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Larval development of *Brachynotus gemmellari* (Rizza, 1839) (Brachyura, Grapsidae) reared under laboratory conditions

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Abstract. The complete larval development of the grapsid crab *Brachynotus gemmellari* (Rizza, 1839) was obtained by culture in the laboratory. Five zoeal stages, the megalopa and the first crab stage are described and illustrated. Larval development from hatching to first crab took 26 days at 20°C. The morphological characters of the larvae of *B.gemmellari* are compared with those of other known larvae of the genus *Brachynotus*.

Introduction

Four species of the genus *Brachynotus* (family Grapsidae) are known to occur in the northeast Atlantic and Mediterranean waters: *B.foresti* Zariquiey-Álvarez, 1968, *B.gemmellari* (Rizza, 1839), *B.sexdentatus* (Risso, 1827), and *B.atlanticus* Forest, 1957. They inhabit the intertidal and/or shallow sublittoral region. The detailed complete larval development is only known for *B.atlanticus* (Rodríguez *et al.*, 1992), whereas some incomplete knowledge exists for the larval development of *B.sexdentatus* (Bourdillon-Casanova, 1960; Paula, 1987).

Brachynotus gemmellari is an endemic species of the Mediterranean. It is known to occur in the Adriatic Sea and Central Mediterranean (Sicily, Tunisia) and also probably in the Eastern Mediterranean (Froglia and Manning, 1978). A population of this species was located off the Ebro delta in the Western Mediterranean. This constitutes the westernmost locality known for the species. The capture of some ovigerous females allowed the rearing of the larvae from hatching to the first crab stage. Specific identification was based on the characters given by Froglia and Manning (1978).

The present paper describes the morphology of the complete larval stages of the grapsid crab *B.gemmellari*. Their larval features are compared with those known for other species of the genus, as well as of the subfamily Varuninae to which the genus *Brachynotus* belongs.

Method

A population of *B.gemmellari* was located off Punta de la Banya and Alfacs Bay in the Ebro delta (western Mediterranean) at depths of between 5 and 17 m. Ovigerous females were collected using a beam trawl ('rastell') in July 1993 from a depth of 9 m. They were kept in a constant temperature room at 20 ± 1°C in aquaria with filtered and well aerated sea water. As soon as the larvae hatched they were placed separately in an aquarium measuring 40 × 25 × 20 cm at a density of 200 larvae l^{-1}; 100 of them were

placed in individual compartments of 30 cm^3 to be checked daily. Water temperature was kept at 20 ± 1°C and salinity at 36. The larvae were fed on fresh nauplii of *Artemia*. Exuviae and specimens of each developmental stage were preserved in buffered 4% formalin.

An interference microscope was used in the dissection and observation of the setal structures of the appendages. All measurements were made using an ocular micrometer, and are based on measurements of 10 individuals within each stage. Total length (TL) was measured in zoeae from the tip of the rostral spine to the tip of the dorsal spine; carapace length (CL), from the base of the rostrum to the posterior margin of the carapace; carapace width (CW) was taken as the distance between the tips of the lateral spines. For the megalopa, carapace width was measured as the greatest distance across the carapace, and carapace length as the distance between the base of the rostrum and the posterior margin of the carapace. For observation, the appendages were dyed with lignin pink and dissected and then mounted on polyvinyl lactophenol. All drawings were made with the aid of a camera lucida. The number of individuals of each stage examined to describe the morphology varied between 5 and 6.

The female crab from which this larval development was obtained has been deposited in the Biological Collections of Reference of the Institut de Ciències del Mar (CSIC) in Barcelona, Registration Number: ICMD 292/1994.

Results

The complete larval development of *B.gemmellari* took place through five zoeal stages and a megalopa. It was completed in a minimum of 19 days from hatching. The first crab appeared at 26 days after hatching. Mean sizes and duration of each larval stage are presented in Table I. Survival data are shown in Figure 1. Tables II and III condense the morphological features and setation type of the different zoeal stages.

Zoea I

Carapace (Figure 2A) globose and smooth, broader than longer, and bearing lateral spines; rostral and dorsal spines well-developed. A pair of dorsal posterior setae. Eyes sessile.

Abdomen (Figure 3A) with five subequal somites and telson. A pair of dorsal setae on segments 2–5. The second somite bears two dorsolateral knobs directed anteriorly.

Table I. Mean (± standard deviation) total length (TL), carapace width (CW) and carapace length (CL), in mm, first day to appear, and mean duration in days of the larval stages of *B.gemmellari* reared in the laboratory

Stage	TL	CW	CL	First day to appear	Mean duration
Zoea I	1.04 (± 0.05)	0.44 (± 0.05)	0.48 (± 0.05)	0	3.5
Zoea II	1.18 (± 0.05)	0.46 (± 0.05)	0.53 (± 0.05)	4	3
Zoea III	1.41 (± 0.05)	0.51 (± 0.05)	0.58 (± 0.05)	8	3.5
Zoea IV	1.69 (± 0.05)	0.68 (± 0.05)	0.64 (± 0.05)	12	3.5
Zoea V	2.17 (± 0.05)	0.89 (± 0.05)	1.00 (± 0.05)	16	4
Megalopa	–	1.00 (± 0.06)	1.30 (± 0.03)	19	6.5
First crab	–	1.40 (± 0.03)	1.44 (± 0.03)	26	

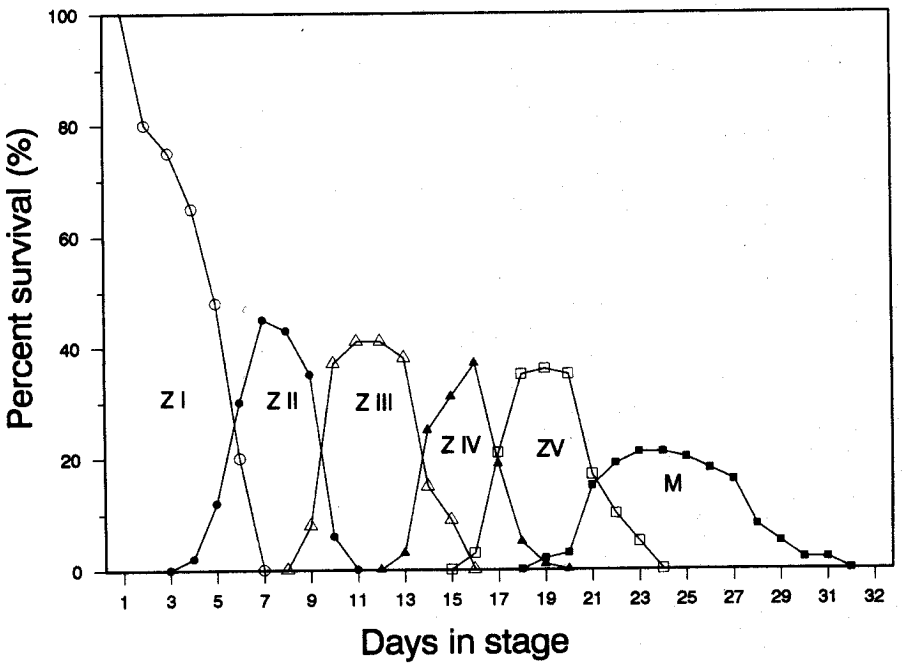

Fig. 1. Percentage survival and duration of larval stages of *B.gemmellari* reared under laboratory conditions.

