**General Notes:**

* SEAMAP sampling methods have changed a lot over time
* Missing details on the gear for the Northeast surveys
* Method from stock assessment seems to be:
  + Identify differences in catchability between surveys (difficult to do; they need to overlap or be tested side-by-side… seems to be researched separately by NMFS)
  + Come up with calibration factors for fish counts and biomass
  + Feed standardized survey results into models (but what do they do with them?)

**Notes—Black Sea Bass Stock Assessment**

<https://www.nefsc.noaa.gov/publications/crd/crd1703/bsb-assessment.pdf>

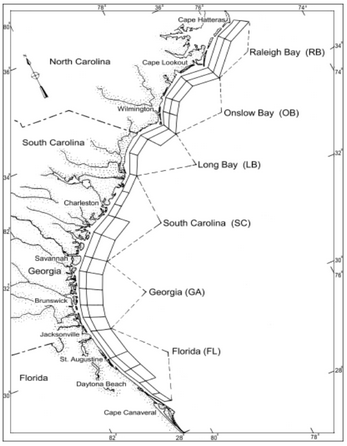
* Calculate fish per tow to compare surveys
* Focused on winter and spring data
* Converted fish per tow to area swept abundance estimates, for NMFS data, and (for spring surveys) used log transformation to deal with very high catch values?
  + NEFSC winter bottom trawl survey: 0.0131 nm squared
  + Spring survey: Albatross 0.0112 nm squared, Bigelow 0.007 nm squared
  + This is going to be a very annoying method for me to implement…

**Notes—Summer Flounder Stock Assessment**

<https://www.nefsc.noaa.gov/publications/crd/crd1615/crd1615.pdf>

* NEFSC spring and fall bottom trawl surveys switched boats in 2009; new one *Bigelow* has very different catchability than *Albatross* (old one)
  + Developed a method to convert HBB to ALB equivalents
  + HBB catches 1-3x the biomass and number of fish! Calibration factors in document

**SEAMAP South Atlantic Coastal Survey (previously Shallow Water Trawl Survey)**



“Strata sampled by the SEAMAP-SA Coastal Survey. Inner (shallow) strata sampled during all seasons throughout the survey. Outer (deep) strata were sampled (south in spring, north in fall) from 1990-2000. (Strata are not drawn to scale.)” <http://www.seamap.org/CoastalSurvey.html>

From SEAMAP: <http://www.seamap.org/SEAMAP%20Annual%20Reports/SEAMAP%20Annual%20Report%202016.pdf>

The Coastal Trawl Survey, conducted by the South Carolina Department of Natural Resources (SCDNR), continued as the long-standing core component of SEAMAP-SA survey activity. The overall goal of this survey is to continue to build a long-term database to provide data for stock assessments and to aid in management of stocks off the coast of the southeastern U.S. Initiated as a pilot project in 1986, this fishery-independent study was designed to monitor the distribution, abundance, and life history aspects of coastal species in the South Atlantic Bight, and to measure associated environmental parameters in nearshore coastal waters. Sampling was standardized in 1990 and in January 2001, the sampling design was changed based on the results of an external program review. Offshore strata were discontinued, and additional stations were added to inshore strata for all three (spring, summer, and fall) cruises to reduce variability in the abundance estimates for priority species. In 2009 through 2012 the seasonal effort was increased again by 10%. However, as of spring 2013, seasonal effort was reduced to pre-2009 levels as a result of funding. Note that as 7 a result of cumulative cost savings the seasonal effort increased to 2009-2012 levels (112 stations per season) for the calendar years of 2015 and 2016. The objectives of the survey were to collect data on annual, seasonal, and latitudinal distribution, abundance, and biomass of most species encountered; collect additional size data on priority finfish, sharks, decapod crustaceans, xiphosurans, and sea turtles; collect additional data on sex and gonad development of White, Pink, and Brown Shrimp and Blue Crabs; and collect otoliths and gonad tissues from selected finfish specimens.

*Methods and Sampling History*

<http://www.seamap.org/documents/CoastalSurveyinfo.pdf> <http://www.seamap.org/documents/Coastal%20Survey/SEAMAP%20CS%20Acknowledgment.pdf>

Samples are taken by trawl from the coastal zone of the South Atlantic Bight (SAB) between Cape Hatteras, North Carolina, and Cape Canaveral, Florida (Figure 1). Multi-legged cruises are conducted in spring (early April - mid-May), summer (mid-July - early August), and fall (October - mid-November). Stations are randomly selected from a pool of stations within each stratum. The number of stations sampled in each stratum is determined by optimal allocation. A total of 102 stations are sampled each season within twenty-four shallow water strata, representing an increase from 78 stations previously sampled in those strata by the trawl survey (1990-2000). Strata are delineated by the 4 m depth contour inshore and the 10 m depth contour offshore. In previous years (1990-2000), stations were sampled in deeper strata with station depths ranging from 10 to 19 m in order to gather data on the reproductive condition of commercial penaeid shrimp. Those strata were abandoned in 2001 in order to intensify sampling in the more shallow depth-zone.

