

APPENDIX G

A

**CODE OF CONDUCT**

FOR

RESPONSIBLE AQUACULTURE DEVELOPMENT

IN THE

U.S. EXCLUSIVE ECONOMIC ZONE

## ACRONYMS OF ORGANIZATIONS AND OTHER USEFUL TERMS

APHIS Animal and Plant Health Inspection Service (USDA)

BMP Best Management Practice

CBD Council on Biological Diversity

CITES Convention on International Trade in Endangered Species

COC Code of Conduct

COE Corps of Engineers

COP Code of Practice

CZ Coastal Zone

DOC United States Department of Commerce

EPA United States Environmental Protection Agency

EEZ Exclusive Economic Zone

EIFAC European Inland Fisheries Advisory Council

EO Executive Order

ESA Endangered Species Act.

FAO Food and Agriculture Organization (of the United Nations)

FDA United States Food and Drug Administration

FWS United States Fish and Wildlife Service

GIS Geographical Information System

HACCP Hazard Analysis Critical Control Point

ICES International Council for the Exploration of the Sea

NEPA National Environmental Policy Act

NMFS National Marine Fisheries Service (NOAA)

NNASA Non-indigenous Nuisance Aquatic Species Act

NOAA National Oceanic and Atmospheric Administration (DOC)

USCG United States Coast Guard

USDA United States Department of Agriculture

## **1. THE RATIONALE FOR AQUACULTURE DEVELOPMENT IN THE UNITED STATES EXCLUSIVE ECONOMIC ZONE (EEZ)**

Aquaculture is the cultivation of aquatic animals and plants in controlled or selected environments for commercial, recreational, or public purposes. Such organisms are raised primarily to supply (sea)food for human consumption, but they can also be used to enhance wild populations, for breeding programs in public aquariums and zoos, rebuilding populations of threatened and endangered species, baitfish production, and to produce other non-food products, such as pharmaceuticals. Aquaculture supports a variety of commercial and non-commercial markets both in the United States and overseas, and the many and disparate sub-industries of aquaculture provide employment, trade and economic well-being, and recreation for a large number of American people. The increasing demand for seafood by American consumers is fueling growth of the aquaculture industry. In its latest annual summary of national fisheries statistics, the Department of Commerce (DOC) reports a 1.3% increase in per capita consumption of edible seafood in 2000. Much of this is attributable to the annual increase in imports, which rose to 1.8 million metric tons of high-value products at a cost of \$10.1 billion. Annual exports are also increasing and now approach 1 million metric tons, but by comparison they are low-value products. Consequently, the trade deficit in edible seafood widened to \$7.1 billion. Farmed aquaculture production in the United States remains just below 400,000 metric tons, with a current value of \$970 million of which 24% is of marine origin. In sum, aquaculture farming technologies contribute about 12% to the total edible fish and shellfish landings in the country, and aquaculture enhancement technologies contribute about half as much again.

Whether the target for the industry is increasing fresh and frozen seafood consumption in the next 25 years, or producing more valuable non-food products from cultured raw materials, government planners and policy-makers are required to identify a sensible and practical strategy for growth. It is critical to improve the nation's capacity for increased cultivation of both freshwater and marine species, and the Aquaculture Policy drafted by DOC in 1999 calls for a fivefold increase in the value of domestic aquaculture production by the year 2025, and a threefold increase in employment.

The 5-year Fisheries Strategic Plan for Sustainable Fisheries by the National Oceanic and Atmospheric Administration (NOAA) proposes a three-pronged strategy for marine aquaculture's primary producers, namely:

- \* Develop and implement environmentally sound aquaculture technologies and practices.
- \* Promote the commercial rearing of at least seven new species.
- \* Identify areas in coastal waters and the EEZ suitable for environmentally sound aquaculture development.

In partnership with other line organizations within DOC and NOAA, and in coordination with other federal agencies, the National Marine Fisheries Service (NMFS) has the mandate to address impediments to the development of a domestic marine aquaculture industry and the necessary environmental safeguards associated with such development.

