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Cumacea (Crustacea) from shallow waters of Bermuda

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Abstract

Seven species of Cumacea, two new (*Cumella somersi* sp.n. and *Schizotrema wittmanni* sp.n.) were identified in samples from shallow waters and sea caves of Bermuda. This is the first record of the genus *Schizotrema* in the Atlantic Ocean, and the first record of *Cumella serrata* CALMAN, 1911 and *Schizotrema agglutinanta* (BĂCESCU, 1971) for Bermuda. The paper includes revisions of all species reported from Bermuda.

Keywords: Cumacea, Bermuda, new taxa, revisions.

Zusammenfassung

Von sieben Cumaceen-Arten aus Seichtwasser- und Meereshöhlenproben von Bermuda sind zwei neu für die Wissenschaft: *Cumella somersi* sp.n. und *Schizotrema wittmanni* sp.n. Das Genus *Schizotrema* wird zum erstenmal aus dem Atlantik vermeldet, und die Arten *Cumella serrata* CALMAN, 1911 und *Schizotrema agglutinanta* (BĂCESCU, 1971) zum erstenmal von Bermuda. Alle bisher in Bermuda gefundenen Arten werden kritisch revidiert.

Introduction

Situated at 32°18'N, 64°46'W in the northwestern Atlantic Ocean, the archipelago of Bermuda is made up of approximately 150 islands and islets, with a total land mass of only 50 km². Despite its high latitude, the oceanic island of Bermuda boasts the northernmost coral reef system in the world, largely thanks to the warm Gulf Stream which passes halfway between the island and North America. Cape Hatteras, the nearest land, lies about 1,000 km to the northwest.

Prior to our study, eight species of Cumacea were known from Bermuda. Of these, only two had been recorded before 1990, both from shallow sea bottoms: *Nannastacus hirsutus* HANSEN, 1895 (also mentioned by VERRILL 1923, MARKHAM & STERRER 1986, BĂCESCU 1992b) and *Cubanocuma* cf. *gutzui* BĂCESCU & MURADIAN, 1977 (MARKHAM & STERRER 1986). More recent collections in sea caves added six species. PETRESCU (1990) described a new species, *Campylaspis cousteauui* and listed *Cumella bermudensis* and *C. sterreri* as nomina nuda. These two species were later described by BĂCESCU & ILIFFE (1991) in addition to *C. spinosa*. BĂCESCU (1992a) described two more species, *Cumella iliffei* and *C. ocellata*. These descriptions were based on material collected by Thomas Iliffe in 1981-82 (Table 1). "*Nannastacus* sp. and Cumacea g.sp." recorded by SKET & ILIFFE (1980) from Walsingham caves referred to taxa which had strayed into caves from the open sea. Eight more species have been reported from the deep sea north

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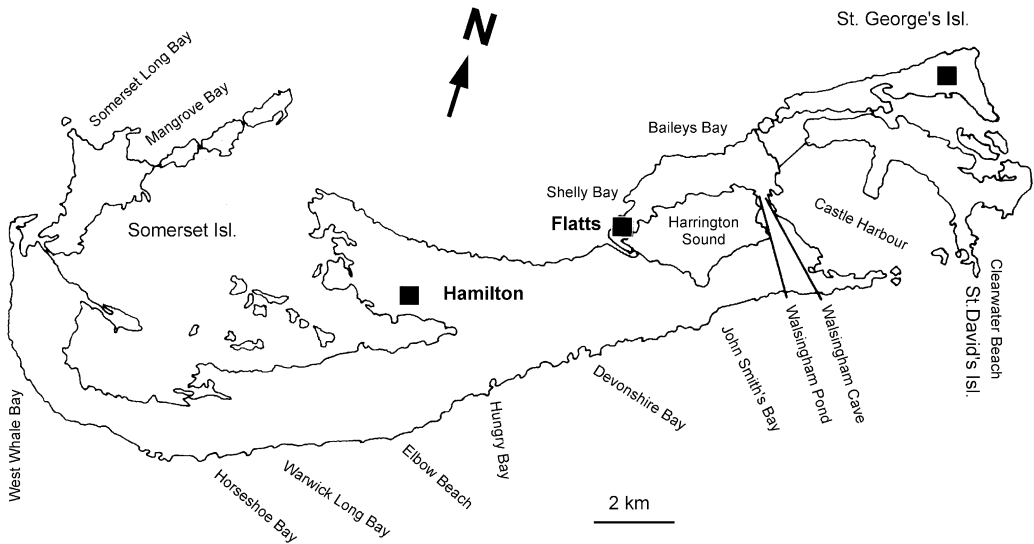


Fig. 1: Bermuda, collecting sites.

of Bermuda, between 37° and 39° N, along the Gay Head-Bermuda transect: three species by JONES (1974): *Campylaspis squamifera* FAGE, 1929 (syn. *C. torulosa* JONES, 1974 according to BĂCESCU, 1992 b), *Campylaspis mansa*, and *Cumella polita*; and five species by REYSS (1974): *Makrokyllindrus sandersi*, *M. hessleri*, *M. stocki*, *M. monodi* and *M. peresi*. Most recently, STERRER (1998) affirmed that 10 species of Cumacea exist in Bermuda.

There are no collections of Cumacea at the Bermuda Natural History Museum. The type specimen of *Nannastacus hirsutus*, collected by the German "Plankton" Expedition at the end of the 19th century, was deposited at the Natural History Museum, Berlin, but is lost. The small lot of specimens from sea caves in the collection of "Grigore Antipa" National Museum of Natural History, Bucharest (Romania) contains type and non-type specimens of *Cumella bermudensis*, *C. sterreri* and of *Campylaspis cousteaui*; but type specimens of *Cumella spinosa*, *Cumella iliffei* and *C. ocellata* no longer exist.

This study, which is mainly based on the material collected in June 2000 from shallow waters around Bermuda, was undertaken as part of the "Bermuda Biodiversity Project" supported by the Bermuda Natural History Museum and the Bermuda Zoological Society, in collaboration with the Institute of Medical Biology (Vienna, Austria) and "Grigore Antipa" National Museum of Natural History, Bucharest (Romania).

Material and Methods

Cumaceans from eight stations and 15 samples were collected by Iorgu Petrescu by snorkeling in the shallow waters (1-6 m depth) of the major islands of the archipelago: St. George's, St. David's, Main Island and Somerset, 18-29 June 2000 (Fig. 1). Samples were collected from various biotopes: sandy bottoms, sand between dead corals, sand with algae cover, and under stones. The samples were collected with a 0.2 mm mesh-size hand net (Table 2).

Table 1: Cumaceans from Bermuda caves collected by SKET & ILIFFE (1978/1979) and ILIFFE (1981, 1982)

species	caves	references
<i>Cubanocuma</i> cf. <i>gutzui</i> (as <i>Campylaspis cousteauui</i>)	Emerald Sink, Cherry Pit, Palm	PETRESCU 1990
<i>Cumella iliffei</i>	Cripplegate, Emerald Sink	BĂCESCU 1992
<i>Cumella ocellata</i>	Cripplegate	BĂCESCU 1992
<i>Cumella</i> (?) <i>spinosa</i>	Walsingham	BĂCESCU & ILIFFE 1991
<i>Schizotrema agglutinanta</i> (as <i>Cumella bermudensis</i>)	Cherry Pit, Cripplegate, Green Bay, Straw Market, Walsingham	PETRESCU 1990, BĂCESCU & ILIFFE 1991
<i>Schizotrema agglutinanta</i> (as <i>Cumella sterreri</i>)	Cherry Pit, Cripplegate, Emerald Sink, Green Bay, Sailor's Choice, Straw Market, Walsingham	PETRESCU 1990, BĂCESCU & ILIFFE 1991
<i>Nannastacus</i> sp.	Walsingham, Walsingham Sink, Corset, Roadside	SKET & ILIFFE 1980
Cumacea g.sp.	Walsingham, Walsingham Sink, Corset, Roadside	SKET & ILIFFE 1980

Table 2: Samples collected by Iorgu Petrescu

sample no	sta. no	location	depth (m)	date	substratum	cumaceans
3	1	Tobacco Bay	4	18.06.	under rocks, outer reef	<i>Cumella somersi</i>
4	1	Tobacco Bay	4	18.06.	algae on rocks	<i>Cubanocuma</i> cf. <i>gutzui</i>
5	1	Tobacco Bay	0	18.06.	under stones	<i>Cumella ocellata</i> , <i>C. somersi</i>
16	5	Elbow Beach	5-6	21.06.	sand on inner side of the reef	<i>Cumella serrata</i>
17	6	Devonshire Bay	1	22.06.	sand between corals (<i>Palythoa caribaea</i>)	<i>Cumella serrata</i> , <i>C. somersi</i>
18	6	Devonshire Bay	0.5	22.06.	sand near shore	<i>Cumella somersi</i>
19	6	Devonshire Bay	0.5	22.06.	under stones	<i>Cumella somersi</i>
21	7	John Smith's Bay	1.5	22.06.	algae (<i>Laurencia obtusa</i>) between stony corals, outer side of reef	<i>Cumella somersi</i>
26	8	Mangrove Bay, Somerset Island	2	25.06.	algae (<i>Laurencia microcladia</i>) on stony corals	<i>Cumella ocellata</i> , <i>C. serrata</i>
27	8	Mangrove Bay, Somerset Island	1.5	25.06.	sand with <i>Thalassia testudinum</i>	<i>Cumella serrata</i>
28	8	Mangrove Bay, Somerset Island	0	25.06.	under stones	<i>Cumella ocellata</i>
32	10	Clearwater Beach, St. David's Island	2	27.06.	fine sand	<i>Cumella serrata</i>
33	10	Clearwater Beach, St. David's Island	2	27.06.	sand with <i>Syringodium</i>	<i>Cumella serrata</i> , <i>C. somersi</i>
37	12	Warwick Long Bay	2	29.06.	sand, inner side of reef	<i>Cubanocuma</i> cf. <i>gutzui</i>

Table 3: Samples collected by Karl Wittmann, Karl Wittmann and Iorgu Petrescu*

sample no.	sta. location	coordinate (GPS)	depth (m)	date	substratum	sampling method	cumaceans
KW 1	1 Tobacco Bay	32°23'N 64°40'W	1-2	18.06.	algae, <i>Caulerpa racemosa</i> , mainly on rocks	hand net	<i>Cubanocuma</i> cf. <i>gutzi</i> , <i>Cumella ocellata</i> , <i>Cumella serrata</i>
KW 4*	1 Tobacco Bay	32°23'N 64°40'W	3	18.06.	gravel and stones between rocks (reef)	washings of gravel and stones	<i>Cubanocuma</i> cf. <i>gutzi</i> , <i>Cumella ocellata</i> , <i>Cumella serrata</i>
KW 17	6 Outer Reef of Bermuda, Eastern Blue Cut	32°23'N 64°53'W	8-12	22.06.	from ceilings of micro-caves and mysid swarms in rock recess above sand	SCUBA-diver operated hand net	<i>Cumella serrata</i>
KW 19	7 Outer Reef of Bermuda, 1 mile S of the Crescent	32°23'N 64°48'W	6	22.06.	gravel and stones between rocks (reef)	washings of gravel and stones	<i>Cumella ocellata</i>
KW 24*	10 Harrington Sound, SE-coast, beneath small island	32°23'N 64°40'W	3	23.06.	<i>Ircinia felix</i>	extraction from sponge	<i>Cumella ocellata</i>
KW 26*	10 Harrington Sound, SE-coast, beneath small island	32°23'N 64°40'W	3	23.06.	<i>Ircinia felix</i>	extraction from sponge	<i>Cumella ocellata</i>
KW 27*	11 Harrington Sound	32°19'N 64°43'W to 32°19'N 64°43'W	13.0-11.5	23.06. (21:38-21:48)	coarse sand, brown algae	boat operated bottom net	<i>Cumella serrata</i>
KW 28*	12 Harrington Sound	32°19'N 64°43'W to 32°19'N 64°43'W	11.5-10.2	23.06. (21:59-22:09)	coarse sand, a few algae	boat operated bottom net	<i>Cumella serrata</i>
KW 30*	14 Harrington Sound	32°19'N 64°44'W to 32°18'N 64°44'W	10.5-9.2	23.06. (23:11-23:21)	coarse sand, filiform (brown) algae	boat operated bottom net	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 31*	15 Harrington Sound	32°19'N 64°44'W to 32°19'N 64°44'W	15.5-13.5	23.06. (23:37-23:47)	coarse sand, brown algae	boat operated bottom net	<i>Cumella serrata</i>
KW 37*	16 Mangrove Bay	32°18'N 64°51'W	2-3	25.06.	sand with <i>Syringodium</i> and brown algae	extraction from 6 empty bottles	<i>Cumella serrata</i>
KW 38	17 Somerset Long Bay	32°18'N 64°52'W	3	25.06.	<i>Thalassia testudinum</i> on sand	hand net	<i>Cubanocuma</i> cf. <i>gutzi</i> , <i>Cumella ocellata</i>
KW 39	18 Outer reef flat of Bermuda, off NASA Point, 'The Basilica'	32°20'N 64°38'W	5-18	26.06.	ceilings of microcaves and mysid swarms above sand	SCUBA-diver operated hand net	<i>Cumella serrata</i>

Table 3: Samples collected by Karl Wittmann, Karl Wittmann and Iorgu Petrescu*

sample no.	sta. location	coordinate (GPS)	depth (m)	date	substratum	sampling method	cumaceans
KW 40	19 Outer reef flat of Bermuda, wreck of 'Rita Zovetta'	32°21'N 64°38'W	10-18	26.06.	mysid swarms in rock recesses and above sand	SCUBA-diver operated hand net	<i>Cumella serrata</i>
KW 41	20 Outer reef flat of Bermuda, 'The Aquarium'	32°19'N 64°40'W	5-18	26.06.	mysid swarms above sand and from microcaves	SCUBA-diver operated hand net	<i>Cumella serrata</i>
KW 43	22 Hungry Bay	32°17'N 64°45'W	0.5-1	29.06.	boulders, large stones	hand net, from underside of stones	<i>Cumella serrata</i>
KW 44	22 Hungry Bay	32°17'N 64°45'W	0.5-1	29.06.	boulders, large stones, gravel	washings of gravel and stones	<i>Cumella ocellata</i> , <i>Cumella serrata</i>
KW 45	22 Hungry Bay	32°17'N 64°45'W	1	29.06.	large stones, gravel and stones	washings of gravel	<i>Cumella hirsuta</i> , <i>Cumella serrata</i> , <i>Shizotrema agglutinanta</i>
KW 47	23 Castle Harbour sound, Tucker's Town Bay	32°20'N 64°41'W	1.5	29.06.	<i>Reniera hogarthi</i>	extraction from sponge	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 48	24 Castle Harbour sound	32°20'N 64°41'W to 32°20'N 64°42'W	12.0-13.0	29.06. (18:35-18:45 day)	sand, brown algae, sponges, <i>Halophila</i>	boat operated bottom net	<i>Cumella serrata</i>
KW 49*	25 Castle Harbour sound	32°20'N 64°41'W to 32°20'N 64°42'W	13.5-13.5	29.06. (20:53-21:03)	fine sand, brown algae, <i>Halophila</i>	boat operated bottom net	<i>Cumella serrata</i>
KW 50*	26 Castle Harbour sound	32°20'N 64°41'W to 32°20'N 64°42'W	12.5-13.7	29.06. (21:15-21:25)	fine sand, brown algae, <i>Halophila</i>	boat operated bottom net	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 51*	27 Castle Harbour sound	32°20'N 64°41'W to 32°20'N 64°42'W	12.0-12.0	29.06. (21:15-21:25)	mud, brown algae	boat operated bottom net	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 52*	28 Castle Harbour sound	32°20'N 64°42'W to 32°20'N 64°42'W	11.5-11.7	29.06. (22:08-22:18)	fine sand plus some mud, algae	boat operated bottom net	<i>Cumella serrata</i>
KW 53*	29 Castle Harbour sound	(start pos. ?) to 32°20'N 64°42'W	10.7	29.06. (22:08-22:18)	fine sand, brown algae	boat operated bottom net	<i>Cumella serrata</i>
KW 54*	30 Castle Harbour sound	32°20'N 64°42'W to 32°20'N 64°41'W	0-1	29.06. (23:07-23:20)	on bottom (ca 12 m): fine sand, brown algae	horizontal plankton tow near surface, with boat operated plankton net	<i>Cumella serrata</i>

Ten additional samples were collected by night dredging together with Karl Wittmann (Institute of Medical Biology, Vienna), from western Harrington Sound and western Castle Harbour.

Prof. Wittmann, who collected mysids, also contributed cumaceans from samples collected by snorkeling (with a 0.3 mm mesh-sized hand net) from almost identical stations as the first set (26 samples), and by SCUBA diving on the northern reef platform (separate 8 samples especially for cumaceans, Table 4) and in Castle Harbour (5-15 m depth). He also collected crustaceans from sponges and empty bottles (Table 3).

