- HENDRIKX, 2000: 164 (table 1).- BOSCHI, 2000: 97 (listed).- LUKE, 1977: 29.

MATERIAL EXAMINED

Type series, "Albatross" St. 2878. The label in the type series jar provides the following data (see comments): Off Cape Beale, Vancouver Island, British Columbia, Canada, 118 m (66 fathoms) (USNM-20537); no date. The jar contains 21 specimens (CLwr 6.5-9.0 mm), plus two abdomens. Straits of [Juan de] Fuca, Washington, USA, "Albatross" St. 3454, 01/Sep/1891, 7 M (CLwr 7.3-15.5 mm; CL 11.0-21.6 mm) and 1 F (CLwr 10.8 mm), 275 m (152 fathoms) (label handwritten by J. E. Benedict) (USNM-25503). Center of Grouse Islet, Boca de Quadra, SE Alaska, "Albatross" St. 4223, 06 Jul 1903, 5 M (CLwr 13.8-17.5; CL 19.7-24.9 mm) and 2 F (CLwr 14.6-16.5 mm; CL 19.7-24.9 mm), 86 m (48 fathoms) (Id. J.E. BENEDICT) (USNM-65706). Skagett Bay, Puget Sound, Washington, 02 May 1946, 2 M (CLwr 17.3 and 18.0 mm; CL 24.2 and 25.3 mm) and 2 F (CLwr 14.7 and 17.5 mm; CL 21.7 and 25.4 mm) (Coll. A.E. NOBLE; Id. S. LUKE) (SIO C-691). Off San Diego (32°46.5' N, 118°20.5' W), California, no date on label, 2 M (CL 19.6 and 22.4 mm), 495 m (275 fathoms) (SIO C-670). Punta Piedras Blancas (ca. 35°32.1' N, 121°24.5' W), California, 11 Apr 1974, R.V. "Agassiz", 27 M (CLwr 7.5-14.5 mm; CL 11.5-21.3 mm), 37 FF (CLwr 8.2-14.2 mm; CL 11.5-21.2 mm), and 2 juv. (CLwr 6.5-7.0 mm; CL 9.5-10.5 mm), 567-603 m, Otter trawl (Coll. T. MATSUI and B. BURNETT; Id. S. LUKE) (SIO-C 1546). Off Coos Bay, Oregon, 21 Jun 1958, 1 M (CLwr 20.7 mm; CL 30.7 mm) and 1 FF (CLwr 16.8 mm; CL 24.3 mm), 130-140 m (72-77 fathoms) (Id. J. HAIG) (ex-AHF, LACM, no catalog number). Petersburg, Alaska, July 1936, 3 M (CLwr 15.2-22.3 mm; CL 19.7-28.8 mm) and 4 F (CLwr 14.6-19.7 mm; CL 18.1-26.2 mm) (LACM Ac. Number A 375).

LECTOTYPE DESIGNATION

One male specimen of the type series USNM 20537, CLwr 8.0 mm, TL 22.3 mm, is hereby designated as lectotype of *M. quadrispina* and illustrated. This designation is justified by the necessity to describe morphologic characters not included in the original description. The other specimens of the type series are all designated paralectotypes.

DESCRIPTION

Carapace with distinct setose transverse striae; secondary striae incomplete (large specimens) or reduced to a few transversal rugae, mostly present laterally. Pterygostomial flap narrow, not inflated. One pair of strong, sharp epigastric spines beyond supraocular spines, often accompanied by a second pair of smaller spines set laterally in line with the larger pair (occasionally a third pair of spinules present, laterally to the smaller spine). One sharp parahepatic spine, longer than the smallest epigastric spine; a parahepatic spinule occasionally present. One strong anterobranchial spine and no postcervical spine. Frontal margin strongly oblique. Rostrum long to very long, usually sharp (occasionally short and ending in a bifurcate tip), finely serrated dorsally and laterally. Supraocular spines sharp, parallel to rostrum or very slightly diverging, not reaching quite to the end of the eyes (extended). Anterolateral spines sharp, shorter than supraocular spines and not reaching the level of the sinus between rostrum and supraocular spines. A second lateral spine between anterolateral spine and cervical groove, much smaller than preceding one. Anterior branchial margin armed with 3 sharp spines, third spine often smaller than preceding two; posterior branchial margin armed with 3-6 spines; 7-10 spines along the entire margin of carapace (excluding anterolateral); spines posterior to cervical suture diminishing in length towards posterior angle of carapace (posteriormost often obsolete). Sternal plastron (sternites 3-7) wider than long, sternite 3 inserted into sternite 4; fourth sternite wide anteriorly, its length less than 1/2 its width. Surface of sternites smooth except for two pairs of rugae on sternite 4 and a few, obscure rugae on sternite 5 (see remarks); lateral parts of sternal plates without granules, tubercles or carinae; transverse ridges on sternal plates weakly (st. 5-6) to strongly (st. 7) raised, finely granulate. Second, third and fourth abdominal segments without dorsal spines. Eyes of medium size, their larger cornea diameter about 1/4 to about 1/3 fitting the distance between bases of anterolateral spines (see comments). Distal spines of antennular basal segment unequal, distomesial much longer than distolateral. Inner lateral spine long, slender, pointing obliquely upward, reaching or slightly overreaching tip of distolateral spine; outer lateral short, less than 1/3 length of inner lateral spine. First (basal) segment of antennal peduncle with one strong distomesial spine reaching or slightly overreaching anterior margin of fourth peduncular segment; second segment with a sharp, strong distolateral spine and an unobscured distomesial spinule; third segment with a sharp distomesial spine. Ischium of third maxilliped almost equal to merus, with one distoventral spine. Flexor margin of merus armed with 4 spines (see comments), the first (most proximal) and last

