CASCO BAY REGIONAL SHELLFISH WORKING GROUP

Photo by Jessica Gribbon Joyce

Shellfish Database Needs Assessment: Summary of a stakeholder survey

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I. Introduction

A. Background

The wild-harvest shellfish industry is an economically and culturally important industry in Maine. In 2020, soft-shell clam landings in the Casco Bay region alone contributed $4.20 million to the economy and quahog landings contributed $2.12 million[1]. Statewide, over the past 40 years, soft-shell clam landings have followed a decreasing trend while quahog landings have generally increased over the last 10 years, and the shellfish community has struggled to adapt to these shifts in combination with other impacts of climate change. Better data and information are essential in addressing these threats to the wild shellfishery, but resources are often unavailable, inaccessible to a general audience, or difficult to interpret.

At the recommendation of the members of the Casco Bay Regional Shellfish Working Group ('WG'), we are developing an interactive data portal to provide local data and information in the intertidal zone. In order to create a resource that is relevant, accessible, and applicable to the challenges facing the shellfish community, the project started with stakeholder engagement in the form of a survey. The survey assessed the needs of the community, support for the data portal project, how the data portal may be used, and how this project can build on the resources that are currently available. Starting the project with stakeholder feedback facilitates community buy-in and helps integrate the needs of the audience into the design of the data portal. Based on survey feedback, the data portal will be organized into action-oriented topics that will aid in decision-making and promote resilience in the shellfish community.

B. Needs Assessment Purpose

The project team conducted this needs assessment to gather information from resource managers and stakeholders to inform the development of an interactive database or data portal for municipal shellfish conservation and management. Feedback was gathered using a survey instrument that included questions about the data and information that municipal shellfish or marine resource commissions currently use, the data and information that would be useful to include, and the format the data portal should take.

C. Project Goals and Objectives

The goal of this project is to develop an online resource of up-to-date, relevant, and accessible data and information pertaining to the intertidal ecosystem and shellfish resources. Through creating this resource, in the form of a data portal, with user-friendly GIS-based map viewers, municipal shellfish committees will have more data available to make informed decisions on the conservation and management of their wild shellfish resources.

Scientists, educators, and students will have centralized data to conduct research or monitoring projects. Harvesters will be able to see trends of changes in the ecosystem and resources over time and identify potential issues and opportunities in the fishery. Organizations providing technical assistance to municipalities or conserving coastal land and access will utilize data to inform priorities and to leverage funding. Municipal planning boards can utilize maps to inform planning in the intertidal zone and identify and mitigate coastal risks to increase resiliency to climate change impacts, including sea level rise.

This needs assessment survey is the first of four objectives needed to achieve the goal of a data portal and ensure that it is grounded in stakeholder feedback and needs from the beginning. The following objectives

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[1] Maine DMR, Commercial Landings Data (2020 data are preliminary): https://www.maine.gov/dmr/commercial-fishing/landings/index.html

include designing the data portal and a plan for ongoing hosting/maintenance, populating the data portal with new and existing data, and providing outreach and training to municipalities to familiarize them with how to utilize the data portal.

D.   Data Collection Methods

The project team gathered feedback through an online survey and via telephone surveys. The online survey was conducted using SurveyMonkey. The WG emailed a survey link to stakeholders, including shellfish committee members, shellfish wardens, researchers, and others providing technical assistance to the shellfish community. Stakeholders who did not have an email or who did not respond to an initial email were contacted via phone to give feedback. Survey responses collected over the phone were documented using SurveyMonkey by the interviewer.

The WG launched the survey on February 1, 2021 at 9 a.m. and was set to close on February 28th, although the feedback period was extended to March 5, 2021 at 5 p.m. In total, there were 61 responses. Only two demographic questions were required, which allowed respondents to skip questions that were not applicable to them. Providing contact information was optional. Names and identifying information have been kept confidential and results will only be provided in aggregate. Names will not be used in any presentations or reports. The survey was for information purposes only and was not conducted as formal research.

This report summarizes the results of the survey, which will be used to plan the format and content of a shellfish data portal. Each question will include the number of responses and the number of respondents who skipped a question, as well as the percent per response for questions with choices. For open-ended questions, responses will be organized by theme.

II. Demographics

A.   Municipal Co-management and Roles in the Shellfish Community

Several species of wild shellfish are co-managed by municipalities in cooperation with the state of Maine's Department of Marine Resources (DMR). The most common species are soft shell clams (*Mya arenaria*) and quahogs (*Mercenaria mercenaria*), although there are six species that can be managed by municipalities[2]. Each municipality with a shellfish resource may adopt a shellfish conservation ordinance to establish commercial and recreational license requirements and may appoint a shellfish management committee (also referred to as a municipal shellfish committee or marine resources commission) to implement the ordinance. Municipal shellfish wardens are appointed to enforce the regulations of the ordinance. Non-profit organizations and researchers may provide technical support and guidance to the municipalities. These groups make up the wild harvest shellfish community.

All respondents were required to select their primary role in the shellfish community and the municipality in which they primarily work. No other identifying information was required, though there was the option to include name and contact information at the end of the survey for follow-up on the status of the data portal project. There was also a voluntary question about any secondary roles the respondent has in the shellfish industry.

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[2] These six species include the Atlantic razor clam (*Ensis directus*), American oyster (*Crassostrea virginica*), European oyster (*Ostrea edulis*) and Atlantic surf clam (*Spisula solidissima*). Read more on DMR's shellfish identification webpage.

When asked about their primary role in the shellfish community, the majority of respondents selected 'Commercial Harvester' (30%), followed by member of a 'Municipal Shellfish Committee/Marine Resource Commission (MRC)' (20%). 'Municipal Shellfish Warden', 'Non-Profit Organization,' and 'Researcher/Academic' all received 8% of responses, followed by several responses with lesser percentages (Figure 1). Those who selected 'Other' (8%), included a state manager and a state biologist from the DMR, two coastal/marine resource managers, and a town clerk.
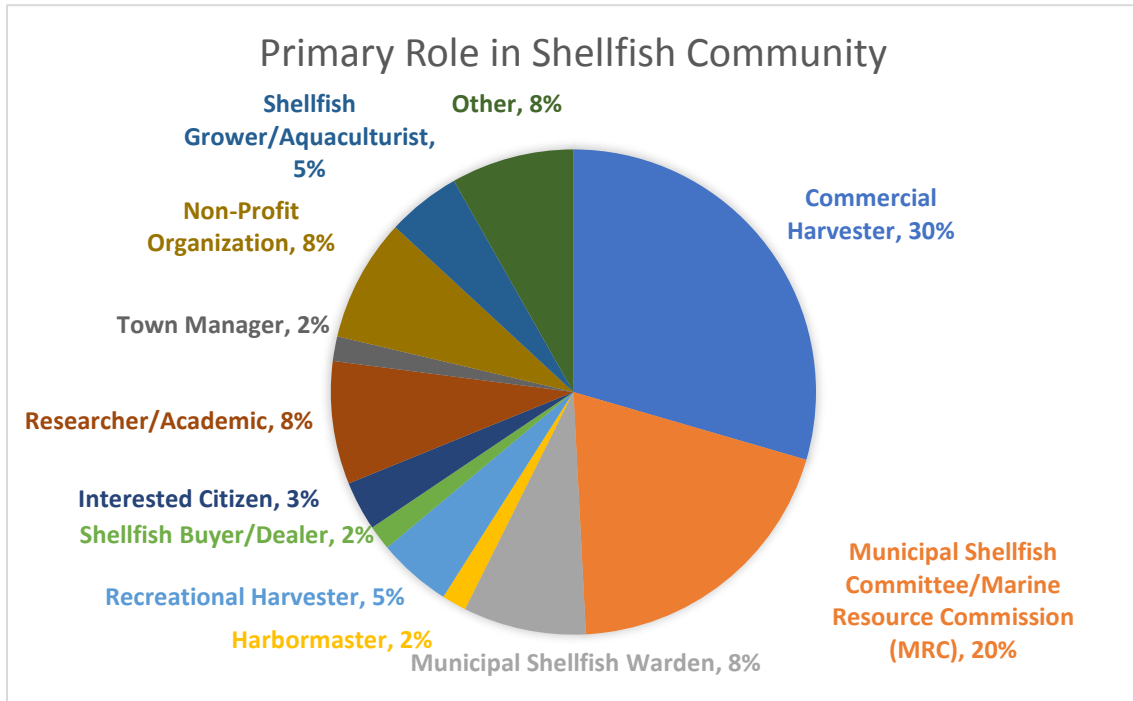

Figure 1: Primary Role in Shellfish Community (n=61).

