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A comparison of life-history traits in calcifying Spirorbinae polychaetes living along natural pH gradients

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ABSTRACT: Low-pH vent systems are ideal natural laboratories to study the consequences of long-term low-pH exposure on marine species and thus identify life-history traits associated with low-pH tolerance. This knowledge can help to inform predictions on which types of species may be less vulnerable in future ocean acidification (OA) scenarios. Accordingly, we investigated how traits of calcifying polychaete species (Serpulidae, Spirorbinae) varied with pH using a functional trait analysis at 2 natural pH gradients around the Castello Aragonese islet off Ischia, Italy. We first observed the distribution and abundance patterns of all calcifying polychaete epiphytes in the canopy of *Posidonia oceanica* seagrass across these gradients. We then used laboratory trials to compare fecundity, settlement success, and juvenile survival in the dominant species from a control (*Pileolaria militaris* Claparède, 1870) and a low-pH site (*Simplaria* sp.). We found significantly higher reproductive output, juvenile settlement rates, and juvenile survival in *Simplaria* sp. individuals from the low-pH site, compared to *P. militaris* individuals from control pH sites, when observed in their respective *in situ* pH conditions. Our results suggest that tolerance to low pH may result, in part, from traits associated with successful reproduction and rapid settlement under low-pH conditions. This finding implies that other species with similar life-history traits may respond similarly, and should be targeted for future OA tolerance research.

KEY WORDS: Ocean acidification · Calcifiers · Settlement success · Fecundity · Early-life survival · Serpulidae · Population resilience

INTRODUCTION

Anthropogenically driven global changes may reduce or alter marine biodiversity (Raven et al. 2005, Widdicombe & Spicer 2008). One such change, ocean acidification (OA), occurs when surface seawater absorbs increasing atmospheric CO_2, resulting in lower pH and reduced availability of the carbonate ions many marine organisms require to build skeletal structures (IPCC 2014). Despite confidence in forecasts of the chemical impacts from this process into the next century (Bopp et al. 2013, IPCC 2014), uncertainty surrounds the corresponding biological and ecological impacts (Harley 2011, Gaylord et al. 2015).

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