
Development of a Policy Framework for Offshore Marine Aquaculture in the 3-200 mile U.S. Ocean Zone

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EXECUTIVE SUMMARY

This report is the first comprehensive assessment of federal policy with respect to the development of aquaculture as a new ocean industry in federally-controlled waters off the U.S. coast. Researched and written by an interdisciplinary, multi-institutional team, the report develops a set of policy approaches to address the gaps and deficiencies of current federal policy with respect to the siting and operation of aquaculture facilities in the U.S. Exclusive Economic Zone (EEZ). Developed in consultation with an advisory committee representing the full range of stakeholder interests, the report draws on the experience with marine aquaculture policy in U.S. coastal states and eight other nations and considers international guidelines for the development of environmentally sound and economically sustainable aquaculture.

The report:

- Describes the current status of marine aquaculture in the United States and the rationale for siting projects further offshore (Chapter 1)
- Reviews the major questions and policy issues in the governance of offshore aquaculture raised by earlier studies (Chapter 2)
- Provides case studies on the experience of the major offshore projects that have sought U.S. approval to date (Chapter 3)
- Presents an overview of the complex framework employed by federal agencies in governing offshore aquaculture under current U.S. law and identifies major gaps and deficiencies in current policy (Chapter 4).

- Identifies alternative approaches based on a review of marine aquaculture policy in U.S. coastal states (Chapter 5).
- Reviews relevant international experience with respect to aquaculture, including approaches to marine aquaculture in eight other nations (Norway, Scotland, Ireland, Canada, Chile, Australia, New Zealand and Japan) and international guidelines for development of the aquaculture industry (Chapter 6).
- Proposes a set of policy approaches that address the full life-cycle of offshore projects (from planning through the issuance of permits/leases, operation and monitoring of facilities, and eventual abandonment at the end of an offshore aquaculture project), and advocates the development of an overall policy for planning and governing all activities in the U.S. EEZ, including aquaculture (Chapter 7).

Scope of Study

The focus of this report is on the policy/regulatory issues involved in placing and operating marine aquaculture structures in the U.S. EEZ for purposes of raising native/locally present species and hybrids. The major policy issues examined in this report are the absence of an explicit policy framework for offshore aquaculture, environmental impacts, public trust issues, and impacts on other users. The wide range of issues related to industry assistance and development, optimum economic development of the industry, and marine aquaculture involving the introduction of new species or genetically modified organisms (including transgenic species) are beyond the scope of the study.

Research Results

Industry Status

Aquaculture is a rapidly growing industry worldwide, and currently accounts for about 25 percent of total seafood production. In the United States, however, the industry represents a relatively smaller share of the seafood market (about 8-9 percent).

Aquaculture is defined in the 1980 National Aquaculture Act as "the propagation and rearing of aquatic species in controlled or selected environments, including, but not limited to, ocean ranching." Aquaculture operations involve hatcheries (land-based facilities to spawn and rear broodstock), nursery culture (the rearing of juveniles to a size conducive to growout), and growout facilities which bring the organisms to full size, ready for harvest.

The aquaculture industry in the United States encompasses a wide range of products, including food fish, bait fish, shellfish, ornamental fish, seaweed, and even alligators in Florida. U.S. aquaculture production totaled 768 million pounds in 1997, consisting largely of freshwater species (mainly catfish, trout, crawfish, tilapia, and striped bass). The major marine species (salmon, oysters, clams, mussels and shrimp) accounted for less than 10 percent of the total. Between 1992 and 1997, production increased by 11 percent in terms of volume and 29 percent in terms of value. Despite its recent growth, U.S. aquaculture remains a relatively small industry, accounting for only about 2 percent of aquaculture pro-

duction worldwide. Net seafood imports, which exceed \$6 billion annually, are among the top contributors to the U.S. trade deficit.

The marine aquaculture industry is technologically diverse, with ponds, raceways, silos, circular pools, closed (water reuse) systems, cages and net-pens, rafts, and long lines used according to the species cultured; it also includes sea ranching. Aquaculture practices range from extensive, with few inputs and modest output, to intensive, with high inputs and output. These diverse technologies have wide-ranging resource needs, produce differing environmental impacts, and require a suite of technological and management responses. The primary rationale for moving operations offshore is the theoretically greater availability of appropriate sites with potentially fewer user conflicts and environmental impacts than in coastal waters closer to shore.

