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# Embryology of the spider crabs *Leurocyclus tuberculosus* (H. Milne-Edwards & Lucas 1842) and *Libinia spinosa* (H. Milne-Edwards 1834) (Brachyura, Majoidea)

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## Abstract

The embryonic development of the spider crabs *Leurocyclus tuberculosus* and *Libinia spinosa* was divided into five periods based on the differentiation of: I) cleavage, II) embryonic primordium, III) optic lobes, IV) optic lobes pigmented and V) chromatophores presence. Different traits such as spines, setae and telson morphology distinguish the two species from period III until hatching. Egg volume was greater in *Leurocyclus tuberculosus* than in *Libinia spinosa*. The duration of each period was different during development. Whereas in *Leurocyclus tuberculosus* period II (morphogenesis) is the longest, in *Libinia spinosa* the period IV is the longest. Complete embryonic development at 14°C lasted 36.7 ± 3.1 days in *Leurocyclus tuberculosus* and 57.4 ± 4.4 days in *Libinia spinosa*.

**Key words:** Embryonic development, *Leurocyclus*, *Libinia*, Majoidea

## Introduction

Brachyuran crabs show diverse strategies of embryonic development, mainly related to variations in egg size and incubation period (Anderson 1982; Hines 1982; Hartnoll & Gould 1988). Similar sized species can have egg masses composed of few large eggs or many small ones (Hines 1982). Variations in egg and brood size along environmental clines can also occur on a single species but to a minor extent (Diez & Lovrich 2010). These variations can have profound effects on postembryonic life, the egg size is linked to a number of fundamental and adaptive traits such as duration of larval development, larval shape, duration of the facultative feeding period, size at metamorphosis, juvenile growth and survival, resistance to starvation and fertilization success (Moran & McAlister 2009).

Eubrachyuran crabs incubate their eggs attached to the pleopods from spawning to hatching (Guinot 1979). The incubation period varies between species and is mainly affected by temperature (Wear 1974; Garcia-Guerrero *et al.* 2003; Bas *et al.* 2007). Salinity, oxygen availability, and pollution may also affect embryonic development rate and hatching size (Botsford 1991; Bas & Spivak 2000; Giménez & Anger 2001; Fernandez *et al.* 2003). These environmentally induced variations in traits in an early life phase (the embryonic phase) are carried over to the next life phase (larva, juvenile or even adult), having potential effect on population dynamics (Giménez 2006).

Different methods have been used to describe the embryonic development in crustaceans. Some of them are based on visual examination of the embryos while others analyze morphological and anatomical changes and the measurements of embryos. The first is considered an appropriate approach to define the early periods, while the second is considered better to define later ones (Stevens 2006).

Studies on the early life stages of Majoidea often include descriptions of the larval stages (Boschi & Scelzo 1968; Barcardit & Vera 1983; Taishaku & Konishi 2001; Penha-Lopes *et al.* 2006). Instead, the embryonic

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