PROCEEDINGS OF THE SEA GRANT BYCATCH WORKSHOP

MARCH 19, 1999

DANFORDS INN, PORT JEFFERSON, NY

edited by
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Welcome, Objectives and Introductions

Mark Malchoff, New York Sea Grant fisheries specialist

Mark welcomed everyone and commented about the good turnout. This workshop came about in response to two letters from John Turner who is the Legislative Director with the NYS Legislative Commission on Water Resource Needs and also serves as a staff member to Assemblyman Thomas DiNapoli. Correspondence from Mr. Turner to both Malchoff and Bill Wise underscored the need for the Marine Resource Advisory Council to investigate bycatch issues, and requested Sea Grant involvement based on Mark's interest in, and research dealing with, recreational hooking mortality. The first meeting in the form of a legislative briefing was held on January 15, 1999. The current meeting is an attempt to explore bycatch issues relevant to NY marine fisheries. Of particular interest is the identification of "success stories" – those modifications in gear or fishing practices which have been demonstrated to reduce the inadvertent capture of non-targeted organisms (i.e. bycatch).

Bill Wise, Marine Resources Advisory Council Chairman

This is one of a series of meetings of the Marine Resources Advisory Council Bycatch Reduction Committee (BRC) in response to Assemblyman DiNapoli's request. The state legislature has historically approached the bycatch issue in a piece-meal approach. Increased information on bycatch may generate better and more informed decision making. We need to lay out what we know about bycatch in both commercial and recreational fisheries; this will be the assignment for the BRC. A report will be made to the Marine Resources Advisory Council at the end of this year and the Council will review approve and submit it to the Department of Environmental Conservation, New York State legislators and anyone else interested.

At the Bycatch Workshop (from left to right), workshop coordinator and New York Sea Grant fisheries specialist, Mark Malchoff; William Wise, Marine Resources Advisory Council Chairman and Living Marine Resources Institute at SUNY Stony Brook; and John Turner of the NYS Legislative Commission on Water Resource Needs.

Panel Discussion: What are some of the commercial discard/bycatch problems in New York? How big is the problem? What solutions can the industry identify?

Bill Wise, Moderator
Panel Members: Dave Aripotch, Tom Knobel, Charlie Wertz, Bob Hamilton, Mark Lofstad, Rich Groh, Bill Wise

Bill Wise opened the panel with comments to the effect that there are no reliable bycatch statistics for the marine commercial fisheries in New York State. For our discussion, bycatch is defined as discards – fish and other organisms not landed for regulatory or market reasons. Panel members spoke about their experiences with bycatch and how they cope with the problem. For brevity's sake, their paraphrased comments are collectively summarized below.

Regulatory Issues in the Trawl Fishery

Bob Hamilton, Dave Aripotch, Charlie Wertz and Mark Lofstad all spoke to the problems associated with restrictive quotas, with summer flounder (fluke) as the prime example. Increased regulations and quota based management directly increases the amount of regulatory discard, often without taking into account fisheries ecology and market forces at work in the fishery. In the case of striped bass bycatch, one solution might be to do away with the 7 fish trip limit, and let draggers catch their allotment as controlled by the number of tags issued. Once a dragger catches his allotment, he can reduce the bycatch of stripers by avoiding known hot spots, adjusting tow times, etc. All of these fishermen expressed frustration at the waste imposed in the fluke fishery. Ideally, the increased mesh size should function as the primary conservation tool in this fishery, with vessel operators being allowed to land what they catch. The problem of insufficient or inaccurate bycatch statistics was mentioned but little consensus was observed. All four trawlermen spoke to the fact that some level of bycatch is unavoidable with trawl gear. Mark Lofstad briefly mentioned the vessel buy-out strategy as a way of reducing overall fishing effort along with bycatch.

Gill Net Fisheries

Tom Knobel and Rich Groh reviewed the characteristics of the near shore gill net fisheries in Gardiner's Bay and along the south shore, respectively. Rich indicated that gill nets are used to target bluefish, weakfish, bunker and some striped bass. The fishery involves a variety of mesh sizes and typically different juveniles go through the nets. Bycatch of juveniles is typically not much of a problem, since six to eight inch mesh nets do not capture many juveniles. Species composition can be manipulated through a variety of measures, but usually just moving to a different area solves the problem. "It is not in the fishermen's interest to catch fish that we cannot utilize," Rich said. Gill nets are a clean fishery. Fisheries are diverse, however, and the perception is that gill nets are non-selective when in fact they can be very selective.

Tom Knobel provided an illuminating list of the variables associated with gill net catch and bycatch in the Gardiner's Bay gill net fishery. Factors affecting catch and bycatch include:

1. Variables in the setting of nets:
- length of time net fishes (i.e. soak time)
- pattern of set
- length of net
- depth of water relative to depth of net
- sinking vs. floating net (controlled through the use of floats)
- direction of set relative to tide, and/or shore

2. Variations in net construction
- hanging ration of twine (affects fish falling out, how they gill, whether fish are "lipped" or stuck on the gill plates)
- thickness of twine (visibility, stiffness, elasticity, breakability)
- buoyancy of corks, weight of leads (the limper the net, the less likely fish will "bounce off," and the more likely that fish of wide size variations are caught)
- mesh size

3. Environment net is set in:
- season
- location
- growth in the water
- trash
- presence/absence of large crab aggregations

Discussion following panelist presentations
MRAC members Mike McCarren and Dave Aripotch, offered comments. Other commentators included Bob Hamilton, Bill Wise, Pat Augustine, and Mark Malchoff. Few remedies were identified, and much of the discussion related to the ideas that increased mesh sizes (in the trawl fisheries) have not been give a chance to work, that is to filter catch from bycatch. Many comments also related to market factors, such that little economic incentive exists for capture of larger fish. "The smallest fish caught using today's gear is large relative to a few years ago, yet prices have not increased, and the prices have not moved up relative to the sizes of fish captured." In the market, the smallest fish is still the smallest fish and is priced accordingly. Biologists should be careful about market predictions based on changes in fisheries management." Some discussion also took place on the issue of coastal quota instead state quotas. Such change in management may reduce bycatch but cannot be implemented at the state level, but rather through MAFMC action.

Bill Wise summarized the panel and discussion with the following observations and conclusions:
- Existing state fluke quota serves to exacerbate the bycatch problem – if state quotas were replaced with a coastal quota, the severity of the problem might be reduced.
- [Larger] net mesh regulations have been invoked to reduce the capture of small fish. Panelists largely felt that managers have been increasing the mesh sizes too quickly to see the beneficial impact of a given mesh size
- Adaptive management might enable the flexibility to more easily address bycatch problems.

Updates and Discussion on Mid-Atlantic Fishery Management Council; NMFS and ACCSP activities in relation to national Standard #9

John Mason, NYSDEC

John began with a review of bycatch terminology:

Bycatch - Fish which are harvested in a fishery, but which are not sold or kept for personal use, and includes economic discards and regulatory discards. Such term does not include fish released alive under a recreational catch and release fishery management program.

Economic Discards - Fish which are the target of a fishery, but which are not retained because they are of an undesirable size, sex, or quality or for other economic reasons.

Regulatory Discards - Fish harvested in a fishery which fishermen are required by regulation to discard whenever caught, or a required by regulation to retain but not sell.

National Standard #9 - Conservation and management measures shall, to the extent practicable (a) minimize bycatch and (b) to the extent bycatch cannot be avoided, minimize the mortality of such bycatch.

John raised the following questions: It's becoming obvious that some kind of compromise will be necessary - what is the middle of the road? What is an available trip limit figure that would work over a longer period of time? Do we need tariffs on non-U.S. caught fish?

Mark Lofstad revisited the market concerns. The current stringent quota not only exacerbates the bycatch problems but also puts NY boats at a distinct disadvantage in the marketplace relative to the Carolinas, and Canadian provinces. Landings from these regions are moving through the same market (Fulton) as are NY fish, but at greater quantities for purely regulatory reasons. "New York State has a healthy fishery but not allowed to catch and keep."

All of us recognize that better data is needed. The Endangered Species Act, and Marine Mammal Protection Act (MMPA) mandate that we get information on endangered species and mammals. These programs have funded some observer efforts, but in the Northeast, it is primarily MMPA and Fishery Management Plan requirements that drive the current low level of observer coverage.

Three organizations are involved in fisheries data programs: Mid Atlantic Fishery Management Council, National Marine Fisheries Service, Atlantic Coastal Cooperative Statistics Program. We here in New York and these three organizations have to begin to get a program to get fisheries data on bycatch. The focus of their [ESA and MMPA] money is not fishery related. We have to move it to the legislative process to develop the funding for this fisheries research. The three organizations are charting their own routes. We need to focus in a single direction.

Collecting Data - Bycatch problem would lessen as quotas were reached. The Sustainable Fisheries Act is focusing us to move in wrong direction. What is needed is a good database , pooled data, not from an individual vessel.

