Average (2003-2012) Presence/Abundance from SMAST Survey
Northeast United States
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1. INTRODUCTION

This data product shows the average presence (for Sand dollar, Bryozoans or Hydrozoans, and Sponges) or abundance (for Scallops, Sea Star, Crab, Hermit Crab, Moon Snail, Flat fish, Red hake, and Skate) within each cell from the New England Fishery Management Council Swept Area Seabed Impact (SASI) model from 2003 to 2012. The main data source for this analysis is 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. The survey was conducted to assess the abundance and distribution of the Atlantic sea scallop on the Mid-Atlantic Bight and Georges Bank and followed a centric systematic sampling design with stations on 1.6 km to 5.6 km grids. At each station a pyramid was lowered to the seafloor. Mounted on the pyramid were two downward facing video cameras that provided 2.84 m^2 and 0.60 m^2 quadrat images of the seafloor. Another video camera, mounted parallel to the seafloor, provided a side profile of the quadrat area to aid in species identification. Lastly, a high-resolution digital still camera collected a single frame image of 1.06 m^2. The vessel was allowed to drift approximately 50 m and the pyramid was lowered to the sea floor again to obtain a second quadrat; this was repeated four times. Sampling four quadrats at each station increased the sampled area to 11.36 m^2. 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. A comprehensive

summary of all projects and analysis related to the video survey from 1999 to 2014 is provided in Stokesbury et al. 2015.

Several references to papers about the video survey method and the data derived from it are listed as supplemental information (see Sources and Authorities for full references). 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.

SMAST survey data was joined to the SASI model grid by assigning survey stations to the grid cell they were closest to. The depth and animal values from each station were then combined to create an average and standard deviation value for each SASI grid cell. Only SASI model grid cells with video survey stations within 5.6 km of all boundaries were used. An abundance index was calculated for the species that had more than one individual in the majority of cells. In this case, the number of individuals were counted within each sample and then averaged across time and within cell. For rare or isolated species, the number of samples with the presence of the species group within each cell were calculated for each year and then averaged across time.

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 funded by 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

- NEFMC (New England Fisheries Management Council). Essential Fish Habitat (EFH) Omnibus Amendment "The Swept Area Seabed Impact (SASI) Model: A Tool

for Analyzing the Effects of Fishing on Essential Habitat", Newburyport, MA. Available: nefmc.org/habitat/sasi_info/110121_SASI_Document.pdf (2011).

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- Stokesbury, K. D. E. 2002. Estimation of sea scallop abundance in closed areas of Georges Bank, USA. Transactions of the American Fisheries Society 131: 1081-1092.
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- Stokesbury, K.D.E. 2012. Stock definition and recruitment: Implications for the US sea scallop (Placopecten magellanicus) fishery from 2003 to 2011. Rev. Fish. Sci. 20:154-164.
- Stokesbury K.D.E, Adams E.K., Asci S.C., Bethoney N.D., Inglis S., Jaffarian T., Keiley E., Rosellon-Druker J.M., Malloy R. Jr., O'Keefe C. 2015. SMAST Sea scallop (Placopecten magellanicus) drop camera survey from 1999 to 2014. Report to

the NEFMC Review of Scallop Survey Methodologies. Available: http://www.nefsc.noaa.gov/SAW-Public/scallop-survey-meth-review-Mar-2015/3-DropCamera_SMAST/New/SMAST%20drop%20cam%20survey%201999-2014%20(Stokesbury).pdf

4. DATABASE DESIGN AND CONTENT

Native storage format: ArcGIS File Geodatabase – simple feature class

Feature Types: Cell polygons

Data Dictionary:

