

# **Fisheries Extension Programming, Adapting to Change**

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

March 2008

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## INTRODUCTION

*“Environmental stewardship, long-term economic development and responsible use of America’s coastal, ocean and Great Lakes resources are at the heart of Sea Grant’s mission”<sup>1</sup>*

The Sea Grant marine advisory or extension program is a clientele-driven, educational program true to the central mission of Sea Grant, yet encompassing a wide-range of topics and approaches that have evolved over time. The “fisheries extension” component exemplifies this flexible approach to confronting critical issues of our time. There is variability in the name of these activities across the nation. In some regions, Sea Grant fisheries educators are called marine advisors; in others they are called extension agents. For the sake of ease throughout this document, we are going to use the term Sea Grant Fisheries Extension Program (SGFEP) to encompass all these activities.

What has not changed over time is the role of SGFEP professionals in developing and disseminating research-based scientific information without advocacy. One of the particular strengths of this group of specialists is its ability to serve as convener, mediator, and liaison in the context of rapidly changing, and often contentious, struggles among the diverse users of our marine natural resources.

Fisheries Extension personnel excel in seeking and applying knowledge that transcends traditional disciplines in order to help individuals, groups and communities achieve practical solutions to the issues they face. As the country’s population moves inexorably towards the coast, as technology leaps forward and energy costs increase, and as the need for healthy foods and a robust environment coincident with demands for employment and recreation, there is no apparent limit on the topics pertinent to SGFEP.

“The Role of Sea Grant Extension Programming in an Era of Changing Fisheries” was published and presented to the Assembly of Sea Grant Marine Advisory and Extension Program Leaders in 1997. This report reflects on that document and looks forward, in an effort to serve as a guide for our future. Identifying and prioritizing achievable goals for SGFEP is the central objective of this report.

### *Reflections on the past; Looking forward*

The 1997 report identified 15 priority areas or topics. Each topic was briefly described (“content”) and four or five “objectives/roles/expectations” for SGFEP were identified. It is a testament to the authors’ abilities that each of these topics has proven to be of critical importance in our coastal communities and most continue to have relevance, albeit often in revised form.

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<sup>1</sup> <http://www.seagrants.noaa.gov/aboutsg/aboutsg.html>

As we move into a discussion of the next decade of SGFEP, we have reorganized the framework that was originally used, combining some of the original topics and adding others, noting linkages between or among the various topics. We have also briefly touched on some of the accomplishments of the past and divulged our new priorities, each one offering opportunities for research, outreach, and engagement.

The primary topics addressed in this document are not all encompassing; issues continue to arise that SGFEP specialists research and respond to as needed, but the topics discussed herein are representative of our array of interests and concerns.

## **FISHERIES MANAGEMENT—NATIONAL, REGIONAL, LOCAL**

### ***(A) Forms of management***

With the passage of the Magnuson-Stevens Fishery Conservation and Management Act in 1976, eight regional fishery management councils were established to ensure that the fisheries resources of the United States yielded the greatest benefit possible to the nation. Since then, the act has been amended several times in an effort to improve management so that the nation's natural marine resources were more effectively protected, along with the fishing communities dependent on them.

As fisheries management grew more sophisticated, SGFEP developed a network of talented individuals with expertise in the whole range of management considerations. Attesting to the recognition of this diverse knowledge base, the 2006 reauthorization of Magnuson-Stevens identified an advisory role for Sea Grant in NOAA Fisheries' training of new fishery management council members.

SGFEP faces such challenges as:

Providing current information and research results to all stakeholders in fisheries on traditional and alternative forms of management, including co-management and ecosystem-based management, effects of management alternatives on both natural resources and on fisheries stakeholders, and alternative ways of limiting catch such as input/output controls, privatization and/or capacity reduction

The complexity and potential consequences of management options that stakeholders face can be daunting. Moreover, growing uncertainties associated with fisheries sustainability, an inability to accurately predict fisheries dynamics, and to develop effective management responses in a risk assessment framework, may further exacerbate this. The implications for communities and individual businesses of individual transferable quotas, harvest refugia, effort quotas, community management, area management, sector allocations, limited entry, and ecosystem management must all be evaluated in the local and regional context if wise choices are to be made. Indeed, in the case of ecosystem management, managerial structures and authorities may need to be redesigned to allow for such new holistic approaches.