The next question asked respondents to identify any additional roles that they have in the shellfish community (Figure 2). This question allowed multiple responses, so they add up to over 100%. About 35% of respondents identified as an 'Interested Citizen,' followed by 'Municipal Shellfish Committee/MRC' members (31%) and 'Commercial Harvester' (17%).
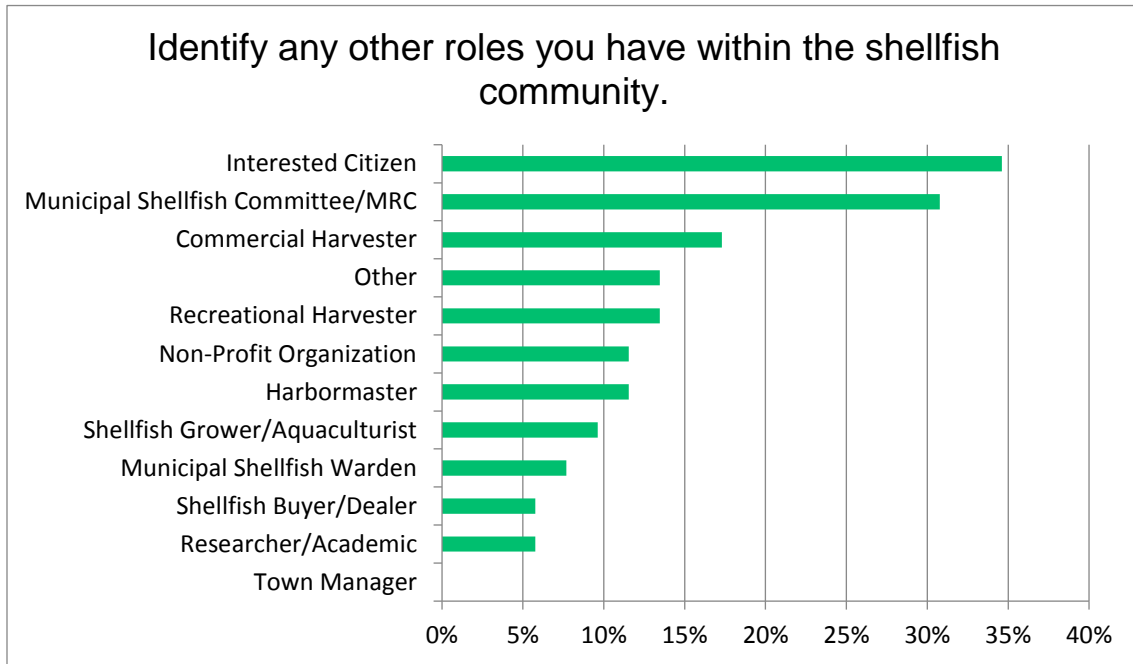
Figure 2: Additional Roles in the Shellfish Community (n=52, multiple selection).

B. The Casco Bay Region

This project defines the Casco Bay region broadly, inclusive of adjacent municipalities and other upstream municipalities in the watershed with shellfish ordinances. The municipalities in the Casco Bay region with shellfish ordinances include: Arrowsic, Biddeford, Brunswick, Cumberland, Chebeague Island, Freeport, Georgetown, Harpswell, Phippsburg, Scarborough, Yarmouth, West Bath, and Woolwich. We received feedback from all 13 of these communities (Figure 3). Responses for the 'Other' category included seven people who work for multiple municipalities in the Casco Bay region and seven people who work coastwide.
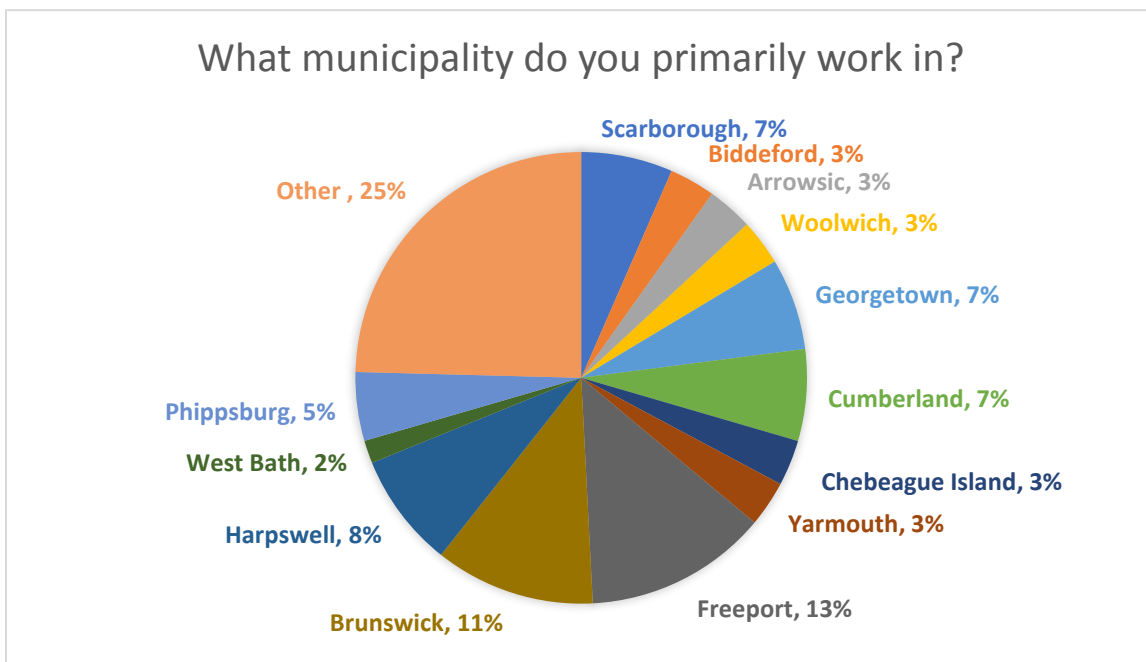

Figure 3: Primary Municipality (n=61).

III. Current Data and Information Use

The following questions provide some background on the issues on which municipal shellfish committees and other organizations in the shellfish community are currently focused on, and how they are using data and information to inform decisions.

When asked about the primary concern of their municipal shellfish committee or organization, the highest responses were for 'Municipal Conservation' (63%), 'Predation' (58%), and 'Municipal Management' (56%) (Figure 4). These were followed by 'Fisheries Diversification' (33%) and 'Availability of Data' (28%). 'Coastal and Ocean Acidification' and 'Competing Uses' follow closely behind with 23% and 19% of respondents selecting these choices, respectively. Responses for 'Other' (11%) included water quality, a lack of social and volunteer capacity, and gentrification interfering with coastal livelihoods. This question allowed multiple selections, so percentages add up to over 100%.
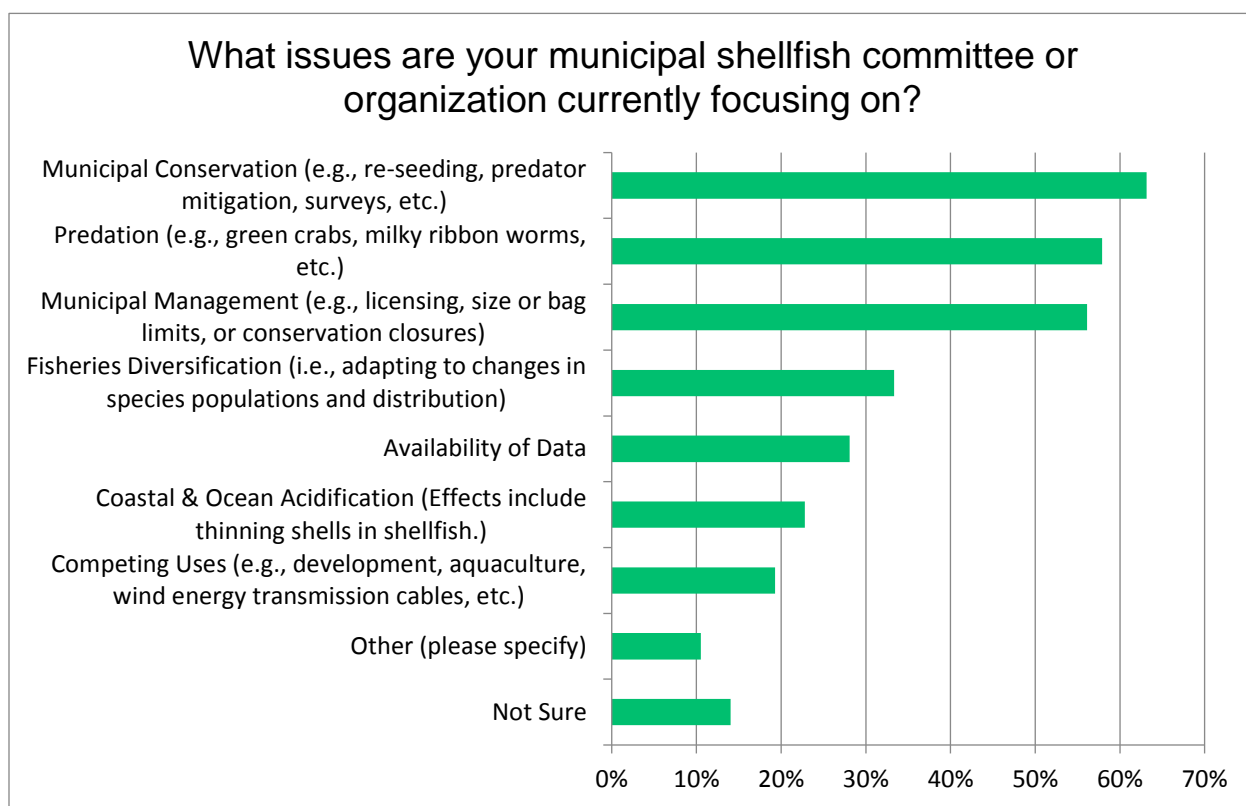

Figure 4: Municipal Shellfish Committee Focus (n=57, multiple selection).

