# The Role of Sea Grant Extension Programming in an Era of Changing Fisheries

A Report to the Assembly of
Sea Grant Marine Advisory
and Extension Program Leaders

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The Sea Grant mission is to promote the wise use and conservation of marine resources through research, technology transfer and education. Sea Grant's enabling legislation did not specify user groups to be targeted for research and education programs. At the time of Sea Grant's inception, the commercial fishing industry had tremendous potential for growth. In the late 1960s and most of the 1970s, after the passage of the Magnuson Fishery Conservation and Management Act, it was national policy to promote increased harvesting of our fisheries resources in order to stimulate the economy and displace the foreign fishing fleet in U.S. waters. By today's standards, the recreational fishing industry was still in its infancy, and it was only logical that the Sea Grant network emphasized research and extension activities targeted at commercial fishing. During this period, Sea Grant had significant and successful programs focused on developing underutilized species and improving fishing efficiency through the development of new technology.

By the mid 1980s, the situation had changed. National goals of displacing foreign fishing fleets and maximizing our fisheries yield were achieved. However, many U.S. commercial fisheries had reached or exceeded maximum sustainable yields. Sea Grant programming with the commercial fishing industry also evolved, and new programs focusing on fisheries conservation engineering, value-added processing and new management techniques were added. Pioneering efforts by Sea Grant have been responsible for major advances in fishing vessel safety, seafood inspection under Hazard Analysis Critical Control Point (HACCP) guidelines and bycatch issues related to endangered or threatened species; all are outstanding examples of Sea Grant's vision and capability. This client base has often come to Sea Grant's defense to fight for continued funding, especially during the critical budget period of the 1980s when Sea Grant's very existence was threatened. During this same period and continuing today, the number of recreational anglers have dramatically increased with concomitant impacts on fishery resources and their involvement with fishery management issues and political action groups.

Sea Grant's Extension Program (SGEP) is are now challenged to find ways to equitably reallocate personnel and programming to meet the needs of these changing and sometimes conflicting constituencies. One challenge that emerges is the need to articulate to both the recreational and commercial industry and to fishery resource managers that the character of SGEP programming is changing in response to emerging issues. Another challenge will be to convince our traditional client base in commercial fisheries that Sea Grant must develop new visions to meet the challenges of the future and than they must remain as an integral part of our process.

To complicate the matter of defining the capability and role of the SGEP in fisheries is the evolution of new advisory programs that have a seemingly defuse and large client base. Issues surrounding global warming, the introduction of exotic species, coastal hazards and non-fisheries marine recreation, for example, all demand a part of a limited programmatic capability. Admittedly, each of these issues can contain a fisheries element, but by and large, they are not issues that are of foremost importance to a fisheries clientele. It is becoming painfully obvious that all constitutent needs will not be met given the present level of program capabilities and funding. Even under the best of circumstances there will be competition for Sea Grant's expertise and capability among the increasingly divergent and numerous client groups.

At Sea Grant Week in 1995, the Sea Grant Extension Program Leaders expressed concern that SGEP capabilities were being diverted from a fisheries base to more of an environmental issue base program. The same concern has been expressed that Sea Grant is leaving a loyal constituency

when the needs of that client base are more critical now than ever. Whether this claim or concern is justified or not, a need to examine the SGEP role in an era of changing fisheries is a reasonable expectation. Certainly, the fishery resources of the U.S. and the industries they support are in a state of dynamic change.

The intent of this document is to identify and evaluate specific areas of concern relative to fisheries and the needs of client groups. Not all the issues facing the commercial fishing industry are addressed, but those included were identified as having an important role for Sea Grant. Many of the issues are contained within Sea Grant's Strategic Plan and NOAA's plan for sustainable fisheries. We have taken the opportunity to expand on these issues and explore possibilities for the research and extension capabilities of Sea Grant to make a significant contribution to the needs of our constituents.

## Traditional and Alternative Fishery Management Strategies

### Content

Since Sea Grant was created 30 years ago, U.S. fisheries have gone from development and Americanization to the current focus on issues of sustainability, globalization, overcapitalization, bycatch, co-management, and allocation. Similarly, there has been a significant transition in SGEP fisheries focus, away from increasing fishers' production towards helping address management-related issues. The commercial and recreational fishing industry, fishery managers, conservation organizations, and concerned citizens are looking for innovative fishery management approaches.

Stakeholders are faced with an array of management alternatives as well as the complex issues and perceived consequences surrounding these options. Examples include individual transferable quotas, harvest refugia, effort quotas, community management, limited entry, and ecosystem management. Participants involved in the fishery management process have a poor understanding about the alternatives and their implications. This will hamper their ability to make wise choices and, therefore, impede public resource management from achieving objectives.

