Project Name and Number

Beach Seining Project
Tautog Tagging Project
Tautog Tracking Project

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Jack Walsh (Sound School Instructor)

I. Summary

Beach Seining Project
The beach seining project is designed to monitor the abundance of fishes (mostly juvenile fishes) in the near shore zone. The principal investigator conducted training in field procedures for students involved in Summer On Site SOE Program conducted at the Sound
School. During the summer, students also completed three beach seine samples on their own with the assistance of the instructor. (See attached Marine Resources Restoration Directed Laboratory, Summer On–Site SOE Program, George Baldwin and Jack Walsh, Program Summary 7–09 to 7–13).

Tracking Project

The tracking project is designed to monitor adult tautog implanted with acoustic transmitters in order to assess their movements and habitat use. The principal investigator implanted an acoustic transmitter in a tautog (Tautoga onitis) as a demonstration with assistance from students from the Sound School. Students also used a hydrophone to locate fish previously implanted and released into New Haven Harbor. They were able to locate a fish which had been implanted the previous year.

Tagging Project

The tagging project is designed to mark young of the year (YOY) or age 0 tautogs and recapture them in subsequent years to discover the habitat used by older juveniles. The students at Sound School have been constructing the traps to be used in the effort. Some preliminary trapping has been done.

II. Introduction

It is commonly accepted that near shore, shallow–water habitats are important nursery areas for many fish species, some of which are of considerable recreational or commercial importance. Juvenile winter flounder (Pseudopleuronectes americanus), scup (Stenotomus chrysops), weakfish (Cynoscion regalis), bluefish (Pomatomus saltatrix), tautog (Tautoga onitis), and even pollack (Pollachius virens) can be captured in the shallow water habitats of Long Island Sound. Other species such as, juvenile menhaden (Brevoortia tyrannus), silversides (Menidia menidia), alewives (Alosa pseudoharengus) blueback herring (Alosa aestivalis), and anchovy (Anchoa mitchilli) while not commercially or recreationally important themselves, form the forage base for predatory species such as
summer flounder (*Paralichthys dentatus*), striped bass (*Morone saxatilis*), bluefish and weakfish which are commercially and recreationally important.

Year class strength is set early in the life history (Cushing 1990) and therefore these nursery areas are crucial for the survival of these fish species. These habitats are also the most likely to be impacted by human activities. Even if habitats are not eliminated or compromised, they vary in their production of juveniles from year to year and from location to location (Beck et al. 2003).

The factors controlling recruitment, the process by which juvenile fish join the adult population, are still poorly understood. The long-term monitoring of juvenile abundance in nursery areas and comparisons to fluctuations in adult abundance will contribute to our understanding of these factors, the relative importance of different nursery areas, and how management might intervene to counteract negative human impacts.

Adults of many of the species mentioned above are currently at historically low levels in Long Island Sound (MacLeod et al. 2005) despite changes in management approaches. In Connecticut, a ban currently exists on the taking of river herring, a collective term for alewives (*Alosa pseudoharengus*) and blueback herring (*Alosa aestivalis*), because of the decline in numbers of spawning adults in recent years. Winter flounder abundance reached an all time low in 2004 and tautog abundance also remains below the long-term average (MacLeod et al. 2005).

**Beach Seining Project**

The proposed seining project will provide data that can be compared to that being collected in other on-going projects. Abundances the Long Wharf site at this site can be compared to other ongoing seining projects being conducted by the senior investigator in Morris Cove on the other side of the harbor, at the Milford Point Audubon Center and at the Clinton town beach. Shallow water muddy habitats, such as those found in the Long Wharf area near the Sound School are preferred by winter flounder (Howell et al. 1999). This population will be accessible to the beach seine at high tide. The state of Connecticut currently stocks the West River in New Haven Harbor with alwives (*Alosa pseudoharengus*) in

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- 3 -
an effort to restore historical spawning populations there (Gephard and McMenemy 2004). Seining at this site may capture juveniles as they make their way downriver to the harbor and so monitor the efficacy of this effort. Juvenile river herring have been captured in the seine by the senior investigator in Morris Cove on the opposite side of the harbor.

