Cape Cod Commerical Hook Fishermen's Association

*Haddock Migration in New England Waters: Year 1 and Year 2 Analysis of Closed Area and Stock Boundaries*

2007 Annual Report to the Northeast Consortium
(Grant Numbers: 05-018 and PZ07030)
**Project Title:**
Haddock Migration in New England Waters: Analysis of Movements between Stocks and Closed Areas, 2007 Annual Report

**Award Number(s):** 05-018 and PZ07030

**Period of Performance:** October 1, 2006 through August 30, 2007

**Principal Investigator:**
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**Abstract:**
This tagging program was designed to deliver much needed information about the potential movements of haddock on Georges Bank and in the Gulf of Maine, providing insight on the relative importance of closed areas to stock recovery and fishery management. From March 2005 until July 2007 over 20,000 haddock were tagged by scientists and trained fishing industry technicians. Tag deployments have closely matched a predetermined strategy designed to release fish in specific proportions both inside and outside of year-round groundfish closed areas on both Georges Bank and in the Gulf of Maine, as well as specific deployment proportions between management areas and sub-areas. Tags were successfully deployed inside the Western Gulf of Maine Closed Area (WGOM), Cashes Ledge Closed Area (CLCA), Georges Bank Closed Area I (CAI), and Georges Bank Closed Area II (CAII). To date, 263 tags have been returned, yielding a 1.3% return rate.

Although the low overall tag return rate is likely due to low U.S. effort and catch relative to stock size, efforts were nonetheless undertaken in 2007 to increase outreach and enhance and publicize the reporting incentive program. Under the innovative scratch-ticket reward system, there have been 32 reported winners to date, totaling $700 in awards.
**Introduction:**
Georges Bank haddock spawning biomass was projected to be about 120 thousand mt in 2003. This is the highest abundance of adult spawners since 1967 and a 10-fold increase since 1993. Despite its importance to commercial fisheries, haddock movement rates within New England waters have not been studied since the 1950s. In particular, the interrelationship between the Georges Bank and Gulf of Maine management units has not been well studied (Figure 1), in part due to the long-term depletion of these stocks during the 1960s.

Figure 1: Spatial definition of haddock management units in the Gulf of Maine and Georges Bank region along with locations of the western Gulf of Maine closed area (WGOM CA), Cashes Ledge Closed Area, Closed Area I (CA I) and Closed Area II (CA II).
Knowledge of haddock movement rates between the Gulf of Maine and Georges Bank management units has potentially important implications for improving stock assessment and management. Determining the spatial definition of stocks is a critical first step in assessing stock status (NRC 1998a). In their review of New England groundfish stock assessments, the National Research Council recommended that the NEFSC “improve the collection, analysis, and modeling of stock assessment data” (NRC 1998b). This study directly addresses the issue of the interrelationship between the Gulf of Maine and Georges Bank haddock stocks.

In addition to the two primary haddock management units, the Georges Bank stock consists of two substocks (Figure 1) that exhibit some morphological differences (Begg et al. 2001). Evaluation of the interchange between the eastern versus western Georges Bank substock issue is of critical relevance at this time because the eastern substock is currently managed under a transboundary harvest sharing agreement between the USA and Canada. 2004 was the first year of this harvest agreement. Movement of haddock between western and eastern Georges Bank may play an important role in stock assessment and also future allocations of haddock between the USA and Canada.

This tagging program was designed to deliver much needed information about the potential movements of haddock on Georges Bank and in the Gulf of Maine, providing insight on the relative importance of closed areas to stock recovery and fishery management.

The issue of how to use fishery and survey data to assess the haddock resource is important for analyses and interpretation of fishery impacts. If the reality were that there is substantial movement between the eastern and western and/or Georges Bank and Gulf of Maine units, then stock assessments would need to change to reflect the movement patterns. In particular, if substantial movements are documented between the Georges Bank and Gulf of Maine management units, then a combined model of the currently separate stocks would be warranted. The same would be true for the Canadian assessment of the eastern Georges Bank management unit that is presently treated as separate from the western Georges Bank management unit for the allocation of harvest under the Transboundary Resource Sharing Agreement of 2003. In addition, new biological reference points would have to be developed for any combination of existing stock units. At present, separate biological reference points exist for Georges Bank and the Gulf of Maine stocks. In 2008, the NEFSC will be re-evaluating groundfish assessments, reference points, and rebuilding targets with independent peer review. Information from this study will provide timely information on the appropriateness of current stock management units and this may impact how the haddock stock(s) are assessed.

**Project Objectives & Scientific Hypotheses:**

**Scientific Goals:**
- Document and improve understanding of current haddock distribution and movement patterns throughout Gulf of Maine and Georges Bank including pilot work to assess movement across closed area boundaries.
- Improve understanding of individual haddock growth rates through tag recaptures.
• Develop and maintain a database in collaboration with the Gulf of Maine Research Institute that will build upon an existing tagging infrastructure that was constructed using Cooperative Research Partners Initiative funding to study cod. The GMRI infrastructure is in place and will effectively and reliably store data, regularly back-up data, and allow easy data transmission to program partners for analysis.
• Make electronic data, database, and archives as well as hard copy data available to NEC and NMFS at conclusion of program.
• Develop a collaborative haddock tagging program between fishermen and scientists to build bridges and strengthen working relationships towards improved understanding of marine ecosystems.
• Increase the value of year one data collected, and provide additional analysis potential and robustness by lengthening the time series of the data into a second year.

Social Goals:
• Create supplemental income for fishermen while participating as partners in broad-scale data collection effort.
• Create formal mechanism for fishermen to contribute to science. This is key to building and maintaining support for the program and other efforts of government scientists.
• Overcome communication barriers over data collection and usage by developing relationships between fishermen and governmental scientists based on trust and mutual understanding.
• Acclimate fishermen to the concept of using fish sales as a means to match federal funds and augment cooperative research objectives. In this study fish sales on dedicated tagging trips will be used to ensure that tagging deployment targets are met.

Objectives:
• Conduct a sampling program to tag 21,000 haddock inside and outside of closed areas on Georges Bank and in the Gulf of Maine during a 24-month tagging period. Dedicated tagging trips will deploy 12,000 tags in inshore closed areas (CAI and WGOM). Non-dedicated tagging trips will deploy 9,000 tags in open areas and offshore closed areas (CAII and Cashes).
• Projected revenues from the sale of fish on dedicated tagging trips will be used to offset total costs of the program to NEC.
• Disperse funds to a wide diversity of vessels from numerous New England ports.
• Provide 100% of dedicated and non-dedicated trips with qualified tagging personnel, consisting of one of the following: Program Coordinator, CCCHFA or GMRI staff, NEFSC scientists, or trained fishermen “technicians.” These technicians will number at least 15, receive both classroom and on-water training, and act to improve the quality of data recorded.
• Manage field operations so that vessel crews participate in actual tagging operations in whichever way the technicians direct their efforts.
• Assign all fishermen the duty to record position, date, time, fish length, tag number, water depth, and water temperature for all recaptures.
• Enhance recapture return rates through outreach to the commercial and recreational fishing industries.
• Make every possible effort to minimize the mortality of the tagged haddock and any bycatch that may occur.
• Manage data so that participants, funders, managers, stakeholders, scientists and the public have access to movement and growth data through various tools including an online interactive mapping portal.

Scientific Null Hypotheses For Testing:
1) Movement of adult haddock between the Gulf of Maine and Georges Bank stocks is negligible.
2) Movement of adult haddock between the western and eastern Georges Bank substocks is negligible.

Hypothesis (1) is the basis for the current USA stock management units. Hypothesis (2) is the basis for the separate treatment of the eastern and western Georges Bank haddock substocks for the Transboundary Resource Sharing Agreement.

Participants

Scientific Partners (primary contacts)

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Honolulu, HI 96822-2326
### Scientific Partners (other key personnel)

<table>
<thead>
<tr>
<th>CCCHFA</th>
<th>GMRI</th>
<th>NEFSC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melissa Sanderson</td>
<td>Sarah Whitford</td>
<td>Jon Brodziak</td>
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<tr>
<td>Sarah Gallo</td>
<td>Pat Foote</td>
<td>Azure Westwood</td>
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<td>Lara Slifka</td>
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<td>Stacy Kubis</td>
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<td>Eric Brazer</td>
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<td>Josh Moser</td>
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<td>Mike Palmer</td>
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<td></td>
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<td>Laurel Col</td>
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### Fishing Vessel Participation (Vessel and captain)

<table>
<thead>
<tr>
<th>Alicia Ann- Greg Walinski</th>
<th>Rueby- Bill Chaprales</th>
<th>Yellow Bird- James Eldredge</th>
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<tr>
<td>Last Chance- Henry McCarthy</td>
<td>Sea Hound- Peter Taylor</td>
<td>William Gregory- Roger Horne</td>
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<td>Lori B- Mike Leary</td>
<td>Sea Venture- Mike Pratt</td>
<td>Peggy B II- Ron Braun</td>
</tr>
<tr>
<td>Never Enough- Bruce Kaminski</td>
<td>Sea Win- Tom Luce</td>
<td>Tenacious- Eric Hesse</td>
</tr>
<tr>
<td>Fiona A- Brian Pearce</td>
<td>Sorry Charlie- Dan Shannon</td>
<td>Mattanza- Eric Hesse</td>
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<tr>
<td>Sandy B II-</td>
<td>Sea Holly- Mark Leach</td>
<td>Special J- John Shusta</td>
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### Industry Technicians

<table>
<thead>
<tr>
<th>Anne Magoon</th>
<th>Kenny Eldredge</th>
<th>Jerry Perry</th>
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<tbody>
<tr>
<td>John Kenneway</td>
<td>Renee Gagne</td>
<td>Katherine Fyfe</td>
</tr>
<tr>
<td>Mike Anderson</td>
<td>Nick Muto</td>
<td>Terry Pickard</td>
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<tr>
<td>Chip Foster</td>
<td>Ray Kane</td>
<td>Leo Maher</td>
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<tr>
<td>Pete Schimmel</td>
<td>Ethan Estey</td>
<td>Jerry Perry</td>
</tr>
<tr>
<td>Jeff Sampson</td>
<td>Chris Van Beeck</td>
<td>Rich Holden</td>
</tr>
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</table>
Methods

Proposed Tag Deployment & Dispersal

We set out to tag 21,000 haddock during a 24-month period from the time at which Exempted Fishing Permits were granted to participating vessels. About twice as many haddock were scheduled to be tagged on Georges Bank compared with the Gulf of Maine because there are more haddock on Georges Bank and also to ensure that a sufficient number of tags are deployed in the Gulf of Maine region. Of the total, (7,000) haddock were scheduled to be tagged on Georges Bank and (3,500) in the Gulf of Maine. In the Gulf of Maine, (2,500) haddock were scheduled to be tagged in closed areas and (1,000) will be tagged in open areas. On Georges Bank, (5,000) haddock will be tagged in closed areas and (2,000) in open areas. Twenty percent (20%) of the closed area tags were proposed to be tagged offshore (Cashes Ledge CA and GB CAII)) and 80% of the closed area tags inshore (GB CAI and WGOM CA). Tags were proposed to be deployed equally among quarters of the year to the extent possible during the 24-month study period.

