



OLD DOMINION UNIVERSITY

Center for Coastal Physical Oceanography

I D E A FUSION

Department of Ocean, Earth and Atmospheric Sciences and
Center for Coastal Physical Oceanography
M.S. Thesis Defense

**“CLIMATOLOGICAL DISTRIBUTIONS OF *EUPHAUSIA SUPERBA*,
EUPHAUSIA CRYSTALLOROPHIAS, AND *PLEURAGRAMMA ANTARCTICUM*
WITH CORRELATIONS TO ENVIRONMENTAL VARIABLES
IN THE WESTERN ROSS SEA, ANTARCTICA”**

Linnea Brynn Davis

Advisor: Dr. Eileen E. Hofmann

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Abstract

Antarctic krill (*Euphausia superba*), crystal krill (*Euphausia crystallorophias*), and Antarctic silverfish (*Pleuragramma antarcticum*) are key mid-trophic level species in the Ross Sea food web that provide connectivity between primary production and the upper trophic levels. Climatological distributions of these species were constructed from net-based and acoustic observations collected in the western Ross Sea from 1988-2004. Distributions of environmental conditions in the Ross Sea were obtained from a high-resolution circulation model (temperature, mixed layer depth, surface speed) and satellite-derived observations (chlorophyll, sea ice cover). These distributions were analyzed with a range of statistical methods to determine the extent to which species distributions are determined by environmental conditions. The results showed that each species occupies a localized habitat defined by different environmental characteristics. Antarctic krill are concentrated along the northwestern shelf break and prefer deep areas overlying warm water at depth, reduced sea ice cover, slow surface speeds, and proximity to the shelf break. Within this habitat, krill biomass is associated with deeper mixed layers. Crystal krill and Antarctic silverfish are concentrated in Terra Nova Bay and prefer southwesterly latitudes, coastal proximity, cold temperatures, and slow surface speeds. Within Terra Nova Bay, crystal krill biomass is associated with cold temperatures and northerly latitudes. Antarctic silverfish biomass is associated with low chlorophyll. The Antarctic krill habitat off the shelf break coincides with the availability of CDW at depth, which is important for early life stages. The crystal krill and Antarctic silverfish habitat in Terra Nova Bay coincides with the coastal polynya, sea ice, cold temperatures, and slow surface speeds that are needed for their early life stages. The habitat characteristics obtained for the three species provide a basis for projecting potential changes resulting from climate change. The habitats identified for the three species delineate regions of the Ross Sea that deserve focused management and inform the selection of regions for marine protected areas that support ecosystem level conservation plans.