

Three new species of Cumacea from the gulf of California (Crustacea, Peracarida).

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Abstract : This paper is a contribution to our knowledge of the cumacea from the western coast of Mexico. Three species new to science from the gulf of California are described : *Diastylis calderoni*, *Cyclaspis concepcionensis* and *Cyclaspis bituberculata*. These are the first three species that are described from this geographic region.

Résumé : Le présent travail est une contribution à la connaissance des Cumacés du golfe de Californie, Mexique. Trois nouvelles espèces sont décrites, elles ont été collectées dans la zone intermarée et dans des eaux peu profondes avec des fonds sableux. Les trois nouvelles espèces *Diastylis calderoni*, *Cyclaspis concepcionensis* et *Cyclaspis bituberculata* sont les premières qui ont été décrites pour cette région géographique.

INTRODUCTION

The cumacean fauna of the gulf of California is virtually unknown. There are only two references somewhat related to our knowledge covering this geographic region. In the sandy-beach fauna of Puerto Peñasco, Sonora, Dexter (1976) listed *Leptocuma forsmanni* Zimmer (1943), a species also occurring in Guaymas and off Percebu Lagoon in the west side of the gulf (pers. obs.). The mention of *Cumella* sp. by Brusca (1980) is the other reference. Only recently was attention paid to a small collection of Cumacea collected mainly from the coasts of Baja California where new species were found (Donath-Hernández, unpubl.). Geographic range extensions were also made as a result of such a study (Donath-Hernández, 1987). This paper describes *Diastylis calderoni* n. sp., *Cyclaspis concepcionensis* n. sp. and *Cyclaspis bituberculata* n. sp., the first three new species of Cumacea reported from the gulf of California (Fig. 1A).

Body length was measured from the anterior tip of the carapace to the posterior edge of the telsonic segment. Exhalant siphons and uropods were excluded in every measurement. Holotypes were deposited in the crustacean collection at the biology institute of the university of Mexico (UNAM) ; paratypes at centro de investigacion cientifica y de educacion superior de Ensenada (CICESE). Used abbreviations for material examined are as follow : juveniles (juv.), adults (ad) and ovigerous (ovig).

Diastylis calderoni n. sp.