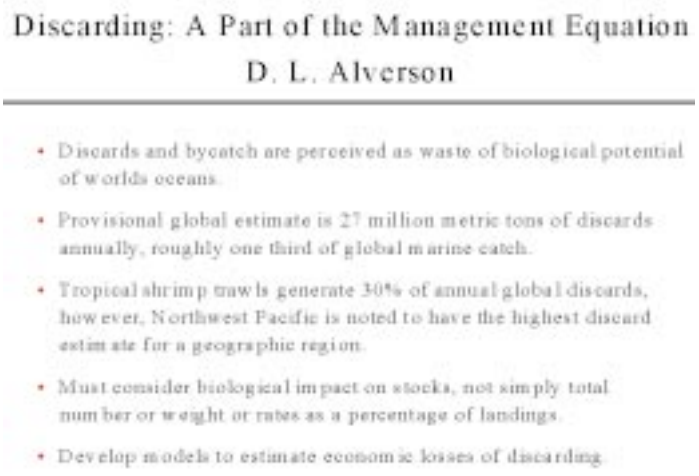
A Review of the 1995 East Coast Bycatch Conference

Dr. Joseph DiAlteris, URI, Rhode Island Sea Grant

Joe began his talk with a passage from Matthew 13:47-48, indicating that bycatch has been recognized for nearly 2000 years. He then presented a chronology of recent bycatch conferences and workshops.

1990 - Bycatch is identified by NMFS as the major fisheries management issue to be addressed in the 90s
1992 - Major bycatch conference held in Newport, Oregon
1992 - Shrimp bycatch conference in Florida
1990 - FAO - a global assessment of fisheries bycatch and discard
1995 - East Coast bycatch Newport, Rhode Island
1999 - NY Sea Grant Bycatch conference workshop in Port Jefferson, NY

Dr. DiAlteris indicated that the goal of his presentation was to provide a summary of the East Coast bycatch conference relative to New York fisheries. His presentation documented the extent of the problem as it was reported in 1995, the impact that bycatch was projected to have on some fish populations, and specifics of bycatch reduction in lobster, whiting, and gill net fisheries. Details of the presentations are given below.



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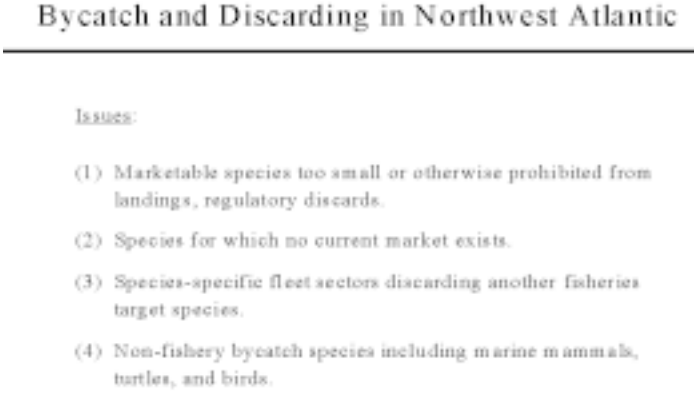


Biological Implications of Bycatch
S. A. Murawski

- Biology of Bycatch.
- Bycatch Impacts on Assessment and Prediction.
- Management Techniques Influence Bycatch.

East Coast Perspective of Bycatch: Do We Have a Problem? (A Moderated Panel Discussion)

Nature of the Problem:

- Bycatch exists in all fisheries ranging from juveniles of target species to protected species.
- Education as to the biological, social, and economic benefits of bycatch reduction is required.

Trust, Cooperation, and Education:

- Fishermen, scientists, environmentalists, and regulators must work together to develop and implement solutions to bycatch problems.

Bycatch Reduction in the Lobster Fishery: A Success Story

Capt. Bob Smith - Pt. Judith, RI
Dr. M. Fogarty - NMFS Scientist

Issue:

- Bycatch of juvenile or sublegal lobsters in traps.

Solution:

- Developed jointly between lobstermen and regulators, escape vents with opening set to release sublegal lobsters.
- Benefit to lobstermen, reduce labor of sorting and handling bycatch.
- Benefit to resource, reduced stress on resource.

Technical Innovations in the Northeast Whiting Fishery to Reduce Bycatch

Capt. James Lovgren - Pt. Pleasant, NJ
A. Carr - MA DMF Scientist

Issue:

- Excessive groundfish bycatch in the small mesh bottom trawl whiting fishery in Cape Cod Bay and elsewhere.

Solution:

- Develop on a cooperative basis between fishermen and gear technologists species separator trawls, evaluate their performance, and require by regulation.

Harbor Porpoise Bycatch Reduction in New England Gillnet Fisheries

Capt. Bob MacKinnon - MA Gillnetters Assoc.
Rollie Barnaby - NH Sea Grant Extension

Issue:

- In 1990, harbor porpoise bycatch in the New England gillnet fisheries was identified as a threat to this marine mammal stock in the region. However, both harbor porpoise stock size and the gillnet fishery bycatch take rate were not known with a high precision.

Solution: (as of 1995)

- Fishermen, scientists, and regulators form Harbor Porpoise Working Group to improve communications.
- Scientists improve the precision of harbor porpoise stock assessment.
- Fishermen initiate the first acoustic alarm ("pinger") experiments to reduce bycatch.
- Regulators increase sea sampling to improve bycatch take estimate.

Harbor Porpoise Bycatch Reduction

Post-1995 Progress

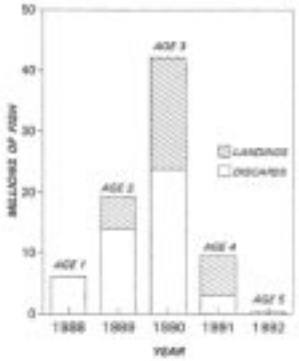
- Initiation of Take Reduction Process in 1996
  (1) Gulf of Maine TRT
  (2) Mid-Atlantic TRT
- Publication of Harbor Porpoise Take Reduction Plan in late 1998.
- New York gillnet fishery included in Mid-Atlantic portion of the final plan, includes time and area closures, and gear restrictions.

Conclusion: A Collaborative Approach to Solving Bycatch Issues

Southern New England - Mid-Atlantic Fisheries

- Sea scallop dredge fishery with a discard bycatch of yellowtail flounder, other flatfish, and juvenile scallops; solution will require gear innovations.
- Pelagic longline fishery for swordfish, sharks, and tuna, with a bycatch of juvenile swordfish, marine mammals, turtles, and billfish; solution will require time and area closures. Note: these have been accomplished with the Offshore Cetaceans Take Reduction Plan.
- Large-mesh trawl fishery for summer flounder, and other groundfish with a discard bycatch of dogfish, skates, sublegal groundfish, and turtles; solution will require innovative management strategies to eliminate high grading and discards within the quota.

Figure 1: Estimated Catch (Landings and Discards) of the 1987 Year Class of Southern New England Yellowtail Flounder, 1988-1992



Conclusion (continued)

- Small-mesh mixed-species trawl fishery for squid, whiting, butterfish, mackerel, and scup with discards of ling cod, skates, undersize fish of the target species, and red hake; bycatch reduction is complex due to variations in fish size, and will require species separation.
- Pot fisheries for lobster and fin-fish have minimal problems with bycatch due to escape vents and high survival of discarded bycatch.

Figure 2: Results of Sea Sampling Trip Reports for Four Gulf of Maine Groundfish Fisheries in 1991

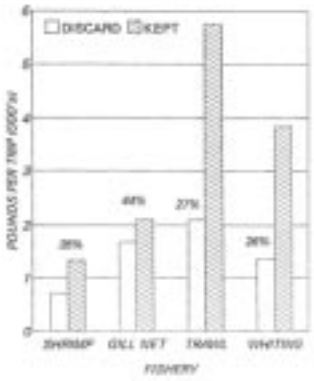
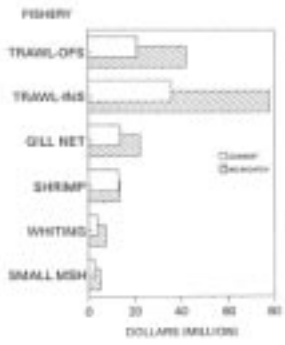


Figure 3: Calculated Ex-vessel Value of 6 Fishery Units Exploiting Gulf of Maine Groundfish Resources Under Current Bycatch Conditions & Assuming No Discard Mortalities for Groundfish Species



Dr. DiAlteris' Concluding Discussion

In the way of conclusion, Joe stated that fishermen, scientists, environmentalists and regulators must work together to develop and implement solutions to bycatch problems. This '95 meeting set the stage. It called attention to the issues within the industry. A lot of progress has been made in the last five years. Some success has been realized in sea scallop gear, pelagic longline fisheries, large-mesh trawl fisheries for summer flounder and other species, small-mesh mixed-species trawl fisheries, and pot fisheries.