This clear government strategy to encourage aquaculture development in the offshore waters of the

Exclusive Economic Zone (EEZ) has been welcomed by the industry. There are serious constraints to expansion of the marine aquaculture industry, in particular the externalities which are affecting traditional coastal sites where fish and shellfish cultivation have been carried out for over a century. Fundamentally these externalities are the result of the nation's population growth and migration to coastal areas. This has increased competition and conflicts between the traditional coastal resource uses, such as property development, recreation, tourism, and fisheries. In turn this has increased public concern over the effects of such private uses on the environment, and put pressure on government officials to protect near-shore areas critical to fisheries habitat.

One practical solution is to further marine aquaculture development by moving offshore beyond the coastal zone. However, this far-reaching strategy poses its own set of constraints, and different technical, environmental, and socio-economic problems must now be addressed by new policy measures and a concerted effort in research in a number of fields. A Code of Conduct can be used to encourage timely investment in aquaculture opportunities in the EEZ by both private and public sectors, while at the same time promoting responsible behavior and minimizing risk to offshore ecosystems and their biodiversity.

## **2. BACKGROUND TO THE DEVELOPMENT OF THE CODE**

"It is national policy to encourage the development of aquaculture in the United States" (National Aquaculture Act of 1980).

The national policy is strongly supported by this Code of Conduct (hereafter called simply - the Code) which particularly addresses the responsible development of aquaculture beyond the territorial waters of the coastal states in the EEZ. But experience and the supporting technologies to develop aquaculture in the EEZ are greatly limited. Therefore, while still supporting an aggressive policy for development of aquaculture in this challenging arena, the fundamental purpose of this document is to temper progress with responsibility, and encourage good stewardship of all living and non-living marine resources found offshore. It attempts to lay out a set of basic principles which embrace environmental, managerial, social, and operational concerns, and elaborate general standards of conduct within these areas. These principles are intended to serve not only governments, tribal, and private enterprises attempting aquaculture in the EEZ, but also those individuals and groups who want to ensure development is conducted wisely.

In addition to the development policy laid out in the National Aquaculture Act, further motivation for this document stems from active participation by the United States in developing and adopting the Code of Conduct for Responsible Fisheries with other member countries of the United Nations Food and Agriculture Organization (FAO) in 1995. Within these guiding principles, aquaculture development is specifically identified as an integral part of Responsible Fisheries, and separately addressed in Article 9.

NOAA has taken the responsibility of developing the national Code for aquaculture development in federal waters. Under the authority of the Magnuson - Stevens Fishery Conservation and Management Act of 1976, as amended, NOAA, through NMFS, has responsibility for federally managed species and for conservation and enhancement of essential fish habitat in the zone seaward of coastal state boundaries to the 200-nautical mile limit of the EEZ. NMFS has additional responsibilities for threatened and endangered species under the Endangered Species Act of 1973, and for marine mammals under the Marine Mammal Protection Act of 1972.

In addition to its regulatory authority over the living resources of the EEZ, NOAA has responsibilities for the culture of marine, estuarine, and anadromous species, including research, development, and outreach, for stock enhancement and private sector development, as well as the adoption of appropriate environment safeguards and technology.

The proposed Code has not been conceived in a vacuum. Article 9 of the FAO Code was a starting point and key reference. A second important reference was the Holmenkollen Guidelines for Sustainable Aquaculture promulgated from the Second International Symposium on Sustainable Aquaculture held in Oslo, Norway in 1997. The Code for the nation's EEZ is similar to these other codes in that it includes a wide variety of offshore ecosystems and species along the full length of the Atlantic and Pacific coasts, in the Gulf of Mexico, and throughout the United States island territories and possessions.

Because of this great diversity, any code for offshore development of aquaculture cannot be specific to any type of system or any one species. Fortunately, individual national sectors and industries are taking initiatives to meet their own responsibilities for sustainable and environmentally sensible development. The Florida Department of Agriculture and Consumer Services, through Rule 5L-3, has established Best Management Practices (BMP) for all aquaculture producers in the state. A code of best practice for responsible shrimp farming has been produced by the Global Aquaculture Alliance, and for shellfish production by the Pacific Coast Shellfish Growers Association. NOAA is currently funding the development of model codes for aquaculture in the Northeast (Maine), and the NMFS Northwest Fisheries Science Center is assisting the Washington Fish Growers Association to prepare BMPs for net-pen salmon farming based on best available science.