Major Offshore Projects

Experience with offshore aquaculture projects in the United States is limited. A large-scale, private sector salmon project proposed offshore Massachusetts in the late 1980s (American Norwegian Fish Farm, Inc.), although never approved or built, drew attention to the issue of the need for a coherent federal policy for the industry. Since then, a small number of projects have been approved, including a federally funded experimental sea scallop project also offshore Massachusetts (SeaStead), a seafood/oil industry venture based on an offshore platform in the Gulf of Mexico (SeaFish Mariculture), and federally sponsored demonstration projects in open waters off New Hampshire, Hawaii, and in the Gulf of Mexico. However, there are currently no active commercial projects in the 3-200 mile ocean zone.

For most offshore projects, the primary regulatory hurdle is a permit from the Army Corps of Engineers; fishery management regulations also present challenges for some types of projects. The major issues that have not yet been adequately addressed in the public policy arena relate to the need to ensure security of tenure for the project (i.e., conveying property rights in public waters that are traditionally free and open to all) while fulfilling public trust obligations, minimizing/mitigating impacts on other users, and ensuring that other government policy objectives, such as environmental protection, are not jeopardized.

Current Federal Policy

Under current law, federal agencies have limited, and often unclear, statutory authority with respect to offshore aquaculture. There are few explicit references to aquaculture in the U.S. Code, and existing authorities do not address the specific issues associated with offshore marine aquaculture. With few exceptions, federal agency statutory authority over offshore marine aquaculture is based on agency interpretation of statutory authority over particular aspects of an aquaculture operation (e.g., waste discharges, placement of structures in navigable waters, etc.).

The key federal agencies currently involved in offshore marine aquaculture are: the Army Corps of Engineers, which issues permits for activities on or in navigable waters of the United States under Section 10 of the Rivers and Harbors Act of 1899; the Environmental Protection Agency, which issues permits for waste discharges into public waters under the Clean Water Act and is beginning to develop standards and effluent guidelines for the aquaculture industry; the National Oceanic and Atmospheric Administration, which manages U.S. fishery resources in the EEZ; and the

Department of Agriculture, which chairs the Joint Subcommittee on Aquaculture to coordinate federal agency activities.

State Policies

Although there has been little practical experience with offshore marine aquaculture in federal waters of the United States, commercial-scale marine aquaculture has developed in state waters along the U.S. coast. Maine and Washington are the most important states in the production of salmon, the primary food fish produced by the U.S. marine aquaculture industry. The main shellfish species for the U.S. aquaculture industry are oysters, clams, shrimp, and mussels. Shrimp are grown mainly in the south (Texas, South Carolina, Florida). Mollusks (clams, oysters, mussels) are produced in the northeast, Pacific Northwest, and the South, with Connecticut, Florida, and Washington among the largest producers. (LA)

The states have significant experience in managing aquaculture leasing programs in coastal waters under their jurisdiction. In recent years, a number of states have taken initiatives to coordinate/streamline the permitting process, establish institutional bodies to address aquaculture issues, adopt policies to address environmental/biological risks, incorporate aquaculture in state legislation and regulation, and integrate aquaculture into their state coastal zone management plans. This experience, combined with responses to a questionnaire sent to state aquaculture coordinators as part of this project (Appendix 2) provide suggestions for planning, permitting, and operations elements to be included in federal policy for offshore aquaculture.

U.S. coastal state experiences with marine aquaculture policy provide useful lessons for the development of a federal approach to planning, permitting/leasing, and oversight of aquaculture facilities in the EEZ. Designation of a lead agency for aquaculture, regulatory flexibility, program consolidation, streamlined application processes, public reviews, environmental assessments, and monitoring of operations are important elements of state policies. A number of states have demonstrated the use of specific policy features such as establishing aquaculture zones, requiring performance bonds, issuing experimental/research leases, allowing the extent of exclusivity to be negotiated, and identifying best management practices (BMPs). Some states have created new institutional authorities, and some have used legislation to specify lease conditions and criteria for lease approval.

International Comparisons and Guidelines

While no other nations appear to have yet developed an explicit regulatory policy framework for their EEZs, a number of nations have had considerable experience with the management of offshore aquaculture located some distance from shore. Of particular interest are Norway, the United Kingdom (Scotland), Ireland, Canada, Chile, Australia, New Zealand, and Japan.