Sea Grant Extension's non-advocacy reputation places it in a unique position to play a strong educational role in fisheries management which should help improve fisheries management at the local, state, and national level.

### Role/Expectations

- Increase understanding by fishers, managers and other stakeholders about current and alternative fishery management options using research-based information and a non-advocacy approach.
- Conduct demonstration research that addresses fishery management issues.
- Identify and implement professional improvement activities for SGEP staff dealing with these issues.
- Identify fishery management research needs, communicate these needs to researchers, and encourage work on those topics.
- Interpret research results for individuals, communities, and organizations to help them participate effectively in the fishery management process and to evaluate management options.
- When appropriate, conduct applied research to measure the effects of implemented management plans.

## Commercial and Recreational User Conflicts

### Content

Sea Grant's research and extension roles in fisheries currently face a more dynamic challenge than when commercial fisheries were the dominant concern. Commercial fishery problems are more complex, and the rapid growth in marine recreational fisheries has resulted in increasing conflicts on the fishing grounds and in fisheries management arenas.

Sea Grant can become more proactive in developing effective research and advisory efforts, focusing on educational and fisheries management issues identified as significant to resolving local-regional-national commercial and recreational user group conflicts. Representing something of a paradigm shift for Sea Grant, the underlying theme

for the changing program focus should be to assist leaders of commercial and recreational fisheries groups to achieve a new level of understanding of marine resources utilization and management. Only by working more together, can limited marine fishery resources be conserved and possibly enhanced for all user groups.

Certain changes in the relationship and status of commercial and recreational fisheries groups require recognition in implementing effective program responses to reduce conflict and encourage more cooperation toward critical resource conservation and utilization management practices. Commercial fisheries must accept the growing influence of recreational fisheries in the management process, including the fact that an increasing segment of the economy is tied to the latter. Commercial fisheries should be more supportive of research-advisory efforts focused on bycatch and possible habitat destruction issues while encouraging similar work on recreational fisheries such as hook and release mortality. Recreational fisheries should not over-stress its shift in status by demanding research and management changes more to "compensate for past grievances" than to "actually improve status of fishery stocks." Both sectors should cooperate more in assisting research efforts to better understand impacts of various fishing and management practices on fish stocks, including use of non-fishing reserve areas, spatial separation, and gear restrictions.

### Role/Expectations

- Encourage programs to establish Commercial-Recreational Fisheries Joint Advisory Committees to assist in guiding advisory and research efforts, especially in identifying issues of conflict as well as issues of potential cooperation between the user groups.

- Develop research and extension projects on socioeconomic and biological aspects of changing fishery management regimes, including proposed spatial-temporal changes in fishing pressure in both commercial and recreational fisheries, impacts of fishing area closure zones, major resource allocation changes among fishery groups, and improved fisheries enforcement.

- Provide SGEP specialists and agents with training in leadership and conflict resolution to develop non-advocacy programming with both communities while maintaining their credibility with each other.

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## The Interface Between Commercial Fisheries and Aquaculture

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The development of aquaculture in the marine environment and Great Lakes region faces constraints generated by the concerns of other users of the coastal zone, including the commercial fishing industry. Concerns relating to spatial access, genetic dilution of wild stocks, disease, water quality, and the displacement of traditional fisheries are commonly voiced in public forums. Yet marine aquaculture offers an opportunity for economic development and employment in some areas adversely impacted by stagnant or declining wild fisheries.

The potential for wild stock enhancement or restocking depends on the ability of marine aquaculture to develop the technology to provide for a broad range of species along with the discovery of ecological and environmental parameters to facilitate success. If the concept for fish stock enhancement becomes more realistic, policies for the protection of wild fish stocks, issues of ownership, and the integrity of the natural environment will become increasingly important. Enhancement of commercial and recreationally used wild stocks of finfish and shellfish offer opportunities for commercial fishermen and supporting infrastructures.

Ocean ranching is attracting increasing attention as a mechanism for integrating aquaculture and commercial fisheries. The use of hatchery reared and/or natural stock for husbanding in designated special areas or structures to a finished product, harvestable by commercial fishermen, is a realistic option for some species. However, there are cases where both commercial and recreational fishing interests have opposed this concept for particular species fearing undue competition, spatial conflicts and the potential for the introduction of non-native or genetically inferior stocks.

The development of open ocean aquaculture offers the existing commercial fishery sector a unique opportunity to utilize vessels, sea going skills, and the shore-based infrastructure. The concept places new and more difficult demands on engineering and financing requirements, and poses new questions on the impacts upon the natural environment.

