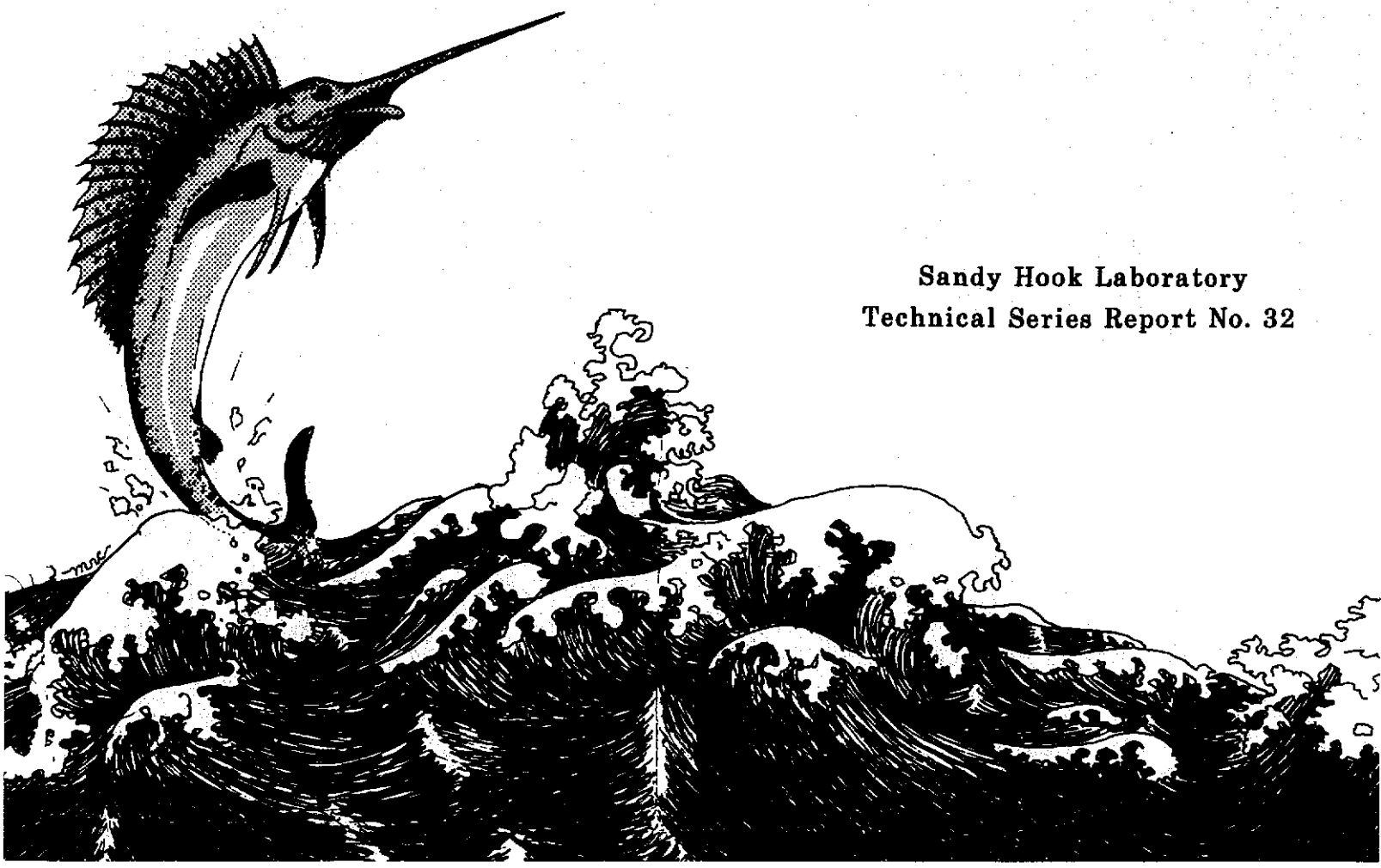
RECREATIONAL FISHERIES AND THE ENVIRONMENT

Past, Present, and Future

Proceedings of the Walford Memorial Convocation

1985



Sandy Hook Laboratory
Technical Series Report No. 32

RECREATIONAL FISHERIES AND THE ENVIRONMENT
PAST, PRESENT AND FUTURE

PROCEEDINGS

OF THE

WALFORD MEMORIAL CONVOCATION

A Workshop Sponsored Jointly by

American Littoral Society
New Jersey Marine Sciences Consortium
National Marine Fisheries Service, Sandy Hook Laboratory

Anthony L. Pacheco, Proceedings Editor

Sandy Hook Laboratory

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Lionel A. Walford
1905–1979

EDITOR'S FOREWORD

There are text references to events of 1985 which will not make much sense to a reader without some prefatory remarks because it was a schizoid year for scientists of the Sandy Hook Laboratory.

The year marked the laboratory's Silver Anniversary; 25 years have passed since the marine research program of the Bureau of Sport Fisheries and Wildlife was launched in the fall of 1960 at Sandy Hook. Their commitment was a response to public concern in preserving recreational values of sea fish resources and their environments and represented a Federal recognition for a continuous and comprehensive program of research.

Over the years, the laboratory has focused on fish and environmental studies to describe the fit of components that affect the lives of game species as food, competitors or enemies. The laboratory has produced an impressive body of research literature to document the statistics of resource trends, changes, and disasters. It has matured as a center of excellence for marine fish and environmental research studies.

On September 20, 1985, the original laboratory building burned. It had been created from the deactivated 50-bed Army Hospital of Fort Hancock, originally designed by Stanford White and completed in 1899. It was the first federal laboratory dedicated to marine recreational fishery research in the United States. Destroyed with the building were research data, study collections, laboratories and the Lional A. Walford Library.

A. L. Pacheco
Proceedings Editor

INTRODUCTION TO CONVOCATION

Stuart J. Wilk
Laboratory Director
Sandy Hook Laboratory

The Walford Convocation series of lectures and workshops was initiated in 1979 to provide a forum for the public to focus on coastal issues and problems. This series is sponsored by three institutions making up the marine science community of Sandy Hook, New Jersey, each involved with the seacoast in a unique way.

The National Marine Fisheries Service is concerned with the assessment of the living marine resources and pollution impacts on stocks and their habitats.

The American Littoral Society, a nonprofit organization of amateur and professional naturalists, encourages the study of marine life, particularly nearshore, and fosters public awareness in coastal issues and needs for conservation actions.

The New Jersey Marine Sciences Consortium provides educational programs, university research support, and advisory services to broaden public awareness and interest in marine resources.

This annual Convocation is intended to honor Dr. Lionel A. Walford who was instrumental in starting all three of these organizations. In 1961, while director of the Sandy Hook Laboratory, he helped guide the formation of the American Littoral Society. In 1974, after he retired from Federal service, he joined the New Jersey Marine Sciences Consortium until 1979. In 1976 he wrote the first New Jersey Sea Grant Program, and served as director of the Sea Grant Office of the Marine Sciences Consortium.

Many of you in the audience probably did not know Dr. Walford. I was fortunate enough to be hired by him some 20-odd years ago, and how I got my job was perhaps the most unique situation I have ever been in. I had read an article in a magazine that told about the new laboratory at Sandy Hook which at that time was a U.S. Department of Interior research facility. The article was full of glowing things about how the lab would study the sea and the interaction between the marine environment and the resources which use it. I was struck with that thought. At the time, I was in pharmacy school, believe it or not, but I thought "This would be a wonderful thing to do. It would be both quite interesting and goes right along with my interests."

It probably broke my mother's heart, but I went to the laboratory and asked for an audience with Dr. Walford, to which he obliged. Imagine, a college sophomore coming in and talking with the director without an appointment. I walked in and he asked, "And what credentials do you have?"

I said, "I nave been in pharmacy school for two years," and he scowled a bit and replied, "Why do you want to work here?" I responded with, "Well, because I really love the ocean and I think I would like to make this a career." He hired me. We then negotiated salary, and he paid me forty dollars a week!

This is not a unique story. It has happened to other people, some quite famous in the field of marine science. Several people in this room today have had similar dealings with Dr. Walford.

Yesterday I spent a good deal of time looking through past proceedings of the Walford Convocations, with the thought of usurping various things that people have recalled about Dr. Walford. But it really was not appropriate. I think his deeds and the ideas he avowed are perpetuating his memory. I would like to make a point of interest. In 1959 he wrote a document entitled, "Prospectus for Marine Fisheries Research in the Federal Government." It was a typical planning document insofar as it listed issues and how they could be solved. However if you look at the research being done today not only in the National Marine Fisheries Service but also at the university and state level, you will find many of his ideas have been perpetuated. At the end of this prophetic document of 1959 he made a statement recognizing that his observations would, in many instances, take a very long time to attain. In today's program, we will try to review recent progress and problems in fishery science of the Middle Atlantic region.

Our first speaker is a long-time friend, and a very interesting person. At the present time Chris Weld is director of the National Coalition for Marine Conservation, an Atlanta/Boston based organization interested in the conservation of marine gamefish. He has also served on the New England Fishery Management Council. Chris has been involved in fishery management, particularly in the management of large gamefish for as long as I have known him.

MANAGEMENT ISSUES OF THE OFFSHORE PELAGIC FISHERY

Christopher M. Weld
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I come from a small town on Cape Ann called Essex, Massachusetts. If anything, it's more a suburb of Gloucester than of Boston and a smaller town, probably, than most of the coastal towns here on the Jersey shore. So small that it doesn't support a hardware store. The local hardware store is in the neighboring town of Ipswich. Nevertheless, an Essex fellow went up the road to Ipswich to the hardware store. The manager said, "Morning, Henry, what's on your mind?" And Henry said, "Sex, but I come for ten-penny nails."

What I had in mind this morning was to present a rather lengthy paper on fishing management offshore, mainly because I really didn't know what kind of an audience I would be talking to. I supposed it to be mostly National Fishery Service people and Sea Grant people thoroughly backgrounded and familiar with the Magnuson Act of 1975. Looking around the room I have a feeling that most of you probably are aware of the Magnuson Act, more popularly known as the 200 Mile Limit Act, but not all that steeped in the workings. So if I started going on about OMB and EEZ and MSY and OY and some other alphabet soup-type words, I'd soon lose you. Incidentally, the reason I had written notes is, if I hadn't, I would lose me, too.

Instead, I'd rather talk informally with you about what is going on offshore--what's out there, what are the problems, how do we manage, why isn't management working; and what can be done to make management more effective.

When we talk about offshore pelagics, we're talking about blue marlin, white marlin, swordfish, sailfish, dolphin, wahoo, tunas of all kinds and sharks of all kinds; most of which are found offshore of New Jersey. To the extent that these fish are within 200 miles off shore they come under the fishery management jurisdiction of the United States. That is, all of them except the tunas. The fact that tunas are exempted from the workings of the 200 mile limit law is one of the great thorns in the side of people who are trying to manage the resources offshore.

When he first invited me to come here today and to talk about these things, Stuart suggested that perhaps I could give you an update of what's been going on over the last ten years or so offshore. The most significant thing that happened in the offshore fishery is the usage of the longline. The longline, to those who aren't familiar with it, is as its name suggests, a very long fishing line suspended between buoys. From these lines are suspended shorter lines with hooks baited with whatever is in current vogue and available to the fishermen. Some of these longlines extend for 20 or 30 miles. The longlines fish at varying depths for the distance that they are

set and they catch whatever is there. If you set the longline during the daytime to catch tunas, it's going to catch all the other daytime feeders in the same area, whether those are sharks or marlin or whatever.

If you set them at night to catch swordfish, for some reason they'll still catch tunas and sharks. The Japanese lines are so long that they are set the clock around because the boat has a long return to begin retrieval from the starting point. Japanese longlines catch virtually everything in the water.

At the adoption of the 200 mile limit, our own domestic tuna fishermen based on the West coast put up stiff opposition. It became apparent to the people who wanted a 200 mile limit that unless they exempted tuna from offshore jurisdiction, we wouldn't get the Act passed.

We have no direct control over what the Japanese do or what anybody else does if they enter within the 200 mile limit to fish for tuna. This makes it very difficult for the Fishery Management Councils to devise management strategies to regulate the fishing on these other species. It is of crucial importance to recreational fishermen that some management strategy be devised to deal with the situation, because most of the pelagic species are fully exploited or they have been overfished and have become heavily depleted.

One of the provisions which Senator Lautenberg's original bill contained is a repealer that closed this exemption to foreign fishing within the 200 mile limit. There have been movements - many of them started here in New Jersey - to close this exemption so that all vessels, regardless of what flag they fly, will be subject to United States fishery jurisdiction. Bills supported by some of these movements have been as close as to success to have come before the House Fisheries Subcommittee. Senator Lautenberg, I think, might have the first proposal to be introduced in the Senate. Unfortunately, as I understand it, he has not been able to find much support among Senate colleagues and either has withdrawn or is considering withdrawing that repealer. It will be interesting to ask him exactly what the status is.

In any event, when Congress enacted the Magnuson Fishery Conservation and Management Act, the Act created seven management councils charged in each case with the task of developing plans to manage the fisheries within their areas of jurisdiction. These plans have to be consistent with a number of criteria built into the Act. The "guts" of the Act, as I see it, is the first criterion, which states that fishery conservation and management plans must prevent overfishing. That seems like a simple enough concept -- the plans stop overfishing and once you prevent overfishing, stocks rebuild. If the stocks are rebuilt, fishing is adequate. If there are enough fish there will be fishing for everybody. Unfortunately, when this fairly simple and straightforward concept was implemented, somebody in the National Marine Fisheries Service wrote a series of guidelines to interpret what this meant. They defined overfishing in a way that I don't think gives much guidance to anybody trying to interpret that Act.

The definition of overfishing is convoluted. In the section of the guidelines dealing with it, the subject of overfishing concludes with the statement -- "Fishing can produce a variety of effects on local and stock-wide abundance, availability, size and composition. Some of these effects have been called overfishing. A Council may recommend measures to prevent or permit these effects depending upon the objectives of the particular plan." In other words, overfishing, according to the guidelines, is whatever the council says it is. National standards also say that fisheries will be managed to produce optimum yield.

Now, "optimum yield" is also a fuzzily defined standard that talks in terms of managing the fisheries to produce the optimum benefit to the fishermen, taking into account the economic needs of the fishery and the biological needs of the resource. It doesn't really prioritize between the needs of the fishermen and the needs of the resources. If overfishing isn't clearly defined, there's no red line. There's no sort of warning flag that says, "Okay, now stop balancing these economic needs and start conserving the resources." The definitions have been turned in on themselves and they're absolutely meaningless.

I think if the Fisheries Conservation and Management Act is to be made effective - and there is to be a legislative review of the Act in 1987 - Congress has to look at the definitions and either decide the fisheries are going to be managed or they're going to be allowed to go down the drain, which is what is happening right now. This is the first place that I would look for improvements.

As far as offshore fisheries are concerned, It is also quite clear that you cannot manage marlin and swordfish and the other offshore species and not manage tuna. They must be managed as a comprehensive unit. Tunas today are managed in accordance with recommendations produced by an international body called ICCAT, the International Council for the Conservation of Atlantic Tunas. This is a body composed of maybe 20 or 30 nations interested in the Atlantic fisheries. Japan is a member of ICCAT, for example, so it's not just Atlantic Ocean countries that make up the organization. To a large extent ICCAT is dominated by France and Spain. France has disproportional clout within the council because many of the west coast Africa nations, the so-called Francophile African countries, Ivory Coast and Senegal, tend to look to France for leadership. French politicians don't want any part of tuna regulation in the Atlantic and, in Europe, to a greater extent than in this country, politics drives science. At any time, ICCAT scientists could come up with astoundingly unrealistic determinations for the stock abundance of Atlantic tuna species, and we could be challenged at any time with an ICCAT majority saying in effect "tuna stocks are healthy, therefore fish as much as you want." This attitude is always bubbling away under the surface.

One argument for not extending U.S. jurisdiction to tunas that is always brought up in Congress and meetings of this kind is, "How can we manage tuna? They're already managed according to international agreement." The answer to that is -- yes, they are managed, and up until now they haven't been

managed all that badly. At least in recent years ICCAT decisions haven't been all that bad. In fact, the National Marine Fisheries Service interpretation or implementation of those recommendations has been faultless or as close as you can get to it. But this could change at any time, and it's completely beyond the power of the United States to do anything except wring its hands.

If you had a radical change, as in a large pulse of tuna fishing, possibly by the Japanese but also potentially by South Koreans or Taiwanese, who also fish in the Atlantic, or by the Canadians, Mexicans, Venezuelans, and other emerging countries of Latin America, a tremendous dent could be put in some of those tuna resources in a very short period of time.

We saw what happened in the mid-70's when the Japanese moved their fishing efforts out of the Mediterranean into the Caribbean for a few years. Until it was stopped by a groundswell of political protest from recreational fishermen, Japan was taking thousands of metric tons of pre-spawn fish right on the spawning grounds, and you could just see the abundance curve of tunas going through the floor. In fact, tunas were fished so hard in that period that even though fishing effort has been greatly reduced, stock trends are still going down. There are so few older fish left that they're dying quicker than they're being replaced by new fish recruiting into the fishery.

The next thing I would ask Congress to change would be the definition of what "optimum yield" is or what "overfishing" is. Also I would ask them to remove the exception of tunas from the 200 mile limit jurisdiction so we would have the power to regulate tunas within the 200 mile limit.

What is so difficult about that? What is so unreasonable in asking for fishing authority over the fish within the 200 mile limit? Well, the principal proponent for not extending U.S. jurisdiction to tuna fishing is the State Department, and it's not entirely clear what motivates the State Department. On the surface they say that they are defending or forwarding the interests of the United States distant water tuna fleet which is based, for the most part, in San Diego and fishes around the world. They say that if we regulate tunas within our 200 mile limit, then every other nation in the world is going to regulate tunas within their 200 mile limit and our fishermen will be excluded from those fisheries. They've been saying this for as long as I can remember, certainly as long as the Coalition has been in existence. Where it all began is difficult to say, probably when Moses was in the bullrushes. We have seen during this whole period United States vessels being successively excluded from 200 mile limits since they came into existence. When they have violated 200 mile limits, United States flag vessels were seized, incurring all kinds of diplomatic tension. This doesn't seem to slow American flag tuna boats down much, as they tend to ignore altogether the limitations that various coastal states in the Pacific try to impose on them. The result is accumulated bad feeling and cries of 'Yankee imperialism'. The most recent and perhaps the most shocking manifestation of this is that a small island state, once part of the British Protectorate of the Gilbert Islands, has entered into a fishing agreement with the Soviet Union. They became so angered with what U.S. tuna boats have done, they decided to deal with the

Russians. The Russians are tickled pink to get a fishing deal in the Pacific. This gives them the provision to put advisors there, put a naval base there and intensify their activities in the Philippines, all stemming directly from this incredible attitude of the State Department. The State Department is now suddenly faced with a new Soviet presence in the Pacific that might never have occurred but for this situation. Maybe they'll wake up and allow the system to be changed.

