

PUBLIC OPINION OF SHELLFISH FARMING

*A report on the public perception of shellfish
aquaculture in select counties in Washington,
Oregon and California*

April 2016

Abstract

This research assessed perceptions and behaviors related to shellfish and shellfish farming, and examined what influences social attitudes toward these activities. Results reveal limited knowledge of shellfish aquaculture across the ten-county study region in Washington, Oregon and California. These results indicate a clear opportunity for increased education and outreach regarding shellfish related activities. The most effective means to share information will be television, newspapers and websites, as well as booths at public events. Study results also reveal a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. When questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, a preference for increased production outnumbered decreased production by a factor of 4.5 to 1. Survey respondents also recognize the benefits of shellfish aquaculture, especially for providing locally produced seafood, creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries. Proliferation of local and regional shellfish aquaculture support will be necessary to continue to realize these benefits.

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Antique dump truck receiving oyster shell from a conveyor belt exiting the National Fish and Oyster Company shucking house in Olympia, Washington.

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Public Opinion of Shellfish Farming

A report on the public perception of shellfish aquaculture in select counties in Washington, Oregon and California

Shellfish Aquaculture and Coastal Communities

Shellfish aquaculture, or farming, provides jobs and revenue for coastal communities. Aquacultured oysters, clams and mussels in Washington state alone generates \$185M of economic impact yearly, and provides 2,700 jobs. Furthermore, for every \$1.00 spent by Washington's shellfish industry, \$1.67 of additional spending is generated in the region (Northern Economics, 2013). Oregon's economic impact from shellfish production remains unknown due to inadequate data collection, but industry experts believe the value is between \$10-20 million. In California, total economic impact for the state's bivalve shellfish aquaculture industry is estimated to exceed \$23 million, supporting 280 jobs (Northern Economics, 2013). Shellfish are also integral components of the coastal ecosystem. As ecosystem engineers, shellfish create conditions for other plant and animal species to thrive, and they play a vital role in nutrient cycling of coastal habitats.

Social Dimensions of Resource Management

Public opinion and values are vital to resource management. Public perceptions relative to environmental and economic issues play a major role in resource use, development and regulation of natural resource industries. Social research can help decision-makers determine how to best address public perceptions and concerns, as well as to develop effective approaches for public communication and engagement.

Public understanding and acceptance of shellfish aquaculture is an essential component of sustaining or expanding the industry along the West Coast. Public acceptance of shellfish activities, including potential for offshore aquaculture, is based on actual and perceived environmental and social concerns. Appropriate siting and expansion of shellfish aquaculture will need to proceed with regard to both environmental and economic impacts, and will require public interest and support. To help build information for this purpose, the Pacific Shellfish Institute and research partners obtained National Oceanic and Atmospheric Administration (NOAA) funding from the Sea Grant Aquaculture Research Program. Our goal is to:

Public understanding and acceptance of shellfish aquaculture is an essential component of sustaining or expanding the industry along the West Coast.

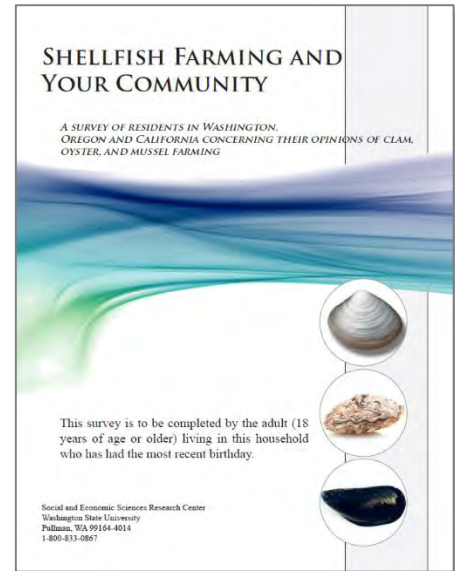
- Help decision-makers understand the social dimensions of shellfish aquaculture
- Increase understanding and support for shellfish aquaculture
- Enhance sustainable development of shellfish aquaculture
- Support NOAA's National Shellfish Initiative, and state level Shellfish Initiatives
- Support marine spatial planning

Our Survey: Shellfish Farming and Your Community

Our survey was designed to assess perceptions and behaviors related to shellfish and shellfish farming, and to examine what influences social attitudes toward these activities. An Advisory Committee comprised of local, state, and federal resource managers, planners, and industry representatives was assembled by the Pacific Shellfish Institute to guide survey development. The survey was implemented by Washington State University's Social and Economic Sciences Research Center. Proper procedures for voluntary participation, informed consent, safeguards for confidentiality, and other human subject considerations were followed (see full survey data report: Allen and Moore, 2014). Participation was voluntary and all data is maintained as anonymous. Survey questions were designed to gauge:

- How do these communities understand, value, and respond to shellfish farming?
- What factors and sources of information influence these social attitudes and values?
- What kinds of outreach might be most effective at improving public awareness of shellfish farming?

Figure 1. Survey cover.



Communities Surveyed

The population for this survey consisted of all residential households within the 10 county study area (Table 1). A total of 862,187 residential households were identified by Genesys Sampling Inc., and a random sample of 4,000 households were selected.

Table 1. Summary statistics for this survey's ten county study region.

