

GAO

Report to the Chairman, Committee on  
Natural Resources, House of  
Representatives

May 2008

# OFFSHORE MARINE AQUACULTURE

Multiple  
Administrative and  
Environmental Issues  
Need to Be Addressed  
in Establishing a U.S.  
Regulatory  
Framework





Highlights of [GAO-08-594](#), a report to the Chairman, Committee on Natural Resources, House of Representatives

## Why GAO Did This Study

U. S. aquaculture—the raising of fish and shellfish in captivity—has generally been confined to nearshore coastal waters or in other water bodies, such as ponds, that fall under state regulation. Recently, there has been an increased interest in expanding aquaculture to offshore waters, which would involve raising fish and shellfish in the open ocean, and consequently bringing these types of operations under federal regulation. While the offshore expansion has the potential to increase U.S. aquaculture production, no comprehensive legislative or regulatory framework to manage such an expansion exists. Instead, multiple federal agencies have authority to regulate different aspects of offshore aquaculture under a variety of existing laws that were not designed for this purpose. In this context, GAO was asked to identify key issues that should be addressed in the development of an effective regulatory framework for U.S. offshore aquaculture. In conducting its assessment, GAO administered a questionnaire to a wide variety of key aquaculture stakeholders; analyzed laws, regulations, and key studies; and visited states that regulate nearshore aquaculture industries.

Although GAO is not making any recommendations, this review emphasizes the need to carefully consider a wide array of key issues as a regulatory framework for offshore aquaculture is developed. Agencies that provided official comments generally agreed with the report.

To view the full product, including the scope and methodology, click on [GAO-08-594](#). For more information, contact Anu K. Mittal at (202) 512-3841 or [mittala@gao.gov](mailto:mittala@gao.gov).

## OFFSHORE MARINE AQUACULTURE

### Multiple Administrative and Environmental Issues Need to Be Addressed in Establishing a U.S. Regulatory Framework

#### What GAO Found

In developing a regulatory framework for offshore aquaculture, it is important to consider a wide array of issues, which can be grouped into four main areas.

*Program administration:* Addressing the administration of an offshore program at the federal level is an important aspect of a regulatory framework. Stakeholders that GAO contacted and key studies that GAO reviewed identified specific roles and responsibilities for federal agencies, states, and regional fishery management councils. Most stakeholders and the studies agreed that the National Oceanic and Atmospheric Administration (NOAA) should be the lead federal agency and emphasized that coordination with other federal agencies will also be important. In addition, stakeholders and some of the studies recommended that the states play an important role in the development and implementation of an offshore aquaculture program.

*Permitting and site selection:* It will also be important to establish a regulatory process that clearly identifies where aquaculture facilities can be located and for how long. For example, many stakeholders stated that offshore facilities will need the legal right, through a permit or lease, to occupy an area of the ocean. However, stakeholders varied on the specific terms of the permits or leases, including their duration. Some stakeholders said that longer permits could make it easier for investors to recoup their investments, while others said that shorter ones could facilitate closer scrutiny of environmental impacts. This variability is also reflected in the approaches taken by states that regulate aquaculture in their waters. One state issues 20-year leases while another issues shorter leases. Stakeholders supported various approaches for siting offshore facilities, such as case-by-case site evaluations and prepermitting some locations.

*Environmental management:* A process to assess and mitigate the environmental impacts of offshore operations is another important aspect of a regulatory framework. For example, many stakeholders told GAO of the value of reviewing the potential cumulative environmental impacts of offshore operations over a broad ocean area before any facilities are sited. About half of them said that a facility-by-facility environmental review should also be required. Two states currently require facility-level reviews for operations in state waters. In addition, stakeholders, key studies, and state regulators generally supported an adaptive monitoring approach to ensure flexibility in monitoring changing environmental conditions. Other important areas to address include policies to mitigate the potential impacts of escaped fish and to remediate environmental damage.

*Research:* Finally, a regulatory framework needs to include a federal research component to help fill current gaps in knowledge about offshore aquaculture. For example, stakeholders supported federally funded research on developing (1) alternative fish feeds, (2) best management practices to minimize environmental impacts, (3) data on how escaped aquaculture fish might impact wild fisheries, and (4) strategies to breed and raise fish while effectively managing disease. A few researchers said that the current process of funding research for aquaculture is not adequate because the research grants are funded over periods that are too short to accommodate certain types of research, such as hatchery research and offshore demonstration projects.

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## Abbreviations

Corps	Army Corps of Engineers
EPA	Environmental Protection Agency
NEPA	National Environmental Policy Act
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
PEIS	programmatic environmental impact statement
USDA	U.S. Department of Agriculture

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United States Government Accountability Office  
Washington, DC 20548

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May 9, 2008

The Honorable Nick J. Rahall II  
Chairman  
Committee on Natural Resources  
House of Representatives

Dear Mr. Chairman:

The U.S. aquaculture industry—which primarily raises fish and shellfish in captivity—is relatively small compared with that of other countries. According to the most recent data available from the Food and Agriculture Organization of the United Nations, the United States was the tenth largest aquaculture producer in the world in 2004.<sup>1</sup> Generally, U.S. aquaculture takes place in nearshore marine waters or onshore—such as in ponds or tanks—that fall under the jurisdiction of individual states. Offshore marine aquaculture, which involves raising fish in cages and shellfish attached to underwater ropes in open-ocean federal waters, has the potential to increase U.S. aquaculture production. A move to offshore operations would mean that aquaculture facilities would be sited in federally regulated waters that generally extend from 3 to 200 nautical miles from the U.S. coast. To date, no offshore aquaculture operations exist in U.S. federal waters. However, a few small-scale commercial and research operations are ongoing in state or territorial waters in Hawaii, New Hampshire, and Puerto Rico, which have conditions similar to the offshore environment such as deep water, rapid currents, and large waves.

With some recent advances in offshore aquaculture technologies and the existence of some open-ocean commercial and research operations in state waters, the aquaculture industry is increasingly interested in expanding to offshore areas. Proponents of offshore aquaculture have argued that it can increase production, while potentially alleviating some of the environmental concerns that have been associated with aquaculture in nearshore areas. For example, nutrients from nearshore aquaculture facilities have, in some cases, decreased the diversity of organisms living in and on the ocean floor—known as the benthic community. Some have

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<sup>1</sup>Food and Agriculture Organization of the United Nations, Fisheries and Aquaculture Department, *The State of World Fisheries and Aquaculture 2006* (Rome, Italy: 2007).

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suggested that faster currents and deeper waters in offshore areas will disperse these nutrients before they can be deposited on the ocean floor. However, others believe that significant environmental concerns remain and should be addressed before the United States authorizes an offshore aquaculture program. For example, fish may escape from an aquaculture facility, whether nearshore or offshore, and interbreed with wild fish, potentially reducing the ability of wild fish to survive. In addition, several nearshore aquaculture facilities have faced challenges in keeping aquaculture-raised fish free from diseases, and offshore facilities could face similar challenges as well. Also, diseases can be transmitted between aquaculture and wild populations, potentially harming both.<sup>2</sup> Finally, the feeds currently used in aquaculture production rely, in part, on ingredients derived from wild-caught fish, raising concerns that an expanded aquaculture industry could result in over-fishing certain species, such as anchovies, which are used in aquaculture feeds.

Currently, multiple federal agencies have the authority to regulate different aspects of offshore aquaculture, under a variety of existing laws that were not designed for this purpose. Additionally, there is no lead federal agency for regulating offshore aquaculture, and no comprehensive law directly addresses how it should be administered, regulated, and monitored. The key federal agencies include the National Oceanic and Atmospheric Administration (NOAA), which has the authority to protect the marine environment from potential negative impacts from a variety of sources, including aquaculture. In this regard, NOAA evaluates proposals for new facilities in the marine environment, such as those for aquaculture or oil exploration, to ensure that marine mammals, endangered species, and national marine sanctuary resources are protected. NOAA also coordinates with eight regional fishery management councils to manage fishing activity and protect fish habitat in federal waters.<sup>3</sup> In addition, the U.S. Army Corps of Engineers (Corps) issues permits for structures in

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<sup>2</sup>Concerns about disease interactions between wild fish and aquaculture facilities received attention recently in response to a 2007 study of nearshore salmon aquaculture operations in British Columbia. The study argued that aquaculture facilities near inlets and channels where juvenile salmon migrate from fresh to marine waters have led to damaging levels of sea lice transmission from aquaculture-raised fish to wild populations. Other scientists disagreed, noting that there are many wild sources of sea lice that could have accounted for the sea lice infections of wild salmon and disputed some of the methods used in the study.

<sup>3</sup>Regional fishery management councils are composed primarily of federal and state fishery management officials and individuals selected by the Secretary of Commerce from lists submitted by the Governors of the states in the councils' regions.

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navigable waters, such as aquaculture net pens where fish are raised, to ensure that navigation is not impeded. Similarly, the Environmental Protection Agency (EPA) issues permits to limit the release of pollutants from aquaculture facilities into U.S. waters.

This complex structure of federal responsibilities for offshore aquaculture has led aquaculture researchers, regulators, those who operate aquaculture facilities (aquaculturists), and environmentalists to advocate for a coordinated approach to regulating offshore aquaculture in the United States. In 2005 and 2007, the administration developed legislative proposals to provide a new regulatory framework for offshore aquaculture.<sup>4</sup> The 2007 legislative proposal was introduced in the House and Senate but has not progressed any farther toward becoming law. Within this context, you asked us to identify key issues that should be addressed in the development of an effective regulatory framework for U.S. offshore aquaculture.

To conduct this work, we reviewed federal laws and regulations, as well as a wide range of studies on offshore aquaculture, including four key studies.<sup>5</sup> These key studies—by the Marine Aquaculture Task Force, the University of Delaware, the U.S. Commission on Ocean Policy, and the Pew Oceans Commission—brought together ocean policy stakeholders to examine, among other things, potential regulatory frameworks for offshore aquaculture. Throughout the report, we cite those studies that reached similar conclusions or made similar recommendations on particular policy issues. If a study is not cited for a particular policy issue, it is because the study did not address that issue. If a study is not cited for a particular policy issue, that study did not address the policy issue. We also visited the states with active nearshore fish aquaculture industries—Hawaii, Maine, and Washington—and met with state and federal regulators to discuss state regulatory frameworks. In addition, we spoke with other relevant federal agency officials; representatives from six of the eight regional fishery management councils; and state officials in California,

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<sup>4</sup>The bills were introduced as S. 1195 in 2005 and as H.R. 2010 and S. 1609 in 2007.

<sup>5</sup>Marine Aquaculture Task Force, *Sustainable Marine Aquaculture: Fulfilling the Promise; Managing the Risks* (Takoma Park, MD: 2007); University of Delaware, *Recommendations for an Operational Framework for Offshore Aquaculture in U.S. Federal Waters* (Newark: 2005); U.S. Commission on Ocean Policy, *An Ocean Blueprint for the 21st Century* (Washington, D.C.: 2004); Pew Oceans Commission, *America's Living Oceans: Charting a Course of Sea Change* (Washington, D.C.: 2003).

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Florida, and Texas, where new marine aquaculture policies are under development.

Based on this information, we developed a questionnaire to assess the level of support for various regulatory policy options. We administered the questionnaire to, and conducted follow-up structured interviews with, a variety of aquaculture stakeholders, including key federal and coastal state officials; representatives from the commercial fishing industry, aquaculture industry, and environmental groups; and aquaculture researchers. We selected these stakeholders because of their knowledge of aquaculture issues and to ensure broad representation across government, industry, and the environmental and academic sectors, as well as broad geographic representation throughout the United States. We sent questionnaires to 28 stakeholders and received responses from 25. For purposes of characterizing the results from our questionnaire and follow-up interviews of our 25 stakeholders, we identified specific meanings for the words we used to quantify the results, as follows: “a few” means at least three, and up to five stakeholders; “some” means between 6 and 11 stakeholders; “about half” means 12 to 14 stakeholders; “a majority” of stakeholders and “many” stakeholders both mean 15 to 19 stakeholders; and “most” means 20 stakeholders or more. We conducted this performance audit from April 2007 to May 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

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## Results in Brief

In developing an effective regulatory framework for U.S. offshore aquaculture, it is important to consider a wide array of issues. These issues can be grouped into four main areas: program administration, permitting and site selection, environmental management, and research. Aquaculture stakeholders whom we contacted generally agreed on how to address some specific issues within each of these four broad areas, but differed on how to address other specific implementation issues.

- *Program administration.* Identifying a lead federal agency, as well as the roles and responsibilities of other federal agencies and states, is key to the administration of an offshore aquaculture program. Most stakeholders we contacted said that NOAA should be the lead federal agency to (1) manage a permitting or leasing program for offshore aquaculture facilities and (2)



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coordinate with other federal agencies. About half of these stakeholders supported NOAA because of its expertise in fisheries and oceans management. In addition, most stakeholders emphasized that formal agreements among agencies are essential to enhance federal coordination and take advantage of each agency's unique expertise. For example, EPA has knowledge of technologies and practices that control and reduce pollutants from marine aquaculture, and the lead federal agency for offshore aquaculture could draw on that experience to protect water quality in federal waters. Regarding the extent to which states should be involved in regulating offshore aquaculture, three of the key studies that we reviewed recommended that states be involved in the development and implementation of a regulatory framework for offshore aquaculture. In addition, a majority of stakeholders agreed that states should be able to "opt out" of the offshore aquaculture program. If a state chose to opt out, it would be refusing to allow any offshore aquaculture to take place in the federal waters adjacent to its state waters. However, the stakeholders also said that states that have not opted out of the program should not have the authority to veto individual offshore aquaculture projects. For example, one stakeholder said he did not support allowing states to veto individual offshore aquaculture projects because few businesses would be interested in investing time and money in obtaining federal offshore aquaculture approvals if any individual state could veto the federal decision. Finally, stakeholders and studies generally agreed that regional fishery management councils should review or comment on offshore aquaculture projects but not be able to veto such projects.

