

Isopods of the genus *Arcturella* (Valvifera: Arcturidae) from the expedition FAUNA I (S Spain), with description of a new species*

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SUMMARY: Three specimens of the genus *Arcturella* (Crustacea: Isopoda: Valvifera: Arcturidae) were collected in the oceanographic expedition FAUNA I (S Spain). The specimens are fully described and illustrated, and a new species, *Arcturella estherae* sp. nov., is established. The two female specimens of this new species can be distinguished from all other species of the genus chiefly by the shape and ornamentation of the pereonite IV. The third specimen resembles *Arcturella carlosoteroi*, but shows certain anatomical differences from the only known specimen of this species.

Keywords: *Arcturella*, Arcturidae, Isopoda, FAUNA I, S Spain.

INTRODUCTION

The genus *Arcturella* Sars, 1897 is currently represented in the Atlantic and the Mediterranean by fifteen species (Table 1): *A. bispinata* Menzies and Kruczynski, 1983, *A. brevipes* Barnard, 1920, *A. carlosoteroi* Reboveda, Wägele and Garmendia, 1994, *A. cornuta* Koehler, 1911, *A. damnoniensis* (Stebbing, 1874), *A. dilatata* (Sars, 1883), *A. dollfusi* Monod, 1925, *A. lineata* (Stebbing, 1873), *A. lobulata* Barnard, 1925, *A. longipes* Barnard, 1920, *A. poorei* Castelló, 1997, *A. pustulata* Barnard, 1920, *A. sawayae* Moreira, 1973, *A. senegalensis* (Koehler, 1911) and *A. spinata* Menzies and Kruczynski, 1983. One additional species is known from the Pacific, *A. nodosa* (Dana, 1849) from the Philippines. Many of these species are known for

only one specimen (e.g. *A. carlosoteroi*, *A. cornuta*, *A. nodosa*, and *A. poorei*).

This paper is the third of a series of contributions dealing with the marine isopod fauna of Spain (Hedo and Junoy, 1999; Rodríguez Sánchez *et al.*, in press) as result of the examination of collections of the oceanographic expedition "FAUNA I" along the south coasts of the Iberian Peninsula (see Templado *et al.*, 1993), and deals with the three specimens of the genus *Arcturella* collected. Two specimens are assigned to a new species, *Arcturella estherae* sp. nov. This new species differs from the others in several aspects, and are therefore considered new to science. Type material is deposited in the collections of the Museo Nacional de Ciencias Naturales (MNCN), Madrid, Spain. The third specimen resembles *Arcturella carlosoteroi*, but shows certain anatomical differences whose taxonomic significance cannot at present be assessed.

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TABLE 1. – Atlantic and Mediterranean species of *Arcturella*

Species	Distribution	Depth (m)	References
<i>Arcturella bispinata</i>	Gulf of Mexico	55-73	Menzies and Kruczynski, 1983
<i>A. brevipes</i>	South Africa	40	Barnard, 1920
<i>A. carlosoteroi</i>	NW Spain	21	Reboreda, Wägele and Garmendia, 1994
<i>A. cornuta</i>	Azores	845	Koehler, 1911
<i>A. dammoniensis</i>	S. England, N France, Italy	0-10	Stebbing, 1874; Norman, 1904; Bocquet and Duchet-Bertin, 1967
<i>A. dilatata</i>	NE Atlantic	20-56	Sars, 1883
<i>A. dollfusi</i>	Morocco	50-750	Monod, 1925
<i>A. lineata</i>	South Africa	10-200	Stebbing, 1873; Kensley and Schotte, 1984
<i>A. lobulata</i>	South Africa	80	Barnard, 1925
<i>A. longipes</i>	South Africa	40-150	Barnard, 1920
<i>A. poorei</i>	S Spain	4	Castelló, 1997
<i>A. pustulata</i>	South Africa	10-80	Barnard, 1920
<i>A. sawayae</i>	Brazil	1-2	Moreira, 1973
<i>A. senegalensis</i>	Senegal, Mauritania	5-10	Koehler, 1911; Monod, 1925
<i>A. spinata</i>	Gulf of Mexico	55-73	Menzies and Kruczynski, 1983

MATERIAL AND METHODS

The oceanographic expedition FAUNA I was carried out in the Gulf of Cadiz, on both sides of the Strait of Gibraltar, Sea of Alborán and Bajos of Motril (S Spain) in July 1989. The objective of this expedition was to capture a representation of all sea fauna and, because of this, both pelagic and benthic samples were taken from various depths between 12 to 1250 m. (see Templado *et al.*, 1993 for sampling details). All sampling material was sorted out in the Museo Nacional de Ciencias Naturales (Madrid) and isopods were later sent in alcohol to the senior author (J.J.) of this paper.

The present specimens were caught with the beam trawl described in Templado *et al.* (1993), preserved in 70% ethanol and dissected in glycerine with minute needles. The microscopic preparations were kept in a drop of glycerine as mounting medium, and sealed with paraffin.

RESULTS

Genus *Arcturella* Sars, 1897

The identification of species of the family Arcturidae is extremely difficult because many genera are inadequately or sometimes inexactly defined. No consensus seems to exist as for characters that must be used to differ the genera of this family (e.g. Stebbing, 1908; Koehler, 1911; Kussakin, 1972; Kensley, 1978; Menzies and Kruczynski, 1983; Brandt, 1990).

