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ORIGINAL PAPER

Anti-predatory chemical defences in Antarctic benthic fauna

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Abstract Antarctic benthic communities are largely structured by predation, which leads to the development of mechanisms of repellence. Among those mechanisms, chemical defences are quite extensive, yet poorly understood. To increase knowledge about the role of chemical defences in the Southern Ocean ecosystems, we assessed the incidence of feeding repellents in sessile and vagile invertebrates from nine phyla: Porifera, Cnidaria, Nemertea, Annelida, Mollusca, Bryozoa, Echinodermata, Hemichordata, and Tunicata (Ascidiacea). Samples were collected at depths of 120–789 m in the eastern Weddell Sea and Bouvet Island, and at depths ranging 0–100 m in the South Shetland Islands. When possible, specimens were dissected to study anatomical allocation of repellents. The common, eurybathic sea star *Odontaster validus* was chosen to perform feeding repellence bioassays, using diethyl ether (lipophilic) and butanol (hydrophilic) extracts from these samples. Among the 75 species tested, 52 % were studied for the first time for anti-predatory properties. Results provide further evidence of the prevalence of defensive metabolites in Antarctic organisms, with 47 % of the species exhibiting significant repellence within their lipophilic extracts. They also suggest a wider use of non-polar defensive chemicals. Sessile taxa displayed highest repellence activities, with ascidians, cnidarians, and sponges being the most chemically protected. Overall, the present study indicates that natural products by mediating trophic interactions between prey and their potential predators play an important role in structuring Antarctic benthic ecosystems.

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Introduction

Antarctic benthos comprises some of the most ancient and stable marine ecosystems worldwide. There, diverse communities of sessile suspension feeders are mainly structured by biotic interactions (Dayton et al. 1974, 1994; Arntz et al. 1994). The Southern Ocean fauna is characterized by the poor presence of fish and decapods as either competitors or predators (Clarke et al. 2004; Gili et al. 2006). Echinoderms are the dominant vagile megafaunal organisms in terms of abundance and diversity (Dayton et al. 1974; Clarke et al. 2004), with many species representing important generalist predators. Hence many organisms have developed mechanisms to deter them (see Avila et al. 2008; Taboada et al. 2013).

Marine natural products (NPs), mostly secondary metabolites, often regulate the biology, coexistence, and coevolution of species without participating directly in their primary metabolism (i.e. growth, development, and reproduction; see Torssel 1983). Although the descriptive