

Hydroacoustic habitat mapping in Potter Cove (King George Island, Antarctica)

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Climate change increasingly affects the coastal areas off Antarctica. Strongest environmental response occurs in the transition zones that mediate between the polar and subpolar latitudes. Potter Cove, a minor fjord at the northern tip of the Antarctic Peninsula is significantly affected by rising temperatures and retreating ice sheets. Large amounts of turbid meltwaters affect both, the seafloor and the water column and cause stress for many biota. There is an increasing demand to monitor the ongoing change and to work out means for comparison with similar coastal ecosystems under pressure. Marine habitat maps provide information on the seafloor characteristics that allow to describe and evaluate the status of the recent coastal ecosystem and to predict its future development. We used a RoxAnn acoustic ground discrimination system, a sidescan sonar, grab samples (grain size and TOC) and underwater video footage to gain habitat information. Supervised and unsupervised classification routines (including fuzzy k-means clustering and LDA) were employed to calculate models ranging from two classes (soft bottom habitat, stone habitat) to 7 classes (including classes of rocks with and without macroalgae as well as classes of gravels, sands and silts). Including organic carbon in the database allowed to identify a carbon-depleted class proximal to the glacier front. Potter Cove reveals features that are related to the climate-controlled environmental change: very rough seafloor topography in a small basin close to the fjord head which was cleared by the retreating tidewater glacier through the past two decades. The increasing distance to the glacier down-fjord causes existing habitats to smooth and mature and new habitats to form. This process will change the terrestrial and marine face of Potter Cove until the ongoing climatic change stops or even reverses. It becomes apparent that the final interpretation of the results benefits significantly from the different discrimination and classification approaches.