The poorly defined genus *Arcturella* Sars, 1897, shares several features with other genera of the family. *Arcturella* was created by Sars (1897) to receive

specimens different to genus *Astacilla* Cordiner, 1795. Both *Astacilla* and *Arcturella* have been separated using different characters, such as length and shape of pereonite IV, general shape of the body, number of oostegites and morphology of pereopod I (e.g. Sars, 1897; Koehler, 1911; Barnard, 1920; Monod, 1925; Bocquet and Duchet-Bertin, 1967; Castelló, 1997). However, the separation between these two genera is not clearly established, since some characters have been described contradictorily in the literature. For example, with respect to the morphology of pereopod I, Kussakin (1972) and Kensley and Schotte (1984) note that both *Arcturella* and *Astacilla* present a strong dactylar claw on pereopod I; Reboreda *et al.* (1994) note that *Arcturella* has no claw and Castelló (1997) notes that *Arcturella* can be distinguished from *Astacilla* by the presence of a claw in the latter and its absence in the former.

The diagnoses of Sars (1897) and subsequent authors (e.g. Barnard, 1920; Bocquet and Duchet-Bertin, 1967; Moreira, 1973; Kensley, 1978; Menzies and Kruczynski, 1983; Castelló, 1997) are consistent in that the principal character for distinguishing the two genera is the size and shape of pereonite IV of females, a character that have leads us to include our specimens, with suitable reservations, in the genus *Arcturella*.

Arcturella estherae sp. nov.

(Figs. 1-4)

Type material: Holotype, 1 brooding female, length 5 mm excluding antennae; MNCN 20.04/5257. Paratype, 1 female, length 5.5 mm excluding antennae; MNCN 20.04/5257.

Type locality: Station 57, Trafalgar (36°04.84'–36°33.53' N, 06°01.00'–06°02.85' W), 76-80 m depth, 20 July 1989, bottom: gravel and stones.

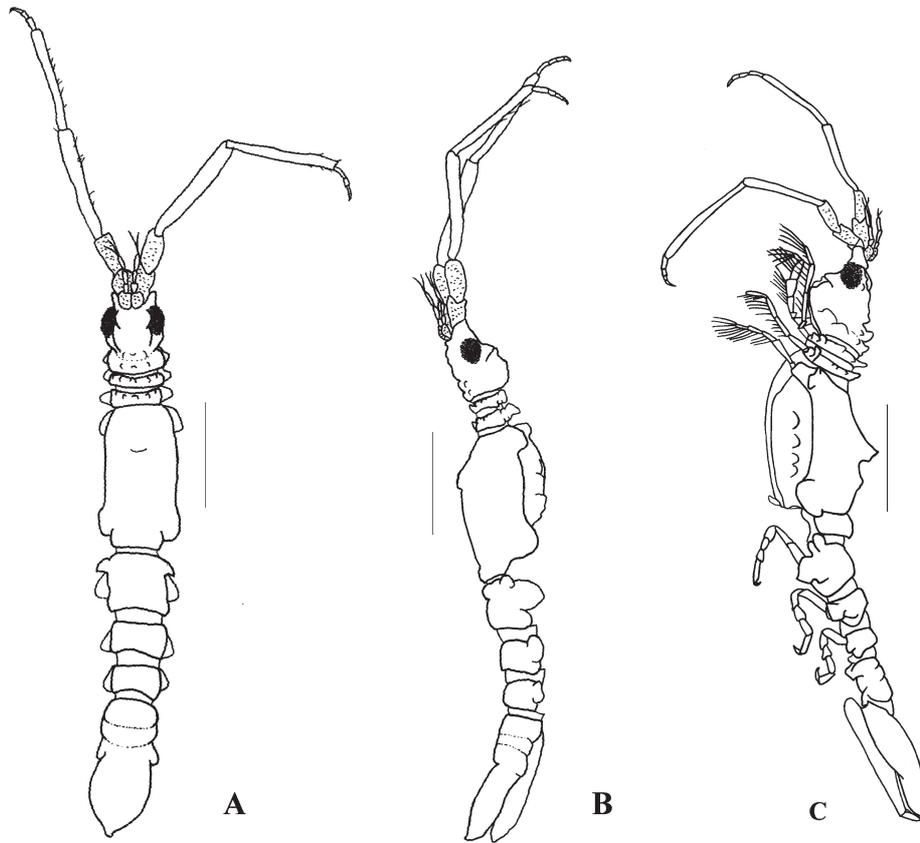


FIG. 1. – *Arcturella estherae* sp. nov., female holotype: A, dorsal view; B, lateral view. Female paratype: C, lateral view. Scale bars: 1 mm.

Etymology: The species is dedicated to Esther Serna Sanz in appreciation of her collaboration in this paper and of her friendship.

Diagnosis: Body elongated, thin but expanding level of pereonite IV. Dorsal sculpture formed by 3 little prominences near the posterior margin of cephalon; 3 protuberances on pereonite I; 5 protuberances arranged in rows over pereonites II and III; middorsal protuberance on pereonite IV. Dactylus of pereopods V-VII with one large terminal claw and one very small false claw.

Description: Body elongated (Fig. 1), 9 times longer than pereonite V in dorsal view excluding antennae, thin but expanding level pereonite IV, wider than the rest of pereonites. Length: 5-5.5 mm. Colour: Pale yellow in alcohol. Cephalon: as wide as long, fused with pereonite I, with 3 little prominences on cephalic surface, near posterior margin of cephalon; eyes relatively prominent and red.

