

Adrian Dahood

George Mason University, United States

Dynamic Food Web Models as a Tool to Evaluate Marine Protected Area Scenarios for the Western Antarctic Peninsula Region

Dr. Adrian Dahood [1], Dr. Kim de Mutsert [1], Dr. George Watters [2]

[1] Environmental Science and Policy Department, George Mason University, Fairfax, USA; [2] Antarctic Ecosystem Research Division, NOAA, La Jolla, USA

The Commission for the Conservation of Antarctic Marine Living Resources (CCAMLR) is actively pursuing establishing a marine protected area (MPA) in the Western Antarctic Peninsula region (WAP). This work seeks to supplement the CCAMLR MPA planning process by using dynamic food web models to explore how MPAs could affect biomass accumulation patterns in the WAP. Ecopath with Ecosim is a multi-tiered dynamic food web modelling software package. It was used to develop a mass balanced food web model (Ecopath), time dynamic simulations of the food web (Ecosim), and spatially and temporally dynamic simulations (Ecospace) for the WAP. The Ecosim model was calibrated using time series data for eight species for the years 1996-2012. The Ecospace simulation was tuned using broad scale trends reported in the literature for the same years. Temporal and spatio-temporal data describing the sea-ice regime were incorporated and improved model fit. Hundred-year scenarios were developed to examine the potential impact of changing sea-ice conditions, fishing levels, and four MPA boundary configurations. The MPA boundaries evaluated do not represent proposals; they were selected to learn about how MPAs could function in the region. Scenario evaluation illustrated the importance of fishing effort and location in influencing spatial patterns of biomass accumulation. Simulation outcomes also indicated that krill may concentrate in southern areas of the WAP. MPA scenario evaluation highlighted that effective MPA configurations in the WAP are very large, are in place for an extended period, and include the southern area where simulations indicated that krill concentrate. The aim of this research is to use insights gained from spatio-temporal dynamic food web modelling to contribute to the discussion on which areas to prioritize for protection in the Western Antarctic Peninsula region.