Material examined. Type locality, Estero de Morua en Puerto Peñasco, Sonora,

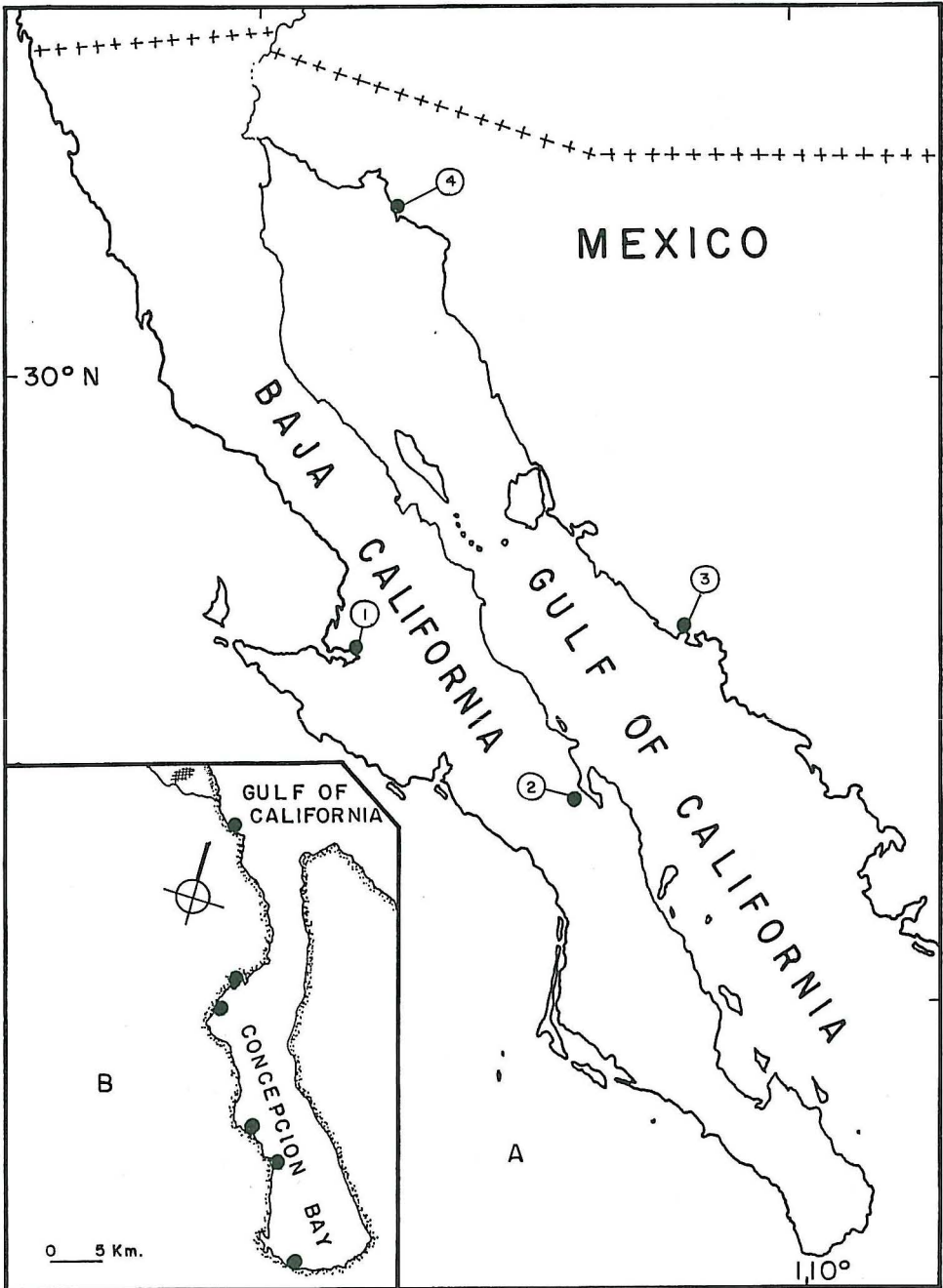


Fig. 1 - Baja California and gulf of California, Mexico. Sampling sites of Cumacea : A, Laguna Ojo de Liebre (1), Bahía Concepción (2), Bahía Bacochibampo (3), and Estero de Merúa (4). B, Bahía Concepción.

Mexico (northeastern gulf of California : 31° 17' N, 113° 26' W). January 1985, holotype adult ♀ (N° 6839 EM). Paratype from type locality : 1 ♀ adult (C. CUM.001).

This species is named after the collector of the only two specimens examined, Luis E. Calderon-Aguilera.

Description. Adult ♀, 6 mm total length (Fig. 2 A, B). Integument well calcified, white, with strong reticular pattern and pitted. Carapace length 1.6 mm, width 1.2 mm and height 1.0 mm, shallowly arched dorsally, mid-dorsal carina absent, single pair of large pointed teeth on each side of the pseudorostral lobes, short concave ridge extending to anterolateral angle of carapace from each tooth ; second ridge beginning behind each antero-lateral tooth extending backward and upward and bending around in a turn, back anteriorly. Rounded eyelobe with three distinct lenses. Pseudorostrum about 1/5 of carapace length, rather sharp in lateral view, slightly blunt anteriorly, tip finely serrated and with four setae. Antennal notch smooth, poorly excavated. Antero-lateral angle with strong pointed tooth, and very small ones posteriorly. Lower margin of carapace somewhat crenulate.

Five pedigerous somites exposed, together about 1/5 of total length, pedigerous somites 1 and 2 narrow ; posterolateral angles of pedigerous somite 5 very long and pointed.

Abdomen more than 1.5 times carapace length : posterolateral angles of abdominal somites 3-5 produced into long spines. Telson one and quarter times the length of the last abdominal somite. Pre-anal part of telson shorter than post-anal, latter with three pairs of lateral spines and pair of very short ones (Fig. 2 L,N).

Antennule (Fig. 2 C) : segment 1 about twice length of segment 2 and very slightly longer than segment 3. Flagellum 4-segmented, segment 2 longest ; accessory flagellum 3-segmented, about 2/3 the length of basal segment of main flagellum.

Antenna (Fig. 2 D) : 4-segmented, setose, distal segment very small, with a terminal feathered seta.

Maxilliped 3 (Fig. 2 E,F) : Basis slightly longer than 1.5 times length of rest of limb (excluding process), external angle developed into process reaching end of merus, bearing about 4 distal feathered setae. Merus with external angle slightly produced, bearing a long feathered seta distally reaching far beyond end of propodus.

Pereopod 1 (Fig. 2 G) : basis slightly shorter than rest of limb. Ischium shorter than merus. Carpus slightly longer than propodus. Dactylus as long as ischium and merus together.

Pereopod 2 (Fig. 2 H) : basis little more than half length of rest of limb. Ischium short. Merus 2.5 times as long as ischium. Carpus 3 times as long as propodus and half as again as dactylus.

