#3

Northeast Consortium

University of New Hampshire • Massachusetts Institute of Technology
University of Maine • Woods Hole Oceanographic Institution

May 9, 2008

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 cooperative research project,

"A Pilot Gillnet Survey of the Cashes Ledge Closed Area."

This project received funding ($25,000) in FY2004 to test the use of gillnets to inventory fish populations in the Cashes Ledge Closed Area of the Gulf of Maine. This area encompasses historically important fishing grounds, which have been closed to groundfishing since 1999. Methods were developed by which groundfish abundance can be regularly monitored with gillnets to have minimal bottom impact, and the ability to sample a variety of habitats and species effectively. Mr. Kevin Kelly of the Maine Department of Marine Resources and Capt. Mathew Thomson of Monhegan Island, Maine were partners on this project.

I am pleased to submit the evaluation documents to the New England Fishery Management Council. This includes the final report, two evaluation reports, and a response to the review written by Mr. Kelly.

The Review:
The evaluation served as a formal assessment of the project. Two 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 perspectives 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. As requested by the NEFMC Research Steering Committee, the review comments are being submitted to the Council anonymously. However, I am always willing to act as a liaison for questions of the reviewers regarding any aspect of the evaluations.

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 G Feeney

Rachel Gallant Feeney
Fisheries Specialist
(603) 862-2276
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CC:
Pat Fiorelli, NEFMC
Chris Glass, Northeast Consortium

Enclosures:

- The Northeast Consortium's guidelines for the final technical evaluation for cooperative research projects, including evaluation criteria.
- Kelly, K. and M. Thompson. *"Pilot Gillnet Survey of the Cashes Ledge Closed Area."* Final report submitted to the Northeast Consortium, July 2006.
- "*Technical evaluation report,*" submitted to the Northeast Consortium July 5, 2007.
- "*Technical evaluation report,*" submitted to the Northeast Consortium August 15, 2007.
- Kelly, K. *"Addendum to Final Report to the Northeast Consortium: A Pilot Gillnet Survey of the Cashes Ledge Closed Area."* Response to the technical evaluation, May 2008.
- Spreadsheet of net measurements.

Northeast Consortium

Final Technical Evaluation for Northeast Consortium Cooperative Research Projects

The Northeast Consortium administers a final technical evaluation of all appropriate aspects of funded cooperative research projects once they are complete, including methods, data, data analysis and management, results and conclusions, deliverables, application for ocean and fisheries management, socio-economic impacts, and other impacts on end-users. The technical evaluation of a project is an essential step in the successful transfer of project results and products to appropriate end-users. Following evaluation, Northeast Consortium staff work to ensure that the data, information, and other deliverables are effectively used and integrated into fisheries and ocean management, further research, commercial fishing practices and products, and other practical applications, as appropriate.

The Final Technical Evaluation Process

The final technical evaluation of each project is unique, since the Northeast Consortium funds research that varies greatly in project topic area, size, and duration. The extent to which research outcomes may impact fisheries management is also likely to be unique. Therefore, the Northeast Consortium facilitates independent evaluations that are appropriate to both the nature of the research and the expected applications of the project outcomes. An internal review is conducted for each project and the vast majority of projects also receive an external review. In each case, a Northeast Consortium staff member is designated to provide programmatic and logistical support to the evaluation process.

Internal review. The Northeast Consortium staff reviews each project to ensure that project reporting requirements are met and that project funds were spent appropriately as determined by the approved project budget. There is also an analysis of the potential impact of project results to fisheries management or other end-users to determine if an external independent review is appropriate. Staff seek input of end-user communities in this determination.

External review. For projects which have results and outcomes that may have an impact on fisheries management or on an end-user community, an external review is facilitated by the Northeast Consortium. This evaluation takes the form of a mail and/or panel review. Project final reports and supporting materials are sent to technical reviewers. The projects are reviewed according to the Northeast Consortium's general criteria for the technical evaluation of completed projects, and possibly project-specific terms of reference. Reviewers submit technical evaluation reports to the Northeast Consortium. The Northeast Consortium staff member may compile a summary of the evaluation reports in the case of multiple reviews.

In the case of panel reviews, a technical expert in an appropriate discipline is selected by the Northeast Consortium Representatives to chair the evaluation panel. The Northeast Consortium staff works with the Representatives and the Chair to select 2-3 additional panel members. The Chair, in consultation with other panel members and the Northeast Consortium, decides how to

proceed with the evaluation, which may include meetings, video conferencing, project visits, interviews with project participants and end-users, and consultations with outside experts on related topics. The Chair may request mail review by additional independent experts. One evaluation report is written by the panel, though reviewers may submit individual comments.

Information Available to Reviewers

The Northeast Consortium staff member provides reviewers with copies of all relevant project documents, including the project proposal, final report, all data sets, publications, press coverage, descriptions and photos of new fishing gear or oceanographic instrumentation, lists of all deliverables and impacts, and names and contact information of all end-users and others who have direct knowledge of the project's real-world impacts and products. Any panel member may request additional information at any time during the evaluation. For mail reviews, the Northeast Consortium staff member can liaison questions about the project between the reviewers and project participants.

Evaluation Criteria

The following are the general criteria that reviewers use in evaluating projects. In addition, project-specific terms of reference are commonly used.

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?

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.

The Final Technical Evaluation Report

The reviewers, whether collectively as a panel or individually, prepare written reports, providing detailed comments on each of the evaluation criteria and terms of reference, noting specific strengths and weaknesses of the project. Reports of approximately five pages in length are anticipated, but longer reports are acceptable. Technical evaluation reports should be submitted by reviewers to the Northeast Consortium within six weeks of receiving project documentation. In the case of a panel review, the report is a "consensus" document written by all panelists. Panelists may provide additional/personal comments in individual reports.

Distribution of a Technical Evaluation Report

Final technical evaluation reports are not posted on the Northeast Consortium's website, but are available upon request on a case by case basis to representatives of end-user communities and organizations. This includes the National Marine Fisheries Service; New England Fishery Management Council; Atlantic States Marine Fisheries Commission; commercial fishing industry organizations and individuals; Coastal Zone Management program; Office of State Planning; the Advisory Committee of the Northeast Consortium; and/or other appropriate local, state, or federal agencies or programs. The Northeast Consortium staff member may prepare a summary of the report targeted for a specific end-user.

External Reviewers

Reviewer selection. Those selected as external reviewers include Northeast Consortium Advisory Committee members and others as needed to ensure appropriate expertise for each project and may come from outside the New England region. The Chair of a panel review may veto the selection of any panelist. The Northeast Consortium may offer honoraria for review panel service to each panel member. Expenses for travel and other incidentals will be reimbursed upon request.

Confidentiality and conflict of interest. The evaluation process is intended to be as fair and objective as possible. Project mail reviews are anonymous. Members of panel reviews are not identified to end-users without their prior permission. The Northeast Consortium seeks such permission only as necessary to provide evidence of authority and expertise; names of review panel members are not otherwise be made public. Panel members may not copy, quote, discuss or otherwise use materials about projects without the consent of the Northeast Consortium and project participants. Conflicts of interest are scrutinized when selecting panel reviewers and it is the responsibility of each panel member to inform the Northeast Consortium of any potential conflicts of interest. Each reviewer must read and sign the Northeast Consortium's conflict of interest and confidentiality policy prior to participating in a review. All materials used in the project evaluation process are returned to the Northeast Consortium or destroyed.

For More Information

Additional information about the Northeast Consortium can be found on its website (www.northestconsortium.org). The Northeast Consortium welcomes comment on policies and procedures at any time. For matters relating to the technical evaluation of cooperative research, please contact Rachel Gallant Feeney, Fisheries Specialist.

