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Philip W. Conkling  
*Island Institute*

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# Fish or Foul?

## Will Aquaculture Carve Out a Niche in the Gulf of Maine?

by Philip W. Conkling



*Despite early promise and an optimal environment, aquaculture has grown more slowly in Maine than it has in other parts of the United States and the world. As Philip Conkling explains, this is due to market forces, scientific and technical issues, cultural opposition, and, more recently, the threat of an endangered species listing for Atlantic salmon. While near-term prospects for significant expansion of the industry appear bleak, Conkling suggests that a fresh generation of pioneers may be able to carve out a new niche, but only by conducting “old fashioned” research and development—on the job, on the water, and in local communities along the coast. 🐟*

The rationale for aquaculture in global terms is overwhelming. According to the United Nation's Food and Agriculture Organization estimates, more than three-quarters of the world's fisheries have reached or exceeded their maximum sustainable yield while the average per capita consumption of fish, especially in developed countries, continues to increase.

Because wild fish harvests cannot meet the increasing global demand for seafood, aquaculture production continues to increase as a share of the fish that is consumed worldwide. In the 1980s, aquaculture production contributed a scant 10% of fish and shellfish consumed worldwide. By the mid-1990s, that share had grown to a quarter of worldwide fish consumption, and that percentage is expected to double sometime in the next decade. In the United States, aquaculture is the fastest growing segment of the agricultural sector, producing slightly less than \$1 billion of farm-raised fish and shellfish products. On the other hand, we import over \$14 billion in seafood products from around the world, three-quarters of which are produced through aquaculture. This value represents the United States' second largest natural resource-based trade deficit, second only to oil.

In the next decade, what role, if any, will Maine coastal and offshore waters play in the expanding aquaculture production in the United States? Although none of us can see far into the future, the near-term prospects for significant expansion of Maine's aquaculture industry appear bleak. The impending listing of wild Atlantic salmon under the federal Endangered Species Act directly targets current operational practices of Maine's salmon aquaculture industry, by far the largest segment of the Maine aquaculture by volume and value. Beyond the direct consequences of a federal listing are inevitable indirect effects. The first citizen-based lawsuits targeting salmon aquaculture operations have already been filed, and there are likely to be more. The lawsuits are fueled by a host of fears, including concerns that beaches and marine environments around fish farms are polluted by feces and farm wastes in an unregulated manner. Other concerns center on fears that farm-raised fish are fed hormones and antibiotics

that can upset the natural evolution of wild species; and on fears that the fin fish aquaculture industry is responsible for allowing escaped farm-raised fish to enter rivers where wild salmon spawn.

#### MAINE'S MARINE ENVIRONMENTS

Maine's saltwater environments potentially available for aquaculture development are a natural endowment of national significance. The state enjoys an enormously long coastline that is compressed into the 250 air miles separating Kittery in the southwest from Lubec at Maine's eastern border with Canada. But within that length are approximately 7,000 miles of saltwater coastline which include 4,500 miles along mainland shores and another 2,500 miles of island shorelines. The bays of Maine from Cobscook and Machias in the east, down through Blue Hill, Jericho and Penobscot in the midcoast to Casco and Saco bays in the western Gulf of Maine offer an astounding variety of habitats with varying temperature regimes, salinities, nutrient conditions and degrees of protection from storm events that can wreak havoc with marine enterprises.

Currently, Maine's aquaculture production consists of approximately \$70 million worth of farm-raised fish and shellfish. The vast majority of this value—over 90%—is produced by the state's Atlantic salmon farms. The remainder of Maine's production derives from small shellfish farms, many of which have specialized in oyster production. Maine's salmon farms have been concentrated in eastern Maine in Cobscook, Machias, Pleasant and Narraguagus bays while the shellfish industry has been concentrated in the Damariscotta estuary.

In the United States, aquaculture is the fastest growing segment of the agricultural sector, producing slightly less than \$1 billion of farm-raised fish and shellfish products.

## EARLY PROMISE: THE EMERGENCE OF AQUACULTURE IN MAINE

Maine salmon farms gained a foothold in the Eastport area in the mid-1980s for three reasons. First, in the early 1980s the Canadian government directly promoted and heavily invested in salmon aquaculture in Passamaquoddy Bay, New Brunswick, just across the border from Eastport. In the early, heady days of salmon aquaculture expansion in New Brunswick, Maine entrepreneurs looked jealously across the international boundary and quickly concluded that the combination of growing conditions that seemed to favor salmon production in New Brunswick also existed in Cobscook Bay. During the mid-1980s, before salmon became a global commodity, salmon farmers were able to market their product for upwards of \$6

In the early 1990s salmon prices entered into a decade-long period of a nearly irreversible price declines.

per pound, in comparison to approximately \$2 per pound today. At such prices, small fortunes could be quickly made, and a multitude of mistakes or bad luck in one year could be recouped from harvests in subsequent years. This, of course, is no longer the case.

