NORTHEAST CONSORTIUM
PROPOSAL COVER SHEET
2005

Project Title: **YELLOWTAIL FLOUNDER TAGGING STUDY, 2006**

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Budget Request: $207,750

Project Description:
New England fishermen and the Northeast Fisheries Science Center request a grant to continue the yellowtail flounder tagging study for a fourth year, tagging approximately 10,000 more yellowtail from the Gulf of Maine to the Mid Atlantic. The proposal is designed to charter commercial fishing vessels to tag yellowtail flounder with conventional disc tags and data-storage tags with the objective of estimating movement among stocks areas and mortality within stock areas as well as providing growth observations. Results are expected to provide valuable information for status determination of yellowtail flounder stocks and fisheries.

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Rationale

Yellowtail flounder is one of the principal resources of the northeast groundfish complex, with major fishing grounds on Georges Bank, off southern New England and off Cape Cod (Figure 1). The fishery for yellowtail is among the most productive and valuable in New England, yielding 12 million lb and $14 million to U.S. fishermen in 2003 (NMFS 2004). However, with all three stocks currently rebuilding from an overfished condition, the potential yield of yellowtail is much greater than the current yield (the estimated maximum sustainable yield from the three New England stocks is 65 million lb; NEFSC 2002, 2003).

Managing the recovery of yellowtail resources and maintaining optimum yield require precise stock assessments and accurate forecasts of the population and fishery. Although yellowtail flounder stock assessments provide valuable information for fishery management advice, several major sources of uncertainty persist. This proposal was developed to complement the current programmatic data collection and analytical methods to reduce uncertainty in stock assessment and management advice for U.S. yellowtail resources.

Assessments of all three New England yellowtail stocks tend to overestimate stock size and underestimate fishing mortality, leading to considerable uncertainty in catch forecasts. The source of this apparent bias is not well known, but may result from movement among stock areas, lack of information on the effect of closed areas on population dynamics, insufficient sampling of areas closed to fishing, inaccurate age determinations, misrepresentative sampling of distributional patterns, underreported catch, or inaccurate assumptions about natural mortality (NEFSC 2002, 2003; TRAC 2004).

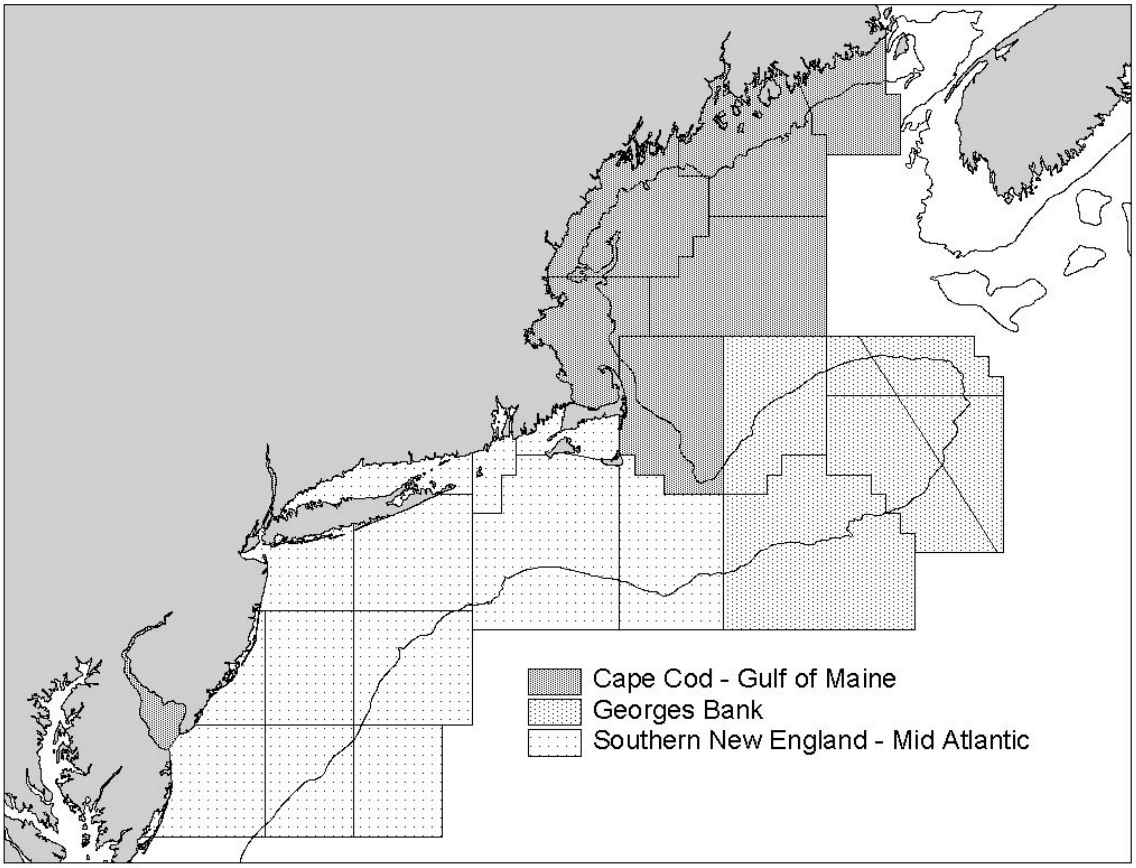

Figure 1. Yellowtail flounder management areas off the northeastern U.S.

Monitoring and managing the Georges Bank yellowtail stock is a difficult issue for the New England Fishery Management Council. Previous stock assessments determined that management actions effectively reduced fishing mortality on the Bank since 1995, and the population responded with substantial and steady increases in biomass (Stone et al. 2004). However, more recent stock assessments indicate that the stock is still overfished (Legault and Stone 2004). Uncertainty in previous stock assessments led to management decisions that allowed excessive fishing mortality and depletion of stock biomass.

The southern New England-Mid Atlantic stock is not rebuilding at an acceptable rate, apparently because fishing mortality has not been effectively reduced, despite management restrictions like the year-round closure of the Nantucket Lightship Area since December 1994. Recent assessments of stock size have been highly uncertain (e.g., the 1999 assessment was rejected as a basis for stock projections because of inadequate sampling, Cadrin 2001). Although the stock definition of Southern New England-Mid Atlantic yellowtail was recently revised (Cadrin 2003a), information on movement of yellowtail between southern New England and Mid Atlantic areas, as well as mixing with the adjacent Cape Cod and Georges Bank resources is limited to historical studies (Royce et al. 1959, Lux 1963). The recent industry-based survey for SNE-MA yellowtail offers a rare opportunity to locate moderate to high densities of yellowtail flounder for tagging (GMA 2002).

The status of the Cape Cod-Gulf of Maine yellowtail stock is particularly problematic for northeast groundfish management. The stock assessment has a great deal of uncertainty but suggests excessive fishing mortality (Cadrin and King 2003). Therefore, the status of the Cape Cod-Gulf of Maine yellowtail stock is a focus of groundfish management in the Gulf of Maine. However, surveys indicate a relatively stable stock, suggesting that (1) mortality rates have been overestimated or (2) the stock is not a closed population. Movement of yellowtail to and from the Cape Cod grounds is not well known. Population dynamics of Cape Cod yellowtail may be greatly influenced by mixing with adjacent stocks, because the Cape Cod grounds are relatively small in comparison with Georges Bank and the Southern New England shelf (Hart and Cadrin 2004). Although data from historical tag recaptures is available (Royce et al. 1959, Lux 1963), and suggests some mixing with the southern New England and Georges Bank stocks, the studies were not explicitly designed to estimate mortality or mixing rates. These data are up to 50 years old and may not represent the current environmental or stock conditions. The likelihood of older yellowtail moving from the Cape Cod grounds to the northern Gulf of Maine is also not well known.

The yellowtail flounder tagging study was designed to address the major sources of uncertainty in yellowtail flounder assessments. The study will provide valuable information on movement, mortality and growth, thereby complementing the current stock assessment methods for yellowtail and improving the reliability of scientific advice for effective fishery management. Furthermore, such cooperative research is building an open working relationship between fishermen, NMFS, state and academic researchers. This proposal was developed with the interaction of fishery scientists and yellowtail fishermen. Through a series of port visits and meetings, industry leaders offer their knowledge of seasonal yellowtail distributions, fishing practices, and practical field experience, and scientists provided input on population modeling, statistical design, and technical protocols. The result is an integrated sampling and analytical plan that is both efficient in the field and technically rigorous for reliable population estimates.

Review of Previous Work

This project contracts commercial fishermen and their vessels to work with scientists to tag and release yellowtail on all fishing grounds off New England, proportional to geographic patterns of abundance. The geographic design is based on statistical fishing areas, with releases in each area proportional to relative abundance of yellowtail (according to NEFSC groundfish surveys). Such a design allows for the estimation of movement among areas and mortality by area.

Tag Deployment - Yellowtail are captured using commercial otter trawls with large mesh (6.5”) and relatively short tows (30 min). All legal-sized fish (>33cm) in viable condition, and some sublegal sized-fish from low density tows in southern New England-Mid Atlantic are tagged with either Peterson discs or data-storage tags. Releases are during the spawning season (May-August; with the exception of 2% of releases in autumn of 2003). Tag specifications are:

- <u>Peterson Discs</u>; Floy Tag 7/8” round, fluorescent pink, labeled “cooperative-tagging.org, tag#, $1000 lottery (or $100 reward), toll free 877-826-2612, provide tags & location and date.” Most fish tagged blank on blind side, scales plucked from approximately 10%, tags on blind side labeled “take some fish scales & return to 166 Water Street Woods Hole MA 02543.”

- Data-storage tags; Lotek LTD 1100, 32K memory, 8mm x 16mm x 27mm; time (dynamic storage & intervals), depth (+/- 0.04psi up to 735psi) & temperature (+/- 0.19^{o} C), 3 year battery, labeled "tag#, Mail tag, date, location to 166 Water Street Woods Hole MA 02543". Oval disc tag labeled "cooperative-tagging.org, $100 reward, toll free 877-826-2612."

Tagging began in 2003 (9,475 releases in 35 days of tagging from 7 vessels), continued in 2004 (19,089 releases in 57 days of tagging from 12 vessels), and is in progress in 2005. To date, 1001 yellowtail have been tagged in 2005 in 5 days of tagging; offshore tagging trips are underway, and a total of 6,732 releases are projected from 18 days of tagging on 5 vessels.

Table 1. Releases of tagged yellowtail flounder by statistical area and year.

Area	statistical area	2003 releases	2004 releases	2005 releases		total releases	% releases
Western Gulf of Maine	513	14	1,468	258		1,740	5%
Mass Bays	514	2,076	1,263	496		3,835	11%
East of Cape Cod	521	2,249	68	386	*	2,703	8%
Cultivator	522	705	828	77	*	1,610	5%
Southwest Part Georges	525	126	3,993	916	*	5,035	14%
Northern Edge Georges	561	422	486	57	*	965	3%
Closed Area II	562	2,921	9,027	3,486	*	15,434	44%
Yellowtail Hole	552	-	188	247		435	1%
Lightship Area	526	123	769	267	*	1,159	3%
southern New England	537	210	547	302	*	1,059	3%
Mid Atlantic	613	305	352	240	*	897	3%
Block Island	539	177	51			228	1%
		9,328	19,040	6,732		35,100	100%

* projected for summer of 2005

Tag Recapture and Outreach System - Tag recaptures are from a year-round commercial fishery with some seasonal geographic closures. The reward system for reporting recaptures involves $1000 lottery tags, 280 high-value ($100) rewards, and $100 rewards for returning data-storage tags. The outreach system includes reward posters, brochures, a project website (cooperative-tagging.org; Appendix A), annual letters to yellowtail fishermen, press releases, and a toll free number (877-826-2612). Every fisherman who reports a recapture is contacted via a phone call and 'thank you' letter with a map detailing movements of the tagged fish. Fishermen who return data storage tags, also receive a graph of the temperature and pressure data from that tag. Mailings and posters about the program have also been distributed to fish processors, fishing associations, NMFS port agents, NMFS Observer Program and research institutions from Nova Scotia to New Jersey. Project hats are given to leading tag returns and collaborators. Since the project began in 2003, 64 $100 rewards were issued and six $1000 lottery drawings were hosted at fishing venues throughout New England. The toll free number for reporting tags (877-826-2612) is maintained and answered by a project coordinator at NEFSC. The existing website has been updated to include more information and a flashy appearance. Several new features include a "Porthole Page", new stock assessments, a policy on lottery drawings and recent publications. The website is maintained and updated regularly with press releases, lottery winners, and data tag returns.

In addition to the standard "thank you" letters and maps, this year the project initiated an "Outstanding Partner" Award to the vessel with the most tag returns. A framed certificate and "thank you" letter signed by the Director of the NEFSC is mailed to the partner and posters announcing the merit are distributed for display in fishing supply houses and around the waterfront. This year, the award went to the F/V Voyager I out of New Bedford, MA (Captains Fred Marques and Tony Fernandes).

Tag Recaptures - As of June 23 2005, tags from 1,797 recaptured fish were reported. Preliminary results indicate frequent movements within the Cape Cod and Georges Bank stock areas with a less frequent movement among stock areas (Figure 2). These returns represent 10% of 2003 tag releases and 4% of 2004 tag releases. Six percent of all lottery tags have been returned; 14% of $100 reward tags and 11% of data tags were returned. The relative return rate of lottery tags to high-value tags indicates a 45% reporting rate, which is exceptional for a commercial fishery.

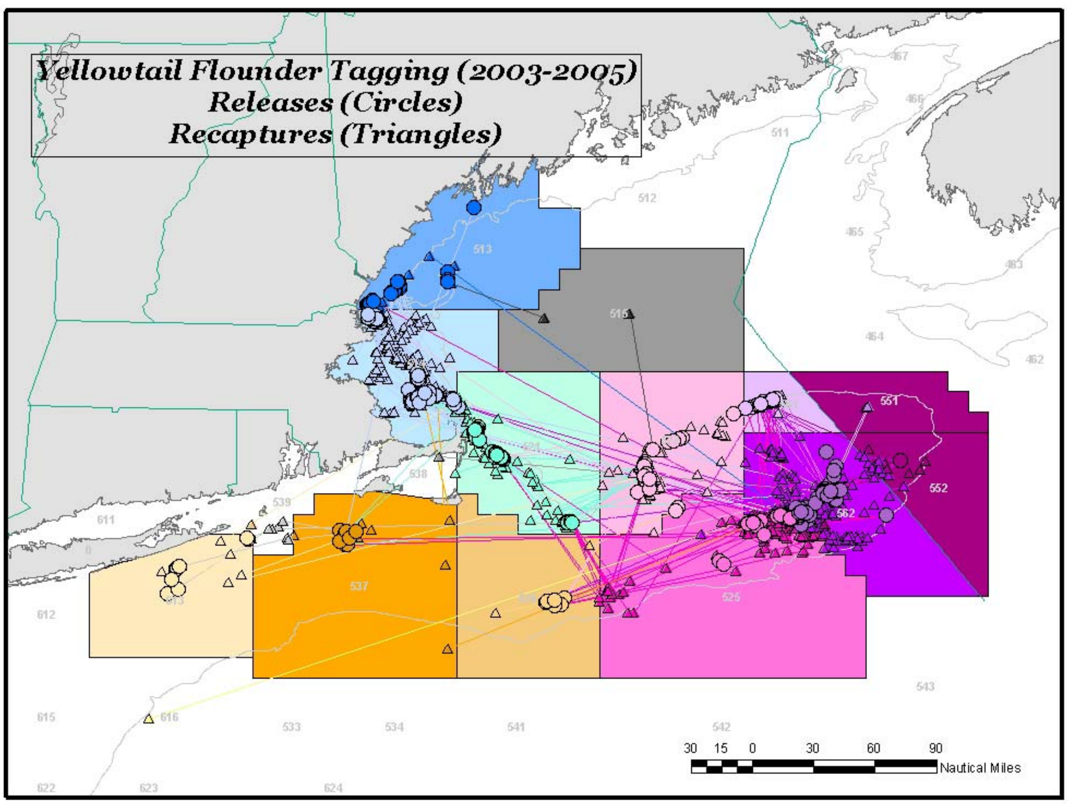

Figure 2. Release sites (circles) and recapture locations (triangles) of tagged yellowtail flounder, as of June 2005.