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Final Report to the Northeast Consortium

Project Title: A Pilot Gillnet Survey of the Cashes Ledge Closed Area

Agreement No: 05-992

Period of Performance: January 1, 2005-June 30, 2006

Date: 25 July 2006

Principal Investigator:

Kevin Kelly
Maine Department of Marine Resources
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Abstract:

The objective of this project is to test the use of gillnets to inventory fish populations in the Cashes Ledge Closed Area (CLCA) of the Gulf of Maine. The CLCA encompasses historically important fishing grounds which have been closed to groundfishing by federal regulation seasonally since 1999 and year round since 2002. Our purpose is to develop a methodology by which groundfish abundance can be regularly monitored in the CLCA. The expected outcome of the project will be a sampling methodology using gillnets that will minimize damage to bottom habitat and sample a variety of species and habitats effectively.

This project is needed to develop eventual long term standardized measures of relative abundance of groundfish in closed areas in collaboration with the commercial fishing industry. Maine DMR and Capt. Thomson were accepted for full funding for this work by Northeast Consortium (NEC) in response to the 2004 Request for Proposals for Project Development awards.

Introduction:

This project was designed to address **monitoring of closed areas** as a topic area from the 2004 NEC Request for Proposals for Project Development Awards. In spite of the recognized importance of CLCA for a multitude of groundfish species, currently no projects monitor groundfish abundance sufficiently in and around this closure area. Since use of multispecies/groundfish gear is prohibited in this area, there is currently no way to assess the fish stocks in the CLCA or the value of the closed area as a conservation tool. While sporadic sampling may occur such as in the National Marine Fisheries Service (NMFS) spring and fall trawl surveys in the Gulf of Maine (GOM), the sampling stations are randomly selected and may only occasionally fall within the CLCA. A survey of the area such as developed in this study is needed to perform this assessment.

Cashes Ledge is a biologically-rich underwater landform located about 80 miles east of the Maine coast, consisting of banks, peaks, and channels with a complex substrate of mud, gravelly sand, and bedrock (Figure 1). The shallow portions of Cashes Ledge occur well within the light-filled underwater zone, resulting in a highly productive area for plankton and a highly diverse fauna including sponges, sea anemones, and a variety of fish. Rare kelp beds are also found here.

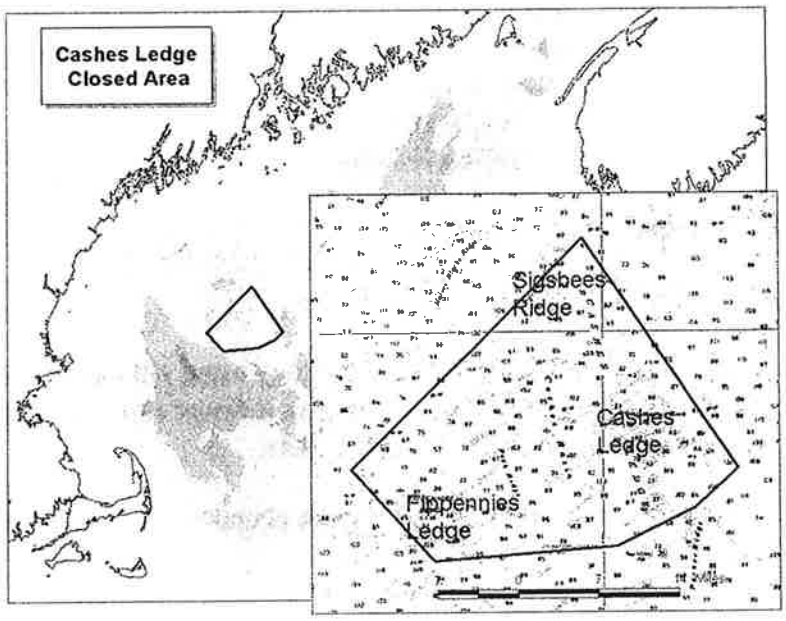

Figure 1. Location of Cashes Ledge Closed Area (CLCA) (*black outline*) within the Gulf of Maine showing former key fishing grounds (inset).

Cashes Ledge has historically been important for groundfishing. According to Rich (1929), the principal fishing on these grounds was for cod, haddock, hake, and cusk. Cod and cusk were present throughout the year and cod was most abundant during February-April in an average depth of 60 fm. Hake were found on muddy edges in summer, with lesser numbers present throughout the year. Haddock were present in considerable numbers from November to February, and sometimes in April at 20 fm. The arrival of dogfish usually put a temporary end to fishing at the end of June or early July. Cusk were present in deeper waters year round. Smaller amounts of halibut and pollock were also taken on Cashes Ledge.

The New England Fishery Management Council established Cashes Ledge as a one-month seasonal groundfishing closure area in 1998 to alleviate mortality on Gulf of Maine (GOM) cod. In 1999 the area was reconfigured and the closure was expanded to four months (July-October). In 2000, an additional one-month (November) conditional closure was added which was triggered if 50% of the Target Total Allowable Catch (TTAC) for GOM cod was reached by July 31 of that year. The Cashes Ledge Closure Area (CLCA) became closed to groundfishing year-round on May 1, 2002 as a result of a settlement agreement among certain parties in *Conservation Law Foundation et al. v. Evans*. The CLCA encompasses the areas around Fippennies Ledge and Sigsbees Ridge, as well as Cashes itself. The closure was extended in 2003 as part of Amendment 13 to the Northeast Multispecies Fishery Management Plan with the additional designation of a portion of the closure (primarily Cashes Ledge itself) designated as a Level 3 Habitat Closure in which no bottom-tending mobile gear is allowed.

The expected outcome of this study is a sampling methodology using gillnets that will minimize damage to bottom habitat and sample a variety of species and habitats effectively. It may be possible based on the results of this study to develop long term standardized measures of relative abundance of target species in closed areas in collaboration with the commercial fishing industry.

Project objectives and scientific hypotheses:

Specific objectives are to:

- Develop and test a sampling methodology using gillnets that could potentially be used in the longer term to measure relative abundance of target species in groundfish closure areas.
- Describe the size structure and relative abundance of target species in CLCA.
- Establish effectiveness of gillnet sampling methodology in CLCA for species such as pollock which are not effectively sampled by trawls.

Participants:

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Methods:

Experimental gillnets were constructed under Capt. Thomson's supervision by Coastal Marine Supply of Gloucester, MA. Each gillnet measured approximately 100 fm long by 1½ fm deep and contained four (4) 25 fm panels of 5.5", 6.0", 6.5" and 7.0" mesh. All dimensions (vertical mesh count, endline length, total floats, distance between 1st float and end, distance between floats, mesh (knot to knot – 10 measurements from middle of each panel), mesh break between floats) for each net were measured and recorded prior to the first deployment of the study. The purpose of the range in mesh sizes was to enable sampling of a broader range of fish sizes and to provide selectivity data to possibly build on in future studies.

In order to perform this study, we applied for a research permit to the National Marine Fisheries Service Northeast Regional Office. We were issued a Letter of Acknowledgement (LOA) which allowed us to perform the study within both the CLCA and Cashes Ledge Habitat Closure. The LOA also permitted us to land and sell any legal-sized fish captured on the survey. Per our agreement with NEC, 75% of the proceeds from these landings were remitted to NEC for the benefit of future research and 25% were retained by the vessel to compensate for expenses in bringing fish to market.