Antennula (Fig. 2A) reaches half the third basal article of antenna; peduncle of three articles, article 1 wider than the other two with creased surface, fla-

gellum of one article bearing in distal part two aesthetascs and two little setae. Antenna (Fig. 2B) length equivalent to the length between anterior margin of cephalon and posterior margin of pereonite IV; five peduncular articles (first peduncular article not shown in Fig. 2B), articles 2 and 3 with creased surface; flagellum of 3 articles, distal article with flattened scale-spines (Fig. 2C) and apical claw. Mandible (Fig. 2D, E) lacking palp; incisor and *lacinia mobilis* each with 3 teeth, 3 broad spines in spine row, molar process distally truncate in right mandible and acute in left mandible. Maxillule (Fig. 2F): inner lobe with 4 distal spines, outer lobe with 9 stout spines. Maxilla (Fig 2G): trilobate, endopod with 9 circumplumose spines and 4-5 simple spines; inner and outer lobes of exopod with 4 and 2 elongated circumplumose spines respectively. Maxilliped (Fig. 2H): palp 5-articulate, endite with one coupling hook and 4-5 circumplumose spines.

Pereonite I fused with cephalon, fusion line visible, with 3 protuberances arranged in row. Pereonites II-III short, with 5 protuberances each, arranged in rows over the 2 segments. Laterally pro-

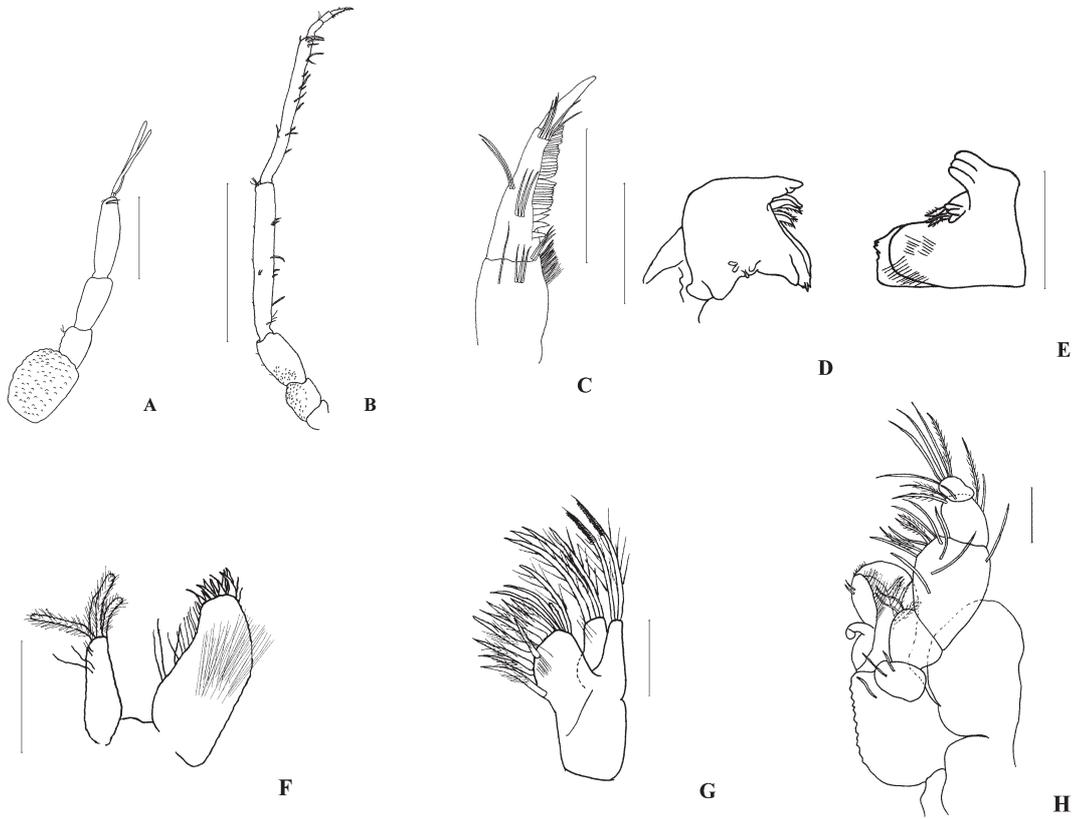


FIG. 2. – *Arcturella estherae* sp. nov., female holotype: A, antennula; B, antenna; C, detail of antenna; D, right mandible; E, left mandible; F, maxillule; G, maxilla; H, maxilliped. Scale bars: A = 0.18 mm; B = 1 mm; C = 0.1 mm; D = 0.14 mm; E = 0.11 mm; F = 0.12 mm; G, H = 0.07 mm.