**Tautog Tagging Project**

Tautog are an important recreational fish whose numbers are currently at low levels (Gottschall et al. 2002). Young-of-the-year (YOY) or age 0 (less than 1 year) fish are known to inhabit shallow water habitats in New Haven Harbor (Pereira 1999) but what other habitats they may be using are unknown. The trawl survey conducted by the state of Connecticut does not pick these fish up until they are 3 or 4 years of age. The following questions remain to be answered:

- Do tautog recruit directly to the breakwaters where they reside as adults.
- Do tautog move there as adults after recruiting to other habitats?
- What habitats are being used by Tautog of 1–2 years of age?

The proposed tautog tag and recapture program is intended to assist in answering these questions. Traps could be deployed near the breakwaters and off the Sound School docks. Beach seining could be conducted at Morris Cove and possibly other sites within the harbor. Recapture of fish as 1 or 2 year olds, which had been tagged as age 0 fish in the nearshore shallow water habitats would demonstrate movement from one habitat to the other. Capture of YOY fish near the breakwaters would indicate recruitment directly to this habitat. Fish captured during the course of the beach seining project might also be tagged and released.

**Tautog Tracking Project**

Sound policies for marine conservation and fishery management need to be solidly grounded in biology. While this principle is seemingly
uncontroversial, it has not been fully realized, particularly with regard to the incorporation of behavioral studies into conservation and management plans (Hilborn and Walters 1992; Shumway 1999; Sutherland 1998; Vincent and Sadovy 1998). The proposed research will focus on seasonal movements and habitat selection of a heavily exploited coastal fish, the tautog or blackfish (*Tautoga onitis*), that will have immediate relevance to management efforts to maintain the viability of this stock in Long Island Sound and other coastal waters of the Northeastern US.

Legislation on fisheries management now mandates attention to such behaviors as habitat selection. Traditional fisheries management techniques relied on adjustments of fishing mortality (via fishing quotas, closed seasons, size limits), with little regard for behavioral characteristics of the species (Hilborn and Walters 1992). To redress this, amendments were recently adopted to The Magnuson–Stevens Fishery Conservation and Management Act (Public Law 94–265), the federal legislation that controls the offshore fishing industry in the United States. These amendments to the act require that research be conducted to identify “essential fish habitat”, defined as “those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity.” Such federal legislation does not have direct jurisdiction over inshore species such as tautog. However, concern for better information on habitat has spread to other management agencies, such as the Atlantic States Marine Fisheries Commission (ASMFC), which represents 15 coastal states and sets goals for the management of coastal species in state waters. A recent review of the Commission’s Tautog Fisheries Management Plan (Stirratt et al. 2000) listed identifying habitat as an important priority for proper management of the fishery. They mention specifically the need to define “specific spawning and pre-spawning aggregation areas” in order to “protect these areas from damage and overuse or excessive exploitation”.

We will conduct analyses of habitat use and its seasonal variability in the tautog by following marked individuals for a full year or more, using ultrasonic tags. Hypotheses about space use will be tested with this spatial information (i.e. are individuals site-attached or
nomadic/migratory)? The degree to which space and habitat use varies with individual state (sex and size) will be tested by systematically selecting the individuals to be tagged and tracked.

(Describe the original conservation need and objectives)

III. Methods

Methods are described in detail in attached SOP’s and are only summarized here.

Beach Seining (Appendix I – Seining SOP 6–12–07)

Beach seine samples are collected in a systematic manner over a fixed distance with a standard net. All fish and invertebrates captured are measured and counted. Vegetation is weighted. Temperature, salinity and dissolved oxygen measurements were made as well. A hand–held GPS unit is used to locate sampling sites.

Tracking Project (Appendix II – Tracking SOP 6–12–07)

The principal investigator implants acoustic transmitters in adult tautog which are released into New Haven Harbor after being held for two weeks in the laboratory to recover from surgery. A hydrophone is used to locate fish periodically within the harbor. The accumulated locations over time provide an estimate of the fish’s home range and habitat needs.