Three (3) sites that were representative of variation in bottom type and depth in the CLCA were selected for this study (Figure 2). Sample stations had the

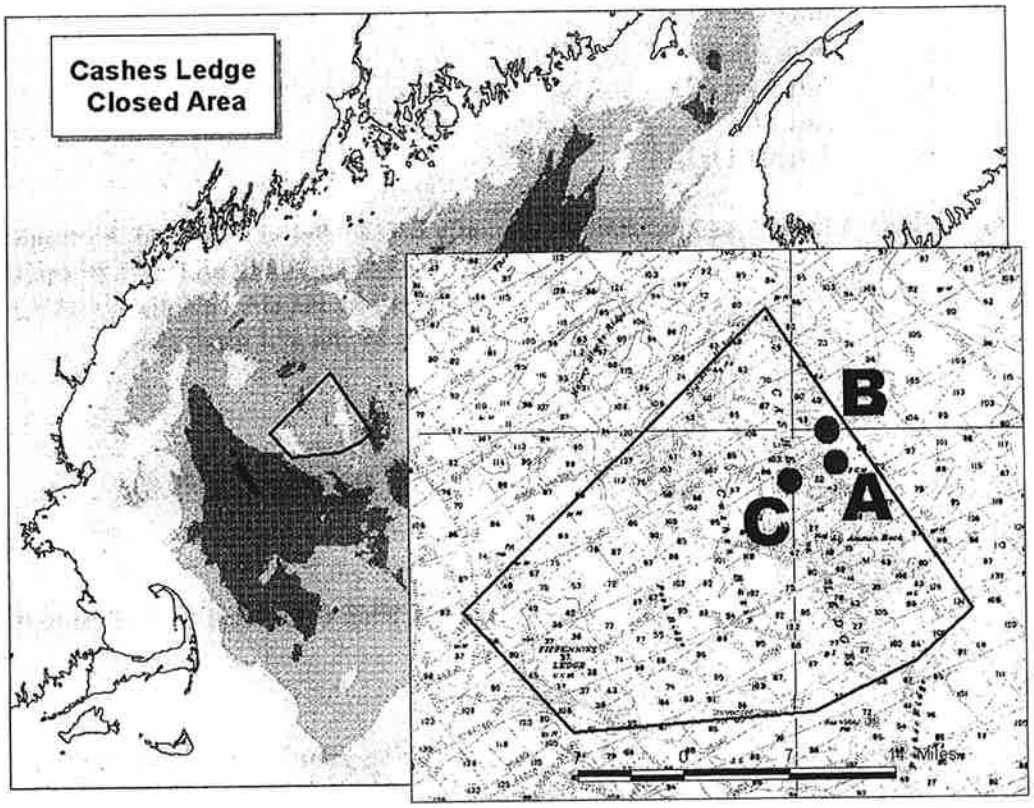

Figure 2. Sample locations (A-C, *inset*) in the CLCA.

following depth, bottom type and location (Lat/Lon):

A. 22 fm, rocks and boulders, 42° 57.85"N 68° 57.11"W
B. 50 fm, gravel and mud, 43° 00.03"N 68° 57.91"W
C. 75 fm, mud, 42° 56.31"N 69° 00.53"W

The project was delayed by approximately 6 weeks due to the length of the NEPA review process. Original project design called for the survey (8 trips) to be completed during March-June 2005. Sampling, however, actually took place during April-August

Each trip was made aboard *F/V Shearwater II*, a 36' by 14' fishing vessel with 6'draft and 225 hp engine, rigged for gillnetting and based in Monhegan Island, ME. There was one contracted scientific observer on each trip and one additional crew member on some trips. Eight (8) trips were completed as follows:

Trip no.	Date
1	April 16-17
2	May 10-11
3	May 31-June 1
4	June 16-17
5	June 27-28
6	July 11-12
7	July 28-29
8	August 11-12

One gillnet was deployed per station, typically set (anchored to bottom) between 1400 and 1600 hrs on Day 1 and retrieved between 0530 and 0800 on Day 2 of each trip. Individual lengths and species of all fish were recorded by net (i.e., location) and mesh size. Aggregate weight was recorded for each species by net and mesh size.

Data:

All data collected have been submitted to NEC and are available at:

http://nec.whoi.edu/jg/dir/nec/HabitEco/

Individual fish lengths (mm) are listed by species for each date, location and mesh size.

Results and conclusions:

The methodology appeared effective at sampling groundfish abundance and distribution in the CLCA, and could potentially be used for a longer term monitoring program for this area.

Although recent studies in the CLCA are extremely limited, this study indicated that groundfish are still abundant on Cashes Ledge. In general, this study demonstrated abundance of white hake, cod, and pollock in this area (Figure 3). Sampling in the spring and summer was also enough to demonstrate that seasonal patterns exist in these species' abundances in the closure area.

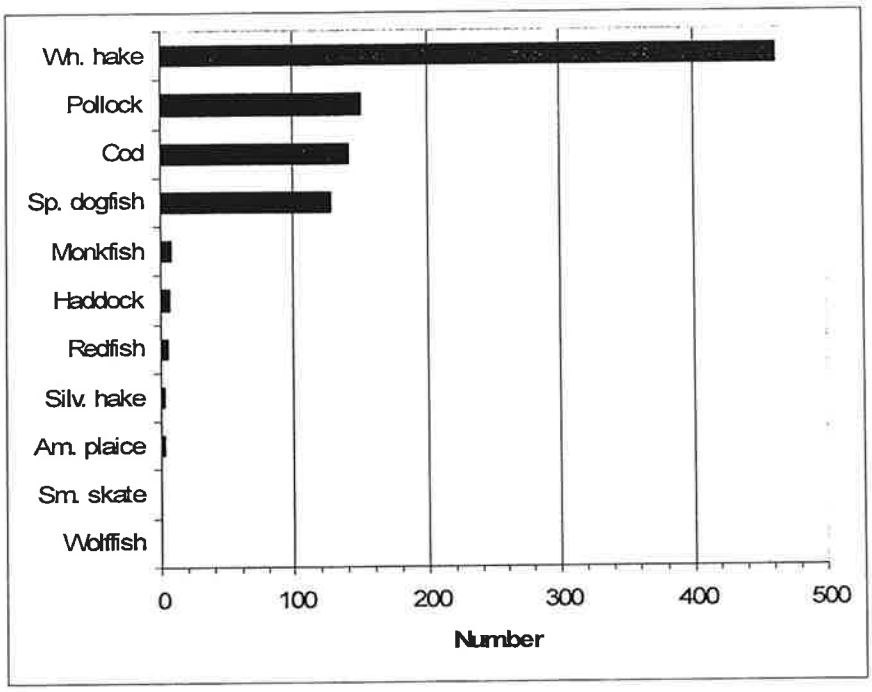

Figure 3. Total abundance of fish by species captured in gillnets during April-August 2005 at three (3) stations in CLCA.

White hake was the most abundant species sampled (Figures 3 and 4). Abundance differed substantially with location and time (Figure 5). Highest abundance was during late June and July at the two shallower sites (e.g., 115 white hake were sampled at the 50 fm site on 12 July). A large portion of the white hake during this time had external signs of spawning, indicating that this could be an important spawning area. Very few white hake were observed at the deepest station (C).

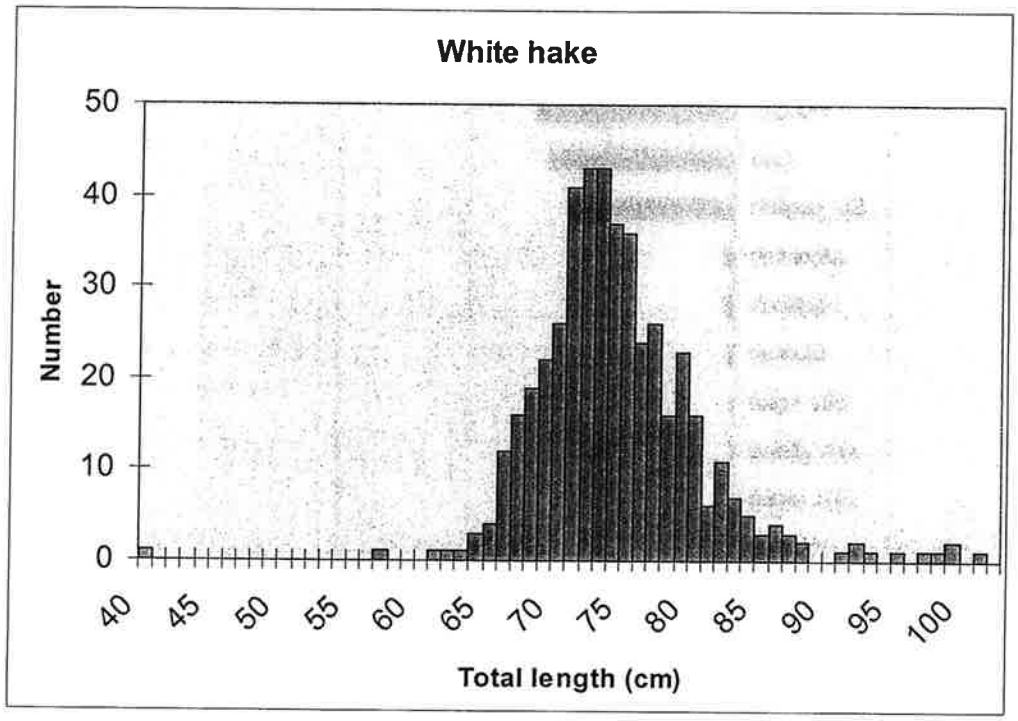

Figure 4. Length frequency of white hake caught in April-August 2005 (all stations).

