

# ELR

## NEWS & ANALYSIS

### Marine Aquaculture: A Growing Business

*Editors' Summary: On February 6, 2007, the Environmental Law Institute hosted a seminar to discuss the environmental implications of the growing business of marine aquaculture. This seminar was the fifth event in the Oceans seminar series. After the moderator offered introductions, the panelists discussed a range of issues, including the current environmental challenges facing aquaculture, laws and policies that regulate existing aquaculture practices, and expanding and emerging sectors such as offshore aquaculture. The seminar concluded with a question-and-answer period. Below is a transcript of the event.*

*[Transcribed by ACE Transcription Service, Washington, D.C. The transcript has been lightly edited, and citations have been added, for ease of reading.]*

#### Moderator:

**Jay Pendergrass**, Senior Attorney, Environmental Law Institute (ELI)

#### Panelists:

**Richard Smith**, Partner, Robinson & Cole L.L.P.

**Becky Goldberg**, Senior Scientist, Environmental Defense

**Billy Plauché**, Partner, Gordon & Buck L.L.P.

**Susan Bunsick**, Senior Policy Analyst, National Oceanic and Atmospheric Administration (NOAA) Aquaculture Program

#### I. Introductions

**Jay Pendergrass:** Today we will be focusing on marine aquaculture in the United States. Each of the panelists will give a short presentation, and after each presentation, the other panelists will give a very brief response.

Richard Smith is a partner in the law firm of Robinson & Cole L.L.P. His practice focuses on environmental and resource management law. He has advised clients on a variety of business development and permitting projects in coastal locations with respect to state and federal permit programs.

Becky Goldberg is a senior scientist at Environmental Defense, a national nonprofit research and advocacy organization. Her major focuses are increasing market demand for more sustainably produced seafood and addressing scientific and public policy issues concerning fish farming and antibiotic use in animal agriculture. She has worked in partnership with major corporations to establish policies for environmentally preferable meat and seafood purchases. She is a member of the U.S. Department of Agriculture's (DOA's) working group to develop organic standards for aquaculture and the marine-based Aquarium Seafood Watch Advisory Board. She has been a member of several aquaculture projects including the Woods Hole Oceanographic Institute and Pew Charitable Trust Aquaculture

Task Force, and was a coauthor on the Pew Oceans Commission's Report on Marine Aquaculture.<sup>1</sup> She has a Ph.D. in ecology and an Honorary Doctorate of Laws.

Billy Plauché is a partner at Buck & Gordon L.L.P. in Seattle. His private practice focuses on complex land use and environmental regulatory issues for both public- and private-sector clients. He represents a number of West Coast shellfish farms and shellfish associations on regulatory issues facing shellfish growers on both permitting issues and in litigation. He was lead counsel for Taylor Shellfish Farms in *Association to Protect Hammersley, Eld & Totten Inlets v. Taylor Resources, Inc.*<sup>2</sup> Before joining Buck & Gordon, he was a trial attorney with the U.S. Department of Justice in the environmental defense section, and represented federal clients in civil litigation on the Clean Water Act (CWA).<sup>3</sup>

Susan Bunsick is a senior policy analyst with NOAA's Aquaculture Program, where she leads legislative and regulatory initiatives in support of marine aquaculture. She has also worked as a marine policy consultant supporting NOAA aquaculture activities. She has a master's degree in Marine Policy from the University of Delaware and a master's degree in Public Affairs.

#### II. Overview of State Permit Programs

**Richard Smith:** I am going to discuss what is happening with respect to state programs. Other panelists will talk about federal programs and offshore issues, but I will focus on nearshore issues, which in most cases include the first three miles offshore.

The traditional aquaculture programs for the state can trace their lineage in part back to Crown Grants, where in

1. This document is available at [http://www.pewtrusts.org/uploaded/Files/wwwpewtrustsorg/Reports/Protecting\\_ocean\\_life/env\\_pew\\_oceans\\_aquaculture.pdf](http://www.pewtrusts.org/uploaded/Files/wwwpewtrustsorg/Reports/Protecting_ocean_life/env_pew_oceans_aquaculture.pdf).

2. 299 F.3d 1007, 33 ELR 20001 (9th Cir. 2002).

3. 33 U.S.C. §§1251-1387, ELR STAT. FWPCA §§101-607.

pre-revolutionary days, the British Crown granted rights in water lands to individuals. We see that today when we look at title research in Connecticut because we can follow those deeded rights down to current owners, particularly the very nearshore waters, which are, in Connecticut, municipal waters.

The state statutory programs are, for the most part, leasing programs where you get a right—a lease—which is an interest in real property subject to the limitations and enabling legislation that allow you to conduct permitted activities within delineated boundaries. We have roughly 30,000 acres in Connecticut that have been traditionally leased shellfish bed areas with 100 years of operations on what we would describe as a natural set, that is, a natural spawn of oysters and clam beds that have been harvested with traditional dredges, either bag dredges or hydraulic dredges, for clamming the traditional species, oysters and clams.

Contemporary state programs have brought about two important changes to the traditional operations. One is an expanding list of species involved; we go from oysters and clams to scallops and goeey duck clams, for example, in the Pacific Northwest. When we talk about the new species, we are largely talking in terms of shellfish with operations that require new equipment. These are not natural open areas; there is some control on access to the areas, and there is some control in the nature of the structures that actually hold the organisms. Finfish, we know from the various examples in the United States, covers salmon, cobia in Puerto Rico, moi and amberjack in Hawaii, live rock, live coral operations in Florida, and culture methods. We have gone from capture-type methods—dredges and bags—to bottom cages, bags, and racks that are actually constructed in place, moved around as necessary, and surface and submerged cages in longline operations.

If you are not familiar with longlines, you can think of them as long clothes lines. They are horizontal main line members from which you drop individual sets of equipment. In the shellfish world, we may be talking about socks, which look like long mesh socks for holding mussels, or we can talk about lantern nets, which are socks that have a little metal square and can be expanded to permit placing oysters on the horizontal support that hangs from the longlines.

The range of operations includes East and West Coasts, Gulf Coast, the long history of natural beds, the recent structure-based operations, and the finfish distribution we touched on. One other note here is that there are some land-based operations for finfish where we have pumped seawater coming in from the ocean through the upland containment raiseways or tanks or other types of land-based equipment. California, for example, actually has CWA discharge permits for abalone and salmon upland operations. Hawaii shrimp operations are another example.

The new issues in aquaculture at the state program level involve expanding authorizations for structure-based aquaculture operations in state waters, again within three miles of shore. In order to conduct those operations, we need several types of authorizations or permits in addition to the right to actually occupy an area, which is typically, as I mentioned, a lease, although sometimes a license is used. So in the state waters, we may have municipal jurisdictions where the very nearshore areas are controlled by local shellfish commissions, for example. Or going a bit further out, there may be a line that delineates municipal and state areas, and

that is where the state would take over and be responsible for granting leases, negotiating the terms of the leases, and establishing the operating requirements that are specific to the lease conditions themselves. In Connecticut, it is actually the state DOA that manages that leasing program, and other states have other administrative departments within their government structure that may be doing that job.

Permits for structures, even in the state waters, fall under both federal and state jurisdictions. Because the structures are an impediment to navigation, they fall under the U.S. Army Corps of Engineers' (the Corps') Structures Permitting Program under the CWA. That authority reaches back to §10 of the Rivers and Harbors Act of 1899.<sup>4</sup> It is based both in the statutory authority and in the Corps' regulatory permit process regulations. Those regulations include a public interest review process that sets out the information requirements for submitting an application to the Corps and the criteria to be evaluated by the Corps with respect to individual projects. The range of issues that need to be addressed in that processing include the proposed projects' effects, impacts on conservation, economics, aesthetics, navigation, environmental concerns, shore erosion, recreation, water supply and conservation, water quality, energy needs, and safety and property ownership considerations, in addition to the general needs and welfare of the people.

With regards to state permit programs, there is typically a statutory authority that is the anchor point of the regulatory program they create. The states differ in their requirements for applications for different types of projects and in the approval standards that are applied. In both the cases of federal and the state programs, there are some alternative means of securing authorization to maintain structures, which include general permits. In the various state and federal programs a general permit is tailored to specific activities. If you qualify with your proposed project in terms of the nature, location, and manner of operation of your activity, you do not have to go through an individual notice-and-comment type permit application review. You have to submit the information and demonstrate that it conforms to the general permit standards. Some do not require acknowledgment from the agencies; other general permits require the agency to concur that you meet the requirements. But it is a more expedited process that has looked at a variety of impact factors, environmental factors, and others in advance, and tailored that program to specific authorized activities.