When the subject of extending U.S. jurisdiction to tunas is raised, another objection, principally by the State Department, is that we can't do this because law between nations states that highly migratory species can only be managed by international agreement. That's very peculiar, because by definition marlins, sharks, dolphins, wahoo and a whole variety of fish we do manage are, by definition, highly migratory species. How can we say that we can manage marlin but we can't manage tunas? How can we say that by exercising jurisdiction over one kind of highly migratory species we don't influence these other countries but we would if we did the same thing with tunas? It's rubbish. This type of logic is what has prevented effective offshore management since the adoption of the Magnuson Act in 1975.

The final major problem that I see in the attempt to effectively manage the offshore resources is the problem of the makeup of the councils themselves. Under the Act, the appointed members, voting members of the council, are those who aren't state officials, people who must be familiar with the fisheries. It would be silly to have it any other way. You couldn't have a council comprised of people who have no knowledge of what's going on.

To have people familiar with the fisheries on the councils, you obviously wind up with fishermen. Fishermen, quite naturally, see themselves as the appointed representatives of a user constituency. It's so blatant in the New England Council that one person represents Gloucester, one represents New Bedford, one represents the Maine fishermen, etc. When it comes to making a hard decision of how you reduce fishing pressure on a given stock and conclude that the only way you can create more fish is to have less fishing, these people find it very difficult to vote against what they perceive as the interests of their so-called constituency. They find it nearly impossible to say to fishermen, "I don't care if you've got a mortgage coming due. I don't care if your catches right now aren't covering your expenses. We're going to have to put you out of business for a period of time. Whatever it costs it's going to be better for you in the long run." A fisherman doesn't see it that way. If he can get by today, tomorrow will take care of itself. This is a common mindset that is by no means unique to fishermen.

With that as the prevailing attitude and with an Act that says to fishermen, "you can manage the fishery by way of optimum yield" -- we have problems. Optimum yield says you can fish the stocks beyond the point where they sustain themselves, beyond their maximum sustainable yield. If that is what's required to take care of your economic need. We don't have any definition from NMFS or the Office of Management and Budget or whoever is now

in charge of managing fisheries saying "you can't fish them any further than this point." The result is no management at all and it is showing up in a lot of fisheries.

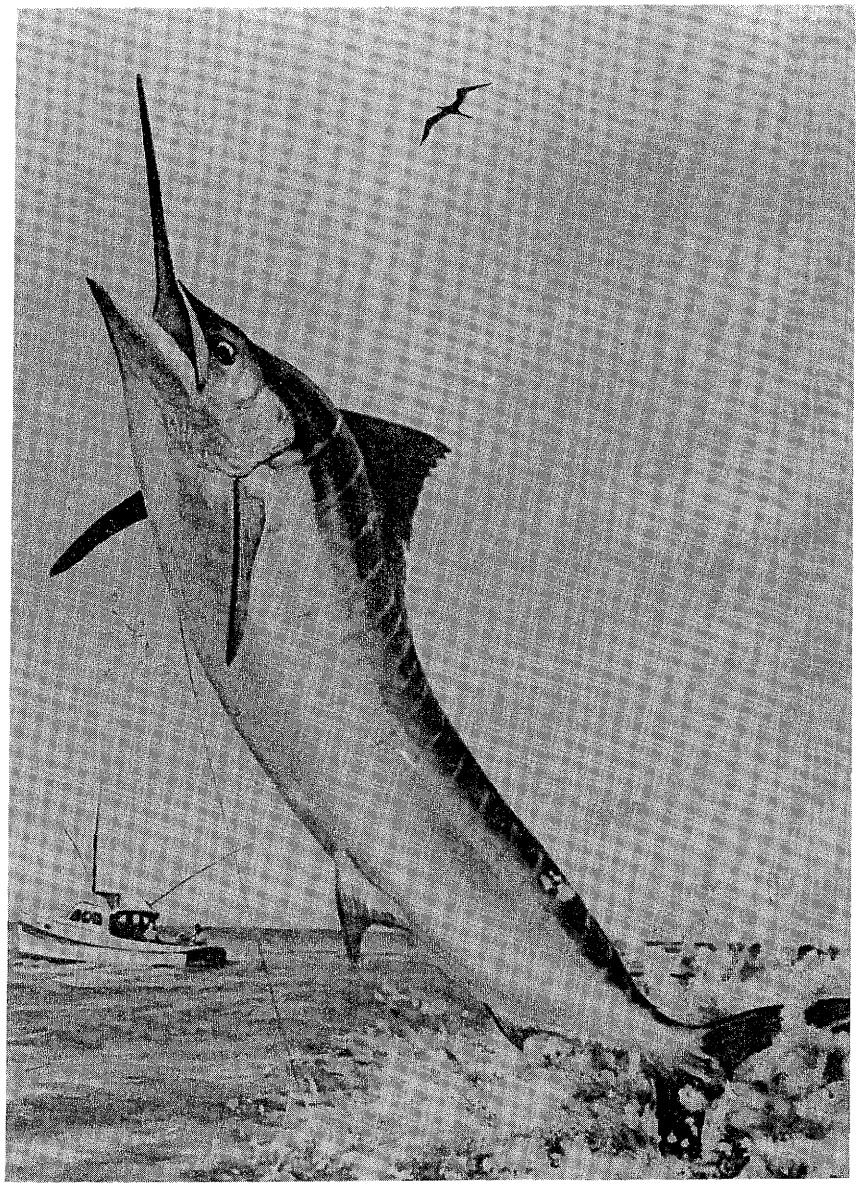
When I left Boston yesterday a headline of the Boston Globe said that a state fishery official discovered overfishing has occurred on Georges Bank and stocks are more severely depleted than heretofore believed. The Globe quoted one of the officials of the State Fisheries Bureau as being surprised by this, the fact that the stocks there have been more overfished than they had realized. They had to say they were surprised, otherwise they would to have to explain why they hadn't done anything about it. The fact is they've known this has been occurring for five years. Now one of the major staple fisheries is going to collapse for reasons quite well understood by those charged with managing it. They knew what was happening. They didn't feel they could do a darn thing about it because it would hurt too much. Nobody wants to accept the reality, the obvious reality that, as Mr. Goodwrench says, you either pay now or you pay later. It costs much more later if you don't do anything now.

The third thing that I would want Congress to do in reviewing the Magnuson Act would be to look at the whole concept of "optimum yield" and ask "Is this any way to run this railroad?" Shouldn't we be talking about a strictly defined sustainable yield or some kind of a maximum economic yield? Although I don't fully understand it, since I'm not an economist, I believe that maximum economic yield allows a fixed level of fishing on a given stock to maximize the return, the economic return to the fishermen. And I take that to mean you fish while you can still get big fish. For example, you don't fish swordfish down to where average catch is under 30 pounds. You take swordfish to the point where the average size caught is the size where you get the most money for them. This is better both for the fishermen and better for the stock. If it means that the fishery will sustain fewer vessels, well, that's reality. Some fishermen will have to do something else. As long as you allow a fishery to operate where anybody can fish the common resource, then you're going to have too many boats and few fishermen making a decent living. It's a hard reality to face up to. It's difficult to go to a fisherman and say, "You're the one, get out." Somebody has to buy his boat; somebody has to pay to retrain him. You can't put him on welfare. It's going to cost money and it's going to take a long time before this happens. I really think that in the interim you're going to see the collapse of a lot of fish stocks and it won't happen just offshore.

As far as recreational fishermen go -- the more commercial fishing works on swordfish and on tuna, the more angler effort you will see diverted to other recreational species. It's going to be interesting to watch this develop. I think nothing is going to happen very fast until there are a series of crises. You can see those crises coming. It's a shame that everything we do in fisheries management seems to be reactive. But once again, the people who don't know anything about fishing have continuously shot down plans that say, "let's watch the stock." Consider the bluefish -- there are plenty of bluefish out there now, but what happens if you suddenly have a large commercial fishery on bluefish? We had a plan. And the Office of

Management and Budget essentially said "Well, if it's not broke, don't fix it." And then they said, "We have really saved some money." In reality they haven't, because when stocks decline it's going to cost a hell of a lot more money than a standby plan.

Those of you who are here this afternoon with Senator Lautenberg should raise the question of offshore jurisdiction of tunas. Those of you who have opinions on this subject should let him know there is support for his position. It's absolutely crucial.



DISCUSSION

MR. ROSARIO: What about the fish farms that are springing up all over the place?

MR. WELD: The fish farms show a lot of promise for certain kinds of fisheries. We can already see that in Europe. The fish farms are producing salmon to the point where they are supplying most of the demand, as I understand it, for restaurants in Europe. The Norwegians, I think, are exporting hundreds of metric tons of salmon raised in fish farms. If it works for salmon it will probably work for similar species, like trout. There is some hope that it could make a contribution to the striped bass problem. They released a great many pen raised striped bass just the other day. It's terrific if it works.

On the basis of what we now know, I don't think you can do that with tunas. Now, I can't tell you why. This is just a hunch; I'm not a biologist, I'm a lawyer. They are, in fact, raising and fattening tunas in so-called tuna farms up in Newfoundland and Nova Scotia right now. The Japanese have been doing it for years. And this means you catch a free swimming tuna, an adult fish, and you confine it somewhere to an area say the size of this auditorium. You hand feed it about five times a day, and you feed it grossly and then you harvest it.

I don't know that they can reproduce conditions artificially that would permit you to hatch out marlin or swordfish or that kind of fish; I think you also would have to release them in huge numbers because of the incredible predation that occurs. I don't see it as a feasible task.

MR. ROSARIO: Didn't fish farmers come about because of all the pollution among other things?

MR. WELD: That's right. All the things that prey on the inshore stock.

MR. ROSARIO: Does it have nothing to do with the 200 mile law? Why don't they dump everything past 200 miles?

MR. WELD: That's an excellent question. Again, you get people from OMB and places like that talking in terms of costs and benefits. And they really don't know what they're trying to measure. They're not trying to measure the impact on fishing.

MR. FEGLEY: Why is it not possible to restrict longlining for tuna within the 200 mile limit on the basis of the fact that the bi-catch is of species that we do regulate?

MR. WELD: That's exactly what we tried to do with the swordfish plan. We tried to say - I think it is eminently reasonable to say - to the Japanese, "if you're fishing for tunas, get your lines out of the water at night. Tunas

don't feed at night." We could say, "you've got to get your longline out of the waters at night in those areas where you're taking swordfish or marlins." The State Department came back and said "you can't say that to these people because they are entitled to fish for a profit."

Now, this doctrine began some five or six years ago when a State Department lawyer wrote a letter to the National Fisheries Service advising how to interpret the law of the sea with regard to the foreign fishermen, i.e., you (the NMFS) can manage our resources, but you've got to balance that management with a reasonable opportunity for the foreigners to come in and fish the tuna. That was the beginning step. And all of a sudden, they're now talking about beyond reasonable opportunity. They're talking about an entitlement to fish for a profit. With one stroke of a pen the doctrine is expanded tenfold, which is the usual way of the State Department or lawyers.

MR. BULLOCH: I have two comments and a question. One is that there is an attempt at aquaculture of dolphins in Bermuda at the moment. Secondly, when you talk about marlin, swordfish and the recreational fishery, there's a rather interesting economic conservation program going on among Florida recreational charter boatmen. If you boat one of the big game fish, you must get it mounted by a taxidermist, through them. Of course, the price is phenomenal. In most cases, what they really want is the fish released to be caught again.

The question I have is on the question of tuna conservation. Why couldn't the United States go after the Japanese on sort of a quid pro quo in much the same way we have in whaling; that is, to bring threat in some completely different category, i.e., economic?

MR. WELD: There are two answers to that. With respect to the tunas, the United States fishing position is the contrary, that is, you can fish. Several years ago, the appropriate State Department guy appeared before a committee of Congress where he was asked point blank, "How can we manage swordfish and marlin fisheries, if you're going to allow a tuna fishery in the same area catching a huge bi-catch of swordfish and marlin?" And the State Department guy, with his back to the wall, admitted that we had a legal right to manage marlins and sharks and swordfish and what have you. But he also said, "you've got to allow this foreign fishery for tunas." There was just no backing down on it. It was a catch-22 situation and he got out of the door before they really nailed him to the wall, unfortunately. Congressman Forsythe of New Jersey wanted a letter written about our position and the State Department obliged. The letter came about six months later saying we recognize the right to manage marlin, etc., and that's all it said. Now they're back on the same track again with the longlines.

The other answer, if I recall what you asked correctly, is that we have done the kind of economic thing you've suggested in the past -- or we've certainly had it under consideration to say to the Japanese or South Koreans or whoever, "Okay, we can't stop you from doing this. Just remember you guys took 70 million tons of pollock off Alaska last year." Recently it's been

brought to the attention of my organization, the National Coalition for Marine Conservation, that there is a very high level of billfish bi-catch by South Korean and Taiwanese vessels down in the southern Caribbean along the Venezuelan coast and off Santo Domingo and the "ABC" Islands. At the meeting a month ago of the advisory board to the U.S. ICCAT delegation, Hal, for one, raised this problem with the National Marine Fisheries and State Department people. It was suggested by the government people, specifically by the National Marine Fisheries Service, that by reminding those people of the economic importance of the access to those Pacific fisheries, whether it was pollock or other fish, it might very well be possible to convince them that it was in their self-interest to lay back on billfish in the Caribbean.

This kind of thing doesn't happen overnight. You don't go to one of your strong oriental trading partners - we don't have that many - and shake your finger at them and say "Get out." You say, "This is causing a lot of concern. There's going to be a backlash of bad will." You try to convince them diplomatically. If that doesn't work, I don't really think the State Department has the stomach to take the cudgel to them.

MR. FEINBERG: About two years ago I participated in the last of the ICCAT meetings at which I was an advisor. And as had been the story for a number of years before that, the biological statistics indicated that certain species of tuna were holding their own fairly well, but the Atlantic bluefin tuna was in jeopardy. Over the years the status of the stocks continued to decline, and I don't really think that's much different today.

After one of the meetings, a group of the eastern representatives decided to have an informal get-together with some of the representatives of the Pacific tuna industry to just talk over this whole jurisdictional question. We had what we felt was a fairly productive get-together with them. Their position was that they really weren't overly concerned in terms of their own existence with the Atlantic bluefin tuna. We reached an understanding - at least I thought it was an understanding with them - that they would not oppose an amendment to the Magnuson Fishery Conservation and Management Act which brought in the Atlantic bluefin tuna and left out the other species. And they said, "Look, as far as we're concerned, you could justify it on several grounds. In the first place, the Atlantic bluefin tuna spawns in the Gulf of Mexico, which is within the American 200 mile jurisdiction. It migrates up the Atlantic coast. Although some tagging recaptures have taken place on the other side of the Atlantic, most of them have taken place in the American waters. In addition to that, this fish is in jeopardy. And with all of this, we could, in effect, live with your going ahead and pushing to get the Atlantic bluefin tuna within the Act. But don't use it as a foot in the door and try to bring in some of the others that we are fishing for in distant waters."

We brought it to the attention of a number of people and felt that it was something worthwhile. It never got anyplace, nobody ever made any effort after that. There had also been an earlier attempt to do something, but it died.

With that kind of a background, do you think the Coalition might be interested in at least to try to bring, as a starter, the Atlantic bluefin tuna within the 200 mile jurisdiction? What is the situation as far as the Coalition goes?

MR. WELD: Well, Bill, those conversations that you began are ongoing. And in fact, we're looking forward to talking to the West Coast people at the ICCAT meeting later this month. There have been continuing indications on the part of some of the West Coast industry representatives that they wouldn't mind if we just said "Okay, bluefin is not a highly migratory species for purposes of the Magnuson Act so we have jurisdiction." Some of the West Coast people we've been talking to don't appear to be as hard line today as they were a few years ago on the idea of taking all tunas in under the Act. It all depends on who you're talking to and where you're talking to them. It's very hard to find one guy who really represents all of the people.

I said earlier that the State Department takes the position they take because they purport to be forwarding the interests of the tuna industry. The more we talk to the tuna guys, the more we began to wonder if this is really true or whether the State Department is doing what they're doing just because they don't want to think about changing gears. There's a certain momentum for doing it the way they've always done it.

I hate to blame everything that's gone wrong on the bureaucrats, because they're only half the story. But the more exposure I get to the State Department and the way they do things, the more disillusioned I become with them. If they do this badly with fisheries, God knows how they represent us in other interests.

The short answer to your question is that these conversations are ongoing and we have very modest, very guarded hopes that something might come of them. Certainly those conversations had something to do with the change in the ICCAT position that said "Okay, you have an eastern stock and a western Atlantic stock, and if you guys want to do something in the western Atlantic, you can do it, just so you don't interfere with what we do in the eastern Atlantic." I think science, to some extent, became the creature of politics, because the biologists are not all convinced that we're dealing with two stocks. But we have had some success, at least we got lower quotas on the western Atlantic stock. Some of that may be attributable to those conversations you refer to, Bill.

MR. WILK: Our next speaker will be Hal Lyman, publisher emeritus of Saltwater Sportsman Magazine. He has served as chairman of the New England Fishery Management Council. I always think of Hal in a special way, because he's the man who wrote the article that led me to my job at Sandy Hook.

INSHORE FISHERIES-DEVELOPMENT, RESEARCH AND THE FUTURE

Henry Lyman
Publisher Emeritus
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I do want to say a word about Bert Walford while I have the opportunity. He was a great friend of mine. Twenty-five years ago - it seems incredible it was that long ago - I was master of ceremonies at the dedication of the Sandy Hook Marine Laboratories. And it's an old story, but it applied first to Bert. He had a scientific and an inquiring mind as those who know him realize - I came up to him and said, "Hi, Bert, how's your wife?" And he cocked his head to one side and his spectacles gleamed, and he said, "Compared with what?" It's a 25-year old story, but it's still true. He was an extraordinary man. He never blamed other people or very rarely blamed other people unless they were incredibly stupid. He hated bureaucrats. His complaint was that bureaucrats loved to cut red tape but they cut it lengthwise.

I was writing a book on bluefish, and I came down to the Sandy Hook Lab, which was doing a lot of bluefish research at that time. And I asked Bert what the various races were and their migrations, and so on. And I took careful notes, I thought. I sent him the first draft of my manuscript, and he called me up and said, "Hal, you have it absolutely backwards, completely wrong." And says he, "It's all my fault. I didn't make it clear to you." Well, it was my stupidity. But that's the kind of guy he was. He straightened me out. When the book came out, I didn't have things backwards.