The Code has been developed with the assistance of stakeholders at regional workshops held in the fall of 2000, and by written contributions. Six workshops were held in Seattle, Honolulu, Galveston, Miami, and in the Boston and Washington, D.C. areas. NMFS has since been working with its federal partners to develop this draft which is now open to further public comment. The ultimate goal is to publish the Code of Conduct for Responsible Aquaculture Development in the United States EEZ in 2002.

### **3. THE NATURE AND SCOPE OF THE CODE**

The Code was drafted by NMFS with the collaboration of stakeholders.

The Code is voluntary. It is a 'soft' law to guide policy, development, and research, and to encourage consistency throughout the sector. It is only applicable to aquaculture development in the EEZ but may be incorporated and form part of a national code of conduct for aquaculture when such a code is developed.

The Code provides principles and standards applicable to all systems and practices for the culture of aquatic animals and plants for whatever purpose.

The Code is to be interpreted and applied in a manner consistent with existing federal regulations and international agreements. Many activities in the EEZ, both specific and non-specific to aquaculture systems and practices, are bound by the regulations of different federal agencies and fisheries commissions under legal mandates from the United States Congress (see Appendix II). Some are also bound by provisions of international laws and agreements in which the United States is a signatory (see Appendix III).

The Code is generic in nature and focuses on broad directives. It is elaborated on the basis of desired outcomes for development, rather than a set of procedures to attain those outcomes. This approach allows a flexibility for balancing the needs of conservation with those of social and economic growth. There is a national policy in place to encourage the development of a competitive aquaculture industry in the country, including the EEZ. Therefore it is the responsibility of the Government to ensure development compatible with responsible stewardship by means of clear and achievable development policies based on financial, social, and environmental sustainability.

The Code adopts a precautionary approach combined with adaptive management as the guiding principle for development. This precept enables scientifically undesirable and potentially unacceptable outcomes to be identified, and provides the contingency to mitigate them.

The Code adheres to the spirit and intent of the FAO Code of Conduct for Responsible Fisheries (CCRF) to which the United States is a signatory and strong supporter, and does not in any way contradict its principles.

The Code is a dynamic document. It will be evaluated and revised periodically as information accumulates through its implementation and the monitoring of development.

The Code is directed towards all groups of persons and individuals who may be engaged in any form of aquatic farming, in enhancement of natural stocks, in conservation of aquatic resources or habitat, and those also involved in the processing and marketing of aquaculture products. Their compliance with the Code is encouraged.

#### 4. THE OBJECTIVES OF THE CODE

The Code has several objectives. These are:

**Promote the contribution of aquaculture to seafood supplies** - The Code should help facilitate the development of offshore aquaculture in line with the policy to encourage sector growth as embodied in the National Aquaculture Act of 1980.

**Promote marine stewardship** - The Code should support the broad effort by the nation to be a good steward of the marine environment and its resources.

**Establish principles for offshore aquaculture** - The Code should establish principles which embrace environmental, operational, management, and social concerns.

**Provide standards of conduct for the sector** - The Code should elaborate general standards of conduct at all levels, including conduct by government, companies and individuals who support these basic principles.

**Provide guidance** - The Code should provide guidance to both the aquaculture industry and to those in government who must act on petitions to use the EEZ for aquaculture.

**Serve as an instrument of reference** - As a soft law the Code should serve as a reference document. It should be a starting point for the development of industrial best practices and for individual state codes. As a reference point it should be a living document, periodically updated to reflect new ideas and information.

**Facilitate cooperation** - As a living document the Code should foster discussion and cooperation between parties with divergent opinions about offshore aquaculture.

## **5. THE RELATIONSHIP OF THE CODE WITH OTHER LEGAL INSTRUMENTS**

The Code is voluntary, and should be interpreted and applied in conformity with all relevant rules and provisions of agreement of international laws and conventions. Nothing in the Code is intended to prejudice the rights, jurisdiction, and duties of the United States under international law, convention, or agreement to which it is a signatory.

The Code should be interpreted and applied with other applicable rules of national law, including the respective obligations of the coastal states pursuant to any national agreements to which they are a party.

The EEZ is a common resource and therefore any and all of the permits, licenses, or the like pursuant to this Code to facilitate aquaculture in the EEZ, for any purpose, cannot constitute a right of property.

