

February 12, 2007

Capt. Paul Howard  
Executive Director  
New England Fishery Management Council  
50 Water St.  
Newburyport, MA 01950

Dear Capt. Howard,

The Northeast Consortium has facilitated an independent technical evaluation of the FY2003 project development award, "Production and testing of an alternative bait selecting for haddock." This small-scale project investigated whether fabricated baits could reduce the catch of cod relative to haddock. It was a partnership between Dr. Susan Goldhor of the Center for Applied Regional Studies, Tom Rudolph of Cape Cod Hook Fishermen's Association, Capt. Mark Leach of North Chatham, Massachusetts, and several other commercial fishermen.

I am pleased to submit the evaluation documents to the New England Fishery Management Council. This includes the final report and three evaluation reports.

*The Review:*

The evaluation served as a formal assessment of the project. Three independent scientists each conducted a mail review of the project, providing comments and suggestions, which while occasionally critical, were made with the intent to improve the research, applications of the data, and future research. The reviewers were asked to focus on the final report, but supporting documents were included in the review package to give further perspective on the project.

*Evaluation Criteria:*

The evaluation criteria are listed in the enclosed document that describes the Northeast Consortium general review process. Reviewers were asked to focus on the second criteria, certification of results, i.e. whether the experimental design was appropriate and if the conclusions are well supported by the data.

*Conflict of Interest and Confidentiality:*

Each reviewer signed the Northeast Consortium's conflict of interest and confidentiality policy for the technical evaluation of projects. The evaluation reports submitted do not necessarily reflect views of the Northeast Consortium, the reviewers' employers, or governments. These reviews were conducted about seven months ago, and the two non-New England reviewers are named. However, the Northeast Consortium is now conducting confidential project reviews, per the recent request of the Research Steering Committee. I am always willing to act as a liaison for questions of the reviewers regarding any aspect of the evaluations.

*Project Leader Response:*

All evaluation reports were sent to Susan Goldhor and Tom Rudolph. They found the reviews to be quite helpful in thinking about next steps for the project, as indicated in the enclosed response letter.

The Northeast Consortium values this cooperative research project and the contributions that it can make to fisheries management and our collective knowledge of the Gulf of Maine and Georges Bank ecosystem. Thank you in advance for your consideration and assistance in ensuring the appropriate use of the study and the evaluation reports in the management arena. Do not hesitate to contact me with any questions you may have.

Sincerely,



Rachel M. Gallant  
Fisheries Specialist  
(603) 862-2276  
rachel.gallant@unh.edu

CC:

Pat Fiorelli, New England Fishery Management Council  
Chris Glass, Northeast Consortium

Enclosures:

- The Northeast Consortium's guidelines for the final technical evaluation for cooperative research projects, including evaluation criteria.
- Leach, M. and S. Goldhor, "*Production and testing of an alternative bait selecting for haddock*," final report submitted to the Northeast Consortium, June 2005.
- Memo from Tom Rudolph, Research Director for the Cape Cod Commercial Hook Fishermen's Association, June 2006.
- "*Technical evaluation report*," submitted anonymously to the Northeast Consortium July 4, 2006.
- "*Technical evaluation report*," submitted anonymously to the Northeast Consortium July 14, 2006.
- "*Technical evaluation report*," submitted anonymously to the Northeast Consortium, August 15, 2006.
- Rudolph, T. and S. Goldhor, letter response to the technical evaluation, submitted to the Northeast Consortium February 9, 2007.

**Production and Testing of an  
Alternative Bait Selecting for Haddock**

**Award No: P4UZE113**

**Period of Performance: October 1, 2003 – February 1, 2005**

**Final Report Submitted: June 2005**

**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**

*Mark V. Leach*

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### **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 scientists<sup>1</sup> 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 have<sup>2</sup>. 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:**

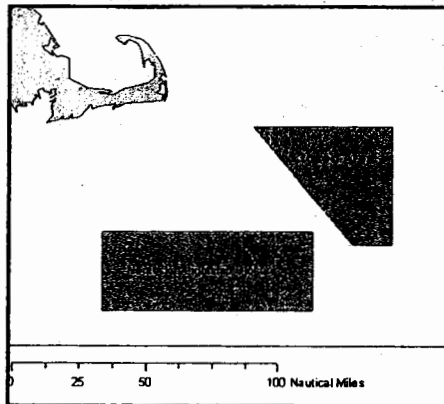
Eight fishing vessels participated in these trials:

Vessel Name	Captain
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 netting<sup>3</sup>.

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 CCCHFA'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	Fabricated	147,623	454	1.040	0.003	141,916
Feb, May-Sept 04	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	Fabricated	36,106	277	1.194	0.009	30,250
Oct 04-Jan 05	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)	Catch rate of Cod as a Percent of		
		Haddock CPUE	Cod CPUE	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.

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- 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.



**Technical Evaluation Report**  
of the  
Northeast Consortium cooperative research project,  
“Production and Testing of an Alternative Bait Selecting for  
Haddock”

**Submitted by:**

**John W. Watson  
NOAA Fisheries  
P.O. Drawer 1207  
Pascagoula, MS 39567**

**July 14, 2006**

[Note: This document is provided to individuals conducting technical evaluations of Northeast Consortium cooperative research projects. It serves as a general guide for writing an evaluation report and can be individualized as appropriate.]