In general, it is clear that offshore marine aquaculture policy needs to be flexible and responsive to industry changes, with simplified, well-coordinated regulatory processes and technically competent staff. Specific approaches used by the countries examined in this study include: 1) a two step approach in which a lease for a particular location is issued first, followed by a license to operate a specific facility; 2) siting criteria or advance determination of "areas suitable for aquaculture" to minimize conflicts; 3) criteria for determining the "capacity" of specific sites (i.e. number and den-

sity of fish per site or per net cage); 4) aquaculture management plans; and 5) interagency processes that promote efficient siting and monitoring of aquaculture facilities.

In addition, international organizations, in particular the UN Food and Agriculture Organization (FAO), provide guidance in the application of principles of sustainable development to world fisheries, which include aquaculture. Of particular relevance are FAO's Code of Conduct for Responsible Fisheries and its companion guidelines that explicitly address application of the code of conduct to aquaculture development. The chief guidance from the broader international environmental community relates to the application of a precautionary approach to aquaculture. These guidelines set forth the types of questions that must be asked of aquaculture development (e.g., whether aquaculture development conserves land, water, plant, and genetic resources; is environmentally non-degrading; and is technologically appropriate, economically viable, and socially acceptable) and requires the parties proposing the development and the governmental agencies managing the development to provide evidence on potential impacts.

Proposed Policy Framework

The framework presented in this report is designed to meet the following criteria:

1. Encourages responsible open ocean aquaculture in the US EEZ.
2. Promotes a decision-making process that is efficient, coordinated, and predictable.
3. Employs a precautionary approach to avoid and minimize environmental impacts and promote integration into the ecosystem.
4. Applies separate criteria to native and non-native species.
5. Is consistent with existing U.S. laws and agency responsibilities.
6. Is equitable and fair to offshore aquaculture and to other U.S. users of the EEZ.
7. Is consistent, to the maximum extent possible, with the coastal, water, environmental, and aquaculture policies of adjacent coastal states.
8. Is consistent with U.S. obligations under international agreements.
9. Will fit within the context of an overall framework for sustainable development of the U.S. EEZ.
10. Produces a fair return to the public for the use of federal ocean space.
11. Is conducted in a transparent manner with opportunities for public involvement.
12. Is adaptive and promotes opportunities for innovation, data collection, and learning.

Recommendations are organized according to the various stages involved in locating and operating a marine aquaculture facility in

offshore waters (planning, permitting, operation, monitoring, and abandonment). They also address the need to establish or modify agency roles in order to provide a more effective framework for offshore marine aquaculture.

Planning

Appropriate planning is needed to identify suitable (and not suitable) areas for offshore aquaculture, avoiding environmentally sensitive areas and avoiding undue interference with other users (navigation, national defense, fishing, recreation, etc.). Planning should take place before areas are offered for aquaculture leasing.

Legislation to provide an overall plan for the mapping, management, development, and conservation of the U.S. Exclusive Economic Zone needs to be developed. In the interim, through executive action, the National Oceanic and Atmospheric Administration and the Department of Interior should be given an explicit mandate to develop assessments of EEZ areas suitable for various uses (including aquaculture) through mapping and analysis.

Joint Permitting

A joint federal/state permitting process for offshore marine aquaculture should be established under the coordination and leadership of the U.S. Army Corps of Engineers in consultation with the (new) NOAA Office of Offshore Aquaculture (see below), first through executive action using an inter-agency memorandum of understanding, and ultimately in new congressional legislation on offshore marine aquaculture.

The joint federal/state permitting process shall involve the use of one comprehensive application form and procedure to meet the application requirements of all agencies involved, that would involve the submission of a proposed operational plan.

Environmental Review **BMP**

Review of offshore marine aquaculture projects should employ the precautionary approach, adhere to the environmental review requirements of the National Environmental Policy Act, and consider mitigation measures to address adverse impacts on other ocean uses.

A set of special standards related to the impact of offshore aquaculture operations on the natural and human environments should be taken into account in the environmental review process (e.g. factors such as minimization of drugs, use of environmentally-friendly feeds, etc.). In general, an environmental assessment should be performed as part of the leasing process, and Environmental Impact Statements should be prepared for individual projects.

The extent of the review process should reflect the risks associated with the project under consideration (e.g., smaller operations using well-understood species/methods vs. larger projects with potential impacts that are not generally agreed upon in the scientific community).

Leasing

Leases (short-term or long-term) giving the aquaculturist exclusive rights to occupy the site and exclusive rights to the cultured organisms should be developed. Such leases should be guided by a set of principles relevant to public trust responsibilities and should specify the scope, size, duration, and other terms of the lease.