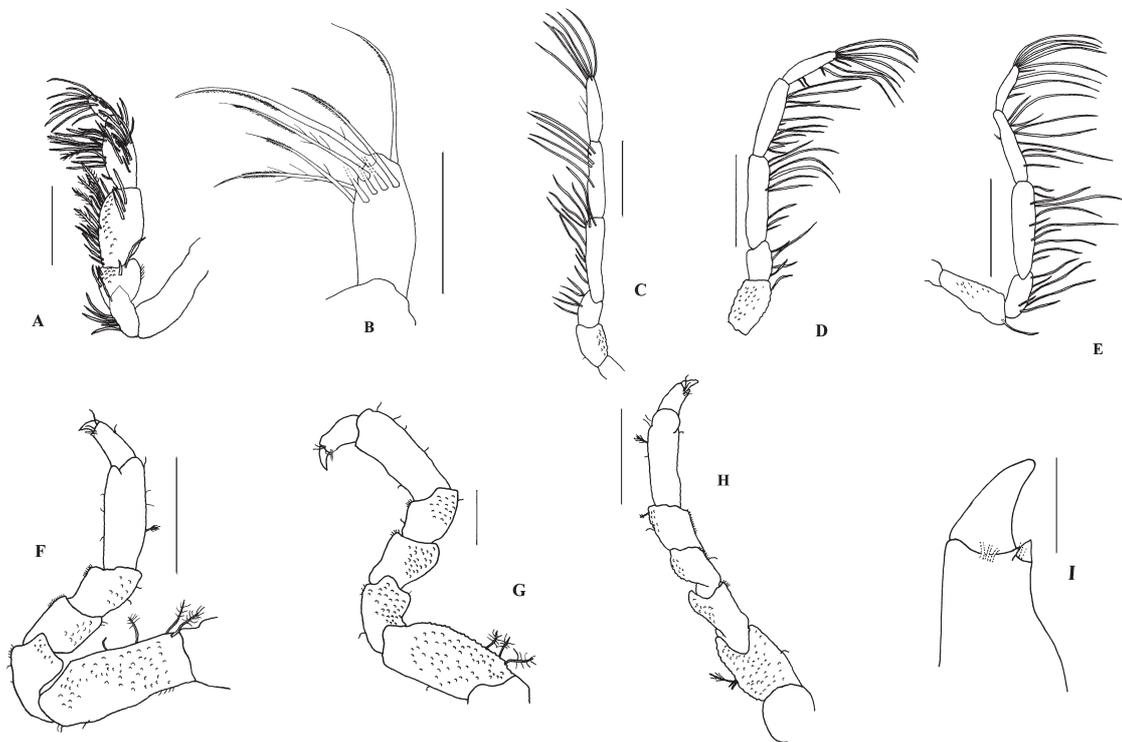


FIG. 3. – *Arcturella estherae* sp. nov., female holotype: A, pereopod I; B, detail of dactylus of pereopod I; C, pereopod II; D, pereopod III; E, pereopod IV; F, pereopod V; G, pereopod VI; H, pereopod VII; I, detail of pereopod VII. Scale bars: A = 0.22 mm; B = 0.10 mm; C, H = 0.28 mm; D, E = 0.32 mm; F = 0.3 mm; G = 0.15 mm; I = 0.05 mm.

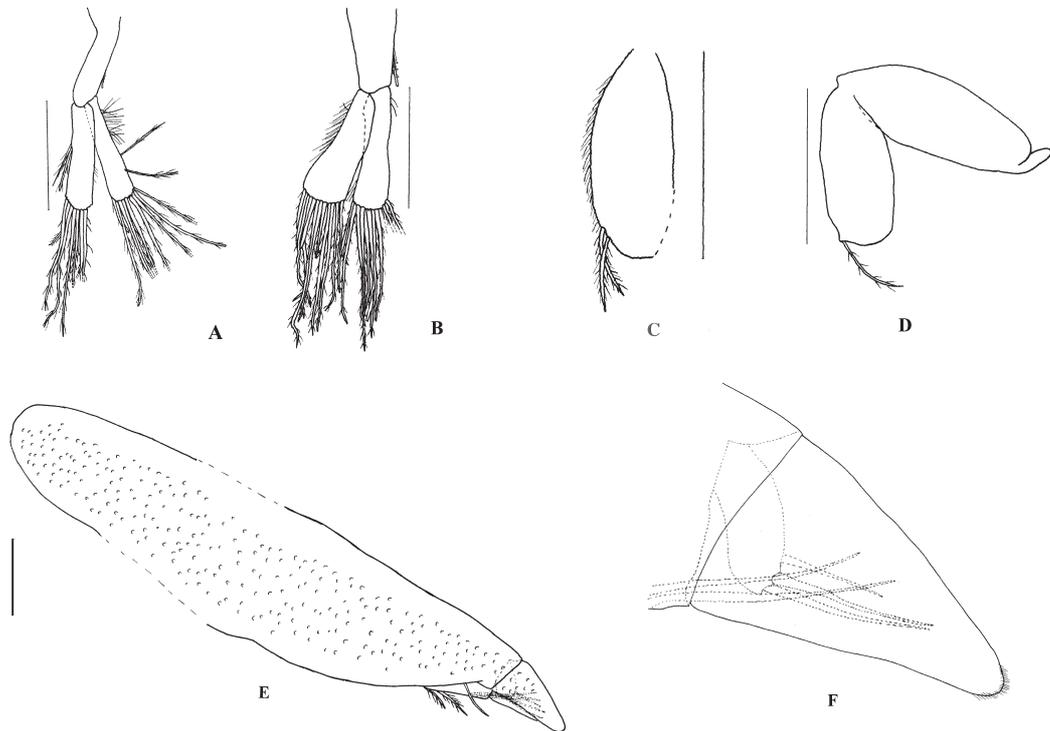


FIG. 4. – *Arcturella estherae* sp. nov., female holotype: A, pleopod 1; B, pleopod 2; C, pleopod 3; D, pleopod 5. Female paratype: E, right uropod; F, detail of right uropod. Scale bars: A = 0.34 mm; B = 0.33 mm; C = 0.41 mm; D = 0.38 mm; E, F = 0.19 mm.

truding supracoxal plates prominent. Pereonites IV wider and longer than the rest of pereonites, of roughly rectangular shape, with protruding rounded edges; with a middorsal protuberance; lateral margin with wavy contour. Pereonites V to VII diminishing in length, rounded laterally protruding supracoxal plate, largest on pereonite V (Fig. 1).

