Proceedings From the
Sixth North Carolina

# Marine Recreational Fishing Forum

## PLANNING:
## The Key to Fisheries Management

April 12, 1997

# Proceedings from the Sixth Annual North Carolina Marine Recreational Fishing Forum



This forum was convened April 12, 1997, to provide the latest information on fisheries management issues and research that affects the recreational fishing industry.

Moderated by Jim Murray, (former) director of the North Carolina Sea Grant Marine Extension Program
Edited by Mac Currin and Jeannie Norris


North Carolina Sea Grant Publication UNC-SG-98-06

This work was partially supported by grant NA86RG0036 from the National Sea Grant College Program, National Oceanic and Atmospheric Administration, to the North Carolina Sea Grant College Program.

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## Welcome and Objectives

Jim Murray is director of the North Carolina Sea Grant Extension Program.

This is the sixth annual N.C. Marine Recreational Fishing Forum. We have these meetings to bring folks up to date on the latest issues in fisheries management and research as they affect the marine recreational fishing community.

Each year, the planning committee chooses a different theme. We have covered topics as diverse as the pros and cons of a saltwater recreational fishing license and ways to deal with fisheries conflict. Last year, we featured the preliminary recommendations of the Fisheries Moratorium Steering Committee. In the 12 months since that meeting, the steering committee has completed its deliberations and submitted its fisheries reform package to the General Assembly. In my view, this is the most comprehensive fisheries reform package in this state's history and probably the largest submitted in any state.

With more than 140 recommendations in that report, no one, including the steering committee, agreed on all of the recommendations. They were a compromise. But one thing that all parties agreed upon — fishery managers, the Marine Fisheries Commission, and sport and commercial fishermen — was the need to develop fishery management plans in this state. Plans to manage key recreational and commercial fisheries is the cornerstone of the recommendations. So the forum planning committee decided to feature the fishery management planning process this year.

Louis Daniel will give a status report and an overview of our fish stocks in North Carolina. Bob Lucas, (former) chairman of the Marine Fisheries Commission and the Moratorium Steering Committee (MSC), will give an update on the MSC recommendations and how they stand in the General Assembly. Mike Street will give an update on plans that are in progress and how the process works in the Atlantic States Marine Fisheries Commission and the various councils.

We are also going to hear from a couple of folks from New England. Peter Shelley, director of the Marine Resources Project, comes at fisheries management from an environmental point of view. And Michael Collins was a fisherman for 25 years. They will offer some 20/20 hindsight and lessons on how North Carolina can avoid some of the mistakes made in New England.

Our luncheon speaker is Gary Matlock of the National Marine Fisheries Service. He will talk about managing highly migratory species — in particular, tuna off North Carolina. He was fisheries director in Texas for many years and was involved in initiating the hatchery program for red drum.

We will discuss some examples of fisheries planning, and we will have some concurrent sessions that will be of interest to you.

We also will feature Fishery Resource Grant projects that were awarded in the recreational area. This will be an opportunity for those who got Fishery Resource grants to report on their findings.

The forum is sponsored by North Carolina Sea Grant, the Coastal Conservation Association (CCA) of North Carolina, the Core Banks Surf Fishing Club, the Davis Island Fishing Foundation, the National Marine Fisheries Service's (NMFS) Beaufort Laboratory, the Division of Marine Fisheries (DMF), the Cooperative Extension Service at NC State University, the N.C. Beach Buggy Association, Outer Banks Sportfishing Schools, the Raleigh Saltwater Fishing Club and the U.S. Fish and Wildlife Service. The Cape Hatteras Anglers Club Inc. is a new sponsor this year.

The planning committee decided the agenda for this forum. I'd like to recognize Dick Brame from CCA, Mac Currin of Outer Banks Sportfishing Schools, Jim Easley from Cooperative Extension, Wilson Laney from U.S. Fish and Wildlife Service, Frank Long from Davis Island Fishing Foundation, John Merriner from NMFS in Beaufort, Tom Monaco of the Core Banks Surf Fishing Club, Bo Nowell from the Raleigh Saltwater Fishing Club and Dale Ward from DMF.

One of the benefits of this forum has been the

proceedings that we publish. I know at NC State University we have students come in and say, "I need to do a term paper on something to do with fish and it is due in two days. Can you help me?" I hand them last year's proceedings, and there is the data for their paper. I have used them quite a bit. This past year, the Seafood and Aquaculture Study Commission asked for copies of the forum on the pros and cons of a recreational saltwater fishing license. So the information gets used well beyond this day.

## Status of the Fishery

Louis Daniel is district manager for the central district of the Division of Marine Fisheries and chairman of the Biological Review Team.

As you know, this is typically the time for the Division of Marine Fisheries (DMF) director's report. Currently, we are searching for a new director for the division. Hopefully, next year he or she will address you in this place. I believe one of the reasons I was asked to address you today was because of a report I gave recently to the Seafood and Aquaculture Study Commission titled "Are Our Fisheries Stressed?"

So I would like to combine that report with a discussion of the status of the stocks, and hopefully that will relate to what Bob Lucas and Mike Street are going to talk about.

Let me start by giving you an idea of what fisheries management is about. Why is it necessary to have programs to develop fishery management plans, and what does that entail? Most of the fish we are dealing with in North Carolina — summer flounder, weakfish, bluefish, red drum and speckled trout — are interjurisdictional fisheries. They have home ranges from about Cape Canaveral, Fla., to Cape Cod, Mass.

During the spring, summer and fall, these fish are relatively evenly distributed throughout this range. States are responsible for protecting fish in their home state under federal and state fishery management actions, such as the Atlantic States Marine Fisheries Commission (ASMFC) and the South Atlantic Fishery Management Council. So during these seasons, all the states are involved in protecting the species while they are in their home waters.

During the winter, these fish tend to be concentrated off the North Carolina coast. It is unlikely that a recreational angler is going to travel 12 miles offshore in February to catch a weakfish, so many of these species are primarily available to the commercial fisheries during the wintertime. But it is incumbent on the state of North Carolina to do everything possible to protect these fish during the wintertime.

What we see during the winter are not just North Carolina fish, but fish that have been protected along their range by other states — these fish are migrating back and forth.

Many of these fish stocks fluctuate in abundance due to a host of different factors. In a stock that is not being exploited heavily or overfished, we see natural fluctuations. We have periods of extraordinarily high abundance and we have periods of low abundance.

During overfishing, the peaks get cropped down, so we don't see extraordinarily high abundance. Also with overfishing, the periods of low abundance tend to last longer because we don't have the spawning stock to help them recover.

With natural fluctuations in fish stock abundance, how do we distinguish between what is natural and what is a man-made problem? We assign different criteria to the fish stocks in North Carolina — whether they are viable and healthy, stressed or depressed.

To assign these categories, we look at a number of factors. We must look at a lot of characteristics of the fish population in concert. Often, they are viewed through a virtual population analysis or some type of a stock assessment structure.

In a healthy population, we see a wide range of year-classes. Where fish may live to be 10 years old, we want to see a small proportion of fish that are 10 years old. Just like a human population, we want to see a small percentage of people living to be 100 years old. We are

not going to see as many 100-year-olds as 20-year-olds, but we will see a small percentage.

As the age structure of that population declines to where the oldest fish may be 4, then there may be a problem with the older fish being cropped off — they are not being protected at smaller sizes and are not being allowed to grow to their maximum age. This is a critical component in population analyses — stock assessments — that are based primarily on the ages of the fish.

Another thing that we want to see is average or better spawning success. To determine that, we look at juvenile abundance indices, typically conducted by fishery independent surveys. This means we go out and actually try to track the juvenile abundance at set stations or random stations that we sample every year.

Certainly there will be natural conditions that affect year-class strength or the numbers of juveniles in the stock. But you hope over the long term that the trend of juvenile abundance remains relatively stable and doesn't decline dramatically.

We also look at fishing mortality rates. We want to maintain those at a relatively consistent level to make certain that we have enough fish in all the different size-classes to maintain a sustainable stock.

Finally, we want to make sure that we maintain a relatively stable recreational and commercial catch per unit effort. If it took 100 anglers to catch 1,000 fish in 1980, and it took 1,000 anglers to catch 1,000 fish in 1996, we can use those trends over time to identify a problem.

If any of these trends show a consistent decline — one year is not going to throw out an alarm signal, but if these trends decline over a narrow period of time — those fisheries might be stressed. And if we get to a point where the stock is declining, and it is sort of an arbitrary point, then we consider those species to be depressed.

Let me give an example of something you see in a fish stock that indicates a problem. Let's look at the catch-at-age matrix for bluefish in 1995. And 1996 looks very similar.

Bluefish live to be 11 years old. In a coastwide assessment, there are representatives of all ages up to 11 years. I am not trying to indicate that there are no problems with bluefish. I just want to use this as an example of a relatively healthy age distribution. We are obviously going to see more fish ages 1, 2 and 3 — the younger size classes — than older fish.

Weakfish is another species of concern in North Carolina and elsewhere. The catch-at-age matrix for 1995 and 1996 show something similar. We see that weakfish live to be 15 years old, yet fish over 6 years old are quite rare.

In two years with the division, my office has aged close to 3,000 weakfish, and we have yet to see one age 7. We should be seeing fish in the 8-, 9- and 10-year range. If I had shown this for 1992, we wouldn't have seen many fish over 3. So we are starting to see some positive signs here with the occurrence of fish ages 4, 5 and 6 in the stock. If we protect the smaller fish and the abundant year-classes, we will see more older and larger fish in the future. That is the goal of fisheries management.

The situation is similar for flounder, which live to be about 15 years old. It is very rare to see anything over age 5. We see a tremendous abundance of fish ages 0, 1 and 2. That is probably due to the fisheries management plan — the quota system, bag limits, size limits, different management aspects. We are seeing a lot of flounder, but what we have to do is hold the course and continue to protect those stocks so that larger, older fish can move into the population.

Something of interest to the recreational fishermen is the North Carolina Saltwater Tournament that we use to track the abundance of large fish. We can use this information. Some people have problems using citation data because of its relationship with other indices. But it does give you trends in large fish abundance.

Since 1980 we have seen a relatively steady increase in the number of recreational citations for trophy red drum. What is particularly interesting about red drum — and this is a testament to the recreational ethic — is that if you compare 1980 to 1995 or 1996, about 10 percent

of the 1980 citations were release citations. In 1995 or 1996, probably more than 95 percent are release citations. So we are getting the message across about the importance of these large females to the spawning stock biomass. Most people consider red drum a trophy fishery and release them rather than taking them back to the cleaning station or bragging about them for an hour before putting them in the dumpster.

The citation data for weakfish show that there is a problem. The indices from citation data are being used to tune these stock assessments, these virtual population analyses. Since 1980, we have seen extraordinarily few citations issued by our tournament. In 1996, that number was the same as in '95 — two citations were issued. We hope to start seeing more of these citations now with numbers of larger, older fish showing up in the population as a result of the ASMFC fishery management plan.

It is important for the recreational community to promote this citation program. I have talked to recreational fishermen who don't take the time to fill out the citation forms. They think it's goofy, that it's for tourists. That is not the case. We need to be able to track large fish abundance. When you catch a trophy, it is very important that we are able to document it. We don't need to know the precise latitude and longitude where you caught your fish. We do need to know general vicinity, when you caught the fish and its size. These are very important pieces of information. You should fill out citation forms every time you catch a trophy.

What is the status of the stocks? What do the recreational fish landings look like over the last few years, and where are things going?

About 16 million pounds of recreational fish were taken in 1995, and about 14 million pounds were taken in 1996. If we eliminate commercial species like menhaden and thread herring — species that aren't used by the recreational fishing industry except as bait — we see a 25/75 percent recreational/commercial split.

In 1995, the combined landings of the commercial and recreational sectors were about 61 million pounds. About 16 million pounds were recreational. In '96, the commercial fishery had a very good year, with about 64 million pounds compared to the recreational sector's 14 million pounds.

These estimates need to be viewed in one important light, though, so that you're clear on their precision. Croaker and dogfish sharks were the two primary commercial and recreational species for this year. Ten million pounds of croaker were landed commercially, and 14 million pounds of dogfish sharks were landed commercially. So you can use that information to see the commercial and recreational split.

I don't believe you can look at the recreational decline in '96 and conclude that there is a problem. There may be disagreement, and that might be a point for discussion. But the winter of 1995-96 was extraordinarily harsh. It probably had some negative impacts on a lot of the fish stocks and kept some people at home. But hurricanes were the most significant events of 1996 that caused the decline. I know personally that it had a detrimental effect on my ability to fish. One thing that we believe is a lot of the people, particularly in inland areas, were unable to get to the coast to go fishing because they had things to take care of at home. They didn't have the weekends to go fishing. They were cleaning up from the hurricanes. So that is a possible explanation for the downward trend in 1996. Overall, we are seeing some positive signs. We are seeing a few more viable species as opposed to more stressed and depressed species.

There are a few species we need a lot more information about. A few species shifted from one of the stressed, depressed or viable categories to being unknown — particularly kingfish or sea mullet. We really don't have a good program to study those animals. Dogfish sharks are difficult because they have an extraordinary life history. Hopefully, one of these fishery resource grants is going to address some of these problems.

We are seeing positive signs in juvenile abundance indices and in expanded age structures. And I think a lot of that has to do with the federal fishery management

plans. We have been involved in the plans and in implementing the regulations for three, four and five years now.

Not just the target species are being affected. We are seeing positive effects from minimum mesh sizes and closed areas, such as the closure to flynets south of Cape Hatteras. Regulations that are directed toward one species are having positive effects on other species. That is our goal.

The division has done extensive work on bycatch reduction devices in the shrimp trawl fishery, in the long-haul seine fishery, in ocean gillnets, in the striped bass and dogfish fisheries, and in the pound net fisheries. We are making great strides to reduce the amount of unwanted finfish bycatch in some of the directed commercial fisheries.

Finally, I think one of the most critical things is the Moratorium Steering Committee recommendations, the Fisheries Reform Act and the critical need for fishery management plans and habitat protection plans. With increased pressure on the primary species come shifts in effort-to-species of historically low importance to both the recreational and the commercial fisheries. These shifts require the Division of Marine Fisheries in North Carolina to assess the stocks now so that we might prudently manage them in the future. Without good, up-to-date information, our regulations can be challenged and oftentimes can be overruled.

So I think with cooperation among the division, the commercial and recreational fishing industries and with the fishery management plans — including our continued good standing with the ASMFC and the South Atlantic Fishery Management Council and our new position on the Mid-Atlantic Fishery Management Council — there are very positive signs for the future.

Harrison Bresee: Regarding your citation index, have the citation weights and size limits changed over time or are they a stable index?

Louis Daniel: They do change. If we were giving out an average of 400 or 500 citations a year and suddenly we were getting 5,000 a year, the minimum weight would increase. Likewise, if a stock is depressed we would see them decrease.

One nice thing about the weakfish citation index is that it has been 6 pounds for the duration of the tournament. But there have been other species that changed. That is what causes the most concern in using it in a virtual population analysis — it may not be the most appropriate way to use that data.

Louis Chemi: What good are the citation indices and the poundage of recreational fish caught without knowing how many recreational fishermen are contributing to the pounds caught and the number of citations?

Louis Daniel: That makes it difficult. We are seeing increased catch per unit effort in some species and lower catch per unit effort in other species.

Think of a mathematical proportion where you have a numerator and a denominator equal a numerator and a denominator. If your numerator is unknown and your denominator is unknown, it is very difficult to solve that equation. How can we identify the recreational fishing community? The only way it has been done successfully in the past is through a recreational fishing license.

Jim Murray: Thank you very much. That was a good transition to our next speaker. The recreational license, of course, is one of the recommendations of the Moratorium Steering Committee for some of the reasons just mentioned.

## Status of the Fisheries Moratorium Steering Committee

Bob Lucas is (former) chairman of the Marine Fisheries Commission and the Fisheries Moratorium Steering Committee.

Riding up here today, I was thinking about how long I have been chairman of the Marine Fisheries Commission — four years this month. It is a volunteer position, kind of like going to college for four years. Now it looks

like I am heading for my master's degree.

Today I want to give an update on where we are and where we are headed. Before that, I want to provide a brief background to put it in perspective. In plain language, I want to do what is right. So what is right?

Everybody has a different perspective. If we could have a little fun, we could go around the room — because most everybody here knows something about fish — and I could ask you, "If you were chairman of the Marine Fisheries Commission, what would you do?" First of all, you would have to ask yourself what you want to accomplish. And that goal is in our book of regulations — to manage, to restore, to develop, cultivate, conserve and protect, and to regulate the marine and estuarine resources of the state of North Carolina. That is what we are trying to do. The next question is how do you go about doing it?

When I joined the commission, I noticed there was no plan to accomplish the above goals — how we were going to do this. We had regulations here and there, no committees and no involvement by recreational or commercial fishermen. Really, what we were doing with fisheries was patchwork regulation. I can understand how commercial fishermen were upset with the state. They didn't know what was coming next in terms of management. I can understand how the recreational fishermen were upset. They were frustrated that it didn't seem like anything was happening — we weren't moving toward any particular goal.

So we tried to change that. We got committees of commercial and recreational fishermen involved and established some goals. The commission itself became more aggressive. We closed some areas to trawling, tried to protect the resource. We closed trawling on the weekends and made a number of changes — but still it wasn't enough. It wasn't part of a plan to accomplish the mission statement that I read to you.

You are chairman of the commission, how are you going to do it? That is how the fisheries moratorium came about. It was partly an effort to come up with a management scheme that was fair to commercial and recreational interests. But the main reason was to come up with a plan that would accomplish our goal to manage and protect the resource. I feel like we have done that with the moratorium recommendations.

They are not perfect. One of the areas that in my opinion has been neglected from a management viewpoint is habitat. The habitat protection plans in the recommendations are a huge step in the right direction. I have been frustrated over the years that the commissions (Marine Fisheries Commission, Environmental Management Commission, Coastal Resources Commission) don't work together — they don't even talk to one another. I haven't seen the chairman of one of these other two commissions in a year and a half. The commissions have to work together because habitat protection is an integral part of managing and protecting the resource.

Number two — we must have a fair and manageable license scheme to determine who the commercial fishermen are and how much and what type of gear they are using. Who is a recreational fisherman? You have to figure out who is taking what. We must have management plans. I will touch on that again.

Next, one of the things that has been really lacking in this state is the law enforcement effort. We must have more people. This week we got a new chief. We have been without one for a year. Now if we get a director of the Division of Marine Fisheries, we will be in business.

We have to create a deterrent to folks who break the law. I am convinced that those are not large numbers, but there must be a deterrent. I've got to share this with you. It was one of the funnier moments in the battles in the legislature. Rep. Robert Grady grilled me for an hour. It was worse than any court. But he did say something that was funny. We were talking about making it a felony to illegally sell and buy fish. Robert said, "You are just going too far." He said, "I can see it right now in Central Prison — the guys can't see each other, but they are talking between cells. One says, 'What are you in for?' Another says, 'I illegally sold some spots.'" But there has to be a deterrent. When some people play by the

rules, everyone has to. We need good enforcement.

The last thing the steering committee recommended was a streamlined Marine Fisheries Commission of only nine people. That is very important. We have 17 now, and it's too many.

It was quite an effort. A lot of things went into the report, but we came up with a very good product.

So where did it go? It went to the Seafood and Aquaculture Study Commission to be debated. But unfortunately, it never came up for debate. The reason given was that the division couldn't handle any more duties. So a two-and-a-half-year effort didn't even get discussed. Rep. David Redwine from Brunswick County — I admire him tremendously — took the moratorium recommendations and introduced them as a bill into the House of the General Assembly of North Carolina. That is where it is.

To give you the latest update, I understand that he will introduce a version of his bill with changes that actually closer reflect the moratorium recommendations. I can also tell you that the recreational license will be the hardest component to get passed.

Management plans, which are the theme here today, are a critical part of the recommendations. Why are the management plans critical and why do we need them? We are trying to accomplish our goal of protecting and preserving the resource. The best way to do it is with management plans because they offer a fair way to manage. They are based on science. I also want to say that just because you don't have all the science doesn't mean you don't do anything. Some people think that if you don't have all the science, you can go ahead and catch fish with no regulations. It doesn't work that way.

The thing I like about management plans is that the user groups participate. If we are going to have any success in North Carolina, commercial and recreational fishermen have to be involved. The plan will involve them. Plans can be written on a species basis, they can be done by area such as striped bass up in the Northeast, or they can be done by gear such as the pound nets — we need to do something about pound nets in this state.

I asked one of the powerful representatives in this state, "Why are you against the recreational license?" He said, "I have had so many folks tell me that all they do is go fishing in the fall and catch a few spots and croakers, and they don't think they ought to have to pay to do it." The point I tried to make to him is I don't think people truly understand where fisheries management is going.

The bill that President Clinton signed giving the Atlantic States Marine Fisheries Commission the power it now has was only signed in December 1994. We have been dealing with the new power of ASMFC for just two years. But it has had a profound effect in the last two years. It has kept the MFC busy reacting to it. Other plans are coming. There will be a croaker plan coming and likely a spot plan. If we don't get involved in this state and begin to drive the management process with our own plans, then all we are going to do is react to federal mandates.

And these people that the legislator is talking about won't be able to go down and fill up their coolers because they will only be able to keep a few fish. The days of people going down in the fall and filling up coolers will be gone. And then, those same people are going to ask the legislator when he's going to do something about managing fish.

If we do it now, we can put this state ahead. We have the best resource on the Atlantic coast. Why people can't see that I do not understand. We have got to make them see it.

Recreational fishermen have to get involved. I believe that it is an educational problem. I spent the first two years on this job trying to understand. No longer does North Carolina stand alone. If we are going to be involved with other states, we certainly want our voice to be heard. We want it to be heard so that the management plans are fair and accomplish the goals that we have talked about. So we have to put in a system that is credible, that makes sense and that will be persuasive.

One fellow told me the other day, "Lucas, you are going to fail." And I said, "Well, that is an ugly thing to say. Why do you say that?" He said, "Because things

haven't gotten bad enough yet. When things get worse, you will prevail." I hate to believe that. I am absolutely convinced that we can prevail with this system. It is radical, but that is what it is going to take.

Louis Biggerstaff: What can we do as individuals to help you?

Bob Lucas: Let me give you an example. First of all, Leo Daughtry is the majority leader in the House. Leo is from my neck of the woods, and he is a great fellow. He and others have made the comment that they really haven't heard from recreational fishermen. You need to touch base with your legislators — you need to go to the legislature. What happens in the House is crucial, because once the Senate sees that the House is moving on this issue, I am convinced that it will come right along. This is a very critical time right now. You have to get up with your legislator and say, "Don't let this die."

Al Allison: I am from Charlotte. It appears from the comments today that the recreational license is critical for good data. Good data are needed for fishery management plans, and the existing data are insufficient to give the proper results. It seems the recreational license is critical to getting good data.

It appears that the average angler and a lot of people are absolutely against this. The information has been excellent. The moratorium plan is excellent. But the political process seems to focus on this tax issue and the guy who fishes twice a year but doesn't want to pay for his fun. It is a shame that it is that way. I have heard others involved with conservation say, "If we don't have a $15 fee or a $5 or $10 fee, let's just don't do anything." I don't want to do that. I hope that this group will not lose its interest.

