The marine benthic invertebrate assemblage recruited to artificial substratum units in shallow waters near Casey Station, Antarctica, and its utility for environmental monitoring.

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Abstract

Community structure, diversity and faunal abundance patterns of the assemblage of marine benthic invertebrates that recruited to Artificial Substratum Units (ASUs) deployed in the shallow nearshore waters of Casey Station, East Antarctica, were investigated to determine the suitability of these ASUs as a sampling method for biological monitoring of Antarctic marine environments. The ASUs employed in this study were made of nylon mesh pot scourers.

The assemblage that recruited to the ASUs was dominated by small motile fauna including peracaridean crustaceans, gastropods and polychaetes. Crustacea were the most diverse group and gastropods were the most abundant group. Species that were often numerically dominant in the samples include *Skenella paludinoides* (Gastropoda), *Antarctogenia macrodactyla* (Amphipoda), *Munna c.f. maculata, Cymnodocella tubicauda* (Isopoda) and *Nototanais antarcticus* (Tanaidacea). Nematodes, nemerteans, turbellarians and ophiuroids are commonly present in the assemblage. Some sessile fauna were also sampled by the units and a spirorbid polychaete commonly occurred in high abundance. Many of the taxa that recruited to the ASUs have also been recorded in other Antarctic locations.

Investigations of the physical structure of the ASU found that the colour of the scourers had no effect on the assemblage and that ASUs made of three scourers would adequately sample the available taxa in sufficient abundances for analysis. Deployment times of one year, which included an over winter period and a late summer collection, sampled an assemblage with consistent numbers of species and abundance ranges of individuals suitable for analyses.

The ASU assemblage is highly variable both within sites and between sites. Multivariate analyses found significant differences within and between all sites and between the control sites and a known impacted site. Analyses of the univariate diversity indices and abundance patterns of selected taxa also detected significant differences within sites and between sites but did not detect differences between control and impacted locations. The

inherent natural spatial variability of the ASU assemblage makes careful choice of control locations particularly important for studies monitoring environmental impacts and change. Control locations must be as similar as possible to reduce all sources of variation that are not related to the impact or disturbance being studied.

The sensitivity of the ASU assemblage to positioning and timing of deployment mean that its use in a monitoring program must follow rigorous standardisation of deployment methods. The high frequency of ice disturbance in shallow Antarctic waters and the risks this poses for experimental units warrant further development of the deployment methods.

Certification

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree.

I certify that any help received in preparing this thesis, and all sources used, have been acknowledged in this thesis.

[redacted]

Sarah Elizabeth Richards

I dedicate this thesis to my grandmother, Kathleen (Kit) Mary Hamilton (1907-2002), who taught me about love, thrift and endurance.

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