

**NORTHEAST CONSORTIUM
Annual Report**

Project Title: Archival Tagging Study of Monkfish, *Lophius americanus*

NEC Award Number: 09-042

Period of Performance: June 1, 2008 – May 31, 2009

Date of Annual Report Submission: June 30, 2009

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Project Participants

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Project objectives and scientific hypotheses

The primary objectives of this project are (1) to investigate movements of monkfish (including deepwater excursions) among the southern and northern U.S. management regions and Canadian waters, and (2) to validate aging methods for monkfish. Additional objectives are to learn about monkfish behavior, including off-bottom excursions (Hislop et al. 2000; Rountree et al. 2006) that may be related to transport on ocean currents and/or spawning behavior; activity rhythms in relation to tidal cycles; and habitat (depth-temperature) associations. We hypothesize that monkfish move extensively and that there is exchange between fishery management areas and a possible deepwater excursion by maturing females from the southern area.

Methods and work plan

We are tagging monkfish with Star-Oddi Centi data storage tags (DSTs) that record time, pressure (depth) and temperature, have a battery life of up to 5 years and a depth capability of at least 2000 m. We are releasing tagged monkfish in 3 areas: Hudson Canyon, the southern flank of Georges Bank and the western Gulf of Maine. Monkfish are captured by our industry partners (commercial gillnetters) using a short soak; fish that are lively and in good physical condition are tagged and released. DSTs are implanted subcutaneously on the fishes' dorsal surface using methods developed under a 2005 NEC Project Development Grant (NOAA Award NA05NMF4721057, Richards 2007) and further refined under this project. Monkfish are also double-tagged with external (t-bar) tags and injected with oxytetracycline for growth validation before release. We plan to release 40 DSTs in each of the three regions using combined funding from NEC and a Monkfish Research Set-Aside (RSA) grant (total 120 DSTs). The tags' inscription states that the entire fish plus the tags must be returned in order to receive a \$500 reward. We are developing an outreach program to alert US and Canadian fishermen to the tagging study. This includes web presence, distribution of posters, placement of articles and advertisements in industry publications, and direct e-mailings to industry members.

The work under this project has been supplemented by a 2008 monkfish RSA grant awarded to Grabowski and Sherwood (GMRI), which increased the number of tags to be released in each site and may allow us to add a tagging site farther to the south.

The experimental design of this project has not changed; however, we were not able to tag during October-November 2008 as originally planned.

Work completed to date

During the first year of this project, we have refined tagging methods, designed and produced a tagging apparatus for use on board commercial gillnet boats, developed tagging protocols and a tagging handbook, developed methods for marking with OTC, released one batch of tagged monkfish in southern New England, and begun our outreach efforts.

Tagging Methods

The results of our 2005 NEC Project Development Grant (development of archival tagging methods for monkfish, Richards 2007) indicated that DSTs should be implanted internally with no external streamer. During the current project, we are following that methodology, but have experimented with alternative methods for suturing. We have concluded that either the purse string suture (as described in Richards 2007) or a simple interrupted pattern (Wagner et al., 2000) will be most effective with monkfish. The purse string suture has the advantage of requiring only one knot, but may be less effective at re-aligning cut surfaces. The simple interrupted stitch can result in better alignment, but requires more knots to be made, which can be difficult under rough conditions at sea. Monkfish skin is far less rigid than most teleosts, thus achieving good wound apposition is more difficult.

Tagging Apparatus

We have developed a tagging box which will allow us to measure, tag and inject the monkfish while keeping it in water in a live tank on board the vessel (Figure 1). The box has been tested on a tagging trip, was found successful and has been reproduced for use on both collaborating vessels.

OTC Marking

We are injecting 75mg OTC per kg body weight intraperitoneally before release of the tagged fish. This is a relatively conservative concentration, but McFarlane and Beamish (1987) found effectiveness of marking did not differ between 75mg/kg and 100mg/kg.

