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Monstrilloid copepods (Crustacea: Copepoda) of Mexico: redescriptions of three species of *Cymbasoma* Thompson, 1888

Монстриллоидные копеподы (Crustacea: Copepoda) Мексики: переописания трех видов рода *Cymbasoma* Thompson, 1888

Eduardo Suárez-Morales
Э. Суарес-Моралес

El Colegio de la Frontera Sur [ECOSUR] Unidad Chetumal. Av. Centenario Km. 5.5, Chetumal, Q. Roo 77014. Mexico.
Eduardo Suárez-Morales: esuarez@ecosur.mx — ORCID: orcid.org/0000-0003-2051-8707

KEY WORDS: semi-parasitic copepods, *Cymbasoma*, zooplankton, Caribbean Sea, taxonomy, redescription.
КЛЮЧЕВЫЕ СЛОВА: полупаразитические копеподы, *Cymbasoma*, зоопланктон, таксономия, переописание.

ABSTRACT. Considering the upgraded descriptive standards for monstrilloid copepods published by Grygier & Ohtsuka [1995], the type specimens of Mexican species were re-examined and redescribed. This study includes the redescription of three Mexican species of *Cymbasoma* Thompson, 1888, currently known as the most diverse genus of the copepod order Monstrilloida. The redescriptions were prepared following currently used standards, particularly in reference to the setal armature of the antennules and details of the cephalothorax integumental ornamentation. This revision reveals previously unnoticed characters; new comparisons of these species with recently described taxa are also provided.

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РЕЗЮМЕ. В свете продвинутых стандартов описания монстриллоидных копепод, принятых в 1995 г., даны переописания трех мексиканских видов *Cymbasoma* Thompson, 1888, наиболее разнообразного рода в отряде копепод Monstrilloida. Переописания соответствуют современным стандартам, в частности, охарактеризованы такие признаки, как строение щетинок на антеннах и детали скульптуры покровов головогруди. Некоторые признаки охарактеризованы впервые; приведены сравнения переописываемых видов с видами, описанными недавно.

Introduction

Members of the copepod order Monstrilloida Sars, 1901 are endoparasites infecting benthic marine invertebrates, *i.e*., polychaetes, molluscs, sponges [Huys *et al*., 2007; Jeon *et al*., 2018; Suárez-Morales, 2018]. Their infective early nauplii and non-feeding reproductive adult and preadult stages are planktonic; they are frequently found in routine zooplankton surveys in coastal systems at all latitudes [Suárez-Morales, 2011, 2018]. Their true diversity is still being explored and it is likely that it is largely underestimated because of their complex like cycle.

The taxonomy of this peculiar group has been hampered mainly by poor original descriptions, thus leading to a limited comparative taxonomic work [Suárez-Morales, 2011, 2018] and doubtful regional records [Suárez-Morales, Grygier, 2021]. The contributions by Grygier & Ohtsuka [1995] addressed the need to establish new descriptive standards for adult monstrilloid copepod comparative work; they proposed upgraded standards for describing the monstrilloid body and appendages, including a systematized nomenclature to recognize the antennules setal elements. Subsequently, the same authors [Grygier, Ohtsuka, 2008] proposed upgraded standards to describe the body integumental ornamentations, pore patterns, and other micro-characters. These two works have become a key reference for describing monstrilloid copepods. During the 1990s, I described several species of monstrilloid copepods of the genera *Monstrilla* Dana, 1849 and *Cymbasoma* Thompson, 1888 that were collected from Mexican waters [Suárez-Morales, 1993a–c, 1994; Suárez-Morales, Palomares-García, 1995; Suárez-Morales, Escamilla-Sánchez, 1997], but was unaware at that time of Grygier & Ohtsuka's [1995] publication with the upgraded descriptive standards. Therefore, I considered that these species should be re-examined and redescribed to match the upgraded standards and thus allow a more accurate morphological comparative work within the highly diverse genus *Cymbasoma*.

Material and Methods

Adult monstrilloid copepods were collected during zooplankton sampling from coastal systems of the Mexican waters of the southern Gulf of Mexico and the Caribbean Sea during 1990–1997. The type specimens were deposited at that time in the U.S. National Museum of Natural History, Smithsonian Institution [USNM] and some specimens were deposited in the collection of Zooplankton held at El Colegio de la Frontera Sur [ECOSUR] [ECO-CHZ-] and were also examined. The species were originally described in different papers by the

author [Suárez-Morales, 1993a–c, 1994] but taxonomically relevant characters like the antennulary setation pattern remained undescribed in all cases. This group of species includes members of *Cymbasoma* Thompson, 1888, the most diverse genus worldwide [Suárez-Morales, McKinnon, 2016, 2025]. During the years 2002–2003, I had the opportunity to reexamine these type specimens with the intention of upgrading and completing their morphological descriptions. In all cases, the original zooplankton samples were fixed in formaldehyde solution, and once sorted, monstrilloid copepods were transferred to 70% ethanol for taxonomic examination and long-term preservation. The type specimens were re-examined and illustrated with the aid of a drawing tube adapted to a Carl Zeiss XA compound microscope. The specimens were set in different positions [dorsal, lateral, ventral] to prepare drawings of all taxonomically valuable characters and appendages. The total body length of the specimens examined was measured from the anteriormost end of the cephalothorax to the posterior end of the anal somite, excluding the caudal rami. Most type individuals are undissected and deposited in vials with 70% ethanol. The present taxonomic account of the Mexican species of *Cymbasoma* follows the general morphological review by Huys & Boxshall [1991] and the upgraded descriptive standards proposed by Grygier & Ohtsuka [1995, 2008] for monstrilloid copepods. Huys *et al*.'s [2007] criteria and nomenclature was used to identify the setal armature of the last male antennulary segment. In the swimming legs formulae, setae are indicated as Roman numerals and spiniform elements as Arabic numerals. The following abbreviations are used in the descriptive section and figures: aes — aesthetasc, avp — anteroventral genital process, dir — dorsal integumental ridges, dnlp — dorsal nipple-like processes, hb — hyaline bodies, ib, ibt — integumental striae belt, irf — integumental forehead wrinkles, L — lappet, lec — lateral eye cup, mec — medial eye cup, mp — medial process, nlp — nipple-like processes, oc — oral cone**,** os — ovigerous spine, pop — preoral pore, s — sensillum, P5 — fifth leg, enp — endopod, exp — exopod. Nomenclature of antennulary setal elements as in Grygier & Ohtsuka [1995].

Results

Subclass Copepoda Milne Edwards, 1840
Order Monstrilloida Sars, 1901
Family Monstrillidae Dana, 1849
Genus *Cymbasoma* Thompson, 1888

Cymbasoma boxshalli (Suárez-Morales, 1993a)

Figs 1–5.

Thaumaleus boxshalli Suárez-Morales, 1993a: 85, figs 1,2.

MATERIAL EXAMINED. Holotype adult female, undissected, deposited in the collection of Crustacea, U.S, National Museum of Natural History, Smithsonian Institution. USNM- 251838; paratype female USNM-251839.Additional material: two adult females from the Mexican Caribbean [ECO-CHZ-00048, ECO-CHZ-00515].

TYPE LOCALITY. Bahía de la Ascensión, central part of eastern Yucatan Peninsula coast [19°47.10′N, 87°33.15′W]. Depth 1.5 m. Date of collection, 6 September, 1991.

REDESCRIPTION. **Adult female**. Total body length of holotype, measured from forehead to posterior margin of anal somite: 2.1 mm; paratype = 2.1 mm. Cephalothorax of holotype 1.29 mm long, representing about 61.4% of total body length; paratype cephalothorax = 1.35 mm long, 64.7% of total length. Antennules moderately divergent, representing 16.7% of total body length and 26.5% of cephalothorax length; paratype antennules 15.2% of body length and 23.8% of cephalothorax length (Figs 1A–C, 4A). Oral cone well-developed, located anteroventrally at 23% about of the way back along ventral surface of cephalothorax in both holotype and paratype individuals (oc in Figs 2B, 3C, 4B). Eyes represented by rounded medial cup and two larger, oval medially pigmented lateral cups (mec, lec in Fig. 3A, C). Forehead anteriorly produced, rounded with integumental corrugations (Figs 3A, C, 4B). Ventral surface of cephalic area bearing: 1) two pairs of nipple-like cuticular processes between antennule bases and oral papilla (nlp in Fig. 2B, 3C, 4B), 2) pair of preoral pores with adjacent wrinkles (pop in Fig. 3C) 3) narrow belt of faint integumental wrinkles adjacent to oral cone (ibt in Figs 1B, C, 2B, 3C).

Antennules (Figs 3B, 5B) 0.34–0.37 mm long, robust, almost 17% of total body length, 4-segmented; segments 1–4 with complete intersegmental sutures. Fourth segment longest. Relative length of segments 1–4 [proximal to distal] as: 20.2: 30.3: 12.3 : 37.2= 100. Following antennule armature nomenclature by Grygier & Ohtsuka [1995], first segment with short, spiniform element 1; second segment carrying slender spiniform elements $2v_{1-3}$ and $2d_{1,2}$, and long dorsal seta IId; third segment with long, curved spiniform element 3 and setiform elements IIId and IIIv; fourth segment with reduced armature including proximal spiniform element $4d_1$, flexible setae IVd, IVv, IVd, Vm, spiniform $4v_{1-3}$, outer margin with four setae of the "b" group of which $b_{1,2,5}$ are branched, and spiniform equally long apical elements 6_1 and 6_2. Paratype antennulary armature as in holotype except for: presence of aesthetasc 4aes, elements $6_{1,2}$ unequally long (Fig. 5B).

First pedigerous somite incorporated into cephalothorax; this and succeeding three free pedigerous somites each bearing pair of biramous swimming legs (Fig. 1A–C). Pedigerous somites 2–4 together accounting for 22.5-23% of total body length in dorsal view. Intercoxal sclerites of legs 1–4 subrectangular. Basis of legs articulating with rectangular coxa along diagonal line. Basis with thin, simple lateral basipodal seta on legs 1, 2, and 4; on leg 3, this seta thicker and longer, lightly setulate and four times longer than on other legs (bs in Fig. 4C, D). Endopods and exopods of swimming legs 1–4 triarticulate (Fig. 4C, D). Outer apical exopodal seta of swimming legs 1–4 with outer margin pinnate, inner margin lightly setose. Armature formula as:

	basis	endopod	exopod
leg 1	1,0	0,1;0,1;1,2,2	I,1;0,1; I,2,2
legs 2–4	1,0	0,1;0,1;1,2,2	I,1;0,1; I,1,2,2

Fifth legs biramous. Exopodal lobe subrectangular, armed with two subequally long distal setae; endopod represented by short, lightly plumose inner seta 0.5–0.7 times as long as carrying segment (Figs 2A, D, 5A).

Urosome consisting of three somites: fifth pedigerous somite, genital double-somite, and anal somite (Fig. 1B, C). Genital somite with expanded proximal half, lateral margins with transverse integumental wrinkles (Fig. 2C). Anal somite bell-shaped, broadening distally, being 0.5 times as long as genital double-somite. Ventral surface of genital somite forming enlarged base of genital spines. Genital spines proximally separate, reaching well beyond distal end of caudal setae (os in Figs 1A–C, 2A, D). Relative length of urosomites, from proximal to distal as: 26.6: 46.8: 26.6 = 100 (Fig. 2C); spines being 48% of total body length. Caudal rami subquadrate, symmetrical, weakly divergent, approximately 1.1 times as long as wide, each ramus bearing three subequally long, smooth caudal setae (I–III).

