Mercury content in Atlantic Herring collected from NOAA Ship Pisces in the Gulf of Main from 2012-2013 (GoMEcosysDynamics project)

Website: https://www.bco-dmo.org/dataset/560671
Version: good
Version Date: 2015-06-22

Project
» CAMEO: Using interdecadal comparisons to understand trade-offs between abundance and condition in fishery ecosystems (GoMEcosysDynamics)

Program
» Comparative Analysis of Marine Ecosystem Organization (CAMEO)

Contributors	Affiliation	Role
Stockwell, Jason	University of Vermont (UVt-RESL)	Principal Investigator
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Dataset Description

Herring were collected in the Gulf of Maine (Jeffreys Ledge and Jordan Basin) and on Georges Bank by National Marine Fisheries Service bottom trawl surveys during fall 2012 and spring 2013. Fish from commercial operators were sampled dockside by the Maine Department of Marine Resources. Fish were frozen immediately and processed in the laboratory within three months of capture. Total length (mm), wet mass (g), and sex were recorded for each fish and otoliths were extracted for age estimation. Mercury estimates were then obtained from whole fish.

Access to these data are restricted until July 2016. Please see PI for information about or access to this dataset.

Methods & Sampling

Herring were collected in the Gulf of Maine (Jeffreys Ledge and Jordan Basin) and on Georges Bank by National Marine Fisheries Service bottom trawl surveys during fall 2012 and spring 2013. Fish from commercial operators were sampled dockside by the Maine Department of Marine Resources.

Data Processing Description

Fish were frozen immediately and processed in the laboratory within three months of capture. Total length (mm), wet mass (g), and sex were recorded for each fish and otoliths were extracted for age estimation.

Whole fish were thawed, homogenized individually, and a subsample of approximately 15 g of homogenate per fish was refrozen until the mercury analysis. Fish from both sampled areas in the Gulf of Maine were selected for analysis to cover the observed range of sizes. Total mercury was measured in accordance with U.S. EPA Method 7473 using a Milestone DMA-80 Direct Mercury Analyzer (Milestone Srl, Bergamo, Italy) at Clarkson University (Potsdam, NY). Detailed methods are described in Zananski *et al.* (2011).

For quality control, we used organic chicken breast meat (Chicken G1, Chicken G2, and Chicken W1) and wild-caught Alaskan sockeye salmon (Salmon G1, Salmon G2, and Salmon W1). G1 samples were run through the meat grinder before herring were ground up and G2 samples were run through the grinder after the herring were ground up. The W1 samples were whole samples (i.e., not run through the meat grinder). If G1, G2 and W1 for each of chicken and salmon were similar that would indicate no contamination during processing. If G1 and G2 are equally higher than W1 then the process adds Hg (from the grinder), and if G2 is higher than G1 then the grinder was not thoroughly cleaned likely resulting in some contamination from previous samples.

[Controls](#)

We used an approximate 10% rule to flag potential outliers. So if we had estimates of 10, 10, and 15 we excluded 15, but if we had 10, 13, and 15 we did not because we did not see a sufficient trend to justify exclusion.

Parameters

Parameter	Description	Units
fishID	unique identifier for each fish in the dataset	number
date_caught	capture date of fish	mm/dd/yy
organization	entity that captured the fish. NMFS NEFSC = National Marine Fisheries Service – Northeast Fisheries Science Center; Providian = commercial herring boat; Western Venture = commercial herring boat	text
cruiseID	research cruise number for fish captured by NMFS NEFSC	text
location	JL = Jeffreys Ledge; JB = Jordan Basin; GB = Georges Bank; for commercially-captured fish -- location is either wharf where fish were collected from or generically Area 3. Specific locations of where commercially-caught fish were captured is unknown. Catch locations for NMFS NEFSC fish can also be located through the BegLat-BeginLon-EndLat and EndLon coordinates	text
lat_beg	starting latitude coordinates of NMFS NEFSC trawl tow from which fish was captured	decimal degrees; North is positive
lon_beg	starting longitude coordinates of NMFS NEFSC trawl tow from which fish was captured	decimal degrees; West is negative
lat_end	ending latitude coordinates of NMFS NEFSC trawl tow from which fish was captured	decimal degrees; North is positive
lon_end	ending longitude coordinates of NMFS NEFSC trawl tow from which fish was captured	decimal degrees; West is negative
mass_wet	wet mass of individual fish	grams
length_total	total length of individual fish	millimeters
sex	F = female; M = male; U = unknown	text
age_otolith	age estimate of individual herring based on analysis of otoliths; age estimates conducted by Lisa Pinkham of Maine Department of Marine Resources - Boothbay Harbor ME	years
Hg_rep1	Replicate 1 of mercury concentration for an individual fish. 'S' numbers mean suspect. See 'quality control' section.	ng/g wet weight
Hg_rep2	Replicate 2 of mercury concentration for an individual fish. 'S' numbers mean suspect. See 'quality control' section.	ng/g wet weight
Hg_rep3	Replicate 3 of mercury concentration for an individual fish. 'S' numbers mean suspect. See 'quality control' section.	ng/g wet weight
Hg_rep4	Replicate 4 of mercury concentration for an individual fish. 'S' numbers mean suspect. See 'quality control' section.	ng/g wet weight
deployment	deployment number during research cruises by NMFS NEFSC	number

Instruments

Dataset-specific Instrument Name	Bottom trawl
Generic Instrument Name	Trawl_custom
Dataset-specific Description	National Marine Fisheries Service Bottom Trawl
Generic Instrument Description	A net towed through the water column designed to sample free-swimming nekton or fish, varies in design depending on the research project.

