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Description of the first juvenile of *Aegla franca* Schmitt, 1942 (Crustacea, Decapoda, Aeglidae)

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Abstract

The post-embryonic development in *Aegla franca* is epimorphic, in which the hatching form is a juvenile that very much resembles the adults in general morphology. Newly-hatched juveniles were obtained under laboratory conditions from ovigerous females bearing eggs at late embryonic stage, and collected from the wild. Upon hatching, some juvenile specimens were cleared, stained, dissected and prepared for light microscopy on semi-permanent slides and each appendage was described in detail and illustrated accordingly. Some specimens were also prepared for scanning electron microscopy to obtain detailed information concerning setal morphology and ultrastructure of some cephalothoracic appendages. Comparison of the present results to previous descriptions of the first juvenile of other aeglid species show some interesting features observed only in *Aegla franca*. These features include the presence of pores on the first and second pairs of antennae; the rudimentary condition of the mandible and the long setae with a subterminal pore and scaly outgrowth distally on the basal bilobed endite of the maxilla.

Key words: Anomura, Aeglidae, *Aegla franca*, first juvenile, description

Introduction

Most anomuran decapods are typically found in marine habitats but some species are estuarine and semiterrestrial. However, known examples of truly freshwater anomurans are restricted to one species of diogenid hermit crab (McLaughlin & Murray 1990) and to all species of *Aegla* Leach. The latter represents the only extant genus of the family Aeglidae Dana, 1852, which, in turn, also includes another two extinct genera from marine sediments (Feldmann 1984; Feldmann *et al*. 1998). All extant aeglids are endemic to temperate and subtropical regions of continental South America (Schmitt 1942; Martin & Abele 1988; Bond-Buckup & Buckup 1994; Bond-Buckup 2003).

Detailed descriptions of the hatching form are available in the literature for the following species from South Brazil: *Aegla prado* Schmitt, *A. violacea* Bond-Buckup and Buckup, *A. platensis* Schmitt, *A. longirostri* Bond-Buckup and Buckup and *A. ligulata* Bond-Buckup and Buckup (Bond-Buckup *et al.* 1996, 1999; Bueno & Bond-Buckup 1996). As for *Aegla perobae* Hebling & Rodrigues, information on the general behaviour and food acceptance of the newly-hatched juvenile kept in aquarium conditions was provided by Rodrigues & Hebling (1978) but the authors did not provide a detailed morphological description of the young form.

In all these cases, the aeglids hatch as juveniles that morphologically resemble the adult form except that they are immature and do not bear pleopods; the latter trait, however, becomes fully developed only in adult females (Martin & Abele 1988). In *Aegla platensis*, Lizardo-Daudt & Bond-Buckup (2003) reported that the embryonized crustacean larval stages, such as nauplius, zoea and decapodid (megalopa), could be recognized as successive embryonic developmental stages within the egg before the actual hatching of the juvenile.

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Aegla franca Schmitt is the northernmost occurring species of aeglid. Currently, *A. franca* is known only from six small tributary streams of the river Canoas system in the counties of Claraval and Franca, southeastern region of Brazil (SLSB personal observation). Apart from the original description provided by Schmitt (1942), no additional information concerning any biological aspect of this species is currently available. The present paper presents a detailed description of the first juvenile and provides some morphological comparisons with other aeglid species for which the first juvenile form has been described.

Material and methods

Three ovigerous females of *Aegla franca* carrying eggs at late embryonic developmental stage were collected from Barro Preto stream, County of Claraval, state of Minas Gerais (20°18'47"S, 47°16'37"W) in late August 2004, and immediately transported to the Laboratory of Carcinology of the Instituto de Biociências, Universidade de São Paulo, state of São Paulo, in a 50 liter plastic container, half filled with water from the stream and provided with continuous aeration. Females were kept in an aquarium and checked periodically for the presence of recently hatched juveniles hidden and protected by the female's flexed abdomen. These juveniles were carefully removed and immediately preserved in 70% alcohol.

For light microscopy (LM), specimens were cleared in 3-4% potassium hydroxide (KOH) solution and stained with picric acid or Bengal rose. Dissected appendages and tail fan (telson and uropods) were mounted in glycerin on semi-permanent slides and drawings were made with the aid of a light microscope equipped with camera lucida, according to procedures employed by Bueno & Rodrigues (1995).

A detailed morphological description is provided for each appendage, except the third and the fourth pairs of pereopods because these were morphologically very similar to the second pair of pereopods. Measurements, in millimeters (mm), were made with a Leitz micrometer scale slide. The drawing of the whole juvenile was made with the aid of a camera lucida mounted on a dissecting scope and the carapace length was measured with an ocular micrometer disc. Carapace length (CL) was measured from the posterior border of the orbital sinus to mid-posterior border of the cephalothorax (Bueno & Bond-Buckup 1996; Bond-Buckup *et al.* 1999). Carapace width (CW) was measured as the largest transverse distance. Fifteen specimens were measured.

For scanning electron microscopy (SEM), whole specimens were sonicated for five seconds, dehydrated in a graded ethanol series and critical-point dried (Critical Point Dryer Balzers CPD 030), and coated with gold palladium (Sputter Coater, Balzers SCD 050). Some specimens had all three pairs of maxillipeds removed prior to SEM preparation to give visual access to the maxillae, the maxillule and the mandibles during SEM observation. Specimens were observed and photographed in a DSM 940 Zeiss scanning electron microscope.

Setal terminology follows Thomas (1970), Martin & Abele (1988), Watling (1989), and Calazans & Ingle (1998). Distribution and numbers of setae on each appendage and telson were compared with the corresponding structure from available descriptions of the first juvenile form of *Aegla violacea*, *A. prado, A. platensis*, *A. ligulata* and *A. longirostri*, as provided by Bueno & Bond-Buckup (1996), Bond-Buckup *et al.* (1996, 1999).

Vouchers of *A. franca* juveniles were deposited at the Museu de Zoologia, of the University of São Paulo, Brazil, under the deposit number MZUSP 17365.

Results

Development in *Aegla franca* is epimorphic. Upon hatching, the juveniles remain protected for a few days on the ventral side of the flexed abdomen of the female. When the female is disturbed, some juveniles may fall off as a consequence of the strong flapping movements of the female's abdomen during the escape reaction. The benthic juveniles are then able to move around the bottom with the aid of the fully functional walking legs (second, third and fourth pairs of pereopods).