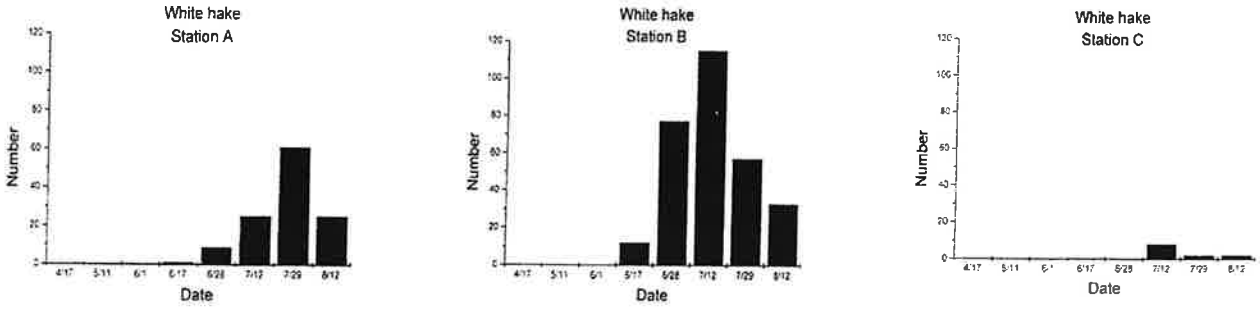

Figure 5. White hake abundance at 22 (Station A), 50 (Station B) and 75 (station C) fathoms at Cashes Ledge in the spring and summer of 2005.

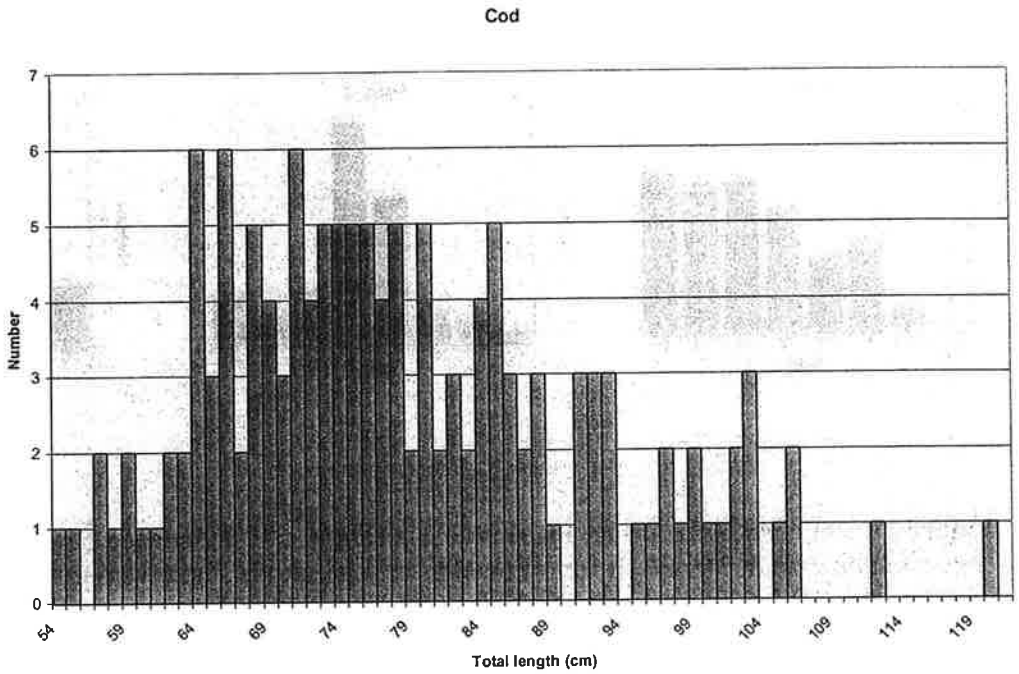

Figure 6. Length frequency of cod caught in April-August 2005 (all stations).

Cod were most abundant at the 50 fm station in June, while abundance was still increasing at the 22 fm station in mid-August when the survey was completed (Figures 6 and 7). In general, variability in cod abundance was much lower than that of white hake. In the 1980s, juvenile cod were frequently observed in studies of the kelp forests of Cashes Ledge (Vadas and Steneck 1988, 1995; Witman and Sebens 1992). Video methods determined that the distribution and abundance of Cashes Ledge cod was approximately an order of magnitude higher than the densities on several inshore ledges (Witman and Sebens 1992). Steneck (1997) determined that the average cod size recorded on Cashes Ledge in the 1980's ranged between 30 and 40 cm (approximately 2 years old based on average growth curves for the Gulf of Maine and Georges Bank [Bigelow and Schroeder 1953]). Older cod are generally found in deeper water (Swain 1993), but Steneck (1997) recorded cod up to a meter in length within the kelp forest at 30 m on Cashes Ledge (i.e., Ammen Rock). Jigging while on station yielded a high catch rate of cod at and around the kelp forest, and cod up to 18 kg (40 lbs) were caught at that location.

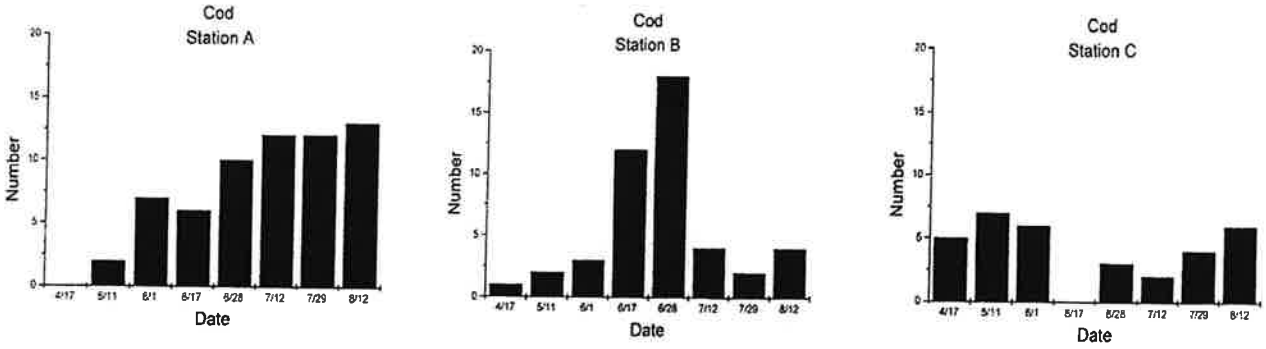

Figure 7. Cod abundance varied by sampling location. As abundance began to decline from its June peak at Station B, it continued to increase at the shallowest station (A). The deepest station (C) exhibited less variation in abundance of cod.

Pollock were captured by all four mesh sizes of gillnets deployed in the CLCA in 2005 (each net consisted of 4 attached panels with 5.5-, 6-, 6.5-, and 7-inch mesh). There were two distinct size groupings that ranged from 30-50 cm and 65-85 cm (Figures 7 and 8).