Pereopods I-IV adapted to filter functions, pereopods V-VII ambulatory. Pereopod I (Fig. 3A) broader and shorter than pereopods II-IV, terminal claw of dactylus absent (Fig. 3B). Pereopods II-IV subsimilar, dactylus and claw absent, setation as in Figure 3C-E. Oostegites lost during the dissection process. Pereopods V-VII with four first articles creased, with sparse setation (Fig. 3F-H). Dactylus with claw and a small false claw in the inner distal angle (Fig. 3I).

Pleotelson (Fig. 1) as long as the pereonites V-VII together, distal part with cone-shaped, tapering to rounded tip, the latter slightly curved dorsally. All segments of the pleon are fused, with two fusion lines visible.

Pleopods 1 and 2 with apical plumose swimming setae (Fig. 4A, B); pleopod 3 broader, with 2 apical plumose setae and lateral short simple setae (Fig. 4C); pleopod 4 lost; pleopod 5 broader, exopodite

with a single apical plumose seta (Fig. 4D). Uropods (Fig 4E, F): biramous; with 3 simple seta and 2 circumplumose setae on inner distal angle of peduncle, smaller ramus with 3 apical setae.

Arcturella sp A.
(Figs. 5-8)

Material examined: 1 female, length 3.5 mm excluding antennae. Station 38, Estepona (36°18.25'– 36°20.20'N, 05°13.25'– 05°12.40'W), 60-62 m depth, 16 July 1989, bottom: gravel (Templado *et al.*, 1993).

Description: Body elongated (Fig. 5), 9 times longer than pereonite V in dorsal view excluding antennae, thin but expanding level pereonite IV, wider and longer than the rest of pereonites. Length: 3,5 mm. Colour: Pale yellow in alcohol. Cephalon: as wide as long, fused with pereonite I, with an anterior pair of tubercles and one simple tubercle behind; eyes relatively prominent and red.

Antennula (Fig. 6A) reaches the beginning of the fourth basal article of antenna; peduncle of three articles (first peduncular article not shown in Fig. 6A) and flagellum of one article bearing in distal part two aesthetascs and two elongated simple setae. Antenna (Fig. 6B) length equivalent to length

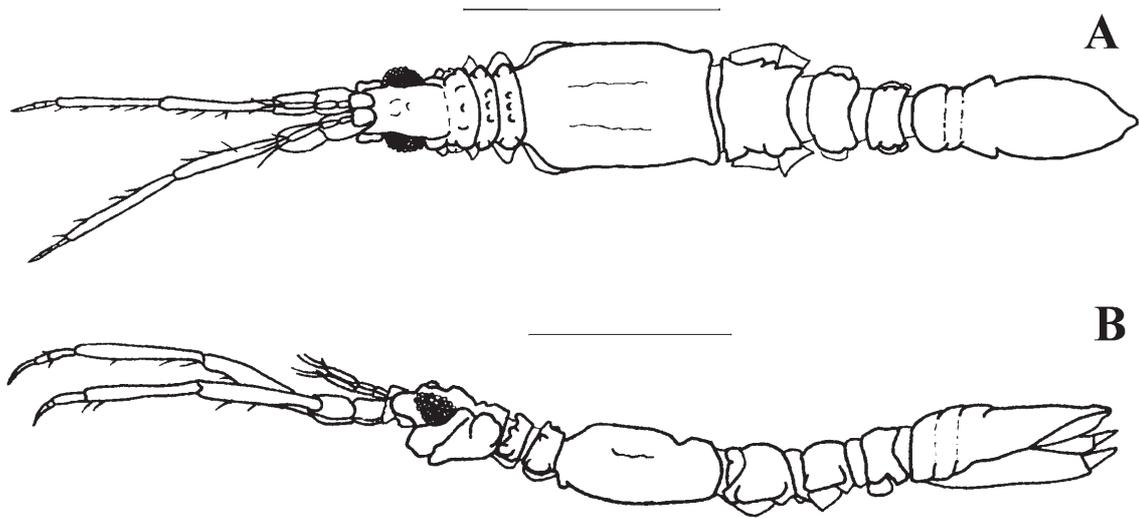


FIG. 5. – *Arcturella* sp. A, female: A, dorsal view; B, lateral view. Scale bars: 1 mm.