Carapace (Fig. 1). subcylindrical, slightly longer (mean: 1.71 mm; range: 1.58–1.79 mm) than wide (mean: 1.68 mm; range: 1.63–1.76 mm); rostrum long, triangular, well developed, and with a carina along its length; anterolateral spine well developed and reaching up to half the length of the eye peduncle; orbital spine small and defining a well developed orbital sinus and a much smaller extra-orbital sinus; hepatic lobes not discernible; protogastric lobes conspicuous; epigastric prominences absent; cervical groove well marked.

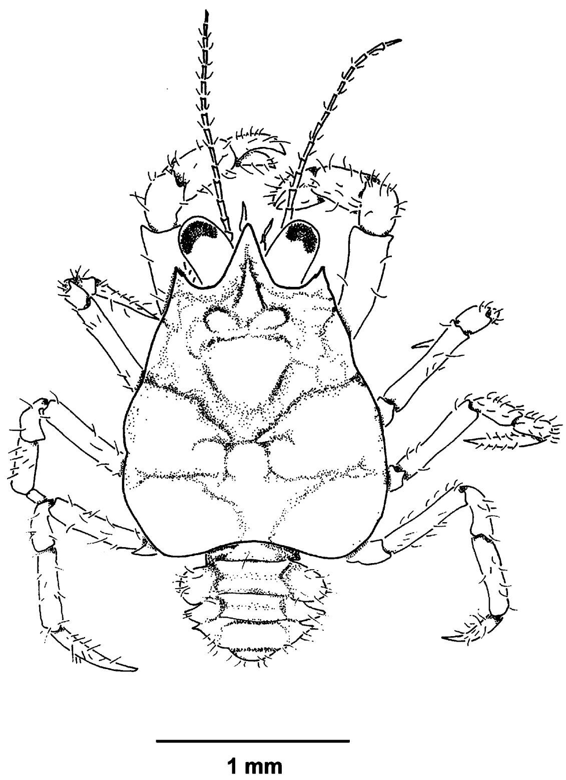

FIGURE 1. First juvenile of *Aegla franca* Schmitt, 1942. Drawing of whole specimen in dorsal view.

Antennule (Figs. 2A, 6A). Uniramous. Basal segment globose, distal half with 6 scattered, simple setae; 6 or 7 plumose setae and a semicircular fringe of 8 simple setae in between; proximal segment with 2 or 3 simple setae mesially; distal segment with 2–5 simple setae. Dorsal flagellum three-segmented; proximal segment lacking setae and aesthetascs; mesial segment with 1–3 simple setae and 1 aesthetasc distally; distal segment with 2 or 3 simple setae and 3 (occasionally 2) aesthetascs distally. Ventral flagellum one-segmented with 1 mesial, 1 apical and 3 or 4 subapical simple setae. Pores present; one near the distal border on the mesial segment of the dorsal flagellum and one subapical in the ventral flagellum (Figs. 6A, C).

Antenna (Figs. 2B, 6B). Uniramous. Peduncle five-segmented. Coxa with 0–2 simple setae; base and ischium, representing the second and third segments, fused (ischiobasis), with 1–4 simple setae; merus subtriangular and bearing 2 or 3 distal simple setae; carpus with 2 or 3 simple setae mesially and 4 simple setae distally; flagellum long, multi-articulate, with 14–16 segments, proximal segment shortest and always without setae; all other remaining segments with 0–8 simple setae around the distal border, except the distal segment which presents simple setae in apical and subapical positions. Several segments of the flagellum present one pore near distal border, providing a somewhat regular distributional pattern along the flagellum (Fig. 6B).

Mandible (Fig. 2C). Uniramous. Incisor process rudimentary, asymmetrical and strongly calcified, with indented border bearing 2 blunt teeth; molar process rudimentary and resembling a small bump on the interior lower border; mandibular palp (endopod) two-segmented; proximal segment with up to 4 simple setae, 2 proximally and 0–2 distally; distal segment with 11–15 denticulate setae, distributed along margins of distal half region.

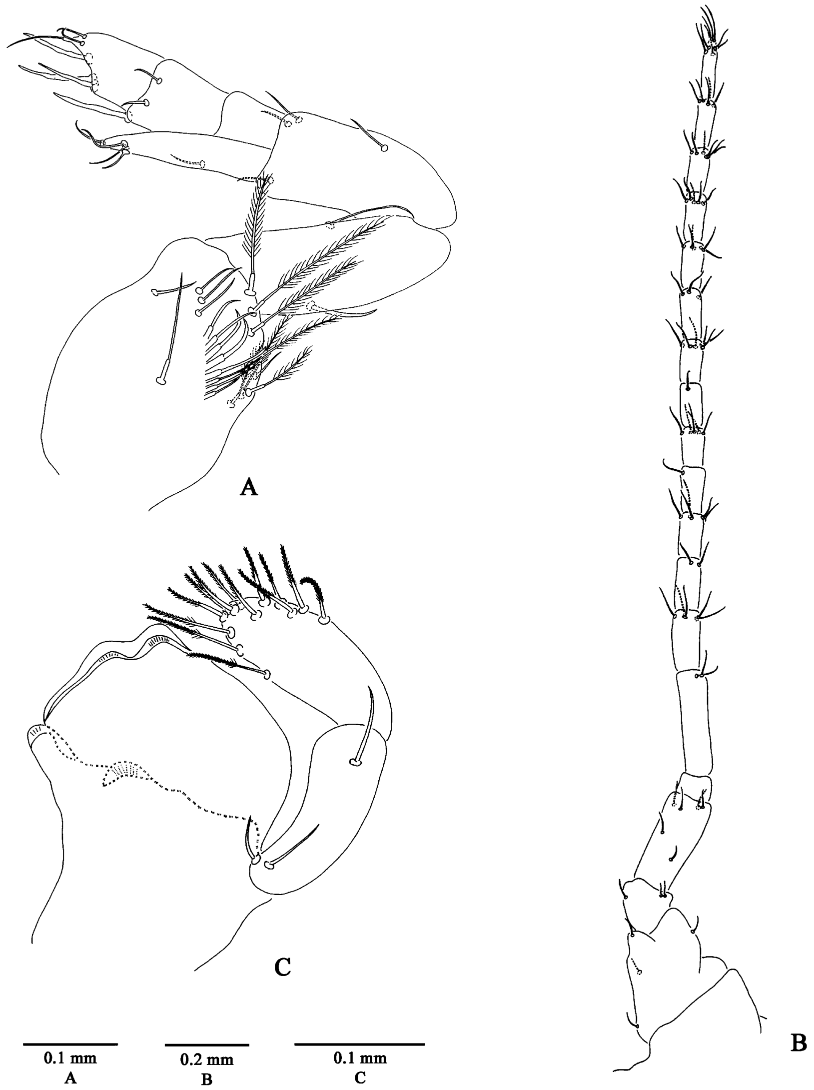

FIGURE 2. First juvenile of *Aegla franca* Schmitt, 1942. **A**, antennule; **B**, antenna; **C**, mandible.