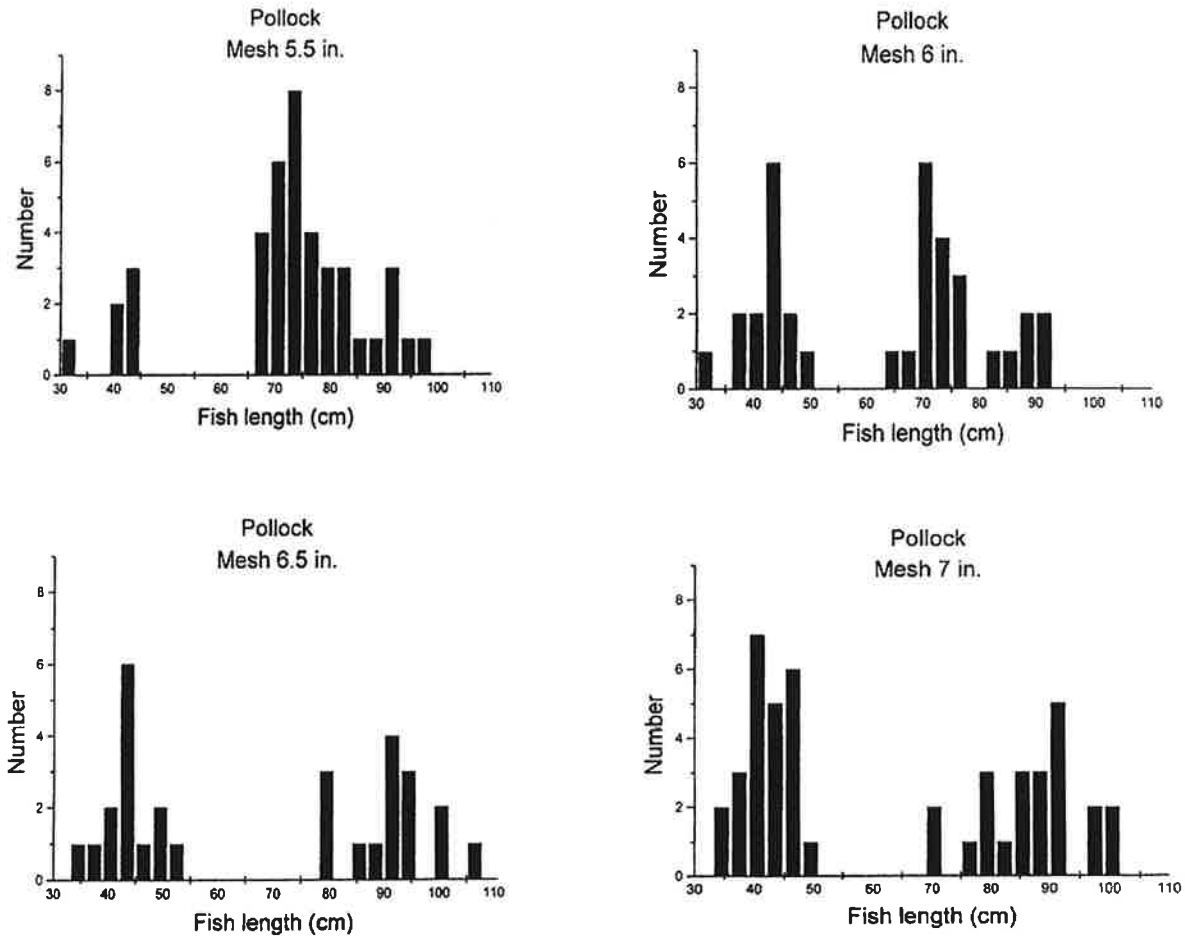

Figure 7. Pollock abundance on Cashes Ledge (all 3 stations combined) captured in gillnets of varying mesh size. Pollock exhibited a bimodal distribution.

Pollock were well-represented in all four mesh sizes.

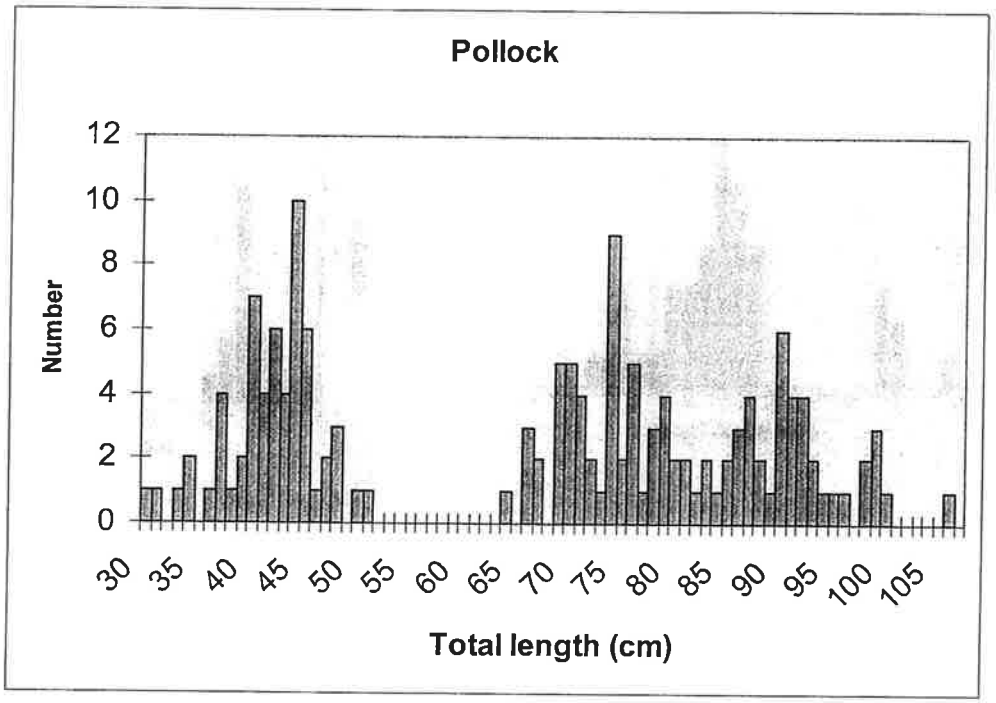

Figure 8. Length frequency of pollock caught in 2005 (all stations).

It would be appropriate based on these results to expand this work to a longer time period so that trends in abundance can be monitored year round and between years. It would also be appropriate for future studies to consider monitoring outside of the closure area to allow for analysis of any effects the closure may have on distribution and abundance of groundfish, particularly cod, pollock and white hake in the region.

Partnerships:

This project initiated a partnership on groundfish research between Capt. Thomson and DMR. The result is that further collaborative research will hopefully take place in the CLCA with these partners as we hope to expand this pilot study into a larger study with a longer time series beginning in 2007. Both partners feel the CLCA is an understudied part of the Gulf of Maine and would like to see further work which will help to explore the value of this area as a conservation tool.

Impacts and applications:

This study provides the basis for possible future monitoring of groundfish distribution and abundance in the CLCA. The methodology could be applied for monitoring of other closed areas, particularly for species which are not amenable to trawls, such as pollock, and for areas where sampling by trawl may cause undesirable effects on bottom habitat. Large areas of the GOM are now closed both year round and

seasonally to reduce fishing mortality and protect habitat, and this methodology could be used if regular monitoring of these closures were to be considered.

Users of this information would include:

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NOAA/NMFS Northeast Fisheries Science Center
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Dr. Ray Grizzle
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Related projects:

A full proposal was encouraged by NEC in May 2006 following a planning letter by Kelly and Thomson entitled *Monitoring Relative Abundance of Groundfish in the Cashes Ledge Closed Area*. The full proposal (in submission) is entitled *Monitoring Relative Abundance and Feeding Ecology of Groundfish in the Cashes Ledge Closed Area* (Kelly, Thomson and Grabowski) and expands on the results of the 2005 survey and in addition addresses monitoring outside of the closure and food habits of groundfish in the Cashes Ledge area.

NMFS/CRPP is another possible source of funding for collaborative research which would expand on the results of this study.

Presentations:

A poster presentation of this study was made by Kelly and Thomson at the 2005 NEC Annual Meeting in Portsmouth, NH.

Literature cited:

Rich, W. H. 1929. Fishing grounds of the Gulf of Maine. Bureau of Fisheries Document 1959:51-117.

