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Two new species of *Sarsinebalia* (Crustacea, Leptostraca) from the Northeast Atlantic, with comments on the genus

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SARSIA

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Two new species of Leptostraca (Crustacea, Malacostraca) belonging to the genus *Sarsinebalia* are described from shallow waters off Galicia (northwest Spain). The new species differ from *S. typhlops*, the only known member of the genus, mainly in having ommatidia externally visible and pigmented eyes, as well as a second maxilla bearing an exopod that is longer than the first article of the endopod. The validity of *Sarsinebalia* is discussed in the light of the new species described.

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INTRODUCTION

In recent years, the number of new species of Leptostraca has greatly increased (Kazmi & Tirmizi 1989; Modlin 1991; Escobar-Briones & Villalobos-Hiriart 1995; Vetter 1996; Martin & al. 1996; Walker-Smith 1998, 2000; Olesen 1999; Haney & Martin 2000; Haney & al. 2001; Walker-Smith & Poore 2001). However, until a few years ago, it was supposed that certain leptostracan genera, such as *Nebalia* Leach, 1814 and *Paranebalia* Claus, 1880, were composed of a limited number of highly variable species, which would have a more or less cosmopolitan distribution. This view changed after the revision of the European shelf species by Dahl (1985), in which a model for the description of leptostracans was set up. This and subsequent works have demonstrated that a number of reliable characters can be used to differentiate species within this group of crustaceans, and have highlighted the importance of scanning electron microscopy for the study of the different appendage structures (Martin & al. 1996; Haney & Martin 2000; Walker-Smith 2000).

In that context, Dahl (1985) erected the genus *Sarsinebalia* with *N. typhlops* G.O. Sars, 1870 as type species, which had been regarded as a somewhat aberrant *Nebalia*. He pointed out that this species showed a number of distinct characteristics not present in the other known *Nebalia* species, justifying the erection of this new genus. Such characteristics are the possession of a rostrum with a ventral keel(s) ending in a short spine, disc-shaped eyes lacking pigment or externally discernible visual elements, an exopod of the first pleopod without a row of spines on the lateral border, and as a supplementary character the fact that the exopod of the second maxilla is shorter than the first article of the endopod. Dahl (1985) strengthens his opinion regarding the existence of some specimens belonging to several undescribed species from the Red Sea and Australia, which would share these characteristics with *S. typhlops*. However, descriptions of these specimens have remained unpublished to date, as new species assignable to *Sarsinebalia* from other parts of the world have not yet been described. In the same work, and in the light of his observations on *Sarsinebalia*, Dahl (1985) suggested that a revision of the taxonomic status of the subspecies *S. typhlops occidentalis* (Hessler & Sanders, 1965) would be necessary. Hessler & Sanders (1965) pointed out that this subspecies, described from the continental slope off the coast of New Jersey (USA), differs from the typical form mainly in having a carapace fold with a more broadly rounded posterior margin, a rostrum that is broader near the base, tapering prominently at the anterior end, and an antennular scale that is proportionally broader.

Olesen (1999) presented a phylogenetic analysis of the extant genera of Leptostraca, questioning the monophyly of *Nebalia*, and highlighting its phylogenetic proximity to both *Dahlella* Hessler, 1984 and *Sarsinebalia*.

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Walker-Smith & Poore (2001) proposed a new hypothesis for the phylogenetic relationships between the leptostracan genera, erecting a new family, Levinebaliidae, for *Levinebalia* Walker-Smith, 2000 and *Paranebalia*. In their analysis, insufficient characters were found to maintain the generic status of the still monotypic *Sarsinebalia*, and therefore *Nebalia* and *Sarsinebalia* were regarded as synonymous.

An examination of leptostracan specimens collected off the coast of Galicia (northwest Spain) revealed that several of them belong to two undescribed species whose characteristics agree well with the generic diagnosis of *Sarsinebalia* given by Dahl (1985), differing only in having pigmented eyes with externally discernible ommatidia, and a second maxilla bearing an exopod that is longer than the first article of the endopod. In light of these new findings, we maintain the genus *Sarsinebalia* in this work, in which two new species are described: *S. cristoboi* sp. nov. and *S. urgorrii* sp. nov.

MATERIAL AND METHODS

Specimens were collected in several locations off the Galician coast (northwest Spain) during 1995, 1996, 1997 and 2000. Samples were taken by means of a Van Veen grab. The specimens were sorted out from the sediment, fixed in 10% buffered formalin, and then transferred to 70% ethanol. At each sampling point an additional sample was taken to provide sediment for physicochemical analysis. The particle size distribution of the sediment was determined following the procedures given in Buchanan (1984). The carbonate content of the sediment was estimated from the volume of CO_2 delivered after treating the sample with concentrated hydrochloric acid, while the organic matter content was estimated from the weight loss after placing sediment samples in a furnace for 4 h at 450 °C.

Line drawings were made using a camera lucida connected to an Olympus BX40 light microscope. Several specimens were subjected to scanning electron microscope analysis, after being dehydrated via a graded ethanol series, liquid CO_2 critical point dried, and sputter coated with gold. These specimens were examined with a Philips SEM XL30 at CACTI (Centro de Apoyo Científico y Tecnológico a la Investigación, Universidade de Vigo). Descriptions of the new species are of females, following the model of Dahl (1985) and other recent works (Martin & al. 1996; Olesen 1999). Measurements were estimated by means of an ocular micrometer. Total length (TL) was measured from the articulation of the rostrum and carapace to the posterior end of the caudal rami, excluding setation; carapace length (CL) was considered as the distance between the articulation of the rostrum and the margin of the posterodorsal cleft; rostrum length (RL) was measured along the midline. The type series is deposited in the Museo Nacional de Ciencias Naturales, Madrid (MNCN), while remaining specimens are kept in the collection of the first author.

SYSTEMATICS

Family Nebaliidae Samouelle, 1819
Genus *Sarsinebalia* Dahl, 1985

Type species: *Nebalia typhlops* G.O. Sars, 1870

Diagnosis

Rostrum with ventral keel(s) ending in a thread-like structure, that projects past tip of rostrum and tapers to form a short spine. Eyes disc-shaped or more or less oval, with or without ommatidia and pigment. Exopod of first pleopod without row of short, complex spines.

Remarks

The original diagnosis of the genus *Sarsinebalia* was established by Dahl (1985) around three main characters: the rostrum ending in a thread-like structure forming a short spine, disc-shaped eye without externally discernible visual elements and pigment, and the exopod of the first pleopod without the typical row of spines present in other genera, such as *Nebalia*. Additionally, the exopod of the second maxilla did not surpass the length of the first article of the endopod, but this last character was considered by Dahl (1985) to be only a supplementary one. By that time, the only described species assigned to *Sarsinebalia* was *S. typhlops*, although Dahl (1985) pointed out the existence of at least three undescribed species from the Red Sea and Australia, whose existence strengthened his point of view on the validity of *Sarsinebalia*.

Walker-Smith & Poore (2001) suggested that *Nebalia* and the still monotypic *Sarsinebalia* should be considered synonymous, because they did not find sufficient distinctive characters to maintain the generic status of *Sarsinebalia* in their phylogenetic analysis. Hence, the presence of a subrostral spine and the absence of a spine row on the exopod of the first pleopod were considered as not having enough relevance at a generic level to separate these genera. The possession of a subrostral spine is shared with *Paranebalia* and *Levinebalia*, and the absence of a spine row is shared with *Speonebalia cannoni* Bowman, Yager & Iliffe, 1985. According to Walker-Smith & Poore (2001) two autapomorphies would unite *Sarsinebalia*

with *Nebalia*: the presence of a rostral keel shorter than the rostrum and the possession of robust setae in the fourth article of the antennule. However, the recently described *N. schizophthalma* Haney, Hessler & Martin, 2001, which was not included in the analysis by Walker-Smith & Poore (2001), does not present robust setae in the fourth article of the antennule, and instead presents several simple setae.

The finding of the two new species described herein, *S. cristoboi* sp. nov. and *S. urgorrii* sp. nov., which agree well with the original diagnosis of *Sarsinebalia* even though they possess eyes with ommatidia and pigment and a second maxilla bearing an exopod that is longer than the first article of the endopod, suggests that *Sarsinebalia* species would form a homogenous group sharing a number of characteristics not found together in any described *Nebalia*. The presence of ommatidia and pigment in *S. cristoboi* sp. nov. and *S. urgorrii* sp. nov. would be a plesiomorphic state within the genus. Additionally, the three *Sarsinebalia* species possess a disc-shaped eye which is different from the typically dorsally convex eye found in most of the species of *Nebalia*, even though some aberrant eyes have been described in several *Nebalia* species, such as the distally bilobed eyes of *N. daytoni* Vetter, 1996 and *N. schizophthalma*, as well as in the closely related *Dahlella caldariensis* Hessler, 1984 with a long and distally curved eye, armed with sclerotized denticles. With these considerations, the validity of the genus *Sarsinebalia* is retained in this paper, following Dahl (1985, unpublished).

NOTE ABOUT AN UNPUBLISHED DESCRIPTION OF A NEW SPECIES OF *SARSINEBALIA* BY E. DAHL

During the course of this work, Dr E. Vetter (Hawaii Pacific University) informed us about the existence of an unpublished manuscript by Dr E. Dahl in which a new species of *Sarsinebalia* is described from two females collected on the northwest African shelf. Dahl points out that in his previous work on the European shelf leptostracan species, these specimens were wrongly said to belong to Red Sea samples, when he mentioned the existence of some undescribed species of *Sarsinebalia* from other parts of the world (Dahl, 1985). Unfortunately, this unfinished manuscript has not been published due to illness. Type specimens were supposed to have been deposited at the Museum of Zoology of Lund University (Sweden), but they have not been found ever since the manuscript was written (Dr L. Cederholm, *in litteris*).

These specimens present the following distinctive characteristics: a subrostral spine projecting past the tip of the rostrum, disc-shaped and nearly quadratic compound eyes with numerous ommatidia, a supra-ocular plate reaching to the middle of the eye, the third article of the mandibular palp not expanding distally, the corner of the posterolateral border of the fourth pleonite produced to form an obtuse point, with short rounded denticles on the posterior margin, and short and broadly rounded denticles on the dorsal and lateral posterior margins of pleonites 6 and 7. Taking into account this description, these females would be very similar to specimens of *S. urgorrii* sp. nov. described herein, particularly regarding the shape and characteristics of the eyes. However, a direct comparison between them is not possible, and therefore we cannot assure that they belong to the same species.

