

Change in NECOFS Oceanographic information by SASI cell

Northeast United States

February 2016

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1. INTRODUCTION

This group of data products contains information comparing each year's monthly and annual average, maximum bottom stress, bottom and surface temperature, and bottom and surface salinity values to 2003 to 2012 values from the Northeast Coastal Ocean Forecast System (NECOFS) joined to the New England Fishery Management Council Swept Area Seabed Impact (SASI) model grid. The purpose of this data product was to characterize change in the physical environmental variables over the domain of the University of Massachusetts Dartmouth School of Marine Science and Technology (SMAST) video survey.

The SASI model is a new quantitative tool for evaluating fisheries management alternatives by examining the tradeoffs between habitat impacts and fishery yields (NEFMC 2011). With the aid of the commercial scallop fishing industry, the SMAST video survey covered the Continental Shelf from the southern Mid-Atlantic to the USA-Canadian border on eastern Georges Bank from 2003 to 2012. The survey followed a centric systematic sampling design with stations on 1.6 km to 5.6 km grids. At each station a video pyramid was lowered for times to obtain four quadrat samples. Within each quadrat, macroinvertebrates and fish were counted and the substrate was identified. When possible fish and macroinvertebrates were identified to species, otherwise animals were grouped into categories based on taxonomic orders. Several references to papers about the video survey method and the data derived from it are listed as supplemental information. Stokesbury 2002, Stokesbury et al. 2004, Adams et al. 2008 and Stokesbury 2012 provide information on the sampling design of the survey and scallop abundance. Adams et al. 2010 and Carey et al. 2013 investigate the scale of scallop beds. O'Keefe et al. 2008 and Carey and Stokesbury 2011 examine the calibration and use of different camera areas and types. Harris and Stokesbury 2010 and Harris et al. 2012 use sediment information collected during the video survey to characterize benthic habitat on Georges Bank. Marino et al. 2007 and MacDonald et al. 2010 used survey information to document the distribution of sea starts and skates, respectively.

NECOFS is an integrated atmosphere/surface wave/ocean forecast model system designed for the northeast U.S. coastal region covering a computational domain from central New Jersey to the eastern end of the Scotian Shelf. The oceanic components of the system were developed based on the Finite-Volume Coastal Ocean Model (FVCOM) developed by Chen et al. (2003) and upgraded by a team effort (Chen et al., 2006a-b, Chen et al., 2011). The NECOFS product used for this project is the GoM-FVCOM results. The GoM-FVCOM grid features unstructured triangular meshes with horizontal resolution of ~ 0.3-25 km and a hybrid terrain-following vertical coordinate with a total of 45 layers, 10 and 5 uniform layers near the surface and bottom, respectively, in regions deeper than 225 m with a transfer to a sigma-coordinate in the shallow continental and coastal regions. The thickness of the uniform layers is 5 m, so the hybrid coordinate transition occurs at locations where all layers have uniform thickness of 5 m. NECOFS hindcast fields have been validated by comparing the results with observations of tidal elevation and currents (Chen et al. 2011), water stratification (Li et al. 2014), surface currents, and Nor'easter and hurricane-induced storm elevation and currents (Beardsley et al. 2013, Chen et al. 2013, and Sun et al. 2013).

2. PURPOSE

The main goal of this project (the “Offshore Video Survey and Oceanographic Analysis: Georges Bank to the Chesapeake”) was to provide a better picture of the marine environment on the highly productive U.S. Northeast Shelf, from the Hague Line to the Chesapeake. This project, which was managed by The Nature Conservancy (TNC) and funded by The Gordon and Betty Moore Foundation, introduced spatial data products that will significantly advance the understanding of marine habitats and ecological function in the Northwest Atlantic. This study provided new information about several species groups observed in a video survey. Additionally, the project has provided a comprehensive baseline of information on the benthic habitat and associated oceanographic conditions on the U.S. Northeast Shelf at a scale that is useful to fisheries managers, spatial planners, and the wider community of stakeholders.