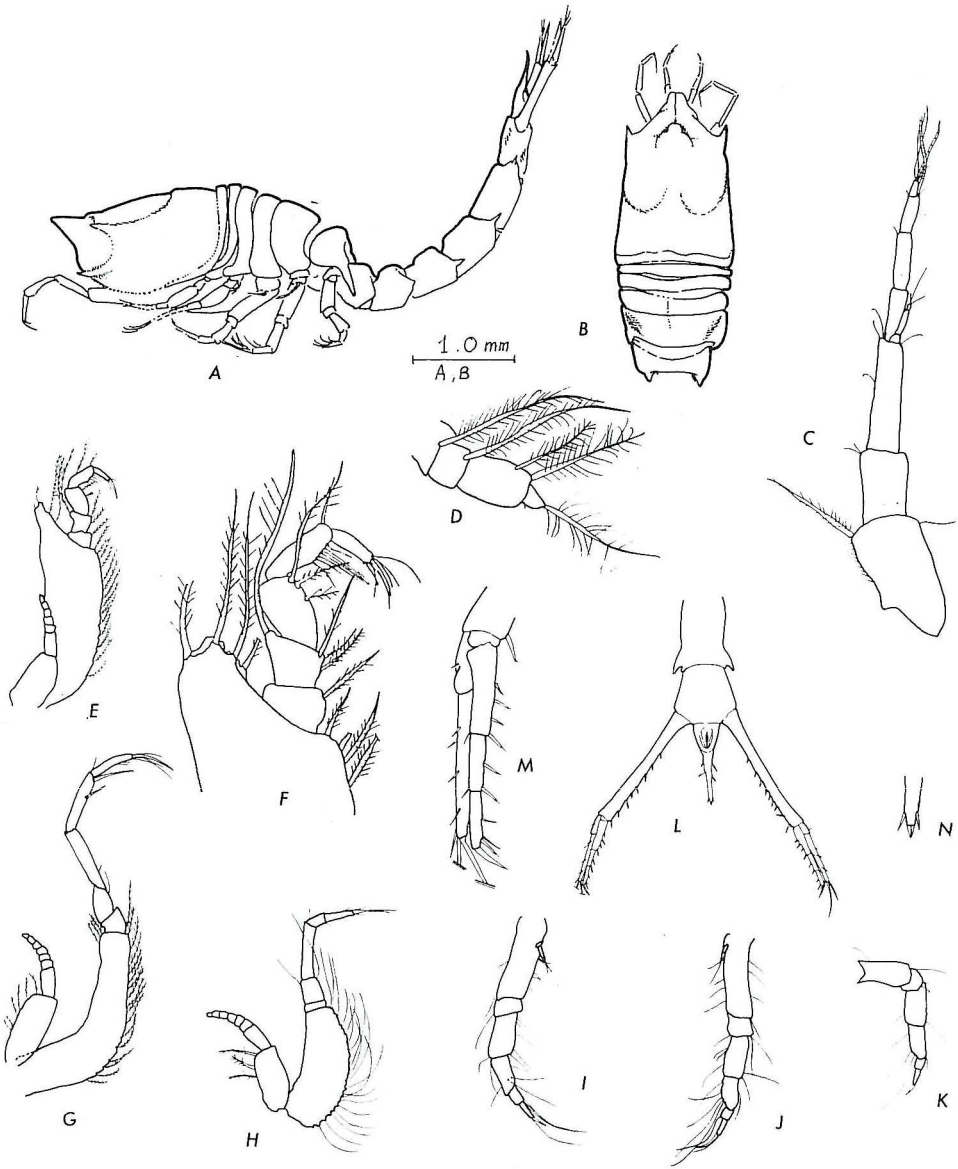


Fig. 2 - *Diastylis calderoni* n. sp. A, adult female, side view; B, cephalothorax, dorsal view; C, antennule; D, antenna; E, maxilliped 2; F, maxilliped 3; G-K, pereopods 1-5; L, uropod; M, uropodal rami; N, telson, distal end.

Pereopods 3 (Fig. 2 I): basis slightly shorter than rest of limb, with rudimentary exopod. Ischium very short. Merus slightly longer than half again as long as carpus. Propodus and dactylus each as long as ischium.

Pereopods 4 and 5 (Fig. 2 J,K) similar to pereopod 3 but shorter; pereopod 4 with rudimentary exopod.

Uropod (Fig. 2 L): peduncle 1.6 times length of telson, with nine spines on inner margin. Rami subequal (Fig. 2 M); endopod 3-segmented, longer than exopod, ratio peduncle/endopod = 1.7; first segment of endopod about as long as next two equally long segments combined; with flagellated terminal spine. Exopod with slender subequal terminal spines.

Remarks. Approximately 16 species of *Diastylis* are known for the entire eastern Pacific coast and the genus has not been previously recorded in the shallow-waters of the Pacific coast of Mexico.

D. calderoni resembles *D. planifrons* Calman, 1912 (Magellan Strait) but it differs by a carapace with a strong tooth on the antero-lateral angle and the absence of a mid-dorsal ridge. The morphology of the third maxilliped is distinct, the pereopod 2 has a longer carpus and the uropodal endopodite is longer than the exopodite. Four other species clearly distinguishable from *D. calderoni* but found near Mexico are: *D. californica* Zimmer, 1936., *D. paraspinulosa* Zimmer, 1926., *D. pellucida* Hart, 1931 and *D. abboti* Gladfelter, 1975. All of them differ to the new species by a carapace distinctly sculptured and the absence of the lateral tooth.

The proportion between the telsonic somite and the telson is subequally similar in *D. calderoni* and *D. abboti*, and equal in *D. californica*. Among the five species *D. pellucida* has the longest telson and an uropodal endopodite 2-segmented.

Cyclaspis concepcionensis n. sp.