Actual Tagging Location Deployment

The program is well underway and is approaching the end of tag deployment. Tagging started in March 2005 and since then 20,219 tags have been deployed with 263 returned. Collaborating with commercial and charter boat fishermen, tags were deployed using two different methods: dedicated and non-dedicated trips. Inshore closed area fish were tagged during dedicated trips and open area or offshore closed area fish were tagged on non-dedicated trips. Trained technicians are deployed on all trips to ensure accurate tag deployment, fish measuring and data recording.

Dedicated Trips

On a dedicated tagging trip, the vessel sailed exclusively for the haddock tagging program at a fixed daily rate which accounts for proximity to shore, the fixed costs of setting baited hooks for haddock and fuel costs. Dedicated tagging trips to year-round closed areas targeted an average of 250 haddock per trip; dedicated trips to rolling closures targeted an average of 125 tagged haddock per trip, tagging only the most vigorous haddock. Trained tagging technicians, NEFSC personnel, or senior program staff will be on board to deploy tags on all dedicated haddock tagging trips. All other legal and marketable bycatch were retained up to existing and applicable trip limits and poundage caps and sold. The proceeds were pooled back into the research project.

Non-Dedicated Trips

On non-dedicated tagging trips, the program sought to capitalize on active commercial longline trips and other research programs as platforms for tagging. Following a similar program developed for the NRCTP, the vessels were paid $5.00 per fish. Only trained tagging technicians, NEFSC personnel, and senior program staff were permitted to deploy tags to maintain an increased level of scientific rigor.
Tagging To Date

<table>
<thead>
<tr>
<th>General Tagging Area</th>
<th>Proposed amount of tags to be deployed over 24 months</th>
<th>Total amount of tags deployed over 24 months</th>
</tr>
</thead>
<tbody>
<tr>
<td>Georges Bank CAI</td>
<td>8,000</td>
<td>7,438</td>
</tr>
<tr>
<td>Georges Bank CAII</td>
<td>2,000</td>
<td>815</td>
</tr>
<tr>
<td>Georges Bank Open Area</td>
<td>4,000</td>
<td>6,862</td>
</tr>
<tr>
<td>Western Gulf of Maine Closed Area</td>
<td>4,000</td>
<td>4,005</td>
</tr>
<tr>
<td>Gulf of Maine Open Area</td>
<td>2,000</td>
<td>244</td>
</tr>
<tr>
<td>Cashes Ledge Closed Area</td>
<td>1,000</td>
<td>855</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td><strong>21,000</strong></td>
<td><strong>20,219</strong></td>
</tr>
</tbody>
</table>

Table 1: Proposed and Current Tag Deployment

Tagging took place inside year-round closed areas in 2005 through 2007 with the successful administration of two Exempted Fishing Permits (EFP’s). The EFP’s (DA-5736, DA-6093) allowed dedicated trips to closed areas with the sale of bycatch under a system of caps on haddock catch, haddock landings, and cod bycatch. The investigators were able to meet the scheduled deployments within the Western Gulf of Maine Closed Area and Georges Bank Closed Area I without exceeding any of the EFP caps.

The year one and year two grants both included deliberate budget shortfalls of $12,188, due to the planned use of fish revenue to supplement the NEC funding. All legal and marketable fish caught that were not tagged were sold, with all associated revenue used towards the project budget. The fish-sales revenue was first used at a rate of 100% in order to meet the shortfall. Upon meeting the shortfall, 75% of subsequent revenues were returned to NEC for re-competition, and 25% were retained by the grantee for discretionary use within the project. In year one the budget shortfall was met and an additional $18,577 was returned to the NEC. The shortfall was also met in year two with an additional $975.05 sent back to the NEC for re-competition.

Tagging Protocol

Haddock were captured using commercial longline and rod and reel gear. Haddock were minimally handled assuring that the protective slime coat was not removed. Haddock were gently removed from the hook by the captain and either handed to a technician or placed in a live well. Captains were trained on how to handle the haddock specifically requiring that they do not touch the gills and do not tag haddock that were severely injured during the hooking or hook removal process. The technician decided whether or not to tag the haddock. If the technician thought that the fish would not survive they were placed in a live well and assessed or returned back to the captain. Two manuals were provided to technicians and are appended to this report (see below for detail on Appendix A). In addition, an addendum to the Haddock Tagging Protocol was written to describe new protocols developed to describe and record overall stamina and mouth injury condition indices of the haddock when they were tagged. The table below describes the indices.
<table>
<thead>
<tr>
<th>Overall Stamina</th>
</tr>
</thead>
<tbody>
<tr>
<td>S1 Alive, strong, much resistance to being handled</td>
</tr>
<tr>
<td>S2 Alive but moderate resistance to being handled</td>
</tr>
<tr>
<td>S3 Alive, but weak, showing little resistance to being handled</td>
</tr>
<tr>
<td>S4 Dead</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>Mouth Injury</td>
</tr>
<tr>
<td>M1 No injury - normal hook entry, little or no blood</td>
</tr>
<tr>
<td>M2 Enlarged mouth injury, slit-like, moderate bleeding</td>
</tr>
<tr>
<td>M3 Severe mouth injury, lip ripped/twisted, jaw broken, profuse bleeding</td>
</tr>
<tr>
<td>M4 Catastrophic to fatal mouth injury, extending to most of face or head</td>
</tr>
</tbody>
</table>

Table 2: Stamina & Mouth Condition Index

Documents in Appendix A (Tagging Protocol Manuals)
- Tagging Protocol for the Northeast Consortium Haddock Tagging Program
- Addendum to Haddock Tagging Protocol for condition indices
- Northeast Regional Cod Tagging Program: Standard Protocol for Tagging and Data Collection (provided to haddock tagging participants as part of the pre-planned cohesiveness between the programs)

We chose to deploy highly visible lime-green Hailprint T-bar tags which include a tag number, the program name, and a phone number and website address for reporting recaptured fish. On-board technicians and scientists recorded the following characteristics for every fish tagged: fishing location, date, time, gear, depth, water temperature, tag number, spawning condition, sustainability and mouth characteristics. 25% of the fish were double tagged to determine tag retention. Datasheets used can be found in the haddock tagging manual.

Data Entry & Verification
With relatively minor additions and modifications, the existing database infrastructure at the Gulf of Maine Research Institute for the Northeast Regional Cod Tagging Program (NRCTP) was modified to cater to the program’s needs. A new component was built that allowed project partners to enter data into a standardized tagging database integrated with a Geographic Information System (GIS). GMRI and Northern Geomantics developed a password protected, on-line data administration system that allows program partners to log on, add and download data and see the results displayed on the website. GMRI’s Data Management and Quality Control Specialist validated that the data was properly entered prior to displaying the information on the website. The data entry web portal can be viewed at www.gmamapping.org/haddockdata.

Public Data Viewing
The data entered provides input for the Internet Map Server (IMS) display. The interactive mapping website is fully populated and operational, and available to stakeholders and the public at www.gmamapping.org/haddockmapping. This site allows viewers to report recaptured haddock and view who, when, where, and size of haddock that have been tagged and recaptured.
Tag Returns

Fishermen reported recaptured tagged haddock in different methods. All tags in the Program include the same toll-free phone number as the Northeast Regional Cod Tagging Program, where U.S. and Canadian fishermen can call to report information. GMRI answers the toll-free calls during the day with an automated message after office hours. Fishermen also used the website to report tags or sent them directly to GMRI and CCCHFA.

GMRI’s Data Management and Quality Control Specialists ensured that all tag returns were dealt with in a timely fashion and were quality controlled. Within a few weeks of receiving a tag, a thank you letter showing where the fish was tagged and recaptured, along with other tagging and recapture data for the fish, was sent back to the fisherman. In addition to providing fishermen with timely information on individual fish movements via prompt follow-up mailings, innovative custom designed scratch-off cash lottery tickets were used as an incentive to further enhance the number of tag returns. The distribution of these items not only serves as a reward, but also serves to publicize the program. During the first year of the program one scratch off ticket was sent to each person that reported a recaptured tagged haddock. Due to low return rates we decided to boost the reward to two scratch off tickets and sent a second ticket to anyone that already reported a recapture.

Outreach

Initial information packages were developed and distributed by CCCHFA prior to initial tagging. These included information about the program’s goals and objectives, where tags should be sent, what data is needed in association with the returned tag, and self-addressed, stamped envelopes to return the tags. Envelopes were printed with headings prompting them to record the pertinent information (date, location, gear type, fish length, etc.). Having these on board fishing vessels should increase the likelihood of tags being returned, and improve the quality of associated data.

CCCHFA maintains a homepage for the haddock tagging program on the organization’s website (www.ccchfa.org/tagging) and also a prominent sidebar on all pages which publicizes the program and directs inquiries. The program staff also participated in regional communication with the other mark-recapture tagging programs (cod, YTF, scup etc.) on such group outreach efforts as NOAA Weather Radio announcements and informational tabling at events such as the New Bedford Working Waterfront Festival. An article about the program was featured in the April 2006 and March 2007 editions of Commercial Fisheries News.

Two mass mailings have been completed, the first one totaling over 500 pieces to American and Canadian Permit Holders and Processing Plants. The second mass mailing has been completed sending an informational newsletter, haddock tagging mini-data sheet and self addressed return envelope to over 5,000 individuals.
Changes from Proposed Work & Complications

- Deployments in CAI fell short by 562 fish due to trips catching overabundances of dogfish. These tags were instead deployed on non-dedicated trips in areas adjacent to CAI.
- Year 1 and year 2 each had one trip scheduled to catch haddock in Closed Area II. Year 1 was unsuccessful and relied on Year 2 to catch and tag 2,000 fish. On the second trip technicians tagged over 700 fish. Further trips were not deployed due to a lack of vessel availability, permit coverage and the prohibitive cost of the trip. The remaining tags were deployed in areas adjacent to CAII using non-dedicated trips. Insurance reasons prevented technicians from sailing on these trips. In order to deploy tags captains and crew were trained in proper handling and tagging procedures and acted as technicians.
- Two trips to Cashes Ledge Closed Area were scheduled for year 2 to adjust for the low amounts of haddock tagged in the area in year 1. The second trip was not very successful and depended on the third trip. 855 fish were tagged totaling 900 haddock between both years.
- Non-dedicated trips were scheduled to the Gulf of Maine Open Area during March and April 2006 when haddock are plentiful and dogfish are largely absent. Most of the haddock caught were greater than legal size and worth more to sell than to tag and release therefore few fish were tagged. Because few haddock were being tagged through this non-dedicated effort, dedicated trips were instead scheduled for GOM open areas to tag all haddock and sell the legal size bycatch. These trips were unproductive catching mostly dogfish and damaged haddock eaten by dogfish. Although attempts were made using rod and reel as the primary method of capture to avoid the dogfish we were unable to meet the expected Gulf of Maine Open Area tag deployment targets.
- Securing International Animal Care and Use Committee Approval (IACUC) under new NEC guidelines was a major unanticipated task. Budget revisions were made to adjust for the extra time demands of this development.
- The year 2 Exempted Fishing Permit (EFP) application and negotiations were far more time-consuming than originally anticipated, especially with regards to the caps on cod and haddock.
- Some tags were reported to have a brown growth on them making it difficult to identify that the fish were tagged. This may have lead to some recaptured tagged haddock not being reported.

