

# Biology of crab embryos in mangrove forests: from evolutionary trends to climate change perspectives

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## Abstract

The knowledge of natural systems require an integrated and extensive understanding in order to better disclose all single components and the network of associated processes. Moreover, with the aim to assess the mechanisms of ecosystem functioning and the resilience and vulnerability in the light of current trend of climate change, becomes essential to address our focus on the most sensible but crucial features. In this light, to extend our knowledge on mangrove ecosystem, we extensively investigated the biology of early ontogenetic stages in a key-stone taxa of mangrove macrobenthos, the brachyuran crabs. We performed a meta-analysis on 159 species from deep-water to terrestrial crabs using the level of terrestrialization, size of crabs, number of eggs, size of clutches and larval strategies as factors. We demonstrated that the embryos of terrestrial species have shifted to air-breathing, overtaking the problem of water viscosity within the masses and that the egg size evolution is solely dependent to the larval retention strategies, regardless of their degree of terrestrialisation.

We selected Sesarmidae as a model family and, for the first time, we compared air and water respiration of developing embryos. Data from eight sesarmid species show a clear landward trend in air-breathing, with more efficient oxygen extraction in air respect to water in the more terrestrial species, confirming that an adaptation to air respiration is present also in early ontogenetic stages. Besides, we assessed and compared the thermal tolerance of the eggs and larvae of two mangrove brachyuran species, *Uca urvillei* and *Perisesarma guttatum* at mid and low latitudinal ranges to make prediction over the whole species resilience in the context of global climate change. With this contribution we want to underline the importance of a wide-ranging life history approach for the understanding of essential process in complex ecosystems as the mangrove forests.

## Keywords

crabs, embryos development, parental care, climate change, life history, adaptive strategy