Material examined. Bahia Concepcion, March 1983: 11 ♀♀ ad., 30 ♀♀ ovig., 14 ♂♂ ad. Holotype ovigerous ♀ (6837 EM), allotype adult ♂ (6837-A EM); paratype ovigerous ♀ (C. CUM002).

Description. Ovigerous female, 2.1 mm total length (Fig. 3 A, B). Carapace well calcified, brittle with distinct reticulate pattern; about 1/3 total length, slightly higher than wide, its height about 3/4 its length; subovoid in dorsal view; frontal lobe shallowly depressed posteriorly; dorso-median carina well developed but flattened for a short distance on posterior half; dorsal margin in side view almost straight and elevated posteriorly; pseudorostral lobes meeting in front of ocular lobe to scarcely form a pseudorostrum; ocular lobe subtriangular with 10 lenses (not drawn) arranged as follows: 1 frontal, 1 central and 2 postero-dorsal lenses as large clear areas, and 3 small edges lenses on both sides; antennal notch distinct, antero-lateral angle subacute.

Combined length of all free pedigerous somites 1/5 total length; dorso-median carina well defined on somites 1-3, barely observable on last two somites; somite 1 exposed on sides but almost concealed on dorsal mid-line; somite 2 in side

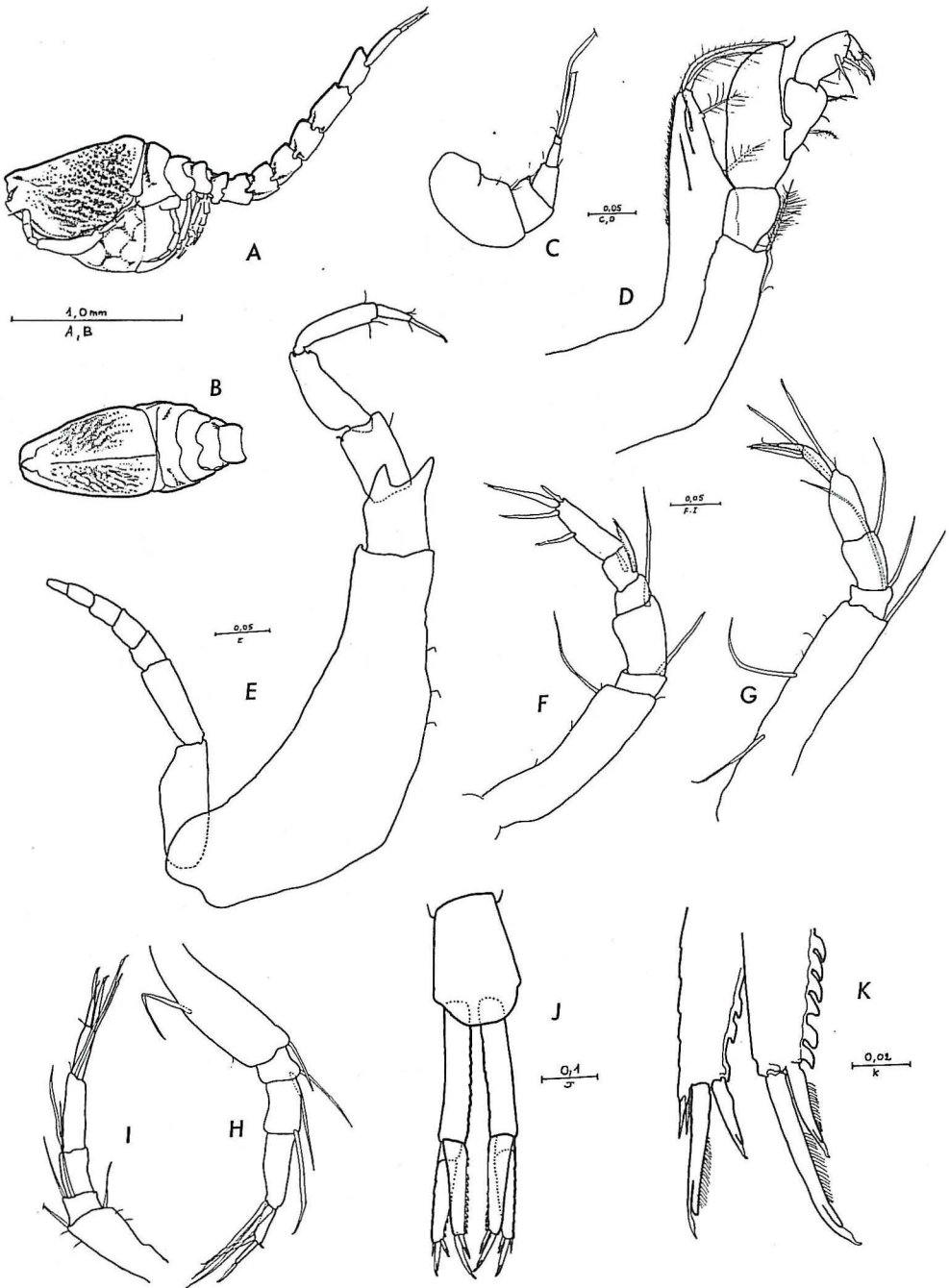


Fig. 3 - *Cyclaspis conceptionensis* n. sp. A, ovigerous female, lateral view; B, cephalothorax, dorsal view; C, antennule; D, maxilliped 3; E-I, pereopods 1-5; J, pleotelson and uropods; K, uropodal rami, distal end.

view continuing the even posterior curve of dorsal margin of the carapace, anterior pleural part expanded; somite 3 in side view somewhat extended posteriorly on mid-line of somite 4; last two somites dorsally depressed bearing a pair of short dorso-lateral elevations.