The third somite bears two minute dorsolateral knobs. The telson is bifid and has a deep median cleft in its inner margin and 3 plumodenticulated setae on each side; the furcae with rows of tiny teeth.

Antennule (Figure 4A) unsegmented and conical, with 2 aesthetascs and 1 seta.

Antenna (Figure 5A) with an elongated protopod bearing two rows of denticles. The exopod is elongated, bears two lateral spines and is acute in its distal half.

Maxillule (Figure 6A) with not-bilobed basal and coxal endites, each of them with 5 setae. Endopod 2-segmented; distal segment with 5 setae, proximal with 1 seta.

Maxilla (Figure 7A) with bilobed basal endite. The proximal and distal lobes of the basal endite with 5 and 4 setae, respectively. Coxal endite with 6 setae. The endopod is unsegmented and slightly bifurcated, with 4 setae. Scaphognathite with 5 (4 + 1) plumose setae.

First maxilliped (Figure 8A). Basis with 2,2,3,3 setae. Endopod 5-segmented, with 2,2,1,2,5 setae, respectively in segments 1–5. Exopod unsegmented, with 4 long terminal plumose setae.

Second maxilliped (Figure 9A). Basis with 1,1,1,1 setae. Endopod 3-segmented, with 0,1,6 setae. Exopod unsegmented, with 4 long terminal plumose setae.

Zoea II

Carapace (Figure 2B). Eyes stalked. Setation as in Zoea I, but with an additional pair of dorsal anterior setae.

Table II. Setations of antennule, antenna, maxillule, maxilla, first and second maxillipeds and abdomen of zoeal stages of *B.gemmellari*

Features	Stages				
	Zoea I	Zoea II	Zoea III	Zoea IV	Zoea V
Abdomen (Figure 3)					
som. proximal	0	1s	3s	5s	7s
som. 2	2k, 2s	2k, 2s	2k, 2s	2k, 2s	2k, 2s
som. 3	2k, 2s	2k, 2s	2k, 2s	2k, 2s	2k, 2s
som. 4	2s	2s	2s	2s	2s
som. 5	2s	2s	2s	2s	2s
som. 6	absent	absent	absent	2s	2s
telson	(3,3)pd	(3,3)pd	(4,4)pd	(4,4)pd	(4,4)pd
pleopod	absent	absent	absent	rudimentary	bud present
Antennule (Figure 4)					
terminal	2a, 1s	3a, 1s	3a, 1s	4a, 1s	6a, 1s
Antenna (Figure 5)					
endopod	absent	absent	bud present	present	present
exopod	2e	2e	2e	2e	2e
Maxillule (Figure 6)					
coxa	0	1sp	1p	1p	1p
coxal endite	4pd, 1sp	4pd, 1sp	4pd, 1sp	6pd, 1sp	8pd, 1sp
basal endite	2pd, 3sp	4pd, 3sp	5pd, 3sp	7pd, 3sp	6pd, 7sp
endopod					
seg. proximal	1sp	1sp	1sp	1sp	1sp
seg. distal	(2,2,1)sp	(2,2,1)sp	(2,2,1)sp	(2,2,1)sp	(2,2,1)sp
Maxilla (Figure 7)					
coxal endite	6sp	6sp	6sp	7sp	10sp
basal endite					
proximal	5sp	5sp	5sp	6sp	8sp
distal	4sp	4sp	4sp	5sp	7sp
endopod	(2,2)sp	(2,2)sp	(2,2)sp	(2,2)sp	(2,2)sp
scaphognathite	(4,1)p	(5,3)p	(7,5)p	(10,6)p	25p
First maxilliped (Figure 8)					
basis	(2,2,3,3)sp	(2,2,3,3)sp	(2,2,3,3)sp	(2,2,3,3)sp	(2,2,3,3)sp
endopod					
seg. proximal	2sp	2sp	2sp	2sp	2sp
seg. 2	2sp	2sp	2sp	2sp	2sp
seg. 3	1sp	1sp	2sp	2sp	2sp
seg. 4	2sp	2sp	2sp	2sp	2sp
seg. 5	4p, 1sp	4p, 1sp	4p, 1sp	4p, 2sp	4p, 2sp
exopod	4p	6p	8p	10p	12p
Second maxilliped (Figure 9)					
basis	4sp	4sp	4sp	4sp	4sp
endopod					
seg. proximal	0	0	0	0	0
seg. 2	1sp	1sp	1sp	1sp	1sp
seg. 3	6sp	6sp	6sp	6sp	6sp
exopod	4p	6p	8p	10p	12p

a = aesthetasc, e = spine, k = knob, p = plumose, pd = plumodenticulate, s = simple, seg = segment, som = somite, sp = sparsely setose.

Abdomen (Figure 3B) as in Zoea I, but with 1 seta in somite 1.
Antennule (Figure 4B) with 3 aesthetascs and 1 seta.
Antenna (Figure 5B) as in Zoea I.
Maxillule (Figure 6B) with 1 plumose seta on the opposite side of the basal endite.

Table III. Setation and other characteristics of the carapace of zoeal stages of *B.gemmellari* (for coding see Table II)

Features	Stages				
	Zoea I	Zoea II	Zoea III	Zoea IV	Zoea V
Carapace (Figure 2)					
No. pairs of setae					
dorsal anterior	0	1s	2s	2s	3s
dorsal posterior	1s	1s	1s	1s	1s
lateral posterior	0	0	2sp	3sp	6sp
ventral posterior	0	0	6sp	9sp	14sp
dorsal spine	0	0	2sp	3sp	5sp
eyes	round sessile	round stalked	round stalked	round stalked	round stalked

Basal endite with 7 setae.

Maxilla (Figure 7B) with 8 (5 + 3) setae on the scaphognathite.

First maxilliped (Figure 8B) with 6 long terminal plumose setae on the exopod.

Second maxilliped (Figure 9B) with 6 long terminal plumose setae on the exopod.

Zoea III

Carapace (Figure 2C) with 2 pairs of dorsal anterior setae, 1 pair dorsal posterior, 2 pairs lateral posterior, 6 pairs ventral posterior, and 2 on the dorsal spine.

Abdomen (Figure 3C) with 3 setae in somite 1; telson with 4 setae on each side of the inner margin.

Antennule (Figure 4C) as in Zoea II.

Antenna (Figure 5C). Endopod present as a bud.

Maxillule (Figure 6C). Basal endite with 8 setae.

Maxilla (Figure 7C) with 12 (7 + 5) setae on the scaphognathite.

First maxilliped (Figure 8C). Third segment of the endopod with 2 setae; other segments unchanged; with 8 long terminal plumose setae on the exopod.

Second maxilliped (Figure 9C) with 8 long terminal plumose setae on the exopod.

Zoea IV

Carapace (Figure 2D) with 2 pairs of dorsal anterior setae, 1 pair dorsal posterior, 3 pairs lateral posterior, 9 pairs ventral posterior, and 3 on the dorsal spine.

Abdomen (Figure 3D) with 6 somites. Somite 1 with 5 setae; somite 6 with 2 setae. Pleopods present as rudimentary small buds.

Antennule (Figure 4D) with 4 aesthetascs and 1 seta.

Antenna (Figure 5D) with a more developed endopod.

Maxillule (Figure 6D). Basal endite with 10 setae; coxal endite with 7 setae.

