Temporal Changes in South Atlantic Ocean Fish Biodiversity

Nathan Baker
The Graduate Program of the University of Charleston

Introduction
• We are in the mist of a global biodiversity crisis
• Changes in fishing pressure and ocean pH and temperature could be altering fish communities
• Fish biodiversity may be declining and becoming more homogenous
• However this pattern likely depends strongly on spatial and temporal scale

Objectives
• Measure changes in fish biodiversity across scales in the South Atlantic Ocean over the past 25 years
• Estimate the relative importance of shifts in 1) number of individuals, 2) degree of species rarity, and 3) spatial clumping on shifts in biodiversity
• Compare the changes through space to changes through time
• Due to environmental change we expect to observe that:
  1) Number of individuals has decreased
  2) Number of species has decreased
  3) Communities have become similar through time and space

Methods
• Use trawl survey data collected by SCDNR SEAMAP group
• Trawl data compiled for each year and across coastal areas:
  • North Carolina, South Carolina, and Florida+Georgia
• Use R statistical program to analyze biodiversity
  • Number of species and number of individuals needed for creating rarefaction curves
  • Quantify effects of species abundance distribution, abundance of individuals, and aggregation

Advantages of the Data Set
• Compiled by SCDNR SEAMAP group
• Contains trawl survey data from 1989 – 2014
• Trawl sites spanning along the coast from Cape Hatteras, NC to Cape Canaveral, FL
• Seasonal sampling with hundreds of thousands of specimens
• Strong data set for sandy bottom communities

Significance
• will provide a new outlook on the biodiversity of soft-bottom fish South Atlantic coastal region
• identify most sensitive components of fish biodiversity
• potentially identify more sensitive regions and improve focus of regional fisheries policies
• Can hopefully serve as springboard for studies on key factors that drive fish biodiversity changes

Further Studies
• Can hopefully try to determine key factors that resulted in observed changes in biodiversity
• Potentially able to measure changes as an effect of:
  • Changing ocean temperatures
  • Changes in ocean pH
  • Changes in fishing pressure
  • Seasonal changes

Potential Results

A) Comparing 1990 community to 2014 community
B) Comparing species richness across coastal regions

Species richness as a function of effort. A) Comparing 1990 community to 2014 community
B) Comparing species richness across coastal regions

Effects of species abundance distribution (SAD), number of individuals (N) and aggregation on the change in species richness (delta S) over time or space

Area of trawl surveys conducted by SCDNR. Three thick lines show latitudinal sections of analysis for this study

Committee Members
Dan McGlinn, Joseph Ballenger, Craig Plante, and Allan Strand