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Concerning Offshore Aquaculture

Presented to the Senate Committee on Commerce, Science, and Transportation
National Ocean Policy Study

April 6, 2006

Introduction

I am honored to have opportunity to testify today about the important issues surrounding offshore aquaculture. My named is Rebecca Goldburg. I am a biologist and Senior Scientist with Environmental Defense, a national nonprofit organization. Environmental Defense not only employs traditional advocacy tools, but also works with corporate partners such as FedEx, McDonald's, and CitiGroup. In a current partnership, Environmental Defense is working with Wegmans, a leading supermarket chain, to support producers of both wild and farmed seafood who are achieving high environmental standards.

I have co-authored a number of scientific articles concerning environmental impacts of aquaculture and was co-author of the Pew Oceans Commission's report on marine aquaculture. Among my current responsibilities, I serve as a member of the Marine Aquaculture Task Force, sponsored by the Woods Hole Oceanographic Institution and Pew Charitable Trusts, and the U.S. Department of Agriculture's Working Group to develop organic certification standards for aquaculture. I have an M.S. in Statistics, Ph.D. in Ecology, and honorary Doctorate of Laws, all from the University of Minnesota.

My testimony will focus on environmental concerns with offshore aquaculture development and the National Oceanic and Atmospheric Agency's (NOAA's) offshore aquaculture legislation, S. 1195. My testimony reflects my views and those of Environmental Defense, but not necessarily the task forces of which I am a member.

Aquaculture is essential to expanding future seafood supplies, but can also diminish them

Aquaculture is frequently cited as means to increase seafood supply in a world where greater quantities of fish cannot be obtained from the oceans. Without a doubt, our oceans are finite, and many fisheries are now overfished or heading towards depletion. At the same time, aquaculture is becoming an increasingly important source of seafood. Roughly 40 per cent of all fish directly consumed by humans worldwide now originate from fish farms.

Environmental Defense supports aquaculture development as a means to increase seafood supplies; nevertheless, pursuing aquaculture development without adequate safeguards may be worse than not pursuing aquaculture at all. Although aquaculture and capture fishing are sometimes viewed as separate endeavors, the future of some aquaculture sectors is inextricably intertwined with fisheries and the health of marine ecosystems. While the production of channel catfish in freshwater ponds, tilapia in tanks, or crawfish in rice fields has little or no impact on marine fisheries, some coastal forms of aquaculture, such as salmon farming in netpens or cages, or shrimp farming in saltwater ponds, typically degrade marine ecosystems and can result in a net loss of fish.[1]

Offshore aquaculture could cause significant harm to marine ecosystems and fisheries

Offshore aquaculture is patterned after salmon aquaculture, and can be expected to have similar (although not identical) impacts. Like farmed salmon, finfish raised offshore will be housed in netcages. These are essentially animal feedlots which sit directly in marine waters, and are vulnerable to at least four distinct types of environmental problems.

1. Escaped farmed fish: Numerous studies[2] document the ecological damage caused by escaped farmed fish. Depending on the location, these include the introduction of non-native fish species and reduced "fitness" of wild fish as a result of interbreeding with escapees of the same species. The offspring of crosses between escaped farmed with wild fish are a bit like pups from matings between domestic dogs and wolves – they are not as capable as surviving and reproducing in nature as their wild ancestors.

The likelihood of large-scale escapes from offshore farms is high if cages are sited in storm-prone areas such as the Gulf of Mexico. Even without storms, escapes frequently occur. In the Caribbean and Hawaii, sharks have torn open fish cages, letting fish escape. Moreover, unlike salmon which breed in freshwater, the marine species targeted for offshore production breed in marine waters. Atlantic cod, for example, breed in ocean enclosures, and although ocean fish cages are relatively sturdy, their very design renders them incapable of containing fish eggs.

The impacts of such fish escapes on the health of wild fisheries could be large if farmed fish are genetically less well-adapted to the ocean environment than local populations of

wild fish. Farmed fish may be weaker genetically as a result of selective breeding, genetic engineering, or simply because fish being farmed were taken from a geographic area with different ecological conditions.

2. Spread of pathogens and use of antibiotics and other drugs: Experience in both terrestrial and aquatic animal production demonstrates that concentration of large numbers of animals in a small area almost inevitably facilitates outbreaks of disease and parasites. Such pathogen outbreaks can jeopardize wild fish. One recent study,[3] for example, shows that salmon farms in British Columbia spread parasitic sea lice from salmon farms to wild pink and chum salmon. It is reasonable to anticipate that similar situations will occur on offshore fish farms, especially if farms become large.