Abdomen less than $1/2$ total length, first five abdominal somites with single carina along mid-line, articular pegs well developed.

Antennule (Fig. 3 C): peduncle with segments 2-3 combined $3/4$ as long as segment 1; main flagellum 2-segmented, segments combined as long as segment 3 of peduncle; accessory flagellum not perceptible.

Maxilliped 3 (Fig. 3 D): basis strongly angled, slightly longer than rest of limb (excluding process), external angle developed into a process reaching end of a merus and bearing two feathered setae on inner border, three on ventral face near outer border and two distal. Merus with external angle also developed into a process, reaching far beyond end of carpus. Carpus shorter than two distal segments combined. Propodus slightly longer than twice as long as dactyl.

Pereopod 1 (Fig. 3 E): basis longer than rest of limb. Ischium $1/7$ as long as basis, with two distal tooth like projections Merus and propodus each shorter than carpus. Dactylus slightly shorter than half as long as propodus, bearing a terminal spine.

Pereopod 2 (Fig. 3 F): basis shorter than rest of limb, Ischium and merus, bearing a distal inner simple seta. Merus longer than carpus and propodus combined. Propodus longer than carpus, bearing two subequal spines. Dactylus longer than merus, bearing two subequal terminal spines.

Pereopod 3 (Fig. 3 G): basis slightly longer than rest of limb, bearing a distal inner simple seta. Ischium and merus with two and one distal inner simple setae respectively. Carpus and propodus bearing two distal simple setae reaching far beyond end of dactylus. Carpus longer than either merus or propodus. Dactylus longer than half length of propodus, bearing a strong terminal spine.

Last two pairs of pereopods (Fig. 3 H, I) similar to pereopod 3. Basis decreasing in length from third to fifth. Merus $3/4$ as long as carpus. Carpus about as long as propodus and dactylus combined.

Uropod (Fig. 3 J, K): peduncle as long as last abdominal segment, without spines or setae on both margins. Ratio peduncle/exopod = 1.4; exopod slightly longer than endopod; both rami with inner margin serrated and bearing two subequal terminal flagellate spines. Exopod also bearing 1-2 outer terminal setae.

Adult male, 2.6 mm total length (Fig. 4 A, B). Differs from female as follows: carapace about $1/3$ total length, less wide and its height slightly longer than $3/5$ length, with lateral very fine oblique granular stria on distinct reticular pattern. Dorsal margin in side view straight and not elevated posteriorly. Pseudorostral lobes barely meeting in front of ocular lobe. Ocular lenses larger than in female.

First free pedigerus somite almost coancealed, barely visible in dorsal view; somite 2 deep, sloping steeply backwards; last stout three somites dorsally depressed

with side plates well developed.

Abdomen slightly longer than half total length, and as usual stouter than in female; somites 1-4 dorsally wider than last two somites.

Antennule: peduncle with segment 2 slightly shorter than segment 3, both segments combined 2/3 as long as segment 1. Main flagellum with proximal segment 2/5 as long as segment 3 of peduncle.

Antenna: Peduncle 3-segmented; segment 3 setose, longer than first two segments combined, flagellum reaching far beyond end of last abdominal segment.

Pleopod (Fig. 4 C): peduncle about twice as long as rami, bearing three plumose setae on inner margin; endopod without outer process, exopod 2-segmented, segments equally long.

Uropod (Fig. 4 D): peduncle bearing 5-7 feathered setae and 6-8 flagellate spines on inner margin; rami subequal, serrated on last third of inner margin. Endopod (Fig. 4 E) bearing flagellate spines, 6-8 short ones on inner margin and two subequal distally. Exopod bearing two long feathered setae on inner margin and three subequal terminal spines: two flagellate and one rudimentary spines.

Habitat. Intertidal, along the western sandy beaches of Bahia Concepcion (Fig. 1 B).

Cyclaspis bituberculata n. sp.

Material examined. Bahia Concepcion, March 1983, 3 ♀♀ juv. Laguna Ojo de Liebre, 27°45' - 27°53' N, 114°06' - 114°19' W (southwestern Baja California), February 1984, 1♀ juv. Bahia Bacoichampo, 27°54' - 27°57' N, 110°58' - 111°06' W (coast of Guaymas, Sonora, Mexico), June 1984, 2 ♀♀ ovig. Holotype ovigerous ♀ (6838 EM). Type locality: Bahia Bacoichampo. Paratype ovigerous ♀ (C. cum 003).