A vital marine aquaculture industry could provide employment opportunities in coastal communities and maintain links to traditional fishing lifestyles. As the marine aquaculture industry expands in the face of rapidly changing, and in some cases, declining commercial fisheries, SGEP must consider ways to bridge its capabilities to serve the needs of both client groups. However, some contend that the reality of displaced commercial fishermen participating in the opportunities presented in an expanding aquaculture is overstated.

### Role/Expectations*

- To facilitate the participation of the commercial and recreational fishing sectors in the expansion of the marine aquaculture industry.
- Develop sound socio-economic, market structure, and business management case studies on aquaculture relationships with wild commercial fisheries.
- Facilitate the transfer of information and aquaculture technology.
- Develop marine aquaculture technology and conduct demonstration projects which are compatible with other uses of the sea.
- Develop methods for addressing and resolving conflicts between marine aquaculture and other competing interests or users of the marine environment.
- Develop alternative institutional and policy structures for managing marine aquaculture and commercial fisheries interactions.

* Some of these objectives are taken totally or in part from the National Research Council 1992, *Marine Aquaculture: Opportunities for Growth.*

## Fisheries Development Through Value-Added Products and Market Development

### Content

Many commercial fisheries are in decline or static; total U.S. landings in 1994 were down 1% from 1993 levels. However, total value increased 11% and for some fisheries, such as lobster, mackerel, Pacific hake, squid, and those species targeted by large processing vessels, landings increased. A recent assessment of world fishery stocks indicated that 60% of the stocks are fully or over-utilized while 24% are recovering, underfished or could sustain more fishing pressure. One trend cited by analysts indicates that there is a transition in the composition of the global and U.S. catch. Today's landings are made up of less traditional and therefore lower valued species which may present an opportunity for economic stability and expansion through the development of value-added products.

One strategy to compensate for slow market growth or undervalued fishery resources is to increase the value of fishery products with consumer friendly product forms which minimize preparation time and waste. Another strategy could incorporate the concept of ultra-fresh fish and shellfish or the marketing of live products.

In addition, the U.S. can better utilize bycatch and processing byproducts. Full utilization of bycatch and discards could expand economic opportunities in both the harvesting and processing sectors. Many international markets are receptive to product forms and species that are quite different from U.S. market expectations. China would be an appropriate example as their increasing demand for seafood presents a new export market for U.S. seafood products.

As U.S. fishery management strategies shift towards rights-based fishing concepts, there is the direct incentive to increase the market value of the available quota. In addition, rights-based fishing strategies often have the secondary effect of stabilizing the supply of fishery resources in the marketplace. Product availability and consistency of supply were cited as a major concern, equal with product safety, for seafood retailers.

### Role/Expectations

- Assist industry in the development of value-added seafood products designed to facilitate ease of use by consumers and food service.

- Assist industry in the development of seafood products with extended shelf-life consummate with product safety.

- Develop marketing strategies to fill niche or time sensitive markets to maximize economic value.

- Conduct applied research/demonstration projects that focus on bycatch utilization and new product development.

- Explore the utility of developing non-traditional domestic and export markets with new seafood products.

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## Tribal/Native American Fishery Issues

### Content

U.S. fishery resources provide food, recreation, biotic diversity, and aquatic community stability. They also support a great many businesses and industrial enterprises. Because of the value placed on fishery resources, there have always been conflicts over their management, allocation among various user groups, and over the management of the water and habitat upon which they depend. Prior to the 1970s, fishery resources of U.S. coastal areas and the Great Lakes were primarily used by commercial fishing interests. Since that time, conflicts between commercial and recreational fishermen have resulted in greater allocations of these resources to recreational fishing interests.

At the same time that the Great Lakes was shifting from a commercial fishery focus to a recreational fishery focus, the decision delivered in Washington v. Fishing Vessel Assn.; 443 U.S. 658 in 1979--which allocated a portion of the Washington state salmon harvest to tribal members--was eroding the control of both commercial and recreational salmon fishermen in that state. The reassertion of treaty fishing rights then spread to the upper midwest, the East Coast and Canada.

Since the 1980s, protests and confrontations have diminished, and states are negotiating settlements with tribes in out-of-court settlements that usually restrict off-reservation treaty rights in return for an annual payment, although litigation is still being pursued in some cases. Many tribes and bands have become active in natural resource management and are trying to address the mistrust many non-tribal resource users feel. They have hired professional biologists, managers, and conservation officers. They actively participate in co-management of the resources with state and federal natural resource agencies. Educational efforts by native American support groups and the tribes and bands themselves have helped build cultural understanding, fostered knowledge about the legal basis of the treaties, and promoted the idea of living in peace. Although many individuals from the fishing and tourism industries have not fully accepted the court mandated resource allocations, obvious conflicts have subsided somewhat, yet they continue to simmer below the surface.