## 6. THE CODE

### 6.1 The Legal Framework

Aquaculture development in the EEZ will be adequately regulated and protected by an integrated and effective legal framework to ensure its growth in a sustainable manner, and one consistent with comparable industries sharing the nation's offshore resources.

The federal government should provide and maintain the necessary legal framework properly integrated for the effective administration of responsible aquaculture in the EEZ.

Development is currently constrained by laws enacted originally to manage wild-stock fisheries or natural resources without consideration for an aquaculture industry's needs, and may result in unintended consequences. Therefore the government should promulgate coherent legislation specific to aquaculture in the EEZ which would:

- \* Be consistent with existing international and national laws for activities within the EEZ, and with the laws and regulations of the coastal states where applicable. Many laws and regulations already exist which have a bearing on EEZ-based development (see Appendix II).
- \* Recognize aquaculture as a legitimate user of the resources of the EEZ, and explicitly include EEZ-based aquaculture in plans for the use of the EEZ to ensure its consideration and evaluation with respect to national development objectives.
- \* Provide a clear definition of the rights and obligations for the prospective developers. Establishment of rights is essential to encourage and secure investment in EEZ-based aquaculture.
- \* Recognize that prospective developers could be multinational companies, or companies partially owned by foreign companies.
- \* Clarify its financial policy instruments, and particularly those which might be shared with the coastal states.
- \* Address the management and resolution of conflicts.

The legal framework, to the fullest extent possible, should use existing institutional infrastructure to facilitate the administration and management of the national aquaculture industry. It should clearly define the jurisdiction of the many federal agencies involved in the regulation of EEZ-based aquaculture at the present time, and provide a mechanism for their continual close coordination.

Inter-agency coordination is essential to: (a) ensure the uniformity of policies for operating in the EEZ; (b) promote standardization and streamlining of regulations and procedures; (c) monitor and evaluate development; (d) simplify the permitting process; (e) increase efficiency and prevent delays in the elaboration of standards and regulations; (f) resolve or avoid conflicts, and (g) minimize costs.

## **6.2 The Administrative Framework**

Aquaculture development in the EEZ will be administered by an appropriate national infrastructure, with one agency designated the overall authority to ensure its efficient organization and management.

### **6.2.1 The designated authority**

The federal government should provide and maintain a fully integrated structure to organize and manage aquaculture development in the EEZ. Administration of the structure should be designated in one authority which has the responsibility to coordinate, support, regulate, and promote all aquaculture activities.

The lack of a single designated authority administering the national sector has delayed development of regulatory guidelines, caused problems to producers who improvised in the regulatory vacuum, and discouraged national investment. Because of their broader legal mandates, the administrations managing some part of the sector have invariably considered it of minor importance within their agency and given it low priority.

### **6.2.2 Coordination**

The administrative framework should include a mechanism for continuous close coordination between those federal agencies and the coastal states directly or indirectly involved with aquaculture activities in the EEZ. This would help reduce possible conflicts, streamline permit procedures, facilitate timely development of regulations, and monitor and assess development impact.

Coordination with coastal states is necessary due to: (a) the inter-dependence of certain EEZ-based and land-based aquaculture activities, such as ocean ranching; (b) the practical need for ports of entry and logistical services, (c) possible state regulations, such as interstate transport of aquatic organisms, which may impede marketing aquaculture products harvested outside state boundaries, and (d) the general need for consistency.

## **6.3 The Policy Environment**

Aquaculture development in the EEZ will have a policy environment to: (a) provide guidelines for development plans and management strategies; (b) encourage entrepreneurs to invest in projects without difficulty and adopt responsible production practices, and (c) promote the development of appropriate regulation and efficient enforcement.

### **6.3.1 Planning**

The competent authority, in cooperation with state and local governments, and stakeholders should prepare a policy, management strategy, and development plan for EEZ-based aquaculture to promote and guide development to ensure it is consistent with marine stewardship. The development plan should be regularly updated.

### **6.3.2 Permitting**

Federal agencies, in cooperation with state authorities, should develop an efficient and open permitting process, including a single consolidated permit, and a designated authority to coordinate the permitting process. Openness is also advisable in issuing and revoking permits, monitoring and evaluation of information, and processes for the appeal of decisions.