Could we propose a free recreational license with a voluntary $5 stamp as a contribution to the foundation as an alternative? I just wanted to propose that as a possible solution to make sure we get our data.

## Fishery Management Plans in North Carolina — Where We've Been and Where We're Going

Mike Street is chief of analysis and planning for the Division of Marine Fisheries.

I have been with the Division of Marine Fisheries (DMF) for 27 years. I have been involved in fishery management planning in various ways since about 1973. I drafted a report for the division in 1979 that outlined how we would prepare fishery management plans.

What I want to do is describe how the fishery management plan process will likely work. I say likely because it will be subject to rule-making and other actions of the Marine Fisheries Commission. Some responsibilities are proposed to be delegated to the commission relative to planning, but it will depend on how the legislation finally comes out.

Fishery management plans (FMPs) are needed in North Carolina for a number of reasons mentioned by Louis Daniel and Bob Lucas. The current system is chaotic. It is crisis-driven. Rules are passed by the Marine Fisheries Commission as problems occur. They are reactive. We react to problems in North Carolina. We react to the needs of federal and interstate fishery management plans. We react to the General Assembly. The system is not proactive.

The management system is perceived as unresponsive by many people in the public: conservationists, general citizens who never fish and especially fishermen. Proclamations are issued. These are one of the more powerful and misunderstood tools in our system. They are intended to be issued as needed. But they are perceived as not related to any big picture because there really is no big picture. So that is one of the issues to be addressed by FMPs.

The goal of our fishery management program is to ensure the long-term viability of North Carolina's commercially and recreationally significant coastal fisheries. The species are easy to identify. They are fish, crabs, shellfish, whatever. But what is a fishery? This is a term that a lot of people use without really understand-

ing. To me, the fishery is the fish and the people. It is the relationship of the fish and the people who use it — how it is regulated and how it is conducted. But it is not just a biological definition — it is a biological, social and economic situation. So we need to be aware of what we mean by the word "fishery."

What do we expect to accomplish with a system based on fishery management plans? First, we will have information for the topic of a fishery management plan — a species, a fishery, a geographic area or some combination. The information will be assembled in one place and be available to the public.

**What will FMPs accomplish?**

- Make available to the public information for species, fishery and area.
- Bring together scientists, recreational and commercial fishermen, scientists, DMF staff and the MFC to define issues and propose solutions.
- State policy of goals, objectives and strategies.
- Provide facts as basis for decisions.
- Offer consistency for users over time.

Some people say, nothing is known about species X. The Division of Marine Fisheries has been around for a long while. Our biologists have been doing research and monitoring since 1965. The National Marine Fisheries Service laboratory in Beaufort has been there more than 100 years. The Duke University Marine Lab has been in operation since the 1930s. The UNC Institute of Marine Sciences in Morehead City has been there since after World War II. There is really quite a lot known about most, but not all, species in North Carolina's fisheries. That information, however, has not been put together for many species. One of the functions of an FMP is to put the information together in a coherent fashion and keep it current so that decisions can be based on facts.

Recreational and commercial fishermen and scientists currently work together through the advisory committees of the Marine Fisheries Commission. They have worked together in the moratorium process. In many fishery management processes, advisory committees meet, discuss things and leave. The staff puts things together. What comes out may not be what the committee members perceived them to be at the meeting. Many members of the public may not know about these meetings. This situation creates problems.

The fishery management planning process includes advisory councils appointed by the Marine Fisheries Commission. The idea is that commercial and recreational fishermen and scientists will sit down together, try to understand the issues and come to some consensus in defining issues and proposing solutions. That is extremely important and central to the process.

The fishery management plan will be a policy statement. It will define how the state intends to manage its fisheries — through coherent policy statements of goals, objectives and strategies. Plans will also include the means to accomplish those goals and objectives and the means to measure achievement of goals and objectives. So there must be a means to measure achievement and there must be accountability.

Plans will provide the factual basis for decisions and they will provide consistency for users over time so the rules are not being changed in the middle of the game. They will be subject to regular review and revision in an open and coherent process. People in business, who are considering investments, will have something to use to make their plans.

What is an FMP? It is a comprehensive, written document. It can apply to species, fisheries, areas or some combination. It includes the background information necessary to see where you are, where you have been, and it will include stock status and fishery status. Stock and fishery status are not the same. The fishery status is influenced not only by stock abundance but by fishing effort, economics, weather, social considerations, alternative use of resources and rules. Rules influence fisheries greatly. And they have to be considered in determining the health of the fish stock.

The habitat protection plans will be integrated into the fishery management plans. Without healthy habitat, you don't have healthy fish stocks. The socioeconomic status of the persons in the fishery must be considered. Every fishery management decision has economic impacts. We need to evaluate those impacts and weigh them in an organized manner.

We have to define our problems. Which problems are real and which are perceived? We want a healthy stock, but what is a healthy stock? We know our goal, but we have to define it. We have to come up with ways to measure it. We have to define our issues.

Objectives are addressable, coherent statements used to achieve our goals. We must look at the ways to achieve those objectives and then make recommendations. Those recommendations could be rules for the Marine Fisheries Commission; they could be legislation by the General Assembly; they could be research and monitoring by the Division of Marine Fisheries, the university system or the federal government; they could be for fishery development if we have an underutilized species. Then we must have a way to measure whether we have achieved our objectives and goals.

Under the N.C. Environmental Policy Act, a document of this kind has to be reviewed through a clearinghouse process — a host of groups and individuals in North Carolina. We also need to consider an environmental assessment and a FONSI — finding of no significant impact.

Where are we now? There are two state fishery management plans that have been approved by the Marine Fisheries Commission. One is the Artificial Reef Management Plan in 1988 that we use to operate our artificial reef program. It works. The other, the Albemarle-Roanoke Striped Bass Plan, was approved by the Marine Fisheries Commission in 1995 and forwarded to the Atlantic States Marine Fisheries Commission (ASMFC). This plan is working too. The stock is coming back strongly. We are working on some draft plans and recently held public meetings on a clam plan.

These other plans have not been developed as outlined under the pending legislation. Citizens have not always been involved from the beginning. These plans have been drafted by the division. We have held public meetings, taken public comment, made revisions and worked with the commission. But the process has been different — it was not a focused and consistent process.

As Bob Lucas mentioned, we are greatly affected by FMPs produced by others. The ASMFC, the South Atlantic Fishery Management Council, Mid-Atlantic Fishery Management Council, National Marine Fisheries Service and the New England Fishery Management Council all have plans that affect the fisheries of North Carolina. So we are reacting to those plans.

We have the largest fisheries for a number of species. We have the best commercial and recreational statistics program on the Atlantic coast. We have among the best fishery monitoring programs on the Atlantic coast. Our data were used heavily to develop others' plans, but we are reacting to those plans in our decision-making process. We should be driving this process for many fisheries.

The new process was developed by the division and sent to the Marine Fisheries Commission and the Moratorium Steering Committee. Both have discussed it. The process is subject to change, depending on legislation. Under the draft

## Where we are

Two state FMPs:

- Artificial Reefs (1988)
- Albemarle-Roanoke Striped Bass (1995)

North Carolina fisheries greatly affected by other FMPs:

- Atlantic States Marine Fisheries Commission: 15 FMPs
- South Atlantic Fishery Management Council: 5 FMPs
- Mid-Atlantic Fishery Management Council: 3 FMPs
- National Marine Fisheries Service: 3 FMPs

legislation, the Marine Fisheries Commission would establish priorities and schedules. It would select the advisory councils as each FMP process begins. The advisors would include commercial and recreational fishermen and scientists with expertise in the subject fishery. There would be a meeting with the advisors and staff to define the issues from the Division of Marine Fisheries' perspective. The advisors and staff would meet every few weeks for four to six months — a very intensive process. Staff would be continually writing, with internal and advisors' review. The draft would be completed and approved by the advisory group (plan development team) and presented to the commission.

The Marine Fisheries Commission would circulate the draft and hold public meetings. It would revise the draft and approve it. The plan would be implemented by the Marine Fisheries Commission, the Division of Marine Fisheries and others with a review and revision process during a three-year cycle.

Approval of a fishery management plan by the Marine Fisheries Commission is not rule-making under the Administrative Procedures Act. If the plan recommended rules, then the Marine Fisheries Commission would have to go through the regular rule-making process of the Administrative Procedures Act with public notification, drafting of rules, presentation to the commission, approval for public hearing, public hearings and submittal through the regulatory review process, including the General Assembly. The rule-making process right now takes one-and-a-half to two years. And people have asked if the FMP process is a way to get around that. This is not a way to get around the Administrative Procedures Act. Rule-making must be in full compliance with the APA.

The division now has sufficient data to write plans for 12 species. Some of these would be statewide or coastwide. Some would be strictly geographic. We have the information, including stock assessments, that we need to write plans now, but we have no staff to assign to it. We don't have funds to support advisory councils or travel money for them to come to meetings. These are proposed in the legislation.

In two or three years, we will have the information to do plans for three other species. So if we have the resources, we could prepare plans for 15 species during the next three years.

Where do we go from here? We need staff and resources. The expansion budget, which is supported by the governor, includes almost $1.9 million and 25 positions for FMPs. Only five people would work on the plans themselves. Nineteen people would conduct field work on new species and fisheries that we are not now working on.

The stocks and fisheries vary every year, so we must monitor them. Our staff is monitoring all that we can right now. We need additional people to initiate work on species such as mullet, hard clams, shad and herring, white perch and others that we just don't touch.

Under the expansion, we would do 31 plans over about eight years. The Redwine bill, House Bill 375, has the same approach, but it is more modest in its recommendations. Under the Redwine proposal, we would do about 24 plans in six or seven years.

The Marine Fisheries Commission would establish priorities, schedules and standards. Those familiar with the ASMFC and the federal council process know that there are standards to which plans must adhere. We would need to establish a version of that in North Carolina, select the initial advisory councils and get on with it. This is how we envision the process working — dependent on legislation and the Marine Fisheries Commission's decisions.

**Which FMPs can be written and when?**

DMF has sufficient data for 12 species:

- menhaden
- bluefish
- southern flounder
- summer flounder
- king mackerel
- Spanish mackerel
- red drum (Pamlico Sound)
- river herring (Albemarle Sound)
- striped bass (Albemarle-Roanoke)
- spotted seatrout
- weakfish
- shrimp

Jim Murray: Are those two figures additive or independent?

Mike Street: Right now, the two bills are independent.

Bo Nowell: One of the things that seems pivotal in the legislation is funding. While we have great regulations, the work is not going to get done without any enforcement or people doing the work. That is why I think the license is key to funding the management process. Otherwise, we are going to have rules that aren't enforced or implemented. We need money to develop fishery management plans. Do you see money coming from some source other than licensing?

Mike Street: Appropriations or licenses.

Bo Nowell: So they would have to come up with the money from the general fund or users.

Mike Street: Well, that is what the expansion budget and the Redwine bill have. There would be appropriations to accomplish those tasks; otherwise, I don't see how it can be done.

Rich Noble: Mike, this is a very nice summary of the process for plan development. You indicated that the approaches to plans might be species, might be fishery, might be gear, might be area. Yet when you indicated the fisheries that you had information for, they were all species approaches. Are you seeing species approaches as being the most likely way to do that? And if so, then how do you match the species plans? Obviously, if I am a livestock farmer and I have goats and cattle at the same time, I need a management plan for both or neither will work.

Mike Street: We will be working on more than one plan at a time. As we work on a given plan, we have to consider what else is out there. That is one reason for the regular review and revision process — to take changes into account. I see the majority of the initial plans as species-based. But as we gather more knowledge and improve and refine the planning process with the public — especially as users become more involved — we will grow more sophisticated. Then we can bring some things together into fishery-based plans or area plans.

The simplest way obviously is by species, but that also leads to problems because virtually all species are taken in many areas by different gears. It is going to be an evolutionary process.

## The Fishery Management Plan in Process — How it Works

Gil Radonski served more than 20 years as head of the Sport Fishing Institute and served on the Mid-Atlantic Fishery Management Council.

I have been asked to address the topic of the fishery management planning process. How does it work? I think most recreational fishermen would answer that it doesn't work. But that is because they understand the process imperfectly, they don't have the wherewithal to make it work or they are malcontents. I believe that the first two are the case and the latter is how we are viewed by most commercial fishing interests.

But as recreational fishermen, recreational fishing activists and recreational fishing advocates, we have to be involved in the process of developing fishery management plans because resources are being allocated. After you develop a good fishery management plan with objectives of a healthy resource and habitat, it comes time to allocate those resources between competing user groups — the recreational and commercial fishing interests.

If recreational fishermen do not get involved at the earliest possible time, they are not going to get their fair share of the allocation. You have to be heard. Later, I will give you some suggestions about how to get involved, but let's go into the process itself. There are essentially four fishery management planning processes.

We have the fishery management plans created

under the Magnuson Act and fishery management plans developed under the Atlantic Coastal Cooperative Fishery Management Act administered by the Atlantic States Marine Fisheries Commission. Now we have the fishery management plans evolving in North Carolina, and we have international fishery management plans such as the regulations on bluefin tuna that are developed under ICCAT (International Commission for the Conservation of Atlantic Tunas).

We have a lot of plans, and I think this is going to be a problem. As we learn how the fishery management plan process of the respective governmental unit works, we have to figure out how they intertwine. There will be a great deal of frustration if government comes to citizens and says, "We want you to be involved in the fishery management plan process," and then four or five people come and say, "We want you to work on our fishery management plan," or people gather and say, "We want to work on our fishery management plan." I would admonish the decision-makers and the regulators, as they develop fishery management plans, to inform the public about how the plans interact so a person is not asked to serve on different advisory committees on blue fish. As we get into this process, we will have to tell people how they play a part, when they can play a part and how important that part is going to be.

When the Magnuson Act passed in 1976, it was just the Fishery Conservation Management Act. Then it was named the Magnuson Fishery Conservation Management Act in honor of its chief sponsor, Warren Magnuson of Washington state. In 1996, the act was amended. The amendment was led by Ted Stevens of Alaska, and it is now known as the Magnuson-Stevens Fishery Conservation and Fishery Management Act.

The act has evolved over the years. And for this group, the real importance was that the act created eight regional fishery management councils to get the public involved in the process. It was literally stepping down government to the local level. So we have a series of councils that develop species-specific or species-grouped plans that involve the public.

When the council begins planning, the very first step is a scoping process. A member of the respective council can start discussing the need for management. The debate filters down to the council staff. Staff members look at the status of the fisheries and the problems, and they develop a scoping document. It is supposed to cover the entire waterfront of the goals, objectives and management problems and status of the fishery — everything to be considered. That scoping document is taken to the public through a series of hearings where additional problems, management objectives or solutions may be identified. Then the council takes that scoping document and selects preferred alternatives from it.

That document then goes back to the fishery management council for review, and a draft fishery management plan is developed. That fishery management plan is again taken, generally with the preferred alternatives, back to the public for additional input. After those hearings, it comes back to the council to be accepted or returned to square one for the development of a new scoping document.

If the council does accept the scoping document and the draft FMP process, it votes on a fishery management plan. And upon its acceptance, the plan is sent to the secretary of Commerce for approval, disapproval or partial approval/disapproval.

When it goes to the secretary, the plan has further public hearing. Fifteen days after receiving the draft FMP, the secretary puts out in the *Federal Register* an announcement of proposed rule-making — rules that will make the fishery management plan work.

Within 95 days of receiving the plan — once it is published in the *Federal Register*, reviewed and the additional public comment comes back— the secretary of Commerce must make a decision. Then, the final rule-making is prepared and published in the *Federal Register*, and we have a fishery management plan.

Now, that is a brief synopsis of the process. And the process does work. Generally, the product of the process is where we seem to have problems. From my stand-

point, the Magnuson Act does a good job of providing the public an opportunity to get involved. That opportunity is not always taken.

When I was on the Mid-Atlantic Fishery Management Council, the public hearings on FMPs or amendments to FMPs generally were very poorly attended. Some had no attendees, and we just closed the meeting. Others had as few as one or two. If you got into the highly sensitive plans — summer flounder, bluefish, etc. — you might scare up a few more people. But it is very difficult to get public opinion. That should not deter us, though. We are given the opportunity, and I think it is incumbent upon us to learn about these issues and get involved.

The second type of plan is done by the Atlantic States Marine Fisheries Commission (ASMFC). That act, effective January 1994, is very recent. It is modeled after the Striped Bass Management Act, which is highly successful. We are seeing stocks of striped bass rebuilding. And a brief summary of how that happened might shed some light on the fishery management process.

The rebuilding of the striped bass fishery came after we reached one of those extremely low points. We had the impending collapse of the striped bass fishery — it was greatly depressed. Maryland Gov. Harry Hughes imposed a moratorium on the harvest of striped bass from Chesapeake Bay, where most of the fish were caught. The moratorium carried a legislative mandate that it would be lifted when the juvenile spawning index reached a three-year average of 8. This provided a system with a specific target so that somebody couldn't just say the fishery has recovered and change the date.

The time came when we got some stronger year classes of striped bass. We were close, but we weren't there yet. And people started to clamor to lift the moratorium. But we still had a very precarious situation with striped bass. We had one strong year-class remaining, the 1982 year-class.

So, federal legislation offered by Gerry Studds of Massachusetts gave a sliding safety net to the 1982 year-class by placing a federally mandated size limit on striped bass to give that year-class a chance to reproduce. The combination of the moratorium and the sliding protection for the 1982 year-class gave us what we have today — a striped bass population that has the spawning potential of several year-classes to provide the safety net that we need for continued year-classes.

Based on what happened with the striped bass, the Atlantic Coastal Cooperative Fishery Management Act was passed. And it extended to 17 or 18 East Coast species the protection that was given to the striped bass. We now have a fishery management planning process for other species, and it is done by the Atlantic States Marine Fisheries Commission.

There is a difference between the federal and state processes. The state process is the ASMFC process because it is made up of the 14 or 15 Atlantic coast states. I think the Atlantic states system is better than the federal system, and it is more contentious. But it is still a good process.

The argument against the Atlantic states program was that it lacked sufficient avenues for public input. And in the early stages, I think that was the case. But I think ASMFC has seen this as a problem and is developing the public input process that will make this system work.

I do see problems down the road — one at the state level, which covers 0 to 3 miles, and at the federal level, which covers 3 to 200 miles. I will take, for example, the bluefish management plan. There is a federal plan by the Mid-Atlantic Council, and there is an ASMFC bluefish plan. And the two clash. When you have two different bodies developing regulations, how do you resolve that?

There is no simple statement of primacy between the two acts. Nowhere does it say that the Magnuson Act is superior to the Atlantic Coastal Act. So you have to devise systems. They have been doing it with joint meetings of the ASMFC's Species Management Board, which deals with bluefish, and the Mid-Atlantic Council's Bluefish Committee. They hash it out. Then they each take a vote, and the vote has to come out exactly the same if you are going to have a meaningful

fishery management plan. Then they take it back to their respective bodies. The ASMFC has to vote on it, and the Mid-Atlantic Council votes. If they come together, you have a single set of recommendations.

So there are potential problems for the interaction of these important pieces of legislation. Mike Street did a great job of covering the North Carolina plan, but that too will present interaction problems.

One great benefit of the ASMFC's planning process is it uses adaptive management. Adaptive management is simply a way of developing management alternatives that can be applied as a situation occurs.

Again, I will use the bluefish management plan as an example. The bluefish management plan was written by the Mid-Atlantic Council and adopted by the secretary of Commerce in about 1987. That plan was written under the old process of developing a fishery management plan with stated management measures. You can't apply any other management measures unless it is so stated in the management plan. This led to a great deal of confusion in setting the quota for bluefish — the commercial quota and the allocation between commercial and recreational.

It is very rigid. Under the adaptive management approach, you take a fishery management plan and develop a framework of management objectives. This framework has a series of measures that can be used, so that as a situation occurs — overharvest, a bad year-class or whatever may affect the fishery — the manager applies recommendations from within that framework to correct the situation.

The drawback of adaptive management is that it gives more responsibility to the manager. You don't have to go back to the council or the ASMFC to get the answer to a question. The managers are given enough authority to move ahead, and that can be a problem. But if you have clearly stated objectives, such as stock rebuilding, and specified dates for reaching them, adaptive management is very beneficial.

There is a move toward adaptive management in the FMP process of the Magnuson Act. Most of the plans now use adaptive management to the extent that they have framework plans. Amendment 1 of the Bluefish Plan will allow for more timely management.

The important thing is that we should get involved. And the reason to get involved is that many fishery management plans will allocate among competing user groups. For those species that are important to recreational fishermen, I urge you to get involved early on.

How do you get involved? If you don't have time, then tell your friends, write letters or make phone calls — do simple things like dip into your pocketbook and support organizations such as the Coastal Conservation Association of North Carolina. Give them the wherewithal to represent you. They are doing a good job, but they need help. Money is hard to come by. Support organizations that meet your needs.

There are people in this room who communicate frequently by e-mail. You will meet some people today and see their faces for the first time, but you will know their names. So get on the Internet — join the e-mail. I think CCA will be developing, more formally I hope, the networking process. But stay involved and make your feelings known. It is a frustrating system. It is slow, but it does work. And if you don't get involved, then you are going to have to accept what is handed to you.

Jim Murray: When the planning committee put together the forum this year, its members wanted to cover the importance of planning and what to look out for as we begin fishery management plans in North Carolina. The fishery in New England has had serious problems, but there were management plants. What went wrong?

## The New England Groundfish Fishery — Lessons in Fisheries Management

Peter Shelley is the director of the Marine Resources Project with the Conservation Law Foundation in New England. He has been involved with fisheries issues in New England from the point of view of the environmental community.

Michael Collins was a fisherman for 25 years and has been involved with the council process.

Peter Shelley: There are a lot of misconceptions about what the experience has been and continues to be in New England. We need to carefully analyze how we reached such a situation and where we think things need to go in order to learn from all the pain.

I work for a nonprofit environmental organization, and I am in charge of the marine resources project. I have been working on marine resources issues in New England for 17 years. I started with oil and gas development, and after 15 years of progress, I got into fisheries management. I am still headed downhill in that arena. Actually, the fisheries area has been integrative for me in an odd way.

When I talk to the public, I talk about the fishery that got away — how New England lost its groundfish. The Gulf of Maine is a system, and the fisheries are interconnected within it. In fact, they are connected all the way down the Atlantic coast.

