

*The Center for Coastal Monitoring and Assessment's mission is to assess and forecast coastal and marine ecosystem conditions through research and monitoring.*

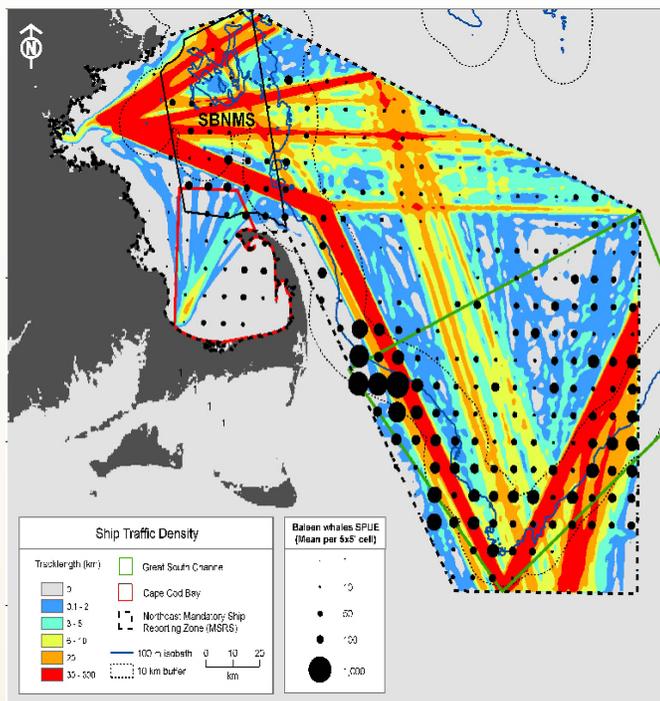
## NOAA Analytical Capabilities for Supporting Spatial Management of Cetaceans in Marine Protected Areas

Biogeographic analysis is an ideal tool for scientists and National Marine Sanctuary managers to evaluate biodiversity conservation and ecosystem integrity across the continuum of spatial and temporal scales. Completing a biogeographic assessment of the distribution of such resources within, across, and beyond the Sanctuary boundary is critical for understanding the Sanctuary within the wider ecological context and understanding how the ecosystem composition changes through time. Using the biogeographic approach, managers can explore potential changes in resource distribution that result from alternative management practices.

### Cetacean Management in MPAs

The ecological characterization completed by NOAA at Stellwagen Bank National Marine Sanctuary included considering a relocation of the Boston Harbor shipping channel to:

- reduce marine mammal vessel strikes
- expand the Sanctuary boundary to encompass additional biological hotspots
- refine monitoring efforts to overcome existing gaps in understanding and data coverage



*Relative ship traffic density (kilometers of ship track per square kilometer) representing data from the first three years (1999-2002) of the northeast Mandatory Ship Reporting System overlaid with Baleen whale relative abundance (SPUE).*

The effective management and conservation of cetaceans within a Sanctuary requires baseline information in the form of accurate and spatially explicit maps of cetacean abundance, as well as characterizations of cetacean-environment relationships. Information on the spatial and temporal distribution of cetaceans can be a valuable tool in the analysis and mitigation of threats from human activity. In addition, investigating cetacean-environment relationships can be extremely useful for:

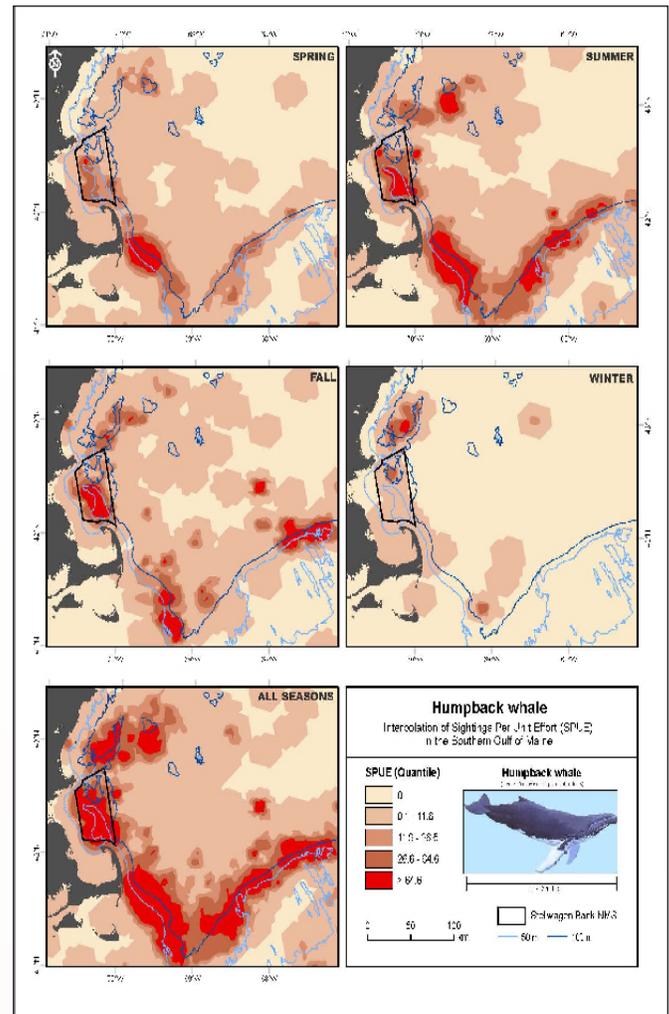
- identification and characterization of high-use areas
- prediction of spatial and temporal shifts associated with environmental change
- interpretation of historical population trends estimated from sightings data
- optimization of cetacean survey designs

