

## The genus *Munida* Leach (Crustacea, Decapoda, Galatheididae) in the eastern tropical Pacific, with description of two new species.

by Michel E. HENDRICKX

### Abstract

In the eastern tropical Pacific, the genus *Munida* is made of 10 previously known and 2 undescribed species, *M. bapensis* sp. nov. and *M. williamsi* sp. nov., distributed from California to Peru and the Galapagos Islands. Nine of the known species were described by Walter Faxon in 1893 (*Munida gracilipes*, *M. obesa*, *M. propinqua*, and *M. refulgens*) and by James Benedict in 1902 (*M. debilis*, *M. hispida*, *M. mexicana*, *M. perlata*, and *M. tenella*). A western-Atlantic species, *M. microphthalma* A. Milne-Edwards, is also reported from Coco Island, Costa Rica. *Munida debilis*, *M. tenella*, and the two undescribed species are known only from the Gulf of California. The *Munida*s from the eastern tropical Pacific have a depth range from 16.5 to 3292 m. Shallow water species (not deeper than 200 m) include *M. debilis*, *M. tenella*, *M. mexicana*, *M. refulgens* and *Munida williamsi*. The present contribution increases from 39 to 74 the number of localities known for the genus in the region.

**Keywords:** *Munida*, eastern Tropical Pacific, redescription, new species.

### Resumen

En el Pacífico este Tropical, el género *Munida* se compone de 10 especies previamente conocidas y dos nuevas especies, *M. bapensis* sp. nov. y *M. williamsi* sp. nov., distribuidas desde California a Perú y las islas Galápagos. Nueve de las especies conocidas fueron descritas por Walter Faxon en 1893 (*Munida gracilipes*, *M. obesa*, *M. propinqua* y *M. refulgens*) y por James Benedict en 1902 (*M. debilis*, *M. hispida*, *M. mexicana*, *M. perlata* y *M. tenella*). Una especie del Atlántico oeste, *M. microphthalma* A. Milne-Edwards, ha sido registrada para la isla del Coco, Costa Rica. *Munida debilis*, *M. tenella* y las dos especies no descritas son conocidas solo del golfo de California. Las *Munida*s del Pacífico este tropical se encuentran en intervalo de profundidad de 16.5 a 3292 m. Las especies de aguas más someras (no más de 200 m) incluyen a *M. debilis*, *M. tenella*, *M. mexicana*, *M. refulgens* y *M. williamsi*. La presente contribución incrementa de 39 a 74 el número de localidades conocidas para el género en la región.

**Palabras clave:** *Munida*, Pacífico este tropical, redescipción, nuevas especies.

### Introduction

Several genera of Galatheididae close to *Munida* Leach have recently been reviewed and a surprisingly high number of new species have been described in the last 10 years. The

great majority of these works are related with species of *Munida* collected on the outer continental shelf or in deeper water of the West Pacific (Molucca archipelago, New Caledonia, Philippines, Indonesia, French Polynesia) (MACPHERSON & DE SAINT LAURENT, 1991; MACPHERSON, 1993a, 1994, 1995a, 1997) and the Indian Ocean (MACPHERSON, 1991). Other works are related to species of the genera *Paramunida* Baba, *Agononida* Baba & de Saint Laurent (MACPHERSON, 1993b, 1995b) and *Bathymunida* (BABA & DE SAINT LAURENT, 1996). Considering only the above mentioned works, a total of 100 new species were described, with an unusual record of 56 new species that were obtained during trawling operations mainly off New Caledonia, at depth of 6 to 2049 m (MACPHERSON, 1994). Obviously, this is a clear indication that the genus *Munida* and related genera are much more diverse than previously thought.

The first species of *Munida* ever described is *Munida bamffica* (PENNANT, 1777), reported from European waters under the name *Astacus bamfficus*. Although the genus *Munida* has since been recognized as relatively common in intermediate depths of the world oceans, the first records of species of *Munida* in the eastern tropical Pacific are by FAXON (1893) who reported 5 species, including 4 new to science, of a total of 24 new species of Galatheididae dredged by the «Albatross» between the Galapagos islands and the Gulf of California, Mexico. The fifth species of *Munida* reported by Faxon (*op. cit.*) concerned a doubtful identification of a specimen collected off Coco Island, Costa Rica, with *Munida microphthalma* A. MILNE-EDWARDS, 1880, a species known from the west Atlantic. Posteriorly, BENEDICT (1902) reviewed the species of the Galatheididae of the United States National Museum and described 45 species of Galatheididae, including 7 species of *Munida* from the east Pacific (one from Chile, one from the Californian Province, and 5 from the eastern tropical Pacific). Since Benedict's paper, no other species of *Munida* has been added to the eastern tropical Pacific crustaceans fauna. Moreover, as for other genera of Galatheididae except *Pleuroncodes* Stimpson, records in literature posterior to 1902 are surprisingly scarce. In his catalogue of the decapod and stomatopod crustaceans of the SCRIPPS benthic invertebrate collections, LUKE (1977) reports 6 species of *Munida*. His records for *M. tenella* Benedict, *M. hispida*, *M. quadrispina*, and *M. refulgens* correspond to previously known range of these species. Record

Table 1. Species of *Munida* known from the east Pacific. Species marked with an \* have not been recorded in the ETP.

SPECIES	TYPE LOCALITY	DEPTH RANGE (m)	NORTHERNMOST RECORD	SOUTHERNMOST RECORD	NUMBER OF LOCALITIES	
					CITED	NEW
* <i>M. curvipes</i> Benedict, 1902.	Off Port Otway, Patagonia	1890	Chonos Archipelago	Port Otway	2	0
<i>M. debilis</i> Benedict, 1902	Cabo San Lucas, BCS Alb. St. 2829	30-57	Gorda Bank, BCS	Tres Marias Islands	1	2
<i>M. gracilipes</i> Faxon, 1893	Gulf of Panama	180-280	Gulf of Panama	Paita, Peru	6	0
* <i>M. gregaria</i> (Fabricius, 1793)	South Atlantic 37°30' S	108	Ancud, Chile	Strait of Magellan	13	0
<i>M. hispida</i> Benedict, 1902	Galapagos Islands	165-518	Monterey Bay, CA	Banco de Mancora, Peru	11	0
<i>M. mexicana</i> Benedict, 1902	Galapagos Islands	16.5-145	West coast of Mexico	Galapagos Islands	8	9
<i>M. ? microphthalmalma</i> A. Milne-Edwards, 1880	Cocos Islands	242	Cocos Islands	Cocos Islands	2	0
* <i>M. montemaris</i> Bahamonde & López, 1962	Valparaiso, Chile	?	Chile	Chile	1	0
<i>M. obesa</i> Faxon, 1893	Gulf of Panama Albatross St. 3355, 3389	327-518	Gulf of Panama	Banco de Mancora, Peru	4	0
<i>M. perlata</i> Benedict, 1902	Galapagos Islands	1142-3292	Gulf of California 23°58' N-108°59' W	Galapagos Islands	2	0
<i>M. propinqua</i> Faxon, 1893	Panama and near Galapagos Islands	490-1713	Gulf of Panama	Peru, 18°19' S-71°12' W	7	0
* <i>M. quadrispina</i> Benedict, 1902.	Off Cape Beale, Vancouver Island, BC	22-1463	Sitka, Alaska	Los Coronados Islands, BC	3	0
<i>M. refulgens</i> Faxon, 1893	Off Cocos Island, off Ecuador and near Tres Marias Islands	76-202	Gorda Bank, BCS	Off Ecuador	5	2
* <i>M. subrugosa</i> (White, 1847)	Rendez-Vous Cove, Auckland Island	0-1080	Ancud, Chile	Strait of Magellan	8	0
<i>M. tenella</i> Benedict, 1902	Off San Jose Island, Gulf of California	27-130	Cabo Tepoca, SON	San Jose Island	1	13
<i>M. williamsi</i> sp. nov.	Off Consag Rocks	29-103	Consag Rocks	Willard Point	-	7
<i>M. bapensis</i> sp. nov.	27°52.5' N - 112°31.5' W	620	Gulf of California 27°52' N-112°31' W	-	-	1

NOTE: Northernmost records are in the East Pacific only.

*M. gregaria* also in SW Atlantic and probably New Zealand.

*M. subrugosa* also in SW Atlantic, New Zealand and S Australia.

for *M. debilis* Benedict, off Estero Tastiota (about 28°13.8 'N - 111°46.7' W), however, represents a range extension to the northern Gulf of California and should therefore be confirmed. The other record presented by LUKE (1977) correspond to one capture of *M. perlata* in the southern Gulf of California, confirmed by WICKSTEN (1989).

Comparatively with other genera of Galatheidae, the genus *Munida* ranks only second in diversity for the eastern tropical Pacific; indeed, there are 27 species of *Munidopsis* reported so far between Mexico and northern Peru (HENDRICKX & HARVEY, 1999).

The purpose of this paper is to review the species of *Munida* from the eastern tropical Pacific as far as taxonomy, geographic distribution, depth, and references in literature are concerned. All species known to this region are redescribed and illustrated according to recent criteria. Two new species are also described on the basis of material collected in the Gulf of California.

## Material and Methods

The eastern tropical Pacific (ETP) is defined herein as the area extending from Magdalena Bay, on the west coast of Baja California Sur, to the area of Paita, Peru, including the entire Gulf of California and all oceanic islands that lie within the latitudinally-defined tropical fringe (see HENDRICKX, 1992; HENDRICKX & HARVEY, 1999).

Material deposited in the crustaceans collections of the United States National Museum, Smithsonian Institution, including type material of four species described for the ETP by W. Faxon and J. E. Benedict, was made available for this study and allow for the redescription of these species. The other material examined and referred to herein was collected by the R/V "El Puma", of the Universidad Nacional (UNAM). These specimens were captured during prospective surveys of benthic fauna off the coast of Sinaloa (SIPCO Project) and in the entire Gulf of California (CORTES Project). Specimens were obtained in sliding dredge or in semi-commercial (35' long) shrimp net. Other specimens were accidentally obtained during a geologic survey (BAP project). Abbreviations used herein are: St, sampling station; T.L., total length; C.L., carapace length with rostrum; C.L.wr, carapace length without rostrum; EMU-, Estación Mazatlán UNAM; USNM-, United States National Museum, Smithsonian Institution, Washington, D.C.; LACM, Los Angeles County Museum, California.

All specimens contained in the Mazatlan collections (referred to EMU in text) were identified by the author.

The description and terminology used in this paper follow the studies recently produced by MACPHERSON (1994, 1997). Terms used in the descriptive account are presented in diagrammatic sketches of a *Munida* (Figs. 1-2).

Species are presented in alphabetic order and include synonymy, list of material examined, description, type locality, known localities to date, depth range, general distribution and comments on species taxonomy, distribution or ecology. In the case of new species, the etymology of the new name is also indicated.

## Results

Up to date, a total of 15 species of *Munida* have been reported from the east Pacific, 10 of which are distributed only in the ETP and 7 are endemic for this region. As stated previously, the presence of *M. microphthalmma*, originally described from the West Indies, is considered doubtful. Two additional species, described herein, have to be added to this list (see *infra.*); both are endemic to the Gulf of California although future sampling might disclose their presence in adjacent zoogeographic provinces.

Records for *Munida* in the ETP are surprisingly scarce. Previous to this work, 39 records were available for the 10 known species. Even more astonishing is the fact that no new records had been reported in the literature for three species since these were described by BENEDICT (1902: *M. debilis*, *M. mexicana* and *M. tenella*).

## Systematic account

### 1. *Munida bapensis* sp. nov. (Fig. 3)

#### TYPE MATERIAL

Holotype, male (22.0 mm C.L. wr; 24.3 mm C.L.), BAP 82 ("Baja Paleo"), St. BC 17 (27°52.5'N - 112°31.5'W), 23-24/V/82, 620 m, box core (col. F. Paez-Osuna) (EMU-5370). Paratype, female (10.2 mm C.L.wr; 14.9 mm C.L.), same station (EMU-5371-A). Paratype, male (8.4 mm C.L.wr; 12.8 mm C.L.), same station (EMU-5371-B).

#### DESCRIPTION

Carapace (without rostrum) slightly longer than wide, somewhat inflated behind epibranchial region; lateral parts depressed. Hepatic region depressed, cardiac region strongly raised. Dorsal surface with distinct, well-marked, raised transverse ridges; metagastric region with strongly raised transversal ridges. Transverse ridges mostly interrupted. A pair of strong epigastric spines located behind supraocular spines and a pair of small spinules between this pair; three medium-size mesogastric spines, almost in line, the middle one slightly behind the other two, and a pair of lateral spinules slightly behind these three spines. No hepatic spine, no branchial spine, but 1-2 branchial spinules occasionally present. A pair of strong, widely set curved spines behind the cervical suture, followed by a pair of similar, smaller spines (one spine sometimes reduced or wanting). Frontal margin transverse. Rostrum long, without lateral spines or spinules, dorsally finely serrate on distal third. Supraocular spines sharp, straight, obliquely set, less than 1/3 rostrum length measured from base of sinus between rostrum and supraocular spines, their tip almost reaching anterior margin of eye; anterolateral spines strong, slightly curved, situated at anterolateral angle, reaching or slightly overreaching sinus between rostrum and supraorbital spines. Branchial margin armed with 4-5 spines, the middle spines the strongest; about 5-6 spines on lateral margin of entire carapace (not including the anterolateral spine); a longitudinal row of three additional spines on the posterior branchial region, set somewhat

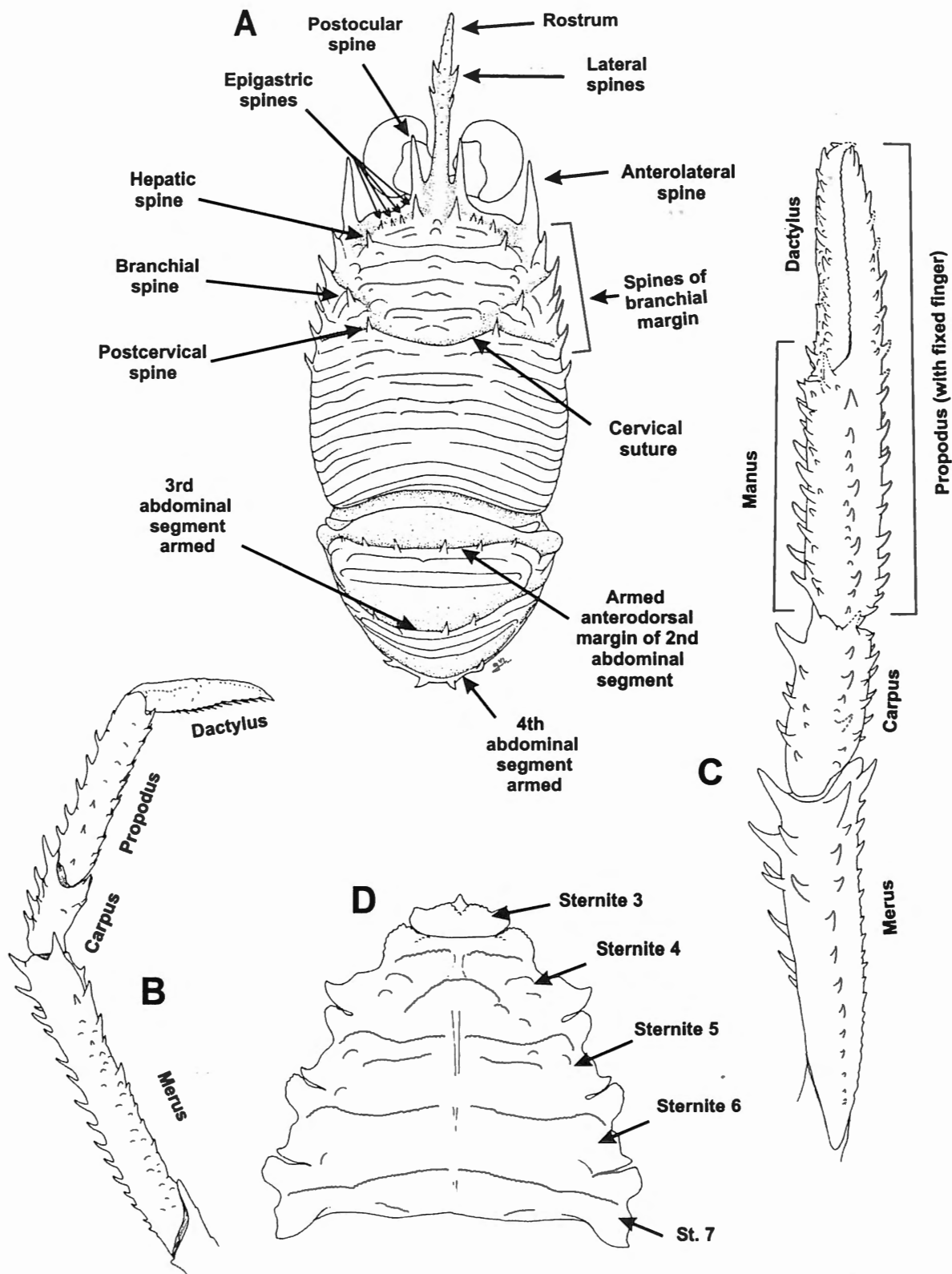


Fig. 1. – Diagrammatic sketch of *Munida*. A) Carapace, dorsal view; B) second pereiopod, lateral view; C) cheliped, dorsal view; D) ventral view of sternal plates 3-7).