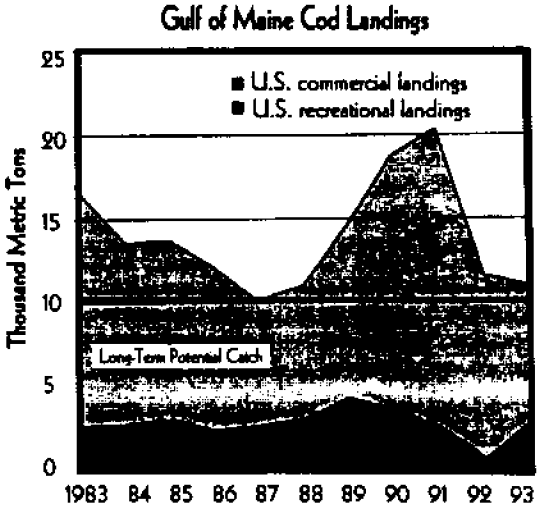
Louis Daniel mentioned shad. You have our shad in the winter but we have your shad in the summer — at least some of them. A lot of those shad come into the Bay of Fundy in the summer to forage. They used to go up the Petitcodiac River to Moncton in large numbers. In the 1960s, the provincial highway department built a causeway across a mile-wide tidal river that the shad used to enter and forage in the Petitcodiac. The fishway was not designed to maintain the tidal surge. As a result, they changed the dynamics of the entire Shepody Bay, and hundreds of tons of sediments that used to move around in the tidal cycles have settled out. The mile-wide river at Moncton is now 100 feet wide at high tide. It has silted in and the estuarine environment is now too hot for the shad.

The Gulf of Maine is the focus of our work. If you drained the Atlantic 100 feet, you would be looking at an exposed Georges Bank. One of the most profound experiences I ever had was going out to Georges Bank — 160 miles east of Boston — and seeing depths of 12, 13 and 14 feet on the fathometer. The bottom of the ocean is exposed here during severe storms.

As an advocacy group, we try to get people thinking of Georges Bank not as the Atlantic Ocean but as a kind of sunken "great lake." Our hope is that people would then start thinking more ecosystemically about the things they put in and take out of the regional waters.

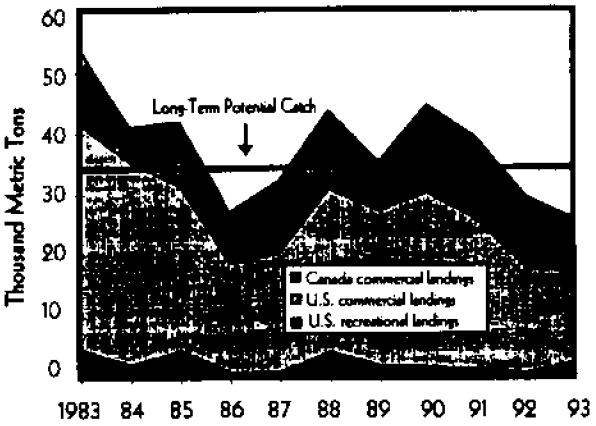
I want to show you some of the stock statuses. Years are across the X-axis and landings in thousand metric tons are on the Y-axis. This does not show catch; far more of these species are caught and thrown back, mostly dead. These are recorded by several port agents in New England and by the fishermen who report. These are U.S. recreational landings and U.S. commercial landings. The long-term potential catch line is a rough projection based on historic information. In New England, we have the benefit of a historical record that dates back to the 1600s showing the kinds and quantities of fish that were caught. One thing we are trying to do is re-educate people about how rich a resource this could be if managed properly. Under natural conditions, this would be an extraordinarily rich resource.

No longer. As you can see, this is what has happened with cod landings in the Gulf of Maine. The Georges Bank cod landings are trend lines that have historically gone up and down. We have forgotten how to go back up. We are trying to learn how to restore the

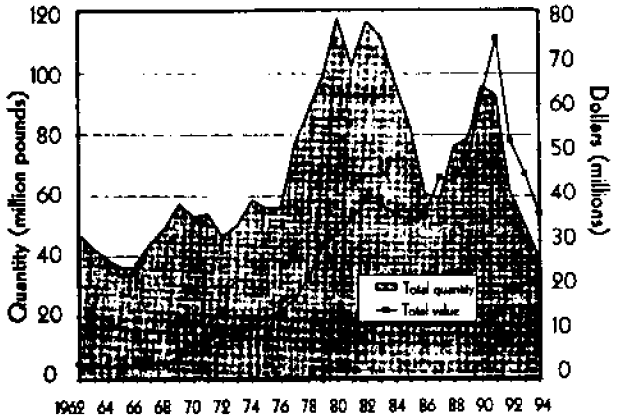



Source: NMFS. 1995. *Status of the Fishery Resources Off the Northeastern U.S. for 1994. Woods Hole, MA: NMFS.*

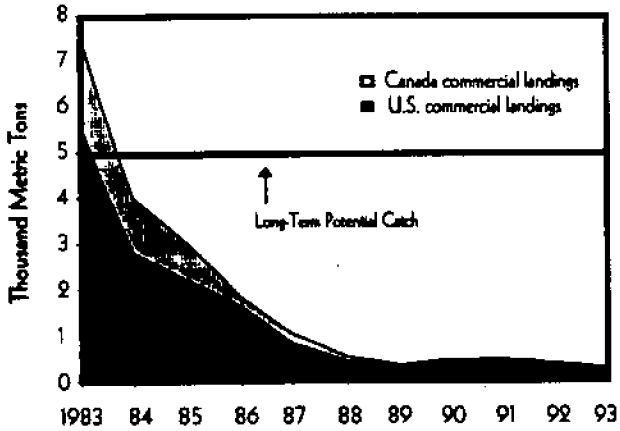
Georges Bank and South Cod Landings



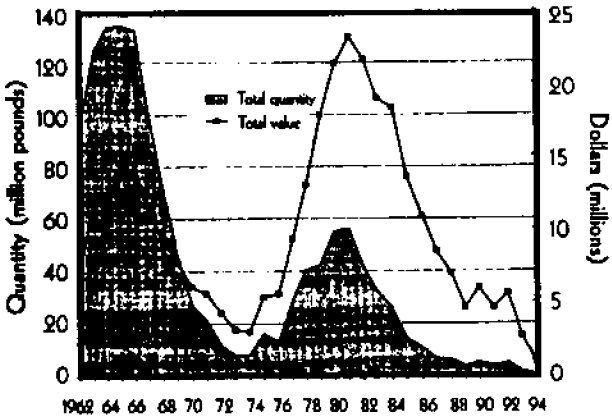

Commercial Landings of Atlantic Cod/Northeastern Region




Gulf of Maine Haddock Landings




Commercial Landings of Haddock/Northeastern Region




Source for charts: NMFS. 1995. *Status of the Fishery Resources Off the Northeastern U.S. for 1994. Woods Hole, MA: NMFS.*

fish without completely losing our domestic fishery.

In the 1960s, haddock landings on Georges Bank were way up. This is an economic line for us. This is not biology. We are approaching this economically. Those are jobs, those are dollars, those are fish cakes, those are books, those are diesel mechanics that repair vessels.

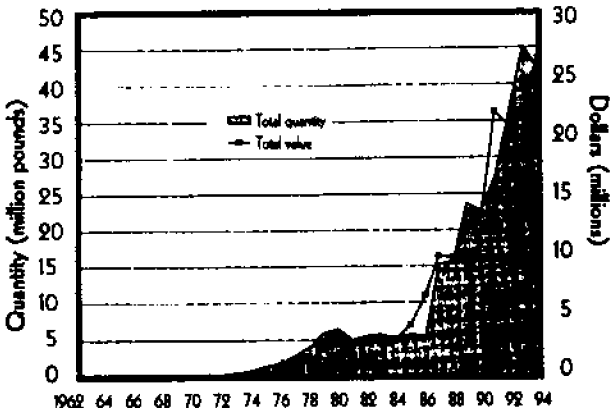
Haddock data for the Northeast region go back further. There were a few peaks from 1962 to 1994. The foreign fleets came in after an enormous year-class was produced in the early 1960s. Haddock don't regularly produce large year-classes, but occasionally there is a monster year-class when the environmental conditions are right. The word got out there was a large year-class on Georges Bank and the entire world came to eat it. There were big landings.

Then the Magnuson Act was passed in 1976 and prices went up. Landings peaked when the U.S. fleet got its act together and started to substitute U.S. capital for foreign capital. It succeeded beyond everyones' wildest dreams. As a result of the increased fishing mortality from this capital influx and related technological improvements, we had a haddock decline that has persisted.

Fisheries planning is a form of insanity that talks about the need to manage but does too little in service of that objective. There is a notion that everything does not need to be managed, or that certain things need to be managed, or that others will take care of themselves. Even when the facts demand that stocks be managed, managers jump in with a plan, but it takes a couple of years even if they are really aggressive.

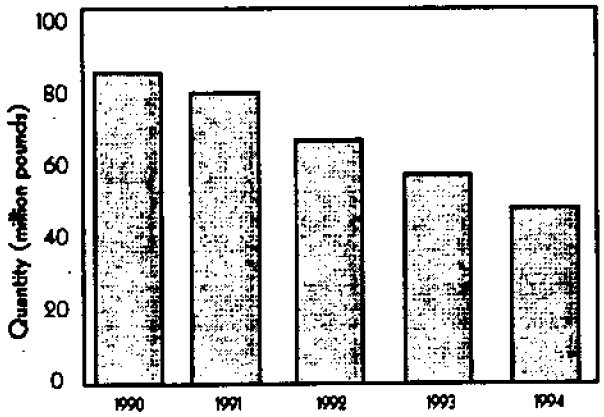
The monk fishery in New England and the mid-Atlantic is an example. Should we manage it? It has had value all along. Livers have always been $14 a pound to the Japanese in the winter. Even though it is a "groundfish," the fleet really didn't go after it in a targeted way. Then the conventional groundfish landings plummeted, and boats turned to monkfish. The increased landings translated into a rapid influx of capital.

Commercial Landings of Monkfish/Northeastern Region




Source: National Marine Fisheries Service, Fisheries Statistics Division, 1995

N.E. Groundfish Landings



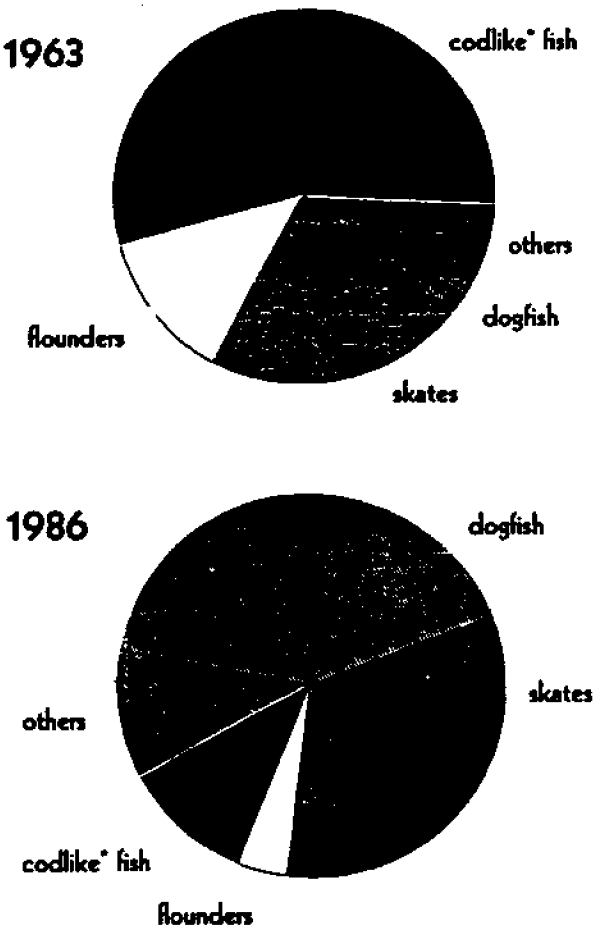

Source: NMFS and Seafood Datasearch (1994 landings estimated)

We now have the capital investments that are capable of producing large monkfish landings, and people start wondering whether they should manage monkfish. When you ask this question so late in the process, you have angry people everywhere. You have angry commercial fishermen, angry recreational fishermen and angry environmentalists. Everyone is angry when managers wait this long to start strategic planning.

It is hard for me to believe that there is anything that doesn't need managing in the world we live in — from diatoms on up to highly migratory pelagics. Someone mentioned cows and sheep earlier today. Farmers are not random about what they manage on their property. They manage as many things as they can without causing an impact on their overall productivity — from what they put into the ground to what they take out, including predators and people.

As I've stated, groundfish have been in steady decline. The relative abundance of species has shifted in New England. In the '60s, roughly two-thirds of the fish

Georges Bank Species Composition
NMFS/NEFC Bottom Trawl Surveys




* includes cod, haddock and hakes

were either flounders or codlike fish. In the '80s and '90s, because of monocropping, the relative proportion of codlike fish and flounders has declined dramatically. Skates, dogfish and others have filled the niche. The ocean is highly dynamic. Something will always move into the void. If you take something out, something else will take its place.

So, who is responsible for this disaster? A lot of you have the notion — probably from the press — that it is the New England commercial fleet.

I went scalloping on the *FV Thor* for a miserable 14 days that I never want to repeat. It is about 95 feet in length — in the largest class of our fishing fleet. But there are larger classes of boats in the world's inventory.

In our region, historically, there was an enormous factory trawler fleet that continues to persist in other parts of the world. A Soviet, Polish and Spanish fleet was there in the late '60s. It was described as a city on Georges Bank. At night you could see ships lit up like New York City. Mercifully, they are gone, although they are asking to come back in.

There are a number of people building domestic freezer trawler ships to harvest mackerel and herring out of Gloucester. Gloucester thinks it is a great idea. Whether North Carolina or other people who are interested in mackerel or herring think it is such a good idea is another question.

The current fishery debate in our region boils down to who gets the right to claim that last fish. Is it going to be an environmental group? Is it going to be a commercial guy? Is it going to be a recreationist? Or is it going to be the Dutch on a factory trawler from "away?" Who is going to get that last fish?

We have been working to end that discussion and talk about how we can grow the pie back to where the environment can sustain higher levels of biological production. That is a difficult task. There are a lot of barriers, like an absence of comprehensive strategic thinking. Harvesting is an important aspect of the picture, but the health of the resource is paramount. Everywhere, the health of fish stocks is being constrained by a lot of factors. Harvesting is certainly one, and I don't want to downplay that. But recovery is a big question in our region. Will these stocks recover even if the fleet disappears, and to what level will they recover?

We have lost huge portions of our coastal estuary habitats due to commercial development, and it continues. What is the impact of this development on the natural productivity levels?

What about pollution? Fishermen pollute. There is no question that occasionally they don't use their heads and they pump their bilges overboard. But it is nothing compared to community inputs. The South Essex sewage district was pumping 30 million gallons daily of untreated sewage or barely treated sewage before we sued them. Boston Harbor has three well-known rivers — the Charles, the Mystic, the Neponset. But the largest river into Boston Harbor is the Massachusetts Water Resources Authority sewage flow. At 400 million gallons a day, it is the largest input of "fresh" water to Boston Harbor. It is clearly having an impact on productivity.

Another factor in our area is obstruction of tidal flow. Tidal power was the principal source of energy for factories years ago. As a result, almost all of our rivers are blocked by something. It might be a highway that doesn't have adequate flushing or it might be a dam. It is a topic that doesn't often come up in fisheries management plans, but it is clearly related to the management of the resource.

A lobster researcher at the University of Maine has a theory that there is a critical phase in a lobster's life history. He thinks that when it goes from the pelagic phase to the benthic phase of its life cycle, it has to get into cobble bottom. Based on his studies, the juvenile has about 15 minutes to do this or it is eaten. This population bottleneck is habitat-controlled. A lobster does not survive if it lands on clay, mudflats or cobble bottom filled with dredge spoil, disturbed by draggers or otherwise altered. The availability of undisturbed cobble bottom may be one of the big controls on the lobster population. There may be similar situations for fish that have either a pelagic or a benthic phase. There may be

phase-specific habitat requirements.

Harvesting is a huge problem in New England, but it is probable that if you eliminated the fleet and had only recreational fishers out there, you would not necessarily have all the fish that your grandparents said were once out there. So many other conditions have changed. To date, management has not effectively addressed the whole suite of things that make a fishery or control the ultimate size and strength of a fish population.

There has been discussion about political will today. In our area, fishery management represents constituency services. That is all it is. Whoever has access to a certain politician and screams the loudest decides what gets pushed and what "management" looks like.

The Gulf of Maine is the largest publicly owned resource and has tremendous strategic and economic importance for our region. There is not a single politician in our delegation who has any strategic appreciation of the coastal zone.

We always stress economics these days, because economics drives ecosystem protection and environmental protection. If we wait for people to become environmentally conscious, we will have a long wait. We are trying to shift toward strategic political will, and the route is based on shifting political awareness of the long-term economic consequences — both positive and negative — of mismanagement.

Michael Collins: For a long time, Peter and his organization were the enemy of the commercial fishing fleet. He was the loudest screamer. He sued the National Marine Fisheries Service and the New England Fishery Management Council for being slow in implementing the management plans. So my introduction to fisheries management was this man, who was my most hated enemy because he was putting me out of work. It has been a long and arduous process for us to be able to talk to each other.

Peter Shelley: How do you develop strategic political will? You bring in economists and you start thinking in terms of macroeconomics, not microeconomics. What is the value of the fishery? At one point, we asked what the federal government thought the value of the regional fishing industry was. It is not an irrational question. Shouldn't someone know this?

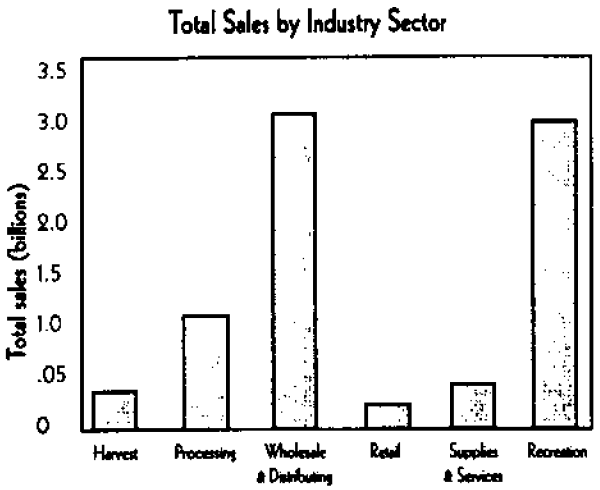
What is the fishery? Does it stop at the docks? Does it stop at the distributors? Does it stop at the tackle and bait shops? Does it stop at the processors? Does it stop at the consumers? Fisheries need to be thought of in terms of all those components.

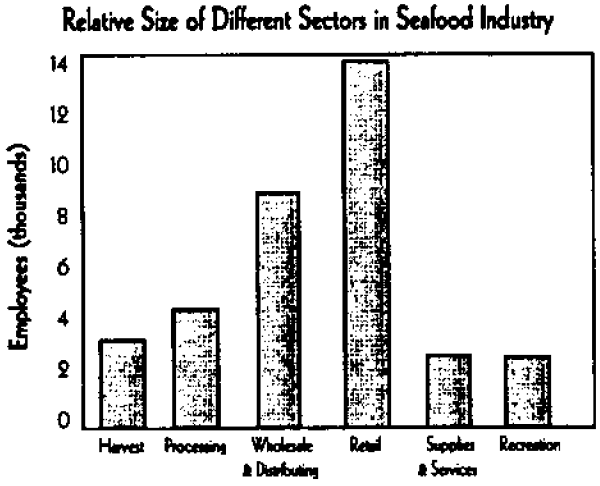
More importantly, all those components need to be aggregated if any fishing infrastructure in our ports can continue to be justified because the commercial and recreational landings are down. I cannot justify the economics of maintaining port infrastructure on the basis of the value of Michael's boat's landings. To municipal government, it all came down to tax revenues: "You produce dollars. If you are not doing that, we will zone the harbor for some activity that will. We will put a condo in there."

So we asked government what the value of the whole fishery was, and government didn't have a clue. None of the states, none of the federal people had a clue of what the relative economic contribution of the fishing industry was. This is in a region with a 300-year history of fishing, and no one can answer this question.

So ULF has started to answer this basic question. And we didn't just look at the harvest sector. We didn't just look at the recreational sector. These are important sectors — there is a lot of political juice in them. The recreational sector in our area does not have a lot of economic juice because it does not create a lot of jobs. But processing and wholesale distributing are big in New England right now.

We have found that if you think about the industry broadly, as a complex of interconnecting economic activities, the fishing industry is bigger than the biotech sector in Massachusetts. It is bigger than manufacturing. Fisheries is an economic engine for our region. You can walk into a politician's office and say, "You don't have a clue about the largest economic activity in this state?"




Source: Dun & Bradstreet and Seafood Datasearch (harvest data is estimated).

You suddenly get his attention in a new way.

Fisheries planners in our region think that if they keep doing the same thing over and over again, it will come out different one of these times. They will get it right, and then everyone will understand and fall in line. That simply doesn't happen.

The experience in New England is a direct function of special-interest power politics. What is distressing in fisheries management is that power politics is still believed to be the way out of this situation — "Let's get all the recreationists together and kick ass." "Let's get the environmentalists together and kick ass," or "Let's get the commercial guys together and kick ass." These tactics don't produce long-term answers.

In 1990, we told the Commerce Department, "You have got to protect the fish." That aspect should be the fundamental function of the Magnuson Act. We filed a lawsuit, and even though there wasn't any precedent for bringing it, we won. Why? Because the federal government was desperate to have someone say, "You have got to start doing your job." It wanted someone else to take the political heat of decision-making.

We learned that we can sue the National Marine Fisheries Service, we can sue the Department of Commerce and we can win. A federal judge can order them to plan. But a fundamental management question remains: Is that plan going to produce a single more fish — one extra cod out on Georges Bank? The only way to produce a single fish out there is if the majority of players buy into it or if you have so much enforcement capacity that you can sit on every boat and have penalties imposed immediately.

We are now striking out in a new direction. We haven't stopped working with the fishery management council. We are trying to make that system work. We have tried to reframe fisheries management so that every decision is not being made solely by government or one interest group. It is oriented more toward personal responsibility, personal accountability, public dialogue and decision-making among ourselves. Then government administers and enforces. If we find where consensus is impossible because there is too much conflict, we think government should mediate or decide at that state. But we are abandoning the notion that government is going to save the day.

Ultimately, we need to start operating as a marine resources community. You have to talk to the commercial fishermen, which is a bit of a challenge — recreational fishermen are equally challenging. There is a cartoon of a fisherman saying to a colleague: If you sell a man a fish, you make a good living; if you teach a man to fish, you are stupid. Opening a dialogue with a fisherman can be a real challenge in terms of getting honest information or developing trust. Michael will now talk about how we have been trying to do that.

Michael Collins: Jim wanted the benefit of our 20/20 hindsight working on management issues. And I would submit that in New England we are still quite blind. I don't know that we have the benefit of that hindsight yet.

I have three recommendations for those of you who are involved in fisheries management plans: participate, participate and participate. We did not participate in New England — and that is coming back to haunt us, and it will for many generations. We did not take advantage of the opportunities presented by public hearings. It was a joke to us. They were never going to stop us. Now there is nothing left. We really have only ourselves to blame. A couple of years ago, Peter understood that this wasn't working anymore. The fisheries management plan was not working and the councils were not doing their job. And we were not changing how we operated.

Two years ago, Peter brought together a group of conservationists, fishermen, scientists and educators to try to understand and implement a different management scheme. What appears fundamental is the need for community-level participation by each of us — recreational and commercial. I would like to just say fishermen because there isn't much distinction. But if we are going to succeed and impact management plans, it has to be done where we live, with those people we live with.