The R/V Lady Lisa, a 75-ft (23-m) wooden-hulled, double-rigged, St. Augustine shrimp trawler owned and operated by the South Carolina Department of Natural Resources (SCDNR), is used to tow paired 75-ft (22.9-m) mongoose-type Falcon trawl nets (manufactured by Beaufort Marine Supply; Beaufort, S.C.) without TED’s. The body of the trawl is constructed of #15 twine with 1.875-in (47.6-mm) stretch mesh. The cod end of the net is constructed of #30 twine with 1.625-in (41.3-mm) stretch mesh and is protected by chafing gear of #84 twine with 4-in (10-cm) stretch “scallop” mesh. A 300 ft (91.4-m) three-lead bridle is attached to each of a pair of wooden chain doors which measured 10 ft x 40 in (3.0-m x 1.0-m), and to a tongue centered on the head-rope. The 86-ft (26.3-m) head-rope, excluding the tongue, had one large (60-cm) Norwegian “polyball” float attached top center of the net between the end of the tongue and the tongue bridle cable and two 9-in (22.3-cm) PVC foam floats located one-quarter of the distance from each end of the net webbing. A 1-ft chain drop-back is used to attach the 89-ft foot-rope to the trawl door. A 0.25-in (0.6-cm) tickler chain, which is 3.0-ft (0.9-m) shorter than the combined length of the foot-rope and drop-back, is connected to the door alongside the foot-rope. In all tows, nets are each given a collection number (port=odd, starboard=even); however data are pooled for analysis, with the port (odd) collection number assigned to the tow. Trawls are towed for twenty minutes, excluding wire-out and haul-back time, exclusively during daylight hours (1 hour after sunrise to 1 hour before sunset). **Contents of each net are sorted separately to species, and total biomass and number of individuals are recorded for all species of finfish, elasmobranchs, decapod and stomatopod crustaceans, cephalopods, sea turtles, xiphosurans, and cannonball jellies. Only total biomass is recorded for all other miscellaneous invertebrates (excluding cannonball jellies) and algae, which are treated as two separate taxonomic groups.** Marine turtles are released in good condition according to NMFS permitting guidelines.

Where large numbers of individuals of a species occur in a collection, the entire catch is sorted and all individuals of that species are weighed, but only a randomly selected subsample are processed and total number is calculated. For large trawl catches, the contents of each net are weighed prior to sorting and a randomly chosen subsample of the total catch is then sorted and processed. In every collection, each of the priority species is weighed collectively and individuals are measured (Table 1). For large collections of the priority species, a random subsample consisting of thirty to fifty individuals is weighed and measured. Depending on the species, measurements of finfish are recorded as total length or fork length, measured to the nearest centimeter. Additional data are collected on individual specimens of penaeid shrimp (total length in mm, sex, female ovarian development, male spermatophore development, occurrence of mated females), blue crabs (carapace width in mm, individual weight, sex, presence and developmental stage of eggs), sharks (total and fork lengths in cm, individual weight, sex), horseshoe crabs (prosoma width and length in mm, individual weight, sex), and sea turtles (curved and straight lengths and widths in cm, individual weight, PIT and flipper tag numbers). Gonad and otolith specimens are also collected during seasonal cruises. A representative sample of specimens from each centimeter size range within each stratum are measured to the nearest mm (TL and SL), weighed to the nearest gram, and assigned a sex and maturity code. Sagittal otoliths and a representative series of gonadal tissue are removed, preserved, and transported to the laboratory at MRRI, where samples are processed. **Hydrographic data collected at each station include surface and bottom temperature and salinity measurements taken with a Seabird SBE-19 CTD profiler, sampling depth, and an estimate of wave height. Additionally, atmospheric data on air temperature, barometric pressure, precipitation, and wind speed and direction are also noted at each station.**

Northeast survey methods (at least as late as 2012—from NOAA documentation): <https://www.nefsc.noaa.gov/femad/ecosurvey/mainpage/cruise_results.html>