To assist in the permitting process, a framework should be developed for the evaluation of aquaculture projects which assesses the benefits and costs in relation to the objectives and priorities of area-specific development, and the management of resources and the environment. To have significant and practical meaning, this framework should include predetermined standards, or allowable limits of impacts.

The development of best management practices (BMPs) for various species-production systems should be given high priority to establish a basis for performance-based management plans, and to provide an objective basis for monitoring and enforcement. Until the regulatory system is put in place, the permit may be used to prescribe interim operational/management standards.

Federal authorities should consider the establishment of long-term leases for aquaculture in the EEZ. Leases would grant appropriate security of tenure for private industry development and improve the financial acceptability of development projects.

Guidelines for remedial compensation for damages caused or suffered by aquaculture producers should be elaborated and made part of permit conditions.

### **6.3.3 Siting**

EEZ-based aquaculture should operate using practices and in locations where negative impacts are minimized while successful production of healthy farmed aquatic organisms is promoted and the economic viability of the operations is maintained. Siting criteria should be developed to promote clarity, consistency and precaution in the permit process. The criteria should be revisited and amended periodically to respond to new information and technology. Inappropriate siting of aquaculture facilities can increase the nature and magnitude of any adverse effects from the production processes.

Criteria for selection of individual sites or broader aquaculture zones for development in the EEZ should be elaborated on the basis of best available scientific, economic, and sociological information. The potential for remediation should also be considered.

A siting guide should be developed for the preparation of site assessments which contains advice to applicants on information sources and documents, appropriate site assessment methods and content of site assessment submissions, including required categories of impact and submission format. The use of Geographic Information System (GIS) methods to synthesize and map available information for siting purposes may be useful technology and should be encouraged.

Although sites for aquaculture development in the EEZ are offshore, it is necessary to address potential economic and social impacts on local communities. Local communities should be made aware of any proposed offshore development and their participation sought in any decision-making processes.

Permitted aquaculture sites should be protected by law against degradation of water quality, theft of both living and non-living property, and public trespass.

Consideration should be given to the establishment of aquaculture zones to facilitate permitting, monitoring and impact assessment, and to allow an integrated area approach to management.

#### **6.3.4 Zoning**

The competent authority, in cooperation with stakeholders and other federal and state authorities, should establish aquaculture zones to improve efficiency and timeliness of siting and management decisions. Pre-identification of suitable areas or zones for aquaculture after a thorough environmental review and consideration of other pertinent factors would contribute to EEZ aquaculture development. Such zones would also enable monitoring on an area-wide basis which could use a more ecosystem-oriented approach, and take advantage of techniques such as satellite monitoring.

The use of designated aquaculture zones, perhaps planned and financed in ways similar to zones for marine parks, ocean dumping, or areas closed to fishing, would speed up development, as individual permit requests for activities in pre-approved areas would receive rapid responses. Designated zones would also help reduce conflicts between resource users and protected habitats, and minimize the potential for any negative impacts on the environment.

#### **6.3.5 Enabling participation and minimizing conflict**

The process for decision-making regarding the policy environment should be transparent. This would include the participation of stakeholders in planning and permitting decisions, and in the review of monitoring information and decisions to revoke or extend permits. Because the EEZ is in the public domain, all information on aquaculture in the EEZ, except confidential business information, should be a matter of public record.

Proactive mechanisms should be emphasized for the prevention of disputes and conflicts. These may include, for example, inter-agency and inter-sector consultation, refined siting criteria, aquaculture zoning, strengthened public participation in siting and management decisions, and similar cooperative measures. Some models exist in some states already, and these should be reviewed and used as appropriate.

## **6.4 The Fiscal Environment**

Aquaculture development in the EEZ will be the responsibility of the private sector, and assisted by appropriate federal policy instruments designed to encourage implementation of the Code, facilitate investment, and minimize the costs of compliance.

The federal government should provide a fiscal environment which encourages investment in responsible development. Federal action is needed to facilitate access to investment capital constrained by the perception of the high risk of EEZ-based aquaculture, and unfamiliarity of working offshore. There is also a need for structural grants, similar to those provided by the European Union, to stimulate aquaculture development in remote rural coastal areas faced with declining fisheries. Financial incentives are appropriate policy instruments to encourage enterprises which, inter alia: (a) provide an ecological benefit; (b) protect the environment; (c) support research and development on new and more ecologically suitable species, or (d) require special start-up marketing as the products are new to the public.