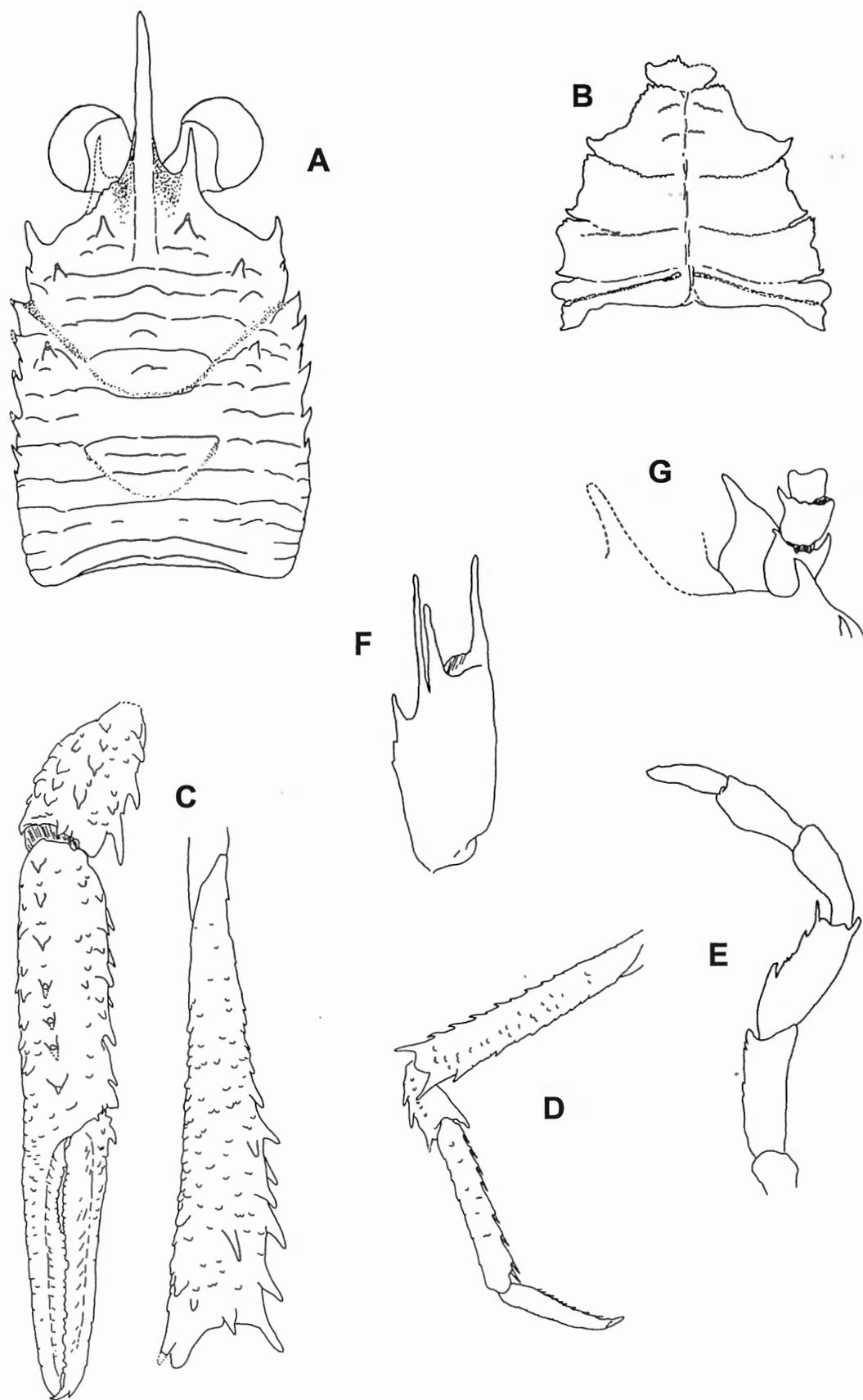


Fig. 7. *Munida quadrispina* BENEDICT, 1902. Male, lectotype (CLwr 8.0 mm) (USNM-20537). A. Carapace, dorsal view. B. Sternal plastron. C. Right cheliped, dorsal view. D. Left second pereopod, lateral view. E. Right third maxilliped, lateral view. F. Right basal antennular segment, ventral view. G. Dorsal view of right antennal peduncle.

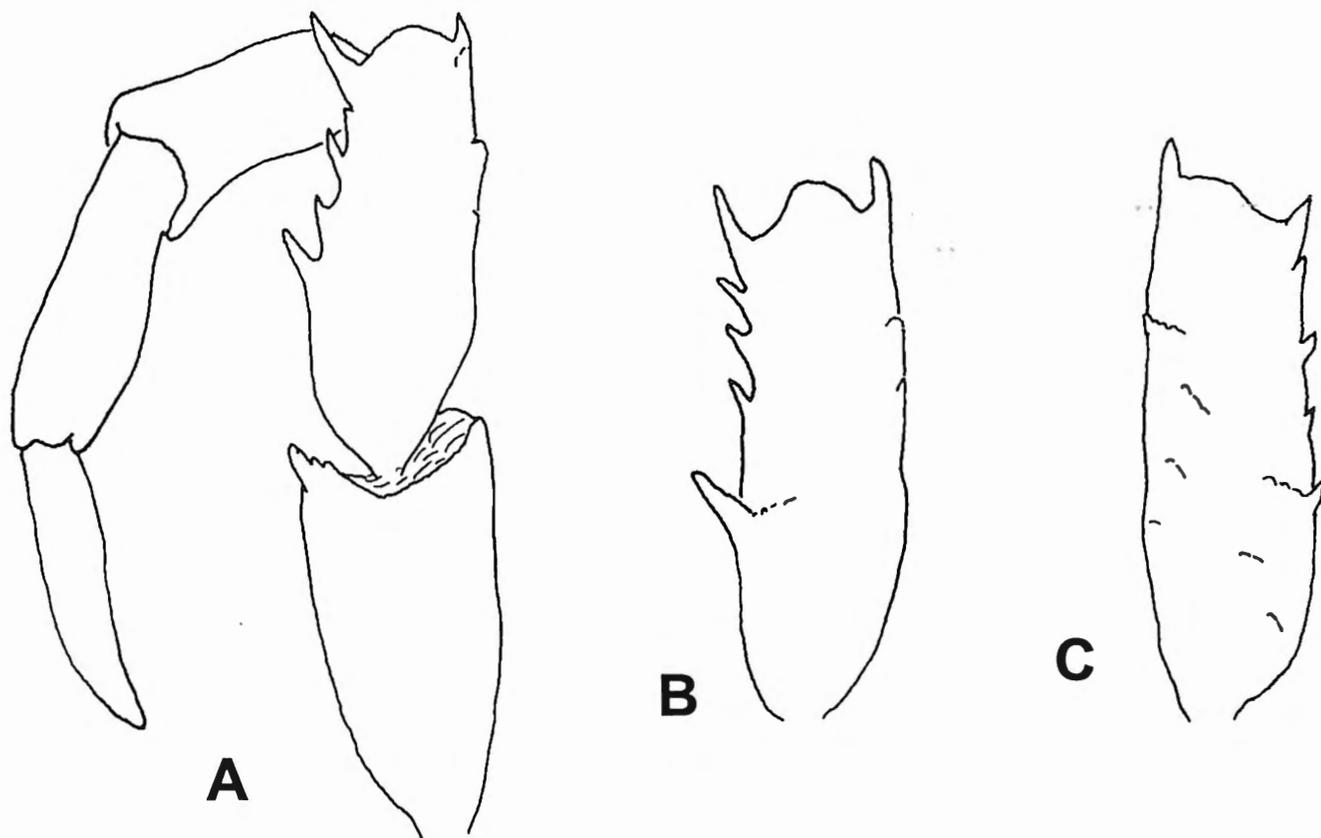


Fig. 8. *Munida quadrispina* BENEDICT, 1902. Third maxilliped of specimens with distinct spines pattern on merus flexor margin. A. Male, CL 24.9 mm, right third maxilliped (USNM-65706). B. Male, CL 31.0 mm, right merus (off Coos Bay). C. Female, CL 25.4 mm, left merus (SIO-C691).

