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SUMMARY REPORT

**Can
America
Save Its
Fisheries?**



A Sea Grant National Issues Forum

September 11, 1995 · National Press Club · Washington, D.C.


Sea Grant

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Sea Grant is a national network of 29 university-based programs of research, education and technology transfer for the protection and wise development of the nation's coastal, ocean and Great Lakes resources. The program is jointly funded by participating coastal states, industry and the National Sea Grant College Program, National Oceanic & Atmospheric Administration, U.S. Department of Commerce.

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All charts and graphs in this publication are reduced versions of overhead transparencies used during presentations at the Sept. 11 forum.

Calls for Action...

U.S. News & World Report

"America's last frontier is seriously overfished, badly polluted...and in deepening trouble..."

6/26/92

The Boston Globe

"...fishermen invested so heavily in boats and gear that they have reduced the groundfish stocks as...low as they were before the 200-mile law..."

4/12/93

The Washington Post

"New...technology, lax regulation...conflicting government policies have combined to accelerate the decline of fish stocks around the globe."

8/14/94

The Economist

"The saddest thing about overfishing...economic waste apart...(is that) environmental damage is hidden beneath the surface..."

3/19/94

USA Today

"Across the nation, commercial fishing is foundering...Ravaged by...pollution, development, overfishing...nearly every major fishing region is in trouble..."

3/10/94

Congressional Quarterly

"These days, fishermen return to port telling tales not of bountiful catches, but of working twice as hard to catch half the...fish..."

10/5/92

Introduction

James Cato
President, Sea Grant Association

"We're here not because we have been successful fisheries managers," Sea Grant Association President James Cato said, "but because we have had many failures and [because] we haven't faced up to the scientific and politically tough decisions that we've needed to make in the past. If we were successful, we wouldn't be here today."

The goal of the Sea Grant Fisheries Forum was to create greater awareness among the nation's media, policy-makers and industry leaders of the status of the nation's fisheries, Cato said, and to try to provide some answers as to why they're in the state they're in, and perhaps shed some light on what can be done to save America's fisheries.



"We felt it was especially timely to conduct this national forum now," he said, noting that the pending congressional reauthorization of the Magnuson Fishery Conservation and Management Act of 1976 "provides a unique opportunity to make changes that will improve our management capabilities."

What is Sea Grant?

The National Sea Grant College Program is a national network of 29 university-based programs that conduct science-based research, outreach and education focused on the nation's coastal, ocean and Great Lakes resources. Cato said the goal of the program is the wise use and development of these resources.

Sea Grant is funded by the U.S. Congress through the National Oceanic & Atmospheric Administration, U.S. Department of Commerce. He noted that the authorizing legislation mandates a minimum one-third matching funds, which come from the nation's universities, state and local governments, industry, and citizen groups. Funding allocations are based on a nationally competitive peer-review system, he said.

Headquartered at many of the nation's major public and private research universities, Sea Grant annually sponsors a wide range of issue-oriented, multi-disciplinary projects involving around 250 institutions, according to Cato. These institutions are located in every coastal state as well as some inland states, ranging from Puerto Rico to Hawaii, Alaska to Florida, and around the Great Lakes.

Alarming Depletion of Fisheries Worldwide

"The United States has jurisdiction over an area of the ocean that is larger than the U.S. land mass," Cato said. "Our coastal ocean resources in the past have represented a largely untapped national opportunity for economic growth and global leadership in sustainable marine resource development."

Perhaps the most highly visible of all coastal ocean resources, he said, are "the living resources - the fish and shellfish that have provided food to human beings for countless generations." He noted that fish represent a significant source of protein in human and animal diets, and the world's expanding human population has created a rapidly growing global demand for seafood.

"Coupled with increasing numbers of highly efficient, long-range fishing vessels, this has resulted in alarming depletion of marine fisheries worldwide," he said.

Citing United Nations Food and Agriculture Organization statistics, Cato said that 70 percent of the world's fish stocks are fully exploited, over-exploited or rebuilding from past over-fishing. Nine of the world's 17 major fisheries are in serious decline, he said, and four others are classified as "commercially depleted."

Worldwide, he said over-fishing and poor management reduce the optimum revenues that could be derived from fishing by an estimated \$15 billion a year. According to the FAO, global fisheries production will need to increase by 25

percent to 91 million tons over the next 10 years just to keep up with human population growth and to maintain current per-capita fish consumption.

"Today's growing competition for the ocean's remaining fishable stocks is already causing international tensions. In the United States, major political confrontations are occurring over the recreational versus commercial use of fishery resources, with part of the argument based on real or perceived economic and social benefits resulting from each use," Cato said. "Clearly, over-exploitation of the marine fishery cannot continue without causing both fish and ultimately human populations to suffer."

American Fisheries at Critical Juncture

Cato noted that the United States has abundant finfish and shellfish resources of tremendous value within its 200-mile Exclusive Economic Zone. Fishing provides a commercial livelihood on all U.S. coasts, including the Great Lakes, and it offers recreational opportunities for millions of Americans.

According to the National Marine Fisheries Service, U.S. commercial fisheries in 1991 had a total impact on the U.S. Gross National Product of more than \$50 billion, he said, "and that's not counting the economic impact of the 17 million people who engaged in recreational fishing that year."

However, fish stocks are less abundant now than they were before 1976, when comprehensive federal fisheries management began with passage of the Magnuson Fishery Conservation and Management Act, Cato said.

"Our fisheries are now at a critical juncture," he said. "Many fish populations are at or near historic lows, including some species that are familiar table fare. At the same time—as you'll hear next from Dr. Sissenwine, chief scientist for the National Marine Fisheries Service—some U.S. fisheries are posting record harvests and appear to be quite robust."

Even so, he said "there is no question" that many species have been over-fished and that others are being mismanaged: Overcapitalization in the fishing industry has contributed to catches in excess of sustainable levels, and depleted fish stocks are causing fish harvesters and processors to go bankrupt.

Habitat destruction is another major factor. "All rivers ultimately empty into the sea, and common land use practices have filled our waters with excess nutrients, toxic chemicals and sediment," Cato said. "Nearly half of the U.S. population lives within 100 miles of the shoreline, and development of our coastal areas has had an extremely adverse impact on many critical coastal habitats."

In response to these problems, he noted that fishery managers are considering new management options, from limited entry to gear restrictions.

"But is this enough?" Cato asked. "Have our fisheries, a common property resource, been exploited to the point of no return? Can commercial fishing continue as a viable, sustainable industry? Can recreational fishing continue to expand to produce both fun and economic benefit?"

Can America Save Its Fisheries?

"This brings us to why we are here today," Cato said. "As a university-based research and outreach program, Sea Grant's fundamental mission is to provide the nation with information that can be used to solve [ocean-related] problems . . . The issue here today is the science-based use and management of America's fisheries resources."

Recognizing that every issue in every region couldn't be covered in one day, he said the forum organizers chose two dozen of America's leading experts on fisheries issues—representing the views of government managers, industry leaders, university scientists, conservationists and Native Americans—and assigned them to panels to address one of three critical questions:

- "Who Owns the Fish?"
- "Are We Organized to Manage?" and
- "How Do Our Changing Coasts Affect Fisheries?"

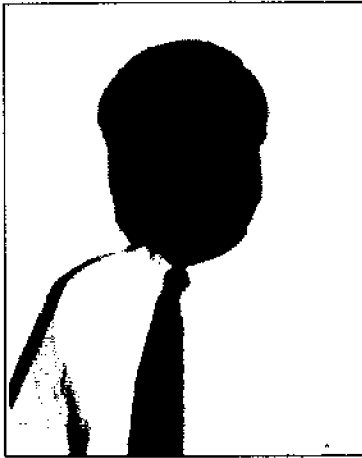
To first provide the necessary background for these discussions, he said, an overview of the current status of America's fisheries would be presented next by National Marine Fisheries Service chief scientist Michael Sissenwine.

The Current Status of America's Fisheries

Michael Sissenwine
Chief Scientist, National Marine Fisheries Service

"Continuing management of fisheries the way it's been done in the past, in my opinion, just isn't going to save our fisheries," asserted Michael Sissenwine, chief scientist for the National Marine Fisheries Service.

In the course of his presentation, Sissenwine developed a proposal that saving American fisheries will require that we overcome resistance to change, as well as be willing to pay for better management. He asserted that current problems are "a direct consequence of the traditional way in which fisheries developed" under centuries-old beliefs that "ocean



resources were so vast that they required no protection, that they couldn't be depleted, and therefore, they were open and available to anyone to use any way they wanted." Such open access to fisheries resulted in "a race for the fish, over-capitalization, too much effort" and a waste of fuel, capital, fish and people's lives.

Such fisheries have led to resource depletion from too much fishing effort and scientific uncertainty as to safe harvest levels, leaving fisheries susceptible to habitat degradation and natural fluctuations in fish stocks. "The fishery evolves to have enough capital, enough fishing power, to be in tune with the fishery under very good conditions, but when the environment becomes unfavorable and stocks decline, you have a serious overshoot which results in a resource depletion," Sissenwine said.

In the end a fishery is economically, socially and politically stressed. "Pressures are exerted by industry and politically to maintain high catch levels in order to support the investment in the fishery, resulting in what I refer to as risk-prone decisions, decisions that are optimistic about the condition of the stock."

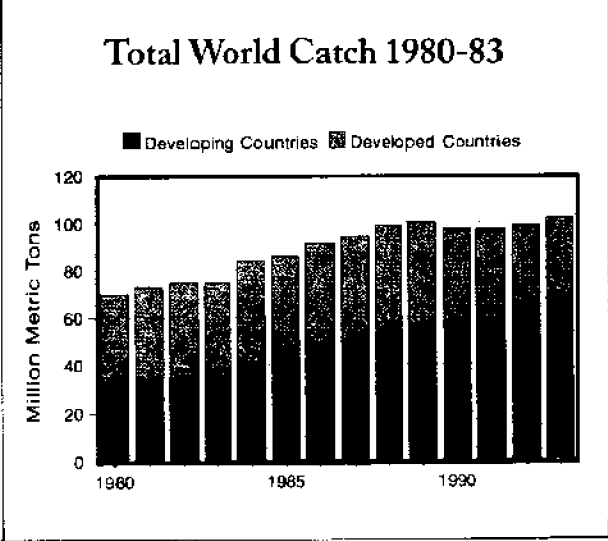
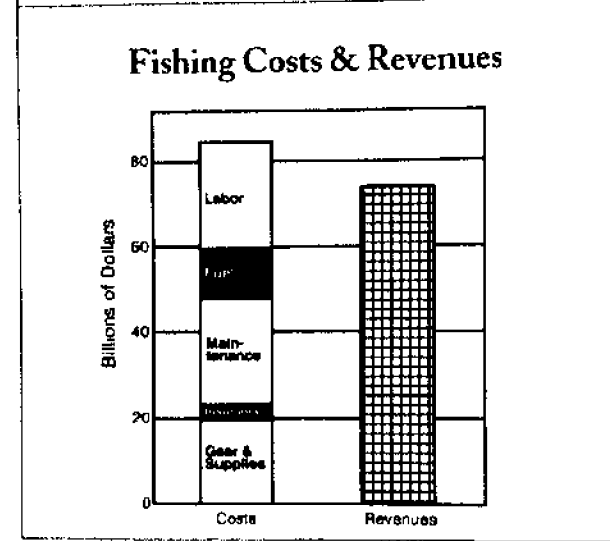
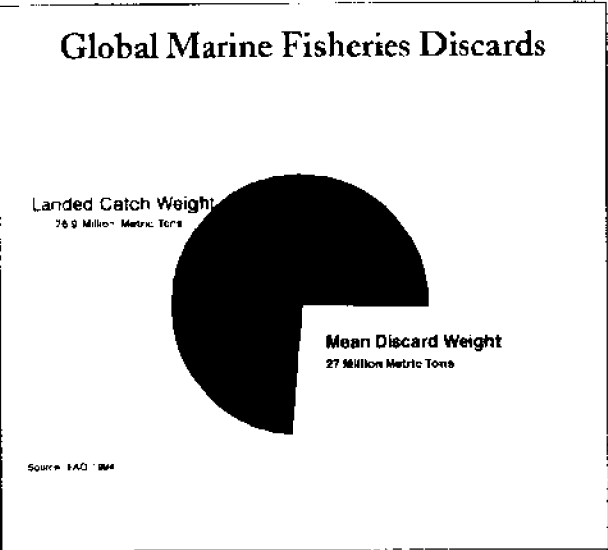
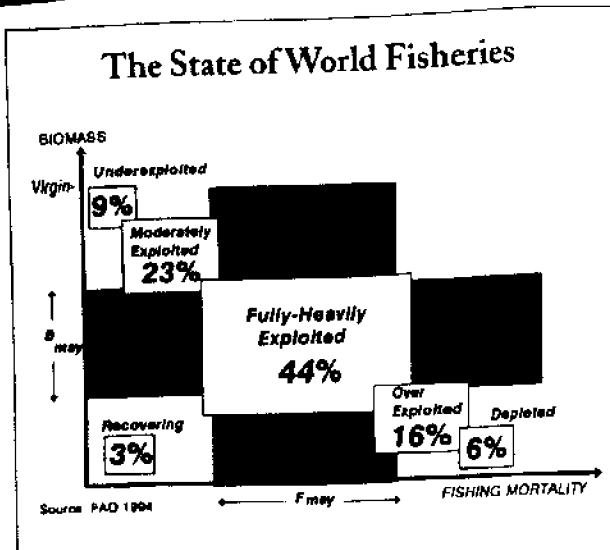
Sissenwine credited an unnamed fisheries scientist with the summary of the circumstances as "interminable debate about the condition of fish stocks until all doubt is removed."

