

A GIS-based fisheries database for the Northwest Atlantic: The GeoCod Project



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INTRODUCTION

- Coastal and offshore marine ecosystems in the northwest Atlantic have undergone dramatic changes over the past five decades.
- Most cod stocks had declined to such low levels that in 1992 a fishing moratorium was declared for this species. Cod have shown minimal signs of recovery and remain at historically low biomass levels.
- Rapid declines of groundfish species have also been accompanied by changes in the abundance and distribution of important forage species such as capelin, large increases in invertebrate species such as northern shrimp and snow crab, and extreme natural variability in ocean climate.
- The complexities of the ocean environment and the relationships between species, fishing and the environment have proven difficult to quantify. A more integrative approach may help to quantify the types and mechanisms of the observed changes.



Fig. 1. Study area in the NW Atlantic.

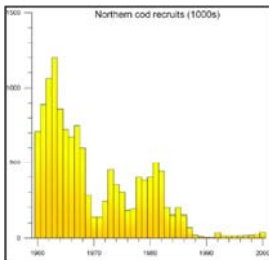


Fig. 2. Northern cod recruits at age 3 located between southern Labrador and the northern Grand Banks of Newfoundland (NAFO Zones 2J and 3KL; Rose 2007).

OBJECTIVES

- The GeoCod project is a two-year Canadian initiative that seeks to develop a spatial decision-support system that will enable fishery managers in the Northwest Atlantic to (1) gain an integrated understanding of changing marine ecosystems and (2) to provide support for the development of new fisheries and ocean policies.

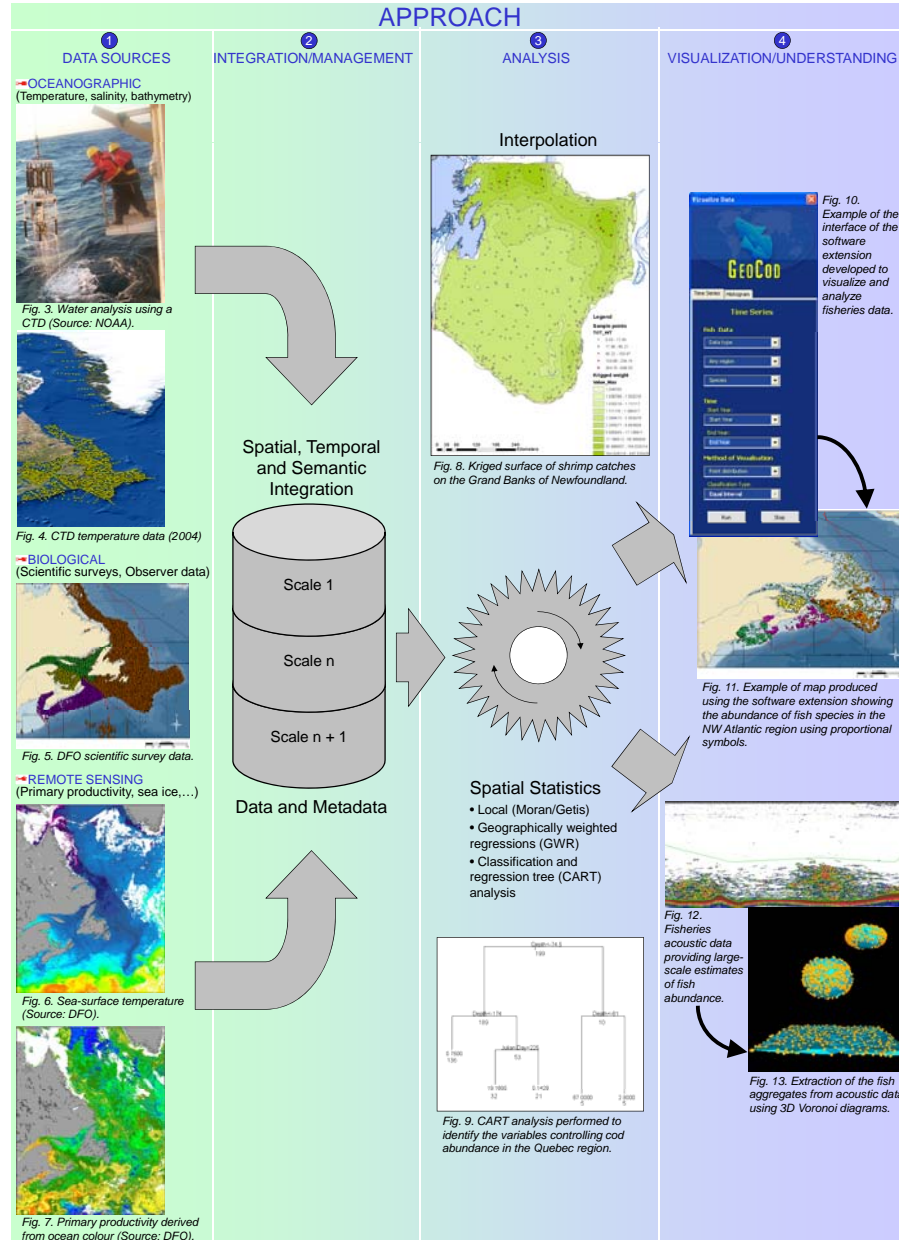
Specific objectives:

- To integrate heterogeneous fisheries and environmental data into a single data model.
- To use spatial statistics to analyze the variations in abundance and distribution of cod, capelin, snow crab and shrimp in relation to fisheries and climate change.
- To develop spatio-temporal visualization tools to help decision-makers gain better insight into dynamic relationships between species distributions/abundances and the environment.



FOR MORE INFORMATION
VISIT
THE GEOCOD WEBSITE:
<http://www.ucs.mun.ca/~rdeville/geocod>

APPROACH



PRELIMINARY RESULTS

- Fisheries data were integrated into an ArcGIS geodatabase after being spatially and semantically integrated in a common framework. Metadata following the ISO 19115 metadata standard were produced. Environmental data have also been integrated to allow further analyses.
- The spatial structure of the data has been analyzed and different methods have been tested for interpolating surfaces.
- An add-on to ArcGIS is under development to access, visualize and analyze fisheries and environmental data (e.g. distribution, abundance and variation of fish over space and time).
- Preliminary work has been done to use fisheries acoustics data as a source to produce 3D volumes from clusters of 3D points that represents fish aggregations. This has been done using 3D Delaunay triangulation and 3D Voronoi diagrams.

CONCLUSIONS

- The GeoCod project is a two year initiative using Geomatics to better understand spatial and temporal variations in cod, capelin, snow crab and shrimp in the Northwest Atlantic region.
- A large database has been compiled from multiple Canadian and US sources to include fisheries and environmental data collected over the past century that can provide a big picture of changes in some of the main commercial fisheries on the Canadian East coast.
- Fisheries and environmental data are currently being analyzed to explore the importance of different parameters (primary productivity, sea temperature and salinity, depth, fishing effort, etc.) on the variations in abundance of the different species.
- In addition, different visualization tools are under development to improve the visualization and understanding of fisheries data, and to better support decision-makers in their understanding of this complex dynamic.
- The outcomes of this project will be a unified fisheries and environmental database, a better understanding of the marine ecosystem, and a set of tools and approaches that will support decision-makers working in fisheries management.

PARTNERS/COLLABORATORS

