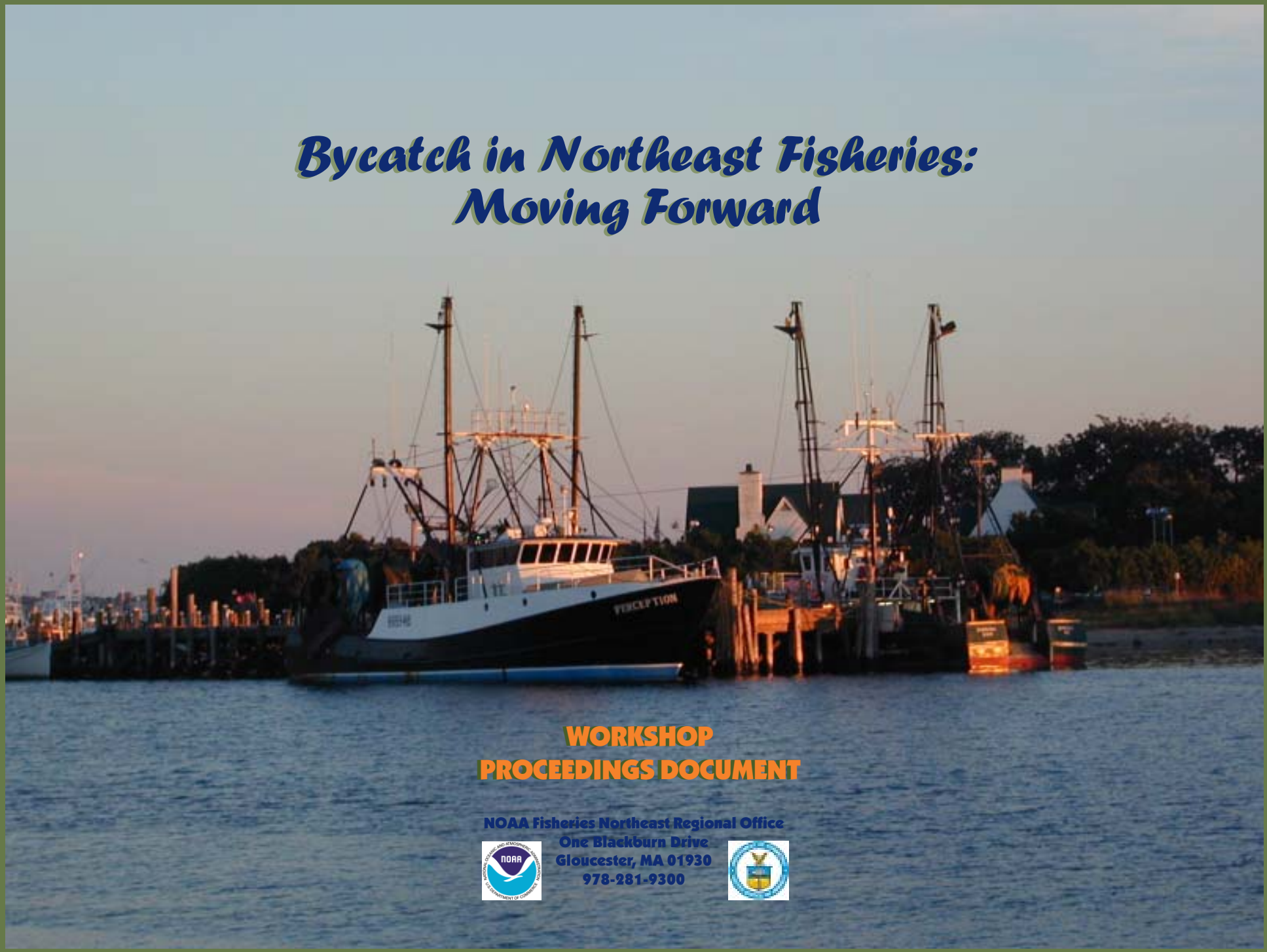
Bycatch in Northeast Fisheries: Moving Forward



WORKSHOP PROCEEDINGS DOCUMENT

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OVERALL SUMMARY

Patricia Kurkul
NOAA Fisheries

I would like to thank the Moderators for the excellent summaries of their working sessions. As I listened, I identified some common themes that ran through the four sessions.

The first is the theme of outreach, communication and training. There have been a lot of comments about the need for such activities, and specific suggestions came out of the working sessions. A number of people have noted that communication has to be a two-way process, and have identified the benefits of face-to-face meetings. This workshop was a first step in establishing this sort of communication, and we need to have more activities like this in the future. As we move forward and improve communication concerning bycatch concerns, we need to involve the full range of interested constituents. We shouldn't communicate just for the sake of saying we did, but need to build trust and partnerships between and among the various groups concerned about the issue of bycatch.

A specific aspect of communication that was noted in several of the sessions was the need to integrate bycatch activities undertaken by the various people and programs working on bycatch issues. There are common threads between finfish management programs and protected species programs, and both the programs and the individuals involved in these two areas need to interact. There are similar interrelationships between various data collection programs and research activities. This need to integrate activities extends into the international arena as well. U.S. programs and researchers need to build on work being carried out in other nations so that we can each learn from one another's successes and avoid one another's pitfalls.

The second recurring theme I heard at this workshop is that there is strong support for cooperative research programs. Specific research areas were mentioned by various people including the need to further use both video and VMS technologies, study fleets and other data collection methods. In addition, there was considerable discussion of the need to develop incentives relating to bycatch. These discussions revealed how challenging it can be to design management programs that provide positive incentives to reduce bycatch. It was noted that some management programs inadvertently create disincentives to reduce bycatch.

Finally, it appears that all of us recognize the bycatch problem generally, and can identify some successes in addressing bycatch issues. However, there also appears to be a general acceptance of the fact that, as stocks improve, the challenges will increase. So I'd like to view this workshop as the beginning of a process, not the end.

MANAGEMENT PANEL SUMMARY

Vince O'Shea
Moderator

The members of the Management Panel exchanged views on the region's most difficult issues regarding bycatch, as well their thoughts about possible solutions. Several central themes emerged during both the panel discussion and breakout sessions.

Urgent priorities for reducing bycatch in the Northeast Region include the need to address the lack of data regarding at-sea discards as well as landings. The management system needs to respond to economic discards, high-grading, and other regulatory driven discards. Improvement in the current situation is not likely to occur without the development of a stronger culture of stewardship from within the industry. This is an opportunity for the industry to demonstrate leadership by addressing bycatch issues in a meaningful and effective way.

Industry's commitment and cooperation is directly linked to trust and confidence in fisheries data. This is a two-way street of helping industry understand the source and limits of the data, as well as a providing a role for industry to participate in quality assurance. Strong communication among all the players is an important element.

Concerns were expressed by some about the dilemma of trying to optimize harvest of healthy stocks while protecting weak stocks. This is of particular concern where local fleets and coastal communities are facing negative economic impacts from restrictive regulations. Other regions have wrestled with this issue, concluding that meaningful protection of weak stocks often means some portion of healthy stocks are left unharvested. Ultimately, these decisions are ones of identifying priorities.

Some have pointed out that the basic management approach is straightforward: set total harvest limits for both targeted and bycatch species based on science; count discards through direct observers or extrapolation of observer data; close fisheries when limits are reached. This approach can drive industry to reduce bycatch in that adoption of successful avoidance techniques is rewarded by full harvest of healthy stocks.

Solving fisheries bycatch in New England is complex given that current over-capacity is driving much of the regulatory and economic discarding presently occurring. Meaningful reduction in bycatch will require addressing the over-capacity issue.

It seems intuitive to ensure a strong link between Protected Species Programs and Fisheries Management given the high potential for protected species problems to force closures of major fisheries.

There is an opportunity now for industry to play a role in crafting effective solutions to address bycatch problems in the Northeast Region. In other areas, where industry was slow to respond, solutions were imposed that were often costly to the industry. The reality is, that as an issue of public policy, bycatch will not go away on its own.

SCIENCE AND RESEARCH PANEL SUMMARY

Dr. Chris Glass
Moderator

First of all let me thank the panel of experts who so eloquently led the discussion during the first session. Each brought enormous experience and expertise to the proceedings and helped stimulate discussion during the sessions that followed. Their input and willingness to participate actively in breakout groups undoubtedly contributed to the overall success of the session. Thanks again to each and every member of the panel.

Overall this was a very interesting exercise and the discussion within each of our 4 breakout groups was vigorous and stimulating. As moderator I was able to move from group to group and listen to discussion unfolding but did not actively participate in the outcome of those discussions. The results and outcome of those discussions are presented in the final report from each group as a non-prioritized, bulleted list. I encourage all participants to read the group reports and to study the detail of their content but here I take the opportunity to present an overview of the days proceedings and to provide a personal perspective on the process and key findings.

The first and most significant observation was that there were remarkable similarities between groups with respect to their responses to each of the questions. Common themes kept recurring and where commonality exists I think this adds considerable weight to those responses. However, the other main observation was that each group identified one or more priorities that were unique to that group and I think the organizing committee should be applauded for structuring the session in a manner that provided scope for creative thinking.

Let me deal with each question in turn. I will not reiterate the responses verbatim, instead I would like to take the liberty of highlighting some of the key priorities that arose during discussion.

Question 1. What are the key science issues for our various constituencies with respect to fishery-related issues and those related to protected species?

- Many participants identified the need to get a better estimate of discard rates both by species and by area. Not only would this give us a better understanding of specific fisheries but would ultimately lead to better and more accurate estimates of overall fish biomass. This in turn would of course lead to better and more effective management of our fisheries resources. This response was noted and highlighted in the panel discussion and in each of the breakout groups and is clearly a priority for moving forward.
- There is a clearly identified need to better understand fish behavior both in terms of their responses to fishing gear but also their behavior with regard to habitat and other factors that may affect temporal and spatial distributions. One recurring theme was that the most effective bycatch reduction devices that have been employed throughout the world utilize differences in behavior patterns between target and non-target species. It was felt that considerable effort should be directed towards studying and quantifying fish behavior, both natural and in response to interaction with fishing gears, and to provide a baseline of data that would assist in development of novel bycatch reduction devices.

Dr. Chris Glass
Moderator

- Each group highlighted the importance of the NOAA/NMFS Cooperative Research Partners Initiative and the Northeast Consortium (among other funding sources) as providing the impetus and funding stream to develop highly effective cooperative research programs within the region. The results of some of these cooperative research programs are now beginning to help in better management of our marine resources but many raised concern over the fragile nature of such funding streams. A generally held belief among all breakout groups was that if cooperative research was to be ultimately effective in better management there was a need to support such initiatives with some form of long-term commitment.

Question 2. What are the highest priorities for new research in estimation of survival rates of discards, fishing impacts of non-target species and habitat, and social and economic dimensions of bycatch?

- All groups identified survivability/mortality of discarded fish to be a high priority for future research. It is clear that bycatch reduction devices are of little use if all the fish that are expelled by the device are subsequently compromised in their ability to survive. A small amount of research has been conducted within the northeast region but a number of working group participants highlighted the wide range of studies being conducted elsewhere, primarily western Europe, and encouraged development of similar studies within the northeast region to better understand extent of mortality induced by contact with bycatch reduction devices. It was acknowledged that such studies are extremely difficult and costly to undertake but that such data would greatly benefit our understanding of total mortality and therefore help improve overall biomass estimates.
- Participants also identified the need to understand mortality rates of fish discarded from the deck of fishing vessels. There are commonly held beliefs for example that fish such as dogfish and skates survive the discarding process with low levels of mortality while others such as haddock and whiting survive rather less well. However, there is little or no data to substantiate such beliefs and the need for such research has been firmly identified. Again, such studies are difficult to do properly and are costly and labor intensive but better data would undoubtedly improve biomass estimates with all its associated benefits.
- There was universal acceptance that there was a dearth of data on impacts of fishing activities on habitat and that considerable efforts should be made to address this issue with emphasis on quantification of such impacts. To date many studies have tended to be qualitative in nature and this has a tendency to polarize debate particularly where recommendations are made with regard to management measures that have important social and economic impacts. As stated above, such studies are particularly difficult and costly but nonetheless imperative. High resolution, multi-beam, seafloor-mapping was identified as an important first step.

Dr. Chris Glass
Moderator

Question 3. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

Responses to this question tended to focus on part of the question namely how to develop cooperative research programs and very little attention was paid to developing research programs aimed at assessing impacts of bycatch on marine ecosystems! That being said, there were a number of important points raised by the working groups that have significant bearing on effectiveness of cooperative research programs that should be highlighted.

Consensus was that it is difficult to assess impacts of bycatch on marine ecosystems when little is known (at least in anything other than superficial terms) of the ecosystems in question. The group response to this was that greater efforts should be made to conduct baseline research on natural processes. By gathering more detailed data on ecological processes and ecosystems and by gathering better data pertaining to bycatch and discard rates within different parts of the marine ecosystem, we may be able at some time in the future to better answer this question.

The other responses to this question are self explanatory but I would like to highlight two here as they were widely identified to be important issues with respect to developing cooperative research programs.

- There were numerous calls to develop and establish some form of centralized repository for scientific information and data gathered from cooperative research programs in the region. At present some if not most of these data are fragmented or simply not available. Establishment of some form of centralized source of data would help avoid duplication of effort, foster collaboration and help coordinate research priorities.
- Embedded in the responses to each of the questions there were numerous references to the need to address aspects of the experimental fishery permit process. It was noted that great strides had been made in recent times to streamline this process (and no single example of permit requests being refused could be identified) but it was still regarded as one of the impediments to conducting timely, effective cooperative research programs. It was recommended that this issue be revisited and concerted efforts be made to implement a system that was responsive without loss of rigorous oversight and controls.

Question 4. How can we improve communication with stakeholders concerning scientific issues in bycatch assessment and management?

As with many of the responses to question 3, responses to this question tended to focus on the obvious, such as utilizing web sites to improve data and information exchange and in general to promote more and better dialogue between industry, science and other stakeholders. Again I take the liberty of highlighting three interesting ideas.

- Results of recent, exhaustive, visioning processes conducted by The Gulf of Maine Research Institute identified middle school students as being the most effective vehicle for getting information to the widest audience and achieving greatest impact with regard to dissemination of information. Paraphrasing part of the

Dr. Chris Glass
Moderator

group dialogue, it would seem that middle school students are sufficiently sophisticated to be able to assimilate relatively high level and substantive scientific information and to view it without preconceived notions or prejudices. The groups recommended that greater efforts be made to explore how information could be made available and targeted towards those of middle school age.

- Members of the scientific and fishing communities spoke highly of initiatives, such as the Marine Resources Education Program, that aim to bring fishermen, scientists, managers and regulators together (and other stakeholders) in a residential classroom setting to better educate all constituents involved in collaborative programs and to learn from shared experiences. The aforementioned course, funded by the Northeast consortium, received glowing references from all involved and there were calls for similar courses to be implemented in other regions of the US as a means to bringing stakeholders together and improving communication. There were also numerous calls to identify long term funding streams to enable the northeast regional course to continue in the future.
- One of the more interesting suggestions during discussion was to explore the possibility of developing some form of 24 hour a day, seven day a week information exchange process through cable television outlets that would deal with all aspects of fishing, fish biology, science, management and regulation. This is analogous to the CSPAN network and participants showed high degree of interest in exploring how feasible this might be as a communication tool.

These comments provide a brief and superficial overview of many hours of substantive and vigorous discussion by a large number of participants. There has been no attempt made to highlight every priority identified during discussion, but merely to provide a flavor of that discussion. I encourage readers to study the report in all its detail and I thank each of the panelists and every participant for a stimulating and productive session.

GEAR TECHNOLOGY PANEL SUMMARY

Arne Carr
Moderator

The Gear Technology Panel addressed the three questions given for their consideration and spent most of the deliberative period on the first question.

This question addressed information and communication bridges between groups: between the researchers and the fishermen; researchers and managers, among researchers, and with environmental groups. Environmental groups were not initially included in this questions but the working group agreed to the importance of their inclusion.

Under this question came priorities for more involvement, communication and planning by all parties. Some of the main points discussed follow:

1. A means must be found to get the fishermen more involved and knowledgeable of information available. A system of professional incentives was discussed with a focus on a possible professional maintenance of a captain's license through renewing credits via participation in courses, workshops, or other medium. This is similar to renewable requirements in professional fields such as dental assistants and teachers.
2. Training should be developed so that those involved in management have better knowledge of the harvesting process.
3. Means must be encouraged to have researchers more involved in the management process, either at the Council level or through the PDT's.
4. Improved means must be found to disseminate information and data in a timely manner. This must include increased accessibility, with a format of everyday language.
5. Priorities for gear research should be further developed such as in a master plan. This should require more collaboration among all parties.

Under Question Two concerning the matter that gear research is a global undertaking and the means to insure that it is included better and easier into the management process, the working group focused on several primary issues. First, gear research should have better access to the management process; several means were discussed that would improve this involvement. Much of the means depended on the immediacy and quality of the research as it related to the active management development. Some innovations should be tracked while other gear developments should be carefully and systematically reviewed and implemented.

Two action items discussed and accepted by the working group were the need for research standards and an accessible international database on current and completed gear research around the globe. In regard to the research standards, ICES does have them and continues to develop more. The US is an ICES member and these standards should be recognized by us and considered in all research.

Arne Carr
Moderator

Question Three related to benefits expected by investing in gear research and resulted in four action items. The discussion on this question commenced with a question "Is bycatch bad?" and this relates to ecosystem effects, opportunistic species and the potential problems of too much selectivity. One further concern was the better utilization of large amount of observer data that may provide better insight into problems and possible solutions via research. A list of 16 specific ideas for needed research was drafted with the intent that these should form a basis of priority for review by the Council Research Steering Committee.

Three words are key to the deliberative results of this group: communication, participation, and access.

Overall the broad expertise of the panelists and audience in the working group provided a sound and active discussion group.

DATA AND MONITORING PANEL SUMMARY

Maury Osborn
Moderator

First, I would like to thank my panelists, the facilitators and reporters, and the panel attendees. The panelists all had excellent credentials, were very well prepared, and were able to offer a diversity of perspectives. The facilitators and the reporters did an excellent job eliciting and recording participant views on a timely basis. And while we did not have a huge number of attendees, we certainly had good participation from enough people who came from a variety of viewpoints, and we had very lively, frank, and useful discussions.

During the panel presentations and discussions, and throughout the workshop as a whole, I detected three over-arching themes:

- Better communications,
- More involvement with the fishing communities, and
- Transparency and education.

On better communications, I heard repeated requests for more, more, more. Fishermen want more information about the science and management related to bycatch issues. They want use of more diverse channels to get the word out to affected communities and individuals. They think scientists and managers should talk to more fishermen and get them to these workshops. They want to instigate more three-way communications between managers, scientists, and fishermen.

With regard to more involvement from the fishing communities, I noticed many requests to include data supplied by fishermen when factoring scientific data into management regimes, and heard many examples of the types of data that should be considered. In addition, there was some discussion of the benefits of involving fishermen directly in observer training. And, I heard requests for managers and scientists to treat fishermen and their practical hands-on knowledge with more respect. This includes improving our sensitivity to the common use of terms with negative or dismissive implications such as "fox in the henhouse" and "anecdotal data." I believe this request for respect needs to be a three-way street among scientists, managers, and fishermen, and was gratified with the way several fishermen participants defended scientists on the panel when their motives were attacked during one of the discussion periods.

The issue of transparency and education applied to improving fishermen's understanding of the use of bycatch and other types of data in stock assessments, and improving their familiarity with observer procedures and the rationales behind certain procedures. The panel participants stressed that the better they understand how data are collected and used to develop management strategies, the better they could accept the data and the need for regulations.

Finally, throughout the panel and the entire workshop, I heard repeated references to the need to prove that good data benefits all involved parties, and the need to improve terminology for bycatch versus discards.

MANAGEMENT PANEL

Question 1. What are the region's most difficult issues? For fish? For protected species?

Panel Discussion

- Regulatory discards
- Economic discards
- Lack of data, information and understanding
- Integration of protected resources and fish management issues
- Gear management – understanding interactions and creating management measures
- Improving bycatch mortality assessment
- Impact on target fishery of differential rebuilding – get full potential yield from stock or adjust to account for bycatch in other fisheries
- Slowing recovery of other species of interest (e.g., Atlantic halibut not well accounted for)
- Northern Atlantic right whales: difficult goal – no flexibility, lack of information, gear interactions
- Improving links between protected species processes with fishery management processes
- Include species other than fish and protected species
- Establishing a culture/system where management/industry is held accountable for bycatch
- Know the problem then figure out how to fix it
- Establish accountability now with existing data and make improvements as we learn more
- Prioritizing problems by species, gear, fishery, environment
- As resources recover gear selectivity decreases
- Creating incentives to avoid bycatch
- Getting information and data from stakeholders
- Using stakeholder information and data in management
- Are existing measures sufficient to demonstrate/establish accountability?
- List of species of concern (NE); dogfish, right whales, sea turtles, species associated with small mesh trawl gear (MA)
- "Bycatch" vs. Magnuson-Stevens definition – tie down what the words mean

workgroup discussion

WORKGROUP DISCUSSION

Group 1

1. Lack of information and data and understanding of bycatch impacts of regulations
2. Attitude change – proactive stewardship
3. Understanding bycatch impacts of ecosystem management
4. Coordination between fisheries management and protected species

Group 2

1. Without penalty, expand VMS daily reports to include bycatch information – real time information to other vessels to avoid area.
2. Explore mechanisms to allow exploitation of recovered fishery without impacting 'weak' or protected species that overlap in space and time.
3. Implement a level of observer coverage sufficient to establish a statistically significant level of discards.
4. Link special focus (Council level) committees to protected species/take reduction efforts.
5. Implement bycatch discard mortality studies.

question 2

Question 2. Do we agree on what the region's bycatch problems are? If not, how do we get to agreement?

panel discussion

PANEL DISCUSSION

- Agreement that lack of data, regulatory and economic discards are a problem
- Agree on the problem but not the magnitude or solutions due to the lack of data
- Different perceptions of approach to solutions
- Trust and confidence key to solutions
- Understanding authority – Magnuson-Stevens, ESA, MMPA
- Agreement on problem, solution and standards are frustrating
- Disagreement on solutions indicates disagreement on problem
- Disagreement on definition
- Common understanding of basic issues to get common understanding of problems
- Disagreement on dogfish-perception of problem-impact of dogfish bycatch

- Management complexity created by Ecosystems Management with respect to bycatch
- Avoiding fishery interactions with protected species
- How much stakeholders are willing to "pay" to solve problems
- Exclude protected species (except turtles) from bycatch solution development? Focus on fish.

WORKGROUP DISCUSSION

The management panel determined that there was general agreement as to what the region's fish and protected species bycatch problems were, and as such, this question was not considered in the subgroups.

Question 3. For the fisheries for which a bycatch problem has been identified, what are the solutions and if there are none, how do we get to a solution?

PANEL DISCUSSION

- Categorize why bycatch is taking place to develop assessments
- Qualitative assessments
- Establish limits on bycatch and hold harvesters to limits; encourage cleaner fishing over time
- Allocate portions of fishery TACs to non-directed fisheries
- Match capacity with acceptable catch and landings
- Gear selectivity
- Eliminate minimum size regulations
- 100% retention of catch and 100% reporting of landings and use existing or establish markets
- IFQs to reduce/manage bycatch
- Create more confidence in data but data collection not complete solution
- Solve unintended mortality (e.g., mortality caused by landing of all catch)
- Apply knowledge to fish where bycatch is less or not a problem
- More confidence in observer data; eliminate potential "observer effect"
- Internal incentives (accept short-term losses to ensure long-term benefits)
- For protected resources, gear modification providing greatest solution potential
- Comprehensive approach to bycatch solution from fish and protected species perspectives
- Characterization of incentives – forced consequences v. benefits of avoidance

- Focus on specific species: Larger butterfish mesh; get away from butterfish
- Recognition of information presented by industry by managers including catch data and ideas for solutions
- Managers must understand that industry is concerned about the problem and want to solve it
- Eliminate uncertainty in future management – conservation credits and management-based incentives
- End distrust and arguing and develop solutions together
- Evolution of understanding and acceptance
- Potential problems of bycatch TAC without directed fishery TAC
- Observers and study fleets (reflecting fleet as a whole) to get accurate real-time data
- To make incentives, redesign closed areas to allow fisheries and move fleet onto healthier resource

WORKGROUP DISCUSSION

Group 1

1. Increase observer coverage with increased funding.
2. Increase the credibility of science with transparency, outreach, fisherman involvement and collaborative research.
3. Create a study fleet that includes 1/3 of overall fleet, government funded, information dissemination through public outreach and web-based information, and feed information into stock assessments.
4. Increase communication to increase trust and increase understanding.
5. Priority to increase information on new/expanded fishery and/or new gear and obtain a baseline.
6. Increase real time reporting and streamline transfer of information into rules.
7. Eliminate high grading with incentives and gear modifications.
8. Reduce allocative discards through ownership and inter-fishery trading.

Group 2

1. Dogfish comprehensive cooperative (NMFS/industry) stock assessment.
2. Characterize barndoor skate bycatch issues and define area/time interactions.
3. Expand gear modification research and implementation to avoid turtle interactions.
4. Develop research survey programs to reduce finfish bycatch in scallop closed area fisheries and redefine boundaries of closed areas to reduce bycatch.
5. Evaluate the use of bycatch triggers as an effective mechanism to reduce bycatch.
6. Conduct gear selectivity work in Loligo fishery to reduce scup bycatch.
7. Develop mesh selectivity for butterfish for spatial GRA management.

Group 3

1. Establish limits on bycatch and hold harvesters to the limit including a number of actions not listed by priority.
2. Create more confidence in the data.
3. Gear selectivity
4. Internal incentives (accept short term losses to ensure long term benefits)
5. 100% retention of catch and catch reporting
6. Determine why bycatch is taking place.
7. Develop gear modifications for protected species.
8. End distrust and arguing and develop solutions together.
9. Consider incentives including forced consequences vs benefits of avoidance.

Question 4. How can we get to a point where the industry is identifying bycatch problems and working cooperatively with managers to develop solutions?

PANEL DISCUSSION

- By showing industry trust and confidence that we are working together – establish a small group addressing an easy issue to solve a problem as an example
- Eliminate fear that information provided by industry will hurt the industry – proactive approach by industry leaders
- Managers consideration and use of data presented by industry
- Eliminate management regimes that tend to promote discards (e.g., trip limits)
- Cooperative research as models that others can work from
- Experimental fisheries and special access programs to foster incentives to talk to managers and work out solutions
- Same effort to avoid fish that there is to catch fish
- Provide incentives to people that identify solutions to bycatch problems
- Developing and accepting proactive solutions to emerging problems – avoid reacting to crises or making litigation the motivation
- Reduce and eliminate the hurdles of fostering cooperation and creating solutions
- Develop better understanding and working relationships between industry, environmental organizations, and managers through open communication and cooperation

- Mediation instead of litigation
- Eliminate differences on how to get a goal/solution

WORKGROUP DISCUSSION

Group 1

1. Highlight case studies and success stories discussing monetary benefits to fishermen from cooperative research and lessons learned.
2. Increase funding for cooperative research.
3. Framing the issue of cooperation between industry and managers.