As many of you know, the original lab was set up to work solely on sport fisheries and Bert became more and more alarmed, because as the years went by, the thrust changed. Once he called me up and said, "Hal, my God, the laboratory is going commercial." They were making some study on a codfish or something rather than on a striped bass or bluefish. Actually, it was one of the few cases where he didn't see into the future. Normally he could see way ahead of any of us. The overlap between commercial fishing and recreational fishing has become more and more pronounced. I use the word "overlap" but if you're a bureaucrat you use the word "interface." I've always asked bureaucrats what "interface" means and when you talk to them, they usually mumble, but what they mean is that they want to keep their little pie over here, and the other guy keeps his little pie over there. They're both on the same plate but don't mingle at all. Actually, recreational fisheries and commercial fisheries are mingling and will continue to mingle. To deny that there's no conflict between those two groups of interests is ridiculous. Of course there's a conflict. You're having two groups of people fishing for the same stocks, very often in the same areas. If they're not fishing for the same stocks, the commercial fishermen may be fishing for the forage fish upon which recreational species feed. So there's constant conflict.

Back, I think it was in 1948, I gave a talk before the Atlantic States Marine Fisheries Commission, and spoke about the growing recreational fishery. And I called it "the sleeping giant." It's interesting to see in fisheries management literature how that term has carried through. The giant today has really grown -- I'd just like to quote a statistic or two.

I was reviewing the recent report from the U.S. Department of Commerce on recreational fishing surveys for 1983 and 1984; 1985 is still in the works. As of the end of 1984 there were approximately 5.8 million marine anglers along the Atlantic coast. In 1984 they caught approximately 246 million fish. That's a lot of fish. Approximately 75 percent of that catch was taken within the three-mile limit. In other words, inside the limits that Chris was talking about a moment ago. The majority of saltwater anglers are inshore fishermen.

I would like to point one encouraging thing to all of you who are disappointed if you have not taken a 1000 pound tuna in the last couple of weeks. The average weight of the fish caught is just a little under two pounds. In other words, your small fish fisherman is predominant, and the big game angler, who is glamorous, pleasant and wealthy is in the minority. It's the small guys, the flounder fisherman, the blackfish fisherman and so on, who predominate the fishery.

Politically, the tremendous growth of recreational fishing has resulted in two major developments. The first, very obvious -- the very number of people who have turned to the sea for their recreational support has a tremendous amount of clout with politicians because each one of these people has a vote. There are that many more voters interested in the marine resources. They outnumber the commercial people approximately tenfold.

The second big clout that the recreational fishery industry has is the economic volume and the economic value of it. There are jillions of figures on what the worth of recreational fishing is. I won't quote them all, but would like to point out two things as far as striped bass are concerned. One economist figures that a striped bass, a 25-pound striped bass in the water -- not caught but in the water -- is an angling opportunity worth $4.12 a pound. That fish would bring anglers to that area at the rate of $4.12 a pound. Atlantic salmon, although it spends a lot of time in the salt water is basically a freshwater angling catch. Atlantic salmon of Canada in the province of New Brunswick are figured to be worth $7.40 a pound. This is as it is caught, not in the water. That gives you a rough idea of what the economics are. It's a very valuable fishery.

Twenty-five years ago when the lab was dedicated, federal and state governments by and large favored the commercial fishing approach. It was the old Bureau of Commercial Fisheries rather than the National Marine Fisheries Service. Only in very recent years was emphasis put on recreational fishing. The Magnuson Act went through. Foreign fishing fleets were pushed off our shores. And then all our domestic commercial fishermen jumped on the bandwagon figuring that they would really make money. They overcapitalized,

overbuilt the fleets and are now, as Chris pointed out, finding themselves overfishing. They are fishing on stocks that are depleted. The Councils, unfortunately, seem to be managing people rather than the future of the resource outside the three mile limit. Inside the three mile limit the various state governments are having their problems, because the commercial fishing pressures make the old pleas that stress two things. First,"We are fishing for food; we are feeding the starving people." Second, "If you control, you'll put us out of business." I submit that if we don't control the fishery, if we don't manage the fishery properly, they're going to be put out of business and their children and grandchildren are going to be put out of business and their children and grandchildren are going to be put out of business.

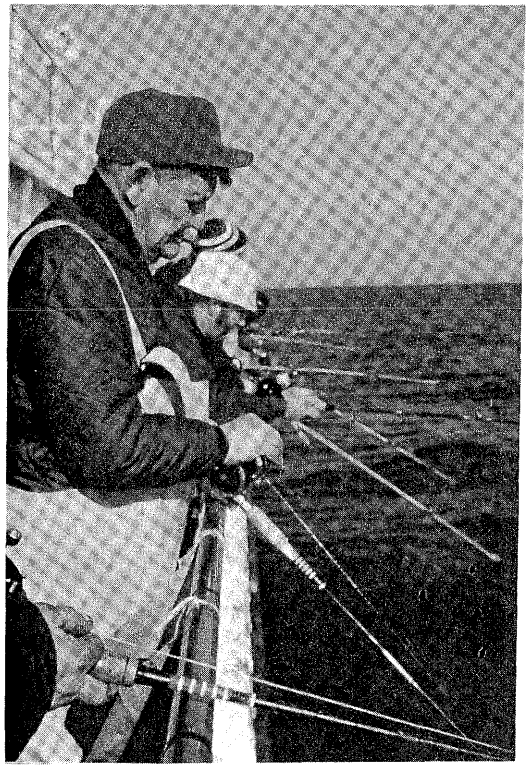
Old Professor Henry Bigelow, who started the Woods Hole Oceanographic Institution, made a very wise remark with reference to inshore and offshore fisheries. He said, "Gentlemen, fish can swim. And if you take something away from one place, it won't be able to go to another place." That is a fairly simple philosophy. But a lot of people don't seem to think that way. They say "Don't restrict me, restrict the other guy out there."

The future, I think, will bring some really dramatic changes. Recreational fishermen are being more and more effective through their various organizations, like the National Coalition and the Littoral Society. One thing that I believe is coming to all coastal states is a marine angling license, whether you like the idea or whether you don't. I am strongly in favor of a marine angling license - if and only if - the monies derived from it are plowed back into the resource, recreational fishing. The license will do two things. First, it will provide funds for building boat ramps and for doing research on species of particular interest to the sportsman. Second, it will give, for the first time, a head count of how many hundreds of thousands of marine anglers there are along all coasts. Today, the politician reads, as I quoted earlier, 5.8 million Atlantic anglers. If you say that to a politician, he will say, "That figure is put out by a bureau interested in building up numbers." If you say 5.8 million anglers pay four or five dollars for a license, there they are. He must admit that there are voters there who want something in particular.

I think what is going to happen in the commercial fisheries, and you can see it coming today, is a system of limited entry. By limited entry, this means that only a certain number of fishing boats will be able to go out to fish for certain stocks. A lot of people argue that this is un-American, and it probably is. It's a controlled economy. However, it has been in force in Alaska now for, I think, 15 years. The people who are in the fishery are making money. The people who are out of the fishery have gone into other business. And they complained, certainly. They are doing the same thing in Canada today with the salmon fishery. They are buying up commercial fishing licenses and telling the fisherman he has to go to farming potatoes or doing something else; he can no longer fish for salmon. I think limited entry is going to come. I was strongly against it in the early days, but have turned 180 degrees. I've found as, first, chairman and then as a member of the

Fishery Management Council and an observer of the Management Council that it cannot act; it cannot bite the bullet to restrict commercial fishing. Some seventy-five percent of the members of the councils are in the commercial industry in one way or another, and they just will not police their own ranks. If they won't police their own ranks, somebody has got to do it for them.

I sincerely hope that commercial fishermen and recreational fishermen will cooperate and work together. In the early days, as noted, the commercial fishermen had the ear of government - federal and state levels. The pendulum has swung the other way. When the Magnuson Act was up for consideration, the commercial men and recreational men all got together and forced Congress into listening to them and the Act went through. Now, because many of the commercial fishermen are in dire financial straits, the trend, unfortunately, is to split up this cooperation. I don't say that the lion should lie down with the lamb. Today, the lion is the recreational fisherman. I would like to see the lion and the lamb cross-breed and produce a "lambion" or "lionamb." Working together, commercial men and the recreational sportsmen, will have a lobby that Congress and state governments cannot ignore. The thing to do is to air dirty linens in small groups together and when in public present a united front. The major difficulty today is getting a united front to protect not the recreational interests, not the commercial interests, but to protect the natural resources upon which both depend. If we don't protect what was once considered the unlimited bounty of the oceans, which we now know is in no way unlimited, and protect it now, there won't be anything left for the next generation.



DISCUSSION

MR. ROSARIO: How about the banks that lend money to these people that build up these organizations, don't they have any policies?

MR. LYMAN: I'll tell you an interesting point about bank loans to the commercial sector, building the commercial fleet. There's a bank in Boston, that shall be nameless, but at one time I ran their conservation program. They are absolutely delighted to lend money to a commercial fisherman, either to build or to operate a commercial fishing vessel. In New England they are particularly delighted because they know that within eight months they will get that boat back. They will foreclose on it, lend money to another guy for the same boat, and the interest rates will go up by two points. They're making money hand over feet. It's the damnest bit of economics that doesn't get any publicity that I ever heard of.

MR. ROSARIO: They're doing the same thing to the farmer. There's some education that's lacking between the banker and the people that he's lending money to.

MR. LYMAN: The bankers are in the business of making money.

MR. ROSARIO: I think they ought to be regulated a bit more than they are.

MR. LYMAN: I agree with you fully. I also think our government should be regulated a little more for loaning money and providing money to underprivileged, underdeveloped nations to destroy their rain forests, for example; or to make all the same mistakes that we've made, in their rivers, polluting their rivers, cutting down trees and having all the top soil wash away, and so on and on. You can find a thousand examples.

I agree with you. They should not be "controlled," but "disciplined." I don't know how you go about it and it's a far cry from fisheries, but it certainly has an influence.

MR. BISHOP: They have Live Aid and Farm Aid. Maybe we need a Fish Aid.

MR. WILK: It's been thought about.

MR. BENNETT: About the limited entry question -- when you talk to commercial fishermen about that idea, their answer usually is that the system will cure itself. They'll pursue a fish until they've knocked it down to the point where it's not an economically feasible pursuit.

MR. LYMAN: This is a terribly dangerous argument. It's a perfectly good economic argument. You get overcapitalization, too many people fishing for too few fish. And eventually you get to the point where the guy is looking for the last unicorn. So all the boats go out of business or maybe only one or two stay in business looking for the last unicorn. However, the

recreational fishermen have nothing to fish for then. In other words, they destroy the natural resource for everybody. The general public have no fish to eat. They are destroying the natural resource for everybody by their own economic selfish pressure. I'm not against commercial fishermen. A great many of my close friends are commercial fishermen. I am against two types of commercial fishermen, the one who doesn't think to the future and the future of the resource, and second, the part-time commercial fishermen. This is particularly true with gill netters, part-time commercial fishermen who don't give a hoorah about the resource. In his drive to make the quick buck with his gill net, he might lose it in a storm, okay? He goes and buys another one. But the net may ghost fish for the next year. The full time commercial man who looks forward is a hard-working citizen. I'm dead set against the part-timer and the guy who wants to catch the last striped bass, the last weakfish.

MR. BENNETT: The other argument they talk about is that limited entry will favor big operators. Is there an answer to that?

MR. LYMAN: What is wrong with favoring the big operators?

MR. WELD: Aside from that, you can say that who the winners or the losers are will be determined by whoever drops the hat. But the point is, I think, to leave the people in the fishery who are really good fishermen. There doesn't have to be big bucks in one kind of fishery. Whoever stays in the fishery is going to make a lot of money because the number of boats in the fishery is going to be set in accordance with the number of boats the fishery can support. Instead of having, say, 1000 boats where a few high hooks are making a good living and another big bunch barely scraping along and another bunch losing money, you have a number of people making a heck of a fine living. There are going to be big winners in limited entry, and there's going to be a lot of losers. The way I see it is to draft legislation so that somehow the winners contribute to the expense of taking care of the losers.

MR. LYMAN: I'd like to elaborate on that a little bit by just pointing to the example of Alaska, which has been doing this for many, many years. As Chris said, there are big winners in Alaska. And, if you talk to an Alaskan fisherman who is in the fishery today and say you want to get rid of limited entry, he'll take you out and drown you. I mean, they think it's the greatest thing that ever happened. And it's working. There are some rough spots, but by and large it's working. One of the curious things is the Alaskan pollock situation where the U.S. limited entry fishermen are concentrating on the salmon and on really high-priced fish. It's very difficult to get them to shift into something like Alaskan pollock which is a low-priced fish. So that's a handicap and why the Japanese are moving into that fishery.

MR. ROSARIO: Washington likes the big fisheries because they can control them better. With a lot of little guys, a lot of little farmers or little fishermen there's no control. But once they've got the big conglomerates, they have control.

Incidentally, how about this Moon, is he taking over a town of fishermen in New England?

MR. LYMAN: The Moonies?

MR. ROSARIO: Yes. Did they take over or was that gossip?

MR. LYMAN: The Moonies moved into Gloucester, which is one of our big fishing ports and they were going after tuna. A terrible scream went up from everybody except the Moonies, who all went out to catch tuna. For about a year they caught some fish and then they stopped catching fish. I think you can pick up those boats today for almost nothing.

MR. WELD: I live next door to Gloucester. The real fear stemmed from Gloucester living on a mattress economy. Money made in the fisheries doesn't go into the bank where the government or anyone can see it. It goes into the mattress. When you have the Monies in the business, suddenly the government has a yardstick that indicates how much money was being made. So the locals hated the Moonies. And before I understood that as the underlying reason, it used to be rather surprising to go to a fishing meeting at night where something was going to be discussed. Fishermen would come in fishing boots, for the most part, and the Moonies would come in beautifully scrubbed with clean shirts and hair combed. You could sense the hostility in the room, the hate was absolutely palpable. It was hard for an outsider like me to understand that until somebody finally revealed the underlying economic reason. Moonies were a terrible threat. All of a sudden the rest of the guys were going to have to pay taxes again.

MR. FEINBERG: Hal, I don't know -- I don't want to get into a debate on limited entry or the saltwater fishing license. I think you can spend a day's symposium on each of those topics. I happen to be opposed to both. But both of them depend on some measure on your definition of a commercial fisherman, which is a very knotty question often raised. I wonder, for instance, if you would consider the man who goes out and catches a 1000 pound tuna on his own boat, brings it back and sells it, or the fellow on the head boat that gets a lot of blackfish and brings them back and sells them, or the fellow on the beach catching striped bass and selling them; are they commercial fishermen? And how do you put them in the limited entry scheme?

MR. LYMAN: I've annoyed a great many people with my definition. A commercial fisherman is an individual who sells or barters his fish for gain, period. In other words, a sport fisherman, so-called, who hook-catches a bunch of fish or catches a big tuna and peddles it in any way, is a commercial fisherman. I don't say it's morally wrong. I just say by definition he is selling his catch. And when you argue in front of a bunch of true commercial fishermen who make their living from the sea, selling their catch and say "Oh, I'm just selling enough fish to meet my gasoline expenses," you get the commercial fishermen's definition of a sport fisherman. He will say, "A sport fisherman is a guy who takes a photo of his catch before he sells it." And I think it's that simple.

Now, when you say "limited entry," let me just carry this a little bit further. If you're selling your catch, then the laws applying to limited entry should apply. I'm sorry. If you can't pay for your gasoline in some other way, I don't think you should classify yourself as a sport fisherman.

MR. GEER: Up in Alaska they also use a system of closures on top of limited entry.

MR. LYMAN: That's correct.

MR. GEER: All of the boats have to come into port and tie up until there are enough fish to be catchable.

MR. LYMAN: That's correct.

MR. GEER: So it's a combination of the two. Also, then, stop the weekend sportsmen from selling tuna at the market.

MR. LYMAN: The closure was in the swordfish plan that Chris mentioned. We tried to push through closures, but when it got to the federal level they said "Oh no, you can't do that." Don't ask me why.

MR. GEER: It's working up in Alaska.

MR. LYMAN: It will work here but the federal government said "No way." Don't ask my why.

MR. WILK: I'd like to move now to Dr. John Boreman. I have had the pleasure of working with John since he came to work for the National Marine Fisheries Service in the area of striped bass management and the administration of the Chaffey Bill. Before that he was with the Fish and Wildlife Service, serving as a Federal witness contributing expert testimony on the Storm King controversy of the Hudson River. Whenever I have a question on striped bass, I call John. Today he has agreed to review the management of striped bass which occured in the last 25 years.

STRIPED BASS RESEARCH AND MANAGEMENT- HOW FAR HAVE WE COME IN 25 YEARS?

by

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INTRODUCTION

During the past 25 years, the striped bass (Morone saxatilis) has been in the forefront of public attention in the Northeast United States. During the first half of this period, recreational and commercial landings of striped bass along the Atlantic Coast rose to record levels, and estimates of juvenile production by the contributing stocks suggested the fisheries would continue to thrive (Figure 1). The species was being touted by some as the "All-American" fish.

About midway through the 25-year period, however, the situation started to change. Juvenile production indices for Chesapeake and North Carolina stocks started dropping and were followed by a drop in coastwide landings. The Chesapeake states and North Carolina were first to experience the drop in landings due to their fisheries' focus on smaller-sized fish (Figure 2). Towards the end of the 1970s, reported landings in the middle Atlantic and New England states were also beginning to decline. By the early 1980s, Chesapeake and North Carolina production indices, as well as reported coastwide landings, were at or near the lowest values on record (Boreman and Austin, 1985).

Because of its popularity, the striped bass has become a focal point of public concern on issues such as power plant and highway siting. Because of its decline in the Northeast, the species has also become a focal point of public concern about estuarine pollution and interjurisdictional management of striped bass during the past 25 years.

The intent of my presentation is to trace the evolution of striped bass research and management in light of the status of the stocks and how that status has changed since 1960. I will not dwell on research findings and management measures.

RESEARCH - THE 1960s

Between 1960 and 1970, production of striped bass in northeast estuaries appeared to be gaining in strength. Dominant year classes (years of exceptional production of striped bass) were occurring every few years in the systems for which records are available. In Maryland waters of Chesapeake

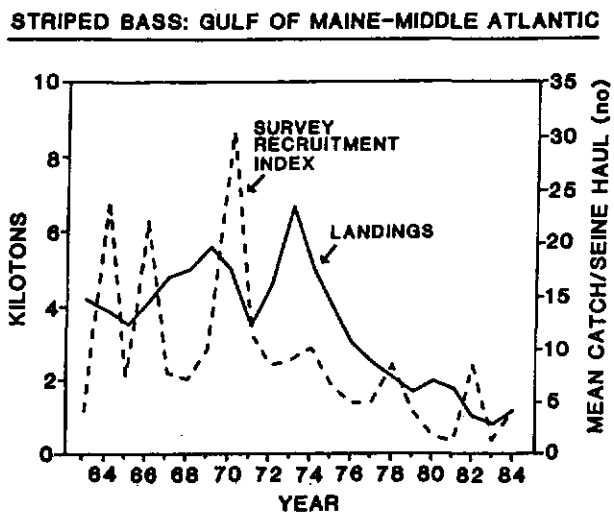

Fig. 1. Total commercial landings and recruitment indices (from Maryland seine surveys in Chesapeake Bay) for striped bass in the Gulf of Maine and mid-Atlantic area.