Table 4: Samples collected by Karl Wittmann by SCUBA with handnet from outer reef of Bermuda (22.06.2000)

sample no	location	coordinates	depth (m)	substratum	cumaceans
KW 1.1	Eastern Blue Cut	32°23' N 64°53' W	15	sand between soft corals on a grand sand flat	<i>Cumella serrata</i> , <i>Cumella somersi</i>
KW 2.1	Eastern Blue Cut	32°23' N 64°53' W	15	sand between soft corals on a grand sand flat, closer to the next reef	<i>Cumella serrata</i>
KW 3.1	Eastern Blue Cut	32°23' N 64°53' W	14	sand on a margin of a small reef	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 4.1	Eastern Blue Cut	32°23' N 64°53' W	13	5 m from a great reef, large sand burrows made by crustaceans	<i>Cumella hirsuta</i> , <i>Cumella serrata</i>
KW 5.1	Eastern Blue Cut	32°23' N 64°53' W	15	fine sand below rocks, on the bottom of microcaves	<i>Cumella serrata</i> , <i>Shizotrema wittmanni</i>
KW 10.1	1 mile south of the "Crescent"	32°23' N 64°48' W	5	very coarse sand with stones, burrows of large animals in sand	<i>Cumella serrata</i>
KW 11.1	1 mile south of the "Crescent"	32°23' N 64°48' W	4-6	fine sand below rock-like microcaves	<i>Cubanocuma</i> cf. <i>gutzui</i> , <i>Cumella serrata</i>
KW 12.1	1 mile south of the "Crescent"	32°23' N 64°48' W	5-6	fine sand from burrows (like holes) between stones	<i>Cumella serrata</i>

Additional material was collected by Dr. Thomas Iliffe from Bailey's Bay (1984), Walsingham Cave (1986, 2000, sta. 0-32, sta. 00-036) and Deep Blue Cave (2000, sta. 00-037).

We also verified the type specimens of *Cumella bermudensis* BĂCESCU & ILIFFE, 1991, *Cumella sterreri* BĂCESCU & ILIFFE, 1991 and *Campylaspis cousteau* PETRESCU, 1990 from the collection of "Grigore Antipa" National Museum of Natural History, and syntypes of *Cumella serrata* in the Zoological Museum, Copenhagen and in the Natural History Museum, London.

Reference collections containing all the identified species and paratypes from this material are deposited at the Bermuda Natural History Museum (BAMZ), Naturhistorisches Museum in Vienna (NHMW) and the rest of them at the "Grigore Antipa" National Museum of Natural History in Bucharest (GAM). Holotypes of the new species are deposited in the National Museum of Natural History, Washington D.C. (USNM).

Results

The material contains 825 specimens of Cumacea which belong to one family, Nannastacidae, three genera and seven species, two of them being new to science.

Cubanocuma cf. *gutzui* BĂCESCU & MURADIAN, 1977, *Cumella hirsuta* (HANSEN, 1895), *Cumella ocellata* BĂCESCU, 1992, *Cumella serrata* CALMAN, 1911, *Cumella somersi* sp.n., *Schizotrema agglutinanta* BĂCESCU, 1971 and *Schizotrema wittmanni* sp.n.

Cumaceans collected from Bailey's Bay in 1984 belong to *Cubanocuma* cf. *gutzui*, *Cumella hirsuta* and *Cumella serrata*; those from sea caves belong to *Schizotrema agglutinanta* Băcescu (Walsingham and Deep Blue caves) and *S. wittmanni* sp.n. (Walsingham cave).

Cubanocuma cf. *gutzui* BĂCESCU & MURADIAN, 1977

(Figs 2-11)

Cubanocuma gutzui BĂCESCU & MURADIAN, 1977: 3-9, figs 1-3.

Cubanocuma cf. *gutzui*: MARKHAM & STERRER, 1986: 362-364, fig.120.

Campylaspis cousteaui PETRESCU, 1990: 9-12, fig. 1; BĂCESCU, 1992 b: 186; PETRESCU, ILIFFE & SARBU, 1993: 393, fig. 11; PETRESCU, 1996:158-160, fig. 2.

Material: 1 ♀, sta. KW 1; 6 ♀♀ (NHMW 19558), 6 ♀♀ (BAMZ 2001193015), sta. KW 4; 1 ♀, sta. KW 11.1; 1 ♀, sta. KW 38; 1 immature ♂, sta. 4; 1 ♀, sta. 37; 5 ♀♀, Bailey's Bay, coll. T. Iliffe, 22.08.1984.

Remarks: *Cubanocuma* cf. *gutzui* was first recorded by MARKHAM & STERRER (1986). By comparison with Cuban females, non-ovigerous females from Bermuda show some differences: numerous small tubercles on carapace (Fig. 2), as BĂCESCU & MURADIAN (1977) mentioned only for immature males; but tubercles are absent in the Cuban females of the same size as the ones from Bermuda (1.77 mm); serrations on carpus of maxilliped 2 (Fig. 3) and on propodi of pereopods 3-5 (Fig. 7-11). Cuban specimens have a small seta instead of strong serration on pereopods. All other characters are similar (Fig. 4-6).

An ample study of the morphologic variability of both sexes and of different stages of development of specimens from different sites of the Gulf of Mexico and the Caribbean will enable to establish the precise taxonomic status of *Cubanocuma* cf. *gutzui*.

Specimens from Emerald Sink Cave and Cherry Pit Cave collected by T. Iliffe and erroneously identified as a new species, *Campylaspis cousteaui* PETRESCU, 1990 also belong to this species, as do the male specimens from Jamaica (PETRESCU & al. 1993) and Abaco Island, Bahamas (PETRESCU 1996).

Cumella hirsuta (HANSEN, 1895)

(Figs 12-37)

Nannastacus hirsutus HANSEN, 1895: 59-60, fig. 3; STEBBING, 1913: 173; VERRILL, 1923: 181-211, pl. LV, fig. 2; MARKHAM & STERRER, 1986: 364, fig. 120; BĂCESCU, 1992 b: 237.

Cumella hirsuta: WATLING, 1991: 752.

Material: 1 ♀, sta. KW 47; 2 ♀♀, sta. KW 30; 2 ♀♀, 1 immat. ♂ (NHMW 19559), sta. KW 45; 2 ♀♀ (BAMZ 2001193016), sta. KW 50; 1 ♀, sta. KW 51; 1 ♀, sta. KW 3.1; 1 ♀, 1 ♂, sta. KW 4.1; 2 ♀♀, Bailey's Bay, coll. T. Iliffe, 22.08.1984.

Description of female (Figs 12-28): Body covered with hirsute tegument. Length: 2.25 mm.

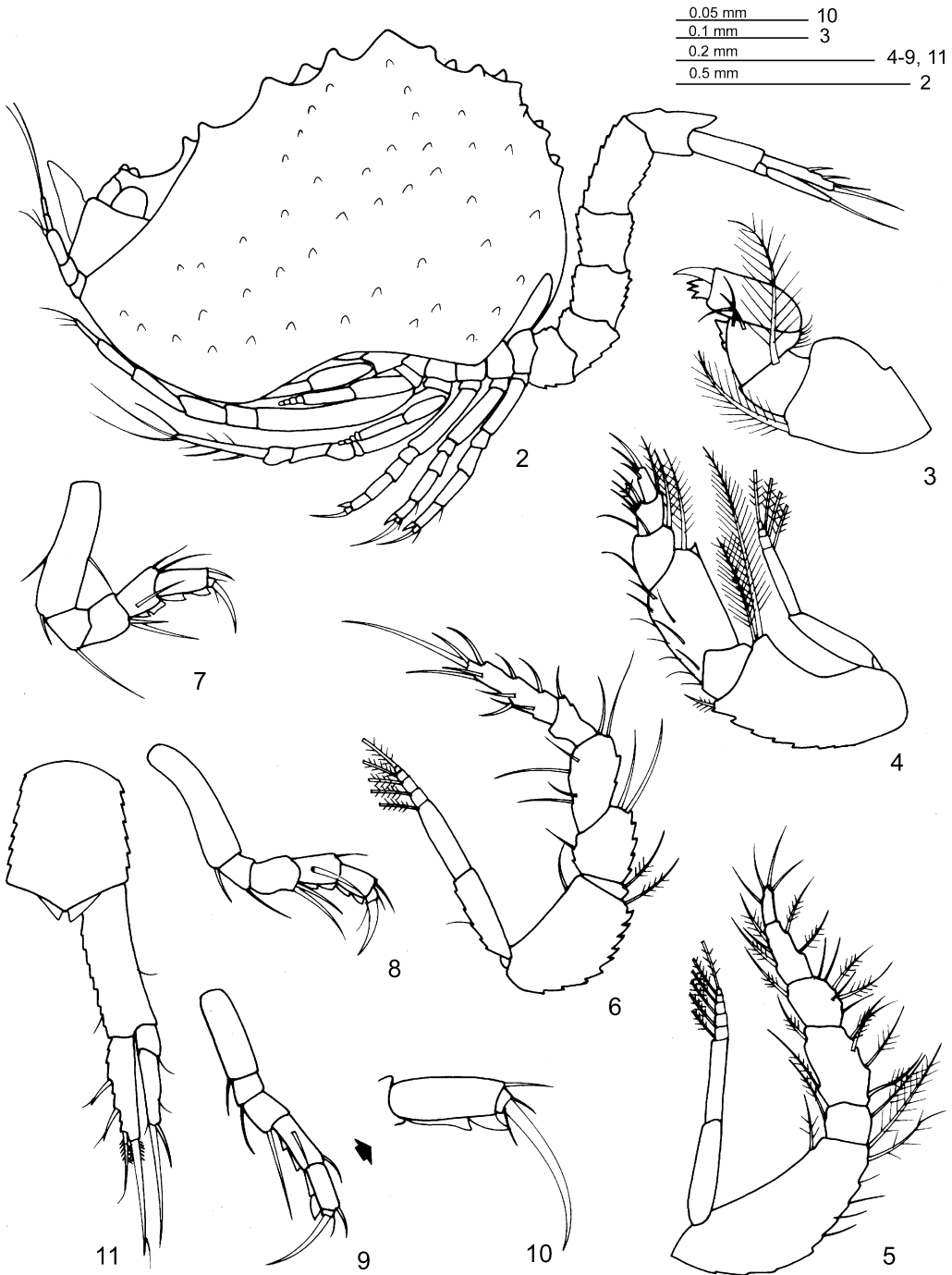


Fig. 2-11: *Cubanocuma* cf. *gutzui* BĂCESCU & MURADIAN, 1977, female. 2: body, lateral view; 3: maxilliped 2; 4: maxilliped 3; 5: pereopod 1; 6: pereopod 2; 7: pereopod 3; 8: pereopod 4; 9: pereopod 5; 10: its dactylus, magnified; 11: uropod.

Carapace (Fig. 12, 13) represents 1/3 of the entire body; small notch; eye lobe with two large lateral pigmented lenses.

Antenna 1 (Fig. 14) as usual for the genus, middle article of peduncle without tubercle.

Antenna 2 (Fig. 15) as usual for the genus, with two pappose setae.

Mouth parts: Labium (Fig. 16), with apical flattened setae. Mandible (Fig. 17), pars incisiva with three teeth; lacinia mobilis with 4 teeth, stout setae between lacinia mobilis and robust pars molaris. Maxilla 1 (Fig. 18), inner endite with simple spine-setae, palpus with two filaments. Maxilla 2 (Fig. 19), pectinated setae on endite of second article, endopod with setae on inner margin up to almost the basis of second article. Maxilliped 1 (Fig. 20), carpus with bifid flattened setae on inner margin; narrow dactylus. Maxilliped 2 (Fig. 21), basis with two plumose setae on inner distal corner; plumose seta on inner margin of merus; propodus with two plumose setae on inner margin. Maxilliped 3 (Fig. 22), basis with outer process, short plumose setae on inner distal corner; merus as long as carpus.

Pereopod 1 (Fig. 23), basis longer than 1/3 of entire pereopod; carpus longer than propodus; dactylus shorter than propodus, with a long claw.

Pereopod 2 (Fig. 24), basis longer than 1/3 of entire pereopod; carpus with setae on inner distal corner; dactylus three times longer than propodus, with three terminal stout setae.

Pereopods 3-5 (Figs 25-27) with progressively shorter bases and longer carpi; dactyli with robust terminal setae.

Uropod (Fig. 28), peduncle 1.28 times longer than last pleonite, 1.66 times longer than endopod, with four stout setae on inner margin; exopod shorter than endopod (0.7:1), with a terminal stout sensitive seta; endopod with a much robust terminal sensitive seta, with microsetae and four stout ones on inner margin.

Description of male (Figs 29-37): Body with rugose tegument. Length: 2.33 mm.

Carapace (Fig. 29) represents a third of the entire body, marked notch, antero-ventral corner with a two small teeth, pseudorostral lobes with a pair of lenses, eye lobe with seven lenses (one frontal, larger, two lateral pairs and a median pair).

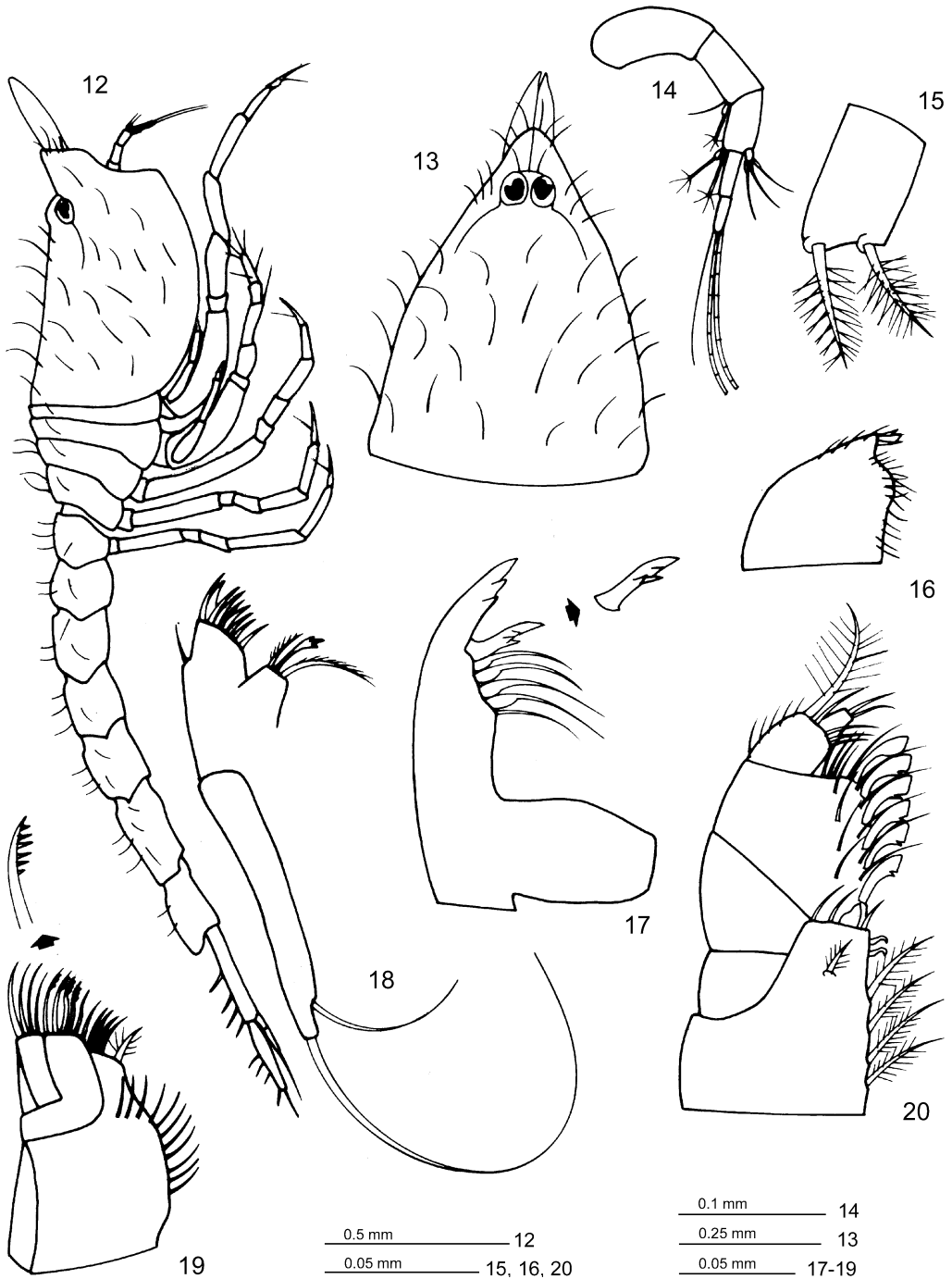
Maxilliped 3 (Fig. 30), basis with an outer process, four plumose setae on distal inner corner; carpus as long as merus; dactylus with a short claw.

Pereopod 1 (Fig. 31), basis represents half of pereopod, with strong crest of hyaline teeth on outer margin, carpus longer than propodus.