A second important reason why the salmon industry was able to expand in eastern Maine was that the opposition to its existence came not from politically powerful groups of summer residents and lobster fishermen, as occurred in midcoast Maine, but from relatively less active and less well-organized groups of traditional fishermen. Scallop draggers and groundfishermen, for instance, who opposed salmon aquaculture in the Eastport area because it infringed on their fishing activities, didn't have the political clout of lobstermen, and their industries were in the process of a slow and painful shrinkage from a collapsing resource base as aquaculture production increased in the early 1990s.

Finally, state regulators and government leaders favored salmon aquaculture's presence in eastern Maine and helped promote its expansion throughout the 1990s. After decades of deeply entrenched unemployment in Washington County, the emergence and rapid growth of salmon aquaculture there seemed to be a godsend. The early salmon farms in Cobscook Bay consisted of a handful of independent farmers who would, it was hoped, reduce job losses and fishing pressure on wild stocks while ushering in a new era of family-based salmon farms reliant on the region's nearly pristine waters. It sounded almost too good to be true—and it was.

The state's shellfish aquaculture industry emerged in a different manner, and it is instructive to contrast its history and prospects with that of its larger "sister" industry of fish farming in eastern Maine. The emer-

gence of shellfish aquaculture in Maine derives almost entirely from one source: the University of Maine's Darling Marine Center in Walpole on the eastern shore of the Damariscotta River estuary. In 1965, a gift of land and funds to build a marine laboratory for the University of Maine led to the

establishment of a facility to provide instruction, expertise and an "incubator" environment for a handful of shellfish farmers who pioneered the industry in Maine. University researchers teamed up with young entrepreneurs, primarily graduate students, to understand the larval development of various species of clams, oysters and mussels, and to develop production techniques suitable for the unique growing conditions found along the Maine coast. Throughout the following two decades, a significant majority of all successful shellfish farmers in Maine derived from the Darling Marine Center's program.

## REALITY SETS IN

In the early 1990s salmon prices entered into a decade-long period of a nearly irreversible price declines. By 1990, the heady days of farm gate prices

of \$5-\$6 a pound were already a distant memory. Business models for new farms seeking financing were based on the assumption of a new reality where prices in the range of \$3.50 per pound were projected.

However, even these more realistic business models had to be adjusted, often before the new salmon production facilities could get up and running. By then, large volumes of salmon from Norway and Scotland had begun to depress prices in Maine and eastern Canada. One of the immense challenges of salmon farming operations results from the biological fact that young salmon raised and fed in ocean net pens take an average of eighteen months to reach marketable size. The young salmon, called “smolt,” that are placed in these net pens have already spent an additional eighteen months in fresh water hatcheries before they are physiologically ready for salt water. Add to this another year at minimum for regulatory review and approval for hatchery and grow-out sites, and it is quickly apparent that integrated salmon production facilities take three to four years of heavy, up-front investment before the first dime is returned on that investment in sales.

During the first half of the 1990s, salmon prices had slumped below \$3 a pound for the first time, causing an initial round of bankruptcies and consolidations to occur. The early dream of a salmon industry composed of a large number of independent fish farmers up and down the coast of Maine had been left behind in the wake of increasing global competition.

Norway has long been the dominant player in salmon technology development and it has dominated world markets. As production increased from large industrial facilities along Norway’s western coastline, Norwegian salmon companies saturated European markets and began to aggressively market excess production in the largest salmon market in the world, which is found in the dense metropolitan belt between Boston and Washington.

The reaction from American salmon producers, most of whom were located in Maine, was to initiate an International Trade Commission (ITC) proceeding alleging that Norwegian government subsidies to its domestic salmon industry constituted unfair trade

practices. The American producers sought a tariff on Norwegian salmon imports. The ITC ruled in favor of American (Maine) salmon producers and imposed a tariff of 25% on Norwegian salmon. Be careful of what you wish.

The jubilation of Maine salmon farmers expecting to see salmon prices stabilize in the range of \$3 per pound, allowing them to remain competitive, was short lived. The virtual exclusion of Norwegian salmon from the large and expanding American markets resulted not in increased opportunity and profits for Maine (and Canadian) salmon growers—but instead, an opening for a new competitor that had burst onto the world scene.