## **Introduction**

This report documents an independent peer evaluation of the project, “Production and testing of an alternative bait selecting for haddock.” This cooperative research project received funding from the Northeast Consortium in FY2003 and was led by Dr. Susan Goldhor of the Center for Applied Regional Studies in partnership with Mark Leach, commercial fisherman. This mail review serves as a formal assessment of the completed project and focused on certification of results.

## **Main findings and conclusions of the evaluation**

The limitations of the experimental design in not having a paired comparison between experimental and control baits makes it very difficult to determine the effect of bait types on ability to selectively target haddock. The report states that a drawback to the study was the inability to set different types of bait at the same time in the same area, but there is no explanation as to why this was not possible. Comparing catches for different baits in different areas at different times introduces many variables that make a determination of bait type effect difficult at best. The differences in CPUE between haddock and cod could be the result of availability of fish, size of fish, gear types (eg. hook types), etc. for which there is no data presented. Having said this, there does seem to be a selective advantage to the fabricated baits based on CPUE data, but the data presented is not conclusive. The support materials accompanying the report also give further indications that there is some effect of bait type on selectivity between haddock and cod and references to other research also indicate the potential for selectivity with fabricated baits. The report is lacking information on fishing techniques, gear configuration, etc and there is no statistical analysis of the data presented. The report states that this was a pilot study for a much larger study and as such the results do indicate justification for a more rigorous study with a well designed experimental design to confirm the results from the pilot study.

## **Reviewer**

The following information about the reviewer is provided as evidence of the authority and expertise of the individual and to help authenticate the independent nature of the review process. The reviewer has signed the Northeast Consortium’s “Conflict of Interest and Confidentiality Policies for the Technical Evaluation of Projects” agreement. The views expressed do not necessarily represent those of the Northeast Consortium.

John W. Watson is currently the team leader for the NOAA Fisheries Southeast Fisheries Science Center’s Harvesting Systems and Engineering Branch. He has been at NOAA and its predecessor agency since 1969 and during that time has conducted extensive research on fishing and fisheries sampling gear. Mr. Watson has designed and supervised cooperative industry projects to develop improved turtle excluder devices for U.S. and international shrimp fisheries, the development of fish bycatch reduction devices for shrimp trawls, the development of selective harvesting seines for the aquaculture.

Technical evaluation of “[project title]”

industry, and the development of bycatch mitigation technology for the pelagic longline fishery

### **Documentation**

In advance of the evaluation, the reviewer was provided with the project’s final report entitled, “Production and testing of an alternative bait selecting for haddock.” It was submitted to the Northeast Consortium on June, 2005. Along with the final report, the reviewer received the project’s funding proposal and a report 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. In addition, project data was available through the Northeast Consortium’s Fisheries and Ocean Data Management System, accessible at: [www.northeastconsortium.org/data.shtml](http://www.northeastconsortium.org/data.shtml).

### **Comments and Recommendations of the Reviewer**

The reviewer was asked by the Northeast Consortium to address the criteria developed for the evaluation of Northeast Consortium-funded projects that are complete (Appendix A), noting specific strengths and weaknesses of the project. All criteria were considered, but evaluation was focused on the second, “Certification of Results.”

### **Project Evaluation**

The project objectives were not entirely clear “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.” Data indicates that squid, herring, trident, Norbait, and Cornell baits were fished at different times and locations.

There was very limited description of the experimental design, methods, and data analysis and the information is inadequate to draw conclusions on the results presented. The lack of a sound experimental design, and statistical analysis limit the contribution of the results and conclusions to a sound basis for management decisions. The results do indicate significant potential for fabricated baits to reduce cod CPUE in a directed haddock fishery and a more rigorous experiment is warranted which could include not only bait types but other gear and or fishing modifications to select for haddock.

The project was a cooperative project with fishermen who were key participants in the project.

The impact of the project is that it indicates the potential for fabricated baits to allow selective fishing for haddock in areas closed or limited to fishing due to cod

## Technical evaluation of "[project title]"

recovery regulations. Selective fishing gear could have a significant economic impact on the fishery and economy provided a rigorous demonstration of the capability of fabricated baits can be undertaken.

Overall rating for the project is good based on the background information and data presented. The results are not conclusive due to the lack of a rigorous experimental design and statistical analysis.

I would give the need for additional research on selective baits a very high priority for the Northeast Consortium provided a rigorous experimental design is possible.

### Summary/Recommendations

My recommendation would be to encourage further evaluation of fabricated baits in a controlled paired design experiment and investigation of combinations of baits and hook types or other gear/and or fishing operation modifications to develop more selective fishing gear and techniques.

## Appendix A

### Evaluation Criteria

The reviewer was asked by the Northeast Consortium to address the criteria listed below, noting specific strengths and weaknesses of the project. Reviewers are asked to consider all criteria but focus their evaluation on the second. The criteria were developed for the Evaluation of all Northeast Consortium-funded projects that are complete.