The last 50 years saw a steady increase in global fish production until the 1990s, when yields began to level off somewhat below the estimated upper limit, or maximum sustainable yield (MSY). He attributed the leveling off in part to the over-utilization and decline of many fish stocks, citing a recent United Nations Food and Agriculture Organization (FAO) study that found a "plurality" of fish stocks to be heavily or fully exploited, placing them at or near the MSY level with 16 percent of fish stocks over-exploited, 6 percent depleted, 3 percent depleted and recovering, and only 9 percent susceptible to further development. He felt that the report demonstrates that "generally fisheries are pretty heavily exploited, but there's not a huge number that are actually pushed beyond" desirable harvest levels.

The more striking news is in an economic assessment of fish stocks worldwide also performed by the FAO. The global cost of fishing is something in excess of \$80 billion, while derived revenues total only about \$75 billion. The picture is even worse if we consider a capital investment of more than \$300 billion in harvesting capacity which is not making a return on investment.

By-catch and the discarding of harvested fish is yet another aspect of the problem, Sissenwine said, citing an FAO estimate that each year 27 million tons of fish—equivalent to about one-third of what is actually landed—are discarded around the world. Even more significantly, while fisheries were once dominated by developed countries, over 60 percent of production is now coming from developing countries, where it is not only an important source of food for local consumption, but also a major source of hard currency. He felt that fish production is "a significant factor in terms of the geo-political stability in some areas."

Fisheries management in the United States is very complicated. The Magnuson Fishery Conservation and Management Act of 1976 created eight regional fishery management councils and produced 34 fishery management plans dealing with more than 500 species of fish. Fisheries management also involves several international fisheries manage-

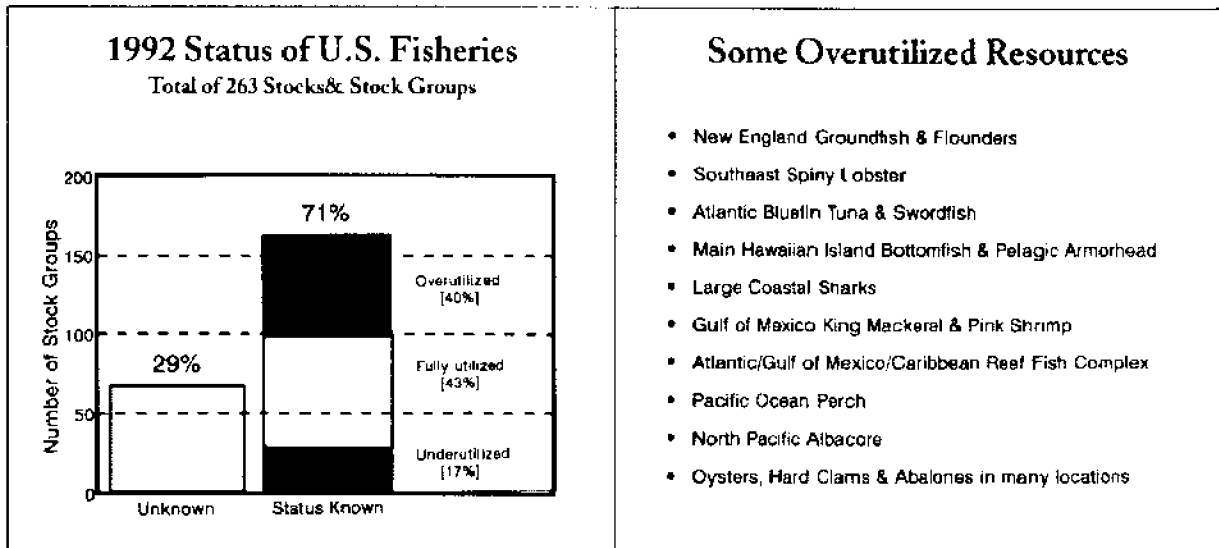


ment organizations, including NASCO for Atlantic salmon, the International Pacific Halibut Commission, ICAP for tuna and other migratory species in the Atlantic, as well as state management efforts and interstate commissions.

Sissenwine pointed out that the three-million-square-mile U.S. Exclusive Economic Zone (EEZ) is the largest of any nation, and the United States is the fifth largest fishing nation in the world. U.S. fish landings have increased over the last several decades to a current level of 4.7 million tons with a landed value of \$3.5 billion, and a post-processing contribution to the U.S. Gross National Product of \$20 billion. U.S. consumers spend \$38 billion on fish annually, including considerable imports, even as the nation exports nearly \$7 billion worth of fish each year.

The fisheries of the United States are further diversified, according to Sissenwine, by the participation of more than 17 million recreational anglers, who spend approximately \$25 billion a year in related activities. In addition to the economic impacts of this enterprise, he said recreational fishing "undoubtedly contributes very substantially to the overall quality of life for many, many millions of Americans."

Sissenwine recommended the National Marine Fisheries Service publication *Our Living Oceans* for reports on the current status of 230 individual fish stocks or groups of species in the United States. That document indicates the potential yield of U.S. fisheries may be as high as 7.5 million tons annually, some 50 percent higher than current landings, if America can deal with the issues affecting fisheries.



However, more information, as well as the rebuilding of some stocks, would be necessary before we could realize that potential, according to Sissenwine. At present, the data needed to assess some 29 percent of the fish stocks is unavailable, but of those for which sufficient data exists, about 40 percent are over-utilized, 43 percent are fully utilized, and 17 percent are under-utilized.

The perceived problems with America's fisheries are real, in Sissenwine's assessment. Historically important stocks such as North Atlantic groundfish and flounder, and Gulf of Mexico reef fish, have declined sharply due either to over-fishing or by-catch. He attributed the latter to a by-catch in the Gulf shrimp fishery in which "seven times as much fish is taken as shrimp," making it the major source of fish mortality.

He also cited such success stories as the striped bass fishery, in which the Atlantic States Marine Fish Commission, the affected states and the National Marine Fisheries Service worked together to restrict fisheries to allow improved recruitment and rebuilding of the stocks. Offshore herring stocks in the Northeast, which were severely depleted before passage of the 200-mile EEZ limit, have also recovered to the point of allowing development of a new fishery.

The Alaskan Bering Sea and Aleutian Island groundfish fisheries have maintained "rather stable abundance levels, high abundance levels through a transition from a foreign fishery to a joint venture fishery to a domestic fishery," which is a biological success story, according to Sissenwine. In his opinion, they demonstrate associated economic issues, however, with shorter and shorter fishing seasons for a fishing fleet that has grown to more than 2.5 times the appropriate size for the available harvest.

Pacific halibut provide the most extreme example of a race for fish, according to Sissenwine. While abundance has been high and the resource has been in generally good condition, very short seasons have resulted in risky fishing in bad weather, deterioration in the quality of landed fish, and marketing problems. The imposition of Individual Transferable Quotas (ITQs), in which the individual shares or rights to fish are assigned, has ended the race.

Sissenwine said the diverse and complex problems of fisheries are generally recognized. Many of the problems have resulted from risk-prone management decisions and demands for unachievable scientific certainty in "the tradition of open access management and other management regimes that have promoted excessive investment in the fisheries, development of the fisheries far beyond what the biological resource can sustain."

Since most fisheries in the United States are finally subject to one form or another of limited access, many others are under consideration for ITQs, and decision-making to limit risks is becoming more the norm, Sissenwine felt our fisheries ultimately could be saved.

He said the benefits of saving the fisheries could be immense, with an increase of more than \$3 billion in profitability generating as much as \$1 billion in tax revenues, \$8 billion in Gross Domestic Product and 300,000 jobs, as well

as improved recreational opportunities. It will cost money to implement the contemplated new management programs, he said, and resistance to change of traditional methods and lifestyles will have to be overcome.

User fees or some other form of increased support from the people involved will be hard to generate when the industry is under economic stress, so compromises will have to be found to change management and share costs equitably. He expressed concern that Congress currently is considering amendments to the Magnuson Act that would actually limit options of the fishery management councils to foster changes in fishery management.

In a subsequent question and answer session, Wilma Anderson of the Texas Shrimp Association questioned his assertion that seven pounds of fish were discarded for each pound of shrimp landed, claiming that a large portion was non-edible, non-marketable species and that recent efforts have reduced the by-catch ratio to 2-to-1. Sissenwine was not aware of the data she cited, but welcomed the news.

-H.P.

Who Owns the Fish?

Moderator:

Michael Orbach, Professor of Marine Affairs and Policy, Duke University Marine Laboratory

Panelists:

William Amaru, Northeast Atlantic Groundfisher

Bart Eaton, Vice President, Trident Seafoods, Inc.

Billy Frank, Chair, Northwest Indian Fisheries Commission

Robert Hayes, National Counsel, Coastal Conservation Association

Suzanne Iudicello, Vice President for Programs, Center for Marine Conservation

Bonnie McCay, Professor of Anthropology and Ecology, Rutgers University

“Granting a right to catch a certain portion of fish is not ownership of those fish,” asserted Suzanne Iudicello of the Center for Marine Conservation. “The government still retains the authority to set the quota level, to revoke the whole program if it sees fit, to change the rules. In that case, then, the public trust responsibility, the stewardship responsibility still remains with the public ownership—that is, the government.”

Panel moderator Michael Orbach, a professor of marine affairs and policy, joined Iudicello in considering the question of ownership broadly—not just absolute ownership, but also the right to use the resource and derive benefits from it. Though they represented diverse user groups and outlooks, the other panelists agreed that the fish are owned by everyone in America rather than select individuals. In fact, most were uncomfortable with the consequences of absolute ownership by an individual and skeptical that such ownership could be enforced.

Iudicello found the question of absolute ownership provocative, one that begs the question of how much an individual should pay for it. “I’m not willing to give away America’s fishery resources for the bargain basement prices that we give away our timber and our public lands and our public water rights. The price would have to be pretty darn high for us to consider that idea.”

Bonnie McCay, a Rutgers University professor of anthropology and ecology, pointed out that if absolute ownership were granted, issues of establishing boundaries would be messy, especially when fish kept moving around.

From a commercial fisher’s perspective, an individual does not own the fish until it comes on board the boat, according to Bart Eaton, a seafood company executive and Bering Sea fisher. Eaton pointed out that, even under an Individual Transferable Quota (ITQ) system of allocation, which turns control of fractions of the allowable catch over to individual fishers, “you’re told you have limited pounds, when to fish, where to fish, what kind of gear to fish.”

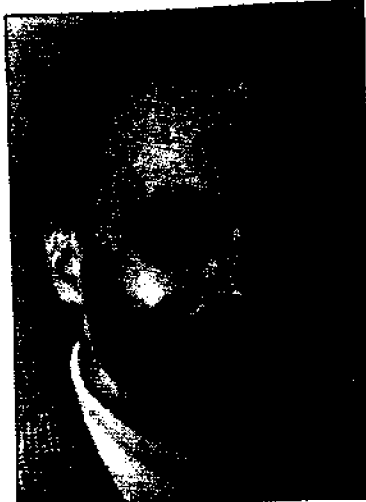
Managing People, Not Fish

Orbach pointed out that “all environmental policy, including fisheries management, is not a scientific issue. It’s a governance issue. It’s a matter of how to change or direct or agree about human behavior, not fish behavior.” He described fisheries management as a process for controlling access to the fish and assuring equitable allocation of the resource among competing needs.