- *Permitting and site selection.* Permits or leases are important to establish the terms and conditions for offshore aquaculture operations. Specifically, stakeholders we contacted, and the University of Delaware study, emphasized that offshore aquaculturists will need the legal right—through a permit or lease—to occupy a given tract of ocean. Some stakeholders were concerned that without legal rights defined in a permit or lease, aquaculturists might not be able to obtain needed business loans. However, stakeholders expressed a range of opinions on the specific terms of offshore aquaculture permits and leases. For example, some stakeholders supported permits or leases with long time frames—20 years or more—to allow investors to recoup their investments, while others advocated for permits or leases with shorter time frames to ensure close scrutiny of environmental impacts during the lease or permit renewal process. In addition, site selection—developing a process to approve offshore aquaculture facility locations—is an important component of regulating offshore aquaculture. Stakeholders supported a variety of approaches that the lead aquaculture agency could use to site new offshore aquaculture facilities, including (1) reviewing and approving sites

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on a case-by-case basis and (2) prepermitting locations by approving sites independently of and prior to submitting individual facility applications.

- *Environmental management.* A regulatory process to review, monitor, and mitigate the potential environmental impacts of offshore aquaculture facilities will also be important. Many stakeholders recognized the value of reviewing the potential environmental impacts of offshore aquaculture over a broad ocean area before any offshore aquaculture facilities are sited—which should involve preparing a programmatic environmental impact statement. A few considered this a sufficient level of environmental review, while others said that a follow-up, facility-specific environmental review should also be required. In addition, the majority of stakeholders supported conducting environmental monitoring at offshore aquaculture facilities to identify changes to the benthic community and disease, among other things. Such monitoring is done for nearshore marine aquaculture programs in Hawaii, Maine, and Washington, although these states vary in the frequency and intensity of monitoring they require. Most stakeholders also supported using an adaptive monitoring approach that would alter monitoring requirements over time as better information became available and help focus on the types of monitoring that are demonstrated to be the most appropriate for tracking changes to the environment. Finally, stakeholders had varied opinions on policies that could be used to mitigate the potential impacts of escaped fish and remediate environmental damage. For example, most stakeholders supported requiring aquaculturists to develop plans to address fish escapes from their proposed facilities. Stakeholders' views varied, however, on whether aquaculturists should be allowed to raise genetically modified species in offshore aquaculture facilities.
- *Research.* Finally, research to address gaps in current knowledge on a variety of issues for offshore aquaculture is an important component of a regulatory framework. Stakeholders, and the four key studies we reviewed, generally agreed that the federal government should fund such research. Most stakeholders said that the federal government should place particular importance on funding research on (1) developing fish feeds that do not rely heavily on harvesting wild fish, (2) developing best management practices, (3) exploring how escaped offshore aquaculture-raised fish might impact wild fish populations, and (4) developing strategies to breed and raise fish while effectively managing disease. Currently, NOAA and the U.S. Department of Agriculture (USDA) fund research on marine aquaculture through, for example, competitive grants. However, some researchers said that grants are funded over time periods that are too short to accommodate certain types of research. For example, researchers in Hawaii told us that the development of healthy breeding

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fish to supply offshore aquaculture operations can often require years of intensive breeding efforts, but that it is difficult to obtain consistent research funding over this long time period.

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## Background

Globally, aquaculture production has grown significantly over the past 50 years, from less than 1.1 million tons around 1950 to about 65.5 million tons in 2004. A majority of global aquaculture fish and shellfish are raised in a freshwater environment and species raised in a marine environment make up about 36 percent of aquaculture production. Marine aquaculture is dominated by high-value fish, such as salmon. Many countries are producing marine fish, though a NOAA official indicated that most production is occurring in shallow, sheltered areas relatively close to shore. A few countries, such as Ireland, have expressed interest in or are developing policy frameworks to regulate offshore aquaculture in the open ocean. To date, however, a NOAA official said that no countries have substantial offshore aquaculture industries with facilities sited in open-ocean environments.

The United States' aquaculture industry includes both onshore and nearshore operations and produces both fish, such as salmon and catfish, and shellfish, such as oysters. Onshore aquaculture facilities are primarily involved in raising freshwater species, such as catfish. Marine aquaculture facilities in the United States are generally located in waters close to shore and in sheltered conditions, and they most frequently raise oysters, mussels, clams, and salmon. The salmon aquaculture industry in the United States is concentrated in Maine and Washington, although the industry is relatively small compared with the global salmon aquaculture industry, accounting for less than 1 percent of the world's production.<sup>6</sup>

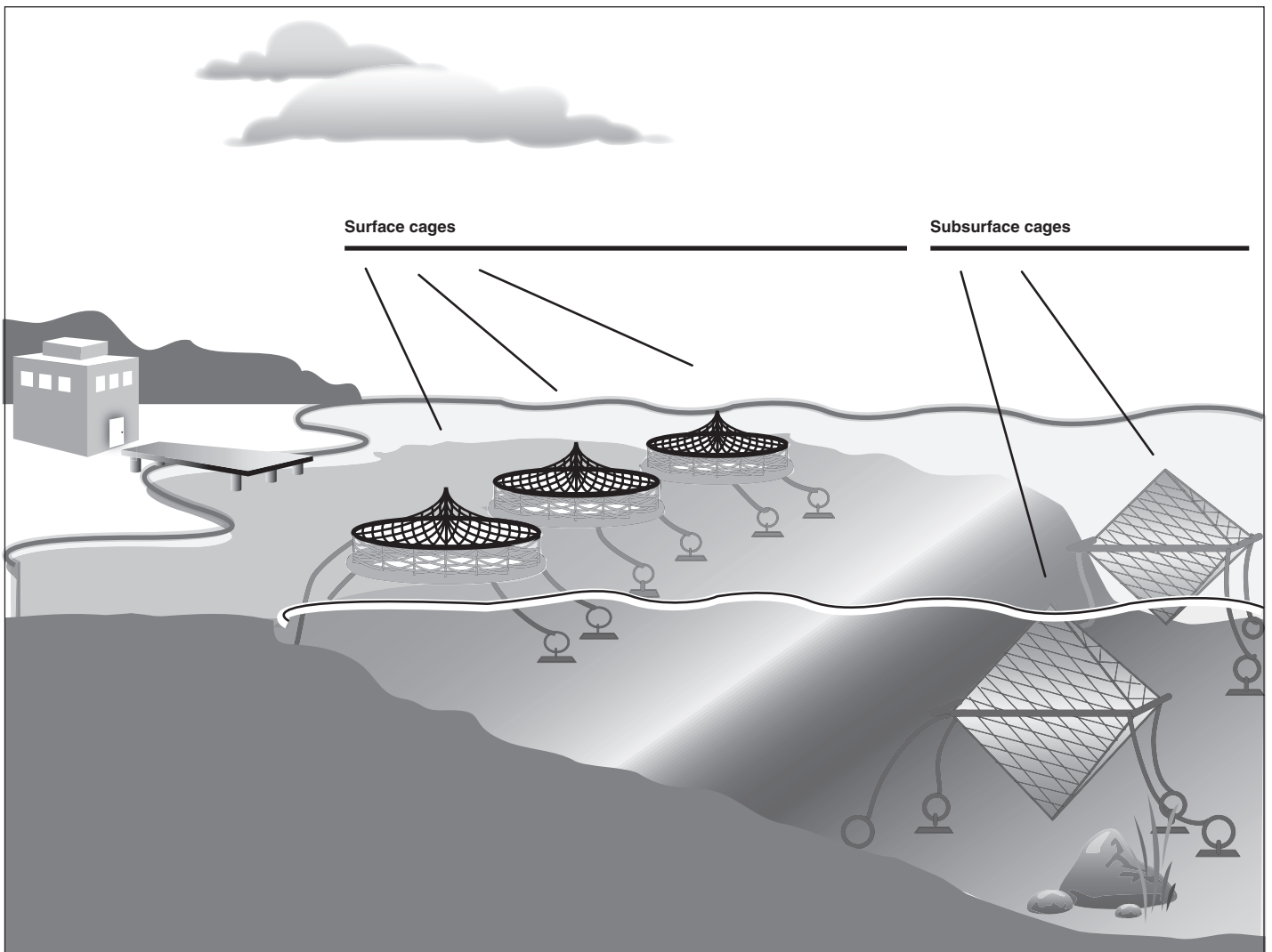
During the last 10 years, four small-scale aquaculture facilities began nearshore open-ocean operations in Hawaii, Puerto Rico, and New Hampshire, in conditions similar to those found offshore. All four facilities grow fish species native to their regions, such as moi and kahala in Hawaii, cobia in Puerto Rico, and cod and halibut in New Hampshire. The New Hampshire project also grows mussels. These open-ocean facilities and similar facilities that may be established in an offshore environment require technology that differs from what is generally needed by nearshore

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<sup>6</sup>Knapp, G., C. Roheim, and J. Anderson, *The Great Salmon Run: Competition between Wild and Farmed Salmon* (Washington, D.C.: TRAFFIC North America and World Wildlife Fund, 2007).

facilities. For example, open-ocean facilities need stronger cages and anchors that can withstand the strong currents and storms that are prevalent offshore. Furthermore, offshore aquaculture will face challenges such as inclement weather, which may prevent offshore aquaculturists from accessing cages due to their location far from shore and could delay essential activities such as feeding.

**Figure 1: Examples of Cages Used in Nearshore and Offshore Aquaculture**



Source: GAO.

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However, there are concerns that offshore aquaculture may have adverse environmental impacts. Specifically, excess nutrients or chemicals from fish food, medication, and fish waste may alter water quality and may also change the composition of the benthic community. Although the environmental impact of an offshore aquaculture industry is uncertain because of a lack of data specific to large-scale, offshore aquaculture operations, data from existing small-scale, open-ocean facilities in state waters provide some information about this kind of impact. Studies of one small-scale commercial facility in Hawaii show that some water quality changes occurred near the aquaculture cages,<sup>7</sup> but that these changes were within the allowable limits of the facility's National Pollutant Discharge Elimination System (NPDES) permit.<sup>8</sup> Also, the data from the site indicated a slight change in the benthic community, but researchers noted that it returned to its original composition after the cages were not used for 6 months. Studies of other open-ocean sites in state or territorial waters found little to no impact on water quality or the benthic community.<sup>9</sup>

Multiple federal agencies, including NOAA, the Corps, EPA, and USDA, have regulatory authorities relevant to various aspects of offshore aquaculture operations (see table 1).

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<sup>7</sup>Ostrowski, Anthony. *Hawaii Offshore Aquaculture Research Project—Phase I*. (Waimanalo, HI: 2000); Ostrowski, Anthony. *Hawaii Offshore Aquaculture Research Project—Phase II*. (Waimanalo, HI: 2001); Helsley, Chuck. *Hawaii Offshore Aquaculture Research Project—Phase III: Critical Research and Development Issues for Commercialization and Supplement for Acquisition of Initial Sedimentation Rate Data around Sea Cages Operating off the Coast of Oahu*. (Waimanalo, HI: 2007).

<sup>8</sup>The Clean Water Act generally prohibits discharge of pollutants into waters of the United States. NPDES permits include limits on the pollutants that can be released, as well as monitoring requirements to ensure that a stipulated level of water quality is retained.

<sup>9</sup>Alston, Dallas, et al. *Environmental and Social Impact of Sustainable Offshore Cage Culture Production in Puerto Rican Waters*. (Mayaguez, PR: 2005); Ward, Larry, et al. *Atlantic Marine Aquaculture Center Open Ocean Aquaculture Annual Progress Report*. (Durham, NH: 2001-2007).

**Table 1: Agencies' Regulatory Responsibilities and Authorities for Offshore Aquaculture**

Agency (Department)	Responsibilities	Authority	Citation
NOAA's National Marine Fisheries Service (Commerce)	Consult with regulating agencies regarding the impact of permitted activities on living marine resources, marine mammals, essential fish habitat, and endangered species.	Marine Mammal Protection Act	16 U.S.C. §1371
		Endangered Species Act	16 U.S.C. §1536
		Magnuson-Stevens Fishery Conservation and Management Act	16 U.S.C. §1855
		Fish and Wildlife Coordination Act	16 U.S.C. §661 <i>et seq.</i>
		Regulate fishing activities, including aquaculture. Performed in consultation with regional fishery management councils.	Magnuson-Stevens Fishery Conservation and Management Act
NOAA's National Ocean Service (Commerce)	Regulate fishing activities, including aquaculture. Performed in consultation with regional fishery management councils.	National Aquaculture Act of 1980	16 U.S.C. §§2801-2810
		Cooperate with other federal agencies in implementing the National Aquaculture Development Plan.	
		Enforce prohibitions on the sale, trade, or transportation of fish or wildlife harvested or attained in violation of federal, state, tribal, or foreign laws.	Lacey Act
NOAA's National Ocean Service (Commerce)	Review and approve state coastal management programs, which identify permissible water uses in the coastal zone. Oversee federal consistency with these programs.	Coastal Zone Management Act	16 U.S.C. §1451 <i>et seq.</i>
		Regulate activities in national marine sanctuaries to protect sanctuary resources.	National Marine Sanctuaries Act
Corps (Defense)	Regulate structures, such as aquaculture cages, in navigable waters through "Section 10" permits.	Rivers and Harbors Act	33 U.S.C. §403
		Outer Continental Shelf Lands Act	43 U.S.C. §1333
EPA	Regulate discharges to navigable waters through NPDES permits. Often authorizes states to issue NPDES permits for discharges to navigable waters within a state.	Clean Water Act	33 U.S.C. §§1342, 1343
Fish and Wildlife Service (Interior)	Consult with permitting agencies regarding the impact of permitted activities on fish and wildlife, including endangered species.	Fish and Wildlife Coordination Act	16 U.S.C. §661 <i>et seq.</i>
		Endangered Species Act	16 U.S.C. §1536
		Regulate the importation and interstate transportation of fish under humane and healthful conditions.	Lacey Act
Minerals Management Service (Interior)	Authorize the use of existing facilities on the outer continental shelf, such as oil and gas platforms, for marine-related activities, including aquaculture.	Outer Continental Shelf Lands Act	43 U.S.C. §1337

Agency (Department)	Responsibilities	Authority	Citation
Animal and Plant Health Inspection Service (Agriculture)	Regulate the movement of aquatic animals in interstate and foreign commerce and respond to aquatic animal disease outbreaks.	Animal Health Protection Act	7 U.S.C. §8301 <i>et seq.</i>
Coast Guard (Homeland Security)	Require structures that are located in waters under the jurisdiction of the United States to be marked with lights and signals to protect navigation.	Rivers and Harbors Act	14 U.S.C. §85

Source: GAO.