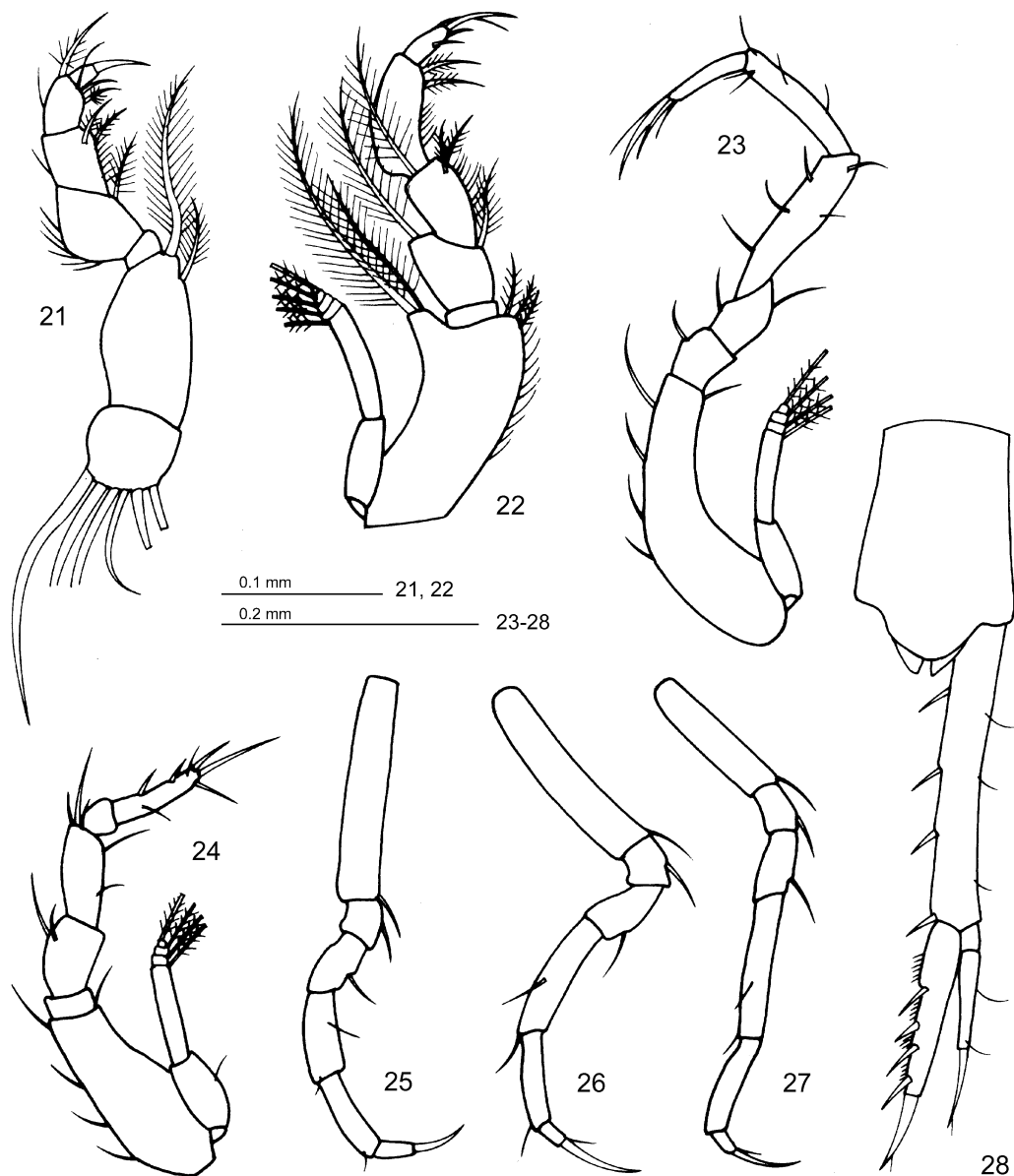
Pereopod 2 (Figs 32, 33), basis represents half of pereopod, with a short hyaline crest on proximal half of inner margin; carpus a little longer than merus; dactylus three times longer than propodus, with three apical simple stout setae, shorter than dactylus.

Pereopods 3-5 (Figs 34-36) with progressively shorter bases and longer carpi, pairs 3 and 4 with short hyaline serrated crests on proximal half of inner margin of bases.

Uropod (Fig. 37), peduncle 1.66 times longer than last pleonite, 1.28 times longer than endopod, with four setae on inner margin; exopod two times shorter than endopod; endopod with four setae on inner margin, terminal robust setae of rami are broken in the only male in our material.

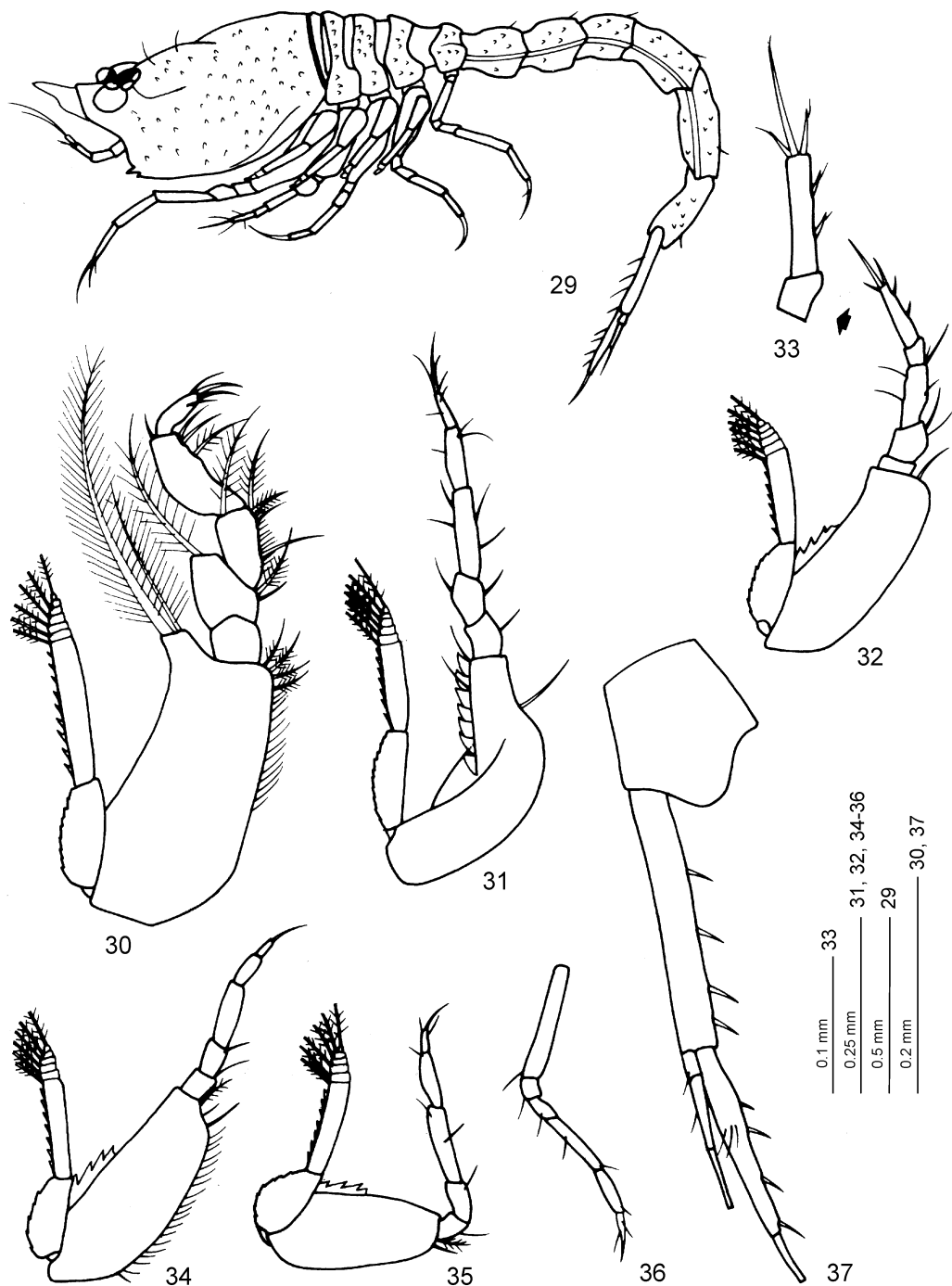


Figs 12-20: *Cumella hirsuta* (HANSEN, 1895), female. 12: body, lateral view; 13: carapace, dorsal view; 14: antenna 1; 15: antenna 2; 16: labium; 17: mandible; 18: maxilla 1; 19: maxilla 2; 20: maxilliped 1.



Figs 21-28: *Cumella hirsuta* (HANSEN, 1895), female. 21: maxilliped 2; 22: maxilliped 3; 23: pereopod 1; 24: pereopod 2; 25: pereopod 3; 26: pereopod 4; 27: pereopod 5; 28: uropod.

Remarks: HANSEN (1895) described this species as *Nannastacus hirsutus* based only on one female, which is lost. But even the description, in German, does not contain morphological characters that would assign it to the genus *Nannastacus*, as for instance the description of the antennule, without any mention of the tubercle on the second article of peduncle which is very characteristic for the genus *Nannastacus*: "Antennule has



Figs 29-37: *Cumella hirsuta* (HANSEN, 1895), male. 29: body, lateral view; 30: maxilliped 3; 31: pereopod 1; 32: pereopod 2; 33: its tip, magnified; 34: pereopod 3; 35: pereopod 4; 36: pereopod 5; 37: uropod.

long, second article of peduncle somewhat longer than the third one; one flagellum completely rudimentary, the remaining one of the same size compared with the terminal article of the antennular peduncle, consisting of two equally sized articles and ending in a pair of very long olfactory setae". Hansen's description contains also three drawings - body, frontal part of carapace with eye lobe in dorsal view, and uropods. Pseudorostral lobes which are meeting in front of the eye lobe are very characteristic for *Cumella* and not for *Nannastacus* (pseudorostral lobes meeting only at the level of their bases, but with divergent tips); eye lobe as drawn by Hansen is unique, as in *Cumella*, and not separated as in *Nannastacus*; finally, the uropodal peduncle is longer than the last pleonite which is also unusual for *Nannastacus* in which the peduncle never exceeds the 6th pleonite, but characteristic for *Cumella*. Hansen's is the only description based on material; the subsequent descriptions (STEBBING 1913, VERRILL 1923) are in fact resumptions of the original one that confirm that this species belongs to the genus *Cumella* even though the name *Nannastacus* is preserved. BĂCESCU (1992b) mentioned it in his catalogue of Cumacea without any comments. WATLING (1991), on the basis of the original description, first correctly placed the species in the genus *Cumella*. This is the first study after Hansen's that is based on actual specimens. Our specimens have also hirsute tegument, similar habitus, carapace, with two pairs of lateral pigmented lenses, same aspect of uropods, with short exopod. Almost all the morphological characters of our specimens not mentioned by Hansen belong to *Cumella*: number of teeth of pars incisiva and lacinia mobilis, maxilliped 1 with a thin dactylus, maxilliped 2 with plumose setae on propodus; but there are a few morphological details like in *Nannastacus*: maxilla 2 and enlarged propodus of pereopods 3-5. *Cumella hirsuta* is closely related with *C. ocellata* BĂCESCU, 1992 and *C. serrata* CALMAN 1911: similar eye lobe, maxilliped 2 and long uropods with unequal rami; also with hirsute tegument and pereopods like those in *C. ocellata*, and with four setae on uropodal endopod as in *C. serrata*; all these three species are placed in the subgenus *Cumewingia* BĂCESCU, 1971 (males with lenses also on pseudorostrum). The most important differences of the female are: four setae on inner margin of uropodal endopod (same number in *C. serrata*, only two in *C. ocellata*) and a carapace without dorsal spine (like in *C. ocellata*, *C. serrata* has six or more). The presence of the genus *Nannastacus* in the western Atlantic is herewith denied.

Cumella ocellata BĂCESCU, 1992

(Figs 38-62)

Cumella ocellata Băcescu, 1992 a: 259-262, figs 2,3.

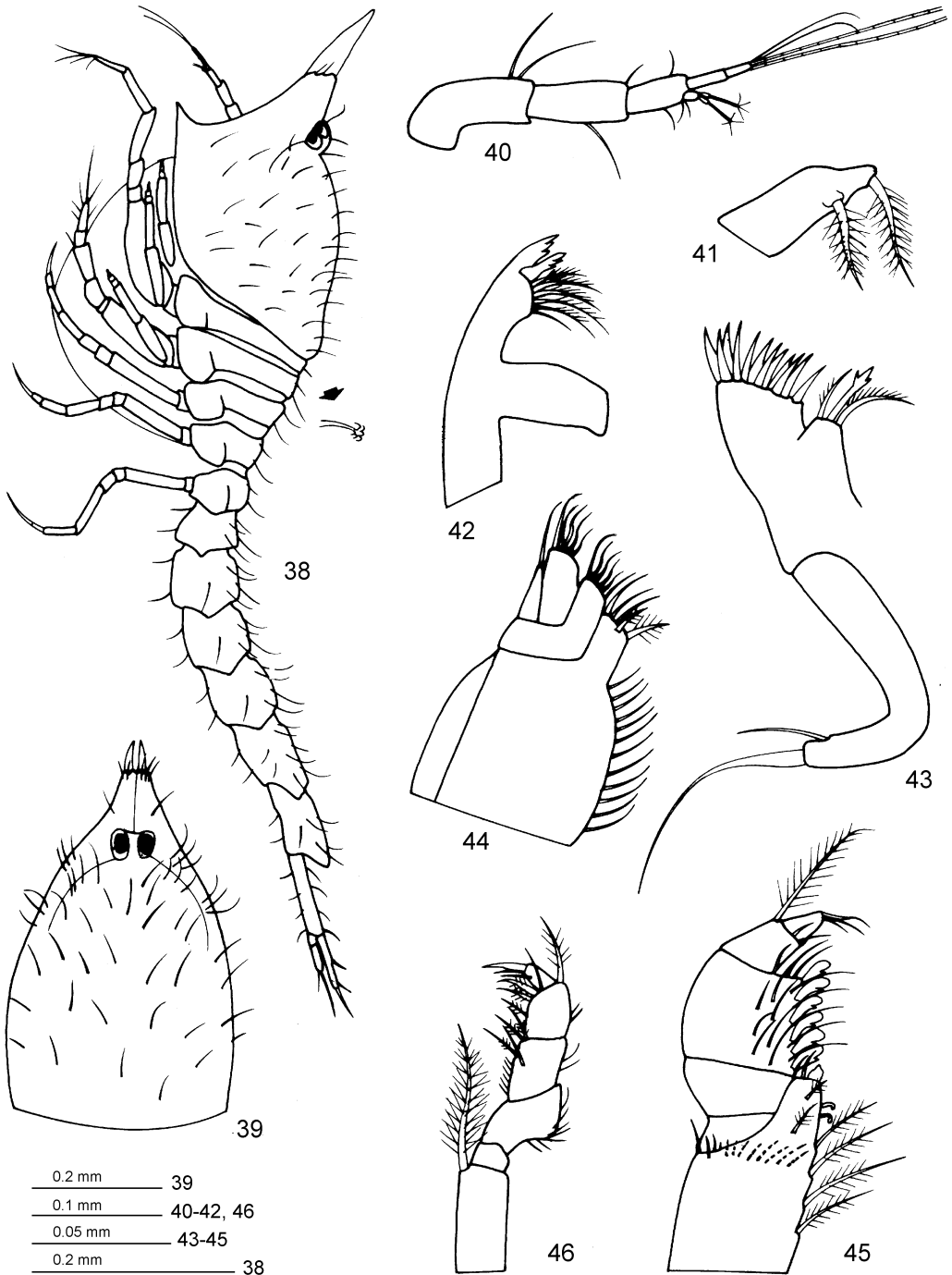
Material: 8 ♀♀, 3 ♂♂ (BAMZ 2001193010), sta. KW 1; 17 ♀♀, 35 ♂♂, sta. KW 4; 1 ♀, sta. KW 19; 1 ♀, sta. KW 24; 2 ♂♂, sta. KW 26; 1 ♀, sta. KW 38; 1 ♀, 6 ♂♂ (NHMW 19560), sta. KW 44; 3 ♀♀, KW 45; 1 ♀, sta. 5; 1 ♀, 1 ♂, sta. 26; 1 ♂, sta. 28.

Description of female (Figs. 38-53): Body (Fig. 38), with hirsute tegument. Length: 1.66 mm.

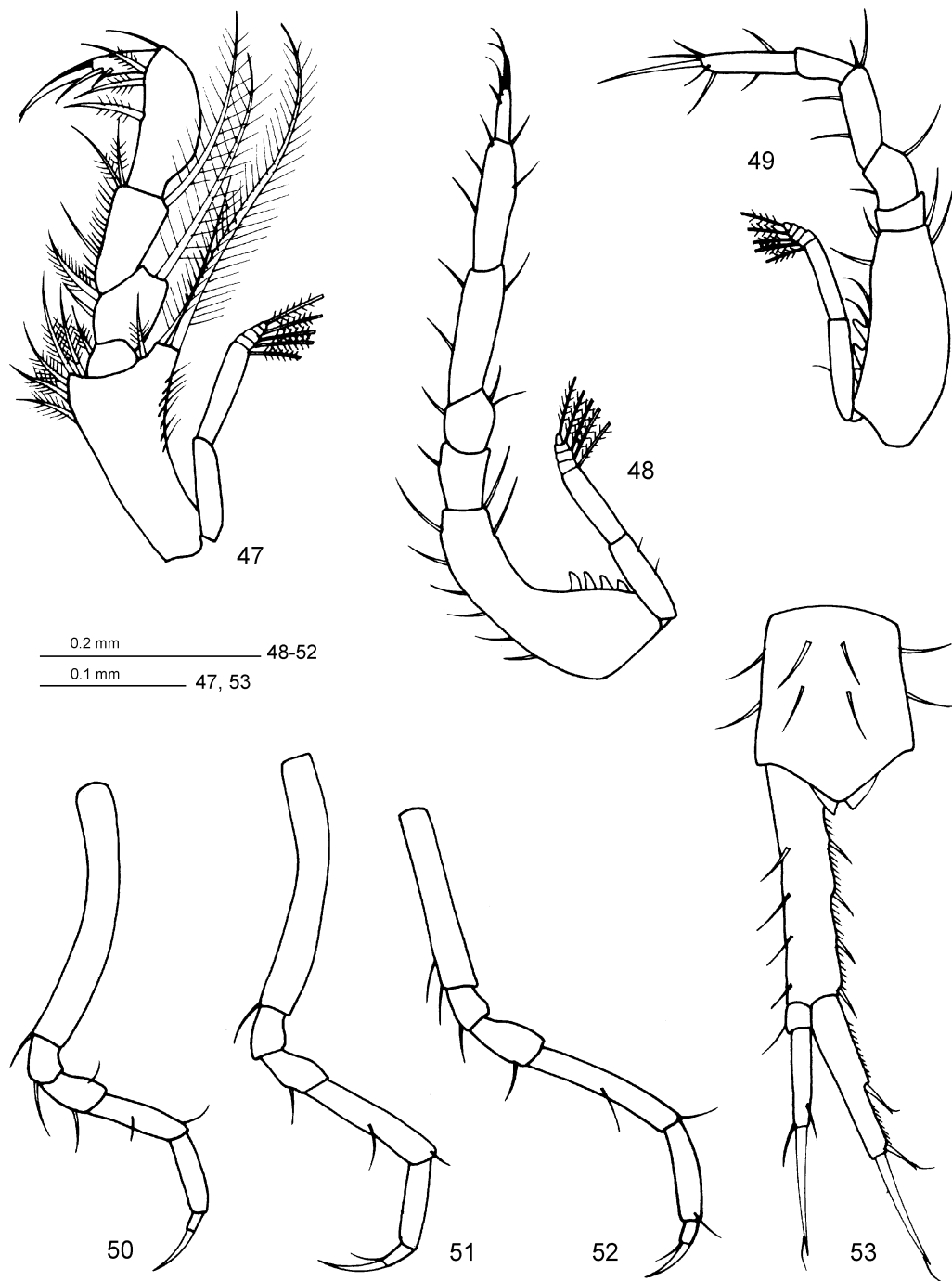
Carapace (Figs 38, 39) represents 1/3 of the entire body, covered with numerous club-like setae; large notch, antero-ventral corner with a strong tooth; eye lobe with two lateral pairs of pigmented lenses; pseudorostral lobes with serrated margin.

