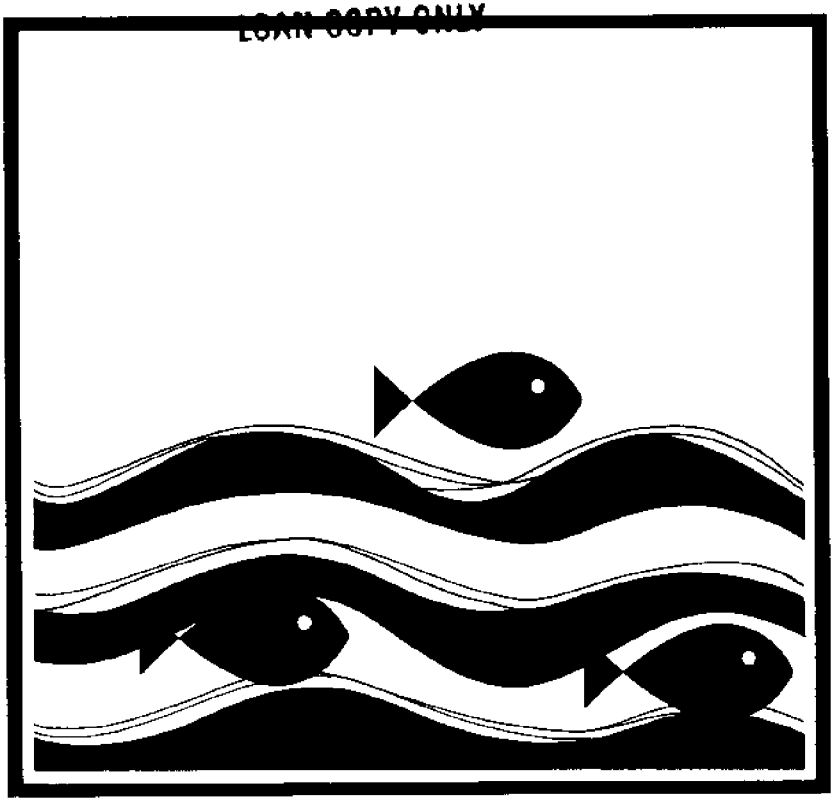
State and Interstate Fishery Jurisdiction: Problems and Progress

Proceedings of a Conference
In Raleigh, North Carolina, 1979



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October 29-31, 1979

Janet Caudle, editor; National Oceanic and Atmospheric Administration through the National Sea Grant Program, Coastal Plains Center for Marine Development Services, North Carolina Marine Science Council, University of North Carolina Sea Grant College Program, North Carolina Department of Natural Resources and Community Development, Office of Marine Affairs of the North Carolina Department of Administration, sponsors

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PREFACE

In October, 1977, the North Carolina Governor's Conference on Extended Fishery Jurisdiction and Management was held in Raleigh, North Carolina. The purpose of this conference was "to assess the problems and progress of implementing" the Fishery Conservation and Management Act (FCMA) of 1976, which made it illegal for foreign fishing vessels to fish the waters of the United States within a 200-mile limit without a permit.

In October, 1979, a follow-up conference was held in Raleigh. The Conference on State and Insterstate Fishery Jurisdiction and Management had the following objectives:

a.) bring more clearly into focus the problems that are being encountered at the state and interstate levels since the establishment of the regional fishery management councils under the FCMA;
b.) provide a forum for the discussion and development of management needs; and
c.) set the stage for modernizing state fisheries laws.

These two complementary conferences cover the entire area from the shore to the 200-mile limit and the species within the area. The proceedings of the 1977 conference were published as *Extended Fishery Jurisdiction: Problems and Progress, 1977;* the papers and edited discussion of the 1979 conference are collected here.

The sponsors of this conference were: the National Oceanic and Atmospheric Administration through the National Sea Grant Program; the Coastal Plains Center for Marine Development Services; the North Carolina Marine Science Council; the University of North Carolina Sea Grant College Program; the North Carolina Department of Natural Resources and Community Development; and the Office of Marine Affairs, North Carolina Department of Administration.

– The Editor
March, 1980

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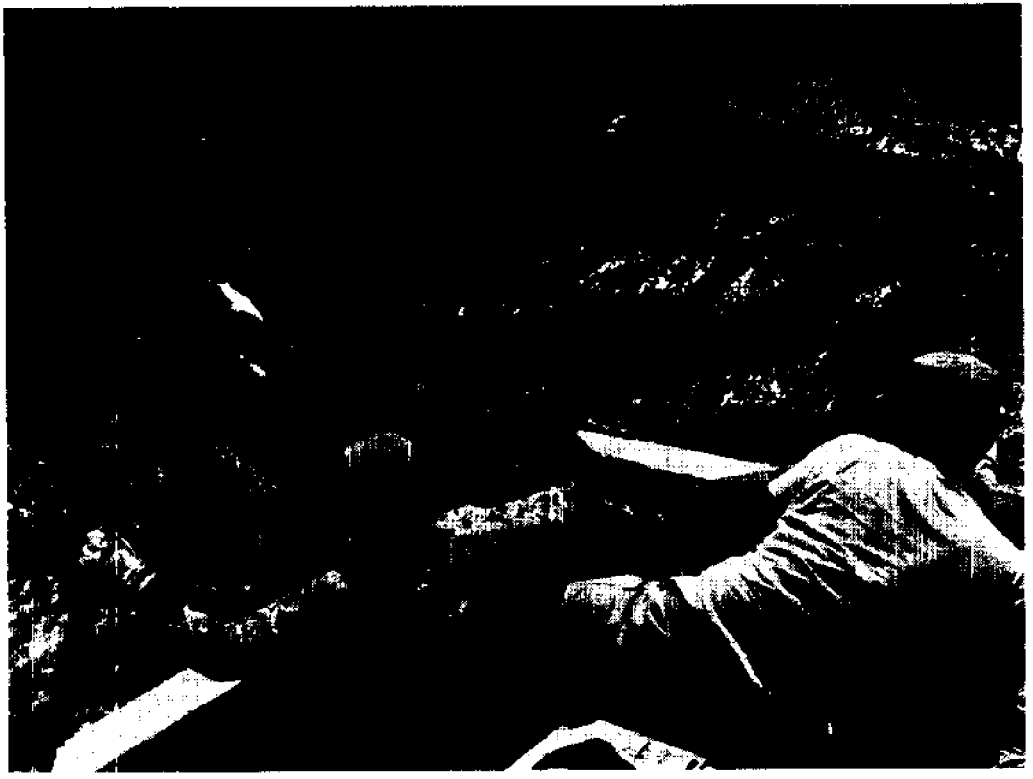
Session Chairman: David A. Adams



OPENING ADDRESS

Joseph Grimsley
Secretary, North Carolina Department of Administration

I take a great deal of pleasure in meeting with you today to begin this conference. During the next 48 hours we will look rather closely at a problem, or a set of problems, in which we share a keen mutual interest. The questions which will be discussed affect not only the groups represented here, but they affect our entire country, since the desire to enjoy seafood on our menu or to fish recreationally is not confined by the artificial boundaries of countries and states. To insure continuing and adequate supplies to meet both commercial and recreational needs we must resolve the issues of jurisdiction and management that confront us at the state and interstate levels, with respect to our fisheries within the territorial waters.

The regional fishery management councils, which were established under the National Fishery Conservation & Management Act of 1976, are hard at work preparing management plans for many of the fisheries outside territorial waters. However, how these fisheries are managed bears directly, in many cases, on the fisheries located within the jurisdiction of the states. Conversely, how we as states manage the fisheries that spend part of their lives within our waters may affect the fisheries outside territorial waters.

In 1974 the North Carolina fishing industry employed some 12,000 persons. The catch brought a dockside price of $17.5 million. The wholesale value of manufactured fishery products was estimated to be $63 million.

In 1978, with 13,000 persons employed, the dockside value reached nearly $41.6 million and the wholesale value was estimated to be $150-200 million. This was a significant contribution to the state's economy, in spite of a decrease in the shrimp yield, which traditionally is one of our most valuable fisheries. Additionally, literally thousands of persons participated in recreational fishing. The value of this contribution to the state's economy is said to exceed that of the commercial value. This indicates that we must continue to do a better job managing our fisheries if we are going to maintain that kind of return. One of the purposes of this conference is to bring us closer to that reality.

As Senator Daniels told you, we have been committed very strongly to developing fisheries and the multimillion dollar seafood handling and processing site at Wanchese Harbor in Dare County. Within the next few years we expect to see major development of seafood processing and related industries that we have never had in this state.

In September I attended a trade fair in West Germany, representing this state with the Coastal Plains Regional Commission. The European countries showed a great deal of interest in our processed fish; the key word is *processed.* The value of the fish increases greatly if we can deliver processed goods to these countries. This will make operations such as Wanchese Harbor even more important. We know the market is there. The impact of this development on our economy should be great, and it is one more reason this state recognizes the need for managing our fisheries.

Since extended jurisdiction came into existence in 1977, the regional councils have been in the process of trying to learn to manage those fisheries that are in the 200-mile zone. This increases the need to better manage those fisheries in the territorial sea.

North Carolina catches over 50 species of fish within its territorial waters. This harvest amounts to between 3 and 4 percent of the harvest of the United States, so our stake in the well-being of the resource is substantial.

In earlier times man caught fish for subsistence by hunting and this is true today to a lesser extent. However, we are moving towards more intensified fishing, just as agriculture moved from small subsistence farming to large agribusiness units. North Carolina continues in its strong support of the management philosophy that strives to maintain the fishery for all—the integrated commercial fisherman, the recreational fisherman and particularly the small fisherman who is out there trying to make a living.

The environment of fishes has been modified both by natural changes and by human technology. This has impacted the availability of fisheries to man, sometimes enhancing and sometimes destroying it. Therefore, no management scheme can progress without full knowledge and understanding of environmental quality and its impacts. A major portion of this conference will examine the role of the well-being of the environment. Unless we are prepared with knowledge and understanding, our contribution to the fisheries management plans being developed by the regional councils may not adequately support our needs. The resulting regional plans may then overshadow our fisheries activities within our own territorial seas with respect to both environmental and availability concerns. Another aspect of this conference will look at current management practices relative to what our management needs may be in the future.

The fisheries that will be discussed fall into three broad groups and require different management strategies: the non-migratory species, which are

found within state boundaries; the migratory species, which move from one territory to another depending on lifestage; and the anadromous species, which traverse from areas under extended jurisdiction to the rivers of our states to spawn. I believe that we can, we must, continue to improve our efforts to work together to resolve these jurisdiction and management problems. If we neglect to accept this responsibility we may find that what we are unwilling to do for ourselves will ultimately be done *to* us in a less than satisfactory manner.

Michael Graham, an eminent fisheries scientists, said back in the 1940s, "The great law of fishing can be stated in a few words: fisheries that are unlimited are unprofitable." Responsible management on our part must seek to ensure the availability of a continuing and profitable supply of this vital natural resource.

Thank you, and I hope you have a most productive and successful conference.

STATE AND INTERSTATE FISHERIES JURISDICTION AND MANAGEMENT, A PERSPECTIVE

David A. Adams
Visiting Professor
North Carolina State University

We have come together to address some of the opportunities facing our fishing industry: "to bring more clearly into focus the problems that are being encountered at the state and interstate levels since the establishment of the regional fisheries management councils under the Fishery Conservation and Management Act of 1976; to provide a forum for the discussion and development of management needs; and to set the stage for modernization of state fisheries laws." The fishing industry has always had opportunities, but it occasionally has needed encouragement to capitalize on them. And I continue to marvel at the wondrous and sometimes devious ways by which generally good ends are often achieved.

In trying to set the stage for this conference, I looked back at the Stratton Commission Report issued almost 10 years ago to see what those gentlemen forsaw, and what they recommended, for the future of our fisheries. I found these statements.

> *With jurisdiction over fishery management and development largely in the hands of the States and with lines of authority between State and Federal Governments ill defined, the responsibility for action is hopelessly splintered. Moreover, the*

tendency toward parochialism in the individual States has led to a mass of protective legislation that militates against research, development, and innovation (Stratton, 1969, p. 95).

* * * * *

Although fish migrate freely across state lines, the Commission was unable to identify a single instance of systematic programs being prepared jointly by two or more states for the management or development of their fisheries resources (Ibid, p. 95).

* * * * *

Interstate cooperation in fisheries has been relatively unsuccessful. Three interstate commissions exist—the Atlantic States, Gulf States, and Pacific Marine Fisheries Commissions. But none has regulatory powers nor adequate staff. Their function is to exchange information on common problems and to recommend legislation of administrative action to the executive and legislative branches to the member States (Ibid, p. 96).

* * * * *

We have not found a single instance where two or more States have initiated coordinated measures and have carried them out for the efficient management of migratory marine species. The history of three regional marine fisheries commissions shows that they have not initiated binding, comprehensive plans for specific endangered fisheries. Nor is there indication that the States individually can initiate efficient fishing exploitation practices of endangered migratory species based on sound scientific, economic, and legal concepts for the range of migratory species makes individual state action ineffective if other States having jurisdiction over a part of the migration range do not join in the managerial effort (Crutchfield, 1969, p. VII-78).

* * * * *

Under existing statutes, the Federal Government has no explicit role in the management of fisheries within the U.S. territorial waters. In view of the discouraging lack of coordination among State programs, the Commission concludes that Federal leadership and guidance—and when necessary regulatory power—must be asserted (Stratton, 1969, p. 96).

* * * * *

The solution becomes not a matter of insisting that the States take action against the will of the majorities, or that Federal jurisdiction be invoked in all cases, but that the Nation adopt, as a matter of policy, that all fisheries are to be managed with the objective of maximizing their benefit to society, that regulatory action be based upon sound biological and economic data, that the individual States be encouraged to adopt a similar objective as a basis for their programs, and that every effort be made to inform the people concerned in each fishery of the effects of unsound regulatory measures based on other premises (Crutchfield, 1969, p. VII-49).

* * * * *

And the commission made some fairly specific recommendations:

. . . that fisheries management have as a major objective production of the largest net economic return consistent with the biological capabilities of the exploited stocks (Stratton, 1969, p. 92).

* * * * *

. . . that the National Oceanic and Atmospheric Agency (BCF) establish national priorities and policies for the development and utilization of migratory marine species for commercial and recreational purposes in cooperation with other Federal agencies, States, and interstate agencies (Ibid, p. 97).

* * * * *

. . . that the United States continue its own research programs aimed at improving stock and yield estimates, cooperate with other nations and programs for this purpose, and explore new techniques for preliminary assessment of stock size and potential yield where new fisheries are contemplated (Ibid, p. 89).

* * * * *

. . . that the geographical area subject to international fisheries management be large enough to permit regulation on the basis of ecological units rather than of species and, when necessary, include the territorial seas. Fisheries commissions should be authorized to manage ecological units whenever they conclude that the additional gains from such management are likely to outweigh the increased costs of undertaking it (Ibid, p. 111).

* * * * *

And some of the more gutty issues:

The Commission recommends that the National Oceanic and Atmospheric Agency (BCF) be given statutory authority to assume regulatory jurisdiction of endangered fisheries when it can be demonstrated that:

- *A particular stock of marine or anadromous fish migrates between the waters of one State and those of another, or between territorial waters and the contiguous zone or high seas, and*
- *The catch enters into interstate or international commerce, and*
- *Sound biological evidence demonstrates that the stock has been significantly reduced or endangered by acts of man, and*
- *The State or States within whose waters these conditions exist have not taken effective remedial action (Stratton, 1969, p. 97).*

* * * * *

The Commission recommends that voluntary steps be taken—and, if necessary, government action—to reduce excess fishing effort in order to make it possible for fishermen to improve their net economic return and thereby to rehabilitate the harvesting segment of the U.S. fishing industry (Ibid, p. 93).

* * * * *

It seems likely that most States could develop regulatory programs involving limitations to the number of fishing units, subject to these criteria, without further legislation; others may require specific legislation. The proposed reorganization of State and Federal responsibilities outlined in the earlier section would make possible the institution of a limited entry program in any interstate fisheries (Crutchfield, 1969, p. VII-67).

* * * * *

As I was running through these recommendations of the Stratton Commission, I hope that all of you were thinking of the steps that have been taken during the last decade to implement them. The National Oceanic and Atmospheric Administration (NOAA) was created, and the National Marine Fisheries Service (NMFS) came into being. Research programs (under PL88-309 and 89-304) were continued and strengthened. Stock assessment and improved statistics were emphasized. In 1972, the State-Federal Fishery Management Program (SFFMP) was initiated, providing a mechanism through which state and federal fishery managers and industry representatives could cooperatively develop management plans for important Atlantic coast fisheries.

A number of planning and policy documents have emerged from NMFS, generally incorporating the principles of management recommended in the Stratton Commission Report. But direct federal intervention into the more controversial issues—species management over their entire range, management by ecological units, catch quotas, and limited entry—has been approached by a more devious route, and might never have been addressed in this time frame if American fisheries had not been faced with an "us versus them" situation.

It was the large increase in foreign fishing off U.S. shores and the concomitant decrease in domestic landings that aroused the nation to action. Disgruntled fisherman led to disgruntled congressmen, and a disgruntled Congress instituted legislative action primarily as an attack against foreign vessels.

Yet both the policy and the mechanism described in the Fishery Conservation and Management Act (FCMA) of 1976 embody many of the recommendations for improvement of the domestic fishery contained within the Stratton Commission Report, and serve as a circuitous (perhaps devious) route by which these recommendations are beginning to be felt by the domestic fleet.

We met here two years ago to discuss the implications of FCMA. The discussion, as one might expect, involved primarily the international and high seas ramifications of the act, but buried within the proceedings are a number of comments directly applicable to our session here.

David Wallace stated the following:

> *. . . under the FCMA the Secretary of Commerce has the authority to enforce regulations only for stocks of fish harvested outside state waters, unless the fishery is predominantly within the FCZ. Except in this latter case, neither the RFMCs nor the Secretary of Commerce can require a state to implement an RFMC-approved plan within its territorial sea, since the FCMA left essentially unchanged the authority of the coastal states to regulate fisheries within the territorial sea. Inland waters, such as Cape Cod Bay, Mobile Bay, and Puget Sound, are not even covered by the FCMA. Attempting to manage interstate fish stocks through the disparate state and local political jurisdictions has been a major weakness in the U.S. system. The FCMA does little to correct this weakness for a number of important stocks (Wallace and Smith, 1977, p. 23).*

* * * * *

> *In short, we need to be moving toward management of total ecosystems. We have only modest capabilities to do so at present, yet this is the direction we must take. We will need to be concerned with the interrelationships among different populations of fish and marine mammals, and of the whole web of life in the oceans and the estuaries. We need to consider not only the resources, but their physical environments and their impact upon man's others activities in the marine ecosystem. We need to be concerned not only with the harvest from commercial fishing but with other uses of fish. We need to consider the welfare of humans who harvest fish for food and recreation, those who process and consume fish, as well as those concerned with environmental interactions in their harvest. This great complexity*

means that more interest groups will have to be involved in decision making (Ibid, p. 27).

* * * * *

B. J. Rothschild added the following:

The states have been exercising their sovereign authority over fishing in the territorial sea since the authority was given to them by the Submerged Lands Act of 1953. This authority rests with the state legislatures. Some of the state legislatures still retain that authority, and have not delegated it to their respective state fisheries director. Since some legislatures only meet annually or less often, speed of reaction of a given state can be quite slow relative to the needs of fishery management.

It is evident that our system of political boundaries, which divide the territorial sea into many separate, sovereign domains, is incongruous with the need to manage fishery stocks and groups of interrelated stocks as ecological units throughout their ocean ranges. This incongruity has led some to believe that the only avenue to effective fishery management is through the assumption of federal authority for the development and enforcement of FMPs for all fisheries, or at least for interstate fisheries, in the territorial sea as well as the FCZ (Rothchild, 1977, p. 68).

* * * * *

Ed Joseph added:

. . . [concerning] the resource management process and some potential effects of implementation of the FCMA on state marine fisheries management. . . . This comes back to something mentioned earlier and that is the partnership approach among the states, federal government, and the regional agencies—the RFMCs. This is where the greatest impact and the implementation of the FCMA potentially could occur. And the impact in this case, should be almost entirely positive should the states choose to take advantage of what I consider to be an opportunity. We have recognized in many cases that as individual states we were unable to deal effectively with the fishery resource, even though it might be largely within territorial waters, as along as it

> *regularly migrated across the borders of adjacent states. . . . [Impact of the FCMA] will depend not so much on what happens out in the FCZ through the implementation of the FCMA, but more so on how the individual states react to what happens. Therefore, it is really incumbent on the individual state to determine whether it is going to take advantage of these opportunities and ensure that implementation of the FCMA, both in an economic sense through enhancement of the fisheries and in the effectiveness of the resource process as now practiced, is going to be positive or negative (Joseph, 1977, p. 153).*

* * * * *

And Bob Schoning concluded:

> *. . . perhaps the least discussed or recognized feature of extended jurisdiction is that it has radically changed the way fishery management programs will be planned and executed in the future. I do not mean just the National Marine Fisheries Service (NMFS). Under the term "we" are included the NMFS, Regional Fishery Management Councils (RFMCs), states, Sea Grant, universities, recreation and environmental groups, industry, the U.S. Coast Guard, the Department of State, NOAA's National Ocean Survey and Office of Coastal Zone Management, and other agencies and organizations that have an interest in or may be affected by extended jurisdiction (Schoning, 1977, p. 160).*

* * * * *

The thoughts of these gentlemen two years ago were most prophetic, for we now have two versions of a management program for territorial sea fisheries, one through state legislation and one through congressional action. As a nation, we have not yet faced the management problem of our fisheries in our internal waters, but we are moving incrementally toward application of sound biological, economic, and political principles in comprehensive management of our fisheries resources. Piecemeal and circuitous, undoubtedly; devious, perhaps; yet an envelopment is usually far safer and surer than a frontal assault.

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STATE LEGISLATIVE PROCESS

Bernard C. Smith
Attorney at Law

Just how do our laws evolve? The common concept of the proposal of a fine piece of legislation by a powerful committee chairman, its release from committee at the chairman's insistence and its inevitable passage on the floor just is not so. Any piece of legislation pertaining to a major problem and affecting a substantial majority of people within a jurisdiction is generally the product of extensive research, input by many professionals, many hearings, a substantial lobbying effort, extended discussion in party caucus and a lot of give-and-take; the legislative process is truly the art of compromise.

These observations, general as they are, are of course directed to the passage of a law in and generally affecting a particular state. The interstate compact route is indeed a more complicated, difficult and time-consuming process, for it necessitates the blessings of our federal government and agreement among a number of legislative bodies who have a genuine and common interest in the problem being addressed by the proposed compact. The obvious differences in the interests of each of our coastal states, for example,

ranging from the heavily industrialized areas to the recreational fishing localities to the strong commercial fishing areas, and those who share any combination of the above, show rather dramatically the difficulties of achieving agreement by all involved jurisdictions as to what must be in your program.

Whether the legislation sought is in the form of model legislation enacted on a state-by-state basis, with the thread of common interest pulling together some unanimity of thought, directed toward a program meeting a regional need, or the even more difficult compact route, there is an absolute need for a dedicated interstate effort on the part of professionals. Professionals who, despite provincial concerns, can look beyond those concerns to the so-called big picture and make their individual and collective contributions to the development of a program which will meet the regional needs. An essential part of this process is to recognize at an early stage of participation that, professional as you are, and professional as you must be, you must also allow yourself to become involved in the political process, even at the early stage of development of a program.

Being involved in the political process does not mean that you jump before the public with all of your sound professional ideas to be included in, for example, a state and interstate fisheries management program. First, get organized, make a concise outline of your program and clear it with your boss. Seek out a legislator in each house who is a strong, patient man—preferably a committee chairman or other member of leadership who shares your basic philosophies on the subject in question—who will give you a realistic analysis of your chances of success and an indication of his intentions, time and priority commitments.

Let me digress for a moment to explain the types of legislators; all are well meaning, but not all are effective.

There is the very successful legislator who has one of the biggest bill loads in the legislature. He cannot turn anyone down, and he passes a lot of bills incorporating fire departments, resolutions congratulating golden wedding anniversary celebrations and local bills. But he does not know what it means to be involved in a major program bill. He will not turn you down, but he will not be very helpful or effective.

There is the majority leader type who has so much difficulty keeping the troops in line that he cannot take the time or effort to be part of the long and sometimes difficult process of a new program bill that is not a hot political item. Get his commitment of support, but select your prime sponsor before you go to him for that support.

There is the bright, knowledgeable guy sharing your sentiments. He is an indefatigable worker who just happens to be with the minority. Get him on the bill, but not as lead sponsor.

There is the do-nothing chairman who is frightened of his shadow and who tries to grab every bill under his jurisdiction. Avoid him, but get the toughest, brightest member of his party and his committee, preferably someone who shares your interest, to take the lead sponsorship.

I could go on telling you who not to get, but I think you get the idea. No matter what the legislative body may be, there are generally a few people who you want to be on your side; seek them out, talk with them and listen to their concerns and suggestions. Your choice here is one big step toward successful enactment of your legislative program. Get your boss to make a personal approach to your governor, or, if you have a friend in the governor's office, make a point of getting to him. Tell him about your program, enlist his support, and ask him to arrange a brief meeting with the governor, in hopes of eliciting his support. If it is a broad-based proposal with some political pizzazz, perhaps you can get the governor out front and then be content with riding the glory road on his coat tails and very much in his shadow. After all, any sacrifice can be made for a good cause.

Having done the above with intelligence and planning, you have brought yourself close to enactment. All you need, now that the bill is going to be released to the floor of both houses, is the majority vote of the members of each of your legislative bodies. Do not take for granted that because the bill is out it is passed. It is amazing how even in "motherhood and apple pie" situations, pocket opposition will develop and must be neturalized. Each of you belongs to community groups and has ties to others interested in your profession and your aims. Solicit help from your community groups, from your professional societies and from the so-called special interest groups that share your enthusiasm for the bill. Bring the force of these people to the support of your cause with letters to the editor of local publications, news releases, attendance at public hearings, letters of encouragement to the sponsors of the legislation and letters of support to the leaders on both sides of the aisle. In short, create your own professional lobbying effort. Anticipate the opposition and be prepared to offset their arguments, or at least dull the impact of them. As you seek the help of these groups, make certain that they know the issues involved and that they thoroughly understand the aims of the legislation. If you fail to do that, if most of those supporters are uninformed as to the merits or the potential weaknesses of the program, the strength you may have gathered in numbers can be substantially diminished.

If it appears that you are doing well in your own jurisdiction but, with the exception of your adjoining state, you are having trouble building regional momentum, you should look to the interstate legislative organizations serving your respective areas, for example, the Council of State Governments or the National Conference of State Legislatures. These organizations are often looking for projects involving regions or combinations of regions, and

there are times when they have the money and the staff to coordinate the program development of model legislation. What they need is persistent and dedicated effort on the part of professionals to help develop the program along proper lines, so that the program is flexible enough to be incorporated in the statutes of all the involved states, but precise enough to accomplish the program goals on a regional basis.

Allow me to draw on a personal experience in this area. I had the honor of chairing a committee of the Council of State Governments charged with the responsibility of developing a marine resource management program for all of the coastal states. We had some fabulous professionals involved: Frank Grice, former director of Marine Fisheries in Massachusetts; Tom Linton, director of Office of Marine Affairs in North Carolina; Thomas Kruse, director of the Fisheries Commission of Oregon; Ed McCoy, of North Carolina's Division of Marine Fisheries; and Dr. Mason Lawrence, former deputy commissioner of New York's Department of Environmental Conservation, to name a few.

With all that talent we still had several problems:

1. We were undertaking the production of a program and a model bill which needed to be adaptable to every fishery management statute in every coastal state;

2. We had too little time under the terms of our grant; and

3. There was no way we could keep all of our principals involved in a follow-up that would check out all of the legislative bodies that would be involved—what they were doing with the program, what they thought our mistakes were, and what they thought should be done in the future.

This program, like so many others, was of too short a term, was underfunded and made no provision for a follow-up effort. Literally thousands of wonderful reports on regional programs are gathering dust in legislative libraries all over this country; they are seldom read, never used. It is my firm belief that this need not be the case; these efforts can be made to produce and can result in effective legislative programs. There is no assurance of continuity in our legislative bodies. Legislators come and go with changing political winds, but more and more career professionals are developing longer terms of service in government. This service experience should and can be a plus for a politically attuned professional who can render a great service in assuring the continuity of effort toward a regional project within his jurisdiction. This requires a great deal of "sticktuitiveness" and some personal risks, but a good legislative program demands no less, and the only way to make certain that a truly effective program can be enacted is for you to stay with it and make certain that the newcomers to the legislative process pick up the partially completed project and, under your gentle guidance, pursue it to successful enactment.

Good laws evolve when knowledgeable, pragmatic, dedicated, persistent and patient people determine that there is a void in the law, that there is a broad-based problem that requires legislative attention, and that this problem may be solved in part by the enactment of a statute. The basic, broad, well-organized program outline then must be sold to the lawmaker who has available the bill-drafting talents that will put the program in a statutory form. Then comes the long, sometimes discouraging and arduous process of guiding the legislation through the legislature and making certain that the executive branch bestows its blessing on the all-important program. It may be substantially different from what you originally wanted, but you have made your big start. There is now time to round out and shape up the missed or previously avoided details.

We must, therefore, assume that now, having made compromises that at one time caused you to choke, you have your basic program enacted into law. Now come the changes, the additions, the deletions and the subtle language modifications that bring the legislation closer to your original aims. They may be in the form of chapter amendments submitted the very year that bill is enacted, or, more likely, they may be in the form of amendments to the law submitted in following legislative sessions. This type of follow-up is of primary importance in making certain that you ultimately get what you wanted included in the law.

It is a never-ending process; there is no magical approach. It is hard, discouraging, frustrating and time-consuming work, but when it is done well there is no greater feeling of satisfaction and elation at having contributed to the development of a program that will benefit generations to come and that has helped meet a problem confronting your profession. No one will remember your diligent, time-consuming effort, but you will have the personal satisfaction of knowing that you have been part of the political process in a very professional way.

LEGAL ASPECTS OF STATE, INTERSTATE AND FEDERAL MARINE FISHERIES JURISDICTION

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INTRODUCTION

The purposes of this paper are to (a) describe existing jurisdictional arrangements for the management of marine fisheries off the coasts of the

United States (US), (b) point up some of the problems associated with the multiplicity of jurisdictions involved, and (c) identify and make some comments on various modifications in these jurisdictional arrangements which have been advanced over the past two years.

EXISTING JURISDICTIONAL ARRANGEMENTS

State Jurisdiction

Pursuant to the Submerged Lands Act (SLA) of 1953, nine states were granted title to and ownership of natural resources off their coasts, including the "right and power to manage, administer, lease, develop, and use the said lands and natural resources . . . in accordance with applicable state law." Natural resources are defined in SLA to include, without limitation, "[O]il and gas, and all other minerals, and fish, shrimp, oysters, clams, crabs, lobsters, sponges, kelp, and other marine animal and plant life . . ." The seaward extent of coastal states' jurisdiction over such natural resources was established in SLA at three nautical miles from the coastline, with an exception permitting states abutting the Gulf of Mexico to establish broader limits of jurisdiction (up to a maximum of three marine leagues) based on historical boundaries.

Following extensive and complex litigation in the US Supreme Court, it was determined that all states would have jurisdiction under SLA to a distance of three nautical miles from the coastline, with the exception of Florida's Gulf coast and Texas. Jurisdiction in those two instances extends three marine leagues from the coastline.[1]

The extended state jurisdiction off Florida's Gulf coast and Texas raised a problem with respect to Congress' power to grant exclusive fishery jurisdiction beyond the three-mile territorial-water limit claimed by the US. In a suit brought in 1970, the federal government contended that it could not have relinquished to Texas and Florida what it did not possess, and that in 1953 it did not have jurisdiction over fishery resources beyond the three-mile limit, an authority gained only in 1966 through the Exclusive Fishery Zone Act (EFZA) of that year. This litigation was settled last year, and the issues in the case mooted, when the US, on the one hand, and the states of

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[1]The "coastline," for purposes of the Submerged Lands Act, has been held by the Supreme Court to be identical with the "baseline" as that term is defined in the Convention on the Territorial Sea and the Contiguous Zone [*done* April 29, 1958, 15 U.S.T. 1606 (1964), T.I.A.S. No. 5639, 516 U.N.T.S. 205, in force September 10, 1964]. *United States v. California*, 381 U.S. 139 (1965). The normal baseline is "the low-water line along the coast as marked on large-scale charts officially recognized by the coastal State," and exceptions thereto are provided for bays and other irregular coastal configurations, permanent harbor works, islands, low-tide elevations, and river mouths.

Texas and Florida, on the other hand, entered into a joint enforcement agreement. The states, in effect, waived their claim to title to fishery resources beyond three nautical miles from the coast, in return for a right of participation with the US Coast Guard in enforcement of fisheries laws and regulations in the area between the three-nautical-mile limit and the three-marine-league limit.

Before leaving state jurisdiction issues, it should be observed that the US Supreme Court, in *Skiriotes v. Florida*, held that states might exercise jurisdiction with respect to their own citizens engaged in fishery activities, even though those activities took place beyond the territorial limits of the state and on the high seas. This authority extends only to citizens of the regulating state, however, and does not afford states competence to regulate activities by citizens of other states, or nationals of foreign countries, beyond their territorial limits. It should also be observed that state regulatory power in this regard is subordinate to any federal regulations adopted for the area in question or any international agreements entered into by the US and other nations with respect to areas of the high seas.

Federal Jurisdiction

Although it continued to adhere to its traditional territorial sea-breadth claim of three nautical miles, the US adopted in 1966 the EFZA, which extended fisheries jurisdiction to twelve nautical miles from the coastline, thus creating an additional nine-nautical-mile belt of national jurisdiction. The federal government did not attempt to regulate fisheries in this contiguous zone, except to exclude or regulate foreign fishing vessels.

In 1976, Congress repealed the EFZA and adopted the Fishery Conservation and Management Act (FCMA) of 1976. That legislation established a "fishery conservation zone" (FCZ), which begins at the seaward boundary of the states and extends 200 nautical miles from the coastline. Within the FCZ the US exercises "exclusive fishery management authority." In addition, FCMA gives the US authority to manage anadromous species, throughout their migratory range, and all continental-shelf fisheries resources beyond the FCZ. This authority does not extend to highly migratory species of fish, however.

The FCMA also establishes a permitting system for admission of foreign fishing vessels to the FCZ, and a national fishery management program centered about eight regional fishery management councils. The councils' powers include the preparation of fishery management plans (FMPs) for implementation, in the form of federal regulations, by the Secretary of Commerce.

Even though the US claims exclusive fishery management authority within the FCZ, those waters retain their legal characterization as "high seas" for

all other purposes, thus preserving freedom of navigation, overflight, scientific research, and other traditional freedoms of the high seas.

The International Area

The area beyond the FCZ (and similar "exclusive economic zones" of other nations) is not subject to any one nation's fishery laws. There is no regulation except that imposed by treaty obligations established when two or more nations agree to limit or regulate their respective citizens in the conduct of a fishery beyond their 200-mile (or other) limits. There are a number of such agreements, as well as commissions established for this purpose, but this issue is tangential to the theme of this paper will not be pursued in detail here.

PROBLEMS PRESENTED BY MULTIPLE JURISDICTIONS

To summarize the foregoing description of jurisdictional arrangements for the management of marine fisheries off the coasts of the US, each coastal state has exclusive management jurisdiction for a distance of three nautical miles from its coast, and beyond that limit the federal government has exclusive management authority. This arrangement presents some obvious problems for management.

First, stocks of fish may migrate along the coast through the jurisdiction of more than one coastal state. If there are conflicting regulations or uncoordinated policies, this may result in poor management of the fishery stock throughout its migratory range, though any given state's approach would be sound if the stock migrated only subject to that state's jurisdiction. To illustrate the point simply, assume a stock of fish with a maximum sustainable yield (MSY) of 100 units migrates through the waters of states A, B, C, and D. If each state, acting independently, establishes an MSY of 100 units, the fish stock will be subject to a harvest 300 percent above recommended MSY. Since each state has *exclusive* authority over its slice of the ocean, there is no mechanism to compel the states to coordinate or harmonize their regulatory measures in order to properly manage the resource.

Second, some living marine resources migrate from state waters into the FCZ, which is subject to the jurisdiction of the federal government. Here, again, there is no mechanism to compel coordination between state management and federal management, so situations similar to that described above with respect to living marine resources migrating in interstate patterns could also occur here.

One of the earliest attempts to deal with the problem of interstate fishery management coordination was the making of three interstate agreements, the Gulf States Marine Fisheries Compact, the Atlantic States Marine Fisheries Compact, and the Pacific Marine Fisheries Compact. The stated

purpose of these interstate agreements, to which Congress gave its consent in accordance with a requirement in the US Constitution, is to promote better utilization of the fisheries (marine, shell, and anadromous) of the respective territorial water areas encompassed by the compact through the development of a joint program for the promotion and protection of such fisheries and the prevention of the physical waste. Unfortunately, in the past the budgets of the commissions established by those compacts have been insufficient for the task of collecting data, and developing and implementing comprehensive interstate FMPs. It may have been, as some cynics have observed, that the sole purpose of these interstate compacts and the commissions created pursuant to them was to ensure against federal encroachment into or preemption of fisheries management in state territorial waters. If that was the function of the agreements, they have succeeded admirably. In attempting to mitigate the problems associated with multiple state jurisdiction, however, the commissions have been less successful, though in some regions of the country a great deal has been accomplished on an informal basis.

Just as no state may compel a sister state to adopt a uniform or harmonious set of fishery management regulations, so the Secretary of Commerce and the regional councils established in the FCMA have no direct management authority in areas subject to the jurisdiction of the several coastal states and the interstate compact commissions. To be more precise, the Secretary of Commerce has no power under the FCMA to promulgate fisheries regulations applicable to state territorial waters. However, in the preparation of FMPs the regional councils may include recommendations for any measures appropriate for the management of the particular management unit throughout its migratory range. Thus an FMP may contain *recommendations* to states concerning appropriate measures which ought to be adopted in order to conform state practices to those which will be in force in the FCZ. Still, ensuring state compliance with such recommendations is a matter of persuasion and cannot be compelled except under extraordinary circumstances. Section 306(6) of the FCMA provides that where (a) the fishing in a fishery, which is covered by a fishery management plan implemented under the FCMA, is engaged in predominately within the fishery conservation zone and beyond such zone, and (b) any state has taken any action, or omitted to take any action, the results of which will substantially and adversely affect the carrying out of such fishery management plan, then the Secretary of Commerce may, after appropriate notice and hearing procedures, regulate the applicable fishery within the boundaries of the offending States (excepting their internal waters). There is no doubt that the federal government has constitutional authority to preempt the states in the regulation of their marine fisheries through the authority of the "commerce clause" of the US Constitution. I have discussed this issue at

some length in another publication (Knight et al., 1973) and will not include an elaboration on the point here.

There are also a number of constitutional and statutory problems involved in any system of interstate or state-federal coordinated fisheries management, which would have to be dealt with when evaluating a particular management proposal. These problems include due process, equal protection, privileges and immunities, interference with interstate commerce, taking of private property without just compensation, anti-trust, and securities regulation laws. Such problems have also been discussed elsewhere, in the context of limited entry, and will not be elaborated upon here (Knight et al., 1975).

SOME SUGGESTIONS AND COMMENTS

In response to the problems noted above, and spurred by the implementation of the FCMA's regional council management system, a number of proposals have been advanced in the past two years for dealing with the multiplicity of jurisdictions involved in marine fisheries management. Among the proposals have been the following.

Extension of FCMA

One solution is to "federalize" jurisdiction over all marine fisheries. Perhaps the most efficient way of achieving this objective would be to extend the jurisdiction and authority of the federal government under the FCMA to state territorial and internal waters. The argument in favor of federal regulation is that it would result in a coordinated program, since there would be only one regulatory authority with power to promulgate and enforce fishery regulations in all US coastal waters. Without such federal regulation, the argument proceeds, there is no assurance that coordinated fishery management agreements will be developed by the several states. Proponents of this position argue further that the states have not been particularly effective in managing migratory species in the past. As noted in one publication:

> *Progress in developing the catching segment of the U.S. fisheries is . . . limited by a maze of laws that states and local governments have enacted to regulate fisheries in the waters over which they have jurisdiction. Many of the laws were passed without biological or economic considerations. Too much of the legislation has been of a political nature and has been the offshoot of conflicts between fisheries (Shapiro, 1971).*

It should be observed, however, that while moving the management function to the federal government would have the effect of eliminating the *state*

political factors from the regulatory system, it could also result in the introduction of *national* political elements which might be even less compatible with the development of a sound fisheries management system. Certainly, there have been difficulties in some regions of the country in implementing FMPs under the FCMA.

Set against these arguments in favor of federal preemption are equally persuasive points in favor of retaining state regulation in territorial waters. It has been suggested, for example, that federal management would remove the process from local areas and thus render the system unresponsive to local natural, human and political conditions. Of course, the regional council system utilized in the FCMA is an attempt to mitigate the adverse affects of centralized management and, on some scale, to decentralize fisheries management power. It has also been suggested that the states have greatly improved their technical capacity for fishery management over the past several years.

Finally, while a federally preempted management system might well serve the *national* interest, overall national objectives might be incompatible w th certain state or local objectives. Under a federal management system these local issues could be subordinated to national interests, while under a state management system more diversity of objectives could be tolerated. The effects of having national objectives could be ameliorated if "national" were not considered synonymous with "uniform." National standards, such as those in the FCMA, can be *applied* in quite diverse fashion as dictated by local and regional considerations. Unfortunately, the federal bureaucracy has a tendency to equate "national" with "uniform" and to apply standardized objectives and management measures across the board without sufficient concern for local problems.

There are, of course, other points which can be addressed in considering extension of the FCMA into state territorial and internal waters. These would include the likely political unacceptability of federal management, a lack of enforcement personnel and other capabilities in the federal bureaucracy as it present exists, and the possible lack of consistent funding for fisheries programs.

New Federal Legislation

A variant of the first solution is to adopt entirely new legislation providing for direct federal regulation of fisheries in state territorial and internal waters. This was the ostensible objective of Senate Bill 2265 (95th Cong., 1st Sess., 1977), introduced by Senator Weicker of New York. When compared with the option previously discussed, this might have the advantage of curing some defects in the FCMA system, but it could also result in further complication of the issue if the federal legislation applicable to territorial waters was not entirely consistent with the regime applicable in the FCZ.

Council-Commission Coordination

In view of the existence of the regional fishery management councils, on the one hand, and the interstate (compact) commissions, on the other hand, it has been suggested that by formalizing the interface between these two bodies a *de facto* integrated regulatory system could be achieved without the necessity for such dramatic action as federal preemption of fishery management in state territorial waters. I have not seen a proposal for new federal legislation to establish such a system of coordination between state and federal elements, though that would be one way to approach the problem. The difficult part would be striking a balance between the power of the councils and the power of the commissions. The commissions would undoubtedly need a new charter in order to give them regulatory powers that they do not now have, and this could serve to exacerbate the problem of interstate management, the state-federal interface problem aside. Nevertheless, assuming this problem could be overcome, the question would be how to balance the power of the council and the commission or, to put it another way, whether the council or the commission in a particular region should have the lead role.

An informal proposal has been advanced by the Southeastern Region of the National Marine Fisheries Service (NMFS) for achieving this sort of council-commission interface on an informal level, without the need for new federal legislation. This proposal was first advanced in November, 1978, in a proposal entitled "Fisheries Management—An Integrated Concept." This proposal suggests a trial implementation, on an informal basis, between the Gulf of Mexico Regional Fishery Management Council and the Gulf States Marine Fisheries Commission. The essence of the proposal is to integrate the activities of the Gulf Council and the Gulf States Commission by jointly establishing priorities and goals and using a common fishery management plan developer. Implementation of the fishery management plans would, however, be separate, and implementation by the states would continue to be on a voluntary basis. Although the presentation did not include specific recommendations as to the kind of action that would be required to implement the concept, it seems that amendments to both the FCMA and the charter of the Gulf States Marine Fisheries Commission would probably be required.

In analyzing this approach the following positive elements can be identified:

1. The proposal would retain state autonomy within state territorial waters.

2. It would probably give an enhanced role to the Gulf Commission in managing fisheries in state territorial waters.

3. It might provide a vehicle for increased funding for Gulf Commission studies and fishery management plan development.

On the negative side are the following factors:

1. The proposal is probably unbalanced in the sense that the Gulf Council would wind up dictating to the Gulf Commission and thus become an effective manager of both the FCZ and state territorial waters.

2. Because of an enhanced NMFS role as envisioned in the proposal, there would be increased federal input into management in state territorial waters.

3. The concept of voluntary action by states has been demonstrated to be ineffective, and it is difficult to imagine that continuation of such arrangement would provide a mechanism for effective interstate fishery management measures.

Do Nothing

An often-overlooked management measure in any situation is to leave the situation as it is, i.e., introduce no new management framework. In this instance, each coastal state would then remain solely responsible for fishery management within its territorial and internal waters, the commissions would continue to perform limited research and advisory roles, and the regional councils and the Secretary of Commerce would manage fisheries in the FCZ. This is, of course, the situation that has given rise to the problem. However, if examination of all reasonable alternatives indicates that the solutions are apt to be worse than the problem, then consideration should be given to a deliberate policy of not changing the present system, at least until much more experience has been gained under the FCMA.

Federal Legislation for an Interstate Fishery Management System

A number of people in the Gulf of Mexico region have for several years been toying with the idea of avoiding what seemed to them to be inevitable federal fishery management preemption in state territorial waters, by adopting a system for strengthening the Gulf States Marine Fisheries Commission and making it a viable management entity such that the reasons justifying federal intervention would no longer exist. No specific proposals had been formulated, however, when in early 1978 I was approached and asked if I would be willing to draft a bill to implement such a commission-strengthening regime. It was finally agreed that the Zapata-Haynie Corporation of Houston, Texas, would pay me a consulting fee to develop such legislation, strictly on a public-interest basis without any specific direction or guidance from that company. As a result of that arrangement I produced in March, 1978, a draft of a proposed "Territorial Waters Fishery Conservation and Management Act of 1978." This was further revised in a second draft dated

28 March 1978. As a working draft the proposal was circulated to members of regional fishery management councils, marine fisheries commissions, industry groups, congressional staffs, and NOAA and NMFS offices, to receive comments and reactions.

The essence of the proposal was to provide for an interstate fishery management system, with the commissions as the focal point, for the development of FMPs without direct federal participation. Although funding would come from the federal government, the commissions would play, among the states within their respective regions, the same role that the regional councils now play under the FCMA. That is, the commissions would develop FMPs and then recommend regulations to be adopted by the affected states in order to implement the plans. The legislation included a lever, constituting a threat of federal preemption, if the affected states did not adopt the appropriate implementing regulations. The draft legislation also included measures to ensure coordination between the adjacent council and commission where dealing with the same fishery management unit.

The philosophy behind this proposal was essentially to retain a dual system (i.e., federal-state) of government in the marine fisheries environment, just as has been done in upland areas. It was feared in some quarters that a monolithic regime would be philosophically inconsistent with the federal system of decentralized government which, at least in theory, has been part of the traditional heritage of the US. It is obvious that certain sacrifices in management efficiency will have to be made if such a dual system is adopted. If one is willing to accept these inefficiencies, then the task simply becomes one of constructing an edifice which will provide an effective interstate and state-federal management system. If one is unwilling to live with those inefficiencies, then one of the other alternatives, aiming at a monolithic system—probably through federal preemption—is the alternative.

CONCLUSION

It has not been the purpose of this paper to advocate any particular solution, but rather to describe the existing jurisdictional arrangements, point out the problems resulting from those jurisdictional arrangements, and to describe and comment on some of the solutions that have been proposed over the last year or two. It is hoped that this paper will spur public debate on the question and lead to a more rational consideration of the alternatives.