The degree of exclusivity will be negotiable, and some form of compensation to the public for the exclusive rights granted will be expected. Rents collected should be used to establish a special fund to support offshore aquaculture management and to provide revenue-sharing to states for impact mitigation.

Monitoring

A monitoring process, which may involve conditions on operations such as insurance, bonds, or environmental monitoring requirements, should be put in place to insure the safety of operations, and, in the case of termination of operations, the removal of structures and the return of the area to its previous state.

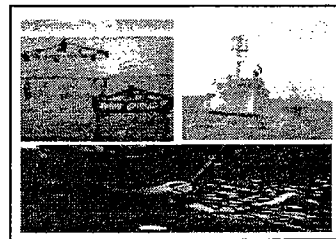
Public Participation

The leasing, permitting, and environmental review processes should be conducted in an open and transparent manner with opportunities for participation by the public and by affected interests.

Administering Agency

The creation of a new NOAA Office of Offshore Aquaculture (OOA) is recommended to oversee the leasing, environmental review, and subsequent monitoring of offshore aquaculture, including the eventual abandonment of offshore aquaculture facilities.

The draft policy framework discussed above is offered for the consideration of interested parties in the Administration, Congress, industry, environmental, and academic community for discussion and deliberation. No doubt parts of the proposed framework will need to be revised and changed, other parts fleshed out, other parts dropped entirely. There may be alternative ways of accomplishing the goals and directions we have suggested. We do think, however, that the broad directions we have put forth on the basis of our review of the issues present in this area, of past work, and of the experiences of coastal states and other nations, are the appropriate directions toward which we should move in order to develop an economically sustainable and environmentally sound offshore marine aquaculture industry in the United States.



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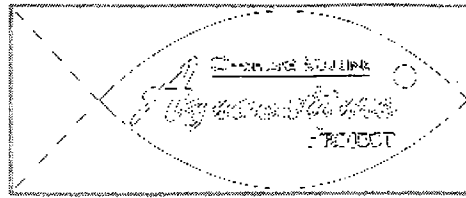
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Development and Testing of an Operational Framework for Offshore Aquaculture in Conjunction with Stakeholders at National and Regional Level

*** About This Project * Previous Work * What's New * Team Members *
* Advisory Committee * Timeline * Workshops * Links * Home ***

Welcome! This page provides information on a collaborative effort being coordinated by Dr. Biliana Cicin-Sain, Professor and Director of the University of Delaware Center for the Study of Marine Policy to develop a policy framework for marine aquaculture in offshore federal waters of the United States.

Background

In a study funded by the National Sea Grant Program (from October 1999 to March 2001), Dr. Cicin-Sain, together with a multi-institutional and multidisciplinary research team representing natural science, social science, legal, industry, and marine advisory perspectives, developed a policy framework for offshore aquaculture in the 3-200 mile U.S. ocean zone. The research team worked with an Advisory Committee composed of representatives from the aquaculture and fishing industries, environmental groups, state and federal agencies, and Congress to define the problems challenging the development of an offshore aquaculture industry in the U.S. and defining policy solutions that give predictability to the industry while insuring environmental safety and fairness to other users.

The study focused on the major issues associated with the development of this new offshore industry: 1) the absence of a federal policy framework on marine aquaculture, 2) environmental effects, 3) and public trust issues related to the occupation of public space and effects on other users. The research examined past studies on this question, and the experience of U.S. coastal states and of 8 other countries with offshore aquaculture to glean lessons on what policy approaches may best be applicable in the U.S. 200-mile zone.

The research developed a set of policy criteria for judging policy options for governance of aquaculture activities, and proposed a set of policy options that address the full life-cycle of offshore projects: from planning, through the issuance of permits/leases, operation and monitoring of facilities, and eventual abandonment at the end of an offshore aquaculture project. It should be noted that this work presents a general policy framework for offshore aquaculture governance, and

that further work--entailing research, policy analysis, and consensus building among stakeholders--is needed to make these policy prescriptions operational and readily implementable.