Sarsinebalia cristoboi sp. nov.
(Figs 1–7, 15A)

Type series

Holotype: female (MNCN 20.04/5326a), TL = 5.5 mm, CL = 2.5 mm, RL = 1.0 mm, Ría de Vigo, 42°13′54″N 8°46′30″W, October 2000, 14 m, "maërl" mixed with gravel. Allotype: male (MNCN 20.04/5326b), TL = 5.6 mm, CL = 2.6 mm, RL = 1.0 mm, Ría de Vigo, 42°13′54″N 8°46′30″W, October 2000, 14 m, "maërl" mixed with gravel. Paratypes: three females (MNCN 20.04/5326c), Ría de Vigo, 42°13′54″N 8°46′30″W, October 2000, 14 m, "maërl" mixed with gravel; one female (MNCN 20.04/5327), Ría de Aldán, 42°19′15″N 8°50′45″W, August 1997, 33 m, coarse sand.

Additional non-type material

One female: Ensenada de Baiona, 42°07′50″N 8°50′52″W, December 1995, 9 m, coarse sand. One female: Ensenada de Baiona, 42°08′10″N 8°50′52″W, December 1995, 12 m, coarse sand. Two females: Ensenada do Grove, 42°30′45″N 8°52′15″W, November 1996, 16 m, "maërl". One female: Ría de Aldán, 42°18′45″N 8°49′15″W, July 1997, 15 m, medium sand. Three females: Ría de Vigo, 42°13′54″N 8°46′30″W, October 2000, 14 m, "maërl" mixed with gravel.

Type locality

Ría de Vigo, 42°13′54″N 8°46′30″W, 14 m, "maërl" mixed with gravel.

Etymology

This new species is named in honour of Dr Francisco J. Cristobo (University of Santiago, Spain), a Galician specialist for the Porifera, in regard to his friendship and his contributions to the field of marine biology.

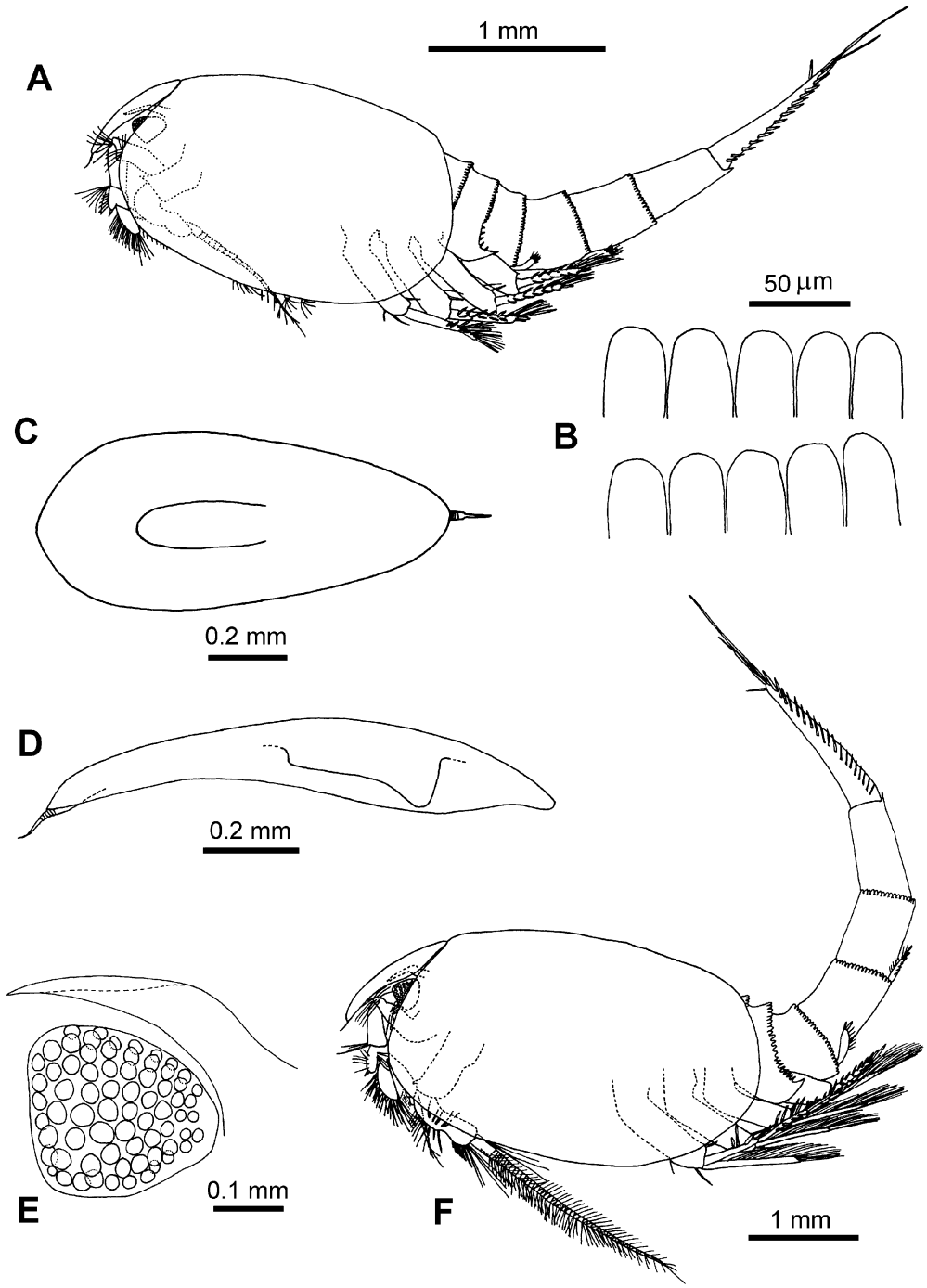

Fig. 1. *Sarsinebalia cristoboi* sp. nov. A. Female (paratype). B. Posterodorsal teeth, pleonites 6–7. C. Rostrum, dorsal view. D. Rostrum, lateral view. E. Eye, lateral view. F. Male (allotype).

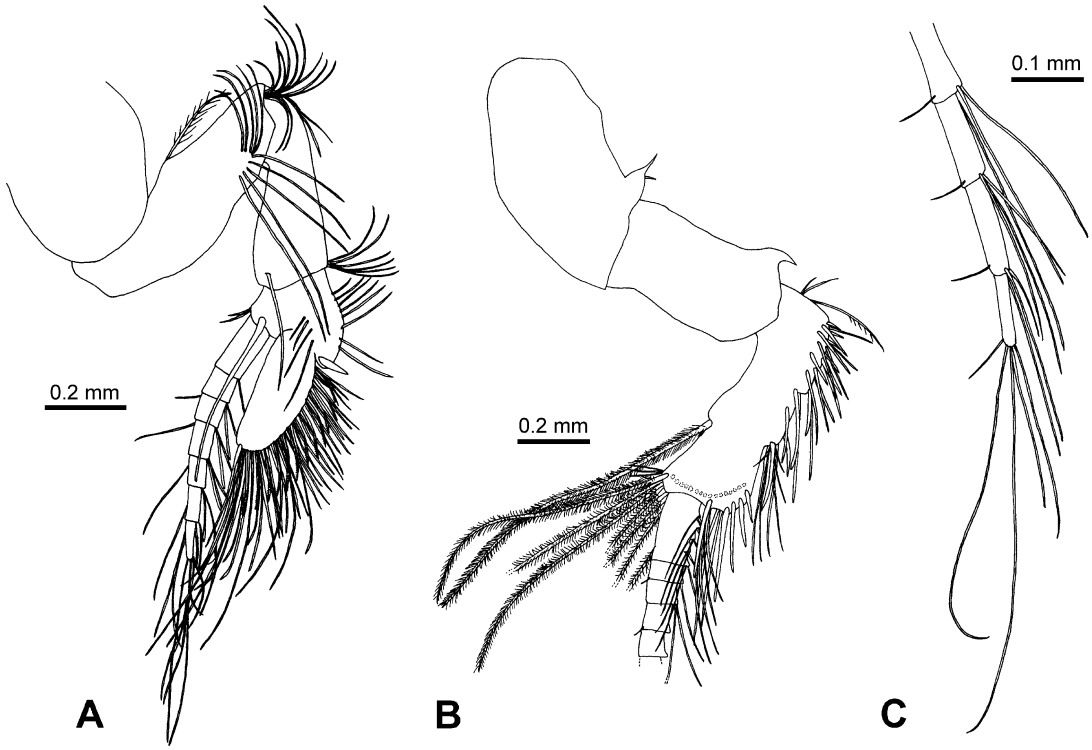

Fig. 2. *Sarsinebalia cristoboi* sp. nov. A. Antennule, lateral view. B. Antenna, peduncle and proximal part of flagellum, lateral view. C. Distal end of antennal flagellum.

Diagnosis of female

Eye disc-shaped, slightly longer than wide, with externally discernible ommatidia and red pigment covering almost entire eye; supra-orbital plate reaching distal end of eye dorsally. Rostrum slightly turning downwards, with paired ventral keels fused proximally. Antennular flagellum with up to eight articles. Exopod of second maxilla longer than first article of endopod. Posterolateral border of fourth pleonite with acute spine-like teeth, ending in larger tooth. Protopod of fourth pleopod with several crenulations along posterior border, ending in acute tooth at posterolateral corner. Fifth pleopod with six large spines along distolateral border. Sixth pleopod with five large spines on distolateral border. Pleonites 6 and 7 with distally rounded teeth along dorsal and lateral posterior borders. Furcal rami about as long as telson and pleonite 7 combined.

Description of female

Largest female 5.6 mm TL, 2.6 mm CL and 1.0 mm RL. Carapace oval, not totally covering fourth pleonite (Fig. 1A).

Rostrum: long, about 2.2 times as long as wide, distally tapering and slightly turning downwards. Paired ventral keels, fused proximally (Fig. 1C, D). Tip of rostrum provided with a terminal spine, segmented proximally (Figs 1D, 7A).

Compound eye: well developed, disc-shaped, slightly longer than wide, distal border straight, with ommatidia and red pigmentation covering almost entire eye (Fig. 1E). Supra-orbital plate with acute tip, surpassing or extending to end of eye.

