

# Diagnosis of *Arcturopsis* Koehler, 1911 and redescription of *A. giardi* (Bonnier, 1896) (Crustacea, Isopoda, Arcturidae)

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King R. A. & Poore G. C. B. 2001. — Diagnosis of *Arcturopsis* Koehler, 1911 and redescription of *A. giardi* (Bonnier, 1896) (Crustacea, Isopoda, Arcturidae). *Zoosystema* 23 (3): 467-477.

## ABSTRACT

The arcturid genus *Arcturopsis* Koehler, 1911 is rediagnosed and a key to its three species given. The type species, *Arcturopsis giardi* herein designated, is redescribed from new material. *Arcturopsis* is diagnosed as follows: body geniculate; margins of head and pereonite 1 separated by lateral incision; antenna 2 slender, with flagellum having a row of spines medially and ending in a claw; pereopod 1 with dactylus and unguis; pereopods 2 to 4 cylindrical and slender with paired closely spaced long setae, flexed between the carpus and propodus, dactylus absent; pereopods 5 to 7 with secondary unguis fused, smaller than the primary unguis; pleotelson with small lateral wing; oostegite 4 with posterior lobe; male more elongate than female, especially pereonite 4; pereonite 3 possessing a midventral appendage with complex apex; male pleopod 1 exopod laterally notched, with three long proximal setae on posterior face; male pleopod 2 with appendix masculina elongate, exceeding endopod, with two apical flagellate appendices. Post-marsupial developmental stages of *Arcturopsis giardi* are described. The species is distinguished from the *A. rudis* and *A. senegalensis* by having a female pereonite 4 without dorsal paired horns, longer than wide, and about seven times as long as pereonite 3, an apically blunt pleotelson, an antenna 2 flagellum of two articles plus a claw, and a male with a tridentate midventral appendage on pereonite 3.

## KEY WORDS

Crustacea,  
Isopoda,  
Valvifera,  
Arcturidae,  
*Arcturopsis*,  
North Atlantic Ocean,  
diagnosis,  
redescription.

## RÉSUMÉ

*Diagnose d'Arcturopsis Koehler, 1911 et redescription d'A. giardi (Bonnier, 1896) (Crustacea, Isopoda, Arcturidae).*

Une nouvelle diagnose du genre *Arcturopsis* Koehler, 1911 (d'Arcturidae) est présentée avec une clé de ses trois espèces. L'espèce type, *Arcturopsis giardi*, ici désignée, est redécrite à partir d'un nouveau matériel. La diagnose d'*Arcturopsis* est la suivante : corps géciculé, bords de la tête et du péronite 1 séparés par une incision latérale ; antenne 2 grêle, avec flagelle muni d'une rangée d'épines médianes et terminant en une griffe ; péreopode 1 avec dactyle et ongle ; péreopodes 2 à 4 cylindriques, grêles, fléchis entre le carpe et le propode, avec des paires de longues soies rapprochées, dactyle absent ; péreopodes 5 à 7 avec ongles secondaires fusionnés et plus petits que les ongles primaires ; pléotelson avec une petite aile latérale ; oostégites 4 avec lobe postérieur ; mâle plus allongé que femelle péronite 4 en particulier ; péronite 3 pourvu d'un appendice médian ventral avec apex complexe ; exopodite du pléopode 1 mâle avec encoche latérale et trois longues soies proximales sur la face postérieure ; pléopode 2 mâle avec appendix masculina allongé, dépassant l'endopodite et muni de deux appendices apicaux flagellés. Les stades du développement postmarsupial d'*Arcturopsis giardi* sont décrits. L'espèce se distingue d'*A. rudis* et d'*A. senegalensis* par le péronite 4 femelle sans paires de cornes dorsaux, plus long que large, environ sept fois plus long que le péronite 3, un pléotelson émoussé apicalement, l'antenne 2 avec flagelle à deux articles plus une griffe et, chez le mâle, par un appendice médian ventral tridenté sur le péronite 3.

## MOTS CLÉS

Crustacea,  
Isopoda,  
Valvifera,  
Arcturidae,  
*Arcturopsis*,  
océan Atlantique Nord,  
diagnose,  
redescription.

## INTRODUCTION

The valviferan arcturid isopod genus *Arcturopsis* Koehler, 1911 is represented by only three species, all from the eastern Atlantic Ocean: *A. giardi* (Bonnier, 1896), described from the Bay of Biscay (Koehler 1911); *A. rudis* Koehler, 1911 from off Portugal; and *A. senegalensis* Koehler, 1911 from off Mauritania (Monod 1925). The genus has been partially redescribed and discussed twice (Barnard 1920; Monod 1925) since the types of its species were collected. Only Monod (1925) based his discussion on newly collected specimens of *A. senegalensis* and *A. rudis*.