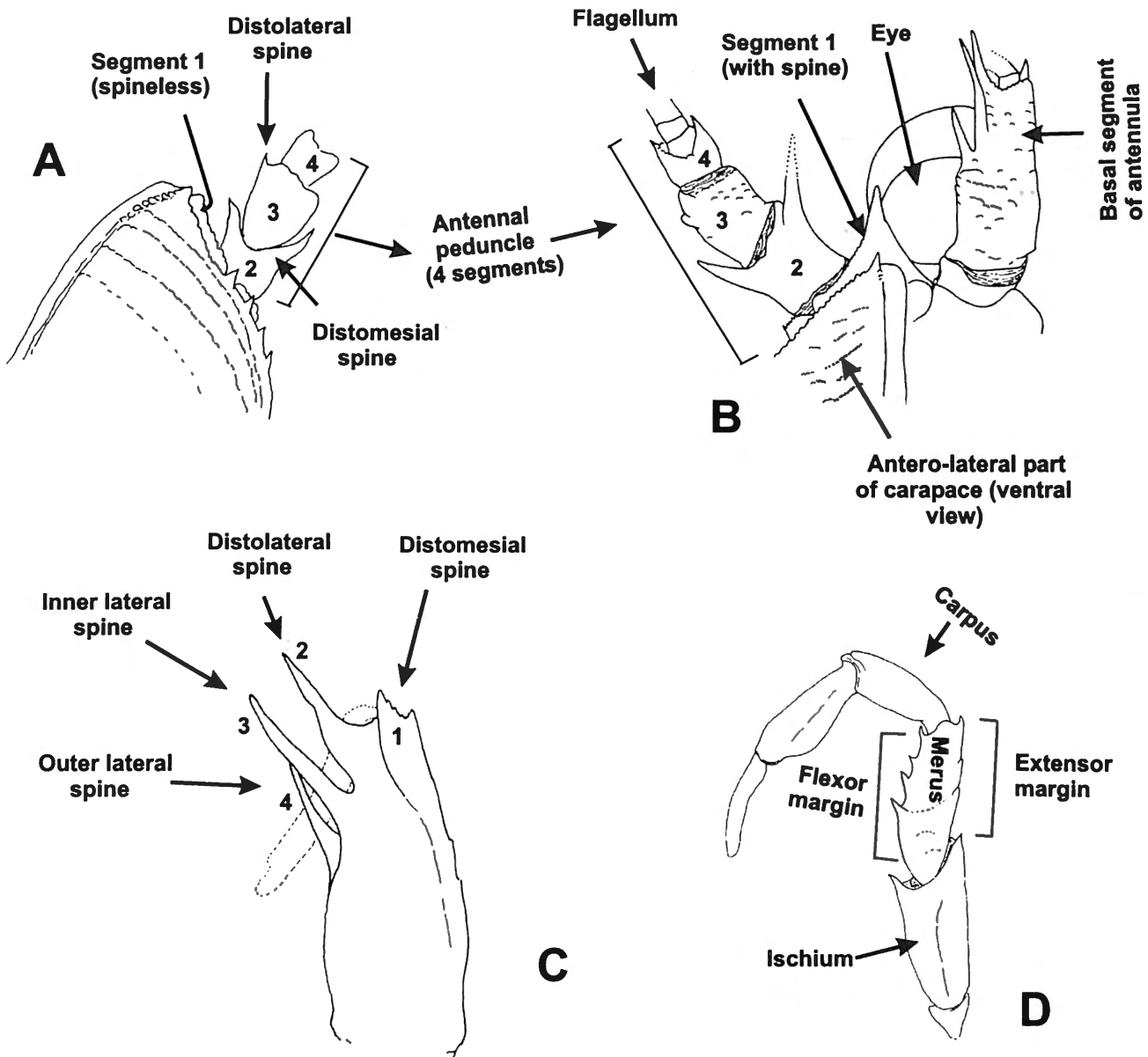


Fig. 2. – Diagrammatic sketch of *Munida*. A) Antennal region, lateral view; B) cephalic region ventral view; C) Basal segment of right antennula, ventral view; D) left third maxilliped endopod, lateral view.

away from the lateral margin in dorsal view. Posterior transverse ridge armed with about 10 spines, more or less arranged in pairs (some lateral spines occasionally wanting), the middle pair the strongest. Third sternite separated from fourth by a deep depression. Fourth thoracic sternite smooth, except for a few clusters of flattened tubercles; sternites 5-6 smooth; sternite 7 with strong granules on lateral parts; transverse ridges between sternites raised, minutely granulate. Second abdominal segment with one row of three pairs of spines on anterior border, followed by a deep transverse groove. Third abdominal segment with two pairs of similar spines on anterior border, and a transverse groove. Fourth without spines; transverse groove present. Eyes large, their diameter slightly longer than 1/2 rostrum length; cornea light brown in preserved specimens. Distal spines of antennular

basal segment very unequal, the mesiodistal short, somewhat laminar, the laterodistal longer and wide; inner lateral spine long, strong, pointing upward, outer lateral spine slender, about 1/2 length of inner spine. First (basal) segment of antennal peduncle with one strong spine on mesial margin, almost reaching distal margin of third peduncular segment; second segment with subequal distomesial and distolateral spines; third segment unarmed. Ischium of third maxilliped a little longer than 1.5 times length of merus measured along the extensor margin, one distoventral spine; flexor margin of merus armed with one strong spine at about mid-length, a distal smaller spine and 1-2 intermediate spinules; extensor margin unarmed. Chelipeds moderately long, slender, unequal, the right longer than left (holotype); longest cheliped 1.4-1.75 times carapace length (including rostrum); merus

armed with four rows of spines, three visible in dorsal view; of these, the central row the strongest, with 4 sharp, curved spines, including the distal one, the upper-outer row with 10-12 sharp, curved spines, alternately long and short, the distal the longest, the upper-inner row made of only 2 strong, sharp, curved spines; ventral row with 4 sharp, curved spines, the distal the longest; carpus somewhat rounded with flat dorsal side, the latter bordered on each side by a row of about 8 small, sharp, curved spines; 4 small spines on both inner and outer faces of carpus and one ventral, distal spine; outer face of propodus (manus) with three rows of 10-12 small spines; dorsal margin of dactylus with a proximal spine and a few lateral spines or spinules; plex without spines; tip of fingers bifids; carpus subcylindrical, much longer than 1/2 dactylus; dactylus shorter than propodus, not gaping; fingers with numerous small projecting teeth; merus shorter than chela (manus and propodus). Second pereopod with a row of 11 sharp, curved dorsal spines on merus; 3 small spines on dorsal edge of carpus, in addition to a long, sharp distal spine; dorsal side of propodus spineless; ventral side of merus with about 15 blunt spines or spine-tipped tubercles forming two irregular rows; one distoventral sharp spine on carpus and a row of movable spinules on propodus; propodus about 2/3 the merus length; dactylus slightly longer than 1/2 half the propodus length.

#### TYPE LOCALITY

Gulf of California, Mexico (27°52.5'N – 112°31.5'W).

#### KNOWN LOCALITIES

Known only from the type locality.

#### DEPTH RANGE

Known only from 620 m.

#### COMMENTS

*Munida bapensis* is readily distinguished from all other *Munida* known from the east Pacific by the advanced position of sternite of third thoracic segment (produced forward), the strong spine at the antero-distal inner angle of the antenna basal segment, the depressed dorsal sides of the carapace and the row of curved spines on the posterior transverse ridge of the carapace. The species is also more inflated than most *Munida* occurring in the area. The shape and size of the antennular basal segment distal spines is also distinctive and can only be confused with *M. hispida*, a species with a similarly projecting third sternite but featuring a very spiny carapace and a different chela.

#### ETYMOLOGY

The specific name is from the name of the cruise during which this species was collected.

## 2. *Munida debilis* BENEDICT, 1902 (Fig. 4)

*Munida debilis* BENEDICT, 1902: 256, fig. 7. - HENDRICKX & HARVEY, 1999: 375 (listed).

#### MATERIAL EXAMINED

CORTES 2, St. 57 (23°8' N – 109°26' W), 21/III/85, 26 specimens (C.L. 7.0 - 9.0 mm), 57 m, oyster dredge, R/V "El Puma" (EMU-2811); St. 62C (21°38' N – 106°32' W), 22/III/85, 160 specimens (C.L. 6.0 - 9.0 mm), 30-40 m, trawl, R/V "El Puma" (EMU-2812).

#### DESCRIPTION

Carapace with well-marked transverse striae, with non-iridescent setae; one row of 4 pairs of epigastric spines behind supraocular spines (1-2 spines occasional wanting in some specimens). No hepatic spine. One pair of small postcervical spines, sometimes wanting on one side. One parahepatic spine and two pairs of branchial spines, obliquely set, the anterior the largest. Frontal margin little oblique. Rostrum very long, almost straight, with lateral spinulations in distal half. Supraocular spines sharp, parallel to rostrum, short, 1/6 to 1/7 the length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip not reaching the middle of the eye; anterolateral spines sharp, about twice as long as supraocular spines, at most reaching the rostrum sinus. Branchial margins armed with 5 sharp spines; 6 spines on lateral margin of entire carapace (excluding anterolateral spine); second lateral spine separated from the anterolateral spine by a distance equal to the base of this spine. Sternite 4 with a pair of anterior, slightly convex striae followed by a central similar striae, all three with their margin granulate, anterolateral margin spiny; sternites 6-7 without carinae or granules on lateral surface; sternites 5 to 7 with transverse ridges not raised, smooth. Second, third and fourth abdominal segments without spines. Eyes medium-size, brown, their diameter larger than 1/2 length of rostrum. Distal spines of antennular basal segment unequal, the mesiodistal spine about twice as long as the distolateral; two lateral spines, the inner one sharp, reaching or slightly overreaching the distolateral spine; outer lateral spine very short. Basal segment of antennal peduncle spineless, its inner side forming a produced crenulate extension; outer distal spine of second segment longer than distomesial spine, reaching about middle of third segment; third segment with a small distomesial spine. Merus of third maxiliped with one long and one short middle spine, and a small distal spine on flexor margin; extensor margin unarmed. Chelipeds equal or slightly unequal, slightly setose, about three times as long as carapace (including rostrum); merus armed with outer and inner row of small spines, with one row of sharp, longer spines on the upper side, lower margin at most spinulate with one distal spine; carpus with some flattened tubercles tipped with a small spinule, upper side with 2-3 small spines and 2 long, sharp distolateral spines; manus section ovale, one row of short, sharp spines on upper margin, and scattered spiny flattened tubercles occasionally present; fingers at most spinulate on margins, except for a sharp, proximal curved dorsal spine and occasionally 1-2 proximolateral spinules on dactylus; cutting edge of fingers denticulate. Fingers very slender, straight, bifid. Carpus short, less than 1/2 but more than 1/3 length of dactylus; dactylus almost same length as propodus; fingers very thin, not gaping, inner cutting edge of fingers finally denticulated, tip bifid. Pereiopods slender. Second pereopod with a row of 6-7 sharp, regularly spaced dorsal

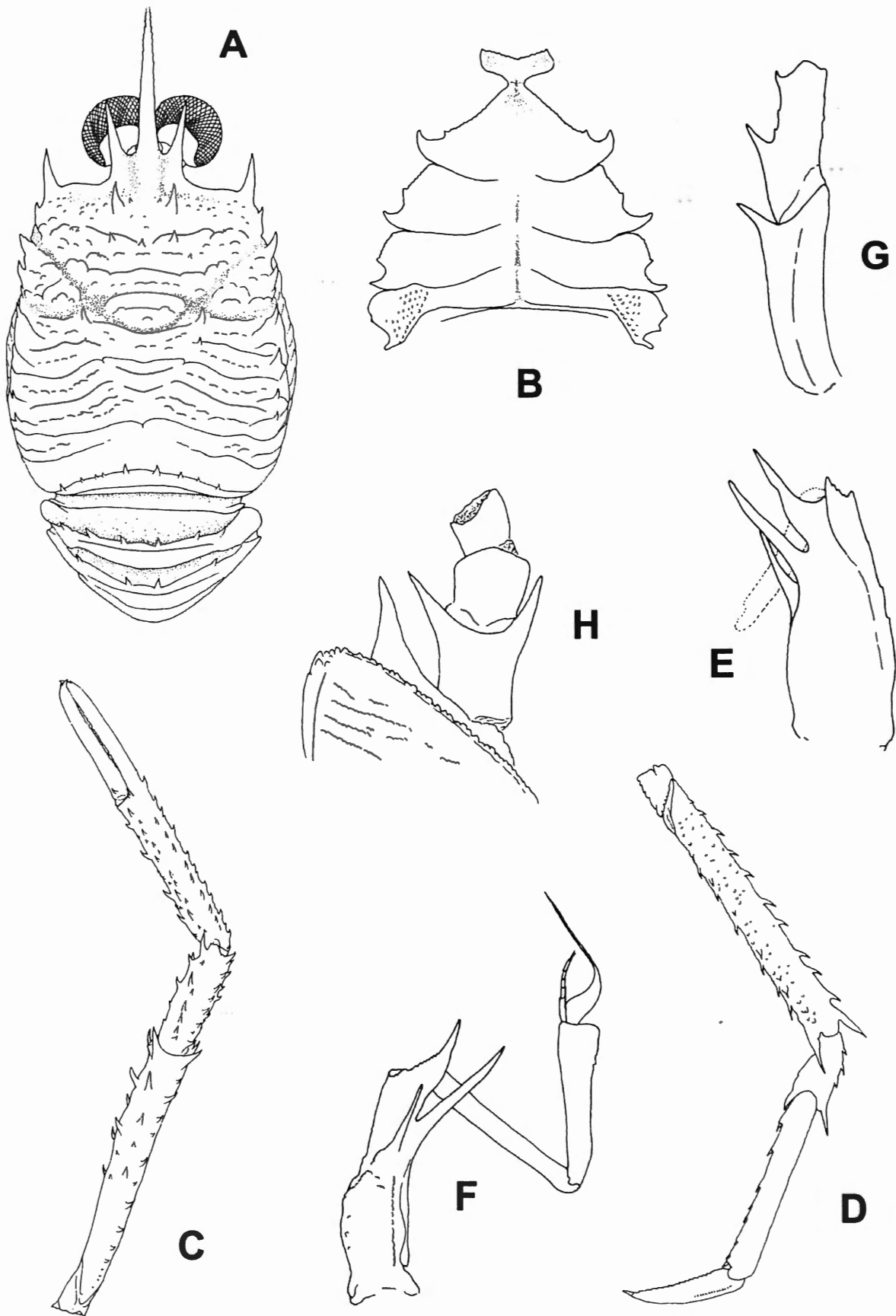


Fig. 3. – *Munida bapensis* sp. nov. Male, holotype (EMU-5370). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) antennular peduncle, ventral view; F) same, lateral view; G) ischium and merus of left third maxilliped, lateral view; H) ventral view of left antennal peduncle.

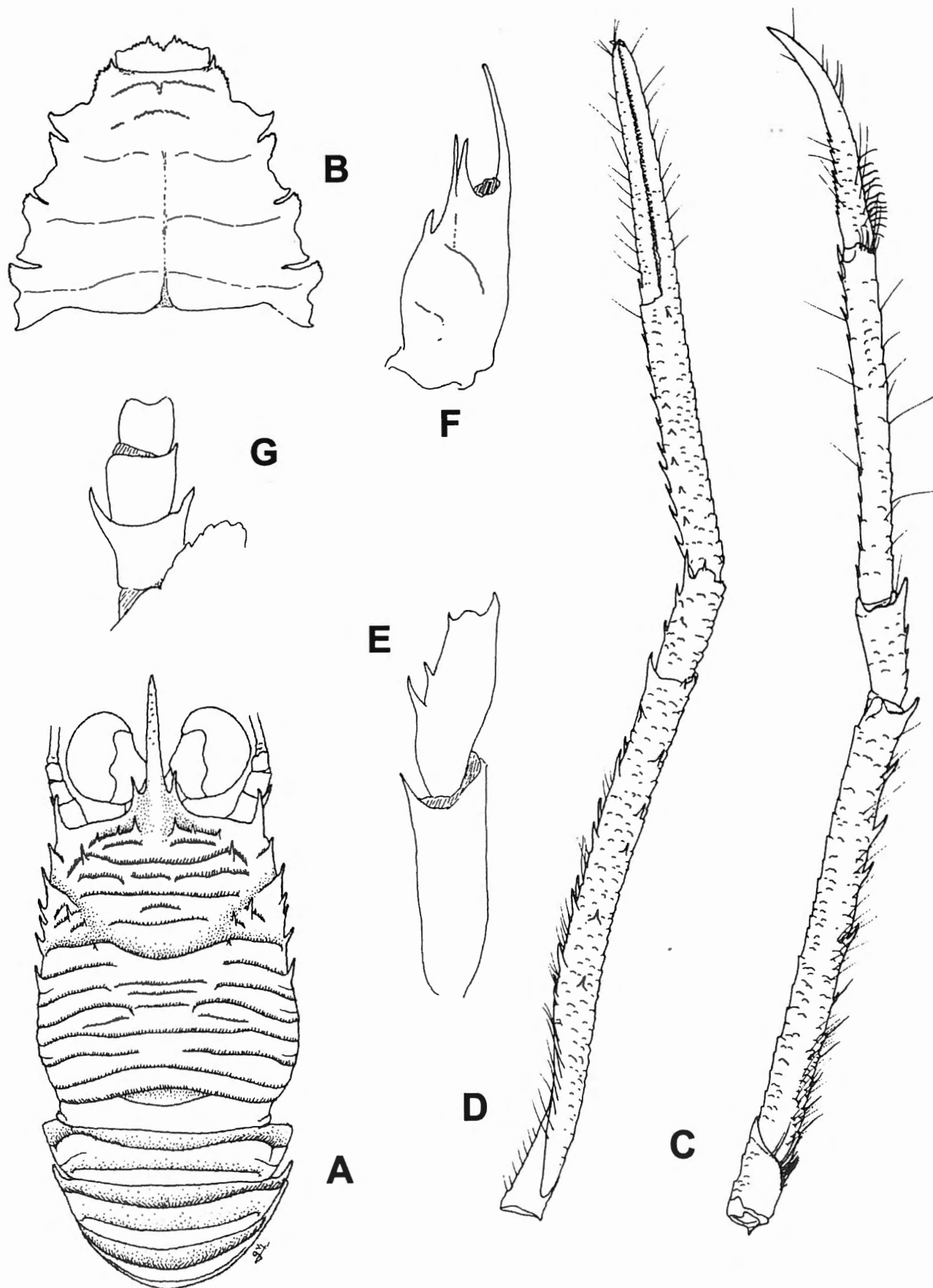


Fig. 4. – *Munida debilis* Benedict, 1902. Male (EMU-2812). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) ischium and merus of right third maxilliped, lateral view; F) antennular peduncle, ventral view; G) antennal peduncle, ventral view.



spines on merus, proximal spines smaller than distal; 4-6 small spines on dorsal edge of carpus, including the distal one; dorsal side of propodus spineless; ventral side of merus spineless, except for a long, sharp distoventral spine; one distoventral sharp spine on carpus and a ventral row of movable spinules on propodus ending in a stronger movable spine; propodus about 3/4 the merus length; dactylus longer than 1/4 the propodus length.