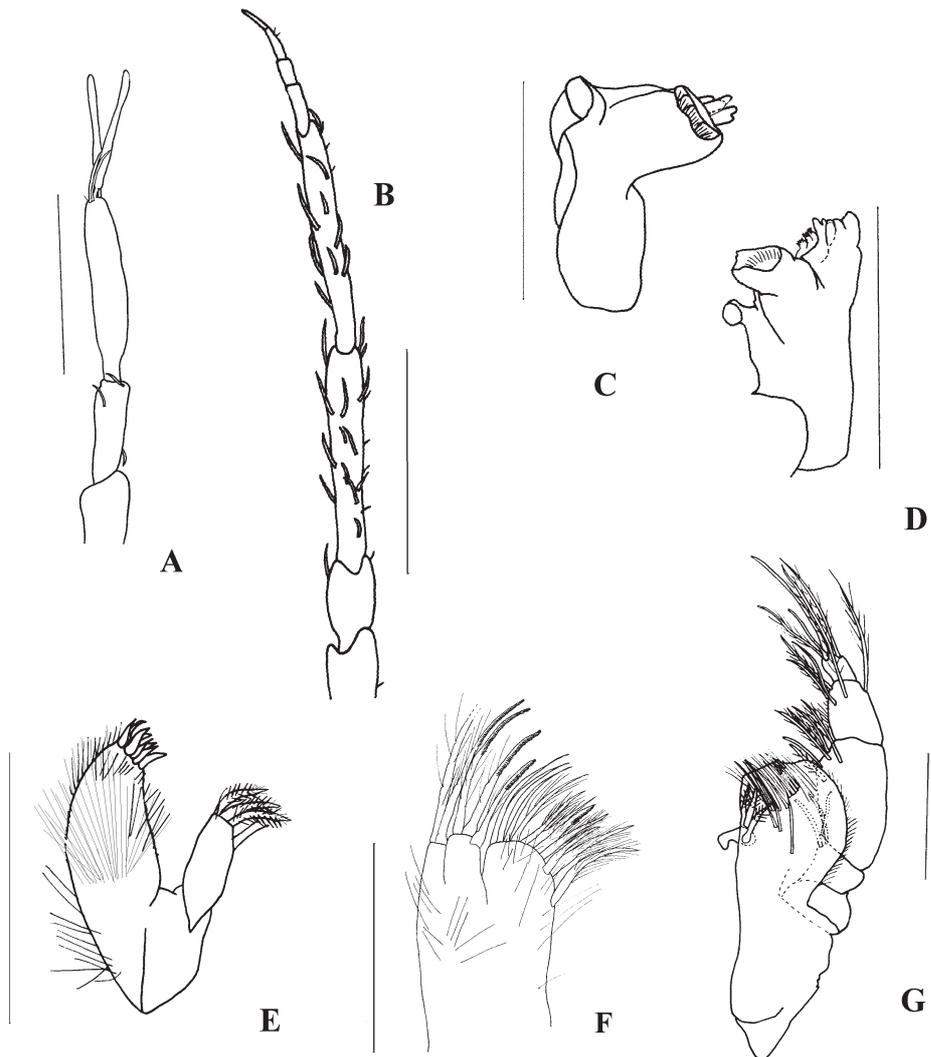


FIG. 6. – *Arcturella* sp. A, female: A, antennula; B, antenna; C, right mandible; D, left mandible; E, maxillule; F, maxilla; G, maxilliped. Scale bars: A = 0.18 mm; B = 0.61 mm; C = 0.15 mm; D = 0.2 mm; E = 0.21 mm; F = 0.12 mm; G = 0.1 mm.