Group 2

1. Give rewards to industry that offer corrections to bycatch issues.
2. Create special issues focus committee at the Council/Commission level so that bycatch issues/solutions can be surfaced here.
3. Create bridge between industry and management to provide incentive to identify bycatch problems.
4. Fishery-specific industry advisors be charged to address/identify bycatch issues.
5. Coordinate funds to investigate gear solutions. Consolidate multiple sources of finds and interests with priorities set by all interested parties.
6. Create special access programs with set-asides to create a study fleet to calibrate bycatch (for stock assessments).
7. Impose penalties to investigate actions by industry to correct the problem.

SCIENCE AND RESEARCH PANEL

Question 1. What are the key science issues for our various constituencies with respect to fishery-related issues and those related to protected species?

PANEL DISCUSSION

- Develop better estimates of discards will lead to better estimates of total biomass
- Undertake targeted social and economic studies to promote alternative fishing methods
- Develop decision analysis tools
- Develop strategies that do not promote race to fish
- Investigate alternative management strategies (community quotas, sector allocations) that will lead to innovative approaches to addressing bycatch
- Need better understanding of fish behavior and temporal and spatial distribution of fish
- Need research to identify and promote methods of fishing that minimize bycatch
- Establish trade-off mechanism that emphasizes individual decision-making

WORKGROUP DISCUSSION

Group 1

1. Develop better estimates of discards to lead to better estimates of biomass
2. Undertake social and economic studies to promote alternative fishing methods
3. Continue to develop high-tech gear and innovative approaches to addressing bycatch
4. Undertake long-term baseline studies
5. Link bycatch level thresholds with management strategies (i.e., community quotas, sector allocations)

Group 2

1. Develop strategic plan to be more proactive
2. Undertake outreach activities targeting communities and student
3. Redefine bycatch
4. Study species resiliency to different modes of capture
5. Identify long-term sources of funding
6. Evaluate bycatch as multispecies rather than single species problem

7. Conduct comprehensive review of all fisheries and information sources to identify data needs and prioritize observer coverage

Group 3

1. Undertake studies of fish behavior in fishing gear
2. Cost benefit analysis of efficacy of bycatch reduction measures
3. Research on long-term sublethal effects of entanglement of protected species
4. Identify alternative methods of collecting discard information

Group 4

1. Develop incentives to fish selectively
2. Need better understanding of fish behavior and temporal and spatial distribution of fish

question 2

Question 2. What are the highest priorities for new research in estimation of survival rates of discards, fishing impacts of non-target species and habitat, and social and economic dimensions of bycatch?

panel discussion

PANEL DISCUSSION

- Research needed for deck handling procedures
- Tagging programs for discarded fish
- Need accurate VTR data
- Need to study post-release survivability for recreational and hook fisheries
- Map market chain for fish from vessel to end user as a means to provide incentives to change fishing practices
- VMS on every vessel
- Develop better way to asses fishing impacts on sea turtles
- Aggressively implement study fleet program
- Study impacts of fishing activities on primary productivity
- Quantify impacts and natural phenomena and compare with fishing impacts
- Map value chain to provide incentives to alter fishing behavior
- Implement IFQs for protected species
- Develop ways to get VMS feedback loop to science and industry
- Compare different methods of fishing with costs of management

WORKGROUP DISCUSSION

Group 1

1. Undertake multibeam mapping of bottom and link its use with function

Group 2

1. Develop incentives to alter fishing behavior to reduce bycatch
2. Conduct post release survival studies related to species/gear/fishery
3. Conduct gear studies on impacts to benthic habitats in order to assess and reduce effects
4. Study population dynamics, behavior, and mortality rates of non-target species that are susceptible to gear
5. Model human behavioral responses incentives and/or regulations

Group 3

1. Research needed for deck handling procedures
2. Develop best practices manual
3. Undertake cost/benefit analysis of bycatch reduction methods

Group 4

1. Utilize VMS as a flexible tool to avoid bycatch
2. Explore the use of IFQs for protected species
3. Study ecosystem effects of bycatch (i.e. forage)

Question 3. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

PANEL DISCUSSION

- Examine lessons learned from European coop. research efforts
- Develop sources of predictable funding and multiple year research
- Need wider scale testing of new gears/strategies prior to rulemaking – may be role for expanding observer coverage

- Need centralized repository for science and related coop research projects – needs to be accessible and states must be included and participate
- Try Take Reduction Team process to resolve issues

WORKGROUP DISCUSSION

Group 1

1. Conduct baseline research on natural processes
2. Develop strategic planning in cooperation with fishermen
3. Leverage cooperative research in terms of science, funding, gear, and sharing results
4. Establish accessible centralized repository for scientific information and related cooperative research projects

Group 2

1. Develop a SARC-like review for cooperative gear projects
2. Streamline experimental fishery permits process and cooperative research programs
3. Land and market bycatch to create a pool of funds for cooperative research
4. Increase incentives to improve industry participation in cooperative research

Group 3

1. Use TRT-like process to approach bycatch problems
2. Develop predictable sources of funding and support multi-year research
3. Establish coordination among organizations that fund cooperative research; avoid duplication, foster collaboration, and coordinate research priorities

Group 4

1. Develop "light" bottom-tending gear

Question 4. How can we improve communication with stakeholders concerning scientific issues in bycatch assessment and management?

PANEL DISCUSSION

- Better define stakeholders and constituencies
- Focus on face-to-face communications, hold periodic meetings, workshops, etc
- Need strategic planning discussions
- Need better public education, including at middle school level
- Establish MREP program on national scale
- Promote more effective industry organization
- Improve cultural climate for fishermen – more definitive and inclusive process

WORKGROUP DISCUSSION

Group 1

1. Website postings
2. Promote better education targeting middle school students
3. FishSpan to facilitate information

Group 2

1. Promote interdisciplinary projects and broad communication among scientists regionally, nationally and internationally
2. Share observer results across the fleet
3. Sustain and expand the use of the marine resource education program or similar program

Group 3

1. Focus on face-to-face communications, hold periodic meetings, workshops, etc.
2. Encourage communication within NOAA

3. Utilize Sea Grant to facilitate communication with the public
4. Utilize observers as point contact and information dissemination

Group 4

1. Encourage exchange between technical staff and fishermen
2. More meetings with stakeholders

GEAR TECHNOLOGY PANEL

Question 1. How can we build a better information bridge between researchers and fishermen, researchers and managers, and among researchers? Included environmental groups as a stakeholder in discussion.

PANEL DISCUSSION

- Outreach is a means of bridging gap between researchers and fishermen.
- Scientists need to approach fishermen and explain the bycatch problem and then work with them to create solutions to the problem. Face-to-face communication.
- In outreach on gear technology, fishermen need to understand how research relates to the management process as a threshold of information.
- Need to develop a culture where fishermen can discuss issues with scientists, researchers, managers and conservationists. (UNH Program)
- Need to invest in people (i.e., NMFS staff) to work in the fishing industry to act as translators of technical information.
- Outreach is a two-way street. Information needs to flow both ways between fishermen, researchers, and managers. Idea for course for fishermen to teach managers about gear.
- Written and web based information is a good means of providing information, but face- to-face contact works best. Reduce technical jargon.
- Researchers/funding agency need to disseminate results, particularly to industry (accountability).
- Provide results of research projects in web-based format, making data and information transparent.
- Science Center needs to publish reader-friendly article in Commercial Fisheries News with some regularity (i.e., monthly).
- Regional Office needs to publish a (quarterly) newsletter to all permit holders in NE Region, focusing on species info., protected species, gear research, etc. Need to describe why measures are necessary.
- Needs to be cooperation between fishermen, managers, researchers and conservation groups. Conservation groups need to be viewed as a stakeholder.
- Professional development/continuing education. Should develop a certification program for fishing permit holders/vessel operators (similar to New England pesticide program) that industry is required to attend, where they are 'forced' to be exposed to information (gear technology, status of stocks, and management). This program would be required to maintain permit.

- There is an opportunity to create a strong incentive for industry to obtain training (i.e., through an accredited program).
- Need a better understanding of the social structure in the fishing industry to better convey information. Should provide information to the right (key) people so that they correctly convey info to industry.
- Could make training rewards based (i.e., access to 'B' DAS).
- Gear technologists/skilled fishermen need to be PDT members. Researchers need to be active in the management process and managers need to make process open to their participation.
- Needs to be a way to make a gear idea move forward into management within a reasonable amount of time (i.e., 6 months).
- Managers need to communicate the management/regulatory process to researchers and industry so they know how their idea will fit into process.
- A process needs to be established to prioritize the implementation of new gear technology (peer review, PDT process, etc.). Workload is a limiting factor in implementing new gear technology. NEFMC's Research
- Steering Committee is currently serving as a funnel for transmitting data and information obtained from gear research into the management process.
- Council members need training on what types of gear they will be managing in their respective regions. Info is currently not provided during Council training sessions.
- Need to address the quality of data. Need to establish a quality control program for project design and statistical analysis.
- Researchers need to find means of sharing data more frequently, more efficiently, etc.
- More institutes need to be involved in joint gear research projects. Need partnerships.
- Managers need to give more support to cooperative research programs.
- Hold workshops for comprehensive planning for conservation engineering (i.e., cod tagging program).
- Need to get around the competitiveness of the grant process to encourage cooperation among researchers.
- Need to eliminate perception that conservation groups are trying to get fishermen off water, and focus on fact that they are trying to find solutions to the bycatch problem.
- Need to build trust and communication between conservation groups and industry/managers/researchers. Can be accomplished through participation in Council process, face-to-face communication, and developing and participating in gear research projects.
- Need to communicate broader cultural values of the general public (i.e., existence value) to the fishing community, managers, and researchers. This is where conservation groups play a large role.

- Need to get representatives from conservation groups and management out on fishing vessels to facilitate communication, learning, and understanding of gear issues.
- Curb litigation to build trust between conservation groups and industry?
- NGOs need to come to table with developing and conducting gear research projects. For example, could cooperate with environmental groups to conduct bottom impact habitat studies.

WORKGROUP DISCUSSION

1. Required or incentive based professional training for fishermen (UNH / MREP model).
2. Comprehensive planning for conservation engineering projects (i.e., cod tagging program).
3. Training for managers on gear and gear technology.
4. Multi-format dissemination of information from NMFS to the fishing community (i.e., article in CFN; newsletter from RO; web-based; videos; the Weather Channel).
5. All three of the following ideas had same ranking:
   a. Managers need to identify and prioritize gear research needs.
   b. Foster development of regional gear engineering group.
   c. NMFS should support joint bycatch/gear technology workshop (with a stakeholder steering committee).
6. Researchers need to be active in management process (i.e., through PDTs and advisory groups).
7. Both of the following ideas had the same ranking:
   a. Identify and work with key industry members for the informal transfer of information to and from the fishing community.
   b. Establish bycatch advisory panel for Councils that includes environmental groups.
8. All five of the following ideas had the same ranking:
   a. Foster more of a collaborative research culture/attitude.
   b. Continue to develop a process to get research results transferred to mangers (address funding, timing, data quality issues).

c. Require collaborative studies among institutions/states.
d. Reduce competitiveness by encouraging cooperative research by contract versus grant process.
e. Environmental groups need to actively participate in workshops, conferences, and collaborative/joint research.

9. All four of the following had the same ranking:
   a. Researchers and managers should formulate a policy for the accessibility of data (entering data and timing of data).
   b. Produce background information via white papers and/or literature reviews.
   c. Research results should be conveyed to NGOs in multiple formats.
10. General information on bycatch/gear issues should be made available to public.

Question 2. Gear research is being done worldwide...how do we ensure that the results of that work become part of the management process?

PANEL DISCUSSION

- U.S. research on some topics leads the charge such as EFH…we should have an opportunity to **share results** of our research out to the rest of the world.
- Host an annual worldwide conference on EFH and gear research? ICES is a good example of an annual conference where there is an exchange of information.
- In other topics, the US is behind the times, so a need to import research from other countries.
- Establish access to information on gear research. Need a central depository of information on gear research being conducted worldwide. RI Sea Grant web-site currently contains some information. Could establish an accessible web-based library of information with abstracts that are in common language.
- Researchers in region should be a conduit for information on gear research, and what may be applicable to a particular problem. Fishermen will not utilize a broad database of information to develop an idea.
- Need to get available information on gear technology into application. Two ways of doing this: 1) Get buy-in on new gear technology from industry (demonstration), or 2) Council/NMFS implement a regulation based on information (regulation).
- Establish a video library to convey results of research, showing that gear technology does work to reduce bycatch.
- Need to expand the expertise on PDTs to include gear experts.

- Need to get buy-in on a gear modification from industry early in the management process in order to shorten the implementation process. Video information would be a useful tool in this regard.
- Needs to be a strong incentive to use new gear. One idea would be to establish bycatch caps for each fishery/species.
- Use ad-hoc gear workshops to advise PDTs on gear development to reduce bycatch.
- Translation of gear research study results from other languages would be useful.

WORKGROUP DISCUSSION

1. The following idea is broken down into four steps:
   a. PDT membership should include gear researchers and fishermen.
   b. Conduct PDT sponsored ad-hoc gear technology workshops.
   c. Researchers need to present results of selected research projects at Council meetings. Selection of projects to be vetted through RSC.
   d. Demonstration of gear technology in the field to get industry buy-in.
2. Develop a policy to quickly address industry innovations.
3. Follow-up on progress of new gear technology once implemented.
4. The following two ideas had the same ranking:
   a. Develop international database of gear research.
   b. Encourage establishment of research standards (i.e., ICES standards), but have a fast-track process for implementing highly promising gear technology without having definitive results.
5. Hold focused workshops for Council and specific PDTs on specific topics (i.e., separator trawl work).

Question 3. What are some areas that might benefit from an investment in gear work?

PANEL DISCUSSION

- The management regime needs to be tied to gear solutions. One example is reduction of redfish bycatch.
- Bycatch of redfish is expected to increase in future years.
- Develop technology to reduce longline impact on coral beds.

- Need to understand impact of gear modifications for reducing bycatch on stock structure and ecosystem. Ecosystem management.
- One broad question is not being raised by this panel: Is bycatch good or bad (in terms of impacts on stocks and ecosystem)? (Develop in afternoon session.)
- Need to investigate turtle excluder devices in both the gillnet and trawl fisheries as turtle populations increase.
- Need to address the issue of developing an escape/discard mortality protocol for gear research. Escape/
- discard mortality is currently not accounted for in gear research.
- Need research to develop a clean/directed haddock fishery.
- Need research to develop a clean/directed monkfish fishery.
- Need research to reduce dogfish bycatch in various fisheries.
- Need to address the issue of dogfish bycatch discard mortality in the form of spontaneous abortion.
- Need research to develop a clean/directed flatfish fishery.
- Need research on developing bottom friendly trawl and dredge gear. (Use of electricity or other hydrodynamic techniques.)
- Need for research into species specific gillnet gear.
- Need studies concerning mortality reduction with trawl gear during a tow.
- Need studies to develop a clean scallop fishery.
- Need barndoor skate excluder studies.
- Develop the idea of 'try-nets'- the ability to identify what species you are setting on by using a smaller 'try-net' first. Could use this concept in gillnet fisheries.
- Need to utilize observer information to determine reasons for discards, which will help direct research needs.
- Develop sound deterrents on ships to reduce ship strikes on large whales.
- Develop trawl nets for scallops
- Develop fish escapement devises for ocean trap net (pound net) fishery.
- Work with gear manufacturers in developing gear technology to reduce bycatch.
- Information obtained from regional bycatch meetings should be reviewed in regards to potential research priorities.

- There is a need to address hook size issue in the longline fishery. Need to come up with standardized hook sizes and types.
- Investigate proper soak times for gillnets to reduce bycatch.

WORKGROUP DISCUSSION

1. Explore the question, "Is bycatch bad?" (Ecosystem effects)
2. Investigate other effects of gear selectivity (i.e., removing large cod over time).
3. Utilize observer data to help understand reasons for discards, and use this to direct research.
4. The RSC should prioritize individual species/gear research.

question 1

panel discussion

DATA AND MONITORING PANEL

Question 1. What are the strengths and weaknesses of various methods for estimation of bycatch including consideration of observer programs, self-reporting system, and alternative approaches such as video monitoring systems? How can we improve performance of each approach?

PANEL DISCUSSION

- Need to prove to fishermen that good data benefit everyone
- Improve communication about upcoming meetings/workshops
- Distribute results of workshop- Explore alternatives, like dock monitoring (as in Canada)
- Conduct studies on, or acknowledge, predation of discarded live fish. How to improve observer program:
- Better training
- Retention rate
- Address problem of placement on small boats (video monitoring?)
- Speed up data turnaround time
- Increase outreach and education
- Increase industry involvement
- Get feedback from industry
- Implement electronic reporting
- Put observers on charter boats, especially large ones
- Add data fields, esp. for recreational/for hire sector
- Provide vessel owner/operator a copy of the observer forms soon after trips over (not a carbon copy at and of trip, which may invite challenge of data recorded)
- Provide all captains copies of observer reports (without making the request)
- Eliminate the references to 'fox in the henhouse'
- Respect 'anecdotal' information - address/explain whether recreational Vessel Trip Report forms are being used
- Improve timeliness from MRFSS - limit collection to data that lend themselves well to self-reporting (not bycatch)
- Ask gear and hook questions on MRFSS
- Explore liability issue of video monitoring

- Need software for better species recognition on video monitoring
- Need to test for integrating protected species and fish bycatch protocols
- Use video cameras on small boats

WORKGROUP DISCUSSION

Items are shown in order of ranking by discussion groups. For example, 2a and 2b have the same ranking.

1. Need to prove to fishermen that good data benefit everyone - share formulas for estimation with fishermen
2. a. Address problem of placement on small boats
   b. Integrate sampling programs, i.e., observers and MRFSS samplers
3. Pilot program for recreational fishermen to report voluntarily their daily catch and bycatch, e.g., web-based system or logbook
4. a. Increase industry involvement by developing a network/database of stakeholder contacts (by sector, species, geographic location, etc.)
   b. Video monitoring: Explore liability issue and develop software for species recognition
5. Have observers measure legal fish first, discards second, assuming fish are presorted
6. Improve observer training and retention rate
7. a. Train observers to sample scales properly to prevent damage to fish
   b. Implement observer electronic reporting
8. Test video monitoring in combination with observer use for appropriate application
9. a. Improve timeliness of MRFSS data estimate access
   b. Provide Provide opportunities to train observers on commercial vessels (e.g., identify volunteer vessels)
   c. Train observers to communicate protocols with fishermen

Question 2. How can we most effectively develop bycatch monitoring programs that address stock assessment, fishery management, and protected species requirements in an integrated fashion?

PANEL DISCUSSION

- Build on existing Observer Program:
- Integrate sampling protocols for fish stock assessments (observing catch on deck) and protected species assessments (monitoring net during haulback)

- Video monitoring could help
- Need scientist-fishermen cooperation to design more efficient protocol
- Conduct thorough testing of new protocols before implementation
- Integrate databases to enable real-time analysis (dealer data and VTR data, VMS and observer data)
- Expand use of study fleet; get more detailed information, esp. on catch and discards
- Use one schedule of observer sea days for fish stock, protected species, and economic information collection (currently, schedule is divided because funding is from separate sources)
- Conduct sensitivity analyses to identify where more detailed data needed (e.g., need age-specific discard information for the assessment of some species)
- Use data simulations (Management Strategy Evaluation)
- Recognize that vessel may be fishing in area to avoid bycatch of quota-managed species
- Improve communication between stock assessment scientists and managers
- Integrate protected species and finfish stock assessments for better ecosystem management

WORKGROUP DISCUSSION

Items are shown in order of ranking by discussion groups.

1. For observer programs, self-reporting systems, and alternative approaches (video monitoring systems), incorporate the use of B Days at Sea with stock assessment and data collection, to increase sample size and industry participation, and reduce bias
   a. Would SAPs be required?
   b. Could bring to Council
2. Integrate sampling protocols for fish stock assessments and protected species assessments, potentially including use of video monitoring equipment for appropriate gear types
3. Conduct sensitivity analyses, such as Management Strategy Evaluation
4. a. Utilize port agents and observers as outreach representatives in an effort to improve and personalize communication
   b. Integrate databases to enable real-time analysis (dealer data and VTR, VMS and observer data)
5. Conduct thorough testing of new protocols before implementation
6. Integrate protected species and finfish stock assessments for better ecosystem management
7. a. Expand use of study fleet

Question 3. Where are the most effective approaches to minimize bias in estimation of bycatch and maximizing the precision of the estimates?

PANEL DISCUSSION

- Do more to target undersampled strata
- Use independent data sets to test for bias
- Recognize that ACCSP observer coverage standards (5% and 2%) should be used when appropriate, but that certain fisheries (e.g., with Gear Restricted Areas) should have different levels of coverage (because of spatial and temporal distribution of the species
- Increase sample sizes
- Ensure good stratification
- Recognize other types of bias within sample distribution (e.g., fish migration, changing conditions of fishery)
- Analyze parameters used by fishermen to make fishing decisions (lunar phase, etc.) and provide that information back to industry
- Look at MRFSS distribution of sampling
- Slight gear changes should be recorded
- Use all available data sources

WORKGROUP DISCUSSION

Items are shown in order of ranking by discussion groups.

1. Explore ways of incorporating fishery-independent data (e.g., weather data, bait, tackle, and fuel sales) into management decisions
2. Better explain methodologies (data collected by observers and sampling strategy) to industry for improved understanding of bycatch estimates and stock assessment and involve fishermen in recognizing other types of bias within sampling distribution
3. Ensure good stratification, e.g., by targeting undersampled strata
4. Increase sample size for observer coverage
5. Explain vessel selection process for observer placement

Question 4. What are the most effective avenues in enlisting cooperation of stakeholders in developing and carrying out bycatch monitoring programs?

PANEL DISCUSSION

- Develop a dialogue between stakeholders, scientists, and managers
- Listen
- Find common ground
- Have mutual respect (at meetings and on the docks)
- Try to find positives about the fishing industry (don't only discuss negatives)
- Use clear terms and definitions about bycatch and discards
- Make presentations of data to the public more clear so there is better understanding of the issue addressed
- Make clear that collection of real data (not estimated) is in everyone's best interest
- Listen to recommendations from industry re: improvements
- Don't dismiss information as 'anecdotal'
- Be proactive: reach out to fishing organizations/tournament organizers to disseminate information, e.g.,
- results of this meeting, brochures, etc.
- Don't depend on the web entirely for contacting the public; written materials have a strong impact
- Contact fishing media
- Issue press release of the results of this meeting
- Have a meeting just for NMFS and media to establish contacts
- Make use of new Outreach position
- Find a way to give advance notice of meeting in trade magazines, even if details not yet final
- Initial announcement, contact person, website, 'watch this space' for more info
- Management needs to be more proactive; currently in a reactive mode (litigation-driven) or based on enforceability
- Make better use of website for meeting preparations (use of forms, etc.) and provide response to those registering
- Outreach and Education will help stakeholders and managers get on same page
- Try to reach the ones who do not regularly attend fisheries meetings
- Let industry reps know when attendance by fishermen is needed to get their input
- May need to offer travel reimbursement/other funding

- (RI) Sea Grant can help (offered several fishermen funding for attending this meeting)
- Provide information through observers
- Fishing associations should have a dedicated liaison with observer program
- Include observers on Councils or Plan Development Teams
- Invite fishermen to observe/participate in observer training (make program more transparent)
- Add meeting information to mailings (permit holder letters); monthly calendar
- Managers should rely more heavily on industry expertise
- Share more information during development stages, e.g., beneficial points of VMS
- Work toward eliminating regulatory bycatch
- Would benefit the portion of recreational sector that depends on catch for food
- Find an economic benefit for all bycatch

WORKGROUP DISCUSSION

Items are shown in order of ranking by discussion groups.

1. Provide copy of observer reports to vessel operators routinely and in a timely fashion; determine desired format of summary, e.g., by adding question to comment card being developed by observer program
2. a. Establish better contact with media, e.g., through outdoor writers and trade publications for better notification of upcoming events (meetings, workshops)
   b. Establish better contact with fishing associations, including establishing fishing group liaisons with observer program, and utilizing observers for outreach
3. a. Electronic observer data collection to improve data access turnaround time
   b. Do not dismiss information from fishermen as "anecdotal"; create other respectful terminology
4. Listen! Three-way communication between fishermen, scientists, and stakeholders)
5. Involve fishermen with observer training
6. Distribute results of workshop via written report and website

SCIENCE AND RESEARCH PANEL - EVALUATIONS

Question 1. What are the key science issues for our various constituencies with respect to fishery-related issues and those related to protected species?

Do you agree with the list of priorities?

- Yes, I think some of the discussion groups priorities for this question are some of the best I've seen. For example (but not limited to) groups 2, 3, and 4's comments about fish behavior, survival, etc. and redefining by-catch.
- Yes, In group 3 bullet 2 (cost benefit analysis of efficacy by bycatch reduction measures) c/b and yes must look at both sides of the equation; costs associated with not reducing bycatch, and benefits if reducing it (to other fisheries, and resources), as well as costs associated with reduction on affected fisheries. (that was intent of group 3)
- Funding research and development has to continue and expand. If we don't look around, keep minds open, and listen to other approaches to solve the complex issues that face us, we will continue to manage crisis to crisis. This applies to all parties.
- I disagree that discard/escape mortality as the critical aspect of bycatch. The bringing to deck of fisher/inveres that survive the process my by unacceptable or unethical. The fao code of conduct and responsible fishing practices should be reviewed and considered when contemplating why bycatch reduction is necessary-mortality is not the only reason to reduce bycatch.
- One of the key issues is that we do not have a solid handle on what is actually being discarded, when, and why. Perhaps increased observer coverage will get to the problem but then we need to work on reduction of discard and improving survival of fisher that we discarded.
- Yes
- Should be better estimates of discard mortality. Group 2 (need to develop incentives to fish selectively, need to better understanding of fish behavior and temporal and spatial distribution of fish) "Bycatch" is too generic and needs to be broken down to components ie, some bycatch mortality makes ecosystem sense.
- General comments for science and research: The patch-work funding is a big issue, many funding sources have separate and unrelated goals so researchers often have to adjust research proposals to include those mandates. This can result in a distraction from the primary focus of the research. Also the short duration of

the funding creates similar problems with a stop and go result to research projects. The deck handling procedures and practices manuals are a great idea. The industry perspective and experience does need to be involved in such a project. I think a tool to help fisherman avoid areas where bycatch is occurring is proactive idea. Utilizing the VMS as such a tool could help bycatch be avoided before it becomes bycatch. The "year class" issue that was brought up… aka the same scientist and the same industry reps at every meeting… is very true. The younger people need to get involved, they need to be recruited actively. (see data and monitoring comments fur further explanations!!)

