

Report of the Northeast Fisheries Science Center

Presented to the New England Fishery Management Council

April 3, 2014

Surveys:

The Spring Bottom Trawl Survey was delayed 3.5 weeks for dockside repairs to the *Bigelow*. Because of the lost time, the survey began off De/Md/Va and will move north in order to maintain the temporal/spatial integrity of the areas sampled within the time series. Unfortunately, the southernmost strata will not be visited this season.

The Atlantic Marine Assessment Program for Protected Species (AMAPPS) aerial survey of wind energy lease blocks on the northeast U.S. shelf was completed on 27 March. Despite the poor weather and plane mechanical problems, the survey completed about 80% of the proposed track lines that covered waters from New York, through the Gulf of Maine (U.S. and Canadian waters), and the Bay of Fundy. The goal of this survey is to characterize the BOEM wind farm areas and the shelf break (out to 2000 m depth) and will inform decisions regarding the sites of wind farms and transmission cables. AMAPPS spring survey cruises on the NOAA ship *Gordon Gunter* are underway surveying marine mammals, sea turtles, and seabirds as well as supporting other research projects by collecting benthic grab and beam trawl samples for use with planned acoustic mapping to help characterize bottom habitats in the Rhode Island, Massachusetts, New York, New Jersey, and Virginia Wind Energy Areas. The sampling information will be used to document the distribution and abundance of marine mammals, sea birds, benthic fauna, plankton, and physical water characteristics and combined with AMAPPS vessel and aerial surveys since 2010 to develop habitat-based density maps of protected species.

The Winter Ecosystems Monitoring Survey using the *Gordon Gunter* sampled 59 stations in the Gulf of Maine and Georges Bank areas. Since 2009, the data from this survey have been deposited in national data centers, including information on larval fish collections for use in stock assessments, zooplankton collections to monitor the base of the food web, hydrographic measurements to track the climate of the northeast U.S. shelf, and ocean acidification samples to support the FORAM Act and the NOAA Ocean Acidification Program. The ongoing collection of samples will allow us to better define the regional and seasonal scales of variability and examine the long-term trend at scales of 3-4 decades.

Stock Assessments and Reviews:

2014

The NEFSC held the SARC58 peer review of butterfish, tilefish, and northern shrimp benchmark stock assessments in January in Woods Hole. The butterfish and tilefish assessments were

accepted. The results will be described at upcoming Council meetings, and are published in NEFSC CRD14-03 (<http://www.nefsc.noaa.gov/publications/>).

The TRAC will conduct a benchmark review of new approaches to the GBK yellowtail flounder (YTF) stock assessment, April 14-19, Woods Hole. The annual TRAC assessment review of EGBK cod, EGBK haddock, and GBK YTF is scheduled for June 23-27 also in Woods Hole. Information about the TRAC is at <http://www.nefsc.noaa.gov/saw/trac/> and <http://www.nefsc.noaa.gov/TRAC-Public/>.

There will be a Stock Assessment Science Program Review during May 19-23 at the NEFSC in Woods Hole. This will cover all aspects of the stock assessment process (modeling, peer review, etc.). The public is encouraged to attend.

The SARC59 peer review of sea scallop and GOM haddock benchmark stock assessments will take place at the NEFSC in Woods Hole, July 15-18. Working papers will be available to the public before the peer review at <http://www.nefsc.noaa.gov/SAW-Public/>.

The NEFSC will carry out operational assessments of pollock, and GOM and GBK winter flounder in the first half of August.

The Center will also carry out assessment updates, data updates, or evaluations of the “rumble strip” approach on a number of stocks: bluefish, black sea bass, scup, summer flounder, mackerel, squids, dogfish, skates, and hakes (silver, red, and offshore).

2015

Scheduling of stock assessments and peer reviews for 2015-2016 will be discussed at the upcoming Northeast Region Coordinating Council (NRCC) meeting on April 29-30. Some of the assessments that are scheduled are listed below, but the schedule is re-evaluated every six months by the NRCC.

The NEFSC will host the SARC60 peer review of scup and bluefish benchmark stock assessments. The timeframe for this assessment is yet to be determined.