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ECONOMIC CONSIDERATIONS OF STATE AND INTERSTATE FISHERIES MANAGEMENT

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It is really a pleasure to be here and to discuss this important issue of fisheries jurisdiction and fisheries management. Sometimes with all of the publicity and the attention devoted to the Fishery Conservation and Management Act (FCMA) of 1976, the regional management councils, the continued questions of how much foreign fishing we allow, the tuna-porpoise situations, and so on, we fail to realize the importance of the harvest within the three-mile limit. For example, of the commercial shellfish catch in this nation, about 50 percent of the pounds and about 40 percent of the value come from within three miles of the shore. Of the finfish catch, almost 75 percent of the pounds and about 50 percent of the value come from within three miles. Therefore, overall, about 66 percent of the pounds and about 50 percent of the value come from within this area.

Now, we know most of the recreation catch is from within three miles and, as was indicated earlier, the expenditures on recreation are probably equal to or greater than the expenditures on the commercial side.

So we are talking about some very important parts of our total resources. This, though, is multiplied in importance when we consider the fact that the states, through their representatives on the regional management councils, have a considerable voting bloc on most regional councils. If you combine that power with the power that they have over the fisheries within their jurisdiction, I think that here rests a considerable amount of responsibility and, we hope, a considerable amount of the generation of action. I think that is what we want to reflect on a little bit more today.

What I would like to do is briefly discuss some of the principles of conservation. By conservation, I think we would all agree, we mean wise use.

In 1978, the Wildlife Society published a monograph that was the result of a workshop put together by the Society and attended by a number of nationally and internationally known individuals involved in fishery management. Holton Talbot summarized the principles that were generated out of

that and indicated that the privilege of utilizing a resource carries with it the obligation to adhere to certain principles. I would like to run through these because I'd like to focus then on one particular principle.

The principles mentioned were:

1. The ecosystem should be maintained in a desirable state such that consumptive and nonconsumptive values could be maximized on a continuing basis, that present and future options are ensured, and that the risk of irreversible change is minimized.

2. Management decisions should include a safety factor to allow for the fact that knowledge is imperfect. For example, if we are talking about managing for whatever vague notion we might have of maximum sustainable yield (MSY), being conservative in moving up towards the level of effort that would bring forth MSY would also be consistent with economic efficiency principles. Therefore, having a safety factor would be desirable not only from a biological standpoint, but also in terms of economic efficiency.

3. Measures to conserve a wild, living resource should be formulated and applied so as to avoid wasteful uses of other resources. I will come back to this principle.

4. Monitoring should always accompany the use of wild, living resources and the results should promptly be made available for critical public review. I am not going to linger on this principle, I think we would all like to see more done.

With respect to principle number three, I am going to repeat it: Measures to conserve a wild living resource should be formulated and applied so as to avoid wasteful uses of other resources. In this context the Wildlife Society publication indicates that the use of a living resource, of any living resource, involves the use of other resources, such as capital, labor or energy. The publication states it is well-known that many fisheries, including some managed on the MSY principle, have gone over in the extent of a rational commitment of capital and labor and fuel.

It indicates that measures for conserving resources should be chosen and applied in a way that does not waste or misuse either natural resources or manmade resources.

The basic consideration that I think is being proposed there and that I want to deal with today is that we must recognize that in dealing with the management of sport and commercial fisheries, whether this is within the state jurisdictions, among state jurisdictions or under federal government control, our primary responsibility is to society in general; therefore, regulations, decisions, restricts and policies should be set in a way that gives appropriate consideration to user groups, but primary consideration to overall public benefit.

We must, therefore, be concerned about the final net benefits that are generated from resource use. Net benefits to society take into account the value to the commercial fisherman, the recreational fisherman, the consumer or other user, minus the private costs that are incurred in attaining that resource, minus the public transactions costs. By public transactions costs we mean those costs of public administration, research and enforcement.

I think that in many of our management decisions we have failed, unfortunately, to take proper account of the fact that regulations do, on one side, impose costs and loss of freedom on fishermen, and, on the other side, require additional public expenditures to enforce those regulations. Therefore, what we are dealing with is basically a formula that has net benefits on one side and on the other side has value to whatever user group we are talking about, minus private costs, minus public costs. If we take actions that increase private or public costs and these actions, such as our research, our administration or our enforcement, do not increase the total value of the resource, then the result is a decline in the net benefit of that resource to society.

Let us take the example of commercial fishing. Net benefits are those values accruing to the industry, minus all the expenditures required on the part of the industry and on the part of the public to attain the product. At the harvesting level the pure profit, or the rent or whatever we might like to call what remains after we subtract all harvesting costs, really is fairly small, even if there is a pretty good earning in that fishery. Fisheries are not very large, so we are talking about a fairly small sum of money over and above the cost of attaining that resource. Out of what is left over is where we, as society, really have to deduct public costs because we are incurring costs for research, for administration, for meetings like this, and so forth.

I am not saying that the profits that are generated by the industry have to directly pay for the research, the administration and the enforcement, but if these public costs are greater than the net benefits that are going to the industry, then I think we have to start raising some questions about what are we really gaining from our actions with this particular resource.

I think the time has come to take a hard look at things and to ask how we can minimize private and transactions costs and still accomplish our objectives. I think it is of particular concern that in a time of inflation and concern about public expenditures that we really have to ask the question: Have we done everything we can to initiate regulatory practices that impose minimum private costs and minimum public research, administration and enforcement costs? And as we proceed with our various management and regulatory approaches we have to stop occasionally and ask ourselves a question: Have we in some situations gone too far in the sense of being beyond the point of attaining conservation of this particular resource, if by

conservation we mean wise use at a cost to society compatible with the benefit of that use? The failure to take action, and the resultant harvesting of our fishery resources at an artificially high cost because of imposed inefficiency from regulations and the public expenditures required to enforce these regulations, may have put us beyond the point where we can attain conservation or wise use at a reasonable cost.

Therefore, with certain species or in certain areas, no matter how unpalatable it might seem, perhaps we should admit that some lower-level goal or principle than was stated by the Wildlife Society, such as simple preservation, may be our only remaining cost-effective goal. That is, if we cannot attain wise use through proper effective and efficient procedures at a cost that is compatible with the benefits we are deriving, perhaps we could say our only real remaining alternative is preservation. We would not like this and this is certainly not what a lot of us have been working towards for a long period of time, but it may be the only rational choice if our management agencies and political institutions do not allow us to take rational management actions.

Related to this, in a keynote speech recently to the Atlantic States Marine Fishery Commission, the Honorable Philip D. Lewis, President of the Florida State Senate, indicated, "We need to provide a balanced program which encourages development of marine resources, strengthens our technological development and provides for protection of resources." It is an attainable goal but one which will require cooperation on the part of all parties. We must continue to be watchful of over-regulation, whether it be federal or state. Over-regulation and red tape can be expensive and time-consuming. We are all endeavoring to create new legislation and to strengthen and expand our programs. While we are doing this, however, it is vital to remember that the bottom line in such expansion efforts is money. That which is created by the government must be paid for by the public. The public is eventually going to demand accountability from its government and we must be prepared to meet that responsibility.

What do we mean now by trying to hold down private and public costs of management in a way that allows us to come up with some net social benefits? Past attempts, I think, have not been terribly successful because what we have wound up with is pretty much a mish-mash of rules and regulations and there have been institutional reasons for that; certainly the FCMA, which allows us the opportunity to move forward very rapidly, is still new.

What we have done with fishery management is, by bits and pieces, put together something that really is not very efficient and does not respond to the basic philosophy and the basic workings of our society, a free enterprise system which allows for choice based on the market system. What we have done is try to force the harvesting sector to go through distortions and

contortions to adjust to what we are trying to fit it in, rather than allow it to work effectively by using regulations that deal with incentive rather than dealing with prohibition. There are a lot of ways that we could provide incentives through the tax system, through subsidies, and so forth. By subsidies, I do not mean subsidies for inefficiency; I am suggesting subsidies for changing catch patterns and so forth.

I will come back to this in a moment, but I want to mention a couple of other things. These are not new ideas at all, but during the past year or so I have become very concerned. I have attended a number of national conferences on limited entry, optimum yield, development policy, and so on, and recently there was a very major task force group designed to come up with management principles in one of our management areas. One of the problems is that I have not seen anything new come from these conferences. We always have the same types of jargon; we require the ecosystems approach, systems analyses, bioeconomic considerations, management for the benefit of society rather than fish, and so on. I wonder how many times we have seen those. And as we look at the documents that are coming from some of these conferences, I think we see basically the same words, the same graphs, and so forth.

I was getting upset with myself and my colleagues and wondering why we are seeing the same old stuff. Then I began to realize that, while certainly we may be at fault, one of the reasons that we see the same old stuff coming is that we are not like the old professor who, after years of teaching and giving the same questions on the exam, got by with simply changing the answers. We have not changed the answers and as other people take a look at these same situations they come up with the same answers. We have not been changing the answers, but, when the administrators and the policymakers and the politicians ask the same questions year after year in a situation that basically they have not changed, they should expect the same answers again and again.

Therefore, it seems to me to be necessary to take some kind of action, either to initiate some changes in the situation or to start asking different questions. By this, I mean it is time to take some political action, but I am not suggesting more regulation. Maybe what I am suggesting is less, or at least a rationalization of the fishery management approach so that we do not go on piecemeal, adding more and more and more regulations. Because there is one thing that we know: If we generate a regulation and it is effective, in the sense of cutting down the catch per day or the earnings per year of a fisherman, that regulation is going to provide an incentive for that fisherman to cheat. And the only way we can prevent that cheating is to have either high fines—the higher the fines the more court costs we are going to have—or more policemen.

I think it is time that we really start to take a look at where we are and try to examine some different approaches. One of the things that might be possible is marine sanctuaries. I do not suggest this because I do not know all of the implications of marine sanctuaries, but I think in certain areas of the country we have reached the stage where we are not attaining any kind of efficient management and we are imposing tremendous regulations, but we are not really effectively controlling catch. If all we have left from society's standpoint is to look at preservation as an option, then maybe we could do it through marine sanctuaries. If all we want to do is to preserve a few species, then maybe we could simply cut things loose outside the sanctuaries. That is not what I would choose but I am not sure that we have an alternative, especially if we continue to proceed the way we are now.

I think, also, that we may not realize at all the costs that are associated with the lack of rational management that I think exists at this point.

The striped bass in the Chesapeake Bay is a good example of this; we know that striped bass population is down and that we have not had a good year class since 1970. Oftentimes it is mentioned that we know there are some serious environmental problems in some of these estuary areas, such as the runoff from agriculture, the herbicides, the pesticides, the decline of the aquatic grasses; maybe this could have an impact. But with this there is always the added thought, especially from the people who are not interested in further environmental controls: It may not be environmental, but may simply be from overfishing. I think it is too bad that we dissipate our potential power to slow down pollution and environmental changes simply because we have not put our own house in order.

I do not think we need a lot more information and, in fact, some of you may have expected me to talk about suggesting moratoriums on fishing effort and limited entry and so forth; I think really the only moratorium that I would suggest today, because I think the other is well laid out and available in many, many publications, is that maybe we should have a moratorium on new studies. In fact, it is these new studies that I think also often give us, whoever is involved, an excuse for no action.

I would like to relate a recent experience. Recently I was asked to prepare a paper as part of the total submission. This was supposed to be a major appendix. As I looked into it, I realized that I did not have enough imagination to come up with anything new because it was the same question that this same agency had hired some people to study six years ago, in a two-year project involving workshops at a number of places and top professionals throughout the United States. Finally, I declined the invitation to write the paper, but gave them a copy of their own study.

I think that is the stage we have reached with a number of our issues. There are, for example, always questions about what types of data we need

for fishery management. In 1965, I was serving with several people in this room on a statistical subcommittee of the Atlantic States Marine Fishery Commission. In the process of serving on that committee we developed a set of data requirements. I would hate to guess how many other times I have been involved and each of you has been involved in setting out data requirement needs or data needs for management. I am not really sure why we do not get beyond the stage of setting out the requirements and into collecting the data.

I think there are only so many times we are willing to do this and there are only so many times that it is worthwhile to do it. Sooner or later someone has to take some action.

Now, one of the things that I think we have to do in considering the public interest, which is what we have to consider, is question whether we are prepared and willing to take the steps necessary to utilize the information we have and to make some of the hard decisions implied by that information. We are kidding ourselves, wasting public money and imposing private costs if we continue to regenerate basically the same information over and over but do not use that information because of political or institutional inaction. This is a tremendous waste, from society's standpoint, and we should no longer be willing to settle for contributing to this.

I think the states have a terrific opportunity to step out now and I hope that they will lead the way beyond what I consider a jungle plateau where we have been for many years; we seem to continually start over, get to that plateau and never quite go beyond it.

A specific example that has to be addressed is recreational fishing. There have been for many years the call and the need for recreational fishing information, information to indicate the value of recreational fishing. The federal government is presently involved in what I consider a good, sound approach to the generation of this information. We are even involved in a part of it here at the University of Maryland; the state of Maryland is putting some money into it. What I am concerned about, however, is what is going to be done with the information when it is generated. I feel confident that it is going to show that there is a great willingness to pay for recreational fishing, but I wonder if this means that the primary use of the data, by people like me in Sea Grant programs and in state and federal agencies, will be simply to justify more research. It seems to me that the people who are in the decision-making role have to be prepared to take that information and make some hard management decisions. Otherwise, I think the primary result of showing the importance of recreational fishing may be to generate more and more studies to show the importance of recreational fishing.

It seems to me that we basically have to take some responsibilities here. We have responsibilities to private individuals and to the public in general.

We have to set some priorities, and be willing to move. And I want to re-emphasize that when I say we have to move, I am not suggesting more regulations, necessarily. I am suggesting that we try to rationalize what we have, preferably to diminish substantially the amount of regulations we have and to change the approach from something that has to be enforced at increasing costs to something that can be done on an incentive basis.

I think we are in an opportune situation here and we are having a conference on fisheries management and jurisdiction. I have attended a lot of state-federal meetings in the past where the states have indicated—this was before the FCMA—that they would like to make some appropriate moves and take some action, but they could not until the federal government took certain legislative action which would make it possible for the states to act. In other words, there was little for the states to do as long as only the three miles were controlled and anything beyond three miles was not.

I think we now have that law, and the state people here, through their activities on the regional councils, in their own states and with the interstate pacts, can really move forward. They can take the lead, put pressures on the councils and the federal government, and establish the philosophy of rational management approaches stated by principle number three of the Wildlife Society: Measures to conserve a wild, living resource should be formulated and applied so as to avoid wasteful use of other resources.

I hope this will be the action of this conference.

COUNCIL EXPERIENCE IN INTERSTATE FISHERY JURISDICTION AND MANAGEMENT[1]

John A. Mehos
Vice President, The Liberty Fish and Oyster Company

I have been a member and the chairman of the Gulf of Mexico Fishery Management Council since it was formed. During the ensuing three years I have watched the management process evolve into a system which appears to have all the elements to make it a successful and useful management system.

The Gulf Council, over the past three years, has been involved in the development of 12 fishery management plans, which will provide management systems for most of the major fisheries in the Gulf. We are now nearing completion of this task and expect that implementation of all these plans will

[1] This paper was prepared for the conference; however, it was delivered by Robert J. Mauermann, Executive Director, Shrimp Association of the Americas.

occur during 1980. A number of these plans have been developed jointly with the South Atlantic Council (SAC) for fishery stocks common to both areas.

Plans that we have developed for fishery stocks endemic to the Gulf of Mexico include those for shrimp, reef fish, groundfish, sharks, stone crabs and coastal herring. In addition, the Gulf Council has taken the lead responsibility for joint development of plans, with the able assistance of the SAC, for common stocks that include mackerel, spiny lobster and coral resources. We have also aided the SAC in the development of plans for billfish, swordfish and calico scallops, which are shared resources. During the remainder of this calendar year we expect to complete and hold public hearings on all of these plans, with the exception of those for calico scallops and coastal herrings.

I have cited these plans to emphasize a point. Of the twelve fisheries for which we are currently developing or have completed plans, five include species which are estuarine dependent and all contain species which are harvested in state waters as well as the fishery conservation zone (FCZ).

This emphasizes the importance of a cooperative approach to management by the regional fishery management councils (RFMCs) and states as partners, particularly in our area. Two of the Gulf states, those with the longest shoreline, have territorial seas extending out to nine nautical miles, rather than the traditional three miles. Thus, a proportionally larger share of the fisheries resource is harvested in state waters and a cooperative approach to shared management responsibility becomes increasingly important.

As most of you are aware, Congress wisely structured the RFMC membership so that each of the states has the opportunity to participate fully in the management deliberations and decisions of the RFMCs. The chief fishery administrator of each state, so appointed by the governor, serves as a voting member of the RFMCs. In the Gulf Council these members constitute approximately thirty percent of the voting membership. Congress also wisely provided each administrator with the flexibility of being represented by a designee of his choice. Normally this designee is the state's marine fisheries manager who formulates management policy for his state.

The Gulf Council has leaned heavily on the management expertise of the states in the formulation of our plans. Nearly one-third of the membership of our Scientific and Statistical Advisory Committee consists of state conservation agency scientists. By directly providing the states with RFMC liaison grants, National Oceanic and Atmospheric Administration (NOAA) has provided us with the opportunity to draw on the knowledge of state systems without adversely affecting or disrupting their existing programs and responsibilities. This exchange has benefited all of us and has resulted in draft plans which are supported by the state fishery personnel.

Gary Knight (Professor, L.S.U. Law Center) has reported on the structure of the governmental fishery management regime as it exists in each of the various states. Basically, we have two types in the Gulf. We have those states in which the regulatory agency is granted the authority to promulgate most of the rules and regulations governing fishing and we have those states where the legislature has retained such authority. We feel that we can be successful in achieving an integrated, cooperative management system under both kinds of governmental structures.

Congress also included representatives from the interstate marine fishery commissions on the RFMCs although in a nonvoting, advisory capacity. This has allowed the Gulf Council to be cognizant of the interstate management systems and efforts within our region, and to move toward integration of our management approaches.

Not long ago, the Gulf Council established a committee to work toward that end with the Gulf States Marine Fisheries Commission. The Gulf Commission has been in operation since 1949 and for thirty years has served as a common forum for discussion and development of cooperative, interstate management systems for implementation by the individual states. It has had notable success in promoting interstate management and standardized regulations in some areas, and has failed in others. The Gulf Commission and the Gulf Council, under the leadership of Charles Lyles, are engaged presently in exploring the possibilities and mechanisms for more effective integration of the Gulf Council and state management regimes. We hope to complete the details of such a system during this calendar year.

In June of this year, Congressman Breaux of Louisiana, Chairman of the Subcommittee on Fisheries and Wildlife and the Environment, raised questions, in relation to his committee's oversight hearings on the Fishery Conservation & Management Act (FCMA) of 1976, that focus on the issues discussed at this conference. The questions were as follows:

> *What problems have been encountered by the Council in the conservation and management of the fisheries and in enforcement of fishery management plans involving species which are taken inside state waters and within the FCZ? What recommendations do you have for overcoming any problems you have identified?*

Our council's response to his questions was as follows:

> *The Gulf Council has not had enough actual experience in implementing plans which impact the state management systems. In the planning process involving transboundary species we have not encountered any major problems.*

Most of the states have competent management systems for most major species and the Council has leaned heavily on the expertise and experience of state management personnel. Some state regulations have been adopted by the Council as proposed management measures in the FCZ. State fishery personnel have recognized the need for effective joint management and have acted responsibly to work with the Council to achieve that objective.

The true test of whether or not joint management can be attained under P.L. 94-265 as now written lies in the political arena and in the will of the many users of our valuable fish resources. The Gulf Council is committed to the proposition that the cooperative approach can and will work. We are doing and shall continue to do everything we can to adopt plans involving transboundary stocks that will be complemented by appropriate state action so that such stocks may be truly managed 'throughout the range'.

Although the attainment of such a goal will not be easy, this Council prefers that approach to the more severe course of preemption of state waters. In the ensuing years we shall work hard with state managers, legislatures and the public to achieve successful management. Meanwhile, we see not need for federal action in this regard.

My current view of the difficulties related to management of transboundary stocks is not greatly different from that expressed by the Gulf Council in June of this year. We are still largely inexperienced in actual implementation of our plans. Most of our plans contain provisions that must also be implemented by the states to be truly effective. Examples of these are as follows:

1. Size limits, gear limitations and areas closed to trawling in our stone crab plan.
2. Closed nursery grounds and seasonally closed trawling areas in our shrimp plan.
3. Bag limits and areas closed to certain gear in our reef fish plan.
4. Size limits, allocation quotas, and fishing zones for specific gear in our mackerel or migratory coastal pelagics plan.
5. Size limits and gear limitations in our spiny lobster plan.
6. Harvesting limitations and prohibitions in our coral plan.

I am optimistic that we can achieve an integrated management system encompassing both state and federal waters, and I believe most of our council members share this view. We recognize that implementation in the states is

likely to be a slow and gradual process requiring several years for completion. Considering the variations in the governmental management structures within the states, in the frequency and timing of legislative sessions, in the importance of fisheries to the respective states and their legislatures, and other differences, we view this extended implementation period as normal and as no threat to the stability of our fishery stocks or to the eventual attainment of our management objectives. In fact, we have already incorporated regional and state differences into our draft plans where it served a useful purpose to do so.

I am optimistic that the system will succeed primarily because of the cooperation of all parties involved in seeking viable solutions and also because the management planning process the Gulf Council follows under the law facilitates the achievement of such cooperation. The process worked in the implementation of our stone crab plan last March. The stone crab plan basically did two things, resolve a serious conflict between users of two types of gear (stone crab pots and shrimp trawls) and establish a management system regulating the harvest of stone crabs.

In resolving the gear conflict, a 60-mile line was used to separate the two user groups during the period of conflict. Federal implementation of this provision proceeded in March, followed by implementation by the legislature of the affected state at the next legislative session.

This effort was successful because of the cooperation, concern and support of all parties involved: the Gulf Council, that state, National Marine Fisheries Service (NMFS), the state legislature and, especially, the stone crab and shrimp industries. NMFS and the Gulf Council prepared a very good and complete plan in record time to provide the basis and supporting documentation for implementing remedial regulations. Segments of both the industry and the state participated in plan development throughout the period and spent endless hours seeking a viable solution that would be the most equitable to all users. NMFS and NOAA personnel performed admirably in moving the plan and the proposed regulations through the system to implementation. The state and industries provided the needed support to assure adoption by the state legislature as soon as possible.

Less successful was the petition of the Texas Gulf shrimp industry to the legislature for action that would make the state shrimp management regime compatible with the draft plan of the Gulf Council. Each year in early summer, Texas Gulf waters are closed to allow growth of undersized shrimp. To compensate for the fact that state jurisdiction is limited to nine miles, which covers only a portion of the shrimp grounds, Texas law also includes a count limit on both catch and landings. The Gulf Council plan provides for a cooperative closure of the fishery conservation zone (FCZ) contiguous with Texas territorial waters and running concurrently with the

Texas closed season but without any count limit, which would be unnecessary. The Texas legislature failed to adopt the bill which would have deleted the count limit in territorial waters, not because of the merits of the issue but because of political differences between Bay and Gulf shrimpers on other proposed legislation under consideration at the same time.

Other proposals in the Gulf Council's shrimp plan fared better. A recommendation to all Gulf states that they close the very shallow waters on the perimeter of their bays as sanctuaries to protect tiny shrimp was adopted by the same Texas legislature that would not remove its count restrictions. Another provision involves a permanently closed shrimp nursery area off Florida, which includes a portion of the territorial sea and the FCZ. The Florida legislature already has enacted provisions for the portion of the nursery ground in state waters prior to federal enactment in the FCZ.

The true test of whether we shall be successful in implementing provisions for transboundary stocks in other plans lies in the political arena, as these examples demonstrate. We shall not be successful if large segments of the recreational and commercial user groups are opposed to a measure, if the state agencies are opposed or if we violate the standards and guidelines of the FCMA in formulating the provisions.

We shall be successful only by a cooperative approach, in which all parties participate and in which they may resolve their differences for the common good of the resource and the community.

In order to assure participation in the cooperative approach, the Gulf Council has established advisory subpanels for each fishery. These subpanels consist of all factions of the user group and membership totals approximately 150 responsible and representative persons. We have a broad-based scientific advisory committee, of approximately 60 prominent scientists, that encompasses all the relevant areas of expertise. We hold extensive public hearings spaced at reasonable geographic intervals across the Gulf, so that interested persons may attend and comment at little cost. We have held as many as fifteen such hearings on a single plan. We take public comment into serious consideration in our revision of plans, and we try to keep the public informed of all aspects of our activities.

There are many who believe that bringing together the many diverse users of our fishery resources to achieve comprehensive management of transboundary stocks can never be achieved under the FCMA as now written. They say the only answer is to amend the FCMA to include state waters. They may prove to be right—eventually. But most of us, in the days when the FCMA was being formulated, told Congress that federal jurisdiction should stop at the outer boundary of the states' waters; that although fishery management planning should be done throughout the range of the fish, regulation in state waters should be left to the states. The implication was

that comprehensive management can be achieved by the cooperative approach. Only time will tell whether such an approach can be successful. This is what we told Congress we wanted. It is up to us to expend the necessary effort to learn whether it will work. Only then can we decide whether to follow the recommended process or to abandon it for sterner measures.

DISCUSSION

COMMENT: I want to applaud Gary Knight's last point; so often it is overlooked that one option is to do nothing . . . I think we really need to ask any management regime if those extra benefits for doing something are worth what it is going to cost. If we cannot show that they are, then we should not do it.

ADAMS: Do you want to respond to that, Gary, or just say amen?

KNIGHT: Amen.

ADAMS: I wonder if you could amplify this incentive-disincentive concept that you were espousing, because it is one that certainly has not been used very much in the fishing business.

NORTON: I think that an example that troubles all of us is the regulation prohibiting the keeping of a particular species once it is brought on board the vessel, because we know that when it is thrown back over, it is dead. That is a waste. The other thing, when it is thrown overboard we do not really know its mortality. This unknown mortality affects a multi-million dollar biological research program, which relies on fishing mortality statistics.

I think we should prohibit throwing anything overboard, and the way to do it might be to impose a tax, but not to totally remove the incentive to bring that fish in.

If fish is selling for 40 cents per pound and by-catch is 2 cents a pound, there is only a minor incentive. Let us say we are talking about cod and haddock. Some of the boats that are fishing for cod, for example, have hold-capacity problems. The way it is done now, they cannot have haddock on board over a certain amount; whatever they have over that amount has to be thrown back. But there is no incentive for them to stop fishing in an area as long as they are catching lots of cod, even if they are catching lots of haddock.

If we want to cut down on the bycatch of haddock, we could change it from being illegal to keep it on board to paying them a small price to keep it on board. This would provide an incentive, because they would rather concentrate in an area where they would catch more cod, for which they would get the full price. If you want to, make it illegal to throw it overboard. But that is something that would have to be enforced.

The main thing is that we can generate an awful lot of savings if we have some kind of restrictive effort. Then we could allow for certain types of incentives to take place, such as incentives for technological development. And we can provide that.

If we want to move effort from one species to another, we could, by taxing the species that we want to cut down the catch of, keeping that money in a fund, and providing a small subsidy to catch some under-utilized species.

Why do people concentrate on a particular species? Because that is what is most profitable for them. Tearing down the profit there and adding something to the under-utilized species, is an incentive approach.

I do not have all the answers, that is for sure. But what is not effective is saying they cannot keep it on board; that is not saving fish and it is not contributing anything to the biological research program that uses those statistics.

QUESTION: Would you elaborate on the net-benefit idea? Sometimes it seems that we look at the value of a fishery and claim the value of that as payoff to management when in fact that is not the case, it is the changing value. Maybe you want to make some comments about that, marginal gains, marginal costs.

NORTON: Well, that is basically what I was referring to when I said that if we have a formula which has on the one side net benefits and on the other side value to consumers or to the fishermen or whoever, then we also have to deduct private costs and public costs. More research, more enforcement or more administration, for example, would increase public costs. The basic question is: What are we doing to value? And I guess what I am concerned about is that an awful lot of our activities are doing very little to add to the value of the catch or the value to consumers or the value to recreation fishermen. And so what we are concerned about is: What is the extra expenditure and what is the extra benefit? If the extra expenditure is positive and the extra benefit is zero, or even maybe in some cases negative, then the net benefit to society from that change is negative.

QUESTION: I like your idea of reversing the tendency from enforcement to incentive as it applies to communities on the coast. I was wondering if, in your plan, there is a way for the fishermen to actually have input on creating some incentives that they would go with?

NORTON: Well, to me that is basically what the philosophy of the regional fishery managements councils (RFMCs) should provide; I think that is important. I guess once again, though, I would emphasize that, from the fisherman's standpoint, if we do not, through administrative action or political action, make it possible for self-ownership to be attained in that fishery, then there is really very little incentive for much else, other than to try to adjust to imposed regulations. Really the only incentive that the

fishermen have is to try to figure out how to overcome a particular mesh size, closed season, size of boat or something. They should have an input and I would hope they would have an input through the RFMCs. I think as businessmen they would rather deal with something like a tax, which would give them the possibility of adjusting their labor-capital ratio and all of these kinds of things. They could deal with that better than to have the federal government or an RFMC say you have to catch this combination of species and you have to do this and you have to do that.

It seems to me that what we have to rely on is the fact that these people are entrepreneurs. If they have a poor engine they are going to do something about it, because that is affecting their profit. If there is a regulation that is imposing a cost on them they are naturally going to try to get around it; not necessarily illegally, but maybe by going to a much larger size engine than is necessary, if that has something to do with getting out to an area before it closes, and so forth.

It is just that taking that approach imposes capital and labor utilization, whereas if we simply took an approach of taxation they could make the adjustments in whatever way would be most profitable to them. If the given level of taxation does not do it, we raise it. At least in both bases we are imposing costs. This is the thing that I think we so often forget. When we impose mesh size regulations we are going to lower the catch per day. That raises the average cost per pound of fish landed. That is no different from putting a tax on it. But in this case we are not letting the fisherman have the choice.

QUESTION: Your model, Dr. Norton, seems to fit the traditional commercial fishing situation without too much difficulty. In the recreational fisheries, of course, the cost is traditionally very high and perhaps the public cost would become abnormally high. Therefore, in what terms would you express the net value of benefit to recreational fisheries? It looks like it would come out negatively every time you use terms that are equivalent to the commercial fisheries; I think we have to have benefits expressed in some other manner.

NORTON: I think first of all we should be using basically the same measure in both, but we do not have an existing market-expressed measure in recreational fishing. So, if we are really talking about net benefits, say on the commercial side, what we would be talking about is something like consumer surplus; that is, how much are people getting and how much more would they be willing to pay than what they actually have to pay? That is applicable on the commercial size and that is applicable on the recreational side.

So what we ask is: What is the willingness to pay for the recreational experience? I think that is fairly clear in terms of the direction we should go

in measuring the benefits. I would disagree with your implication that that would mean we would have negative benefits, because I think the willingness to pay for recreational fishing is very high and that there are tremendous potential benefits. I am not sure that we need a great deal of public expenditures to make it possible to attain those benefits. We need some public expenditures for statistics just to measure the value; we need to know what it is. But I do not think we need a lot of regulations. I think if we do, then we should take a look at things like the sanctuary approach rather than trying to impose a bag limit on every recreational fisherman. Trying to impose that and enforce it would be tremendously costly and there should be some alternatives to approaching rational management without getting into that.

I agree with you that the measure is not there, but it can be generated. I think that it is very high and the public expenditures do not necessarily have to offset that.

QUESTION: Do you have any suggestions for some of the other economic considerations of fisheries management? We are talking about the harvesting sector, but also considering the expansion of the markets for the final product, the processing capacity producing new demands on the resource, and the linkage between the activities of that area at the state management level and the biological management. Do you have any suggestions on improving that linkage and considering the market expansion and the increased pressure on the stocks produced?

NORTON: I think that your point is well made. It was suggested today that markets are being generated and processing plants are being built and so forth; that scares me because all that means to me is that unless we have some method of actually controlling effort, we are generating new markets and we are going to be raising the price of fish. That is going to be drawing additional effort into the fishery and, therefore, with the approach we have taken the only alternative we have is to try more piecemeal types of regulations. The way I would tie it together is to say that if there is an expanding market, if we are doing anything to expand markets, they we had better do something to rationalize management. That just makes it all the more urgent.

QUESTION: The theme of this conference is obviously interstate fisheries management and jurisdiction. But there is one other arena that has to be considered in this realm of fisheries management and that is inter-RFMC management. How would you characterize the degree of cooperation among the Gulf Atlantic Council, the South Atlantic Council, and the Caribbean Council?

MAUERMANN: We have had really very little contact with the Caribbean Council; there have been some conferences. As I indicated in my presentation, we have worked with the South Atlantic Council on the bill fish plan, as they are the lead RFMC; also, we have provided them with all of the

information on the shrimp plan that was available. They will hold public hearings on the shrimp plan in the South Atlantic area because many shrimp fishermen from this area also fish in the Gulf.

I do not know of many closely related activities with the Caribbean Council other than some meetings held between the Gulf Council, the South Atlantic Council and the Caribbean Council on bill fish. I am not sure how successful and cooperative those meetings were. But I do believe that our relationship with the South Atlantic Council has been excellent and I think it will continue to be; I think we will work very closely with them.

QUESTION: Do you think that licenses for marine recreational anglers have a positive effect on marine recreational communities' participation in the RFMC activities, as well as funding for research, and so forth?

MAUERMANN: I am not quite sure I understood your question. It is not a license directed only to marine anglers, it is a sport fishing license for all waters, salt water and fresh water; it is one license.

ADAMS: Because sport fishermen are paying some part of the freight, through the license, do they think they can get a better day in court?

MAUERMANN: Well, they make a lot of noise, have a lot of demands and have been successful in getting certain projects developed on the coast as a result of their licensing participation.

QUESTION: I would like to direct this question to people from the Gulf area. Given the RFMCs' responsibility for management planning, the FCMA issues as a standard that stocks should be managed as single units throughout their range and the experience acquired to date, do you think the RFMCs provide an adequate forum for development of management plans for inter-jurisdictional stocks, whether they occur predominantly inside or outside the territorial sea?

MAUERMANN: Yes, I think so. The RFMCs have strong state representation and provide the opportunity for exchange of information. The plans all include full range of the species. If they are estuary-independent or back and forth, as most of them are, our plans address that and make recommendations to the states on what management measures we feel would be effective in state waters.

Now, as was pointed out earlier, the RFMC, of course, can only recommend this. But since the RFMC is composed of about 30 percent of state people and the advisory panels are largely state scientists from the state agencies that have regulatory responsibility, there is a pretty good chance that they are sitting in on the formulation of these developments and that they will have strong influence with their own state people in implementing them.

COMMENT: With regard to Dr. Norton's remarks, I think it is desirable to understand that there is an important distinction between "sanctuaries,"

which are generally becoming synonymous with "closed areas," and "marine sanctuaries," which are very specifically defined in the Marine Protection Research and Sanctuaries Act of 1972. Sanctuaries may be appropriate and effective management measures to take in state waters and perhaps the fishery conservation zone. The legal definition of marine sanctuaries does not allow, in my opinion, for such a designation as a fisheries management tool, and fishing activity in a marine sanctuary is not the RFMC's to regulate. It is much harder to get marine sanctuary designation than it is, for example, to implement a fishery management plan, closed area or sanctuary, and it is much harder to get that designation removed than it is to amend a fishery management plan to eliminate a closed area as circumstances change.

NORTON: I do not have any comment; I agree with the legal definition that is there. I am not a lawyer, but I am not really clear on why it would not be possible for a RFMC to designate an area as closed to fishing for a very long period of time. I was not referring to the Marine Protection Act as such, just to the concept of the sanctuary.

MAUERMANN: I think Dr. Norton was using lower case "marine sanctuaries" and not caps and lower case "Marine Sanctuaries." That concept has not been an outstanding success, I think, nationally.

QUESTION: I want to follow up my earlier question with a second one based on the response: Is it correct to conclude from your answer that species such as menhaden, sea trout, spotted trout and red drum, perhaps, are appropriate species for the RFMC to address in planning development activities?

MAUERMANN: No, I do not think so; certainly not as a very high priority. Sea trout or speckled trout are harvested primarily in inside waters, very few occur in the fishery conservation zone. This is not true with red drum; I do not know how high a priority this RFMC will give red drum, but it would be appropriate to address that fishery, surely.

QUESTION: Well, I think this is a critical area and I am not sure we have really covered it. In your opinion, will the RFMC ever develop a management plan for menhaden fishery in the Gulf of Mexico, and/or sea trout and/or red drum, or will we have to seek some other planning mechanism for those kinds of stock that occur predominantly or exclusively in the territorial sea but migrate across state bounds?

MAUERMANN: You are asking my opinion. I am not sure that I can speak for the RFMC because it is going to make those decisions as time goes on, but I think I would reverse the order of priority for management plans by the RFMC of those species you listed. The highest priority would be red drum, because there are certain areas where that species is a problem; second would be spotted trout, speckled trout; and third, lowest in priority, would be menhaden.

QUESTION: The reason this is critical, at least from the federal point of view, is the money. As you know, the state-federal program has been in operation since the early 1970s on a nationwide basis and we have funded planned development activities, in part, for the resources which you and I have discussed. I think the issue that faces our people is, if the RFMC will eventually assume the management planning responsibility for menhaden, sea trout and/or red drum then the question arises: Is there any sense in committing funds to a different planning mechanism today versus one that will take place perhaps in two, three or four years? This is particularly critical given the other priority programs that the federal government has to deal with.

I think the kind of response that is required is either a yes or a no from the RFMCs on this; yes, they will eventually develop plans for these resources, or no, they will not. It is not a question of perhaps.

MAUERMANN: I think it is important that that question be addressed to the RFMC. Let the RFMC take action on it and make a decision.

COMMENT: We have been attempting to do that and we have not been very successful in getting a straight answer to that question. I am not referring specifically to your RFMC. It is a hard question, but I think it should be addressed by all the RFMCs and the states together; I think it is a matter of the people getting their act together in terms of who will assume responsibility for what. Then the budgetary questions we face will become a lot easier to address.

QUESTION: Dr. Norton, are you talking about oceanographic or biological research or are you talking about economic and social research?

NORTON: I guess what I was really suggesting is that we have done an awful lot of research and generated a lot of information that, first of all, no one has used, and second we have more or less forgotten about. Therefore, before we move forward with more research, maybe we could take a look at what type of research we really need to address management questions, then take a look at what is available, and then, at that point, decide what additional types of research we need and whether we really want to put money in additional research.

COMMENT: I have been watching one RFMC's struggle with questions that have to be answered under the FCMA, and many times in developing the regional plan they do not know even how many people are in the fishery, let alone specific styles of participation and so on. I contest the statement that we have too much data, when in most cases we do not even know how many people are in the fisheries.

In North Carolina, for example, there is not even a good estimate of how many people are in shrimp fishing. I just do not see how you can argue that we can have plans on the basis of this data, let alone, as I said before, styles of participation.

NORTON: I guess my only response is that, first of all, I would want to know why we have to have the number of people in order to develop a management plan. I guess I am somewhat surprised it is not available but maybe we could gather that on a sampling basis. I think we could go through and list a large number of categories and data that theoretically we need for management decisions. It is not really clear in my own mind that we need a lot of additional information to make some fairly basic decisions like, for example, that we probably have enough vessels in most of our fisheres to harvest what is available. As to the question of whether additional vessels should be allowed, I do not know. Do we have to know exactly how many fishermen are in the fishery?

COMMENT: The law requires it because a management plan has to take into consideration impacts, and you cannot tell what the impacts are going to be if you do not know how many people are there. Also, even if the law would not require it, you have the question of compliance. Those who are going to be managers of the fisheries have to know what kind of people they plan to manage, because they are not managing fish, they are managing people.

NORTON: I would agree. I would say that if you went through a list of data needs that were developed by almost any group over the last ten years, there is probably an indication that those types of data are needed; why it has not been done I do not know.

COMMENT: Well, why it has not been done is a different question from why it should not be done.

NORTON: My point was that we need to ask the question: Is it needed? Apparently somebody feels it is not needed for rational management, and if the state legislatures and the administrators in the state are not willing to say this is what we need, then what other conclusion can you draw than the fact that they do not think it is needed?

I am not saying I agree that it is not needed, but I do not think they recognize this need.

COMMENT: I thought I heard you say that we should put a moratorium on research.

NORTON: That would not sell to this group too well. I think what we need to do is look at what has been done, look at what we are doing, look at what is needed, and draw some conclusions.

ADAMS: I think most of us will agree that much research has been done without ever asking the question: What good will it be when we get it? I believe Virgil Norton's basic point is that we should first structure the question and then look for the answer in the most efficient way. The answer to why we do not know how many shrimp fishermen are in North Carolina is a really pretty complex one, but the truth is that we do not.

I want to come back to a question asked earlier, because the business of individual citizen participation in this whole mess is very expensive, very frustrating and very important. The question concerned more citizen participation in the initiative mode as opposed to the reactive mode. It is very easy, I think, to get citizen participation in a reactive mode if you throw the target up, but what has been your experience in the initiative mode?

MAUERMANN: It has been excellent. We have selected very carefully the members on our advisory panel to represent the fisheries for which we are developing plans. Those are the people who have met with us and told us what their problems were, participated in the very beginning elements of the planning process, and stayed with us all the way through. Each one of the fishery management plans has an advisory subpanel that has met with the RFMC, met with the management committees, appeared before the RFMC, made presentations and really participated in the formulation of the draft plans. As you say, once those plans are formulated, they go out to public hearings, and they get a lot of reaction. But having had the principal industry representatives from those fisheries participate in the beginning stages of the planning process makes them the best salesmen you could possibly have, because it is their plan by that time. So they go back to the rest of their constituents, if you want, and say, "Look, this is what the council's done. We were there and this is what we wanted them to do and they did it."

Panel Presentation: Non-Migratory Species

Session Chairman: R. H. Loring

INTRODUCTION TO NON-MIGRATORY SPECIES PANEL

Richard H. Loring
Aquacultural Research Corporation

INTRODUCTION

We are here to discuss non-migratory species. The definition set up for us by the outline of the conference was "any species which remain within state borders," excluding anadromous species, which were to be considered separately from non-migratory species. Under this definition we should discuss primarily the sedentary animals, versus the free-swimming animals. Included would be molluscs—clams, oysters, mussels, scallops, and some crustaceans (crabs)—and a minimum of finfish species.

PRESENT MANAGEMENT PRACTICES

Simplistically stated, the goal of natural resource management is to continue a resource at least at present levels, and preferably to increase those levels, for economic or recreational benefits for the broadest segment of our society. Also, the goals include being able to overcome the negative impacts of such issues as maintenance dredging, oil spills, pollution of all types, and population pressure.

A more insidious conflict is the indirect habitat destruction. This has its greatest impact on non-migratory species. Habitat destruction is the result of man's land-based activity in almost every circumstance. I can think of only a few examples of permanent *natural* habitat destruction: the gradual silting over of shellfish beds; the movement of sandbars covering shellfish beds or closing off estuaries and reducing salinities; or major storms altering salinities. The list of man's potential destruction is endless. The dumping of wastes, filling of wetlands and dredging of estuarine bottoms are the most disastrous.

Present management practices do little to reduce the habitat destruction inherent in these negative impacts. Present management practices include wetlands-protection regulations, but still allow the issuance of permits for marine and maintenance dredging. Oil-spill controls are still not effective, as anyone who reads the newspapers knows. Pollution controls have a chance of

working, but in a very slow fashion. Presently, there are no controls for population pressure on the coastal areas. These pressures, in addition to being the cause of much of the pollution and demand for dredging, cause excessive runn-offs when the land area adjacent to wetlands has an impervious cover of streets, houses, and parking lots. Worst is the continual demand for filling of wetlands, although in the Northeast this activity is generally being curbed. With this population pressure, the demand for more marinas is continual; thus the destruction process continues in another cycle.

In regard to the management of shellfish resources, some limited entry is now utilized along with a catch limit and a minimum-size limit. Restocking is practiced to a limited extent. However, aquaculture is not encouraged. It is actually discouraged by not allowing bottom leases. The main contributing factor to this situation is that commercial wild-catch fishermen are far more numerous than farmers, and our government officials formulate their policies for the *short-range benefit of the majority.*

Overfishing a resource is one of the greatest dangers that present management practices are now grappling with. The commercial wild-catch fisherman has fought every type of control for the protection of a natural resource until the resource was dangerously depleted. The surf clam industry is a case in point. By using relatively sophisticated technology (compared with the hand digging of inshore quahaugs) to overharvest a particular low-cost resource consistently, the resource was depleted. Only when strict controls were instituted, in the way of limited entry (no new boats), was there any hope of recovery.

On the other hand, restocking is usually advocated by the wild-catch fishermen. There is considerable local pressure on Cape Cod to restock clam beds, particularly for recreation purposes. The Town of Dennis, in which my hatchery facility is located, is an example of the economics of restocking. The town has a year-round population of approximately 13,000 and has issued 1800 shellfishing permits. Of these 1800, about 1750 are family permits. Consider for a moment. The weekly limit for a family permit is one peck of quahaugs. If each permit holder went digging *only once a year,* rather than the permitted once a week, the aggregate taking would be 437 bushels. To restock these 437 bushels would require 218,500 clams. To end up with 200,000 clams, one would have to purchase over 400,000 clams from a hatchery, assuming the mortality rate could be restricted to 50 percent (which would be a favorable rate), and have a staff of shellfish officers to construct nursery areas and enforce the protection of same. This is about twice what the town is capable of doing now, with its existing budgets, and would probably cost far more than the taxpayers would be willing to pay for this one peck per year per family. The economics could not equal the actual benefit or even the perception of that benefit. The conclusion of all these

numbers is that artificial restocking is not something that can be looked to for any significant help in maintaining our natural resources.

This same town, and numerous others on Cape Cod, also restock with adult quahaugs (chowders) for a "put and take" restocking method. This method I really do not even find worthy of comment. It is a *total* waste of money.

Restocking for commercial purposes, with no contribution from the commercial fishery, is also not acceptable.

IMPACT OF COMPETING ACTIVITIES

Our panel is set up to address competing activities from the commercial point of view and from the recreational point of view. I would like to add my comments from the aquacultural point of view, which although commercial, is in competition with the wild fishery. As I see it, the farmer (aquaculturalist) is on one side of the conflict and on the other side are the commercial wild-catch fishery, recreational fishery, and recreational water sports such as scuba-diving, water-skiing, and sailing. The commercial wild-catch fishery and recreational fishery could, theoretically, share a resource in terms of both catch and area. But the commercial/recreational fishery is in direct conflict with water sports and both of these are in conflict with aquaculture. The farmer requires completely limited entry on his "farm"—the leased bottom area as well as in the water column and the surface area. Protective devices are frequently suspended from rafts or pens on the surface. They extend down through the water column and/or are placed directly on the bottom. Any traffic through such an area would wreak havoc on the property of the farmer.

In my experience the hunters—wild-catch fishermen—are the most vocal opponents of the farmers. I would hope that having the example of an aquaculture establishment that offered no threat to their livelihood would change their perception of the threat. However, the following story shows the opposite.

Aquacultural Research Corporation obtained grants totaling approximately 20 acres for growing shellfish in the Town of Chatham in the mid-1960s. Every five years, as grants came up for renewal, the fishermen would oppose the renewal, in spite of the fact that hatchery-spawned quahaugs had been planted on the grants after this historically unproductive area had been prepared by clearing and cleaning. This hatchery stock was then spawning and throwing off spat that would set down in non-grant areas and increase the wild-catch fishery. Also, bay scallops, a very lucrative and sought-after species, which had only occasionally grown in this area, returned to the area in great abundance after the cleaning of the area. When bay scallop season opened, Aquacultural Research Corporation voluntarily opened its grants to

the scallopers and restricted only the taking of quahaugs. Even this was not acceptable to the wild-catch commercial fishermen. Because they are a vocal group who comprise a majority, versus the minority of aquaculturists, our last lease on four acres was not renewed last spring. Only one one-acre grant is still in existence in the town and this probably will not be renewed.