SGFEP recognizes that the effects of these diverse alternatives may not be easily anticipated and, therefore, that adaptive management should be an integral part of future fisheries management. Sea Grant's non-advocacy reputation places it in a unique position to play a strong educational role in this regard. Translating the results of social science research that evaluates management options for the stakeholders, promoting inclusion of multiple stakeholders in the decision-making, and facilitating discussions about alternatives should help improve fisheries management at the local, state, and national level.

## *OBJECTIVES/ROLES/EXPECTATIONS*

- Increase understanding by fishermen,<sup>2</sup> managers and other stakeholders about current and alternative fishery management options using research-based information and a non-advocacy approach.
- Conduct research that addresses fishery management issues and fosters the development of improved decision tools.
- Identify and implement professional improvement activities for SGFEP staff dealing with these issues.
- Identify fishery management research needs, communicate these needs to researchers, and encourage work on those topics.
- Conduct research to develop improved predictive tools to address fisheries uncertainties furthering the potential for risk-sensitive, precautionary fisheries management.
- Interpret research results for individuals, communities, and organizations to help them participate effectively in the fishery management process and to evaluate management options.
- Conduct applied research to measure the effects of implemented management plans, including the unanticipated consequences such as impacts on safety.

### ***(B) Bycatch issues***

The issue of bycatch and discards in commercial and recreational fisheries has netted 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, endangered or threatened species (PET), 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 sustainability of marine resources.

Advances in gear and techniques with respect to size and species selectivity are necessary. New management strategies mandate measures to reduce the unintentional capture of unwanted fishery resources, including closures if bycatch limits are exceeded. The Sustainable Fisheries Act (S.39) amended the Magnuson-Stevens Fishery Conservation and Management Act by adding terms and definitions such as “bycatch,”

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<sup>2</sup> Contrary to academic practice, those who engage in fishing prefer to be known as fishermen, regardless of their gender.

“economic discards,” and “regulatory discards.” It is clear that bycatch issues and associated implications for fishery management will continue to be an important part of SGFEP programming.

Sea Grant plays 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 and techniques, regulatory constraints, and management controls provide only a partial solution to bycatch issues. In many fisheries there are two levels at which species and size selectivity occur: that accomplished by inherent gear parameters, and that resulting from human factors. Relatively simple modifications in deck management and gear application can be important. Many of these potential operation modification solutions for bycatch management and discard mortality remain unexplored.

Goals identified by Sea Grant-sponsored workshops include: (1) the approach of full utilization of fishery resources by minimizing bycatch discards; (2) the elimination of over-exploitation; (3) the successful implementation of ecosystem-based management, recognizing the multiple trophic level effects of fisheries related mortality; (4) reducing the opportunity for conflict among fishery sectors arising from a shared risk of bycatch; 5) the acquisition of high quality data and accurate information on bycatch issues and conflicts; and (5) the definition of realistic goals for bycatch reduction.

### ***OBJECTIVES/ROLES/EXPECTATIONS***

- Evaluate bycatch associated with existing gear and develop new technologies to reduce 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.

### ***(C) Protected, threatened or endangered species interactions***

Natural environmental variation unpredictably alters the biomass of many of the world’s species. Separating the effect of these natural events from biomass alterations due to anthropogenic influences can be problematic. Quantifying and assessing the influence of bycatch and/or vessel collisions, for example, on a given large whale species can be

daunting. Assessing the effect of alterations on essential habitats or food resources is, at present, virtually impossible. If a link between commercial fishing and the deaths of protected, endangered or threatened (PET) species becomes apparent, access to fishing grounds and/or the use of certain types of gears may be prohibited or restricted. If the threat of mortality is perceived as more likely to result from a vessel strike, shipping lanes may be altered.