In addition to the responsibilities described in table 1, NOAA’s Aquaculture Program coordinates the agency’s aquaculture research activities and conducts outreach and industry development efforts, such as sponsoring the 2007 National Marine Aquaculture Summit. Similarly, USDA also chairs the interagency Joint Subcommittee on Aquaculture which, among other things, is creating a federal plan for managing aquatic animal health and has convened a science and technology task force to update the federal strategic plan for aquaculture research.<sup>10</sup>

In addition to agency-specific responsibilities and authorities, all federal agencies are required to comply with the National Environmental Policy Act (NEPA).<sup>11</sup> Under NEPA, agencies evaluate the likely environmental effects of projects that could significantly affect the environment. For example, permits for aquaculture facilities or oil platforms might necessitate such a review. An agency may also elect to prepare a programmatic environmental impact statement (PEIS). A PEIS could either be prepared to help develop regulations for an industry by evaluating its potential for environmental, social, and economic impacts or to evaluate proposed actions sharing geographic and programmatic similarities after regulations have been established, such as siting a number of aquaculture facilities in the same general location that plan to raise the same species.

If an offshore aquaculture industry develops, a variety of individuals and organizations will have a stake in how the industry is regulated and how it affects the environment. Specifically, federal agencies would be

<sup>10</sup>In addition to USDA, other member agencies of the Joint Subcommittee on Aquaculture are: Department of Commerce, Department of the Interior, Department of Energy, Department of Health and Human Services, EPA, Corps, Small Business Administration, Agency for International Development, Tennessee Valley Authority, National Science Foundation, and Farm Credit Administration.

<sup>11</sup>42 U.S.C. §§ 4321-4347.

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stakeholders because they would regulate the offshore aquaculture industry, or guide and fund public research on offshore aquaculture. Coastal states would be stakeholders because an offshore aquaculture industry could potentially have impacts on natural resources in their state waters and provide economic benefits to coastal communities. The commercial fishing industry would be a stakeholder both because it may have to share ocean space with aquaculturists, and the offshore aquaculture industry could affect the environment that supports wild fish populations. The aquaculture industry would be a stakeholder because it is interested in developing offshore facilities. Environmental groups would be stakeholders because they are interested in protecting marine resources, and the offshore aquaculture industry could affect those resources. Finally, researchers would be stakeholders because they are technical experts and want to ensure proper application of scientific knowledge.

Over the last 5 years, four key studies have been conducted with stakeholder input that examined, among other things, potential regulatory frameworks for offshore aquaculture. These four key studies are as follows:

- The Marine Aquaculture Task Force study was developed by a group of scientists, legal scholars, aquaculturists, and policy experts who sought to gather information about aquaculture and its positive and negative effects. The Marine Aquaculture Task Force's approach to gathering such information included meeting with aquaculturists, marine scientists, fishermen, public officials, and others in regional meetings in the states of Alaska, Florida, Hawaii, Massachusetts, and Washington.
- The University of Delaware study was prepared by an interdisciplinary team with backgrounds in marine policy, law, industry, state government, environmental protection, and marine science. This study made recommendations for developing a comprehensive regulatory framework for sustainable offshore aquaculture in the United States based on information from literature reviews and consultations with stakeholders through national and regional workshops throughout the United States.
- The Pew Oceans Commission study was developed by a bipartisan, independent group to identify policies and practices necessary to restore and protect living marine resources in U.S. waters and the ocean and coastal habitats on which they depend. The Pew Commission brought together a diverse group of American leaders from the worlds of science, fishing, conservation, government, education, business, and philanthropy. The Pew Commission conducted a national dialogue on ocean issues by



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convening a series of 15 regional meetings, public hearings, and workshops to listen to those who live and work along the coasts.

- The U.S. Commission on Ocean Policy study, which was required by the Oceans Act of 2000, established findings and developed recommendations for a coordinated and comprehensive national ocean policy.<sup>12</sup> The U.S. Commission had 16 members drawn from diverse backgrounds, including individuals nominated by the leadership in the United States Senate and House of Representatives. The U.S. Commission held 16 public meetings around the country and conducted 18 regional site visits, receiving testimony from hundreds of people. The study includes detailed recommendations for reform of oceans policy.

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## It Is Important to Consider Many Issues in Four Key Areas When Developing a Regulatory Framework for Offshore Aquaculture

A wide array of issues within four key areas—program administration, permitting and site selection, environmental management, and research—are important to consider when developing an offshore aquaculture program for the United States. Specifically, identifying a lead federal agency, as well as the roles and responsibilities of other federal agencies and states, are key to the administration of an offshore aquaculture program. In addition, permits or leases are important to establish the terms and conditions for offshore aquaculture operations. Site selection is also an important component of regulating offshore aquaculture. Moreover, reviewing environmental impacts of, and monitoring environmental conditions at, offshore aquaculture facilities are key to identifying the scope and nature of potential environmental issues that may require mitigation. Finally, it is important that a regulatory framework include research to address gaps in current knowledge on a variety of issues related to offshore aquaculture. Stakeholders whom we contacted generally agreed on how to address some specific issues within each of the four key areas but differed on many other issues.

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## Key Program Administration Issues

Aquaculture stakeholders that we contacted and key studies that we reviewed identified specific roles and responsibilities for federal agencies, states, and regional fishery management councils. Specifically, most stakeholders and all four studies we reviewed agreed that NOAA should be the lead federal agency for offshore aquaculture and emphasized that coordination with other federal agencies will be important. Moreover, the

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<sup>12</sup>Pub. L. No. 106-256, Sec. 3(f)(1), 114 Stat. 647 (2000).

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## Roles and Responsibilities of Federal Agencies

majority of stakeholders we contacted said NOAA should be the lead agency for research on offshore aquaculture, although stakeholders were evenly divided about whether NOAA or USDA should be responsible for promoting or supporting the offshore aquaculture industry. In addition, stakeholders and three of the key studies we reviewed recommended that states be involved in the development and implementation of a regulatory framework for offshore aquaculture.<sup>13</sup> Stakeholders told us that states should have the ability to opt out of the offshore aquaculture program, but that those states that have chosen to participate should not have the ability to veto individual offshore aquaculture facility proposals. Finally, stakeholders generally supported regional fishery management councils having the opportunity to comment on individual offshore aquaculture facility proposals but did not support councils having other authorities, such as veto authority, over individual proposals.

Most stakeholders that we contacted and the four key studies that we reviewed agreed that NOAA should be the lead federal agency for offshore aquaculture, both to manage a new permitting or leasing program for aquaculture in federal waters and to coordinate federal responsibilities for offshore aquaculture. About half of the stakeholders said they supported NOAA as the lead offshore aquaculture agency because of its experience managing ocean resources. One study, conducted by the University of Delaware, also stated that NOAA was the best choice for a lead agency because of its extensive expertise and knowledge of marine science and policy. However, a few stakeholders we spoke with who did not agree that NOAA should be the lead agency said that other agencies, such as USDA or the Corps, would be better equipped to serve as the lead agency. Two of the stakeholders who supported USDA explained that since aquaculture is ultimately an agricultural activity, USDA would be best able to effectively regulate the industry and coordinate with other agencies. One stakeholder, who supported the Corps as the lead agency, said that since the Corps is currently the *de facto* lead federal agency for aquaculture permitting in state waters, the Corps should also assume that role for offshore aquaculture in federal waters.

Most stakeholders, and the University of Delaware study, stated that it was important for NOAA to develop formal agreements, such as regulations or memorandums of understanding, with other federal agencies to define the

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<sup>13</sup>Marine Aquaculture Task Force, University of Delaware, and U.S. Commission on Ocean Policy.

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responsibilities, authorities, and procedures for regulating offshore aquaculture. Some stakeholders also suggested that close coordination with agencies will allow NOAA to draw on each agency's expertise when developing regulations or making permitting decisions. For instance, one stakeholder said that EPA has expertise in protecting marine water quality in state waters, and the offshore aquaculture program could draw on that experience to protect water quality in federal waters. Another stakeholder suggested that since aquaculture is a food production business, close coordination with USDA could draw on USDA's experience in developing food production industries. The administration's 2007 legislative proposal for offshore aquaculture requires that the Department of Commerce consult with other federal agencies, as appropriate, while developing regulations for an offshore aquaculture program.

Despite strong support for NOAA as the lead agency for offshore aquaculture, stakeholders were about evenly divided on whether those responsibilities should be assigned to a new NOAA office or an existing NOAA office. One stakeholder who supported creating a new office in NOAA said that existing offices currently focus on the conservation of marine resources and that aquaculture is a fundamentally different enterprise meriting a separate office that can focus on developing the aquaculture industry. The studies conducted by the University of Delaware and the U.S. Commission on Ocean Policy also suggested that a new office be created to manage the offshore aquaculture program. Of the stakeholders who said that an existing office should manage the offshore aquaculture program, a few mentioned that this would keep NOAA small and streamlined.

A majority of stakeholders also said that NOAA should be responsible for managing federal research related to offshore aquaculture, including funding marine aquaculture research and the development of offshore aquaculture technologies. A few stakeholders emphasized that NOAA should coordinate on both research and technology development with other agencies, particularly USDA. Stakeholders who did not support NOAA as the lead agency for technology development generally supported USDA or said that the federal government should not support technology development at all. One stakeholder supported USDA because he said it has a superior record in developing aquaculture technology for both freshwater and marine aquaculture. Another stakeholder emphasized that he did not support government funding for offshore aquaculture technology development because funding should come from the aquaculture industry, particularly for any technologies needed to comply with environmental regulations.

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Stakeholders were also about evenly divided on whether NOAA or USDA should be responsible for promoting and supporting the offshore aquaculture industry, though a few stakeholders did not think this was a role for the federal government. One stakeholder who said that NOAA should promote the offshore aquaculture industry suggested that NOAA should restructure its mission to support not just offshore aquaculture but the production of sustainable seafood from wild fisheries, as well as offshore aquaculture. Another stakeholder said that USDA is the logical choice to promote and support the offshore aquaculture industry because it has experience marketing agricultural products. In contrast, a few stakeholders said that promotion or support of the offshore aquaculture industry is not a role for the federal government. One stakeholder objected to government promotion of offshore aquaculture because it amounts to the government promoting one industry over another, for instance, promoting offshore aquaculture at the expense of other types of aquaculture, such as nearshore shellfish aquaculture.

Finally, stakeholders expressed concern over having one agency, such as NOAA, be responsible for both regulating and promoting the offshore aquaculture industry because of the potential conflict of interest between those two responsibilities. One stakeholder suggested that NOAA regulate the industry and develop offshore aquaculture technologies and that USDA focus on promoting offshore aquaculture. In this context, at the state level, Maine, Hawaii, and Washington have each separated their regulatory and promotion agencies. Despite Hawaii's and Maine's separation of these responsibilities, officials from both states said that agencies have the ability to balance these competing responsibilities. In fact, one state official in Hawaii stated that keeping promotion and regulatory responsibilities together can allow officials to share expertise, thereby increasing efficiency and resulting in cost savings. A NOAA official said that NOAA's mission is to enable marine aquaculture, with appropriate environmental safeguards, and that the agency has consistently balanced its missions of enabling and regulating other industries.

## Roles and Responsibilities of States

Three of the key studies we reviewed recommended that states be involved in the development and implementation of a regulatory framework for offshore aquaculture.<sup>14</sup> For instance, the U.S. Commission on Ocean Policy recommended that any proposed federal permitting and

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<sup>14</sup>Marine Aquaculture Task Force, University of Delaware, and U.S. Commission on Ocean Policy.

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leasing program be coordinated with aquaculture-related regulations developed at the state level to provide regulatory consistency to the industry and manage potential environmental impacts that cross jurisdictional lines, such as the spread of disease. The administration's 2007 legislative proposal for offshore aquaculture requires coordination with coastal states during the process of establishing regulations for offshore aquaculture.

In addition, a majority of stakeholders supported a policy that would allow states to opt out of the offshore aquaculture program. If a state chose to opt out, it would be refusing to allow any offshore aquaculture to take place in the federal waters adjacent to its state waters. Of those who supported an opt-out provision, a majority said that states should be able to opt out of fish aquaculture anywhere in the 200 miles of federal waters directly offshore from their state waters. A few stakeholders stated that the opt-out provision should apply only within a certain distance from shore—ranging from 5 to 12 miles. The administration's 2007 legislative proposal for offshore aquaculture includes a provision that would allow a state to opt out of offshore aquaculture within 12 miles of its coast. NOAA officials explained that the agency's decision to limit the opt-out provision to 12 miles was a policy decision that balanced the need to give states a reasonable buffer zone and the difficulty of identifying boundaries between states out to 200 miles in the exclusive economic zone. For example, while it is relatively clear where the boundaries of Alaska's state line would be when extended out to 200 miles, state boundaries on the New England coast overlap extensively, even relatively close to shore.