The gist is that politics doesn't work. We are learning in New England that if you think you have won today, you are going to lose tomorrow. For a while, it seemed like the big draggers were the winners. I was a big dragger, and most of the council seats were represented by big dragging interests. We thought, "We are always going to be protected." We are the bad guys now. We are out the door. The smaller boats and inshore fisheries are the winners. Tomorrow, somebody else is going to be the winner.

The lobster fleet now thinks because it has a bit of a jump on a management plan, that it is the winner. It just doesn't work that way. So participate, participate, participate. We have got to be together. I think that the work Peter and I are doing leads us to that. It is getting down to the local level.

Peter Shelley: Some government officials who hear this discussion say "Gee, Shelley, you have been hanging around the commercial guys too much. You are buying the whole routine and you don't realize the value of the government's contribution." I believe firmly in the good faith and intentions of most government managers and scientists, but then I think about the complexity of this resource and how fast it changes. Gil Radonski is right. Adaptive management and framework adjustments that only take 20 days are big improvements over doing a plan amendment, which might take a year and a half even if everyone agrees on what to do.

In our area, fisheries change rapidly. A temperature gradient sets up and all of a sudden the haddock are there spawning and they need to be protected. We have one research tow in the spring and one research tow in the fall. It is a good research program on one level. But is it going to spot the kind of a micro-situation that might influence the health of two or three year-classes of haddock stocks for years to come? No. It doesn't do an effective job allowing for dynamic adaptive management. Fishermen do have or could cost-effectively develop that "micro-information," however.

How can recreationists contribute information? That would be an incredibly valuable discussion — as hard as it is for you all to share where you catch the big fish. Likewise, the commercial guys, who have a mortgage and a lot of things depending on their ability to outcompete the next boat, have an impossible time sharing information. One thing we learned, actually from the banking industry, was a way to share information that would allow us to grow the pie without compromising individual knowledge or competition.

Banks found out how to grow the pie without giving up their competitiveness. The explosion of the credit and debit bank card industry was a function of a very sophisticated information encryption system in which they recorded proprietary information that was not subject to regulation.

The biggest thing fishermen are worried about is their competitors. They are worried about Salvio finding

out where the fish are schooling up this spring. But if researchers could have real-time access to what the landings were on the deck of enough boats — what the age structure was — then you open some dynamic management possibilities. We need this data to manage.

In our area, fishermen distrust management because they don't believe that two- or three-year-old data — which forms the basis of almost all of our plans — has relevance to the management actions needed to make a difference next month out on Cash's Ledge. They are partially wrong, but they are partially right, and that is the dilemma. How do we manage to generate data from fishermen without compromising their individual competitive edge?

Michael Collins: As a fisherman, I believe that what is really fundamental to the process is the ability to cultivate a trust relationship with the scientific, political and management communities. I used to report on those NMFS logs that I was fishing in Kansas. And nobody ever said, "How come you are making tows in Kansas City?" It doesn't work. There must be some way that we can have real trust.

And that is what is neat about the work that Peter and I have been doing. Initially, I absolutely did not trust this man to have my best interest in his heart. I have come to understand that together we can craft a plan that serves us both equitably and fairly. The conservation community is incredibly important to the future of the fisheries and the ecosystem. Until fishermen can accept that and learn from that, we will not go forward.

Peter Shelley: Three points: Planning is a simple technical exercise. Having a plan is the easiest part of fisheries management. A plan without implementation and administrative resources is insulting — a charade at best.

Michael Collins: It is true that a rule you don't participate in making is one you won't obey. The Yankee fleet is phenomenally inventive in getting around rules and landing fish that are under or over the quota. Until I have a real stake — I mean a real stake — in making that rule, I am not going to obey it.

Peter Shelley: Plan development, fair and effective administration and adaptive management are missing in New England. A real bunch of aggressive commercial harvesters have moved into the management vacuum. Our system selects for those people. The high-liners now may well be the guys who break the most rules. And the rest of the commercial fleet is just as outraged by that as anyone. When you look at fishing history and how allocations get made, you see that the more fish you land without getting caught, the better off you are down the road in terms of having access to more fish.

In our region now, we are fighting against two trends. One, we are fighting against ITQs. The ITQ argument is this: People cannot get this "public commons" to work. We must have an open marketplace where the dollar bill makes all the decisions. And the recreational side should be just as nervous about ITQs or privatization schemes as anyone, because all of a sudden a public trust resource is going to have a bunch of property rights attached to it. Not many of you are going to be able to buy much of that.

But in the face of mismanagement or no management, ITQs will — and probably should — happen. There is a tremendous economic and resource waste; and if nothing else works, then we must say, "OK, we have to privatize because the resource is being destroyed."

The second battle line for us is brought on by the world trade in fish. We have small boats set up in small coastal communities. All of a sudden, a 450-foot Dutch processor wants to anchor and process 80 tons of herring a day. On the surface, that looks like a good thing, but perhaps it is not in the long term. So we are fighting against these enormous forces that are moving down on us and challenging our ability to be creative in developing alternative management strategies.

The challenge for us is managing this public resource as a community without turning it all over to

the government or private capital markets to manage.

This will be difficult. The commercial fleet in New England today has a strong feeling of "live and let live." I will run my own boat ethically, I will treat my crew properly, I will care about health care, I will care about throwing rubbish overboard. But that son-of-a-gun next to me is just the opposite. He doesn't care as long as he gets the biggest share of that dollar bill without getting thrown into jail. The ethical person is very reluctant to say, "What you are doing is wrong, John, and I am going to stand up against you. You are hurting fishermen like me in the public's eye. You are hurting me in the recreational fishing community. You are hurting me in the environmental community. You don't speak for me and you don't act for me."

Getting people to take responsibility and to speak up is critical. And it has got to come from those of us who have an interest in, a love of and knowledge about the marine resource. Most of the public does not have a clue about what's happening beneath the surface of the ocean beyond what Jacques Cousteau told them 20 years ago. They don't know where their fish are coming from.

We have got to start making them care also. For us to fight among ourselves while we face these kinds of challenges is completely counterproductive. It is not where Michael and I are headed. We would like to encourage you in your "battle plans" to be more inclusive — maybe take your strategic thinking up another order of magnitude. And think about Sea Grant in particular. It provides good practical research and should be at the heart of any good management effort.

We all have a lot to do under extremely trying circumstances. But it is also an incredibly exciting time.

Michael Collins: When I started fishing in 1969, the first net I built was called a 40-60. It had a 60-foot foot rope and a 40-foot head rope. The last net I built in 1994 had a 500-foot foot rope.

Don't let that happen if you can avoid it. I thought I was doing the right thing, and in many ways I was. I was supporting my family. But there was no management. There was no participation. We weren't asking ourselves those hard questions — whether we were doing the right thing. That has to stop. And hopefully, it is beginning to turn around in New England — we will see.

Bo Nowell: It is good to hear you talk about working together. I think that is very important. In this state, we have a plan before our legislature to work together to manage the fishery and develop fishery management plans. Yet we have a commercial industry that is fighting a recreational license despite the fact that it would bring money into the management process and identify more sources of data. That industry fears giving recreational anglers more clout. What would you say to that industry publicly, to deal with that fear or anxiety?

Michael Collins: Get your kids to talk to their kids. At some point we have got to personalize this issue. We have commercial fishing organizations that are opposed to conservation and to recreational interests. You have to leave those organizations behind because they are not working. They are not serving anybody's interests. If a commercial organization is on public record as opposing something that the entire population says is probably a good thing, something is wrong.

In the forum you had on finding common ground, I saw in the proceedings that one individual commented that personal contact is the most important thing. And I really truly believe that. Go to every commercial fisherman you know. This is the way to do it.

Peter Shelley: I think there are some mechanical things you can do. A lot of contemporary dispute-resolution techniques exist. These are very powerful tools if people are willing to use them. For example, the Magnuson Act includes a sleeper provision that our group wrote. It authorizes fishery management councils to do collaborative problem-solving. And the federal legal framework supports these sorts of collaborative processes.

If I were the governor of North Carolina, I would set up a process to get recommendations about how to fund

research, management enforcement and the administration needed to support the fisheries that are important to the state. And I would make my decision based on what comes out of that group process.

Gil Radonski: Thank you for that explanation, Peter, on how to do it. And we have done it. It is called the Fisheries Moratorium Steering Committee. Unfortunately, the answer you can't give us is how to deal with North Carolina politics. You are looking at it from a New England perspective. We have a system here that is typical of Southern marine fisheries management institutions — the political power lies in the coastal zone. And we can make all the wise decisions, bring together all these people as the governor did through Bob Lucas, and over a two-year period come up with some very good pictures of the problem and solutions, only to have it stifled by the political process and the legislators in the coastal zone.

We have also found that if you have a fishery problem and you don't get resolution through the normal process, say the Magnuson Act, you just go and find the most friendly federal judge (currently he resides in Norfolk) and get a solution to that problem.

So we have done many of the things you are recommending. We are proceeding. The progress is glacial, but we are making changes because we are employing many of the things that you are telling us to do. Our kids are talking to other kids and we are getting a generation that is more in tune to this.

Fisheries is important globally. The *Times-Picayune* in New Orleans won the Pulitzer Prize in journalism on fisheries issues, which I think is one of the most important things to happen recently. It was an eight-piece article on global fisheries that dealt with fisheries in Louisiana. If you read some of the copy, which you can get off the Internet, you can strike out the word Louisiana and insert North Carolina, and much of it pertains. So we have a problem. I greatly appreciate you coming here to share your experiences with us. We have activists here who are moving in that direction. I hope we can keep encouraging them. That progress is glacial, but we are moving ahead and we have to keep going.

Peter Shelley: I agree. I think that you are in a learning process, and failure is part of that. What you make of your failures is very important to what you have learned from your experience.

You may be way ahead of us in some respects. And it would be nice to learn about that. But like us, there is no formal mechanism for change except through the existing institutions, and they are wired up in funny ways to perpetuate their own agendas that don't bring people in.

The one thing that I would advise is reframing the politics of fisheries in North Carolina away from power politics and constituency services and toward some larger strategic objective. Make it a little less comfortable for politicians to feel like they deserve sainthood for screwing up a three- or four-year process.

Jim Murray: The vision of the Moratorium Steering Committee was to do what these guys were talking about — participatory management or co-management. The new advisory committee structure involved in these fishery management plans is outlined in detail in the Moratorium Steering Committee report.

B.J. Copeland is former director of the North Carolina Sea Grant Program

Going home yesterday, I saw a car with a vanity tag that read, "Jeremiah 29:11." So I went home and looked it up. It says, "There is hope for the future." I reckon that is why you are here today — there is hope for the future. Gary Matlock is going to tell us something about it.

We recognize here in North Carolina that our fisheries are in trouble. We have talked about water quality and other problems with our fisheries. And we have two or three things that have now worked their way through the legislature to improve water quality in our coastal waters. Hopefully they will work.

We also know that habitat and conservation of

habitat is important to fisheries. We have not done a good job with stewardship in that area either, and there are recommendations concerning that. Mike Street and his folks at Division of Marine Fisheries have come up with some habitat management plan activities, and we hope that the legislature will see fit to pass that during this session. It is very important.

We know that we have overfishing. We have made some recommendations about that, and we will see what the legislature will do about it. We also know that there are user conflicts over allocation of resources, and we have plans to deal with some of that.

We need more plans. Fisheries management plans are a partial answer to that. But none of this is going to work unless we all work together. We have got to participate. More importantly, we have got to reach some agreement among the users. Until we participate and come up with a plan in which we can all be stakeholders, it won't work.

The Moratorium Steering Committee worked for two years to make some recommendations along those lines. The steering committee was made up of every conceivable interest in the fishing business. We had environmentalists, commercial fishermen, recreational fishermen, lawmakers, scientists, consumers, processors, the whole bit. That plan, which developed over two years, is now in the final and most important part of its existence. It is in the hands of the legislature and it is up to you. The legislature represents you and makes laws, and now is the time to get behind it.

## Managing Highly Migratory Species

Gary Matlock is director of the Office of Sustainable Fisheries for the National Marine Fisheries Service.

I appreciate the opportunity to talk to you about highly migratory species. But within that very general topic, I would like to comment about the Magnuson-Stevens Fishery Conservation and Management Act as it was amended last year and then talk about the fishery management process, the development of plans as they relate specifically to HMS, or highly migratory species.

It is important to know what HMS includes. Under the Magnuson Act, it includes Atlantic tunas, oceanic sharks, swordfish, sailfish, marlin and spearfish. Those are the primary Atlantic coast species in the management strategy applied by the National Marine Fisheries Service to both recreational and commercial fishermen.

HMS is probably one of the most contentious and political activities in which the agency is involved. It doesn't seem to matter what we do — it is never right. And it probably never will be right because there are so many interests competing for what they want, or think they want, from each of those species.

Today, the commercial harvest of all large pelagic sharks, swordfish and bluefin tuna is prohibited. No one can take those animals. They are closed for varying reasons, but primarily because the quotas for commercial harvest of those three groups have been reached. We closed sharks on April 7, we closed swordfish at noon today, and we closed bluefin tuna about a month and a half ago.

There are changes in the way we manage these species. These changes are responding primarily to a continuing demand. Interest in their take is growing, and as a result of unlimited growth, there is a need for shorter seasons to reduce the amount of fish that can be taken. In fact, those amounts are decreasing each year.

The bluefin tuna quota set last year was actually less than in 1992. A 50 percent reduction on sharks is in place. There is a quota for large coastal sharks, and another category of sharks is now subject to a quota that was imposed at the same time as action was taken to close the season on large coastal sharks. The swordfish quota is also declining. On June 1, 1997, it will go down and will decrease even further in 1998 and 1999.

In fact, there are simply not enough fish to support the growing demand for them. And as a result, through a management strategy using quotas, we are faced with earlier closures each year.

There are four major federal laws that apply to the management of highly migratory species. They include

the Magnuson-Stevens Fishery and Conservation Management Act, the Atlantic Tunas Conservation Act, the Endangered Species Act (ESA) and the Marine Mammal Protection Act (MMPA).

You might ask how those last two have any bearing or effect on what goes on with HMS. The answer is that in the process of trying to catch highly migratory species, other things get caught: marine mammals and turtles, depending on the gear that is used, and other fish. So the MMPA and the ESA both affect fishing seasons and open areas in order to reduce the bycatch of those species covered under MMPA and ESA. In fact, last year under MMPA we closed the directed swordfish drift gillnet fishery, and that remains closed to reduce the potential take of right whales.

So there is a significant interaction between these species and those that are covered under other federal laws. The bycatch of marine mammals, endangered species and other species is becoming the single most important factor — more so than the directed take itself — in what seasons and kinds of management exist relative to HMS. And many of the comments that I have made, while directed specifically at HMS, apply to the management of fisheries throughout the country.

There is one international body that is also directly involved in managing HMS. In fact, if that body recommends a particular quota or take in a certain way, the United States is obligated to implement that approach or that quota on its domestic fishermen. That requirement is contained within the Atlantic Tunas Convention Act. That body is known as ICCAT, or the International Commission for the Conservation of Atlantic Tunas. So not only is there a very integrated domestic set of activities, there is also a very significant international arena. ICCAT is also involved in managing swordfish and billfish, and it appears to be becoming more involved in managing sharks internationally. An advisory committee that meets this month (April 1997) has created a working group to manage sharks because their status is so precarious worldwide.

Excluding tuna, highly migratory species were managed on the East Coast by the five regional fishery management councils, which were created under the Magnuson Act in 1976. In 1990, a change in the law put management of those species, including Atlantic tunas, directly under the purview of the National Marine Fisheries Service. This law bypassed the formal requirement that councils had to develop FMPs, or fishery management plans. It still requires the National Marine Fisheries Service to consult with the councils that are involved and affected by what goes on with HMS. They are not eliminated by any means,

Prior to passage of the Magnuson Act in 1976, there was effectively no federal management of fisheries in this country. In 1976, that changed so dramatically that it has affected the lives of many thousands of people throughout the country. It created a set of eight regional management councils designed to bring people together at the local level and to involve them in managing fishing activities. The act authorized and required those councils to develop fishery management plans.

While a few states developed FMPs prior to that time, it generally was not a common practice. In 1976, that changed dramatically. The FMPs that are developed by the councils, with the aid of those involved in the fishing activities, have become a norm and a model for many states.

The first plan that Texas put together was in 1984, and it dealt with oysters. The second one that was published dealt with shrimp. And the model that was followed was the FMP that had been developed by the councils at the federal level.

Those FMPs are created by councils, but in that process they use advisory panels of scientists and others who are affected by the regulations in one form or another. They are designed to gather input for developing FMPs from people who know about fishing. And they differ in terms of how they work and how they have worked.

Since we started managing fisheries federally in this country 20 years ago, there have been some success stories and many failures. That is a very short time frame

when you consider that the prevailing scientific view at the time was that you couldn't hurt fisheries in the ocean. The ocean was so vast, so broad, there was no way that fishing could ever do anything to the animals out there. In 20 years, we have gone from that perspective to managing fisheries and recognizing that today about 47 percent of the species we know something about are overfished — including every one of the HMS species that are overfished, fully exploited or near that level.

That is a tremendous change in a 20-year time period. And I don't think many people involved in management stop and think about that much. The evolution during that short time really has been dramatic. There is still a lot of improvement to be made. And the amendments that were passed last year have attempted — more significantly than at any time since 1976 — to deal with these kinds of changes.

The Magnuson-Stevens Act is very different today than it was in 1976. To give you an example of the difference, the National Marine Fisheries Service is required as of Oct. 1, 1997, to report to Congress a list of every overfished fishery covered by the Magnuson Act. Within one year of that reported list, the councils are required to submit to NMFS an amendment to their fishery management plans — there are 39 of them — including how they intend to stop overfishing and begin stock rebuilding. Rebuilding is to be accomplished within a 10-year period.

There is some room for exception but not much. The councils have to begin immediately dealing with the status of overfished fisheries. That also applies to HMS. And at the current status, almost all of those species that are included in HMS will probably fall into that overfished category, and rebuilding plans have to be submitted to the secretary of Commerce within one year of the date the list was sent to Congress.

It is a tremendous change from 1976, when the law said that FMPs were designed to prevent overfishing — not to wait until it happens and then try to correct it. But many of the plans didn't prevent overfishing, and now we are at the stage where we have to deal with the overfishing status more directly than before.

Many amendments to the Magnuson Act were passed last year. Most of them have the National Marine Fisheries Service and the councils doing something within a very short time frame. In fact, there are about 10 areas within which every FMP has to be amended, and those amendments have to be submitted by Oct. 11, 1998. We have a tremendous amount of work to do creating those amendments and following up on those submitted. There are now three new national standards to add to the one on overfishing. Those national standards deal with fishing communities and identifying how regulations impact them. The councils must now develop amendments to minimize bycatch and reduce mortality.

Lastly, a new national standard on safety of human life at sea has to be considered. There were four other standards that have been changed, although they are not nearly as significant as these last three.

Since I am in North Carolina, I will mention that the Mid-Atlantic Fishery Management Council now has a change in its membership that includes two seats — one for the fishery agency principally responsible for management in the state and one for an obligatory seat coming from North Carolina. We made that second appointment a month ago — I think it is Rick Marks.

The councils are now required to deal with essential fish habitat. In the case of HMS, it remains to be seen how big a requirement that will be, but nonetheless it is there and it will have an effect on many of the other plans. There is a prohibition on establishing individual fishing quotas (IFQs) or individual transferable quotas (ITQs) until October 2000. That will allow the National Academy of Sciences to complete one of 16 studies, which must be conducted between now and next year, before IFQs become a tool in fisheries management again.

Regarding HMS, there is a requirement now to develop a plan or amend each of the plans for all of the highly migratory species on the East Coast. There are plans in place for swordfish, shark and billfish. There is

no plan in place for Atlantic tunas. So we have to prepare a plan. Before we can begin developing and amending plans, we have to appoint an advisory panel for each of those four plans — three exist and one does not. We have to appoint an advisory panel specifically to deal with pelagic longlines. We have published a solicitation for nominations for the billfish plan and for the Longline Advisory Committee.

We have also published a notice to use one of three approaches to deal with the other three plans. And those options are: to keep things as they are with two separate plans and add a tuna plan; to combine the swordfish and sharks into one plan and do tuna as a separate plan; or to combine all three of them into one plan. We are receiving comments on those three approaches before we appoint advisory panels.

There are requirements concerning gear. We have to identify all of the gear that is legally used in the EEZ to take highly migratory species. After identifying that legal gear, there is a requirement that anybody who wants to use any other kind of gear actually submit a request to the secretary of Commerce. It may or may not be authorized in some fashion. But once that list of authorized gear is done, everything else is illegal.

There is a provision in the Magnuson Act that allows for negotiated rule-making. That provision requires that we publish guidelines on how we intend to implement that within six months, and we are just about done with that. It should be out in the *Federal Register* very soon.

In addition, there is a requirement that would create a central registry of all limited access permits. That way, liens that are held for those permits can be centralized to assist banks in making loans relative to the value of those permits. We have done an advance notice of proposed rule-making that raises all the applicable issues. We have been asked by the bank representatives in Alaska, where this was initiated, to extend the comment period by six months so that they can be aware of all the substantive issues with which we have to deal.

Those 16 reports, due by October 1998, include the National Academy of Sciences studies on individual transferrable quotas, community development quotas, New England groundfish and the science relative to Amendment 7 to the reef fish fishery management plan in the Gulf of Mexico.

Tom Quay: You said commercial shark landings are closed for the rest of the year?

Gary Matlock: They are closed through July 1. The second semiannual period of the shark quota will begin July 1. At that time, they will operate on half the quota they had last year. And that is for large pelagics, not for every shark.

Peter Shelley: What do you think the future of the NMFS research vessels and the program for gathering information on these species will be?

Gary Matlock: We will not have a NOAA corps to run them. The fleet will be smaller than it is now. And we likely will be using private vessels more than we do now. There is a necessity to have vessels of the kind and size to do the things that we need done.

Gil Radonski: Gary, you mentioned a lot of accomplishments over the last several years. You left out a very important one that I want you to share with the audience, and that is the creation of the Office of Recreational Fisheries within NMFS.

Gary Matlock: Rollie Schmitten has been in the office since 1993 and has made some very significant changes in the way we do business. He began his tenure by making trips around the country to find out what people were concerned about — not just within the agency but outside as well. And he learned in the process that the commercial and recreational sectors felt like they did not have a way to focus their contact with the agency. So Rollie set up two offices in our recent reorganization.

One of the offices was a commercial fishing liaison

group. The second was a group that deals directly with recreational anglers. Dick Schaefer is head of that office. And his role is to continue Rollie's approach of getting out, talking to people and becoming a mechanism for people with recreationally related concerns to get directly to Rollie. It also allows my office to get that input and use it in managing HMS.

Gil Radonski: I think it was very important that Rollie set up that position, and I appreciate the efforts that you guys made. Bill Price, who works in that office, has been in contact with a lot of people, and I hope that they can get to North Carolina and meet with folks like us here because we do have input for them and we want to meet with them.

