



This workshop was dedicated to Reid Wilson,
Cobscook Bay handline fisherman, died April 17, 2005.

Report to Maine Sea Grant/Project Development Funds:

Gulf of Maine Cod Science and Policy Workshop

Host: Benjamin Neal, Marine Programs Officer
Island Institute, Rockland, Maine
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Introduction

For centuries fishermen have been drawn to the Northwest Atlantic for its bountiful fish stocks, but over time exploitation of this valuable natural resource has led to its decline. *Gadus morhua*, commonly known as the Atlantic Cod, has been a target species throughout the history of the Northwest Atlantic fishery. The cod fishery in the Gulf of Maine has supported local communities along the coast of New England and Canada for centuries. However, changes in technology and increases in fishing effort have impacted cod populations greatly. As cod stocks have declined, advancing technologies have allowed fishermen to exploit new populations and sustain the industry. In the last few decades this process has pushed stocks so low that cod is no longer as viable a fishery in the Gulf of Maine, causing fishermen to enter into other fisheries or seek alternative forms of employment.

The problem of overfishing and declining fish stocks in the Gulf of Maine is undeniable, but the issue remains poorly understood with little improvement or resolution. Various management regimes have been employed through the years to attempt to regulate the fishery, but none has effectively protected cod stocks, as can be seen from their current state. Research has been done to attempt to understand current cod populations, but there is little consensus as to what this research may mean for management of the stock. ***The purpose of the Gulf of Maine Cod Science and Policy Workshop was to present recent Gulf of Maine cod research projects and to engage the scientific community, fishermen, and other interested parties in a discussion of the application to management and future of regional groundfish research.***

This report summarizes the four workshop presentations, and lists attendees and contact information. The Island Institute thanks Maine Sea Grant and the University of Maine Extension for contributing to this event.

AGENDA

- 9:00** **BREAKFAST** - 4th floor Conference Room-Island Institute
9:30 **Introductions;** goals and objectives of workshop; agenda; schedule for the day
9:45 **Presentation:** Analyzing 19th Century Fisheries Records to Determine the Historical Abundance and Distribution of Gulf of Maine Cod
Dr. W. Jeffrey Bolster, Department of History, University of New Hampshire
- 10:30** **Q & A** on Analyzing 19th Century Fisheries Records
10:45 BREAK
11:00 **Presentation:** Northeast Regional Cod Tagging Program, *Dr. Shelly Tallack, Program Manager, Gulf of Maine Research Institute*
- 11:45** **Presentation:** Canadian Cod Tagging Results, Northeast Regional Cod Tagging Program
Don Clark, Biologist, Marine Fish Division, Canada DFO
- 12:15** **Q & A** on Northeast Regional Cod Tagging Program
12:30 LUNCH
1:00 **Presentation:** Maine - New Hampshire Inshore Groundfish Trawl Survey
Sally Sherman, Maine Department of Marine Resources
- 1:45** **Q & A** on Maine - New Hampshire Inshore Groundfish Trawl Survey
2:00 BREAK
2:15 **Stock Assessments & Research Applications:** *Tom Nies, Senior Fishery Analyst-Groundfish, New England Fisheries Management Council*
- 3:00** **Facilitated Discussion:** Management Applications and Future Research
Sherman Hoyt, Fisheries Outreach Coordinator, Maine Sea Grant
- 4:30** END
5:30 DINNER All attendees invited.

Report preparation by: Benjamin Neal, Island Institute, Thomas Buehrens, Bowdoin College, and Patrick Mahoney, Bowdoin College

Presentation Summary: Analyzing 19th Century Fisheries Records to Determine the Historical Abundance and Distribution of Gulf of Maine Cod

Dr. W Jeffrey Bolster, Dr. William B. Leavenworth, Karen E. Alexander
UNH Cod Project

In this study, an interdisciplinary team of ecologists, statisticians, and historians have used archival documents to estimate historic cod populations in various parts of the Gulf of Maine. One recently published study focuses on the cod biomass of the Scotian Shelf, an area off of Newfoundland. Utilizing fishing logbooks from a core of vessels sailing from Beverly, MA, the group was able to extrapolate the total take of over a thousand vessels that were known to be fishing on the Scotian Shelf between 1852 and 1859. This data was then worked into established population models to calculate the biomass of cod in the area fished. The group estimated that the biomass of cod on the Scotian Shelf in 1852 was 1.2 million metric tons, compared with less than 50,000 metric tons today. Put in another way, 43 schooners based in Beverly were able to catch more metric tons of cod than the entire Canadian fishing fleet took from a larger area in 1999. The study also illuminated a short term cod population crash that occurred between 1852 and 1859. During this period, the fleet experienced a fifty percent decrease in catch per unit effort as it increased in size, despite its utilization of more efficient technologies. By showing how populations have changed over time, this study accentuates the scale of population crash that has occurred in North Atlantic cod populations over the past 150 years.

