Cod tag recaptures reveal 'migration highways'

by Shelly Tallack

PORTLAND, ME – The Northeast Regional Cod Tagging Program (NRCTP) was initiated in 2002 and has been coordinated by the Gulf of Maine Research Institute (GMRI). The last region-wide Atlantic cod tagging effort took place around 50 years ago and much has changed in the fishery since then.

Through a series of town meetings facilitated by the New England Aquarium along the New England coast in 2001, stakeholders identified the need for a large-scale effort to tag 100,000 cod over a two-year period and provide contemporary movement information for cod in the Gulf of Maine and neighboring waters.

The aquarium's final report made a number of recommendations that have been adopted by the NRCTP over the past six years.

The core objectives of the program have been to:

- Develop a collaborative cod tagging program between scientists and fishermen in the Gulf of Maine region, including Canada;
- Make the tagging data available to the public via an online GIS (geographic information system) mapping interface;
- Obtain and analyze data from T-bar tag recaptures to improve our understanding of cod distribution, movement, and growth; and
- Develop testable hypotheses for continuing tagging studies.

It's safe to say the project has met and even surpassed these goals.

GMRI photo

Capt. Michael Sosik of the F/V Bigger n'Better holds a tagged cod ready for release.

Between March 2003 and July 2005, a total of 48 scientists and the crew of 106 fishing vessels worked together to release over 114,000 tagged cod.

Collaborative effort

The logistical challenge of tagging across a large study area was overcome by sharing the tagging effort between five partner organizations: Canada's Department of Fisheries and Oceans (DFO); the Island Institute; the Maine Department of Marine Resources; the Cape Cod Commercial Hook Fishermen's Association; and the University of Massachusetts Dartmouth School for Marine Science and Technology (SMAST).

Each tagging organization worked with commercial and recreational fishermen in their area to release tagged cod in specific locations across all three cod management areas – 5Y, 5Z, and 4X – within the Gulf of Maine.

The collaborative nature of this initiative has been a key strength of the project. Between March 2003 and July 2005, a total of 48 scientists and the crew of 106 fishing vessels worked together to release over 114,000 tagged cod.

Both fishermen and scientists were trained to apply T-bar tags using a standardized tagging technique. Each tag was printed with a unique number that essentially acted as a "passport" for each cod tagged, allowing us to compare where the fish was tagged to where it was caught.

The only way a tagged cod's movements can be recorded is if it is recaptured and reported by a fisherman. So, the success of this program was hugely reliant on the support of fishermen throughout the region. To date over 6,500 recaptures have been reported.

GIS mapping

Tagging the fish was just one programmatic challenge. With such a large number of cod movement records being collected, the NRCTP also needed to develop a sophisticated data management system that would be useful scientifically.

We also wanted fishermen involved in or interested in the program to be able to see the near real-time cod movement information as it was reported.

To date over 6,500 recaptures have been reported.

A GIS-enabled database and mapping interface developed in collaboration with Northern Geomantics of Hallowell, ME has been highly successful on both counts.

It has been effectively used for storing and organizing all the tagged cod release and recapture data collected. Equally important, the mapping site has allowed participating fishermen to see where cod are moving both on an individual fish basis or as a batch of cod defined by their release location, spawning condition, and fish size.

The GIS mapping web site can be accessed online at <www.gmamapping.org/codmapping>. Take some time to explore the many different ways to look at the data by selecting different filters, choosing the option to see lines between where individual fish traveled, and by clicking on a "fish" to see where it was tagged and recaptured, how long it was at liberty, and how much it grew.

Migration

When this program began, fishermen had a variety of opinions about how they thought cod moved within the Gulf of Maine region. Some talked of inshore/offshore movements, while others believed there was a circular migration pattern.

Obtaining answers to fish movement questions takes time, since a high number of tag returns from a number of years and a variety of fishing locations and gear types is needed to find consistencies in the movements observed.

With recaptures being reported from tagged cod that have been at liberty for up to five years, the NRCTP data now show repeated trends in cod movements.