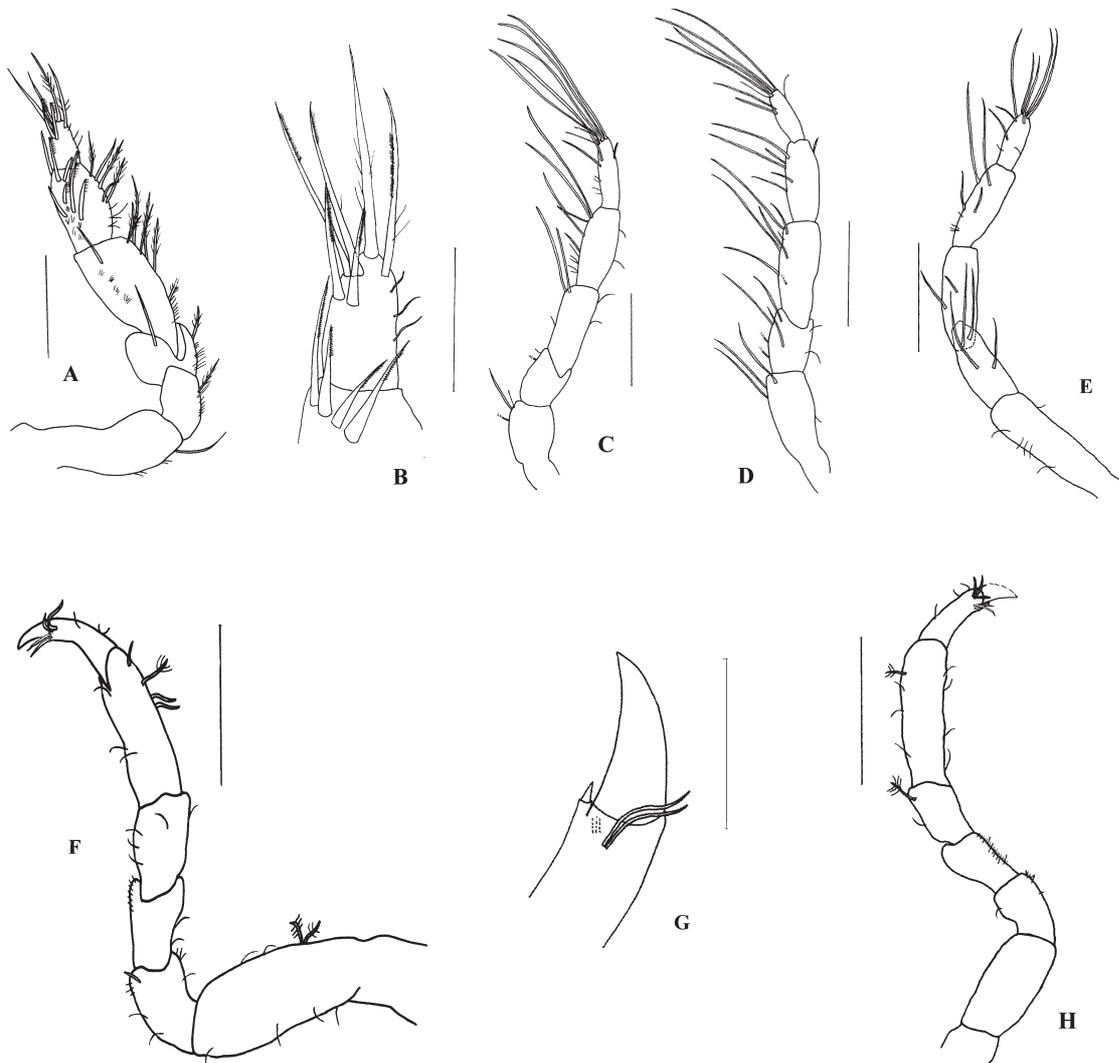


FIG. 7. – *Arcturella* sp. A, female: A, pereopod I; B, detail of dactylus of pereopod I; C, pereopod II; D, pereopod III; E, pereopod IV; F, pereopod V; G, detail of pereopod V; H, pereopod VI. Scale bars: A = 0.14 mm; B = 0.07 mm; C, E = 0.15 mm; D = 0.17 mm; F = 0.24 mm; G = 0.06 mm; H = 0.3 mm.

between anterior margin of cephalon and posterior margin of pereonite IV; five peduncular articles (first peduncular article not shown in Fig. 6B), articles 2 and 3 wide, with the same length, articles 4 and 5 slight and long, with numerous simple setae along inner part; flagellum of 3 articles, each of them with short simple setae, and an apical claw. Mandible (Fig. 6C, D) lacking palp; incisor and *lacinia mobilis* each with 3 teeth, 3 broad thorny spines in spine row, molar process distally truncate in right mandible and acute in left mandible. Maxillula (Fig. 6E): inner lobe with 3 distal spines and 3 short simple setae in basal part of them, outer lobe with 8 broad spines in apical part. Maxilla (Fig. 6F): trilobate, endopod with 7 circumplumose spines and 4-5 simple spines; inner and outer lobes of exopod with 3 and 2 elongated circumplumose spines

respectively. Maxilliped (Fig. 6G): palp 5-articulate, endite with one coupling hook and 3 circumplumose spines.

Pereonite I fused with cephalon, fusion line visible, with 3 protuberances arranged in row. Pereonites II-III short, with 3 protuberances each arranged in rows over the 2 segments. Pereonite IV wider and longer than the rest of pereonites, of roughly rectangular shape, with each anterior corner lightly projecting and rounded; with smooth surface except for little lateral prominences. Pereonites V to VII diminishing in length, rounded laterally protruding supracoaxal plate, largest on pereonite V (Fig. 5).

Pereopods I-IV adapted to filter functions, pereopods V-VII ambulatory. Pereopod I (Fig. 7A) broader and shorter than pereopods II-IV, terminal claw of dactylus absent (Fig. 7B). Pereopods II-IV