Sea Grant's strengths in research, outreach, and education can be brought to bear on the issues and controversies associated with tribal fishing rights. The role that Sea Grant can play in the tribal fishing rights issue is similar to the role that Sea Grant has already played in dealing with the recreational/commercial fishery user conflicts. The primary difference is that the native American treaties carry the weight of federal law and are not simply a socio-cultural issue.

### Role/Expectations

- Sea Grant can play a role in training native Americans through academically based and non-formal educational programs so that they can provide leadership for their communities in natural resource management.

- Sea Grant can serve as a facilitator for consensus building on key issues, conduct educational workshops for tribal members and decision makers, be a conduit for unbiased, research-based information to address critical sustainable fishery issues, work with youth to help them understand resource issues and to help eliminate racial misunderstanding, and develop culturally sensitive educational strategies for educating tribes and bands about fishery related issues.

- Because of Sea Grant's non-advocacy role, Sea Grant can address many of the issues that could not credibly be addressed by either the tribes or the states involved in a dispute. Sea Grant has the ability to fund research in a variety of disciplines and to bring multi-discipline teams together to address critical issues.

## Bycatch Issues as They Relate to Both Fisheries Management and Fishing Operations

### Content

The issue of bycatch and discards in commercial and recreational fisheries has captured the attention and scrutiny of the general public, resource managers, and environmental groups. The real or perceived waste of potentially valuable fishery resources, the inadvertent capture of protected or endangered species, and the inherent inefficiencies related to harvesting operations capturing unwanted animals require the attention of responsible research and educational programs dedicated to the wise utilization and conservation of marine resources. Regulations to limit fishery operations with significant bycatch problems have been imposed with forthcoming additional constraints almost a certainty. Advances in species specific fishing and size selectivity of fishing techniques are necessary in order to advance the wise utilization of our fishery resources. Specifically, new management strategies will mandate measures to reduce the unintentional capture of unwanted fishery resources, or the fishery will face severe operational constraints. The newly enacted Sustainable Fisheries Act (S.39) revamps the Magnuson-Stevens Fishery Conservation and Management Act by adding new terms and definitions. These include the terms "bycatch," "economic discards," and "regulatory discards" among others. It is clear that bycatch issues and associated implications for fishery management will continue to be an important part of Sea Grant MAS programming.

Sea Grant has and is currently playing a significant role in addressing bycatch issues through technology development, conservation engineering research, demonstration projects, and information transfer. It has become increasingly evident that modifications of fishing gear, regulatory constraints, and management controls are only a partial solution to bycatch problems. In many fisheries there are two levels of species and size selectivity: that which is accomplished by the fishing gear, and that which is accomplished by the crew of the fishing vessel. Relatively simple modifications in deck management and vessel operations by the captain and crew can be important, yet largely unexplored, solutions for bycatch management and discard mortality.

Despite some obvious techniques and available technology to address the problems of bycatch, progress has been hampered by the lack of specific goals for the management of bycatch. However, through several Sea Grant sponsored technical presentations and workshops, some consensus of goals have emerged.* These goals include: (1) the approach of full utilization of fishery resources by minimizing bycatch discards; (2) the elimination of over-exploitation to minimize the impacts of bycatch on the viability of fishery populations; (3) the reduction of conflicts between fishery sectors caused by competition for bycatch species; (4) the development of credible data and accurate information on bycatch issues and conflicts; and (5) define realistic goals for bycatch reduction.

### Role/Expectations*

- Evaluate existing technologies and develop new technologies for the reduction of bycatch.
- Develop technologies for product development and marketing of bycatch species harvested under a full utilization management strategy.
- Assess economic costs and socio-economic implications of bycatch reduction strategies.
- Develop and implement educational programs to foster deck management and fishing practices conducive to the reduction of discard mortalities.
- Engage in cooperative efforts with NMFS and other organizations for the reduction of bycatch and discards.
- Develop and disseminate information on the likely results of alternative bycatch reduction strategies.

* Some of these objectives are taken totally or in part from: Meeting the Challenges of Bycatch: New Rules and New Tools. Steven A. Murawski. *Solving Bycatch--Considerations for Today and Tomorrow.* University of Alaska Sea Grant College Program. Report No. 96-03. September 25-27, 1995. Seattle, Washington.

