Functional group diversity and composition in relation to environmental differences in Marguerite Trough, West Antarctic Peninsula

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Marine ecosystems in Antarctica are thought to be highly vulnerable to dynamic global warming. In the deep-water ecosystem, benthic organisms are likely to be among the best indicators to environmental changes and give early warnings of ecosystem vulnerability. In 2017 we sampled deep-water benthic assemblages across a continental shelf trough in Marguerite Bay, West Antarctic Peninsula (WAP). This region is one of the hotspots of climate mediated physical change on Earth. Video and images were captured at 5 stations, each with 20 replicates to identify and compare benthic functional group composition and diversity. We also collected adjacent environmental information of depth, temperature, salinity, oxygen and chlorophyll-a (using a CTD). We identified 1,382 individuals from 13 functional groups across all five sites. With 557 individuals, MT5 (the northern bank of the trough) comprised the most functionally varied assemblages, accounting for 40% of total abundance. Climax sessile suspension feeders were the most dominant group with 539 individuals (39% of the total abundance). This included Porifera, Brachiopoda and erect Bryozoa. A multivariate analysis showed that assemblages at MT5 significantly differed from MT1, MT2, MT3 and MT4 in terms of functional group composition. This biological difference was coincident with topographic and substrate differences of MT5 (predominantly rocky), compared to the other stations (mainly sediment). In terms of physico-chemical parameters, MT5 was similar to MT1 and MT2 (the southern bank and nearby), particularly characterised by similar temperature and chlorophyll-a values. However, MT5 differed in depth. Depth emerged as a key factor in the Bio-Env analysis in which it contributed the most to the difference of functional groups between MT5 and other stations. Our study shows that a non-invasive, low taxonomic skills, functional group approach not only valuable in providing functional perspective on environmental status, but they also proved to be sensitive to environmental variability.

Keywords: benthic community, functional group, diversity, Marguerite Trough, West Antarctic Peninsula.