Study Area	Sample Size	Completed Surveys	Response Rate	Sample Error	Households in Area
Total Study Area	4,000	1,250	34%	±3%	862,187
<i>Washington Study Area</i>	2,400	770	35%	±4%	640,462
Skagit	400	129	34%	±9%	51,473
Kitsap	400	131	36%	±9%	107,367
Pacific	400	150	42%	±9%	15,547
Thurston	400	125	33%	±9%	108,182
Pierce	400	109	29%	±9%	325,375
Mason	400	126	35%	±9%	32,518
<i>Oregon Study Area</i>	800	282	38%	±6%	48,952
Tillamook	400	145	39%	±9%	18,359
Coos	400	137	37%	±9%	30,593
<i>California Study Area</i>	800	198	26%	±7%	172,773
Humboldt	400	103	27%	±9%	61,559
Marin	400	95	24%	±9%	111,214

Survey Response

Residents were first asked to complete the survey online, but those who did not respond to the web survey were later sent a paper version of the questionnaire. During the study period, 652 surveys were collected online and another 598 were mailed in, resulting in a 34% response rate. Sampling error, or the degree to which the randomly selected sample of respondents represents the population from which it is drawn, was calculated at $\pm 3\%$. At the time of the survey U.S. Census data estimates 1,519,653 adults lived in the ten county study area.

Survey responses were analyzed on a county, state, and regional level. Throughout this report, when differences between county level survey responses were not significant, data are presented by state, or for the entire study population. In other words only grouped data are presented to avoid charts depicting very similar responses. When grouped data are presented, they have been weighted to reflect their actual proportion of households within the larger study (Table 2).

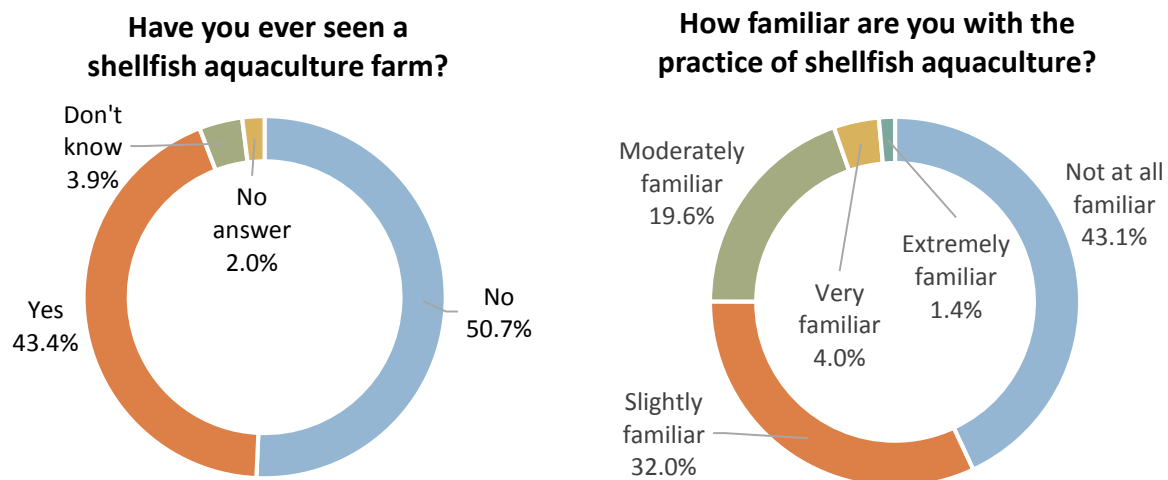
Table 2. Weight used to reflect the actual population of each county.

County	Weight
Kitsap	0.065117077
Mason	0.092330524
Pacific	0.278887308
Pierce	0.304189011
Skagit	0.576639766
Thurston	0.768958121
Coos	1.203900677
Tillamook	1.343866057
Humboldt	1.722427085
Marin	4.658831128

Community knowledge of shellfish aquaculture

Survey results reveal limited knowledge of shellfish aquaculture. More than 50% of respondents had never seen a shellfish aquaculture farm, and 43.1% stated they were not at all familiar with the practice of shellfish aquaculture (Fig. 2).

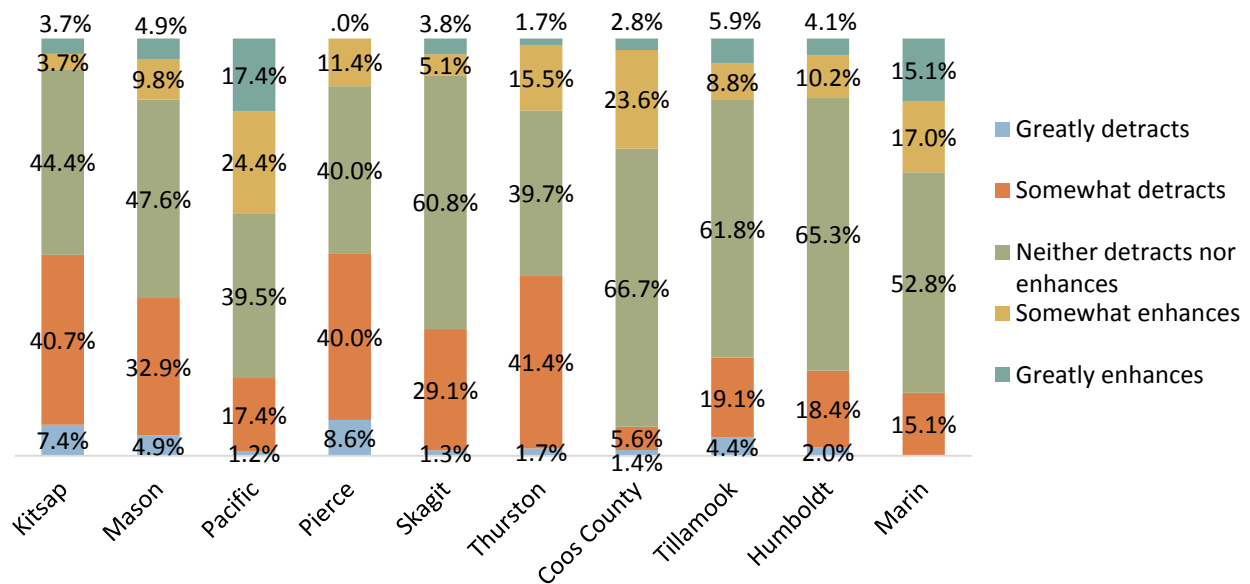
Figure 2. Survey responses from two questions, as stated, for the total study area.



