

Blue Hill Bay Under the Microscope Over Atlantic Salmon Farming Plans *By Gregory Williams*

BLUE HILL—To farm or not to farm—salmon that is.

That is the question floating around Blue Hill Bay these days as proposals to raise more than a million finfish in the bay meet with concerns from scientists, state and federal organizations and residents.

Many concerns expressed to date revolve around the environmental impact finfish farms may have on the health of the bay's waters and marine life.

The aquaculture proposals, made by Atlantic Salmon of Maine and Acadia Aquaculture, involve raising salmon to be sold in larger consumer markets, using net pen aquaculture techniques.

The fish would be raised from smolts to market size within 24-square-meter steel pens. They then would be harvested, processed and trucked to markets primarily along the eastern seaboard of the United States.

Potential Impacts

Area residents in recent weeks have expressed concern about a variety of potential impact farms may have on the surrounding environment. Among the concerns are low-current velocities, the bay's ability to flush waste produced by the fish into the Gulf of Maine, increased algal and bacterial growth and the loss of biodiversity.

"My feeling is if we have reasonable doubts, it is better to look for sites we can be more confident in," says Neal Pettigrew, an associate professor of physical oceanography at the University of Maine in Orono and a Blue Hill resident. "We have the technology to study this bay in plenty of detail."

Pettigrew, who has served as a coastal circulation specialist in a five-year study of Penobscot Bay begun in 1996, says more should be understood about Blue Hill Bay's circulation before more leases are granted.

The parties involved in the debate agree that the current rates are low and that little is known about the bay's circulation patterns, but they disagree on whether that means finfish aquaculture is unacceptable for Blue Hill Bay.

Officials from the Department of Marine Resources, U.S. Army Corps of Engineers and Department of Environmental Protection say they are concerned by the low current rates in the bay because they may result in the buildup of waste under the pens, depleting the biodiversity of the surrounding marine environment.

Reducing Footprint

They also agree that if site managers practice good husbandry—such as reducing the spillage of food pellets, producing an acceptable number of fish and moving the pens around within the lease sites—the "footprint" on the sea floor could be reduced.

Pettigrew is not convinced, saying that before the state grants leases to companies wanting to farm finfish in Blue Hill Bay, more research must be done on the flushing cycle between the bay and the Gulf of Maine.

Pettigrew says he understands that the state monitors sites for environmental impact, but he fears that if leases are granted, the result will be that the state will be in the position of having to close down the sites.

This, he says, would generate significant resistance from companies, given their investment. The cost of Atlantic Salmon's 28 proposed pens, barge and accessories off Long Island would exceed \$1.6 million, the application states.

Pettigrew says the currents may not be strong enough to sufficiently disperse the spilled feed and fish waste falling through the water column under the operation. This, he says, could lead to the formation of bacterial mats and environmental degradation of the sea floor community directly under the pens. Such mats, he says, indicate a "complete loss of the macrofaunal community"—consisting of a variety of marine creatures, such as crustaceans, fish, worms and anemones.

Serve as Caution

"We really don't understand much of anything concerning circulation in Blue Hill Bay," Pettigrew says. "I'm afraid, frankly, we could have a problem."

This, he says, "should serve as a caution to slow down" the process of granting permits for finfish farms in the bay.

Pettigrew says he is not opposed to aquaculture enterprises per se, but simply wants them to be located in suitable sites. Blue Hill Bay's "very low currents," he says, suggest that the area is not suitable for finfish farming.

John Sowles, a biologist and director of the Department of Environmental Protection's marine program, agrees with Pettigrew's claim that there is little understanding of the bay's circulation patterns and that the bay's currents are slower than at existing aquaculture sites.

Sowles says that his department judges aquaculture operations solely on their impact on water quality and habitat. He says the department is concerned about

the potential environmental impacts, but that it does not have a sound basis to deny the proposals up front.

Sowles says the fine-grained silt and mud sediments off Long Island suggest low current rates incapable of dispersing the fish waste. Those found off Bartlett Island, he says, suggest a "slightly better" location.

Classified Waters

The state legislature, he says, has classified Maine's inland and coastal waters to protect water quality and marine habitat. Blue Hill Bay, Sowles says, is classified as an "all purpose" area, in which the loss of any indigenous marine species is unacceptable.

Slow currents, shallow depths and inadequate husbandry can lead to the build up of organic matter—such as bacterial mats—resulting in the elimination of indigenous species. He says that when and if a site's impact gets to this point, the DEP is required by law to correct the situation.

"Most people know I am a firm promoter of aquaculture, but I hold the line when it comes to environmental impact," Sowles says. "It has a place on the coast, but we can't get so enthusiastic that we forget about the natural resource [the marine environment]."

After hearing news a decade ago about "severe" environmental impacts from finfish operations in Norway, British Columbia and other areas of the world, Sowles says the department began to conduct studies along the Downeast coast. Some sites, he says, were found to impact the marine environment in an "unacceptable" manner and were downsized or abandoned.

