

Production and Testing of an Alternative Bait Selecting for Haddock

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**P.I.s: Mark Leach
CCCHFA
210 Orleans Road
North Chatham, MA 02650
508-945-2432
markvleach@hotmail.com**

**Susan Goldhor
CARS
45-B Museum Street
Cambridge, MA 02138
617-876-7252
susangoldhor@comcast.net**

Abstract:

The primary purpose of this project was to test whether fabricated baits could reduce the catch of cod, relative to that of haddock, to an extent that would allow hook fishermen to harvest haddock in areas closed to cod fishing. Eight benthic longline fishermen tested haddock baits developed in Norway and the Aleutians, as well as squid and herring. In addition, a novel fabricated bait was developed for this project by S.Goldhor, and a small amount of the initial version was manufactured and tested. All three fabricated baits fished well and significantly reduced the catch rates of cod, relative to that of haddock, below that achieved with herring. During 494 hauls, over the course of 141 trips, the catch rate of legal-sized cod as a percent of the catch rate of legal-sized haddock (all catch measured by weight) was: Squid: 9.1%; Herring 3.6%, Novel S. Goldhor: 6.36%; Aleutian: 0.7%, Norwegian: 0.3%. It is clear from this preliminary work that fabricated baits have immense power to make hook fishing more species-selective.

Introduction:

In 1994, year-round closures of fishing grounds on Georges Bank were implemented in the Northeast Multispecies Fishery Management Plan (FMP) of the New England Fishery Management Council (NEFMC). The closures were implemented with the intent of rebuilding overfished stocks of yellowtail, haddock and cod. Nearly a decade later, these closures have been attributed with protecting numerous fish stocks and undersea habitats and Georges Bank haddock is one of the most impressive success stories to date. In fact, haddock spawning biomass is projected to be about one-half of the way to a rebuilt status in 2003.

With the haddock stock rebuilding steadily, it would seem logical that haddock would once again be a principal target for hook and line fishermen from Chatham. Fishing practices have changed substantially amongst mobile gear fishermen on Georges Bank in recent years; they have switched from trawling a wider range of Georges Bank to focusing their efforts on the boundaries of the closed areas to catch haddock as they migrate out of the closed areas. This is largely in response to a decrease in cod trip limits and availability, with a corresponding increase in haddock trip limits and availability. As such, abundance of haddock outside of the closed areas has become reduced for hook and line fishermen rather than augmented by the haddock rebuilding success story.

Certain grounds are now closed to fishing because of poor cod stock recovery, despite the fact that these grounds support healthy, fishable stocks of haddock. Methods of targeting haddock while excluding cod would be very useful to hook fishermen hoping to expand their fishing grounds and increase their haddock harvest. Research by Norwegian scientists¹ has shown three methods by which longliners can increase their haddock catches while greatly decreasing that of cod:

1. Replacing squid with herring, which is a better bait for haddock than for cod.
2. Using smaller baits, which are more likely to catch haddock than cod.
3. Using a commercially available biodegradable fabricated bait which greatly favors haddock.

It is generally agreed that longlining is one of the least environmentally damaging fishing methods. The great argument against longlining is its lack of selectivity, although potentially, it is one of the most selective fishing methods we have². We are only starting to exploit that potential for selectivity and we see the manipulation of baits as an important method for doing so. Since attractants, taste, mouth feel, set time, size and shape can all be manipulated, fabricated baits can improve species and size selectivity. Since these baits can be manufactured as a sausage, or extruded into a continuous sausage-like shape, the ease of baiting and the possibility of mechanical baiting are both greatly increased. When a herring is cut into bait, the tail portion is a poor bait, the viscera often fall out of the flesh or off the hook, and the head is hard to cut evenly; in short, only a fraction of the hooks baited from it will fish well. The same is true of squid. The fabricated bait uses either wastes or the entire fish and renders it consistent in its ability to stay on the hook and catch.

Project objectives and scientific hypotheses:

The hypothesis was that fabricated baits made of herring waste could select for haddock and against cod to a greater extent than natural herring baits. We also hypothesized that we could design a haddock bait that could rival the imported ones. Our objective was to test all experimental baits against both herring and squid, under commercial longlining conditions. Fabricated bait will be fished against herring in trials. We were interested not only in the bait's ability to catch haddock and exclude cod, but also in the ease of baiting and hook cleaning, number of hooks coming up empty, and the fishermen's general responses to this type of bait.