Maxilla (Figure 7D). Basal endite with 6 and 5 setae on the proximal and distal lobes, respectively. Coxal endite with 7 setae. Scaphognathite with 16 (10 + 6) setae.

First maxilliped (Figure 8D). Distal segment with 6 setae. With 10 long terminal plumose setae on the exopod.

Second maxilliped (Figure 9D) with 10 long terminal plumose setae on the exopod.

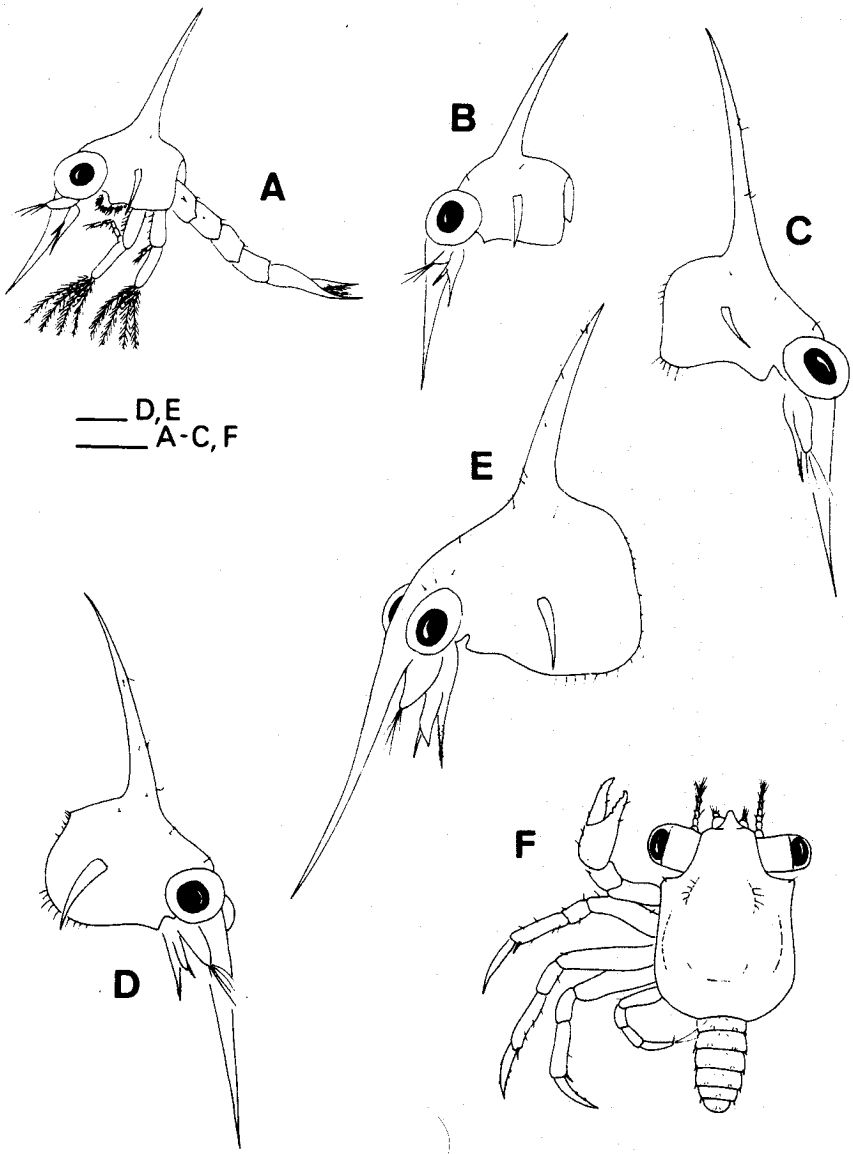

Fig. 2. *Brachynotus gemmellari*: **A**, first zoea lateral view; **B**, carapace second zoea; **C**, carapace third zoea; **D**, carapace fourth zoea; **E**, carapace fifth zoea; **F**, megalopa dorsal view. Scale bar 0.2 mm.

Zoea V

Carapace (Figure 2E) with 3 pairs of dorsal anterior setae, 1 pair dorsal posterior, 6 pairs lateral posterior, 14 pairs ventral posterior, and 5 on the dorsal spine.

Abdomen (Figure 3E). Somite 1 with 7 setae. Pleopods present as buds.

Antennule (Figure 4E) with 6 aesthetascs and 1 seta.

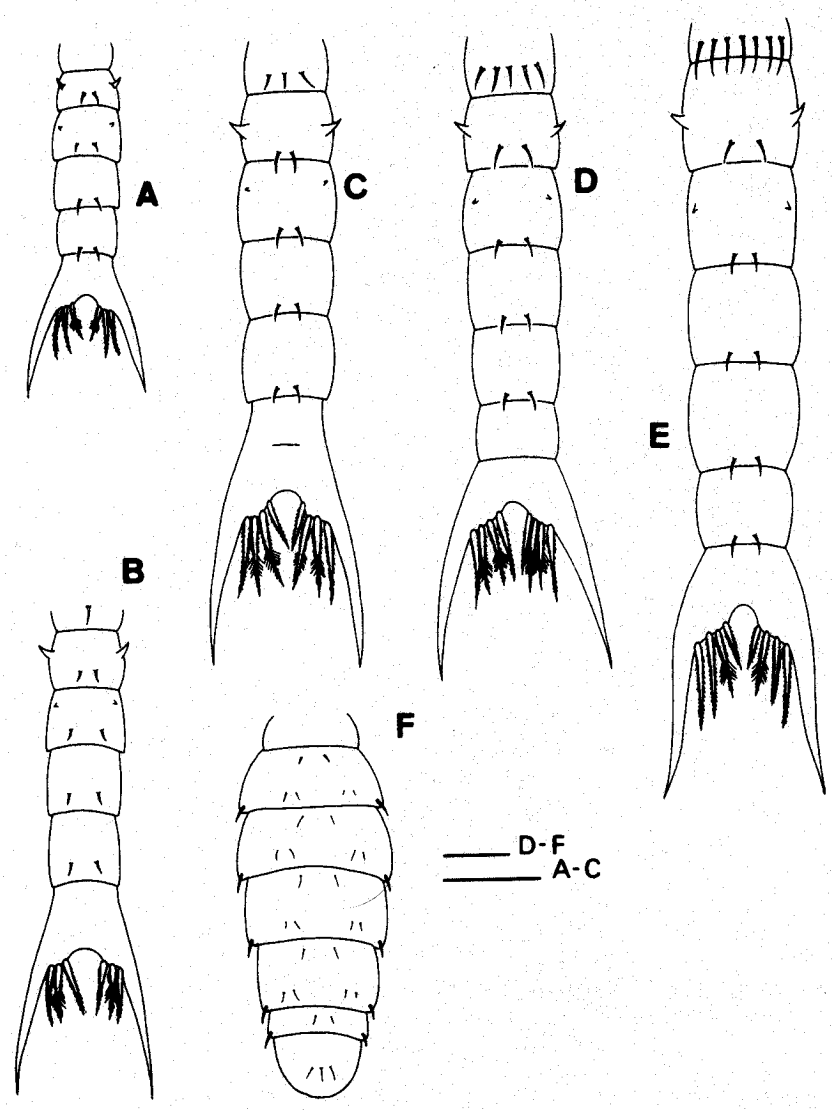

Fig. 3. *Brachynotus gemmellari*: abdomen. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.2 mm.