“Managing people means you have to know how they behave and what their values are,” Orbach said. “Our human values determine how we decide to behave towards the fish and the environment.” He felt ownership of the fish and the rights to benefit from them are the core of fisheries management.

The Magnuson Fishery Conservation and Management Act of 1976 represented the federal government’s first entrance into fisheries management. It is based around a principle of public participation in management decisions through regional fishery management councils. The Magnuson Act was specific in directing that social and economic factors be incorporated into all allocation decisions.

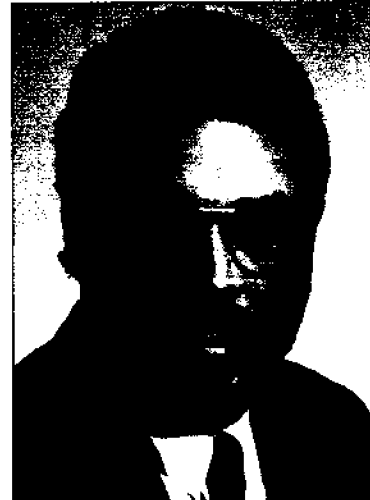
Orbach pointed out that no rule or regulation is strictly biological, and in fact each is social and economic and somehow allocates the fisheries. Because the process of federal management is so new, it is continually evolving in terms of law and policy. “What we are moving towards in management these days is paying attention up front to what the



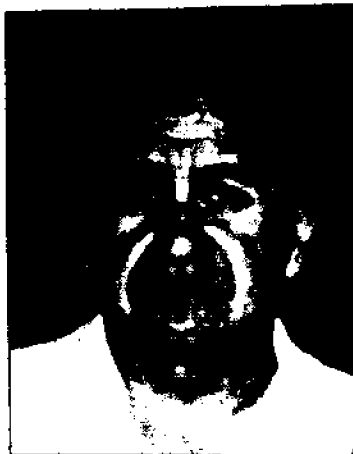
Michael Orbach



William Amaru



Bart Eaton



Billy Frank



Robert Hayes



Suzanne Iudicello



Bonnie McCay

allocation and distribution is going to be from our rules and directing the rules to have certain allocations.”

In considering fisheries resources as common property, Professor McCay observed that “it is as messy and problematic as any democratic system that involves social groups with different and competing histories, interests and views of the world, and it’s further complicated by a natural world that is very hard to understand and predict.”

The Right to Fish

Eaton expressed concern that the current system of regulations implementing the Magnuson Act were insufficient to prevent returning control of the fisheries to foreign interests if individual access were granted through a system of ITQs.

“I think that just has to be very well thought out if we want to put our natural resource, our fisheries resources in a forum that can be freely traded around the world,” Eaton said, “because we see in the North Pacific that is a very real possibility with the large amount of foreign ownership in the factory trawler fleet and even in the shore bases. That’s a question we feel has to be very well discussed. It should be put on the table

right away so we really know, so we don't get trapped into one of the unintended consequences, because that's usually what we grapple with later in fisheries management."

Recreational fishers have an entirely different perspective. Robert Hayes of the Coastal Conservation Association pointed out the "ever-present pressure to harvest fish to the maximum extent." Recreational fishers "want to conserve those fisheries because a larger biomass gives us the ability to catch those fish, and that's what we are actually all about." The concept of allocating portions of the allowable catch to individuals in no way addresses their concerns, he said.

A Heritage of Fish

Declines or depletion of fisheries ultimately will force fishers to abandon them as uneconomical, or they may be forced out of a fishery through management actions to restrict access. Ultimately, families who have sent fishers to sea for generations may no longer do so. William Amaru, a Northeastern U.S. groundfisher, admitted that after a 300-year history "perhaps the open aspect of resource harvesting has probably lived out its usable lifetime." He said New England fishers are willing to make concessions to change and have had to live a lifestyle of change, as immortalized in a Chatham, Mass., monument to commercial fishers, "The Chatham Fisherman: Ever Changing to Remain the Same." The prospect of limiting access to fisheries, necessary as it may be, is distressing because it is important to the lives of fishers to be able "to get up in the morning, go out, knowing that I have rules and regulations that I have to live by, but knowing that I can still go out and that my son someday could perhaps do the same, his children and your children. I am bothered that we may be losing that in the future."

Fish are more than a source of income for many Americans. Their harvest and use, even their very existence, are the foundation for rich cultural traditions extending back to the first settlement of this continent thousands of years ago. Billy Frank, chairman of the Northwest Indian Fisheries Commission, eloquently expressed such cultural concerns for fisheries: "Our life is built around salmon, and when you talk about who owns the salmon or who owns the resource, we always felt that no one did and that we all have to share and try to keep that alive, because it was part of our life . . . It was in our bloodstream and [what] we ate—that was our food. It was our bartering and everything that we had, and our families were built around the resource, whether it was the animals, whether it was the birds, whether it was the salmon, the shellfish, everything out in the ocean."

Responsibility for the Health of Fisheries and Fish Stocks

The CMC's Iudicello admitted that the environmental community was a relative newcomer to the realm of fisheries management, but that they have made a difference.

"This is a public resource issue," she said, "and every single one of us not only has the right, but I would say the responsibility, to get involved in learning about and participating in the questions of fisheries management, just as we do in questions of what's going to happen to the national park or other public land, timber, or other public resources."

Amaru said that he didn't know a single fisher who is unwilling to make concessions and change the way they do things for the health of the fishery and the resource.

"They want to be part of solving the problem. They don't want to have to look back someday and say 'the good old days' and 'this is the way it used to be when we could go fishing'," the Massachusetts fisherman said. "We, as stakeholders, are the ones who are directly affected by the rules and regulations as they are changing and coming down."

He reminded those present that a fisher's life is not in meeting rooms, but "out on the water. He's isolated, he's alone most of the time." It is as big an adjustment for fishers to become effective in a meeting as it would be for a person skilled in public forums to become a successful fisher.

Trident Seafood's Eaton introduced concerns about the level of investment in fisheries as a driving force in excess effort and pressure on the management system, saying "I've always been almost entranced by the role of government in providing the incentive to put capital into the fisheries." Before the foreign fleets could be removed from the new EEZ in the late 1970s, industry was told by the federal government to build more boats, he said, "so people were building more boats." Then they were told they had to build more boats before they could get rid of the joint ventures. In addition to plentiful private financing, there were MORAD loans and the Capital Construction Fund created by the National Marine Fisheries Service (NMFS) to foster construction and renovation of vessels. As "the oil patch" in the Gulf of

Mexico collapsed, he said, even vessels from that industry were renovated and moved into fisheries.

Eaton noted that the encouragement to invest capital was not limited to vessels but extended onshore, where efforts were made to "extort the Japanese in the 'Fish and Chip' days in return for a joint venture if they'll put capacity on the beach." Now the federal government is saying there is too much capital in fisheries, he said, asking, "Well, what do we expect?"

"I would expect if somebody that did the United Nations studies around the world would take what the deficit is and determine how much government incentives have been given to fisheries around the world, it's probably going to match pretty close," Eaton said. "The intended consequences never usually happen anyway, and it's the unintended ones that we have to be aware of."

Eaton concluded that not only in fisheries management, but in business one must "try and live in the future, try and think about what is the future going to be, because there can be some terrible mistakes made in investments."

Frank echoed Eaton's concern for a long-term vision, noting that many resource users are transient, and privatizing the resource won't guarantee that they consider the long term: "I haven't [seen] private property people doing a very good job, because the . . . land changes tomorrow. I might be talking to the doctor today. He's gone tomorrow. Us Indian people are still here. We're still in the exact same place. We're still relying on the same resource day in and day out. But you people move on. You sell your land, you're gone tomorrow, and we're still here."

Is It All Up to Fishers?

Commenting from the audience, Norma Ware, General Counsel for U.S. Senator Marc Basnight, noted that blame for fisheries problems was not limited to the people actually doing the fishing. Many other people and their activities affect the health of fish stocks. "I don't think that it is fair to make Mr. Amaru and Chief Frank and the commercial fishermen bear the entire brunt for the decline of the resource," she said, "because I don't believe they are responsible for the entire decline."

Citing nonpoint-source pollution, transportation runoff and agency management of watersheds, she asked, "If the fish do belong to everybody, to what extent are those people who are taking actions that impact on the resource held responsible? To what extent do these environmental concerns impact, and should those people who violate those environmental regulations be held responsible for the impact on the resource?"

Orbach noted that it was even possible for people who own coastal land, as well a share of the common property fisheries resource, not to be aware that their actions on land might affect their investment at sea.

For the most part, users of fishery resources tend to be swept up into the allocation fight and do not consider the threat of upland activities to their shared interest in the fish. Frank noted that "we fight each other. You hear it right here in this panel. And that's wrong. We shouldn't be doing that. We should be looking up the river a little ways and up the streams. We should be looking out to sea and beyond the 200-mile [EEZ]."

Iudicello concurred with the need to consider the fish stock in a broader light. "We agree totally with everybody on the panel who said you've got to get out of the ocean, get back on the beach, get up the banks, up the rivers where it's really happening. But once you get on private land, then everything—the whole picture—changes, and you have different interests against you."

In summary, the panel concurred that the fish belong to everyone, but they differed in their assessment of how to manage them. They recognized that the issue affects all Americans, and that we share responsibility for the future health of the resource.

Billy Frank provided perhaps the most apt summary of the cumulative impacts of our activities on fishery resources, along with ample food for thought regarding our collective ownership and responsibility for them: "If we look at the Lower 48 and moved it to Alaska, and took all them hydroelectric dams and moved them to Alaska, and took the breadbasket of California that feeds all of us, moved it to Alaska, we would have a lot of salmon down here."

Are We Organized to Manage?

Moderator

Bradford Matsen, Pacific Editor, *National Fisherman Magazine*

Panelists:

Robert Francis, Professor of Fisheries, University of Washington

Douglas Hall, Assistant Secretary for Oceans and Atmosphere, U.S. Department of Commerce; deputy administrator of the National Oceanic and Atmospheric Administration

Carl Safina, Director, Living Oceans Program, National Audubon Society

Courtland Smith, Professor of Anthropology, Oregon State University

Clement Tillion, Past Chair, Member, North Pacific Fisheries Management Council; Past Chair, International North Pacific Fisheries Commission

"The federal government's ability to manage is mixed," admitted Douglas Hall, Assistant Secretary for Oceans and Atmosphere for the U.S. Department of Commerce and Deputy Administrator of the National Oceanic & Atmospheric Administration (NOAA). While all panelists in this session agreed that the nation's current system of fisheries management needs some tinkering, they disagreed as to the type and degree of change needed.

"We're failures as fisheries managers and I believe, of course, that it's because we use the same system for fisheries management that the Soviet Socialist Republic used for years for agriculture and got the same results. The Commons are a disaster," said Clement Tillion, past chair of the North Pacific Fishery Management Council, who argued for a more capitalistic fisheries management system involving limited access to the fishing grounds and the payment of fishing fees or royalties to the federal government.

However, Carl Safina, founder and director of the National Audubon Society's Living Oceans Marine Conservation program, opposed any "ownership" of fishing quotas by private industry. "In my opinion," Safina said, "the fish are our birth right. They're absolutely priceless, utterly not for sale."

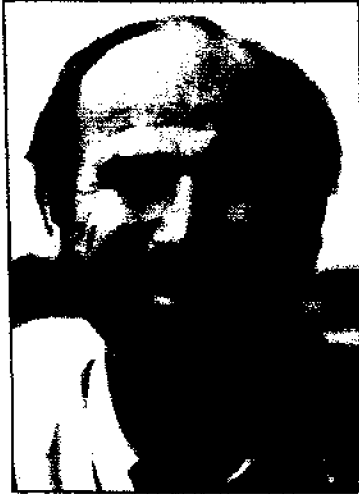
But the panel was not convened to reach consensus, according to moderator Bradford Matsen, editor of *National Fisherman* magazine. Instead, he said he hoped the panelists might reach "conciliation on some level."