Participants:

Eight fishing vessels participated in these trials:

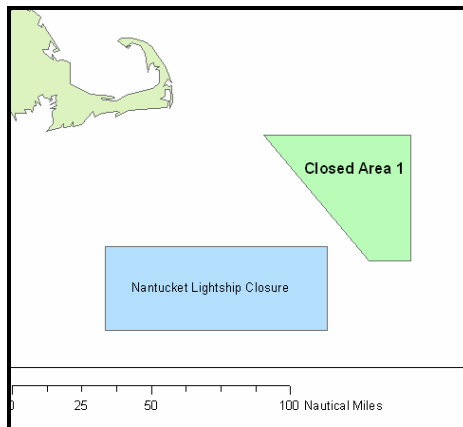
<u>Vessel Name</u>	<u>Captain</u>
Never Enough	Bruce Kaminski

Peggy B II	Ron Braun
Sea Hound	Peter Taylor
Susan Lee	Mike Russo
Tenacious	Eric Hesse
Wendy Jean	Terry Pickard
William Gregory	Roger Horne
Yellowbird	Jamie Eldredge

All data collection was completed by independent onboard scientific data collectors supplied by REMSA. Paul Parker, the CCCHFA's Executive Director, and Mark Leach, CCCHFA Board of Directors Member, monitored the trials and assigned vessels to the project and to specific baits. Dr. Susan Goldhor located the commercial baits, made contact with the companies involved and placed the orders. She designed the experimental bait, collected ingredients, and went to Cornell to manufacture it with the help of their meat products technician.

Methods:

The research occurred in Closed Area I, with the principal goal of demonstrating that access to Closed Area I for hook and line fishermen will reduce impact on Georges Bank cod by redirecting effort to a traditional hook and line fishery for haddock.



The bio-degradable fabricated baits used in this project were all made of herring, and all were manufactured as a continuous sausage. The haddock bait was developed primarily by Dr. Svein Lokkeborg, working in collaboration with Mustad, the major European longline gear manufacturer. Mustad and Lokkeborg formed a subsidiary (Norbait) to produce and market the bait. The U.S. bait is being produced in Akutan by Trident Seafoods. The Trident bait differs slightly from the Norbait in composition, but generally follows the Norbait guidelines. From our observation, as well as from Lokkeborg's published papers, the bait appears to be ground herring mixed with a gum to improve adhesion, stuffed into a sausage casing-shaped tube of netting³.

Despite the availability of commercial baits, we made an initial attempt at developing our own, in order to avoid shipping costs and provide a constant supply. Also, the commercial bait is thicker than our fishermen would like. Working with the Cornell sausage lab, S.G. manufactured approximately 200 pounds of bait which she designed, made of ground herring. It was extruded into ordinary frankfurter casing of a diameter specified by the fishermen. All baits were stored frozen.

All hauls were observed and processed by a trained, independent scientific data collector and met the guidelines set forth by the various Exempted Fishing Permits (EFP) necessary to perform the research. The actual round catch weights of each species (kept and discard) on a haul by haul basis were measured. When actual weight measurements of landed fish could not be obtained, estimated weights were determined by counting the number of individual fish and converting to dressed weight using the average landed weight per trip. Dressed weight was

converted to round weight using the NMFS standard conversions for groundfish (1.17 cod, 1.14 haddock). Length measurements of all cod, all sublegal haddock, and 33% of legal haddock were also collected. On preliminary trips, a subset of adult haddock were weighed and measured to confirm that the length-weight relationships agreed with previous assessment data collected by NMFS4. Data were entered into the New England Fishery Science Center SeaSamp database, as well as CCHFA's in-house database.

Data:

Complete trip data will be available online in Excel format after the results have been published. However, in this section the most relevant data are presented in a simple format. We have divided the fishing period into three periods, according to permits. The first period (EFP 280) and most of the second period (EFP 338) represents results using traditional baits: squid, mackerel and herring. At this time, we had not yet been able to obtain any fabricated baits. The first Trident bait was not used until mid-July, and the first Norbait until late August. The Cornell bait was fished in August.

Although it is not technically covered by this grant, we also include data from EFP 448, which is of interest because it presents catch rates of fabricated bait fishing during the same time period as herring, for October '04 through the end of that year, a time roughly comparable to the first period, when no fabricated baits were available. CPUE is a measure of catch rate (pounds per hook) that allows for corrections in effort when comparing landings of fish species.

Area	Bait Type	Haddock landed, lbs	Cod landed, lbs	Haddock CPUE	Cod CPUE	Effort (# hooks)
CAI						
EFP 280	Squid	94,958	7,438	1.471	0.115	64,564
Oct-Dec 03	Mackerel	1,652	77	0.903	0.042	1,830
	Herring	111,179	4,844	1.142	0.050	97,315
EFP 338 Feb, May-Sept 04	Fabricated	147,623	454	1.040	0.003	141,916
	Squid	24,453	3,477	0.596	0.085	41,058
	Herring	101,786	3,728	0.622	0.023	163,611
	Clams	199	154	0.098	0.076	2,034
EFP 448 Oct 04-Jan 05	Fabricated	36,106	277	1.194	0.009	30,250
	Herring	40,942	630	1.067	0.016	38,359

In addition, we calculated performance of each of the three fabricated bait types separately, as the catch rate of cod as a percent of haddock (in order to correct for effort).