The federal government should seek to minimize development costs by encouraging industry-government partnerships in research, in monitoring and enforcement; zoning for aquaculture development, enforcement of BMPs by producer organizations, etc., and by focusing more efforts on prevention and avoidance than on remediation and conflict resolution. Public costs should be reduced or recovered by, inter alia, better coordination among federal agencies, simplifying mechanisms for the permit process, and collecting annual registration fees.

Major cost reductions would be achieved in the long term by reducing uncertainties which require vigorous precautionary approaches, establishing a record of compliance and responsible management by the industry, and developing cost-effective measurement systems for monitoring purposes. The federal government might also consider bearing the main burden of monitoring as a financial incentive until the industry is established and can assume full responsibility. In such cases the federal government would use concerned farms as indicators and fit them for more comprehensive data collection.

## **6.5 Managing Risk and Uncertainty**

Aquaculture development in the EEZ will adopt the guiding principle of a precautionary approach combined with adaptive management to achieve sustainable development in offshore waters.

### **6.5.1 Adaptive management**

A precautionary approach combined with adaptive management should be the guiding principle of responsible aquaculture development by all stakeholders. Adaptive management enables periodic amendment on the basis of information collected during monitoring, and advances in science and technology. Combining the precautionary approach with adaptive management is appropriate to EEZ-based aquaculture because the offshore industry is new to the world, and information on

production systems and their interaction with the environment is minimal. Accordingly, this approach calls for careful monitoring of pre-agreed parameters, record keeping, and reporting on pre-agreed schedules.

This broader application of the precautionary approach requires a management plan for aquaculture in the EEZ to be in place which clearly specifies management objectives, and how impacts of development are to be assessed, monitored, and addressed. The plan should also specify mobilization of the necessary resources for management, monitoring, and research. Standards, reference points, pre-agreed actions, contingency plans, and other parameters will be critical and need to be developed in consultation with stakeholders. In the interim, responsible and practical measures should be applied until such time as a management plan is in place.

Pilot projects should be encouraged and supported at specific sites to provide information which would improve the information base, assess environmental effects, and help improve standards for environmental protection. An expedited review and permit procedure should be used for projects of this nature.

### **6.5.2 Conserving biodiversity**

All stakeholders should conserve the genetic diversity and maintain the functional integrity of the many ecosystems in the EEZ, and minimize the risks by carefully evaluating each activity on a case-by-case basis through the permitting process.

Regulations and decisions regarding the risk to biodiversity, particularly from introduction of aquatic organisms and use of genetically-altered organisms, should be guided by internationally accepted codes of practice, existing federal regulations and procedures (e.g. NEPA, ESA, NNASA, etc.) and, where appropriate, by approaches and regulations in use at the state level. The same protocols should be used as tools in any evaluations of impact subsequent to the agency's decisions. Protocols in use or in preparation at the international level, and existing relevant federal regulations, are listed in Appendix II.

Biodiversity in the territorial waters of neighboring countries as well as the coastal states should be safeguarded when there is a significant potential for the spread of introduced and genetically altered species with reproductive capabilities. This can be achieved by sharing information, and through consultation and cooperation on preventive and remedial measures.

Regulations should be flexible and distinguish between aquaculture activities which differ in nature and impact, and consequently may require different regulatory approaches and levels of precaution. Distinctions should be made also regarding the sensitivity and uniqueness of species and ecosystems.

### **6.5.3 Introductions and genetically altered species**

The competent authority, in cooperation with concerned federal agencies, should regulate the introduction of non-indigenous aquatic organisms and genetically-altered indigenous species into

EEZ waters to prevent threats to the diversity and abundance of native species, and to the ecosystems on which they depend. For stock enhancement, risks to wild stocks should be minimized by adoption and enforcement of production strategies which provide organisms with minimal genetic divergence from their wild counterparts.

The competent authority should encourage the use of a single, unified, federal permitting process for introduction and transplantation, and any use of genetically altered aquatic organisms, through federal-state-private sector partnership. Existing national regulations should be consolidated into a single body of law relevant to aquaculture in the EEZ.