Stakeholders who supported providing the states the ability to opt out did so for various reasons. A few stakeholders said they supported an opt-out provision because offshore aquaculture could still affect a state's natural resources. For example, escaped fish could travel into state waters and spawn, potentially interbreeding with wild fish populations in state waters, which could reduce the ability of wild fish to survive. Three stakeholders said that this provision is necessary for political reasons—that without the ability for states to opt out, it would be difficult to garner enough support to enact offshore aquaculture legislation. Stakeholders who opposed the state opt-out provision also listed various reasons. A few stakeholders argued that states should not make decisions about the use of federal resources, and one stakeholder said that allowing states to opt out is contrary to a nationally stated goal of increasing domestic seafood production. Other stakeholders proposed more flexible opt-out policies. For instance, one stakeholder supported a policy that would allow states to selectively opt out of particular locations, rather than opting out of

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offshore aquaculture entirely. In addition, a few stakeholders mentioned using an “opt-in” policy, in which states would need to declare their support for offshore aquaculture before any facilities could be located in the waters adjacent to their coasts.

Regardless of how the opt-out provision is applied, the majority of stakeholders agreed that states that participate in the offshore aquaculture program should not have the ability to veto individual offshore aquaculture projects. One stakeholder was concerned that, if states were allowed to veto individual offshore aquaculture projects, then this would prevent offshore aquaculture development since few businesses would be interested in investing time and money in obtaining federal approvals if a state could ultimately veto a federal decision. A few stakeholders who opposed veto authority for states explained that, since offshore aquaculture would be in waters under federal jurisdiction, states should not be allowed to overrule federal decisions.

Stakeholders who supported giving states veto authority said that offshore aquaculture could affect states’ natural resources. For instance, disease could spread from fish in offshore facilities to fish in state waters requiring state and federal regulators to coordinate closely to manage the disease. A few stakeholders, including NOAA, said that states could use the Coastal Zone Management Act—rather than veto authority—to challenge offshore aquaculture proposals. For instance, a state could determine that a proposed offshore aquaculture facility was inconsistent with the state’s coastal zone management plan. According to NOAA officials, a state could only make this determination if the proposed offshore aquaculture facility would clearly violate provisions of the state’s coastal zone management plan. In addition, one stakeholder was concerned that states would not be assured of preventing proposals they objected to, since the Secretary of Commerce has the authority to override states’ objections under certain circumstances.

Finally, although the majority of stakeholders did not support veto authority for states participating in the program, most stakeholders said that states should have the opportunity to provide input regarding proposed offshore aquaculture facilities, such as comments on potential environmental impacts or proposed facility locations. Three of the key studies we reviewed also recommended that states have the opportunity to

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## Roles and Responsibilities of Regional Fishery Management Councils

comment on proposed facilities.<sup>15</sup> In particular, the Marine Aquaculture Task Force study said that federal agencies should use states' comments on proposed facilities to ensure that permits issued for offshore aquaculture are integrated with regional marine planning efforts and do not undermine the effectiveness of ongoing state conservation measures. In its response to our questionnaire, NOAA agreed that adjacent states should have an opportunity to provide comments regarding proposed projects.

Finally, stakeholders generally agreed on how regional fishery management councils should be involved in regulating offshore aquaculture. For instance, most stakeholders indicated that councils should have the opportunity to provide comments on proposed offshore aquaculture projects in their regions. Some stakeholders, including NOAA, emphasized that councils should comment on proposed projects to ensure that they will not adversely impact wild fisheries or fish habitat managed by the councils. The University of Delaware and Marine Aquaculture Task Force studies also supported allowing councils to review or comment on offshore aquaculture projects. Representatives from five of the six councils that we spoke with wanted the opportunity to comment on proposed offshore aquaculture projects.<sup>16</sup> Most stakeholders also agreed that councils should not have veto authority for proposed projects within their regions. Some stakeholders did not support a veto for councils because they believed the councils are dominated by wild fishery interests and might veto projects simply to avoid any potential competition in their markets. In contrast, representatives from two councils wanted more direct authorities, such as the ability to approve or deny proposed offshore aquaculture projects. For example, a representative from the Western Pacific council said that councils should have this additional authority because councils are best positioned to address region-specific issues that may not be considered in a nationwide top-down permitting process.

Most stakeholders also agreed that offshore aquaculture should not be subject to some of the regulations that are currently used to manage wild fisheries under fishery management plans, including restrictions on season of harvest, size of the fish that may be harvested, and the method that may

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<sup>15</sup>Marine Aquaculture Task Force, University of Delaware, and U.S. Commission on Ocean Policy.

<sup>16</sup>The sixth council representative said that the council does not have a unified position on whether they want to be involved in permitting issues for every proposed project.

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be used to harvest fish. Because offshore aquaculture is considered fishing under Magnuson-Stevens Fishery Conservation and Management Act, the councils could impose these types of restrictions on offshore aquaculture operations.<sup>17</sup> According to NOAA, many offshore aquaculture tasks, such as stocking cages outside of fishing season and harvesting small fish, would be illegal under current regulations for species managed under fishery management plans. Therefore, the administration's 2007 legislative proposal for offshore aquaculture would exempt offshore aquaculture facilities from fishing restrictions under current law.<sup>18</sup> The University of Delaware study reached a similar conclusion stating that offshore aquaculture facilities should be exempt from restrictions that apply to wild fisheries. About half of the stakeholders who agreed with this approach told us that offshore aquaculture is a completely different enterprise from fishing and does not result in an increase or decrease of the wild stocks managed by councils. One stakeholder suggested that subjecting offshore aquaculture facilities to catch restrictions for wild fisheries is like limiting poultry production to duck hunting season. Representatives from five of the six councils we interviewed also supported exempting offshore aquaculture facilities from catch restrictions placed on wild fisheries. However, a representative from the South Atlantic council was concerned that it is too soon to enact such an exemption since any escapes from offshore aquaculture facilities could impact wild fisheries.

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## Establishing the Terms and Conditions, and Selecting Appropriate Sites, for Offshore Aquaculture

Permits or leases are important to establish the terms and conditions for offshore aquaculture operations, including authorizing aquaculture activities and providing the legal right to occupy an area of the ocean.<sup>19</sup> In addition, developing a process to select appropriate sites was identified as an important component of planning for offshore aquaculture facilities and most stakeholders supported a variety of approaches to approve aquaculture facility locations.

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<sup>17</sup>See NOAA's interpretation in Memorandum from Jay S. Johnson, Deputy General Counsel, NOAA, & Margaret F. Hayes, Assistant General Counsel for Fisheries, NOAA, to James W. Brennan, Acting General Counsel, NOAA, Regulation of Aquaculture in the EEZ (Feb. 7, 1993).

<sup>18</sup>The exemption applies only to hatchery-raised fish that were not taken from the wild. If an aquaculture operation harvested wild fish for broodstock—adult fish kept for breeding purposes—or to put in offshore cages, their wild harvests would still be subject to catch restrictions.

<sup>19</sup>The rights granted by permits versus leases can vary depending on how they are written.



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## Permits or Leases

Permits or leases are important to establish the terms and conditions for offshore aquaculture operations, including authorizing aquaculture activities and providing legal rights to occupy an area of the ocean. Several existing federal permits—such as EPA’s NPDES permit for water quality and the Corps’ section 10 permit for structures in navigable waters—can regulate specific offshore aquaculture activities, such as the release of pollutants into, or the installation of structures in, U.S. waters. In addition, according to the University of Delaware study and stakeholders we talked to, offshore aquaculturists will need a legal right—through a permit or lease—to occupy a given area of the ocean. Some stakeholders identified this legal right as important for financing offshore aquaculture operations because it would have market value and, therefore, could be sold, or used as collateral on a loan to allow aquaculturists to secure funding for their projects.

According to NOAA officials, however, permits are more appropriate than leases for aquaculture operations beyond the territorial sea, which extends 12 miles from the shore.<sup>20</sup> Specifically, NOAA officials stated that, under customary international law, it is well established that the United States has exclusive rights to regulate economic activities, such as fishing and aquaculture, in the U.S. Exclusive Economic Zone, which generally extends from 3 to 200 miles from shore. While this jurisdiction and authority do not include any proprietary rights for waters or submerged lands beyond the territorial sea, NOAA officials stated that other types of permits issued by NOAA have provided the security of tenure—the right to occupy an area of the ocean—necessary for obtaining financing, or selling the permits.

However, when questioned on the most appropriate vehicles for authorizing an offshore aquaculture program, the majority of stakeholders told us that an offshore aquaculture program should include both permits and leases. Some stakeholders articulated distinct and important benefits for both permits and leases. For example, a few stakeholders said permits should have shorter time frames to ensure compliance with regulations and best management practices while leases should grant a long-term right

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<sup>20</sup>Although NOAA could theoretically issue leases for aquaculture facilities between 3 and 12 miles, the administration’s 2007 legislative proposal for offshore aquaculture would authorize permits for all aquaculture facilities in federal waters. NOAA officials said they prefer this approach because it sets up a consistent regulatory framework throughout federal waters.

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to occupy a given area of the ocean to encourage investment.<sup>21</sup> One stakeholder said that investors may be less receptive to permits as a mechanism for assigning the legal right to occupy an area of the ocean because they perceive permits to grant fewer legal rights. However, others stated that either a permit or lease could be used to secure legal rights and, thereby, encourage financial investment. For instance, two stakeholders said that whether one identifies a document as a permit or a lease is unimportant as long as the document provides legal rights to the area.

Stakeholders also expressed a range of opinions on the specific types of permits or leases that should be issued. Most stakeholders supported issuing both commercial and research permits or leases. For example, one stakeholder stressed the importance of research permits or leases for further developing a commercially viable offshore aquaculture industry. In addition, many stakeholders supported issuing emergency permits or leases that allow facility relocation in the case of natural events such as hurricanes or red tides, but NOAA did not support this approach. A NOAA official told us that emergency permits or leases are not necessary because offshore aquaculture facilities would be difficult to move and, therefore, aquaculturists would be unlikely to take advantage of such a permit or lease. NOAA officials emphasized, however, that there are other ways, besides emergency permits or leases, of addressing emergencies, such as modifying the terms of an existing permit to allow facilities to relocate. In addition, stakeholders expressed differing opinions about whether to allow short-term permits or leases to allow an aquaculturist to test the feasibility of a proposed offshore aquaculture facility. For example, one stakeholder questioned the utility of short-term permits or leases because the costs associated with offshore aquaculture make it impractical to operate facilities for a short period of time. Two others were concerned that either emergency or short-term permits or leases could be used to circumvent permitting requirements associated with longer term commercial permits or leases.

Stakeholders' opinions also varied on the appropriate length for commercial permits or leases, with some stakeholders supporting time frames of approximately 20 years and others supporting shorter terms

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<sup>21</sup>Best management practices are operating procedures, schedules of activities, maintenance procedures, and other management practices that aquaculturists can use to prevent or reduce impacts on the ocean environment.

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such as 10 years. Some stakeholders stressed the need for longer permits or leases to allow time for the operation to become profitable. The states we visited have taken varying approaches on this issue. For example, while Maine issues 10-year leases to facilities in nearshore state waters, a state official recognized that an offshore facility would require a larger investment and, therefore, need a longer term permit or lease to recoup initial investments. Hawaii issued 20-year leases to its two existing nearshore open-ocean aquaculture facilities. Conversely, a state official from Washington supported shorter permit or lease lengths because offshore aquaculture is new and, therefore, the full impacts on the environment are unknown. Similarly, a few stakeholders we spoke with did not support longer terms out of concern that permits or leases would be difficult to revoke midterm in cases of environmental damage or stressed that if permits had longer terms, then regulators should be able to revoke permits early if such damage were to occur. The administration's 2007 legislative proposal for offshore aquaculture would authorize permits for 20-year terms and includes language allowing the suspension or revocation of a permit.

Regardless of their opinions on permit or lease terms, the majority of stakeholders supported public involvement during the permitting or leasing process. Most stakeholders indicated that the public should have the opportunity to both comment for the record and present evidence at public hearings associated with permitting or leasing decisions. Some stakeholders noted that because facilities will be located in public waters, a permitting or leasing process requires transparency and public input. However, a few stakeholders who supported public participation also expressed concern that some public comments and hearing testimony could be misinformed or unnecessarily stall the decision-making process. Based on their experience with this issue, state regulators and others that we spoke to in Hawaii and Maine also supported public involvement. For example, a key regulator, researchers, and aquaculturists involved with existing aquaculture facilities in Hawaii's state waters identified public involvement as key to a successful and transparent permitting process. In Hawaii, the main permitting process authorizing aquaculture operations requires public hearings as part of its approval process. Both aquaculturists and researchers in Hawaii said that the public involvement process ultimately decreases opposition to proposals because applicants can modify their plans in response to public comments or alleviate public concerns by providing more comprehensive information about the proposal. For example, one aquaculturist adjusted the site and specifications of his operation in response to requests made during a public hearing. Similarly, state regulators in Maine also stressed the

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importance of public involvement in their states' permitting and leasing approval process. Maine requires a public scoping meeting before an aquaculturist may submit an aquaculture application. Officials have found this early dialogue between the aquaculturists and the public useful in resolving concerns while the details of the proposed facility are still under development.