Unacceptable impact, he says, primarily means a resulting formation of bacterial mats, dominance of one or two species and the subsequent elimination of other sea life and the presence of toxic hydrogen sulfide gas, not considered a danger to humans, but rather to sea life—including the very finfish being farmed, he says.

When a Concern

Such activities, he says, do occur naturally on an occasional basis without the presence of finfish farming. It is when the evidence becomes more regular that it is of concern to the department, he says.

Sowles says that finfish operations contribute "quite a load" of nutrients, including nitrogen and phosphorus, which when in excess can lead to increased algal growth, in addition to the bacterial mats. He says such enrichment can be

beneficial—as it may also lead to increased numbers of fish—until it begins to dominate other sea life.

Jon Lewis, aquaculture specialist for the Department of Marine Resources, agrees with the claim that the currents at the sites have "very low" rates. Lewis says he has a concern about the currents and that the Blue Hill Bay site reviews are the first in which he has commented on current speed and sedimentation.

He reports that "periodic storm driven waves may substantially increase the water velocity" at the sites, though the muddy sediments on the bottom suggest otherwise.

Lewis says that, if approved, the Long Island site—with a maximum production of 10 million pounds of fish—would be the largest site in Maine.

"At 10 million pounds, I anticipate that that is a large load for that site," Lewis says. Sowles agrees.

Impact Method Needed

Lewis says his department has discussed and recognized the need for a method of looking at the cumulative impact of finfish aquaculture proposals, but currently has nothing in place. Sowles says his department has had similar discussions with no results and that it is up to the legislature to implement a plan.

"It's a classic case of a lack of a long-term use plan for coastal waters," Sowles says. "At some point we're going to be faced with having to do that."

Sowles says the waters belong to the state—including its residents—and that no matter how unpopular it is, zoning will be necessary. Right now, he says, it is a "free-for-all."

Lewis and Sowles say they are concerned about having a program in place to monitor the cumulative effects of fish waste that has been successfully flushed away from existing pen sites by currents and wave activity and deposited elsewhere.

Sowles says that experience with existing sites shows that the waste is often deposited in the vicinity of eddies—or swirling waters—which collect the waste after being dispersed from the pens. But because the the circulation of Blue Hill Bay is not understood, the state does not know where to look for such deposits when monitoring sites.

Compared to Norway

Bob Hukki, assistant farm manager for Atlantic Salmon of Maine, says that the bay's currents are sufficient and are comparable to those around pen sites in Norway. He says environmental problems have resulted at those sites in the past, but salmon farmers have adjusted their techniques to reduce the impact.

When asked about the usage of container bags—or "diapers" as they are referred to in the industry—to catch the spilled feed and feces, Hukki says that such a technique has been tried elsewhere, but that it just "moves the problem somewhere else."

Jay Clement, project manager for the U.S. Army Corps of Engineers, says the bags "work to a point," but that spillage can occur.

Hukki says that the best ways to reduce the impact are to control production and limit the amount of feed. Allowing the site to sit fallow every other year, he says, would let the natural biological activity—such as the decay of waste and the ingestion of spilled feed by sea life—heal the environment.

Clement agrees with Hukki on this issue and says the corps can include conditions on the lease to reduce the environmental impact from spilled feed and fish waste.

The proposed sites in Blue Hill Bay have greater depths than sites farther Downeast, which Clement says should allow for better dispersion of spilled feed and waste.

Other Sites

Tidal ranges at sites farther east can be up to 22 feet Clement says, or much larger than that of Blue Hill Bay, which he estimated to be around 10 feet. This, he says, suggests better flushing due to the movement of more water.

"There are valid concerns that have been raised about low currents," Clement says. "Whether that is mitigated by the depth and best management practices the company intends to employ has yet to be determined."

Clement says that monitoring sometimes shows a "surge" in marine life populations being fed by the spilled food. This, he says, is called the "birdfeeder effect" of the pens. Sowles says such bottom enrichment is good to a point, but if there is too much, it will lead to a few dominant species. Clement agrees with Sowles, saying a case could be made for the loss of biodiversity.

Hukki says he doesn't see spilled feed being an issue, but admits feces from the salmon could be a problem without adequate precautions.

The addition of waste from more than 1.3 million fish that would be grown at the proposed Bartlett and Long Island lease sites, Pettigrew says, would create a situation "very similar to a sewage problem."

A multiyear study, completed in 1992 and funded by state and federal money, determined that at a Toothachre Cove salmon pen site off Swan's Island, shows that bacterial mats develop due to slow currents, but are flushed away by annual storm activity.

Clement says the study shows that the "long-term environmental impacts" at that Toothachre Cove site have been "minimal," as have been those at other sites in Maine. He says "the findings made to date do not show significant environmental impacts."