



## Troubled waters: Risk perception and the case of oyster restoration in the closed waters of the Hudson-Raritan Estuary

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### ABSTRACT

Pathways to recognizing shared interests in addressing environmental problems are sometimes blocked by a lack of understanding or even misperceptions among stakeholder groups, which can impede productive communication. Drawing on a currently evolving case study, this study examines the perceptions of stakeholders involved with oyster restoration in waters of the Hudson-Raritan Estuary considered unsuitable for commercial harvesting (i.e., closed waters) in New York and New Jersey. Survey research conducted with commercial shellfish farmers and oyster restoration volunteers shows that support for oyster restoration is less related to stakeholder group identification and more to the perceived risks to public health and the economy, and the perceived ecological benefits. The conclusions suggest how these results might be used to demonstrate where agreement exists among stakeholder groups, which could improve discussion about oyster restoration and advance shared interests.

### 1. Introduction

Communication interventions in support of environmental initiatives are destined to fail if inadequate attention is given to the complex, social dynamics and perceptions of stakeholders that these initiatives affect. Too often, the “best intentions” for environmental restoration may end up in policy-related quagmires due to a lack of understanding or knowledge about key factors underlying support or opposition. Hence, the importance of formative audience research to identify motivations and potential barriers and to inform communication cannot be overstated.

This paper offers a case study examining the views of stakeholders involved with an ongoing debate about oyster restoration in the waters of the Hudson-Raritan Estuary in New York and New Jersey considered unsuitable for commercial harvesting (i.e., closed waters). Generally, scientists see two primary barriers to successful oyster restoration from a sparse remnant population: (a) the question of scientific feasibility, i.e., the efficacy of hatchery propagation and the sufficiency of habitat and necessary scale to rebuild self-sustaining populations, and (b) regulatory constraints on restoration efforts such as an inability to establish a sanctuary from harvest in healthy waters or prohibition of restoration in closed waters (c.f., [3,7,11,13,14,18,22,33,27]). Closed waters constitute a primarily urban special case that has greater potential significance along the

more highly developed coastline of New York, New Jersey and Southern New England. In closed waters, despite the potential ecological and economic benefits of oyster restoration, which are described in greater detail below, there are heightened risks related to poaching, which factor into policy support. Whereas some states have permitted small scale oyster restoration in closed waters under certain circumstances, public health concerns led to a prohibition on oyster restoration in closed waters of New Jersey. In an effort to better understand and inform communication about oyster restoration in closed waters of the New York/New Jersey Harbor area, this study sought to investigate how different stakeholder groups view the relative magnitude of the various risks and benefits.

#### 1.1. Oysters of the Hudson-Raritan Estuary

For many in the northeastern United States, the native eastern oyster, *Crassostrea virginica*, is far more than a culinary delicacy. It signifies the cultural and ecological histories of New York City and its boroughs surrounding the New York/New Jersey Harbor, the Hudson River, and the larger area within which these watersheds (among others) intersect—the Hudson-Raritan Estuary. Here, oysters were once abundant, relatively safe to eat, and affordable. As Kurlansky notes in his (2007) book, *The Big Oyster*, the *Crassostrea virginica* was once easier to find on New York City street corners than hotdogs, harvested by

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myriad baymen<sup>1</sup> whose supply was only a short walk from where they were consumed. From the outset, however, demand exceeded supply, which was compounded by the rise of urban infrastructures that catalyzed serious deficiencies with waste water control and pollution in the New York/New Jersey Harbor [11]. Following what Kurlansky [21] considers the peak years of oyster harvesting in New York (1820–1910), concentrations of pollution became hazardous for the already diminishing supplies of shellfish and a risk to public health—as evidenced by widespread outbreaks of typhoid fever in the early 1920s associated with consuming contaminated and unregulated shellfish (see [41], p. 143).

Today, wild oysters are rare in the New York/New Jersey Harbor, while commercial and recreational harvesting and consumption are banned [42,43]. The National Shellfish Sanitation Program (NSSP) and departments of environmental protection and conservation in New York and New Jersey have termed this restriction as “closing” or “condemning” waters in which shellfish are present in order to restrict human consumption of them ([41], p. 217).<sup>2</sup> These designations are made by each state and involve assessments of water quality, shellfish abundance, and whether anti-poaching enforcement monitoring is necessary.<sup>3</sup> Globally, oyster reef habitats have declined by 85% over the past 200 years, and in the case of the Hudson-Raritan Estuary, losses in oyster habitat have been attributed primarily to industrial and sewage pollution, deep-water harbor dredging, shoreline development, and over-fishing [11,23,3]. Such losses, particularly for areas like the New York/New Jersey Harbor, have eliminated the ecological benefits oysters and oyster reefs provide to the surrounding ecology, including benthic habitat provisioning, water filtration and nutrient cycling, and shoreline erosion reductions (c.f., [32,34]).