Accomplishments towards NECCHT Program Objectives to Date

- Scientific Research Permits (SRP) were secured to cover CAI in March and April 2005 and 2006, to ensure that spawning fish would be tagged there and to cover ovary collection needs of the NEFSC.
- Innovative incentives (scratch off lottery tickets) were researched, designed and acquired. United States Postal Service Money Orders were acquired and transferred to GMRI for fulfillment of the winning tickets. Table 3 on page 13 lists the number of reported scratch off ticket winners and the amount of money they won.
<table>
<thead>
<tr>
<th>No. of Winners</th>
<th>32</th>
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<tbody>
<tr>
<td>$10 Winners</td>
<td>25</td>
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<tr>
<td>$50 Winners</td>
<td>5</td>
</tr>
<tr>
<td>$100 Winners</td>
<td>2</td>
</tr>
<tr>
<td>$500 Winners</td>
<td>0</td>
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</tbody>
</table>

TOTAL $$  $  700.00

Table 3: Incentive Lottery Winnings to Date

● Program graphics designed by Dr. Tallack
● Informational brochures and posters designed, printed, laminated as necessary and distributed across the region to docks, auction houses, processors, marine supply stores, research institutes, fisheries organizations, and stakeholders.
● A year two EFP application and Environmental Assessment (EA) was prepared and submitted, triggering a lengthy negotiation and revision process. This EFP proposed action was published in the Federal Register; the EA was returned with a Finding of No Significant Impact; and an Exempted Fishing Permit (DA-6093) was issued on July 11, 2006. The sale of bycatch (including haddock not viable for tagging), upon which the project budget depends, was allowed under the EFP. The EFP was successfully administered and monitored with final reporting completed in May 2007.
● Letter of Understanding and Statement of Work between GMRI and CCCHFA was drafted and executed. GMRI submitted a satisfactory semiannual progress report 3/05/07.
● Classroom and on water training of tagging technicians took place
● International Animal Care and Use Committee Approval (IACUC) was granted for the haddock tagging protocol allowing year 2 tagging to initiate (06/13/2007). IACUC applications and approval required significantly more staff time than anticipated. Budget revisions were made to adjust for the extra time.
● Database continues to be updated as more tags are deployed and recaptured. Recapture reports are generated in real time. (see www.gmamapping.org/haddockdata)
● Informational project homepage updated and operational (see www.ccchfa.org/tagging)
● Online GIS mapping interface updated and operational, allowing public access to program data in real time (see www.gmamapping.org/haddockmapping)
● Tag deployments are summarized by area as shown in Table 1.
● Approved tag recaptures (n=263 as of 1/3/2008) are presented graphically in relation to releases in Figure 2.
● A draft paper was prepared by the NEFSC scientific advisor and his team (Jon Brodziak and Laurel Col, Northeast Fisheries Science Center, “Preliminary Analyses of Northeast Consortium Cooperative Haddock Tagging Project Data Through 21-June-2007,”). This report is preliminary and not intended for publication; it is available by contacting the primary investigator.
● As of 7/1/2007, Year 2 fish revenues have been realized in the amount of $13,488.07. Of this total, $12,188.00 was retained to offset a designed budget shortfall and balance the program budget. Under NEC contractual guidelines, an additional $975.05 was returned to the NEC for re-competition for a total savings to the funder of $13,163.05. The remaining $325.02 is retained in the program budget for discretionary use by the investigators. Year 1 fish revenues resulted in a total of $32,493.85 savings to the funder.
Advertisements were placed in the following publications detailing procedures for recording and reporting a tagged haddock.

- Commercial Fisheries News
- Fishermen’s Voice
- National Fisherman
- The Portuguese Times
- The Navigator
- Working Waterfront/ Inter Island News
- National Fisherman

Commercial Fisheries News published an article about the project in the March 2007 issue.

Results to Date
Currently 263 tags have been returned since initial deployment. This does not constitute a significant enough sample size for a full discussion of technical results, however a preliminary draft paper was prepared by the NEFSC scientific advisor and his team (Brodziak, Jon and Laurel Col, Northeast Fisheries Science Center, “Preliminary Analyses of Northeast Consortium Cooperative Haddock Tagging Project Data Through 21-June-2007,” 7/5/2007). This paper is not intended for publication; but it is available by contacting the primary investigator.

Figure 2: Current tag deployments and recaptures
Data
Tag recovery data will be analyzed to determine the probability of movement between areas (T_{ij}). If tag recaptures indicate movement from one stock area to another, posterior probabilities of haddock movement rates will be estimated using appropriate binomial or multinomial models with uninformative beta or Dirichlet priors and the WINBUGS software for Bayesian data analysis (Congdon, 2001). This approach will provide confidence intervals for movement rates that are easily interpretable by fishery managers. An alternative analysis will be conducted using the MARK software program for analysis of marked individuals with movements among multiple strata (MARK available at: http://www.cnr.colorstate.edu/~gwhite/mark/mark.htm). A likelihood-based model of haddock movement rates may also be developed to estimate movement rates if sufficient tag recoveries occur. Model structure will follow standard approaches to account for population dynamics and differences in fishing effort among areas (Hilborn, 1990; McGarvey and Feenstra, 2002).

The average direction and magnitude of haddock movements will be conducted using GIS mapping and spatial analyses to estimate density. These maps and associated analyses will be used to create graphs that show the direction and magnitude of haddock movements to stakeholders in the fishery management process.

Data has not been submitted to the Northeast Consortium Fisheries and Oceans Database because the dataset is incomplete and unaudited. However, a GIS web interface allows users to view tag deployment and return location in real time by accessing the program web interface at: http://www.gmamapping.org/haddockmapping/viewer.htm. Interested parties who want access to raw data in spreadsheet form can contact the lead investigator. With a log-on username and password, these data can be downloaded through the data entry website www.gmamapping.org/haddockdata.

Partnerships
This project supports an excellent partnership between scientists and fishermen. Technicians and scientists accompany fishermen out at sea. This allows them to not only tag haddock, but also gain insight into normal fishing techniques. Fishermen have been integrally involved in the project from design through implementation. They have also participated enthusiastically in the financial model which minimizes permit related discards and returns revenue to the program.

Collaborating with Jon Brodziak and Laurel Col from the Northeast Fisheries Science Center, scientists have been deployed on tagging trips to collect valuable spawning information and deploy data tags. Working with Hunt Howell from the University of New Hampshire we were able to successfully receive IACUC Approval. The partnership with GMRI to piggyback on the existing cod tagging infrastructure has also been highly successful.

Impacts & Implications
Because this study is still incomplete and the preliminary analyses are based on a limited number of returns, data from this study were not used in the 2008 NEFSC haddock benchmark assessment (GARM III). It is expected that information from this study will used in future
assessments as well as management reviews on the appropriateness of the current stock management units.

**Related Projects**
The 2005-2006 season constitutes the second year of haddock tagging. This project would not have been possible without the data management and tag return infrastructure already in place at the Gulf of Maine Institute developed during the Northeast Cod Tagging Program.

An NEC grant program entitled “Is Closed Area I Serving as a Refuge for Haddock? A Prototype Study of Fine-Scale Movement through the Use of Acoustic Tagging Techniques”, managed by Graham Sherwood from the Gulf of Maine Research Institute, is also taking place. CCCHFA staff and fishermen have provided logistical support, including the provision of NECCHT tags.

**Presentations**
- Northeast Regional Mark Recapture Tagging Workshop (October 2004)
- New Bedford Working Waterfront Festival (September 2005)
- Maine Fishermen’s Forum (March 2006) Title: Collaborative Northeast Groundfish Tagging Program: Results and Applications.
- Tom Rudolph presented at Orleans Elementary School in March 2006, teaching students the importance of tagging projects and how to tag fish.
- Lara Slifka presented at the 2007 Ocean Quest Teacher Workshop, teaching teachers about cooperative research, focusing on the Haddock Tagging Program.

**Student Participation & Volunteers**
Nichola Meserve completed an extremely successful graduate summer internship in August 2005, working since June on the haddock tagging program. Nichola designed and acquired the outreach and reward materials (posters, scratch tickets, website language etc.), wrote the tagging manual, assisted with training, performed all data entry and approval, and sailed on numerous tagging cruises. Scott Donahue, an undergraduate at the University of Connecticut started working on the Haddock Tagging Project in May 2006. Scott is looking forward to assisting with tagging trips, data entry, and outreach. During the summer of 2007 Melissa Vasquez, Anthony Rafferty and Caitlin Luderer from Duke University participated in the haddock tagging program through data entry and tagging. Jed Smythe from Davidson University has participated on haddock tagging trips and data entry. Without the help of 6 dedicated volunteers we would not have been able to complete such a large mailing in 2007.

**Published Reports & Papers**
No reports have been published at this time.
Images

Figure 3: Tom Rudolph and Shelly Tallack teaching technicians how to properly tag a haddock.

Figure 4: Haddock swimming in holding tank aboard the FV Lori B.
Future Research

Like all tagging programs, this one would benefit from continued deployments. A time series would be established for the dataset, enabling much more diverse and conclusive analyses about movement and distribution. In addition, fishermen’s interest and stake in the program would be increased, as would opportunities for supplemental income. Funding support needs would be minimal due to the established infrastructure. Targeted pulse releases could be done based on times and areas identified through the findings to date.

It would also be beneficial to design and implement further work to identify the reason behind the lower than expected number of recaptures being reported, and to determine the relative contribution to the low rate of the following: capture-related mortality, tagging mortality, tag loss, low compliance (reporting) rate or low recapture rate. The investigators suspect the prime reason is the latter, specifically a lack of effective fishing effort in U.S. waters combined with a very large overall stock size.