#### TYPE LOCALITY

Cabo San Lucas, Southern Baja California, Mexico.

#### PREVIOUSLY KNOWN LOCALITIES

Known only from the type locality, Cabo San Lucas (22°52' N – 109°55' W), Southern Baja California, Mexico.

#### DISTRIBUTION

Southern Gulf of California.

#### DEPTH RANGE

The type material was obtained at 56 m. Material examined was captured between 30 and 57 m.

#### COMMENTS

The material examined was obtained in the vicinity of Gorda Bank, a locality very close to Cabo San Lucas. *Munida debilis* should therefore and so far be considered an endemic from the Baja California southern tip, sensu Garth (1960).

There is an additional, unconfirmed record by Luke (1977) from off the coast of Sonora ("Estero Tastiota", 28°13.8'N – 111°46.7'W); otter trawl on sandy bottom at 64-75 m (SIO-C 770). This material, which consists in 5 specimens of ca. 1 cm C.L., was determined by S. Luke (L. Lovell, pers. Comm.) and if correctly identified would represent a range extension for this species all the way up to the northern Gulf of California.

In the material examined, the chelipeds are either equal or

Table 2. Environmental data obtained during sampling of species of *Munida*. Temperature and dissolved oxygen measured at bottom level (NA = data not available; T = trawl; O = oyster dredge; Sa = sand; Si = silt; Cl = clay; CS = coarse sand; MS = medium sand; FS = fine sand; VFS = very fine sand).

Cruise	Station	Date	Depth (m) /method	Temp. (° C)	O <sub>2</sub> (ml/l)	Substrate			Sand
						Sa	Si	Cl	
SIPCO 1	C2	24/04/81	66/T	15.4	0.77	10	48	42	–
CORTES 1	8	04/05/82	55/O	16.0	2.5	Gravel			–
CORTES 1	19	06/05/82	30-35/O	14.2	3.5	100	00	00	MS
CORTES 1	21	06/05/82	102-110/T	–	3.0	100	00	00	MS
CORTES 1	33	08/05/82	75-80/T	16.0	3.1	02	46	53	–
CORTES 1	38	09/05/82	60/T	17.0	3.5	75	18	07	VFS
CORTES 1	43	10/05/82	73/T	16.2	4.23	NA			–
CORTES 1	47	11/05/82	49/T	17.3	3.1	83	10	07	VFS
CORTES 1	55	13/05/82	38/O	23.0	5.4	Gravel			–
CORTES 1	56	13/05/82	100/O	14.8	1.5	100	00	00	MS
CORTES 2	8	11/03/85	64-70/O	17.5	3.5	99	–	–	FS
CORTES 2	20	13/03/85	52/T	13.6	3.25	97	–	–	FS
CORTES 2	21	13/03/85	91/T	13.4	2.90	NA			–
CORTES 2	25	14/03/85	112/T	12.4	1.90	96	–	–	FS
CORTES 2	33	15/03/85	79/T	13.5	1.9	NA			–
CORTES 2	37	16/03/85	32/T	15	5.0	85	–	–	–
CORTES 2	39	16/03/85	95-103/T	13.0	1.7	82	12	06	–
CORTES 2	44	17/03/85	91-102/T	14.2	2.4	74	25	01	–
CORTES 2	46	18/03/85	99/O	12.6	0.90	95	–	–	FS
CORTES 2	50	20/03/85	97/T	13.2	1.9	62	34	04	–
CORTES 2	57	21/03/85	57/O	18.5	4.8	95	–	–	CS
CORTES 2	62C	22/03/85	30-40/T	18.0	3.0	89	–	–	FS
CORTES 3	3	09/08/85	27/T	29	4.5	87	–	–	FS
CORTES 3	8	30/07/85	42/O	19.8	3.4	97	–	–	FS
CORTES 3	21	1/08/85	115/T	16.3	2.22	97	–	–	FS
CORTES 3	33	03/08/85	79/T	22.7	3.1	64	25	12	–
CORTES 3	37	04/08/85	29/T	28.0	4.0	91	–	–	VFS

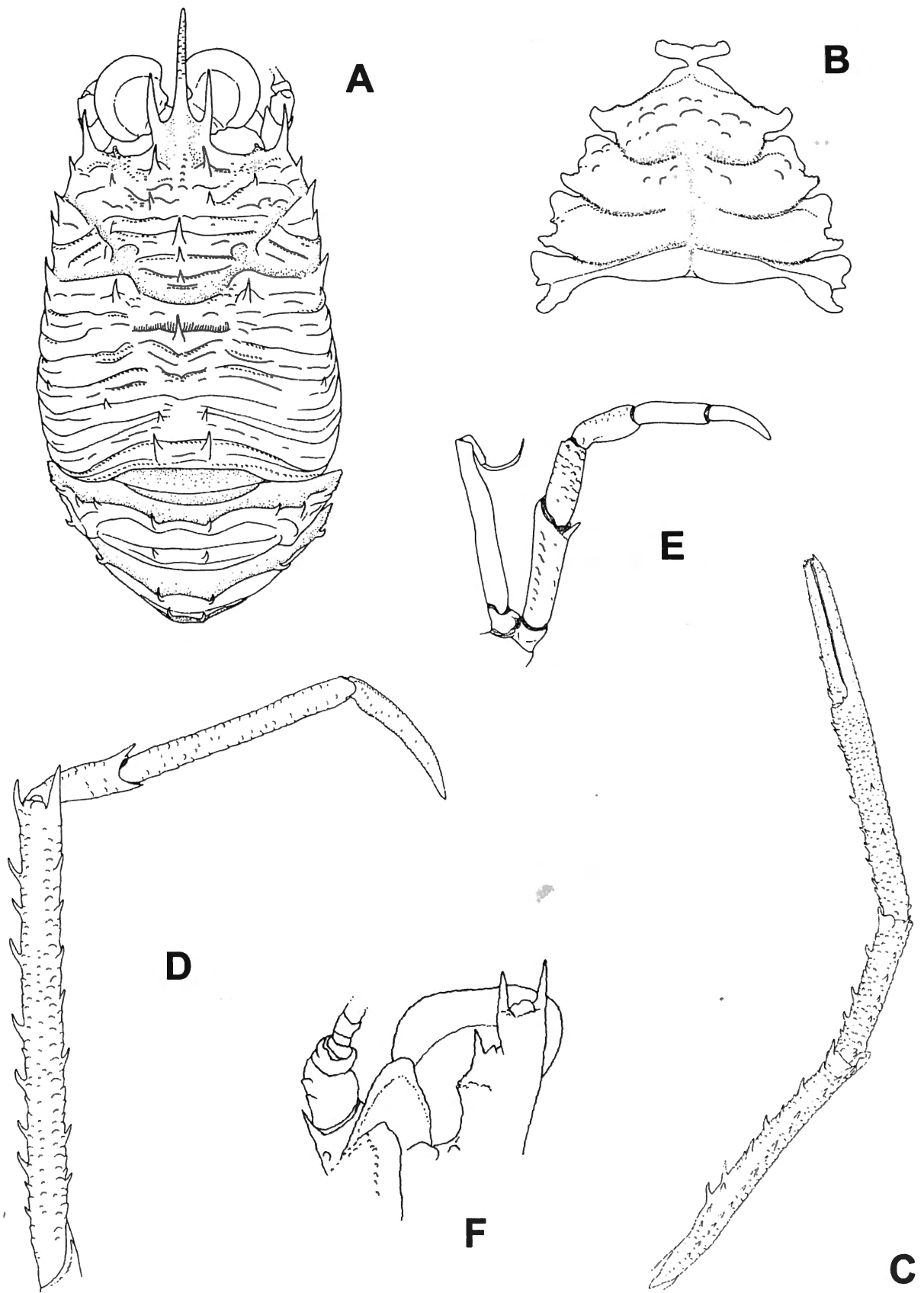


Fig. 5. – *Munida gracilipes* Faxon, 1893. Male (USNM-234306). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) right third maxilliped, lateral view; F) ventral view of cephalic region, showing antennular and antennal peduncles.

slightly unequal; many of the specimens collected have lost one or both chelipeds, making difficult to assess how representative are specimens with a slight heterochely. The type illustrated by BENEDICT (1902; Fig. 7) presents chelipeds of the same size. As already noted by BENEDICT (*loc. cit.*), the proximal spine of the dactylus might be wanting and the dorsal margin of spines on manus can be reduced to a mere line of spinules. In fact, spines on *M. debilis* is a variable feature and a same catch can bring specimens with a rather distinct degree of spinulation.

The extraordinary scarcity of records for this species should be emphasized as it has apparently never been cited in literature since its original description. As indicated by its specific name, *M. debilis* is extremely fragile and complete specimens (body with attached pereopods) are rarely found in samples. Specimens examined were collected on sandy substrate (89% fine sand and 95% coarse sand); epibenthic water temperature and dissolved oxygen of 18-18.5°C and 3.0-4.8 mlO<sub>2</sub>/l, respectively (Table 2).

### 3. *Munida gracilipes* FAXON, 1893 (Fig. 5)

*Munida gracilipes* FAXON, 1893: 179; 1895: 77, pl. XVI, figs 2, 2b. - BENEDICT, 1902: 308. - DEL SOLAR, 1970: 46. - DEL SOLAR *et al.*, 1970: 21. - Wicksten, 1989: 315 (listed). - LEMAITRE & ALVAREZ-LEON, 1992: 47. - HENDRICKX & HARVEY, 1999: 375 (listed).

#### MATERIAL EXAMINED

R/V "Velero IV", Herradura Island (09°32' N - 84°45'54" W), Costa Rica, 17/V/1973, 1 male (C.L. 26.9 mm) and 1 female (C.L. 24.9 mm), 183-219 m (Id. Janet Haig) (USNM-234306).

#### DESCRIPTION

Carapace with well-marked transverse striae; four epigastric spines arranged in a square, two behind each lateral rostral spine, the anterior pair the largest; behind this square is a line of three gastric spines, longitudinally arranged, the anterior the largest. A small hepatic spine. A widely set pair of large spines, just back of the cervical suture, followed by a similar cardiac spine. A pair of large spines on intestinal region, close to posterior margin of carapace, preceded by a (obsolete) pair of smaller spine, the four spines forming a square. Frontal margin almost straight, slightly concave. Rostrum without lateral spinulation. Supraocular spines sharp, slightly curving inward, almost 1/2 the length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip not reaching anterior margin of cornea; anterolateral spines long, sharp, similar to supraocular spines and clearly overreaching this sinus. Branchial margins armed with 3-4 spines; about 7 spines on lateral margin of entire carapace. Surface of sternites 4 and 5 squamose; lateral surface of sternite 7 smooth; sternites 5 to 7 with transverse ridges slightly granulated. Second abdominal segment with three pair of strong, sharp spines, two lateral and one central, the latter stronger; lateral pairs accompanied by 1-2 smaller spines or spinules. Third abdominal segment with three pair of strong, sharp spines, two lateral and one

central. Fourth abdominal segment with a pair of central spines and one lateral spine. Abdominal segments 2-4 with a pair of strong, sharp spines close to posterior margin, forming a square with the central anterior pair of each segment; a third, stronger spine on posterior margin of 4th abdominal segment. All spines sharp and curved forward. Eyes very large, their diameter much wider than 1/2 length of rostrum. Distal spines of antennular basal segment subequal, mesio-distal very slightly longer; only one very short lateral spine visible on the specimen (inner lateral spine broken?). A sharp outer distal spine on second segment of antennal peduncle. Merus of third maxilliped without spines on flexor margin; extensor margin unarmed. Chelipeds and walking legs squamous. Chelipeds long and very slender, much longer than twice the length of carapace (including rostrum), with row of sharp spines, stronger on lateral and dorsal margins; dactylus a little longer than 1/2 length of propodus; carpus cylindrical, about same length as dactylus. Pereiopods long and slender. Merus of second pereopod with strong, sharp lateral inner and outer spines; manus unarmed; propodus about 1/2 the merus length; dactylus slightly more than 1/2 the propodus length.

#### TYPE LOCALITY

Gulf of Panama.

#### PREVIOUSLY KNOWN LOCALITIES

Gulf of Panama (*Albatross* station 3391) (FAXON, 1893); Tumbes, Banco de Mancora, Zorritos y Paita, Peru (DEL SOLAR, 1970; DEL SOLAR *et al.*, 1970). Gulf of Panama and off Colombia (LEMAITRE & ALVAREZ LEON 1992; record from Colombia in an unpublished thesis).

#### DISTRIBUTION

Herradura Island, Costa Rica to off Colombia.

#### DEPTH RANGE

280 m (FAXON, 1895); 180-250 m (DEL SOLAR *et al.*, 1970).

#### COMMENTS

According to Faxon (1895, pl. XVI, Fig. 2b) the flexor margin of the merus of the third maxilliped bears a spine; this spine was not observed on the material examined.

### 4. *Munida hispida* BENEDICT, 1902 (Fig. 6)

*Munida hispida* BENEDICT, 1902: 259, fig. 10. - SCHMITT, 1921: 166, pl. 31, fig. 3. - DEL SOLAR, 1970: 46. - DEL SOLAR *et al.*, 1970: 21. - WICKSTEN, 1989: 315 (listed). - HENDRICKX, 1995: 557 (illustrated).

#### MATERIAL EXAMINED

Type material, Galapagos Islands, off Chatham Island, "Albatross" St. 2817, 1 specimen (T.L. 83.0 mm), 487 m (Id. J.E. Benedict) (USNM-20535).

#### DESCRIPTION

Carapace covered with many small spines, most bordering transverse striae; two long, sharp epigastric spines behind the base of the supraorbital spines and two much smaller spines

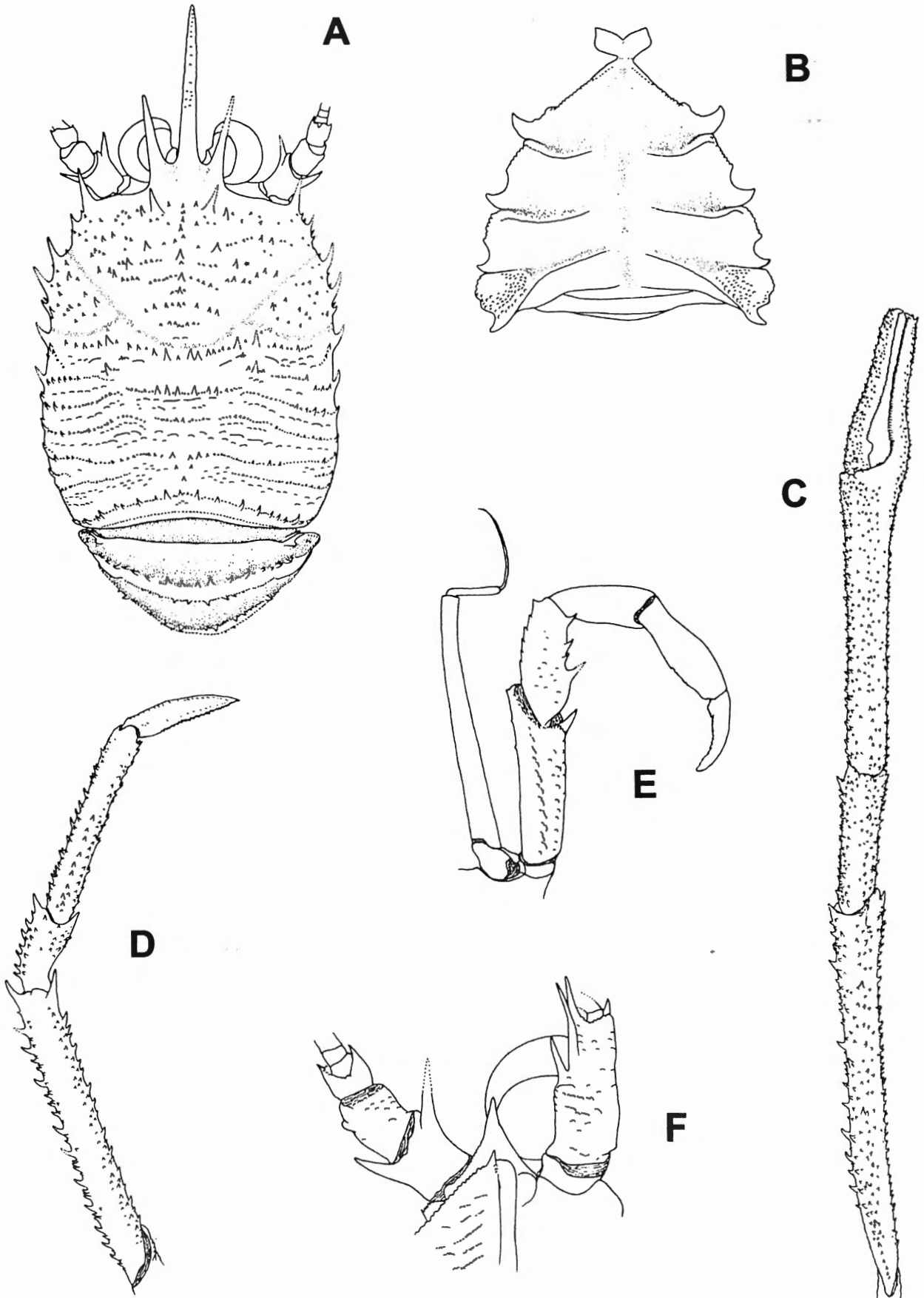


Fig. 6. – *Munida hispida* Benedict, 1902. Type (USNM-20535). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) right third maxilliped, lateral view; F) ventral view of cephalic region, showing antennular and antennal peduncles.