Figure 4: Effects of Cod-end Mesh Size on the Proportion of Trawl Catch Discarded for All Species Caught in Otter Trawl Sea Sampling the the Northeast Atlantic off the U.S., 1989-1992

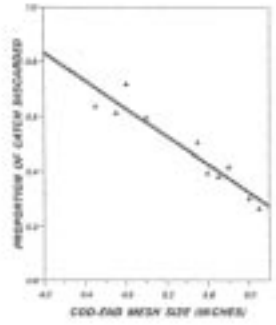


Figure 6: Potential Impacts of Dead Discards on Single-Species Stock Assessment Calculations

IMPACT OF DISCARDS ON FISHERY PREDICTIONS

PARTIAL RCT	ASSESS. CALC.		CONSTANT PROPORTION	VARIABLE PROPORTION: PREDICTABLE	VARIABLE PROPORTION: UNPREDICTABLE
CONSTANT (e.g., CATCH FORECAST, VPA, SSB(R))	SHORT-TERM FORECAST		0	**	0 + error
	LONG-TERM CATCH FORECAST	RELATIVE YIELD	*	***	* + error
		RELATIVE BIOMASS	*	**	* + error
CHANGING (e.g.,MESH ASSESS.)	SHORT-TERM LOSSES-GAINS		**	***	** + error
	LONG-TERM LOSSES-GAINS	RELATIVE YIELD	**	***	** + error
		RELATIVE BIOMASS	*	*	* + error

0 = NO; * = SMALL; ** = MEDIUM; *** = MAJOR

Figure 5: Schematic of Potential Biological Processes Influenced by Kept and Discarded Bycatch

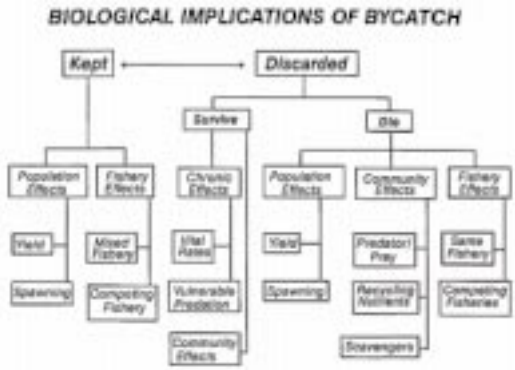


Figure 7: Fishery & Regulatory Factors Contributing to Increased Bycatch in Open-Access Fisheries Controlled by Indirect Management Measures

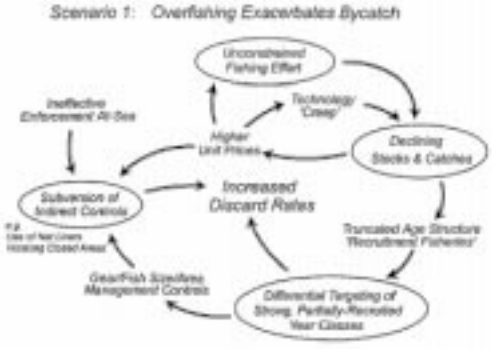
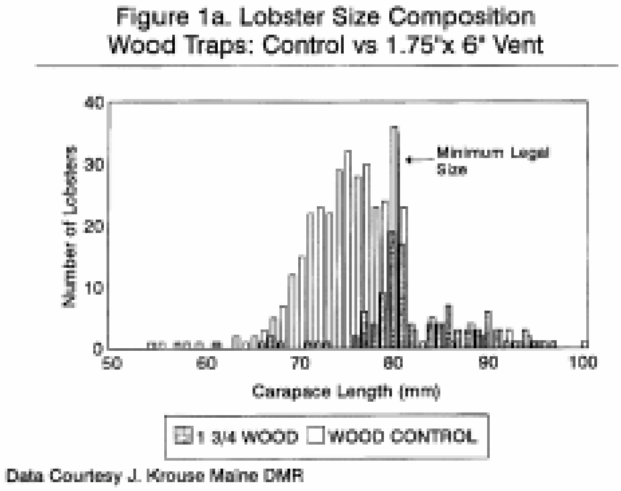
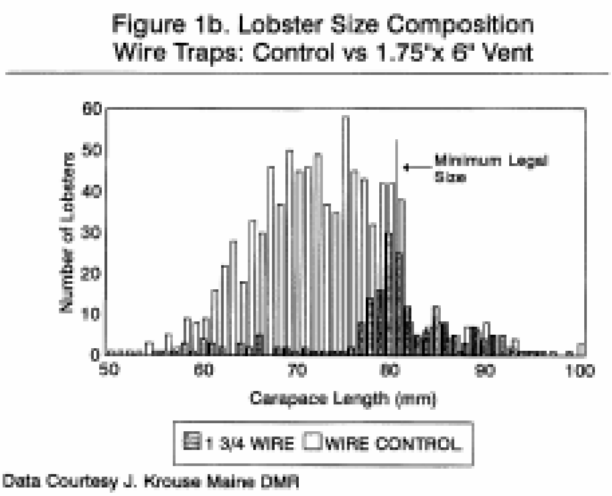


Figure 8: Fishery and Regulatory Factors Contributing to Increased Bycatch in Open-Access Fisheries Controlled by Quotas on the Target and Bycatch Species

Figure 9: Fishery and Regulatory Factors Contributing to Discard of Nontarget Species as Fishery Diversity and Complexity Increase

Figure 10: Size Composition of American lobsters for control (unvented) and experimental (1.75" x 6" vents) for (a) wood traps and (b) wire traps



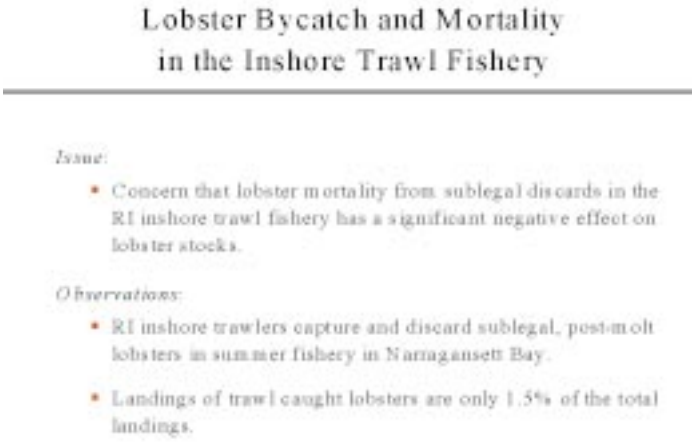


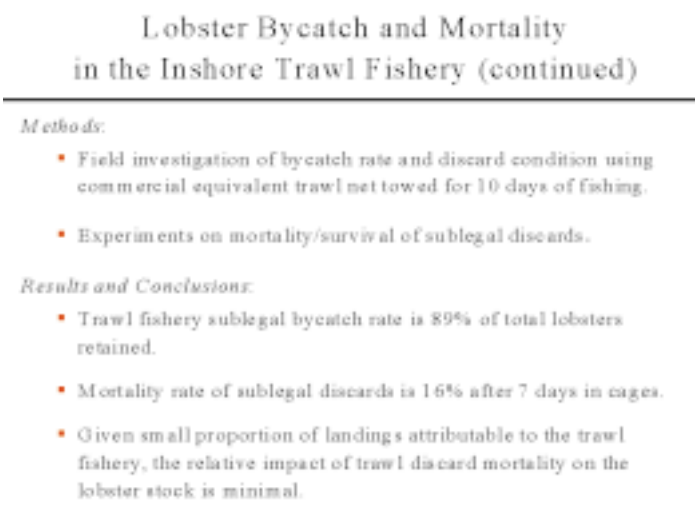
Applications of Bycatch Studies in Rhode Island Fisheries Management Cooperative projects between:

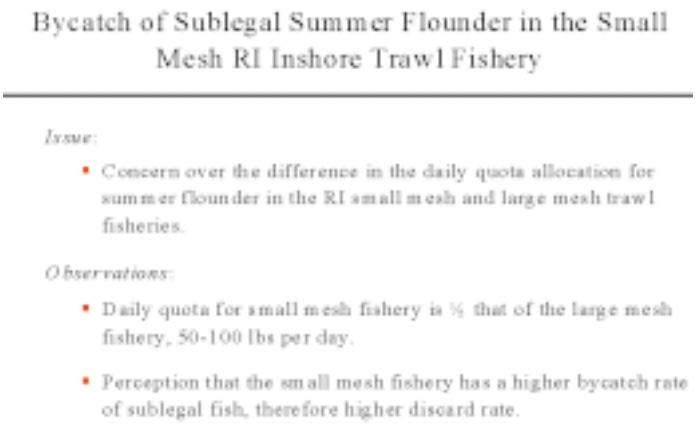
RI Dept. of Environmental Management, RI Sea Grant Extension Program and RI Trawl Fishermen

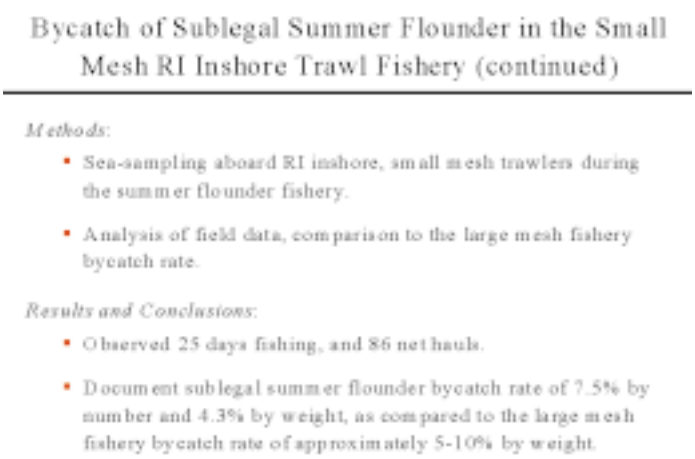
Laura Skrobe, URI, Rhode Island Sea Grant

Laura reviewed three studies dealing with lobster, summer flounder and winter flounder. The first study, completed 1997, dealt with the issue of lobster mortality from sublegal discards in the Rhode Island trawl fishery. Analysis of the catch and experimental observation of discarded sub-legals indicated that "the relative impact of trawl discard mortality on the lobster stock is minimal." Her second investigation, completed 1997, dealt with the perception that the small mesh [summer flounder] fishery has a higher bycatch rate of sublegal fish, therefore higher discard rate. Subsequent field research and analysis showed that little difference in bycatch rate by weight occurred between the large mesh and small mesh fisheries in Rhode Island. In her third study, pending 1999, Ms. Skrobe developed an analysis of winter flounder catch characteristics using selectivity curves from trawl catches, in concert with known age-weight relationships. The analysis showed that the losses in numbers of fish which pass through 6.5 inch square mesh codends relative to 6.0 inch, would be more than offset by the increase in weight of the catch, attributable to increases in biomass of the "unfished" cohort. Details of the presentation are given below.