Tagging Project (Appendix III – Tracking SOP 6–12–07)

Juvenile, young of the year tautog are captured in eel pots and marked with coded wire tags (CWT). Recaptures of these marked fish in can yield information on growth rates, population sizes and, in subsequent years when recaptured at remote locations, habitat preferences of older (age 1 and 2) juveniles.

(Describe activities and methods [by year if a multi–year award] or provide reference to pages in QAPP/SOP if appended as an exhibit.)
IV. Results

A. Outputs – Progress to Date

a. Beach Seining – One training session was conducted with students and instructors from Sound School. In addition, three beach seining collections were completed this summer as in conjunction with the Summer on Site SOE Program at the Sound School. Two species of fish (*Menidia menidia* and *Fundulus* sp.) and three species of invertebrates were collected.

b. Tracking Project – one trip was made with students to locate previously released tautog which had been implanted with acoustic transmitters. The students located one fish (fish # 666) which had been released the previous year.

c. Tagging project – Construction of traps has been completed, some preliminary trapping has been done.

B. Future activities.

a. Training of students beginning school this fall will take place this month for all three projects

b. Tracking of previously released fish will continue

c. Tagging of juveniles will begin this fall

d. Data will be entered into the database maintained by Norwalk Maritime Center.

1. If your application included the logic framework model, provide the short-term output values and any additional indicators not included in the full proposal used in the analysis:

   Activities
   Short-Term Outputs
   Long-Term Outputs
   Indicator
   Baseline Value
   Predicted Value of Project Output
   Actual Value of Project Output
If your application did not included the logic framework, describe project outputs, any realized post-project outcomes and quantify the results using indicators and baselines.

For additional guidance and examples of a Logic Framework Table With Indicators, see http://www.nfwf.org/evaluation/.

2. Attach any supplemental graphs, maps, digital photos and other types of analytical output for project evaluation.

3. Identify and briefly explain any discrepancies between what actually happened compared to what was predicted in the application using the information provided above.

B. Post–Project Outcomes

1. The logic framework presented in the full proposal additionally included a final column where predicted values of post-project outcomes were to be provided. If your application did not include a logic framework, please identify any medium- to long-term results that may occur after the project concludes.

2. Describe any current progress towards achieving these post–project outcomes.

3. Will there be continued monitoring of post–project outcomes beyond the current funding period? Are there adequate resources (personnel and financial support) for continued evaluation and monitoring? If not, what additional resources are needed?

4. Describe any revisions in the indicators, methods and data that may be needed for post–project monitoring.
V. Discussion and Adaptive Management

A. Lessons Learned and Transferability

1. Describe the lessons learned about effective and ineffective conservation practices associated with this project. Which of these key lessons should be shared with other conservation organizations?

2. To what extent did the evaluation and monitoring activities for this project inform your organization about effective conservation practices and what lessons were learned from an evaluation perspective?

3. Based on these lessons learned, what are your organizations next steps?

B. Dissemination

1. Describe the nature and extent of information communicated to the general public, key partners, other practitioners or other scientists?

2. Attach as Exhibits any publications, brochures, videos, outreach tools, press releases and other appropriate “products” that resulted from this project.

B. NFWF Adaptive Management

(Please offer any suggestions to NFWF to help improve their project administration.)

VI. References

(Attach a list of secondary references used in conducting this project and the evaluation.)

POSTING OF FINAL REPORT:

This report may be shared by the Foundation and any Funding Source for the Project via their respective websites. In the event the PI or the PI’s
institutional affiliation intends to claim that this Final Report contains material which should not be posted on such organizational websites because it is protected from disclosure by statutory or regulatory provisions, the PI shall so notify NFWF and shall clearly mark all such protected materials as “PROTECTED”, providing an accurate and complete citation to the statutory or regulatory source for such protection.