Disease and parasite outbreaks also lead producers to administer antibiotics and other drugs, usually via feed to entire cages of fish. These drugs inevitably end up in marine ecosystems, where they select for resistant bacteria, sometimes in types of wild fish consumed by humans.[4] In addition, their use results in foods from drug-treated animals – which many consumers prefer to avoid. It is possible to significantly reduce drug use through vaccine development, as salmon farmers have accomplished, to their credit. But, these vaccines have not eliminated problems with pathogens and drug use.

3. Water pollution: Modern "industrial" farms or feedlots – whether hog farms or fish farms – raise large numbers of animals in small areas, often using feeds imported from distant places. One common consequence is water pollution, as a significant fraction of the nutrients in feeds end up in the animals' wastes. In the case of fish pens or cages, there is no attempt to capture these wastes, which flow directly into surrounding waters.

In a scientific paper I published last year with Rosamund Naylor at Stanford University (copy included),[5] we estimated the potential impacts of waste discharges from a $5 billion U.S. aquaculture industry – a target figure used by NOAA. Using figures from salmon farming, we calculated that a $5 billion per year offshore aquaculture industry would discharge annually an amount of nitrogen equivalent to that in untreated sewage from 17.1 million people or the entire North Carolina hog industry of about 10 million hogs. Nitrogen is the nutrient primarily responsible for "eutrophication," including algal blooms and dead zones, in marine waters.

Of course, widely spaced marine fish farms sited in areas with strong currents would likely have little impact – an argument for moving marine fish farms out of the coastal zone and into marine waters. Nevertheless, fish farms may cluster geographically near infrastructure such as processing plants and transportation, just as terrestrial hog farms tend to do. If farms become large and clustered, or are sited in areas especially vulnerable to nutrient pollution, their water pollution impacts could be marked – just as water pollution has been a major impact of North Carolina's large, clustered hog farming industry.

4. Farming carnivores: Most of the species targeted for offshore production, such as halibut, cobia, and Pacific threadfin (moi), are – like farmed salmon -- highly carnivorous. These fish are now raised on feeds with high levels of fish meal and fish oil made from wild caught fish. Until and unless new feed technologies are developed and commercialized, farming fish offshore will likely require two to four times more wild fish to be caught for their feed than is ultimately harvested.[6] The resulting net loss of fish protein means that offshore fish farming is not an alternative to capture fishing, and may actually increase fishing pressure on wild fish populations as demand and prices rise for fish meal and fish oil. Moreover, the current practice of capturing massive quantities of small fish such as sardines, anchovies, and mackerel to manufacture feed, may deprive marine predators, including many commercially important fish, of the food they need to flourish.

Farming carnivorous fish can also increase the amounts of environmental contaminants that consumers are exposed to in their food. Fish meal and oil can contain significant levels of chemicals such as PCB's. Several studies show that farmed salmon have higher concentrations of these contaminants in their flesh than most wild salmon. Without careful attention to the composition of fish feeds, offshore fish farming could not only increase pressure on wild fisheries but also produce relatively contaminated food products for U.S. consumers.

An analysis of the potential cumulative impacts of offshore aquaculture development is essential

The environmental impacts of offshore aquaculture will depend, somewhat ironically, on the success of NOAA's push to develop offshore farms. Experimental or small-scale commercial fish farms, such as those now funded or subsidized by NOAA, are unlikely to have major environmental effects – as evidence to date confirms. But, what if offshore farming booms, and becomes a major means of food production, akin to the poultry or swine industries? What are the potential impacts on marine ecosystems and America's wild fisheries if NOAA policy "succeeds?"

A number of environmental, fishing, and consumer organizations, including Environmental Defense, have repeatedly asked NOAA over the last 18 months or so to draft a Legislative Environmental Impact Statement for S. 1195. However, the agency has not done so.

Nevertheless, an analysis of the potential cumulative impacts of offshore aquaculture is clearly essential if NOAA is to pursue offshore aquaculture in a careful and informed manner. Environmental Defense recommends that Congress require NOAA to complete such an assessment before legislation on offshore aquaculture is enacted.

NOAA's offshore aquaculture legislation lacks provisions essential to safeguard marine fisheries and ecosystems

Especially given the serious concerns about the impacts offshore aquaculture development, it is critical that any pertinent legislation contain strong environmental safeguards. This case is argued persuasively by Stanford University scholar Rosamund Naylor in a spring, 2006, paper published in the National Academy of Sciences' journal "Issues in Science and Technology" (copy included).[7] Unfortunately, S. 1195 lacks key mandates essential to protecting the marine environment and the public interest, three of which are detailed below.