Survey participants were also asked what type of information their municipal shellfish committee uses regularly to inform decision making (Figure 5). This question had the option to select 'all that apply,' so the responses add up to over 100%. The highest four responses were 'Shellfish License Allocations' (68%), 'Local Knowledge' (64%), 'Shellfish Surveys' (63%), and 'Water Quality Data' (59%). About 39% of respondents selected 'Dept. of Marine Resources (DMR) Landings Data' and 32% selected 'DMR Shoreline Surveys.' Of the 57 respondents, 16% selected 'Not Sure,' and 7% selected 'Other.' Some of the comments on 'Other' included addressing water quality issues, educating the public about the shellfish community, and maintaining access to the mudflats.
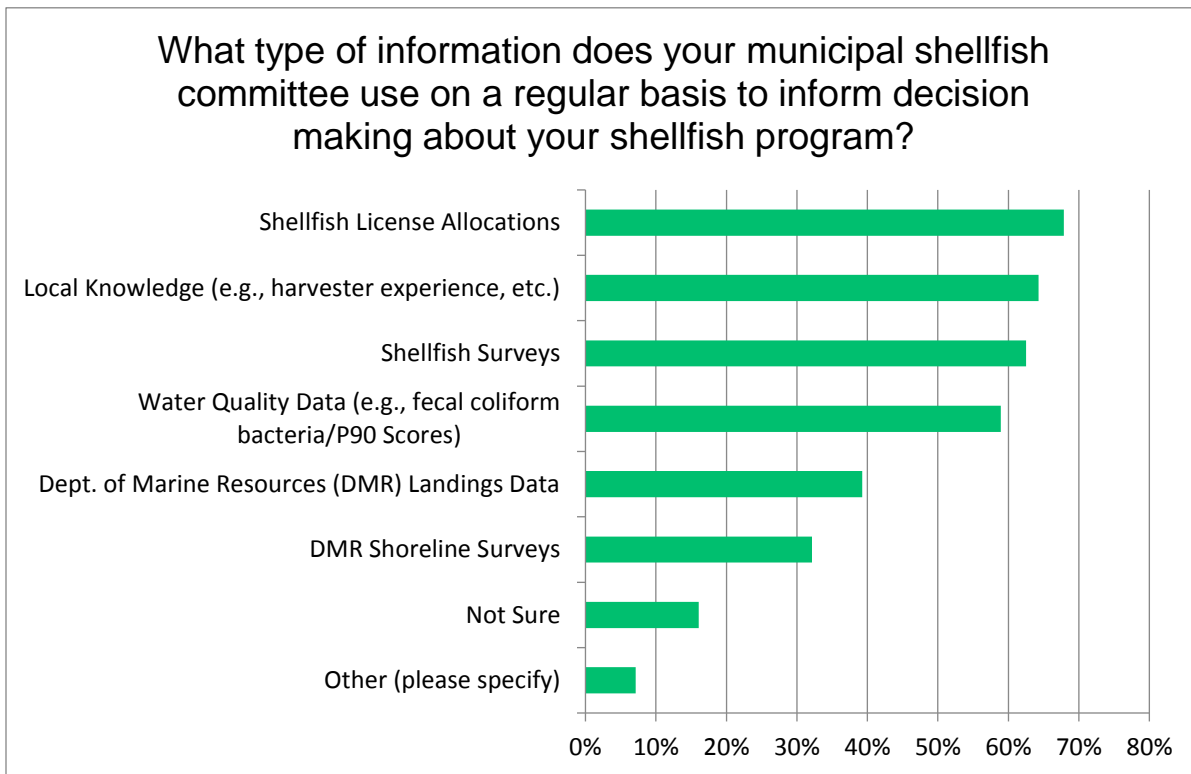
What type of information does your municipal shellfish committee use on a regular basis to inform decision making about your shellfish program?

Figure 5: Data and Information Used by Shellfish Committees (n=56, multiple selection

An open-ended follow-up question asked what data or information the respondent's municipal shellfish committee or organization uses to address their primary focus. Of the 36 people who responded, 33% mentioned using local shoreline surveys or green crab surveys, 33% referenced experience-based knowledge, and 31% mentioned using published research, including research on ocean acidification, predation, and invasive species. Other responses included landings data and water quality data from the DMR.

IV. Data and Information Needs Assessment

A. Annual Shellfish Management Review Data

Municipalities with a shellfish ordinance are required by law to complete the DMR Annual Shellfish Management Review (also referred to as the annual shellfish report). This annual shellfish report serves as a management plan for towns and includes the following information: shellfish committee contact info; committee meeting details; management goals and implementation actions; licenses allocated and taken out; conservation credits; warden activity; conservation activities completed - closures, transplanting, spatfall enhancement, predator reduction; survey locations & results; proposed management activities; and shellfish conservation budgets.

First, participants were asked whether they were aware of the DMR requirement for municipalities to submit an annual shellfish report. Of the 53 individuals who responded, 83% were aware of this requirement. The annual shellfish report may be completed by the municipal shellfish committee, municipal shellfish warden, the town manager, or a combination of these parties. On the survey, most respondents indicated 'Municipal Shellfish Warden' (41%) or 'Chair of Municipal Shellfish Committee' (37%) when asked who completes the report, followed by 'Town Manager and/or Town Clerk' (29%) (Figure 6). About 24% of respondents selected 'Not Sure,' and 16% selected 'Members of the Municipal Shellfish Committee.' There were nine people, or 18% or

respondents, who selected 'Other.' Many specified that their coastal/marine resource officer, harbormaster, or a combination of the parties listed complete the annual shellfish review.
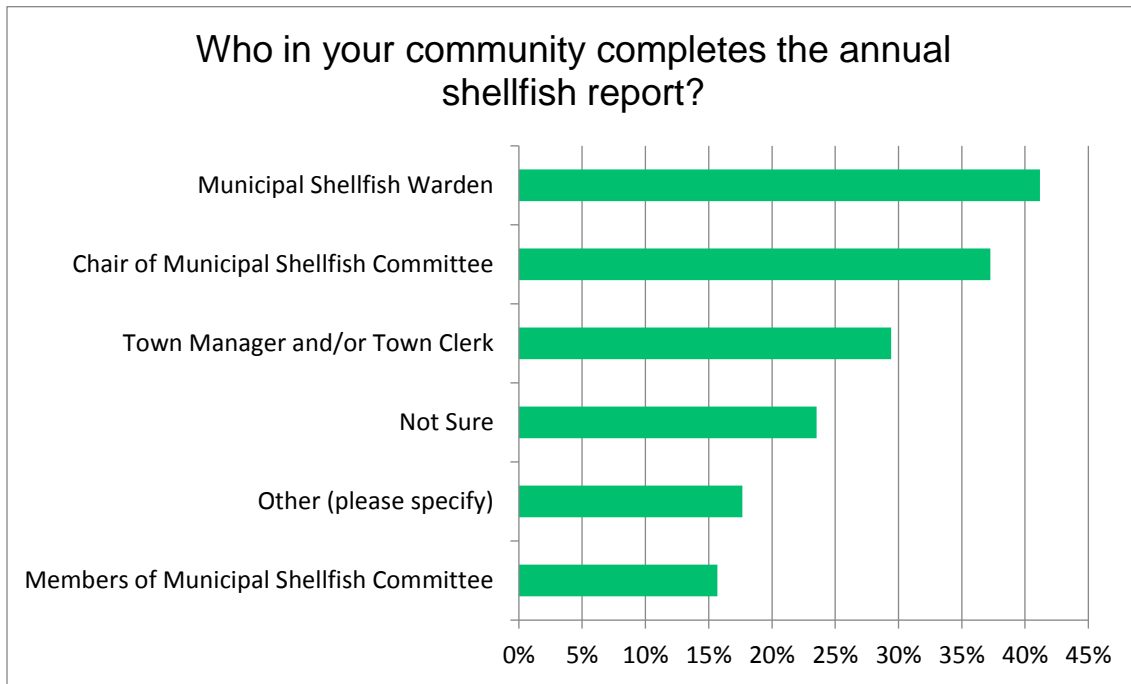

Figure 6: Annual Shellfish Report Responsibilities (n=51, multiple selection).