(distal) long, the other two short; distal spine usually longest of four; a short, sharp distal spine on the extensor margin. Chelipeds squamous, slender in smaller specimens, longer and stronger in males. Male chelipeds 2.25-2.35 times as long as carapace (CL, including rostrum); merus longer than 3/4 carapace length (CL), 2.8-3.2 times as long as carpus, about 1.7 times as long as palm; carpus c. 1/3 merus length; palm and fingers equal; palm 2.75 to 3.25 as long as high. Fingers not gaping, distally crossing and ending in a spine; a row of small to medium size teeth on fingers cutting edge; a dorsal, curved spine at base of dactylus. Pereiopods slender. Merus proximally triangular and distally square in cross section, with 4 rows of spines, mostly in distal half, spines long and sharp on dorsal and inner rows, shorter on outer row, each row ending with a sharp, larger distal spine. Carpus with a row of 4 dorsal spines; outer face with 3 rows of spines, upper row strongest, inner face with one row of 4 spines; all spines longer distally. Propodus with one dorsal, one ventral and three outer rows of short spine, occasionally reduced to a tubercle; inner face covered with flattened tubercles. Flexor margin of dactylus spinulated.

TYPE LOCALITY

Off Cape Beale, Vancouver Island, British Columbia, Canada, according to label in the type material jar, but probably West of Mouth of Strait Juan de Fuca, Washington, USA, according to "Albatross" station data.

DISTRIBUTION RANGE

Munida quadrispina has been reported from Alaska, USA, to Baja California, Mexico (WICKSTEN, 1989; CADIEN, 1997). RATHBUN (1904: 14) reports a continuous distribution for this species from Alaska to South of San Diego, including records for the following geographic areas: Kodiak to southeastern Alaska, British Columbia, Puget Sound to Strait of Fuca, west coast of Washington and Oregon, northern California limit to Monterey, Monterey to San Diego, and San Diego and southward.

DEPTH RANGE

In depths of 22-1463 m (WICKSTEN, 1989; CADIEN, 1997). RATHBUN (1904) reports the species in three different bathymetric ranges (50-100, 100-500 and 500-1000 fathoms).

COMMENTS

Quite unfortunately it appears that some data on the label in the type series jar cannot be trusted. This label, which has obviously been transcribed from the original label of BENEDICT, includes the following data: "Smithsonian Institution National Museum, 20537, *Munida quadrispina* Ben., off Cape Beale, Vancouver Il. B.C., Sta. 2878 - 66 fms". The catalog number (20537) is the one provided by BENEDICT

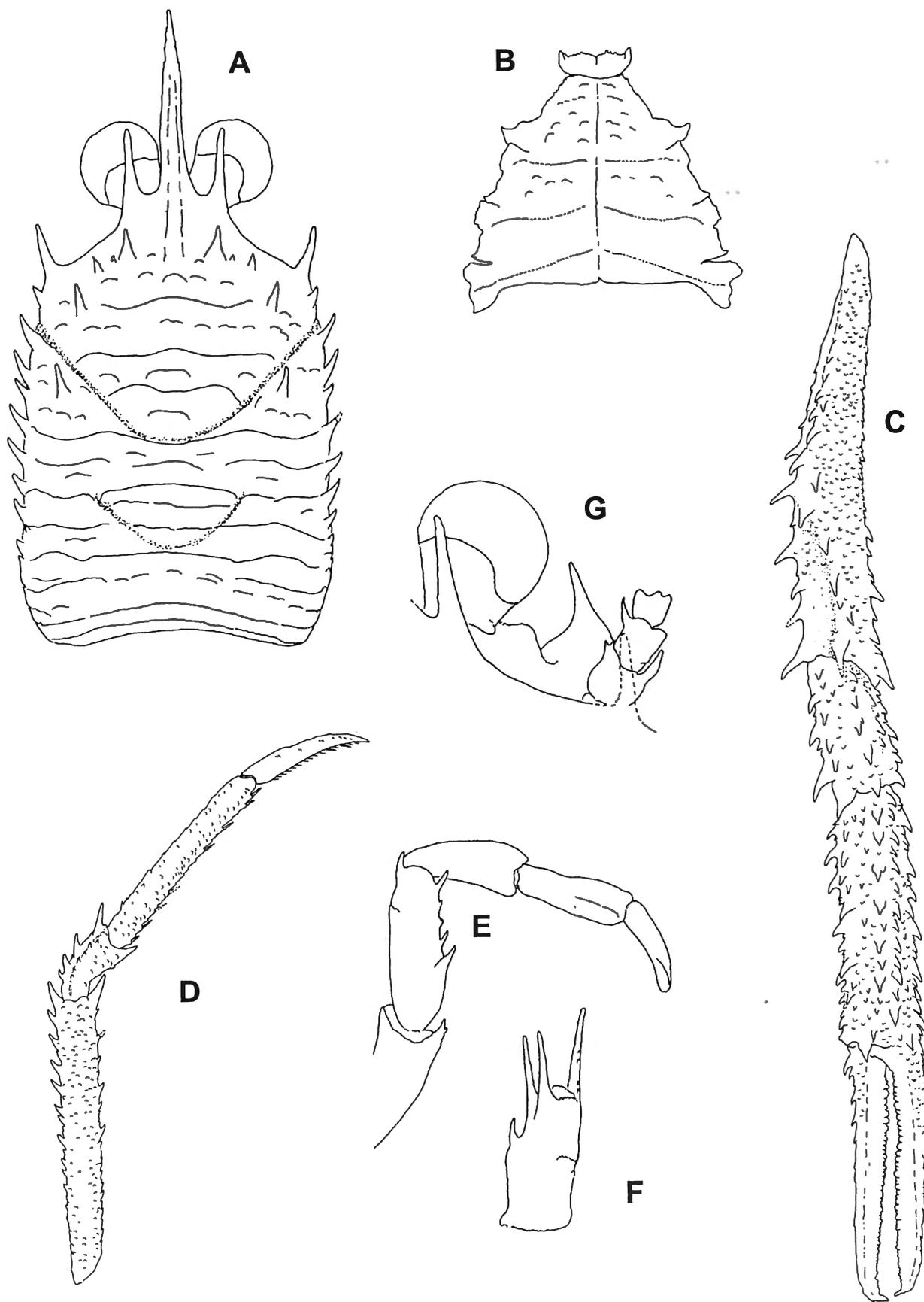


Fig. 9. *Munida quadrispina* BENEDICT, 1902. Male, Boca de Quadra (CLwr 15.0 mm) (USNM-65706). A. Carapace, dorsal view. B. Sternal plastron. C. Right cheliped, dorsal view. D. Left second pereiopod, lateral view. E. Right third maxilliped, lateral view. F. Right basal antennular segment, ventral view. G. Dorsal view of right antennal peduncle.