Maxillule (Fig. 3A). Uniramous. Protopod with 2 or 3 plumose setae; coxal endite with 6 simple setae, 3–5 pappose setae, 7 or 8 denticulate setae, all located along distal border; basal endite with 1 or 2 simple setae and 2 pappose setae subdistally, 5–7 denticulate setae distally and 9 cuspidate setae along distal margin; endopod long, indistinctly bilobed, with up to 3 denticulate setae, 1 mesially and 1 or 2 subdistally.

Maxilla (Fig. 3B). Biramous. Coxal endite bilobed; lower lobe larger than the upper one, with 0 or 1 simple setae, 7 denticulate setae distally and 9 plumose setae subdistally; upper lobe with 2 simple setae proximally, 3 plumose setae mesially and 3 apical denticulate setae. Basal endite bilobed; lower lobe with 3 or 4 long setae bearing subterminal pore and several small scaly outgrowths subdistally on the pore facing surface (Fig. 6D), 5 or 6 denticulate setae on the distal border, and 2 simple setae mesially. Upper lobe larger and more setose than the lower one, with 7 or 8 long setae bearing subterminal pore and small scaly outgrowths subdistally, identical to those described on the lower lobe, and 8–11 denticulate setae located on the distal border, and 1 simple setae mesially. Endopod elongated and devoided of setae. Exopod well developed, broad, with 5–8 simple setae on distal half of surface and a fringe of 70–77 plumose setae marginally.

First maxilliped (Fig. 3C). Biramous. Coxal endite with 5 marginal denticulate setae, 1 denticulate setae on dorsal surface, and 4–6 pappose setae. Basal endite larger, subrectangular, with row of 5 plumodenticulate and 1 plumose setae on ventral surface, 2 simple setae on dorsal surface, 28 or 29 denticulate setae distributed along inner margin, and 1 or 2 pappose setae on outer margin. Endopod elongated, with 2 or 3 subapical and apical plumose setae. Exopod one-segmented, with 5 or 6 plumose setae along distal border.

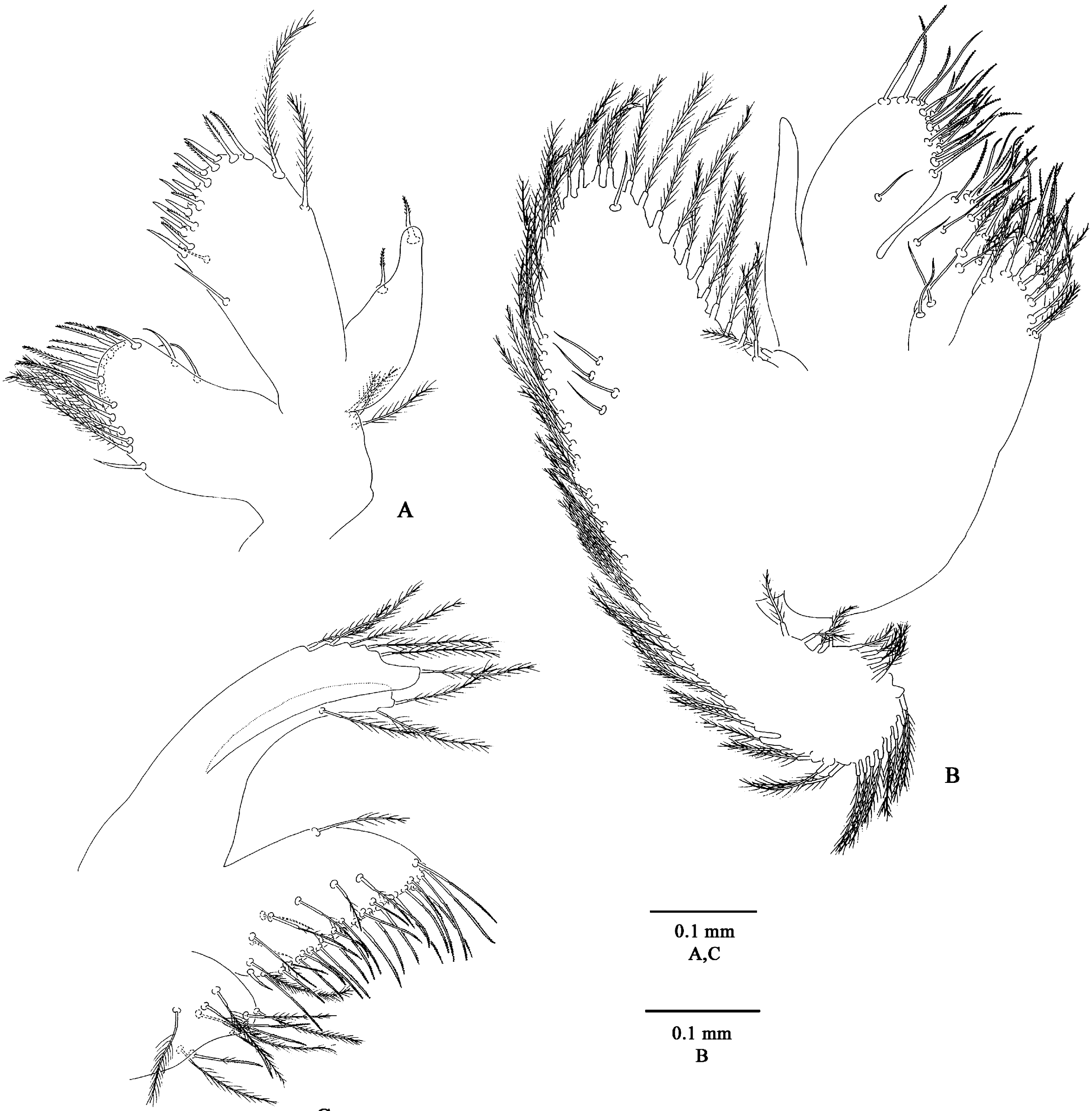

FIGURE 3. First juvenile of *Aegla franca* Schmitt, 1942. **A**, maxillule; **B**, maxilla; **C**, first maxilliped.