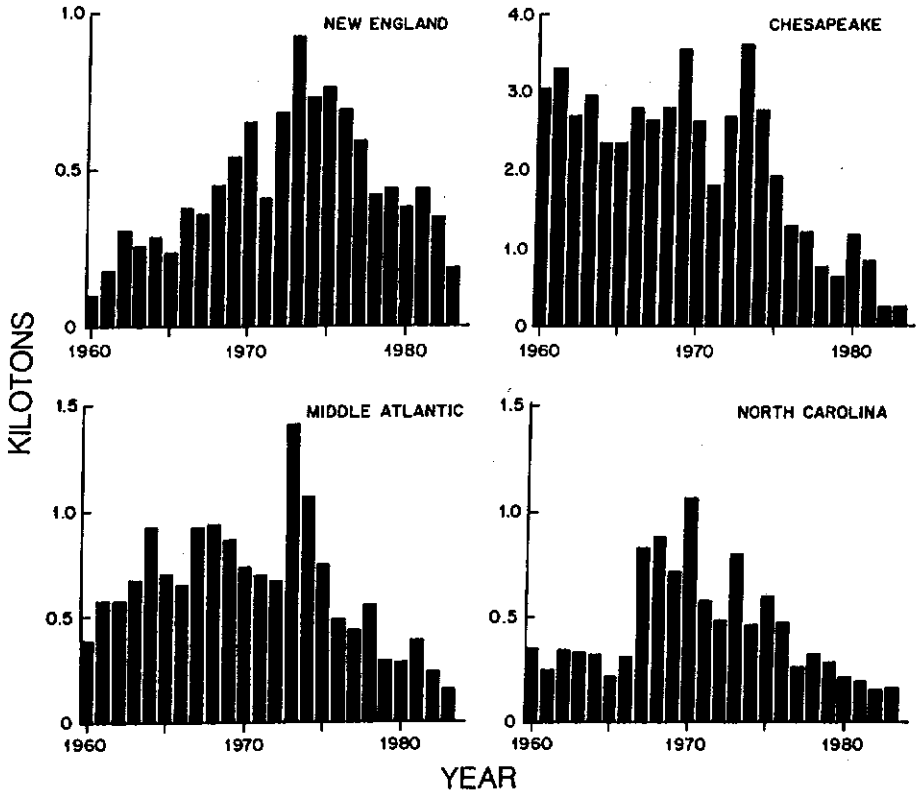

Fig. 2. Total commercial landings of striped bass in the New England region (Maine through Connecticut), the Middle Atlantic region (New York, New Jersey and Delaware), the Chesapeake region (Maryland and Virginia), and North Carolina, 1960-1983, based on "Fisheries Statistics of the United States."

Bay, dominant year classes occurred in 1962, 1964, and 1966; in Virginia waters of the Bay they occurred in 1963, 1966, and 1967; and in the Roanoke River/Albemarle Sound region of North Carolina they occurred in 1961 and 1967. These stocks, along with the Hudson River stock (for which riverwide production estimates prior to 1969 are not available), support fisheries for striped bass from North Carolina to Canada. Estimates of commercial and recreational harvest of striped bass along the Atlantic Coast doubled during this period (Boreman and Austin, 1985).

Research on the coastal migratory stocks of striped bass focused on defining the parameters affecting the general life history of the species. A survey of papers on coastal migratory striped bass that were published during the 1960s reveals that the major research topics were migratory behavior, racial differences, factors affecting survival of early life stages, biological characteristics of the species in various coastal regions, and characteristics of the fisheries. Although these studies produced a lot of valuable information on the life history of individual stocks of striped bass in the Northeast, there was no serious attempt to draw all the information together to form general conclusions regarding the status and relationships among the various stocks.

At the time of his death in 1963, one of the most prolific and well-respected striped bass biologists, Dr. Romeo Mansueti, appeared to be at a point in his career where he was beginning to use his knowledge of striped bass biology to determine how man can most efficiently use estuaries for fish production. His paper on the effects of civilization on striped bass (Mansueti, 1962) was the first attempt by a striped bass scientist to relate observations of striped bass production to multiple and often conflicting uses of estuaries by man.

In documenting the increase in striped bass landings along the Atlantic Coast during the 1960s, Dr. Ted Koo of the University of Maryland issued a warning to scientists and managers:

> "A study of the history of many fisheries will reveal that it is not infrequent that a serious depletion of the fishery takes its root while the fishery reaches a peak... In order to have a better appraisal of the future outlook, we must know the condition of the stock... Much more data and much more accurate statistics are required for such an evaluation. Some day we may regret that such has not been done sooner." (Koo, 1970).

Dr. Koo was pushing for a coastwide research program because he was uncomfortable using the landings statistics he gathered to make a judgment concerning the "health" of the stocks that contributed to the coastal fisheries.

RESEARCH - THE 1970s

Reported commercial landings of striped bass along the Atlantic Coast in 1973 were the highest on record, principally due to the superdominant year class produced in the Chesapeake Bay in 1970. However, another dominant year class has not been produced in the Bay since 1970, nor in the Roanoke/ Albermarle Sound region since 1976. By 1980, reported commercial harvest was about one-third of the harvest 10 years earlier. The decline in production by the Chesapeake and North Carolina stocks has put increasing importance on the Hudson River stock as a contributor to the coastal fisheries.

The Hudson River stock also gained in importance during the 1970s because of public concern over the siting and operation of power plants in the spawning, nursery, and overwintering areas of Hudson River striped bass, as well as striped bass in Virginia and Maryland. As a result, striped bass research started to shift away from natural history studies towards studies that were still site-specific, but more issue-oriented. This shift in focus was brought about, at least in part, by passage of the National Environmental Policy Act in 1969 (42 U.S.C.A. 4331-4335, 4341-4342, 4344), which made environmental protection a part of the mandate of every Federal agency and department. For striped bass research, environmental impacts of electric generating plants sited on estuaries became the major issue and source of support.

Major topics for research on coastal migratory striped bass in the 1970s were estimation of the impacts of thermally-induced mortality caused by discharge of heated effluents by the power plants, and the impacts of entrainment and impingement mortality induced by cooling water withdrawals by the power plants. Power plant research lead to significant advances in the development of sampling technology and in the understanding of the impacts of these sources of mortality on striped bass, not to mention the expenditure of tens of millions of dollars and the employment of literally hundreds of scientists to study the species. Efforts to reconcile differences in scientific opinion concerning the species were stymied, however, because of the lack of adequate information on the interaction between power plant mortality and other sources of mortality, and an insufficient understanding of the underlying biological processes. As such, the most sophisticated population models presented in support of the scientific opinions failed to provide useful long-term predictions of power plant impacts (Barnthouse et al., 1984).

During the latter part of the 1970s, scientists studying striped bass began accumulating evidence that sources of mortality other than power plants may be as important or more important in controlling year class strength. These other sources include nutrient overenrichment leading to depleted oxygen concentrations in striped bass nursery waters, contamination of estuarine and coastal waters by municipal and industrial discharges and emissions of toxic substances, sequences of unfavorable natural climatic events, and excessive exploitation. It became increasingly evident that the decline in production of striped bass in the Chesapeake and in North Carolina may have been caused

by a suite of factors. As power plant issues began to lose public attention in the early 1980s, these other factors began to guide striped bass research.

RESEARCH - THE 1980s

The passage of an amendment to the Anadromous Fish Conservation Act by Congress in 1979, calling for an Emergency Striped Bass Study, provided the impetus to finally undertake a coordinated coastwide examination of the factors affecting production of the coastal migratory stocks. Every coastal state and concerned Federal agency has had an opportunity to provide input to the design and conduct of the research program. Information accumulated under the aegis of the cooperative program includes identification of spawning and nursery habitats of the major stocks; characterization of the harvest of those stocks in terms of age, sex, and stock composition; estimation of juvenile production by the major stocks; analyses of the effects of fishing, contaminants, disease, and other environmental stressors on survival of eggs, larvae, juveniles, and adults; and compilation of statistics on the economic dependency of coastal communities on the striped bass resource (USDOI and USDOC, 1984).

MANAGEMENT

It became increasingly evident in the 1970s that the coastal migratory stocks of striped bass had to be managed in a coordinated and consistent fashion. Fish tagged in the Chesapeake Bay, for example, have been recaptured in Canada and every coastal state from Maine to North Carolina. States had different minimum sizes, creel limits, and seasons, making it difficult to determine if a change in one state's regulations would have any impact on the stocks' reproductive potential. Since most of the harvest of striped bass is predominantly within 3 miles along the coast, management jurisdiction resides with the states. Under the administration of the Interstate Fishery Management Program of the Atlantic States Marine Fisheries Commission (ASMFC), scientists and managers from the coastal states and Federal government prepared a management plan for the coastal migratory stocks.

The Interstate Fishery Management Program is not the first attempt at managing the stocks on a coastwide basis. The issue of cooperative management of migratory striped bass was an important factor that lead to the creation of the ASMFC in 1942 (ASMFC, 1981). At that time, the U.S. Fish and Wildlife Service was attempting to implement a uniform minimum size limit of 16 inches, based on the research findings and recommendations of Merriman (1942) and Neville (1942). As of 1981, only 6 states had implemented the 16-inch minimum size regulation.

The ASMFC's coastwide management plan for striped bass has also run into implementation problems. The basis of the problems is attempting to impose uniform regulations on a diverse striped bass fishery. When minimum size measures are imposed, some fisheries suffer more than others due to their size selectivity. Some fishing gear, such as gill nets and trawls, are size-selective because of their mesh size. Other gear, such as trap nets, are

size-selective because they rely on age-specific schooling behavior; and some gear, such as handlines, are non-selective and are totally at the mercy of local abundance. Imposition of any regulation that adjusts minimum size would affect allocation of catch among these three gear categories.

Another problem that has arisen in attempting to manage the multi-stock striped bass fisheries is that one of the stocks, the Hudson River stock, does not appear to be declining in production. However, due to a lack of research information on the stock composition, managers are setting regulations as if the Chesapeake and Roanoke/Albemarle stocks are present everywhere along the coast.

The Atlantic Striped Bass Conservation Act of 1984 (Public Law 98-613) enables the Secretary of Commerce to impose a moratorium on the harvest of striped bass in waters of any state from Maine to North Carolina judged not to have fully implemented the measures of the ASMFC's striped bass management plan. Whether or not this Act provided the necessary motivation, all coastal states have, for the first time in history, been deemed in compliance with a coastwide management plan for striped bass. The motivation may also have come from the continuing decline in striped bass production indices for the Chesapeake Bay, and the inability of researchers to isolate the specific cause or causes for the decline. At the present time, it appears that the most practical measure to prevent a continued decline in production is to significantly reduce the fishing mortality rate along with implementing a program to improve water quality and striped bass habitat in Chesapeake Bay and North Carolina.

SUMMARY

Over the past 25 years, we have seen research change focus from general life history studies to site- and issue-specific studies to a coordinated coastwide program. In the same period, the coastal states have recognized the value of consistent management measures. The need for such measures and coordinated research has its roots in the inception of the Atlantic States Marine Fisheries Commission 40 years ago. However, fear of losing the valuable and popular striped bass resource has changed wishes into reality. Too often scientists are called upon to determine what happened when fisheries are losing their prosperity, and not often enough are they called upon to determine what might happen while the fisheries are still prosperous.

I am optimistic about the future of research and management of coastal migratory fish stocks in the Northeast. Scientists and managers are applying the lessons they have learned on striped bass to other species, some of which appear to be in greater danger. The value of research on basic life history requirements and on the character and extent of the fisheries is being recognized and supported. It has become evident over the past 25 years that scientists and managers cannot work independently.

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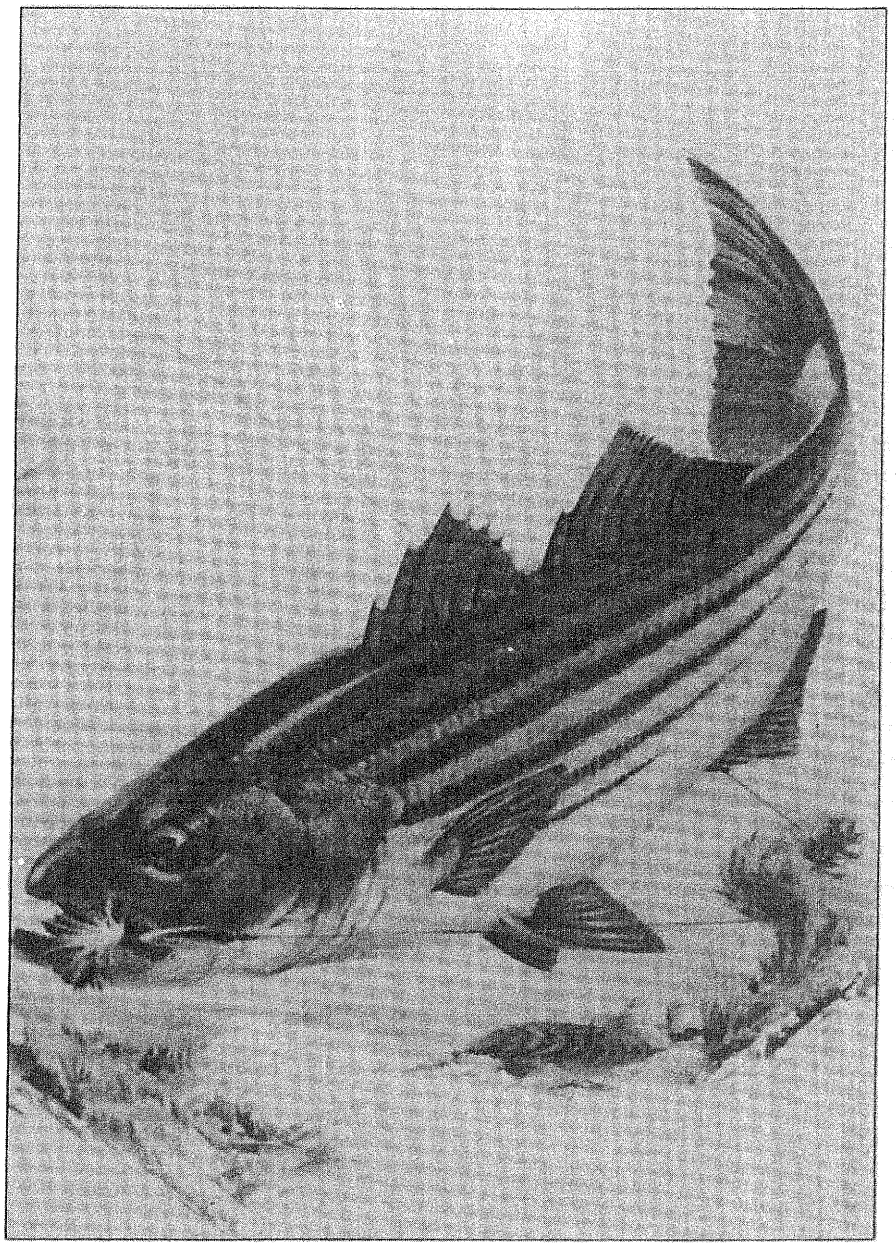

DISCUSSION

MR. ROSARIO: About 20 or 25 years ago the fishermen in Chesapeake Bay around Virginia were complaining that their oyster beds were being killed and that nobody did anything about it. Now the striped bass is being affected. The oyster industry down there was affected by chemical plants and pollution.

DR. BOREMAN: Well, in terms of a response -- my comments are directed to coastal migratory fish stocks themselves and the concern on their research and management. The striped bass has been a kind of banner species. The lessons that we've learned on striped bass and the mistakes that we've made are pointing, finally, to the direction of what types of research we need to do. We need to go back to the understanding of basic life history of the species. The work that was started in the 1960s and then dropped, we have to pick up again and continue. For example, the best data we have on estimating the maturity of striped bass; that is, looking at a female striped bass to see when she's going to be spawning, was collected by Dan Merriman in 1938, because he collected his data away from the spawning grounds on eastern Long Island and Rhode Island. From these data he estimated how many fish would be spawning the following spring. The other data available were collected on the spawning grounds themselves. Here you get into the problem of having only mature fish or fish that are maturing going to the spawning grounds, so the information is biased. Our best data are 40 years old, and still we're having problems convincing the states that this type of data is necessary to whatever population model we want to do.

MR. BENTLEY: I've read with a lot of interest about the introduction of fingerling bass in the Navesink River. Has there been any success to it? Last year and this year.

DR. BOREMAN: I haven't heard anything about the results either, of that project. Interestingly, fingerlings were collected in 1870 from the Navesink and transported out to the West Coast by hatchery train, by the the first U.S. fishery commissioner, Spencer Baird, who also founded our Woods Hole Laboratory. That started the West Coast population.

MR. BENTLEY: I've read that last year and this year a certain number were introduced in the upper reaches of the Navesink, but there's never been anything to say it was successful.

DR. BOREMAN: They're introducing them here and also in the Delaware River, in the Upper Bay of Maryland, to restore stocks.

MR. LYMAN: John, you commented that the population of stripers in the Hudson seems to be holding steady or going up and elsewhere declining. The West Coast has a little different problem, as you know, because of water supplies. But have you any recent data on the Canadian population in the St. Lawrence? I haven't seen anything.

DR. BOREMAN: I've talked with the Canadian striped bass scientist, Brian Jessop, and he's come to several meetings where I've given this type of talk. As far as he's concerned, they have had a serious decline in production. I'm not sure about the St. Lawrence stock, but stocks around the Bay of Fundy are declining.

As an aside, looking over data of the American Littoral Society, there were three striped bass tagged in the Bay of Fundy that wound up in the Hudson River. That's one interesting thing that we did not know before -- that they do get up to the Bay of Fundy and come back to the Hudson River. That's important for future reference. If they go ahead with the proposed tidal power project it may affect the Hudson River production of striped bass.

MR. BISHOP: I'm a reporter, but I've got a question. Doesn't New York City's 250 million gallons a day of raw sewage affect the striped bass?