Analytical Design - The analytical model is based on the assumption that the observed pattern of recaptures is a function of harvest rate in each area and movement among areas. If the population of tagged yellowtail is representative of the entire population, the estimates of movement and mortality will also be representative. The analytical design will relate the observed number of tag returns (r) to a predicted number of tag returns:

1) $$\tilde{r}_i^{\,t} = n_i^t \beta_i^t \frac{F_i^t\left(1-e^{-(F+M)}\right)}{\left(F_i^t + M\right)}$$

and tags at the beginning of a time step is a function of abundance at the beginning of the time step in all areas, movement to the area (or residence in the area) and survival in the area:

2) $$n_i^{t+1} = \sum_j \alpha_{ij}^t S_j^t n_j^t$$

where

n_j^t is the number of tags present in area *j* at time *t*

β_i^t is the reporting rate in area *i* at time *t*.

F_i^t is the fishing mortality rate in area *i* at time *t*.

M is the natural mortality rate

$\alpha_{i,j}^t$ is the proportion of tags in area *j* that move to area *i* at time *t*

S_i^t is the survival in area *i* at time *t* [$S=e^{-(M+F)}$]

The parameter β_i^t can be calculated as the ratio of lottery tag returns to high value ($100) tag returns, assuming that all recaptures of $100 tags are reported. The parameters $\alpha_{i,j}^t$ (movement) and F_i^t (fishing mortality) can be estimated to fit model predictions to the observed frequency of seasonal returns by area. The number of tag returns and the duration of the study will dictate how many parameters can be reliably estimated. The model has flexible spatiotemporal resolution, so that stock areas can be analyzed by statistical areas, and movements can be analyzed by season, if the number of tag returns supports such detail.

The field protocol and analytical design were peer reviewed at “a workshop to review and evaluate the design and utility of fish mark - recapture projects in the northeastern United States” and considered to be a valid approach to address the project objectives (Tallack et al, eds. 2005; excerpted in Appendix C). A preliminary application of the analytical model was reviewed at the 2005 cooperators’ meeting. For the purposes of model development, a simple 9-parameter model (a fishing mortality rate and two movement coefficients for each of the three stock areas) was developed using a monthly time step. Starting values were based on current fishing mortality estimates from the most recent stock assessments, and proportional movement from historical tagging studies. Model residuals were used to explore deviation of observed recaptures from expectations using starting values of model parameters. Model parameters were not estimated for this illustration, and results were merely based on starting values.

Patterns of model residuals indicate disagreement between the frequency of tag recaptures and model expectations, which are a function of the assumed starting values for the model parameters. For example, the number of observed recaptures from the

Cape Cod-Gulf of Maine and southern New England-Mid Atlantic areas are consistently and substantially less than model expectations. The pattern of recaptures suggests that the estimate of fishing mortality during 2003 and 2004 is less than the estimate of 2002 F from the most recent stock assessments. Similarly, the number of observed recaptures from Georges Bank are substantially less than model expectations, except for recaptures in June, July and August of 2004, when recaptures are more than expected. These large positive residuals coincide with the closed area access program, indicate that fishing mortality was greater during those months.

For the purposes of model development, it appears that annually varying fishing mortality and perhaps seasonal mortality rates (e.g., during the access program) may be required to adequately fit the observed pattern of tag recaptures. There were no consistent patterns of monthly residuals that indicate seasonal movement patterns. One aspect of the model is that a greater time at large may be required to provide reliable estimates of movement or mortality in southern New England-Mid Atlantic, because the observed frequency of movements and recaptures in the southern New England-Mid Atlantic area are low.

Tank and Cage Experiments - Holding experiments were performed to assess tag retention and tagging-induced mortality. In 2004 and 2005, tank experiments were conducted to assess tag-induced mortality. On the last tow of four inshore tagging trips, 30 fish were kept in a flow-through tank on board, and transported to a flow through holding tank in Woods Hole via oxygenated shipping bags maintained at approximately 10°C. Fish were fed regularly and observed daily. One experiment observed 20 tagged fish and 10 untagged controls for 35 days. They were also held for up to a year to observe tag retention. A second experiment acclimated 30 untagged fish for 2 weeks, after which 20 were tagged. Subsamples were removed from the holding tank at durations of 0, 24 and 168 hrs. Tissue samples around the tag site were preserved and analyzed for histological reaction at the University of Maryland Fish Pathology Lab.

Results from the first 2004 tank experiment showed different patterns of mortality which suggests tag-induced mortality may be substantial, but better controls are needed. Results from the second holding experiment showed no histological reaction at the tag sites, so the mortality observed in holding experiments may not be related to tagging. The long-term holding study observed no tags lost, with some fish held for over a year.

In 2005, we received a Project Development Award of $5,500 from the Northeast Consortium to design small cages and a deployment system that can evaluate tagging-induced mortality of yellowtail flounder, a necessary component of the tagging study. Cages are cylindrical (6' diameter, 2' high), made of 1-inch coated wire mesh, with two 50' cement runners for stability. Cages were initially deployed in 24-26 fathoms. Our experimental design involved collecting yellowtail in Ipswich Bay using tagging protocol (i.e., short tows with little bycatch of other species and immediate placement in flow-through tanks). We tagged 15 fish and placed them in a cage floating at the surface by the boat. We also placed 15 untagged fish in the cage for control observations. Tagged and control fish were selected using the quality control procedures in the tagging protocol to insure that viable fish are included in the study. Cages were lowered to the bottom. Oceanographic equipment (Hydrolab©) was deployed on a cage during deployment to monitor water quality during the experiment.

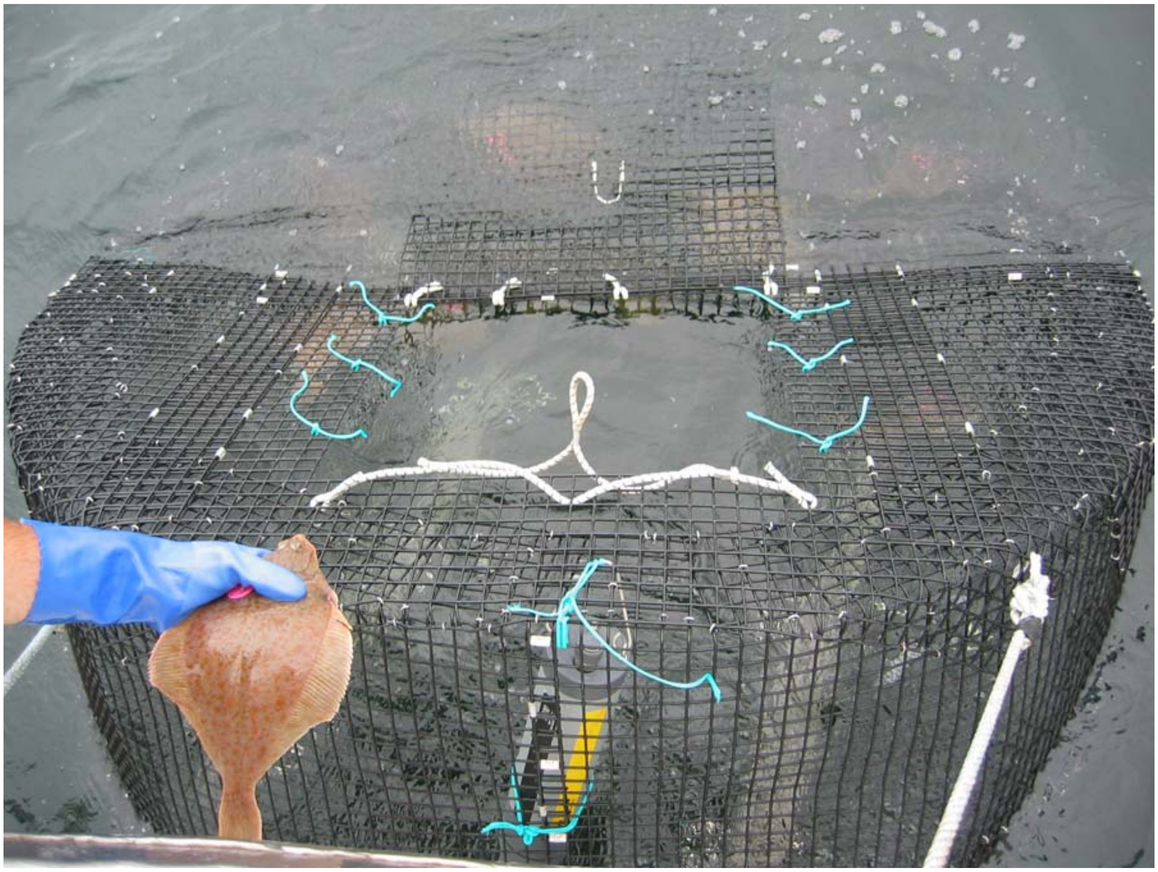

Figure 3. Tagged yellowtail flounder being deployed in a holding cage to evaluate tagging-induced mortality.

After three or four days, cages were hauled to the surface to observe survival of tagged and control fish. The ratio of survival of tagged and control fish was used to estimate tag-induced mortality. Survival of all tagged and control fish is an alternative estimate of mortality that includes that trawl-capture system. Tissues were collected from five tagged fish and three control fish from each cage deployment to assess tag-induced stress. Preserved tissues will be analyzed by the University of Maryland Fish Pathology Lab for histological examination. Tissue analysis is funded by the Living Marine Resources Cooperative Research Center, associated with tank studies for yellowtail flounder. Each of the three cages was loaded with fish and deployed four times (totaling 12 deployments with 360 fish) from June 6 to 20, 2005. Cages were retrieved after three or four days. Fish were inspected for viability and condition and subsampled for tissue analysis. Data were keypunched and will be audited before statistical analyses are performed.

Results from the cage experiments indicated low overall mortality of tagged and control fish. Of the 360 fish in the experiment, only 15 died, and more control fish died than tagged fish. Six fish died in the second deployment, which was associated with poor weather conditions and cage movement. Therefore, it appears that the trawl-capture and caging system impose more mortality than tagging. Preliminary analysis of unaudited data indicates no tag-induced mortality, because more control fish died than tagged fish, and approximately 3% mortality from the capture and cage system. Removal of data from cage-3, where sand-fleas were observed eating live fish, suggests a 1% mortality from the trawl-capture system. The cage experiments were considered so successful and efficient that they are presently being conducted on Georges Bank and are planned for southern New England this summer.

Data-storage tags - Forty data-storage tags were returned, indicating distinct off-bottom movements. All tags at large more than one month indicated distinct off-bottom movements (Cadrin and Westwood 2004). Off-bottom movements were typically in evening hours, between 18:00 and 22:00 (Figure 4), lasting an average of four hours, ascending to an average of 15m off-bottom. The frequency of off-bottom movements varied geographically, an average of once every ten days off Cape Cod, and once every three days on Georges Bank. The frequency of off-bottom movements did not significantly vary by season (Figure 5).

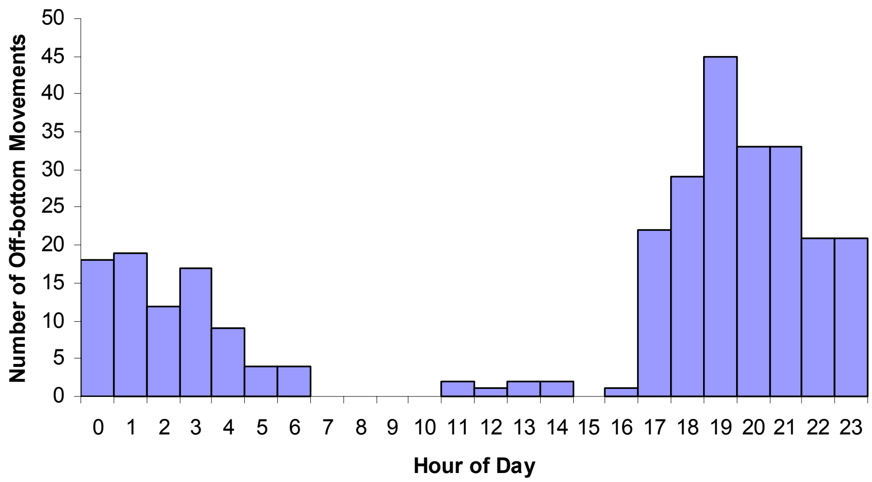

Figure 4. Frequency of off-bottom movements by time of day as indicated by data-storage tags deployed on yellowtail flounder.

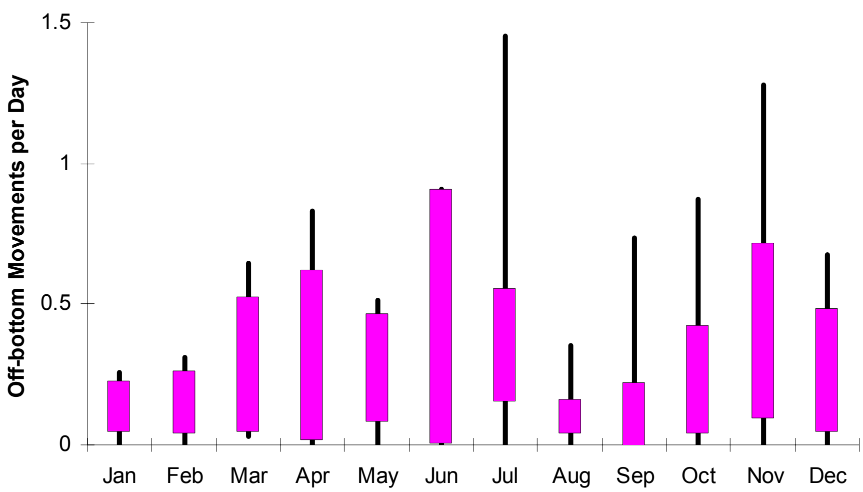

Figure 5. Monthly frequency of off-bottom movements of yellowtail flounder with data storage tags (indicating range and 95% confidence interval).

A collaborative analysis with SMAST oceanographers is using depth, temperature, tidal phase and amplitude to geolocate tagged fish during each data-tag deployment. Preliminary results suggest much more movement than indicated by disc tag recaptures, with some round-trip movements between stock areas (Gröeger et al, in preparation).

These results illustrate how archival tags enhance the interpretability and power of tagging studies. Until recently, the well-studied yellowtail flounder was thought to be a "sedentary" fish, feeding on epibenthic fauna and limited to relatively shallow, sandy habitats. This strict habitat preference and the discontinuous distributions of such habitats were considered to limit movement among offshore banks and shelves, thereby maintaining geographic stock structure. The movement patterns indicated by disc tags likely involves passive drift in midwater currents, similar to patterns observed for other flatfish species. Therefore, the use of electronic tags reveals an important aspect of yellowtail behavior that was not apparent after decades of intense research.

Project Objectives and Scientific Hypothesis

There are several objectives of the Yellowtail Flounder Tagging Study:

- estimate movement rates among yellowtail fishing grounds
- provide independent estimates of mortality for each stock area
- confirm age determinations
- foster cooperative relationships between scientists and fishermen.

The general approach is based on an experimental design that tags a representative subsample of the entire population and an analytical design that models simultaneous movement and mortality. Thereby, the experimental design corresponds to the analytical design, and population estimates support all three technical objectives (movement, mortality and growth) with one study. One hypothesis to be tested is the expected changes in fishing mortality in 2004 and 2005 resulting from substantial management changes (e.g., closed area access programs, days at sea restrictions, rolling closures). A third year of tag releases will provide observations to increase the power of the analysis and allow for more reliable estimation of movement and mortality model parameters.

Project Plan and Experimental Design

This proposal to the Northeast Consortium is to contract commercial fishermen and their vessels to work with scientists to tag and release yellowtail on all fishing grounds off New England, proportional to geographic patterns of abundance. The geographic design is based on statistical fishing areas, with releases in each area. Such a design will allow estimation of movement among areas and mortality by area. The proposed project is designed to continue the experimental design to detect changes in movement or mortality rates resulting from recent fishery management actions.

The project plan was refined to respond to comments from the fall 2004 peer review (Appendix C), and the spring 2005 cooperators' meeting (Appendix B; note that the spring meeting was held after the NEC planning letter for this proposal was submitted, resulting in some changes in the proposed work and budget). Comments from peer review were addressed by updating the geographic analysis of survey catches (using 2000-2004 surveys; Figure 6) to distribute 2006 tag releases; identifying high-reward tags with fluorescent yellow tags; releasing more double-tagged fish; the tagging database is undergoing a major restructuring to support routine quality control and data summaries;

envelopes with required information are being distributed; links to other tagging websites were added to the revised website; the strategy for releasing data-tags was reconsidered; and outreach to Canadian fishermen was improved.