Finally, it is critical that funding is made available for continued support of the tag reporting and database management components of this program for at least several additional years (often referred to in fish tagging circles as “keeping the lights on.”) Tag recaptures and returns reporting can be expected to continue and the cost of collecting and rewarding this information is extremely minimal relative to the benefits. This function should be viewed as a vital way to protect the initial investment of time and money by the funder. Again, the close collaboration with the Northeast Regional Cod Tagging Program should be capitalized upon. The opportunity to piggyback continued program maintenance onto cod maintenance is exactly the sort of potential efficiency gains foreseen by the program designers.
Appendix A: Tagging Manuals and Protocols
Contents
1 – Project Background
2 – Equipment
  2.1 - Equipment provided by CCCHFA
  2.2 - Equipment provided by the contracted captain
3 – Modification to Fishing Practices
4 – Handling Techniques
5 – The Tagging Procedure
  5.1 - The right fish to tag
  5.2 - The wrong fish to tag
  5.3 - Loading the tagging gun
  5.4 - Applying the T-bar tag
  5.5 - Double-tagging
6 – Measuring Haddock
7 – Checking for Spawning Condition
8 – Comments --- What is worth noting?
9 – Data Entry
10 – Releasing Tagged Haddock
11 – Recaptured Tagged Haddock
  11.1 - During a non-dedicated commercial trip
  11.2 - During a dedicated tagging trip
12 - Skin Tags, Gun Misfires, and Breaks in Tag Number Sequence
  12.1 - Skin tags
  12.2 - Skin tags in double-tagged fish
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  12.4 - Breaks in tag number sequence
13 – Care of Equipment
14 – Tagging Contacts
1 – PROJECT BACKGROUND

- The Northeast Consortium Haddock Tagging Program is a cooperative research project to test the existing assumptions about movement rates of haddock, *Melanogrammus aeglefinus*, in New England waters and to evaluate movement in and out of closed areas. Tagging will also provide insight on haddock growth rates, mortality, spawning cycles and age profiles.
- The project utilizes work performed by a large number of independent contractors. Every effort must be made to follow standardized protocols for handling and tagging haddock, recording data and releasing the tagged haddock.
- The tagging protocol adopted for the Northeast Consortium Haddock Tagging Program is presented in this manual. The techniques described here are based on the experiences and knowledge of both fishermen and scientists in other tagging projects.
- By agreeing to follow standardized protocol, each contractor will help ensure the credibility of the program and the association by maximizing fish survival, tag retention and accuracy of recorded data.

2 – EQUIPMENT

2.1 Equipment provided by CCCHFA

All tagging and measuring equipment and data sheets will be supplied by the association. Please assure prior to departure that all equipment is in working order.

**Tagging Gear Checklist:**
1. Tagging guns (x2)
2. Tags (500 minimum for dedicated trip)
3. Measuring board and towel
4. Data Sheet 1 (x10); Data Sheet 2 (x50), pencils and clipboard
5. Thermometer
6. Gloves (x2)

2.2 Equipment provided by the contracted captain

All fishing gear, live wells and electronics (GPS or LORAN, depth recorder, etc.) will be the responsibility of each contractor. Please assure prior to departure that all equipment is in working order.

3 – MODIFICATION TO FISHING PRACTICES

- **Fish Condition:** Our priority is to obtain fish that are *strong* enough to be tagged and released in good condition. Haddock must be 14” (36cm) to tag.
- **Haul-back:** To avoid detrimental pressure effects to the fish, haul back from any depth should be conducted *very slowly*.
- **Depth:** Tagging should focus on fish caught at depths of *up to 50 fathoms* when possible. However, if the productive waters are deeper, fish caught at >50 fathoms can still be tagged (particularly during colder months) provided that haul back is extra slow.
- **Live wells:** Use of live wells with fresh-flowing seawater is *strongly recommended* so that fish can be caught, stored in the well, tagged as a batch and then released. Chances of survival are higher if the fish can recover from the capture process in a live well before (and sometimes after) tagging. Live wells also allow for selection of the strongest fish, i.e those congregating on the bottom of the well.
- However, live wells should only be used when the well water can be maintained at a temperature *less than 50°C*. If this is not possible, fish should be tagged in real time as they come aboard without tanking (other than to store fish for less than 5 minutes if haul back is
• **De-hooking**: Haddock must be removed from the hook by hand by backing and twisting of the hook (like when jigging). **Under no circumstances** should hooks be removed by hydraulic power or by allowing the fish to contact the fair lead roller. Damage to soft tissue of the mouth renders the fish unsuitable for tagging.

4 – HANDLING TECHNIQUES
- Trauma to each haddock must be kept at a minimum.
- Fish handling time should be minimized. Strive for a single fish **handling time of less than one minute**.
- Ideally, all tagged haddock should be **handled only once** in a gentle, yet efficient manner.
- The provided pair of cotton gloves should be worn to minimize abrasion and mucus loss at all times. Any hand that handles a haddock must be gloved.
- If the fish appears weak after tagging, try returning it to the live well for resuscitation.
- Use **two hands to carry** the fish. Avoid carrying the haddock by its tail – it may cause spinal damage.
- Only one fish should be handled at a time for tagging and measuring.

5 – THE TAGGING PROCEDURE

5.1 – The right fish to tag
- Only tag haddock that are appear strong and healthy.
- Minimum haddock size for tagging is **36cm (14”)**.

5.2 – The wrong fish to tag
Do **NOT** tag when:
- The haddock shows fresh injury or bleeding;
- The haddock’s stomach is visible through the mouth;
- The haddock’s eyes are bulging;
- The haddock has swallowed the hook or damage to the soft tissue of the mouth occurs when de-hooking;
- The haddock appears weak or lethargic;
- The haddock can’t swim down in the tank (it may be helpful to gently push on the belly and toward the vent while the fish is in the water to help it vent trapped gas);
- The haddock does not meet the minimum size requirement (see above).

5.3 – Loading the tagging gun
- Tags are supplied in strips of 50 with each tag in sequence. Tag numbers start on the 1 and end on the zero (ex. 122051-122100). Load the strip of tags or “clip” in **ascending order**.
- The T-bar should be at a right angle to the spine of the strip
- To load, gently push the tags far enough that the first tag is visible in the open groove of the needle.
- If tags get stuck at any time, depress and hold the trigger in and gently pull the strip of tags back out of the gun. Then reload.
5.4 – Applying the T-bar tag

- Wet the measuring board and towel to minimize slime loss.
- Remove one fish from the live well, place on measuring board and cover its head with the wet towel.
- Measure the haddock, check for spawning conditions and record any important comments (see sections 6, 7 and 8).
- Insert the needle of the tagging gun just below the first dorsal fin, and push it in at a downward angle of about 45 degrees or less.
- The point of the needle should penetrate past the midline of the fish and past the interneural bones. The depth to which the tagging needle should be inserted will depend on the size of the fish. Tagging may be facilitated by moving the fish to an upright position against the side of the measuring board. Angling the needle slightly toward the head will result in a better placement of the tag (less drag, etc.).
- **Depress the trigger to release the tag, hold the trigger depressed, and rotate the gun and needle about 90 degrees, pause for a second, remove the needle from the fish, and release the trigger.**
- Care should be taken to minimize enlargement of the wound by keeping the needle straight through the entire procedure, and to complete the steps in order, i.e., insert needle, depress trigger, rotate gun, pause, remove from fish, and release trigger.
- If done correctly the “T” anchor of the tag will be behind the interneural bones and firmly anchored. Care must be taken to avoid penetrating at an angle that results in damage to the spinal column or penetration of the body cavity.
- **Before releasing the fish, read the number of the inserted tag to the recorder, who will match it to the data sheet.** Every tag number must be verified against the data sheet after it is in a fish; one mistake early could create a cascading error that will invalidate the data for the entire day.

Remember to turn the gun 90 degrees after depressing the trigger. Keep the trigger depressed until after the needle is removed from the fish. The depth to which the tagging needle should be inserted will depend on the size of the fish. Insert it just deep enough to catch the interneural bones beneath the fin. Too deep a placement could penetrate the body cavity and injure the fish.

5.5 – Double-tagging

- **Every 4th fish** needs to be “double-tagged.”
- Insert the first tag as normal, then insert the 2nd tag about 2.5cm (1”) **behind the 1st tag** and along the first dorsal fin.
- With smaller fish, the 1st tag may need to be inserted slightly further forward to allow space for the 2nd tag.
- Verify the number of both tags against the data sheet. The data sheet provides lines for two tag numbers for every 4th fish (see attached example of Data Sheet 2).
• If the application of an initial tag is obviously poor (not secure, bad placement, etc), also give this fish a second tag. Refer to sections 12.1-12.3, about skin tags and gun misfires.

6 – MEASURING HADDOCK
• Make sure the measuring board is wet – this will help minimize abrasion.
• Place the haddock with its nose in contact with the vertical edge of the measuring board making sure that the mouth is closed.
• Measure the total length of the haddock from mouth tip to tail tip.
• Round this measurement to the nearest cm (or the nearest ½ inch). If the measurement is exactly at the ½ centimeter or ¼ inch, round up.
• Be sure to indicate at the top of Data Sheet 2 whether using centimeters (preferred) or inches (“Fish lengths are in:”).

7 – CHECKING FOR SPAWNING CONDITION
• Spawning condition is only evident externally when gonads are ripe and running. If matter, other than fecal material, runs out of the vent of an adult haddock with little or no pressure (i.e. a slight squeeze of the belly), then it is “ripe.”
• If this matter is a milky liquid, tick “milt” on Data Sheet 2, next to the specific fish.
• If this matter is fish eggs, tick “eggs” on Data Sheet 2. Look closely as eggs may be subtle. If you don’t have time to look closely, stop checking and indicate so on the data sheet.
• Be sure to indicate at the top of Data Sheet 2 whether or not you are checking for spawning condition.
8 – COMMENTS --- WHAT IS WORTH NOTING?

- Presence of lice or parasites;
- Fish color;
- Evidence of an old injury (if a new injury, the fish should not be tagged);
- Anything that went wrong with the tagging procedure such as skin tags, gun misfires, or a break in tag number sequence, (see section 12 – Skin Tags, Gun Misfires, and Breaks in Tag Number Sequence);
- If the fish didn’t swim away or is belly-up upon release – this is a “floater”. If you are less certain about whether it swam away, write “floater?”;
- If a seagull or other animal got the haddock after being release – write “surface attack”;
- Recaptured tagged haddock (see section 11 – Recaptured Tagged Haddock).

9 – DATA ENTRY (See Attached Sheets)

- **Data Sheet 1** is used to record trip and haul information. Fill in all pertinent information on Data Sheet 1 when fishing starts.
- All fish tagged and released at a location will be treated and recorded as a batch with the same haul #. If the live well gets crowded however, you can tag and release the fish as a haul and start a new haul at the same location.
- Start a new line on Data Sheet 1 each time you tag and release a group of fish or move to another location more than ½ mile away, and assign the next group a new haul number. All information should be filled in prior to moving to another location or starting a new haul.
- Maintain the same tagger for the entirety of a given haul. If a new person takes over the gun, start a new haul.
- **Data Sheet 2** is used to record each fish caught and tagged. Record haul #, fish count, tag #, fish length, spawning condition (if checking for) and any other important information. Restart the fish count at 1 when starting a new haul.
- You can note any additional comments that refer to a complete haul on the back of Data Sheet 1. Any recaptures that occur should also be recorded here.