Priorities to conserve genetic biodiversity should not deter research to improve breeds in ways which will avoid any future threats to the environment.

#### **6.5.4 Aquatic animal health**

All stakeholders should take any necessary action to minimize any potential for the transmission of diseases and parasites which may occur in aquaculture facilities, or associated with organisms released for stock enhancement, to wild populations. This can be achieved by using healthy stocks, maintaining good growing conditions, and by frequent monitoring to facilitate early detection. Disease diagnostic services and veterinary expertise should be made available, and utilized by the aquaculture industry.

#### **6.5.5 Managing other risks**

Critical habitats, protected areas, endangered species, predators, etc. should be safeguarded by means of refined siting criteria, inclusion of adequate parameters in the monitoring and assessment process to allow evaluation of impact on a broader ecological scale, and by enforcing specific precautionary measures at the production level. These strategies should be combined with careful record keeping, and monitoring and assessment of impacts at a frequency commensurate with risk.

Measurable performance standards, such as the sediment biological effects standard, should be adopted to prevent degradation in sediments beneath aquaculture facilities, and in the vicinity of farming sites.

#### **6.5.6 Monitoring, evaluation, and enforcement**

Federal authorities, in cooperation with the states, should establish effective procedures for environmental monitoring and impact assessment to minimize potential adverse ecological changes, and economic and social consequences of EEZ-based aquaculture development. These efforts should be guided by pre-determined development priorities and well-founded objectives for the management of resources and the environment.

The federal government and the private sector should be prepared to work together to monitor aquaculture development in the EEZ. Monitoring of compliance in distant locations in the EEZ poses considerable problems, and cost-effective means of monitoring the offshore waters pose a challenge to the regulatory agencies. Therefore new cooperative approaches should be considered, including the use of voluntary compliance through self-regulation and a fiscal environment to encourage investment in sustainable technologies and operational practices.

The near-field and far-field effects of development should be monitored, and both the adverse and positive effects of aquaculture should be recorded.

## **6.6 Responsible Aquaculture at the Production Level**

Aquaculture development in the EEZ will establish and enforce measures to ensure responsible management practices and attitudes at the farm level to minimize potential harm to the environment and ensure its sustainability.

### **6.6.1 Best management practices**

The federal government, in cooperation with states, industry, and other stakeholders should establish and enforce measures to ensure responsible management practices at the farm level to minimize potential harm to the environment and ensure sustainable development. It should assist and cooperate with each sub-industry working in the EEZ to promote best management practices and attitudes, and include them as enforceable elements of permits. Best management practices (BMPs) are recognized as valuable tools for industries to set responsible performance and production standards which can be used in lieu of government regulation, and serve as a 'seal of quality' for products.

The federal government should encourage and support the development of BMPs for various production systems. These would help set standards for specific culture systems which could serve as conditions for permits and references for monitoring compliance. Industry sub-sectors would prepare and periodically update their BMPs based on the best available scientific information and assessment of risk. As BMPs are voluntary instruments the federal government and other concerned agencies should adopt appropriate procedures to monitor compliance.

### **6.6.2 Information and record keeping**

Given the novelty of EEZ-based aquaculture, the federal government should place emphasis on operators keeping records on their stocks and on specific environmental parameters to enable effective assessment of impact. This should be done in the most cost effective way. Information collected by operators should also be used to improve responsible farm management, and as an information source for adaptive management. Reporting of environmental information or farm events which have potential negative environmental consequences should be carried out in a timely manner to minimize these consequences and allow rapid mobilization of remedial measures.

Required information collection and reporting requirements should be described in the federal permit, and these conditions periodically reviewed for their utility and relevance.

### **6.6.3 Prevention of escapes and endangerment to other species**

Escape prevention, combined with remedial action to address significant escape events, should be the key strategy for reducing potential risk to other species. Prevention should be given the highest priority, but contingency plans to recover escaped stock, or otherwise prevent interactions with wild stocks should also be developed and implemented in the case of significant escape events. Escape prevention and management plans should be prepared in consultation with fishery management bodies and constitute an enforceable element of the permit.