Steneck, R. S. 1997. Fisheries-induced biological changes to the structure and function of the Gulf of Maine Ecosystem. Plenary Paper. pages 151 - 165 in Wallace, G. T., and Braasch, E. F. (eds.). Proceedings of the Gulf of Maine Ecosystem Dynamics Scientific Symposium and Workshop. RARGOM Report, 91 - 1. Regional Association for Research on the Gulf of Maine. Hanover, NH.

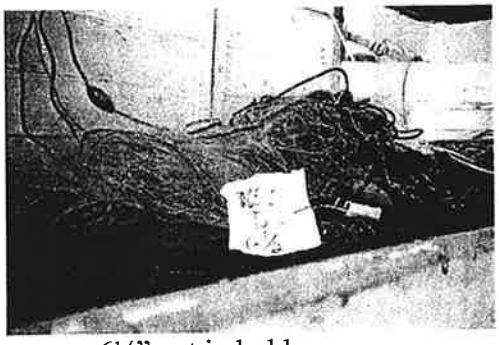
Vadas, R. L., and R. S. Steneck 1988. Zonation of deep water benthic algae in the Gulf of

Maine. Journal of Phycology 24:338-346.

Witman, J. D., and K. P. Sebens. 1992. Regional variation in fish predation intensity: a historical perspective in the Gulf of Maine. Oecologia 909:305-315.

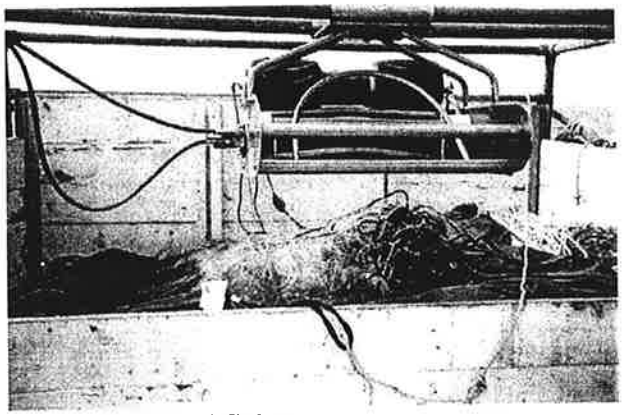
Appendix:

Photos from the field:



6½" net in hold

Rope and highflyer ready to set



Gear and flaker

A net's yield from Cashes Ledge

Capt. Mattie Thomson and mate Tristan aboard *F/V Shearwater II*

Transporting catch to market

Addendum to *Final Report to the Northeast Consortium: A Pilot Gillnet Survey of the Cashes Ledge Closed Area* (report date: 25 July 2006, author: Kevin Kelly)

Comments on the above report by two technical reviewers were forwarded to the author by Northeast Consortium (NEC). There was consensus that more was needed in the report to a.) help the reader understand the project and gain insight as to how it could lead to future research and monitoring of closed areas and b.) provide more detail to support the conclusions drawn. During the technical review several questions were forwarded by NEC to the author. Response to some of the questions required input from the fishing industry partner who was not available at the time. Contact was eventually made with the partner but at that point the technical reviews had already been completed. This addendum will attempt to provide information which may have been helpful to the technical review process and will also hopefully address other points made by the reviewers.

The importance of standardizing sampling gear and deployment methodology was stressed heavily by one reviewer who thought the project was lacking in this regard. The author acknowledges more detail could have been provided on the gear and its deployment. In particular the reviewer was concerned about three parameters which are known to affect catch rates and species-specific selectivity and that could bias results:

1.) hanging ratios
2.) net height
3.) twine diameter (particularly important for cod)

At the time of the review the author was unable to provide information on hanging ratios (in response to a reviewer's question "Were the hanging ratios the same on all panels?"). The project partner has since stated to the author that hanging ratios were the same on all panels and the nets were hung on a one-half basis.

Endline length (distance between float line and lead line, which is equivalent to net height) did indeed vary between mesh panels (*see attached net measurements*), as pointed out by the technical review. This variation effectively created tie downs which meant the amount of mesh per area was not equal between nets. The author acknowledges that this factor should be standardized in future studies to prevent possible bias in the sampling gear. The gear overall was not manufactured to exact specifications for each parameter such as mesh count and net height. To some degree (e.g., mesh size) the final product represented what was available from the net company. More careful control however over some phases of net design and construction however would be warranted were future studies to occur.

Information on twine diameter was also not available at the time of the review but the project partner has since stated that twine size was the same on all panels (Japanese #14 which is equivalent to American 277). This factor therefore should not have created any bias between nets.

One reviewer also expressed concern over standardization of deployment time. This factor could have been documented more clearly in the final report; however it is not felt that there was considerable variation in deployment time. Soak time varied between 16-17.5 hours per net per trip (n=24). The survey protocol called for an overnight set of each net. The actual deployment time was somewhat of a logistical consideration given the long steam time to and from the sampling area (round trip 14-16 hrs.) and the need to complete each trip within a 36 hour period. Thus the goal of an overnight set for each net on each trip was achieved and the soak time did not vary by more than 90 minutes between nets or trips.

The informative technical reviews provided much insight on the project. These reviews will be very helpful in guiding any future work that may develop from the pilot survey. The author feels the 2005 project was a successful first step in developing an efficient, cost-effective technique for monitoring groundfish (including pollock which are not amenable to trawls) in the Cashes Ledge Closed Area.

Technical Evaluation Report
of the Northeast Consortium cooperative research project:

"A Pilot Gillnet Survey of the Cashes Ledge Closed Area"

Anonymously Reviewed

July 5, 2007

Project Success

The project generally accomplished its stated goals and objectives, acknowledging that the study was relatively small, meaning that conclusions from such a limited data set can only go so far.

Certification of Results

There is no reason to believe that the data presented in the report and listed on the website are anything other than credible, but details are lacking. Precision and accuracy are difficult to determine, but no detail was included on the exact methods, such as the type of length (fork length vs. total length) by species, or information about the equipment used to weigh the fish and observe lengths.

A small project such as this cannot be expected to generate sufficient data to draw large conclusions, but the project proposal and the project final report could have included some information about statistical analysis methods appropriate to multi-panel gillnet catches, and specifically how such data could be used to make statements about species stock structure.

Data Accessibility and Dissemination of Results

Data was easily accessible on the Ocean Data Management System. The annual and final reports are on the NEC project page as well. A poster was developed for one of the NEC annual meetings. The author reports on page 13 that follow-on funding was sought indicating that there was further distribution of results to other potential investigators.

Project Partnerships

The project appeared to be a good functioning partnership, and also appeared to have come about because the topic was of mutual interest to both scientist and fisherman. It is difficult to tell from the materials given if all the parties were equally engaged, but on the surface it appears to be the case.

Project Impacts

The short term impacts of this project are likely small, though if it stimulates further study, could be much larger. Gillnet selectivity patterns are reasonably well studied for several species, and for different mesh sizes. The impacts of gillnets on the benthos - part of their argument in proposing the study - are not as well known (other than for studies of ghost gillnets), but the study did not undertake this specifically. The project partners did indeed demonstrate that it's possible to rig and fish the nets as designed, and to collect and summarize the data, but this could have been expected, given their respective expertise. On the other hand, obtaining good data from such a closed area would be beneficial (especially it was originally closed to reduce mortality on cod, and finding out if the closure helped seems appropriate), and this project introduces one method to gather such data. If this project encourages a more full examination of gillnetting as a survey tool, then it will have accomplished a good deal.

End Users

The most specific end users for the methods and data from this project would be the Habitat Conservation Group and the Survey Group of NMFS in the Northeast Region, and the Habitat Subcommittee of the NEFMC.

Overall Rating

I'd rate this project as Good. The project partners completed their work in good fashion, apparently had a productive relationship while engaged in the work, and the project was completed in the allotted time.

Future Research

This project was developed and implemented as a pilot, to demonstrate the utility of fishing gillnets to sample fish populations, with minimal benthic disturbance, and to sample fish such as pollock which don't lend themselves to trawl sampling. As a pilot, it demonstrated that this can be accomplished in the main. A larger sampling would be the next logical step.