Most respondents indicated that their town uses information from past reports to inform decision making, with 67% of the 59 respondents selecting 'Yes' and only 12% selecting 'No.' About 21% of respondents selected 'Not Sure.' When asked whether it would be useful to have online access to the information included in these annual shellfish reports, for their community and/or other neighboring communities, over 71% of the 52 respondents indicated that they would. About 13% of respondents indicated 'No,' and 15% selected 'Not Sure.'

A follow-up question asked what format respondents would prefer for submitting the annual shellfish report. Most of 51 who responded either preferred an online form (61%) or had no preference (33%). About 6% favored a paper form.

Participants were asked to select which of the sections from the annual shellfish reports would be useful to have access to for management decisions. All of the datasets in the list were selected by 33% or more of the respondents. The most common selection was 'Conservation Activities Completed' (67%). Responses for 'Licenses Allocated and Sold' (61%), 'Proposed Management Activities' (61%), 'Survey Locations and Results' (59%), and 'Management Goals and Activities' (59%) were similarly high (Figure 7). About 41% of respondents were interested in 'Shellfish Committee Contact Info,' followed by the remaining sections of the report, which each had a selection rate between 33% and 37%.
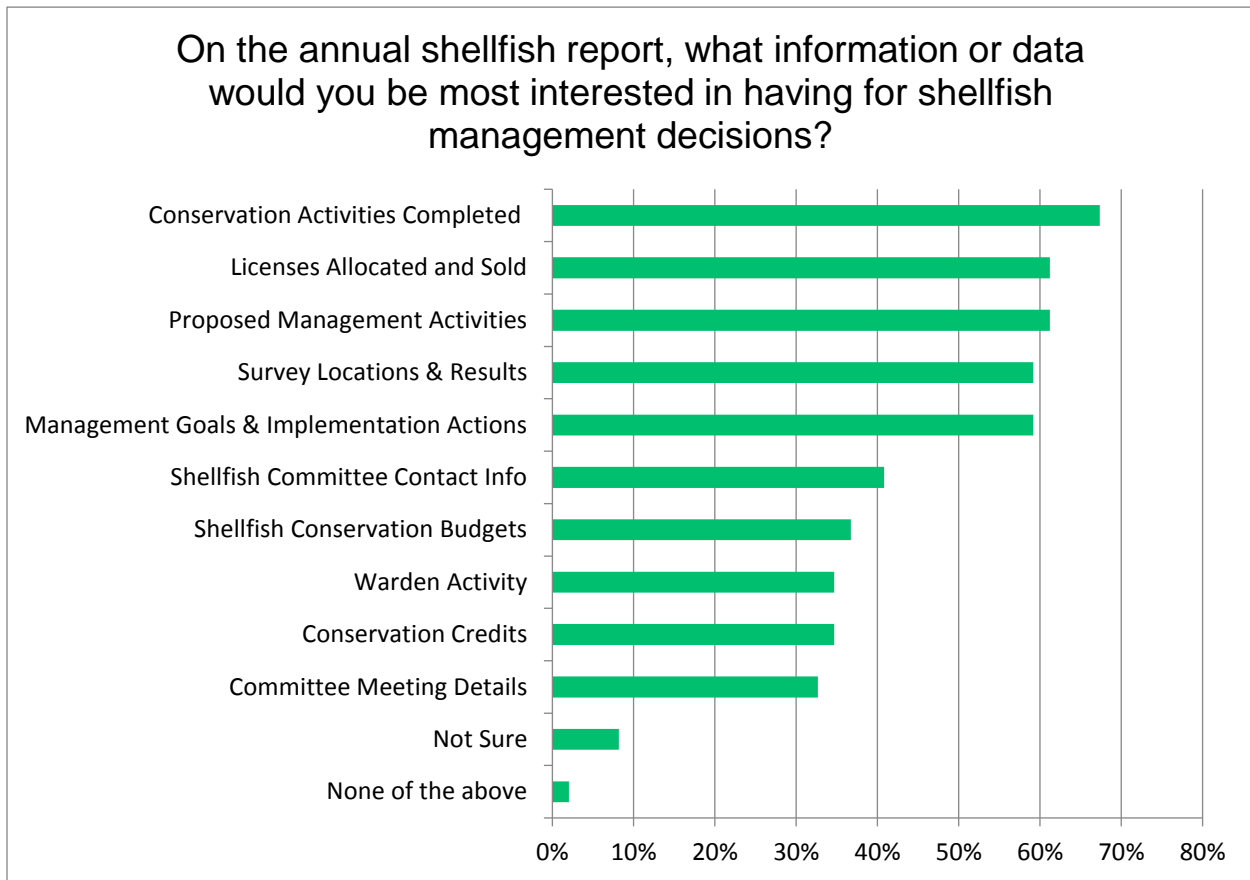
On the annual shellfish report, what information or data would you be most interested in having for shellfish management decisions?

Category	
Conservation Activities Completed	~67%
Licenses Allocated and Sold	~61%
Proposed Management Activities	~61%
Survey Locations & Results	~59%
Management Goals & Implementation Actions	~59%
Shellfish Committee Contact Info	~41%
Shellfish Conservation Budgets	~36%
Warden Activity	~35%
Conservation Credits	~35%
Committee Meeting Details	~33%
Not Sure	~8%
None of the above	~2%

Figure 7: Interest in Information from Annual Shellfish Reports (n=49, multiple selection).

An open-ended question followed, asking respondents if there was any other information that is not currently included in the report that might be useful for management decisions. Out of the 21 responses, some of the most common responses included: landings or harvest data by area harvested, town water quality and weather records, the effectiveness of management or conservation activities, and any additional support needs that towns have, which could be met by volunteers or civic organizations. One commenter suggested including access points to the intertidal zone and any changes to access. Another expressed concern over the burden that adding sections to the annual shellfish report would create for small shellfish programs.

B. Marine & Environmental Data

This section of the survey focused on the data related to marine and environmental conditions that could be incorporated into the shellfish data portal. This data could help inform conservation activities, management decisions, and planning.

Respondents were given the list and asked to select the datasets to which they would like to have access when making shellfish management decisions. At least 30% of respondents were interested in all of the listed datasets, but the highest interest was in 'Fecal Coliform Counts (P90 Scores)' (77%), followed by 'Shellfish Growing Area Classification' (71%) and 'Conservation Closures' (69%) (Figure 8). Other datasets with high responses included