Second maxilliped (Fig. 4A). Biramous. Coxa with 7 or 8 pappose setae located on the inner margin. Endopod 5-segmented, ischiobasis (base and ischium fused) with 0–2 simple setae, 7–10 pappose setae, all located on the inner margin; merus subrectangular with 3–5 denticulate setae on the inner margin; carpus subtriangular with 2 denticulate setae, one of them is shorter and other much longer; propodus with 7–9 subdistal and distal denticulate setae, dactylus subtriangular with 10 denticulate setae on distal half region, and 2 apical serrate setae. Exopod two-segmented; proximal segment with 3–4 pappose setae near the inner border and 4–5 marginal simple setae; distal segment (flagellum) bearing 1–2 simple setae and 3–4 apical plumose setae.

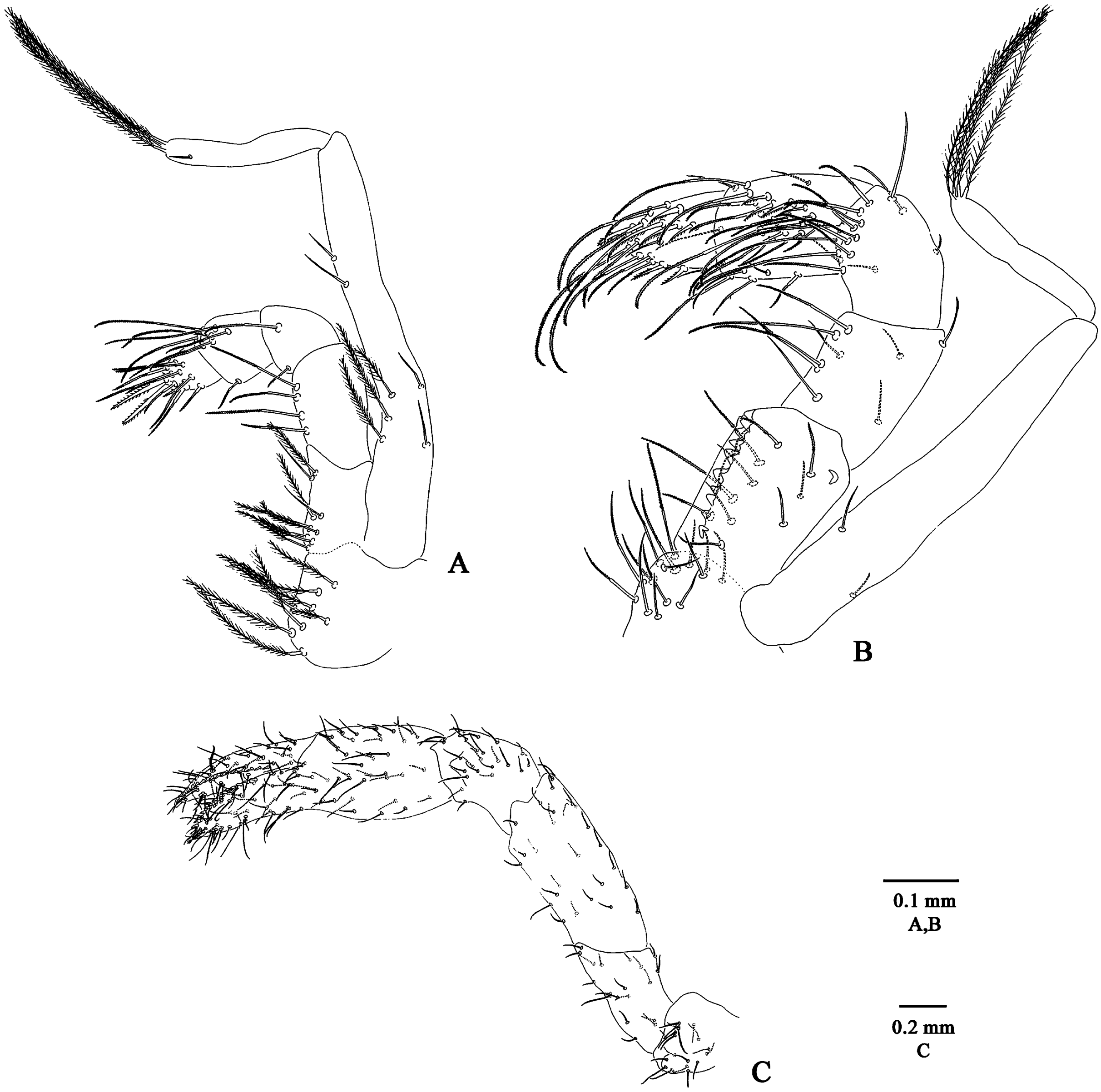

FIGURE 4. First juvenile of *Aegla franca* Schmitt, 1942. **A**, second maxilliped; **B**, third maxilliped; **C**, first pereopod (cheliped).

Third maxilliped (Figs. 4B, 6E–F). Biramous. Endopod five-segmented; ischiobasis with 6 or 7 simple setae and 8 denticulate setae along inner border of the base section; 6–8 simple setae and 5–7 denticulate setae evenly distributed, 1 conspicuous spiniform projection subdistally near outer margin (Fig. 6F), crista dentata along inner margin formed by 9 or 10 corneous tubercles which become progressively larger towards distal border (Figs. 4B, 6F); merus subrectangular with 5–7 simple setae evenly distributed and 4 denticulate setae on the inner margin; carpus subcylindrical with 3–5 simple setae and 11–13 denticulate setae distributed over distal half region; propodus with 7 or 8 simple setae, 14 denticulate setae and 3 or 4 sword setae (Fig. 6E); dactylus subcylindrical and rounded apex, with 1–4 simple setae, 10–13 denticulate setae and 4 or 5 serrate setae, all located on the distal half of the segment. Exopod two-segmented; proximal segment with 1 or 2 marginal simple setae; distal segment (flagellum) with 0 or 1 simple setae and 4 apical plumose setae.