DR. BOREMAN: It has not. The thesis that Romeo Mansueti presented in his paper referring to the effects of civilization on striped bass was that the discharge of effluents, including municipal effluents, has been the basis of the food chain of striped bass. As civilization has developed around the estuaries, the striped bass food chain has developed and benefitted the striped bass. However, he also threw in a note of caution about nutrient overenrichment and we see evidence of that now, where there is just too much discharge. The Hudson River scientists have been claiming for years that primary untreated effluent has been doing some good for striped bass production. If New York opens up the billion-dollar secondary treatment plant and cleans it up to 90 percent, will the striped bass populations decline? You're a reporter, so I'll couch my answer in terms of ...it's a possibility.

MR. BISHOP: Ed Koch was right -- I'm sorry.

MR. FEINBERG: I have a rather short question. Your presentation brought out two things with which I certainly agree. Number one, that current harvest rates do not necessarily indicate the health of the stock. And number two, that too often scientists are given the job of trying to rectify things after, in effect, the horse has been stolen. That was the attitude of the Mid-Atlantic Fishery Council when it undertook to develop a bluefish management plan. They felt that because the harvests were high that didn't mean that sometime very shortly the stocks could not collapse. They adopted a plan which they felt they could put in place and perhaps keep a finger on the stock. When that plan went up to the National Marine Fisheries Service, the Service wouldn't support it. One of the reasons given was the fact that the stocks appeared to be in good shape.

How do you reconcile what you're saying about striped bass with what the National Marine Fisheries Service did in regard to the bluefish plan?

DR. BOREMAN: Well, in terms of what the National Marine Fisheries Service did in regard to the bluefish plan, I don't think I can answer. That was our Regional Director's decision and I don't want to answer for him, it would be

inappropriate. But my comment stands that, as I said before, the time to look at a fish stock - and I support your comment entirely in this regard - is before it's too late to prevent you from getting the information you need right now. We need to sample striped bass to find out what's going on. There are not enough out there to begin with. If you don't act, not only do you not get the information you need, but when you do get the information and finally figure out what has happened, it may be too late to do anything about it. You then may have to resort to extreme measures, like restocking the bay with hatchery reared fish or something like that. So, I agree with you. And if you have questions on the bluefish plan decision, I'll give you Dick Shaefer's phone number and address.

MR. GEER: You almost sound like you were giving raw sewage credit for sustaining the striped bass population, which I find incredible to believe. How do you explain the fact that there's such a healthy population development in the first place and you didn't find it?

DR. BOREMAN: I'm not giving raw sewage credit for sustaining the population. There appears to be a link between the amount of sewage and the level of production of striped bass, at least historically. That may have ended and maybe overpollution is causing the decline, I don't know. This is one of the nine hypotheses that we're looking at to determine what caused the striped bass decline. I don't mean to imply if it weren't for pollution there wouldn't be striped bass.

MR. GEER: You said that the population would might go down if there was secondary treatment.

DR. BOREMAN: I said it's a possibility. But whether you can prove it was the switch to secondary treatment that caused the decline, I would say right now you probably never would be able to prove it within the realm of how we measure our striped bass population.

MR. ATRAN: In the last few years many of the states have been adopting the recommendations of the Committee, closing spawning areas and imposing more restrictive regulations. Is there any indication whether or not the fishery is responding to that or is it too soon to tell?

DR. BOREMAN: Too soon to tell, and I'm not sure that we could tell immediately. What we have been telling states is the first thing they're going to see, when they go to a moratorium, is a lot of little fish that haven't been caught. First of all, because the exploitation rate on those fish in the Chesapeake Bay apparently has been very high. When you remove an exploitation rate on the order of half of the stock per year, hopefully you take that mortality rate away. You're going to have a lot of small fish, and we're starting to see that in Chesapeake Bay.

There was also a warning to the managers because the fishermen are going to see many little fish. They will put pressure on the states to end the moratorium or to relax the management measures, but that's not the time to do

it. The thing to do is to let these fish grow to spawning size, then determine what restrictions you need on management.

MR. ROSARIO: Can striped bass be farmed?

DR. BOREMAN: Yes. There are some experimental projects going on in Chesapeake Bay right now to actually raise them and stock them in the Bay. It's a small operation, but Maryland is very serious about moving into full-scale hatchery production to restore Maryland stock of striped bass.

MR. WILK: Our next speaker is Dr. Frank Daiber, professor of biology at the University of Delaware. Frank has agreed to talk about the role of estuaries in the life of coastal fishes and in the fisheries. Frank is one of the foremost experts in that area. He is also someone who has supported the study of weakfish in this part of the coast. In the '50's and early '60's when weakfish stocks declined, Frank predicted the situation. Many of his early writings provide the basic biological knowledge of that species that we need and use today.

THE ROLE OF THE ESTUARY AND TIDAL MARSH IN THE LIVES OF COASTAL FISHES

by

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What have we learned about the role of the estuary in the lives of the coastal fishes? An estuary has been typically defined as "a semi-enclosed coastal body of water having free connection with the open sea and within which the seawater is measurably diluted with fresh water deriving from land drainage" (Cameron and Pritchard, 1963). Almost two-thirds (by value) of the United States' commercial fish catch and much of the marine recreational catch spend at least a part of their lives within the confines of an estuary (McHugh, 1966). Dominance of estuarine species is especially great along the Atlantic and Gulf of Mexico coasts. Twenty years ago, at the time of the Symposium on Estuarine Fisheries, Walford (1966) posed a number of questions including the following: What is the relation between the area of an estuary and the size of the animal population that it will support? What proof is there that the existence of any species is totally dependent on estuaries? Do large numbers of larvae prove that estuaries are absolutely essential as nursery grounds? These are still, by and large, the questions for which we have only partial answers. Most estuarine species have complex life histories which may interact with an estuary in different ways. These include migratory routes, spawning sites, nurseries, role in community organization, and the contribution to the coupling of the estuary with the marine habitat.

USE OF THE ESTUARY AS RELATED TO SPAWNING SITE

There are four groups of fish whose spawning sites are associated with the estuary. Migratory forms such as the salmonid species and the shad, Alosa sapidissima, must make their way through the estuary to and from their freshwater spawning sites (Dymond, 1963; Hildebrand, 1963, Healey, 1982). The American eel, Anguilla rostrata, must make a round trip through the estuary to the oceanic spawning site. These various species must contend with a significant physiological transition (Simenstad et al., 1982) as well as the degrading aspects of urban and industrial expansion as they traverse the estuary and make the freshwater passage.

A second group including the alewive, Alosa pseudoharengus; blueback herring, A. aestivalis; and striped bass Morone saxatilis, spawn in fresh to slightly brackish waters (Hildebrand, 1963; Polgar, 1982). (See Kennedy, 1982, pp. 315-442 for discussions of anadromous fishes in estuaries). Further down the estuary are the spawning sites for the silverside, Menidia menidia, (Moore, 1980; Middaugh, 1981; Cadigan and Fell, 1985), mummichog, Fundulus

heteroclitus, (Taylor et al., 1977, 1979); winter flounder, Pseudopleuronectes americanus; Atlantic tomcod, Microgadus tomcod (Pearcy and Richards, 1962); and weakfish, Cynoscion regalis (Harmic, 1958). These are included in the third group.

The fourth group comprise the offshore spawners. The menhaden, Brevoortia tyrannus (Reintjes and Pacheco, 1966; Wilkens and Lewes, 1971; Thayer et al., 1985), the croaker, Micropogonias undulatus (Haven, 1957; Weinstein et al., 1980), the spot, Leiostomus xanthurus (Thayer et al., 1974; Weinstein et al., 1980; Weinstein and Walters, 1981), and flounders, Paralichthys sp. and plaice, Pleuronectes platessa (Weinstein et al., 1980a, 1980b; Rijnsdorp et al., 1985) have been identified as species that spawn in the open ocean and then appear within the estuary as larvae and/or as juveniles.

NURSERY

With the exception of the mummichog, which spends its entire life within the tidal marsh environment, the members of the last three groups spend only a portion of their lives within the boundary of the estuary. A number of investigators have considered the estuary to be a nursery ground where these various species could carry out productive foraging and be less subject to predation (Haven, 1957; Reintjes and Pacheco, 1966; Wilkens and Lewes, 1971; Weinstein, 1979; and Weinstein and Brooks, 1983).

The Atlantic menhaden appears to spawn over much of the continental shelf (Nelson et al., 1977) with the hatching of eggs and early development of larvae occurring in the ocean. Reintjes and Pacheco (1966) found no transforming larvae at sea but larvae undergoing metamorphosis were taken in tributaries of lower salinities. Larvae enter New England estuaries from May to October, October to June in the Middle Atlantic states, and December to May in the South Atlantic states (Reintjes and Pacheco, 1966). Wilkens and Lewes (1971) reported menhaden entering the estuarine waters of North Carolina from November to May with the peak of abundance in February and March after the water had warmed to about 10 C. These larvae then move upstream where they are most abundant in the 1% to freshwater zone. However, they do not move into the entirely freshwater portion of the system. After transformation, the juveniles form schools and appear to seek higher salinities by moving toward the lower estuary.

The same kind of pattern has been reported for the croaker (Haven, 1957) and the spot (Weinstein and Brooks, 1983). Weinstein and Walters (1981) found spot larvae entering Middle and South Atlantic estuaries in December with peak densities in early spring. Weinstein and Brooks (1983) considered the spot to be very nicely illustrative of the transit role of the estuary. The larvae are transported up bay in the more saline bottom waters with a progressive increase in size as the juveniles move down the estuary in the fresher surface waters. A similar pattern was reported by Pearcy and Richards (1962). While a greater number of winter flounder and tomcod were found in the brackish waters of the upper estuary, such larvae were much more abundant in the bottom

waters than in the surface waters. Weinstein (1979) and Rogers et al. (1984) suggested that the young actively seek out creek headwaters and other freshwater sites and that the estuary fills up backwards during recruitment with larger individuals continually bleeding off toward downstream habitats. Rogers et al. demonstrated that seasonally freshwater areas are important functional components of estuarine nursery zones. They observed that the nursery function of specific locations will be governed by individual species responses (or lack thereof) to freshwater encroachment and hydrodynamic factors. Rogers et al. found it remarkable that low-salinity and freshwater areas serve as primary zones of recruitment for so many species and that their peak recruitment and utilization periods coincide with the period of maximum riverine influence that temporarily creates a much larger proportion of the "preferred habitat." Along this same vein Weinstein (1979) found that the standing crops for the majority of species indicated lower productivity per unit area in the high salinity marshes closest to the ocean. The progressive increase in size of the juveniles for the various species following larval transformation in the upper and mid sections of the estuary clearly indicates the positive role the estuary plays as a nursery.

COMMUNITY ORGANIZATION

The organization of the tidal marsh-estuary fish community can take a variety of forms. It can be defined on the basis of numerical dominance or biomass, permanent species vs transients or seasonal sequences. Richards and Castagna (1970) identified 11 species to be in residence in the marsh seaside waters of the Delmarva peninsula. Ten of these species made up 98 percent of the total number collected, with Atlantic silverside, M. menidia, being the most abundant. Subrahmanyam and Coultas (1980) considered the cyprinodontiform species to be the resident species in Florida marshes while all the others were considered to be transients because they were represented by juvenile forms only. Weinstein (1979) considered the mummichog, the striped killifish, Fundulus heteroclitus, and the Atlantic silverside to be the only residents in the marshes of the Cape Fear River area of North Carolina.

The majority of the community dominants are transients, being resident for only a part of their life cycle. Bozeman and Dean (1980) found that five species comprised 99 percent of the larvae captured from a South Carolina tidal creek; the spot (53.5%); pinfish, Lagodon rhomboides (31.8%); menhaden 11.9%; croaker (1.7%) and speckled worm eel, Myrophis punctatus, (0.5%).

The Gulf killifish, Fundulus grandis; longnose killifish, F. similis; and sheepshead, C. variegatus and other typical estuarine fish such as spot and pinfish were among the 10 dominant species in Florida marsh creeks (Subrahmanyam and Coultas, 1980). Weinstein and Brooks (1983) found that the spot dominated the nekton of both the sea grass meadows on the eastern shore of the Delmarva peninsula and an adjoining tidal creek. This sciaenid comprised more than 80% of all individuals in both habitats and was nearly four times as abundant in the tidal creek.

Shenker and Dean (1979) found a wide variation among the three diversity indices that they used to evaluate the composition of the fish community of a South Carolina tidal creek. Such results suggested a high degree of utilization of this habitat by larval and juvenile fishes. The variability also reflected the diurnal-nocturnal activity patterns of some species. The wide variation in catch size would suggest that many species can use the intertidal marsh without intense competition for available space and energy.

Seasonal pattern of abundance and distribution are another conspicuous component to the estuarine marsh community (Bozeman and Dean, 1980). The number of species was greater in the summer (41) and fall (32) than in the winter and spring (20 each) sampling of a South Carolina marsh creek. The number of individuals was not affected by season (Cain and Dean, 1976). In contrast, Subrahmanyam and Coultas (1980) reported a significant increase in the numbers of fish in a west Florida marsh creek during the warm season. They observed that fluctuations in the numbers of individual species revealed a replacement of dominants and a seasonal succession in tidal creeks with Gulf and longnose killifishes in summer and fall, the spot from January through May, the bay anchovy, Anchoa mitchilli in summer and the sheepshead minnow in late summer.

Transient species, recruited primarily from the ocean and residing in the tidal creeks during their early life stages, form a conspicuous seasonal component of the marsh fauna and may play an important role in the organization of marsh communities. Their distribution within the marsh system is influenced by salinity gradients and to a lesser extent by substrate character (Weinstein et al., 1980b).

Earlier, Rogers et al. (1984) demonstrated that a preferred habitat can be expanded at certain periods of the year by the enhanced influx of fresh water. By the same token the preferred habitat can be contracted. As an example, Price et al., (1985) have put forth a hypothesis that could help explain the decline of the striped bass in Chesapeake Bay. They suggested that the decline resulted, in part, from the loss of deep-water habitat for the adults which was caused by fertilizer enrichment from neighboring farmlands which increased planktonic production and, in turn reduced the concentrations of dissolved oxygen. A related hypothesis suggested that changes in the nearshore habitat for juvenile striped bass, involving severe declines in submerged aquatic vegetation due to nutrient-driven planktonic shading, also contributed to the decline of the striped bass. Nutrients (nitrates and phosphates) and chlorophyll a, an indicator of phytoplankton biomass, have increased in many areas of the bays and tributaries. Such trends were qualitatively associated with greater deoxygenation of the deep channel in the mid- and upper bay. The combination of the expanding hypoxic pool and summer temperatures above preferred levels for adult striped bass may contribute to an "oxygen-temperature squeeze" that forces adults onto shoal areas of the bay or out of the upper bay. Many of these shoal areas lack suitable cover for juvenile striped bass and their prey. Strong intraspecific competition among striped bass may be occurring, brought on by the loss of benthic habitat. One can presume that such losses of habitat

would have adverse impacts on the organization of the estuarine fish community, presumably induced, in part, by man's increased diversity of interests in the estuarine habitat.

MARINE-ESTUARINE COUPLING

There are at least two ways in which there is a coupling between the coastal marine habitat and the estuary.

LARVAL TRANSPORT. As pointed out in the previous section, transient species, primarily recruited from the ocean habitat make up a substantial portion of the tidal creek fauna. The evidence suggests that the eggs and larvae are subjected to an open ocean environment that for a sufficient length of time to be affected by oceanic conditions. In the case of the menhaden, there is a progressive increase in larval size from offshore to inshore stations as well as an increase in the distance offshore from north to south. The young are well inshore in the New England-New York area. During the early larval stages there is a passive drift period in which larval movement is the result of ocean currents. This completely passive stage ends when the menhaden larvae achieve a length of 10 to 12 mm some 30 to 45 days after hatching (Nelson et al., 1977).

Nelson et al. (1977) suggested that currents with an onshore component, particularly during the passive larval phase, would seem to be important for transport of the larvae from offshore spawning grounds to the estuarine nursery. Transport to the vicinity of estuaries would increase the opportunity for entering the nursery grounds, resulting in good year classes during years with strong onshore transport. Offshore water movement or weak onshore transport would increase the distance that must be actively traversed, thus reducing the changes of survival and resulting in a poor year class. The examination of wind plots showed strong westerly onshore movements during January-March in the area south of Cape Hatteras. This coincided with the spawning of menhaden south of Cape Hatteras. In the mid-Atlantic area the stronger westerly transport occurred during the November-February period of menhaden spawning. The concurrence of these two events may provide a mechanism for transporting fish larvae into the vicinity of estuarine environments particularly along a north-south oriented coastline. Nelson et al. found zonal Ekman transport to be the most significant parameter that was tested for determining onshore transport of menhaden larvae. Shaw et al. (1985) suggested that longshore advection within the horizontally stratified coastal boundary layer is the major mechanism for transporting Gulf menhaden Brevoortia patronus larvae in the east-west oriented continental shelf waters of western Louisiana to the nursery ground rather than cross-shelf transport from immediately offshore of the estuary.

Nelson et al. (1977) suggested that, after the passive transport stage has been passed (for menhaden), the timing of larval entrance to estuaries is apparently controlled to some extent by the larvae and is somewhat independent of water movement. Once larvae are transported to the vicinity of the estuary, larval behavior can play a significant role in the transport to the

nursery ground. Studies carried out by Rijnsdorp et al. (1985) in the Easter Scheldt and the Wadden Sea of the Netherlands demonstrated that plaice larvae usually were most abundant in the bottom stratum, but during nighttime flood tides they moved into the mid-depths and the surface strata. They found that flood catches exceeded the ebb catches of pelagic larvae. These results suggested that plaice larvae accomplish passive but selective horizontal transport by swimming up from the seabed during flood tides and remaining on the sea bed during ebb tides. Thus the efficiency and direction of transport is influenced by active behavioral response of the larvae to the tidal flow. Pearcy and Richards (1962) observed much the same pattern with the winter flounder and tomcod in the Mystic River of Connecticut. They found that 97 percent of the total number of larvae collected hatched from demersal eggs. Such larvae were much more abundant in the bottom waters than the surface waters. It was postulated that demersal eggs are important in reducing offshore dispersal by currents and that the vertical distribution of larvae from this egg type may enhance retention within the estuary.

The specific behavior responses of the post larvae of various species will enable them to reach and stay within specific portions of an estuary. Weinstein et al. (1980a) demonstrated this with the spot, croaker and the post larvae of flounder of the genus Paralichthys. Such species-specific responses can take place despite intensive tidal flows and relatively high exchange ratios as found, for example, in the Cape Fear, North Carolina estuary. Riding out the ebb on the bottom and responding to currents on the flood would be a prime mechanism for upstream movement. Both the spot and the flounder were observed to migrate toward the surface at night while the croaker tended to remain on the bottom. Getting up into the water column on the nighttime flood would enable the larvae to make a lateral movement into the marshes while staying on the bottom would preclude such change of habitat. the result was that croakers were generally located in the deeper channel while the spot and flounder were commonly taken in the marsh.