1. **Project success:** Did the project accomplish its stated goals and objectives?
2. **Certification of results:** Is there adequate description of the approaches to experimental design, methods, and data analysis? Were these approaches appropriate? Are there other approaches that the participants could have considered or used? Are the data accurate, precise, and believable? Are the results and conclusions well supported by the data and statistically valid? Can the results and conclusions contribute to a sound basis for management decisions and policies? If not, can anything be done to allow this?
3. **Data accessibility and dissemination of results:** Are the data available through the Northeast Consortium Fisheries and Ocean Data Management System? Are the data being served via another internet-accessible database? If so, are the data formatted suitably for data integration by the Northeast Consortium database? Are the project deliverables (publications, reports, and communications materials) of high quality? Have they been distributed appropriately? Is the final report complete, sufficient, and understandable to end-users?
4. **Project partnerships:** Consider the degree to which the project was of mutual interest to participants and whether partners were key participants throughout the course of the project, including project design, data collection and analysis, and application of the results or products. What were the most and least successful aspects of the partnership? Were all parties equally interested and engaged in the project?
5. **Project impacts:** What impacts has the project had or could it have? What are the potential effects on fishing practices; socio-economics; and fisheries, coastal, and ocean management?
6. **End-Users:** Being as specific as possible, who could benefit from knowing about the research? How can a fishing sector incorporate any new information from the project? Which fishery management organization, working group, or plan development team could use the data?

Technical evaluation of “[project title]”

7. **Overall rating.** Rate the overall project according to the criteria listed above as excellent, very good, good, fair, or poor. Explain the reasoning behind the rating.
8. **Future research.** Is additional research needed to answer the original questions posed by the project? Are there obvious avenues of further research that should or must be pursued? Given the investment to date, should this future research be a high priority for the Northeast Consortium?
9. **Additional comments and guidance.** Provide any additional comments that will assist the Northeast Consortium in evaluating this project.

**Technical Evaluation Report**  
of the  
Northeast Consortium cooperative research project,  
“Production and Testing of an Alternative Bait Selecting for  
Haddock”

August 15, 2006

## **Introduction**

This report documents an independent peer evaluation of the project, "Production and Testing of an Alternative Bait Selecting for Haddock." This cooperative research project received funding from the Northeast Consortium in FY2003 and was led by Mark Leach of the Cape Cod Commercial Hook Fishermen's Association (CCCHFA) in partnership with Dr. Susan Goldhor of the Center for Applied Regional Studies. This mail review serves as a formal assessment of the completed project and focused on the certification of results.

## **Main findings and conclusions of the evaluation**

The study reviewed was a successful Project Development Award because it tested the feasibility of an idea and laid the groundwork for possible future research. It was a notable use of funds and had a strong partnership with the industry. The idea of the project is inventive and has the possibility of significant impacts in the future. Improvements need to be made to the statistical analyses and descriptive information of certain aspects of the project need to be developed. Overall the project was rated very good.

## **Reviewer**

The following information about the reviewer is provided as evidence of the authority and expertise of the individual and to help authenticate the independent nature of the review process. The reviewer has signed the Northeast Consortium's "Conflict of Interest and Confidentiality Policies for the Technical Evaluation of Projects" agreement. The views expressed do not necessarily represent those of the Northeast Consortium.

The reviewer has a M.S. in fisheries and has worked extensively with industry on collaborative research for the past 7 years with a focus on selectivity and catch comparison studies. Responsibilities include proposal writing, coordination and analyses of cooperative research experiments as well as field sampling and presentation of results.

## **Documentation**

In advance of the evaluation, the reviewer was provided with the project's final report entitled, "Production and Testing of an Alternative Bait Selecting for Haddock." It was submitted to the Northeast Consortium in June 2005. Along with the final report, the reviewer received the project's funding proposal, a white paper dated October 2005 entitled "Selective Targeting of Haddock using Fabricated Bait: An Industry Motivated Special Access Demonstration Project," and a memo from Tom Rudolf, Research Director for the CCCHFA from June 2006.



## **Comments and Recommendations of the Reviewer**

The reviewer was asked by the Northeast Consortium to address the criteria developed for the evaluation of Northeast Consortium-funded projects that are complete (Appendix A), noting specific strengths and weaknesses of the project. All criteria were considered, but evaluation was focused on the second, "Certification of Results."

### **Project Evaluation**

#### *Project Success*

The primary purpose of the project was to test whether fabricated baits could reduce the catch of cod relative to haddock. The hypothesis tested was that "fabricated baits made of herring waste could select for haddock and against cod to a greater extent than natural herring baits." A second hypothesis proposed was that a local fabricated bait could rival the imported ones. Testing of the fabricated baits was successful with sample sizes larger than the original goals. Initial analysis of the results indicate the possible reduction in cod compared to haddock. The development and testing of the local bait was insufficient to make the comparisons to prove its superiority over the other fabricated baits. Additionally, there was an objective to look at the ease of baiting and hook cleaning, number of hooks coming up empty, and the fishermen's general responses to the bait. There was no mention of what was accomplished towards this objective in the methodology or results.

#### *Certification of results*

As a first step to reviewing the final report, comparisons were made between the final report and the original proposal letter. There were some key differences between what was proposed and what was actually conducted. The main one being the number of bait types studied. The original proposal specified that herring was going to be compared to a fabricated bait developed at Cornell based on the composition of the previously manufactured Norbait fabricated bait. The final report indicates that three different fabricated baits were tested against natural bait including herring, squid, and mackerel. The investigators are commended for going above and beyond what was originally proposed; however, with the limited amount of resources for which the study was conducted, in this case the simpler the better would have probably been more appropriate.