Just so that *you* have an accurate perception of the "threat" posed by aquaculture grants, I will point out that the original 20 acres under lease to Aquacultural Research Corporation comprised less than a fraction of one percent of the potential shellfish growing area in the town. Yet aquaculture is not given the chance to exist on an equal footing with the wild-catch fishery. This short-sighted perception probably will not change until there is no more wild-catch fishery.

MANAGEMENT NEEDS AND INTERACTIONS

My primary concern is to control the *indirect* impact on the non-migratory species. If the habitat is destroyed, there will not be any catch to limit. The population pressure on coastal areas with its attendant pollution, filling, dredging, etc., must be controlled. As I see it, the best tool we have at our disposal to exert this control now is zoning. This is the only way to control population density. Once this type of control is initiated, then costal zone management at the federal, state, and local levels can carry out the regulation of any land-based activity in a coordinated fashion.

We must continue to have catch limits and size limits, but this must be done in conjunction with limited entry. These regulations must be strictly enforced. Yet we cannot allow limited entry to protect the "haves," allowing them to continue to prosper, while keeping the "have nots" from a natural resource that belongs to the public. This *has* happened in Massachusetts. In 1978, it was decreed that no new commercial lobster shellfishing licenses would be issued. The only fair way is to issue the licenses on a lottery basis. Size and catch limits will not work by themselves because as the supply gets smaller the demand pressure increases until the resource is either decimated or priced out of the market. An economic barrier does exist. This very thing appears to be happening at the retail level in the shrimp market now. Shrimp is coming off the menus. The economic barrier is being reached. Also, decimation of some species has already occurred, the sea clam being the prime example. This, unlike the shrimp, was a low-cost, high-volume product. Good technology and greed (but not good sense) overfished the resource.

Artificial restocking in the open marine environment is only a temporary device to slow down the decline. As stated earlier with the example of the Town of Dennis, restocking is simply not economically feasible.

Artificial restocking with hatchery stocks is a means of subsidizing with local tax dollars a recreational fishery and/or commercial wild-catch fishery.

This subsidizing of recreation may be acceptable since it has a broad-based, indirect benefit to the local population. It is analogous to the government owning parklands for the benefit of the public. The perception of being able to go out and "dig your own," the wild-hunter image that we Americans cling to, greatly appeals to people, even though they may not actually do it. Just knowing that they can is what counts. It is a part of living in a coastal area (and has a certain tourist attraction, which in turn has its economic benefits). This is something most people are willing to subsidize, myself included. However, any direct subsidy to the wild-catch fisherman through restocking is absolute economic foolishness to which I am philosophically opposed. If this were to begin, there would be no end. I realize that certain food producers in the United States have been subsidized and are now subsidized for *not* growing the product. I also realize that foreign factory ships are subsidized by the foreign government. This does not change my opposition to the practice.

Overall, the best solution for the non-migratory species would be to re-educate the wild-catch fishermen and to teach the wild hunters to become farmers. It is the quickest way to engender respect for the natural resource that may still be out there.

CURRENT MANAGEMENT PRACTICES FOR NON-MIGRATORY SPECIES

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Until the last few years, the non-migratory species were receiving the bulk of attention from fishery managers. This was not due to the fact that non-migratory species were necessarily more important than those which do migrate, but rather because virtually all authority to manage fishery resources was vested in the separate states. Thus, institutional mechanisms were seldom available for dealing with widely ranging stocks in a coherent fashion. It is, therefore, with the non-migratory species that we have the greatest experience, and should be best able to evaluate what we have done and how well we have done. In the discussion to follow, I will concentrate on a variety of fishery goals that we have attempted to attain and use a number of case examples to show how we have applied efforts or regulations to achieve those goals.

As a first step in this discussion, some exploration of definitions may be appropriate. For the purpose of this conference the speakers were advised

to define non-migratory species as those which do not cross interstate boundaries. This is a perfectly good operational definition, but I am going to bend this definition slightly for reasons that will become clear. There are few fishery organisms that are truly non-migratory, except for those that are non-motile, such as oysters or clams. Some species are clearly migratory in parts of their range and non-migratory in other geographic areas. The spotted sea trout is an example of the latter case. Where two or more states share a common body of water, virtually all motile species are more or less migratory by our conference definition. For the purpose of my discussion I am going to deal with species that are predominantly non-migratory. In a resource management sense we have attempted to deal with these species as if they were non-migratory. An example of such a species group is provided by the penaeid shrimp of the southeastern United States. They are unquestionably migratory but we deal with them as if they were not. I will cite several examples from this fishery.

Management goals are potentially very numerous and as varied as the fisheries to which we attempt to apply them. Some management goals are meaningful for a broad range of fisheries, while others make good sense only in rather narrow, specific cases. This paper will attempt to deal with goals which are generally thought to have wide application. I am using "goals" in the sense of a condition we wish to achieve or at least move closer to. Often we find that two worthy goals which appear to be partially in conflict are both being sought for the same fishery. In such cases we find ourselves in a delicate balancing act.

Resource managers, myself included, appear to have great difficulty in keeping a clear distinction between what we do and why we do it. So often the management action tends to become the goal rather than what we are trying to accomplish by that action.

SPECIFIC MANAGEMENT GOALS

1. *Maximize Net Profits.* This goal, or some slight variant of it, is frequently listed by economists as one of the most significant management goals for a commercial fishery. Yet it is difficult to document actual cases where we have designed management plans to accomplish this goal. Probably the reason it is so seldom a stated goal is that we are still reluctant to promote limited-entry regimes, especially in this part of the country. Yet it is highly questionable whether we can take positive action toward this goal so long as there is no way to adjust harvest capacity to the size of the harvestable resource. In the minds of many, in fact most people, the concept of limited entry in a common-property resource still appears philosophically incompatible. The practice of long-term leasing of oyster grounds may be as close as we come to limited entry in this region.

2. *Maximize the Yield (Pounds) Per Recruit.* Many would argue that this is not a proper goal and maintain that we should want to maximize the yield per recruit only to achieve some other purpose and it is that other purpose which should be stated as the goal. I include it here because it is so widely perceived as being a legitimate goal and is so often sought in fishery management. A variety of management measures are utilized to help increase the yield per recruit, but minimum sizes are probably the most common. In managing the blue crab fishery, most states have adopted a minimum size of five inches from point to point across the shell. This is one size limit that is rather seriously enforced, at least for the commercial sector of the harvest. The minimum size does impose an additional burden on the crab pot fisherman. Consequently, many states are now experimenting with automatic calling devices. The inclusion of one or more escape ports designed into the pot, is one of the more common devices. I believe the principal motive for adoption of this minimum size was, in most cases, the desire to avoid waste of undersized crabs or increase the yield per recruit, but it accomplishes other ends as well. The crab-picking houses do not want crabs less than five inches because of the lower meat yield and much higher unit cost of picking. Consequently, these minimum size limits enjoy broad support among the processing sector of the industry.

Ten or fifteen years ago, many states retained on their law books long lists of fishes for which there were minimum size limits. It was rather widely recognized that most of these size limits were not only nonenforceable, they were largely unnecessary. In recent years many states have struck such widespread limits from their law books. The tendency today is to go back and institute minimum sizes, but on a highly selective basis. The species for which minimum sizes make most sense are those with long life spans, rapid early growth and relatively low natural mortality rates. Florida enforces an 18-inch minimum size limit on snook; North Carolina has recently reinstituted a new size limit on fluke (summer flounder). Some fishery biologists are looking seriously at red drum as a good candidate for increasing the yield per recruit by a minimum size limit.

For many species of non-migratory crustaceans and fishes, the younger, smaller stages occupy different habitats than the adults. In such cases, it may be far more effective to close those areas to directed fisheries and force effort into these areas occupied by larger individuals. This is commonly done in the shrimp management programs, but not entirely for the purpose of increasing yield per recruit.

3. *Increase or Maximize the Yield (Dollars) Per Recruit.* This is a legitimate goal but one that is seldom stated in just these terms. It is my observation that in the southeastern US, this is the overriding goal of most shrimp management programs. It may not be clear to some how this goal differs

from maximizing the poundage yield per recruit. For some species, in fact, the two would coincide. This goal has real meaning even when one is dealing with a short-life-cycle species with high natural mortality rates, but for which there is a steady increase in price per pound with increasing size. In recent weeks, the price per pound for a 70 count shrimp has been $2.00, compared to a price of $3.90 for 36-40 and $6.00 for 16-20 count shrimp. For that kind of differential, one can afford to sacrifice considerable poundage for increased dollar yield. These are, of course, limitations to this approach. The domestic shrimp market requires a wide variety of sizes for different uses. The extreme high price for a 16-20 count shrimp would not exist if the entire production were concentrated in that size range, and all other uses would be denied the appropriate size.

One can cite another high-priced, "non-migratory" crustacean with which the approach described above would not work. Most of the harvest of the spiny lobster fishery is processed into a frozen, packaged form. The processing industry wants a relatively small, uniformly sized lobster tail, and the price per pound may actually decline above what the processing sector considers an ideal size.

4. *Allocate a Limited Resource Among Users to Achieve Certain Social and Economic Benefits.* This represents a family of goals and the precise wording would depend, in large part, on the specific fishery being addressed. The reasons for wanting to achieve this generalized goal statement would vary, as would the management techniques used to achieve it.

The allocation problems that generally receive the greatest attention are those which deal with allocating limited resources between commercial and recreational users. Most of our non-migratory fishery resources in the southeastern US are shared by both commercial and recreational users and, in some cases, competition is severe or at least perceived as severe. The competition between hook-and-line recreational fishermen and commercial gill-netters for certain types of fish has been an increasing problem throughout the Southeast and in the Gulf of Mexico. The principal species in contention in this region are spotted sea trout and red drum.

Within the shrimp industry there is growing concern over real or potential competition from the increasing numbers of recreational fishermen who use cast nets, lift nets or shrimp seines. Where there may be a few laws relating to these activities, the recreational shrimp fishery is largely unregulated. Since most or all fishery managers are unaware of the number of participants or the magnitude of the harvest, we are not even in a position to know whether this activity requires regulation.

There are many allocation problems among different segments of both the commercial and recreational fishery. Within the commercial fisheries, allocation problems between those who use mobile gear and those who fish

with fixed gear are common. In some cases we may have allocation questions about what portion of the harvest is appropriate for each and in other cases we are attempting to allocate fishing grounds. In South Carolina we have had for some years allocation problems between traditional shrimp trawlers and channel netters. The channel net is essentially a trawl net set in a fixed position and which fishes when the tidal currents sweep shrimp into it. We have attempted in the past to solve this problem by allocating fishing grounds to the separate components of harvesters. Thus far, no satisfactory solution has been found.

Allocation problems among different sectors of recreational fishermen are not rare. The competition between spear fishermen and hook-and-line fishermen on Florida reefs has been well publicized. An unusual problem has recently surfaced in South Carolina. Over the last five years, we have seen rapid growth of the gill-net fishery in competition with the hook-and-line fishery. While this would appear to be a commercial/recreational allocation problem, we have determined that the gill-net activity is largely recreational and that only a small percentage of the participants produce fish for normal commercial channels.

These allocation problems have not been dealt with by the individual states, with a few exceptions. In Florida, territorial waters in some countries are completely closed to spearfishing. Also in Florida, the snook is designated a game species, so in this case the entire harvest has been allocated to one user group. In South Carolina only striped bass, among coastal fishes, is designated a game species. In Georgia many internal coastal waters are closed to gill-netting and trawling, thus largely allocating many of the fishes to recreational users.

The problem of allocation, and even its legitimacy, is often attacked and almost always controversial. While it is quite understandable that every user group wants to maintain its right of access to a resource, it also seems reasonable that if a common-property resource belongs to society at large, then that society has the right to decide how that resource will be utilized. Most of the problem arises over how society reaches that decision. The question becomes whether or not society, through whatever mechanism, reaches a reasonable allocation decision or whether one pressure group prevails unfairly over all others.

5. *To Enhance and/or Promote Recreational Use of a Resource.* This, again, is one of those families of goals for which one has to deal with a specific case in order to develop a legitimate goal statement in the strict sense. Many management activities, however, are designed to meet this end, and specific examples are numerous. This is one area in which there is much confusion over why we take certain actions. There are, in fact, two quite different kinds of motivation behind this goal and the two can be in conflict, but

are not necessarily so. We must recognize that there is a very valuable recreational industry that provides a wide range of goods and services to the recreational angler. Direct sales of goods and services just in our southeastern region run into hundreds of millions of dollars annually and provide thousands of jobs. The broad range of secondary services which make up the whole scene of coastal tourism is closely tied to the recreational fisheries. Many management activities can be directly related to enhancing the desirable economic impacts from this sector of the fishing industry. This is a perfectly legitimate goal since society at large does benefit from the use of the common-property resource in question. The other side of this motivational coin is that we want to improve the recreational experience for the individual angler. The two approaches can come into conflict because the economic impact of the recreational fisheries is largely a function of the number of participants and is not a direct function of the harvest, whereas the level of pleasure to the angler is closely related to individual harvest. The two approaches do come into conflict when the resource is heavily exploited. The greater the number of anglers, the greater the expenditure and economic benefit; however, the greater the number of anglers, the greater the congestion and the lower the harvest in number and mean size of fishes caught per angler.

Let us look briefly at some of the management techniques that are in use to achieve this goal of enhancing recreational use of the resource. Probably the most obvious and successful have been actions to improve access. These take several forms including boat ramps, bridge catwalks, parking facilities adjacent to public beaches, artificial reefs and public piers. All of the states in our region have done much good in this area; Florida has been a leader in this regard.

Another form of enhancing recreational use is direct regulation, and one form is the imposition of bag limits. These are common in many states where public shellfish grounds are maintained. Bag limits among marine fishes in this region are rare, but one notable example is a bag limit of four fish per angler in the Florida snook fishery. Where bag limits are reasonably imposed, the motive is obviously to spread a limited resource among a great number of participants.

6. *To Maintain Public Order in the Prosecution of a Fishery.* This is an unusual goal in that it is preventive rather than positive but it is a valid one nevertheless. Many fishery regulations are designed to meet this end, and many examples could be cited among fisheries based on non-migratory stocks. The problems that this goal is designed to solve differ from allocation problems discussed earlier in that conflict problems considered here are not necessarily based on dividing up a scarce resource; in fact, the target resource for the conflicting parties may not even be the same resource. A recent case in point would be the serious conflict that developed in Florida Bay between

stone crab pot fishermen and shrimp trawlers. This was a case of the incompatibility of two kinds of fishing gear operating in the same place at the same time. Apparently the only way to avoid a shooting war in this case was in allocation of fishing grounds, which achieved physical separation. Many rules and regulations prescribe the minimum distances that similar fixed fishing gear may be set apart. This may have nothing to do with allocation of the resource, but rather the activities of one individual interfering with fishing activity of another. Those familiar with shad fisheries and blue crab fisheries will recognize many such problems. In any state where there is an active crab pot fishery, the fishery administrator can count on continuing complaints from the pleasure-boating community over the hazard-to-navigation problem imposed by crab pot floats and connecting lines.

SUMMARY EVALUATION OF NON-MIGRATORY SPECIES MANAGEMENT

We as fishery managers have not done very well in meeting reasonable fishery goals. On the other hand, we have done at least as well as one could expect, considering the constraints on resource management and the seemingly conflicting desires on the part of society at large.

Some fisheries are quite well managed, and I would cite the shrimp fisheries of the southeastern region as perhaps the best example. This is a relatively simple fishery, our knowledge of the biology of the stocks is reasonably good, and the several states involved are in rather close agreement on the goals of management. Beyond this fishery, good examples are rather hard to find.

One of the major constraints is that although we are now thinking and talking about well-designed management systems, that is not the condition under which we presently operate. Most management activities in operation today are the result of individually enacted laws designed to solve a specific problem. A collection of such individual actions is unlikely to result in any coherent management plan. I believe we are moving in the proper direction and I believe the passage of the Fishery Conservation and Management Act of 1976 was a major stimulus in getting all action levels to think more about the development of coherent management plans for fisheries.

If society can decide how it wishes fisheries to be managed, I am convinced we have the management tools to achieve those ends.

IMPACTS OF COMPETING USER ACTIVITIES ON NON-MIGRATORY SPECIES

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The purpose of this paper is to discuss, from the point of view of the recreational fisherman, the impacts of competing activities on non-migratory species. However, in order to understand how recreational fishermen regard other users of marine resources and how they are affected by them, it is necessary to understand the nature of the recreational fisherman's interest in those resources. This may seem obvious to some, but a review of the literature is fraught with surprises.

For many years it was fashionable to describe the recreational fisherman's interest in marine resources in terms of "the quality of the recreational experience"—a phrase that has come to mean many things to many people. The phrase was intended originally to describe the fact that surveys showed that recreational fishermen indulged in fishing for the sake of companionship, a day on the water, a chance to mess about in boats and a host of other reasons not directly related to the business of capturing fish. In analyzing the needs of recreational fishermen, some spokesmen for recreational fishermen have used the phrase to refer to the fact that unlike the commercial fisherman, the angler is interested in size as well as quantity. With respect to fish that are difficult to catch, such as tarpon and bonefish, the quality of the recreational fishing experience might be said to relate to the availability of fish.

Whatever this phrase was originally intended to mean, it is now frequently used as a kind of "put down" in adversary debate by spokesmen for commercial fishing interests who sneeringly refer to "sports" who come to "play with" fish, as compared with the more serious, and inferentially more noble and deserving "real fishermen" who wrest their living from the sea, à la *Captains Courageous*. Certainly it is true that some important species of gamefish are rarely eaten. One seldom sees bonefish or tarpon on the table. On the other hand, there seems to be a trend toward eating sailfish and marlin; and some sharks have long been regarded by knowledgeable anglers as a great delicacy. In fact, the great majority of fish taken by anglers are retained for home consumption. Thus, to the extent that the phrase connotes size and availability of a target species, "the quality of the recreational experience" is an essential element of the recreational fisherman's interest in marine resources; nevertheless, the basic and primary interest of recreational fishermen is in boating and killing fish. For management purposes this means that the recreational fisherman is primarily interested in the *abundance* of

gamefish; therefore, any activity that impinges upon the abundance of gamefish is relevant to the recreational-fishing interest. Viewed in this light, the interest of the recreational fisherman is very broad, and the number of activities that impact thereon are many.

Generally speaking, the fishing methods used by recreational fishermen in pursuit of finfish are comparatively inefficient. The presence of many tons of fish is required for anglers to land a single ton. Moreover, most recreational fishermen are interested in size as well as quantity, and some are only interested in taking large fish. Under the Fisheries Conservation and Management Act (FCMA) of 1976, this is an optimum yield (OY) factor which has implications that may not be fully appreciated. For example, in most fishery management plans OY appears to take into account only actual landings by the recreational fishery instead of an estimate of the stock size needed to produce such lands and to maintain an inshore fishery available to the greatest number of recreational fishermen. By the same token, a management scheme having as its sole objective producing the highest sustainable commercial landings would probably be antithetical to recreational fishermen hoping to catch a whopper, because fishing for maximum yield per recruit will rarely allow fish—particularly, long-lived, slow-growing fish—to survive to recruit to trophy-sized year classes. Consequently, to maximize recreational benefits, stocks must be harvested at levels that will allow different stock structures than are needed for optimum commercial harvests. This principle applies equally to migratory and non-migratory species.

The *availability* of gamefish is just as important to recreational fisheries as the abundance of gamefish, and one is not necessarily a function of the other—particularly with non-migratory species. A population of fish residing beyond the range of anglers cannot sustain a viable recreational fishery. Blue marlin regularly migrate to the northwestern Atlantic in the summertime but rarely come within a hundred miles of the New York-New England coastline. As a result, there is no blue marlin fishery in the Northeast. Similarly, local livery-boat fisheries will collapse if inshore stocks of target species are decimated by overharvesting, pollution or habitat destruction. A good example of this is the decline of recreational fishing in Florida Bay. In the five-year period 1972 through 1977, catches of seatrout, red drum and snook fell off dramatically in Everglades National Park, and the direct impact of this can be seen by the fact that in 1977 only 85,700 anglers visited the park in 34,800 boats; whereas in 1972, 171,000 sportsmen used 90,000 boats to fish the park (Ruoff, 1972).

COMMERCIAL FISHING

The principal activity competing with recreational fishing is commercial fishing, which impacts directly and indirectly upon recreational fishing. The

combined impacts of the competing interests upon the resources can be, and frequently are, devastating. When both fishing factions compete for the harvest of a single stock, or even a given species of fish, the first concern of all should be for the abundance of the fish. From a strictly partisan point of view, however, the recreational fisherman's first concern usually relates to a diminution of expectations caused by a reduced population of the target species. When stocks are overfished, bodies of fish are harder to find, catches shrink, the average size of the fish caught is usually smaller and, if you must, the quality of the fishing experience is greatly impaired. In the typical situation, relations between recreational and commercial fishermen become antagonistic, gear conflicts proliferate and sometimes mayhem ensues.

Head-to-head competition on local grounds is not necessary for commercial overharvesting to impact adversely upon recreational fishing. Many stocks of fish found inshore are part of common populations extending offshore. Fishing offshore affects the abundance inside (Hennemuth, 1973). Of course, commercial competition is not absolutely necessary to the decimation of a resource. Just by reason of the fishing pressure brought to bear by huge numbers of anglers targeting on an accessible and relatively stationary species, recreational fishermen can deplete stocks without the assistance of their commercial brethren. The impact of recreational fishing (with an assist from environmental factors) on snook stocks in Florida has been devastating. There are grim results from a tagging program conducted by the Florida Department of Natural Resources for the past three years. Gerald E. Breyer, who compiled the results, reports that the tag return is a spectacular 10 to 13 percent annually, which indicates that the fish migrate very little and that recreational fishermen take a tremendous toll (Waterman, 1979).

Even in the absence of overharvesting, commercial fishing activities may reduce the availability of target species to recreational fishermen. A heavy, local concentration of commercial fishery effort on certain forage species may cause predators to move elsewhere. For many years recreational fishermen have been vocally critical of menhaden fishing operations, particularly in enclosed waters such as Narragansett Bay, Long Island Sound, Delaware Bay and Chesapeake Bay. The perception that large menhaden catches will mean poor striped bass and bluefish fishing persists, despite well-designed public relations efforts by the menhaden industry and the publication of contrary scientific conclusions (Oviatt, 1977). The role of predation at different tropic levels and its implications for management purposes are imperfectly understood (Sykes and Manooch, 1979). Scientists were caught by surprise when sequential overharvesting by foreign fleets in the North Atlantic turned up unsuspected relationships between herring, mackerel and squid. More recently, the abundance of yellowtail in Florida waters has been attributed to the overharvesting of groupers and mutton snappers, species

that normally prey upon yellowtail. A better understanding of such relationships is essential to effective fishery management.

Finally, commercial fishing can impact adversely upon recreational fishing by preempting important fishing ground. Preemption may occur in the form of a gear conflict, as where gillnetters may set net on a reef in such manner that drift fishing is impossible. Or it may take the form of habitat destruction, as in the case of roller-trawl damage to coral formations. The practical solution to such problems is to allocate fishing grounds among competing groups, with an appropriate amount set aside in sanctuaries for recreational fishing. The recent Gray's Reef proposal appears to be just such an imaginative use of the sanctuary device; it would reserve a rich bottom area for this fast-growing recreational fishery in Georgia. A related problem is that posed by lost or abandoned fishing gear, mostly gill nets and pots, that not only impede access to desirable fishing areas but also continue to catch fish indefinitely. In some areas attempts should be made to retrieve and destroy such gear in order to reopen the grounds to fishing and put an end to the wasteful destruction of fish.

The business of managing marine fisheries for OY is still in its infancy, and the regional fishery management councils (RFMCs) are just beginning to come to grips with the difficult task of allocating harvests among recreational and commercial fishermen in mixed fisheries. The problem of allowing for the indirect interests of recreational fishing is frequently overlooked, ignored or inadequately addressed. The usual excuse given is that there is insufficient data available to permit a meaningful analysis and the formulation of an appropriate management strategy. Certainly, critical data is often unavailable and impossible to obtain in timely fashion. Sometimes it is not at all clear exactly what data is required. More often, however, inadequately defined management objectives and a failure to determine what should be the OY of the fishery underlie the failure to adequately accommodate the interest of the recreational fishery.

No generally accepted understanding of the OY concept appears to exist, either within the National Marine Fisheries Service (NMFS) or among the members of the various RFMCs. Literature on the subject is sparse and strangely one-dimensional. Mathematicians explain OY in terms of models; economists in terms of economics; biologists, biology, and so forth. Sooner or later OY questions will come before the courts for adjudication, and in the absence of a definitive body of literature on the subject, the lawyers will impose their views on the fishing community, which is not necessarily a result to be devoutly favored. An analysis of what passes for OY in the existing fishery management plans (FMPs) dealing with fisheries with a significant recreational fishing interest, such as the anchovy, Pacific salmon, and Atlantic mackerel plans, would be an interesting way to remedy the literature gap.

NON-FISHING ACTIVITIES

Non-fishing activities impacting upon non-migratory species of concern to recreational fishermen are those which through habitat destruction or degradation of water quality result in reduced abundance or availability of gamefish. Such impacts are caused by pollution, land development, dredging, dumping, the siting of energy facilities and a host of other activities. They are for the most part the inevitable by-products of the on-going urbanization of coastal areas. In the decade following 1960, the population at large grew by 13 percent, but the metropolitan population expanded by 23 percent (Allen, 1978). By the year 2000, urban regions, most of which are located on or near the coast, will occupy one-sixth of the continental United States (US) land area and contain five-sixths of our nation's people (Rockefeller et al., 1972). It would be unrealistic to suppose that such growth will not be accompanied by increased energy requirements, land development and the aggravation of an array of nearly insurmountable problems relating to spills, run-offs and waste disposal.

The highest and best uses of wetlands are popularly believed to be as locations for shopping centers, housing developments, tank farms and marinas. It is an unfortunate fact of life that this perception is both widespread and deep-rooted. Moreover, it is also an unfortunate fact of life that the American public resists land-use regulation as an unwarranted extension of government. Therefore, we can look forward to continued loss of significant amounts of vital spawning and nursery areas.

In recent years the pace of wetland loss has greatly accelerated. Nationwide, there were about 127 million acres of freshwater and saltwater wetlands originally, but by 1968 there were only about 75 million acres left (Bellrose, 1976). According to a 1973 report, more than 40 percent of the nation's estuaries, marshes, and wetlands have been modified. Dredging, channeling, filling and pollution gravely threaten most areas that remain (Watt, 1973). Contrary to earlier ideas, the inhabitants of coastal-shelf waters do not depend primarily on saltwater-marsh productivity for nutrients (Haines, 1975). But developers who argue, therefore, that tidal wetlands are expendable overlook the essential role such environments play as spawning and nursery grounds for coastal fish and as a natural depository for wastes with an important, if limited, sewage-treatment capacity (Hedgepeth, 1978). The removal of wetland and fishery areas excises food-chain foundations, thereby tending to reduce the amount of food available to sustain populations of predators at the higher end of the food chain, many of which are non-migratory gamefish. Thus wetland removal impacts upon the abundance of gamefish. Additionally, to the extent that wetland removal results in the diminution of significant prey-species populations in a localized area, such removal may result in reducing the availability to anglers there of otherwise

abundant species. Such is the situation in Florida Bay referred to earlier, where some species of fish, plentiful elsewhere, such as sea trout, channel bass, tarpon, bonefish and mullet, are in short supply because the productivity of the Everglades has been impaired by the diversion of large amounts of fresh water for consumption, irrigation, flood control and industrial usage. Snook are also scarce, but snook populations are down everywhere in Florida; the cause is thought to be an insecticide used in coastal areas.

Conservation implies wise utilization of resources. The consequences to tarpon, for example, of continued nursery-ground reduction are uncertain. If Florida's tarpon populations are largely recruited from local populations, then protection of the habitat of the late larval and early juvenile stages is essential to the maintenance of the resources (Robins, 1977). It is by no means clear that such tradeoffs under the Coastal Zone Management Act (CZMA) will be managed with more acuity than tradeoffs made without benefit of CZMA. The State of North Carolina Coastal Management Program, for example, is an admirable policy statement; nevertheless, one cannot help but wonder how much local support it will receive in the years to come. As it points out, "Local government officials are dependent on economic development for the maintenance of a strong local tax base to provide and upgrade services" (p. 64). In preliminary discussions, "Residents of North Carolina's coastal zone consistently emphasized the need for economic development and growth in their land use plans" (p. 72). One cannot help but suspect that when economic push comes to environmental shove, local governments will find a rationale favoring economic development.

Growing energy demands produce a variety of impacts, some of which are not fully understood. Power plants are usually sited, sometimes in clusters, in estuaries where they gobble up gigantic amounts of water rich in eggs and larval fishes, heat it up and spit it out—frequently with a dose of chlorine added for good measure. Channels are dug to enable fuel carriers to reach and feed the plants, thereby altering the estuary bottom and creating a soil-disposal problem, which is made chronic by the need for maintenance dredging. The quantity of material produced annually by maintenance dredging in the US is 229 million cubic meters. In addition, new dredging produces another 61 million cubic meters (Boyd et al., 1972). Much of this material contains significant accumulations of toxic industrial and agricultural wastes. Finally, the production and transportation of oil to fire the power plants is attended by a constant occurrence of spills and, as the recent *Argo Merchant* and Campeche spills have demonstrated, the technology to contain and clean up spills in the open ocean simply does not exist at this time, governmental assurances to the contrary notwithstanding.

Of all the threats posed to the fisheries by competing non-fishing activities, recreational fishermen tend to regard oil spills with the greatest alarm.

Nevertheless, it is unclear that such a high degree of concern is warranted, except where the potential for spills exists in critical spawning and habitat areas. Obviously spills are undesirable in any circumstances, but the degree of their undesirability depends to a great degree upon where they occur. A major spill in Chesapeake Bay or Long Island Sound, which share severely stressed environments, could wreak inordinate amounts of damage, whereas a spill in the open ocean might be comparatively harmless. Even in the open ocean, however, a spill on a spawning ground could have very grave effects. On Georges Bank, for example, the Bureau of Land Management admits that the most severe spill could remove 2,000 square miles of inshore, mixed-groundfish grounds from production (Lease Sale No. 42, SEIS p. 150). Studies of the Campeche spill and its effect upon the Texas Shrimp fishery should tell us something of the threat which spills pose to bottom dwellers and just how long-lived such effects are likely to be.

Admittedly, major spills from oil wells like Campeche and its predecessor in the North Sea are statistically rare. Transportation-related spills are more common and, with the ever-increasing volume of petroleum imports, they can be expected to become more common still. Only comprehensive safety measures rigorously enforced can reduce the threat of such spills. But beyond this, it is important to supplant the historical custom of studying the prospective impacts of each incremental activity, usually with a view to justifying it on the basis of cost effectiveness, by recognizing instead the need to study the total impact of an energy system on the entire affected ecosystem.

Like oil spills, the impacts of spills of other toxic substances, run-offs, point-source pollution and dumping vary in severity in relation to where they occur as well as according to the nature of the substances involved. Pollution in any of the great, more or less enclosed, resource-rich bodies of water such as Long Island Sound, Chesapeake Bay and Tampa Bay is sure to be more harmful than the same or even greater amounts of pollution in the open ocean. Offshore waters are comparatively pristine and capable, through dilution and dispersion, of absorbing enormous amounts of toxic substances without substantial harm. By comparison, near-shore environments are more likely to be stressed, and each increment to existing pollution is more likely to have a significant impact. In recent years recurrent fish kills in San Francisco Bay, Long Island Sound and the New Jersey shore bear witness to the fact that there is a limit to how much can be leached, spilled and dumped without consequence.

Bays and estuaries self-destruct over a period of time as a result of siltation. Man alters the process by dredging, water diversion and pollution. Describing the effects of urban runoffs in San Diego Bay, Smith and Graham (1976) wrote, "Fine silts and clays smother many bottom organisms and increase turbidity thus decreasing the amount of sunslight necessary for growth

of flora living in the Bay waters or on the bottom. Organic materials introduced with runoff utilize oxygen from the water, thus decreasing supplies vital to all aquatic fauna." In addition to silt, clay and organic materials, storm and drain waters can introduce a variety of other pollutants into bay waters. Oil and grease from city streets, agricultural pesticides, and lead particles that owe their origin to air pollution and the combination of high-octane gasoline, all enter the Bay through run-off (Browning et al., 1973).

Dumping in particular causes problems that dump-site planners seldom anticipate. Unless accompanied by an independent inspector, barge operators rarely confine their activities to designated dump sites, and "short-dumping" tends to be the rule rather than the exception. Moreover, dumped material sometimes "creeps," under the influence of unsuspected bottom currents, with disastrous effects to benthic life. Thus impacts thought to be localized are not. Habitat destruction occurs over large areas, usually nearshore, with the result that non-migratory fish are driven off or exterminated.

Regional Environmental Protection Agency officials have been generous in issuing so-called emergency permits allowing permit holders to dump toxic materials outlawed by federal regulations, and they have been lax in monitoring permitted dumping; so that only the dumpers know the quantity and nature of the materials dumped. This leaves us with the unappetizing prospect of discovering new wasteland areas caused by unlawful disposal of outlaw materials in nonconforming containers.

Because of the magnitude of the problem, sewage disposal is probably the most difficult to deal with of all the waste-disposal problems. The current solution is to reduce it to its most noxious state (sludge), treat it with too much chlorine and dump it into the ocean. Municipal waste contains all kinds of industrial waste products, such as oil, grease, acids and heavy metals, but if it could be broadcast in an unconcentrated form, the harmful effect of such toxicants might be offset by the nutrients contained in the balance of the material. When sludge is deposited in a dump site in great quantities, the reverse is true. The result is to preempt the bottom area of the dump site from fishing and reduce water quality in a large surrounding area. As the cities grow and spread, the problem becomes more severe.

CONCLUSION

The aggregate impact of man's activities on marine ecosystems is unknown. Decades of overfishing in some areas have modified the community structure of many ecosystems and perhaps altered their stability features (Alverson, 1978). All ecosystems, whatever their capacity to recover from disturbance, have thresholds beyond which further change is irreversible, at least in terms of human lifetimes and the foreseeable future. Thresholds of irreversibility are not easily recognized, as we have found to our chagrin in

the management of many resources (Dasmann, 1978). It is far better, if we are truly concerned for the future, to keep exploitation rates within obvious safe limits and to resist absolutely pressure to increase the level of perturbation of stressed environments.

This philosophy of caution with respect to exploitation of natural resources is clearly expressed in the FCMA in Sec. 301(a)(6): "Conservation and management resources shall take into account and allow for variations among, and contingencies in, fisheries, fishery resources, and catches." The definition of "conservation and management" [Sec. 3(2)] includes the charge that conservation and management rules, methods and other measures "assure that irreversible or long-term adverse effects on fishery resources *and the marine environment* are avoided" (emphasis added). And most authorities agree that the same caution is embodied by implication in the concept of OY. It should be noted that the term "fishery resource" is defined in Sec. 3(9) of the FCMA to include "any habitats of fish."

Unfortunately, fisheries within state jurisdiction are rarely managed pursuant to a comprehensive management act. Management policies are usually circumscribed by a body of laws enacted over a long period of time on an *ad hoc* basis. The lack of coordination among states and between state and federal authorities occasionally provides a loophole allowing overexploitation. Similarly, overlapping jurisdiction among a number of federal agencies, all of which have regulatory responsibilities for energy, dumping, dredging, development and other activities in the coastal area and adjacent waters, militates against a comprehensive effort to protect coastal resources. If this network of state, federal and interagency regulatory authority can be regarded as a single system, then it can be said that the "system" is not very good. A great many well-intentioned, even highly motivated people work for the system, but despite their efforts the system does little to protect marine resources from the adverse impacts of competing uses. Each of such uses is the focal point of competitive and often contradictory policies, a situation which guarantees that the system will never work any better until and unless this country adopts an oceans policy giving appropriate priority to the protection of living marine resources. Groups representing both recreational and commercial fishermen and environmental organizations having a general concern for the conservation of marine resources have repeatedly called upon Congress to undertake the formulation of a comprehensive policy, so far to no avail.

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IMPACT OF COMPETING ACTIVITIES

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Harrison Seafood

We were asked to speak of the impact of competing user activity on non-migratory species from a commercial viewpoint. To begin with, the definition of a "competitor" is in order. A competitor in using natural resources which affect non-migratory species of fisheries in, in my opinion: (a) any user group that makes use of the fishery itself, or (b) any user group that uses or encroaches upon the environment of a fishery in a non-migratory group.

Who are the competitors? Again, we have two basic broad groups, the users and the users of the environment, and among these we have commercial fishermen, recreational fishermen, who are split into two groups, and the aquaculture industries.

I have split recreational fishermen into two groups; first we have the true recreational fishermen, and second we have the part-time commercial fishermen who call themselves recreational fishermen. I think this distinction has to be made, particularly in light of statistical analyses.

In the user group of the environment we have commercial and private transportation users of the waterways, the commercial, private and governmental groups for dumping, dredging, sewage discharging, heating, cooling, neutralizing, and masking of various other duties and deeds, either illegally or legally; we have commercial, private and governmental development projects; we have recreational boating, such as sailing and cruising; and last we have management and political agencies who are also competitors for our natural resources.

Let us discuss these groups very briefly. In the group of commercial fishermen we have many types or subgroups: the finfishermen, such as the trap-netters, gill-netters, trawl-netters, purse seiners and long-liners; the shellfishermen, who are dredgers, tongers, and rakers, primarily after the scallops, oysters, clams or whatever is dormant on the bottom; and the fishermen who are potters, trawl-liners and draggers, after lobsters, crabs and shrimp.

Each type of commercial fishermen using each type of basic gear is a competitor against each other type; dredgers versus draggers versus long-liners, we have had wars over that; potters versus tongers versus seiners, again, disputes and fights, things that Christopher Weld (National Coalition for Marine Conservation) alluded to.

This morning in the Raleigh *News & Observer* there was an article about North Carolina and a point was made regarding the dwindling oyster harvest. Although the article mentioned that the shrimp catch climbs, it dealt basically

with the decline of the oyster harvest; it said, "Fishermen and state marine officials alike point to poor law enforcement, a lack of proper management, pollution of waters and modern residential and business development along the coastal shores as the reasons for the decline in oyster supplies." In one paragraph they covered what we are all here about.

But here is where the article gets down to the nitty-gritty of what I am pointing out: "They also blame an increase in clam production for reducing oyster-bed production; fishermen say clam digging disturbs the oyster beds, burying small oysters and killing them."

Each subgroup competes with each other for space, resource and environment, and we have to recognize that we are all users and we are all competitors against each other.

Now, about the true recreational fishermen, the commercial fishermen generally agree that these fishermen are more often allies than adversaries. They take what they need for food and catch fish for recreation, but do not wantonly waste the resources. They are gentlemen and sportsmen. They strive to protect and improve the environment; again, they are great allies. Unfortunately, in my opinion, they are in the minority of recreational fishermen.

The true recreational fishermen recognize that there are enough fish for everyone, usually want fair and equitable treatment by legislative bodies, generally do not want to outlaw commercial fishing and exert a good and just influence with legislative and regulatory bodies.

Now, the so-called recreational fishermen, who are really part-time commercial fishermen, are generally radicals who automatically want to outlaw all commercial fishing; that includes aquaculture and goldfish raising—you name it, they are against it. They will say it really hurts their market. Typically, they will spend hours memorizing all statistics relating to the value of recreational fishing to the gross national product, how many gallons of gasoline have been purchased—although they have backed off that because they do not want to tell everybody how much gasoline they are using—and how the state of Maine would shut down if they did not purchase its worms.

These fishermen can usually be found in one or more of the following "good deeds": fishing any crab or lobster pot they can find and then cutting the buoy so that the owner loses $10 a pot or whatever it cost him; spending hours finding and waiting for a beach seiner or a purse seiner or any other fisherman that they can find, so they can put their boats in the path of his fishing so that he is whipped. They are the marine police's greatest informants of any minor infraction that they can observe, and their last avocation is selling their catch of fish, usually below market value, while preaching to all about the evils of commercial fishing.

Most commercial fishermen have as much contempt, dislike and disregard for this type of recreational fishermen as I, and we as commercial

fishermen have respect and admiration for the true recreational fishermen. And again I say that true recreational fishermen are our allies.

Let us move on to aquaculture industries. Generally, those engaged in aquaculture are the quiet, unsung and practical competitors in our marine environment. They enhance, assist and nurture the marine environment to raise their own products. Instead of taking everything, they use their own investments of capital and time to assist in giving back.

Aquaculturalists compete for bottoms in such activities as clam and oyster raising, but in general they bend over backwards to be good citizens. They have by far the most to lose in any degradation of environment. I think that it should be stated that any of us who are in the aquaculture business are usually found to be leading the charge in trying to keep our waters clean, trying to keep the bottom free from as much dredging and siltation, and so on, as possible.

Let us move on to transportation users of the waterways. These groups tend to degrade the environment by tearing up fixed fishing gear, creating oil, chemical and other spills, and requiring vast dredging, dumping and filling projects. They lead a rather weak Corps of Engineers in the projects that are detrimental to the overall environment. I will explain that further in a minute.

Groups that require dumping and dredging and other types of discharges, namely toxic, for some reason or other seem always to place their spoil on top of the greatest nursery grounds. They always seem to want to do the digging in the middle of the areas that offer the best catches. I do not know why that is; they always say, "These are the best core sample areas," and so on.

We had a case recently in Virginia where, thanks to the Commissioner of Marine Resources and his commission, Newport News Shipbuilding & Drydock Company was blocked in its attempt to go in and for eighteen continuous months dredge spoil from the most prolific harvesting grounds for the winter crab dredge fishery in the state. Now, we did not mind them taking some spoil but we hated losing the grounds in our dredging season. Fortunately, the commission said, "Sorry, folks, you can work there in the six months of the summer because there is no potting going on in that area, but in the wintertime you are going to leave it alone."

This is a case where we really had no objection to the dredging in that area and the company needed the spoil, but the commission had the good sense to mediate between the two groups and satisfy both ends of the spectrum. I have to respect and admire the commission for doing this and reaching the conclusion that it did. I know there was a lot of political pressure at the time, but the commission had enough backbone to stand up to it and say, "This is the way it's going to be." We need more of this.

We had a case in Maryland in 1964 where the Corps of Engineers wanted to deepen and widen the C & D Canal. The C & D Canal transverses the area

between Delaware Bay and Chesapeake Bay in the northern portion of the Eastern Shore. However, the Corps of Engineers wanted to dump the spoil because they could not find suitable spoil-dumping areas on the Eastern Shore, even though quite a few had been offered. The Corps wanted to dump the spoil out in the middleground area north of Poole's Island, between Poole's Island and Spesussi Island, which happens to be the area where 85 percent of all the striped bass in Maryland are spawned. Now, 85 percent of all striped bass hatched on the East Coast are spawned in Maryland, and 85 percent of that, which I assume to be somewhere near 45 to 50 percent of the total East Coast population, is spawned right where the Corps wanted to dump this spoil.

Fortunately, the commercial-fishing interests and some of the recreational-fishing interests gathered enough political force and blocked them. We finally beat them before the Public Works Commission of the state, and the Colonel who was in charge of that district was asked why he picked that area. He said he did not have any place else to go. We said, "Well, aren't you concerned with the current and subsequent ecological problems?" He said, "I've already gotten my orders, six months from now I'm going to be in the Panama Canal Zone." That was his answer, and that is why I say "a very weak" Corps of Engineers; in many, many instances a lot of these decisions are made by people who do not care because six months from now they will be somewhere else, and they know it.

Sewage discharge is another good topic. Municipal sewage authorities generally have a license to steal. They can do most anything they want and when they get caught with their hands in the till they say, "Okay, juice up the chlorine, that will make everything all right." Well, the health department likes that and then it comes down to low plate counts. Of course, it is killing all the larvae in the water and a lot of swimming fish, but that is okay. And this is a real competitor; this is a competitor that is very formidable.

I live on the back river, and I have not kept track of how many times the back river has been closed since the first of May. I happen to have a fairly substantial investment on the back river in the oyster business, and I know that we did not harvest over 50 bushels of oysters although we probably should have harvested quite a few thousands of bushels this summer. Every time the counts in the river would drop down, we would have another rainstorm and Langley Air Force Base, the guardian of the public, would add another bypass, and away we would go again. Now there is a big dispute between Langley Air Force Base and Hampton Roads Sanitation District because Langley is tired of getting sued by us and they want to put in some pumps that are guaranteed to relieve their problem. But the problem is that those pumps will have so much pressure they will back up everything else in the Hampton Roads Sanitation District, so everybody else is going to have their problem.

Heating, cooling, thermal pollution, neutralizing and masking are competitors. Most of you involved in regulatory agencies and governmental work cannot afford to say some of the things that some of us who are not involved can say; the governor is not going to fire me. But many of us private citizens in private industry feel that there are too many cases where industries producing toxic chemicals are allowed to mask these by dumping into the rivers. We have seen a recent example in the Commonwealth, it is called kepone; bad subject. If the State Water Pollution Control Board had done its homework properly, kepone would have never existed. But the board did not do its homework properly and kepone did exist and does exist and is going to continue to exist for many, many decades. It is a shame, because one of the natural wonders of the world, the James River, has been affected. Water control boards generally are lax, frequently incompetent, and occasionally development-oriented; they are generally understaffed by good people and overstaffed by a group of other people, or all of the above.

I am very sympathetic to many people on water control boards; I am speaking of the employees of the boards themselves, because I see them working very diligently trying to do a job, to keep our environment at the present level and raise it, and every time they turn around somebody is smacking them in the face. It is a shame. These are our competitors.

Development projects usually require considerable dredging or filling; they divert natural flows of currents and nutrients; in many cases they cause large destruction of wetlands, and they generally are accompanied by substandard disposal plants and waste treatment plants.

Let us get to my last subject, management and political agencies as competitors. In many cases we have outmoded water and land-use ideologies; do some reassessment of your thinking.

We have very outmoded catch and gear regulations and laws, in some instances because of the lack of political backbone to make any changes. In too many instances regulatory and educational agencies have become grant factories, losing sight of their true mission in life; they are increasingly in search of the federal buck. Instead of using the time and the facilities that the taxpayers have already paid to create these institutions, they are constantly in search of grants, no matter of how far afield of what they normally do, so that they can grow further and fast. That is not what they are getting paid to do. I have had some very spirited discussions in the past with several people regarding this. Unfortunately, that is my opinion.

MANAGEMENT NEEDS AND INTERACTIONS FOR NON-MIGRATORY SPECIES FISHERIES

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Management of non-migratory species within the territorial sea has been vested in the states' legislatures and fishery agencies or smaller jurisdictional sub-units (counties, townships, towns, etc.) since the colonial era. Multi-state commissions have been established to coordinate and facilitate resource management on a coast-wide basis, river basin or shared jurisdictional boundary. Today's speakers have reviewed a number of these and recounted the successes and failures in several managerial endeavors. I am an optimist and believe management of the territorial seas fisheries is at a major crossroads. The deliberations at and following this conference will facilitate a unified positive approach to resource management.

My objectives are to suggest management strategies for non-migratory species within the territorial sea and to comment upon perpetuation of these fishery resources given the impact(s) of man's activities upon the resources and the environment. Much of the discussion will be redundant with that which follows for migratory species.

I shall not belabor the biological, physical and chemical attributes of the estuaries. Numerous scientific treatises and journal articles extoll the virtues and idiosyncracies of these water bodies. Suffice it to say, we have amassed a large body of literature on the subject and there are still many unresolved topics, particularly related to system function and forcing mechanisms.

Management of resources may theoretically be addressed from two perspectives: biocentrically, such as preservation of a stock or species from extinction, or anthropocentrically, for the direct benefit of man (as food or recreation). I shall address resource management from the latter view. This approach requires an appreciation and understanding of the system in which the target resource(s) resides and the interactions of that species with other species in the system; systems ecology and predator-prey interactions may combine to negate the presumed benefits of even the most elaborate regulatory schemes.