Antenna (Figure 5E) with a developed endopod, longer than the exopod.

Maxillule (Figure 6E). Basal endite with 13 setae; coxal endite with 9 setae.

Maxilla (Figure 7E). Basal endite with 8 and 7 setae on the proximal and distal lobes, respectively. Coxal endite with 10 setae. Scaphognathite with 25 setae.

First maxilliped (Figure 8E). Exopod with 12 long terminal plumose setae.

Second maxilliped (Figure 9E) with 12 long terminal plumose setae on the exopod.

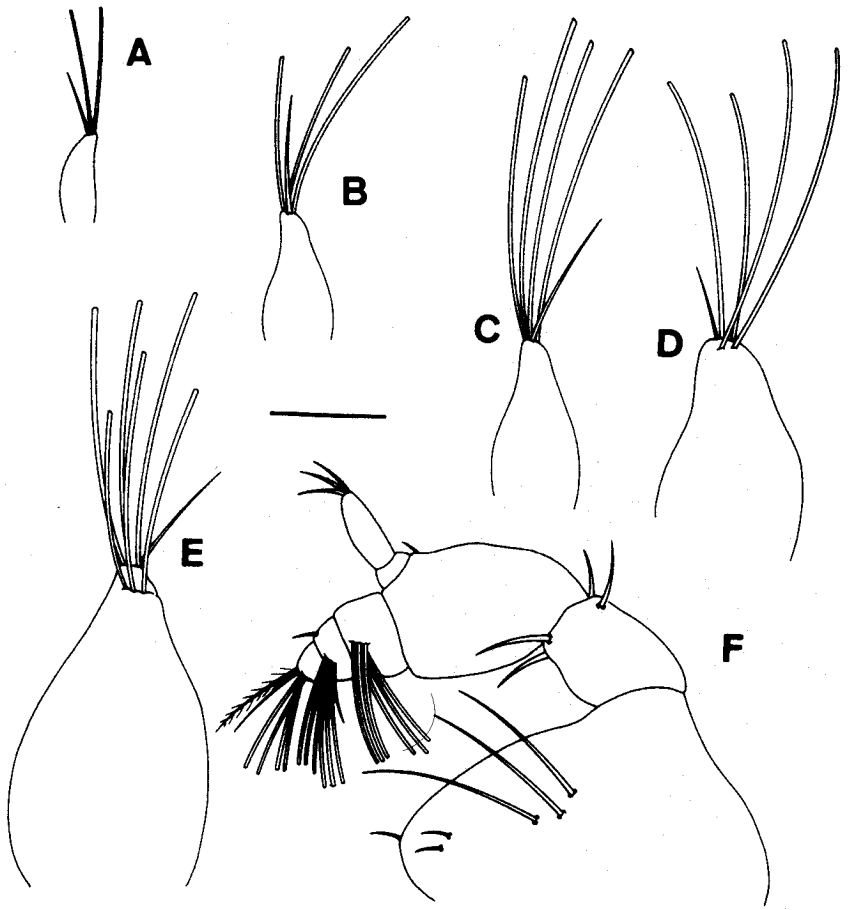

Fig. 4. *Brachynotus gemmellari*: antennule. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

Megalopa

Carapace (Figure 2F; Figure 10F). Longer than broad, subquadrate and laterally inflated. Frontal region developed into a ventrally deflexed, bluntly rounded rostrum with a distinct median cleft. Anterolateral margins present as 2 rounded lobes with one simple seta on their external angle. Row of 5 hairy setae on both margins of the mesogastric region ridges.

Abdomen (Figure 3F; Figure 10E). Six segments, broader than longer, plus a semicircular telson; setation as illustrated. The uropods are 3-segmented, with 9 plumose setae on the distal segment and 1 plumose seta on the second segment.

Antennule (Figure 4F). Biramous, with a well developed bulbous basal segment with 3 simple setae; peduncle 2-segmented with 1,1 simple setae; endopod 2-segmented with 3 apical setae in the distal segment; exopod 3-segmented, with 6 aesthetascs on the

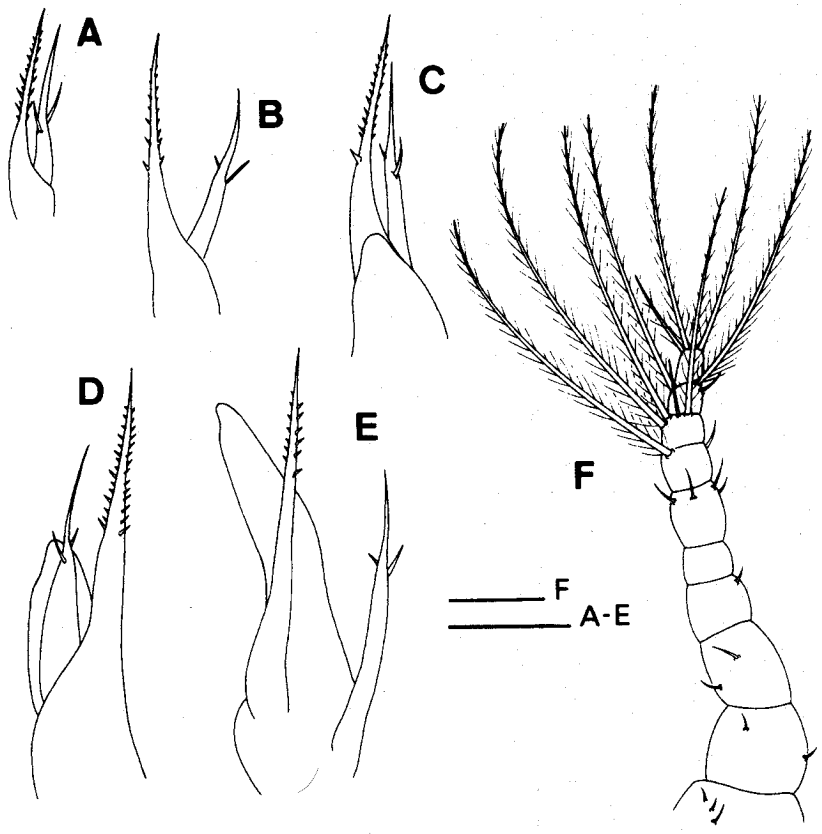

Fig. 5. *Brachynotus gemmellari*: antenna. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

proximal segment, 6 aesthetascs, 1 plumose seta and 1 simple seta on the second segment, and 5 aesthetascs and 1 plumose seta on the distal segment.

Antenna (Figure 5F). 10-segmented. Setation (respectively, for each segment, starting proximally): 3 simple; 2 simple; 2 simple; 1 simple; 0; 4 simple; 1 plumose; 3 plumose and 1 simple; 2 plumose and 1 simple; 2 plumose and 1 sparsely setose setae.

Maxillule (Figure 6F). Coxa with 2 simple and 2 sparsely setose setae; coxal endite with 12 sparsely setose and 7 plumodenticulate setae; basal endite with 19 sparsely setose and 5 plumodenticulate setae; endopod 2-segmented with 2,4 simple setae.

Maxilla (Figure 7F). Coxal endite bilobed, with 5 sparsely setose and 8 simple setae on the outer lobe and 5 sparsely setose setae on the inner lobe; basal endite bilobed with 8 sparsely setose and 10 sparsely setose setae, respectively on the inner and outer lobes; endopod unsegmented with 2 setae; scaphognathite with 42–44 plumose setae.