Cheliped (Figs. 4C, 6G). Uniramous and six-segmented. Coxa with 14–19 simple setae; base and ischium fused (ischiobasis), subrectangular with 12–19 simple setae; merus subrectangular with 22–28 simple setae; carpus subtriangular with 20–25 simple setae; propodus with 30–44 and 46–52 simple setae on manus and fixed finger, respectively; cutting edge of fixed finger with 13 or 14 denticles obliquely and serially arranged and 1 apical robust spine (Fig. 6G); dactylus with 1 apical robust spine; 43–54 simple setae and bearing 13–18 denticles obliquely and serially arranged on the cutting edge (Fig. 6G). These denticles along the cutting edge of both fingers are less numerous and more spaced in the proximal half. In the distal half, the series of denticles are so closely together that they partially overlap one another.

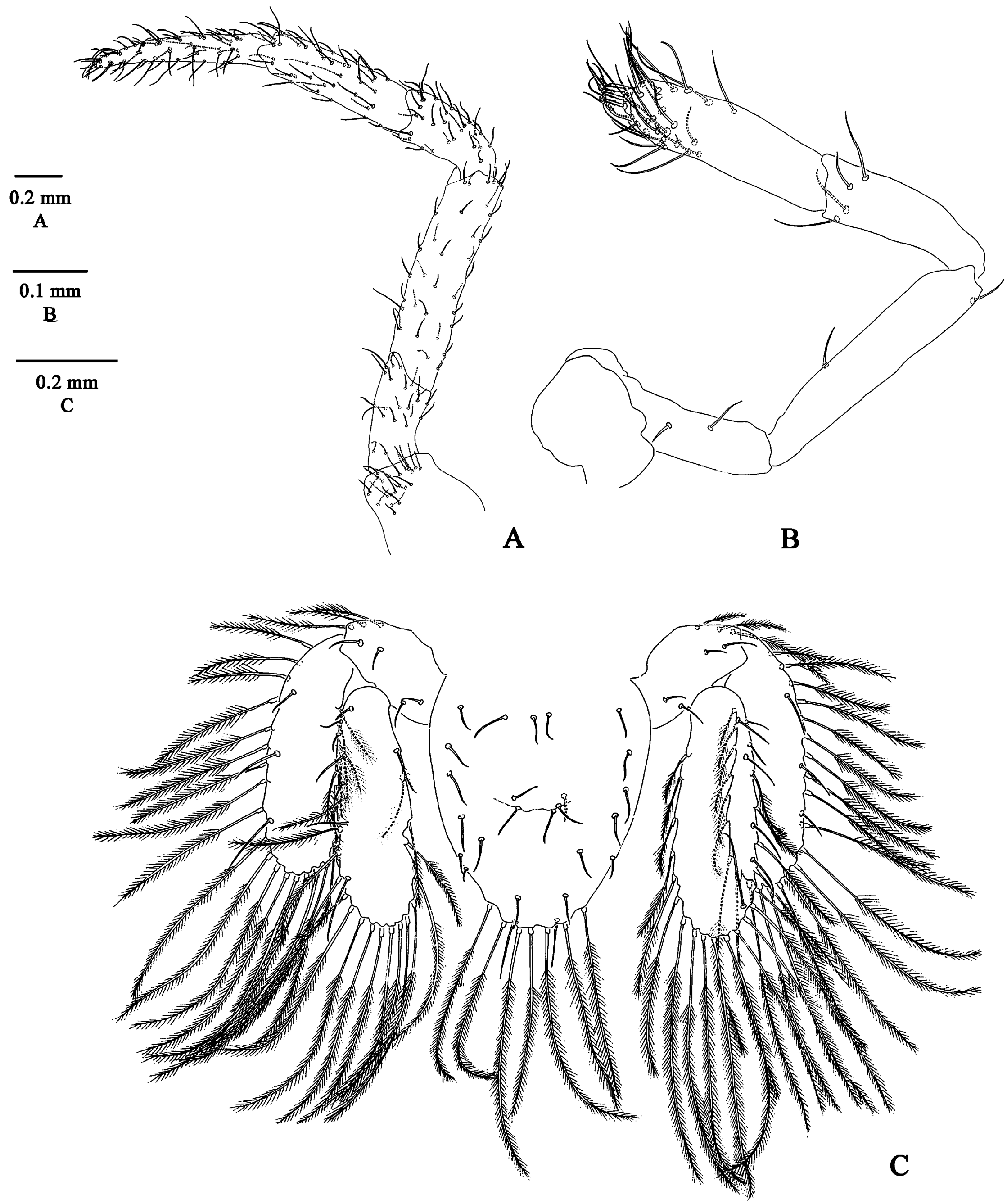

FIGURE 5. First juvenile of *Aegla franca* Schmitt, 1942. **A**, second pereopod; **B**, fifth pereopod; **C**, telson and uropods (tail fan).

