THE MARINE BIOTA OF SHALLOW-WATER HYDROTHERMAL VENTS AT MILOS, AEGEAN SEA

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Abstract

Macroalgae, seagrass and epifauna were analysed to generate hypotheses about the mechanisms through which vents affect shallow-water ecosystems. They include: increased nutrient supply or food resources; greater habitat provision for cryptic species; induction of advective mechanisms favouring larval settlement, and an intermediate disturbance regime created by periodic emission of toxic fluids.

Keywords: Hydrothermal vents, macroalgae, epifauna, seagrass, Aegean Sea

Introduction

Shallow-water vents occurring along Mediterranean coasts (especially along the Aeolian and Hellenic arcs), emit heat, gas and metals in coastal marine ecosystems. While similar emissions are know to strongly influence the surroundings in deep-sea vents, little has been documented in their shallow–water counterparts. We summarise the results obtained from recent researches carried out at Milos island, Aegean Sea (1). The analysis of macroalgae, seagrass and epifauna offered a sufficiently large array of benthic community responses to generate a first set of hypotheses about the mechanisms through which vents affect shallow-water ecosystems.

Methods

The study was carried out in June 1996 in Palaeochori Bay. Its sea-bottom was mapped by echosounder, and canopy cover of existing seagrass beds was estimated visually. Six rocky shoals, all within 40 m depth, were recognised: three were close to hydrothermal vents, three were not (2). Qualitative samples of macroalgae and fauna were collected at all the sites, and later identified to species. Epibenthic communities were investigated quantitatively by taking images (4 photo-stations x replicate), each with a different slope, i.e., (sub)horizontal, inclined, (sub)vertical and overhanging using a UW camera with a wide-angle (15 mm) lens. Slides were analysed to calculate percentage cover of different taxa. Epibenthic communities were define by cluster analysis on cover data.

Results

Cymodocea nodosa and *Posidonia oceanica* covered the inner and the outer part of the bay, respectively (3). Both showed a patchy distribution but only *C. nodosa* was found in zones with hydrothermal vent, often living in dense rings as close as 12 m from the emission.

83 algae, [36 Rhodophyceae, 33 Fucophyceae, 13 Chlorophyceae, 1 Tribophyceae (4)], and 212 epifaunal species (5) [24 Porifera (6), 32 Cnidaria (7, 8), 33 Serpuloidea (9), 4 Brachiopoda (10)] were collected. Both lists (especially algae) included a large proportion of species with warm-water affinities. Vent sites were comparatively species-richer than non-vent sites.

58 species (algae, poriferans, bryozoans, cnidarians, polychaetes and ascidians) were recognized in the photosamples (11). Substratum cover was nearly 100 % in almost all the stations. Cluster analysis defined three communities dominated by algae and three by animals. Comparing vent and non-vent sites and the different slopes, the most significant differences were detected for overhangs, where the groups dominated by scleractinians and sponges and by sciaphilic algae, respectively, were more abundant at vents.

Discussion

No vent-obligate macroepibenthic species were found: however, the high number of species with warm-water affinities can be related to seawater temperature anomalies induced by venting (12). While the immediate vicinity of vents was usually deprived of macroepibenthos, diversity was proportionally higher at vent sites (5). Vent proximity also correlated with higher epibenthic cover on overhangs, whose morphology may comport confinement and hence accumulation of vent emissions (11). Venting appeared detrimental to *P. oceanica* while *C. nodosa*, a more tolerant species, took advantage (1).

These results underline a significant influence of shallow-water venting. These effects range from taxonomic selection, some species or higher groups being favoured while others are inhibited, to a general enhancement of species richness. The latter may be caused by (9): increased nutrient supply to algae or food resources to filter-feeding epifauna; greater habitat provision for cryptic species through enhanced deposition of carbonate mounds; induction of advective mechanisms favouring larval settlement, and an intermediate disturbance regime created by the periodic emission of toxic fluids. Further studies are necessary to test these hypotheses and elucidate the vent-induced patterns on shallow-water biota.

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