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PLANT-MICROBE-ANIMAL INTERACTIONS - ORIGINAL RESEARCH

Ocean acidification induces changes in algal palatability and herbivore feeding behavior and performance

Cristian Duarte[1,2] · Jorge López[3] · Samanta Benítez[1,2,4] · Patricio H. Manríquez[5] · Jorge M. Navarro[3] · Cesar C. Bonta[3] · Rodrigo Torres[6] · Pedro Quijón[7]

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Abstract The effects of global stressors on a species may be mediated by the stressors' impact on coexisting taxa. For instance, herbivore–algae interactions may change due to alterations in algal nutritional quality resulting from high CO_2 levels associated with ocean acidification (OA). We approached this issue by assessing the indirect effects of OA on the trophic interactions between the amphipod *Orchestoidea tuberculata* and the brown alga *Durvillaea antarctica*, two prominent species of the Southeast Pacific coast. We predicted that amphipod feeding behavior and performance (growth rate) will be affected by changes in the palatability of the algae exposed to high levels (1000 ppm) of CO_2. We exposed algae to current and predicted (OA) atmospheric CO_2 levels and then measured their nutritive quality and amphipod preference in choice trials. We also assessed consumption rates separately in no-choice trials, and measured amphipod absorption efficiency and growth rates. Protein and organic contents of the algae decreased in acidified conditions and amphipods showed low preference for these algae. However, in the no-choice trials we recorded higher grazing rates on algae exposed to OA. Although amphipod absorption efficiency was lower on these algae, growth rates did not differ between treatments, which suggests the occurrence of compensatory feeding. Our results suggest that changes in algal nutritional value in response to OA induce changes in algal palatability and these in turn affect consumers' food preference and performance. Indirect effects of global stressors like OA can be equally or more important than the direct effects predicted in the literature.

Keywords Ocean acidification · Algae · Amphipods · Feeding behavior · Growth rate

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✉ Cristian Duarte
cristian.duarte@unab.cl

1 Departamento de Ecología y Biodiversidad, Facultad de Ecología y Recursos Naturales, Universidad Andrés Bello, República no. 440, Santiago, Chile

2 Center for the Study of Multiple-drivers on Marine Socio-ecological Systems (MUSELS), Universidad de Concepción, Concepción, Chile

3 Instituto de Ciencias Marinas y Limnológicas, Facultad de Ciencias, Universidad Austral de Chile, Valdivia, Chile

4 Centro de Investigación e Innovación para el Cambio Climático (CIICC), Facultad de Ciencias, Universidad Santo Tomas, Ejército 146, Santiago, Chile

5 Laboratorio de Ecología y Conducta de la Ontogenia Temprana (LECOT), Centro de Estudios Avanzados en Zonas Áridas (CEAZA), Avenida Ossandón 877, Coquimbo, Chile

6 Centro de Investigación en Ecosistemas de la Patagonia (CIEP), Coyhaique, Chile

7 Department of Biology, University of Prince Edward Island, 550 University Avenue, Charlottetown, PE C1A 4P3, Canada

Introduction

The effects of global environmental stressors (e.g., climate change) on marine organism may be modified or mediated by indirect effects resulting from the impact of these stressors on coexisting species (e.g., Poore et al. 2013; Suttle et al. 2007). For example, increments in temperature (global warming) or pCO_2 in the seawater (ocean acidification; OA) may affect plant–herbivore relationships (e.g., O'Connor 2009) and interspecific competition (Díaz-Pulido et al. 2011). In addition, indirect effects have been shown to influence significantly the

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