When asked if shellfish farms enhance or detract from the scenery of coastal areas, in all counties except Washington's Thurston and Pierce counties, the majority of responses indicated that farming "Neither detracts nor enhances" the scenery (Fig. 3). In these two counties an equal (40.0%) or slightly greater (41.4%) percentage of respondents felt

shellfish farms “Somewhat detracts” from the scenery of coastal areas. This contrasts to areas with the highest proportion of “Somewhat enhances” responses, which were Pacific County Washington (24.4%), Coos County Oregon (23.6%) and Marin County California (17.0%).

Figure 3. How much do shellfish farms enhance or detract from the scenery of coastal areas?



Influence of waterfront property ownership

In an attempt to assess the influence of waterfront property ownership on opinions about shellfish farming, respondents were asked if they own saltwater waterfront property and, if yes, the seasonality of their residence. The vast majority of respondents from the randomly selected households did not own waterfront property, but the highest percentage of saltwater waterfront property ownership occurred in Washington in Mason, Kitsap and Pacific counties (Table 3). Among waterfront property owners, year-round residence was the norm. Pierce and Skagit counties had higher proportions of seasonal residence respondents, but overall response from saltwater waterfront property owners was also low in these counties (Pierce n=8 and Skagit n=12) so further analysis was not attempted.

Regardless of current waterfront property ownership, respondents were asked to consider if a future purchase decision would be influenced by commercial shellfish activities (Fig. 4). A “No effect” response was most frequent across all survey respondents, but the Washington survey population diverged from this trend with the highest percentage of responses (32.9%) indicating a “Somewhat negative” effect, followed by “No effect” (29.6%). The Washington survey population also had the highest proportion of respondents anticipating a “Very negative” (14.0%) effect on their decision to purchase waterfront property if commercial shellfish harvest was within view of the home.

Table 3. Responses to the survey question: “Do you own saltwater waterfront property?”
And if yes: “Are you a seasonal or year-round resident of this property?”

<i>Study Area</i>	<i>No</i>	<i>Yes (n=)</i>	<i>Seasonal resident</i>	<i>Year-round resident</i>
Kitsap	84.5%	15.5% (20)	10.0%	90.0%
Mason	79.2%	20.8% (26)	19.2%	80.8%
Pacific	87.8%	12.2% (18)	0%	100.0%
Pierce	92.7%	7.3% (8)	50.0%	50.0%
Skagit	90.6%	9.4% (12)	41.7%	58.3%
Thurston	91.8%	8.2% (10)	10.0%	90.0%
<i>Washington Study Area</i>	90.4%	9.6% (73)	30.1%	69.9%
Coos	91.1%	8.9% (12)	16.7%	83.3%
Tillamook	90.3%	9.7% (14)	35.7%	64.3%
<i>Oregon Study Area</i>	91.0%	9.0% (25)	20.0%	80.0%
Humboldt	98.1%	1.9% (2)	0%	100.0%
Marin	93.5%	6.5% (6)	0%	100.0%
<i>California Study Area</i>	94.9%	5.1% (10)	0%	100.0%

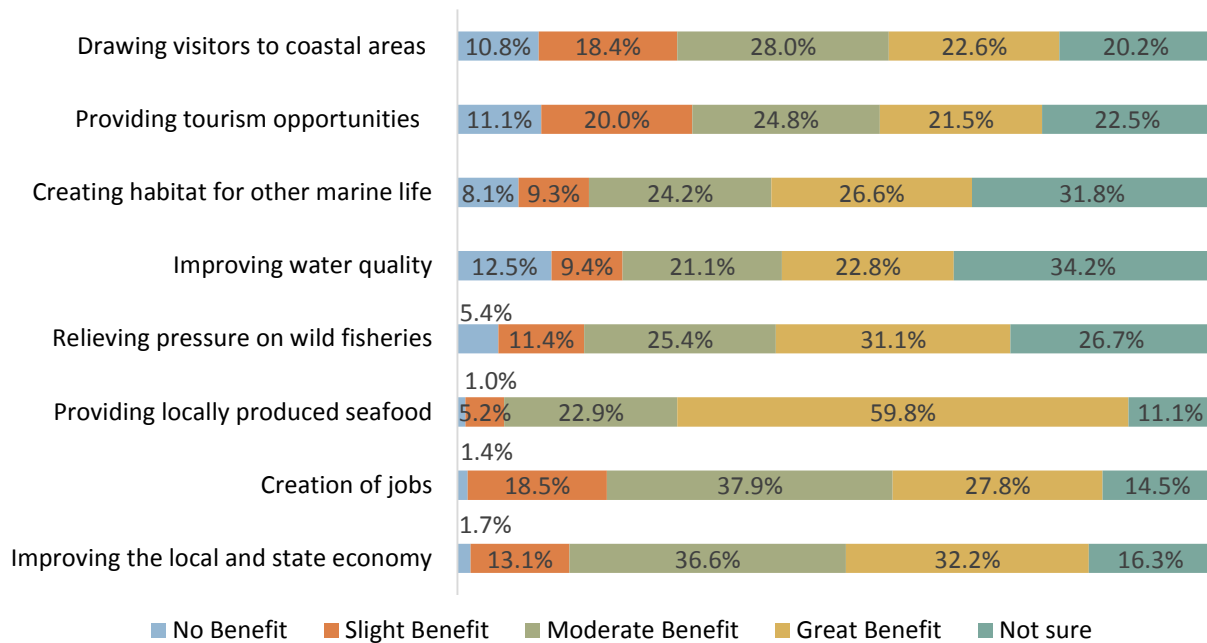
Figure 4. If you were looking to purchase waterfront property what effect would having commercial shellfish harvest within view of your home have on your decision?