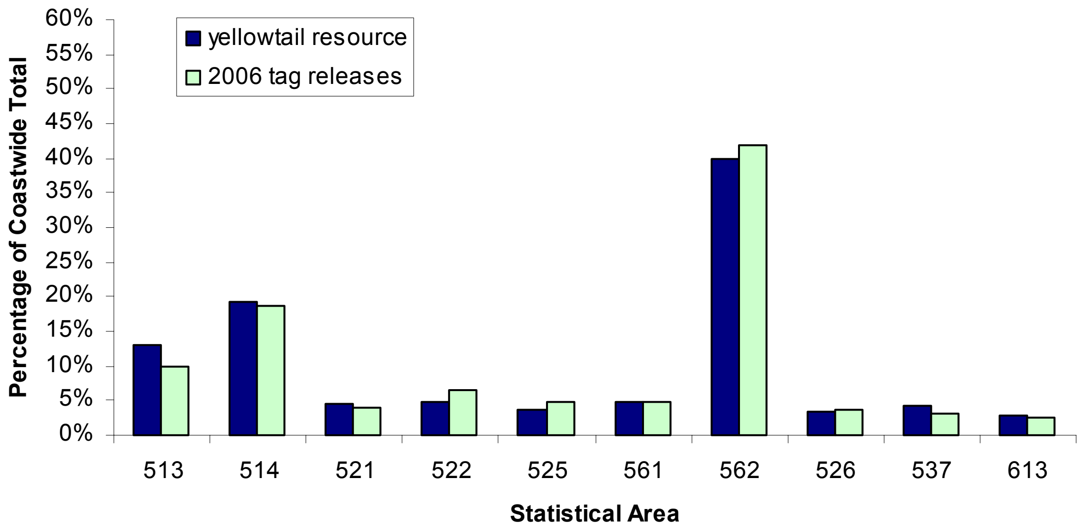

Figure 6. Proportional yellowtail tag releases and relative stock abundance (as indicated by recent NEFSC surveys) by statistical area (see Table 1 for a description of statistical areas).

Several decisions about the 2006 project plan were made at the spring cooperators' meeting. In 2005, all 133 data-tags will be deployed in or near Closed Area II and in 2006, data-tags will be deployed in the Great South Channel. In 2006, 1000 disk tags will be deployed in NLS with a unique number series which will be excluded from the movement-mortality model, but used to study movement near the NLS closure. The criteria for vessel selection will promote a mix of old and new cooperators to expand the circle of cooperative research.

In response to suggestions from the meeting, a new double-sided reward poster with information detailing the project was designed. The poster incorporated pictures of the new $100 yellow disk tag and new orange scale blanks. Posters are translated in Portuguese, French and Spanish to foster better communication between scientists and fishermen in New Bedford and Canada. To compliment the new database, phone logs have been carefully revised to collect more information without compromising critical recapture information. Scale envelopes labeled with yellowtail tagging pertinent info have been distributed throughout the ports by key cooperators and through mailings.

One additional change in response to the success and relative ease of 2005 cage studies is that a cage deployment is proposed for each tagging trip to monitor tagging-induced mortality.

According to the revised project plan, we propose that in spring and summer 2006, 44 days be chartered to tag approximately 10,000 yellowtail, distributed by local abundance of fishing grounds (Figure 6), plus an additional 1000 tag releases in the Nantucket Lightship area, as an ancillary study. The cooperatively developed field protocol (Appendix D) will be maintained. Funding from the Northeast Consortium will provide the necessary cooperation with industry in the form of vessel contracts and local knowledge of yellowtail distribution and seasonal habits, to extend current tagging efforts to the entire U.S. range of yellowtail, and provide estimates of mixing and mortality for all U.S. stocks. Scientific Research Permits will be obtained from the national Marine Fisheries Service to exempt vessels from days-at-sea and access to closed areas while tagging, but all catch is released (all viable yellowtail are tagged and released, and bycatch is minimized). A third year of releases will help to test for annual changes in fishing mortality and movement rates.

Reward posters will continue to be produced and distributed to ports from Nova Scotia to the Mid Atlantic. Reporting rates will be assessed with a tiered reward system (e.g., $1,000 lotteries for most tag returns and fewer instant $100 rewards) to allow an estimate of reporting rate. All tag returns will be reported via a toll-free number (877-826-2612). Everyone who reports a tag recapture will receive a "thank you" letter with a map, giving details of the tagged fish and its movements. Tag reporters will also be acknowledged on the website, and through annual rewards ($100) to the most frequent tag reporter. Project brochures will be distributed at meetings and on the docks, and provided to fishing organizations and tagging participants for distribution. Updates on tagging results and project details will be posted online at www.cooperative-tagging.org. The tag reporting system, outreach program and database management will be maintained by NEFSC throughout the term of the study (i.e., as long as tags are being recaptured). The NEFSC will host the second yellowtail tagging cooperators' meeting to summarize the year of tagging efforts and begin planning for 2005.

The general approach to cooperative research is to involve fishermen who are both experienced in the yellowtail fisheries and local representatives of the industry. Thus, vessel contractors not only provide sampling platforms, but are also active in project outreach to maximize tag returns. Personal outreach is essential for success of tagging studies (Bernstein and Iudicello 2000).

Personnel and Available Resources

The greatest resources available to the project are its personnel. Fishermen and researchers have cooperated to develop the general approach and technical details of the tagging study through several meetings from Rhode Island to Maine. Although many fishermen have provided input and are willing to cooperate for the duration of the project, vessel contracts will go out for bid through Federal requisitions.

<u>Co-Principal Investigators</u>

Steve Cadrin, Northeast Fisheries Science Center, Woods Hole MA

Steve has been a fisheries biologist for 20 years, and as a member of the Population Dynamics Branch, is responsible for stock assessments of yellowtail flounder. Steve's Ph.D. dissertation was "Stock Structure of Yellowtail Flounder."

Azure Westwood, Northeast Fisheries Science Center, Woods Hole MA

Azure is a marine biologist under contract with NEFSC to coordinate cooperative research on yellowtail flounder. Azure has experience in community-based fisheries science and management from American Samoa, Alaska and New England.

Stacy Kubis, Northeast Fisheries Science Center, Woods Hole MA

Stacy brings years of experience tagging sea turtles, tracking locations using radio telemetry and modeling growth. Stacy manages the yellowtail tagging database and vessel contracts.

Rodney Avila, F/V Trident, New Bedford MA
Rodney has decades of experience in the Georges Bank yellowtail flounder fishery as an owner and operator of the F/V Trident. Rodney cooperated in developing tagging protocol and will continue to support outreach activities in New Bedford, where nearly half of the U.S. yellowtail catch is landed.

David Goethel, F/V Ellen Diane, Hampton NH
David is a Gulf of Maine groundfish fisherman with experience in cod tagging and cooperative research. David has also helped in the experimental design and will continue to help with outreach in the Cape Cod-Gulf of Maine area.

Fred Mattera, F/V Travis & Natalie, W. Kingston RI
Fred is a highliner in the yellowtail fishery and has been instrumental in the development of the industry-based survey for southern New England yellowtail. Fred also provided input for the tagging study design and will coordinate recaptures in the IBS study.

Luis Ribas, F/V Blue Skies, Provincetown MA
Luis is a leader in the Provincetown fishing fleet, with years of experience in other fisheries off Portugal and in the North Sea. Luis has helped pioneer innovative fishing gear to target flounder and reduce bycatch and was an initial proponent of tagging Cape Cod yellowtail.

Other fishermen who are involved in the yellowtail tagging study are Tony Borges (F/V Sao Paulo), Bill and Jason Amaru (F/V JoAnne-A III), Steve Follette (F/V Heather Lynn), Shawn McLellan (F/V Elizabeth), Maggie and John Raymond (F/V Olympia) and Proctor Wells (F/V Tenacious), Ed Barrett (F/V Phoenix and F/V Sirius), Carl Bouchard (F/V Stormy Weather), Scott Westcott (F/V Mary Ellena) and Dennis Robillard, Jr. (F/V Julie Ann).

<u>Cooperating Research Agencies</u>
Many people are collaborating on this study and have contributed to its design:
- *NMFS*: Steve Murawski, John Boreman, Frank Almeida, Fred Serchuk, John Hoey, Paul Rago, Josh Moser, Gary Shepherd, Bill Overholtz, Nathan Keith, Jonathan Duquette, Rob Johnston, Kevin McIntosh, Bill Duffy, Dave Radosh, Chris Legault, Jay Burnett, Sarah Pregracke, Vaughn Silva, Patricia Yoos, Heather Sagar, Earl Meredith, Sarah Babson-Pike, Mike Palmer , Steve Kelly, Erin Kupcha, Katie Lovett, Joe Mello, Anthony Morales and Chris Zanni.
- *MADMF*: Jeremy King, John Boardman, Brian Kelly and David Pierce
- *SMAST*: Rodney Rountree, Dave Martin, Joachim Gröeger, Russ Kessler and Darin Jones
- *RIDFW*: April Valliere and Sarah Pierce
- *Canada DFO*: Heath Stone
- *University of Maryland*: Larry Alade, Eric May, Andrea Johnson and Erica Anuszewski
- *Northeast Consortium, University of New Hampshire:* Rachel Gallant
- *Manomet Center*: Chris Glass, Greg Morris and Kris Joppe-Mercure
- *REMSA Observers:* Janine L'Heureux and Meryl Segal

In addition to personnel resources, the proposed study will have the support of NEFSC, providing data (e.g., the commercial weighout database, logbook data, observer program information, and the NEFSC survey database) computational hardware and software, toll-free phone support, website maintenance, and scientific research permits. Industry representatives also have the ability to communicate the objectives of the project to other yellowtail fishermen, thereby maximizing the potential reporting rate of recaptured tags.

Dissemination of Results, Impacts and Deliverables

Deliverables:

- Estimates of total mortality by stock area and year, based on mark-recapture observations.
- Estimates of annual movement rates among areas.
- Confirmation of age determinations through mark and recapture observations.

The results from this study will benefit researchers and managers, helping to improve the management of yellowtail resources. New information on yellowtail movement, independent estimates of mortality and confirmation of age determinations should be useful for academic, state, and federal scientists and will be important information for fishery managers (i.e., the New England Fishery Management Council). The cooperative approach used in the experimental design is being continued throughout the data collection, analysis and interpretation stages of the study. Therefore, results and conclusions will be a product of all cooperators.

Co-principal investigators and other cooperators will meet annually to review results to date. Results will be posted on the website (cooperative-tagging.org) and presented to stock assessment workshops (e.g., SAW, TRAC), management meetings (e.g., groundfish committee) and industry groups (e.g., fishermens' forum, Fish Expo) in the form of technical reports and visual presentations by project participants. Estimates of mortality and movement, as well as growth confirmations will be prepared for the 2008 benchmark assessments of all yellowtail flounder stocks, for consideration in the determination of stock status.

Data:

Data from tag releases and recaptures are continually being added to the yellowtail tagging database. When the project is complete, a comprehensive database will be provided to the Northeast Consortium Fisheries and Ocean Database. Preliminary data can be provided upon request. The Northeast Fisheries Science Center has dedicated resources to maintain the yellowtail tagging database indefinitely as a part of the NEFSC Data Management System.

Literature Cited

Bernstein, B.B. and S. Iudicello. 2000. National evaluation of cooperative data gathering efforts in fisheries. National Fisheries Conservation Center, Ojai CA, report to NMFS (http://nfcc-fisheries.org/media/io_3d_14B.pdf)

Cadrin, S.X. 2001. Southern New England yellowtail flounder. In Assessment of 19 Northeast Groundfish Stocks through 2000. NEFSC Ref. Doc. 01-20: 54-66.

Cadrin, S.X. 2003a. Stock assessment of yellowtail flounder in the southern New England-Mid Atlantic area. NEFSC Ref. Doc. 03-02.

Cadrin, S.X. 2003b. Stock structure of yellowtail flounder off the northeastern United States. Univ. Rhode Island Ph.D. Dissertation. 148p.

Cadrin, S.X. and J. King. 2003. Stock assessment of yellowtail flounder in the Cape Cod-Gulf of Maine area. NEFSC Ref. Doc. 03-03.

Cadrin, S.X. and A.D. Westwood. 2004. The use of electronic tags to study fish movement: a case study with yellowtail flounder off New England. ICES CM 2004/K:81 (available online http://www.ices.dk/products/CMdocs/2004/K/K8104.pdf)

Gulf of Maine Aquarium (GMA). 2002. Implementing an industry-based survey pilot fleet. Gulf of Maine Aquarium, Portland ME.

Hart, D. and S.X. Cadrin. 2004. Metapopulation analysis of yellowtail flounder. In Applications in RAMAS. Oxford University Press (in press).

Legault, C.M and H.H. Stone. 2004. Stock assessment of Georges Bank (5Zhjmn) yellowtail flounder for 2004. DFO Res. Doc. 2004/03.

Lux, F.E. 1963. Identification of New England yellowtail flounder groups. Fish. Bull. 63: 1-10.

NEFMC (New England Fishery Management Council) 2003. Social and economic impacts of the alternatives. In Draft DEIS of Amendment 13 to the Northeast Multispecies Fishery Management Plan (www.nefmc.org/documents).

NEFSC (Northeast Fisheries Science Center). 2002. Assessment of 20 Northeast Groundfish Stocks through 2001. NEFSC Ref. Doc. 02-16.

NEFSC (Northeast Fisheries Science Center). 2003. Report of the 36th Northeast Regional Stock Assessment Workshop. NEFSC Ref. Doc. 03-06.

NMFS (National Marine Fisheries Service) 2004. Fisheries of the United States, 2003. Current Fisheries Statistics No. 2003.

Royce, W.F., R.J. Buller and E.D. Premetz. 1959. Decline of the yellowtail flounder (*Limanda ferruginea*) off New England. Fish. Bull. 59: 169-267.

Stone, HH, S. Gavaris, C.M. Legault, J.D. Neilson and S.X. Cadrin. 2004. Collapse and recovery of the yellowtail flounder (Limanda ferruginea) fishery on Georges Bank. J. Sea Res. 51(3-4):261-270.

Tallack, S., Rago, P., T. Brawn, S. Cadrin, J. Hoey, and L. Taylor Singer. 2005. Proceedings from a workshop to review and evaluate the design and utility of fish mark - recapture projects in the northeastern United States. NEFSC Ref. Doc. 05-02. (available online http://www.nefsc.noaa.gov/nefsc/publications/crd/crd0502)

TRAC (Transboundary Resources Assessment Committee). 2004. Report of the Meeting held 15-17 June 2004. TRAC Proceedings 2004/01.

Budget and Budget Justification
A total of **$207,750** is requested from the Northeast Consortium, 76% of which is allocated to cooperating fishermen (see Appendix E for the Northeast Consortium budget format). The majority of the proposed budget is allocated to vessel contracts ($140,000 for 18 inshore days at $2,000 per day and 26 offshore days at $4,000 per day). Funding is also requested for tag rewards ($15,000), and to support cooperative meetings ($2,500). For the 2005 meeting, fishermen were paid a stipend of $150 to attend the meeting. Collaborators feel that fishermen's participation in planning and interpretation should be valued and compensated. A total of $50,250 is requested to purchase 11,000 more disc tags, 200 data-storage tags and tagging equipment. Other costs for the study (field and lab personnel, scientists' travel, lab facilities, support of reporting and data management systems, outreach materials) are being contributed by NEFSC. Costs have been evaluated based on a cost-effective approach to improving the yellowtail tagging study.

<u>Vessel Charter Costs</u>
The rates for vessel charters for yellowtail tagging are categorized as inshore day-trips (e.g., $2,000 per day, from the 2004 Northeast Consortium guidelines) or multi-day offshore charters (e.g., $4,000 per day, based on comparisons to similar studies). Based on concerns about the high cost of offshore trips raised by the consortium, two economic analyses are described below that justify a substantial cost differential between inshore and offshore trips. Industry leaders reviewed the economic analyses as well as their own costs and agreed that a cost of $4,000 per offshore day will be acceptable to most cooperators. The cost of $4,000 per day is also the initial rate agreed to for the yellowtail tagging and survey work (IBS 2002) before the substantial increase in fuel prices in 2003.