VARIABILITY. After its original description, this species was reported by Suárez-Morales [2001] from Curaçao, an island in the eastern Caribbean; it was presented therein as a first, but partial redescription, lacking the comparative details

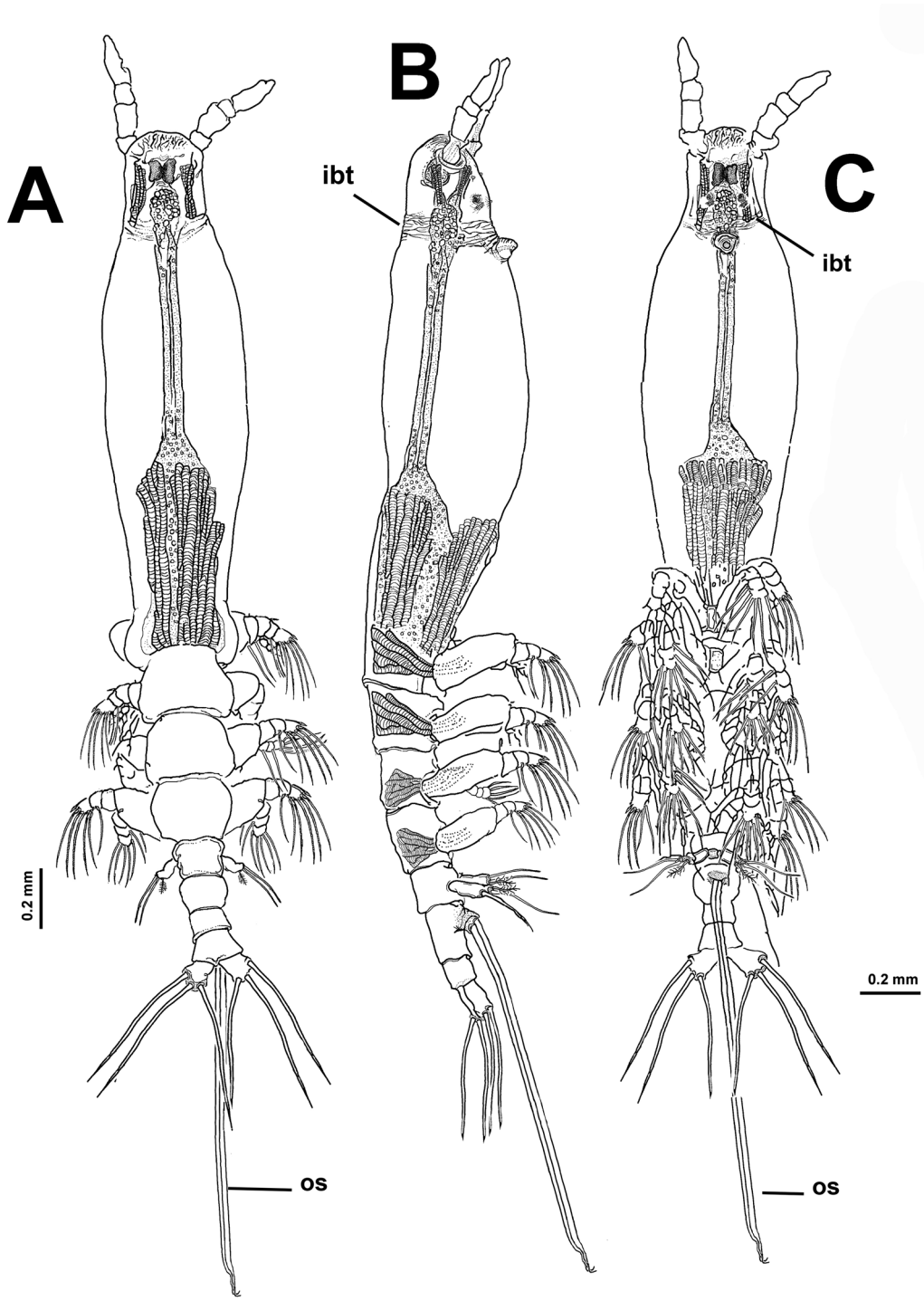

Fig. 1. *Cymbasoma boxshalli*, holotype, ♀: A — habitus, dorsal view; B — idem, lateral view; C — idem, ventrel view.
Рис. 1. *Cymbasoma boxshalli*, голотип ♀: A — общий вид, дорсально; B — то же,латерально; C — то же, вентрально.

of the present work. A further analysis reveals that the Curaçao female (body length = 1.8 mm) is smaller than the holotype and paratype specimens from Mexico (2.1 mm). The cephalic ornamentation of the Curaçao individual includes the same elements originally described in *C. boxshalli*, like 1) the preoral pores (mentioned as cuticular whorls by Suárez-Morales [2001]), 2) the usual nipple-like processes, only one pair was reported in the Curaçao female vs. two pairs in the type specimens (Figs 2B, 3C, 4B), and 3) a reduced patch of transverse integumental wrinkles on the post-oral surface, present only ventrally in the Curaçao female [Suárez-Morales, 2001, fig. 2]; contrastingly, this integumental ornamentation is wider, belt-like in the type specimens (Figs 1B, 2B) The antennules were incompletely described for the Curaçao female, but most setal elements can

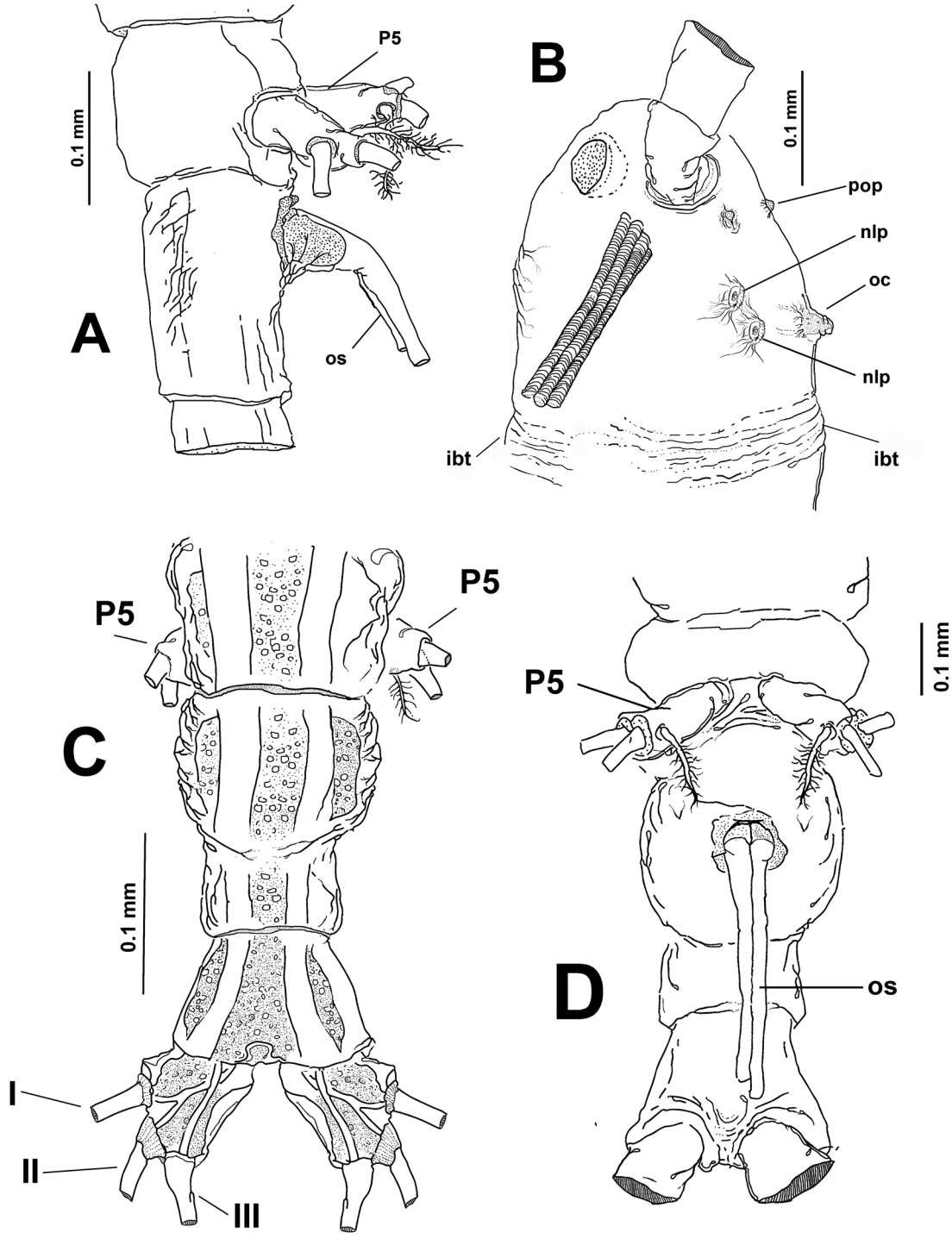

Fig. 2. *Cymbasoma boxshalli*, holotype ♀: A — urosome with fifth legs (P5), lateral view; B — cephalic region, lateral view; C — urosome with fifth legs (P5), dorsal view; D — idem, ventral view. Abbreviations in Methods.

Рис. 2. *Cymbasoma boxshalli*, голотип ♀: A — уросома с 5-й парой ног (P5), латерально; B — головной отдел, латерально; C — уросома с 5-й парой ног (P5), дорсально; D — то же, вентрально. Сокращения в разделе Методы.

be identified; a well- developed spiniform element 3 is shared by all the specimens compared as well as the armature of segments 1–3. Also, in the Curaçao female three setae of the "b" group were illustrated as distally branched, a character shared with the type females; however, the holotype lacks the aesthetasc 4aes, which is present in the paratype (Fig. 5B) and also in the Curaçao female [Suárez-Morales, 2001, fig. 3]; also, the apical elements $6_{1,2}$ are subequally long in the Curaçao female, as observed in the paratype. The fifth leg armature is similar in both type specimens and the Curaçao female, with two distal setae and an inner reduced one; however, the length of the latter element remains unknown because these setae are missing in