Perceived benefits and impacts from shellfish aquaculture

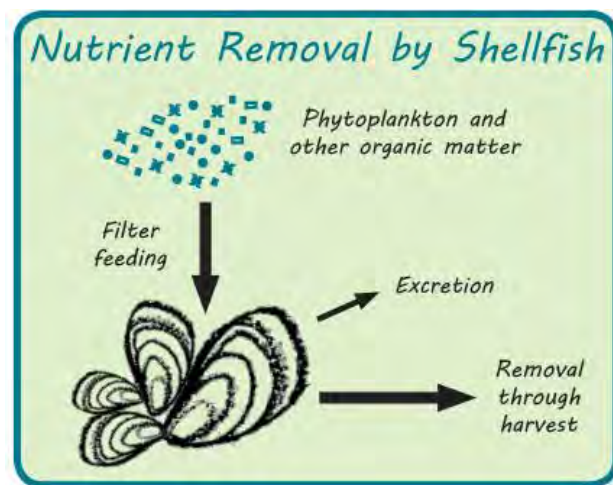
When asked to rate various benefits of shellfish aquaculture on a scale from “No Benefit” to “Great Benefit” respondents’ selected “Great Benefit” most frequently when associated with “Providing locally produced seafood” (59.8%). Respondents also noted a great benefit associated with creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries (Fig. 5). Attention to “Not sure” responses indicates that the survey population was uncertain if shellfish aquaculture plays a role in “Creating habitat for other marine life” and “Improving water quality”.

Figure 5. How much of a benefit do you believe shellfish aquaculture brings to the following?



There is an extensive body of scientific literature that demonstrates the linkage between shellfish filter feeding activity and marine water quality. Shellfish consume nitrogen and phosphorus containing plankton and detritus, improving water clarity and playing an integral role in nutrient cycling of coastal habitats. Through filter feeding shellfish feed on a wide range of suspended particles in the water column, including phytoplankton, bacteria and detritus (Fig. 6). Furthermore, as ecosystem engineers, shellfish create conditions for other plant and animal species to thrive.

Figure 6. Nutrient cycling and nutrient removal, or bioextraction, through shellfish harvest.

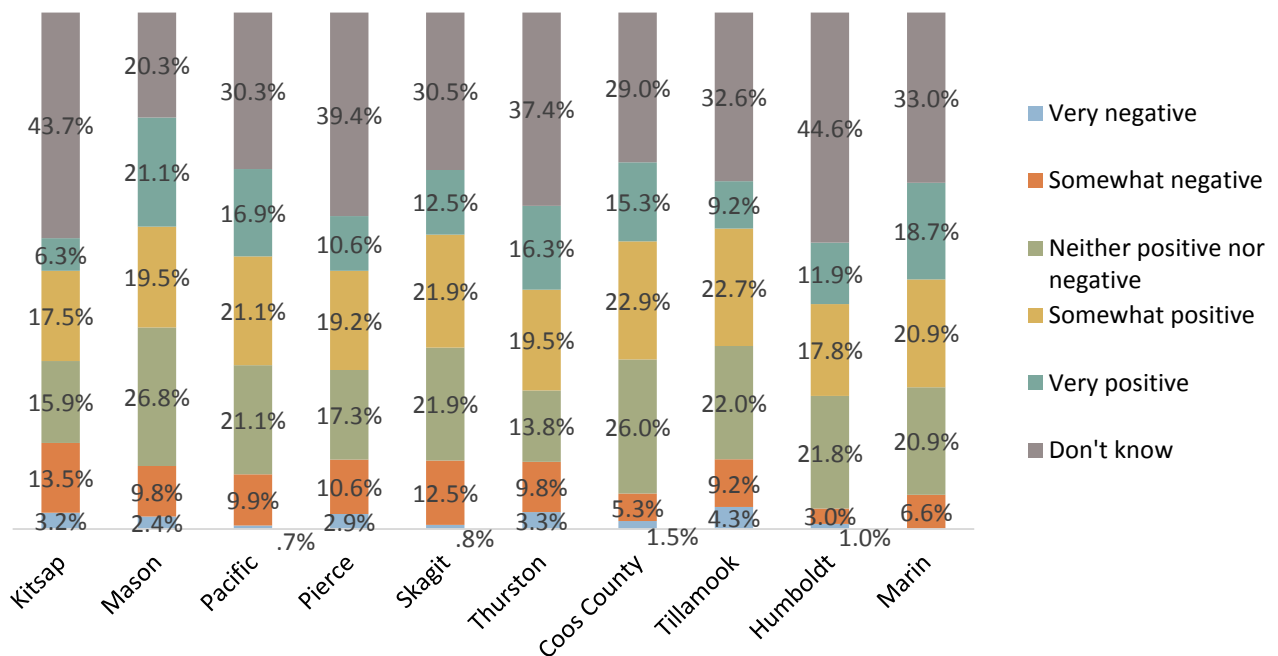


Shellfish also provide valuable ecosystem services to humans. The benefits people obtain from ecosystems are termed ecosystem services, and can be grouped into four broad categories: provisioning, regulating, habitat (formerly termed "supporting") and cultural services (Millennium Ecosystem Assessment, 2005). Shellfish have been identified as providing all four types of services, including water quality and habitat benefits (Table 4). Yet when asked about the impact shellfish farms have on the environment, in all but one county the most frequent response was "Don't know" (Fig. 7). The exception to this trend was Washington's Mason County, where respondents selected "Very positive" most frequently (21.1%) when asked "What type of impact do you think shellfish farms have on the environment?"

Table 4. Ecosystem Services provided by shellfish.