The CWA discharge permit program involves finfish sites and aquaculture, but not shellfish, because, generally, shellfish do not require the addition of food or other materials to the water; they procure their own food from planktonic sources. So we are talking about finfish. The CWA is delegated to the states, which means the states typically have primary responsibility for reviewing and approving CWA discharge permits that authorize you under the state and federal programs. The standards that the states apply can be no less stringent than the federal standard, so the federal standard sets the benchmark and the states are free to adapt additional requirements to their CWA discharge permit program. The regulations may identify standards for different types of operations or different parameters of the specific site that is being reviewed. The U.S. Environmental Protection Agency (EPA)

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4. 33 U.S.C. §403.

in 2004 just concluded its rulemaking for aquaculture activities under the CWA and set the standard for permit issuance at the federal level.

There are other criteria in the CWA that have been raised as possible considerations when we are permitting new facilities such as ocean discharge criteria under §403, which is a standard that prohibits unreasonable degradation to environmental quality from permitted activities and requires that you demonstrate that you are maintaining ecosystem diversity, productivity, and stability with the operation that is being permitted. In cases where there is determined to be insufficient information to specifically confirm that you have met the §403 requirement, there can be permanent requirements put in place that will ensure that there is no reasonable degradation by imposing, for example, monitoring and management practices to address the additional criteria.

Some of the facilities have permitting requirements for state water locations that include monitoring temperatures, salinity, dissolved oxygen, nitrates, phosphates, doing whole effluent toxicity, and making regular reports under the certification that the information is accurate. They also establish mixing zones and boundary points at which you must demonstrate compliance with numerical criteria as well.

To wrap up the CWA permit program for states, one example of a new criterion is the California legislation for marine facilities that in addition to having a state program for effluent discharges would require that effluent discharges be prevented to the maximum extent possible in addition to meeting whatever other regulatory standards are set out in the discharge permits. They also establish specific requirements at the state level in terms of fish meal and fish oil use by requiring that the use shall be minimized for aquaculture facilities in order to reduce the adverse effects on global ocean ecosystems.

When we talk about structures permits at the state level, we have to consider that not only are there structures permit criteria, but there are also the Coastal Zone Management Act (CZMA)<sup>5</sup> standards at the state level. The CZMA statutory mandates that the state would establish the requirement, obviously, that they be consistent with that authority. There is typically an evaluation of resource impacts, tidal wetlands impacts, beach system and other natural resource impacts of the proposed project, and a need to demonstrate after evaluation that the impacts and conflicts with other uses of the coastal zone are acceptable as determined by the regulatory agency.

An example of conflicts with other uses is fishing operations in the vicinity of your aquaculture facility. In order to secure the permit at the state level, you had to demonstrate that the aquaculture equipment was not going to interfere with established fishing operations. That led to a situation where we sat down with fishermen and identified what our operation was going to look like in terms of the physical layout, the structures, the anchors, etc., and talked with them about how they used that same general area for fishing. In this case, we determined that they needed to fish a particular shoal area adjacent to the leased area for the aquaculture equipment, and they do so in a circular pattern where we could cut off the corners to round them out a bit,

pull the anchor system in a bit, and they simply worked around the equipment that has been allowed under the new aquaculture permit.

As I touched on in my discussion of the Corps' structures program, national security is an interest that has to be evaluated in terms of impacts by aquaculture gear. It is the same standard that would apply to other kinds of operations that are also permitted under that program. Another example of trying to make the operations and other uses coincide would be a case in which we had a nuclear submarine base in Connecticut. We proposed that there be a marina, dockminium, a public marina, and a public fishing pier across the river from the sub-base. We were able to identify ways to make those operations compatible and meet the needs of security personnel at the sub-base and maneuvering of submarines by creating a restricted zone in the river that controlled the speed of vessels through that area. We also set up a means of identifying those vessels that were authorized to go into the marina, so distant security personnel could essentially identify these folks; we know where they are going and why they are turning or maneuvering. Remarkably enough, we were able to wrap up those permit discussions in October 2001, which I thought was going to throw us off a bit in our schedule, but, amazingly, we had tremendous cooperation from the Navy and found some great ways to resolve security concerns at that point in time.

There are many different approaches and variations in state programs; different program requirements, different permitting procedures, different application information requirements, and different agencies that are authorized to review and approve those projects. The states are a great sort of laboratory for evaluating alternative approaches. As we know from speaking with state regulators, when they are developing any of their various permitting or regulatory programs, they discuss what they are hoping to do with other agencies and other states to see what has worked, what has not worked, and how they have used different approaches and adapted them for their own needs. One thing to consider is the extent to which we can adapt that range of alternatives and experiences when we talk about federal programs as well. So we may be able to gain advantage in our efforts to focus on offshore issues by thinking about how things have or have not worked at the state level.

**Becky Goldberg:** I want to second that state programs are really, really important. Certainly, my presentation is going to focus on marine finfish aquaculture and the push by NOAA to get it offshore. But if we look at where such operations are now operating commercially, they are all within three miles offshore and actually are regulated by states as a result, as Richard pointed out. The states are taking increasing interest in such operations. As Richard noted, California passed a very comprehensive set of aquaculture regulations last May; Florida is also working administratively on regulations for marine finfish farm, so the states are really taking an important role.

**Susan Bunsick:** I would like to thank Richard for his great overview of not only the state programs, but also the state versus federal jurisdictional issues. I want to point out that there is a role for NOAA in state waters; it tends to be more of a consultative role under the Magnuson-Stevens Fishery

5. Pub. L. No. 92-583, 16 U.S.C. §§1451-1456 (1972).

Conservation and Management Act (MSA) of 2005<sup>6</sup> and other statutes in terms of potential impacts on essential fish habitat, marine endangered species, and the like. I'll be talking a little more about the offshore in my talk, but I want to point out that whatever we propose at the federal level, it is not intended to override or preempt the existing laws and regulations already in effect that govern many, many aspects of marine aquaculture and set a lot of standards already for the U.S. industry. I think that is what is important to note as we move forward. There may be a need for additional U.S. standards that are unique to the offshore, but many requirements have been developed already.

**Billy Plauché:** I'll cover some similar issues, a little more specifically with regard to shellfish, but the CWA regulatory structure is something that we have dealt with a lot as well, working through Corps permits. One of the hurdles, or one of the significant transaction pieces, of that has been dealing with the essential fish habitat and Endangered Species Act (ESA) consultation processes. So the question I have for Richard is what has been your experience in both your NPDES [national pollutant discharge elimination system] permits and Corps permits on those consultation processes? Have those been hurdles for you or have they gone relatively smoothly out in your area on the finfish side?

**Richard Smith:** Well, the essential fish habitat issues always come up because we have the entire coast in Connecticut highlighted as essential habitat for everything from winter flounder to striped bass. We have been fortunate in being able to quantify likely impacts largely because we can do so with surveys on winter flounder, for example, because we can really identify their areas, and that is essentially a footprint impact. Marinas, ferry terminals, and things of that sort have a primary impact because they put down a footprint that essentially consumes some amount of the environment. We found that, generally, the water quality impact, circulation impact, and other impacts have been fairly manageable, and we have been able to address it through compensation.

### III. Environmental Concerns and Policy Considerations for Marine Finfish Aquaculture

**Becky Goldberg:** I am going to talk today about some of the environmental and policy issues concerning marine finfish aquaculture. NOAA is pursuing offshore aquaculture, essentially growing fish in cages sited well out into the ocean in federal waters. Legislation prepared by NOAA was introduced to the U.S. Senate in June 2005, and NOAA's stated goal in the past has been a \$5 billion per year aquaculture industry.

When those of us in the environmental community and elsewhere start to think about the environmental impacts of marine finfish aquaculture, there is one place we all look for guidance and experience, and that is salmon farming. Salmon farming has absolutely boomed in recent decades. It now comprises the majority of the salmon that are produced worldwide, and salmon are grown in net pens or net cages just like these in coastal waters. These systems for finfish are a lot like the offshore fish systems that are now in development. The major difference is that the offshore systems

are designed for much more stormy waters and therefore, tend to all have tops, but they all allow the flow of ocean waters through the systems; they are essentially floating feed lots.

