The genus *Munida* Leach (Crustacea, Decapoda, Galatheidae) 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. refugens*) and by James Benedict in 1902 (*M. debilis, M. hispida, M. mexicana, M. perlata, and M. tenella*). A western-Atlantic species, *M. microphthalmus* A. Milne-Edwards, is also reported from Coco Island, Costa Rica. *Munida debilis, M. tenella, M. mexicana, M. refugens* 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.

**Introduction**

Several genera of Galatheidae 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 *Bathy munida* (BAB & 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 bamifica* (PENNANT, 1777), reported from European waters under the name *Astacus bamificus*. 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 Galatheidae 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 doubtfull identification of a specimen collected off Coco Island, Costa Rica, with *Munida microphthalmus* A. Milne-Edwards, 1880, a species known from the west Atlantic. Posteriorly, BENE DICT (1902) reviewed the species of the Galatheidae of the United States National Museum and described 45 species of Galatheidae, 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 Galatheidae 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. refugens* correspond to previously known range of these species. Record
<table>
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<th>SPECIES</th>
<th>TYPE LOCALITY</th>
<th>DEPTH RANGE (m)</th>
<th>NORTHERNMOST RECORD</th>
<th>SOUTHERNMOST RECORD</th>
<th>NUMBER OF LOCALITIES CITED</th>
<th>NEW</th>
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<td><em>M. curvipes</em> Benedict, 1902</td>
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<td>Gorda Bank, BCS</td>
<td>Tres Marias Islands</td>
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<td>2</td>
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<td>180-280</td>
<td>Gulf of Panama</td>
<td>Paita, Peru</td>
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<td><em>M. gregaria</em> (Fabricius, 1793)</td>
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<td>Ancud, Chile</td>
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<td><em>M. hispida</em> Benedict, 1902</td>
<td>Galapagos Islands</td>
<td>165-518</td>
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<td>Banco de Mancora, Peru</td>
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<td><em>M. mexicana</em> Benedict, 1902</td>
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<td>165-145</td>
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<td><em>M. macrophthalmus</em> A. Milne-Edwards, 1880</td>
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<td>490-1713</td>
<td>Gulf of Panama</td>
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<td>Los Coronados Islands, BC</td>
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<td><em>M. refugens</em> Faxon, 1893</td>
<td>Off Cocos Island, off Ecuador and near Tres Marias Islands</td>
<td>76-202</td>
<td>Gorda Bank, BCS</td>
<td>Off Ecuador</td>
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<td><em>M. subrugosa</em> (White, 1847)</td>
<td>Rendez-Vous Cove, Auckland Island</td>
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<td><em>M. tenella</em> Benedict, 1902</td>
<td>Off San Jose Island, Gulf of California</td>
<td>27-130</td>
<td>Cabo Tepoca, SON</td>
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<tr>
<td><em>M. williamsi</em> sp. nov.</td>
<td>Off Consag Rocks</td>
<td>29-103</td>
<td>Consag Rocks</td>
<td>Willard Point</td>
<td>-</td>
<td>7</td>
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<tr>
<td><em>M. bupensis</em> sp. nov.</td>
<td>27°52.5'N-112°31.5'W</td>
<td>620</td>
<td>Gulf of California 27°52'N-112°31'W</td>
<td>-</td>
<td>-</td>
<td>1</td>
</tr>
</tbody>
</table>

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 Tastiotla (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 redescriptions 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 ethymology 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. microphthalmia*, 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 hapensis* 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.)
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 tubercules; 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 ligh 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-outter 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; polex without spines; tip of fingers bifid; 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 pereiopod with a row of 11 sharp, curved dorsal spines on merus; 3 small spines on dorsolateral 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 tubercules 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 antennal 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).
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).

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<th>O_2 (ml/l)</th>
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<td>CORTES 2</td>
<td>50</td>
<td>20/03/85</td>
<td>97/T</td>
<td>13.2</td>
<td>1.9</td>
<td>62</td>
<td>34</td>
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<tr>
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<td>57</td>
<td>21/03/85</td>
<td>57/O</td>
<td>18.5</td>
<td>4.8</td>
<td>95</td>
<td>–</td>
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<tr>
<td>CORTES 2</td>
<td>62C</td>
<td>22/03/85</td>
<td>30-40/T</td>
<td>18.0</td>
<td>3.0</td>
<td>89</td>
<td>–</td>
</tr>
<tr>
<td>CORTES 3</td>
<td>3</td>
<td>09/08/85</td>
<td>27/T</td>
<td>29</td>
<td>4.5</td>
<td>87</td>
<td>–</td>
</tr>
<tr>
<td>CORTES 3</td>
<td>8</td>
<td>30/07/85</td>
<td>42/O</td>
<td>19.8</td>
<td>3.4</td>
<td>97</td>
<td>–</td>
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<td>1/08/85</td>
<td>115/T</td>
<td>16.3</td>
<td>2.22</td>
<td>97</td>
<td>–</td>
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<td>03/08/85</td>
<td>79/T</td>
<td>22.7</td>
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<td>29/T</td>
<td>28.0</td>
<td>4.0</td>
<td>91</td>
<td>–</td>
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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 future 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 pereiopods) are rarely find 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 mlO₂/l, respectively (Table 2).