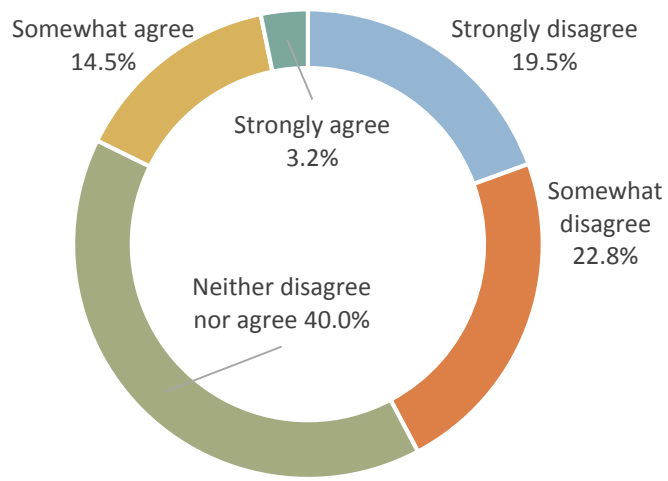
Provisioning	Commercial, recreational and subsistence fisheries Aquaculture Fertilizer and building materials (lime) Jewelry and other decoration (shells)
Regulating	Water quality maintenance Protection of coastlines from storms and waves Reduction of march shoreline erosion Stabilization of submerged land by trapping sediments
Habitat	Cycling of nutrients Nursery habitats
Cultural	Tourism and recreation Symbolic of coastal heritage

Figure 7. What type of impact do you think shellfish farms have on the environment?



When asked specifically if environmental risk is associated with shellfish aquaculture, respondents were somewhat more decisive (Fig. 8). While 40% of respondents were neutral in their position, only 3.2% indicated they “Strongly agree” with the statement that “shellfish aquaculture poses an environmental risk.” Amongst those disagreeing with the statement, 22.8% “Somewhat disagree” and another 19.5% “Strongly disagree” that shellfish aquaculture presents an environmental risk.

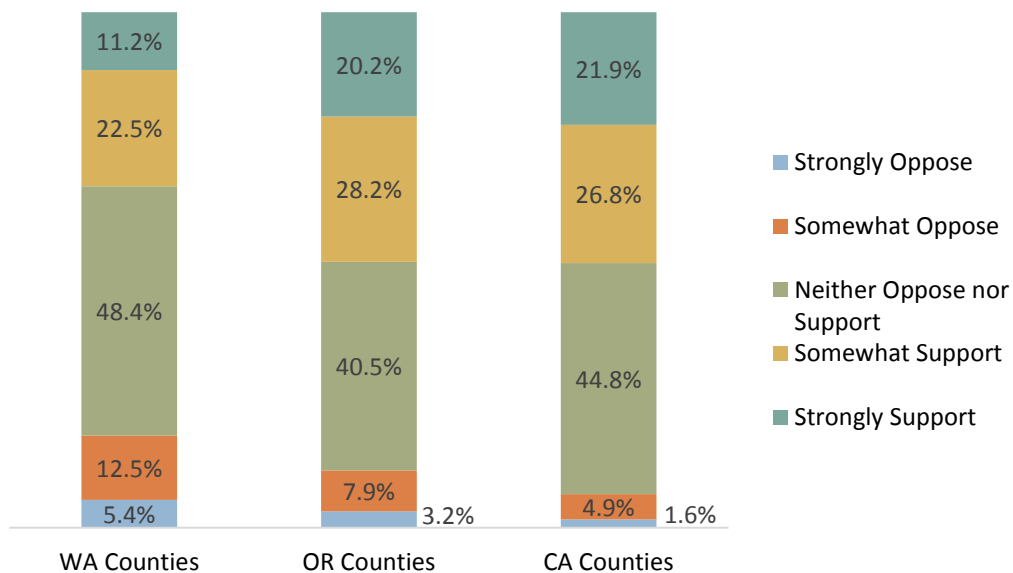
Figure 8. How strongly do you agree or disagree that shellfish aquaculture poses an environmental risk?



Support for shellfish aquaculture development

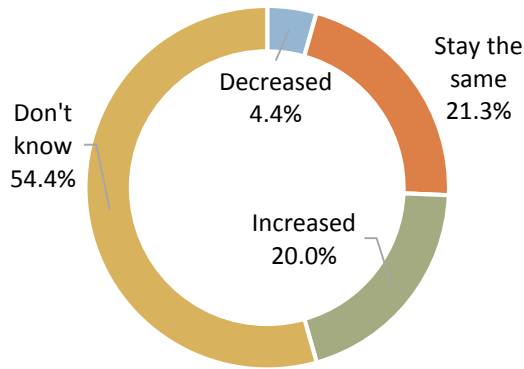
When questioned about the level of support respondents felt toward shellfish aquaculture expansion, the most common response across the study region was “Neither Oppose nor Support” (Fig. 9). Between the three state’s study regions, Washington had the largest proportion of respondents indicating this neutral position. The Washington study region also had the largest percentage of respondents stating strong opposition (5.4%) and the smallest percentage of “Somewhat Support” (22.5%) and “Strongly Support” (11.2%) responses. Strong support for development of nearshore shellfish aquaculture was highest among the California study region respondents (21.9%). Across all three states, “Strongly Support” responses outnumbered “Strongly Oppose” responses to this survey question.

Figure 9. Do you support or oppose the development of nearshore shellfish aquaculture?



In the Washington counties, strong support outnumbers strong opposition by a factor of 2 to 1 (11.2% to 5.4%). Oregon “Strongly Support” responses compared 6 to 1 (20.2% to 3.2%) and California by a factor of nearly 14 to 1 (21.9% to 1.6%).