Additional Comments and Guidance

If priority is given to sampling the closed areas such as Cashes Ledge, then this project will have good utility. With more data, better estimates can be made of relative abundance, and the influences of time, location, depth and mesh size can be better fleshed out.

Information about the Reviewer

The reviewer is a scientist and outreach/extension agent who has been involved to various degrees in fishing gear cooperative research in New England for approximately 15 years, focusing principally on trawl net modifications for bycatch reduction. He has served on review panels for various funding agencies, in fisheries and aquaculture.

Measurements on experimental gillnets to be used on Cashes Ledge pilot gillnet project w/ Matthew Thompson

measurements done by M. Thompson, K. Kelly and Catherine Salerno (GMRI) at DMR on 28(?) March 2005 on new, unused gear

comments by M. Thompson:

this is "heavy nylon salvage"

floats are 5.5 oz. buoyancy

net deployment:

no tie downs

two (2) 40-50 lb. anchors per net, secured to ocean bottom

Attachment 1						
Net A						
	5.5" and 6" mesh					
		6" mesh		**5.5" mesh**		
	vertical mesh count =	25.5		22.5		
	endline length (in.) =	119		96	(20.5 meshes)	
	total floats =	20		21		
	between 1st float and end (in.) =	36		34		
	between floats (in.) =	74		74		
		73		76		
		74		76		
	mesh (knot to knot) (mm)	149		138		
	(10 measurements taken from middle of panel)	152		143		
		151		141		
		148		140		
		151		144		
		152		143		
		148		142		
		153		143		
		154		142		
		148		142		
					mesh break between floats (in.) =	67

Net B						
	6.5" and 7" mesh					
		7" mesh		**6.5" mesh**		
	vertical mesh count =	20.5		20.5		
	endline length (in.) =	111.5		108		
	total floats =	23		20		
	between 1st float and end (in.) =	21.5		34		
	between floats (in.) =	78		82		
		78		82		
		78		82		
	mesh (knot to knot) (mm)	178		166		
	(10 measurements taken from middle of panel)	176		166		
		179		168		
		176		168		
		179		166		
		181		166		
		180		167		
		179		167		
		179		168		
		179		168		
					mesh break between floats (in.) =	54

Net C						
	5.5" and 6" mesh					
		6" mesh		**5.5" mesh**		
	vertical mesh count =	22.5		22.5		
	endline length (in.) =	98		109		
	total floats =	24		24		
	between 1st float and end (in.) =	36		0		
	between floats (in.) =	73		77		
		74		74		
		73		75.5		
	mesh (knot to knot) (mm)	150		142		
	(10 measurements taken from middle of panel)	152		142		
		152		142		
		153		141		
		152		141		
		152		142		
		152		140		
		152		141		
		151		141		
		152		141		
					mesh break between floats (in.) =	77

Net D						
	6.5" and 7" mesh					
		7" mesh		**6.5" mesh**		
	vertical mesh count =	25.5		20.5		
	endline length (in.) =	142		95		
	total floats =	22		21		
	between 1st float and end (in.) =	41		33		
	between floats (in.) =	79		81		
		78		83		
		79.5		81		
	mesh (knot to knot) (mm)	180		165		
	(10 measurements taken from middle of panel)	183		168		
		183		164		
		182		162		
		182		165		
		183		165		
		182		165		
		182		164		
		182		166		
		181		165		
					mesh break between floats (in.) =	82

Net E						
	6" and 5.5" mesh					
		6" mesh		**5.5" mesh**		
	vertical mesh count =	22.5		22.5		
	endline length (in.) =	105		108		
	total floats =	20		21		
	between 1st float and end (in.) =	40		33		
	between floats (in.) =	75		78		
		71		76		
		73		78		
	mesh (knot to knot) (mm)	152		140		
	(10 measurements taken from middle of panel)	155		141		
		155		139		
		154		140		
		155		140		
		155		140		
		155		141		
		155		141		
		155		141		
		154		141		
					mesh break between floats (in.) =	77

Net F						
	6.5" and 7" mesh					
		7" mesh		**6.5" mesh**		
	vertical mesh count =	25.5		20.5		
	endline length (in.) =	144		116.5		
	total floats =	21		20		
	between 1st float and end (in.) =	36		25		
	between floats (in.) =	77		83.5		
		77.5		78		
		78		81		
	mesh (knot to knot) (mm)	180		165		
	(10 measurements taken from middle of panel)	179		167		
		180		164		
		180		166		
		182		165		
		179		166		
		179		165		
		180		165		
		183		167		
		182		166		
					mesh break between floats (in.) =	95

Technical Evaluation Report

of the
Northeast Consortium cooperative research project,

"A Pilot Gill net Survey of Cashes Ledge Closed Area"

Anonymously reviewed

08/15/07

1. Introduction

This report documents an independent peer evaluation of the project, "A Pilot Gill net Survey of Cashes Ledge Closed Area." This project development award received funding from the Northeast Consortium in FY2004 and was led by Kevin Kelly of Maine DMR in partnership with Capt. M. Thompson. This mail review serves as a formal assessment of the completed pilot study and focused on project design and its applicability to survey work. Gear and deployment methodology must be standardized in the survey in order to provide equality in the gear's sampling characteristics over time and space. If gear and deployment methodologies are not standardized with regard to various parameters known to effect catch rates and size selectivity species specifically, then survey results are biased by the piece of gear used and spatial, temporal and catch comparison between sites cannot be made with confidence.

Abiotic gear factors such as mesh size, twine material, twine diameter, and hanging ratios influence fish retention and size distributions (Hamley 1975, Machiels et al. 1994, Hovgard and Lassen 2000, Yokota et al 2001, Holst et al. 2002). In addition, more obvious factors like net length, height, and tie down use affect the amount of area fished and consequently fishing power/catch rates. It is, therefore, a necessity that such factors be first standardized and then adequately reported in any scientific work.

These factors are approximated, very poorly reported, or not reported at all in this study. This makes me wonder if a thorough literature search of gill net work and/or surveys was conducted prior to formulation of experimental design. In addition, only some catch results are reported and discussed, but no explanation is given as to why others are not. All results appear to be available on the Northeast Consortium's database, but they are not easily understood in the given format. Such reporting of data should not suffice. It is the researcher's responsibility to fully discuss all findings even if they do not point to a given conclusion. This is especially true of surveys.

2. 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 Master's in Marine Science Fisheries and PhD. in Marine Science Biology and over 10 years of experience in doing gear research, including work on haul seines, fyke nets, pound nets, dredges, trawls, pots and gill nets. The reviewer has held various positions on management councils, committees, commissions and workgroups due to gear expertise.

3. Documentation

In advance of the evaluation, the reviewer was provided with the project's final report entitled, "A Pilot Gill net Survey of Cashes Ledge Closed Area." It was submitted to the Northeast Consortium on 7/25/06. Along with the final report, the reviewer received the project's funding proposal and 0 manuscripts submitted for publication in peer reviewed literature. In addition, project data was available through the Northeast Consortium's Fisheries and Ocean Data Management System, accessible at: www.northeastconsortium.org/data.shtml.

4. 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, noting specific strengths and weaknesses of the project. All criteria were considered, but evaluation was focused on the second, "Certification of Results." Comments specific to the criteria are listed in Appendix A. Other comments are given in Section 4a.

4a. Project Evaluation

I agree with the surveyor that gill nets can be used to define trends in abundance and may be especially valuable in areas with sensitive benthic habitats. Site selection and justification are adequate and work plan seems appropriate. The study is weak, however, in experimental design with regard to its standardization of gear attributes, applications, and reporting.