Public opinion/perception is a powerful driver in the management of PET species and has a direct effect on the fishing industry. If people associate a certain product with the destruction of wildlife that they value, they may stop buying that product. Such reactions most often occur when the death of charismatic mega fauna like turtles, birds, or marine mammals is involved. The effect of public opinion on the fishing industry was demonstrated in the 1970's when tuna sales plummeted after the dolphin bycatch in the purse seine fishery became known. The industry rapidly responded with gear alterations and a promotional campaign that included dolphin-safe product labeling. The industry became acutely aware that public perception could cause extreme economic losses to the fishing industry and all others who depend on the seafood harvest.

As an unbiased provider of scientifically based information, SGFEP is well-situated to help bring together state and federal agency personnel, academic scientists, fishermen, environmentalists, coastal development interests, and others to identify ways and means to reduce the impact of human-induced alterations to marine PET species. This effort conforms to the intent of Congress, which specifies in the Endangered Species Act "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 been successful in inventing and testing gear, and in developing fishing techniques that reduce bycatch of such species. However, as the demand for both seafood and imported goods rises, the potential for interaction with PET species increases. This will no doubt increase the utility of the SGFEP in its role of helping the commercial and recreational fishing and shipping sectors reduce interactions with such species.

### *OBJECTIVES/ROLES/EXPECTATIONS*

- Keep informed of potential conflicts between fishing and/or cargo vessels and PET 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 or shipping and 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 and recreational fishermen and non-target animals.

- Assist NOAA and other fishery management agencies in the research on and implementation of effective measures for use in marine mammal take-reduction plans.
- Develop educational programs for both the general public and fishermen on the success and advances of applied research.
- Facilitate the active participation of user groups in collaborative 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.
- Encourage formal and informal interactions with ship owners/operators, policy makers, and conservationists so that all parties can have access to the expertise of researchers and research capabilities.

### ***(D) Ecosystem-based management***

The increasing recognition that climate, habitat and individual fisheries cannot be addressed in isolation has contributed to a paradigm shift from single species management towards ecosystem-based management. In particular, the recognition that humans are an integral part of the ecosystem indicates an expanding need for the SGFEP to participate in this evolution of natural resources management. Successful ecosystem-based management must account for climate change, species-habitat interactions, trophic linkages and human activities. Sea Grant's history of addressing the human dimensions of fisheries places it at the forefront of such efforts.

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. SGFEP 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.

### **Habitat**

More than 75% of our economically important fishery stocks depend on the health of our inshore and/or nearshore environments. Loss and degradation of these habitats to pollution, development, dredging and other human activities are among the most critical long-term threat to our fisheries. Global climate change looms as an overwhelming force in the alteration of fishery habitats, with as-yet-unknown trajectories. Protection and maintenance of critical fishery habitat is by far the best investment our nation can make in sustaining our fisheries, as restoration of degraded habitat is both difficult and expensive (though increasingly necessary).

## **Climate**

The U.N.'s Intergovernmental Panel on Climate Change (IPCC) reports clear evidence that the earth's climate is changing. The average global air temperature is warming, leading to melting glaciers and rising sea levels worldwide. SGFEP is beginning to host symposia and discussions about how climate change could affect our fisheries, as well as property, water resources, and public health.

## **Invasive species**

Invasive species are fundamentally destabilizing forces. Increased globalization has contributed to dispersal of invasive species, driving environmental change worldwide. In aquatic and marine ecosystems, these species alter pathways of energy flows and can severely disrupt native species. In essence, invasive species impose severe impediments to natural resource management, economic growth, and sustainable development.

The International Convention on Biological Diversity charged governments to "Prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species." Although there are case histories on a global scale that identify increasing ecological and economic impacts of invasive species introductions, governmental responses to the invasive species issue, especially policy development, has been impeded by a paucity of current, and quantitative data on biological and economic impacts. In particular, the societal costs are often very difficult to quantify as they can include unemployment, impacts on infrastructure, environmental degradation, and a loss of biodiversity.

