

Assessing Nitrogen Carrying Capacity for Blue Hill Bay, Maine: A Management Case History

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Abstract As net-pen aquaculture in coastal waters grows, regulatory agencies must consider the potential for localized eutrophication. To avoid excessive nutrient concentrations, Maine sees value in dispersing farms over larger regions. Often, little environmental baseline information exists in these new areas on which to base a risk assessment. This case history attempts to convey the process by which a permitting decision was made using a weight-of-evidence approach. By drawing on readily available sources of information, simple models, and basic water quality monitoring data, the effect on Blue Hill Bay by an existing salmon farm was analyzed and the potential effect of a proposed net-pen aquaculture was predicted. In the process, a range of carrying capacities was developed, depending on temporal and spatial scale. The exercise has potential value to regulatory scientists and policy makers by identifying new research, monitoring, and compliance issues. In the end, the exercise demonstrates that neither aquaculture nor carrying capacity should be viewed as static and in isolation from other stressors.

Keywords Carrying capacity · Net-pen aquaculture · Nitrogen · Management · Coastal Eutrophication

1 Introduction

In Maine, aquaculture is one of several designated uses of State water for which water quality is to be protected. Yet net-pen aquaculture itself has the potential to degrade water quality and in turn affect other existing and designated uses. This case history chronicles steps and decisions made by resource scientists confronted with having to assess the capacity of Blue Hill Bay to support finfish aquaculture without impairing water quality and other designated human and ecological uses. Attempts are made to convey how regulatory agency staff manage uncertainty in the decision-making process, by drawing on a wide variety of resources to assess risks associated with nutrient enrichment from a salmon farm and balancing those risks with other coastal policy objectives.

Marine net-pen aquaculture poses a unique set of challenges to environmental permitting agencies accustomed to conventional wastewater treatment systems. Water quality laws and regulations in most jurisdictions were developed decades ago to control discharges from factories and cities, long before net-pen aquaculture became established. The design and performance of conventional wastewater treatment plants have benefited from a long history of development. For the most part, today's engineers are able to predict waste discharge loads and their impact on water quality from these conventional systems.

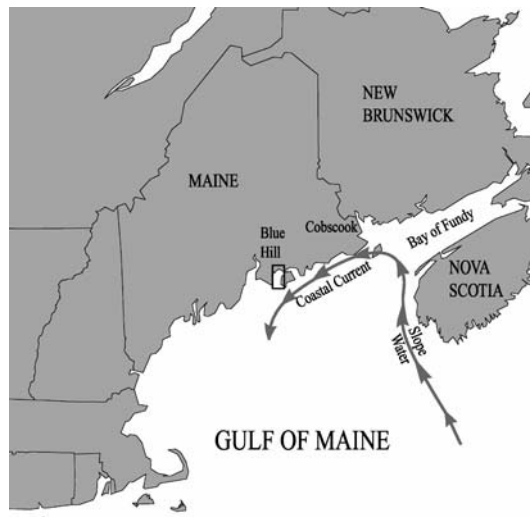


Fig. 1 Gulf of Maine regions showing Blue Hill Bay (insert) in relation to the nutrient-rich coastal current