Comparing perceptions of aquaculture: waterview & non-waterview residents

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Introduction

Aquaculture activities have taken place in Rhode Island's waters for over one hundred years. In the early twentieth century about one third of the Narragansett Bay was leased for oyster cultivation (Pietros & Rice 2003). Today, only about 0.13% of Narragansett Bay waters and 1.8% of the coastal salt ponds in Rhode Island are used for shellfish aquaculture operations (RI CRMC 2013). This practice is defined as the commercial farming of shellfish species, such as clams, oysters and mussels, in order to harvest and sell them (Fig 1). The Rhode Island Coastal Resources Management Council (CRMC) has the responsibility of permitting aquaculture activities in the state's coastal waters. Part of the permit reviewing process requires the CRMC to consider the public interest. Per RI General Laws, "the process of aquaculture should only be conducted within the waters of the state in a manner consistent with the best public interest" (RI GL 20-10-1). Incorporating this aspect into the reviewing process can be complicated because there are multiple, different public interests about shellfish aquaculture. There are several factors that can influence how a person values the state's waters and perceives aquaculture development.

Fig. 1: Shellfish aquaculture farm in Ninigret Pond

This study focuses on exploring Rhode Islanders' multiple interests associated with shellfish aquaculture. More specifically, this study will compare the perceptions of aquaculture between RI residents who live in properties that have views of coastal waterways (water view) and those who live in properties without coastal water views (non-waterviews).

Methods

To discover what the public thinks about aquaculture, we administered a mail survey to about Rhode Island residents. Two hundred seventy-two surveys were returned. Mail surveys are an efficient method of reaching out to a large sample of individuals that are dispersed throughout a certain area (Dillman et al. 2009). We were targeting responses from residents throughout the state, like those in coastal communities as well as inland areas; so administering a mail survey was a useful technique to reach out to everyone. With stratified random sampling we were able to target these different communities and reach residents with a variety of backgrounds and interests that could influence their perceptions of aquaculture. To maximize the survey response rate, we followed Dillman et al.'s (2009) tailored design method. A cover letter that explained the purpose of the research was sent out with each survey, as well as a self-addressed and stamped envelope for the respondents to send back their completed survey. We sent out a postcard reminder of the survey about 4 weeks later, and then a second round of surveys about 4 weeks after that.

Fig. 2: Map of study area (NB representing Narragansett Bay and SP representing coastal salt ponds).

Part of the survey consisted of photo simulations that showed different levels of aquaculture in the Narragansett Bay and the coastal salt ponds (Figs 2 & 3). The simulations shown gradually increased the density of aquaculture development. Photo simulations are useful for measuring normative standards of quality that are related to densities of use (Manning et al. 2009). The normative standards of these simulations can be used to develop an estimate of the social carrying capacity for aquaculture, the point when the level of aquaculture becomes unacceptable to respondents. For each simulation, respondents were able to choose from a 7-point scale (1 being very unacceptable to 7 being very acceptable). We plotted the average response of acceptability for each photo to derive a social norm curve, which would help provide an estimate for the social carrying capacity of aquaculture in each waterbody.

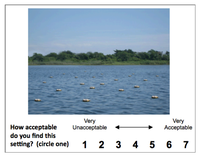

Fig. 3: Example of the photo-simulated questions.

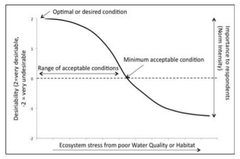

Fig. 4: Example of hypothetical social norm curve.

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree	
I SUPPORT SHELLFISH AQUACULTURE...						
in general	1	2	3	4	5	
in Rhode Island's coastal waters	1	2	3	4	5	
in RI coastal waters near my home	1	2	3	4	5	I don't live near the RI coast.
in RI coastal waters that I use the most	1	2	3	4	5	I don't use RI coastal waters.

Fig. 5: Survey question regarding respondents' support levels for aquaculture

In addition to photo simulations, the survey also asked respondents questions about their levels of support for aquaculture and their perceptions of aquaculture impacts. Respondents were able to answer these questions on a Likert-type scale, which is a 5-point scale (ranging from 1=do not support/agree at all to 5=fully support/agree).