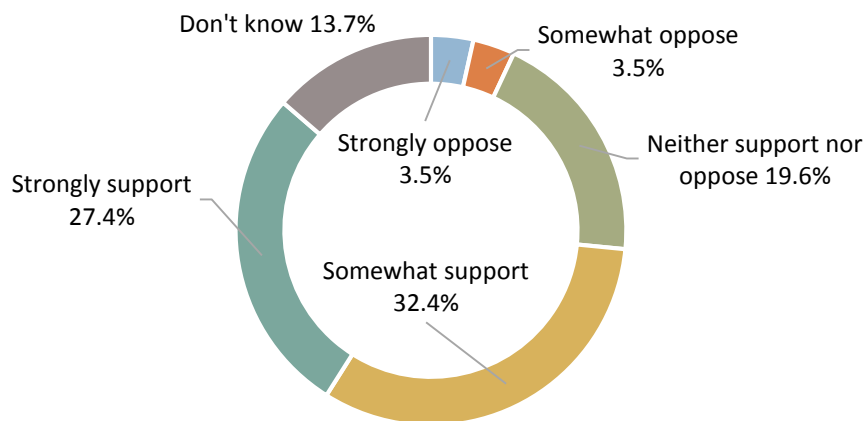
Figure 10. Do you think nearshore shellfish aquaculture production in your state should be...?



When questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, (Fig. 10) opinions were similar across the study region. Respondents in the entire study population were 4.5 times more likely to support an increase in nearshore shellfish production than those wanting production to decrease in their state (20.0% to 4.4%). Another one-fifth of respondents (21.3%) felt production should stay the same.

When asked explicitly about policies surrounding increased shellfish aquaculture in their state, respondents better articulated their level of support (Fig. 11). Across the entire study region only 3.5% of respondents “Strongly oppose” and another 3.5% “Somewhat oppose” policies supporting shellfish aquaculture. In contrast, 27.4% “Strongly support” and another 32.4% “Somewhat support” policies supporting shellfish aquaculture and increased domestic seafood production.

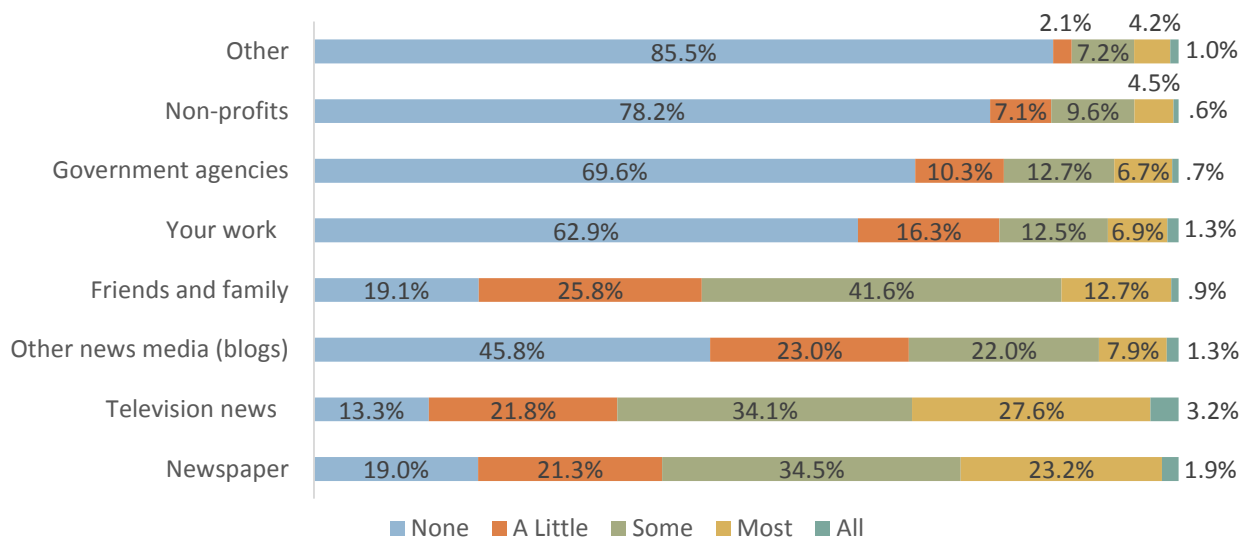
Figure 11. How strongly do you support or oppose the creation of policies that support shellfish aquaculture and increased domestic seafood production in your state?



Information Sources and Preferences

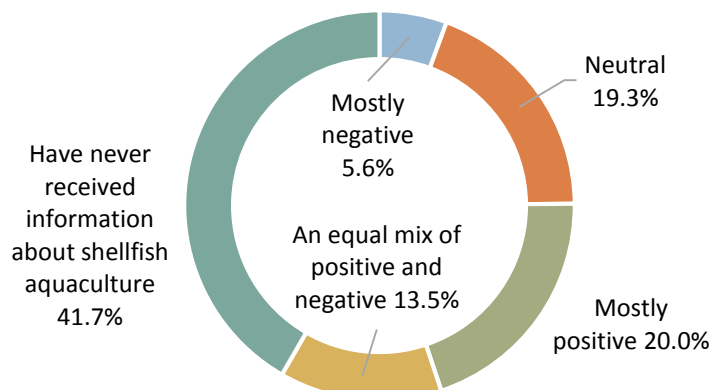
Understanding where community members receive their information can be valuable toward planning outreach and engagement programs. Often the source of information can also have a significant influence on individual opinions. When queried about their source of information regarding the health of local marine waters, respondents indicated a strong reliance on television news programming, newspaper, and friends and family (Fig. 12). When asked about non-profits and government agencies, these two groups had the largest percentage of “None” (78.2% and 69.6%, respectively). In other words, respondents indicated that they obtain no information regarding the health of local marine waters from these sources.

Figure 12. How much of your information on the environmental health of local marine waters and coastal areas come from the following sources?