Antennule: peduncle four-segmented. Second article widest at midpoint, about three times as long as wide, with two clusters of setae distally and subdistally, and with plumose seta dorsally at midpoint (Fig. 2A). Third article shorter than second, widest distally, with terminal dorsal cluster of setae and additional distal seta placed ventrally. Fourth article shorter than third, with row of about eight setae and one stout terminal spine, all of them along dorsolateral border; next to insertion of antennular scale an additional row of setae is present; a long and thicker seta is attached near articulation of flagellum. Antennular scale oval and elongate, about 2.3 times as long as wide, with several

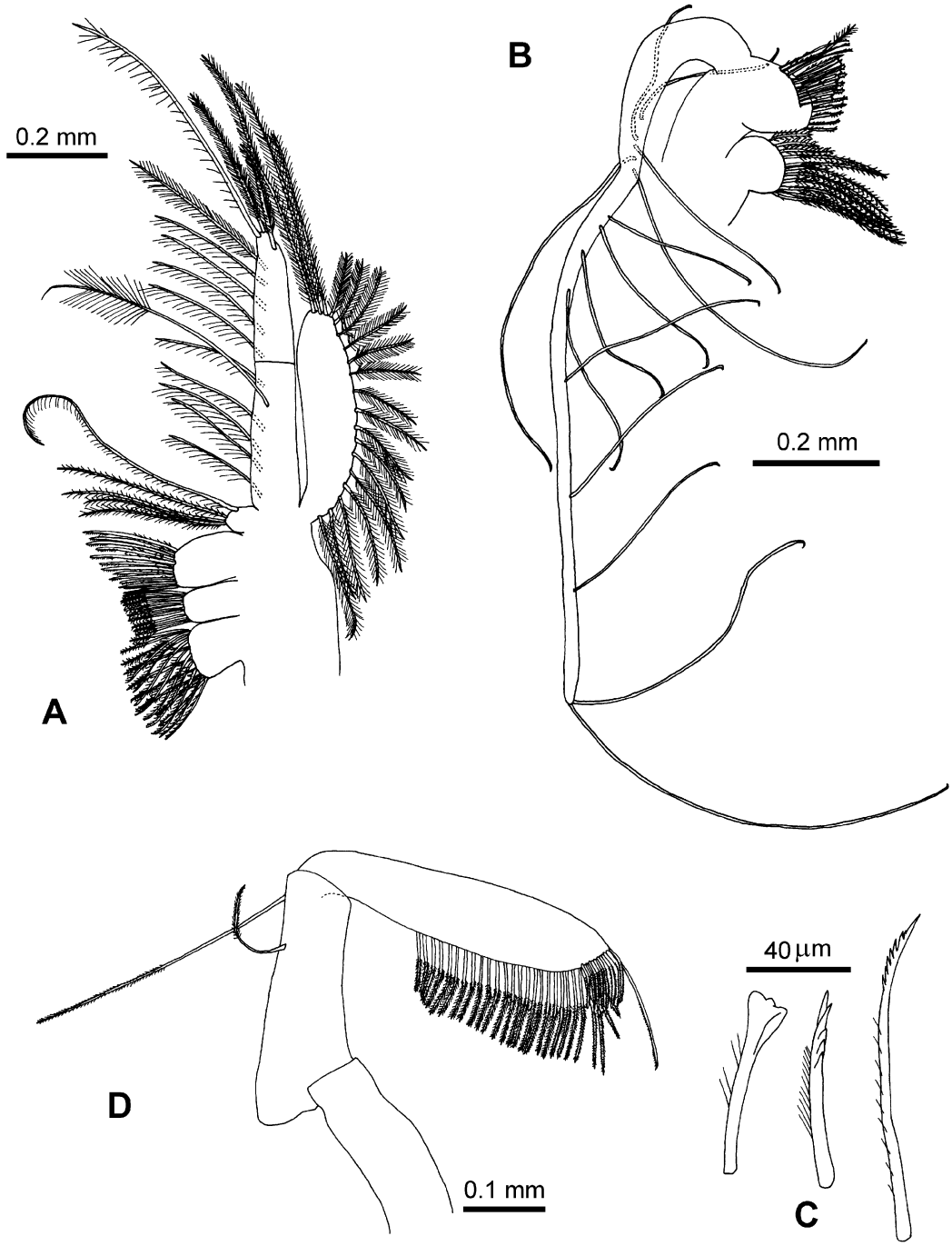

Fig. 3. *Sarsinebalia cristoboi* sp. nov. A. Second maxilla. B. First maxilla. C. Setae from distal endite of first maxilla. D. Mandibular palp.

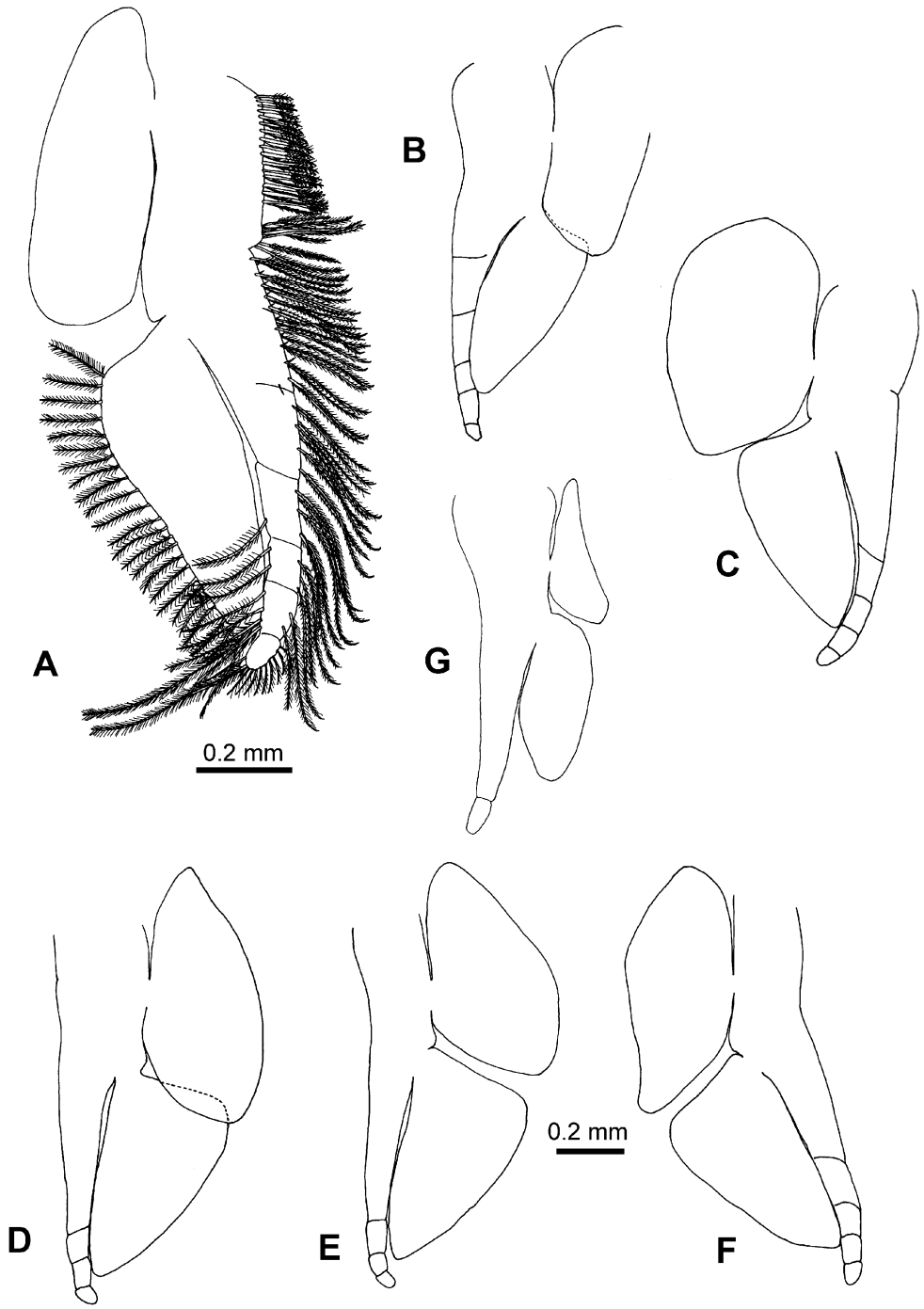

Fig. 4. *Sarsinebalia cristoboi* sp. nov. A. Thoracopod 1, showing setation. B. Thoracopod 2. C. Thoracopod 3. D. Thoracopod 5. E. Thoracopod 6. F. Thoracopod 7. G. Thoracopod 8.

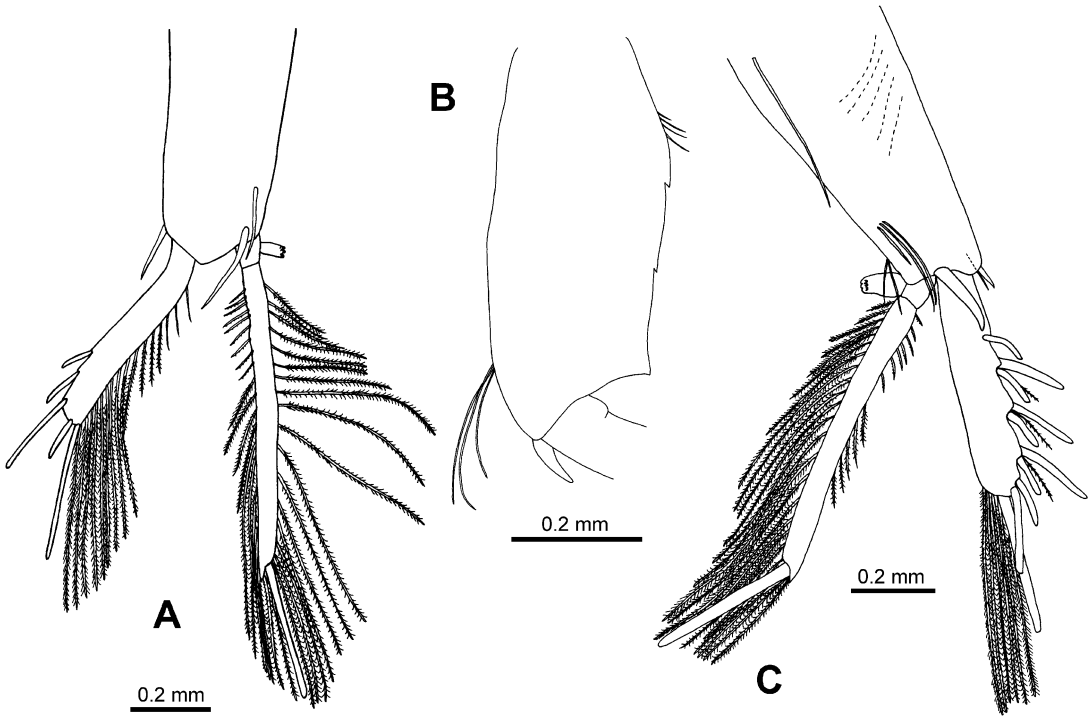

Fig. 5. *Sarsinebalia cristoboi* sp. nov. A. First pleopod, ventral view. B. Fourth pleopod, protopod, lateral view. C. Second pleopod, lateral view.

rows of setae of different lengths: (a) long simple setae, (b) stout curved setae, proximally smooth and distally provided with blunt serrations (Fig. 7C), and (c) thinner and longer setae with sharp teeth (Fig. 7D). Flagellum less than half length of peduncle, with seven articles (occasionally six or eight), each of them with pair of aesthetascs and several setae, the latter increasing in length in distal articles (Fig. 7B).

Antenna: peduncle three-segmented (Fig. 2B). First article with thin dorsal tooth placed distally. Second article about twice as long as wide, with curved dorsal terminal tooth, larger than that of first article. Third article longer than second, with several stout spines and setae along dorsolateral border, long ventral plumose seta subdistally and row of about 15–18 long plumose setae placed sub- and distally. Flagellum slightly shorter than peduncle, with 16–17 articles, each of them with several long and short setae (Figs 2C, 7E).