- Most for group 1, (develop better estimates of discards to lead to better estimates of biomass, undertake social and economic studies to promote alternative fishing methods, continue to develop high-tech gear and innovative approaches to addressing bycatch, undertake long-term baseline studies, link bycatch level thresholds with management strategies (i.e., community quotas, sector, allocations)) group 3, (undertake studies of fish behavior in fishing, cost benefit analysis of efficacy of bycatch reduction measures, research on long-term sub-lethal effects of entanglement of protected species, identify alternative methods of collecting discard information) group 4, (develop incentives to fish selectively, need better understanding of fish behavior and temporal spatial distribution of fish). Group 2 (develop strategic plan to be more proactive, undertake outreach activities targeting communities and student, redefine bycatch, study species resiliency to different modes of capture, identifying long-term sources of funding, evaluate bycatch as multispecies rather than single species problem, conduct comprehensive review of all fisheries and information sources to identify data needs and prioritize observer coverage) don't have time to do revisit all these. Incentives to fish selectively = good idea.
- Sounds good = protected species issues should also be included, not just tilefish.
- Most of the ideas discussed in these groups are good. Some are a bit far-fetched in practice. But, even if they are far-fetched fisherman for the most part will comply with regulations that keep them in business.
- Yes
- The key issues are basic ones for now:
  1) How much bycatch is there?
  2) What is the survival rate once thrown back?
  3) What are some simple procedures that could be implemented on fishing boats to decrease the amount of bycatch landed and improve its survival if it is landed (keep it in the shade, keep it wet, etc.)
- Yes

SCIENCE AND RESEARCH PANEL - EVALUATIONS

Question 2. What are the highest priorities for new research in estimation of survival rates of discards, fishing impacts of non-target species and habitat, and social and economic dimensions of bycatch?

Do you agree with the list of priorities?

- Yes
- Yes
- NOAA/NMFS must create incentives to fishing industry. They still take from fisherman (cut DAS, closed areas)- as seen by industry. That to improve atmosphere, foster better relationship, giving back is key.
- Need to alter definition of "scientific research" in magnson-stevens to end the specific exclusion of gear research; thus easing the issuance of permits.
- I would say that one of the highest priorities for researching survival rates of discards and fishing impacts on non-target spp and habitat would be to obtain more funding for at-sea research, perhaps using trap systems to retain bycatch to study survival post capture and video survey to study habitat impacts.
- Yes
- Group 2 (develop incentives to alter fishing behavior to reduce bycatch, conduct post release survival studies related to species/gear/fishery, conduct gear studies on impacts to benthic habitats in order to assess and reduce effects, study more population dynamics, behavior, and mortality rates of non-target species that are susceptible to gear, model human behavioral responses incentives and/or regulations) the law does not say to "reduce effects" to habitat- we are to minimize "average" impacts.
- Yes
  With need for BMP manual—wrong "product"
  Multi-beam mapping, gear studies on habitat and fish interaction also very important
- Yes, Yes, Cost benefit analysis can be extremely helpful, yet in certain instances, should not be the deciding factor of whether a measure/device is used or not. "Use of IFQ's for protected spp" what is this specifically as it translates into regs? Was this discussed in detail?
- Yes

- Multi-beam mapping like the raised footrope trawl has a limited use. Multi-beam mapping the scallop fishery would be of some use where the codfish fishery would be a waste of time. But, did anyone discuss the absolute abundance estimates from K Stubesburg? Multi-beam mapping is a replication in a sense or a very least a lot of money to spend on a resource that already had a good assessment
- Yes
- I think that multi-beam mapping is probably not something bycatch reduction resources should be spent on. I think research on post-release mortality is very important. Work should be done to integrate these studies with the cod tagging program already underway, (use its infrastructure to track the survival of fish caught and thrown back overboard as bycatch).
- Yes

SCIENCE AND RESEARCH PANEL - EVALUATIONS

Question 3. How can we most effectively develop cooperative research programs for assessing impacts of bycatch on marine ecosystems?

Do you agree with the list of priorities?

- Yes, another theme from most of the group and panelists from each of the panels has been combining databases, existing service, science and industry, and making them available to all (and easily available). I think this is an excellent idea.
- Yes, group 4 bullet 1(conduct baseline research on natural processes) recommendation also included (but was left off the board) "low impact" gear that would increase survival of escapees.
- Group 1 bullet 4 (establish accessible centralized repository for scientific information and related cooperative research projects), i.e. list of scientists and vessels working on specified topic/species. Group 4 bullet 1 (Develop "light" bottom-tending gear) "lighter impact" not necessarily lighter in weight, i.e. "weak" in scallop industry if wt. decreased.
- Yes
- Not sure, SG already does this very well light bottom gear and "lateral" thinking surly needed.
- Sound good
- No, group 2.." streamline exp…" needs to be a higher priority.
- Yes
- Once again I see the work "create a baseline" this tells me we either have a baseline the participant does not know what it is or we don't have a baseline. If the latter is true than the fishery independent survey needs a major overhaul. If there is a baseline past is dependable than management MUST FOLLOW! For gear improvements that will offer real solutions industry should be lead by industry with overall goals outline by research/management.
- Yes
- The most critical need in this area is for an accurate accounting of what is caught and thrown back as bycatch!

- Yes, The ideas presented throughout this whole document and each group do require elaboration—I hope that each had a brief summary to correctly clarify the intent of the ideas- as presented in respective group.

SCIENCE AND RESEARCH PANEL - EVALUATIONS

Question 4. How can we improve communication with stakeholders concerning scientific issues in bycatch assessment and management?

Do you agree with the list of priorities?

- Yes
- Yes
- Yes
- No, Yes
  See previous comment about mandated meeting attendance- fisherman must be requires to attend meetings that present and discuss significant issues.
- Yes group 3 (focus on face-to face communications, hold periodic meetings, workshops, etc., encourage communication within NOAA, utilize Sea Grant to facilitate communication with the public, Utilize observers as point contact and information dissemination). Face to face very important, may lead to good listening. Not sure "stakeholders" have been well ID'd. This is a problem among 3 distinct groups: comm/ rec'd fisheries, managers, scientists. As such, more of an internal industry (vs the general public), while other groups should be part of the dialogue, the real challenge will be to get 3 groups about on better footing. The timing of this meeting maybe an example of why communication is so poor. Why not do this during winter months when more comm (rec'd) fisheries can attend?
- Group 1 bullet 2, (Promote better education targeting middle school students) and others? Why middle school students? (start 6th grade). Group 1 bullet 3 (Fishspan to facilitate information) idea = CSPAN, 24 hour fish coverage. Group 2 bullet 3 (Sustain and expand the use of the marine resource education program or similar program) make national, MRED (f. UNH funded by NE consortium). Group 3 Bullet 1 (focus on face-to face communications, hold periodic meetings, workshops, etc). Group 4 bullet 2 (more meetings with stakeholders).
- Yes, education should include everyone, esp stakeholders, not just 5th and 6th graders.
- Yes
- Communication seems to be the biggest issue in this group. The doors for communication and participation should pull on industry/ re sector or permit occasions arise.

- Yes
- 1. The fish research.org website could be a great resource if it was better funded. Instead of re-inventing the wheel why doesn't NMFS secure funding for it (even take over its administration). 2. Get port agents back on the docks! 3. Send observers' reports to vessel captains and owners as a matter of course, whether they request them or not! In the entire cost of an observed trip, this would be minimal additional cost.
- Yes

GEAR TECHNOLOGY PANEL - EVALUATIONS

Question 1. How can we build a better information bridge between researchers and fishermen, researchers and managers, and among researchers? Included environmental groups as a stakeholder in discussion.

Do you agree with the list of priorities?

- #3 (Training for managers on gear and gear technology) UNH together with commercial fisherman has proposed a "workshop by fisherman for non-fisherman", targeting managers and staff at various organizations including conservation organizations. If funded, invitations for participants will be published.
- Why was the workshop panel limited to gear technology? Why not a panel on fisheries practices, effort adjustments? Gear technology is not the only method to address to bycatch issues.
- Yes
- Yes
- Yes, 1) research, results and outreach should be extended to members of the recreational fishery. 2) Work should be done with gear manufacturers in terms of standardizing gear designs and finding costs effective alternatives for gear material.
- Yes
- Yes
- Question 1 (Required or incentive-based professional training for fisherman (UNH/ MREP model) i.e. certificates. Use observer data to help understand why B/C is occurring—helps drive solutions. Question 9. B. (Produce background information via white papers and/or literature reviews) where is that information and availability?
- Yes. Environmental groups often do not have resources $ to travel, participate. So allow set aside money to bring them into the process. Better use of observer data & their presence to ID why B/C is occurring.
- OK
- Yes
- Yes
- I certainly agree with the idea that researching should be on PDT's etc, if their research is aimed at filling a perceived management goal.

- Yes
- Most of them. 1) If industry doesn't get involved, others will. At about $1,200 a day, we need to get this cost down and find a better way to fund. Get mono coverage in these Menhadden Fisheries, mono work on new gear technology, mono effort on decreasing bycatch and discards, promote use of circle hooks and how to release fish. Very Good Effort on getting this all together and all of us attending this workshop.
- Question 1 (required or incentive based professional training for fisherman (UNH/ MREP model)), Yes. Question 2 (Comprehensive planning for conservation engineering projects (i.e., cod tagging program)) good, already being done. Question 3 (Training for all managers on gear and gear technology) yes. Question 4 (Multi-format dissemination of information from NMFS to the fishing community (i.e) article from CFN; newsletter form RO; web-based videos; the Weather Channel)) Ok, weather channel- minor. Question 5 (All three of the following ideas had the same ranking A) managers need to identify and prioritize gear research needs. B) Foster development of regional gear research group. C) NMFS should support joint bycatch/gear technology workshop (with a stakeholder steering committee)), only with the industry. Question 6 (Researchers need to be active in management process (i.e. through PDT's and advisory groups), yes. Question 7 A&B (Both of the following ideas had the same ranking a) Identify and work with key industry members for the informal transfer of information to and from the fishing community. B) Establish bycatch advisory panel for Councils that includes environmental groups) Yes, first environmental groups need to understand the fishery. Question 8 (a) all 5 of the following ideas had the same ranking A) foster more of a collaborative research culture/attitude b) Continue to develop a process to get research results transferred to mangers (address funding, timing, data quality issues) c) require collaborative studies among institutions/ states d) reduce competitiveness by encouraging cooperative research by contract verses grant process e) Environmental groups need to actively participate in workshops, conference, and collaborative/joint research) Yes, Yes, Ok, Ok, Yes and stay out of court so or not to appear on spoiled boats. Question 9 (All four of the following had the same ranking: a) researches and managers should formulate a policy for the accessibility of data (entering data and timing of data) b) Produce background information via white papers and/or literature reviews c) research results should be conveyed to NGO's in multiple formats d) general information on bycatch/gear issues should be made available to public) A) No! After publishing only! B)Yes , C)Ok, D)Yes

GEAR TECHNOLOGY PANEL - EVALUATIONS

Question 2. Gear research is being done worldwide...how do we ensure that the results of that work become part of the management process?

Do you agree with the list of priorities?

- Yes, Accept that some problems may not have a technological fix; ok, that the costs (research, implementation, monitoring, and enforcement) may out weigh the benefits. Explore shift to alternative gears/ methods as the "fix".
- Yes
- Gear tech panel question 2 (develop a policy to quickly address industry buy-in) fully agree
- Yes, Research standards are key. Too often it is said project results are like comparing apples and oranges. This creates more frustration and discontent. Establishing protocols is basic good science—can't ignore!
- Yes
- Managers should be sent to international meetings and abroad to inquire into methods used in other countries. These managers should then report their findings to fisherman and policy makers for potential use domestically.
- Yes
- Mostly
- Yes, Number 1(The following idea is broken down into four steps: A) PDT membership should include gear researchers and fisherman. B) Conduct PDT sponsored as-hoc gear technology workshops. C) Researchers need to present results of selected research projects at Council meetings. Selection of projects to be vetted through RSC. D) Demonstration of gear technology in the field to get industry buy-in.) is a really good idea.
- Yes
- Sounds good
- Yes
- I agree that Council members/ PDT members should have greater contact with gear researchers.
- Yes

GEAR TECHNOLOGY PANEL - EVALUATIONS

Question 3. What are some areas that might benefit from an investment in gear work?

Do you agree with the list of priorities?

- Yes
- Yes, Number 1 (Explore the question, "Is bycatch bad?") manipulating bycatch levels as a mean to address ecosystem imbalances its faulty reasoning. Scientists/managers need to identify the causes for the imbalance and address the cause: not manipulate another variable to offset the effects of the action causing the impacts to the ecosystem.
- Number 1 (Explore the question, "Is bycatch bad?") add to the ecosystem effects, adverse impacts on other fisheries.
- Question 3 (Utilize observer data to help understand reasons for discards, and use this to direct research) and question 4 (The RSC should prioritize individual species/gear research) as priorities.
- Yes
- Reductions in catch of unwanted species and undersized fish!
- Yes. A general idea in all groups, use the observers to collect and then share about what they have learned.
- With all the focus on improving communication with the fishing industry- where was the fishing industry represented on the coordinating committee?
- Not sure-"RSC" what?
- Yes, number 1 (Explore the question, "Is bycatch bad?") and number 2 (Investigate other effects of gear selectivity) really are the same.
- Bycatch of protected species is bad and we are mandated by law to eliminate bycatch of protected species.
- Good
- Yes
- Yes. Much of the research could be considered pilot in nature. There are problems that require more extensive longer-term research to provide adequate data and design to be successful. I say this to further emphasize this need and attitude.

DATA AND MONITORING PANEL - EVALUATIONS

Question 1. What are the strengths and weaknesses of various methods for estimation of bycatch including consideration of observer programs, self-reporting system, and alternative approaches such as video monitoring systems? How can we improve performance of each approach?

General Comments

- The training (and yearly updating of training) for the captains is a great way to update information and faster communication. Scientists /managers/fishermen all need to have cross-over training. There are not enough scientists who have been out on the boat and few of the industry folks understand all the requirements placed on managers, etc.
- Observer training- get them young. The suggestion of recruiting at colleges and universities is a great way to develop a new "year-class" of scientists and managers who will have the on-hand, on-boat experience to understand and build trust with the fishermen.
- There needs to be a streamlining of the process from data to policy. By the time a policy is in place the data it is based on it is outdated! Get research into policy faster.
- Demonstrations and workshops are an excellent way to build the trust and cross-train.
- Send observers to undergraduate schools to present information about the job to courses such as marine biology, fisheries, etc. where students may be interested in working as observers upon graduation. Use Powerpoint to display the variety of work involved, the crews, ALL weather they may experience, etc. so that the interested students will most likely be those that will remain longer and not just make a couple trips.
- Have all future contracts involving observers include a "call-in" system where fishermen must give the contractor 48-72 hr. notice of a trip so that the observer can contact the vessel prior to the scheduled departure. Helps to guarantee the observer of a paying trip and the fishermen of a system where the observer does not just show up in the morning looking for a trip. Example based on the closed area scallop fishery program.
- Observers would probably record more precise data than industry but with lower coverage. Industry self reporting would cover the entire fleet but could involve "false" reports. Video surveys would be labor intensive and expensive. Increase observer coverage and require coverage of all vessels. Provide incentives to fishermen for self reporting and compare with observer data.

- The performance of the NE observer program could be improved by increasing oversight of current program. The program has been unfortunately staffed for many years. Their level of competence, knowledge, skills, and abilities may be inadequate to maintain and support an enlarged program. Please use the experience of previous contractors as a resource for developing and maintaining a good observer program.
- Some good ideas here – especially cross-over with samplers/observer programs.

Do you agree with the list of priorities?

- Certainly with the idea of giving vessels a better idea of what the data will be used for!
- Yes (7 times)

1. Need to prove to fishermen that good data benefit everyone – share formulas for estimation with fishermen
   - The formulas aren't the problem. Fishermen don't trust the ability of the NMFS gear to catch the fish. The feeling is that the net arrangement is so inefficient it is useless.
2. (a) Address problem of placement on small boats
   (b) Integrate sampling programs, i.e., observers and MRFSS samplers
   - a. ?
   - b. good
3. Pilot program for recreational fishermen to report voluntarily their daily catch and bycatch, e.g., web-based system or logbook

- Good

4. (a) Increase industry involvement by developing a network/database of stakeholder contacts (by sector, species, geographic location, etc.)
   (b) Video monitoring: Explore liability issue and develop software for species recognitition

- Yes, but make sure integration is complete.

5. Have observers measure legal fish first, discards second, assuming fish are presorted.

- This is contradictory to improve discard survivability.
- Is observers report periodically published? How can we access these reports?
- Make sure this does not conflict with best practices for dealing with bycatch, i.e. identifying species on the dock whose chances of survival are enhanced by quickly returning them to the water.
- OK

DATA AND MONITORING PANEL - EVALUATIONS

Question 2. How can we most effectively develop bycatch monitoring programs that address stock assessment, fishery management, and protected species requirements in an integrated fashion?

General Comments

- In all SAP fishery
- Provide an incentive for fishermen to want to self report accurate data.
- Use port agents and observers for outreach – good idea.
- Emphasis should be concentrated on items 1-4.

1. For observer programs, self-reporting systems, and alternative approaches (video and monitoring systems), incorporate the use of B Days at Sea with stock assessment and data collection, to increase sample size and industry participation, and reduce bias
   (a) Would SAP's be required?
   (b) Could bring to Council
2. Integrate sampling protocols for fish stock assessments and protected species assessments, potentially including use of video monitoring equipment for appropriate gear types
3. Conduct sensitivity analyses, such as Management Strategy Evaluation
4. (a) Utilize port agents and observers as outreach representatives in an effort to improve and personalize communication
   (c) Integrate databases to enable real-time analysis (dealer data and VTR, VMS and observer data)

Do you agree with the list of priorities?

- Yes (6 times)

DATA AND MONITORING PANEL - EVALUATIONS

Question 3. Where are the most effective approaches to minimize bias in estimation of bycatch and maximizing the precision of the estimates?

General Comments

- How about training for crews to improve/standardize self-reporting?
- The effects of environmental conditions on fishing are highly complex. Further explanation of methods to accurately access environmental effects on gear would be a huge move forward in understood intentions at very least
- Need verification process that a representative sample of the fleet is being observed.
- Increase observer coverage and include entire fleet
- #3 more important
- Most of these seem so logical I would think they are already occurring?

3. Ensure good stratification, e.g., by targeting undersampled strata

Do you agree with the list of priorities?

- Yes (5 times)
- No (1 time)

DATA AND MONITORING PANEL - EVALUATIONS

Question 4. What are the most effective avenues in enlisting cooperation of stakeholders in developing and carrying out bycatch monitoring programs?

General Comments

- Data needs to be sent out to interested parities quickly after being collected.
- There must be an effort to getting the observer data and VMS data back out to researchers working with industry. Also, getting the data to the Council's various committees and panels
- Make data user friendly,
- Must improve feedback to stakeholders
- #1 and #2 good ideas – should be doing already

1. Provide copy of observer reports to vessel operators routinely and in a timely fashion; determine desired format of summary, e.g., by adding question to comment card being developed by observer program (17 people)
2. (a) Establish better contact with media, e.g., through outdoor writeers and trade publications for better notification of upcoming events (meetings, workshops) (10 people)

MANAGEMENT PANEL - EVALUATIONS

Question 1. What are the region's most difficult issues? For fish? For protected species?

Do you agree with the list of priorities?

- Yes overall but disagree with Group 2, #2. This is not a bycatch issue and, in fact, will likely exacerbate the bycatch problem. Also, there was confusion on the part of participants on the scope of the workshop where many believed the focus was solely on fish discards. This misconception, overran much of the discussion and fish issues percolated to the top.
- Yes, but disagree with Group 1, #2. In my opinion, the managers have the opinion or belief that stakeholders (real-industry) may not have an attitude change. Being from industry (recreational) I would disagree both on a personal level and on an industry-wide level. One of the overarching concepts from all the groups was communication. It becomes apparent to me as I look at the comment that there is a lack of communication on many levels if there is any belief whatsoever that industry, commercial and recreational industry, does not already have a strong feeling of stewardship already. Please pass this comment along to the management panelists and the moderator Mr. O'Shea as well.
- This has been a frustrating process because the central theme of the conference "moving forward" to solve bycatch problems was interpreted in widely different ways by participants. This difficulty was highlighted in the small group discussions where there was a difference of opinion about what an "action item" meant. For example, on "attitude change-proactive stewardship" some group participants wanted to go further and describe how that change could happen. What actions could be taken to facilitate the "attitude change"? There was a feeling among some participants, myself included, that the conference was recreating the wheel and the real challenge is moving the wheel forward. Action steps to move the wheel should have receive more attention. To some extent, this is a reflection of the difference between agency perspective and industry perspective. Each group defines "action" in very different ways. So, "attitude change" applies to everyone. Another workshop should explore this theme and move us forward.
- Yes. I would reword Group 1, #3 to read: Understanding bycatch impacts on ecosystems and addressing bycatch within an ecosystem-based approach to management.
- Yes. Well covered and fully vetted.
- Yes. Explore methodologies to measure and sample release mortality by recreational fishermen.

EVALUATIONS

- Yes. Some believed that there is not good data so nothing can be done. This idea is going to cause problems in the future in trying to stop any changes in industry bycatch.
- Group 1, #2: Maybe NMFS managers need to change their attitude from regulators to cooperators/partners. Group 1, #3: Very important – what are the impacts of harvesting large fish in place of small fish, releasing skates alive while removing yellowtail flounder, releasing starfish alive to eat clams/scallops.
- Language – the way the last question was phrased shows an agency viewpoint. Agency needs to communicate with industry and visa-versa.
- Avoiding the panic reaction and being proactive will help to avoid the poor application of science and the lack of data that is so common now. I agree with the comment that suggested this panic reaction stems from ignoring a problem until it affects another stakeholder group to the point that it demands action.
- I would reverse #2 and #1. I'm new to the discussion, but I think "waiting for more data" can be used to slow progress at the expense of critical resource management. Got the feeling there are many things we can/should be doing right now – and all parties are aware of what needs to be done.
- Yes, especially change of attitude to greater stewardship and being more proactive – this includes everyone including fishermen. Managers and supervisors need to do outreach to fishermen but fishermen should do the same to maintain/improve relationships with managers, etc.
- Lack of information is always a problem, but you still have to take action! It can be a disingenuous excuse for inaction and shouldn't be so used.
- Yes.
- Very little discussion of protected species. One participant noted that he thought the focus of this workshop was fish; several others agree. However, there were several panelists with a protected species focus. This is one of the few workshops that actually brought protected species management and fisheries management together – one of the priorities identified – however, the group missed an opportunity because there was almost no discussion on protected species during the breakout groups.
- The framework for improving bycatch reporting seems o.k. The dependence on observer coverage seems to be a "silver bullet" to my people. The failure of the observer program is that it is a "lousy job" in that it is thankless work in a crappie place. Being on a commercial vessel is challenging in the best of circumstances. I don't know the statistics but I'll bet the average observer works at the job for less than one year. You can't get good at any job in less than one year. The observer program as it sands is not the observer – the group discussed how the program could be tracked to keep observers for longer. This needs to be explored if the observer program is to be what it can be.
- Yes.
- Yes.

MANAGEMENT PANEL - EVALUATIONS

Question 2. Do we agree on what the region's bycatch problems are? If not, how do we get to agreement?

Do you agree with the list of priorities?

- Yes.
- Impossible to agree/disagree without knowing what the panel agreed were the region's problems.
- Yes.
- I disagree. It is wonderful that individual say they agree on what bycatch problems are – yet this is a controversial issue and it's a shame that this wasn't discussed in more detail. Not everyone agrees on this, beyond a very cursory level.
- I disagree. Though thee is some knowledge and agreement, there is need to clarify the magnitude of some of the problems. There did appear to be some uncertainty in the gear group as to what management really thought as to priority ranking.
- Yes. Vince O'Shea made the perfect comment that the industry should consider "if you don't do it, somebody else will!"
- Yes.
- The group agreed that there are bycatch problems. Unfortunately, there were no active fishermen in the group to dispel the myth that the spring dogfish is near extinction.
- Yes.
- Yes.
- I disagree. The major issue is we do not know the interrelationships between species and within species. In the last 40 years, we have developed a fishery targeting mature large cod while trying to do save small cod. The large cod may have been the spawning refugia for the species. Many similar questions exist with other species.

EVALUATIONS

- So, there is general agreement that there are problems but what are these problems? Too much bycatch? Is this due to fishing practices, management, or both?
- Yes.

MANAGEMENT PANEL - EVALUATIONS

Question 3. For the fisheries for which a bycatch problem has been identified, what are the solutions and if there are none, how do we get to a solution?

Do you agree with the list of priorities?

- Mostly. Most important to develop a level of trust with all stakeholders. Support experimental/RSA type program with 100% retention to fully evaluate bycatch. Implement triggers for bycatch to limit overall harvest.
- Yes.
- The primary method of reducing bycatch in a fishery that has been identified with a problem is to identify which species are being caught inadvertently, study how the species interacts with the gear in question and try to modify the gear to avoid the species. If that is not possible, develop regulation requiring that (if survival of released fish is low, i.e., red fish) the species in question be retained and utilized in some way. This will require exploration into alternate use of the resources. Bycatch caps are needed incorporated with IFQs and/or some other method of recording total catch for the entire fleet.
- Yes.
- Disagree because insufficient input from active commercial fishermen drives the list to reflect interests of attendees.
- For the most part. Gear modification work should be moved up and hand in hand with better understanding about why bycatch is reoccurring.
- Yes, especially need to increase trust and understanding. Need to create more confidence in the data can only be done to a certain extent with obvious limitations. If this is just a perception issue and the priority involves greater transparency, then I agree. But if it is aimed at original data collection, the limits should be recognized.
- I believe increased observer coverage is critical to establishing better buy-in by environmental groups to any solution or solutions.
- Yes.
- For the most part. Change or eliminate regulations that promote discards and high-grading and match capacity with harvest.

EVALUATIONS

- I think the overall feel for bycatch in the group was pretty good. Methods for using management as a tool to regulate bycatch were not new or innovative. The answer seems to be the same as its always been.
- Yes.
- Yes.

MANAGEMENT PANEL - EVALUATIONS

Question 4. How can we get to a point where the industry is identifying bycatch problems and working cooperatively with managers to develop solutions?

Do you agree with the list of priorities?