## Protected or Endangered Species Interactions

### Content

Human activity and the natural variations in the oceanic environment combine to cause unpredictable changes in the biomass of the world's oceans. These changes are especially problematic in areas that host significant commercial fishing pressure. When a species is declared threatened or endangered, access to fishing grounds can be restricted or declared off-limits when resource managers perceive a possible link between commercial fishing and the death of threatened or endangered species.

Public perception of the fishing industry also suffers as people begin to associate seafood harvest with destruction of protected wildlife. Consumers may stop buying certain seafoods that they believe come from fisheries that incidentally kill turtles, birds, marine mammals, or other animals. These outcomes can cause extreme economic loss to the fishing industry and others who depend on seafood harvest.

The SGEP is Sea Grant's primary link between state and federal governments, and the public. As an unbiased provider of scientifically based information, the Sea Grant MAS is well-situated to help bring together state and federal agency personnel, academic scientists, fishers, environmentalists, coastal development interests, and others to identify ways and means to reduce the impact of human-induced and natural environmental changes on marine species. This effort conforms with the intent of Congress, which specifies in the Endangered Species Act that "Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species."

Sea Grant research and advisory efforts have already recorded good success in inventing and testing gear, and in fishing techniques that reduce bycatch of protected species. As the demand for seafood rises, fishing pressure will increasingly stress marine resources. This will no doubt increase the utility of the Sea Grant Marine Advisory Program in its role of helping the commercial fishing industry reduce interactions with threatened and endangered species.

### Role/Expectations

- To keep informed of potential conflicts between fishermen and protected/endangered species and serve as an early warning system that can alert stakeholders to the scope of the problem.
- Develop skills in conflict resolution, coping strategies, and the communication of scientifically derived information about fisheries/marine animal interactions to the lay public.
- Build on current successes and expand efforts in fishing gear research, field testing, and advisory services aimed at reducing interactions between commercial fishermen and non-target animals.
- Assist NOAA and other fishery management agencies in the implementation of marine mammal take-reduction plans.
- Develop educational programs for both the general public and fisherman on the success and advances of applied research.
- Encourage formal and informal interactions with fisheries resource managers, policy makers, and conservationists so that all parties can have access to the expertise of researchers and research capabilities.

## Habitat and Fishery Issues

### Content

More than 75% of our economically important fishery stocks depend on the health of our inshore and/or nearshore environments. The increasing loss of habitat in these nursery grounds to pollution, unwise development, and other human activities is likely the single most critical long-term threat to our fisheries. Given the costs and the infrequent successes in cleaning up and restoring our damaged coastal ecosystems, protection and maintenance of

critical fishery habitat is by far the best investment our nation can make in sustainable fisheries.

Habitat issues cannot be dealt with in a vacuum or addressed on a piecemeal basis, segregated from other environmental issues. To deal with habitat issues we must recognize the ecosystem connections which underlie quality habitat, and address the linkages between air, water, land, and living things, including humans. This is often termed an ecosystem management approach. At a minimum, fisheries professionals need to begin a paradigm shift to broaden the habitat concept to more of a watershed/airshed approach. Our current research and data collection focus primarily on single species or areas, and will continue to be of limited value without an unbiased, integrative process to help incorporate ecological complexity into responsible public policy. Sea Grant has the opportunity to provide this framework.

Sea Grant is uniquely capable of making a difference to the nation with respect to enhancing, protecting, and restoring critical coastal ecosystems. However, there are no quick fixes to these environmental issues. MAS needs to continue its role in public education by providing the best, unbiased information to help the public understand the issues and to ensure wise policy development. We must also facilitate the development and transfer of new and novel solutions to those responsible for managing these ecosystems. We must make short-term gains in stewardship of coastal ecosystems whenever possible, but remain steadfast in our commitment to inter-generational sustainability.

### Role/Expectations

- Educate the public, stakeholders, managers, and policy makers on the importance of ecosystem management with the emphasis on the longer-term sustainability of fishery resources.
- Facilitate the development of measurable goals for sustainability of our fishery resources, and then make sure that the highest quality research is performed and evaluated to allow implementation of these goals.
- Educate communities, watershed associations, and other public and private groups on the research, technologies and approaches to fisheries habitat restoration, maintenance and enhancement.
- Assist the public, stakeholders, managers, and policy makers to overcome the emphasis on geopolitical boundaries and think more regionally, nationally, and internationally.

## Marine Safety

### Content

While the hallmark payoff of Sea Grant's research and outreach is typically viewed as sustainable coastal and marine economic development, a compelling argument can be made that the most significant thing Sea Grant does is help save lives. Through cooperative work with the U.S. Coast Guard and other safety groups, Sea Grant Marine Advisory efforts from New England to Texas and Alaska, have helped lower the number of deaths and injuries suffered by those who work in one of the nation's most hazardous industries.