For the first objective of determining whether fabricated baits could select for haddock and reduce the catch of cod as compared to natural baits, the sample sizes (number of hooks fished) were larger than originally proposed. There was concern over the ability to compare one bait to another because it is stated that they were unable to set different types of bait at the same time in the same area. There is no discussion as to why this was

not possible. This results in the lack of direct comparisons between baits since fish are temporally and spatially active. Therefore, the investigators make a statement that the best measure of the fabricated baits success is the comparison of haddock CPUE and cod CPUE with a single type of bait; however, there is no verification as to what fish were available to the gear which is obviously a very important factor affecting the ratio of catch. Side-by-side comparisons could help alleviate some of the questions regarding area and time effects. Setting lines side-by-side in the same general area and the same time would reduce some of the possible differences and provide more accurate comparisons. However, this would work best with fewer bait types, going back to the methodology in the original proposal.

The final conclusion made is that "fabricated baits caught significantly more haddock than cod, illustrating that they are selective." The initial visualization of the results shows that all baits seem to select for haddock over cod and certainly the percentages rank the baits on their performance. From those percentages, it appears that the Norbait and Trident fabricated baits are "more selective" however, it is inappropriate to use the word "significantly," when no tests of significance were conducted. Since each bait is examined individually because of time and area affects, there is no way to statistically compare the values. Statistics can be conducted on the individual species CPUEs. An ANOVA could be run on CPUE for haddock and cod to test for differences between time and area. Calculating CPUE corrects for differences in effort but the comparison of cod to haddock is not necessarily required. If no differences are detected between time and area then it can be assumed that they are not variables that affect the differences in catch. Subsequently, a comparison could be made between baits. Without seeing the raw data it is difficult to suggest other analysis techniques that could be utilized, however, the investigators should review other statistics so that statements regarding significance can be made. It is understandable the reluctance to read more into the data than appropriate based on some of the limitations in the methodology. However, based on what was calculated caution should be made before making conclusive statements.

It is unclear what the  $n$  is, i.e., number of hooks or hauls. Since the CPUE was calculated as pounds per hook, it seems the  $n$  would therefore be number of hooks. This is not specified in the report. In addition, the data presented is the means but there are no confidence intervals shown.

The second objective was the development of a local fabricated bait that could rival the imported ones. Unfortunately, only a minimal amount of the Cornell bait was produced so that the sample size was much smaller than for the other baits tested. In the original proposal this bait was going to be the main fabricated bait tested but in the final report, it seems the Cornell bait took a back seat.

The third objective was to look at the different hooking characteristics of the baits. This was mentioned in the Project Objectives and Scientific Hypotheses section of the final report but was never discussed again. This would have been a relatively easy task to complete by conducting onboard surveys of the fishermen's responses and have the

*Technical evaluation of "Production and Testing of an Alternative Bait Selecting for Haddock"*

observers note those characteristics of interest, i.e., ease of baiting, hook cleaning, and number of hooks coming up empty.

As a stand alone document, the final report is lacking certain information that would be important for the reader to know. The white paper provided does include some of this information so having both documents is essential.

Information that would have been useful to include in the final report:

- Describe more fully the difference between the three fabricated baits as the Trident and Norbait performed much better at reducing the catch rate of cod as compared to the Cornell developed bait (noting that the effort was much less for the Cornell bait) – the composition of the baits described was similar.
- Explanation of the reason Mustad started redevelopment of fabricated bait since the original proposal states that Mustad had to close their bait subsidiary, and some history about Trident bait.
- A more detailed description of how the longlines were fished, number of hooks per line, soak time, etc.
- The white paper has a useful discussion of the food preferences of cod versus haddock which is not mentioned in final report. This information is key as to why the project idea will work in the first place.

*Data accessibility and dissemination of results*

Currently the data will not be available online until the results have been published. The report specifies that data were entered into the Northeast Fishery Science Center SeaSamp database and the CCCHFA's in-house database. However, all other aspects of the project are quite accessible and can be found on both the Northeast Consortium website as well as the CCCHFA website. The materials available including the final report, white paper, and website materials are complete, sufficient, and understandable to end-users. The information available on the CCCHFA website is useful for fishermen and others, and a great avenue to disseminate the results of the project to a larger audience.

*Project partnerships*

The partnerships associated with this project are commendable. The fishermen partners showed their support by volunteering their time and vessels to conduct the research and the level of effort was high relative to the budget. In addition, the landings were donated back to the project therefore expanding the research. The industry representative was a key principal investigator and was involved in all aspects of the project. This project is a good example of collaborative research in action.

### *Project impacts*

This project could have substantial impacts in the future. There are a few different aspects to the project. The first being the use of a bait that would reduce the catch of cod compared to haddock. The second is the development of a selective bait that would be available to fishermen locally therefore reducing the price and providing an ease of accessibility. As haddock is rebuilding and cod is remaining a species of critical concern, it is important to find ways to access the haddock resource without impacting the cod stocks. Special Access Programs (SAPs) are one technique being examined and considered in many fisheries to try and accomplish this. Studies like this one are going to become more and more important as species rebuild.

### *End-Users*

Before the results of this study are presented to the appropriate audience, the issues raised earlier need to be addressed, specifically the statistical analysis. An obvious end-user is the appropriate management agency. The results should be presented to the NEFMC. The true success of a collaborative research project, if the results are appropriate, is the inclusion of the design in regulations. In addition, and perhaps even before that, the fishermen need to be made aware of the study and the tested alternatives available – the fabricated baits. In the end, if regulators do not create a SAP based on the results, fishermen still have the option to fish with the more selective bait. Clarification does need to be made between the different baits tested. In the end, either one bait should be put forward as the "ultimate" bait to use or a general directive that all artificial baits can be used.