Koehler (1911) did not select a type species for his genus from the three he dealt with. Abundant material of one species, *Arcturopsis giardi*, has now become available from the Capbreton Canyon, Bay of Biscay (Golfe de Gascogne). The opportunity exists therefore to redescribe this species in detail and to designate it as type species of *Arcturopsis*. The types of *A. giardi* no longer exist and a neotype is selected.

*Arcturopsis* was distinguished from other genera of Arcturidae, in particular *Arcturella* Sars, by the possession of extremely sexually dimorphic characters (Koehler 1911). Bonnier (1896) characterised his species and later Koehler (1911) the genus by extremely elongate males (especially at pereonite 4) and by an appendage projecting from the midventral surface of pereonite 3 of males. A more comprehensive diagnosis is presented here to unambiguously distinguish the genus from other arcturid genera. A key to its species is presented.

Following redescription of the adults, the postmarsupial development of *A. giardi* is described based on the terminology of Zimmer (1926) and Hessler (1970). Seven developmental stages were defined after examination of morphological variation of pereopod 7, pleopods 1 and 2, pereonite 4, and oostegite formation. These stages are manca 1, manca 2, juvenile female, brooding female, juvenile male stage 1, juvenile male stage 2, copulatory males. In other isopods a manca 3 stage has been characterised by the presence of a

rudimentary and non-functional pereopod 7 (Hessler 1970; Svavarsson & Davídsdóttir 1995). No specimens from the Capbreton population of *A. giardi* could be assigned to this stage. Material is lodged in the Muséum national d'Histoire naturelle, Paris (MNHN) and Museum Victoria, Melbourne (NMV).

## SYSTEMATICS

Family ARCTURIDAE Bate & Westwood, 1868

Genus *Arctuopsis* Koehler, 1911

*Arctuopsis* Koehler, 1911: 8. — Barnard 1920: 385-386. — Monod 1925: 72-73.

TYPE SPECIES. — *Astacilla giardi* Bonnier, 1896 (herein designated).

SPECIES INCLUDED. — *Arctuopsis giardi* (Bonnier, 1896); *Arctuopsis rudis* Koehler, 1911; *Arctuopsis senegalensis* Koehler, 1911.

## DIAGNOSIS

Body cylindrical and geniculate. Lateral margins of head and pereonite 1 separated by incision. Antenna 2 slender, flagellum of 2 or 3 articles with row of spines medially and ending in a claw. Pereopod 1 with dactylus and unguis. Pereopods 2 to 4 cylindrical and slender with paired closely spaced long setae, flexed between the carpus and propodus, dactylus absent. Pereopods 5 to 7 with secondary unguis much smaller than the primary unguis and fused. Pereopods 5 to 7 progressively smaller. Pleotelson with small lateral wing. Oostegite 4 with posterior lobe. Male more elongate than female, especially pereonite 4; pereonite 3 possessing a midventral appendage with com-

plex apex. Male pleopod 1 exopod laterally notched, with three long proximal setae on posterior face of exopod. Male pleopod 2 with appendix masculina elongate, exceeding endopod, with two apical flagellate appendices.

## REMARKS

The key diagnostic characters that ensure the differentiation of *Arctuopsis* from other arcturid taxa are the extreme elongation of pereonite 4 in the male compared to the female and the presence of the midventral appendage on the male. The systematics of the genus has been confused by the transfer of species to other genera. *Arctuopsis hirsutus* Barnard, 1914 and its subspecies *A. hirsutus subglaber* Barnard, 1914 are junior synonyms of *Astacilla corniger* (Stebbing, 1873) (see Kensley 1984). *Arctuopsis melitensis* Koehler, 1911 is type and only species of *Arctopsis* Barnard, 1920.

Further confusion has been caused by the resemblance of female specimens of *Arctuopsis* to those of *Arcturella* Sars, 1897. Monod (1925) attempted to place *Arctuopsis senegalensis* in *Arcturella* based on observations on a single ovigerous female specimen. Believing that Koehler (1911) had included two separate species in his description of *Arctuopsis rudis*, Monod proposed that the females and some males belonged to a new species which he described as *Arcturella dollfusi*. Only the copulatory males with fully formed midventral appendages were retained in *Arctuopsis rudis*. The males described by Monod (1925) as *Arcturella dollfusi* are probably juvenile specimens of *Arctuopsis giardi* in which the midventral appendage is not fully formed. *Arcturella dollfusi* is therefore a junior synonym of *Arctuopsis rudis*.

## KEY TO SPECIES OF *ARCTUOPSIS* KOEHLER, 1911

1. Female pereonite 4 with distinct dorsal paired horns and lateral tuberculation; body of male and female heavily tuberculate ..... *A. rudis*
- Female pereonite 4 with no dorsal horns, some body tuberculation; males smooth .. 2

2. Female pereonite 4 wider than long anteriorly (triangular), about four times as long as pereonite 3; pleotelson apically rounded; antenna 2 flagellum of three segments plus claw; male midventral appendage with spoon-shaped apex ..... *A. senegalensis*
- Female pereonite 4 longer than wide, about seven times as long as pereonite 3; pleotelson apically blunt; antenna 2 flagellum of two segments plus claw; male with tridentate apex on midventral appendage ..... *A. giardi*

*Arcturopsis giardi* (Bonnier, 1896)  
(Figs 1-4)

*Astacilla giardi* Bonnier, 1896: 581-587, pl. 31, figs 3; 4.