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Objectives

Building on the work described above and also on other useful work sponsored by the Sea Grant Technology Program on the legal framework affecting offshore aquaculture (by Kristen Fletcher and others in the Gulf of Mexico Region) and related work, this project will develop and test an operational framework for offshore aquaculture in conjunction with stakeholders at national and regional levels. The previous research team has been expanded to add additional perspectives from industry, environmental groups, the coastal states, and from two other regions in which offshore aquaculture activity is taking place (the Gulf of Mexico and the Pacific Islands). The following additional research participants have been invited to collaborate:

- John Corbin, Aquaculture Coordinator, State of Hawaii
- Jeremy Firestone, Center for the Study of Marine Policy, University of Delaware
- Kristen Fletcher, Director of the Mississippi/Alabama Sea Grant Legal Program
- Tony MacDonald, Executive Director, Coastal States Organization
- Betsy Hart, Executive Director, National Aquaculture Association
- Ralph Rayburn, Associate Director, Texas Sea Grant Program
- Boyce Thorne-Miller, Senior Scientist, Ocean Advocates

The expanded research team is working to develop a detailed operational framework for offshore aquaculture addressing the five aspects noted below. The work involves research, policy analysis, and consensus building among stakeholders and will be developed first at the national level, in cooperation with relevant stakeholders (including federal and state agencies, congressional staff, environmental and industry groups), and then tested and tailored in the context of the three regions which currently exhibit the most extensive activity in offshore aquaculture: New England, the Gulf of Mexico, and the Pacific Islands. Detailed guidance will be developed, tested, and tailored to the three regional contexts for the following five aspects of the framework:

1. Procedures for planning and site assessment for aquaculture operations in the 200-mile ocean zone, including the use of zoning and such tools as remote sensing and geographical information systems.
2. Joint state/federal permitting process for aquaculture involving the use of one comprehensive application form and procedure to meet the application requirements of all agencies involved.
3. Guidelines and standards for the environmental review process to be followed in offshore aquaculture.
4. Guidelines and standards for the issuance of short-term and long-term leases giving the aquaculturist the right to exclusive use of ocean space, subject to certain conditions and rents.
5. Guidelines and standards for monitoring of aquaculture operations, which may involve

conditions on operations such as insurance, bonds, environmental monitoring requirements to insure the safety of operations and, in the case of termination of operations, the removal of structures and the return of the area to its previous state.

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General Methodology

1) The two-year study begins with a workshop (national workshop 1) in Washington DC to which all the federal agencies with a regulatory role in offshore aquaculture, together with Congressional staff and other relevant interests, will be invited to meet with all members of the project team. The approach to be followed in developing the detailed guidance for the operational framework will be discussed and various options for addressing each of the five aspects noted above will be presented.

2) The team will then develop, in draft form, the detailed operational guidance on each of the five aspects of the operational framework.

3) Different members of the team will take the lead in convening one workshop in their respective regions with the relevant stakeholders and submit the draft guidance to discussion by the regional-level stakeholders. The intent here is to tailor and refine national-level guidance to fit the varying realities that characterize different offshore regions of the U.S. Three regional workshops are envisioned.

4) The team will then revise the operational framework taking into account the feedback from the regions, and present a draft revised operational framework to the national-level entities/groups which had participated in national workshop 1.

5) The team will reconvene the participants involved in workshop 1 to present the draft operational framework, obtain input and recommendations for alteration and revision (national workshop 2). A final operational framework will then be produced in the last months of the project for formal presentation to Congress, to the federal agencies, and other interested parties.

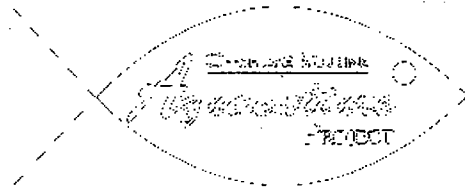
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Rationale

This project advances the general policy approach developed in past research to an operational and readily implementable framework and build consensus among both national and regional level stakeholders on desirable options to be included in the operational framework.

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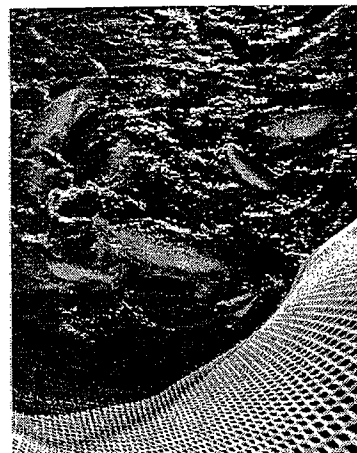
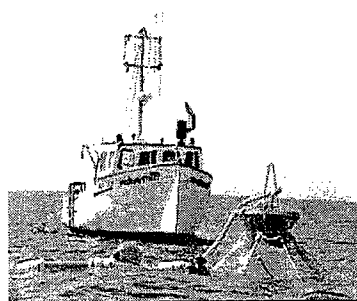
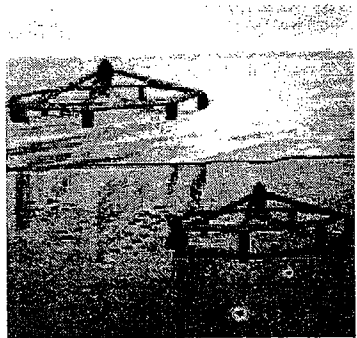
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FOREWORD AND ACKNOWLEDGEMENTS

