Vol. 502: 157–167, 2014
doi: 10.3354/meps10703

MARINE ECOLOGY PROGRESS SERIES
Mar Ecol Prog Ser

Published April 15

Ocean acidification affects predator avoidance behaviour but not prey detection in the early ontogeny of a keystone species

Patricio H. Manríquez[1,*], María Elisa Jara[1], María Loreto Mardones[1], Rodrigo Torres[2], Jorge M. Navarro[1], Marco A. Lardies[3], Cristian A. Vargas[4], Cristián Duarte[5], Nelson A. Lagos[6]

[1]Instituto de Ciencias Marinas y Limnológicas, Facultad de Ciencias, Universidad Austral de Chile, Valdivia, Chile
[2]Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Coyhaique, Chile
[3]Facultad de Artes Liberales, Universidad Adolfo Ibáñez, Santiago, Chile
[4]Laboratorio de Funcionamiento de Ecosistemas Acuáticos, Centro de Ciencias Ambientales, Universidad de Concepción, Concepción, Chile
[5]Facultad de Ecología y Recursos Naturales, Departamento de Ecología y Biodiversidad, Universidad Andrés Bello, Santiago, Chile
[6]Facultad de Ciencias, Universidad Santo Tomás, Santiago, Chile

[7]*Present address:* Laboratorio de Ecología y Conducta de la Ontogenia Temprana (LECOT), Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Avenida Ossandón 877, Coquimbo, Chile

ABSTRACT: In a series of laboratory Y-maze experiments, we investigated the directional response of juveniles of the muricid snail *Concholepas concholepas*, a rocky-shore keystone predator characteristic of the southeastern Pacific coast, in displaying prey detection and predator escape behaviour after 5 mo rearing under contrasting levels of pCO_2: 390 (present-day), 700 and 1000 µatm CO_2 (as expected in near-future scenarios of ocean acidification [OA]). Regardless of the experimental condition, juveniles significantly chose the Y-maze arm containing prey. In general terms, the directions of the displacement paths of the snails in the Y-maze were straight from the starting point to the final position, where the prey items were offered. Moreover, juveniles reared at present-day concentrations and 700 µatm CO_2 significantly avoided displacement in the Y-maze arm receiving predator odours. This predator-avoidance behaviour was disrupted in juveniles reared at 1000 µatm CO_2. In most cases, displacements recorded under such conditions were sinuous, and the trial individuals did not significantly choose the predator-free arm. In contrast, displacement paths recorded for snails reared at present-day concentrations and at 700 µatm CO_2 were straight from the initial to the final position, with displacements mostly ending near the prey and in the arm free of cues associated with predation. The loss of responses to a natural predator under high pCO_2 levels in the early ontogeny of *C. concholepas* may result in ecologically deleterious decisions by this keystone species. We conclude that the negative effects of OA on the chemosensory behaviour of keystone species could have negative consequences for community dynamics.

KEY WORDS: Y-maze · Chemoreception · Decision-making · Early ontogeny · Mucous trail · pH · *Concholepas concholepas*

INTRODUCTION

Changes in seawater chemistry (e.g. changes in pH and carbonate ion values) in the marine environment are expected to take place under scenarios of ocean acidification (OA) (Orr et al. 2005). OA, as a consequence of rising global CO_2 levels, is expected to have negative impacts primarily on marine shell-forming organisms (Gazeau et al. 2007, Fabry et al. 2008, Salisbury et al. 2008). Most

*Corresponding author: patriciohmanriquez@gmail.com