in front of these; a longitudinal line of small spines runs from the base of the rostrum to a distance from the cervical suture, where it meets a transverse line of about 8-10 small spines; two obliquely set slightly larger spines on each side of the longitudinal line. Hepatic region and branchial regions spinulated. A transversal, slightly sinuous row of spine crossing the carapace beyond the cervical suture, followed by a much shorter transversal line of similar spines; posterior border of carapace with an armature of 10-18 sharp spines. Frontal margin almost transverse. Rostrum very long, dorsally spinulous, almost straight. Supraocular spines sharp, diverging, curved in lateral view, less than 1/2 length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip far overreaching the cornea; anterolateral spines stout, straight, medium-size, shorter than supraocular spines and not overreaching the rostrum sinus. Branchial margins armed with 3-4 strong spines and several spinules; about 6-8 spines on lateral margin of entire carapace (excluding anterolateral spine), the posterior spines much smaller. Surface of sternite 4-6 almost smooth; lateral part of sternite 7 with many small granules; sternites 5 to 7 with transverse ridges smooth, raised. Second, third and fourth abdominal segments dorsally spined. Second abdominal segment with two rows of spine, the anterior row made of a cluster of four central spines and 7-8 lateral spines on each side, the posterior row with two central spines and 4 lateral spines on each side, all spines smaller than in anterior row. Third abdominal segment similar to second, but with lesser spines (4-5 lateral; 3 central) on anterior row and with posterior row armed with spinules. Fourth abdominal segment with a pair of spines (somewhat blunt) on anterior row only. Posterior row of spines wanting in smaller specimens. Eyes medium-size, their diameter, much less than 1/2 length of rostrum. Distal spines of antennular basal segment unequal, the mesiodistal much shorter; two lateral spines, the inner one long, sharp, upturned, the outer one short, similar to the distolateral spine. Distomesial spine of first segment of antennal peduncle short, blunt, not reaching distal margin of second segment; distomesial spine on second segment sharp, longer than outer spine and reaching distal margin of third segment. Merus of third maxiliped with 3-4 spines on flexor margin, including the distal spine; extensor margin armed with small spiny tubercles. Chelipeds very long and slender, covered with row of small spines and scattered spinules, more than three times as long as carapace (including rostrum); spines of dorsal row of merus and carpus stronger than the rest; ventral margin of fixed finger and dorsal margin of dactylus with spinules. Carpus cylindrical, slightly shorter than dactylus; dactylus about 1/2 propodus length; fingers sinuous, gaping, with a strong projecting teeth near the base of dactylus. Pereiopods relatively slender. Second pereopod with a row of strong spines alternating with shorter spines along the superior edge of merus, distal spines stronger; about 7 spines on dorsal edge of carpus, in addition to a stronger distal spine; dorsal side of propodus similar to merus, with spines and spinules; ventral side of merus with fewer, smaller spines, the terminal one long and sharp; one distoventral sharp spine on carpus and a row of spinules on propodus; propodus about 3/4 the merus length; dactylus about 1/2 propodus length.

## TYPE LOCALITY

Chatham Island, Galapagos Islands.

## PREVIOUSLY KNOWN LOCALITIES

Galapagos Islands (*Albatross* 2817) and off Baja California (*Albatross* 2987), Mexico (BENEDICT, 1902). Off Santa Catalina (*Albatross* 4410), off La Jolla (SCRIPPS haul 1157), NW off Cedros Island, BC, Mexico (*Albatross* 2987); Galapagos Islands (SCHMITT, 1921). Tumbes, near Banco de Mancora (3°48' S - 81°22' W), Peru (DEL SOLAR, 1970; DEL SOLAR *et al.*, 1970). Monterey Bay (ca. 36°50' N), California, off Santa Cruz and Anacapa Islands (WICKSTEN, 1989).

## DEPTH RANGE

518 m (DEL SOLAR *et al.*, 1970). 165-500 m (WICKSTEN, 1989).

## COMMENTS

When he described *M. hispida*, Benedict (1902) choose as type material the largest specimen available from a small lot of two. According to Benedict, the other specimen, much smaller, ... "lack many of the spinules, and the spines are larger; the fourth segment of the abdomen may show only two small protuberances in place of the row of spines. The chelipeds are much shorter, and they are armed with definite rows of spines; the palm is prismatic, and the prehensile edges of the fingers are in contact [no hiatus] throughout". Benedict (*op. cit.*) considered these as normal intraspecific variations in younger specimen.

5. *Munida mexicana* BENEDICT, 1902  
(Figs. 7, 8)

*Munida mexicana* BENEDICT, 1902: 264, fig. 13. - HENDRICKX, 1993a: 7 (listed); 1993b: 309 (table); 1996: 616 (listed).

## MATERIAL EXAMINED

SIPCO I, St. C2, off Punta Piaxtla, 24/IV/81, 3 specimens (C.L. 8.0 - 10.3 mm), 66 m, trawl (EMU-2802).

CORTES 1, St. 19, off San Miguel Cape, 06/V/82, 26 unsexed specimens (C.L. 5.0 - 10.0 mm) and 25 ovigerous females (C.L. 6.0 - 10.0 mm), 30-35 m, oyster dredge, (EMU-2805 & 2810); St. 21, off San Miguel Cape, 6/V/82, 6 unsexed specimens (C.L. 7.0 - 11.0 mm), 102-110 m, trawl; St. 43, Tepoca Bay, 10/V/82, 1 unsexed specimen (C.L. 7.0 mm), 73 m, trawl; St. 47, off Estero Tastiota, 11/V/82, 4 unsexed specimens (C.L. 5.0 - 7.0 mm) and 5 ovigerous females (C.L. 5.0 - 8.0 mm), 49 m, trawl; St. 55, off Gorda Bank (23°8' N - 109°27' W), 13/V/82, 7 unsexed specimens (C.L. 5.0 - 10.0 mm) and 5 ovigerous females (C.L. 7.0 - 8.0 mm), 38 m, oyster dredge (EMU-2806).

CORTES 2, St. 8, San Marcial Point, 11/III/85, 95 unsexed specimens (C.L. 4.0 - 11.0 mm) and 18 ovigerous females (L.C. 6.0 - 11.0 mm), 64-70 m, oyster dredge (EMU-2803 & 2815); St. 20, off San Miguel Cape, 13/III/85, 2 unsexed specimens (C.L. 6.0 mm), 52 m, trawl.

CORTES 3, St. 8, off San Marcial Point, 30/VII/85, 14 unsexed specimens (C.L. 6.0 - 9.0 mm) and 10 ovigerous females (L.C. 7.0 - 9.0 mm), 42 m, oyster dredge (EMU-2807).

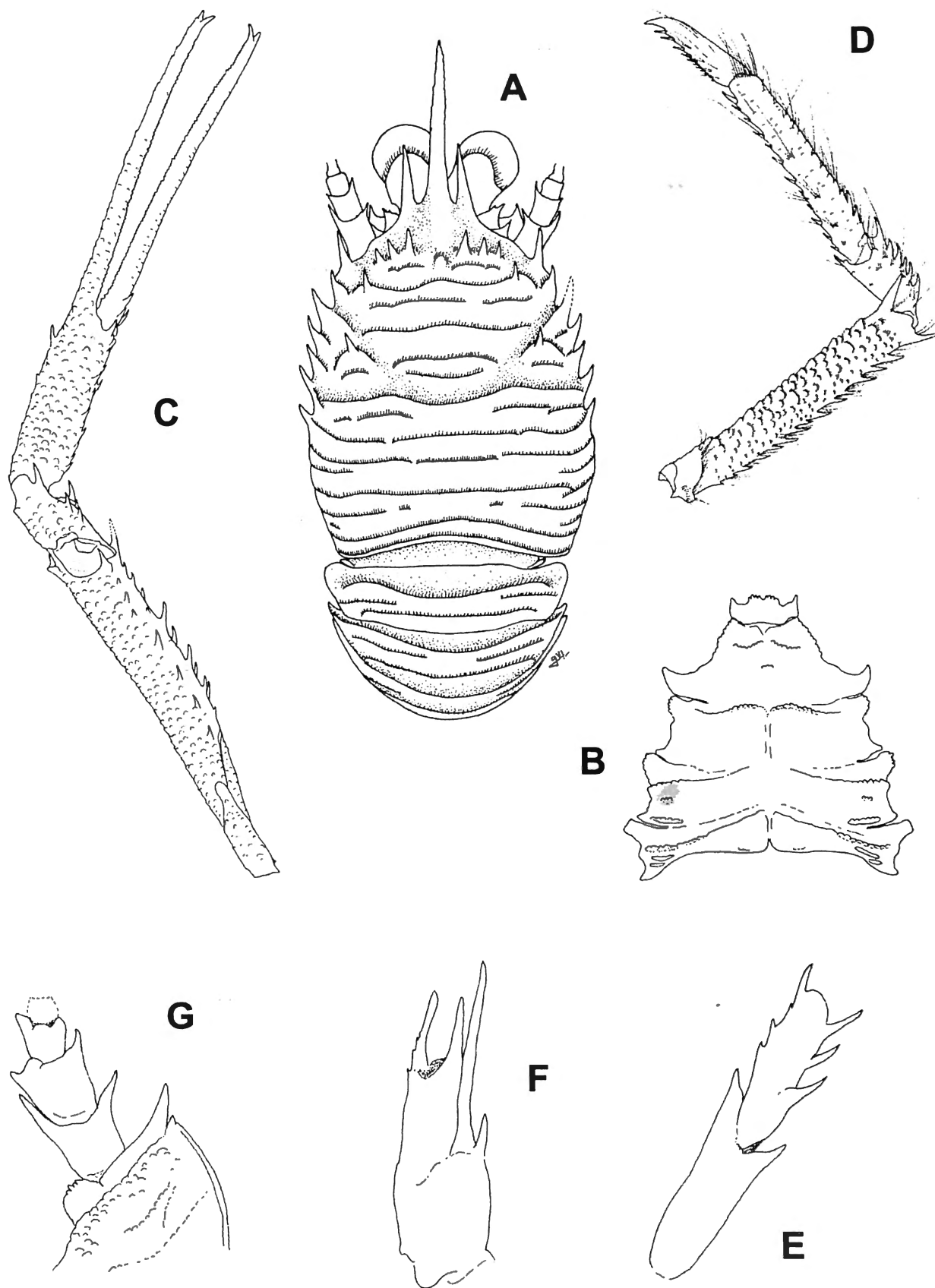


Fig.7. – *Munida mexicana* Benedict, 1902. A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) ischium and merus of right third maxilliped, lateral view; F) left antennular peduncle, ventral view; G) antennal peduncle, ventral view.

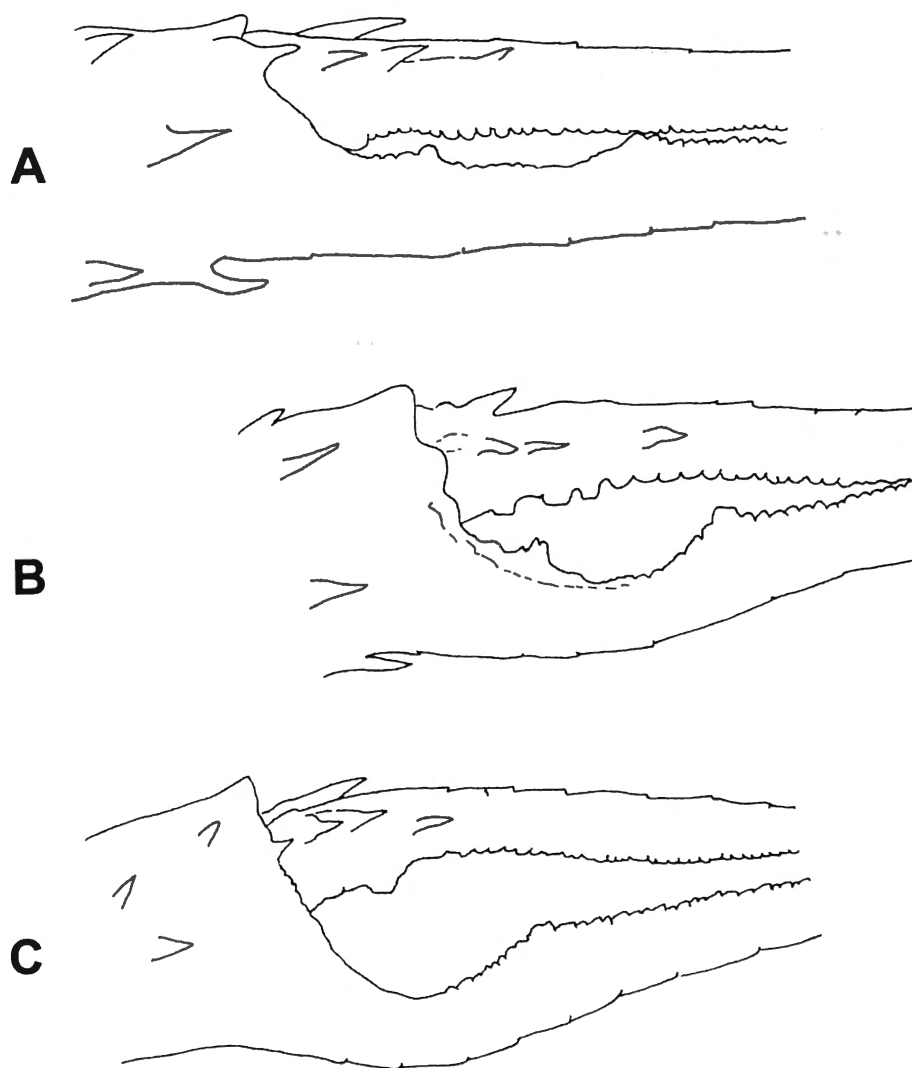


Fig. 8. – *Munida mexicana* Benedict, 1902. A-C) Development of the hiatus of cheliped.

#### DESCRIPTION

Carapace with well-marked transverse striae; 4 pairs of epigastric spines, anterior three pairs in line, behind supraocular spines, the 4th pair a short distance behind this line, widely set. No hepatic spine. One anterior branchial spine, occasionally blunt. No postcervical spines. Frontal margin strongly oblique. Rostrum very long, almost straight, tip slightly upturned, with dorsal and lateral spinulations. Supraocular spines sharp, parallel to rostrum, short,  $1/3$  to  $1/4$  length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip reaching about the middle of the eye; anterolateral spines sharp, much shorter than supraocular spines and not overreaching the rostrum sinus. Branchial margins armed with 5 strong spines; 6 spines on lateral margin of entire carapace (excluding anterolateral spine). Sternite 4 with a pair of semi-circular granulated striae and a small cluster of granules; sternites 6-7 with short marked carinae on lateral surface; sternites 5 to 7 with trans-

verse ridges raised, laterally granulated. Second, third and fourth abdominal segments without spines. Eyes medium-size, dark brown, their diameter about  $1/2$  length of rostrum. Distal spines of antennular basal segment subequal; two lateral spines, the inner one sharp, overreaching distal spines and much longer than the outer one which is also shorter than distal spines. A short, strong distal spine on first segment of antennal peduncle; distolateral spine of second peduncular segment longer and stronger than distomesial spine, none reaching margin of third segment. Merus of third maxilliped with 3 long, sharp spines on flexor margin; extensor margin armed with 2 small, blunt spines, a sharp distal spine, and a diminute subterminal spinule. Chelipeds equal or unequal, in this case the right often the longest and the strongest; chelipeds long, about three times as long as carapace (including rostrum), stout except for fingers, setose, covered with flattened tubercles some of which end in a sharp spine or spinule; merus armed with outer and inner row of medium-

size spines, with 3 irregular rows of sharp spines on the upper side, these rows converging to a strong distal spine, and with a lower row of flattened spiny tubercles ending in a strong, flat distal tooth; carpus with many flattened tubercles, some tipped with a sharp spine, especially on the outer side, and with an anterodistal flat tooth; manus inflated, also covered with flattened tubercles, some tipped with a spine, more numerous on upper side; base of dactylus with a row of 3-5 sharp, slender spines on each side and a strong dorsal curved spine. Fingers very slender, curving inside in their distal 1/2, tip bifid or trifid. Carpus short, less than 1/4 length of dactylus; dactylus long, about one and a half times propodus length; fingers very thin, not gaping in females and smaller males, inner cutting edge of fingers finally denticulated. Fingers of largest males usually strongly gaping (hiatus) in their proximal 1/3; dactylus with a strong, cylindrical projecting tooth near its base. Pereiopods relatively slender. Second pereopod with a row of 12-15 sharp, regularly spaced dorsal spines on merus; 4-6 spines on dorsal edge of carpus, including the distal one; dorsal side of propodus with 2-4 small proximal spines; ventral side of merus spineless, except for a long, sharp distoventral spine; one distoventral sharp spine on carpus and a row of movable spinules on propodus; propodus about 3/4 the merus length; dactylus about 1/2 propodus length.

#### TYPE LOCALITY

Galapagos Islands (*Albatross* station 2816).

#### PREVIOUSLY KNOWN LOCALITIES

West coast of Mexico and Bay of Panama (*Albatross* stations 2794, 2809, 2826, 2829, 2833, 2988, and 3012); Galapagos Islands (BENEDICT, 1902). West coast of Baja California and Gulf of California; Galapagos Islands (J. HAIG, in litt.).

#### DISTRIBUTION

From Magdalena Bay, West Coast of Baja California, off San Miguel Cape, Southern Baja California and Cabo Tepoca, Sonora, Mexico to Bay of Panama; Galapagos Islands (HENDRICKX & HARVEY 1999; J. HAIG, in litt.).

#### DEPTH RANGE

Known from 16.5 to 145 m (BENEDICT, 1902). Specimens reported herein were obtained between 30 and 102-110 m.

#### COMMENTS

*Munida mexicana* is by far the most common species found on the continental shelf in the Gulf of California. According to BENEDICT (1902: 264), the relative length of the fingers of the chelipeds varies and in some specimens there is a hiatus near their base. Our Gulf of California material also features these variations. The size and shape of the hiatus is indeed quite variable among specimens as are the number, shape and size of the projecting fingers teeth on the inner cutting edge of the hiatus (Fig. 8).