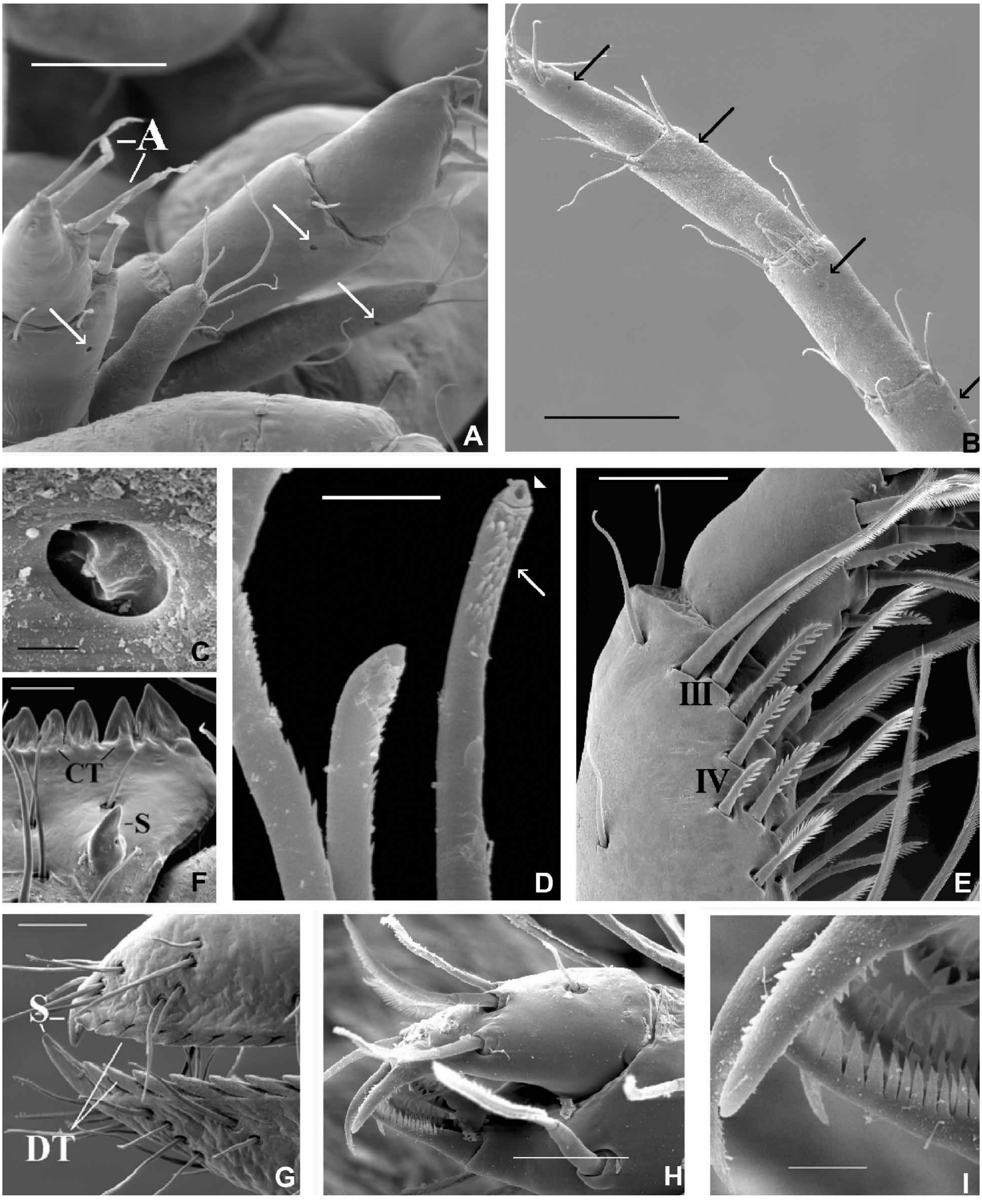

FIGURE 6. First juvenile of *Aegla franca* Schmitt, 1942. **A**, aesthetascs (A) on mesial and distal segments of the antennular dorsal flagellum; pores (arrows) on the dorsal and ventral flagella (bar = 60.51 µm); **B**, pores (arrows) on distal segments of the antennal flagellum (bar = 77 µm); **C**, Magnified view of an antennular pore (bar = 1.67 µm); **D** Scale setae with subterminal pore (arrowhead) and scaly outgrowths (arrow) on the upper lobe of the distal endite of the maxilla (bar = 5.08 µm); **E**, denticulate setae (III) and sword setae (IV) of the propodus of the third maxilliped (bar = 50.85 µm); **F**, ischium with corneous tubercles (CT) forming the crista dentata and the ventral spiniform projection (S) (bar = 25.42 µm); **G**, distal half of movable and fixed fingers of cheliped showing serially arranged denticles (DT) and apical spine (S) (bar = 52.97 µm); **H**, minute chela of the fifth pereopod (bar = 25.48 µm); **I**, detailed of the apical serrate setae from the minute chela of the fifth pereopod (bar = 5.67 µm).

Second pereopod (Fig. 5A). Uniramous. Coxa with 15–18 simple setae; base and ischium fused (ischiobasis), subrectangular and with 17–26 simple setae; merus subrectangular, longer than the other segments of the appendage, with 27–42 simple setae; carpus subrectangular with 20–30 simple setae; propodus subrectangular with 37–44 simple setae; dactylus subtriangular with 50–67 simple setae and an apical robust spine.

Third and fourth pereopods uniramous and similar to second pereopod.

Fifth pereopod (Figs. 5B, 6H–I). Uniramous, reduced as compared to other pereopods, and not used for locomotion. Dacylus and fixed finger of propodus form a minute chela (Fig. 6H). Protopod globose with 0–2 simple setae; ischium subrectangular with 1 or 2 simple setae; merus subrectangular with 2–3 simple setae; carpus subrectangular with 3 or 4 distal simple setae; propodus with 24–28 simple setae distributed over the distal half and 3 apical stout serrate setae (Fig. 6I); dactylus with 5 simple setae and 4 serrate setae (Fig. 6I).

Uropods (Fig. 5C). Biramous. Basal segment (protopod) short, with 3 or 4 mesial simple setae and 2 or 3 marginal plumose setae. Endopod with 5–7 simple setae submarginally and 18 or 19 plumose setae along free border; exopod with, 2–4 simple setae submarginally and 22–25 marginal plumose setae along free border. On both endopod and exopod, the distalmost group of plumose setae are the longest.

Telson (Fig. 5C). laminate, subtriangular, lacking dorsal longitudinal suture; 7–11 long plumose setae along posterior border and 20–26 simple setae distributed over the dorsal surface.

Discussion

The post-embryonic development in *Aegla franca* is epimorphic, in which the hatching form is a juvenile that very much resembles the adults in general morphology. The first juvenile of *A. franca* is larger than the corresponding instar of any other aeglid described so far (Tab. 1). Newly hatched juveniles still remain protected by the flexed abdomen of the female. This parental care has been observed in other aeglid species and it may last for several days (see Bahamonde & López 1961; Rodrigues & Hebling 1978; Bond-Buckup *et al*. 1996; Bueno & Bond-Buckup 1996; Swiech-Ayoub & Masunari 2001; Lizardo-Daudt & Bond-Buckup 2003).