To tease apart the different movement patterns, GMRI has conducted a variety of analyses that take into consideration the following: displacement and distance traveled; direction of travel; size effects;

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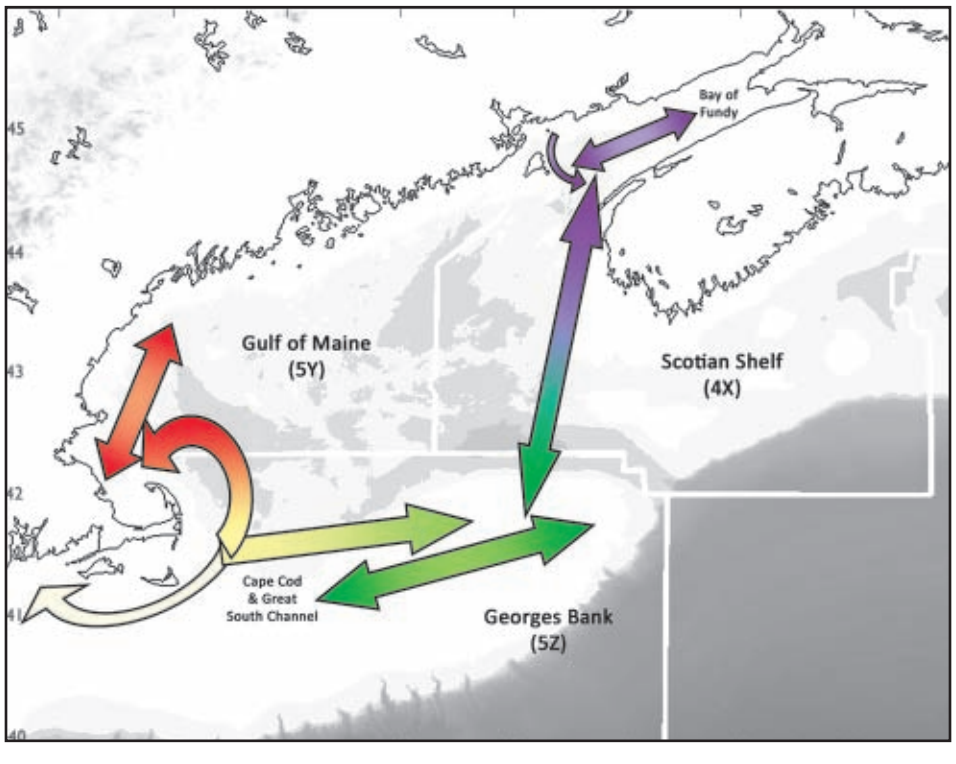
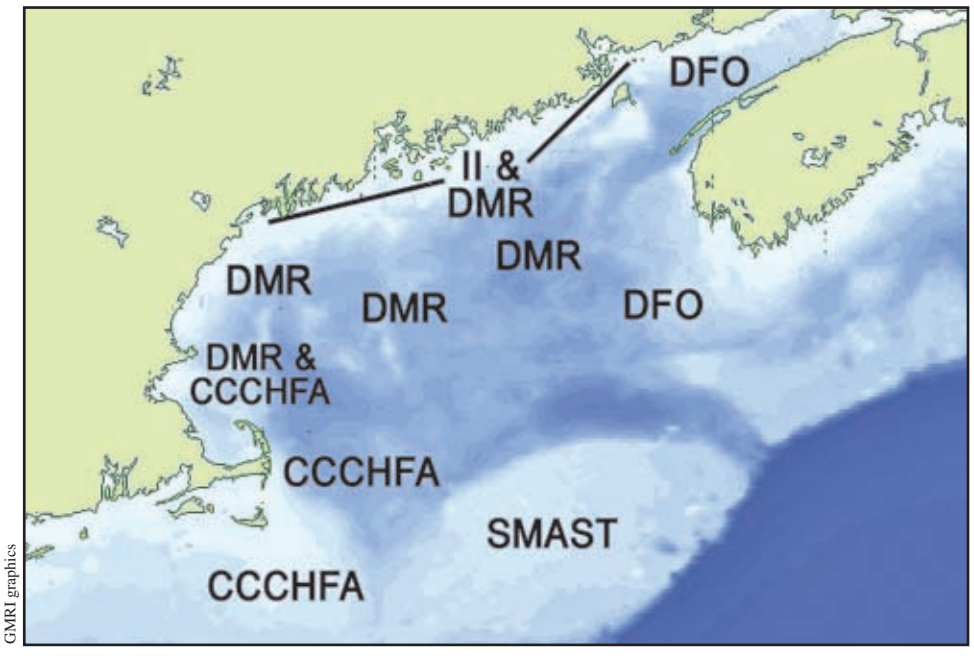


The colored arrows show probable "migration highways" for cod in the Gulf of Maine region, which GMRI developed from analyses of movement patterns based on tag returns.



GMRI graphics

The Gulf of Maine Research Institute (GMRI) coordinated tagging in target areas throughout the Gulf of Maine. The five major tagging organizations were Canada's Department of Fisheries and Oceans (DFO), the Island Institute (II), the Maine Department of Marine Resources (DMR), the Cape Cod Commercial Hook Fishermen's Association (CCCHFA), and the UMass Dartmouth School of Marine Science and Technology (SMAST).

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differences between release locations; and seasonal patterns.