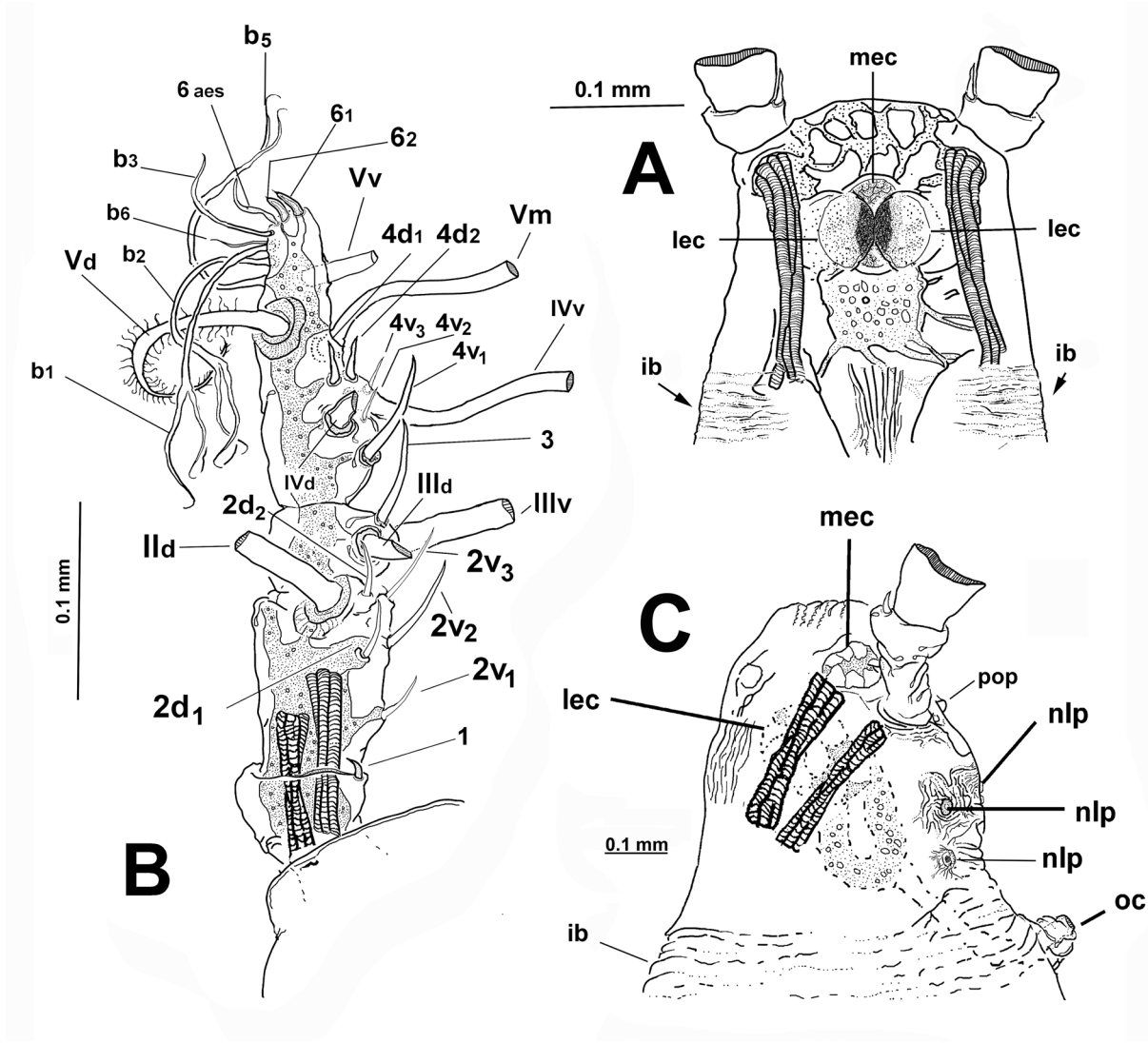

Fig. 3. *Cymbasoma boxshalli*, holotype ♀: A — cephalic region, dorsal view; B — right antennule, dorsal view, setal nomenclature *sensu* Grygier & Ohtsuka's [1995]; C — cephalic region, lateral view. Abbreviations in Methods.

Рис. 3. *Cymbasoma boxshalli*, голотип ♀: A — головной отдел, дорсально; B — правая антеннула, дорсально, номенклатура щетинок по Grygier & Ohtsuka's [1995]; C — головной отдел, латерально. Сокращения в разделе Методы.

the Curaçao specimen [Suárez-Morales, 2001, fig. 11]. In the Curaçao female the proximal half of the genital double-somite is expanded as in the type females but lacks integumental ridges on its lateral surface [Suárez-Morales, 2001, fig. 5]. The ovigerous spines are relatively shorter in the Curaçao female (36% of total body length) than in the types from the Mexican Caribbean (48% of total body length).

Male. Unknown.

REMARKS. There are several characters of this species that were not adequately described in its original description in 1993 [Suárez-Morales, 1993a] and even in a further report of this species from Curaçao [Suárez-Morales, 2001]. Complete illustrations of the habitus of the type females are here provided for the first time (Figs 1A–C, 4A) to aid in the practical identification of this species in plankton samples. The armature of the antennules was in urgent need of revision; for instance, three elements of the "b" group ($b_{1,2,5}$) were illustrated as unbranched in the original description [Suárez-Morales, 1993a, fig. 2c], but in fact they are distally bifurcate in both the holotype and the paratype (Figs 3B, 5B). The setal elements present in the type specimens are identified, illustrated, and labelled in this redescription, thus allowing a more accurate comparisons and among the Caribbean species of *Cymbasoma*. Also, the coarse forehead surface noticed in the re-examination was not mentioned or illustrated by Suárez-Morales [1993a]; the same is true for the eye cups, which were originally described as present and moderately developed; it was possible now to provide more details about their relative size, shape, and pigmentation. The cephalic integumental ornamentations were not typically deemed relevant in the taxonomy of monstrilloid copepods, but they can be considered an aid to separate species of *Monstrilla* and *Cymbasoma* [Cruz Lopes da Rosa *et al*., 2021; Chang, 2012].

Cymbasoma boxshalli was originally placed in the invalid genus *Thaumaleus* because of its having of only one somite between the genital double-somite and the caudal rami [Issac, 1975; Huys, Boxshall, 1991]. It was then compared with *C. tumorifrons* Isaac, 1974; *C. pallidum* (Isaac, 1974), C. *thompsoni* (Giesbrecht, 1893) *C. claparedii* (Giesbrecht, 1893), and

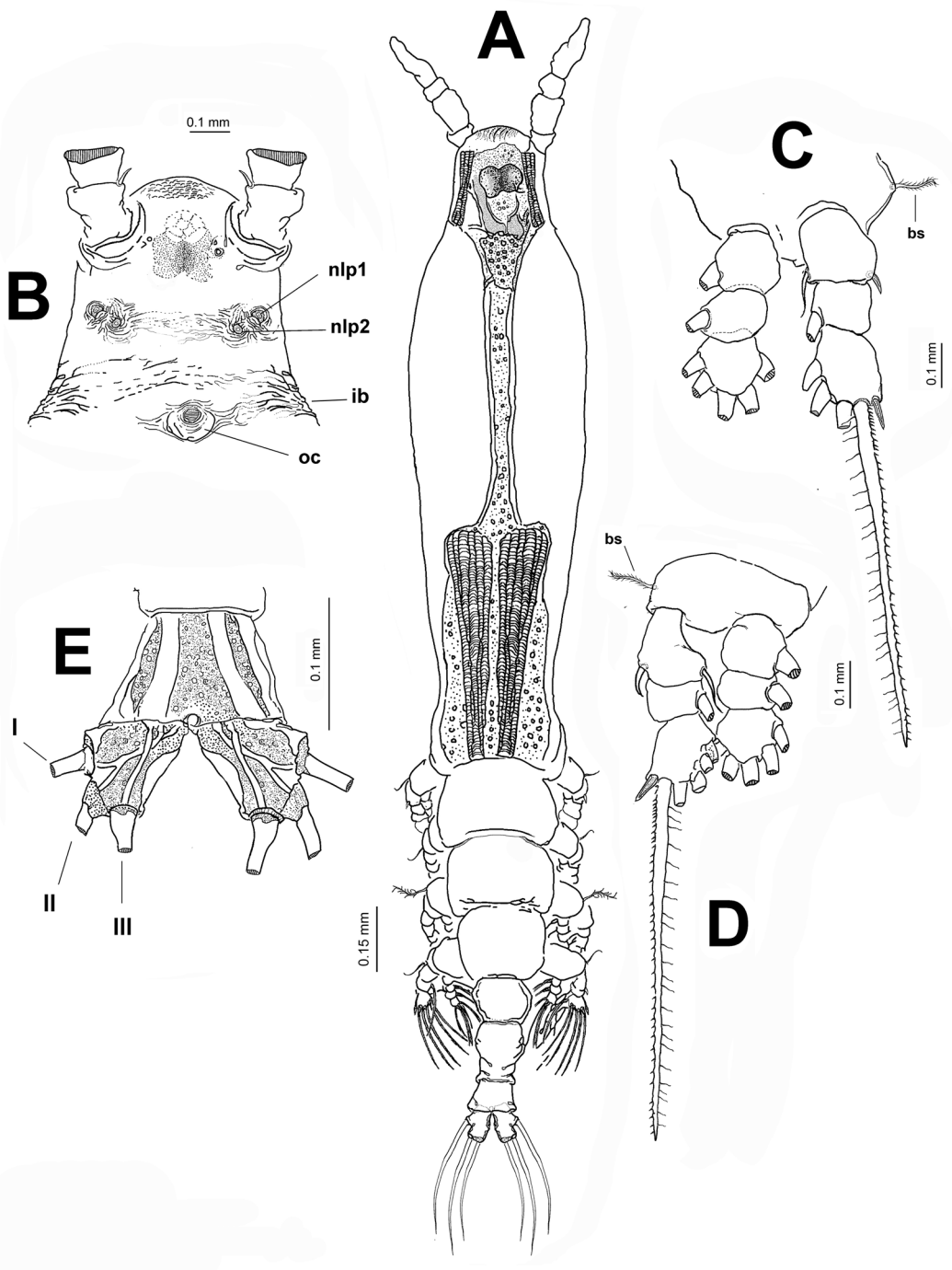

Fig. 4. *Cymbasoma boxshalli*, holotype ♀ (A), paratype ♀ (B–E): A — habitus, dorsal view; B — cephalic region, ventral view; C — P1; D — P4; E — caudal rami with setae I–III *sensu* Huys & Boxshall [1991]. Abbreviations in Methods.

Рис. 4. *Cymbasoma boxshalli*, голотип ♀ (A), паратип ♀ (B–E): A — общий вид, дорсально; B — головной отдел, вентрально; C — P1; D — P4; E — каудальные ветви с щетинками I–III по Huys & Boxshall [1991]. Сокращения в разделе Методы.

C. malaquini (Caullery et Mesnil, 1914) based on the absence of a dorsal suture on the genital double-somite and ovigerous spines measuring about half the body length or less. A further distinction was established with the single-lobed fifth legs of *C. boxshalli* vs. bilobed legs of *C. pallidum*, *C. thompsoni*, and *C. malaquini* [Suárez-Morales, 1993]. Overall, *C. boxshalli* was found to closely resemble *C. claparedi*. Both species also share similar body proportions, a long setal element 3 *sensu* Grygier & Ohtsuka [1995], a reduced element 1 [Giesbrecht, 1893] and strongly pigmented reddish eyes [Giesbrecht, 1893]. These two species can be separated by the fifth leg armature, comprising four setae in *C. boxshalli* vs. three in *C. claparedii* whose fifth leg also has a smooth inner margin, thus lacking an endopodal lobe [Giesbrecht, 1893]. In *C. boxshalli* the endopod is represented by a short plumose inner seta. In addition, the antennulary segments 3–4 are partly fused in *C. claparedii* [Giesbrecht,