Salmon had become such a valuable global commodity that large multinational corporations had taken notice, including companies such as BP (the old British Petroleum) that were looking to diversify into new businesses. Salmon—especially Atlantic salmon that are more highly favored in the market than sea-ranched Pacific salmon—cannot be raised just anywhere, but one area of immense potential exists along the immensely long, island-protected shoreline of Chile. The multinationals that had moved into business-friendly Chilean waters—expecting to export their salmon to Japan—had just scaled up their production in the mid-1990s. The ITC ruling gave them a golden opportunity to enter the U.S. market. By 1995, salmon prices had drifted back down between \$2.00 and \$2.50 per pound as Chilean salmon flooded into American markets. And the bottom was not in sight.

Meanwhile, shellfish farmers had experienced little of the growth and intense competition that had both benefited and afflicted the salmon industry. Shellfish aquaculture has always benefited from high demand and high prices for its production, but technical hurdles from shellfish diseases and predation have literally plagued this sector of the industry. Shellfish farmers in Maine have had important and valuable niches in their respective markets, but have generally been unable to scale up production to become a dominant force even in local areas.

The only large shellfish aquaculture company—Great Eastern Mussel—had disappointing results in

“bottom culture,” where seed mussels dredged from shallow waters are scattered at controlled densities to grow out on bottom leases. To begin with, mussel leases were notoriously difficult for Great Eastern to acquire. Great Eastern’s strategy was to develop local partners that would submit applications for leases, then acquire seeds from Great Eastern and sell the bottom-cultured product to Great Eastern one-and-a-half or two years later. But contract mussel growers were reluctant to invest their time and resources in developing lease sites and then be required to sell their product to only one market for processing. Particularly Downeast, growers are wary of making themselves dependent on one “big corporation.”

Great Eastern also faced local opposition. The idea of “fencing off” the ocean commons for the benefit of private companies ran directly into the buzz saw of the prevailing political philosophy of most Maine fishermen—the waters are for the benefit of everyone, or at least of anyone who has the pluck to defend individual territory against outside depredation. Besides, the tradition had always been that most important marine resource allocation issues, certainly in the lobster fishery, were decided informally at the local level and not through complicated state adjudicatory proceedings. Repeated lease applications submitted by Great Eastern throughout the 1980s were invariably greeted by intense local opposition. When some applications were granted, opponents responded by going to the Maine Legislature to argue for changes in Maine’s aquaculture law. The result of those appeals was to increase the regulatory hurdles aquaculture lease applicants had to surmount, which were generally discouraging to new or would-be entrants into any aquaculture operation.

Certainly another part of the disappointment for the shellfish aquaculture sector resulted from an unfortunate change in priorities at the University of Maine’s Darling Center. The University found it difficult to manage this distant branch, located far from the Orono campus. In the early 1990s parts of the Darling Center program and staff were relocated to Orono and other parts gradually went downhill until resignations and retirements had emptied the Center of its earlier talent

and resources to support shellfish aquaculture enterprises. To be sure, the Darling Center reinvented itself as a center for summer research attracting many nationally and internationally recognized experts, but from the aquaculture industry point of view, the change in program focus was a large disappointment.

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## RECENT DEVELOPMENTS

As the 1990s drew to a close, the salmon aquaculture industry went through several more rounds of consolidation as the pace of global competition among multinational organizations continued to increase. Salmon prices hovered around \$2 per pound, certainly a boon for consumers, but at a cost of continued consolidation in the industry. Recently, prices have firmed a bit into the range of \$2.50 per pound.

It is interesting and symptomatic that the vertical integration of ocean grow-out sites with fresh water hatchery facilities had gone a step further upstream. Several of the largest players in salmon aquaculture are now the feed companies that have acquired both hatchery and production facilities. They can, in effect, decide on a year-to-year basis where to make their profit in an environment of steadily shrinking margins. As prices continue to soften, hatcheries have been forced to sell smolt at lower and lower prices. As hatcheries have become less profitable, profits can still be made by selling feed. But the feed companies need the farmers to stay in business if they are to have customers, so investors have begun to acquire the feed companies as well as the hatcheries and the farms themselves.

