



COASTAL ISSUES IN NEW ENGLAND

Estuaries and the Coastal Zone:

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Challenges and Opportunities

Based on a R.I. Sea Grant Coastal Issues in New England Lecture

by

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or the purposes of describing coastal issues in New England, the coastal zone is defined as a band of variable width that borders on the six New England states. This zone is a band of dry land and adjacent ocean space—water and submerged land—in which land ecology and use directly affects ocean ecology, and vice versa. Geographically, the landward border is necessarily vague. However, the seaward boundary can be defined as the extent to which human land-based activities have a measurable influence on the chemistry of the water and/or the ecology of marine life. This may extend to the edge of the continental shelf. Estuaries are defined as semi-enclosed areas of the ocean, where fresh water from the land and rivers is mixed with sea water, and are an important part of the coastal zone in New England.

People are becoming increasingly aware of the finite limitations of the coastal zone as a place to live, work, and play, and as a source of valuable resources. More than 50 percent of the New England population currently lives in counties bordering on the ocean, and this percentage is rapidly increasing. Ketchum (1972) divided use of the coastal zone into six major categories:

- 1) living space and recreation
- 2) industrial and commercial activities
- 3) waste disposal
- 4) food production
- 5) natural resources
- 6) special government uses

It is not possible to adequately address all of these categories in a brief discussion of the coastal zone. Instead, this white paper will focus on living resources, fisheries, and aquaculture—items 4 and 5 above.

The living marine resources of the United States hold vast wealth. Most of these valuable resources are captured in the coastal zone or are dependent upon the coastal zone during some life-history stage. The long-term potential yield of demersal

and pelagic fish in the Northeast is about 1 million metric tons. The United States currently realizes less than half of this because of ineffective resource management. It has been reported that marine fishing industries and allied enterprises contributed more than \$24 billion annually to the U.S. economy in 1988. In addition, it is difficult to assess how much recreational fishing and other recreational activities add to the quality of life of millions of Americans. The coastal zone is potentially much more valuable than most people realize even when assessed in this simplified manner.

Present Issues and Future Opportunities

EXPLOITATION OF COASTAL ECOSYSTEMS

It is clear that the living resources of the coastal zone are extremely valuable. William Overholtz, chief of the National Marine Fisheries Service Mid-Atlantic Offshore Fishery Resources Investigation, made clear the effects of overexploitation on living resources in the Georges Bank area in a previous "Coastal Issues in New

England" lecture. This condition of overexploitation holds not only for Georges Bank, which is under federal jurisdiction, but also for much of the New England coastal zone inside the three-mile limit, which is under the jurisdiction of the individual states. There is no doubt that in the near future there will be increasing demands for renewable living resources on the coastal zone, both for recreational as well as commercial use.

How is this dilemma of increased demand on already highly exploited or overexploited resources to be resolved? This is not an easy question, and it can be addressed in several ways. First, the condition of open access to living resources, which have become relatively scarce, is a leading cause of severe resource depletion, economic inefficiency, and consequent loss of employment and recreational opportunities in much of the coastal zone. The United States has largely restricted international open access by extending national jurisdiction to 200 miles. However, the United States still permits open access to virtually all domestic fisheries within this area. The domestic fleet now has more fishing power than the entire international fleet, which was eliminated from Georges Bank shortly after the 1976 passage of the Magnuson Fisheries Conservation and Management Act. Under the conditions of open access to the coastal zone even by domestic fishing fleets—that is, unlimited entry into the fishing industry—both capital and labor flow into the fisheries for as long as the total anticipated earnings are greater than the total anticipated costs. This leads to a condition of overexploitation and economic inefficiency. Effective control and limitation of fishing effort to limit fishing mortality is the key to proper sustainable manage-

ment of exploited fisheries. Schemes for reducing fishing mortality by restrictive gear regulations, such as mesh size restrictions, or reductions of fishing seasons appear to have little impact on reducing fishing mortality rates. The future of all commercial fisheries in the New England area will remain dismal without acceptance of the fundamental premise that there must be some form of exclusive user rights to control access to the resource. Biological regulations, which include restrictions in gear, size limits, and/or seasonal closures, are no longer effective in maintaining stocks or economic efficiency in commercial fisheries. The best way to prevent overcapitalization and consequent biological and economic calamities is to issue individual transferable quotas (ITQs), which give the holder the right to catch a fixed number of fish, using whatever level of investment the holder wishes. This concept is somewhat similar to the medallions, which allow a limited number of taxicabs to operate in New York City. The ITQ, in theory, removes incentives for overinvestment in gear. But it is not a panacea because illegal activities can destroy the system if participants are allowed to ignore the quotas.