(1902) in his original description, and "Albatross" St. 2878 appears as one of the two [type] localities cited by the author after his description of *M. quadrispina*. The jar also contains a second label with the (printed) species name and author (BENEDICT) and the classical TYPE indication, printed in red color (in use at the USNM). "Albatross" stations original ledgers and the station reference data base available at the USNM, however, provide a distinct set of data for "Albatross" St. 2878 (i.e., North Pacific Ocean, United States, Washington, West of mouth of Strait of Juan de Fuca, 25 Sept 1888, 66 fms, Ship's Dredge, 48°37'00" N, 125°32'00" W) (Rose A. GULLEDGE, pers. comm., March 2003). The only coincidence is the depth (66 fms) and we must therefore conclude that either BENEDICT wrote the erroneous data on the original label (no longer available) or that the original data were erroneously transcribed on the new, more recent label, which seems quite unlikely given that both station number and USNM catalog number are correct. Incidentally, the depth of 267 fathoms reported by BENEDICT (1902: 269) in the "Locality" paragraph is the depth registered at "Albatross" St. 2960, which is located off the Channels Islands, North of San Miguel Island, California (Rose A. GULLEDGE, idem).

SCHMITT (1921: 166) cites as type locality for *M. quadrispina* "Albatross" Station 2878, "off Cape Beale, Vancouver Island, British Columbia, 66 fathoms", thus indicating that he probably had access to the data written on the label in the type jar (USNM 20537), although he doesn't say so. HART (1982: 164) also cites "off Cape Beale, 121 m" as the type locality, but these data might have been taken from SCHMITT (loc. cit.).

The type series available at the Smithsonian Institution (USNM 20537) is made of 21 specimens (and two abdomens) ranging in size from CLwr 6.5 mm to CLwr 9.0 mm. All specimens are incomplete and many are partly damaged. Only one specimen has both chelipeds and 6 out of 8 pereopods still attached; five additional specimens have one cheliped attached and miss some pereopods. The rest (15 specimens) miss both chelipeds and usually some pereopods; of these, four are completely crushed, four are partly damaged (crushed carapace or incomplete abdomen) and one is infested by a bopyrid isopod. In his 1902 description of *M. quadrispina*, BENEDICT reports material from as many as 19 stations, including "Albatross" station 3454. It is therefore rather surprising that the specimens obtained from this later station (still available today as lot USNM 25503), much larger than any specimens available in the type series (i.e., USNM 20537), were not selected by BENEDICT as the type material. The reference to specimens larger than those of the type series is provided by BENEDICT (1902: 269) at the end of the original description, when he indicates that the length of a large specimen is 35 mm. The length of the specimen illustrated in the original description (BENEDICT, 1902: 270, fig. 17) is of about 33 mm (body length); no specimens of the type series USNM 20537 overreaches 25 mm in body length, which indicates that the specimen illustrated probably did not belong to the type series (unless specimens of this series have been lost between 1902 and today) but represented a larger specimen selected from another lot. Inci-

dently SCHMITT (1921: 166) reproduced the illustration of BENEDICT (1902: fig. 17) and indicates in the text that the type is 35 mm long, which is most probably an error based on BENEDICT's statement related to the maximum length of the species. Material labeled *M. quadrispina* found in the LAMNH and SIO holdings and examined during this study, feature a CLwr of up to 20.7 mm, 2.3 times as long as the largest specimens of the type series.

A size series of *M. quadrispina* was established using three lots, all originally identified by Benedict: lot USNM 20537 (type) (specimens from CWwr 6.5 mm to 9.0 mm); lot USNM 25503 (specimens from CWwr 7.3 mm to 15.5 mm); and lot 65706 (specimens from CWwr 13.8 mm to 16.5 mm). All these specimens were carefully compared and undoubtedly represent the same species. The large specimens identified by BENEDICT were then used as comparative material to check on identification of the much larger specimens available from the LACM and SIO holdings. A male from Boca de Quadra (USNM-65706), identified by J.E. BENEDICT, is illustrated (see Fig. 9).

Munida quadrispina appears as a variable species in many respects. First of all, the presence of four spines on the flexor margin of the merus of third maxilliped is not a constant character. Although this was already noted by BENEDICT (1902: 270), he quite unfortunately named his species after this character (*quadrispina*). Among the material examined, number of spines or spinules on flexor margin of merus varied from 2 to 5 (Fig. 8); variations between left and right maxilliped of specimens were also commonly observed. Carapace of some specimens also feature a small postcervical spine and a parahepatic spinule; striae on carapace and rugae on sternum vary from weak to strong; size of granules on sternites transverse ridges are also variable, from weak to strong. The material from Boca de Quadra (USNM-65706) includes very spiny specimens (see Fig. 9) in which spines on all appendages are strong and sharp; cheliped bear numerous small spiny tubercles and lateral margins of carapace is armed with sharp spines and spinules (a total of six on posterior branchial margins). The specimens from Skagett Bay, Puget Sound, possess much shorter and stronger chelipeds, with strong, curved spines and numerous flattened tubercles, and a shorter rostrum. These specimens, however, are considered to represent the extreme variations of these characteristics within the species and intermediate forms were observed among the material examined.

Consistent characters that permit to distinguish *M. quadrispina* from all other species of *Munida* known from the East Pacific in which the inner distal spine of the basal antennular segment is considerably longer than the outer distal spine [i.e., *M. debilis* BENEDICT, 1902; *M. gregaria* (FABRICIUS, 1793); *M. mexicana*, BENEDICT, 1902; *M. refulgens*, FAXON, 1893; *M. subrugosa* (WHITE, 1847); *M. tenella* BENEDICT, 1902; and *M. williamsi* HENDRIKX, 2000] are: orbital margin very oblique; supraocular spines longer than anterolateral spines; chelipeds not extremely long and slender; cheliped fingers not considerably longer or considerably shorter than palm; no spines on abdominal segments; sternum 3 projecting forward, well separated from sternum 4; basal segment of antennal peduncle ending in a sharp inner spine; flexor margin of merus of third maxilliped

with 2-5 spines or spinules; carpus and propodus of third maxilliped without lateral, lobular expansion.