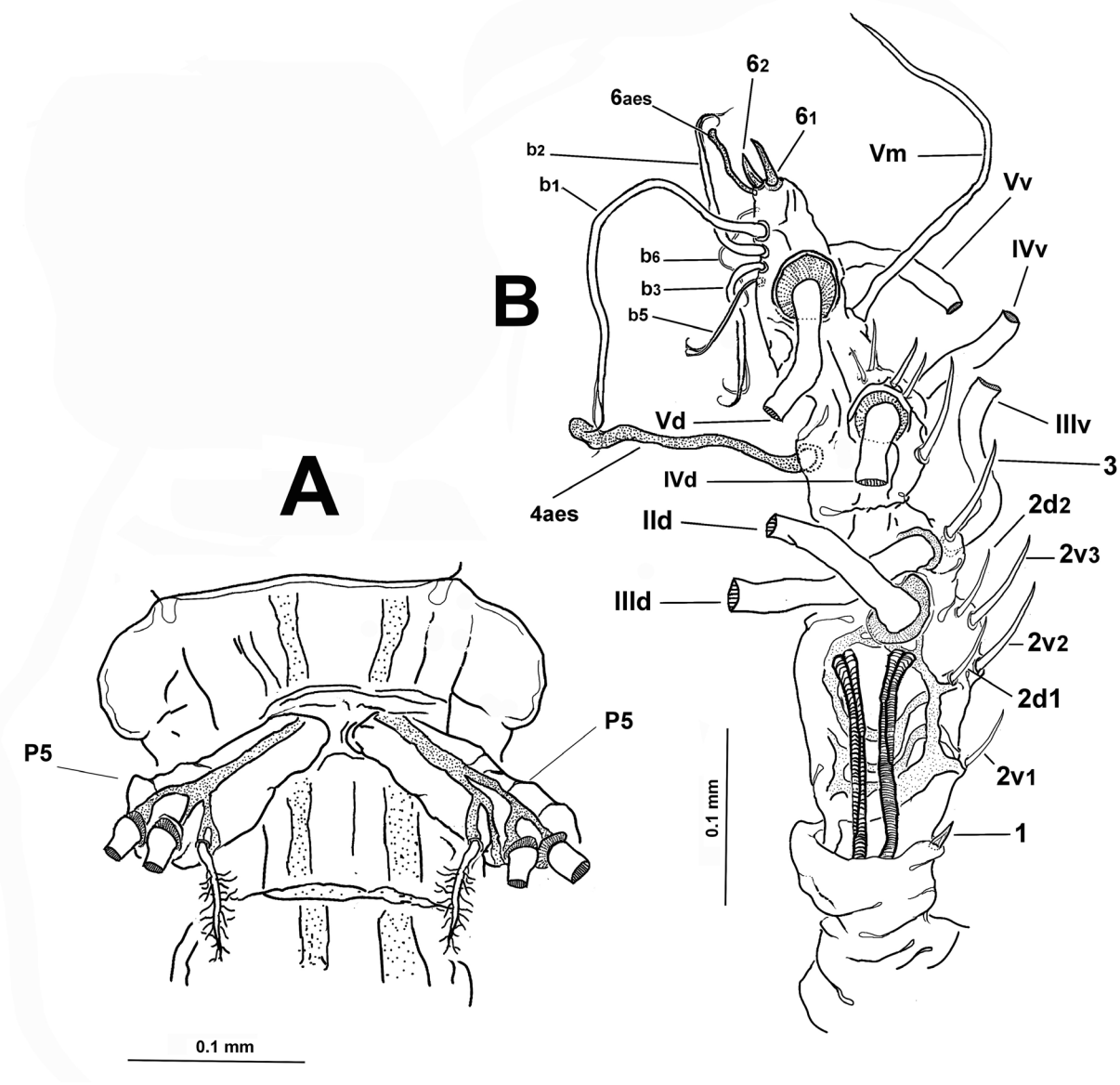

Fig. 5. *Cymbasoma boxshalli*, paratype ♀: A — fifth pediger and fifth legs, ventral view; B — right antennule with setal armature *sensu* Grygier & Ohtsuka [1995], dorsal view.

Рис. 5. *Cymbasoma boxshalli*, paratype ♀: A —5-я пара ног и их сегмент, вентрально; B — правая антеннула, строение щетинок по Grygier & Ohtsuka [1995], дорсально.

1893] vs. a complete suture dividing these two segments in *C. boxshalli*; the cephalic ornamentation was not depicted for *C. claparedi* so it is likely that more differences could be found in these characters. Suárez-Morales [2001] recognized the morphologic resemblance of *C. boxshalli* with the *C. rigidum* species group, which is known to comprise several undescribed species in different geographic areas, like the Mediterranean, the Caribbean [Suárez-Morales *et al*., 2020], and the North Atlantic [Suárez-Morales, Mercado-Salas, 2023]. In reference to the fifth leg structure, populations identified as *C. rigidum* exhibit a wide variability [Suárez-Morales, 2006], but remnants of an endopod are usually present in species of the *C. rigidum* group, but in *C. boxshalli* the endopod is represented by a small seta, thus diverging from this pattern.

Cymbasoma quintanarooense (Suárez-Morales, 1994)

Figs 6–8.

Thaumaleus quintanarooensis Suárez-Morales, 1994: 381, fig. 1a–g.

MATERIAL EXAMINED. Holotype. Female, vial deposited at the National Museum of Natural History, Smithsonian Institution [USNM 251842]. Paratypes: adult female, vial deposited at the same institution [USNM 251843], four paratype females deposited in the collection of Zooplankton at ECOSUR [ECO-CHZ]. Type specimens undissected, ethanol-preserved. Additional non-type material: adult female from Chelem lagoon, southern Gulf of Mexico [21°19.35’N; 89°49.10’W] collected January 14, 1991 [ECO-CHZ-00517].

TYPE LOCALITY. Bahía de la Ascensión, Caribbean coast of Mexico [19°47.35′N; 87°33.15′W]. Date of collection September 5, 1991.

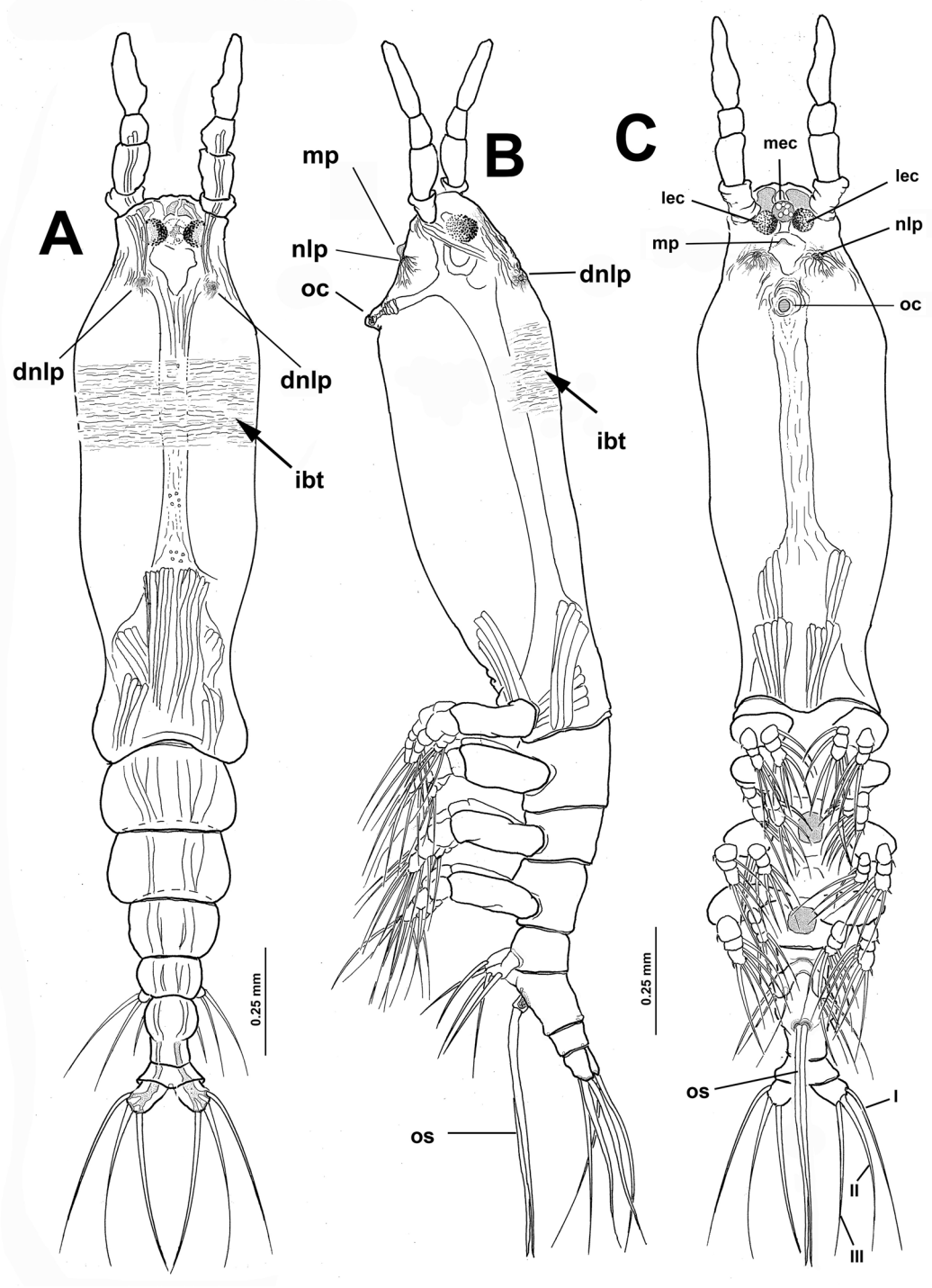

Fig. 6. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), holotype ♀; A — habitus dorsal view; B — idem, lateral view; C — idem, ventral view. Abbreviations in Methods.

Рис. 6. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), голотип ♀; A — внешний вид, лорсально; B — то же, латерально; C — то же, вентрально. Сокращения в разделе Методы.

DESCRIPTION. **Adult female**. Body length of holotype female = 2.25 mm; length range of paratypes between 1.9 and 2.3 mm with an average of 2.1 ± 0.2 mm. Body length of Chelem specimen = 1.95 mm. Cephalothorax long, relatively robust, with moderately expanded lateral margins (Fig. 6A), cephalothorax representing almost 62% of total body length. Oral cone moderately developed, prominent, papilla-like (oc in Figs 6B, C, 7B, 8A), located 20% of way back along ventral surface of cephalothorax (Fig. 6B). Cephalic region anteriorly subquadrate in dorsal view, 'forehead' flat, with weak integumental corrugation, ornamented with pair of small sensilla (s in Fig. 7B). Ventral preoral surface with integumental ornamentation including single pair of nipple-like processes in the holotype and paratype specimens (nlp in Figs 6B, C, 7B, 8A) and medial