As with other species, entire specimens (i.e., with chelipeds and walking legs attached) are scarcely found in samples and it is difficult to establish a relationship between, on the one hand the size and shape (i.e., hiatus present or absent) of the chelipeds fingers and, on the other hand the size and sex of specimens.

According to BENEDICT (1902) the merus of the first walking leg "shows upwards to twenty-five spines when viewed from above"; it is difficult to assess what Benedict meant by "viewed from above". Close examination of illustration by Benedict (1902: fig. 13) shows that the merus of second pereopod has about 25 spines on upper and lower margins combined.

Environmental data obtained at sampling stations of material examined indicate that *M. mexicana* is associated with the intermediate shelf (30 to 73 m depth), in temperatures comprises between 13.6 and 23.0°C and in a relatively wide range of dissolved oxygen (0.77 to 5.4 ml/l). Substrates include mostly sandy and occasionally muddy bottoms (Table 2).

#### 6. *Munida ? microphthalma* A. MILNE-EDWARDS, 1880. (Fig. 9)

*Munida microphthalma* A. MILNE-EDWARDS, 1880: 51. - MILNE-EDWARDS & BOUVIER, 1897: 32, pl. II, figs 9-13. - FAXON, 1893: 179; 1895: 78. - WICKSTEN, 1989: 315 (listed).

#### MATERIAL EXAMINED

None.

#### TYPE LOCALITY

West Indies.

#### KNOWN LOCALITIES

East Atlantic (West Indies) (BENEDICT, 1902). In the east Pacific, it has been reported with some doubts from one locality only: off Cocos Islands, Costa Rica. This record was made on the basis of a single ovigerous female by FAXON (1893: 179).

#### DEPTH RANGE

242 m in the east Pacific (FAXON, 1893).

#### COMMENTS

It is presently impossible to determine whether the material reported by Faxon (1893) belongs to *M. microphthalma* or not. The original description of this species in 1880 had no illustrations. MILNE-EDWARDS & BOUVIER (1897) illustration of this species, based on material from the West Atlantic, published a few years later, is represented here (Fig. 9) but it does not include morphologic features (e.g., sternum, antenna and antennular peduncles) in use in modern taxonomy. Unfortunately, in his otherwise well-illustrated study of the *Albatross* material published posteriorly, FAXON (1895: 78) did not present an illustration of his material which was not available for this study. According to FAXON (*op. cit.*), the Coco's specimen differs from the specimen of *M. microphthalma* illustrated by HENDERSON (1888: pl. III, fig. 4; material from the Atlantic, "Challenger" Report) in "...the chela [of the Coco's specimen] has no spine on the outer margin of the dactylus, and the row of spines on the outer face of the hand is obsolete." These variations, however, are not considered significant.

The figure from MILNE EDWARDS & BOUVIER (1897) reproduced here shows a species with a row of six gastric spines, no



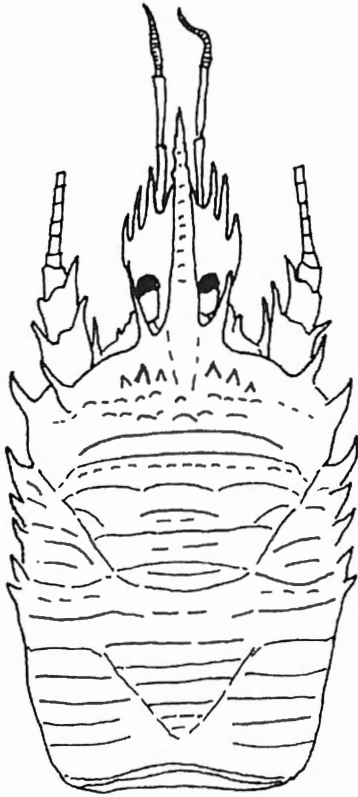


Fig. 9. – *Munida microphthalmalms* A. Milne-Edwards, 1880.  
Carapace, dorsal view (redrawn from Milne Edwards and Bouvier, 1897).

hepatic, branchial or postcervical spines, very small eyes (less than 1/8 the length of the rostrum), very sharp, diverging supraocular spines, strongly diverging anterolateral spines that do not reach the sinus between the rostrum and the supraocular spines, a strongly protruding antennular basal segment with a short mesiodistal spine, a longer laterodistal spine and two lateral spines, the outer one being the shortest; the first segment of the antenna peduncle bears a sharp, long mesial spine reaching the anterior margin of the second segment, the latter with both a mesial and lateral distal spines, while the third peduncular segment bears a sharp, mesiodistal spine. The illustration of MILNE EDWARDS & BOUVIER (*op. cit.*) does not show the abdomen; in the text (page 34), it is stated that the second abdominal segment is armed with a row of four spines

According to BENEDICT (1902), *M. microphthalmalms* has the second segment of the abdomen armed; chelipeds are less than four times the length of the carapace and the flexor margin of the merus of the third maxilliped is armed with two spines.

#### 7. *Munida obesa* FAXON, 1893 (Fig. 10)

*Munida obesa* FAXON, 1893: 176; 1895: 73, pl. XVI, figs 1, 1a. - BENEDICT, 1902: 311. - DEL SOLAR, 1970: 46. - DEL SOLAR *et al.*, 1970: 21. - WICKSTEN, 1989: 315 (listed). - LEMAITRE & ALVAREZ-LEON, 1992: 47. - HENDRICKX, 1995: 557 (illustrated).

#### MATERIAL EXAMINED

Syntype, Gulf of Panama, "Albatross" St. 3389, 1 female (C.L. 33.0 mm with rostrum), 378 m (Id. W. FAXON) (USNM-25490).

#### DESCRIPTION

Carapace with distinct transverse striae; two long, sharp epigastric spines behind the base of the supraorbital spines and two much smaller spines beyond these, forming a square with the largest spines; a longitudinal row of about 6 small spines in the median line just between these two pairs, and a transverse row of 3 small spines running almost parallel to frontal margin; a cluster of 3 spinules on hepatic region; metagastric area with several spines arranged in transversal rows following striae; one branchial spine; two pairs of postcervical spines, the outer pair the largest; two curved spinules close to posterolateral corner of carapace. Frontal margin transversely oblique. Rostrum long, slightly curved, with inconspicuous dorsal spinulation. Supraocular spines sharp, almost parallel to rostrum in dorsal view, long and overreaching 1/2 length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip far overreaching the cornea; anterolateral spines stout, medium-size, slightly curving inside, shorter than supraocular spines but clearly overreaching the rostrum sinus. Branchial margins armed with 3 strong spines of about equal size; about 8-11 spines on lateral margin of entire carapace (excluding anterolateral spine), the posterior spines much smaller. Surface of sternite 4-6 smooth; sternites 5 to 7 with transverse ridges smooth, not raised. Second abdominal segment with 8-9 medium-size spines. Third abdominal segment with 2 (sometimes four) spines, the largest pair (if two pairs present) in lateral position. Fourth abdominal segment without spines. Eyes small, their diameter less than 1/2 length of rostrum. Distal spines of antennular basal segment equal; two lateral spines, the inner one long, sharp, far overreaching distal spines, the outer one much reduced, about 1/2 length of the distal spines. Distomesial spine of first segment of antennal peduncle long, sharp, clearly overreaching distal margin of third segment; second segment with subequal distomesial and distolateral spines, both overreaching third segment. Merus of third maxilliped with one very long, sharp spine on flexor margin and no distal spine; extensor margin armed with diminute spinules. Chelipeds long and slender, more than twice as long as carapace (including rostrum), with rows of spines on all joints; merus with 4 rows of spines; ventral row of spinules ending in one stronger distal spine; dorsal row with very strong, sharp spines on distal 1/2, paralleled by second row of smaller spines; inner and outer rows with medium to strong spines; carpus with rows of medium-size spines and a few stronger spines on dorsal margin; lower and upper margin of manus spiny; ventral margin of fixed finger spineless; dorsal margin of dactylus with a few proximal spinules. Carpus subcylindrical, about 2/3 length of dactylus; dactylus slightly longer than propodus (palm). Pereiopods relatively slender. Second pereopod with a row of strong spines along superior edge of merus, distal spines stronger; 4 small spines on dorsal edge of carpus, in addition to a sharp distal spine; dorsal side of propodus without spines; ventral side of merus with spines, the terminal one very long; one

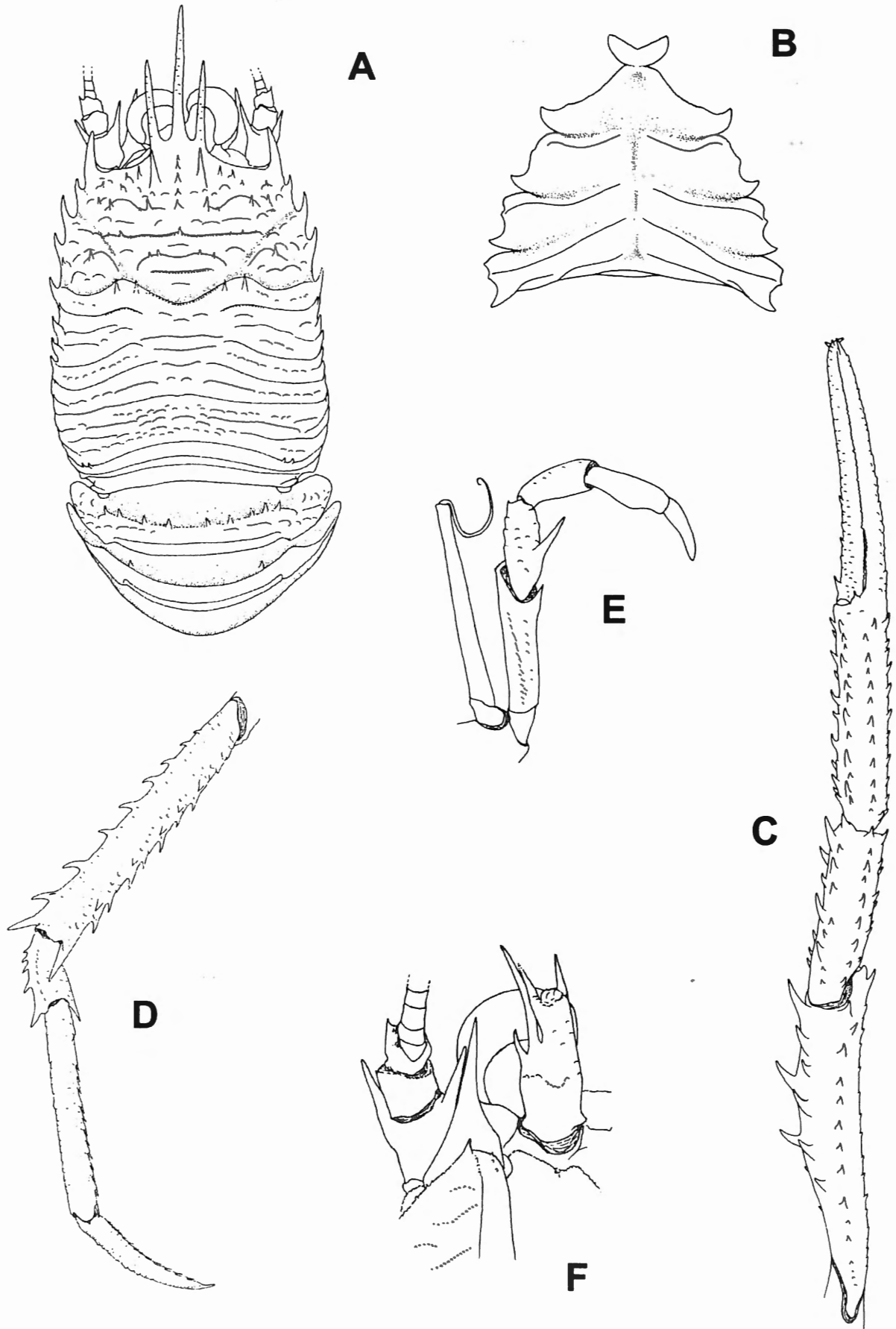


Fig. 10. – *Munida obesa* Faxon, 1893. Syntype (USNM-25490). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereopod, lateral view; E) right third maxilliped, lateral view; F) ventral view of cephalic region, showing antennular and antennal peduncles.

distoventral sharp spine on carpus and a row of movable spinules on propodus; propodus about 3/4 merus length; dactylus more than 1/2 propodus length.

#### TYPE LOCALITY

Gulf of Panama.

#### PREVIOUSLY KNOWN LOCALITIES

Gulf of Panama ("Albatross" 3355 and 3389) (FAXON, 1893; no new data by BENEDICT 1902); Tumbes, near Mancora Bank (3°48' S – 81°22' W), Peru (DEL SOLAR, 1970; DEL SOLAR *et al.*, 1970). Panama to Colombia (LEMAITRE & ALVAREZ-LEON, 1992).

#### DISTRIBUTION

Gulf of Panama to Mancora Bank, Peru.

#### DEPTH RANGE

327 - 378 m (FAXON, 1893); 518 m (DEL SOLAR *et al.*, 1970); 385 m (WICKSTEN, 1989).

#### COMMENTS

This rather large species of *Munida* appears to be restricted to the southern portion of the eastern tropical Pacific. As in the case of *M. gracilipes*, record for Colombia by LEMAITRE & ALVAREZ-LEÓN (1992) is based on an unpublished thesis. All specimens recorded in literature, including the Colombian material, are from below 200 m depth, which might explain the scarcity of records available to date.

### 8. *Munida perlata* BENEDICT, 1902 (Fig. 11)

*Munida perlata* BENEDICT, 1902: 266, fig. 14. - WICKSTEN, 1989: 315 (listed).

#### MATERIAL EXAMINED

Type, Galapagos Islands "Albatross" St. 2808, 1 ovigerous female (C.L. 14.9 mm with rostrum), 1141 m (Id. J.E. BENEDICT) (USNM-20538).

#### DESCRIPTION

Carapace with distinct transverse striae; two epigastric spines beyond the base of the supraorbital spines; in addition to these, several (spiny) tubercles arranged in a transverse line. No hepatic, parahepatic, branchial and postcervical spines. Frontal margin transversely oblique. Rostrum straight, with dorsal spinulation. Supraocular spines robust, short, parallel to rostrum in dorsal view, their tip not reaching cornea, pointing upward in lateral view, about 1/3 length of rostrum measured from base of sinus between rostrum and supraocular spines. Anterolateral spines medium-size, diverging, shorter than supraocular spines, not overreaching sinus. Branchial margins armed with 5 spines of about equal size, except the fifth which is smaller; about 5-6 spines on lateral margin of entire carapace (excluding anterolateral spine). Sternite 4 with an anterior oblique granulated ridge; surface of sternites 5-6 mostly punctate; sternites 5 to 7 with transverse ridges smooth. Second abdominal segment with 4 (6 according to Benedict illustration) spines, the middle pair

the strongest; a deep transversal groove. Third and fourth abdominal segments without spines, with a deep transversal and continuous groove. Eyes very small, their diameter less than 1/3 length of rostrum. Distal spines of antennular basal segment stout, unequal, the lateral much longer than the mesiodistal; two lateral sharp spines, the external one about 1/2 length of inner one. Distomesial spine of first segment of antennal peduncle long, sharp, reaching distal margin of second segment; second segment with subequal distomesial and distolateral spines. Merus of third maxilliped with one strong spine on flexor margin and no distal spine; extensor margin unarmed. Chelipeds stout, short and heavy, flattened, about one and 1/4 as long as carapace (including rostrum), with rows of spines on all joints; merus with 4 rows of spines, dorsal row with two spines only, distal spines the strongest of each row; two strong, curved spines on inner margin of carpus in addition to rows of medium-size spines; lower margin of manus with strong, curved spines and smaller, curved spines on upper margin; ventral margin of fixed finger spinulous; dorsal margin of dactylus without spine. Carpus oval, stout, about 3/4 length of dactylus; dactylus and propodus (palm) similar in size. Pereiopods stout. Second pereopod with a row of spines along the superior edge of merus, distal spines stronger; 1-2 small spines on dorsal edge of carpus, in addition to a sharp distal spine; dorsal side of propodus without spines; ventral side of merus with obtuse spines, one distoventral sharp spine on carpus and a ventral row of movable spinules on propodus; propodus about 2/3 merus length; dactylus about 1/2 propodus length.

#### TYPE LOCALITY

Galapagos Islands.

#### KNOWN LOCALITIES

Off Galapagos Islands, *Albatross* 2808 (BENEDICT, 1902), southern Gulf of California (23°58'4" N – 108°59'5" W) (WICKSTEN, 1989).

#### DISTRIBUTION

Only known from the type locality and the southern Gulf of California.

#### DEPTH RANGE

1142 m (BENEDICT, 1902). At 1920-3292 m (LUKE, 1977; WICKSTEN, 1989).

#### COMMENTS

The only available records for *M. perlata* are both in deep water (>1100 m), from the type locality and the southern Gulf of California. The southern Gulf record is from an Isaac Kidds mid-water trawl and consist of a single specimen of about 3 cm C.L. identified by S. Luke (SIO-C 761) (L. Lovell, pers. com.).

### 9. *Munida propinqua* FAXON, 1893 (Fig. 12)

*Munida propinqua* FAXON, 1893: 178; 1895: 76, pl. XVIII, figs 1, 1a. - DEL SOLAR *et al.*, 1972: 12. - WICKSTEN, 1989: 315 (listed). - HENDRICKX, 1995: 558 (illustrated).