The NEFSC will host the SARC61 peer review of the pollock and ocean quahog benchmark stock assessments in November-December.

The annual TRAC assessment review of EGBK cod, EGBK haddock, and GBK YTF is scheduled for June, <http://www.nefsc.noaa.gov/saw/trac/>.

The NEFSC will conduct Operational Assessments of many of the stocks in the NE multispecies groundfish Fishery Management Plan. The timeframe for these assessments are yet to be determined.

Other assessments or reviews that are being discussed by the NRCC include: scallop survey methods, lobster, sturgeon, and numerous assessment updates.

Additional Activities:

Multispecies Modeling at NEFSC

In response to the Councils interest to explore options for Ecosystem-Based Fishery

Management (EBFM), NEFSC scientists have worked closely with the Scientific and Statistical Committees of both councils over the last several years to develop approaches for EBFM tailored to the emerging management preferences of each council. In a collaborative effort, scientists from throughout NEFSC have been exploring options for development of a flexible analytical framework for EBFM in the Northeast. Principal elements of the approach include (1) establishment of a transparent connection between single species and ecosystem-based advice using multispecies assessment models as a natural bridge, (2) development of multiple operating models to test assessment models and candidate management procedures through simulation, (3) application of assessment models spanning a spectrum of complexity to evaluate the issue of model uncertainty (4) use of these results to assess uncertainty and risk, and (5) evaluation of tradeoffs in a bioeconomic context. The models under development are designed to accommodate spatial structure and to incorporate consideration of climate variability and change. They are designed to provide recommendations for Annual Catch Limits for individual species to meet the management responsibilities of the councils. The overall approach was presented at the Third National Ecosystem Modeling Workshop held in Seattle March 18-20, 2014.

New Climate Vulnerability Assessment Protocol

A new protocol for assessing the vulnerability of fishery species to climate change is being implemented for 79 fishery species in the Northeast region. The protocol was recently announced by NOAA (<http://www.st.nmfs.noaa.gov/ecosystems/climate/activities/assessing-vulnerability-of-fish-stocks>) and the Northeast is the first region to run the assessment. The protocol is based on expert opinion regarding the sensitivity and exposure of species to climate change. The assembled group of 14 experts met for three days (4-6 March) at the NEFSC Narragansett Laboratory to review each species and develop a preliminary ranking of vulnerability. The results of the assessment will be peer-reviewed and are expected to be available during the summer of 2014. The results will: 1) identify which species are likely to be most strongly affected by projected climate changes in the Northeast, 2) increase our understanding of why these species are likely to be vulnerable, and 3) identify data gaps that can be used to help researchers prioritize efforts to track and understand effects of climate change on marine resource species.

North Atlantic right whale migration

NEFSC scientists have initiated a Western Atlantic wide acoustic data collection and will start analyses directed at understanding the North Atlantic right whale migration route, particularly in areas of current concern such as the mid Atlantic. Data contributions have been wide reaching from Cornell, Oregon State, Washington and Duke University, JASCO consulting, Maine DMF, DFO, the US Navy and BOEM.

Acoustic monitoring to track minke whales

Scientists using passive acoustic monitoring to track minke whales in the Northwest Atlantic have found clues in the individual calling behaviors and movements of this species. These findings—recently published online in the journal *Behaviour*—provide insight into one of the least studied baleen whales, contribute to an improved understanding of minke whale calling behavior, and will help determine how far these animals can be heard in different habitats. The

results will also be important in further developing and interpreting passive acoustic monitoring for this species. http://www.nefsc.noaa.gov/press_release/pr2014/scispot/ss1402/