## Site Selection

Developing a process to approve aquaculture facility locations is an important component of regulating offshore aquaculture according to federal regulators, environmentalists, and researchers. For instance, NOAA officials in Hawaii emphasized that siting aquaculture facilities away from areas known to have high concentrations of marine mammals could reduce the likelihood that aquaculture facilities would adversely affect these animals. In Maine, some environmental groups also advocated siting aquaculture facilities outside known fish migration corridors to reduce the interactions between aquaculture-raised and wild fish, thereby reducing the likelihood that disease will be passed from aquaculture-raised to wild populations.

Although the majority of stakeholders we contacted supported a variety of approaches that federal regulatory agencies could use to approve aquaculture facility sites, there was a lack of consensus on any one approach. These approaches include (1) determining whether a site is appropriate on a case-by-case basis, (2) prepermitting locations by approving sites independently of and prior to submitting individual facility applications, (3) zoning ocean areas to identify both appropriate areas for offshore aquaculture and prohibited areas, and (4) developing aquaculture parks containing multiple facilities in areas that are unlikely to result in conflicts between aquaculture facilities and other ocean uses and have optimum access to land-based aquaculture services.

Those stakeholders who supported using a case-by-case site selection strategy agreed that regulators should assess the appropriateness of a specific site. One stakeholder who supported the approach stated that aquaculturists are most likely to know which locations best fit their planned operations and type of species and, therefore, should be the ones to propose aquaculture facility site locations. Two other stakeholders noted that this approach is advantageous during the early stages of offshore aquaculture development because it requires only knowledge about proposed facility sites rather than a wide variety of potential sites. However, a few stakeholders also criticized the case-by-case approach, saying that it could create additional costs for applicants or lengthen the permitting process. In addition, according to a few stakeholders, this

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approach would create a less standardized process for approving facilities than other approaches would. Another stakeholder expressed concern that the case-by-case approach would not allow regulators to collectively assess the cumulative impacts of several sites located near one another because they would be assessed individually. Currently at the state level, Hawaii, Maine, and Washington all use the case-by-case approach for approving sites within their state waters. For example, in Hawaii, regulators consider the impacts of a proposed site on marine mammals and ocean users, such as native Hawaiian fishermen, among other things, when deciding whether to approve a facility site.

Those stakeholders who supported a prepermitting site selection strategy agreed that regulators should assess the suitability of a location for aquaculture before, and independently of, individual aquaculture applications. In this context, the University of Delaware study describes prepermitting as the process of establishing appropriate areas for offshore aquaculture by conducting environmental assessments of potential sites; creating a master plan for siting in the area; determining which aquaculture techniques and projects are appropriate for that area; creating a general permit authorizing use of the area, approved by other regulatory agencies; and, ultimately, issuing individual permits for occupying the area. A few stakeholders told us that prepermitting would make site approval more predictable and consistent, and another said that it would allow for cumulative environmental review of multiple projects. However, certain stakeholders who supported a prepermitted approach noted that establishing such a system will be time consuming and, therefore, not feasible in the short term. A few stakeholders were opposed to using prepermitted site selection. Two of these stakeholders questioned the appropriateness of making regulatory agencies responsible for selecting facility locations, stating that this approach may not identify the most viable sites. Furthermore, a stakeholder who did support prepermitting still noted that permit holders may unreasonably expect a prepermitted location to produce high yields and blame regulators if this does not occur.

Those stakeholders who supported a zoning approach to site selection agreed that regulators should use a process in which government agencies would designate allowable uses—both aquaculture-related and others—for various ocean areas. However, stakeholders expressed many of the same concerns about a zoning approach as they did about a prepermitting approach. For example, a few stakeholders were wary of allowing regulatory agencies to select sites that may ultimately be unsuccessful. Among these stakeholders was a state regulator in Florida, a state which initially created aquaculture zones in their state waters but later shifted to

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a case-by-case site-selection approach because it allowed them to better identify appropriate sites for specific aquaculture operations. While a few stakeholders considered aspects of zoning and prepermitting approaches to be similar, others distinguished zoning as being a more far-reaching approach than prepermitting. Similarly, a few stakeholders supported zoning as a method to systematically manage the ocean ecosystem and identify appropriate sites. Alternatively, two stakeholders expressed concerns about the technical feasibility of zoning the ocean because the process would be too time consuming due to the extensive information needed about appropriate uses for broad areas of the ocean. In addition, Hawaii state officials responsible for developing Hawaii's aquaculture industry expressed concerns about zoning. They said that the extensive work necessary for zoning federal waters would unnecessarily delay offshore aquaculture development.

Stakeholders we contacted were less supportive of establishing aquaculture parks compared with the other approaches to site selection. According to the University of Delaware study, aquaculture parks could be designed to provide adequate space for aquaculture operations in an area environmentally suited to the operations, with minimal user conflicts and access to land and coastal services. Aquaculture parks could be managed by a private-sector entity, a government agency, or a public-private partnership. Like the prepermitting site selection approach, a few proponents of aquaculture parks said the approach made the permitting process more predictable, while another stakeholder was concerned that this approach involved regulators too heavily in the site selection process. In addition, stakeholders identified issues unique to aquaculture parks. One stakeholder said that parks could allow greater business efficiencies by consolidating necessary aquaculture infrastructure and supplies like dock facilities and fuel into one area, but others were concerned that offshore aquaculture facilities would be located too close to one another. They asserted that concentrating offshore aquaculture facilities within the confines of aquaculture parks would not be in the best interest of aquaculturists and could also lead to increased environmental impacts.

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## Key Environmental Management Issues

Most stakeholders we contacted supported an environmental review of the potential impacts of offshore aquaculture facilities before any facilities are sited, which can help agencies approve facilities in areas less likely to suffer ecological harm. In addition, stakeholders generally supported monitoring environmental conditions at offshore aquaculture facilities once they begin operations. Most stakeholders supported an adaptive approach to monitoring that would alter monitoring requirements over

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time to focus on the measures demonstrated to be the most appropriate for tracking changes to the environment. Stakeholders also generally supported conducting regular inspections of offshore aquaculture facilities. However, stakeholders did not always agree on how to mitigate the potential environmental impacts of escaped aquaculture-raised fish, including restrictions on the types of fish that could be raised in offshore cages, whether fish should be marked or tagged, and whether facilities should be required to develop plans outlining how they would respond to fish escapes.

## Reviewing Potential Environmental Impacts

Most stakeholders we contacted generally supported an environmental review prior to offshore aquaculture facilities' beginning operations to ensure that these facilities are established in areas less likely to suffer ecological harm. For instance, a majority of stakeholders recognized the value of reviewing the potential environmental impacts of offshore aquaculture over a broad ocean area before any aquaculture facilities are sited—which involves preparing a PEIS. But these stakeholders also articulated different views on the goal of a PEIS for offshore aquaculture. While some stakeholders emphasized that a PEIS should examine the potential environmental impacts of an offshore aquaculture industry, other stakeholders noted that a PEIS would be most useful if it reduced the need for facility-specific environmental reviews. While the administration's 2007 legislative proposal requires NOAA to conduct a PEIS, it does not specify exactly what the PEIS should include. In this context, in 2006, California enacted a law to allow fish aquaculture facilities in state marine waters, which requires the state to conduct a review similar to a PEIS. The law requires the review to consider, at a minimum, 10 factors, such as: appropriate areas for siting aquaculture facilities; the effects of aquaculture on ocean and coastal habitats, marine ecosystems, and commercial and recreational fishing; and the potential environmental impacts of escaped fish, medications, and the use of fish meal and fish oil. A few stakeholders said that it is not important for the federal government to conduct a PEIS for offshore aquaculture. Two of these stakeholders stated that a PEIS would require a significant amount of data and would take a very long time, unnecessarily delaying the development of offshore aquaculture.

While a few stakeholders considered the broad level of review in a PEIS to be sufficient, about half of the stakeholders we contacted suggested that a facility-specific environmental review, conducted in accordance with NEPA, should also be required. About half of the stakeholders who supported the facility-specific review said that such reviews could examine site-specific or facility-specific issues that cannot be addressed in

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a broader PEIS. In its response to our questionnaire, NOAA indicated that a facility-specific review is very important and stated that the complexity of this type of review should reflect the risk level of the project. For instance, a review of a project that uses technologies, species, and sites that are well understood could draw on existing documentation, while a proposal for a project that uses a new species or untested technology may require a more in-depth review. Of the few stakeholders who supported only the PEIS, two stakeholders said that if the PEIS was done correctly, a facility-specific review should not be necessary. One stakeholder mentioned that requiring a facility-specific review for each proposed offshore aquaculture facility would be expensive for aquaculturists and would be a barrier to offshore aquaculture development.

With regard to the states' approaches for addressing environmental reviews, we found that Maine and Hawaii both require facility-specific environmental reviews for proposed aquaculture facilities in their state waters. Maine requires that applicants collect environmental baseline data on sediment characteristics; the benthic community; water quality; and existing uses of the site, such as commercial fishing and recreational boating. Once an application is submitted, the state also conducts a site review, which can include conducting video surveys of the area and gathering water quality information. Hawaii requires a similar level of detail from its applicants through an environmental assessment process. Aquaculture industry representatives and state regulators in Hawaii both told us that they supported Hawaii's process.

Most stakeholders also stated that considering the potential cumulative impacts of aquaculture facilities is important when evaluating offshore aquaculture proposals. Two stakeholders suggested that cumulative impacts be considered as part of the PEIS process. The University of Delaware and Marine Aquaculture Task Force studies both recommended that agencies consider cumulative impacts of offshore aquaculture facilities during environmental reviews. The administration's 2007 legislative proposal includes language requiring that a permitting process address the potential cumulative impacts of offshore aquaculture on marine ecosystems, human health and safety, other ocean uses, and coastal communities. In addition, many stakeholders offered suggestions for mitigating cumulative impacts, including siting facilities far enough apart that their operations will be less likely to affect one another, combining multiple kinds of aquaculture—such as fish and shellfish—to take advantage of shellfish's ability to remove nutrients from the water column, and limiting the number of fish within a given cage or area. An industry representative also pointed out that it is in the best interest of



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## Monitoring Environmental Conditions and Inspecting Facilities

aquaculturists to locate their facilities far from one another to avoid being affected by potential water quality or disease problems from neighboring facilities.

Stakeholders generally supported monitoring a variety of potential environmental impacts of offshore aquaculture facilities once they have been approved and are operating, though they varied on the types of monitoring they supported for fish and shellfish aquaculture facilities. While most stakeholders said it is important to monitor both fish and shellfish aquaculture facilities for impacts on the benthic community and disease outbreaks, stakeholders said it is more important to monitor fish aquaculture facilities than shellfish aquaculture facilities for chemical levels in the water. In addition, some stakeholders mentioned that monitoring fish aquaculture facilities for escapes will be very important.

Maine and Washington have developed monitoring programs for their nearshore aquaculture facilities, which provide examples of how the federal government could implement the types of monitoring recommended by stakeholders for offshore aquaculture facilities. Specifically, we found that these states have developed monitoring programs—although they vary significantly between states—to address benthic community, disease, and chemical impacts for nearshore fish aquaculture facilities. For example, Maine’s general NPDES permit for salmon aquaculture facilities requires multiple kinds of benthic community monitoring, including color video or photographic evaluations of the ocean floor under and around each net pen twice per year and a detailed analysis of samples of benthic community organisms at least once every 5 years. In contrast, Washington requires video evaluations under net pen facilities twice every 5 years but requires detailed analysis of samples of benthic community organisms only if routine video evaluation results show that the facility samples exceed the permit requirements. Maine and Washington also both have regulations to control disease outbreaks in fish aquaculture facilities. Both states require that an aquaculturist whose fish test positive for certain diseases notify the state within 48 hours. Maine and Washington can require a number of mitigation measures—depending on the severity of the outbreak and the potential for the disease to impact other aquaculture-raised or wild fish—including requiring that the infected fish be quarantined, removed, or destroyed. Finally, if aquaculturists use medications to treat disease, Maine requires them to monitor the concentration of those medications in benthic sediments. Washington requires aquaculturists to monitor for antibiotics in benthic sediments if antibiotic use could pose a threat to human health or the environment.

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Although monitoring was identified as important by stakeholders, state regulators in Hawaii identified some challenges to monitoring the nearshore, open-ocean aquaculture facilities in Hawaii state waters. Specifically, Hawaii state regulators said they do not have the data to determine whether medications used to treat fish for disease could affect the marine environment. These officials suggested that EPA could help the states evaluate these impacts by developing standardized laboratory tests that could detect medications in the marine environment, as well as by developing protocols for monitoring such medications. Another monitoring challenge, according to aquaculturists in Hawaii, is that some types of monitoring, such as collecting sediment samples beneath the cages for benthic community analysis, are very difficult to conduct in open-ocean conditions. Diving for these samples in deep water is dangerous and, as a result, aquaculturists find it difficult to obtain insurance coverage for deep water diving.

In addition to supporting specific types of environmental monitoring for fish and shellfish facilities, most stakeholders also supported using an adaptive monitoring approach that would allow regulators to change monitoring requirements over time to focus only on the types of monitoring demonstrated to be the most appropriate for tracking changes to the environment. Some stakeholders said that an adaptive monitoring approach would provide regulators the flexibility to respond to new information on environmental risks and change monitoring requirements accordingly. Others mentioned that, since offshore aquaculture is a new industry, it is difficult to predict the impacts and the monitoring measures needed beforehand, and so the flexibility of adaptive monitoring would be appropriate. The University of Delaware study also recommended that monitoring requirements and regulations be flexible and adaptive to allow regulators to modify these requirements as warranted by changes in environmental conditions. Officials in Maine also supported adaptive monitoring and suggested that regulators need flexibility to adjust monitoring requirements to ensure that resources are focused on monitoring the most important measures.