Antenna 1 (Fig. 40) as usual for the genus, main flagellum with two long articles.

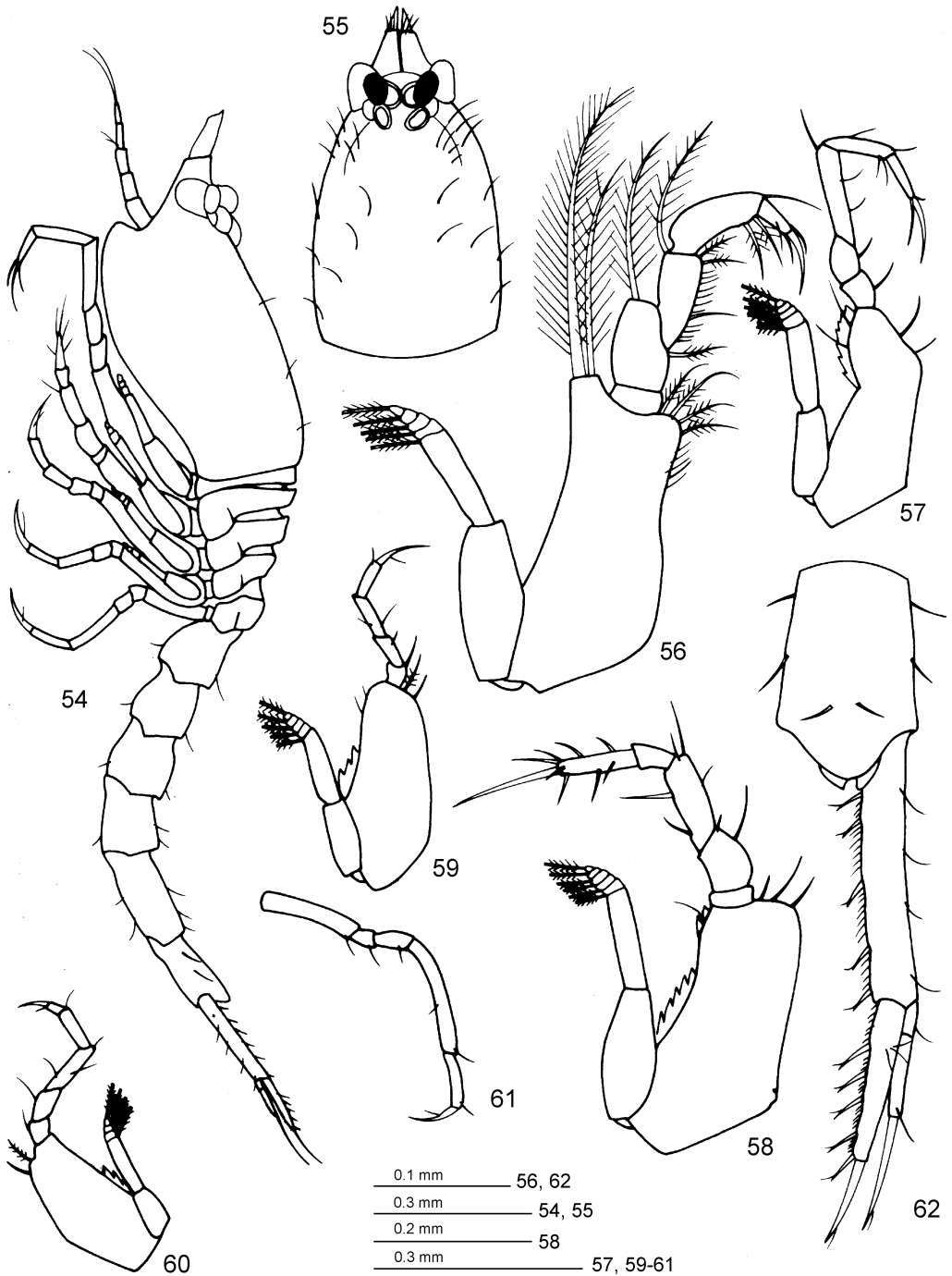
Antenna 2 (Fig. 41) as usual for the genus.



Figs 38-46: *Cumella ocellata* BĂCESCU, 1992, female. 38: body, lateral view; 39: carapace, dorsal view; 40: antenna 1; 41: antenna 2; 42: mandible; 43: maxilla 1; 44: maxilla 2; 45: maxilliped 1; 46: maxilliped 2.



Figs 47-53: *Cumella ocellata* BĂCESCU, 1992, female. 47: maxilliped 3; 48: pereopod 1; 49: pereopod 2; 50: pereopod 3; 51: pereopod 4; 52: pereopod 5; 53: uropod.



Figs 54-62: *Cumella ocellata* BĂCESCU, 1992, male. 54: body, lateral view; 55: carapace, dorsal view; 56: maxilliped 3; 57: pereopod 1; 58: pereopod 2; 59: pereopod 3; 60: pereopod 4; 61: pereopod 5; 62: uropod.

Mouth parts: Mandible (Fig. 42), pars incisiva and lacinia mobilis with three teeth, six spine-seta-like setae between lacinia mobilis and robust pars molaris. Maxilla 1 (Fig. 43), outer endite with 12 simple spine-setae, palpus with two unequal glabrous filaments. Maxilla 2 (Fig. 44), terminal margin of articles with simple setae. Maxilliped 1 (Fig. 45), setae at the level of articulation between basis and ischium, hand-like flattened spine-setae on inner margin of carpus; dactylus a little enlarged. Maxilliped 2 (Fig. 46), basis with a feathered seta on inner margin, two plumose setae on inner margin of propodus. Maxilliped 3 (Fig. 47), basis with four plumose setae on inner distal corner, a process on outer corner, with two long unequal plumose setae; carpus longer than merus and shorter than propodus; large propodus with a curved outer margin.

Pereopod 1 (Fig. 48), basis a little longer than 1/3 of the pereopod length, with a short hyaline crest on outer margin; ischium as long as merus; carpus subequal with propodus; propodus two times longer than dactylus.

Pereopod 2 (Fig. 49), basis a little longer than 1/3 of the pereopod length, with a short hyaline crest on outer margin; short carpus (carpus: merus = 1.7), with two setae on its inner distal corner; dactylus 1.6 times longer than propodus, with a short seta on each margin, three apical simple setae, terminal one shorter than dactylus.

Pereopod 3-5 (Fig. 50-52) progressively longer, with progressively shorter bases and longer carpi.

Maxilliped 3 and pereopods 1, 2 with exopods.

Uropod (Fig. 53), peduncle 1.29 times longer than last pleonite, with setae on outer margin and four robust setae on inner margin, entire inner margin with setules, 1.4 times longer than endopod; exopod a little shorter than endopod, with an apical long sensitive spine-seta; endopod with setules and two sensitive setae on inner margin and an apical long sensitive robust seta.

Description of male (Figs 54-62): Body with few setae (Fig. 54). Length: 1.6-1.8 mm.

Carapace (Fig. 55) a little longer than a third of the entire body; eye lobe with a large frontal lens and four pairs of lateral ones (the biggest is also the most pigmented one), each pseudorostral lobe with a large lens near the lateral lenses of eye lobe.

Maxilliped 3 (Fig. 56), basis a little shorter than half of maxilliped, four plumose setae on distal inner corner and two long plumose setae on outer process; carpus as long as merus, with setules on inner margin, dactylus with a strong curved claw.

Pereopod 1 (Fig. 57), basis a little shorter than half of pereopod, a distal serrated hyaline crest on outer margin; carpus longer than propodus, propodus longer than dactylus; dactylus with a strong claw.

Pereopod 2 (Fig. 58), basis a little shorter than half of pereopod, a proximal serrated hyaline crest on outer margin; carpus 1.5 longer than merus; dactylus two times longer than propodus, with two short simple setae on each side, two subterminal and a terminal simple setae.

Pereopod 3-5 (Figs 59-61) with progressively shorter bases and longer carpi. Pereopods 3 and 4 with a short hyaline crest on proximal half of outer margin of basis.

Maxilliped 3 and pereopods 1-4 with exopods.

Uropod (Fig. 62), peduncle 1.2 times longer than last pleonite, with few setae on outer margin and numerous setules interspersed with five spine-setae on inner margin, 1.6 times longer than endopod; exopod shorter than endopod, with a terminal long sensitive spine-seta; endopod with setules interspersed with five long spine-setae on inner margin, terminal sensitive spine-seta shorter than that of exopod.

Remarks: This species is closely related to *Cumella hirsuta* (HANSEN, 1895) with regard to the hirsute tegument, the eye lobe of female, pereopods and long uropods, but it differs by having more numerous lenses on the eye lobe in males, maxilliped 2 with one seta on basis instead of two, uropodal endopod with two setae in female (versus four) and five in male (versus four). This species belongs to the subgenus *Cumewingia* BĂCESCU. *Cumella ocellata* is now recorded also from the open sea, not only from caves.

Cumella serrata CALMAN, 1911

(Figs 63-95)

Cumella serrata CALMAN, 1911:348-349, pl.32, fig 19-24; WATLING, 1991: 752; BĂCESCU, 1992 b:226.

Material: 594 specimens from 39 samples, 3 ♂♂, 1 ♀, sta. KW 1; 3 ♀♀, sta. KW 4; 2 ♀♀, sta. KW 17; 5 ♂♂, 1 ♀, sta. KW 27; 2 ♀♀, sta. KW 28; 5 ♂♂, 4 ♀♀ (BAMZ 2001193011), sta. KW 30; 3 ♂♂, 1 ♀, sta. KW 31; 1 ♂, 2 ♀♀, sta. KW 37; 1 ♀, sta. KW 39; 1 ♂, sta. KW 40; 1 ♂, 1 ♀, sta. KW 41; 3 ♂♂, 1 ♀, sta. KW 43; 14 ♂♂, 15 ♀♀, sta. KW 44; 6 ♂♂, 5 ♀♀, sta. KW 45; 1 ♂, sta. KW 47; 5 ♀♀, sta. KW 48; 5 ♂♂, sta. KW 49; 112 ♂♂, 5 ♀♀, sta. KW 50; 20 ♂♂, 20 ♀♀, sta. KW 51; 5 ♂♂, 4 ♀♀ (NHMW 19561), sta. KW 52; 4 ♂♂, 4 ♀♀, sta. KW 53; 9 ♀♀, sta. KW 54; 10 ♂♂, 8 ♀♀, sta. KW 1.1; 14 ♂♂, 20 ♀♀, sta. KW 2.1; 26 ♂♂, 37 ♀♀, sta. KW 3.1; 25 ♂♂, 63 ♀♀, 3 juv, sta. KW 4.1; 3 ♂♂, 9 ♀♀, sta. KW 5.1; 4 ♂♂, 12 ♀♀, sta. KW 10.1; 1 ♀, sta. KW 11.1; 12 ♀♀, sta. KW 12.1; 1 ♀, sta. 16; 1 ♂, sta. 1; 12 ♂♂, 23 ♀♀, sta. 17; 1 ♂, sta. 26; 1 ♀, sta. 27; 1 ♀, sta. 32; 10 ♂♂, 16 ♀♀, 1 manca, 1 juv, sta. 33; 4 ♀♀, sta. 34; 1 ♂, Bailey's Bay, coll. T. Iliffe, 22.08.1984. Syntypes (14 ♂♂), from Zoological Museum (Copenhagen), CRU-8072; syntypes (4 ♂♂), from the Natural History Museum (London), no 1910.11.23.22-25.

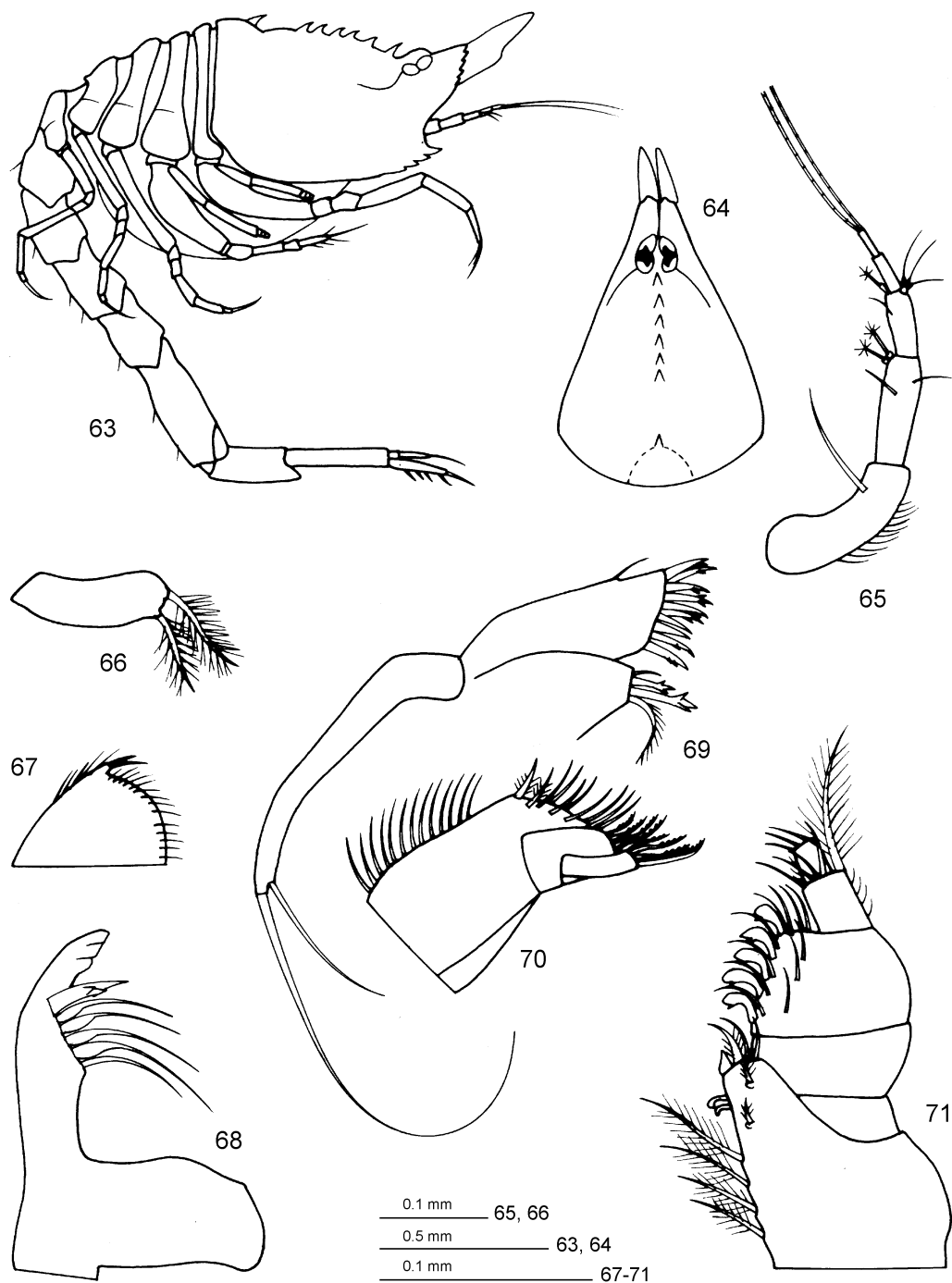
Description of female (Figs 63-79): Body with a few fine setae (Fig. 63). Length: 2.5-2.7 mm.

Carapace (Fig. 64) with 6-7 dorsal spines, one of them on the more elevated posterior extremity, marked notch, antero-ventral margin with a short serration; pseudorostral lobes with serrated anterior margin; eye lobe with two lateral pairs of pigmented lenses.