Bait Type	Effort (#hooks)	Haddock CPUE	Cod CPUE	Catch rate of Cod as a Percent of Haddock
Squid	105,622	1.131	0.103	9.14%
Herring	299,285	0.848	0.031	3.62%
Trident	54,860	0.831	0.006	0.72%
Norbait	93,651	1.229	0.003	0.28%
Cornell	5,535	0.436	0.028	6.36%

Results and Conclusions

The major conclusion from our data is clearly that longlining has the potential (and now, in terms of cod and haddock, the actuality) to be very selective. Even changing from squid to herring offers a significant reduction in

the take of cod relative to that of haddock. Fabricated baits push the envelope further; the Norbait being particularly impressive. It is also impressive that a novel fabricated bait, on the first try was able to show a cod CPUE less than herring. Because there was only enough Cornell bait for seven sets, these figures are far less robust than the others, for which dozens of sets were made.

One drawback to the study is the inability to set different types of bait at the same time in the same area. A direct comparison between baits (such as the cod CPUE as a percentage of haddock CPUE) presents an inaccurate comparison, as fish are temporally and spatially active. As there is no way to correct for this, the best measure of the fabricated baits' success is the comparison of haddock CPUE and cod CPUE within a single type of bait. The fabricated baits caught significantly more haddock than cod, illustrating that they are selective.

All of the data presented here are from a single area: CA1. Whether these data can be extrapolated to other areas is unanswered. However, at least for CA1, these data provide a very strong argument for allowing hook fishermen to fish for haddock in areas that are closed to protect the rebounding cod stocks.

Partnerships

This was a project where the interests of the scientist and the fishermen coincided. Both were set on testing the commercially available haddock baits under local conditions, and both had an interest in developing a local bait. The latter was of the greatest importance when we believed that no commercial haddock bait was available. However, given the production and price limitations of the commercial bait, the development of a local bait regains importance. The fishermen participating in this project have been truly invested in the research, as it is providing a robust dataset that has allowed for the development of experimental fisheries. The expanding research was accomplished due to their willingness to donate the landings back to the project budget in order to extend the dataset. Everyone worked together to obtain the bait and then to test it, in the timeliest fashion.

Impacts and Applications

The data generated from these trips, as well as additional trips done outside the scope of this grant, supported the Georges Bank Hook Sector Inc.'s proposal to create a special access program (SAP) that would allow for a small haddock fishery within Closed Area I. In the fall of 2004, the New England Fisheries Management Council implemented a special access program in Georges Bank Closed Area 2 for 2.2 million pounds of haddock. Canadian longliners, who face the possibility of being banned from fishing because of their supposed lack of selectivity, are vitally interested in our data and bait.

Related Projects

This project to test fabricated bait acted as a pilot for what has become a much larger study. Leveraging a \$50,000 matching grant from the Kaplan Fund, the pilot gave us the basis to collect data from over 130 trips in Closed Area I and 12 trips in Western Gulf of Maine and Cashes Ledge. In an effort to provide similar fishing opportunities to larger vessels in the Gulf of Maine, CCCHFA has received a \$300,000 contract by CRPP to demonstrate the feasibility of a hook and line haddock SAP in Closed Area II and the Western Gulf of Maine. The potential applications of this project are very great for the entire northwest Atlantic; indeed, anywhere that cod and haddock coexist.

Presentations

No presentations have been made.

Student Participation

No students participated in this project.

Published Reports and Papers

A white paper, entitled *Selective Targeting of Haddock Using Fabricated Bait: An industry motivated special access demonstration project*, by Melissa Sanderson, Thomas Rudolph, Mike Russo, and Mike Leary, has been submitted for peer review to the Research Steering Committee. This paper includes

much of the data collected under this NEC grant. Upon completion of the CRPP project and data collection in other areas, the white paper will be finalized for publication. This paper is attached to the final report. Summary of the NEC project is online: <http://www.ccchfa.org/pages/2/20/> and will be updated with the final report once approved by NEC.

Images

No images are being submitted.

Future Research

The data generated by this small project, and the dramatic need for a haddock bait that could exclude cod, allowed the CCCHFA to leverage other grants and contracts (listed above) to enlarge the areas covered and to greatly increase the number of trips. However, we were unable to get funding to continue our research on our own, locally produced bait. If the dollar continues to fall, and fuel (and hence shipping) prices continue to rise, and Norbait production continues to be limited, northeast fishermen may well encounter difficulties in purchasing sufficient quantities for their needs. We therefore believe that continuing research on a bait that could be produced locally should be a priority.

1 Lokkeborg, S. & A. Bjordal, 1992. Species and size selectivity in longline fishing: a review. *Fish. Res.*, 13: 311-322.

2 Bjordal, A. & S. Lokkeborg, *Longlining*, 1996, Fishing News Books, Cambridge, MA.

3 Lokkeborg, S., 1991. Fishing experiments with an alternative longline bait using surplus fish products. *Fish. Res.*, 12: 43-56.

4 Brown, B. and R. Hennemuth, 1971. Length-weight relations of haddock from commercial landings in New England, 1931-1955. NOAA Tech. Rep. NMFS SSF-638.