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	Double	*
6	Stations	The number of SMAST survey stations averaged to create the data within the SASI grid cell	Double	*
7	DepthAve	The average depth in fathoms of the SMAST survey stations within the SASI grid cell. One fathom is about 1.8 meters.	Double	*
8	ScallopAve	The average number of scallops counted in the SMAST survey stations within the SASI grid cell.	Double	*
9	SeaStarAve	The average number of sea stars (*Asterias* spp.) counted in the SMAST survey stations within the SASI grid cell.	Double	*
10	CrabAve	The average number of crabs counted in the SMAST survey stations within the SASI grid cell	Double	*
11	HerCrabAve	The average number of hermit crabs counted in the SMAST survey stations within the SASI grid cell	Double	*
12	SandDolAve	The average number quadrats per a SMAST survey station with sand dollars present within the SASI grid cell	Double	*
13	BryHydAve	The average number quadrats per a SMAST survey station with bryozoan or hydrozoan growth present within the SASI grid cell.	Double	*
14	HolesAve	The average number quadrats per a SMAST	Double	*

		survey station with holes (burrowing species) present within the SASI grid cell. Holes were not tracked until 2005. Cells with blank values for holes were only surveyed prior to 2005		
15	SpongeAve	The average number quadrats per a SMAST survey station with sponges present within the SASI grid cell	Double	*
16	MnSnail	The average number of moon snails counted in the SMAST survey stations within the SASI grid cell. Moonsnails were not tracked until 2005. Cells with blank values for moon snails were only surveyed prior to 2005.	Double	*
17	FlatFishAv	The average number of flat fishes counted in the SMAST survey stations within the SASI grid cell.	Double	*
18	RHakeAve	The average number of red hake counted in the SMAST survey stations within the SASI grid cell	Double	*
19	SkateAve	The average number of skates counted in the SMAST survey stations within the SASI grid cell	Double	*
20 -33	SpeciesSD	The standard deviation between station values for the corresponding species	Double	*

Feature Class Name: AveragePresenceAbundance

Total Number of Unique Features: 920

Dataset Status: Complete

5. SPATIAL REPRESENTATION

Geometry Type: vector polygon
Reference System: GCS North American 1983
Horizontal Datum: North American Datum 1983
Ellipsoid: Geodetic Reference System 1980

XY Resolution: XY Scale is 0.000000001
Tolerance: 0.000000008983153 degrees

Geographic extent: -75.144 to -66.329, 36.391 to 42.491

IS0 19115 Topic Category: biology, environment, oceans

Place Names:

Atlantic Ocean, Chesapeake Bay, Delaware Bay, Georges Bank, Gulf of Maine, Long Island Sound, Massachusetts Bay, Nantucket Shoals , Wilkinson Basin.

Recommended Cartographic Properties:

(Using ArcGIS ArcMap nomenclature)

For Average abundances:

Classified, Manual classification, 5 classes (percentile ranges), color model: R-G-B

<16th Percentile: 69 – 117 – 181

16th – 84th Percentile: 162 – 180 – 189

84th – 97.7th Percentile: 255 – 255 – 191

97.7th – 99.9th Percentile: 245 – 152 – 105

> 99.9th Percentile: 214 – 47 – 39

For Average presence:

Classified, Manual classification, 5 classes, color model: R-G-B

0: 255 – 255 – 128

0 – 25%: 250 – 209 – 85

25 – 50%: 242 – 167 – 46

50 – 75%: 173 – 83 – 19

75 – 100%: 107 – 0 – 0

Scale range for optimal visualization: 5,000,000

6. DATA PROCESSING

Processing environment: ArcGIS 10.2, Windows 7 Professional, Intel Core i5 CPU

	Process Steps Description
1	SPATIAL JOIN SMAST survey data to SASI model grid.
2	Calculate averages (from abundance or presence counts indices) and Standard deviation per cell across all years
3	For average abundances, calculate percentiles (similar to 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 SMAST and the SASI model (6200 unique cells).

Positional Accuracy: Sample locations based on SMAST 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

Distribution Liability: Data provided as is. Neither SMAST nor any of the participants on this project makes any warranty, expressed or implied as to the use or appropriateness of use of the enclosed data, nor are there warranties of merchantability or fitness for a particular purpose or use. No representation is made as to the currency, accuracy or completeness of the information in this dataset or of the data sources on which it is based. Neither SMAST nor any of the participants in this project shall be liable for any lost profits or consequential damages, or claims against the user by third parties.