A query of 2002 northeast observer data for otter trawl trips indicated that the 65 observed trips that were at sea for seven days or more were more than 6 times more costly than the 205 observed day trips. Operational costs included damage, supplies, food, water, oil, ice and fuel, but did not include overhead costs (vessel cost, dockage, insurance, etc) which are also greater for larger, offshore vessels:

Table A1. Reported daily costs of observed day-trips and multi-day trips in 2002.

days	1-day trips	>7 day trips	cost ratio
trips	205	65	
crew	1.8	4.4	2.5
damage	$ .64	$ 42.96	4.5
supplies	$ .20	$ 13.65	1.9
food	$ 4.80	$ 87.81	5.9
water	$ 0.08	$ 3.93	46.6
oil	$ 8.29	$ 29.11	3.5
ice	$ 9.79	$ 05.92	10.8
fuel	$ 70.58	$ 79.28	6.8
cost	$ 20.39	$ 62.65	6.3

Similar costs were obtained from an economic survey conducted for an analysis of the economic impacts of Amendment 13 to the Groundfish Plan, (NEFMC 2003; Drew Kitts and Eric Thunberg, NEFSC personal communication). Revenue per day was estimated as $1,521 for an inshore trawler (<50 feet) and $6,254 for an offshore trawler (50-70 feet):

Table A2. Economic analysis of vessel costs and revenues (Drew Kitts, personal communication)

Vessel Category	Average
Trawl < 50 feet: revenue per day	$ 1,521
Variable costs per day	$ 268
Yearly overhead costs	$ 30,073
Trawl 50 to 70 feet: revenue per day	$ 6,254
Variable costs per day	$ 363
Yearly overhead costs	$ 66,937

Based on these analyses, the proposed vessel costs ($1500 per day inshore and $4000 per day offshore) are justified. The current state of the yellowtail stocks is that much of the resource is offshore, on Georges Bank, where tagging is inherently more expensive. We propose that Consortium funding be used to maintain geographically proportional tag releases.

<u>Data Storage Tag Costs</u>

Data-storage tags are high-technology products that are expensive in comparison to conventional tags. However, the information gained from a single data-storage tag can be extremely valuable. The manufacturer of the proposed tag, LoTek (based in Newfoundland), is one of three manufacturers of data-storage tags, and offers the most affordable data-storage tag on the market ($185 per tag, including a 10% government discount). Star Oddi (based in Iceland) offers a similar tag to the Lotek tag, but the cost is $368 per tag. Wildlife Computers (based in Washington state) specializes in more advanced data-storage tags that monitor heart rate and light intensity that are $750 or more. Therefore, the LoTek data-storage tag is the most cost-effective product that can meet our needs.

Resumes

STEVEN X. CADRIN
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EDUCATIONAL HISTORY

Ph.D., University of Rhode Island 2003 (Fisheries Science),
  Dissertation research on stock structure of yellowtail flounder.

M.S., University of Massachusetts, Dartmouth 1995 (Marine Biology),
  Thesis research on morphometric stock discrimination of American lobster.

B.S., Long Island University, 1985 (Marine Science/Biology)

PROFESSIONAL HISTORY

Northeast Fisheries Science Center, Woods Hole, MA. Research Fishery Biologist, 9/96 to present. Population dynamics modeling and fishery stock assessments of yellowtail flounder, northern shrimp, inshore longfin squid and other species of exploited finfish and shellfish. Research interests include stock structure and precautionary harvest strategies.

Massachusetts Division of Marine Fisheries, Sandwich, MA.
Population Dynamics Specialist, 10/88 to 9/96. Population modeling for stock assessment of Atlantic menhaden Atlantic herring, American lobster and Atlantic Cod. Bottom trawl and haul seine surveys, quantitative data analysis, and extensive sea sampling.

New York State Division of Marine Resources, Stony Brook, NY.
Shellfish Specialist, 4/87 to 10/88. Research and management of exploited shellfish species. Bay scallop rehabilitation project.

Eaton's Neck Aquaculture Corporation, Northport, NY.
Shellfish Aquaculturist, 4/86 to 4/87. Bivalve culture techniques for bay scallops and hard clams.

National Marine Fisheries Service, Foreign Fisheries Observer Program.
Fisheries Observer, 6/85 to 4/86. Biological sampling of yellowfin sole (NMFS Alaska Region), squid and mackerel (Northeast Region).

RELATED PUBLICATIONS

Cadrin, S.X., K.D. Friedland and J. Waldman, editors. 2005. Stock Identification Methods: applications in fishery science. Elsevier Academic Press, Amsterdam.

Cadrin, S.X. and V.M. Silva. 2005. Morphometric variation of yellowtail flounder. ICES J. Mar. Sci. 62: 683-694.

Rice, J., S.X. Cadrin, and W. Clark. 2005. Population dynamics and management of flatfish. P. 319-346 in Flatfishes, R. Gibson, editor. Blackwell Science.

Cadrin, S.X. and A.D. Westwood. 2004. The use of electronic tags to study fish movement: a case study with yellowtail flounder off New England. ICES CM 2004/K:81 (available online http://www.ices.dk/products/CMdocs/2004/K/K8104.pdf)

Stone, H.H., S. Gavaris, C.M. Legault, J.D. Neilson and S.X. Cadrin. 2004. Collapse and recovery of the yellowtail flounder (Limanda ferruginea) fishery on Georges Bank. J. Sea Res. 51(3-4):261-270.

Murawski, S.A., R.W. Brown, S.X. Cadrin, R.K. Mayo, L. O'Brien, W.J. Overholtz, and K.A. Sosebee. 2002. An introduction to the history of fishes in the Gulf of Maine. pp 1-7 in Collette, B and G. Klein-MacPhee, eds. Bigelow and Schroeder's Fishes of the Gulf of Maine. Smithsonian Institution Press, Washington, D.C.

Cadrin, S.X. 2000. Advances in morphometric analysis of fish stock structure. Rev. Fish Biol. Fisheries. 10: 91-112.

Cadrin, S.X., A.B. Howe, S.J. Correia, and T.P. Currier. 1995. Evaluating the effects of two mobile gear fishing closures on finfish abundance. N. Am. J. Fish. Management 15: 300-315.

AZURE DEE WESTWOOD
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EDUCATION: Bachelor of Science in Marine Biology, University of California, Santa Cruz, June 2001. Senior Essay An Environmental Perspective to Using Individual Transferable Quotas (ITQs) to Manage New England Groundfish, supervised by Prof. Marc Mangel.

Licensed Vessel Captain, Master 100 Ton Inland with OUPV Near Coastal, New England Maritime, United States Coast Guard approved curriculum. Hyannis, MA, March 2003.

WORK EXPERIENCE:
<u>Fisheries Technician</u>, Integrated Statistics, Woods Hole MA
Coordinate cooperative tagging research with the Northeast Fisheries Science Center and the New England fishing industry. Design and distribute outreach materials to ports. Team leader in Rhode Island Fish and Wildlife Industry-based survey pilot study for yellowtail flounder on F/V Mary Elena, Pt. Judith, RI. Scientific member of NOAA spring trawl survey on Georges Bank. Tasks included fish identification, CTD and plankton tow operation.

<u>Commercial Fisherman</u>
* Pago Pago, American Samoa. Nov. 2001 - June 2002. Deck boss on Albacore tuna longliner, F/V "Maria J" and deckhand on F/V "Julie Irene".
* Dutch Harbor, Alaska. Oct. 2001. Deckhand on Alaskan King Crab boat, F/V "Aleutian Beauty".
* Chatham, Massachusetts. Sept. 1999 - June 2001. Deckhand on several benthic longline vessels, harvesting Atlantic codfish and spiny dogfish.
* Exmouth, W. Australia. Oct. 1998. Deckhand on Yellowfin tuna longliner, F/V "Patricia Rose".

<u>Outreach and Campaign Coordinator</u>, Cape Cod Commercial Hook Fishermen's Association, Chatham, Massachusetts. Sept. 1999 - June 2001.
Daily bridging gaps between New England fisheries stakeholders through education, creative partnerships, research, mediation and public rallies for grassroots, non-profit fisheries conservation organization.
* Presented educational workshops & lectures to fishermen, community groups, elementary to college classes, fisheries management and science communities.
* Grant writing for organizational funding and special projects.
* Created first Community Fisheries Action Center in New England offering technical services, education and skill workshops, resources and a comfortable meeting place for the Cape Cod fishing and coastal community.
* Organized 2 grassroots campaigns in Washington D.C. and Boston, MA.
* Co-founder of the Nereid Network, a Women's Marine Alliance, Jan. 2000.

<u>Deck Hand</u>, San Diego, CA. August - Sept. 2002.
Sportfishing charter boat, "Ranger 85". Albacore, bluefin tuna, Mahi Mahi and yellowtail.

<u>Aquaculture Manager</u>, Harwich, Massachusetts. April - Aug. 2001.
Cape Cod Oyster Farm. Growing and monitoring oysters on private land grant.

<u>Research Assistant</u>, Santa Cruz, CA. March 1999 - September 1999.
Prof. Marc Mangel Salmon lab. Data entry, filing and journal research. Organized 2nd Annual Symposium on Krill, University of California, Santa Cruz, August 1999.

NAUI Scuba Instructor, Santa Cruz, CA. Feb. 1996 - Aug. 1999.
qua Safaris Scuba Center. Retail sales and class instruction from beginner to specialty.

STACY ANN KUBIS
Northeast Fisheries Science Center, NMFS
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EDUCATION:
M.S., University of Central Florida, 2003 (Biology)
University of Queensland, graduate credits
University of Rhode Island, graduate credits
B.S., Virginia Tech, 1997 (Biology)

WORK EXPERIENCE:
Northeast Fisheries Science Center, Woods Hole MA. Fishery Biologist, 2/2005 to present. Responsible for assisting in the coordination of tagging studies for yellowtail flounder, black seabass, scup and haddock. Participates in various field studies and cooperative research with fishermen.

North Carolina State University, Morehead City NC. Research Assistant 8/2004-2/2005. Provided field assistance to graduate students conducting fisheries research. Participated in surveys of fish abundance and diversity using seining, trawling and surf-fishing.

Wider Caribbean Sea Turtle Conservation Network, Beaufort NC 1/2004-2/2005.
Provided scientific support for developing, implementing and evaluating sea turtle research and conservation projects. Participated in field projects and associated data analysis and interpretation. Led various field projects including the deployment of satellite tags on leatherbacks off Costa Rica and in the Mediterranean and behavioral experiments off Trinidad.

Southeast Fisheries Science Center, Beaufort NC. Fisheries Observer 9/2003-12/2003.
Responsible for sampling sea turtles incidentally caught in pound nets. Turtles were identified, measured, PIT and flipper tagged, and sampled for blood and skin biopsies.

University of Central Florida, Orlando FL. Research Assistant 12/1998-5/2003.
Graduate teaching assistant for ecology, biology, vertebrate zoology, herpetology. Graduate assistant for various research cruises.

Osceola County Public Schools, Kissimmee FL. K-12 Teacher, 8/1998-4/1998.
Fifth grade teacher, and 6th grade math and science teacher.

Mote Marine Laboratory, Sarasota FL. Intern 9/1997-4/1998.
Participated in post-season sea turtle nesting beach studies and marine mammal stranding work.

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PROFILE
Forty years of experience in the fishing industry, captain of seven fishing vessels, owner of two fishing corporations and project manager for a center providing employment and training services to fishermen. A strong commitment to helping fishermen and their families adjust to a changing industry. Strengths include computer proficiency and excellent communication skills.

EDUCATION
Dartmouth High School, 1961- Dartmouth, MA

WORK HISTORY
New Bedford Harbor Development Commission
May 2003- Assistant Wharfinger

New Bedford's Fishermen's Family Assistance Center, New Bedford, MA
July 1999 – May 2003- Project Manager
* Manage Fishing Center and staff
* Provide all materials and design slide show presentations to promote
  Center activities

January 1996- Present - Outreach Specialist
* Contact fishermen at the docks to inform them of the Center's services
* Create brochures and informational material for distribution at the docks
* Prepare media presentations including television
* Document work with logs and monthly reports

1994 – 1997 New England Fishery Management Council

1968 - Present Trident Fishing Corporation and RJR Fisheries, Inc., New Bedford, MA, Owner and President

1963 - 1996 Worked as Captain on Fishing Vessels out of New Bedford, MA

F/V Seven Seas	(1994 - 1996)
F/V Trident	(1968 - 1994)
F/V Ocean Spray	(1967) 6 months
F/V Skipjack	(1996-1967)
F/V Gertrude D	(1964-1965)
F/V Barbara T. Clifton	(1964 – 6 months
F/V Catherine & Mary	(1962 - 1964)

RELATED ACTIVITIES AND AFFILIATIONS
Member, Board of Directors:

New Bedford Port Society	(2001-Present)
Trawlers Survival Fund	(2001-Present)
Massachusetts Fishermen's Partnership	(1995 – Present)
Chairman of U.S. C.G. Law Enforcement Committee	(1994 - 1997)
Instructor at U.S. C.G. Training School – Otis Air force Base	(1994 – 1998)
Northeast Atlantic Swordfish Net Association	(1989 - 2000)
Point Club Insurance Co.	(1989- Present)
New Bedford Seafood Cooperative	(1988 - 1994)
New Bedford Seafood Producers Inc.	(1980 - 1992)

DAVID TYLER GOETHEL
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EDUCATION
* 1971-1975 Boston University, School of Liberal Arts. Boston, Mass. B.A. Cum Laude in Biology.
I fit as many marine oriented courses into my schedule as were available. These have included graduate courses in Ichthyology and Oceanography. Special interests lie in the field of fishing gear and its effect upon the fisheries of the Northwest Atlantic. I have written several papers on this subject that have been highly recommended by the professors involved.
* 1968-1971 Needham High School, Needham, Mass.

WORK EXPERIENCE
<u>F/V "Ellen Diane"</u> Owner/ Operator of the 44 foot dragger (1983-present).
Responsibilities: The capture of fish and shellfish by otter trawl. The capture of Bluefin tuna by handline method, and limited seasonal use of gillnets. I also maintain the vessel and run the business including payroll and accounting.

<u>Seabrook Fisheries</u>, Seabrook, NH (1977-1983)
Share Owner of the Party Fishing Boat Lady Erika.
Owner, 24 foot Lobster/Gillnetter Boat "Ellen Diane" (1973-1983)

<u>Eastman's Fishing Parties</u>, Seabrook, NH (1973-1983)
Captain, 65 foot fishing party boat. May 1 to Oct. 15
Coast Guard Merchant Marine License # 790476 issue # 6 for Master of Near Coastal (20 miles) Steam or motor vessels of 100 gross tons.
I also hold an F.C.C. marine radio operator permit #Mp-HQ-28172
Responsibilities: Operation, navigation and maintenance of vessel as well as providing as successful a fishing trip for the passengers as possible. I carried over 20,000 people over the course of a good season.

<u>New England Aquarium</u>, Boston, Mass. (1975-1976)
Research Biologist, studying the effects of temperature and gas supersaturation in adult menhaden under contract for Boston Edison.
Responsibilities: Capture and maintenance of menhaden as well as measurements of standard water quality(dissolved oxygen, pH, salinity, ammonia, etc.) Design and construction of experimental apparatus and field studies at Plymouth Nuclear Plant. Successful completion of thermal tolerance experiments including performance of autopsies on fish. Successful completion of a series of experiments using compressed air to degas supersaturated water including work with Weiss saturometer and Nitrogen equation developed by other members of N.E. A. research staff.
Technical Report: "Evaluation of Bubble Degassing Technique to Reduce Supersaturation of Discharge Waters." Published for Boston Edison Company, Pilgrim Nuclear Power Plant, Feb. 1, 1976.

<u>Eastman's Fishing Parties</u>, Seabrook, NH (1967-1972)
First Mate on a 65 foot fishing party boat.
Responsibilities: To satisfy customers, handle docking and anchor equipment, learn the operation and maintenance of the vessel and where to find the fish. In addition during this time I worked on a pick-up basis on various coastal gillnetters and lobster boats as operator of the vessel, operator of the net hauler and as the man who picks fish from the nets.

PROFESSIONAL MEMBERSHIPS
* 2002-present, Board of Directors, Northeast Seafood Coalition
* 1989-1998 President, Tri-Coastal Seafood Co-Op Inc. General oversight of the Fish Co-Op with 1995 sales of over $2,000,000.00 of groundfish and bluefin tuna.
* 1997-present, Yankee Fishermens Co-Operative Association.

* 1992-present, Board of Directors, New Hampshire Commercial Fisherman's Assoc.
* 1989-1998, President, Tri-Coastal Seafood Co-Op with 1995 sales over $2 million of groundfish and bluefin tuna.
* 1988-1998, Board of Directors, Tri-Coastal Seafood Co-Op Inc. Newburyport, Mass.