Globally, ballast water has been implicated as the major source of species invasions. In a 1981 report for Environment Canada, R.S. Howarth presented surveyed ballast tanks of 55 foreign ships bound for the Great Lakes, prophetically described the potential for ballast water as a vector of invasive species, and correctly predicted the invasion of zebra mussels into the Great Lakes one decade before its arrival. Other studies by Jim Carlton describe the problem worldwide.

Invasive species can also include pathogens or disease causing organisms that may also threaten the health of humans, fish, wildlife, and plant populations. The introduction of a new pathogen, such as viral hemorrhagic septicemia, can lead to extensive mortality among native organisms. Although first discovered in the marine environment, the vector of viral hemorrhagic septicemia globally is unknown. Ballast water is a leading suspect since the virus has also been found in the Great Lakes. This suggests that pathogens such as vectors of viral hemorrhagic septicemia may be considered under the invasive species umbrella.

Marine fisheries on both coasts are facing the spread of *Didemnum* (sea squirts) that may be making wide areas uninhabitable for fish eggs and shellfish larvae, with potentially devastating impacts on the lucrative scallop industry and other fisheries.

### **OBJECTIVES/ROLES/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.
- Evaluate research on general, critical and essential fish habitat, including studies of the impacts of anthropogenic activities
- Foster the development of stewardship among stakeholders for improved fish habitat protection and management
- Educate communities, civic and policy associations, and other public and private groups on emerging research, technologies and approaches to fisheries habitat restoration, maintenance and enhancement.
- Research and evaluate potential impacts of climate change on fisheries
- Organize conferences and symposia to further the state of knowledge
- Help fisheries stakeholders plan for potential change
- Educate stakeholders on the risks of invasive species to sustainable fisheries, the identification of potential vectors and steps to reduce their spread.
- Assist the public, stakeholders, managers, and policy makers to overcome the emphasis on geopolitical boundaries and think more regionally, nationally, and internationally.

### ***(E) Social and economic considerations***

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. Fishermen, 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.

It is imperative that all stakeholders 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 and other stakeholders 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 socioeconomic 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 and current uses of the resource.

### *OBJECTIVES/ROLES/EXPECTATIONS*

- Document social and economic effects of management policies at levels of detail necessary for fishery resource managers to make informed decisions.
- 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.
- Expand research and extension functions through training and educational programs for Sea Grant personnel.
- 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.
- Expand databases necessary to adequately deal with the diversity of individuals and the concerns about resource management.

## COOPERATIVE FISHERIES RESEARCH

Obtaining a consensus among fishermen, scientists, conservationists and resource managers as to the validity of commercial fisheries data has long been a problem in resource management. Fishermen often complain that the data used for management decisions is outdated, insufficient, biased, or incorrect. Consequently, there has been a perception that management regulations have been inappropriately designed and this has negatively affected both compliance and job satisfaction. In order to successfully resolve gear conflicts, user conflicts, resource assessments, and numerous fishery development conflicts, data must be accurate and supportable.

Cooperative research projects have begun to tap the expertise of commercial fishermen's long and varied experiences to improve fisheries and other marine research. Successful projects indicate that partnering with commercial fishermen is not only a valuable method of obtaining fishery dependent data but that commercial vessels can be useful platforms for collecting fishery independent data. Industry-science-manager partnerships have the greatest potential for obtaining data acceptable to all stakeholders. Mutual cooperation during collection processes imparts legitimacy to collected data that is exceptionally useful when results are to be used for stock assessment purposes.

Furthermore, fishermen's records, experiences, and expertise can be very important in designing and implementing projects. Specifically, these partnerships can go beyond just the collection of data, to using experiential knowledge to ground truth research questions, methodologies, and existing data, and to solve problems cooperatively. Fishermen and scientists involved in cooperative fisheries research projects report greater mutual understanding, trust and the likelihood of long-lasting partnerships.

Expanding on this notion to include citizen science -- a similar partnership between scientists and the general public -- may offer comparable rewards. By including all stakeholders (e.g. fishermen, beachcombers, armchair naturalists, school children) in selected projects, efforts to ground truth, collect and interpret high quality data, and disseminate these results is possible, while making real contributions towards successful management.