### *Overall rating*

I would give this project an overall rating of very good. Improvements need to be made to the analysis and there is some missing information that the inclusion of the white paper helped to clarify. The rating of very good is based on the partnerships and support of the fishing industry and leveraging of minimal funds to complete the project as well as the innovativeness of the concept, and concern for the future of the stocks and the fishery.

### *Future research*

As stated in the final report, the importance of developing locally available fabricated bait is a priority. A cost analysis between importing bait and producing bait should be reviewed. The two baits available are from Europe (Norbait) and Alaska (Trident) and it was specified that the Norbait production is limited, although no mention was made of the availability of the Trident bait. If in fact fabricated bait proved to be more selective for haddock, the production of the appropriate fabricated bait will become extremely important.

## **Appendix A**

### **Evaluation Criteria**

The reviewer was asked by the Northeast Consortium to address the criteria listed below, noting specific strengths and weaknesses of the project. Reviewers are asked to consider all criteria but focus their evaluation on the second. The criteria were developed for the Evaluation of all Northeast Consortium-funded projects that are complete.

1. **Project success:** Did the project accomplish its stated goals and objectives?
2. **Certification of results:** Is there adequate description of the approaches to experimental design, methods, and data analysis? Were these approaches appropriate? Are there other approaches that the participants could have considered or used? Are the data accurate, precise, and believable? Are the results and conclusions well supported by the data and statistically valid? Can the results and conclusions contribute to a sound basis for management decisions and policies? If not, can anything be done to allow this?
3. **Data accessibility and dissemination of results:** Are the data available through the Northeast Consortium Fisheries and Ocean Data Management System? Are the data being served via another internet-accessible database? If so, are the data formatted suitably for data integration by the Northeast Consortium database? Are the project deliverables (publications, reports, and communications materials) of high quality? Have they been distributed appropriately? Is the final report complete, sufficient, and understandable to end-users?
4. **Project partnerships:** Consider the degree to which the project was of mutual interest to participants and whether partners were key participants throughout the course of the project, including project design, data collection and analysis, and application of the results or products. What were the most and least successful aspects of the partnership? Were all parties equally interested and engaged in the project?
5. **Project impacts:** What impacts has the project had or could it have? What are the potential effects on fishing practices; socio-economics; and fisheries, coastal, and ocean management?
6. **End-Users:** Being as specific as possible, who could benefit from knowing about the research? How can a fishing sector incorporate any new information from the project? Which fishery management organization, working group, or plan development team could use the data?

*Technical evaluation of "Production and Testing of an Alternative Bait Selecting for Haddock"*

7. **Overall rating.** Rate the overall project according to the criteria listed above as excellent, very good, good, fair, or poor. Explain the reasoning behind the rating.
8. **Future research.** Is additional research needed to answer the original questions posed by the project? Are there obvious avenues of further research that should or must be pursued? Given the investment to date, should this future research be a high priority for the Northeast Consortium?
9. **Additional comments and guidance.** Provide any additional comments that will assist the Northeast Consortium in evaluating this project.

**Technical Evaluation Report**  
of the  
Northeast Consortium cooperative research project,  
**“Production and testing of an alternative bait selecting for  
haddock”**

Submitted by:

**R. G. Halliday (Scientist Emeritus)**  
Science Branch, Department of Fisheries and Oceans, Canada  
Bedford Institute of Oceanography, Dartmouth, Nova Scotia,  
Canada, B2Y 4A2

4 July 2006

## Technical evaluation of "Production and testing of an alternative bait selecting for haddock"

### Introduction

This report documents an independent peer evaluation of the project, "Production and testing of an alternative bait selecting for haddock." This cooperative research project received funding from the Northeast Consortium – Award No. R4UZE113. This mail review serves as a formal assessment of the completed project and focuses on certification of results.

### Reviewer

The following information about the reviewer is provided as evidence of the authority and expertise of the individual and to help authenticate the independent nature of the review process. The reviewer has signed the Northeast Consortium's "Conflict of Interest and Confidentiality Policies for the Technical Evaluation of Projects" agreement. The views expressed do not necessarily represent those of the Northeast Consortium.

R. G. Halliday presently holds Scientist Emeritus status at the Bedford Institute of Oceanography after serving for 35yr as a fisheries scientist with the Canadian Department of Fisheries and Oceans. Most of his research has been on groundfish, particularly cod and haddock, and has included experiments on longline gear selection. He served for 10yr on the editorial board of the Journal of Northwest Atlantic Fisheries Science.

### Documentation

In advance of the evaluation, the reviewer was provided with the project's Final Report entitled, "Production and testing of an alternative bait selecting for haddock." It was submitted to the Northeast Consortium in June 2005. Along with the Final Report, the reviewer received the project's funding proposal ("Production and testing of an alternative bait selecting for haddock" dated October 2003), a White Paper entitled "Selective targeting of haddock using fabricated bait: an industry motivated special access demonstration project" and a memo from Rudolph to Gallant of June 5, 2006 providing context.

### Comments and Recommendations of the Reviewer

The reviewer was asked by the Northeast Consortium to address the criteria developed for the evaluation of Northeast Consortium-funded projects that are complete (Appendix A), noting specific strengths and weaknesses of the project. All criteria were considered, but evaluation was focused on the second, "Certification of Results."