- Yes. Use harvest preferences for sectors using selective gear/strategies as incentive for industry innovation and adaptation.
- I was on this working group and I just wanted to clarify some points that came out of Group 2. For point 2: we wanted to suggest the formation of a bycatch reduction committee within the Council and/or Commission. That committee would consist of members from the industry, management, science, and conservation. We envisioned that committee as being in charge of first consulting with industry advisors and then prioritizing issues. We also envisioned that committee as coordinating with take reduction teams on protected species issues.
- Yes. Particularly agree with Group 2, items 2, 4, and 6.
- Yes.
- The primary way to get to a point where industry is concerned about their bycatch and discard amount is to make it financially attractive for them to do so. One way to do this is to develop alternative uses of discard species. They could be required to retain all bycatch and report what they are catching. Incentives for "clean" catches could be imposed or fines for "dirty" catches.
- Yes.
- Disagree. The only way to get fishermen into the process is to mandate their involvement. Fishermen should be required to ear 12 continuing education credits every 3 years to maintain their operators license and/or be allowed to participate in certain fisheries. The credits can be earned by attending meetings where information can be conveyed in both directions (fishermen to managers/researchers).
- Mostly. Cooperative research is important and would to a long way toward improving education and communications. Reward system for those who bring real-world innovations to the table. Penalty system for those who routinely abuse the mandates in place. These are public resources and should be considered an opportunity vs. a right to fish them.
- Somewhat. Greater communication with industry would be excellent as far a building trust and achieving buy-in for regulations. However, industry should not self-regulate and this would be a concern if industry becomes

responsible for management decisions (i.e., managers rely too heavily on industry approval). This is simply bycatch of human nature and a conflict of interest – no one's fault.

- How about something along the lines of these sea state program in the Bering Sea where bycatch rates are monitored by the fleet and sends out satellite notifications to one another about bycatch hot spots?
- Yes.
- This is the only group who introduce "rewards" to fishermen for aiding in helping to solve problems without giving a positive reason for fishermen to want to help solve problems and there will be no mistake from them.
- Yes.
- Yes.

A Collaborative Program to Assess Possible Temporal Access To Closed Area II: Targeting Yellowtail Flounder Without Significant Bycatch of Cod and Haddock

Glass, C.W. Raymond, M. Sarno, B. Feehan, T. Morris, G.

Seasonal and year-round closures of fishing grounds have been useful tools for the Northeast Multispecies Fishery Management Plan (FMP) of the New England Fishery Management Council (NEFMC). These closures have proven effective in improving the status of several species covered under the FMP, and in particular, the status of Georges Bank (GB) yellowtail flounder.

The status of GB yellowtail flounder has improved markedly since the implementation of Closed Area II in 1994. The spawning stock has increased from 2600 mt in 1992 to 33,500 mt in 1999 (SAW, 2000). Mean biomass has also increased from 4,500 mt to 49,600 mt in the same time period (SAW, 2000). In 2001 the TRAC Advisory Report on Stock Status estimates the SSB to be between 37,000 and 50,500 mt (80% probability) and the mean biomass to be between 48,000 and 66,500 mt (80% probability). This brings the GB yellowtail flounder biomass well above the rebuilding target of 49,000 mt (TRAC, 2001).

Here we report on a cooperative research program between the fishing industry and scientists on an observer based survey program to document the quantity and composition of catch and discards, and assess whether the rebuilt GB yellowtail flounder stock, within Closed Area II, can be accessed on a seasonal basis without significant bycatch of cod and haddock.

Results from this study demonstrate that cod, haddock and yellowtail flounder show spatial and temporal separation and that yellowtail can be harvested without a significant bycatch and discard of either cod or haddock. Furthermore, the results show evidence of clear spatial/ecological separation between major species showing evidence of ecological niche separation. The results are discussed in terms of their implications with regard to management of rebuilding and rebuilt stock access.

Marine Mammal - Fisheries Interactions: Take Reduction Planning

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The incidental capture/entanglement of non-target species in fishing gear, or bycatch, has been a central concern of resources managers, the commercial and recreational fishing industries, conservation organizations, scientists, and the public, both nationally and globally for the past several decades. Recently, the U.S. Commission on Ocean Policy declared bycatch as the largest threat currently facing marine mammals in the United States. The Marine Mammal Protection Act (MMPA), as amended in 1994, provides that the National Marine Fisheries Service (NOAA Fisheries), the agency responsible for conservation and management of cetaceans and several pinniped species (i.e., dolphins, whales, porpoises, seals, and sea lions), shall develop and implement take reduction plans (TRPs) for each **"**strategic**"** stock that interacts with a commercial fishery that has frequent or occasional bycatch of marine mammals. The immediate goal of a TRP is to reduce, within 6 months of its implementation, the incidental mortality and serious injury of marine mammals below potential biological removal (PBR) levels established for the subject marine mammal stock(s). The long-term goal of a TRP is to reduce, within 5 years of its implementation, the incidental mortality and serious injury of marine mammals to insignificant levels approaching a zero mortality and serious injury rate, taking into account the economics of the fishery, the availability of existing technology, and existing State or regional fishery management plans. To assist in developing these plans, NOAA Fisheries convenes take reduction teams (TRTs). Take reduction teams generally consist of representatives of Federal agencies; relevant coastal states, regional fishery management councils, and interstate fisheries commissions; academic and scientific organizations; environmental groups; all commercial and recreational fisheries that incidentally take the subject marine mammal stock(s); Alaska native organizations or Indian tribal organizations; and others as the Secretary of Commerce deems appropriate. To date, TRTs have developed several measures that have significantly reduced marine mammal bycatch. For example, the Harbor Porpoise TRT recommended using acoustic devices, i.e., pingers, that have helped reduce harbor porpoise bycatch in gillnets to levels below PBR for harbor porpoise. Other TRP measures that have achieved MMPA goals include time/area closures, gear modifications, and modifications to fishing operations. NOAA Fisheries is currently working to reauthorize the MMPA such that it includes provisions to: facilitate research on gear and fishing modifications to reduce bycatch, to investigate alternative monitoring systems (i.e., vessel monitoring systems to complement or, in some cases, replace observer coverage), and equitably address bycatch in all fisheries (i.e., both commercial and recreational) via the take reduction plan development process.

ACCSP Bycatch Data Collection Standards

The Atlantic Coastal Cooperative Statistics Program (ACCSP) is a cooperative state-federal program to design, implement, and conduct marine fisheries statistics data collection programs and to integrate those data into a single data management system that will meet the needs of fishery managers, scientists, and fishermen. Initially focusing on fishery-dependent data, program partners have examined the data collection needs for commercial, recreational and for-hire fisheries coastwide, and set minimum standards for collecting relevant data from each. Planning began with establishment of an MOU in 1995 and implementation has been progressing rapidly since the late 1990s.

The ACCSP partners have written standards for commercial fishing and recreational fishing (both for-hire and private boat/shore) to collect data on bycatch, releases, and protected species interactions. For quantitative data, commercial vessels should be required to carry bycatch observers, and fishermen should be required to report protected species interactions and releases and discards of managed species. For qualitative bycatch data, the ACCSP has approved a variety of reporting structures including data collected through the Turtle Stranding and Marine Mammal Stranding Networks. Quantitative data for recreational fisheries come from existing intercept surveys for catch and from at-sea observer data collected on headboats. For qualitative data, questions can be added to effort surveys conducted via telephone.

The ACCSP's Bycatch Prioritization Committee includes stock assessment biologists, field supervisory personnel, and observer program and protected species experts from partner agencies. Each year the Committee develops a priority matrix of fisheries to be sampled. Partners consider the priorities established in the matrix when considering bycatch sampling proposals. The Committee is also prioritizing partner bycatch databases for integration into the ACCSP's coastwide data warehouse, which includes catch/effort and biological information from Atlantic coast fisheries.

Cooperative Gear Research Leading to Effective Management: A Case History

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The successful creation of an exempted small-mesh whiting *Merluccius bilinearis* fishery off Provincetown, Massachusetts with a mandated trawl net, the raised footrope trawl, provides an instructive example of navigating from a good idea to a cleaner fishery. The raised footrope trawl, an innovative net design that arose from cooperative research, largely eliminated a major bycatch problem in the Cape Cod Bay whiting fishery. Starting from tinkering with net designs, the Massachusetts Division of Marine Fisheries was able to shepherd the establishment of an exempted fishery where the raised footrope trawl is required. The lengthy, but passable, voyage of the raised footrope trawl over 10 years into successful implementation provides a potential model for other gear researchers interested in seeing good cooperative research result in good fishing opportunities.

Bycatch and Commercial Fishermen

Bill Lee

To an otter trawl fisherman out for flounder and cod, an encounter with a school of dogfish can end with both damage to gear and wasted time at sea. Whereas herring bycatch can result in additional income on a day when there is a demand for fresh bait.

Shrimp fishermen do not like the added work of culling herring and small whiting as discards except when there is a demand for fresh bait and then it's all part of the trip.

To set hundred of hooks for cod only to come up with dogfish can be a waste of bait for some, but if the price of dogfish is up, then it's catch of the day.

Small skate north of Cape Cod are discarded as bycatch where south of the Cape they are kept as lobster bait and help pay for the trip.

Crabs eat lobster bait so to lobstermen they are a nuisance in the winter when there is no demand, but come summer when the price goes up, it can pay the fuel bill.

Bycatch and Recreational Fishermen

Bill Lee

Bycatch is both welcomed and dreaded by recreational fishermen. Most fishermen enjoy fishing and their time spent relaxing in and around the water, the tug on the line and the possibility of catching the "big one". Then, after hours with nothing, still hoping for that big cod or haddock, up comes a dogfish. For some this is a disappointment and for others it's shark for dinner.

If you're out there with a friend or your children and they catch their first fish, it doesn't matter what it is. To them it's the "big one".

If you're trying to get that cod for dinner and all you can bring up are dogfish, then it's just bycatch and a nuisance.

Squid and Pollock are known to attack the bait before it can get to the bottom.

Industry Trials of a Sea Scallop Dredge Modified to Minimize the Catch of Sea Turtles

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In response to increasing numbers of sea turtle interactions observed by the sea scallop industry and subsequently corroborated by NMFS observers, a series of 15 experimental cruises were carried out during the summer and early fall of 2003 on the continental shelf waters of the mid-Atlantic Bight. The objective of the cruises was to examine the efficacy of a modified commercial sea scallop dredge designed to reduce the bycatch of sea turtles in the sea scallop fishery. The modification consisted of a chain mat spanning the opening of the dredge mouth. The performance of the experimental gear was assessed by comparing a modified dredge fished simultaneously with an unmodified dredge. Although additional cruises are scheduled for the summer of 2004, preliminary results indicate that the modification was successful in eliminating the bycatch of turtles with relatively small reductions in the catch of the target species. A total of 2,430 tows in 195 days at sea were observed during the trials with seven sea turtles captured in the unmodified dredge and none captured in the modified dredge. Of the tows that were sampled by the observers, the modified dredge captured significantly ($p<0.001$) less scallops relative to the unmodified dredge. On a percentage basis, the modified dredge captured 6.8% less scallops than the unmodified dredge. It is anticipated, however, that the difference in sea scallop catches will decrease over time as industry becomes more familiar with the use of the chain configuration. These cruises demonstrated that a simple modification to the standard sea scallop dredge can be effective in eliminating the incidence of sea turtle bycatch without substantial concomitant reductions in the capture of the target species.

Discarding in the Small-Mesh Fisheries of the Mid-Atlantic Bight

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National Fisheries Institute - Scientific Monitoring Committee

Small-mesh fisheries of the Mid-Atlantic Bight, particularly *Loligo* squid, butterfish, and silver hake pose potential difficulties for management because the small mesh size used may enhance discards of non-target commercially and recreationally-important species. This study analyzed the NMFS-NEFSC observer database from 1997 to early 2002 augmented by independent observations to evaluate the importance of discarding in these fisheries in the Mid-Atlantic. Ten target species-discard species pairs were identified in which the volume of discards was significant: silver hake, *Illex* squid, and butterfish in the *Loligo* fishery; spiny dogfish, silver hake, butterfish, and summer flounder in the silver hake fishery; and weakfish, spiny dogfish, and butterfish in the butterfish fishery. These discarded species were characterized by high discarding volume in the targeted fishery in comparison to other targeted fisheries; high discarding volume in comparison to discarded species in the targeted fishery, or high discarding volume in comparison to the commercial landings volume of the same species. Market considerations accounted for most of the discards in the 10 target species-discard species pairs with the majority of these discards occurring from the capture of undersized individuals. Regulatory discards did not appear to be an important component of discarding, except for scup. All discard-to-target species landings ratios were low; in most cases below 0.2, except for spiny dogfish and butterfish discarded in butterfish-targeted tows. Target species volume is the primary generator of high total discard volume, rather than high per-tow catch and discard rates. The analyses suggest that space and time options for discard reduction are few and unlikely to be successful, because the pattern of discarding is only stable over short time and space scales. An obvious approach to managing discards in the small-mesh fisheries is to evaluate more rigorously codend mesh sizes or other net modifications that might effect a reduction in the catch of undersized individuals. An exception is spiny dogfish, where discarding events are frequent and discarding is high. A more detailed evaluation of spiny dogfish discards in small-mesh fisheries is needed, especially for butterfish. Discarding has increased in *Loligo* squid-targeted tows for several species despite efforts to reduce scup discarding through time-area closures. Area-time closures to control discarding should be evaluated for the likelihood that differential effort distribution may have exacerbated discarding elsewhere.

An Assessment of Scup Bycatch-reduction in the Directed Scup and *Loligo* Squid Fisheries

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A species of concern is scup, discarded in the directed scup and *Loligo* fisheries. Approaches to minimize scup discards have included gear modifications and time-area closures (GRAs). This study was undertaken to evaluate the influence of various codend mesh sizes (11.43-12.7 cm) on scup discarding in the winter-trawl scup fishery and to evaluate the legal 2002 *Loligo* squid net and the modified net legal in 2003 to reduce scup discarding in the *Loligo* squid fishery operating during the GRA closures.

In the scup net testing study, scup discards were high in directed scup tows regardless of codend mesh, typically one to five times landings. Scup discards in this study did not differ significantly from observed scup-targeted tows in the NMFS observer database. Most were regulatory discards required by the 22.86 cm TL size limit. Mesh sizes $\leq$ 12.7 cm, including the current legal mesh size (11.43 cm), did not adequately filter out scup smaller than 22.86 cm. The median length of scup discards was about 19.83 cm TL. Overall, lowering the legal size for scup from 22.86 to 19.83 cm TL would greatly reduce discard mortality in the directed scup fishery.

In the *Loligo* net testing study, *Loligo* catches were significantly greater in the southern GRA than in the northern GRA. Of the 34 tows taken in the southern GRA, not a single scup was caught, but scup were caught in the northern GRA. *Loligo* catches were reduced by vessels using the modified net by about a factor of three. The net modification under test was an extension panel of 45 meshes of 13.97 cm square mesh positioned behind the body of the net and in front of the codend. Scup catches were also reduced in the northern GRA with the modified net. This reduction in both scup and *Loligo* catches may be explained by the reduction in total catch observed with the modified net. One vessel fishing in the southern GRA did not have a decline in *Loligo* catch using the modified net. Thus, the modified net can produce reduced catches of mostly smaller-sized finfish, without impairing squid catches, but the data also indicate that this result may not be routinely achieved. The history of the scup discarding issue in the *Loligo* squid fishery demonstrates that discard reduction cannot be accomplished without adequate prior evaluation of discard sources, without the requisite and concomitant experimental evaluation of the results of regulatory reform, and without adequate commercial-scale testing of perspective reforms prior to implementation.

Can we get there from here? Cooperative Research and Commercial Fishing in New England

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This paper critically examines the goals of a cooperative research initiative in New England from the perspective of members of the commercial fishing industry. The data were collected from a mail survey of persons engaged with the commercial fishing industry in New England (n=295). The goals of a research consortium developed and funded to support cooperative research that were evaluated are: (1) to develop partnerships between commercial fishermen and researchers, educators, and coastal managers; (2) to enable commercial fishermen and commercial fishing vessels to participated in cooperative research and the development of selective gear technologies; (3) to bring fishermen's information, experience, and expertise into the scientific framework needed for fisheries management; (4) to equip and utilize commercial fishing vessels as research and monitoring platforms. The respondents were asked, to rate on a three point scale (not, somewhat and very) the importance and achievability of each goal, and to make comments on why they responded the way they did. The results suggest that each of these goals were seen as important, but not necessarily achievable. Based on the comments, it is important to develop partnerships (Goal 1) because it was perceived that everyone had a common interest in the stock health, cooperative research may improve the science and the fisheries management decisions, and it may improve the relationships between fishermen, scientists and managers. Furthermore, many fishermen commented that they wanted to participate and felt they had a professional obligation to do so. Others added that it was in fishermen's best interest to partner. At the same time, achievability of this goal was seen as more questionable due to mistrust between stakeholders, perceived hidden agendas in the motives of scientists and managers, and a belief that no common ground currently exists and that it may not be in the fishermen's best interest to partner. Furthermore, many fishermen cited the reclusive nature of the fishing profession as a barrier to partnerships, along with poor communication and mutual understanding between fishermen and scientists. Last, the fishermen's perception of the attitudes of scientists also served as a barrier to achieving the partnership goal – specifically that scientists were arrogant and did not respect fishermen. The results presented in this paper can assist the sponsors of cooperative research develop targeted education and communication strategies for the commercial fishing industry.

Cod Bycatch Survival from Longline Fishing Gear

Marianne Farrington, Arne Carr, Henry Milliken, Mark Szymanski,
Michael Pol and John Mandelman

The survival of Atlantic cod (Gadus morhua) released mechanically or by a method that immobilized the hook and flipped the fish back through the barb was tested in two ways, holding fish for 72 hours and sampling blood chemistry. Of the 118 sublegal-sized cod assessed, 44 were removed using the mechanical technique while 74 were removed using a flip technique. Although the 72-hour survival was 30% for mechanically removed fish and 41% for the flipped fish, these data were not found statistically robust. When an additional 74 mechanically removed fish from a second study were added to the totals and the data reevaluated, the percentages for survival did not change. However the more robust sample size did confer significance to fish removed by the tail flip method. Conventional stress-related blood components were analyzed concurrently to determine the relationship between fishing protocol and survivability, specifically whole-blood lactate, hematocrit, plasma protein, and serum values for glucose, Cl-, K+, Na+ and osmolality. Normal blood profiles were inferred from cod that were caught by hand jigging and bled within one minute from the set of the hook. Control values were obtained from cod that were captured by jigging, not bled and then held in cages along with longlined fish assessed for their 72-hour survival. Except for K+ and glucose, all other parameters measured in the cod taken directly from the longline were significantly elevated over normal values regardless of dehooking protocol. These values were similar to previous results and indicate that longline-caught cod experience a moderate level of stress from the fishing process. After 72 hours, lactate, Na+, cortisol and hematocrit values remained significantly elevated from normal values. In addition, lactate, Na+ and Cl-, osmolality, cortisol and hematocrit control values were significantly elevated over normal values indicating some aspect related to the cage/survival methodology was stressful.

The Use of Composite Mesh Codends to Reduce Bycatch and Discard in North Atlantic Fisheries

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The at-sea discarding of fish harvested from the ocean and its associated mortalities have been recognized and noted by fisheries scientists as inherent problems in the management of world fisheries for many years. Such practices constitute not only waste of a valuable resource but perhaps more importantly help contribute to observed decline in many of the world's marine fisheries.

However, despite considerable research efforts into technical measures to mitigate bycatch and discard, success has in general been limited. This may in-part reflect the *ad hoc*, and hence non-directed, nature of many such research programs but lack of implementation of novel bycatch reduction devices may also reflect the conservative nature of fisheries managers.

Here we present a case study where technical measures have been developed in the Northwest Atlantic to reduce inadvertent capture of cod in bottom trawl fisheries. This measure has been shown to effectively reduce bycatch and discard. We report on the success of the technical measure, its general acceptance by industry and potential reasons for lack of implementation. Using this example we discuss the usefulness of technical conservation measures as a management tool.

Cooperative Research and Fisheries Science & Management in New England: Attitudes and Opinions from the Commercial Fishing Industry

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Cooperative research seeks to promote partnerships between fishers and researchers to advance our understanding of the marine and fisheries sciences and provide meaningful, high quality information to managers, educators, fishers, and the science communities. The success of cooperative research, at least in part, depends upon the commercial fishing industry's willingness to be actively engaged in the research process, including the design, data collection and analysis, reporting, and application of the research findings. There are many potential barriers to cooperative research and very little empirical research on the social or human dimensions of this topic. This poster seeks to provide a preliminary understanding of what members of the commercial fishing industry in New England know and think about cooperative research and fisheries science and management. We present the results from the initial stages of a comprehensive study of cooperative research from a mail survey (n=295) of active participants in the commercial fishing industry. The survey respondents were a highly engaged subset of active fishermen, with over half engaging in the fisheries management decision-making process (i.e., attending Council meetings, contributing money to fishing-related causes, calling or writing government representatives, and commenting on fishery management plans). Among this group, there was a high degree of support and willingness to participate in cooperative research and a strong belief that cooperative research is making a difference in fisheries management and fishing communities. For example, 95% believe cooperative research is important; 88% believe cooperative research will lead to better management decisions; 86% believe cooperative research will improve relationships between fishermen and scientist; 80% believe cooperative research is a good investment of Federal dollars; and 77% believe cooperative research provides economic benefits to fishing communities. However, a closer look at these fishermen's attitudes demonstrates a bifurcation of support and attitudes between National Marine Fisheries Service (NMFS) scientists and university-based scientists: 70% respect university or academic scientists, whereas 30% respect NMFS scientists; and 55% trust university scientists more than NMFS scientists. In spite of these obstacles, these fishermen know that they can learn from scientists and that scientists can learn from them (89%). While many of the responding fishermen do not believe university-based scientists (60%) or NMFS scientists (75%) have the necessary understanding to collect fishery management-relevant data, they feel they have knowledge and experience important to fishery management and policy (88%). Therefore, while the underlying trust and respect between fishermen and scientist may not be strong, the attitudes toward cooperative research, the belief that it makes a difference and the incentives for participating are significant. There remain strong interests and motives to participate in cooperative research. The time is right for more and successful cooperative research ventures.

Matching Minimum Legal Fish Size to Codend Selectivity Patterns to Minimize Bycatch in the Georges Bank Trawl Fishery

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The results of codend mesh size selection studies for 6.5, 7.0 and 8.0 inch, square and diamond shaped webbing have been incorporated into single and multi-species yield per recruit (YPR) and spawning stock biomass per recruit (SSBPR) analyses for the Georges Bank trawl fishery. Winter flounder dominated the catch in the 2002 investigation, but sufficient data were also collected on yellowtail flounder and Atlantic cod to be included in the analyses. The results of these analyses indicate that the current minimum mesh sizes nearly maximize the YPR and that further increases in mesh size will only marginally increase SSBPR for these three groundfish species. The current minimum legal fish size for winter flounder and yellowtail flounder correspond to approximately the L_{10} on the selection curves for 6.5 inch square and diamond shaped codends. While the existing legal minimum fish size minimizes the observed discard of sub-legal sized flounder, it also maximizes the loss of legal sized fish to commercial trawl fishery. This provides an incentive to fishermen to circumvent the minimum codend mesh size regulations, so as to decrease the loss of legal sized fish, and thus ultimately results in an increase in actual (unobserved) discards. An increase in the minimum legal fish size to the L_{50} (15-16 inches) would increase observable regulatory discards, but would significantly reduce the incentive to circumvent minimum mesh size regulations, thus minimizing actual discards. The current minimum legal fish size for Atlantic cod approaches the L_{50} of the 6.5 inch codend selection curves, therefore no change in the minimum legal fish size for this species is suggested. Reducing the incentive to circumvent minimum codend mesh size regulations protects all fish species from excessive discarding of sub-legal sized fish that will undoubtedly be captured when using a codend with less than 6.5 inch mesh.

Quantifying Fish Behavior in Mouth of Bottom Trawls

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Understanding fish behavior in the mouth of a bottom trawl during the capture process is critical to the development of species selective, commercial fishing gear or highly efficient, non-selective, scientific sampling gear. Knowledge of fish behavior in the vicinity of the trawl mouth is required for the design of trawl technologies that will reduce the bycatch of unwanted species in the commercial trawl fisheries by separating unwanted species prior to entering the trawl. Similarly, a scientific sampling trawl ideally takes a representative sample of all species in association with the seabed, and if some species can swim longer than the trawl duration or faster than the towing speed, then they will be missed in the trawl capture process resulting in an unrepresentative sample.

Analysis of video data collected in the mouth of a bottom trawl was conducted for the purpose of developing a quantitative understanding of the behaviors of various fish species groups during the capture process. Through the development of ethograms, transition matrices, contingency tables and Chi square tests of independence, video data of fish behavior in the mouth of a bottom trawl was analyzed. Observed behaviors were divided into five distinct groups for five different species groups. The species groups included sharks, skates, roundfish, flatfish, and squid. Results showed distinct behavioral reactions by species groups, and the statistical of behavioral dyads indicate that previous behaviors can be used to predict subsequent behaviors, that is related behaviors are dependent. Sharks swim in the net mouth at towing speed, near the seabed for an average of 12 seconds before dropping back into the body of the trawl. Flatfish again swim on the bottom ahead of the trawl sweep for 9 seconds before dropping back into the body of the trawl. Squid rise through water column in the net mouth, swim at irregular speeds, but after 5 seconds enter the body of the trawl. Skate again swim on the seabed, staying ahead of the trawl sweep, but after 2 minutes enter the body of the trawl. Finally, roundfish swim in the net mouth in the middle or upper portion of the net for more than 20 minutes before dropping back into the trawl body. These variations in species group behavior have important implications for the development of species-selective commercial trawls because species selection is best achieved in the trawl mouth. Likewise, the species-specific catchability of a scientific sampling trawl would be affected if the tow duration was reduced from 30 to 15 minutes, if some species swim on average for more than 20 minutes.

How Much Observer Coverage is Enough for Estimating Total Discards Both Precisely and Accurately?

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Bycatch is a critical source of mortality for marine species, including endangered species, heavily fished commercial and recreational target species, and many species of so-called trash fish whose importance in marine food webs is now being recognized. Whether management objectives include conservation or fisheries yield, adequate measurement of at-sea mortality is a necessary component of any management framework, and observers at sea are the most reliable source of information. The amount of observer sampling effort, when not constrained by the money allocated to the research program, is usually set to achieve a desirable level of precision assuming that the observers sample the fleet randomly. The issue of bias in discard estimates is often not addressed, despite the fact that many observer programs allocate sampling effort opportunistically to vessels that volunteer to carry observers. The bias introduced by non-random sampling, and by the changes in fisher behavior in the presence of observers, must be addressed. Such methods as comparing the catches of observed and unobserved vessel-trips should be an ongoing component of any observer program. Assuming that the observer samples are representative of the fishery, our literature review and simulation studies suggest that coverage levels of at least 20% for common species and 50% for rare species would give reasonably good estimates of total discards. However, the required level of coverage could be much higher or much lower for a particular fishery, depending on the size of the fishery, distribution of catches and discards and spatial stratification of the fishery.