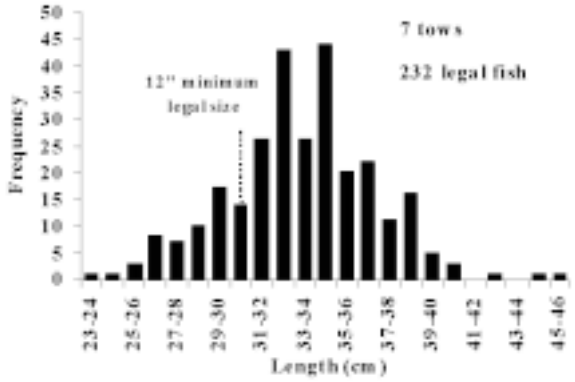


Effect of Increasing the Codend Mesh Size from 6 to 6.5 inch Square-shape on the Retained Catch of Winter Flounder in the RI Inshore Trawl Fishery

Issue:

- Concern that the proposed increase in minimum codend mesh size from 6 to 6.5 inch square-shape will significantly reduce winter flounder catch for a prolonged period, and therefore present an economic hardship to the RI inshore trawl fishery.

Figure 11: Observed Length-Frequency of Winter Flounder Captured in 6" Square Mesh



Effect of Increasing the Codend Mesh Size from 6 to 6.5 inch, Square-shape on the Retained Catch of Winter Flounder in the RI Inshore Trawl Fishery (continued)

Methods:

- Review previous studies of flatfish mesh selectivity.
- Collection of field data on size distribution of retained catch with the existing 6 inch square-mesh codend.
- Estimation of size distribution of future catch with the proposed 6.5 inch square-mesh codend.
- Estimation of the lost catch and duration of impact.
- Submit proposal for mesh selectivity study to verify predictions and build trawl fishermen confidence.

Figure 12: Percent Retained of Winter Flounder Based on SF = 2.0

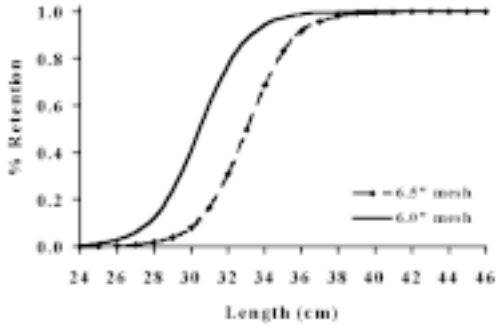


Figure 13: Length-Frequency of Winter Flounder Encountering the 6" Square Mesh

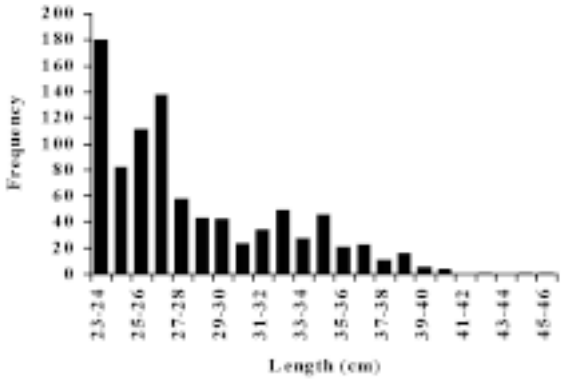


Figure 14: Predicted Length-Frequency of Winter Flounder Captured in a 6.5" Square Mesh

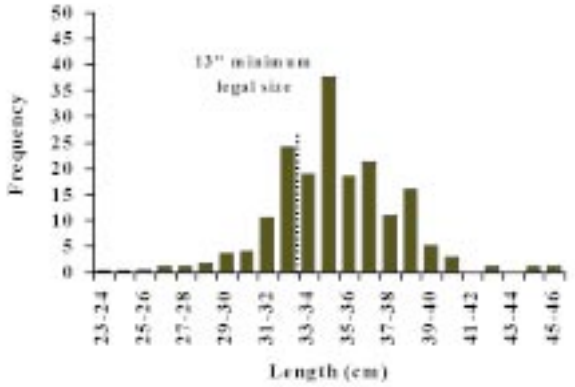


Figure 15: Predicted Immediate Loss Due to Increasing From 6 to 6.5 inch Square Mesh Codend

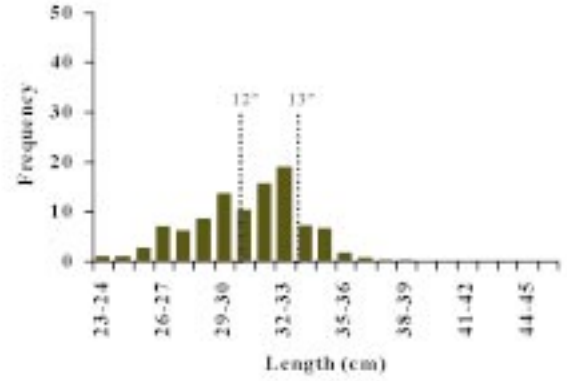


Figure 16: Von Bertalanffy Age-Length Relationship for Winter Flounder

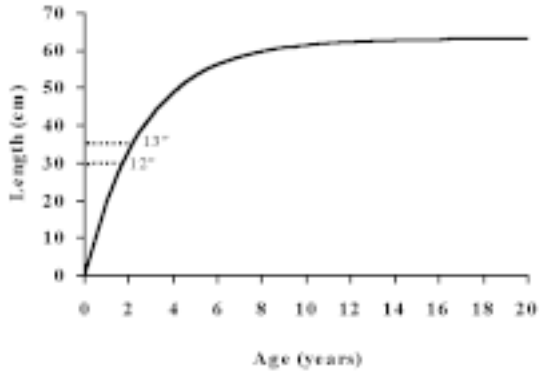
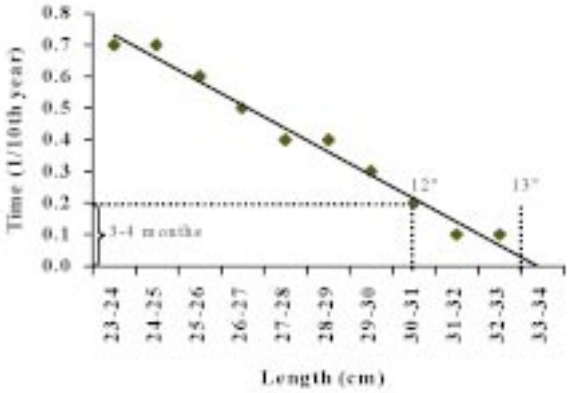


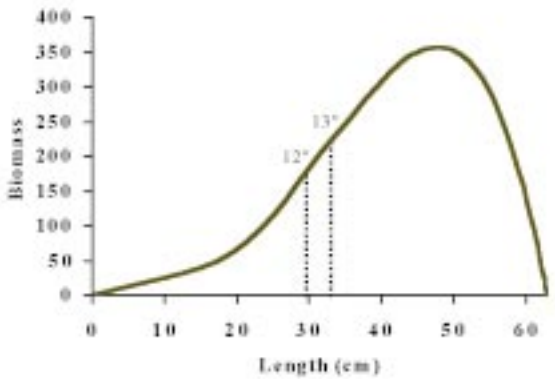
Figure 17: Estimated Duration of Loss as Fish Grow from 12 to 13 inches



Proposed Selectivity Study

- Apply for Experimental Fishery Permit so as to be able to retain and measure all sublegal winter flounder prior to discarding.
- Arrange for two (2) volunteer, RI inshore trawl fishing vessels equipped with 6 and 6.5 inch square-mesh codends, and small mesh liners, and Sea Grant Extension staff/student observer for 3-4 fishing days.
- Design field experiment, each vessel alternating between 6", 6.5", and small mesh liner tows of equal duration in random pattern. Observer measures all winter flounder.
- Analyze data, developing selectivity functions for both 6 and 6.5 inch square-mesh.
- Compare to results of previous studies and re-evaluate impact.

