“Offshore Video Survey and Oceanographic Analysis: Georges Bank to the Chesapeake” project

Dave Bethoney[†]
Kristin Kleisner[‡]
Mark Anderson[‡]
Changsheng Chen[†]
Bradley Harris[*]
Sally McGee[‡]
Chris McGuire[‡]
Skye Moret[‡]
Jay Odell[‡]
Kevin Stokesbury[†]
Liu Zhao[†]

Executive Summary

The “Offshore Video Survey and Oceanographic Analysis: Georges Bank to the Chesapeake” project introduced spatial data products that will significantly advance the understanding of marine habitats and ecological function in the Northwest Atlantic, from the Hague Line and the northern edge of Georges Bank to the mouth of the Chesapeake Bay. 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.

The project was completed through two phases. During the first phase, the project team assembled and updated published data from the Northeast Coastal Ocean Forecast System (NECOFS; http://fvcom.smast.umassd.edu/necofs)and the University of Massachusetts Dartmouth, School for Marine Science and Technology (SMAST) scallop survey. Because these data were already published, but not available in a centralized location, this phase was critical for establishing baseline of data to facilitate combined analysis and integration into public data portals.

In the second phase of the project, ten years (2003–2012) of data from the SMAST scallop survey and NECOFS were used to create new products describing the benthic habitat, benthic animal abundance and distribution and the environmental conditions in the survey area. This analysis facilitated a better understanding of the spatial variability of oceanographic factors such as bottom and surface temperature and salinity, and sheer stress due to currents. A key finding from this analysis was a comprehensive evaluation of the sediment types and stability of those sediments within the study region. Additionally, the project team produced maps of abundance for eight species and presence/absence maps for four species. Together these 12 species represented the most commonly observed benthic organisms over the study region. These maps were produced annually, as 10-year averages, and as anomalies over the time series to provide a detailed species-by-species accounting of the key benthic species in the region.

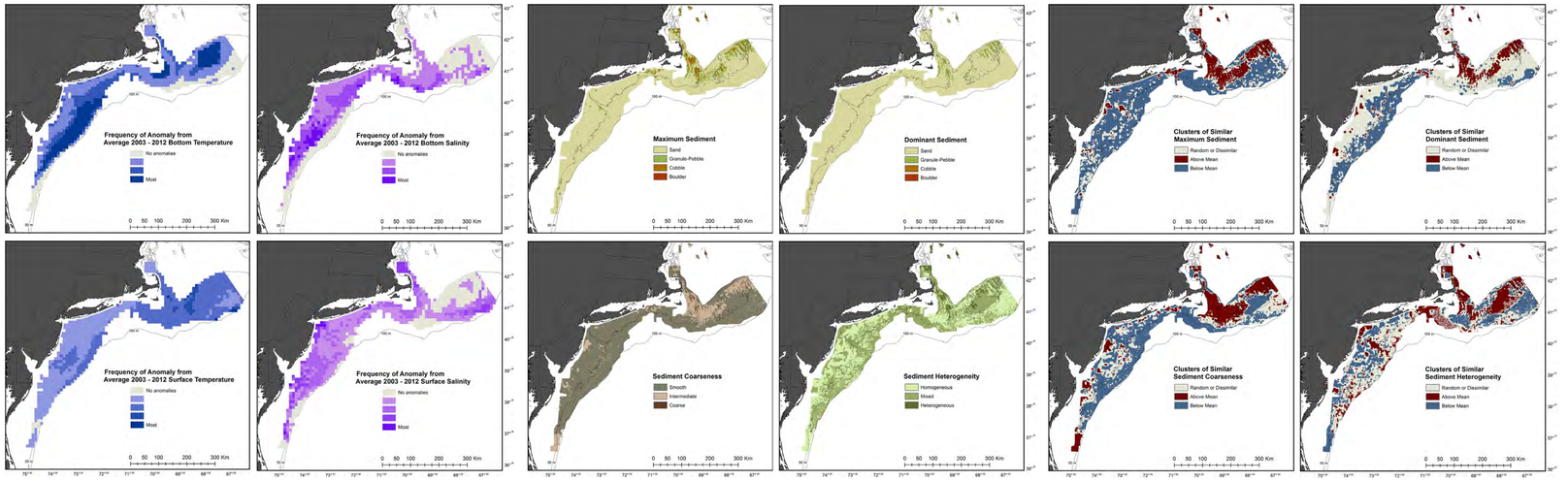
The project team also produced a map illustrating regions with high benthic biodiversity in terms of the main species sampled by the video survey. Illustrating areas with the highest concentration of species from the eight dominant groups with abundance data provides a type of ‘hotspot’ identification that can be useful for spatial planning and management. An area of high biodiversity was identified in the Great South Channel region on the southern portion of Georges Bank, indicating that this is a region of significant benthic biodiversity on the U.S. Northeast Shelf.