As we think about the environmental impacts of salmon farming, there are a lot of issues I could talk about, but I am going to just quickly review three of them today. One of the concerns in salmon farming I would like to highlight is nutrient pollution. As I said, salmon farms are essentially floating feed lots; that is, you put a lot of fish in a cage in one place and add feed. And because the cages are directly in coastal waters, there are large amounts of fish feces and other waste that flow into the surrounding coastal waters.

With that in mind, Rosamond Naylor, who is an economist at Stanford, and I decided a couple of years ago to try and estimate the nitrogen discharge from a \$5 billion per year offshore aquaculture industry. We focused on nitrogen because it is the limiting nutrient for algae in marine waters in most cases, and so it is the source of all sorts of problems. We used figures from salmon farming and estimated that annual nitrogen discharges from a \$5 billion per year offshore aquaculture industry would be roughly equal to that from the North Carolina hog industry, which is about 10 million hogs, or from the nitrogen in the untreated sewage of 17 million people.

How do we put that in context? To be fair, it sounds like a lot, but these nitrogen numbers are still small compared to many of the natural nitrogen fluxes in the ocean. But that said, they could be significant, depending on where the discharges are. In particular, we know from experience with hog and chicken farms that livestock systems tend to cluster geographically because they need to be near feed mills; they need to be near slaughterhouses and so on. It is reasonable to expect that we will see the same thing in the ocean, and if farms cluster, then we really have to start thinking about the water pollution impact. So we cannot necessarily depend on dilution as the solution to pollution.

Another issue I would like to touch on briefly is that of salmon escape. This has been a really hot issue in salmon farming. Atlantic salmon are the predominant species farmed worldwide. On the West Coast of North America, escapes of farmed Atlantic salmon have been an important issue because of concerns that the Atlantic salmon will establish populations that compete with Pacific salmon populations, which are both valuable and in some cases in ecological trouble. These concerns have been exacerbated by the fact that it is clear now that there are Atlantic salmon breeding in British Columbia rivers.

There is another concern about salmon escapes in areas where Atlantic salmon are native; that is, in the North Atlantic, in Europe, Eastern Canada, and Maine. And that is that escaped farmed salmon breed with wild Atlantic salmon. To be a little bit simplistic, it is a bit like breeding a wolf with a domesticated dog; you get offspring that are not as fit to survive and reproduce in the wild and, essentially, you screw up the wild salmon genetics. There is certainly reason to believe that the concerns I just articulated for salmon could also be entirely applicable to many types of marine finfish that are now being targeted for offshore aquaculture production.

A third concern to do with aquaculture, in particular the cultivation of marine finfish, is the fact that most of these species are high on the food chain. They are fed a diet that is

6. Pub. L. No. 104-297.

high in fish meal and fish oil that is made from wild caught fish. It takes something like three pounds of wild caught fish to produce a pound of farmed salmon, and that result is important, not so much because of the number, but because when we have aquaculture that depends on substantial amounts of wild fish as inputs, it means that aquaculture is not really a way to supplement wild fish populations. In fact, it is just another way of putting pressure on marine resources. This becomes a very real concern as aquaculture grows because populations of wild fish that are used for feed are limited, and at least in the case of fish oil, we are already pushing up against the limits of available supplies.

Atlantic salmon are a 4.2 on an index that runs from 1 to 5, with 5 being the highest on the food chain. They are pretty high up there. These other fish are fish that have been experimented with or in commercial offshore production now in the United States. You can see that they are pretty much all similarly high on the food chain. So this feed issue is applicable to the development of offshore fish farming.

With that, I am going to turn and talk a little bit about some of the policy considerations. Particularly, I would like to point out very briefly that the environmental community had some serious concerns about NOAA's 2005 Offshore Aquaculture Legislation. Our biggest concern was the fact that the bill allowed, but did not compel, NOAA to protect marine fisheries and ecosystems when it issued permits for offshore aquaculture facilities. We were also concerned about the fact that there were no requirements for transparency and public participation and permit decisions and monitoring and so on, despite the fact that fish farms would be in public waters which have other important uses like fishing.

We were concerned, in addition, about the ad hoc approach to permitting. There were no ocean areas that were off-limits; there was no mention of consideration of cumulative impacts of fish farms. So we were not very happy with the bill that was introduced last session. To segue, more recently there has been additional focus on what such legislation might look like, and I'm going to spend a little time, therefore, detailing some of the recommendations made by the Marine Aquaculture Task Force, which was a body sponsored by Woods Hole Oceanographic Institute, the Pew Charitable Trusts and the Lenfest Foundations. We released a report on January 8, 2007, making a number of recommendations about marine aquaculture development with a specific policy focus on marine finfish aquaculture.<sup>7</sup> The report makes a number of recommendations; I'm just going to go through a few important ones.

On governance, the report recommended that the U.S. Congress should enact legislation ensuring that strong environmental standards are in place to regulate the siting and conduct of offshore marine aquaculture, and should give NOAA the lead role. So in this way, we echoed in some ways what NOAA has done so far, and that there is a need for some additional authority as aquaculture develops.

We looked at a number of the environmental issues concerning marine aquaculture and made several recommendations about ways these issues should be addressed. One of the issues is water pollution. We did not look to NOAA but rather looked to EPA as the agency that administers the CWA, and we recommended that EPA should review and, if necessary, revise existing effluent limitations for aqua-

culture. We also recommended that EPA should ensure that there are federal and state marine water quality standards or guidelines which protect marine ecosystems so that EPA cannot only think about individual operations, but can also think about whether there is a cumulative effect of these operations on the marine environment.

We made some recommendations concerning potential fish escapes from aquaculture facilities, and escapes—I did not say this when I talked about them before but they seem to be inevitable. You can reduce escapes on finfish aquaculture facilities; you do not seem to be able to eliminate them. We recommended that marine aquaculture permits should be limited to native species of the local wild genotype unless it can be demonstrated that the risk of harm to the marine environment is negligible. We put a strong burden of proof on fish farmers, if they are going to grow anything but a local fish, to show that it is safe to do so. We also made some recommendations concerning fish feed. The first recommendation is pretty straightforward and that is that NOAA and other agencies should support research and development for alternative, more sustainable feed ingredients, and, indeed, there are some in development now that are very promising.

Perhaps a little more unusual, we recommended that as cost-effective alternative ingredients become available, NOAA should establish a milestone for feed which is reflected in farm operating permits. So in other words, as alternative feed ingredients become available, NOAA should use the permitting system to begin to get adoption of these feed options in order to solve the ecological challenges that come from growing marine carnivores. Finally, with that, I would like to wrap up with, instead of a conclusion, a question that maybe we can discuss as a group afterwards, and that is will NOAA prepare and Congress consider aquaculture legislation for strong protections for the marine environment in this congressional session? I have been told by officials at NOAA that they are indeed significantly revising the legislation for next session and that it is a stronger bill, from my perspective, than the previous bill. But the bill has not been yet made public and it remains to be seen how it will move forward. I have been told that for NOAA it is the number one oceans priority for this congressional session.

**Susan Bunsick:** I will start by reacting to the question. The answer is, yes, NOAA is revising the bill. We listened to what we heard at the two hearings on the previous version of the bill last spring and we were glad to see the recommendations of the Woods Hole Marine Aquaculture Task Force. We looked at all those suggestions and, as you mentioned, there is strong support to get a bill sent up to Congress this session. We have looked at many of the issues that Becky has raised in her talk, and will continue to do so as it moves forward—the bill still needs to be cleared by the administration before it goes to Congress. But we are definitely moving in that direction.<sup>8</sup>

**Richard Smith:** Two thoughts. One is that we certainly need to address environmental impacts of proposed facili-

7. *Supra* note 1.