Finally, most stakeholders wanted federal agencies to require inspections for the security of structures and equipment at the aquaculture site, as well as for compliance with the terms and conditions of permits, among other things. The University of Delaware study stated that regulators should conduct both announced and unannounced inspections. For instance, announced inspections could be conducted to oversee chemical treatments of fish or obtain water samples from the cages. Unannounced

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Mitigating the Potential Impact  
of Escaped Fish and  
Remediating Environmental  
Damage

inspections could be useful if the permitting agency suspects that the operator is not meeting permitting conditions.

Stakeholders had varied opinions about other policies related to offshore aquaculture that could be used to mitigate the potential environmental impact of escaped aquaculture-raised fish, including restricting the types of fish that could be raised in offshore cages, requiring fish to be marked or tagged, and requiring facilities to develop plans outlining how they would respond to fish escapes. Specifically, a majority of the stakeholders supported a policy that would limit offshore aquaculture to species native to the region in which the facility is located. The administration's 2007 legislative proposal includes language to require that offshore aquaculture facilities raise only species that are native to the aquaculture facility's geographic region unless a scientific analysis shows that the harm to the marine environment is negligible or can be mitigated. A similar approach is currently being used by Maine, in which a proposal to raise nonnative species that have never been cultured in Maine must be presented at a public hearing in addition to the regular environmental review process. By contrast, in California, an official told us that the state prohibits aquaculturists from raising nonnative species. About half of the stakeholders we spoke to also supported a policy that would prohibit raising genetically modified species offshore. The administration's 2007 legislative proposal includes language to require that offshore aquaculture facilities not raise genetically modified species unless a scientific analysis shows that the harm to the marine environment is negligible or can be mitigated. One stakeholder said he opposed a prohibition on genetically modified species because it could reduce the competitiveness of U.S. industry by preventing U.S. companies from raising species that may become economically important.

Stakeholders also had varied views on a policy that would require aquaculturists to mark or tag their fish to distinguish them from wild fish.<sup>22</sup>

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<sup>22</sup>Marking or tagging could be done in a variety of ways. For instance, Washington state requires that aquaculture-raised fish be exposed to different temperatures throughout the rearing process in a hatchery (before the fish are transferred to a marine cage). These temperature changes create a distinctive pattern, similar to tree rings, on a particular bone in the fish, thereby making it identifiable as from a hatchery in Washington. Maine's aquaculture industry currently uses a genetic method of marking fish in which the genetics of aquaculture-raised fish are distinctive and documented so that a sample of scales taken from an aquaculture-raised fish can identify the facility where that fish was raised. In addition to these methods, physical tags could also be used, though two stakeholders mentioned that tagging fish causes stress and increases mortality.

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The majority of stakeholders we spoke with supported this policy, often citing the need to hold aquaculture producers accountable for fish escapes. In addition, a few stakeholders said that marking or tagging fish would also allow researchers to gather additional information about the impacts that escaped fish have on wild populations. Three of the six regional fishery management council representatives we spoke with said that marking or tagging aquaculture-raised fish was a good idea. The council representatives were generally concerned with how aquaculture-raised fish would complicate their efforts to enforce wild fisheries regulations. For instance, council representatives said that if aquaculture-raised fish are indistinguishable from wild fish, then this increases the potential for illegally caught wild fish to be passed off as aquaculture-raised fish, undermining wild fisheries enforcement. One NOAA official and a representative of the Gulf of Mexico council, however, suggested that a tracking system with a paper trail to follow aquaculture-raised fish from offshore cages to the marketplace could alleviate some of the concerns raised by stakeholders. Most stakeholders who opposed marking or tagging of aquaculture-raised fish did so because they said that this practice is expensive. A NOAA official opposed requiring marking or tagging for each offshore aquaculture facility, but noted that if there is a scientific basis for it because of a high risk of environmental harm from escapes from a particular aquaculture facility, the agency would support marking or tagging for that facility.

States have developed marking requirements for fish raised in nearshore aquaculture facilities that provide examples of how the federal government could implement marking requirements for fish raised offshore. Maine and Washington currently require aquaculture-raised salmon in their marine waters to be marked so as to be distinguishable from wild populations. For instance, one environmentalist in Maine explained that wild Atlantic salmon—an endangered species—are highly adapted to their environments, including the particular river in which they were hatched. As a result, interbreeding with aquaculture-raised salmon could change the genetics of the wild population and reduce the ability of wild Atlantic salmon to survive. In Washington, the marking requirement stems from a desire to identify aquaculture-raised Atlantic salmon found spawning in state rivers. British Columbia also has an Atlantic salmon aquaculture industry. Marking aquaculture-raised fish from Washington can clarify whether fish are escaping from U.S. aquaculture facilities or from Canadian ones. Aquaculturists raising fish in Hawaii’s open-ocean state waters told us that the state does not require them to mark or tag their fish.

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Most stakeholders also supported requiring aquaculturists to develop plans to address fish escapes from their proposed offshore aquaculture facilities. NOAA indicated that requiring aquaculturists to submit escape response plans is very important. The administration's 2007 legislative proposal states that environmental requirements must include safeguards to prevent fish escapes that may cause significant environmental harm. Most stakeholders also agreed that aquaculturists should be required to develop emergency response plans in the event that aquaculture operations need to be temporarily relocated. The University of Delaware study also supported the development of such plans, which they believe could also help aquaculturists relocate their facilities in an emergency, such as if a red tide or large storm system threatened the aquaculture-raised fish.

Most stakeholders also supported a requirement that aquaculturists provide a financial guarantee, such as a bond, letter of credit, insurance policy, or trust fund, to cover the cost of removing abandoned aquaculture facilities. For example, two stakeholders supported this policy because, in the event that the aquaculturist goes bankrupt, the guarantee prevents the government from having to pay to remove the facility. Both Maine and Hawaii use a similar approach for aquaculture in their state waters by requiring companies to obtain bonds for removing aquaculture facilities when aquaculture operations cease. In its response to our questionnaire, NOAA indicated that it supports requiring this type of financial guarantee.

Stakeholder views varied, however, about whether a similar financial guarantee should be required to remediate environmental damage caused by an offshore aquaculture operation, with about half of the stakeholders supporting such a requirement as a necessary and logical accountability provision. A few stakeholders stated that without a financial guarantee, any damage caused by a facility would require public funds for remediation. Other stakeholders objected to requiring a financial guarantee for remediating environmental damage. Some stakeholders cited a variety of concerns with bonds for environmental remediation, such as (1) difficulty proving that the environmental damage was caused by a particular facility, (2) difficulty quantifying the damage, and (3) that the cost of providing such a guarantee, particularly if there are no numerical limits on the total environmental damages that could be claimed, might hinder offshore aquaculture industry development. One NOAA official said that requiring a financial guarantee for mitigation of the benthic habitat in the immediate vicinity of the aquaculture site is practical but did not agree with a requirement for mitigation of all other environmental damage.

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To address the issue of financial guarantees to cover environmental damage from aquaculture facilities in state regulated waters, California recently enacted a marine aquaculture law, which includes a provision requiring a financial guarantee from companies to cover environmental damage, but specifies that the extent of environmental damage and related costs will be determined by the state Fish and Game Commission. An environmentalist involved in the negotiations surrounding the law explained that identifying a specific entity—the state Fish and Game Commission—to determine the extent of environmental damage was a compromise acceptable to both the aquaculture industry and environmental groups. Specifically, he said that environmentalists supported the compromise because it holds aquaculture facilities accountable for environmental damage, while industry supported it because it is confident that the Fish and Game Commission will deal with environmental damage issues fairly. About half of the stakeholders that we contacted said that they would support a similar provision at the federal level. Two stakeholders suggested that NOAA could make determinations about the extent of environmental damage at the federal level since it has experience assessing impacts on the marine environment. One stakeholder who did not support a federal government system similar to California’s feared that the criteria for identifying environmental damage could change from year to year, thereby increasing the risk of investing in offshore aquaculture.

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## Priorities for Aquaculture Research and Limitations of Current Programs

It is also important for a regulatory framework to include federally funded research to address gaps in current knowledge on a variety of issues related to offshore aquaculture. Stakeholders identified four research areas as particularly appropriate for federal funding—the development of alternative fish feeds; the development of best management practices; the investigation of how escaped aquaculture-raised fish might impact wild fish populations; and the development of hatchery technologies to breed and grow fish, while effectively managing disease. In addition, while NOAA and USDA fund research on marine aquaculture through, for instance, competitive grants, some researchers said that these grants are funded over time periods that are too short to accommodate certain types of research.

## Federal Research Priorities

Stakeholders we contacted and the four key studies we reviewed generally agreed that the federal government should fund aquaculture research to address gaps in current knowledge. Stakeholders identified four research areas as particularly appropriate for federal funding. These four research areas are as follows:

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- Most stakeholders supported research to help in the development of alternative fish feeds, citing reasons such as protecting wild species from overfishing because wild species are currently used as a source of fish meal and fish oil, and helping to lower industry costs. For example, a NOAA official noted that the demand for fish feed has increased in recent years, leading to a steep rise in the price of aquaculture fish feeds. Due to this price increase, industry representatives and researchers are interested in developing alternative feeds that cost less.
  - Most stakeholders also supported federal research that would help develop best management practices. For example, one stakeholder said that best management practices are very important because they identify accepted practices for aquaculturists to follow and provide a method for agencies to judge whether aquaculture facilities are operating appropriately.
  - Most stakeholders supported federally funded research investigating how escaped aquaculture-raised fish might impact wild fish populations. One stakeholder supported this research because existing research on escapes does not focus on the species likely to be raised offshore.
  - Many stakeholders also supported federal research that would help develop hatchery technologies to breed and grow the fish that ultimately populate offshore cages, while effectively managing disease. Aquaculturists have identified the hatchery stage of aquaculture as particularly difficult because hatchery fish are susceptible to diseases, young fish need specially formulated feeds, and breeding fish is complex.

While stakeholders generally identified these areas as priorities, a few stakeholders also emphasized that federal funding should focus on research that helps regulate the aquaculture industry or mitigate environmental impacts. Research into how escaped aquaculture-raised fish might impact wild fish populations is an example of this type of research. Other stakeholders, as well as the U.S. Ocean Commission study, suggested that federal research should also assist aquaculture industry development. For instance, one stakeholder suggested that the top issue for government funding should be determining which species will be commercially viable for offshore aquaculture. Similarly, the stakeholder noted that developing a species for aquaculture is difficult for the private sector to do because it is very expensive and would take 10 to 30 years.

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Components and Potential  
Limitations of the Current  
Federal Aquaculture Research  
Program

NOAA and USDA currently support research on marine aquaculture through, for example, competitive grants. NOAA's major competitive grant program for marine aquaculture is the National Marine Aquaculture Initiative, which funded approximately \$4.6 million in projects related to marine species during the 2006 grant cycle. NOAA also manages funding for a number of offshore aquaculture-related projects, such as the open-ocean aquaculture demonstration project off the coast of New Hampshire. Similarly, USDA's Cooperative State Research, Education, and Extension Service funds external aquaculture research through such vehicles as competitive grant programs, land grant institutions, and regional aquaculture centers. In addition, USDA's Agricultural Research Service conducts research at its federal science centers and laboratories.

Several researchers, including some whom we interviewed during our site visits, identified potential limitations of the current federal aquaculture research programs. Specifically, they said that many of the available competitive grants are funded over time periods that are too short and at funding levels too low to accommodate certain types of research. For example, researchers in Hawaii said that the development of healthy breeding fish to supply offshore aquaculture operations can require years of intensive breeding efforts, but that it is difficult to obtain consistent research funding over this longer time period.

Both USDA and NOAA officials acknowledged that demonstration projects and other lengthy research projects may be difficult to complete within current competitive grant time frames. However, they noted that appropriations for their programs dictate the current length of these grants. USDA officials identified some programs that could be used for long-term research, including competitive grants from the agency's regional aquaculture centers or the agency's Agricultural Research Service internal research projects. The regional aquaculture centers set their own priorities and funding allocations, which allows centers to focus on long-term offshore aquaculture research if they so choose. For instance, the regional center in Hawaii has supported research that applies to offshore aquaculture, but none of the other centers currently support research specifically related to offshore aquaculture. A USDA official also suggested that the Agricultural Research Service could support long-term projects if such projects are identified as priorities in future 5-year plans for aquaculture research. The Agricultural Research Service uses feedback from aquaculturists and regulatory agencies, among others, to identify priorities and develop 5-year plans for aquaculture research. Agricultural Research Service officials indicated that the current 5-year plan directs



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about one-third of the agency's aquaculture funding to research related to marine species.

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## Concluding Observations

An effective federal regulatory framework for U.S. offshore aquaculture will be critical to facilitating the development of an economically sustainable industry, while at the same time protecting the health of marine ecosystems. As the Congress considers providing a cohesive legislative framework for regulating an offshore aquaculture industry, we believe it will need to consider a number of important issues. A key first step in developing a U.S. regulatory framework could be designating a lead federal agency that has the appropriate expertise and can effectively collaborate and coordinate with other federal agencies. In addition, setting up clear legislative and regulatory guidance on where offshore aquaculture facilities can be located and how they can be operated could help ensure that these facilities have the least amount of impact on the ocean environment. Moreover, a regulatory framework could also include a process for reviewing the potential environmental impacts of proposed offshore aquaculture facilities, monitoring the environmental impacts of these facilities once they are operational, and quickly identifying and mitigating environmental problems when they occur. Inclusion of an adaptive management approach by which the monitoring process can be modified over time could be useful not only to ensure that the most effective approaches are being used to protect the environment but also to help reduce costs to the industry. In addition, a transparent regulatory process that gives states and the public opportunities to comment on specific offshore aquaculture projects could help allay some of the concerns about the potential environmental impacts of offshore aquaculture. Finally, because the offshore aquaculture industry is in its infancy much remains unknown, and many technical challenges remain, such as the best species to raise offshore and the most effective offshore aquaculture practices. In this context, there may be a role for the federal government in funding the research needed to help answer these questions and facilitate the development of an ecologically-sound offshore aquaculture industry.