The data gathered by Weinstein et al. (1980a) and others supports the hypothesis that post larvae exhibit behavioral patterns with respect to photoperiod and tide which are instrumental in enabling such organisms to: 1) accumulate in upstream nurseries by utilizing net nontidal flows in the lower layers; 2) make strong lateral movements into the marsh habitat and 3) stay in both of these nursery areas by effectively dropping out of the water column on the ebb tide. It is suggested that such behavioral response would be a prime mechanism for entering the estuary and finding an appropriate nursery habitat.

Tanaka (1985) has described another behavioral response that could direct the post larvae to suitable nursery sites. During metamorphosis the larvae of the red sea bream, Pagrus major, are transformed into pelagic juveniles and they begin to move into Shijiki Bay in Southwestern Japan. After immigration they become demersal at which time their main food items are the copepods, Acartia clausi and A. steneri. Both species are concentrated near the bottom and their densities increase towards the innermost part of the bay. This gradient of copepod distribution leads the early juveniles to the nursery

ground where gammaridean amphipods, the most important food for demersal juveniles, are abundant.

To summarize, tidal and nontidal currents as well as food gradients may play a significant role in transporting larval fish to the vicinity of the estuary and directing the larvae to suitable nursery grounds. In the early stages this may be passive transport but, with subsequent development, specific behavioral patterns may have an equally important role in coupling the ocean habitat and the estuary.

ENERGY TRANSFER. While tidal and nontidal currents, as well as food concentrations, may serve to direct larvae to an estuary and its nursery grounds, the quality of food and its availability may have a profound effect on the well-being, even survival, of the larvae and juvenile fish. In the early stages of development, menhaden feed on particulate material individually selected with zooplankton being dominant. During their first summer these juvenile menhaden transform from a diet of zooplankton to a filter feeding mode ingesting fine flagellates and phytoplankton. Reintjes and Pacheco (1966) considered food to be the principal biological factor affecting the well-being of menhaden in the estuary. One could conceive a situation where continued phytoplankton blooms, which could have a deleterious effect on striped bass as portrayed by Price et al. (1985), could enhance the menhaden population during their sojourn in the estuary.

Martin et al. (1985) suggested how food quality could affect the nutritional state of fish larvae. They employed morphometric, histologic and two biochemical techniques, RNA:DNA ratio and fatty acid composition and concentration, in their examination of striped bass larvae from the Potomac River. All four techniques gave evidence of a poor nutritional state early in the season but not later. Larvae from upriver tended to have better histological scores than downriver larvae. Mean scores tended upward after late April, which was the earliest time larvae with completely absorbed yolk sacs were caught. Morphometric scores tended to be lower early in the season for small larvae with improvement as the season progressed. Scores were synchronous with the density of larvae; peaks of both occurred in early May when samples were dominated by small larvae. Poor nutritional state was negatively correlated with temperature and the freshwater cladoceran Bosmina. The RNA:DNA ratios were more scattered early in the season and for smaller larvae. The ranges were much more restricted later in the season and for larger larvae. In laboratory reared larvae, fatty acid levels below 10 mg/larva indicated starvation. Fatty acid levels for wild larvae were lowest early in the season and exceeded the starved level in all subsequent collections.

Early in the season copepods dominated the zooplankton. Later Bosmina and other cladocerans dominated the zooplankton, especially at upriver stations. The change in dominance occurred in mid-May 1981, coinciding with changes in index values. Martin et al. suggested that larval striped bass depend on larger zooplankters, especially Bosmina, for nutritional well-being.

Thayer et al. (1974) have suggested that zooplankton abundance may control the survival of fishes during their transition from larvae to juveniles and that the larvae have a significant effect on reducing the standing crop of zooplankton. They had noted that during November larval fishes, primarily pinfish, spot and menhaden began entering the Newport River estuary in North Carolina. The larvae reached maximum abundance in the estuary during March and April with a corresponding significant decline in zooplankton abundance. The reduction in zooplankton abundance could in turn have a retarding influence on larval growth rate.

If the larvae of juveniles can turn to other foods, then reductions in abundance of one kind of food should not have a marked effect. As an example, Moore (1968) and Cadigan and Fell (1985) have reported the Atlantic silverside to be a diurnal opportunistic omnivore. Moore recorded that possum shrimp, Neomysis americana; amphipods, Ampelisca vadorum; horseshoe crab, Limulus polyphemus eggs; isopods; Edotea triloba and copepods comprised the five most frequently occurring foods for Delaware silversides. Cadigan and Fell found copepods, shrimp (mostly Crangon and Palaemonetes) and plant material (mostly Spartina) to be the most important items for fish from Connecticut. There is a seasonality to the kinds of food ingested by silversides. Horseshoe crab eggs and larvae were fed on most heavily during June and July, isopods in August, amphipods and Neomysis in September and October and by November and December, Neomysis and copepods were dominant. Cadigan and Fell found size and spatial differences. Smaller silversides ingested more copepods and larger fish consumed more shrimp. Shrimp, copepods and fish eggs were dominant food items in the lower estuary while plant material, fish and copepods were most important in the upper estuary.

The presence of plant material and detritus in the gut of fishes (Schmelz, 1964; Cadigan and Fell, 1985, and others) has led to characterizing a detritus-based food web in the intertidal communities of the estuary. Odum and Heald (1975) considered detritus to be important to consumers in the estuary, wherein they established the concept that there is a group made up of a few species but many individuals of herbivorous and omnivorous organisms, including a few species of fish, all of which derive their nourishment from a diet of vascular plant detritus and small quantities of fresh algae. Energy is then transferred from these detritus consumers to lower carnivores and then to high carnivores. Shenker and Dean (1979) and others have noted that there are large numbers of young commercial and forage fish that frequent the intertidal marsh creeks. While most of them are not detritus feeders they benefit from the high productivity of such marshlands as secondary consumers.

While a fish like the mullet, Mugil sp., common in the estuary, ingests great quantities of detritus and thrives (Odum, 1970) there are others like the mummichog which, while it ingests quantities of detritus, does not thrive on it (Prinslow et al., 1974; Katz, 1975). Weisberg (1981) and Weisberg and Lotrich (1982a) clearly demonstrated the need of a high protein diet for the mummichog. The mummichog is primarily a daytime feeder that feeds most actively at high tide, regardless of whether or not high tide inundates the marsh surface. When it can move onto the marsh surface the fish consumes prey

characteristic of the site (Weisberg et al., 1981). When the mummichog is allowed access to the marsh surface it grows at a faster rate than when it is restricted to the subtidal portion of the habitat. Since the growth rate of restricted fish increased substantially when fed a supplemental ration and was even higher than the growth rate of unfed unrestricted fish, the availability of food, rather than the behavioral responses due to release from crowding, must be responsible for the increased growth when mummichogs are allowed access to the marsh surface. It is apparent that the intertidal marsh surface contains food resources necessary for the natural mummichog population (Weisberg, 1981; Weisberg and Lotrich, 1982b).

A number of authors have pointed out the coupling between estuarine-marsh habitat and that of the open ocean (through the transfer of energy) (Bozeman and Dean, 1980; Weinstein et al., 1980b; Weinstein and Walters, 1981; Weisbery et al., 1981; Weisberg and Lotrich, 1982b; Cadigan and Fell, 1985). Weisberg (1981) and Weisberg and Lotrich (1982) called attention to the energy contained in the prey taken from the marsh surface by the mummichog as it moves to the subtidal habitat with the ebbing tide. These fish are in turn eaten by larger predators or scavengers who would move out of the marsh through the estuary to the ocean. This same pattern of energy transfer would occur with silversides when they move offshore in the fall (Cadigan and Fell, 1985) and for the spot, croaker, menhaden, etc., when they leave the estuary (Bozeman and Dean, 1980). Weinstein et al. (1980b) estimated that there was a total of 7.02 k cal/m^2 available for export to the lower estuary and marine environment in the late summer and fall from the Cape Fear River estuary. This transfer provides an appreciable enrichment of the coastal waters, actively moving from the tidal march and estuary "under its own power."

SUMMARY

The estuary has specific roles to play in the lives of coastal fishes. Many fish identify it in terms of spawning sites. Migratory forms use it as a conduit. Some spawn in the fresh to nearly fresh waters, others spawn in the higher salinities yet within the confines of the estuary and a fourth group spawns in the ocean although the young then move back into the estuary for some period of time.

There is no hard proof that these coastal fish have a physiological need that can be served only in the estuary. The estuary does, however, serve as a nursery where positive growth of larvae and juveniles occurs before they return to the ocean.

There is a definite organization to the fish community. There are those species that are identified as permanent residents and there are many transients, usually young, that spend only a part of their lives in the estuary before returning to the ocean. This community is organized along a temporal, spatial, and salinity axis.

There is a coupling between the ocean and the estuary for those fish that spawn offshore. By passive drift and by behavioral responses the larvae find

their way into the estuary and become established in a nursery habitat. There is also a coupling through the transfer of energy and nutrients as the various species of fish move offshore from the marsh-estuarine habitat to the ocean.

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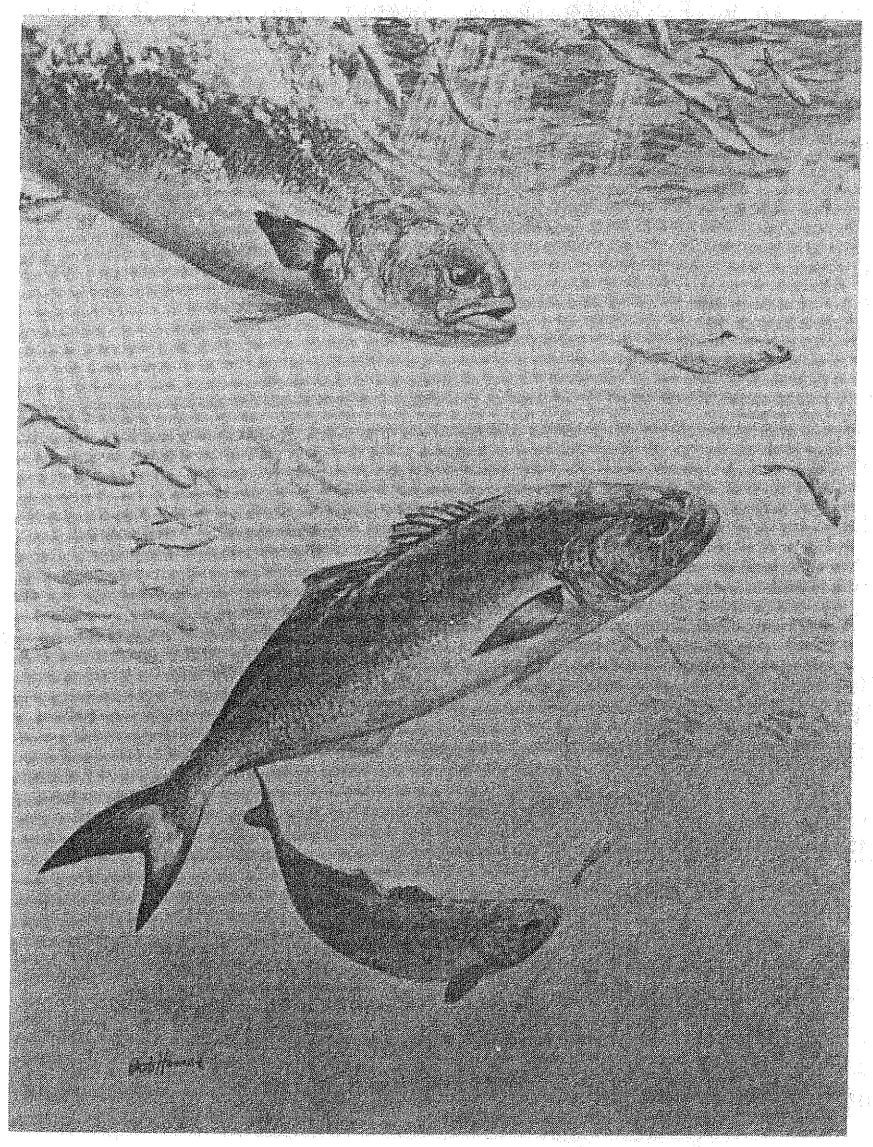


DISCUSSION

MR. ROSARIO: How about the birds that migrate and carry food energy out?

DR. DAIBER: There is no question they move a lot of energy that they have obviously consumed; no question about it. This is one of the points that we know essentially nothing about. When we're talking about a marsh system we usual think of the transfer of nutrients and food from the marsh out into the ocean. But there is also a terrestrial component of some magnitude and we don't know what the magnitude is.

MR. O'REILLY: You mentioned a few figures of the fish export in term of kilocalories on a calorie or carbon basis. Would your figures represent a significant fraction of the marsh production?

DR. DAIBER: I don't know. Maybe if I dug it out I could find some numbers but I don't recall them. People have generated numbers of one kind or another. We don't know how much actually recycles within the marsh system itself, which never leaves the marsh to go out into the adjoining estuary. We don't know what that number is. We can collect material in one form or another by one means or another to estimate what actually leaves the system, but even that is suspect. We don't know how much energy exchange takes place within the system itself; therefore, we don't know what the relative importance of those two are.

MR. WILK: I have some questions relative to weakfish, an estuary-dependent species quite important to the recreational community as well as commercial endeavors. How much do we really know about the weakfish and do you have any theories which could explain the ups and downs of the species? It has cycled periodically over a 20-year span.

DR. DAIBER: Let me answer the second one first, and I think this applies also to other species of fish. I remember listening to Ed Joseph, who is now in South Carolina. As you may remember, he dealt with fishermen in the lower part of the Chesapeake Bay, in Virginia waters. I remember hearing him say that in talking with the old fishermen there, that their fathers were not familiar with the croaker at the turn of the century. They found this to be a very unusual fish. By the late '40s, the croaker was very abundant and was commonly recognized. We saw it in Delaware. The first year I came to Delaware, 1952, was the best year I ever saw for croaker and it's been going downhill ever since. And I can't help but wonder, in view of John Boreman's comments this morning about the striped bass, where the same kinds of declines are taking place in Canada as they are in the Chesapeake Bay and elsewhere along the Atlantic. We may also be confronted here with a pattern of cycles. The length of the cycle may be very different from one species to another.

I would suggest to you that there may be a certain amount of space out there that is fixed, what Germans call Lebensraum; and if one species is up, something else has to be down.

MR. WILK: What are your feelings about holding capacities in estuaries? Do you feel that they have a distinct holding capacity in terms of finfish, both for numbers of species, as well as biomass, the total weight of individuals? Do you feel that we're doing a great injustice; if estuaries start to shrink, their resources will be taxed further because estuaries have a limited capacity. In other words, Delaware Bay can support only so many metric tons of finfish and although the mix may change over time, the biomass remains relatively the same.

DR. DAIBER: I would suspect that probably food plays an important role in terms of the holding capacity for a group of species. I'm using "food" here in its very broad sense; that is, we can be dealing with a single species or with a complex of species. If there is insufficient food, the holding capacity is going to be decreased.

The quantity of food present may be influenced by any number of things. It may be a climatic pattern. It may be the result of a pollution pattern. Those kinds of things can affect the holding capacity. If everything were ideal, I believe that there would be a definite biomass sustainable by a particular system.

MR. BENNETT: For species that are spawned offshore and come into the estuary and use it as a nursery -- are you saying the presence of those species in the estuary proves their dependence on the estuary, or that it may not, or that it may for some? I thought I heard you say it two different ways.

DR. DAIBER: I don't think it's coincidental that they are there but I am not sure. I'm not aware of anything that has been done that absolutely proves that these fish need reduced salinity to survive.

MR. ROSARIO: Do you think it's better with a mixture of sweet water and salt water?

DR. DAIBER: We certainly find some larval forms concentrating there, and don't find the great numbers of them developing offshore, true at least for some species. Again, I would suggest that the food supply can have a profound influence on how well they grow and how many of them actually survive and manage to escape predators.

It may be that the estuary plays a role in simply providing shelter for these smaller fish, because the water is shallower, larger predators can't get at them quite as readily.

MR. BENNETT: I find myself talking to groups about preservation or conservation of estuaries because the Littoral Society is very interested in the topic. I say that the estuary is the key to the survival of many coastal species and give examples of growth of some fish like the bluefish that come in and can grow up to an inch a week in some estuaries. I say this to emphasize the value of the estuary. And yet, I hesitate to say they're essential. There's a good chance if there weren't any estuaries the bluefish

would do fine along the beach. I think you may be saying, "we're really not sure."

DR. DAIBER: Few physiologists are interested in biochemical processes under the conditions of an estuarine system. People simply haven't been working in that area. We haven't experimented in a laboratory environment where we can control some things. We don't know whether dilution of seawater is essential for sustaining the life of a particular species at particular stages in its life cycle. At least I'm not aware of it.

MR. BULLOCH: Could we continue that question and approach it from a different point of view? Over the years there's been a rather reasonably significant decline in tidal marshland along the eastern seaboard. If your hypothesis is viable, then you would have to say perhaps, there is no long-term effect on fish population. Is that so, or is it so variable that one can't really say one way or the other?

DR. DAIBER: I don't like to duck behind things, but one of the questions that people have been asking for some time is how much marsh can we bury or get rid of or in some way destroy and still sustain the yield of fishing and invertebrates, like blue crabs and clams. I would suggest to you that we are not very close to that particular answer. We don't know at this present time if we remove "X" number of acres from a marsh, from a particular estuarine system, what that does in terms of negative impacts on the populations in any quantitative way. We have qualitative impressions that would suggest that something is taking place. For example, years ago I caught more hogchokers, little round flounder that some of you are familiar with. I don't know what its ecological role is in the estuarine system. It's a bottom feeder. It feeds on worms and other creatures that live on the surface of the mud or in the mud. We collected them in such great quantities that sometimes we destroyed our trawl gear trying to retrieve the net. I remember one time we bent our gear all out of shape, I mean the iron work, because we had such a large load of hogchokers. We had to call in other trawlers. Now we hardly see any hogchokers in Delaware Bay.

Our instrumentation says that the Delaware Bay seems to be improving; chemical analyses of the water, etc., suggest that things are improving. Here we are faced with a situation where at least the hogchoker, a nondescript little flatfish, has greatly declined. I don't know whether it is due to some cyclic pattern or to some pollution problem that exists in the system and is not being measured.

MR. WILK: Perhaps competition with some other species.

DR. DAIBER: Perhaps. Again, the idea of "Lebensraum".

MR. BULLOCH: The oyster is an example of something that was in great abundance at one time and was basically wiped out by man. And it may have been that you're overharvesting, basically you were mining rather than attempting a sustainable harvest. It's possible.