Sea Grant can be the unbiased party working to obtain the best data possible that all parties are willing to use to solve fisheries problems. We can encourage the affected parties to work together collecting or ground-truthing data or assumptions. Given the availability of electronic communication, such careful data collection and analysis could lead to timely fishery management decisions. SGFEP could play an active role in this process.

*OBJECTIVES/ROLES/EXPECTATIONS*

- Promote the use of fishing vessels, fishermen, and fishing community members in research and the collection of data.
- Encourage the collection of experiential knowledge and traditional ecological knowledge by recording oral histories or other methods.
- Participate in cooperative and collaborative research as a scientific partner, liaison, or convener.
- Encourage and assist fishermen in the collection of fishery dependent data in a format compatible with research and management needs.
- Explore the possibilities offered by citizen science for low cost and high quality data.

## MARINE BUSINESSES

### ***(A) Marine business management practices***

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. Changing demands, resource allocation issues, and seasonality exacerbated by regulation are factors that SGEP has dealt with effectively in the past and will continue to challenge business 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 widespread use of personal computers has made a vast array of statistics available for planning.

The U.S. has not moved fully to rights-based fishing, though several such programs have been established and more are likely to be implemented in the next several years. Businesses should be structured in preparation for potential changes, and the experiences of both domestic and international businesses currently operating in these programs made accessible through SGFEP. Businesses will benefit from SGFEP information sharing and research. Elements of the SGFEP 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.

### ***OBJECTIVES/ROLES/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.
- Research and conduct programs on community-based alternatives to individual rights-based management
- Conduct programs on valuation of rights based licenses, limited access privileges, 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.

## ***(B) Value-added products and market development***

Total U.S. landings in 2005, though lower than in 1997 when the first edition of this report was submitted, indicate gradual recovery with modest increases since a low point reached in 2000. Furthermore, total economic value has increased. Though U.S. increased exports to 3 billion pounds of edible seafood in 2006, 5.4 billion pounds of edible seafood was imported so the U.S. has a declining share of the domestic seafood market.

The majority of the protein consumed by the world's human population is comprised of fish, but an assessment of world fishery stocks indicated that 60% of the stocks are fully or over-utilized while 24% are recovering, under-fished or could sustain more fishing pressure. In addition, 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 that 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. The certification of sustainability has also become a marketing tool in some fisheries.

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.

To the extent that 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. Seafood wholesalers, processors and retailers repeatedly cite product availability and consistency of supply as a major concern, equal with product safety.

### ***OBJECTIVES/ROLES/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 evaluating the cost benefits of the certification of sustainability
- 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.

### ***(C) Recreational and subsistence fishing***

The economic benefits associated with recreational fishing, derived from direct and indirect expenditures associated with chartering fees, purchasing equipment, licenses, food, entertainment, travel and lodging, is well-reported in coastal and Great Lakes' states. Recreational fishing is also valued for its social or cultural benefits. SGFEP often plays a significant role in the evaluation of the various benefits of recreational fishing. Furthermore, some programs are involved in the design and implementation of artificial habitats or habitat improvements; the development of technological improvements that improve the experience of recreational fishing or lessen its ecological impacts.

According to Fisheries of the United States 2006, “nearly 13 million anglers made more than 89 million marine recreational fishing trips on the Atlantic, Gulf and Pacific coasts. The estimated total marine recreational catch was almost 476 million fish, of which 55 percent were released alive. The estimated total weight of harvested catch was 257 million pounds.” Though the recreational catch constitutes only a small portion of the total quantity of fish caught in the U.S., it is directed at a fairly small number of species, so monitoring of recreational catch is required by federal legislation. Recent research has also raised serious questions about release mortality on Gulf and South Atlantic species. SGFEP helps publicize fisheries regulations and best practices pertaining to recreational fishing, making information available to tourists and residents alike.