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## Agency Comments and Our Evaluation

We provided a draft of this report to the Departments of Agriculture, the Army, and Commerce; and also to the Environmental Protection Agency for review and comment. We received written comments from the Department of Commerce, EPA, and USDA. Overall, the Department of Commerce's NOAA stated that the report accurately presented information regarding the opportunities and challenges for offshore

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aquaculture and will contribute to the discussion of environmentally responsible and sustainable offshore aquaculture. NOAA also commented on many issues discussed in our draft report, expressing three areas of concern.

- NOAA listed several issues it thought were not adequately addressed in the report, including the role aquaculture can play in the development of a safe, sustainable, domestic seafood supply. These issues were outside our scope which was focused on identifying key elements of a federal regulatory framework for offshore aquaculture.
- NOAA said that by indicating that the environmental impacts of an offshore aquaculture industry are uncertain due to a lack of data specific to such facilities, we were diminishing the importance of the findings from environmental monitoring of the small-scale open ocean aquaculture operations in state waters. We do not agree. Our report acknowledges that the results of environmental monitoring at small-scale open ocean facilities have found modest impacts. However, as larger facilities begin operating, their impacts could become more pronounced. Given that such facilities do not yet exist, it is too early to know what their impacts will be.
- NOAA said that our report did not adequately discuss offshore shellfish aquaculture. We believe that it did. Most of the policy issues raised in the report apply equally to shellfish and fish aquaculture. In those cases where the issues differ for shellfish and fish aquaculture, we discussed them separately.

NOAA also provided technical comments, which we have incorporated in the report as appropriate. NOAA's comments and our detailed responses are presented in appendix III.

EPA provided clarifying language regarding their expertise in regulating water quality related to offshore aquaculture, which we incorporated as appropriate. EPA's comments are presented in appendix IV.

The Department of Agriculture provided two comments on the report. First, USDA mentioned two issues that it did not think were adequately addressed in the report.

- USDA said that a mechanism for a coordinated federal-wide research framework exists through the Joint Subcommittee on Aquaculture. Our report acknowledges that USDA chairs the interagency Joint Subcommittee on Aquaculture and that the Subcommittee is currently working to update the federal strategic plan for aquaculture research.

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- USDA also said that it has a wide diversity of aquaculture research that is not limited or directed by whether the fish will be raised in fresh, brackish, or salt water. Characterizing all of USDA's aquaculture-related research activities was not within the scope of our report. Rather, our report is focused on offshore marine aquaculture. As such, we reported what stakeholders told us regarding research related to offshore marine aquaculture.

Second, USDA explained that it did not feel that it was appropriate to respond to our questionnaire on offshore aquaculture because it asked for individual opinions related to policy matters. USDA's comments and our detailed responses are presented in appendix V.

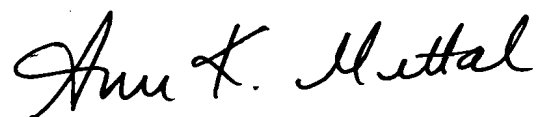
The Department of the Army did not have any comments on the report.

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We are sending copies of this report to the Secretaries of the Army, Agriculture, and Commerce; the Administrator of the EPA; appropriate congressional committees; and other interested parties. We also will make copies available to others upon request. In addition, this report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report or need additional information, please contact me at (202) 512-3841 or [mittala@gao.gov](mailto:mittala@gao.gov). Contact points for our Offices of Congressional Relations and of Public Affairs may be found on the last page of this report. Key contributors to this report are listed in appendix VI.

Sincerely yours,



Anu K. Mittal  
Director, Natural Resources  
and Environment

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# Appendix I: Objective, Scope, and Methodology

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The objective of this report was to identify key issues that should be addressed in the development of an effective regulatory framework for U.S. offshore aquaculture. To address this objective, we reviewed key academic and government-sponsored studies that analyzed proposed regulatory frameworks for offshore aquaculture in federal waters; reviewed existing federal laws that include provisions that are applicable to offshore aquaculture, as well as federal agencies' regulations, policies, and guidance for marine aquaculture; reviewed laws, regulations, policies, and guidance for marine aquaculture in selected states; visited aquaculture facilities in selected states; and administered questionnaires to, and conducted follow-up structured interviews with, a variety of aquaculture stakeholders.

We identified studies on offshore aquaculture regulations by conducting a literature search of online databases for studies and reports from government agencies, nonprofit organizations, industry associations, and academia. We also obtained references from aquaculture experts and agency officials at the National Oceanic and Atmospheric Administration (NOAA), the U.S. Department of Agriculture (USDA), and the U.S. Environmental Protection Agency (EPA). After reviewing various studies, we identified four key studies that examined offshore aquaculture and made recommendations to improve the regulatory framework for offshore aquaculture. These key studies—by the Marine Aquaculture Task Force, the University of Delaware, the Pew Oceans Commission, and the U.S. Commission on Ocean Policy—brought together ocean policy stakeholders to examine, among other things, potential regulatory frameworks for offshore aquaculture. These studies of offshore aquaculture regulations were each developed in the last 5 years with stakeholder input and discuss a variety of issues related to marine aquaculture. Throughout the report, we cite those studies that reached similar conclusions or made similar recommendations on particular policy issues. If a study is not cited for a particular policy issue, it is because the study did not address that issue.

To identify existing federal laws that include provisions that are applicable to offshore aquaculture, as well as federal agencies' regulations, policies, and guidance for marine aquaculture, we interviewed officials from the NOAA's National Marine Fisheries Service, NOAA's National Ocean Service, the U.S. Army Corps of Engineers, the EPA, the Department of the Interior's Fish and Wildlife Service and Minerals Management Service, and the USDA's Animal and Plant Health Inspection Service. We also reviewed a wide variety of laws to identify federal agencies' responsibilities and authorities for offshore aquaculture. The laws we reviewed included the

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Marine Mammal Protection Act, the Endangered Species Act, the Magnuson-Stevens Fishery Conservation and Management Act, the Coastal Zone Management Act, the Rivers and Harbors Act, the National Environmental Policy Act, the National Aquaculture Act of 1980, and the Clean Water Act.

We identified relevant state laws, regulations, policies, and guidance for marine aquaculture by interviewing state regulators, environmentalists, representatives of the commercial fishing industry, and representatives of the aquaculture industry in California, Florida, Hawaii, Maine, Texas, and Washington. We selected these states because they currently regulate, or are in the process of developing regulatory frameworks for, aquaculture operations in state waters, and because they represent different geographic areas of the United States. Additionally, we met with state and federal regulators in Hawaii, Maine, and Washington—the states with active nearshore fish aquaculture industries—to discuss state regulatory systems and visited aquaculture facilities in Hawaii and Maine.

Based on issues identified in the four key studies, and in our interviews with federal and state officials, we developed a questionnaire on the elements of a regulatory framework for offshore aquaculture. Prior to distributing the questionnaire, we conducted pretests with stakeholders who were similar to those we intended to survey and modified some questions in response to those results.<sup>1</sup> The final questionnaire covered a range of topics including which federal agencies should be responsible for various program administration activities such as program management and agency coordination; how a potential permitting or leasing program should be structured, including to what extent various stakeholders should be involved in the process; opinions on the types of environmental review and monitoring that should be required as part of a regulatory framework; and what should be the priority areas for potentially federally funded aquaculture research.

In addition to developing the questionnaire, we identified key aquaculture stakeholders to respond to the questionnaire. We selected these stakeholders because of their expertise in aquaculture at the national, state, or local level; to provide representation across academia,

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<sup>1</sup>These pretesters were: Susan Bunsick, Policy Analyst, NOAA Aquaculture Program, National Oceanic and Atmospheric Administration; Mark Drawbridge, M.S., Senior Research Biologist, Hubbs-SeaWorld Research Institute; Roger Fleming, Attorney, Earthjustice; and W. Richard Smith, Jr., Partner, Robinson & Cole LLP.

government, industry, and the nonprofit sector; and to provide broad geographic representation throughout the United States. To ensure that our initial list of stakeholders satisfied these criteria, we asked two noted aquaculture experts to review our selections. Both experts submitted three additional names for our consideration—two of which were the same individuals—otherwise they both agreed our list satisfied our criteria. The two individuals recommended by both experts were then included as stakeholders. See appendix II for a list of the stakeholders who responded to our questionnaire.

We distributed the questionnaire to 28 stakeholders electronically, asking them to fill it out and return it to GAO. We received 25 responses. Three federal agencies with responsibilities relating to offshore aquaculture—the Department of the Interior, the USDA, and the EPA—did not provide official or complete written responses to the questionnaire. However, we met with officials from these agencies to discuss their responsibilities related to aquaculture. After reviewing the questionnaire responses we received, we conducted follow-up structured interviews with each stakeholder to clarify some responses and to obtain additional details on stakeholders' responses to some open-ended questions. To identify trends in responses, we analyzed the results of the questionnaire by summarizing responses and producing descriptive statistics using Microsoft Access. In addition, we qualitatively analyzed open-ended responses from the questionnaire and responses from follow-up interviews to provide additional insight into stakeholder views on key issues that should be addressed in the development of a regulatory framework for offshore aquaculture. For purposes of characterizing the results from our questionnaire and follow-up interviews of our 25 stakeholders, we identified specific meanings for the words we used to quantify the results, as follows: “a few” means at least three, and up to five stakeholders; “some” means between 6 and 11 stakeholders; “about half” means 12 to 14 stakeholders; “a majority” of stakeholders and “many” stakeholders both mean 15 to 19 stakeholders; and “most” means 20 stakeholders or more.

We conducted this performance audit from April 2007 to May 2008 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objective. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objective.

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# Appendix II: Stakeholders Consulted by GAO Regarding a Regulatory Framework for Offshore Aquaculture

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The following stakeholders responded to our questionnaire and participated in follow-up interviews regarding administrative and environmental issues that should be addressed in the development of an effective regulatory framework for U.S. offshore aquaculture:

- Sue Aspelund, Special Assistant to the Commissioner, Alaska Department of Fish and Game;<sup>a</sup>
- Brian E. Baird, Assistant Secretary, Ocean and Coastal Policy, California Resources Agency;
- Sebastian M. Belle, Executive Director, Maine Aquaculture Association;
- John Connelly, President, National Fisheries Institute;
- Cora Crome, Fisheries Policy Advisor, Office of the Governor, State of Alaska;<sup>a</sup>
- Bill Dewey, Manager of Public Affairs, Taylor Shellfish Company;
- Robin Downey, Executive Director, Pacific Coast Shellfish Growers Association;
- Kathleen Drew, Executive Policy Advisor, Office of Washington Governor Chris Gregoire;
- Tim Eichenberg, Former Director, Pacific Regional Office, Ocean Conservancy;<sup>b</sup>
- John Forster, Ph.D., President and Aquaculture Consultant, Forster Consulting Inc.;
- Rebecca Goldberg, Ph.D., Senior Scientist, Environmental Defense Fund;
- Samantha D. Horn Olsen, Aquaculture Policy Coordinator, Maine Department of Marine Resources;
- Dr. Richard Langan, Director, Atlantic Marine Aquaculture Center and Open Ocean Aquaculture Program, University of New Hampshire;
- George H. Leonard, Ph.D., Aquaculture Director, Ocean Conservancy;<sup>b</sup>
- John R. MacMillan, Ph.D., President, National Aquaculture Association;

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**Appendix II: Stakeholders Consulted by GAO  
Regarding a Regulatory Framework for  
Offshore Aquaculture**

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- Dr. Larry McKinney, Director of Coastal Fisheries, Texas Parks and Wildlife Department;
- Rosamond Naylor, William Wrigley Senior Fellow and Director, Program on Food Security and the Environment, Stanford University;
- J.E. Jack Rensel, Ph.D., Principal Scientist, Rensel Associates Aquatic Sciences;
- Dr. Michael Rubino, Manager, NOAA Aquaculture Program, National Oceanic and Atmospheric Administration;
- Mitchell Shapson, LL.M., Policy and Legal Analyst, The Institute for Fisheries Resources;
- Neil Anthony Sims, Co-founder and President, Kona Blue Water Farms, LLC, and Founding Boardmember, Ocean Stewards Institute;
- Chip Smith, Office of the Assistant Secretary of the Army (Civil Works), Assistant for Environment, Tribal and Regulatory Affairs;
- Linda L. Smith, Senior Policy Advisor, Office of the Governor, State of Hawaii;
- Albert G.J. Tacon, Ph.D., Technical Director, Aquatic Farms Ltd.;
- Paula Terrel, Commercial Fisherman & Fish Farming Issues Coordinator, Alaska Marine Conservation Council;
- Jose Villalon, Director, Aquaculture Program, World Wildlife Fund; and
- Sherman Wilhelm, Director, Division of Aquaculture, Florida Department of Agriculture and Consumer Services.

<sup>a</sup>Both Sue Aspelund and Cora Crome contributed to the stakeholder response for the state of Alaska. Because we received a single questionnaire and conducted a single follow-up interview, we treated them as a single stakeholder for purposes of analysis even though they are acknowledged separately here.

<sup>b</sup>Both Tim Eichenberg and George Leonard contributed to the stakeholder response for the Ocean Conservancy. Because we received a single questionnaire and conducted a single follow-up interview, we treated them as a single stakeholder for purposes of analysis even though they are acknowledged separately here.