Quantitative Ecology and Socioeconomics Training

The NOAA Northeast Fisheries Science Center (NEFSC), the Woods Hole Oceanographic Institution (WHOI), and the University of Massachusetts-Dartmouth School for Marine Science and Technology (SMAST) are working together to train future generations of scientists in a program designed to address an anticipated shortfall of researchers in the fields of quantitative fisheries and ecosystem science. Under a NOAA program called Quantitative Ecology and Socioeconomics Training (QUEST), the new partnership will focus on teaching and advising in graduate fisheries programs and in developing new technologies to improve assessment and management capabilities. As part of this collaborative effort, three new fellowships for WHOI scientists and a new faculty position at SMAST were created with NMFS funding through the Cooperative Institute for the North Atlantic (CINAR), a nonfederal research consortium located at WHOI. These new positions will collaborate to train graduate students in cutting-edge methods, technologies, and research approaches. This new partnership is a tangible step toward educating future personnel in quantitative aspects of fisheries science. See http://www.nefsc.noaa.gov/press_release/pr2014/news/NR1405/

Drift bottle traced back a half decade

Drift bottles were released during the last cruise of the *Albatross IV* in November 2008. One of the bottles ended up in the Azores in 2009, another washed ashore in 2011 on St. Lucia in the Caribbean. Recently, another drift bottle was found on Sable Island and traced back to the *Albatross III* Cruise that departed Woods Hole on April 17, 1956 to collect hydrographic data and sample haddock eggs and larvae in the Georges Bank-Gulf of Maine region. For more details, go to: http://www.nefsc.noaa.gov/news/features/drift_bottles/

Selected Recent Publications:

Effects of hydraulic dredging on the benthic ecology and sediment chemistry on a cultivated bed of the hard clam, *Mercenaria mercenaria*. (2014). By Ronald Goldberg, Julie M. Rose, Renee Mercado-Allen, Shannon Meseck, Paul Clark, Catherine Kuropat, and Jose J. Periera. Aquaculture (accepted manuscript).

Impact of Predation by the Invasive Crab *Hemigrapsus sanguineus* on Survival of Juvenile Blue Mussels in Western Long Island Sound. (2014). By Diane J. Brousseau, Ronald Goldberg, and Corey Garza. Northeastern Naturalist, 21(1):119-133. 2014.

Effects of elevated CO₂ in the early life stages of summer flounder, *Paralichthys dentatus*, and potential consequences of ocean acidification. Chambers, R.C., Candelmo, A.C., Habeck, E.A., Poach, M.E., Wieczorek, D., Cooper, K.R., Greenfield, C.E., and Phelan, B.A.

Biogeosciences, 11:1613-1626, doi:10.5194/bg-11-1613-2014, 2014.

Decadal changes in zooplankton of the Northeast U.S. continental shelf. Hongsheng Bi, Rubao

Ji, Hui Liu, Jo Young-Heon, J Hare. PLoS ONE 9(1): e87720. doi:10.1371/journal.pone.0087720 .

Hedonic Pricing of Atlantic Cod: Effects of Size, Freshness, and Gear; By Lee, M.A. Accepted for publication at *Marine Resource Economics*. Publication scheduled for September, 2014.

Measuring the Economic Value of Increased Precision in Scientific Estimates of Marine Mammal Abundance and Bycatch: Harbor *Porpoise Phocoena phocoena* in the Northeast U.S. Gill-Net Fishery. Bisack, K., and G. Magnusson. 2014. *North American Journal of Fisheries Management*. 34:311–321.

Leatherback Turtle Movements, Dive Behavior, and Habitat Characteristics in Ecoregions of the Northwest Atlantic Ocean. Dodge KL, Galuardi B, Miller TJ, Lutcavage ME (2014) PLoS ONE 9(3): e91726. doi:10.1371/journal.pone.0091726.

Historical versus contemporary climate forcing on the annual nesting variability of loggerhead sea turtles in the Northwest Atlantic Ocean; Mike Arendt, Jeffrey Schwenter, Blair Witherington, Anne Meylan, and Vincent Saba. PLoS ONE, Dec 2013, Vol. 8 Issue 12, DOI: 10.1371/journal.pone.0081097.

Marine Ecosystem-Based Management. Fogarty, M.J. and J.J. McCarthy (Eds). 2014. Harvard University Press, Cambridge.552.pp.

The art of marine ecosystem-based management. Fogarty, M.J. 2014. Can. J. Fish. Aquat. Sci. 71:479-490.