*Arcturopsis giardi* – Koehler 1911: 19-20, fig. 10.

TYPE MATERIAL. — Queries to the Muséum national d'Histoire naturelle, Paris and to the Zoological Museums in Hamburg and Berlin failed to reveal the whereabouts of the 16 specimens (nine females, four adult males and three others) collected by the *Caudan* in the Bay of Biscay. A neotype is selected here.

MATERIAL EXAMINED. — **Capbreton Canyon**. NE Atlantic Ocean, Bay of Biscay, 43°38.00'N, 1°51.79'W, 923 m, RV *Côte d'Aquitaine*, epibenthic sled, stn Capbreton, 7. VII.1988, J. C. Sorbe, neotype, 1 ♀ 8.4 mm (88/ DI19, MNHN-Is5689); 1 ♂, 20.8 mm (MNHN-Is5690); 3 juvenile ♂♂ 13.5 mm, 15 mm, 7.4 mm and 1 juvenile ♀ 6.5 mm (MNHN-Is5691, Is5695); 2 manca 4.9 mm, 3 mm; 1 ♂ 21.5 mm, 4 juvenile ♂♂, 12.5 mm, 12 mm, 8.5 mm, 6 mm, 1 ♀, 8 mm, 1 juvenile ♀, 6.6 mm and 2 manca, 5 mm, 3 mm (NMV J44925-J44931).

DESCRIPTION

*Female*

Body geniculate, cylindrical. Anterolateral margins of head rounded, small rostral point evident. Fusion of head and pereonite 1 indicated by a dorsolateral groove incised laterally. Lateral margin of pereonite 1 extended anteriorly overlapping and fusing with margin of head. Fused head with a tubercle central and anterior to eyes, two tubercles posterior to eyes and one tubercle on dorsal posterior margin of pereonite 1. Pereonite 2 with small lateral tubercles, lateral margins extended. Pereonite 3 wider than pereonite 2, with lateral tubercles, lateral margins extended. Pereonite 4 about six times as long as pereonite 3, dorsally wider than pereonite 3 anteriorly, tapering

posteriorly, with anterior lateral expansions, anterior half dorsally elevated, with rounded tubercle on dorsal posterior margin, and with two smaller tubercles anteriorly. Pereonites 5 to 7 progressively shorter, with paired tubercles dorsally, with lateral expansions visible dorsally. Pleotelson with evidence of three fused pleonites, its total length similar to combined lengths of pereonites 5 to 7; in dorsal view pleotelson lateral margin rounded, with small anterior lateral wings and truncate apex.

Eyes round, dorsolateral. Antenna 1 extending to just beyond end of second peduncular article of antenna 2; flagellum slender with lateral and distal aesthetascs. Antenna 2 slender, more than half as long as body; flagellum of two articles plus straight claw; flagellum lower margin with or rarely without row of simple spines along full length (see Remarks).

Mouthparts concealed by lateral expansion of head and pereonite 1. Left mandible molar with finely toothed molar bearing proximal seta; lacinia mobilis 4-toothed; incisor irregularly 3-toothed. Right mandible with smooth molar; spine row of 4; 3-toothed incisor. Maxilla 1 inner lobe with three terminal setae; outer lobe with nine distal robust setae. Maxilla 2 inner lobe with 13 plumose setae, middle lobe with four setae, outer lobe with two setae. Maxillipedal endite with four mesial setae; palp articles 2 and 3 with mesial setal rows, article 4 with mesial and lateral setal rows, article 5 with distal setae.

Pereopod 1 included within margin of head; propodus as long as carpus, mesially setose; dactylus less than half length of propodus, bearing unguis, longer than dactylus. Pereopods 2 to