Munida subrugosa (WHITE, 1847)
(Fig. 10)

Munida subrugosa.- HAIG, 1955: 38 (complete synonymy), fig. 10.- RETAMAL, 1973:13, figs. 14-16; 1974: 12; 1981: 22, fig. 93.- BAHAMONDE, 1986: 107, fig. 3 (distribution), tables 1-2.- RODRIGUEZ & BAHAMONDE, 1986: 283-294 (partim), fig. 2.- HENDRICKX, 2000: 164 (table 1).- BOSCHI, 2000: 98 (listed).- RETAMAL & JARA, 2002: 206 (listed).

MATERIAL EXAMINED

Estero Huito, Golfo de Ancud, Chile, 15 Dec 1948, Lund University Chile Expedition, 2 M (CLwr 22.0 and 20.8 mm) and 2 F (CLwr 13.15 and 16.3 mm), 5-6 m (Id. J. HAIG) (LACM, ex-AHF, no registration number). Canal Beagle (54°48' S, 68°16' W), Tierra del Fuego, Argentina, 12 Mar 1974, 2 M (CLwr 18.5 and 25.1 mm; CL 26.0 and 33.2 mm) and 4 F (CLwr 16.3-23.5 mm; CL 22.2-30.8 mm) (id. E. BOSCHI) (EMU-5405).

DESCRIPTION

Carapace with distinct setose transverse striae; secondary striae present, incomplete. One pair of epigastric spines, behind the supraocular spines, and a much smaller pair of lateral spinules. Small parahepatic spinules occasionally present. First ciliate transverse striae behind the epigastric spines with a pair of small spines (occasionally wanting). No branchial spines. Two pairs of small postcervical spines, the outer pair usually stronger; some of these spines sometimes obsolete. Frontal margin almost straight; lateral margins slightly convex. Rostrum moderately long, stout, without lateral spines, its width (measured at level of sinus between rostrum and supraocular spines) less than half rostrum length. Supraocular spines short, acute, straight, less than half length of rostrum, not overreaching anterior margin of cornea (eyes extended); anterolateral spines sharp, well-developed but shorter than supraocular spines, reaching or not the level of the sinus between rostrum and supraocular spines. A group of spines or spinules on hepatic margin. Anterior branchial margin armed with 4 irregular spines; posterior branchial margin armed with one spine similar to the anterior four; about 6-9 spines and spinules on lateral margins of entire carapace behind cervical groove. Sternal plastron (sternites 3-7) wider than long, with granulate striae on sternites 4-7. Sternite 3 inserted into sternite 4, anterior margin irregular, laterally rounded; fourth sternite wide anteriorly, its length slightly more than 1/2 its width, surface with numerous curved striae, the anteriormost strongly elevated, all striae granulate; sternite 5 with one pair of anterior transverse striae; sternites 6-7 with smaller, more obscure transverse striae. Second abdominal segment with two pairs of short, sharp dorsal spines, the inner pair stronger, the outer pair sometimes obsolete. Third and fourth abdominal segments with a pair of spines similar in size to inner pair of second abdominal segment. Eyes small; cornea diameter about half the length of rostrum (projected) and less than 1/3 the distance between the antero-

lateral spines; ocular peduncle short. Distal spines of antennular basal segment very unequal, the distomesial much longer and minutely spinulate; two lateral spines, the outer spine shorter than the mesiodistal spine, the inner spine about equal to distolateral spine and slightly pointing upward. First (basal) segment of antennal peduncle spineless, its inner side forming a narrow, produced, crenulate extension; second segment with a short outer distal spine. Flexor margin of merus of third maxilliped unarmed; a sharp, short distal spine on extensor margin; carpus and propodus slightly produced laterally (frontal view), dactylus compressed, long and narrow. Chelipeds and walking legs squamous. Chelipeds stout, more than twice as long as carapace length (including rostrum) in males and less than twice as long in females, with scattered flattened tubercles and blunt spines on lateral faces. Merus proximally triangular and distally squarish in cross section; a row of curved spines on dorsal margin, number of spines variable (4-12; see comments), the distal spine much stronger; a group of 2-3 strong subterminal, mesial spines next to the dorsal row, and an isolated subterminal spine lateral to the dorsal row; a strong distal spine on upper lateral face of merus; inner ventral side with a row of 3-5 spines, the distal spine much stronger; carpus with a row of 3-5 sharp dorsal spines, and a row of 3 spines on inner ventral side; a row of 2-5 small spines on upper part of palm and a few similar spines on outer face of manus; no ventral spines on propodus and pollex; fingers and propodus of about the same length, squamous, without marginal spines, except for one proximal spine on dactylus; carpus subquadrate, short, massive, longer than 1/2 dactylus length; merus about 2/3 carapace length, more than twice as long as carpus and about 1.5 times as long as palm; fingers about as long as palm. Pereiopods compressed. Second pereopod with a row of 12-15 strong, sharp, curved spines along the superior edge of merus, spines increasing in size from proximal to distal margins and ending in a much longer, sharp distal spine; inferior edge of merus without spines, except for a strong, sharp, distal spine; carpus with 2-3 sharp dorsal spines, the distal spine the longest, and a strong ventrodistal spine; propodus without dorsal spines and with movable spinules on the ventral margin. Propodus about 2/3 merus length; dactylus longer than half propodus length, flexor margin spinulated.

TYPE LOCALITY

Rendez-vous Cove, Auckland Islands (HAIG, 1955).

DISTRIBUTION RANGE

From Calbuco, Chiloe Province, around the southern tip of America and through the Magellan Strait to Tierra del Fuego and Montevideo, Uruguay; Falklands Islands. New Zealand (HAIG, 1955; RETAMAL, 1981). Ancud, Port Otway (Puerto Barroso), Chile; Messier Channel, Cockle Cove, Trinidad Channel, Smith Channel, Punta Arenas, Port Famine, Grays Harbour, Paso Brecknock, Strait of Magellan; western Patagonia (HAIG, 1955). Gulf and Canal of Ancud, Ralún Bay, Sono Reloncaví, Gulf of Quetalmahué, Chile (HAIG, 1955: material examined).