Minimal Bycatch in the Northeast Atlantic Surfclam and Ocean Quahog Fishery

David H. Wallace and Thomas B. Hoff

The Magnuson-Stevens Fishery Conservation Management Act requires Management Councils to consider the bycatch effects of existing and planned conservation and management measures. In the Atlantic Surfclam and Ocean Quahog Fishery Management Plan none of the management measures increase the minimal levels of bycatch. The surfclams and ocean quahogs are managed under an individual transferable quota management system that reduces the "race to fish" and therefore significantly reduces bycatch. The surfclam and ocean quahog fisheries are extremely clean, as evidenced by the past three clam surveys conducted by the Northeast Fishery Science Center. Surfclams and ocean quahogs comprise nearly ninety percent of the total number of animals caught in these three surveys when "clappers" (empty clam shells) are counted with the live clams. The percentage of the two species collected alive in the scientific surveys was nearly eighty-five percent. Very few fish were caught in any year. During the 1,577 tows completed in the three surveys, there were only 210 fish caught, with the little skate making up over half the catch. Only Atlantic sea scallops, representing other commercially desirable invertebrates were caught at one percent. Commercial clam vessels fish cleaner than the scientific surveys gear which has a liner in the dredge in order to collect all animate and inanimate objects encountered. Commercial dredges do not have liners and have bars which are spaced several inches apart so as not to collect anything but the targeted surfclams and ocean quahogs. In fact, the processors reduce the payments to the vessels if large amounts of "things" other than the targeted clam resources are delivered to the plant.

A Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico Fisheries

Elizabeth J. Petras, Ellen Keane, Dennis L. Klemm, Henry Milliken, Kimberly T. Murray, Paul M. Richards

All five species of sea turtles in the Atlantic Ocean and Gulf of Mexico are listed as either endangered or threatened under the Endangered Species Act (ESA). Incidental capture in fisheries is a major limiting factor in the recovery of sea turtles in these areas. NOAA Fisheries, the agency responsible for protecting sea turtles in the marine environment, has implemented conservation and monitoring programs, regulations, and other actions under the ESA to recover these species. To further help meet ESA recovery goals for sea turtles, NOAA Fisheries is implementing the Strategy for Sea Turtle Conservation and Recovery in Relation to Atlantic Ocean and Gulf of Mexico Fisheries (Strategy). The Strategy is a new gear-based approach to reducing incidental capture of sea turtles in U.S. commercial and recreational fisheries. A gear-based approach facilitates a comprehensive evaluation of fishery impacts across states, federal, and regional boundaries and will increase management effectiveness. NOAA Fisheries will be seeking stakeholder involvement, scientific peer review, and general public input as an essential component to implementing the Strategy. The primary Strategy goals are: 1) to conserve and recover sea turtles; 2) to evaluate the significance of bycatch by gear type; 3) to develop and implement plans for take reduction by gear type; and 4) to authorize fishery takes consistent with ESA mandates.

Promoting Clean-Fishing Across New England's Fisheries: An Innovative New Approach to Managing Bycatch

Gilbert Brogan, Charlotte Hudson, Courtney Sakai

Each year, tens of millions of pounds of fish, birds, marine mammals, sea turtles, and other forms of unwanted sea life are unnecessarily caught and discarded – dead or dying — in New England's fisheries because of regulations, economics or other factors. This "bycatch" or "dirty-fishing" as it is often called is recognized as one of the most serious problems facing global fisheries.

Oceana has developed a comprehensive, multi-species approach to account for and reduce dirty-fishing in the New England groundfish fishery, while creating incentives for those sectors of the fishery that demonstrate their ability to fish without bycatch. The approach is based on the concurrent management of target and bycatch species, using hard limits that allow for the maximization of target catch while providing stocks of concern, threatened and endangered species, and other species the ability to recover.

At-sea observers will be used on enough fishing trips to provide statistically reliable bycatch estimates in all fisheries. Best estimates of bycatch would then be incorporated into all estimates of fishing mortality and into catch levels.

Absolute limits ("hard caps") are then established in consultation with technical experts on both the amount of directed catch and bycatch (including non-fish bycatch) that can occur in each sector of the fishery. A fishery sector or a management area, is closed when either the applicable target cap or bycatch cap is met. Subsequent review of catch and bycatch data will then be used to ensure that "cleaner" sectors are rewarded over those that experience higher levels of bycatch.

Specific examples of how the approach can be implemented in New England and elsewhere will be provided.

Physiological Assessment of Spiny Dogfish Bycatch

John Mandelman and Marianne Farrington

Akin to other over-fished coastal elasmobranch species, Western Atlantic spiny dogfish shark (Squalus acanthias) populations have rapidly declined during the last decade. A very indiscriminate and traumatic mode of capture, otter trawling inflicts severe physical and physiological harm upon its catch. Because significant numbers of discarded non-target and juvenile target species fail to recover from the trawling experience, fitness of discarded bycatch and the physiological causes of post-activity related fish mortality are major issues challenging fishery-managers. Because spiny dogfish physiological parameters change drastically during trawl-capture, the current study will investigate 72-hour and 30-day post-release survivability and the immediate physiological changes (through blood withdrawal) associated with trawl-caught spiny dogfish discards under both field (cages) and captive (aquarium) conditions. An inevitable stress associated with the hauling and sorting aspects of trawling, air-exposure will be investigated independently for post 72-hour survival. Because general post-release elasmobranch survival is unknown and unpublished fisheries data indicates significant trawl-related post-release spiny dogfish mortality, more extensive discard survival investigation will yield a better understanding of spiny dogfish population dynamics. Monitoring corollary physiological changes will provide fisheries managers better understanding of the more detrimental impacts of the experience, thus aiding the development of trawl-technology and policy more conducive to spiny dogfish discard survival. Despite the notion that intracellular acidosis and hyperkaelemia are the primary contributors to stress-induced fish mortality, commercial fishing's effect on trawl-impacted elasmobranchs and physiological stress work regarding a commercially important elasmobranch remain unstudied. During initial work to assess physiological changes and bleeding protocols across varying degrees of stress, blood samples were taken from 230 spiny dogfish across 3 separate treatments and 5 separate Western Atlantic sampling expeditions in 2002-2003. Conventional hematological stress parameters, specifically deprotinized whole-blood lactate, whole-blood hematocrit, plasma protein, and serum levels of glucose, Cl-, K+, Na+, and osmolality were measured from blood taken immediately following normal otter-trawl, longline, and relative short-term captivity. Hematocrit, ion, and lactate levels of dogfish captured by otter-trawl were significantly higher than for those less exhaustively captured via longline and maintained in captivity. In addition to elevating conventional stress parameters, spiny dogfish either reduce plasma volume or sequester additional blood cells upon exhaustive activity associated with otter-trawl fishing.

A Collaborative Program to Test the use of a Cod/haddock Separator Panel in Trawl Nets

Gregory Morris, Christopher Glass, Benedetta Sarno and Benjamin Foster,
Manomet Center for Conservation Sciences

Since 1994, the New England groundfishery (the nation's first fishery, and still New England's principal fishery) has been subject to a strict management regime. As a result, the status of many stocks and, in particular, Georges Bank (GB) haddock and GB yellowtail has improved dramatically. In contrast, improvement in GB cod has been slowed by recruitment failure. One of the challenges faced by the industry is to be able to harvest haddock without further depleting cod.

The project reported here was designed to test the effectiveness of using a separator trawl gear in New England waters to separate cod from haddock and to assess its potential to reduce bycatch of cod and other species, while maintaining haddock catches.

Two cod/haddock separator trawl gears were built by Nordsea (Halifax, Canada). The study was conducted on four commercial trawlers, 2 large ones (F/V Olympia and F/V Capt'n Jake) and 2 smaller ones (F/V North Star and F/V Joanne A.). In order to meet size related specifications for these vessels, two different nets were built. Complete nets were constructed and modified from original by inserting a 4" (small mesh) separator panel dividing the trawl into an upper and lower codend.

The results show substantial and significant separation of cod between top and bottom codends for both classes of vessels. Although cod were not separated exclusively into the bottom codend, the results nevertheless demonstrate that cod capture could be significantly reduced (if not totally eliminated) by fishing such a net with no codend on the lower portion. Furthermore, inadvertent capture of many other species of concern such as skates, monkfish and dogfish would also be reduced thereby substantially lowering bycatch and discard overall. However, haddock appeared not to separate into the upper codend, as expected, but to be evenly distributed in both top and bottom codends. This may partly be explained by the low numbers of haddock encountered during the study.

Comparing the Performance of the Sweepless Raised Footrope Trawl to the Standard Raised Footrope Trawl and the 5% Federal Bycatch Standard

The raised footrope trawl (RFT) is a popular and successful bycatch-reducing net design; the exempted whiting trawl fishery in upper Cape Cod Bay was established with its mandatory use. The sweepless RFT (SRFT) is an improvement on the RFT for three main factors: the sweep of the RFT can get hung up on ghost fishing gear or other debris, causing the net to fish closer to the seafloor and incur higher bycatch; Federal regulations of the RFT designed to ensure the net fishes cleanly are numerous and specific, making it complex to rig and to enforce; and the sweepless RFT has less bottom contact. The SRFT has not been as popular as the RFT at least partly because its ability to avoid bycatch and retain whiting is not well quantified.

A recent study allowed the collection of catch and bycatch data on commercial whiting vessels using both nets. Quantitative analysis of sea sampling results verified low overall bycatch results (less than the 5% Federal bycatch standard) for both gear types (2.3% RFT; 4.2% SRFT). Results indicated that the SRFT performed similar to the RFT in terms of bycatch percentage and retention size of whiting catches. While these data were not part of a rigorous gear comparison, they suggest that the SRFT, when fished properly, can maintain efficient whiting catch rates and low bycatch rates, while decreasing interaction with other gear and the sea floor, and simplifying rigging and enforcement. Further, the low bycatch levels of both net types in this fishery indicate whiting fishing can continue with these net designs without major impact on recovering species. This poster presents these results as part of an effort to promote the use of the sweepless RFT.

Large Mesh Codend Dramatically Reduces Bycatch of Undersized Monkfish in the Gulf of Maine

Benedetta Sarno, Christopher Glass, Gregory Morris and Benjamin Foster,
Manomet Center for Conservation Sciences

Monkfish are currently regulated under the groundfish complex and are fished using standard codends, made of 6 ½" netting. In this type of fishery, the level of bycatch of undersized monkfish is frequently up to 50% of the total monkfish catch. This is largely due to the peculiar shape of monkfish: their large head prevents undersized fish from escaping through the meshes.

In July 2003, Manomet Center for Conservation Sciences (MCCS) conducted a preliminary study during which 233 monkfish across the length spectrum were measured for total length, maximum girth, width and height. Monkfish proved to be nearly as round as they were long and twice as wide as they were high. In particular fish that measured between 48 and 52 cm long, for which the regulated length of tail can be cut, appeared to need an opening measuring 10*20 cm to be released. This translates approximately to a 12" mesh size.

In October 2003, MCCS conducted a small project in the Gulf of Maine, to compare the monkfish bycatch rates of a vessel towing a large mesh codend (12'), and a vessel towing a regular 6 ½ " codend. The two vessels towed side by side, for a total of 22 paired hauls.

The results showed that the large mesh codend caught only 14 lbs of undersized monkfish (equal to 0% of the total monkfish catch), while the regular codend caught 5191 lbs of undersized monkfish (=40% of total monkfish catch).

The large mesh codend proved to be very effective at releasing undersized monkfish and the bycatch of undersize monkfish was virtually eliminated.

The Effect of Codend Mesh Size and Shape on Discards of Sublegal Groundfish Species in the Gulf of Maine Multispecies Trawl Fishery

Pingguo He, Rachel Hamilton, and Carl Boucher

Trawl codend mesh sizes and shapes are heavily regulated in each fishery to allow the escape of sublegal size fish and the retention of legal size fish. We conducted a comprehensive field experiment to evaluate the retention of sublegal groundfish species by different trawl codends on board a 45' commercial fishing vessel in western Gulf of Maine. We examined following two parameters: 1) Discard rates of sublegal fish by species in relation to legal size fish captured (sublegal discard rates), and 2) retention of sublegal size fish in relation to total sublegal fish entering the codend (sublegal retention rates). Five codends of different mesh sizes and shapes were tested: 6", 6-1/2", and 7" diamond meshes, and 6-1/2" and 7"square meshes. We analyzed Atlantic cod, haddock, yellowtail flounder, the American plaice (dab) witch flounder (grey sole) and winter flounder (blackback).

Finding Solutions Together: Combining Outreach and Research to Resolve Bycatch Issues in the Southern New England Fisheries

Kathleen Castro, David Beutel, Laura Skrobe, and Barbara Somers
University of Rhode Island – Rhode Island Sea Grant, Fisheries Center, East Farm – Building 83
Kingston, RI 02881

One of the key missions of the Rhode Island Sea Grant (RISG) Sustainable Fisheries Extension Program is to engage and enable stakeholders to play critical roles in science and management of the fisheries. This is accomplished through research, education, and outreach. The research component involves conducting applied collaborative research on issues that elucidate processes and link solutions with the effective science and management of the resource and the fisheries.

The RISG Fisheries Program has a long successful history contributing to the solutions for bycatch problems in Rhode Island, and the New England region through collaborative research and outreach with fishermen, environmentalists, and the management agencies. A main objective of the program is to characterize and reduce bycatch in New England and Mid-Atlantic fisheries through research using alternative gear technologies and gear designs.

A variety of collaborative gear research projects with the commercial fishing industry have been conducted in the last few years by RISG. These include: * Trawl codend mesh selectivity studies on yellowtail, winter, and summer flounders – these studies evaluated the selection properties of several mesh configurations to provide guidance for assessing the impact of minimum size limits and codend mesh size restrictions on yield. Four different mesh sizes and shapes were investigated for each species. * Bycatch characterization study on scup – conducted a study on the effects of increasing mesh size on the characterization and reduction of bycatch from the directed scup bottom trawl fishery comparing the currently regulated mesh size and 2 experimental nets. * Pot selectivity study on increasing escape vent size on black sea bass and scup – catch efficiency and size selectivity were studied in the New England inshore pot fisheries targeting black sea bass and scup using experimental fish pots equipped with circular escape vents of four different sizes.

Outreach projects such as the Regional Bycatch Workshop and Gear Selectivity Workshops provide stakeholders the ability to input their knowledge into the process as well as receive information from various other organizations on fisheries science and management. This poster will address major results of these research and outreach projects.

Collaborative fishery research gives fishermen the ability to be involved in fisheries research and management from all stages. RISG Fisheries Program utilizes the extensive knowledge of the fishermen in the development of research ideas and employs them for the actual research. In this manner, fishermen are involved in the practice of science and then possibly management, giving them confidence in the data quality and a buy-in into the process.

Effects on Benthic Invertebrate Ecological Variables Related to Sea Scallop Presence and Fishing Effort

Andrew C. Walker, William D. DuPaul, Virginia Institute of Marine Science

Recent concerns over including the commercial species Placopecten magellanicus in studies that compare the effects of mobile fishing gear on benthicinvertebrates across closed area boundaries prompted this research. Sampling was conducted using a mesh-lined, eight-foot New Bedford-style scallop dredge at 120 stations across the Georges Bank region during the 2002 NOAA sea scallop survey cruise. Five ecological variables were determined: density, biomass, species richness, Pielou's Evenness, and the Shannon-Wiener Diversity Index. Removal of Placopecten magellanicus and its attached epifauna from the analysis determined that only species richness was found to be significantly higher within closed area regions. Species that were present in association with live sea scallop shell within open areas were additionally observed attached to benthic substrate within closed fishing regions. Epifaunal taxa within open areas were less likely to find a stable attachment site aside from small (<100mm) Placopecten magellanicus shells due to active fishing pressure which removed larger scallops and disturbed the benthic environment. When Placopecten magellanicus epifauna were included in the analysis, only biomass was found to be significantly greater within closed area regions. This increase in biomass was associated with the increased surface area of live Placopecten magellanicus present within the closed areas. Though the fishery shucks the scallops at sea and returns the shells to the benthic environment, attached epifauna are not found to proliferate on this substrate.

Atlantic Cod and American Plaice Catch in the Winter Haddock Fishery of Georges Bank

David Martins, Darin Jones, Ross Kessler, Rodney Rountree
Graduate School of Marine Science and Technology
University of Massachusetts
706 South Rodney French Boulevard
New Bedford, MA 02744-1221

Marine species of fish do not live isolated in a vacuum. Different species feed upon each other and compete for food and space. This phenomenon is called biological interactions which, together with the fact that an ideal net of 100% selectivity is a utopian assumption, will always lead to a mix of species in the catch and net, respectively. Thus, biological interactions produce technological interactions and hence create the issues of bycatch and discarding – even if the fishery targets just one species such as haddock on Georges Bank.

These two issues are the major reasons why the School for Marine Science and Technology (SMAST - University of Massachusetts, Dartmouth) began a co-operative industry based fishery research program with the New Bedford fishing fleet in November 2000. Since its inception the program has completed two years of field observations with catch and discard data collected during normal fishing operations. A total of 5,986 trawl tows from 169 fishing trips, primarily on the northern flank of Georges Bank, were reported from November 2000 through October 2001 and continuing from August 2002 through July 2003. Fishermen recorded the target species for each tow. Haddock were the target species in 597 tows and averaged 767 lbs/tow. On the tows targeting haddock, Atlantic cod and American plaice were a component of the catch averaging 113 lbs/tow and 17 lbs/tow, respectively. The peak by-catch of Atlantic cod occurred in March (250 lbs/tow), coinciding with the highest haddock catches in March and April.

Most of the haddock targeted tows (344 out of the 597) occurred in the winter fishery (January - March) located north and west of Closed Area I with an average catch of Atlantic cod of 120 lbs/tow during this time. Similar to patterns for the entire Georges Bank, by-catch of cod was greatest in March, when haddock catches peaked. The catch of American plaice in tows targeting haddock was negligible during the winter fishery, averaging only 12 lbs/tow. The area northeast of the Closed Area I had the highest average catch of American plaice but was still less than 45 lbs/tow. This data suggests that fishermen can successfully target haddock and realize low catches of Atlantic cod and American plaice, especially considering that during normal fishing operations fishermen were not trying to reduce catches of cod or plaice. However, it should be pointed out that these findings reflect specific results in space and time.

Northeast Fisheries Observer Program Kiosk

Amy Sierra Van Atten, Northeast Fisheries Observer Program
National Marine Fisheries Service

Observer programs are a vital component of fishery management. The National Oceanographic and Atmospheric Administration (NOAA) is responsible for the management of the Nation's marine resources for the economic and social benefit of all citizens. NOAA meets this responsibility through "their science-based conservation and management and promotion of the health of the environment" (NOAA Fisheries Mission Statement).

To help ensure productive future harvests, scientists from NOAA Fisheries (also known as the National Marine Fisheries Service or NMFS) study the life history, stock size, and ecology of economically important fisheries and marine ecosystems. Collecting the most complete, unbiased and relevant data possible involves cooperative efforts between fishery managers, the fishing industry, and scientists.

The Northeast Fisheries Science Center (NEFSC) manages the Northeast Fisheries Observer Program placing scientific observers aboard commercial fishing vessels. The Northeast Fisheries Observer Program helps the agency meet its fishery management obligations under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), Marine Mammal Protection Act (MMPA), and the Endangered Species Act (ESA).

The Program:

The Northeast Fisheries Observer Program places biologists aboard commercial fishing vessels from Maine to North Carolina to collect economic and biological fisheries information. A variety of gear types are observed, including gillnet, trawl, dredge, longline, pots, and weirs. The data are used to improve and test fishery management decisions to maximize benefits for fishermen and sustain natural resources.

Observer Duties:

- Perform a safety check of the vessel before departure
- Record interactions between marine mammals, sea turtles, and seabirds and gear
- Record information on fishing effort and location
- Record species composition and disposition of catch
- Collect biological information such as size frequencies and sex ratios
- Collect biological samples for stock assessments and other studies
- Collect economic information for use in impact assessments of proposed fishing regulations
- Participate in cooperative research projects

Be Involved:

We welcome feedback from vessel owners and operators. Cooperation between fishermen and the Observer Program will lead to better data and better management decisions.

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Northeast Region

Patricia Kurkul

Bycatch in Northeast Fisheries: Moving Forward

Northeast Regional Bycatch Workshop
Pat Kurkul, Regional Administrator

2001 Regional Team

- Comprised of all fishery management entities
  - Regional Office/Science Center
  - Mid-Atlantic and New England Council
  - Atlantic States Marine Fisheries Commission

2002 Regional Team

- Response to Oceana's Petition for Rulemaking
  - Outlined national initiative and goals
  - Expanded regional team
    - Atlantic Coastal Cooperative Statistics Program
    - Rhode Island Sea Grant

Team Tasks

- Reviewed background information
- Draft regional plan – September 2003
- Current regional plan – November 2003
- Recommend initial priorities

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Initial Priorities

- Priority fisheries
- Monitoring
- Research
- Management
- Education/outreach

Priority Fisheries

- Mid-Atlantic and New England Gillnet
- Mid-Atlantic and Georges Bank Scallop Dredge
- Mid-Atlantic Small Mesh Otter Trawl
- Pot/Trap Gear

Monitoring Priorities

- Update quantitative estimates
  - Bycatch by gear and fishery
  - Incorporate into the SAW process
- Increase observer coverage
  - Address regional priorities
- Conduct review of available information
  - Identify additional existing sources of information

Research Priorities

- Gear modifications
  - Reduce bycatch in priority fisheries
- Study animal behavior
  - Relating to developing gear
- Participate in URI Sea Grant project
  - S-K Grant project to form regional gear engineering working group

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Management Priorities

- Incentives to reduce bycatch
  - Harvest rights arrangements
  - Management measure alternatives

Collaboration

- Bycatch workshop
- Conduct annual bycatch forum

Purpose of Workshop

- Bring knowledge and experience to discussions
- Share wide range of perspectives on bycatch
- Formulate specific ideas
- Recommend priorities
- Identify potential solutions to bycatch

Goal

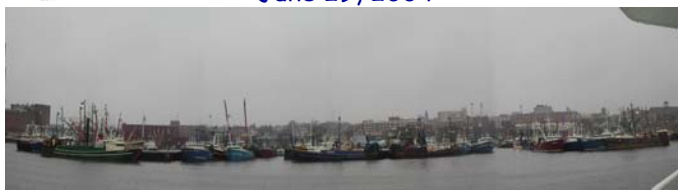
- Recognize that entities and individuals are concerned with, funding work on, or otherwise addressing bycatch issues

Progress towards regional consensus on identification of bycatch issues, priorities, and specific objectives

Bycatch in Northeast Fisheries: Moving Forward

Northeast Fisheries Science Center
Working Group

Paul Rago and Susan Wigley
Northeast Fisheries Science Center
Woods Hole
June 29, 2004



Acknowledgements

- Steve Murawski
- Ralph Mayo
- Kathy Sosebee
- Mark Terceiro
- Mike Fogarty
- Wendy Gabriel

Objectives of Presentation

- Role of discards in stock assessments
- How discards are estimated
- Precision of discard estimates
- Accuracy of Observer data
- Allocating Observer coverage

What does NMFS do with all those Observer Data?

F/V Santa Maria, in Nantucket Lightship Closed Area, August 1999--Results o a single 10 minute tow, one dredge

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Role of Discards in Stock Assessments

Catch is a major input to most stock assessment models.

Discards are a component of catch

Total Catch=Discards +Landings

Discard data come primarily from Fisheries Observer Program

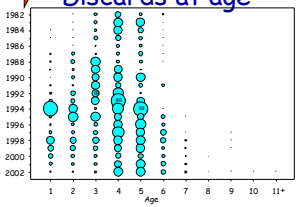
Landings data come from Vessel Trip Reports, Dealer Reports, Port Sampling data

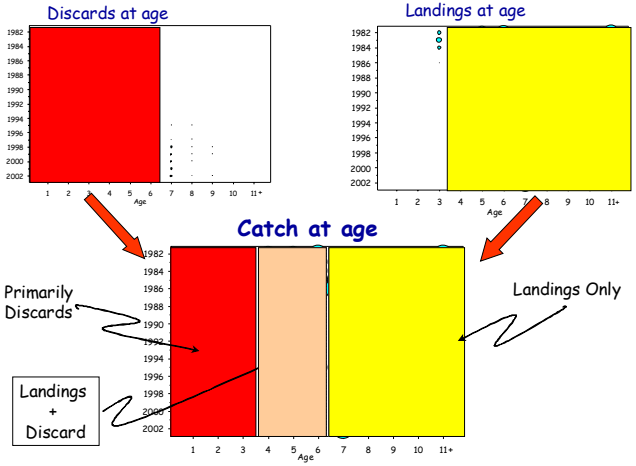
Discard Estimation for Stock Assessments

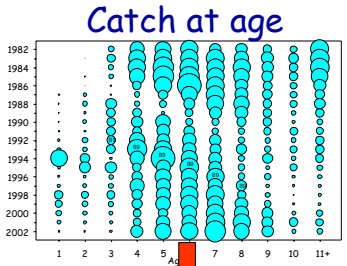
Discard length frequency data
Age and length information

Total Discarded lbs

Discards at age







Abundance Indices

Assessment Model

Population Size
Population Biomass
Fishing Mortality
Recruitment

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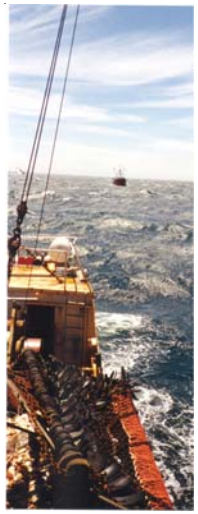
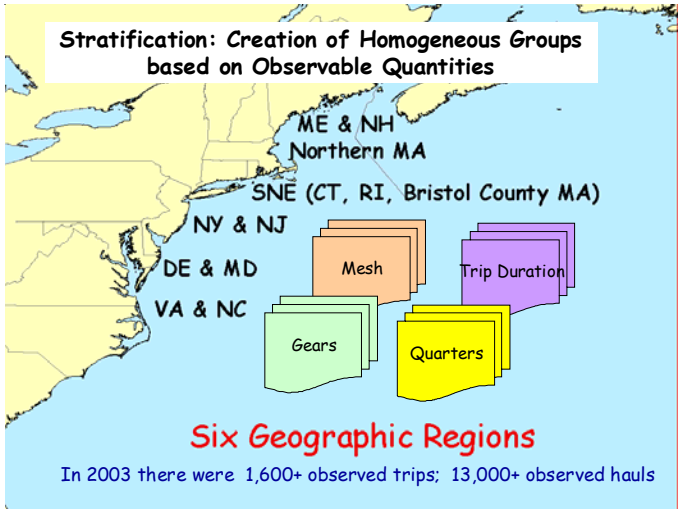


Why is Discard Estimation so Complicated?

- Broad Geographic Regions
- Diverse Fleets
- Multiple Gears/Configurations
- Multiple Species
- Varying Trip Duration
- Seasonal Variations
- Legal Mandates, Regulations
- Limited Resources



How do we estimate Total Discards?