GOVERNMENTAL APPOINTMENTS

New England Fisheries Management Council, Council Member 2004; Industry Advisor on the following boards: Research Steering Committee (1999-present), Herring (1996-present), Whiting (1996-present), Interspecies (1996-1999), Responsible Fishing (1996-1998), and Groundfish Oversight Committee (1988-1990).

Atlantic States Marine Fisheries Commission, Industry Advisor on the following boards:
- Shrimp (1995-present), Herring (1996-present) and ACCSP Discard Prioritization Committee (1999-present).
- The Governor's Advisory Committee on Shore Fisheries (1999-present).
- Nominated by Governors Jeanne Shaheen, Steve Merrill and Judd Gregg for a seat on the New England Fisheries Management Council (1990, 1996, 1997, 1998, 1999, 2000, 2001, 2002).

PROFESSIONAL CONFERENCE PARTICIPANT

* NOAA Managing Our Nations Fisheries Conference, 2003: Presenter, Cooperative Research
* American Fisheries Society Annual Meeting, 2003: Presenter, Cooperative Research
* National Academies : Presenter on Fisherman's Perspectives on Co-operative Research (2002)
* President's Commission on Ocean Policy: Presenter on Fsherman's views on changes needed to Ocean Policy (2002)
* Marine Resource Education Project. Board of Directors, Presenter and Graduate Funded by the Northeast Consortium, Univ. of New Hampshire (2002)
* National Academies, National Research Council. Presenter, "Effects of Otter Trawl Gear on Habitat in the Gulf of Maine" (2001)
* Pew Oceans Commission Participant in discussion on current state of U.S. fisheries (2001)
* North Atlantic Responsible Fishing Conference, St. Johns, Newfoundland, Canada (2000)
* North Atlantic Responsible Fishing Conference, Fraserburgh, Scotland (2000)
* Global Programme of Action Coalition for the Gulf of Maine (United Nations Mandated Event): Held in Portland, Maine with participants from US and Canada. I was sponsored by the International section of NOAA-National Ocean Service to participate in the Resource Use panel and the Toxics panel (1998)
* East Coast By-Catch Conference: Featured Speaker, presenting as an expert on the use and effectiveness of the Nordmore grate in the Northern Shrimp fishery Co-operative Research Projects

CURRENT CO-OPERATIVE RESEARCH PROJECTS

* Yellowtail Flounder Tagging Study (2003-present)
* Study Fleet Project (2003-present)
* Determining Groundfish Patterns in and Around Western Gulf of Main Area Closure (2002-2003)
* Temporal and Spatial Distributions of Cod in Western Gulf of Main Statistical Areas 132 and 133 (2001-2003)

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EDUCATION
University of Rhode Island 1969-1972, Political Science
Cranston East High School, 1969, Cranston, RI

WORK EXPERIENCE
* Owner/Captain F/V "Travis & Natalie" (1984-present) 84' offshore freezer trawler
* Captain F/V "Barbara Joan" (1981-1984) 68' offshore trawler
* Captain F/V "Deborah Ann" (1980-1981) 48' inshore trawler
* First Mate on several inshore trawlers (1977-1980)
* Owner/Captain/Mate F/V "Hobbit" (1974-1976) 48' inshore trawler
* Crewman on several inshore and offshore trawlers (1972-1974)

ACTIVITIES AND AFFILIATIONS
* Board of Directors, Trawler Survival Fund (2002-present) representing RI fishermen's interests on groundfish issues
* Industry Advisor, Industry Based Survey (2001-present) yellowtail survey project
* Industry Representative, National Fisheries Institute Science Monitoring Committee (2000-present) representing Pt. Judith fishing industry on Mid Atlantic fishery issues
* Board of Directors, Point Club Fishing Vessel Mutual Insurance Company (1986-present; President 1998-present; Vice President 1988-1998) Director to establish safety at sea training.
* Board of Directors, Sunderland Marine Mutual Insurance, Sunderland UK (1998-present) principal underwriter of the Point Club
* Board of Directors, Point Judith Fishermen's Cooperative Association (1985-1994; Vice President 1986-1994)
* Board of Directors, Atlantic Offshore Fishermen's Association (1985-1990) offshore lobster group
* Industry Advisor, New England Fishery Management Council (1987-1998) Large Pelagic, Groundfish and Conservation Engineering Committees
* University of Rhode Island Advisory Council for Fishing Safety Training Program (1987-1990)
* Co-Chairman, Northeast Atlantic Swordfish Net Association (1989-1999)
* Atlantic Offshore Take Reduction Team Committee (1996)

ACHIEVEMENTS
* 1990 recipient, National Fisherman' Highliner Award
* 1987-1991, principal performer in television advertisement for "New England Fishermen and Alka Seltzer Cold Medicine"

LUIS M. RIBAS
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WORK EXPERIENCE
Captain, F/V Blue Skies (1995-Present) President, Barrosa Fishing Corp.
Co-owner, F/V Blue Ocean (2000-Present) President, Blue Ocean Fisheries Corp.
Responsible for running all aspects of successful commercial fishing business using two 62' groundfish draggers based out of Provincetown, MA. Supervise crew of four.

Assistant Harbormaster, Town of Provincetown (1999-Present)
Assist Harbormaster in all operations of busy commercial and recreational pier area. Responsible for enforcement on harbor and pier as well as boaters assistance and information.

Research Partner, Mass. Division of Marine Fisheries (2000-Present)
Received 2 grants to participate in federal-funded research project entitled "Reducing Bycatch of Cod in Trawl Fishing". Developed the Ribas net. Conducted research with the Raised Foot Rope Trawl in the whiting fishery, and scup and squid research.

Commercial Fisherman, New Bedford, MA (1985-1994)
Served in all positions, including Captain, mate, engineer, and deck hand on five different large groundfish trawling vessels.

Crew Member, F/V Bremen, Cuxaven, Germany (1977-1985)
Performed bridge, deck, engine room and fish processing duties on 300' trawl processor ship in the North Sea, Greenland and Labrador (New Found Land) waters.

EDUCATION
September-November 1977 - Land-based training and learning on building and repair of fishing gear for the North Sea Fishing School in Germany sponsored by the German fishing company

December 1977-1978 - At-sea training with the application of the land-based skills Learned Navigational skills while at sea

PROFESSIONAL HONORS

October 2002	Recipient, Fisherman of the Year Award, National Fisherman Magazine presented on October 4, 2002.
2001-Present	Founder and President, PROFISH-Provincetown Fishermen's Association
2003	Nominee, to serve as a council member on the New England Fisheries Management Council.

SKILLS

Engine and electrical repair, fishing net design and repair, knowledge of computers and software including Microsoft office, and navigational software, knowledge of fishing industry, audio/video equipment, strong communication skills with the fishing community, CPR and first Aid certification

Description of Prior Cooperative Research Results and Impacts
All principal investigators are involved in the 2004 and 2005 yellowtail flounder tagging study funded by the Northeast Consortium:

Yellowtail Flounder Tagging Study (FY2003 $200,000 and FY2004 $100,000)
New England fishermen and the Northeast Fisheries Science Center were awarded a grant from the Northeast Consortium to expand and improve the yellowtail flounder tagging study for yellowtail flounder in Northeast U.S. waters. The study is designed to tag yellowtail flounder aboard commercial fishing vessels with conventional disc tags and data-storage tags from Maine to the Mid Atlantic with the objectives of estimating movement among stocks areas and mortality within stock areas as well as providing growth observations.
This project coordinates several concurrent field studies with a common tagging protocol, a single experimental and analytical design, the same tag return system as well as coordinated outreach efforts. Through the cooperation of industry leaders and fishery scientists, the study was planned to reduce uncertainty in yellowtail flounder stock assessments, thereby improving fishery management. Further details on the project design and results are available online at cooperative-tagging.org.

Flatfish Cage System for Bycatch Studies (FY2004 Project Development Grant $5,500)
Captain David Goethel and the Northeast Fisheries Science Center were awarded a Project Development Award to develop a cage system for holding flatfish for studying bycatch mortality. We designed small cages and a deployment system that emulated conditions for flatfish discarded from fishing operations for later observation of survival or mortality. A short-term application of the system was to evaluate tagging-induced mortality of yellowtail flounder, a necessary component of the tagging study. The application also provide background information on survival of healthy, untagged yellowtail from short tows for context on survival in the holding system. The objective of the short-term study was to test the feasibility of the system for future bycatch mortality studies for improved assessment and management of New England flatfish resources.

<u>David Goethel</u>, a co-principal investigator has been or currently is involved in the Study Fleet Project and three projects funded by the Northeast Consortium:
Determining Groundfish Species Movement Patterns in Closed Areas (FY2000)
Collaborating with Hunt Howell, University of New Hampshire, the field study monitored movement patterns of groundfish in several areas in the western Gulf of Maine, using tag and recapture techniques. Approximately 20,000 Cod were tagged in areas 132, 133 and 156. Time/area closures, because of their relatively small size, present new challenges in resource assessment. In particular, little is known about the small-scale movements of groundfish within and between these areas, and the biological processes that occur within the closed areas are poorly understood.

Intensive Study of the Western Gulf of Maine Closure Area (FY2002 $204,340)
Led by Raymond Grizzle, University of New Hampshire, the study is examining a combination of ecosystem factors including primary production, bottom habitat heterogeneity and temporal dynamics, and potential human impacts to the seafloor. The objective is to initiate an ecosystem-level assessment of the effectiveness of the Western Gulf of Maine Closure Area. In addition, the study will provide an opportunity to develop new approaches to habitat mapping that may have important ramifications for fisheries management. Investigators are using satellite remote sensing of primary production, multibeam acoustic mapping of the seafloor, videographic mapping of the seafloor, and grab sampling of sediments and benthos to produce detailed maps of primary production and bottom habitat characteristics for a portion of the closed area and adjacent
areas. The new maps and other information will be combined with existing data from the study area to assess the potential effects of the closure on groundfish populations and overall habitat quality.

Determining Groundfish Movement Patterns In and Around the Western Gulf of Maine Area Closure (FY2002 $134,243)
Led by Hunt Howell, University of New Hampshire, the study is evaluating the western Gulf of Maine area closure. Area closures and marine protected areas are becoming increasingly popular as fisheries management tools. Theoretical benefits include: 1) providing a refuge from harvesters and a consequent

reduction in fishing mortality; 2) serving as a source of eggs and larvae that can rebuild populations outside of the closed area; and 3) simplified enforcement. While it is clear that they can be effective if the closed area encompasses a large part of the available habitat and the species are largely immobile, their utility for highly mobile, migratory species is less certain. This study seeks to study the movement patterns of groundfish in and around the Western Gulf of Maine Area Closure using mark and recapture techniques. Results of the study will provide fisheries scientists and managers with detailed information about the temporal and spatial distribution of several groundfish species, which will thus contribute towards our understanding of this closed area's effectiveness.

A Fishing Gear Workshop by Fishermen for Non-Fishermen (FY2004 $27,510)
In the past decade, fishing gear and harvesting related issues have become topics among those who have interests in fisheries but are not commercial fishermen. This group of people includes federal and state scientists and professors who work with fishermen in cooperative research projects, staff and volunteers working for fishermen associations and organizations, fisheries managers and staff members who work for various committees, councils, commissions and congressional delegations, and representatives of conservation organizations. While they have various strengths in their respective professions, lack of knowledge on fishing gears and their operations is evident. We propose to organize a pilot three-day workshop for sixteen such participants so that they will have better understanding of fishing gears, operational methods, and conservation issues of commercial fishing gears in use in New England. The workshop will be primarily instructed by active commercial fishermen with at-sea and on-the-dock components. Two trawl skippers and two gillnet skippers will be involved in on-the-dock instructions and discussions, practical demonstrations of gears, and fishing demonstrations at sea.

Other co-principal investigators also have demonstrated the ability to successfully contribute to fisheries science through various cooperative research projects:
<u>Steve Cadrin</u>
* Worked with other co-investigators to develop the southern New England-Mid Atlantic tagging study and the 2003 NEFFSC tagging study. Tagging demonstrations began in March 2003, with a sea-trial on the Massachusetts Survey in May 2003. Tagging began in Massachusetts Bay on June 23, 2003.
* Chaired the Industry-based Survey Design Subcommittee to address sampling designs of cod and yellowtail IBS projects (August 2004 to present).
* Cooperative research on *Loligo* squid spawning and maturity in the late 1990s, working with squid fishermen to locate areas of spawning and collect samples for laboratory processing. The study led to a better understanding of *Loligo* reproductive dynamics.
* Cooperative research on lobster fecundity in the early 1990s, working with offshore lobster fishermen to collect large ovigerous females. The results improved estimates of egg production per recruit.

<u>Azure Westwood</u>
* Worked with other co-investigators to develop the southern New England-Mid Atlantic tagging study and the 2003 NEFFSC tagging study. Tagging demonstrations began in March 2003, with a sea-trial on the Massachusetts Survey in May 2003. Tagging began in Massachusetts Bay on June 23, 2003.
* Chief scientist on cooperative research cruises for the yellowtail industry-based survey (spring and fall 2003, spring 2005), the monkfish survey (2003 and 2004) and the Mid Atlantic mesh bycatch study (2004).
* Worked with outer Cape Cod hook fishermen to bridge gaps between New England fisheries stakeholders through education, creative partnerships, research, mediation and public rallies for grassroots, non-profit fisheries conservation organization.
* Presented educational workshops & lectures to fishermen, community groups, elementary to college classes, fisheries management and science communities.
* Created first Community Fisheries Action Center in New England offering technical services, education and skill workshops, resources and a comfortable meeting place for the Cape Cod fishing and coastal community.

<u>Stacy Kubis</u>
* Worked with other co-investigators on the 2005 yellowtail tagging study, administering the tagging database.
* Chief scientist on cooperative research cruises for the yellowtail industry-based survey (spring 2005).

* Worked with outer Cape Cod hook fishermen on a haddock tagging and maturity study.

<u>Rodney Avila</u>
* Currently involved in a cooperative cod tagging project with SMAST.
* Worked with other co-investigators to develop the 2003 NEFFSC tagging study. Actively involved in project outreach in New Bedford.
* Cooperated with Arne Carr, MADMF, on various gear research to decrease bycatch.

<u>Fred Mattera</u>
* Worked with other co-investigators to develop the southern New England-Mid Atlantic tagging study.
* Instrumental in developing the yellowtail Industry-Based Survey in the southern New England-Mid Atlantic area. Two offshore trawlers completed 300 tows (150 random stations and 150 industry-selected stations) in May 2003, and are planned to sample another 300 stations in autumn 2003.

<u>Luis Ribas</u>
* Worked with the Massachusetts Division of Marine Fisheries on "Reducing Bycatch of Cod in Trawl Fishing.". He developed the Ribas net, conducted research with the Raised Foot Rope Trawl in the whiting fishery, and participated in scup and squid research.

Current and Pending Support for Principal Investigators
* Steve Cadrin and Stacy Kubis are full-time employees of NEFSC and are partly funded by the NEFSC Cooperative Research Partners Program, but do not derive income from cooperative grants.
* Azure Westwood is under contract with NEFSC to develop cooperative research for yellowtail flounder, but does not derive income from cooperative grants.
* Rodney Avila, Trident Fishing Corporation, was awarded contracts of $40,000, $44,000 and $28,000 from NEFSC to tag yellowtail flounder on Georges Bank in July 2003, August 2004 and August 2005, respectively. He was also awarded $15,000 to tag cod by SMAST.
* David Goethel was awarded contracts for the two Northeast Consortium studies described above, and was awarded contracts of $7,500, $10,500 and $7,500 from NEFSC to tag yellowtail flounder in Massachusetts Bay in June and July 2003, and coastal Maine in June 2004 and June 2005, respectively. He is also funded by the Study Fleet Project.
* Fred Mattera and is not currently contracted for cooperative research.
* Luis Ribas was awarded two contracts of $7,500 from NEFSC to tag yellowtail flounder in Massachusetts Bay in June and July 2003, and July 2004.

Appendix A. Cooperative-Tagging.org

Yellowtail Flounder Cooperative Tagging Project

Real People **Real Boats** **Real Science** … and making a difference in New England fisheries.

In Memory of Captain Scott Westcott

The Project

Who's Involved

Tag Return Details

Press & News

Lottery/Winners

Posters

The Trips

Results

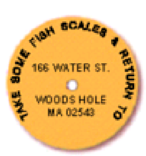
About YT

Data Tags

Links

FAQs

Email Azure.Westwood@noaa.gov with Comments/Questions



Find any of these tags?