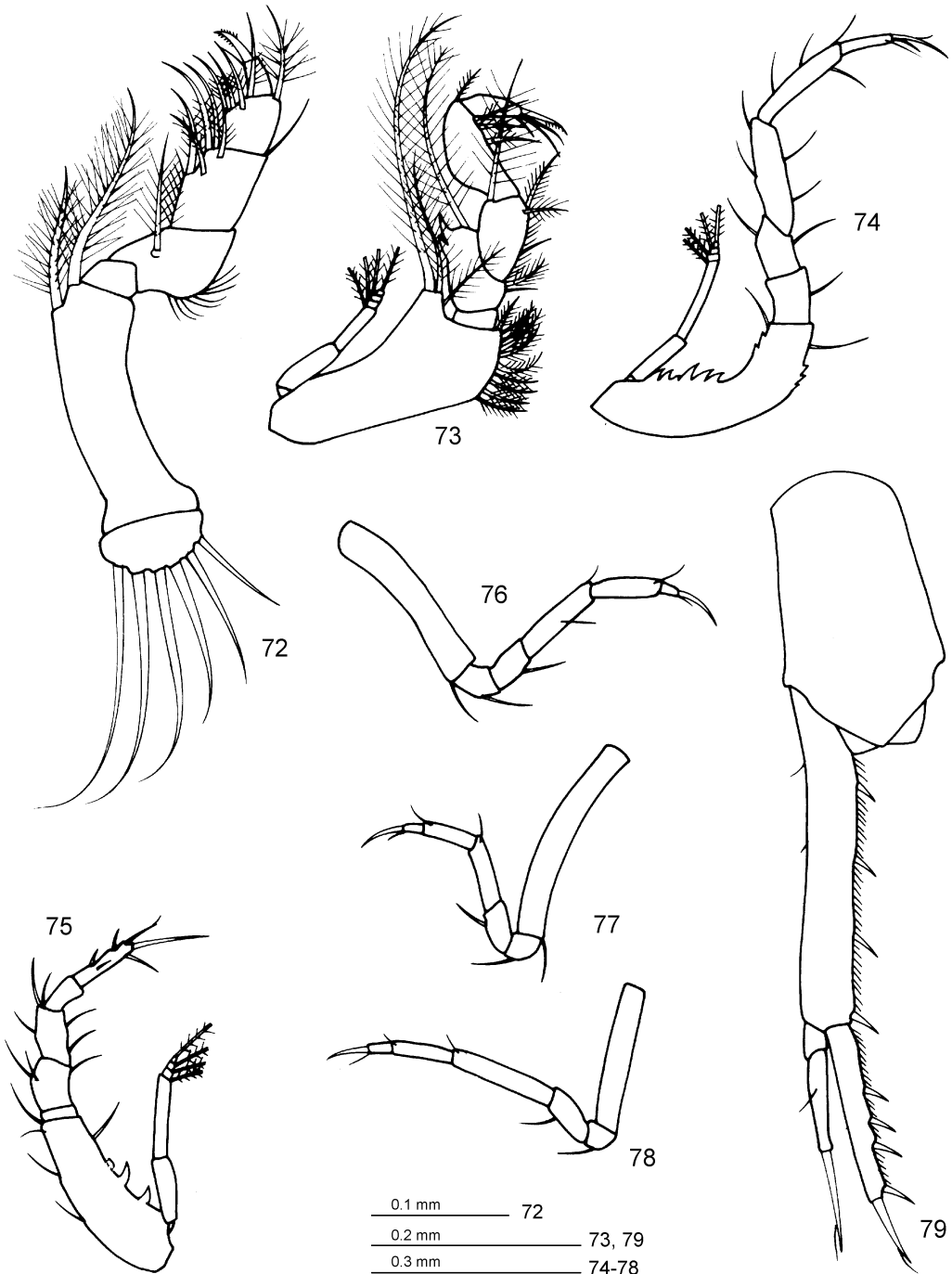
Antenna 1 (Fig. 65), second article of peduncle almost 2 times longer than the third.

Antenna 2 (Fig. 66), one article with two robust pappose setae.

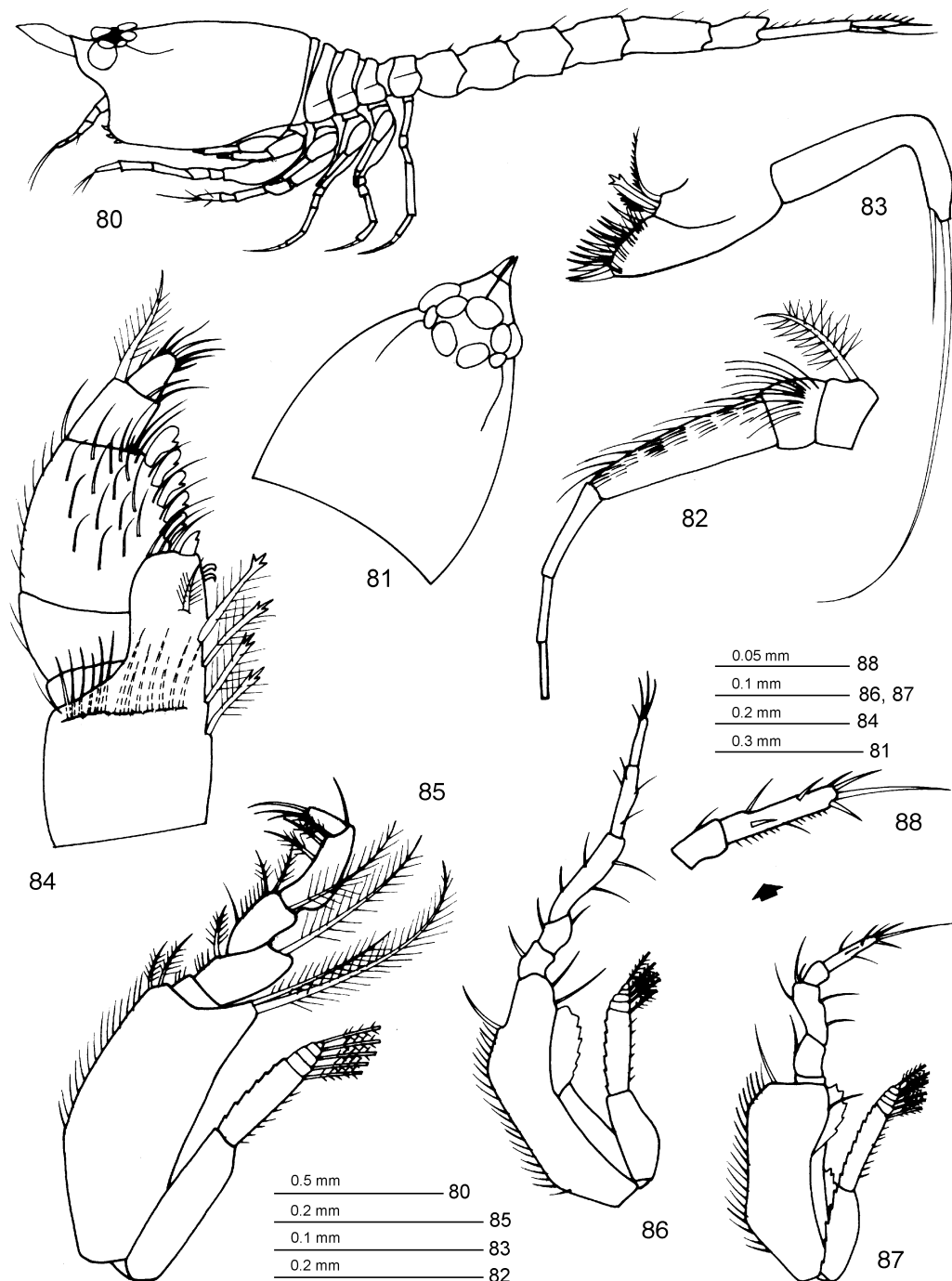
Mouth parts: Labium (Fig. 67), with two short setae on its acuminate extremity. Mandible (Fig. 68), as usual for the genus, with pars incisiva and lacinia mobilis with three teeth, spiniform setae with bulky bases between lacinia mobilis and truncated pars molaris. Maxilla 1 (Fig. 69), outer endite with pectinated robust setae, inner endite with two trifid robust setae; palpus with two unequal glabrous filaments. Maxilla 2 (Fig. 70), ending articles with pectinated setae, a row of simple setae on inner margin of basis. Maxilliped 1 (Fig. 71), basis with four plumose setae on inner margin, carpus with serrated flattened setae on inner margin and rows of simple setae; enlarged dactylus. Maxilliped 2 (Fig. 72), basis with two unequal pappose setae on inner margin; merus with a plumose seta on inner margin, propodus with two forked setae on inner margin; dactylus with a microserated claw. Maxilliped 3 (Fig. 73), basis with a short outer process and nine plumose setae on inner distal extremity; merus with two teeth on outer margin.



Figs 63-71: *Cumella serrata* CALMAN, 1911, female. 63: body, lateral view; 64: carapace, dorsal view; 65: antenna 1; 66: antenna 2; 67: labium; 68: mandible; 69: maxilla 1; 70: maxilla 2; 71: maxilliped 1.



Figs 72-79: *Cumella serrata* CALMAN, 1911, female. 72: maxilliped 2; 73: maxilliped 3; 74: pereopod 1; 75: pereopod 2; 76: pereopod 3; 77: pereopod 4; 78: pereopod 5; 79: uropod.



Figs 80-88: *Cumella serrata* CALMAN, 1911, male. 88: body, lateral view; 81: carapace, dorsal view; 82: antenna 2; 83: maxilla 1; 84: maxilliped 1; 85: maxilliped 3; 86: pereopod 1; 87: pereopod 2; 88: its dactylus magnified.

Pereopod 1 (Fig. 74) basis longer than 1/3 of entire pereopod, with strong teeth on outer margin; carpus as long as propodus; dactylus as long as terminal robust curved seta.

Pereopod 2 (Fig. 75) basis longer than 1/3 of entire pereopod, with two strong teeth on outer margin; short carpus (a little longer than merus); dactylus 1.7 times longer than propodus, with terminal robust sensitive setae.

Pereopods 3-5 (Fig. 76-78) with progressively shorter bases and longer carpi, dactyli with stout terminal setae.

Uropod (Fig. 79) peduncle 1.7 times longer than last pleonite and two times longer than endopod, with microsetae and four robust ones on inner margin; exopod shorter than endopod (0.74:1), with a long terminal robust sensitive seta; endopod with microsetae and four robust setae on inner margin (a larger space between subterminal seta and the previous one than between the inner setae), terminal robust sensitive seta shorter than that exopod's one.

Description of male (Figs 80-95): Body (Fig. 80) with smooth tegument. Length: 2-3 mm.

Carapace (Fig. 81) represents 1/3 of the entire body, longer than high, longer than pereon; marked notch, antero-ventral corner with a short serration; eye lobe with seven lenses (one apical, two pairs lateral and one median), a large lense on each pseudorostral lobe near the lateral lenses of eye lobe.

Antenna 1 as in female.

Antenna 2 (Fig. 82) as usual for the genus, last article of peduncle with several groups of short setae on inner margin; the previous articles with a pappose seta and numerous long setae.

Mouth parts: Maxilla 1 (Fig. 83) as usual for the genus. Maxilliped 1 (Fig. 84) as in female, with more setae on basis, carpus and dactylus. Maxilliped 3 (Fig. 85), basis with an outer process and two plumose setae on inner distal corner, setae on inner margin; setae on inner margin of merus and carpus.

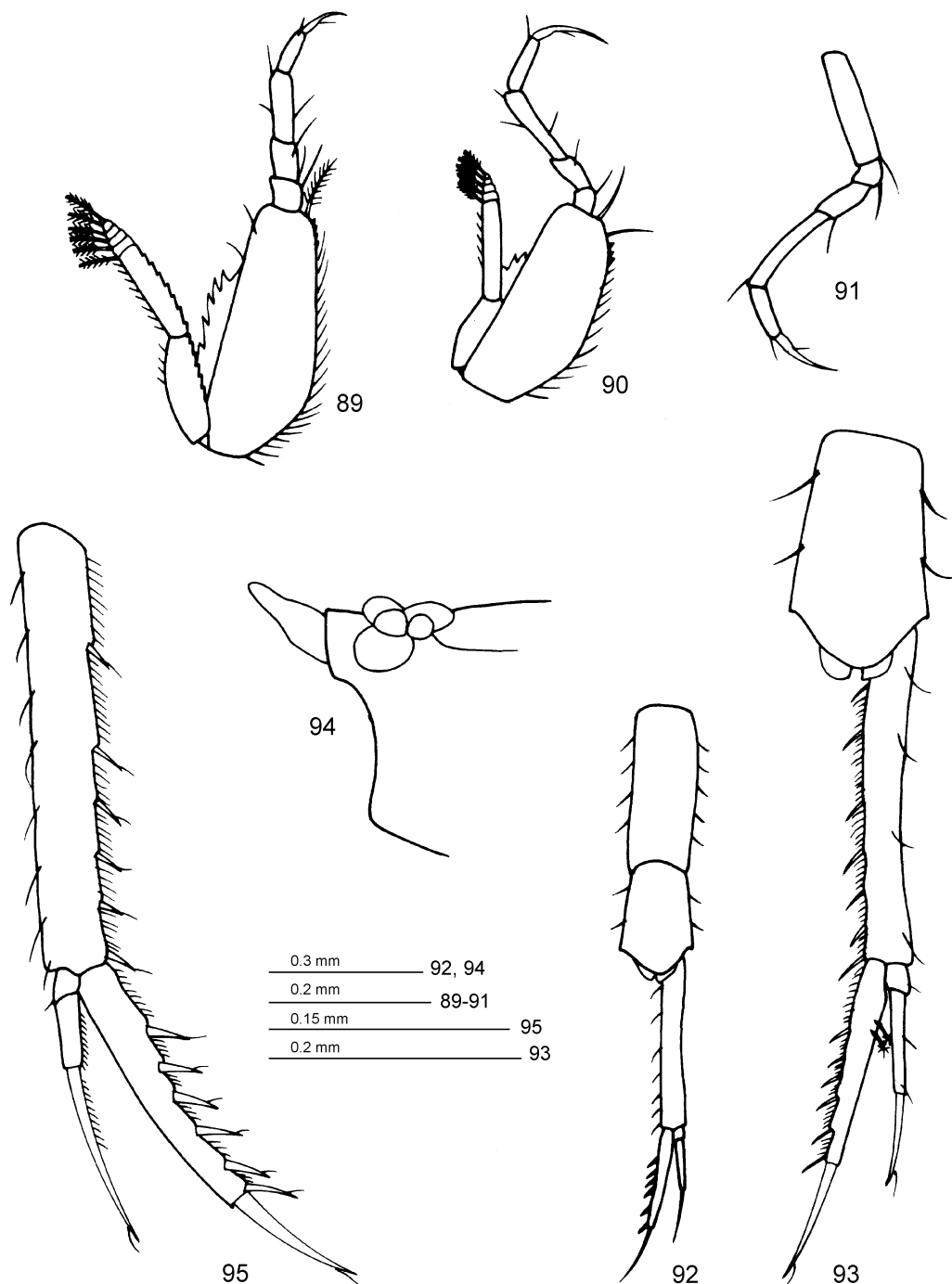
Pereopod 1 (Fig. 86), basis longer than 1/3 of entire pereopod, with a serrated hyaline crest on outer margin (distal half); carpus longer than propodus; propodus longer than dactylus; dactylus with a short terminal seta.

Pereopod 2 (Figs 87,88), basis longer than 1/3 of entire pereopod, with serrated hyaline crests on outer margin; dactylus two times longer than propodus, with three terminal robust simple setae.

Pereopods 3-5 (Fig. 89-91) with progressively shorter and slender bases and longer carpi; serrated hyaline crests on outer margins and numerous fine setae on inner margins of bases of pereopods 3 and 4.

Uropod (Figs 92, 93), peduncle 1.45 times longer than last pleonite and 1.6 times longer than endopod, with numerous microsetae and 6-7 robust setae on inner margin; exopod shorter than endopod (0.64:1), with long robust sensitive seta; endopod with microsetae and six stout setae on inner margin, terminal robust sensitive seta.

Remarks: The most abundant of all *Cumella* species found in Bermuda. This is the first time this species has been found since it was described in 1911 from St. Jan Island, for-



Figs 89-95: *Cumella serrata* CALMAN, 1911; 89-93: male from Bermuda; 94, 95: male syntype from Copenhagen. 89: pereopod 3; 90: pereopod 4; 91: pereopod 5; 92: last two pleonites and uropod; 93: uropod, magnified; 94: frontal part of carapace; 95: uropod.

mer Danish Antilles (now St. John, U.S. Virgin Islands), and is the first record for Bermuda. *Cumella serrata* is closely related to *C. hirsuta* and *C. ocellata* but differs by maxilliped 3 with more numerous plumose setae on inner margin of basis, with spine-setae on merus and by pereopods 1 and 2 with strong spine-setae on outer margin of basis; and it has more spines on carapace than *C. somersi* sp.n. It also belongs to the subgenus *Cumewingia* BĂCESCU.

The examined 14 male syntypes from the collection of the Zoological Museum in Copenhagen revealed a morphology similar to our specimens, also with lenses on pseudorostrum (Fig. 94) and peduncle of uropod 1.6 times longer than its endopod, with six sensitive setae on inner setulated margin; short exopod (exopod/endopod: 0.39) with a long apical robust sensory seta; endopod with six long sensory setae on setulated inner margin and an apical robust long sensory seta (Fig. 95). The other four male syntypes from the collection of the Natural History Museum in London have similar characters. No female exists in the syntypes series, even though Calman's description is based on both sexes.

Cumella somersi sp.n.

(Figs 96-120)

Holotype: ♀, USNM 309764;

Paratypes: 1 ♀, 1 ♂ (GAM Cum 279), sta. 3; 1 ♀ (GAM Cum 280), sta. 5; 10 ♀♀, 9 ♂♂, 8 immat. ♂♂ (BAMZ 2001193012); 13 ♀♀, 9 ♂♂, 8 immat. ♂♂, 7 juv. (NHMW 19555), sta. 17; 2 ♀♀ (GAM Cum 281), sta. 18; 1 ♀, 1 ♂ (GAM Cum 282), sta. 19; 7 ♀♀, 1 ♂ (GAM Cum 283), sta. 21; 3 ♀♀, 1 ♂ (GAM Cum 284), sta. 33; 1 ♀, 1 ♂ (NHMW 19556), sta. KW 1.1.