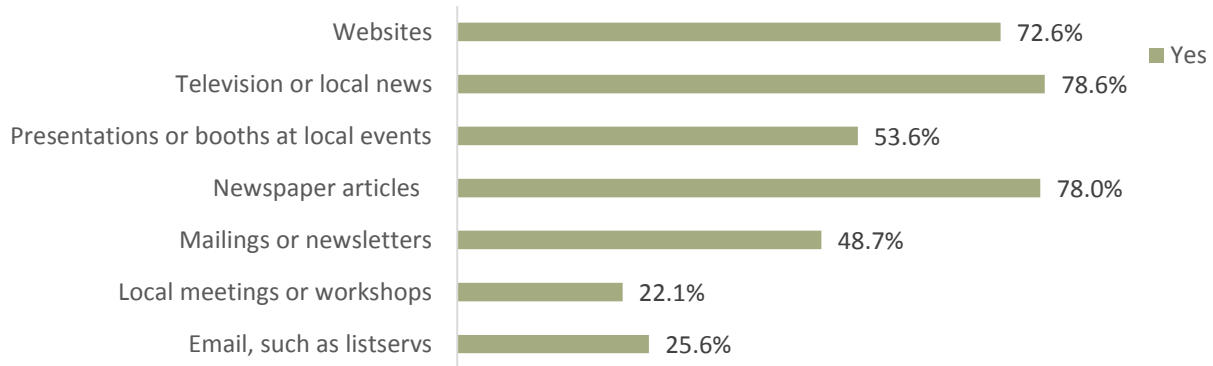
When asked if the information received about shellfish was negative, neutral, or positive, the largest segment of responses (41.7%) indicated that they have never received information about shellfish aquaculture (Fig. 13). These results indicate a clear opportunity for increased education and outreach. When asked which method they would prefer, if they were to receive information concerning local shellfish aquaculture, respondents indicated a preference for television (78.6%), newspapers (78%) and websites (72.6%) (Fig. 14). These results regarding information preferences correspond to the major sources respondents receive information on the health of local marine waters (Fig. 12). Other preferred

Figure 13. Is the information you receive about shellfish aquaculture mostly negative, neutral, or mostly positive?



methods of communication include presentations at booths and local events (53.6% yes responses) and mailings or newsletters (48.7% yes responses.)

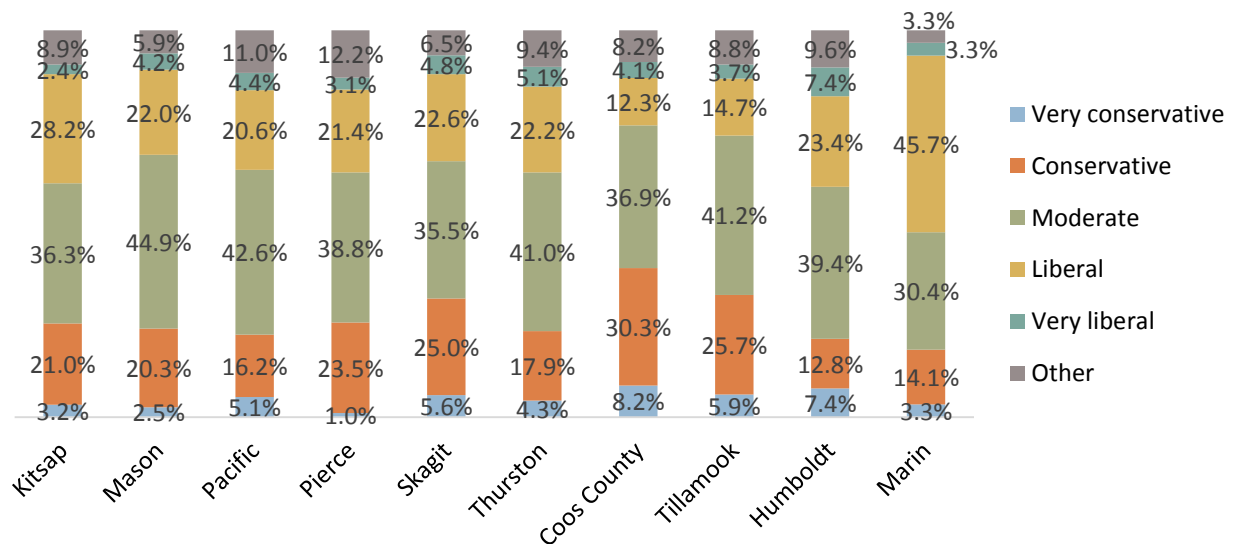
Figure 14. *If you were to receive more information concerning local shellfish aquaculture, which of the following methods would you prefer?*



Survey Population Demographics

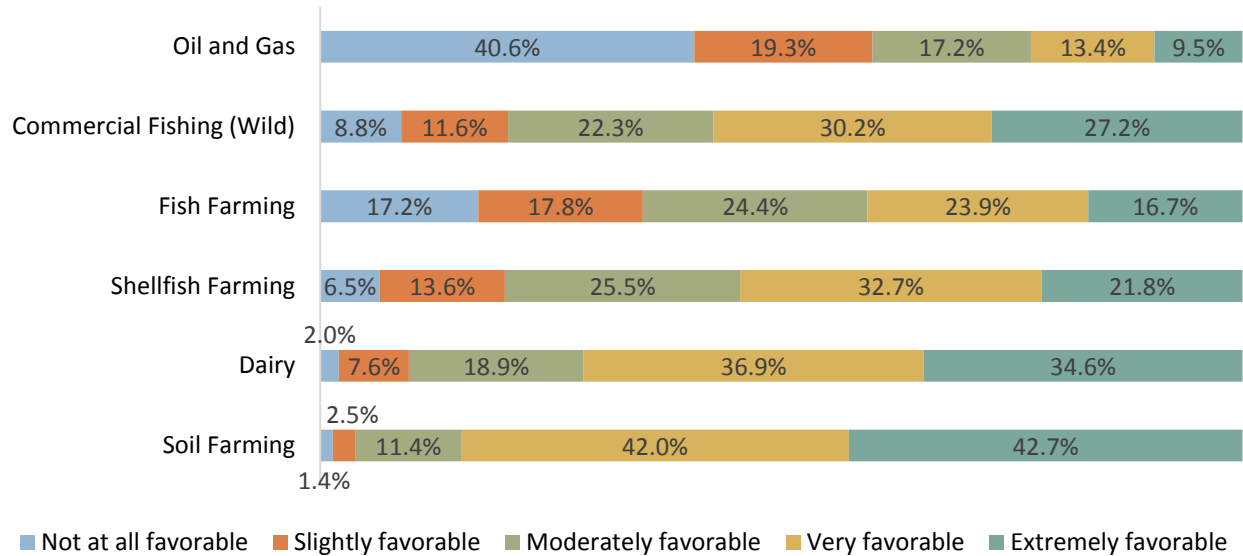
In an effort to better understand community responses, this study asked numerous questions about personal experience with shellfish related activities, political preference and general opinion of a few natural resource dependent industries. These questions were in addition to demographic information typically collected for surveys (e.g. age, sex, education level, income, etc.). Only a few of these questions are presented here, and are offered simply to aid the reader’s interpretation of results. These data demonstrates that the population of individuals who responded to the survey accurately characterizes these communities. When questioned about political values, responses covered both ends of the political spectrum, with the largest portion identifying themselves as “Moderate” (Fig. 15).