Mandible: palp well developed, with three articles (Fig. 3D); first article shorter than second, the latter with two setae, the shortest placed subdistally and the longest distally; third article longer than second, not expanding distally; from proximal third to terminus, a row of setae bearing lanceolate setules; distal border with shorter row of stouter setae with lateral serrulations (Fig. 7F).

First maxilla: protopod with two endites (Fig. 3B); first endite with plumose setae; second endite larger than first, with setae arranged in two rows comprising about seven spatulate, two setulose, and 16 distally denticulate (Fig. 3C). Palp well developed, about five times the length of protopod, with long and spaced setae.

Second maxilla: protopod with four endites; endites 1 and 3 the largest and endite 4 the smallest (Fig. 3A). Endopod longer than exopod, composed of two articles, distal one shorter than proximal one; exopod clearly surpassing articulation between two articles of endopod. All endites, exopod, and endopod with plumose setae. Distal seta of second article of endopod as long as entire ramus.

Thoracopods (Fig. 4): endopod exceeding length of exopod, segmented distally, with plumose setae along margin, longest ones on distal article (Fig. 7G); exopod with shorter setae along lateral margin; epipod of thoracopod 8 reduced in size.

Pleonites: posterior border of first pleonite lacking

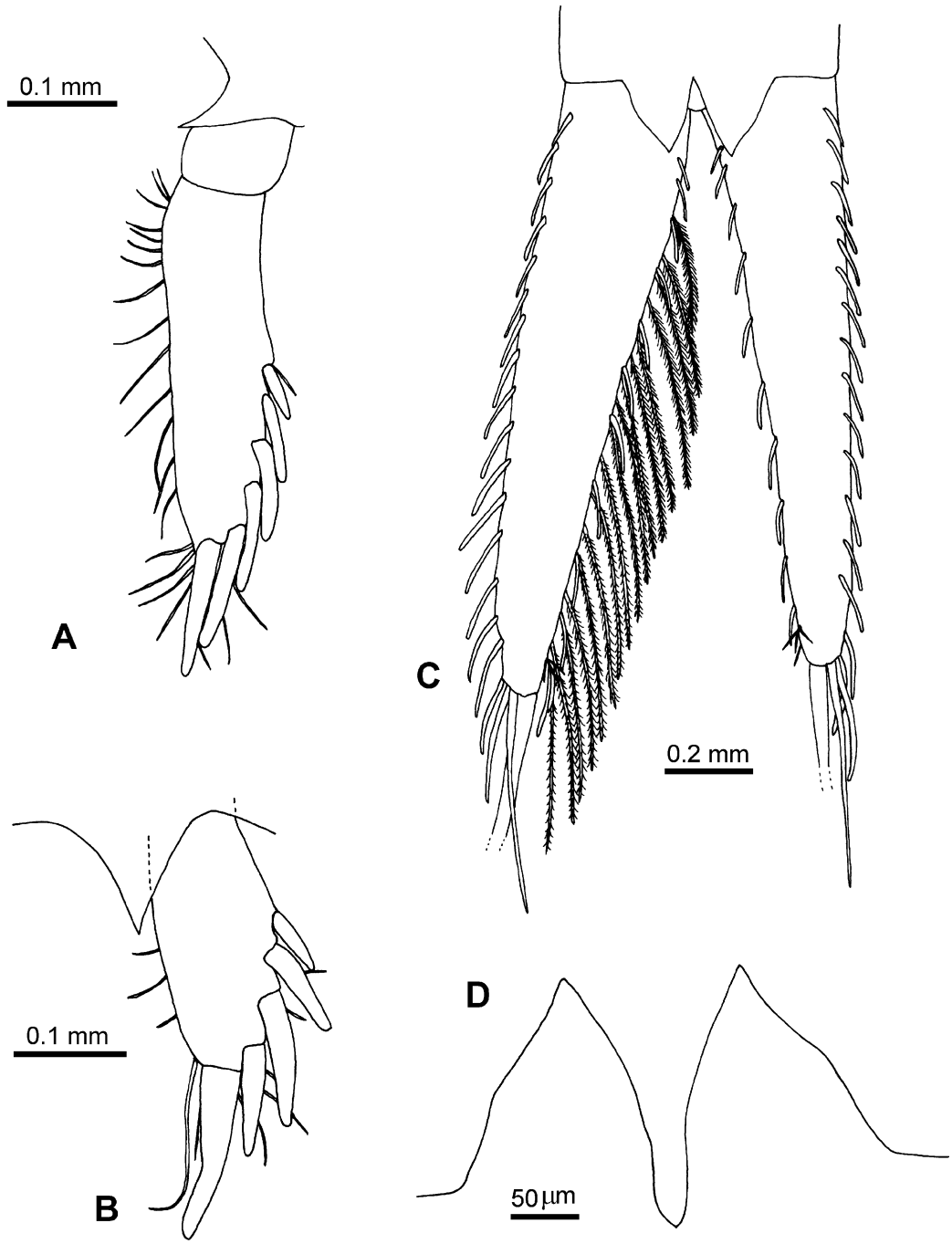

Fig. 6. *Sarsinebalia cristoboi* sp. nov. A. Fifth pleopod, ventral view. B. Sixth pleopod, ventral view. C. Caudal furca, ventral view (plumose setae not figured in left ramus). D. Anal scales.

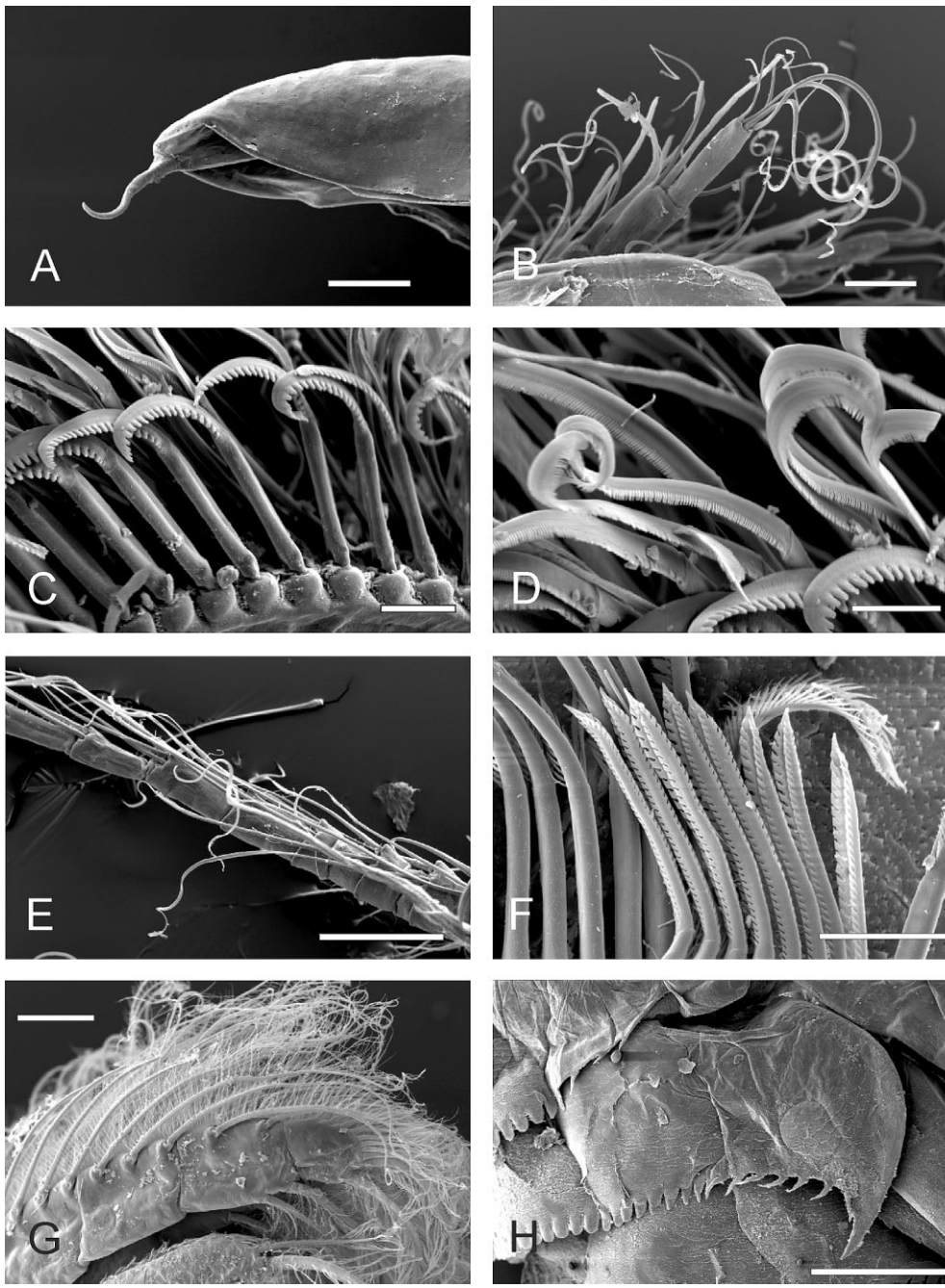

Fig. 7. *Sarsinebalia cristoboi* sp. nov., scanning electron micrographs. A. Rostrum, distal end. B. Antennular flagellum, distal end. C. Antennular scale, stout serrate setae. D. Antennular scale, serrate setae. E. Antennal flagellum, medial articles. F. Mandibular palp, setae with lateral serrulations. G. Thoracopod, distal end of endopod. H. Fourth pleonite, posterolateral border. Scale bar: A–B, G: 50 µm; C, 20 µm; D, 10 µm; E, 0.1 mm; F, 20 µm; H, 0.2 mm.

denticles. Second pleonite bearing row of denticles along posterodorsal border; denticles distally rounded becoming acute and more spaced towards both ends of row. Third pleonite with denticles along dorsal and lateral posterior borders; denticles showing same shape variation as in second pleonite. Fourth pleonite with distally rounded denticles along posterodorsal border; posterolateral border bearing acute spine-like teeth, ending in larger tooth (Fig. 7H). Pleonites 5–7 with distally rounded denticles on posterior border (Fig. 1B).

First pleopod: protopod with several basal thin spines (Fig. 5A); exopod about 0.8 times the length of protopod, with five subdistal and distal spines and several plumose setae along medial margin; endopod two-segmented with plumose setae on lateral and medial margins of distal segment, basal segment with appendix interna.

Second pleopod: protopod with several lateral and subdistal simple setae, one long proximal seta, one stout spine next to exopod base, and larger stout spine between both rami (Fig. 5C). Exopod with row of spine pairs, each pair consisting of one long and one shorter blunt spine, between both spines a short setulose seta; medial margin with long plumose setae, three stout spines distally. Endopod two-segmented, distal segment with long plumose setae on lateral and medial margins and large terminal stout spine.