Controlled utilization of the non-migratory resources of the territorial sea requires the formulation and espousal of primary and/or secondary goals of management. Given a definition of goals, development of a management plan to fulfill these goals can proceed. The specific regulations promulgated by regulatory bodies must be couched in an understanding of the biology of

the various components in the fishery. If you review existing laws and regulations you will find that this has not always been the case.

Passage of the Fishery Conservation and Management Act (FCMA) of 1976 and the espousal of optimum yield (OY) in the management plans for fishery conservation zone (FCZ) fisheries suggest that policy and programs in the inshore fisheries should consider OY as the goal in management. The concept of OY is broad enough to include maximum sustainable yield (MSY), maximum economic benefits, and so forth, for specific fisheries as the conditions dictate in commercial or recreational fisheries.

Virtually all fishery management agencies and even multi-state compacts have an "apple pie and motherhood" statement in their charters. Their programs are to be established and maintained to *conserve* and *improve* or *foster* the resources under management for the benefit of the constituency, be they recreational or commercial users. The roles of the commission(s) and legislature(s) vary in their degree of authority within the management decision process, but by and large the state legislatures have been very guarded in the release of control to the management agency. To wit, changes in the management program often are mediated in the legislature after a considerable lapse of time, since these bodies are not in continuous session.

I herein presume that reasonable goals for a management program for non-migratory fisheries include: providing seafood from commercial activity; providing recreational activity; maintaining populations for sustained yield; and creating economic activity through direct employment and other business activity in seafood and recreational support business.

The popularity and relative immobility of non-migratory fishery resources bring the successes and failures of management to the view of the constituency and the fishery administrator more rapidly than is the case for migratory species in the territorial sea or continental shelf species. This "grassroots awareness" of the non-migratory resources has generated a greater political and regulatory responsiveness than for the migratory resources, much to the chagrin of the manager.

Constraints to the formulation of management strategies include: biology of the animals; water quality; hydrography and morphometry; economic, social and political customs and law; and multiple human uses of the water body and surrounding land. We have far greater direct control over the latter two constraints than over the biology of the animals, natural water quality or hydrography and morphometry.

Inshore waters, such as the Chesapeake Bay and its tributary rivers, support mixed fisheries. There is commercial and recreational harvest for almost all species, yet regulatory measures or even licenses for marine recreational fishermen do not exist in many states. Thus the data set for number of harvestors and catch from the resource is incomplete.

Most management programs have evolved toward management by restriction on the size and composition of the catch. This approach tends to promote inefficiency in harvest but does in many cases give maximum employment. The confounding maze of regulations applicable to a given coastal resource makes one question the wisdom of "management," and wonder if management of marine fishery resources is truly possible.

Very strict regulation of a fishery for non-migratory species in a confined area, i.e., a single river or a state, allows "best" use by the affected constituency; even if areas to the north and south have conflicting or diametrically opposed views on harvest of the resource. Contrast sustained annual yield with "pulse fishery." Which is harder on the resources, the local economy and the local fisherman? Biologically the impact is very similar; we rely upon the natural balance of population parameters to perpetuate the resource in an annual (or longer) cycle. Here, for nonmigratory stocks, the local management options are great in contrast to those for migratory species.

MANAGEMENT STRATEGIES

The ultimate purpose of resource management is to insure the attainment of maximum benefit from the resources either singularly or collectively. In contrast to inland fisheries, those of the marine realm have not been subjected to extensive manipulation through season, creel limits, augmentation (stocking) or habitat enhancement. Most biologists and managers would concur that the resources have survived *in spite* of the regulations rather than because of them. The extant regulations are usually aimed at fisherman control rather than concern for the biological health of the managed resource. Underlying this syndrome of "do something, even if it is wrong" or "if it is broken, fix it." is the concept of the marine resources as common-property resources. Thus the effort expended in the fisheries usually exceeds that amount which would be exerted were the resource privately held. This results in a trend toward overcapitalization and overharvest as individual fishermen seek to maintain an economic edge over their competitors.

Managers have at least four options (strategies) available to formulate coherent management plans. They are:

1. *Private resources.* This is an approach akin to land ownership and agricultural development.

2. *Totally public resources.* Allow the interaction of supply and demand to determine the maximal benefit derived from the managed resource.

3. *Public resources with allocation of fishing rights.* Limiting entry in the fishery or allocating quotas for specific harvesting sectors or areas.

4. *Public resources with augmentation.* Public harvest that is supplemented by stocking of young in public waters.

The body of laws and customs to date argues strongly against option one. Marine resources simply do not lend themselves to private ownership and individual exploitation. Option two has been, by and large, the approach taken for numerous resources within the territorial seas. Finfish and crustacean species in particular are well-suited to this approach. The problems and attempted solutions are documented profusely in the body of law and regulations extant today. The unlimited number of participants typically leads to a decreasing profit margin for the individual harvester. Thus the fishery expands until net profit approaches zero or operations become an exercise in deficit spending. Marine resources will seldom become extinct biologically but they may become so depleted that continued fishing is a waste of financial resources and labor. Option three has recently received considerable attention relative to FCMA. In the territorial sea, application of this option exists in the New England area with township or town-owned weirs leased for the harvest of anadromous fishes. Salmon fisheries of the West Coast also serve as a current example. This option is not consistent with the present legal base and will not likely be viable for management of non-migratory fishery resources in the territorial sea. Option four has been practiced most often in the shellfisheries of the territorial sea with oysters as the classic example. It also has potential for selected finfish stocks, though most of those for which it is proposed are migratory in nature (striped bass and Atlantic salmon).

SHELLFISH RESOURCES

Oysters

Production of oysters throughout the coastal states has declined since the late 1800s. As an example, Chesapeake Bay production has fallen from seven million bushels annually in the 1890s to about 500,000 bushels today. The history of the fishery may be classified into three phases: 1) From the 1890s to 1930, harvest dropped from seven million to three million bushels annually, with overfishing of the wild resource cited as the cause. 2) With some curbing of fishing activity, the period 1931-1959 evidenced an increase in production to about four million bushels annually. 3) The situation from 1960 to the present can only be classified as a catastrophic decline in production to under one million bushels annually (Figures 1 and 2).

Under the existing marketing, harvesting and habitat conditions, production is expected to remain at this low level. The decline on public bottoms in 1960 was a result of MSX. This pathogen killed the oysters in growing areas above 15 parts per thousand salinity. Compounding the situation, the death of mature oysters in the lower reaches of the James River decimated recruitment to the major seed-oyster areas. These upper James River seed

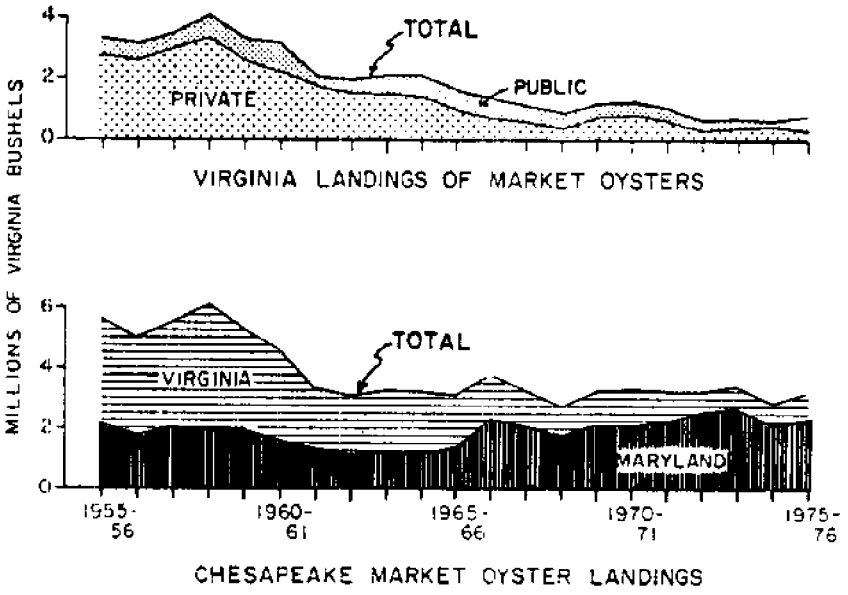

FIGURE 1. Landings of market oysters in Chesapeake Bay (from CRC 1977).

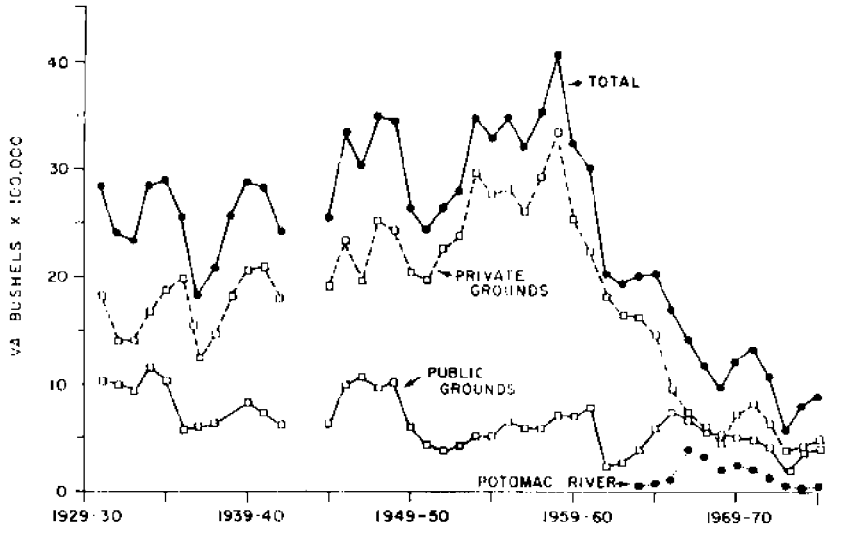

FIGURE 2. Virginia catch of market oysters 1930-1 through 1974-5 (from Haven, et al. 1978).

areas are the source of over 75 percent of the oyster seed planted on leased bottoms in Virginia. Thus in concert with increased larval mortality due to reduced water quality (chlorinated effluents, agricultural and industrial discharges or runoff), the successful setting rates for oyster spat have declined by about 90 percent (D. Haven, personal communication). Oyster growers soon decided not to plant the remaining seed stock in areas subject to MSX mortalities and concentrated their planting efforts in areas where MSX was not a problem. Other growers continued to utilize the MSX-infected areas for several years since there was little incentive to move: little increased market demand for oysters, relatively stable dockside prices for oysters and inflation. Oyster growers were caught in an economic squeeze and subsequently elected to stop planting as many oysters. A second oyster pathogen, *Dermocystidium*, has increased in the amount of area infected to the point that Maryland oyster beds are now severely impacted. Maryland oyster stocks have experienced similar declines in seed production. With these conditions, the future of the Cheapeake Bay oyster fishery and those of other producing states is not bright relative to natural reproduction, transplanting success and leasing programs.

The future of the oyster industry may be improved by implementing a coherent management program in several areas simultaneously.

1. *Streamlined legal and regulatory framework.* A review of the extant laws, regulations and customs must be undertaken with the purpose of adopting a minimal restraint in the fishery. This would eliminate inefficiency in harvesting (handtongs only, etc.) and create an incentive for the industry to apply higher technology in the harvesting of seed and market oysters. Interim precautions are necessary to avoid overharvesting, should aggressive implementation of technological innovation outstrip progress in repletion programs.

2. *Stock enhancement.* Techniques for production of oyster spat in hatcheries have been developed and implemented with some success in the United States (US). Much of the West Coast production is now dependent upon hatchery-produced spat. The declining successes in natural spatfall and increasingly restricted areas of disease-free seed-oyster harvesting argue strongly for the adoption of state-owned oyster hatcheries to supply the seed stock for public oyster rocks. Further, sales of seed to private leaseholders at cost of production should be permitted. Should economic factors provide incentive for expanded production, privately owned hatcheries may be a viable solution to larger growers' or industry cooperative's demand for seed.

3. *Seafood marketing and promotion.* Many segments of the seafood industry subscribe to the belief that supply of stock is a major limiting factor affecting their operations. However, low per capita consumption, sensitivity of product image to adverse publicity (i.e. pesticides, bacterial pathogen,

virus, heavy metals), short shelf life and fluctuating supply of raw product have interacted to inhibit aggressive promotion marketing practices so common in other food products. The industry must encourage the development of the resource to levels which afford a stable supply of raw product and develop secondary processing methodologies which are consistent with the seasonality and volume of raw resource. Volume sales and diversified marketing practices with internalized quality control must be developed if the industry is to free itself from the boom-and-bust cycle. Consumer confidence is a key element for an expanded and stabilized oyster industry.

4. *Natural recruitment.* The failure of spatfall since the 1960s has largely precipitated the present status of the oyster industry. Researchers have not yet pinpointed the cause(s) of the failure. The increased development of the coastal zone and adjacent waters for multiple uses (industry, seafood, housing) has resulted in qualitative and quantitative changes in estuarine water quality. A growing number of researchers feel the decline in production of spat and seed oysters may be attributable to the species composition of the phytoplankton in the estuary. If the required foods of young oysters are not available or qualitative changes in these foods have occurred, then present production levels may be "all we can expect" in the future. Research programs to define the nutritional requirements and factors controlling spat set and growth are needed. When limiting factors affecting recruitment are defined, management programs can be undertaken to optimize conditions for maximal production. Estuarine water quality is of paramount importance to continued oyster production.

Soft Clams

Soft clam production was formerly centered in the New England area, but with declining abundance in Maine the fishery has shifted southward. Today, Maryland is the leading producer. Overfishing has been a primary factor affecting the soft clam stocks available in the several states. Water quality, natural variation in environmental factors (flooding, temperature) and natural predation (blue crab, rays, etc.) are density-controlling factors of importance to the perpetuation of the fishery.

Fluctuations in abundance of soft clam due to catastrophic events can have long-term effects upon the fishery. The lasting effects are exemplified by the Maryland landings (Figure 3) before and after Tropical Storm Agnes in 1972.

Blue Mussels

The blue mussel offers a potential resource for expansion on the East Coast. Harvest is presently at a low level in the New England area (about one million pounds), with sales going into specialty markets. Low harvests of

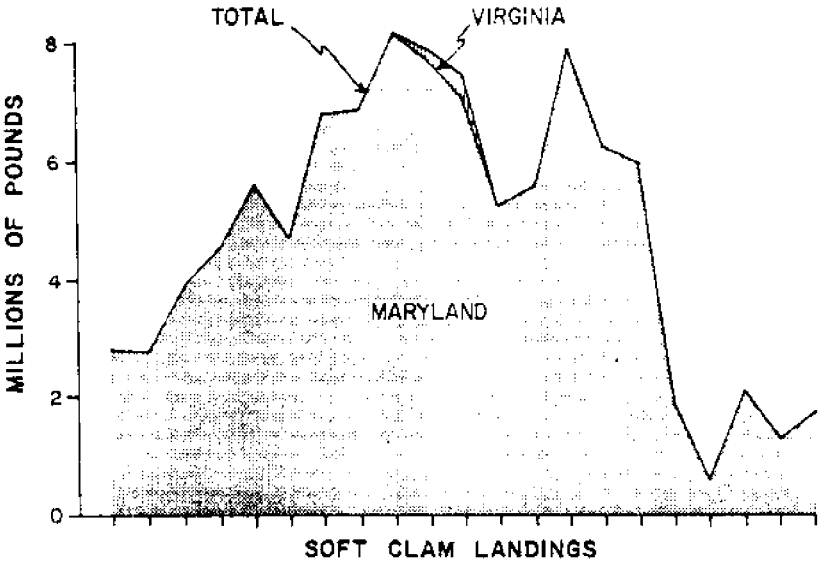

FIGURE 3. Soft clam landings from Chesapeake Bay (1956-1976) (from CRC 1977).

oysters and soft clams suggest that market substitution of blue mussel is a distinct possibility.

Key factors to expanded blue mussel production are its short life cycle, inability to tolerate warm temperatures and low salinities. Thus many estuarine areas where culture might be practiced will not support blue mussel populations on a year-round basis. Development of techniques for catching the young mussels from natural spawn and rearing them in rafts or trays offer exciting mariculture potential from New York northward.

CRUSTACEAN RESOURCES

Blue crabs are the primary non-migratory crustacean fisheries. The fishery landings are centered in the Chesapeake Bay with some increasing landings in the southern states. Complexity of life cycle, multiple larval stages, prolific spawning, and low price for product have been major factors suppressing interest in development of aquaculture for the blue crab. The species is primarily sought in the hard crab or recently molted stages. Populations of adult and juvenile crabs are relatively non-migratory between major water bodies such as Delaware Bay, Chesapeake Bay or Pamlico Sound. However, larval stages may be transported out of the spawning areas to nursery areas north or south, where they become mixed with locally spawned young crabs.

Blue crab stocks have historically undergone irregular fluctuations in abundance with causal factors yet to be identified. In Chesapeake Bay, commercial landings range from 45 million pounds (1955) to 97 million pounds (1966) without any demonstrable trends toward either a long-term increase or decrease in resource abundance. The species is short-lived and available to the commercial fishery from its maturational molt (soft crab) until death approximately one year later. Relatively little is known of the factors affecting year class success or effects of water quality on larvae or juveniles. There has been no demonstration of a parent-progeny relationship for blue crabs although there are widespread regulations concerning sponge crab protection, sanctuary areas and minimal sizes in commercial catch. Most regulations were enacted because of old beliefs which have not been borne out by recent field research.

The recreational catch of blue crabs (soft, peeler and hard) is no doubt substantial, but there are no reporting requirements. A statistical reporting program for identification of harvest by recreational crabbers should be instituted.

Future blue crab fisheries will be similar to those of the present. Substantial activity in catch reporting and forecasting of abundance from juvenile surveys will be essential management tools.

FINFISH RESOURCES

Finfish in the territorial sea have relatively few representatives which might be considered non-migratory. Economic importance of these species is much lower than the migratory territorial sea stocks and continental shelf species.

The reproductive strategy of non-migratory finfishes typically is one of high fecundity to compensate for the natural variations in environmental factors which cause egg or larval mortality. Hence the resources are quite variable in abundance from year to year. The long-term trend in most estuarine-dependent stocks has been downward with declining water quality, incidence of toxicants, and reduced nursery habitat being cited as contributing factors.

American eel and white perch are two primary species in the non-migratory category. Commercial demand for American eel has increased steadily over the last decade and no foreseeable cessation is projected. Yellow eels are harvested during the spring and fall for export to the orient, migrating silver eels are taken in the fall for export to Europe, and elvers (juveniles) are in high demand in springtime by Taiwan and Japan for culture. This high fishing pressure upon all life stages is viewed with some apprehension by biologists and managers.

Eel stocks in other parts of the world have drastically declined, thus making the US stocks increasingly valuable. Since eels require 10 or more years to reach maturity, the unrestricted harvest of elvers and yellow eels may adversely affect future US supplies. Population assessment and descriptive catch statistics for the eel fishery are virtually nonexistent today. I believe restriction of elver harvest and development of resource assessment data for the yellow eel are necessary to develop a management program for a continued eel fishery.

White perch comprise a large proportion of the estuarine finfish biomass, yet commercial and recreational harvests are believed to be relatively light. This fish is long-lived and slow-growing, therefore, the likelihood of major increases in future catch is low.

Fisheries for non-migratory finfish are diffuse and involve both recreational and commercial harvest. The large number of participants, extant gear restrictions, and growing recreational fishery pressure in the bays and rivers lead me to presume that conflicts between users will increase with time, with intensity being dictated by both overall stock availability (non-migratory species) and abundance of the migratory species in the same or nearby fishing areas. Successful management will require accurate catch statistics for all harvesters and resource-assessment programs which are predictive.

Enhancement of non-migratory finfish populations by stocking existing species in the estuary is unlikely. However, introduction of artifically produced hybrids may have potential application. Hybrids might include progeny from striped bass, white perch or white bass crosses produced in hatcheries. Precedence exists in the established inland populations in reservoirs. This approach might stimulate new recreational and commercial fishing if hybrids can be produced which are non-migratory, fast-growing, and sterile and that offer the manager a substitution resource for selected intensively fished areas or periods of low natural population abundance.

CONCLUSIONS

- User access to the resources and extraction from the resources are controllable, but abundance of the non-migratory resources is generally beyond the direct control of man. Shellfish abundance is an exception and can be controlled by man using existing technology.
- Environmental interactions in the form of catastrophic events (i.e., floods, droughts, high or low temperatures) are uncontrolled acts of God which may limit the effectiveness of a management program based upon natural reproduction of the resources.

- Statistical data on harvest by all user groups needs to be obtained for all fisheries. Undefined harvest by one segment might represent the critical fraction for assessment of the success or failure of a management program. Catch data are essential if the benefits (+ or -) of regulatory actions are to be inputs in the management decision process.
- A commercial fishery will tend to stabilize at a level of harvest where value of the catch is proportional to the costs of catching it. Yet with most non-migratory stocks both recreational and commercial interests are harvesters. To date, we have not identified nor quantified the factors which determine recreational demand. The recreational fishery component is expected to continue to increase in importance. It must be included in resource allocation decisions.
- Estuarine resources are dependent upon suitable habitat, food and water quality for survival. Long-term resource management success will be governed by our ability to maintain and improve habitat quality for the desired resources.

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DISCUSSION

QUESTION: You stated that in South Carolina there are approximately 3,000 gill nets and that they are, to your knowledge, recreational. How do you define the recreational fisherman?

JOSEPH: Since this is a licensed fishery we were able to survey it, we think, with some adequacy. I think a strict definition centers on whether one sells the fish; if so, he ceases to be recreational. Recreational fishermen are fishing almost entirely to stock their freezers or to give fish away to their friends; these fish do not enter normal commercial channels. Now, we could talk all day about the definitions of commercial and recreational fishermen, obv ously, but of the fish caught by recreational fishermen, I would say a very small percentage are sold in any form and almost none of them through traditional commercial channels.

QUESTION: I have a couple of questions I would like to pose for anybody who thinks he may have an answer. First, I recognize that as far as linkages are concerned we could relax regulations and greatly increase the

efficiency of the harvest, but then when that is done where would you find, in Maryland for instance, about 10,000 jobs that would put the workmen back to work? Or would you just put them on the welfare rolls? Second, what about the efficiency of the animals who reproduce themselves? Nobody is considering this point. Do we increase our harvesting capability well beyond their capability to reproduce? I do not really expect the answers but I would just like to remind you that we are here dealing with a public resource and we had better keep in mind that increasing the efficiency of the harvest does not always equate the greatest overall good.

HARRISON: I would like to respond to that. In answer to the first question, I do not know that it is the state's position or the management agency's position to worry about what is going to happen to 10,000 jobs, because history has kind of proven that, on the water particularly, it takes care of itself. I think that in too many instances we are using archaic methods, that there are better methods to use, and that there are methods that we can use to attract young people to our industry. But you seem to have answered your own question with the change in regulations three or four years ago when you allowed push boats for the sailboat fishing. Because there was a problem, it became politically expedient to allow push boat dredging; hence, we had an increase in production, we had an increase in employment, and boats that were no longer being built suddenly were being rebuilt from the keel up. A dredge boat that could have been bought before then for $500 suddenly became a very valuable $25,000 vessel. These are the things that I think the economics of the system will take care of and that should not be regulated. We have, as an example, in the soft-clam industry many, many people who feel that we can sustain more than a 15-bushel limit, but that is the limit and that is what is being adhered to. Naturally there are a number of catchers who are catching two limits a day. The point is that the clams could probably sustain it but, for economic reasons, the 15-bushel limit is left on.

I personally am a great believer in leaving economics to the marketplace. I would rather catch 50 bushels a day, and give the housewife and the consumer a better value, than inflate the prices to both.

JOSEPH: I would like to make one comment on this question of increase in efficiency; it is something we deal with to a considerable extent in many of our discussions at the regional fishery management council (RFMC) level. I do not think that very many of us have much of a problem in wanting to increase efficiency. I think where we sometimes run into a problem is in trying to increase efficiency for harvest of a very limited resource. As soon as you do this, in many fisheries, you run immediately into an overharvest situation which provides then another set of regulations to prevent the newly efficient gear from overharvesting. We still have a lot of fishery

resources that are extremely limited and one change in efficiency simply leads to another round of regulations, in many cases. I think many of us have not found a way out of that dilemma, short of some sort of entry system.

QUESTION: To what scientific information do you refer that shows that in the Chesapeake Bay the harvesting of menhaden reduces the abundance of striped bass? Are you aware that 12 percent of the harvest in Chesapeake Bay is anchovies? Can you tell the difference between a small anchovy, a small menhaden and the stump of a striped bass?

HARRISON: I think you misquoted me; what I said was that there were scientific papers to the contrary, that in fact menhaden harvesting was yet to be proved to diminish the stock of striped bass and bluefish available to the recreational fishery. I purposely withheld comment on the quality of those papers. Between a young anchovy and a young menhaden, I am not sure I can tell the difference. Between a young swordfish and a young menhaden, it depends how young you are talking about.

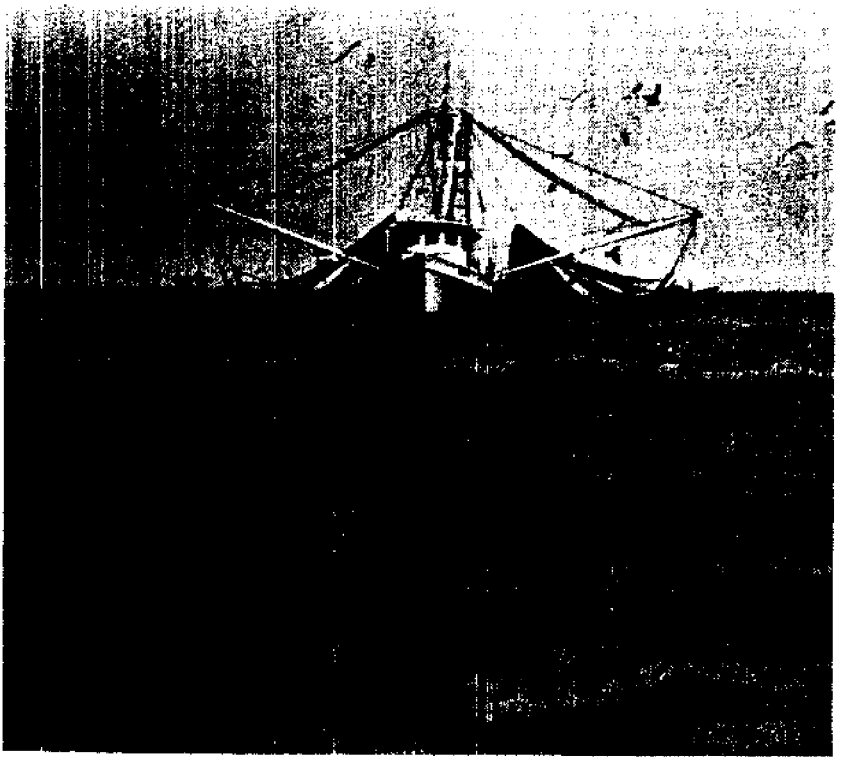
QUESTION: You seemed to indicate in the former problem in the Delaware Canal that there was very little control that the public had over that permit; I thought today that we had gotten over that hurdle and that a group that has a valid interest in the way a permit application is handled has a lot of input. Are you saying in the last five years we have given up what we had?

HARRISON: In my opinion, I am not really sure we have gained very much; I attended a meeting last Tuesday with the Virginia Marine Resources Commission and quite to the surprise of the commissioner and all of his associates, a gentleman walked in from the Virginia Ports Authority and announced that the Virginia Ports Authortiy--and this has to be in league with the Corps of Engineers—was going to request a very large tract of land on Hampton Bar. This is quite a large and prolific clam-producing area, as well as a potential oyster-raising area (it had been and unfortunately was decimated by MSX), but they are going to request it as a new fill site for creating an island. This caught everybody by surprise.

I am not really sure that we have made a whole lot of progress. The progress that has been made has been greatly appreciated, but still we are back in the situation where most of us, the sport fisherman, the commercial fisherman, are business people; we do not have time to constantly and consistently go to every hearing and every meeting there is. We have a situation in Hampton Roads concerning an oil refinery. If it had not been for a bunch of great ladies we would have never been able to fight this thing nearly as hard as we have. It looks like we might lose, but we hurt them financially because we delayed them for seven years.

Panel Presentation: Migratory Species

Session Chairman: John P. Harville



INTRODUCTION TO MIGRATORY SPECIES PANEL

John P. Harville
Executive Director
Pacific Marine Fisheries Commission

This panel is going to consider migratory fish species other than the anadromous species, which enter fresh water for spawning purposes. It may be worthwhile to comment about this. Actually, National Standard 3 of the Fishery Conservation and Management Act (FCMA) of 1976, which states that fisheries must be managed as a unit throughout their range, was not conceived solely to deal with migratory species; the standard requires that to the extent practicable a species or group of related species will be managed as a unit throughout its range. Therefore, wherever the range of such a species extends through several different jurisdictions, those jurisdictions will develop coordinated and coherent plans and programs for management of the shared resources. However, that standard concerns population ranges, the continuity of genetic materials and therefore of population dynamics. The extent of that range may be in part the result of active migration, as in striped bass and salmon, but it also may be a product of passive dispersal of eggs or larvae or adults by water mass movements, as for many shellfish, anchovies, sardines and many other pelagic groups.

The key element is a range of continuity of the population, and, therefore, the vulnerability of that population as a whole, the pressures placed upon it at any point along the range.

I think that we have had a lot of confusion erected by assuming that this principle applied to migratory patterns, when in reality it applies to the range of the species. For example, our Pacific states of Oregon and California have to work together toward the conservation and wise management of shrimp beds that lie off their common boundary, because an improvident harvest in one area could destroy the fishery for both states. It makes no difference at all whether the obvious continuity in the population concentrated over the green mud that lies offshore is a product of active migration or a product of passive dispersal of the eggs. We really do not know and it really does not matter.

Similarly, all of the Pacific states support parallel regulations for conservation and harvest of Dungeness crab. They have pot designs and size limits that are designed to harvest only the mature males and leave in the sea the females and the immatures. Again, we do not know and it does not matter whether that continuity up and down the coast is a product of migration or, as we think, the more passive dispersal of the materials.

It is true that we are interested in the migration patterns, but for other reasons. Migratory patterns do accelerate the pace and frequency of species disperal and they also produce special problems in fisherman management, due to the aggregation of individuals and therefore their predictable availability of harvest.

Again, let me give some examples from my own experience. Every spring hundreds of our Pacific coast salmon trawlers begin to hone the hooks on their tuna jigs and to monitor the radios to find out if the albacore schools have begun to arrive off Southern California. The minute the word is good, they stow their salmon rigs and race offshore and follow those fish up the coast and harvest them, sometimes going all the way into British Colombia.

Elsewhere around the world, fishing people have learned to predict these periodic arrivals, as, for example, in the Philippines. I have observed places in the upriver areas where the river is literally clogged with very intricately woven weirs and seines and baskets with which the people harvest larval shrimp and fish and transform them, by fermentation and salt, into an odoriferous purple paste called "bygune." You can smell a bygune village downwind for five miles. This harvesting is a serious problem, not because of the dispersal as much as the migratory pattern.

In another instance, along the ocean shores of the Philippines you will find, in a certain time of the year, fishermen with little nets and weirs picking up the larvae of bongos, the milk fish, which is the most valuable fish in the Philippines. The fishermen do not know where the fish spawn, but they know the fish arrive on shore at a certain time and they then transfer the fish to ponds. In about six months the fish are marketable size and are by far the most valuable and highly sought fishery product in the area.

Let us turn then to the papers of our experienced fishery managers for their views on special management concerns as they relate to migratory species or others; as we found earlier, sometimes these patterns or these limits are not all that realistic. At the same time, let us keep in mind the fact that we need cooperative management for a given fishery as a unit throughout its range, for reasons of genetic and population continuity, which may or may not be the result of active migration.

MIGRATORY SPECIES

Spencer Apollonio
Commissioner, Maine Department of Marine Resources

Discussion of interstate fishery management involves some attention to the nature of the various resources, the problems requiring the need for management, the existing management authority—or lack of it—available to the coastal states, the actual management activities that have been undertaken, and finally, the considerable activity that is currently underway, almost exclusively in the planning stages, as a result of the state-federal programs and by the various regional fishery management councils (RFMCs).

A significant natural factor affecting the kind and extent of interstate management should be kept in mind; it is the very different character of the continental shelf off the coastal states on the three coasts. The migratory fish patterns on each of the three coasts are also significantly different. These two large characteristics significantly affect the management arrangements and the perceptions of the need for management. The East Coast has the combination of shelf and migration patterns of fish that most appropriately leads to interstate management. Perhaps most of the active interest is on the East Coast. A number of Atlantic coast states have statutory authority for interstate management agreements. And the Atlantic States Marine Fisheries Commission has adopted Amendment One, which provides that the Commission may act as the regulatory agency for interstate management. It should be noted that not all Atlantic coast states have adopted Amendment One.

On the West Coast the continental shelf is practically nonexistent. Most migratory species are essentially high-seas species that occur only incidentally in the territorial seas. The Pacific Marine Fisheries Commission has nothing in its charter comparable to Amendment One. Those migratory species that do interest the three Pacific states do not, as a rule, find their way into the territorial sea and thus are not subject to the effective management authority of any single state.

The Gulf States Marine Fisheries Commission Charter contains authority comparable to Amendment One of the Atlantic States Compact, but it has not been implemented. In addition, two Gulf states, Mississippi and Louisiana, have statutory authority for interstate management agreements, but these provisions have not been implemented.

Such interstate management action is now being addressed by the shrimp, menhaden and coastal migratory pelagic fish plans that are now in preparation by the Gulf Fishery Management Council.

On the three coasts, the state-federal program currently is supporting nine programs that fit the category we are discussing. All of these are also

subject to possible management implementation by the RFMCs, except striped bass and menhaden on the East coast. None of the RFMCs have apparently expressed intent to develop management plans for those two species, probably because they are so clearly and closely confined in their exploitable phases to the territorial waters over which the RFMCs have no authority.

Only in Northern New England is there a clearly defined interstate management agreement over a species—Northern shrimp—migrating through the territorial seas and into the fishery conservation zone (FCZ). This program began when Massachusetts, New Hampshire and Maine agreed to establish a mesh regulation, a closed season, and landings quotas under the Atlantic State Marine Fisheries Commission's Amendment One, the first actual use of such compact authority on either the Atlantic or Gulf coasts. The Northern shrimp management program is supported, through the state-federal program, by annual surveys of shrimp abundance—presently lamentably low, for reasons which are not clear and subject to continuing debate-by sampling of commercial landings, and by annual interstate commission review of the recommendations of a scientific advisory committee. The agreement includes periodic cooperative enforcement activity at sea, primarily, by the enforcement officers of the three states, and the court has handed out convictions on uncontested violations of the mesh regulations. Nevertheless, there is disagreement on the legality of the authority and process by which the three states adopted their comparable regulations under Amendment One.

At the present time, incidentally, the Atlantic States Marine Fisheries Commission is debating possible new legislation, at either the state or federal level, for interstate territorial-seas management authority. An apparent objection to such state legislation is the uncertainty surrounding the legality and process of the Northern shrimp agreement. Such uncertainties, however, must be resolved, even if the legislation is proposed at the federal level; unless, of course, state authority is to be completely overturned or ignored—an unlikely possibility.

The legal and procedural uncertainties attendant upon implementation of Amendment One led to a review by the Law School of the University of South Carolina under a Sea Grant study. The study concluded there were serious difficulties with the implementation procedures of the three states—a conclusion based upon premises which have been informally contested by the Maine Attorney General's office. We are thus left with a considerable cloud over the legality of the only clear example of formal interstate management of migratory fish. The management agreement persists, nevertheless, and is generally observed, because it is clearly needed and is supported in principle by a clear majority of the industry. The agreement serves both conservation and economic objectives, the significant goal being to insure the harvesting of a high-quality product which has legitimate conservation benefits.

There is some discussion that the New England Fishery Management Council should assume responsibility for Northern shrimp management. This is not a useful suggestion because the council cannot hope to improve on the relative simplicity of the Atlantic States Marine Fisheries Commission regulatory process, and it could not implement more meaningful management regulations. The clear lesson here is that the states would be well advised to use the interstate commission regulatory authority whenever possible, and avoid the excessively complicated and unnecessarily tedious federal regulatory procedures of the Fishery Conservation and Management Act of 1976 (FCMA).

It is useful to review the present interest and activity in interstate management of striped bass on the Atlantic coast. The principal production area is Chesapeake Bay, and from 1958 through 1970 the population produced a number of strong and dominant year classes which resulted in remarkable annual commercial landings, culminating in 16 million pounds in 1973. No dominant year class has been apparent since 1970, but neither has the annual year-class strength been particularly poor compared to the long-term average. There is, nevertheless, concern for an apparent depletion of the resource even though the standard of comparison may be unrealistically high because of the exceptionally strong year classes in the 1960s. However that may be, since late 1977 a state-federal program has considered the issue involving all states from Maine through North Carolina. Interim regulations have been proposed designed 1) to extend strong year classes over a longer period of time and to produce a wider diversity of year classes within the population, and 2) to provide a proportionately larger share of the production to the producing states.

Prior to this cooperative effort, there had been no serious attempt at interstate management, and the numerous laws and regulations on striper fishing from Maine to North Carolina do not reflect any consistent view of regional management needs. The proposed interim regulations are apparently a majority agreement now of the participating states and advisors, but there is conspicuously lacking at this time a clear view of how the regulations will be implemented across 11 states.

The West Coast is conspicuously lacking in formal interstate management agreements or in statutory management authority. In fact, it has no commercial fishery that is carried out exclusively in the territorial seas of any of the three Pacific states. All fisheries occur to at least a significant degree in the FCZ and therefore formal agreements for management plans are now being addressed through the Pacific Fishery Management Council.

The lack of formal authority or agreements among the three coastal Pacific states previously did not prevent effective management measures to solve common problems. There apparently has been a long history of the

three states informally working well together for consistent management practices. The lack of clear statutory authority on the Pacific coast has, unlike some instances on the Atlantic coast, been interpreted to mean that there is nothing to prevent such agreements. And the apparent success of such informal understandings lead the states to conclude that there is no need for formal authority within the Pacific Marine Fishery Commission, and, therefore, why bother? An example of such happy resolution of common interstate problems is pandalid shrimp, the grounds of which lie astride the boundaries of the states. Compatible closed seasons and acceptable quotas for shrimp have been in effect for over ten years, enacted by each of the states independently but as a result of a mutual understanding and agreement of the problem. It appears also, incidentally, that the three states will respond by individual regulation to recommendations of the RFMC as they have in the past to mutual recognition of common problems.

In the Southeastern Atlantic states only North Carolina has adopted Amendment One of the Atlantic States Marine Fisheries Commission. There do not appear to be any interstate management agreements among those states. There are agreements on the sharing of common resources in areas that form boundaries between the states.

The characteristic movements of fish in the Southeast Atlantic have not encouraged effective interstate agreements. Shrimp have been viewed as very much a matter for local management, but generally there has been little need for shrimp-management activities. Those migratory fish, king and Spanish mackerel, snappers and groupers, that are abundant in Florida's territorial waters are, as a rule, well offshore, beyond the territorial waters, as they move northward off Georgia and South Carolina. Effective management therefore was beyond the control of the states. But the South Atlantic Fishery Management Council is now developing plans for these species moving along the coast and away from the territorial waters into the FCZ.

Spotted seatrouts and red drum are non-migratory in Florida, but migratory in the northern part of their range. There is considerable regulatory activity for these species in the Gulf, as discussed earlier by Dr. Joseph (Director, South Carolina Department of Wildlife and Marine Resources), and increasing concern in the South Atlantic area, largely as a result of increasingly heavy effort in the southern part of their range. These species are apparently largely confined to territorial waters and therefore not under council jurisdiction. Neither are they subject to state-federal attention. In the absence of these states adopting Amendment One and lack of statutory authority for interstate agreements, progress on effectivement management is problematic. Management of menhaden, harvested largely in the FCZ in the Gulf, is under consideration by the state-federal program. The status of management prior to the initiation of that review in the last year or so can

be summarized conveniently by quoting from the Technical Report prepared in 1977 for the state-federal program by the Gulf Coast Research Laboratory, "The Menhaden Fishery of the Gulf of Mexico: A Regional Management Plan."

> *The menhaden fishery is one of the United States' oldest and most valuable fisheries and is the largest in volume of landings. Menhaden landings were first recorded in the Gulf of Mexico in 1880, when less than 1,000 pounds were landed in West Florida. With considerable annual fluctuations, landings increased to the 1971 record of 1.6 billion pounds (728,868 metric tons). This amounted to 74.4% of the U.S. menhaden landings and over 32% of the total U.S. commercial harvest of fishery resources. Landings at Gulf of Mexico ports have exceeded 1 billion pounds each year since 1971.*
>
> *Throughout this long history, regulation of the fishery has largely consisted of local restrictions imposed by state governments or local political entities. In most cases these regulations were established in response to political pressure resulting from long-standing institutional conflicts. Since drastic declines in Atlantic menhaden resources occurred in the 1960s there has been increasing concern about the well-being of Gulf of Mexico menhaden resources.*

The report comments further on menhaden management, as quoted:

> *Present System. Menhaden management at the present time is left mainly in the hands of the industry which harvests the resource on an economic basis. The states exercise few management controls other than setting of seasons and defining sanctuary areas in response to pressures generated by long-standing institutional conflicts. This system has worked quite well in the past but concern for this valuable fishery resource has increased since the decline in Atlantic menhaden stocks and as the estimated maximum sustainable yield for Gulf menhaden, based on current technology, is presently being harvested.*
>
> *The present system is not flexible enough to readily incorporate biological and other pertinent data into management procedures which suffer from political pressures generated by the public's adverse reactions to certain menhaden harvesting techniques. A continuing problem of management has been to counteract the largely unwarranted reactions of the public.*

Since the preparation of that report, the states have agreed to uniform closing dates for the fishery, and the Gulf Fishery Management Council has assumed responsibility for further menhaden management.

The report contains a useful review of the advantages and disadvantages of offering options for interstate management of the menhaden fishery, as quoted:

> *A. The basic structure is the Gulf State-Federal Fishery Management Board (GS-FFMB) which will set policy for regional management actions. The Management Board will establish appropriate procedures and policies to take necessary actions to design, implement and evaluate all regional management activities.*
>
> *The advantages of this option are that all members of the Board have knowledge of and an interest in fishery management problems and the state administrators regularly advise their state decision makers on fishery management problems as well as make recommendations to their legislators. Also they are members of the Gulf States Marine Fisheries Commission and, therefore, can coordinate the activities of the Board and Gulf States Marine Fisheries Commission. Inclusion of the National Marine Fisheries Service Regional Director as a member provides representation of Federal interests.*
>
> *There are two disadvantages of this option. The first is that the member state administrators can commit their respective state agencies to a course of action only with the approval of their management body and through legislative or guvernatorial action. Secondly, this or any formalized regional management scheme would require legislative approval to enter into reciprocal management programs in most cases.*
>
> *B. Continue to manage the Gulf Menhaden fishery in the same manner as currently exists (no action).*
>
> *1. Advantageous current management practices include:*
>
> *a. Voluntary restrictions of effort self-imposed by the existing industry which, despite numerous changes, has remained relatively stable over a long period.*
>
> *b. Concurrent open seasons set by Alabama, Missippi and Louisiana at the request of industry.*
>
> *c. Production from the resources is at or near the best available maximum sustainable yield estimates.*

d. The cost of management under the present system is relatively low for a fishery of such great importance.

2. Disadvantages of the current system include, but are not necessarily limited to:

a. Management responsibility has not been delegated to a regional agency that can provide for implementation of the proposed new system.

b. The best current estimates of maximum sustainable yield are not satisfactory and additional funding under a regional management system is essential for the achievement of significant improvement.

c. Economic, environmental and social factors are not always considered in management under the present system nor is any apparent means for either acquiring the necessary data or including such data in management considerations under the present system.

d. State regulations have closed areas to menhaden fishing without due consideration of biological, ecological and economic information that is already available.

C. Manage the fishery by the Gulf Regional Fishery Management Council.

1. Advantages

a. The Council has funding to recommend management of fisheries beyond territorial waters.

b. The Secretary of Commerce may accept, implement and enforce regulations recommended by the Council.

c. Most of the menhaden population spends the winter spawning season offshore.

2. Disadvantages

a. About 90 percent of the menhaden harvest is taken in territorial waters where states have jurisdiction.

b. The menhaden industry prefers that management under the new system remain with the states.

c. Menhaden production depends on maintenance of estuarine nursery areas located in territorial waters as well as successful spawning in offshore waters.

D. Manage the Gulf Menhaden fishery by some regional body yet to be created. Since two regional management bodies are already established the task force found no advantages in the creation of a new management body.

E. Manage the Gulf Menhaden fishery by some combination or variation of the other options. No satisfactory

combination or variation of existing management bodies found any support in the task force.

Shrimp management in the Gulf also is described in the Technical Report Series of the Gulf Coast Research Laboratory:

Shrimp fishery data have been collected along the Gulf of Mexico in one form or another since about 1880. The systems in the various states have been based on available biological knowledge tempered by sociological inputs. Managers have been pressured by conflicting interests in various segments of the harvesting sector particularly since the inception of the offshore fishery. Inadequate catch and effort statistics, fluctuating markets, gaps in life history data and well meaning but often disabling legislation have further handicapped the managers.

Despite these handicaps, the resource remains healthy as evidenced by a general upward trend in reported landings and continued existence of a large recreational fishery in which the landings are largely unreported.

The fishery has generally been economically sound; however, large increases in fuel costs, construction costs, inflation in general and a dropping catch per unit effort (CPUE) have begun to erode the economic base of the fishery. Overcapitalization and a return to the domestic fishery by vessels from foreign waters for various reasons were not matched by as correspondingly large an increase in shrimp prices until mid-1975.

The general objectives of the present state management systems have been to protect the resource and maximize catch among the various user groups. Regulation of the size of harvestable shrimp has increased the economic return but has also led to needless wastage due to the discarding of undersized shrimp. Currently most States regulate the harvestable size by opening and closing of seasons; however, enforcement of regulations has always been a problem.

The fishery has principally been managed within the several Gulf States with little communication between the States until the inception of the Gulf States Marine Fisheries Commission (GSMFC) in 1949. Since that time the GSMFC has been able to resolve some differences between the various States, recognizing that the resource itself is not

cognizant of State boundaries. The GSMFC has no regulatory power and reluctance by State legislatures to yield authority within their State boundaries has hampered implementation of a regional approach to management of the shrimp resource.

Finally the South Atlantic and Gulf Management Councils have jointly prepared a management plan for coastal migratory pelagic species (three species of mackerel, tunny cobia, dolphin and bluefish), the primary objective of which is to prevent gear and user-group conflicts, to provide for a total allowable catch for king mackerel, and to provide for a data-reporting system.

By way of a very brief summary of interstate migratory fish management, one might state that the need has been recognized for years as testified to by statutory authority of a number of states and in two interstate commissions, but that in a formal way little has been done. In spite of very considerable planning activity in recent years, the means of implementation of management plans for migratory fish at the state or interstate compact level remain unclear.

THE EFFECT OF COMPETITION AMONG USER GROUPS ON THE ESTABLISHMENT OF OPTIMAL FISHERY MANAGEMENT

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INTRODUCTION

With the advent of a better data base on some species and as mandated by the Fishery Conservation and Management Act (FCMA) of 1976, fishery administrators and managers as well as the area councils are faced with the proposition of developing fish management plans based on the best scientific information available. Such plans should be objective and directed at providing the best return from an available species. This statement, simplistic on its face, poses many difficult questions, particularly when dealing with valuable commercial species. What is the best return? To whom should it apply? Is it maximum economic gain and should it be aimed at the best profit margin, or should it be directed at satisfying the highest demand for fishing? What about total pounds and maximal food production? Finally, are we to direct maximal production and benefits primarily toward the national welfare or to a specific region, state, or even to a special segment of the industry?