Figure 15. *Which of the following best describes your political beliefs or values?*



When asked how favorable or unfavorable respondents were toward certain natural resource dependent industries, opinion varied. At one end of the spectrum, the oil and gas industry was viewed most negatively with 40.6% rating it as “Not at all favorable” while soil farming (terrestrial agriculture) was rated “Extremely favorable” by 42.7% of respondents. The fishing, shellfish and dairy industries fell somewhere in between, in terms of favorability rating (Fig. 16).

Figure 16. How favorable or unfavorable are you toward each of the following?



This survey also pursued understanding of citizen’s general familiarity with shellfish as a local natural resource. Encompassing both commercial and recreational activities, respondents were asked “Have you ever personally harvested shellfish?” Results revealed a majority of “Yes” responses in all counties surveyed, except Kitsap County (equally split)

Table 5. Have you ever personally harvested shellfish?

Study Area	No	Yes
Kitsap	50.0%	50.0%
Mason	19.4%	80.6%
Pacific	24.5%	75.5%
Pierce	54.3%	45.7%
Skagit	38.3%	61.7%
Thurston	49.2%	50.8%
Washington Study Area	49.7%	50.3%
Coos County	36.8%	63.2%
Tillamook	30.8%	69.2%
Oregon Study Area	35.5%	64.5%
Humboldt	61.2%	38.8%
Marin	72.3%	27.7%
California Study Area	68.5%	31.5%
Total Study Area	52.9%	47.1%

and Pierce County in Washington, and Humboldt and Marin counties in California (Table 5). Pierce County, Washington, and California results may be explained by the limited shellfish resources available for public harvest in these regions. In contrast, Washington’s Mason County had the highest percent (80.6%) of “Yes” responses, reflecting the region’s public shellfish resources, and the county’s large sector of shellfish aquaculture employment. Pacific County had a similarly high (75.5%) percent of respondents indicating experience with shellfish harvest.

Conclusions

This survey assessed perceptions and behaviors related to shellfish and shellfish farming, and examined what influences social attitudes toward these activities. Survey results reveal limited knowledge of shellfish aquaculture across the ten-county study region. More than half of all respondents indicated that they had never seen a shellfish aquaculture farm, and 43.1% stated they were “not at all familiar” with the practice of shellfish aquaculture. Furthermore, when asked if the information received was negative, neutral, or positive, the most frequent response was that they have never received information about shellfish aquaculture.

These results indicate a clear opportunity for increased education and outreach regarding shellfish related activities in Washington, Oregon and California. Results also suggest that the most effective means to share information will be television, newspapers and websites, as well as booths at public events. These information outlets are stated preferences for the total study population, but also correspond well with the information sources respondents indicate they depend on for discerning the health of local marine waters.

This study also reveals a considerable level of support for policies supporting shellfish aquaculture and increased domestic seafood production. While the most common response to this policy question was “Neither Oppose nor Support” the “Strongly Support” responses outnumbered “Strongly Oppose” responses in all counties. In the Washington counties, strong support outnumbers strong opposition by a factor of 2 to 1. In Oregon strong support for shellfish aquaculture expansion outnumbered strong opposition 6 to 1, and California by a factor of nearly 14 to 1. Similarly, when questioned if nearshore aquaculture production in their state should be increased, decreased, or stay the same, a preference for increased production outnumbered decreased production by a factor of 4.5 to 1.

This evidence of citizen support for shellfish aquaculture policies and expansion provides strong justification for continuing to elevate shellfish issues, both regionally and nationally. Example efforts include the state of Washington Shellfish Initiative, and NOAA’s National Shellfish Initiative, both of which were launched in 2011 with expansive regional partnerships and support. These initiatives should continue, providing critical leadership and focus to expand opportunities for shellfish farming and restoration. Respondents to this survey recognize the “great benefit” of shellfish aquaculture, especially for: providing locally produced seafood, creation of jobs, improving the local and state economy, and relieving pressure on wild fisheries. Proliferation of local and regional shellfish aquaculture support will be necessary to continue to realize these benefits.

Citations

Allen, Thom and Danna Moore. 2014. *Shellfish Farming and Your Community Residential Survey*. Data Report 13-077. Prepared for The Pacific Shellfish Institute. WSU Social and Economic Sciences Research Center. Pullman, WA.

Millennium Ecosystem Assessment. 2005. *Ecosystems and Human Well-Being: Synthesis*. Island Press, Washington. 155pp.

Northern Economics, Inc. 2013. *The Economic Impact of Shellfish Aquaculture in Washington, Oregon and California*. Prepared for Pacific Shellfish Institute.



Shellfish harvest and transport barge anchored in the Nisqually Reach region of southern Puget Sound, with Mount Rainier in the background.