Pleopods 3–4: similar to second pleopod; protopod of fourth pleopod with posterior margin crenate (Fig. 5B).

Fifth pleopod (Fig. 6A): uniramous, two-segmented; distal article about 3.4 times as long as wide, with six spines along distolateral and terminal border, increasing in length distally, and with several simple setae along medial and distal border. Acute triangular process between both pleopods.

Sixth pleopod (Fig. 6B): uniramous, one-segmented, with five lateral and distal spines increasing in length distally and a few simple setae along medial and distal border. Acute triangular process between both pleopods.

Telson, anal scales and furca: anal scales with acute points, with no distinct "shoulder" (Fig. 6D). Furcal rami tapering distally (Fig. 6C), approximately equal to length of telson and pleonite 7 combined (Fig. 1A); bearing 15–17 short spines along lateral margin and 10–12 along medial margin, with plumose setae on medial margins; distally two long spines, terminal one twice length of penultimate spine, thicker basally, and about 0.7 times length of furcal rami.

Coloration: specimens in life more or less transparent or whitish, having conspicuous red pigment in eyes.

Male

A subadult male has also been found between 13 females (Fig. 1F). Antennular flagellum is eight-segmented, with articles thicker than those of the female, bearing long aesthetascs (Fig. 15A). Antennal flagellum longer than peduncle and extending to the end of the carapace, with about 40 articles; pleopods comparatively longer in relation to body length.

Ecology

This species has been collected at depths of between 9 and 33 m, mainly in clean coarse sand bottoms corresponding with the *Branchiostoma lanceolatum–Clausinella fasciata* community, and in coarse sand bottoms with a high presence of calcareous algae belonging to the genera *Lithothamnion* and *Phymatolithon*, which are commonly known as "maërl". The coarser granulometric fractions were predominant (Q_{50}: 0.85–0.9 mm), and the percentage of the silt–clay fraction was small (0.025–2.35%). These sediments present a high content in carbonates (61.3–74.6%) and a low content in organic matter (1.3–2.5%).

The following companion fauna were found in the clean coarse sand bottoms: the polychaetes *Pisione remota* (Southern, 1914), *P. parapari* Moreira, Quintas & Troncoso, 2000, *Parapionosyllis cabezali* Parapar, San Martín & Moreira, 2000, and *Polygordius appendiculatus* Fraipont, 1887, the bivalves *Goodallia triangularis* (Montagu, 1803) and *Clausinella fasciata* (da Costa, 1778), and the cephalochordate *Branchiostoma lanceolatum* (Pallas, 1778), while the following species were collected in the "maërl" bottoms: the molluscs *Lepidochitona cinereus* (Linnaeus, 1767), *Acmaea virginea* (Müller, 1776), *Jujubinus exasperatus* (Pennant, 1777), and *Kellia suborbicularis* (Montagu, 1803), and the crustaceans *Phtisica marina* Slabber, 1769 and *Pisidia longicornis* (Linnaeus, 1767).

Distribution

To date, known only from the Galician coast (Ría de Vigo, Ensenada de Baiona, Ría de Aldán, and Ensenada do Grove).

Remarks

This species can be distinguished from *S. typhlops* by its eyes, which have ommatidia and red pigmentation, and by a second maxilla bearing an exopod longer than the first article of the endopod. Additionally, in *S. typhlops* the third article of the mandibular palp presents a long seta proximally (see Dahl 1985, fig. 101), which was not observed in *S. cristoboi* sp. nov. The species closest to *S. cristoboi* sp. nov. is *S. urgorrii* sp. nov., also described herein, which has a similar body appearance but differs from *S. cristoboi* sp. nov. in having longer eyes, the supra-orbital plate never reaching the distal

end of the eye (Fig. 8F), an antennular flagellum with more aesthetascs per article (Figs 9A, 14B), an antennal flagellum with spines and coarser setae (Figs 9B, 14E), and the posterolateral border of the fourth pleonite bearing rounder denticles (Fig. 14G) that distinctly do not present a spiny shape as in *S. cristoboi* sp. nov. (Fig. 7H). Additionally, both species have not been found coexisting in the same bottoms, even in the same location, *S. cristoboi* sp. nov. apparently preferring sediments with predominantly coarser elements ("maërl", gravel, coarse sand).

Sarsinebalia urgorrii sp. nov.
(Figs 8–14, 15B)

Type series

Holotype: ovigerous female (MNCN 20.04/5328), TL = 5.25 mm, CL = 2.0 mm, RL = 0.75 mm, Ensenada de Baiona, 42°08′10″N 8°50′15″W, May 1996, 10 m, medium sand. Allotype: male (MNCN 20.04/5329a), TL = 5.45 mm, CL = 2.0 mm, RL = 0.85 mm, Ensenada de Baiona, 42°08′10″N 8°50′15″W, November 1996, 10 m, medium sand. Paratypes: Ensenada de Baiona: one female (MNCN 20.04/5330), 42°08′10″N 8°50′15″W, December 1995, 10 m, medium sand; one post-ovigerous female (MNCN 20.04/5331), 42°08′10″N 8°50′15″W, July 1996, 10 m, medium sand; one female (MNCN 20.04/5332), 42°08′10″N 8°50′15″W, October 1996, 10 m, medium sand; one female (MNCN 20.04/5329b), 42°08′10″N 8°50′15″W, November 1996, 10 m, medium sand; one female (MNCN 20.04/5333), 42°07′50″N 8°49′44″W, December 1995, 9 m, medium sand; one subadult male (MNCN 20.04/5334), 42°07′30″N 8°50′15″W, December 1995, 7 m, muddy sand.

Additional non-type material

Ensenada de Baiona: one female, 42°08′10″N 8°49′44″W, December 1995, 8 m, muddy sand; two females, 42°07′50″N 8°50′15″W, December 1995, 8 m, medium sand; one female, 42°07′50″N 8°49′44″W, December 1995, 9 m, medium sand; three females, 42°07′30″N 8°49′44″W, December 1995, 8 m, fine sand, 42°08′10″N 8°50′15″W, 10 m, medium sand: April 1996, one subadult male; June 1996, four females; July 1996, two females; August 1996, one female; September 1996, two females; October 1996, six females, two subadult males; November 1996, three females.

Type locality

Ensenada de Baiona, 42°08′10″N 8°50′15″W, 10 m, medium sand.

Etymology

This new species is named in honour of Dr Victoriano Urgorri (University of Santiago, Spain), eminent Galician malacologist, in appreciation of his teaching in marine biology, his kindness and his friendship.

Diagnosis of female

Eye disc-shaped, longer than wide, with ommatidia and red pigment; supra-orbital plate about 0.6 times length of eye. Rostrum slightly turning downwards, with paired ventral keels fused proximally. Antennular flagellum with up to eight articles. Exopod of second maxilla longer than first article of endopod. Posterolateral border of fourth pleonite bearing rounded teeth, ending in a larger tooth. Protopod of fourth pleopod with several crenulations along posterior border, ending in acute tooth at posterolateral corner. Fifth pleopod with six large spines on distolateral border. Sixth pleopod with four large spines on distolateral border. Pleonites 6–7 with distally rounded teeth along posterior border. Furcal rami equal to or slightly shorter than telson and pleonite 7 combined.

Description of female

Largest female of 5.25 mm TL, 2.0 mm CL and 0.75 mm RL. Carapace oval, not covering fourth pleonite (Fig. 8A).

Rostrum: long, about twice as long as wide, distally tapering and turning downwards. Paired ventral keels, fused proximally (Fig. 8D). Tip of rostrum provided with terminal spine, segmented proximally (Figs 8C, 14A).

Compound eye: well developed, disc-shaped, longer than wide, distal border straight, with ommatidia and red pigmentation covering almost entire eye (Fig. 8F). Supra-orbital plate with acute tip, extending about two-thirds of dorsal surface of eye.

Antennule: peduncle four-segmented (Fig. 9A). Second article widest at midpoint, about three times as long as wide, with two clusters of smooth and plumose setae distally and subdistally, and with plumose seta dorsally at midpoint. Third article shorter than second, widest distally, with terminal dorsal cluster of setae and additional distal seta placed ventrally. Fourth article shorter than third, with row of seven setae and one stout terminal spine, all of them along dorsolateral border; next to insertion of antennular scale an additional row of setae; a very long and thicker seta attached near articulation of flagellum. Antennular scale oval, about 1.8 times as long as wide, with several rows of setae of different lengths: (a) long simple setae, (b) stout curved setae, proximally smooth and distally provided with blunt serrations (Fig. 14C),

