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Effects of ocean acidification on larval development and early post-hatching traits in *Concholepas concholepas* (loco)

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ABSTRACT: Larval stages represent a bottleneck influencing the persistence of marine populations with complex life cycles. *Concholepas concholepas* is a gastropod species that sustains the most important small-scale artisanal fisheries of the Chile-Peru Humboldt Coastal current system. In this study, newly-laid egg capsules of *C. concholepas* collected from 3 localities along the Chilean coast were used to evaluate the potential consequences of projected near-future ocean acidification (OA) on larval development and early post-hatching larval traits. We compared hatching time, hatching success and early survivorship of encapsulated larvae reared under contrasting average levels of pCO_2: 382 (present-day), ca. 715 and ca. 1028 µatm CO_2 (levels expected in near-future scenarios of OA). Moreover, we compared morphological larval traits such as protoconch size, thickness and statolith size at hatching. Some of the developmental traits were negatively affected by pCO_2 levels, source locality, female identity, or the interaction between those factors. Meanwhile, the effect of pCO_2 levels on morphological larval traits showed significant interactions depending on differences among egg capsules and females. Our results suggest that OA may decouple hatching time from oceanographic processes associated with larval transport and reduce larval survivorship during the dispersive phase, with a potential impact on the species' population dynamics. However, the results also show geographic variability and developmental plasticity in the investigated traits. This variation may lead to an increased acclimatization ability, facilitate the persistence of natural populations and mitigate the negative effects that OA might have on landings and revenues derived from the fishery of this species.

KEY WORDS: Hatching time · Hatching success · Early larval survival · Protoconch size · Protoconch thickness · Statolith size · Egg capsule wall thickness · Developmental plasticity

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INTRODUCTION

Larval survival in marine invertebrates represents a bottleneck in the recruitment of species with complex life cycles (Rumrill 1990, López et al. 1998). Therefore, adequate larval development and survival have important implications for both the aquaculture and fisheries of species of economic impor-

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