

FROM OBSERVATION TO EFFECT: INTEGRATED APPROACHES TO MONITORING AND ASSESSMENT IN MARINE ECOSYSTEMS IN ANTARCTICA, AN OVERVIEW FROM CASEY STATION

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Monitoring includes both targeted studies designed to verify the predicted effects of specific activities and more exploratory studies designed to detect “unknown” or unpredicted impacts. In the marine environment monitoring typically begins with an empirical experiment or survey, such as measuring chemicals in the environment or testing for differences in biota between impacted and reference areas. From this, correlations between the presence of a disturbance (e.g. contamination) and differences between impacted and reference areas are either confirmed or disproved – with due allowance for natural variation.

The step lacking from many monitoring programs is the specific demonstration of a causal link using manipulative experiments in which the disturbance is simulated in a controlled environment, either in the field or laboratory. This stage is often seen as too difficult or too time consuming but is vital to unequivocally demonstrating that an impact is occurring and is attributable to the activity in question. It is particularly necessary when there is no before-impact data, and is a very sensible precaution if expensive remediation actions are being considered.

We demonstrate how we used this approach at Casey Station to show that an abandoned waste dump has caused impacts in adjacent marine communities. Importantly we planned an integrated series of surveys and experiments, requiring development of methods specifically suited to Antarctic conditions, including optimising methods for measuring metals in Antarctic sediments and testing a range of experimental monitoring techniques.

We show that recruitment experiments are particularly useful for demonstrating the link between anthropogenic disturbance and their effects. They can be utilized at a range of spatial and temporal scales and provide information about a key process that is crucial for ecosystem recovery. We present results from a series of experiments in different habitats which demonstrate similar responses, and show the value of integrated an approach to marine monitoring in Antarctica.