In adult aeglids, both ventral and dorsal antennular flagella are multiarticulated (Martin & Abele 1988), but in newly-hatched juveniles the ventral flagellum consists of one segment only and the dorsal one is formed by three segments, as in *A. franca* (Fig. 2A) and all five species for which the hatched form has been described (see Bond-Buckup *et al.* 1996, 1999; Bueno & Bond-Buckup 1996). The number (four) and position of aesthetascs (three on the distal segment and one on the intermediate segment) on the dorsal flagellum appear to be fairly constant in the juveniles in all these species.

The number of segments on the antennal flagellum shows slight variation among newly-hatched aeglids and ranges from 14 to 18 according to species (Tab. 1). Similar to *A. prado*, and perhaps also *A. longirostri*, *A. franca* presents the minimum number of segments (14) upon hatching, but the number of total simple setae distributed along the flagellum is higher than those found in the two former species. This is comparable to that reported for two other aeglid juveniles, which present additional segments in the flagellum: *A. platensis* (17 segments) and *A. ligulata* (18 segments) (Bond-Buckup *et al.* 1999).

One distinct feature observed in *A. franca* is the presence of pores, of presumed chemosensory function, in some segments of the antennular flagella (in the one-segmented ventral flagellum and in the mesial segment of the dorsal flagellum) (Fig. 6A) and in several segments of the distal half portion of the antennal flagellum (Fig. 6B). All of these antenular and antennal segments bear one pore only, always located subdistally. These sensilla have not previously been recorded for either juvenile or adult aeglids and further studies are needed to establish their nature and function.

The rudimentary morphology of the mandibular incisor process in the newly-hatched juvenile of *A. franca* (Fig. 2C) differs markedly from the well developed condition described for the structure on the corresponding instar of other aeglids. In *A. prado* and *A. violacea*, the state of development of the mandibles of the first juvenile has been characterized as well-developed, with a well calcified incisor process, bearing asymmetrical, well-formed teeth that morphologically resemble the adult form. This similarity is usually associated with the juvenile phase of species with epimorphic development (Bueno & Bond-Buckup 1996; Bond-Buckup *et al.* 1996). Although a detailed description of the pair of mandibles in the first juvenile of *A. platensis* was not provided by Bond-Buckup *et al.* (1999), it appears that it also fits in the category of well-developed, as inferred by the illustration of that appendage provided by the authors.

TABLE 1. Comparison of some quantitative features concerning the carapace, antennal flagellum, scaphognathite, cheliped and telson among the first juvenile of some aeglid species.

Character	Aeglid species		
	A. franca	*A. prado*	*A. violacea*
Carapace			
Length (variation in mm)	1.58–1.79	1.02–1.36	1.01–1.38
Width (variation in mm)	1.63–1.76	0.85–1.19	1.08–1.51
Antennal flagellum			
Number of segments	14–16	14	15
Total number of simple setae	53–63	36	36–38
Maxilla			
Plumose setae on scaphognathite	70–77	50–52	42
First pereopod (cheliped)			
Number of denticles along cutting edge of fixed finger	13–14	9	15
Number of denticles along cutting edge of movable finger	13–18	11	11
Telson			
Number of plumose setae on distal border	7–11	17–20	19–22
References	A	B	C

continued.

Character	Aeglid species		
	A. longirostri	*A. ligulata*	*A. platensis*
Carapace			
Length (variation in mm)	1.39–1.48	1.42–1.58	1.13–1.39
Width (variation in mm)	1.26–1.33	1.33–1.52	1.01–1.23
Antennal flagellum			
Number of segments	14–15	18	17
Total number of simple setae	36–42	54	56
Maxilla			
Plumose setae on scaphognathite	61–69	63	50–55
First pereopod (cheliped)			
Number of denticles along cutting edge of fixed finger	-	-	-
Number of denticles along cutting edge of movable finger	-	-	-
Telson			
Number of plumose setae on distal border	9–12	13	13–17
References	D	D	D

References: A) this study; B) Bond-Buckup *et al.* (1996); C) Bueno & Bond-Buckup (1996); D) Bond-Buckup *et al.* (1999).

According to Lizardo-Daudt & Bond-Buckup (2003), juveniles of *A. platensis* do not feed exogenously during the first few days of life, and subsist only from the yolk reserves concentrated in the cephalothoracic region. After this endogenous resource has been completely expended, the juvenile begins to search for food in the environment. The rudimentary mandibular morphology observed in the first juvenile of *A. franca* may well be associated with this initial period of exclusive yolk-feeding, during which the mandibles would not be functional. As for the rudimentary molar process, this will remain in this condition into the adult (Martin & Abele 1988). On the other hand, the degree of development of the two-segmented mandibular palp in the first juvenile of *A. franca* is very similar to other aeglids at the same life stage (Bueno & Bond-Buckup 1996; Bond-Buckup *et al.* 1996, 1999).

Bond-Buckup *et al.* (1999) reported that *A. longirostri* differs from *A. violacea*, *A. prado*, *A. platensis* and *A. ligulata* in that the former lacks setulose (= plumose) setae on the distal (=basal) endite of the maxillule, a type of seta which is present in variable number in the other four species. In *A. franca*, plumose setae are also absent on the basal endite but pappose setae are present instead, as reported for *A. ligulata* and *A. longirostri* by Bond-Buckup *et al.* (1999).

The maxilla is already well-developed and fully functional in the juvenile of *A. franca*, and morphologically resembles the adult condition. As in all adult decapods, the maxilla plays an important role in handling food particles, and in promoting water movement inside the branchial chamber. Upon hatching, the water ventilation in *A. franca* is promoted by constantly moving the large foliaceous exopod (scaphognathite) which is ornamented by 70–77 plumose setae along its margins. This number of plumose setae is higher than that observed for other newly-hatched aeglids (Tab. 1).

The peculiar kind of setal morphology found on both lobes of the basal endite of the maxilla, that is, long setae with scaly outgrowths subdistally and restricted to the side where a subterminal pore opens (Fig. 6D), has not yet been reported for any appendage either in juvenile or adult aeglids. Scale setae, resembling this one but apparently without a pore, have been described on the border of the minute chela of the fifth pereopod in adult *A. platensis* from Uruguay (Martin & Felgenhauer 1986). Thomas (1971) described a dense fringe of papillate setae with apical pore, on the distal margin of the coxopodite and basipodite in the maxillae of the crayfish *Austropotamobius pallipes* (Lereboullet). Setae with a distal pore are usually associated with a chemoreceptive function and groups of these setae may be found associated with mouth appendages that participate in food handling and tearing while sensing its chemical properties (Jacques 1989).

