



Morphology of larval and first juvenile stages of the kangaroo shrimp *Dugastella valentina* (Crustacea, Decapoda, Caridea), a freshwater atyid with abbreviated development and parental care

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Abstract

The larval development of *Dugastella valentina* consists of two zoeal stages and a decapodid. Larval stages are not free living; the complete larval development takes place in the female's incubation chamber. The two zoeae, the decapodid and first postlarval stages still have a large amount of yolk, which ensures their nutritional independence (lecithotrophic stages) while staying within the maternal incubation chamber and the first days after release. The first juvenile is the first free living stage. In the present study the morphology of all larval stages as well as the first juvenile are described and illustrated, and comparison with known larval stages of atyids is made.

Key words: lecithotrophic, heterochrony, benthotrophic

Introduction

The kangaroo shrimp *Dugastella valentina* (Ferrer Galdiano, 1924) is a freshwater atyid shrimp endemic to the Gulf of Valencia area (Spain) in the eastern Iberian Peninsula. The information on the life cycle of *Dugastella valentina* is incomplete, and is almost entirely restricted to data on geographical distribution (Sanz & Gómez 1984) and preliminary life history results (Sanz Santos & Sanz 1994). Recently, Cuesta *et al.* (2006) provided the first data on the larval stages (two zoeae and a decapodid) and the unusual parental care behaviour of this species, in which complete larval development takes place in the female's incubation chamber. However, there are currently no data on the morphology of the larval and postlarval stages.

In the two zoeae and the decapodid stage there is still a large amount of yolk, which ensures the nutritional independence of the larvae (lecithotrophic stages) while they are inside the maternal incubation chamber. The first juvenile is the first free living stage. In the present study the morphology of all the larval stages as well as the first juvenile stage are described and illustrated. We compare these larval stages with the known larval stages of other atyids.

Material and methods

More than 100 ovigerous females of *Dugastella valentina* were collected at different locations in Valencia and Alicante (Spain) over 4 sampling periods during the spring of the years 2005 to 2008. They were transported live to the laboratory and kept in aquaria in order to study their larval phase and behaviour.

Taking into account that larval development takes place in the female's incubation chamber, we used two methods to study the morphology of the larval stages: we removed the different larval stages directly from the maternal incubation chamber, and we took terminal eggs and cultured them "in vitro" until they hatched.

Cultured larvae were not fed as *Dugastella valentina* larvae are obligate lecithotrophs (Anger and Cuesta, unpublished data). The water was changed daily and the larvae were checked for moulting and mortality. Females