- Total Discards = Discard Ratio Estimate x Quantity, summed over all strata

$$Total\ Discard = \sum_{h}^{All\ Strata} \left(\frac{discard}{kept} \right)_h Total\ Landings_h$$

$$Total\ Discard = \sum_{h}^{All\ Strata} \left(\frac{discard}{day\ fished} \right)_h Total\ Days\ Fished_h$$

Discard Ratios

Two commonly used discard ratios are:

Discard Ratio = $\frac{\text{sum of observed discard lbs}}{\text{sum of observed days fished}} = \frac{d}{df}$

Total discarded lbs = $\frac{d}{df}$ X Total Days Fished by the fleet

Discard Ratio = $\frac{\text{sum of observed discarded lbs}}{\text{sum of observed kept lbs}} = \frac{d}{k}$

Total discarded lbs = $\frac{d}{k}$ X Landings by the fleet

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Various Forms of Discard / Kept Ratios

Single species

Witch discarded lbs / Witch kept lbs X Witch Landings = Total Witch discarded

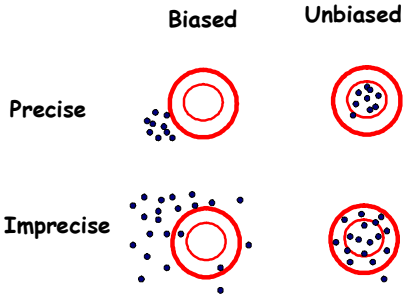
Two different species

YT discarded lbs / Scallop kept lbs X Scallop Landings = Total YT discarded lbs

Species aggregates

winter skate discarded lbs / 10 gf species kept lbs X 10 gf species Landings = Total skate discarded lbs

How Good Are The Estimates?



Coefficient of Variation ~ A measure of Precision

Accuracy ~ A measure of Bias

Example: 2003 Witch Flounder d/k ratios and estimated discards

		Observed				Metric Tons	
Year	Half	Trips	Disc.	Kept	Ratio (CV)	Landings	Discards
2002	1	30	2,511	38,836	0.065 (0.22)	1,741.9	113.2
	2	178	10,237	92,966	0.110 (0.08)	1,446.4	159.1
total						3,188.3	272.2
2003	1	164	18,142	168,514	0.107(0.11)	1,510.7	161.6
	2	176	18,387	154,401	0.119(0.13)	1,610.7	191.7
total						3,121.4	353.3

2003 discard ratios (d/k)

Large-mesh Otter Trawl Fishery on Georges Bank

Species	Qtr	Trips	Ratio	CV
GB Cod	1	49	0.02	0.23
	2	52	0.05	0.39
	3	36	0.02	0.32
	4	40	0.04	0.28
GB Haddock	1	45	0.01	0.18
	2	48	0.02	0.31
	3	30	0.02	0.33
	4	41	0.02	0.36
GB Yellowtail	1	26	0.07	0.27
	2	31	0.01	0.27
	3	17	0.02	0.56
	4	20	0.03	0.51

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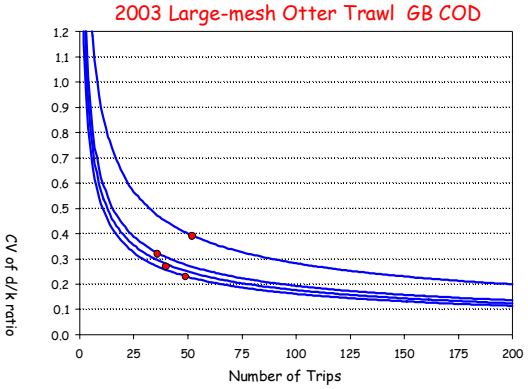
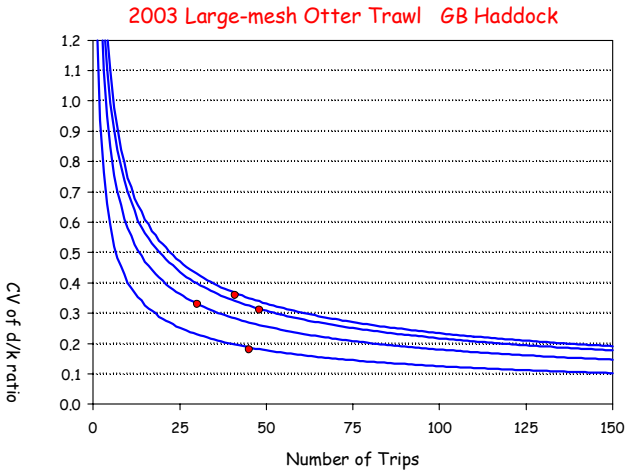
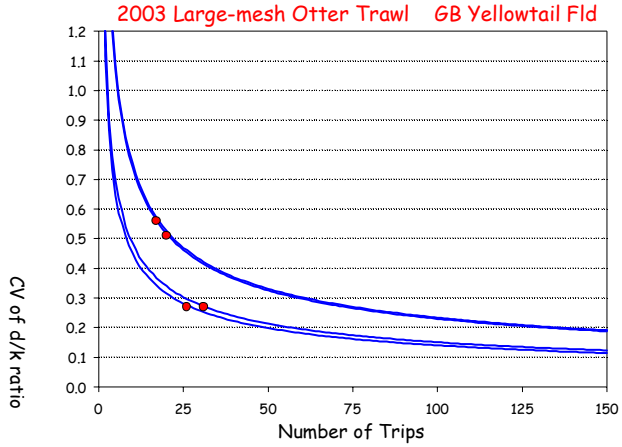
Expected precision of Discard/Kept Ratio

Based on CV the observed discard rates for trips within a stratum
Derive the expected CV for various sample sizes (number of trips)







Consider Species Groups

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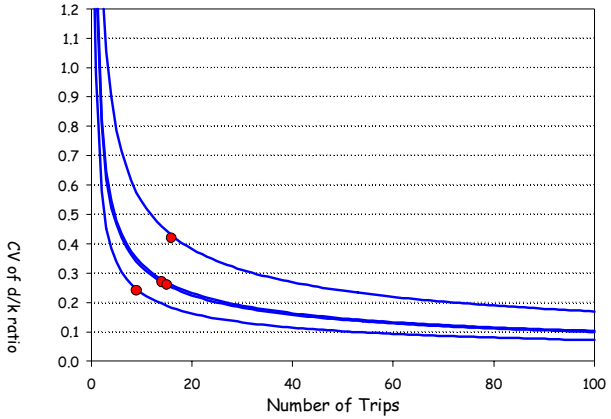
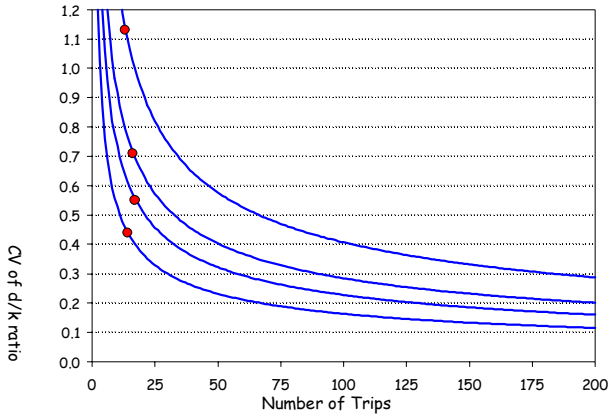
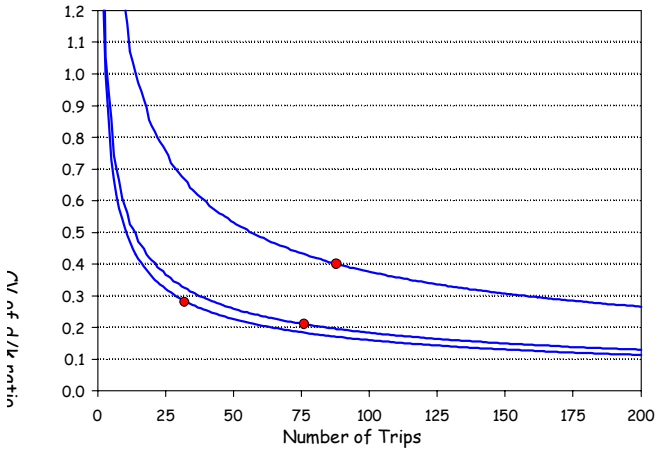
2003 NE Groundfish in Large-mesh Otter Trawl in ME&NH



2003 Fluke,Blk Sea Bass & Scup in Large-mesh Otter Trawl in SNE



2003 Monkfish in Gillnet in Northern Mass.



Accuracy of Observer data: Ongoing Analyses

Comparison of the Observer data set with independent data sets:

Vessel Monitoring System data,
Vessel Trip Report data

Compare trends in landings,
Compare spatial and temporal trends

Examining specific fishing behavior patterns: number of hauls, haul duration, catch rates, etc.)

Doveryai, no proveryai,
Russian proverb
Trust, but verify

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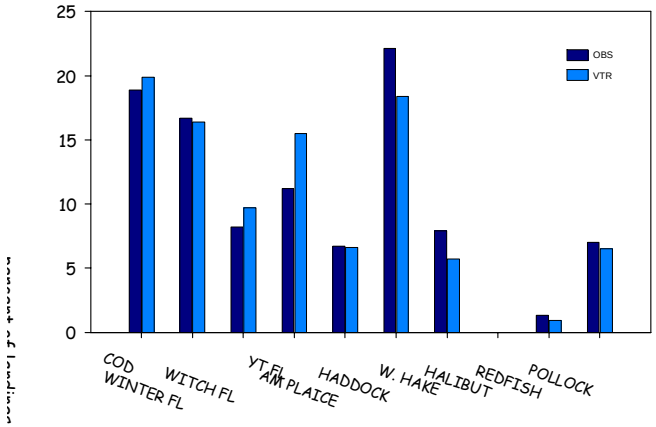
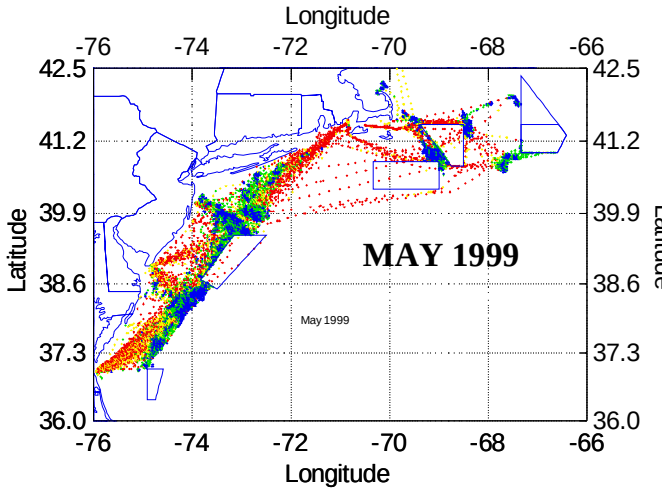
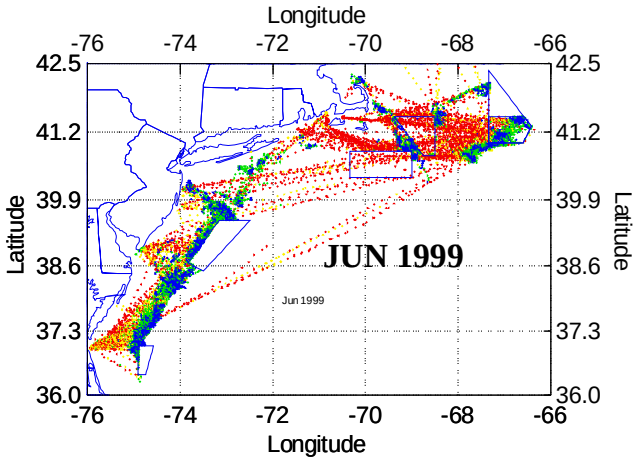
Comparing species compositions for Otter trawl gear



Vessel Tracking System: Testing the Observer Effect

- Hourly position and velocity measures by geosynchronous satellite
- Pooled by 1 nm sqr quadrats
- Computed ave speed by quadrat and time period.
- Ship velocity < 5 knots ==> fishing activity for scalloping.
- Ship velocity <3.5 knots➔ fishing activity for trawlers





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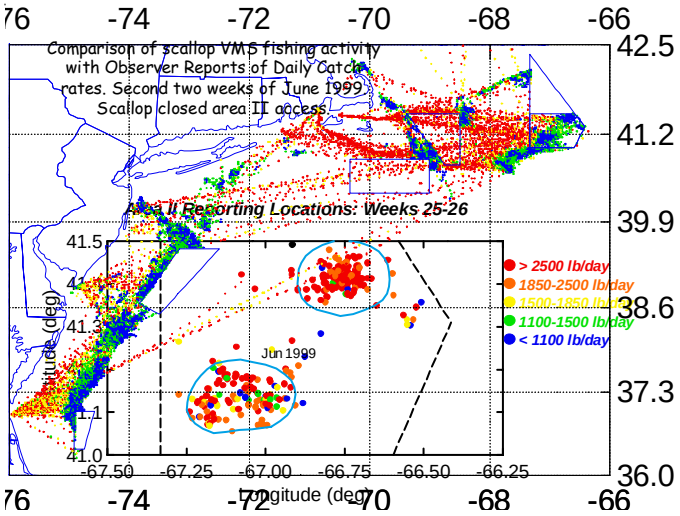

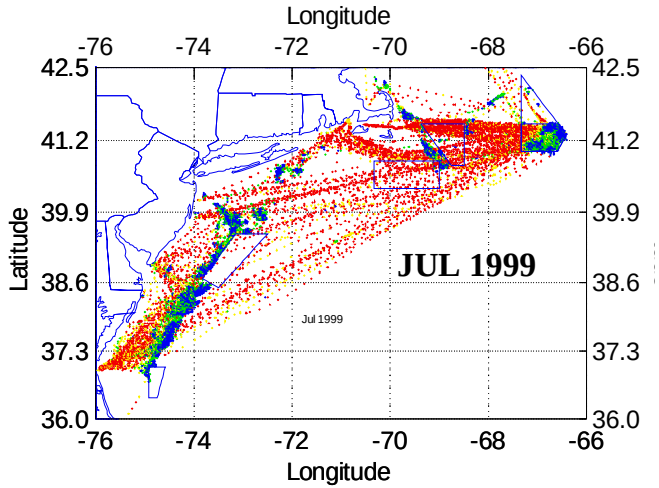

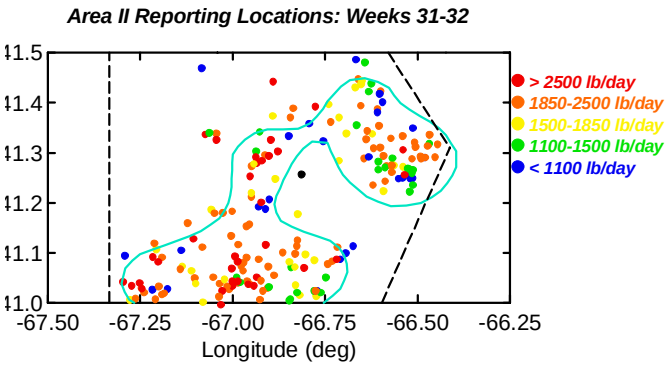

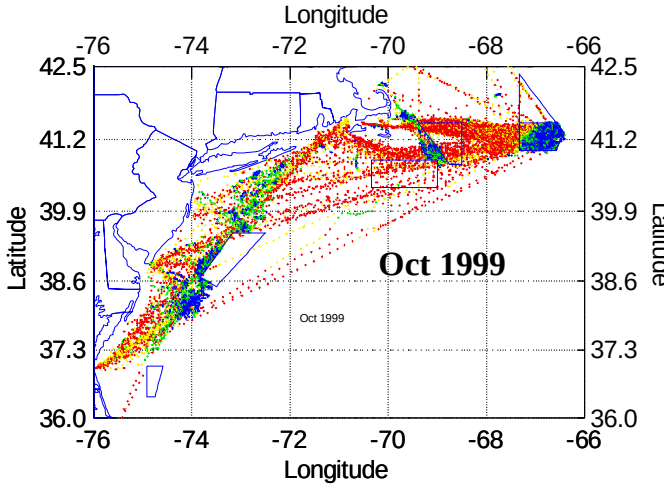

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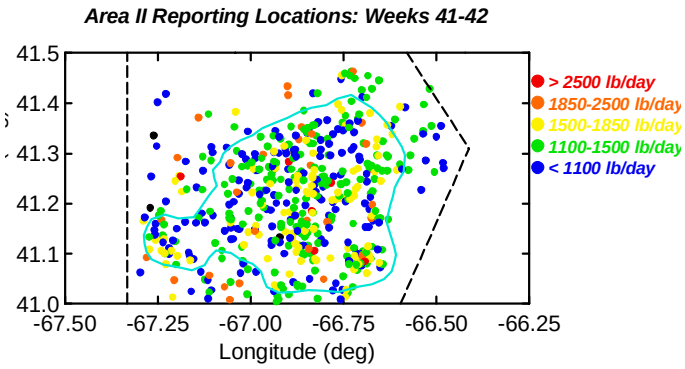

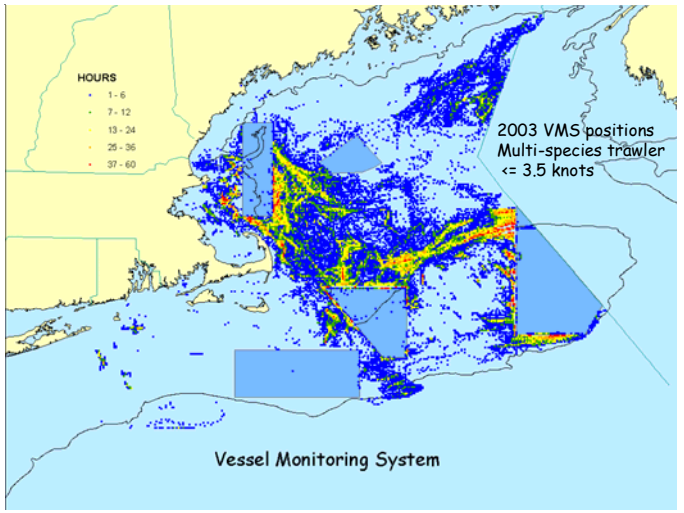

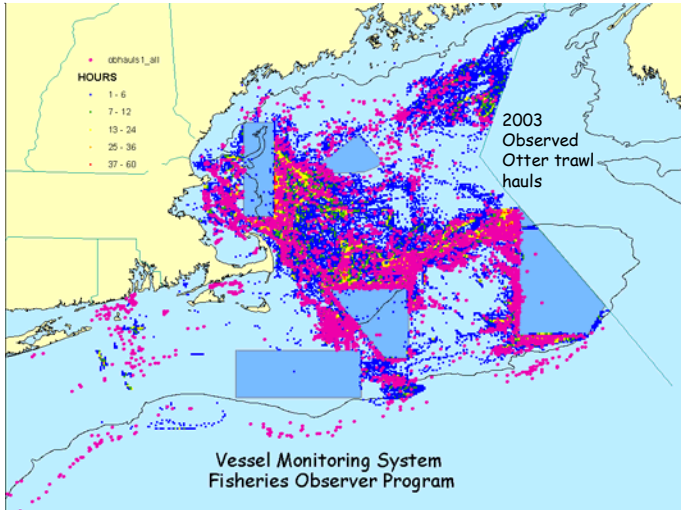

Discard estimation is usually conducted in a single-species context. However, most trips are catching multiple species during a trip.

When allocating observer coverage, a multi-species context is necessary to obtain adequate coverage. Focusing on a single species is myopic.

Most questions are unanswerable. Example: Is it better to reduce cod or scallop discards? Dogfish?

A well designed program must

1. Rely on observable attributes for strata definition.

2. Recognize that not all trips will result in useful information

3. Distribute risk over all strata

4. Recognize that discard patterns can be ephemeral.

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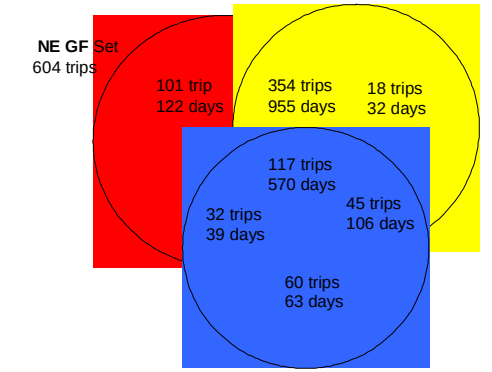
Can We Optimize Allocation of Observer Coverage?

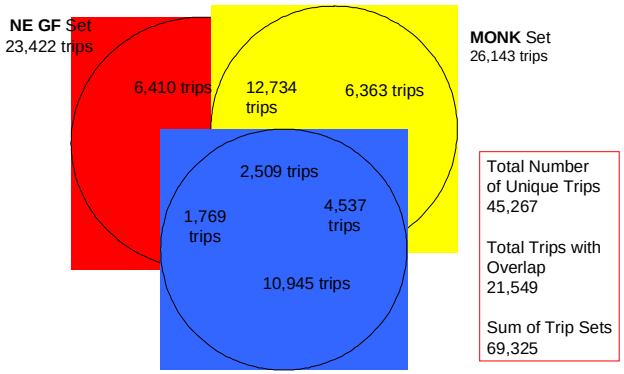
- Optimization is not getting the max for the minimum!
- Optimization is doing the best with the resources available…
  - $
  - Staff
- Subject to Constraints
  - Legal mandates
  - Management objectives
  - Geographic and temporal coverage
  - Redirection of resources

Number of trips and sea days in the Observer data subsets (Q3-4:2002 + Q1-2:2003
(727 trips and 1887 sea days)



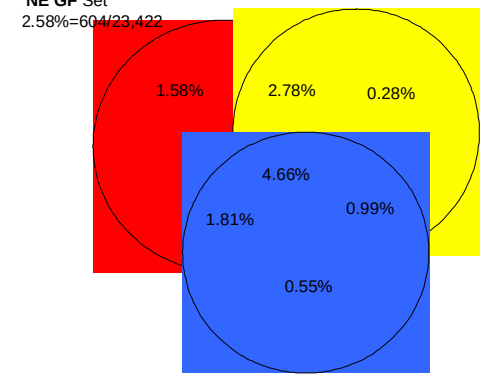
Note:
All shrimp and scallop trips removed

Number of trips in VTR data subsets
(45,267 trips)



Note:
All shrimp and scallop trips removed

Sampling Fraction: Observer Trips/VTR trips
(45,267 unique trips)



Note:
All shrimp and scallop trips removed

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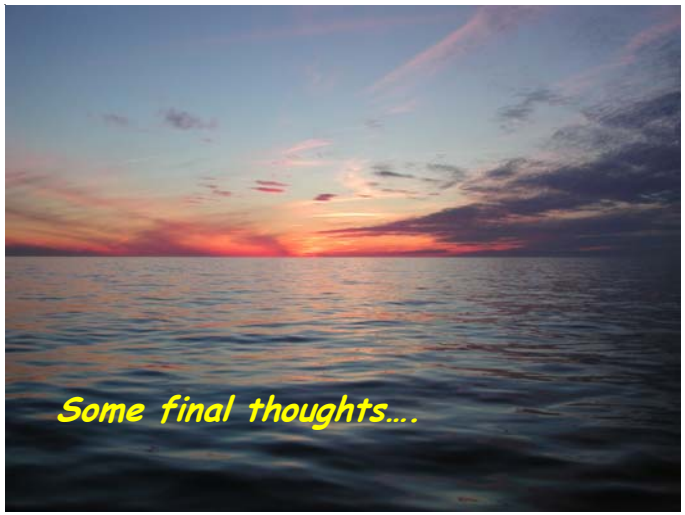
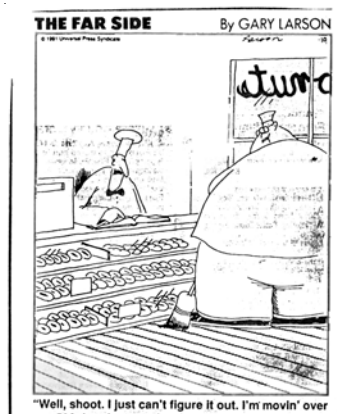
Dr. Paul Rago





Well, shoot. I just can't figure it out. I'm movin' over 500 doughnuts a day, but I'm still just barely squeakin; by.

Discards represent unacceptable economic loss.

Accurate and precise estimates of discard could lead to better use of marine resources.

Sound ecosystem management.

"life does not stand still while specialists put their minds in order"
Michael Graham, 1950. Address to United Nations

Well, there it goes again … And we just sit here without opposable thumbs

Be flexible.
Anticipate future needs.

Discard problems are moving targets.
Need ability to adapt annually.

Recovery will not be easy or simple

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David Potter

Northeast Fisheries Observer Program

David Potter
NEFSC

NEFOP Program History

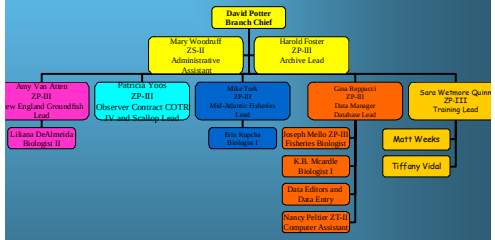
- 1977 Foreign Fleet Coverage
- 1988 Domestic Coverage
- 1990 Protected Species beginning with Harbor Porpoise
- 1994 Re-Authorization of the MMPA
- 2001 New England Groundfish
- 2004 Amendment 13

Northeast Fishery Observer Program Objectives

- Work with Industry to Improve Fishery Information Database
- Monitor Biological Characteristics of Catch
- Estimate Takes of Protected Species
- Monitor Discards
- Monitor Experimental Fisheries
- Design and Monitor Experimental Gear
- Obtain Economic Information
- Monitor Foreign Fisheries
- Monitor catch in certain cases

Fisheries Sampling Branch Table of Organization

October 2003



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Organization

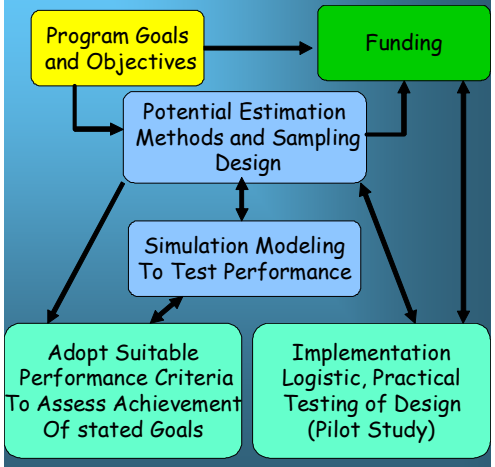
Branch Chief
Branch Administrative Assistant
Biologists (6)
Statistician (1)
Computer Assistants (1)
Program Director (Contractor)
Administrative Assistants (2)
Supervising Editor (1)
Editors (5)
Entry (4)
Area Coordinators (6)
And… OBSERVERS (60)

Northeast Fishery Observer Program Budget

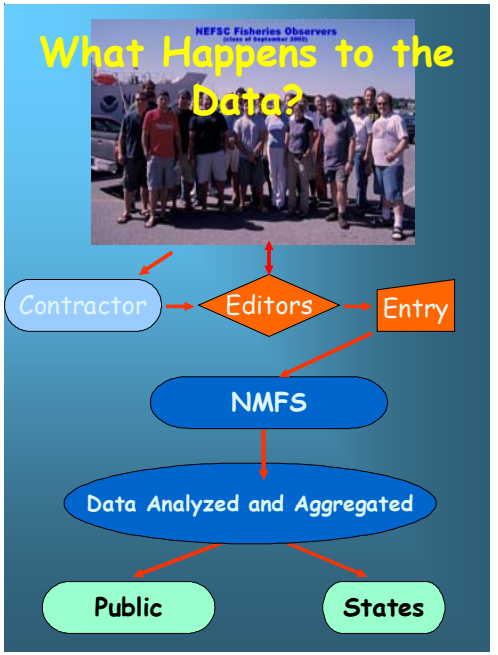
Funding Sources:
- NOAA Fisheries
- Atlantic Coast Cooperative Statistics Program
- NOAA Office of Protected Species
- Industry Funded Fisheries

Approximate Cost:
$1,150 per day at sea
$618 Contractor Quality Bonus
NMFS Infrastructure
Staff. Equipment
Total Budget: $10 Million

The Observer Program Process



What Happens to the Data?