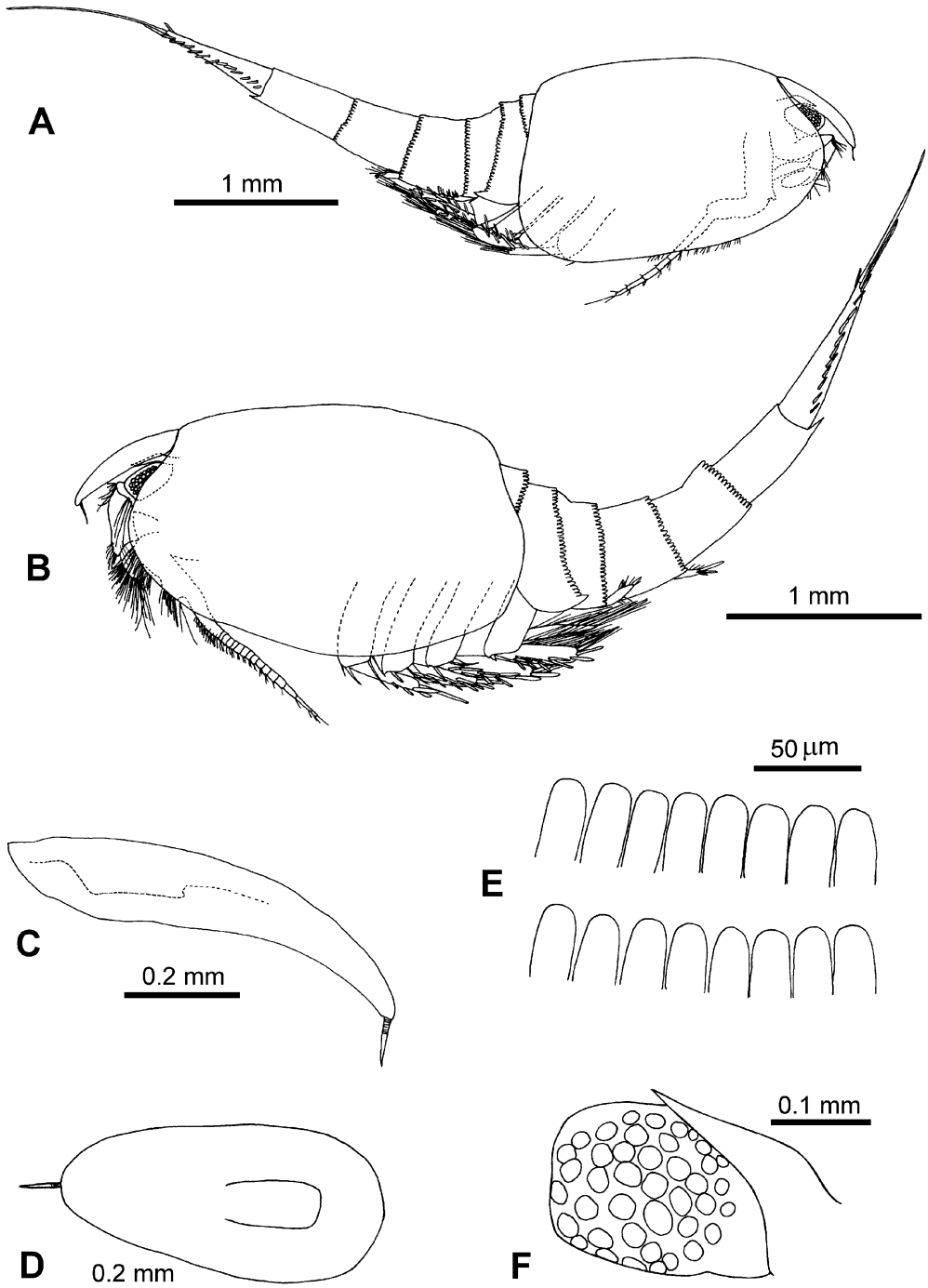

Fig. 8. *Sarsinebalia urgorrii* sp. nov. A. Female (paratype). B. Male (paratype). C. Rostrum, lateral view. D. Rostrum, dorsal view. E. Posterodorsal teeth, pleonites 6–7. F. Eye, lateral view.

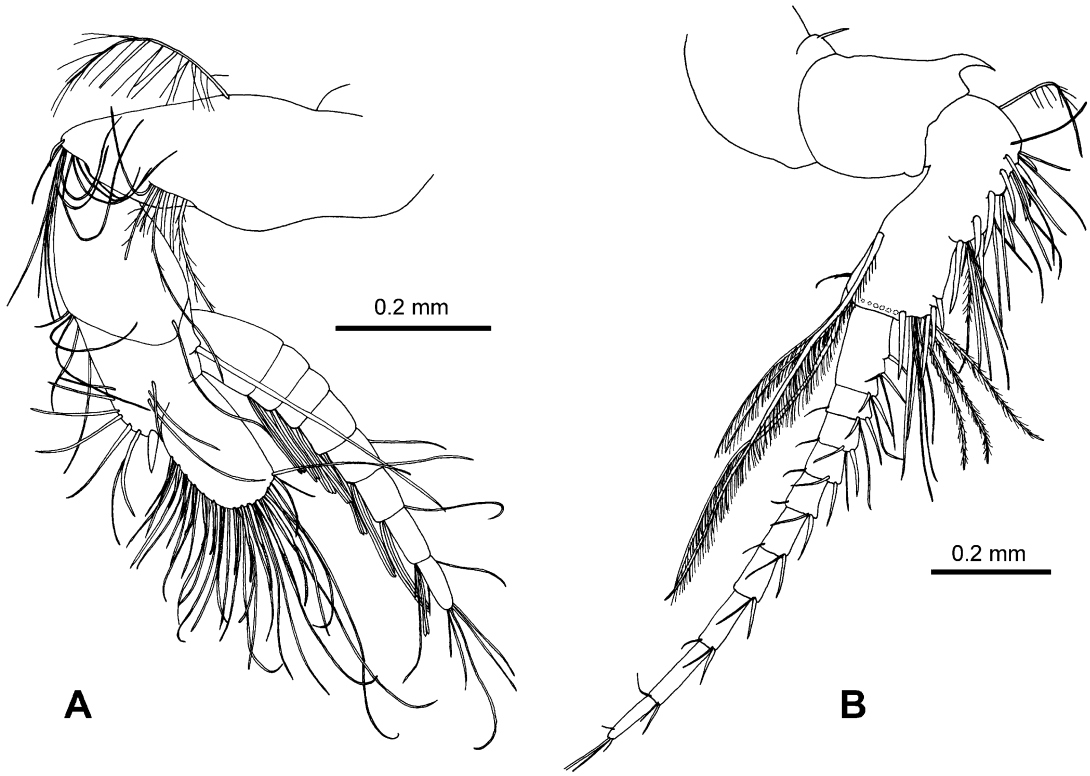

Fig. 9. *Sarsinebalia urgorrii* sp. nov. A. Antennule, lateral view. B. Antenna, lateral view.

and (c) thinner and longer setae with sharp teeth (Fig. 14C). Flagellum about half length of peduncle, with eight articles, each with several aesthetascs (Fig. 14B).

Antenna: peduncle three-segmented (Fig. 9B). First article with thin dorsal spine-like tooth placed distally. Second article about 1.3 as long as wide, with curved dorsal terminal tooth, larger than that of first article. Third article longer than second, with several stout spines and setae along dorsolateral border (Fig. 14D), long ventral plumose seta placed subdistally, and row of about 12 long plumose setae placed distally. Flagellum almost as long as peduncle, with up to 13 articles, each with several terminal setae and spines (Fig. 14E).

Mandible: palp well developed, three-segmented (Fig. 10B); first article shorter than second, latter with two setae, shortest placed subdistally and longest distally; third article longer than second, not expanded distally; with row of setae bearing lanceolate setules from proximal third to terminus; distal border with shorter row of stouter setae with lateral serrulations (Fig. 14F).

First maxilla: protopod with two endites (Fig. 10A), first endite with plumose setae; second endite larger than first, with setae arranged in two rows comprising about seven spatulate, two setulose and 14 distally denticulate. Palp well developed, about five times length of protopod, with long spaced setae.

Second maxilla: protopod with four endites; endites 1 and 3 largest and endite 4 smallest (Fig. 10C). Endopod longer than exopod, composed of two articles, distal one slightly longer than proximal one; exopod clearly surpassing level of articulation between two articles of endopod. All endites, exopod and endopod bearing plumose setae. Distal seta of second article of endopod as long as entire limb.

Thoracopods (Fig. 11): endopod exceeding length of exopod, more or less segmented distally, with plumose setae along margin; exopod with some setae along its lateral margin; thoracopod 8 with particularly reduced epipod.

Pleonites: first pleonite lacking denticles on posterior border. Second pleonite bearing acute denticles along posterodorsal border. Posterior border of pleonites 3–7 with distally rounded denticles (Fig. 8E). Posterolateral margin of fourth pleonite ending in large tooth (Fig. 14G); with several denticles along margin, triangular or

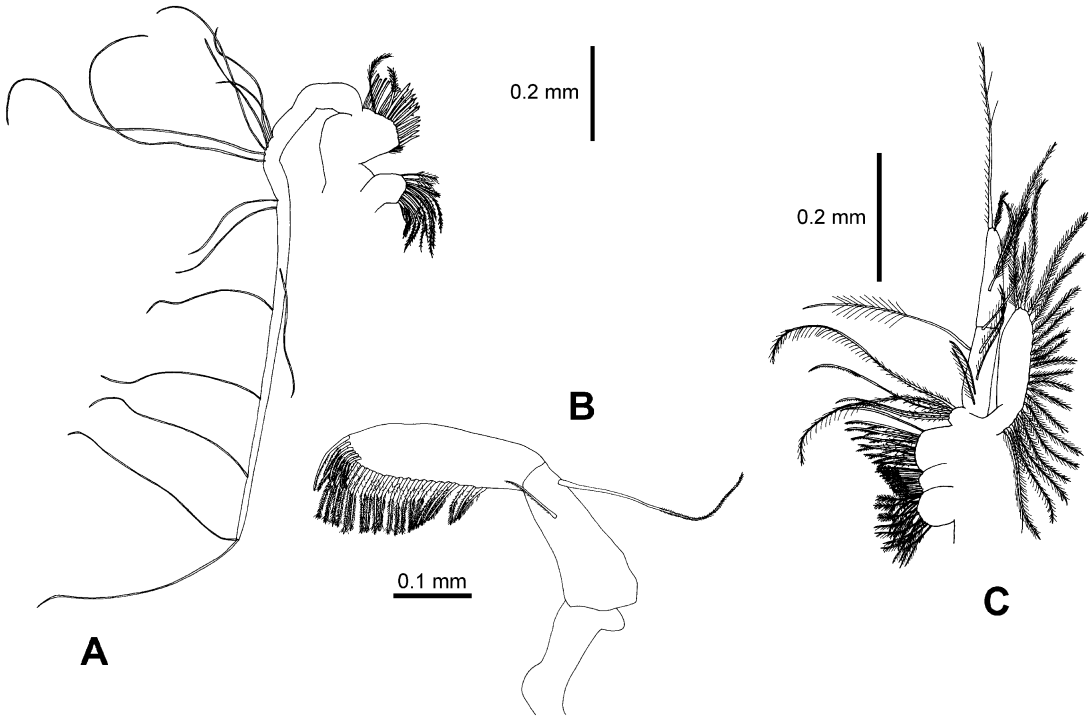

Fig. 10. *Sarsinebalia urgorrii* sp. nov. A. First maxilla. B. Mandibular palp. C. Second maxilla.

with parallel sides, more or less rounded distally, but never with a spine-like shape, only young specimens (about 2–3 mm long) bearing some acute teeth.

First pleopod: protopod with several distal spines (Fig. 12B); exopod about 0.7 times length of protopod, with five stout subdistal and distal spines and several plumose setae along medial margin; endopod two-segmented with plumose setae on lateral and medial margins of distal segment, basal segment with appendix interna.

Second pleopod: protopod with few marginal and subdistal smooth setae and single distal plumose seta, one spine next to exopod base and another one between two rami (Fig. 12C). Exopod with row of spine pairs, each pair consisting of one long and one shorter blunt spine, between both spines a short plumose seta; medial margin with long plumose setae, three stout spines distally. Endopod two-segmented, distal segment with long plumose setae on lateral and medial margins and a terminal stout spine.

Pleopods 3–4: similar to second pleopod; protopod of fourth pleopod with posterior margin crenate (Fig. 12A).

Fifth pleopod (Fig. 13A): uniramous, two-segmented; distal article about 3.5 times as long as wide, with five or six spines along lateral and terminal border, increasing in length distally, several simple setae along medial and distal borders. Acute triangular process between both pleopods.

Sixth pleopod (Fig. 13B): uniramous, one-segmented, with up to four lateral and distal stout spines increasing in length distally and a few simple setae along medial and distal borders. Acute triangular process between both pleopods.

Telson, anal scales and furca: anal scales with small acute points, with no distinct "shoulder" (Figs 13E, 14H). Furcal rami tapering distally (Fig. 13C), approximately equal to or slightly shorter than telson and pleonite 7 combined (Fig. 1A); bearing 15–16 short spines along lateral margin and 10–11 along medial margin, with plumose setae on medial margins; distally two long spines, terminal one 2.5 times length of penultimate spine, thicker basally, and about 1.5 times length of furcal rami (Fig. 13D).