Type locality: Bermuda, Devonshire Bay; sand between stony corals, 1 m depth, near the boiler reef, sta. 17, collected on 22 June 2000 by Iorgu Petrescu.

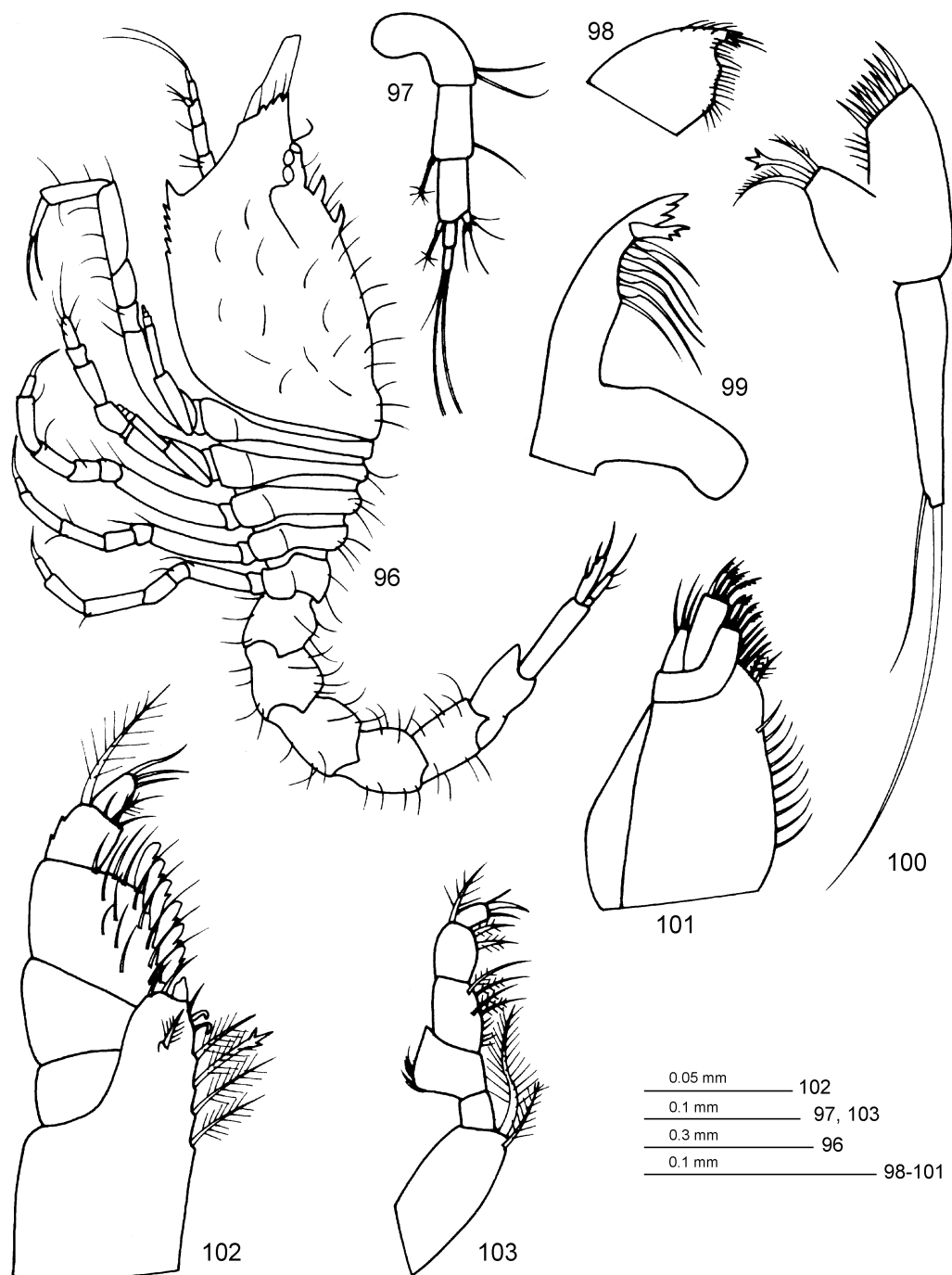
Etymology: Dedicated to the memory of Sir George Somers who, after being shipwrecked in Bermuda in 1609, founded the first colony.

Description of female (Figs 96-110): Body with hirsute tegument covered with club-like setae. Length: 1.73 mm.

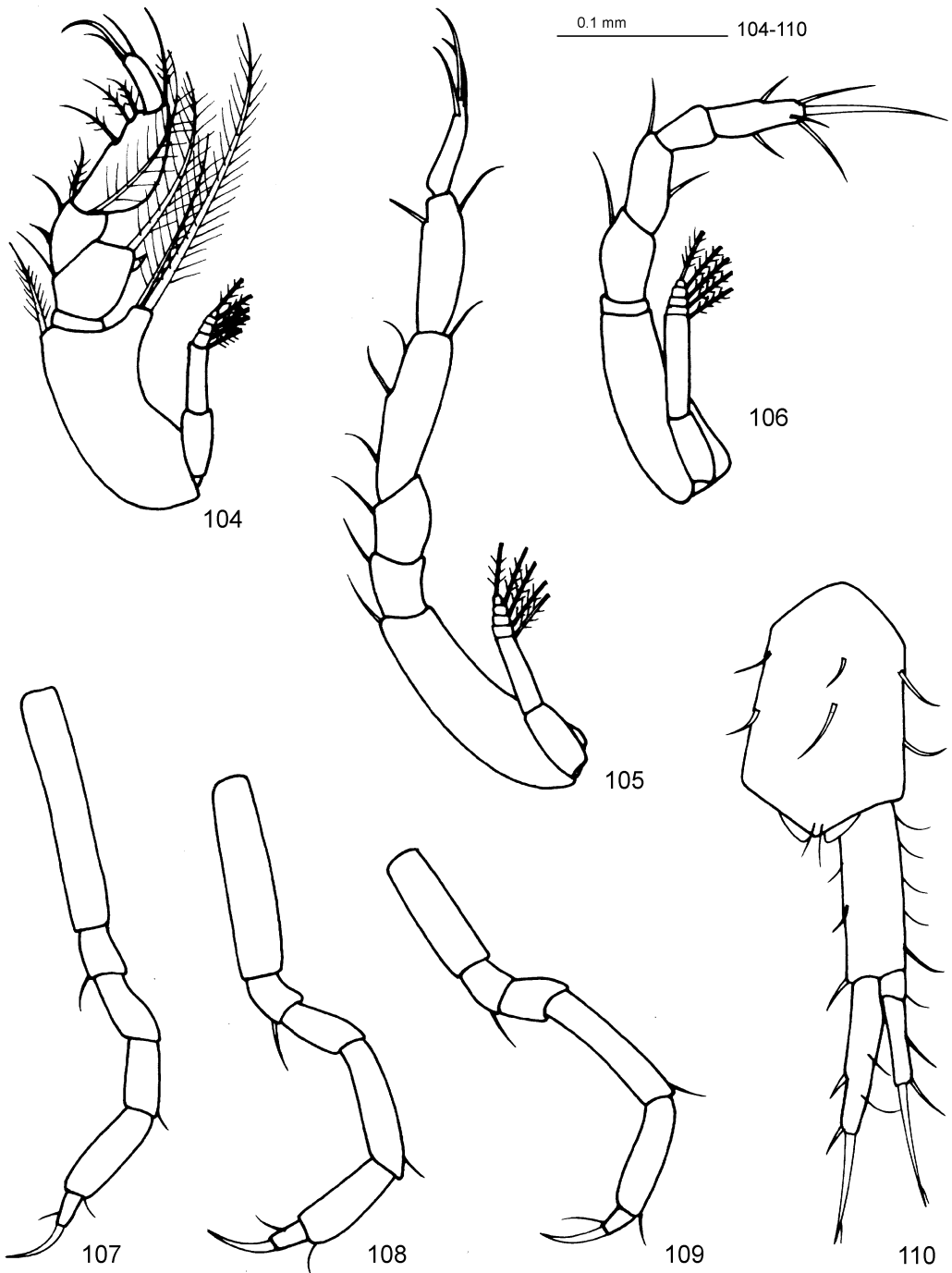
Carapace (Fig. 96), two dorsal spines on eye lobe, serrated antero-ventral margin, first tooth is stronger, eye lobe with five lenses (one frontal and two pairs of lateral ones).

Antenna 1 (Fig. 97), peduncle with short articles, short main flagellum.

Mouth parts: Labium (Fig. 98), with two terminal short setae. Mandible (Fig. 99), pars incisiva and lacinia mobilis with three teeth, six spiniform setae with bulky bases between lacinia mobilis and truncated pars molaris. Maxilla 1 (Fig. 100), outer endite with simple robust setae, inner endite with a middle robust trifold seta. Maxilla 2 (Fig. 101), ending articles with pectinated setae, row of simple setae on inner margin of basis. Maxilliped 1 (Fig. 102), basis with plumose setae on inner margin, one of them is trifold, serrated flattened setae on inner margin of carpus, large dactylus. Maxilliped 2 (Fig. 103), as usual for the genus, basis with two plumose setae, two forked setae on inner margin of propodus. Maxilliped 3 (Fig. 104), basis with an outer process with two long plumose setae; propodus two times longer than carpus.



Figs 96-103: *Cumella somersi* sp.n. paratype, female. 96: body, lateral view; 97: antenna 1; 98: labium; 99: mandible; 100: maxilla 1; 101: maxilla 2; 102: maxilliped 1; 103: maxilliped 2.



Figs 104-110: *Cumella somersi* sp.n. paratype, female. 104: maxilliped 3; 105: pereopod 1; 106: pereopod 2; 107: pereopod 3; 108: pereopod 4; 109: pereopod 5; 110: uropod.

Pereopod 1 (Fig. 105), a little shorter than 1/3 of pereopod, carpus longer than propodus (1.3:1).

Pereopod 2 (Fig. 106), longer than 1/3 of pereopod, carpus a little longer than merus, with a simple seta on inner distal corner; dactylus two times longer than propodus, with a long simple apical seta.

Pereopods 3-5 (Fig. 107-109), with progressively shorter bases, longer carpi and propodi; short dactyli with curved terminal stout seta.

Uropod (Fig. 110), peduncle shorter than last pleonite (0.72), a little longer than endopod, a small spine-seta on inner margin; exopod a little shorter than endopod, with a long sensitive terminal seta; endopod with two spine-setae on inner margin and a long sensory terminal seta (shorter than in exopod).

Description of male (Fig. 111-120): Body (Fig. 111) with very few setae. Length: 2.1 mm.

Carapace (Fig. 112) more than two times longer than high; antero-ventral margin with a small serration, pseudorostral lobes with serrated margins and with a pair large lenses; eye lobe with seven lenses (one frontal, two lateral pairs and a median pair).

Antenna 2 (Fig. 113), last article of peduncle with groups of short setae, previous two articles, glabrous.

Maxilliped 3 (Fig. 114), basis with a short outer process, four plumose setae on distal inner corner; propodus 1.3 times longer than carpus.

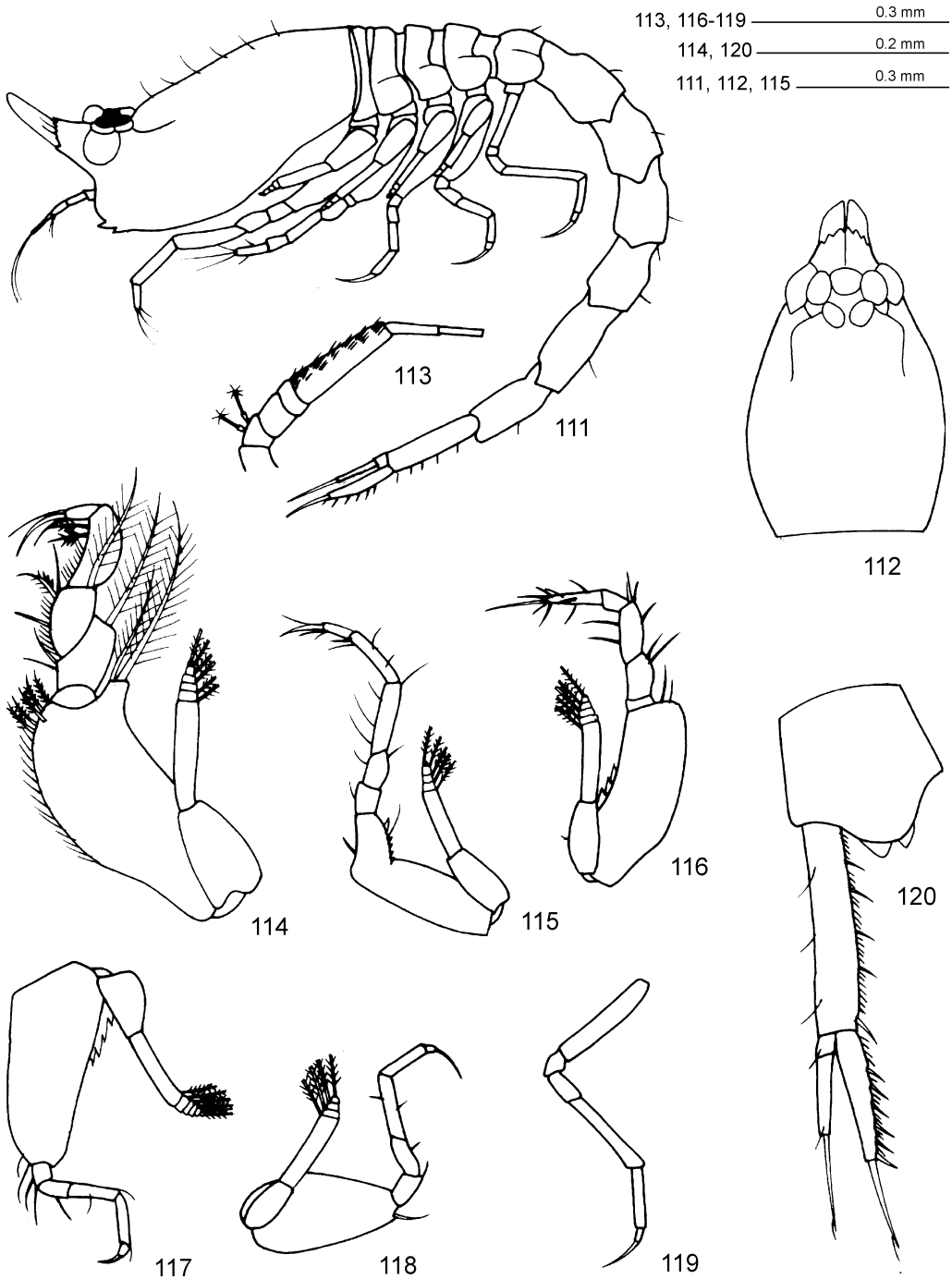
Pereopod 1 (Fig. 115), a short hyaline serration on outer distal margin of basis, carpus and propodus subequal.

Pereopod 2 (Fig. 116), a small hyaline serration on outer proximal margin of basis, short carpus (1.7 times longer than merus); dactylus 1.66 times longer than propodus, with simple terminal seta.

Pereopods 3-5 (Figs 117-119) with progressively shorter bases and longer carpi; short dactyli with a terminal curved thin setae.

Uropod (Fig. 120), peduncle 13 times longer than last pleonite and 1.5 times longer than endopod, with five longer setae on setulated inner margin.

Remarks: The most closely related species are *Cumella ocellata* BĂCESCU, 1992 (with hirsute tegument with the same club-like setae) also from Bermuda, and *Cumella meredithi* BĂCESCU, 1971 from Florida waters (smooth tegument), with almost similar pereopod and uropod length, with number of setae on uropodal endopod as in *C. ocellata* BĂCESCU, 1992. The new species differs by: dorsal spines on carapace, serrated antero-ventral margin of carapace (*C. meredithi*, *C. ocellata*) and endopod with two setae versus three (*C. meredithi*). The other species from Bermuda with dorsal spines on the carapace, *Cumella serrata*, has more spines and longer uropods. *Cumella somersi* sp.n. belongs to the subgenus *Cumewingia*.



Figs 111-120: *Cumella somersi* sp.n. paratype, male. 111: body, lateral view; 112: carapace, dorsal view; 113: antenna 2; 114: maxilliped 3; 115: pereopod 1; 116: pereopod 2; 117: pereopod 3; 118: pereopod 4; 119: pereopod 5; 120: uropod.

Key to the species of *Cumella* from Bermuda

Females

- 1a – Carapace with dorsal spines 2
- 1b – Carapace without dorsal spines 3
- 2a – Carapace with six to seven dorsal spines; long uropods *C. serrata* CALMAN, 1911
- 2b – Carapace with two dorsal spines; short uropods *C. somersi* sp.n.
- 3a – Uropodal endopod with four inner spine-setae *C. hirsuta* HANSEN, 1895
- 3b – Uropodal endopod with two inner spine-setae *C. ocellata* BĂCESCU, 1992

Males

- 1a – Eye lobe with nine lenses *C. ocellata* BĂCESCU, 1992
- 1b – Eye lobe with seven lenses 2
- 2a – Uropodal endopod with six inner spine-setae 3
- 2b – Uropodal endopod with four inner spine-setae *C. hirsuta* HANSEN, 1895
- 3a – Uropodal peduncle 1.4 times longer than last pleonite *C. serrata* CALMAN, 1911
- 3b – Uropodal peduncle 1.3 times longer than last pleonite *C. somersi* sp.n.

Schizotrema agglutinanta (BĂCESCU, 1971)

(Figs 121-149)

Cumella agglutinanta BĂCESCU, 1971: 12-14, fig. 5; WATLING, 1991: 752.