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Some Issues in Observer Sampling

- Is Sampling Representative of the Fleet as a Whole?
- What are the Biases?
- Does Fishing Behavior Change when Observers are Onboard?
  - What could prevent this?
- Coverage levels, how much is enough?
- Funding (Timing!)
  - Federal
  - Industry
- How to deal with Refusals
  - Outreach
  - Enforcement

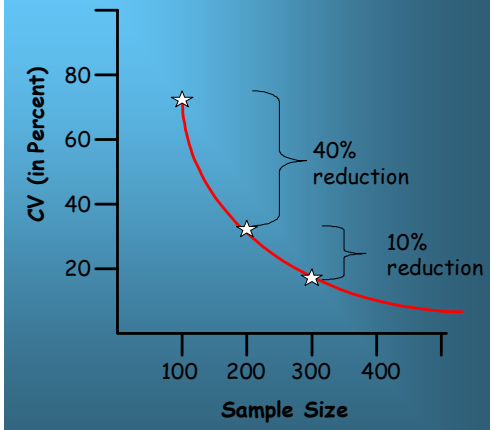
Coverage Levels Percent Coverage or Sample Size?

- *Percentage coverage* is inappropriate. It may well oversample or undersample.
- A statistical determination of a *sample size* is much better.
  - Fits the population
  - Conserves resources
  - Addresses the problem

Sampling?

- Sampling *Estimates* the real world.
- Samples have 'confidence limits' on them. Meaning *how sure are we that it is a good estimate.*
- The larger the sample size the lower the CV.
- BUT! Beyond a certain point there are diminishing returns.
- Example

Sample Size vrs CV



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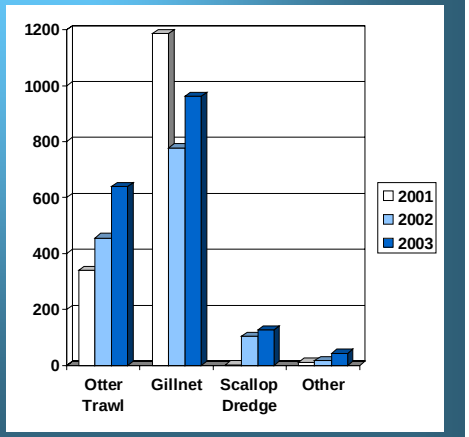
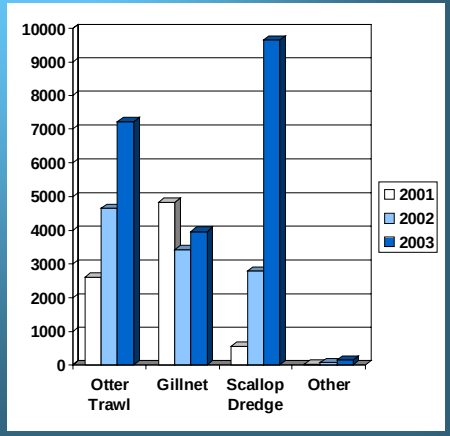
Hot Topics for the Observer Program

- Observer Health and Safety Regulations Changes
  - 50 CFR 600.746
  - USCG Safety Decal
- Changing Coverage Requirements
  - NE Groundfish
  - MA Scallop
- Electronic Data Entry at sea
- Data Confidentiality
  - NAO 216
- Northeast Training Center

Number of Trips by Fishery



Number of Hauls by Fishery



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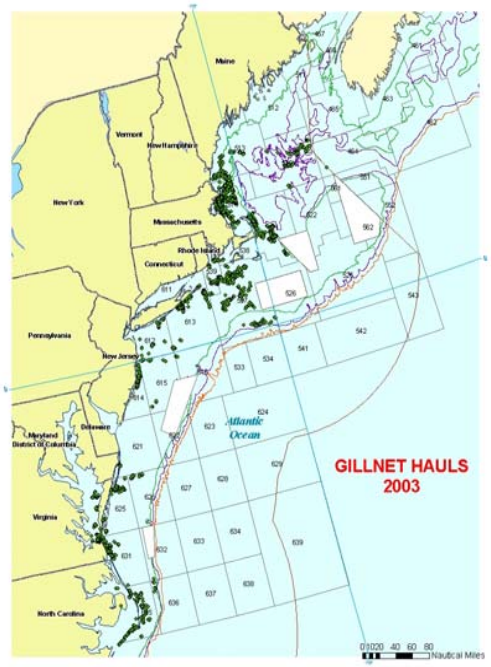

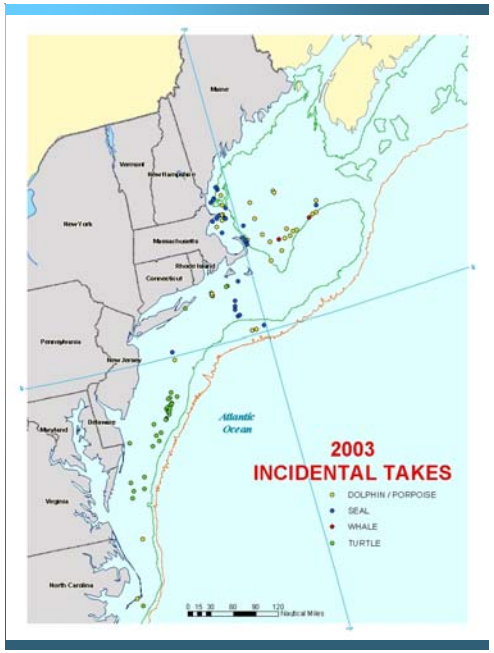

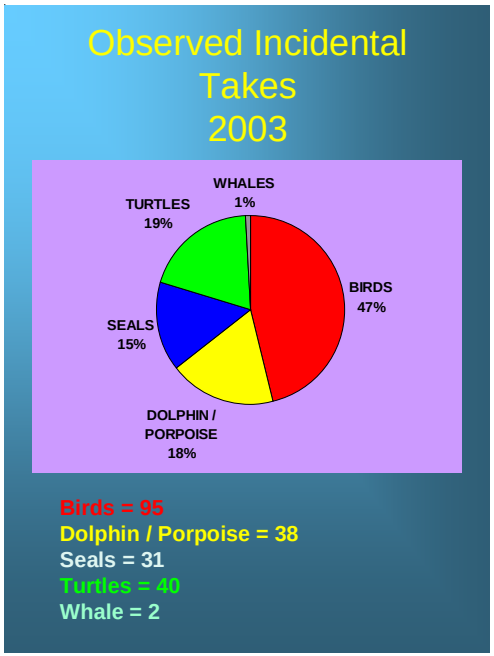

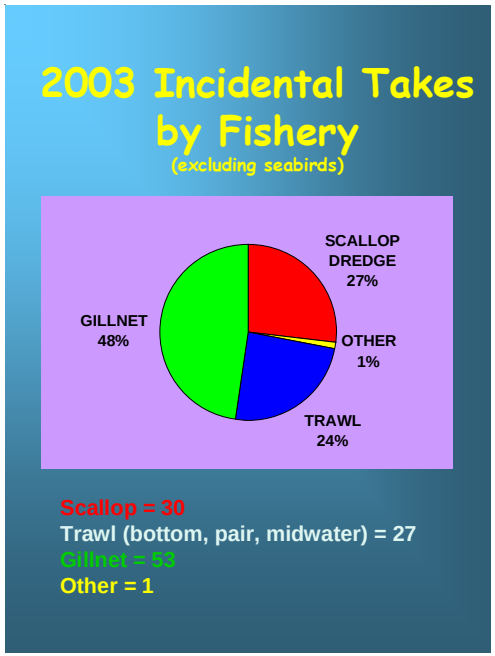

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THE FUTURE

- Observer Programs will grow
  - Litigation driven
  - Management needs
- More industry participation
  - Program direction
  - Funding
  - Experimental studies
- Electronic Data entry at sea
- More Outreach and Education
- More Access to data
- Web Site Development

New England Fishery Management Council

Paul Howard

Management Perspectives on Bycatch

NOAA Fisheries Bycatch Workshop

July 29 – July 1, 2004

Paul J. Howard, Executive Director
New England
Fishery Management Council

Magnuson Act Definition of Bycatch

National Standard 9

"… fish that are harvested in a fishery, but which are not sold or kept for personal use"; includes economic and regulatory discards.

M-S Act Charge to Councils

- **Conservation and management measures shall, to the extent practicable, minimize bycatch; NSGs provide guidance to determine what is "practicable"**
- **If bycatch cannot be avoided, management measures must minimize bycatch mortality**
- **FMPs must establish standardized reporting programs to assess amount and type bycatch**

NSGs place emphasis on avoidance of bycatch. Additionally, Council must:

- **Promote development of a bycatch database;**
- **Assess the effects of each measure on the amount and type of bycatch;**
- **Select measures that will minimize bycatch and bycatch mortality;**
- **Monitor selected measures for impacts on bycatch;**
- **Consider other applicable law (MMPA, ESA, etc.)**

New England Fishery Management Council

Paul Howard

Why is minimizing bycatch important?

- Removals of species and alteration of habitat structure and complexity may affect ecosystem/forage base
- May reduce populations to unsustainable levels and jeopardize rebuilding plans
- Could trigger fishery closures causing significant economic losses

Historical Perspective

- Through early 90s discarding of juveniles of target species controlled only by mesh regulations and area closures
- Small mesh fisheries (whiting, shrimp) retaining juvenile groundfish
- Scallop fishery discarding large amounts of yellowtail flounder
- High takes of harbor porpoise occurring in gillnet fishery
- Small monkfish discarded in many fisheries

Council Solutions – Direct Measures

- Approved largest mesh size for groundfish, worldwide
- Improved match between min. fish size and mesh size
- Established exempted fisheries program – 5% rule for groundfish
- Prohibited brush sweep gear
- Increased possession limits to reduce discards

Council Solutions – Direct Measures

NEFMC Required:

- Raised footrope trawl in Mass. whiting fishery to avoid flounder bycatch
- Whiting separator trawl (grate) to reduce groundfish bycatch and allow an inshore GOM fishery
- Nordmore grate in no. shrimp fishery to exclude finfish and reduce bycatch of juvenile groundfish

New England Fishery Management Council

Paul Howard

Council Solutions – Direct Measures

- Placed caps on bycatch for scallop vessels operating in groundfish closed areas; fishery closes when cap is reached
- Increased ring size (to 4") and twine top mesh size (to 10") to reduce bycatch of small scallops and finfish in scallop fishery
- Required pingers on gillnets by area/season to reduce porpoise takes

Council Solutions Indirect Measures Approved

- Effort controls (limited entry, DAS)
- Seasonal and year round area closures
- Crew and gear limits
- Increased trip limit in whiting fishery as an incentive to use large mesh
- No possession of barndoor, thorny and smooth skates
- Skate baseline review in all FMPs
- Development of new technologies through RSC and cooperative research programs

Future Bycatch Reduction Initiatives – Groundfish SAPs

- New technologies - haddock separator trawl in CAII Haddock SAP
- Operational changes - optional use of specific bait to avoid cod and hook sector retention of all legal-sized cod in CAI Hook Gear SAP
- Hard bycatch TACs for species of concern
- No discard provision - minimizes discards of legal-sized fish; flip to A DAS required

Possible Future Bycatch Reduction Initiatives – Herring and Monkfish FMPs

- Establish TAC set-asides to address incidental catch of herring in the mackerel fishery
- Change regulatory definition of midwater trawl gear to clarify how gear is intended to be fished
- Separate monkfish DAS from groundfish and scallop DAS, require large mesh on monkfish-only DAS
- Close areas to protect deep-water coral concentrations

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Paul Howard

Bycatch Reporting

- Vessel Trip Report System (VTR) – each permitted vessel must report catch and landings in VTRs submitted to NMFS on periodic basis
- Sea sampling/observer program - dedicated personnel to observe and estimate amount of discards on a haul-by-haul basis
- Marine Recreational Fishery Statistical Sampling (MRFSS) – intercepts and random phone calls

Challenges - General

No magic bullet to achieve goal. Problems with different gears, competing fisheries, interactions among fisheries/gears and stocks at low levels.

Challenges – NS 9 Guidelines

- Guidance suggests practicability determination should be based on ecological changes that result from bycatch, effects on marine mammals and sea birds, changes in fishing, processing and marketing costs, changes in social and cultural values of fishing activities, and more …
- Much of this information is NOT AVAILABLE for most fisheries

More Challenges

- Obtain better information
- Establish effective monitoring programs
- Develop incentives to avoid bycatch
- Address added complexity as emphasis shifts to EFH and ecosystems-based management
- Address obstacles to cooperative research (establish set-asides, improve experimental fishery permit process)

New England Fishery Management Council

Paul Howard

Mid-Atlantic Fishery Management Council

Dr. Chris Moore

Bycatch in the Mid-Atlantic: Moving Forward

Dr. Christopher Moore
Deputy Director

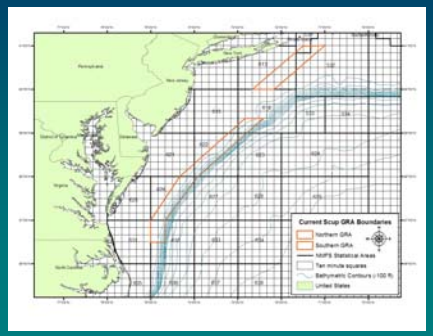
Mid-Atlantic Council

- Largest of 8 Councils
- 21 voting members
- 4 non-voting members
- Industry advisors
- Manage 12 species
- 10 species rebuilt/rebuilding
- New York – North Carolina

Management Measures

- Indirect:
  - Limited Entry
  - Quotas/ITQs
- Direct:
  - Minimum Mesh
  - Escape Vents
  - Gear Restrictions
  - GRAs

Scup GRAs

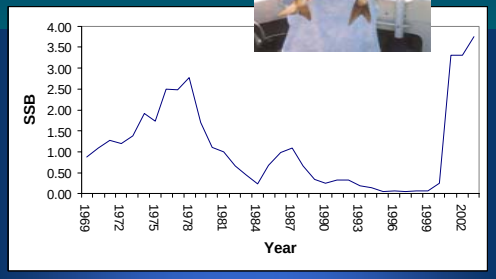


Mid-Atlantic Fishery Management Council

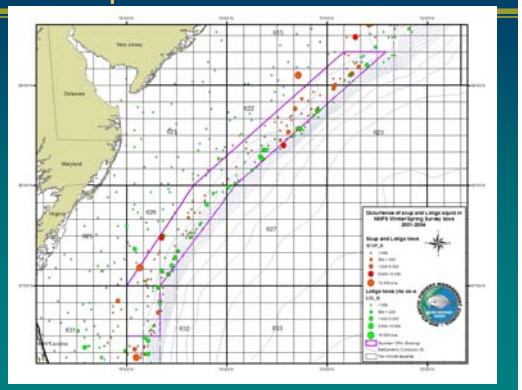
Dr. Chris Moore

Scup

- Management Effect



Survey Overlap



Small Mesh Gear Modifications

- Council funded research -Manomet
- 5.5” square mesh extension
- Access program for GRAs
- Reduced both scup and loligo

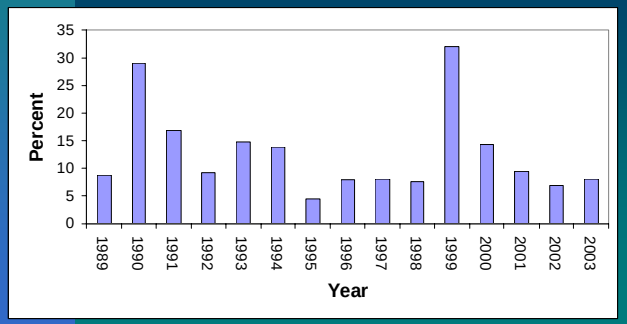
Scup – Commercial Regulations

- Mesh restrictions
- Winter coastwide quotas
- Possession limits

Mid-Atlantic Fishery Management Council

Dr. Chris Moore

Summer Flounder Discards



Black Sea Bass Escape Vents

- Collaborative research
- Current regulations
- New Studies

Mackerel, Squids, Butterfish

Amendment 9 to the FMP
- Discards in …
- Discards of …

SMB Bycatch Problems

- Loligo discards after a closure
  - Modify bycatch allowance

Mid-Atlantic Fishery Management Council

Dr. Chris Moore

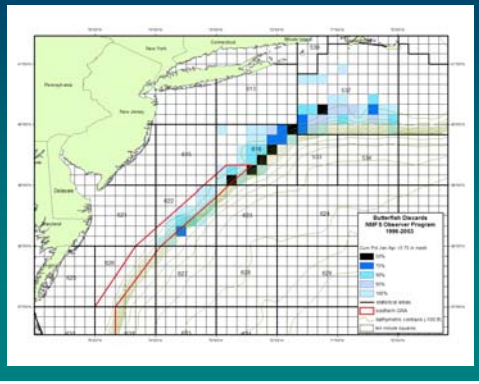
SMB Bycatch Problems

- Incidental harvest of Loligo in Illex
  - Discontinue Illex exemption
  - Modify Illex exemption

SMB Bycatch Problems

- Butterfish discards
  - Increase cod-end mesh size
  - Use of BRD in the Loligo fishery
  - GRAs

What? Another GRA?



Bycatch and other FMPs

- Surfclam and Ocean Quahog
- Tilefish
- Bluefish
- Spiny Dogfish

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Dr. Chris Moore

Recreational Bycatch

- Post release mortality
  - Summer flounder (10%)
  - Black sea bass (25%)
  - Scup (15%)
- Bluefish (10%)
- Management measures
  - Possession, size and season

Research Set-Aside Program

- Response to lack of information
- Quota allocation equals dollars
- Bycatch Priorities

Moving Forward

Atlantic States Marine Fisheries Commission

Vince O'Shea

Perspectives on Bycatch

by

John V. O'Shea, Executive Director

www.asmfc.org

ASMFC FMP Standard

"Management measures shall be designed to minimize waste of fisheries resources"

1942 – Compact of the Atlantic States Marine Fisheries Commission

ASMFC Bycatch:

1995 – ISFMP Charter

"The portion of a catch taken in addition to the targeted species because of non-selectivity of gear to either species or size differences; may include non-directed, threatened or endangered and protected species."

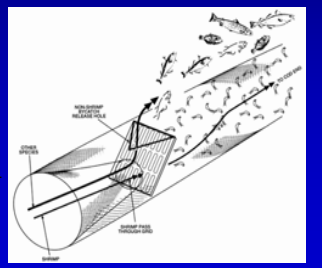
ASMFC Actions to Address Bycatch

Atlantic States Marine Fisheries Commission

Vince O'Shea

Northern Shrimp

- 1992 - Nordmore Grate Required
- Protects Cod, Haddock, Flounder
- Industry-Verified Effectiveness



Weakfish

- 1996 - NC-FL, BRDs on Shrimp Nets
- Weakfish Mortality Halved
- 300 lb Bycatch During Closed Season
- Pound Net Escape Panel Coming Soon

Summer Flounder

- States Set Aside 15% for Bycatch
- Trip Limits – Discards to Landings

Spiny Dogfish

- Trip Limits to Allow Landings
- Low Levels Discourage Targeting

American Shad

- 29 River Stocks Need to be Rebuilt
- Weak Stocks Drive Management
- Ocean Fishery Restricted to 5% of Trip

Atlantic States Marine Fisheries Commission

Vince O'Shea

ASMFC Bycatch Activities

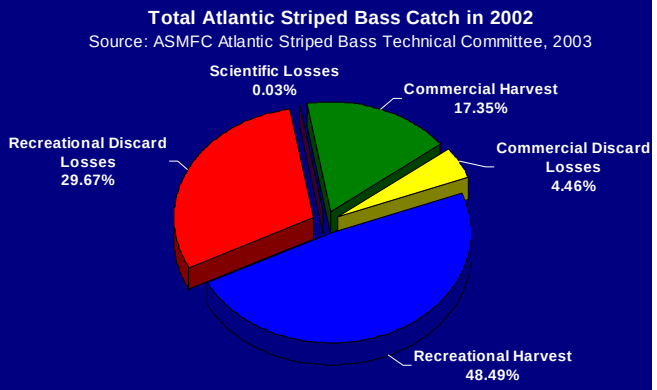
- 2001 - Summer Flounder Workshop
  - Highlighted Source of Bycatch
  - Recommended Solutions
  - Prioritized Research Needs

ASMFC Bycatch Activities (cont)

- 2003 - Circle Hooks
  - Define Circle Hooks
  - Angler Education
  - Future Research Recommendations
- States Promote Ethical Angler

Bycatch Challenges

Striped Bass



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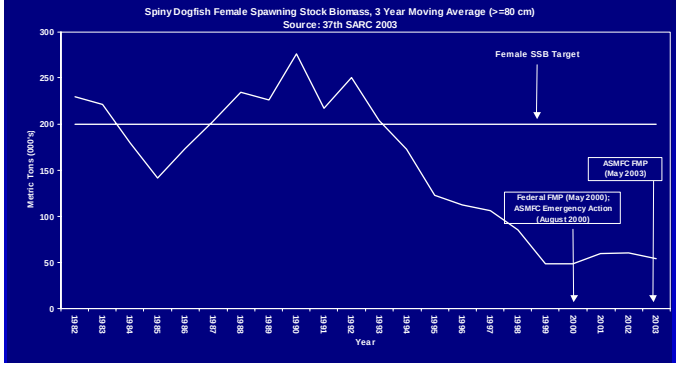
Striped Bass (cont)

- Committed to Bycatch Addendum
  - Establish Data Collection Program
  - Recreational Mortality & Commercial Discards

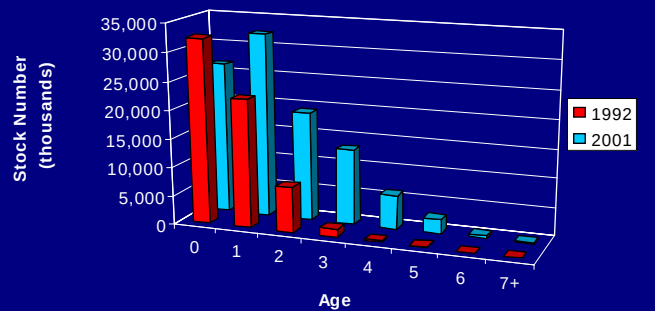
Future Challenges

As Stocks Recover the Potential for Interactions will Increase

Spiny Dogfish



Summer Flounder



Atlantic States Marine Fisheries Commission

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Atlantic Sturgeon

- Increased Bycatch Likely
- Endangered Species Act Implications
- Potential Impacts on Other Fisheries

American Shad

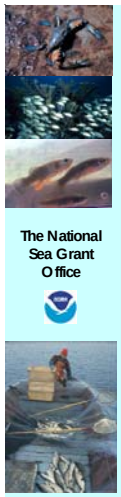
- 2005 - Ocean Intercept Fishery Closed
- Regulatory Discards will Increase

Conclusions

- Rebuilding Doesn't Solve Bycatch
- In Fact, Bycatch Likely to Increase

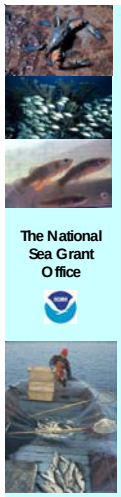
Conclusions

- Collective Responsibility of all Harvesters
  - Stewardship
  - Innovation
  - Commitment



The Sea Grant Fisheries Extension Enhancement Program: Its Evolution and Future

Bill DuPaul
Virginia Sea Grant



Background

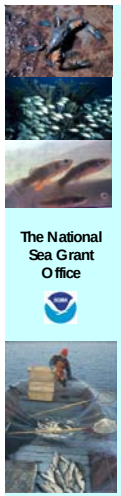
Demand for SG Fisheries Extension has increased

- ***Fisheries management increasingly complex**
- ***Regulatory burden has increased**
- ***Technology playing increasing role**

While at the same time

- ***Sea Grant fisheries extension reduced**
- ***Outreach capabilities of management agencies limited**

Senator Gregg (NH) Proposed to Increase Sea Grant Fisheries Extension



Designed to....