Approved: ___________________________    Date: ____________
(name and title)


Pereira JJ, P. Clark and R. Goldberg. (1999) Abundance and distribution of juvenile tautog (Tautoga onitis) and cunner (Tautogolabrus


New Haven Harbor Watershed
Environmental Monitoring Program

Beach Seining

STANDARD OPERATING PROCEDURES MANUAL

June 26, 2007

Prepared by: ________________________________ Date:______________
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Approved by:
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Table of Contents

1. Scope and Application
2. Definitions
3. Health and Safety
4. Summary of Method
5. Clothing and Footwear
6. Equipment and Supplies
7. Procedure
8. Data Analysis/Calculations
9. Data Management/Records Management
10. References
11. Forms and Data Sheets
1. **Scope and Application**

   1.1. The purpose of this procedure is to outline a consistent procedure for sampling small fish, invertebrates and vegetation in the nearshore zone with a beach seine so that data collected is comparable from one sampling event to the next.

2. **Definitions**

   2.1. Beach seine: A net strung between two poles which is pulled through the water by an individual at each end.

   2.2. GPS: Global positioning system, hand-held electronic device which determines position (latitude and longitude) by triangulation of satellite positions.

   2.3. YSI (Yellow Springs Instrument, Inc): a hand-held electronic device which measures temperature, salinity, and dissolved oxygen in the water.

   2.4. Spread rope: A rope five meters in length which is strung between the beach seine poles and kept taut to insure the opening is fixed at 5 meters.
3. Health and Safety

3.1. Shells, rocks, and broken glass can cause severe lacerations to feet. See recommendations under clothing and footwear.

3.2. Sunscreen and bug repellant should be considered for all seining trips.

4. Summary of Method

4.1. Sampling is conducted during a four hour period which lasts from 2 hours before to 2 hours after the low tide or the high tide depending on the site.

4.2. A standardized seine is towed parallel to shore for a distance of 40 meters

4.3. All organisms captured in the seine are sorted by species and individuals are measured or collectively weighed.

4.4. A subsample is taken for any species which is too numerous to measure all individuals

5. Clothing and Footwear:

5.1. Seiners should wear chest waders or a bathing suit and old sneakers when conducting seining.
6. Equipment and Supplies

6.1. Bag seine, 25 feet long made of ¼ inch mesh and weighted every 3 inches along the foot rope. The head rope should have a three inch Styrofoam float every 6 inches.

6.2. Plastic painter’s buckets (5)

6.3. Clipboard

6.4. Data sheets

6.5. Pencils

6.6. Measuring boards (3)

6.7. Spring scales (3)

6.8. Waders and boots

6.9. YSI (temperature, salinity, and DO meter)

6.10. Ziploc bags and labels

6.11. Collector’s permit

6.12. Ice and Ice Packs

6.13. Small coolers (2)

6.14. Battery-powered air pump

6.15. Camera

6.16. Bug repellant

6.17. 40 meter measuring line

6.18. 5 meter spread rope
7. Procedure

7.1. Use 40 meter measuring line to lay out length of seine haul

7.2. Enter water at start point and position yourselves such that the inshore seine is approximately one seine length from shore.

7.3. Keeping the spread rope taut and the seine opening perpendicular to the shore, proceed to the other end of the seine haul, keeping poles in contact with the ground at all times.

7.4. When nearing the end of the seine haul, the near shore seiner should pivot toward the shore while the offshore seiner walks faster until the seine opening is parallel to the shore. When the seine is parallel to shore, the seiners should proceed toward and up onto the shore until the bag is resting on the beach and out of the water. Time is recorded on the data sheet at this point.
7.5. While seine is being pulled, the rest of the seining crew should proceed to the takeout point, fill the sorting buckets with seawater, and take temperature, salinity and dissolved oxygen measurements if appropriate.

7.6. Latitude and longitude should be recorded for the start and the end of each tow.

Fish and invertebrates are sorted into buckets generally by species. Organisms are identified using standard guides (see References). Numerous species will merit their own bucket while scarce species can share a bucket. Fish total length is measured to the nearest millimeter. Shrimp total length is measured to the nearest millimeter; carapace width is measured on crabs, carapace length for lobsters. Organisms which cannot be identified are placed in a plastic bag, labeled with the date and location of capture and placed on ice or frozen until a positive identification can be made by the primary investigator. Vegetation is sorted into piles by
species and a visual estimate of the percentage of the catch each species represents is made. Total weight of all the vegetation is then recorded.