# Appendix III: Comments from the Department of Commerce

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



**THE SECRETARY OF COMMERCE**  
Washington, D.C. 20230

April 25, 2008

Ms. Anu K. Mittal  
Director  
Natural Resources and Environment  
U.S. Government Accountability Office  
441 G Street, N.W.  
Washington, D.C. 20548

Dear Ms. Mittal:

Thank you for the opportunity to review and comment on the Government Accountability Office's draft report entitled *Offshore Marine Aquaculture: Multiple Administrative and Environmental Issues Need to be Addressed in Establishing a U.S. Regulatory Framework* (GAO-08-594). On behalf of the Department of Commerce, I enclose the National Oceanic and Atmospheric Administration's comments on the draft report.

Sincerely,

A handwritten signature in black ink, appearing to read "Carlos M. Gutierrez".

Carlos M. Gutierrez

Enclosure

**Department of Commerce  
Comments on the Draft GAO Report Entitled  
“Offshore Marine Aquaculture: Multiple Administrative and Environmental Issues  
Need to Be Addressed in Establishing a U.S. Regulatory Framework”  
(GAO-08-594/May 2008)**

**General Comments**

The Government Accountability Office (GAO) Offshore Marine Aquaculture Report captures the growing interest in offshore aquaculture in the United States as an additional form of domestic seafood production. The report accurately presents the opportunities and challenges for this new form of seafood production by succinctly summarizing information from major publicly and privately funded studies, representatives of key stakeholder groups, and the experience of selected coastal states. GAO’s report will contribute to the discussion of environmentally responsible and sustainable offshore aquaculture in the broader context of the National Oceanic and Atmospheric Administration’s (NOAA) overall marine aquaculture program.

Issues of considerable interest to the public not examined in the report are the role of aquaculture and its relevance to a safe, sustainable domestic seafood supply, the net environmental benefits of aquaculture production, and the creation of jobs from coastal communities to the American heartland.

As the Nation’s oceans and fisheries agency, NOAA has already begun to address the administrative and environmental issues highlighted in the GAO report. The agency established an aquaculture program in 2004, and has been working with Congress on national offshore aquaculture legislation since 2005. NOAA is also supporting internal and external marine aquaculture research and collaborating with other federal agencies on broader initiatives such as the implementation of a National Aquatic Animal Health Plan.

In addition to its dual mandate to protect the marine environment and manage sustainable use of living marine resources, NOAA is already tasked with providing the best available science about marine aquaculture to policymakers and the public so that government agencies can make informed regulatory and policy decisions. NOAA’s existing grant programs such as the National Marine Aquaculture Initiative support priority aquaculture research topics identified in the GAO report, including projects to evaluate sites for offshore aquaculture and assess the environmental risks and mitigation options for offshore production technologies and species.

Consistent with GAO’s findings, stakeholders at a National Marine Aquaculture Summit, which was organized by NOAA and hosted by the Secretary of Commerce in June 2007, emphasized the need for transparent, consistent, and predictable regulations and environmental protections in order for the offshore aquaculture industry to move forward in the United States. Similarly in 2007, NOAA adopted a 10-Year Plan for Marine Aquaculture, which also includes a comprehensive regulatory program for environmentally sustainable marine aquaculture as a priority goal. Summit participants and NOAA’s 10-Year Plan also pointed out the need for additional research, as indicated in GAO’s report.

See comment 1.

See comment 2.

By highlighting the importance of the siting, monitoring, and management of marine aquaculture operations, GAO accurately reflected stakeholders' concerns over preventing or minimizing adverse environmental impacts of marine aquaculture. However, its focus on the lack of data on the environmental impacts of commercial scale offshore aquaculture operations (since these do not yet exist) diminishes the importance of findings based on environmental monitoring and research at the five small-scale open ocean operations in U.S. state waters. These operations have shown insignificant environmental effects to date, and the adaptive monitoring approaches that GAO describes in the report will provide a way to ensure that these impacts remain minimal as projects scale up in size. Also, the lessons learned from managing and regulating commercial finfish aquaculture in Maine, Washington State, and elsewhere, as cited in the report, as well as the experience with stock enhancement and shellfish farming in the United States, provide a substantial body of knowledge about the net environmental effects of marine aquaculture and the regulatory approaches that will apply to offshore aquaculture.

See comment 3.

NOAA is fully engaged in issues relating to the use of fish meal and fish oil in aquaculture feeds, a priority issue identified in the report. As stated, fish meal and fish oil are important components in the feeds for many farm-raised species, from pigs and poultry to farmed fish. As ingredients in aquaculture feed, fish meal and fish oil support normal growth for cultured species, and maintain the important human health benefits of seafood. However, both the relatively high cost of fish meal and fish oil, and growing pressure on the wild fisheries that supply it, are fueling research on suitable alternative feed ingredients. This research has led to significant improvements in reducing the reliance on fish meal and fish oil for feeds for many cultured fish species. NOAA and other federal agencies play a vital role in continuing to fund feeds research and the transfer of technology to industry. For example, in 2008, NOAA is partnering with the U.S. Department of Agriculture on an initiative to advance the development and commercialization of alternatives to fish meal and fish oil in aquaculture feeds.

See comment 4.

Two additional topics of importance to NOAA are not adequately addressed in the report: offshore shellfish aquaculture and regional initiatives to regulate offshore aquaculture under existing fishery management authorities. Shellfish aquaculture accounts for most of the current U.S. marine aquaculture production (over 80 percent by value), and in 2008, NOAA is sponsoring a symposium on Shellfish Aquaculture and the Environment. Although the symposium will focus mainly on issues associated with existing operations in coastal areas, expansion of coastal shellfish aquaculture production is limited by coastal development—which has made it difficult to find appropriate, affordable sites closer to shore—and interest in open ocean mussel farming is growing rapidly in the United States. Commercial fishermen and others in New Hampshire, Massachusetts, and California have established open ocean production of mussels as a way to supplement their income. This highlights the natural synergy linking aquaculture with many aspects of commercial and recreational fishing.

It should also be noted the Gulf of Mexico Fishery Management Council is developing a generic amendment to several of its Fishery Management Plans that would establish a permitting program for aquaculture facilities in federal waters in the Gulf of Mexico. All of the issues identified in the GAO report have been addressed in various scoping documents prepared by the Council in cooperation with NOAA and have been informed by extensive public input. It is possible the Council may submit its proposal for Secretarial review later this year.

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The following are GAO's comments on the Department of Commerce's letter dated April 25, 2008.

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## GAO Comments

1. The issues identified by NOAA are outside the scope of our review, which was to identify key elements of a federal regulatory framework for offshore aquaculture.
2. We believe our statements regarding the lack of data on the environmental impacts from large-scale commercial offshore aquaculture operations are appropriate. As NOAA points out, these large-scale operations do not yet exist. On page 9 of the report, we stated that environmental monitoring at the existing small-scale research and commercial open-ocean aquaculture operations in Hawaii, New Hampshire, and Puerto Rico has found modest environmental impacts. However, as facilities begin to scale-up, their impacts on the marine environment could become more pronounced. Given the lack of such large facilities to date, it is too early to know what the environmental impacts of large-scale commercial offshore aquaculture facilities will be.
3. We believe that the report adequately discusses offshore shellfish aquaculture within the context of offshore aquaculture. Most of the policy issues raised in the report apply equally to shellfish and fish aquaculture. For instance, the need for clear federal leadership, a sound permitting system, and additional research all apply equally to shellfish and fish. In cases where the issues differ for shellfish and fish aquaculture—such as for environmental monitoring protocols—we discussed shellfish aquaculture separately from fish aquaculture.
4. We are aware of the efforts of the Gulf of Mexico Fishery Management Council to develop a generic amendment to their fishery management plans to establish an offshore aquaculture program in the Gulf of Mexico. While we discuss the roles and responsibilities of fishery management councils on pages 19 and 20, we did not discuss this regional initiative in our report because it was outside our scope of identifying key elements of a federal regulatory framework for offshore aquaculture.

# Appendix IV: Comments from the Environmental Protection Agency



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

APR 21 2008

OFFICE OF  
WATER

Ms. Anu Mittal  
U.S. Government Accountability Office  
Natural Resources and Environment, Room 2T23  
441 G Street, N.W.  
Washington, D.C. 20548

Dear Ms. Mittal:

Thank you for providing the Environmental Protection Agency (EPA) with an opportunity to review the draft report "Offshore Marine Aquaculture." We provided comments on an earlier draft of this report to GAO staff during a conference call on March 27, 2008. Our comments at that time focused on the description of the Clean Water Act programs that control the release of pollutants from aquaculture facilities. We were pleased to see that the current draft responds to our comments.

We would like to submit one additional comment on this draft report. On page 5, line 4 of the draft, GAO states, "For example, EPA has expertise in protecting marine water quality in state waters, and the lead federal agency . . ." We suggest rephrasing this sentence to read, "For example, EPA has *knowledge of technologies and practices that control and reduce the pollutants discharged from open water aquaculture*, and the lead federal agency . . ."

If you have any questions about our comments, please let me know, or contact Mary Smith, Director of the Engineering and Analysis Division, at 202-566-1000.

Again, thank you for the opportunity to comment.

Sincerely,

A handwritten signature in black ink, appearing to read "Michael Grumbles".

Benjamin H. Grumbles  
Assistant Administrator

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# Appendix V: Comments from the Department of Agriculture

Note: GAO comments supplementing those in the report text appear at the end of this appendix.



United States  
Department of  
Agriculture

Research  
Education  
Economics

Office  
of the Under  
Secretary

Room 216W  
Jamie L. Whitten Building  
Washington, DC 20250-0110

MAY 01 2008

IN REPLY

REFER TO: Draft Report GAO-08-594, "Offshore Marine Aquaculture: Multiple Administrative and Environmental Issues Need to Be Addressed in Establishing a U.S. Regulatory Framework" (360830)

Ms. Anu K. Mittal  
Director  
Natural Resources and Environment  
United States Government Accountability Office  
Washington, D.C. 20548

Dear Ms. Mittal:

I am responding on behalf of the Agricultural Research Service (ARS), Cooperative State Research, Education, and Extension Service (CSREES), and Animal and Plant Health Inspection Service (APHIS). Thank you for the opportunity to review and comment on the subject draft report. General comments are provided for your use in preparing the final report.

I would like to take this opportunity to clarify two points:

**KEY PROGRAM ADMINISTRATION ISSUES ( P. 17)**

First in oral comments, the Department of Agriculture (USDA) officials stressed that a mechanism for a coordinated Federal-wide research framework exists through the Joint Subcommittee on Aquaculture (JSA) of the Office of Science and Technology Policy. Further, USDA emphasized the wide diversity of its aquaculture research portfolio that is not limited, influenced or directed by water salinity or the aquatic environment of production systems or their locations. These comments were not reflected in this report.

USDA administers numerous major programs to encourage and support the development of private-sector aquaculture in freshwater, brackish water, and marine environments. USDA recognizes private-sector farming of fish and shellfish as a form of agriculture. Delineation of aquaculture research into marine and freshwater components is complex, as some species have life cycles in both environments; some hybrids involve crosses of freshwater and marine species; and new advancements in technology include growing marine species under low salinity culture conditions that are much lower than their natural marine environment. Programs supported by USDA include research to develop husbandry practices to control and manage predictably the entire life cycle of marine species for commercial production; improved breeding stocks of production animals; nutrition programs to improve diets and nutrient utilization; aquatic animal health; extension, education; economics; statistical reporting; marketing support; farm services; risk management; natural resource conservation; and other services provided to U.S. agriculture.

See comment 1.

Ms. Anu K. Mittal

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USDA has made significant investments in these programs over the last ten years with substantial impacts on the development of the diverse U.S. aquaculture industry.

USDA firmly believes that the U.S. aquaculture industry and our public are best-served through interagency cooperation and collaboration and that the JSA is an excellent coordinating structure to facilitate multi-agency planning and coordination of research and development programs.

***REGULATORY FRAMEWORK QUESTIONNAIRE (APPENDIX I, P. 46)***

Second, USDA (ARS, APHIS, and CSREES) did not provide a written response to the GAO questionnaire because many questions sought opinions on a variety of policy issues - e.g., "in your opinion which one of the following agencies, if any, should be the lead agency for funding marine aquaculture research?" USDA already has provided information on the Department's official position for a number of issues and policies related to aquaculture. USDA officials did not feel that it was appropriate to provide individual opinions related to policy matters through a questionnaire that was provided to diverse stakeholders.

The two comments have been coordinated with the staffs of both CSREES and APHIS. Once again, we appreciate the chance to review and comment on this draft report.

Sincerely,



Gale A. Buchanan  
Under Secretary

cc:  
C. Hefferan, CSREES  
C. Smith, APHIS

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The following are GAO's comments on the Department of Agriculture's letter dated May 1, 2008.

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## GAO Comment

1. We believe the Joint Subcommittee on Aquaculture was adequately addressed in the report. Specifically, we mentioned on page 11 that USDA chairs the interagency Joint Subcommittee on Aquaculture and that the Subcommittee is currently working to update the federal strategic plan for aquaculture research. In addition, characterizing all of USDA's aquaculture-related research activities was not within the scope of our report. Rather, our report is focused on offshore marine aquaculture. As such, we reported what stakeholders told us regarding research related to offshore marine aquaculture.



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# Appendix VI: GAO Contact and Staff Acknowledgments

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## GAO Contact

Anu K. Mittal, Director, (202) 512-9846, or [mittala@gao.gov](mailto:mittala@gao.gov)

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## Staff Acknowledgments

In addition to the individual named above, Stephen D. Secrist, Assistant Director; Leo G. Acosta; Nancy Crothers; Kathleen Gilhooly; Janice M. Poling; Katherine Raheb; Jerry Sandau; Julie E. Silvers; Barbara Steel-Lowney; Shana Wallace; and Monica L. Wolford, made significant contributions to this report.

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