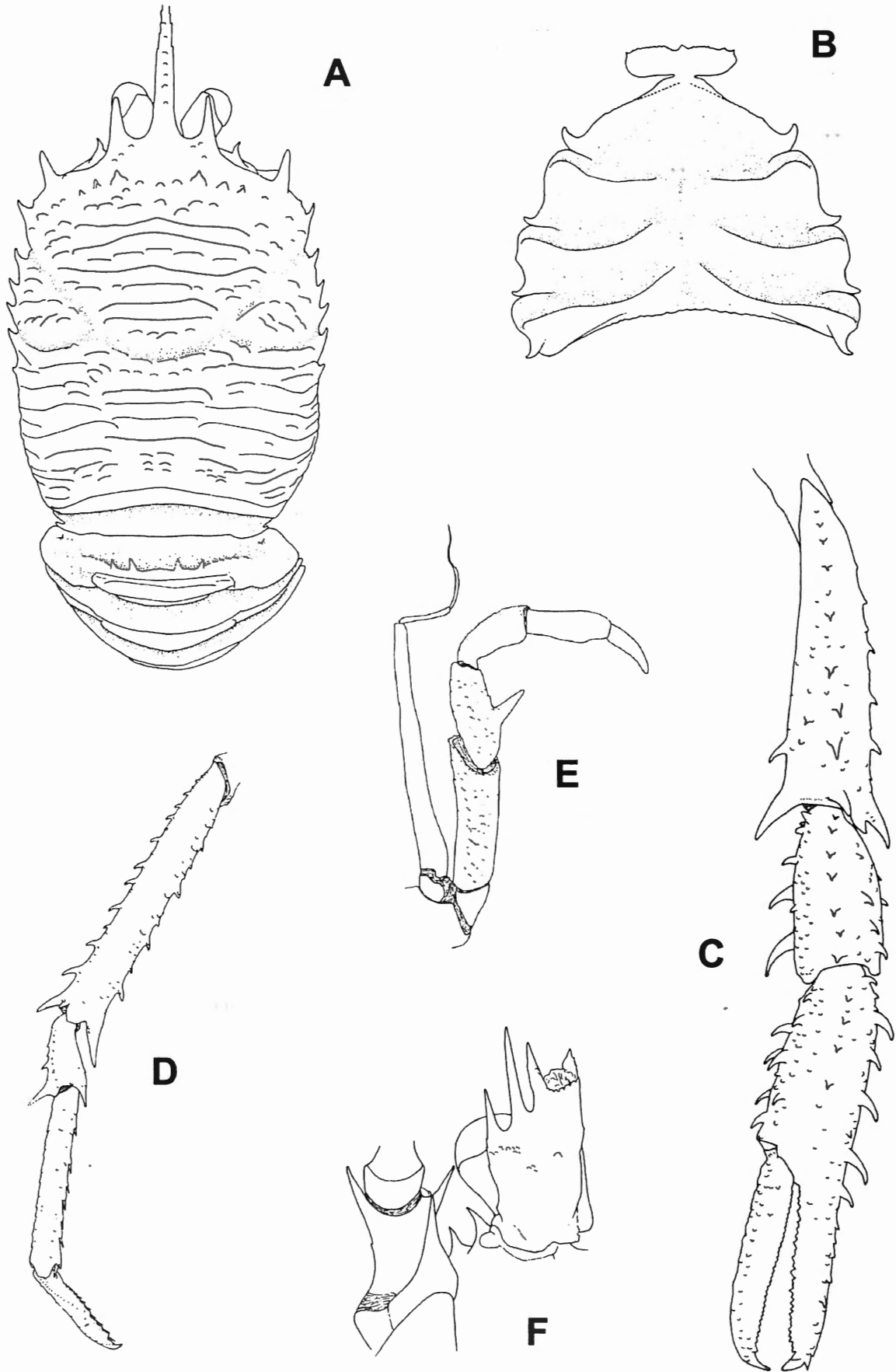


Fig. 11. – *Munida perlata* Benedict, 1902. Type (USNM-20538). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) right third maxilliped, lateral view; F) ventral view of cephalic region, showing antennular and antennal peduncles.

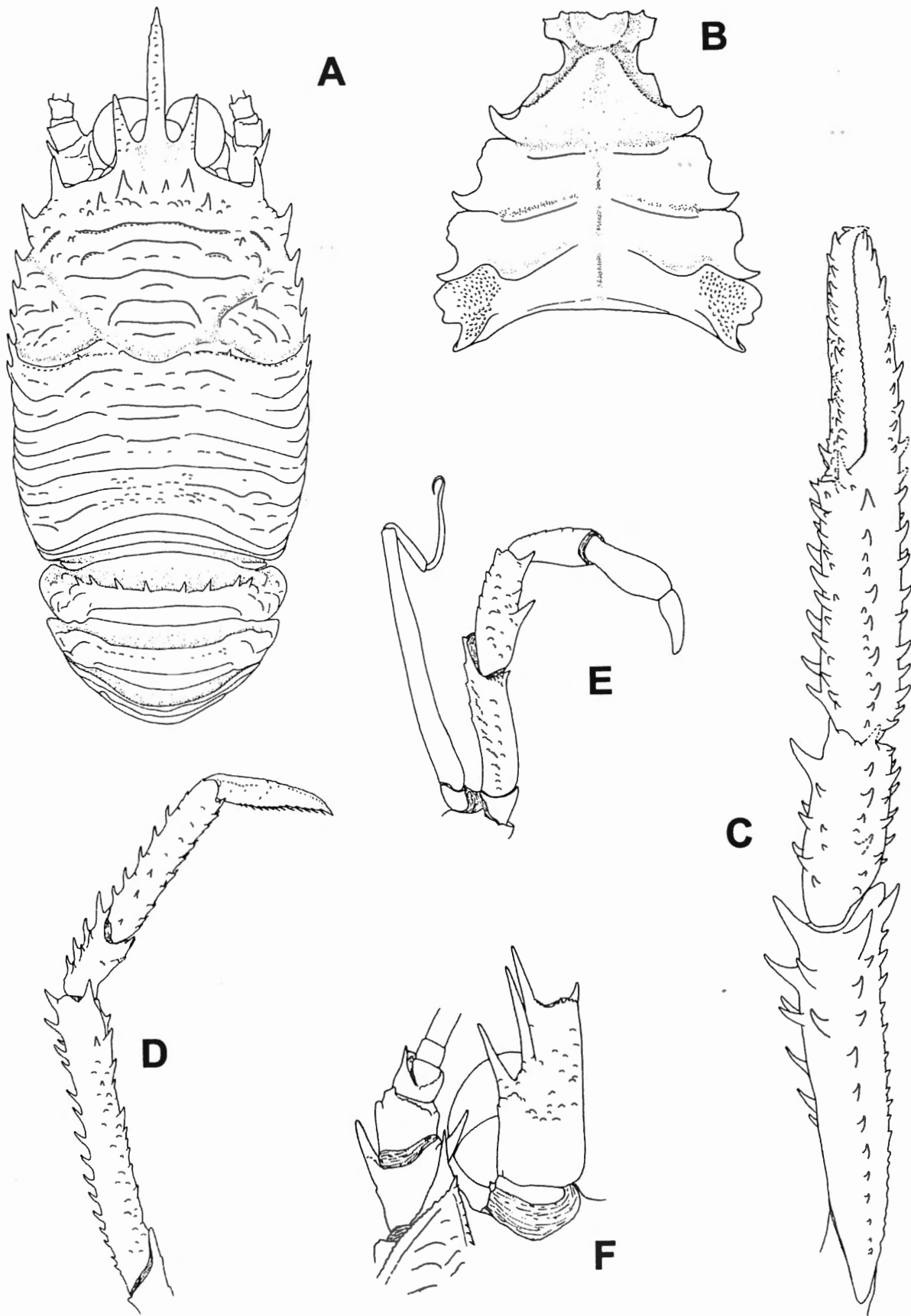


Fig. 12. – *Munida propinqua* Faxon, 1893. Syntype (USNM-25492). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) right third maxilliped, lateral view; F) ventral view of cephalic region, showing antennular and antennal peduncles.

## MATERIAL EXAMINED

Syntype, Gulf of Panama, "Albatross" St. 3384, 1 male (C.L. 27.8 mm with rostrum) and 1 ovigerous female (C.L. 27.3 mm with rostrum), 825 m (Id. W. Faxon) (USNM-25492).

## DESCRIPTION

Carapace with distinct transverse striae; three pairs of epigastric spines, the middle pair the largest, arranged and located just behind the base of supraocular spines, the lateral pair made of smaller spines, slightly behind the anterior line of four. A pair of small parahepatic spines. A small branchial spine. A widely set pair of small postcervical spines. Frontal margin transversely oblique. Rostrum sinuous in lateral view, without lateral spinulation but with dorsal spinulation. Supraocular spines robust, strongly curved in a vertical plane, diverging, slightly shorter than or about 1/2 the length of rostrum measured from base of sinus between rostrum and supraocular spines, dorsally spinulose, their tip slightly overreaching the cornea; anterolateral spines medium-size, shorter than supraocular spines, not overreaching this sinus. Branchial margins armed with 4-5 spines; about 5-6 spines on lateral margin of entire carapace (excluding anterolateral spine). Sternite 4 with a well-marked oblique granulated ridge; surface of sternites 5-6 almost smooth; lateral surface of sternite 7 granulated; sternites 5 to 7 with transverse ridges almost smooth. Second abdominal segment with 8 stout spines arranged in four pairs; a deep transversal groove. Third and fourth abdominal segments without spines, with a deep transversal groove and either a series of pits (third) or a small lateral groove (fifth) in front of transversal groove. Terga 2-4 smooth behind transversal groove. Eyes medium-size, their diameter about 1/2 length of rostrum. Distal spines of antennular basal segment unequal, the lateral much longer than mesiodistal; two lateral spines, external spine about same length as laterodistal spine. Distomesial spine of first segment of antennal peduncle at most reaching distal margin of second segment of antennular peduncle; distal spines of second segment subequal, not exceeding third segment. Merus of third maxilliped with two spines on flexor margin, including distal spine; extensor margin unarmed (spinulose tubercles). Chelipeds stout, heavy and wide, about twice as long as carapace (including rostrum), with rows of strong spines on all joints; spines particularly strong on distal 1/2 of merus and carpus; merus with one row of strong, sharp spines forming two rows in distal 1/3, two ventral parallel rows of medium to small spines, and one row of spines on each lateral side, the inner row the strongest; carpus oval, stout, about 3/4 length of dactylus; dactylus and propodus (palm) similar in size; manus compressed laterally, with an outer row of strong spines in addition to dorsal and ventral rows; fingers with spines throughout their length. Pereiopods stout. Second pereopod with strong spines along the superior edge of merus, carpus and propodus; inferior edge of these joints with less numerous medium to small-size spines; propodus about 2/3 merus length; dactylus more than 1/2 the propodus length.

## TYPE LOCALITY

Gulf of Panama and near Galapagos Islands.

## KNOWN LOCALITIES

"Albatross" St. 3384, 3394, and 3404 (FAXON 1893). Gulf of Panama and near the Galapagos Islands (BENEDICT 1902). Off Peru (11°50'5 S - 77°58' W) (Garth & Haig, 1971). Peru (03°52' S - 81°23' W; 11°09' S - 78°16' W; 18°19' S - 71°12' W) (DEL SOLAR 1972).

## DISTRIBUTION

From the Gulf of Panama to Southern Peru.

## DEPTH RANGE

693-920 m (BENEDICT, 1902); 1290-1713 (GARTH & HAIG, 1971); 490-810 (DEL SOLAR, 1972).

10. *Munida refulgens* FAXON, 1893

(Fig. 13)

*Munida refulgens* FAXON, 1893: 177; 1895: 75, pl. XVII. - BENEDICT, 1902: 312. - WICKSTEN, 1989: 315 (listed). - LEMAITRE & ALVAREZ-LEON, 1992: 47. - HENDRICKX, 1995: 558 (illustrated).

## MATERIAL EXAMINED

CORTES 1, St. 55, off Gorda Bank, 13/V/82, 4 males (C.L. 21.8-25.95 mm) and 1 female (C.L. 21.50 mm), 38 m, trawl; St. 56, off Gorda Bank, 13/V/82, 86 males (C.L. 11.5 - 21.1 mm) and 216 females (C.L. 11.4 - 24.9 mm), 100 m, oyster dredge (EMU-2822).

## DESCRIPTION

Carapace with well-marked transverse striae, mostly unbroken, with short iridescent setae; 4 pairs of epigastric spines, the longest pair beyond the base of the supraorbital spines, the other pairs smaller. A sharp hepatic spine and two sharp branchial spines, the largest similar in size to the largest gastric spine, the smaller set obliquely slightly beyond the first branchial spine. Two or 3 pairs of small postcervical spines, disposed laterally (some specimens lack one or two spines on one side). Frontal margin slightly oblique. Rostrum very long, almost straight, dorsally subserrate and with 2-3 subterminal lateral spines and a variable number of distal spinules. Supraocular spines sharp, slightly diverging, short, about 1/5 length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip reaching the proximal third of the eye; anterolateral spines sharp, longer and stronger than supraocular spines and overreaching the rostrum sinus. Branchial margins armed with 5 spines; about 6 spines on lateral margin of entire carapace (excluding anterolateral spine), all similar in size. Fourth sternite with a few patches of granules and three granulated striae, the posteriormost forming an arch; fifth sternite with a pair of transverse striae; sixth and seventh smooth, with a few isolated groups of granules; sternites 5 to 7 with transverse ridges granulated, slightly raised. Second, third and fourth abdominal segments without spines. Eyes large, brownish, their diameter about 1/2 length of rostrum. Distal spines of antennular basal segment very unequal, the mesiodistal much longer, distally sharp, thicker proximally; two lateral spines, the inner one long, slender, sharp, the outer one short, slightly curved. No distal spine on first segment of antennal peduncle, this segment with a plate-like expansion; second

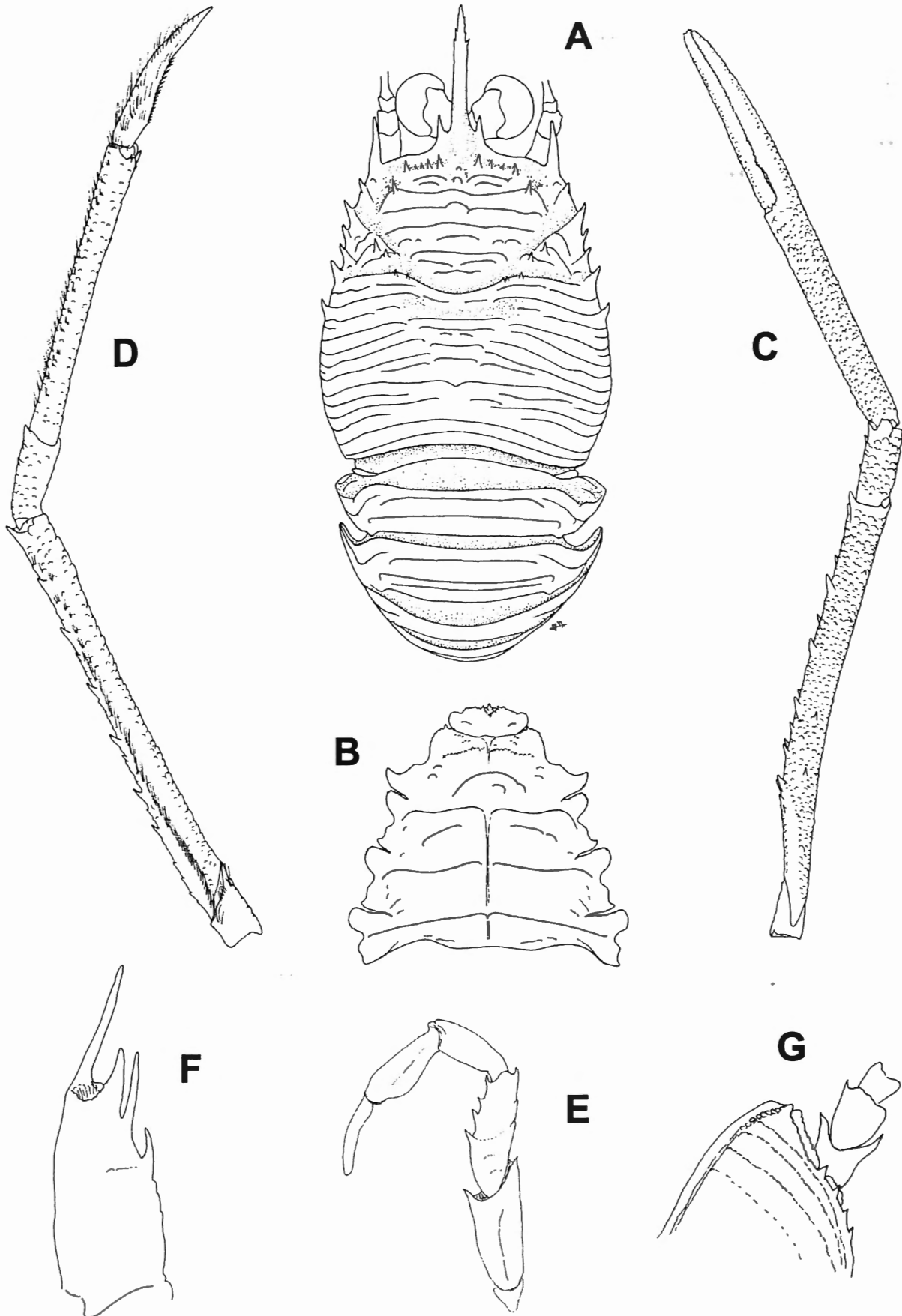


Fig. 13. – *Munida refulgens* Faxon, 1893. Male (EMU-2822). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) endopod of left third maxilliped, lateral view; F) ventral view of left antennular peduncle; G) ventral view of antennal peduncle.

segment with small to moderately long distolateral spine and an unobvious distomesial, subterminal spine; an unobvious distomesial spine on third segment. Merus of third maxilliped with 3 spines on flexor margin, including distal spine which is much shorter and proximal spine which is by far the strongest; extensor margin unarmed, except for a minute distal spine, similar in size and shape to the distal spine on flexor margin. Chelipeds very long and slender, entirely covered with flattened granules (squamoses), 3-5 times as long as carapace (including rostrum); merus armed with three rows of spines, the inner row with 5-7 sharp spines, the upper with 7-9 sharp spines and the outer with 3-7 shorter, blunt spines, all numbers including distal spine; carpus with 3 distal and subterminal spines when observed in dorsal view, occasionally a few smaller spines on the upper margin; flattened granules on dorsal margin of propodus occasionally ending in a small, blunt spine, ventral margin spineless; margins of fingers spineless, except for a weak, blunt proximal spine at base. Carpus cylindrical, 1/3 to 1/2 length of dactylus; dactylus about 3/4 propodus length; fingers either straight and not gaping or flattened, with a variable proximal gap with numerous projecting teeth; in larger specimens, the fingers are wider, convex and with a shallow to deep groove parallel to the lower margin of the fixed finger. Pereiopods slender. Second pereopod with a row of 8-10 sharp dorsal spines on merus, including the distal spine; 1-2 spines and a few spinules on dorsal margin of carpus, in addition to a stronger distal spine; dorsal side of propodus spineless; ventral side of merus spineless, except for a long, sharp distoventral spine; one small distoventral spine on carpus and a row of minute movable spinules on propodus; propodus about 2/3 merus length; dactylus about 1/2 propodus length.