On a smaller scale, salt ponds and estuaries are suffering from the same conditions, namely overexploitation of limited renewable resources and consequent reduction of recreational and tourist opportunities. The concept of open access to commercial exploitation of the limited resources in these relatively small semi-enclosed environments is detestable and should be eliminated as soon as possible. It seems incongruous that any form of open-access commercial fishing is still allowed in these small salt ponds. On the other hand, with

proper controls, numerous opportunities exist for enhancing fisheries in coastal ponds by creating new habitat, by stocking to enhance existing recreational fisheries, and/or by the introduction of suitable exotics or genetically engineered organisms. An example of a potential candidate sport fish for our New England salt ponds is the striped bass-white bass hybrid, which is successfully reared in South Carolina and is an important developing enterprise in Kentucky.

The challenges and opportunities concerning the capture fisheries in the New England coastal zone consist of quickly and clearly recognizing that the present concept of open access to fisheries must be replaced by a new paradigm that provides some form of exclusive user rights to the major fisheries. Without this, the outlook for revitalization and sustainability of these important resources will be extremely gloomy. With respect to coastal salt ponds, open-access commercial fisheries should be quickly eliminated, and positive steps toward enhancement of recreational fisheries should be undertaken.

AQUACULTURE

Globally, aquaculture—including artificial propagation of marine, anadromous, catadromous, and freshwater species—is experiencing an annual growth of more than 5 percent per year, which is in considerable excess of the growth rate of all capture fisheries on a world-wide basis. According to the Food and Agriculture Organization of the United Nations, production of aquacultural products in the year 2000 will be in excess of 20 percent by weight and 50 percent by value of the total global fishery sector output. In the United States, aquacultural operations produced nearly 300,000 tons of product worth nearly \$500 million in 1988. Sadly, New England

Potential Solutions Toward the Creation of a Viable Aquaculture Industry

Institutional Solutions

- Consider aquaculture in coastal zone and local planning.
- Define aquaculture as a form of agriculture.
- Specify geographic zones for aquaculture in coastal zone planning and management.
- Establish aquaculture leasing programs.
- Define the regulatory role and coordinating mechanisms of agencies and minimize delays.
- Identify a lead agency for aquaculture in each state.
- Develop consistent federal/state regulations.
- Remove legal impediments and piecemeal approach to conflict resolution.

Research/Information Solutions

- Conduct research on perceived environmental problems.
- Develop better management practices for the industry.
- Strengthen academic research programs.

Political Solutions

- Establish statewide aquaculture advisory councils.
- Involve industry in state decision-making processes.
- Create aquaculture industry organizations.
- Elect supportive public officials.

Educational Solutions

- Educate legislators and management agency officials.
- Educate the general public and commercial fishermen regarding the nature of the industry.
- Educate aquaculturists regarding public concerns.

has contributed very little to this total in the past, and this poor performance record should be changed as soon as possible.

A recent report (DeVoe et al., 1992) details some aquaculture conflicts in the eastern United States, and the material that follows is based on this report and other reports related to the same problem from diverse regions. Coastal aquaculture in New England, at present, includes a limited amount of salmon raising in net pens, raising hard clams and oysters on intertidal bottoms, and culturing mussels. It has been reported that conflicts between aquaculture and more traditional users of land and water resources are the most serious constraints to an expanding aquaculture industry. Eight categories of use conflicts have been described, including:

- 1) recreation (fishing, swimming, boating)
- 2) commercial fishing (reduction of fishing area)
- 3) limited space (minimum number of adequate sites)
- 4) development (industrial, residential, land-use issues)
- 5) environmental/resource concerns (water availability, pollution, wetland impacts, exotic species)
- 6) aesthetics
- 7) lack of a lead agency (confusing permit process, too many agencies)
- 8) theft and vandalism (organisms and sites)

But the most important factor not listed here is the establishment of clear property rights to land, water, and species used in aquaculture. In some cases, aquaculture would require the state to create exclusive, private rights to public coastal areas. This involves a decision to prefer one use over another, and the issue becomes one of whether or not tradi-

tional public trust users be given priority over new or non-trust users. Thus far, the decision process has favored the traditional users, especially in Rhode Island.

Potential approaches to solutions have been identified by some states to address use conflicts described above. These include institutional, research/information, political, and educational solutions. (See sidebar at left.)

Some states have made considerable progress in achieving many of these solutions. South Carolina, for example, has a very comprehensive and effective strategic plan for aquaculture development that New England states could emulate. Connecticut also has a comprehensive plan and has made measurable progress in accommodating aquaculture to coastal zone issues. Rhode Island is probably the least progressive of the New England states in this area and, at present, has no strategic plan for aquaculture development.