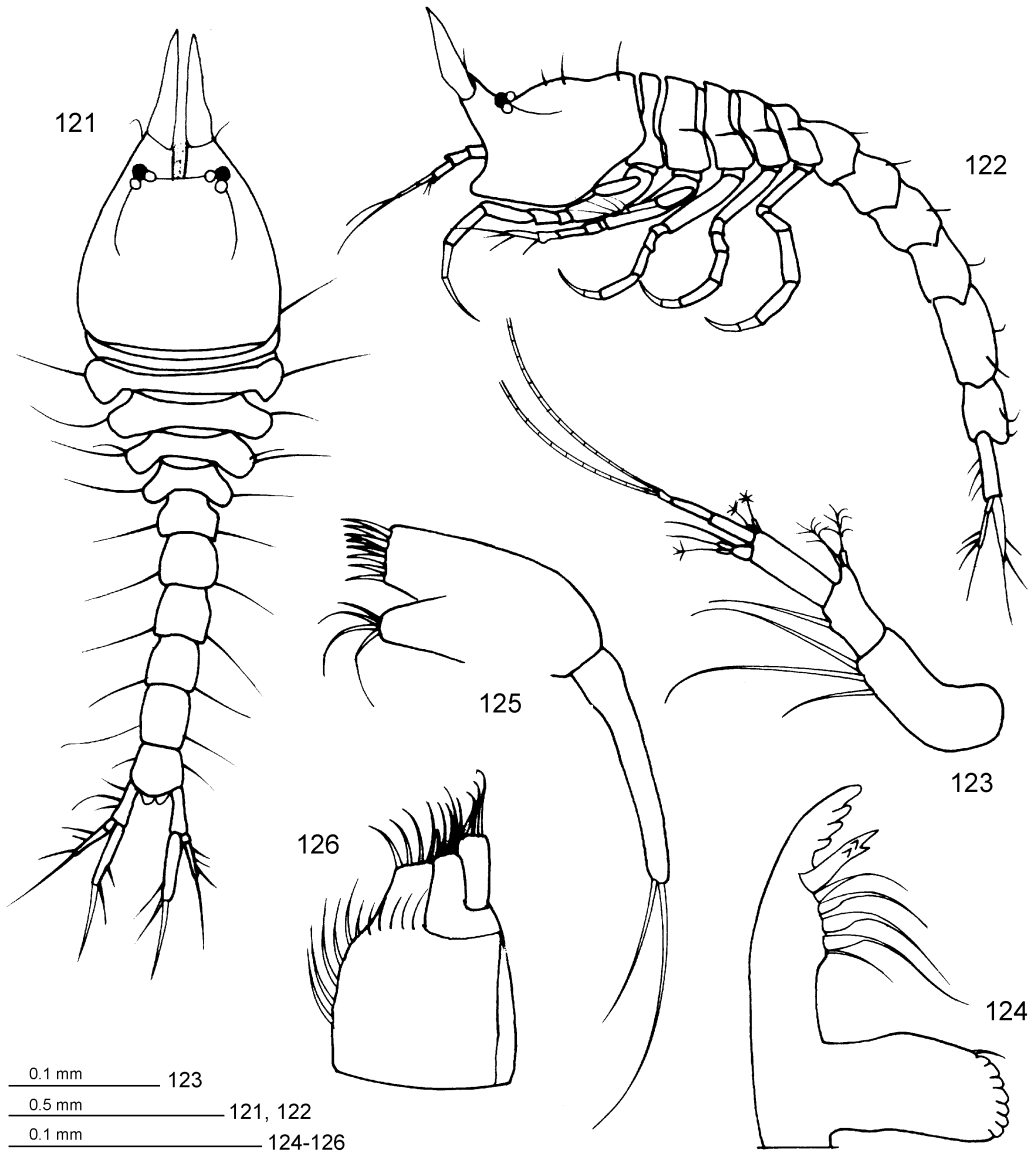
Cumella bermudensis PETRESCU, 1990: 12 (nomen nudum); BĂCESCU & ILIFFE, 1991: 9-10, fig. 1.

Cumella spinosa BĂCESCU & ILIFFE, 1991: 10-12.

Cumella sterreri PETRESCU, 1990: 12 (nomen nudum); BĂCESCU & ILIFFE, 1991: 12, fig. 3.

Material: Wittmann, Hungry Bay - 1 ♂, sta. KW 45; Iliffe, Walsingham Cave - 19 ♀♀, 1 ♂, 11.9.1986; 9 ♀♀, 1 ♂ (BAMZ 2001193013), 10.10.1986; 4 ♀♀, 3 juv., (NHMW 19562), 22.10.1986; 1 ♀, sta. 00-32, 26.11.2000; 1♀, Deep Blue Cave, sta. 00-037, 1.12.2000. Material from the collection of "Grigore Antipa" Museum: *Cumella bermudensis* – holotype ♂, Walsingham Cave, (GAM 49372), non-type material – 2 spec. (GAM 256162), Straw Market Cave, 1981; 1 spec. (GAM 256164), Green Bay Cave, 1982; 6 spec. (GAM 256165), Castle Harbour, 1978; 1 ♀ (GAM 256166), sta. 53002.01, 1981; 1 ♂ (GAM 256167), Cripplegate Cave, 1981; 3 ♀♀ (GAM 256168), Cripplegate Cave, 1981; *Cumella sterreri* – holotype ♀, allotype ♂, paratypes 1 ♀, 1 ♂, 1 juv. (GAM 49373), Walsingham Cave; non-type material: 1 spec. (GAM 256169), Green Bay Cave, 1982; 1 ♀, 5 ♂♂ (GAM 256170), Cherry Pit Cave, 1981; 1 spec. (GAM 256171), Green Bay Cave, 1982; 4 spec. (GAM 256172), Straw Market Cave, 1981; 1 spec. (GAM 256173), Sailor's Choice Cave, 1982; 1 spec. (GAM 256174), Emerald Sink Cave; 8 spec. (GAM 256175), Walsingham Cave, 1982; 3 spec. (GAM 256176), Walsingham Cave, 23.6.1982; 4 spec. (GAM 256177), Walsingham Cave, 29.11.1978; 2 spec. (GAM 256178), Walsingham Cave, 10.6.1982; 1 spec. (GAM 256179), Walsingham Cave, 29.11.1978; 4 spec. (GAM 256180), Walsingham Cave III, 8.12.1978; 2 spec. (GAM 256181), Walsingham Cave III, 29.10.1978; 1 spec. (GAM 256182), Walsingham Cave III, 5.1.1979; 1 spec. (GAM 256183), Walsingham Cave III, 12.12.1978; 4 spec. (GAM 256184), Walsingham Cave III, 5.1.1979.

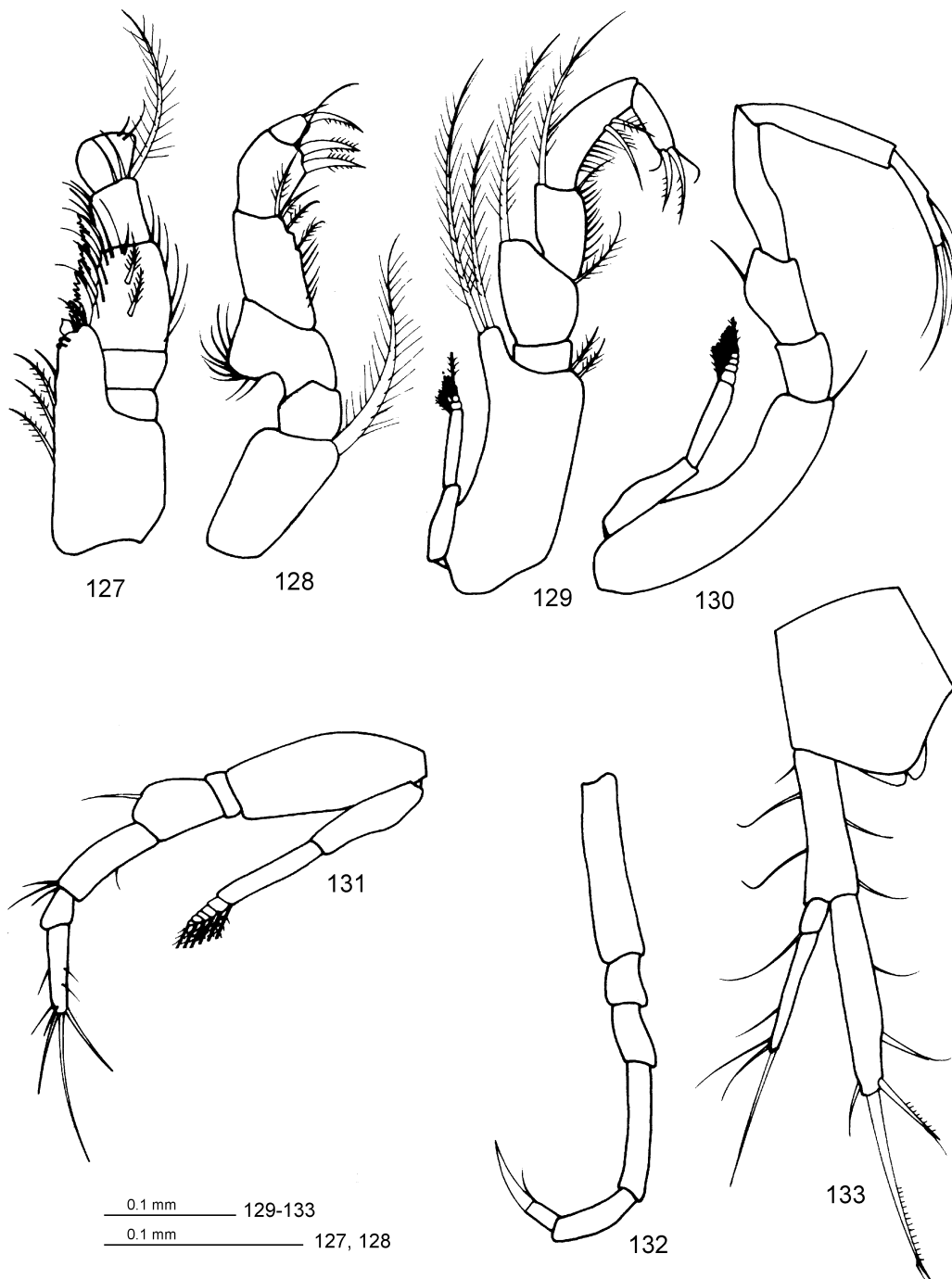
Description of female (Figs 121-133): Body (Figs 121,122), covered with a few setae. Length: 1.70 mm.



Figs 121-126: *Schizotrema agglutinanta* (BĂCESCU, 1971), female. 121: body, dorsal view; 122: body, lateral view; 123: antenna 1; 124: mandible; 125: maxilla 1; 126: maxilla 2.

Carapace a little shorter than 1/3 of entire body length; marked notch, completely separated pseudorostral lobes; upturned pseudorostrum; eye lobe with two separated groups of lenses (three lenses, one pigmented, each).

Antenna 1 (Fig. 123), first article of peduncle with long simple setae; second article with a tubercle with two stiff sensitive setae; third article longer than previous one, accessory flagellum shorter than first article of main three-articulated one.



Figs 127-133: *Schizotrema agglutinanta* (BĂCESCU, 1971), female. 127: maxilliped 1; 128: maxilliped 2; 129: maxilliped 3; 130: pereopod 1; 131: pereopod 2; 132: pereopod 3; 133: uropod.

Mouth parts: Mandible (Fig. 124), pars incisiva and lacinia mobilis with four teeth, five setae (four with bulky bases) between lacinia mobilis and truncated pars molaris. Maxilla 1 (Fig. 125), outer endite with simple stout setae; palpus a little longer than outer endite, with two glabrous filaments. Maxilla 2 (Fig. 126), ending articles with simple apical setae, a row of simple setae on inner margin of basis up to the articulation with the next article. Maxilliped 1 (Fig. 127), carpus with flattened hand-like setae on inner margin; large and rounded dactylus. Maxilliped 2 (Fig. 128), basis with strong plumose seta on inner margin; carpus, the longest article excepting basis; propodus with two robust serrated setae on distal inner corner; dactylus with strong serrated claw. Maxilliped 3 (Fig. 129), basis with an outer process; merus longer than carpus; dactylus with two serrated claws.

Pereopod 1 (Fig. 130), basis a little longer than 1/3 of entire pereopod, carpus as long as propodus; propodus longer than dactylus; dactylus with long terminal setae.

Pereopod 2 (Fig. 131), basis a little longer than 1/3 of entire pereopod; dactylus two times longer than propodus, with three terminal stout simple setae.

Pereopod 5 (Fig. 132), carpus two times longer than merus; strong curved claw two times longer than dactylus.

Uropod (Fig. 133), peduncle shorter than last pleonite (0.84), with enlarged distal extremity, as long as exopod and 0.77 times shorter than endopod, with long setae on both margins; exopod with long setae on outer margin and terminal simple seta; endopod with two long microserrated robust sensory setae on inner margin and a longer terminal one.

Description of male (Figs 134-149): Body (Figs 134,135), with smooth tegument. Length: 1.4-1.5 mm.

Carapace (Figs 136,135) as in female, more excavated on posterior half on ventral margin; notch without serration; upturned short pseudorostrum; eye lobe as in female.

Antenna 2 (Fig. 137), last article of peduncle with groups of short setae, previous one with very long setae.

Maxilliped 3 (Fig. 143) with bulky basis, rest like in female.

Pereopod 1 (Fig. 144), carpus a little shorter than propodus; dactylus with a serrated terminal seta.

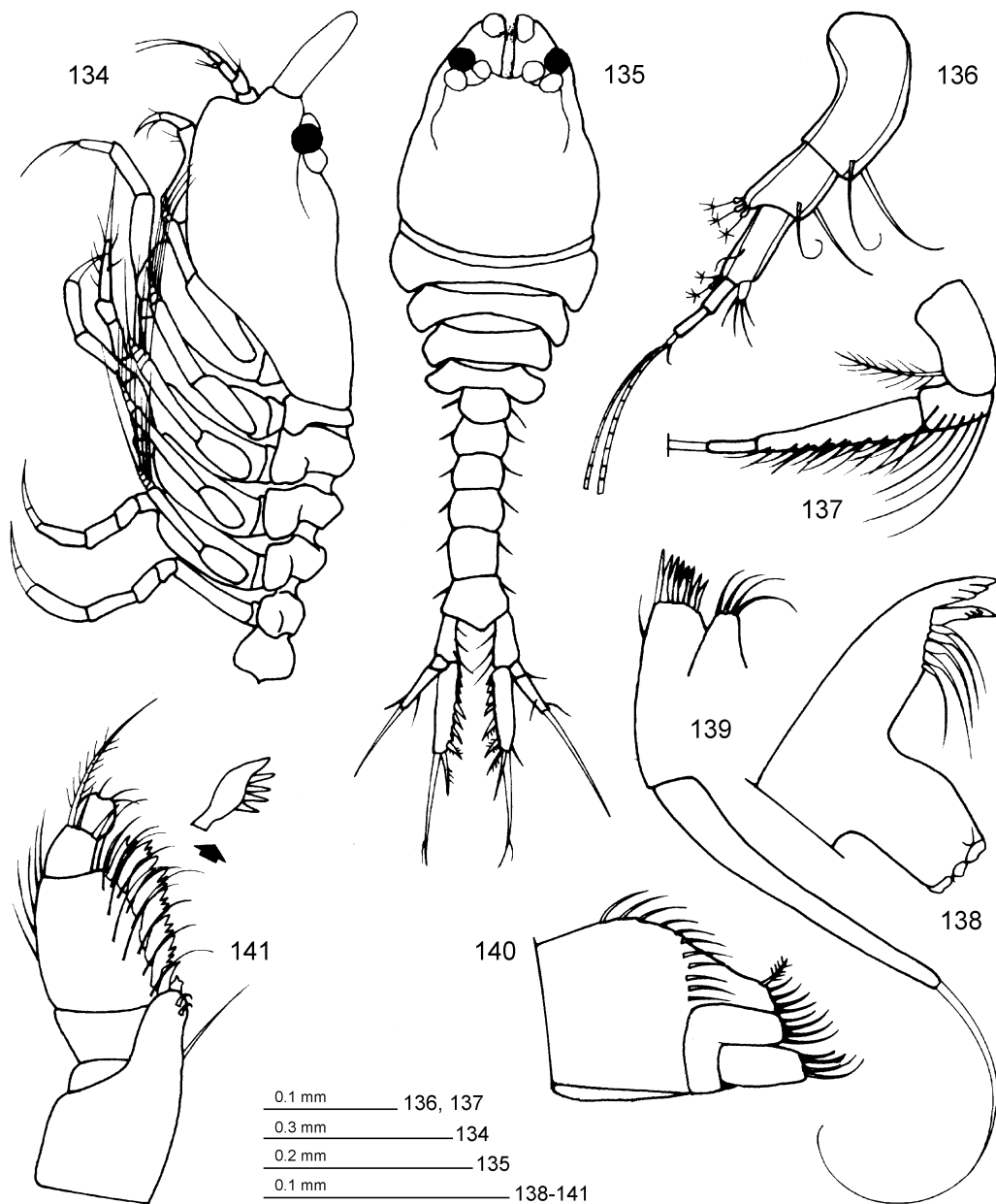
Pereopod 2 (Fig. 145) as in female, excepting basis.

Pereopods 3-5 (Fig. 146-148) with progressively shorter bases and longer carpi, enlarged propodi like in female.

Exopods on maxilliped 3 and pereopods 1-4.