Recently, the group has begun processing logbooks for nearshore Gulf of Maine Fisheries from the mid-19th century. This data promises to trace a similar population decline in areas within the Gulf of Maine, with the bulk of documents originating in Frenchmen's Bay, Machias and Deer Isle. The group has found that most vessels based in the Frenchmen's Bay region fished within site of shore, roughly between Penobscot Bay and Grand Manan. They estimate that 34 small schooners fishing just in this small, nearshore region were able to bring in more cod in 1861 than were brought in from the entire Gulf of Maine in 1999. This shows the large scale of the Downeast nearshore cod fishery, which has been historically underestimated. It also indicates a reverse economy of scale, with small boats actually operating more efficiently than large boats during the period. Downeast Maine was home to a small scale, family operated fishery that was highly diversified and operated within a relatively small area, but still was able to bring in a large quantity of cod.

While cod populations may currently be making a small recovery in the Gulf of Maine, they are far below the productive potential of the ecosystem. We need to keep historic populations in mind when evaluating the current condition of the fishery. These analyses put the current fishery in perspective by showing the scale at which the New England fishery once operated.

Presentation: Northeast Regional Cod Tagging Program

Dr. Shelly Tallack,

Program Manager, Gulf of Maine Research Institute

Don Clark

Biologist, Marine Fish Division, Department of Fisheries and Oceans

In these presentations Shelly Tallack and Don Clark described preliminary findings of the Northeast Regional Cod Tagging Program, a collaborative mark-recapture study. The three year study, ending in 2005, had three primary scientific goals: to identify movement patterns of cod throughout the Gulf of Maine and neighboring waters; to document cod growth rates; and to identify spawning areas. The study was not designed to provide stock assessment data but does potentially have implications for future stock assessment.

In the study over 100,000 cod over 14 inches were caught by 250 fishermen on 75 boats and tagged by a combination of around 30 scientists and 50 fishermen. Gear types included otter trawl, hook and line, and very limited gillnetting. Sixty-six percent of cod were tagged on commercial vessels with the remaining fish being tagged on recreational vessels. To date tag return rates have increased from 1.8% to 3.8% over the first two years of returns, and it is hoped that the rate will eventually reach 5%.

Preliminary results indicate that recaptured fish are larger than the released fish. It is possible that this is because of differences in the gear used for marking versus recapture, with recapture gear favoring larger fish. Other possibilities include differences in catchability or survivability by size class. Lastly of course is the possibility that the distribution of recaptures toward larger fish represents growth. This is at least partially supported by the initial finding that growth of individual fish increased with increasing days at liberty. Additionally, growth rates varied by area. Fish tagged in the Bay of Fundy grew significantly faster and were heavier at a given length than those tagged on Brown's Bank or the Scotian shelf.

While data is only in the beginning stages of analysis and returns are still streaming in, some patterns in movement have been observed. In Canada, fish tagged on Brown's Bank and the Scotian shelf have tended to be recaptured relatively close to where they were released with little mixing between these areas and the Bay of Fundy. While this pattern of local recapture remains mostly true for cod less than 55cm tagged in the Bay of Fundy, larger fish from the Bay of Fundy have often been recaptured on George's Bank and basin as well as in the far western Gulf of Maine. Additionally, site fidelity for all groups declined with increasing time at liberty. George's Basin also seemed to be a potential mixing area for large cod, with recaptures in the basin coming from a large range of release locations, and generally tending toward larger individuals with a mean size around 75cm.

Larger scale trends in movement have also been observed. Distance traveled by fish released in the spring increased throughout the summer and into the fall but decreased by winter, suggesting a cyclical seasonal pattern in movement. The distribution and scale of movement also changed with age, and cod from a given area did not necessarily show similar movement to other cod tagged in the same area. One noticeable pattern was the dearth of tagging and recaptures all along mid-coast Maine despite tagging effort in the area.