### Project Evaluation

**Project success:** The funding proposal states the intention to produce and test a new fabricated bait that will select for haddock and reduce cod bycatch. The new fabricated bait was to be fished against herring baits in trials to demonstrate its performance. The relative efficiency of its use was also to be examined, e.g. ease of baiting and bait retention. It appears, however, that the proposed budget (and the grant received) was almost entirely for production of baits. The Final Report indicates that a new bait was indeed produced and thus, in this regard, the project had some degree of success. However, this bait was tested in only a few longline sets, giving a ratio of cod to haddock similar to that of natural baits. No reference is made in the report regarding efficiency of use. Thus, the project was not successful in establishing that the new fabricated bait reduced the bycatches of cod.

The Final Report gives a revised statement of purpose, i.e., that it was to test whether fabricated baits (in general) could reduce the catch of cod relative to haddock, and gives results for tests using two commercially available fabricated baits in comparison to natural baits. It is the results of this project that are evaluated below, although the work has been supported through a number of grants other than the one in question (Rudolph memo).

**Certification of results:** The Final Report does not provide enough information to fully understand and provide a scientific evaluation of the work performed. Piecing the story together from all four of the items made available provided a better perspective (but not without a fair amount of work). A fuller account of methods and a more thorough analysis of the data are required to establish conclusions that are supported scientifically.

The authors of the report recognize that the fundamental problem with the trials is that it has not been possible to adopt an experiment design that compares baits under identical conditions, most specifically, in the same place at the same time. There are fine scale differences in the distribution of cod and haddock which, if not accounted for, can bias results.

Another important question is that of bait size. Using natural baits that were larger than the fabricated baits could account for the differences observed. No information is provided on bait sizes.

Hook size and type can also affect species selection but no data are provided on the hooks used and how they may have differed among trials.

No data on bait or hook size may have been collected but there is reference to some of the trials being conducted "side by side" in the Rudolph memo, so there may be a basis to analyze the data in more detail regarding spatial-temporal effects. Furthermore, substantial amounts of length-frequency data were collected that are not

Technical evaluation of "Production and testing of an alternative bait selecting for haddock"

utilized in this report but which could provide insights on the selective properties of the different gear configurations.

(The White Paper gives an account of variation in cod and haddock catch rates and length-frequencies for the fabricated bait trips (only) by geographic area, but this paper suffers from the same scientific deficiencies as identified above for the Final Report.)

**Overall rating:** The Final Report is obviously not intended to be a scientific paper. As a general review of research on, and development of, more species selective fishing methods by the CCCHFA, it provides a good progress report and takes a balanced view of results to date. Despite the deficiencies in experimental design, one cannot argue with the authors' view that, based on the weight of evidence, the results with fabricated baits are most encouraging and justify pursuing this research further. The cost in scientific rigor must be offset by the potential practical improvements that such demonstration projects can bring about through the effective engagement of fishermen in the management of their fishery.



CAPE COD  
COMMERCIAL HOOK FISHERMEN'S ASSOCIATION, Inc.  
210 Orleans Road  
North Chatham, MA 02650 • 508-945-2432 Fax: 508-945-0981  
E-mail: [contact@ccchfa.org](mailto:contact@ccchfa.org)  
Web: [www.ccchfa.org](http://www.ccchfa.org)

Rachel Gallant  
Fisheries Specialist  
Northeast Consortium  
UNH, Morse 142  
Durham, NH 03824

June 5, 2006

Dear Rachel,

I am pleased to hear that the Northeast Consortium (NEC) will be conducting a technical review of our 2003 Project Development Award entitled, "*Production and testing of alternative bait selecting for haddock.*" This exciting project was part of a critical, ongoing effort to explore ways in which New England fishermen can target haddock with minimal bycatch of cod. Most regional stakeholders are well aware of the need to shift effort off of depleted stocks like cod and onto healthier, rebuilding stocks like haddock. While a variety of conservation engineering techniques with different gears have been proposed and tested through this effort, CCCHFA has focused its efforts on hook and line, especially the use of alternative baits. This project development award (PDA) provided support for the testing of various fabricated baits. Also known as restructured baits, these are sausage-like products consisting of an attractant material, typically some kind of fish waste, combined with binders and fillers and extruded into a casing. This PDA allowed for testing of commercially available baits, as well as the manufacturing and testing of a custom product.

In support of the technical review, you requested a 1-2 page memorandum which would describe all the CCCHFA bait testing to date, to place the PDA work in context. I welcome this opportunity in light of the fact that our work now spans nearly three years, and has taken place through a sometimes bewildering array of different Exempted Fishing Permits (EFP's) and with support from a number of different funders, from the Northeast Consortium to the fishermen themselves. Through it all the deck protocols have remained the same, however, and some very interesting and promising trends have become apparent. The fabricated baits seem to keep the bycatch of cod, expressed in catch per unit effort (CPUE) quite low across a wide variety of times and places.

CCCHFA has experienced difficulty in finding an audience for the big picture, since many entities are focused on just their particular grant cycle or permit. It is my hope that this summary will provide the review committee with enough context that regional interest will be sufficiently piqued to open a broader discussion of the benefits of longlining with fabricated baits. Please let me know of any and all assistance I can provide to you or the committee.