First maxilliped (Figure 8F). Coxal endite with 10 sparsely setose setae; basal endite with 8 sparsely setose setae; endopod unsegmented with 3 simple setae; exopod 2-segmented with 3 and 4 plumose setae, respectively on the proximal and distal segments; epipodite with 4 simple and 2 sparsely setose long setae.

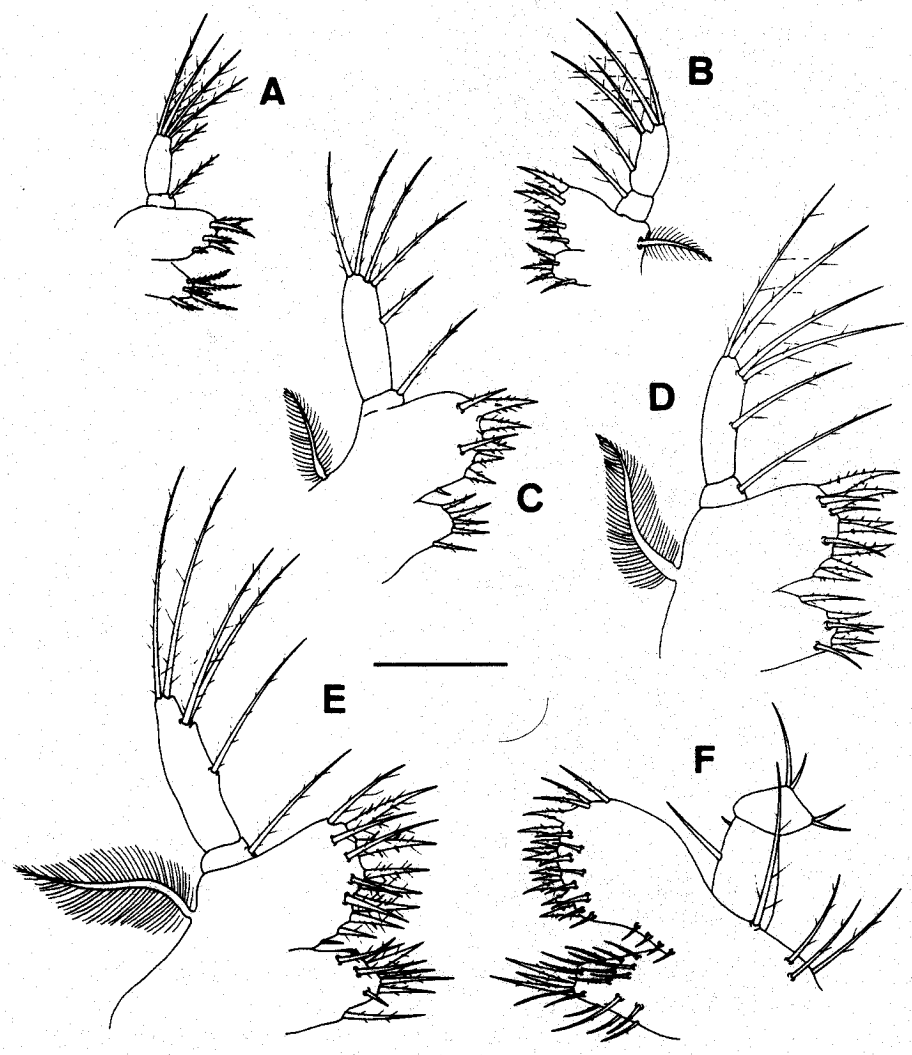

Fig. 6. *Brachynotus gemmellari*: maxillule. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

Second maxilliped (Figure 9F). Endopod 4-segmented, with 1 sparsely setose, 1 sparsely setose, 5 sparsely setose, 8 plumodenticulated setae, respectively on each segment; exopod 2-segmented with 1 spine and 5 plumose setae, respectively on each segment.

Third maxilliped (Figure 10A). Endopod 5-segmented, with 11 sparsely setose and 4 simple setae, 5 sparsely setose and 3 simple setae, 4 sparsely setose, 9 sparsely setose, and 9 sparsely setose setae, respectively for each segment; exopod 2-segmented with 2 simple and 4 plumose setae, respectively for each segment.

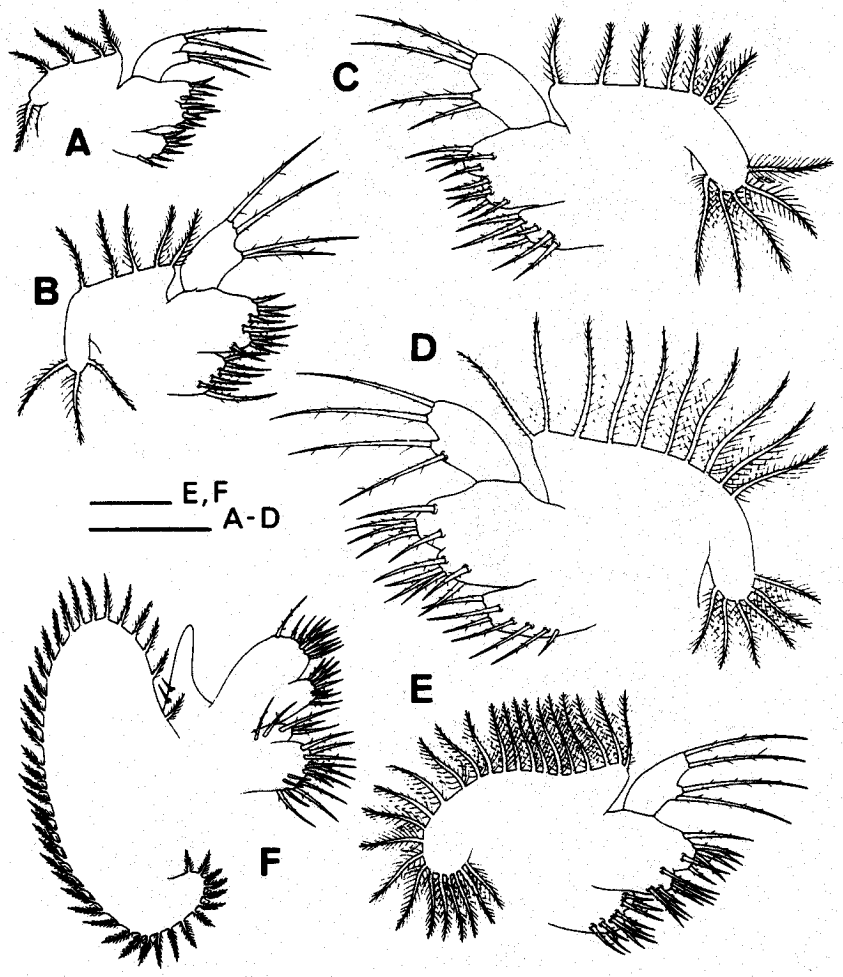

Fig. 7. *Brachynotus gemmellari*: maxilla. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

Pereiopods (Figure 10B–D). Chelipeds inflated, equal; coxa with 6 plumose setae; propodal inner margin denticulated only in the apex; dactylar inner margin toothless and tip recurved; pereiopods 2–4 similar, dactylar inner margin armed with 5, 3, and 2 short teeth, respectively for each pereiopod; dactyl of pereiopod 5 with 3 long highly denticulated setae on apex. Setation as illustrated.