Figure 18: Biomass of the Unfished Cohort as a Function of Length of Winter Flounder



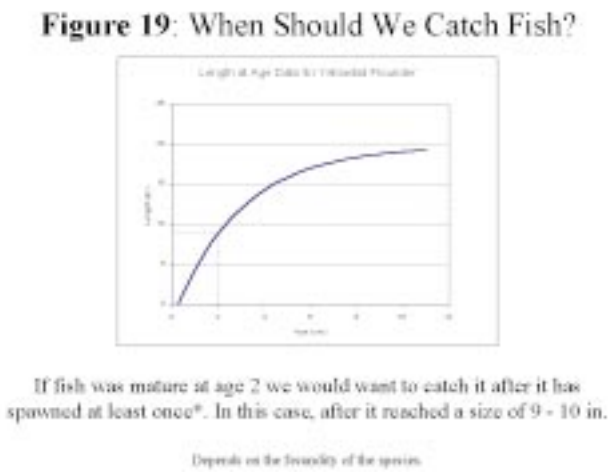
An Overview with an Emphasis on Trawl Gear Modification

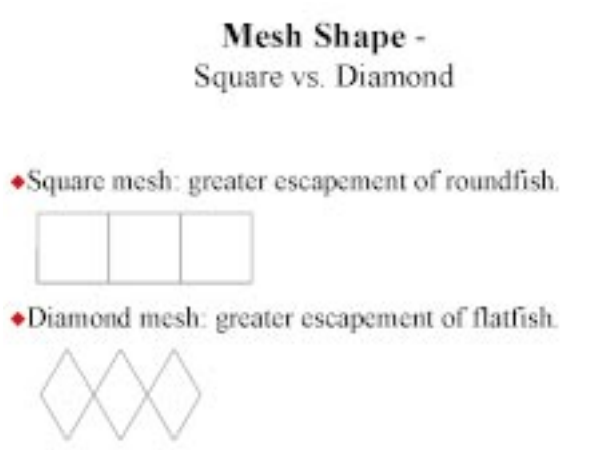
Henry Milliken, NMFS - Woods Hole, MA

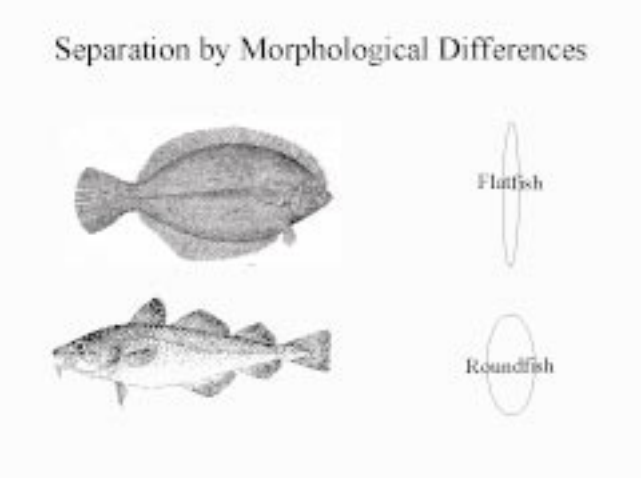
Henry defined the major problem regarding world fish stocks. Many fish stocks are presently at levels below that which can withstand present fishing efforts. But, when managers reduce fishing efforts, fishermen lose income, perhaps their livelihood.

Then Henry listed some of the methods one can use to rebuild fish stocks. They typically include reduction of fishing effort, rebuilding habitat, closing areas to fishing and reducing bycatch. He then provided an extensive review of gear issues associated with bycatch. Gear types he reviewed included bottom trawl, longline, scallop and clam dredge, gillnet, and purse seines. He posed the question, "What methods have been and are currently being employed to reduce bycatch in the various fisheries?" This question set the stage for a gear by gear discussion of methods and strategies that have been employed to reduce bycatch. Variables and methods include (by gear type):

1. Bottom Trawl - flat and roundfish
- mesh shape - square versus diamond (see art at right)

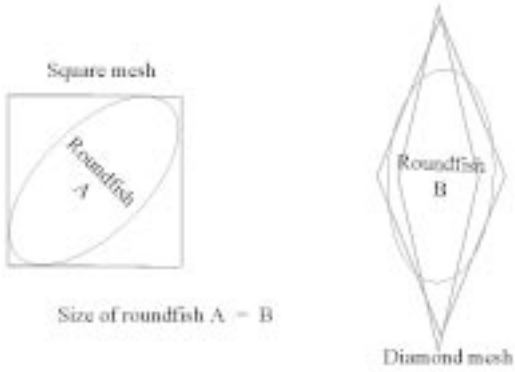






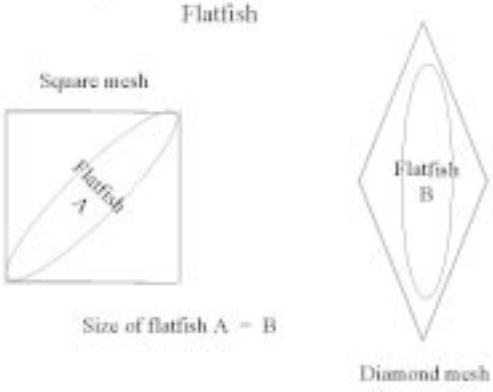
Square vs. Diamond

Roundfish

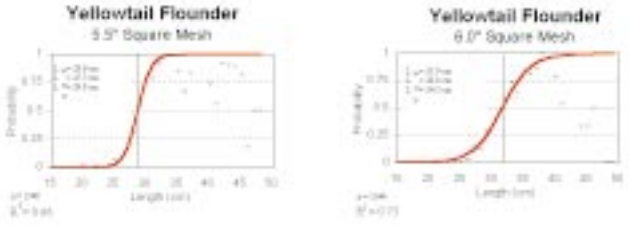


Square vs. Diamond

Flatfish



Figures 20 & 21:
Selectivity of Mesh Size



Courtesy of DeAlteris and Harris, 1994

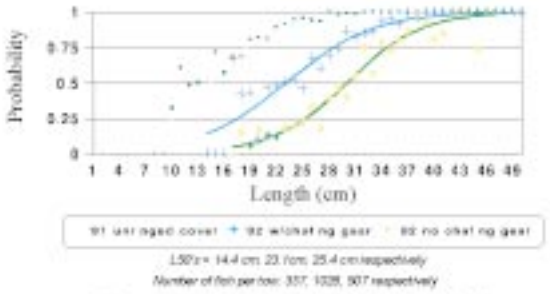
- twine mesh color

Twine (Mesh) Color

- **Contrast** (used within the net in panels)
  - Entice fish to leave the net by being an apparent means of escape.
  - Requires the fish to react to the stimulus
- **Camouflage** (used within the net in panels)
  - Blend with the substrate or surface.
  - Does not require the fish to respond to the stimulus - flatfish.

Figure 22: WHITING SELECTIVITY 2 3/4" MESH

11/91-Cover without rings;11/92 Ringed cover with chafing gear; and 11/92 Ringed cover without chafing gear.

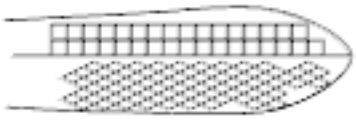


Courtesy of Mass Division of Marine Fisheries

- codends - raised footrope

Composite Codends - Etc.

- Utilization of square and diamond mesh to maximize escapement of bycatch for multi-species fishery.

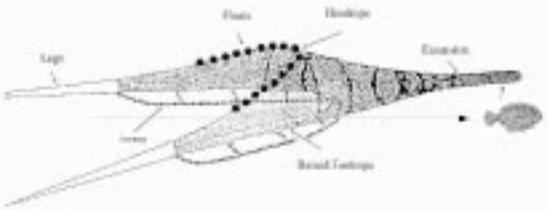


Codend

Also:

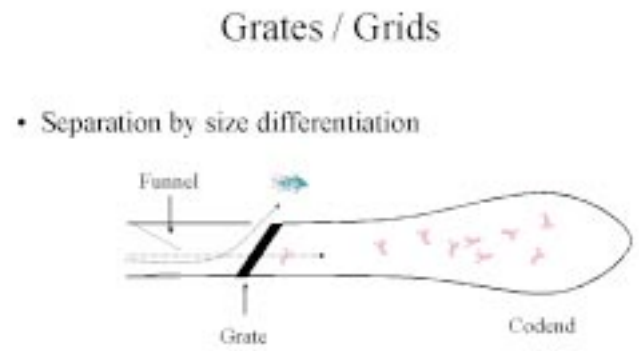
- Reduction or elimination of chaffing gear to provide the greatest available escapement area.

Raised Footrope Trawl

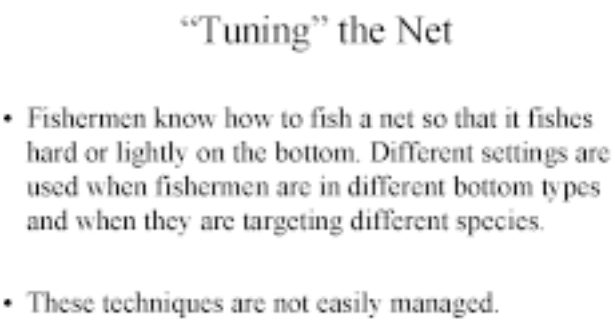


Courtesy of Mass Division of Marine Fisheries

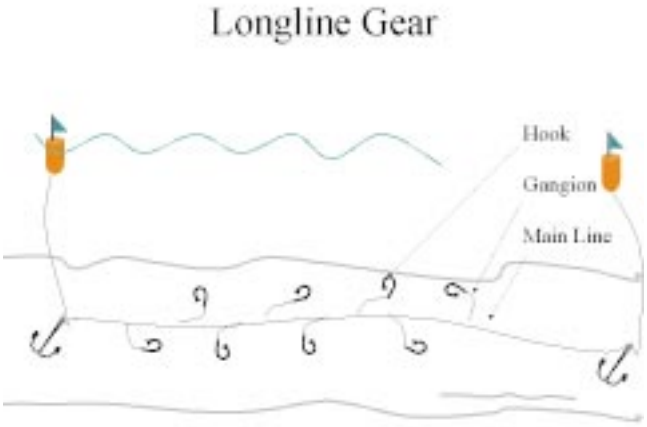
- grates/grids - separation by size



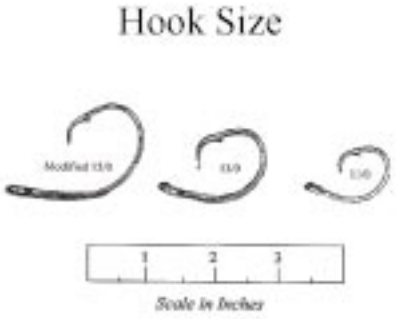
- "tuning" the net - done by fishermen themselves