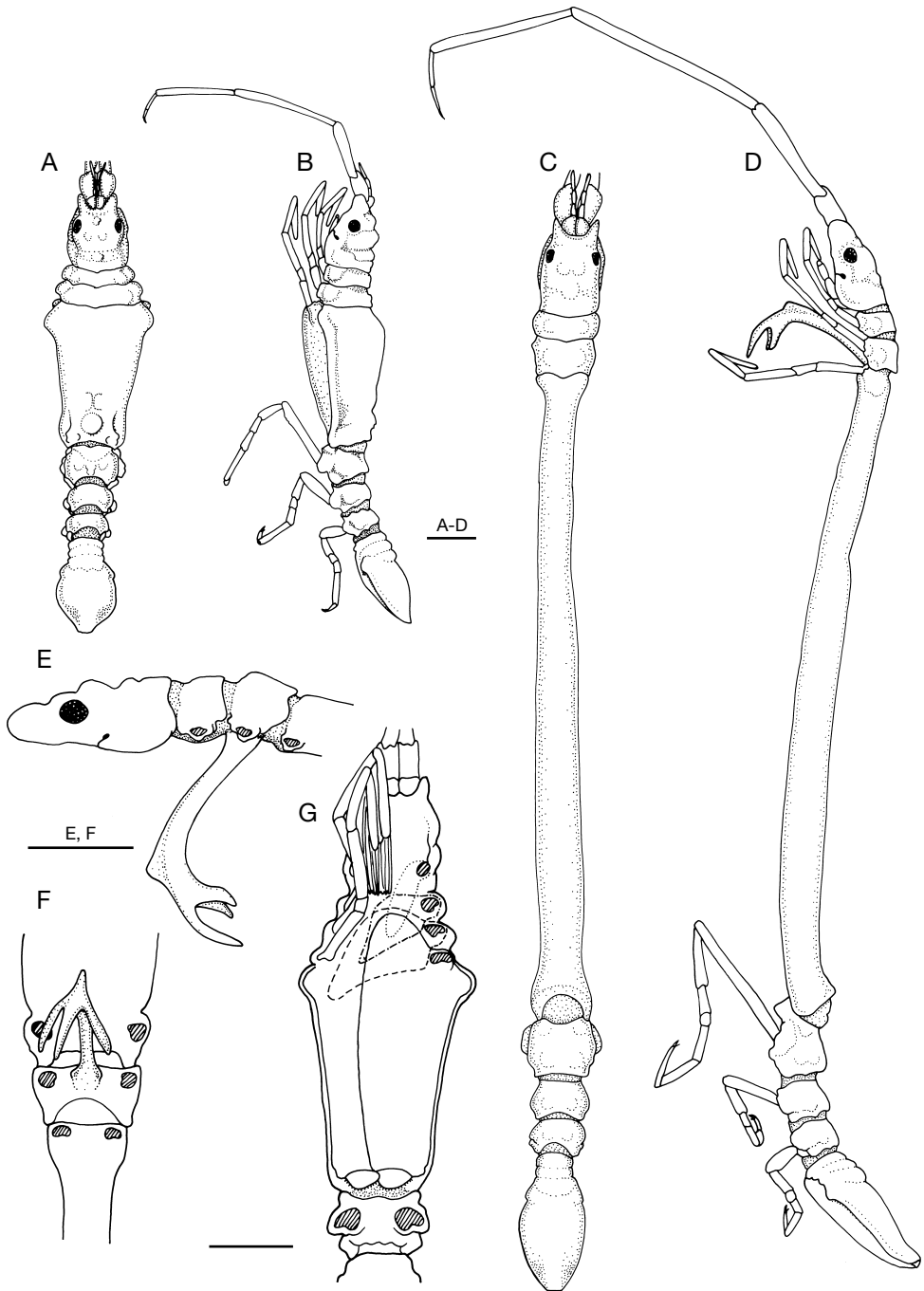


FIG. 1. — *Arcturopsis giardi* (Bonnier, 1896); **A, B**, ♀ habitus (MNHN-Is5689); **C, D**, ♂ habitus (MNHN-Is5690); **E**, ♂ midventral appendage (lateral view); **F**, ♂ midventral appendage (ventral view); **G**, ovigerous ♀ (ventral view). Scale bars: 1.0 mm.