By combining the outcomes of these analyses, it has been possible to describe the probable "migration highways" for cod in the Gulf of Maine region.

Area by area

Here is a summary of the study's findings by local area.

- **Georges Bank –** Small fish recruit here from the Cape Cod waters (5Z), but most adult fish then stay offshore on Georges Bank with seasonal northward movements into the Bay of Fundy (4X) during spring and summer before returning south to Georges Bank for fall and winter.
- **Bay of Fundy –** For the spring and summer, most movements are confined to the Bay of Fundy (4X), but come fall, these cod head south to Georges Basin (4X) and Georges Bank (5Z/4X) waters. Little exchange has been seen between Bay of Fundy and Gulf of Maine (5Y) cod, except for around Passamaquoddy Bay.
- **Inshore Gulf of Maine –** The program's largest cod were tagged in inshore Gulf of Maine (5Y) waters. Of the cod released in this area, few have been recaptured outside of inshore Gulf of Maine waters. Instead, these cod shuffle northwards and southwards along the New Hampshire/Maine coastline.

This finding is in line with the localized movement patterns documented in a recent University of New Hampshire cod tagging study. The NRCTP's data provide considerable evidence that a good number of young fish from the Cape Cod region (5Z) recruit to the inshore Gulf of Maine (5Y) population.

- **Cape Cod and Nantucket Shoals –** The majority of fish tagged here were sublegal (less than 21") at the time of tagging and their movements for the first year at liberty were fairly localized.

During the winter of 2003-2004, a number of Cape Cod releases were recaptured from inshore waters off Rhode Island and Connecticut. This migration is thought to represent young fish seeking warmer waters during the cold snap of the 2004 winter. This migration was less pronounced the following winter.

These smaller, pre-adult fish appear to diverge as they mature and join adult populations. Cape Cod (5Z) fish were seen to recruit eastwards to the Georges Bank area (5Z) and also northwards to the inshore Gulf of Maine area (5Y).

Of all the movements observed throughout the region, some were anticipated, for example the exchanges of fully recruited cod between the Bay of Fundy (Canada, 4X) and Georges Bank (US, 5Z).

Maybe less anticipated was the split in migration for smaller cod recruiting from Cape Cod nearshore waters (5Z) to either the inshore Gulf of Maine waters (5Y) or Georges Bank (5Z) and, thus, ultimately the Bay of Fundy.

GMRI photo

Fishermen who participated in the Northeast Regional Cod Tagging Program were trained in standardized tagging techniques.

Stock assessment

Identifying the primary migration routes has been one major achievement, but the tagging data also have been considered for the potential to provide supplementary information for the stock assessment process, particularly for the Gulf of Maine (5Y) and Georges Bank (5Z) cod stocks.

To this end, GMRI has been working with a number of scientists: Mark Terceiro, Ralph Mayo, Loretta O'Brien, and Timothy Miller at the Northeast Fisheries Science Center; Don Clark at DFO; and Steve Cadrin at SMAST.

As a group, the focus has been to calculate mixing rates between stocks in order to better understand the extent to which the different cod stocks interact.

The NRCTP tagging data were presented at a number of cod stock assessment workshops leading up to the August 2008 Groundfish Assessment Review Meeting (GARM). This was strong confirmation that fishery scientists in this region are interested in and are

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Maine lobster task force looks for consultant

FREEPORT, ME – The eight-member lobster task force created by Maine Gov. John Baldacci in October held its first meeting in Augusta on Dec. 16 to launch an effort to identify strategies to bolster the state's lobster industry.

The task force's charge is to hire and oversee an outside contractor to conduct an analysis of the industry, review the analysis, and then come up with an "action plan" to guide the industry towards long-term economic sustainability.

To get the ball rolling, the Maine Department of Marine Resources (DMR), which is providing staff support for the task force, issued a request for proposals (RFP) on Dec. 30.

The RFP asked interested outside consultants to explain how they would conduct a "comprehensive analysis of marketing, business, and management strategies" to increase profitability within the industry.

This kind of work is called a SWOT analysis, which stands for "strengths, weaknesses, opportunities, and threats."

The proposals were due on Jan. 20.

Task Force Chairman and Executive Director of Coastal Enterprises Inc. Ron Phillips said the task force would meet again on Jan. 27 to review the RFP proposals.

The SWOT analysis will form the basis of the action plan. The task force is supposed to present its recommendations to the governor by April 15.

The RFP says that a maximum of $150,000 may be allocated for this project. According to Baldacci's executive order creating the task force, funding for the contractor's services will come from the Lobster Research, Education, and Development Fund, which is supported by lobster license plate sales.