8. Data analysis and calculations

8.1. Subsamples: When a species are too numerous to measure all of them, a well-mixed (so that all size classes are represented) subsample is taken and used to determine the total number of fish collected. The subsample is weighed and then all the individuals are measured. The total weight of the remaining fish and the empty weight of the bucket are taken and recorded on the data sheet. Unmeasured fish can also be counted rather than weighed. The total number of fish of the given species collected and the length frequencies for the entire sample can then be calculated.

8.2. Formula for subsample calculation by weight is

\[ T = \frac{U}{S}(N) + N \]

where

- \( T \) = Total number of fish collected
- \( U \) = Weight of the unmeasured fish
\[ S = \text{Weight of the subsample} \]

\[ N = \text{Number of fish in the subsample} \]

8.3. Formula for subsample calculation by count is \( T = (N_u + N_m) \)

where

\[ T = \text{Total number of fish collected} \]

\[ N_u = \text{number of unmeasured fish} \]

\[ N_m = \text{Number of measured fish (the subsample)} \]

9. **Data Management/Records Management**

9.1. All data is recorded on standard datasheets in the field (see section 11)

9.2. Date is entered in Access database

10. **References**


11. **Fprms and Datasheets**

11.1. Datasheets printed on waterproof paper (see attached).
New Haven Harbor Watershed
Environmental Monitoring Program

Fish Tracking

STANDARD OPERATING PROCEDURES MANUAL

June 26, 2007

Prepared by: ______________________________Date:____________
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# Table of Contents

1. **Scope and Application**

2. **Definitions**

3. **Health and Safety**

4. **Summary of Method**

5. **Clothing and Footwear**

6. **Equipment and Supplies**

7. **Procedure**

8. **Data Analysis/Calculations**

9. **Data Management/Records Management**

10. **Quality Assurance**

11. **Training**

12. **Figures**

13. **References**

14. **Forms and Data Sheets**
1. Scope and Application

1.1. This procedure outlines methods for locating fish (*Tautoga onitis*) that have been previously implanted with an acoustic transmitter and released near the New Haven Harbor breakwaters.

2. Definitions

2.1. Acoustic Transmitter – a pinger which emits a coded string of acoustic pulses that can be used to identify individual fish. A CT-82 Sonotronics transmitter is being used which has a range of 1000m and a battery life of 14 months. (Figure 1.)

2.2. Directional Hydrophone – a hydrophone, fitted with a cone shaped bell that increases the volume of the signal received when the hydrophone is pointing directly at the transmitter. (Figure 2.)

3. Health and Safety

3.1. Since this activity is conducted from boats, all boating safety rules apply.

4. Summary of Method

4.1. The hydrophone is lowered over the side of the ship and the area scanned for transmitter signals.
4.2. When a signal is detected the boat’s position is recorded and a bearing to the transmitter signal is taken. The boat is repositioned and the process repeated.

4.3. The intersection of the two bearing lines indicates the position of the fish.

5. Clothing and footwear

5.1. Weather appropriate clothing

5.2. Non-skid, boat appropriate footwear should be worn.

6. Equipment and Supplies

6.1. Directional hydrophone

6.2. Receiver

6.3. Extra Transmitter (to check equipment functionality)

6.4. Data sheets printed on water-proof paper

6.5. Clipboard

6.6. Bearing Compass

6.7. Pencils

6.8. Extra AA batteries if boat does not have AC power available
7. Procedure

7.1. Adult tautogs, $\geq 45$ cm total length, are captured by otter trawl near New Haven Harbor by personnel from the National Marine Fisheries Service Laboratory at Milford, CT. After surgery to implant the transmitter, and a refractory period of two weeks, the principal investigator will release these fish in the area where they were captured. Personnel from the Sound School are not involved in this procedure.