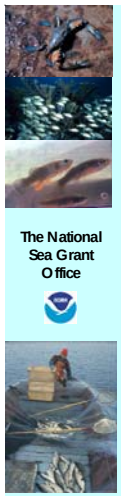
..... enhance fisheries outreach to an array of fisheries constituents

..... achieve measurable outcomes

..... provide foundation for a long-term, sustained and expanded program

..... establish structure for national coordination and leadership, regional planning and priority setting, yet, with flexible local implementation

..... involve partnering with fishery management agencies and industry clients



Fisheries Extension

FY02 Plan ($3M unfunded mandate)

- **Reallocation ($1,050,000)**
  - **$20K from programs**
  - **$15K from NSGO**
- **Regional PD ($990K)**
  - **6 regions x $165K**
- **National competition ($900K)**
- **Coordination and synthesis ($60K)**

Northeast Sea Grant

Bill DuPaul



State/Institutional Programs

29 programs participated in 1 year program

Issues addressed

- **Workshops: 3**
- **Newsletters/brochures: 4**
- **Outreach/education: 10**
- **New part-time hires: 2**
- **Information to decision makers: 3**
- **Fisherman-scientist collaboration: 2**
- **Value-added fishery products: 2**
- **Training, research, other: 5**

End date: summer/fall 2003



Regional Program Development

The Future of the Fishing Industry and Fishing Communities on the West Coast

Great Lakes Fisheries Leadership Curriculum Development

Educational Efforts for the Gulf of Mexico Fish Industry



Regional Program Development

Education Programs for Commercial and Recreational Fisheries along the South Atlantic Coast

Education and Outreach Enhancement for the Mid-Atlantic Charter Boat Fisheries

Collecting and Mapping Fishing Gear Areas in the Northeast



National Competition

11 projects

$957,333 total (range: $19,000 - $150,000)

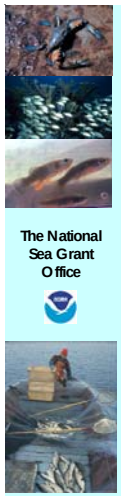
National collaboration in fishing technology (MA)

Sharks in Perspective II: From fear to fascination (FL)

Coast wide fish life history and habitat associations (CA)

An educational program regarding methylmercury in Gulf of Mexico marine fish (MS-AL)

Training and education in support of effective control for scombroid poisoning (MD)



National Competition

Great Lakes Fisheries Leadership Institute (MI)

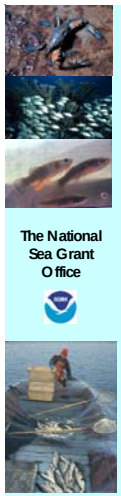
Fisheries facilitation fund (NH)

Shark Sense: Putting the Atlantic and Gulf Coast sharks into perspective for the public (NC)

Using collaborative workshops to develop new approaches of the northern shrimp fishery in New England (ME)

Summit for the sustainability of the Gulf of Mexico shrimp fishery (TX)

Better information for better management: Fisheries educational workshop (RI)

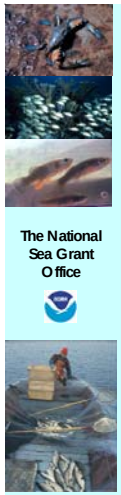


Fisheries Extension FY03

Language

House – "$3,000,000 for competitive grants for fishery extension activities"

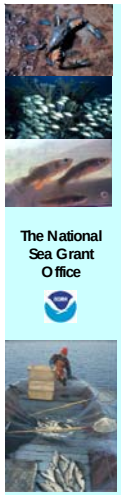
Senate – "no less than $3,000,000 will be dedicated towards hiring of additional personnel, at the State program level"



Mutual Assumptions

Intent of Congress to increase number of personnel conducting fisheries extension activities

Fisheries Extension Enhancement concept and design co-developed between NMFS and Sea Grant



NSGO Implementation & Funding

$2.4M NSGO; $600K programs thru re-programming

Competition for additional personnel and resources, does not include production aquaculture

Must partner with fishery management agency(s)

To participate, must re-program existing federal SG funds (1:4 ratio)

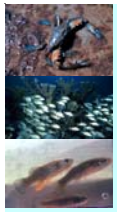
Match required

5-year commitment, reviewed after four years

$150K available for national coordination

Northeast Sea Grant

Bill DuPaul



The National Sea Grant Office

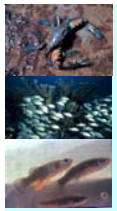
FY03 Fisheries Extension Enhancement Competition

29 Sea Grant Programs submitted proposals (+ Pennsylvania & Lake Champlain)

61 separate modules developed

$4.47 million requested
range: $12,000 – $200,000
average request: $73,300

210 letters of support



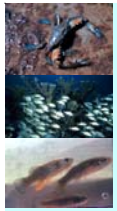
The National Sea Grant Office

Proposal Review – 2004 Funding

Proposal review went forward without certainty of funding

Review process left fundable proposals asking for approximately $3 million

$2 million approved for Fisheries Extension



The National Sea Grant Office

National Fisheries Extension Enhancement

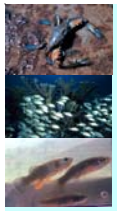
IMPLEMENTATION

National Leadership
NMFS/SG

Synthesis
Strategic planning
Tracking
Success/failures

Regional Coordination
NMFS/SG/Councils

Annual
Local Priority Setting
• State management
• Industry assoc.
• NGOs
•Stakeholders



The National Sea Grant Office

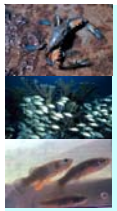
Benefits/Strengths

Greater involvement between fishery management agencies and Sea Grant Programs at a local level

- outreach, communications and research capabilities
- 30+ years of Sea Grant experience in stakeholder-driven educational programs; a continuity of presence

More informed and receptive constituency

More coordinated process for interacting with constituents



The National Sea Grant Office

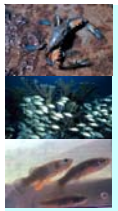
Benefits/Strengths

More effective and efficient access by Sea Grant to fishery management agency's science and management information

Feedback loop from constituents to fisheries management agencies, via Sea Grant Extension agents, regarding new research, management and educational need

Improve ability to address problems on regional basis

Projects will have outcome based objectives



The National Sea Grant Office

Northeast FEE Awards FY04

MAINE - Enhancing the Involvement of Fishermen in Marine Protected Areas, Activity within Maine State Waters and the Gulf of Maine; Tracy Hart, Paul Anderson; $37,642

MARYLAND - Maryland's Changing Fisheries-- (Fisheries Anthropologist Specialist); Doug Lipton, Michael Paolisso; $15,678

NEW HAMPSHIRE - Fisheries Extension Enhancement: Technology Transfer from Cooperative Research Projects; Brian Doyle; $78,000

NORTH CAROLINA - Enhancing the Quality of North Carolina's Fisheries Extension and Applied Research Products; Jack Thigpen; $33,826

RHODE ISLAND - Developing Partnerships to Support Sustainable Fisheries and Regional Coordination; Kathleen Castro; $56,659

VIRGINIA - A proposal to increase the capacity for fisheries extension in the area of bycatch, including fishing interactions with protected species; William DuPaul; $100,000

Sea Grant and Bycatch Issues in the Mid-Atlantic

Bill DuPaul

NOAA

Sea Grant Virginia

William & Mary VIMS Virginia Institute of Marine Science School of Marine Science

Mid-Atlantic Sea Grant Bycatch Reduction & Related Projects Recent or Ongoing

NC

- Circle hook use in pelagic recreational fishery

Virginia

- Scallop dredge selectivity; 4" dredge rings
- Scallop dredge selectivity; large mesh twine tops (with Ron Smolowitz)
- Black sea bass pot selectivity
- Scallop dredge sea turtle interactions (with Ron Smolowitz)
- Scallop trawl selectivity; finfish bycatch
- Catch and release mortality in recreational fisheries

Northeast Sea Grant

Bill DuPaul

Source of Manpower & Sea Grant Extension

	FTEs	# of Agents/Specialists
NY	< 0.1	1
NJ	0.0	0
MD	0.0	0
DE	0.0	0
VA	2.0	4 (1 to be added in '04)
NC	< 0.75	3

Mid-Atlantic Sea Grant Bycatch Related Programs

Sources of Funding:

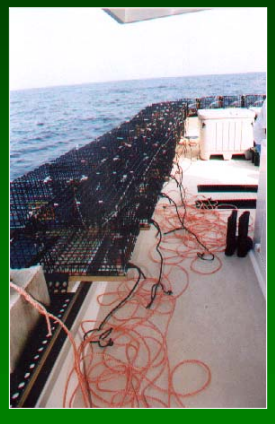
- Research TAC Set-asides
- Fishing Industry Resource Grants VA & NC
- Sea Grant Extension Programs
- Student Stipends

Education & Outreach

Catch & Release and Recreational Fisheries

Target Species –Black Sea Bass

Problem: Sub-legal fish were being retained in habitat pots resulting in mortality.



Northeast Sea Grant

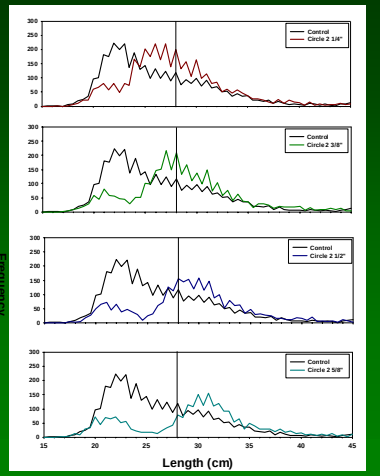
Bill DuPaul

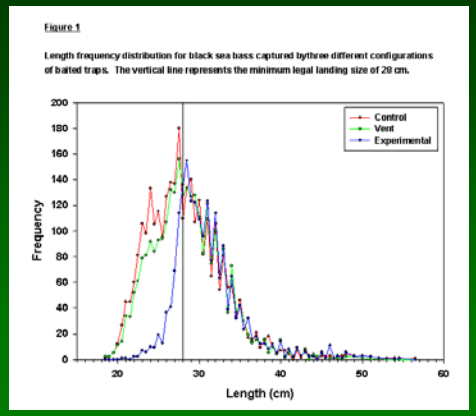
Target Species – Black Sea Bass

Solution: Match selective properties of escape vents with current MLS

Results

- Circular escape vents
- Increasing vent size shifts curve to right
- Larger vents = more larger fish
- Behavioral issues w/ small fish confounded estimates of selectivity





Bycatch Reduction – Finfish

Problem: Finfish bycatch can be problematic…varies spatially and temporally.

Northeast Sea Grant

Bill DuPaul

Finfish Bycatch Reduction Device

Possible Solution: Roller Sweep & Excluder Chains

Intended to deflect finfish from mouth of dredge.

Bycatch Reduction – Finfish

Known Solution: Twine Top Mesh Size

Future Work: Modifications to twine top hold promise for further reductions in finfish bycatch....but how large of a mesh is reasonable

Finfish Bycatch Comparison

Species	12" Square	8" Diamond
Skates	983	1524
Blackback flounder	165	475
Yellowtail flounder	118	219
American plaice	1	5
Monkfish	72	145
Scallops	2249	2911

Finfish bycatch aboard F/V *Thor* in the open area adjacent to Closed Area II during September/October 1998. The comparison was being made between a 12" twine top hung on the square versus an 8" twine top hung on the diamond. A total of 34 tows with 9.22 hours of towing time were analyzed.

Target Species – Sea Scallop

Solution:

- Limit entry
- Reduce effort
- Impose gear restrictions

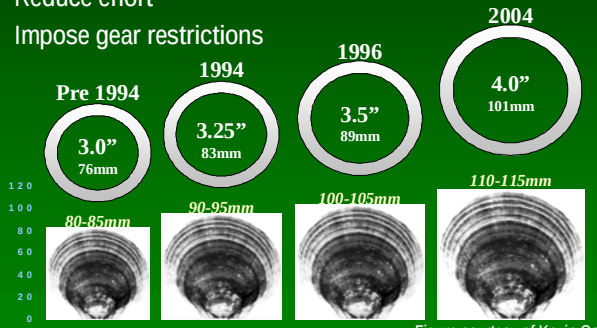


Figure courtesy of Kevin Goff

Northeast Sea Grant

Bill DuPaul

Pre-1994

Scallop dredges had poor selectivity characteristics.

For some current gear, selectivity remains problematic and discarding is significant.

Catch of scallops in Closed Area 1 tow. 2000

ECONOMIC DISCARDS

Bycatch and discards of >10 mpp scallops from same tow. Gear selectivity can't help here.

BYCATCH OF INVERTEBRATE ASSEMBLAGES

4" ring dredges can significantly reduce invertebrate bycatch.

Northeast Sea Grant

Bill DuPaul

Bycatch Reduction – Protected Species

SEA TURTLES
Solutions:

- Closure of grounds while turtles are present
- Modification of dredge
  - Keep out turtles
  - Keep in scallops

Species of Special Concern: Barndoor Skate

Bycatch Research

Can present opportunities to gather important life history information.

MS J-512 (Rec'd 16 December 2002 – Elasmo. Symposium, Back from Authors Sep 4)

Observations on the Life History of the Barndoor Skate, *Dipturus laevis*, on Georges Bank (Western North Atlantic)

Todd Gedamke[1*], William D. DuPaul[1] and John A. Musick[1]

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Phone: 804-684-7315 - Fax: 804-684-7161 - E-mail: gedamke@vims.edu

*Corresponding author

Abstract

The barndoor skate (*Dipturus laevis*) has been reported to be close to extinction in parts of its northern range and is believed to be particularly vulnerable to fishing mortality due to its relatively large size. A lack of basic life history information, however, has hampered an accurate assessment and management of north Atlantic populations. In an attempt to fill this void, information was collected from 2,310 specimens caught during commercial sea scallop dredging in the southern section of Georges Bank Closed Area II. Eighty-seven fish were determined to be mature from a visual inspection of reproductive tracts and the allometric growth of claspers, ovidcal glands, and developing ova. Sexual dimorphism was apparent in length at 50% maturity with females maturing at 116.3 cm and males at 107.9 cm. A preliminary analysis of 118 vertebrae indicates faster growth ($k = 0.14$ to 0.18) and younger female maturation (6.5 to 7.2 yrs.) than previously believed. Thus, resilience of the barndoor skate to overfishing may be higher than recently assumed.

Introduction

The barndoor skate *Dipturus laevis* (Mitchill 1817), is one of many skate and ray species caught as bycatch in finfish trawl and scallop dredges in the Northwest Atlantic. Until recently, this species has received little attention, due primarily to its low market value (Musick et al., 1999; Dulvy et al., 2000; Kulka et. al., MS 2002), until a recent study suggested its potential extinction (Casey and Myers, 1998). Casey and Myers (1998) reported that the barndoor skate, once a common bycatch species off southern Newfoundland, had become locally extirpated in parts of its northern range due to overfishing. They also contended that "long-term research surveys on the continental shelf between the Grand Banks of Newfoundland and southern New England reveal that…the barndoor skate…is close to extinction (Casey and Myers, 1998)." Subsequent petitions to place the species on the U.S. National Marine Fisheries Service Endangered Species List and listing of the the barndoor skate as vulnerable by the IUCN (Union for the Conservation of Nature and Natural Resources) placed the barndoor skate in the middle of conservation and extinction risk debates (Diaz-Soltera, 1999; Musick et. al., 1999; NEFSC, 2000).

The barndoor skate is the largest member of the family Rajidae found in the northwestern Atlantic, reaching a maximum length of 152 cm and a weight of 20 kg (Bigelow and Schroeder, 1953a). The species is found from Cape Hatteras to the Grand Banks of Newfoundland, Gulf of St. Lawrence and Nova Scotia (Leim and Scott, 1966; McEachran and Musick, 1975). It ranges from shallow coastal waters to depths greater than 400 metres and tolerates water temperatures of 1.2-20° C (Bigelow and Schroeder, 1953b; McEachran and Musick, 1975). Recent analysis of Canadian survey and commercial fisheries data suggests that the overall distribution of the species is far more extensive than originally thought both in terms of depth and northern range (Kulka et al., MS 2002; Simon et al., MS 2002). Barndoor skates were found as far north as the Labrador Shelf to 62° N and into depths of about 1600 meters with significantly higher catch rates at depths below 450 metres (Kulka et al., 2002; Simon et al., MS 2002). These studies

Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island

Sea Grant and Bycatch Issues in the Northeast

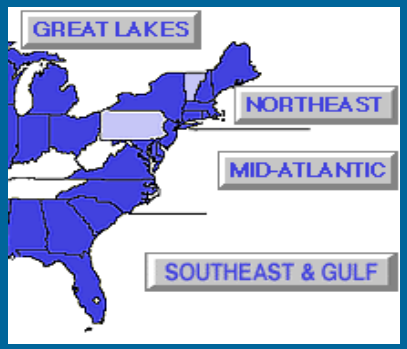
Kathleen Castro
RI Sea Grant
NE Fisheries Coordinator

Northeast Sea Grant

Kathleen Castro

Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island



Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island

Total FTE's for Bycatch Work: 3.35

ME: 0.5
NH: 0.25
MA: 0.5
RI: 2.0
CT:0
NY:0.1

Source of Funds:

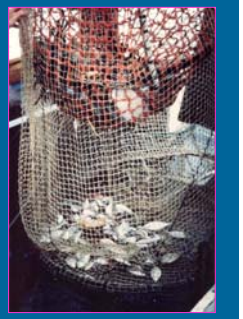
NEC: 3
SK: 2
NFWF: 1
CRPI: 3
Mid-Atlantic Set-Asides: 1
National Sea Grant: 2

Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island

MOBILE GEAR

•Grid device to reduce cod in flounder trawls -NH
•Soft species selection system to
•separate cod, haddock and flounder-NH
•Use of water borne kites in shrimp trawl codend to reduce small shrimps and fish-NH
•Selectivity of knotless twine codends-ME
•Comparison of 3.5 and 4" rings in inshore scallop fishery-ME



Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island

- Effects of increasing trawl belly taper and large mesh panels in a groundfish trawls- ME
- Development of an off-bottom trawl -ME
- Trawl codend mesh selectivity studies on yellowtail, winter and summer flounders-RI
- Bycatch characterization of scup - RI

FIXED GEAR

- Whale free buoy design-MIT
- Pot selectivity study on increasing escape vent size on black sea bas s and scup-RI
- Low profile flounder gillnets to reduce cod catch-NH

Northeast Sea Grant

Kathleen Castro

Northeast Sea Grant Fisheries

Connecticut Maine Massachusetts New Hampshire New York Rhode Island

Outreach Projects

- Regional Bycatch Workshops (2002-2003)
- Gear Conservation Engineering Working Group and website
- One on one or specialty talks
- Managing our Fisheries panel
- RBAT steering Committee
- NE Bycatch Workshop

Sea Grant Bycatch Workshops: Common Themes

- Progress has been made but more work needs to be done
- Concerns about the waste
- Frustration about disconnect between research results and implemention
- Need to accurately quantify discards
- More extensive monitoring of situation

Suggestions on How to Make Further Progress

- Workshops
- Improved data collection
- Research
- Management practices
- Education
- Communication
  - Regional Coordination

Management Panel

Moderator: Vince O'Shea
Panelists: Chris Moore, MAFMC
Paul Howard, NEFMC
NEFSC Staff
Mary Colligan, NERO
Joel McDonald, NOAA GC
Sima Frierman, NY
Bud Brown, ME
Gib Brogan, Oceana

Panel Questions

1. What are the region's most difficult bycatch issues?
2. What are the region's bycatch problems?
3. For the fisheries for which a bycatch problem has been identified, what are the solutions?
4. How can we get to a point where the industry is identifying bycatch problems?

Gear Technology Panel

Moderator: Arnie Carr, MADMF (retired)
Panelists: Thomas Moth-Poulsen, MADMF
Ron Smolowitz, Coonamessett Farm
Glenn Salvador, NERO
Jim Lovgren, MAFMC
Frank Blount, NEFMC
Geoff Smith, Ocean Conservancy
John Williamson, NEFMC
Gordon Colvin, MAFMC

Panel Questions

1. How can we build a better informational bridge?
2. How do we ensure results of work become part of the management process?
3. What are areas that benefit from gear work?

Moderator's Overview

Data and Monitoring

Moderator: Maury Osborn, ACCSP
Panelists: Tony Bogan, NJ
Bill Lee, MA
Ellen Pikitch, PEW
Greg Power, NERO
NEFSC Staff

Panel Questions

1. What are strengths/weaknesses of methods for estimating bycatch?
2. How can we most effectively develop bycatch monitoring programs?
3. How do we minimize bias in estimation of bycatch and maximize precision of estimates?
4. How do we enlist cooperation of stakeholders?

Science and Research

Moderator: Chris Glass, Manomet
Panelists: Ken Hinman, Nat'l Coalition for Marine Conservation
Danny Cohen, NJ
Frank Mirachi, MA
Don Perkins, ME Aquarium
Mary Colligan, NERO
NEFSC Staff

Panel Questions

1. What are the key science issues for our various constituencies?
2. What are the highest priorities for new research?
3. How can we most effectively develop cooperative research programs?
4. How can we improve communication with stakeholders?

Bycatch in Northeast Fisheries: Moving Forward

GROUP REPORTS

Management-Q1

- **Region's most difficult issues**
- Group 1:
  - Lack of information and data
  - Attitude change
  - Understanding impact of ecosystem mgmt.
  - Fisheries and protected species coordination

Management-Q1

- Group 2:
  - Expand VMS daily reports
  - Exploitation of recovered fishery without impact
  - Observer coverage
  - Special focus committees
  - Discard mortality studies

Management-Q2

- Agreement on bycatch problems

The management panel determined that there was general agreement and this question was not considered in the subgroups

Final Group Reports

Management Panel
Vince O'Shea

Management-Q3

- **Solutions to bycatch problems**
- Group 1:
  - Increase observer coverage
  - Increase credibility of science
  - Study fleet
  - Increase communication
  - Priority on new fisheries
  - Increase real-time reporting
  - Eliminate high grading
  - Reduce allocated discards

Management-Q3

- Group 2:
  - Dogfish assessment
  - Barndoor skate bycatch
  - Gear modification research
  - Research survey programs
  - Bycatch triggers
  - Gear selectivity in *Loligo*
  - Mesh selectivity for butterfish

Management-Q3

- Group 3:
  - Limits on bycatch
  - Confidence in data
  - Gear selectivity
  - Internal incentives
  - 100% retention
  - Determine why bycatch is taking place
  - Develop gear modifications for protected species
  - End distrust and arguing
  - Consider incentives

Management-Q4

- **Cooperative identification of bycatch problems**
- Group 1:
  - Highlight case studies and success stories
  - Increase funding for cooperative research
  - Framing issue of cooperation

Management-Q4

- Group 2:
  - Rewards to industry
  - Create special issues focus committee
  - Create bridge between industry and mgmt.
  - Industry advisors for bycatch issues
  - Coordinate funds to investigate gear solutions
  - Create special access programs
  - Impose penalties

Science and Research-Q1

- **Key science issues**
- Group 1:
  - Better estimates of discards
  - Social and economic studies
  - Innovative approaches
  - Long-term baseline studies
  - Link bycatch level thresholds

Science and Research-Q1

- Group 2:
  - Strategic plan for bycatch
  - Outreach activities
  - Redefine bycatch
  - Species resiliency
  - Identify sources of funding
  - Evaluate bycatch multispecies
  - Comprehensive review of information

Science and Research-Q1

- Group 3:
  - Undertake studies of fish behavior
  - Cost/benefit analysis
  - Research on sub-lethal effects
  - Identify alternative methods

Final Group Reports

Science & Research
Dr. Chris Glass

Science and Research-Q1

- Group 4:
  - Develop incentives to fish selectively
  - Understanding fish behavior

Science and Research-Q2

- **Highest priorities for new research**
- Group 1:
  - Undertake multibeam mapping of bottom

Science and Research-Q2

- Group 2:
  - Develop incentives to alter behavior
  - Post release survival studies
  - Gear studies on impacts to benthic habitat
  - Population dynamics
  - Human behavioral responses

Science and Research-Q2

- Group 3:
  - Deck handling procedures
  - Best practices manual
  - Cost/benefit analysis reduction methods

Science and Research-Q2

- Group 4:
  - Utilize VMS as a flexible tool
  - Explore use of IFQs
  - Study ecosystem effects

Science and Research-Q3

- **Cooperative research program development**
- Group 1:
  - Baseline research
  - Strategic planning with fishermen
  - Leverage cooperative research
  - Establish centralized repository

Science and Research-Q3

- Group 2:
  - SARC-like review
  - Streamline fishery permit process
  - Land and market bycatch
  - Increase incentives

Science and Research-Q3

- Group 3:
  - Use TRT-like process
  - Develop predictable sources of funding
  - Establish coordination among organizations

Final Group Reports

Science & Research
Dr. Chris Glass

Science and Research-Q3

- Group 4:
  - Develop “light” bottom-tending gear

Science and Research-Q4

- **Improve communication with stakeholders**
- Group 1:
  - Website postings
  - Education targeting middle schools
  - FishSpan

Science and Research-Q4

- Group 2:
  - Promote interdisciplinary projects
  - Share observer results
  - Expand use of education programs

Science and Research-Q4

- Group 3:
  - Face-to-face communication
  - Communication within NOAA
  - Use Sea Grant to facilitate
  - Utilize observers

Science and Research-Q4

- Group 4:
  - Encourage exchange - technical staff/fishermen
  - Meetings with stakeholders

Data and Monitoring-Q1

- **Strengths and weaknesses of bycatch estimation**
- Group
  - Share formulas for estimation
  - Address problem of placement
  - Integrate sampling programs
  - Pilot program for recreational fishermen
  - Develop network/database
  - Video monitoring
  - Measure legal fish first

Data and Monitoring-Q1

- Group:
  - Improve training and retention rate
  - Sample scales properly
  - Implement electronic reporting
  - Test video monitoring
  - Improve timeliness of MRFSS data
  - Provide opportunities to train observers
  - Communicate protocols of fishermen
  - Explore alternatives
  - Ask type and location

Data and Monitoring-Q2

- **Develop bycatch monitoring programs**
- Group:
  - Incorporate use of B Days at Sea
  - Integrate sampling protocols
  - Conduct sensitivity analysis
  - Use port agents as outreach representatives
  - Integrate databases
  - Conduct through testing
  - Integrate stock assessments
  - Expand use of study fleet
  - Integrate sampling protocols

Final Group Reports

Data & Monitoring
Maury Osborn

Data and Monitoring-Q3

- **Effective approaches to minimize bias**
- Group:
  - Incorporating fishery independent data
  - Explain methodologies better
  - Ensure good stratification
  - Increase sample size
  - Recognize bias within distribution
  - Explain vessel selection process

Data and Monitoring-Q4

- **Effective avenues in enlisting cooperation**
- Group:
  - Provide copy of observer reports
  - Establish contact with media
  - Establish contact with fishing associations
  - Electronic observer data
  - Do not dismiss information from fishermen
  - Listen-3 way communication
  - Involve fishermen with training
  - Use observers for outreach

Data and Monitoring-Q4

- Group:
  - Distribute results of workshop
  - Personalize communication

Data and Monitoring-GP

- General Points:
  - Need to prove to fishermen that good data benefits everyone
  - Better define terms “bycatch” and “discards”

Final Group Reports

Gear Technology
Arnie Carr

Gear Technology-Q1

- **Better information bridge**
- Group:
  - Professional training for fishermen
  - Comprehensive planning
  - Training for managers on gear
  - Multi-format dissemination of information
  - Identify and prioritize
  - Foster development of gear group
  - Support technology workshop

Gear Technology-Q1

- Group:
  - Active in management process
  - Work with key industry members
  - Establish advisory panel
  - Foster collaborative research
  - Develop process to transfer results
  - Require collaborative studies
  - Encourage cooperative research with contract
  - Environmental group participation

Gear Technology-Q1

- Group:
  - Policy for data accessibility
  - Produce background information
  - Convey results to NGO
  - Provide information to the public

Gear Technology-Q2

- **Worldwide research**
- Group:
  - PDT membership
  - PDT sponsored workshops
  - Presentation of research projects
  - Demonstration of gear technology
  - Policy to address industry innovation
  - Follow-up on progress
  - Develop international database

Final Group Reports

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Gear Techology-Q2

- Group:
  - Encourage establishment of standards
  - Hold focus workshops

Gear Technology-Q3

- **Areas that benefit from investment in gear work**
- Group:
  - Explore question: “Is bycatch bad?”
  - Investigate other effects of gear selectivity
  - Utilize observer data
  - Prioritize species/gear research

Gear Technology-PL

- Parking Lot:
  - Study habitat gear interaction

Initial Thoughts

What Now?

- Results on website
- Coordinating Committee
- Revise bycatch implementation plan
- Finalize proceedings

Feedback

Thank You