Matsen opened this panel's discussion with a statement of issues: "The fisheries of the United States are currently managed under a myriad of local and state and federal fishing laws, including the Magnuson [Fishery Conservation and Management], Marine Mammal and Endangered Species acts, that are now the focus of congressional debate," said Matsen. "This regulatory environment has created regimes and agencies that are often in conflict and, in some cases, have engendered or condoned fishing practices that run counter to our national goal of sustainability of our marine and other food resources. As a result, consumers and members of the fishing community are burdened with the economic and cultural fallout from stock collapses, access limitation, the negative public perceptions arising from waste and by-catch, and other real and perceived abuses." Matsen then asked the panel to examine the contradictions, successes and failures of our current management regimes and assess the prospects for constructive change.

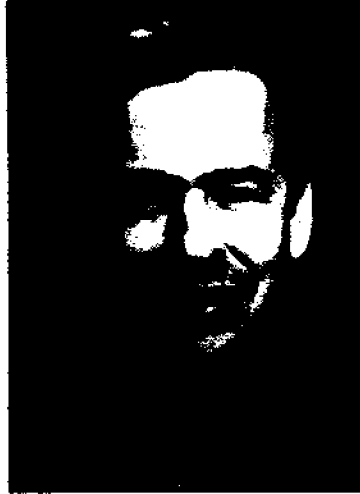
Long-Term Natural Change vs. Short-Term Management

Robert Francis, a professor of fisheries at the University of Washington, discussed the "mismatch between natural variation and the scales of variability of existing fishery management institutions." He noted that "contemporary human institutions seem incapable of riding out these [long-term] natural scales of variation that we're only now becoming aware of." Professor Francis said the exceptions tend to be events that occur over relatively short periods of time, such as "El Nino," a disruption of Pacific Coast oceanographic conditions that can cause drastic reductions in anchovy and salmon harvests. "El Nino is really just a very short kick to a system and when the kick is over, the system, in general, returns to the state it was before the kick happened," he said.

But in the North Pacific where climate oscillations may last from 20 to 70 years, long-term changes may have more



Bradford Matsen



Robert Francis



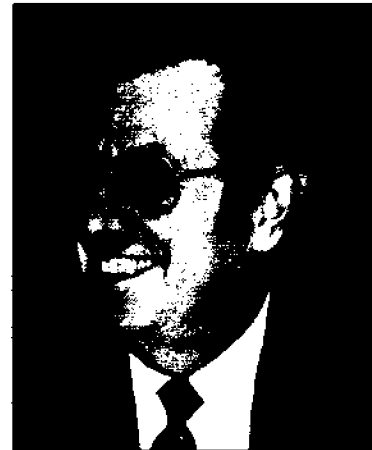
Douglas Hall



Carl Safina



Courtland Smith



Clement Tillion

profound effects on the environment. According to Francis, a major climate or shift in the late 1970s may have had a tremendous impact on West Coast fisheries, increasing salmon and groundfish production in Alaska and decreasing salmon production in the Pacific Northwest.

Human activities, such as fishing, can also trigger unexpected long-term changes in marine ecosystems, said Francis. Management institutions usually view the effects of over-fishing on a short-term time scale, assuming that they are reversible and predictable, he said. These institutions assume that biological communities operate under some kind of long-term equilibrium, that fishing can disturb this equilibrium, but, as soon as the disturbance is removed, the system will return to its initial state. "That may be true in the short term," said Francis, "but it is not true in the long term."

One example, he said, is the dramatic decline in populations of the Steller sea lion in the Gulf of Alaska and Bering Sea. Although current fishing practices tend to be blamed for this decline, Francis said he thinks it's likely that the primary cause is "perhaps the fisheries of the 1950s and 1960s when tremendous quantities of whales were removed from the North Pacific." When populations of whales declined, stocks of pollock, which now support a major fishery, grew. In addition, he said, the climate shift of the late 1970s also favored pollock, as well as cod and flatfish. As a result, the types of food available to sea lions changed dramatically.

"This major re-organization of the ecosystem has taken place over perhaps 30 to 40 years, partially in response to [human] exploitation, partially due to some very significant shifts in the environment," Francis said. He noted that these

CLEMENT TILLION:

"I think we [in Alaska] are entitled to some credit because we grossly under-harvest . . . Our first chairman [of the Pacific Fishery Management Council] was a banker, Elmer Rasmussen . . . and he said, 'The Congress, in their wisdom, have allowed bankers' - this was in '76 - 'to take risks that no sane banker should ever take. Our nation will pay for that mistake. I'm not going to make those mistakes with my bank and I don't think we should make that mistake with our fish,' Our scientists told us that we had 3 million metric tons [of groundfish in the North Pacific] that we could safely harvest. He moved that we set a cap of 2 million metric tons on it so that we would have at least a 30 to 35 percent reserve, and that's why we have fish."

ROBERT FRANCIS:

"One thing you have to recognize when you're dealing with Alaska salmon fisheries is that they're mostly wild fish and that the habitat, for the most part, is pristine. And so the opportunities are there for the populations to produce when the environmental conditions are right.

"If you contrast that with the area of the Pacific Northwest, it appears that the ocean environmental conditions that are favorable to production of Pacific Northwest salmon are opposed to those that are favorable to the production of Alaska salmon. So the ocean environmental conditions are probably not that good for Pacific Northwest salmon [right now].

"But you also have to look further [because] that's not the issue. The issue is that essentially there's no habitat in the Pacific Northwest for wild salmon and that what we've done is substitute with hatcheries. So we've tried to have our cake and eat it, too, and I think we're seeing the results of that."

types of changes are difficult to see because they occur very slowly or because there are very long lag-times between cause and effect.

Changes in Federal Management

NOAA Deputy Administrator Hall reported on changes his agency has made to improve fisheries management. (NOAA oversees the National Marine Fisheries Service [NMFS], which is charged with managing the nation's fisheries.)

Hall opened by calling the federal government's record of fisheries management "mixed" and referring to fisheries data outlined by NMFS chief scientist Michael Sissenwine at the outset of the forum. He then related changes NOAA/NMFS has made to improve the management of overexploited fisheries.

First, he said, "we have tried to take actions that err on the side of conservation." He said the agency has also tried to work with regional fishery management councils to ensure that scientific uncertainty is not used "as an excuse not to act."

Secondly, federal managers have "worked to ensure that decisions are based on the best science possible," said Hall. However, he said low budgets have restricted the data collection necessary for good science. For example, Alaska pollock stocks, which support one of the most valuable fisheries in the country, are only surveyed every third year.

Another aspect of assuring the best possible science is to "open ourselves up to outside review," Hall said. Recently, federal management plans for bluefin tuna were reviewed by other scientists and agencies. As a result, "we discovered that some errors had been made," the NOAA administrator said. "We recognized those errors, we acknowledged them, and we made policy changes based on that information."

Thirdly, the agency has increased its efforts to deal with the social and economic impacts of fisheries management decisions. "Last year we provided a \$30 million economic package to New England after enacting some very tough conservation measures," Hall said. "We also provided a total of \$26 million to the Pacific Northwest for salmon fishermen when we closed the salmon fishery."

A fourth point concerns strengthening partnerships with regional fishery management councils and “disciplining the process,” according to Hall. In the 1980s, it was well known that there were problems with New England groundfish stocks “and nothing was done about the problem, at least nothing meaningful,” he said. “We have proposed amendments to the Magnuson Act that would allow the councils a year to act and then if the council did not act...we [NOAA] would be required, under the law, to take action.”

Hall also said that the agencies are working to streamline the regulatory process. “We have now identified 45 percent of the fisheries regulations that we think can be taken off the books, that are either obsolete, redundant or unnecessary,” he said.

Conservation vs. Allocation

“I come from a state that did it right,” said Clement Tillion, a resident of Halibut Cove, Alaska, and a past chair of the North Pacific Fishery Management Council. “If we [Alaska] were an independent nation, we’d be number 10 in the world in fisheries production.”

Tillion attributed the health of Alaska’s fish stocks to policies initiated after statehood. “When we took over [salmon management] from the federal government in 1959, we had one-eighth the amount of salmon we had today.” According to Tillion, salmon runs recovered and other stocks remained plentiful because the state decided to separate conservation, or protection of the resource, from the political issues of allocation, or who can catch the fish.

“When our [fishing] areas are shut down, it [only] requires 12 hours notice. Nobody gets compensated and only the commission can override him [the responsible biologist] for cause . . . We have areas that have been closed 10 years, no compensation for anybody, and a lot of people think the closure was wrong, but it makes no difference,” he said. “That’s why we have more fish coming back to Alaska today...than when Russia owned it in 1867.”

Tillion also said that Alaska had avoided another mistake of using a sport fishing mentality in commercial fisheries. “Our sports ethic is very good. Maximize the resource and maximize the opportunity of any individual to participate . . . To carry that [ethic] over to commercial fishing is absolutely idiotic. It’s a food producing industry.”

Tillion said he is in favor of Individual Transferable Quotas (ITQs), under some systems of which individual companies or fishers own the right to fish for a certain percentage of each annual harvest. “But I’m not in favor of reckless ITQs that don’t pay their way,” said Tillion. He proposed that private industry pay royalties to the government for the right to fish.

Tillion felt that a system involving personal accountability could help reduce the problem of by-catch, or the discard of unwanted or illegally-caught fish. By-catch control is much more difficult in a common property fishery, he said, explaining that if “you have a 12-day season and you’ve got a \$9 million dollar investment in your boat, you set your machinery for the size of the fillets you think you’re going to get the most of, and anything bigger or smaller goes overboard and you just plow along...until they shut you down for the by-catch.”

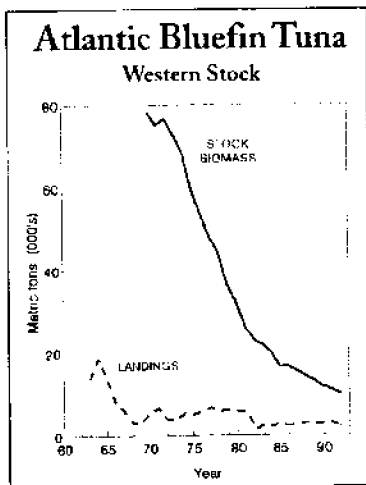
Losing A Birth Right

Carl Safina, founder and director of the National Audubon Society’s Living Oceans Marine Conservation program, noted that he had been invited to join the panel as a representative of an advocacy group. However, he said he considered himself more a refugee—“somebody who can’t go home again, somebody who was born into a rich world and has memories of a richer place than what exists now...”

Since he has lived, worked and studied in one area for most of his life, Safina said that he is not a refugee in space. Rather, he is a refugee in time. The abundance of marine life he grew up with no longer exists, he said, noting that it is no longer possible to go swordfishing in the area where he lives or to sight more than a few white marlin a year. “Personally, I resent that. That’s a destruction of the richness of my biological inheritance,” Safina said.

Safina said that the United States has “squandered the opportunity” for good management offered by the Magnuson Fishery Conservation and Management Act of 1976. The decline in haddock stocks is one example of that lost opportunity, he said. He presented statistics showing how haddock populations rebounded in the late 1970s, after the passage of the Magnuson Act, “only to be destroyed when the council system really took hold, the subsidies really, finally had their effect.” He also showed statistics detailing the decline of other North Atlantic species such as sharks, swordfish and bluefin tuna.

Although he views marine resources as a "birth right," Safina said that he thinks that some kinds of ITQ [individual transferable quota systems] make sense. "All I'm saying is that if we want to sell shares of quotas, that's one thing," he explained. "If we want to talk about privatizing the fish, I will never accept that. I don't know of many examples where private enterprise has helped natural resources."



Michael Sussemaine/NMFS

Regarding the primary question addressed by the panel, "Are We Organized to Manage?", Safina said, "Yes, we are organized to manage, but we are also organized to mismanage. What we need to do in the [reauthorization of the] Magnuson Act is simply take away the authority to mismanage and let the councils retain the authority to manage well. Let them have the authority to do what's right. Let them not have the authority to allow continued over-fishing, [to] avoid rebuilding of stocks. Give them some real authority on habitat and do something about by-catch and a number of other things."

For information on his specific recommendations for improvements in fisheries management, Safina referred the audience to his article published in the Spring 1994 volume of *Issues in Science and Technology* and another article scheduled for publication in *Scientific American* in November.