Because of the low return rates and the low occurrence of spawning fish among returns (~1%) there has not been significant analysis to reveal spawning areas in U.S. waters, but as data comes in this will soon be possible. However, in Canada primary spawning occurs in the fall along the coast of Nova Scotia and in the spring in the Bay of Fundy and on Brown's Bank.

While data is only in the beginning stages of analysis, preliminary results of the study indicate that cod movements are not stochastic, but rather defined by patterns that are varying in their consistency by area and season as well as in different age classes of fish. This study presents information which may be valuable for management bodies which in many cases have drawn stock assessment surveys and fisheries allocations down political and arbitrary rather than ecological lines.

Presentation Summary: Maine - New Hampshire Inshore Groundfish Trawl Survey

Sally Sherman

Maine Department of Marine Resources

In this presentation Sally Sherman presented the results from the first five years starting in 2000 of the Maine-New Hampshire Groundfish Trawl Survey. The goals of the survey were fourfold: to fill an information gap in ME and NH waters; to create a long-term fisheries independent database, to contribute to the interpretation of trends seen in other studies, and to foster collaborative research between scientists and fishermen.

The survey trawls were conducted in five regions along the Maine and New Hampshire coasts at four different depths from 5 fathoms to 56+ fathoms, thus creating 20 sampling strata. The study attempted to complete 115 trawls each spring and fall, with most the trawls being divided between randomly generated areas within each strata, as well as 40 fixed locations. The trawls were completed using a modified shrimp net with a sweep of 4" cookies and 6" cookies in the bosom. The net had a 70' footrope, and a 59' headrope with 2" mesh, a 1/2 inch cod end liner, and a total fishing area of 85 feet. Trawls were standardized at 20 minute lengths at 2-2.5 kts.

In the study relatively few cod were encountered. Cod were not in the top ten most common species caught either by weight or by number, and juvenile cod comprised the vast majority of the cod catch, both in the spring and fall. Furthermore, the average number of cod per tow varied from around 1-8 fish with no change in abundance over the period of the study. In both spring and fall surveys, adult cod were much more prevalent in the extreme western and eastern areas of the survey, with very few adults encountered along all of mid-coast Maine. Juvenile cod were encountered more evenly throughout the survey regions, with significantly more in the 2-6 cm range encountered in the spring. Consistent with other studies, the number of actively spawning (ripe and running) cod encountered was very low at around 2% of the total cod catch.

It is hoped that long-term funding can be obtained to continue this study in order to create a significant time series.

Presentation Summary: Stock Assessments and Research Applications

Tom Nies

Senior Fishery Analyst- Groundfish, New England Fisheries Management Council

In this presentation, Tom Nies discussed the process by which research can advise policy. While the Council needs to make the final approval of management actions, they are advised by subject oversight committees that focus on certain issues or species. Plan development teams supply the committees with technical data and research needed to assess the issues. Every few years a Stock Assessment Workshop (SAW) is held to reevaluate the status and structure of the stock. The Research Steering Committee is where new research can be incorporated into the management structure. However, there is a requirement that raw data is provided along with the research. The law requires that assessments be based upon stock by stock analyses, with nineteen different species being managed in this manner. The council has several tools at its disposal to manage the fishery, including days at sea (DAS) restrictions, gear restrictions, and area closures. Since collaboration between independent researchers and the Northeast Fisheries Science Center needs to occur well before the SAW, it is often very difficult to incorporate new research into this system.

Facilitated Discussion Summary: Management Applications and Future Research

Sherman Hoyt

Fisheries Outreach Coordinator, Maine Sea Grant

Near the beginning of this discussion, a question was posed asking whether the historical research presented was done for the purpose of academic exercise or expressly to influence management. Dr. Bolster explained that while the initial impetus for their research came from the discovery of a wealth of archival documents, as the research progressed they hoped it would apply in a practical manner to the current debate over fisheries management. He emphasized the importance of elucidating shifting baselines to show how diminished the scale of today's fishery really is. Altering the general public's view of historical cod biomass could greatly influence management, specifically by bringing public concerns directly to state representatives in Washington. In addition to the historical research presented earlier in the workshop, the discussion also focused on the value of fishermen's knowledge, both through stories about the past and through current knowledge of the fishery. However, doubt was expressed over the difference between popular interest in the fisheries and popular action, with the latter being needed to actually make a change in policy. It is possible that a fundamental change in management is necessary to adequately address issues in such a dynamic and varied fishery. The fishery is both a source of food and a supporter of communities, making it necessary to manage for both aspects along with sustainability.