RFP details

In explaining the situation confronting the Maine lobster industry, the RFP pointed out that landings in the state exceeded 63 million pounds with an ex-vessel value of nearly $281 million in 2007.

But low boat prices took a toll on the fishery's landed value in the fall of 2008. The estimated October 2008 harvest was worth less than $20 million – down more than 67% from a high of more than $60 million in October 2005.

"Despite its importance to Maine's economy, participants in the lobster industry have long been aware that, relative to other successful businesses, this industry operates on low gross margins," the RFP stated.

"The industry has also faced challenges in capitalizing on the Maine lobster brand, expanding markets, and acquiring and holding pricing power," it continued.

In addition to the SWOT, the RFP asked that the consultant "review the structure of lobster fisheries and markets in other locations to achieve a better understanding of our competitors and Maine's position in the global marketplace."

> ***Relative to other successful businesses, this industry operates on low gross margins.***
>
> **—Maine lobster task force RFP**

The specified fisheries and markets included Nova Scotia, New Brunswick, the Caribbean, South Africa, Australia, and New Zealand.

Obstacles

Task force members have identified several obstacles they know the Maine lobster industry faces.

"The lack of instate processing and other value-added features presents a major weakness for the industry," Phillips said.

Dane Somers, executive director of the Maine Lobster Promotion Council, pointed out that getting everyone in the industry on the same page could be a potential stumbling block.

"The challenge will be to come up with a plan that is balanced and represents all voices in the industry," he said.

Industry input

According to the RFP, the action plan designed by the task force after reviewing the SWOT analysis and other information "will be designed to support industry innovation," as well as the viability of Maine fishing communities and all parts of the lobster industry.

The RFP contained a requirement that the successful applicant include an "outreach strategy for gathering information from industry members."

Task force members were aware that industry members were anxious to be both heard and included in this process. As of mid-January, plans had not been firmed up but Patrice McCarron, task force member and executive director of the Maine Lobstermen's Association, said fishermen would have an opportunity to offer their own ideas.

"Because we are still not sure who the consultant will be or when they will officially start, we are tentatively scheduled to hold our public panels in late February," she said. "We will nail that down once we have our consultant on board."

In addition to Phillips, Somers, and McCarron, task force members are: George Lapointe, DMR commissioner; Jim Nimon, Department of Economic and Community Development; Daniel Hildreth, Diversified Communications; and former state Sen. Dana Dow of Waldoboro.

Gina LeDuc-Kuntz
Lorelei Stevens

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considering the potential of nontraditional datasets to play a role in stock assessments and, in turn, future fishery management.

Most recently, similar analyses also have been undertaken in preparation for presenting the NRCTP migration information at the Transboundary Resource Assessment Committee (TRAC) Workshop in St. Andrews, New Brunswick in January 2009.

The TRAC focuses on the transboundary management area known as Eastern Georges Bank, or statistical squares 551, 561, 552, and 562. It is encouraging that the tagging data are being reviewed in an attempt to better understand the cod in these neighboring Canadian and US fishing grounds.

Goals exceeded

Overall, the Northeast Regional Cod Tagging Program has far exceeded its original goals. This study was originally proposed as a two-year project, but over the years, GMRI has successfully competed for additional funds, carrying the NRCTP into 2009.

Such long-term financial commitment from the National Marine Fisheries Service (NMFS) Northeast Region Cooperative Research Partners Program confirms that NMFS understands the value in supporting long-term collaborative projects, not only to enable the exchange of expertise through industry-science partnerships, but also to enable the collection of nontraditional data to improve our knowledge and understanding of the region's valuable fishery resources.

The NRCTP has proven to be an extremely successful example of collaborative research, as evidenced by the number of participants throughout the region and by the variety of ways in which these data have already been used.

In the current economic climate, it is unlikely that GMRI will be able to secure further funds for this study. But GMRI remains committed to collecting and responding to cod tag returns for as long as resources permit.

On behalf of all program partners, GMRI would like to thank all the fishermen and scientists who have contributed to the NRCTP and have played such an important part in improving the regional understanding of Atlantic cod movement in the Gulf of Maine.

For more information on the NRCTP, please visit our web site at <www.codresearch.org>. Or contact Shelly Tallack at the Gulf of Maine Research Institute by phone at (207) 228-1639 or e-mail at <stallack@gmri.org>. ■

Shelly Tallack is an associate research scientist with the Gulf of Maine Research Institute specializing in fish migration, bycatch mortality, and gear selectivity.

She holds a PhD in fisheries science from the University of the Highlands and Islands based at the North Atlantic Fisheries College in Scotland and is an adjunct scientist at the University of Southern Maine. Tallack has served as program manager for the Northeast Regional Cod Tagging Program since 2003.