10 – RELEASING TAGGED HADDOCK

- After the tag number is verified and all data recording complete, lower the fish to the water and release as gently as possible. If vessel sides are high, consider using a chute, or let go the fish when the water is highest against the vessel sides.
- A two-handed carry with one hand at the head and the other under the tail will control the fish the best. Release headfirst and try to avoid “belly flops.”
- Positioning the tagging table near the rail will allow for easy releases.
- Watch to check that the haddock has swum down (if not, note as a “floater”) and is not consumed by another animal (if not, note the “surface attack”).

The gentle release of a tagged fish near the surface of the water.
11 – RECAPTURED TAGGED HADDOCK

11.1 During a non-dedicated commercial trip

- Remove the tag and collect the required data (tag #, fish length, location, date, spawning condition, overall fish condition, water depth and temperature).
- Call in the collected data using the number shown on the tag (1-866-447-2111) – this is a toll-free number for calls from the US and Canada. Reports can also be made via e-mail to tagging@gmri.org

11.2 During a dedicated tagging trip

- Check to see if the tag is still good (i.e. is still securely in place, area is not infected)
- If the original tag is good: Do NOT give the fish a new tag. Record the number of the old tag, haul#, fish length, spawning condition and comments in the margin of Data Sheet 2. Note it as a “re-release with old tag.” Also write this information on Side B of Data Sheet 1.
- If the original tag is bad: On Data Sheet 2 record the original tag number in the Comments column, then re-tag the cod inserting the 2nd tag bout 2.5cm (1”) behind the 1st tag. Record the new tag number in the Tag# column. Collect all other data as if the fish were being tagged for the first time. Also write this information on Side B of Data Sheet 1 and note it as a “re-release with old and new tag.”

12 – SKIN TAGS, GUN MISFIRES, AND BREAKS IN TAG NUMBER SEQUENCE

12.1 – Skin tags

- A haddock is considered “skin-tagged” if the tag is inserted but the T-bar does not sit behind the interneural bones. This should be avoided, but when it does occur, follow the procedures below:
  - Only remove the skin tag if damage to the surrounding tissue will be minimal, i.e. the tag is very close to the skin, or the T-bar has not yet unfolded and the tag can be backed out easily.
  - Insert an additional tag – write the “good” tag number in the Tag # column and in the Comments column, write “skin tag,” the number on the skin tag and whether it was removed or not.

12.2 – Skin tags in double-tagged fish

- If a haddock is supposed to be double-tagged but the 1st tag is a skin tag, add a second tag. Record the “good” tag number in the Tag# column. In the Comments column, write “skin tag” and enter the skin tag #. This haddock is not considered double-tagged.
- If a haddock is supposed to be double-tagged but the 2nd tag is a skin tag, do not insert a 3rd tag. Record the “good” tag number in the Tag# column. In the Comments column, write “skin tag” and enter the skin tag #. This haddock is not considered double-tagged.

12.3 – Gun Misfires

- If the gun misfires two tags at once, record the 1st tag # in the Tag # column. In the Comments column record the 2nd tag # and write “double-fired”.
- The maximum number of tags a fish can receive is 3. This allows for one single tag fire and one double-fire. But if the first trigger pull double fires, do NOT attempt to put in a 3rd tag as it could double fire again, amounting to 4 tags, which the database is not designed to hold.

12.4 – Breaks in tag number sequence

- Very, very infrequently, there may be an error in the printing process that produces two consecutive tags with the same tag number. If you catch the second of the two tags after tagging a fish with it, double tag the fish with another tag 2.5cm (1”) behind the 1st tag. Record the 2nd tag number in the Tag # column, and write the 1st tag # in the Comments column and “duplicate print.” If you are double tagging a fish and tag with two tags of the same number, write the number in the Tag # column and again in the Comments column and “duplicate print.”
• If there is a break in the tag number sequence for any other reason that is explainable, be sure to make a clear note of it in the Comments column of the fish where the sequence break occurs (i.e. the gun jams and you remove the tags and insert a new clip of tags, you use a loose tag from within the tagging gear box, you start a new clip of tags, you reverse a clip of tags that was loads backwards, etc.)

• **Breaks in tag sequence with no notation are completely unacceptable!**

13 – CARE OF EQUIPMENT

• Unused tag clips should be stored in the plastic box to prevent crushing and misalignment. On completion of a tagging session, replace any un-used strip in its original labeled bag and return to the box.

• Rinse the tagging gun with warm water and air dry gun completely after use. Lubricate any metal parts with vegetable oil and store in air tight container.

• Remove the needle before cleaning and re-insert it before resuming next tagging. Needles should also be soaked in vegetable oil after being cleaned. Wipe dry afterwards with a paper towel.

• When putting needles into the gun, make sure the screw is lined up with the channel in the needle. Do not screw the needle too tight or the plastic needle shaft may crack.

• Replace the needle if it gets bent; otherwise, the gun may jam.

• Use the protective cap to cover the needle whenever the gun is not in use. It clips into two holes on top of the gun when not in place.

• Whenever experiencing difficulty with the gun, be gentle; forcing may cause the gun to break. Be sure to depress the trigger before trying to remove any jammed tags.

14 – TAGGING CONTACTS

Tom Rudolph                  Shelly Tallack  
CCCHFA                     Gulf of Maine Research Institute  
210 Orleans Road          PO Box 7549  
North Chatham, MA 02650   Portland, ME 04101  
508-945-2432              207-772-2321  
tom@ccchfa.org            stallack@gmri.org

To report a tagged haddock: call toll-free (1-866-447-2111) or e-mail (tagging@gmri.org)
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<th>Vessel ID</th>
<th>Name:</th>
<th>Federal Permit #:</th>
<th>Documentation #:</th>
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<th>Captain &amp; crew</th>
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<td>Research organization</td>
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<td>Temperatures are in:</td>
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NEC Cooperative Haddock Tagging Program

Continued? Y/N

Page ___ of ___
Haddock Tagging Manual Addendum

Condition Indices

Condition indices will be used in the future to correlate condition at release with likelihood of recapture.

These are DRAFT procedures, but please try to integrate them into your sampling today.

Each fish should be rated in two (2) categories: Overall Stamina and Mouth Injury

1- Overall Stamina

   S1 - alive, strong, much resistance to being handled,
   S2 - alive but moderate resistance to being handled,
   S3 - alive, but weak, showing little resistance to being handled,
   S4 - dead.

2- Mouth Injury

   M1 - No injury - normal hook entry, little or no blood
   M2 - Enlarged mouth injury, slit-like, moderate bleeding
   M3 - Severe mouth injury, lip ripped/twisted, jaw broken, profuse bleeding
   M4 - Catastrophic to fatal mouth injury, extending to most of face or head

The condition index rating should be written in the comments field for each fish when possible to record it. Record the rating as “SXMY”. Therefore the best fish would receive a rating of S1M1 and a dead fish with no face would receive a rating of S4M4.
Northeast Regional Cod Tagging Program

Standard Protocol for Tagging and Data Collection

May 2004
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1 - Project background

- The Northeast Regional Cod Tagging Program represents an international partnership of scientists and fishermen working together to investigate the movement of Atlantic cod, *Gadus morhua*, throughout the Gulf of Maine and neighboring Canadian waters.

- The success of this program is in part dependent on the utilization of standard techniques when handling and tagging cod, recording data and releasing the tagged fish.

- The tagging protocol adopted by the Northeast Regional Cod Tagging Program is presented in this booklet. The techniques described were developed with the help of both scientists and fishermen, based on their experiences with other cod tagging projects.

- Please help us in our efforts to standardize our methodology for this region-wide cod tagging program by practicing the techniques outlined in this publication; particular advice is given with regard to modification to fishing practices, handling techniques, tag and release procedures and data recording.
2 - Modification to fishing practices

2.1 Depth fished

- Our priority is to obtain fish that are strong enough to be tagged and released in good condition.
- **Haul-back**: Pressure changes can have a very detrimental effect on the fish caught; haul-back from any depth (all fishing methods) should therefore be very slow.
- Where possible, tagging should focus on fish caught at depths of up to 50 fathoms. However, if the productive waters are deeper, fish caught at depths >50 fathoms can still be tagged (particularly during the colder months) providing that haul-back is extra slow.
- Fish which come up slightly weak, but without showing signs of air retention, should be soaked in the live well for revival. Recovery can be surprisingly fast, and large cod in particular can become difficult to hold and tag after being in the live well!

2.2 Trawl gear

- Tow durations must be short (10-20 minutes).
- **Haul-back** must be very slow to maximize the survival of the fish caught; this is particularly crucial once the doors have left the seabed and the net is rising through the water column.
- The “start” of each tow refers to when the gear starts fishing (the doors are set); the “end” point of each tow refers to when haul-back begins.
- All trawl vessels must have on board at least one live well. The catch can be stored for recovery before tagging; particularly weak fish may also need a recovery soak after tagging and before release.
2.3 Hook and line gear

- Undertake repetitive drifts, until too few fish are caught.
- **Live wells are strongly recommended:** fish should be collected, stored in the well, tagged as a batch and then released. If catching, tagging and releasing one-by-one, a live well may not be necessary.
- It is also recommended that barbs on the hooks are flattened or removed to induce as little injury to the fish on hook removal as possible.

2.4 Lobster gear

- The cod tagged will reflect a bycatch and will probably be released one by one (no live tank is required).

3 - Handling techniques

- It is crucial that any stress caused to each cod be kept to a minimum. All handling must be gentle (take care not to rub off the protective mucus), but also efficient, to minimize the handling time.
- With practice, the handling time of a single fish should be **less than 1 minute**. Ideally, all tagged cod should be handled **only once**.
- The use of a live well with fresh-flowing seawater is recommended in most cases; chances of survival are higher if the fish can recover from the capture process in a live well before (and sometimes after) tagging.
- If the fish appears weak after tagging, try returning it to the live tank for resuscitation - if only 1 live well is on board, the cod should be gently held away from any other cod in the tank.
- For gear-types where tagging and release occurs within seconds of the fish being caught, a live well may not be required.
- When not using a live well, tag only those fish which can be tagged immediately - **do not tag fish** which have been on the deck and out of water for any length of time.
4 - Live wells

4.1 Acceptable live wells

- The live well may vary so as to best suit the size of the tagging vessel.
- Acceptable live wells include any form of clean, oil-free container (including fish totes) with a hose to provide a gentle flow of fresh seawater - the water supplied must be similar in temperature to the water from which the cod were taken.