The Biogeography Branch of NOAA's Center for Coastal Monitoring and Assessment provides sophisticated analytical capabilities to examine cetacean-environment relationships and the spatial and temporal patterns of relative abundance, mapping regional cetacean abundance, and interpreting seasonal species patterns. This includes the capability to examine a wide range of environmental variables that include key ambient water parameters, bathymetric structure, and mapping prey densities by season. The spatial extent of this study area included known feeding grounds and other high-use areas, such as corridors of cetacean movement.

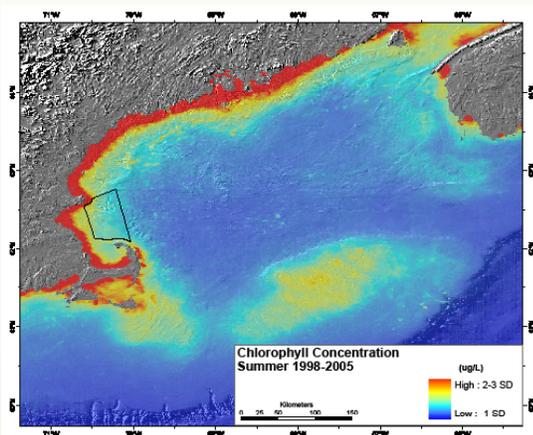
## Biogeography Branch Capabilities

- Conversion of spatially and temporally referenced cetacean sightings data into spatial layers or surfaces depicting distribution patterns and cetacean high use areas/low use areas including major corridors and aggregations.
- Provision of remotely sensed environmental data to help characterize spatial dynamics in and surrounding the sanctuary (i.e. chlorophyll concentrations, sea surface temperature).
- Linking abundance or occurrence patterns to environmental variables using statistical predictive models and then mapping the relationships through space. This approach provided not only predictive maps but also quantitative information on the ecological relationships within the environment.
- Identify spatial gradients of probable interaction between human activity and cetacean activity. Given sufficient spatial data, the Biogeography Branch can identify and map relatively high conflict zones or low conflict zones using spatial information on boat traffic, fishing effort, and then examining the extent of overlap with cetacean distributions.
- Examining the cetacean activity areas in relation to the protected area boundaries and providing suggestions for optimizing boundary placement and reserve design.

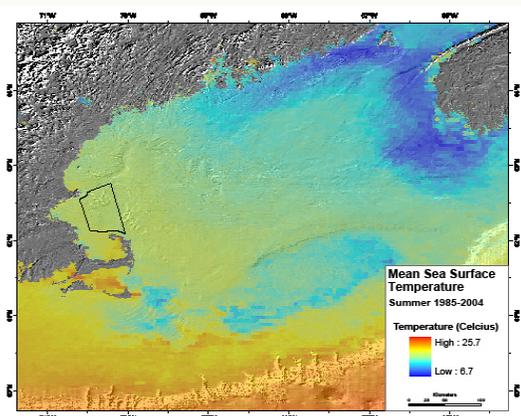
For more information on cetacean products completed for the Stellwagen National Marine Sanctuary visit <http://ccma.nos.noaa.gov/products/biogeography/stellwagen/welcome.html>.



Seasonal patterns of interpolated sightings-per-unit-effort (SPUE) data for Humpback whale in spring, summer, fall, winter and all seasons combined for the southern Gulf of Maine (1970-2005).



Summer mean chlorophyll surface temperature within the Gulf of Maine, 1985-2004.



Summer mean sea surface temperature within the Gulf of Maine, 1985-2004.

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