Predicting blue crab abundance and landings with life-stage variables from fisheries independent surveys from Charleston Harbor, South Carolina

Modeling the effectiveness of fisheries independent surveys to measure blue crab (*Callinectes sapidus*) populations in Charleston Harbor, South Carolina

Marked high fluctuations in blue crab (*Callinectes sapidus*) seasonal and annual abundance, and commercial landings are typical, but data from both fisheries independent and dependent surveys have shown declines in populations in recent years in South Carolina and along the broader South Atlantic Bight region. Despite several long-term fisheries independent surveys encountering blue crab, predictive models have not been developed in South Carolina to quantify or explain variation in abundance, commercial landings and population structure (size and sex ratio). The purpose of this study is to explore predictive relationships between multiple, lagged population structure variables of blue crab and abundance and landings. Because blue crab sampling is easily affected by sampling artifacts, data from several long-term South Carolina Department of Natural Resources (SCDNR) fisheries independent blue crab surveys were put through a rigorous data wrangling process to develop a standardized abundance expressed as a catch per unit effort (CPUE) for each survey. Single and multiple Ordinary Least Squares regression models were populated with 1- and 2-yr. lagged population structure explanatory variables. A tidal creek trawl is the only survey with significant, but weak correlative relationships between lagged mean annual population structure variables and its own mean annual total CPUE. No interactions between explanatory variables were observed when used to populate multiple regression models, but additive models had improved correlations. Significant relationships with stronger correlation were found, however, when commercial landings with a fishing effort factor were predicted using the Harbor Trawl survey immature males lagged 1-yr, and the Creek Trawl survey’s mature males lagged 1-yr. No interaction was observed between these variables when used to populate a multiple regression model, and correlation did not strengthen. Results from these analyses suggest effective population sampling by the surveys, but a potential influence on abundance of blue crab from outside factors such as fishing, habitat or environmental variables. Integrating the influence of habitat or environmental variables in CPUE calculations and the employment of advanced modeling techniques should be explored further.