Coloration: preserved specimens more or less transparent or whitish, sometimes with red pigment in eyes.

Male

Five males were found, four of them subadults (Fig. 8B), which constitute less than 15% of the specimens

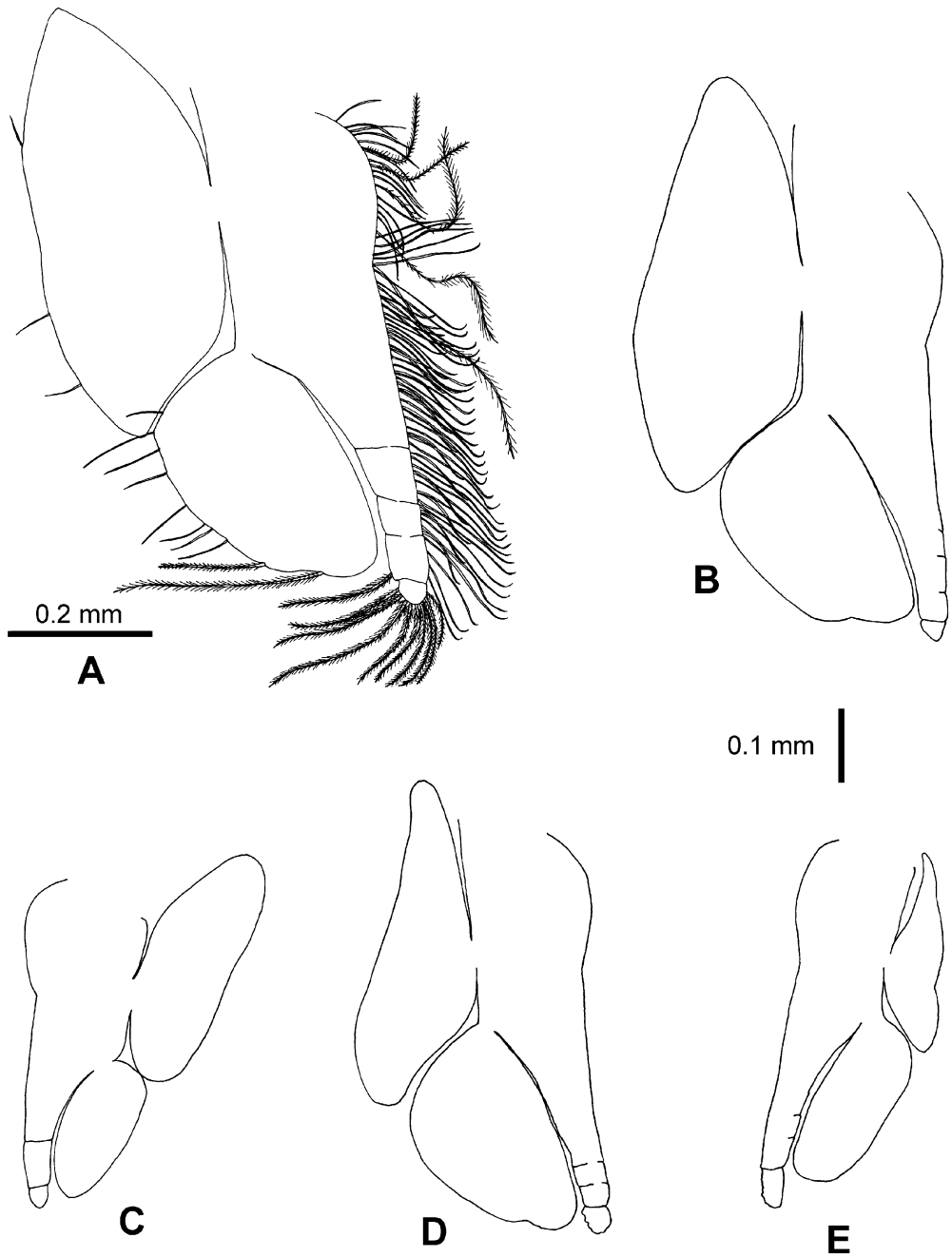

Fig. 11. *Sarsinebalia urgorrii* sp. nov. A. Thoracopod 3, showing setation. B. Thoracopod 4. C. Thoracopod 1. D. Thoracopod 7. E. Thoracopod 8.

collected. Males are very similar to females, presenting some differences in the antennular flagellum, whose articles are thicker than those of females (Fig. 15B). Besides, the antennal flagellum is longer with a higher number of articles (about 35 in the most developed male).

Ecology

This species has been found at depths of between 7 and 10 m. Most of the specimens have been collected in medium sand bottoms (Q_{50}: 0.33–0.38 mm), with a silt–clay fraction between 3.0 and 3.6%, a high carbonate content (79.7–82.6%) and a low organic matter content (2.0–2.3%). The benthic community is characterized by the presence of the polychaetes *P. parapari, P. remota, Streptosyllis websteri* Southern, 1914 and *Glycera capitata* Ørsted, 1843, and the molluscs *Caecum imper-*

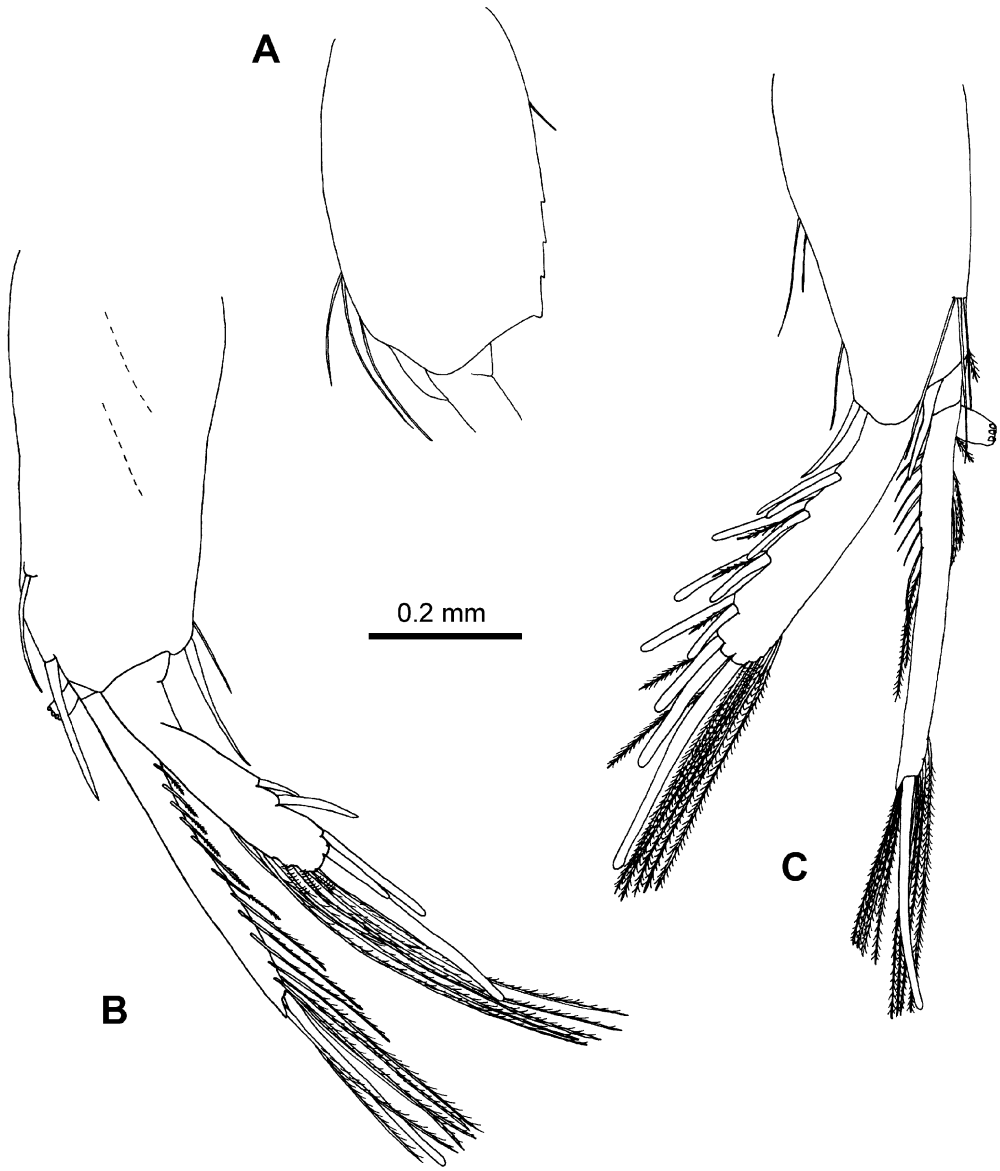

Fig. 12. *Sarsinebalia urgorrii* sp. nov. A. Fourth pleopod, protopod, lateral view. B. First pleopod, lateral view. C. Second pleopod, lateral view.

