Improving the quality of species distribution models at large spatial scale to better future predictions

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The Southern Ocean is one of the regions on Earth that has experienced the fastest climate change over the last 30 years. Environmental consequences such as increase in sea water temperature, shifts in marine front position, seasonal changes in sea-ice extent will impact benthic communities. In this context, determining the factors that drive species distribution is fundamental for conservation issues, as understanding the impact of climate change on species communities is a prerequisite to develop appropriate conservation strategies.

Many works have stressed the need to improve the quality of sampling effort in macroecological and biogeographical studies of the Southern ocean. This idea was supported by the Census of Antarctic Marine Life (CAML), a 5-year project that aimed to improve our knowledge of all levels of marine life in the Southern Ocean. Despite the numerous oceanographic cruises led under the umbrella of the program, gaps still persist in our knowledge of species distribution and diversity in non- and little-explored areas. Species distribution modeling can be used to improve our knowledge of species distribution. Procedures were developed for predicting species distribution over vast areas and quantifying species – environment relationships.

This was applied on *Antarctic echinoids*, which are a common component of benthic communities. Echinoids occur in a large range of habitats from coastal areas to deep sea and *show various ecological traits including nutrition and reproductive strategies. Modeling was performed using occurrence data from* a coherent dataset including over 7100 georeferenced records obtained during 150 years of sampling effort.

Our main aim was to produce robust species distribution models and predict potential shifts in species distribution with regards to environmental changes. We tested the performance of ten different modeling procedures and the effect of the chronological addition of new records on model performance, comparing periods before and after CAML cruises and the consequent increase of sampling effort. Then, we quantified and corrected our models for sampling bias. All analyses were performed with R and incorporated in a GIS.