7.2. Before leaving the dock, hydrophone operation is checked with an unimplanted transmitter.

7.3. Boat is positioned near the middle of one of the three breakwaters surrounding New Haven Harbor and the directional hydrophone is lowered over the side.

7.4. The entire length of the breakwater is checked for acoustic tags by slowly rotating the hydrophone.

7.5. If a signal is detected, the fish is identified by counting the pulses or measuring the pulse interval, the position of the boat
(Latitude and Longitude from the GPS) and a bearing taken toward
the transmitter are recorded.

7.6. The boat is repositioned and another bearing is taken toward
the transmitter. The goal is to attempt to get a 90 degree
directional difference between the two bearing lines so that their
intersection marks the position of the fish.

7.7. If a second bearing line is unattainable, the position of the
fish will be taken to be the intersection of the bearing line and the
breakwater.

7.8. The process is repeated for the other breakwaters and for the
opposite side of the breakwaters since the signal cannot pass
through the breakwaters.

7.9. Types of observations

7.9.1. Location observations: the investigators attempt to locate all
fish in the system.

7.9.2. Focal observations: The investigators repeatedly locate
several fish throughout the day in order to look at the scope of
daily movements.
8. Data Analysis/Calculations

8.1. Boat positions with associated bearing lines are entered into ArcView software.

8.2. A point theme representing fish positions is constructed by placing points at intersections of bearing lines or the intersections of bearing lines and the breakwaters indicating fish positions.

8.3. If the bearing lines do not intersect prior to reaching the breakwaters, an oval is drawn between the tow lines, closest to the breakwaters (or some other hard structure) indicating the probable location of the fish. The position of the centroid of the oval will be entered in the database as the fish location. More than two bearings can be taken if necessary to help clarify the position of the fish.

8.4. Data accumulated over the summer can be used to calculate home ranges for each fish using the Movement extension of ArcView.
9. Data Management/Records Management

9.1. Boat positions, bearing directions, and transmitter code are all entered on a standardized datasheet printed on waterproof paper. Data is entered into a spreadsheet for importation into ArcView.

9.2. ArcView serves as the database for tracking data. Data is stored on the network drive at the NMFS Milford laboratory. This data is backed up daily.

10. Quality Assurance

10.1. Once plotted, inappropriate boat locations and bearings can be identified and deleted or corrected by consulting the ship’s log book.

11. Training

11.1. Training is conducted by Jose Pereira (NMFS–Milford Laboratory) annually.
12. Figures

Figure 1. Sonotronics CT-82 acoustic transmitter with magnetic switch in place. Numbers represent the tag’s unique acoustic code which identifies individual fish.
Figure 2. Directional hydrophone, receiver and headphones for tracking fish.

13. References

14. Forms and Datasheets (See attached.)
New Haven Harbor Watershed
Environmental Monitoring Program

Fish Tagging With Coded Wire Tags

STANDARD OPERATING PROCEDURES MANUAL

June 26, 2007

Prepared by: __________________________Date:______________
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1. Scope and Application

2. Definitions

3. Health and Safety

4. Summary of Method

5. Clothing and Footwear

6. Equipment and Supplies

7. Procedure

8. Data Analysis/Calculations

9. Data Management/Records Management

10. Quality Assurance

11. Training

12. Figures

13. References

14. Forms and Data Sheets
1. **Scope and Applications**

1.1. The purpose of this procedure is to outline the procedures for conducting a tag and recapture study of juvenile tautog (*Tautoga onitis*) in New Haven Harbor, Connecticut but could be applied to other species and locations as well.

2. **Definitions**

2.1. **CWT**: Coded wire tag

2.2. **Beach seine**: A net strung between two poles that is pulled through the water by an individual at each end.

2.3. **Eel Pot**: a trap useful for capturing small fishes (See Figure 1.)

2.4. **Scup trap**: A trap used for larger fishes (See Figure. 2.)