2. Longline Gear

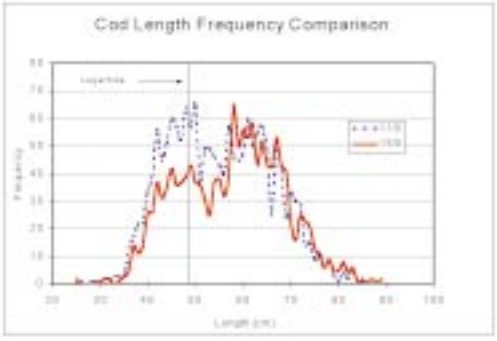


- hook size



Courtesy of Mass Division of Marine Fisheries

Figure 23:
Hook Selectivity



- length of gangion
- placement of main line
  - surface/bottom/off bottom

3. Scallop or clam dredge
- size of rings - spacing selects for different sized clams
- grates/netting - to reduce flatfish bycatch
- speed of gear - some fish out-run slower gear
- closed areas

4. Gill Net
- mesh size
- twine color
- acoustic pingers
- differences - hanging the net/taut versus loose
- placement of the net - bottom set vs. pelagic
  - areas with marine mammals vs. areas with no or few marine mammals
- soaktime

5. Purse Seine
- redesigned nets as in the case of dolphins bycatch reduction
- acoustic deterrents
  - scare marine mammals from net before they are captured

Mr. Milliken's Concluding Discussion

In conclusion, many other bycatch reductions have been tried and completed. Gear modification has a history of success that makes it a viable method of reducing bycatch, which will aid in the rebuilding of the fish stocks. Scientists, fishermen and managers are just beginning to work together on bycatch issues. Only with cooperation between these three groups will progress be achieved.

Hooking Mortality in the Weakfish and Summer Flounder Recreational Fisheries: Influence of Various Terminal Tackle Configurations

Mark Malchoff , NY Sea Grant fisheries specialist

Mark began his talk with a brief description of the economic value of the marine recreational fishery in NY. The American Sportfishing Association has developed economic summaries based on an analysis of the U.S. Fish and Wildlife Outdoor Recreation Survey, which takes place every five years. The economic output associated with saltwater fishing in NY is estimated at just over $1billion, and directly enables over 9600 jobs. As with the commercial fishery, efforts should be taken to protect this industry concurrent with efforts to reduce inadvertent mortality.

While bycatch is now defined as not including recreational hooking mortality, non-targeted fish that are returned alive to the water but later succumb also result in wasted fishery resources. In this function, hooking mortality operates very much like bycatch – hence the inclusion of the topic in this bycatch conference. Mr. Malchoff then summarized by what is known about hooking mortality in the nearshore recreational fisheries in the following tables.

Table 1. Selected Fishery Bycatch (i.e. Hooking Mortality) Issues in New York: What is known, what is unkown?

SPECIES	*ISSUES*	*RESEARCH AVAILABLE*	*REFERENCE*
Summer Flounder	- barbless hooks	No	
	- bait vs. lures	No	
	- hook size	No	
	- hook style	Some	Malchoff & Lucy (1998)
Striped Bass	- mortality of large fish	No	
	- mortality during closed season	No	
	- impact of circle hook		
	- bait versus lures	No	
	- barbless hooks	Yes	Harrell (1998)
	- hook size	No	
	- salinity	No	
		Yes	
		No	
		Yes	May (1990)
Bluefish	- snapper mortality	Yes?	Malchoff (1995)
	- bait vs. lures	Yes	Ayvesian (1998)
	- barbless hooks	No	DeAlteris and Williams (1995)
Black Sea Bass	- depressurization	No	
	- impact on sex ratios	No	
Porgy	- barbless hooks	No	
Winter Flounder	- hook size	No	
Tautog	- depressurization	No	
	- hook size	No	
	- hook style	No	
Weakfish	- hook size	No	
	- hook style	No	

Table 2
What are we discarding and what is the impact?

SPECIES	*TOTAL CATCH (STATE WATERS)*	*1997 B2 CATCH (STATE WATERS)*	*% B2*	*MEAN MORTALITY KNOWN/ PUBLISHED*		*B2 MORTALITY*	*REFERENCE*
Summer Flounder	3,263,733	2,073,518	63%	Yes	14%	290,292	Malchoff & Lucy (1998)
Striped Bass	1,105,658	924,613	83%	Yes	8%	73,969	Diodai & Richards (1996)
Bluefish	1,686,453	898,401	53%	Yes	15%	134,760	Malchoff (1995)
Black Sea Bass	703,257	508,239	72%	Yes	4.7%	23,887	Bugley & Shepherd (1991)
Porgy	940,494	317,957	37%	Yes	10%	34,795	Malchoff (1995)
Winter Flounder	600,791	205,697	34%	No	?	?	
Tautog	240,802	158,592	66%	No	?	?	
Weakfish	203,535	90,549	44%	Yes	3%	2,716	Malchoff & Heins (1997)

Mr. Malchoff then reviewed some hooking mortality research that he has conducted. The presentation is shown below.

Major points on hooking mortality:

- Hooking mortality has only recently received research attention.
- Many variable in many fisheries have yet to be investigated.
- The research that has been done suggests that hooking mortality is often quite low.
- Few studies have investigated catch and release mortality as a function of hook type or hook size.
- Work in NY and Virginia indicates that circle hooks are not effective in reducing hooking mortality in recreational summer flounder fisheries.

Methods:

- Series of angling trials
  - 7 to 31 fish per trial
- All fish tagged and caged near angling site. Recorded bait type, wound location, salinity and water temp.
- All fish recovered after 72 hours. Mortalities expressed as percentage of total number of fish in each trial.
- Null hypothesis = Mortality was equal for fish caught on either bait type. (Fisher's Exact test at p=0.05)

Short-Term Hooking Mortality of Weakfish (*Cynoscion regalis*) Caught on Single-Barb Hooks

Mark Malchoff
New York Sea Grant Institute
Cornell University Lab
Riverhead, NY

Steve Heins
New York State Dept. Environ. Cons.
Division of Marine Resources
East Setauket, NY

Catch and Release

Collection Site

Objectives

- Estimate short term mortality following catch and release angling
- Compare differences in mortality as a function of bait type (artificial lures vs. natural bait)

Weakfish Mortality

	Temp. (C)	Salinity (‰)	(N)	Mortality (%)
Trial 1	27	29	26	0.0
Trial 2	23	23	31	6.5
Trial 3	23	25	26	3.8
Trial 4	22	32	7	0.0
Total			90	
Mean mortal.				2.6
95% Confid. Interval				0.6-7.0

Conclusions

- 1) Estimated short term mortality rates for weakfish were very low (0 to 7%).
- 2) Weakfish mortality did not differ significantly between bait types.
- 3) Suggests that c&r mortality <20,000 fish in 1991 based on MRFSS data. Possibly as low as 4500 in 1995, if ratio of "B2" to total catch is similar to 1991.

Issues:

- ✓ Catch & release mortality is poorly understood in the summer flounder recreational fishery
- ✓ Lack of mortality estimates serves to hinder the stock assessment effort
- ✓ Applied research may reveal methods for reducing post-release mortality

Short-Term Hooking Mortality of Summer Flounder

in New York and Virginia

Mark Malchoff, NY Sea Grant, mhm4@cornell.edu
Jon Lucy, Virginia Sea Grant, lucy@vims.edu

Objectives:

- Estimate short term mortality following catch and release angling
- Compare differences in mortality as a function of:
  - ✓ hook style and/or size
  - ✓ hook wound site
  - ✓ fish size (length)
  - ✓ water temperature
  - ✓ other variables

Summer Flounder Discards in New York

Total Catch (A+B1+B2)	B2	B2%	Mort. Rate	Est. Mort.
3.2 million*	2.0 million*	63%	8-14%	145K to 290K

*MRFSS/NMFS

Hook Styles and Sizes

Methods:

- Series of angling trials (10 to 25 fish/ trial)
- All fish tagged and caged near angling site. Recorded hook style/size, wound location, presence of bleeding, salinity and water temp.
- All fish recovered after 72 hours. Mortalities expressed as percentage of total number of fish in each trial.
- Bookstrapping to develop mean mortality w/ 95%C.I.
- Chi-square tests and logistic regression