Gary Matlock: I will pass the word back to him, and he may be in contact with you to find out what you would like done.

Tom Quay: We hear that Florida, Georgia, South Carolina and Virginia have much stronger, more restrictive fishery regulations than North Carolina. Why?

Gary Matlock: I am not going to answer that. I haven't the foggiest notion, because I don't know the local interactions or the systems nearly as well as I know those in Texas, for example. I wouldn't touch that with a 10-foot pole.

B.J. Copeland: Thank you Gary. Bob Ditton at Texas A&M University and others are studying the bluefin tuna fishery here and they need information. If any of you have been bluefin tuna fishing on our coast this year, complete one of the surveys and return it to Ditton. Your input is necessary for assessing the kinds of management that you want, the value of that fishery and whether it is important to you.

## Fishery Management Plan Case Studies
### • Snapper/Grouper

Michael Jepson is a representative of the South Atlantic Fishery Management Council.

A lot of what we have heard today is of great interest to me as a social scientist because the I think the issue of participation in fisheries management is key. One of my jobs with the council is to conduct social impact assessments — how their regulations impact people and communities.

I want to talk about the council process. It is going to be a bit redundant. But I want to key on your participation — how and why you can participate.

Let me review what the council is, what it does and how it does its job. The South Atlantic Fishery Management Council is one of eight regional councils created by the Magnuson Fishery Conservation and Management Act. It is responsible for the conservation and management of fish stocks within a 200-mile limit off the coasts of North and South Carolina, Georgia and east Florida to Key West outside the 3 miles.

Council members are citizens who are knowledgeable about some aspect of fisheries in their state. They serve three-year terms and are appointed by the secretary of Commerce from lists of nominees submitted by the governor of each state. The official responsible for marine fisheries management in each state and the regional director of the National Marine Fisheries Service are also voting council members. Nonvoting members of the council include representatives of the U.S. Fish & Wildlife Service, the U.S. Coast Guard, the State Department and the Atlantic States Marine Fisheries Commission.

The function of the councils is to prepare fishery management plans and recommend regulations for each fishery in the region. The regulations are designed to produce optimum yield annually. Optimum yield is defined as the amount of fish that will provide the greatest overall benefit to the nation in terms of food production and recreational opportunity.

The council staff will prepare plans using the best scientific information available for each fishery. And the goal is to provide the council with information so that it can identify key problems and issues, establish management objectives, develop management measures and recommend regulations to implement the management measures.

At various stages of development, input from council advisory panels is sought. Advisory panels consist of people involved in or knowledgeable about the fishery. In addition, the council consults its scientific and statistical committees, which are made up of qualified scientists who provide expert opinion on the scientific validity of technical information for each plan. There are also other types of plan development teams and assessment groups that offer expertise to the council at various times during the process.

The public participates in the development of FMPs through scoping meetings and public input at council meetings. When a plan is drafted, public hearings are held throughout the region. The South Atlantic Council will hold public hearings in each of the four member states. Often, there will be two or more public hearings in a state, depending upon the nature of the fishery being considered and the number of fisheries that might be affected. Once the council decides to take final action on a plan, it is submitted to the secretary of Commerce for review and approval.

The scoping process is where public input comes in. The South Atlantic Council will generally begin a scoping process because a recent assessment says public input or changes are needed to a fishery management plan. We may have letters or comments from people who think some type of management change is needed in a fishery.

After the scoping process, the staff will develop an options paper. The options paper is often presented to the Scientific and Statistical Committee and the Plan Development Team, which may offer suggestions on how to reach certain goals within that management plan. Once developed, the options paper goes, for example, before the Snapper/Grouper Advisory Panel, and it will make recommendations.

Advisory panels are made up of commercial fishers, recreational fishers, seafood dealers or processors, people involved in the industry and environmentalists. This is one of the points where the public has input — by appointment to an advisory panel. You can have direct influence on the options that will be taken to the public.

Snapper/grouper amendments 8 and 9 offer an example of how that works. With Snapper/Grouper Amendment 8, the council decided on an action that had been provided by the advisory panel as an option and was modified through public input. Once the advisory panel made its recommendations, the document went to the Snapper/Grouper Committee, which offered recommendations.

When the committees finish with their recommendations, the document goes to full council, which recommends what should go to public hearing. Staff members develop a public hearing document that incorporates all of the information they received, including scientific information on the status of the stocks. It also includes actions and options the council deems necessary to achieve the required regulatory action.

Public hearings are the primary place where the public has input. At this time, we hear from commercial fishers, recreational fishers, seafood dealers, processors, environmentalists and the general public.

As a social scientist I believe that the public hearing process doesn't work as well as it could. In the past, public hearings have been more of a monologue where the council members sit before the public and take testimony. But we have heard today that for the public to participate, there needs to be dialogue. In some cases, we have instituted a brief informal period before the public hearing that allows people to talk to council staff and members to clarify actions within the management plan.

Snapper/Grouper Amendment 8 was nearly 300 pages long when it first went out to public hearings. It is hard enough for technical staff and technical committees

to review and understand such a document. The public will have even more difficulty. So we provided this time when people could ask questions about what the action means and what its effects are. And it was successful. These meetings must happen if management is going to make public participation a real thing.

Council members often comment that they don't want to hear people just complain — they want people to come with ideas. When people can sit down and talk with staff, they are more able to develop ideas as to how management should work. And they give more effective public testimony.

After the public hearing, the staff prepares a public hearing summary of the comments. And that is provided to the Snapper/Grouper Committee. The committee reviews the public testimony and comments and makes recommendations to the council.

Snapper/Grouper Amendment 8 has gone through a strange evolution. It was originally two different documents, amendments 8 and 9. It was then combined into one amendment. After public hearings, it was split into two amendments again. Now we have Snapper/Grouper Amendment 8, which is going soon to the secretary of Commerce. Snapper/Grouper Amendment 9 is going back to public hearing. That decision came about as a result of public testimony.

I want you to remember that whenever we take an amendment to public hearing, it involves proposed actions. I think sometimes people are convinced that these issues have already been decided, but they have not. The public hearing is the time and place for your comment. It can be effective and it can result in changes in a plan or amendment.

The council has to take final public testimony, and here is another point where you can comment. Once it takes final public input and modifies the amendment, the council submits the amendment to the secretary of Commerce. So there are many places where you have an opportunity to participate in this process, and you need to take advantage of that.

There are 12 actions in Amendment 9 with many options, and it may appear to primarily affect the recreational fishery. That is not the case. Most of the commercial impacts have been placed in Amendment 8, which deals with a limited access system for snapper/grouper for the commercial fishery. That has gone forward now and will be submitted to the secretary.

Three major fisheries will be impacted by actions taken in Amendment 9 — gag grouper, red porgy and vermilion snapper. Amendment 9 also has commercial impacts. There is consideration of a three-month seasonal closure for the commercial fishery and other impacts on other fisheries.

In Amendment 8, the council is revisiting its definition of overfishing. These species are now considered overfished if their spawning potential ratio (SPR) is below 30 percent. The council wants to revise its definition of overfished to a 20 percent SPR ratio. But it wants to use a target level or optimum yield level of 40 percent as its management level. The reason is that if you define optimum yield and the overfished level at an SPR of 30 percent, the fishery will fluctuate above and below that level. Part of that fluctuation is environmental, and part of it is fishing pressure. But the council felt that with an overfished level of 20 percent, it should manage that fishery at a 40 percent target level. That way, you aren't regularly dropping below your overfished level. The problem is that every time you go below the overfished level, the councils are mandated to establish a rebuilding period. They are trying to avoid these frequent overreactions by separating the overfished level and the optimum yield or target level.

The recent assessment on gag grouper is 13 percent SPR, porgy is 13 percent and vermilion snapper is 19 percent. So the council has to take action. Red porgy has been under a rebuilding program since 1991. And somewhat stringent actions were taken in Amendment 4. However, some scientific information suggests those actions still will not bring these fisheries out of an overfished level. Based on the SPRs, the three species are going to have significant management measures put in place.

The management proposed for gag is to increase the minimum size limit from 20 inches to 24 inches total length for commercial and recreational fisheries and to prohibit all harvest January through March. The impacts of that regulation would reduce the commercial and recreational catch in North Carolina by 42 percent. In the first year, it would also reduce the catch 35 percent in South Carolina, 6 percent in Georgia and 7 percent in Florida. The January-through-March closure is designed to protect the fish during spawning. When we take this to public hearing, you should comment on these impacts.

One of the proposed actions for vermilion snapper is to increase the recreational minimum size limit from 10 inches to 12 inches total length. This could reduce the headboat catch by 74 percent and private and rental boat catch by 49 percent.

We have proposed to increase the red porgy minimum size limit from 12 inches total length to 13 inches total length for both recreational and commercial fishermen and to establish a five-fish bag limit. The 13-inch size limit would reduce the total catch by 22 percent with commercial and recreational reductions about the same. At this time, we don't have the data to assess how the combination of the bag limits and size limits will affect catches. We have an estimate that the recreational catch would be reduced by 14 to 68 percent and the head boat catch would be reduced by 8 to 60 percent.

Tom Quay: Mike, when you refer to these percent reductions in the head boat catch, are you are referring to percent reduction in red porgy catch and not the total catch of other species?

Michael Jepson: Right, just in that species. There is a proposal to impose a two-fish-per-day bag limit on both gag grouper and black grouper, contained within the five grouper aggregate bag limit. There is also action to impose a one-fish-per-day bag limit on amberjack. These are significant actions that the public needs to be aware of, and you would surely want to comment on.

From those examples you can see there is reason to participate in this process and have some say. Not necessarily to say that the council shouldn't do this or that but perhaps to suggest other ways the council might address these issues, to come up with meaningful reductions and to rebuild that stock.

So how do you participate? You need to provide testimony at public hearings. I haven't seen a lot of testimony by individual recreational fishers. There are organizations that represent recreational fishers and they often testify. But more individual recreational fishers should comment on the issues. You should apply for advisory panel positions. Advisory panels can have an influence. They provide key information that can turn into options in the amendments and have an affect on the way that fishery is managed. Finally, you can be well informed and become a council member. It is going to take a lot more than just being informed to become a council member — you have to have some political ties. But the South Atlantic Council has had a couple of advisory panel members who are now council members.

How do you become informed? You can subscribe to our council newsletter, the *South Atlantic Update*. It contains a lot of good information. The council often advertises in the *Update* for advisory panel positions, so send in an application if you want to. The council also has a World Wide Web home page as a source for information. You can find our newsletter and news releases there. In the future, we hope to have some FMPs on the home page. And you can call the council office. Staff are always there and ready to talk with you about upcoming amendments or any other issue, so offer your suggestions. Oftentimes staff can help you make your suggestion more effectively and apply it to the issue that is appropriate.

I want to impress upon you that participation is important. This is a bureaucracy, and it is often difficult to get bureaucracies to move as fast as you want them to. But if we become innovative and think about how we can improve the process, then bureaucracies can change.

Work at the local level if you really want to have influence and get people to have dialogue. Get the local

fishing association together with the commercial fishing association and have some dialogue. Include environmentalists. Then go to the councils or the state commissions and present options that you have formed at that level. It would make the council's job easier if it didn't have to come up with all the options. It is very difficult these days to find information and to collect data in a timely manner that can help explain the issues, especially social and economic information. Fishing organizations, both commercial and recreational, and environmental groups can work to improve data collection.

Government cutbacks are one reason that data collection is suffering. If we could find innovative ways for the public to offer information and get it to the councils or to the states, then I think fisheries management would be greatly improved.

Don Betts: The guys I fish with are catching grouper in 200 and 300 feet of water. When we bring a grouper up, it has its intestines hanging out of its mouth and its rectum. We just don't think that grouper is going to survive when we put it back. I would like to hear that it would. But whether it is 18 or 24 inches, that fish is dead. If you could use that as one of your bag limit, it may make more sense.

I also want to know what effect international fishing has on us beyond the 200-mile line.

Michael Jepson: I am sorry to say I don't know if I can answer either of those questions. As a social scientist, I don't have that much background on the biology of grouper and their release mortality after you puncture the air bladder and send them back down. I have seen reports that they are supposed to survive, but I am not sure how effective that is.

These questions need to be brought out at the public hearings. But also talk to council members, staff and advisory panel members.

John Meriner: For your information, the three representatives on the South Atlantic Fishery Management Council who would be your points of contact in that process are Peter Moffitt, Jody Gay and Dennis Spitzbergen.

Relative to release fish mortality, reports are available. And indeed you are better off puncturing the air bladder and releasing it than just putting it back overboard as is. Help it out by shoving the intestine or gut back in the mouth as much as you can. There is pretty good survival of fish having that done.

As far as other nations' reef fish here, that is somewhat open to debate. That would come out of the Caribbean and South American linkages perhaps. But right now the stocks are managed here as South Atlantic domain.

### • Striped Bass and Weakfish

George Lapointe manages the Interjurisdictional Fisheries Management Program for the Atlantic States Marine Fisheries Commission.

I want to do three things today. First, I want to talk about the Atlantic States Marine Fisheries Commission because there are some misconceptions. The program has changed a lot since passage of the Atlantic Coastal Act and reorganization five years ago. It is broader than it was in the past. I want to describe how the commission's fishery management program operates, particularly in regard to public participation in managing striped bass and weakfish.

These are largely my own comments. They are based on my experiences working in Virginia on fish issues, working for the International Association of Fish and Wildlife Agencies on legislative issues and animal rights issues, and now working with the commission's Interstate Fisheries Management Program, where I have been for about two and a half years.

The commission was formed in 1942 "to promote the better utilization of the fisheries — marine, shell and anadromous — of the Atlantic Seaboard by the development of a joint program for the promotion and protection of such fisheries and by the prevention of physical waste

of the fisheries from any cause. It is not the purpose to authorize the states joining herein to limit the production of fish or fish products for the purpose of establishing or fixing price thereof or perpetuating monopoly." This is a way of saying that even in 1942, the states recognized that interstate fisheries needed cooperative management and they shouldn't waste fish.

The commission has been trying to boost public participation in its process, particularly since the passage of the Atlantic Coastal Fisheries Cooperative Act. That is something we will work to improve until we die or retire because the way that public participation is used by our organizations, states and conservation organizations and the way that the public reacts will continue to change over time.

You have heard today that the same things folks were working on in 1942 to form the commission are still what we are working on, the feds are working on and you are working on within the state.

It is important to recognize that the commission is an organization of states that work together to solve common fisheries issues. It isn't a federal agency. We work closely with the regional fishery management councils. I currently sit on the New England Fishery Management Council and the South Atlantic Fishery Management Council as a nonvoting member, and my boss, Jack Dunnigan, sits on the Mid-Atlantic Fishery Management Council. We work with the National Marine Fisheries Service. We have joint plans with the Mid-Atlantic Council for bluefish, summer flounder, scup and black sea bass. We have joint plans with the South Atlantic Council for red drum, and we do cooperative planning on Spanish mackerel. We work with New England jointly on Atlantic herring.

We recognize, although we don't do it perfectly all the time, that we need to work with our federal partners and others in joint planning. The 15 Atlantic coast states, from Maine to Florida, are members of the commission. Each state in the commission is represented by three members: in North Carolina, it is Dennis Spitzbergen, a representative of the Division of Marine Fisheries; Rep. David Redwine, a state legislator; and Damon Tatem, the governor's appointee.

The organizational structure starts with the full commission, representing all 15 states, which have the final approval authority for our fishery management plans. Next is the executive committee, which is a governing board. Next, the Interstate Fishery Management Program Policy Board, which is my board of directors. And finally there are the species management boards. The big difference between the council process and ours is that the commission's management boards have the final decision-making authority on FMPs. All the commission can do when a management board approves a plan is accept or remand it. It can't make change. And this is in contrast to the council, which has the decision-making authority.

This causes one of our biggest problems — the mechanics of joint planning. We get our committee together with our board and agree on something that the committee takes to the full council, which makes a change. Then we start over. Now, when we meet jointly with the council, our board meets with the full council so everyone agrees to the same thing at the same time.

The commission is made up of a number of program areas. I am in charge of the Interstate Fishery Management Program. We have a Research and Statistics Program that works on recreational and commercial fishery statistics, research prioritization and stock assessment work. The commission's Research and Statistics Program has spent a lot of time on the Atlantic Coastal Cooperative Statistics Program (ACCSP), which we are trying to get in place with the councils, the states and the federal government.

For many years, different statistics programs were used by the Southeast and the Northeast, by the states and feds, and by adjacent states. The numbers aren't comparable and that causes trouble in using the data we have. In these times of budget constraints, getting statistics that compare apples to apples is good, and that is what the Atlantic Coastal Cooperative Statistics Program is meant to do. The program is scheduled to be

operational next year. So this is an enormous change, and it will require a commitment on the part of all our government organizations and the fishing community. The statistics program also has some advisory panels because public input is needed in developing a new statistical program along the Atlantic coast.

The commission also has a habitat program headed by Dianne Stefan. And it is trying to emphasize the importance of habitat to fisheries. Our habitat committee is working with my program to increase the emphasis on habitat in our fishery management plans. They work cooperatively with the councils and the National Marine Fisheries Service to implement the essential fisheries habitat provisions of the Magnuson Act because they realize that habitat and coastal waters affect fish in the EEZ and vice versa.

We have a recreational fisheries program funded through Wallop-Breaux, which tries to keep states up to speed on broad recreational fisheries issues. They are working this year on reauthorization of the Wallop-Breaux law. They have worked with individual states on Take a Kid Fishing programs, and they have coordinated our work on artificial reef programs. We also have a staff member working on outreach programs and protected species issues as they impact commission FMPs.

Protected species issues will become bigger components of our management programs, both from the commercial side and the Marine Mammal Protection Act. We have an Atlantic sturgeon FMP that impacts shortnose sturgeon, so the Endangered Species Act kicks in there quite a bit. Our protected species program is trying to identify those issues and outline them in FMPs, although at this point we don't plan to make those compliance issues in our plans.

Our Interstate Fishery Management Program (ISFMP) cares for and feeds the commission's 18 fishery management plans. The purpose of my program is to promote the conservation of Atlantic coastal fisheries resources and to use the best available scientific information. Further, the ISFMP must allow for adequate public input. The program operates under a charter that outlines the necessary components of the fishery management plans and how the program will run.

Much of this has come under fisheries management plans, but there are a couple of things that bear mentioning. Our FMPs are meant to be flexible. There are two things about this flexibility that make the plan different from the council plans. When I talk about striped bass, I won't be able to outline all the provisions of our plan because we have something called conservation equivalency. The concept is that states should be able to tailor the fishery management programs to local needs as long as the states maintain a common conservation foundation. In other words, if we need a 15 percent reduction in a fishery, we don't care how North Carolina gets to that point as long as it is verifiable, and that can be different than the way Virginia or South Carolina does it.

We use adaptive management. We have found our FMPs aren't static. We are always behind in data by one or two years. No sooner do you get something done than the conditions in the fisheries change. The adaptive management sections of our plans allow provisions that can be changed to make them as current as possible. Our charter has provisions for a "fishery emergency" that can be fishery- or resource-based. We can act quickly.

The groups mentioned in our charter develop and implement our plans. First is our Species Management Board, a group of commissioners who have the decision-making authority for a certain species. For striped bass, it is the directors from Maine to North Carolina. For weakfish, it is Massachusetts to Florida. We annually ask our states which plans they are interested in. If they are interested in a plan, they are put on the species board.

We have technical committees that provide advice to the board on issues that need to be addressed. We usually have subcommittees of the technical committees. Most of our boards have stock assessment subcommittees. For striped bass, we have a tagging committee because there is a coastwide tagging program. We have a lot of flexibility in providing subcommittees to address individual problems.

With all of the plans we are amending, we have also

established citizen advisory panels. These are made up of people with an interest in and a knowledge of the fishery. Like our technical committee, these groups provide advice to the board. When people become involved in our advisory panel process they tend to think they'll be running the management program, and they aren't. Their advice comes in at the same level as technical advice to the board. The board has to weigh that whole mix and then make a decision. I think it has been pretty successful. We have a charter for our citizen advisory panels that explains their function and guides the conduct of their business. The chairs of all our advisory panels form an advisory committee that meets twice a year. We let the advisory panels tell us how our process is working. It has been an extremely active group, and the advice has been useful.

We have plan development teams and plan review teams. These are what I call the worker bee teams that write the fishery management plans. The plan review team looks at the plan annually to make sure it is current and to determine whether it needs changing. In this process, we get public input a number of ways. One is through our advisory panels. We are now required under the Atlantic Coastal Act to hold public hearings along the coast — at least four for major actions. We have a policy of holding at least one public hearing in each state that requests one on management actions. We also take letters and phone calls, and we encourage public input.

The Atlantic Coastal Fisheries Cooperative Management Act was passed in 1993. And this act was modeled after the Atlantic Striped Bass Conservation Act, a law that significantly affected the striped bass recovery along the Atlantic coast. I will mention three parts of the act that really influence how ASMFC does business.

First, the Atlantic Coastal Act requires that states comply with our plans or face a moratorium on fishing for the species in question. It is important to remember that the states put the plan together, so they're required only to follow the provisions of their own plan. It is not the federal government that makes determinations on compliance; rather, it is the commission. The Atlantic Coastal Act also allows the secretary of Commerce, in the absence of a federal fishery management plan, to put complementary regulations in the EEZ. Weakfish hearings were just held up and down the coast, and since there is not a council plan, we can have complementary action in state and federal waters. The federal rules under this provision have to meet the national standards in the Magnuson Act. And they are superseded by a council plan, if one exists. The last thing the act does is direct the commission to provide for adequate public input to our fishery development process.

Our striped bass plan has been, continues to be and will be the commission's most visible and controversial program. We and all of our conservation partners are credited in the comeback of striped bass, but the effort continues to need a lot of care and feeding. We wrote our first striped bass plan in 1981, and we have worked on striped bass planning ever since. As a matter of fact, the commission was set up to work on striped bass in 1942, so it took almost 40 years to get our first FMP done, although we weren't working on it the whole time.

Amendment 5 to our striped bass plan was approved by the commission last year. It established a structure through which the Atlantic striped bass fishery can be liberalized and has been liberalized over the past few years. And it should provide a mechanism for cutting back the fishery if needed. Beginning next year, the plan calls for managing the fishery at a mortality rate of F = 0.4. The amendment also has a recreational bag limit of two fish at 28 inches along the coast and a 20-inch minimum size limit in producer areas. The plan sets commercial quotas for the states that allow commercial fishing.

Over the next year, one important component in the management process will switch our assessment to a virtual population analysis. This will allow a population estimate for East Coast striped bass that can be allocated among the states. We'll really need our advisory panel to help us with allocation because we have found in other quota management plans — fluke is an example — that it is not an easy process for those involved.

Prior to the Atlantic Coastal Act, the commission was criticized for not having a process for open public input to our management process. And we made a concerted effort with Amendment 5 to open our process to interested parties, to use our citizen advisors, to hold public hearings, and to hold open meetings as well. During the course of developing the striped bass plan, our advisory panels met six times. And very importantly, a lot of their ideas were incorporated into the FMP. These included the absolute minimum in our 18-inch plan; a go-slow approach to opening the fishery where we went to half of the target fishing mortality rate for the first two years — that is now three years; basing all quotas on the Chesapeake Bay stock, where the best data were available; and the abandonment of all bag limits over two fish.