Conservation as Allocation

"Resource management cannot shrink from the fact that it is about allocation as well as conservation," according to Courtland Smith, a professor of anthropology at Oregon State University. During the panel discussion, Smith described examples of fisheries management actions that effectively transferred the right to fish from one group to another:

- The 1974 Boldt Decision increased the amount of the State of Washington's annual salmon catch that could be caught by members of treaty tribes from five percent to 50 percent. As a result, catches by non-treaty fishers dropped dramatically. During the same time period, the status of stocks was getting worse, rather than better, which caused further declines in non-treaty catches, Professor Smith said.

- "In 1975, the last Snake River dam was completed. That ended a period of 40 years, from the mid-1930s, where decisions were made in the Pacific Northwest to allocate the water resources to the economic development of the region as opposed to fisheries. And so we're seeing the results of that decision now [in the drastic decline of salmon runs in the Snake River]," said Smith.

- The equity principal, used as a basis for negotiating the 1985 Pacific Salmon Treaty between the U.S. and Canada, gives some priority to fishers in the area where a particular stock originated. Recently, federal managers determined that Alaska fishers were violating this principal by taking more salmon from the Columbia River and rivers in British Columbia than they were entitled to. The Alaska troll fishery was closed.

- Issues of managing for wild vs. hatchery salmon stocks also raise questions of allocation as well as biological and conservation issues, he said.

- "The shift from the capture of salmon to the culture of salmon...has a lot of impacts" for commercial fishers, coastal communities and consumers, Smith said.

The credo among many management institutions is to "base the decision on science, not politics," according to Smith. However, he said, fisheries science cannot necessarily provide answers to the many economic and social issues that are raised by management decisions. "Allocation conflicts are basically about different preferences [treaty vs. non-treaty fishers, water for power vs. water for salmon, wild fish vs. hatchery fish, etc.] and we have to work out a way to deal with those difference preferences," said Smith. Individuals and society will have to decide what is most important to them.

As an example, Smith posed this question: "How much do I want to see old growth timber and salmon resources swimming up the streams of my boyhood versus how much do I want to see economic changes take place so that I can sell more newspapers and more of my articles and more of the things that make the economy go?"

At the close of his presentation, Smith stated that "these are tremendously complex and dynamic systems, and to assume that we can come up with . . . one set of rules that are going to work in all time and all space . . . is kind of a naive assumption. . .

We're always going to have a situation where there's a great deal of change."

Is Ecosystem Management Possible?

Asked by a member of the audience whether if ecosystem management was possible, Safina replied that he doubted that many managers were able to take on the difficult and complex task of ecosystem management. "But I've also thought that trying to manage on an ecosystem basis is perhaps not as important as it sounds because we're not managing the ecosystem or the fish. We're managing the people. And when a person unties his boat in the morning, he doesn't go ecosystem fishing. He goes tuna fishing or cod fishing or lobstering."

Francis added that he thought it was possible to manage human activity and the harvest of individual species using an ecosystem perspective. He said the ability to manage this way depends, in part, on the interaction between the three major federal acts regulating fisheries: the Magnuson Act, the Endangered Species Act and the Marine Mammal Protection Act. In the Pacific Northwest all three acts come into play simultaneously. "To the extent that those acts are complementary or compatible, then perhaps we'll be able to do ecosystem management," Francis said. "But if they're incompatible I'm not sure what we can do."

According to NOAA administrator Hall, gaps in data and understanding limit the agency's ability to manage large systems: "We don't even know the status of [some] individual stocks, much less how they interact with other species. So there are some big gaps that you need to close before you can manage on the ecosystem basis." Hall said he thought that government agencies had come closest to ecosystem management in the Pacific Northwest while trying to reconcile and coordinate forest plans and salmon recovery plans.

- K.F.

Safina's Recommendations for Changes to the Magnuson Fishery Conservation and Management Act

- Define and prohibit over-fishing
- Mandate rebuilding of depleted populations
- Conserve and restore habitat: give NMFS veto power over coastal development permits
- Protect and rebuild large pelagic species (sharks, tunas, billfishes)
- Mandate a national policy to reduce by-catch
- Prohibit sale of sexually immature fish
- More easily enable policies that limit entry into particular fisheries
- Recover user fees to finance incentives for voluntary attrition from fisheries
- Establish formal procedures for certification of new types of fishing gear
- Diminish conflicts of interest on the regional fisheries management councils.

How Do Our Changing Coasts Affect Fisheries?

Moderator

John Magnuson, Director, Center for Limnology, University of Wisconsin-Madison

Panelists

Wilma Anderson, Executive Director, Texas Shrimp Association

Benny J. Gallaway, President, LGH Ecological Research Associates

Kenneth Hinman, Executive Director, National Coalition for Marine Conservation

Kai Lee, Director, Center for Environmental Studies, Williams College

James Lichatowich, Fishery Biologist, Alder Fork Consulting

Marc Miller, Professor of Anthropology and Fisheries, University of Washington

"We hear people say that environmental issues are the most critical issues of fisheries," panel moderator John Magnuson began. "Others say they're a scapegoat for the real problem and if you focus on the environmental problem, you're missing the real key problem, which is over-fishing. I would argue that . . . it is now essential to recognize that human-caused changes to the coastal zone compete significantly with the habitat resources necessary for the vitality of fisheries."

Kenneth Hinman, executive director of the National Coalition for Marine Conservation, echoed that theme: "We can't just deal with regulating the number of fish we remove from their environment without doing something to protect that environment."

After acknowledging the problems caused by overfishing, the panel turned its attention to how environmental changes also stress fisheries. These changes may be due to human development in coastal areas, to pollution, or even to natural variation in climate patterns. But all panelists agreed that environmental problems often contribute to fishery problems.

Example: The Pacific Salmon Fishery

Fisheries biologist James Lichatowich identified loss and degradation of habitat as the most serious danger facing depleted salmon stocks in the Northwest.

"For Pacific salmon," he said, "the question 'can we restore habitat?' clearly translates to the much broader and larger question, 'can the Pacific salmon fishery be saved?'"

And saving the fishery has profound social and economic implications. According to Lichatowich, "the fishery itself is worth a billion dollars a year, even in its depleted state, and produces 10,000 jobs."

He noted that salmon are migratory animals and depend on a variety of ecosystems. "The salmon's range extends from a mountaintop where an eagle takes the carcass to feed its young, all the way out to the waters of the Japanese current," Lichatowich said. He compared the salmon's ecosystem to beads on a chain, the beads being important places like spawning and rearing grounds, and the chain being the connection between those places.

"At every point on this chain of beads, the salmon are fighting a losing battle with human economic interests," he said. "The beads are disappearing, and the chain is being broken in several places."

Lichatowich said habitat restoration is a better tool than hatchery production to revive a depleted fishery. He compared two restoration programs on two major Northwest river systems: the Fraser and the Columbia. Both restoration programs have histories of 50 years or more, but each took a different approach to restoration.

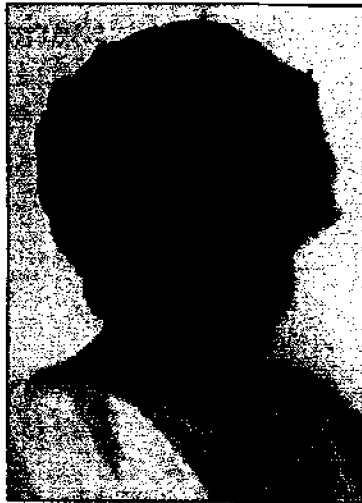
In the Fraser River, natural production and habitat restoration were high priorities. As a result, according to Lichatowich, the Fraser River is recovering and has reached historically high salmon production levels.

By contrast, in the Columbia River, hatchery production was prioritized over habitat issues. During the first 40 years of the Columbia program's existence, less than one percent of the budget was spent on habitat. The result: historically low levels of salmon production on the river.

"Unfortunately, the Columbia River approach is the norm, and the salmon's current declining status throughout the



John Magnuson



Wilma Anderson



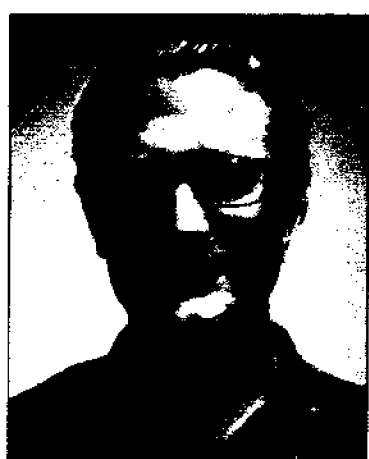
Benny J. Galloway



Kenneth Hinman



Kai Lee



Marc Miller

northwest is the result," Lichatowich said.

He noted that the Columbia is dammed and the Fraser undammed, but pointed out that these decisions to build dams were part of the philosophy of river management.

"The Fraser main stem is not dammed today in part because salmon were given a high priority, and the protection of critical salmon habitat, the migration corridors, were given a high priority, and it was believed that hatcheries were not an adequate substitute for natural production. It's not because people didn't want to build dams on the Fraser that the dams aren't there," he said.

"The point I want to make in terms of restoring habitat and can we restore habitat is this: we've relied on a silver bullet approach to restoration and management of Pacific salmon, usually using hatcheries as a substitute for stewardship and healthy river systems. It's time that we admit that the 120-year experiment, the attempt to use hatcheries to avoid facing the problems of deteriorating rivers, has failed. It's time to honestly try to repair the strings and beads that comprise the individual stocks of salmon and their ecosystems in the Northwest."

Example: The Gulf Coast Shrimp Fishery and the "Dead Zone"

Wilma Anderson, executive director of the Texas Shrimp Association, put the value of the shrimp industry in these terms: "In the state of Texas, we've got 30,000 people employed. They've got a \$326 million base payroll, and we're worth

\$600 million to the State of Texas."

Given those numbers, and the fact that she owns three shrimping vessels herself, Anderson was alarmed to learn how much shrimp habitat in the Gulf of Mexico was being lost and endangered.

"Without habitat, we had no livelihood," she stated.

The rate of habitat loss is substantial, according to Benny Gallaway, president of LGH Ecological Research Associates. Gallaway reported that coastal marshland, valuable as rearing habitat to post-larval and juvenile stages of shrimps, is being converted to open water habitat at a rate of 35 square miles per year, mostly due to human activity.

"While the specific loss rates vary among the coastal basins, the annual rate of loss ranges up to 17 percent of the total wetland area available for shrimp use in some of these areas. It doesn't take a rocket scientist to calculate that some action is needed," he said.

The situation is just as bad as you move from coastal marsh out into the Gulf, Gallaway said. The broad, muddy-bottom shelf of the western Gulf provides migration and spawning habitat for the shrimps. In recent years, and perhaps dating back to the late 1940s, up to 7,000 square miles of this region experience oxygen-deficient bottom waters, creating a so-called "dead zone."

"In this dead zone, oxygen-depleted bottom waters are found from 12 to 100 feet of water depth, starting at about a half-mile off shore, extending to as much as 45 miles off shore, and may extend up to 60 feet above the bottom into the water column," Gallaway explained. "This condition is believed to result from a fertilization effect of the Mississippi River discharge in combination with the stratified water conditions. The effect is certainly affected, if not actually caused by modern agricultural practices and alteration of the Mississippi River flood plain and discharge pattern."

The appearance of the dead zone, said Gallaway, happened about the same time as the collapse of the white shrimp fishery in the western Gulf of Mexico.

Conflict is inevitable, Gallaway said: "The shrimp migrating out of the estuaries . . . can't migrate through the dead zone, so they just go right down a near-shore corridor, putting the shrimp, turtles and fishery all together at the same time and at the same place."

Commercial fishers have felt the effects, Anderson said. Gulf shrimpers are now more highly concentrated in a smaller area—the same area where sea turtles are congregating. This congestion may increase the by-catch of turtles along with the shrimp harvest. She said the Texas Shrimp Association studied the problems and crafted its own regulatory proposal which they recently presented to the National Marine Fisheries Service.

"Our plan is very stringent, more stringent than the NMFS plan," Anderson said. "It also enhances sea turtle protection. It reduces by-catch. It is shrimp conservation, and it is economic stability of the fishery."

Interestingly, oil and gas platforms in the Gulf of Mexico have actually provided additional habitat to some marine species, Gallaway said.