The FCMA indicates the answers to these many questions can be had in something called "optimum yield" (OY), but an adequate definition of the term and a procedure for developing such plans are not easily arrived at. It is not intended to debate the OY question here, but rather to look at specific types of problems that will be faced by the planner or administrator in developing an ideal or objective management plan even when an adequate data base is available. It will be evident that competing user groups, with historical patterns of fishing and politically established regulations, have developed such a level of inertia and local power base that establishing a scientifically designed management program might become near impossible. This should be more obvious if we consider that, in part, the idea of OY requires that we address the sociopolitical, and socioeconomic aspects of management procedures.

While this discussion could generally address several species and areas, it is felt that an examination of specific problems associated with an ideal Gulf shrimp plan and the improbability of having it accepted by the industry should serve as a type case. This is especially true because a 20-year data base on shrimp allows for a high level of predictability of annual crops and provides, for the first time, most of the information needed to develop an objective and scientifically designed fishery plan.

EVOLUTION OF THE GULF SHRIMP FISHERY

The Gulf shrimp fishery as a commercial venture began in the latter part of the 19th century in Louisiana. The vast shallow and protected nursery area along the Louisiana coast was the principal location where seining could be carried out effectively; this was the most effective means of taking shrimp before the introduction of the otter trawl in 1917. A lack of refrigeration and the distance between the fishing area and urban center precluded the development of a large-scale raw shrimp market. This resulted in the development of the first cannery at Grand Terre Island in 1867 and evolved into a Louisiana fishery predominantly made up of large numbers of small inshore boats and a cannery-orientated industry. From the late 1800s to 1940s, nearly 90 percent of the Gulf shrimp production occurred in Louisiana. Production increased over the years and peaked in Louisiana in the early 1940s (Fig. 1) at over 100 million pounds, heads-on. Since then the Louisiana production has oscillated around 75 million pounds annually. The catch is predominantly from nearshore and inshore areas and is made up of smaller size shrimp.

In the late 1940s and early 1950s, significant supplies of large brown shrimp *(Penaeus aztecus)* were discovered in offshore waters of Louisiana and Texas. This lead to the development of the larger vessel offshore fleets,

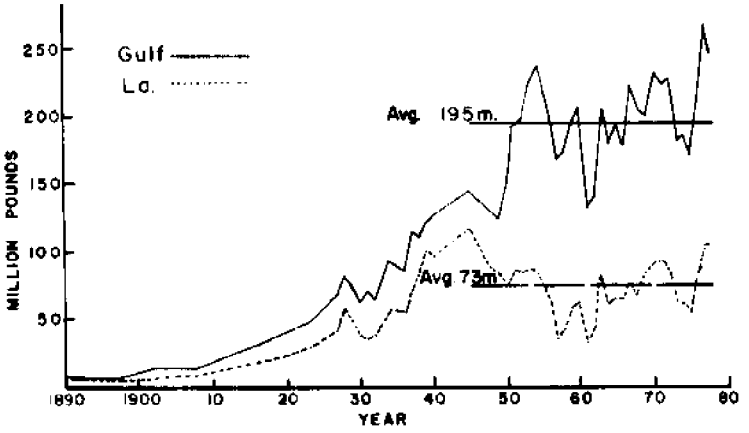

FIGURE 1. Total shrimp landings, heads-on weight, Louisiana and Gulf of Mexico, 1890-1979.

principally domiciled in Texas and Louisiana, but with significant numbers of vessels in Alabama and Mississippi (Table 1). Total Gulf production immediately increased to over 200 million pounds heads-on wieght by the early 1950s, and has cycled around the 195 million level for the past 32 years (Fig. 1). The evolution of the shrimp fishery has developed highly varied and distinct patterns of interests and needs throughout the industry and has resulted in politically developed laws and regulations that tend to reflect the interest and power of certain segments of the industry and the particular desires of each state's constituents. Scientific data and population dynamics information, unavailable before the 1960s and 1970s, have been only partially utilized in the establishment of the more recent laws and regulations.

STATE REGULATIONS

Shrimp management and regulatory procedure in the four Northern Gulf states are highly varied and polarized. They reflect the needs and desires of the local industry and this difference is best represented by comparing Texas and Louisiana (Table 2).

Several facts are evident from Table 2. Louisiana and Texas land about the same weight of shrimp, but there are distinct differences in the average size of the shrimp taken and value of the catch. Texas' regulations are aimed at large shrimp, of greater value, caught by a limited number of large offshore boats. Louisiana caters to a large number of small boats, fishing in inshore or nearshore waters, that take smaller shrimp of lesser value. Aside from the differences in economic value, some of the advantages and disadvantages of the two systems are:

Table 1. A comparison of numbers of boats fishing shrimp reported by National Marine Fisheries Service and states.

	Louisiana		Texas		Florida		Alabama		Mississippi	
Type of License	State Data	NMFS Data	State Data	NMFS Data	State Data	NMFS Data	State Data	NMFS Data	State Data	NMFS Data
Vessel over 5 net tons	1799	1600	1568	1904				148	1626	541[4]
Boat under 5 net tons	12080	3500	2129	600	23000[1]	6000	2299[2]			
Shrimp Trawls	9101	--	10000	--	?	?		472	3500	363
Non. Res. Vessel & Boats	2000	--								
Recreational Trawls—unlicensed	35000[3]						8000[3]			

[1]Commercial licenses issued to all types of boats: commercial, recreational, charter, etc.
[2]All size commercial shrimp boats.
[3]Unlicensed recreational boats used in shrimping.
[4]NMFS statistics are an eight-year average.

Table 2. A comparison of Texas and Louisiana shrimp production regulations.

	Louisiana	Texas	Remarks
Legal Size	No size limit—Spring Season. 68 lb. (heads-on)—Fall Season.	No size limit—Bay Season. 65 lb. heads-off.	Texas—39 count, heads-on. Louisiana—112 count, heads-off.
Enforcement of Size Law	Applies inshore only. Discards low. Enforced on vessel. Enforcement difficult.	Dockside enforcement. Percent discards very high.	Louisiana discards few useable shrimp. Texas observed to discard 23%–45% (by weight) of small but useable shrimp (Baxter, 1973).
Percent of Catch Inshore	71%	19%	Represents percent of total Gulf catch for 12 years (1967-79).
Percent of Catch Offshore	40%	48%	Represents percent of total Gulf catch for 12 years (1967-79).
Percent Landings	37%	39.4%	Percent 12 year total Gulf production.
Percent Value	30.9%	49.9%	Percent 12 year average.
Season Closures	Applies inside shoreline only. Beyond shoreline open year round.	Includes all state waters out to three leagues.	Seasons vary from state to state. Basically designed to protect small shrimp.
Number of Vessels	15,600	3,600 - 4,000	Note: Figures greater than NMFS data. Includes total licensed vessels per state (Fig. 1).
Number of Licensed Trawls	9,100	10,000	On non-commercial vessels.

A. Texas' regulations, directed at large shrimp and higher prices, force a large number of discards, which are both marketable and a waste of valuable food (Baxter, 1973; Berry et al., 1969). This procedure is not likely to seriously affect the maximum sustainable yield (MSY) of Gulf production, but it reflects a significant loss in poundage and dollars because of discarding. Forcing the fishery offshore requires larger, more expensive vessels and tends to restrict entry into the fishery on small capitalization as well as elevate the consumer costs of shrimp.

B. Louisiana affords many small boat fishermen and good catches of medium and small shrimp at a lower economic level. Not much is discarded or wasted and this procedure maintains the principal canning industry along the Gulf coast. The management system in Louisiana probably does reduce the total Gulf production of large-size, high-priced shrimp, since large numbers of smaller shrimp are captured in the inshore bay systems before they migrate offshore.

It is apparent that the extreme positions of Louisiana and Texas do not represent a Gulf-wide management procedure that reflects the best use of the available data, if it is assumed that production of the maximum pounds of useable shrimp with the least waste is the objective. These state programs only represent that which is desired by the politically stronger elements of the industry and which satisfies the need of specific elements of the fishery. An analysis of a management plan based solely on scientific and statistical data is described herein, but it is doubtful that it would be acceptable to a majority of the industry, because the result would bring about a distinct sociopolitical and socioeconomic shift in various segments of the industry.

To avoid a complicated statistical discussion in this short report, most figures have been reduced to an average percentage of the total Gulf production from 1967 to 1976 for each state or area being compared. This procedure clearly demonstrates the different effects of state regulations and lends itself to a discussion of the need for better planning and regulations. All data is from National Marine Fisheries Service (NMFS) statistical publications on catch and landings.

A TECHNICAL APPROACH TO MANAGEMENT

The available data base for managing shrimp is probably as good as any that has been developed, yet there are still several glaring holes in the information and in some cases the available data historically has been misapplied. The problems inherent in the data and the use of it, some of which can be corrected, are:

1. Exceptionally good data is available for the estuarine and inshore areas, but much less comparable data is available for the offshore area.

2. The number of vessels reported fishing by the NMFS does not truly reflect the fishing pressure (Fig. 1).

3. Data on poundage, size and economic value developed at the landing site, while showing the size and value of the industry in a state or region, has been too frequently misapplied to population dynamics or used as evidence to support regulations.

4. Catch data by zones or region, though much more useful, is not available soon enough, nor is it as well developed as needed.

5. Too much emphasis is placed on poundage harvested and little or none on the number of individuals taken. The latter is a true reflection of the actual population produced in an area and available for management.

6. We have been too slow in determining the relationship between nursery areas and the principal areas of harvest, and have failed to make this a major management tool.

We might ask why full use of the data base has not occurred in the past and to what extent can we expect its use in the present shrimp plan? In both bases full use has not been possible because the effects of a totally scientific approach could result in recommendations for industry-wide changes that are strongly resisted. Let us look at some of the specific cases.

There is now evidence that the fishing pressure on shrimp, particularly in the nursery areas, is far too high but is not reflected in the numbers of vessels reported fishing by NMFS statistical data (Fig. 1). While there is little evidence that the stock is hurt by the pressure, it is evident that a well-regulated, economically sound commercial industry may be rapidly deteriorating. The obvious answer, either limited entry or closure of large, easily fished nursery areas and nearshore waters to great numbers of presently licensed fishermen, would be difficult if not impossible to accomplish. Conversely, even in areas where regulations are in force to require the taking of large shrimp, the purpose is largely to control the economics of the industry rather than efficient management, as witnessed by the large numbers of useable shrimp discarded under the Texas system (Baxter, 1973). Reduction of this waste by removal of size limits once the season is open may also be resisted because it could affect prices.

The use of poundage and value of landings in a particular state or area can be grossly misleading when these data are taken as the real productivity of the area and when they are used as a guide to the management of the population. For example, Figure 2, based on pounds and value landed, would indicate that Texas produces as much shrimp in its nursery areas as Louisiana, but manages its production better since the average production in pounds is as great or greater than Louisiana, and has considerably higher economic value. Conversely, an examination of Figure 3 reveals clearly that about 10 percent of the catches landed in Texas are taken off of Louisiana and result

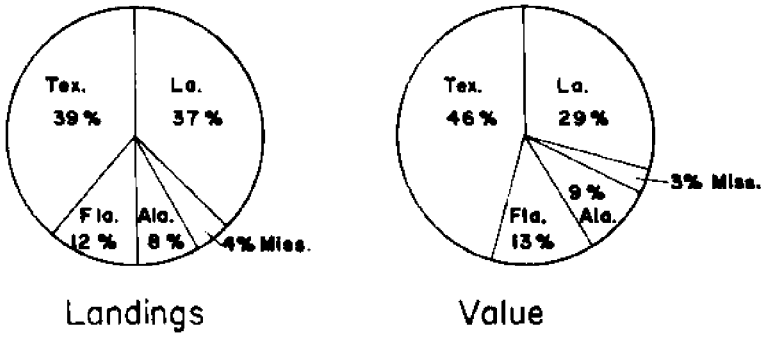

FIGURE 2. Comparison of Texas and Louisiana production and value by landings.

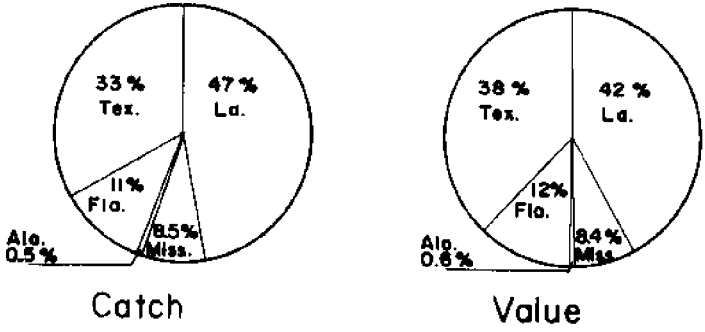

FIGURE 3. Comparison of Texas and Louisiana production and value by catch from zones associated with each state

from the productivity of the Louisiana nursery grounds. This evaluation of productivity and value shifts the emphasis to Louisiana and the importance of its management procedure on total Gulf production. A realization that the states of Mississippi and Alabama also get much of their catch from the same area makes this point more emphatic. Thus, more than 50 percent of the total Gulf catch is apparently supported by the Louisiana nursery area and offshore waters.

An examination of Figure 4 further indicates the importance of the Louisiana shrimp production and its system of management in relation to the total Gulf. Figures 4A and B clearly indicate the difference between the value of large shrimp taken offshore and the value of smaller shrimp taken inshore. With 31 percent of the total catch representing only 16% of the value, and with Louisiana catching 71 percent of all shrimp taken inshore (Fig. 4C), it is probable that a significant increase in the value of the catch would occur if

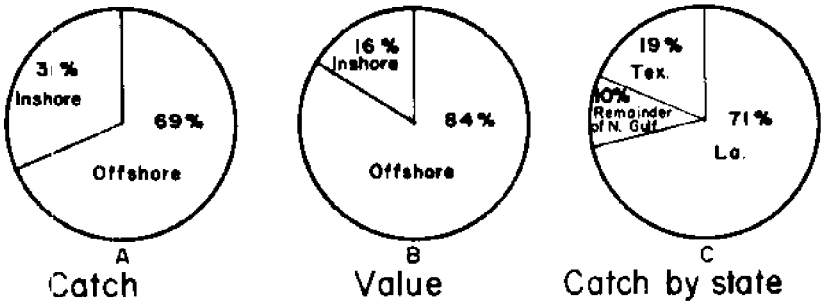

FIGURE 4. Proportion of Gulf catch and value taken offshore and comparison of inshore catch by states.

more of these shrimp were caught at a larger size offshore. Thus the Louisiana system effectively lowers the total value of the Gulf catch.

Another important factor frequently overlooked is the number of individuals in the population available to be managed or harvested at designated sizes. Figure 5 compares the percent of the total Gulf production of shrimp taken by Louisiana, Texas and the remainder of the Gulf. In pounds landed, Texas leads Louisiana slightly over the 10-year average (Fig. 5A), but in pounds taken from state waters in areas supplied by state nursery areas, Louisiana accounts for 47 percent of the total weight of Gulf production (Fig. 5B). Furthermore, since Louisiana catches 71 percent of all the inshore Gulf production (68 count and smaller, heads-on) (Fig. 4C), the taking of such a large volume of small shrimp translates into 57% of the total Gulf shrimp population by individuals coming from the Louisiana area (Fig. 5C). With more than half of the total population (individuals) developing in and migrating from the Louisiana nursery system, the management of this significant share of the Gulf shrimp crop can be very important.

A more critical examination of the shrimp crops from Texas and Louisiana indicates that Texas makes more efficient use of a smaller number of individuals produced each year. While taking approximately the same number of individuals in offshore waters, they manage to produce about 10 percent more in pounds and value (Fig. 6). This comparative production offshore may not be distinct enough to warrant a major change in procedure, but if we examine the inshore catches a far greater difference is apparent. Of all of the shrimp taken in inshore waters in the two states, Texas takes only 21 percent in pounds and 18 percent in numbers compared to Louisiana's 79 percent and 82 percent, respectively. This means that Texas catches nearly 80 percent of its crop by numbers in offshore waters while Louisiana takes less than half of its crop offshore, the remainder being taken in inshore areas at a much smaller size (Fig. 7). It is apparent that Louisiana has a greater ability

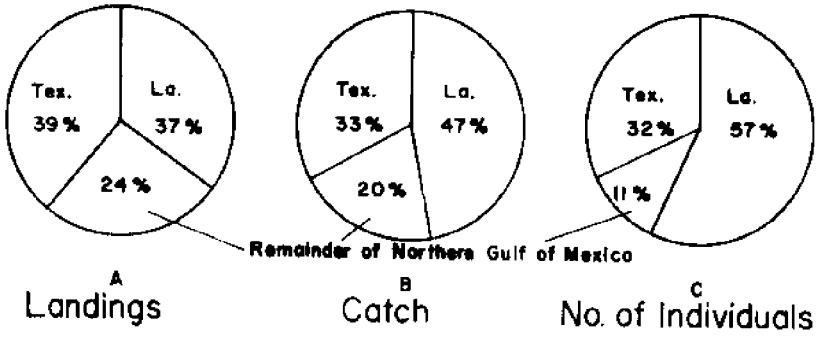

FIGURE 5. Comparison of Texas, Louisiana, and remainder of Gulf of Mexico production by landings, catch, and numbers of individuals.

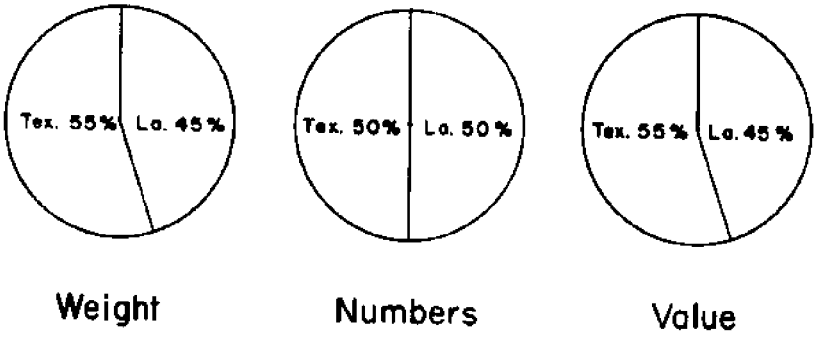

FIGURE 6. Comparison of state's portion of combined Texas-Louisiana offshore catch by weight, numbers, and value.

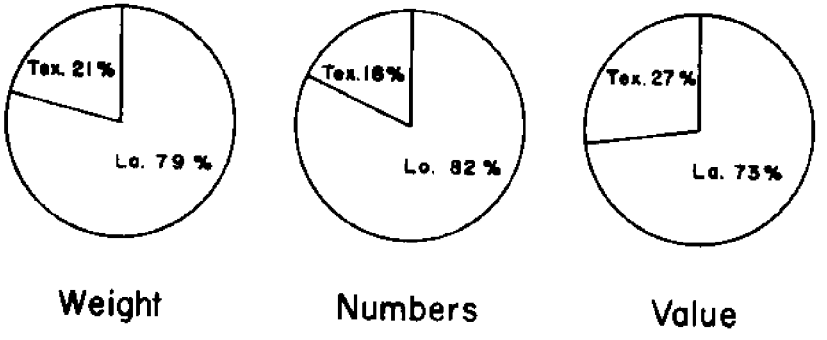

FIGURE 7. Comparison of state's portion of combined Texas-Louisiana inshore catch by weight, numbers, and value.

to produce shrimp and has more latitude to increase production in pounds, average size and value than does Texas. No doubt a significant shift in Louisiana's regulations to reduce the taking of small shrimp could result in a sharp increase in value of the Gulf production and perhaps a measurable increase in poundage. In light of this analysis, one might ask: Why has not such a change been made in Louisiana's management procedures?

DISCUSSION

As a representative of the Louisiana administrative system, which attempts to regulate and manage the shrimp crop, I can say that even with the data as presented above available the ability to arrive at optimal use of the crop eludes us for several reasons.

Our most difficult decision deals with two factors:

A. Most of the shrimp never reach a large size while in the state's territorial waters. Tagging studies now in progress indicate that in most cases they are well beyond the three-mile limit and have migrated considerable distances westerly before achieving the 65 count, heads-off size preferred by the offshore fishing industry.

B. The majority of Louisiana's fishermen use small boats and cannot follow the shrimp offshore or compete with the larger boats.

If Louisiana adopted regulations similar to Texas, little or none of its production would come from its territorial waters, some 12,000 commercial small boats and 10,000 sport trawlers would be denied an opportunity to fish within the states boundaries, the Gulf canning industry would die and a large percent of the shrimping income would be immediately transferred from one segment of the industry to another. Such regulatory procedures would not be accepted by the majority of the Louisiana industry, nor is it likely the legislative body would allow laws adversely affecting so many citizens. Furthermore, the FCMA requires that such socioeconomic factors be considered in a fisheries plan. This fact would tend to protect historic fishing patterns that are shown to be inefficient by more accurate data. Some answers to inefficient procedures must be developed, however. A continued increase in fishing pressure may not hurt stocks, but certainly a valuable economically sound commercial industry will be reduced or destroyed and efficient management of an important source of food will not be achieved.

Some compromise between the offshore and inshore (large shrimp vs. small shrimp and the commercial vs. recreational) positions is needed, but even this would require some drastic changes in the Louisiana system. An approach to a compromise position was presented to the industry and the legislature several years ago, but it failed even though a majority of the industry approved it. This plan included:

A. Prohibition of shrimping in about one-half of the nursery areas having extremely shallow water and predominantly very small shrimp.

B. Seasonal fishing only in an area involving the larger embayments and the territorial sea.

C. Development of a licensing system that distinctly separates the commercial fishermen from the recreational fishermen. The commercial license should be priced to exclude all but the serious commercial fishermen dependent on the stock for a livelihood. Recreational and part-time fishing should be restricted to a take solely to satisfy home consumption.

D. Size should only be used as a criteria for opening or closing seasons or areas, but once open, all shrimp taken should be used. This should apply Gulf-wide to avoid waste.

E. The historic canning industry should be guaranteed sufficient catch of smaller shrimp to meet their needs.

The above proposals were defeated in the legislature because a minority segment of the industry felt they would be giving up too much or could not compete with the remainder of the industry. They were able to have their legislators kill the proposal in committee.

CONCLUSION

It is difficult for fishery administrators to arrive at what technically could be considered optimal production in view of the problems discussed above. In my opinion it will be accomplished in one of two ways. If the stability and economics of the commercial industry eventually collapse, then the outcry will force change over the present industry rigidity and political positions. I would prefer, however, to use an educational program based on technical data analysis to sell a new procedure to the industry. This can only be accomplished over a considerable period of time and with a significant amount of good data and a willingness to compromise. It is hoped that the shrimp management plan now being developed by the Gulf States Fisheries Management Council will encourage the development of additional statistical information that may be used to convince the industry of a need to change.

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MANAGEMENT NEEDS AND INTERACTIONS

John Harville [1]
Executive Director
Pacific Marine Fisheries Commission

I will discuss what I perceive as some of the management needs and interactions that we face; essentially I will make a case for the need for improved multistate cooperation and for strengthening of state-federal partnerships in the management of our wide-ranging fishery resources.

I will deal with this in three steps. The first step concerns the continuing role of the marine fisheries commissions. This is something that Irwin Alperin (Executive Director, Atlantic States Marine Fisheries Commission) asked me to address. Second, I would like to remind us of some of our very significant progress under the Fishery Conservation and Management Act (FCMA) of 1976. This progress pertaining to FCMA fisheries certainly will spill over into the management of fisheries that are not subject to FCMA. Third, and certainly most important for the purposes of this conference, I will identify some of the major problems that we have to face together if we are going to improve our ability to manage these shared resources.

Regarding the continuing role of the marine fisheries commissions, Gary Knight (Professor, Louisiana State University Law Center) and I noted yesterday the landmark effect on the states' role in fisheries management of the Submerged Land Act, which began its effect in the 1940s. The 1940s are also when Harry Truman proclaimed US intention to take action wherever necessary to conserve our fish stocks offshore. This Truman Proclamation, so-called, was actually the genesis of extension of jurisdiction over fisheries years later on a worldwide basis. In the present context, even more importantly, it scared our coastal states, who saw here the specter of a federal take-over of fisheries jurisdiction, and it stimulated the formation of the interstate marine fisheries commissions on the Atlantic, Gulf and Pacific coasts.

At least on the Pacific coast the commission originally was formed specifically to prevent a power vacuum which would encourage a federal take-over. Since the late 1940s, when these compacts were established, they have served their states and the country as a whole quite effectively in some of the ways that have already been noted. Under the compacts, cooperative research, monitoring and the collection of information have been stimulated and this information has been transferred among their states, their constituency in the federal government and even other nations. The compacts have provided useful regional forums for review of fishery issues and fishery

[1] Irwin Alperin, the scheduled speaker, was called away at the last minute; John Harville agreed to present his own views on this topic.

problems, and they have helped to focus their states' powers and influence to bring about, in many cases, legislative and administrative action to address those problems.

However, as has been pointed out many times, this has been through only whatever influence they could bring to bear, because they have had no authority to compel any action.

Because of this history of interaction among the states, the interstate marine fisheries commissions very definitely laid the foundations, in terms of attitudes and working groups, for implementation of the regional fishery management councils under FCMA. On the Pacific coast, as an example, we have working committees for salmon and steelhead fisheries, for crab and shrimp, and for groundfish; these became the core elements of the Pacific Fishery Management Council's management plan development teams, using as a base the information which the states had been collecting for years with partial support from the federal grant-in-aid programs, the Commercial Fisheries Research and Development Act and the Anadromous Fish Conservation Act. These provided a major share of the information base which was required for those management plans. Some of it, of course, came from federal agencies that were also conducting research. But the basic information about these fisheries, particularly in their inshore phases, had been developed by the states, which were, to a large extent, funded in part by the matching grants from the federal government.

State-federal cooperative action, under what I consider to be a very timely National Marine Fisheries Service (NMFS) initiative, the State-Federal Fisheries Management Program provided a framework program for salmon management which got the Pacific Council off to a running start on its very first meeting in October, 1976. The council took salmon, despite the enormous complexity of that fishery, as its first target; part of the reason it could do this was that we were able to present them with a ready-made core plan which merely needed to be modified, adapted and implemented.

We have already talked about the Dungeness crab plan, which is sitting on the shelf waiting to be implemented if and when we ever need it. And projects under the State-Federal Fisheries Management Program are moving toward production of the timely catch and effort data that is required for implementation of the council plan.

I want to emphasize that these are our states' accomplishments, reached through the use of their interstate marine fisheries commissions as vehicles or mechanisms. I might point out that similar programs have taken place on the other coasts.

But compacts are not separate entities, they are merely the agents of the states, leading to cooperative effort and the ability to focus this cooperative effort into purpose and activity.

The programs I have cited on the Pacific coast certainly are paralleled elsewhere, and the degree to which those programs have been assisted by federal grant-in-aid programs and by the State-Federal Fisheries Management Program cannot be underestimated.

I find it very difficult when people say that these programs have accomplished little or nothing. Because of the work that was done on these programs, the Pacific Council has been able to move, and to move quickly and effectively; because of the work that was done I am sure we are at least a year ahead in many of our operations.

However, again, the commissions lack any effective mechanism for forcing compliance, and as Richard Schaefer (Chief, State/Federal Division, National Oceanic and Atmospheric Administration) has pointed out, the question has to be asked: What are our states' intentions with respect to fishery management plans that are not subject to council jurisdiction?

As I have said, I do not think that we have a problem on the Pacific coast, because our major fisheries are subject to council jurisdiction and because we do have a coordinated approach to dealing with them on a council level. We expect the council to develop management plans, we expect the Secretary of Commerce to implement those plans outside of three miles, and we expect the states to implement them inside of three miles. So far the track record is good.

For example, California, which has the most complex system of implementing regulations, requiring the legislature do it for commercial fisheries, delegated to Charles Fullerton (Director, California Department of Fish and Game) the authority to implement on an emergency basis any regulation that is necessary to carry out a council management plan.

The states of Washington, Oregon and Alaska already have this kind of authority and I think the states have shown that they will bite the bullet, even when the risks are great and the arguments are bitter, as they were over the Pacific salmon management plan; the states did enact regulations parallel to those carried out by the Secretary of Commerce.

Before turning attention to the problems we have got to solve in working together for management of our shared resources, I think we ought to remind ourselves of some of the progress we have made in the very few years since FCMA came into being. I want to emphasize again that this is not just progress with respect to council operation, it is a new area with respect to management of fisheries and indeed in terms of American governors, as the senators and congressmen who put that act together reminded us when they first addressed the new regional council membership over three years ago.

I would identify three very important ways in which the FCMA has moved us effectively forward. First and most obvious, it has given us control over harvest out to 200 miles; it has given us management of the fisheries in

the oceans off our shore. The result of this is that, in the several years since we have been operating, we have approximately halved the effort and the catch of fish by foreigners in our waters, we have required that they harvest according to our rules, and, in many instances most significantly, we have reduced accordingly the impact of those fisheries targeting on the species that we do not use in terms of bycatch. For example, of importance is the reduction in the take of salmon and halibut off our shores in the Northwest. And just recently, by negotiations between the North Pacific Fishery Management Council scientists and Japanese fishermen, we were able to change foreign regulations to very materially reduce the incidental take of halibut. It was simply a matter of changing from a trawl fishery to a long-line fishery.

The second major advance under FCMA is that we have broadly democratized the management planning and decision-making process. We do not have, as we used to, just public reaction to plans that are put forward. Instead, we have public initiation of action. This happens at all levels in the council operation. Council members are appointed from the public and from user groups, and these representatives are in the majority on the management councils. It is true that the state directors and the regional director for NMFS serve on those councils, but in every case the majority members are public appointees.

The public is well represented on our scientific and statistical committees and on the Pacific coast, at least, those committees are very powerful. User grounds and the general public are represented on the advisory panels and enter into the complex problem of decision-making. Added to this, of course, is the process of public hearings; therefore, at every step in the procedure of management plan development, there is broad representation of user group and public interest.

Sometimes we are challenged with not listening. More often it is a case of our not always agreeing, but in any case there is that representation. This is truly a state-federal-public-user partnership. It is complex, frustrating and time-consuming, but democracy generally is and because, as someone pointed out earlier, the states and the users help plan the program, they will therefore help to implement it.

I want to make a personal observation here because I hear challenges made on occasion. I serve as a nonvoting member on two regional fishery management councils and I have kept careful track of the votes that take place on those councils; in not one instance can I point to a predictable polarization of those votes by a particular array of user backgrounds. We have had divisions as, for example, in the development of the anchovy plan by the Pacific Council. The recreational users were interested in maintaining the bay fishery and the commercial users wanted to see that fishery grow; the result was a council decision that was clearly a compromise.

I think that while democracy is often clumsy and often difficult and often frustrating, it certainly is working, at least in the councils with which I am associated.

The third and last major explansion, that I emphasize as one that interests me most as a fisheries professional, is the new dimensions for management planning that are brought about by the new national standards. Some of those standards merely reinforce long-established objectives, such as best available data and flexibility of our response. Others are truly new, such as the optimum yield concept, which requires that we consider a broad array of public values, as Virgil Norton (Chairman, Department of Agricultural and Resource Economics, University of Maryland) emphasized. We may not be doing this too well as yet, and we are having trouble with the definitions, but at least it is a new parameter for our endeavors. Concern with economic efficiency and all that this can mean for some limitation on effort and on capitalization is central to the issue. Concern with management as a unit throughout the range, not only for fisheries that are subject to council jurisdiction but also because the impact will spill over into other fisheries, is another important consideration.

These broadly stated objectives, publicly stated now and not hidden under the table, change the way in which we have to make decisions. No longer can we biologists retreat comfortably into concern for resource protection and maximum sustainable yield (MSY), saying that socioeconomic matters are not in our shop. The multi-disciplinary approach is mandated, which disagrees somewhat with what Virgil Norton has said. I agree with him, in principle, that we should not be carrying on unnecessary research, but I am totally convinced that we desperately need additional research in a whole array of areas, especially in the socioeconomic zone, where our information base is almost nonexistent.

These, I think, are our gains under FCMA; control of our oceans; involvement of our public in planning and operations of our regional fisheries development; and a vastly broadened and, in my view, much improved set of management goals and guidelines that are much more in consonance with what Virgil Norton and others have said about considering total value to our people.

Along with these gains, however, have come some very critical problems, which together we have to work on and solve. Some of these problems are inherent in trying to carry out so difficult a mandate as FCMA; it is just not easy, as has been pointed out by Lyle St. Amant (Assistant Secretary, Louisiana Department of Wildlife and Fisheries) and others, to manage resources as complex as these.

Other problems, however, are a product of the way we think, the institutions we are trying to defend and the bureaucracy we create in the process.

I would like to focus on four problem areas. The first of these is the achievement of multi-agency cooperation for management of shared resources, which is precisely the objective of this conference and what Gary Knight talked about; second is the rationalization of the complex, conflicting federal laws that we have on our backs; third is some improvement in the implementation of our planning processes and our implementation of those plans; and finally, and perhaps underscoring all of the others, the mobilization of our political will to get the job done.

I see these as problems we must address together and we must solve or we will only partially realize the promise of these new developments.

I decided upon this partly because I knew Terry Leitzell (Assistant Administrator for Fisheries, National Oceanic and Atmospheric Administration) was going to be addressing you at the banquet. I am confident that he is going to present some problems to you from his perspective, which is a little different from mine, and I know he is going to ask for your help and advice in resolving them. I urge you to listen to what he has to say and to respond to what he has to say with your own views and your own advice, because in fisheries management we are at a crossroads in the relationship of the federal government and the states.

The first problem of these four, and I will address them quickly, was opened up for your consideration yesterday by Richard Schaefer's question: How can we best achieve an integrated and coherent management of shared fishery resources which are distributed through multiple state and/or state-federal jurisdictions? In other words: How are we going to go about this process of working together effectively to manage the fisheries which we share and in which one jurisdiction can ruin the opportunities for the other by carelessness?

I think there are some things we can do. The first is make FCMA work effectively for fisheries which are subject to regional fishery management council planning. You already know my views on that; I have spoken of them with respect to the Pacific coast. I think that by developing these plans with all of the input that is required under FCMA, by involving our states actively in the process, because it is indeed our state scientists and our state directors and our state advisors that are providing the major share of the input to the development of these plans, we should come up with a plan which not only will be acceptable from the federal point of view but which our states can support. The federal government then will implement it in the fishery conservation zone and the states will implement it with parallel regulations in the territorial sea. These regulations do not need to be identical, they merely need to be compatible. I think that if we find an acceptable mechanism for the states, through use of this liaison, to participate fully in the process, we can manage our fisheries well, without necessarily being threatened with a broad ax to get the job done.

However, there are fisheries in which FCMA oversight will not work as it is presently laid out, and Gary Knight and others have spoken of this. I think we must find an acceptable mechanism for the states with what I think is a necessary input from the councils and the federal government; there has to be a liaison function because fisheries are interrelated. Can we find a mechanism for the states to cooperate effectively for coherent researching, monitoring and managing of species what are not subject to council jurisdiction? Again, we do have some on the Pacific coast; we are gathering data on albacore, we are working with the states in coordinating efforts on marine mammals, and we are heavily involved in gathering the data necessary to better manage our nearshore recreational fisheries. These are not subject to council management, either because they are defined out by the law or because the states are already handling them very effectively. Elsewhere we may need a regional mechanism, and Gary Knight laid out some alternatives for you to consider.

In my opinion, and I want to underscore this, we must succeed in this effort, we must. If we do not, and I am speaking now as a representative of the states, the states face federal preemption somewhere, sometime. It has happened before, with respect to marine mammals, with respect to endangered species, and certainly with respect to air and water quality. If we do not solve the problem for ourselves, within ourselves, the federal government will take it over.

My second concern is how can we go about implementing the premises of the FCMA given certain of its imperfections, its conflicts with other federal laws, and in some cases I think an unfortunate amount of bureaucratic myopia as to its real intents and purposes. As Bernard Smith (Attorney at Law) pointed out, laws generally are not perfect when they are first laid down. FCMA is no exception. It is an excellent document with an excellent concept but it certainly has flaws. There was not adequate foresight in some cases, circumstances have shifted in others and we have a camel-constructed-by-committee nature of certain of the compromises that were put together at the last minute. One of these is the section that deals with federal preemption when fisheries are harvested predominantly in the territorial sea and the states do not take adequate action or take action which is in some way damaging. That was done at the very last minute by a staff group and was approved as a way of avoiding potentially fatal hangups between some powerful people in the Congress.

Politics has been defined as the art of the possible and this was a case of adapting to what was possible. We will have to live with that for a while, although I think we can anticipate some cleanups in the near future in that legislation. Hearings have been held in the National Marine Fisheries Service itself and some important housekeeping changes have been suggested.

By the way, I do not think that pre-emption clause is all that bad. I certainly would not write it that way if I had a choice, but I think it is something we can live with; I have indicated some of the reasons why.

I think also, that we must seek ways to resolve the more serious unconformities and inconsistencies of FCMA with other federal laws and statutes. The Marine Mammal Protection Act, for example, sequesters the top predators in the system, the marine mammals, from any management control; it is making it virtually impossible for us to manage resources in which humans and marine mammals compete. This is a terrible inconsistency that must be remedied somewhere down the line. We cannot manage fisheries according to ecosystem concepts if the top predators in those systems are immune from any management control.

Another example is the applications of EPA, the Environmental Protection Agency, with respect to effluence from fish-processing plants. This problem has been addressed, as many of you here know. It is very convenient, when you want to do things the simplest way possible, to hang a chunk of hardware on the end of a pipe and control what comes out of that pipe. As George Harrison (President, Harrison Seafood) pointed out, one thing you can do is dump more chlorine into it; you can thereby reduce the bacterial level of that effluent and satisfy somebody's requirements and it is too bad about what it does to the environment. Unfortunately, it is more convenient to deal with effluence in terms of point discharge control without regard for the impact on the environment. Yet, with fish-processing wastes, we are merely returning to the sea what we took from the sea and under proper dilution factors that material is enrichment, not pollution.

Somehow we must change the terms of reference with which EPA considers these kinds of problems. This is a very important matter.

Similarly, FCMA has built into it all kinds of requirements for review and careful handling and public hearings; yet we are required by interpretations of the law to run every management plan through the National Environmental Protection Act (NEPA) process, which is redundant and expensive, not necessarily expensive in terms of time but in terms of putting a whole new bureaucratic overlay into the system.

Finally, I have two more brief examples, one important and one I think almost amusing in its ridiculousness. The applications of certain administrative laws and the Federal Advisory Committee Act and others hamstring what we are doing. For example, there is the requirement that every action of a regional fishery management council be published in the *Federal Register,* which nobody reads; at least, nobody except some of the people in government and some of you here who have to.

My example that illustrates how ridiculous this sort of thing can be has to do with Guam. Under certain exemptions and special privileges that exist

in Guam, foreign fishermen, that is, foreign owners in foreign vessels, may land fish in Guam for transshipment to the United States, but a United States citizen may not fish with a foreign vessel and land fish in Guam because the Jones Act applies to his operations.

These are things, and any one of them could be the subject of a whole meeting like this, that I think we must address together with our lawmakers; in some cases changes in the law will be required, and in other cases merely a change in the interpretation will be required.

This leads me to my third point, that we must refocus attention to serving the spirit of the law, the intent of the Congress, instead of becoming preoccupied with semantics and nitpicking over the meanings of words. In my frustration on this I have sometimes called it our latter-day sophistry syndrome; we have become so preoccupied with the intricacies of legal semantics, but remain unfamiliar with the real intent, that we fail to stress the system, we fail to say what can we do. Instead we make a judgment that we cannot do something.

I could give you a number of examples. The one I just mentioned about NEPA requirements is an example. I think the one that I have found most frustrating as a member of two councils was when they were looking for guidance on optimum yield (OY). We were being told by people, who were attempting to interpret the law, that OY should be expressed as a quota. We objected to this and asked, "Now, do you really have to express OY as a quota," and the answer came back, "No, it's not really meant to be a quota. However, your management regulations must always achieve it and may never exceed it."

We have since changed this; it is no longer our directive and we are recognizing, as many of you know, that OY may not be a number at all. It might very well be expressed, as it is in crab fisheries, with the number of crabs that can be harvested with a given type of legal gear in which you conserve the females and conserve the young males and take only the mature males; or it might be defined in terms of escapement of salmon to the spawning grounds.

So we are gaining, but the point I want to make here is I think it is imperative that we go back and look at the intent of the laws rather than sitting down in a legalistic way and trying to interpret each individual word and all of the nuances that it may have.

I think the procedure has to be to stress the system and see if a given procedure cannot be carried out.

Then my third point in this series is whether we can sufficiently streamline our management plan development and approval processes to conserve our management dollars and time, as Virgil Norton suggested, and bring this whole complex system into compliance with the life cycles of fish and the

harvesting cycles of fishermen. This is what we often call the underlying principle for the approval process of management plans. This approval process now requires something like 250 days (about eight months) and generally even that cannot quite be managed; it has not in the plans that I have been associated with.

This means that you are devising and setting plans for next year before you have your data from this year in hand. There are some solutions and happily we are working together toward them. We need to find ways to shorten this time schedule.

There are ways of reducing the length of the approval process. The most important way is to regionalize more and more of the review process. The basic review ought to be in the region, and only with respect to compliance with national laws and national policy should that review take place at headquarters.

We should move in the direction of generic or framework plans in which a plan is a five-year (or more) strategy document, the strategy for management. Then we could use the regulations for the annual detail that is required for the tactics to implement those strategies.

Again, we are moving in these directions. I do not want to have the points I am raising imply total frustration, but they do identify the areas in which I think we must move together in order to make our rational, joint, cooperative management work.

My final point is: Are we prepared to move adequately in order to more effectively mobilize our manpower and financial resources in order to achieve the long-term monitoring data collection and analysis and necessary research which is required for proper implementation of management plans?

My concern here, and it is a very important one, is that I do not think that we have adequately differentiated at the national level between the tasks of developing management plans which are not on a one-shot basis but are instead a very major instantaneous effort, and the long-term problem of monitoring the fishery and carrying on the ongoing research that is necessary for implementation; because of the prestige and the national visibility of the regional fishery management councils we have supported them very well financially. They have received the operational and programmatic funds that they have needed, which has not always been what they wanted but has been what they really needed.

But this is for management plan preparation. It is a short-term effort, and our councils, under emphasis from the Congress, have seen their function as being essentially administrative and short-term. They have not seen this as being a situation in which the councils are to erect a new cadre of research scientists to carry on long-term research. To date, regrettably, we do not appear to have given adequate national recognition to this need for ongoing

monitoring, data collection and long-term, management-related research. Again, I concur in a way with what Virgil Norton said. The research needs to be relevant and it needs to be needed, but it is definitely needed in the areas where we presently are very lacking.

Here is a key role to be performed by our states. This has to do with their history of being engaged in such management, their capabilities, their manpower, and the fact that the stocks are found within their waters, if not as adults, then as larvae or juveniles in the fresh waters and the estuaries. This is a key task to be performed by the states and happily the states are there to do it, because one of the constraints upon the federal government these days is inability to hire additional personnel. It is possible to get money but it is very tough to get people.

The FCMA calls for the use of the best available scientific data and this requires current data of acceptable quality and timeliness and it requires new initiatives. And since this management regime is truly a state-federal effort in its origins and in how it should be carried out, I believe it should involve state and federal participation. I believe the grant-in-aid programs I mentioned earlier, the Anadromous Fish Conservation Act and the Commercial Fishery Research and Development Act, are perfect mechanisms for this because they are mandated by the Congress, they use both state and federal money and the job can be done without finding any new federal bodies to do it because the states or contractors can handle it.

Yet, since 1971, no new funds have come into those programs except for some modest inflation-compensating increases which the interstate compacts won through a direct compaign with Congress, and this is the first advance since 1970. But these increases do not even make up for inflation over that period and at the same time we are looking at a whole array of new research anc management and monitoring tasks which need to be carried forward.

Simiarly, the State-Federal Fisheries Management Program is a made to order mechanism for joint planning and implementation; yet here, as in the grant-in-aid programs, we have been advised that no new initiatives are to be considered in this program until after fiscal year 1982. That is three years and we have not even been developing plans that long. I am concerned about our ability to mount the necessary resources between ourselves as states and the federal government to get this work done.

In my view and that of my states, the needs are here now, the problems are here in front of us, and to get the job done we ought to be innovative and courageous in moving forward with whatever means we have at hand.

In the context of our topics for this conference, then, let us keep in mind how far we have progressed under FCMA; at the same time let us seek the means and generate the political will to develop our interagency capacilities for conservation and management of our shared resources, including the

necessary financial support of the ongoing monitoring, data collections and research.

Let us also find ways to rationalize our inconsistent and conflicting laws to support the basic intent of FCMA, and of all of us, that we manage these fisheries effectively. Let us work together toward these goals and consolidate the gains we have achieved under FCMA, while still preserving the basic princ ples of our constitutional government, which has to do with the role of the states and the role of the federal entity in the management of our shared resources.

DISCUSSION

ST. AMANT: I might comment on the statement that although we have reciprocal laws in our management procedures, they have not been activated in the case of shrimp. I think here again we learn that problems are more than just a question of politics or something like that. Few people realize that the shrimp moving in the Gulf system come in at different times. There is a three- or four-week or as much as a five-week differential between the shrimp entering and leaving the estuary around the delta and, say, Galveston, Texas; and a similar situation exists as you move east. We do not know why this is, but as you move east and west the shrimp are much later. So you run into the problem that Louisiana, in certain sections of the coast, has shrimp that are catchable and that are already emigrating. The local people are saying, "We have got to catch the shrimp. If we do not, they are going to be gone and somebody else will catch them." Maybe 75 or 100 miles away they are saying, "Look, our shrimp are not ready to catch, and we want to keep the season closed."

This makes it a little bit difficult to do any reciprocal management. Now, we do have reciprocal agreements with respect to licensing and with respect to such things as shrimp fishing for bait-shrimp fishery, and where the lines of the state are involved we reciprocate with respect to whether we fish both s des when the season is open and that type of thing. But because of the nature of the shrimp fishery it is a little difficult to get into the business of managing cooperatively unless you are going to make it something the group would like to have—let everything offshore grow up to considerable size and let everything be caught offshore.

HARVILLE: Let me take the opportunity to comment on the pecularities on the Pacific coast which Spencer Apollonio discussed very well. I would suggest that there are two characteristics of the Pacific coast that are different than the other coasts. One is the character of the ecology of the coast. As Spencer Apollonio indicated, we simply do not have major fisheries which

are harvested by several of the states which are not also significantly harvested in the fishery conservation zone. Therefore, all of our major commercial fisheries that are available for such planning are subject to Fishery Conservation Management Act (FCMA) of 1976 jurisdiction and regional fishery management council (RFMC) planning. And so we have taken on the Pacific coast the very logical position that the way to implement those plans is for the states to work with the federal government and with the public in the development of those plans and then to implement them. And it is working. It is working very well for us.

There are some fisheries which are not subject to RFMC management, such as the albacore fishery, but we do not really manage it very much anyway. We mainly monitor it because it will require international management in the long run. There are other fisheries for which the RFMC has decided it need not develop a management plan because there simply are not significant problems in it. Spencer Apollonio mentioned the Dungeness crab project for which, under the State-Federal Fisheries Management Program, we developed over a three-year period a definitive set of documents and detailed information concerning that fishery and containing virtually all that is needed to know for its management, plus a very careful and thorough analysis of alternatives for a limited entry.

Well, the limited entry possibility went down the drain, as far as public attitude is concerned, when the fishery rebounded and there was no longer any clamor from the fishermen to cut down on the effort. We will see what happens in a few years when the fishery again drops off.

At the same time, the fishery is being very adequately managed by the states without the need for a RFMC plan and therefore, the RFMC has placed that plan on the back burner until such time as it may be needed.

The second factor I think that is different about the Pacific coast is the very large and well-established management capabilities of the Pacific states. We do not have very many states; there are only three of them that are contiguous. They have been managing the fisheries by landing laws; in fact, they have a history of working cooperatively, even far beyond the three-mile limit, as Spencer Apollonio pointed out.

I emphasize these things, again recognizing that you have three people up here representing three parts of the country, to point out that one must address a different set of problems with a different set of procedures, given the variances that exist around our country.