All Survey tows were completed using the standard NEFSC bottom trawl survey protocol for the NOAA ship Henry B. Bigelow. A 20-minute survey trawl haul was made at each pre-selected station. The standard towing speed was 3.0 knots, speed over ground. The scope ratio used varied with depth and was determined by the NEFSC standard scope ratio table. Sampling was conducted using a NEFSC standardized 4-seam, 3 bridle survey trawl rigged with a rockhopper sweep. The trawl was fished using 2.2 meter, 550 kilogram (kg), Poly Ice Oval trawl doors and 36.6 meter (20 fathom) bridles. Net-monitoring equipment was used to observe trawl performance on all stations. Throughout the cruise, a hydroacoustic survey was conducted during transit between bottom trawl stations using the Simrad EK-60 system, as well as the ME-70 system. After each tow, the catch was sorted by species and weighed using motion compensated digital scales. Representative length frequencies were collected for all caught species. All catch and biological data were recorded using the newest version of the shipboard automated data entry system, Fisheries Scientific Computing System (FSCS). This system implements basket tracking techniques and uses digital scales, electronic measuring boards, touch screen displays, and barcode scanners to record data on deck; FSCS also archives the data on the ship’s computer network. Sampled fish were assigned individual identification numbers, measured, weighed to the nearest 0.001 kg and further sampled for age and growth studies. Bony fish were measured to the nearest centimeter (cm) to the end of the central caudal ray (fork length); biological samples were collected concurrently with measuring operations (Table 1). Sharks and skates were measured to the end of the caudal fin (total length). Disk width was measured for rays. Lobsters were measured in millimeters (mm) from the posterior edge of the eye socket to the end of the carapace; the presence or absence of a V-notch was also noted. Crabs were measured across the carapace width (cm). Shell height was measured in cm for selected bivalves. The remainder of the catch (miscellaneous invertebrates, shells, substrate, et cetera) was also recorded. Surface temperatures were measured using the hull-mounted temperature sensor at a depth of three meters. Temperature and conductivity profiles were made at each survey trawl station using a conductivity, temperature, and depth (CTD) system. Bottom salinity samples were obtained to calibrate the CTD. Water samples were also taken for fluorometer calibrations.

*From my PhD proposal (June 2017):*

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | NOAA Federal Trawl Surveys | SEAMAP-SA | NEAMAP | NCCA |
| Responsible Agencies | NOAA Regions | ASMFC, NMFS, SAFMC, USFWS, State DNRs/DFWs | ASMFC, NEFMC, NMFS, SAFMC, USFWS, State DNRs/DFWs, VIMS | EPA |
| Targets / Goals | Fishery-independent data collection | Research and fisheries management | Research and fisheries management | Water quality, chemistry, toxicology, and benthic invertebrates |
| Area Surveyed | All federal waters | Florida to Cape Hatteras | Cape Hatteras to Maine | National estuaries and coasts |
| Depth Surveyed | Various | Various depth strata; 4-10m most consistently sampled | Various depth strata; 21-40 ft shallowest sampled | Unclear; likely very shallow (~1-10 m) |
| Years Surveyed | 1968-2008 (Northeast) | 1986-2016 | 2006-2015 | 1990-2006, 2010 |
| Seasons Surveyed | Spring (Northeast) | Spring, summer, fall | Spring, fall | June-September (for 2010 data) |
| Survey Gear | Trawl; varies by survey region | Trawl; 1.875” trawl, 1.625” codend | Trawl; matches Northeast Region NOAA survey | Benthic grabs for invertebrates; assortment of fishing gears including trawl, gillnet, seine, hook and line |
| Number of Sites | Unknown | Over 100 | 150 (41 in shallowest stratum) | 87 Southeast, 238 Northeast (2010) |
| State of Data | Quality-checked by Pinsky lab; different data sources integrated and standardized | Quality-checked by Pinsky lab; different data sources integrated and standardized | Some quality control by Pinsky lab; not all data collated and standardized | No quality checks yet; data is spread across numerous raw files downloaded from EPA |
| Notes | Northeast and Southeast Regions use different survey gears and methods; unclear how much Southeast data is available | Sampling methods have changed over time, including addition of new sites and elimination of outer (deeper) strata sampling | Need to confirm that I have all their data, including latest years available | Operated as EMAP-Estuaries and NCA 1990-2006; survey suspended, then replaced by NCCA, which occurs every 5 years (2015 data not yet available) |
| Sources | (Pinsky et al., 2013) | (Morley et al., 2016; Southeast Area Monitoring and Assessment Program, 2014) | (Bonzek et al., 2008) | (Hale et al., 2017; USEPA, 2009, 2015) |

**Table 1.** Summary of data available for analysis in Chapter 3. Acronyms used: Atlantic States Marine Fisheries Commission (ASMFC), DFW (Department of Fish and Wildlife), DNR (Department of Natural Resources), EMAP-Estuaries (Environmental Monitoring and Assessment Program – Estuaries), EPA (Environmental Protection Agency), NCA (National Coastal Assessment), NCCA (National Coastal Condition Assessment), NEAMAP (Northeast Area Monitoring and Assessment Program), NEFMC (New England Fishery Management Council), NMFS (National Marine Fisheries Service), NOAA (National Oceanic and Atmospheric Administration), SAFMC (South Atlantic Fisheries Management Council), SEAMAP-SA (Southeast Area Monitoring and Assessment Program in the South Atlantic), USFWS (US Fish and Wildlife Service), VIMS (Virginia Institute of Marine Science)