First crab (Figure 11A–C)

Carapace slightly longer than broad, with 3 acutely denticulated protrusions (anterolateral teeth) on the anterolateral margins, with 5, 5, and 4 minute denticulations in each tooth, respectively; frontal margin rounded, denticulated, with a medial dip; postero-lateral margin rounded and strongly denticulated; posterior margin of ocular

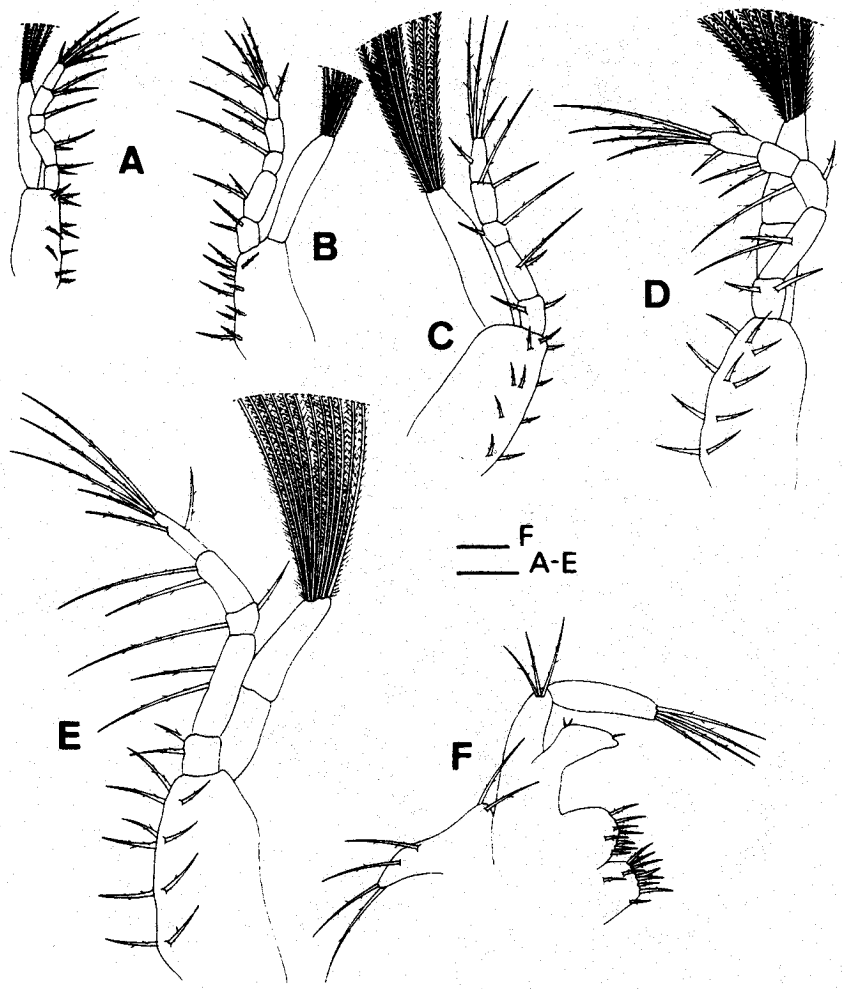

Fig. 8. *Brachynotus gemmellari*: first maxilliped. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

orbita denticulated; groups of setae on the epibranchial region. Chelipeds stout, equal in size, with 3 longitudinal rows of tubercles; pereiopods subequal, with margins slightly denticulated. Setation as illustrated. Third maxilliped with 5-segmented endopod with 22, 13, 8, 3, and 7 setae, respectively; exopod 2-segmented with 9 setae on the proximal segment and 6 terminal plumose setae on the distal segment; epipodite with 54 plumodenticulate setae and 2 long plumodenticulate setae proximally plus 25 non-plumose long setae.

Discussion

The larval stages of *B.gemmellari* were compared with previous descriptions of

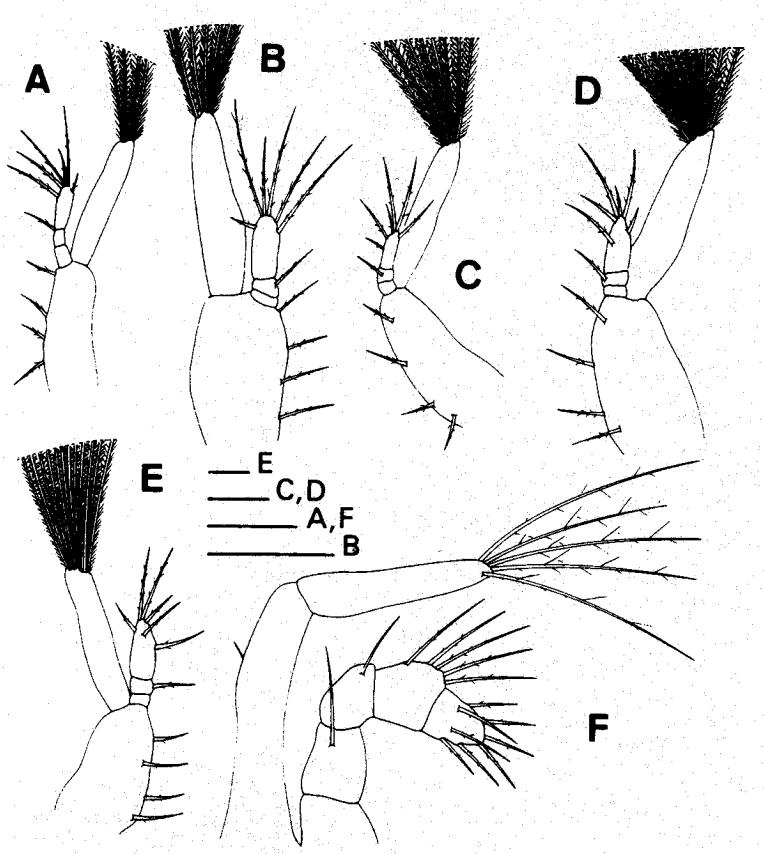

Fig. 9. *Brachynotus gemmellari*: second maxilliped. **A**, first zoea; **B**, second zoea; **C**, third zoea; **D**, fourth zoea; **E**, fifth zoea; **F**, megalopa. Scale bar 0.1 mm.

Brachynotus larvae, restricted to the work of Rodríguez *et al.* (1992) on the complete larval development of *B.atlanticus*, and to the limited descriptions of the larval development of *B.sexdentatus* (Bourdillon-Casanova, 1960; Paula, 1987).

The main differences between the zoeae of *B.gemmellari* and those of *B.atlanticus* are found in size, setation, and on the presence or absence of knobs on the third abdominal segment. Zoeae of *B.gemmellari* are clearly smaller than those of *B.atlanticus*; for example, the zoea I mean total length is 1.48 mm in *B.atlanticus* and 1.04 mm in *B.gemmellari*, and in zoea V it is 3.42 mm and 2.17 mm, respectively. Variations in setation are also found (Table IV), especially concerning setation of the endites of the maxillula and maxilla, setation of the maxilla scaphognathite from the third zoeal stage, and number of aesthetascs of the antennula. Notwithstanding, the clearer difference between the two species consists in the absence of knobs on the third abdominal segment in *B.atlanticus*. This characteristic was confirmed by examination of newly hatched specimens of this species reared specifically to examine this subject.