Damon Tatem was the chair of our striped bass AP until he became a commissioner. We held two sets of hearings on Amendment 5. We take credit for the success of the striped bass recovery, but I tell people no matter how successful our management program is, we will get some future environmental condition that leads to poor year-class production and the abundance of striped bass will go down. And the real test of our planning will be how you react to a retraction in the fishery when that happens.

The objectives of our weakfish plan were: to restore the weakfish population over a five-year period by restricting harvests and using other available means to reach and maintain a target fishing mortality of F = 0.5 — we are supposed to go to that level next year; to restore and expand an age and size structure to ultimately restore trophy fisheries; to restore weakfish to their previous geographic range; and to promote the identification and conservation of a critical habitat.

The weakfish plan covers the states from Florida to Massachusetts. It includes a 12-inch minimum size limit. We have been working cooperatively with the South Atlantic Council on another major component of the weakfish plan — a requirement that bycatch reduction devices be used in shrimp trawls in the South Atlantic area. This provision should help weakfish as well as a lot of other species. The BRD requirements in the plan are being challenged, but given the tenor of what the commission is doing, requirements in the Magnuson-Stevens Act, you can be assured that BRD requirements will be included in other commission and council plans as appropriate. Certainly our croaker FMP, which should be revised next year, will include BRD provisions.

One thing we got into with weakfish was people saying that the management process had nothing to do with fish going up and down. And without trying to separate the effects of fisheries management from what I call the hand of God on fish stocks, the weakfish resource is slowly recovering, expanding and improving. Fishing mortality rates that used to be in excess of 2 are below 1 now, and we are supposed to go to a fishing plan that reaches F = 0.5 next year. This will be a challenge to achieve because it will be a significant reduction in the weakfish fishery along the coast. As with striped bass, we used APs, public hearings, etc.

We are trying to improve the way we receive public input, get our messages to you and handle the management process. One thing we need to recognize is the limits of planning by consensus. Whatever our plan is, it won't meet the needs of all the fishermen involved. Hopefully the product will meet the needs of the largest segment of the fishery possible, but it will never keep everybody happy. I tell people that I know that fishery management can be maddening. But if you get mad and walk away, we are not going to get the public input that we need consistently. Frankly, we need people who are involved long enough to have a history of the process. We also need broad representation. We have a tendency to think we have two interest groups in the fishery management plan: the recreational and commercial sector. And broadly this is true, but we need to recognize there are folks outside the fishing community who are interested in balanced conservation.

Within the two broad groups — recreational and commercial — there is an array of groups that need to be included in our deliberations. The council uses advisory

panels, and I certainly endorse their use because they work. They are expensive, they are cumbersome and hard to set up, but they work. They provide the people with the history and the people whom managers need to reach. Importantly, those people feed into the community and tell others what you are doing. Public outreach is one thing our institutions aren't good at, and your advisors can help with that. Advisors should be chosen with care. They should be knowledgeable; they should be the type of people who participate in public forums and will put in the time needed to work through the problems, the issues and the anxieties in the management process. As North Carolina moves forward with an advisory process, install mechanisms to remove people who don't participate. Simply having their names filled in the slot doesn't help anybody.

People have a tendency to think they can't get involved unless they are one of a legion. None of us likes to do it, but write a letter, make a call and visit. You don't need a million comments; you need a few well thought-out comments.

I don't know how to separate different kinds of comments. I have a tendency to view a letter or a phone call differently than a postcard. And when I think about Internet access, I think about this the same way. People are not going to put the same amount of energy and thought into Internet messages as somebody who is a letter-writer. And I don't know how we judge this.

I ran into this with a hunting controversy when I was with the International Association of Fish and Wildlife Agencies. An animal protection group sent 3,000 postcards to the Fish and Wildlife Service about management on the refuge system. And the Fish and Wildlife Service called up and said, "These are valid comments." I said, "OK. What am I supposed to do, get 3,500 comments to balance it?" I would welcome input from people on how to handle this. If 3,000 angry people send e-mails to George Lapointe when we open our home page, how do I handle those in a logical and fair fashion? I don't know at this point.

Public input isn't public polling. We have a tendency to think that if my group gets 1,000 comments and John Merriner's gets 200 comments, mine mean five times as much as his does. That is not true. Public input is one component of the management process, but how you weigh that isn't easy.

Some people get involved in the process and they say, "Well, you didn't take my comments into account this time; therefore your system has failed." But when they get a chance to reflect, they realize that one of their comments wasn't been taken into account, but many others were.

We have noticed that fisheries management plans are never finished. We have a tendency to think we can write a plan and put it on a shelf, but it becomes useless. In reality, our striped bass plan will never be done because the fishery is changing and the fishermen are changing. The care and feeding of those plans takes as much effort as developing them. The striped bass and weakfish plans require nearly as much of my staff's time now as the development did because they are dynamic and states want to change the requirements. So as you develop more plans, the workload gets heavier.

We are involved in Atlantic herring fishery management in the North Atlantic, which doesn't impact North Carolina greatly, although you have some commercial fishermen interested in it. The herring plan is now being changed for two reasons. One is the impact of one plan on another. As the New England fishery management or the multi-species plan was putting more restrictions on fishermen, people said, "Go herring fishing," or "Go mackerel fishing." And we now have spillover that is impacting the herring fishery.

Because people are trying to take advantage of the herring resource, which is vast now, we heard about factory trawlers being built for use in the New England herring fishery. I heard about one that has a yearly capacity equal to that of all other participants in the fishery — about 100,000 metric tons a year. We don't have anything in our plan to prohibit that because for years our plan was to get people into the herring industry. These are things that people need to pay attention to.

We have talked about best available data and data needs. And we will never have enough data to manage our fisheries well. In the case of striped bass, we have a data-rich plan. But there are always questions we can't answer or analyses we can't do because there aren't enough data. As you get into other species for which there are less data — such as eels — we have to recognize that the planning process will occur with less data. The best available data will be scant, and we have to be honest about that.

One thing I like to tell people is to question the data. As an example, we had an Atlantic herring research needs document. I was looking through it, and one item for assessing herring was to look at the impacts of fisheries or sea level change on the resource. The idea was that they could read the water gauge at Booth Bay Harbor lab and figure out what the herring resource was like. It was completely ridiculous but it was included in the research list. Don't just assume there are only good ideas in the research needs documents. We all make mistakes.

As North Carolina develops its fishery management plans, keep in mind my friend Ray Evans' first rule of survival: "Be wise and plagiarize." Take from the council, the commission and other states the parts of fishery management plans that have worked. You don't need to reinvent the wheel.

We have mentioned briefly single-species management versus multi-species management. We would all like to better understand and incorporate interactions into our management program. But as you get more complex, things get slower. Trying to figure out the effects of one species on another slows down the planning process, and the effects of one part of the fishery on another slows down the management process. Consider the interaction between bluefish and striped bass. My short answer is yes, they interact; what the quantification is, I don't know. And if we want to wait for our management process and our scientific community to understand those interactions before we move forward, we are all going to be dead and gone. We have to act with the best available information.

FMPs are all about allocation — allocation among different user groups. One of the problems with overfishing is that we haven't allocated enough of the fish to the fish. We always talk about total mortality being equal to fishing mortality and natural mortality. We need to allocate enough fish to survive and allocate enough fish to natural mortality and then worry about the people allocation. And for a group like the commission, and I suspect in North Carolina if you develop interstate plans, allocation among geographic areas will be difficult. I suspect it will be one of North Carolina's most contentious issues if you develop area or state FMPs. How much goes to the north side of Albemarle Sound and how much to the south? It isn't easy.

As you carry forward with planning, be specific — as specific as possible. Be as up-front and honest as possible, because in my experience, when we leave vagaries in plans they come back to haunt us, and the energy needed to get through the vagary in the short term is usually less than the energy needed to get through it in the long term. And people may think you have broken faith by changing the plan later.

We need to be honest about what we are trying to do with our management process. We need more outreach in our plans. Resource agencies as a whole are not great at outreach. We need your help and we need the help of news organizations to try new and innovative methods for outreach.

We are all inconsistent with regard to political will. If I want my politician to get involved and he or she does and the result is something I like, that is the politician helping out the little guy. If you get your politician involved, that is meddling — the fisheries' analogy to pork barrel. We need to be cautious about how we interact with our politicians and do it openly with other folks in the process.

One of the big failures in our management process in the past has been that we have tried to incrementally make changes. When the tough decisions need to be made on striped bass, on weakfish, on summer flounder,

we have had a tendency to make the smallest change we could because we don't want to impact our constituents. But in fact, it usually results in a cascade of incremental approaches, the sum of which is a big approach. You lose stock with the fishing community, which gets tired of all the changes. People say, "Make the tough decisions, figure out what needs to be done, and leave us alone for a while." They would rather take one big hit than five little ones.

Gil Radonski: George, you talked a lot about getting involved and public input, and you talked about the striped bass. There was a recent amendment to the striped bass plan and the public really got involved. A large percent of them selected one alternative and were very satisfied with it. It went through the process and ASMFC selected a different alternative. It was very unpopular all along the eastern seaboard.

I tell you that ASMFC has a real problem with recreational fishing interests. Why should we get involved? It is not really a question — it is a comment on the public hearing process. And if ASMFC wants people to be up-front, it needs to be up-front with the people it deals with.

George Lapointe: I concur. I made my comment about public polling in part for that reason. Some of the things that came up with the addendum to the striped bass plan, which allowed the bay to increase its quota this year, weren't well brought out in the whole management process.

One is that we made a commitment to our states in the original plan to keep F the same among the states. That didn't come out well in the public hearing process. And so that is a valid criticism. Two, the reason we started the addendum process was we found a problem in our plan at a time when striped bass quotas were increasing. If we had followed the letter of the plan, the coastal quota would have dropped by 40 percent in one year and then gone up to about 130 percent of its former level the following year. Folks realized that wasn't something that they had intended to do. But I don't think the message about what we were doing and why we were doing it was well conveyed, so your criticism is valid.

Gil Radonski: It is not so much a criticism as an effort to make you aware. You asked us to stay with the process. Now we want the ASMFC to stay with the process and keep us involved — let's play on a level field. I wanted to make you aware that people in this room and along the eastern seaboard are concerned about this process. If we do things to reduce that public participation, we are going to pay a price.

George Lapointe: I think our mistake was in the way we communicated what we were trying to do.

Jim Murray: Sea Grant is administering the Fishery Resource Grant Program now. There were not many applications from the recreational fishing community, and there should be. Recreational fishermen are eligible.

### Status of Bycatch Research and Management

Jeff Gearhart is a marine biologist with the N.C. Division of Marine Fisheries.

I am going to give a history of the Division of Marine Fisheries' bycatch research program — where we have been and where we are heading.

Most of the work done by the division was funded under the Albemarle-Pamlico Estuarine Study. There is a fisheries plan within that. And as a part of the fisheries plan, the division was asked to look at bycatch, reduce its impacts and come up with better fishing practices.

The division was asked to start a gear development program. So we started a pilot program that was funded under the Atlantic Coastal Fisheries Cooperative Management Act (ACFCMA). I was hired to start that program and conduct gear development, solidify it and make it a permanent fixture within the division. A couple of factors driving gear development in bycatch reduction

was industry growth and potential overfishing. The increases in commercial and recreational fishermen who come to North Carolina lead to potential overfishing.

Twenty-two species of fish are classified as stressed. Compliance with the weakfish fisheries management plan mandates us to reduce juvenile weakfish mortality by 50 percent. The Magnuson Act, the Marine Mammal Protection Act and the Endangered Species Act mandate us to monitor and reduce bycatch in fisheries, whether it be protected species or fish that are managed under a plan. And public perception is the biggest issue. Whether this is a real problem or not, it is perceived as a problem, and we have to do something about it. Reducing bycatch can't hurt the resource.

The goal of the fisheries plan in the APES Comprehensive Conservation and Management Plan is to restore or maintain fisheries and provide for their long-term sustainable use for both commercial and recreational fishers. What tools do we have to accomplish this goal? We have size limits to help protect spawning stocks and potential spawning stocks; we have gear restrictions to target the harvest of certain size classes of fish; we have new and more efficient gear; and we have time, area and seasonal closures for areas with high incidence of bycatch. These all protect juvenile fish and potential spawning stock.

So what have we been doing? We have looked into gear development within most of our fisheries — trawls, long haul, pound nets, pot fisheries, gillnets.

Within the trawl fishery, we have tested numerous bycatch reduction devices (BRDs), turtle excluder devices (TEDs) and combinations of both in the shrimp fishery. We have also developed a flounder TED with the help of the National Marine Fisheries Service's Pascagoula Harvesting Division. We have tested tailbag mesh size to reduce juvenile fish landings in several fisheries — flounder trawl, flynets, crab trawl.

North Carolina was the first state to require BRDs in trawl nets. Our original rule came out in 1992 and the rule was flexible. It said no person may use a shrimp trawl in the internal coastal waters without an operational fish excluder device.

What is an operational fish excluder device? We left the rule flexible because we learned from the nightmare that the National Marine Fisheries Service went through when it imposed TED regulations on the industry. NMFS developed this gear without the help of industry. It came up with something and said, "Here, you have to use this." That did not work. So NMFS got industry representatives to help develop good designs. Today, the TEDs used most in the industry were developed by commercial fishermen.

We are going the same way with the fish excluder. And we have come up with some great designs that work really well. The first design, probably the simplest, was the Florida fish excluder. It is made out of metal bar, round bar stock, and it is installed in the tailbag. We found that placement in the tailbag is critical. If it is too far forward, it won't reduce bycatch enough. If it is too far back, you get too much shrimp loss. So we have done extensive testing on a round model, a triangular model and on different shapes and placements in the tailbag. We found optimum placement of these fish excluders to maximize bycatch reduction and still retain the amount of shrimp that is acceptable to the industry.

BRDs work on the premise that fish are attracted to an area of reduced water flow. When they orient in those areas to get out of the current, there is an opening for them exit the trawl. Currently, we don't require a certain placement, but we have a rule in the works to be more specific (Figure 1).

The large mesh funnel excluder is actually an extended funnel (Figure 2). The original did not have the extension. It is put just ahead of the cod end, and it chokes the water down, creating areas of reduced water flow or eddies. Large webbing is around the funnel, and when fish orient in those areas they can escape. If we do come up with specific requirements, this one and the Florida fish excluder would be allowable.

The Sea Eagle was developed by Bill Hickman, a commercial fisherman in the Wilmington area. It is based on the Florida fish excluder design except it is

made of PVC pipe. You can use various pipe diameters. We have tested this extensively at different locations. This one and the others mentioned meet the 50 percent reduction in the number of weakfish mandated by the Atlantic States Marine Fisheries Commission's weakfish management plan. The FFE (Florida fish excluder) results in a 53 percent reduction in weight for weakfish (Figure 3).

To test flynet devices, we used a trouser trawl design in which we put two tailbags on a flynet (Figure 4). A flynet works under the same premise as a trawl. It is a cone-shaped net that is dragged through the water. It has larger mesh in the wings and herds fish down to the smaller mesh in the cod end. We tested different size tailbags, mesh sizes of tailbags in the flynets using the trouser trawl design, in a paired tow design, both inshore and offshore.

In inshore tests, the estimated weight of the catch was reduced significantly in most cases. So it reduces bycatch and is size-selective for the fish. At this time we require 3-inch mesh in the tail bag (Figures 5 and 6).

We have tested various mesh size escape panels in sciaenid (croaker, weakfish, croaker, spot) pound nets and flounder pound nets. These have worked very well in the flounder pound net fishery in reducing the number of undersized flounder being caught. I am working with Murray Fulcher on a Fishery Resource grant this fall, testing sciaenid pound net escape panels.

The basic design of a pound net consists of a lead panel that leads to a trap. Fish encounter the lead panel and follow it down to the trap. They can't find their way out, and there is a funnel that leads into the heart. The fishermen bunt that piece of net and dip out the fish (Figure 7).

Right now in our flounder pound net fishery, we have a 13-inch size limit with zero tolerance — no undersize fish come to the dock. If they catch them, they have to sort them out by hand. Escape panels help the fisherman. If they reduce undersized fish, they have fewer fish to handle.

We have recently held public hearings on requiring escape panels in flounder pound nets statewide. They are now only required south of Bluff Shoals.

In the flounder pound net fishery, the body webbing is 4 inches and the escape panels are 5-plus inches. We tested several sizes, but we require 5-plus inches. We tested a number of potential locations but found the best escapement in the corners (Figure 8).

We are concerned about the percentage of unmarketable fish within a pound net with and without escape panels. On average, our tests showed 40 percent of the fish in the net with no escape panel were undersize flounder. In the one with the large mesh escape panel, only 5 percent were undersize flounder (Figure 9).

For sciaenids it may be different. Early tests of sciaenid pound nets with 1-inch mesh showed 93 percent of the fish in there were undersize; 2-inch-plus mesh had 8 percent; and 3-inch-plus showed no undersized/unmarketable fish (Figure 10). I am going to work with escape panels of 2 inches, 3 inches and 3 1/2 inches to see if we can exclude some of those fish. When you use the 3-inch-plus mesh, you also are losing some marketable fish — we want to minimize that as much as possible.

North Carolina was the first state to require cull rings in crab pots. Cull rings are small rings placed at different locations in the pot to allow small crabs and fish to escape. As a result of our work in North Carolina, Florida is thinking about requiring cull rings. Florida requires the use of biodegradable panels in its pot fishery to prevent ghost pot fishing — pots are sometimes stripped of their irons, the floats are cut and they are discarded or blown away by storms. With a biodegradable strap or panel, it will open and let whatever is inside escape rather than die.

We also tried to develop shrimp pots as an alternative to trawling. They look like a low-profile crab pot. But they didn't work well north of Wilmington. In Core Sound, the Pamlico and Albemarle sounds, the shrimp were too spread out. Around Wilmington, you have tidal creeks that concentrate shrimp, and it is conducive to a

*Continued on Page 46*

Figure 1:
Florida Fish Excluder (FFE)

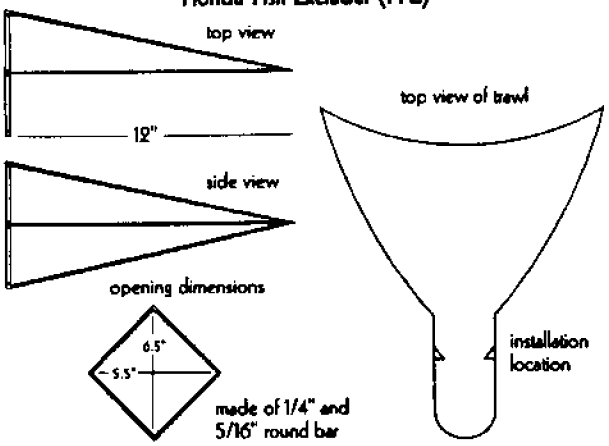



Figure 2:
Large Mesh Extended Funnel BRD (LMEF)

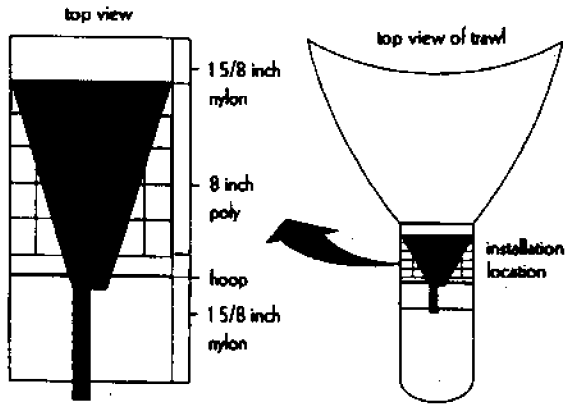



Figure 3:
N.C. DMF Tested and Certified BRDs
Percent Reduction by Weight for Selected BRDs

| BRD | Shrimp | Weakfish | Spot | Croaker | Total Finfish |
|---|---|---|---|---|---|
| FFE | -7.8 | -53.4 | -50.7 | -53 | -48.3 |
| Sea Eagle | -4.9 | -46.4 | -44 | -49.3 | -44.2 |
| LMF | -7.9 | -57.5 | -71.4 | -36 | -33 |
| LMEF | -2.1 | -50.3 | -71.4 | -63.1 | -54.7 |

All BRDs listed meet weakfish reduction mandates of the ASMFC's weakfish FMP

Figure 4:
Trouser Trawl

Generalized pattern used in bycatch reduction work 1993-94

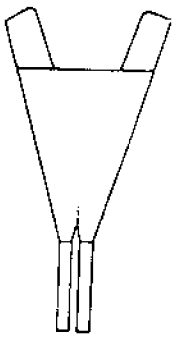


Figure 5
Length-frequency distributions of weakfish caught in diamond mesh (open bar) and square mesh (solid bar) cod ends

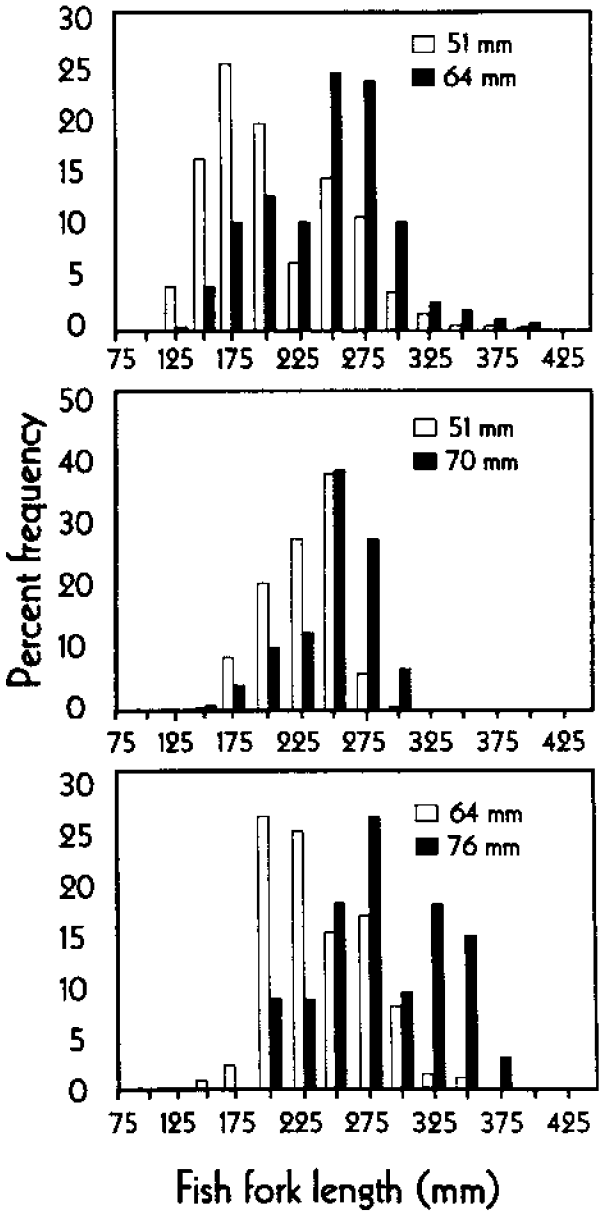


Figure 6
Estimated total catch weight in the control and experimental cod ends of the trouser trawl nearshore work, by tow

| | control cod end | | experimental cod end | |
|---|---|---|---|---|
| Tow number | stretched mesh (in) | estimated weight (lb) | stretched mesh (in) | estimated weight (lb) |
| 1 | 2-in diamond | 500 | 3-in square | 350 |
| 2 | 2-in diamond | 1,500 | 3-in square | 500 |
| 3 | 2-in diamond | 2,500 | 3-in square | 500 |
| 4 | 2-in diamond | 3,500 | 3-in square | 1,500 |
| 5 | 2-in diamond | * | 3-in square | * |
| 6 | 2-in diamond | 20,000 | 3.5-in square | 20,000 |
| 7 | 2-in diamond | 1,000 | 3.5-in square | 3,000 |
| 8 | 2-in diamond | 4,000 | 3.5-in square | 4,000 |
| 9 | 2-in diamond | 500 | 3.5-in square | 150 |
| 10 | 2-in diamond | 2,000 | 3.5-in square | 1,000 |
| 11 | 2-in diamond | 1,500 | 3.5-in square | 400 |
| 12 | 2-in diamond | * | 3.5-in square | * |
| 13 | 2-in diamond | * | 3.5-in square | * |