The value of Sea Grant's extensive experience in marine safety training was fully realized with passage of the Commercial Fishing Vessel Safety Act of 1988. It was then that Congress mandated the use of specific safety gear aboard fishing vessels and required that commercial fishermen undergo marine safety training.

Recognizing Sea Grant's time-tested programs in marine safety training, the fishing industry, the U.S. Coast Guard, the National Transportation Safety Board, and an array of other state and local agencies looked to Sea Grant for guidance in setting-up a uniform system for delivery of new, federally-mandated safety and survival training.

Sea Grant training methods and information have been adapted for delivery to children, from kindergarten through high school. Sea Grant programs have worked with groups such as the Alaska Marine Safety Education Association to produce teacher guides and student workbooks, curriculum guides, and videos used in presentations to kids. Much of what Sea Grant has developed in this field for commercial fisheries can easily be applied to the charter boat and recreational boating activities of the general public.

### Role/Expectations

- Continue to support network "training the trainer" efforts through the program's Marine Advisory services. Efforts should also be maintained in concert with the U.S. Coast Guard and Coast Guard Auxiliary in helping commercial fishermen understand federally mandated safety requirements.

- Continue to inform fishermen about the need for safety training and help commercial safety trainers maintain high quality training programs.

- Increase activity in fishing vessel stability research and gear design and testing. The National Marine Advisory network will be the primary medium for involving the fishing industry in all phases of these efforts, from the assessment of need through conceptualization of research and delivery and utilization of results.

## Gear Conflicts and Gear Management

### Content

Competition for fish, fishing grounds, markets, gear, permits, and new and innovative fishing strategies is nothing new to the commercial and recreational fishermen. In fact, it may be the one characteristic common to all fishermen. Because of declining resources and increased effort, the competition for fish and space has turned ugly in many parts of the country. The overused phrase "too many fishermen and too few fish" is usually at the heart of most gear conflicts. The most common problem is the conflict between fixed gear and mobile gear. Lobster traps, crab traps, longlines, and gillnets are the predominate fixed-gear fisheries involved in gear conflicts with mobile-gear fisheries like scallop drags, bottom trawls, seiners, and mid-water trawls. The monetary and emotional cost to the industry is tremendous. Gear is destroyed, lost, and abandoned. Fisheries resources are wasted and lost gear creates environmental problems.

Gear conflicts also occur when there are too many fishermen attempting to fish the same area with the same type of gear or targeting the same species with multiple gear types. Many of these problems are enhanced by management regimes like quotas, time and area closures, and shortened seasons. When areas are closed, fishermen move to other areas where they have not traditionally fished, causing conflict situations. High prices paid for certain species also can create a "gold-rush mentality" which contributes to gear conflicts.

In some states there are conflicts with the use of commercial fishing gear by part-time and recreational fishermen. This increases when effort limitations are implemented, and competition for space and resources develop among full-time, part-time, and recreational users of commercial gear and traditional hook and line fishermen.

### Role/Expectations

- Conduct educational programs on collaborative problem solving, arriving at consensus, and conflict resolution. The skills used in dealing with gear conflicts can also be used in all aspects of managing marine resources. Identifying all the stakeholders and bringing them to the table should be a priority for Sea Grant.

- Educate marine users and managers to the fact that most conflicts can not be solved, but they can be managed. Sea Grant's goal should be to help marine users deal with gear conflicts efficiently, peacefully, and at minimum cost.

- Increase support for applied research into fishing gear with regard to selectivity, effect on habitat, interactions with marine mammals, and by-catch. The socio-economic effects of gear conflicts and resolutions should be studied as part of the process and looking for the "unintended consequences" in solutions can be a role for Sea Grant.

## Socio-economics of Fisheries in Transition

### Content

The American public has increasingly demanded more stringent management and regulation of marine resources in response to declining resource levels. Along with this situation, come social and economic disruptions. Fishers, for example, might have to move to another community or state to obtain employment. Restaurant workers typically dependent upon expenditures by commercial and recreational anglers may experience reduced earnings or even loss of employment as resource levels decline or the ability to harvest fish is restricted.

Alternatively, the social and economic structures of entire communities may be affected by management regulations.

A major problem with past management and regulatory efforts is that managers simply had little appreciation and understanding of the relationship between social and economic consequences, fishery management and regulatory strategies. As a result, fisheries management that failed to prevent the decline of resource levels eventually had serious detrimental effects on the social and economic structures of fishing communities.