Some differences concerning size and setation are also found when comparing the

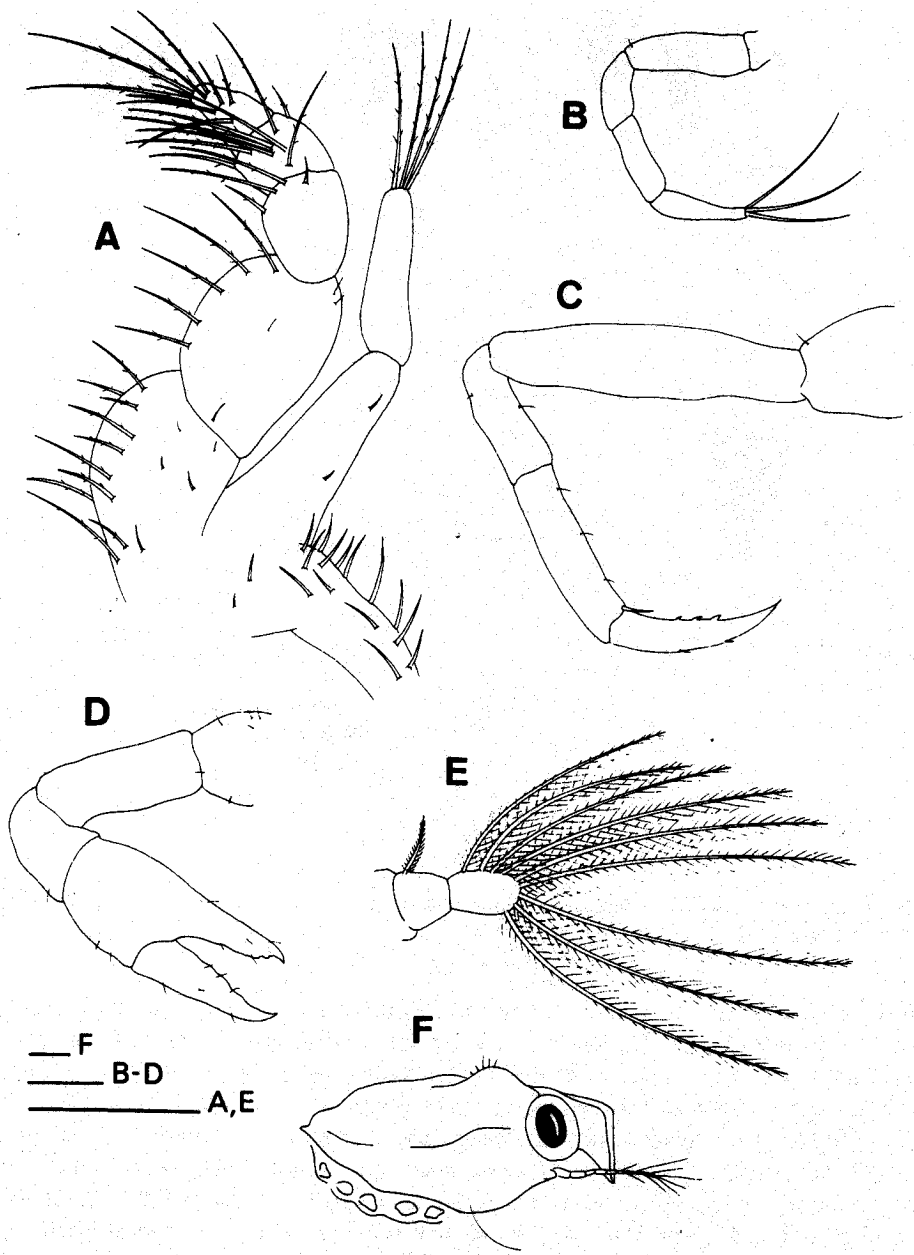

Fig. 10. *Brachynotus gemmellari*: megalopa. **A**, third maxilliped; **B**, fifth pereiopod; **C**, third pereiopod; **D**, cheliped; **E**, uropod; **F**, lateral view. Scale bar 0.2 mm.

magalopae of *B.gemmellari* and *B.atlanticus*, the former being smaller than the latter (Table IV). Besides these differences, some other characteristics enable an easy separation between the two species. Thus, whereas *B.atlanticus* bears two setae on the anterolateral margin, *B.gemmellari* only carries one. Another remarkable difference is

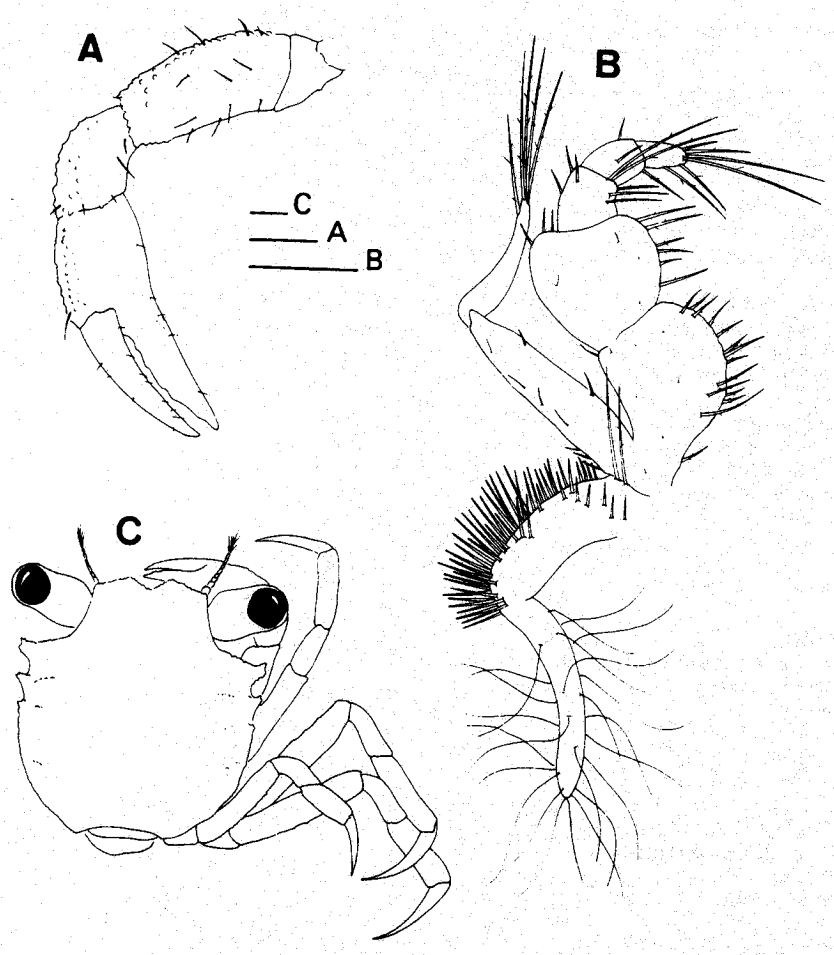

Fig. 11. *Brachynotus gemmellari*: first crab. **A**, cheliped; **B**, third maxilliped; **C**, dorsal view. Scale bar 0.2 mm.

the greater slenderness of the pereiopods of *B.gemmellari*. The ratio length/width of the pereiopods is lower in *B.atlanticus* (i.e. length/width ratio of the merus of the fourth pereiopod = 4.6 in *B.atlanticus*; 6.5 in *B.gemmellari*).