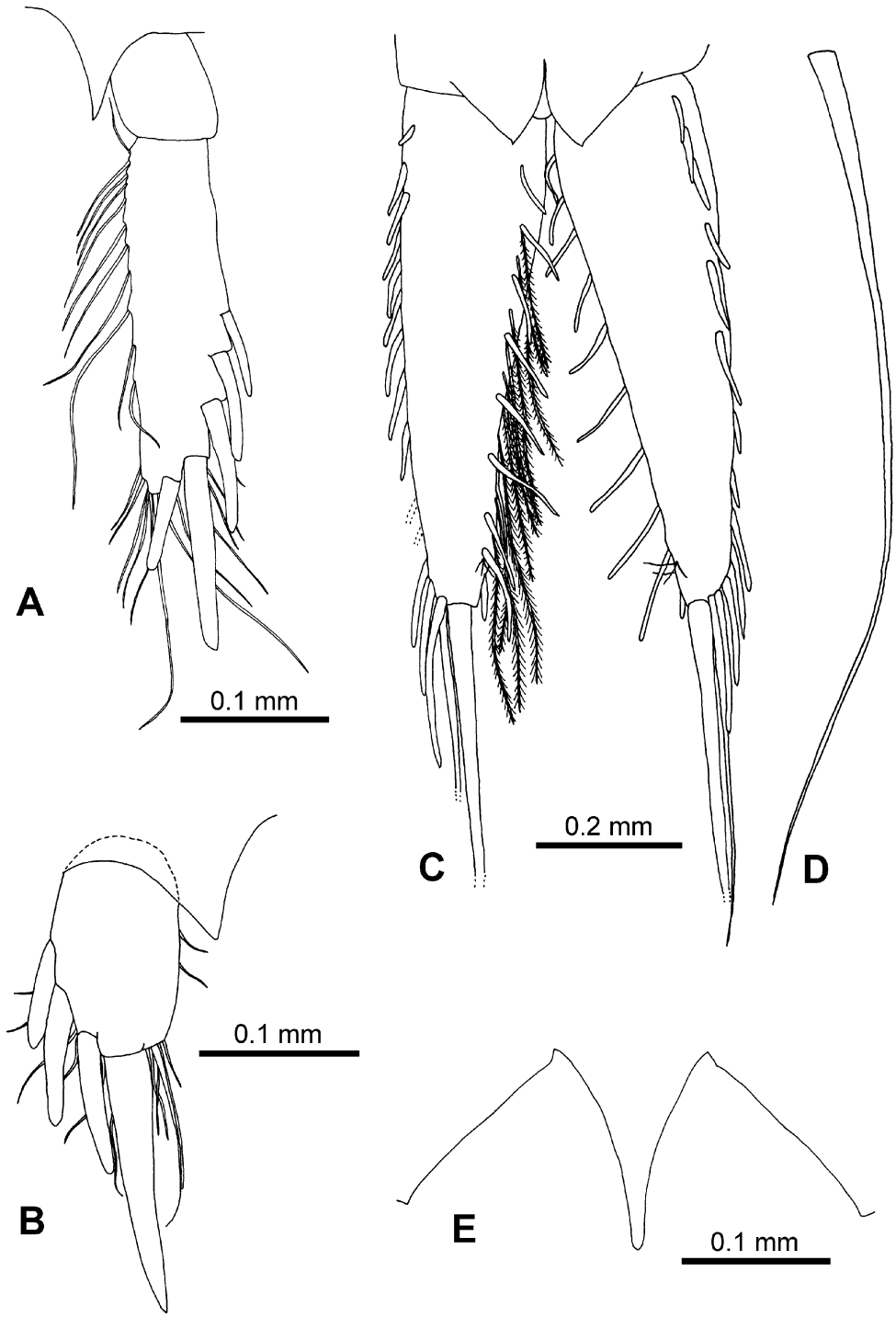

Fig. 13. *Sarsinebalia urgorrii* sp. nov. A. Fifth pleopod, ventral view. B. Sixth pleopod, ventral view. C. Caudal furca, ventral view (plumose setae not figured in left ramus). D. caudal furca, longest distal seta (same scale as C). E. Anal scales.

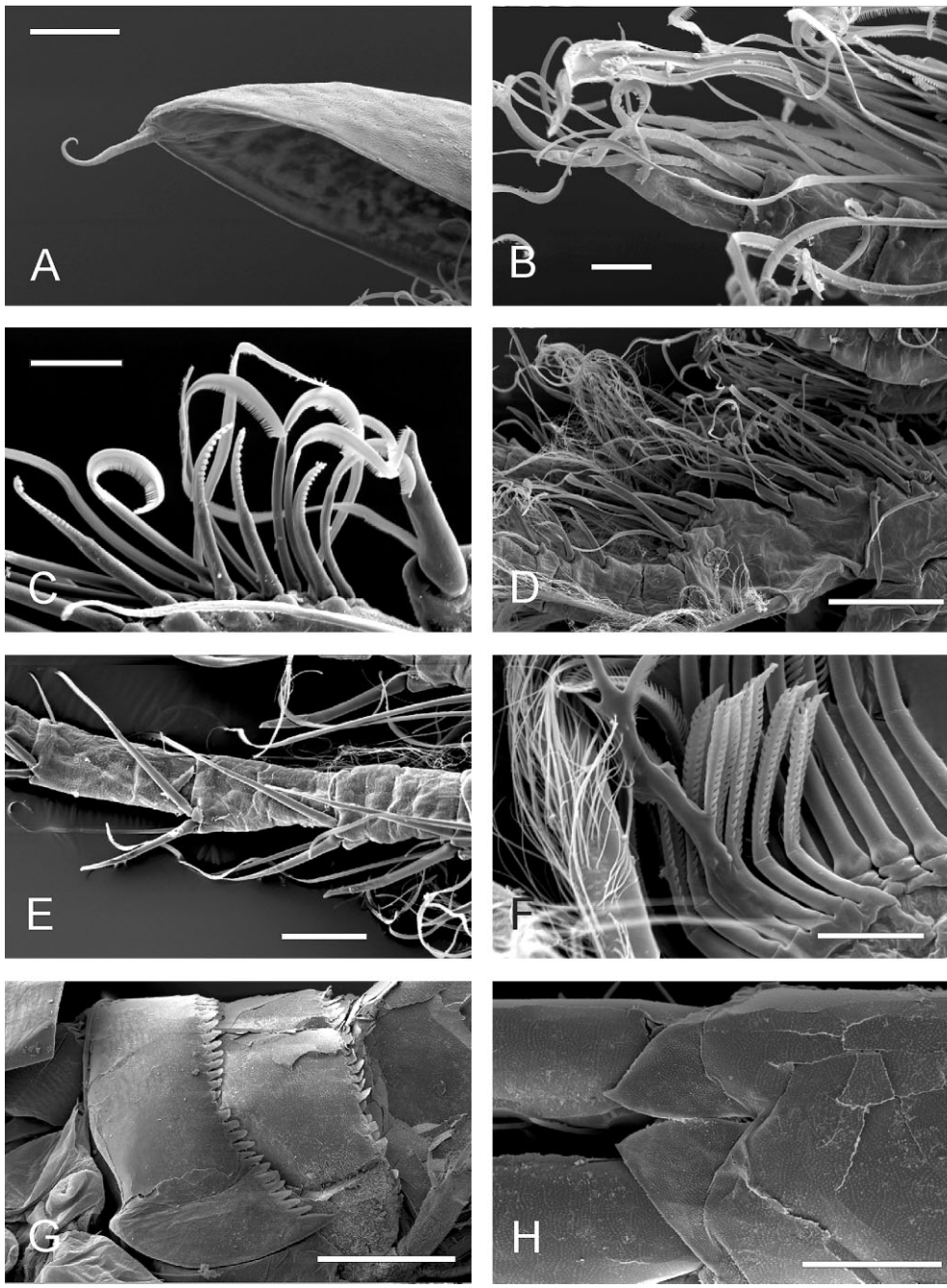

Fig. 14. *Sarsinebalia urgorrii* sp. nov., scanning electron micrographs. A. Rostrum, distal end. B. Antennular flagellum, distal end. C. Antennular scale, stout serrate and serrate setae. D. Antennal peduncle, third article. E. Antennal flagellum, medial articles. F. Mandibular palp, setae with lateral serrulations. G. Fourth pleonite, posterolateral border. H. Anal scales. Scale bar: A, E, 50 μm; B–C, F, 20 μm; D, H, 0.1 mm; G, 0.2 mm.

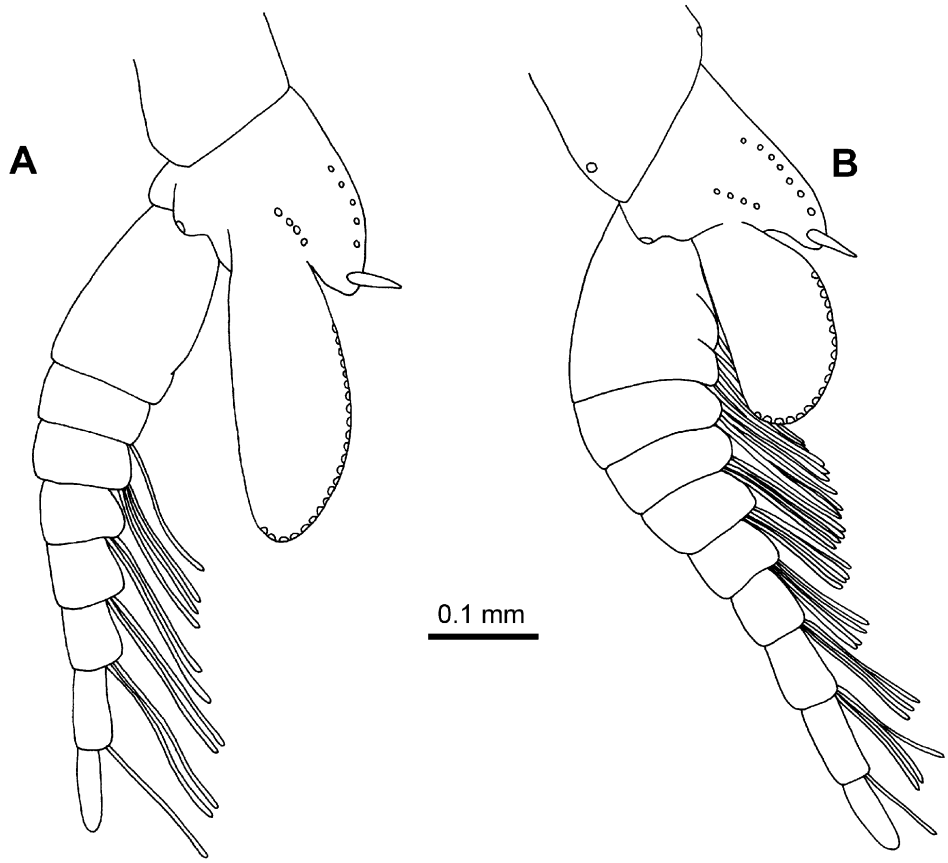

Fig. 15. *Sarsinebalia cristoboi* sp. nov. A. Male antennule, fourth article and flagellum, lateral view. *Sarsinebalia urgorrii* sp. nov. B. Male antennule, fourth article and flagellum, lateral view. A, B: setae not figured.

foratum (Kanmacher, 1798) and *Digitaria digitaria* (Linnaeus, 1758).

A small number of specimens of *S. urgorrii* sp. nov. was collected in fine sand and muddy sand bottoms (Q_{50}: 0.23–0.24 mm; silt–clay = 3.8–6.2%; carbonates = 72.9–75.3%; organic matter = 2.4–3.8%). The most abundant accompanying species were the polychaetes *Caulleriella alata* (Southern, 1914), *Heteromastus filiformis* (Claparède, 1864), and *Glycera tridactyla* Schmarda, 1861, the molluscs *Nassarius reticulatus* (Linnaeus, 1758), *Mysella bidentata* (Montagu, 1803), and *Fabulina fabula* (Gronovius, 1781), and the crustaceans *Photis longipes* (Della Valle, 1893) and *Apseudes latreillii* (Milne-Edwards, 1828).

Distribution

To date, known only from Ensenada de Baiona (Galicia).

Remarks

Sarsinebalia urgorrii sp. nov. differs from *S. typhlops* mainly in possessing pigmented eyes with externally discernible visual elements and a second maxilla bearing an exopod that is longer than the first article of the endopod. As established in the remarks for *S. cristoboi* sp. nov., the two new species described in this paper are similar, but they are differentiated by the length of the supra-orbital plate, the armature of both antenular and antennal flagella, and the shape of denticles present on the posterolateral border of the fourth pleonite.

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