"From the 1940s to the present, over 3,000 oil and gas structures have been installed, and platforms now dot what was once a nearly featureless mud bottom. Bottom fishing ground has been lost to these structures, their associated debris and interconnecting pipelines. However, these losses have been offset, at least in part, by the development of rich reef fish communities, including species of commercial and recreational value."

However, Gallaway said marine species attracted to artificial reef structures are significantly different than shrimps. "Reef species typically have, at least in the Gulf, life histories such that they cannot withstand heavy fishing pressure. In contrast, the short life history and high productivity of the shrimps renders them almost immune to all but the most intense of fisheries. Thus, the benefits that we receive from the artificial reefs may, in comparison, be short-lived, particularly considering that most of these will ultimately be removed by law."

These problems in the salmon and shrimp fisheries are examples that illustrate a wider problem, observed moderator Magnuson, who noted that "we see similar problems with many other fisheries, especially those that depend on coastal waters and estuaries for reproduction, nursery habitat and growth."

'Death by a Thousand Cuts'

"I think anybody who has been involved in the fisheries management arena knows that most of the players enter that arena as adversaries, whether it's commercial fishermen, one against the other over gear conflicts, or commercial

against sport fishermen, and fishermen against environmentalists, or all of the above against the federal fishery managers," said Ken Hinman, executive director of the National Coalition for Marine Conservation.

"There are some very different values at stake and some very different perspectives. But on one issue, we can and we absolutely must get along, and without question that is protection of the marine environment that the fish depend on for their survival," he continued. "This is the common ground that sport and commercial fishermen, environmentalists and fisheries managers stand upon to fight for a common cause against a common enemy. I think, unfortunately, most of the fishing interests are still just giving little more than lip service to habitat protection."

Hinman offered some reasons for what he called a "lack of progress" in this area. The first is what he called a crisis mentality, both in the fishing community and in the public at large.

"The threats of habitat destruction and pollution are always present, but they never seem imminent," he said. "Isolated fish kills tend to get a lot more attention than the fact that by destroying habitat by filling in wetlands, we are gradually reducing the carrying capacity of the environment that supports fish. I think it's very often pushed to the back of our minds, along with global warming and the depletion of the ozone layer."

The second reason is what Hinman termed the enormous scope of the threat: "So much of habitat loss is death by a thousand cuts. It's the loss of an acre of wetland here or two acres there. Also, the decisions are very often made locally, involving literally dozens of state and federal agencies sometimes."

Third is the problem of limited resources. Hinman said he felt the National Marine Fisheries Service is understaffed and under-equipped to deal with the many problems facing fish habitat. Trade associations and non-governmental organizations similarly aren't dealing well with habitat issues either, Hinman said.

"They are too easily distracted and very often to other more immediate concerns, such as over-fishing, which is reaching epidemic proportions all around the country," he said.

Finally, Hinman acknowledged that distrust and enmity among all the organizations and interests involved presents a huge obstacle to progress.

"It's hard to overcome those things and to put them aside," he said. "But the fact is that if we do not, we are going to continue to lose the battle to protect the fish habitat, and we will lose the fish ultimately."

What Can be Done?

"Is there still a place for fisheries (along) our changing coasts?" asked panel moderator Magnuson. "I think we all know the answer to that is yes, but . . . there is going to have to be a change within the fisheries."

Kai Lee, director of the Center for Environmental Studies at Williams College, stressed the need to apply rigorous, practical science to help solve fisheries problems. Carefully designed experiments can find the factors most important to productive fisheries, Lee said. Once those factors are found, policy can be implemented accordingly. Lee calls this strategy "adaptive management."

Fishing itself can provide the experimental data, Lee said.

"Catching a fish means that there is a measurement, there is data available to the fisheries manager," he explained. "Fishing is a set of experiments. And indeed the science of fisheries and fishery management, fisheries biology, is founded on the fact that fishing is the best way that we have of figuring out what is underneath the surface of the water."

Lee used an example of adaptive management from Australia. There, a five-year-old set of experiments has already shed light on which environmental factors are most valuable to commercially valuable fisheries there.

"The initial hypotheses were there might be lots of other causes. But in only five years time, by continuing with fishing under these controlled conditions, it's been possible to learn a substantial amount," he said.

"Adaptive management is such an obvious idea, you have to ask yourself why isn't it more common," he said. "It's not more common because it's slow. The experimental learning times are on the order of years. Human economies and human institutions tend to shift much more rapidly than biology."

"In general, what adaptive management tries to do is to combine two things that don't fit together very well - rigorous science and practical politics." Lee said. "Unless you're practical about your politics, unless you work with the people who are in your fishing community, you're going to wind up with a conflict that you can't resolve, because you're working out in the ocean or in rivers, in places where people have to collaborate. But if you aren't rigorous with your

science, then you won't learn anything or you won't learn it very fast. If today's fishery crisis implies nothing else, it is that it's very important for us to learn as quickly as we can."

Marc Miller, a professor of anthropology and fisheries at the University of Washington, noted conflicts between what he called "extractive and aesthetic conservation values" embodied in the policies of the nation's natural resource agencies. He stressed that fisheries problems are "not so much discovered by scientists as projected by constituencies. Fishery problems require a human judgement that a particular condition is biologically, socially, economically or morally unacceptable."

The philosophy of sustainability is at the core of both extractive and aesthetic values, Miller said. Likewise, environmental degradation threatens them both.

"These values are also embodied, albeit in competing ways, in the Magnuson Fishery Conservation and Management Act, the Marine Mammal Protection Act and the Endangered Species Act," Miller said. "These acts reflect competing societal values."

"It is no longer appropriate for fishery managers or fishery constituencies to be familiar with one of these statutes," he said. "We must be conversant in all three."

Political Action and Greater Cooperation Crucial

Hinman stressed that political action and increased cooperation are also crucial to solving fisheries problems. "As regards (protecting) habitat, it's clear that the Magnuson Act really has no teeth," the executive director of the National Coalition for Marine Conservation said. "[It] does not provide fishery managers with any authority to affect decisions made by other federal agencies that are going to impact that habitat, and they can be working directly in opposition to fishery management goals contained in federal fishery management plans."

"We would like to see the National Marine Fisheries Service given authority to prohibit or modify or alter, provide recommended substitutions, alternatives for projects that are going to impact in a significant way fish habitat," Hinman added. "The Canadian Minister of Fisheries has that authority. It's similar to what EPA has in the case of wetlands. And I don't think it's something that everybody should be afraid of . . . because as we've seen in those cases where agencies do have that authority, they use it to affect change during the process, the approval process and the permitting process, and not just as a club to veto things. The vetoes are actually used fairly rarely."

He said he viewed the National Marine Fisheries Service and the regional fisheries management councils as "the advocates for all of us in the federal government. And if we can't give them all that much more authority, we have to give them a stronger voice, and we have to require that other agencies not just listen to what they have to say but actually respond in detail with how they are going to address the concerns that the fishery managers have raised, or how they're going to modify the permits and the projects to alleviate or mitigate those potential damages."

Perhaps more importantly, Hinman said he thought a formal alliance among commercial fishers, anglers, environmentalists was needed "as an antidote, if you will, to the wise use movement."

"But I think, in this case, this would be the real thing. This would not be a charade. This would be jobs from the environment, not jobs versus the environment," he said. "We heard this morning there are \$3.5 billion from the commercial industry, probably an equal amount from the recreational industry, hundreds of thousands of jobs."

Hinman felt such a formal alliance would get attention in Washington.

"I think the fact that we would be bringing people that very often are fighting on issues into the same congressional office to say that we both agree that this is what needs to be done can make an impression."

Models for the Future

The panelists offered several models of successful multi-interest collaborations:

Hinman described an alliance on ocean dumping on the East Coast that involved all the various coastal interests, commercial and sport fishers, environmentalists, tourists, beach lovers, beach communities, chambers of commerce, and others. That effort succeeded in ending the dumping of sewage sludge off the East Coast.

Professor Lee mentioned how a generation of air pollution control technology and legislation has made progress in

cleaning up some air pollution problems. But he issued a caveat: "There are successes, but I think you have to consider them in the context of overall economic and population growth, which will cause many of the things that really are successes not to look so successful."

More specific to fisheries, Lichatowich told of an alliance in the Northwest where local community groups are trying to address problems in their watersheds. "In those groups, they are bringing together fishermen, loggers, farmers, into planning activities and restoration activities," the fisheries consultant said. "In most cases, those efforts are still new enough that you can't really see a lot of dramatic results, but at least it's bringing people together who weren't talking before, and they are talking in the watershed. The home watershed that people live in is the central point that brings them together."

"I'm real encouraged about that, because I think this new paradigm of ecosystem management, if it's going to work, to me, it has to do two things: It has to recognize the importance of local knowledge, and it has to begin to tailor the problem description and the solution to the individual watershed units," Lichatowich said. "And these local groups, I think, are in a good position to begin implementing those two criteria. Whether they're going to be legitimized by the institutions that override all this is another question, and whether they're going to be able to combat the forces outside the watershed that might be overcoming what they can do within their watershed is still to be answered. But at least there are some areas where these diverse interests are talking."

- L.W.

Luncheon Address

George Reiger

Conservation Editor, Field & Stream Magazine

"Unless state and federal administrators stop basing fisheries management on 'the Disney Doctrine' that wishing will make it so, we'll have more citizen uprisings, such as occurred last year in Florida when [some commercial] nets were outlawed," according to George Reiger, conservation editor for *Field & Stream*.

In his luncheon address, Reiger blamed over-fishing and government mismanagement for drastic declines in stocks of many Atlantic fishes. He called for conservation by both commercial and recreational fishers to reverse these declines. However, he said conservation measures must be fair. "The angler is being asked to bear a far greater share of the conservation burden than the commercial fisherman," Reiger said.

Reiger opened his talk with a quote from another sports writer regarding the "generally acknowledged decrease in the numbers of saltwater fish during the last few years." Reiger noted that the "year those words were written was 1922 and Atlantic coastal fisheries were in what was then considered a serious, even shocking state of decline. The irony is that many modern fishermen would regard the fishing that people were complaining about back then as excellent." He said that Frank Stick, the author quoted, "would have sneered at recent findings that the Atlantic coastal striped bass is now 'fully recovered'."

Reiger said sports fishers have long been skeptical of federal involvement in fisheries management. He cited 19th century federal programs to introduce new, exotic species to U.S. rivers. As a result, German carp "spread more rapidly across the country than did the German cockroach," seriously harming native fisheries and water quality, said Reiger. In contrast, the introduction of shad and striped bass to western water systems was beneficial, according to Reiger. However, "federal technicians indoctrinated with codes of genetic purity and exotic cleansing" are now trying to eliminate striped bass and shad from western rivers and lakes even though there is "only presumption of competition with salmon in the case of striped bass and absolutely none in the case of the shad," said Reiger.

"The proposal to destroy shad demonstrates the political naïvete of many federal biologists," continued Reiger. He said that eliminating shad will halt a popular sports fishery and therefore alienate sports fishers whose support is critical to federal attempts to restore salmon runs.

These and other government actions have broken the tacit agreement fishers and the government made early this century, said Reiger. "That compact meant that fishermen would give up our right to fish when, where and how we liked and even pay the government a licensing fee or monies through earmarked taxes on fishing gear as long as the government sustained and even increased the schools of the most desirable fishes." But, according to Reiger, this compact was broken because "greed, not science continues to dominate fisheries management, federal as well as state."

For example, said Reiger, Atlantic shark fisheries were rapidly depleted after a commercial market for shark fin developed. "As a recreational angler, I'm now allowed to keep one shark per day, even though that's clearly too many. Even more absurd is that my neighbor, who pays a relatively modest fee for a commercial fishing license, is allowed to keep up to 7,500 pounds of shark per day. Not only is restoration impossible under such rules; the sportsman who by and large didn't deplete the sharks to begin with bears the biggest burden."

Reiger cited bluefin tuna, "the pelagic equivalent of bison," as another example of poor management and an unfair conservation burden for sports fishers.

"The National Marine Fisheries Service has a plan that claims bluefin tuna will be—and here's that phrase again—fully recovered within 25 years," he said. "I'll be dead by then!"

Reiger called for an end to commercial catches of bluefin tuna. To be fair, he added, recreational catches should also halt.

In his discussion of the need for even-handed conservation measures, Reiger also criticized "so-called sportsmen who sell their catch" as well as "big-money fishing contests" and management agencies who allow such tournaments.