* too small to sample

Figure 7
Characteristics of a Generalized Sciaenid Pound Net

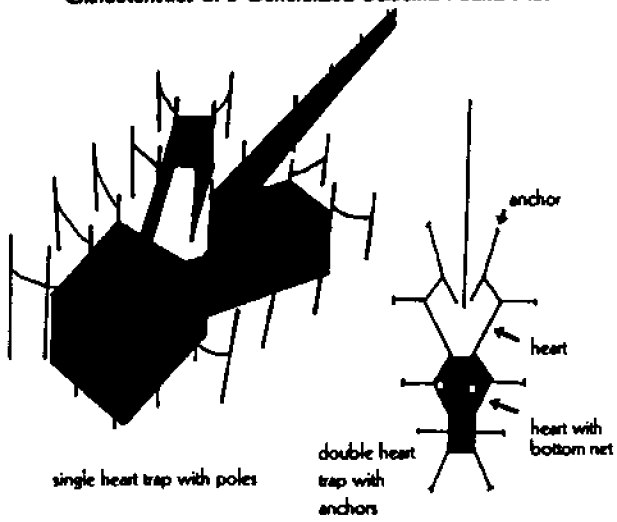



Figure 9
Pound Net Culling Device

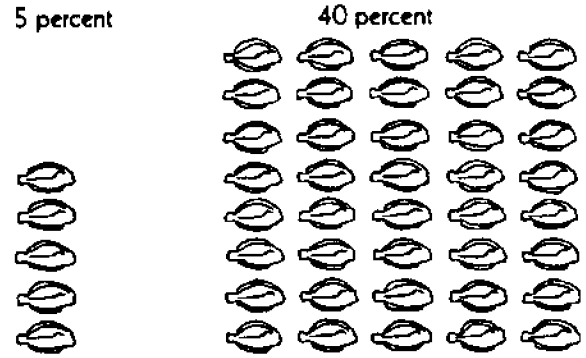



Figure 10
NMFS Sciaenid Pound Net Gear Testing
Percent Marketable fish retained (by weight) for diamond hearts tested in 1992

| Mesh | Weakfish | Spot | Croaker | Spanish Mackerel |
|---|---|---|---|---|
| 1 3/4" | 93 | 99.5 | 89 | 73 |
| 2 1/2" | 80 | 99.6 | 71 | 63 |
| 3 1/2" | 0 | 0 | NA | 10 |

Mesh sizes are stretched mesh measurements.

Figure 8
Location of Escape Panels Tested in the Pound Net Fishery for Flounder

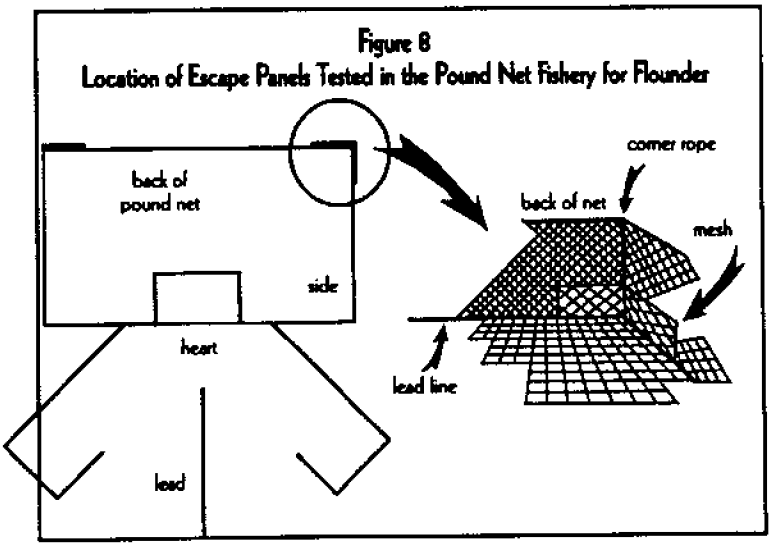


Figure 11
Long Haul Panel Placement and Evaluation of 2 3/4" Square Polyethylene Mesh in the Bunt Net

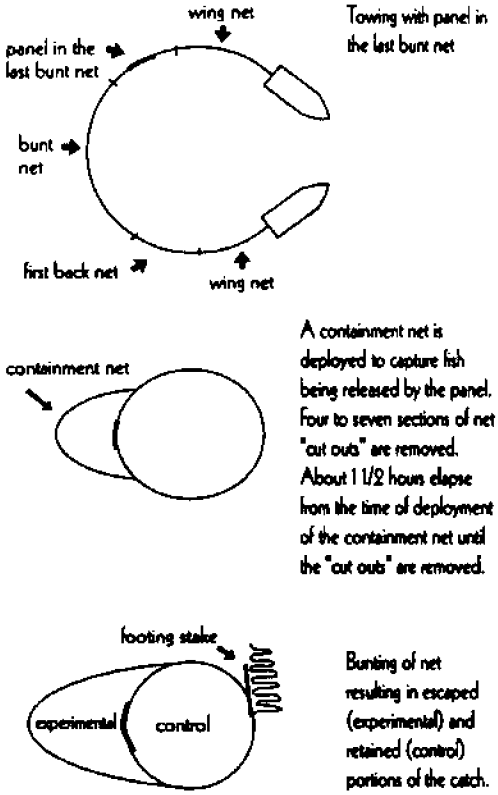



Figure 12
N.C. DMF Long Haul Culling Device Tested in 1992

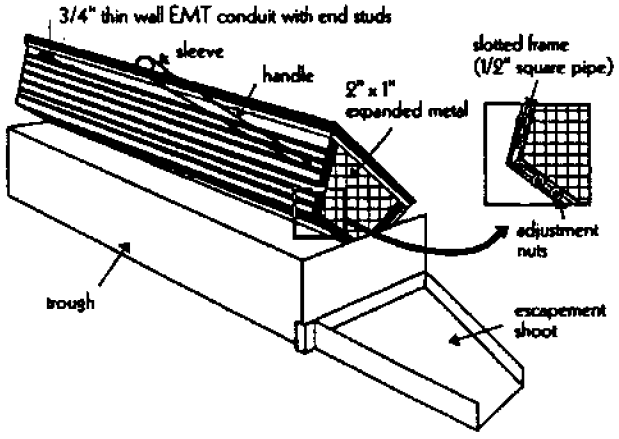



Figure 13
DMF Internal Gill Net Striped Bass Bycatch Monitoring
Number and percent mortality of striped bass observed in gill nets in the Albemarle Sound area less than and greater than 18 inches

| Target | Yards Observed | SB < 18" | Percent Mortality | SB > 18" | Percent Mortality |
|---|---|---|---|---|---|
| flounder | 2,150 | 5 | 100 | 82 | 60 |
| shad | 5,445 | 1 | 0 | 144 | 63 |
| perch/ herring/ mullet | 6,624 | 380 | 50 | 6 | 33 |

flounder: > 5 1/4" sink with tie-downs
shad: > 5 1/4" float
herring/mullet: 3"-3 1/4" float
perch: 3"-3 1/4" sink

cast net fishery like they have in South Carolina and Georgia.

We tested a culling device in the long haul fishery. It was a boat-mounted culling device to exclude juvenile fish before they came to the dock. We also tested a mesh escape panel but had a problem with fish being gilled in larger webbing. We are currently testing alternative materials (Figure 11).

As an example, we had one set this year with 4,000 pounds of unmarketable fish in our retention net — we landed 1,000 or 1,500 pounds of undersize fish at the dock from that haul. Now, I do have questions about whether all of the fish are actually going through the rings or escaping by other means. I am trying to deal with those concerns now.

One cull device that we tested didn't work well. It was a good idea. It mounts on the back of the boat — you dump the fish into the tray, and it has a slotted conduit that you could adjust to different sizes that dumps the fish back into the water rather than going to the dock (Figure 12).

We need to learn a lot more about our gillnet fisheries, especially the internal fisheries, because they are so diverse. It takes all of our manpower to monitor them. We have done some gillnet selectivity work with the Hatteras fishermen to come up with mesh size

requirements for weakfish to stay in compliance with ASMFC. We have also monitored bycatch in the internal gillnet fishery.

We did some striped bass bycatch monitoring in the ocean sink net fishery. Originally it was slated for dogfish, but we had to diversify into small mesh bluefishing and even in the monkfish fishery 20 miles offshore. Our people also went out on gillnet boats in the Albemarle Sound to observe the bycatch within their gillnets. The data are very preliminary, and we cannot yet accurately assess bycatch in gillnet catches. Hopefully we will get numbers to help with stock assessments and to answer some of the questions people have about gillnet bycatch.

In the flounder gillnet fishery, we have five fish less than 18 inches and 82 greater. They are using 5 1/4 inch webbing, so they are getting larger fish. But this depends on the length of the set, which needs to be factored in.

In the flounder fishery, we require 3- or 4-foot tie-downs. Making the nets fish shorter has helped reduce some of the bycatch in that fishery (Figure 13).

So where are we going? We are trying to develop a permanent state-funded gear development program in the division rather than relying on federal funds. It will give us more flexibility. We have already developed a statewide gear team. We want to continue with shrimp trawl research as more devices come out. And we want to start this three-year pilot program that I am working on now to look at issues such as alternatives for long haul pound net and gillnet fisheries.

Jim Easley: In terms of the pound net escape panels, why not just make the whole trap an escape panel?

Jeff Gearhart: In some of these fisheries, if you go to a larger mesh you are going to gill a lot of fish when you harden the net. If you have a panel in there, you can get that by the fish before you have any problems gilling.

Don Betts: Does a shrimp trawler have to empty his bag every so often?

Jeff Gearhart: No time limit.

Don Betts: When does he empty his bag? Like the release bag on the back, if you keep pulling and don't stop the water pressure, you are going to kill the fish.

Jeff Gearhart: But this allows fish to escape the trawl while it is under tow.

Don Betts: They will escape?

Jeff Gearhart: Yes.

Don Betts: How?

Jeff Gearhart: (demonstrates how FED works) It does work. But after a while if the catch builds up, it is going to change how that works. We are going to deal with that with hour tows and 30-minute tows versus commercial conditions that may be two or three hours. So our answer is you have to conduct commercial evaluations.

Don Betts: What if they won't let you on the boat?

Jeff Gearhart: They will. They are very involved with the data collection. We contract commercial vessels to conduct these evaluations.

Jim Murray: This project stems from a Fishery Resource grant. Three years ago the General Assembly established the Fishery Resource Grant Program. That program provides $1 million per year in grants to fishermen — commercial and recreational fishermen, seafood processors and dealers, and aquaculturists. The intent is to give the money to fishermen, not to academics. To my knowledge, it is the only program of its kind in the country.

This year Sea Grant administered it. We got 87 applications for funding totaling about $3.2 million. Only about 5 to 7 of the 87 were recreational in nature. Last year there were a few. The Coastal Conservation

Association got a grant for trout tagging. Bill Hitchcock got a grant to produce a catch-and-release video, which you are going to see. And Roger Rulifson got a grant to look at shad in the Albemarle area, which is a quasi-recreational project.

I bring this up to introduce Bill Hitchcock and to encourage the recreational fishing community to apply for those dollars. We returned $200,000 to the state coffers because we wanted to fund only quality proposals. Bill will be getting another grant next year in part because of his track record with this project.

## Catch-and-Release Video

Bill Hitchcock owns Hitchcock Broadcasting, a television production company in Morehead City.

When you want to learn something, the best way is to actually be there. Obviously you can't do that all the time. The second best thing is to make a video and get it in the hands of people. We made 500 copies of this catch-and-release video and mailed it to people such as sportswriters and newscasters, bait-and-tackle shop owners, pier operators and members of fishing clubs. We wanted to involve as many different people in as many different locations as possible — the logic being that anybody who sees this in North Carolina is going to be near somebody involved with this project.

The premise of this catch-and-release video is to help the recreational angler decrease release mortality. On television, particularly when you watch the bass fishing shows, you see one or two things done. You see a fish grabbed by the mouth, stuck in the water, swished back and forth and let go. Magically he is OK. Unfortunately, there is more to it. There are a lot of species of fish and there are lots of ways of releasing fish.

In this video, you will see people like Jim Murray and Jim Bahen from North Carolina Sea Grant, Bob Eakes from Red Drum Tackle in Buxton or Joe Shute from Captain Joe Shute's in Atlantic Beach. You will see N.C. Aquarium personnel and Division of Marine Fisheries personnel. These are the people who are actually doing catch and release.

And as I found out as the producer of this program, catch-and-release techniques are ongoing, constantly changing, and we could probably fill the top of every table in this room with the research that is being done. The idea is to educate people so they can spread the word.

We mailed a copy of this video to every fishing club. They meet one a month, and I am sure they're going to come up without a program or their guest is going to cancel. Now, they have the video and they can play it.

There is also a perceived value to a video. It will stay on somebody's desk. It doesn't get thrown away. And videos get shown, so this educational process is ongoing.

This is from the television show *North Carolina Saltwater Special Edition*. (Videotape played.)

## Plan to Improve Water Quality in the Neuse River

Lin Xu is an environmental engineer for the N.C. Division of Water Quality

I appreciate the opportunity to share some of the ideas about how to improve water quality in the Neuse River.

The Neuse River flows 200 miles across the piedmont and the coastal plain. Its basin covers almost 4 million acres. The upper basin is largely urbanized areas, and the lower basin is mainly rural and agricultural.

The Neuse and its tributaries were classified as nutrient sensitive waters (NSW) in 1988. At that time, there were water quality problems in the freshwater portions of the Neuse due to excess phosphorus. The phosphorus level was successfully reduced through wastewater treatment regulations and the phosphorus detergent ban. Even with the progress made to reduce the phosphorus concentrations, excess nutrients contribute to the present water quality problems in the Neuse River basin.

The Neuse River estuary experienced severe and

frequent fish kills in the summer of '95, which led to health advisories, and certain areas were closed to fishing. The excessive amount of nitrogen in the estuary has been identified as a key factor in the low oxygen conditions that caused massive fish kills in recent years. The excess nitrogen in the estuary is a result of human activities originating from rural, suburban and urban areas.

Some of these sources contribute more than others. For example, wastewater treatment plants are a source of the nitrogen load to the rivers — a source that the vast majority of us contribute to, especially those of us who live in more urbanized areas. Stormwater runoff is another source of nitrogen input, especially runoff that carries nitrogen from the fertilized lawns and commercial areas. Agricultural land is another source — cropland that is fertilized with commercial fertilizers and animal waste. Some other sources can be development activities that result in urbanized, commercial and industrial areas and failing septic systems. Even the air can contribute nitrogen. The bottom line is that we all share responsibility, and we also must share responsibility to clean it up.

The Environmental Management Commission (EMC) attempted to distribute the responsibility for cleaning up the Neuse. It began by using the best available scientific knowledge. It then considered delivery of the nitrogen from different sources and existing regulatory programs to control these loadings to the estuaries from agriculture, urban, stormwater and forestry sources. A draft conceptual Neuse River NSW strategy has been developed by the EMC to use the most cost-effective measures to control nitrogen.

In January 1996, a group of scientists convened by the Senate Select Committee on River Quality and Fish Kills, agreed that a 30 percent reduction in nitrogen loading would significantly reduce the frequency and severity of algae growth and fish kills associated with low dissolved oxygen levels. And that goal was codified by the General Assembly in the last session — House Bill 1339. In order to meet these goals, both point (nitrogen from a pipe) and nonpoint (nitrogen from stormwater runoff, urban areas, agriculture and forestry) sources can contribute only 70 percent of the existing nitrogen load, regardless of further development. That sets the goal at reducing the current load of 6.7 million pounds of nitrogen per year to 6.1 million pounds per year and holding it there. This is a collective goal for the entire basin. In other words, each of the farmers, landowners and dischargers does not have to meet the goal individually.

There has been a major effort by federal, state and local governments, industry and citizen groups to identify ways to solve the problems and to clean up the Neuse. Since 1984, we have had volunteer nonpoint source programs such as the agriculture cost share programs, which made good progress. But the Neuse is still in trouble, and we need to do more to reduce the frequency and severity of algae growth and fish kills in the estuaries. So for that, EMC is considering mandatory measures in addition to the volunteer measures.

The mandatory measures that have been considered apply to both point sources and nonpoint sources. They are designed to address the largest contributors of nitrogen. The point source programs cover wastewater treatment permits and illegal discharges; the nonpoint programs cover stormwater management, animal waste management, nutrient management and buffers.

So while animal waste management is going to comply with Senate Bill 1217, which was passed last year, an additional setback 25 feet from the ditches will apply to animal waste as a result of the Neuse plan. We took the Neuse plan to public hearing at the end of 1996, and we received a large number of comments. Currently, we are working with the Environmental Management Commission's five hearing officers to try to update the Neuse plans based on the comments we received. And we will go back to the EMC to have these approved at the June meetings. Based on the regulatory procedures, the Neuse management plan will not be in effect until August 1998. Meanwhile, there are other programs within our departments.

Another solution to address the nonpoint source pollution problem is to form local nonpoint source teams. A nonpoint source team is formed by representatives of local governments; interested groups and individuals; and federal, local and state agencies such as USDA-NRCS and local Soil and Water Conservation districts. As soon as the nonpoint source teams form, the Division of Water Quality will work with them as a partner on the mission to identify, prioritize and address the nonpoint source-impacted waterbodies.

The process starts with a discussion of existing nonpoint source programs. This will promote mutual understanding at the local level of programs within various agencies that address nonpoint source issues. And due to limited resources, the nonpoint source team probably will not be able to address all the NPS-impaired waters in the basins. So we will prioritize the waterbodies and issues, determine their needs and develop action plans to address the priority waterbodies.

The action plan will have the contact persons and time frames for certain goals. The important part is to implement the action plans, measure their success through monitoring and determine whether additional measures are needed for the impaired waterbodies.

At the end of 1996, the state agreed to contribute a portion of Section 319 grants to the nonpoint source teams. For those of you not familiar with 319 grants, they are a part of the federal Clean Water Act. The Division of Water Quality gets about $1 million per year for research projects. The projects will include education and research of best management practices (BMPs), BMP implementations and watershed restorations.

So the state nonpoint source working group approved a portion of the money for the teams to use as seed money for addressing problems at the local levels. The nonpoint source team this year got the grant; next year, the Neuse will get a portion of the 319 grants. Currently, there are three Neuse River nonpoint source teams because of the river's complexity and geographic differences. The lower-, mid- and upper-Neuse nonpoint source teams are in the process of identifying existing NPS programs. Next year, each team will probably get about $100,000 to develop a project to address the priority waterbodies and issues in the basins.

To close, the Neuse River is a treasure that belongs to North Carolinians, so we all share in the responsibility to keep it healthy.

Lou Biggerstaff: Many people would say that a lot is wrong with the Neuse River, and the state and Water Quality Division are not prepared to deal with it. Is it a matter of money? Do they not want the tourism in the country to go down the drain the way the TV programs have shown it? The programs you laid out will take three more years of study before starting something, and you are still talking about $1 million that won't begin to do it. How much money would it take to start doing something rather than talking about it?

Xu: There are several programs for the Neuse — including the mandatory nutrient sensitive water strategy currently being proposed. That will be taken to the Environmental Management Commission in June. A new animal waste regulation is in place. At the same time regulatory programs are going to EMC, volunteer programs are going on in the basins and in our department. We try to identify the problems and address them too.

Lou Biggerstaff: They have been identifying the problem for 10 years. Can you mention one item done by the Division of Water Quality in the last two years to improve water quality in the Neuse River other than talk about it?

Lin Xu: I wish I had an answer for you.

Skip Kemp: That was a tough question.

Lou Biggerstaff: We have got a tough problem down there, and talking doesn't get it done.

Skip Kemp: There are some things that have been done. I would think in the last two years, they would have done something.

Lou Biggerstaff: Now, wait a minute — I said other than talk about it.

Skip Kemp: I said done. I think they have done something.

Lou Biggerstaff: They have done something?

Skip Kemp: Well, haven't they done something about regulating the application of animal waste?

Lou Biggerstaff: You come on down there and see. I will show you how they regulate it. I will show you where it flows into the river.

Skip Kemp: I am sure there are places where that is happening, too. I am not defending that practice by any means.

Lou Biggerstaff: No, you could not defend it.

## Economic Assessment of the Bluefin Tuna Fishery

Jim Murray is (former) director of North Carolina Sea Grant's Extension Program

As you all are aware, large schools of giant bluefin showed up off the North Carolina coast in 1994. Some argue they were there all along and just weren't fished; others argue that they have changed their migratory patterns. But one of the interesting things about the fishery is that it gave us a chance to do an economic before-and-after study. In previous years on the Outer Banks, where this fishery takes place in the winter, there was very little fishing and economic activity. So from an economic perspective, it was a very nice place to study some of the benefits of a recreational fishery — in this case a catch-and-release recreational fishery.

There is a lot of interest, even from the National Marine Fisheries Service, in any data that might be provided. Today, you have heard that social, economic and cultural data are very important in the fishery management plans, and the decision-makers look at these things as they begin talking about quotas.

Rich Novak, a former agent in Sea Grant's Manteo office, did a preliminary assessment of the economic returns of this fishery for the 1996 season, primarily January, February and March. In this presentation, I am reporting on Novak's findings.

This winter, the survey has been extended. The American Sportfishing Association (ASA) is funding a study by Bob Ditton at Texas A&M University. And Bob is getting some social information about this fishery. ASA is interested because it would like to show that a catch-and-release fishery for giant bluefin tuna in North Carolina has a large economic impact to these communities. So Sea Grant tried to show some preliminary numbers on what the impact may have been.