Tag Releases

We have made one tagging trip aboard the F/V Gertrude H (Ted Platz, owner/operator) on January 13, 2009. On this trip, 18 monkfish were captured, all were considered in excellent condition and were tagged and released (release locations shown in Figure 2). Shortly after this trip, the captain brought his gear in for the winter, so no further trips could be made. Further tagging trips are tentatively scheduled for July, 2009.

Outreach

We have begun to develop our outreach program. This includes design of a poster (Figure 3), development of web presence (<http://www.nefsc.noaa.gov/read/popdy/monkfish/Survey2009/taggingstudy.htm>), purchased ads in Commercial Fishery News, and articles prepared for industry publications and for NOAA and GMRI press releases (to be released after most fish are tagged). Further outreach efforts will include mailings and e-mailings to members of the Monkfish Defense Fund, mailings to monkfish and groundfish permit holders, and outreach through the Fishery Management Councils, and Canadian port agents.

Results to Date

Most of our work to date has involved refining techniques and developing field protocols and apparatus as described above. None of the 18 tagged monkfish have been recaptured to date.

Future Work

In the next 12 months, the remaining tags will be released and outreach efforts will be put into full operation. We expect to put out most of the tags during July 2009; however, if we judge that water temperatures are too warm, we will postpone tagging until the fall offshore migration (Oct-Dec).

Impacts and applications

The most important impacts and applications from this project will be realized when tagged fish have been recaptured and the data and samples analyzed. In the near term, others involved with tagging may benefit by using the protocols and apparatus that we have developed.

Related projects

This project is being leveraged by a 2008 Monkfish Research Set-Aside grant to Grabowski, Sherwood, Platz and Caldwell (Monkfish RSA Project 08-MONK-008, <http://www.nero.noaa.gov/StateFedOff/coopresearch/rsa/MonkfishRSASummary.html>). The RSA project provides for an increase in the number of tags to be released in each area, and may allow for an additional release site nearer the southern range of monkfish in US waters.

Partnerships

The fisherman-scientist partnership has been excellent. The project has involved 2 fishing vessels (6 fishermen) to date and will likely involve more in the coming year. Fishermen were involved with developing protocols and methodology for at-sea work, and helped with data collection, documentation and the logistics of tagging on board their vessel.

Presentations

Presenter: Graham Sherwood

Title: Archival Tagging Study of Monkfish

Meeting: Northeast Consortium Annual Participants' Meeting

Date: March 25, 2009

Location: Portsmouth, NH

Presenter: Larry Alade

Title: Developing Surgical Methods for Implanting Archival Tags in Monkfish

Symposium: Advances in Tagging and Surgical Procedures

Meeting: American Fisheries Society

Date: Sept. 3, 2009

Location: Nashville, Tennessee

Published reports and papers

None to date.

Data

None are available yet.

Literature Cited

Hislop, J.R.G., J.C. Holst and D. Skagen. 2000. Near-surface captures of post-juvenile anglerfish in the North-east Atlantic-an unsolved mystery. *J. Fish. Biol.* 57:1083-1087.

McFarlane G.A. and R.J. Beamish. 1987. Selection of Oxytetracycline for Age Validation Studies. *Can. J. Fish. Aquat. Sci.* 44: 905-909.

Rountree, R.A., J.P. Goeger, and D. Martins. 2006. Extraction of daily activity pattern and vertical migration behavior from the benthic fish, *Lophius americanus*, based on depth analysis from data storage tags. ICES CM 2006/Q:01.

Richards, R.A. 2007. Development of Tagging Methods for Monkfish, *Lophius americanus*. Final Report to Northeast Consortium.
http://www.northeastconsortium.org/ProjectView.pm?id=7069&on_update=RECORDSET_refresh_list

Wagner, G. N., Stevens, E. D., & Byrne, P. (2000). Effects of suture type and patterns on surgical wound healing in rainbow trout. *Transactions of the American Fisheries Society* 129, 1196-1205.



Figure 1. Apparatus for tagging monkfish while keeping them submerged. Note incision on monkfish ready for tag insertion. Measuring board is embedded in base of box.