Click here
for more info or call toll free:

1-877-826-2612

New tags in 2005:

Yellow $100 tags

Orange scale blanks

Thanks to the key cooperators:

NOAA Fisheries, SMAST & New England fishermen

Funding generously provided by NOAA Fisheries Stock Assessment Improvement Funds, the Northeast Consortium and NMFS Cooperative Research Partners Program

Welcome Page

Privacy Policy www.nefsc.noaa.gov

Appendix B. Cooperative Yellowtail Tagging 2nd Annual Meeting

May 2, 2005 – Woods Hole, MA

Participants:

Fishermen:
Rodney Avila Sr.
Carl Bouchard
Steve Follett
David Goethel
Fred Mattera
Dennis Robillard Jr.
Scott Westcott

SMAST:
Joachim Groeger
David Martins
Rodney Rountree

NE Consortium, UNH:
Rachel Gallant

RI Fish & Wildlife:
Sarah Pierce
April Valliere

Manomet Center:
Kris Joppe-Mercure Greg Morris

REMSA Observers:
Janine L'Heureux
Meryl Segal

NEFSC:
Larry Alade
John Boreman
Steve Cadrin
Bill Duffy
Jonathan Duquette
John Hoey
Rob Johnston
Nathan Keith
Stacy Kubis
Kevin McIntosh
Josh Moser
Bill Overholtz
Mike Palmer
Sarah Pregracke
Paul Rago
Fred Serchuk
Gary Shepherd
Vaughn Silva
Azure Westwood

The meeting began with a welcome and introduction from **John Boreman**, the Director of the Northeast Fisheries Science Center (NEFSC). He commended the yellowtail tagging project on its success as a cooperative research project.

Azure went over the contents of the meeting packets, the agenda for the day, and lead a round of introductions.

Steve Cadrin gave a presentation on the background of the yellowtail tagging project and then reviewed the objectives of the project, experimental design, field protocol, outreach, etc. Steve finished up with a summary of Canadian (DFO) tagging that Heath Stone conducted in 2004/2005.

David Goethel presented a summary of 2004 tagging on his vessel (F/V Ellen Diane). The main goals were to avoid cod, dogfish and skates AND still catch a sufficient number of yellowtail in good condition for tagging. To do this, shorter ground cables (15 fa) were used and the hydraulics were slowed down during haul back. Fish were held in round kiddie pools and the deck was kept wet at all times. Some key points from the presentation were:

1) Water temperature is an issue in fish survival. Water should be from a clutch pump, not engine water.
2) Short handling times are essential.
3) How you release the fish matters. We need to minimize orientation time by releasing the fish nose-down into the water.

Dave noted that the majority of recaptured fish are in excellent condition; however, he caught one tagged fish with an infection possibly due to a bad nickel pin. Dave expressed his support and interest in the cage/mortality study slated for 2005. Azure added that they learned a lot about transporting fish for the holding study from colleagues at Great Bay Aquaculture.

Azure summarized the 2004 trip aboard the F/V Blue Skies with Captain Luis Ribas. The major problem on this trip was warm water temps killed 6 of 30 fish that were to be used in the holding study. She then moved on to the first Georges Bank trip of 2004 aboard the F/V Olympia with Captain John Raymond. She noted that offshore trips are very productive with thousands of fish being tagged on each leg. Azure finished up by summarizing the trip aboard the F/V Trident with Rodney Avila Jr. Rob Johnston added that Rodney Jr. was a huge asset to the project, both as a fisherman and a yellowtail tagger – he was an active player in all aspects of the work.

Nathan Keith summarized the 2nd Georges Bank (GB) trip aboard the F/V Elizabeth with Captain Shawn McLellan. Hurricane Alex required the tagging team to alter their trip plans. Despite that, they were still able to tag 3500 fish in 10 days.

Rodney Rountree from School for Marine Science and Technology (SMAST) summarized their tagging work from 2004 (n = 2709). As a side project, they took calibrated photos of ~ 40% of the fish so condition could be looked at. They're searching for a student to take on this task. Rodney presented the results of a circular statistic analysis which showed the direction and distance moved by season.

April Valliere discussed the yellowtail industry based survey (IBS). She explained that tagging was initially part of the project, but turned out to be too much to take on so it was handed over to Massachusetts Division of Marine Fisheries (MADMF) and SMAST. Even though the IBS has great potential for tag recaptures, only 2 fish have been recaptured to date. Steve added that those 2 tags are valuable info.

Steve C. summed up the trip reports by adding that the project has met it's goal of proportional tag distribution and that flexibility in the offshore trips has helped by allowing time to "clean-up" in areas that needed more tags.

Paul Rago gave a summary of the Northeast Tagging Workshop. He stated that all tagging programs are linked and we should learn from other projects. He noted that this project is first rate in its statistical design. Changing the color of High Reward tags to enhance tag returns was a recommendation from the workshop and has been implemented for the 2005 tagging season.

- **David Goethel** suggested that fishermen might be able to help us determine who is reporting tags and who isn't. This will help us calculate a more accurate reporting rate.
- **Rodney Avila Sr.** suggested we improve our outreach/communication with fishermen. He says fishermen are confused as to what they should do with tags and need more information regarding the tagging project. He also suggested our posters should be double-sided and be more informative.
- **Carl Bouchard** suggested we have tag/scale envelopes available in fish houses and that a prompt response to a tag return is extremely important.
- **Fred Mattera** suggested we emphasize the essential information (tag #, date, location and length) through outreach to improve the quality of the tag return data.
- **Dave Martins** raised the question: What does a fisherman do with a tagged fish when fishing regulations are in place? Steve responded by saying, "If you catch it, return the tag", explaining that the simplest rule may avoid confusion.

Breakout Discussions:

During the lunch break, participants were organized into groups to discuss the following topics. A brief report of breakout discussions was presented to the entire group after lunch.

1) Protocols
    a. Some deck hoses are too powerful.
    b. Should ice be added to water to keep temperature down? Will this affect salinity?
    c. Should fish with high reward (HR) and data storage tags (DST) be lowered to the bottom in a cage to ensure their survival on the way down?
    d. Should boats with high gunnels use a shoot to release tagged fish?
    e. Tags should be organized in numerical order prior to tagging to minimize data recording errors. However, we still need to confirm the tag number for each fish; we can't assume it's the next number in the series.
    f. Field data sheets and database should be revised to make comments standardized. Revise the protocol to have pictures representing each main comment category.
    g. Some believe wet gloves are necessary for tagging, others say wet hands are ok.
2) Outreach
    a. Does the color of tags increase the likelihood of predation? Rodney Rountree stated that red, orange and yellow are absorbed at depth and are the correct colors to use.
    b. We need to revise the lottery policy to encourage reporting all tags, even those with little information.
    c. We should keep a presence on the docks and distribute tag/scale envelopes to dealers.
    d. A monthly column in Commercial Fisheries News with hot topics, new events, interesting tag returns, star returners, and photos should be submitted.
    e. We should consider giving recognition to a fisherman each month as a "star returner" and post on web, newspaper, docks, service centers, etc.
    f. Information on posters should be more specific.
    g. John Hoey suggested we need more direct outreach to fishermen at meetings. We need to know when and where they occur so we can inform them about up-coming projects. Rodney and Fred said they don't even show up to meetings hosted by fishermen. "We're all fighting the same battle."
    h. We should translate the posters into French to have better communication with the Canadian fishing community.
3) Holding Study
    a. What are some unintended consequences of the holding study? ie: predators, sand fleas (?) – secondary levels of stress. Use of cameras and/or hydrolab may provide more info/insight.
    b. We can take histological samples from fish to determine stress.

   c. Methodology for deploying cages was discussed.
4) Future of YT tagging
   a. We need to meet original objectives for the 2008 yellowtail flounder benchmark.
   b. The center is planning a workshop next fall to focus on analysis of data.
   c. How much time is needed to get the number of recaps to do the analysis is not yet known.
   d. At some point the project will move from tag-release mode to tag-recapture mode.

Lottery Winner: John Hoey drew the winning tag (Tag# 10387), returned by Ignazio San Fillipo, F/V Cat Eyes, out of Gloucester, MA. Ignazio has returned 23 tags to date.

Suggestions for future lottery drawings:

- Provincetown Portuguese Festival, Provincetown, MA - June 23-26, 2005
  - Blessing of the Fleet at MacMillan Pier, Provincetown, MA - June 26, 2005 at 1:00 pm
- St. Peter's Fiesta, Gloucester, MA - June 23-26, 2005
  - Blessing of the Fishing Fleet from the Boulevard (near Fisherman's Memorial Statue) - June 26, 2005 at 3:00 pm
- Blessing of the Fleet, Plymouth, MA - July 16, 2005
- Working Waterfront Festival, New Bedford, MA - September 23-25, 2005
- Safety Training Workshops

A policy on lotteries and eligibility was proposed and modified by the group.

- Lottery drawings are held approximately every 2 months or as fishing industry trade shows, festivals and events arise that are appropriate to host drawings.
- Only 1 tag is drawn.
- Winners must provide their social security number to claim their reward.
- All qualifying tags remain in the lottery bowl for each drawing. Winning tags are removed from the bowl. Vessels who return multiple qualifying tags are eligible. All tags must be mailed to; Attn: YT Tag, 166 Water Street, Woods Hole, MA 02543.
- Tags returned by commercial fishermen with the following info: Name/Address/phone, Vessel name/port, Tag number, Location, Date of recapture.
- Tags returned by processors with at least the following information: Name of person who found the fish, Company name/address/phone, Date tag was found, Point of purchase.
- Tags returned by others (eg. beach-goers, non-related researchers, etc.) are eligible if they provide the following: Name/Address/phone, Company, affiliation, or circumstance in which the tag was recovered, Tag number, Location, Date of recovery
- Tags returned by observers, scientists or other non-fishing cooperators are not eligible.

The group decided that the most important info is Name/Address/Phone, Vessel, Tag #, Date, Location – other info (length, scales, depth, etc. are bonus info). The quality of the location and date are very important; we need to know if they are exact or approximations. For processors, we might only be able to get point of purchase information, not vessel info. We need a token of appreciation for fishermen who return tags that are not eligible for the lottery to keep them interested in the project.

New Website:

- We should replace the seiner with a dragger on the homepage.
- We take TRAC working paper off the website or change its name.
- Should we include contact info for cooperators who appear on the website (email only?)
- Should we include counters for number of tags released and recaptured?
- Add a section about yellowtail bycatch – "Report and return ALL captured tags." This could go on the poster too.

The next meeting should be in January 2006 to allow advanced planning for 2006 tagging.

Steve C. went over model development and demonstrated how the model works. He stressed that we can't assume a constant harvest rate over the entire year, and that we need a better estimate of reporting rate. Fred Serchuk suggested we get data on commercial fishing effort to improve our understanding of probability of recapture in stat areas.

Joachim Groeger presented results of Cod DST analysis and inferred movements from oceanographic data.
Steve C. presented results from DST analysis. Fish come off bottom at sunset for approximately 4 hrs. Off-bottom movements are not related to spawning. Off-bottom movements may be related to feeding.

- Fred Serchuk, Rodney Avila Sr., and Fred Mattera all suggested that off-bottom movements may be related to the lunar cycle. We should look at off-bottom movement patterns within months. The fishermen supported the lunar cycle hypothesis by adding they catch more fish on a full moon than a new moon.
- Scott Westcott suggested off-bottom movements may be an avoidance behavior related to skate densities.

- Greg Morris suggested we access the night tow data from the Study Fleet.
- Steve C. suggested we change the release structure for DST tags for 2005 and test a hypothesis instead of scattering tags throughout the region.

Data Storage Tag Deployments:
- April Valliere suggested the Nantucket Lightship Closed Area (NLS).
- Fred Mattera suggested we flood the area where the biggest problem is (ie: SNEMA).
- Rodney Avila Sr. suggested we might not get tags back in SNEMA due to the disincentives to fish there.
- Rodney Rountree advised that 100 tags is not enough to split up into different areas; they all need to go in one place in order to get enough returns for a statistical analysis.
- Carl Bouchard suggested Ipswich Bay.
- Greg Morris suggested Great South Channel to study movements among the three management areas.
- A conclusion on DST strategy for 2005 was discussed (see conclusions below).

Larry Alade presented results of the holding study from 2004 and the scope of the proposed cage study for 2005.
- Fred Serchuk questioned whether 3 days was enough time for the cage study considering the results from the holding study (mortality increased at day 17).
- Others suggested there was a trade-off between a short study and the added effects of starvation, burying, etc with a longer study.
- Fred Mattera noted a URI paper on scup, in which mortality was caused by cages.

2005 Work Plan
- Fred Serchuk suggested we put some tags in area 561 to continue the series.
- Steve went over the bid packages and the bid process.
- The fishermen in the group suggested that the dollar amount needs to increase to account for rising fuel costs.
- Fred Mattera suggested the 'lower' per day amounts might restrict the caliber of vessels that submit bids.

Conclusions from the meeting:
1) Data Storage Tags
    a. In 2005, all 133 tags will be deployed in or near Closed Areas II.
    b. In 2006, DSTs will be deployed in the Great South Channel. The Great South Channel was considered to be a more important management issue than Ipswich Bay, which will be a leading candidate for subsequent DST deployments.
2) NLS
    a. 2006 – 1000 disk tags will be deployed in NLS with a unique number series which will be excluded from the movement-mortality model, but used to study movement near the NLS closure.
    b. This will require a revision to the proposal/budget to increase number of sea days for deployment of 1000 tags in NLS.
3) Criteria for Vessel Selection
    a. The group agreed that a mix of old and new cooperators is best, and we need to expand the circle of cooperative research.
    b. We should expand the criterion so that participation in cooperative research includes: returning tags, taking observers onboard their vessel, and attending meetings.
    c. David Martins suggested we ask fishermen to include number of bunks for offshore trips to be sure they can accommodate the tagging crew.
    d. Fred Mattera suggested adding a section related to safety. Steve C. added that safety was in the contract requirements, but adding a point about proven vessel safety was a possibility.

Appendix C. Peer Review Report

(excerpts from Tallack et al. 2005. Proceedings from a workshop to review and evaluate the design and utility of fish mark - recapture projects in the northeastern United States)

2. Discussion on the Yellowtail Flounder Cooperative Tagging Study
The Yellowtail Flounder Cooperative Tagging Study was presented to the workshop (see p.15), and participants offered suggestions to improve the study. The discussion was constructive and led to several possible modifications of field protocol, analytical approaches and outreach methods. Suggestions from the group as well as aspects from other tagging studies were compiled by yellowtail tagging collaborators as issues for discussion and consideration for future work. These issues are included as numbered sections at the end of each subheading.

2.1 Data collection protocol
Several issues about experimental design were discussed. Interaction with stakeholders to identify goals and associated design elements was viewed as a strength of the project. There was general consensus that releasing tagged yellowtail in proportion to local abundance was sound. However, there was a suggestion to update the analysis of geographic distribution for future tagging.
Methods of minimizing or evaluating tag-induced mortality were suggested, including an inspection of recapture rates for fish in 'good' and 'excellent' condition. Other tagging studies use wet cotton gloves to minimize scale loss when handling fish, but scale loss is not apparent for yellowtail when using wet bare hands.

Data-storage tags
The use of data-storage tags (DST) was discussed as a complement to conventional tagging. The utility of DST information may be more associated with understanding movement mechanisms than representing movement of the population. Therefore, a strategic shift from representative DST releases to hypothesis-driven releases may more effectively complement to the representative design of disc tag releases. Particular recommendations included:

Revise the strategy of DST releases from representative of the population to more specific hypothesis testing (e.g., saturate the edge of stock areas or closed areas).

Evaluate the geographic distribution (currently based on 1998-2002 survey data) needs to be updated to 2000-2004.

Increase the number of double-tagged releases to better evaluate tag retention.

2.2 Outreach
The group discussed several aspects of outreach and reporting systems. For example, indicating highvalue tags with a different color may be beneficial, as long as it is at least as visible as the lottery tags. Particular recommendations included:

Bilingual letters should be included in mailings.

It may be better to have a high-value tag with a different color, as long as it is at last as visible as lottery tag.

Links to more tagging websites are needed on the yellowtail website.

More outreach to Canadian fishermen is needed (e.g., the toll-free number needs to be supported for calls from Canada, mailings directed at Canadian process plants and docks).