Marine aquaculture is a promising new use of offshore waters in the United States. As one of the newer uses of the ocean, marine aquaculture needs to be developed in an environmentally sustainable manner taking into account impacts that may result for ocean resources, environments, and users. However, at present, there is no explicit policy framework at the federal level in the U.S. for managing and providing guidance for the development of offshore marine aquaculture.

This report addresses issues that must be confronted in the development of this new industry; especially those related to environmental impacts, effects on other users, and issues related to the exclusive private use of public waters. The study draws lessons from past efforts to address these concerns, and from the experience of coastal states and other nations in managing offshore marine aquaculture. A policy framework for managing aquaculture operations in federal waters in the U.S. Exclusive Economic Zone is proposed.

This work is the product of the research and discussions among a diverse and multidisciplinary research team, including scholars and practitioners in the fields of marine science, aquaculture industry, ocean policy, and environmental law. It is interesting to note that, notwithstanding the variety of perspectives and backgrounds represented on the research team, after extended discussions, the team was able to develop a broad consensus on the policy framework proposed here, although not always agreeing on every detail of the framework.

Much of the research and the writing of the report was carried out by the University of Delaware members of the research team (Susan Bunsick, Biliana Cicin-Sain, John Ewart, and Robert Knecht) with valuable input from Richard DeVoe (marine aquaculture, South Carolina Sea Grant Consortium), Tim Eichenberg (environmental law, legal consultant, San Francisco), Harlyn Halvorson (marine science and biotechnology, University of Massachusetts, Boston), and Robert Rheault (marine aquaculture industry, Rhode Island). Many thanks are due to Danielle M. Tesch, Center for the Study of Marine Policy, for her assistance in the project, especially in the analysis presented in Chapter 2 of the report, to Jorge A. Gutierrez, Center for the Study of Marine Policy, for technical editing, graphics, and formatting of the report, and to Catherine Johnston, Center Program Coordinator, for managerial support.

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Dr. Biliانا Cicin-Sain
Project Director
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Executive Summary

This report is the first comprehensive assessment of federal policy with respect to the development of aquaculture as a new ocean industry in federally-controlled waters off the U.S. coast. Researched and written by an interdisciplinary, multi-institutional team, the report develops a set of policy approaches to address the gaps and deficiencies of current federal policy with respect to the siting and operation of aquaculture facilities in the U.S. Exclusive Economic Zone (EEZ). Developed in consultation with an advisory committee representing the full range of stakeholder interests (see Appendix 1), the report draws on the experience with marine aquaculture policy in U.S. coastal states and eight other nations and considers international guidelines for the development of environmentally sound and economically sustainable aquaculture.

The report:

- Describes the current status of marine aquaculture in the United States and the rationale for siting projects further offshore (Chapter 1)
- Reviews the major questions and policy issues in the governance of offshore aquaculture raised by earlier studies (Chapter 2)
- Provides case studies on the experience of the major offshore projects that have sought U.S. approval to date (Chapter 3)
- Presents an overview of the complex framework employed by federal agencies

in governing offshore aquaculture under current U.S. law and identifies major gaps and deficiencies in current policy (Chapter 4)

- Identifies alternative approaches based on a review of marine aquaculture policy in U.S. coastal states (Chapter 5)
- Reviews relevant international experience with respect to aquaculture, including approaches to marine aquaculture in eight other nations (Norway, Scotland, Ireland, Canada, Chile, Australia, New Zealand and Japan) and international guidelines for development of the aquaculture industry (Chapter 6)
- Proposes a set of policy approaches that address the full life-cycle of offshore projects (from planning through the issuance of permits/leases, operation and monitoring of facilities, and eventual abandonment at the end of an offshore aquaculture project), and advocates the development of an overall policy for planning and governing all activities in the U.S. EEZ, including aquaculture (Chapter 7).

► Scope of Study

The focus of this report is on the policy/regulatory issues involved in placing and operating marine aquaculture structures in the U.S. EEZ for purposes of raising native/locally present species and hybrids. The major policy