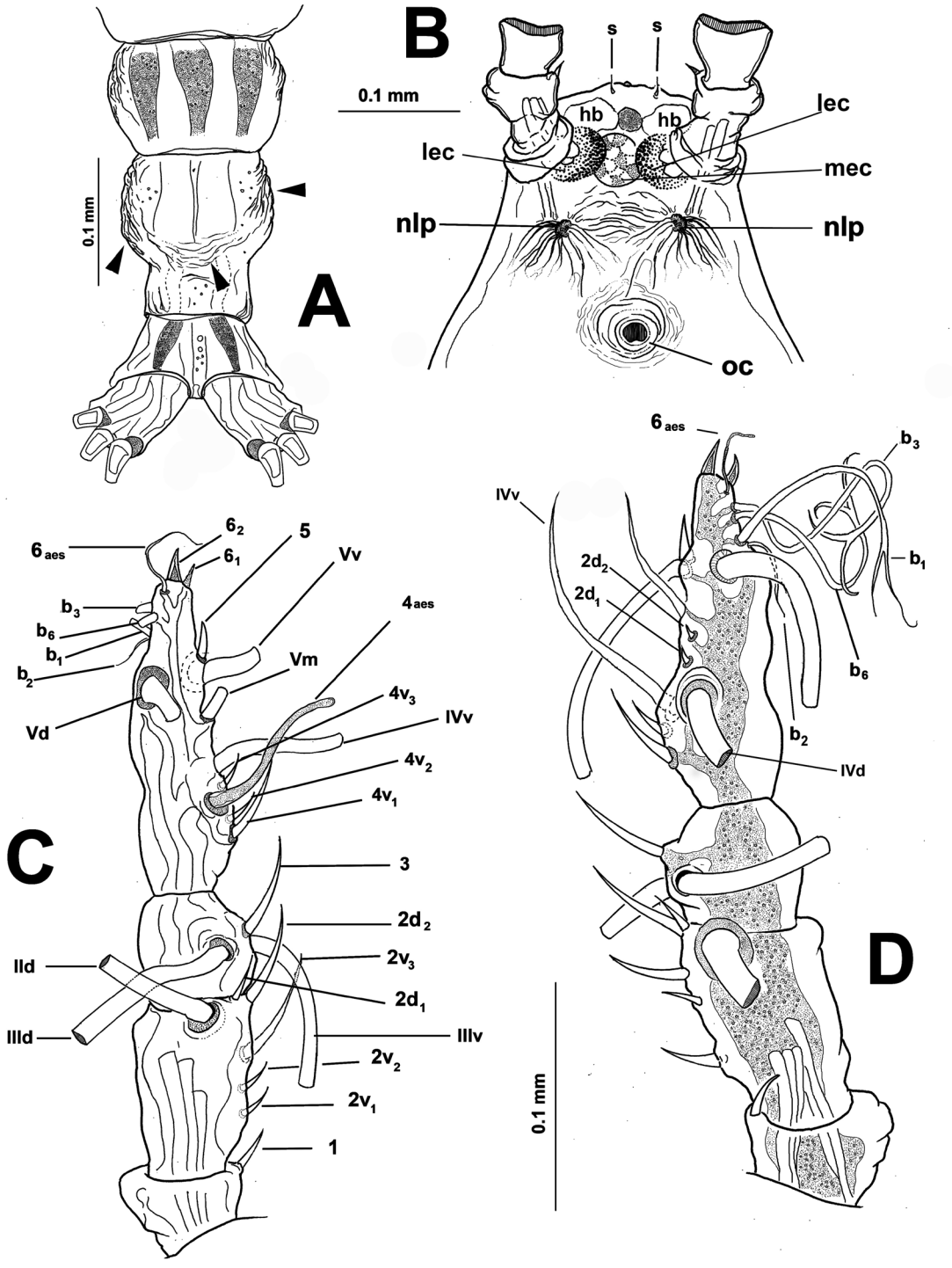

Fig. 7. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), holotype ♀; A — urosome, dorsal view; B — cephalic region, ventral; C — left antennule, dorsal, setal armature *sensu* Grygier & Ohtsuka [1995]; D — right antennule, dorsal. Abbreviations in Methods.

Рис. 7. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), голотип ♀; A — уросома, дорсально; B — головной отдел, вентрально; C — левая антеннула, дорсально, строение щетинок по Grygier & Ohtsuka [1995]; D — правая антеннула, дорсально. Сокращения в разделе Методы.

low protuberance (mp in Figs 6B, C, 8A). Eyes comprising two lateral cups and medial cup (lec, mec in Figs 6C, 7B. 6C); lateral eye cups strongly pigmented on inner half, with a diameter about the same as that of weakly pigmented medial eye cup (Figs 6C, 7B). Ventral surface between antennules and oral cone bearing pair of preoral pores (pop in Fig. 8A). Dorsal surface of cephalic region ornamented with pair of dorsal nipple-like processes (dnlp in Figs 6A, B, 8A). Anterior half of cephalothorax with thick belt of faint integumental wrinkles covering its dorsal and (partly) lateral surfaces (ibt in Fig. 6A, B).

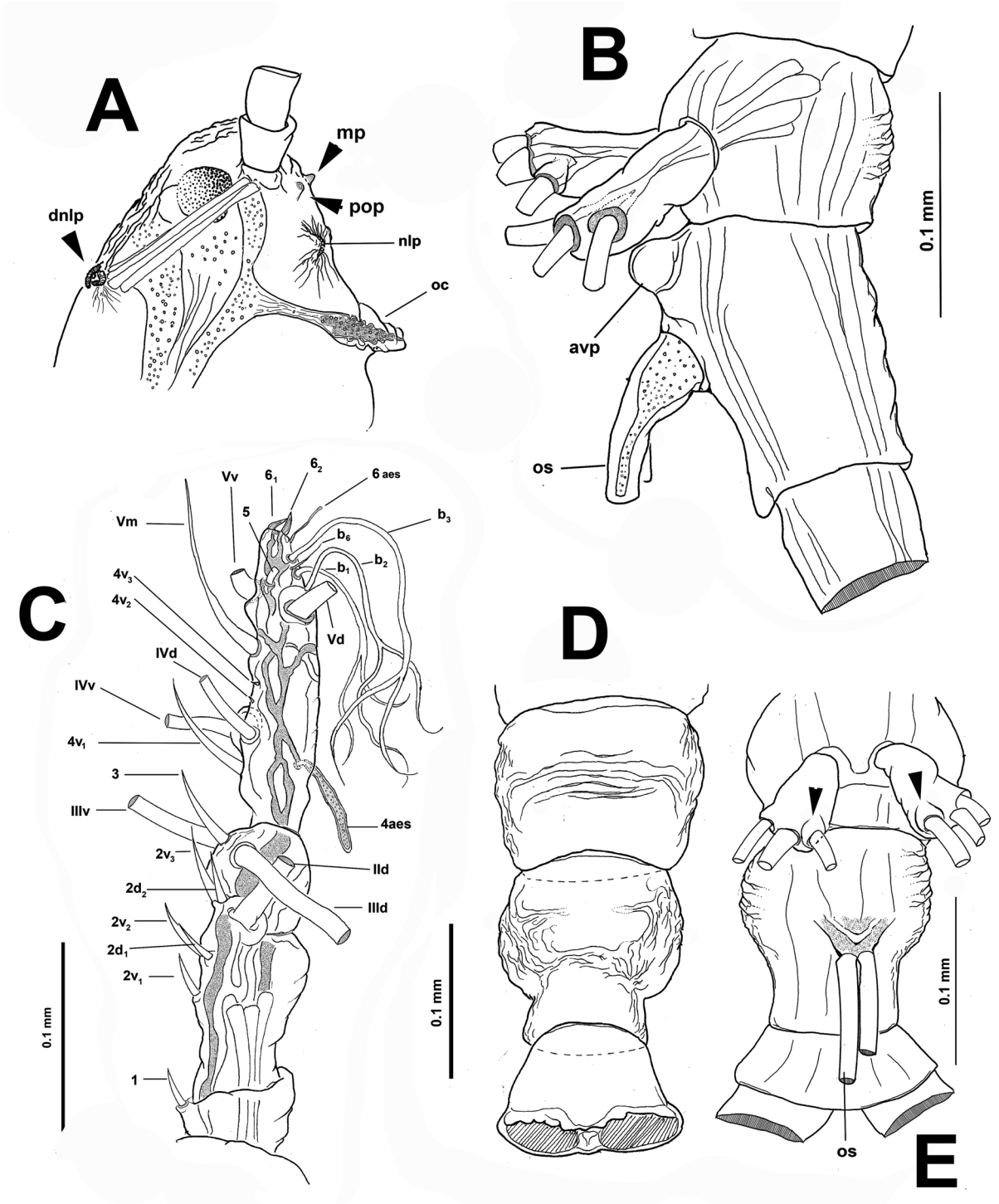

Fig. 8. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), paratype ♀; A — cephalic region, lateral; B — urosome, lateral; C — right antennule with armature *sensu* Grygier & Ohtsuka [1995], dorsal view; D — urosome, dorsal view; E — idem, ventral view. Abbreviations in Methods.

Рис. 8. *Cymbasoma quintanarooense* (Suárez-Morales, 1994), паратип ♀; A — головной отдел, латерально; B — уросома, латерально; C — правая антеннула, вооружение по Grygier & Ohtsuka [1995], дорсально; D — уросома, дорсально; E — то же, вентрально. Сокращения в разделе Методы.

Urosome consisting of three somites: fifth pedigerous somite (with fifth legs), genital double-somite ventrally carrying pair of ovigerous spines barely reaching beyond distal end of caudal setae (os in Fig. 6B, C), free preanal somite, and anal somite carrying pair of caudal rami. Length ratio of holotype urosomites (from proximal to distal) 36.25: 40.77: 20.98 = 100 (Fig. 8D) and similar proportions in paratypes: 36.79 : 40.56 : 22.64 = 100 (Fig. 8B).

Fifth pedigerous somite with field of integumental wrinkles on lateral and dorsal surfaces in holotype and paratypes (Fig.

8B, D, E). Genital double-somite with swollen proximal half in both holotype and paratypes (Figs 7A, 8D, E), with integumental wrinkles on dorsal and lateral surfaces. Genital double-somite with pair of slender, straight ovigerous spines arising from ventral surface (Figs 6B, C, 8B, D). Tips of ovigerous spines acute, straight (Fig. 6B, C). Anal somite with smooth lateral margins, widening distally (Figs 7A, 8D). Caudal rami subrectangular (Fig. 7A), about 1.7 times as long as broad, each ramus armed with three caudal setae (I–III), setae being equally long.

Antennules length ranging between 0.33–0.46 mm in type specimens (0.45 mm in holotype), representing about 22% of total body length and almost 34% of cephalothorax length (Fig. 6A,B); antennules distinctly 4-segmented, anteriorly directed (Fig. 6C); segments 1–4 divided, with complete intersegmental sutures (Fig. 7C); distal fourth segment longest, representing about 45–46% of antennulary length; length ratio of antennular segments (proximal to distal) as 12.60 : 25.21 : 15.96 : 46.23 = 100 (holotype) (Fig. 7A, C), 14.13 : 24.45 : 16.30 : 45.12 = 100 (paratype). Following Grygier & Ohtsuka's [1995] setal nomenclature for female antennules, first segment with spiniform setal element 1, second segment bearing dorsal setiform element IId, and long, slender spiniform elements $2v_{1–3}$, latter (2v3) being longest, and spiniform elements $2d_{1,2}$. Third segment with long, robust spiniform element 3 and adjacent setiform elements IIId and IIIv. Fourth segment longest of antennule, proximal half armed with spiniform elements $4v_{1–3}$, minute spiniform elements $4d_{1,2}$, long ventral aesthetasc 4aes and long, biserially setulated setiform element IVv, IVd; distal half armed with setiform elements Vv, Vd, short spiniform element 5, and several setae of the "b-group" ($b_{1–3}$, b_6) on outer distal margin, elements $b_{1,3,6}$ distally branched (Fig. 7C, D); apical spiniform elements $6_{1,2}$ subequally long, apical aesthetasc 6aes slender (Fig. 7C, D). Paratypes antennulary armature (Fig. 8C) complete, as in holotype (Fig. 7C, D).

First pedigerous somite and succeeding three free thoracic somites each bearing well-developed pair of biramous swimming legs, with exopods longer than endopods. Intercoxal sclerites rectangular, smooth. Setal armature pattern as described originally by Suárez-Morales [1994]. Armature of swimming legs 1–4 as:

legs	basis	endopod	exopod
Leg 1	1,0	0,1; 0,1;1,2,2	I-1; 0-1; I,2,2
Legs 2–4	1,0	0,1; 0,1;1,2,2	I-1; 0-1; I,2,3

Fifth legs (Fig. 8B, E) represented by a single oblong exopodal lobe armed with three setae, two setae inserted terminally, subequal in length and breadth; third seta inserted in small inner lobe representing the endopod (arrowheads in Fig. 8E).

Male unknown.