2.3 Data management and analysis
The movement-mortality model was a topic of discussion. To allow sequential calculations, the process equation assumes that tagged fish move to new areas at the beginning of each time step then are exploited by the fishery. This simplification may not adequately represent the actual system. The evaluation of model structure and performance using analysis of historical data was also considered to be worthwhile. The potential use of acoustic arrays for assessing tag-induced mortality was mentioned, but may be less effective for demersal fish if tags keep pinging after death. The value of double-tagging was also mentioned as an approach to evaluating tag retention. Reporting rate can be approximated by the portion of yellowtail catch from vessels that report tag recaptures to catch from vessels that catch a large volume of yellowtail but do not report recaptures. Similarly some fishing trips can be expected to have 100% reporting rate (e.g., observed trips, trips by project collaborators).

Analytical recommendations

Permit numbers of vessels from which tag recaptures are reported and their associated catch should be tabulated and compared to catch of vessels for which there are no tag returns.

Fishing trips that likely have 100% reporting (e.g., observers on board, project cooperators) should be identified and used as the 'gold standard' for calculating relative reporting rates.

A comparison of return rates of yellowtail in 'excellent' or 'good' condition should be evaluated to assess tag-induced mortality.

The sensitivity of the model assumption that movement occurs before mortality should be explored.

Database recommendations

Methods should be developed to make audited data available to project collaborators and the public.

Tag return envelopes should be provided with required information.

Vessel name and permit number should be recorded as a critical information when tags are reported.

Inspection of the mode of reporting (phone, mail, intermediate contact) may help to identify what we should do to promote reporting recaptures.

Recaptures with less reliable information should be identified.

More data support is needed for timely keypunching, audits, and ease of analysis.

Appendix D. 2004 Tagging Protocol

Tagging Check List

PAPERWORK/OTHER

- Captain's Haul Logs
- Tagging Data Sheets (water-resistant)
- Clip board
- Scale envelopes
- Mechanical pencils/lead
- Camera

TAGGING EQUIPMENT

- Clear plastic divider box
- 2 measuring boards
- Lottery tags, pre-organized numerically
- Pink blanks
- Orange scale blanks
- 3" nickel pins
- $100 pink/yellow tags
- Data storage tags (activated prior to the tow)
- Data storage tag oval blanks
- Magnet
- 2 spring loaded pliers
- Tweezers for plucking scales
- Rubber bands for scale envelopes
- Working surface
- Holding tanks for the fish
- Timing device

S A M P L E

YELLOWTAIL FLOUNDER COOPERATIVE TAGGING PROJECT
CAPTAIN'S HAUL LOG

TRIP ID	YT2005- 01	VESSEL NAME	Ellen Diane	DATE SAILED (mm/dd/yy)	6/15/2005	DATE LANDED (mm/dd/yy)	6/15/2005
PORT	Hampton, NH	HULL ID #	654949	CAPTAIN	Dave Goethel		

HAUL #	7	STAT AREA	513	WIND SPEED	10 kn	WIND DIRECTION	N = 0° S = 180°	NE = 45° SW = 225°	E = 90° W = 270°	SE = 135° NW = 315°	or 123 °
HAUL DATE (mm/dd/yy)	6/15/2005			TOW SPEED	3 kn	AVERAGE DEPTH	24 fm		WIRE OUT	75 fm	

			LATITUDE / LONGITUDE (DD MM.M) -- LORAN (XXXXX)			
			LATITUDE / BEARING	LONGITUDE / BEARING	WATER TEMP	48 °F °C
BEGIN	TIME (24 HRS)	13:47	42° 52.310	-70° 42.740	TOTAL CATCH (ESTIMATED)	110 lbs
END	TIME (24 HRS)	14:16	42° 53.050	-70° 42.410	YT CATCH (ESTIMATED)	66 (= COUNT * 2.2) lbs

SPECIES	POUNDS	SPECIES	POUNDS	COMMENTS
Mixed Skate	15			Caught 1 tagged cod - #17555
Cod	20			Small 5" tear in the net; mended
Ocean Pout	5			YT count = 30 (30 * 2.2 = 66 lbs)
BlackBack	4			

How to fill out Captain's Log

- The Captain and Chief scientists are to arrange specific areas to fish based on the contract agreement prior to departure.

- Insure that the captain has enough haul logs for the trip. Explain how to properly fill out the sheets. Fill in all fields on the data sheet. Important points to remember:

  – ***Trip ID:*** On day trips, each day is entered as a new number (i.e. Day 1 = 01, Day 2 = 02, etc.) For trips of duration greater than 1 day, the same number should be entered for every day aboard the same vessel (i.e. Day 1 = 10, Day 2 = 10, etc.)

  – ***Haul #:*** Haul numbers will reset for single day trips but not for multi-day trips.

  – ***Wind direction*** can be circled if it is an estimate. Exact wind direction readings, from a computer or anemometer, should be written in the wind direction box (i.e. the wind direction is 93°).

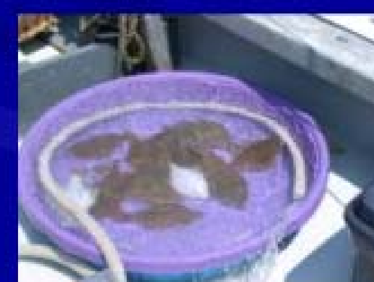
  – ***Begin*** and ***End haul*** times should be entered in 24 hour clock mode.

  – ***Total catch*** should equal the sum of individual species estimates including yellowtail. Yellowtail weights should not be recorded as a count. If you count the number of fish, assume each one weighs 1 kg (2.2 lbs). Multiply your count by 2.2 and record in the box marked "YT Catch Estimated".

  – Make any comments about torn gear, net obstructions or other observations in the ***"Comments"*** section.

Getting ready to tag

- During steam out of prior to tow haul back, pre-arrange the lottery tags numerically. Organizing them on a nickel pin with 50 per pin.
- Ready the tag box with the following:
  - Pins
  - Pink blanks and Orange scale blanks
  - Lottery tags (pre-arranged numerically)
  - $100 reward tags
  - Data storage tags and DST oval blanks
  - Rubber bands, scale envelopes, pliers, pencils and a timing device
- The chief scientist should activate enough DSTs to last for 1 day. Be sure to record the time they were activated (24 hour clock).
- Designate and record on the data sheet who will tag and record.
- Pre-fill the tagging data sheet with the heading information (Vessel name, date, etc.)
- During haul back, set up the deck in a way that is appropriate and safe based on the deck configuration.
- Set up a tagging bench or station
- Set up live well (s) and run the deck hose to fill.



Top: Improvised tagging bench used on a smaller vessel. Bottom: Large and small live wells.

Activating the Data Tags

- Hold the tag with its yellow bead thermistor to your right. The magnetic reed switch will be at the top edge of the tag.
- To begin a recording session, tap the tag at its upper right or left corner 4 times with one pole of a magnet. The four taps must occur within two seconds and the magnet must not come near the tag for the following two seconds. After each tap, move the magnet at least 2-inches away from the tag. The magnet does not need to actually touch the tag.
- The light-emitting diode (LED) will blink brightly to indicate that the tag has started. It will then blink at 14- and 15-second intervals (an average of once every 14.06 seconds), one blink corresponding to each sample that is taken.
- If the LED blinks approx. twice each second, the tag is in a rapid-recording test mode. To clear this, tap the tag 4 times with the magnet. The test mode will drain the battery more quickly than the normal recording mode.

Specifics to Fishing

- The priority is to obtain fish that are strong and healthy enough to be tagged and released in good to excellent condition (see condition ratings on page 11).
- Captain is responsible for finding concentrations of yellowtail
- Tow duration is to be short, no more than 40 minutes, to ensure small enough tows to process without undue stress and exposure to the fish. Ideal tow duration is between 15-30 minutes, depending on the area and time of day.
- If tows come up with few yellowtail and numerous skates and other species, move to another area. Bycatch, particularly skates, damage the condition of yellowtail.
- **Do not begin another tow while fish are being released, even if this compromised the amount of tows that can be done per day.**
- For day trips, perform 6-10 tows per day, depending on steam time and weather.
- For offshore, multi-day trips, make as many tows as possible in day light hours. **Stop fishing before dusk.**

Sorting the catch

- Have Captain estimate total catch (in pounds) and record on his tow data sheet.
- Choose the quickest most efficient way to isolate live yellowtail from the catch.
- With straight yellowtail tows, bag can be dumped in live well (if using a large live well).
- If the tow is mixed species, dump the tow on a wet deck.
- Gently select yellowtail from the mix and **place upright** in the live well (s).
- If there are enough people, have the crew isolate the yellowtail while the scientific staff begin tagging.

Top: Dumping clean catch directly into live well.
Bottom: Dumping mixed catch onto a wet deck.

Tagging – I: Fish Condition

- Gloves are not required to handle the fish (it is easier to handle the fish without gloves). If gloves are preferred, use rubber gloves that will not cause scaling. If no gloves are used, make sure hands remain wet when handling fish.
- Chose a fish from the live well and assess its condition. Only tag EXCELLENT or GOOD rated fish:
  - Rate the fish (1) if it is in **EXCELLENT** condition. Excellent fish will be lively, scale condition clean and relatively unscathed. Operculum or mouth movement may be noticeable. Fish feel robust and have strength when held against the measuring board. No blood clotting present around gills or operculum. Fish may be flapping, although yellowtail are generally calm, even when in excellent condition.
  - Rate the fish (2) if it is in **GOOD** condition. Good condition fish are those that generally look healthy, exhibit some signs of an excellent fish. Strong body with no large abrasions of defects. Fish may have scale abrasion or net marks. Anal protrusion or slight anal tearing present.
- Fish rated (3) are in **poor condition** and unfit to tag. Fish is unacceptable to tag if it appears that the chance of survival is low, heavy abrasion is present, body is flaccid, and there is little movement or reaction to handling. Notate why fish is unfit to tag (i.e. "giant gash, gilled, heavily abraded" etc.) or if the fish is dead ("beheaded, torn body" etc.)

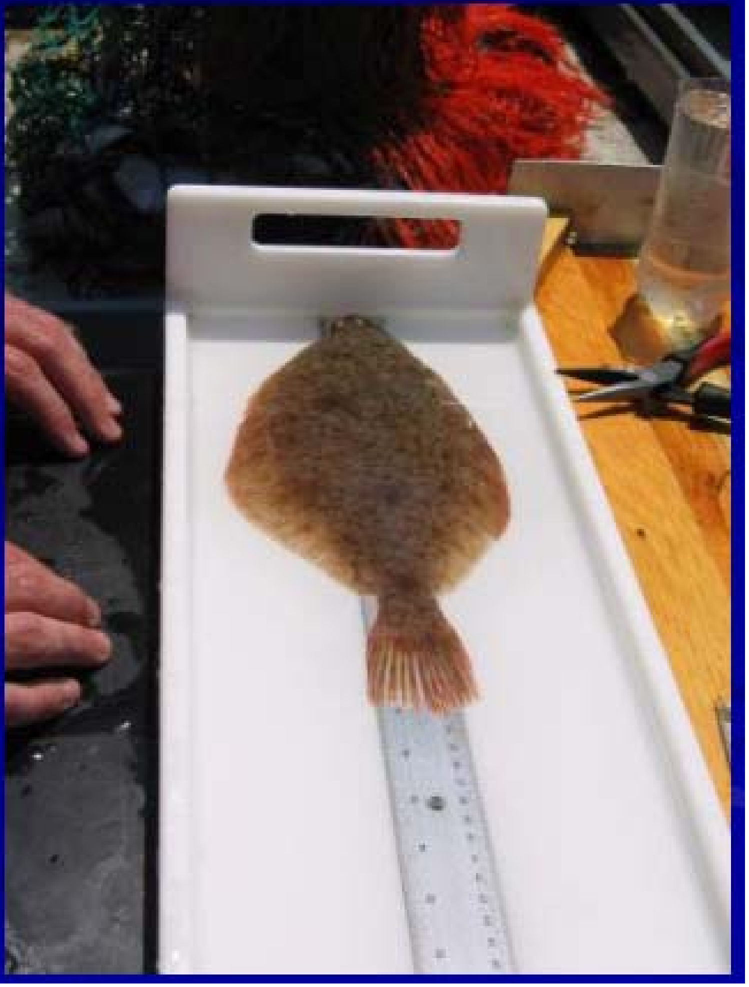
Tagging - II: Sexing

- Determine the sex of each fish. Maturity stage is not necessary to notate.
- Determine the sex by candling the fish. Hold the fish up to the sunlight and examine the ventral area of the blind side.
- Nearly all legal sized females should be mature (if tagging during the spawning season) and have a large ovary extending posteriorly from the abdominal cavity.
- Inspect the ventral area of the blind side to determine if an ovary is extending into the ventral tail meat:
  - If there is darker tissue extending from the abdominal cavity toward the caudal area, code as "female."
  - If the ventral and dorsal portions of the tail (posterior to the abdominal cavity) are identical in color, code as "male."

Top: Female. Bottom: Male.

Tagging – III: Measuring

- After the condition of the fish is deemed excellent or good, proceed to measure the fish.
- Minimize the time out of the water and handling of the fish.
- Fish size: Measure from end of snout to end of tail (to 1cm accuracy).
  - Southern New England tagging areas – Tag all sub-legal (less than 33cm) fish and legal (33+ cm). Gauge the size and capability of sub-legal fish to carry a DST before applying data storage tags.
  - All other tagging areas – Tagging legal fish is priority (33cm +). Tag sub-legal fish as time allows and not to detract or affect the quality or progress of tagging legal fish. Chief scientist can decide whether a fish is too small to tag.



Applying Peterson Disks - I

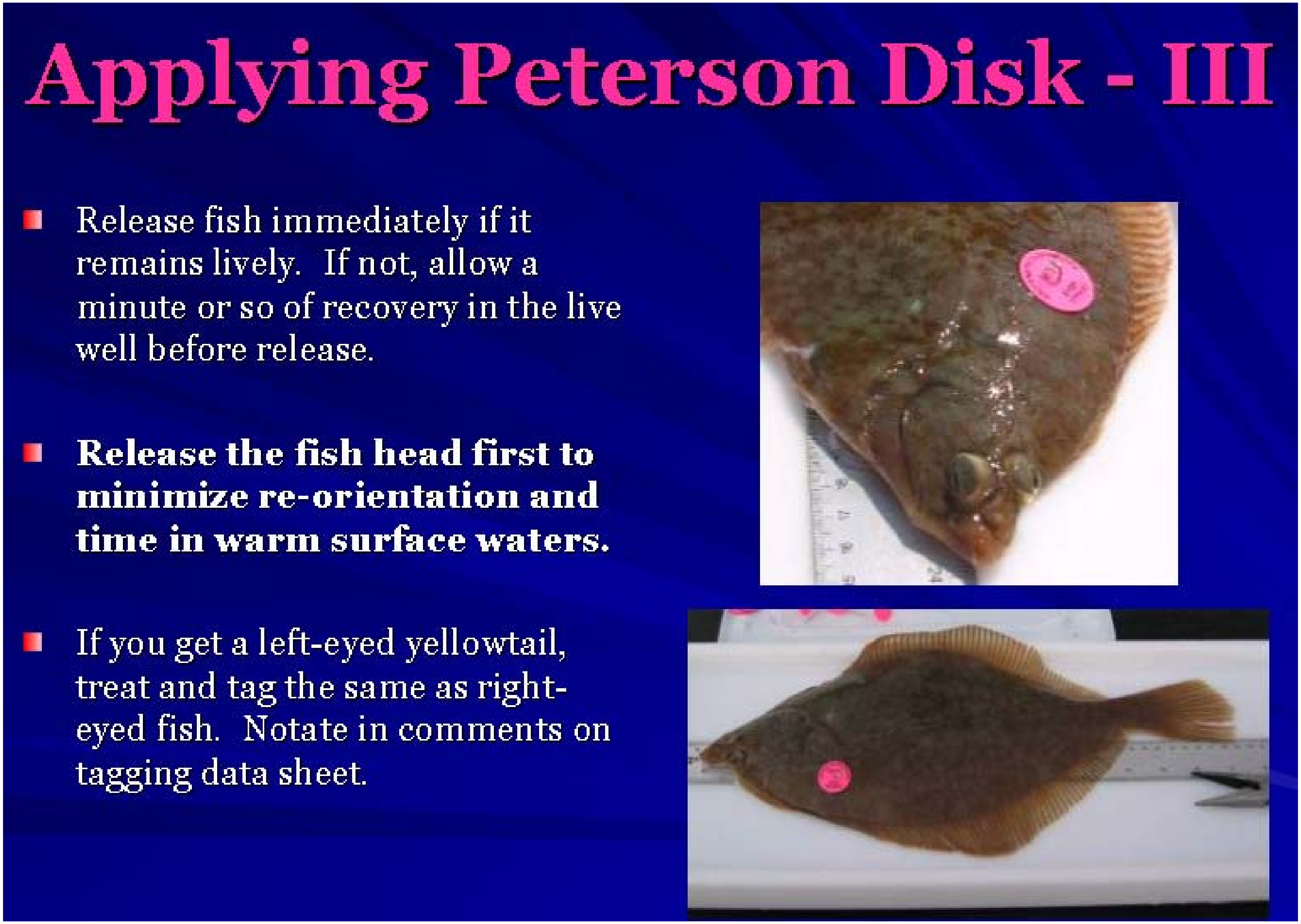
- Locate lateral line arch on blind side of fish. Place the pin with blank disk installed just above the middle of line arch. Puncture the fish.