Given the synergistic ecological functions of oysters in estuarine habitats, non-governmental organizations (NGOs) have sought to engage local communities and restore oyster reefs in areas of the Hudson-Raritan Estuary as a way to help improve water quality, biological diversity, and help mitigate storm surges during hurricanes [20,35]. Additionally, the economic benefits of oyster restoration are estimated to yield between \$5500 and \$99,000 per hectare annually (not considering commercial harvesting) and could provide a reasonable timeframe in which initial costs are recovered (between two to 12 years), likely making it an overall net gain [13,7]. In New York restoration efforts include proposals for large-scale restoration, including the Billion Oyster Project and the Living Reefs storm surge abatement project funded by HUD.

Environmental, economic and community benefits notwithstanding, state regulatory agencies in New York and New Jersey have noted the public health and economic risks of restoration as their paramount concern. The public health risk is obvious, but poaching also entails risks to the legal oyster interstate commerce if poachers circulate oysters from closed waters into the marketplace and food poisoning results (see [28,30]). Despite evidence of increasing water quality in the

<sup>1</sup> Discussions of this gendered term are scant in socio-linguistic or anthropological studies of maritime culture in the Northeast and beyond, although it is suggested in Kurlansky [21] that the “bayman” was, and is, a marker of identity that remains embedded in the historical distinction between men and women that was acute during the industrial revolution. Given its cultural significance, it is used here.

<sup>2</sup> First, it is worth noting that waters may vary in the levels with which they are closed or condemned. The NSSP classifies waters as “conditionally approved, restricted, or conditionally restricted” based on a variety of factors ([41], p. 52). Second, there are exceptions to commercial harvesting activities in closed waters, such as the act of “shellstock relaying” in which contaminated shellfish or oysters are removed from closed waters and placed in sufficiently clean or open waters for a certain period of time until sold for public consumption (see [41], pp. 52–54).

<sup>3</sup> To note, water classification as described by the NSSP is not limited to assessments of water quality or shellfish abundance only. States may choose to restrict certain waters from commercial harvesting or growing of shellfish because the area is considered an environmental sanctuary (for the case of New Jersey, see the New Jersey Administrative Code [26]; for New York, see New York State Department of Environmental Conservation [31]).

New York/New Jersey Harbor thanks to improvements in waste water treatment, regulators in New York have remained cautious toward issuing permits for restoration projects, and New Jersey banned restoration activities altogether in closed waters in 2010 ([27,29], p. 22). Of paramount importance to New Jersey regulators were concerns about poaching and insufficient resources to monitor the restoration beds and enforce closed waters ([27], p. 1). Recently, New Jersey passed legislation that allows the state to reconsider its ban and determine the feasibility of reinstating regulated forms of restoration in closed waters (see [33]); discussions are still ongoing as to next steps for restoration efforts in New Jersey.

Factoring into decisions about whether to support restoration efforts are the risk and benefit perceptions of stakeholders involved with and affected by oyster restoration; these include commercial shellfish farmers, NGO managers and volunteers, and policymakers and regulators in New York and New Jersey. Understandably, stakeholders may be less supportive of restoration in closed waters if they do perceive that the risks outweigh the benefits. Thus, alongside research examining the ecological and economic benefits of oyster restoration is a need to examine the perceived risks and their potential impact on restoration efforts.

Few studies have examined risk perceptions and communication in relation to oyster restoration. One study examined how oyster gardeners’ “sense of place” in New York City [20] influenced their interest in participating in oyster gardening. They found that memories of oyster harvesting obtained from family experiences or historical nostalgia were motivating factors. Although Krasny et al. [20] did not explore participants’ opinions about oyster restoration directly, their work suggests that practices somewhat related to oyster restoration, such as oyster gardening, are both a form of environmental stewardship and meaning-making specific to the ecology of areas around the Hudson-Raritan Estuary. For oyster restoration specifically, participation in large-scale projects may increase the well-being of coastal populations through an enriched connection to their marine environment [1].

This case study identifies the variables related to stakeholders’ support for oyster restoration, whether differences in opinion exist between stakeholder identities, and whether group affiliation is the most effective approach to predict restoration support. As with any given risk topic, perceptions have been examined relative to engagement with community meetings, interactions with others, media use, familiarity, and the confidence individuals place in risk managers or organizations (e.g., [4,15,16,24,37]).

Of particular relevance to this case study are risk perceptions related to public health and local commercial shellfish economies as a result of current poaching issues in New Jersey and New York. Relatedly, this includes the extent to which perceived risks, benefits, familiarity with restoration, and perceptions of governing authorities relate to support for oyster restoration in closed waters. Rather than provide an assessment of public health or economic risks relative to oyster restoration, this study sought to assess perceptions of risks and benefits among stakeholders to better inform deliberative communication and policy development. Two broad questions guided our inquiry:

RQ1: To what extent do individuals who identify as oyster gardeners or restoration volunteers differ in their views from those who identify primarily as commercial farmers of oysters or shellfish in relation to (a) perceived risks and benefits of oyster restoration in closed waters, (b) familiarity and engagement with the issue, (c) confidence in regulating authorities’ ability to manage restoration risks to public health, (d) biocentrism, and (e) concern for climate change?

RQ2: Overall, which factors have the strongest relationship with support for oyster restoration?

## 2. Methods

An electronic survey was used to gather responses between June and August of 2016 from (a) stakeholders involved with commercial

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