Uropod (Fig. 149), peduncle as long as last pleonite, longer than exopod (1.15) and shorter than endopod (0.8), long setae only on inner margin; exopod with a long terminal simple seta; endopod longer than exopod, with five microserrated sensory robust setae on inner margin and a much longer terminal one (as long as endopod).

Remarks: Antenna 1 (Fig. 136), mouth pieces (Fig. 138-140) and maxillipeds 1 and 2 of male are as in the female (dactylus of maxilliped 2 without a microserrated robust terminal seta) (Figs 141, 142).



Figs 134-141: *Schizotrema agglutinanta* (BĂCESCU, 1971), male. 134: body, lateral view; 135: body, dorsal view; 136: antenna 1; 137: antenna 2; 138: mandible; 139: maxilla 1; 140: maxilla 2; 141: maxilliped 1.

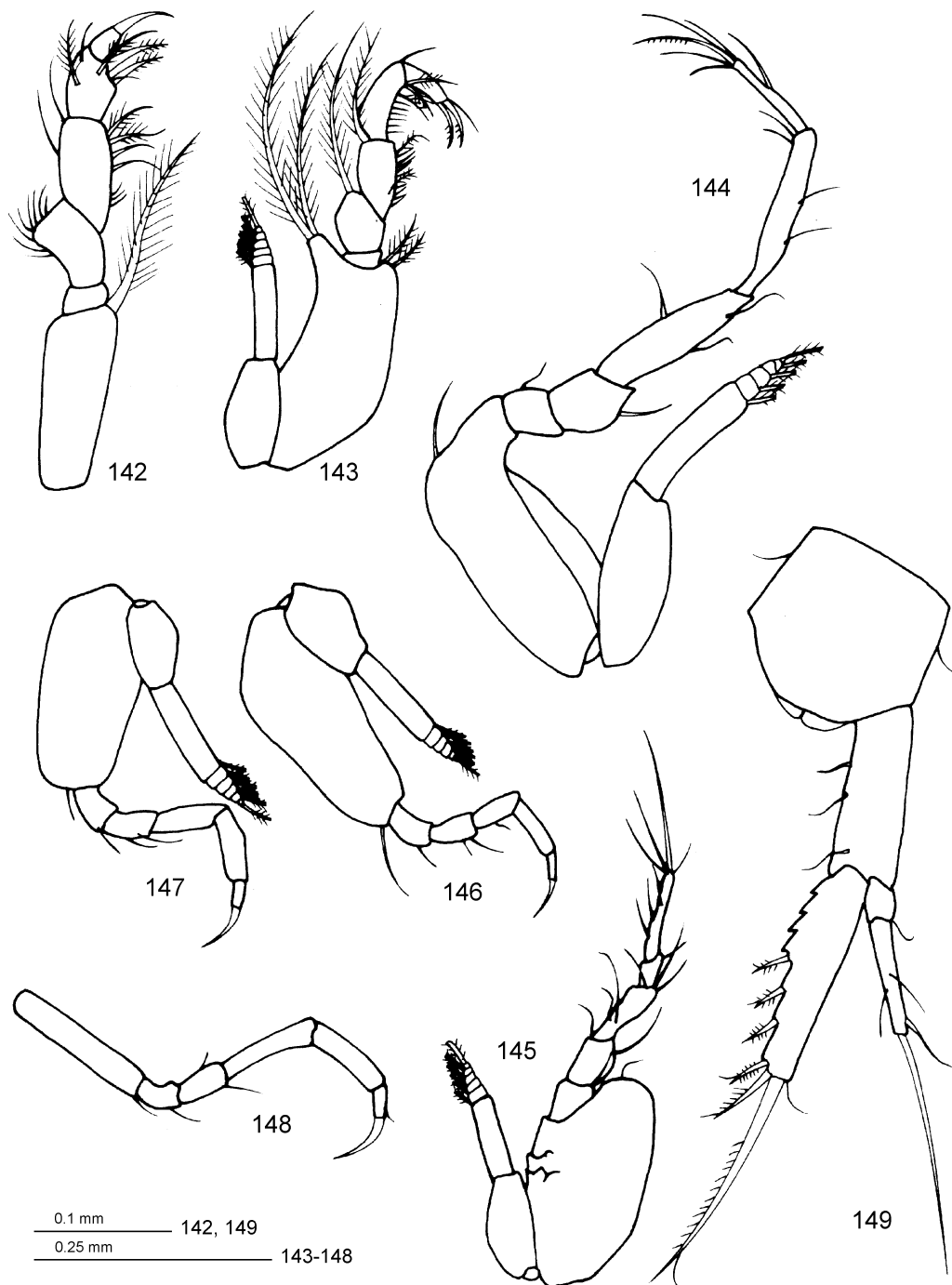
BĂCESCU & ILIFFE (1991) described *Cumella bermudensis* based on females and *C. sterrei* based on males from Bermuda caves. Most of the females and males were from the same sample. From a study of the type specimens as well as non-type specimens col-

lected from caves by T. Iliffe (1978-1986) (Table 1) we conclude that *Cumella bermudensis* is synonymous with *C. agglutinanta* BĂCESCU, 1971 from Florida and Cuba. On the other hand, *C. agglutinanta*, of which no preserved specimens exist, seems to belong to a genus other than *Cumella*. According to Băcescu's original description, Florida specimens have some features uncharacteristic for *Cumella*: pseudorostral lobes not meeting in front of eye lobe, eye lobe with "spaced ommatidia" (separated groups of lenses), peduncle of antennule with a tubercle on second article (only figured and not mentioned in text in descriptions of *C. agglutinanta*, *C. bermudensis* and *C. sterreri*), "uropods extremely short, flattened, very enlarged distally". BĂCESCU & ILIFFE (1991) also considered that "*C. bermudensis* belongs to the group 'scabra' for whom *C. agglutinanta* and *C. coralicola* BĂCESCU, 1971 are the most characteristic taxa". WATLING (1991) maintained this species within the genus *Cumella*. But all these are in fact characters of the genus *Schizotrema* CALMAN. Our study confirms this hypothesis by adding other morphological details. We also presume that females and males found in the same samples, and sharing characters (antennule, mouth parts, pereopod 5) belong to the same species, even though there is sexual dimorphism. Studied specimens (including type specimens) differ from the original description (BĂCESCU, 1971) in the following: completely separated pseudorostral lobes, no lenses on pseudorostrum of males (all three pairs of lenses figured by Băcescu are located on the eye lobe), no spines on pleon and uropodal peduncle. The only species of *Schizotrema* with long and thin uropodal peduncle recorded up to this moment is *S. depressum* CALMAN, 1911 from the Indo-Pacific.

Cumella spinosa described by BĂCESCU & ILIFFE (1991), also from Walsingham Cave, is quite similar to *Schizotrema agglutinanta* (especially to the specimens described as *Cumella bermudensis* and *C. sterreri*), in the following characters: optical elements placed in two separated groups (not so visible in *C. spinosa*, only pigmented patches), antennule with a tubercle on the second article of peduncle ("dactyloid process" in the original description), maxilliped 2, pereopods and uropods. It differs only by having longer siphons and a more hirsute tegument. Quite possibly, *C. spinosa*, *Cumella bermudensis* and *C. sterreri* are in fact one and the same species, even though this cannot be verified because of the loss of *C. spinosa* holotype (the only existing specimen). PETRESCU (1990) only mentioned the species *Cumella bermudensis* and *Cumella sterreri* without any description.

Cumella iliffei BĂCESCU, 1992, recorded from Cripple Gate Cave, is not so accurately described and figured. But is very clear that it has a *Schizotrema*-like uropod, with peduncle shorter than last pleonite and enlarged, with unequal rami with long terminal setae. Băcescu did not give any detail about tubercle on antennule, figured carapace is more like in *Cumella* as regarding the pseudorostrum lobes and optical elements (not so evident). Because all the type specimens were lost it is difficult to correctly establish the taxonomic status of this species at this time.

The only species of *Schizotrema* previously recorded from the Atlantic was *S. atlanticum* from the eastern Atlantic (BĂCESCU & MURADIAN 1972); however, CORBERA & SORBE (1999) placed this species in the genus *Nannastacus*. This is therefore the first record of the genus *Schizotrema* not only from Bermuda but also from the Atlantic Ocean.



Figs 142-149: *Schizotrema agglutinanta* (BĂCESCU, 1971), male. 142: maxilliped 2; 143: maxilliped 3; 144: pereopod 1; 145: pereopod 2; 146: pereopod 3; 147: pereopod 4; 148: pereopod 5; 149: uropod.

***Schizotrema wittmanni* sp.n.**
(Figs 150-158)

Holotype: ♂, USNM 309765.

Paratypes: 1 ♂ (BAMZ 2001193014), Walsingham Cave, sta. 00-032, coll. T. Iliffe, 26.11.2000. – 1 ♂ (NHMW 19557), Walsingham Cave, sta. 00-036, coll. T. Iliffe, 30.11.2000.

Type locality: Outer reef of Bermuda, Eastern Blue Cut, fine sand under rocks, 15 m depth, sta. KW 5.1, collected on 22.06.2000 by Karl Wittmann (Scuba diving).

Etymology: Dedicated to Karl J. Wittmann (Vienna), in deep gratitude for his support, cumacean collections and valuable advice all of which made this field trip possible and successful.

Description: Body with rugose tegument, dorsal spines on pleonites 1-3. Length: 1.61 mm. Carapace (Fig. 150) represents 0.62 of entire body length; marked notch with a short serration on antero-ventral corner; upturned pseudorostrum with serrated anterior margin; eye lobe with two separated groups of lenses (three lense, one pigmented, each).

Antenna 1 (Fig. 151), second article of peduncle, the shortest, with a small tubercle with long sensory setae.

Maxilliped 3 (Fig. 152), basis with an outer process with two long plumose setae, a tooth on inner distal corner; carpus longer than merus; dactylus with two serrated terminal robust setae.

Pereopod 1 (Fig. 153), basis a third of entire pereopod, with a short crest of hyaline teeth on outer margin (distal half); carpus a little shorter than propodus; propodus longer than dactylus; dactylus with a short microerrated terminal seta.

Pereopod 2 (Fig. 154), basis longer than 1/3 of entire pereopod, with a short crest of hyaline teeth on outer margin (distal half); dactylus 1.55 times longer than propodus, with three simple terminal setae.

Pereopods 3-5 (Figs 155-157) with progressively smaller bases, short carpi, as long as enlarged propodi; dactyli with strong claws.

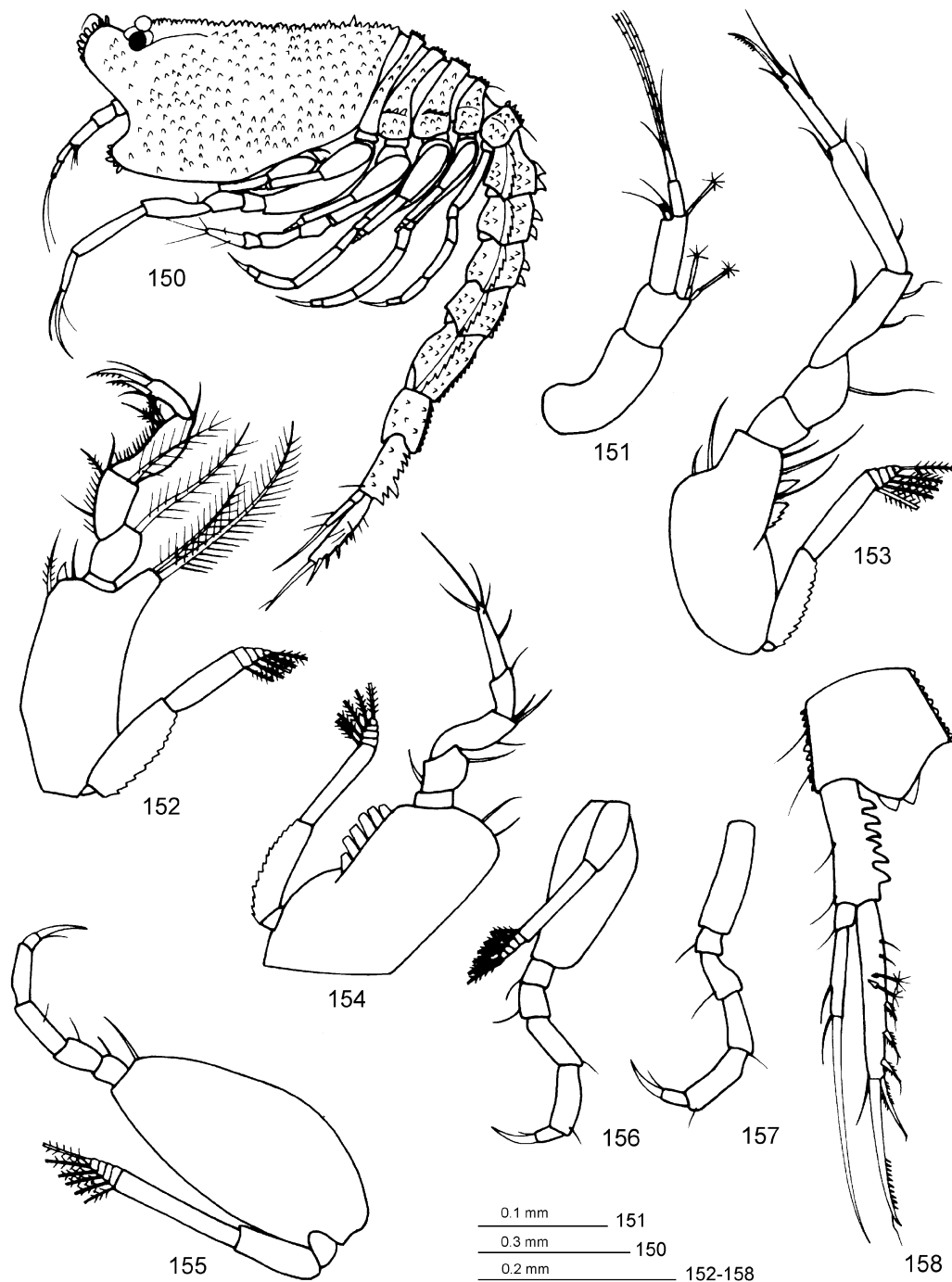
Exopods on maxilliped 3 and pereopods 1-4, with short bases and long ischia.

Uropod (Fig. 158), peduncle as long as last pleonite, a little longer than exopod and shorter than endopod (0.77), large rounded teeth on inner margin; exopod shorter than endopod, with a very long terminal seta; endopod with four microerrated sensory setae on inner margin and a longer terminal one (shorter than endopod).

Remarks: This new species is related to *Schizotrema agglutinanta*, from which it differs by granulose tegument, longer carapace (carapace/entire body: 0.4 in *S. wittmanni* and 0.37 in *S. agglutinanta*), pleonites with spines and uropodal peduncle with teeth. The only species of *Schizotrema* with long uropodal peduncle with spines is *S. depressum* CALMAN (PETRESCU 1997).

General remarks on the distribution of Cumacea in Bermuda

As a result of this study the presence of seven species of Cumacea was established; an eighth species, *Cumella(?) iliffei* BĂCESCU, is probable but could not be confirmed



Figs 150-158: *Schizotrema wittmanni* sp.n. holotype, male. 150: body, lateral view; 151: antenna 1; 152: maxilliped 3; 153: pereopod 1; 154: pereopod 2; 155: pereopod 3; 156: pereopod 4; 157: pereopod 5; 158, uropod.

because no specimens of this species exist in collections. All the species belong to Nannastacidae, the cumacean family which monopolizes the shallow waters in all tropical ecosystems, at least to a depth of 15 m. This low cumacean diversity is in agreement with the generally reduced diversity of marine life from Bermuda (STERRER 1998). The three genera differ in habitus, with 1) *Cubanocuma* having a large carapace, styliform pars molaris of mandible and maxilliped 2 with teeth; 2) *Cumella* having a short carapace, truncated pars molaris of mandible and unique eye lobe; and 3) *Schizotrema* having a short carapace, truncated pars molaris of mandible and eye lobe separated in two groups. These differences are related to their feeding and hiding behaviours: *Cubanocuma* is a predator, with mandible and maxillipeds as in *Campylaspis*, very characteristic for feeding on living Foraminifera (WATLING & MCCANN 1997, BĂCĂSCU & PETRESCU 1999). The large and heavy carapace makes *Cubanocuma* almost look like a sand grain, and we presume that this cumacean does not bury itself as deep in the substratum as the others. *Cumella* and *Schizotrema* are filter-feeders, the main morphologic difference being the aspect of the eyelobe. *Cumella* is present in a large variety of habitats (also in Bermuda): epibenthic, buried in sand, under stones, but also in habitats with algae and seagrass (sandy-muddy bottoms), from shallow to deeper waters, and in cryptic habitats such as sponges and empty bottles. It has a larger ecological plasticity than the other two, and is also the most abundant of all (*Cumella serrata* is the most common cumacean from our samples). *Schizotrema* is more restricted, recorded in Bermuda generally from deeper waters (15 m) and from sea caves. Most of the cumaceans prefer calm shores, and are therefore rare on Bermuda's south shore where stronger waves and finer, more mobile sediments prevail.

Diversity of species is higher (no more than three species) in very shallow waters (1-3 m, Tobacco Bay sta. KW 1, sta. KW 4, Hungry Bay, sta. KW 45) than in deeper ones.

Only two species of Cumacea are recorded from sea caves: *Schizotrema agglutinanta* and *S. wittmanni*, both of them penetrated from the open sea.

Three taxa are shared with adjacent areas: *Cubanocuma gutzui* with the Gulf of Mexico and the Caribbean Sea, *Cumella serrata* with the U.S. Virgin Islands, and *Schizotrema agglutinanta* with Florida and Cuba. The remaining four/five species are known so far only from Bermuda.

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