'Water Quality Monitoring Data' (67%), 'Aquaculture Leases – Proposed and Existing Sites' (65%), and 'Molluscan Shellfish Areas' (58%).[3] Additional responses can be viewed below in Figure 8.
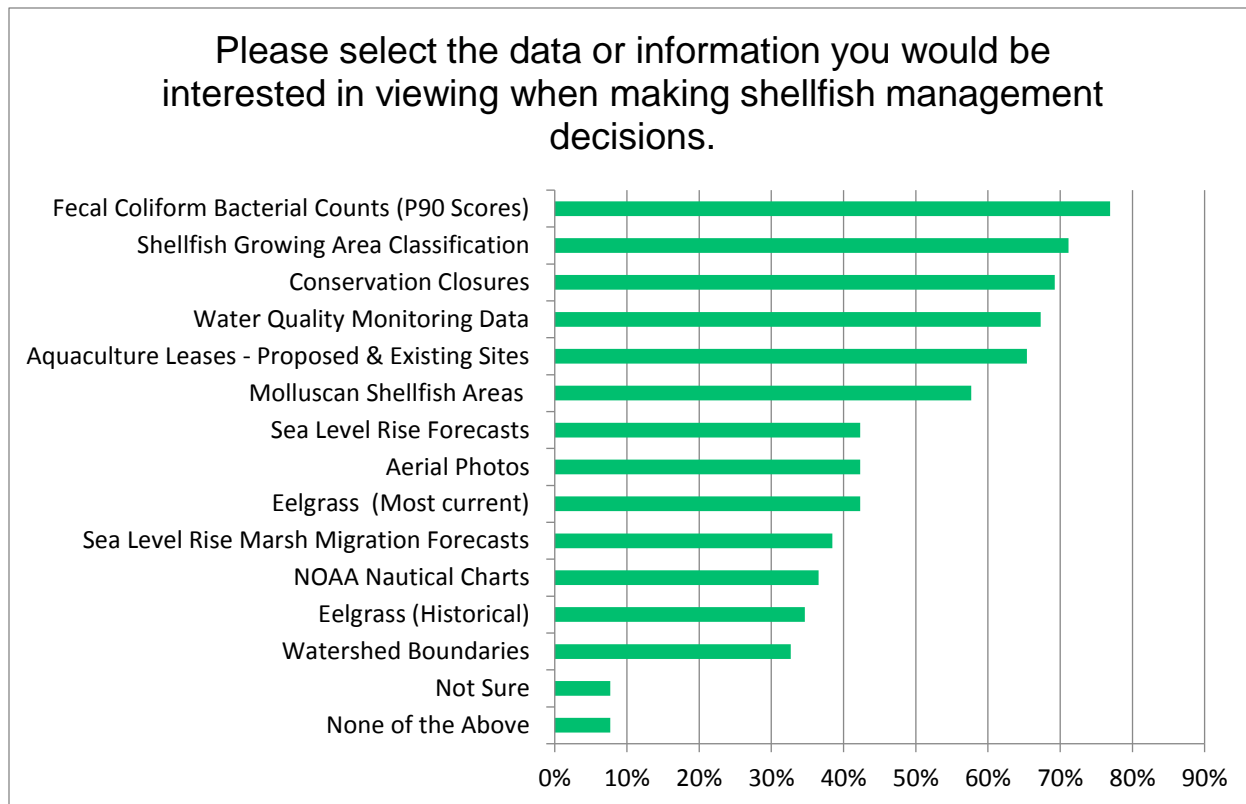

Please select the data or information you would be interested in viewing when making shellfish management decisions.

Figure 8: Interest in Marine and Environmental Data (n=52, multiple response).

There was also an opportunity to list other marine or environmental datasets not included in this list in an open-ended question. Some themes that emerged in these responses included:

- Rainfall data and changes to rainfall closure criteria
- Marine soil sediment maps and bathymetry
- Water circulation maps
- Lower low water line
- Essential Fish Habitat data or endangered species data to meet requirements for predator net licensing
- Town specific research and shellfish surveys conducted by researchers

There were also a few comments that mentioned ensuring the database is user-friendly and using a format that synthesizes this data into useful advice.

C. Land Based Utilities, Ownership, and Pollution Data

This section of the survey inquired about land-based data that may be relevant to shellfish management, including municipal infrastructure, zoning, and pollution data. Datasets related to landcover, septic systems, and wastewater treatment could help identify sources of water pollution. Surface runoff may facilitate the flow of bacteria or other pollutants into coastal waters, leading to degraded water quality that may impact the health of

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[3] These six datasets are all currently available in Maine DMR's Public Health Web Map.

shellfish populations. In particular, high levels of fecal coliform bacteria can contaminate shellfish populations and make them dangerous for human consumption. For this reason, areas of the intertidal can be closed to harvesting by the Maine DMR when fecal coliform levels reach a certain threshold.

Respondents were asked to select any datasets that they would be interested in viewing when making shellfish management decisions. The highest three responses included 'Failing Septic Systems' (83%), 'Point Source Pollution (Maine Dept. of Environmental Protection [DEP])' (79%), and 'Public Access Points' (75%) (Figure 9). These were followed by 'Wastewater Treatment Facility Discharges' (63%), 'Combined Sewer Overflows' (58%), and 'Municipal Sewer Treatment Plants' (50%). All the datasets listed were selected by at least 30% or higher of the respondents, and can be viewed in Figure 9.
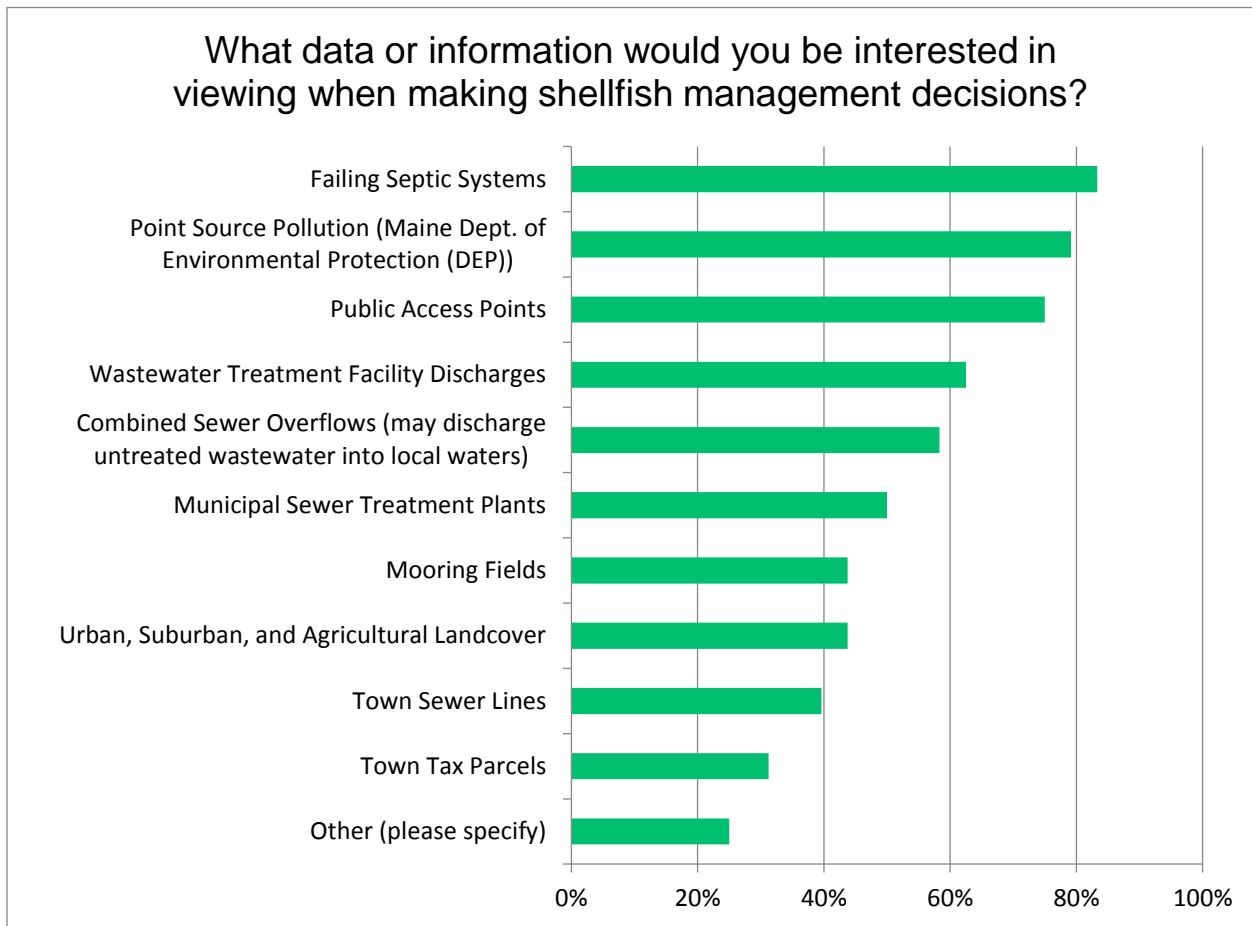

Figure 9: Interest in Land-based Data (n=48, multiple response).

A final open-ended question asked for any other data that we did not list that would be applicable to shellfish management. Some themes that emerged in the responses include:

- Impervious cover
- Overboard discharges
- Locations of permanent and removable docks and pier structures
- Sediment type and shoreline erosion maps
- Locations of research projects in intertidal, the groups involved, and the topic (acidification, diversification, predator protection)

- Downeast Institute's applied research on clam recruitment and survival
- Zoning maps, construction sites, and building codes

V. Data Portal Format and Access

This section of the survey focused on how stakeholders would access and interact with the data. This will inform the format of the 'front end' of the data portal, also referred to as the user interface. Most of these questions gauge level of interest in potential features of the data portal on a five-point scale from 'Very Interested' to 'Not At All Interested.'