Recently, Maine’s salmon industry mounted another international trade case, this time against Chile alleging that Chilean salmon producers were dumping salmon in U.S. markets at prices below their production costs. The case was resolved in favor of Maine salmon growers, resulting in an excise tax of 4.5% levied on imported Chilean salmon. It may not have leveled the international competitive playing field for Maine salmon producers, but the resolution of this second case brought in a general firming of prices and just enough breathing room for production to begin increasing from Maine’s salmon farms by the late 1990s.

## ENDANGERED SPECIES

Just as the global economic picture brightened for Maine salmon producers, the industry was under pressure again from a new threat. During the past year, the United States Department of the Interior has signaled its intention to list the Atlantic salmon population in seven Maine rivers as threatened under the Endangered Species Act. Many individual salmon runs in Maine rivers, where the fish were once abundant, have long since gone extinct as distinct population segments. Their disappearance is the legacy of a century of dam blockages, habitat destruction and pollution. But the federal government contends that salmon runs in the seven rivers, primarily in eastern Maine, represent genetically recognizable distinct population segments, and that their numbers have declined to such low levels that a federal listing is advisable. It is unlikely to occur this year.

The governor of the state of Maine, along with most of the salmon industry, has challenged the proposed listing on both scientific and economic grounds. The state's official position is that the existence of seven distinct population units in the rivers in question is factually incorrect. The gene pool of the salmon in these rivers, the argument goes, has been modified by decades of stocking by federal managers from non-river specific salmon. Thus, no "pure" fish remain. On economic grounds, the industry argues that business conditions are already so marginal that the additional regulatory burdens that would attend Endangered Species Act designation would drive the industry out of Maine to invest in other regions, where environmental regulation is less stringent.

The Department of the Interior, which is responsible for enforcing the Endangered Species Act, is under pressure from a lawsuit filed by several large national and regional environmental groups, all of whom are contending that salmon runs have declined to critically low levels over a period of several decades.

According to official pronouncements from the Maine Aquaculture Association, the future for large-scale salmon aquaculture in Maine will be significantly

influenced by the pending cases over whether an Endangered Species Act designation is biologically or genetically defensible. Parenthetically, many knowledgeable experts believe that, aside from what the ultimate decision over listing is, Atlantic salmon are in decline for reasons that have less to do with the threats posed by salmon aquaculture than the disappearance of adult salmon on their winter feeding grounds. Whether Atlantic salmon, when they leave Maine rivers, are dying as a result of unregulated high seas fishing, or from habitat changes potentially associated with global warming and the consequent shift of their prey species to other regions, no one really knows.

It is undeniable that the multinational corporations that are the backbone of the industry are capable of moving their capital assets from region to region, depending on business conditions. It is also true that corporate public relations campaigns are capable of overstating the threats of government regulation and that they can learn to live with a listing under the Endangered Species Act.

Changes in operating procedures would be required, but whether these would be so draconian as to make salmon production uneconomical would depend on the details of what changes actually would be required. More likely than the salmon aquaculture companies packing up and moving elsewhere is that Maine operations would suffer from a decline in new investment in expanded operations, relative to other areas, given the uncertainty associated with what additional regulations might be imposed.

To add to the salmon aquaculture woes, a local environmental group, Friends of Blue Hill Bay, has recently filed a notice of intent to sue a salmon grower and the Environmental Protection Agency for failing to acquire a National Pollutant Discharge Elimination



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System permit required under the federal Clean Water Act for point sources of pollution.

### CULTURAL OPPOSITION

Beyond the market and regulatory hurdles faced by the aquaculture industry is a deeply rooted opposition to the whole idea of transforming the Maine coast away from traditional fisheries and toward a more “rational” use of the waters for controlled modes of production. In some senses this cultural opposition to aquaculture is like an ancient confrontation between a fishing culture based on “hunting and gathering” and a culture based on tending crops in an agricultural setting. The fact is that despite severe downturns in coastal fisheries, very few fishermen have shifted into aquaculture. The new entrants into aquaculture have come mostly from the ranks of the college educated, who believe they will be able to transform

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their technical training and expertise into a viable and profitable living. By and large, the school of hard knocks has not produced aquaculture entrepreneurs.

Fishermen, especially lobstermen who are politically active and astute, see no reason to cede traditional local control over fishing territories governed by complex kinship and local relations to state and federal bureaucrats wanting to make room for aquaculture to diversify local economies. In this cultural opposition to aquaculture, traditional fishermen are joined by another powerful group—summer shorefront property owners. Many people who are attracted to Maine’s scenic beauty and the immense recreational boating opportunities—and who have spent small fortunes to acquire such assets—are often supremely disinterested in seeing state and federal authorities award exclusive rights to the water column for new “industrial” uses. Although the state legislature and regulatory agencies have not been par-

ticularly fertile ground for opposition from summer residents, the courts have been a remedy of last resort. Many aquaculture leases have either been overturned by the courts or stalled to the point of discouraging further investment from entrepreneurs.