Where possible inventory tracking systems and sufficient record keeping should be used to identify stocks, and to monitor losses from various causes, including losses to predation, disease, escape events, and unexplained losses, where relevant. The use of a comprehensive inventory-tracking information system, and other reporting requirements specified in the permit, would ensure consistency, and make review, auditing, and assessment of risks easier and more effective. Inclusion of records on the origin and genetic modifications made to broodstock could also help assess potential genetic impact of escapees.

Aquaculture facilities and cultured stocks should not endanger natural predators. Producers should have effective anti-predation plans, and use selective anti-predator devices where feasible.

### **6.6.4 Product quality and safety**

The quality and safety of any aquaculture product cultured in the EEZ for human consumption should be assured by compliance with existing regulations and standards. Applications currently required for producing and marketing seafood, and ensuring its quality and safety for human consumption include (a) the United Nations Codex Alimentarius, of which the United States is a signatory, (b) Hazard Analysis Critical Control Point methods for the safe handling, processing, and transportation of seafood, which are universally accepted and used, and (c) existing Food and Drug Administration regulations in the United States.

### **6.6.5 Management of aquatic health**

Producers should reduce incidence and loss to disease, and the possible spread of disease to wild populations, by managing the aquatic health of their stocks. Desirable practices include using disease-free and robust seed stock or fry from reputable dealers, reducing stress through good husbandry and hygiene, providing adequate nutrition, and controlling and preventing disease through the use of vaccination and approved therapeutics. Producers should report significant losses due to disease, and outbreaks of reportable diseases. Remedial actions should be taken as appropriate, and proper methods for the disposal of dead or infected organisms should be utilized.

Management of the health of aquatic organisms cultured in EEZ sites would benefit from a unified and complete federal aquatic animal health infrastructure and strategy, and an adequate aquatic animal health service.

## **6.7 Research and Development**

Aquaculture development in the EEZ will support an effective program for applied research by stakeholders and help achieve the goal of responsible development. It will encourage and facilitate cooperative research at the regional and sub-regional levels, and promote sharing of results to achieve industrial uniformity and efficiency.

The federal government should strengthen the existing institutional framework and allocate adequate funding for cooperative research and development in the EEZ. Investment in research and development in offshore aquaculture is justified in terms of U.S. leadership in fundamental science, long-term economic growth, the expansion of domestic and export markets for aquaculture products and services, reduction in the trade deficit of seafood, the creation of a diverse range of jobs, and decreased pressure on threatened commercial stocks.

The federal government should recognize that the industry can make technological advances in many areas, including safeguarding the environment. Consequently it should invest in research and development in collaboration with the industry and continue to provide critical support services within its own research centers. It should also support scientific exchange programs to benefit from research and technologies developed abroad in identified priority areas.

The federal government should ensure proper linkage between applied research and development and promote the use of results for management decisions, and encourage regulatory agencies to set reference points and performance criteria. Production-scale pilot research should be strengthened as it is a key link in the development chain. The federal government should consider establishing a number of research stations in the EEZ for the purpose of scaling up research results, demonstration, and training.

The establishment, growth, and competitive position of responsible EEZ-based aquaculture in the global marketplace will be directly related to the resources invested in research and development of sustainable technology. Responsible aquaculture requires the availability of sound scientific information to assist industry develop cost-effective and environmentally sound facilities and technologies and to assist the federal government, industry and other interested parties in making decisions. As there is no current aquaculture industry extant in the EEZ little information is available.

## **6.8 Public Education, Outreach, and Information Dissemination**

Aquaculture development in the EEZ will make a special effort to increase public awareness about the rationale for offshore aquaculture, and in particular to provide information addressing issues of concern to the public.

The federal government, industry, non-federal researchers, and other interested parties should participate in programs of awareness to educate consumers, policy makers, and the public about aquaculture in the EEZ, to communicate promising research results, and to demonstrate environmentally sound and cost-effective technologies. They should also seek to improve coordination of aquaculture education, training, and extension between public agencies.

Technology transfer, information dissemination, and access to national and global information and technology can be improved and strengthened. The development of appropriate data bases linked to electronic delivery systems would enhance information exchange and facilitate timely communication and implementation of the latest research results and advances by the industry. Participation in international information networks would improve access to important technology.

The industry, in cooperation with the federal government, should support the development of effective market information systems. In addition to improving industry awareness, technologically modern systems would help formulate policies and strategies.