We analyzed responses to these survey questions by using Mann-Whitney U tests to see if there were any significant differences in the responses of waterview and non-waterview residents. Significance for all statistical tests was determined at the commonly-accepted 5% level.

Results

Respondent Characteristics

Population	Waterview Residents (n=105)	Non-Waterview Residents (n=158)
Average Age	63	59
Gender	68% male, 32% female	64 % male, 36% female
% Involved in Community Organizations	56%	54%

Table 1: Characteristics of survey respondents.

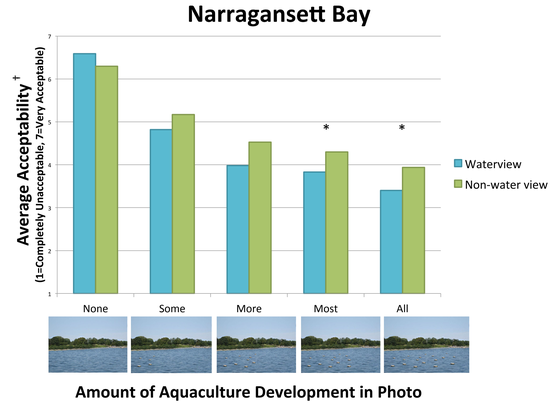

Fig. 6: Average acceptability of different aquaculture settings in photo simulations of Narragansett Bay.

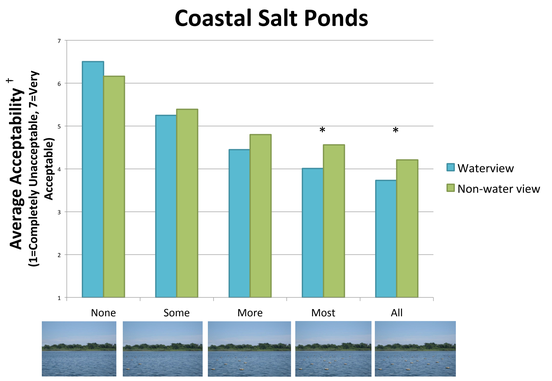

Fig. 7: Average acceptance of different aquaculture settings in photo simulations of coastal salt ponds.

* Results of Mann-Whitney U Test show significant differences ($p<0.05$) in the responses to these photos.
† For illustrative purposes, these figures show mean responses to the photos. Mean ranks were used in the analysis.

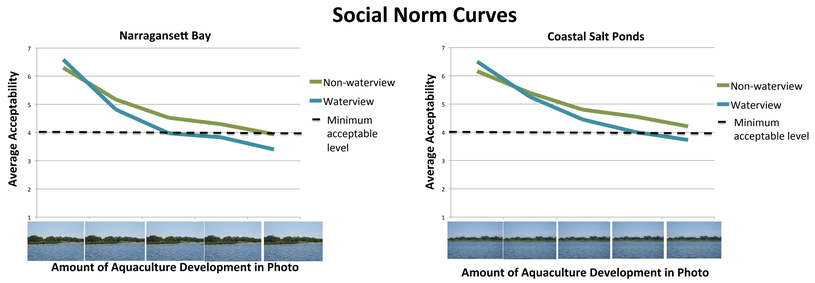

Fig. 8: Social norm curve of the acceptable amounts of aquaculture in Narragansett Bay simulation.

Fig. 9: Social norm curve of the acceptable amounts of aquaculture in coastal salt pond simulation.

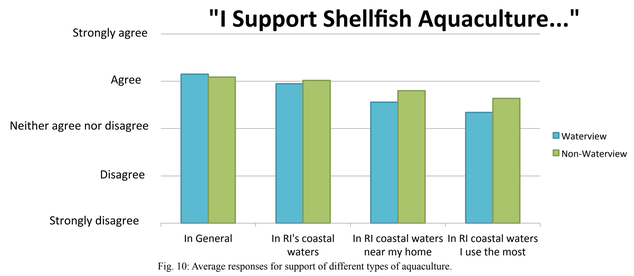

Fig. 10: Average responses for support of different types of aquaculture.