APOLLONIO: I guess I do want to comment and the comment is stimulated by Lyle St. Amant's observation of the great differences among the different regions. I first have to tell you that I am developing a list of phrases of fisheries management, which in a general abstract way is the solution to all of our problems, except that when it comes time to apply them

specifically we begin to run into difficulties. Optimum yield, of course, heads the list of solutions to our problems. Another one is limited entry; a third, which is very popular in New England right now, is multi-species management, and as a result of Dr. St. Amant's comment perhaps I am going to add the phrase interstate management.

As he indicated, the need for interstate management, depending upon the particular area of course, may be more a perceived need than a real need. I think we have to give that very significant thought. Of course, there is a great deal of discussion right now; it is a popular subject to discuss the urgency of the need for interstate management and we are giving a great deal of thought and attention to the mechanisms for accomplishing that. But it may turn out, as he pointed out, that when we take into account the very real regional differences for some fisheres, it may not be such a good idea after all.

QUESTION: You touched on the subject of the three states in the Northern shrimp fishery that had agreed, under Amendment One, on a plan; then you said it was contested by the attorney general of Maine. What are the legal questions under Amendment One?

APOLLONIO: The agreement among the three states was not contested by the attorney general's office in Maine; the agreement and the means of implementation by the three states were reviewed by the University of South Carolina Law School and that report raised a number of questions about the legality of the procedures which the three states could use to implement the agreement under Amendment One.

In fact the report said that it is not a legally binding agreement and does not have the force of law; I have not looked at it for a couple of years but that is my recollection of what it says. And it based that criticism of the legality of the agreement upon, as I say, comments about the procedures that the states used; the Maine attorney general's office has informally challenged the assumptions within the report about the procedures which the three states used.

So the University of South Carolina Law School is saying, "No, it is not a legally binding agreement," but the Maine attorney general's office informally is saying, "Well, you are wrong, it is a legally binding agreement because you do not understand what happened." And that is where it stands at the moment.

QUESTION: What are the other two states saying? Do they feel it is legally binding or not?

APOLLONIO: Yes, apparently so; the three attorneys general of the three states took a different view of whether it could be implemented, and the Maine attorney general's office said there was no problem with Amendment One and the procedure used, which is basically a regulatory procedure in Maine. One other attorney general took no position at all and the third

attorney general said that it will have to go before the legislature of this particular state and have a legislative endorsement, legislative action on the statutory basis, for implementing the agreement. So the states took three different positions as to how to implement Amendment One.

QUESTION: You made the comment that on the West coast, California, Oregon and Washington, have managed to get regulatory control; regulations, I suppose, have been part of it, of fishery management plans. Can you give an example of where they have been able to use that authority?

HARVILLE: Sure. In the place where something new had to be done, California. The other states already had this authority. The authority is vested in the commission in Oregon, with a very short turn-around time, and the director of fisheries in Washington has the authority already. In California the legislature delegated to Charles Fullerton (Director, California Department of Fish and Game) emergency powers to enact these regulations; there is a review process and eventually the legislature has to come in with confirming action, but it takes the time constraint out of the system.

QUESTION: The legislature must come in later for enactment?

HARVILLE: At a later time the legislature would have to conform or confirm the action of the state director. There has not been a total delegation of that responsibility.

But the real thrust of your question, I think, is: Has this been used, has it really worked? And the answer is yes; it has been used in the Pacific Fishery Management Council area for both the salmon plan and the anchovy plan. In both cases the plans were adopted by the Pacific Council and implemented by the Secretary outside of three miles. In the case of the salmon plan it required concurrent implementation by Oregon and Washington and California; in the case of the anchovy plan it required concurrent implementation by California. In both cases Charles Fullerton took the necessary implementing action and the legislature backed him up. So it is working.

Now, I am not going to say it will always work. One of these days we will come up with a salmon plan that will manage coho fisheries the way they ought to be and California will object. I do not know what is going to happen then.

But I can tell you that so far it is working, and I am convinced that the reason it works is because of the democratic process by which the effort is put together. Our state scientists, our state managers, and our state advisors have helped create the plan. And if you help create something, then you are more likely to help implement it.

QUESTION: I want to pursue further some of the issues that were raised yesterday with respect to the planning responsibility, some comments that Spencer Apollonio made in his part of the session.

Spencer, I conclude from your remarks that if the fishery is constituted

predominantly in the territorial sea it basically, in your opinion, would fall outside the realm of the planning authority given to the RFMC by the FCMA. I am not a lawyer but I am not sure that is a correct conclusion. I was led to believe that the RFMCs would have planning responsibility for resources in their geographical areas of responsibility without regard to whether those resources occurred predominantly inside or outside, but only planning responsibility or at least assumed planning responsibility. Now if that is true, then I would concur with your feeling that obviously resources like menhaden and perhaps sea trout and some others we discussed yesterday might better be addressed under some other mechanism, whatever that might be.

But the Atlantic States Marine Fisheries Commission, for example, had submitted a proposal to our agency (National Marine Fisheries Service) identifying some six to a dozen resources that that commission believes should be addressed in terms of management planning under the state-federal program vis-a-vis the RFMC forum mode, and among them are resources like bluefish. It becomes very difficult for our program to respond to that kind of a proposal when there remains doubt as to who really will assume planning responsibility for bluefish. The Mid-Atlantic Fishery Management Council has initiated planning responsibility with respect to bluefish and at the same time the Atlantic States Marine Fisheries Commission says no, they would like to assume planning responsibility for the bluefish.

I think that those kinds of differences need to be resolved between the RFMCs and the commissions and/or states directly and I would like your suggestion as to how we should go about doing that.

HARVILLE: While he thinks about it just a minute, I would like to add a point that I think might be relevant from the Pacific Fishery Management Council. I felt that your question as raised yesterday is one that we cannot answer because it is one that has to evolve. We can provide certain guidelines as to whether a plan should fall under the RFMC or should fall outside the RFMC.

Let me use the Pacific area as an instance. There are two fisheries in which our RFMCs decided to develop management plans even though the fishery was certainly predominantly inside three miles. (Incidentally, I do not think that term is relevant. The word "predominance" applies only to the preemption clause. The question really is: Is the fishery harvested *significantly*, to any measurable amount, and that is quite different from *predominantly.)* In the case of coho salmon, the North Pacific Fishery Management Council is in the process of developing a management plan even though only about 17 percent of the harvest is in the fishery conservation zone. The reason for this is that the North Pacific Council and the Fishery Board of Alaska have agreed that they want a joint plan and they have given the job to the North Pacific Council. Actually, the North Pacific Council began that effort before

they had that agreement.

I am really looking forward to the joint meeting we have scheduled for mid-December, the first on record between the Alaska Board of Fisheries and the North Pacific Council.

In the case of the Pacific Council area we did the same thing on Dungeness crab even though by far of the bulk of the Dungeness carb harvest is inside the three. Now, in that case we simply decided to back off from developing a Dungeness crab plan, not because of any question of jurisdiction but because we do not need it. As long as there is not a problem, why have a plan? Similarly, the Pacific Council has developed a plan for jack mackerel and carried it through the hearing process, but it is going to sit on the shelf until we need to implement it.

I think this is in line with what Virgil Norton was saying. Let us not develop a plan just because it is there; let us develop a plan when we need it. And so our view on the Pacific coast, where I think we have a somewhat relevant instance in this case, is that if the fishery is harvested to an extent in the fishery conservation zone, management is needed in order to rationalize that fishery. Then it belongs to the RFMC to do so. And it certainly was true of the coho salmon plan and we think under some circumstances, if we needed limited entry, for example, it would be true for Dungeness crab.

But on a year-by-year basis, I think we are going to have to reassess our priorities; in both RFMCs we have set aside certain plans for consideration now because of the incredible work load of the plans that are left.

So I do not think that, other than establishing some principles, we can go down a list and say forever and ever this is going to be RFMC, this is not going to be RFMC.

APOLLONIO: Unfortunately, I missed the limited entry conference but I was told that one of the memorial comments made at that conference was that if it is not broken, do not fix it. That is relevant to what I am going to say.

I thought this issue of what was appropriate for the RFMCs and what was not appropriate for the RFMCs was pretty clear. But apparently it is going to become unclear and therefore a matter of debate for months or years to come.

First of all, I do believe that there are a number of important species which are not any business of the RFMCs. Menhaden would clearly be one and we can think of others; the wheat fish, for example, and flounder in certair areas and so on, more in the mid-Atlantic and the South Atlantic area, I think, than in the New England area as we discussed at the Atlantic States Marine Fisheries Commission meeting a couple of weeks ago.

I would like to go back to think about why FCMA came around in the first place. First of all, there was no question that there was clear

management authority by the states in the three-mile limit in the territorial waters. Way back in the beginning, ten years ago, that was an undisputed fact; there was clearly management authority there. It may not have been used very well—that is another point—but the authority was clearly there. And FCMA came about to fill an obvious vacuum; that is to say, there was not effective management or management authority beyond the territorial seas so FCMA came along to fill that need and to fill the vacuum.

Now we are saying that FCMA really has to fill an alleged vacuum inside the territorial waters. I do not think that is true. Why should FCMA become involved in an area where it was not needed in the first place?

I repeat again that a number of species are clearly in the territorial waters and clearly subject to state jurisdiction or interstate jurisdiction if the states perceive a real need for exercising such jurisdiction. And that jurisdiction has existed for at least thirty years, depending upon how you count it; if you start from the Submerged Lands Act it has been twenty-odd years.

If the states perceive the need to exercise their authority they have that authority and I do not see why then the FCMA should presume to go into that area when FCMA was not created for that purpose.

COMMENT: I think if we have a theme for this conference, Virgil Norton spoke about it yesterday when he said that one had to manage for the maximum benefit and not necessarily in the sense of the maximum disbenefit in change for the sake of change.

One of the problems that we have is that when we establish management plans on the basis of economically efficient fishing practices we dispossess fishermen and parts of the industry that are not economically viable in terms of the characteristics of the use in our FCMA calculations. At the same time we shift that burden to other parts of the tax economy without any due regard. I know that Spencer Apollonio is aware of it, but I would very much like to refresh our memory about the occurrences in Newfoundland with the salt fish fishery. There was an effort to concentrate the fisheries, through management plans, into regional group fishing interests. The management plan, although it was very efficient in terms of fishery, was very inefficient in terms of the resources which were being used. In fact, the cost to reorganize was greater than the tax revenues generated through this reorganization practice.

Quite frequently, as I said, looking at the way in which we develop our regional plans, where we should organize our state system, we find ourselves faced with the same problem: Do we go ahead for the benefit of an efficient, economically viable fishery on the cost level or shall we try and maximize the benefit for the greatest number of coastal inhabitants who are presently participating in fisheries? We know there are people within the areas who are fishing on a subsistence level and these people are effectively removed by

actions of the plan from participation in the fisheries.

Perhaps this is one area in our development of planning, if planning is necessary, where we should look at the wider picture of the benefits and disbenefits than just those derived entirely by our fishery industries.

APOLLONIO: I do not think you are taking issue with anything that I said; I think you are reinforcing one of the points that I was making. It was that net economic return may not in fact be the proper objective for fisheries management, that it is quite possible to conceive of other very legitimate objectives of fisheries management; with that we totally agree.

HARVILLE: If I might add just a couple of points to that. I do not think that speakers talking about economic benefits necessarily are talking about maximum economic return; they are recognizing, at least many of them are, these differences.

I am reminded of the education many of us got who attended the Food and Agriculture Organization of the United Nations International Conference on Fishery Development about five years ago. The point was made very forcibly there that objectives for fisheries differ widely, depending on the country and the state of that country's economy and a lot of other things. We are in a very great conservation-ethic era and much concerned about the conservation of a resource; many people are talking about economic efficiency, fewer boats, less wastage and so on. But in many developing nations the primary goal is the production of protein for people along the shore who need it. It depends upon the nature of the area, the nature of the resource, the nature of the economy and the goals of the people. I know when we begin to deal with these things internationally we become aware of this.

QUESTION: The bluefish plan started because the word went out that people were commercially harvesting blues. After an RFMC meeting had broken up a bunch of people came in complaining about some other people coming in and taking over the bluefish, saying that they have a big export market to Africa; and by golly, there goes the bluefish. Now, the issue was very simple: concern by bluefish fishermen that a pursue seine industry with an export market was going to dip into that bluefish resource.

In the state waters we had to solve that problem years ago. New York resolved that problem easily by simply saying there could be no purse seining for bluefish in state territorial waters. Now, under the FCMA you cannot just say, "Okay, we agree with that concept and there will be no purse seining for bluefish in the Fishery Conservation Zone." There is no way you can do it that simply. We have got to discuss a thousand kinds of issues and then we might say whether or not it is a good idea not to have a purse seine bluefish fishery for export market.

Now, we thought initially that of all the fish we have got on our Eastern seaboard there is one there is no need to be worried about and that is

bluefish, and we agreed on it. The bluefish are in great supply, and we drew the bluefish plan. Then along came this one incident and out of that came the concern: How do you approach that issue? The notion was that about the only way you can approach purse seineing in the Fishery Conservation Zone is that you have to have a bluefish plan. If you can work your way around that, great.

HARVILLE: I guess what you are saying applies to Spencer Apollonio's analogy that the watch was not broken but sure was bent.

QUESTION: With one comment that was made I could not agree. If a fishery does not need to be managed then we obviously should not spend our dollars in attempting to do so. Dungeness crab has been referred to as being out of the doldrums one way or another and the RFMC does not feel the fishery needs management at this time. Of course, five years ago we (NFMS) initiated a plan for the Dungeness crab and there was a problem. I understand that perhaps it was economic and social, but federal and state dollars combined in excess of $300,000 were committed to the resolution of that particular problem and now in some magical way the problem has disappeared. Given that rationale I am concerned about, for example, our current efforts to develop a management plan for crab beds on the Atlantic coast. Given my experience I would certainly concur that there is a comparable decline in the stocks at the present time; the very year that the plan was completed they produced the largest year class ever produced and the problem will magically go away and we will have spent a lot of dollars and everything else and put another plan on the shelf. So I am not sure I buy that rationale with respect to not doing anything on our resources after we have committed funds for the plan for a problem that had disappeared.

With respect to a previous comment, if it is true that there is no problem with bluefish, then why has the Atlantic States Marine Fisheries Commission submitted to us bluefish as one of the resources for which state-federal programs should commence formulation of a management plan?

HARVILLE: It may be that bent watch we are talking about. Just so you will feel better about Dungeness crab, do not worry, they will be back.

Spencer Apollonio was asking me the same question; the problem with Dungeness crab is it is a cyclic fishery; it has cyclic populations and it is a terribly overcapitalized fishery. But the problem with limited entry, as you all know, is a very complicated one, particularly where you have opportunity for transfer from one fishery to another. Our Scientific and Statistical Committee has made it clear on the Pacific coast that if we are going to address limited entry, we are going to have to do it on more than a fishery-by-fishery basis; we are going to have to look at it in terms of impacts from one fishery to another.

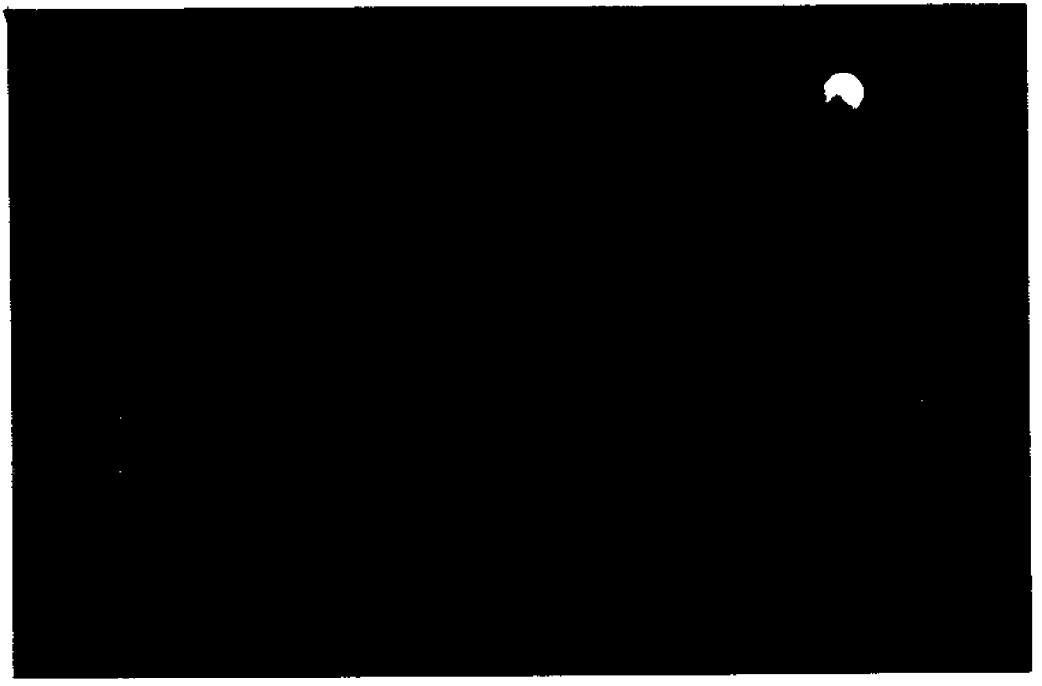
There was no need for biological management of Dungeness crab. What

we spent the money on, as you know, was for the economic studies that were necessary to develop the options for limiting entry and those options are still there and they are still very sound and, incidentally, they apply to other fisheries as well as they do to Dungeness crab. With respect to Dungeness crab we are in the down cycle right now and I will predict that the industry is going to be back shouting for a limited entry in the next few years when the bottom drops out of that resource and they are looking at 10,000 boats out there trying to harvest 5,000 crabs.

So it is a different situation, I think. It is unfortunate that our efforts in that regard came to fruition just about the time the resource rebounded and nobody cared. But they will be back, and we will be ready.

Banquet Address

Terry L. Leitzell



STATE/FEDERAL MANAGEMENT OF INTERJURISDICTIONAL FISHERIES— WHERE DO WE GO FROM HERE?

Terry L. Leitzell
Assistant Administrator for Fisheries
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National Oceanic and Atmospheric Administration

I note with pleasure that one of the objectives of this conference is to examine problems at state and interstate levels encountered since the implementation of the Fishery Conservation and Management Act (FCMA) of 1976. Inasmuch as the National Marine Fisheries Service (NMFS) is the lead federal agency for the FCMA and has mandated responsibilities under it, I am most interested in the discussions and conclusions of this conference.

This conference is most timely with regard to some on-going activities within NMFS. As a matter of fact, in light of the National Oceanic and Atmospheric Administration's (NOAA) reponsibilities under FCMA and the Coastal Zone Management Act (CZMA), we currently are reevaluating our State/Federal Fisheries Management Program (SFFMP), which provides the primary NOAA focus for assisting state management of interjurisdictional stocks in the territorial sea. Therefore, I would like to briefly describe the evolution of the SFFMP, its accomplishments, the impact of the FCMA on the SSFMP, our current thinking as to areas the SFFMP might move into, and conclude with a few questions and comments for your thought as we jointly consider new directions for the SFFMP.

WHAT HAS BEEN DONE?

In 1971, in response to the Stratton Commission's call for state/federal management of shared fisheries resources based on national objectives and sound scientific data, NOAA instituted the SFFMP under the general authority of the Fish and Wildlife Coordination Act of 1956. The goal of the SFFMP has been to produce rational management of interjurisdictional fisheries resources harvested predominantly or exclusively in territorial waters. We do

this through the development and implementation of comprehensive fisheries management plans (FMPs) designed to optimize social, recreational, and economic benefits on a sustainable basis. The principal objectives for attaining this goal have been: (1) to develop and maintain an institutional structure that facilitates cooperative state/federal management planning and action, with advice from resource users; (2) to design and implement appropriate program policies and planning guidelines that provide for shared decision-making and positive, timely management action; and (3) to develop and promote appropriate state legislation that provides the necessary regulatory authority to manage fisheries effectively.

Since the inception of the SFFMP, approximately $5 million in federal contract monies has been spent in support of development and implementation of interjurisdictional FMPs for American lobster, Northern shrimp (Gulf of Maine), striped bass, summer flounder (fluke), Atlantic and Gulf of Mexico menhaden, South Atlantic shrimp, Gulf of Mexico shrimp, Southern California coastal species, spotted sea trout/red drum, surf clam, Dungeness crab, and Pacific salmon. Thus far, state/federal management planning essentially has been completed for American lobster, surf clam, Northern shrimp, South Atlantic shrimp, Gulf menhaden, Gulf shrimp, Dungeness crab, and Pacific salmon. However, only a few of these plans have been implemented to any major extent by the states. The surf clam plan was converted by the Mid-Atlantic Fishery Management Council into an FMP under the authority of the FCMA, while work on the American lobster and Pacific salmon has been made available to the New England and Pacific Fishery Management Councils, respectively, for inclusion in their plan development programs for eventual implementation under the FCMA. A number of state regulatory changes also have been made regarding American lobster. The Northern shrimp plan was implemented under Amendment 1 of the Atlantic States Marine Fisheries Commission. The shrimp data collection system recommended by the South Atlantic shrimp plan has been implemented by the concerned states.

One impediment to plan implementation has been that many state fisheries agencies lack the regulatory authority needed to manage marine fisheries resources in their jurisdictions. Instead, many states have chosen to manage fisheries through the legislative process. Therefore, plans based upon the best available scientific evidence, and supported by the state fisheries agencies, still may be thwarted by the legislative process, which can be extremely slow. In an attempt to improve this situation, NMFS contracted with the Council of State Governments several years ago to develop model state fisheries legislation for consideration by the states which, if adopted, would give greater regulatory authority to state fisheries agencies. Of those states continuing to depend largely upon the legislative process to manage fisheries,

only New Jersey and Rhode Island have made significant progress toward adopting the model legislation. Where needed and helpful, I will support efforts at the state level to transfer fisheries management authority, to the maximum extent possible, from a legislative process to a management process carried out by the executive branch of state government as recommended by the Council of State Governments in its report, "To Stem the Tide."

While only some management plans actually have been implemented, the SFFMP has assisted and enhanced interstate fisheries cooperation, coordination, and planning. The SFFMP pioneered a cooperative approach to marine fisheries management, of which much has been incorporated in the FCMA. For example, the concept of regional fishery management councils (RFMCs) was derived from what are now called the Marine Fisheries Boards of the SFFMP. The FCMA also adopted the SFFMP principle that management be conducted according to plans based upon the best scientific information and user input. Moreover, the SFFMP accustomed state and federal fisheries administrators to working more closely with each other in developing management plans for shared resources. Without question the groundwork laid by the SFFMP facilitated the early implementation and progress of the FCMA.

WHERE ARE WE NOW?

The United States (US) Congress specified several national policies for management of US marine fisheries resources, including interjurisdictional stocks, in its enactment of the FCMA. One such policy is to promote the management of marine fish stocks throughout their range where practicable. Many species covered by the FCMA occur, at some time in their lives in the territorial sea or inland waters. Further, many are estuarine-dependent. Approximately 67 percent of the total US commercial landings, and about 70-80 percent of the domestic marine recreational harvest, are taken from the territorial sea and inland waters. The FCMA neither extends nor diminishes state management authority within the territorial sea, except under very special conditions. It does not allow federal intrusion into inland waters where so many interjurisdictional stocks and fisheries occur. Clearly, achievement of the national policy, which refers to the management of fisheries stocks throughout their range, depends on close state/federal cooperation.

The FCMA assigned management planning responsibility to eight RFMCs. As I previously pointed out, in a few cases these RFMCs have accepted and adopted, with some modification, plans initiated and developed under the SFFMP. Moreover, some RFMCs have identified and/or initiated management planning for fisheries resources which may be harvested predominantly in the territorial sea, e.g., summer flounder (fluke), bluefish, Pacific salmon, Gulf of Mexico menhaden, and Dungeness crab. In fact, at least on the West coast,

it appears that the Pacific and North Pacific Fishery Management Councils may provide an appropriate planning vehicle for managing nearly all of the interjurisdictional fisheries resources in that area.

The FCMA, however, does not provide specifically for the management of interjurisdictional fisheries resources harvested predominantly or exclusively in territorial waters. Although the FCMA provides a useful mechanism for management planning, it still relies on state/federal cooperation for the implementation, monitoring, evaluation and revision of management plans. We recognize that these tasks, when combined with FCMA-mandated requirements for state participation on the RFMCs, amount to a significant additional work load on each of the coastal states. The problem of satisfying management demands is even greater when one considers that most, if not all, of the FCMA activities have been imposed upon existing mandates and responsibilities vested with the state agencies by their respective state legislatures. In addition to a state's responsibility for management of species confined to that state, the states also share management responsibility for interjurisdictional species which lie beyond the exclusive authority of the FCMA. Thus, we recognize that many state agencies and resources now probably are stretched beyond reasonable limits. This is one of the issues we need to address immediately, and together.

WHERE ARE WE GOING?

The last three years unquestionably have been the most productive, controversial, and frantic years in the history of fisheries management and conservation activities in the US. The implementation of the FCMA, the increased awareness of the need for protection of marine resource habitats, the implementation of the CZMA, the rapid growth of US domestic harvesting capacity, the exciting advances in research toward multispecies and ecosystem management, and the increasing pressure of competing uses for ocean space have all combined to make our jobs much more complex and difficult. In addition, pressures to reduce both personnel and budgets in state and federal governments have compounded the difficulties of our work. I believe we must immediately reexamine together the entire range of relationships between the states and the federal government with regard to fisheries-management-related activities. We must determine whether or not there is a need for reorienting our respective programs to ensure that state and federal efforts are being targeted toward areas of highest priority to both of us. We cannot continue on our present path if we are to have any hope of enhancing our cooperative relationship into one that more effectively addresses all of the problems which we face. Let me provide a few personal views for your consideration as we attempt to begin this essential dialogue.

With regard to management planning activities for interjurisdictional stocks in territorial waters, my current thinking is that NOAA should support such efforts only when:

(1) Such stocks can be identified clearly as being in need of management because of conservation needs and/or social or economic problems;

(2) They are of considerable value and importance to both states and the nation;

(3) The RFMCs do not intend to prepare management plans; and

(4) A reasonable expectation exists of achieving plan implementation.

Let me also suggest five other areas that we should examine for possible emphasis within the SFFMP.

1. *FCMA.* The FCMA has given extensive new responsibilities to both the federal government and the states, working with and through the RFMCs. RFMCs have identified serious gaps in the availability of catch, effort, economic, social and biological data required for effective management and conservation of our marine fisheries resources. In many instances, the states, through their existing data management systems, are in the best position to help fill those gaps. In addition, proper enforcement and monitoring of FMPs are major factors in successful FMP implementation. Much of this task logically should be taken on by the states, yet some states may be unable to take on greater enforcement and monitoring responsibilities without additional funds. Some federal assistance currently is available for state participation on RFMC activities, but I am sure that most, if not all, states feel that the assistance is inadequate. Unless we have close cooperation among the states, the RFMCs and the federal government, the FCMA will not achieve its potential as an effective management and conservation system.

2. *Habitat Protection.* The increasing development of coastal areas and expanding of outer continental shelf development activities into new areas, many with high fish production, require more emphasis on habitat protection. State involvement in these activities is essential because of the vital importance of wetland and estuarine areas to many of our fisheries and because of state actions to lease offshore petroleum areas within their own waters. Federal legislative authority for protection of living resources in these situations exists in the Fish and Wildlife Coordination Act, in the CZMA, and among other statutes, but must be well coordinated with state actions to be fully effective. Moreover, such coordination must be accomplished on a timely basis to be responsive to resource needs and crises.

3. *Coastal Zone Management.* The implementation of state coastal zone management plans significantly affects activities such as habitat protection and the development of onshore fisheries support facilities, and provides a superb opportunity for guiding coastal development in a manner consistent with the needs of living marine resources and the fishing community. However,

the coordination, both within individual state governments and between the states and federal government, has not consistently achieved the results which I believe are possible through effective implementation of the CZMA.

4. *Fisheries Research.* The success of many of the coordination activities mentioned in the three paragraphs above will depend heavily on adequate research by both the state and federal governments in understanding the economics of various fisheries; the dependence of species or stocks of fish on particular areas for spawning or early growth; and, of course, the entire range of biological factors necessary for effective management.

5. *Cooperative Data Collection and Management.* For a number of years, NMFS and the coastal states have shared various responsibilities in the collection and management of fisheries data. The degree of sharing has depended on the relative needs of, and the extent of investment by, the states and the federal government in a given area. The FCMA has increased dramatically the need for such cooperative state-NMFS regional information systems. NMFS and the states now are embarking on a program of reassessing their needs for fisheries data, and are developing regional data collection and management systems that will answer those needs. However, the states and NMFS require dedicated programmatic support and significant financial investment if they are going to be successful in developing such cooperative information systems.

I wish that I could tell you that adequate resources in terms of both personnel and dollars are available to achieve immediate success in all of these areas. Unfortunately, even with well-coordinated action, our combined resources will not be sufficient to address effectively all of these problems at one time. However, as I said earlier, I do not believe that we can continue along our present path. We must jointly make serious decisions identifying areas of emphasis and associated priorities for immediate attention. Securing more resources from state legislatures and Congress would help significantly, but I believe our success in accomplishing such augmentation will depend heavily on a state/federal partnership with unquestioned commitment for tangible results. An effective partnership is essential for both of us. However, I want to state frankly that I cannot support expansion of the SFFMP, and perhaps not even the current level of activities, unless decisions are made regarding priorities and emphasis. Those priorities almost certainly will vary from region to region, but we cannot have a successful program if the variation is extensive among the individual coastal states of each particular region. Success will not be easy, but I am ready to commit my efforts to try and achieve it and hope that all of you will join me in that effort.

NOAA and the NMFS are ready to provide a coordinating role for moving forward in this fashion, using every opportunity that presents itself over the next several months, especially a conference planned for late Janu-

ary between state Fish and Wildlife directors and NOAA officials. The sooner we can sort out our needs and priorities the better it will be for all of us.

DISCUSSION

QUESTION: In your address you indicated you wanted some counsel from the states and that you needed to get your act together with the states. My question is: Given realities of budget cycles and planning, if you can get the kind of reactions you are hoping for from the state directors meeting in January, is there time to get some action now? As you know, we are concerned about now, not three years from now.

LEITZELL: I understand that. We have been talking within the National Marine Fisheries Service (NMFS) about methods for getting this kind of advice and answers; we do not have all the answers yet as to ways to do that; I would like to have an opportunity for a number of my people in the NMFS to interact particularly with state directors between now and the state directors meeting in January to discuss some of the questions that have been raised. I hope that at the state directors meeting we will be prepared to seriously address and reach some consensus on the problem. If that is done that will still leave us time to put a new initiative into the fiscal '82 cycle. It also means, however, that we could work to re-orient the existing problem. I do not see any way of augmenting funding for either the current fiscal year or for fiscal '81, which is now locked up. The budget is locked up and at the Office of Management and Budget and will go to Congress in January. But this certainly is an opportunity to re-orient the existing state-federal program and even perhaps, if there is some general agreement either in particular regions of the country or among particular states, to orient the grant-in-aid program for certain kinds of activities.

So I think there are things that can be done now in terms of actual increases in the budget, however, that will probably have to wait until the '82 cycle.

QUESTION: Knowing that there have been some difficulties in developing funding for this year for the recreational fishing statistics, I have the following questions: One, whether through reprogramming we are assured of full funding of the recreational fish statistics-collection program this year? Second, what your plans are for funding, say, next year? Third, how do we look at that problem in the years after taking into account, for example, that you have a very substantial continuing commercial fishery program?

LEITZELL: I think we all understand that recreational data is one of the major areas where there are gaps in most places around the country.

With regard to the national program we will be able to fund it this year;

whether it will be through reprogramming or through another kind of effort we will be able to fund that program. For the next fiscal year, fiscal '81, we have resubmitted into the budget for '81 the item that was dropped by Congress this year; the budget is currently at the Office of Management and Budget and frankly I was somewhat mystified in not being able to get much clarification out of Congress as to why it was dropped from the '80 budget. I think next year we have to make sure that it is better understood by the House Appropriations Committee, the committee that dropped it.

I am reasonably pleased so far with the program in that in addition to simply getting the national program started, the amount of piggybacking efforts by regional fishery management councils (RFMCs) and states that I mentioned in the speech last night seems to be growing and seems to be relatively successful. In that sense I think it is perhaps an area that can provide a very good example of the kind of effort we can achieve through state and federal cooperation and produce a much-needed product. So I am pleased at this point with the way it is developing. As far as I am concerned it is a base program. It is not something that I see as being phased out over time. And if it continues to develop the way it is, I think it will be a model for perhaps some other cooperative efforts.

QUESTION: You are talking about reprogramming; pretty soon you are going to be reprogramming the reprogramming. But what are the chances, say, in '82, of getting some money to at least collect the data so we know what is going on in that fishery during the year that fishery is being conducted?

As you know, we are taking a lot of risks. We have a minimum amount of information to set quotas, seasons, bag limits or whatever. We need to be able to get information daily so that we can adjust during the season to take care of what our estimates did not know was going to happen to that fishery.

The second part of the question is: Is there going to be some relaxation or changing to allow the RFMCs, like state governments, to be able to adjust in season either up or down? Now we have the ability to shut things down but many times our estimates may be the other way and we should increase quotas of seasons because we did not estimate correctly on those populations. What is your prediction about that?

LEITZELL: The first point, which is a question that I think is probably one of concern to almost all of the RFMCs at the moment, is monitoring the fisheries during the time that they take place and ensuring that data collection is current and is available as the RFMC goes through its planning efforts for a succeeding year. There are, I think, serious needs in this particular area. It is one of the ones that I identified. I think that kind of support for the Fishery Conservation and Management Act (FCMA) of 1976 activities is one that we ought to seriously consider for state-federal cooperation and

coordination. It is one, frankly, that we cannot do on our own. Many states, particularly on the West coast, have good systems for doing this, at least in terms of the basic data collection. Often the problems are pulling the data together, getting the raw material and putting it into a useable form.

We have made some progress on that, particularly in areas where we are trying to computerize the data and make it available in very short term for RFMC and management use. I think that is an area where we really have to think seriously about concentrating some of the available resources that are in the state-federal and the grant-in-aid programs.

On the ability to adjust in season, I think we have all been frustrated by a lot of the procedural requirements that go with the FCMA. My own reading right now of what is likely to come out of the oversight hearings on the FCMA is that there will be very few changes in the actual way that the law is structured and the application of the various laws to it. Consequently, I think that the relatively long period for putting initial management plans, and I say "initial" meaning the first time, into place will probably not change very much. Frankly, I think that given the strong emphasis that the law places, and that I personally support, on public participation and input into management plans, a fairly long period of time for plan preparation and approval is probably necessary. I think we in the Department of Commerce can shorten, and in a number of cases have shortened, our review time considerably.

A point was made yesterday about pushing more for regional review and action by the NMFS on management plans, and that is exactly the kind of effort that we are undertaking. We are asking our regional offices, the people who are directly involved with the RFMCs, and the regional attorneys from National Oceanic and Atmospheric Administration (NOAA) who are directly involved with the RFMCs, to do the basic review of plans for the Secretary of Commerce through all the bureaucratics. That is useful in two respects. One, it ensures that people who have been involved in the day-to-day development of the plans are the ones who are putting together the analysis rather than people who have not been involved; and second, through education, I guess, we can continue to try to narrow the scope of that review to what it is supposed to be in the law, which is basically whether or not a plan complies with the specifics of the law. There is a big difference between that and the role that the NMFS regional directors play in terms of helping the RFMC or acting as a RFMC member and choosing specific management measures.

We still have some problems in sorting out those roles, but I think we are getting a lot better with it.

In terms of making management more immediate and providing the opportunity to change, we have tried to develop some methodology that will move in that direction. One method that was mentioned yesterday was the

question of a framework fishery management plan. Someone also mentioned multi-year fishery management plans. There is a lot of flexibility that can be built in, even under the existing law, which will allow RFMCs to make changes in conjunction with the NMFS as the season progresses.

We have managed to build that flexibility into a number of plans to close down fisheries or parts of fisheries when certain limits are reached. We have managed in the herring plan in the northwest Atlantic to build in what is actually a flexible optimum yield, which is essentially a formula rather than a specific number, which allows adjustment in either direction, up or down. If we can be successful in the monitoring of efforts, as we were talking about so that we have good and current data, I think there is enough flexibility in the law to make adjustments.

There is a trade-off involved, however, and I do not want to hide that. Under the current law the way to make adjustments is to be somewhat less specific in the plan and to have the specifics put into the regulations which implement the plan. As far as I am concerned, the regulations can be drafted by the RFMC, and frankly I would be delighted if they were, and submitted along with the plans, rather than going through the essential two-step process that we presently do.

Frankly, I think that is more meaningful to the industry as well. I think the fishermen are looking for the regulations. They are not necessarily looking for the plan in most cases. In terms of understanding what is happening, that is a better way to go. The regulations can be changed much more easily than we can change the actual plan itself. But the plan can build in the kind of flexibility that allows the regulations to be changed in a very short period of time.

I would not want to say at the moment that we can go so far under that system as is presently done with state management of salmon on the West coast, where it is a day-to-day and often and hour-to-hour kind of operation, but we can get, I think, pretty close to that kind of effort.

So I think there is some real hope but not a great likelihood for major overhaul of the law at this point. Nor do I think it is necessary to achieve that particular objective. But it is going to take a degree of trust and cooperation between the Department of Commerce and the RFMCs to make that kind of system work.

QUESTION: My question is in the mackerel plan, to give you a concrete example, that we are developing. We are talking about different types of gear and there are gear conflicts very directly involved. We have yet to go to a public hearing, although we will be in January. Now, every developed regulation that will pertain to the type of gear and maybe season closures or area closures for a period of time will be in the regulations; from what you said, we could come back and very simply change the regulation to modify or

delete some method of harvest without having to go back through the thousand and eleventy-three days to alter the plan?

LEITZELL: That is correct. Basically what you need to do is to write into the plan enough of the framework of objectives that you are trying to achieve so that there is guidance for amending the regulations. You cannot simply write a one-line plan which says, "This plan is all," and then attach regulations. You need to provide a framework of policy that the RFMC is trying to apply to a particular fishery. But I think that can be done; it is done in most plans, anyway. The problem has been that in most plans all of the specific regulations, area closures, triplements, whatever you are dealing with, are put into the plan, so to change them you have to go through a plan amendment procedure. But put in the plan an objective that you are trying to prevent gear conflict and achieve an associated conservation of the resource and spell it out in some detail and then, in the regulations, specify the exact areas that will be closed or open and how you are going to separate gear and so forth. Then all you have to do if you have a change, for example, in the amount of effort that is available from a particular gear type, or if you have a change in availability of the resource in a particular area, is change the regulations. It is much easier—I am not saying it is the kind of thing to do like that—but it is much shorter than the eleventy-seventy-three day process that you mentioned.

QUESTION: How much shorter? What do you envision as the amount of time it would take to change the regulation in a plan?

QUESTION: Suppose the RFMC had met and decided upon a proposed change in regulation, and we then started through the process. Are we talking about thirty days, ninety days?

LEITZELL: It depends partly on the seriousness of the change but, if it is a change that has been worked through and appears basically non-controversial, you could presumably do it in fifteen days.

COMMENT: There are no non-controversial changes.

LEITZELL: The point being that when there is a controversial change you do have to provide for public input; if the RFMC has provided for the public input and there has been discussion and so forth, when you are done you could do it in fifteen days.

COMMENT: You are saying basically then that for anything that would be as possibly radical as a gear restriction, the prohibition of a type of gear, that we might very well have to go back to a public hearing in the area as opposed to just having a RFMC meeting.

LEITZELL: That is right; it depends on the amount of controversy involved. The point that was raised on the other hand, for example, is maybe you are dealing with a salmon plan and you are halfway through the season. The actual data collection during the season shows that the resource, the run

that year is, say, 30-40 percent higher than had been predicted, which it seems is not unusual these days with salmon. Presumably that would be a relatively non-controversial change to increase the overall yield. You would have problems of allocation amongst the user groups but again you could take care of that kind of thing quite quickly.

All I am saying is that you shorten the process after the RFMC has finished; that is the part that gets very short, so long as the RFMC involved has provided for adequate public process and public input when there is a controversial activity.

COMMENT: So then it is just a matter of advertising—

LEITZELL: It is a matter of a very short comment period of fifteen days in the *Federal Register* and it is in effect.

COMMENT: And the fact that your office will process it in that period of time.

LEITZELL: Sure. It can be done.

QUESTION: Recently there have been reports that you and Robert Kenecht of the Office of Coastal Zone Management (OCZM) have communicated about improving the habitat protection area of fisheries. Could you elaborate on some of the methods or means of cooperation that you anticipate to improve this area?

LEITZELL: Rober Kenecht, for those who do not know, is Assistant Administrator for OCZM. We have been having discussions for some time with regard to the fisheries aspect of coastal zone management plans under Sec. 306, which are essentially the implementation plans after the basic state coastal zone management plan has been approved. In the regulations which apply to implementation grants to states, NOAA has the authority to require that a certain amount of the funds given to a state be used for specific purposes. Two of the areas that we have talked about have been habitat protection and fisheries development, particularly the development of onshore areas in the coastal zone either for processing plants or service facilities or for docking facilities. We have been trying to encourage individual states, when they submit their implementation plans to us, to identify certain amounts of funds for these projects. We are still in the process of working all of this out, and there are still amendments to the Coastal Zone Management Act, which are being processed through the executive branch of the federal government and through Congress, which will deal with these particular kinds of problems.

How successful it will be in practice will depend to some extent on how much we in NOAA put pressure on individual states to look at specific kinds of activities in the coastal zone. Also, in a lot of states, success will depend on how effective the interaction is between coastal zone offices and the offices of fisheries or natural resources or whoever is in charge of those kinds

of resources.

But it is, in my view, an excellent opportunity to advance some of the concerns that I think are becoming very widespread in the industry, one of them being habitat protection. There is money in coastal zone and there is a lot more money available for dealing with these kinds of activities through coastal zone implementation grants than there is in the state-federal program or the grant-in-aid programs. In that sense it is a real opportunity that I want to take advantage of. I am going to be expanding the regional office field staffs in all of my five regions to deal more directly with fisheries-related coastal zone management activity. NOAA does not have a field staff that deals directly with coastal zone activities, that coastal zone management work has been done in Washington and we in the NMFS are going to at least see that the fisheries aspects are covered more directly from all of our field offices. So I see real opportunities in that area.

I must say that a year and a half ago at the last state directors meeting there was great pessimism expressed by the Fish & Wildlife directors with regard to the possibility of the use of coastal zone management money and coastal zone management planning to assist in fisheries management, and habitat protection development within individual states. I think that is gradually beginning to turn around; as Charles Fullerton says, it certainly has in California. It is partly a question of state bureaucracies and the interrelationship among the different offices in the executive branches of the states, but I think that opportunity is going to come to fruition and I look forward to it.

QUESTION: When will the proposed rules for a soft-shell project be sufficient to reach the *Federal Register?*

LEITZELL: The question refers to the basic guidelines for implementation of the fisheries development program; the industry-government cooperative part of the program was announced by the administration last May. They have been cleared by me, they have been cleared out of NOAA, and, quite frankly, we are at the moment working on cost-sharing provisions with the Office of Management and Budget. Once those are done they will be on the street. I mean it could be this week, it could be next, but it will be soon. At this point I think they are pretty good; I think they will provide a good basis for industry's submission of proposals. They are later than I would have liked, obviously.

COMMENT: I think your reference to that state directors meeting of a year and a half ago raises not skepticism so much as a concern that here under NOAA there were two agencies that were dealing with fisheries. We as state directors would have preferred if NOAA could have said, "Okay, we have got planning money in Coastal Zone Management but we are going to give that planning money to NMFS and only have one agency under NOAA

administering fisheries funds, even if there were some for planning." I think it was that attitude, rather than some other attitude that was of concern.

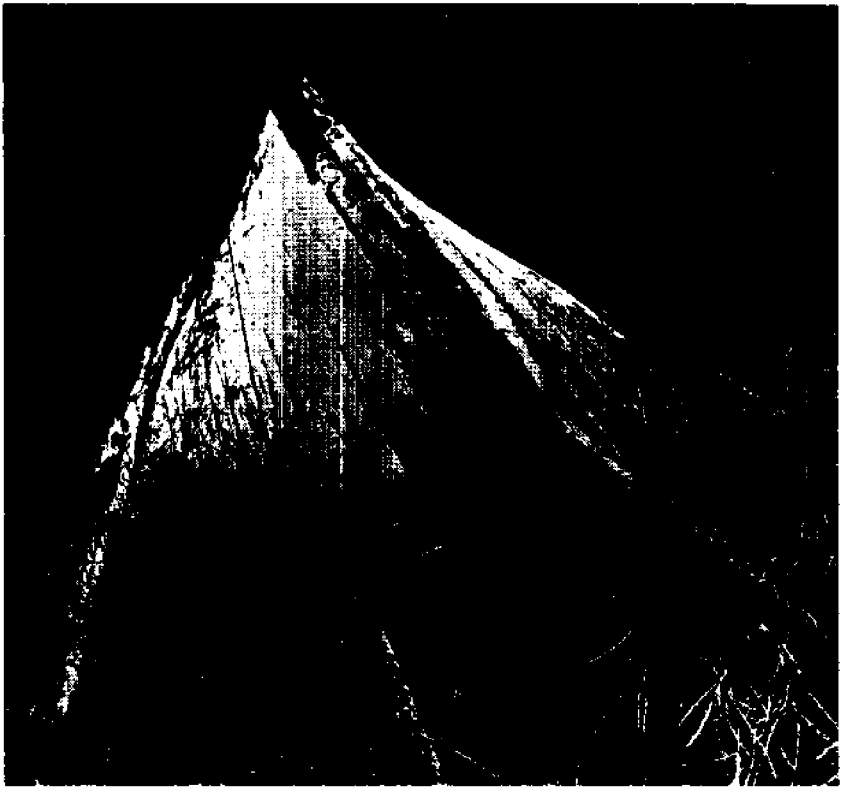
LEITZELL: Well, I think there is some truth to that. I think there have been problems in the past in coordination within NOAA between Coastal Zone Management Act planning activities and fisheries planning activities. The bureaucratically simple solution of having them give the money to us obviously would not work, but partly because many of the states involved did not want that kind of activity. Without trying to be critical I would have to say again that many of the coastal zone offices which were new in the states were not particularly anxious to have their fisheries administrators controlling some of the coastal zone planning money. They wanted more flexibility than that. I think that is changing, too. I think the relationships are becoming better as the coastal zone offices become more secure and understand their role. I think we can work it out without having to go through that kind of specific change.

I understand your problem, that it does make it difficult. If we can get all the states to support that kind of thing, I am sure we could manage to do it in Washington.

COMMENT: I want to say something about coastal state zoning. I was one of the optimists at that meeting a year and a half ago. I went back to our state and this year they gave us a grant of $50,000 to lay our plans out, with a guarantee of at least $200,000 next year to start implementing those plans on the fishery part of the coastal zone management. So there is a way if you are willing to go back and take a digressive attitude about it, to take some of the moeny from another bureaucracy and put it in your bureaucracy and get the work done.

Panel Presentation: Anadromous Species

Session Chairman: E. C. Fullerton



INTRODUCTION TO ANADROMOUS SPECIES PANEL

E. C. Fullerton
Director, California Department of Fish and Game

The management of anadromous fish presents many unique problems for state management agencies. These problems run the entire gamut of political, biological and socioeconomic considerations. True, it can be said that all management problems involve these factors. However, with anadromous fish, their unique biological requirements, migration patterns through many political jurisdictions, social significance in both Indian and non-Indian cultures and communities, and their high value as commercial and recreational resources place management demands on anadromous fish that are unequaled in other fisheries.

The quality of anadromous fish that is most responsible for creating these unique management problems is the fact that they *are* anadromous and migratory. This quality intertwines the political and biological aspects of management to the point where they cannot be addressed separately. Today the biopolitical aspects of anadromous fish management are the area requiring the most attention from resource managers. I consider the socioeconomic aspects of management to be on a different level. This is not to say that I consider the socioeconomic considerations to be of secondary importance. On the contrary, as I will show later, the socioeconomic value of anadromous fish is the driving force behind nearly all management efforts. However, until and unless the biopolitical problems are resolved, there can be no satisfactory resolution of the socioeconomic problems.