DR. DAIBER: We don't know when it comes to cycles and we see a decline in a fish, as in the case of striped bass. We don't know wheather we are overfishing on the down- or upside of the cycle. This could have a very profound influence on the outcome for that particular species -- whether we're pushing it towards extinction or depletion. We don't know the impact of such things as the intake screens in power plants - one of the biggest predators that I can conceive of. If you look at it in ecological terms, the cooling system of a nuclear power plant or even a coal fired power plant drawing on an estuary, acts like a predator, destroying fish and whatever else may be impinged upon the screen. They removed fish by the truckload from these screens, or used to. It's better now, I think, than it used to be, but it's still destroying "X" number of "X" pounds of fish and any of the other invertebrates that might be up in the water column.

We don't know the impact of that. We don't know how to measure mortality rates in striped bass or any other fish that's out there because we don't know the size of the population to begin with. Therefore, we don't know the magnitude of impact of our fishing on that population. We haven't successfully yet been able to measure the size of the population that exists out there. We can do it in some lakes and get some estimate there because the fish can't get away from us, but in the ocean it's completely a wide open system.

MR. FEINBERG: Doctor, is it known whether larvae that ultimately wind up in a specific estuary are there as a matter of chance, basically by wind and current, or whether there's some sort of an instinct that returns certain larvae to certain estuaries, as they say salmon return to the river in which they spawned?

DR. DAIBER: I think the brief answer is, I don't know. Let me expand on that. We don't know whether the eel larvae come back to the same estuary in which their parents traversed. Many years ago I made some larval checks over a series of summers sampling the input into various tidal creeks that discharged on the Delaware side of Delaware Bay. I had shanghaied a bunch of graduate students and stiff-armed them into sampling over a 24-hour period. We repeated this a number of times. We often would have a fine collection of fish eggs and larvae at the mouth of one creek and just a few miles up the beach at another system we would have a very different quantity of eggs and larvae. I became convinced that whatever we saw in our nets was simply a reflection of a swarm of eggs and larvae that happened to be present at the mouth of the creek as the tide began to flood. We're talking about the patchiness of plantonic organisms or "swarms". On that basis I think it is a fortuitous sort of situation controlling entrance of these eggs and larvae into a particular system.

Other fishes certainly can find their way back. I think we have evidence now that indicates that shad return to the parental stream. We have very good evidence nowadays, of course, that the various salmonid species also return to their parental stream. The mystery still exists on how they find the mouth of the Columbia or Frazier or whatever river it happens to be. We know how they

find their way into the creek where they were actually spawned. We don't know, as they move across the ocean; how they find that particular major river system that discharges into the ocean, whether it is in New Brunswick, into the Gulf of St. Lawrence, or the Frazier River into the Pacific. The sense of smell and the memory of that sense of smell is the important key so far as salmonids returning to the stream bed in which they were hatched. It's a navigational and a behavioral sort of thing that directs them back to the mouth of a river. They are able somehow to find navigational cues which you and I can't perceive yet to get them back to the coastline after having been at sea a couple of years and thousands of miles away from the mouth of that particular river.

MR. BENNETT: Frank is too much a gentleman to plug his own book, so I will. We have it on our ALS bookshelves. It's called Animals of the Tidal Marsh and it's published by Van Nostrand Reinhold. I guess it's been out within the past two years.

DR. DAIBER: Three years.

MR. BENNETT: If anybody is interested in pursuing it, it's fun to read and full of information. I highly recommend that book. And I think Frank is also too much a gentleman to mention the fact that he's having a second book coming out next year on the impacts of man's development on some estuaries.

DR. DAIBER: Specifically, tidal marshes.

MR. ROSARIO: Professor Cole at Sandy Hook said that every so often he goes out and takes some grass and pushes it into the water to start another piece of land. Why don't they do that more? I heard somebody else out in Long Island was doing it, too.

DR. DAIBER: You are talking about creating a new marsh. They're doing it in a number of places and there have been a number of people who have developed the procedure for doing this. I suspect the main reason why it isn't done more is because it costs money. It's a relatively easy process.

MR. ROSARIO: Right.

DR. DAIBER: This can be done by using seeds. We're talking about primarily the cordgrass. It can be done by taking the seeds and sowing them, as you would a grain like wheat, rye, or oats, on the intertidal area and taking some precautions that you don't lose the seeds by the flushing of the tide. Alternately, you can take plugs from a wild marsh. Simply take a plug of grass with roots and everything else and transplant it. That is obviously labor intensive. The most expensive way of doing it is to take the seeds and raise them in a nursery until they are of sufficient size to be handled and then plant them.

The least expensive and the most uncertain method is to plant the seed itself. It's fast because you can use ordinary agricultural equipment to sow

and bury the seeds, towed behind a tractor or a team of horses. Horses are a little slower but don't rust. The most expensive method is to start the stock in a nursery and then plant the shoots, because it's labor intensive.

MR. ROSARIO: I think that's a good project for the kids to start early in life, maybe in elementary school.

DR. DAIBER: Yes, however you must be sure if you're going to do this, that you want to use material that is locally collected. You shouldn't collect grass from a hundred miles away. It doesn't seem to perform as well as local plant material.

INTRODUCTION OF SENATOR F. LAUTENBERG

MR. WILK: The Senator is here and I thank him for his efforts to attend. I would like to present Dr. Bob Abel, president of the New Jersey Marine Sciences Consortium, to introduce the Senator.

DR. ABEL: The honor is mine as the privilege of introducing Senator Frank R. Lautenberg this afternoon.

The Senator was graduated Columbia in 1949. Just a few years later he co-founded Automatic Data Processing, ADP, served as president and guided it into becoming the largest and most powerful organization of its kind in the world.

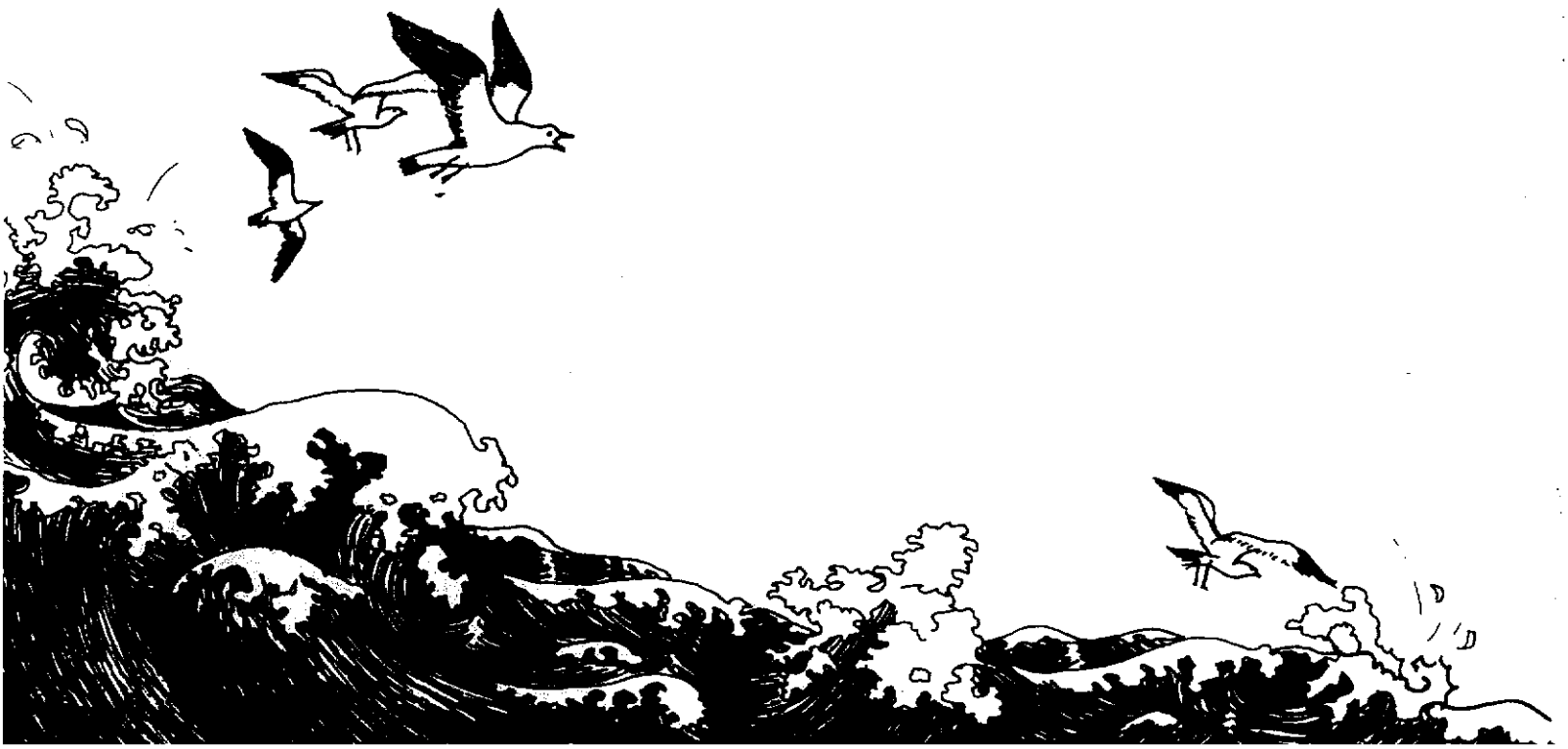
When I had my first look at the Senator's list of affiliations and accomplishments, the only thing I could think of was put it on slides and ask for questions. I'd like to offer you some highlights.

The Senator has served on the New York-New Jersey Port Authority, as president of the Association of Data Processing, and he is, in fact, a member of the Hall of Fame for Information Processing.

The Senator has always been interested in cancer research, and founded in his father's name, the General and Tumor Immunology Center several years ago.

The first time I ever introduced a Senator it was Warren Magnuson, quite a long time ago on the occasion of his receiving the Neptune Award for service to the ocean community. I was extremely impressed with the occasion and, to be honest, with myself. So I laid it all out, and after I got through with some lengthy introduction, the Senator got to his feet and went to the microphone and said, "You know, when I hear words like that I could only wish that my poor dear parents were here to listen to them. My father would have enjoyed them and my mother would have believed them." You see, what he was trying to tell me is, "Sonny, don't ham it up." You must understand, that's not so easy to avoid in the case of Senator Lautenberg. If there is one issue on which all of the residents of New Jersey are unified, it is that our aquatic environment is in awful shape and something has got to be done about it. And if there is one person in Washington who is identified with doing something about it, it is Senator Lautenberg.

Now, he does this from his seat on the Senate Committee on Environmental Public Works. What you have to realize is the Senator also sits on two of the most important and busiest committees in Congress; that is Budget and Appropriations. What I'm trying to convey is a sense of the preciousness of the Senator's time, and how fortunate it is that he can share a little bit of that time with us this afternoon. And I simply wanted to give you a sense of the enormous pride with which I introduce Frank R. Lautenberg, Junior Senator from the state of New Jersey.



A WASHINGTON PERSPECTIVE OF FISHERY NEEDS AND PRIORITIES

Frank R. Lautenberg
United States Senator
Washington, DC

SENATOR LAUTENBERG: That introduction was impressive, not for the listing of my credentials so much, but for the fact that it was done without notes. We haven't met each other, nor had a chance to talk at length. That was very, very well done. I wish I had that kind of memory and could, at the same time, speak with such grace.

I am grateful and pleased to be here. Bob did say that I am junior Senator. I'm reminded about that too often, even though Bill Bradley, the very thoughtful and very capable United States Senior Senator, is 20 years my junior. That's about the only place -- in the United States Senate -- in recent years where I've been junior to anything, with oncoming age and the white hair belying whatever I'd like to tell you otherwise.

It's with apologies that I address you for having been so late. We were in the Senate last night until twelve-thirty. You probably heard about that on the radio. We were trying to resolve the issue of whether or not the government continues to function. There were those of us who thought it ought to stop, and there were others who thought we ought to continue. We finally agreed to raise the debt ceiling by a few billion to keep the government going for five days more. Frankly, I wish that raising the debt ceiling was today's subject, because there was some interesting sleight-of-hand involved; not dishonest in terms of the outcome, but in terms of the pressures in trying to have the issue resolved. We had the money to keep the government going. We did have to borrow from the Social Security trust fund, but that money is repayable with interest and there would be no loss. Where you borrow you pay interest, whether you pay it to the Social Security fund or whether you pay it to the banks or to the community from which you borrow. Anyway, it was resolved at twelve-thirty last night and, therefore, I had to stay in Washington. I was unable to be with you this morning, but I am pleased I could come this afternoon.

I did want this chance to talk to you because we share a common interest to the issues described by Dr. Abel, aquatic interests, and I've developed a very active agenda in the environmental area.

I came to the Senate from the corporate world, and the natural affiliation for me was the Commerce Committee or the Banking Committee. But when Scoop Jackson, who was one of the finest environmental legislators we've ever known, along with Senator Warren Magnuson, also of Washington, passed away he was replaced by Senator Dan Evans who chose to be on the Environment or Public Works Committee. This opened a seat on the Committee for a Democrat. Knowing how much environmental quality means to people in New Jersey, and after seeing the state's problems first-hand, I developed a very

active interest in environmental matters. I'm pleased to say that I can talk to you about some of the things I've done as a result of my involvement.

One of the questions that was raised here today was how do you protect our marine environment and how do we protect our recreational fisheries, our coastal interests? One of our greatest natural resources is our ocean and coastal environments.

We have an enormously long coastline for the size of our state, some 370 miles. It goes from the Palisades along the Hudson River, down to Cape May, up to Trenton. We have some of the prettiest beaches on the East Coast, and we do have an extensive fishery industry.

Tourism ... recreation ... our state's billion dollar fishing industry ... all of them depend upon the health of the marine environment. And we here understand and respect that marine environment and know how fragile it really is and how easy it is to damage. We've come a long way in protecting it - not sufficiently - but it's been about at least 15 years we've been working against the tide, to use a marine term. We continue to tax marine resources with pollution, habitat degradation, and overfishing. Just look at some of the things that have happened.

Millions of gallons of raw sewage are still spewed into our waterways. New York City alone contributes more than 200 million gallons a day -- just from New York City. And then they take the residual materials, sewage sludge and, right now, it's being dumped 12 miles off our coast. We're going to be moving that dump site, as you know, temporarily. Temporarily moving it, because the oceans are not places where we ought to be dumping our garbage.

High bacteria counts still close our beaches and shellfish grounds. We continue to degrade our wetlands and other productive coastal environments. We have to protect the marine environment, but the job is made more difficult when we start looking at the budgetary climate and, frankly, an Administration that hasn't been supportive at the level we would like to see, in its environmental programs. It's a constant battle. We're pushing one way and they're pushing back the other way, on Superfund and some of the other major environment problems.

In our state we have felt the brunt of these cuts. Sponsors of this Convocation include the National Marine Fisheries Service's Sandy Hook Laboratory and New Jersey Marine Sciences Consortium. In the last five years the Administration has tried to cut the work of the Lab and then tried to kill the Sea Grant Program which supports the Consortium and its work. Congress has continued to reject the Administration's recommendation because we've heard from people who are interested, people like yourselves, people who stand up for the environment, and people who are willing to stand up with me and others up to the Administration. Making your voices heard in Congress is an essential factor, because Congress, despite appearances to the contrary, does hear you.

Issues affecting the marine environment are very high on my agenda. And two such issues on that agenda have been of great interest to people of our region. One is that Boston proposes to dump its sewage sludge at the 106-Mile dumpsite. We shouldn't allow this. The fact that they have overused the capacity of the disposal site that they presently have, doesn't mean that they now ought to transfer that to off our coastline. Rather, they should go on to look for the solution that's finally going to deal with the problem. Now, if the ocean continues to be used on a temporary basis, it saddens us, but we know we ultimately must stop dumping in the ocean. That's a simple premise I hope we'll all agree on. We don't want to add to our grief and our problems here by encouraging or by permitting Boston to send down 65 tons per day of sewage sludge.

Many of you in this room have fought long and hard to end the sewage sludge dumping at the 12-mile dumpsite. Together we've pressed for a long-term alternative to ocean dumping, but have agreed to permit it to continue for another period of time at a dumpsite, 106 miles off the coast. In deeper waters, there is more active distribution of the materials that are dumped there; but again, this is only temporary solution. That's the position that I take.

When EPA announced its decision to end dumping at the 12-mile dump site this was the first time EPA showed that it was going to cooperate with us to end the sewage sludge dumping in the ocean. So I was shocked to learn Boston proposed to dump their material off the New Jersey coast. And that's not a short-term proposal, despite the comments to the contrary. They suggest that they'll need it for at least eight years. Their alternative is composting, a long-term alternative, hopefully, to ocean dumping. But that may not be available until 1996 and we all know how deadlines slip. Boston wants to dump at the site for what it claims is an interim period. That's a fairly long time. Their view of dumping sewage sludge down here is not unlike their view of dumping tea some time ago in the harbor. It's not going to be. If they think that battle was tough, wait until we get done with this one. This week I'm introducing legislation to bar Boston from dumping the sludge at the 106-mile dumpsite.

There are three reasons for this action. First, the application to do this is really a step backward. It's a step back from the goal that many of you share with me, and that is, again, to emphasize, stop ocean dumping altogether. Second, if Boston can do it, why then can't others? Boston would set a precedent for other cities with sludge disposal problems. They would say, "look, we don't want to do this on a permanent basis, but for now we have no alternative. Let's cooperate and do this." And that, I think, would be one of the worst actions we could take in terms of our interest in a clean ocean. Third, Boston's dumping could block the end of dumping at the 12-mile site. EPA signed agreements with ocean dumping sewage authorities to end the dumping at the 12-mile site by the end of 1987 -- that's where it stands now. Well, we chose the year '87 not because we wanted to let the time go by before we moved this material further out to sea. EPA argued that these authorities needed time because there was a shortage of vessels and barges, to

take the sludge out that distance. It's quite a different trip from dumping at the 12-mile site. Twelve miles out is a roundtrip during the day, a hundred and six miles out is certainly not. But where will Boston get the vessel capacity if there is a shortage? Will that then consume the capacity that's going to be built and continue this problem we have. One scenario which might happen would be a statement, "okay, we can't deliver you the vessel capacity, therefore, communities or sewage authorities can continue to be able to exercise on an interim basis dumping at the 12-mile site." That's unacceptable. I am going to get my legislation in and hope that together with companion legislation which has been introduced in the House by Congressman Howard, we'll put an end to Boston's ill-advised plan.

Boston's effort is further proof of EPA's lack of effort to develop safe, cost-effective, land-based alternatives for the disposal of sewage sludge. Now I know that New Jersey authorities have tried to implement land-based alternatives and they've be thwarted. Unless EPA expands the effort, more and more cities will start to view the ocean as the viable means of disposing of the sewage sludge.