3. SOURCES AND AUTHORITIES

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4. DATABASE DESIGN AND CONTENT

Native storage format: ArcGIS File Geodatabase – simple feature class

Feature Types: Cell polygons

Data Dictionary:

** Some lines include multiple fields

Line**	Name	Definition	Type	Size
1	OBJECTID	Uniquely identifies a feature	OBJECTID	*
2	Shape	Geometric representation of the feature	geometry	*
3	100km_Id	SASI 100 km unique identifier	Short	*
4	1000Km_Id	SASI 1000 km unique identifier	Double	*
5	AreaKm	The area of the SASI grid cell in kilometers	Double	*
6	TS_Nodes	The number of NECOFS output locations used to create the temperate and salinity data within the SASI grid cell	Double	*
7	TS_Join	The method in which temperature and salinity values were calculated for the SASI grid cell. "Average" – Values from NECOFS output locations within the SASI model grid cell were used to calculate average and standard deviation. "Closest" – No NEFCOS output location was within the SASI model grid cell, so temperature and salinity values from the closest NECOFS output location were	Text	254

8	Diff[MONTH]BT	used. The difference between this year's average bottom temperature (°C) and the 2003 to 2012 average bottom temperature for this particular month	Double	*
9	Diff[MONTH]ST	The difference between this year's average surface temperature (°C) and the 2003 to 2012 average bottom temperature for this particular month	Double	*
10	Diff[MONTH]BS	The difference between this year's average bottom salinity and the 2003 to 2012 average bottom temperature for this particular month	Double	*
11	Diff[MONTH]SS	The difference between this year's average surface salinity and the 2003 to 2012 average bottom temperature for this particular month.	Double	*
12	Avg_[YEAR]BT	The difference between the yearly average and the 2003 to 2012 average for bottom temperature for all months from this particular year.	Double	*
13	Avg_[YEAR]ST	The difference between the yearly average and the 2003 to 2012 average for surface temperature for all months from this particular year.	Double	*
14	Avg_[YEAR]BS	The difference between the yearly average and the 2003 to 2012 average for bottom salinity for all months from this particular year.	Double	*
15	Avg_[YEAR]SS	The difference between the yearly average and the 2003 to 2012 average for surface salinity for all months from this particular year.	Double	*
16	Str_Nodes	The number of NECOFS output locations used to create the bottom stress data within the SASI grid cell.	Double	*
17	Str_Join	The method in which bottom stress values were calculated for the SASI grid cell. "Average" – Values from NECOFS output locations within the SASI model	Text	254

		grid cell were then used to calculate an average and standard deviation. "Closest" - No NEFCOS output location was within the SASI model grid cell, so the bottom stress values from the closest NECOFS output location were used.		
18	Diff_[MONTH]MSt	The difference between this year's average maximum bottom stress (N m2) and the 2003 to 2012 average maximum bottom stress for the particular month	Double	*
19	Avg_[MONTH]Str	The difference between this year's average bottom stress (N m2) and the 2003 to 2012 average bottom stress for this particular month	Double	*

Feature Class Name: SASI_GridYEARMonthlyDiffBotStressBotSurfTempSal

Total Number of Unique Features: 920

Dataset Status: Complete

5. SPATIAL REPRESENTATION

Geometry Type: vector polygon

Reference system: NAD 1983 UTM Zone 19N

Projection: Transverse Mercator

Geographic Coordinate System: GCS North American 1983

Horizontal Datum: North American Datum 1983

Ellipsoid: Geodetic Reference System 1980

XY Resolution: XY Scale is 0.0001 Meters

Tolerance: 0.001 Meters

Geographic extent: -75.679 to -66.275, 36.391 to 42.496

ISO 19115 Topic Category: biology, environment, oceans

Place Names:

Atlantic Ocean, Georges Bank, Gulf of Maine, Massachusetts Bay, Nantucket Shoals, Wilkinson Basin.

6. DATA PROCESSING

NECOFS data was joined to the SASI model grid by first reducing the SASI domain to only grid cells with S Mast video survey stations within 5.6 km of all boundaries. Surface and bottom temperature (°C) and salinity values from NECOFS output locations within a SASI model grid cell were then used to create an average and standard deviation value for each SASI grid cell. Twenty four SASI grid cells did not have a NECOFS output location within them and were assigned the temperature and salinity value of the closest NECOFS output location. Bottom stress values ($N\ m^2$) were joined in the same manner, except with different NECOFS output locations. Nine SASI grid cells did not have a NECOFS output location within them and were assigned the bottom stress value of the closest NECOFS output location. The layer file for each environmental variable displays values divided by percentiles that approximately reflect standard deviations from the mean.

7. QUALITY PROCESS

Attribute Accuracy: Original attribution was retained from source material and are considered authoritative.

Logical Consistency: These data are believed to be logically consistent.

Completeness: Data are complete based on input source data from S Mast and the SASI model (6200 unique cells).

Positional Accuracy: Sample locations based on S Mast video scallop survey. Accuracy based on GPS in video pyramid used for this survey. Results are aggregated by SASI cell, which each have a resolution of 10 kilometers.

Timeliness: Source data are up to date, as of April 2016.

Use restrictions: Not for Navigation

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