The biopolitical nature of the problem stems from the fact that anadromous fish are directly dependent on having access to suitable marine, estuarine and freshwater habitats. Management responsibility for these different habitats rests with a number of different political agencies, each one answering to a different constituency, and often not listening to one another.

A case in point is the management of Pacific salmon on the West Coast While at sea, Pacific salmon enter up to seven different zones of jurisdiction, each involving a different set of managers and a different constituency. These zones are the state waters of California, Oregon, Washington and

Alaska (inside 3 miles), the fishery conservation zone (FCZ) (from 3 to 200 miles), Canadian waters, and the high seas (beyond 200 miles). Interestingly enough, the zone in which we have been most successful in reaching agreement on management is the high seas. The Fishery Conservation and Management Act (FCMA) of 1976 claim of jurisdiction over anadromous fish of United States (US) origin beyond the FCZ has been recognized, and we have successfully negotiated international management agreements for salmon on the high seas. We have yet to negotiate a satisfactory management agreement with Canada and because of the sensitivity and complexity of the issues I will not go any further into this aspect. We have implemented management plans developed by the Pacific Fisheries Management Council in the FCZ and in state waters with varying degrees of success, depending on whose opinion you hear. Management measures developed by the Pacific Council have dealt entirely with ocean take restrictions. The reason for this is that the only direct control the FCMA has over anadromous fish, or any other fish for that matter, is the ocean harvest. And herein lies the major problem—for the causes for most of the decreases in salmon production in the Pacific relate to decreased freshwater production of fish and not to increased ocean harvest.

Management of the freshwater habitat is by far the most difficult aspect of anadromous fish management in the West, largely for political reasons. Management control is held by a multitude of federal, state and local governments ranging from federal agencies to local water districts. In the West the political clout in watershed and water management is held by agriculture, lumber, power and urban water interests. Fisheries have traditionally taken a back seat to these powers. Our primary problem is in providing sufficient water at the right time and right temperature, plus maintenance of and access to suitable spawning and rearing habitat.

The Pacific Council is preparing a comprehensive salmon plan which is to cover salmon and steelhead throughout their freshwater, estuarine and marine environment. The Pacific Council recognizes that the FCMA does not extend management authority into inland waters. Indeed, we in the West are very state rights-oriented regarding fish and wildlife management, and we strongly resist any attempt of the federal government to usurp state management authority in inland waters. This comprehensive plan is envisioned to be a broadly scoped document to be used as a management guide for the many agencies that have jurisdiction over inland fisheries, waters and watersheds.

Pacific coast states have a tradition of strong state fish and wildlife programs and we intend to continue this involvement in the future. In California, the state is planning to implement the most ambitious program to date to rebuild our anadromous salmonid resources. Information developed in the Comprehensive Salmon Plan should provide us with much-needed information to further this effort.

The impetus for the extraordinary time and effort being placed on anadromous fish management is, of course, the high socioeconomic value of anadromous fish. They are among the most valuable of all fisheries resources within the US. Pacific salmon alone usually rank in the top three in value of all commercial fish landed in the US. In 1978 the ex-vessel value of Pacific salmon was $254.5 million, third in value behind crab and shrimp. Unlike crab and shrimp, which have comparatively minor value as recreational fisheries, anadromous fish are among the most valuable of all recreational fisheries. In fact, many anadromous species are reserved as purely recreational species in many parts of the country.

Their social value to both Indian and non-Indian cultures, especially in the Pacific Northwest, is inestimable. Recent court decisions and interpretations of these decisions by the US Supreme Court have allocated salmon to certain treaty Indians. These allocations to treaty Indians have resulted in significant reductions in non-Indian recreational and commercial take of salmon. These non-Indian fisheries, especially the ocean recreational and commercial troll fisheries, are important to the economic well-being of many coastal communities and provide a unique life style that is highly valued by the participants. Any action to alter these fisheries, with resultant alteration of coastal economies and life styles, inevitably results in a storm of protest.

I have used the case of Pacific salmon management as an introduction to this panel on adadromous species for I feel that this case is an excellent example of the various management issues unique to anadromous fisheries management. The one area where we may differ from the other coasts is that I do not consider interstate problems to be the major unresolved management issues in the Pacific. As I stated earlier, the major problem lies in the freshwater environment, and, with the exception of the Columbia River, management of individual rivers and estuaries involves a single state, and a host of federal and local governmental agencies. It is hoped that attention at this conference will not be directed solely at state/interstate fishery management problems, but will include other intergovernmental relationships as well.

MANAGEMENT PRACTICES FOR ANADROMOUS FISHERY RESOURCES

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INTRODUCTION

First, let us define the subject of this presentation, i.e., anadromous

fishery resources. The word "anadromous" comes from the Greek words "ana," meaning "upward," and "dromos," which means "running," combined to become "running upstream." An anadromous fish, therefore, refers tc any species which enters freshwater streams to spawn and reproduce, but spends a major part of its life in the marine environment.

Anadromous fishery resources have been beset historically with major problems--both those occurring naturally and those associated with man's encroachment upon the environment. Naturally occuring phenomena, like the 1964 Alaska earthquake and the landslide at Hells Canyon on Fraser River, have taken large tolls on runs of anadromous fishes. Fortunately, most species are resilient and respond to man's attempts at management.

I will focus primarily on those management activities carried out by federal and state agencies designed to maintain and regulate the harvesting of anadromous fishes. Management of any fishery, no matter how localized, is a complicated and imprecise endeavor. Anadromous species, which require both fresh- and saltwater, which travel great distances in both of these environs and which flagrantly ignore jurisdictional boundaries, provide fishery managers with unique, and oftentimes bewildering challenges. How we have met these challenges and how we have dealt with the intricacies of managing these anadromous fisheries are the topics of this presentation.

OVERVIEW OF THE MANAGEMENT REGIME

To get an accurate perspective on the magnitude of the problems facing managers of anadromous fishes, we should recognize that there are roughly two-dozen anadromous species in the United States (US), ranging from Pacific and Atlantic salmon through other salmonids, striped bass, American shad and other river herrings, sturgeons, smelt, down to and including the infamous sea lamprey. During their life cycles, many of these resources pass through a multitude of different jurisdictions and, as a result, are subject to management under many different authorities, institutions, and agencies at different or, sometimes, at the same times. To illustrate this point, we can use as an example Pacific salmon, which during a life cycle may pass through as many as five different state and federal jurisdictions, and over which at least 15 agencies and institutions exercise some management control.

As adults, Pacific salmon of US origin may occur in the territorial seas and inland waters of the Pacific coast states, on Indian reservations, in the territorial seas or fishery conservation zone of foreign nations (e.g., Canada), in the US fishery conservation zone (FCZ), and in the open ocean seaward from this 200-mile FCZ. Pacific salmon of Fraser River (British Columbia) origin are subject to management control in a defined area under a US-Canada agreement. The management entity is the International Pacific Salmon

Fisheries Commission, and the implementing agencies are the National Marine Fisheries Service, the U.S. Fish and Wildlife Service, and the Canadian Department of Fisheries and Oceans.

When Pacific salmon of US origin occur beyond the US FCZ, they are subject to the exclusive fishery management authority of the US as provided by the Fishery Conservation and Management Act (FCMA) of 1976. The FCMA extended such authority to cover "all anadromous species throughout the migratory range of each such species beyond the fishery conservation zone; except that such management authority shall not extend to such species during the time they are found within any foreign nation's territorial sea or fishery conservation zone (or the equivalent), to the extent that such sea or zone is recognized by the United States" [Sec. 102(2)]. Japanese fishing for Pacific salmon on the high seas is currently governed by a 1978 protocol to the US-Canada-Japan International Convention for the high seas fisheries of the North Pacific Ocean. Pacific salmon of US origin are also intercepted by Canadian fishermen off British Columbia. Bilateral negotiations to limit these interceptions are underway. Similarly, Atlantic salmon of US origin are intercepted off the Canadian East Coast. The US is looking at ways to deal with this problem.

The FCMA established eight regional fishery management councils within specific geographical areas of the US, and charged each with the responsibility to "prepare and submit to the Secretary a fishery management plan with respect to each fishery within its geographical area of authority ... [Sec. 302(h)(1)]. The FCMA assigns responsibility for the implementation (i.e., promulgation of regulations) of such plans to the Secretary of Commerce. Although the FCMA further specifies that "to the extent practicable, an individual stock of fish shall be managed as a unit throughout its range, and interrelated stocks of fish shall be managed as a unit in close coordination" [Sec. 301(3)], the Secretary's implementation authority is confined to the FCZ and beyond, and may only extend into the territorial sea, which remains the realm of state authority, under very special conditions [Sec. 306]. Management plans for Pacific salmon have been prepared by both the Pacific and North Pacific Fishery Management Councils, have been implemented in the FCZ by the Secretary of Commerce through the National Marine Fisheries Service, and are enforced jointly by that agency and the US Coast Guard.

As noted above, with only one exception, nothing in the FCMA "is to be construed as extending or diminishing the jurisdiction or authority of any State within its boundaries" [Sec. 306(a)]. Therefore, management authority and responsibility for Pacific salmon within the territorial sea and inland waters reside with the fisheries agencies of California, Oregon, Washington, Idaho and Alaska. One exception to state management authority within state boundaries is with respect to fishing rights extended to certain Indian tribes.

Treaties of the US with a number of Pacific Northwest Indian tribes secure to the latter certain rights to take fish, including Pacific salmon, on their reservations and at their usual and accustomed fishing grounds outside those reservations. Indian tribes exercise management and regulatory jurisdiction over fisheries on their reservations. The federal courts, however, also have recognized certain degrees of tribal regulatory jurisdiction over their members' exercise of off-reservation treaty fisheries vis-à-vis the states in certain areas of the Pacific Northwest. These treaty fishing rights apply to all stocks of salmon under US control or jurisdiction, including jurisdiction exercised by the states, and entitle the tribes up to 50 percent of the harvestable salmon runs that, absent prior interception by other state citizens, would pass through or be available at any of the treaty tribes' usual and accustomed fishing grounds, wherever located. Currently, those rights have been expressly held to apply to many of the Washington salmon stocks originating from Grays Harbor, Washington, northward, and to all Columbia River-system salmon stocks originating above Bonneville Dam.

RESOURCE USERS

Now that we have briefly identified some of the resource problems and jurisdictional complexities that confront the managers of anadromous fisheries, using Pacific salmon as an example, let us not overlook the difficulties in dealing with the multitudes of competing fishermen. Basically, there are three major groups: recreational fishermen, commercial fishermen and subsistence fishermen.

Recreational fishermen are far from being a homogenous group always having the same common fishery interests and objectives. Indeed, there are fly fishermen, spin fishermen, bait fishermen, bank fishermen, pier fishermen, boat fishermen, etc. These, in turn, may be further subcategorized, e.g., rental-boat fishermen, "head-boat" fishermen, charter-boat fishermen, private-boat fishermen, "still" fishermen, troll fishermen, etc. Similarly, commercial fishermen are also highly heterogeneous and employ a variety of fishing gears and methods. There are trawl fishermen, trap fishermen, troll fishermen, gill-net fishermen, seine fishermen, spear fishermen, set-line fishermen, etc For subsistence fishermen probably the only commonality is their need to take fish for survival purposes. The degree of inter- and intra-group competition among so many factions should be abundantly obvious. The fishery manager, of course, is expected to assure the present and future well-being of the resource, while satisfying the needs of each of these competing fishermen. As any fishery manager with more than a few weeks of experience can tell you, this borders on being an impossible task.

MANAGEMENT PRINCIPLES AND PRACTICES

The first National Standard of the FCMA with respect to fishery management is that "Conservation and management measures shall prevent overfishing while achieving, on a continuing basis, the optimum yield from each fishery" [Sec. 301(a)(1)]. The FCMA defines the term "optimum yield" from a fishery as "the amount of fish (A) which will provide the greatest overall benefit to the Nation, with particular reference to food production and recreational opportunities; and (B) which is prescribed as such on the basis of the maximum sustainable yield from such fishery, as modified by any relevant economic, social or ecological factor" [Sec. 3(18)]. Within the general context of these fundamental fishery management principles, i.e., preventing overfishing while achieving (and, to the extent possible, increasing) optimum yield, there are three broad categories of management practices that are applied to anadromous fisheries resources: (1) those that serve to protect, maintain and restore environmental quality; (2) those that serve to enhance resource production; and (3) those that serve to conserve the resources.

1. Maintenance and Restoration of Environmental Quality

Anadromous fishes are unique in that as adults they enter freshwater rivers and tributary streams to reproduce. In that regard, the protection, maintenance and restoration of freshwater habitat is perhaps the single most important and cost-effective effort that can be made to assure continued natural production of the stocks. The key element of this effort is the prevention and abatement of organic and inorganic pollution.

Prevention and abatement of organic and inorganic pollution in streams has been a common concern of fishery managers for many years. In many cases, freshwater environments have not yet been restored to conditions that will support pre-pollution levels of anadromous fish populations, and perhaps never will. On the other hand, we can point to several instances of success in recent years where massive pollution-abatement programs have contributed in whole or part to the restoration of anadromous fish runs. I refer, for example, to the Connecticut River in New England and the Willamette River in Oregon.

In 1978, over 90 adult Atlantic salmon returned to the Connecticut River. This is the largest run of salmon to return to that river in well over 100 years. Abatement of human, industrial and agricultural pollutants, combined with other intensive management practices in recent years, has contributed greatly to that occurrence. Similarly, the Willamette River had, for many years, been so polluted during the summer and fall that salmonids suffocated while simply trying to swim through the lower portion of the

river on their upstream migrations. In the 1960s an extensive campaign to clean up the river proved highly successful. Reestablished runs of fall chinook and coho salmon now pass successfully through the lower river to upstream spawning areas.

Measures aimed at preventing and abating stream siltation include a variety of techniques to control soil erosion in watershed areas. For example, in areas where cattle and sheep graze near fragile watercourses, the Bureau of Land Management (BLM) has encouraged the erection of fences to prevent encroachment of those animals along stream banks, thereby protecting, or allowing the recovery of, shoreline vegetation. Similarly, most Western states have regulations pertaining to timber harvesting that require leaving undisturbed "buffer strips" of trees along streams during logging operations. This type of "preventive maintenance" is much preferred to after-the-fact rehabilitation measures. Additionally, many states require seeding, sodding, or replanting of stream banks with trees such as willows following logging, road construction, or similar operations to reduce water runoff, minimize siltation of streams and, in some cases, provide shade for maintenance of stream temperatures and shelter for the fish.

2. Enhancement of Resource Production

Resource enhancement practices may be divided into two key components: (1) environmental alteration and (2) artificial propagation and stocking.

Environmental alteration has proved a useful practice for enhancement of anadromous resource production. It includes, for example, such measures as adding gravel to low-production streams to increase and extend spawning areas; adding sills to modify riffle/pool ratios; removing dams, log jams, and other natural and man-made barriers to fish passage; and constructing fish ladders and lifts over impassable barriers. Although dams on anadromous fish rivers are generally considered detrimental, there are certain situations in which they can be beneficial to anadromous resources. The Shasta Dam in California, for instance, has allowed for controlled flow of suitable temperature water, and now salmon run upstream and spawn year-round. This is a unique situation, but one that could and should be considered by managers in developing future management programs for anadromous fishes.

Artificial propagation, a major resource-enhancement effort practiced in the US and elsewhere in today's world, consists of constructing, operating and maintaining hatcheries, spawning channels, gravel incubators and other similar structures. Artificial production has been successful on both the East and West Coasts of the US for many anadromous species.

Hatcheries have been in common use on the West Coast for salmon since the late 1800s, and many dwindling runs have been salvaged and restored

because of hatchery production. Later on, I will discuss in further detail the Columbia River Fisheries Development Program and the effect its hatcheries have had on the runs of salmon into the Columbia basin.

Spawning channels are relatively new in fisheries propagation. In essence, a streambed-like channel is constructed, the proper gradient determined, gravel of a specific size and depth deposited, and the flow of water controlled. In recent years, spawners have been metered into such channels so that the proper adult densities are attained over the spawning gravel. This technique has been very successful in certain areas with certain species, but less than successful in others. It requires an adequate supply of spawners, proper water quality, and the proper environment for rearing the juveniles.

Another technique used successfully to enhance salmon runs is to plant eggs in the natural gravel of the streambed. Occasionally a surplus occurs at a hatchery egg-taking station and these eggs are fertilized and transported to areas underutilized by adult spawners, and deposited in the gravel by hand. This is not a technique that lends itself to large production of fry, but can be a key procedure for opening up new areas or providing for naturally produced and reared fry in areas blocked by an obstruction.

A procedure which has received much publicity lately, and which shows a great deal of promise, is a technique known as "ocean ranching." This concept differs little from normal hatchery operations except that it relates usually to a privately owned commercial operation, whereby the fry are liberated to migrate to the ocean to feed and grow, captured while ascending their natal streams to spawn, and then sold. Enough eggs are taken to maintain or increase the numbers of fish coming back and to offset those losses to ocean and river fisheries, as no control can be exerted over the fish while they are in the public domain.

Many new runs and new populations have been established through the use of hatchery production, and stream-stocking techniques. Striped bass were successfully introduced into waters on the West Coast as far back as the mid-1800s, and have been successfully reproducing ever since. More recently, hatching, rearing and stocking techniques have been used to introduce stocks of striped bass into the coastal waters of the Eastern and Gulf States, and have even provided naturally reproducing stocks within the inland waters of Kentucky, the Carolinas, Oklahoma, Virginia and Texas.

No one who is conversant with management techniques can fail to note the successful introduction of coho and chinook salmon into the Great Lakes system in the 1960s. This was a successful filling of an ecological niche by a suitable species; it has not apparently upset any biological community, yet has provided for a very successful recreational fishery.

3. Conservation of the Resources

Conservation of anadromous fishery resources, as with other fishery resources, may be viewed as dealing with two major objectives: (1) minimizing natural mortality, and (2) controlling fishing mortality.

Aside from protecting and maintaining a healthy environment that will minimize the natural mortality of anadromous fishery resources, fishery managers have taken additional active steps in recent years toward meeting this objective. Again using Pacific salmon as an example, fish screens have been placed at entrances to irrigation channels and industrial water diversions to protect downstream migrants from being stranded on agricultural fields, or from being killed by machinery. Fingerling bypass systems have also been installed at many hydroelectric facilities to keep juvenile fish from being funneled through power-generating turbines. Flow regulation on many dammed rivers and streams has been successfully used to lessen nitrogen supersaturation of the water during times of heavy migration. This condition of nitrogen supersaturation causes a condition known as "gas bubble disease" on both juvenile and adult fishes, and has been a serious problem below moderate to high-head dams during periods of high flow over the spillways. In addition to flow regulation, physical modification of spillways has also successfully reduced this problem.

Another technique that has proved successful in protecting downstream migrants has been the physical transportation of fish downstream past dams and associated areas of unacceptable water. At hatcheries or collection stations, the fish are loaded into tank-trucks or barges equipped with aeration devices, and are then trucked or barged downriver for release below the problem areas. This technique is quite costly, but is successful in protecting salmon smolts.

Controlling fishing mortality is, of course, critical to the conservation of anadromous fishery resources. Since fishes cannot be trained to protect themselves from overharvest, fishery managers must limit harvest by regulating the users. All of us are familiar with such regulatory practices as the establishment of seasons, size limits, quotas or "bag" limits, gear restrictions, areal restrictions, etc. The primary purposes of such regulations has been, and remains, to control harvest and to allocate that harvest in some predetermined fashion among the competing fishermen. More recently, however, fishery managers have been challenged to develop and implement even more sophisticated schemes for allocating harvestable surpluses among competing users, especially as a rapidly expanding number of resource users seek to harvest limited numbers of fish. Without placing limits on the number of users that can engage in a fishery, as well as limits on the harvest, the only possible outcome over time is smaller and smaller shares of the harvest for each competing user. If left unchecked, this will eventually result in

unacceptable economic opportunities for commercial users, and unacceptable "enjoyment" opportunities for recreational fishermen. Therefore, while still in early stages of trial and development, several states have implemented moratoriums on licensing in certain fisheries, and one state (Alaska) has already implemented a full-fledged program to limit and reduce the numbers of fishermen in many of its fisheries, including those for Pacific salmon. Indeed, the entire concept of public domain, as it pertains to fish, is being questioned and scrutinized more critically, and this inquiry will probably intensify in the future.

CASE STUDY: COLUMBIA RIVER

One of the more elaborate projects to restore and manage anadromous fishery resources has been the Columbia River Fisheries Development Program, where management practices are used to salvage the fishery from possible extinction and are allowing it to regain its place as a viable and important industry in the Pacific Northwest.

The Columbia River and its tributaries comprise a watershed of approximately 259,000 square miles, or an area the size of Texas. Vast areas of Idaho, Washington, and Oregon are drained by the Columbia and its tributaries. A total of five species of salmon are found in the Columbia River, and have sustained a commercial fishery since about 1860. The total annual catch of salmon ranged between 20 and 40 million pounds from 1870 to 1930, then dropped to a low of about 10 million pounds annually in the early 1960s. This precipitous decline was not due entirely to overfishing and poor management practices, but due in a large part to the fact that mainstream dams on the Columbia shut off much of the natural spawning area. It is estimated that dams, irrigation projects, logging and industry have reduced by one-half the spawning areas available in the Columbia drainage for anadromous fish.

This problem, and the need to rectify it, was recognized over 40 years ago when the Mitchell Act, which authorized the Columbia River Program, was passed. Its prime purpose was to compensate for the damage that federal water projects had done to the anadromous fishery resources. The Mitchell Act authorized the construction of salmon hatcheries and attendant engineering and biological investigations necessary to conserve the fishery resources of the Columbia River. It also authorized construction and maintenance of devices in the basin to improve feeding and spawning conditions for fish, to protect migratory fish from irrigation projects, and to provide for free migrations over obstructions.

The major emphasis over the years has been the construction and operation of hatcheries. A total of 22 hatcheries are funded by the program, and produce over 100 million smolts annually. In addition to producing increased

runs of fish, the program protects and enhances the natural production by funding the construction and maintenance of fish screens, and fish passage devices. A total of 720 fish screens have been installed to protect downstream migrants from being shunted into irrigation canals. A total of 86 fishways have been constructed, two in Idaho, 56 in Washington, and 28 in Oregon, to assist adult salmon in proceeding upstream to their spawning areas.

In addition to these items of direct benefit to the salmon resources, the program has funded research studies to improve hatchery techniques, and to provide information on survival, migration, and timing of runs.

The total funding for the program has increased through the years to about $6 million annually. The benefit/cost ratio is 4.2 to 1 for fall chinook, and 7 to 1 for coho salmon. The total catch of salmon has increased from the low of about 10 million pounds a year in the early 1960s to over 30 million pounds annually together. We feel that the program has been a success, due to the application of successful conventional management practices, and the development of new and sometimes unique techniques such as travelling screens, automated feeding devices at hatcheries, and fish transportation schemes.

In summary, I would say that through the years fishery managers have successfully applied management techniques to anadromous fish, and have usually succeeded in protecting the resources. Much is yet to be learned, however, and this will present a challenge to the biologists of tomorrow. The greatest challenge will not be in simply protecting the resource, but in satisfying the demands of an ever-increasing public, while watching the environmental quality diminish.

RESTORATION OF ANADROMOUS FISH TO THE CONNECTICUT RIVER: IMPACT OF COMPETING ACTIVITIES

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The Connecticut River flows 660 km from northern New Hampshire, approximately due south to Long Island Sound at Saybrook, Connecticut (Fig. 1). The elevation at Fourth Connecticut Lake in New Hampshire is 800 m (mean sea level). The river drains a basin of 29,000 km^2 of which one percent is within the Province of Quebec, 27 percent within New Hampshire, 35 percent in Vermont, 24 percent in Massachusetts, and the remaining 13 percent in Connecticut (Stolte, 1979).

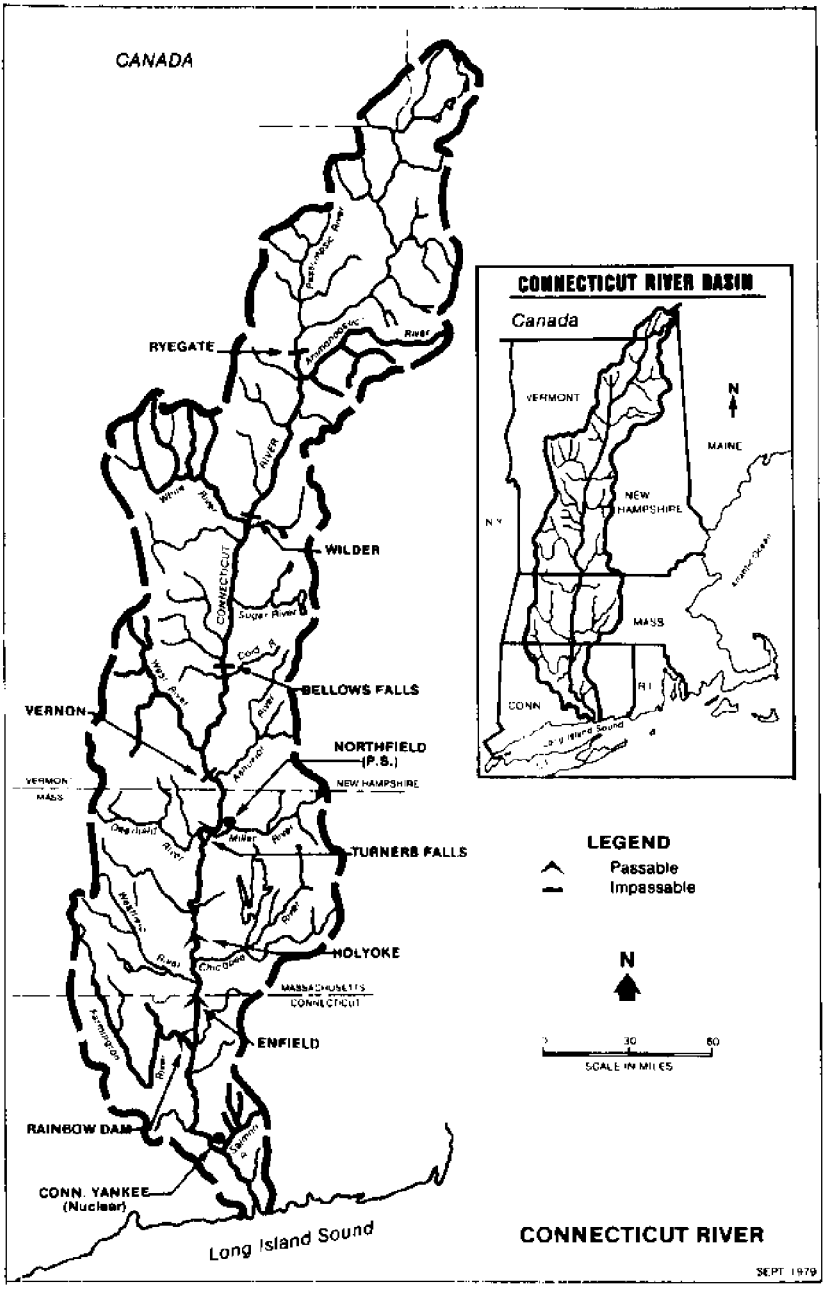

FIGURE 1. Connecticut River Basin.

Precipitation in the generally forested watershed ranges between 110-120 cm per year. In the upper reaches in the White and Green Mountains annual precipitation can include in excess of 100 cm of snow annually.

Over two million people reside in the watershed, primarily in the states of Massachusetts and Connecticut, with basin land use divided between forest (79 percent), cropland (9 percent), pasture (4 percent), urban areas (4 percent) and other related uses (4 percent).

Mean monthly flows at Thompsonville, Connecticut, for the period 1968-1976 ranged from a high of 1500 cms in April and May to a low of 200 cms in August and September (Stolte, 1979). Water temperatures during the same period at the same station averaged a low of 1.6° C during January to a high of 25.6° C in July and August.

Sixty-three fish species make up the freshwater resident and anadromous fish community of the watershed with several salmonids occurring as routinely stocked fish and part of the particular states' fisheries management program. The principal anadromous species are sea lamprey *(Petromyzon marinus)*, shortnose sturgeon *(Acipenser brevirostrum)*, blueback herring *(Alosa aestivalis)*, alewife *(Alosa pseudoharengus)*, and American shad *(Alosa sapidissima)*. Atlantic salmon *(Salmo salar)* supported a substantial commercial fishery in colonial times.

Historical records leave little doubt that the fisheries of the Connecticut River were important to the native Americans as well as the early European settlers in the region. However, the utility of the river, first as a major transportation system and later as a source of water-driven power (both requiring dam construction), led the way to an early decline in many of the important anadromous fisheries, particularly salmon and shad. In a review of the history of the Connecticut River fisheries, Douglas Moss (1960) suggests the relevance of earlier history to the problems in more recent times. His opening statement is quoted as follows:

> *It is a matter of interesting record that the history of the Connecticut River is filled with accounts of conflict by divergent interests in the exploitation of this body of water. A resume from old histories of the Connecticut Valley is enlightening and causes us to realize that many problems of today are not without precedent.*

The first major development to directly impact anadromous fish, principally Atlantic salmon, was the construction in 1798 of an impassible 5-meters-high dam at Turners Falls, Massachusetts (Fig. 1) (Moss, 1960). The purpose of the dam was to assist in the development of locks and canals for water transportation. Four years following the completion of this dam, salmon were no longer observed attempting to pass upstream.

Downstream of Turners Falls at Holyoke another natural falls became a prime site for placement of a dam. Several were built and subsequently destroyed during the first half of the 19th century, and the present 9-meters-high dam was constructed in 1900. The lowermost dam at Enfield, Connecticut, also built to provide water for a transport canal, was completed in 1829 (Merriman and Thorpe, 1976).

Dams further upstream, presently without fish passage facilities, which block the known migrations of salmon and shad, occur at Vernon, Bellows Falls and Wilder, Vermont (Fig. 1). Built after Turners Falls, these had negligible historical impact on the fate of anadromous species.

The present Connecticut River Anadromous Fish Program became an official multistate/federal[1] effort with the signing of a formal cooperative agreement in June of 1967 (Devine, 1971). The established program goals were to:

1. realize the full potential of the fishery resources of the Connecticut River;
2. provide the public with high-quality recreational fishing opportunities in a highly urbanized area; and
3. provide for long-term seafood needs.

Specific research and management efforts would be keyed to enhancing and maintaining populations of resident fish species and establishing sustained runs of anadromous fish in the Connecticut River basin with emphasis on American shad and Atlantic salmon. The planning and implementation of a program would be carried out by the Technical and Policy Committees for Fishery Management of the Connecticut River Basin. Devine (1971) reviews the establishment, organization and goals of the committees. The purpose of this paper is to look at the major impacts or potential impacts of various competing uses of the river and fishery resources, and the committees' efforts to deal with them. The following areas will be reviewed:

1. adequacy of fish passage facilities;
2. water development projects;
3. water quality; and
4. fisheries management.

COMPETING ACTIVITIES

Fish Passage Facilities

The first insurmountable barrier to anadromous fish migration exists at Holyoke, Massachusetts (Table 1). After receiving a Federal Power Commission license in 1949, the Holyoke Water Power Company experimented with

[1]Voting membership consists of representatives of the fishery agencies of the states of Connecticut, Massachusetts, New Hampshire, and Vermont as well as the U.S. Fish and Wildlife Service and National Marine Fisheries Service.

TABLE 1. Barriers to anadromous fish migration on the Connecticut River, type and status of passage facilities.

Name of Dam	Location	Height	Ownership	Passage Facilities	
				Type	Status
	(km from mouth)	*(m)*			
Holyoke	137	9.1	Holyoke Water Power Company (Northeast Utilities)	fish elevator	completed[1]
Turners Falls	195	11.0	Western Mass Electric Company (Northeast Utilities)	fish ladders	under construction[2]
Vernon	227	10.7	New England Power Company	fish ladder	under construction[3]
Bellows Falls	277	9.8	New England Power Company	fish ladder	Settlement Agreement signed and order issued by FERC[4]
Wilder	347	18.6	New England Power Company	fish ladder	Settlement Agreement signed and order issued by FERC[4]

[1]A Settlement Agreement between the fishery agencies and the power company allows for expansion of the present facilities as the population expands.

[2]Estimated completion date is 1 May 1980; project is ahead of schedule.

[3]Estimated completion data is 1 May 1981.

[4]A Settlement Agreement signed between the fishery agencies and the power company implements a design and construction schedule based upon specified numbers of adult Atlantic salmon returning to Holyoke.

various fish passage devices and by 1955 was lifting shad above the dam with an elevator system (Henry, 1977). Between 1969 and 1972, designs for improved passage facilities at Holyoke, new facilities for Turners Falls, Vernon, Bellows Falls and Wilder on the mainstem, as well as Rainbow Dam on the Farmington River, an important tributary in Connecticut, were completed (Devine, 1973). Based on the completion of passage design parameters, the Technical and Policy Committees began negotiations with the various utility companies. By 1972 the program coordinator could report the completion of an agreement between the Policy Committee and the Holyoke Water Power Company for an expanded fish elevator system capable of passing one million shad and forty thousand Atlantic salmon. Various improvements in the fishlift have resulted in passing a higher percentage of shad entering the river (Henry, 1977). A record 346,000 shad were lifted in 1976, and over 255,000 in 1979. Additionally, 23 Atlantic salmon were successfully trapped at Holyoke in 1978, with another 18 accounted for in the trap in 1979, as the result of stocking efforts.

In 1972, the Farmington River Power Company, operators of the Rainbow Dam on that river, agreed to construction of a fish ladder at that facility. Construction funding was provided, through a cooperative agreement, by the Connecticut Department of Environmental Protection, the Farmington River Power Company, and the U.S. Fish and Wildlife Service as a federal aid (Dingle-Johnson) project. Initial operation of the ladder began in 1976 with the successful passage of 1204 shad (Moffit, 1979). In 1978, 55 salmon were trapped at Rainbow and an additional 23 have been captured for broodstock purposes in 1979.[2]

Negotiations were underway by 1972 for passage at Turners Falls, owned by Northeast Utilities, and Vernon, Bellows Falls and Wilder Dams, owned by New England Power Company (Devine, 1973). Initial failure to reach agreement between the committees and the Western Massachusetts Electric Company (Northeast Utilities is the parent company) resulted in formal adversary hearings before the Federal Power Commission[3] between the four basic states, who were joined by four private organizations (For Land's Sake, Massachusetts Public Interest Research Group, Trout Unlimited, and Environmental Defense Fund) and the utility company in October of 1975.

However, midway through the hearings an out-of-court settlement was reached, which called for the completion of two of three needed fishways at Turners Falls by 1981. Provisions for earlier construction of the third (spillway) ladder were to be based upon the financial status of the company or the finding of more than 500 dead shad below the dam (Lanse, 1977). An actual count of 4997 dead shad in 1976 triggered the simultaneous

[2]As of August 15, 1979.

[3]Now known as the Federal Energy Regulatory Commission.

construction of all three fishways at Turners Falls in 1978, with anticipated completion in 1980 (Table 1).

During 1975-76, negotiations between the basin states' fishery representatives, again joined by the four private organizations, and the New England Power Company began. These negotiations involved fish passage at Vernon, Bellows Falls and Wilder.

A Settlement Agreement, signed in October of 1978 and subsequently approved by the Federal Energy Regulatory Commission (FERC), has established the timetable for fish passage at these sites. Construction at Vernon began in May of 1979 (Table 1). The ultimate construction of ladders at these upstream locations will provide access to several of the major historical spawning grounds for Atlantic salmon and to all of the habitat formerly utilized by shad (Fig. 1).

All early negotiations and agreements to date have been primarily to provide for upstream fish passage for adult anadromous fish. However, the need for adequate downstream passage was recognized, and Devine (1973) outlined studies to be undertaken to assess the effects of barriers on the downstream migration of both adult and juvenile shad.

The Connecticut River historically has had a large proportion (38-41 percent) of repeat spawners of shad in samples taken near the mouth of the river. This repeat spawner component has been shown to be a significant element of the spawning migrations (Jones et al., 1977; Leggett, 1976). Since the most recent improvements in the Holyoke fishlift (Henry, 1977), the proportion of shad entering the river that have been lifted over Holyoke has ranged from 34 percent to 72 percent in 1979 (Steve Henry, personal communication), compared to less than 15 percent in previous years. Above Holyoke, downstream migrants enter the Holyoke canal system and can return successfully to the river only by passing through a variety of electrical turbines, unless excessive river flows remove flashboards. In this event some adult shad pass down over the dam. The obvious high mortality of adult shad trying to pass downstream from above Holyoke has resulted in recent efforts by the utility company to devise a two-step system of electrodes to guide outmigrants. The first electrode array prevents fish from entering the uppermost canal system, while the second array acts as "standard" direct current shocker to divert fish into a by-pass tube around the turbines. Indications from efforts in 1979 suggest the latest designs have considerable promise in successfully guiding downrunners, especially adult shad (John O'Leary, personal communication).

DEVELOPMENT ACTIVITIES

Fish passage facilities directly affect access to needed spawning grounds and can result in the extirpation of anadromous fish from a river basin.

In the second half of the twentieth century, however, increasing attention has been given to the effects of other development activities upon anadromous fish. Dredge and fill operations, construction of nuclear or fossil-fuel steam electric stations, and pumped storage hydroelectric projects are typical examples of projects that can have adverse impacts on fish populations. Two projects on the mainstem Connecticut River below Vernon Dam have been evaluated in relation to their possible effects on anadromous fish. The first was the operation, beginning in 1967, of Connecticut Yankee Power Plant at Haddam Neck on the lower Connecticut River and the second was the operation of the Northfield Mountain Pumped Storage Hydroelectric plant in Northfield, Massachusetts (Fig. 1, Table 2).

The number of investigations addressing the life history of the American shad and its contribution to the fishery attest to the commercial and recreational importance of the species (Table 2). A review of these studies is presented in Jones et al. (1977). Consequently, many of the ecological investigations carried out as a result of the construction and operation of the Connecticut Yankee Atomic Power Plant concentrated on shad (Leggett, 1976; Marcy, 1976).

Leggett concluded that the thermal plume of the plant was not an impediment to the upstream or downstream migration of adult shad. This was due in part, he felt, to (1) the location of the river channel, which is proximal to the river bank opposite the plant, and (2) the fact that the shad are strongly oriented to the main river channel.

Marcy, working with the early life-history stages (eggs, larvae, and juveniles), concluded that the effect of shad egg entrainment in the power plant could result in the loss of one adult shad to the population and that the operation of the plant did not affect known shad spawning areas. Again the resulting impact was minimized due to plant location, which was approximately 16 km downstream from the lowermost known spawning areas. Investigations of the effect of the heated effluent on young-of-the-year shad clearly showed that temperatures were elevated to a level that would cause substantial mortality (12.5-100 percent). However, additional investigations indicated shad could detect, and thereby avoid, the lethal temperatures (Marcy et al., 1972; Marcy, 1976). Investigators thus concluded that plant operation had a negligible thermal effect on young shad.

The impetus to have a broad-based ecological study concerned with the impacts of the Connecticut Yankee Atomic Power Plant was the result of a permit issued by the Connecticut Water Resources Commission (Merriman and Thorpe, 1976). At the time of the issuance in 1964, the Policy and Technical committees were not in existence. However, the second major

TABLE 2. Factors affecting certain anadromous fish evaluated by various environmental studies associated with the operation of two projects on the mainstem Connecticut River (yes = evaluated, NA = not applicable).

Species	Migration		Impingement		Entrainment			
	Juveniles	Adults	Juveniles	Adults	Eggs	Larvae	Juveniles	Adults
Connecticut Yankee Atomic Power Plant								
river herring[1]	no	no	no	no	no	yes	NA	NA
American shad	yes	yes	no	no	yes	yes	NA	NA
Atlantic salmon[2]	no	no	no	no	no	no	NA	NA
Northfield Mountain Pumped Storage Hydroelectric Project								
American shad	yes	yes	NA	NA	no	no	yes	yes
Atlantic salmon	yes	no	NA	NA	NA	NA	yes	NA

[1]Blueback herring *(Alosa aestivalis)* and alewife *(Alosa pseudoharengus)*.

[2]This species did not exist as part of the finfish fauna of the Connecticut River during the first two years of study (1965-1966) and thereafter in only limited numbers resulting from initial introductions related to the restoration effort (Stolte, 1979).

mainstem development proposed during the 1960s, the Northfield Mountain Pumped Storage Hydroelectric Project, was issued a construction and operation license in 1968. Resident fish and anadromous fish studies conducted for the applicant, Northeast Utilities of Berlin, Connecticut, were the result of direct input by Policy and Technical committees.

During the resident fish survey, 22 of 25 species sampled in the Turners Falls Pool (the lower reservoir for the plant) were collected in the upper reservoir between 1973-1975. This included, in 1973, an Atlantic salmon smolt, apparently the result of fry stocking research being done in the White River Watershed in Vermont (Meyers, 1977).

Research conducted between 1973-1978 studied the impact of plant operation on the migratory behavior of shad adults and juveniles, as well as salmon smolts. Entrainment of juvenile shad and salmon smolts was also monitored during the investigations. Layzer (1978a) found that some observed shad behavior that could interrupt directed upriver migration of adult shad was related to the pumping cycle of the Northfield Mountain operation. However, under the conditions of trucking fish from Holyoke, and other factors related to his studies, he concluded that plant operation had minimal effects on shad behavior.

Migration of juvenile shad past Northfield Mountain revealed that only 13 percent of the radio tagged fish moved past the plant tailrace during the pumping cycle and none of these were entrained (Layzer, 1978b). Apparently

their normal daily migration peaks occur either when the plant is not operating or is in a generating mode, thus reducing the probability of entrainment.

Work involving Atlantic salmon smolts was initiated in 1976 to determine the possible entrainment of migrating smolts. This study recognized that the major natural salmon reproduction estimated to take place in the watershed will be above Vernon Dam (Stolte, 1979). Therefore, any major entrainment of salmon smolts could have a serious impact on the entire salmon restoration effort. Due to the study design and variability of plant operation, an absolute mean percentage entrainment was impossible to predict. Findings did show that 13 percent of the smolts observed during the pumping cycle, which diverted 10-20 percent of river flow, were entrained. Additionally, entrainment increased with increasing river flow diversion. When 73-75 percent of the river flowing past the tailrace was diverted, entrainment approached 70 percent (Layzer and O'Leary, 1979).

Research related to the operation of these two projects, while not necessarily complete (Table 2) has been quite extensive with regard to the two major species of concern to the Policy and Technical committees. Both projects, though of different types, are electrical generating units. Hydroelectric generation is a third major man-made use of the river impacting both resident and anadromous fish resources. Although discussed earlier in the context of fish passage facilities, another concern to the fishery agencies is flow levels. Stolte (1979) lists 14 dams on the mainstem Connecticut, 11 of which are used for hydroelectric generation and consequently alter "normal" river flow to optimize generating capacity.

Flow on these run-of-the-river hydroelectric stations is manipulated during low-flow periods to optimize the production of peaking power. Consequently, several reaches of the river, such as the Holyoke Pool between Holyoke and Turners Falls (Fig. 1), show daily fluctuations in water level, depending upon whether water is being stored or electricity is being generated.

During periods of upstream water storage (during normal low-flow periods), substantial water reduction can take place downstream; this has a serious detrimental effect on anadromous fish, especially the juvenile stages of shad, which are riverine residents from approximately June to November. In a 1970 report by the Corps of Engineers, a flow of 0.20 cfsm (cubic feet per second per square mile of upstream drainage area) was recommended at water control structures to protect fishery resources. Although both the Fish and Wildlife Service and the Policy and Technical committees recommended 0.25 cfsm, the former figure was accepted by the study and is presently the guiding instantaneous-flow regulation used in the Connecticut River Basin (Ben Rizzo, personal communication) and was recently (June, 1979) recognized by the Federal Energy Regulatory Commission in a

long-term license issued to the New England Power Company to operate Vernon Dam. A flow of 0.20 cfsm in the Connecticut River Basin equals about 12-13 percent of mean annual flow and is recognized as a minimal "fish survival" flow. The U.S. Fish and Wildlife Service is presently reviewing flows in typical New England rivers for the purpose of establishing a flow policy (in terms of cfsm or percentage mean annual flow) to further protect and/or enhance fish resources.

WATER QUALITY

Stolte (1979) indicates that over two million people inhabit the Connecticut River Basin, and the majority reside downstream from Turners Falls. Large population centers are located at Springfield, Massachusetts, and Hartford, Connecticut, and substantial industrial complexes have been developed in the vicinity of these centers. Additionally, with cropland utilizing 9 percent of the basin's land, organic pollution as well as agricultural pesticides, in addition to industrial process discharges, have had a continuing adverse impact on the water quality of the Connecticut River.

As a result of advances made in waste water management during the last 10 years, water quality is no longer a serious impediment to the salmon restoration effort (Stolte, 1979). Certainly temperature and dissolved-oxygen parameters generally fall within the preferred range suggested by DeCola (1970, 1975) (Table 3). Sampling of resident fish, particularly white perch, *(Morone americanus)*, suggests that pesticide residues are declining and are not inhibiting populations of these species.

Heavy-metal residues have been found in whole-tissue samples of resident fish as well as adult salmon, but the impact on Atlantic salmon or shad is not well known. As Table 3 suggests, less historical work has been done in this area than on pesticides, yet heavy-metal contamination cannot be overlooked as a problem area to be assessed and addressed. In 1978, when 77 adult spring-run salmon returned to the Connecticut River, all but one ultimately died prior to spawning. Of those that died only 60 percent tested positive for the presence of furunculosis. Although heavy metals were not directly implicated, rather intensive investigations were performed on several fish to determine the presence of pesticides or metals.

Connecticut River adult salmon possessed about equivalent or slightly lower levels of pesticide residues than resident fish, but substantially higher levels (1.25-21.6 times greater) than resident fish from the Penobscot or Kennebec Rivers in Maine, which also support adult salmon runs. Heavy-metal sampling indicated that the salmon carried generally higher levels than resident species (Table 3) in the Connecticut River, as well as higher levels than resident fish from the Kennebec or Penobscot (Gary Taylor, personal

Table 3. Selected water quality parameters on the Connecticut River for certain years 1968-1976.

Year	Aug. water temp.[1]		Aug.[2]	Pesticides and Heavy Metals[3]									
	Mean	Range	d.o.	DDT	DDE	PCB	Arsenic	Cadmium	Copper	Lead	Mercury	Selenium	Zinc
	(degrees centigrade)			*(parts per million)*									
1968	18.5	11-24	--	1.21	0.55	--	--	--	--	--	-	-	--
1970	21.8	16.5-28.0	6.8	0.89	0.64	9.4	--	--	--	--	0.51	--	--
1973	--[4]	--[4]	4.9	0.00	0.59	7.9	--	0.06	--	0.48	0.42	0.98	--
1976	17.5	4.0-24.0	7.6	0.06	0.19	4.0	0.25	0.11	4.87	0.40	0.27	--	21.9

[1]South branch Ashuelot River, Marlborough, New Hampshire; a tributary near the New Hampshire/Massachusetts state line.
[2]Near Thompsonville, Connecticut.
[3]From white perch *(Morone americanus)* sampled near Windsor Locks, Connecticut, for the National Pesticide Monitoring Program.
[4]USGS temperature records not available.

communication). The only metal analyzed across several years on resident species has been mercury, and data suggest a decline in levels found in whole-tissue samples (Table 3). However, most of our adult salmon returns are from smolt stockings, resulting in few of our fish remaining (as presmolts or adults) in the river for any extended time period. Due to the short residency period it seems unlikely that levels shown in our adult fish can be attributed solely to conditions in the river.

Although the overall water quality is improving in the areas of domestic pollution and pesticides, much remains to be learned about the overall effects of pollutants on the Connecticut River anadromous fisheries restoration program.