8. The National Offshore Aquaculture Act of 2007 was transmitted to Congress in March 2007, and subsequently introduced as H.R. 2010 and S. 1609. On July 12, 2007, the Subcommittee on Fisheries, Wildlife, and Oceans of the House Committee on Natural Resources held a hearing on H.R. 2010, but there has been no further action as of mid-October 2007. Additional information is available at <http://aquaculture.noaa.gov/us/2007.html>.

ties. We have got to be careful about two points. One is to not oversimplify or extrapolate some program-wide projections. For example, looking at an entire build-out of demand for aquaculture and trying to estimate its nitrogen impacts and equating it to 17 million people. If we are going to do that, we obviously have to consider the fact it is not a single point source. If we look at the Exclusive Economic Zone (EEZ), it is—whatever number—many million square nautical miles. It is a lot of water. If we are going to take the extreme of the entire build-out and its nitrogen loading, we should flip it to the entire EEZ, at which point you are down to the environmental nitrogen loading of about 4.5 people per square ocean nautical mile or statute mile. In other words, it is down to a drop in the bucket.

The other point is the question of reduction fisheries. The United States will not control global reduction fishery markets; it is just not possible. For the last 20 or 30 years, the reduction in fisheries volume has been [at an] essentially steady state. It is not because of China's aquaculture; it is not because of our aquaculture system. It is because it is not a contained market. If it is not used in aquaculture, it is going to be used in the poultry industry, the swine industry, the beef industry, or as other supplements. So it is a market question.

If aquaculture is willing to pay more money than the poultry industry to get that reduction fishery material, they are going to buy it and we are going to use it. If they are not, then somebody else is going to buy it and use it. I think it is great if we can find alternatives in plant products and soybeans and other things that people are researching now because that will be a tremendous asset to aquaculture producers to have an alternative feed source. If we can demonstrate that the price works and the nutrient values work, then that is what is going to happen—aquaculture is going to focus on alternatives like any other market.

**Billy Plauché:** You have raised a lot of questions that are out there, scientifically. What efforts are underway to try to get some of that information developed? I assume there are some through NOAA?

**Becky Goldberg:** On feeds, specifically?

**Billy Plauché:** Or just generally the outstanding scientific issues on offshore aquaculture. Is NOAA looking into those or is that a project that you see users undertaking themselves when they come in and apply to establish operations?

**Becky Goldberg:** Well, NOAA is certainly investing some funds in research. To be fair to the agency, I think they have not had appropriations [and] they would have liked to pursue research and development. Some of the efforts are coming from the private sector, certainly, on the feed alternatives. There is a lot of interest in developing alternatives, not so much necessarily from offshore aquaculture but actually from existing sectors like shrimp and salmon farming, trout farming, etc. Whereas the use of fish meal and fish oil is going up worldwide, prices are rising and suddenly there is economic reason to develop some alternatives. I think we will also have to look to the producers themselves to develop some of the science. It is going to take a lot of effort by a lot of people.

#### IV. Shellfish Farming Regulatory Issues

**Billy Plauché:** I want to deal a little bit with use conflicts and regulatory issues around shellfish farming. These are two intertwined issues, in my experience. As use conflicts arise, regulatory scrutiny increases and we are just now coming to grips with some of those issues in the shellfish farming community. Before I get into the regulatory issues, I would like to spend just a few minutes talking a little bit about shellfish farming because I think it is different than finfish farming and other activities that have been discussed. There are two primary reasons for that difference: first, shellfish farming, as Richard mentioned a little bit, is a historic use; it has been going on for 100, 150 years in a lot of states. In fact, in Washington, the first agriculture product produced in the state of Washington was an oyster, back in 1849. So it is a historic use and while, as Richard noted, there have been some new types of shellfish culture that are going forward, and the industry is looking at different methods and different species, the vast majority of the shellfish industry farms as it did historically. Oysters and clams are cultivated in the same places, by and large, in the same way, in many cases, by the same families that have been doing it for 100, 150 years. These are uses that have been there for a while.

Secondly, shellfish are filter feeders and, therefore, they provide an environmental benefit: they improve water quality and improve water clarity. Shellfish also provide fish habitat; there are lots of great studies on that. They can benefit eelgrass growth. There are lots of positive environmental effects of shellfish culture. Really, because of those two things, the history and the environmental benefit, shellfish culture has not historically had a lot of regulatory scrutiny under the CWA and other environmental statutes.

Of late, as more and more people all over the country are moving into waterfront areas and we are getting more residential development in areas that were traditionally shellfish-growing areas—rural areas—use conflicts are increasing. The first thing that happens when folks move in and think, “I am not sure I like looking at that,” is they start asking about the regulatory controls on shellfish farming.

With that introduction, I would like to give a general overview of some of those regulatory restrictions. I will also try to give you some examples where the issues have arisen. First, on the federal level, as Richard mentioned, the CWA is the big stick for regulatory scrutiny on all of these aquaculture activities. The NPDES program was the initial focus of some of the neighboring property owners trying to increase shellfish farming regulation.

My first involvement with Taylor Shellfish and with shellfish generally was defending a CWA citizen suit that was brought by a group of property owners that did not like looking at a mussel raft that Taylor Shellfish had offshore of their beaches. These neighbors brought a citizen suit arguing that that mussel raft released pollutants, was a point source, and required an NPDES permit. We litigated that case ultimately up to the U.S. Court of Appeals for the Ninth Circuit, and the Ninth Circuit held that shellfish and their byproducts are not pollutants, and shellfish farms are not point sources, and therefore, they do not need a CWA NPDES permit.

Having overcome that hurdle, the next issue that came up very quickly was that the Corps started looking at shellfish

farming. This arose in Humboldt Bay with a 300-acre oyster farm down there; again, the issues arose because of some neighborhood opposition to the farm. The farm had been there since 1950 but began to change its culture method from traditional bottom culture to the longline culture method that Richard talked about. The Corps stepped in and said, "You know, we think that this requires a CWA permit. While it may not require an NPDES permit, it requires a dredge and fill permit from the Corps under §404." So we spent a lot of time going back and forth to the Corps about what shellfish activities may and may not be regulated. Ultimately, we agreed to disagree on that issue and tried to move toward a programmatic permitting regime with the Corps for shellfish culture.

The first step toward a programmatic permit was in September 2006, when the Corps issued its draft proposed nationwide permits. One of those was a new nationwide permit, Nationwide Permit-D, which has now been numbered Nationwide Permit 48, that was proposed to cover most existing shellfish farming operations. We issued comments that are being reviewed by the Corps. As I understand, the final rule should be out in the next week or two and we will see what can be covered under a nationwide permit. For those activities that are not covered under a nationwide permit, we are going to be pursuing a regional general permit with the Corps by coast—West Coast, Gulf Coast, and East Coast shellfish farming activities. We will try to get those new operations permitted programmatically.

One of the hurdles that we face is that it's not just the Corps permit that is implicated; there are a number of consultations and other approvals that go along with the Corps permit. One is from NOAA, the Essential Fish Habitat and Endangered Species Act consultation. In fact, shellfish growers are out here this week talking to their congressmen, talking with NOAA, and working on how to do a programmatic consultation on these programmatic permits. These are significant issues.

The default will be individual permits and individual consultations for all of the shellfish growers. We have one example of that right now: Coast Seafood, who I think has the one individual permit and individual consultation in the country for a shellfish cultivation operation. It took about 10 years to get and cost about \$500,000 in consultant fees to get through the process. Most shellfish farming operations are fairly small, mom-and-pop operations, and they just cannot shoulder that kind of burden. So we are working closely with the agencies to try to get these farms permitted programmatically.

One way the state jumps into the mix is once you have to get a Corps permit, the state, as Richard indicated, has to do both the CZMA consistency review of the permit as well as the §401 review of the permit, looking to make sure that the permit is consistent with state CZMA enactments and state water quality enactments. And that regulatory process is in addition to state coastal permits that are required in some states. For example, California Coast Seafoods had to get a State Coastal Development Act permit from the California Coastal Commission.

These state processes are another venue where these use conflicts are being acted out. The best example I can give is a legislative hearing last week in the Washington State Legislature on two competing shellfish regulatory bills. One was put together by the industry, and was basically an at-

tempt to get a programmatic, comprehensive review of shellfish farming activities. It was setting up a stakeholder committee with state agencies, tribes, interested environmental groups, and shellfish farmers to try to get a comprehensive state regulatory approach for shellfish farming that we could then use for Shoreline Management Act<sup>9</sup> purposes and CZMA purposes. Some neighborhood opposition groups had proposed a different piece of legislation that would actually add a new permitting regime for a specific type of clam farming, geoduck clam farming.