It is imperative that resource managers be fully informed of the possible social and economic consequences of resource management. Moreover, as the nation increasingly imposes more stringent forms of management and regulation, it will become more important for resource managers to work closely with communities to seek solutions to avoid serious disruptions in the social and economic structures.

More fishing communities will likely experience an ever increasing number of social and economic changes caused by management and regulation. In addition, social and economic changes will also occur due to changes in market demand, harvesting technology and natural changes in the abundance and distribution of fish stocks. If rights-based management regimes are increasingly utilized by resource managers, there will be additional social and economic issues confronting fishing communities. With the increasing formation of various recreational and conservation groups, issues about resource allocation will have to be resolved with rigorous socio-economic analyses and good science.

Areas in need of more attention include management goals and objectives; the social and economic aspects of recreational angling; the relationship between community structure, economic impacts, and resource levels; the public perception of resource conservation; and the evaluation of the historical use of the resource.

### Role/Expectations

- To document social and economic effects of management policies at levels of detail necessary for fishery resource managers to make informed decisions.
- To provide information for purposes of management, the researcher base will have to be expanded to include more social scientists, economists, community planners and developers, individuals affected or possibly affected by management, and members of the general public. To expand research and extension functions through training and educational programs for Sea Grant personnel.
- To provide for public education and appreciation to a broad audience about problems in fishing communities by working more closely with planners, community administrators or officials, and various citizen groups and trade associations.
- To expand databases necessary to adequately deal with the diversity of individuals and the concerns about resource management.

## Application of Progressive Business Management Practices in the Fishing Industry

### Content

Sea Grant Extension Programs have dealt effectively with business management education of diverse audiences. Aquaculture, commercial fishing, recreational angling, and related businesses operate in an increasingly complex environment. Business planning is critical for not only startups, but also for existing businesses. Factors of changing demand, competition for resource share, and seasonality exacerbated by regulation can be dealt with by the SGEP. Educational efforts must note the rapid growth of personal computer utilization and access to a large array of statistics available for planning.

Past emphasis on developing enterprise budgets and record-keeping systems included applied research to acquire the educational material. Future programs will include economic assessment techniques and decision making processes using the best available information.

The U.S. is trailing many nations in rights based fishing. Businesses must be structured in preparation for rights based fishing. Experiences of businesses operating in these programs must

be available. Much of the information is international in nature. Businesses will benefit from MAS information sharing and Sea Grant research. Elements of the SGEP experience can serve as a foundation for the new efforts. Record-keeping and business analysis experience can facilitate expansion into rights based fishing, resource valuations, market driven aquaculture development and coastal community development.

### Role/Expectations

- Conduct programs on market driven perspective of aquaculture investment in what has often been a technology driven industry.

- Conduct programs on alternative rights based fishing management measures envisioning an increase in applications to states' waters. Conduct programs on valuation of rights based licenses and individual quotas.

- Conduct programs on valuation of fisheries and habitat resources for use in allocation and environmental damage determinations.

- Conduct programs on resident population and tourism growth to forecast resource demands for coastal development and recreational fisheries.

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## Relationships with Environmental, Conservation and Fishery Advocate Groups

### Content

Advocate groups increasingly have become involved in fisheries management over the past several years. The majority of these groups are reasonable, sincere and have provided positive input into the management process. Sea Grant has a history of successful involvement with many interest groups and its capabilities in the conflict resolution process is a credit to the Sea Grant Extension network. However, expectations that positive relations can be attained with all advocate groups at all times is unrealistic. Consequently, with the incorporation of caution and accurate judgement, Sea Grant is positioned to be an excellent conduit for the resolution of differences among the increasing numbers of advocate groups that wish to be involved in fishery issues.

### Role/Expectations

- Interaction with fishery and non-fishery advocate groups is essential. Sea Grant Extension's historic role as a non-advocate places it in a unique position to work effectively with opposing interest groups and functions to provide unbiased, scientifically verifiable information.

- Identify key responsible leaders and initiate interaction among diverse advocate groups. Opportunities will continue for SGEP to serve in the role of a facilitator. Enhanced communication and cooperation will continue to be essential in resolving conflicts regarding public resources.

- Identify appropriate and timely research and information needs through involvement and interaction with advocate groups.

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## Role of Marine Fisheries Education

### Content

All citizens are stakeholders in our fishery resources, not only for seafood, recreation and other economic benefits, but also for the health of our global ecosystem. As a recognized source of scientifically accurate and current fisheries information, Sea Grant has an opportunity as well as a responsibility to improve the literacy of the public, including K-12 educators and students, in the area of fisheries science and management.