As a baseline gauge of support for the project, participants were asked whether they would be interested in a shellfish-focused online database. Of the 54 who responded, 75% expressed interest in an online database, with 56% selecting 'Very Interested' and 19% selecting 'Somewhat Interested' (Figure 10). About 15% of respondents selected 'Neutral,' and 12% were either 'Not Very Interested' or 'Not At All Interested.'
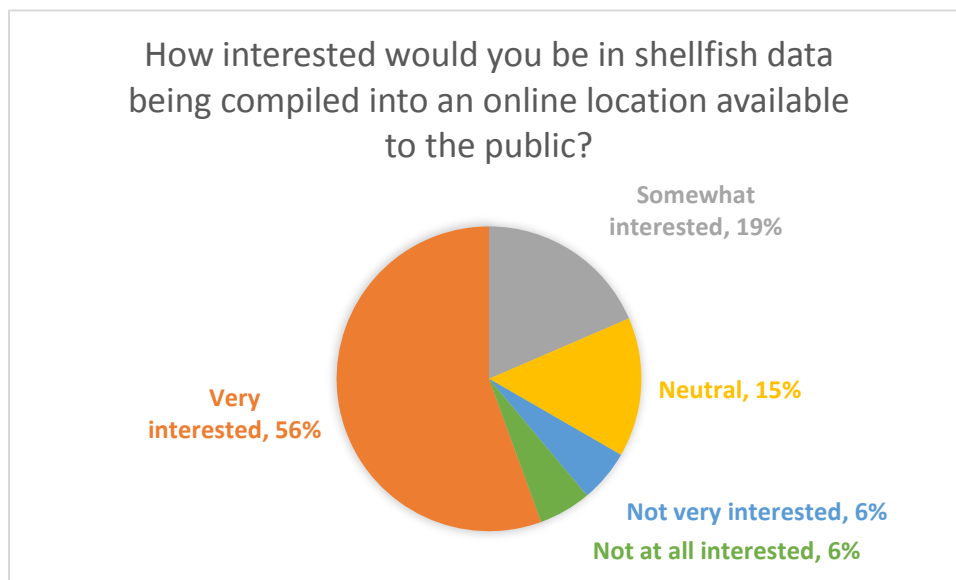

Figure 10: Interest in an Online Shellfish Database (n=54).

Participants were then asked how interested they would be in a map viewer with data layers that could be turned on and off. In total, 78% of the 54 people who responded expressed some level of interest in this feature, whether they selected 'Very Interested' (56%) or 'Somewhat Interested' (22%) (Figure 11). About 11% of respondents selected 'Neutral,' and 12% were either 'Not Very Interested' (6%) or 'Not At All Interested' (6%).

How interested would you be in shellfish data being displayed in a map where layers could be turned on and off?

Somewhat interested, 22%

Neutral, 11%

Not very interested, 6%

Very interested, 56%
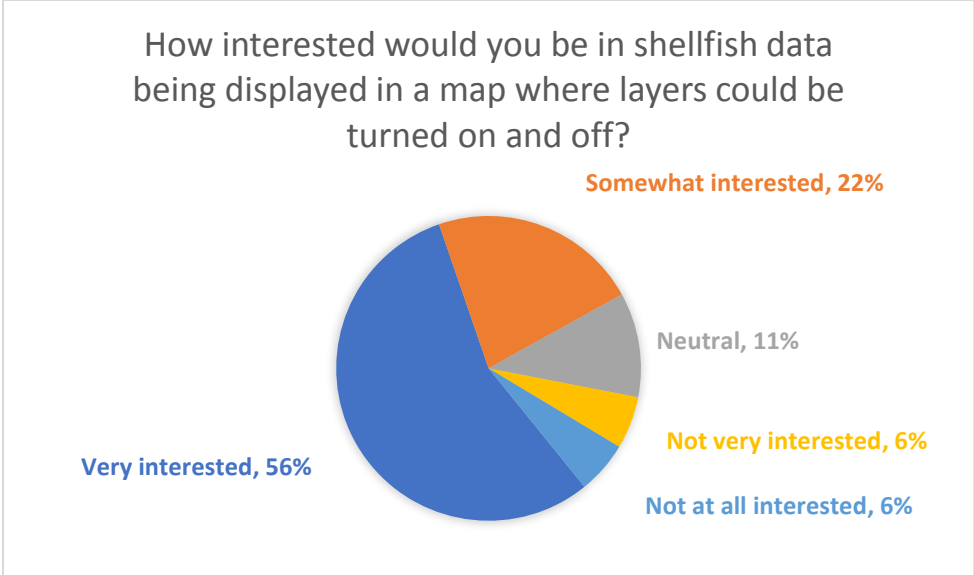
Not at all interested, 6%

Figure 11: Interest in Data Layers (n=54).

When asked to rate their interest in the ability to print local and/or regional maps from the data, 77% were 'Very Interested' (57%) or 'Somewhat Interested' (20%), 11% selected 'Neutral,' and 12% were 'Not Very Interested' (6%) or 'Not At All Interested' (6%) (Figure 12).

How interested would you be in the ability to print local and/or regional maps from the data?

Somewhat interested, 20%

Neutral, 11%

Very interested, 57%

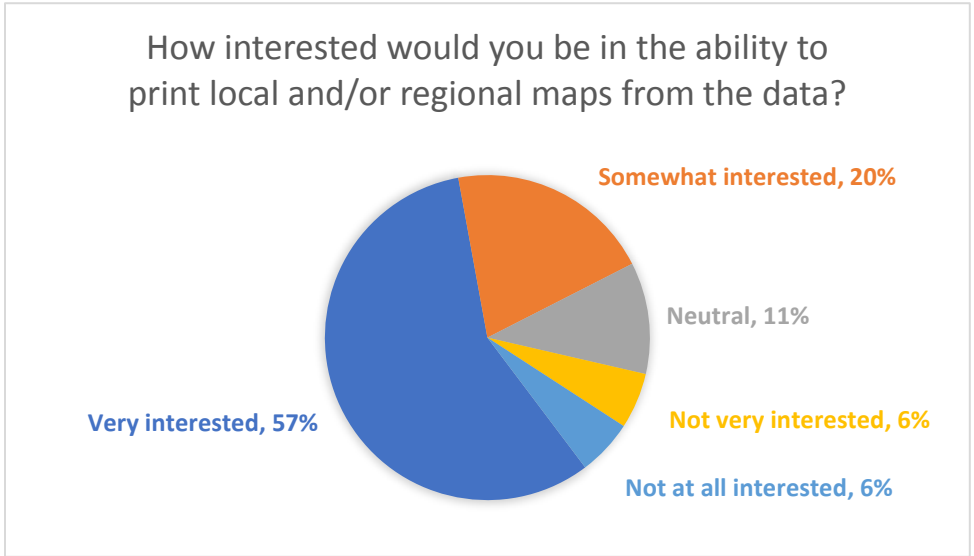Not very interested, 6%

Not at all interested, 6%

Figure 12: Interest in Printable Maps (n=54).

The level of interest was slightly lower when participants were asked about the ability to download spatial datasets or tables (GIS shapefiles, MS Excel files, etc.). Of the 54 participants who responded, 72% expressed some level of interest, with only 44% selecting 'Very Interested' and 28% selecting 'Somewhat Interested' (Figure 13). About 13% indicated that they were neutral about this function, and 14% reported being 'Not Very Interested' (7%) or 'Not At All Interested' (7%).
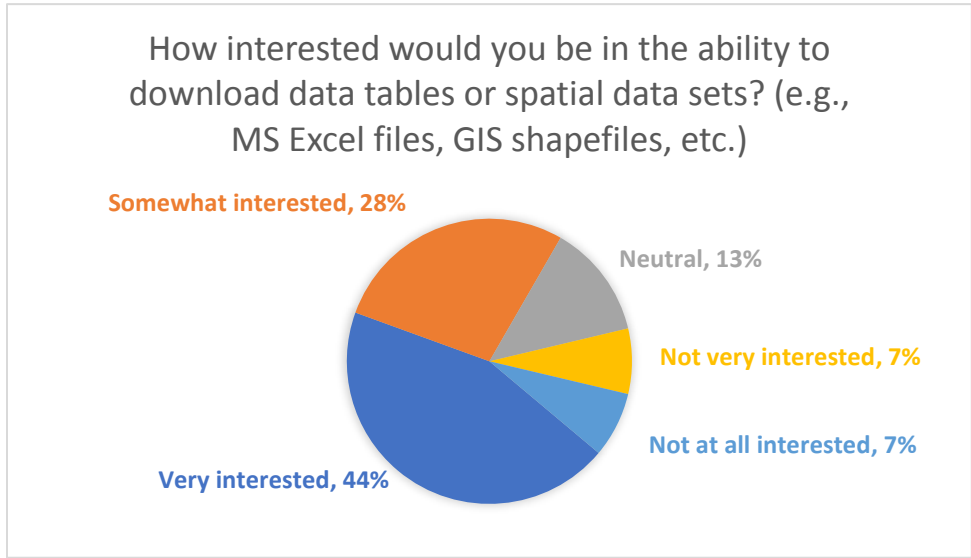
Figure 13: Interest in Downloadable Tables and Datasets (n=54).