Subsistence fishing participation is not yet well understood. Neither the extent to which individuals or families are fisheries-dependent, the species sought, nor the population characteristics of this sector has been considered nation-wide. Initial steps are being taken to reach subsistence fishermen to provide seafood safety information, for example. SGFEP has the physical presence and capacity to further knowledge about this sector.

#### ***OBJECTIVES/ROLES/EXPECTATIONS***

- Evaluate the costs and benefits of maintaining and/or increasing recreational fishing tourism
- Research and promote techniques to increase the survival of “catch and release” practices in recreational fishing
- Develop creative ways to improve data-collection on recreational fisheries
- Help improve communication among the various fisheries stakeholders
- Assist in the development and distribution of information about regulatory

- measures and best practices in the recreational fisheries
- Research the subsistence fishing community

### ***(D) Commercial fisheries and aquaculture***

The development of aquaculture in the marine environment and Great Lakes region offers enormous potential to provide additional seafood for American consumers and help to offset the multi-billion dollar U.S. trade deficit created by imported seafood. Nonetheless, aquaculture faces a variety of constraints with concerns relating to spatial access, genetic interactions between farmed and wild fish, competition, disease, water quality, and the displacement of traditional fisheries are commonly voiced in public and other forums. Yet marine aquaculture offers an opportunity for economic development and employment in some areas adversely impacted by stagnant or declining wild fisheries. A sustainable aquaculture industry could contribute to the revitalization of many small ports and harbors struggling to maintain critical fishing infrastructure in the face of reduced harvest and increasing regulation. Fishermen have the skills on the water, own boats, understand product quality and distribution channels, and are adept entrepreneurs who could readily transition fully or part-time into the aquaculture arena. Sea Grant researchers and extension personnel have demonstrated their ability to facilitate both aquaculture and fisheries development. Sea Grant could be instrumental in bringing together aquaculture technology and capable fishermen to increase seafood production.

The potential for wild stock enhancement or restocking has been demonstrated with white sea bass in California and its further application will depend on the ability of marine aquaculture to develop hatchery technology to provide for a broad range of species. A great deal of research will be needed to determine the ecological and environmental parameters that facilitate success, and to evaluate the economic feasibility of restocking. If fish stock enhancement becomes a more common management tool, 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.

The development of open ocean aquaculture may offer the existing commercial fishery sector a unique opportunity to utilize vessels, sea going skills, and the shore-based infrastructure that currently supports commercial fishing. The technology exists to move offshore in net pen and submersible cage designs and a number of successful pilot demonstration and commercial farms are operating in California, Hawaii, Maine, New Hampshire, Puerto Rico and Washington. Legislation and regulatory regimes have been adopted in many states and federal legislation addressing waters of the EEZ is pending. It is imperative, however, that any offshore aquaculture be done in a sustainable fashion, economically and ecologically.

### *OBJECTIVES/ROLES/EXPECTATIONS*

- Facilitate the participation of the commercial and recreational fishing sectors in the expansion of the marine aquaculture industry, while not overstating the potential opportunities for employing displaced fishermen
- 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 that 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.

## IV. MARINE SAFETY

With the passage of Commercial Fishing Industry Vessel Safety Act of 1988, Congress mandated the use of specific safety gear aboard fishing vessels and required that commercial fishermen undergo marine safety training. Through cooperative work with the U.S. Coast Guard and other safety groups, Sea Grant efforts from New England to Texas, Oregon and Alaska, have helped lower the number of deaths and injuries suffered by those who work in what is still one of the nation's most hazardous industries.

Sea Grant programs have also worked with such groups as the Alaska Marine Safety Education Association to produce teacher guides and student workbooks, curriculum guides, and videos useful for presentations to kids. Much of what Sea Grant has developed can easily be applied to the charter boat and recreational boating activities of the general public.

### *OBJECTIVES/ROLES/EXPECTATIONS*

- Support network “training the trainer” efforts. 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.
- 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 SGFEP network is a 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.