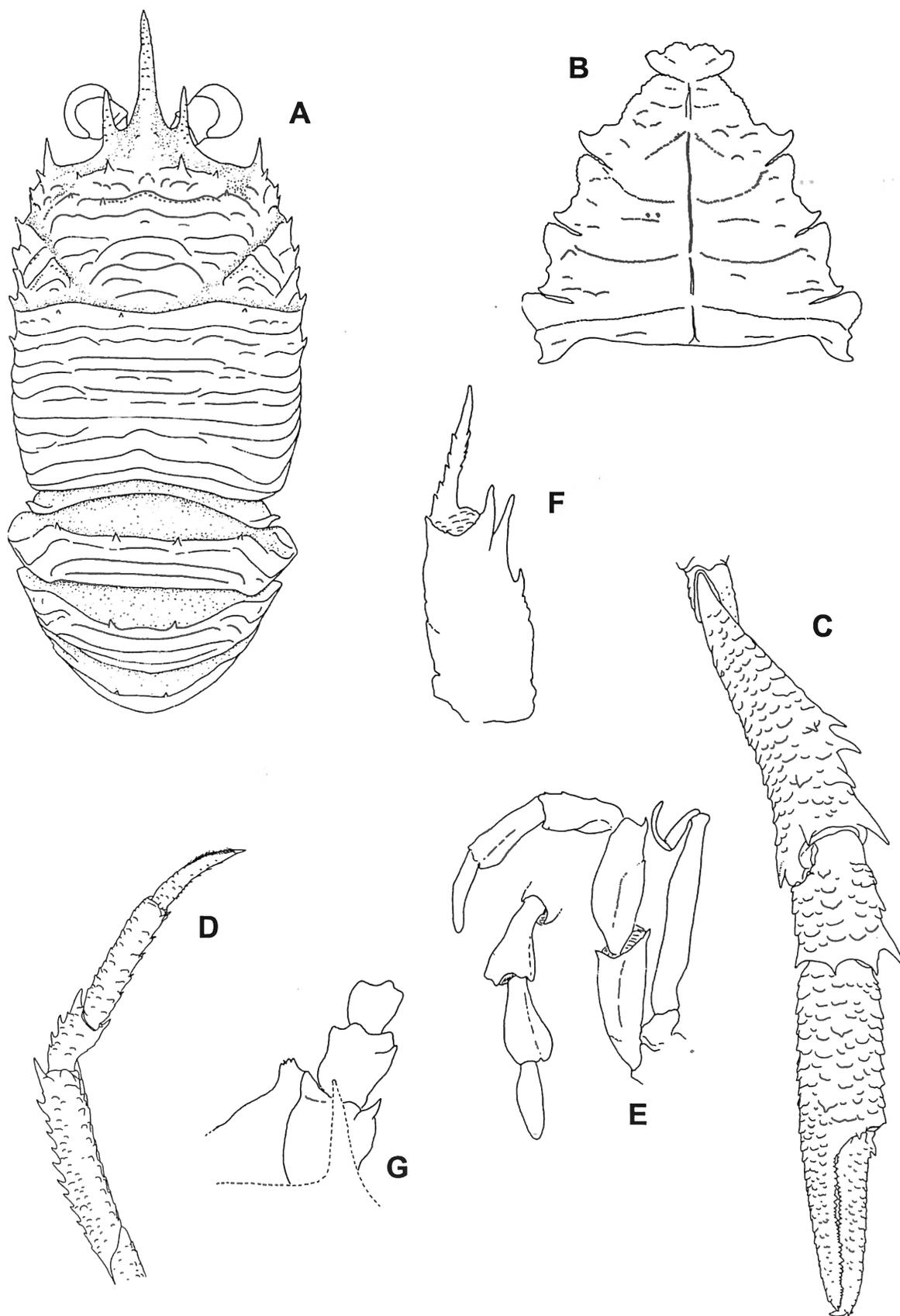


Fig. 10. *Munida subrugosa* (WHITE, 1847). Male, Estero Huito, Gulf of Ancud (CL 29.8 mm) (LACM). A. Carapace and abdomen, dorsal view. B. Sternal plastron. C. Right cheliped, dorsal view. D. Right second pereiopod, lateral view. E. Left third maxilliped, lateral view and ventral view and frontal view of last three segments. F. Right basal antennular segment. G. Dorsal view of right antennal peduncle.

DEPTH RANGE AND HABITAT

From shore to 600 fathoms (0-1080 m) (HAIG, 1955). The largest serie of data related to the habitat of this species is provided by HAIG (1955: list of 26 sampling stations): from 0 to ca. 200 m; fine sand (with algae or clay), coarse sand (with mud, shells, small stones or boulders), stones with gravel and sand, muddy sand with shells and algae, small stones). Except for two samples obtained at 100 m and ca. 200 m, all specimens examined by HAIG (1955) were caught between 0 and 70 m.

COMMENTS

Munida subrugosa is a fully benthic species, with young and adults bottom-living (HAIG, 1955). Rostrum is usually moderately long, stout, but in some specimens it is reduced and the tip is blunt (broken?). In this case supraocular spines are more than half the length of rostrum.

Material examined includes spiny and little spiny specimens. In spiny specimens, the spines are sharper on pereopods 2-4. Number and size of spines on merus and carpus of chelipeds also vary considerably from one specimen to another, with

more, sharper spines in spiny specimens, while the little spiny specimens feature squamous rugae instead of sharp spines.

Key to the species of *Munida* LEACH known to the East Pacific (17 species)

The key that appears below includes the six species presented in this paper and the 12 species previously reported by HENDRICKX (2000) for the eastern tropical Pacific. Terminology used in the key is explained in details in HENDRICKX (2000: Figs. 1, 2). The dichotomic key mostly uses characteristics considered diagnostic; some additional characters that are considered helpful to distinct a species from others have occasionally been added in brackets. Due to variation of several morphological characteristics used to separate species of *Munida* (e.g., number and size of spines on carapace and abdominal segments; size of chelipeds; number and size of spines on merus and ischium of third maxilliped), the identification key must be used with caution and the reader should always refer to the detailed description and illustrations of each species after using this key.