There is the possibility for this project to be scaled up in the future based on the outcomes of this regionally-focused database. Participants were asked to rate their municipality's interest in viewing statewide shellfish data in addition to regional data for shellfish management purposes. About 68% of the 50 respondents indicated that their municipality would be 'Very Interested' (38%) or 'Somewhat Interested' (30%) in an expanded area of focus (Figure 14). A larger percent of respondents selected 'Neutral' than in previous format questions (24%), and a lower percentage selected 'Not Very Interested' (4%) or 'Not At All Interested' (4%).
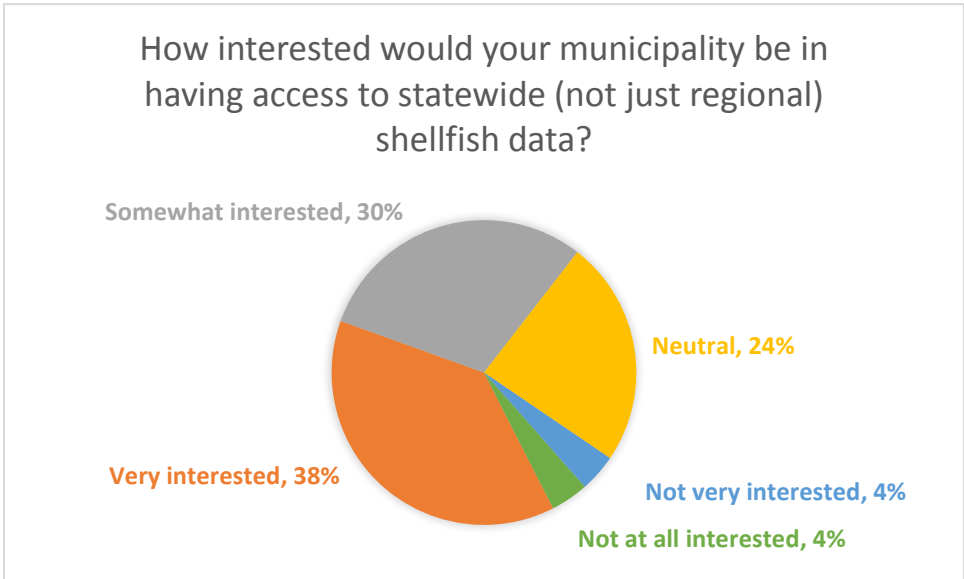

Figure 14: Interest in Statewide Database (n=50).

In a follow-up to this question, participants were asked to describe how they would use statewide data if it was available. Some of the most common responses expressed interest in comparing management and conservation

strategies across municipalities, viewing trends in landings and water quality data, and identifying common challenges in order to foster collaboration.

There was also an open-ended question to gather any other input on the database project that this survey overlooked, or to share insights into how this database could be used in the participant's work. Several respondents recommended that the database needs to be accessible to people with less computer experience and "fisherman-friendly," and emphasized the importance of the database being cellphone-compatible and printable. Some comments expressed concern with the accuracy of shellfish survey data collected by license holders. Others emphasized the importance of involving communities throughout the process of building the database or in the ability to organize the data to answer specific questions.

VI. Municipal Support

This section of the survey gauged the level of support that municipalities may be willing to contribute to an online shellfish database, whether in data, staff time, or financial support. When asked whether municipal staff or shellfish committee members would be willing to contribute municipal data, 44% of the 48 respondents selected 'Somewhat Likely' and 27% selected 'Very Likely.' while 17% selected 'Neutral' (Figure 15). About 6% indicated that it was 'Not Very Likely' and 6% indicated that it was 'Not Likely At All.'

How likely is it that municipal staff or shellfish committee members would be willing to contribute municipal data to this database?

- Somewhat likely, 44%
- Neutral, 17%
- Not very likely, 6%
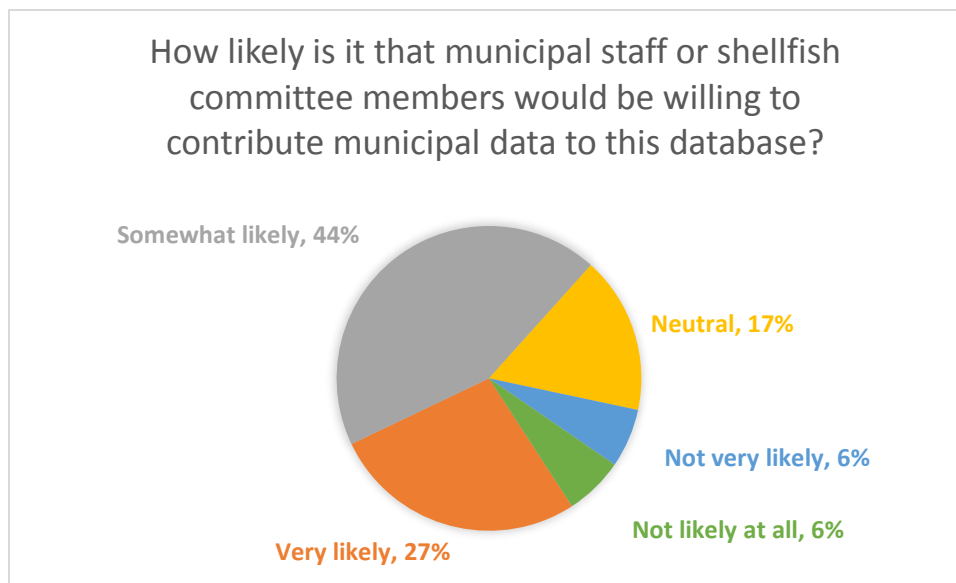- Not likely at all, 6%
- Very likely, 27%

Figure 15: Likelihood of Municipal Data Contribution (n=48).

The following question asked respondents who would be responsible for uploading municipal data if they selected 'Somewhat Likely' or 'Very Likely' in the previous question. About 32% of responses were 'Shellfish Committee Chair,' and another 32% were 'Other' (Figure 16). Common follow-up responses to this included a coastal/marine resource managers, shellfish managers, or a combined effort from the municipal shellfish warden, municipal shellfish committee, and town clerk[4]. The next most common response was 'Municipal Shellfish Warden' (29%), followed by 'Town Clerk' (5%) and 'Town Planner' (3%).

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[4] Some municipalities have a coastal/marine resource manager in addition to a shellfish warden. A warden's role is often more regulatory and focused on enforcing the municipal shellfish ordinance, while a resource manager may focus on the administrative needs of a municipal shellfish program. This varies by municipality.
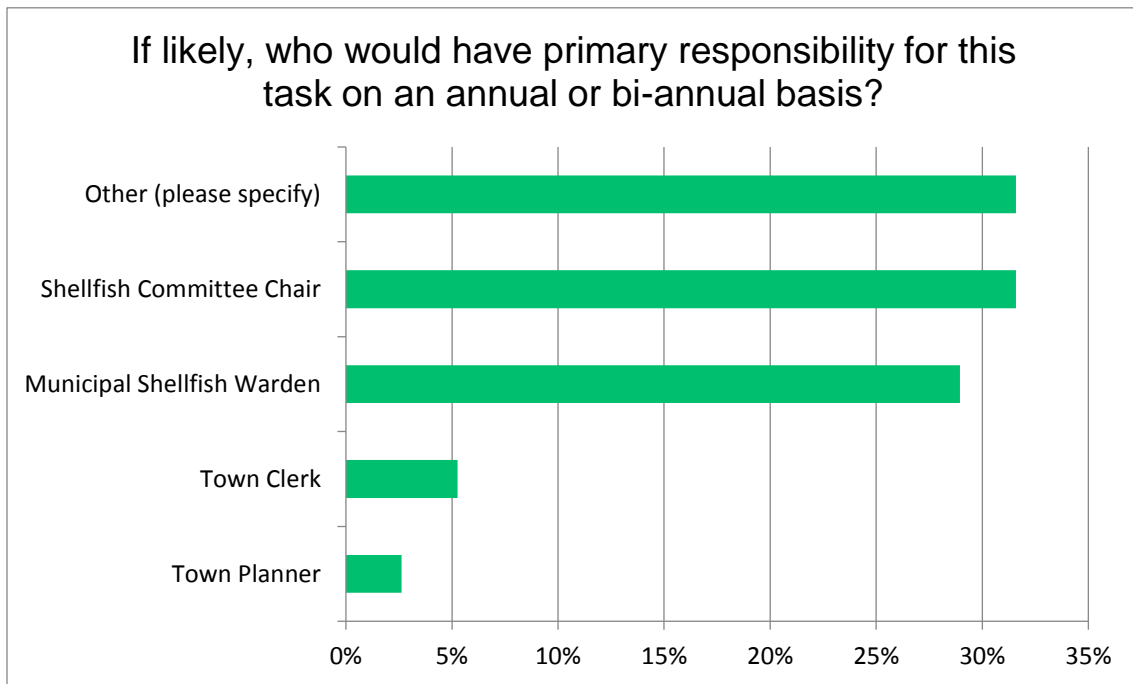
Figure 16: Responsibility for Municipal Data Contribution (n=38).