#### TYPE LOCALITY

Off Coco Island, off Ecuador and near Tres Marias Islands.

#### KNOWN LOCALITIES

"Albatross" St. 3367 (off Coco Island), 3378, 3379 (off Malpelo Island), and 3427 (Tres Marias Islands) (FAXON 1893). Off the coast of Ecuador (BENEDICT, 1902). Tres Marias Islands to off Malpelo Island, 95-183 m (WICKSTEN 1989). Coco and Malpelo Islands (LEMAITRE & ALVAREZ-LEON 1992).

#### DISTRIBUTION

From the southern Gulf of California, Mexico to Ecuador; off Tres Marias, Coco and Malpelo Islands.

#### DEPTH RANGE

76-202 m (BENEDICT, 1902); 95-183 m (WICKSTEN, 1989); 38-100 m (present study).

#### COMMENTS

Present record (at Gorda Bank, Baja California Sur) is the first for the west coast of the Gulf of California. The type material used by FAXON (1893) is considerably larger than the material examined herein. Proportion of carapace and chelipeds length seems to be much variable according to size of specimens. Variation of number of postcervical spines is

also noteworthy (1 to 3 pairs, with variation between one side of the carapace and the other).

The specimen used by FAXON (1893) as type material and illustrated in a subsequent publication (FAXON, 1895: Pl. XVII) is much larger than the examined material (C.L. 43 mm vs 26 mm). Proportion of carapace/cheliped length obviously varies with specimen size, the cheliped being proportionally longer in largest specimens. FAXON (*op. cit.*) did not represent a hiatus between the fingers of his large type material, which might indicate that this character is not always present in *M. refulgens*.

Material examined was collected between 38 and 100 m, on medium sand and gravel; epibenthic water temperature and dissolved oxygen values were 14.8-23°C and 1.5-.5.4 mlO<sub>2</sub>/l, respectively (Table 2).

#### 11. *Munida tenella* BENEDICT, 1902

(Fig. 14)

*Munida tenella* BENEDICT, 1902: 274, fig. 20. - HENDRICKX, 1995: 559 (illustrated).

#### MATERIAL EXAMINED

CORTES 1, St. 8, Carmen Island, 4/V/82, 4 unsexed specimens (C.L. 7.0 - 10.0 mm) and 2 ovigerous females (C.L. 7.0 mm), 55 m, oyster dredge (EMU-2816A); St. 19, off Cape San Miguel, 6/V/82, 32 unsexed specimens (C.L. 3.0 - 9.0 mm) and 16 ovigerous females (C.L. 6.0 - 9.0 mm), 30-35 m, trawl; St. 21, off Cape San Miguel, 6/V/82, 2 ovigerous females (C.L. 8.0 and 10.0 mm), 102-110 m, trawl (EMU-2818); St. 55, off Gorda Bank, 13/V/82, 2 unsexed specimens (C.L. 4.0 and 6.0 mm), 38 m, Van Veen dredge (EMU-2820-B).

CORTES 2, St. 20, off Cape San Miguel, 13/III/85, 2 unsexed specimens (C.L. 6.0 and 10.0 mm) and 5 ovigerous females (C.L. 8.0 mm), 52 m, trawl (EMU-2821A); St. 21, off Cape San Miguel, 13/III/85, 91 unsexed specimens (C.L. 6.0 - 16.0 mm) and 12 ovigerous females (C.L. 6.0 - 11.0 mm), 91 m, trawl; St. 25, Tiburon Island, 14/III/85, 167 unsexed specimens (C.L. 7.0 - 16.0 mm) and 13 ovigerous females (C.L. 12.0 - 19.0 mm), 112 m, trawl (EMU-2833A); St. 44, off Tepoca Cape, 17/III/85, 2 unsexed specimens (C.L. 8.0 and 12.0 mm), 91-102 m, trawl (EMU-2819A); St. 46, off Estero Tastiota, 18/III/85, 3 unsexed specimens (C.L. 4.0 - 9.0 mm), 99 m, Van Veen dredge; St. 50, off Rio Fuerte, 20/III/85, 10 unsexed specimens (C.L. 5.0 - 9.0 mm), 97 m, trawl (EMU-2819C).

CORTES 3, St. 3, off Santa Maria Bay, 30/VII/85, 15 unsexed specimens (C.L. 5.0 - 10.0 mm) and 1 ovigerous female (C.L. 11.0 mm), 27 m, oyster dredge; St. 21, off San Miguel Cape, 01/VIII/85, 7 unsexed specimens (not measured), 26-28 m, trawl.

GUAYTEC II, St. 69, off Angel de la Guarda Island, 11/VIII/87, 11 unsexed specimens (not measured), 65-82 m, trawl.

#### DESCRIPTION

Carapace with well-marked transverse striae with iridescent setae; 3-4 pairs of epigastric spines, the longest pair beyond the base of the supraorbital spines, the other smaller. A sharp hepatic spine and a sharp branchial spine, similar in size to the largest gastric spine. One or two pairs of postcervical



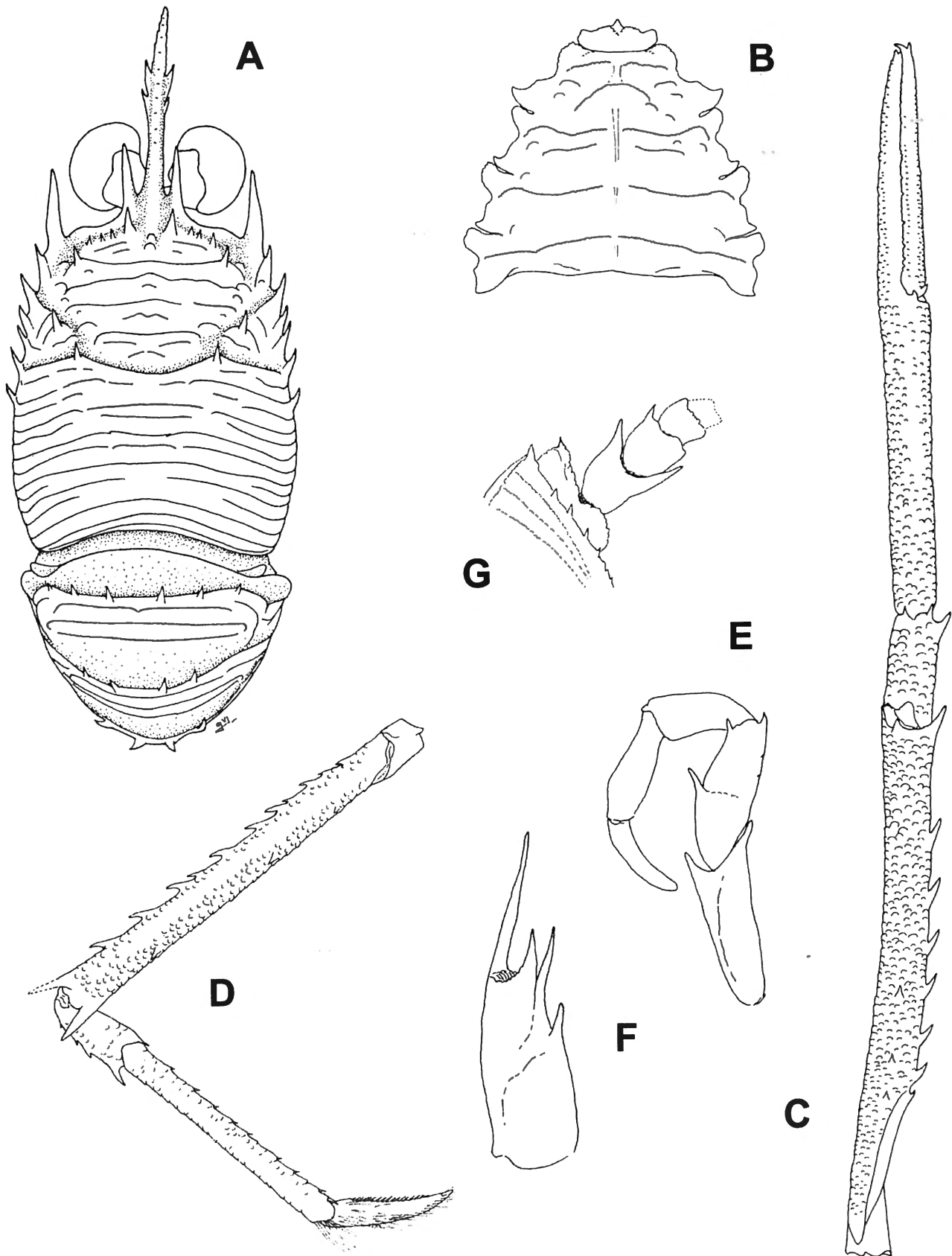


Fig. 14. – *Munida tenella* Benedict, 1902. Male (EMU-5372). A) Carapace, dorsal view; B) sternal plastron; C) left cheliped, dorsal view; D) endopod of left second pereiopod, lateral view; E) endopod of third maxilliped, lateral view; G) antennal region, ventral view; F) left basal antennular segment, ventral view.

spines, disposed laterally (some specimens have one spine on one side, two on the other). Frontal margin transversely oblique. Rostrum very long, almost straight, dorsally subserrate and with 2-3 lateral spines, occasionally reduced to spinules. Supraocular spines sharp, almost parallel to rostrum, short, 1/3 to 1/4 length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip reaching about the middle of the eye; anterolateral spines sharp, longer than supraocular spines and overreaching the rostrum sinus. Branchial margins armed with 4-5 strong spines; about 6 spines on lateral margin of entire carapace (excluding anterolateral spine), the posterior spines slightly smaller. Sternites 4-6 without lateral carinae; sternite 4 with a pair of granulated anterior striae and a posterior arcuate striae, in addition to a few, short lateral striae; a pair of granulate striae on sternite 5 and short, lateral striae on sternites 5-7; sternites 5 to 7 with transverse ridges finely granulated, slightly raised. Second, third and fourth abdominal segments dorsally spined. Second abdominal segment with 3 pairs of spines; third abdominal segment with two pairs of spines; fourth abdominal segment with a pair of strong, closely-set middle spines and a pair of smaller lateral spines. Eyes large, black, their diameter greater than 1/2 length of rostrum. Distal spines of antennular basal segment very unequal, the mesiodistal much longer, blade-like in its middle part and sharp, upturned distally; two lateral spines, the inner one long, sharp, the outer one very short. A short mesial spine on laminar first segment of antennal peduncle; second segment with a distomesial and a distolateral spines, the latter longer and overreaching length of third segment; third segment with a short distomesial spine. Merus of third maxilliped with 2 spines on flexor margin, including the distal spine which is much shorter; extensor margin unarmed, except for a diminute distal spine. Chelipeds very long and slender, squamose and entirely covered with clusters of setae, about four times as long as carapace (including rostrum); merus armed with three rows of spines, the inner row with 7 strong spines, the middle with 6 and the outer with 9; carpus with 3 distal spine and two additional, smaller spines on the inner margin; dorsal margin of propodus spiny, with 10-14 small spines, ventral margin spineless; dorsal margin of dactylus spineless, except for a strong proximal spine, tip bifid. Carpus cylindrical, less than 1/2 length of dactylus; dactylus about 3/4 propodus length; fingers very thin, straight, not gaping, fingers with numerous projecting teeth. Pereiopods slender. Second pereopod with a row of 8-12 strong dorsal spines on merus; 2-7 spines on dorsal edge of carpus, in addition to a stronger distal spine; dorsal side of propodus spineless; ventral side of merus spineless, except for a long, sharp distoventral spine on outer side; one distoventral sharp spine on carpus and a row of movable spinules on propodus; propodus about 3/4 merus length; dactylus slightly less or about 1/2 propodus length.

#### TYPE LOCALITY

Off San Jose Island, Gulf of California.

#### KNOWN LOCALITIES

Off San Jose Island, Gulf of California, "Albatross" (BENEDICT, 1902).

#### DISTRIBUTION

Throughout the Gulf of California, Mexico.

#### DEPTH RANGE

Between 70 and 130 m (BENEDICT, 1902). Material examined is from 27-112 m.

#### COMMENTS

According to BENEDICT (1902: 275), the third and fourth abdominal segments of this species have a "line of two spines" each; the illustration presented by BENEDICT (1902: Fig. 20), however, clearly shows two (one pair) large and 4 (two pairs) much smaller spines on the anterodorsal margin of the third segment. Also, the specimen illustrated here has two pairs of spines on the fifth abdominal segment, vs. the "line of two" (one pair) stated by BENEDICT (1902: text and fig.). *Munida tenella* is obviously a variable species in this respect, but all specimens examined clearly have spines on all three abdominal segments.

It is surprising that such a common species has never been reported after it was described on the basis of material obtained from off San Jose Island. The material examined is from 12 localities throughout the Gulf of California.

#### 12. *Munida williamsi* sp. nov.

(Fig. 15)

#### TYPE MATERIAL

Holotype, male (9.9 mm C.L.wr; 16.0 mm C.L.), CORTES 2, St. 33, off Willard Point, 15/III/85, 79-80 m, trawl (EMU-5359). Paratype, male (7.5 mm C.L.wr; 11.1 mm C.L.), same station (EMU-5360). Paratype, male (7.7 mm C.L.wr; 11.1 mm C.L.), same station (EMU-5361). Paratype, male (10.0 mm C.L.), same station (LACMNH-C.R. 19854591). Paratype, male (12.0 mm C.L.), CORTES 2, St. 37, off Consag Rocks, 16/III/85, 30-34 m, trawl (EMU-5362). Paratype, female (14.2 mm C.L.), CORTES 3, St. 33, off Willard Point, 03/VIII/85, 76-82 m, trawl (EMU-5364).

#### ADDITIONAL MATERIAL EXAMINED

CORTES 1, St. 33, off Willard Point, 08/V/82, 1 female (C.L. 11.0 mm) and 2 ovigerous females (C.L. 11.0 - 14.0 mm), 75-80 m, trawl (EMU-5366); St. 38, off Consag Rocks, 09/V/82, 2 males (C.L. 8.3-8.4 mm), 1 female (C.L. 10.9 mm) and 1 ovigerous female (C.L. 12.0 mm), 60 m, trawl (EMU-5368). CORTES 2, St. 37, off Consag Rocks, 16/III/85, 4 males (C.L. 11.1-13.1 mm) and 9 ovigerous females (C.L. 9.2-14.9 mm), 30-34 m, trawl, (EMU-5363); same station 10 males (C.L. 8.4-13.1 mm) and 19 ovigerous females (C.L. 8.6-13.9 mm) (EMU-5365); St. 39, off Consag Rocks, 16/III/85, 3 males (C.L. 8.5-10.8) and 3 ovigerous females (C.L. 9.2-9.7 mm), 95-103 m, trawl (EMU-5369).

CORTES 3, St. 37, off Consag Rocks, 04/VIII/85, 2 males (C.L. 10.5-12.6 mm) and 2 ovigerous females (C.L. 12.5-13.9 mm), 29 m, trawl (EMU-5367).