- | | |
|--|----------------------|
| 1. A pair of spines or a row of spines and spinules close to posterior margin of carapace | 2 |
| No spines on posterior margin of carapace | 4 |
| 2. Lateral parts of seventh thoracic sternite without granules (a row of spines set longitudinally beyond the rostrum, including three gastric and one strong cardiac spines) | <i>gracilipes</i> |
| Lateral parts of seventh thoracic sternite with numerous granules | 3 |
| 3. Carapace covered with numerous spines and spinules set along the transversal striae; propodus of second pereopod with numerous dorsal spines or spinules | <i>hispida</i> |
| Carapace with no transversal row of spines and spinules; propodus of second pereopod without dorsal spines or spinules | <i>bapensis</i> |
| 4. Eyes very small, their diameter about 1/8 length of rostrum (second abdominal segment armed with four spines; carapace with no hepatic, branchial or postcervical spines; supraocular spines sharp, strongly diverging) .. | <i>microphthalma</i> |
| Eyes medium to large | 5 |
| 5. At least one pair of dorsal spines on second and third abdominal segments | 6 |
| No dorsal spines on third abdominal segment; second abdominal segment with or without dorsal spines | 8 |
| 6. Distal half of rostrum with lateral spines. Anterolateral spines of carapace much longer and stronger than supraocular spines. Sternite 3 closely set within sternite 4 (two pairs of strong dorsal spines on fourth abdominal segment) | <i>tenella</i> |
| Distal half of rostrum without lateral spines. Anterolateral spines of carapace shorter than supraocular spines. Sternite 3 projecting forwards, separated from sternite 4 | 7 |
| 7. No dorsal spines on fourth abdominal segment. Distomesial and distolateral spines of antennular basal segment short, of about equal length | <i>obesa</i> |
| A pair of dorsal spines on fourth abdominal segment. Distomesial spine of antennular basal segment much longer than distolateral spine | <i>subrugosa</i> |
| 8. Distomesial spine of antennular basal segment shorter or of about equal length than distolateral spine. Dorsal spines present on second abdominal segment | 9 |
| Distomesial spine of antennular basal segment much longer than distolateral spine. Second abdominal segment without dorsal spines or with un conspicuous spines | 12 |
| 9. Lateral parts of seventh thoracic sternite with numerous granules. Dorsal margin of propodus of second pereopod bearing about five strong spines | <i>propinqua</i> |
| Lateral parts of seventh thoracic sternite without granules. Dorsal margin of propodus of second pereopod smooth of with inconspicuous spinules | 10 |

-
10. No distal spine on flexor margin of ischium and merus of third maxilliped (no spines on hepatic and branchial regions; eyes small, their diameter less than 1/3 rostrum length) *perlata*
 A distal spine on flexor margin of ischium and merus of third maxilliped 11
-
11. Dorsal and ventral margins of merus of second pereopod armed with sharp, long spines. Ischium of third maxilliped of about the same length as merus *curvipes*
 Ventral margin of merus of second pereopod armed with spines, dorsal margin bearing spinules. Ischium of third maxilliped much longer than merus *montemaris*
-
12. Rostrum triangular, its base very wide. Third maxilliped extremely long, laterally compressed; distal joints with a lobular, flattened projection; ischium and merus without spines *gregaria*
 Rostrum spiniform, sharp. Third maxilliped not extremely long or laterally compressed; distal joints subcylindrical; ischium and merus with at least one spine on flexor margin 13
-
13. Fingers of chelipeds longer than palm. Lateral parts of sixth and seventh thoracic sternites with short, well marked carinae. Flexor margin of merus of third maxilliped armed with three, equally spaced and similar strong spines (frontal margin very oblique; anterolateral spines not overreaching sinus between rostrum and supraocular spines) *mexicana*
 Fingers of chelipeds shorter or equal to palm. Lateral parts of sixth and seventh thoracic sternites without carinae. Flexor margin of merus of third maxilliped armed with up to five spines or spinules of different length 14
-
14. Supraocular spines weak, about half the length of anterolateral spines 15
 Supraocular spines strong, equal in size or stronger than anterolateral spines 16
-
15. Eyes large, their diameter longer than half rostrum length. Dorsal margin of palm of chelipeds armed with small, sharp spines. Dactylus of second pereopod strongly curved, considerably longer than half the length of propodus *debilis*
 Eyes medium sized, their diameter about half rostrum length. Dorsal margin of palm of chelipeds unarmed. Dactylus of second pereopod curved, half the length of propodus *refulgens*
-
16. Chelipeds long, very slender, cylindrical; fingers slender, much shorter than palm; upper margin of palm without spines. Sternite 3 closely set within sternite 4. Distomesial spine of antennular basal segment about three times as long as laterodistal spine *williamsi*
 Chelipeds strong, heavy, fingers wide, of about the same length as palm; upper margin of palm spiny. Sternite 3 projecting forwards, separate from sternite 4. Distomesial spine of antennular basal segment less than twice as long as laterodistal spine 17
-
17. Carapace and lateral margins strongly convex; gastric region wide, about 1/3 carapace width measured at gastric region level; pterygostomian flap not visible in dorsal view. Merus of male chelipeds c. 2 – 2 1/2 times as long as carapace *quadrispina*
 Carapace dorsally depressed, laterally inflated, lateral margin almost straight in its anterior 2/3; gastric region narrow, about 1/4 carapace width measured at gastric region level; pterygostomian flap visible in dorsal view. Merus of male chelipeds c. 3 times as long as carapace *macrobrachia*
-

Additional records for tropical-subtropical species

Some additional records for eastern tropical species reported by HENDRICKX (2000), most unpublished and some included in the general range of these species, are provided below. These records complete the previously known distribution or represent new depth or distribution records along the Pacific coast of America for six species of *Munida*.

Munida hispida BENEDICT, 1902

About 40.5 miles off Punta Banda (166°), Baja California, Mexico, St. 10990-66, 09 Feb 1966, 13 M (CL 13.3-17.1 mm), 10 F (CL 13.8-18.0 mm) and 5 damaged specimens (NS, NM), 190-215 m (105-120 fathoms) (Id. J. HAIG) (LACM, ex-AHF, no registration number). Baja California, 31°22.5 N, 118°38.0 W, Mexico, R.V. "Calafia", 17 Feb 1979, 1 M (CL 36.75 mm), 1080 m (600 fathoms) (Id. M.K.

WICKSTEN) (LACM, ex AHF, no registration number). About 0.8 miles SSE of Guñ Island, California, USA, 17 Jun 1969, N/B Scofield, prawn set 42, 2 M (CL 40.8 mm, TL 104 mm; CL 42.5 mm, TL 110 mm; length of largest chelae of largest male, 270 mm), 1 FF (CL 33.8, TL 89.0 mm; length of largest chelae, 107.4 mm) and 3 partly damaged specimens (chelae missing) (2 M, CL 33.6 and 44.0 mm; 1 F, CL 32.3 mm), 250 m (140 fathoms) (Id. M.K. WICKSTEN) (LACM, ex AHF Ac. Number 1969-9). About 10.7 miles off Newport Pier (008°), St. 227-89, "Velero IV", 18 Sep 1975, 1 M (CL 39.5 mm), 335-500 m (185-274 fathoms), 6 feet beam trawl (Id. M.K. WICKSTEN) (LACM ex AHF-895-1). North of San Clemente Island, California, USA, St. 1019-39, 24 Nov 1939, 1 F (CL 23.5 mm), 2 FF (CL 26.5 and 29.9 mm) and 4 damaged specimens (NS, NM), 450-540 m (250-300 fathoms), (Id. J. HAIG) (LACM ex AHF; no registration number). Remarks.- The male collected by the R.V. "Calafia" is the deepest known record for this species (c. 1080 m), previously

reported from 165-518 m (see HENDRICKX 2000). Examination of largest specimens from Gull Island confirms that, even in largest sizes, females of *M. hispida* feature no gap between fingers of chelae while largest males feature a very wide gap.