2.5. **Silicon blocks**: Cured silicon caulking, cut into small blocks for injection of tags.
3. Health and safety

3.1. Care should be taken to avoid puncture wounds caused by fish dorsal spines or accidental injection with the tagging gun.

3.2. Students will learn proper use of safety equipment / safety practices

3.2.1. Life Jackets – worn at all times

3.2.2. VHF Radio will be used when on the water

3.2.3. Emergency Kit / Safety Box will be used when on the water

3.2.4. Throw Ring will be brought when on the water

3.2.5. Student behavior will adhere to high hazard protocols

3.2.6. Man Overboard

3.2.7. Trimming the boat

3.2.8. Proper Loading and Unloading

3.3. Students will acquire seamanship skills related to lines and fishing gear.

3.4. Students will be aware of location of lines when pulling and setting traps to avoid
entanglement resulting in a possible man overboard.

4. Overview of procedure

4.1. This document describes procedures for anesthetizing, tagging, recovery, and release of juvenile tautog.

4.2. Students will record location of traps utilizing nautical charts and location recorded by latitude and longitude lines.

4.3. Students will plot and navigate to trap locations.

4.4. Students will determine the vessel position by means of GPS chart plotter / fishfinder and visual bearings and ranges.

4.5. Procedures for record keeping, recovery and reading of tags.
5. Clothing and Footwear

5.1. Chest waders or bathing suit and foot protection (not sandals) should be worn when beach seining.

6. Equipment and Supplies

6.1. Measuring board

6.2. Multishot hand tagger and tags

6.3. 3 portions of MS 222 for each station to be sampled

6.4. Fresh water for rinsing the tagger

6.5. Silicon Blocks made by squeezing silicon caulking into a cafeteria tray, allowing it to dry, and cutting it up into small squares. Tray is first coated with a non-stick spray.

6.6. Pre-printed labels

6.7. Vials or other containers

6.8. 3 dishpans (anesthesia, recovery, and euthanasia)
6.9. Datasheets

7. Procedure

7.1. Capture of fish

7.2. Beach seining (see beach seining SOP for guidance)

7.3. Traps

7.3.1. Trap Construction

7.3.1.1. Preparation:
   7.3.1.1.1. Gather tools: Wire cutters, Hog ring pliers, Stainless Hog rings
   7.3.1.1.2. Using the model–count meshes of each panel
   7.3.1.1.3. On graph paper, make a scale drawing of the panels–(include all cuts and bends)

7.3.1.2. Construction:
   7.3.1.2.1. Measure wire / Mark cuts with white out
   7.3.1.2.2. Cut wire into panels (SAFETY GOGGLES MUST BE WORN)
   7.3.1.2.3. Cut all panels at the same time. Taper cut funnel panels to shape (eel trap)
   7.3.1.2.4. Cut indentations in body and top
   7.3.1.2.5. Cut off all wire fingers
   7.3.1.2.6. Bend Panels
   7.3.1.2.7. Bend door end flaps before clipping body together
   7.3.1.2.8. Bend four funnel panels
   7.3.1.2.9. Bend throat panel
   7.3.1.2.10. Bend door cover panel

7.3.1.3. Hog ring panels together
7.3.1.3.1. Hog ring body
7.3.1.3.2. Hog ring four funnel panels
7.3.1.3.3. Hog ring throat
7.3.1.3.4. Hog ring corners of door end

7.3.1.4. Assemble trap
7.3.1.4.1. Assemble funnel/throat piece
7.3.1.4.2. Attach funnel to body
7.3.1.4.3. Attach door

7.3.1.5. Finish work
7.3.1.5.1. Cut and attach bungy cord
7.3.1.5.2. Cut and attach latch
7.3.1.5.3. Inspect trap for mistakes
7.3.1.5.4. Check throat for sturdiness

7.3.1.6. Trap Dimensions
Panel dimensions for eel trap:
(1) 1 Body – 48” x 24”
(1) 1 Throat – 8” x 11”
(2) 1 Door – 17” x 12”
(3) 4 Funnels – 9” x 12” *Taper cut using template