It was just fascinating to watch the use conflict issue play out of that legislative hearing. The shellfish farmers were out testifying, talking about their traditional shellfish farming activities, their family ties, and their ties to these lands and waterways. The neighborhood groups were out as well—one of their big supporters was the Realtors Association. The realtors came up and testified that this was affecting property values—shellfish farming activities were driving down property values. So you really got a snapshot of how that use conflict plays out, and I hope offshore aquaculture is not the only answer to it. I hope we can get some programmatic regulatory support in the nearshore as well.

Finally, the place that this really plays out at a kind of fundamental level is local zoning and land use planning activities. In Washington, our Shoreline Management Act also has a strong local component where local governments adopt shoreline master programs, where they can put forward regulatory regimes for shellfish aquaculture. In Washington we also have the Growth Management Act<sup>10</sup> that requires all counties to adopt comprehensive plans and zoning regulations that address certain issues. This use conflict issue is playing out in these zoning processes. For example, one county in Washington is considering putting some very serious restrictions on the ability to develop additional shellfish farms. Other counties have said that shellfish farming is not a use we are going to allow. The state has said shellfish farming is a preferred shoreline use; this tension will get played out in the local zoning context.

We have actually started looking at growth management and local zoning as a potential positive way to address some of the use conflict issues. One of the cornerstones of growth management or smart growth is stopping residential and commercial developments from sprawling out into rural areas and driving the resource-based uses out. Timber, agriculture, mining—those, at least in the Washington Growth Management Act, are strongly protected uses. Basically, one of the first things that counties have to do under Washington's Growth Management Act is designate their long-term commercially significant agriculture lands, mining lands and timber lands, and then make sure that those uses are not going to get squeezed out by competing residential development.

In a lot of states, Washington being one of them, there are statutory provisions that note that shellfish farming is a type of agricultural activity. We are starting to develop an approach with local governments in the state of Washington to designate shellfish culture areas under the Growth Management Act as a resource-based, agriculture use that should be protected from competing residential development. That

9. WASH. REV. CODE §90.58 (1971).

10. WASH. REV. CODE §36.70A (1990).

approach is in its formative stages but is one of the tools we see using to try to deal with use conflicts.

I want to emphasize these are really significant issues for the shellfish farmers in the country. We are trying to increase aquaculture production in the United States, and shellfish is a great way to do that because shellfish farming is an environmentally friendly enterprise that makes a lot of sense to encourage. Taylor Shellfish just last week purchased Fanny Bay Oyster Company, which is the largest shellfish company in British Columbia. This was the fourth or fifth shellfish farm up in British Columbia that Taylor has purchased. Taylor has market demand for shellfish; they need farms to grow it and processing capacity to process it. To add that processing capacity and those farms, Taylor took a hard look and said: “You know, the regulatory environment has a big question mark on it in the United States and in Washington, in particular. The better investment right now is in British Columbia, where the shellfish industry is welcomed with more open arms.”

That means 100 jobs that would have been in rural economies in Washington are now up in British Columbia; it moved that economic engine up to British Columbia. It is a paradox, as we start talking about increasing aquaculture production in the United States, that some of the regulatory restrictions are starting to move it out of the United States.

**Richard Smith:** What we are going to see is, again, as Billy pointed out, this never ending competition between multiple users and the fact that we need to apply some good science, putting parameters in terms of our permitting programs and demonstrate to the public that this is an important contribution to our society and our economy. There has to be a way to make it acceptable for us all to use the coastal zone, because we cannot. It is just too inefficient for all of us—producers, property owners, and others—to be butting heads over the approval for individual operations on a case-by-case basis.

**Becky Goldberg:** I would just like to remark on the issue you raised about tough environmental regulations, the pushing aquaculture elsewhere. It is a legitimate issue. At the same time, beyond shellfish, when we look at some of the countries where, say, salmon and shrimp farming are really booming, in Latin American and Asia and so on, the environmental regulations are often not enforced. I do not say they are not there; they are not enforced. I just do not see it as a reasonable pathway for the United States to take the attitude that we need to have some parity with aquaculture regulation in other countries because in a lot of places, we are looking to production in developing countries. We need to level up rather than level down. While there certainly are a number of issues that confront shellfish growers, in particular, because of the fact that shellfish production is often immediately offshore where very wealthy people are building their residences, at the same time we have to be careful about how we use those arguments.

**Billy Plauché:** Just to be clear, my focus is on the process. The ultimate result in the Coast Seafood case was a finding of no significant environmental impact for that operation, and not likely to adversely affect endangered species findings. But the process to get there was a bear. Shellfish farmers, in particular, need clean water to survive; they are some of the biggest advocates for clean water in the coun-

try and they are not advocates of decreasing environmental regulation. But we need to try to come up with a process that will not put the burden of individual permitting on individual growers.

**Susan Bunsick:** I would like to also mention the regulatory issues. The important thing for the U.S. aquaculture industry is the need for regulatory certainty and that is something NOAA is trying to do something about, both in our role under current authorities as well as in the future as we move forward with any new authorities for offshore. And I would like to thank you for pointing out the economic opportunities that are lost when we do not have regulatory certainty. Also thank you for putting aquaculture in the context of other uses. When you think about impacts—positive and negative or net benefits—of aquaculture, you have to look at it in terms of what are the impacts of other uses. Coastal development, as many people are aware, has tremendous impacts on water quality and ecosystems. So it is that balance we need to focus on in the policy arena. Thanks for introducing that into the discussion.

## V. NOAA Aquaculture Programs

**Susan Bunsick:** Thank you for inviting me to the Environmental Law Institute panel. I did attend last month’s seminar on other ocean uses, such as wind energy, which is another new use of the ocean that is on the policy agenda for Congress and agencies. So I am glad that ELI decided to focus on aquaculture as yet another one of those legitimate ocean uses for the nation.

Just a little background on me . . . I got interested in marine policy issues—and aquaculture in particular—because I really like the ocean and I love great seafood. I looked at where things are going with fisheries, and I asked myself, “Well, where are we going to get this seafood in the future?” And I will be the first person in the world to tell you I want to see aquaculture move forward, but not at the expense of our oceans. I think that it is also true what we have heard from the shellfish people—they need clean water. The finfish people need clean water. If we all look at what we share in terms of shared expectations for this country and the oceans, I think it is to move forward in a way that will allow aquaculture to develop in a way that supports NOAA’s stewardship responsibilities under other laws and that assures that aquaculture moves forward sustainably.

I am pleased to be able to work on these issues. I did some preliminary work at the University of Delaware while I was in a master’s program and doing NOAA-funded research specifically on offshore. I am pleased to see the interest in aquaculture within NOAA and the U.S. Department of Commerce (DOC). We are all working together on trying to make this move forward in a sustainable way. We got a lot of attention over the offshore aquaculture legislation, but before I get into details on that, I want to spend time on my presentation focusing on putting into perspective our overall program at NOAA for U.S. aquaculture.

The NOAA Aquaculture Policy (1998)<sup>11</sup> defines aquaculture as “the propagation and rearing of aquatic organisms in controlled or selected environments for any commercial, recreational, or public purpose.” Thus, NOAA uses a

11. This document is available at [http://aquaculture.noaa.gov/pdf/17\\_noaaAqpolicy.pdf](http://aquaculture.noaa.gov/pdf/17_noaaAqpolicy.pdf).



broad-based definition of aquaculture that focuses on the onshore, the nearshore, as well as the offshore for all sorts of purposes, including stock enhancement and habitat restoration. The legislation we sent to Congress for the offshore has really been over 10 years in the making. Once that is enacted, we would still have to go through a two-year rule-making process before we could really do anything with it for the industry.

Marine aquaculture is a very small—tiny—industry in the United States. It is less than a 2% share of U.S. seafood supply and it is only about 20% of the U.S. aquaculture industry. The biggest crop of aquaculture in the United States is catfish, a freshwater species grown mainly in ponds or raceways in the southern United States. When you are talking about marine, you are talking about a very small amount of current production. But it does encompass a range of species: a variety of finfish, shellfish, plants, ornamentals, and, moving forward, to include things like biopharmaceuticals and other new products.

Another important part of what we do at NOAA relates to marine stock enhancement or hatchery production. What many people do not realize is that much of what is considered Alaska's wild salmon actually starts out in a hatchery. The fish spend their early days in the netpen and then they are released and they spend most of their lives at sea before they are caught again as wild. But hatcheries support a range of other commercial and recreational fisheries as well, e.g., commercial oysters and crabs, recreational Pacific rockfishes, and Gulf redfish, and as I mentioned already, habitat restoration. Locally, we have programs in the Chesapeake Bay for oysters. There are researchers working on blue crab enhancement out of the University of Maryland Biotechnology Institute in Baltimore.