Munida obesa FAXON, 1893

Banco de Mancora (03°35' S, 81°10' N), Peru, 9 May 1969, 1 M (CL 23.8 mm), 117 m (Col. E.M. DEL SOLAR) (Id. J. HAIG) (LACM ex AHF 1966-16). About 8.4 miles off Isla Herradura (232°), St. 18942-73, Costa Rica, 17 May 1973, 1 F (CL 25.2 mm) (Id. J. HAIG) (LACM ex AHF 147-04).

Munida gracilipes FAXON, 1893

About 8.4 miles off Isla Herradura (232°), St. 18942-73, Costa Rica, 17 May 1973, 8 M (CL 17.7-21.15 mm), 3 F (CL 16.2-20.3 mm) and 2 FF (CL 17.9 mm), 219 m (Id. J. HAIG) (LACM ex AHF 147-05). Off Yasila (05°08' S), Peru, 10 May 1969, 4 M (CL 15.0-18.2 mm), 225 m (Col. E.M. DEL SOLAR) (Id. J. HAIG) (LACM ex AHF 1969-16). Off Peru, 05° 03' S, 81°21' W), 29 Aug 1970, 2 FF (CL 15.15 and 15.6 mm), 180 m (Col. & Id. E.M DEL SOLAR) (LACM ex AHF 1970-15).

Munida refulgens FAXON, 1893

About 2 miles off Isla Manuelita (055°), Costa Rica, 02 Jun 1973, "Velero IV", St. 1941-73, 1 M (CL 32.8 mm; TL 87.5 mm; length of both chelae, 201 mm), 109 m (Id. J. HAIG) (LACM ex AHF 203-01). About 2.1 miles off Isla Manuelita (033°), Costa Rica, 02 Jun 1973, "Velero IV", St. 19042-73, 3 FF (CL 26.7, 28.7 and 30.0 mm; length of largest chelae for these specimens, 134, 151 and 163 mm), beam trawl, 128 m (Id. J. HAIG) (LACM ex AHF 153-06). About 2.5 miles SW of Isla Cleopha, Islas Marias, Mexico, St. 2602-54, 08 Feb 1954, many damaged specimens, the largest c. 24 mm CL, 37-74 m (20-41 fathoms) (Id. J. HAIG) (LACM ex AHF; no registration number).

Remarks.- The three large ovigerous females from Isla Manuelita feature wide, non gapping, flattened fingers, as in FAXON's illustration (1893: Pl. XVII). Largest chelae is 5.0 to 5.4 times carapace length; this ratio increases with specimen length.

Munida mexicana BENEDICT, 1902

Melpomene Cove, Guadalupe Island, Mexico, St. 1919-49, 19 Dec 1949, 1 M (CL 6.8 mm) and 1 F (CL 6.3 mm), 62-65 m (34-36 fathoms) (Id. J. HAIG) (LACM ex AHF; no catalog number). Melpomene Cove, Guadalupe Island, Mexico, St. H46-153, 08 Dec 1946, one small specimen (NS, NM) (Col. C.L. HUBBS; Id. J. HAIG) (LACM ex AHF; no catalog number). Off Medidor Island, Panama, 28 Mar 1939, 2 M (CL 7.5 and 7.9 mm) and 36 additional specimens (NS, NM), depth unknown (Id. J. HAIG) (LACM ex AHF; no catalog number). Between Gorgona and Gorgonilla Islands (02°56'

N, 78°13.7' W), Colombia, 28 Apr 1968, Te Vega Expedition, St. XVIII-11, 1 F (CL 4.5 mm), 4 FF (CL 4.05-5.10 mm) and 4 damaged specimens (NS, NM), 108-198 m (60-110 fathoms) (Col. J. YARNALL; Id. J. HAIG) (LACM ex AHF 1968-8). A large series of additional material identified by J. HAIG was also reviewed (see Table 1).

Remarks.- HENDRICKX (2000: 178), citing as source of information "J. Haig, in lit.", reported *M. mexicana* from the west coast of Baja California without further details. Review of ex AHF material identified by the late J. HAIG and that obviously served as the base for her communication, allows to record Guadalupe Island as the northernmost distribution limit for this species to date. The southernmost continental distribution limit is extended to 02° 56' N, 78°13.7' W, between Gorgona and Gorgonilla Islands, Colombia. The Galapagos record for this species (see HENDRICKX, 2000) is an oceanic record.

Table 1. Additional records of *Munida mexicana* in the east Pacific. All material identified by J. HAIG, mostly unsexed and unmeasured, and kept at the LACMNH, ex AHF, unregistered (except specimens from San Nicolas Island; access number 1193-06).

Locality	Date	Depth	Specimens
Gulf of California, Mexico			
Puerto Refugio, Angel de la Guarda Island	27 Jan 1940	11 m	1
South of Tortuga Island	18 Mar 1937	81 m	2
Tepoca Bay (St. 696-37)	04 Feb 1940	20-24 m	2
San Ignacio Bay (St. 742-37)	31 Mar 1937	55-90 m	2
San Nicolas Island, San Carlos	02 Jul 1978	20 m	3
Perico Point, Carmen Island	21 Mar 1949	13-20 m	2
West Coast of Baja California			
Off entrance Magdalena Bay	03 May 1950	51-61 m	1 FF, CL 5.5 mm
Dewey Channel, Punta San Eugenio	27 Feb 1941	—	1
North of Dewey Channel (St. 1261-41)	27 Feb 1941	—	1

Munida propinqua FAXON, 1893

The ex AHF collection contains two lots of material which are part of the records published by DEL SOLAR (1972). Off Peru, 18°18' S, 71°11' W, IMARPE cruise 7201, January 1970, 1 M (CL 28.7 mm), trawl 15, 650 m (Col. E.M. DEL SOLAR; Id. J. HAIG) (LACM ex AHF 1972-9). Mancora Bank (03°51.3' S, 81°18.2' W), Peru, 11 Jan 1971, 1 M (CL 26.4 mm), depth unknown (Col. E.M. DEL SOLAR; Id. J. HAIG) (LACM ex AHF 1971-5).

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