The question of whether or not past carrying capacities indicated by the presented research could actually be reached was also discussed. Don Clark expressed the need to manage the fishery on a variety of different scales, placing emphasis on increasing survival to accrue more old fish and raise spawning potential. While we currently manage the areas that actually have cod in them, it will be necessary for the old spawning areas to come back to attain past carrying capacities. However, it is also necessary to know whether or not coastal areas were used for feeding or spawning. If they were used exclusively for feeding, the current depletion of coastal cod stocks could be attributed to development which has eliminated anadromous forage fish runs that the cod depended on for food. However, if they came near shore to spawn, the problem could be more complicated than a lack of food, and the stocks may require measures other than restoration of forage fish stocks to return to these areas.

Several future research needs were also addressed. Many expressed a need to further understand cod stocks. Dr. Tallack suggested that acoustic tagging studies could provide more detailed data on cod movements, but such a project would be hard to accomplish due to high costs. Studies comparing current data with historical tagging studies and studies of genetics could also provide useful information on cod stocks. Generally, the question of whether or not there are, could be, or once were, localized populations of cod needs to be investigated. While current data does not provide an answer to that question, when such information becomes available, both social and biological factors will need to be taken into consideration before new management can be created.

LIST OF WORKSHOP ATTENDEES

Name	Organization	Phone	Email
Jean Logan	Blue Frontier Campaign	(703) 317-1684	jeanlogan@cox.net
Donald Clark	Canada Dept. of Fisheries and Oceans	(506) 529-5908	clarkd@dfo-mpo.gc.ca
Jeff Bolster	University of New Hampshire	(603) 862-3016	jeff.bolster@unh.edu
Cindy Smith	Maine Dept. Marine Resources	(207) 624-6558	cindy.smith@maine.gov
Jen Litteral	Mt. Desert Island Biological Lab	(207) 266-5625	jlitteral@mdibl.org
Karen Alexander	University of New Hampshire	(603) 862-4482	karena@unh.edu
Bill Leavenworth	University of New Hampshire	(603) 862-4482	sapereau@yahoo.com
Thomas Buehrens	Bowdoin College Resource Associates/Bowdoin College	(207) 721-5945	tbuehren@bowdoin.edu
Anne Hayden	Bowdoin College	(207) 725-9742	ahayden@bowdoin.edu
Pat Mahoney	Bowdoin College	(207) 721-5452	pmahoney@bowdoin.edu
Ben Neal	Island Institute	(207) 594-9209x299	bneal@islandinstitute.org
Shelly Tallack	Gulf of Maine Research Institute	(207) 228-1639	stallack@gmri.org
Pat Foote	Gulf of Maine Research Institute	(207) 228-1639	pfoote@gmri.org
Sarah Whitford	Gulf of Maine Research Institute	(207) 228-1639	swhitford@gmri.org
Bill Hoffman	Mass. Div. of Marine Fisheries	(978) 282-0308x106	bill.hoffman@state.ma.us
Daniel Salerno	Mass. Div. of Marine Fisheries	(978) 282-0308x105	daniel.salerno@state.ma.us
Sally Sherman	Maine Dept. Marine Resources	(207) 633-9503	sally.sherman@maine.gov
Tom Nies	NEFMC	(978) 465-0492	tnies@nemfc.org
Ed Stern	Fisherman	(617) 785-8003	stern.ed@gmail.com
Ted Hoskins	Downeast Groundfish Initiative	(207) 374-2028	hoskinst@earthlink.net
Kevin Kelly	Maine Dept. Marine Resources	(207) 633-9543	kevin.kelly@maine.gov
Kerrie O'Donnell	Maine Dept. Marine Resources	(207) 633-9557	kerrie.o'donnell@maine.gov
Jim McCleave	University of Maine	(207) 581-4392	mccleave@maine.edu
Dana L. Morse	University of Maine	(207) 563-3146x205	dana.morse@maine.edu
Roger Fleming	Conservation Law Foundation	(207) 729-7733	rfleming@ccf.org