Figure 24:
Hook Type and Bleeding

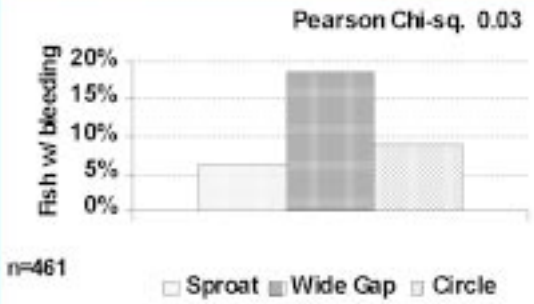


Figure 25:
Bleeding and Mortality

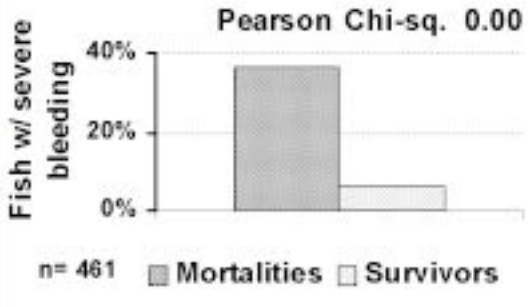


Figure 26:
Hook Style and Deep Hooking

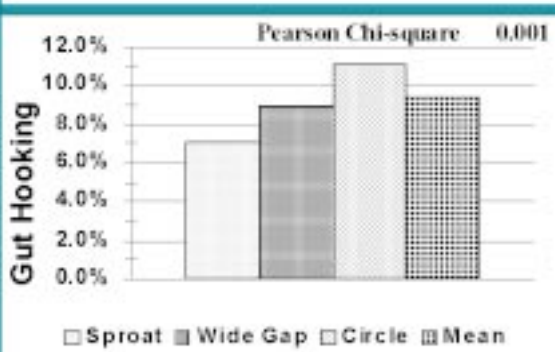


Figure 27:
Mortality and Hook Type

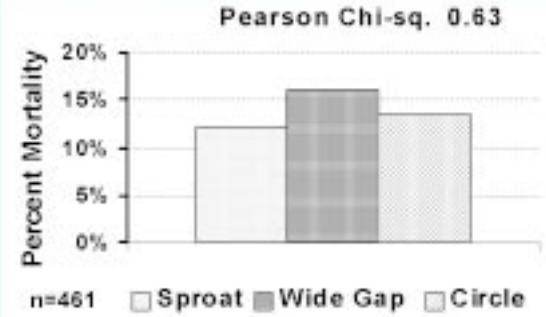
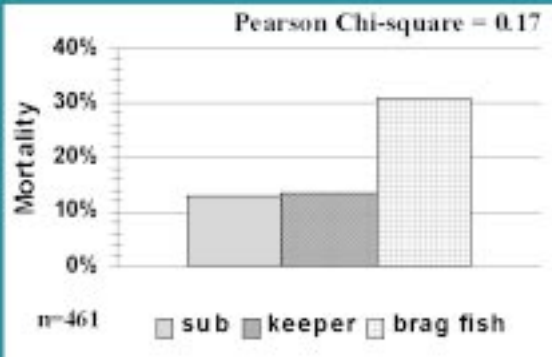
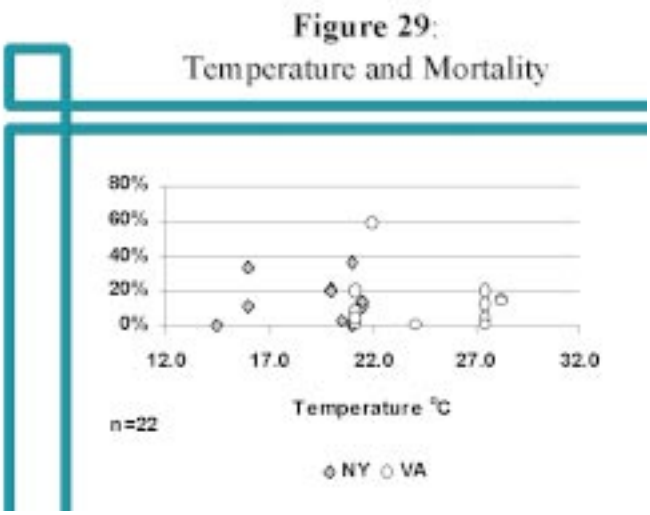


Figure 28:
Mortality and Total Length



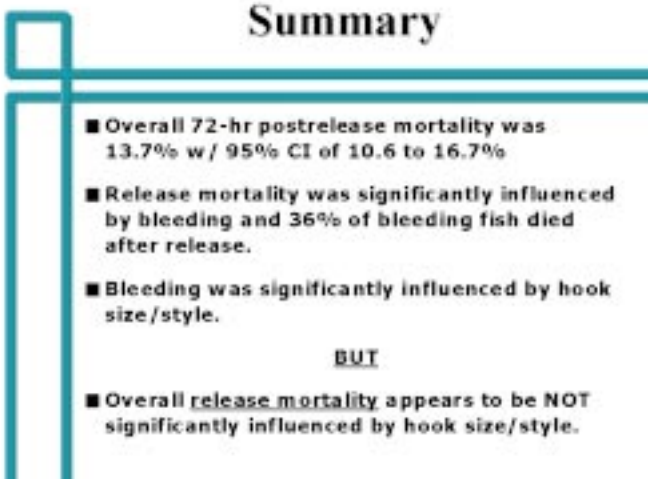


Logistic Regression model

CONDNEW =
CONSTANT+NEWSTYLE+TEMPGRP+SITE*BLEED

Parameter	Estimate	t-ratio	p-value
1 CONSTANT	-0.926	-2.103	0.035
2 SINGAT	-0.541	-1.374	0.169
3 WIDE GAP	0.028	0.072	0.943
4 TEMPGRP_1	-0.427	-0.641	0.521
5 TEMPGRP_2	0.486	1.194	0.232
6 SITE_1*BLEED_1	-1.788	-5.581	0.000
7 SITE_2*BLEED_1	0.0	.	.
8 SITE_3*BLEED_1	1.508	2.456	0.014

LL of constants only model = LL(0) = -179.720
2*[LL(B)-LL(0)] = 55.916 with
7 df Chi-sq p-value = 0.000
McFadden's Rho-Squared = 0.156



Panel Discussion: Charter/Party Industry Characterization of Non-target Catches in Nearshore Fisheries

Mark Malchoff, Moderator
Panel Members included: Fred Schwab, Jim House and Anthony DiLernia

Comments by Fred Schwab, Member of the Marine Resources Advisory Council

Fred related his characterization of non-target fish capture in the marine recreational surf fishery in which he has participated for nearly 5 decades. His interest in management is reflected in the fact that he was New York State's representative on the advisory group that helped to develop the original Interstate Striped Bass Management Plan, and since its inception in 1994. In addition he serves as New York's recreational fishery advisor on the Atlantic States Marine Fisheries Commission's Striped Bass Advisory Panel and has served on New York's marine Resources Advisory Council for nine years.

He emphasized that recreational anglers may have a much different view of the value of non-targeted catch as opposed to commercial fishermen. He indicated that the term "to discard" – synonymous with abandon or throw away, is often incorrectly used to describe portions of the recreational catch. In Fred's view (and this opinion is no doubt shared among many anglers), a live fish released back to its environment has great value, perhaps much greater than that of landed fish. This is especially the case in striped bass fisheries, where for years "catch and release" was the rule rather than the exception. Even today the vast majority of striped bass hooked by recreational anglers are released alive rather than killed, due to continued stringent bag and size limit restrictions. He similarly advocated limiting the use of term "trash fish," to describe non-targeted species, given the important ecological roles played by species like dogfish, and skates.

Fred reinforced the concept of "value" in his description of the surf fishery. Although it is typically unproductive relative to fishing from a boat, it has a large following both locally and nationwide. Clearly "value" in the striped bass surf fishery has much different connotation than does the same term when applied to fish as a commercial product.

Included in Fred's presentation was review of the species targeted and gear types used in the surf fishery. Gear types include artificials (with growing interest in flycasting) and natural baits. Target species in descending order of importance are striped bass, bluefish, and weakfish when the latter species are "present in fishable numbers." Surfcasters also "catch but seldom target or keep false albacore, bonito, Spanish mackerel, Atlantic herring, summer flounder, sea robins, sundials and the occasional oddity. Of course as with all categories of fishermen, they also catch sublegal sized fish."

Depending upon the location fished and the lures or bait used, it is possible for an angler to encounter two and even three species on a single tide, and while he may be targeting just one species, the others caught are not regarded as bycatch and when released are not being discarded. Environments hosting this recreational activity include ocean beaches, bay beaches, jetties, and inlets both day and night.

Fred also reported that some shore anglers who fish largely for the table and who use bait, seek winter and summer flounder, blackfish, northern kingfish, blowfish and a few other species. This group encounters bycatch in the form of sublegal sized specimens and a variety of non-targeted species including those so-called "trash fish." On average, these shore anglers fish less frequently than those who seek bass, bluefish and weakfish but [in Fred's opinion] , this group not only accounts for a very high rate of release fish mortality and kept fish, but also the highest per angler rate of retained sublegal fish.

Of course, as within any user group, there are those who are conscientious. During [Fred's] nearly five decades of fishing the surf, there have always been those who release much or all of what they caught, but admittedly, the percentage that did so was below that of the present day. While one could argue that recent possession and minimum size limits gave birth to catch and release, the fact of the matter is that the near collapse of the striped bass resource some 20 years ago caused an increasing number of shore and near shore anglers to adopt a strong conservation ethic, which over time was applied to other species as well.

With regards to release rates Fred referenced a December 1998 report to Congress which notes that an average of 24% of striped bass caught by anglers were released alive from 1979 to 1981, 68% from 1982 to 1985 and roughly 92% since 1995. (Of course regulatory measures are a factor with respect to the high percentages in recent years.) Per Amendment 1 of the Bluefish Fishery Management Plan dated July 1998, it is estimated that the angler catch of bluefish released in 1987 was 24% and has steadily risen to 54% in 1996.

According to a July 1998 ASMFC Technical Committee report, an estimate total of 15.7 million striped bass were released coastwide by recreational anglers during 1997 of which 14.4 million were estimated to have survived.