The other issue of great interest here is the Sandy Hook Laboratory's destruction and our concern that it be rebuilt. I know that we don't have to spend a lot of time to convince this audience of the key role that the Sandy Hook Laboratory plays in marine environment issues, particularly in our region. The recent fire destroyed a building, a lab, records, equipment. And after the fire the first thought, of course, was "what about the Laboratory's future?" And I share that concern with you. Within a week of the fire I was able to persuade the Senate Appropriations Committee to require NOAA - that's the National Oceanic and Atmospheric Agency - to start planning for the replacement. We told NOAA to send us a report by February 1, 1986 outlining the options for a permanent replacement in New Jersey. Because the remaining lab facilities can't be ignored, we told NOAA to discuss the adequacy of these facilities, as well.

I heard rumors that NOAA might use the fire as an excuse for closing the Sandy Hook Laboratory. I didn't know whether the rumors were true or whether they weren't, but we couldn't sit back to wait and see. I didn't want to permit this to happen, so, I introduced legislation yesterday morning prohibiting NOAA from moving the laboratory out of New Jersey. The amendment was adopted just in time. Moments after it was approved by the Senate, I learned that the University of Delaware had recruited one of its senators, Senator Bill Roth, to approach Secretary of Commerce, Malcolm Baldrige, urging that the Secretary locate the replacement facilities at the University of Delaware College of Marine Studies, in lieu of New Jersey.

Well, we had a very tough few moments, because the Delaware newspapers carried a nice headline about where this facility was going to be. And while the headline was being distributed in Delaware, we in the Senate were enacting legislation that practically cut off any possibility that moving the laboratory to Delaware might take place.

I have worked with Senator Roth on patent protection and other trade legislation, and we are good friends. But when he tried to amend my amendment to make it essentially inoperable, I said "No, I won't agree to that." And when the chairman of the committee said, "When I accepted your amendment I didn't know there was any controversy," I said, "I didn't know either, but you have it. It's been approved by the Senate and it needs consent to rescind or change the action that we've taken." He said, "Well, can't we have a debate on that?" And I said, "Yeah, forever, and we're not going to permit my amendment to be changed."

It has to go to a conference committee with the House Appropriations Committee. The Senate passed it; the House has to agree to it. But we'll be working with our own delegation here -- Congressman Howard, who is a man of considerable influence on the House side, Congressman Dwyer, who sits on the House Appropriations Committee, Congressman Hughes from the Atlantic County area -- all of whom are vitally interested in keeping this lab in New Jersey. So, I'm fairly optimistic. While I can't guarantee what's going to happen, I'm going to do whatever I can to see that the expertise and the talent and the information that's been gathered here over the years remains here. As a matter of fact, We're hoping to be able to upgrade this facility to make it even more vital in our marine research efforts. We want to restore the Laboratory. We want to develop a first-class science facility, a center of excellence for marine science around the country. To make it happen, we're going to need support from all segments of the marine science community. I urge all of you who are concerned about marine sciences and the Sandy Hook Laboratory to join together to help make such a facility a first-class facility.

There are two other matters I'd like to discuss with you while we're still here, amendments to the Clean Water Act and amendments to the Magnuson Fishery Conservation and Management Act.

Earlier this year the Senate passed the Clean Water Act amendments for 1985. This bill reaffirms the goal of the Clean Water Act to restore and maintain the integrity of the nation's waters. It makes a number of changes which strengthen the Act. First, the bill includes an amendment that I wrote to require New York City to end it's unconscionable practice of discharging raw sewage into the Hudson and East Rivers. My provision imposes tight deadlines on the city to bring two sewage facility treatment facilities being built - one on the North River, one in the Red Hook area - on line. Failure to meet these deadlines which, by the way, have been extended time and time again, will result in tough penalties on New York City.

While thousands of other cities across the country have struggled to comply with the Clean Water Act, New York City remains the only major city in the country still discharging raw sewage into the nation's waterways. My amendment says that if they don't meet the deadlines imposed in the legislation, they will not be able to continue issuing building permits. We've given the City lots of latitude, but now we mean business; this has been going on for years. In addition, the Convention Center is about to come on-

stream and will produce another million gallons of raw sewage a day. It's outrageous. A million gallons a day from that one facility.

The Senate's bill preserves federal funding for building sewage treatment plants. It phases in financing of state revolving loan programs to fund sewage treatment construction on a long-term basis. The Administration had proposed to end federal funding, but the Senate Environment and Public Works Committee rejected the proposal. We knew that we couldn't ensure clean water if we don't have up-and-running sewage treatment facilities.

EPA estimates that the nation has over $100 billion in unmet sewage treatment needs and the situation in our state is typical. New Jersey Department of Environmental Protection estimates the State's needs at $4.5 billion. New Jersey waters will continue to suffer unless these needs are met.

Just this past summer, all of you, I'm sure, are aware, that beaches in Asbury Park, Wildwood, and North Wildwood were closed because of high bacterial levels. Those bacterial levels were traced to inadequate sewerage treatment facilities. I'm pleased to see that Federal funding has been awarded to upgrade plants at two of these inadequate facilities in Asbury Park and Cape May. Unfortunately, the OMB has tried to thwart Congress by barring EPA from funding the construction of new sewage treatment facilities. I offered an amendment to the EPA appropriations bill which the Senate adopted which overturns this OMB order.

The Clean Water Amendments include numerous other improvements, for instance, the nonpoint source pollution program and a national estuary program. It also requires EPA to develop regulations for the use and disposal of sewage sludge. Once finally enacted, the bill will continue to enhance our nation's effort to clean up our precious water resources. We hope that takes place in the not too distant future.

We've also been busy in the Senate with fishery management and conservation issues. Earlier this year I introduced a bill to amend and reauthorize the Magnuson Fishery Conservation and Management Act. Under this Act, the United States manages the fishery resources in the 200-mile fishery zone, except for tuna.

My bill received widespread support from New Jersey's fishing and environment interests and from the National Coalition for Marine Conservation. And I'm pleased to note that Chris Weld of the National Coalition group has spoken to you already. My bill contains two provisions which are of interest to you. First, it would make fishery habitat conservation an integral part of the fishery management process. Fishery productivity is directly affected by habitat quantity and quality. Effective fishery management requires habitat maintenance and management. The Magnuson Act, however, is silent on the role fishery habitat plays in the management process. My bill would make it clear that you can't manage fisheries without addressing habitat. Federal agencies would have to consider any habitat

measures recommended in a fishery management plan or by a fishery management council. If enacted, this legislation would help put an end to ill-advised projects like Westway, which moved forward without regard for fishery habitat.

The bill would also end the exclusion of tuna from management under the Magnuson Act. It would preserve for America's recreational and commercial fishermen the priority to harvest this valuable resource. Recreational fishing for tuna, marlin, swordfish, the so-called big game fish, is particularly important off our coast. State officials estimate that in 1983 over 800 boats made 4,400 trips off New Jersey and caught almost 24,000 of these big game fish.

My bill would put U.S. law in conformance with the worldwide practice of management of tuna in a nation's fishery conservation zone. But because we don't extend jurisdiction over tuna, a Japanese longline fishery is being conducted inside the U.S. 200-mile zone. The Japanese catch tuna which would otherwise be caught by U.S. fishermen. Now, I don't know whether you know, but this longline fishery drops a line up to 80 miles long and U.S. boats try to stay 2 miles away to avoid entanglement. You're talking about 320 square miles of ocean occupied by one of these boats off our coast. It's not really fair.

And Japanese hooks don't have signs that say "Tuna Only." They hook swordfish, billfish and sharks. Although these species are required to be released within United States waters, 70 to 90 percent die from being hooked. The tuna exclusion has been hurting one of our prime recreational fisheries, and we hope to correct that.

I've discussed many issues with you today, water pollution, sewage sludge dumping, fishery management, habitat conservation, and marine science research. But through all of these issues, my friends, you must see the common thread. That is, the need for wise management of our marine environment and its resources. We must take a holistic approach to protecting our marine environment, an approach which addresses all man-made and natural actions which affect this environment. Those of you here today have demonstrated your interest in the wise management of marine resources. I hope you continue to make your voices heard on the problems facing our marine resources. I think that we can solve these problems. We can certainly address them so that our oceans and our coastal resources can be used, not only by those of us who are present here now, but those who follow us, our children and the following generations. I thank you for your patience and for your interest and your help on these issues.

DISCUSSION

MR. BENNETT: On behalf of the American Littoral Society, thank you for being here. Chris Weld did touch on the tuna exclusion this morning, and I would just alert you. He asked us to impress upon you the interest in including the tuna in the Act. Maybe you could go into a little detail about the possible problems of getting tuna covered and where we might help.

SENATOR LAUTENBERG: It's relatively simple, but hard to solve.

West Coast fishermen, of course, don't want my amendment to change the tuna exclusion because there aren't a lot of tuna within that 200-mile limit on the West Coast off our borders. The West Coast fishermen range off the coast of South America and out in some of the Pacific Islands and within 200 miles of the borders of those countries. So they say they don't want the U.S. to regulate tuna because they believe that these countries also will regulate tuna and could lock U. S. fishermen out of the opportunity to fish those waters.

We've seen what happens as soon as you open up national waters to other countries' fishermen. You lose control of these things. Often foreigners can overfish these species. That's why we passed the 200 mile law in the first place. We are seeing such problems now with the Japanese tuna fishermen. So these are regional differences. We must persuade our west coast friends that my legislation is the best thing for tuna and management of our marine resources. If they can reduce their opposition a bit, I think my legislation could be passed rather quickly.

MR. ROASARIO: About the Boston dumping, why can't they go another 40 miles and do it beyond the 200-mile limit?

SENATOR LAUTENBERG: Because we're still bound by treaty, an international treaty, the London Dumping Treaty, to strictly limit dumping beyond the 200 mile zone is still dumping. Otherwise, you can imagine all the countries coming out and dumping it in international waters. That would be terrible. This way we force each country to pay attention to its own needs. You would then really be inviting ocean dumping, I think, on a permanent basis.

DR. ABEL: Thank you, Senator. An observation and a question. You were talking about rebuilding the fisheries lab. You see, Stu here, is limited in his freedom to lobby because he is both a gentleman and an employee of the Commerce Department. I respond to neither of those categories, my folks are going to be pushing to get that lab back.

The question -- has the issue of burning waste at sea, the so-called ocean incineration issue, come before your committee yet?

SENATOR LAUTENBERG: We've had hearings on it and, as usual, there are the proponents and the opponents.

The proponents, I think, have something going for them to some extent. This isn't an endorsement of ocean incineration, but what it does say, my friends is, we have to continue to explore ways of dealing with this toxic material that we've learned to create. In my view, the best way to deal with these things is waste minimization -- to try and sort out the things that we're putting into our solid waste dump sites and our sewage systems and so forth, to see whatever we can do to reduce that. We are faced with inadequate places under the present technological system to dispose of materials, so I think that we are going to see experimentation done with ocean incineration. Unless there are overriding reasons why we can't protect the public health at the same time we deal with this, I think there may be some incineration demonstration projects.

DR. ABEL: I'm interested in your view that it is more or less an open-ended issue. Senator Gagliano has asked if the Consortium will sponsor a symposium on the topic.

SENATOR LAUTENBERG: We've had the variety of the people you get at a hearing, the people who operate vessels, the people who build them, the people in the communities who think that it's okay as long as the material isn't carted through their communities or loaded in their communities, port communities, and so forth. You know, I've learned something. I came out of the corporate world, as you know or as you've heard, and for me being in the United States Senate is a privilege and an honor. But it's also a source of mystery and amazement about how you reconcile all the differences of a varied constituency of 240 million people -- there are regional and state and community differences, ethnic differences, income differences, and attitudes about environment.

We are in some measure talking to ourselves, because we're the people who have some sense about what's in the ocean. We know of this opportunity to protect Nature's beneficience in this beautiful ocean of ours. We've managed, wherever there's population of any size, to spoil the environment. Well, the ocean, I think, is one of the last frontiers. Most people who live inland a little bit don't give a damn about the ocean. Those who are part of the environmental movement do, but you have to use a lot of persuasion.

Acid rain is an example. We get it along with New York State -- the eastern states get it from western neighbors. Well, I want to tell you, it's tough to persuade them that they ought not to just simply put up stacks higher and higher and higher so that it gets up into the windstream and doesn't, for the most part, fall on their own communities.

It seems to me there is progress taking place since I've been in the United States Senate, for which I feel I can take some credit.

The thing that we have to do is to continue to lobby aggressively for the environment. And you can't be a gentleman. Where do they wind up? Nice guys wind up last. There's a very aggressive competition for resources out there. I mean, when I saw this thing by Senator Roth -- he writes a letter in

which he sympathizes with us, with the Federal Government, over the loss of this fine facility. And in practically the next paragraph it's, "We in Delaware have the university, have the scientists and have all that." It's like someone calling up the widow the day after the funeral wanting to take her to dinner to console her. It's not a nice thing to do, even if she's one's heart's desire. So I moved quickly, because I had some suspicion that something like that could be taking place and we just played it right. I've a very good staff. What I proposed to Senator Roth is they build a facility there and that NOAA have an additional facility. We don't have enough research going on to tend to the needs of our oceans and estuaries, we ought to build another lab. And I said, "Go ahead and do it and I'll help you get it built." By the way, I must tell you that my scorn in this case is not simply for Delaware. It's for any state that wants to get it outside our own.

DR. ABEL: Isn't it a bit auspicious that if it weren't for the happy coincidence of you and Mr. Dwyer serving on the subcommittee on Commerce, Justice, State and Judiciary, New Jersey's chances would be greatly diminished?

SENATOR LAUTENBERG: That's true. And that's why you have to keep me there. The Congress is going through a very trying time because of the budget deficit, as I'm sure you've seen. I that concern what we're doing with our environment is stronger today than it's ever been. We do see things happening. You do see the evidence of a return to a cleaner river system. The shad have increased in their population substantially. The Lewis family, who have been fishing at Lambertville for 70 years, said that this was the largest catch that they've seen in the history of their family fishing up there.

You do see signs of things happening. But when you start competing for resources, you have to be aggressive because we've had limits declared on any increases in revenues. If you don't have more revenues, your only choice is to cut back on expenses and how you divide those expenses becomes a critical factor. You know this - and I'm not politicking. but telling you philosophically how I see things.

MR. ROSARIO: Why not take it from the tobacco lobby?

SENATOR LAUTENBERG: I'm willing to take it from tobacco. I'm willing to take if from defense, although we have to maintain a strong defense. No one in government will deny that. We can't trust our friends or whatever you want to call them, on the other side. But the fact of the matter is, there can be a central proposal to cut back and not to continue to invest more in making war. Building the strength from within the society is where it has to happen. You build it by having people educated, by having a clean environment. Build it by trust in government. You shouldn't have to worry when turning your faucet on that your youngsters will drink something that will hurt them. That's part of how you build the strength of a society. The question of the division of resources is presenting us with terrible problems.

I'm considered a liberal Democrat and a corporate executive serving in the Senate, I epitomize the business image. I started a small business and now that company has 18,000 employees, built entirely on our system, paying our taxes, doing the right thing, encouraging the employees and providing a national resource. It does because we were the founder of data processing, the computing service industry which today employes several hundred thousand people. We did that under the free enterprise system. So, I have the credentials to talk about the business aspects of our society. At the same time I must try and comprehend what we have to do to make it function. We simply can't cut out all of the programs that a democratic nation has to have, and those include programs like the FAA, for instance."

When we started talking about cutting back on the budget - I talked to the business people - and I said "Okay, I agree with you." I talked to oil executives a couple weeks ago and the first thing they wanted to talk about - they represent the largest oil companies that are giants, anyway - was about the budget. They wanted to hear how we're going to do our thing to get the budget balanced and to hear about the cuts we're going to make.

MR. ROSARIO: Tax them.

SENATOR LAUTENBERG: I can't say that, but you should say it louder.

What I said to them was, "Look, I agree with you. I want to cut back on government expenses. And this week we voted on a cut for the Federal Aviation Administration of 250 million dollars. Everybody who reads a newspaper or has any sophistication at all knows very well that air safety is at a relatively low point compared to where it's been. We crowd the skies with more aircraft and more passengers, and we've witnessed one of the worst years for aviation mishaps than we've had in more than 20 years. So now we're going to cut back on the FAA. No air research, stop looking for explosives. But every time you fly or your wife or your kid flies, you're going to be a little more concerned. I'm a long-time flier. I've logged millions of miles in the air. I worry more than I did in all of the time since I started to fly.

"The next thing we're going to cut is the Coast Guard. We'll take them away from around our coast where we're interdicting drugs. So what if drugs are a scourge on society? We can't afford it and we're going to cut down on border guards. And they're going to come through as they please. So what? We've got to cut back on expenses." And the message begins to get through. Cutting back doesn't mean not giving lazy bums handouts and casting unfortunates out saying, "Shift for yourself." Now we are talking about cutting programs that affect essential services.

When we talk about the FAA, the business types don't want the FAA cut back. The business types don't want more drugs coming into our society and addicting our children often before they have a chance to make their intelligent decisions. They don't want that.

So, when we talk about what our responsibilities are, we don't want to see cuts in environmental programs. We know that we have to find another way to finance them. The way to finance them, part of it, is going to have to be in getting more revenues and making sure that those who ought to be paying are paying.

Bill Bradley's book on fair tax tells you that for anybody in a group of people that are making over a million dollars a year, the average tax rate is 17-1/2 percent. If you talk to working people they'll tell you they pay more than 17-1/2 percent. We have to cut back in sensible places. There's a lot of competition. There is a massive attitude overtaking us down there, "Cut, cut, cut," "Give away your responsibilities." If we give them away, and let the President make those decisions, we'd see a nation a lot different in character. But I'm talking to the converted.

Thanks, everybody.

BIBLIOGRAPHY OF SALTWATER ANGLING FROM MONTAUK TO OCEAN CITY

From historical beginnings, the confluence of rivers and ocean tides in the Bight has produced an abundance of marine resources and stimulated the interest and attention of fishers. Despite the problems that have been spawned as a result of growth and industrial "progress" the modern angler still finds contentment in his sport. Marine sportfishermen of Long Island and New Jersey spend over $250 annually in pursuit of their avocation.

Information of the areas' recreational fishery, statistics, past resource trends and developing changes is scattered. This bibliography is an attempt to document information sources. Thanks for contributions are due Phil Briggs (NYDEP), Don Byrne, Chuck and Linda Idelberger (NJDEP), Ron Smith (Del.), and Jennifer Thomas (NJ Sea Grant). I especially appreciate the help of Claire Steimle, Librarian, Sandy Hook Laboratory, for her information networking and helpful suggestions.

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