When asked about the likelihood of financial contributions to the maintenance of the database, many of the respondents were 'Unsure' (51%) or indicated an unwillingness to pay (31%) (Figure 17). Only 8% selected the lowest paying bracket, $0-$50, and even smaller percentages of respondents selected the higher brackets.
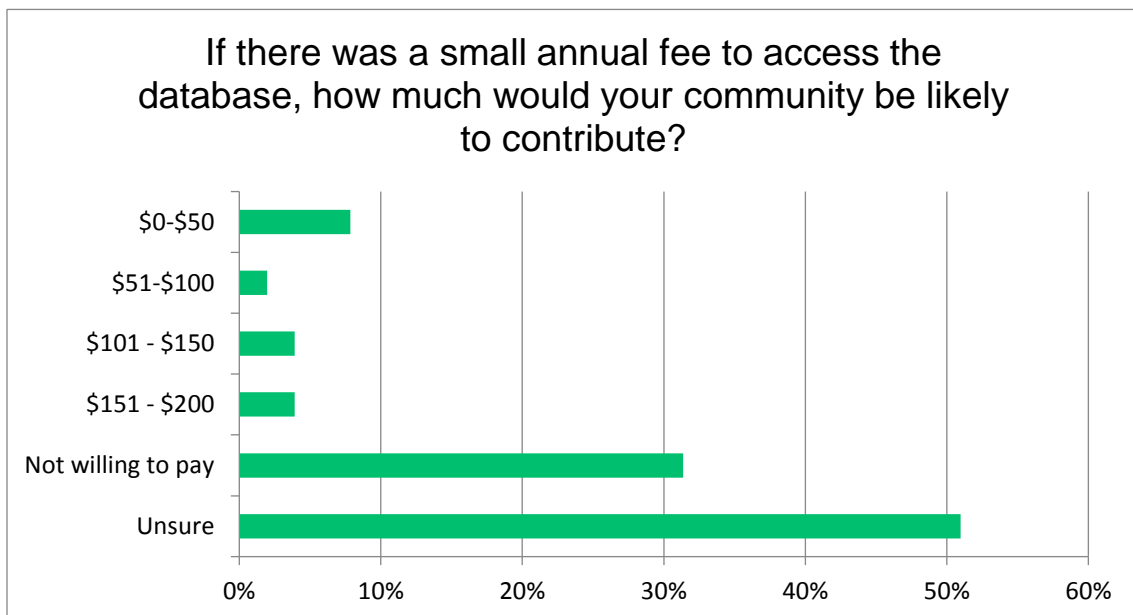

Figure 17: Likelihood of Municipal Financial Contributions (n=51).

VII. Conclusions and Recommendations

Currently, the wild-harvest shellfish industry is facing a multitude of challenges—predation, ocean acidification, and other ecosystem changes that are contributing to shifts in shellfish resources. Soft-shell clam landings, which have historically been the backbone of Maine's intertidal wild harvest shellfish industry, have followed a declining trend for decades, while quahog landings have followed an increasing trend over the last 10 years. This poses new challenges to harvesters and municipal shellfish committees as they try to adapt, often with limited data and information. Many of the relevant data and information are not publicly available, not updated, and/or not accessible to someone without technical expertise or training. This project's goal is to create a centralized, user-friendly means of accessing data for shellfish management by creating several themed map viewers that address specific management, conservation, and planning questions. Shellfish committees will be able to use these viewers to site conservation activities, prepare for the impacts of a changing climate on intertidal habitats, and share information with other shellfish committees.

The feedback from this survey indicates broad support for the creation of a map-based, visual database that offers multiple ways to interact with and access the data. Many respondents indicated interest in being able to print tables and maps, download datasets, and access the database on a cellphone. Many of the respondents reported that their municipal shellfish committee or organization is currently focused on the issues of municipal conservation, such as re-seeding and shellfish surveys, addressing predation on clam populations, or on municipal management decisions, such as licensing and conservation closures. Currently, many of these decisions are based on license allocations, local knowledge, and municipal shellfish surveys. The data portal represents a chance to store and share this knowledge over time, while expanding the data and information available to make management decisions. When resources allow, there is also strong support for the expansion of this data portal in order to compare trends and exchange management and conservation strategies coastwide.

The marine and environmental datasets in which participants expressed the most interest can be sorted into a few different themes that align with many of the interests and concerns stakeholders referenced in this survey. These themes (and associated datasets) could include: 1) siting conservation activities (water quality, municipal shellfish survey data, municipal shellfish conservation activity information, DMR shoreline survey data, DMR landings data by species, predator trapping or monitoring data; other uses in the intertidal zone, and marine sediment maps); 2) finding and fixing pollution sources to reopen closed mudflats (point-source pollution, failing septic systems, wastewater treatment plants, CSOs, watershed boundaries, rainfall closure data, industrial/agricultural landcover, and zoning); 3) monitoring habitat change (sea level rise forecasts, marsh migration forecasts, DMR shoreline surveys, shoreline erosion rates, and historical/current eelgrass data); and 4) evaluating competing uses/access to the intertidal (public access points, aquaculture leases (existing/proposed), shoreline surveys, aerial photography).

Some challenges that this survey highlighted include ensuring data integrity, securing sustained municipal data contributions, and making the data portal user-friendly. Several participants brought up a concern that municipal shellfish surveys may not use standardized, consistent methods of data collection or recording methods, and that using this data in the portal would be misleading. As an aside, Manomet is developing guidance for municipal shellfish committees to increase the consistency and accuracy of survey techniques, in collaboration with the Casco Bay Regional Shellfish Working Group and DMR. This guidance will hopefully improve the quality of future surveys. While data gathered by municipalities may not undergo a quality

assurance process, this data will include a disclaimer when used in the data portal so that users to understand its source and limitations.

Another potential barrier is sustaining municipal data contributions without significantly increasing the burden on town staff, shellfish wardens, and shellfish committees that may already have limited capacity. Several participants flagged this concern in open-ended questions, which was mirrored by the 29% of respondents who selected 'Neutral,' 'Not Very Likely,' or 'Not Likely At All,' when asked about their municipality's willingness to contribute data to the data portal. When asked about who would likely have this responsibility, most respondents selected 'Other,' and indicated that the responsibility could fall to several different parties. While this project cannot address the time and capacity constraints of municipal shellfish programs, this emphasizes the need to simplify the data input process. For example, since a primary data source from municipalities is the annual DMR Annual Shellfish Management Review report, collaborating with DMR on making data and information from these reports available electronically would significantly reduce time needed for data entry each year.

The data portal development team could also help municipalities identify a clear division of responsibility for inputting data and include it in the data portal maintenance plan. Concerns about accessibility of the data portal can be addressed by organizing training sessions for stakeholders and by organizing data around actionable themes to inform specific decisions. The data portal will also undergo user-testing with actual stakeholders with different roles in the shellfish community to make sure the design is intuitive and tailored to its real-world uses.

The development of an interactive online data portal of physical, biological, and social data in the intertidal will support municipal planning and decision making around habitat conservation and enhancement of wild shellfish species in the intertidal zone. By creating a resource that is accessible and action-oriented, communities will be able to better understand Casco Bay ecosystems, adapt to climate change impacts in the coastal zone, and plan for the restoration and conservation of wild shellfish populations. Healthy shellfish populations sustain harvester jobs and provide vital ecosystem services. This supports two strategies outlined in the *Maine Won't Wait: A Four-Year Plan for Climate Action Plan*, as well as five of the recommendations to achieve those strategies*.*

VIII. Next Steps

The feedback gathered in this needs assessment survey will be used as the basis for a shellfish geodatabase plan, which will include a preliminary plan for the data portal's interface and functions. This plan will also include a review of existing datasets and their sources, and will highlight data that is not currently available. The survey data will be supplemented with additional scoping sessions with a broader range of stakeholders, including town planners and organizations providing technical support to municipalities. This will inform the development of the first iteration of the data portal for user-testing and feedback sessions with stakeholders. Once the final iteration of the data portal is developed, a user training and outreach plan will be developed and implemented to ensure that the tool reaches its key audience and is accessible. From there, a long-term maintenance and funding plan will be developed to keep the data portal up-to-date.

IX. Acknowledgements

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