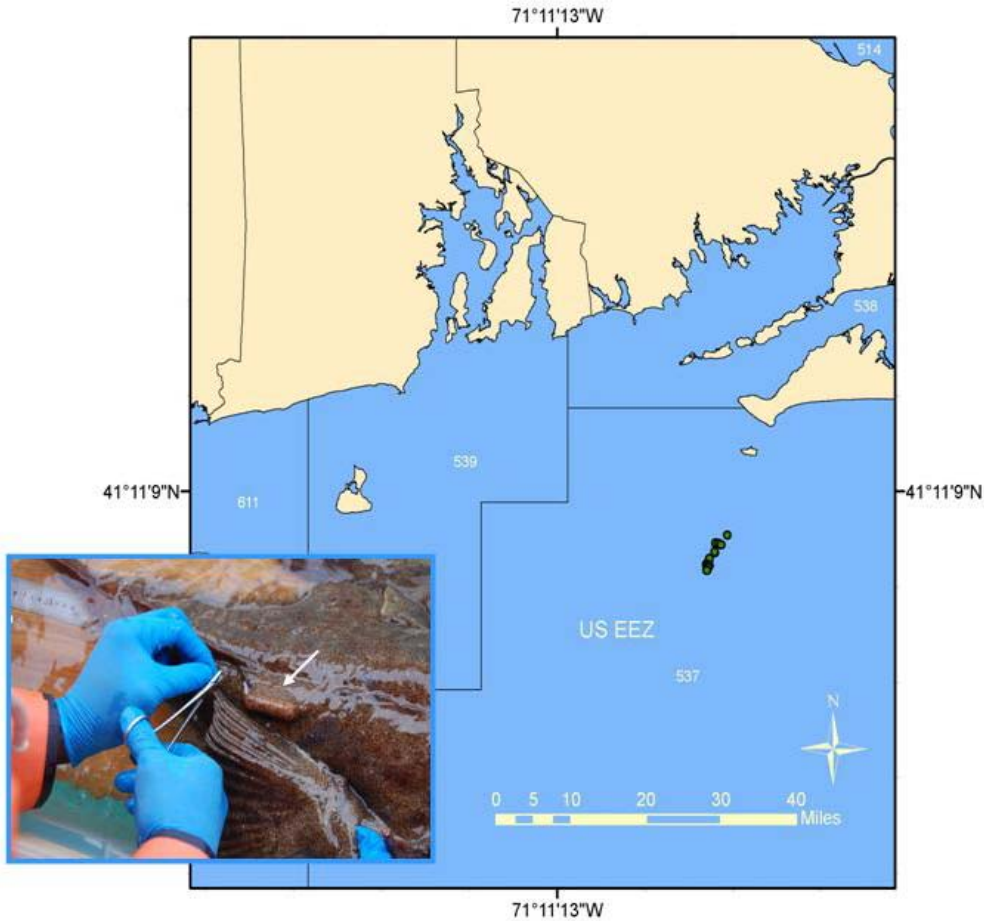




Figure 2. Location of tag releases in southern New England in January 2009. Inset: photo of tag (arrow) ready to be sutured in place.



Cooperative Monkfish Tagging Study

Have you caught a monkfish with **pink** tags?
If so, you are eligible for a...



\$500 REWARD



These fish have been implanted with electronic data storage tags to help us investigate large-scale monkfish movements and behaviors.

To Claim Your Reward:
You must **SAVE THE ENTIRE FISH*** and report capture date and location.

To report a tagged fish or for more information:
visit: <http://www.gmri.org/tagging> or
<http://www.nefsc.noaa.gov/read/popdy/TagReporting/TagReporting.htm>
email: monkfishtagging@gmri.org (subject monkfish)
call toll-free: 1-866-447-2111

*Please store on ice or freeze if necessary.

Contact us for instructions on where to send the fish and to receive your reward.



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Figure 3. Poster developed for outreach for archival tagging study.