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**The Reevaluation of Groundfish Stock Status with Existing Acoustic Data
Providing Stability In New England Groundfish Assessments
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At a time of great concern over the management and status of New England groundfish, its impact on coastal fishing communities, and the deployment and calibration of survey trawl gear, existing acoustic data collected over the past four years are a readily available source of information that can provide stability in groundfish estimates.

Introduction

For the past four years, hull-mounted transducers on NOAA survey vessels have been used with state-of-the-art scientific echo sounders to collect high-resolution acoustic data on fish concentrations and abundance during each of the fall, winter and spring surveys since 1998. This database, which now contains 6,000 acoustic records, has not been processed, analyzed or used in New England groundfish stock assessments. Acoustic techniques are routinely used other U.S. fish surveys such as the Gulf of Alaska and Bering Sea groundfish surveys for walleye pollock, the largest fishery in the U.S. These combined acoustic-trawl survey assessments are based on methods refined and used by Dr. Kenneth Foote in Norwegian acoustic-trawl stock assessments. Dr. Foote is now a Senior Scientist with the Woods Hole Oceanographic Institution (WHOI) in Massachusetts. Acoustics is a technology and data source used around the world to augment trawl survey data. In New England, such surveys can provide:

1. A nearly independent estimate of abundance for groundfish accessible to acoustics, e.g., cod, haddock, redfish; available at no additional operational cost that can produce a relative index and serve as a comparative tool for the entire NMFS trawl survey effort in the Gulf of Maine and Georges Bank;
2. A continuous record of high-resolution information on stocks that can show stock clusters and local distribution of stocks, thus overcoming the sparseness of trawl data, which are further limited by aggregated catch composition over towing distances at each station (as trawl data are integrated records), filling in data among or between stations;
3. A map of fish distribution of groundfish accessible to acoustics in relationship to management areas and thus a tool to visualize changing distribution patterns for stock groups including haddock, redfish, and cod;
4. A measurement of and tool to calibrate catchability coefficients of trawl survey gear, since acoustic signals provide an independent index based on remote observation before the greatest movement of fish in response to the passing noise field radiated by the survey vessel's propeller, lessening effects due to particular trawl gear, including capture avoidance due to problems in gear deployment; and
5. A data source collected with minimal impact on stocks or the environment that can be effectively used in closed areas or sensitive ecosystems.

Work Statement

Ocean Trust, a national non-profit research foundation, and WHOI have initiated a collaborative research effort to conduct an independent analysis of the NMFS acoustic data and produce a new, acoustically derived, independent estimate of abundance for New England groundfish. The acoustic records will be processed and analyzed to produce a report on the overall size, abundance and distribution of groundfish both geographically and through the water column. Notwithstanding concerns over the use of trawl data in current stock assessments, the trawl samples will be used to interpret the acoustic data, specifically to associate acoustic densities with species and year classes. Issues of trawl selectivity and avoidance-induced behavior reactions will also be addressed, if in comparative fashion because of the different sampling volumes associated with the transducer and trawl.

The reduction of the collected acoustic data is a substantial effort that involves the retrieval, processing and analysis of 6,000 acoustic data sets collected during the past four annual spring, fall and winter trawl surveys that make up 12 separate survey data sets on groundfish. The work will be conducted sequentially on each data set beginning with the most relevant trawl acoustic records so that a relative index of abundance and distribution patterns can be produced in the fastest time frame possible. The assessment will be repeated for each of the 12 separate data sets from the three annual surveys over the four-year period. The first assessment will be completed within 6 months with the second assessment following within 3 months, and subsequent remaining assessment reports produced every 2 -1½ months thereafter.

A six-month report will provide detail on the process and give an initial comparative tool for both NMFS trawl surveys and industry observations. It is anticipated that the reports will establish a stock trend and ability to track age classes and their distribution through the population. A total of 12 acoustic assessment reports will be presented over the length of the project that is expected to take at least 26 months.

The research team will consist of WHOI and Ocean Trust scientists (K. Foote, T. Lassen, D. Chu, and a research assistant level II). They will perform the following tasks:

1. Retrieval of echo sounder data and entry of these into a computer system with appropriate postprocessing software, e.g., EchoView or BI500.
2. Perform postprocessing of echo sounder data, including error correction in connection with bottom detection, computation of area backscattering coefficient in layers relative to the bottom, and entry of values of this coefficient in a database with resolutions of 0.1 n.mi. in sailed distance and 1 m height differences relative to the bottom.
3. Visualize postprocessed echo sounder data in both graphic and table presentations.
4. Analyze echo sounder data with biological data derived from research bottom trawl stations: Interpret echogram, assuming known fish species and size distributions. Compute mean backscattering cross section from standard target strength – length regression equations. Divide area backscattering coefficients by this number to determine biological measures of fish concentration.

5. Visualize biological measures of fish concentration in graphs, distribution and population density maps and tables by species and year classes.
6. Document technical work (processing, analysis, and visualization) and present results with estimate of abundance, relative index and distribution of stocks in the Georges Banks and Gulf of Maine ecosystem.
7. Present results and findings to industry and fishery managers, and respond to questions on the analysis and interpretation of the results.

Conclusion

Acoustic signals can show changes in stock patterns, geographic distributions and concentrations in abundance for the groundfish complex, and for species and year classes by comparing the acoustic signals to the species and age composition in NMFS survey trawl data. Given that the observed abundance and distribution of groundfish reported by the fishing industry are not reflected in NMFS stock assessments, that serious questions are being raised concerning the validity of survey conclusions, and new fishery restrictions are being proposed that will have a serve impact on several New England fishing communities, a reassessment of the Gulf of Maine and Georges Bank stocks is needed to provide a clear and rational direction for the management of groundfish and stability of local communities.

Budget

The estimated cost for the acoustic assessment, presentations and reports is as follows:

Period	<u>2003</u>	<u>2004</u>	<u>2005</u>	<u>Total</u>
Labor	\$144,105	\$134,404	\$58,456	\$336,965
Travel	4,461	4,461	2,961	11,883
Reports/Supplies	3,845	1,430	3,850	9,125
Indirect	<u>83,763</u>	<u>75,958</u>	<u>23,305</u>	<u>183,026</u>
Total:	\$236,174	\$216,253	\$88,572	\$540,999

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