#### DESCRIPTION

Carapace with well-marked transverse striae, mostly unbroken, with iridescent setae; 3-4 pairs of epigastric spines, the

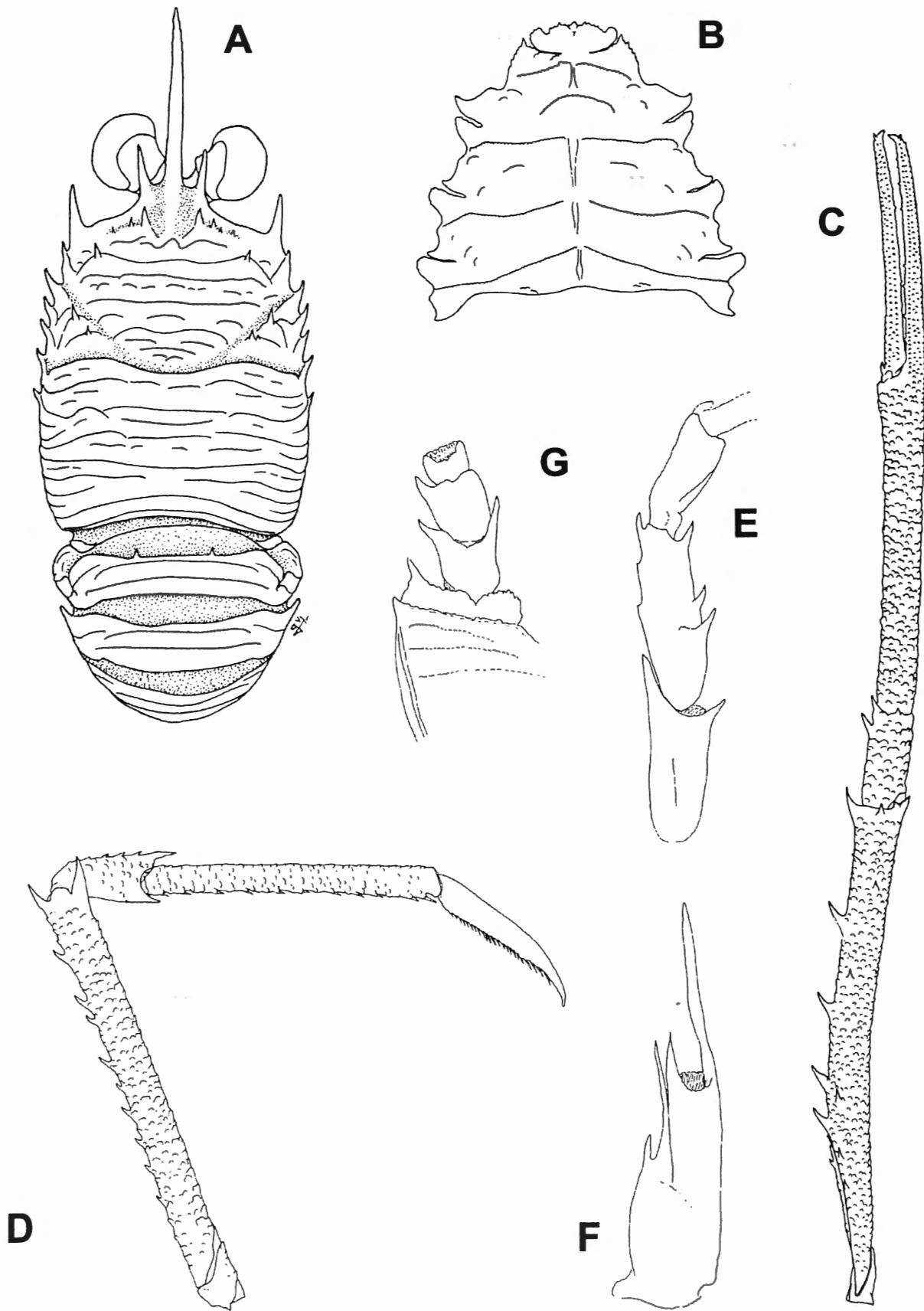


Fig. 15. – *Munida williamsi* sp. nov. Male (EMU-5359). A) Carapace, dorsal view; B) sternal plastron; C) right cheliped, dorsal view; D) right second pereiopod, lateral view; E) endopod of right second pereiopod, lateral view; G) antennal region, ventral view; F) right basal antennular segment, ventral view.

longest pair beyond the base of the supraorbital spines, the other smaller. A sharp hepatic spine and two branchial spines, the anterior the largest, the posterior occasionally with a minute lateral spine. Postvervical spines generally obsolete or absent. Frontal margin transversely oblique. Rostrum very long, almost straight, dorsally subserrate; no lateral spines or spinules. Supraocular spines sharp, slightly diverging, short, less than 1/4 the length of rostrum measured from base of sinus between rostrum and supraocular spines, their tip reaching about the middle of the eye; anterolateral spines sharp, equal in length to supraocular spines, not overreaching the rostrum sinus which is wide. Branchial margins armed with 4-5 strong to medium-size spines; about 6 spines on lateral margin of entire carapace (excluding anterolateral spine), the posterior spines slightly smaller. Surface of sternite 4 with a pair of strong, slightly oblique granulated anterior striae and a posterior arcuate striae, in addition to a few, short lateral striae and a well-developed spine an anterior margin, next to sternite 3; surface of sternites 5-7 with short, arcuate striae; no lateral carinae on sternites; sternites 5 to 7 with granulated transverse ridges, slightly raised. Second abdominal segment with a pair of dorsal spines, third and fourth unarmed. Eyes medium-size, brownish, their diameter smaller than 1/2 length of rostrum. Distal spines of antennular basal segment very unequal, the mesiodistal much longer, blade-like in its middle part and sharp, slightly upturned distally; two lateral spines, the inner one long, very sharp, the outer one very short. First segment of antenal peduncle wide, projecting forwards and ending in a mesial spine; second segment with distomesial and distolateral spines, the latter much longer and reaching 1/2 length of third segment; third segment with a short distomesial spine. Merus of third maxilliped with 3 spines on flexor margin, including the distal spine; middle spine the shortest and located close to proximal spine which is about as long as distal spine; extensor margin unarmed, except for a medium-size distal spine. Chelipeds very long and slender, squamose and entirely covered with clusters of setae, about 2 1/2 to 3 1/2 as long as carapace (including rostrum); merus armed with three rows of spines, the inner row with 6-7 spines, the middle with 6-7 longer, sharp spines and the outer with 6-9; carpus with 3 distal spine and two additional, smaller spines on the dorsal margin; dorsal margin of propodus with up to 10 very small spines, vanishing distally; ventral and lateral margins spineless; dorsal margin of dactylus spineless, except for a strong proximal spine. Carpus cylindrical, less than 1/2 length of dactylus; dactylus about 3/4 propodus length; fingers very thin, straight, not gaping, fingers with numerous small projecting teeth, tip bifid or trifold. Pereiopods slender. Second pereopod with a row of 8-10 dorsal spines on merus; 4-5 spines on dorsal edge of carpus, in addition to a stronger distal spine; dorsal side of propodus spineless; ventral side of merus spineless, except for a strong distoventral spine on outer side; one distoventral sharp spine on carpus and a row of movable spinules on propodus; propodus about 2/3 merus length; dactylus more than 1/2 the propodus length.

#### TYPE LOCALITY

Off Willard Point (29°54.9'N – 114°19.3'W), Baja California, Mexico.

#### KNOWN LOCALITIES

Willard Point, Consag Rocks (30°59.0'N – 114°03.1'W, 31°09.0'N – 114°15.3'W, 31°16.2'N – 114°22.1'W, 31°18.2'N – 114°25.0'W), and San Luis Gonzaga Bay (29°46'N – 114°09'W), Gulf of California, Mexico.

#### DISTRIBUTION

Upper Gulf of California, Mexico.

#### DEPTH RANGE

29-103 m.

#### COMMENTS

*Munida williamsi* is close to *M. tenella*. The two species can be separated using the following characters: eyes are much smaller, postocular spines slightly shorter and more diverging and rostrum is slender and without lateral spines in *williamsi*; the merus of third maxilliped bears 3 spines on flexor margin in *williamsi*, vs. 2 spines in *tenella*; abdominal segments 2-4 of *tenella* are spined, with particularly strong median spines on segment 4, while both 3rd and 4th segment are consistently unarmed in *williamsi*; the dorsal spines on first abdominal segment are often diminute or wanting. There is generally no postcervical spines in *williamsi*, while there is a pair of sharp spines in *tenella*; the anterolateral spines of the carapace of *tenella* are proportionally longer in *tenella* and clearly overreach the sinus between the rostrum and the postocular spines sinus; the dactylus of the second pereopod is proportionally longer in *williamsi*.

*Munida williamsi* is a variable species, with spinules on dorsal margin of manus of cheliped occasionally stronger. Several specimens examined also feature much shorter chelipeds than the type material. One specimen features a sharp postcervical spine on the left side of the carapace and, in some small specimens, an obsolescent spinule could be observed on one side of the carapace only.

The species is so far restricted to the northern Gulf of California. Considering that sampling operations were performed throughout the Gulf when the species was captured, it is assumed that *M. williamsi* is endemic of the northern Gulf.

#### ETYMOLOGY

The specific name is in honor of the late Austin B. WILLIAMS, in recognition of the intensive work he performed with crustaceans and the assistance he provided many times to the author.

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## References

- BABA, K. & DE SAINT LAURENT, M., 1996. Crustacea Decapoda: Revision of the genus *Bathymunida* Balss, 1914, and description of six new related genera (Galatheidae). In: A. Crosnier (ed.), Résultats des Campagnes MUSORSTOM, Vol. 15. *Mémoires Muséum national d'Histoire naturelle*, Paris. 168: 433-502.
- BAHAMONDE, N. & LÓPEZ, M. T., 1962. Un galatheido nuevo para Chile. *Munida montemaris* n. sp. *Revista Chilena de Historia Natural*, 55: 85-91.
- BENEDICT, J.E., 1902. Description of a new genus and forty six new species of crustaceans of the family Galatheidae, with a list of the known marine species. *Proceedings of the United States National Museum*, 26: 243-334.
- BOONE, P.L., 1938. 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. Part V, Crustacea. *Bulletin of the Vanderbilt Marine Museum*, 7: 197-281.
- BRUSCA, R.C., 1980. Common intertidal invertebrates of the Gulf of California. Univ. Arizona Press, Tucson, Arizona. 2<sup>nd</sup>. Ed. 513 p.
- DEL SOLAR, E.M., 1970. Crustáceos braquiuros (Cangrejos), anomuros y estomatópodos de las zonas nerito-pelágica y litoral de Tumbes. *Boletín de la Sociedad Geográfica de Lima*, 89: 40-48.
- DEL SOLAR, E.M., 1972. Addenda al catálogo de crustáceos del Perú. Informe del Instituto del Mar del Perú. 38: 1-21.
- DEL SOLAR, E.M., F. BLANCAS S. & R. MAYTA L., 1970. Catálogo de crustáceos del Perú. Lima, Perú 1-46.
- FABRICIUS, J.C., 1793. Entomologia systematica emendata et aucta secundum classes, ordenes, genera, especies adjectis synonymislocis, observationibus, descriptionibus. *Hafniae*, 2: 519.
- FAXON, W., 1893. Reports on the dredgings operations off the west coast of Central America to the Galapagos, to the west coast of Mexico, and in the Gulf of California,... VI. Preliminary description of new species of Crustacea. *Bulletin of the Harvard Museum of Comparative Zoology*, 24 (7): 149-220.
- FAXON, W., 1895. Reports on an exploration off the west coast of Mexico, Central and South America, and off the Galapagos Islands, ... XV. The stalk-eyed Crustacea. *Memoirs of the Museum of Comparative Zoology of Harvard University*, 18: 1-292.
- FILHOL, H., 1885. Recueil de mémoires, rapports et documents relatifs à l'observation du passage de Vénus sur le soleil du 9. Decembre 1874. Vol. 3, pt. 2. Mission de l'île Campbell, Chapt. 7, Crustacés. 349-510.
- GARTH, J.S., 1960a. Distribution and affinities of the brachyuran Crustacea. In: The biogeography of Baja California and adjacent seas, Part II. Marine Biotas. *Systematic Zoology*, 9 (3): 105-123.
- GARTH, J.S. & HAIG, J., 1971. Decapod Crustacea (Anomura and Brachyura) of the Peru-Chile Trench. *Allan Hancock Foundation Contributions*, 335: 6.3-6.20.
- HAIG, J., 1955. Reports of the Lund University Chile Expedition 1948-49. 20. The Crustacea Anomura of Chile. *Lunds University Arsskr. New Ser.* 2, 51 (2): 1-68.
- HART, J.F.L., 1982. *Crabs and their relatives of British Columbia*. British Columbia Provincial Museum Handbook. 40.
- HENDERSON, J.R., 1888. Report on the Anomura collected by H.M.S. *Challenger* during the years 1873-76. *Report Scientific Research Voyage Challenger, Zoology*, 27: 1-221.
- HENDRICKX, M.E., 1992. Distribution and zoogeographic affinities of Decapod Crustaceans of the Gulf of California, Mexico. *Proceedings of the San Diego Society of Natural History*, 20: 1-12.
- HENDRICKX, M.E., 1993a. Crustáceos Decápodos Bentónicos del Sur de Sinaloa, México. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México*, 64 (1): 1-16
- HENDRICKX, M.E., 1993b. Crustáceos decápodos del Pacífico mexicano pp. 271-318. In: Salazar-Vallejo, S.I. & N. E. González (Eds.). *Biodiversidad Marina y Costera de México* 865 pp.
- HENDRICKX, M.E., 1995. ANOMUROS. pp 539-564. Guía FAO para la identificación de especies para los fines de la pesca. Pacífico centro-oriental. Vol. I. Plantas e Invertebrados. 646 p. W. Fischer, F. Krupp, W. Schneider, C. Sommer, K.E. Carpenter & V.H. Niem. (Eds.). FAO, Roma, Italia.
- HENDRICKX, M.E., 1996. Habitats and biodiversity of decapod crustaceans in the SE Gulf of California, Mexico. *Revista de Biología Tropical*, 44 (2A): 603-617.
- HENDRICKX, M.E. & A.W. HARVEY., 1999. Checklist of anomuran crabs (Crustacea: Decapoda) from the eastern tropical Pacific. *Belgian Journal of Zoology*, 129 (2): 363-389.
- LEMAITRE, R. & R. ALVAREZ-LEON., 1992. Crustáceos decápodos del Pacífico colombiano: lista de especies y consideraciones zoogeográficas. *Anales del Instituto de Investigaciones Marinas de Punta de Betín*. 21: 33-76.
- LUKE, S.R., 1977. Catalog of the benthic invertebrate collections. I. Decapod Crustacea and Stomatopoda. *University of California*. SIO Ref. Ser. 77-9: 72 p.
- MACPHERSON, E., 1991. A new species of the genus *Munida* Leach, 1819 (Crustacea, Decapoda, Anomura, Galatheidae) from the western Indian Ocean, with the redescription of *M. africana* Doflein and Balss, 1913. *Scientia Marina*, 55 (4): 551-556.
- MACPHERSON, E., 1993a. Crustacea Decapoda: species of the genus *Munida* Leach, 1820 (Galatheidae) collected during the MUSORSTOM and CORINDON cruises in the Philippines and Indonesia. In: A. Crosnier (ed.) Résultats des Campagnes Musorstom vol. 10. *Mémoires Muséum national d'Histoire naturelle*, Paris. 156: 421-442.
- MACPHERSON, E., 1993b. Crustacea Decapoda: species of the genus *Paramunida* Baba, 1988 (Galatheidae) from the Philippines, Indonesia and New Caledonia. In: A. Crosnier (ed.), Résultats des Campagnes Musorstom vol. 10. *Mémoires Muséum national d'Histoire naturelle*, Paris. 156: 443-473.
- MACPHERSON, E., 1994. Crustacea Decapoda: Studies on the genus *Munida* Leach, 1820 (Galatheidae) in New Caledonian and adjacent waters with descriptions of 56 new species. In: A. Crosnier (ed.), Résultats des Campagnes Musorstom. vol. 12. *Mémoires Muséum national d'Histoire naturelle*, Paris. nat. 161: 421-569.
- MACPHERSON, E., 1995a. Crustacea Decapoda: New records of species of the genera *Munida* Leach, 1820 and *Paramunida* Baba, 1988 (Galatheidae) from New Caledonia, with the descriptions of 56 new species. In: A. Crosnier (ed.), Résultats des Campagnes Musorstom vol. 15. *Mémoires Muséum national d'Histoire naturelle*, Paris. 168: 423-431.
- MACPHERSON, E., 1995b. Crustacea Decapoda: Species of the genera *Munida* Leach, 1820 and *Paramunida* Baba, 1988 (Galatheidae) from the seas around the Wallis and Futuna Islands. In: A. Crosnier (ed.), Résultats des Campagnes Musorstom vol. 15. *Mémoires Muséum national d'Histoire naturelle*, Paris. 168: 387-421.

- MACPHERSON, E., 1997. Crustacea Decapoda: Species of the genera *Agononida* Baba & de Saint Laurent, 1996 and *Munida* Leach, 1820 (Galatheididae) from the KARUBAR cruise. In: A. Crosnier & P. Bouchet (eds.), Résultats des Campagnes Musorstom vol. 16. *Mémoires Muséum national d'Histoire naturelle*, Paris. 172: 597-612.
- MILNE-EDWARDS, A., 1880. Reports on the results of dredging under the supervision of Alexander Agassiz in the Gulf of Mexico, and in the Caribbean Sea, etc. VIII. Etudes préliminaires sur les Crustacés. *Bulletin of Comparative Zoology*, Harvard, 8 (1): 1-68.
- MILNE-EDWARDS, A. & E.L. BOUVIER. 1897. Reports on the result of dredging under the supervision of Alexander Agassiz, in the Gulf of Mexico (1877-1878), in the Caribbean Sea (1878-1879), and along the Atlantic coast of the United States (1880), by the U.S. Coast Survey "steamer Blake", Lieut.-Com. C.D. Sigsbee, U.S.N., and Commander J.R. Bertlett, U.S.N., Commanding. XXXV. Description des Crustacés de la Famille des Galathéides recueillis pendant l'expédition. *Memoirs of the Museum of Comparative Zoology*, Harvard 19 (2): 1-141.
- PORTER, C.E., 1916a. Los crustáceos decápodos chilenos del Museo Nacional (estudios críticos). III. La Fam. Galatheididae. *Boletín del Museo Nacional de Chile*, 9: 95-100.
- PORTER, C.E., 1916b. Materiales para la fauna carcinológica de Chile. XII. Sobre los Galatheididae del Museo Nacional. *Revista Chilena de Historia Natural*, 20: 111-117.
- RATHBUN, M.J., 1904. Decapod crustaceans of the northwest coast of North America. *Harriman Alaska Expedition*, Washington, 10: 1-190.
- RATHBUN, M.J., 1910. The stalk-eyed Crustacea of Peru and adjacent coasts. *Proceedings of the United States national Museum*, 38: 531-620.
- RETAMAL, M.A., 1981. Catálogo ilustrado de los Crustáceos Decápodos de Chile. *GAYANA*, (44): 7-67.
- SCHMITT, W.L., 1921. The marine decapod Crustacea of California. *University of California Publications in Zoology*, 23: 1-470.
- SCHULTZ, G.A., 1969. How to know the marine isopod crustaceans. W.M.C. Brown Company Publishers. U.S.A. 359 pp.
- WHITE, A. 1847., Description of a new genus and five new species of Crustacea. In: Jukes, Narrative of the surveying voyage of H.M.S. "Fly", ... in Torres Strait, New Guinea, and other Islands of the Eastern Archipelago during the years 1842-1846. 2 (8): 335-338.
- WICKSTEN, M.K., 1989. Ranges of offshore decapod crustaceans in the eastern Pacific Ocean. *Transactions of the San Diego Society of Natural History*, 21 (19): 291-316.

Michel E. HENDRICKX

Estacion Mazatlan UNAM

P.O.Box 811 Mazatlan Sinaloa 82000 Mexico

e-mail: michel@mar.icmyl.unam.mx