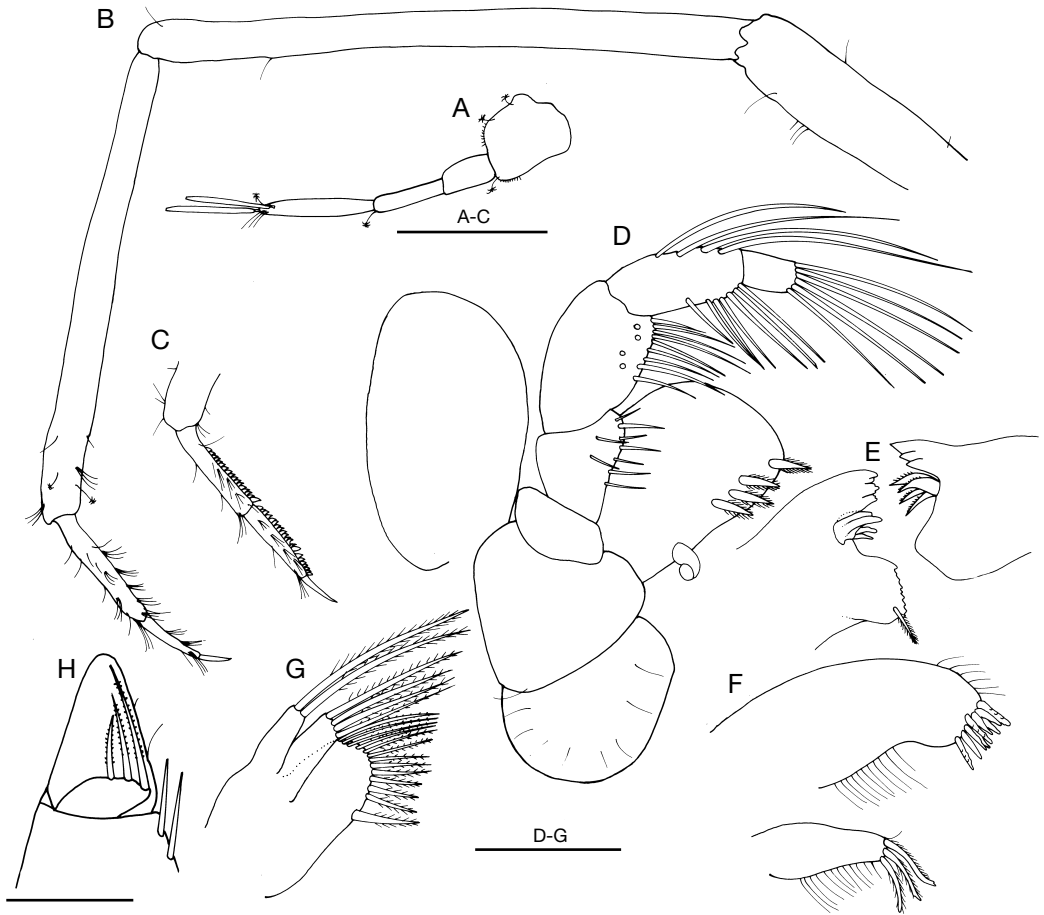


FIG. 2. —*Arcturopsis giardi* (Bonnier, 1896); **A, B, D-H**, ♀ (MNHN-Is5689); **A**, antenna 1; **B**, antenna 2; **C**, antenna 2 flagellum with scales (NMV J44931); **D**, maxilliped (left); **E**, left and right mandible; **F**, maxilla 1 (left); **G**, maxilla 2 (left); **H**, uropod. Scale bars: A-C, H, 0.25 mm; D-G, 0.5 mm.

4 carpus to propodus with paired rows each of about 9 to 11 long setae; dactylus absent; flexion between carpus and propodus present. Pereopods 5 to 7 progressively shorter; dactylus smooth, secondary unguis much smaller than primary.

Uropodal exopod oblique, not reaching midpoint of endopod, with three unequal distal setae.

Oostegites present on maxilliped and pereopods 1 to 4; maxillipedal oostegite rounded; oostegite 1 strap-like and extending posteriorly; oostegites 2 and 3 more or less triangular, thin; oostegite 4 chitinised, with transverse suture delimiting posterior lobe.

*Male*

Body approximately 2.5 times as long as that of female, extremely geniculate and cylindrical. Anterolateral lobes of head rounded, rostrum small. Head and pereonite 1 fused and with similar ornamentation to female. Pereonite 2 with slight tuberculation, small extension of lateral margins. Pereonite 3 with slight dorsal tuberculation, larger than pereonite 2, small extension of lateral margins; with midventral structure projecting more than three times depth of pereonite 3, extending forward and curving to project posteriorly, with two lateral projections and one large posterior projection. Pereonite 4 about 18 times longer than pereonite 3,

