
Species distribution modeling and the heterogeneity of Antarctic biodiversity data

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Abstract

Species Distribution Modeling (SDM) is commonly used in biogeography and macroecology for analyzing the patterns of species distributions and the environmental factors that control them. It’s a crucial issue to biodiversity conservation in the current context of climate change and direct anthropogenic stressors.

SDM is challenging when applied to marine life, especially for the remote and still little-known biodiversity of the Southern Ocean due to the scarcity and heterogeneity of the data available.

Prior to analyzing the link between species distribution and future environmental changes, we decided to explore the heterogeneity of biotic and abiotic data in space and time with regards to past environmental changes. We worked with a dataset that includes more than 7,000 georeferenced occurrence data of Antarctic echinoids, data obtained from samples collected in the Southern Ocean (i.e. south of 45°S latitude) during oceanographic cruises led over the last 150 years or so. Echinoids are common in benthic communities of the Southern Ocean. A total of 80 different Antarctic species occur and display contrasted life traits, ecological niches, and distribution patterns across austral provinces and bioregions.

Environmental data were gathered from datasets of the World Ocean Atlas 2013 and from those used in the Biogeographic Atlas of the Southern Ocean published in 2014. Data were formatted to the same 0.1 degree grid resolution. Different modeling procedures were applied (Maxent, BRT, GAM), their performances compared with each other and in relation to the size and nature of echinoid ecological niches as well as to data heterogeneity.

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Keywords: Species distribution modeling, Antarctic, Echinoids, Macroecology