REMARKS. This species was described from a few Caribbean females originally assigned to the invalid genus *Thaumaleus* Krøyer, 1849 following Isaac's [1975] criteria [Suárez-Morales, 1994]. Later on, males collected from a Caribbean reef area were assigned to *C. quintanarooense* [Suárez-Morales, 2000]. The invalidity of *Thaumaleus* was documented by Grygier [1993]. Consequently, all species assigned to *Thaumaleus* were transferred to *Cymbasoma* Thompson, 1888, which is currently the most diverse genus of the order Monstrilloida [Suárez-Morales, McKinnon, 2016, 2025; WoRMS, 2025]. In its original description, *C. quintanarooense* was compared with species of *Thaumaleus* recognized by Isaac [1975] as having a notch on the anal somite, like *T. frondipes* (Scott, 1904), *T. rostratus* Scott, 1904, *T. zetlandicus* Scott, 1904, and *T. rigidum* (Thompson, 1888). My re-examination of the type specimens revealed that the anal somite has smooth lateral margins, thus lacking a notch (*sensu* Isaac [1975]), as noted by Suárez-Morales [2001] in the Chelem female and in the males assigned to this species [Suárez-Morales, 2000]. The main character used by Suárez-Morales [1994] to separate *C. quintanarooense* from other congeneric species was the fifth leg structure and armature comprising three setae, one of which arises from a reduced inner lobe, thus diverging from the pattern exhibited by *C. rigidum* and related species [Suárez-Morales, 2006; Suárez-Morales, Mercado-Salas, 2023]. The same character was used to distinguish *C. quintanarooense* from its Caribbean congener *C. boxshalli*, also with three setae on the fifth leg but the innermost being reduced and not arising from a reduced endopodal lobe. The ovigerous spines are equally long in the type individuals and in the Chelem female, representing about 48% of total body length. The Chelem female exhibited a set of integumental wrinkle fields on the preoral ventral surface and the dorsal cephalic surface [Suárez-Morales, 2001, fig. 1A, B], as described herein for the type specimens. In addition to these wrinkle fields, the Chelem female has an incomplete belt of faint transverse integumental striation covering part of the cephalothorax dorsal and lateral surfaces [Suárez-Morales, 2001, fig. 1A, B, D]; this faint ornamentation remained unnoticed to Suárez-Morales [1994] in the type females. A further comparison of *C. quintanarooense* involved several other recently described congeneric species with a similar integumental ornamentation pattern on the cephalothorax, like the Australian *C. tharawalorum* Suárez-Morales et McKinnon, 2016, *C. tranteri* Suárez-Morales et McKinnon, 2016, *C. annulocolle* Suárez-Morales et McKinnon, 2016, *C. markhasevae* Suárez-Morales et McKinnon, 2016, *C. astrolabe* Suárez-Morales et McKinnon, 2016, and *C. dakini* Suárez-Morales et McKinnon, 2016 [Suárez-Morales, McKinnon, 2016]. *Cymbasoma quintanarooense* can be distinguished from these species by differences in the coverage and position of the integumental wrinkles and by its fifth legs structure and armature. In this group of Australian species, the fifth legs exhibit a strongly developed, but unarmed inner endopodal lobe, thus contrasting with the weakly developed, armed inner lobe exhibited by *C. quintanarooense*. The same is true in reference to *C. norvegicum* Suárez-Morales et Mercado-Salas, 2023 and *C. pedroi* Suárez-Morales et Mercado-Salas, 2023, two oceanic members of the *C. rigidum* species group, both with unarmed and well developed endopodal lobes [Suárez-Morales, Mercado-Salas, 2023]. *Cymbasoma bali* Desai et Krishnaswamy, 1962 has also some affinities with *C. quintanarooense*, including the body proportions and shape, strongly pigmented eyes, and a fifth leg armed with three subequally long setae [Suárez-Morales, McKinnon, 2016, fig. 27]. It differs from *C. quintanarooense* in several aspects: 1) the cephalic integumental ornamentation is patchy, reduced in *C. bali*, present mainly on the perioral surface vs. a wide belt-like pattern covering the dorsal surface in *C. quintanarooense*, 2) prominent oral cone in *C. bali* vs. a relatively reduced oral cone in *C. quintanarooense*, 3) details of the antennule armature, including a very long element 3 and strong apical elements 6_1 and 6_2 in *C. quintanarooense* vs. weak development of these elements in *C. bali* [Suárez-Morales, McKinnon, 2016, fig. 27A], and 4) in *C. quintanarooense* fifth leg the endopodal lobe is absent, whereas a small endopodal lobe is present in *C. bali* [Suárez-Morales, McKinnon, 2016, fig. 26F].

Cymbasoma chelemense Suárez-Morales et Escamilla-Sánchez, 1997

Figs 9–12.

TYPE MATERIAL. Holotype adult female, undissected, vial deposited in the collection of Crustacea, U.S, National Museum of Natural History, Smithsonian Institution, Washington, D.C., USNM 264077. Adult female paratype in collection of Zooplankton, at ECOSUR, Chetumal, Mexico [ECO-CHZ-00513]. Adult male allotype, same locality [USNM-264078].

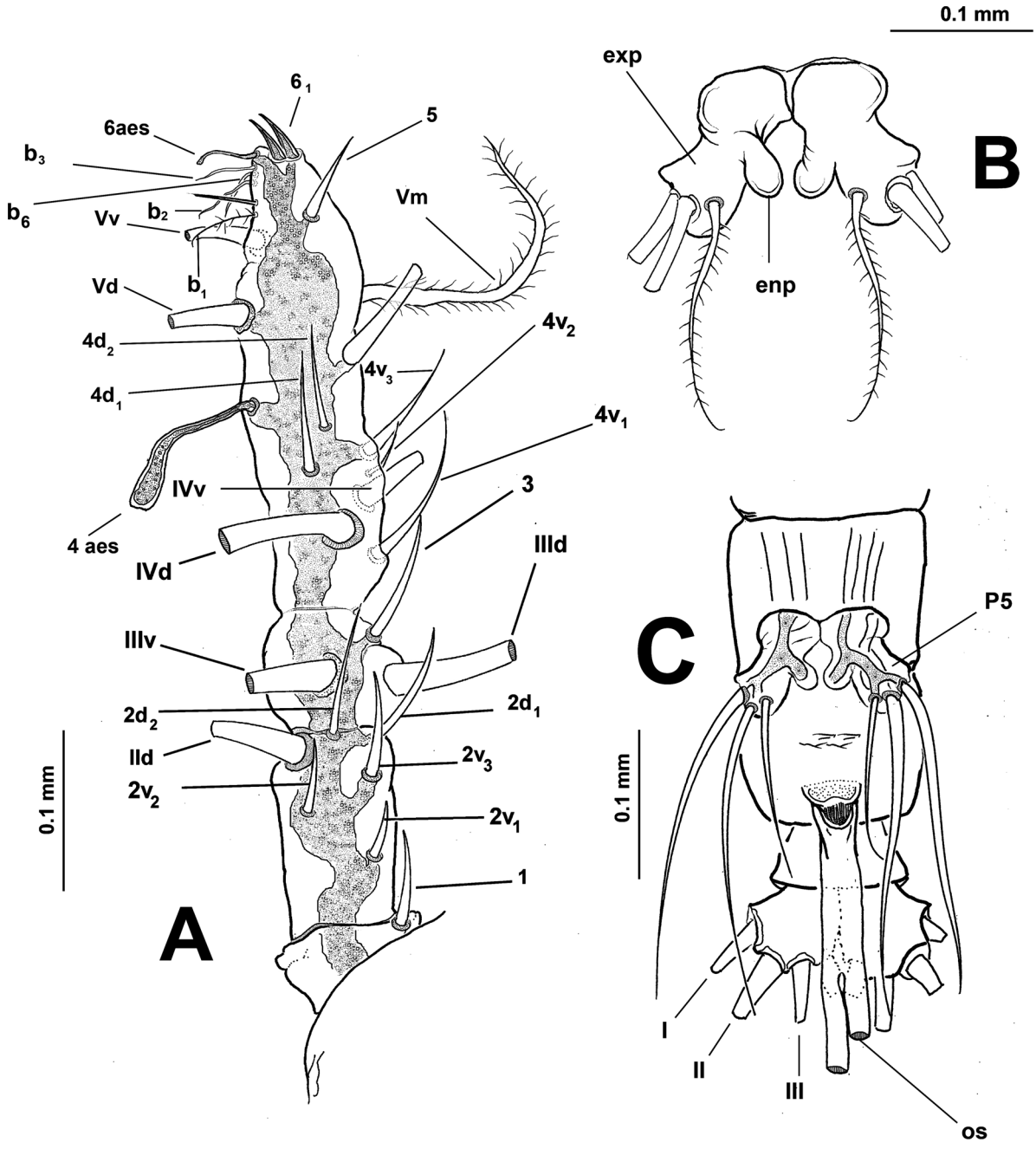

Fig. 9. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, holotype ♀; A — left antennule, armature *sensu* Grygier & Ohtsuka [1995], dorsal; B — fifth leg, ventral view; C — urosome, ventral view. Abbreviations in Methods.

Рис. 9. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, годотип ♀; A — левая антеннула, вооружение по Grygier & Ohtsuka [1995], дорсально; B — нога 5-й пары, вентрально; C — уросома, вентрально. Сокращения в разделе Методы.

TYPE LOCALITY. Laguna de Chelem, northern coast of the Yucatan Peninsula [21°19.35′N, 89°49.10′W]. Date of collection: February 18, 1991.

DESCRIPTION. **Adult female**. Body length of holotype = 2.3 mm. Cephalothorax elongate, cylindrical, with straight lateral margins, relatively long, representing almost 70% of total body length. Oral cone moderately developed, papilla-like, located 22% of way back along ventral surface of cephalothorax. Cephalic region narrowing anteriorly in dorsal view, 'forehead' produced, heavily ornamented with pattern of integumental wrinkles (irf in Fig. 10A) and pair of slender sensilla (s in Fig. 10A); ventral preoral surface with integumental ornamentation including pair of nipple-like processes with adjacent integumental wrinkles (nlp in Fig. 10A, Suárez-Morales, Escamilla-Sánchez [1997, fig. 2A, B]). Eyes comprising two lateral cups and ventral medial cup, latter slightly smaller than lateral cups; lateral eye cups strongly pigmented medially in the original description (see Suárez-Morales, Escamilla-Sánchez [1997, fig. 2A]), eye cups relatively smaller in present redescription (lec in Fig. 10A).