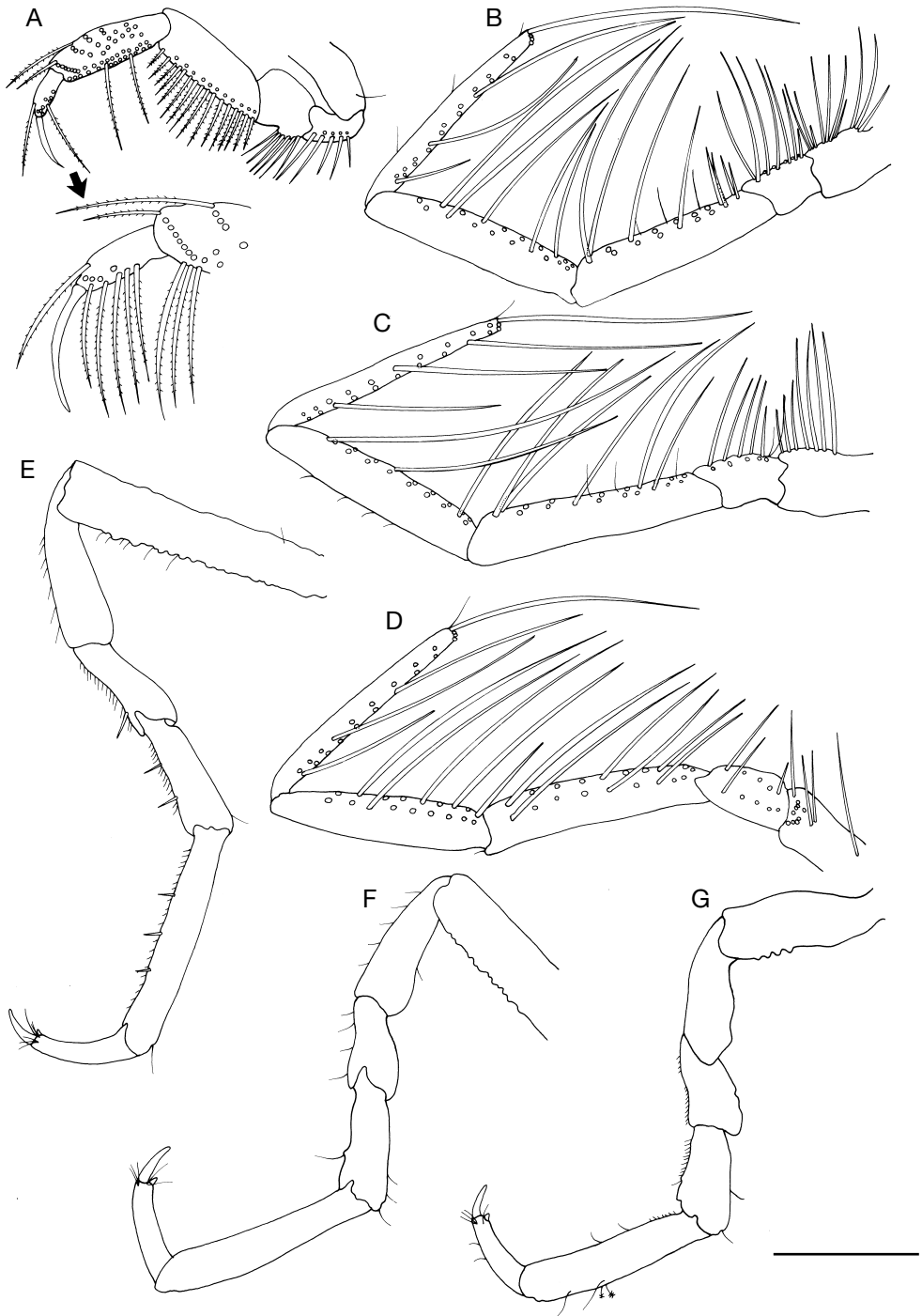


FIG. 3. — *Arcturopsis giardi* (Bonnier, 1896), ♂ (MNHN-Is5689); **A**, pereopod 1; **B**, pereopod 2; **C**, pereopod 3; **D**, pereopod 4; **E**, pereopod 5; **F**, pereopod 6; **G**, pereopod 7. Scale bar: 0.5 mm.