Why do we need aquaculture? You just have to look at the supply and demand numbers. We have growing U.S. seafood consumption, which is currently in the range of six to seven million metric tons a year. We import about 70% of that seafood. Aquaculture worldwide is a much more developed industry than it is here in the United States, and about 40% of what we import is actually coming from aquaculture farms in other countries. We are projecting a seafood gap of about two million metric tons by 2025 and we already have a seafood trade deficit that runs around \$8 billion a year.<sup>12</sup>

I think most people who look at wild fisheries do not really see any potential for significant increases in wild-captured fish in the future. The question is, if we are going to eat more seafood, as nutritionists encourage us to do, where are we going to get it? It has to come from farms, and the question is, is it going to come from some domestic sources of aquaculture or are we going to just keep increasing our imports of aquaculture products from other countries? If we keep importing, as Billy mentioned in his talk, we are going to pass up opportunities to create jobs and other opportunities in our coastal communities. When you talk about a new aquaculture farm opening up, it is not just a handful of direct employees working on the farm; it is all the supporting services that go into that—the people who supply the ice for their trucks and the processing plants. In the United States, we have processing plants that are on the verge of closing down because they cannot get enough wild products to pro-

cess, so they can only operate for part of the year. If they have aquaculture, they have a year-round source to keep their facilities functioning.

Aquaculture, as I mentioned at the beginning, has become a national priority, and more so over the last several years. A few years back, *The Economist* featured aquaculture, *The Blue Revolution*,<sup>13</sup> but we really kicked it up from the policy point of view with the work of the U.S. Commission on Ocean Policy, which issued its report, *An Ocean Blueprint for the 21st Century*,<sup>14</sup> a little over a year and one-half ago. This was followed by the U.S. Ocean Action Plan,<sup>15</sup> the Bush Administration's response to the U.S. Commission on Ocean Policy's recommendations, which was required by the law that established the ocean commission. The Administration was required to respond to the commission's recommendations as to what are you going to do to implement these things. Aquaculture was featured in the U.S. Commission on Ocean Policy report (Chapter 22, "Setting a Course for Sustainable Marine Aquaculture")<sup>16</sup> and certain actions, including transmittal of offshore aquaculture legislation, were listed in the Ocean Action Plan as a commitment of the Administration in response.

Another recent document is the draft 10-Year Plan for the NOAA Aquaculture Program. This is a draft plan for NOAA moving forward, looking at these various studies and also looking forward to how does NOAA want to build our own program. It was prepared at the request of our independent advisory committee, the Marine Fisheries Advisory Committee (MAFAC), which consists of representatives from various stakeholder groups who encouraged NOAA to develop a 10-year plan for marine aquaculture. MAFAC has endorsed the plan; we have put it out for public comment and it is now being revised and it will be vetted through NOAA and issued later this year.<sup>17</sup>

So we are working on our plan for the future. Our overall program has four major components: regulation; science/R&D; outreach and education; and international. This group is I think mostly interested in the regulatory and science side of it. With respect to regulation, in addition to developing a regulatory framework for the exclusive economic zone, we are trying to do a better job under existing laws to process permits for coastal aquaculture that have been mentioned already by the other speakers. And we are working with other programs within NOAA that are responsible for essential fish habitat in coordinating our advice to the Corps on developing the nationwide permits for shellfish aquaculture.

As an aquaculture program, we are also working on in-house guidance that we could provide to the people who actually review the permits at our regional offices. And we think with that sort of information and ability to tie the permit reviewers to the experts in the field or to the sources of information—the latest scientific literature or access to monitoring protocols and models that have been developed—we could help speed up the regulatory review process at least on NOAA's end.

13. *Fish Farming: The Promise of a Blue Revolution*, *ECONOMIST*, Aug. 7, 2003, at 19.

14. This document is available at <http://www.oceancommission.gov>.

15. This document is available at <http://ocean.ceq.gov/actionplan.pdf>.

16. This document is available at [http://www.oceancommission.gov/documents/full\\_color\\_rpt/22\\_chapter22.pdf](http://www.oceancommission.gov/documents/full_color_rpt/22_chapter22.pdf).

17. The Plan will be available at <http://www.aquaculture.noaa.gov>.

12. More recent data shows that the United States imports about 80% of its seafood, about one-half of which is farmed, and that the seafood trade deficit is now about \$9 billion.

In support of that, we also have a science and research and development operation that consists of some internal NOAA capability—laboratories in NOAA Fisheries and NOAA Ocean Service—and the National Marine Aquaculture Initiative,<sup>18</sup> a competitive grants program that has funded some of the offshore aquaculture research and development. It has been in state waters but it has been demonstrating the technologies and it has been monitoring and measuring the impacts of those technologies. And we have some regional research and development initiatives that include demonstration projects to look at some of the issues related to the different types of technologies, including shellfish production.

We also do outreach and education. We try to attend a lot of conferences and we are populating our website. We are providing information and working with other federal agencies on what is called the National Aquatic Animal Health Plan,<sup>19</sup> which has been developed in partnership with the Food and Drug Administration and the U.S. Department of Agriculture (USDA). And that is getting out to the industry and to the states now. And to the extent we can—with limited resources and time on our hands—we try to engage the international community in terms of sharing information and trying to develop approaches to the issues that are common throughout the world on aquaculture.

So that is a quick overview of what, as a program, we are trying to do. Moving on to the offshore—why do we want to go offshore? Well, as has been mentioned already, there are limited nearshore areas in most of our states. There is really no easy way to allow operations in federal waters or to set standards under current law. There are a few laws that apply to aspects of offshore aquaculture, but there is no comprehensive law that applies. There is no such thing as a federal offshore aquaculture permit. The map up here shows the U.S. EEZ that is about 3.4 million square miles.<sup>20</sup> The federal authority, as Richard mentioned, would start at three miles off most of our states, so it will be 3 to 200 miles, which is the outer limit of the EEZ.

So what we are looking at is a way to give NOAA the authority to issue permits in federal waters, to establish the environmental requirements, to conduct monitoring, to enforce the provisions, and to conduct research in support of the regulatory process. As I mentioned already, we have been working on this at NOAA for more than 10 years—longer than I have been at NOAA—including the preparatory work on the technologies and also on the approaches to the environmental issues and to the type of species you raise. As a result, we have had a number of demonstration projects that have led to the establishment of some commercial shellfish and finfish operations and these operations are showing good environmental and production results.

At the University of New Hampshire, we have an offshore facility about six miles from the shore, but it is in state waters because there are a few islands off there. The facility has been operating since 1999.<sup>21</sup> There have also been pro-

jects in Hawaii and Puerto Rico, and that has led to one commercial operation in Puerto Rico and several in Hawaii.

We are moving forward based on the national commissions that have looked at aquaculture production in federal waters, not only the U.S. Commission on Ocean Policy, but also the recent study from the Woods Hole Marine Aquaculture Task Force. But the drivers go back to the 1980s with the National Aquaculture Act, which stated that development of aquaculture—all forms, freshwater and marine—was in the national interest. That law set up an inter-agency group called the Joint Subcommittee on Aquaculture (JSA), in which NOAA represents the DOC on the Executive Committee. It is permanently chaired by the USDA. The U.S. Fish and Wildlife Service (FWS) is an active player. The JSA is a vehicle for any federal agency dealing with aquaculture to get together on a quarterly basis to engage in discussions about aquaculture policies and regulations.

One of the provisions in that law that had not really been looked at too seriously over a steady period since 1980 is the regulatory barriers and impediments to aquaculture and to working together to facilitate the regulatory process for the industry. And so, that is part of what we are doing, both in terms of the offshore and what we can do in terms of NOAA's role in the nearshore area. We have DOC and NOAA policies that support aquaculture as well. We have been talking to stakeholders and we have dealt with experts to develop models and other tools we can use in aquaculture.