Sincerely,

Tom Rudolph  
Research Director  
CCCHFA



CAPE COD  
COMMERCIAL HOOK FISHERMEN'S ASSOCIATION, Inc.  
210 Orleans Road  
North Chatham, MA 02650 • 508-945-2432 Fax: 508-945-0981  
E-mail: [contact@ccchfa.org](mailto:contact@ccchfa.org)  
Web: [www.ccchfa.org](http://www.ccchfa.org)

### **Introduction:**

CCCHFA has conducted research on longline selectivity when targeting haddock since October 2003. The experimental protocol for these trips was developed in consultation with NOAA Fisheries' Northeast Fisheries Science Center (NEFSC), Northeast Regional Office Sustainable Fisheries Division (NERO-SFD) and REMSA Inc., and has been consistent throughout the work. Independently contracted Scientific Data Collectors (SDC) execute an enhanced NMFS SeaSamp protocol, with the focus on 100% enumeration of the catch (hook by hook) to certify the results. Sub-sampling is done as necessary and as intensively as possible, with the focus on round weights and length measurements for all cod and all sub-legal haddock. In addition, a sub-sample of kept haddock is measured for all strings, and all bycatch is weighed and measured for one string of each fishing event (tide). All legal haddock is retained and the dealer weigh-out is observed. Copies of the field sampling manual (protocol) are available upon request. Some trips have also been covered by Federal observers from the Northeast Observer Program (NOP), provided by the contractor AIS Inc.

Data management has also been consistent. Various project data are entered into two different databases (db). The lead SDC contracted by CCCHFA enters the data into an internal db designed and maintained by CCCHFA. All work in Georges Bank Closed Area I (CAI) is housed in an MS Excel db. Subsequent work in other closed areas and in the Eastern U.S./Canada Resource Sharing Area (EUSCA) is housed in an MS Access db. These internal databases are used for EFP monitoring and other time-sensitive work, as well as serving as a backup and error-checking tool. Concurrently, the lead SDC enters the data into the NMFS SeaSamp database under special project codes. Trips observed by AIS Inc. are keypunched by the NOP.

By and large the work was designed as a Special Access Program (SAP) Demonstration Project. This project classification was established by SFD in consultation with the NERO Cooperative Research Partners Program (CRPP) in 2004 to describe projects which aim to demonstrate biologically sustainable (i.e. low bycatch) and economically viable (i.e. high target catch) fishery opportunities. Once accepted such a fishery may then be incorporated into the management plan as an SAP, with carefully relaxed input controls, partial hard Total Allowable Catch (TAC) limits and higher standards of monitoring. Under this model, the inquiries aimed to cover a diverse array of times and locations, but within this framework, the investigators and fishermen targeted areas in which they could harvest haddock efficiently. The consistently required utilization of the fish revenue to fund the research further necessitated this approach.

### **Timeline and Description of Work:**

Research began in the northwest corner of CAI in October 2003, and continued through the end of December under EFP DA-280. This portion of the work was largely paid for through the sale of the fish caught on the trips; vessels were paid a fixed daily rate. Additional support came from the J.M Kaplan Fund. 49 trips took place under this EFP. In addition to targeting haddock in diverse locations within the zone that would eventually become the CAI Hook Gear Haddock SAP, these trips performed side-by side analysis of different baits (herring, mackerel, squid). Late in the program, support from the FY03 NEC PDA made possible the acquisition and testing of three different fabricated baits (Trident™, Norbait 700E™, and the homemade product designed by Susan Goldhor), including side by side trials against other baits. This fabricated bait testing showed tremendous potential, and continued under the PDA into early 2004. A final report on the PDA, entitled "*Production and Testing of an Alternative Bait Selecting for Haddock,*" included analysis of this data and was submitted in June 2005.



CAPE COD  
COMMERCIAL HOOK FISHERMEN'S ASSOCIATION, Inc.  
210 Orleans Road  
North Chatham, MA 02650 • 508-945-2432 Fax: 508-945-0981  
E-mail: [contact@ccchfa.org](mailto:contact@ccchfa.org)  
Web: [www.ccchfa.org](http://www.ccchfa.org)

The results of EFP DA-280 were summarized in a document presented to the NEFMC and SFD entitled, "*Georges Bank Hook Sector Closed Area I Special Access Program (SAP)*" which is available upon request.

In 2004 the work continued on two fronts. EFP DA-338 was secured to allow the Cape Cod fleet to survey CAI in all the previously un-sampled months except the peak spawning months of March and April, and expanded the study area to the entire northern portion of CAI (i.e. the original SAP area and additional areas to the east and south). This work took place in summer 2004 and through June 2005, and continued to be funded through fish revenue. Analysis is ongoing.

At the same time, CCCHFA worked with a group of fishermen from Portland, Portsmouth, Gloucester, and the South Shore of Massachusetts to secure a CRPP award (contract #EA133F-04-CN-0042) to allow the research to be replicated in other year-round closed areas in the Gulf of Maine (GOM) and on offshore Georges Bank (GB). This CRPP project, entitled "*Using Hook and Line to Minimize Cod Bycatch in a Directed Haddock Fishery on Georges Bank and in the Gulf of Maine,*" concluded field work in February 2006, and is currently in the analysis and reporting phase, with submission of the completion report expected in July 2006.