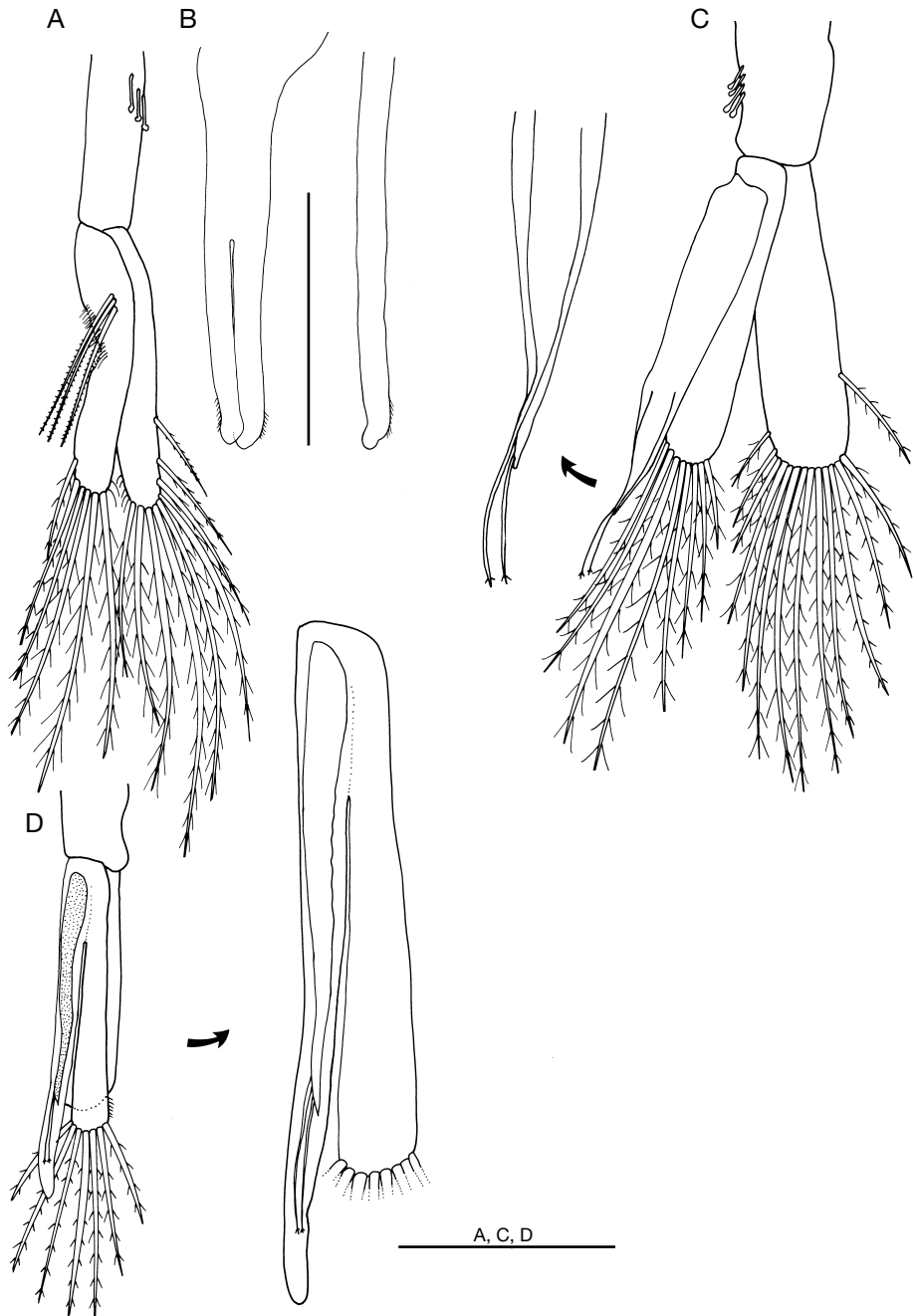


FIG. 4. — *Arcturopsis giardi* (Bonnier, 1896); **A-C**, ♂ (MNHN-Is5690); **A**, pleopod 1; **B**, penes (dorsal and ventral views); **C**, pleopod 2 with appendix masculina; **D**, pleopod 2 of juvenile with rudimentary appendix masculina (NMV J44928). Scale bars: A, C, D, 0.5 mm; B, 0.2 mm.