As I mentioned earlier, I have participated in university studies. The University of Delaware study<sup>22</sup> looked specifically at a framework for the offshore, and the second phase of that study<sup>23</sup> came out only earlier this year on how to operationalize the recommendations in that study. A lot of that dovetails with the recommendations from the other reports we have seen, i.e., that NOAA should take the lead, we need legislation, we need environmental provisions, and we need to monitor results. A lot of these studies are converging—telling us we are moving in the right direction on what we are trying to accomplish.

As I mentioned, we have had some competitive grants and congressional appropriations targeted at some of our aquaculture activities, both for stock enhancement and commercial operations, and we continue to work on the stock enhancement issue. There is a lot of overlap because if you figure out how to culture a fish at a hatchery, well, what you do with that fish could serve different purposes. You could be releasing it into the wild to replenish wild stocks, or you could sell it to a producer to put in a pen or other grow-out facilities and then you raise it to market size and sell. A lot of technologies are the same in terms of animal nutrition, genetics, and the like.

I want to close with this schematic, courtesy of the New Hampshire Open Ocean Aquaculture Site.<sup>24</sup> I think it cap-

18. This document is available at <http://aquaculture.noaa.gov/funding/grants.html>.

19. This document is available at [http://www.aphis.usda.gov/animal\\_health/animal\\_dis\\_spec/aquaculture/naah\\_plan.shtml](http://www.aphis.usda.gov/animal_health/animal_dis_spec/aquaculture/naah_plan.shtml).

20. This map is available at [http://aquaculture.noaa.gov/pdf/uscopeez\\_map.pdf](http://aquaculture.noaa.gov/pdf/uscopeez_map.pdf).

21. For more information on the University of New Hampshire program, see <http://www.oaa.unh.edu/>.

22. CICIN-SAIN ET AL., DEVELOPMENT OF A POLICY FRAMEWORK FOR OFFSHORE MARINE AQUACULTURE IN THE 3-200 MILE U.S. OCEAN ZONE (2001), available at <http://darc.cms.udel.edu/sgeez/sgeez1final.pdf>.

23. CICIN SAIN ET AL., RECOMMENDATIONS FOR AN OPERATIONAL FRAMEWORK FOR OFFSHORE AQUACULTURE IN U.S. FEDERAL WATERS (2005), available at <http://darc.cms.udel.edu/sgeez/sgeez2final.pdf>.

24. Graphic available at [http://www.oaa.unh.edu/publications/project\\_briefs/offshore\\_site.pdf](http://www.oaa.unh.edu/publications/project_briefs/offshore_site.pdf).

tures a lot of what we are doing here. This is a schematic of a four-cage system, submerged cages for finfish with submerged long lines for mussels nearby. That helps in terms of environmental impacts—the mussels are filter feeders so they absorb some of the nutrients coming out of the submerged pens. There are projects looking at throwing in some algae culture in here as well, to make it even more multi-trophic. And we have the feeding buoys. There is a lot of technology development to support the industry and this is an automated feed buoy. On the far right is an environmental monitoring buoy at UNH. The results are fed right back into a lab where someone sits at a computer and could monitor what is going on out there.

The boats are very similar to what you might use in commercial fishing. In fact, in New Hampshire, they have had a number of commercial lobstermen and other fishermen who have invested in submerged long line technology for mussels and are now actually growing mussels in state waters in the Gulf of Maine, but in open ocean environments and selling them under a trademark called Isles of Shoals mussels, which is where this area is located.

**Billy Plauché:** I would just comment that as NOAA moves forward looking at offshore aquaculture, a plea of sorts: “Do not forget about the nearshore environment.” I mean it is true that shellfish are good wastewater treatment devices out here for the offshore aquaculture, but it is also a great crop on the nearshore. Please keep focused on what already exists as a good viable commercial industry, if we can just get the regulatory system working.

**Becky Goldberg:** I just would like to offer an observation on the argument about seafood imports that—70 or 80%, depending on its figures—you said, U.S. seafood is now imported. You said, I guess, 40% from—

**Susan Bunsick:** About 40%—

**Becky Goldberg:** From aquaculture, and those figures are certainly approximately right. And so the argument is that we have to have offshore aquaculture because we do not want to be importing all this food. But it is a little bit of an odd argument to me, an era where at least many people in government espouse a degree of globalization and production as opposed to flow to where it makes the most sense economically. Well, I think there probably is an opportunity for aquaculture to grow in the United States. The fact is that operating offshore is going to be expensive because you have got to deal with equipment that is three miles or more offshore and going back and forth with boats and all that sort of thing. And labor costs are clearly much cheaper in other parts of the world for fish processing and so on.

And so, well, I can certainly understand an impetus for aquaculture development activities in the United States. From a personal perspective, I have always been a little bit suspect of the argument that we should be doing this to close the U.S. seafood deficit because I just do not see that as a possibility, particularly as the U.S. population seems to keep wanting to eat more and more seafood.

**Susan Bunsick:** Well, I do not think you would eliminate it, of course, but I think the economic opportunities are a consideration, for instance, the cost of distributing goods

around the world, of flying fish on ice from wherever you are growing it in Chile, or wherever else. You have to factor in those added costs, as well. But as government, our role is to set up a clear regulatory framework and it is up to the industry to decide whether they think they could be successful in that environment.

The problem has been, to date, that the regulatory environment has been very unclear and you do not want to go and invest if you might be closed down in a year or two. You want something that says, “If I submit all my paperwork and I get a permit and I comply with all the terms and conditions, barring any unanticipated emergency, I can go on operating for a reasonably long time and have a chance of making money at my business,” and that is what we are trying to do.

**Richard Smith:** I have two general points. One, with respect to the question of federal legislation, I think we should keep in mind that success is not going to be defined in that arena by passing an offshore aquaculture bill, it is going to be defined by passing an offshore aquaculture bill that will foster U.S. offshore development of aquaculture systems. We can have a really great gold-plated bill that makes everybody happy to the nth degree, but if no one takes an interest in actually producing out there, we fail, period.

We also want to keep in mind the issue of food safety and food security. Relying on other countries to produce a primary sector of our protein sources is probably not the best approach for the long haul, both in terms of maintaining the quality of our food sources and the availability of those sources in the future. If we transition from a global market system that focuses on the need and distribution of energy to an economy and global system that focuses on the need for protein sources, we should be prepared with all our resources to have that be a multisector contributing production system in the United States.

## VI. Questions and Answers

**Audience Member:** One thing that surprises me about the discussion so far has been the lack of an ecosystem approach to these sorts of things. On the one hand, a discussion of a little bit of a fallacy that I heard from Miss Goldberg with respect to the species mix—if you introduce non-native species and they breed with the native species and produce offspring, they actually are the same species. If they can produce five offspring, they are a single species. You are talking about different varieties of the same species; that is not ecologically correct to talk about those as being different species. On the whole system aquaculture approach, it seems like when we are talking about shellfish that can filter out nutrients, finfish that are consuming or producing chemically active nutrients—and you mentioned a little bit I think, Ms. Bunsick, about the aquaculture, that in effect if we could look at some ecosystem approaches that allow us to bring all those together in the same location, particularly where we are getting some terrestrial man-based concentration of nutrients. We really can actually set up some filtration systems, but bays and open areas of sea that can really be processing our nutrients cycles are very important, with some potential implications for global climate—or carbon sequestration.

The last point I was curious about is the role that eco-tourism, particularly, recreational fisheries, might play in inte-

grated aquaculture that pulls from the top-level species by bringing them toward the closed areas like in southern California in-shore, or whether that might be a way to reduce impacts on the wild species of certain key fishery areas.

**Becky Goldberg:** I want to react, although I do not really understand your first comment about species. So suffice it to say that there is no one biologically accepted definition of what makes a species; people still debate about that. And in the case of Atlantic salmon, where there has been concern about genetic impacts and we are trying to restore wild Atlantic salmon populations, and to have this continual flow of essentially not such great genes into the wild Atlantic salmon population is a really big problem. And we might see similar sorts of situations with offshore aquaculture where, for example, Atlantic cod is being targeted for aquaculture development; it is down in the dumps in terms of the wild populations. Cod has an intricate population structure, sort of akin to salmon, and we might see these same sort of genetic impact issues even though we are farming native species.

But I want to also respond to what you said about people not talking about an ecosystem approach. You know, I think that is very important and I cannot tell you how many topics I threw out of my talk because I was told I had 12 minutes.