### THE FUTURE

Does aquaculture have a future on the Maine coast? The jury is still out. Despite the abundance of pristine sites along the Maine coast, aquaculture has grown more slowly here than in many other regions of the United States and other countries. The most fundamental reason for the skepticism, if not outright hostility to aquaculture in many towns and harbors along the Maine coast, may result from the fact that the laws regulating its development are administered by state and federal agencies. Local residents are perennially surprised when the fine print of a legal notice is filed in a town newspaper announcing an aquaculture lease hearing for a site in town waters. Because many other activities relating to the use of local harbors and waters are governed locally, a state proceeding immediately tends to put local government officials, fishermen, conservationists and other concerned citizens on the defensive. They react by organizing “David vs. Goliath” campaigns and are often successful in driving off the outside invader.

In such an atmosphere it is difficult for a proposed aquaculture operation to get its case across effectively in the court of public opinion. Maine’s aquaculture statute does require that local harbor masters be notified and approve of a site application, but often the purview of a harbor master does not extend beyond the immediate bounds of the moorings in a harbor. Many successful aquaculture applications have been preceded by intense local outreach to local selectmen, planning boards, fishermen and riparian owners. Such an effort is not required under law, but has been a successful strategy to blunt opposition before it is mobilized by meeting with concerned local residents and modifying the proposal before everyone gets locked into a pitched battle from which retreat is difficult.

This article has pointed out many of the daunting hurdles that loom in the path of salmon aquaculture enterprises that need to expand their operations on the Maine coast if they are to remain globally competitive. Having covered the problems, it is important to highlight the fact that salmon aquaculture is the most technically advanced form of aquaculture currently practiced anywhere in the world. The technology depends on local access to large volumes of fresh water for hatchery operations and access to pristine waters for ocean grow-out. Only three states in the United States have the necessary biological conditions for salmon aquaculture: Alaska, Washington and Maine. Alaska has banned salmon net pen aquaculture as incompatible with maintaining their river stocking programs. Washington State has de facto stopped salmon aquaculture from expanding in Puget Sound as a result of conflicts with riparian owners and environmentalists. This leaves Maine as the one viable alternative left for a domestic industry. If Maine is unable to approve additional salmon lease applications along the coast, this will be tragic for the state's aquaculture interests in the long run.

Even though the picture for corporate fish farming is fraught with difficult challenges, the picture for shellfish aquaculture may be brighter. Maine recently amended its aquaculture law to create a new leasing process for experimental operations of less than two acres. More than fifty new leases have been applied for under this designation, virtually all of them proposing to raise one or more species of shellfish. This surge in lease applications demonstrates that watermen and entrepreneurs are still interested in expanding aquacultural enterprises and opportunities. Many of these new enterprises will not, of course, be successful, but the potential for innovation is substantial and some will likely be able to scale up into significant operations in the future.

If technical hurdles can be overcome, the prospects for shellfish aquaculture may also be brighter because they are less capital intensive in their start-up phases, although the shellfish industry suffers from a low critical mass and from at least a decade's worth of lack of investment in research and development to understand the basic biology of many of the species

that are of interest. Still, aquaculture degree programs are growing at both the University of Maine and at private colleges, and the idea of an owner-operator type of enterprise working along the Maine coast has very deep historic and cultural roots.

If there is reason for optimism that aquaculture will carve out new niches in Maine in the near future, it is because a new generation of pioneers is doing the required research and development the old-fashioned way—on the job and on the water in local communities in one-on-one conversations. This may not be the best way to grow an industry quickly, but given the deeply rooted history and political philosophy ingrained in countless towns and fishing villages along the coast, it may be the only way. 🐟



*Philip W. Conkling founded the Island Institute in 1983 and, since that time, has directed its growth as President. Mr. Conkling is the author of the 1999 revised edition of **Islands in Time**, a close study of the natural and human history of the islands along the Maine coast. He is also the editor of **From Cape Cod to the Bay of Fundy: An Environmental Atlas of Maine** and is publisher of the **Island Journal** and **The Working Waterfront**. Mr. Conkling serves on several non-profit boards including the **University of New England Board Advisory**, **Maine Coast Heritage Trust Council**, the **Conservation Law Foundation** and the **Maine Aquaculture Innovation Center**.*