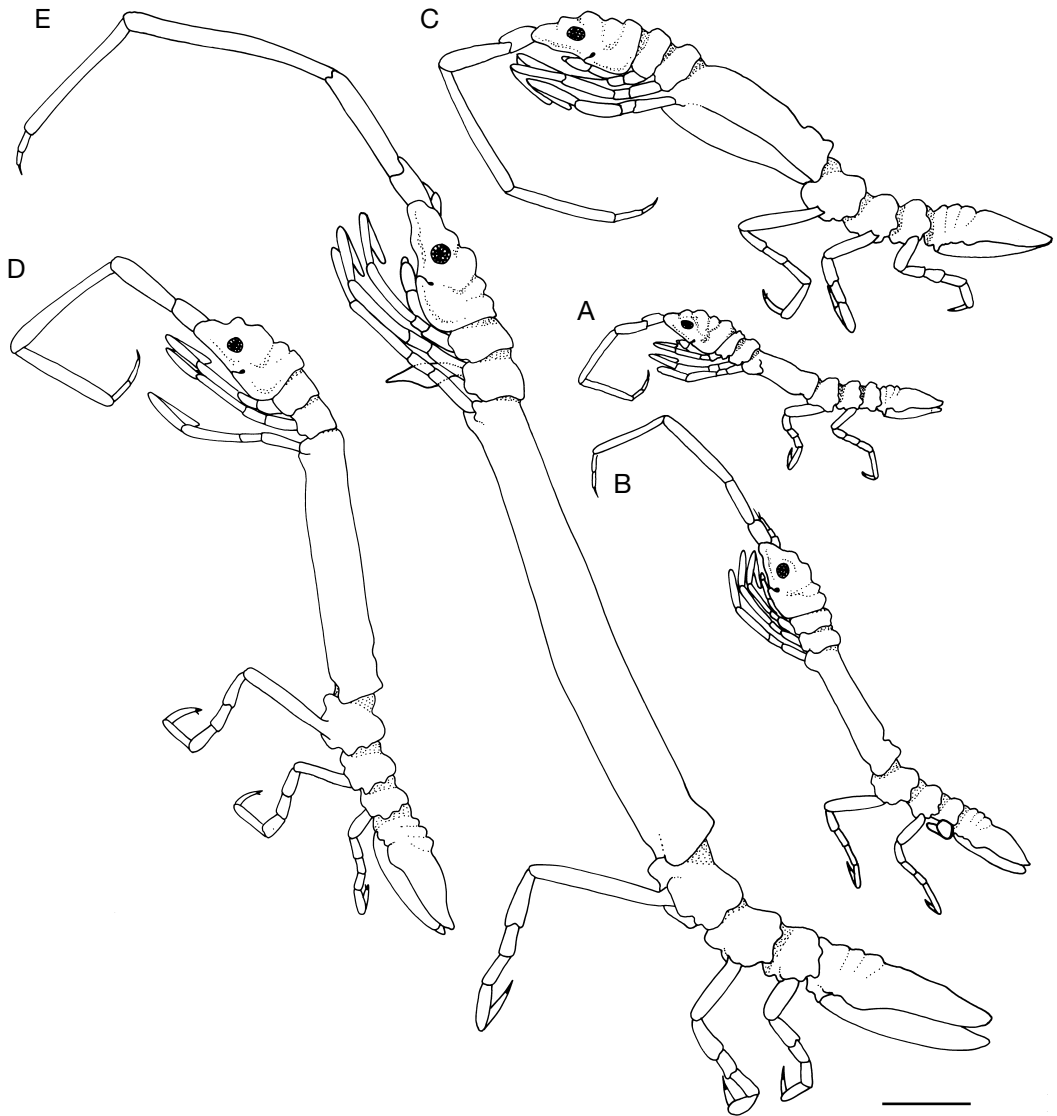


FIG. 5. — *Arctuopsis giardi* (Bonnier, 1896); A, manca 1; B, manca 2; C, juvenile female; D, juvenile male stage 1; E, juvenile male stage 2. Scale bar: 1.0 mm.

in dorsal and lateral view constricted for anterior third and widening posteriorly. Pereonites 5 to 7 progressively smaller, smoother than in female but with some tuberculation, lateral margins extended. Pleotelson with evidence of three fused pleonites plus pleotelson, as long as pereonites 5 to 7. Pleotelson more elongate in dorsal view than female, with anterior lateral wings and truncate end.

Eyes round, dorsolateral. Antennae 1 and 2, mouthparts, pereopods and uropods as in female. Penial plate divided anteriorly. Pleopod 1 exopod with a lateral finely setose notch, with three plumose setae of equal length on posterior face. Pleopod 2 appendix masculina basally as wide as endopod, exceeding endopod by one-third its length, tapering to two barbed filaments.

## DEVELOPMENTAL STAGES

*Manca 1* (Fig. 5A)

Sexes undifferentiated, pereopod 7 absent.

*Manca 2* (Fig. 5B)

Sexes undifferentiated, pereopod 7 visible as a bud on the ventral surface of pereonite 7.

*Juvenile female* (Fig. 5C)

Pereopod 7 well-developed, pereonite 4 anteriorly widened dorsally, oostegites not fully developed although rudimentary ventral marsupium formed.

*Brooding female* (Fig. 1A, B)

Oostegites fully developed and ventral marsupium fully formed; marsupium with eggs, embryos or mancas.

*Juvenile males, stage 1* (Fig. 5D)

Pereopod 7 well-developed, midventral appendage on pereonite 3 visible as a bud, penial plate not evident, appendix masculina not present.

*Juvenile males, stage 2* (Fig. 5E)

Midventral appendage on pereonite 3 developed and visible laterally between the pereopods, penial plate not evident, pleopod 2 bearing simple cylindrical appendix masculina.

*Copulatory males* (Fig. 1C, D)

Midventral appendage on pereonite 3 fully developed with tridentate apex curved backwards, penial plate fully developed, appendix masculina fully developed.

## REMARKS

Bonnier's type material of *A. giardi* cannot be found but his published description is detailed and we are satisfied that the new material belongs to this species. The female drawn here in detail has no spines on the lower margin of the first two articles of the flagellum of antenna 2 but in all the other specimens in the sample examined (male and female) spines occurred (Fig. 2B, C).

*Arcturopsis giardi* differs from the other two species of the genus in many ways. In *A. giardi*

pereonite 4 of the female is not as triangular in dorsal view as in *A. senegalensis* but more elongate and there are no lateral tuberculations as in *A. rudis*. *A. giardi* females are not as ornamented as females of the other two species. The flagellum of antenna 2 is of two articles and not three as in the other two species. The pleotelson of the *A. giardi* female is more rounded laterally. The males of *A. giardi* also seem to be more elongate, especially pereonite 4, than the males of the other two species. The morphology of the midventral appendage seems to be species specific with those of *A. senegalensis* and *A. rudis* not tridentate. Comments on *A. rudis* and *A. senegalensis* are based on Koehler's (1911) original descriptions and illustrations as no specimens could be found for new observations. The male type specimen of *A. rudis* is most likely to be a juvenile as the midventral appendage does not look to be fully formed; pleopods 1 and 2 were not figured.

## Acknowledgements

We thank J. C. Sorbe (Laboratoire d'Océanographie biologique, Arcachon) for collecting the material and sending it for redescription. Thanks also to Dr Danielle Defaye (MNHN, Paris), Dr Oliver Coleman (Zoological Museum, Berlin) and Dr Angelika Brandt (Zoological Institute and Museum, Hamburg) for assistance in our search for material.

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*Submitted on 10 May 2000;  
accepted on 18 December 2000.*