The challenges and opportunities that face aquaculture in the New England coastal zone are numerous, but not insurmountable. The major issues involve rationalization of land and water use (leasing and zoning) for aquaculture, more expedient and effective resolutions of use conflicts, and development of a reasonable regulatory framework and attitude toward aquaculture. Aquaculture can contribute effectively to the sustainability and yields of both commercial and recreational fisheries for both vertebrates and invertebrates in New England. There is no question that marine food production from the New England coastal zone will evolve in the future from the present day capture fishery methods to a culture-based industry in which capture fisheries are enhanced by hatchery operations. The basic strategy for the development of aquaculture is to reduce,

through various technological innovations, the natural constraints that limit the productivity of wild aquatic resources. This will have profound effects on future uses of the coastal zone and for the conservation of living resources in New England.

Conservation of Coastal Ecosystems

It is evident that the natural environments of fish and invertebrates, as well as potential aquaculture stocks, are being affected by increasingly severe and pervasive man-made changes. Fisheries and aquaculture are more vulnerable to environmental degradation than most other areas because they are dependent on higher levels in the food chain.

Little progress in environmental conservation and management in the coastal zone can be expected unless the relationships between external stresses, such as winds and tides, on the environment and their effects on living resources are quantitatively understood. Coastal circulation models—models which simulate the effects of wind stress, tides, and bottom topography—need to be developed further. These include models of contaminant flows and analyses of the effects of water circulation on man-made changes in primary production, or on the survival of fish and invertebrate eggs and larvae for improving the understanding of recruitment processes.

We also need to know more about the dynamics of plankton blooms induced by human activities. The dynamics of such blooms are complex since both man-made and natural factors are probably involved. Additionally, a quantitative understanding of the underlying ecological processes is critical to further prediction and control of noxious, and sometimes dangerous, plankton outbreaks. The University of Rhode

Island Graduate School of Oceanography is playing a leading role in this area. Even though environmental issues are more acute in the coastal zone and hydrodynamic processes are much more complex than in the open ocean, there are few physical oceanographers concentrating on coastal problems in New England.

The effective conservation of coastal ecosystems will require considerably more research and intelligent management decisions. All of the research tools needed for effective coastal zone management are not yet at hand, and their prompt development should be encouraged in institutions of higher learning.


Summary

This white paper addresses only a few of the challenges and opportunities related to coastal zone management. Although the present state of living resource management in the coastal zone is inadequate in many respects, it is possible to be optimistic about the future if certain fundamental constraints to effective management are reduced. The major points made in this paper include the following:

- 1) As long as the condition of unlimited access to living resources of the coastal zone is acceptable, it will not be possible to effectively manage coastal living resources. Some form of exclusive user rights must be developed for all commercially exploited fisheries of the coastal zone.
- 2) Coastal salt ponds are suffering from similar overexploitation of limited renewable resources, with consequent reductions of yields and recreational opportunities. The time has come to relegate these salt ponds to recreational activities almost exclusively in the interests of maximizing social benefits and restoring depleted stocks.

- 3) The coastal zone should be more realistically partitioned to better accommodate a potentially valuable aquaculture industry. This industry might be of significant value to existing commercial fisheries by supplementing valuable stocks under certain conditions, as well as contributing to recreational fisheries through enhancement or creation of new fisheries. In addition, it would be a source of income and employment. Comprehensive strategic plans are needed for aquaculture development in those states where none exist. Rhode Island is a case in point.

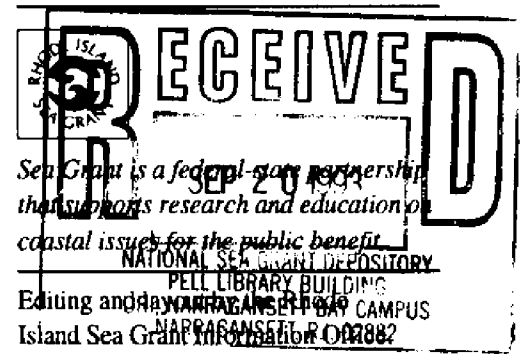
The challenges and opportunities are tremendous. But people must recognize that only bold and imaginative plans will lead to more effective utilization of the coastal zone. It is time to put these plans into action. This will take a lot of doing but recognition of the major problems and support of prompt remedial action will help immeasurably.


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For Your Reference:

Ketchum, B.H. (ed.) 1972. *The Water's Edge: Critical Problems of the Coastal Zone*. MIT Press, Cambridge, Massachusetts.

DeVoe, M.R., R.S. Pomeroy, and A.W. Wypyszinski. 1992. Aquaculture conflicts in the eastern United States. *World Aquaculture* 23(2):29-67.



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