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


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 pair of small 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 supraoculairs 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. 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, mesiodistal 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 cylindricus, about same length as dactylus. Pereiopods long and slender. Merus of second pereiopod 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)


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 spinulosus, 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 spinulated. 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 antennal 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 maxilliped 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 pereiopod 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)


**MATERIAL EXAMINED**
SIFCO 1, St. C2, off Punta Fiaxtla, 24/IV/81, 3 specimens (C.L. 8.0 - 10.3 mm), 66 m, trawl (EMU-2802).
CORTES 1, St. C2, 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, off San Marcial Point, 11/III/85, 95 unsexed specimens (C.L. 4.0 - 11.0 mm) and 18 ovigerous females (C.L. 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/VI/85, 14 unsexed specimens (C.L. 6.0 - 9.0 mm) and 10 ovigerous females (C.L. 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.
DESCRIPTION

Carapace with well-marked transverse striae; 4 pairs of epicranial 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 spinulation. 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 transverse 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 maxiliped 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-

Fig. 8. – *Munida mexicana* Benedict, 1902. A-C) Development of the hiatus of cheliped.
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 tip bifid or trifid. Carpus short, less than 1/4 length of dactylius; 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 pereiopod with a row of 12-15 sharp, regularly spaced dorsal proximal 1/3; dactylus with a strong, cylindrical projecting tip bifid or trifid. Carpus short, less than 1/4 length of dactylius; 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 tip bifid or trifid. Carpus short, less than 1/4 length of dactylius; 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

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 pereiopod 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).


(Fig. 9)


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. microphthalmal* 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. microphthalmal* 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
hepatic, branchial or postcervical spines, very small eyes (less than 1/8 the length of the rostrum), very sharp, diverging supraocualr spines, strongly diverging anterolateral spines that do not reach the sinus between the rostrum and the supraocualr spine, 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. microphthalma* 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.

**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 spines 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 spines close to posteroalateral 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 diminue 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 spines 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 pereiopod 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 pereiopod, 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' - 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-Leon (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.

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8. *Munida perlata* Benedict, 1902
(Fig. 11)


**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, parhepatic, 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 antennar 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 maxiliped 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 spindulous; 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 pereiopod 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 spines on propodus; propodus about 2/3 merus length; dactylus about 1/2 propodus length.

**TYPE LOCALITY**
Galapagos Islands.

**KNOWN LOCALITIES**

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

**DEPTH RANGE**

**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)

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.
**DESCRIPTION**

Carapace with distinct transverse striæ; 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 spinulous, their tip slightly overreaching the cornea; anterolateral spines medium-size, shorter that 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 serie of pits (third) or a smooth. Second pereiopod with strong spines along the superior edge 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 pereiopod 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**


**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)


**MATERIAL EXAMINED**

CORTES 1, St. 55, off Gorda Bank, 13/V/82, 4 males (C.L. 21.8-25.9 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 striæ, 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 subcarrate and with 2-3 subterminal lateral spines and a variable number of distal spines. 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 striæ, the posteriormost forming an arch; fifth sternite with a pair of transverse striæ; 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, ticker 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 inconspicuous distomesial spine; an inconspicuous 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 diminate distal spine, similar in size and shape to the distal spine on flexor margin. Chelipeds very long and slender, entirely covered with flattened granules (squamosum). 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 pereiopod 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 diminute movable spines 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

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. refugens.

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_2/1, respectively (Table 2).

11. Munida tenella BENEDICT, 1902
(Fig. 14)


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 subcerebral 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 sharper 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. Stermites 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 spinous. 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 unarmend, except for a diminate 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 spinous, 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, straigh, not gaping, fingers with numerous projecting teeth. Pereiopods slender. Second pereiopod 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 disoventral spine on outer side; one disoventral 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-5539). Paratype, male (7.5 mm C.L. wr; 11.1 mm C.L.), same station (EMU-5530). Paratype, male (7.7 mm C.L. wr; 11.1 mm C.L.), same station (EMU-5551). 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-5562). Paratype, female (14.2 mm C.L.), CORTES 3, St. 33, off Willard Point, 03/VII/85, 76-82 m, trawl (EMU-5564).

**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-5566); 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-5568). 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-5563); same station 10 males (C.L. 8.4-13.1 mm) and 19 ovigerous females (C.L. 8.6-13.9 mm) (EMU-5565); 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-5569).

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-5567).

**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. Postvertical spines generally obsolete or absent. Frontal margin transversely oblique. Rostrum very long, almost straight, dorsally subcurred; 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 antennal 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 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 trifid. Pereiopods slender. Second pereiopod 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.

**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°46.0'N - 114°09.0'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 characteristics: 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 postvertical 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 pereiopod 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 postvertical spine on the left side of the carapace and, in some small specimens, an obsolete 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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