One of the most promising technologies is one Susan talked about, where we take more of an ecosystem approach to aquaculture development. We do not go for the feedlot style monoculture that has characterized industrial animal production in this country, but actually ask how do we create a constellation of several species that we grow together in order to maximize output for our input of feeds, and also recycle the nutrients that come out of the farms.

And so, there has been a lot of work with growing salmon, with mussels, and seaweeds to do this, although [it is] not available on a commercial scale. There is a more intricate operation now going on in an experimental operation in British Columbia, which has about five or six species with flat cod at the center, but sea cucumbers underneath to eat the feces as they come down. So we need more of that approach.

The other area where a much more ecosystem-based approach is needed is in the fish feed sector where we have entire major fisheries—something like 30% of the world's captured fisheries are captured in order to make animal feed. And these fisheries are managed with a traditional single-species approach where you catch as many fish as you think you can and let the population not crash. But these capture targets are not set with any consideration of what taking that many fish out of the system means for all the other critters in the marine food web.

And there is now an area of fishery science called ecosystem-based management, which is emerging to try and consider these sorts of issues. But nowhere is it more important than in the so-called reduction fisheries for fish feed because those fisheries tend to be smaller, with less valuable fish, lower on marine food webs. And if we take too many of them out of the ocean, we are undercutting marine food webs.

Ecosystem-based management is a really, really critical part of the approach to dealing better with the issue of aquaculture feeds. It is true what Richard said, that in terms of in the last decade or two decades, the total catch of fish for feeds has not increased markedly globally. But no one

knows really if that catch that we are getting now is okay or whether it is actually undercutting marine ecosystems overall, all the commercially valuable predatory fish, sea birds, seals, and so on that depend on those fish for food.

**Billy Plauché:** Just on the ecosystem management piece, that is really something that the shellfish community has been pushing quite a bit for as we go through some of these consultations. It is far easier to study the very site-specific impact when you put up an oyster down on a blade of eelgrass—does the eelgrass go away?—than it is to look at an entire estuary. And what we have found is that the estuaries where shellfish are cultivated are the healthiest estuaries on the West Coast. But coming up with a study that quantifies to a mathematical certainty the benefits shellfish have on the estuary is extremely difficult.

There are a lot of studies showing the water quality benefits, the eelgrass growth, estuary-wide benefits of shellfish culture, the habitat benefits that the shellfish provide, oftentimes, providing mixed habitat from eelgrass and shellfish. Overall, shellfish are a net benefit to estuarine functions, but what we find in going through some of these very site-specific consultations is that those big concepts are really hard to reduce to mathematical certainty.

**Audience Member:** I am the Director of Marine Fisheries for the state of Mississippi. In 1967, I attended a marine fish husbandry meeting put on by Oregon State in Newport, Oregon. Forty years later, Susan says aquaculture is a national priority. I hope we do things a little faster in the next 40 years, but I agree, it is a national priority. In my former life as 30 years Director of Fisheries for the state of Louisiana, I did not know I was in aquaculture business. We leased some 400,000 acres at one time. It is all going to be competition for the available space. In Mississippi, currently, a lot of our problems have been taken care of, unfortunately, by the big mansions along the waterfront. It is not the way I would like to see things done, but that is what is happening.

One of our biggest problems that I see—and this is a global problem—is not restricted to the Gulf, although it seems to be on our forefront now because of the storms in Florida, Mississippi, Alabama, and Louisiana. We are not going to have access to waterfront for any type of fisheries operation because waterfront property is so valuable. In some cases in Mississippi, casinos seem to be the thing, high-rise condominiums and this sort of thing. If we do not have waterfront access for whatever uses we need, I think all of these fisheries are going to be moved.

Now, in Louisiana, in those years when I was working with the oyster farmers, there was another industry involved and that was petroleum—oil and gas. The only group that was in competition with oil and gas would be oyster farmers. Had it not been for the oyster leaseholders, oil and gas could have really gone rampant. And that coastal area in the Gulf could have had a tremendous amount of additional damage, but because the oyster leaseholders were in place, oil and gas just did not run rampant.

**Audience Member:** I think your description of the whole regulatory permit system was addressing the offshore permit systems. And I was wondering is that similar for the inland water and lakes permit systems?

**Richard Smith:** Well, my presentation was on the near-shore, up to roughly three miles offshore. Inland, obviously, you do not face a similar state-regulated leasing issue. We are talking about recirculating systems or pond systems inland, they typically would need discharge permits, for example, unless they are entirely recirculated, and even the recirculated systems have some material that is typically going to be in an effluent stream.

So, they may have discharges that are regulated under the CWA. They would not have structures permit requirements from the Corps or the state programs, but they might also be regulated by the DOA if they have an aquaculture program. There are some licensing and record keeping and reporting requirements that would typically apply. And obviously, that changes state-to-state and it does not even mention the very local issues of zoning and similar restrictions.

**Becky Goldberg:** Just to offer a comment on that, I think the major distinction is many of the inland systems are on private property and the marine systems are not.

**Audience Member:** I have a question and perhaps a challenge for Susan and NOAA. You mentioned in your talk that your primary role at least in the nearshore is a consultative role in the processing of permits and the effects of these aquaculture operations. Why in the nearshore applications of the CZMA, particularly in §309, can you not have a more facilitative role in helping us address some of these conflicting usages? Section 309 provides state funding for comprehensive aquaculture planning that could help us address some of these areas and I think it is an area in which, instead of just being consultative, you could be facilitative.

**Susan Bunsick:** I think that is a good point. What I did not play up in my talk . . . is that the NOAA Aquaculture Program is actually what we call a matrix-managed program. I work for NOAA Fisheries but we run the program for all of NOAA. The National Ocean Service would be the part of NOAA that is responsible for CZMA-type activities. That is definitely something we will put on our radar screen to discuss.

**Audience Member:** I have seen it done successfully elsewhere around the world.

**Audience Member:** Susan, in working on the regulatory structure for offshore aquaculture to facilitate business making the choice of going offshore or not, to what degree are you working on siting questions as well as construction and structural questions? How will marine aquaculture survive what appears to be increasing storm activity?

**Susan Bunsick:** Siting is actually at least as important as the technology because of the other uses and because of the physical requirements of the site. Right now, most of the cages need about 120 feet of water, and they need to be anchored somehow. So sites cannot be too shallow because the waves will be too strong, but they also cannot be too deep because they have not figured out how to anchor at that depth yet. They may in the future.

The user conflicts you have been hearing about and the appropriate site in terms of current, temperature, and salinity, is something we are starting to work on. As we move forward with the federal program, it is definitely an important part of what we need to do in terms of identifying potentially good sites. I do not think we are at the point where NOAA could go and say this whole area of the ocean shall be aquaculture—we do not have that authority at this point. But we could go and study it and say these are things that seem to be more appropriate for the types of technologies now and not preclude someone from nominating a site outside that area.

**Audience Member:** I wanted to ask with respect to open ocean aquaculture, how much consideration has been given to rights and obligations under customary international law?

**Susan Bunsick:** Are you talking about in terms of delineating the EEZ or in terms of who would be eligible to . . . ?

**Audience Member:** No, I am really talking about obligations to protect the marine environment.

**Susan Bunsick:** Okay, the proposed offshore act would not override any existing laws or international treaties or anything. So to the extent—well, just the management of aquaculture in the EEZ falls under the Law of the Sea management of resources, and that is how that would play. Yes, in terms of the rights of passage and all, that would all be still enforced. We would not affect that.

**Audience Member:** And if there were conflicts with some of these partners from overseas, how would you see those being resolved?

**Susan Bunsick:** I am not going to speculate on that. At this point, I do not see that as being an immediate issue on a horizon.

**Audience Member:** With all the imports coming in from unregulated foreign fisheries, and with our potential to develop regulated fisheries here, why do you seem to say we should not develop here but we should let development happen elsewhere, where there might not be regulation? Does it make better sense to get a good environmental policy for the world, and not just for the United States?

**Becky Goldberg:** I am not against aquaculture development here. The point I was making was that while there may be opportunities for fish farm development here as well as the opportunities to create models for the rest of the world, or technology that can be used elsewhere, I question one of the rationales for U.S. aquaculture development that we are somehow going to close or largely close our seafood deficit. I think that the economics of production are probably going to continue to drive growth in overseas production for import here because of the case of offshore aquaculture, the cost of operating offshore, because of labor cost and so on. And so I do not see the U.S. seafood deficit as going away.