A remedial understanding of the gear is obvious. Sample distributions across spatial and habitat variability were considered. Nets resembled sampling gear in that they consisted of various mesh sizes in a single location and attempts to approximate gear lengths, heights and soak times were made. An attempt to measure all dimension was also made, but these dimensions were not reported, possibly because they were not standardized. A host of other important gill net gear factors were not recorded or reported, and thus, there is no way of knowing whether they were standardized. This often happens in cooperative studies that are not strictly controlled. Assumptions of effect of a given gear factor are made by the fisherman, either based on their perception that they do not matter or for convenience. Identical webbing may not be available so they make do with assuming it will not matter. Gear is thus not standardized with regard to a given factor that does affect catch in an undefined and unequally distributed way. This violates the principle assumption upon which a survey is based, that a given sampling device is working identically in various locations.

Gill net attributes known to effect catch size distribution and species specific retention, as recognized in scientific literature, should be reported and standardized. This is basic and essential when your objectives are to develop adequate methodology for a survey to describe size distribution and relative abundance. Reporting and standardization of such factors is also necessary to identically repeat the survey and for comparison with other studies and within this study over time. This repeatability is one of the principle values of surveys.

It is well established that gillnets can be selective with regard to size and species, with selectivity varying due to biotic factors, including morphology, behavior, and vertical and horizontal distributions (Hamley 1975, Marais 1985, Reis 1999, Machiels et al. 1994, Dickson 1989, Purbayanto 2000). It is a common misconception that technical gill net characteristics are not of equal importance. It is necessary, when designing a survey, that technical gear parameters and application variability be well documented for their influencing size distributions and that fishing power be considered, referenced, and standardized. Fish are not simply gilled by gill nets, that is, prevented from backing out of the webbing by a mesh caught behind the gill cover. Fish can be retained by wedging, that is, held by a mesh or meshes around the body. They can also become entangled by a unique morphological attribute such as teeth, maxillaries, snood, or other projections without necessarily penetrating the net (Hamley 1975). The degree to which a given species is retained by a given method in a specific mesh size once interaction occurs depends on a combination of both abiotic and biotic factors that result in unique size distributions and retention attributes that are species specific. When conducting survey work, these differences in retention should be discussed.

Hanging ratio is well documented as one of the most important factors that effect catch (Hamley 1975, Hovgard et al. 2000, Dickson 1989), yet it is not reported or even mentioned in this work. At low hanging ratios, nets contain a high mesh-to-area ratio that provides a greater opportunity for entanglement of fish across a wider range of sizes. By contrast, increasing this ratio provides a greater likelihood of gilling, and thus, a more defined size range (Gray et al. 2005). Tying down a gill net also increases the mesh-to-area ratio, augmenting likelihood of entanglement. Though I was told no tie downs were used in this study intentionally, varied endline lengths and tying together nets of vastly different heights effectively created tie downs of varied lengths on every net fished. I am assuming for this discussion that the endline length is the length of the rope connecting float line to lead line, though this should be made clear in the report. Since nets were always tied together in the same series, but endline lengths were not standardized nor were vertical mesh counts, no four section nets fished like any other. Joining together a piece of net that is 191.25 inches tall (25.5 mesh of 7.5 mesh) to one that is 133.25 inches tall (20.5 meshes of 6.5, section F just as an example) essentially creates a tie down for the taller net section. In addition, since panel order was consistently 6.0 5.5 7.0 6.5 for each gillnet, tying a 7" section to a 5.5" in the middle of each net would compound this tie down effect (191.25" tall, 7" mesh section F and 123.75"tall 5.5" mesh any section) in an unpredictable manner in the middle of each four section net. Nets that were assumed to be identical in their fishing power and size selectivity did not fish the same amount of the water column at each site due to this inconsistent height variability. Catches would thus be biased by which net section was deployed at a given location. Gill net selectivity work on cod suggests that twine thickness has a substantial effect on fishing power (Holst et al. 2002), but again, there was no mention of what it was or if it varied between like or unlike meshes.

Vertical mesh counts were not standardized even between net sections of like mesh sizes (5.5 and 6 or 6.5 and 7" see highlighted sections of attached sheets A,B,C, D, E,F). In

order to provide comparison over time and space, gear characteristics like net length and fishing height, not just vertical mesh count, must be standardized as much as possible. Approximating such factors may lead to severe bias and fatal flaws. Deployment factors that are known to effect catch rates such as soak time and deployment as it relates to diurnal cycle also need to be standardized, recorded, and reported. Approximation is not adequate; it allows for uncontrolled bias in fishing time and space and thus efficiency. This is especially true for surveys when assumed equal gear selectivity is the bases of spatial and ultimately temporal comparisons.

Once gear attributes are standardized, variations in deployment will naturally occur due to the nature of field work. Bad sets (drug anchors etc.) and unequal soak times are the norm in field work. The effect of this variability can be minimized by converting catches to a catch per unit effort unit. For gill nets, this is generally expressed as a number of species or pounds per 300 ft of net per hour soak time. Recording catches in CPUE provides for better intra and inter study comparisons over time as well.

In short, not reporting or approximation of gear and application characteristics known to effect catch rates and size distributions and reporting raw catch information that is not adjusted for effort is not adequate for surveys in marine science.

4b. Summary/Other Recommendations

This project is by no means a total loss, though 2005's data set may be. One could leave these nets as is and fish them enough in the same location to determine if gear variability truly affects size distribution and abundance estimates by panel. Then, apply this adjustment factor every time to each panel. This is a whole new can of worms though and much more complicated then what you originally set out to accomplish. You could assume the differences don't make a difference, but I had a high school teacher who was fond of telling me what this type of assumption can lead to.

This survey is a good idea, it just needs a lot more controlled scientific design. I get the feeling the fishermen was left alone a little too long while constructing gear. Best advice is to standardize gear and application variables and report in CPUE to get rid of natural variability that cannot be avoided. In addition, do a literature search before you design project and hang net. Also, you should cite literature in your paper, especially the discussion section. It is best to be your own reviewer, it disarms critics.

5. Citations

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Reis, E.G. and Pawson M.G. Fish morphology and estimating selectivity by gill nets. *Fish Res.* 1999; 39:263-273.

Yokota K., Fujimori Y., Shiode D. and Toakai T. Effect of thin twine on gill net size-selectivity analyzed with the direct estimation method. *Fish. Sci.* 2001; 66:97-103.

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? *Objectives were to develop a sampling methodology that could describe size structure and relative abundance of target species. Close to harvestable sizes should be added to this objective. No attempt was made to sample specimens of smaller year classes. Though the investigator is on the right track, gear variability, and thus varied efficiencie,s currently prevent confidence in comparisons between sites with regard to size structure or relative abundance.*

2. **Certification of results:** Is there adequate description of the approaches to experimental design, methods, and data analysis? *No.* Were these approaches appropriate? *Gear to collect samples was not standardized. Fatal flaw in experimental design.* Are there other approaches that the participants could have considered or used? *Standardize gear and deployment report both and reduce bias due to unavoidable variation by reporting CPUE.* Are the data accurate, precise, and believable? *As long as comparison between sites are not made, it is possible that gear variability between like meshed nets did not severely bias overall relative abundance estimates given that different net sections were randomly distributed across sites. This, of course, requires that the number of samples was large enough and I am not sure this is the case. If it were my work, I would be very worried about precision and start over. You are not throwing the same sized dart every time.* Are the results and conclusions well supported by the data and statistically valid? *Flawed by lack of gear standardization.* Can the results and conclusions contribute to a sound basis for management decisions and policies? *No.* If not, can anything be done to allow this? *Surveys fail or succeed on their ability to repeat a standardized approach with a standardized gear over time and report in manner that can be used for comparison with other sites and at the same site over time. Enough said.*

3. **Data accessibility and dissemination of results:** Are the data available through the Northeast Consortium Fisheries and Ocean Data Management System? *They are available but not in a very usable format. This online data leads me to believe that each mesh was not fished an equal amount of time? If this is the case, this needs to be stated in the report and reporting relative abundances without effort standardization to a CPUE unit becomes ridiculous.*

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? *Could provide valuable information, but not as is.*

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? *Not as is.*

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. *Poor, read the evaluation.*

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? *Answered in review. In short, good idea but potentially fatal flaws in design.*

9. **Additional comments and guidance.** Provide any additional comments that will assist the Northeast Consortium in evaluating this project.