The differences between *B.gemmellari* and *B.atlanticus* are even clearer in the first crab. Besides the size, larger in *B.atlanticus* than in *B.gemmellari* (1.52 mm CL in *B.atlanticus*, and 1.48 mm CL in *B.gemmellari*), the anterolateral teeth of the carapace are more serrated in *B.gemmellari*. Also, *B.atlanticus* shows an additional, or second, row of tubercles in the frontal region, which is not found in *B.gemmellari*.

When comparing the larvae of *B.gemmellari* with those of *B.sexdentatus*, size appears to be the main difference observed, it being much larger in *B.sexdentatus* than in *B.gemmellari* and, indeed, *B.atlanticus*. The fifth zoea attributed to *B.sexdentatus* by Paula (1987) and described from plankton samples differs from all the other larvae of the genus *Brachynotus* especially by its size (5.4 mm TL) and by the presence of some

Table IV. Morphological differences in the larval stages of *B.gemmellari* and *B.atlanticus*

	B.gemmellari	*B.atlanticus*
Zoea I		
Maxilla setation:		
S on basal endite		
proximal	5	4
distal	4	5
Abdomen:		
K on Somite 3	2	0
Zoea II		
Carapace setation:		
S lateral posterior	0	1
S ventral posterior	0	1
Antennule setation:		
A, S	3, 1	4, 1
Maxillule setation:		
S basal endite	7	6
Maxilla setation:		
S on basal endite		
proximal	5	4
distal	4	5
Abdomen:		
K on Somite 3	2	0
Zoea III		
Carapace setation:		
S ventral posterior	6	5
Antennule setation:		
A, S	3, 1	4, 1
Maxilla setation:		
S on basal endite		
proximal	5	4
distal	4	5
S on coxal endite	6	7
S (pl) on scaphognathite	12	14
Abdomen:		
K on Somite 3	2	0
Zoea IV		
Carapace setation:		
S ventral posterior	9	13
S dorsal spine	3	5
Antennule setation:		
A, S	4, 1	5, 1
Maxillule setation:		
S on basal endite	10	12
S on coxal endite	7	8
Maxilla setation:		
S on basal endite		
distal	5	6
S on coxal endite	7	8
S (pl) on scaphognathite	16	25
Abdomen:		
K on Somite 3		
Zoea V		
Carapace setation:		
S lateral posterior	6	5
S ventral posterior	14	17
S dorsal spine	5	6

Table IV. Morphological differences in the larval stages of *B.gemmellari* and *B.atlanticus* (*continued*)

	B.gemmellari	*B.atlanticus*
Antennule setation:		
A, S	6, 1	8, 1
Maxillule setation:		
S on basal endite	13	16
S on coxal endite	9	7
Maxilla setation:		
S on basal endite		
proximal	8	9
distal	6	7
S on coxal endite	10	13
S (pl) on scaphognathite	25	29
Abdomen:		
S on somite 1	7	8
K on somite 3	2	0
Megalopa		
Morphometrics (in mm):		
CL	1.30	1.48
CW	1.00	1.11
Çarapace setation:		
S on anterolateral margin	1	2
Antennule setation:		
S on basal segment	3	2
S on peduncle	1, 1	4, 1
A, S on expopod	17, 3	16, 2
Antenna setation:		
S	3, 2, 2, 1, 0, 4, 1, 4, 3, 3	2, 2, 0, 0, 0, 4, 2, 4, 4, 3
Maxillule setation:		
S on coxa	4	3
S on basal endite	24	23
S on coxal endite	19	22
Maxilla setation:		
S on basal endite	18	20
S on coxal endite	18	21
S (pl) on scaphognathite	42–44	42
Maxilliped 1 setation:		
S on coxal endite	10	19
S on endopod	3	2
Maxilliped 2 setation:		
S on endopod	1, 1, 5, 8	1, 1, 9, 9
Maxilliped 3 setation:		
S on endopod	15, 8, 4, 9, 9	14, 9, 7, 10, 8
S on exopod	2, 4	0, 5
Pereiopods:		
S on chelipeds	6	9
Sp on dactylus	5, 3, 2	3, 3, 3

Abbreviations and remarks: K = knob; S = setae; A = aesthetascs; pl = plumose; Sp = spine.

additional plumose setae on the endopod of the first maxilliped. The short descriptions of the megalopa and first crab of *B.sexdentatus* (Bourdillon-Casanova, 1960) do not allow a proper comparison with the other corresponding described larval stages of the genus; it can only be remarked that the conical protuberances of the mesogastric region of the megalopa are longitudinally elongated in *B.gemmellari* and *B.atlanticus*. Also, the first crab of *B.sexdentatus* appears to present a more hairy aspect, i.e. with a higher setation on the carapace.

Of the four subfamilies currently recognized within the family Grapsidae (Grapsinae, Plagusinae, Varuninae, Sesarminae), only the Grapsinae and Plagusinae present characters at the larval level which distinguish and characterize them well (Pereyra Lago, 1993), whereas the larvae of Sesarminae and Varuninae do not possess characteristics which allow to distinguish them properly. Rice (1980), however, differentiated three groups within the larvae of Sesarminae-Varuninae.

Rice (1980) included the larvae of the genera *Cyclograpsus*, *Chasmagnathus*, *Helice*, *Hemigrapsus*, and *Eriocheir* within subgroup I, which was characterized by the fact that all the larvae possessing lateral spines on the carapace, only 2 + 2 setae on the endopod of the maxilla and more than three pairs of posterior telson processes in the later zoeal stages. The known larvae of the genus *Brachynotus* can be included within this subgroup. According to these characteristics, the genera *Metaplax* and *Cyrtograpsus* can also be included within this subgroup (Scelzo and Lichtschein, 1979; Pasupathi and Kannupandi, 1988; Krishnan and Kannupandi, 1989). However, the zoeae of *Helice leachi* do not present lateral spines on the carapace (Baba *et al.*, 1984 in Pereyra Lago, 1993), as also happens in the first zoea of *Cyclograpsus cinereus* and *C.intiger* (Costlow and Fagetti, 1967; Gore and Scotto, 1982). These two species of *Cyclograpsus* acquire the lateral carapace spines in the second zoeal stage as happens in the subfamily Grapsinae (Cuesta and Rodríguez, 1994).

There is also a high intrageneric variability concerning the knobs on the abdominal segments. Thus, these knobs are present on segments 2, 3, 4 and 5 in *Eriocheir sinensis*, on segments 2, 3 and 4 in *E.rectus*, *Chasmagnathus convexus* and *Cyclograpsus intiger*, on segments 2 and 3 in *Chasmagnathus laevis* and *Cyclograpsus punctatus*, and only in segment 2 in *Cyclograpsus cinereus* (Fagetti and Campodonico, 1971; Baba and Fukuda, 1972; Green and Anderson, 1973; Gore and Scotto, 1982; Kim and Jang, 1987; Ingle, 1992; Shy and Yu, 1992). Of the three *Brachynotus* species whose larval development is known, *B.sexdentatus* and *B.gemmellari* bear the knobs on the abdominal segments 2 and 3, whereas *B.atlanticus* only in segment 2.

Pereyra Lago (1993) also remarked on the occurrence of important differences in the setation of the mouthparts of the species of Rice's (1980) subgroup I. Only two of the characters used by Rice (1980) can therefore be used to group them. All these considerations make the validity of subgroup I accordingly doubtful.

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