Deployments

PC2012plus

Website	https://www.bco-dmo.org/deployment/561048
Platform	R/V Pisces
Start Date	2012-09-16
End Date	2013-06-13
Description	This 'deployment' is a collection of locations that are the NOAA bottom trawl surveys of Fall, 2012 and Spring, 2013. The 'deployment' includes: 2012 Fall Bottom Trawl Survey: NOAA ship Pisces. 2013 Spring Bottom Trawl Survey: NOAA Ship Henry B. Bigelow (R-225) Cruise No. HB 13-01 (Parts I - IV) The HB 13-01 Bottom Trawl Survey was conducted in four parts from 4 March to 9 May 2013: part I was from 4 - 5 March and 14 - 26 March; part II, 26 March - 5 April; part III, 9 - 26 April; part IV, 30 April - 9 May. The area of operation was the continental shelf from Cape Lookout, NC, to the Nova Scotia Shelf, including Georges Bank and the Gulf of Maine. Station

Project Information

CAMEO: Using interdecadal comparisons to understand trade-offs between abundance and condition in fishery ecosystems (GoMEcosysDynamics)

Coverage: Gulf of Maine, North West Atlantic

Description from NSF award abstract:
The investigators will conduct a model-based investigation of the dynamics of a productive pelagic ecosystems in the Gulf of Maine. The middle trophic levels in highly productive marine ecosystems are typically dominated by a few species of pelagic fish, such as sardines and anchovies in upwelling environments or herring and/or capelin in temperate and subpolar regions. These species act as important conduits for energy to higher trophic levels, including larger fish, seabirds, and cetaceans. When abundant, small pelagics can exert significant pressure on their prey, typically large mesozooplankton. Small pelagic fish exhibit complex dynamics and managing these species under an ecosystem approach is challenging. This modeling study will track both the abundance and condition of representative copepods (*Calanus finmarchicus*, *Centropages typicus*), herring, and bluefin tuna. The investigators will use a rigorous comparison of conditions from the 1980s and 1990s to develop the model. They will examine the sensitivity of this ecosystem to changes in fishing pressure on the middle trophic levels and to changes in the magnitude and timing of primary production. They will also consider the impact of increased temperature on the ability of *C. finmarchicus* to accumulate lipids and alter the condition of herring and tuna.

The project will lead to improved knowledge of ecosystems with productive food webs. It will also directly

impact address issues related to the management of the herring resource in the Gulf of Maine. The investigators will examine the consequences of ignoring condition of zooplankton and fish, as is the case with the current stock assessment. They will also explore the dynamical properties of the model ecosystem and consider under what conditions it is possible to have both abundant and well conditioned herring.

Program Information

Comparative Analysis of Marine Ecosystem Organization (CAMEO)

Website: http://www.nsf.gov/geo/oce/programs/CAMEO_Webpage.jsp

CAMEO Science Plan (2012).

The Comparative Analysis of Marine Ecosystem Organization (CAMEO) program was implemented as a partnership between the NOAA National Marine Fisheries Service and National Science Foundation Division of Ocean Sciences. The purpose of CAMEO was to strengthen the scientific basis for an ecosystem approach to the stewardship of our ocean and coastal living marine resources. The program supported fundamental research to understand complex dynamics controlling ecosystem structure, productivity, behavior, resilience, and population connectivity, as well as effects of climate variability and anthropogenic pressures on living marine resources and critical habitats. CAMEO encouraged the development of multiple approaches, such as ecosystem models and comparative analyses of managed and unmanaged areas (e.g., marine protected areas) that can ultimately form a basis for forecasting and decision support. Central to the program was the emphasis on collaborations between academic and private researchers and federal agency scientists with mission responsibilities to inform ecosystem management activities. (adapted from CAMEO website)

This funding opportunity implemented CAMEO research by supporting the development of research tools and strategic approaches through the following types of proposals:

1. Development of strategies and methodologies for comparative analyses that can be applied consistently across spatial and temporal scales and ecosystems, and that facilitate the design of decision support tools for marine populations, ecosystems and habitats.

2. Development of models that address key scientific questions by comparing ecosystems and ecosystem processes. Models that are geographically and temporally portable, and that incorporate assessment of modeling skill, are particularly encouraged.

3. Retrospective studies that analyze, re-analyze or synthesize existing information (historic, time-series, ongoing program, etc.) using a comparative approach.

4. Studies that integrate the human dimension within ecosystem dynamics. The CAMEO program seeks to promote interdisciplinary research using comparative approaches to link marine ecosystem research with the social and behavioral sciences in new and vital ways.

To guide program priorities, a Science Steering Committee was formed through Dr. Linda Deegan and the initial Scientific Planning Office at the Marine Biological Laboratory in Woods Hole, MA. This Committee was designed to provide scientific advice and broad direction to NOAA and NSF regarding the CAMEO program.

Funding

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