Fred also offered some observation on techniques or practices that are likely to increase hooking mortality. Some of these techniques are often associated with novice or casual anglers. They are often adopted because they can be quite effective while requiring less angling expertise. These include:

- use of "clam bellies" in the striped bass fishery
- "chunking"
- "dead sticking" or leaving one or more rods unattended

Conversely, Fred suggested that mortality could be reduced through greater adoption of:

- circle hooks
- barbless hooks
- fewer rods or fewer unattended rods
- better treatment of released fish (including work ing fish in shallow water to facilitate water flow across the gill membranes)
- greater understanding of influence of water tem perature on post catch-and-release mortality
- reduced "fight times" thereby reducing stress in release fish
- diligent attention to tackle (i.e. replace leaders, use wire leader when in the presence of bluefish, and retie knots after these items are exposed to wear and abrasion)

Fred stated that, “educating anglers is important, but my files contain nearly a dozen instructional pamphlets originating from federal and state agencies and private organizations, which focus on the release process.” Also, during the past 15 years fishing publications have repeatedly featured articles on catch and release and the causes of fishing mortality, and many “How To” fishing articles encourage anglers to release most or all of what they catch.” This suggests that despite the good efforts, additional educational techniques or delivery methods will be required to reach new and culturally diverse angling audiences.

In the way of conclusion, Fred argued that, “as with all methods of catching fish, there is bycatch and release mortality associated with surf and shore angling. The release mortality rate may or may not be 8% as estimated for the striped bass recreational fishery, or 15% assumed for bluefish, but I do not believe that it exceeds that of other angling categories.”

Can and should efforts to reduce [angling] bycatch be incorporated into management plans and regulatory programs, and are there related problems which should be addressed through the legislative process? Is there a need to educate the angling public? In all three instances, my answer is yes. But it is again pointed out that education is already an ongoing process and in my opinion there is a need for more direct measures to address both bycatch and release mortality relating to the activities of all resource user groups.

Panel Discussion continued; Comments by Jim House, North Fork Captain's Association

Captain House characterized recreational bycatch in the charter and partyboat fishery based on the North Fork of Long Island (Tables 4-6). Jim based his presentation on the collective opinion of several prominent captains in the fishery. While these data are somewhat anecdotal, they characterize in a rather detailed fashion, the catch of non-targeted fish in one portion of the Long Island recreational nearshore fishery.

In the striped bass fishery ratios of catch to bycatch varied from 1:1 to 30:1, depending upon season, time of day, and bycatch type (Table 3). Similarly, ratios in the blackfish (tautog) recreational fishery ranged from 1:1 to 15:1 (Table 4). In the codfish fishery, recreational bycatch was quite low with observed ratios of 1:1 to 1:10 (Table 5). Finally, he presented information about the summer flounder fishery, indicating catch to bycatch ratios of 1:1 to 15:1, again depending upon season and species. Among the well known variable influencing recreational bycatch in all of these fisheries are; minimize of the target species, bag limit, angler skill, and bait type.

Charter / Party: Estimation of non-target catches from the North Fork of Long Island by Captain Jim House

Table 3: Estimated Bycatch Ratios (Catch: Bycatch) in the Striped Bass Fishery

BYCATCH TYPE	*MONTH*							
	May	June	July	August	Sept.	Oct.	Nov.	Dec.
Bluefish (day)	1:10	1:10	1:10	1:3	1:10	1:10	1:10	30:1
Bluefish (night)	30:1	15:1	15:1	15:1	12:1	12:1	20:1	No data
Sub-legal Striped Bass (day)	1:10	1:5	1:3	1:3	1:8	1:10	1:10	3:1
Sub-legal Striped Bass (night)	1:1	3:1	3:1	3:1	3:1	5:1	No data	No data

Variables:

Minimum Size: 28" limit has likely caused a decrease in short fish bycatch

Bag Limit: 2 fish for charter party likely has decreased the short fish bycatch

Angler Skill: proper bait presentation likely decreases short fish bycatch

Bait: using the proper bait likely decreases short fish bycatch

Table 4: Estimated Bycatch Ratios (Catch: Bycatch) in the Blackfish Fishery

BYCATCH TYPE	*MONTH*			
	May	Oct	Nov	Dec
Short fish	2:1	1:1	2:1	1:3
Bergals	Occassional	Occassional	Occassional	Occassional
Scup		15:1		

Variables:

Minimum Size: 15" limit will cause an increase in short fish bycatch but more breeding age fish will be available

Bag Limit: difficult to judge effect

Angler Skill: likely no effect

Bait: Clams = smaller blackfish, more scup and more bergals

Crabs = bigger blackfish less bycatch

Table 5: Estimated Bycatch Ratios (Catch: Bycatch) for the Codfish Fishery

BYCATCH TYPE	*MONTH*							
	April	May	June	August	Sept.	Oct.	Nov.	Dec.
Short fish	1:4	1:3	1:2	1:1	1:2	No info	1:4	1:3
Bergals	1:2	1:2	1:2	1:2	1:2	No info	1:3	1:2
Dogfish	Negligible	Negligible	Negligible	Negligible	1:10	No info	1:1	1:2

Variables:

Minimum Size: size limit of 21" has caused an increase in short fish bycatch but more breeders will be available

Bag Limit: no bag limit

Angler Skill: no effect apparent

Bait: no effect apparent

Table 6: Estimated Bycatch Ratios (Catch: Bycatch) in the Summer Flounder Fishery

BYCATCH TYPE	*MONTH*					
	May	June	July	August	Sept.	Oct.
Short fish	5:1	1:2	1:3	1:3	3:1	3:1
Sea Robin	15:1	10:1	8:1	10:1	15:1	15:1
Sundial	1:1	1:1	1:1	1:1	1:1	1:1
Skate	15:1	15:1	15:1	15:1	15:1	15:1

Variables:

Minimum Size: 16" limit will cause an increase in short fish bycatch; more breeders available

Bag Limit: smaller bag limit may increase short fish bycatch

Angler Skill: hooking a fish early in a bite would decrease mortality

Bait: no effect apparent

Location: skates tend to be in deeper water, sundials in shallow water

Panel Discussion continued; Comments by Anthony DiLernia, Kingsborough Community College and member of MAFMC

Tony began his presentation with a review of some SFA Definitions. The reader is referred to John Mason's discussion above for definitions of bycatch and economic discards. As noted earlier, bycatch does not include fish released alive under a recreational catch and release fishery management program.

He then posed the question as to whether one encounters bycatch in recreational fisheries. If the angler is motivated only by the experience (i.e. catch and release fisheries) there is no bycatch, since no true target species/size exists. If "the motivation is to land large consumable quantities of fish, thus making the angling experience economically justifiable (i.e. bottom fishing) then something like bycatch does occur. In most situations, the angler is motivated by a combination of factors, including the angling experience, socialization, and the opportunity to bring something home for consumption.

While motivation will vary with individual recreational anglers and target species, some generalizations can be drawn for recreational fisheries although these generalizations will not be as broad based as those focused on commercial fisheries.

Information for legislature to consider before enacting regulations related to bycatch:

- Recognize that there is much ongoing activity at the federal and regional levels as required by the Sustainable Fisheries Act update to the Magnuson Act. [Editor's note: special attention may be focused on regulatory activities related to National Standard #9].

- Recognize the distinction between post catch-and-release mortality in the recreational fishery and bycatch in the commercial fishery. In the former situation, federal law does not appear to mandate decreases, yet educational and voluntary efforts along with newer gear technologies (i.e. circle hooks) has and will continue to produce higher survival rates and less waste in the fishery. Regardless of definitions, catch and release can produce sustainable economic activity on a fixed resource. For example, the striped bass charter fishery in New York Harbor probably relies on relatively few fish, since fish are "reused" many times in the course of a season. The same fish is caught over and over again.

- Some species can support both harvest and catch and release fisheries that should be recognized. For example, in the head boat [partyboat] summer flounder fishery, most anglers are focused on "harvest" when fishing early in the season. By late summer in some west end bays, most legal size fish have been caught, resulting in a de facto catch and release fishery based upon sublegal fish just so people can have the angling experience. "This is when we really practice catch and release."

A Summary and Identification of Issues

Bill Wise

No one expected to come out with the perfect solution to the bycatch problem. However, as an outcome of this meeting, several issues were clearly identified.

Data

Additional observer data is needed to determine actual bycatch numbers. Observers on boats have been offered by some commercial fishermen. Then we can begin to look seriously at drafting a proposal to establish a state-funded observer program. The objective would be to get fishermen to report accurately or get someone on the boat to do it for them.

- Log books - Look for ways to get commercial fishermen to fill them out honestly and that will not hurt commercial fisherman. A realistically crafted observer program is needed including a guarantee that the fishermen will not get closed down by log book accounting for discards.

- Catch and release – Many factors in many fisheries remain unresearched. A prime example is circle hooks in the striped bass fishery where there is lots of anecdotal information not verified by research.

Regulatory Bycatch

Attempts to rebuild fish populations have included management measures that clearly have exacerbated bycatch. Commercial draggers have argued that the trip limits are too conservative and punishing, resulting in hardship and increased bycatch.

Interested parties should explore other regulatory mechanisms that might reduce regulatory bycatch while still limiting fishing mortality. What can New York do about this? Push New York State for changes in the *Sustainable Fisheries Act.*

Gear Research Issues

- Transferability from other states or regions. Research may require replication in NY.
- Funds for research. More are needed.
- Literature review. Producing a compilation of existing research would be helpful.

Gear Modification

Examine gear research transferability from other states or regions.

Education based on bycatch research for:

- The general public
- Schools
- Decision makers

Bring user groups together

Bringing commercial and recreational groups together might lead to educational approaches or money for buyout.

There are roles for:

- Trade associations
- Sea Grant
- Marine Extension

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