Description. Ovigerous female, 5.2 mm total length (Fig. 5 A, B), carapace about 1/3 total length, higher than wide, vertical depth shorter than 2/3 its length, coarsely reticulately pitted with fine reticulate background pattern, limy granules thick on raised edges of large reticulations and bottoms of the pits less calcified; on either side below lateral parts of pseudorostral suture is a tubercle.

Dorso-median carina well developed from middle of ocular lobe, dorsal margin little arched in lateral view with a posterior hump. Pseudorostral lobes not quite attaining apex of ocular lobe. Ocular lobe about 1/5 carapace length, broadest anteriorly with small but distinct nine lenses. Antennal notch distinct, moderately deep; antero-lateral angle subacute.

Combined length of all free pedigerous somites longer than 1/5 total length; five somites visible; somite 2 deep, with dorsal margin sloping moderately back from level of upper edge of carapace; pleural parts broadened and antero-laterally extended reaching lower hinder margin of carapace; somite 3 narrow dorsally with

dorsal margin evenly arched and pleural parts also widened and postero-laterally extended; two last somites less deep with mid-dorsal carina more developed than first three somites.

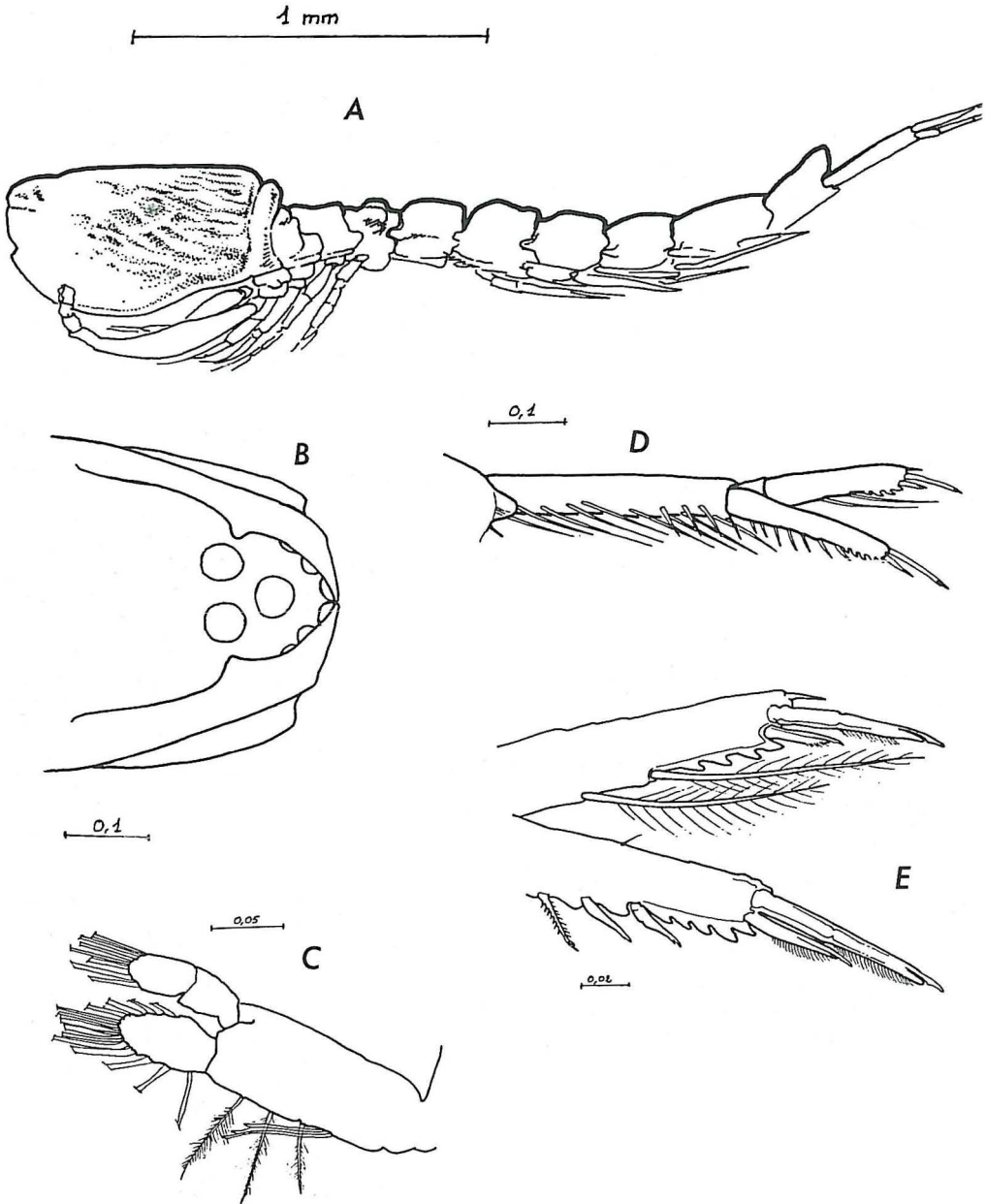


Fig. 4 - *Cyclaspis conceptionensis* n. sp. A, adult male, lateral view; B, carapace, dorsal view; C, pleopod; D, uropod; E, uropodal rami, distal end.

