Northeast Consortium Annual Report Form
July 1, 2004

1. Project Title: *Assessment of Bottom Habitat Community Recovery in the Western GoM Closed Area* (2002)

2. Project Leader: Cameron McLellan
McFish Inc.
Attn: Ann Morrow
52 Center Street
Portland, ME 04101
(207) 838-1091

3. Other Key Project Participants:

Les Watling and Emily Knight
Darling Marine Center
University of Maine
Walpole, ME 04573

Laura Taylor Singer
Gulf of Maine Research Institute
P.O. Box 7549
Portland, ME 04112

Joseph T. Kelley
Department of Geological Sciences
University of Maine
Orono, ME 04469-5790

4. Goals and objectives, or Project Rationale:

The Primary objective of this project is to examine the state of recovery of till habitats in the WGOMC. This area has been closed to most kinds of bottom fishing (exceptions include surf clam/quahog dredge gear and shrimp trawls) since 1998 or 2000. As a result of this release from disturbance, we anticipate noticeable differences in habitat characteristics between areas not fished for the last five or two years and adjacent, fished areas of similar substrate type and depth. We also expect a smaller area (length/width and number of drag marks visible on the SSS) of drag marks from fishing in the closed area compared with the actively fished area. If visible, drag marks in the closed area should be degraded, discontinuous and partly in-filled by non-human factors, compared with areas actively fished.

We are testing the following hypotheses:

H_1: There is no difference in the abundance and diversity of attached epifauna between substrates of similar type inside and outside the Closure Area.

$H1_A$: There are significant differences in both abundance and diversity of attached epifauna between substrates of similar type inside and outside the Closure Area.

H_2: There will be a smaller number and areal extent of drag marks inside the closed area compared with outside the area.

H_{2A}: There will be no significant difference in the number and areal extent of drag marks inside the closed area compared with outside the area.

These hypotheses are currently being tested on till substrate types, and will be examined in both two-tailed and one-tailed (i.e., stating specifically that the unfished area has significantly greater abundance and diversity of attached epifauna) configurations.

5. Approach and work plan:

The WGOMC runs from 43°15' latitude south to 42°15', and west to east from longitude 70°15' to 69°55' (figure 1). At the time that sampling was conducted, it had been closed to groundfishing for five years west of the 70° line, and two years east of the 70° line. With forty days of sampling time, we were able to survey 18 sites, 3 to 5 stations/site, in areas both in and out of the WGOMC on a variety of habitat types. We then chose to focus our current efforts on comparing communities of one substrate type, therefore we will only discuss sampling sites that will be used in the final product of this analysis, which is a comparison of sites in and out of the WGOMC of till substrates at a depth range of 100 – 130 m. Study sites in and out of the WGOMC used in this project were chosen based on depth, substrate type, and most importantly, the level of past or present fishing effort.

Benthic sampling was conducted in the two year portion of the closure, and in an actively trawled area known as the Kettle (see figure 1), located roughly 16 nautical miles north of the WGOMC. We focused on comparing communities in and out of the WGOMC on till habitats, which refers to a heterogeneous mix of mud, sand, and gravel often located around the bases of rocky outcrops.

6. Opportunities for partnership between commercial fishermen and researchers:

This project has brought together a long-established groundfish fisherman with the scientific community to tackle the difficult questions about how trawling impacts the bottom habitat. There have been many new partnerships developed among the fishermen involved and the scientists.

7. Work completed to date:

Thus far, benthic data have been collected in the form of video, and sediment grab sampling during 40 days at sea in 2002. Samples taken continue to be processed and analyzed using multivariate techniques. Side scan sonar imaging, which was also proposed in this project, will be conducted in July of 2004 following additional ROV and sediment grab sampling funded through NMFS/CRPI.

8. Results to date:

Results thus far are based on analysis of video data taken via ROV in sites both inside and outside the WGOMC.

- Five sites were investigated in the two year portion of the WGOMC, with three to

five ROV stations/site, and four sites in the actively trawled Kettle, with three ROV stations/site.

- All sessile, or weakly mobile, invertebrates were identified and quantified in each ROV transect in frames where the ROV was positioned on the bottom.
- Due to unequal numbers of frames in some transects, numbers were standardized to 50 frames.
- Non-parametric multi-dimensional scaling (NMDS) was used to investigate similarities in epifaunal species diversity and abundances (figure 2).

ANOSIM analysis found a p-value of 0.08, thus our plot suggests a weakly significant partitioning between closed and open stations (see Figure 2).

9. Impacts and applications:

Our project is an example that science and the fishing industry can work together on one of the most controversial issues in fisheries management - the impacts of trawling on benthic habitats. In the scientific community, our project is one of few that has had the opportunity to conduct sampling on a wide variety of spatial scales, thus our results will provide vital information on the impacts of trawling because our sampling regime more closely reflects the large scales over which fishing operates.

10. Related projects:

The NEC funds did not cover all the scientific expenses to process the 2002 samples and expenses to conduct the final analysis of the data so we have sought additional funds. We have received funding from the National Marine Fisheries Service/ Cooperative Partners Research Initiative to conduct another 30 days of sampling, continue to process samples from the 2002 fieldwork, and analyze the data.

11. Published reports and papers:

None.

12. Presentations and posters:

Posters:

- Effects of Trawling on Benthic Habitats: An Analysis of Recovery in the WGOM Closure, Benthic Ecology Meeting, Alabama, March 2004
- Effects of Trawling on Benthic Habitats: An Analysis of Recovery in the WGOM Closure, University of Maine, Graduate Student Expo, April 2004
- Effects of Trawling on Benthic Habitats: An Analysis of Recovery in the WGOM Closure, Ocean Sciences Meeting, ASLO, Honolulu, HI, February 2004

Presentations:

- Effects of Trawling on Benthic Habitats: An Analysis of Recovery in the WGOM Closure, Darling Marine Center Graduate Student Symposium, May 2004

13. Student participation:

The data from this project, combined with additional data, will serve as the masters thesis for Emily Knight, University of Maine. Emily is working under the direction of Dr. Les Watling. Allen Gontz, a doctorate student under Daniel Belnap at UMaine, is conducting the side-scan sonar.