Figure 1: Two types of live wells (A and B) and cod stored before tagging (C).

4.2 When not to use a live well

- If for any reason tagging is being undertaken when surface water temperatures are considerably higher than bottom water temperatures, the warmer waters in the live well will reduce the cod's ability to survive the tagging procedure.
- Under these circumstances, fish should only be tagged if it can be released immediately.
4.3 Taking cod out of the live wells

- Remove only one fish at a time for tagging and measuring.

- In larger live wells: Use a dip net to scoop up the cod, taking care not to cause abrasion.

- In smaller live wells: Cod will often suspend themselves with their heads down - if so, you can gently take hold of the cod by the tail (using your right hand) - don’t lift yet! Use your left hand to collect up the rest of the fish and support its weight with the left arm. Try to avoid carrying the cod by its tail - it may cause spinal damage.

Figure 2: The preferred way of carrying cod.

Figure 3: Removing cod from the live well using a dip-net.
5 - The tagging procedure

5.1 Loading the tagging gun

- Ensure the strip of tags is in the correct sequence order (ascending);
- Make sure the T-bar is at right angles to the spine of the strip (Figure 4B) - otherwise, the tags may jam in the gun;
- Load the tagging gun, gently pushing the tags far enough that the first tag is visible in the open groove of the needle (Figure 4C).

Figure 4: A loaded tagging gun (A). The T-bars of the tags must be aligned at right angles to avoid gun-jams (B) and the first tag must sit in the groove of the tagging needle (C) (note: the yellow tags are practice tags).
5.2 Applying the T-bar tag

- Holding the loaded tagging gun, insert the needle just below the first dorsal fin - the needle should be angled forwards (towards the head) and streamlined with the cod’s body (Figure 5A).
- The needle should be inserted just deep enough to catch the bones beneath the fin. An angle of about 45° should ensure that the T-bar anchor goes behind the interneural bones (Figure 5B); an angle greater than 45° may cause injury to the spinal column or penetration into the body cavity.
- Inject tag, turn the gun and needle 90°, pause for a second - this ensures that the anchor is securely locked between the bones - then remove the needle from the fish.

Figure 5: Inserting a T-bar tag into cod: aiming the needle (A), inserting the tag behind the interneural bones (B) and the end result (C).
5.3 Double-tagging cod

- Every 10th fish needs to be “double-tagged”.
- The 1st tag should be inserted as normal, with the 2nd tag being about 2.5cm (1”) behind the 1st, also along the first dorsal fin (Figure 6).
- With particularly small fish, the 1st tag may need to be inserted slightly further forward to allow space for the 2nd tag.

**Figure 6: A double-tagged cod; the two tags are approximately 2.5cm (1”) apart.**

5.4 High-reward tagging

- From May 2004 onwards, the majority of vessels will be adding the following step to their tagging procedure.
- 10% of cod tagged on these vessels will receive a high-reward tag.
- Fish tagged with high-reward tags **should never receive two tags** (if a gun double-fires, please cut one tag out and make a note of this in the fish Comments).
- The revised Data sheet 2 (p.23) has every 5th and 15th row shaded to prompt you when to tag with a high-reward tag.

**Figure 7: The high-reward tag.**
6 - **How to measure cod**

- Make sure the measuring board is wet – this will help minimize abrasion.
- Place the cod with its nose in contact with the vertical edge of the measuring board (Figure 8A) – make sure the mouth is closed as this can affect the final measurement.
- If bright, use a damp towel to shade its eyes from the light.
- Measure the total length – i.e. from the nose to the fork of the tail fin (Figure 8B).
- Round this measurement to the nearest cm (or the nearest ½ inch), i.e. 58cm in Figure 8B.
- If measuring in inches, please make note of this on the data sheet (under “Fish lengths are in...”).

**Figure 8:** The total length of the cod is measured by putting the nose flush to the end of the measuring board (A) and measuring to the end of the middle of the tail (B).

7 - **How to check for spawning condition**

- Spawning condition is only evident externally when gonads are ripe and running. If matter, other than fecal material, runs out of the vent of an adult cod with little or no pressure (i.e., slightly squeezing belly), then it is “ripe”.
- Gently press the flesh around the fish belly, towards the vent.
- If this matter is a milky liquid, tick **milt**; if instead you see fish eggs (these should be clearly visible), tick **eggs**.
- Please indicate at the top of the data sheet whether or not you are checking for spawning condition.
8 - Comments - what is worth noting?

- Presence of lice or parasites (Figure 9);
- Fish color;
- Evidence of old injury;
- If the fish didn’t swim away, i.e. it is belly up – this is a “floater”;
- Did a seagull get to the cod after being released? If so, write “seagull”;
- **Recaptured tagged cod** - (see 9.1 - Recaptured tagged cod);
- Anything that went wrong with the tagging procedure for this fish.

9 - Recaptured tagged cod

9.1 During a tagging trip

- Check to see if the original tag is still good (i.e. it is not coming out or infected):

  - If the original tag is good: Don’t give the fish a new tag. Record the tag #, haul #, fish length and all other information in the margin of **Data sheet 2** (Tagging, p.22 & p.23) - re-release the fish. Add this information to **Data sheet 3** (Tag Recaptures, p.24).

  - If the original tag is not good: On **Data sheet 2** (Tagging, p.22 & p.23) record the original tag number in the Comments column, then re-tag the cod inserting the 2nd tag about 2.5cm (1”) from the 1st tag. Insert the new tag number in the Tag # column. Collect all other data as if the cod were being tagged for the first time.

- By the end of each trip, all recaptured fish should also be recorded into **Data sheet 3** (Tag Recaptures, p.24). This time, the new tag # goes into the Comments column and the original tag #(s) are entered into the Recaptured Tag # column. This sheet will be needed during the data entry process.

9.2 During a commercial trip

- Remove the tag and collect the required data (date, location, tag #, fish length, spawning condition, water depth & water temperature).

- Please call in the data you have collected using the number shown on the tags (1-866-447-2111) - this number is toll-free for callers in both the US and Canada.
10 - Tag misfires and troubleshooting

10.1 Skin-tagged cod
- A cod is considered “skin-tagged” if the tag is inserted but the T-bar does not sit behind the interneural bones. This should be avoided as much as possible, but for “skin-tagged” cod, please follow the following procedures:
  - Remove the skin-tag only if little damage to surrounding tissue is likely, i.e., if 1) the tag is very close to the skin, or 2) the T-bar has not yet unfolded and is still in line with the rest of the tag, allowing the tag to be back-out easily.
  - Insert an additional tag – write the “good” tag # in the Tag # column and in the Comments column, write “skin-tag” and enter the skin-tag #.

10.2 Skin-tags in double-tagged fish
- If a cod is supposed to be double-tagged but the 1st tag is a skin-tag, add a 2nd tag; in the Tag # column, record the “good” tag #, in the Comments column, write “skin-tag” and enter the skin-tag #. This cod cannot be considered as being “double-tagged”.
- If a cod is supposed to be double-tagged but the 2nd tag is a skin-tag, do not insert a 3rd tag; in the Tag # column, record the “good” tag #, in the Comments column, write “skin-tag” and enter the skin-tag #. Again, this cod cannot be considered as being “double-tagged”.

10.3 Double-fire tags
- If the gun fires two tags at once, record the 1st tag in the Tag # column and record the 2nd in the Comments column – write “double-fired” in the Comments.
- The maximum number of tags a cod can receive is limited to 3 – this allows for 1 single tag followed by a double-fire in a double-tagged fish. But if the first trigger shoots 2 tags, do not attempt to add a 3rd tag incase the gun double-fires again (amounting to 4 tags total!). The database is not designed for 4 tags per fish!
- High-reward tags: If the gun double-fires when inserting high-reward tags, cut one tag out – do not release a high-reward tagged cod with more than one high-reward tag in it.
11 - When NOT to tag

11.1 Do NOT tag when
- The cod shows fresh injury or bleeding;
- The cod’s stomach is visible through the mouth;
- The cod’s eyes are bulging;
- If the cod has swallowed the hook;
- The cod appears weak and lethargic;
- If the cod can’t swim down in the tank;
- If the cod is smaller than 36cm (14’’).

11.2 What size cod to tag
- The optimal size of cod to tag is 43cm (17’’) and larger.
- The minimum tagging size is 36cm (14’’) - any smaller than this and the likelihood of survival is reduced.

12 - Releasing tagged cod
- Lower the fish to the water; if vessel sides are high, consider using a chute, or let go of the fish when the water is highest against the vessel sides.
- Release the cod headfirst - try to avoid “belly flops”.
- Watch to check that the cod has swum down - if not, note this as a “floater”.

Figure 10: This cod has been released close to the water, via a chute.
13 - Care of equipment

13.1 Care and storage of tags

- Tags are supplied in strips of 50 with each tag in sequence.
- Each strip of tags is packed in a labeled and re-sealable plastic bag. These are contained in a rigid plastic box, in which the unused strips should be stored to prevent crushing and misalignment. On completing a tagging session, replace any part-used strip in its original labeled bag and return it to the tackle box.

13.2 Care of the tagging gun

- Rinse the gun in warm fresh water, with a small amount of detergent added, after use. Put on a paper towel and expose to warm air to dry out the inside completely. Lubricate any metal parts with vegetable oil and store in an airtight container.
- Remove the needle before cleaning and re-insert it before resuming next tagging – the needles should be soaked in vegetable oil after being cleaned. Wipe dry afterwards with a paper towel.
- When putting needles into the gun, make sure the screw is lined up with the channel in the needle (Figure 11A). Take care not to screw the needle in too tight - the plastic needle shaft will crack!
- Spare needles are inexpensive, and a number of these should be obtained.
- The protective cap covering the needle should be kept in place when not tagging (Figure 11B). It clips into two holes on the top of the gun when not in place.
- If engaged in a prolonged tagging session, occasional flushing with fresh water will minimize the possibility of corrosion and keep the mechanism free of foreign matter.

Figure 11: The channel in the needle to seat the screw (A) and re-capping the needle between use (B).
14 - Tagging gun troubleshooting

- Always carry at least one spare tagging gun and needle, as this will enable you to rectify any problem after your tagging is finished instead of wasting time when holding live fish.

- All disassembling of tagging guns MUST be carried out indoors (where possible) to avoid losing gun parts on the deck.

- Whatever the problem, be gentle with the gun – do not use force as the gun may break.

- If the needle gets bent, the gun may jam – replace the needle.

- If tags get stuck, depress and hold the trigger in, then gently pull the strip of tags back out of the gun.

- Make sure when loading the gun that the strip of tags is inserted only far enough to line the first tag up within the cradle of the needle.

- If the next tag does not feed into the needle position, depress and hold the trigger in, remove the strip and re-load. If the tag still does not feed into the correct position, resume tagging with the other end after checking for any evidence of grit etc. in the feed mechanism. Remember the tags will be out of sequence!