- Make smooth, clean puncture at a **perpendicular angle** to fish body until blank is flush with blind side.

Applying Peterson Disks -II

- Place pink disk (with side labeled "Call toll free 1-877-826-2612…") facing away from fish on nickel pin, flush with fish body.
- To trim the pin, place needle-nose pliers slightly above flush with tag, cutting edge up and trim the pin. There should be about 1 inch of pin left once trimmed.
- Grab the end of pin with the tips of needle nose pliers. Crimp pin in a U-shape. Close gap between crimp tightly. Crimp should measure approx. 3 mm.
- Bend crimp over with pliers so it's at a perpendicular angle to the post of the pin (parallel to the fish body). **Insure there is space between tag and bend (approx. 3-4 mm, depending of fish size) to allow room for growth. For sub-legal fish, allow approx. 12-24 mm for growth, depending on fish size.**




Applying Peterson Disk - III
Release fish immediately if it remains lively. If not, allow a minute or so of recovery in the live well before release.
Release the fish head first to minimize re-orientation and time in warm surface waters.
If you get a left-eyed yellowtail, treat and tag the same as right-eyed fish. Notate in comments on tagging data sheet.

Applying Data Tags – I

- **What you will need:** 1) Activated data tags, 2) pink oval backing tags, 3) nickel pins, two per tag, 4) pliers, 5) tweezers for taking scales, and 6) scale envelopes.
- Make sure the tag has been activated by watching for a red flash on the tag. If activated during the trip, the flash should be every 15 seconds to 1 minute.
- Data tags are applied using 2, 3" nickel pins (instead of the 1 used for disk tagging).
- Ready the oval backing tags by placing a pin in one end. Make sure the labeled side will be facing out.
- Align the oval blank similarly to the disk tag, above and centered to the lateral line arch.
- **Insert the first pin at a perpendicular angle** to the fish body. This is very important in aligning the tag correctly over the pins.
- When the pin and oval disk are in place, insert the second pin, **getting the two pins as parallel as possible** to each other.
- Fit the data tag, return address label up, over the pins.

Applying Data Tags - II

- Trim the pins one at a time. Place the needle-nose pliers slightly above flush with tag, cutting edge up and trim. There should be about 1 inch of pin left once trimmed.
- Grab the end of pin with the tips of needle nose pliers. Crimp pin in a U-shape. Close gap between crimp tightly. Crimp should measure approx. 3 mm.
- Bend crimp over with pliers so it's at a perpendicular angle to the post of the pin (parallel to the fish body). **Insure there is space between tag and bend (approx. 3-4 mm, depending of fish size) to allow room for growth.**
- For sub-legal fish, chief scientist will decide whether the fish is big enough to carry a data tag. If tagging, allow approx. 12-24 mm for growth, depending on fish size.
- Be sure to record the time when the fish is released for every data tag deployed.

Getting Scale samples

- Scale samples are to be collected for the following fish:
  - All $100 tags
  - All data tags
  - $1000 lottery tags that are applied with orange or pink scale sample backing tags.
- Chief scientist will decide how many scale samples to collect.
- Generally, taking scales from at the beginning of each tagging session is helpful in assuring scales are collected from fish in the best condition.
- Only take scales from fish in excellent condition.
- If taking scales will compromise fish health, take scales from next fish.
- Pluck 5-10 scales using forceps from just above the lateral line, approx. midway on body of fish.
- Place scales in a small envelope and label with the station information, date, sex and length of the fish.
- Record any comments on the data sheet.

S A M P L E

SHEET 1 OF 1

YELLOWTAIL FLOUNDER COOPERATIVE TAGGING PROJECT
TAGGING DATA SHEET

TRIP ID	YT2005-____ ____	HAUL #	7	STAT AREA	513	HAUL DATE (mm/dd/yy)	6 / 15 / 04

TAGGER1	Azure Westwood		TAGGER2	Stacy Kubis		RECORDER	Steve Cadrin
	BEGIN	END		BEGIN	END	COMMENTS	
TAGS USED	19100	19112	TAGS USED	19150	19162		
TAGS USED	H01080		TAGS USED	D1050			
TOTAL YT TAGGED	30		FEMALES	20	MALES	10	
# YT DISC ALIVE	1		# YT DISC DEAD	1			

KEY: Condition: (1) EXCELLENT, (2) GOOD, (3) UNACCEPTABLE

	Sex (M,F,U)	Length (cm)	Tag Number	Condition (1,2,3)	Time (24 hr)	TRAWL DAMAGE: Scale Loss	Abrasions	Fin Damage	Fin Tearing	Anal Explosion	Anal Tearing	Net Marks	BIOLOGICAL COMMENTS: Ambi	Lympho	Milt/Ripe	Old Wound/Scar	Sea Lice	Scales (Y,N)	Comments (Tag Type, Notes, etc.)
1	M	36	D1050	1	14:22	SL	AB	FD	FT	AE	AT	NM						Y	DST
2	F	42	H01080	2	:	SL	AB	FD	FT	AE	AT	NM						Y	$100 HR TAG
3	F	41	19100	1	:	SL	AB	FD	FT	AE	AT	NM						N	
4	F	38		3	:	SL	AB	FD	FT	AE	AT	NM						N	POOR COND
5	M	39	19150	1	14:25	SL	AB	FD	FT	AE	AT	NM						N	
6	M	37	19101	2	:	SL	AB	FD	FT	AE	AT	NM						N	
7	F	40		3	:	SL	AB	FD	FT	AE	AT	NM						N	DEAD
8	F	36	19151	2	:	SL	AB	FD	FT	AE	AT	NM						N	
9	F	35	19102	2	:	SL	AB	FD	FT	AE	AT	NM						N	
10	F	42	19103	1	:	SL	AB	FD	FT	AE	AT	NM						N	

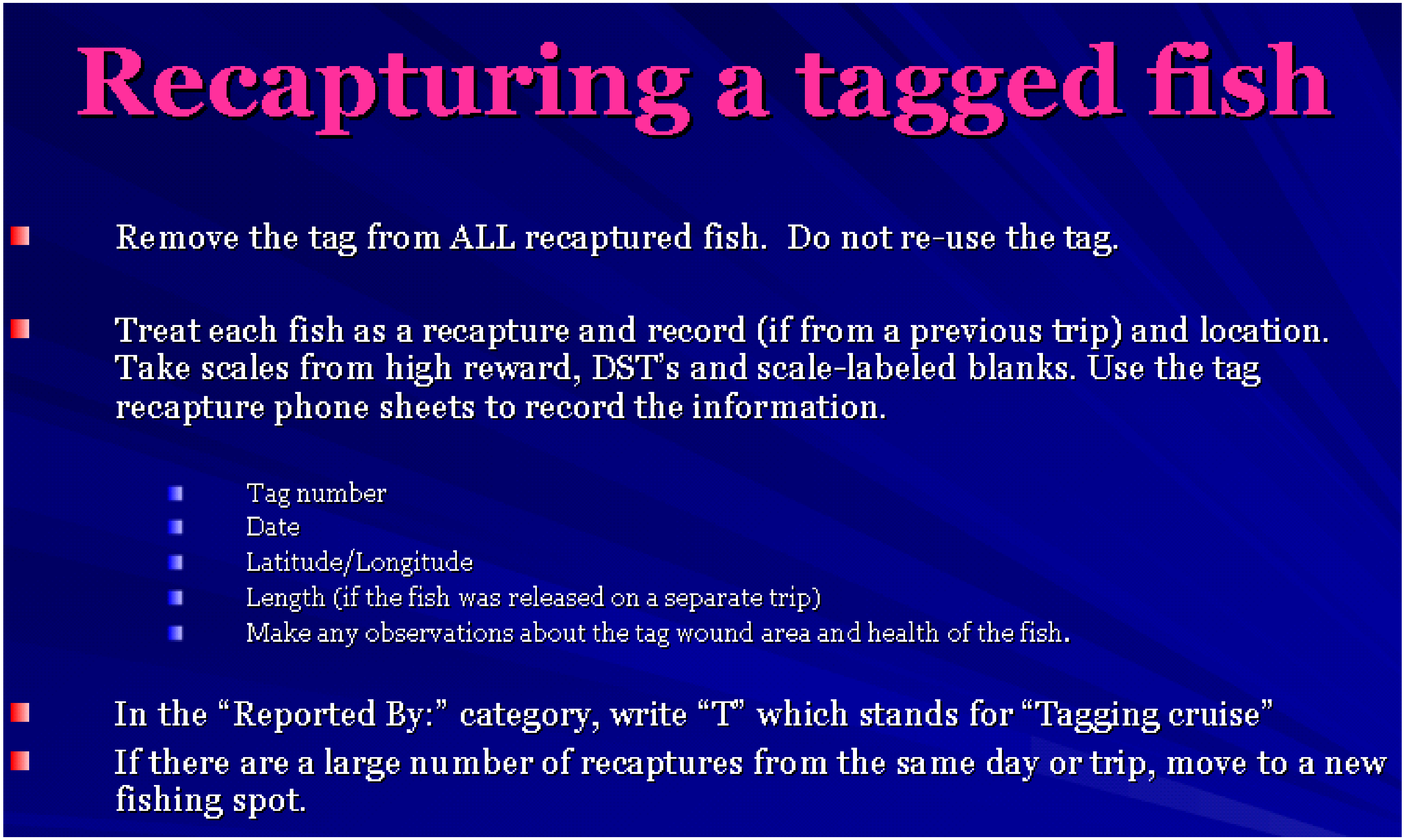
TRIP ID	YT2005-____ ____	HAUL #	7	STAT AREA	513	HAUL DATE (mm/dd/yy)	6 / 15 / 04

KEY: Condition: (1) EXCELLENT, (2) GOOD, (3) UNACCEPTABLE

	Sex (M,F,U)	Length (cm)	Tag Number	Condition (1,2,3)	Time (24 hr)	TRAWL DAMAGE: Scale Loss	Abrasions	Fin Damage	Fin Tearing	Anal Explosion	Anal Tearing	Net Marks	BIOLOGICAL COMMENTS: Ambi	Lympho	Milt/Ripe	Old Wound/Scar	Sea Lice	Scales (Y,N)	Comments (Tag Type, Notes, etc.)
11	M	35	19152	1	14:27	SL	AB	FD	FT	AE	AT	NM						N	
12	F	41	19104	1	:	SL	AB	FD	FT	AE	AT	NM						N	
13	M	40	19153	1	:	SL	AB	FD	FT	AE	AT	NM						N	
14	F	38	19105	1	:	SL	AB	FD	FT	AE	AT	NM						N	
15	M	38	19154	1	:	SL	AB	FD	FT	AE	AT	NM						N	
16	F	37	19155	1	:	SL	AB	FD	FT	AE	AT	NM						N	
17	F	36	19106	1	:	SL	AB	FD	FT	AE	AT	NM						N	
18	F	36	19156	1	:	SL	AB	FD	FT	AE	AT	NM						N	
19	M	35	19107	2	:	SL	AB	FD	FT	AE	AT	NM						N	
20	M	39	19157	1	:	SL	AB	FD	FT	AE	AT	NM						N	
21	F	44	19108	1	14:33	SL	AB	FD	FT	AE	AT	NM						N	
22	F	42	19158	1	:	SL	AB	FD	FT	AE	AT	NM						N	
23	M	32	19159	1	:	SL	AB	FD	FT	AE	AT	NM						N	
24	F	47	19109	2	:	SL	AB	FD	FT	AE	AT	NM						N	
25	F	41	19160	1	:	SL	AB	FD	FT	AE	AT	NM						N	
26	F	40	19110	1	:	SL	AB	FD	FT	AE	AT	NM						N	
27	M	35	19161	1	:	SL	AB	FD	FT	AE	AT	NM						N	
28	F	44	19111	2	:	SL	AB	FD	FT	AE	AT	NM						N	
29	F	43	19162	2	:	SL	AB	FD	FT	AE	AT	NM						N	
30	F	44	19112	2	14:35	SL	AB	FD	FT	AE	AT	NM						N	

Filling out the tagging data sheet

- Paper is "Right in the Rain" water-resistant.
- Trip ID and Haul #: (refer to page 7, ("Filling out the Captain's Log").
- Each tagger will have a pre-arranged set of tags on nickel pins. The tag numbers to be used will be recorded at the beginning of the haul for each tagger and modified at the end of the haul after all the fish have been tagged.
- Record the number of live and dead discards.
- Note the condition of the fish. There are 2 categories, "trawl damage" and "biological comments". Check all that apply to the fish being tagged.
- Make any additional comments in the "Comments" field to the far right.
- Be sure to record the page numbers and all heading information on each sheet used. Each 2-sided sheet is considered one page and given the same number.
- The recorder must tally the total fish tagged and discarded at the end of the tagging session.


Recapturing a tagged fish
Remove the tag from ALL recaptured fish. Do not re-use the tag.
Treat each fish as a recapture and record (if from a previous trip) and location. Take scales from high reward, DST's and scale-labeled blanks. Use the tag recapture phone sheets to record the information.
Tag number
Date
Latitude/Longitude
Length (if the fish was released on a separate trip)
Make any observations about the tag wound area and health of the fish.
In the "Reported By:" category, write "T" which stands for "Tagging cruise"
If there are a large number of recaptures from the same day or trip, move to a new fishing spot.

Appendix E: Budget Worksheet

Northeast Consortium Budget Worksheet

Organizing your budget in these cost categories will facilitate processing of your award. Your budget justification narrative should explain assumptions used to arrive at the budget amounts. Insert rows if you need additional space.

NOTE: Some cells in this worksheet are protected. If you need to add rows, you will need to turn off the protection. Click here for instructions.

Grantee: Northeast Fisheries Science Center

Project Duration (months): October 2005-September 2006

Principal Investigator: Steve Cadrin

Project Title: Yellowtail Flounder Tagging Study

	BUDGET		
COST CATEGORIES:	**Industry**	**Research Org**	**TOTAL**
1. Salaries and wages			
Principal Investigator			
(Insert Name)			
Assistants or Associates			
(Insert Name)			
List all other participants receiving salary			
(Insert Name)			
(Insert Name)			
Subtotal salaries and wages	**$ -**	**$ -**	**$ -**
2. Fringe benefits (*insert your benefits rate*)			
Subtotal personnel expenses (1 and 2)	**$ -**	**$ -**	**$ -**
3. Permanent equipment			
Insert itemized list of equipment			
Subtotal equipment	**$ -**	**$ -**	**$ -**
4. Travel			
Meeting Stipends	$ 2,500		
Subtotal travel	**$ 2,500**	**$ -**	**$ -**
5. Supplies, materials, and other direct costs:			
Disc Tags (11,000 @ $0.75/tag)		$ 8,250	
Data Tags (200 @ $185/tag)		$ 37,000	
Miscellaneous Equipment		$ 5,000	
Lottery and high-value rewards	$ 15,000		
Subtotal supplies and materials	**$ 15,000**	**$ 50,250**	**$ -**
6. Contracts			
Inshore Vessels (18 days @ $2,000/day)	$ 36,000		
Offshore Vessels (26 days @ $4,000/day)	$ 104,000		
Subtotal contractual	**$ 140,000**	**$ -**	**$ -**
Subtotals Direct Costs	**$ 157,500**	**$ 50,250**	**$ -**
Indirect Costs (*insert your indirect/overhead rates*)			
TOTAL	**$ 157,500**	**$ 50,250**	
		GRAND TOTAL:	**$ 207,750**

Letter proposals for Project Development Awards do not need to demonstrate a 75% industry/25% research

TOTAL PROJECT COST	**Costs**	**Percentage of direct costs**
Commercial Fishing Industry	**$ 157,500**	**75.8%**
Research Organization	**$ 50,250**	**24.2%**