Mandatory environmental standards: To provide adequate protections for marine fisheries and ecosystems, no permit for offshore aquaculture should be issued unless the permit will not result in any significant adverse impacts to marine fisheries and ecosystems. Permits should be consistent with environmental standards that include provisions to minimize the ecological and genetic impacts of escaped farmed fish (for example by prohibiting farming of non-native fish); prevent the spread of disease and parasites by farmed fish; require monitoring for water pollution; strictly limit alteration of marine habitat; encourage the use of feeds with reduced levels of fisheries products; and bar harm to marine wildlife.

S. 1195 lacks such mandates for environmental protection, and instead gives NOAA enormous discretion to implement environmental standards the agency chooses to develop. S. 1195 thus appears to conflict with NOAA's own "*Code of Conduct for Responsible Aquaculture Development in the U.S. Exclusive Economic Zone,*" published in 2002, to provide guidance on marine aquaculture development. NOAA's Code stipulates that, "aquaculture development in the EEZ will adopt the guiding principle of a precautionary approach combined with adaptive management to achieve sustainable development in offshore waters." Moreover, the Code includes provisions intended to minimize disease, parasites, chemical inputs, and impacts on wild stocks, and to protect local communities.

Congress can also look to states for guidance. The State of California, which already bans the cultivation of salmon, non-native species and genetically engineered organisms in marine fish farms, appears poised to enact legislation (S.B. 201) to mandate comprehensive environmental standards for farming of native fish species in the State's coastal waters. The California standards would address crucial issues, including selecting appropriate fish farm sites, preventing fish escapes, and minimizing use of fish-based feeds, drugs, and chemicals.

Public participation and access to information: A transparent public process helps to ensure that offshore aquaculture will not harm ocean resources important to stakeholders outside the aquaculture industry. Yet, S. 1195 lacks any provisions concerning transparency, public notice, and public comment periods for permit applications, nor do existing

Department of Commerce regulations speak to these matters. Although S. 1195 mandates that NOAA "consult" with regional Fisheries Management Councils before issuing a permit, it is unclear what such consultation would entail. As a result, it is conceivable that NOAA's permit process could largely escape public scrutiny if an applicant declared the information in a permit application "confidential business information," or NOAA provided no public notice and comment period concerning the application.

This lack of transparency and public process is contrary to NOAA's 2002 "Code," which urges both transparency and public participation. The public should have access to information in permit applications needed to evaluate the environmental impacts of proposed facilities, and public notice and comment should be required.

Managing ocean resources to minimize conflicts and maximize public benefits: Offshore aquaculture is one among many oceans uses – such as energy production, conservation areas, and fishing -- that affect the health and sustainability of ocean resources. A key conclusion of the U.S. Commission on Ocean Policy[8] is that while the federal government should manage ocean resources for the maximum long-term benefit of the nation, current uncoordinated and incoherent offshore management undermines such management. A shift toward ecosystem-based management of offshore resources coupled with a strengthened governance system is necessary to better conserve and manage ocean resources. Decisions regarding the establishment of standards and approval processes for offshore aquaculture should take into account the need to establish an offshore management regime for all ocean resources and activities.

Ideally an offshore aquaculture system would operate within a broader offshore regime that minimized conflicts and met environmental and economic objectives, including those of conservationists and fishermen. NOAA's 2002 Code of Conduct for Responsible Aquaculture urges that aquaculture zones be established to prevent conflicts and provide for efficient siting of facilities. Other areas might be off limits because they are fishing grounds, shipping lanes, military sites, national marine sanctuaries, recreational areas, and so on. Unfortunately, S. 1195 does not provide for such planning and governance, but rather establishes a national policy for offshore aquaculture development without adequate balance of other economic and conservation interests.

S. 1195 also fails to require offshore aquaculture companies to pay back to the public a fair return for use of public trust resources. A key part of the government's commitment to maximizing the benefits to the nation of public trust resources is compensation – called resource rents – for their use by the private sector. The principle of returning a fair portion of funds to the public is applied on land to ranchers, timber and mining companies, and in the ocean to oil and gas companies. Environmental Defense recommends that resource rents from offshore aquaculture be required and that they are applied to activities that protect and restore the ocean environment.

Conclusion:

NOAA's pursuit of offshore aquaculture development raises a number of concerns, based on experience with other types of marine aquaculture. These concerns are not purely environmental; degradation of marine ecosystems can harm fishermen's economic livelihoods, as well marine resources more broadly. Offshore aquaculture should only go forward following implementation of strong environmental safeguards, including assessment of potential cumulative impacts of aquaculture development. Appropriate legal requirements must be established to ensure that projects meet strong environmental standards, are subject to public process, and are consistent with a larger framework for ocean governance.

These requirements may seem stiff, but it is now widely recognized that our oceans are finite and vulnerable to abuse. Offshore aquaculture should only proceed under a framework that recognizes what we now know is necessary to protect and restore the health of our oceans and all of us who depend on them.

Thank you for your consideration.

Rebecca Goldburg

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