- If a tag has started to feed out, but is jammed in the needle, do NOT try to force it through. Remove needle with jammed tag and with the trigger depressed, remove the strip of tags. Then ease out the jammed tag, taking care not to damage the needle. Inspect needle and ejector pin for damage or fouling. Replace with spare needle if needed. Flush out gun in fresh water if possible, and operate gun a few times without tags to ensure mechanism is free. Replace strip of tags and resume tagging.

- If the previously jammed tag is in reasonable condition, it can often still be used. Put individual tags aside until the rest of the tagging strip has been used up. Then insert the anchor into the pointed end of the needle and apply in the normal way – remember that the tag number may be out of sequence!
### Data sheet 1: Trip & Haul

#### Trip Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vessel ID</td>
<td>Vessel name &amp; Documentation # (e.g. US Coast Guard # or State Documentation #).</td>
</tr>
<tr>
<td>Trip #</td>
<td>The # of the tagging trip being undertaken by your vessel (e.g. 1,2,3).</td>
</tr>
<tr>
<td>Captain &amp; crew</td>
<td>Names of the Captain and crew on the trip.</td>
</tr>
<tr>
<td>Gear used</td>
<td>The type of fishing gear used during this trip (i.e. trawl, hook, trap singles or strings).</td>
</tr>
<tr>
<td>Research organization</td>
<td>The local research organization you are affiliated with.</td>
</tr>
<tr>
<td>General area fished</td>
<td>Please record the trip’s predominant tagging area here - if you changed locations, use the location where the majority of fish were tagged and released.</td>
</tr>
<tr>
<td>Date range for trip</td>
<td>The range of dates for this trip; please record as mm/dd/yy - mm/dd/yy.</td>
</tr>
<tr>
<td>Total no. of fish tagged per trip</td>
<td>The total number of fish tagged during this trip, (this should be filled out at the end of the trip for use as an error-checking tool).</td>
</tr>
<tr>
<td>Water depths are in:</td>
<td>Please indicate whether you record water depth in fathoms, feet or meters.</td>
</tr>
<tr>
<td>Temperatures are in:</td>
<td>Please indicate whether you record water temperatures in Fahrenheit (°F) or Centigrade (°C).</td>
</tr>
<tr>
<td>Comments</td>
<td>If you have any comments regarding your trip/haul, (e.g. gear problems, fish abundance, weather etc.), please enter them on the Comments sheet, and note the corresponding haul #.</td>
</tr>
</tbody>
</table>
### Haul information

- **Haul #** • This refers to the trawl #, hook set # or trap string # (or single trap #).

- **Date** • Please record as mm/dd/yy.

- **Start location & End location**
  - **Start** = when the net / line / trap starts fishing (e.g. doors are set).
  - **End** = when the net / line / trap stops fishing.
  - **Position** can be recorded in either Lat / Lon or LORAN – please use the two columns provided. The release site must be within 0.5 miles of the haul end-point.
  - **Time** - This is the time at the start and end of the haul and should be entered in 24-hour format, Eastern Standard Time (EST).
  - **Depth** - This is the depth of water fished at the start and end of the haul; please indicate at the top of the data sheet whether you record water depth in fathoms, feet or meters (see Water depths are in:).

- **Temperature** • Refers to water temperature at the end of the haul / hook-set / trap string; enter data in the relevant columns, i.e. surface for surface temperature or bottom for bottom temperature and indicate at the top of the page which unit you are measuring in, i.e. Temperatures are in: Fahrenheit (°F) or centigrade (°C).

- **Tagger** • The tagger is the person tagging each fish. This need only be re-entered when there is a change in tagger. Please enter initials.

- **No. of fish tagged per haul** • The number of fish tagged in each haul/hook set/trap line – this is for data quality control purposes and should be completed at the end of each haul as this information is useful when checking data at sea.
# Data sheet 2: Tagging (both original (p. 22) and updated (p. 23) data sheets)

## Header information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vessel ID</strong></td>
<td>Vessel name &amp; Documentation # (e.g. US Coast Guard # or State Documentation #).</td>
</tr>
<tr>
<td><strong>Trip #</strong></td>
<td>The # of the tagging trip being undertaken by your vessel (e.g. 1,2,3).</td>
</tr>
<tr>
<td><strong>Date</strong></td>
<td>Please record as mm/dd/yy.</td>
</tr>
<tr>
<td><strong>Are you checking for spawning condition?</strong></td>
<td>Please indicate whether or not you are checking for spawning condition (see below). If you are not, the columns referring to condition should always be empty.</td>
</tr>
<tr>
<td><strong>Tagger</strong></td>
<td>Please enter name of tagger(s) for this sheet.</td>
</tr>
<tr>
<td><strong>Fish lengths are in:</strong></td>
<td>Please indicate which unit fish measurements are in; cm or inches (cm is the preferred unit). If measuring in cm, please round to the nearest whole cm. If measuring in inches, please round to the nearest ½ inch.</td>
</tr>
</tbody>
</table>

## Fish information

<table>
<thead>
<tr>
<th>Field</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Haul #</strong></td>
<td>This refers to the trawl #, hook set # or trap string # (or single trap #).</td>
</tr>
<tr>
<td><strong>Fish count</strong></td>
<td>Please number the fish consecutively (e.g. 1,2,3,4.....) starting at 1 for each haul. This allows you to easily count how many fish were tagged per haul.</td>
</tr>
<tr>
<td><strong>Tag #</strong></td>
<td>The full tag number should be recorded in the first row of each data sheet; providing that the tag numbers do not break in sequence, only the last 4 digits need be recorded hereafter, until the next data sheet.</td>
</tr>
<tr>
<td><strong>Double-tagged fish:</strong></td>
<td>Every 10th row is shaded and is also deeper; these are for double-tagged fish; i.e. the fish receives 2 tags along the dorsal fin, approximately 2.5cm (1”) apart (Figure 6). Both tag numbers are entered (1 per cell of the Tag # column), but all other information need only be entered once per double-tagged fish.</td>
</tr>
<tr>
<td><strong>High-reward tagged fish:</strong></td>
<td>From May 2004 onwards we are inserting high-reward tags into 10% of cod tagged. On the updated Data sheet 2 (p.23) every 5th and 15th row are single, but shaded and begin with HR. These rows indicate when to tag a cod with a high-reward tag. Please record all six digits.</td>
</tr>
<tr>
<td><strong>Fish length</strong></td>
<td>This should be measured in centimeters (cm), rounded to the nearest cm. (If measuring in inches, please round to the nearest ½ inch and indicate this unit of measurement at the top of Data sheet 2).</td>
</tr>
</tbody>
</table>
### Data sheet 2: continued

**Spawning condition**
- Refers to **spawning condition** - this is only evident externally when gonads are ripe and running. If matter, other than fecal material, runs out of the vent of an adult cod with little or no pressure (i.e., slightly squeezing belly), then it is ripe. If this matter is a milky liquid, tick **milt**. If instead it is lots of little fish eggs (these should be clearly visible), tick **eggs**. Please indicate at the top of the data sheet whether or not you are checking for spawning condition.

**Comments**
- This column is for comments associated with an individual fish, e.g. the presence of lice or parasites, old injuries or scars, if the fish floated after being released.
- Use this column also for recording all breaks in tag sequence!!!
<table>
<thead>
<tr>
<th><strong>Data sheet 4: Cod not tagged (p. 25)</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Header information</strong></td>
</tr>
<tr>
<td>• see Data sheet 2.</td>
</tr>
<tr>
<td><strong>Fish information</strong></td>
</tr>
<tr>
<td><strong>Haul #</strong></td>
</tr>
<tr>
<td>• This refers to the trawl #, hook set #</td>
</tr>
<tr>
<td>or trap string # (or single trap #)</td>
</tr>
<tr>
<td>during which the cod was captured.</td>
</tr>
<tr>
<td><strong>Fish count</strong></td>
</tr>
<tr>
<td>• see Data sheet 2.</td>
</tr>
<tr>
<td><strong>Reason not tagged</strong></td>
</tr>
<tr>
<td>• Check whichever reason applies:</td>
</tr>
<tr>
<td>- Check “undersized” if the cod caught</td>
</tr>
<tr>
<td>was less than 36cm (14”).</td>
</tr>
<tr>
<td>- Check “poor condition” if the fish</td>
</tr>
<tr>
<td>was too weak to tag, or was dead.</td>
</tr>
<tr>
<td>- Check both “undersized” and “poor</td>
</tr>
<tr>
<td>condition” if both apply.</td>
</tr>
<tr>
<td><strong>Fish length</strong></td>
</tr>
<tr>
<td>• see Data sheet 2.</td>
</tr>
<tr>
<td><strong>Spawning condition</strong></td>
</tr>
<tr>
<td>• see Data sheet 2.</td>
</tr>
<tr>
<td><strong>Comments</strong></td>
</tr>
<tr>
<td>• see Data sheet 2.</td>
</tr>
</tbody>
</table>
### Data sheet 1 - Side A

**Data sheet 1: Trip & Haul**

<table>
<thead>
<tr>
<th>Vessel ID</th>
<th>Name</th>
<th>Federal Permit #</th>
<th>Documentation #</th>
<th>Trip #</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Cyanita</td>
<td>594267</td>
<td>800473</td>
<td>1</td>
</tr>
</tbody>
</table>

**Captain & crew**: Mike Cross, Steve Baker & Henry Howell  
**Gear used**: Trawl  
**Research organization**: DMF  
**General tagging area**: Cashes Ledge  
**Date range for trip**: 05/12/04 - 05/13/04  
**Total no. of fish tagged per trip**: 20  
**Water depths are in**: Feet, Meters, Fathoms  
**Temperatures are in**: °F, °C

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Date min/hour</th>
<th>Time (h:mm)</th>
<th>Depth (feet)</th>
<th>Lat (or LORAN)</th>
<th>Lon (or LORAN)</th>
<th>Time (h:mm)</th>
<th>Depth (feet)</th>
<th>Lat (or LORAN)</th>
<th>Lon (or LORAN)</th>
<th>Temperature</th>
<th>Tagged (millis)</th>
<th>No. of fish tagged per haul</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>05/12/04</td>
<td>2050</td>
<td>37</td>
<td>43°00'060</td>
<td>69°31'410</td>
<td>2105</td>
<td>40</td>
<td>43°01'060</td>
<td>69°02'430</td>
<td>6</td>
<td>ST</td>
<td>14</td>
</tr>
<tr>
<td>2</td>
<td>05/12/04</td>
<td>2300</td>
<td>42</td>
<td>43°00'069</td>
<td>69°31'440</td>
<td>2310</td>
<td>38</td>
<td>43°02'083</td>
<td>69°32'410</td>
<td>6.5</td>
<td>ST</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>05/13/04</td>
<td>0659</td>
<td>44</td>
<td>43°03'021</td>
<td>69°45'410</td>
<td>0714</td>
<td>49</td>
<td>43°03'050</td>
<td>69°46'440</td>
<td>6</td>
<td>PD</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>05/13/04</td>
<td>0030</td>
<td>47</td>
<td>43°00'060</td>
<td>69°26'050</td>
<td>0040</td>
<td>44</td>
<td>43°00'060</td>
<td>69°28'040</td>
<td>7</td>
<td>PD</td>
<td>3</td>
</tr>
</tbody>
</table>