Moratoriums are the only thing that really works to restore fisheries, said Reiger. Stocks of striped bass were not restored "by the fine-tuning of length and seasonal limits or by allotments for poundnetters over gillnetters. Striped bass came back because in 1985 a Maryland resource administrator had the intestinal fortitude to shut down all fishing for the

species, commercial and recreational alike."

"So, can we save America's fisheries?" asked Reiger. "Yes, but only if (a) we accept the fact that most marine fisheries are in trouble—the West Coast's in-stream flow problems, the exception to the rule—because of over-fishing; (b) that all of us, recreational and commercial fishermen alike, are part of the problem; and (c) that all parties must make sacrifices proportionate to their impact so that all parties will also accept management plans based on science and mutual sacrifice."

"If, for example, as National Marine Fisheries Service surveys indicate, there are 4.2 million marine anglers trying to catch striped bass from Maine to North Carolina, yet fewer than 10,000 commercial fishermen in the same region [are] trying to do the same, it's absurd to go on allotting striped bass between the two groups on a 50-50 basis," said Reiger. "But it's equally absurd to allot an angling limit of two fish per person per day [fishing regulations in some states] when all the adult striped bass from Maine to North Carolina will not be enough to sustain the fishery at that rate for 4.2 million anglers."

At the conclusion of his speech, Reiger said that private sports groups "may be our best hope" for conservation and stock restoration. These clubs "are determined to restore the forgotten compact between the private and public sector," said Reiger. "And make no mistake: without that conservation compact there can be no future for America's fisheries."

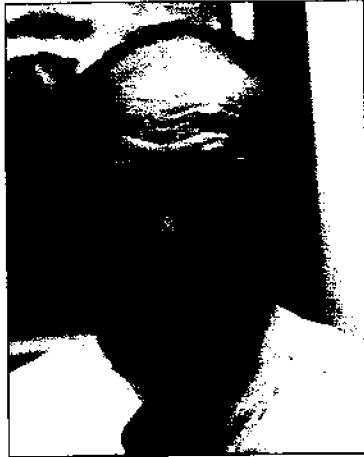
During the question-and-answer period following his speech, Reiger was asked about the impacts of commercial fishing bans on consumers. Reiger said that consumers can get fish other ways. Regarding Florida's net ban, Reiger said that many of the fish sold in Florida's restaurants and fish markets are caught by hook-and-line. He felt aquaculture can also make up for commercial fishing closures. In Maryland, aquaculturists increased production during striped bass closures and now supply more fish than commercial fleets did before the moratorium, Reiger said.

- K.F.

Summation

Ronald Dearborn
Director, University of Alaska Sea Grant College Program

"I think I'm struck more by the similarity of today's discussions with other issues this nation is dealing with, rather than by the uniqueness of fisheries," said Ronald Dearborn, chair of the steering committee for the fisheries forum, in summing up the day's discussions. "This is a tough environment for visionary leadership . . . But I think we must continue to realize that in this area, as others, leadership is critical."



In lieu of leadership, he said, we may have to be satisfied with linking rights and ownership with stewardship and responsibility.

"We're reminded that our fish are part of a world market, just as grain, automobiles, computers. Our decisions will reflect this economic pressure as we move forward in managing this resource," he said. "We've been reminded several times of the connection between our use and stewardship of the land with the quality of the ocean and the resources found there, like fish abundance."

Scientific Ignorance

"I think if I have one disappointment it's that we have not talked enough about ignorance," Dearborn said. "It's not for a lack of the quality or the motivation of our scientists, but we really don't understand the relationships of fish with a changing ocean environment. It's a complex system."

For example, if the world's best scientists were drawn together in a single room to address the radical declines of sea lions, he said, those scientists would conclude that it was food availability that was causing these declines. But if then asked how to change the management of pollock, the United States' largest fishery, for the single purpose of helping sea lions, he predicted some of the scientists would recommend taking more pollock to release food to the sea lions, because pollock feed on all the fat prey fish that have twice the caloric value of pollock themselves, while the others would argue to take fewer pollock to help sea lions, because any pollock in a net is not one in a sea lion's mouth.

"We're not talking percentages. We're not talking small issues. We're talking about a level of ignorance that prevents us from making sound decisions," he said.

As for addressing ignorance, Dearborn observed that the tendency these days is to focus on the negative, "particularly to bash government, to seek out villains any time our fortune falls below our expectations." These human habits get in the way, he said, when people try to learn from difficult situations, such as fisheries in distress. To attack ignorance, he suggested putting a higher emphasis on addressing successes.

"Why is the Maine lobster fishery now at twice the landings in this decade compared to the prior several decades? Where did the largest fishery, the Alaskan pollock fishery, where did it come from? We didn't use to have it. Why has every Alaska salmon harvest in this decade been at or near record levels?" he asked. "We have some broad ideas and assumptions about that, but clearly I think if we get away from the problems and get away from the villains, we may provide ourselves an opportunity to learn faster."

Many Thanks

In concluding, Dearborn thanked panelist Kai Lee for bringing up the issue of communication: "The reason we have shared in a number of successes and the reason that we have avoided more disasters is that we have continued to talk with each other, even when we have disagreed."

"Our nation's Sea Grant College Program thanks you for joining in this diverse discussion," Dearborn said. "We are pleased to have had the opportunity to host you and to share with you in these discussions, and we look forward to

addressing these and other coastal issues in the future."

He extended his thanks to all of the rest of the panelists and especially the Sea Grant communicators that organized the fisheries forum—Nancy Blanton, Communications Manager for the Washington Sea Grant Program; Kathy Hart, Communications Director for the North Carolina Sea Grant College Program, and Stephen Wittman, Assistant Director for Communications at the University of Wisconsin Sea Grant Institute.

- S.W.

Speaker Biographies

William Amaru

New England Groundfisher

William Amaru has more than 20 years of experience as a New England ground fisher. In June 1995, he was appointed to the New England Fishery Management Council. In 1993, Amaru established a new business — Fisheries Research and Conservation — developed to engineer fish nets to be size- and species-selective. He has designed fishing gear and owned a commercial boat-building business. Amaru also currently owns and operates Chatham Harbor and Pleasant Bay Tours, which provides environmental tours of Pleasant Bay, Mass. He has been an instructor at the Massachusetts Maritime Academy and has served on the U.S. Coast Guard's First District Commercial Fishing Law Enforcement Working Group. He received his undergraduate degree from State University of New York at Albany and is currently pursuing a Master's of Marine Affairs at the University of Rhode Island.

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Wilma Anderson

Gulf of Mexico Shrimper

Since 1991, Wilma Anderson has served as executive director of the Texas Shrimp Association and the Gulf Shrimp Research & Development Foundation. Anderson lives in Aransas Pass, Tex., where she owns and operates three 75-foot Gulf shrimp trawlers. She has more than 20 years of experience in the Gulf shrimp fishery. She is a graduate of Bemidji State University in Minnesota.

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James C. Cato

Florida Sea Grant Director

James C. Cato has been the director of the Florida Sea Grant Program and a professor at the University of Florida since 1982. He is currently president of the Sea Grant Association. Cato has served as chair of a 15-member Blue Ribbon Marina Committee to review submerged land leasing and marina policies for the governor of Florida, was chair of the scientific and statistical committee of the Gulf of Mexico Fishery Management Council for eight years, and was the only academic to serve on a 12-member national task force appointed by the administrator of the National Oceanic and Atmospheric Administration in 1986 to make recommendations regarding legislative revisions to the Magnuson Fishery Management and Conservation Act. Cato has acted as an advisor to the National Marine Fisheries Service and to the South Atlantic and Caribbean fishery management councils. He has authored or co-authored 135 publications, including monographs, scientific journal articles, book chapters, magazine articles and extension documents for lay audiences. Cato earned a Ph.D. in food and resource economics from the University of Florida and B.S. and M.S. degrees in agricultural economics from Texas Tech University.

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Ron Dearborn

Alaska Sea Grant Director

Since 1985, Ron Dearborn has served as director of the Alaska Sea Grant College Program. He is also a member of the executive committee of the University of Alaska School of Fisheries and Ocean Science and currently chairs the Regional Marine Research Board for the Alaska region. From 1987 to 1988, he was president of the National Sea Grant Association. Prior to moving to Alaska, Dearborn was director of the Maine Sea Grant College Program. He has served on various committees of the Sea Grant Association, the Council of Sea Grant Directors, and the National Association of State Universities and Land Grant Colleges. He received his B.S. in mechanical engineering from the University of Maine and his M.S. in ocean engineering from the University of Massachusetts.

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Bart Eaton

Seafood Processor and Fisher

Since 1984, Bart Eaton has served as vice president of Alaska Operations for Trident Seafoods, which processes and markets king crab, Tanner crab, salmon, herring, pollock, cod, surimi and fish meal. He is a partner in two state-of-the-art longliner catches/processors operating in the Gulf of Alaska and Bering Sea. For more than 20 years, Eaton fished Alaskan and Bering Sea waters for crab, shrimp and salmon. He has helped develop at-sea and shore processing facilities in Alaska. In 1973, Eaton served as the industry advisor to the State Department on fishery resource allocations to Japan and the Soviet Union. He was the Alaska delegate to the Law of the Sea Conference in New York in 1974 and 1975. Eaton advised Alaska Senator Ted Stevens and Congressman Don Young on the drafting and implementation of the Fisheries Conservation and Management Act of 1976. He was appointed to two consecutive terms on the North Pacific Fishery Management Council from 1976 to 1982. In 1985, the governor of Alaska made Eaton a voting member of the Alaska Seafood Marketing Institute.

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Robert Francis

Fisheries Scientist

A professor at the University of Washington School of Fisheries since 1986, Robert Francis is known for his research on the effects of natural climate variability on fish stocks in the Pacific Northwest. Francis was director of the University of Washington's Fisheries Research Institute from 1986 to 1992 and currently chairs the National Research Council Committee on the Bering Sea Ecosystem. He is also a member of the PICES Bering Sea Work Group. From 1979 to 1985, he served as a fisheries biologist for the Northwest and Alaska Fisheries Centers of the National Marine Fisheries Service. He has an undergraduate degree from the University of California, and a master's and Ph.D. in fisheries from the University of Washington. He has authored and co-authored numerous publications on climate change and salmonid production, and climate change and its effects on fisheries.

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Billy Frank

Native American Fisheries

Billy Frank is the chairman of the Northwest Indian Fisheries Commission, serving as the key natural resources representative for 20 Indian tribes in western Washington. He is the commissioner representing the Nixqually, Puyallup and Squaxin Island tribes. Frank is a member of the Nisqually tribe and served as fisheries manager for the tribe for more than a decade. He has fished the Nisqually River all of his life. He was a commissioner to the Washington State Centennial Commission and chairman of the Native American Committee. Frank has served as a policy adviser for the U.S./Canada Salmon Interception Treaty and numerous other local, state, federal and international fisheries management efforts. He has received the Albert Schweitzer Award for Humanitarianism, the American Indian Distinguished Service Award, the National Common Cause Award and the Washington State Environmental Excellence Award among other honors.

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Benny Gallaway

Fisheries Habitat Ecologist

Benny Gallaway is president and ecologist for LGL Ecological Associates Inc., LGL Alaska Research Associates Inc. and LGL Ecological Genetics Inc. For more than 20 years, Gallaway has headed these companies, which have conducted ecological studies of the Alaskan Beaufort and Bering seas, commercial shrimping in the Gulf of Mexico, coral reefs, and Gulf of Mexico ecosystems. Gallaway is a visiting member of the graduate faculty of the Department of Wildlife and Fisheries Sciences at Texas A&M University. He has authored more than 30 publications and 75 reports.

He received his undergraduate, master's and Ph.D. degrees from Texas A&M University.

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Douglas Hall

Fisheries Administrator

Douglas Hall is assistant secretary for oceans and atmosphere and deputy administrator of the National Oceanic and Atmospheric Administration. Prior to joining the U.S. Department of Commerce, Hall was vice-president of The Nature Conservancy, a 670,000-member organization dedicated to preserving the world's biodiversity. He managed the organization's communications and public outreach efforts. In 1992 while on leave from The Nature Conservancy, Hall served as political director for the campaign of vice presidential nominee Albert Gore. Hall has also served as press secretary and then chief of staff for U.S. Senator Jim Sasser of Tennessee. He was also a partner for The Communications Co., a Washington-based media consulting firm, and is a former reporter for the *Detroit Free Press* and the *Nashville Tennessean*. He received a B.A. in English from the University of North Carolina at Chapel Hill and an M.B.A. from Stanford University.