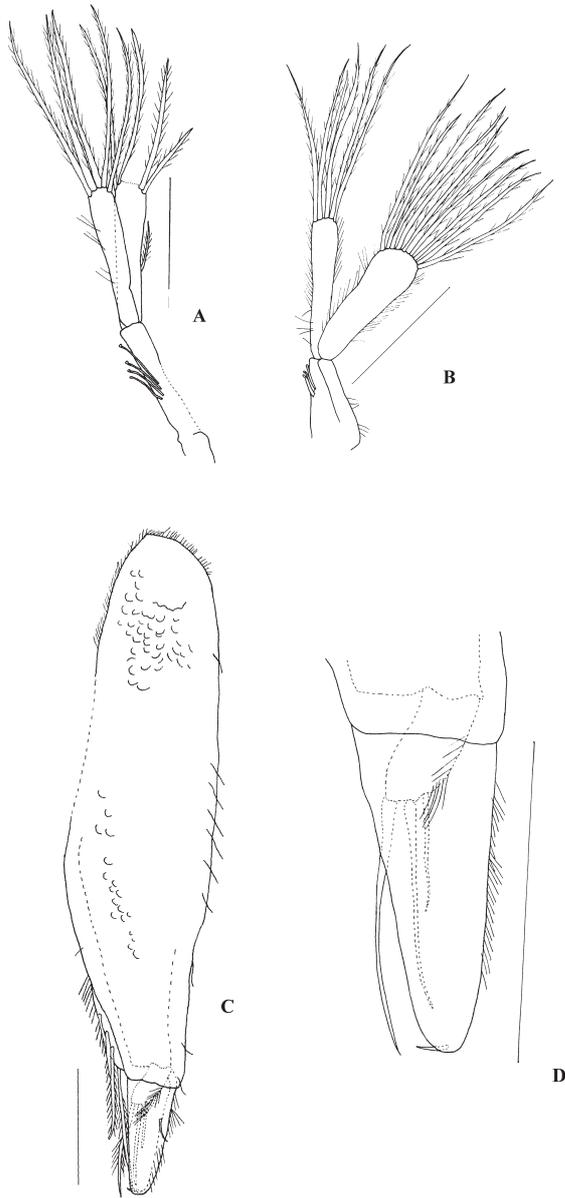


FIG. 8. – *Arcturella* sp. A, female: A, pleopod 1; B, pleopod 2; C, right uropod; D, detail of right uropod. Scale bars: A = 0.23 mm; B = 0.21 mm; C, D = 0.15 mm.

subsimilar, dactylus and claw absent, setation as in Figures 7C-E. Oostegites lost. Pereopods V and VI with sparse setation (Fig. 7F, H), dactylus and claw (Fig. 7G). The specimen is not complete and pereopod VII is lost.

Pleotelson (Fig. 5) lightly longer than pereonites V-VII together, distal part with cone-shaped, tapering to rounded tip, the latter slightly curved dorsally. All segments of the pleon are fused, with two fusion lines visible.

Pleopods 1 and 2 with apical plumose swimming setae (Fig. 8A, B). Pleopods 3, 4 and 5 lost. Uropods

(Fig. 8C, D): with 4 circumplumose setae on inner distal angle of peduncle, the longer of the two rami with numerous short simple setae in external lateral margin, shorter ramus with 3 long apical plumose setae and numerous short simple setae in external lateral margin.

DISCUSSION

The species of genus *Arcturella* are mainly identified by shape and ornamentation of pereonite IV in females, bearing dorsally one (*A. lineata*, *A. sawayae* and *Arcturella estherae* sp. nov.), two (*A. bispinata*, *A. cornuta*, *A. damnoniensis*, *A. dilatata*, *A. dollfusi*, *A. poorei* and *A. spinata*), or many prominent protuberances or spines (*A. pustulata* and *A. senegalensis*), or lacking them (*A. brevipes*, *A. carlosoteroi*, *A. lobulata* and *A. longipes*). *A. estherae* sp. nov. can be separated from the other species of the genus by the presence of only one dorsal protuberance in pereonite IV of females, a feature shared with *A. lineata* and *A. sawayae*. The elongated and rectangular-shaped pereonite IV and the general ornamentation of the body of *A. estherae* sp. nov. easily distinguish this species from *A. lineata* and *A. sawayae*. It can be further distinguished from *A. lineata* by the morphology of pereopod I (the latter species having a strong, dactylar claw). These three Atlantic species are known from different areas: *A. lineata* from South Africa, *A. sawayae* from Brazil and *A. estherae* sp. nov. from Spain. Table 2 shows comparative measurements for these three species and for *A. carlosoteroi*, *A. damnoniensis* and *A. poorei*, three species recorded in the neighboring waters.

Arcturella sp. A. resembles *A. brevipes*, *A. carlosoteroi*, *A. lobulata* and *A. longipes* in lacking dorsal protuberances in pereonite IV of females. The three South African species (*A. brevipes*, *A. lobulata* and *A. longipes*) lack ornamentation in pereonites I-III, whereas the two Spanish species (*A. carlosoteroi* and *Arcturella* sp. A) have small tubercles in these pereonites. *Arcturella* sp. A resembles in general appearance *A. carlosoteroi*, but may be distinguished by the presence of tubercles in cephalon, by the number of tubercles in pereonites I-III (being 3 in *Arcturella* sp. A. and 5 in *A. carlosoteroi*), by the shape of pereonites V-VII and pleotelson, and by small details in appendices. These differences could be sufficient to establish a separate species but, the other hand, they could represent variations in char-

TABLE 2. – Comparison between measurements of females of five species of *Arcturella* and *Arcturella estherae* sp. nov. TL: total length (mm); L IV: maximum length of pereonite IV (mm); W IV: maximum width of pereonite IV (mm); R1: ratio of total length to maximum width of pereonite IV; R2: ratio of length to width of pereonite IV. Asterisks: data taken from figures.

Species	TL	L IV	W IV	R1	R2	References
<i>A. carlosoteroi</i>	5.2	1.5*	1.1*	4.6*	1.3*	Reboreda <i>et al.</i> , 1994
<i>A. damnoniensis</i>	6.8	2.1*	2.7*	2.6*	0.7*	Bocquet and Duchet-Bertin, 1967
<i>A. lineata</i>	7-8	1.7*-1.9*	1.5*-1.7*	4.5	1.1*	Kensley and Schotte, 1984
<i>A. poorei</i>	5.5	1.3	1.5	3.6	0.8	Castelló, 1997
<i>A. sawayae</i>	7.9-8.3	2.3*	2.6*	3.0*	0.8*	Moreira, 1973
<i>A. estherae</i> sp. nov.						This study
Holotype	5	1	0.5	10	2	
Paratype	5.5	1.5	1	5.5	1.5	

acters from *A. carlosoteroi*, a rare species that is known from only one specimen. Additional specimens are required to solve this question.

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