Northeast Regional Cod Tagging Program

Continued? Y / N

Page _1_ of _1_
### 15.2 Data sheet 1 - Side B

#### Data sheet 1: Trip & Haul

**Comments for individual hauls:**

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Recapture: #010050</td>
</tr>
<tr>
<td>2</td>
<td>Gear got hung up; tow was short (10 min) - no fish</td>
</tr>
<tr>
<td>3</td>
<td>Recapture: #010119</td>
</tr>
<tr>
<td>4</td>
<td>Recapture: # 010124 &amp; 5, 010131, 010006 &amp; 7. Caught cod too small to tag.</td>
</tr>
</tbody>
</table>
## 15.3 Data sheet 2 - Original (March 2003)

**Data sheet 2: Tagging**

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Fish Count</th>
<th>Tag #</th>
<th>Fish length</th>
<th>Spawning condition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>01015</td>
<td>75</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0116</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0117</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0118</td>
<td>93</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0119</td>
<td>66</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0120</td>
<td>57</td>
<td></td>
<td></td>
<td>Lice present</td>
</tr>
<tr>
<td>7</td>
<td>0121</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0122</td>
<td>115</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0123</td>
<td>82</td>
<td></td>
<td></td>
<td>Old injury to eye</td>
</tr>
<tr>
<td>10</td>
<td>0124</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0126</td>
<td>47</td>
<td></td>
<td></td>
<td>Double fins (#010127)</td>
</tr>
<tr>
<td>12</td>
<td>0128</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0129</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0130</td>
<td>65</td>
<td></td>
<td></td>
<td>Floater</td>
</tr>
<tr>
<td>15</td>
<td>0131</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>0132</td>
<td>38</td>
<td></td>
<td></td>
<td>Seagull</td>
</tr>
<tr>
<td>17</td>
<td>0133</td>
<td>55</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>0134</td>
<td>48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>0135</td>
<td>76</td>
<td></td>
<td></td>
<td>Skin tag #010134</td>
</tr>
<tr>
<td>20</td>
<td>0136</td>
<td>42</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>0137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Northeast Regional Cod Tagging Program*

Haul #3: #010119, 63cm, Eggs
Haul #4: #010124 & #010125, 67cm, milt
Haul #5: #010131, 58cm
Haul #6: #010006 & #010007, 49cm

*Continued? Y / N*

Page 1 of 1
## 15.4 Data sheet 2 - High-reward tagging (May 2004 onwards)

**Data sheet 2: Tagging**

<table>
<thead>
<tr>
<th>Vessel ID</th>
<th>Trip #</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyntia</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

**Tagging Details**
- Date: 05/12/04 and 05/13/04
- Are you checking for spawning condition? Yes
- Tagger: Sam Taylor & Pat Barton
- Fish lengths are in: Cm, Inches

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Fish Count</th>
<th>Tag #</th>
<th>Fish length</th>
<th>Spawning condition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>010118</td>
<td>78</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0116</td>
<td>77</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0117</td>
<td>77</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0118</td>
<td>90</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>HR</td>
<td>H00018</td>
<td>60</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>010119</td>
<td>68</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0120</td>
<td>67</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0121</td>
<td>80</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0122</td>
<td>118</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>0123</td>
<td>67</td>
<td>✓</td>
<td></td>
<td>Old injury to eye</td>
</tr>
<tr>
<td>11</td>
<td></td>
<td>0124</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0125</td>
<td>47</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0126</td>
<td>59</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>0127</td>
<td>69</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>0128</td>
<td>65</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0129</td>
<td>63</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0130</td>
<td>65</td>
<td></td>
<td></td>
<td>Floater</td>
</tr>
<tr>
<td>4</td>
<td>0131</td>
<td>58</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0132</td>
<td>36</td>
<td></td>
<td></td>
<td>Seagull</td>
</tr>
<tr>
<td>4</td>
<td>0133</td>
<td>42</td>
<td></td>
<td></td>
<td>Tag # out of sequence, correct</td>
</tr>
<tr>
<td>4</td>
<td>0137</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** During data recording, check the check-boxes as verification that the tag number being recorded matches that being inserted into the fish at that time.
### 15.5 Data sheet 3 - Tag Recaptures

Data sheet 3: Tag Recaptures

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Recapture Count</th>
<th>Recaptured Tag#</th>
<th>Fish Length</th>
<th>Spawning condition</th>
<th>Comments / Additional tags</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>010050</td>
<td>77</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>010119</td>
<td>68</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>010124</td>
<td>67</td>
<td>✓</td>
<td>Double-tagged fish, Lice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>010127</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>010131</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>010006</td>
<td>49</td>
<td></td>
<td>Double-tagged fish</td>
</tr>
<tr>
<td></td>
<td></td>
<td>010007</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Vessel ID: Cyhanta

Date (mm/dd/yy): 05/12/03 and 05/13/03

Are you checking for spawning condition? Yes ✓ No

Tagger: Sam Taylor & Pat Burton

Fish lengths are in: Cm ✓ Inches

Continued? Y / N

Page _1_ of _1_
## Data sheet 4: Cod not tagged

### Vessel ID: Cyanite

<table>
<thead>
<tr>
<th>Date (mm/dd/yy)</th>
<th>Are you checking for spawning condition?</th>
<th>Tagger</th>
<th>Fish lengths are in:</th>
</tr>
</thead>
<tbody>
<tr>
<td>05/12/04 and 05/13/04</td>
<td>Yes/No</td>
<td>Sam Taylor &amp; Pat Burton</td>
<td>Cm/Inches</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Haul #</th>
<th>Fish Count</th>
<th>Reason not tagged</th>
<th>Under sized</th>
<th>Poor condition</th>
<th>Fish Length</th>
<th>Spawning condition</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>✓</td>
<td></td>
<td></td>
<td>77</td>
<td>✓</td>
<td>Fresh injury</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>3</td>
<td>✓</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>✓</td>
<td></td>
<td></td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1</td>
<td>✓</td>
<td></td>
<td></td>
<td>50</td>
<td></td>
<td>beak</td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>34</td>
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<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
<td>30</td>
<td></td>
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<tr>
<td>5</td>
<td></td>
<td>✓</td>
<td></td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>4</td>
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<td>✓</td>
<td></td>
<td></td>
<td>28</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
16 - Tagging Locations
# 17 - Tagging trip checklist

<table>
<thead>
<tr>
<th>Tagging equipment</th>
<th>Personal gear</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>In tackle box:</strong></td>
<td><strong>Tagging gear:</strong></td>
</tr>
<tr>
<td>• Tagging guns (x3)</td>
<td>• Oil skins</td>
</tr>
<tr>
<td>• Packs of needles (x2)</td>
<td>• Boots (steel-capped recommended)</td>
</tr>
<tr>
<td>• Actual tags</td>
<td>• Gloves (long-sleeved recommended)</td>
</tr>
<tr>
<td>• Practice tags</td>
<td>• Glove liners</td>
</tr>
<tr>
<td>• Vegetable oil in container</td>
<td>• Warm clothing</td>
</tr>
<tr>
<td>• Tweezers (to remove needles from oil)</td>
<td>• Hat/Cap</td>
</tr>
<tr>
<td>• Tape measure (sewing type)</td>
<td>• Sunglasses</td>
</tr>
<tr>
<td>• Flat-head screw-driver</td>
<td>• Sun block</td>
</tr>
<tr>
<td>• Thermometer (waterproof)</td>
<td>• Knife</td>
</tr>
<tr>
<td><strong>In dry box:</strong></td>
<td><strong>Dry gear:</strong></td>
</tr>
<tr>
<td>• Paper towels</td>
<td>• Change of dry clothes</td>
</tr>
<tr>
<td>• Plastic zip-loc freezer bags</td>
<td>• Sleeping bag, sheet &amp; pillow</td>
</tr>
<tr>
<td>• Spare Writing utensils</td>
<td>• Towel</td>
</tr>
<tr>
<td>• Sharpie marker</td>
<td>• Toiletries</td>
</tr>
<tr>
<td>• Tagging Protocol Manual</td>
<td>• Motion sickness products</td>
</tr>
<tr>
<td>• Data sheet 1 (20 sheets)</td>
<td>• Preferred foods</td>
</tr>
<tr>
<td>• Data sheet 2 (250 sheets = 5000 fish)</td>
<td>• Book</td>
</tr>
<tr>
<td>• Clip-boards (X2: wheelhouse &amp; deck)</td>
<td>• (Camera)</td>
</tr>
<tr>
<td><strong>Larger equipment:</strong></td>
<td><strong>Safety gear:</strong></td>
</tr>
<tr>
<td>• Measuring board</td>
<td>• Survival suit (EPIRB &amp; strobe attached) and</td>
</tr>
<tr>
<td>• Totes (minimum x4)</td>
<td>• plastic bags for feet</td>
</tr>
<tr>
<td>• Water tanks (minimum 1)</td>
<td>• PFD</td>
</tr>
<tr>
<td>• Deck hoses</td>
<td></td>
</tr>
<tr>
<td>• Towel for shading cod</td>
<td></td>
</tr>
<tr>
<td>• Dip-net</td>
<td></td>
</tr>
</tbody>
</table>
Appendix A: Outreach
i. Mini-data sheets

<table>
<thead>
<tr>
<th>No.</th>
<th>Date</th>
<th>Tag #</th>
<th>Haddock length</th>
<th>Location</th>
<th>Year</th>
<th>Water depth</th>
<th>Water temp</th>
<th>Observing conditions</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>3</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>4</td>
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<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Please provide us with as many of these data as possible, tag and mail the tags and the form together in the SASE.

Please provide us with your contact details so that you can send you a reward – we greatly appreciate your help!

Name: 
Address line 1: 
Address line 2: 
City: 
Telephone: 
Email: 
Vessel Name: 
Gear Used: 
Number of tags found:

ii. Link to Commercial Fisheries News Article

http://www.fish-news.com/cfn/editorial/editorial_4_06/Haddock_tagging_program.html

iii. Example Published Advertisement

Have you caught a HADDOCK with a LIME GREEN tag?

Phone: 1-866-447-2111
E-mail: tagging@gmri.org

Please call or e-mail haddock tag recaptures with the following information to receive your scratch ticket with the potential to win up to $500:
Tag #, date, time, length, location, depth, temperature, gear, fate of fish

http://www.gmamapping.org/haddockmapping/