FOR MORE INFORMATION

The products from both phases consisted of a series of static maps, shapefiles, and supporting metadata designed for **access through the NEFSC Ecosystem Assessment webpage, The Nature Conservancy’s Conservation Gateway, and the Northeast Ocean Data Portal:**

https://www.conservationgateway.org
http://northeastoceandata.org

Oceanographic findings

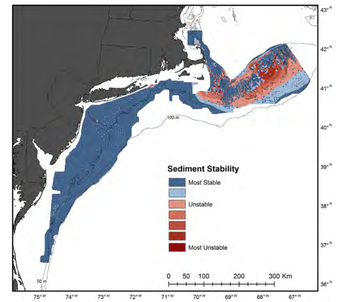


above Maps indicating frequency of bottom or surface temperature and salinity anomalies within a New England Fishery Management Council Swept Area Seabed Impact model grid cell. An anomaly was present within a cell when an annual temperature or salinity value was one standard deviation higher or lower than the average decadal variation. Temperature and salinity values were derived from the Northeast Coastal Ocean Forecast System.

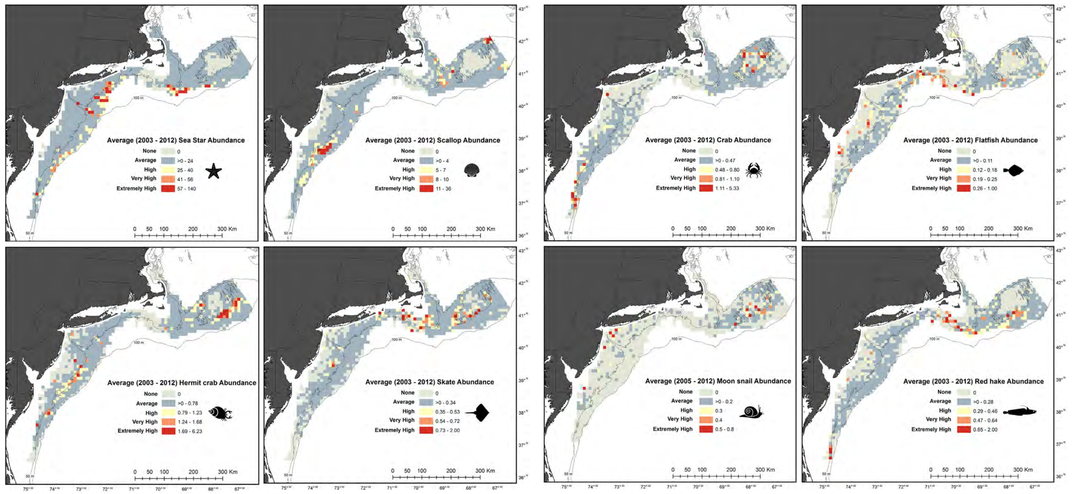
above Map of the maximum sized and dominant (most common) sediment types, as well as sediment coarseness and heterogeneity based on sediment observations from the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey.

above Map of the spatial structure (i.e., clustering or random distribution) of the maximum and dominant sediment types, as well as sediment coarseness and heterogeneity based on sediment observations from the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey.

right Sediment stability on the U.S. Northeast Shelf.



Biological findings



above Average abundance of eight animal groups based on observations from the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey from 2003 to 2012. Moon snails were not quantified until 2005.