Concern for the ecological health of the oceans and our nearshore environments remains high among the general public as well as school-age audiences. Misinformation and lack of easy access to accurate fisheries information can hamper citizens' attempts to interpret issues in areas such as seafood quality and supply, recreational/commercial fishery conflicts, and endangered species/fisheries interactions. Educators in particular require accurate information supported by scientific research rather than emotional appeals to assist them in guiding student investigations. Sea Grant educators, working with researchers and fisheries managers, are in an ideal position to develop resources to address these needs.

In addition, clients in fishery-based communities, especially educators and students, need to be aware of how their local economy

relates to regional and global fisheries. An understanding of how changes in the status of the fishery could impact the community's economy is critical for those who are faced with decisions concerning education and careers.

Fisheries education not only meets an immediate information need, but also can enhance current educational practices. Traditionally, marine education programs and curriculum materials, including many produced by Sea Grant, have focused on the basics of marine science. This information has been successfully integrated into school curricula and informal education programs for the public. However, today's educators are responding to the needs of our society and environment by developing curricula which incorporate not only scientific facts but also problem-based, interdisciplinary investigations. Fisheries management, which incorporates science, economics, sociology, mathematics, and technology, provides an exciting theme for marine education that can be made appropriate and interesting for students of many ability levels and backgrounds. A search of Sea Grant fisheries publications results in many varied resources, but only a few are targeted for educators and students.

### Role/Expectations

- Develop resources for educators and students, such as print materials, CD-ROMs, websites, and videos which focus on fisheries science and fisheries issues. These resources should, when appropriate, incorporate a problem-based approach which presents background information in a structured and developmentally appropriate fashion, and present scenarios and problem-solving activities which model the work of scientists, managers, and industry personnel.

- Develop fisheries education programs and publications such as fact sheets, non-technical reports, newsletter articles, public service announcements, lectures, and slide presentations for the general public.

- Develop more in-depth outreach programs such as videoconferences, workshops, symposia, and round-table discussions for specific target audiences including fisheries managers, educators, or scientists. A recent example of such an effort is the Sea Grant National Issues Forms held in September 1995 -- *"Can America's Fisheries Be Saved?"*

- Development and delivery of fisheries education products should be spearheaded by the educators with the active involvement of scientists, communicators, fisheries specialists, and other extension personnel.

- Investigate opportunities for national/regional collaboration in the development of education programs which address national and global fisheries issues in topic areas such as sustainability, global climate change, and non-indigenous aquatic species.

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## Relationships with Other Agencies, Management Councils, and Interested Parties

### Content

The clientele base of the SGEP has broadened as the diversity of groups interested in fisheries issues has expanded. Examples included commercial and recreational fisheries groups, regional fishery management councils, environmental organizations, federal, state and local agencies/ government, and professional societies. All of these groups can individually and collectively benefit from learning about and utilizing the latest research-based information and technology. These groups also need to work together to address pressing fisheries issues.

### Role/Expectations

- Provide access to, and understanding of, current research information generated by university-based research.

- Facilitate interactions and cooperation between organizations to work together on fisheries issues.

- Convey research needs identified by organizations to the research community and encourage appropriate research projects.
- Participate and contribute expertise, in a non-advocacy and non-regulatory manner, on appropriate committees and advisory groups.

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## Fisheries Data Collection

### Content

A significant problem in fisheries management is obtaining a consensus as to the validity of commercial fisheries data as perceived by fishermen, scientists, conservationists, and resource managers. Fishermen often complain that the data used for management decisions is outdated, insufficient, biased, or incorrect. Consequently, the level of compliance with regulatory constraints may not be high. The success of fisheries management can be increased if all parties agree on the validity or appropriateness of fishery data. Gear conflicts, user conflicts, resource assessments, and many fishery development conflicts need good data for successful resolution.

Commercial fishermen have, in most cases, been neglected in the data collection process. This may have been a lost opportunity as many fishermen have long and varied experiences which could be an asset in data collection. There are now many indicators that the commercial fishing industry could be valuable partners in the process of obtaining fishery dependent data, and commercial vessels can be used in collecting fishery independent data for stock assessment purposes.

### Role/Expectations

- Promote the use of fishing vessels and fishermen in the collection of data and the conduct of research. Scientists are usually very surprised at how capable and reliable fishermen become when they have some ownership in the project. Fishermen have many years of experience and their records and experiences can be very important in designing and implementing research projects.

- Encourage and assist fishermen in the collection of fishery dependent data in a format compatible with research and management needs.

- Sea Grant can be the unbiased party working to obtain the best data possible that all parties can use to solve fisheries problems. We can encourage the effected parties to work together collecting data. In this age of electronic communication, fishery management decisions can be made on a timely basis and Sea Grant could play an active role in this process.