Fish trap dimensions
(1) 1 Body – 96” x 24”
(2) 1 Bottom 24” x 24”
(3) 2 Top – 13.5’ x 24”
(4) 2 Corners – 6” x 10.5”
(5) 4 Funnels – 21” x 4.5”
(6) 1 Bait Door – 6” x 7.5”
(7) 1 Bait Tower – 2” x 9.5” x 1.5”
(2) 13.5” x 1.5”
7.4. Trap use

7.4.1. When hauling the gear (traps) the boat should be set into the wind or current which ever is strongest.

7.4.2. Eel pots are baited with chopped blue mussels or frozen brine shrimp in a small meshed bait bag and can be fished in areas having cobble and macroalgae or eel grass, around pilings and docks, Scup traps should be fished near larger rock structures especially bed rock outcroppings and breakwaters and baited with chopped clams or crushed crabs.

7.5. Anesthesia

7.5.1. A 300mg portion of Tricaine methylsulfonate (MS 222) is pre–weighed in the laboratory and kept in a small screw cap jars or vials.

7.5.2. At the sampling site, the MS 222 is mixed with 2 liters of seawater in the field when fish large enough to be tagged (≥ 30
mm total length) have been captured. This results in an
anesthetic solution of 150 mg/l.

7.5.3. If tagged fish are recaptured they may be euthanized by
leaving them in the anesthetic solution until they stop breathing.
This can be done when all untagged fish have been tagged and
released.

7.6. **Tagging**

7.6.1. At each location, a tag is injected into a block of silicon
prior to tagging any fish. Another tag is injected into the
silicon when all the fish from that site have been tagged. The
silicon is retained in a vial with a label on which is recorded the
date and the location so it is known that all tags recovered
from recaptured fish which fall between those two numbers are
from that site on that date.

7.6.2. Captured fish are checked for tags using the V–detector
(see figure 3).

7.6.3. Recaptured, tagged fish are euthanized, measured, and
placed in a Ziploc bag along with the appropriate label, which
records the site, time and date of capture and kept on ice for
transport back to the laboratory and subsequent recovery of
the tag.

7.6.4. Untagged fish are anesthetized, measured, tagged in the
left cheek (see Figure 4).

7.6.5. Newly tagged fish are checked for tag presence using V-
detector and placed in clean seawater to recover.

7.6.6. Recovered, newly tagged fish are released at the same
location where they were captured.

7.7. **Tag recovery**

7.7.1. The left cheek of euthanized fish, which have been
transported back to the laboratory, is carefully cut open with a
scalpel.

7.7.2. The tag, which is magnetized, can be found by carefully
probing the opening with a pair of forceps.

7.7.3. The tag can then be examined under the dissecting
microscope and the number recorded.
7.7.4. Using tape to stick it to a 3x5 index card label with the fishes tagging history can save the tag.

8. Data analysis/calculations
   8.1. Days at liberty can be calculated by subtraction of release and recapture dates on a spreadsheet.
   8.2. Release and Recapture locations can be plotted with GIS software to calculate distance moved and to look for general patterns of movement.

9. Data Management
   9.1. Data is entered on standardized data sheets (see attached)

10. Training
    10.1. Training will be conducted prior to the field work by Jose Pereira, NMFS, Milford Laboratory
11. Quality Assurance Procedures

11.1. All data is entered in an Access database and stored on the NMFS Laboratory, Milford, CT and is backed up daily.

11.2. Database entry form safeguards check for inappropriate fish lengths, dates etc.
12. Figures

Figure 1. Eel pot, set on end with access door open.
Figure 2. A scup trap. Circular central tower holds the bait and is accessed from the bottom. Yellow surgical tubing fingers are the entrances to the trap.
Figure 3a. Preparing to check an anesthetized fish for coded wire tags using a V-detector. 3b. The V-detector. Animal is swiped through V-notch to check for tags.
Figure 4a. Preparing to tag an anesthetized tautog in the left cheek. b. the Multishot hand tagger
13. References
   13.3  http://www.argent-labs.com/

14. Forms and datasheets (see attached)