Vol. 550: 121–134, 2016
doi: 10.3354/meps11727

MARINE ECOLOGY PROGRESS SERIES
Mar Ecol Prog Ser

Published May 25

Distribution and functional traits of polychaetes in a CO_2 vent system: winners and losers among closely related species

M. C. Gambi[1], L. Musco[2,6,*], A. Giangrande[3], F. Badalamenti[2], F. Micheli[4], K. J. Kroeker[5]

[1]Stazione Zoologica Anton Dohrn - Integrative Marine Ecology, Villa Dohrn-Benthic Ecology Center, 80077 Ischia, Napoli, Italy
[2]Laboratory of Marine Ecology - IAMC - CNR, 91014 Castellammare del Golfo, Italy
[3]University of Salento, DiSTeBA, 73100 Lecce, Italy
[4]Hopkins Marine Station, Stanford University, Pacific Grove, CA 93950, USA
[5]University of California at Santa Cruz, Santa Cruz, CA 95064, USA

[6]*Present address:* Stazione Zoologica Anton Dohrn, 80121 Napoli, Italy

ABSTRACT: We report on fine taxonomic and functional analyses of polychaetes associated with rocky reefs along a gradient of ocean acidification (OA) at the volcanic CO_2 vent system off the Castello Aragonese (Ischia Island, Italy). Percent cover of algae and sessile invertebrates (a determinant of polychaete distribution) was classified into functional groups to disentangle the direct effects of low pH on polychaete abundance from the indirect effects of pH on habitat and other species associations. A total of 6459 polychaete specimens belonging to 83 taxa were collected. Polychaete species richness and abundance dramatically dropped under the extreme low pH conditions due to the disappearance of both calcifying and non-calcifying species. Differences in distribution patterns indicate that the decreasing pH modified the structure and biological traits of polychaete assemblages independent of changes in habitat. A detailed taxonomic analysis highlighted species-specific responses to OA, with closely related species having opposing responses to decreasing pH. This resulted in an increase in the abundance of filter feeders and herbivores with decreasing pH, while sessile polychaetes disappeared in the extreme low pH zones, and were replaced by discretely motile forms. Reproductive traits of the polychaete assemblages changed as well, with brooding species dominating the most acidified zones. The few taxa that were abundant in extreme low pH conditions showed high tolerance to OA (e.g. *Amphiglena mediterranea*, *Syllis prolifera*, *Platynereis* cf. *dumerilii*, *Parafabricia mazzellae*, *Brifacia aragonensis*), and are promising models for further studies on the responses of benthic organisms to the effects of reduced pH.

KEY WORDS: Annelida · Algal cover · Ocean acidification · Hard bottoms · pH gradient · Covariation · Mediterranean Sea · Functional trait analysis

INTRODUCTION

Increased anthropogenic CO_2 emissions are predicted to be among the major drivers of global change in the coming century in both terrestrial and marine ecosystems (Gattuso & Buddemeier 2000, IPCC 2014). Large among-species variation in biological responses to CO_2-induced ocean acidification (OA) is evident in the literature, but it is biased towards calcifying organisms (Ries et al. 2009, Kroeker et al. 2010, 2013a), with most available data derived from laboratory or mesocosm studies (Fabry et al. 2008, Feely et al. 2009, Kroeker et al. 2010, 2013a). However, recent studies performed in natu-

*Corresponding author: luigi.musco@szn.it