Charter boat operations in 1995 began doing trips primarily for catch and release of these fish. It created international publicity. And by 1996, people were coming from as far away as Australia to fish. This fishery created economic opportunity to the point where Outer Banks businesses that had previously been closed were now opening in the winter for the first time. At least two businesses reported their best month ever in February 1996. That is out of the entire year, including the summer tourism months.

The analysis included four towns — Avon, Buxton, Frisco and Hatteras Village. Keep in mind there was also economic gain by other communities. For example, some of the anglers stayed north of the Oregon Inlet bridge in Nags Head, Kill Devil Hills and even Manteo. Novak collected spending and revenue data by surveys of boat captains, business owners and managers, food service and lodging, and via tax receipts from public officials. They keep data on both lodging and restaurant receipts in Dare County.

The Division of Marine Fisheries surveyed anglers

from Jan. 6 to Feb. 25, only about half of the full season for 1996. During this period, agents interviewed 1,142 people and measured 246 fish. The mean length was about 147 centimeters and about 175 lbs. They estimated around 2,000 charter boat trips and about 1,000 private boat trips. There was about a 10-to-1 ratio of fish released to fish harvested.

Most of the people sampled came from Virginia. North Carolina was second and Maryland and other mid-Atlantic states followed.

Typically, fishermen were catching an average of seven to 10 fish per trip. I think that was generally a function of how well their backs held up. Most of these fish were in the small-medium category in 1996 — less than 73 inches.

There were 28 boats operating out of Teach's Lair Marina, another six out of Oden's Dock and another 25 out of Hatteras Harbor Marina for a total of 59 boats. Their estimated revenue during this time was $2.3 million based on total fishing days times the average price per boat plus tips for the mates. Another four part-timers yielded $58,000 calculated the same way.

The private boats are not fully accounted for. A number of boats fishing from the Morehead City area were not included. Figuring three trailered boats per day boosts the direct impact to around $2.6 million. And this is probably an underestimate.

In 1994, very few motels were open in the winter months. By mid-January 1996, a few motels opened to meet the extra demand for customers fishing for bluefin tuna. A market also appeared for upscale rental cottages. It is anecdotal information, but a lot of these folks had more money than those of us who work at the university and would think nothing about shelling out $4,000 or $5,000 to rent an upscale cottage for a week. That created a new market for home rentals in the Hatteras area in the winter months.

The lodging receipts based on Dare County tax records went up by about 243 percent or about $300,000 between 1994 and 1996. Arguably, most of that is related to bluefin tuna. Meal receipts from 1994 to 1996 increase by 173 percent — a little over $200,000.

So in summary, using just direct numbers, we are seeing a $3.1 million increase in revenues.

Other ways folks might spend money include souvenirs, grocery stores and gasoline, and these are not included in this figure.

The analysis does not take into account what is called the multiplier effect, and Jim Easley, an economist, could tell you more about that. Let's use the $3.1 million figure — by the time that money circulates through the economy, its impact is $6 million to $9 million.

Let's look at bait, for example. Several hundred thousand dollars of bait is purchased for this fishery. That money goes to a commercial fisherman who lives in Hatteras. He spends it at the grocery store, and the store owner spends it elsewhere. So economists use a multiplier, and the total economic impact for that area might be two to three times higher than the direct estimate. Again, these figures are underestimated.

There were other unmeasurable or intangible economic benefits from the fishery. Here's just one anecdote — a guy came in and plopped down $2 million for a sportfishing boat while he was in Hatteras.

There was also positive publicity for the area. It is very hard to get a grasp on what that means economically, but there is no way that the Hatteras charter boat fleet could have afforded to pay for the publicity associated with this fishery. People who came in during the winter got to know the captains and the fishery, and they will come back or tell friends about how great the fishing was off Hatteras. There was national and international media attention, which bodes well for Hatteras and the fishing fleet.

This year, a group of scientists visited from the Massachusetts Department of Natural Resources, New England Aquarium, Stanford University, NMFS, and they were spending money as well.

So Bob Ditton is going to get a lot more information from his survey. I think we can show a sizeable economic gain to those communities in the winter months

when not much else is happening — all attributable to this fishery.

Lou Biggerstaff: Did you get to go?

Jim Murray: I have not been.

Lou Biggerstaff: We fished it in '93, '94 and '95. The fish got too far north for us to go out of Morehead City. But I know last year one boat made 27 trips from Morehead City. They were in the Morehead area starting at Thanksgiving, and after December they had already gone north.

Jim Murray: What size were they? Were they running the same size this year?

Lou Biggerstaff: The ones we caught last year were smaller fish. We brought in one, over your head. That is the first and last one I will ever keep. The reason these fishermen come is because there is no sport in catching them. You can go out there and catch them, but getting them in the boat is the sport.

Jim Murray: I know Mac Currin was out there two years ago and literally caught one on a beer can just fooling around.

Lou Biggerstaff: You can catch them on a bare hook.

Tom Quay: What does a $2 million sportfishing boat look like?

Jim Murray: I have never seen one.

## Life History of the Hickory Shad

Roger Rulifson is a fish biologist at East Carolina University.

If you haven't been fishing up in the Weldon area on the Roanoke River, you are missing a great thing in the springtime because there is a new fishery there. It is a hickory shad fishery. These are 1- to 2-pound fish, and they look kind of like American shad.

It is unclear why suddenly we see this big increase in hickory shad here in North Carolina, especially in the Neuse River system. Very little is known about the species along the eastern seaboard of North America. It used to be that hickory shad were reported from the Bay of Fundy down to Florida, but now we find them only south of Long Island. It appears that the hickory shad's center of abundance is here in North Carolina, and yet we know very little about them.

Two years ago, my student Chris Batsavage began his master's thesis on the hickory shad in North Carolina. Last year we were fortunate enough to get Fishery Resource grant money to study this fish. And so Chris Batsavage is going to tell you about what we have found so far in this study.

Chris Batsavage: Three common species are related to the hickory shad; the American shad, alewife and blueback herring. A lot more research has been done on those fish than the hickory shad, and little is known about this fish throughout its range.

The hickory shad population has been increasing in the Roanoke River and Albemarle Sound over the past few years, and as a result, a significant recreational fishery now takes place during their spawning run in March and April. They average about 1 to 2 pounds, and when they are really abundant, it is common for anglers to catch up to 100 a day and sometimes more.

They are not prized as table fare. However, the roe from the females is considered to be a delicacy around Weldon. And some residents keep hickory shad and eat them during the year.

Many of the key life-history aspects of the hickory shad are not well known. The last two extensive studies were done in the late '60s — one in the Altamaha River in Georgia and one in the Neuse River in North Carolina. It has been assumed that the life history of the hickory shad is identical to American shad, and therefore the management plans for both fish have been identical.

However, we found that the life history of hickory shad isn't the same as the American shad in all cases.

The key life-history aspects that need to be understood for making management decisions include the population structure (age, size and sex distributions), age at maturity, fecundity (potential number of eggs produced by the females), spawning habitats and the juvenile nursery grounds. The goal of our study was to characterize the key life-history aspects of hickory shad in the Roanoke River/Abermarle Sound watershed to provide basic information for state and federal fishery management plans.

The objectives of our study were to estimate potential fecundity, to identify the juvenile nursery grounds, and to determine the age, size and sex compositions of pre-spawning adults in the Albemarle Sound and near the hypothesized spawning grounds in the Roanoke River.

The Roanoke River's headwaters begin in southwest Virginia. It flows about 137 miles from Roanoke Rapids Dam to Albemarle Sound. Its watershed consists mostly of swamp forests, blackwater streams and oxbow lakes. The natural river flow has been altered by several reservoirs upstream.

About 14 tributaries, including the Roanoke River, enter the Albemarle Sound, which is located in the northeast part of the state. From west to east, it is about 55 miles long; from north to south it is 3 to 14 miles wide. It is a relatively shallow estuary with a central basin depth of 18 to 25 feet, and its shoreline consists mostly of cypress swamps and small sandy beaches.

Adults were collected from February through May of 1996 from three sources: the N.C. Division of Marine Fisheries' independent gillnet survey in Albemarle Sound, the Roanoke River National Wildlife Refuge gillnet survey and the recreational fishery on the Roanoke River in Weldon.

The data recorded from these fish included fork length, body weight, body depth, gonad weight, sex and gonad color. We also calculated the gonadosomatic index (GSI) for these fish, and that is the percentage of the hickory shad's body weight consisting of the gonads (testes or ovaries).

For aging the fish, we used the scale method. We followed aging criteria for hickory shad and the American shad used in previous studies.

For fecundity estimates, we took subsamples from each ovary. The eggs were counted in each subsample and were extrapolated to estimate the total number of eggs.

To identify juvenile nursery grounds, we used two types of gear. The first was a 60- by 6-foot beach seine with a quarter-inch mesh and a 6- by 6-foot tailbag. We used an 18-foot bottom trawl that was towed by an outboard-powered boat. We made two five-minute tows at each site.

The sites in Albemarle Sound were sampled twice a month from May to October 1996, and at each site we recorded the water temperature, dissolved oxygen, secchi depth (a measure of water clarity), air temperature, wind direction and velocity, weather and time of day. The fish we collected were enumerated by species and preserved.

We examined 266 hickory shad in the Albemarle Sound: 111 from the Roanoke River National Wildlife Refuge and 266 from Weldon. In Albemarle Sound and Weldon, there were slightly more females than males.

People fishing at Weldon prefer to harvest larger female roe shad. However, the fishermen who were supplying us tended to keep everything they caught, so we were getting a pretty good representation of what was in the river at that time.

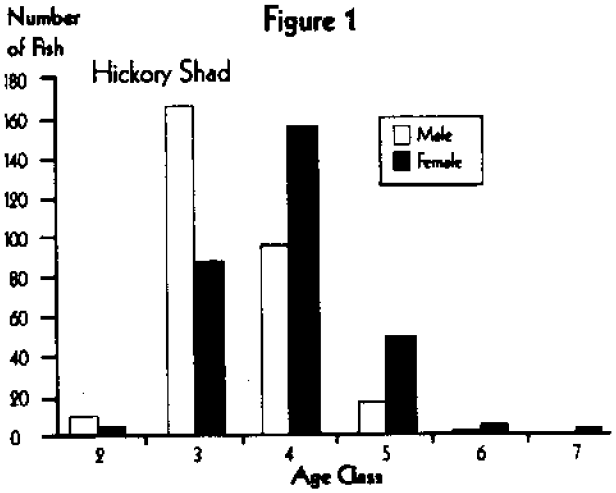
In the Roanoke River National Wildlife Refuge, there were many more males than females, and this can be attributed to the gillnet mesh size used in their survey. They used a 2 1/2-inch to 3-inch gillnet mesh, which would select for the smaller male fish.

In general, the females were larger than the males. The minimum, maximum and mean fork lengths for Albemarle Sound and Weldon are fairly similar. In the Roanoke River refuge, though, the mean fork lengths for the males and females are almost identical. This can be

attributed to the mesh size used in their gillnets. The 2-plus-inch to 3-inch mesh would select for males and the smaller females.

We found the majority of the male fish were age 3, while the majority of the female fish were age 4 (Figure 1). There is a sharp decline in the number of males and females ages 5 through 7, especially when compared to ages 3 and 4 fish. This age-class distribution is fairly similar to what has been seen in other studies on hickory shad.

Figure 1




The mean fork lengths for both male and female hickory shad increased with age. However, there is a lot of overlap in the size ranges among the different ages. Ages 2 through 5 females have a lot of overlap, and most of those fish fall between a 300- to 350-millimeter size range (Figure 2). With male fish, we see generally the same trend. The size ranges for ages 3 and 4 fish are very similar, and likewise, there is a lot of overlap in the age 2 fish versus ages 3 and 4 versus age 5 (Figure 3). Therefore, it is hard to tell how old a hickory shad is by looking at the fork length.

We also wanted to take a look at the age of maturity for hickory shad. About 36 percent of the male fish we examined were sexually mature by age 2, and 39 percent of the females were mature by then. By age 5, 100 percent of both sexes were sexually mature (Figure 4).

We also examined the spawning marks on their scales. These are scarlike rings formed by the erosion of

Figure 2

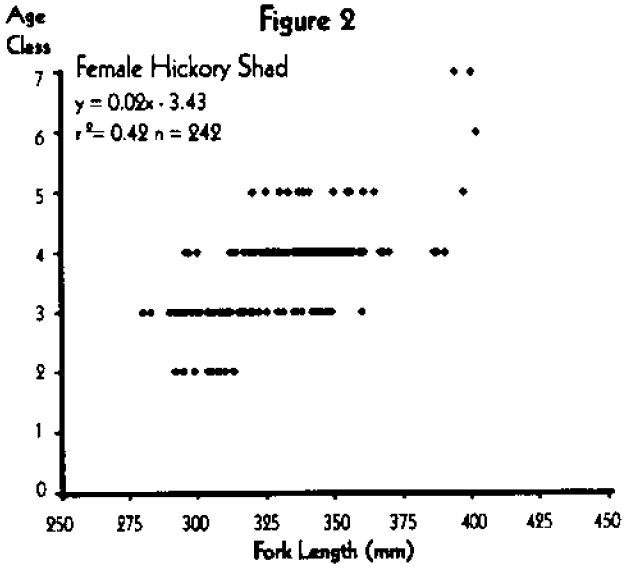



Figure 3

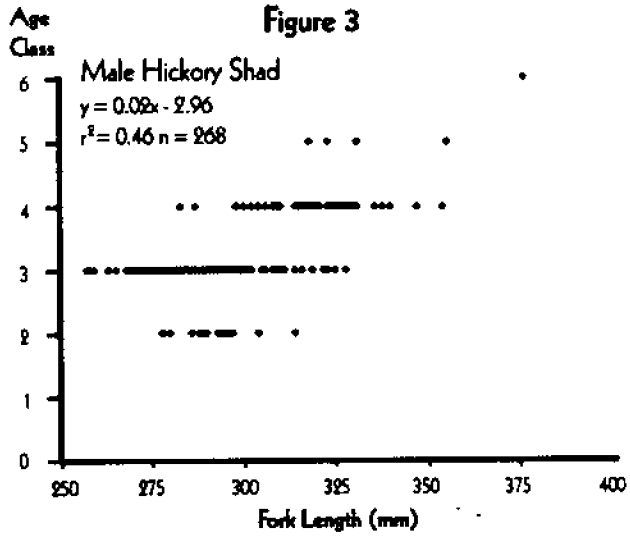



Figure 4

Age at maturity percent of male and female hickory shad in the Albemarle Sound/Roanoke River watershed, 1996.*

| | | age | | | |
|---|---|---|---|---|---|
| | n | 2 | 3 | 4 | 5 |
| male | 233 | 36.1 | 97.9 | 99.6 | 100 |
| | | (84) | (228) | (232) | (233) |
| female | 213 | 38.5 | 93.9 | 98.6 | 100 |
| | | (82) | (200) | (210) | (213) |
| Sexes | 446 | 37.2 | 96 | 99.1 | 100 |
| combined | | (166) | (428) | (442) | (446) |

* Numbers of fish mature by each age in parentheses.

the scales from lack of feeding during the spawning migration. They are counted as annual rings. Spawning marks tell you how many times these fish had spawned previously. About 25 percent of the females we examined had no previous spawning marks. The majority of them had one or two spawning marks on their scales. There were few female fish that had three or more spawning marks.

For the male fish, about 47 percent were virgin fish, and another 46 percent had one spawning mark. Fewer males than females had two or more spawning marks.

We examined 47 fish for fecundity, and these fish spanned the size ranges of females we collected. The overall range of fecundity was from 80,290 to 478,944 eggs. The mean number of eggs per gram had a lot of variation. It ranged anywhere from slightly more than 1,500 eggs per gram to a little fewer than 4,000 eggs per gram. One thing we noticed among the three locations was the mean fecundity at Albemarle Sound was larger than the mean fecundity in the Roanoke River refuge. This is indicative of the size difference among females at those two locations. Generally, fecundity increases with age, although a lot of variation exists, especially with fish ages 3 and 4 (Figure 5).

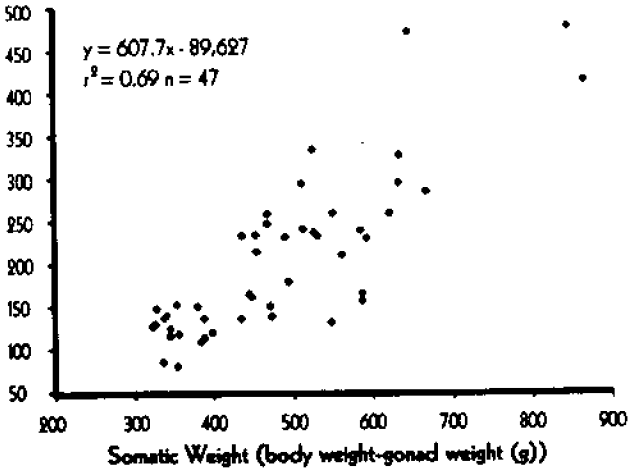
**Figure 5**

Potential fecundity to age class relationship for female hickory shad


We also wanted to look at how fecundity compared with somatic weight — the total body weight of the hickory shad minus the ovary weight. This was done because the larger, heavier ovaries naturally have a higher fecundity and would influence this relationship. And we see fecundity generally increases as somatic weight increases (Figure 6).

**Figure 6**

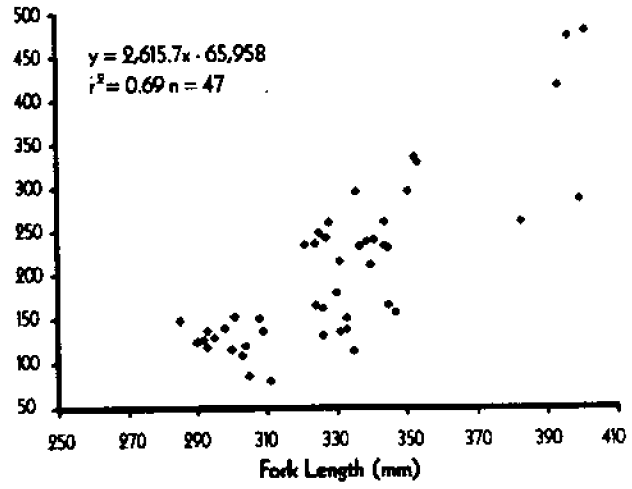
Potential fecundity to somatic weight (g) relationship for female hickory shad




We also compared fecundity to the fork length of these fish and basically saw the same relationship — fecundity generally increases with fork length (Figure 7).

**Figure 7**

Potential fecundity to fork length (mm) relationship for female hickory shad




We are recording the gonadosomatic index for female fish only. There is a large difference between the

minimum and maximum values in each of the three areas. The pre-spawn fish have a GSI close to the maximum, while the post-spawn fish will have a GSI close to the minimum. The minimum GSI for fish from the upper Roanoke River is higher than the minimum GSI for Albemarle Sound. We think that when these fish finish spawning and head down the river to the ocean, the ovaries are being resorbed by the body by the time they get to Albemarle Sound. So the gonadosomatic index will be less as they head back to the ocean.

We also wanted to know how fecundity related to the gonadosomatic index. Again, we found a general increase in that relationship, with fecundity being higher as the gonadosomatic index increased (Figure 8). But we did have a bit of variation in those as well.

## Figure 8

Catch per unit effort of four juvenile *Alosa* species by region in beach seines in Albemarle Sound and selected tributaries.*

| | CPUE by region | | | | |
|---|---|---|---|---|---|
| species | Northwest | North-Central | Southwest | South-Central | Southeast |
| | (n=39) | (n=27) | (n=15) | (n=20) | (n=26) |
| Hickory shad (n=10) | 0.1 | 0.2 | 0 | 0 | 0.1 |
| American shad (n=38) | 0.2 | 1 | 0.1 | 0.1 | 0 |
| Alewife (n=232) | 1.1 | 3.1 | 0.7 | 4.0 | 0.5 |
| Blueback herring (n=6,140) | 1.8 | 19.2 | 366.9 | 2.4 | 0 |

* Numbers of samples in parentheses.

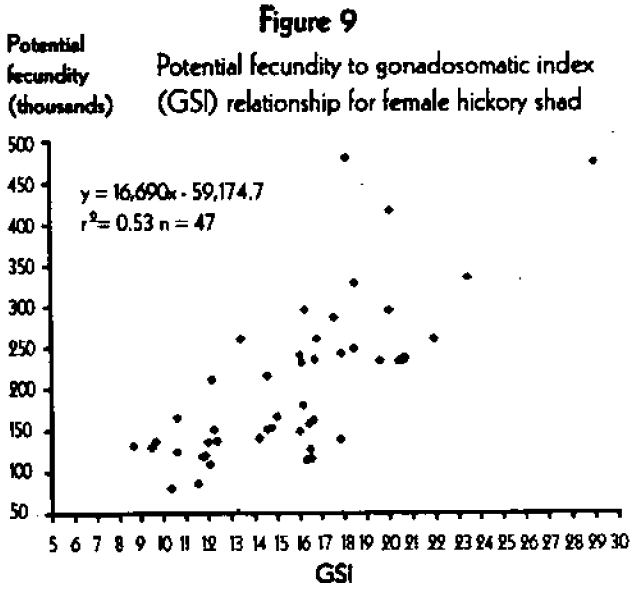
In our juvenile survey, we did not find many juvenile hickory shad in the Albemarle Sound, especially when compared to the number of juvenile American shad, blueback herring and alewifes we collected (Figure 9). We suspect that hickory shad leave the river and sound at a very early age and do not use the Albemarle Sound as a nursery ground like the other three alosids. The nursery grounds are still unknown for the Roanoke River and Albemarle Sound hickory shad.

The location and distribution of first-year, immature adults are poorly documented through their range. A study in the late 1960s on the Altamaha River in Georgia was one of the few that found a significant number of juvenile hickory shad. Shrimp trawlers, working 0 to 5 miles off the coast of Georgia, collected more than 800 juvenile hickory shad in their trawls. This was far more than were collected in the Altamaha River or its adjoining estuary during that same study.

In conclusion, hickory shad are a short-lived fish, and mortality appears to be high after age 4. The earliest age of maturity for both males and females is 2. One hundred percent of the males are mature by age 4, while 100 percent of the females become sexually mature by age 5. The large variation in length at age makes size limit management difficult if it is done to ensure all fish spawn at least once.

## Figure 9

Potential fecundity to gonadosomatic index (GSI) relationship for female hickory shad




For management considerations, we believe that recreational anglers should be conservation-minded when harvesting hickory shad on the spawning grounds. Although they are abundant now, we feel that harvesting 50 to 100 hickory shad a day is too many.

The seasonal commercial value of hickory shad tends to regulate the harvest, although it is low. They are caught as bycatch in the American shad fishery. Usually the larger female hickory shad are caught in the 4- to 5-

plus-inch mesh gillnet used to catch American shad, and the ones that are caught are marketed with American shad and sold in local seafood markets.

Question: Chris, have you done any scale age verification using the otoliths?

Chris Batsavage: No, not yet. I did take the otoliths out of 450 or 500 hickory shad, and I plan to compare the ages I get from the otoliths to the ages from the scales of the same fish.

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