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Robert Hayes

Sportfishing and Fishery Law

Robert Hayes is the legal counsel for the Coastal Conservation Association and the American Sportfishing Association. His law practice focuses on international trade and natural resources. He has been involved in the Northwest spotted owl and endangered salmon issues. Hayes has been active in legislation to amend the Endangered Species Act, the Marine Mammal Protection Act, the Magnuson Fishery Conservation and Management Act and the Clean Water Act. Between 1975 and 1976, he acted as staff attorney for the National Oceanic and Atmospheric Administration before becoming Southeast regional counsel, providing legal advice to the Gulf, South Atlantic and Caribbean fishery management councils. Later, Hayes was deputy assistant general counsel for fisheries for the National Marine Fisheries Service and director of the NMFS Office of Industry Services, where he negotiated U.S. bilateral fishery trade agreements with Japan, Korea, Spain, France and Portugal. Hayes received his J.D. from Catholic University.

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Kenneth Hinman

Fisheries Conservation

Ken Hinman has acted as executive director of the National Coalition for Marine Conservation (NCMC) since 1982. The NCMC, a nonprofit organization based in Leesburg, Va., is dedicated to conserving ocean fish and protecting the environment. He is editor of the NCMC's quarterly newsletter, *Marine Bulletin*, and coordinates the NCMC Marine Fisheries Symposium series on contemporary issues affecting saltwater fishing and conservation. In 1991, the symposium focused on marine fish habitat conservation. Hinman is the author of numerous marine conservation articles. He writes a conservation column for *Marlin* magazine and his articles have appeared in *Salt Water Sportsman*, *Sportfishing*, *Sea Frontiers*, *Tide*, *Southern Saltwater* and other publications. Hinman earned a B.S. from the University of New Hampshire. Hinman serves on the U.S. Advisory Committee to the International Commission for the Conservation of Atlantic Tunas, the National Marine Fisheries Service Shark Operation Team and the steering committees of the Marine Fish Conservation Network and the Ocean Wildlife Campaign. He chairs the South Atlantic Fishery Management Council's Billfish Advisory Panel.

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Suzanne Iudicello
Marine Conservation

Suzanne Iudicello is vice president for programs and general counsel at the Center for Marine Conservation, a nonprofit organization dedicated to protecting the health, diversity and productivity of the marine environment. Iudicello began as a legal associate with the CMC while earning her J.D. at George Washington University. She provided research and analysis for the successful 1986 legal challenge that halted the Japanese high seas driftnet fishery in the North Pacific. Iudicello represented the environmental community in the fishing industry negotiations that led to the 1988 and 1994 amendments to the Marine Mammal Protection Act. Iudicello leads CMC's efforts regarding reauthorization of the Magnuson Fishery Management and Conservation Act and is a member of the steering committee of the Marine Fish Conservation Network, a coalition of fishing and conservation groups. She sits on the board of directors of the National Fisheries Conservation Center and has authored many articles on marine fisheries, bycatch and marine debris.

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Kai N. Lee
Environmental Management Policy

Kai Lee is a professor of environmental studies and director of the Center for Environmental Studies at Williams College in Massachusetts. Lee taught political science and environmental studies at the University of Washington from 1973 to 1990. He took a sabbatical in 1990-1991 as a research fellow and visiting professor at the Kyoto Institute of Economic Research. His book *Compass and Gyroscope: Integrating Science and Politics for the Environment* was published in 1993, and its ideas have been influential in the planning of adaptive management in the Pacific Northwest forests and Pacific salmon. His 1986 article, "Adaptive Management: Learning from the Columbia River Basin Fish and Wildlife Program," set out an experimental approach to rebuilding the salmon runs of the Columbia basin, the world's largest attempt at biological rehabilitation. Lee has served on seven committees of the National Academy of Sciences. He received an A.B. degree from Columbia, his Ph.D. in experimental physics from Princeton and completed a two-year fellowship in social science at the University of California.

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James Lichatowich
Fisheries Biologist

James Lichatowich has been involved in Pacific salmon issues as a researcher, manager and scientific advisor for more than 25 years. He is formerly the chief of fisheries research and assistant chief of fisheries for the state of Oregon. He is currently a private consultant. He has specialized in evaluating the status of salmon and steelhead populations and developing restoration plans and programs in the Pacific Northwest. Lichatowich is a member of the Independent Scientific Group for the Columbia River Salmon Restoration Program. He is also under contract with Island Press to write a book on the history of the Pacific salmon. The book's purpose is to clearly describe the causes for the current collapse of Northwest salmon stocks and provide a reasonable approach to restoration. Lichatowich received his B.S. and M.S. in fisheries science from Oregon State University.

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John Magnuson
Fisheries Scientist

John Magnuson is director of the Center for Limnology and a professor of zoology at the University of Wisconsin-Madison. He chairs the National Research Council (NRC) Oceans Study Board's Committee on Fisheries. He also chairs the NRC's Committee on the Protection and Management of Pacific Northwest Anadromous Salmonids and has served on the NRC committee to review bluefin tuna. Magnuson is a member of the steering committee of the Long-Term Ecological Research Program of the National Science Foundation and co-chairs the emerging issues working group of the International Joint Commission on Great Lakes Water Quality. His research interests are in fish and

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Bradford Matsen

Fisheries Editor and Author

Bradford Matsen is the Pacific editor of *National Fisherman* magazine and the author of five fisheries-related books: *Planet Ocean: A Story of Life, the Sea and Dancing to the Fossil Record*; *Reaching Home: Pacific Salmon, Pacific People; Shocking Fish Tales; Northwest Coast and Deep Sea Fishing*. In addition, he has written three documentary film scripts: "People of the Tides," "Alaska and the Pacific War" (winner of the Cine Golden Eagle) and "More Fish." Matsen has been editor of *Alaska Fisherman's Journal* and *Alaska Health Quarterly* and associate editor of *Seafood Leader*. He has written articles that have appeared in such publications as *Audubon*, *Mother Jones*, *Pacific Northwest*, *Wooden Boat*, *Alaska Airlines Magazine*, *Oceans*, *Seafood Business* and many more. He received his B.A. from the University of North Carolina at Chapel Hill and California State University and holds a master's from the University of California.

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Bonnie McCay

Maritime Anthropologist

Bonnie McCay is a professor of anthropology and ecology at Rutgers University. She has focused much of her research efforts on studying the human dimension of fisheries management. McCay serves as a member of the committee on economics and social sciences of the Atlantic State Marine Fisheries Commission, the advisory committee of the Smithsonian's Ocean Planet exhibit, and the scientific and statistical committee of the Mid-Atlantic Fishery Management Council. She has also served on two National Research Council committees. She has published numerous articles and book chapters in scientific and lay publications about fisheries management and its effects on the fishing community. McCay received her B.A. in anthropology from Portland State University and her Ph.D. in ecological anthropology from Columbia University.

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Marc Miller

Cultural Anthropologist

Marc Miller is a professor of marine affairs and an adjunct professor of anthropology and fisheries at the University of Washington. His research focuses on natural resource management, marine recreation, coastal zone management and marine values. He has served as a member of the scientific and statistical committee of the North Pacific Fishery Management Council since 1990. He was associate editor of *Coastal Management* from 1983 to 1993. Miller has edited several special issues of journals and published articles concerning the management of fisheries, coastal and marine ecotourism, and marine environmental ethics. He received his B.A., M.A. and Ph.D. from the University of California.

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Michael Orbach
Fisheries Anthropologist

Michael Orbach is a professor of marine affairs and policy at the School of Environment at Duke University. He is nationally renowned for his expertise in fisheries management policy research, particularly limited entry. Orbach has received North Carolina Sea Grant support to study fishery policy issues and their effects on watermen. He also received Sea Grant support in Florida to study effort management in the spiny lobster fishery. Orbach served for 10 years as a member of the North Carolina Marine Fisheries Commission. He has published numerous scientific articles on such issues as effort management, migratory fishers, fishing communities and fisheries policy. He received his undergraduate degree in economics at the University of California at Irvine and his master's and Ph.D in anthropology at the University of California at San Diego.

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George Reiger
Conservationist and Author

Since 1974, George Reiger has been the conservation editor for *Field & Stream*. He has written more than 12 books, including *Profiles in Saltwater Angling*, *Fishing with McClane*, *The Audubon Society Book of Marine Wildlife*, *The Southeast Coast* and *The Silver King*. Reiger has also authored more than 1,000 articles for such diverse publications as *Fly Fisherman*, *National Geographic*, *New Scientist*, *New York Times Magazine*, *Science Digest* and *Sea Frontiers*. Prior to joining *Field & Stream*, he was the Washington editor of *Audubon* and a senior editor for *National Wildlife* and *International Wildlife* magazines. Reiger has been a visiting professor of the history of conservation at Yale University and a member of the delegation to the Vietnam Paris Peace Talks.

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Carl Safina
Marine Conservation

Carl Safina is the founder and director of the National Audubon Society's Living Oceans Marine Conservation Program. He has worked for the society since 1979. Safina is currently a visiting professor at Rutgers University. Safina is a member of the U.S. Fish and Wildlife's Shortnose Sturgeon Recovery Team, the World Conservation Union's Shark Specialist Group, the Mid-Atlantic Marine Fishery Council and the board of directors of the Antarctica Project. He has produced numerous book chapters, scientific and professional journal articles, technical reports, and lay articles about fish and fishery management. Safina has assisted in developing more than six Audubon Society films and documentaries. In 1993, Safina spoke before the U.S. Senate Commerce Committee on the federal fishery management council system, interstate fishery management, and international management of tunas, sharks and billfish. He regularly provides comments to the National Marine Fisheries Service regarding fishery management issues, particularly regarding tunas, sharks and billfish. Safina received his B.A. from the State University of New York and his master's and Ph.D. from Rutgers University.

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Michael Sissenwine
Fisheries Management

Michael Sissenwine is the senior scientist for the National Marine Fisheries Service. Prior to coming to Washington, D.C., Sissenwine headed various divisions of the NMFS Northeast Fisheries Center in Woods Hole. He is an adjunct professor of oceanography at the University of Rhode Island. Sissenwine is a member of the guiding group of experts of the program on ocean science in relation to living resources for the International Oceanographic Commission, co-director of the joint National Oceanic and Atmospheric Administration/National Science Foundation GLOBEC

program, and the U.S. delegate to the International Council for Exploration of the Sea. He has written more than 100 publications and scientific reports regarding fisheries science, management and trends. Sissenwine received his B.S. in mathematics from the University of Massachusetts and his Ph.D. in oceanography from the University of Rhode Island.

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Courtland Smith

Fisheries Anthropology

Courtland Smith is a professor of anthropology and an adjunct professor in the College of Oceanography and the Department of Fisheries and Wildlife at Oregon State University. He was a member of National Research Council's Committee on Protection and Management of Pacific Northwest Anadromous Salmonids and the National Oceanic and Atmospheric Administration's Fishery Management Study Blue Ribbon Panel. Smith has authored two books — *Salmon Fishers of the Columbia* and *The Salt River Project: A Case Study of Cultural Adaptation to an Urbanizing Community* — and written numerous fisheries-related articles for scientific journals and general-interest publications. He received a B.M.E. in mechanical engineering from Rensselaer Polytechnic Institute and a Ph.D. in anthropology from the University of Arizona.

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Clement Tillion

Fisher and Fishery Manager

In 1991, Clement Tillion was appointed chairman of the North Pacific Fisheries Commission. From 1990 to 1994, he was a special assistant to Alaska Governor Hickel on fisheries. Tillion spent 28 years as a fisher, catching salmon, king crab, shrimp and halibut. He served seven terms in the Alaska House of Representatives before being elected and presiding over the state senate. Tillion is a charter member and later served as chairman of the North Pacific Fishery Management Council. In 1982, he was appointed Alaska Director of International Fisheries and External Affairs. For 20 years, Tillion advised the U.S. State Department on fisheries. Tillion received the Highliner Lifetime Achievement Award from *National Fisherman* magazine and the Wallace H. Noerenberg Award for Fisheries Excellence from the Alaska chapter of the American Fisheries Society. The emperor of Japan awarded Tillion the order of the sacred treasure gold and silver star.

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