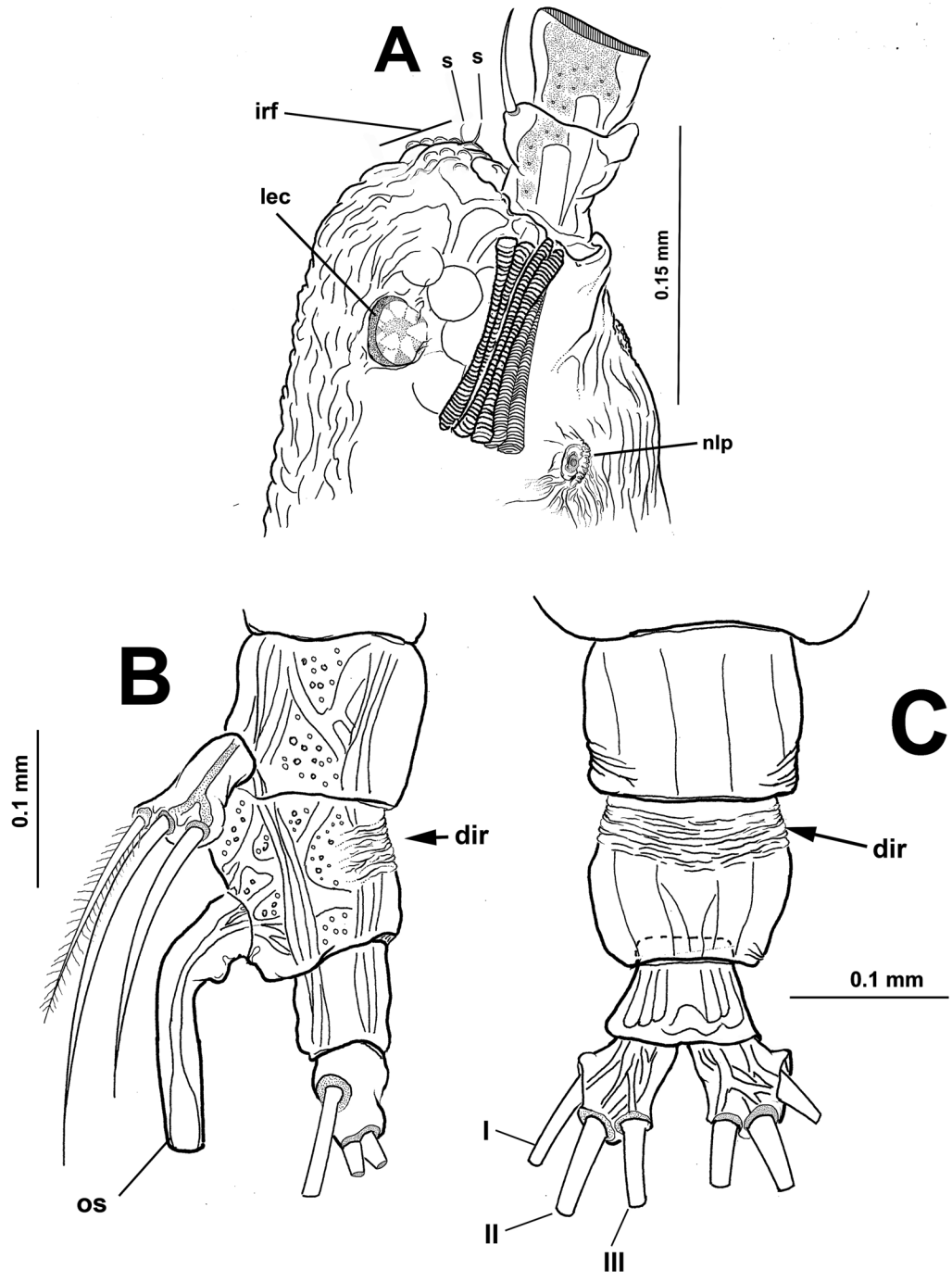

Fig. 10. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, holotype ♀; A — cephalic region, lateral view; B — urosome, lateral view; C — idem, dorsal view with caudal rami, dorsal, caudal setae I–III armature *sensu* Huys & Boxshall [1991]. Abbreviations in Methods.

Рис. 10. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, голотип ♀; A — головной отдел, латерально; B — уросома, латерально; C — то же, дорсально, с каудальными ветвями, дорсально, строение каудальных щетинок I–III по Huys & Boxshall [1991]. Сокращения в разделе Методы.

Urosome consisting of three somites: fifth pedigerous somite (carrying fifth legs), genital double-somite with pair of ovigerous spines reaching well beyond distal end of caudal rami [Suárez-Morales, 1993a, fig. 1a], and anal somite carrying pair of caudal rami; length ratio of urosomites (from proximal to distal) 42.18: 40.62: 17.2 = 100 (Figs 9C, 10B,C). Genital double-somite longest of urosome, barrel-shaped (Figs 9C, 10C), with dorsal surface ornamented with field of transverse integumental ridges covering proximal 1/3 of somite dorsal surface (dir in Fig. 10B, C, Suárez-Morales, Escamilla [1997, fig. 3A]). Somite carrying pair of slender ovigerous spines on ventral surface; spines fused proximally, separation point at distal mar-

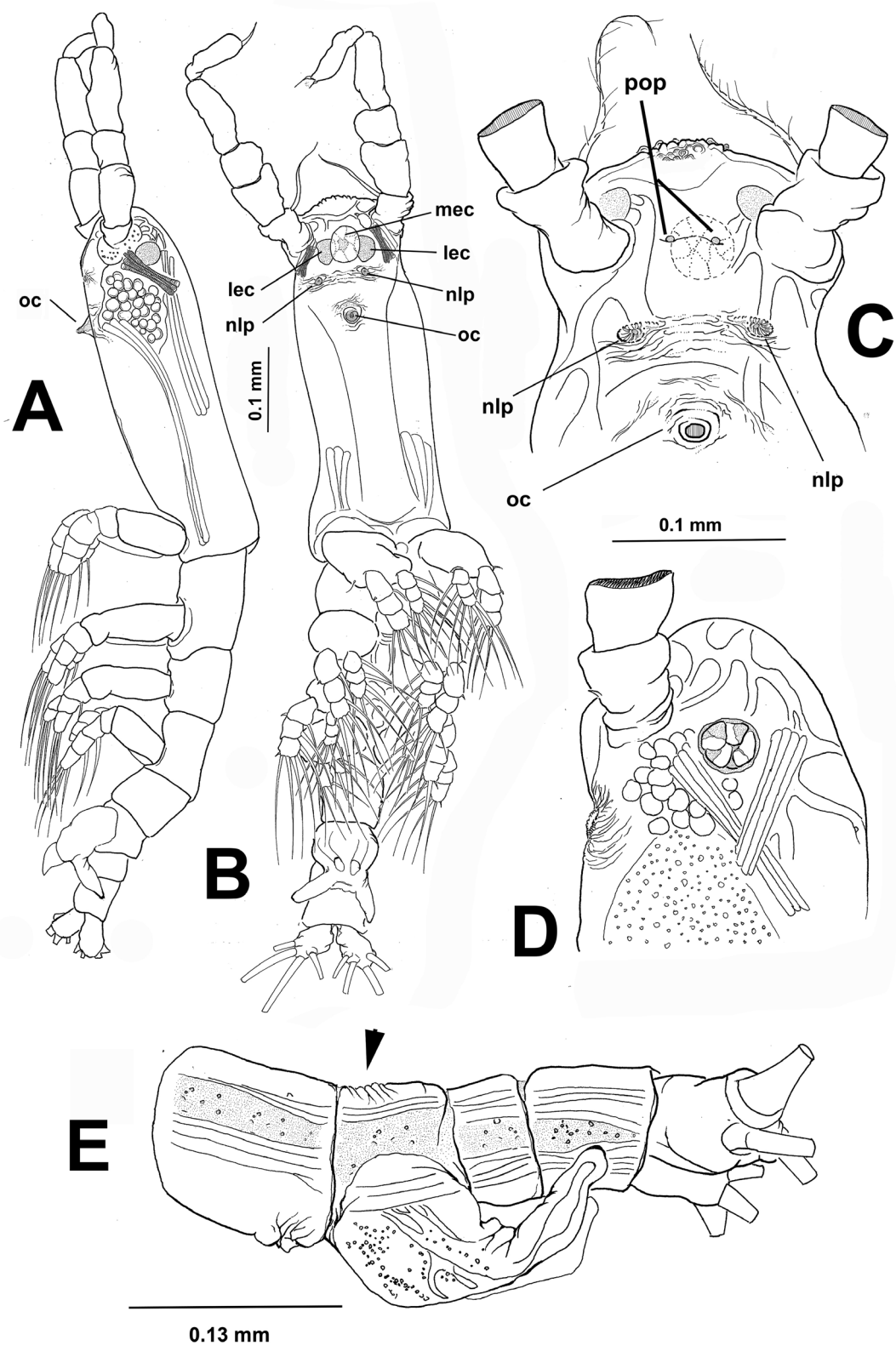

Fig. 11. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, allotype ♂; A — habitus, lateral; B — idem, ventral; C — cephalic region, ventral view; D — idem, lateral view; E — urosome, lateral view, arrowhead — dorsal integumental ridges. Abbreviations in Methods.

Рис. 11. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, аллотип ♂; A — внешний вид, латерально; B — то же, вентрально; C — головной отдел, вентрально; D — то же, латерально; E — уросома, латерально, стрелками показаны дорсальные складки интегумента. Сокращения в разделе Методы.

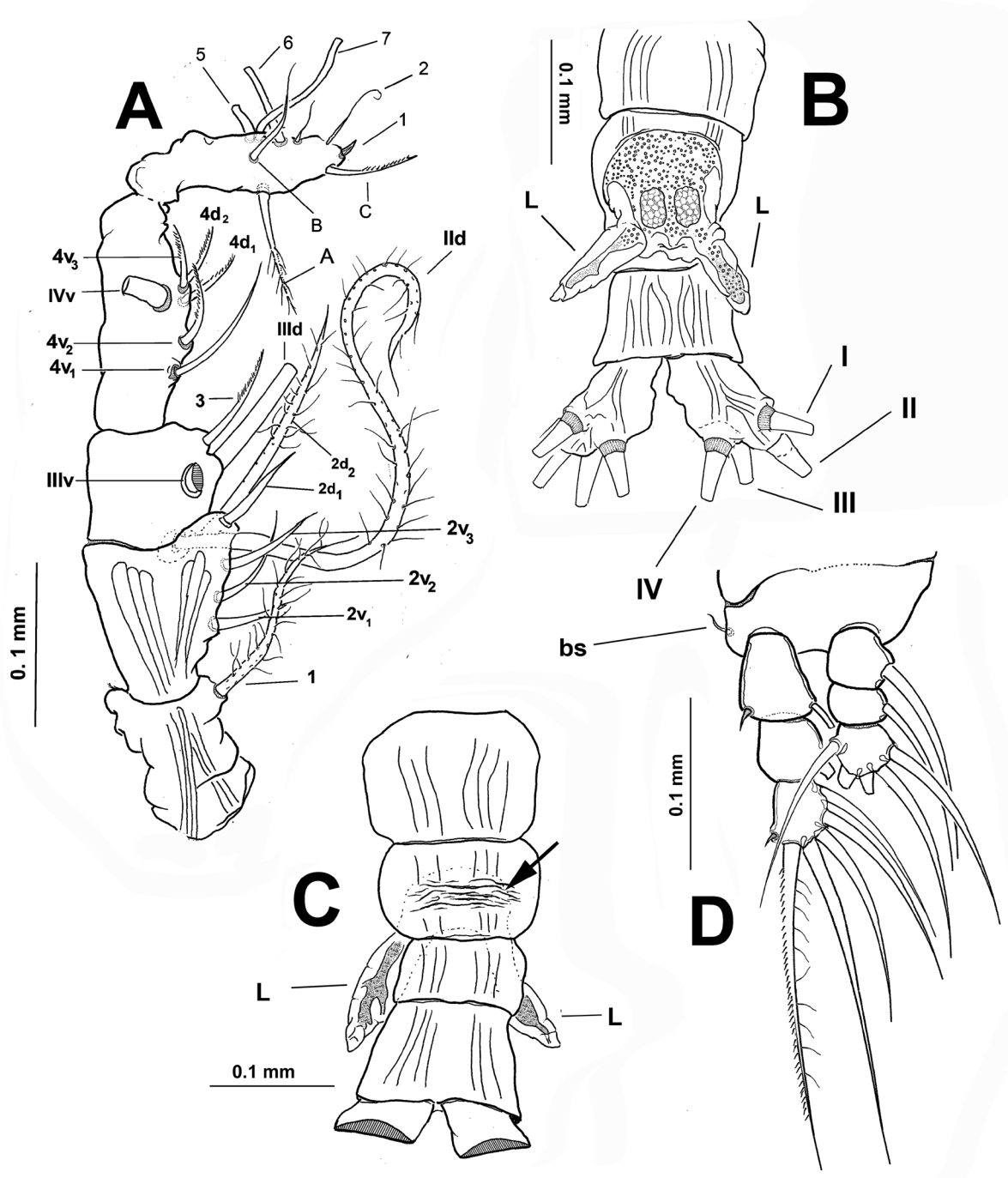

Fig. 12. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, allotype ♂; A — left antennule with armature *sensu* Grygier & Ohtsuka [1995] and Huys *et al*. [2007], dorsal view; B — urosome, ventral, caudal setae I–III *sensu* Huys & Boxshall [1991]; C — idem, dorsal, integumental ridges arrowed; D — leg I, anterior view. Abbreviations in Methods.