Results (cont.)

On average, respondents were generally accepting of aquaculture development in Narragansett Bay and the coastal salt ponds. There were some differences between the perceptions of waterview and non-waterview residents. The results from the Mann-Whitney U tests (as shown in Figs. 6 & 7) showed that non-waterview residents tended to view the photo simulations with more aquaculture development as more acceptable than waterview residents. The differences become significant as the amount of aquaculture development increases. There were significant differences between waterview and non-waterview residents for the "most" category ($U=6818.5$, n_1 103=, n_2= 155, $p=0.045$) and "all" category ($U=6785$, n_1= 105, n_2= 154, $p=0.026$) in the Narragansett Bay photos. Also, there were significant differences between waterview and non-waterview residents for the "most" category ($U=6672.5$, n_1= 104, n_2=, 154 $p=0.022$) and "all" category ($U=6817$, n_1= 104, n_2= 153, $p=0.049$) in the photos in the coastal salt pond simulations.

Figures 8 & 9 further illustrate these findings using a social norm curve. In each location, waterview residents have a higher acceptability for the photos containing no aquaculture development. Social carrying capacity (indicated by the minimum acceptable level) for shellfish aquaculture in Narragansett Bay is reached at lower levels of development for waterview residents than non-waterview residents. Similarly, in the coastal salt ponds, the social carrying capacity was reached at lower levels of development for waterview residents than for non-waterview residents, though this was at a higher level of development than in Narragansett Bay.. Social carrying capacity for non-waterview residents in the coastal salt ponds was not reached, as shown by their curve remaining above the line of acceptability. The difference in these curves suggests that residents may be more accepting of higher levels of aquaculture development in coastal salt ponds than Narragansett Bay.

There were no significant differences between waterview and non-waterview residents' reported levels of support for aquaculture (Fig. 10; $p>0.05$ for all types of support). There seems to be more support for aquaculture in general than for aquaculture in waters used by respondents.

Fig. 11: Aquaculture work boat on Ninigret Pond.

Fig. 12: Aquaculture worker on Ninigret Pond.

Discussion & Conclusion

Fig. 13: Aquaculture cages

These findings indicate that respondents generally support shellfish aquaculture in two different coastal water bodies in RI. The results also show that there are some differences between waterview residents' and non-waterview residents' perceptions of aquaculture. We expected the waterview residents to perceive the aquaculture development as more unacceptable than non-water view residents, and our results support this. The most notable differences were found in the responses to the photo simulations. Non-water view residents tended to tolerate higher levels of aquaculture development in both Narragansett Bay and the coastal salt ponds than waterview residents. There were no significant differences between waterview and non-waterview respondents for any of the support questions without photos, suggesting that the photo-simulations allow for more detailed understanding of respondents' support for particular aquaculture development scenarios. Aquaculture farmers, planners, and managers can use these findings when creating or reviewing proposals for shellfish farms in Narragansett Bay and the coastal salt ponds.

Respondents tended to be more supportive of aquaculture in general than in coastal waters that they use the most, indicating that there are some feelings of NIMBY-ism (Not In My Backyard) related to aquaculture development in RI.

The social norm curves for each coastal water body followed the hypothetical trend (see Fig 4) and showed that the social carrying capacity differs between waterview and non-waterview residents. Non-waterview residents were found to tolerate higher levels of aquaculture development, and there was a higher social carrying capacity for the coastal salt ponds setting. Social carrying capacities could possibly differ if the photo simulations showed other features of aquaculture development, such as aquaculture workers, a work barge, or exposed aquaculture cages. The norm curves also showed a large decline within the first three levels of aquaculture, but then the curves tend to flatten out. These results raise questions about what causes the initial decline in acceptability, what features make development more acceptable in the salt ponds, and also what other factors could influence the social carrying capacity of aquaculture development.

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