Permitting proved a substantial challenge for the CRPP project. The original EFP application was partially rejected, and the portion granted was consequently late. The Georges Bank Closed Area II (CAII) portion of the project was denied a permit, while the Western Gulf of Maine Closed Area (WGOM), Cashes Ledge Closed Area (CLCA), and GOM Rolling Closure III (RC III, Platts Bank) work was permitted to go forward in certain components of those closed areas during specific seasons under EFP DA-448. This work took place from December 2004 through September 2005. Additional fabricated bait testing supported by the PDA took place in the GOM on these trips but was not available in time for inclusion in the PDA completion report. It was, however, included in a white paper prepared for NMFS by CCCHFA in September 2005 entitled, "*Selective Targeting of Haddock Using Fabricated Bait: An industry motivated special access demonstration project*" (available upon request). This document took a broad, CPUE oriented view of fabricated bait performance and included analysis of data from CAI, CAII, EUSCA, WGOM, CLCA, and RCIII.

It should also be noted at this time that EFP DA-448 had another component, the last piece of the puzzle in CAI: those areas east and south of the originally surveyed SAP area were also surveyed for the critical time period of October through December, filling out the survey for all areas in the north portion of CAI. This was accomplished in 2004. This work was not funded by the CRPP. Analysis is ongoing.

Finally, in June 2005, EFP DA-735 was secured to allow the CRPP work to take place on offshore GB. Because critical grounds in the CAII Habitat Area of Particular Concern (HAPC) were omitted from the permit, additional areas were targeted in the EUSCA. This work concluded in February 2006. Analysis of this, all other CRPP data, and any ancillary data deemed necessary are underway by Yong Chen, Associate Professor for Fisheries Population Dynamics at the School of Marine Science at the University of Maine.



CAPE COD  
COMMERCIAL HOOK FISHERMEN'S ASSOCIATION, Inc.  
210 Orleans Road  
North Chatham, MA 02650 • 508-945-2432 Fax: 508-945-0981  
E-mail: [contact@ccchfa.org](mailto:contact@ccchfa.org)  
Web: [www.ccchfa.org](http://www.ccchfa.org)

Finally, management, budget, and especially, EFP constraints made the setting of controls difficult throughout the project. At times, for instance under EFP DA-735, vessels were effectively prohibited from setting anything except fabricated bait by extremely low poundage caps on cod bycatch. Interested parties seeking bait-to bait comparisons are advised to consider alternative data sources including CCCHFA data and Canadian GB data collected in 2005 by the Centre for Sustainable Aquatic Resources and summarized in a report entitled, *"Norbait Trials in the Canadian Longline Haddock Fishery on Georges Bank to Reduce By-Catch of Atlantic Cod"* (available upon request).

February 9, 2007

entitled, "Production and testing of an alternative bait selecting for haddock." Thanks as well for this opportunity to respond to the valuable comments provided by the three reviewers, and offer suggestions for submitting these important results to the New England Fishery Management Council Research Steering Committee. As we are sure you're aware, these trials form just one small part of what is now a pretty big picture surrounding the use of different baits in the directed longline fishery for haddock. We would urge the Northeast Consortium to make every effort to help end users, including the RSC, understand that this project should be viewed as part of that larger whole.

We cannot stress enough that in keeping with the reviewer's main suggested theme, this PDA was, in fact, followed up with a substantial amount of bait testing, including many side-by-side comparisons between different natural and fabricated baits, despite budget and permit considerations which continued to present serious obstacles to their consistent implementation. This was a simple pilot demonstration, which leveraged other funds and activities to maximize the diversity and scope of what was attempted, including the innovative production of a prototype fabricated bait with limited funds.

The reviewers also share a concern regarding the effects of hook and bait size. While not specifically mentioned in the report, hook size was standardized throughout the project (12/0 circle). Bait size was also consistent, driven largely by yield considerations. For all fabricated baits the diameter was fixed at manufacture at approx. 2.5cm and thickness of approximately 20cm was set by the fishermen when cutting the continuous sausage into disks.



CAPE COD  
COMMERCIAL HOOK FISHERMEN'S ASSOCIATION, Inc.  
210 Orleans Road  
North Chatham, MA 02650 • 508-945-2432 Fax: 508-945-0981  
E-mail: [contact@ccchfa.org](mailto:contact@ccchfa.org)  
Web: [www.ccchfa.org](http://www.ccchfa.org)

Finally, it should be noted that many of the concerns raised by the reviewers are addressed in a completion report recently submitted to the NCRPP (available upon request). It should again be stressed that even that project is but another part of a much more comprehensive picture. Any eventual look at the management implications of haddock-selective baits should include the PDA described herein, the NCRPP project in its entirety, and several other data sources including the following:

- CCCHFA bait testing in Georges Bank Closed Area I under EFP's DA-280, DA-338, and DA-448 (all available in the NMFS SeaSamp database under special project codes available upon request)
- CCCHFA catch monitoring data for haddock tagging EFP's using fabricated baits (DA-5736 and DA-6093), between 2005 and present, in all major year round closed areas (available upon request)
- NMFS observer data from the commercial fishery in FY2005 and FY2006, which includes substantial amounts of fabricated bait sets, alongside both other baits and otter trawl gear
- Data collected by Canadian researchers and commercial fisheries observers on Eastern Georges Bank.

Please accept our sincere thanks for your time and effort spent preparing this important project for presentation to the management community. It is our hope that discussion about this PDA can take place concurrently with those for the NCRPP project. Please let us know when and how we can be of service in the next several months in order to facilitate this discussion.

Sincerely,

Tom Rudolph  
Research Director  
CCCHFA

Susan Goldhor  
President  
Center for Applied Regional Studies