Рис. 12. *Cymbasoma chelemense* Suárez-Morales et Escamilla-Sánchez, 1997, аллотип ♂; A — левая антеннула, вооружение по Grygier & Ohtsuka [1995] и Huys *et al*. [2007], дорсально; B — уросома, вентрально, каудальные щетинки I–III по Huys & Boxshall [1991]; C — то же, дорсально, стрелками показаны складки интегумента; D — нога 1-й пары, вид спереди. Сокращения в разделе Методы.

gin of caudal rami (Fig. 9C); spines equally long, both ending in straight parallel acute points (os in Fig. 10B, Suárez-Morales, Escamilla [1997, fig. 1C]). Caudal rami short, subquadrate (Figs 9C, 10C), about 1.2 times as long as broad, each armed with three subequally long caudal setae (I–III) (Fig. 9C).

Antennules almost 0.4 mm long, representing about 17% of total body length and almost 25% of cephalothorax length [Suárez-Morales, Escamilla, 1997, fig. 2C,D]; as usual in female *Cymbasoma*, antennules distinctly 4-segmented, relatively robust, anteriorly directed, weakly divergent (Fig. 9A, Suárez-Morales, Escamilla [1997, fig. 2C, D]); intersegmental divisions of segments 1–3 complete (Fig. 9A); segments 3–4 divided by integumental constriction and weak suture (Fig. 9A). Length ratio of antennular segments (proximal to distal) 13.72: 20.91 :

14.37 : 50.90 = 100 (Fig. 9A). Following Grygier & Ohtsuka's [1995] setal nomenclature for female antennules, first segment with long, spiniform setal element 1 reaching halfway of succeeding segment; second segment bearing setiform element IId, and slender spiniform elements $2v_{1-3}$ and $2d_{1,2}$; third segment with long, spiniform element 3 being as long as bearing segment and adjacent setiform, lightly setose elements IIId and IIIv; fourth segment longest of antennule, proximal half armed with long spiniform element $4v_1$, shorter elements $4v_{2-3}$, $4d_{1,2}$, setiform elements IVv and IVd, and short aesthetasc 4 aes (Fig. 9A). Distal half of fourth segment with long, biserially setulated setiform elements Vd, Vv, Vm, and short, robust spiniform element 5; outer distal margin carrying several unbranched, slender setae of the "b-group" ($b_{1-3, 6}$); apical elements $6_{1,2}$ spiniform, acute, with reduced adjacent aesthetasc 6aes (Fig. 7E).

First pedigerous somite and succeeding three free thoracic somites each bearing well-developed pair of biramous swimming legs, all with exopodite longer than endopodite [Suárez-Morales, Escamilla-Sánchez, 1997, fig. 3C, D]. Swimming legs 1–4 slender, with setal armature pattern as:

legs	basis	endopod	exopod
Leg 1	1,0	0-1; 0,1;1,2,2	I-1; 0,1; I,2,2
Legs 2–4	1,0	0-1; 0,1;1,2,2	I-1; 0,1; I,2,3

Fifth legs (Figs 9B, 10B) biramous, represented by subrectangular exopodal segment (exp in Fig. 9B) armed with three terminal setae, innermost seta being shorter and narrower than adjacent two; endopodal lobe (enp in Fig. 9B), represented by small globose unarmed protuberance. Fifth leg setae long, reaching beyond distal margin of anal somite (Fig. 10B).

Remarks on female. In its original description, Suárez-Morales & Escamilla-Sánchez [1997] recognized strong affinities of *C. chelemense* with *C. longispinosum* (Bourne, 1890), based on Isaac's [1975] criteria. They emphasized several characters to establish its affinity with *C. longispinosum*, including: 1) the relatively long cephalothorax, representing nearly 70% of the body length, 2) the position of the oral papilla at anterior 20% of cephalothorax, 3) the antennule/cephalothorax length ratio (1/3 of cephalothorax length), 4) the presence of dorsal wrinkles on the genital double somite, and 5) basally conjoined ovigerous spines. A female of *C. chelemense* was recently recorded in Colombian coastal waters by Dorado-Roncancio & Dorado-Roncancio [2018]. Based on the brief analysis provided by these authors, it is possible that they have an undescribed member of the *C. longispinosum* species group, but the identification of the Colombian female as belonging to *C. chelemense* is not sustained by their data. The cephalothorax of the Colombian female [Dorado-Roncancio, Dorado-Roncancio, 2018, fig. 2B] is relatively short, representing only about 60% of the total body length *vs*. a value of 65–70% typical of members of the *C. longispinosum* group [Üstun *et al*., 2014; Suárez-Morales *et al*., 2020]. Also, the antennule armature of the Colombian female appears to diverge from *C. chelemense* in several details, including: 1) a shorter element 1 (*sensu* Grygier & Ohtsuka [1995]), 2) shorter element 3, 3) shorter element $4v_1$, and 4) the "b-group" setae (*sensu* Grygier & Ohtsuka [1995]) were not recognized as such by the authors but only mentioned as "three aligned setae", a group in fact comprising four setae in *C. chelemense* [Suárez-Morales, Escamilla-Sánchez, 1997, fig. 2C, D; Fig. 9A]. In addition, Dorado-Roncancio & Dorado-Roncancio [2018] show an illustration of a smooth ventral surface of the genital double-somite and compare it with the wrinkled dorsal view of *C. chelemense* and emphasize the taxonomically negligible subquadrate caudal rami. Also, Dorado-Roncancio & Dorado-Roncancio [2018, fig. 2F] present part of the ovigerous spines of the Colombian female, whose bifurcation appears to be positioned at the distal margin of the anal somite, thus diverging from its placing in *C. chelemense* [distal end of caudal rami] [Fig. 9C]. The terminal outer spine of the first swimming leg exopodal ramus, marked by Dorado-Roncancio & Dorado-Roncancio [2018, fig. 2H] as a character of *C. chelemense*, is present in all monstrillids. Overall, it is likely that the Colombian female reported by Dorado-Roncancio & Dorado-Roncancio [2018] is an undescribed species with some affinities to the *C. longispinosum* species group; it should be described with additional material (males or females) from Bahía de Cartagena, Colombia. Thus, Dorado-Roncancio & Dorado-Roncancio's [2018] record of this species from Colombia is deemed invalid, a conclusion supporting the assumption that the species of the *C. longispinosum* group have restricted, endemic geographic distributions [Suárez-Morales *et al*., 2020].

Adult male. Noticeably smaller than female. Body length of allotype = 1.10 mm. Cephalothorax 0.57 mm long, representing 50% of total body length (Fig. 11A). Oral cone moderately prominent, positioned at 28% of cephalothorax length (oc in Fig. 11A–C). Cephalic region slightly protuberant bilaterally in dorsal view. Eyes comprising midventral cup and pair of lateral cups. Lateral cups slightly smaller than medial cup, weakly pigmented (lec, mec in Fig. 11B). Forehead rounded, weakly produced, with shallow integumental ridges (Fig. 11C (sensilla absent between antennulary bases. Other cephalic integumental processes comprising single pair of nipple-like processes (nlp in Fig. 11B,C), pair of preoral pores (pop in Fig. 11C), and adjacent field of faint integumental wrinkles.

Urosome consisting of fifth pedigerous somite (lacking fifth legs or fifth legs remnants), genital somite (carrying genital apparatus), short preanal somite, and anal somite. Genital somite with corrugate dorsal surface (arrowed in Fig. 12C). Genital somite slightly longer than fifth pedigerous somite. Genital apparatus of type II [Suárez-Morales, McKinnon 2014], represented by pair of divergent, narrow, leaf-like genital lappets (L in Fig. 12B, C), these being moderately elongate and dorsally directed in lateral view (Fig. 12A), reaching midlength of long anal somite (Fig. 12C); somite with smooth lateral margins. Common basal joint of lappets straight, smooth, weakly produced (Fig. 12B). Anal somite about twice as long as preanal somite in dorsal view, comprising 33% of urosome length; no suture visible on ventral or dorsal surfaces, but with cuticular hyaline frill along distolateral margins. Caudal rami subrectangular, approximately 1.4 times as long as wide, each ramus armed with four setae (setae I–IV in Fig. 12B).

Antennule length = 0.32 mm. Antennules relatively long, geniculate, representing 32% of total body length, and 64% of cephalothorax length. As usual in male monstrilloids, antennule 5-segmented, all segments separated, with segment 5 located distal to geniculation (Fig. 12A). Length ratio of antennulary segments, from first to fifth as: 14.86: 16.89 : 12.83 : 28.37 : 27.02 (= 100). Setal element 1 (*sensu* Grygier & Ohtsuka [1995]) on first segment noticeably long, biserially setulated, reaching beyond distal margin of succeeding second segment. Second segment armed with elements $2v_{1-3}$, $2d_{1,2}$, with element $2d_2$ remarkably strong and long, and long setiform element IId reaching proximal margin of fifth segment (IId in Fig. 12A). Setiform elements IIId, IIIv, and spiniform element 3 present on third segment [element IIIv broken off, but socket present]. Fourth segment with spiniform elements $4d_{1,2}$, $4v_{1-3}$ and setiform element IVv. Fifth segment armature (*sensu* Huys *et al*. [2007]) with elements A–C inserted on inner margin and elements 1–5 on outer and apical margins

REMARKS. Suárez-Morales & Escamilla-Sánchez [1997] matched the males and females of this species by their co-occurrence in the same sampled area, the resemblance with other males assigned to *C. longispinosum* [Giesbrecht, 1893;

Sars, 1921] and their sharing of morphological characters in both sexes, including: 1) cuticular corrugation on the forehead, 2) transverse corrugation pattern on the genital somite, and 3) the relatively strong development of antennulary elements 1, 3, and $2v_3$ (*sensu* Grygier & Ohtsuka [1995]). In addition, all males believed to represent species of the *C. longispinosum* group in the literature (*i.e*., Giesbrecht [1893]; Sars [1921]; Martin Thompson [1983]; Leite *et al*. [2010]) including *C. chelemense* [Suárez-Morales, Escamilla-Sánchez, 1997] and *C. jinigudira* from Australia [Suárez-Morales, McKinnon, 2016] have four caudal setae.

According to Üstün *et al*. [2014] and Suárez-Morales *et al*. [2020], *C. chelemense* clearly belongs to the group of species related with *C. longispinosum*. This group is currently known to contain at least 8 nominal species showing subtle but consistent differences [Üstün *et al*., 2014] and its members are distributed in distinct geographical areas, including Europe (*C. longispinosum s.str*.), the Gulf of Mexico (*C .chelemense*) [Suárez-Morales, Escamilla-Sánchez, 1997], the Gulf of California (*C. californiense* Suárez-Morales et Palomares-García, 1999), Japan, Korea, Vietnam, India (*C. morii* (Sekiguchi, 1982) [Chang, 2014; Grygier, 1994]), China (*C. stricturum* (Zhou *et al*., 2025)), the Red Sea, Egypt (*C. janetae* Mageed, 2010), Turkey (*C. sinopense* Üstün, Suárez-Morales et Terbiyik, 2014), western Australia (*C. jinigudira* Suárez-Morales et McKinnon, 2016), and Belize (*C. belizense* Suárez-Morales, Vásquez-Yeomans et Santoya, 2020). After its original description, *C. chelemense* was assigned to the *C. longispinosum* species-group by its size, body proportions with an elongate cephalothorax (+ 63% of total body length), relatively short urosome, proximally fused ovigerous spines, bilobed female fifth legs with unarmed inner lobe and outer lobe bearing 3 setae, and the presence of conspicuous integumental ornamentation on the genital double-somite [Suárez-Morales, 2011; Üstün *et al*., 2014]. Most of these species are endemic and confined to restricted geographic areas, but two of them are known from Mexico, *C. chelemense* in the southern Gulf of Mexico and *C. californiense* in the Gulf of California.

Conflict of interests: The author declares no conflict of interest.

Ethical approval: No ethical issues were raised during this research.

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