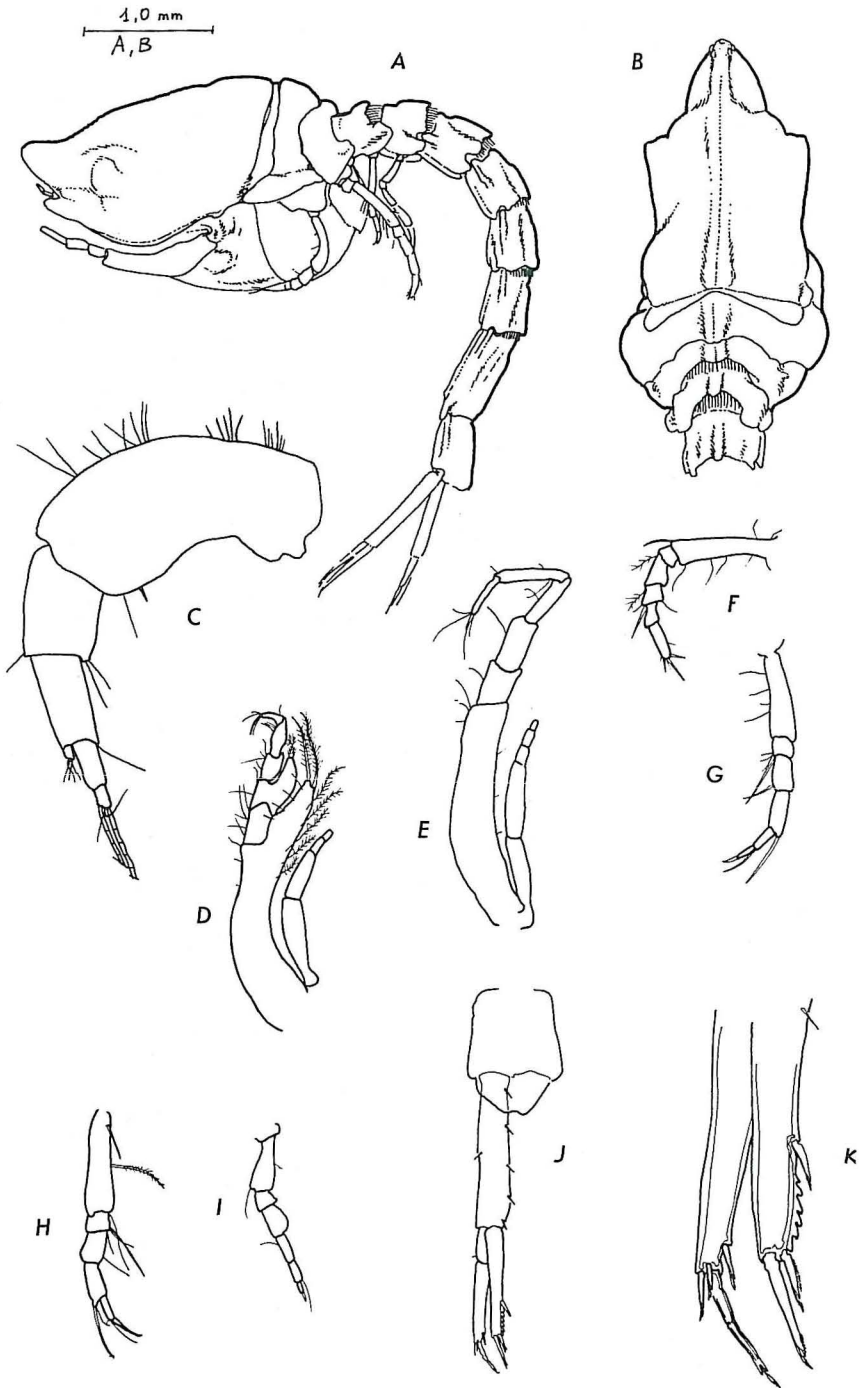


Fig. 5 - *Cyclaspis bituberculata* n. sp. A, ovigerous female, lateral view; B, cephalothorax, dorsal view; t = tubercle; C, antennule; D, maxilliped 3; E-I, pereopods 1-5; J, uropod; K, uropodal rami. D-I (100 x), C and K (400 x).

Abdomen half total length, first to fourth abdominal somites with a well developed median carina and including last pedigerous somite, with dorso-lateral carina on each side. Articular pegs well developed.

Antennule (Fig. 5 C): segment 1 longer than segments 2-3 combined; segments 2 longer than segment 3; main flagellum 2-segmented, half as long as segment 3 of peduncle; accessory flagellum well developed.

Maxilliped 3 (Fig. 5 D): basis much longer than rest of limb (excluding process), external angle developed into a process reaching distal end of merus, bearing plumose setae, five near outer margin, four on inner margin and two distal. Ischium longest of remaining segments, its length less than 1/5 as long as basis. Merus with external angle also developed into a process, slightly exceeding end of carpus, bearing a terminal plumose seta. Propodus longer than carpus or dactylus. Dactylus bearing three terminal spines.