## **V. COASTAL DEVELOPMENT**

Burgeoning growth as Americans move inexorably towards the coast, affects fisheries in multiple ways. Non-point source pollution has well-known effects on estuaries that serve as the nursery grounds for a majority of marine fisheries. Recent research attributes the chemicals associated with everything from laundry to birth control to a loss of successful spawning of marine species.

Along with Sea Grant's Coastal Communities Development Program, SGFEP is poised to collaborate with the Environmental Protection Agency's Smart Growth initiative to help facilitate education and training opportunities for local decision-makers along the coast that will lead to implementation of smart growth concepts. Particular concerns for SGFEP and its constituency include the maintenance of working waterfront and the resolution of conflicts among multiple waterfront users.

### ***(A) Working waterfront and access***

A variety of commercial fisheries in all regions of the United States are experiencing economic declines associated with the implementation of new fishery management measures, increased competition from imported seafood products, and loss of the working waterfronts that are critical to sustaining commercial fishing infrastructure in coastal communities. As the biomass of some of the fish species begins to rebound, the importance of retaining waterfront access for commercial operations is accentuated. SGFEP is helping coastal communities with long term planning, exploring ways to preserve and enhance their working waterfront through innovative tax rules such as evaluations based on current use, the selling of development rights to land banks or other nonprofits, and the enhancement of mixed uses with a strong emphasis on water dependent uses.

#### ***OBJECTIVES/ROLES/EXPECTATIONS***

- Educate coastal communities about the benefits of retaining a working waterfront
- Work with multiple stakeholders to design mutually beneficial plans for waterfront use
- Partner with non-profit groups to encourage or facilitate working waterfront retention

### ***(B) Tourism/recreation***

Rapidly expanding populations have increased competition and conflict over natural resources in the coastal zone. The growth in demand for such recreational activities as fishing, boating, jet skiing, swimming, scuba diving, or surfing often places commercial

fishing interests are at odds with the desires of these other interest groups. In some areas of the country, both commercial fishing interests and recreational interests find themselves in disputes with energy developers and/or those who advocate for protecting all resources through “no use” regulations.

In response, SGFEP has become more proactive in developing effective research and advisory efforts focused on the resolution of commercial and recreational user group conflicts at local, regional and national levels. SGFEP has successfully convened stakeholders – commercial fishing, recreational fishing, other users, and fishery managers – to attend programs to enhance critical thinking and communication skills. Only by working together, can limited marine fishery resources be effectively managed for shared use and sustainability.

As demand for coastal and waterfront access increases in all sectors, it is imperative that SGFEP continue to promote cooperation and help reduce conflict. For example, cooperative fisheries research programs, often facilitated or participated in by SGFEP, have led to innovative research-advisory efforts focused on bycatch and habitat issues, that ultimately benefited all stakeholders. Additional research efforts are needed to better understand impacts of various fishing and management practices on fish stocks, including the effects of alterations in the spatial, temporal and/or gear—related aspects of operation. Understanding interactions between the fisheries and aquaculture is also needed (see separate section). Furthermore, SGFEP can continue to play a significant role in harbor planning for facilitation of appropriate multiple uses.

### *OBJECTIVES/ROLES/EXPECTATIONS*

- Encourage programs to establish Multiple Users Advisory Committees to assist in guiding advisory and research efforts, especially in identifying issues of conflict as well as issues of potential cooperation among user groups.
- Develop research and extension projects on socioeconomic and biological aspects of changing fishery management regimes, including proposed spatial-temporal changes in fishing effort in both commercial and recreational fisheries, impacts of fishing area closure zones, major resource allocation changes among fishery groups, and improved fisheries enforcement.
- Provide SGFEP specialists and agents with training in leadership and conflict resolution to develop non-advocacy programming with all stakeholder communities while maintaining their credibility with each.
- Provide leadership skills training for commercial fishermen, recreational fishermen, other stakeholders and fishery managers to enhance communication within and between these groups and to allow these stakeholder groups to interact, discuss, and create solutions for balancing fisheries issues and management strategies.
- Participate and contribute expertise, in a non-advocacy and non-regulatory manner, on appropriate committees and advisory groups.