FISHERIES MANAGEMENT

Perhaps the most complex issue regarding the anadromous fish restoration efforts on the Connecticut River lies not with other uses of the water (river) resource, but with competing uses of the fish resources. Moss (1960) described the late-19th-century efforts to restore Atlantic salmon to the Connecticut River. The results of several years of fry stocking in inland tributaries in the early 1870s culminated by 1878 in the commissioners of Connecticut tracing about 500 Connecticut River salmon to the Fulton Market in New York City. The report of these fish, which were apparently taken by the commercial shad fishermen in the lower reaches of the river, prompted the New Hampshire Commission to relate in its report for 1878 that " . . . , neither Massachusetts nor New Hampshire proposes to spend any money in stocking that stream." (Stolte, 1979).

Although the very recent returns (90 salmon in 1978, 49 to date in 1979) of salmon are encouraging, the answers to managers' questions regarding the impact of other fisheries remain. Nevertheless, some of the questions and concerns presented by Peterson (1975), particularly the potential catches by marine recreational and commercial sport fisheries, must be addressed if the total program is to succeed. The commercial shad fishery in the lower Connecticut River accounted for 5.6 percent of the salmon in 1978 and 6.1 percent to date in 1979. The inshore fisheries of Massachusetts, Rhode Island and Connecticut have accounted for 2.5 percent of 597 total tag returns (through 1978) and 13.3 percent of 113 tags returned from saltwater. The remaining 484 tags were from smolts still in some freshwater portion of the basin.

While much remains to be done to assess the impacts of the fisheries, the problem on interstate management of salmon within the mainstem of the Connecticut River has been addressed (Jones, 1975). The vehicle to accomplish this could be a Connecticut River Atlantic Salmon Commission

having representation from the member states as well as the United States Fish and Wildlife Service and the National Marine Fisheries Service. The commission's purpose would be to promote the restoration of Atlantic salmon to the Connecticut River by development of an interstate program of stocking, protection, management, research and regulation.

Each state would be represented by two members, one appointed by the respective state's governor to serve a three-year term and the second to be the executive officer of the administrative agency charged with fisheries resource management in the compact area, specifically the mainstem. In essence, this latter member would be equivalent to the present Policy Committee member. The federal representatives would be the respective regional directors, or their designates, of the U.S. Fish and Wildlife Service and the National Marine Fisheries Service.

The primary regulatory power of the commission would be the legal authority to establish regulations for the conduct of fishing on the mainstem of the Connecticut River. This would include: (1) open and closed seasons possibly by river reach; (2) open or closed hours or days in particular areas; (3) prescribe legal gear; (4) establish minimum legal lengths; and (5) daily, season and possession creel limits. Additionally, the commission would retain authority to remove fish from trapping facilities for broodstock purposes. A Connecticut River Basin Atlantic salmon license would be issued by the commission, but handled by the individual states.

The above elements were presented in 1978 to the respective state legislatures for passage. To date, New Hampshire has passed the legislation and the governor has appointed the citizen commission member. Legislation has also been passed and signed by the governor in Connecticut. In the remaining two states, generally favorable action has been taken at the appropriate committee(s) levels within one or both houses of legislature, but final passage is not complete. Fish-management-agency representatives do not anticipate problems with ultimate passage. However, in some instances, the bills may have to be reintroduced.

Table 4 presents the present sport and commercial fishing regulations of the basin states that apply to shad and salmon on the Connecticut River. The salmon season, length, and bag limits for several states are intended as regulations for landlocked Atlantic salmon, but presently cover sea-run fishing as well. Salmon seasons generally begin in April but close in September (New Hampshire), October (Massachusetts, Vermont) or the following February (Connecticut). Size limits are consistent at 380 mm (15 inches). Bag limits are uniform at two per day in all states except Connecticut, where only one is allowed (Table 4).

A similar variety exists in the shad sport-fishery regulations. Two states allow a daily bag limit of six fish (Connecticut and Massachusetts) while

Table 4. Present fishing regulations pertaining to selected anadromous species on the Connecticut River mainstem.

State	Species	Season	Sport Fishery		Commercial Fishery	
			Min. Length	Daily Bag	No. days	No. nets
CT	Atlantic salmon	3rd Saturday in April to Feb. 28	380 mm	1	NA	
MA	Atlantic salmon	April 15-Oct. 15	380 mm	2	NA	
VT	Atlantic salmon	2nd Saturday in April to last Sunday in Oct.	380 mm	2	NA	
NH	Atlantic salmon	April 1-Sept. 30	380 mm	2	NA	
CT	American shad	April 1 until closed by Commissioner annually	None	6	April 1-June 15 (closed Friday night sundown to Sunday night sundown weekly)	
MA	American shad	All year	None	6	NA	
VT	American shad	NA	NA	NA	NA	
NH	American shad	All year	None	2	NA	

New Hampshire allows two per day (Table 4). Presently New Hampshire does not have a sport fishery on the mainstem Connecticut, but can anticipate at least limited effort, perhaps in 1980, with access provided upstream from Turners Falls Dam. Vermont will also have access to shad sport fishing in state waters at that time.

The Connecticut River presently supports the only viable commercial shad fishery in New England. This fishery legally operates weekdays between April 1 and June 15 in the lower 75 km of the mainstem (Stolte, 1979). During the period 1965-1969, the commercial fishery harvested between 11.8-22.0 percent of the population (female to male catch ratio is about 2:1) with total catches ranging between 50,000-175,000 shad (Leggett, 1976; Vic Crecco, personal communication). Estimates for 1979 indicate commercial fishermen harvested about 14 percent of an estimated run of 355,000 (Peter Minta, personal communication). Despite this effort, much of which coincides with the anticipated early returns of Atlantic salmon, reports of salmon taken in shad nets accounted for only five known salmon in 1978 and three in 1979 (as of late August).

Since commercial salmon fishing is banned in Connecticut, shad fishermen are allowed, by special action of the Commissioner, to possess captured

salmon. All such captured fish must be turned in to the Connecticut Department of Environmental Protection. The commercial shad fishery is presently regulated by the State of Connecticut and in the future will also come under the jurisdiction of the Connecticut River Atlantic Salmon Commission. Thus a management mechanism exists to assure the escapement of returning adult salmon once in the mainstem. Less certainty surrounds the prospect of successfully managing for the impacts of coastal trap fisheries in Massachusetts and Rhode Island as well as incidental catches by commercial fisheries along the Maine coast.

SUMMARY

The present Connecticut River anadromous fish restoration program has been active since 1967 with the formation of Policy and Technical committees composed of representatives of the fishery agencies of the basin states as wel as the National Marine Fisheries Service and US Fish and Wildlife Service. The committees recognized the lack of (or inadequate) fish passage facilities as the principal impediment to restoration of salmon as well as enhancement of existing shad stocks. Thus initial efforts concentrated on preparing design parameters for passage devices and subsequent negotiation with util ty companies to establish construction schedules. To date this effort has resulted in an improved lift at Holyoke, anticipated completion of a three-fish-ladder system at Turners Falls for the 1980 spring run, and the initiation of construction (May, 1979) at Vernon, Vermont. American shad will now have access to an additional 31.7 km of river in 1980 and another 51.2 km in 1983.

Major electric power development projects have been monitored either by impetus of the respective states or by the committees. No project has shown a major, chronic, site-specific adverse impact to date. However, the committees continue, as the representatives of the responsible fishery management agencies, to be concerned about future as well as continuing water resource users and their potential adverse impacts on anadromous fish restoration efforts.

Water quality has not been implicated as a deterrent to the restoration effort. Data on temperature, dissolved oxygen, and pesticides indicate suitable or improving water quality of those parameters. Sampling for heavy metals indicates the presence of a wide variety, but the impact on the fish of the levels shown is unknown. Due to the lift history of the anadromous fish, it seems unlikely that their mainstem river residency is sufficient to accumulate the levels shown in salmon, for example. The impact of heavy-metal pollution on the various life-history stages of both salmon and shad is not well known.

While issues involved in getting anadromous fish to their habitat, and the resulting quality of that habitat often involves other users of the river resource, the fisheries manager must constantly monitor and understand the impact of competing users for the fish resource. Additionally, efforts in other areas such as fish passage construction indicate that traditional fisheries, such as the sport fisheries below Holyoke, and below Enfield, where the continually failing dam provides less delay, may be impacted.

The program to restore salmon has involved a wide variety of concerns from traditional management needs and efforts such as smolt stocking to habitat surveys and research as well as development of a mainstem commission. The complexity of the program is apparent in reviewing the recently drafted "Strategic Plan for the Restoration of Atlantic Salmon to the Connecticut River Basin" (Stolte, 1979). The planning effort sponsored by the US Fish and Wildlife Service in cooperation with the basin states and the National Marine Fisheries Service has resulted in the most comprehensive review of the task facing the committees to date.

The present Connecticut River anadromous fish restoration program, now 12 years old, has provided evidence that given the continued direction and backing of the responsible fishery agencies, progress can be made. In 1980 fishery personnel will be releasing the first smolts from a male and female taken from the river in 1977. The White River National Fish Hatchery in Vermont should be at full production by 1981 or 1982, increasing the smolt releases by 400-600 percent. By 1983 shad will have access to 42 percent more river than when the committees began work.

There have been delays, disappointments and setbacks, but the result over the years has been substantial progress. Much remains to be done but the mechanism established for the Connecticut River has proven to be capable of monitoring the potential impacts of competing river users as well as managing the fishery resource.

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MANAGEMENT NEEDS AND INTERACTIONS RELATING TO ANADROMOUS FISHERIES MANAGEMENT

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The effort fishery managers expend toward the "management" of any particular fishery varies significantly. The more important a particular fish becomes to the diverse and competitive user groups, the more effort usually is expended in attempting to "manage" the fishery. Let me list the most common anadromous fishes according to the esteem most of us bestow upon them and, therefore, our need to manage:

A. salmon (list your own species preference),
B. striped bass (or rock if you prefer),
C. sea run trout (brown and rainbow in particular),
D. American shad (hickory shad of less importance),
E. rainbow smelt,
F. the sturgeons (short nose and Atlantic),
G. river herring (alewife and blueback), and
H. Sea lamprey.

Since anadromous fish are a common-property resource, they are primarily managed by government agencies for maximum public benefit. Thus, the goals of fishery managers line up like this:

1. to maximize the productivity (harvest, yield) of selected species for both recreation and food purposes;

2. to maximize public opportunity (recreational/commercial) to share in harvesting and utilization of the resource;

3. to maximize social harmony between competing user groups by attempting to reduce social conflict where feasible;

4. to ensure the survival of sufficient brood fish capable of producing a strong year class of juveniles, providing habitat conditions are favorable;

5. to maximize the carrying capacity of habitats by improving habitats, as well as by minimizing environmental stresses; and

6. to minimize the productivity of nuisance species (sea lamprey).

On the other hand, the goals of the fishermen are often somewhat different. Usually, they are no more complicated than trying to catch as many fish as possible, with minimal interference from either regulatory agencies or competing fishermen. Unfortunately, this goal is often in conflict with those of the fishery manager.

For the most part, it is much easier to propose management goals than it is to figure out how to achieve them. Then, to make things even more complicated, it can be difficult determining exactly what it is we are going to "manage" in order to achieve those lofty goals. Just what is manageable and what is not? The basic assumption often made is that we are going to manage some particular fish—but that is easier said than done. Fish are not particularly amenable to management except when confined in hatcheries. Therefore, what we usually end up doing is trying to manage fishermen and/or habitats. Fishermen, of course, feel that "management," when directed at them, is designed to make their fishing efforts less efficient—which is probably true in the short term, but not meant to be true in the long term.

Fortunately, habitats are more responsive to management than fishermen, providing that we can generate the time, money and expertise to do it. In any event, over the years, fishery managers have delineated the following subjects as being manageable.

1. Species and/or groups of species within some specific habitat or geographic area. Recently, Mid-Atlantic Fishery Management Council staff suggested that for a proposed combined shad and river herring management plan, the following possible management units be considered:

   a. Shad and river herring within the Fishery Conservation Zone (FCZ)
   b. River herring within the FCZ
   c. Shad and river herring within all U. S. waters
   d. River herring within all U. S. waters
   e. All shad and river herring within U. S. jurisdiction
   f. All river herring under U. S. jurisdiction.

2. Fishermen, categorized in many ways and usually within some specific geographic or political boundary:

a. residency: resident, non-resident (foreign, tourist)

b. occupation: recreational, commercial, charter-boat operation, etc.

c. method of fishing: trawler, long-liner, angler, gill-netter, etc.

d. age and/or sex: juvenile, senior citizen, etc.

3. Habitats. Management measures designed to make habitats more productive and/or accessible to both fish and fishermen include stocking new waters (such as stocking smelt in the Great Lakes and striped bass in reservoirs).

4. Artificial Propagation Units (hatcheries, spawning channels).

5. Manmade Capital Facilities (power plants, sewage treatment plants). Usually, management measures are geared to minimizing mortality from impingement, suffocation, etc.

Having come this far, the next step is to determine the possible means of plan implementation. Referring once more to the Mid-Atlantic Council staff's proposed Shad-River Herring Plan, there are listed the following alternatives, as designed from council staff's perspective:

a. Manage only in the FCZ.

b. Manage in the FCZ and work with states through the State-Federal Fisheries Management Program, Atlantic States Marine Fisheries Commission, or other mechanisms to develop management in the Territorial Sea where it will be most effective.

c. Manage in FCZ and in State waters, through voluntary cooperation of the states incorporated in plan management measures.

d. Preemption (Federal) of State's jurisdiction if management obviously fails after implementation.

The next rung in the management ladder is to determine which of the many possible strategies or management measures listed below may be deployed to achieve the desired goals and/or objectives, recognizing that each proposal invariably has significant ramifications, which include those that are political, social, economic, as well as biological—not to mention the enforceability, where applicable:

a. regulation of the sizes of mesh of fishing nets;

b. regulation of fishing gear and appurtenances, other than regulation of the size of the mesh of fishing nets;

c. regulation of the size limits of fish that may be retained on board any fishing craft or landed, or exposed or offered for sale;

d. regulation of total catch by species, group of species, or, if appropriate, by regions;

e. establishment of open or closed seasons;

f. establishment of open or closed areas;

g. limitation of entry;

h. production and stocking fish from hatcheries;

i. restriction of user groups (designating game fish status to a species);

j. selective elimination of a species (lamprey control);

k. improvement and protection of habitats on the qualitative level (water-quality criteria);

l. improvement of habitats on the physical level (development of fish passage facilities);

m. development of fisherman access to a fishery (boat-launching sites);

n. deliberately doing nothing, while allowing the "Law of Diminishing Returns" to take effect.

Not surprisingly, all of the above "a" through "g" have been proposed by the Mid-Atlantic Council Staff's proposed Shad-River Herring Plan. Also, the staff added two others: "permitting" and "reporting requirements."

It should be emphasized that a viable plan of action that can be legitimately pursued is simply to *take no action,* as indicated in "n" above. This decision can be based on the premise that either there is no significant problem that needs to be resolved with a particular fishery or that even if there appears to be a problem such as "excessive" fishing pressure, the problem will take care of itself under the classic "Law of Diminishing Returns." Under this philosophy, the "manager" assumes that as fishing success declines, fishing effort will substantially decrease long before minimal spawning stocks needed for spawning success have been decimated. The "no action plan" has been one commonly used by fishery administrators over the years and it has worked out fairly well for many marine species, though not necessarily for those that are anadromous.

The Shad-River Herring Plan also outlines "Possible Management Objectives" as follows:

a. maintain stock(s) so as to allow total harvest at maximum sustainable yield level on a continuing basis;

b. maintain historical commercial-recreational catch distribution;

c. maximize recreational fishery;

d. maximize commercial fishery;

e. allow unlimited recreational and commercial catches;

f. control rate of any possible stock decline.

Which of the above do you believe are realistically achievable?

One of the most esteemed anadromous fishes on the Atlantic Seaboard is the striped bass or rockfish. Fishermen continuously pursue this dynamic fish for both food and sport, thereby generating very heavy fishing pressure. Consequently, the number of fish available never satisfy the demand and fishermen are in constant competition with each other. Needless to say,

unhappy fishermen demand that something be done. It should not be surprising then to learn that the states from Maine to North Carolina have needed to develop many strategies to "manage" this fish if for no better reason than to respond to political pressure from the fishing public.

Mr. Mike Leverone, Project Manager for the State-Federal Striped Bass Project, recently compiled a summary of existing state legislation affecting striped bass (see Table 1).

You will note certain similarities as well as the significant differences between the various management measures adopted by the 11 coastal states over 50 or more years. Although we cannot be sure of the precise goals each state was attempting to meet, presumably they have been similar to the first four of the goals of fishery managers listed earlier in this paper.

Currently, many striped bass fishermen believe that the supply of fish is dwindling rapidly and that the survival of the fish is in jeopardy. While there is no question that there are fewer fish to be caught in 1979 than during the all-time peak years between 1973-1975, there is considerable disagreement relative to the significance of that difference.

As a result of this concern, the striped bass is now the subject of an intensive effort, by the 11 coastal states from Maine to North Carolina and the National Marine Fisheries Service, to develop a synchronized management plan through an organization called the State-Federal Striped Bass Sub-Board. The planning effort includes input by an appointed Regional Citizens Advisory Committee and Scientific and Statistical Committee who, after many months of deliberation, came up with "Recommendations for Interim Regulations" shown in Table 2.

The Striped Bass Sub-Board, composed of state marine fisheries directors, National Marine Fisheries Service personnel and Atlantic States Marine Fisheries Commission personnel, is responsible for determining which management measures should ultimately be adopted by the involved states to reduce fish mortality.

I believe you will find considerable benefit in reviewing the comments made by Mike Leverone (Project Manager, State-Federal Striped Bass Project) on the specific recommendations noted in Table 2. His comments, as quoted follow:

> Geographic Differentiation.
>
> *The coastal areas referred to in these interim regulations may be defined as those marine regions where the principal representatives of the striped bass stock are not pre- or early recruits, but older and larger migratory striped bass located on or in-between their feeding and wintering grounds. Non-coastal areas are those estuarine regions considered to be spawning and nursery grounds of the species.*

These coastal and non-coastal regions will be defined more precisely by the Science and Statistical Committee before these regulations are implemented.

Minimum Size Limits: 26" TL, Coastal Waters.

Protection of young striped bass before they have participated in at least one spawn is a popular sentiment among many fishermen. As discussed earlier, a minimum size limit of 26" TL would allow female striped bass to spawn at least once before becoming subject to harvest. This size limit would also serve to maximize both the quantity and quality of eggs released on the sprawning grounds, as discussed below.

If egg production by a year class is considered against the mortality rate, the total biomass of eggs produced by that year class will reach a maximum when the fish are approximately 26" TL (age VI) (J. L. McHugh, personal communication). Smaller fish are more abundant but produce fewer eggs overall, since not all females of that size are mature and the number of eggs released by a young fish is small compared to an older one (Hardy, 1978). Larger "cow" bass individually may produce more eggs, but because they are less abundant the total production by a cohort is smaller. The optimum size of 26" TL assumes an annual mortality rate of 40-60%. If the rate is actually 20-30%, as some believe, the peak in egg production by a cohort will occur at age VII when the fish are 28"-30" TL.

A potential criticism of the above is that ten or more year classes may be represented on Chesapeake Bay spawning grounds each spring. Thus, even if egg production of the younger year classes is maximized, the efforts of the older cohorts taken together could account for the greater part of the eggs released. However, this argument neglects the occurrence of organic chemicals (e.g., PCBs) and heavy metals in the organs and edible flesh of striped bass, and the possible influence of these agents on the viability of the species' eggs, larvae, and young. Unfortunately, only limited data are available to indicate how chemical contamination may affect striped bass reproduction. However, it may be expected that younger fish would carry a lower burden of contaminants than older ones. Consequently, the eggs released by the younger females would likely be more viable than those from older spawners.

TABLE 1. Striped bass *(Morone saxatilis)* management project summary of state regulations for the coastal United States, Maine to North Carolina.

State	Permitted Catch Methods	Size, Bag Limit, and Seasons	Sport License Required	Disposition of Catch
Maine	Hand line, rod and reel or spear only (spearfishing limited to the hours between sunrise and sunset).	None	None	May sell catch.
New Hampshire	Illegal to use seine, weir, or net.	16" fork lenth (FL)	None	May not sell catch if caught in state waters.
Massachusetts	Hook and line only	16" (FL)	None	
Rhode Island	Hook and line; fish traps between Sept. 1 and Oct. 14 no obstruction to free passage within 150 feet of shore. Nets and seines prohibited.	16" (FL)	None. License required for commercial fish traps.	
Connecticut	Sportfishing only.	16" (FL) minimum. No closed season.	License required upstream from the statutory coastal demarcation line.	
New York	Any method.	16" (FL). Closed season Dec. 1 - Mar. 15 in Hudson and Delaware Rivers. Nets, seines illegal in these areas. Superseded by closure order of 1976, prohibiting all commercial fishing in Hudson River between The Battery and Troy Dam, and all fishing between Troy Dam and Fort Edward.	License required when caught in fresh water, except Hudson River to Troy Dam.	

New Jersey	Rod and line, goggle fishing (defined as hand-propelled spear, dart, arrow or other missile held while person is completely submerged). Nets and other methods illegal.	18" Total length (TL). Bag limit of 10 fish per day. Open season from Mar. 1 - Dec. 31. Striped bass caught in Delaware Bay must be greater than 10" and less than 20 lbs. (no closed season). Between N.J. and Pa. not less than 12". Open season Mar. 1 - Dec. 31 (no bag limit).	No salt water license. Required when caught in fresh water.	May sell catch if of legal size.
Delaware	Hook and line, haul seine and gill nets permitted in Del. Bay and Del. River.	Legal size range 12" (FL) to 20 lbs. for commercial and sportfishing in Del. River and Del. Bay. In remainder of state, minimum size is 12" (FL). No maximum size. No bag limit. Commercial fishing permitted Nov. 1 - Apr. 30.	None	May sell catch.
Maryland	All methods, except purse seine and otter trawl.	Illegal if less than 12" (TL) or more than 32" TL. Lawful to have 1 bass per day over 32" (TL) if caught by hook and line, except between Mar. 1 and Apr. 30.	No sport license. Must have commercial fishing license to sell or transport across State boundaries, except those caught on hook and line provided no more than 100 lbs. are transported or sold each day.	Permit required for sportfisherman sale of striped bass.
Virginia	All methods.	Less than 14" (TL) or more than 2 bass over 40" in one day.	None for saltwater. Regular license required for fishing for striped bass in fresh water.	May sell catch.
North Carolina	All methods.	12" (TL) minimum. Illegal to fish in New Hanover County. Other county laws may apply.	None	May sell catch.

TABLE 2. Recommendations for interim regulations.

	Recreational		Commercial	
	Coastal	Non-Coastal	Coastal	Non-Coastal
Size limits	26" TL	14" TL	26" TL	14" TL[1]
Creel limits	4 per day[2]	8 per day[2]	None	None
Allowable methods	Rod & reel	Rod & reel	All[3]	All[3]
Disposition of catch	No sale	No sale	Sale allowed	Sale allowed
License required	None	None	Yes[4]	Yes[4]

[1]In instances where pursuit of traditional fisheries for other species results in the incidental catch of smaller striped bass (e.g. white perch gill-netting in Chesapeake Bay), a minimum size of 12" TL shall be allowed. At no time, however, shall striped bass less than 12" TL be taken or possessed.

[2]The captain and mate aboard a chartered vessel shall be considered anglers for the purpose of determining daily possession limits.

[3]Includes catch by rod and reel and other methods allowable under current regulations and statutes.

[4]A separate license may be provided for rod and reel commercial fishermen. Fees shall be set at a level sufficiently high to discourage opportunists without placing undue burden upon bonafide commercial fishermen in pursuit of a livelihood. Alternately, availability of licenses may be limited to a period of two months ending 90 days prior to the accepted commencement of the fishing season for striped bass.

As indicated in the earlier discussion of the migratory behavior of striped bass, many of the young coastal migrants return to Chesapeake Bay in the fall and winter. There they may be subject to harvest by commercial fisheries operating under the less restrictive size and creel limits applied to non-coastal areas. Thus, the proposed 26" TL minimum size limit for coastal waters cannot guarantee that ALL of the young coastal migrants will escape to maturity or participate in at least one spawn. However, it will ensure that substantially more fish will escape than would otherwise, without this regulation.

Finally, in order to judge the overall impact of an increase in minimum size limits, it is necessary to consider the life expectancy of undersize fish that are accidentally captured. Whether taken by nets or hook and line, striped bass will be subject to physiological stresses and mechanical damage which decrease their chances of survival after release. Gear restrictions and conscientious handling techniques may ameliorate this source of additional mortality.

Minimum Size Limits: 14" TL, Non-Coastal Water.

If the rate of growth is considered in relation to the rate of mortality, the greatest yield per recruit is obtained at a size of approximately 16" FL (17" TL) for striped bass (Merriman, 1941). That is, as a year class is followed through time, the loss of individuals through natural mortality is more than offset by the high rate of growth of those that survive, until a maximum is reached at 16" FL (age III).

Thus, a minimum size limit of 16" FL represents an ideal harvest size in non-coastal waters. However, in nursery areas such as Chesapeake Bay, a minimum size limit of 16" FL would severely reduce traditional recreational and commercial fisheries because of the extensive emigration of age III striped bass (15"-17" TL; 14"-16" FL) from these areas into coastal waters. Increasing the minimum size in non-coastal areas to 14" TL from 12" TL would allow these traditional fisheries to continue. In fact, an increase in the overall yield to the fisheries would probably result. On the average, striped bass allowed to grow from 12" to 14" TL will show an increase in weight of 64.3%, from .66 to 1.08 pounds, according to the length/weight equations developed by Mansueti (1961). A 14" TL size limit in non-coastal waters would have the additional benefit of allowing male striped bass, which predominate in these areas, to participate in two spawning seasons rather than one.

As with the proposed 26" TL size limit for coastal waters, there will be some mortality of undersized fish that are released. An additional concern associated with the 14" TL size limit is the possibility of interference with other fisheries. Young striped bass often occur in the same locations as white perch, a species especially important to commercial fishermen in Chesapeake Bay and Albemarle Sound. The mesh size of the gill nets currently used to take white perch will capture striped bass of 11-13" TL as well. Under the proposed regulations, these fish would have to be returned to the water; many will not survive. Some method, such as mesh size restriction, may be specified to minimize this mortality.

Creel Limits.

The specific numbers of fish allowed in the creel limits under consideration (four per day in coastal waters and

and eight per day in non-coastal waters, for non-commercial fishermen) are admittedly arbitrary. Without information on the distribution of catches among individual fishermen, it is impossible to estimate the extent to which the harvest would be reduced. If "10% of the fishermen catch 90% of the fish," as is often said, creel limits may indeed result in a reduction of the total harvest. A more definitive benefit of the proposed limits is to encourage sportfishermen to take no more striped bass than they and their families can use. Unlimited catches are a luxury the resource cannot withstand.

Limits on the catch of commercial fishermen are often economically, as well as politically, difficult to justify. Rigorous analyses of the costs and benefits involved are required before limits can be imposed which may reduce or eliminate traditional occupations or remove striped bass from the market-place. It is suggested that the wording of the interim regulations, under the section on creel limits or quotas for commercial fisheries, be changed to read as follows:

> *Gear or catch limitations may be specified at any time if indicated by latest available information.*

As with size limits, most but not all striped bass that are released after capture will survive the experience. In addition, a creel limit may be regarded as a challenge by some fishermen, who may actually increase their fishing effort above normal in order to obtain that goal.

Disposition of Catch/Licenses.

Expensive, mandatory licenses for the sale of striped bass seem attractive as a means of reducing fishing pressure by eliminating or restricting the opportunistic fishermen. It is commonly held that a license cost of $100-$500 will exclude all but serious, full-time commercial fishermen. However, the very high value of striped bass in recent years provides such an economic incentive that the desired effect of high license fees may not be realized. Further, the constitutionality of such practices may be questioned in the context of restricting access to a public resource.

It is suggested that the various states jointly develop a uniform system for the breakdown of licenses by gear types. Such a system would facilitate state-by-state comparisons of catch and expended effort.

Conclusion.

In considering restrictive regulations for striped bass it should be remembered that more eggs in the water does not necessarily ensure increased production of fish. The success of a year class depends upon any number of physical, chemical, and biological factors. Some of these are independent of the densities of eggs, fry, or fingerlings; for example, water temperature and river flow. Others are density dependent; an example is competition between individuals of the same or different species for available food. The relation between stock size and recruitment is a classic problem in fisheries science. Recent dominant year classes of striped bass have been produced by relatively large brood stocks. In contrast, relatively low parental stocks accounted for the 1934 dominant year class studied by Merriman (1941). The only immediate mediating force available to fishery managers is the regulation of fishing practices. Until a better understanding is developed of the factors contributing to the successful reproduction of the species, responsible management of striped bass should be directed toward: 1) ensuring there are enough brood fish to produce a dominant year class if conditions are favorable; 2) reducing fishing pressure to prolong the survival of each year class; and 3) dividing the limited stocks of this valuable resource fairly among the growing number of people who seek it.

As the second part of this paper, I was asked to "Discuss how fisheries resources can continue to exist in the Territorial Sea with the impact of man's activities including fishing."

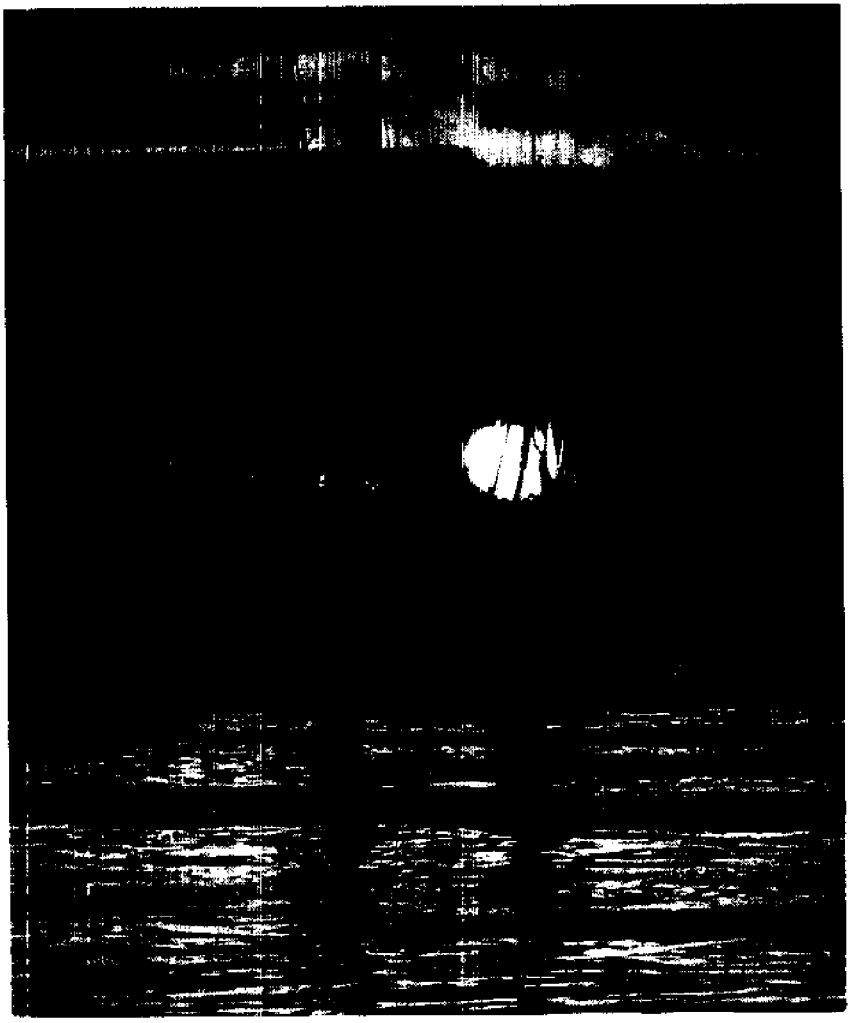
My response is that because there are many millions of people who have vested interests in the welfare of territorial sea fisheries, that this public, if kept properly informed and advised, will make sure that the fishery survives. This public will use every political expediency necessary to preserve some balance between marine edge development and marine habitat protection. When convinced that a particular fishery is in jeopardy from overfishing or pollution, this public will accept regulations to protect that fishery.

It is up to the fishery manager to be sure that this genuinely concerned public is properly advised and alerted.

If we do our job on a sound professional level, the public will respond and the fishery should continue *ad infinitum*.

Conference Summary

George Reiger



CONFERENCE SUMMARY

George Reiger
Conservation Editor
Field and Stream

This is not the first time I have served as a summarizer at a fisheries conference, but there may be practical reasons I was chosen to summarize this conference. The first has to do with my work as a writer, and I stress writer, not journalist. Writers are concerned with ideas, I hope, and journalists by and large with events.

Our collective constituencies of recreational and commercial fishermen, scientists and politicians, educators and lawyers, are increasingly aware of the frustrations as well as the opportunities, the roadblocks as well as the progress, associated with managing those amazingly fertile and economically valuable resources found in the territorial and jurisdictional seas of the United States.

As a writer I have the responsibility to help find and publicize ways around the roadblocks so all our jobs can be done more effectively. Some would call this "job communication"; I prefer the word "education." But it comes to the same thing.

Another reason I may have been selected to summarize this conference is that with no direct stake in a fisheries bureaucracy, Sea Grant program, or the fishing industry, I could be counted on to say a few things that were not said, perhaps could not be said, by some of the participants in the conference.

My work involves moving around the country, frequently fishing and visiting with all kinds of people. They provide very different—some might insist too narrow, but undeniably essential—views of many of the issues we have discussed here in the last few days. For example, at the opening of the salmon season off Westport, Washington, last spring, I was aboard a charter boat whose bookings were down like all of Westport's bookings—nearly 50 percent over last year—due to gasoline shortages, but equally important, the salmon shortages. Chinook limits have been reduced to one fish a day and the coho bonus was not enough to sustain the former crowds that had made regular weekend pilgrimages to the coast up until last year.

We caught hake off Westport which, to an Easterner like me, was fun and later good food. But my Pacific Northwest companions treated this wonderful resource like trash; several hake were killed and thrown back before I collared everyone on board and persuaded them to save for me what in the Atlantic is known as the whiting (same genus but different species). A National Marine Fisheries Service (NMFS) official was with me and he repeated all the mindless gospel about the Pacific hake being worthless as a food fish.

Incidentally, I first encountered this prejudice 15 years ago while fishing for salmon off California's Farallon Islands. The hake were always blamed by the local charter skippers for any of our slow days aboard.

Anyway, I cleaned the hake we caught on the Westport boat and that evening ran a taste test with the NMFS representative and his family, comparing the hake with some rockfish we had also caught that day. The hake won easily and unanimously.

Yet rockfish, a more slowly maturing and in other respects more difficult to manage group of fishes than hake, are what NMFS and Washington state fisheries officials are trying to encourage Northwest Pacific charter skippers to pursue as an alternative to salmon during the lean seasons now upon us. I cannot help but believe such an effort is akin to moving down a dead-end street, not too dissimilar from North and South Carolina's nonlimited programs for developing recreational deepwater reef-fishing, and I cannot help blaming Pacific Northwest biologists, who for over half a century have been a major party to the notion that unless a fish has an adipose fin, it cannot be of much use or value.

This costly bias against Pacific hake is so deeply set that it will require a concentrated public educational effort even to make a dent in the by now knee-jerk assumptions concerning the species.

Thus, I sympathized with the young skipper of the *Chieftain,* who said, as we ran back to the dock at Westport, "If I had to do it all over again, I guess I would not have become a fisherman."

The gap between rhetoric and reality, between needs and events, is not unique to the Pacific Northwest. This summer I visited Massachusetts and saw the harpoon pulpits for swordfish and tuna on the bows of many of the so-called sport fishing boats at Wellfleet and Provincetown. In that state, any recreational fisherman can also call himself a commercial fisherman, when convenient, for the price of a few dollars for a license.

Just a few weeks ago I fished off North Carolina's Outer Banks, tagging king mackerel and sharks. I was surprised to see other charter boat crews in the area keeping the sharks caught by their clients and was told that the sharks enjoy a local commercial market. Intrigued, I made further inquiries ashore and learned by going to the local fish-cleaning station that the sharks were actually put into barrels with mackerel heads and other refuse and

carted off to the National Park Service-administered dump at Oregon Inlet. I have since learned at this conference that other nontarget species, including even wahoo and yellowfin tuna, are at times dumped when the recreational fishermen do not want their catch and their charter skippers feel that they do not have enough fish to run to the market, or the price is thought to be too low to make the effort of cleaning and transportation worthwhile.

Who is ultimately responsible for this ignorance and waste? North Carolina, because it licenses chartermen on the basis of tests that feature navigational and boat-handling skills but teach nothing about marine resources? NMFS, because such wasted pelogic species fall within its management purview? The National Park Service, because its concessionaires are boatmen more interested in profit than in teaching their customers something about the real value of sport fishing and the function and meaning of renewable resources?

Perhaps no agency is to blame, for do we not live in a society with a selfish disregard for the future, pious speeches about our children's welfare notwithstanding?

My examples are not meant to single out the sport fishing industry. After all, I have pulled alongside anchored shrimpers culling their catch off Florida's Dry Tortugas and exchanged a six-pack of beer for a barrel full of culled crabs and dozens of fish species, mostly juveniles, in order to turn the barrel's contents into bait. And then I have drifted away, watching as the cullers shoveled small hills of so-called trash catch overboard compared to the mere mounds of shrimp they kept aboard.

Even as a boy, I remember biologists clucking their tongues about this wasteful side of the shrimping industry, but in all the intervening years the shrimp industry has continued to grow like topsy while nothing has changed in its grotesque waste of the enormous bycatch.

Thus, while this skeptical soul was appreciative of our host's warm welcome, I was not as enthusiastic as people on the state's payroll by the governor's long-distance announcement that he had drummed up at least one and possibly more seafood-processing plants for North Carolina. I would like to know more about what impact that plant will have, directly and indirectly, on local resources. And as a resident and active fisherman of Virginia's coastal waters, I would like to know how accelerated development of the seafood industry in North Carolina will affect resources in neighboring states.

Joseph Grimsley spoke of the possibility of these impacts and the need for more research, but I fear that as usual, the research will come only after the plants are in place—time enough to provide grist for future historians of the fishing industry but not in time to provide much meaning or effect on contemporary political and economic judgments.

David Adams may have overstated the case in his comment about knowing of no example in which two states had worked together willingly and well on common-marine-resource problems. However, he reminded us that the Fishery Conservation and Management Act (FCMA) of 1976 became law not because state governments and the fishing industry were seeking management guidelines from a more comprehensive authority, but because most Americans had a gut feeling about kicking the foreigners out of our offshore waters. Political, not scientific, interests were served, and how far we are from a generalized approach to common-problem solving is seen in the fact that the resources of such important ecosystems as Puget Sound and the Chesapeake Bay are still not managed in a comprehensive manner.

Bernard Smith gave us a cram course in legislative personalities, and he suggested ways to accomplish political goals which, for better or worse, are sometimes resource management goals. Just the fact that many of us appeared to find his information novel indicates how much we may have neglected our civic duties as educated persons with a serious point of view.

Smith's presentation was a good reminder that theoretical physicists may get away with living in ivory towers, but fisheries biologists, never.

Smith also pointed out that one of the most vital tasks of the biologist is education—education of the politicians and administrators who come and go while resource-management problems seem to go on forever.

Gary Knight provided us with the legal background of many of our jurisdictional squabbles and then offered the legal alternatives for resolving conflicts between state and federal interests, including the time-honored practice of doing nothing.

While this technique often works when the conflicts are more potential than real, it also places the burden of survival on the natural hardihood and resiliency of our marine fishery resources, rather than on human common sense and our collective genius for compromise.

Virgil Norton used a Wildlife Society definition of conservation that included a prohibition on the waste of other resources during the exploitation of the target resource. Although this definion generally refers to the kinds of waste that go on in the shrimp industry, Norton skillfully broadened the concept to include such elements as wasted energy, capital and labor. He focused on the net benefit of a fishery to society at large, but left me, at least, uncertain as to how we measure all the variables associated with net benefit.

More efficient management might put marginal fishermen, the old or those just starting out in business, out of business. Yet in several attitude surveys conducted in the British Isles and the United States and recently reported on in *National Fisherman* magazine, most commercial fishermen were found to place self-reliance and creativity in their work above security,

while security appears to be the common denominator of factory workers. Which type of personality should society, for its greatest good, regard with special consideration, the security-seeking nine-to-fiver or the self-reliant fisherman? What will be society's net loss by putting the less efficient, self-employed gill-netter on the beach while rewarding corporate-owned purse seiners?

Robert Mauermann gave a generally rosy account of cooperative management programs in the Gulf but admitted that when Congressman John Breaux asked the regional fishery management council (RFMC) what problems it was experiencing, RFMC members could only reply that they still do not have enough experience to give a thoughtful answer.

However, I was pleased to hear that genuine public input was so great in Texas, for in the bad old days before the FCMA, it was precisely public inertia that permitted state administrators to wink at the dredging of shell bars in Galveston Bay and Laguna Madre and to establish marine-resource regulations based more on whim than science.

Richard Loring described the conflicts he, as a shellfish aquaculturist and entrepeneur, is experiencing with so-called wildcatch fishermen who view his activities as a threat to their own. Loring stressed that public education, not more regulation, is the best way to resolve those kinds of problems.

Edwin Joseph dealt with the difficulty of making old definitions meaningful after we have new information which contradicts the old. The marine biologist is working like Alice in Wonderland to fit his programs into the context of such phrases as the "three-mile territorial seas" or even "county and township authorities." The brown shrimp is highly migratory, yet it must be managed as a non-migratory species because the states say so. Yet even when neighboring states bend over backwards to be polite to one another regarding the management of a common resource, so long as shrimp from the continental shelf landed in, say, Louisiana, or channel bass landed in North Carolina but spawned God knows where are thought of as Louisiana shrimp or North Carolina drum, the job of the marine resource manager is going to be an uphill struggle.

Chris Weld referred in passing to the paradox that while too few fish are the bane of all fishermen, too many jade the palate of the sportsman. Yet just what constitutes too few or too many depends on so many unmeasurable factors, even including possibly far-fetched variables as whether or not the fisherman had an argument with his wife the night before he set off on his trip, one despairs whether we will ever nail down the definition of "optimum sustained yield" beyond the shaky legal compromise described under the FCMA.

Yet Weld warned that unless scientists and sociologists attempt to refine our definitions now, lawyers in the courts will do so later. And speaking as

a lawyer, Weld expressed a professional disgust with the gap between the fine policy statements issued by the states and RFMCs and the realities at the local level. That is not always so but often so.

George Harrison tried to define various marine resource user groups but I was a little bothered by his white hat/black hat distinctions. After all, as a defender of the hunting tradition, I found that while some would have it that only 10 percent of us are slobs, actually most decent and law-abiding citizens are slobs every so often, and our general problem is based on the fact that the evil we do does live after us.

Thus, I have known normally good commercial men to harpoon a swordfish being worked by a sport fisherman or perfectly nice recreational anglers to pick a fight over nothing with a man trying to earn his living from the sea. Cultural background and maybe even barometric conditions more than genes may lie at the heart of the problem, and education, not regulation, is its cure.

John Merriner addressed the opportunities of managing inshore fisheries. He suggested success lay principally with designating primary and secondary goals under long-term programs. He pointed out that inland fisheries managers have always had an easier time than their marine colleagues because of the habitat restraints. Yet is is analogous habitat restrictions in bays and estuaries that offer creative and cost-effective possibilities for habitat enhancement and stocking of hybrids which may provide much of the momentum for future inshore management.

Although yesterday morning's session was concerned with non-migratory species—and discussed shrimp—yesterday afternoon's session was concerned with migratory species—and discussed shrimp. Lyle St. Amant's description of the subtle differences between Louisiana and Texas management perspectives on this common resource indicated that while all may be cooperation on the Gulf Fishery Management Council today, the potential for mischief is very real. Once again, we were impressed with the thought that while young fisheries biologists may think their future work will entail scientific fisheries management, most of what awaits them is political people management, and if they are good or lucky, maybe we should change that last word to "manipulation."

Spencer Apollonio seemed to suggest that much of the ordinary work of the RFMCs could be and had been done before the FCMA by cooperating state resource agencies. Yet while busy-work is the nature of any bureaucracy, especially a new one eager to justify its existence, the FCMA's greatest contribution may be nothing more or less than acquainting the ordinary citizen with a larger perspective of the nation's marine resources.

Ten years ago a decline in the striped bass population off Cape Cod would have been viewed mostly as Massachusetts' problem. Today the man in the street, sometimes more readily than a biologist paid by the state,

accepts the principle that since striped bass wander all up and down the Atlantic coast, regional, not state, regulations should prevail in managing such resources.

John Harville provided us with an inspiring overview of cooperation in the West. With my Atlantic coast perspectives I certainly envy the Pacific region's track record. However, this record is based on the unique history of human settlement and development as well as a remarkably homogeneous marine ecosystem.

When I recall that the concept of saltwater recreational fishing licenses dates back nearly half a century in California, I smile ruefully at the current Atlantic coast debate in which marine recreational licensing and management are sometimes described as plots concocted by the Kremlin.

This morning's session was concerned with anadromous fish management, and we have all felt pride and pleasure in the tremendous progress made in this area. Charles Fullerton and Richard Schaefer described the restoration effort for Pacific salmon, particularly those produced in the Columbia watershed, and Stephen Rideout described the successful effort to see Atlantic salmon once again running up the Connecticut River, an effort which at the same time has done much to enhance the anadromous shad fisheries.

All of these programs depend on interstate cooperation, but until the federal government could provide sticks and carrots in the form of water quality standards, an anadromous fish act, and adequate funding, such monumental achievements would have remained in the realm of pipe dreams, not realities.

Best of all, while some state and industrial representatives initially complained about the stick-and-carrot techniques and creeping federalism, most executives and administrators today are thrilled with the results and the states and industries involved are now falling over one another in a scramble to take credit for a job well done.

Furthermore, the threat of federal usurpation of local authority has led to the formation of interstate compacts which may lead to regional management of other resources besides anadromous fishes.

Anthony Taormina spoke about the two things that every kind of personality can agree on and wants, namely, more fish and less pollution. Yet fisheries scientists have traditionally concerned themselves with somehow producing more fish rather than lending all their interest and expertise to environmental debate. I suggest that the future holds more environmental debate than fish production in store for fishery scientists.

There has been some feeling expressed that there was not enough give-and-take at this conference, that most of us seemed weary or overwhelmed by the odds or information. I would like to put a more optimistic

interpretation on this relative silence by suggesting that it reflects a sober appraisal of the complexities of modern marine-resource management and a determination not merely to survive the intrigue, pettiness, and the dull tendency in a democracy for everyone to insist on expressing his or her opinion long after that identical opinion has already been expressed, but a will to prevail over the many problems confronting the well-being of the marine environment.

I like to think that whatever our jobs, we are all professionals with the service-to-society implications of that word.

The FCMA is only a start toward better information, better understanding and better cooperation among all sectors involved in resource management. Let us do more to feature public education and let us get on with our work.

As Terry Leitzell advised us last evening, "We cannot afford to wait."

APPENDIX

LIST OF ACRONYMS

ASMFC	Atlantic States Marine Fisheries Commission
BLM	Bureau of Land Management
CZMA	Coastal Zone Management Act
EFZA	Exclusive Fishery Zone Act
EPA	Environmental Protection Agency
FERC	Federal Energy Regulatory Commission
FCMA	Fishery Conservation and Management Act of 1976
FCZ	fishery conservation zone
FMP	fishery management plan
GSMFC	Gulf States Marine Fisheries Council
MSY	maximum sustainable yield
NEPA	National Environmental Protection Act
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
OCZM	Office of Coastal Zone Management
OY	optimum yield
RFMC	regional fishery management council
SAC	South Atlantic Council
SFFMP	State/Federal Fisheries Management Program
SLA	Submerged Lands Act
US	United States
USFWS	United States Fish and Wildlife Service

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