Bond-Buckup *et al.* (1996) and Bueno & Bond-Buckup (1996) described the exopod of the first pair of maxillipeds as having two elongated rami in the first juvenile of *A. prado* and *A. violacea*, respectively. This condition was not observed in the juvenile of *A. franca*, in which the afore-mentioned thoracic appendage presented a non-ramified, one-segmented exopod. In adult aeglids, the first maxilliped is biramous but the exopod itself presents no additional ramus. Martin & Abele (1988) described the exopod of this thoracic appendage in adult aeglids as two-segmented: the basal segment produced as a lamellar lobe and the distal as a multiarticulated flagellum. The morphology of the exopod in *A. franca* juveniles differ significantly from the adult condition.

Setation of the endopod of the second maxilliped of *A. franca* juveniles is dense. Denticulate setae are typically present in all segments except on the ischiobasis, which presents simple and pappose setae only. Stout serrate setae are restricted to the dactylus. Martin & Abele (1988) pointed out that this pair of thoracic appendages is employed for both feeding and grooming in adult aeglids. Bauer (1989) mentioned that the second maxilliped is employed in the grooming the antennule in the anomuran *Petrolisthes galathinus* (Bosc), but earlier Martin & Felgenhauer (1986) found it difficult to ascertain whether that was also valid for aeglids.

Bauer (1981) noted that antennular preening by the third maxillipeds is a widespread behaviour in decapod crustaceans. These thoracic appendages possess brushes of typically serrate setae that play an important role in the cleaning of chemoreceptor sensillae distributed on the antennule (Bauer 1989). In adult aeglids, Martin & Felgenhauer (1986) confirmed the participation of the third maxilliped in the cleaning process of both antennules and antennae, which is accomplished by drawing the flagella through areas where groups of specialized setae are concentrated such as those near the propodus-dactylus and merus-carpus articulations. Serrate and denticulate setae with double rows of setules are already present in great numbers on the endopod of the third maxilliped of the first juvenile of *A. franca*, and their distribution is particularly dense on the inner surface of the carpus, propodus and dactylus segments.

Additionally, a few stout serrate setae are found on the last two segments of the third maxillipeds and are probably involved in grooming the pereopod surfaces, as suggested by Bauer (1989) for decapods in general. In fact, Martin & Felgenhauer (1986) reported that the dactyli of the walking pereopods are groomed by insertion into the mouth area between the third maxilliped. The well-developed crista dentata along the inner margin of the fused ischiobasis (Figs. 4B, 6F) may also scrape the surfaces of the inserted dactylus of the pereopod as suggested for adult aeglids by Martin & Felgenhauer (1986).

Considering the similarities of the morphology and setation between the third maxilliped endopod of the juvenile of *A. franca* and of adult aeglids (see Martin & Abele 1988 for illustration of appendages in adult forms), it is clear that at hatching, the third maxillipeds are already fully functional for use in grooming.

The general morphology and setation of the first pereopod (cheliped) is similar among first juveniles of aeglids including *A. franca* though the number of denticles along the cutting edge of the fixed and movable fingers may vary with species (Tab. 1). Denticles obliquely and serially arranged as seen in the juvenile form (Fig. 6G) no longer exist in the adults, in which the cutting edges of both fingers are ornamented by a series of tubercules with large implantation area. The presence of these tubercules on the chelae of adult aeglids (*A. franca* included) was recognized by Schmitt (1942), who described this armature as “a close-set pavement or palisade of corneous scales”. However, the large tooth which is present proximally on the fixed finger in the adult of *A. franca* is not yet present in the juvenile.

The reduced fifth pereopod is employed for general body grooming in adults, for cleaning brooded eggs in females, and for cleaning the gills enclosed inside a branchial chamber in many anomuran groups, such as the Galatheidae, Porcellanidae, Paguridae, Lithodidae, Hippidae (Bauer 1981, 1989), and Aeglidae (Martin & Felgenhauer 1986). In juvenile *A. franca*, setation of the fifth pereopod is scarce except on the distal half of the propodus (including the fixed finger) and the dactylus. In addition to some serrate setae on the propodus and dactylus, the small chela of the fifth pereopod presents strong, stout serrate setae at the apex of both fixed and movable fingers (Fig. 6H, I). These stout serrate setae from each finger point in opposite directions and overlap distally, suggesting an efficient mechanism for the active removal of accumulated detritus on the gills by the opening and closing movement of this minute chela. Indeed, Martin & Felgenhauer (1986) stated that the minute chela, and its associated brush of specialized setae, is employed in grooming the posterior gills in adult aeglids. However, Martin & Felgenhauer (1986) and Martin & Abele (1988) noted that the small chela of the fifth pereopod in adult aeglids presents limited opening movement and may not be functional, so the grooming of the gills is performed more intensely by the brushes of serrated setae concentrated distally on the pereopod than by the chela itself.

In most adult aeglids, there is a typical and clear dorsal longitudinal suture that divides the dorsal surface of the telson in two equal halves, except in *A. papudo* Schmitt and *A. alacalufi* Jara & López for which this suture is lacking (Jara & López 1981; Martin & Abele 1988). This suture, however, is absent in the first juvenile of *A. franca* as well as in all five species for which the first juvenile form has been described (Bond-Buckup *et al.* 1996, 1999; Bueno & Bond-Buckup 1996), and it may still remain absent even in the second juvenile instar as in the case of *A. violacea* (Bueno & Bond-Buckup 1996). The longitudinal suture eventually develops in the adults of *A. franca*. Bond-Buckup *et al.* (1999) mentioned that the undivided telson of the first juvenile of *A. platensis* and *A. longirostri* presents a “beginning of a suture on the posterior margin”, a condition which could not be clearly discernible in *A. franca*. The number of plumose setae on the posterior border of the telson also varied according to species (Tab. 1), and although the juvenile of *A. franca* is by far the largest among all species listed in Table 1, the number of these type of setae was the lowest.

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