Pereopod 1 (Fig. 5 E): basis shorter than rest of limb. Ischium 1/7 as long as basis. Merus slightly longer than half again as long as ischium. Carpus longer than merus and shorter than propodus. Dactylus about equal to merus; bearing two slender sub-equal terminal spines and long terminal seta.

Pereopod 2 (Fig. 5 F): basis shorter than half length of rest of limb, bearing on dorsal face a double row of denticles (not drawn). Ischium 1/5 as long as basis. Merus longer than carpus. Carpus longer than propodus, bearing a stout distal inner spine. Dactylus as long as carpus and propodus combined.

Last three pairs of pereopods all alike (Fig. 5 G-I); basis decreasing in length from third to fifth; merus shorter than carpus, widened on last pereopod.

Uropod (Fig. 5 J): peduncle longer than last abdominal somite, bearing five small spines on inner margin. Rami shorter than peduncle. Ratio peduncle/endopod = 1.9; endopod serrated on last third part of inner margin bearing an inner spine and two subequal terminal flagellate spines with sensory tip. Ratio peduncle/exopod = 1.6; exopod also bearing flagellate spines with sensory tip, 1 subterminal on inner margin and three subequal terminal ones.

Habitat. In all three localities, both inside and outside the gulf of California, *C. bituberculata* was found in sand; intertidal in Bahia Concepcion (Fig. 1 B) and Laguna Ojo de Liebre (Scammon's Lagoon). Depth of collecting in Bahia Boca-chibambo unknown.

Remarks. *C. conceptionensis* is close to the following American species with both uropodal rami truncate and each armed with two terminal spines: *C. pustulata* Zimmer, 1943, from northeastern USA; *C. platymeruss* Zimmer, 1944, and *C. bacescui* Omholt & Heard, 1982, from the gulf of Mexico, *C. jonesi*, *C. micans* and *C. reticulata*, all of them described by Roccatagliata (1985) from Brasil and Argentina and *C. perelegans* Roccatagliata, 1987, from Brasil.

C. conceptionensis differs from all these species as follows: in *C. pustulata* the carapace has a longitudinal ridge; in *C. platymeruss* the carapace lacks a pseudo-

rostrum and has two protuberances on the frontal lobe ; in *C. bacescui* the carapace lacks also a pseudorostrum and has numerous oblique striae ; *C. jonesi* and *C. micans* are longer species, the carapace lacking a coarse reticulated pattern ; in *C. jonesi* the abdominal segments 1-4 have a double dorso median carina while in *C. micans* they are uncarinated ; in *C. reticulata* the carapace has a conspicuous mid-dorsal elevation on the frontal lobe of the males and in the females the posterior dorsal hump is almost unnoticeable, the last two thoracic somites lack dorso-lateral elevations and the segments of the third maxilliped and the first pereopod have marginal serrations and lamellae ; in *C. perelegans* the carapace is remarkably sculptured by prominent ridges.

Another very close Brazilian species to *C. conceptionensis* is *C. striata* Rocca-tagliata 1987. In *C. striata* the abdominal segments have a double dorso-median carina and, as in *C. micans*, the third maxilliped has a merus with an upper border of the process truncated. The uropodal exopodite bears more than two setae on the inner margin and the endopodite has only a terminal spine.

There are only three known species of *Cyclaspis* from the eastern Pacific ; *C. nubila* Zimmer, 1936, from California ; *C. testudinum* Zimmer, 1943, from the Galapagos Islands and Colombia, and *C. peruana* Zimmer, 1943, from Peru. All of them differ from *C. conceptionensis* by having two or more spine on the inner margin of the uropodal endopodite of the females and only one terminal spine on both rami.

C. bituberculata can be easily distinguished from any of the American species by a carapace with two antero-lateral tubercles and with the exception of *C. dolera* Zimmer, 1944, by an elongated and narrow ocular lobe.

ACKNOWLEDGMENTS

To Dr. Mihai Bacescu and an anonymous reviewer for their important suggestions to the improvement of this paper. To Dr. John C. Markham for his English corrections to the manuscript and to Dr. Tomas Camarena for the abstract in french ; to Mrs. Clara Yañes for most of the drawings. This paper was part of the author's thesis submitted to CICESE in partial fulfillment of the requirements for the Degree of Master of Science. Financial support was made available through a scholarship from Consejo Nacional de Ciencia y Tecnologia and Centro de Investigaciones de Quintana Roo.

Resumen : El presente trabajo es una contribución al conocimiento de los cumáceos de la costa occidental de México. Se describen tres nuevas especies para la ciencia : *Diastylis calderoni*, *Cyclaspis conceptionensis* y *Cyclaspis bituberculata*, encontradas en la zona intermareal de playas arenosas del Golfo de California. Estas son las tres primeras especies que se describen en esta región geográfica.

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