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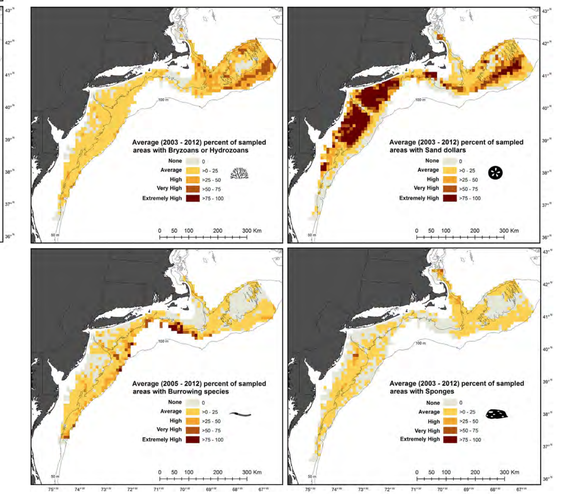
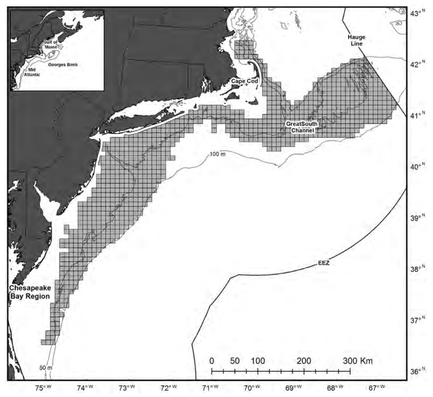
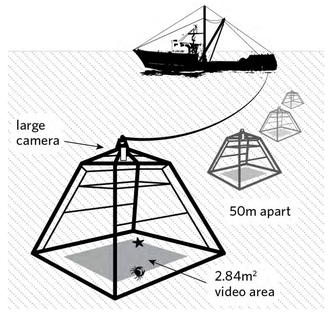


above Average presence of four animal groups based on observations from the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey from 2003 to 2012. Burrowing species, identified by holes in the substrate, were not quantified until 2005.



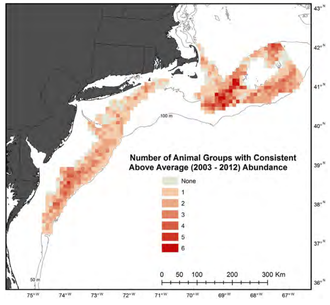
above The Northeast U.S. Shelf illustrating the various regions and the spatial extent of the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey within the Swept Area Seabed Impact model grid (gray areas). Resource wide surveys were conducted on Georges Bank and the Mid-Atlantic from 2003–2012 and in 2014 on a 5.6 km grid. Finer scale surveys on 1 km to 4 km grids were conducted in various areas starting in 1999.



above University of Massachusetts Dartmouth, School for Marine Science and Technology video survey pyramid with cameras and lights used for data collection.

below Animal groups and variables studied.

ANIMAL GROUPS	VARIABLES
sea stars	surface temperature
scallops	bottom temperature
bryzoans + hydrozoans	surface salinity
sand dollars	bottom salinity
hermit crabs	bottom stress
skates	sediment type
sponges	sediment coarseness
red hake	sediment heterogeneity
moon snails	animal group abundance
crabs	animal group presence
flatfishes	
burrowing species	



left Animal ‘hotspots’, areas with consistent above average abundance of benthic animal groups (sea stars, scallops, hermit crabs, skates, red hake, moon snails, crabs, flatfishes), based on observations from the University of Massachusetts Dartmouth, School for Marine Science and Technology scallop video survey from 2003 to 2012.

Project Takeaways

- This study utilized existing management tool to facilitate the interpretation and use of results.
- Data were leveraged from a single species survey to create data products about multiple animal groups (sea stars, scallops, bryozoans and hydrozoans, sand dollars, hermit crabs, skates, sponges, red hake, moon snails, crabs, flatfishes, and burrowing species) and the environments in which they live.
- The result was a decadal snapshot of oceanographic and benthic species distributions.
- Georges Bank appears to be a more dynamic ecosystem than the Mid-Atlantic with larger magnitudes of benthic stress, more areas with a higher diversity of benthic epifauna, and coarser substrate types.
- Both surface and bottom temperatures have tended to be more variable along the shelf break in the Mid-Atlantic Bight.
- On Georges Bank, bottom temperatures have fluctuated more in the center of the shelf, but have remained consistent around the shelf break. In contrast, surface temperatures have tended to fluctuate more across the whole of Georges Bank.
- Bottom salinities have tended to fluctuate more south of Cape Cod.
- The most variable areas of either average or maximum bottom stress are south of Nantucket and in the center of Georges Bank.
- The Great South Channel appears to be an area of high environmental variability and was most diverse in terms of continently observed animal groups.